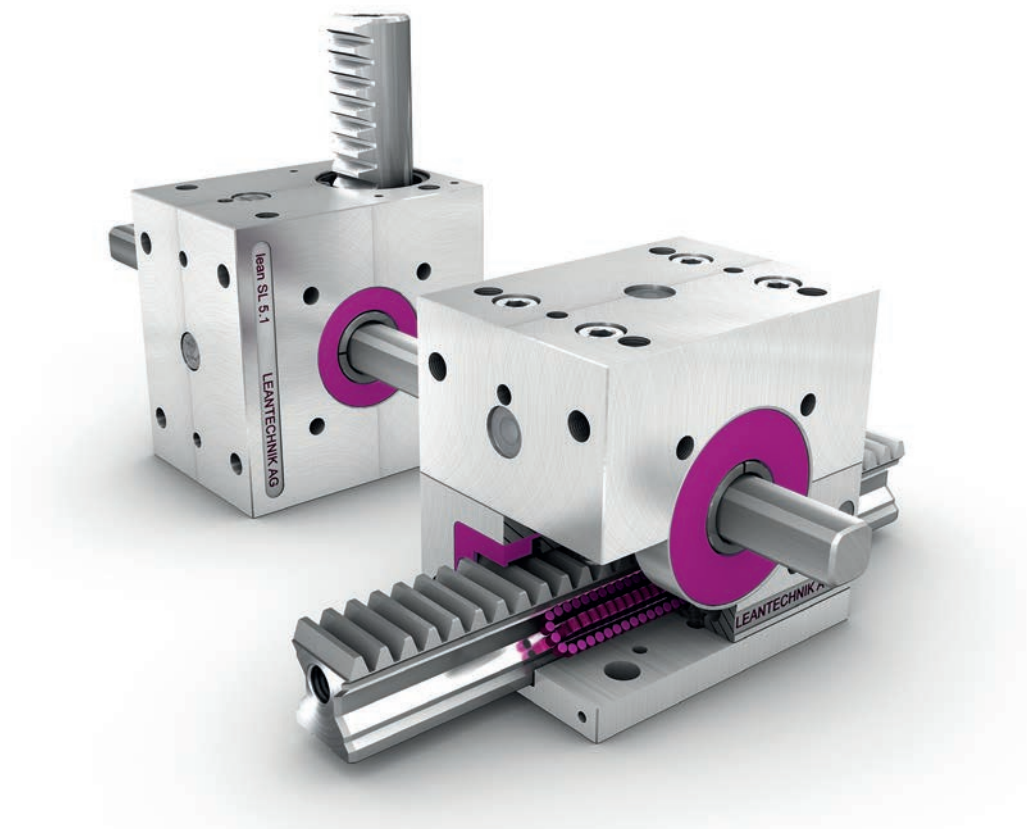


# LEANTECHNIK AG

## Full catalog lifgo® & lean SL® 5



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## Introduction

Dear reader or user,

Whenever synchronous, precise, fast, and high-performance motions are required, our lifgo® and lean SL® gear rack gearboxes are reliable, proven functional components in a variety of industry sectors.

Below, we present the product series and the new accessories available for our gearboxes. The various operating options and the increased number of available item combinations are just a few of the benefits offered by our modular system which we intend to extend still further in the coming years.

In addition to our lifgo® and lean SL® series of gearboxes, we also provide functional units and partial and turnkey systems, which are sold in all variations under the leantranspo® name. Here, our individualized approach to manufacturing in combination with a modular system brings many advantages.

Get a picture of the multifaceted possibilities for applications and combinations. The modular construction of our products allows countless variants, which are presented here in excerpts and examples. The present catalog has been extended to include a variety of technical data. Accessories such as the compensating block for guide cars and the mechanical arrest system have also been included in the product portfolio.

Do not hesitate to visit our website to find further information on ways of solving a range of lifting and synchronisation tasks:

### [www.leantechnik.com](http://www.leantechnik.com)

Our website has videos showing our gearboxes in numerous applications. In addition to the application examples, you can also explore the function and installation of our products in animated pictures.

The "download" area also has 3D data and models of the products for download in various file formats.

### CD

We will be happy to send you a CD containing the video presentations of our products, as well as CAD data in 2D and 3D and standards for toolmaking.

### The LEANTECHNIK AG Team

Our team is ready to support you in implementing your ideas. Call us or make an appointment to discuss your individual lifting and transfer application with us.

We hope that you will find our product range of interest and look forward to hearing from you. Our catalog will give you an initial overview of our products and services. We will be happy to assist you in any way in finding a solution for your individual lifting application.

Your LEANTECHNIK AG Team

Quality Management Certification in accordance with DIN EN ISO 9001  
Registration no. 254883 QM ff.

## Generation 5 • lifgo® & lean SL® 5

Generation 5 combines two gearbox concepts: the proven lifgo® and lean SL® series are now compatible. Each series has its strengths, and the combination can yield the optimal result for your lifting application.

**lifgo®** with linear guided gear racks, for fast and precise requirements

**lean SL®** with round gear rack guides, for simple lifting motions

**leantranspo®** is the name given to the partial and complete functional systems based on lifgo® and lean SL®

Thanks to the various possible combinations, countless types of lifting systems can be designed economically and efficiently. The logical, modular construction of the units results in a modular system that offers design engineers enormous flexibility and versatility in operation using just a few accessories. This modular system comprises all the components required for the construction of simple lifting systems through to complex transfer and shuttle solutions – in proven **LEANTECHNIK AG** quality.

### lifgo® 5.0 to 5.3 • Unique features

#### One basic model – four variants

lifgo®, lifgo® linear, lifgo® double and lifgo® linear double share the same basic design, allowing problem-free replacement, expansion, and flexible system design.

#### 4-way roller guide for gear rack on lifgo®

This design allows higher loads and lower operating noise levels.

#### Adjustable precision with eccentric configuration

You can adjust the tooth flank clearance and precision of the gearboxes yourself with the “eccentric” configuration.

#### High resisting torque for more transverse force bearing capacity

lifgo® 5 can support high transverse forces, thanks to its excellent resistance torque.

#### Four standard pinion shafts for creative system designs

Four standard pinion shafts – profile (PW), one or two pins (ZA 1/ZA 2), and a hollow shaft with keyway (PFN) – are available for all sizes of lifgo® and lean SL®.

#### Long service life for durable use

lifgo® 5 stands for quality and guarantees reliable functionality.

#### Gear rack protection – simple and flexible

Environments with high levels of contamination or dust call for the use of a gear rack protection with a simple, secure screw-type fixing mechanism that permits versatile use.

#### Simple installation with few accessories

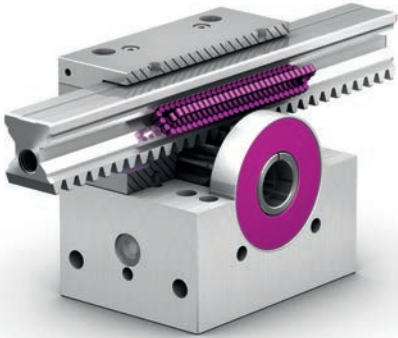
Thanks to the modular system design, only a small number of accessories are required to install the lifgo® 5. This simultaneously reduces the cost to the user.

#### More options thanks to flexible mounting

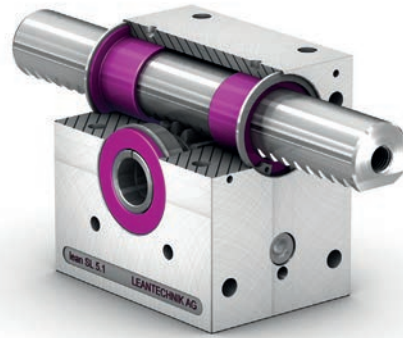
lifgo® 5 possesses fixings on 4 sides. It can therefore be installed on all horizontal and vertical surfaces.

#### Compatibility for flexible design

lifgo® and lean SL® are compatible – the two gearbox series can be combined in one and the same system.



lifgo®



lean SL®

### lean SL® 5.0 to 5.3 • Unique features

#### Large diameter, wide tooth profile

With a large gear rack diameter and wide tooth profile, the lean SL® series is particularly resistant to bending in the guide areas and possesses a long service life.

#### Long service life for durable use

The lean SL® is a robust gearbox that is characterized by its long service life.

#### Easy-to-install, versatile gear rack protection

The lean SL® gear rack protection is easy to use and suitable for practically all sectors of industry.

#### More options thanks to flexible mounting

lean SL® possesses fixings on 4 sides. It can therefore be installed on all vertical and horizontal surfaces.

### leantranspo® • Unique features

#### Unlimited possibilities

The leantranspo product range comprises the development and design of partial and complete functional systems based on lifgo® and lean SL®. Whenever mounted parts, motors and steel constructions are used in addition to the two gearbox systems, then the supplied components form a leantranspo® system.

#### Professionalism and experience


Take advantage of the long-standing experience of our engineering team which will be happy to advise you regarding all your development and design requirements.

#### Custom solutions

leantranspo® means tailor-made solutions that are designed specifically for you so that they respond perfectly to your particular requirement.

## Using this manual

To ensure clarity and ease of use, there are just a few graphic symbols and styles that will help you navigate through this manual:

|                 |   |  |
|-----------------|---|--|
| 1. Note         |  | Important installation, safety, and functional notes, as well as information on dimension sheets and tables. |
| 2. Colored type |   | Indicates <b>important information</b> in the text.  |

## Applications, designs, and service

The applications and designs presented below are by way of example only.

Individual designs are created and calculated according to the technical requirements of the application. Countless applications are possible in principle, and not all of them can be presented. Give your imagination free rein. If you have questions or if we can assist you with your ideas, please call us.

Ask us to check the design of your application for you. The results of this verification can be incorporated in your design work to help you find the best possible solution.

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Our products are subject to continuous further development. We reserve the right to make technical changes that support product improvements © LEANTECHNIK AG/patented and utility patent no. 296 15 825.9. Reproduction of any kind, in whole or in part, requires our written permission.



## References (sample)

### A

ABB Automation GmbH  
 ABB Engineering Shanghai Ltd.  
 ADAM OPEL AG  
 AP&S International GmbH  
 A-Tooling Ab, Sweden  
 AUDI AG

### B

Benteler AG  
 BLEICHERT Automation GmbH & Co.KG  
 BMW AG/Group Ltd.  
 Braun GmbH

### C

Carl Zeiss Jena GmbH  
 CMC S.r.l.  
 Continental Reifen Deutschland GmbH  
 ContiTech Techno-Chemie GmbH

### D

Daimler AG  
 Dambach Lagersysteme GmbH  
 Dieffenbacher GmbH

### E

EBZ Group  
 Eissmann Automotive Deutschland GmbH  
 Emil Bucher GmbH & Co.KG

### F

Festo AG & Co.KG  
 FFT EDAG Produktionssysteme GmbH & Co. KG  
 FLABEG Deutschland GmbH  
 Ford of Europe GmbH  
 Ford Motor Company of Australia Limited  
 Ford Motor Company U.S.

### G

Gehring Technologies GmbH  
 Goodyear Dunlop Tires Operations S. A.  
 GROB-Werke GmbH & Co.KG

### H

Herrhammer GmbH  
 Hörmann Automotive Gustavsburg GmbH

### I

Ideal-Werk C. + E. Jungeblodt GmbH + Co. KG  
 Illig Maschinenbau GmbH & Co. KG  
 Ilseemann Automation  
 Inductoheat Europe GmbH  
 IWM Automation GmbH

### J

Johnson Controls Autobatterie GmbH & Co. KGaA  
 Julius Blum GmbH

### K

Kolb Technology GmbH  
 KUKA Flexible Manufacturing Systems (Shanghai) Co., Ltd.  
 KUKA Roboter GmbH  
 KUKA Systems GmbH

### L

Liebherr Group

### M

Manz Automation AG  
 Miele + Cie. KG  
 Muhr & Bender KG  
 Müko Maschinenbau GmbH  
 Müller Weingarten AG

### N

Neue Halberg-Guss GmbH

### O

Olbrich GmbH  
 OPTIMA packaging group GmbH  
 Otto Bihler Maschinenfabrik GmbH & Co. KG

### P

Papier-Mettler  
 Pintsch Bamag Antriebs- & Verkehrstechnik GmbH  
 Porsche AG PSE AG

### R

RENAULT s.a.s  
 Robert Bosch GmbH

### S

Saint-Gobain PAM Deutschland GmbH  
 Schaefer Förderanlagen- & Maschinenbau GmbH  
 Schuler Group  
 Siempelkamp GmbH & Co. KG  
 SK Hydroautomation GmbH  
 SLCR Lasertechnik GmbH  
 Sollich KG  
 Sturm Group

### T

Thyssen Krupp Lasertechnik GmbH  
 Thyssen Krupp Steel AG  
 ThyssenKrupp System Engineering GmbH  
 TMS Transport- und Montagesysteme GmbH

### V

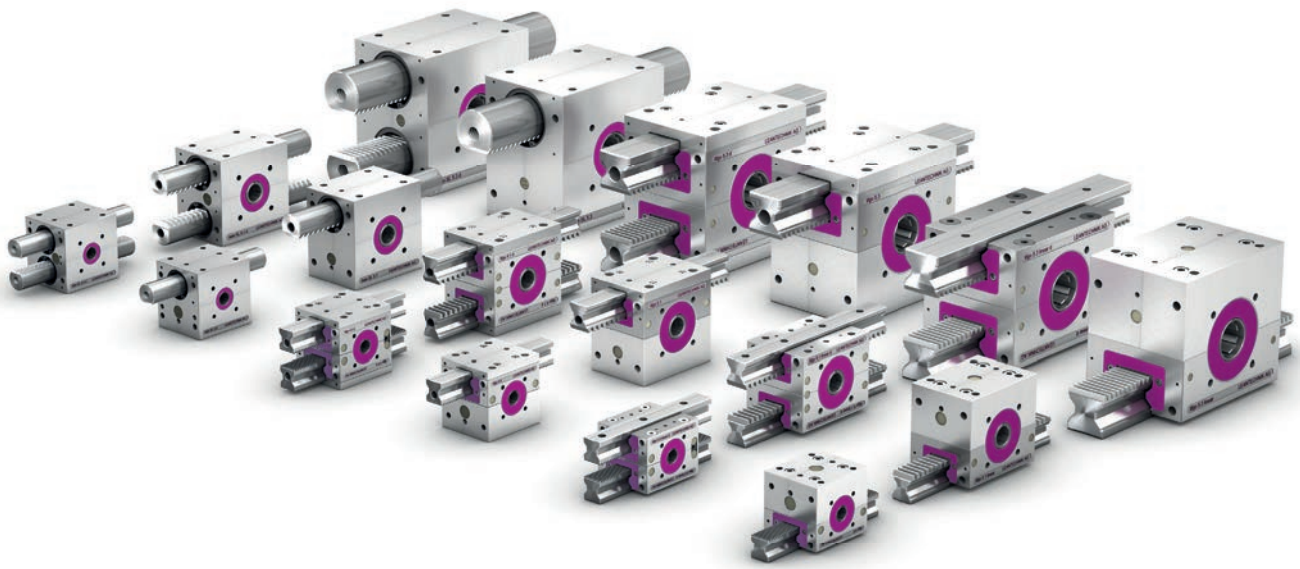
Vacuumschmelze GmbH & Co KG  
 Voestalpine AG  
 Voith Industrial Services GmbH  
 Voith Paper GmbH & Co.KG  
 Voith Turbo GmbH & Co.KG  
 Volkswagen AG

### W

Wafios AG  
 Wanzl Metallwarenfabrik GmbH  
 WICKERT Maschinenbau GmbH  
 Wieland-Werke AG

### Z

Zasche Sitec handlings GmbH  
 ZF Lenksysteme GmbH



## 1 Function & combination

### 1.1 Introduction to functionality

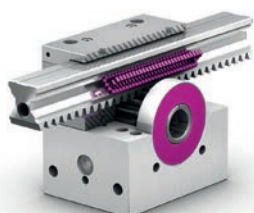
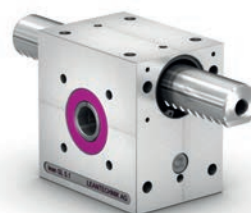
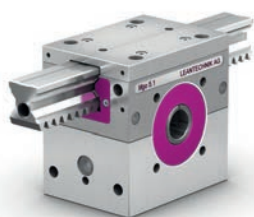
lifgo® and lean SL® are two gearbox series offering different performance levels. They are both available in three different sizes.

**lifgo® 5.0 – 5.3:** Lifting, guiding, and positioning. Fast, precise, and strong

**lean SL® 5.0 – 5.3:** Gearboxes for simple, cost-effective lifting devices

Both gearbox types can be combined with each other. They are compatible with one another and support each other's functions. The differences and commonalities of our two series, lifgo® and lean SL®, are presented on the following pages.

#### lifgo® & lean SL® • Differences



lifgo®

lean SL®

The most important differences between lifgo® & lean SL®:

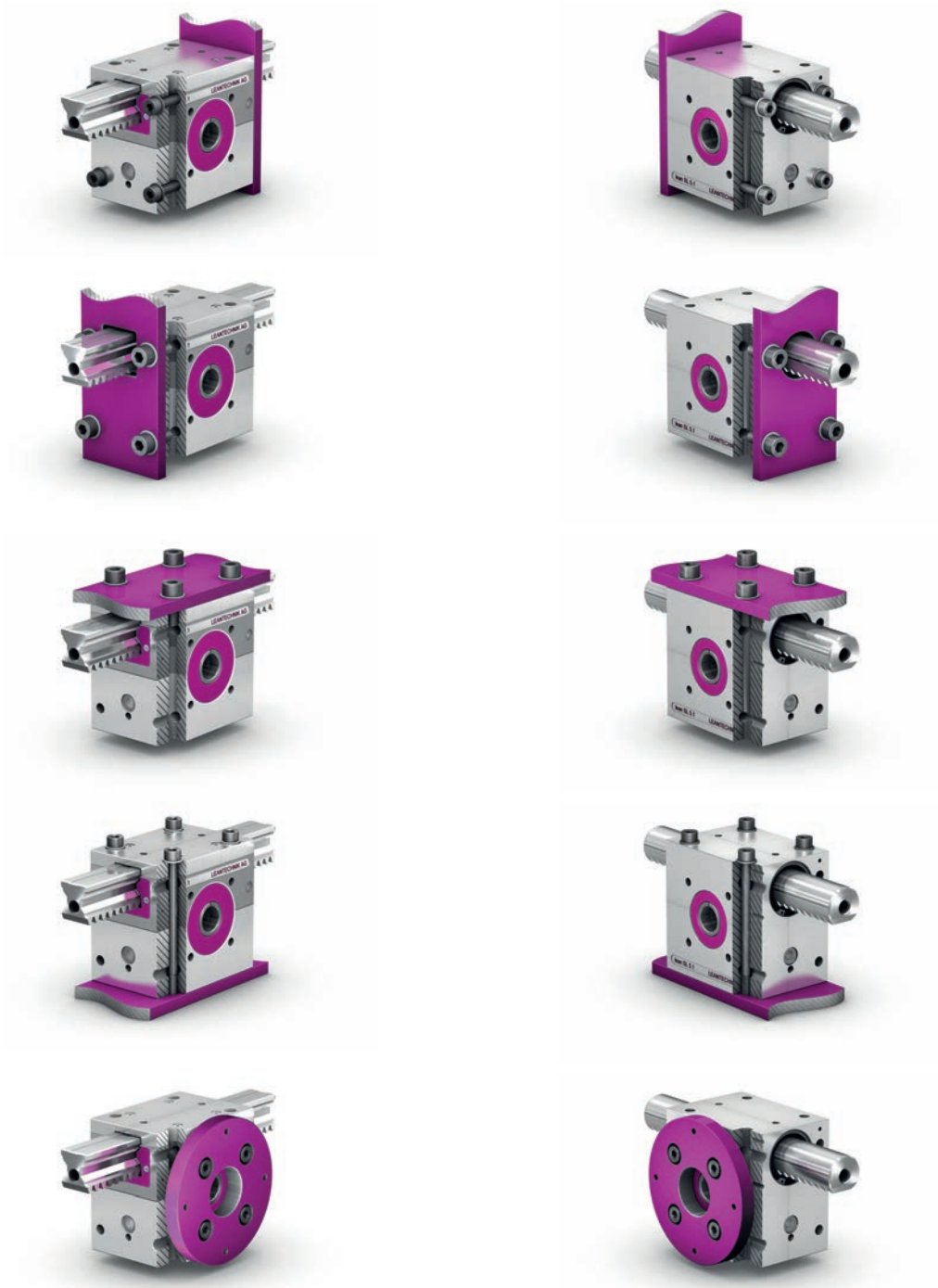
#### lifgo®

- 4-way roller guide
- precise guidance
- high positioning accuracy
- high lifting speed
- also available in "linear" and "double" variants

#### lean SL®

- sliding guide bearings
- simple guidance
- simplified positioning accuracy
- medium lifting speed
- also available as "double" variant

## lifgo® &amp; lean SL® • Commonalities



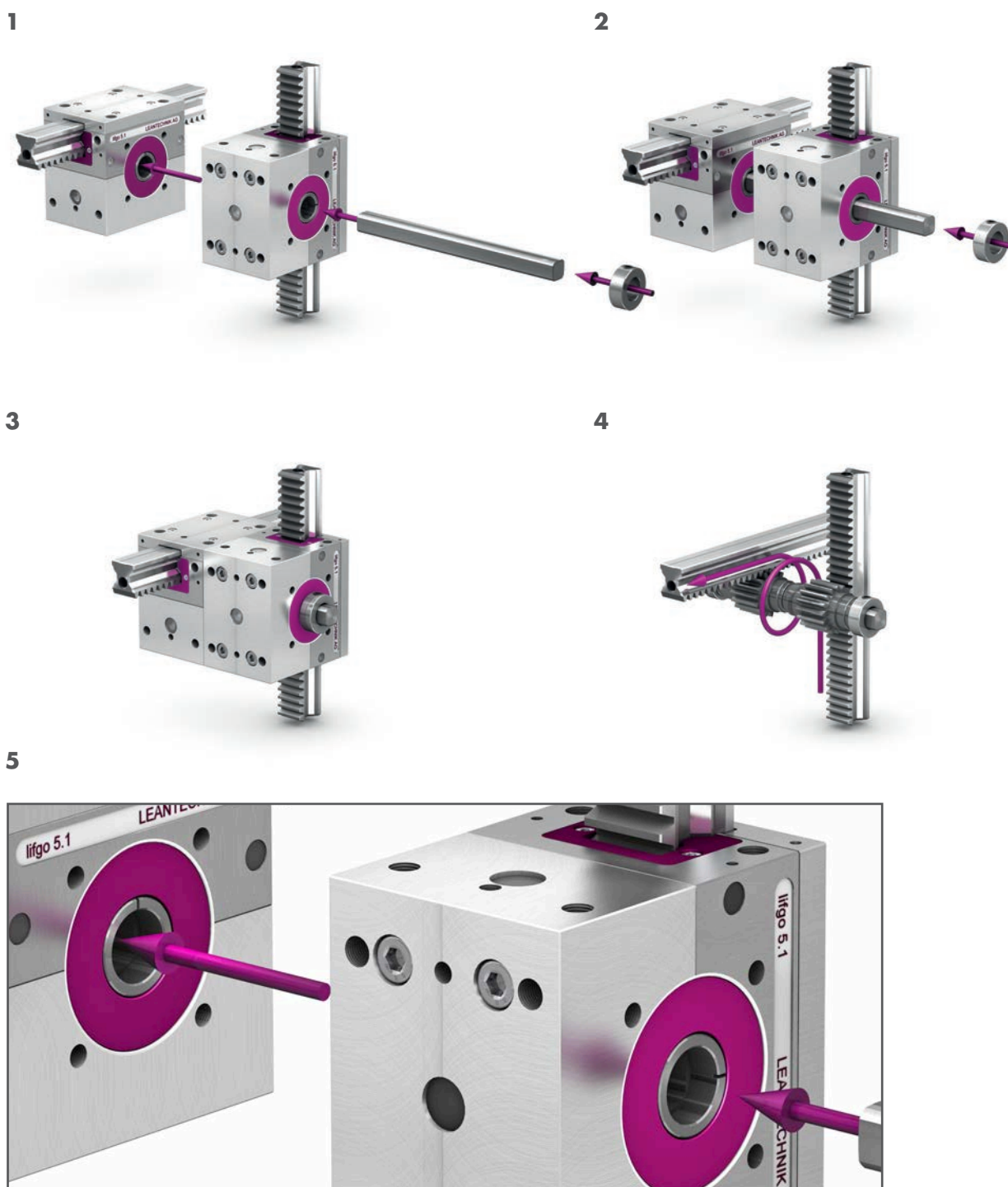
lifgo®

lean SL®

The most significant commonalities of the lifgo® and lean SL® gearbox series:

- Identical connection dimensions and screw mounts for each size
- Identical tooth pitch (to)/module and pitch diameter for each size
- Identical pinion shaft designs for each series and size
- Screws can be threaded in directly and/or passed through
- Gearboxes can be installed on horizontal and vertical surfaces
- Mounting screw dimensions are the same in vertical and horizontal orientation

## lifigo® &amp; lean SL® • Rotationally rigid, interlocked connection with profile shaft (PW)



Our profile shaft ensures a rotationally rigid, interlocked connection between the pinion with the horizontal gear rack and the pinion responsible for driving the vertical gear rack. A linear horizontal motion is thus converted to a linear vertical motion in a 1:1 ratio. The stroke (mm/360°) is different for each gearbox size (Fig. 1 – 3).

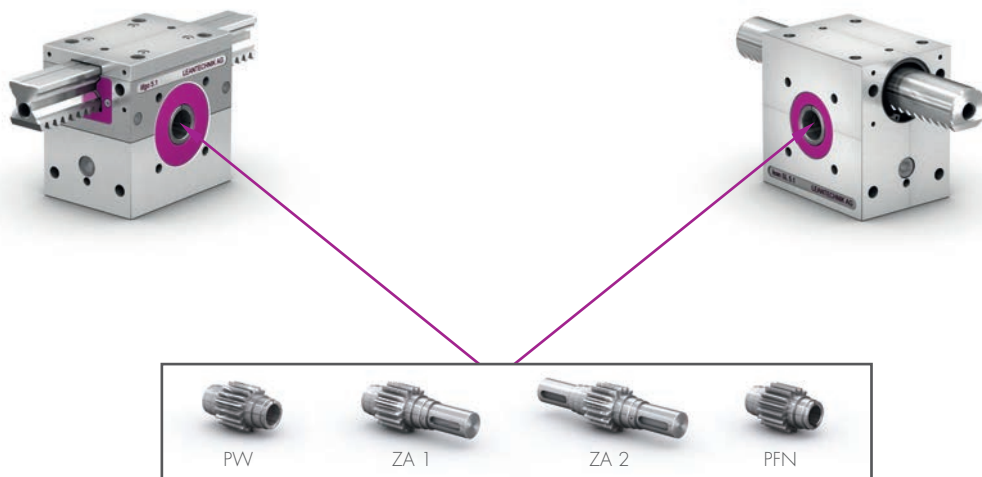
By sliding in the gear rack horizontally, the rotary motion is transmitted to the profile shaft by means of the pinion shaft (Fig. 4). The profile shaft synchronizes the tooth position of the gearboxes in 90° steps. For this to be possible, the gearboxes must be aligned in accordance with the positioning mark on the pinion (Fig. 5) and then both of them must be connected in this position to the profile shaft. As a result, the gear rack positions are also synchronized (simultaneous engagement of the gear racks with the pinion shaft is a prerequisite).

### lifgo® & lean SL® • Pinion shaft ends

In addition to profile shafts (PW) as a rotationally rigid connection, the lifgo® & lean SL® modular system offers three more standardized pinion shaft ends.

These include the pinion shafts with pins and a keyway, in versions with one pin (ZA 1) or two pins (ZA 2). A hollow shaft with a keyway (PFN) has also been standardized. The dimensions are the same for all lifgo® and lean SL® versions, for each size. They can be found on the dimension sheets.

The keyway and pin versions are particularly well suited for highly dynamic, low-clearance, and alternating load motions.



### lifgo® double & lean SL® double • Gearboxes with two gear racks



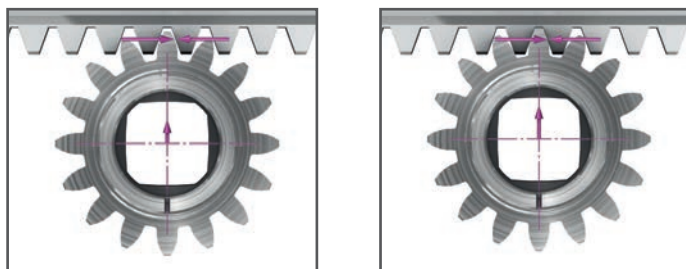
lifgo® double & lean SL® double with parallel gear rack guide in sizes 5.0 – 5.3. For use in gripper devices and gripper shuttle systems, for example.

## lifgo® • Features

The lifgo® gearbox series meets high standards and possesses some technical features and variants that the lean SL® and lean SL® double series do not provide:

### lifgo® eccentric: Adjustable tooth flank clearance

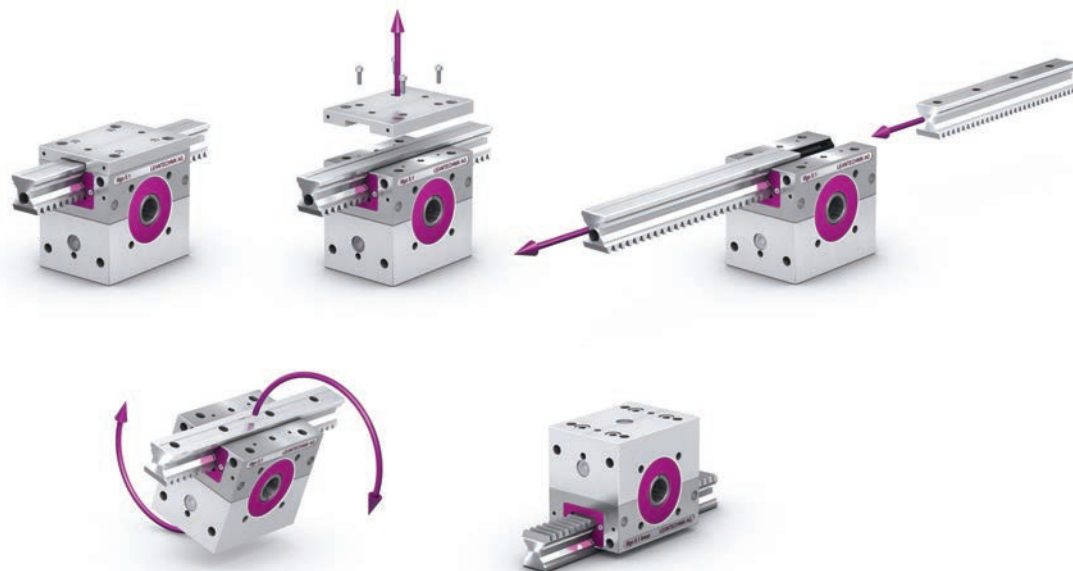
In the lifgo® "eccentric" version, the tooth flank clearance can be adjusted. Please indicate the desired positioning accuracy in the project data.



See also the adjustment values on pages 55/59.

**lifgo® linear:** long travel, any number of gear racks

**lifgo® becomes lifgo® linear:** By removing the adapter plate and making a few small adjustments, lifgo® can also be used as a "linear" module. It very simply becomes the right drive unit for long travel strokes.



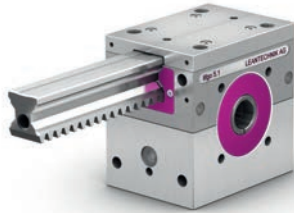
Applications:

**Horizontal & vertical stroke:** long travel with any number of multi-part gear racks

**Vertical stroke:** addition of reinforcement profiles at the tapped holes in the gear rack, and addition of auxiliary devices (e.g., suction pads, grippers, functional unit) at the end of the gear rack

## 1.2 Position & combination of the series

### The four basic positions of the gearbox



The sequence of pictures shows the basic assembly options in the horizontal and vertical direction. They are identical for lifgo® (top) and lean SL® (bottom). Note that both series can be combined with each other in all positions.



### Combinations of the series

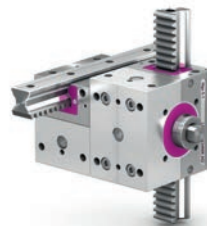
**lifgo® + lean SL®**



**lifgo® linear + lean SL®**



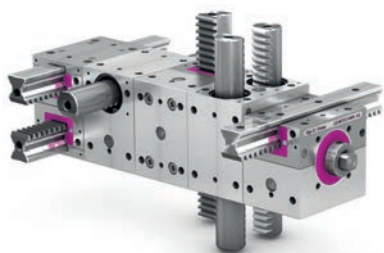
**lifgo® linear + lifgo®**



From high-precision to low-cost – compatibility between series reduces costs.

**lifgo® double + lean SL® + lifgo® + lean SL® double + lifgo® linear**

from left to right



The illustration above shows all the possible lifgo® and lean SL® gearbox combinations at a glance.

### Direction of rotation/operation



Gearbox combinations basically convert horizontal linear motion into rotation, and then into vertical linear motion. The drive motion can take place in any effective direction (arrow). Reverse operation is also possible.

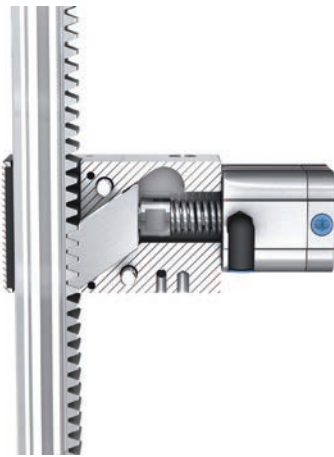
### 1.3 Mechanical arrest system for lifgo® & lean SL® (ASS)

The mechanical arrest system (ASS) is a mechanism that is mounted on the gearbox in order to prevent the uncontrolled descent of systems, system components or heavy weights and also to prevent the unwanted application of forces. It makes it possible to ensure that systems, machines or equipment do not descend suddenly or collapse during inspections or repair work. When used in combination with lifgo® or lean SL® gearboxes, the ASS can also be used as a positioning unit for a given value. Please ask us.

The **secured force is 5 times greater than the nominal force** of lifgo® or lean SL® gearbox. **It is not permitted to exceed these forces at any time.** However, should this occur then it is essential to check the functioning of the ASS, the lifgo® or lean SL® gearbox and the gear rack. Otherwise, correct functioning can no longer be guaranteed.

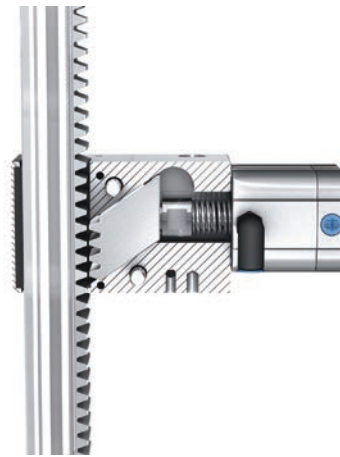
The **direction of securing** is opposite to the lifting direction and securing is possible **in only one direction of movement** (see figures) and only provided that an electronic drive containing a service brake is used.

1



Mechanical arrest system locked

2



Mechanical arrest system unlocked

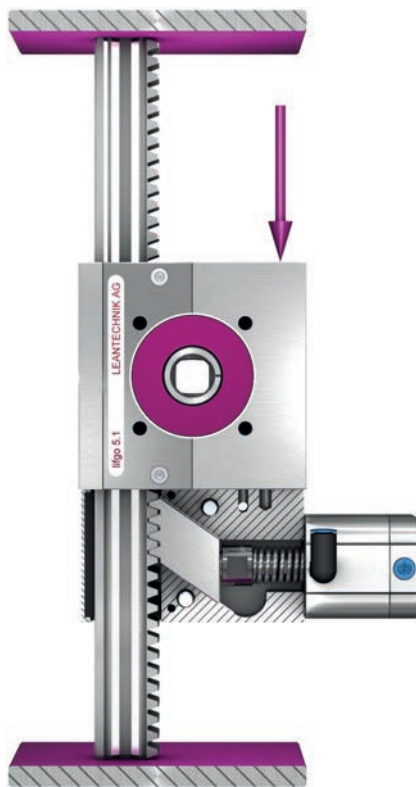
This protective device has a simple, robust method of operation. In normal operation, an air cylinder keeps the ASS open against a mechanical spring pressure. This is the "free-moving" position.

When it is necessary to apply the protective device, the system is first stopped. The air is drained from the ASS air cylinder and the spring pressure forces the toothed bar towards or into the gear rack. The inductive switch at the air cylinder indicates that the mechanism has left its "free-moving" position. The system is now descended **at low speed** until the spring pressure fully engages the toothed bar in the gear rack (see Fig. 1). When this locked position has been reached, a second inductive switch indicates this to the control unit. The downward movement is then stopped immediately. The system is now mechanically held in place by the interlocking components.

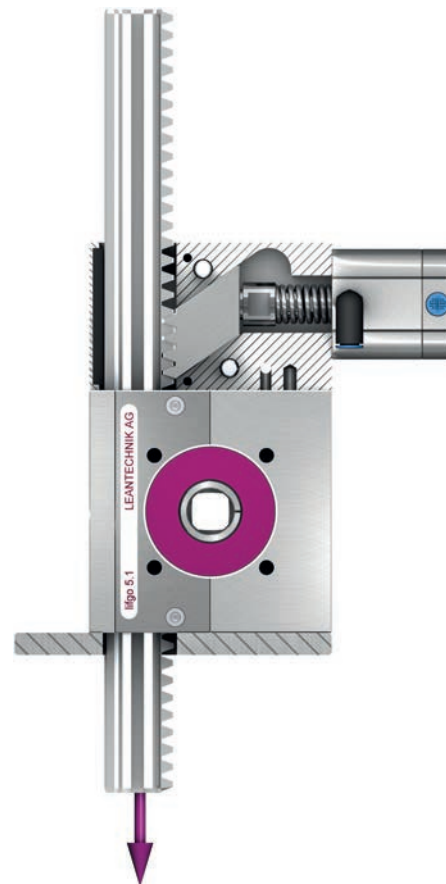
To unlock the system again, it is necessary to repressurize the air cylinder. Next, the system is raised **at low speed** again (see Fig. 2). The toothed bar is released and pressed back by the pressure of the cylinder. The inductive switch first indicates that the system is no longer in the locked position and then reports that the free-moving position has been reached. The system can now resume normal operation.

In the event of a power supply failure, the system's service brake must first be activated. Slightly afterwards, the air cylinder is depressurized. The toothed bar moves towards the gear rack to just in front of the closest tooth. If the system does not descend any further then the ASS remains in this position. However, if for any reason, the system continues to descend then the spring pressure presses the toothed bar into the next possible tooth space and consequently locks the system in place due to the action of the interlocking components.

In accordance with VDE and EU guidelines, all the functions must be wired in a suitable control unit in compliance with DIN 60204.



Gearbox moves the lift load



Gear rack moves the lift load

Aachen University tested the ASS in November 2012 and confirmed its suitability for use.



## 2 Applications & examples

### Note on the presentation of the application examples

On the following pages, we present the most important possible applications and uses for the lifgo® and lean SL® series.

In order to achieve a uniform view of the many different applications, the gearbox size 5.1 was used for all the presentations. All applications shown can, of course, also be implemented in the sizes 5.0 and 5.3 – with lifgo®, lean SL®, or a combination of the two series.

**!** The detailed depiction indicates which of the two series is used in each application. This is of importance depending on the concrete application in question. You can also trace the force flow and motion sequences. In many cases, reverse operation is also possible.

### Explanation of the term primary gearbox **P**

Note the role of the primary gearbox in the illustrations and applications. It distributes the drive forces acting on it within the lifting system, and does not perform any direct lifting, pushing, or positioning task itself.

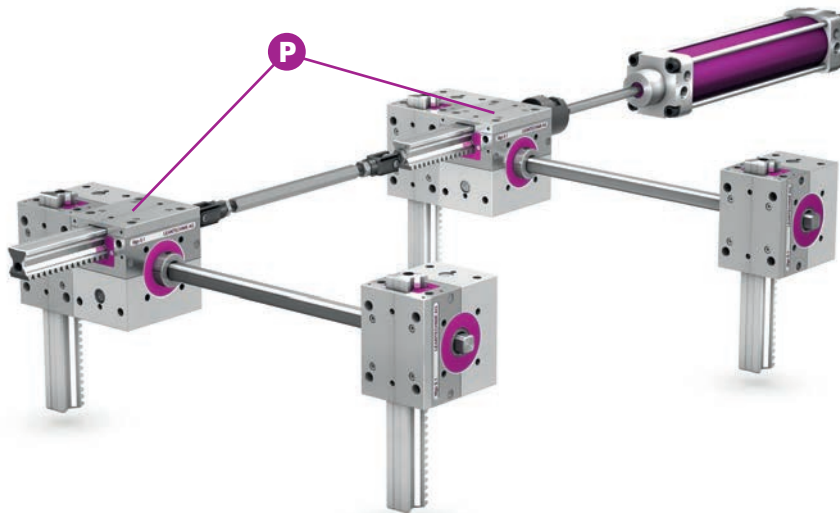
The gearbox itself is no different from other gearboxes. The terminology refers solely to its location.

**!** The maximum permissible force transmission (= **nominal force, in Newtons (N)**) of an individual gearbox must not be exceeded.

## 2.1 Synchronous lifting motion

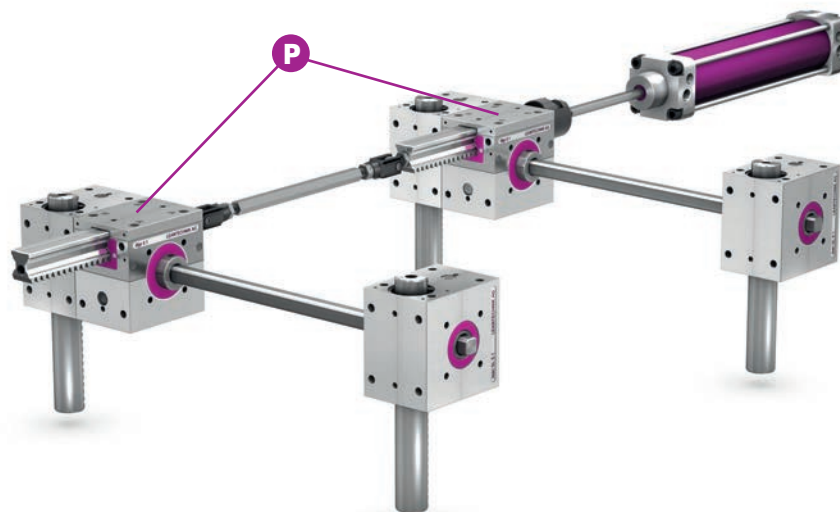
For the systems shown below in this chapter, all lengths and distances as well as the lifting speed and load capacity can be freely selected.

### Standard lifting system with lifgo® and air cylinder drive



The two primary gearboxes from the lifgo® series each distribute half of the maximum potential force to the four gearboxes with vertical gear racks. The lifgo® gear racks bear the applied loads, and can absorb transverse forces.

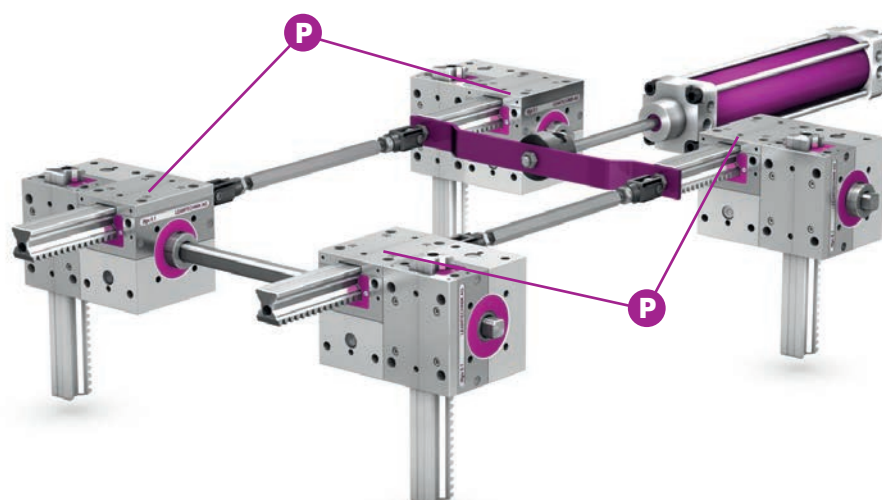
### Standard lifting system with four lean SL® units as vertical gearboxes



A plate or device bolted to the end faces of the gear racks ensures the vertical orientation of the gear racks in the real-life application.

! Transverse forces are not permitted in this application.

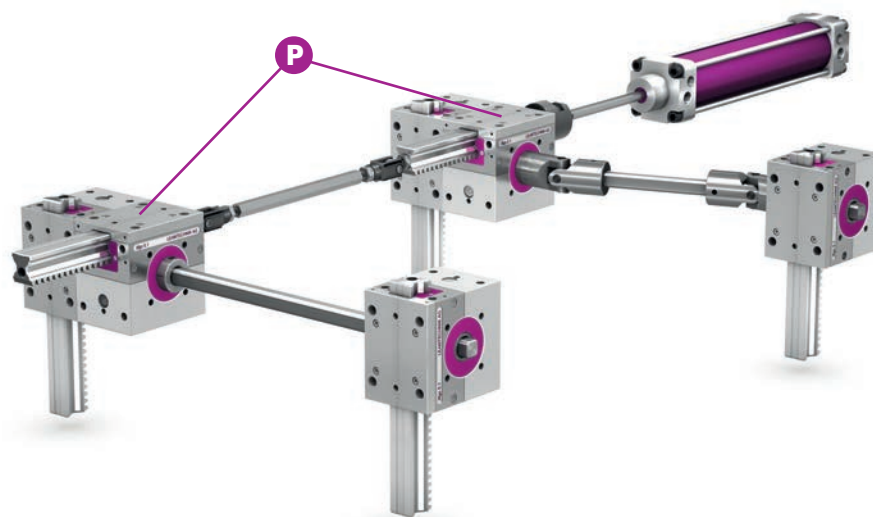
### Lifting systems with four vertical and four primary gearboxes



This system provides fourfold force transmission (depending on the size) to the vertical stroke. Non-centered loads can be supported here because a closed mechanical polygon is installed.

! The maximum load at any given lifting unit must not be exceeded.

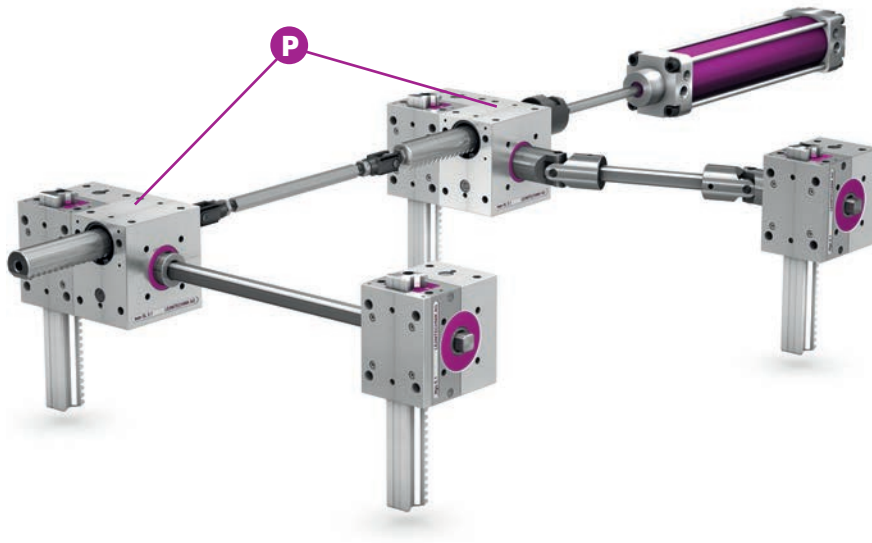
### Lifting system with universal joints/lifgo® primary gearbox



Lifting systems with four vertical and two primary gearboxes. The position of the gearbox for the rear axis can be varied via the universal joint.

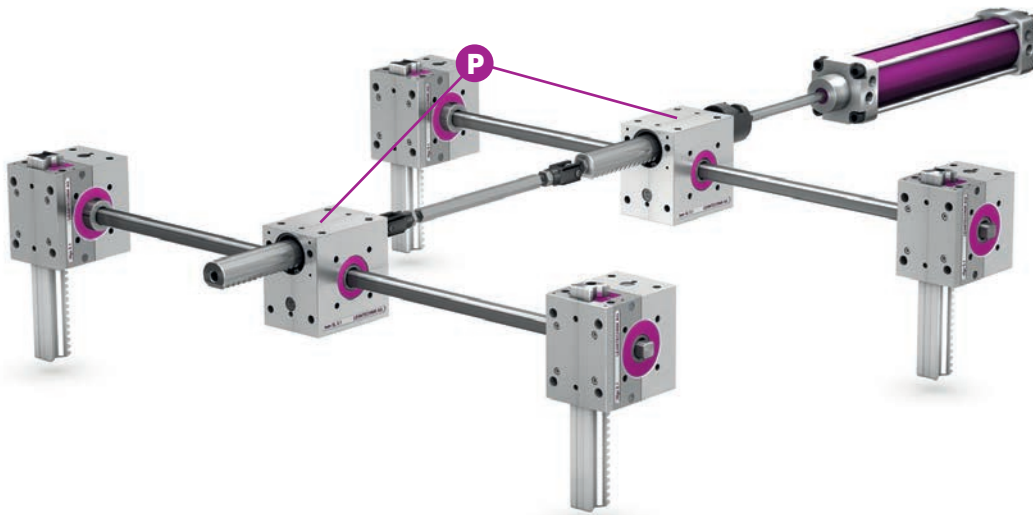
Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### Lifting system with universal joints/lean SL® primary gearbox



In this application, two lean SL® units are used as the primary gearbox. This results in a lower lifting force than in the previous application. Vertical guidance of the lift load is ensured by using the four lifgo® gearboxes.

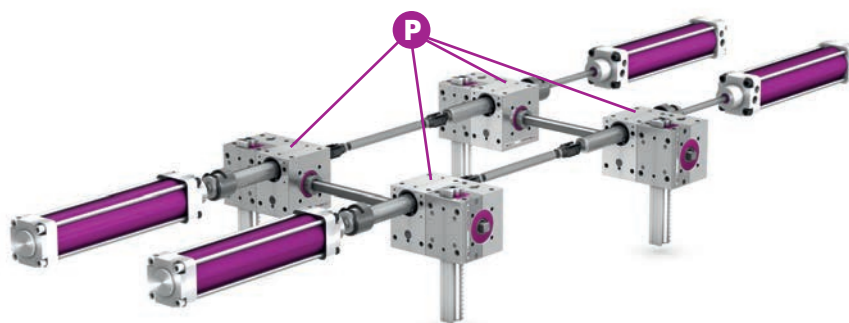
### Lifting system with 4 lifting points



Combination of a lean SL® unit as primary gearbox and a lifgo® gearbox. The lean SL® unit operates at a lower lifting force than a lifgo® of the same size. When the force transmission level at the lean SL® is low, this ensures high guidance and positioning quality via the vertical stroke provided by the lifgo®.

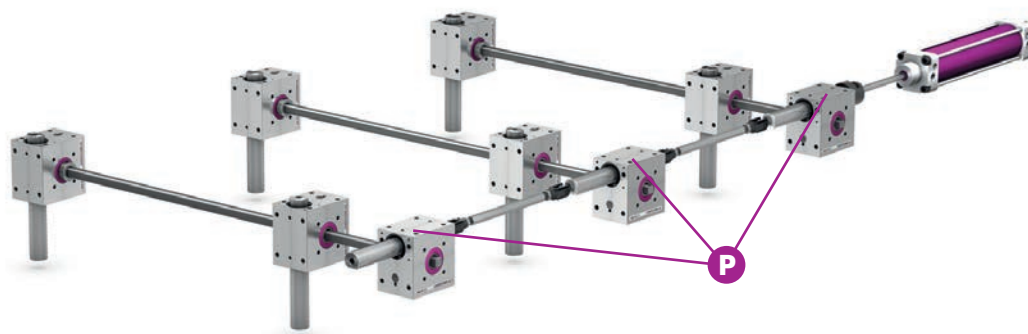


### Lifting systems with 4 vertical and primary gearboxes



One air cylinder is connected to each of the lean SL® series primary gearboxes. In this application, four times the maximum nominal force can be generated. The gearboxes of the lean SL® series synchronize the force and motion of the air cylinders.

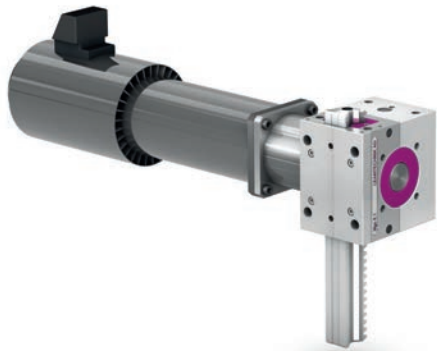
### Lifting system with 3 primary gearboxes in series



In this application, the horizontal gear racks of the lean SL® primary gearboxes function as “tie rods”, as do the differential couplings.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### lifgo® with attached drive



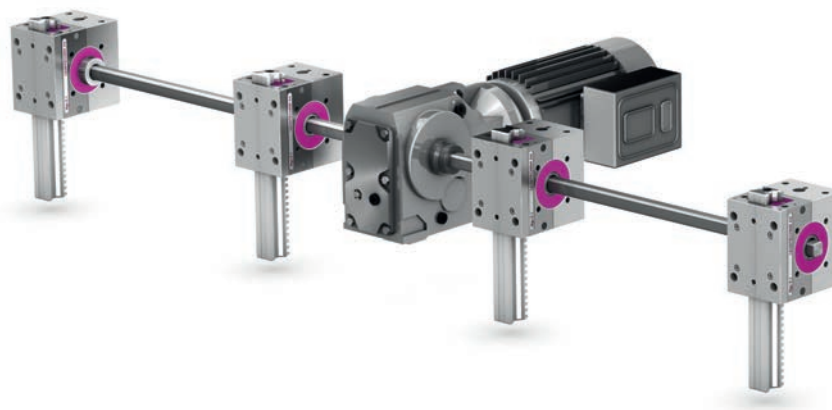
The lifgo® pinion shaft is equipped with pins and a keyway. For precise positioning (horizontal/vertical), the gearmotor is directly connected to the lifgo® pinion using a form-fit coupling. Used as a positioning and adjusting drive, the drive unit can also be used, for example, for pouring and tilting devices.

### Pair of lifgo® units with rotary reinforcement



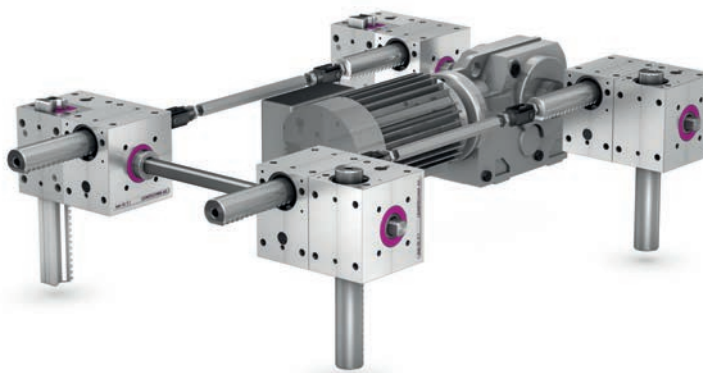
Used in the same way as in the previous example. In this pair of lifgo® units, the rotational reinforcement transmits the rotary motion from the first to the second gearbox at the same position.

## lifgo® lifting system in series



Lifting system and device for lifting long parts and profiles, for example. This application can also provide the vertical stroke in a single-row shuttle. See also page 40, bottom.

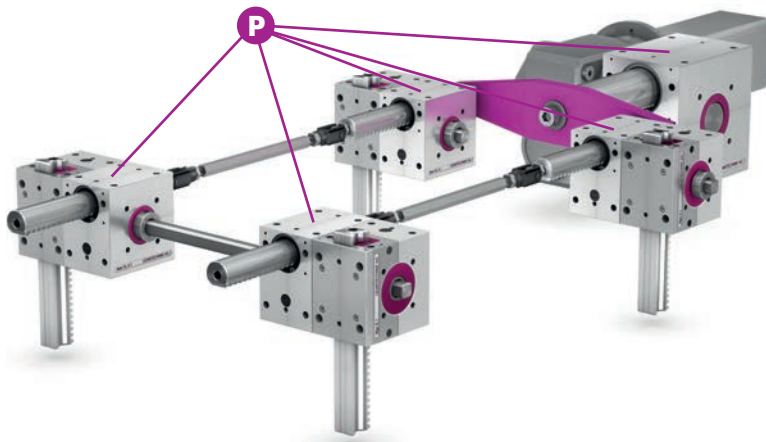
## Lifting system construction with lifgo® and lean SL®



The vertical gearboxes on the left-hand side are from the lifgo® series, and function as a guide and transverse force support for any mounting plate that may be present. If two lifgo® gearboxes are sufficient when low transverse forces need to be supported, then lean SL® gearboxes (here the vertical gearbox on the right-hand side) can be used for other tasks.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### Lifting system, standard configuration, large gearbox as tension drive



The large gearbox used as a tension drive can come from the lifgo® series or lean SL®, depending on the force requirement (here lean SL®). Non-centered loads can be supported due to the closed force polygon and because maximum force and torque transmission are possible. The installation space in the center remains available.

### Lifting system with 2 distributor gearboxes and one gearmotor



Force transmission to the gearboxes is at a maximum. The installation space under any mounting plate that is present can be used as required. In this application, the combined use of the lifgo® and lean SL® series is once again possible.

## Lifting system, U-shaped with 2 distributor gearboxes



In this U-shaped application, the installation space in the center remains free. In this case, the maximum torque  $Mt^2$  is the torque of the profile shaft on each side.

! The maximum permissible rated force of a gearbox must not be exceeded.

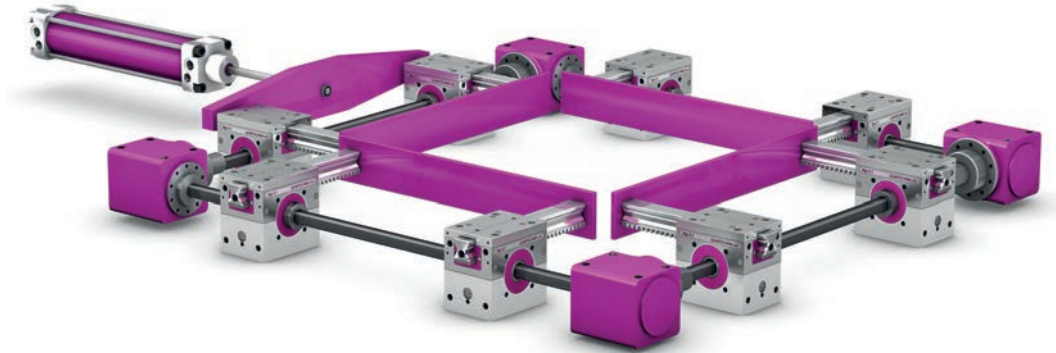
## Circular arrangement of lifgo® gearboxes



This lifgo® application can be used for clamping and/or centering round objects. The closure of round bodies (casings) is another potential application.

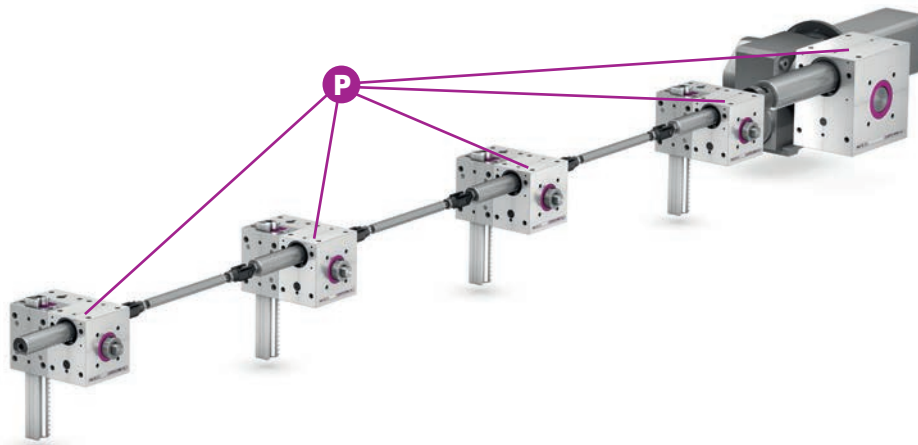
Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### Arrangement in a rectangle/square



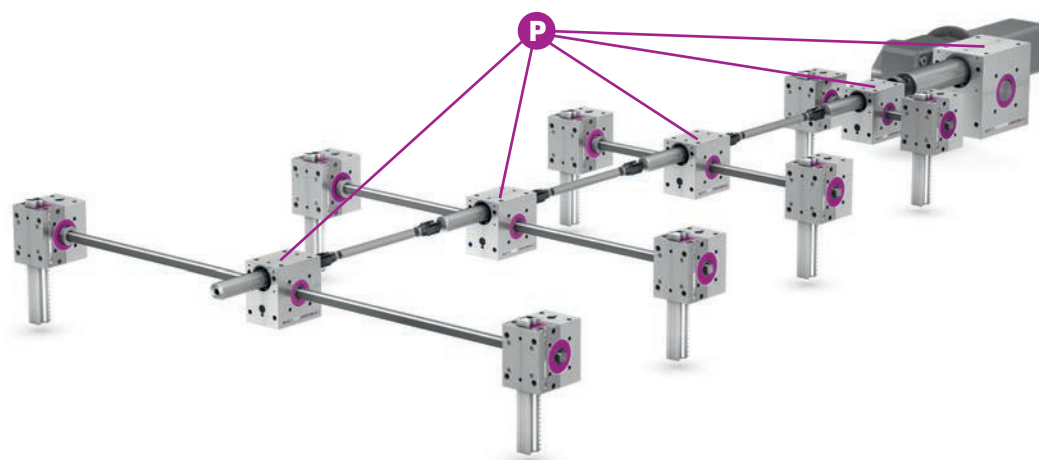
This application with lifigo® series gearboxes is used for clamping and/or centering.

### Serial arrangement of gearboxes



This construction is used to lift long, narrow mounting plates, for example when lifting production parts into machine tools. A large lean SL® series gearbox is used here as the tension drive. The vertically oriented lifigo® gearboxes guide the mounting plate.

### Arrangement of gearboxes in 4 rows



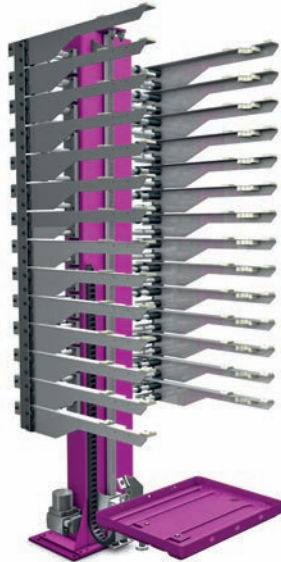
Arrangement as in the serial arrangement of gearboxes. In addition to the lean SI® gearboxes, lifgo® gearboxes are now installed on both sides, in order to lift wide, guided mounting plates, for example.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

## 2.2 Lift columns

For the systems shown below in this chapter, all lengths and distances as well as the lifting speed and load capacity can be freely selected.

### Lift column as intermediate stacking unit with a lifgo® linear



This application with a lifgo® linear provides intermediate storage of flat products at various levels.

### Lift column – lift device with two lifgo® linear units and auxiliary guide



Here, lifting forks are directly installed on the lifgo® linear unit. Various useful auxiliary elements can be installed. Our lift columns are also available with counterweights.

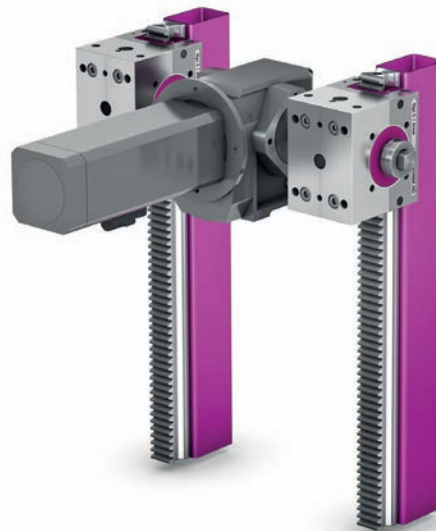


### Lift columns with auxiliary guide



Precise guidance for lift operations with high, off-center loads. The application permits high loads and a large transverse force capacity. It is suitable, for example, for the precise lifting-in and positioning of loads and production devices.

### Lift column with reinforcement profiles on the lifgo® linear gear rack



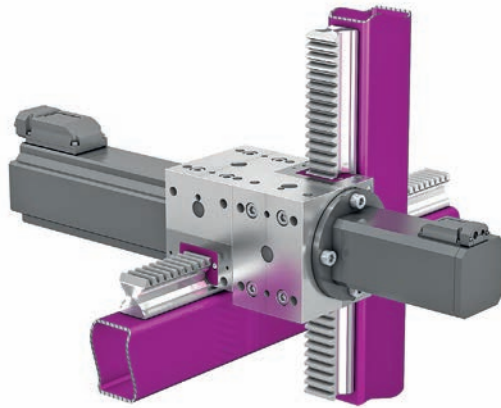
Lift column with particularly rigid design, for lifting heavy parts/fixtures in assembly lines, such as for the final assembly of front axles with engine/transmission in the automotive industry. Large stroke heights, high transverse force capacity and positioning accuracy.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

## 2.3 leantranspo® • Transfer, handling, pick & place

For the systems shown below in this chapter, all lengths and distances as well as the lifting speed and load capacity can be freely selected.

### Horizontal drive with attached vertical drive



Representation of a transfer function. For the horizontal drive (X or Y stroke), a lifigo® linear unit with linear gear rack is placed on the carrier. The drive travels at the same time. A lifigo® linear unit is mounted on it for the Z-stroke.

### 1-axis transfer, linear axis, horizontal/vertical



1-axis transfer with lifigo® linear. Very fast, large strokes, for transport from "A to B".

## 2-axis portal, variable



2-axis transfer with lifgo® linear for each axis. Grippers, clamps, vacuum devices, or other auxiliary devices can be installed at the ends of the gear racks.

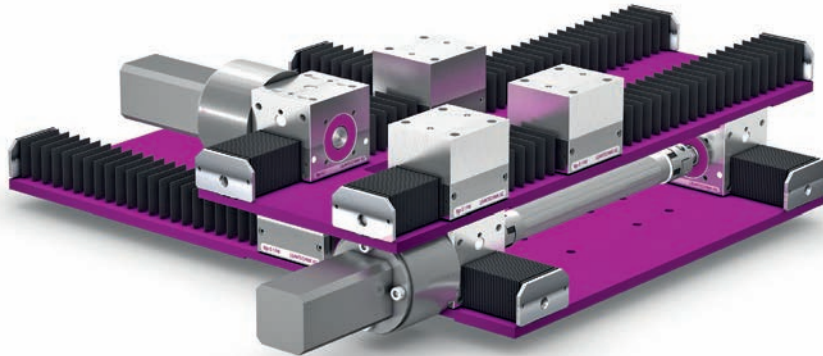
## Portal for single-side access



Compact 3-axis handling system with extendible support arm. Ideal for one-sided access. Compact, fast, precise, and low-vibration due to linear guide reinforcements.

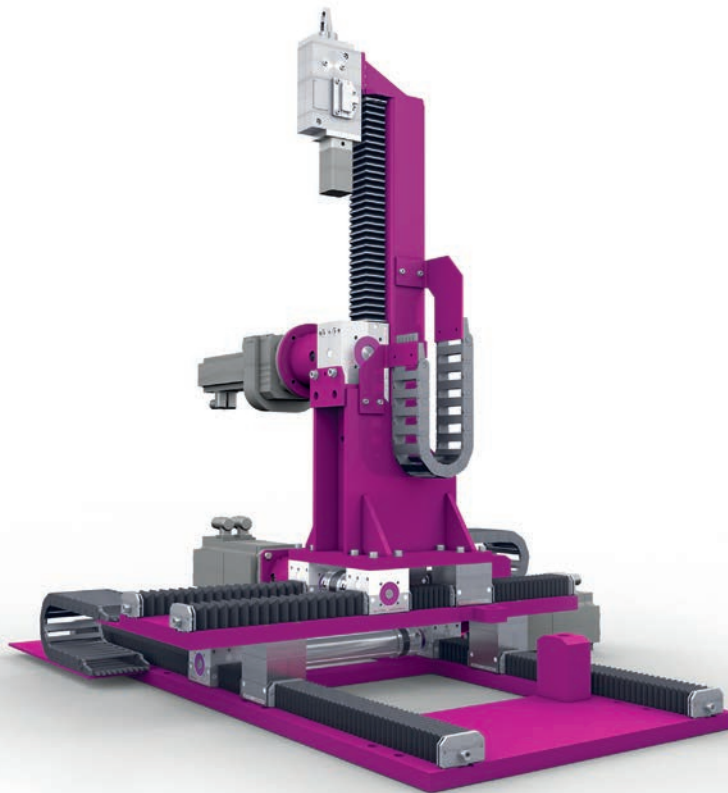
Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### 2-axis positioning table with auxiliary equipment on request



Standing 2-axis positioning table for high loads and fast travel speeds. A Z-axis or other accessories can be mounted. A suspended version is also possible.

### 3-axis positioning system (DAP) based on lifgo®



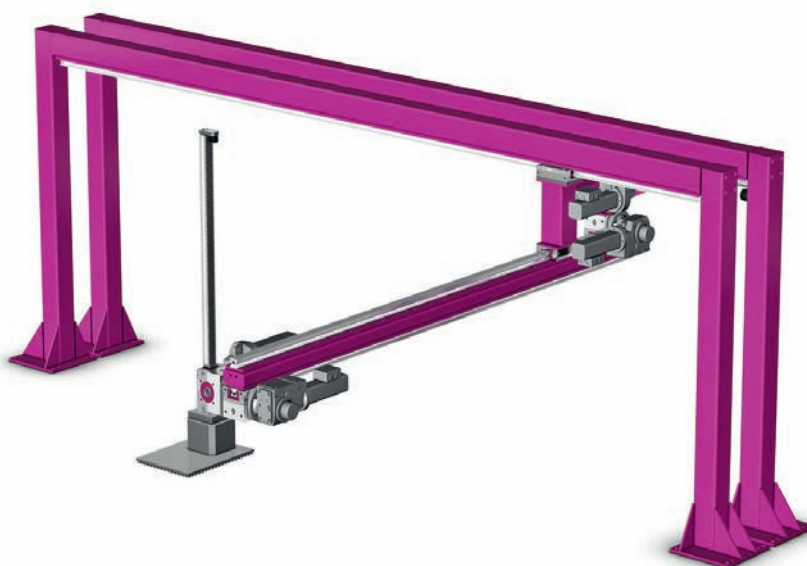
Flexible spatial movement thanks to lifgo® gearbox controlling 3 axes. Components are picked up and clamped at the top end of the Z-axis. The system is able to support transverse forces and process forces. It is suitable for use, for example, in production lines in the automotive industry. The DAP makes it possible to manufacture chassis frames of different sizes and shapes on one and the same production line. To do this, the distances between the pick-up points are adapted automatically for each chassis frame. For an illustration of the functioning of the system, you can also watch the video on our website.

### 2-axis portal with 2 vertical axes



Portal with two lifgo® linear units and an additional lifgo® guide. Two lifgo® units are installed on it for the Z-axis. Auxiliary devices are installed at the ends of the gear racks.

### 4-axis system with rotary head and suction pad



4-axis "pick & place" system with linear motion. The fifth axis is used as an off-center rotary axis with a suction pad or magnet. This application is used for picking up area-optimized pre-cut parts (sheet metal, etc.) and for the accurately aligned stacking of the parts on the opposite pallet.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

## 2-axis transfer with gripper function



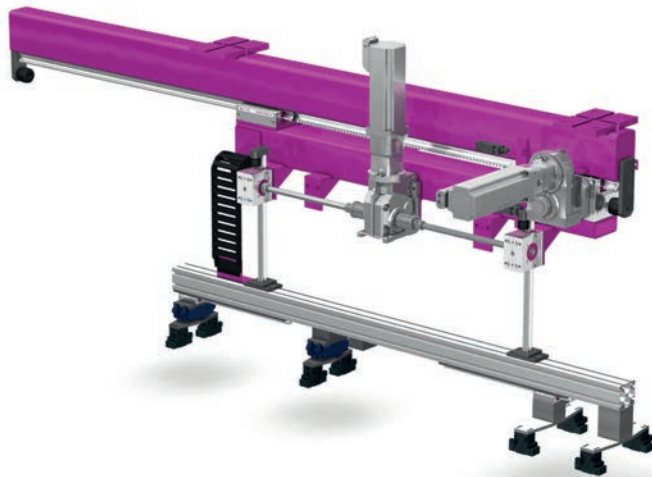
Standing 2-axis transfer part feeder. One horizontal stroke axis, one gripper or closing axis, synchronous from both sides towards the middle. Can be used as a stepped conveyor. Also available as a 3-axis transfer system with horizontal and vertical stroke and synchronous closing axis.

## Notes

## 2.4 leantranspo® • Shuttle & transfer

For the systems shown below in this chapter, all lengths and distances as well as the lifting speed and load capacity can be freely selected.

### 1-arm shuttle, suspended, 2-axis drive



Suspended 1-arm shuttle. The gear rack and lifgo® linear unit for the horizontal drive are suspended below the beam. The assembly and second lifgo® for the Z-stroke are fixed to it. Grippers, suction pads, or other devices can be installed on the suspended standard aluminum profile.

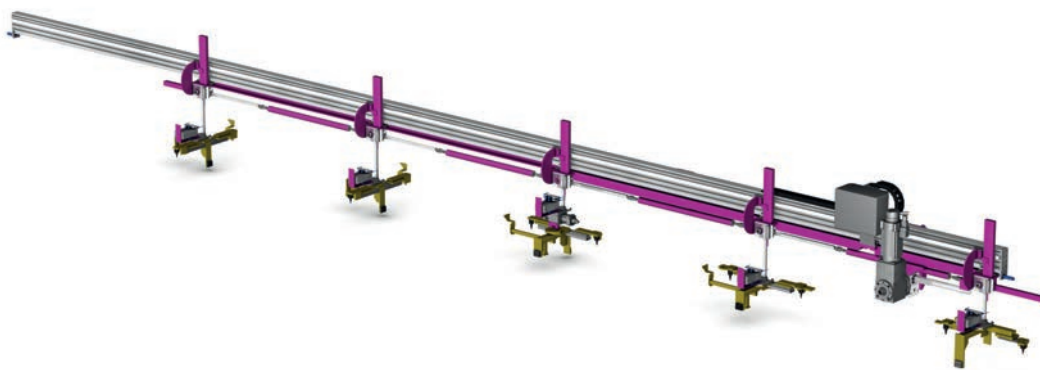
### 1-arm shuttle, standing, 2-axis drive



lifgo® gearboxes are oriented vertically in the Z-direction, connected and synchronized by means of the rotary axis. Rotary reinforcements ensure precise angular synchronicity. A lifgo® linear unit with additional lifgo® guide cars is mounted to permit the reverse movement of the profile beam in the X or Y directions. This creates a 2-axis reversing shuttle.



### 1-arm shuttle, suspended, 2-axis drive with 5 gripper stations



The horizontal stroke is suspended. In contrast to the previous example, the vertical stroke has been designed such that a second lifgo® gearbox is installed in the horizontal direction next to each vertically oriented gearbox.

The gearboxes are each connected and synchronized by a profile shaft. In the horizontal direction, a tensile force acts on the gear racks and causes the pinion to rotate. This force is transferred to the vertical lifgo®, and the rotation is again redirected into a linear motion (vertical in this case).

### 2-arm shuttle, standing, 2-axis external drive



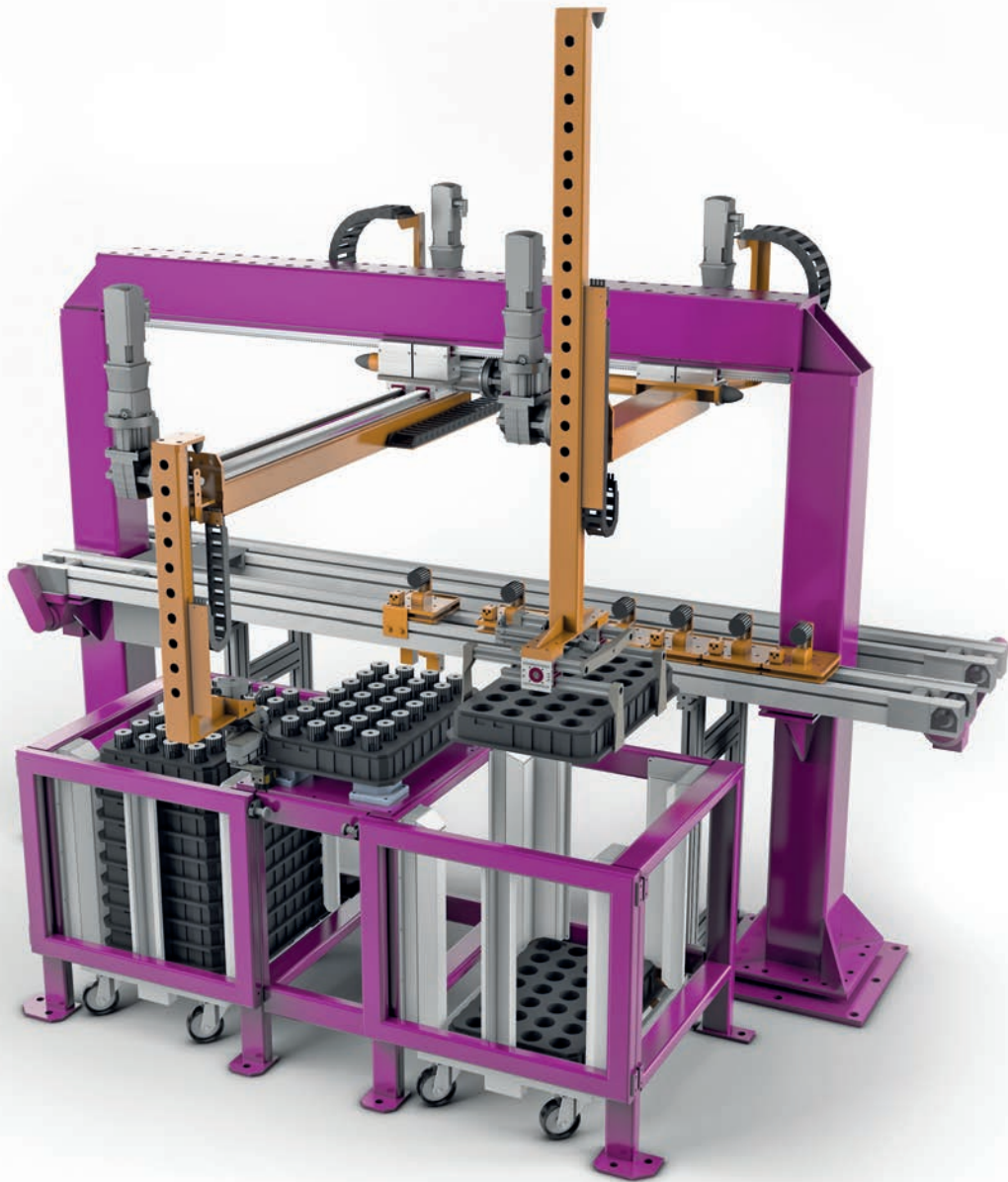
Designed as a 2-axis transfer shuttle with externally mounted drives. The system can also be designed as a 3-axis transfer gripper shuttle.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

## 2.5 leantranspo® • Complete systems

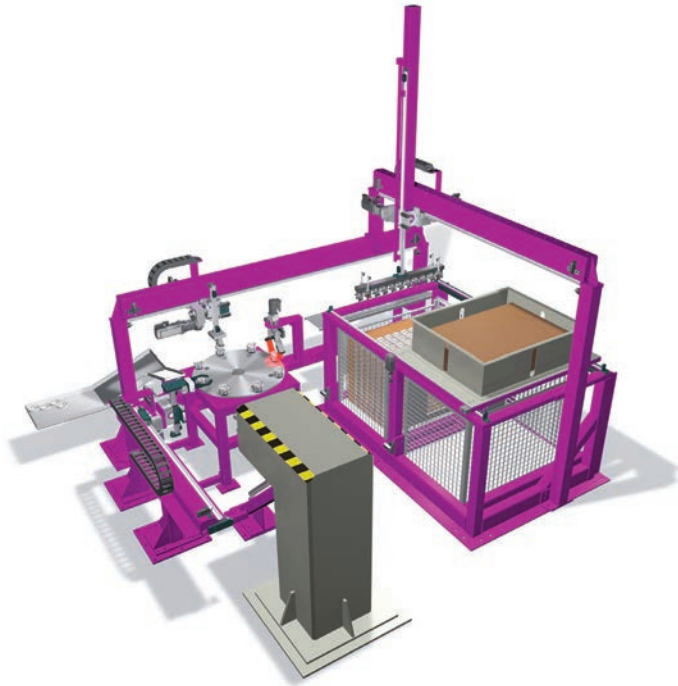
For the systems shown below in this chapter, all lengths and distances as well as the lifting speed and load capacity can be freely selected.

### lifgo® portal system with 3-axis gripper arm and 2-axis palletizer



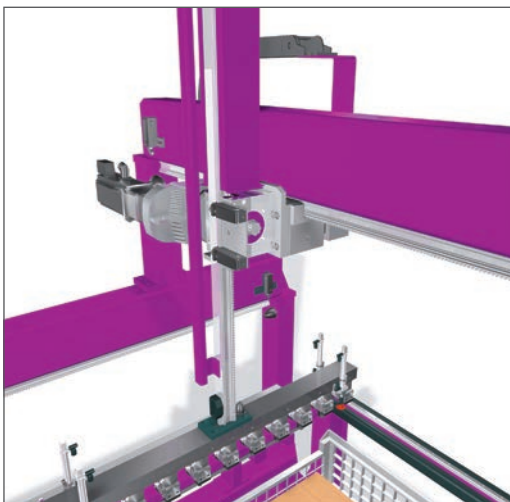
Complex combination of palletizer and feed mechanism. The movements of the two arms are harmonized with one another. The 3-axis gripper arm takes the blanks from the left-hand stack, places them on the conveyor and returns a finished part to the blister pack. The 2-axis palletizer which moves the blister pack to the 3 different positions was implemented using two lifgo® double gearboxes and two lifgo® linear gearboxes. Gripper jaws are attached to the ends of the lifgo® double gearboxes and transform the gearboxes into gripper modules. The system was completely designed, built, and assembled.

## Sorting system, complete



Complete system, including controls and integration in the manufacturing process for the removal of production parts – in this case, large industrial castings. The lifgo® series is used in various multi-axis portals and transfer systems. High cycle time. Precise guiding and positioning.

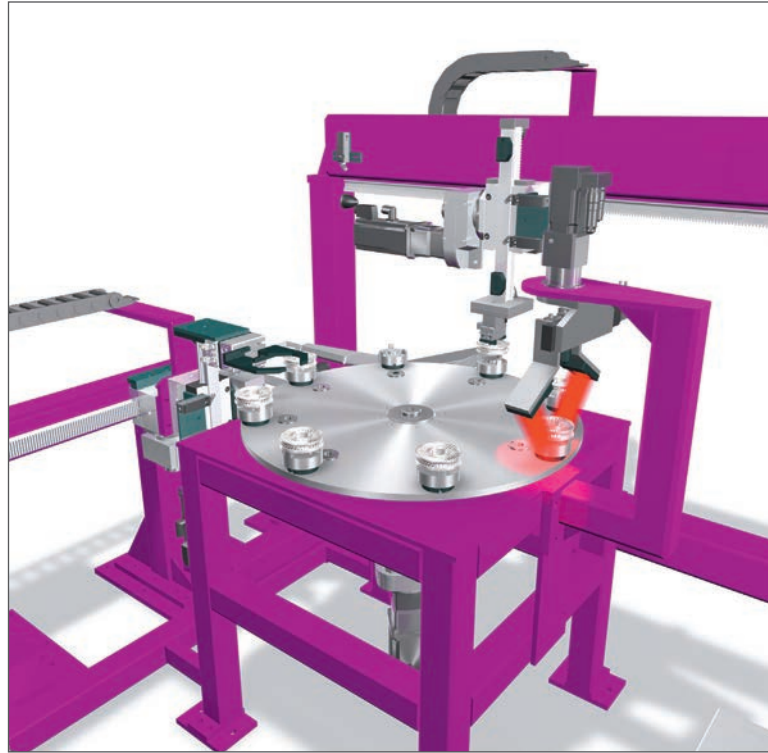
## lifgo® linear 2-axis module, ready-to-install design



Modules with 1 or 2 axes are available. They can be provided as designed and assembled units. The level of completion can be determined individually. The assembly illustrated here is a 2-axis module, lifgo® linear (X-Z stroke) including end switches, end-of-stroke dampers, media chains, and drives.

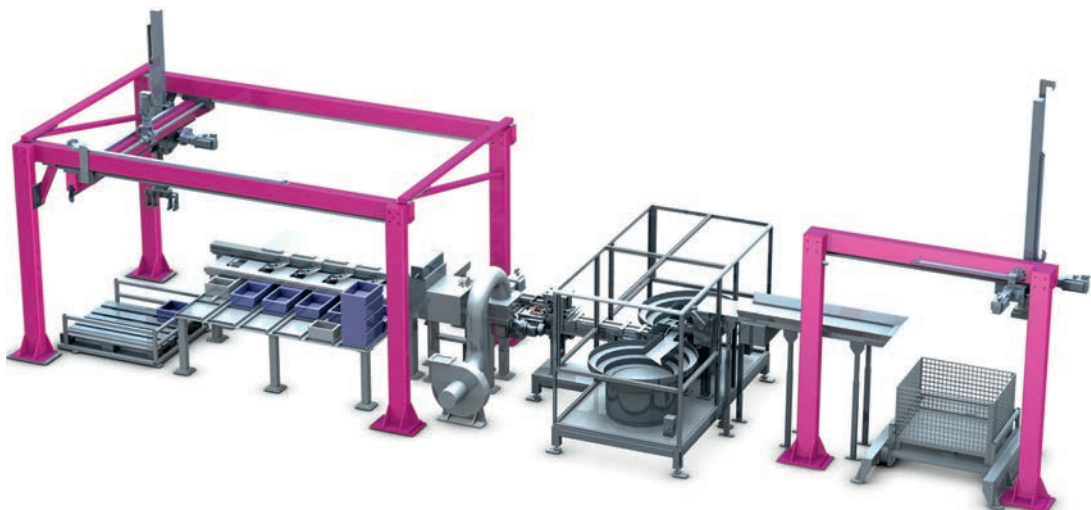
Note that all the systems illustrated here are simply examples and that many other constructions are possible.

### Partial system with lifgo® and third-party components



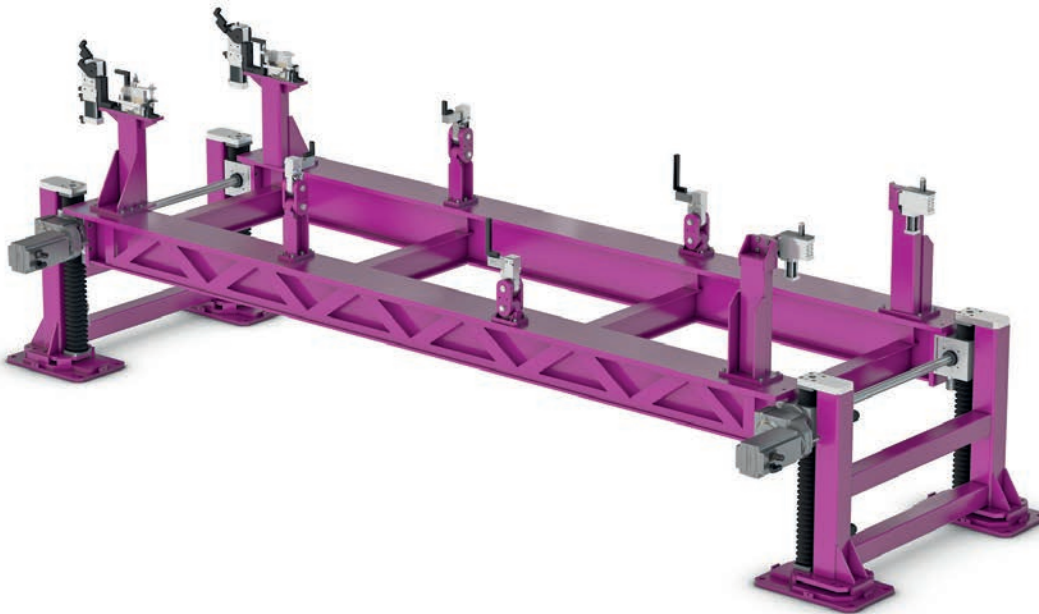
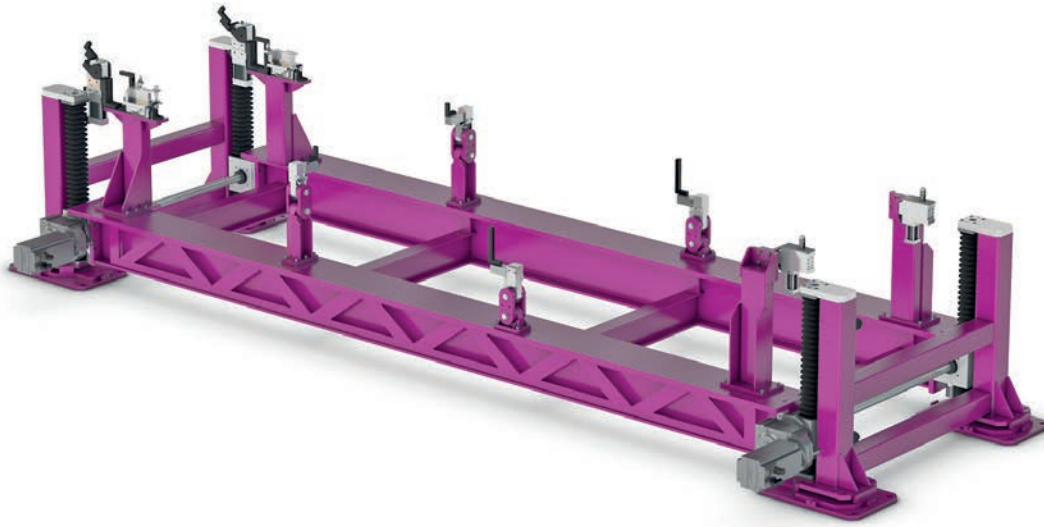
Design and construction of a round measurement table with feed and removal function using lifgo® linear axes. All lifgo® elements of a single size from the modular system are used here.

### Sorting system with lifgo® and third-party components



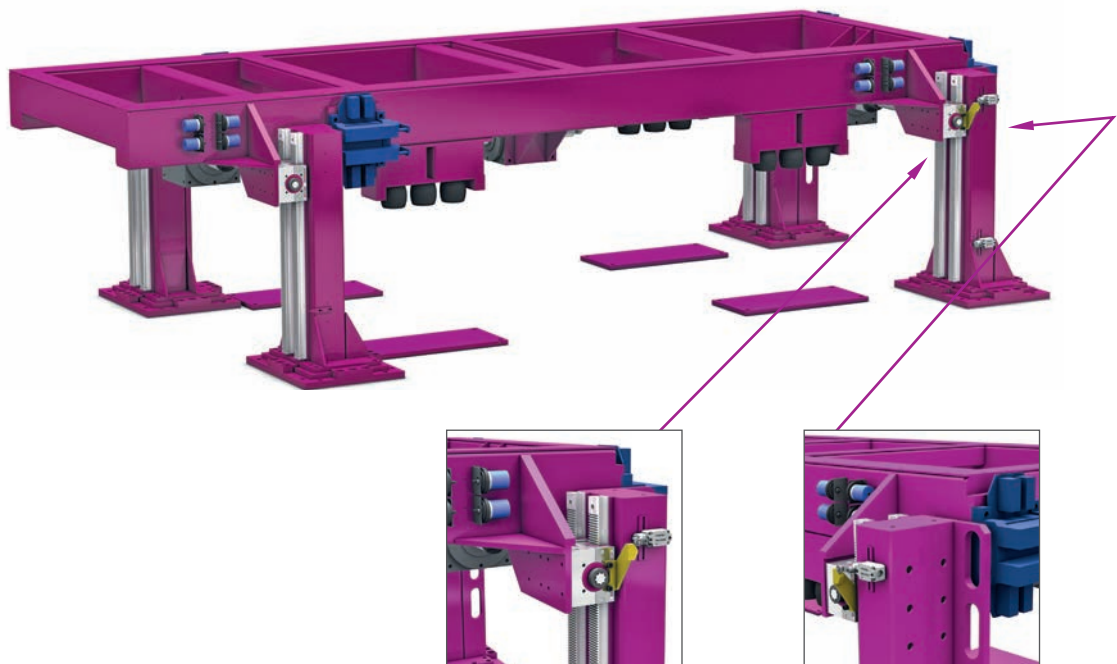
Complex sorting system, including controls and logistics, for stacking sorting boxes in a storage area. The system was completely designed, built and assembled.

## lean SL® lift table



Lift table for high loads with high repeat accuracy. Loose guidance to prevent overdefinition, for example during centering tasks. A lift table consists of two double columns, each of which is equipped with two lean SL® gearboxes and, in the configuration illustrated here which uses size 5.3 gearboxes, is able to lift 1800 kg, for example.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

**lifgo® precision lift table**

Application for high loads with high positioning and repeat accuracy. Precise guidance and maintenance of position during the stroke are required. Safety pegs, central lubrication, and damping are used as auxiliary equipment here. Synchronicity is maintained by a central drive.

**lifgo® linear transfer – 17 meters, with gripper stations**

Partial transfer system with lifgo® linear for the horizontal stroke. Scope includes steel construction, assembly, operational testing, and final installation. The grippers take parts from the transfer and dip them into process baths for further processing. Used in the chemical industry.

Note that all the systems illustrated here are simply examples and that many other constructions are possible.

## 2.6 Project questionnaire

|                      |                      |
|----------------------|----------------------|
| Contact person       | Company              |
| <input type="text"/> | <input type="text"/> |
| Date                 | Address              |
| <input type="text"/> | <input type="text"/> |
|                      | Phone/Fax/E-mail     |
|                      | <input type="text"/> |

|  |                      |                      |                      |                        |    |
|--|----------------------|----------------------|----------------------|------------------------|----|
| Designation of axis  | <input type="text"/> | <input type="text"/> | <input type="text"/> | (X/Y/Z/Rot.)           |    |
| Direction of operation   | <input type="text"/> | <input type="text"/> | <input type="text"/> | Vert./Horiz./Rot.      |    |
| Lifting length   | <input type="text"/> | <input type="text"/> | <input type="text"/> | mm                     |    |
| Lifting time   | <input type="text"/> | <input type="text"/> | <input type="text"/> | s                      |    |
| Speed  | <input type="text"/> | <input type="text"/> | <input type="text"/> | m/s                    |    |
| Acceleration   | <input type="text"/> | <input type="text"/> | <input type="text"/> | m/s <sup>2</sup>       |    |
| Mass   | <input type="text"/> | <input type="text"/> | <input type="text"/> | kg                     |    |
| Transverse load  | <input type="text"/> | <input type="text"/> | <input type="text"/> | N                      |    |
| Process force  | <input type="text"/> | <input type="text"/> | <input type="text"/> | N                      |    |
| Lever arm  | <input type="text"/> | <input type="text"/> | <input type="text"/> | mm                     |    |
| Positioning accuracy   | <input type="text"/> | <input type="text"/> | <input type="text"/> | mm                     |    |
| Repeat accuracy  | <input type="text"/> | <input type="text"/> | <input type="text"/> | mm                     |    |
| Drive type   | <input type="text"/> | <input type="text"/> | <input type="text"/> | Servo/Rot./Pneu./Hydr. |    |
| Cycle time,  | <input type="text"/> | <input type="text"/> | <input type="text"/> | double strokes/h       |    |
| Operating time   | <input type="text"/> | <input type="text"/> | <input type="text"/> | hrs/day (days/yr)      |    |
| Service life   | <input type="text"/> | <input type="text"/> | <input type="text"/> | Years                  |    |
| Gear rack protection   | <input type="text"/> | <input type="text"/> | <input type="text"/> | yes/no                 |    |
| Lubrication  | <input type="text"/> | <input type="text"/> | <input type="text"/> | Manual/Perm./Central   |    |
| Dimensions   | L x W x H            | <input type="text"/> | <input type="text"/> | <input type="text"/>   | mm |
| Construction type<br>(suggestions, installation location)                        | <input type="text"/> |                      |                      |                        |    |
| Fixing possibilities<br>(System, lifgo®, gear rack, etc.)                        | <input type="text"/> |                      |                      |                        |    |
| Operating environment<br>(temperature, welding area, dust, gases, humidity etc.) | <input type="text"/> |                      |                      |                        |    |





### 3 lifgo® & lean SL® • Technical data & dimension sheets

#### General

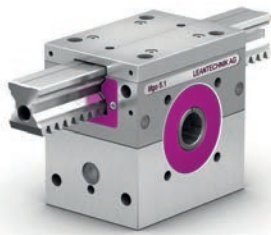
Technical data and dimension sheets for all gearbox types and the associated variants are listed below. **Please observe the important notes on the use of lifgo® and lean SL® gearboxes on this page.** They apply to all types of gearboxes and accessories.

Specific notes on the individual gearboxes or accessory components, and their associated technical data and illustrations, are found on the corresponding page.

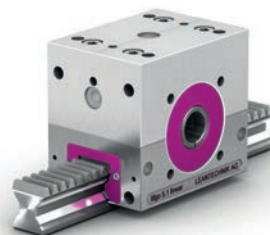
- ! lifgo® & lean SL® can be combined or used as replacements for each other.
- ! The lifgo®/lean SL® pinion connections are identical. Force transmission is not identical.
- ! lifgo® & lean SL® have the same accessories, and identical interfaces and dimensions.
- ! All gearboxes have centering points for installing adapter discs for mounting gearmotors.
- ! The **PW version (profile shaft)** is standard. We carry profile shafts as accessories for synchronization and rotationally rigid connection. For the pin (ZA 1/ZA 2) and keyway (PFN) versions, couplings and connectors must be configured on a project-specific basis.
- ! The total lifting force is made up of the weight and acceleration force.
- ! In the case of vertically oriented gear racks, their own weight plus that of the mounted parts must be taken into consideration.
- ! Note the maximum permissible transverse force moments of the lifgo® gearbox.
- ! lean SL® gearboxes cannot support any transverse forces.
- ! The lifting force and torque transfer of the primary gearbox must not be exceeded.
- ! Make sure that the system documentation addresses the initial and maintenance lubrication of the gearboxes and that lubrication at the site is ensured.
- ! Only one plug may be removed for lube holes U, U1; all others remain installed in order to prevent uncontrolled grease discharge.
- ! One grease nipple is threaded into each tapped hole U, U1, and tightened.
- ! Ensure that all lube holes remain accessible after installation.
- ! Note that the lifgo® gear rack guide and the pinion housing must be lubricated separately. In the case of lean SL®, they must be lubricated together.
- ! Make sure that the correct pinion shaft version is specified when ordering.
- ! Observe the maximum transmitted forces of the accessory components in the gearbox system.
- ! Observe the general rules of physics and mechanical engineering (VDMA) when configuring the system.
- ! All dimensions are shown in millimeters (mm).
- ! The tolerance for the location of dowel holes is  $\pm 0,02$  mm for all gearboxes.
- ! For safety reasons, request the theoretical service life of your application.

### 3.1 lifgo® 5 • Technical data & dimension sheets

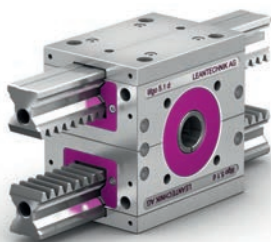
#### 3.1.1 lifgo® series • Technical data



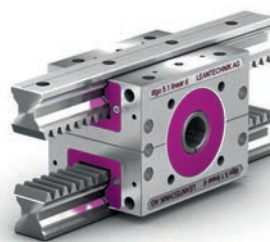
**lifgo®**



**lifgo® linear**



**lifgo® double**



**lifgo® linear double**

**!** Make sure that the article number refers to the correct pinion shaft version.



PW



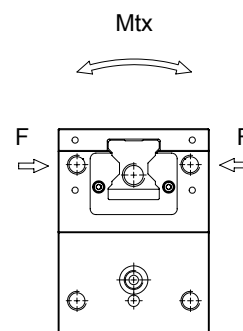
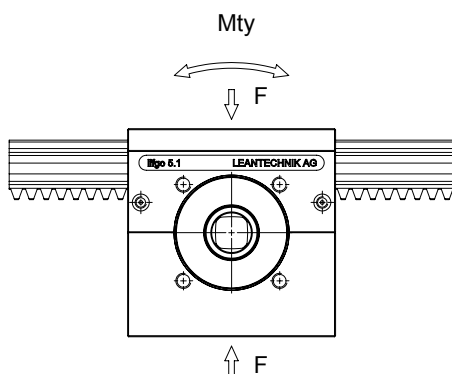
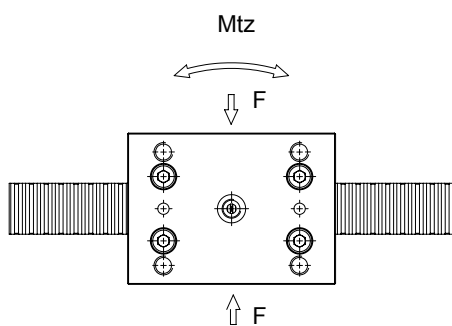
ZA 1



ZA 2



PFN



- ! The technical data on this page apply to all versions of the lifgo® series (lifgo®, lifgo® linear, lifgo® double, lifgo® linear double).
- ! The breakaway force for new, unlubricated gear rack guides is 30N per lifgo® unit. This value drops to near zero after the run-in phase.
- ! The breakaway force of hardened gear racks is approximately 80N.
- ! The pretensioning of guide cars is 2%.

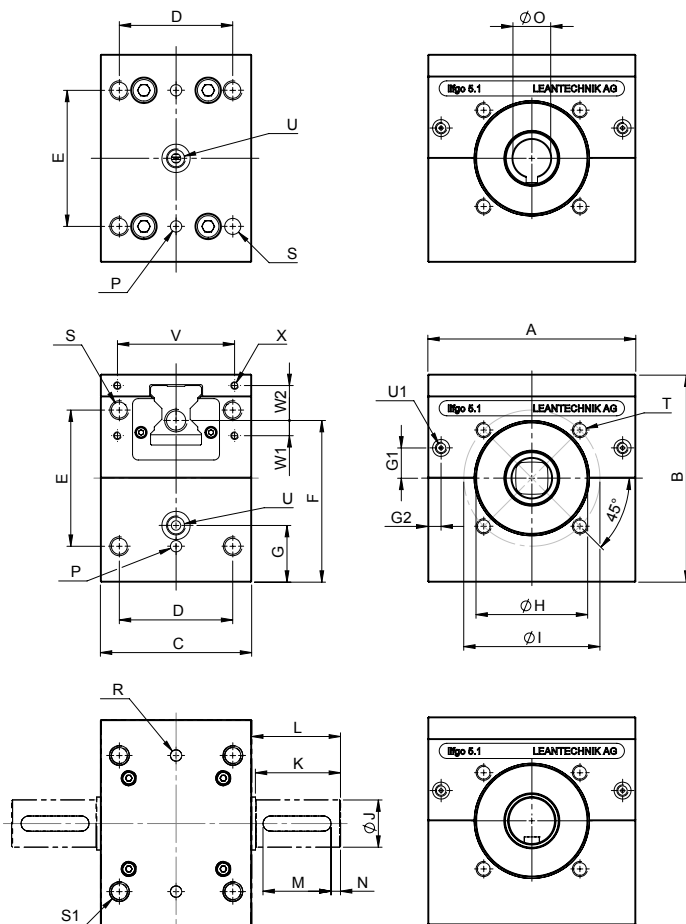
| lifgo® Series technical data |                     | Unit             | 5.0        | 5.1        | 5.3        |
|------------------------------|---------------------|------------------|------------|------------|------------|
| Lifting force                | $F_{max}$           | N                | 2000       | 3800       | 15900      |
| Lifting speed                | $v_{max}$           | m/s              | 3          | 3          | 3          |
| Acceleration                 | $a_{max}$           | m/s <sup>2</sup> | 50         | 50         | 50         |
| Torque                       | $M_{max}$           | Nm               | 20         | 76         | 477        |
| Pitch diameter               | $\varnothing T_k$   | mm               | 20         | 40         | 60         |
| Gear ratio                   | Stroke              | mm/360°          | 62,8318    | 125,6637   | 188,4955   |
| Efficiency                   | $\eta$              |                  | 0,92       | 0,92       | 0,92       |
| Temperature resistance       | t                   | °C               | -10 to +80 | -10 to +80 | -10 to +80 |
| Static torque                | $M_{t, stat.}$      | Nm               | 570        | 760        | 4400       |
| Dynamic torque               | $M_{t, dyn.}$       | Nm               | 280        | 390        | 2200       |
|                              | $M_{t, stat.}$      | Nm               | 380        | 650        | 3300       |
|                              | $M_{t, dyn.}$       | Nm               | 180        | 330        | 1600       |
|                              | $M_{t_2, stat.}$    | Nm               | 380        | 650        | 3300       |
|                              | $M_{t_2, dyn.}$     | Nm               | 180        | 330        | 1600       |
|                              | Static load ratings | F stat.          | N          | 38400      | 51200      |
| Dynamic load ratings         | F dyn.              | N                | 19100      | 25900      | 79600      |

### 3.1.2 lifgo® gearboxes

#### 3.1.2.1 lifgo® 5.0 – 5.3 • Dimension sheet



**!** Make sure that the article number refers to the correct pinion shaft version.



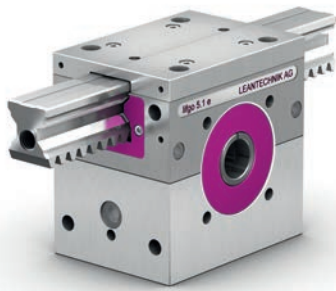



This standard lifgo® is compatible and can be combined with lean SL® gearboxes of the same size.

| lifgo® gearbox                                  | Unit | 5.0  | 5.1                                     | 5.3  |   |
|---|------|------|---|--|---|
| A   | mm   | 80   | 110                                     | 180  |   |
| B   | mm   | 80   | 110                                     | 180  |   |
| C   | mm   | 70   | 80                                      | 130  |   |
| D   | mm   | 55   | 60                                      | 105  |   |
| E   | mm   | 50   | 72                                      | 120  |   |
| F   | mm   | 59   | 85,5                                    | 139,5                                      |   |
| G   | mm   | 26   | 30                                      | 55   |   |
| G1  | mm   | 7,5  | 16                                      | 21,5                                       |   |
| G2  | mm   | 7    | 7                                       | 13   |   |
| Centering flange (if used, remove sealing ring) | H    | mm   | ∅ 38,5 H7 ↓2                            | ∅ 59 H7 ↓3                                 | ∅ 92 H7 ↓3                                |
|   | I    | mm   | ∅ 48                                    | ∅ 72                                       | ∅ 110                                     |
| Key DIN 6885 P9                                 | J    | mm   | ∅ 14 h7                                 | ∅ 25 h7                                    | ∅ 42 h7                                   |
|   | K    | mm   | 30                                      | 45   | 60  |
|   | L    | mm   | 32                                      | 47   | 62  |
|   | M    | mm   | 25                                      | 36   | 50  |
| Key DIN 6885 P9                                 | N    | mm   | 2                                       | 5  | 5   |
|   | O    | mm   | ∅ 10 H7                                 | ∅ 20 H7                                    | ∅ 35 H7                                   |
|   | P    | mm   | ∅ 6 H7 ↓10                              | ∅ 6 H7 ↓10                                 | ∅ 6 H7 ↓10                                |
|   | R    | mm   | ∅ 6 H7 ↓2,5                             | ∅ 6 H7 ↓3,5                                | ∅ 6 H7 ↓10                                |
|   | S    | mm   | M8 ↓25<br>∅ 6,8 through                 | M10 ↓25<br>∅ 8,5 through                   | M12 ↓35<br>∅ 10,2 through                 |
|   | S1   | mm   | └┘ ∅8,5 ↓8,5<br>M8 ↓25<br>∅ 6,8 through | └┘ ∅10,5 ↓11,5<br>M10 ↓25<br>∅ 8,5 through | └┘ ∅12,5 ↓19<br>M12 ↓35<br>∅ 10,2 through |
| Lube hole                                       | T    | mm   | M6 ↓8                                   | M8 ↓10                                     | M10 ↓20                                   |
| Lube hole                                       | U    | mm   | M10 x 1 ↓10                             | M10 x 1 ↓10                                | M10 x 1 ↓10                               |
|   | U1   | mm   | M6 ↓5                                   | M6 ↓5                                      | M6 ↓5                                     |
|   | V    | mm   | 58                                      | 62   | 100                                       |
|   | W1   | mm   | 5,5                                     | 8  | 21,5                                      |
|   | W2   | mm   | 15,5                                    | 18,5                                       | 30  |
|   | X    | mm   | M4 ↓8                                   | M4 ↓8                                      | M4 ↓8                                     |
| Weight PW                                       | kg   | 1,30 | 3,20                                    | 14,30                                      |   |
| Weight ZA 1                                     | kg   | 1,41 | 3,55                                    | 16,15                                      |   |
| Weight ZA 2                                     | kg   | 1,45 | 3,72                                    | 16,81                                      |   |
| Weight PFN                                      | kg   | 1,33 | 3,17                                    | 14,51                                      |   |

| Article number | 5.0     | 5.1     | 5.3     |
|----------------|---------|---------|---------|
| lifgo® PW      | 500 001 | 500 002 | 500 003 |
| lifgo® ZA 1    | 500 005 | 500 006 | 500 007 |
| lifgo® ZA 2    | 500 009 | 500 010 | 500 011 |
| lifgo® PFN     | 500 013 | 500 014 | 500 015 |

### 3.1.2.2 lifgo® eccentric 5.0 – 5.3 • Dimension sheet



 Make sure that the article number refers to the correct pinion shaft version.



PW



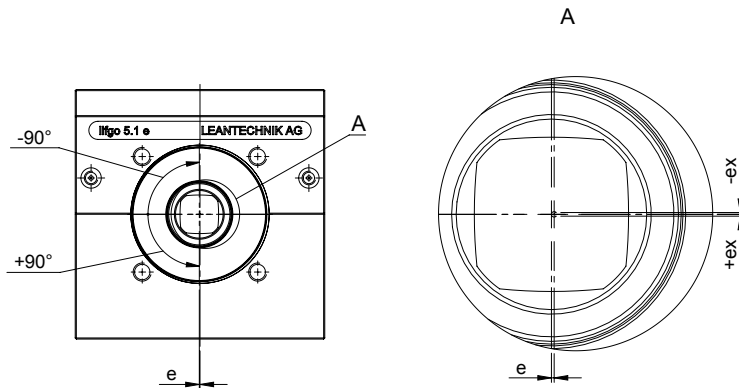
ZA 1



ZA 2



PFN

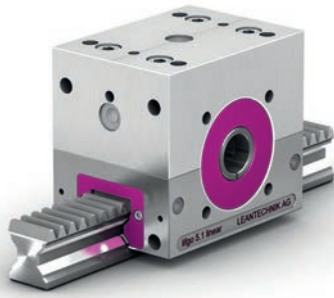



- ❗ The dimensions of the “eccentric” version are identical to those of the standard lifgo®. Please use the dimensions on page 53.
- ❗ In the “eccentric” version, the pinion shaft is adjusted relative to the gear rack, allowing the tooth flank clearance to be adjusted. It can be readjusted at a later time. Motor flanges, gearbox bell housings, etc. remain centered on the pinion during adjustment.
- ❗ Note that “eccentric” gearboxes cannot be combined with standard gearboxes (centered bearings). The pinion shafts are not aligned. (Max. lateral error 0,3 mm).
- ❗ Follow the instructions for use, available as a separate PDF. A printed copy is included with the gearboxes.

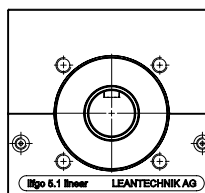
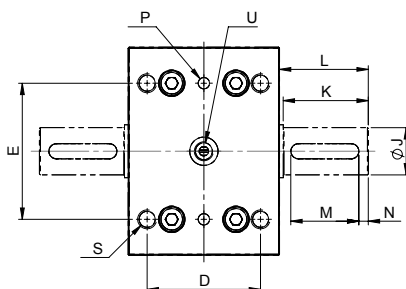
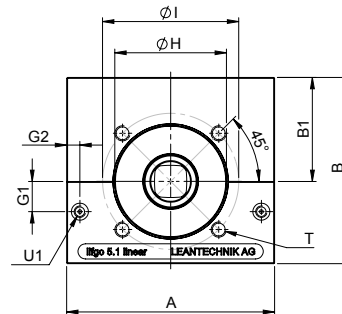
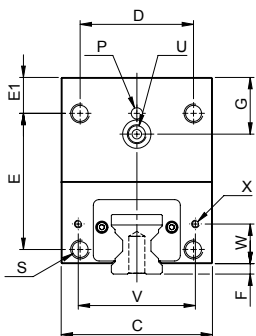
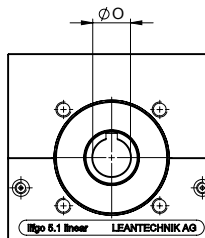
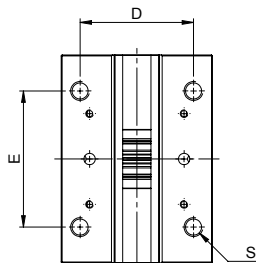
| lifgo® eccentric reduced play |    | Unit | 5.0     | 5.1     | 5.3     |
|-------------------------------|----|------|---------|---------|---------|
| Adjustment range              | e  | mm   | ± 0,200 | ± 0,300 | ± 0,300 |
| Adjusting steps               | n  | mm   | ± 4     | ± 6     | ± 6     |
| Adjustment per step           | e0 | mm   | 0       | 0       | 0       |
|                               | e1 | mm   | ± 0,076 | ± 0,078 | ± 0,078 |
|                               | e2 | mm   | ± 0,141 | ± 0,150 | ± 0,150 |
|                               | e3 | mm   | ± 0,185 | ± 0,212 | ± 0,212 |
|                               | e4 | mm   | ± 0,200 | ± 0,260 | ± 0,260 |
|                               | e5 | mm   |         | ± 0,290 | ± 0,290 |
|                               | e6 | mm   |         | ± 0,300 | ± 0,300 |

| Article number        | 5.0     | 5.1     | 5.3     |
|-----------------------|---------|---------|---------|
| lifgo® eccentric PW   | 500 017 | 500 018 | 500 019 |
| lifgo® eccentric ZA 1 | 500 021 | 500 022 | 500 023 |
| lifgo® eccentric ZA 2 | 500 025 | 500 026 | 500 027 |
| lifgo® eccentric PFN  | 500 029 | 500 030 | 500 031 |

### 3.1.2.3 lifgo® linear 5.0 – 5.3 • Dimension sheet



 Make sure that the article number refers to the correct pinion shaft version.





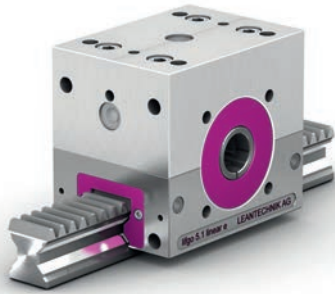
! lifgo® linear is used for long stroke lengths, with a fixed gear rack.


! If the gearbox is fixed and the gear rack is freely moveable, then it can be reinforced with profiles.

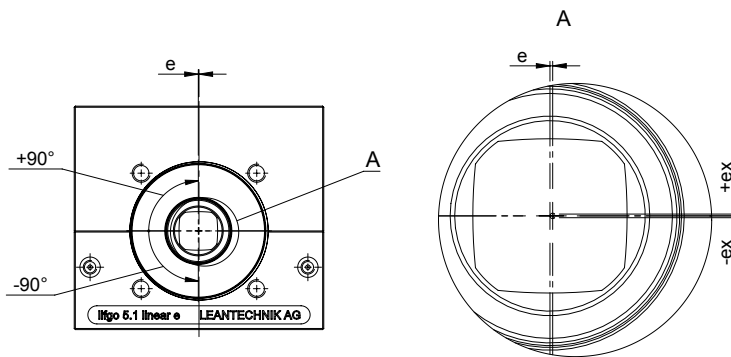
| lifgo® linear                                      | Unit | 5.0  | 5.1                     | 5.3                      |                           |
|--|------|------|-------------------------|--------------------------|---------------------------|
| A  | mm   | 80   | 110                     | 180                      |                           |
| B  | mm   | 71,5 | 98,5                    | 161                      |                           |
| B1   | mm   | 40   | 55                      | 90                       |                           |
| C  | mm   | 70   | 80                      | 130                      |                           |
| D  | mm   | 55   | 60                      | 105                      |                           |
| E  | mm   | 50   | 72                      | 120                      |                           |
| E1   | mm   | 15   | 19                      | 30                       |                           |
| F  | mm   | 3,5  | 5,5                     | 5                        |                           |
| G  | mm   | 26   | 30                      | 55                       |                           |
| G1   | mm   | 7,5  | 16                      | 21,5                     |                           |
| G2   | mm   | 7    | 7                       | 13                       |                           |
| Centering flange (if used,<br>remove sealing ring) | H    | mm   | ∅ 38,5 H7 ↓2            | ∅ 59 H7 ↓3               | ∅ 92 H7 ↓3                |
| I  | mm   |      | ∅ 48                    | ∅ 72                     | ∅ 110                     |
| Key DIN 6885 P9                                    | J    | mm   | ∅ 14 h7                 | ∅ 25 h7                  | ∅ 42 h7                   |
| K  | mm   |      | 30                      | 45                       | 60                        |
| L  | mm   |      | 32                      | 47                       | 62                        |
| M  | mm   |      | 25                      | 36                       | 50                        |
| N  | mm   |      | 2                       | 5                        | 5                         |
| Key DIN 6885 P9                                    | O    | mm   | ∅ 10 H7                 | ∅ 20 H7                  | ∅ 35 H7                   |
| P  | mm   |      | ∅ 6 H7 ↓10              | ∅ 6 H7 ↓10               | ∅ 6 H7 ↓10                |
| S  | mm   |      | M8 ↓25<br>∅ 6,8 through | M10 ↓25<br>∅ 8,5 through | M12 ↓35<br>∅ 10,2 through |
| T  | mm   |      | M6 ↓8                   | M8 ↓10                   | M10 ↓20                   |
| Lube hole  | U    | mm   | M10x1 ↓10               | M10x1 ↓10                | M10x1 ↓10                 |
| Lube hole  | U1   | mm   | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
| V  | mm   |      | 58                      | 62                       | 100                       |
| W  | mm   |      | 18                      | 21                       | 43                        |
| X  | mm   |      | M4 ↓8                   | M4 ↓8                    | M4 ↓8                     |
| Weight PW  | kg   |      | 1,20                    | 2,95                     | 13,25                     |
| Weight ZA 1  | kg   |      | 1,31                    | 3,30                     | 15,10                     |
| Weight ZA 2  | kg   |      | 1,35                    | 3,47                     | 15,76                     |
| Weight PFN   | kg   |      | 1,25                    | 2,92                     | 13,46                     |

| Article number     | 5.0     | 5.1     | 5.3     |
|--------------------|---------|---------|---------|
| lifgo® linear PV   | 500 033 | 500 034 | 500 035 |
| lifgo® linear ZA 1 | 500 037 | 500 038 | 500 039 |
| lifgo® linear ZA 2 | 500 041 | 500 042 | 500 043 |
| lifgo® linear PFN  | 500 045 | 500 046 | 500 047 |

### 3.1.2.4 lifgo® linear eccentric 5.0 – 5.3 • Dimension sheet



 Make sure that the article number refers to the correct pinion shaft version.

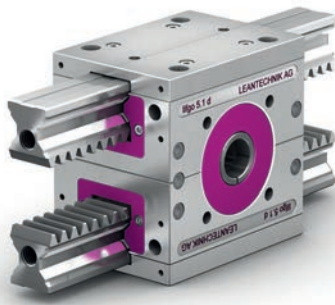



- ❗ The dimensions of the “eccentric” version are identical to those of the lifgo® linear. Please use the dimensions on Page 57.
- ❗ In the “eccentric” version, the pinion shaft is adjusted relative to the gear rack, allowing the tooth flank clearance to be adjusted. It can be readjusted at a later time. Motor flanges, gearbox bell housings, etc. remain centered on the pinion during adjustment.
- ❗ Note that “eccentric” gearboxes cannot be combined with standard gearboxes (centered bearings). The pinion shafts are not aligned. (Max. lateral error 0,3 mm).
- ❗ Follow the instructions for use, available as a separate PDF. A printed copy is included with the gearboxes.

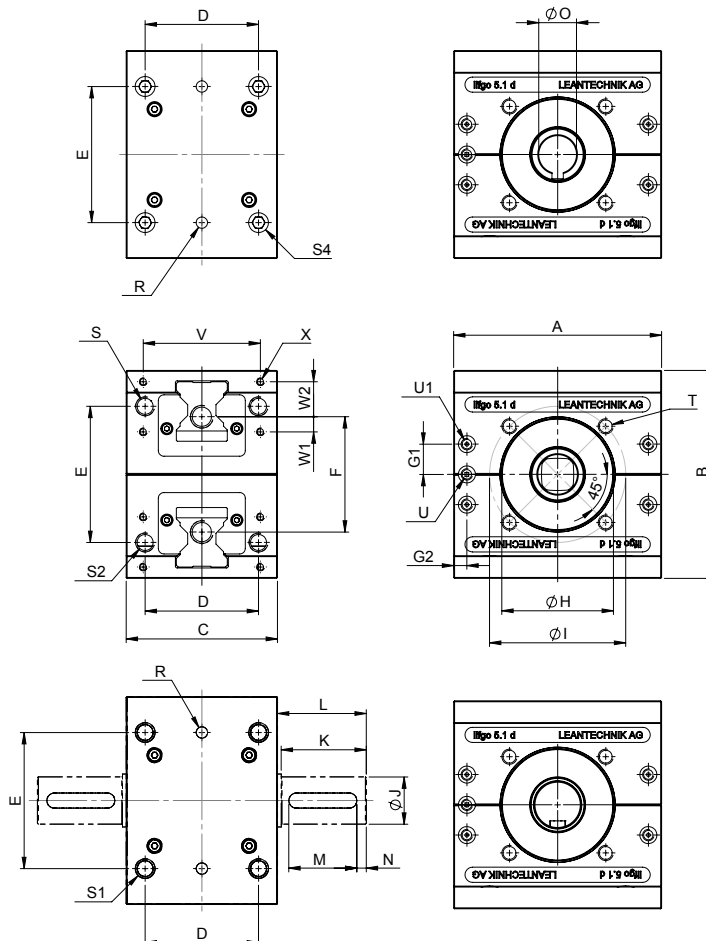
| lifgo® linear eccentric reduced play |    | Unit | 5.0     | 5.1     | 5.3     |
|--------------------------------------|----|------|---------|---------|---------|
| Adjustment range                     | e  | mm   | ± 0,200 | ± 0,300 | ± 0,300 |
| Adjusting steps                      | n  | mm   | ± 4     | ± 6     | ± 6     |
| Adjustment per step                  | e0 | mm   | 0       | 0       | 0       |
|                                      | e1 | mm   | ± 0,076 | ± 0,078 | ± 0,078 |
|                                      | e2 | mm   | ± 0,141 | ± 0,150 | ± 0,150 |
|                                      | e3 | mm   | ± 0,185 | ± 0,212 | ± 0,212 |
|                                      | e4 | mm   | ± 0,200 | ± 0,260 | ± 0,260 |
|                                      | e5 | mm   |         | ± 0,290 | ± 0,290 |
|                                      | e6 | mm   |         | ± 0,300 | ± 0,300 |

| Article number               | 5.0     | 5.1     | 5.3     |
|------------------------------|---------|---------|---------|
| lifgo® linear eccentric PVV  | 500 049 | 500 050 | 500 051 |
| lifgo® linear eccentric ZA 1 | 500 053 | 500 054 | 500 055 |
| lifgo® linear eccentric ZA 2 | 500 057 | 500 058 | 500 059 |
| lifgo® linear eccentric PFN  | 500 061 | 500 062 | 500 063 |

### 3.1.2.5 lifgo® double 5.0 – 5.3 • Dimension sheet



 Make sure that the article number refers to the correct pinion shaft version.






lifgo® double is suitable for “feeding to center” or “stroke to center”, and for gripping and closing movements.

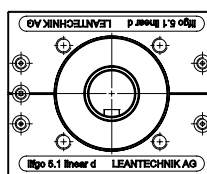
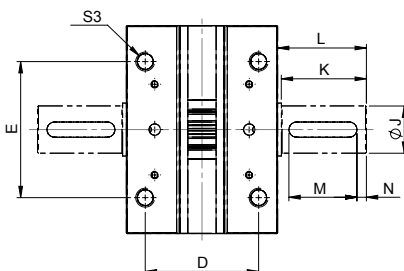
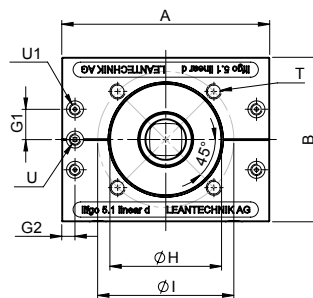
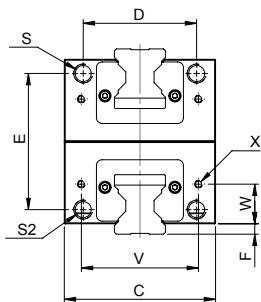
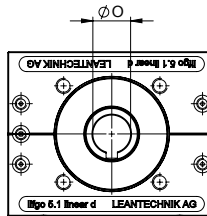
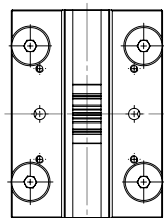
| lifgo® double                                      | Unit | 5.0 | 5.1                     | 5.3                      |                           |
|--|------|-----|-------------------------|--------------------------|---------------------------|
| A  | mm   | 80  | 110                     | 180                      |                           |
| B  | mm   | 80  | 110                     | 180                      |                           |
| C  | mm   | 70  | 80                      | 130                      |                           |
| D  | mm   | 55  | 60                      | 105                      |                           |
| E  | mm   | 50  | 72                      | 120                      |                           |
| F  | mm   | 38  | 61                      | 99                       |                           |
| G1   | mm   | 7,5 | 16                      | 21,5                     |                           |
| G2   | mm   | 7   | 7                       | 13                       |                           |
| Centering flange (if used,<br>remove sealing ring) | H    | mm  | ∅ 38,5 H7 ↓2            | ∅ 59 H7 ↓3               | ∅ 92 H7 ↓3                |
| Key DIN 6885 P9                                    | I    | mm  | ∅ 48                    | ∅ 72                     | ∅ 110                     |
|  | J    | mm  | ∅ 14 h7                 | ∅ 25 h7                  | ∅ 42 h7                   |
|  | K    | mm  | 30                      | 45                       | 60                        |
|  | L    | mm  | 32                      | 47                       | 62                        |
|  | M    | mm  | 25                      | 36                       | 50                        |
| Key DIN 6885 P9                                    | N    | mm  | 2                       | 5                        | 5                         |
|  | O    | mm  | ∅ 10 H7                 | ∅ 20 H7                  | ∅ 35 H7                   |
|  | R    | mm  | ∅ 6 H7 ↓2,5             | ∅ 6 H7 ↓3,5              | ∅ 6 H7 ↓10                |
|  | S    | mm  | M8 ↓25<br>∅ 6,8 through | M10 ↓25<br>∅ 8,5 through | M12 ↓35<br>∅ 10,2 through |
|  | S1   | mm  | └┬∅8,5 ↓8,5<br>M8 ↓25   | └┬∅10,5 ↓11,5<br>M10 ↓25 | └┬∅12,5 ↓19<br>M12 ↓35    |
|  | S2   | mm  | M8 ↓11                  | M10 ↓14                  | M12 ↓24                   |
|  | S4   | mm  | └┬∅ 8,5 ↓8,5            | └┬∅10,5 ↓11,5            | └┬∅12,5 ↓19               |
|  | T    | mm  | M6 ↓8                   | M8 ↓10                   | M10 ↓20                   |
| Lube hole  | U    | mm  | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
| Lube hole  | U1   | mm  | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
|  | V    | mm  | 58                      | 62                       | 100                       |
|  | W1   | mm  | 5,5                     | 8                        | 21,5                      |
|  | W2   | mm  | 15,5                    | 18,5                     | 30                        |
|  | X    | mm  | M4 ↓8                   | M4 ↓8                    | M4 ↓8                     |
| Weight PV  |      | kg  | 1,55                    | 3,75                     | 16,10                     |
| Weight ZA 1  |      | kg  | 1,66                    | 4,10                     | 17,95                     |
| Weight ZA 2  |      | kg  | 1,70                    | 4,27                     | 18,61                     |
| Weight PFN   |      | kg  | 1,58                    | 3,72                     | 16,31                     |

| Article number     | 5.0     | 5.1     | 5.3     |
|--------------------|---------|---------|---------|
| lifgo® double PV   | 500 065 | 500 066 | 500 067 |
| lifgo® double ZA 1 | 500 069 | 500 070 | 500 071 |
| lifgo® double ZA 2 | 500 073 | 500 074 | 500 075 |
| lifgo® double PFN  | 500 077 | 500 078 | 500 079 |

### 3.1.2.6 lifgo® linear double 5.0 – 5.3 • Dimension sheet



 Make sure that the article number refers to the correct pinion shaft version.





For the lifgo® linear double version, reinforcements or infeeds can be mounted on the gear racks.

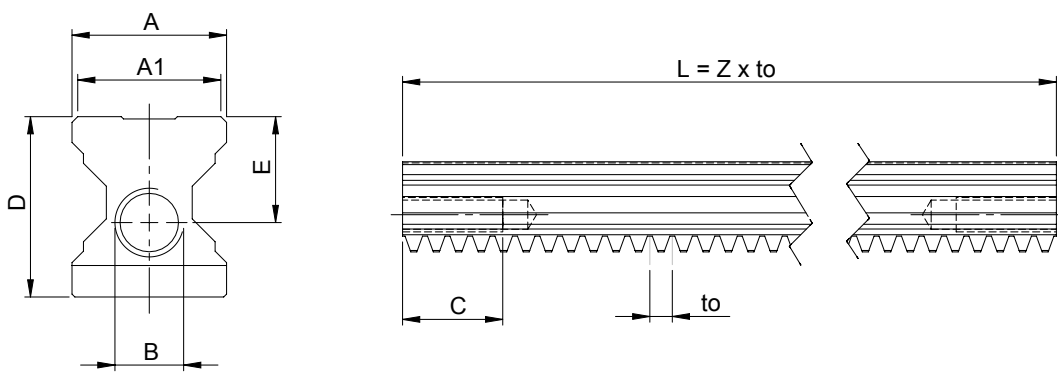
| lifgo® linear double                            |    | Unit | 5.0                     | 5.1                      | 5.3                       |
|---|----|------|-------------------------|--------------------------|---------------------------|
|   | A  | mm   | 80                      | 110                      | 180                       |
|   | B  | mm   | 63                      | 87                       | 142                       |
|   | C  | mm   | 70                      | 80                       | 130                       |
|   | D  | mm   | 55                      | 60                       | 105                       |
|   | E  | mm   | 50                      | 72                       | 120                       |
|   | F  | mm   | 3,5                     | 5,5                      | 5                         |
|   | G1 | mm   | 7,5                     | 16                       | 21,5                      |
|   | G2 | mm   | 7                       | 7                        | 13                        |
| Centering flange (if used, remove sealing ring) | H  | mm   | Ø 38,5 H7 ↓2            | Ø 59 H7 ↓3               | Ø 92 H7 ↓3                |
|   | I  | mm   | Ø 48                    | Ø 72                     | Ø 110                     |
| Key DIN 6885 P9                                 | J  | mm   | Ø 14 h7                 | Ø 25 h7                  | Ø 42 h7                   |
|   | K  | mm   | 30                      | 45                       | 60                        |
|   | L  | mm   | 32                      | 47                       | 62                        |
|   | M  | mm   | 25                      | 36                       | 50                        |
| Key DIN 6885 P9                                 | N  | mm   | 2                       | 5                        | 5                         |
|   | O  | mm   | Ø 10 H7                 | Ø 20 H7                  | Ø 35 H7                   |
|   | S  | mm   | M8 ↓25<br>Ø 6,8 through | M10 ↓25<br>Ø 8,5 through | M12 ↓30<br>Ø 10,2 through |
|   | S2 | mm   | M8 ↓11                  | M10 ↓14                  | M12 ↓24                   |
|   | S3 | mm   | M8 ↓15                  | M10 ↓25                  | M12 ↓35                   |
| Lube hole                                       | T  | mm   | M6 ↓8                   | M8 ↓10                   | M10 ↓20                   |
| Lube hole                                       | U  | mm   | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
|   | U1 | mm   | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
|   | V  | mm   | 58                      | 62                       | 100                       |
|   | W  | mm   | 18                      | 21                       | 43                        |
|   | X  | mm   | M4 ↓8                   | M4 ↓8                    | M4 ↓8                     |
| Weight PW                                       |    | kg   | 1,35                    | 3,35                     | 14,80                     |
| Weight ZA 1                                     |    | kg   | 1,46                    | 3,70                     | 16,65                     |
| Weight ZA 2                                     |    | kg   | 1,50                    | 3,82                     | 17,31                     |
| Weight PFN                                      |    | kg   | 1,38                    | 3,32                     | 15,01                     |

| Article number            | 5.0     | 5.1     | 5.3     |
|---------------------------|---------|---------|---------|
| lifgo® linear double PVW  | 500 081 | 500 082 | 500 083 |
| lifgo® linear double ZA 1 | 500 085 | 500 086 | 500 087 |
| lifgo® linear double ZA 2 | 500 089 | 500 090 | 500 091 |
| lifgo® linear double PFN  | 500 093 | 500 094 | 500 095 |

### 3.1.3 lifgo® accessories

#### 3.1.3.1 lifgo® gear racks • Dimension sheet

The gear rack bears guide loads. It is subjected to tensile, compressive, and transverse forces. Note the moment of inertia and the torque loads on the gearboxes (see Page 51). The gear rack is symmetrical in construction.





**!** When a gear rack protection is used, the gear rack length increases by the installed length of the protection. **For heavy loads, we recommend the use of hardened & ground gear racks.** Have the theoretical service life calculated.

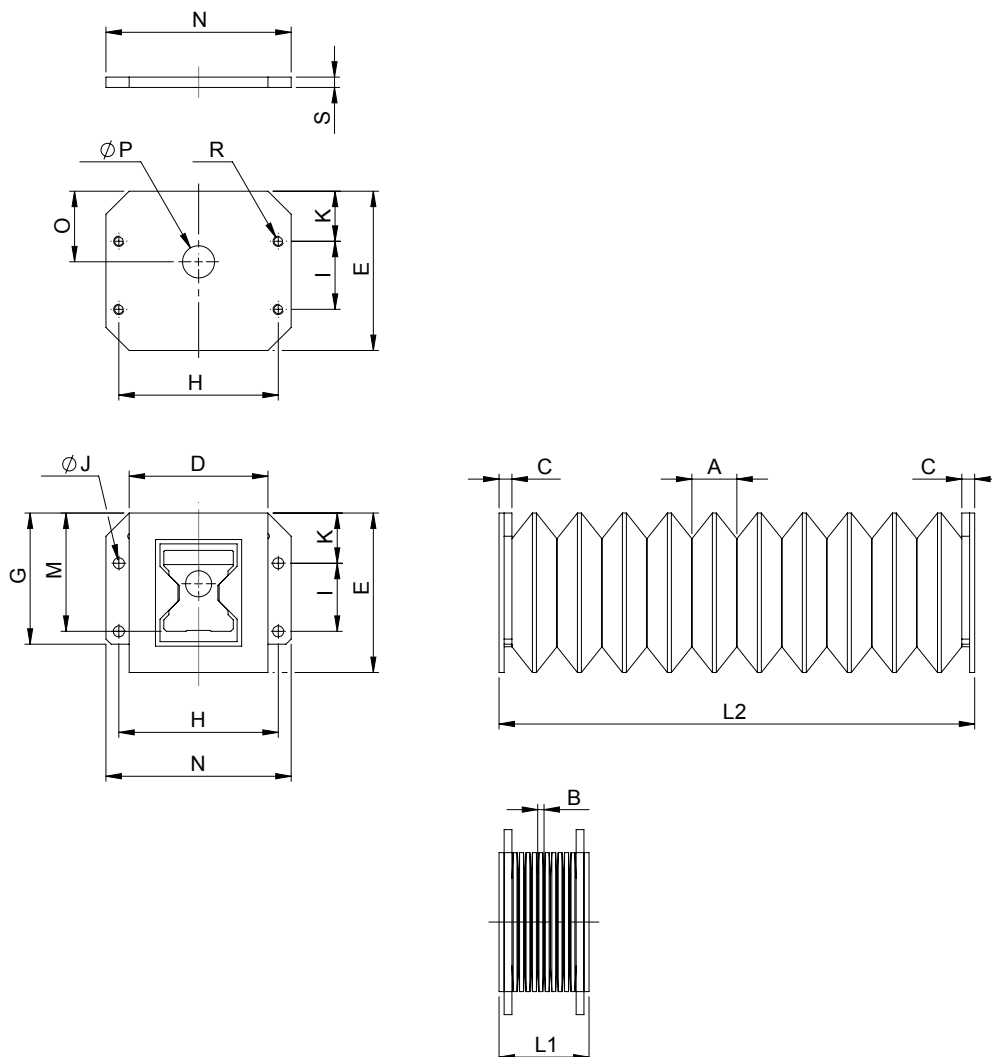
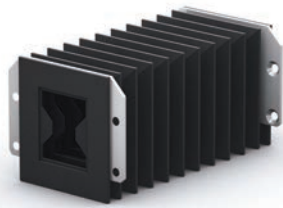
Always add the number of teeth "Z = \_ \_ \_" to the article number

| lifigo® gear rack       | Unit | 5.0             | 5.1                  | 5.3   |        |
|-------------------------|------|-----------------|----------------------|-------|--------|
| A                       | mm   | 23              | 27                   | 48    |        |
| A1                      | mm   | 21              | 25                   | 46    |        |
| B                       | mm   | M10             | M12                  | M20   |        |
| C                       | mm   | 30              | 35                   | 50    |        |
| D                       | mm   | 26              | 31,5                 | 48,5  |        |
| E                       | mm   | 16              | 18,5                 | 26,5  |        |
| Gear rack length        | L    |                 | L = Z x to           |       |        |
| Number of teeth         | Z    |                 | as per customer data |       |        |
| Module                  | m    | 1,0             | 2,5                  | 2,5   |        |
| Tooth pitch             | to   | mm              | to = m x Pi          |       |        |
| Moment of inertia       | Ix   | mm <sup>4</sup> | 16411                | 22961 | 253179 |
| Moment of inertia       | Iy   | mm <sup>4</sup> | 24216                | 35018 | 297984 |
| Polar moment of inertia | Ip   | mm <sup>4</sup> | 40628                | 57979 | 551164 |
| Weight                  |      | kg/m            | 3,82                 | 4,84  | 14,45  |

| Article number    |                   | 5.0     | 5.1     | 5.3     |
|-------------------|-------------------|---------|---------|---------|
| lifigo® gear rack |                   | 500 113 | 500 114 | 500 115 |
| lifigo® gear rack | ground            | 500 504 | 500 505 | 500 506 |
| lifigo® gear rack | hardened & ground | 500 169 | 500170  | 500171  |

### 3.1.3.2 lifgo® gear rack protection & end plate • Dimension sheet

This gear rack protection is not suitable for use in welding areas. The end plate is used for mounting the gear rack protection on the lifgo® gear rack.



**!** Check whether the operating conditions require a gear rack protection.  
 This gear rack protection is **not suitable for use in welding areas**.  
 It is shipped with retaining plates and screws.

The gear rack protection is silicone-free.

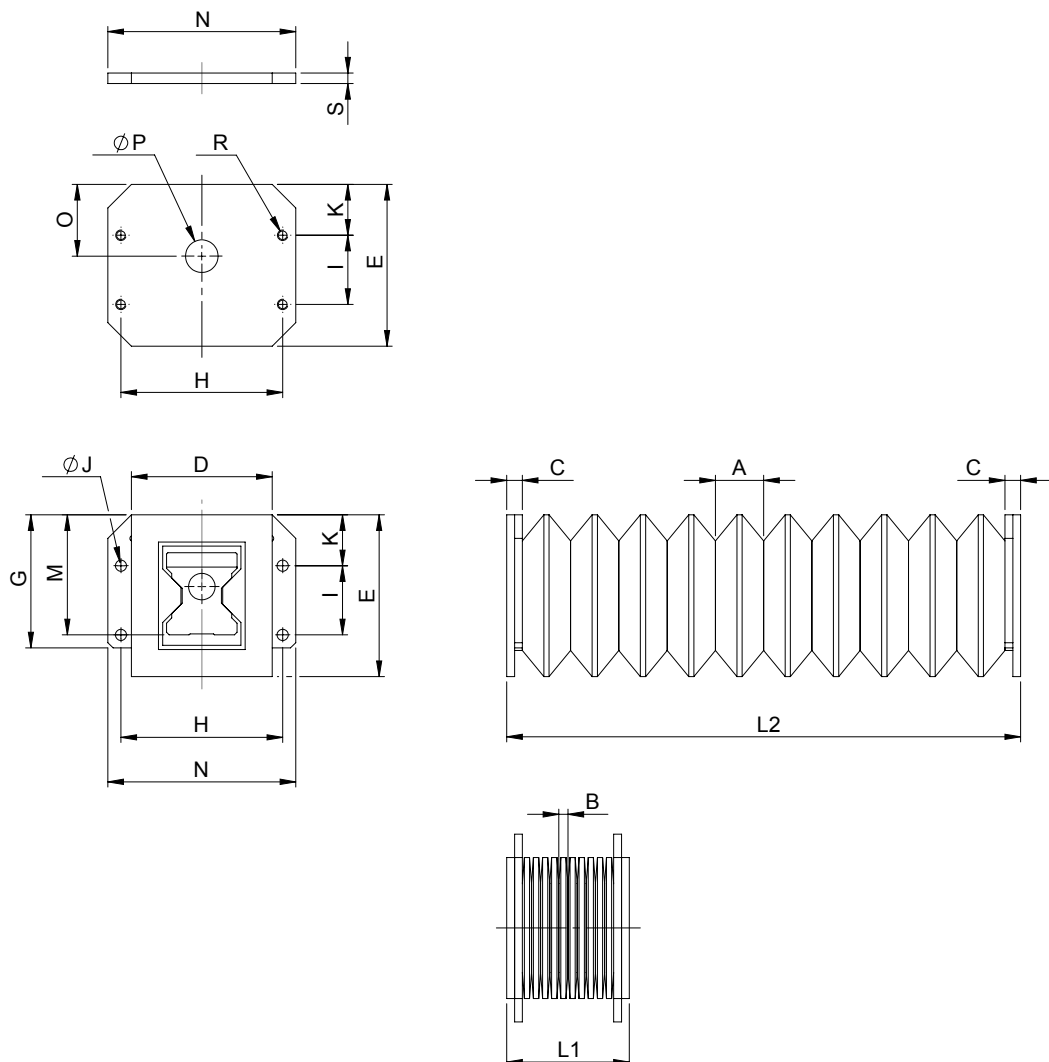
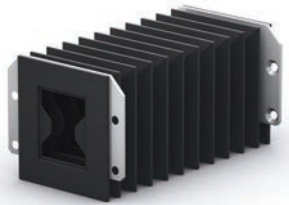
Always add the number of folds "F = \_ \_ \_" to the article number.

| lifgo® gear rack protection |         | Unit | 5.0                       | 5.1                 | 5.3                 |
|-----------------------------|---------|------|---------------------------|---------------------|---------------------|
| Stroke per fold             | A       | mm   | 17,5                      | 17,5                | 27,5                |
|                             | B       | mm   | 2,5                       | 2,5                 | 2,5                 |
|                             | (A - B) | mm   | 15                        | 15                  | 25                  |
|                             | C       | mm   | 5                         | 5                   | 5                   |
|                             | D       | mm   | 50                        | 54                  | 92                  |
| Number of folds             | E       | mm   | 54                        | 62                  | 94                  |
|                             | F       | each | as per customer data      |                     |                     |
|                             | G       | mm   | 44,5                      | 51                  | 84                  |
|                             | H       | mm   | 58                        | 62                  | 100                 |
|                             | I       | mm   | 21                        | 26,5                | 51,5                |
| Stroke                      | J       | mm   | ∅ 4,3<br>√8,5 x 90°       | ∅ 4,3<br>√8,5 x 90° | ∅ 4,3<br>√8,5 x 90° |
|                             | K       | mm   | 18,5                      | 19,5                | 23,5                |
|                             | L       | mm   | L = L2 - L1 = F x (A - B) |                     |                     |
|                             | L1      | mm   | L1 = 2 x C + F x B        |                     |                     |
|                             | L2      | mm   | L2 = 2 x C + F x A        |                     |                     |
|                             | M       | mm   | 40                        | 46                  | 71,5                |
|                             | N       | mm   | 68                        | 72                  | 112                 |
|                             | O       | mm   | 24                        | 27,5                | 45                  |
|                             | P       | mm   | ∅ 10,5                    | ∅ 12,5              | ∅ 20,5              |
|                             | S       | mm   | 4                         | 4                   | 4                   |

| Article number              | 5.0     | 5.1     | 5.3     |
|-----------------------------|---------|---------|---------|
| lifgo® gear rack protection | 500 121 | 500 122 | 500 123 |
| lifgo® end plate            | 500 539 | 500 541 | 500 543 |

### 3.1.3.3 lifgo® gear rack protection SB & end plate • Dimension sheet

This gear rack protection is suitable for use in welding areas (SB). The end plate is used for mounting the gear rack protection on the lifgo® gear rack.



**!** Check whether the operating conditions require a gear rack protection. This gear rack protection is **suitable for use in welding areas**. It is shipped with retaining plates and screws.

Note that in its retracted state, the "SB" version requires 1,0 mm more installation space per fold (dimensions A, B and C).

The gear rack protection is silicone-free.

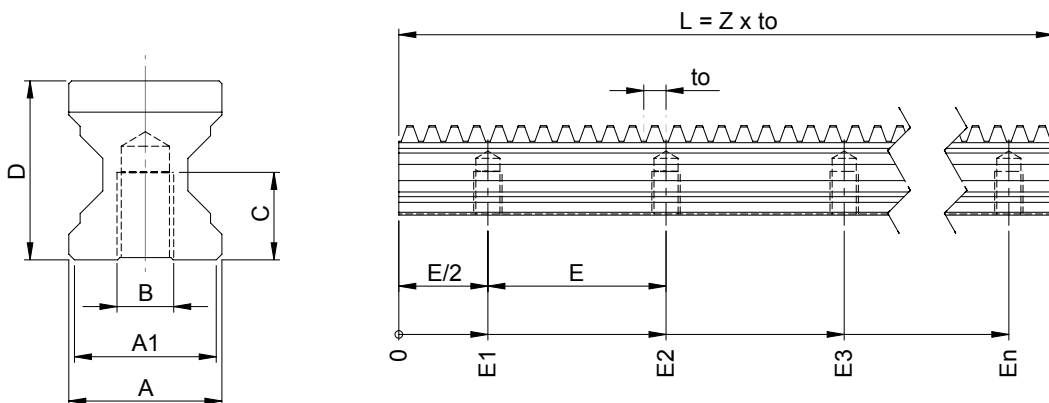
Always add the number of folds "F = \_ \_ \_" to the article number.

| lifigo®<br>gear rack protection SB |         | Unit | 5.0                              | 5.1                  | 5.3                  |
|------------------------------------|---------|------|----------------------------------|----------------------|----------------------|
| Stroke per fold                    | A       | mm   | 18,5                             | 18,5                 | 28,5                 |
|                                    | B       | mm   | 3,5                              | 3,5                  | 3,5                  |
|                                    | (A - B) | mm   | 15                               | 15                   | 25                   |
|                                    | C       | mm   | 6                                | 6                    | 6                    |
|                                    | D       | mm   | 50                               | 54                   | 92                   |
| Number of folds                    | E       | mm   | 54                               | 62                   | 94                   |
|                                    | F       | each | as per customer data             |                      |                      |
|                                    | G       | mm   | 44,5                             | 51                   | 84                   |
|                                    | H       | mm   | 58                               | 62                   | 100                  |
|                                    | I       | mm   | 21                               | 26,5                 | 51,5                 |
| Stroke                             | J       | mm   | ∅ 4,3<br>√ 8,5 x 90°             | ∅ 4,3<br>√ 8,5 x 90° | ∅ 4,3<br>√ 8,5 x 90° |
|                                    | K       | mm   | 18,5                             | 19,5                 | 23,5                 |
|                                    | L       | mm   | $L = L2 - L1 = F \times (A - B)$ |                      |                      |
|                                    | L1      | mm   | $L1 = 2 \times C + F \times B$   |                      |                      |
|                                    | L2      | mm   | $L2 = 2 \times C + F \times A$   |                      |                      |
|                                    | M       | mm   | 40                               | 46                   | 71,5                 |
|                                    | N       | mm   | 68                               | 72                   | 112                  |
|                                    | O       | mm   | 24                               | 27,5                 | 45                   |
|                                    | P       | mm   | ∅ 10,5                           | ∅ 12,5               | ∅ 20,5               |
|                                    | R       | mm   | M4                               | M4                   | M4                   |
| S                                  | mm      | 4    | 4                                | 4                    |                      |

| Article number                  | 5.0     | 5.1     | 5.3     |
|---------------------------------|---------|---------|---------|
| lifigo® gear rack protection SB | 500 510 | 500 511 | 500 512 |
| lifigo® end plate               | 500 539 | 500 541 | 500 543 |

### 3.1.3.4 lifgo® linear gear racks • Dimension sheet

The gear rack bears guide loads. It is subjected to tensile, compressive, and transverse forces. Note the moments of inertia and the torque loads on the gearboxes (see Page 51). The gear rack is symmetrical in construction. Reinforcement profiles and/or feed lines can be fixed and routed using the tapped holes at the rear.



**!** When a gear rack protection is used, the gear rack length increases by the installed length of the protection. **For heavy loads, we recommend the use of ground or hardened & ground gear racks.** When a suspended guide rail is used, take account of the load capacity of the screws. Have the theoretical lifespan calculated.

The gear rack mounting screws must be checked and a calculation performed according to the load.

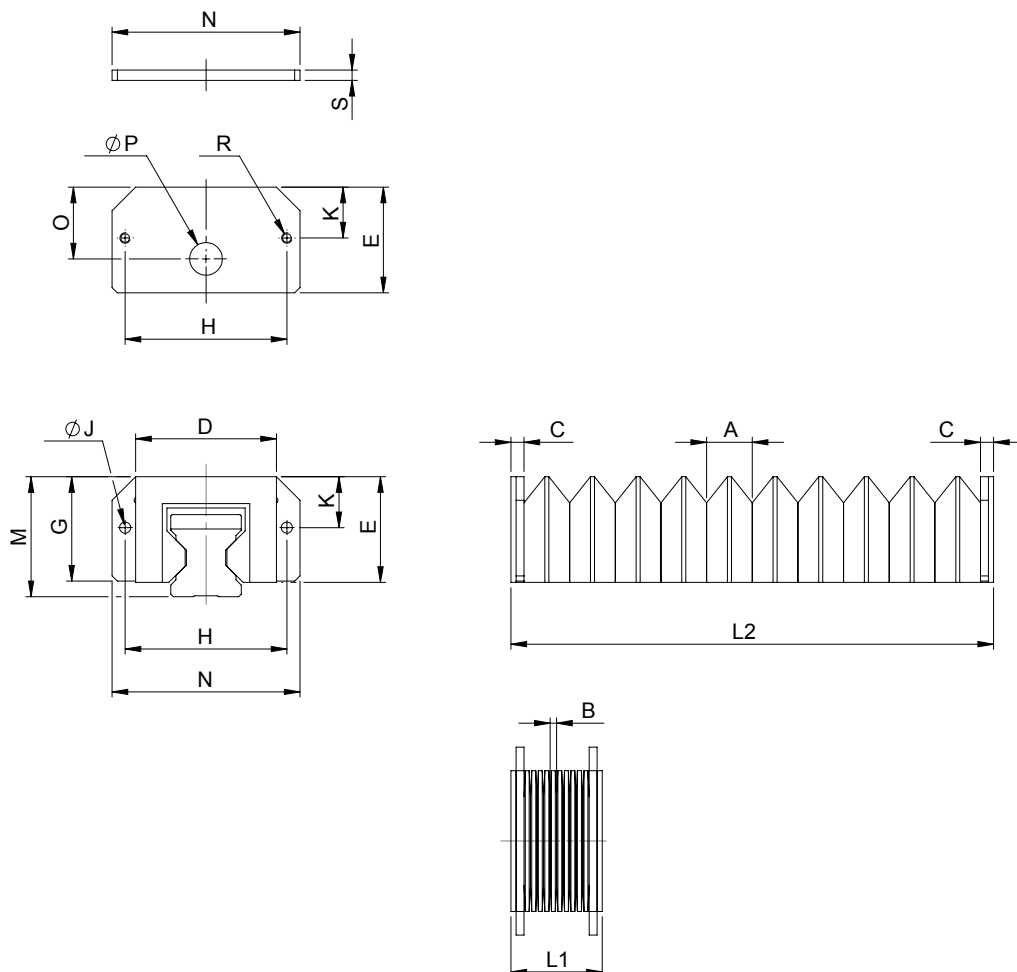
Always add the number of teeth "Z = \_ \_ \_" to the article number.

| lifgo® linear gear rack           | Unit       | 5.0  | 5.1                        | 5.3        |
|-----------------------------------|------------|--|----------------------------|------------|
| A                                 | mm         | 23   | 27                         | 48         |
| A1                                | mm         | 21   | 25                         | 46         |
| B                                 | mm         | M10  | M10                        | M12        |
| C                                 | mm         | 15   | 15                         | 20         |
| D                                 | mm         | 26   | 31,5                       | 48,5       |
| (E = Ze x m x Pi)                 | mm         | 62,831853  | 62,831853                  | 109,955743 |
| E1                                | mm         | 31,42  | 31,42                      | 54,98      |
| E2                                | mm         | 94,25  | 94,25                      | 164,93     |
| E3                                | mm         | 157,08   | 157,08                     | 274,89     |
| Hole spacing from front end       | mm         | $E_n = Z_e \times m \times \text{Pi} \times (n - 1/2)$ |                            |            |
| Gear rack length                  | mm         | $L = Z \times t_o$                                     |                            |            |
| Max. number of holes              | each       | whole number $N_{max.} = (Z - Z_e/2 - 2)/Z_e + 1$      |                            |            |
| Number of teeth                   | each       | as per customer data                                   |                            |            |
| Number of teeth between two holes | each       | 20   | 8                          | 14         |
| Module                            | m          | 1,0  | 2,5                        | 2,5        |
| Tooth pitch                       | to         | mm   | $t_o = m \times \text{Pi}$ |            |
| Moments of inertia                | lx, ly, lp | mm <sup>4</sup>  | see lifgo® gear rack       |            |
| Weight                            | kg/m       | 3,82   | 4,84                       | 14,45      |

| Article number          |                   | 5.0     | 5.1     | 5.3     |
|-------------------------|-------------------|---------|---------|---------|
| lifgo® linear gear rack |                   | 500 117 | 500 118 | 500 119 |
| lifgo® linear gear rack | ground            | 500 507 | 500 508 | 500 509 |
| lifgo® linear gear rack | hardened & ground | 500 173 | 500 174 | 500 175 |

### 3.1.3.5 lifgo® linear gear rack protection & end plate • Dimension sheet

This gear rack protection is not suitable for use in welding areas. The end plate is used for mounting the gear rack protection on the lifgo® linear gear rack.





**!** Check whether the operating conditions require a gear rack protection.  
 This gear rack protection is **not suitable for use in welding areas**.  
 It is shipped with two retaining plates and screws.

The gear rack protection is silicone-free.

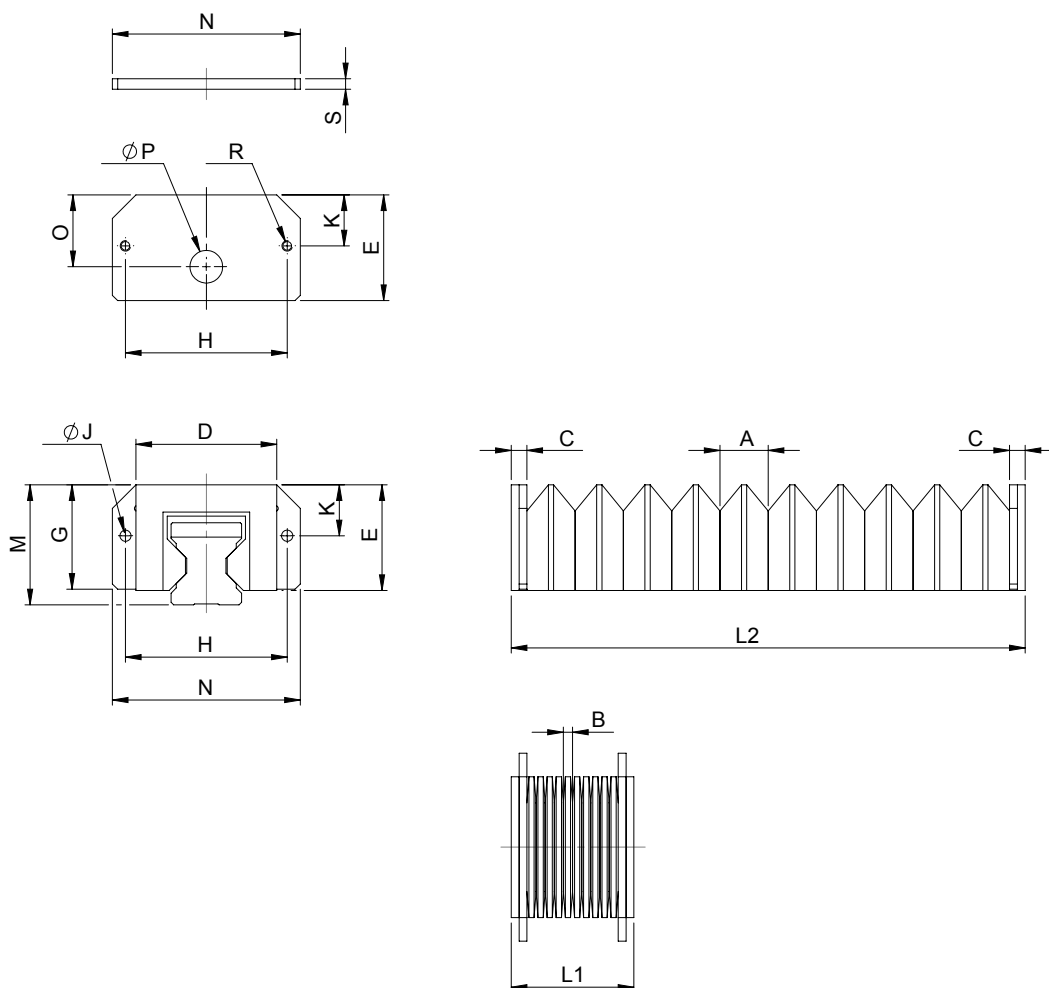
Always add the number of folds "F = \_ \_ \_" to the article number.

| lifgo® linear gear rack protection |         | Unit | 5.0                              | 5.1                  | 5.3                  |
|------------------------------------|---------|------|----------------------------------|----------------------|----------------------|
| Stroke per fold                    | A       | mm   | 17,5                             | 17,5                 | 27,5                 |
|                                    | B       | mm   | 2,5                              | 2,5                  | 2,5                  |
|                                    | (A – B) | mm   | 15                               | 15                   | 25                   |
|                                    | C       | mm   | 5                                | 5                    | 5                    |
| Number of folds                    | D       | mm   | 50                               | 54                   | 92                   |
|                                    | E       | mm   | 36,5                             | 40,5                 | 66,5                 |
|                                    | F       | each | as per customer data             |                      |                      |
|                                    | G       | mm   | 36                               | 40                   | 66                   |
| Stroke                             | H       | mm   | 58                               | 62                   | 100                  |
|                                    | J       | mm   | ∅ 4,3<br>√ 8,5 x 90°             | ∅ 4,3<br>√ 8,5 x 90° | ∅ 4,3<br>√ 8,5 x 90° |
|                                    | K       | mm   | 18,5                             | 19,5                 | 23,5                 |
|                                    | L       | mm   | $L = L2 - L1 = F \times (A - B)$ |                      |                      |
|                                    | L1      | mm   | $L1 = 2 \times C + F \times B$   |                      |                      |
|                                    | L2      | mm   | $L2 = 2 \times C + F \times A$   |                      |                      |
|                                    | M       | mm   | 40                               | 46                   | 71,5                 |
|                                    | N       | mm   | 68                               | 72                   | 112                  |
|                                    | O       | mm   | 24                               | 27,5                 | 45                   |
|                                    | P       | mm   | ∅ 10,5                           | ∅ 12,5               | ∅ 20,5               |
| R                                  | mm      | M4   | M4                               | M4                   |                      |
| S                                  | mm      | 4    | 4                                | 4                    |                      |

| Article number                     | 5.0     | 5.1     | 5.3     |
|------------------------------------|---------|---------|---------|
| lifgo® linear gear rack protection | 500 125 | 500 126 | 500 127 |
| lifgo® linear end plate            | 500 540 | 500 542 | 500 544 |

### 3.1.3.6 lifgo® linear gear rack protection SB & end plate • Dimension sheet

This gear rack protection is suitable for use in welding areas (SB). The end plate is used for mounting the gear rack protection on the lifgo® linear gear rack.



**!** Check whether the operating conditions require a gear rack protection.  
 This gear rack protection is **suitable for use in welding areas**.  
 It is shipped with retaining plates and screws.

Note that in its retracted state, the "SB" version requires 1,0 mm more installation space per fold (dimensions A, B and C).

The gear rack protection is silicone-free.

Always add the number of folds "F = \_ \_ \_" to the article number.

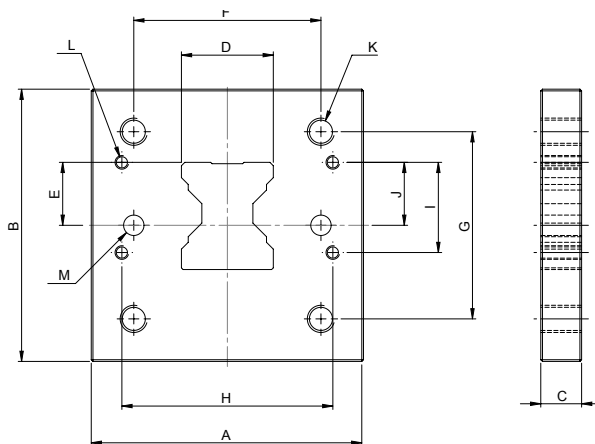
| lifgo® linear gear rack protection SB |         | Unit | 5.0                              | 5.1                  | 5.3                  |
|---------------------------------------|---------|------|----------------------------------|----------------------|----------------------|
| Stroke per fold                       | A       | mm   | 18,5                             | 18,5                 | 28,5                 |
|                                       | B       | mm   | 3,5                              | 3,5                  | 3,5                  |
|                                       | (A - B) | mm   | 15                               | 15                   | 25                   |
|                                       | C       | mm   | 6                                | 6                    | 6                    |
| Number of folds                       | D       | mm   | 50                               | 54                   | 92                   |
|                                       | E       | mm   | 36,5                             | 40,5                 | 66,5                 |
|                                       | F       | each | as per customer data             |                      |                      |
|                                       | G       | mm   | 36                               | 40                   | 66                   |
| Stroke                                | H       | mm   | 58                               | 62                   | 100                  |
|                                       | J       | mm   | ∅ 4,3<br>√ 8,5 x 90°             | ∅ 4,3<br>√ 8,5 x 90° | ∅ 4,3<br>√ 8,5 x 90° |
|                                       | K       | mm   | 18,5                             | 19,5                 | 23,5                 |
|                                       | L       | mm   | $L = L2 - L1 = F \times (A - B)$ |                      |                      |
|                                       | L1      | mm   | $L1 = 2 \times C + F \times B$   |                      |                      |
|                                       | L2      | mm   | $L2 = 2 \times C + F \times A$   |                      |                      |
|                                       | M       | mm   | 40                               | 46                   | 71,5                 |
|                                       | N       | mm   | 68                               | 72                   | 112                  |
|                                       | O       | mm   | 24                               | 27,5                 | 45                   |
|                                       | P       | mm   | ∅ 10,5                           | ∅ 12,5               | ∅ 20,5               |
| R                                     | mm      | M4   | M4                               | M4                   |                      |
| S                                     | mm      | 4    | 4                                | 4                    |                      |

| Article number                        | 5.0     | 5.1     | 5.3     |
|---------------------------------------|---------|---------|---------|
| lifgo® linear gear rack protection SB | 500 516 | 500 517 | 500 518 |
| lifgo® linear end plate               | 500 540 | 500 542 | 500 544 |

### 3.1.3.7 lifigo® gear rack retaining plate AZ & end plate • Dimension sheet

The gear rack retaining plate provides a rigid connection between the mounted parts and the gear rack. To this end, the retaining plate is pressed onto the gear rack in the guide direction. The tapped holes "K" can be used to mount additional components for the customer.

The gear rack retaining plate is only intended to take up torque. It cannot therefore transfer forces in the gear rack guide direction. The retaining plate is mounted flush with the front surface of the gear rack using a shrinkage process.





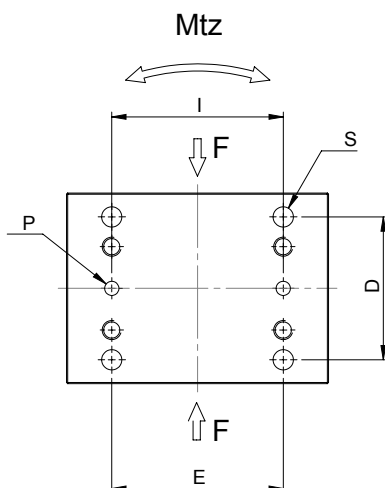
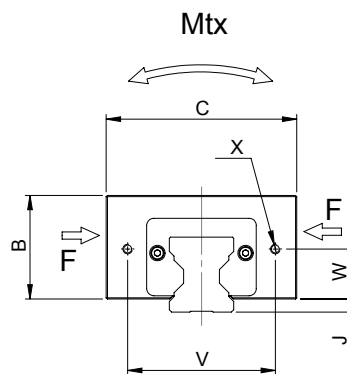
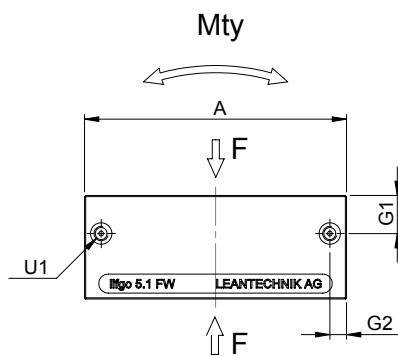
Be sure to indicate precisely which gear rack will be used with the AZ plate when ordering a gear rack retaining plate.

| lifgo® gear rack retaining plate AZ |    | Unit   | 5.0    | 5.1    | 5.3 |
|-------------------------------------|----|--------|--------|--------|-----|
| A                                   | mm | 70     | 80     | 130    |     |
| B                                   | mm | 70     | 80     | 130    |     |
| C                                   | mm | 10     | 12     | 15     |     |
| D                                   | mm | 23     | 27     | 48     |     |
| E                                   | mm | 16     | 18,5   | 26,5   |     |
| F                                   | mm | 50     | 55     | 90     |     |
| G                                   | mm | 50     | 55     | 90     |     |
| H                                   | mm | 58     | 62     | 100    |     |
| I                                   | mm | 21     | 26,5   | 51,5   |     |
| J                                   | mm | 15,5   | 18,5   | 30     |     |
| K                                   | mm | M6     | M8     | M10    |     |
| L                                   | mm | M4     | M4     | M4     |     |
| M                                   | mm | Ø 6 H7 | Ø 6 H7 | Ø 6 H7 |     |
| Weight                              | kg | 0,33   | 0,51   | 1,70   |     |

| Article number                      |              | 5.0     | 5.1     | 5.3     |
|-------------------------------------|--------------|---------|---------|---------|
| lifgo® gear rack retaining plate AZ | spark-eroded | 500 181 | 500 182 | 500 183 |

### 3.1.3.8 lifgo® guide car 5.0 – 5.3 • Dimension sheet

Guide cars provide support and guidance, and fit on both guide rails and gear rack rails within a size category.





Note the static and dynamic load ratings when configuring the components. They are identical to those for the lifgo® gearboxes (see Page 51).

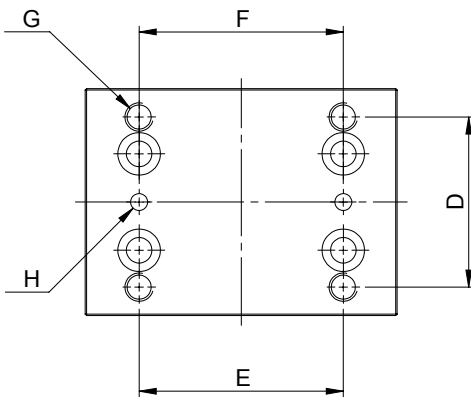
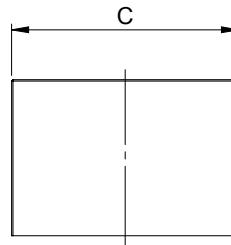
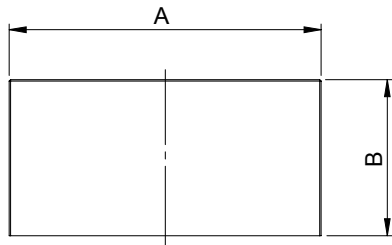
Ensure that the lube holes remain accessible after assembly.

| lifgo® guide car     | Unit                    | 5.0              | 5.1                     | 5.3                      |                           |
|----------------------|-------------------------|------------------|-------------------------|--------------------------|---------------------------|
| A                    | mm                      | 80               | 110                     | 180                      |                           |
| B                    | mm                      | 31,5             | 43,5                    | 71                       |                           |
| C                    | mm                      | 70               | 80                      | 130                      |                           |
| D                    | mm                      | 55               | 60                      | 105                      |                           |
| E                    | mm                      | 50               | 72                      | 120                      |                           |
| G1                   | mm                      | 7,5              | 16                      | 21,5                     |                           |
| G2                   | mm                      | 7                | 7                       | 13                       |                           |
| Dowel holes          | I                       | mm               | 44                      | 72                       | 120                       |
|                      | J                       | mm               | 3,5                     | 5,5                      | 5                         |
|                      | P                       | mm               | ∅ 6 H7 ↓4               | ∅ 6 H7 ↓5                | ∅ 6 H7 ↓6                 |
|                      | S                       | mm               | M8 ↓20<br>∅ 6,8 through | M10 ↓25<br>∅ 8,5 through | M12 ↓35<br>∅ 10,2 through |
|                      | U1                      | mm               | M6 ↓5                   | M6 ↓5                    | M6 ↓5                     |
|                      | V                       | mm               | 58                      | 62                       | 100                       |
|                      | W                       | mm               | 18                      | 21                       | 43                        |
|                      | X                       | mm               | M4 ↓8                   | M4 ↓8                    | M4 ↓8                     |
| Lifting speed        | v <sub>max</sub>        | m/s              | 3                       | 3                        | 3                         |
| Acceleration         | a <sub>max</sub>        | m/s <sup>2</sup> | 50                      | 50                       | 50                        |
| Static torque        | M <sub>t, stat.</sub>   | Nm               | 570                     | 760                      | 4400                      |
| Dynamic torque       | M <sub>t, dyn.</sub>    | Nm               | 280                     | 390                      | 2200                      |
|                      | M <sub>t, stat.</sub>   | Nm               | 380                     | 650                      | 3300                      |
|                      | M <sub>t, dyn.</sub>    | Nm               | 180                     | 330                      | 1600                      |
|                      | M <sub>t, z stat.</sub> | Nm               | 380                     | 650                      | 3300                      |
|                      | M <sub>t, z dyn.</sub>  | Nm               | 180                     | 330                      | 1600                      |
| Static load ratings  | F stat.                 | N                | 38400                   | 51200                    | 161400                    |
| Dynamic load ratings | F dyn.                  | N                | 19100                   | 25900                    | 79600                     |
| Weight               |                         | kg               | 0,80                    | 2,10                     | 9,10                      |

| Article number    | 5.0     | 5.1     | 5.3     |
|-------------------|---------|---------|---------|
| lifgo® guide cars | 500 097 | 500 098 | 500 099 |

### 3.1.3.9 lifgo<sup>®</sup> compensating block 5.0 – 5.3 • Dimension sheet

If necessary, the compensating block compensates for the height of the missing lifgo<sup>®</sup> housing.







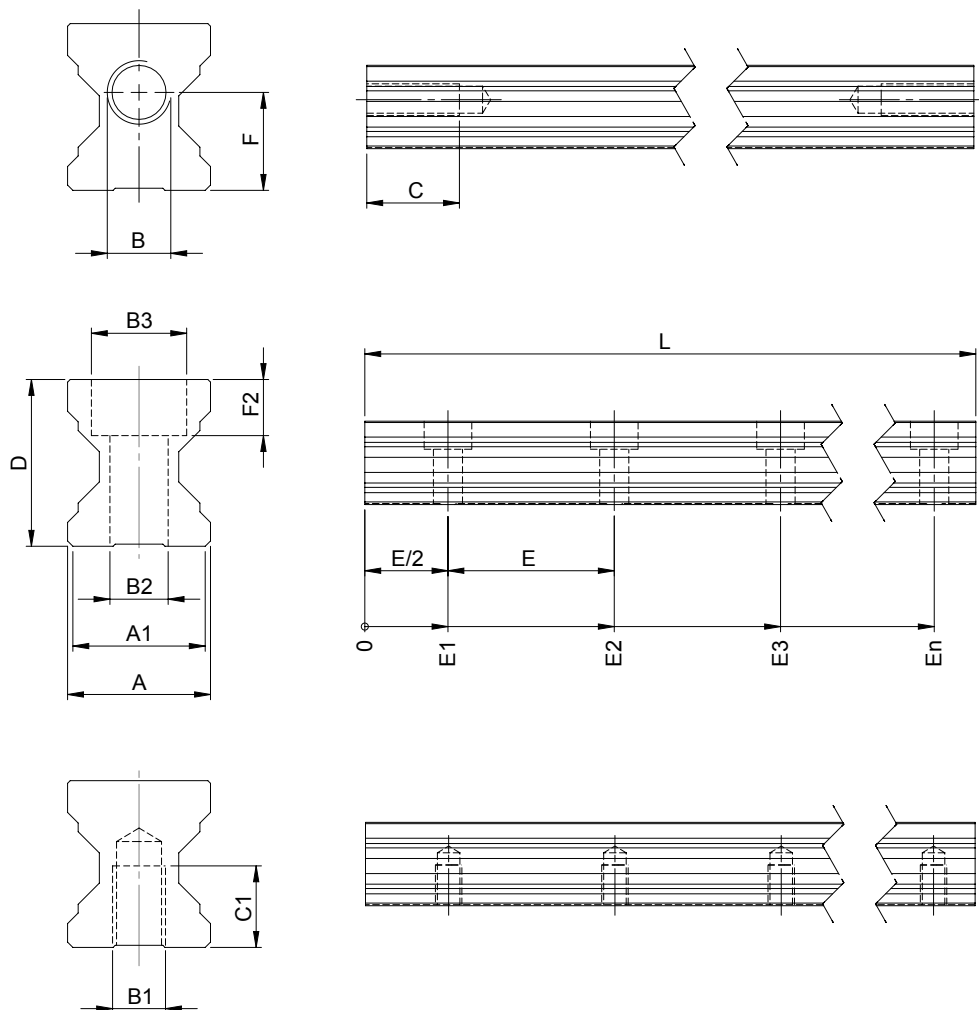
The compensating block is shipped with screws and dowel pins which are used for mounting it on the guide car.

| lifgo® compensating block |   | Unit | 5.0                     | 5.1                      | 5.3                       |
|---------------------------|---|------|-------------------------|--------------------------|---------------------------|
|                           | A | mm   | 80                      | 110                      | 180                       |
|                           | B | mm   | 40                      | 55                       | 90                        |
|                           | C | mm   | 70                      | 80                       | 130                       |
|                           | D | mm   | 55                      | 60                       | 105                       |
|                           | E | mm   | 50                      | 72                       | 120                       |
| Dowel holes               | F | mm   | 50                      | 72                       | 120                       |
|                           | G | mm   | M8 ↓20<br>Ø 6,8 through | M10 ↓25<br>Ø 8,5 through | M12 ↓35<br>Ø 10,2 through |
|                           | H | mm   | Ø 6H7 ↓10               | Ø 6H7 ↓10                | Ø 6H7 ↓10                 |
| Weight                    |   | kg   | 0,60                    | 1,25                     | 5,50                      |

| Article number            | 5.0     | 5.1     | 5.3     |
|---------------------------|---------|---------|---------|
| lifgo® compensating block | 500 883 | 500 884 | 500 885 |

### 3.1.3.10 lifgo® guide rails • Dimension sheet

Guide rails are available with or without holes for screw attachment from the "top" or the "bottom." The hole spacings correspond to those of the lifgo® linear gear racks. The guide rails, with guide cars, are used in parallel with lifgo® or lifgo® linear. Multiple guide rails can be laid end-to-end. The gear rack protection on pages 72 and 74 can be used for these guide rails.



**!** For multi-part guide rails, the “E2” dimensions must be maintained at both ends of the rail (**symmetry**).

For multi-part guide rails, the parting joints of the rail and the substructure must not be in line.

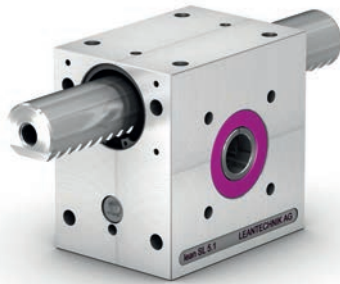
When using the guide rail, consider the load capacity of the screws.

| lifgo® guide rail                      | Unit               | 5.0             | 5.1                          | 5.3       |            |
|--|--------------------|-----------------|------------------------------|-----------|------------|
| A                                      | mm                 | 23              | 27                           | 48        |            |
| A1                                     | mm                 | 21              | 25                           | 46        |            |
| B                                      | mm                 | M10             | M12                          | M20       |            |
| B1                                     | mm                 | M10             | M10                          | M12       |            |
| B2                                     | mm                 | Ø 9             | Ø 11                         | Ø 13,5    |            |
| B3                                     | mm                 | Ø 15            | Ø 18                         | Ø 20      |            |
| C                                      | mm                 | 30              | 35                           | 50        |            |
| C1                                     | mm                 | 15              | 15                           | 20        |            |
| D                                      | mm                 | 26              | 31,5                         | 48,5      |            |
| (E = Ze x m x Pi)                      | E                  | mm              | 62,831853                    | 62,831853 | 109,955743 |
| (example result for lower calculation) | E1                 | mm              | 31,42                        | 31,42     | 54,98      |
|  | E2                 | mm              | 94,25                        | 94,25     | 164,93     |
|  | E3                 | mm              | 157,08                       | 157,08    | 274,89     |
| Hole spacing from front end            | En                 | mm              | En = Ze x m x Pi x (n - 1/2) |           |            |
|  | F                  | mm              | 16                           | 18,5      | 26,5       |
|  | F2                 |                 | 8,6                          | 10,6      | 12,6       |
| Total length                           | L                  | mm              | as per customer data         |           |            |
| Number of teeth between two holes      | Ze                 | each            | 20                           | 8         | 14         |
| Module                                 | m                  | mm              | 1,0                          | 2,5       | 2,5        |
| Moment of inertia                      | Ix                 | mm <sup>4</sup> | 18660                        | 31938     | 303725     |
| Moment of inertia                      | Iy                 | mm <sup>4</sup> | 32149                        | 65956     | 438696     |
| Polar moment of inertia                | Ip                 | mm <sup>4</sup> | 50810                        | 97895     | 742422     |
| Weight                                 | Hole at front      | kg/m            | 4,02                         | 5,40      | 15,43      |
|  | Screwed from above | kg/m            | 3,70                         | 4,82      | 14,80      |
|  | Screwed from below | kg/m            | 3,90                         | 5,25      | 14,26      |

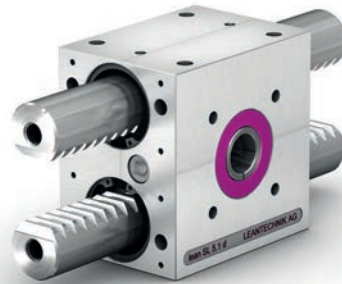
| Article number    |                    | 5.0     | 5.1     | 5.3     |
|-------------------|--------------------|---------|---------|---------|
| lifgo® guide rail | Hole at front      | 500 101 | 500 102 | 500 103 |
| lifgo® guide rail | Screwed from above | 500 105 | 500 106 | 500 107 |
| lifgo® guide rail | Screwed from below | 500 109 | 500 110 | 500 111 |

### 3.2 lean SL® 5 • Technical data & dimension sheets

#### 3.2.1 lean SL® series • Technical data



lean SL®



lean SL® double

**!** Make sure that the article number refers to the correct pinion shaft version.



PW



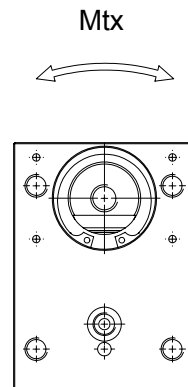
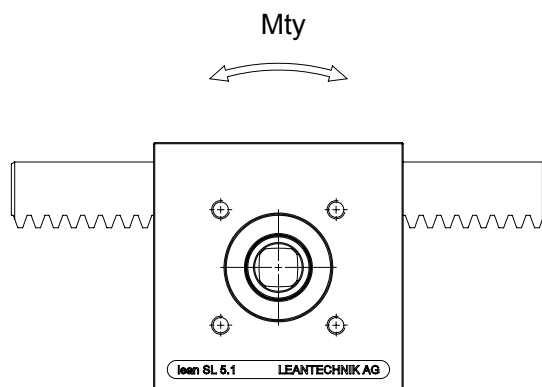
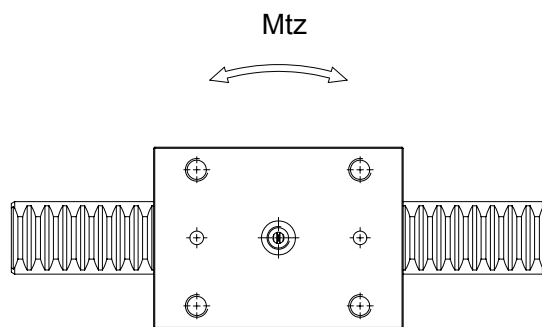
ZA 1



ZA 2



PFN



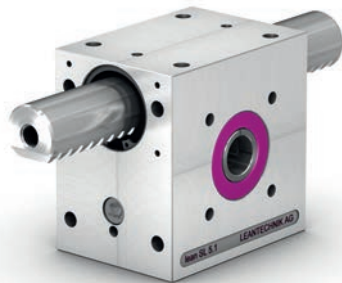
**!** The performance data listed apply to both the lean SL<sup>®</sup> and lean SL<sup>®</sup> double versions of each size.


The frictional forces in the bushings increase due to torques. This leads to reduced efficiency and increased wear of the bushings (sliding bearings). Please note that this means that a greater driving torque will be required.

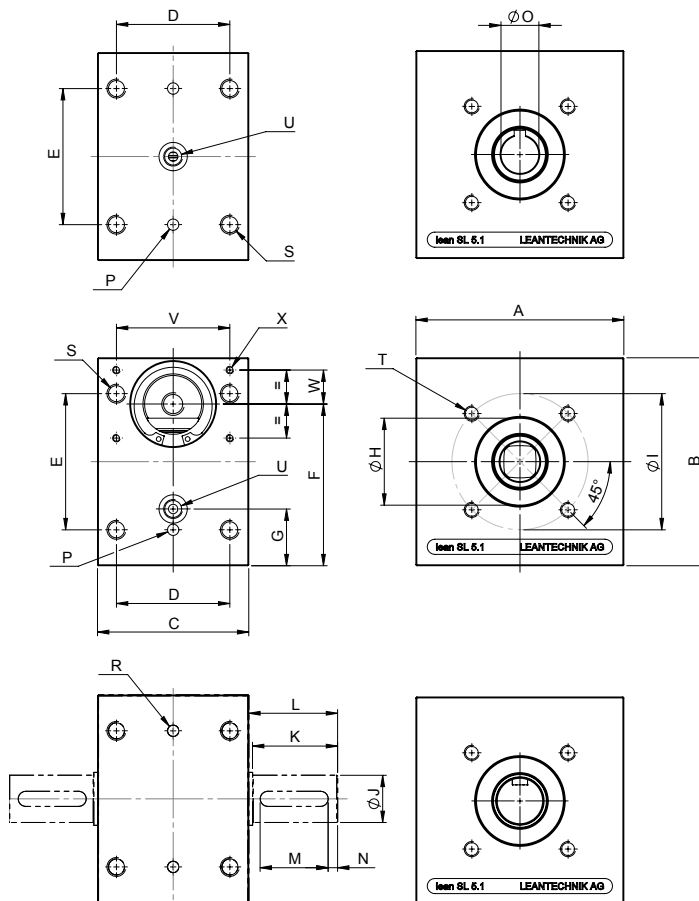
| lean SL <sup>®</sup> series<br>Technical Data |                         | Unit             | SL 5.0      | SL 5.1      | SL 5.3      |
|---|-------------------------|------------------|-------------|-------------|-------------|
| Lifting force                                 | $F_{max}$               | N                | 800         | 2000        | 8000        |
| Lifting speed                                 | $v_{max}$               | m/s              | 0,6         | 0,6         | 0,6         |
| Acceleration                                  | $a_{max}$               | m/s <sup>2</sup> | 30          | 30          | 30          |
| Torque  | $M_{max}$               | Nm               | 8           | 40          | 240         |
| Pitch diameter                                | $\varnothing T_k$       | mm               | 20          | 40          | 60          |
| Gear ratio                                    | Stroke                  | mm/360°          | 62,8318     | 125,6637    | 188,4955    |
| Efficiency                                    | $\eta$                  |                  | 0,8         | 0,8         | 0,8         |
| Temperature resistance                        | t                       | °C               | -10 to +100 | -10 to +100 | -10 to +100 |
| Static torque                                 | $M_{t_x \text{ stat.}}$ | Nm               | 0           | 0           | 0           |
| Dynamic torque                                | $M_{t_x \text{ dyn.}}$  | Nm               | 0           | 0           | 0           |
|   | $M_{t_y \text{ stat.}}$ | Nm               | 200         | 400         | 2000        |
|   | $M_{t_y \text{ dyn.}}$  | Nm               | 18          | 22          | 150         |
|   | $M_{t_z \text{ stat.}}$ | Nm               | 500         | 1000        | 4000        |
|   | $M_{t_z \text{ dyn.}}$  | Nm               | 50          | 110         | 700         |

### 3.2.2 lean SL® gearboxes

#### 3.2.2.1 lean SL® 5.0 – 5.3 • Dimension sheet



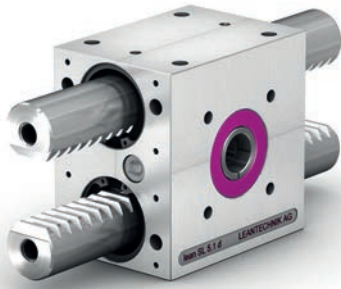
 Make sure that the article number refers to the correct pinion shaft version.



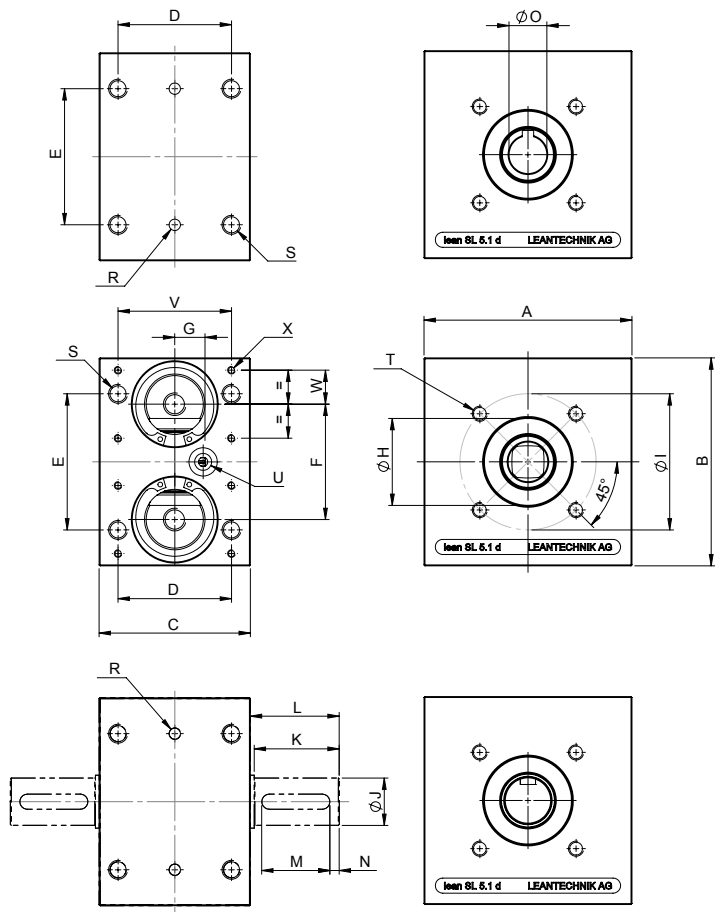
| lean SL® gearboxes                                 | Unit | SL 5.0 | SL 5.1                  | SL 5.3                   |                           |
|--|------|--------|-------------------------|--------------------------|---------------------------|
| A  | mm   | 80     | 110                     | 180                      |                           |
| B  | mm   | 80     | 110                     | 180                      |                           |
| C  | mm   | 70     | 80                      | 130                      |                           |
| D  | mm   | 55     | 60                      | 105                      |                           |
| E  | mm   | 50     | 72                      | 120                      |                           |
| F  | mm   | 59     | 85,5                    | 139,5                    |                           |
| G  | mm   | 26     | 30                      | 55                       |                           |
| Centering flange (if used,<br>remove sealing ring) | H    | mm     | Ø 26 K6 ↓3              | Ø 47 K6 ↓4               | Ø 72 K6 ↓4                |
|  | I    | mm     | Ø 48                    | Ø 72                     | Ø 110                     |
| Key DIN 6885 P9                                    | J    | mm     | Ø 14 h7                 | Ø 25 h7                  | Ø 42 h7                   |
|  | K    | mm     | 30                      | 45                       | 60                        |
|  | L    | mm     | 32                      | 47                       | 62                        |
|  | M    | mm     | 25                      | 36                       | 50                        |
|  | N    | mm     | 2                       | 5                        | 5                         |
| Key DIN 6885 P9                                    | O    | mm     | Ø 10 H7                 | Ø 20 H7                  | Ø 35 H7                   |
|  | P    | mm     | Ø 6 H7 ↓10              | Ø 6 H7 ↓10               | Ø 6 H7 ↓10                |
|  | R    | mm     | Ø 6 H7 ↓5               | Ø 6 H7 ↓3                | Ø 6 H7 ↓5                 |
|  | S    | mm     | M8 ↓16<br>Ø 6,8 through | M10 ↓20<br>Ø 8,5 through | M12 ↓27<br>Ø 10,2 through |
| Lube hole  | T    | mm     | M6 ↓12                  | M8 ↓12                   | M10 ↓20                   |
|  | U    | mm     | M10x1 ↓10               | M10x1 ↓10                | M10x1 ↓10                 |
|  | V    | mm     | 52                      | 60                       | 100                       |
|  | W    | mm     | 15                      | 18                       | 35                        |
| Gear rack protection                               | X    | mm     | M4 ↓6                   | M4 ↓8                    | M4 ↓8                     |
| Weight PW  |      | kg     | 1,00                    | 2,35                     | 9,70                      |
| Weight ZA 1  |      | kg     | 1,11                    | 2,70                     | 11,55                     |
| Weight ZA 2  |      | kg     | 1,15                    | 2,87                     | 12,21                     |
| Weight PFN   |      | kg     | 1,03                    | 2,32                     | 9,91                      |

| Article number | SL 5.0  | SL 5.1  | SL 5.3  |
|----------------|---------|---------|---------|
| lean SL® PW    | 500 129 | 500 130 | 500 131 |
| lean SL® ZA 1  | 500 133 | 500 134 | 500 135 |
| lean SL® ZA 2  | 500 137 | 500 138 | 500 139 |
| lean SL® PFN   | 500 141 | 500 142 | 500 143 |

### 3.2.2.2 lean SL® double 5.0 – 5.3 • Dimension sheet



! Make sure that the article number refers to the correct pinion shaft version.







In the "double" version, the maximum transmitted torque is the same as for the individual gearbox.

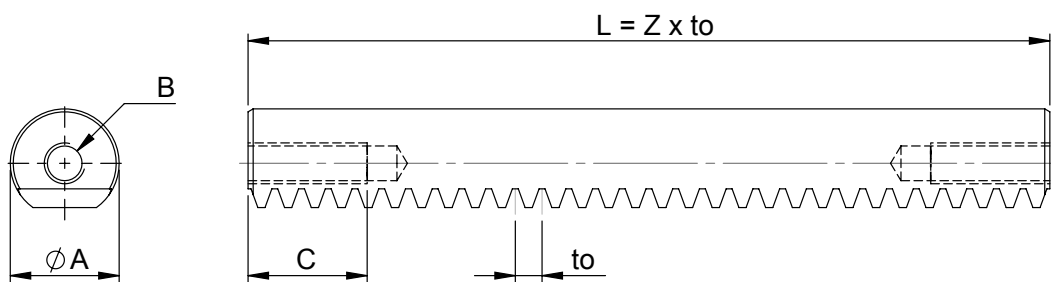
| lean SL® double                                 | Unit | SL 5.0 | SL 5.1                  | SL 5.3                   |                           |
|---|------|--------|-------------------------|--------------------------|---------------------------|
| A   | mm   | 80     | 110                     | 180                      |                           |
| B   | mm   | 80     | 110                     | 180                      |                           |
| C   | mm   | 70     | 80                      | 130                      |                           |
| D   | mm   | 55     | 60                      | 105                      |                           |
| E   | mm   | 50     | 72                      | 120                      |                           |
| F   | mm   | 38     | 61                      | 99                       |                           |
| G   | mm   | 20     | 15                      | 15                       |                           |
| Centering flange (if used, remove sealing ring) | H    | mm     | ∅ 26 K6 ↓3              | ∅ 47 K6 ↓4               | ∅ 72 K6 ↓4                |
|   | I    | mm     | ∅ 48                    | ∅ 72                     | ∅ 110                     |
| Key DIN 6885 P9                                 | J    | mm     | ∅ 14 h7                 | ∅ 25 h7                  | ∅ 42 h7                   |
|   | K    | mm     | 30                      | 45                       | 60                        |
|   | L    | mm     | 32                      | 47                       | 62                        |
|   | M    | mm     | 25                      | 36                       | 50                        |
| Key DIN 6885 P9                                 | N    | mm     | 2                       | 5                        | 5                         |
|   | O    | mm     | ∅ 10 H7                 | ∅ 20 H7                  | ∅ 35 H7                   |
|   | R    | mm     | ∅ 6 H7 ↓5               | ∅ 6 H7 ↓3                | ∅ 6 H7 ↓5                 |
|   | S    | mm     | M8 ↓16<br>∅ 6,8 through | M10 ↓20<br>∅ 8,5 through | M12 ↓27<br>∅ 10,2 through |
|   | T    | mm     | M6 ↓12                  | M8 ↓12                   | M10 ↓20                   |
| Lube hole                                       | U    | mm     | M10x1 ↓10               | M10x1 ↓10                | M10x1 ↓10                 |
|   | V    | mm     | 52                      | 60                       | 100                       |
|   | W    | mm     | 15                      | 18                       | 35                        |
| Gear rack protection                            | X    | mm     | M4 ↓6                   | M4 ↓8                    | M4 ↓8                     |
| Weight PW                                       |      | kg     | 0,90                    | 2,10                     | 8,29                      |
| Weight ZA 1                                     |      | kg     | 1,01                    | 2,45                     | 10,14                     |
| Weight ZA 2                                     |      | kg     | 1,05                    | 2,62                     | 10,80                     |
| Weight PFN                                      |      | kg     | 0,93                    | 2,07                     | 8,50                      |

| Article number       | SL 5.0  | SL 5.1  | SL 5.3  |
|----------------------|---------|---------|---------|
| lean SL® double PW   | 500 145 | 500 146 | 500 147 |
| lean SL® double ZA 1 | 500 149 | 500 150 | 500 151 |
| lean SL® double ZA 2 | 500 153 | 500 154 | 500 155 |
| lean SL® double PFN  | 500 157 | 500 158 | 500 159 |

### 3.2.3 lean SL® accessories

#### 3.2.3.1 lean SL® gear racks • Dimension sheet

lean SL® series gear racks are supported in sliding bushings. They are designed to transfer tensile and compressive forces. They cannot bear transverse forces. See the technical data on page 85.



**!** The gear rack is symmetrical in construction. When a gear rack protection is used, the gear rack length increases accordingly. Have the theoretical lifespan calculated.

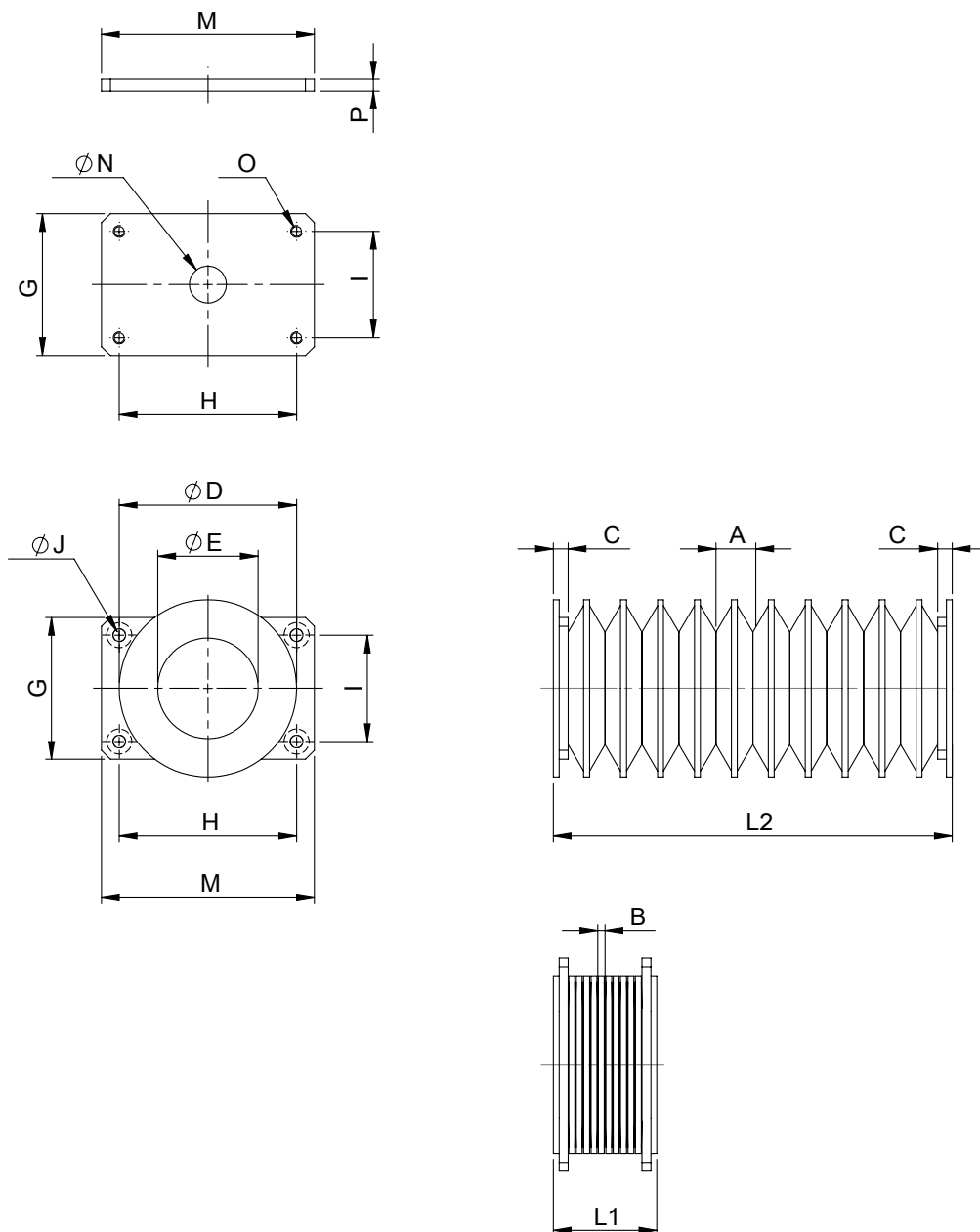
Always add the number of teeth "Z = \_ \_ \_" to the article number.

| lean SL® gear rack      |    | Unit            | SL 5.0               | SL 5.1  | SL 5.3  |
|-------------------------|----|-----------------|----------------------|---------|---------|
|                         | A  | mm              | Ø 25 h6              | Ø 32 h6 | Ø 60 h6 |
|                         | B  | mm              | M10                  | M12     | M20     |
|                         | C  | mm              | 30                   | 35      | 50      |
| Number Teeth            | Z  | mm              | as per customer data |         |         |
| Module                  | m  |                 | 1,0                  | 2,5     | 2,5     |
| Tooth pitch             | to | mm              | 3,1416               | 7,8540  | 7,8540  |
| Moment of inertia       | lx | mm <sup>4</sup> | 12054                | 24330   | 352513  |
| Moment of inertia       | ly | mm <sup>4</sup> | 17856                | 44042   | 572284  |
| Polar moment of inertia | lp | mm <sup>4</sup> | 29910                | 68372   | 924797  |
| Weight                  |    | kg/m            | 3,50                 | 5,45    | 19,10   |

| Article number     | SL 5.0  | SL 5.1  | SL 5.3  |
|--------------------|---------|---------|---------|
| lean SL® gear rack | 500 161 | 500 162 | 500 163 |

### 3.2.3.2 lean SL® gear rack protection & end plate • Dimension sheet

This gear rack protection is suitable for use in welding areas (SB). The end plate is used for fixing the gear rack protection on the lean SL® gear rack.



**!** Check whether the operating conditions require a gear rack protection. This gear rack protection is **suitable for use in welding areas**. It is shipped with two retaining plates and screws.

The gear rack protection is silicone-free.

Always add the number of folds "F = \_ \_ \_" to the article number.

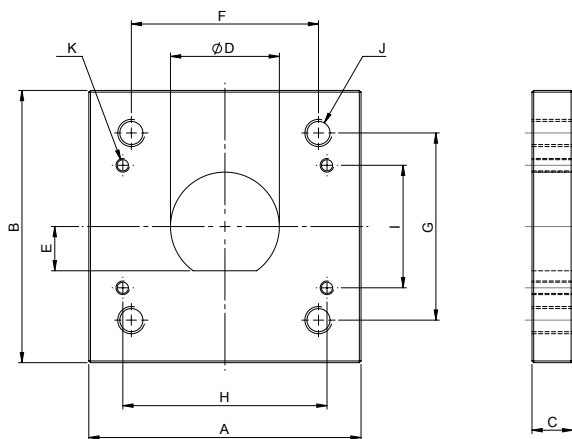
| lean SL® gear rack protection | Unit    | SL 5.0 | SL 5.1                           | SL 5.3               |                      |
|-------------------------------|---------|--------|----------------------------------|----------------------|----------------------|
| Stroke per fold               | A       | mm     | 12,5                             | 12,5                 | 27,5                 |
|                               | B       | mm     | 2,5                              | 2,5                  | 2,5                  |
|                               | (A – B) | mm     | 10                               | 10                   | 25                   |
|                               | C       | mm     | 5                                | 5                    | 5                    |
|                               | D       | mm     | Ø 50                             | Ø 60                 | Ø 110                |
| Number of folds               | E       | mm     | Ø 26                             | Ø 34                 | Ø 60                 |
|                               | F       | each   | as per customer data             |                      |                      |
|                               | G       | mm     | 41                               | 48                   | 80                   |
|                               | H       | mm     | 52                               | 60                   | 100                  |
|                               | I       | mm     | 30                               | 36                   | 70                   |
| Stroke                        | J       | mm     | Ø 4,3<br>√ 8,5 x 90°             | Ø 4,3<br>√ 8,5 x 90° | Ø 4,3<br>√ 8,5 x 90° |
|                               | L       | mm     | $L = L2 - L1 = F \times (A - B)$ |                      |                      |
|                               | L1      | mm     | $L1 = 2 \times C + F \times B$   |                      |                      |
|                               | L2      | mm     | $L2 = 2 \times C + F \times A$   |                      |                      |
|                               | M       | mm     | 63                               | 72                   | 110                  |
| N                             | mm      | Ø 10,5 | Ø 12,5                           | Ø 20,5               |                      |
| O                             | mm      | M4     | M4                               | M4                   |                      |
| P                             | mm      | 4      | 4                                | 4                    |                      |

| Article number                | SL 5.0  | SL 5.1  | SL 5.3  |
|-------------------------------|---------|---------|---------|
| lean SL® gear rack protection | 500 177 | 500 178 | 500 179 |
| lean SL® end plate            | 500 548 | 500 549 | 500 550 |

### 3.2.3.3 lean SL® gear rack retaining plate AZ • Dimension sheet

The gear rack retaining plate provides a rigid connection between the mounted parts and the gear rack. To this end, the retaining plate is pressed onto the gear rack in the guide direction. The "J" thread and the end face thread can be used for mounting.

The gear rack retaining plate is only intended to take up torque. It cannot therefore transfer forces in the gear rack guide direction. The retaining plate is mounted flush with the front surface of the gear rack using a shrinkage process.





Be sure to indicate precisely which gear rack will be used with the AZ plate when ordering a gear rack retaining plate.

| lean SL®<br>gear rack retaining plate AZ | Unit | SL 5.0  | SL 5.1  | SL 5.3  |
|--|------|---------|---------|---------|
| A  | mm   | 70      | 80      | 130     |
| B  | mm   | 70      | 80      | 130     |
| C  | mm   | 10      | 12      | 15      |
| D  | mm   | Ø 25 P7 | Ø 32 P7 | Ø 60 P7 |
| E  | mm   | 10      | 13      | 22      |
| F  | mm   | 50      | 55      | 90      |
| G  | mm   | 50      | 55      | 90      |
| H  | mm   | 52      | 60      | 100     |
| I  | mm   | 30      | 36      | 70      |
| J  | mm   | M6      | M8      | M10     |
| K  | mm   | M4      | M4      | M4      |
| Weight                                   | kg   | 0,34    | 0,51    | 1,64    |

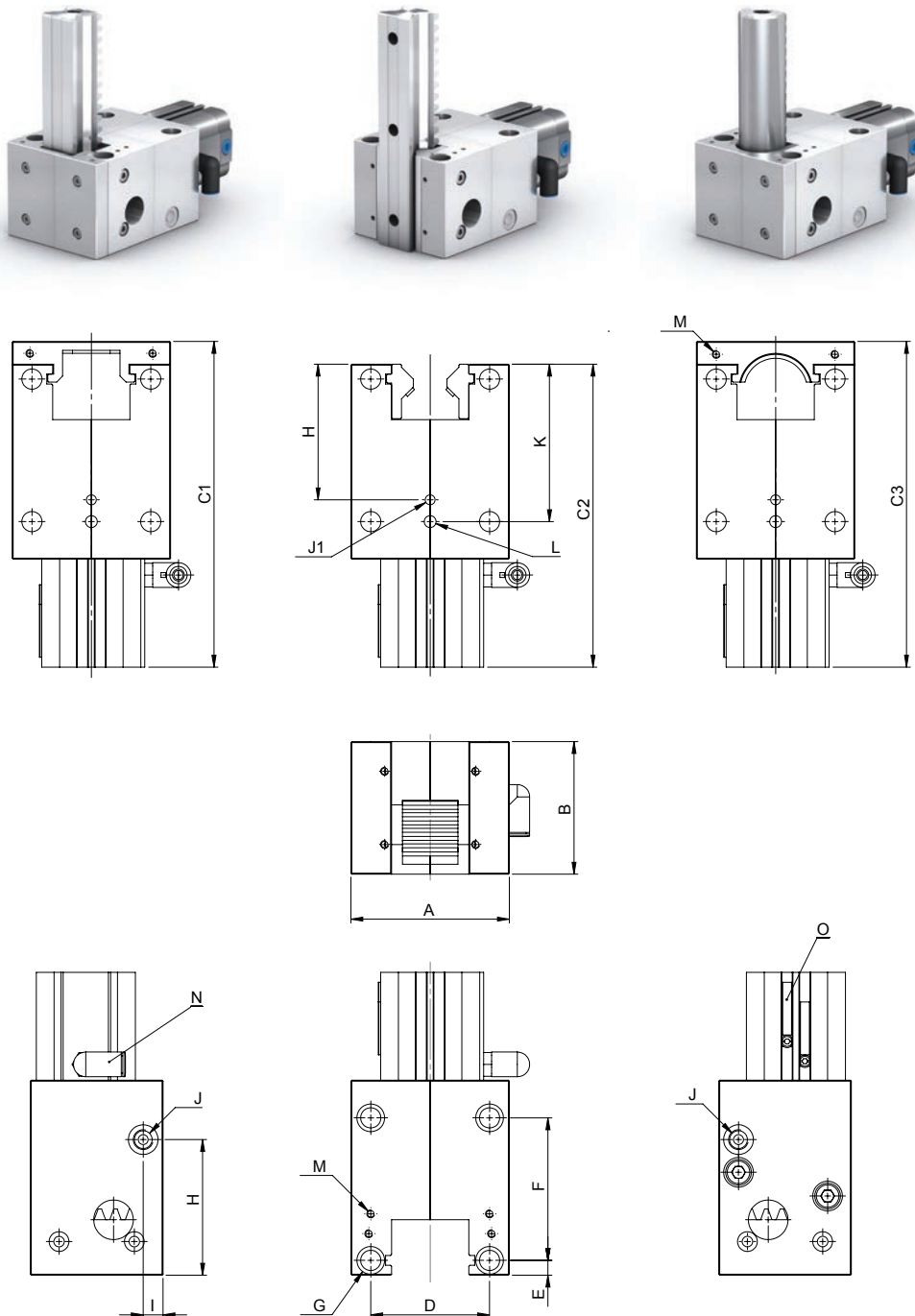
| Article number                        | SL 5.0  | SL 5.1  | SL 5.3  |
|---------------------------------------|---------|---------|---------|
| lean SL® gear rack retaining plate AZ | 500 185 | 500 186 | 500 187 |

### 3.3 Accessory parts for lifgo® & lean SL® (identical)

#### 3.3.1 Mechanical arrest system (ASS) • Dimension sheet

The mechanical arrest system (ASS) is mounted on the gearbox and ensures that systems, machines and equipment do not descend suddenly or collapse.

A detailed description of its functioning can be found on page 18.



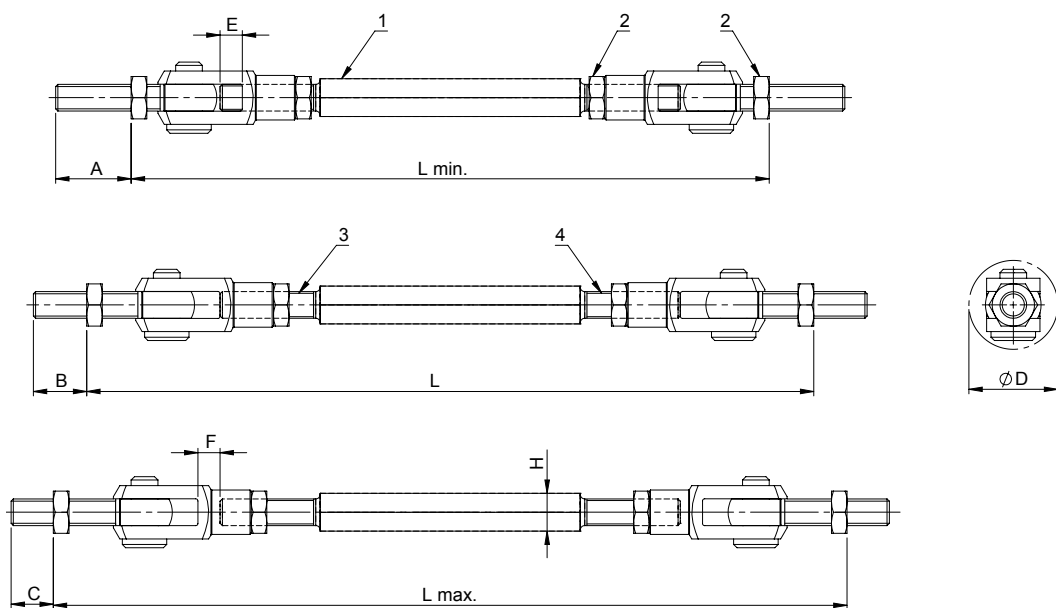


| Mechanical arrest system (ASS) for lifgo® & lean SL® | Unit | 5.0                          | 5.1                            | 5.3                          |           |
|--|------|------------------------------|--------------------------------|------------------------------|-----------|
| A  | mm   | 70                           | 80                             | 130                          |           |
| B  | mm   | 55                           | 67                             | 90                           |           |
| C1   | mm   | 124,5                        | 164,5                          | 216,5                        |           |
| C2   | mm   | 116                          | 153                            | 197,5                        |           |
| C3   | mm   | 124,5                        | 164,5                          | 216,5                        |           |
| D  | mm   | 55                           | 60                             | 105                          |           |
| E  | mm   | 6,5                          | 7,5                            | 11                           |           |
| F  | mm   | 50                           | 72                             | 120                          |           |
| G  | mm   | Ø 8,2 through<br>└┬┘Ø12 ↓8,6 | Ø 10,2 through<br>└┬┘Ø14 ↓10,6 | Ø 13 through<br>└┬┘Ø20 ↓12,6 |           |
| H  | mm   | 45,5                         | 68,5                           | 106                          |           |
| I  | mm   | 10                           | 10                             | 10                           |           |
| Lube hole for pinion/gear rack                       | J    | mm                           | M6 ↓6                          | M10x1 ↓10                    | M10x1 ↓10 |
|  | J1   | mm                           | Ø 5                            | Ø 5                          | Ø 5       |
|  | K    | mm                           | 56,5                           | 79,5                         | 131       |
| Dowel hole   | L    | mm                           | Ø 6F7 ↓10                      | Ø 6F7 ↓10                    | Ø 6F7 ↓10 |
| For gear rack protection                             | M    | mm                           | M4                             | M4                           | M4        |
| Plug-in connector for air hose                       | N    | mm                           | Ø 6                            | Ø 6                          | Ø 6       |
| Proximity switch                                     | O    |                              | SME-8M-DS-24VK-0,3-M8D - Festo |                              |           |
| Weight lifgo®  | kg   | 1,9                          | 3,5                            | 11,4                         |           |
| Weight lifgo® linear                                 | kg   | 1,8                          | 3,3                            | 10,5                         |           |
| Weight lean SL®                                      | kg   | 2,0                          | 3,6                            | 11,5                         |           |

| Article number                         | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|--|-------------------|---------|---------|---------|
| lifgo® mechanical arrest system        |                   | 500 600 | 500 601 | 500 602 |
| lifgo® linear mechanical arrest system |                   | 500 604 | 500 605 | 500 606 |
| lean SL® mechanical arrest system      |                   | 500 608 | 500 609 | 500 610 |

### 3.3.2 Differential coupling • Dimension sheet

The differential coupling is an adjustable tie rod. It is installed horizontally or vertically as a connector between two gear racks. Follow the installation and usage instructions shown in the sample pictures starting on page 22.



**!** Differential couplings must be axially flush when installed, and may be used only as draw bars. Please also follow our installation tips and the installation videos on the internet.

The minimum screw-in depth "C" (eyebolt/gear rack) must be maintained.

Always add the length "L = \_ \_ \_ \_" to the article number.

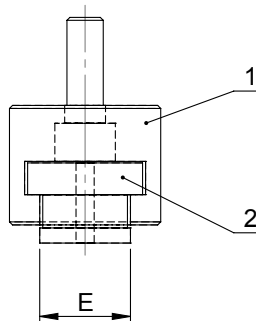
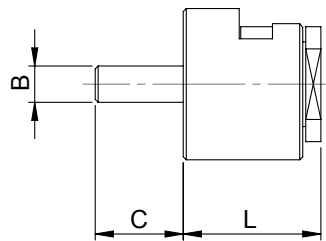
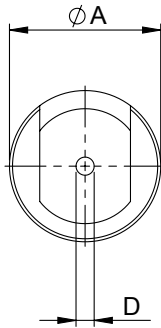
| Differential coupling for lifgo® & lean SL® | Unit                   | 5.0  | 5.1                           | 5.3          |              |
|---|------------------------|------|-------------------------------|--------------|--------------|
| A   | mm                     | 30   | 34                            | 50           |              |
| B   | mm                     | 21   | 24                            | 37           |              |
| Thread-in depth, min.                       | C                      | mm   | 15                            | 19           | 25           |
| Penetration opening                         | D                      | mm   | Ø 35                          | Ø 40         | Ø 65         |
|   | E                      | mm   | - 8                           | - 10         | - 15         |
| Adjustment range using coupling rod         | F                      | mm   | + 8                           | + 10         | + 15         |
|   | G                      | mm   | ± 16                          | ± 20         | ± 30         |
| 1 coupling rod                              | H                      | mm   | SW 14                         | SW 17        | SW 27        |
|   | L                      | mm   | as per customer data          |              |              |
| Adjustment range                            | L min.                 | mm   | L min. = L - 2xE - 2x (A - B) |              |              |
|   | L max.                 | mm   | L max. = L + 2xF + 2x (B - C) |              |              |
| Installation length                         |                        | mm   | 180                           | 230          | 360          |
|   | to                     | mm   | 1500                          | 1700         | 2000         |
| Dynamic tensile force                       | F <sub>max</sub> dyn.  | N    | 8700                          | 12600        | 36700        |
| Static tensile force                        | F <sub>max</sub> stat. | N    | 11600                         | 16800        | 49000        |
| 2 jam nut                                   |                        | mm   | SW 17                         | SW 19        | SW 30        |
| 3 left-hand thread                          |                        | mm   | M10x1,25                      | M12x1,25     | M20x1,5      |
| 4 right-hand thread                         |                        | mm   | M10x1,25                      | M12x1,25     | M20x1,5      |
| Weight                                      |                        | kg/m | 1,15+0,27 kg                  | 2,01+0,50 kg | 3,64+2,20 kg |

| Article number        | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|-----------------------|-------------------|---------|---------|---------|
| Differential coupling | all lengths       | 500 189 | 500 190 | 500 191 |

### 3.3.3 Coupling unit • Dimension sheet

The coupling unit is a coupling for tension and compression, and connects the gear rack to an air or electric cylinder. The unit consists of two parts:

The **coupling sleeve** (1) is screwed to the gear rack, and the **coupling nut** (2) is threaded onto the piston rod of the cylinder. Various thread sizes are available to match the mating threads.



**!** Coupling nuts with special threads are available. They are not included in the table.

Always add the thread size "M = \_\_ x \_\_" to the article number.

| Coupling unit for lifgo® & lean SL® | Unit                   | 5.0  | 5.1                  | 5.3   |       |
|-------------------------------------|------------------------|------|----------------------|-------|-------|
| A                                   | mm                     | Ø 50 | Ø 50                 | Ø 65  |       |
| B                                   | mm                     | M10  | M12                  | M20   |       |
| C                                   | mm                     | 27   | 29                   | 33,5  |       |
| Thread                              | D                      | mm   | as per customer data |       |       |
| Width across flats                  | E                      | mm   | SW 30                | SW 30 | SW 36 |
|                                     | L                      | mm   | 45,5                 | 45,5  | 78    |
| Dynamic tensile force               | F <sub>max</sub> dyn.  | KN   | 10                   | 12    | 40    |
| Static tensile force                | F <sub>max</sub> stat. | KN   | 16                   | 18    | 63    |
| Weight                              |                        | kg   | 0,58                 | 0,58  | 1,65  |

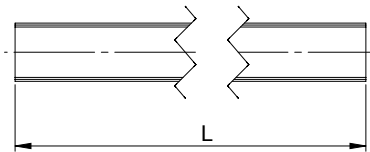
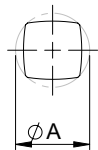
| Article number | lifgo® & lean SL® | 5.0        | 5.1        | 5.3        |
|----------------|-------------------|------------|------------|------------|
| Coupling unit  |                   | 500 193    | 500 194    | 500 195    |
|                | Thread            | M10 x 1,25 | M10 x 1,25 | M20 x 1,50 |
|                | Thread            | M12 x 1,25 | M12 x 1,25 | M22 x 1,50 |
|                | Thread            | M16 x 1,50 | M16 x 1,50 | M27 x 2,00 |
|                | Thread            | M20 x 1,50 | M20 x 1,50 | M30 x 2,00 |

### 3.3.4 Profile shafts • Dimension sheets

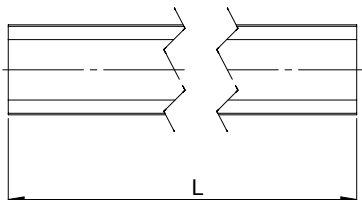
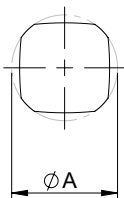
Profile shafts provide rotationally rigid connections between several gearboxes (PW version). They are inserted through the pinion shafts of the gearboxes to be connected. At the same time, the profile shaft ensures the synchronicity and alignment of the pinions of connected gearboxes.



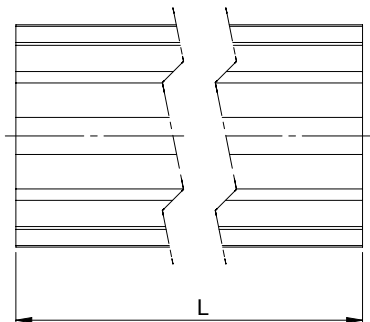
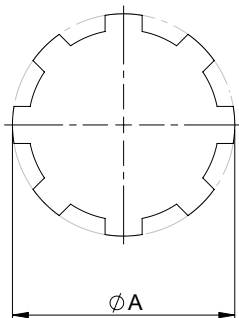
PG 14



PG 20



KW 42



**!** The pinion positions of two gearboxes remain synchronized for a gear rack position from 0° for “gearbox 1” to 90° for “gearbox 2”.

Always add the length “L = \_ \_ \_ \_” to the article number.

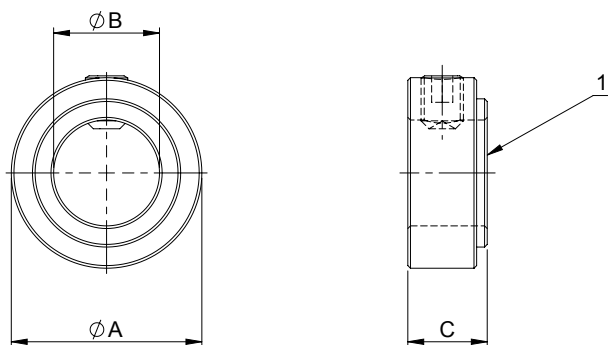
| Profile shaft<br>for lifgo® & lean SL® | Unit   | 5.0                  | 5.1     | 5.3          |           |
|--|--------|----------------------|---------|--------------|-----------|
|  |        | Polygon              | Polygon | Spline shaft |           |
| A                                      | mm     | Ø 14                 | Ø 20    | Ø 42         |           |
| L                                      | mm     | as per customer data |         |              |           |
| Max. torque                            | Mt     | Nm                   | 40      | 152          | 954       |
| Angle of twist                         |        | °/m                  | 1       | 1            | 1         |
| Straightness                           |        | mm/m                 | 0,3     | 0,3          | 0,3       |
| Polar moment of inertia                | lp     | mm <sup>4</sup>      | 2140,29 | 11563,94     | 229252,02 |
| Principal moment of inertia            | lx, ly | mm <sup>4</sup>      | 1071,14 | 5781,97      | 114626,01 |
| Weight                                 |        | kg/m                 | 0,90    | 2,10         | 9,30      |

| Article number | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|----------------|-------------------|---------|---------|---------|
| Profile shaft  |                   | 100 130 | 100 166 | 100 198 |

### 3.3.5 Adjusting collar & sliding sleeves • Dimension sheet

#### Adjusting collar

Adjusting collars secure profile shafts in the axial direction. They are secured with compression ring screws.



**!** Two adjusting collars are needed per profile shaft in order to secure both directions. Make sure that the adjusting collar is installed with the correct side (1) facing the gear-box housing (see drawing).

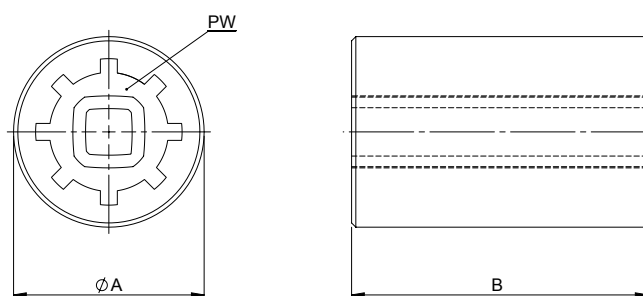
| Adjusting collar for lifgo® & lean SL® | Unit | 5.0  | 5.1  | 5.3  |
|--|------|------|------|------|
| A                                      | mm   | Ø 30 | Ø 36 | Ø 70 |
| B                                      | mm   | Ø 14 | Ø 20 | Ø 42 |
| C                                      | mm   | 15   | 15   | 20   |
| Weight                                 | kg   | 0,06 | 0,07 | 0,35 |

| Article number   | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|------------------|-------------------|---------|---------|---------|
| Adjusting collar |                   | 500 463 | 500 464 | 500 465 |



## Sliding sleeves

Sliding sleeves can be used when installing lifgo® or lean SL® units in gearboxes with hollow shafts/shrink discs. Profile shafts with sliding sleeves create an interlocking, rotationally rigid connection between gearboxes and gearmotors.



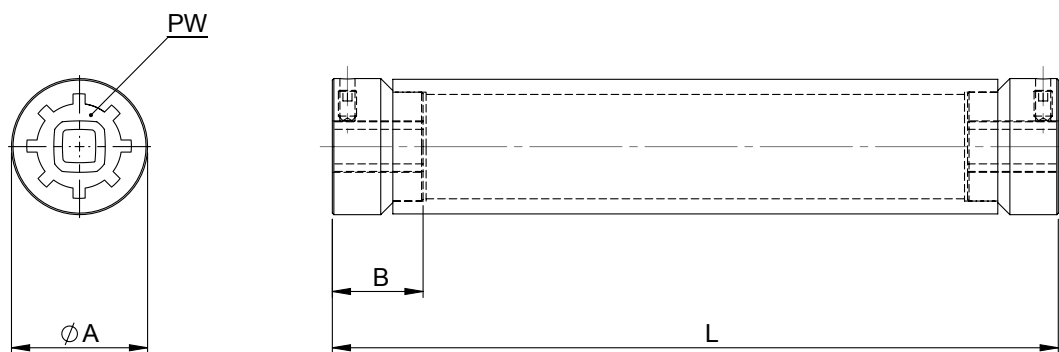
**!** When a sliding sleeve and profile shaft are used, the mechanical synchronicity of the system is maintained.

| Sliding sleeves for lifgo® & lean SL® | Unit | 5.0     | 5.1     | 5.3     |
|---------------------------------------|------|---------|---------|---------|
| A                                     | mm   | Ø 35 h7 | Ø 45 h7 | Ø 90 h7 |
| B                                     | mm   | 60      | 70      | 90      |
| Profile shaft                         | PW   | PG 14   | PG 20   | KW 42   |
| Weight                                | kg   | 0,40    | 0,72    | 3,63    |

| Article number | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|----------------|-------------------|---------|---------|---------|
| Sliding sleeve |                   | 500 439 | 500 440 | 500 441 |

### 3.3.6 Rotational reinforcement • Dimension sheet

We recommend the use our rotational reinforcement in cases of large axis spacing or high torsional forces. They prevent asynchronous behavior in the lifting system due to twisting or torsion of the profile shafts.



**!** The profile shafts and rotational reinforcements are secured axially by compression ring screws. Please use short profile shafts as much as possible, always taking the insertion depth "B" into consideration.

Always add the length "L = \_ \_ \_ \_" to the article number.

| Rotational reinforcement for lifgo® & lean SL® | Unit   | 5.0             | 5.1       | 5.3                  |            |
|--|--------|-----------------|-----------|----------------------|------------|
| Insertion depth                                | A      | mm              | Ø 30      | Ø 45                 | Ø 89       |
|  | B      | mm              | 25        | 30                   | 90         |
|  | L      | mm              |           | as per customer data |            |
| Max. torque                                    | Mt     | Nm              |           | see profile shaft    |            |
| Polar moment of inertia                        | Ip     | mm <sup>4</sup> | 45850     | 245897               | 2804721    |
| Principal moment of inertia                    | Ix, Iy | mm <sup>4</sup> | 22925     | 122948               | 1402360    |
| Profile shaft                                  | PW     |                 | PG 14     | PG 20                | KW 42      |
| Weight   |        | kg/m            | 1,86+0,20 | 4,63+0,51            | 11,90+5,53 |

| Article number           | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|--------------------------|-------------------|---------|---------|---------|
| Rotational reinforcement |                   | 500 478 | 500 479 | 500 480 |

### 3.3.7 Shaft adapter 1 and 2 & profile shaft adapter • Dimension sheet

Shaft adapter variants 1 and 2 act as rotationally rigid connectors between the gearbox and the profile shaft/gearbox.

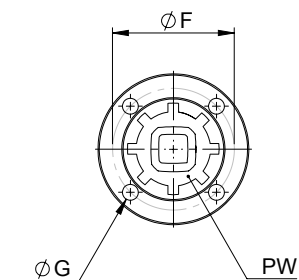
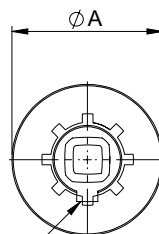
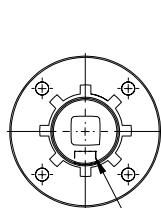
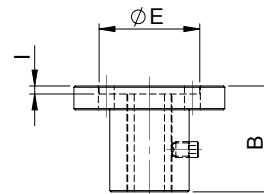
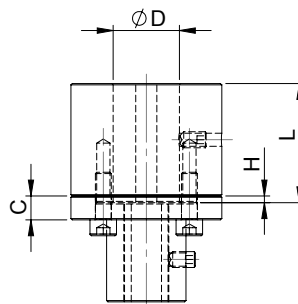
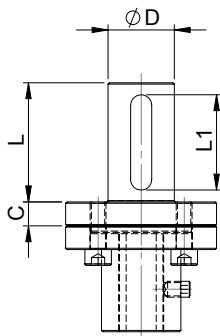
The profile shaft adapter is also available individually if the gearbox connection is to be established by the customer.



**Shaft adapter  
Variant 1**

**Shaft adapter  
Variant 2**

**Profile shaft adapter**



PFN  
DIN 6885 P9

**!** The dimensions "D" and "L" and the variant, 1 or 2, are configured or selected by the customer.

Always add the dimensions "D = Ø \_\_\_\_ x L \_\_L1" in mm and the variant V \_ to the article number.

| Shaft adapter/profile shaft adapter for lifgo® & lean SL® | Unit  | 5.0                  | 5.1        | 5.3        |
|---|-------|----------------------|------------|------------|
| A   | mm    | Ø 45                 | Ø 57       | Ø 90       |
| B   | mm    | 28                   | 40         | 65         |
| C   | mm    | 8                    | 9          | 16         |
| D   | mm    | as per customer data |            |            |
| E   | mm    | Ø 28 H7 ↓2,5         | Ø 38 H7 ↓3 | Ø 58 H7 ↓4 |
| F   | mm    | Ø 35                 | Ø 46       | Ø 72       |
| G   | mm    | Ø 5,3                | Ø 6,2      | Ø 10,5     |
| H   | mm    | 2                    | 2,5        | 3,5        |
| I   | mm    | 2,5                  | 3          | 4          |
| L   | mm    | as per customer data |            |            |
| L1  | mm    | as per customer data |            |            |
| Torque max.   | Mt Nm | 40                   | 152        | 954        |
| Profile shaft   | PW    | PG 14                | PG 20      | KW 42      |
| Weight variant 1  | kg    | 0,27                 | 0,63       | 2,56       |
| Weight variant 2  | kg    | 0,45                 | 0,94       | 3,25       |
| Weight PWA  | kg    | 0,12                 | 0,24       | 1,10       |

| Article number          | lifgo® & lean SL® | 5.0     | 5.1     | 5.3     |
|-------------------------|-------------------|---------|---------|---------|
| Shaft adapter variant 1 | secured           | 500 455 | 500 456 | 500 457 |
| Shaft adapter variant 2 | secured           | 500 487 | 500 488 | 500 489 |
| Profile shaft adapter   | secured           | 500 483 | 500 484 | 500 485 |

### 3.3.8 Universal joint single/double & drive shaft • Dimension sheet

The universal joints (DIN 808-G) and drive shafts are designed for rigid torque transmission in case of differences in height and alignment errors.

Our universal joints are designed for sizes 5.0 and 5.1, and our drive shaft is designed for size 5.3. You should also pay attention to the notes on the following page.

Single universal joint



Double universal joint



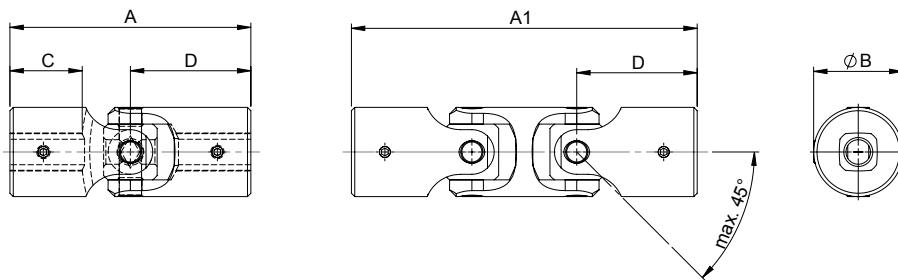
Drive shaft



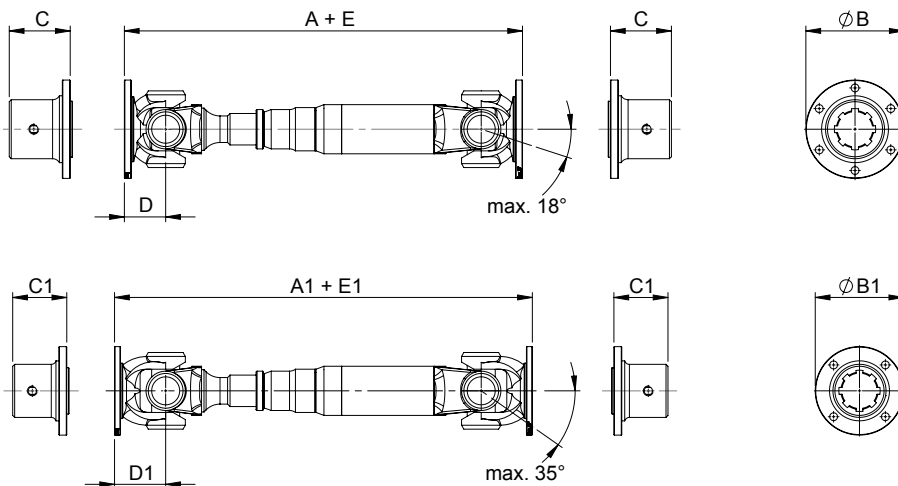
Two universal joints with a profile shaft as a connector



#### Universal joint



#### Drive shaft



**!** Ensure proper fork placement when using two universal joints. They must be aligned. The angle of bend at both forks and the connection plane must be identical. The maximum bend angle "β" must not be exceeded. The maximum transmitted torque depends on the bend angle "β".

Take note of the "gimbal error" if the joint is to be used for positioning.

Drive shafts are designed for each project individually.

| Universal joints for lifgo® & lean SL® | Unit | 5.0  | 5.1  | 5.3 |
|--|------|------|------|-----|
| A                                      | mm   | 108  | 108  |     |
| A1                                     | mm   | 155  | 155  |     |
| B                                      | mm   | Ø 40 | Ø 40 |     |
| C                                      | mm   | 30   | 30   |     |
| D                                      | mm   | 54   | 54   |     |
| β                                      |      | 45°  | 45°  |     |
| Weight, single                         | kg   | 0,82 | 0,74 |     |
| Weight, double                         | kg   | 1,10 | 1,02 |     |

| Article number          | lifgo® & lean SL® | 5.0     | 5.1     | 5.3 |
|-------------------------|-------------------|---------|---------|-----|
| Universal joint, single |                   | 103 489 | 103 487 |     |
| Universal joint, double |                   | 103 490 | 103 488 |     |

| Drive shaft for lifgo® & lean SL® | Unit | 5.0              | 5.1 | 5.3        |
|-----------------------------------|------|------------------|-----|------------|
| A min.                            | mm   |                  |     | 393        |
| A1 min.                           | mm   |                  |     | 425        |
| B                                 | mm   |                  |     | Ø 100      |
| B1                                | mm   |                  |     | Ø 90       |
| C                                 | mm   |                  |     | 62         |
| C1                                | mm   |                  |     | 55         |
| D                                 | mm   |                  |     | 42         |
| D1                                | mm   |                  |     | 52         |
| Removal length                    | E    |                  |     | 80         |
| Removal length                    | E1   |                  |     | 80         |
| Weight                            | β    |                  |     | 18° or 35° |
|                                   |      | Project-specific |     |            |

| Article number | lifgo® & lean SL® | 5.0 | 5.1 | 5.3     |
|----------------|-------------------|-----|-----|---------|
| Drive shaft    | project-specific  |     |     | 105 086 |

### 3.3.9 Couplings, gearmotors, & air cylinders

We also provide and calculate the required couplings, gearbox bells, motors, gearboxes, and/or air cylinders and other purchased or accessory parts for our lifting, transfer, and synchronized systems.

The parts shown below are examples, and are available in a wide variety of versions. If you prefer a certain manufacturer or model series when selecting, please let us know before technical design has begun.

On request, we can also assemble these components into functional units. Discuss your application with us.

**Gearbox flange**



**Gearbox bell**



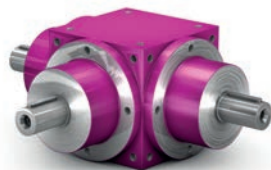
**Coupling**



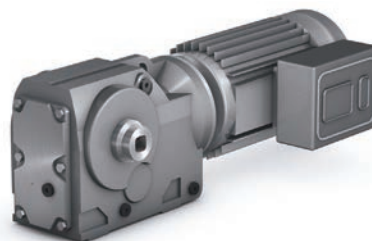
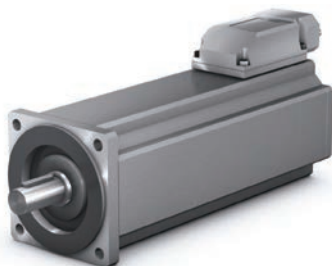
**Drive shaft**



**Distributor gearbox**



**Drives & motors**





## Notes



## 4 Installation & commissioning

The installation and use of our lifgo® and lean SL® gearbox series are highly customized. For this reason, it is impossible to produce generally applicable assembly instructions that cover all applications and installation options.

We refer you to our "installation videos", which are available for both lifgo® and for lean SL®. We will also be happy to send them to you on a CD. They are also available on our website.

Individual installation instructions are included with each delivery depending on the shipped articles. If you would like this documentation in advance, we will be happy to send it by e-mail as a PDF file. Please ask us!



## 4.1 Installation instructions

- !** Before assembling the gearbox, synchronize the drive pinion positions relative to each other by rotating the marks on all the pinions to the same position. This step will be easier if you place all the gearboxes next to each other and slide a profile shaft through all the gearboxes. The pinion positions relative to each other are the same, even for a 90° angle. For pinion shaft versions ZA 1 / ZA 2 and PFN, you can use the location of the keyway as a guide. When doing this, **do not remove the shipping lock** (for lifgo® gearboxes).
- !** Position the gearbox as required and bolt from the top or the bottom. Tighten the screws only slightly. Use the supplied dowel pins.
- !** If present, assemble the profile shafts using universal joints as shown in the drawing (rotational connection). Each individual profile shaft requires two adjusting collars to prevent sideways drift. Gearboxes are automatically synchronized with each other by the profile shafts. Slide the adjusting collars against the housing and tighten their retaining screws. The profile shafts are now installed with no axial play. Connect all gearboxes with rotational connections in this way.
- !** In the case of lifgo® and lifgo® linear, remove the shipping locks from the gear rack guides (located inside) by sliding in the gear rack. See the illustrations in the "Installation & Commissioning lifgo® 5" manual (available as a PDF file).
- !** Insert gear racks into those gearboxes that are connected by profile shafts. Slide the gear racks in until just before the pinion shaft, so that the first tooth of the gear rack can engage with the pinion shaft. Rotate the profile shaft to draw in the gear racks and move them to the final position. All gear racks (horizontal/vertical) must move in at the same time. Put on the gear rack protection (if used).
- !** Establish the power connection between the drive (air cylinder/gearmotor) by means of the coupling unit or gearbox adapter. Position the first gearbox behind the drive. All gearboxes connected by the profile shaft are adjusted together. Adjust the gear racks to the same height as the first gear rack behind the drive, by rotating the profile shaft.
- !** The differential coupling (DK) is installed as a tension device between the gear racks and can be adjusted. The dimension "L" is determined by the design, and is preset. The DK functions as a turnbuckle. For specific information about installation, please see our lifgo®/lean SL® installation video which depicts the adjustment and alignment operations in detail. A description can be found in the "Installation & Commissioning lifgo® 5/lean SL®" manual (available as a PDF file).
- !** Check that the system runs easily, and tighten all screws completely.
- !** Place any accessories on the vertical gear racks and secure in place. Check again for smooth operation. Assembly is complete.

**!** Put the entire system in place first and then tighten all screws.

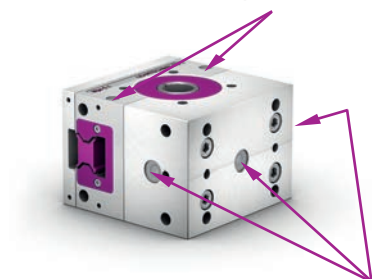
Insert the gear racks immediately in order to ensure synchronization.

Check the setting of the differential coupling, and make sure that all screws and nuts are tightened securely.

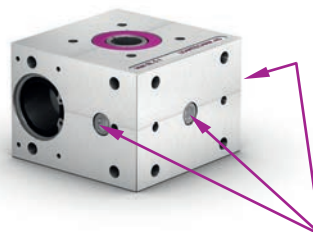
## 4.2 Initial & maintenance lubrication • Intervals

lifgo® gearboxes require initial lubrication at two locations (gear rack guide and housing), and lean SL® gearboxes require lubrication at one location (housing) (see lubrication point illustrations below). Make sure that only one plug is removed in order to thread in the grease nipple (included in scope of delivery).

Possible lubrication points on lifgo® guides (both sides)



Possible lubrication points on lifgo® housings



Possible lubrication points on lean SL® housings

Dirt can be deposited on and stick to exposed gear racks and guide rails, in particular. In order to maintain the functionality of seals and cover strips, this type of contamination must be removed regularly.

- ❗ Only one plug may be removed from a lubrication hole (see drawings in the lifgo® or lean SL® dimension sheets; U, U1). All other plugs must remain in place in order to prevent grease from escaping.
- ❗ Ensure that the basic lubrication is adequate prior to commissioning. Follow the instructions of the lubricant manufacturer and pay particular attention to any indications of incompatibility.

We recommend greases compliant with DIN 51825 as lubricants. Select according to load:

### Pinion/gear rack (housing)

Lubricant – K2K, DIN 51825

for normal loads

Lubricant – K2K, DIN 51818

for higher loads

### Guide cars

Low-viscosity grease – DIN 51826 NLGI 00 or NLGI 000

- ❗ Greases with a solid lubricant component (such as graphite or MoS<sub>2</sub>) must not be used.


All gearboxes have a light preliminary lubrication ex works. This is sufficient for a test run of 10 strokes. Initial lubrication must be performed prior to commissioning or a test run. This is performed in three stages, each using a third of the total quantity indicated in the table on page 118, above:

1. Grease the lifgo® guide car with a third of the total quantity indicated in the first table on page 118.
2. Perform three double strokes to move the lifgo® guide car or gear rack/guide rail backwards and forwards by at least three times the car length.
3. Repeat steps 1 and 2 twice.
4. Check whether a film of lubricant is visible on the gear rack/guide rail.

- ❗ Caution: When lubricating the guide car by hand, do not apply more than one third of the specified grease quantity during initial lubrication.

### Commissioning lubrication

| lifgo® & lean SL® |                          | 5.0  | 5.1  | 5.3   |
|-------------------|--------------------------|------|------|-------|
| Grease quantities | Unit                     |      |      |       |
| lifgo® guide car  | cm <sup>3</sup> – grease | 1,9  | 2,2  | 6,6   |
| lifgo® housing    | cm <sup>3</sup> – grease | 7,5  | 26,6 | 71,2  |
| lean SL® housing  | cm <sup>3</sup> – grease | 11,4 | 26,6 | 121,4 |

 Perform a test run of 100 strokes with no load. Then perform a maintenance lubrication.


### Maintenance lubrication


The specifications presented here assume typical operating periods for servo drives, interrupted by rest periods, and continuous lubrication. The values for daily and monthly lubrication cannot be determined by calculation. They are merely recommendations intended to emphasize the importance of good lubrication. Proven solutions for continuous lubrication include automatic lubricating bushings and central lubrication systems.


When units are exposed to environmental conditions such as contamination, the use of lubricating coolants, vibration, or impact loads, we recommend shorter lubrication intervals, and longer intervals for lighter loads. Maintenance lubrication quantities and intervals are shown in the following table:

### Maintenance lubrication quantities and intervals for gearboxes

| lifgo® & lean SL®                         |                     | 5.0    | 5.1    | 5.3    |
|---|---------------------|--------|--------|--------|
| Grease quantities                         | Unit                |        |        |        |
| lifgo® guide car                          | cm <sup>3</sup> /km | 0,0025 | 0,0030 | 0,0325 |
| Lubrication cartridge 60 cm <sup>3</sup>  |                     |        |        |        |
| L – Range                                 | km                  | 24000  | 20000  | 1850   |
| lifgo® housing                            | cm <sup>3</sup> /km | 0,0540 | 0,0625 | 0,1223 |
| Lubrication cartridge 125 cm <sup>3</sup> |                     |        |        |        |
| L – Range                                 | km                  | 2320   | 2000   | 1020   |
| lean SL® housing                          | cm <sup>3</sup> /km | 0,06   | 0,07   | 0,125  |
| Lubrication cartridge 125 cm <sup>3</sup> |                     |        |        |        |
| L – Range                                 | km                  | 2080   | 1780   | 1000   |

 Due to unknown local conditions, it is not possible to give a definite recommendation for grease quantities and intervals. Maintenance personnel must pay closer attention to the state of the lubrication at the start of system operation and react accordingly.

 An obvious film of lubricant should be visible on gear racks and guide rails, but no larger quantities should ooze out of the gearbox or the guide car. The quantity of grease must be increased or reduced based on individual experience. This also applies when grease dispensers and central lubrication systems are used.

 When cleaning agents are used, care must be taken prior to recommissioning to ensure that the amount of lubricant meets the manufacturer's recommendations, and that no cleaning agent residue remains.

## 4.3 3D data & formats

All of the products in this catalog are also available in various 3D data formats on a CD/DVD. Some data formats are also available for download from our website [www.leantechnik.com](http://www.leantechnik.com)

**The following data formats can be found both on our CD/DVD and on our internet site.**

IGES  
STEP AP 214  
SAT 6.0

**The following data formats are available only on CD/DVD.**

CATIA V5 part  
Parasolid x\_b  
Parasolid x\_t

**The following data formats are available only on request.**

DWG  
DXF





## 5 T&C

### 5.1 Sales and delivery conditions

#### 1. General validity

The conditions listed below are the basis for all business transactions, exclusive of any other conditions and agreements not approved by us in writing, even if the wording below is not specifically included for each individual subsequent transaction. We accept the purchasing conditions of the buyer or purchaser only to the extent that they do not deviate from our contractual conditions, including in the case that the former contain contradictory stipulations. Any individual clause of these contractual conditions that is legally invalid does not affect the legal validity of the remaining clauses. Contractual conditions that deviate herefrom are expressly declined.

#### 2. Proposals and proposal documents

Cost estimates and proposals are binding for a period of 90 calendar days. Documents associated with the proposal, such as illustrations, drawings, weights, and dimensions are only approximate, unless they are expressly designated as binding. The supplier retains ownership and copyrights of all cost estimates, drawings, and other documents. Orders are considered accepted only when they have been confirmed by us in writing. Until then, our proposal is non-binding. Additional agreements, extensions, or changes made by telephone, telegraph, or orally, require written confirmation in order to be valid. For prices that are not expressly designated as firm in our proposals and order confirmations, we reserve the right to adjust prices accordingly if the cost factor (material, personnel costs, energy, and general costs, tariffs, shipping costs, etc.) increases significantly after the contract is concluded and prior to delivery. We are not bound to maintain previous pricing for follow-up orders. The minimum invoice amount is 100.00 Euro. Amounts up to 100.00 Euro can be paid in cash, with no discount, if the order is picked up. Excess or short deliveries of 10% are considered to be agreed to.

#### 3. Prices

Prices are ex works, exclusive of packaging, plus legally mandated value-added tax.

#### 4. Delivery lead time

Delivery lead times are estimated, even if this is not expressly stated. Every partial delivery is an independent order. Delivery lead times generally start after complete written agreement to the conditions of the contract, including the availability of any data, drawings, test samples, etc. to be provided by the buyer or purchaser at no cost and in the requested quantities and final versions. Delivery lead time is considered to be met when readiness to ship is reported on time, if shipment is not possible through no fault of our own. If we are unable to make timely delivery, the buyer or purchaser must provide an appropriate extension of time. The buyer or purchaser may not refuse partial deliveries. Liquidated damages due to non-fulfillment or late fulfillment will be declined.

## 5. Prevented delivery

Operational interruptions of any kind, force majeure events, work stoppages, lockouts, etc. at our facilities or those of our suppliers, as well as any other causes or events that prevent receipt, production, or shipment, release us from compliance with any delivery obligations through their duration, including any resulting events, and entitle us, if the details of the conditions require, to completely or partially cancel the delivery obligations without the buyer/purchaser being entitled to withdraw from the contract in such cases.

## 6. Shipment

Shipment is ex works, and is always at the cost and risk of the buyer or purchaser. Risk, including the risk of confiscation, transfers to the buyer or purchaser upon transfer of the goods to the carrier or freight forwarder, but no later than upon their departure from the factory. If no special instructions are provided, the means and route of shipment will be selected according to our best discretion but no liability will be accepted for selection of the least expensive or fastest shipment. If goods reported as ready for shipment are not picked up immediately, or if shipment is permanently or temporarily impossible, the purchase price is nevertheless due. We are then entitled to store the goods at the cost and risk of the buyer at our discretion. The supplier has no liability for weather damage during shipment or storage of the ordered goods.

## 7. Packaging

If no other express agreement has been made, and acknowledged by us in writing, we will package according to our best discretion. Packaging will be invoiced at cost price and will not be taken back. Insurance against breakage and damage due to shipping or fire is the responsibility of the buyer or purchaser.

## 8. Claims and rights in case of defects

Deviations of dimensions, weights, and goods are permissible according to DIN standards. Any claims must be presented to us immediately in writing within 8 days of receipt of the goods in respect of visible defects, including all necessary details, such as the article, invoice, and delivery note numbers and the type of damage. The buyer initially has the right to supplementary performance for any existing defects. If the supplementary performance is not successful, the buyer can demand a reduction in the purchase price, or, at his option, withdraw from the contract. Any further damage claims will be declined, such as liability for damage by the supplied goods to the customer's legal goods (damage to other items), subsequent damages, loss of earnings, etc. These limitations on claims for damages do not apply in the case of gross negligence by the seller, or by intentional or grossly negligent breach of duty on the part of a legal representative or assignee of the seller. This limitation also does not apply to liability for damages arising from injury to life and limb, or prejudice to health due to a breach of duty by the seller, or intentional or negligent breach of duty by a legal representative or assignee of the seller. The term of expiry for claims and rights due to defects in the supplied goods and services – for any legal reasons whatsoever – and for claims of damages is 1 year. Claims and rights due to defects do not refer to merely minor defects, nor to natural wear; this applies in particular to seals and other wear parts. Such claims and rights are also excluded if they are based on improper use, operation, or unsuitable equipment, insufficient maintenance or repair, improper installation or modifications by the buyer/purchaser or third parties. If the claim of defect is determined to be unjustified, then the buyer/purchaser must repay any expenditures that have been incurred. The above provisions apply accordingly if other goods are provided in place of those contractually agreed upon, as long as agreement to the change or deviation is reasonable for the buyer/purchaser, taking our interests into consideration.

## 9. Replacement delivery

Replacement delivery or credit can be issued only after complete determination of a duty of replacement, by detailed analysis at our factory. For this purpose, the goods forming the object of the claim must be sent to us at no cost to us. In cases of dire need, replacement will be provided against an invoice for the current price, and a credit issued after a duty of replacement has been established. In the case of subcontracted operations, we guarantee only that your parts will be processed correctly. Further claims for damages, such as replacement material, are not valid. Reference is made to the prescribed non-liability clause of the German Federal Cartel Office. If changes or repair work are performed by the buyer or purchaser or third parties without our prior authorization, our liability no longer applies. Further claims by the buyer or purchaser, and in particular claims for compensation for damages that do not affect the delivered goods themselves, are not valid.

## 10. Acceptance and testing

If a functional test of the goods to be provided is prescribed or agreed to, then it will take place at our factory immediately after readiness to ship, at the cost of the buyer or purchaser. If the buyer or purchaser fails to perform such a test, then the goods are considered to be delivered fully accepted upon leaving our factory.

## 11. Payment conditions

If no other payment conditions are set forth in our proposal, payment is due within 30 days of the invoice date with no discount. Discountable exchange is accepted as payment only after express agreement. Credits for exchange or checks are always provisional upon receipt, and irrespective of earlier due date of the purchase price in the case of delay by the buyer/purchaser, occur on the validation date on which we can make use of the equivalent value. In the event of failure to comply with the target date, interest of 8% above the base interest rate will be charged. Failure to comply with payment conditions, or conditions that are made known to us after conclusion of the contract and that may affect the creditworthiness of the buyer/purchaser, will cause all payments to become due immediately, without regard for the maturity of any accepted exchange. They also entitle us to make pending deliveries only upon prepayment or provision of security, and to withdraw from the agreement after a suitable extension of time, or to demand payment of damages due to non-fulfilment, without regard to the right of retraction of the goods provided under retention of title, at the cost of the buyer/purchaser. The buyer/purchaser is entitled to retention and offset only if undisputed or legally enforceable claims thereto are made valid.

## 12. Retention of title

1. Goods delivered or processed by us remain our property as security for all of our claims, including conditional claims and claims of limited duration, arising from the entire business relationship until such goods have been paid for in full. The buyer or purchaser is, however, entitled to use the goods during the normal course of business.
2. The retention of title extends to products made by processing, combining, or connecting our goods at the full value thereof, whereby we are considered to be the manufacturer. If the right to title of third parties persists after processing, combination, or connection to the goods of third parties, then we obtain co-ownership at the ratio of the billed value of these processed goods.
3. Receivables from third parties arising from resale are transferred to us as security with immediate effect, in whole or to the extent of our co-ownership, by the buyer. The buyer is empowered to obtain said receivables for our account until revocation or cessation of his payments to us. The buyer or purchaser is not authorized to assign the receivables, even for purposes of collecting the receivables by means of factoring, unless the factor is simultaneously obligated to secure consideration in the amount of our share of the receivables directly to us for as long as we have outstanding receivables from the buyer or purchaser.
4. We must be informed by the buyer or purchaser immediately by registered mail of access by third parties to the goods and receivables belonging to us.
5. Exercise of the retention of title does not imply withdrawal from the contract.
6. The goods, and receivables taking their place, may not be promised to third parties or transferred or used as security prior to payment of our receivable amount in full.
7. If the value of the security that can be realized is greater than our receivable by more than 10%, then we will release securities of our choice to that extent upon request by the buyer or purchaser..

## 13. Place of fulfilment and jurisdiction

Place of fulfilment and jurisdiction for deliveries and payments, claims from checks and exchanges, and all other rights and obligations arising from the transaction, is our corporate headquarters in Oberhausen, for both parties.

## 14. Data storage

Upon initiation of the business relationship, we will commence data storage according to the provisions of the German Federal Privacy Law.