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PRODUCT NEWS

2018

LinMot®

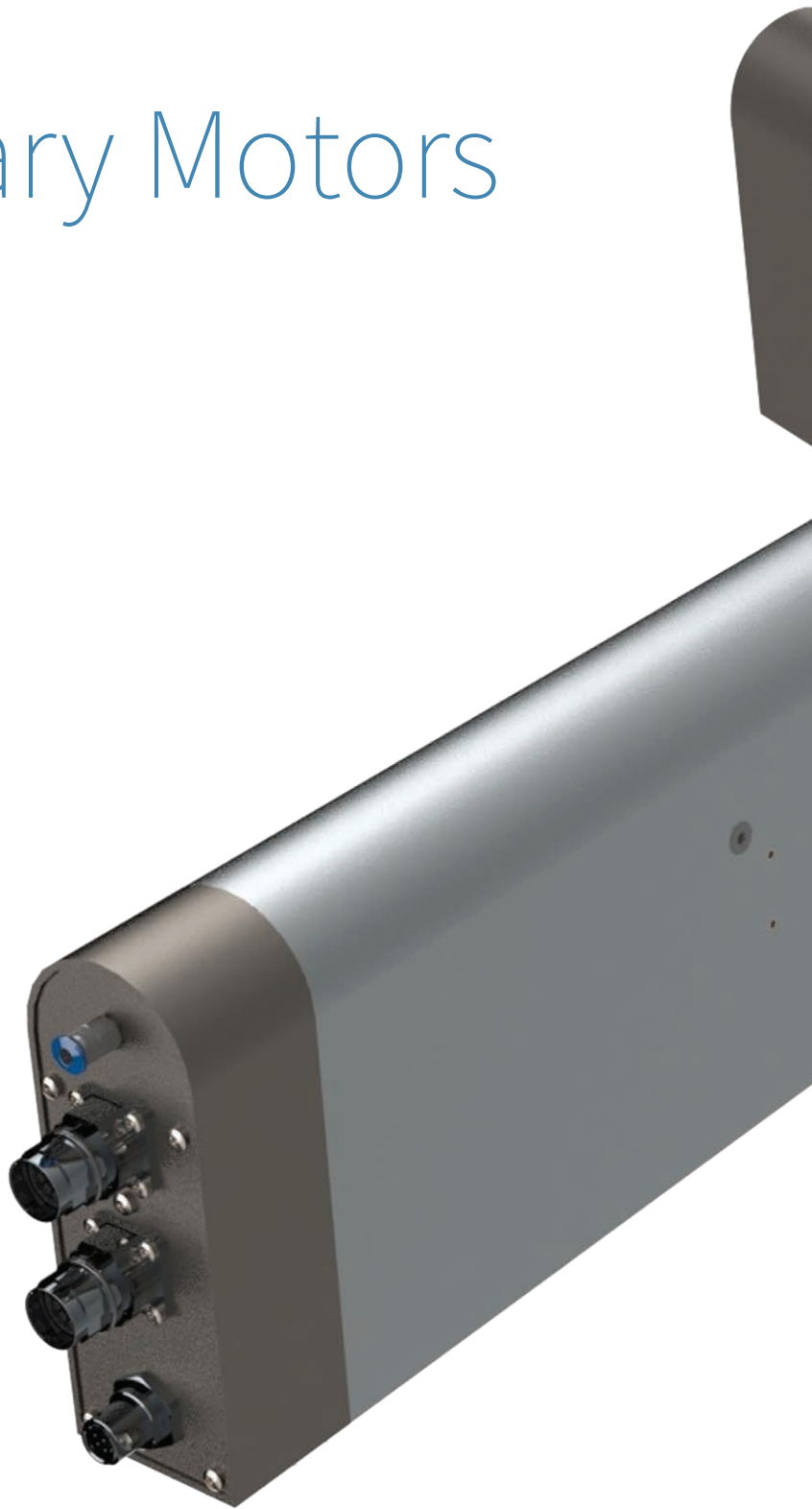
Linear Rotary Motors

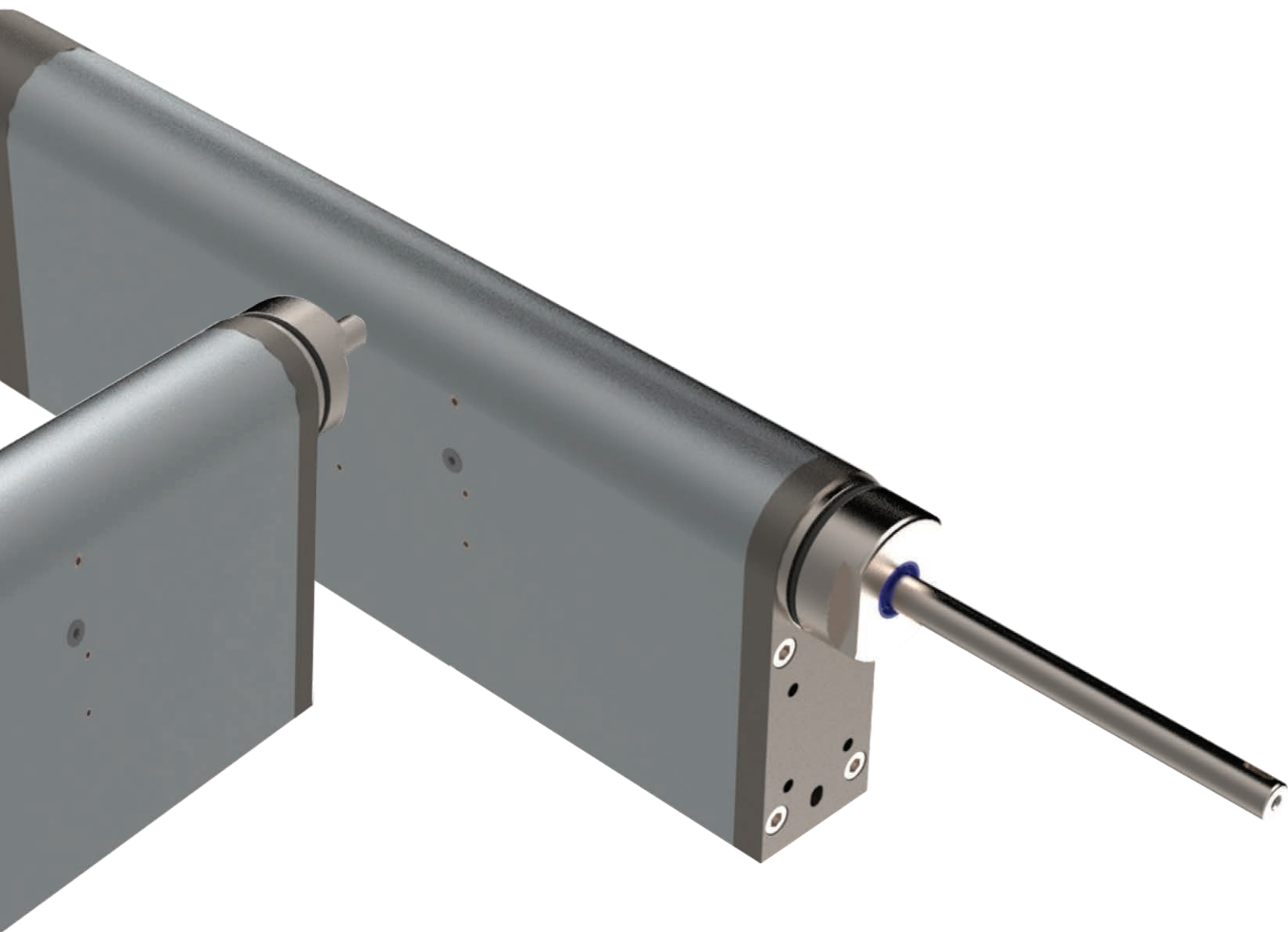
PR02-52

LinMot expands the product range of linear rotary motors by another motor type.

The new PR02 motor series is characterised by a new design in which the motors, including additional components, are integrated in a slim housing. In addition to the linear motor and the rotary motor, options such as a magnetic spring „MagSpring“ or a torque sensor can also be installed. The MagSpring ensures that the weight force of the moving load is passively compensated and the torque sensor enables precise, reproducible and recordable capping processes like they are required in the pharmaceutical industry, for example. This effectively prevents the axis from lowering when it is not energized. With the new design, the user benefits from the shortened installation length of the entire unit and the hygienic design with surfaces that are easy to clean.

The performance data of the PR02-52 series correspond to those of the already proven PR01-52 series, with a stroke of 100mm. The linear rotary motor generates a maximum force of 255 N and a maximum torque of 2.2 Nm.





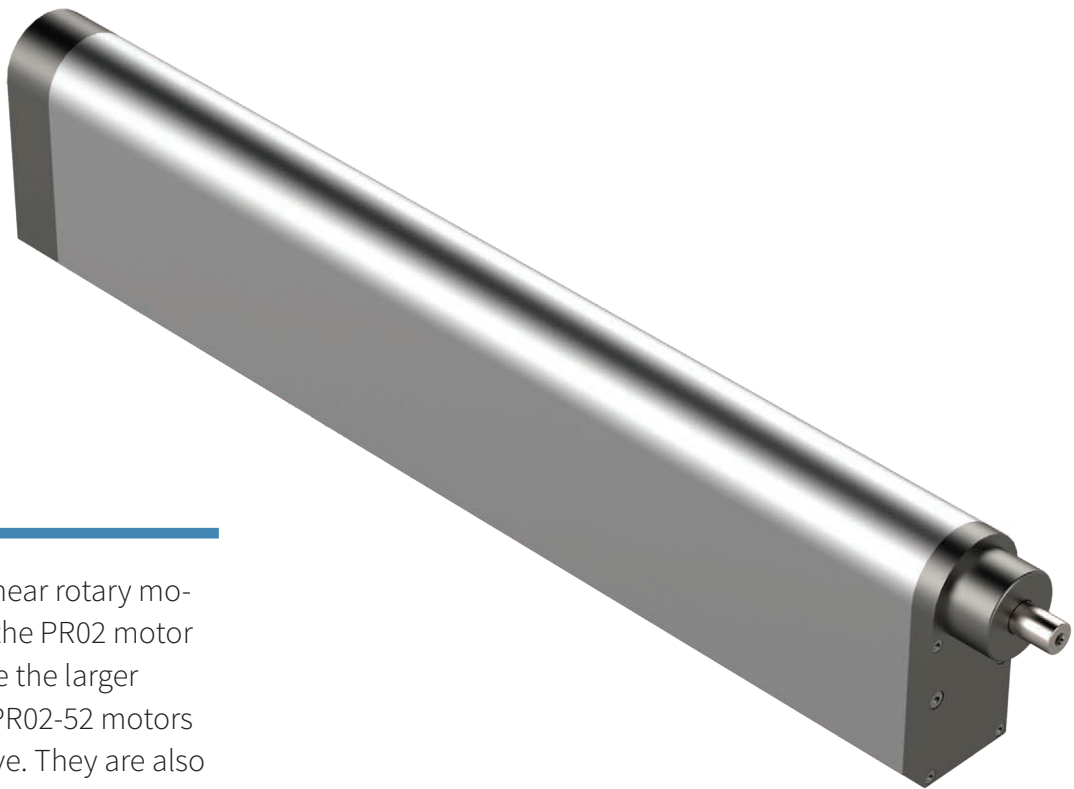
The PR02 motors will be available from mid-2018.

- » Independent linear and rotary motions
- » New design with smooth surfaces for the pharmaceutical industry
- » Innovative design principle with shorter installation length
- » Integratable options such as MagSpring or torque measuring shaft
- » Max. stroke up to 100 mm

Stroke up to	mm	100
Peak Force	N	255
Nominal Force	N	51
Peak Velocity	m/s	3.9
Peak Torque	Nm	2.2
Constant Torque (Halt)	Nm	0.47
Max. Number of Revolutions	rpm	1500
Repeatability	mm	±0.05
Length	mm	451

Linear Rotary Motors

PR02-88



The PR02-88 linear rotary motors complete the PR02 motor family. They are the larger version of the PR02-52 motors described above. They are also based on the new design, in which the rotary motor, linear motor and the magnetic spring „MagSpring“ are housed in a slim, easy-to-clean housing.

For demanding applications such as the capping of trigger or pump sprays, the PR02-88 motor series features a hollow shaft to accommodate a non-rotating shaft for holding the pump head, for holding a shaft as a tappet or for the supply of compressed air or vacuum. A stroke of up to 300 mm enables the insertion of a suction tube in trigger or pump spray heads.

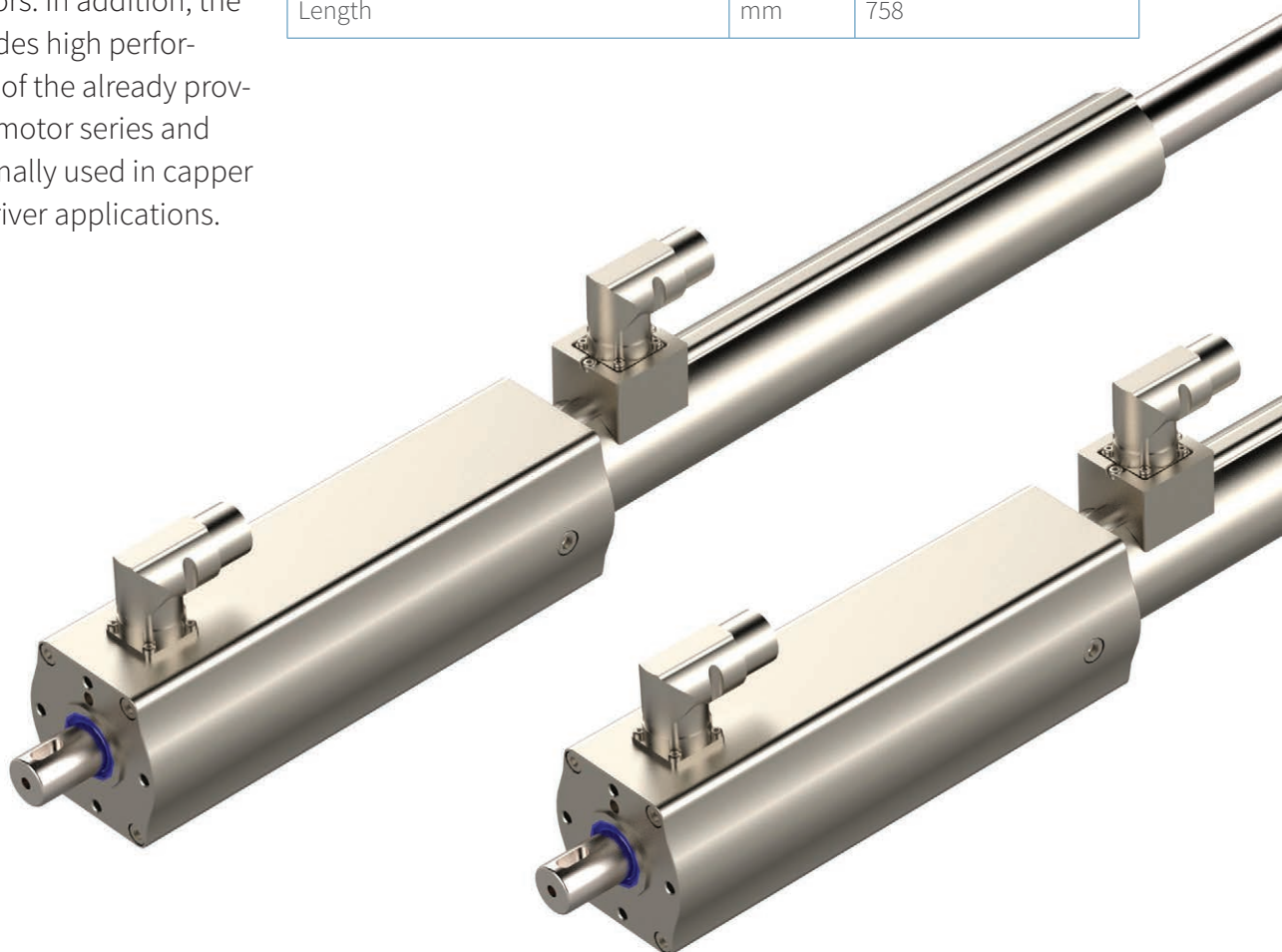
The PR02-88 motors will be available from mid-2018.

Stroke up to	mm	300
Peak Force	N	572
Nominal Force	N	145
Peak Velocity	m/s	3
Peak Torque	Nm	8.9
Constant Torque (Halt)	Nm	1.9
Max. Number of Revolutions	rpm	1000
Hollow shaft	mm	9
Length	mm	647 / 1047

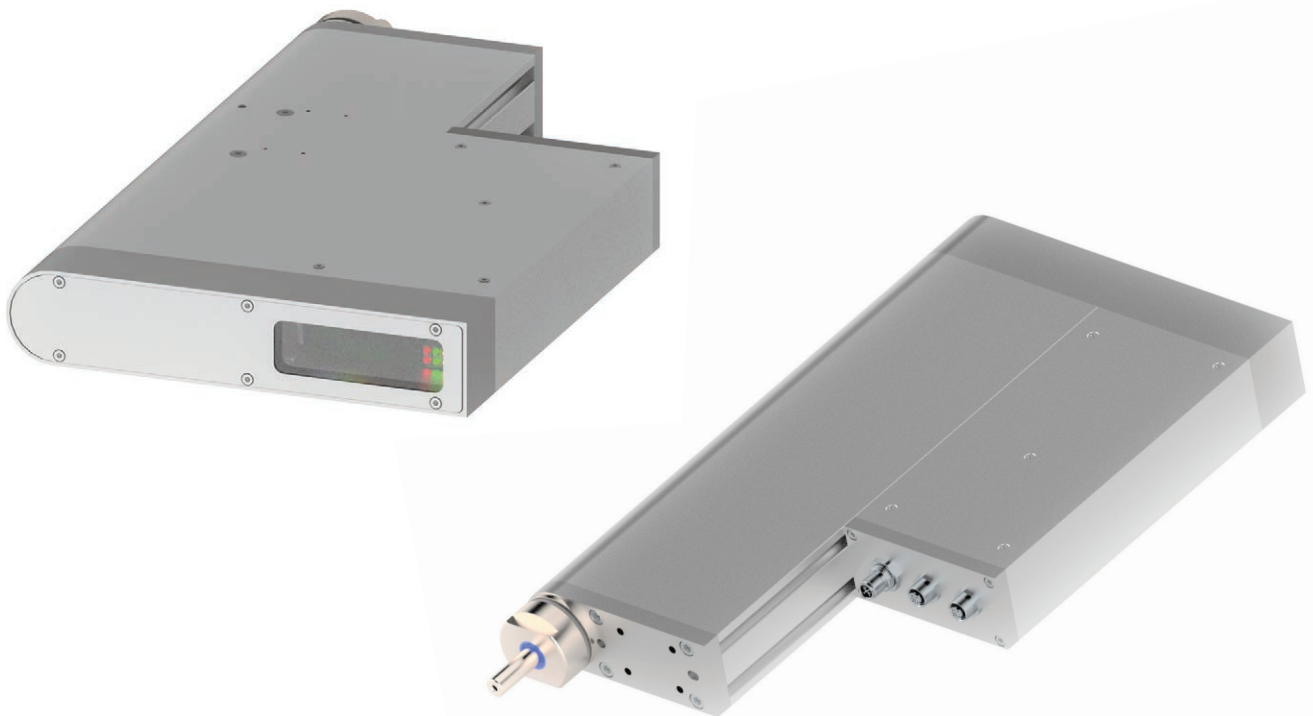
Linear Rotary Motors PR01-70

With the new motor size PR01-70 as an intermediate size between the existing PR01-52 and PR01-84 series, LinMot introduces a linear rotary motor with 70mm outer diameter and completes the PR01 series. Due to the flattened outer surfaces, the installation space can be used even better when using several motors. In addition, the motor provides high performance data of the already proven PR01-84 motor series and can be optimally used in capper and screwdriver applications.

Stroke up to	mm	150
Peak Force	N	572
Nominal Force	N	145
Peak Velocity	m/s	3
Peak Torque	Nm	8.9
Constant Torque (Halt)	Nm	1.9
Max. Number of Revolutions	rpm	1000
Repeatability	mm	±0.05
Length	mm	758



Linear Rotary Motor PRD02 with integrated Drive



As an absolute novelty, LinMot is presenting the PR02 linear rotary motor with a built-in servo drive at the SPS ipc Drives in Nuremberg. Especially in capper applications where several linear rotary motors are installed on a carousel, the compact PRD02 with integrated drives helps to solve space problems and enables an even more compact design. The integrated two-axis drive also significantly reduces the wiring effort, since the motor cables are no longer required and the power supply and the bus only have to be supplied once per module.

The integrated drives can be controlled via ProfiNet, EthernetIP, EtherCAT, Sercos III and Powerlink.

Linear Rotary Motors with integrated drives will be available from the second half of 2018 onwards.

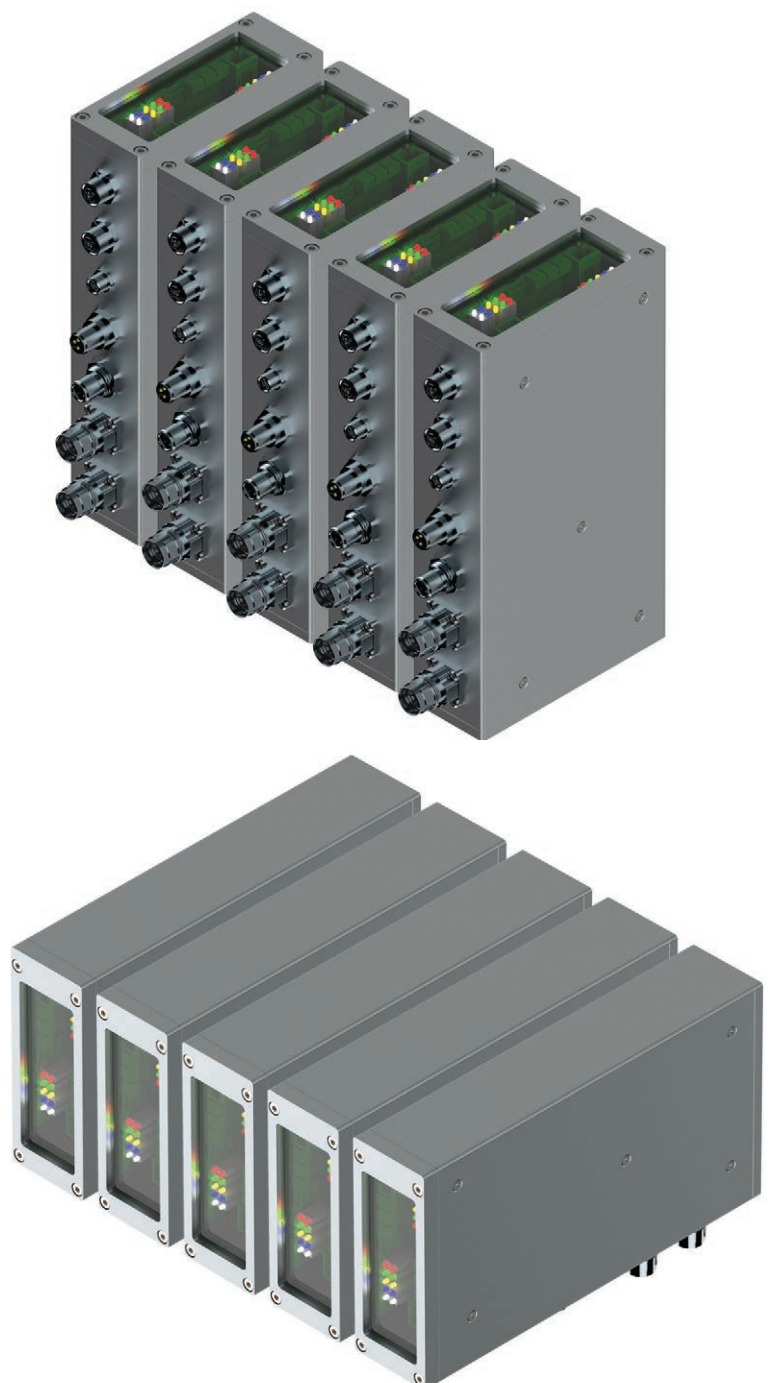
2-Axis Near by Drive D2250

In the course of the further development of the servo drive family, LinMot introduces a new servo drive for the control of 2 axes in a compact IP64 housing. This drive can be placed as a decentralized solution close to the actuator components and does not require any additional space in the control cabinet. As a 2-axis drive, the D2250 series was specially developed for the LinMot linear rotary motors, but it can also be used for the decentralized control of LinMot linear motors and rotary motors.

The drive can be operated with 24-72VDC and supplies the motor with a phase current of up to 25 A. It has an Industrial Ethernet interface for ProfiNet, Ethernet IP, EtherCAT, Sercos III and Powerlink. The device profiles CiA402, SoE, Profidrive and CIP Sync are also supported. The bus protocols are simply selected via a DIP rotary switch. For ProfiNet, Ethernet IP, EtherCAT, Sercos III the drive can be configured directly via the Industrial Ethernet interface.

All operating elements, switches and interfaces as well as the status display are installed behind a protective cover, which guarantees the required tightness for decentralised installation. The drive is thus protected against dust and water in accordance with protection class IP 64 and does not require any additional cover.

The 2-axis D2250 drives will be available from mid-2018.



Functional Safety Drives

As part of the further development of the servo drive C series, LinMot will be launching the new functional safety drives next year. These servo drives are based on the existing C1250 and C1450 series and feature additional safety functions in the new 2S version. In addition to the STO (safe stop) and SS1 (control until standstill), which were already available in the 1S version, the new drives also offer the functions Save Stop 2 (SS2), Safe Operation Stop (SOS), Save Limited Speed (SLS) and Save Brake Control (SBC/SBT). The safe brake control (SBC) has been even extended by a brake test (SBT) in which the braking effect can be checked cyclically.

In a first version, the controllers are equipped with Profisafe safety busses via PROFINET and PROFIdrive. In the future, safe bus communication and safe bus protocols will also be available via EtherCAT, EtherNET IP, Powerlink and Sercos. In the meantime, all of the functions described above can be activated via the safe digital inputs. In addition, a safe two-channel output is available.

For the implementation of functional safety solutions, LinMot linear motors with safe encoders will also be offered from mid-2018. The external appearance of the motors (stators and sliders) remains unchanged. The new motors do not require an additional sensor and are also connected to the drive with the familiar single-cable solution for safe drive control.

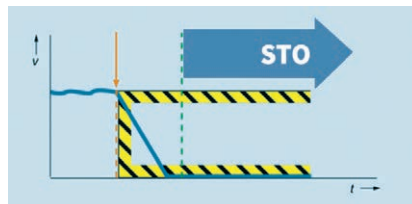
The new servo drives are additionally equipped with a safe hipurface DSL encoder input for safe control of rotary motors. This encoder input requires only two lines and makes it possible to use a single-cable solution for the safe control of rotary motors.



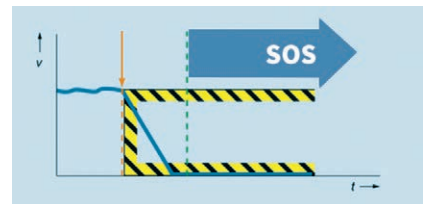
STO: Save Torque Off



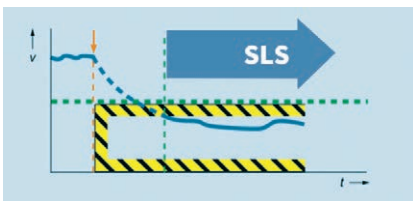
SS1: Save Stop 1



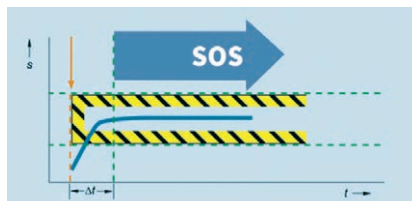
SS2: Save Stop 2



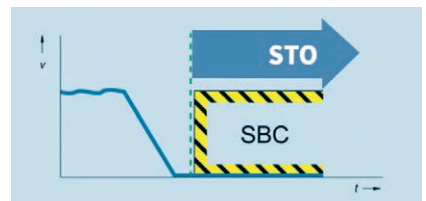
SLS: Save Limited Speed



SOS: Save Operation Stop



SBC: Save Break Control



Servo Drive C1450

As part of the further development of the servo drive C series, the new C1450 servo drive is offered to the user. These flexible servo drives are suitable for simple point-to-point motions as well as for the realization of complex tasks with axis and NC synchronisation.

With a power stage of 230 V, this drive was developed primarily for controlling the LinMot linear motors P10-54 and P10-70, but they can also be used for controlling rotary motors. The C1400 is available with all well-known Industrial Ethernet interfaces such as Profinet, EtherCAT, Sercos III and Powerlink for communication with the higher-level controllers. With this drive, the expansion of bus interfaces is ensured by a modular bus system. In addition, LinMot offers the device profiles CoE, SoE, PROFIdrive and from the beginning of 2018 also CIP Sync for the EtherCAT and PROFINet drives.

Furthermore, the drives offer up to 100 internally programmable motion profiles and an internal sequencer, which gives the possibility of implementing fast-moving images and sequences, internally. This makes it possible to relieve the higher-level control and apply very time-critical processes without delays and jitter.

- » 1 x 240VAC 15Arms peak phase current
- » For LinMot P10 linear motors & AC servomotors
- » 100 programmable motion profiles
- » 255 storable motion commands
- » Interface for incremental or absolute sensors
- » Configurable via Industrial Ethernet



Linear Motor Family

P10-54



LinMot now offers a further motor family in the field of 3-phase linear motors 230-480VAC for control with external controllers or LinMot drives. This product brings to market a compact, tubular linear motor in the medium power range for dynamic positioning tasks or for replacing pneumatics.

Equipped with an incremental encoder, the linear motors can be controlled by drives from any manufacturer. This enables simple integration into the existing control concept with the drives introduced by the machine and plant manufacturer. Alternatively, the linear motors can be controlled with the LinMot drives of the series C1400 with 230VAC and E1400 with 3x400VAC.

The P10-54 motors are available in 4 sizes, with forces ranging from 335 to 870 N. The extensive selection of sliders produces a closely tiered range of strokes, with a maximum stroke of up to 1720 mm. The motor data, with accelerations from 400 m/s² and a maximum speed of over 7 m/s, leave nothing to be desired in terms of dynamics. The rotating TWIN plug with push-pull connectors for power and encoder cables provides the greatest possible flexibility in the cable exit, guaranteeing reliable, time-saving cable routing in the system. The single-piece clamping flange supports fast and easy installation of the stator in the system.

- » 230VAC and 3 x 400VAC technology
- » Peak forces up to 870 N
- » Stroke range up to 1720mm
- » 1Vpp sin/cos or A/B incremental encoder
- » Extremely high dynamics
- » Rotating push-pull TWIN connector for power and encoder cables
- » One-piece clamping flange
- » Can also be controlled by standard third-party servo drives

Stroke up to	mm	1720
Peak Force	N	871
Nominal Force	N	270
Peak Velocity	m/s	7.1
Peak Acceleration	m/s ²	413
Repeatability	mm	0.01
Stator Length	mm	222-402
Slider Length	mm	350-2000

Configuration and Monitoring via Industrial Ethernet

With the LinMot servo drive series C1250, C1450, E1200 and E1400, the configuration and monitoring of linear motors has become even more convenient. The drives can now be addressed centrally via the EtherCAT fieldbus by Ethernet communication (EoE). The parameterization of the axis, the monitoring with oscilloscope, the travel along time curves and the internal sequence

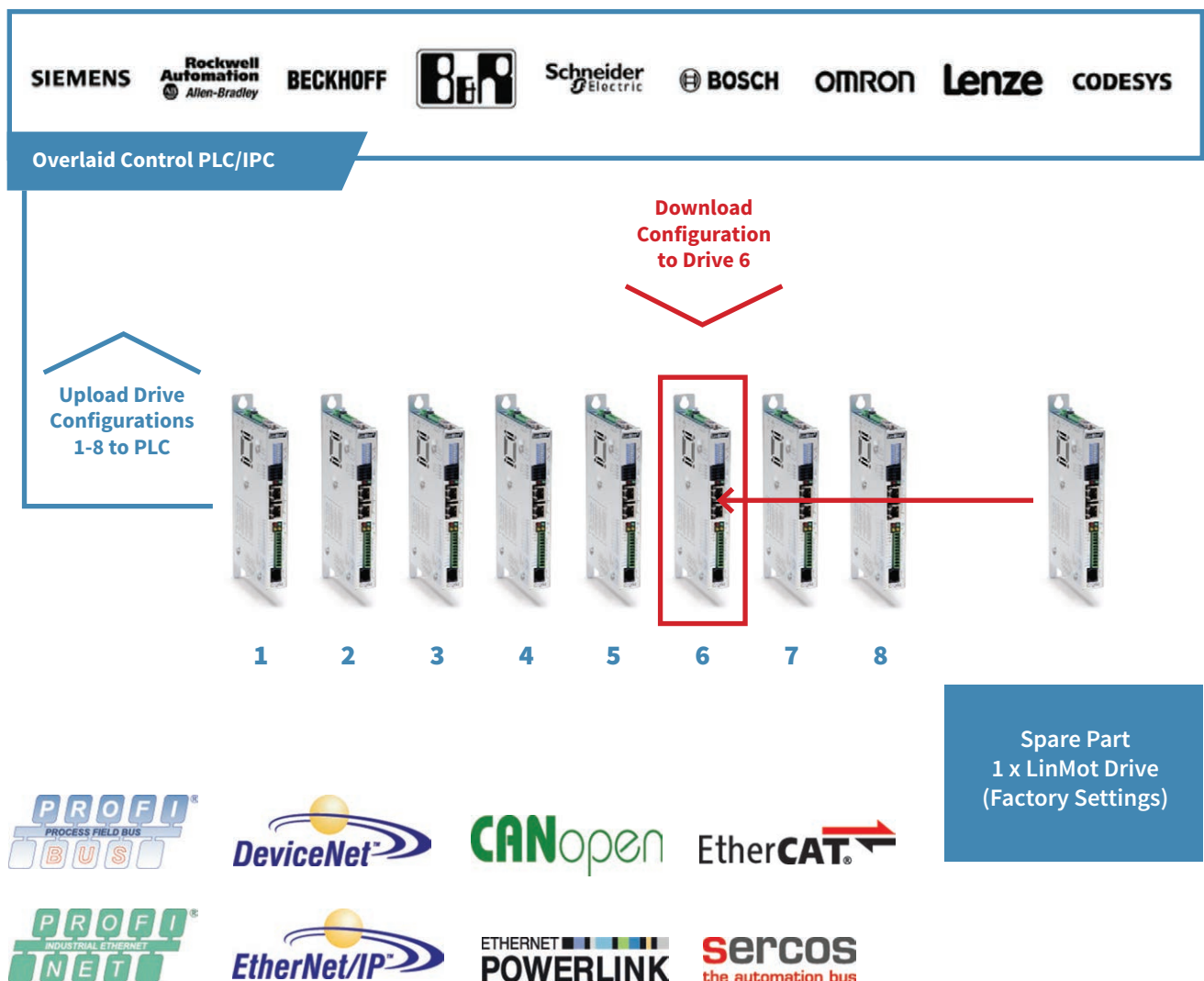
control (command table) can thus be carried out quickly via the real-time interface with the LinMot Talk. The same also works with ProfiNet, Ethernet IP and Sercos, where the PC is directly connected to the network for configuration. In the future, a firmware update via the realtime bus will be also possible.



Automatic Drive Configuration via PLC

With LinMot drives that communicate via a field-bus or Industrial Ethernet, the complete drive configuration can be loaded directly from the PLC. If a drive needs to be changed in the system during servicing, it is sufficient to integrate a drive with factory settings into the network. This servo

drive is automatically configured by the controller when the system is started up. In case of service, a drive can be exchanged within a minute without expert knowledge and without having to search for files or configure the drive manually using PC tools.



Linear Motor

PD03-37Sx120F-HP

with integrated Drive

Thanks to the innovative concept of the PD03 linear motor with integrated control electronics, the servo drive in the control cabinet can be dispensed. The installation time and the work effort will thus be greatly reduced. On the application side, this opens up the possibility to efficiently couple the devices in a daisy chain linkage. Modular machine concepts can also be implemented simply and easily using the new linear motors with integrated drives.

The motors with integrated drives are available in the short version 37Sx120 and achieve a peak force of 255 N. The drive supplies the motor with a phase peak current of up to 25 A and has an industrial ethernet interface. The EtherCAT interface and the device profiles CoE and SoE are currently available. The config interface and the DIP switch are mounted behind a protective cover, which guarantees the required tightness. The complete motor with integrated drive is accordingly protected according to protection class IP 65 against dust and water spray infiltration.



- » High-Performance linear motor with integrated drive
- » Compact form factor
- » High dynamics
- » Suitable for daisy chain linkages
- » Integrated mounting flange
- » Low cabling effort
- » Low overall costs
- » Simple commissioning

Stroke up to	mm	400
Peak Force	N	255
Nominal Force	N	35
Peak Velocity	m/s	3.8
Peak Acceleration	m/s ²	450
Repeatability	mm	±0.05
Stator Length	mm	170
Slider Length	mm	240 - 600

Highlights from the LinMot eCatalogue

- » Comprehensive information is available for each product:
 - Data sheets
 - Installation Guides
 - 3D CAD files
 - EPLAN macros
 - SPS function modules
- » All main product groups can be filtered by specific properties, such as:
 - Max. Force
 - Diameter / Length
 - Encoder Feedback
 - Supply
 - Safety Function
- » The innovations are visible at a glance.
- » The appropriate software is available for download for each product.
- » Coordinated accessories are suggested for each product to ensure the correct installation of your system.
- » In the shopping cart you collect conveniently the desired products and send them to us for a price inquiry.



The closure twist

Design flexible closure processes with linear-rotary motors

Closure processes can be designed much more flexibly with linear-rotary motors than with conventional cam disc technology. That is why Tölke, a packaging machinery specialist, has outfitted its new high-performance filling and closing line with linear-rotary motors from LinMot. The operator of the system profits from shorter setup times, lower downtime, and a wider range of applications for the machine.



“Mechanical cam discs have proven their worth in linear-motion processes for decades and will continue to be used in many lower- and medium-performance filling and closing machines in the future,” says Franz-Josef Patzelt, one of the managing directors of Franz Tölke GmbH. “With their electronic pendants, however, the closure process is much easier to adapt to individual product requirements, and product changeover can be done much more quickly, which more and more users are demanding.”

The company had already done a lot in the past to add flexibility to their filling and closing machines that use conventional cam-stroke technology. By using transport cups with identical outer shape and individualized inner contours, often only the cups had to be swapped out for a product changeover. If it was necessary to swap out all of the part-specific components of a machine, then Tölke made sure that this could be done quickly by hand, with no tools required.

FLEXIBLE CAROUSEL WITH 16 LINEAR-ROTARY MOTORS

If the closing process itself needs to be modified for a product changeover, however, it is usually necessary to change out the mechanical cams involved in the linear motion of the screwing process.

Because this is a time-consuming and costly process, Tölke has now built a carousel machine with 16 closing stations for an application with frequent product changeovers. The entire screwing process is handled by one model PR01-84 linear-rotary motor at each station.

This electric motor, part of the PR01 series from LinMot, was specially developed for the closing and screwing process. It combines both a linear motor and a rotary direct drive in a compact housing, each of which is controlled separately. This means that any combination of linear and rotary motions can be implemented.

“For the rotary part of the screwing process, we have been using a rotary servomotor instead of a pneumatic motor for a long time wherever the screwing application requires a defined turn angle and a defined torque, and when we want to perform a product changeover at the push of a button,” explains Franz-Josef Patzelt.

CLOSER WITH ELECTRONIC LINEAR AXIS

What is new, however, is the use of an electronic linear axis in the closer. “The cap needs to be picked up, placed on the bottle, and then guided so as to provide optimal support for the rotary motion,” says Markus Kröger, the Tölke project manager responsible for this job. “If this linear motion were controlled by a cam disc, then the heights at which the cap is picked up and placed down would be fixed, and the entire motion sequence would be defined.”

If modifications to the motion sequence were required for a product changeover, then the mechanical solution would require different closure heads or even different cam discs to be installed, or the machine builder would have to integrate adjustable cam discs. In some cases, a spring would also need to be installed to compensate for the weight of the head. “With a direct drive and an electronic stroke curve, none of this is needed anymore,” explains Markus Kröger. With the

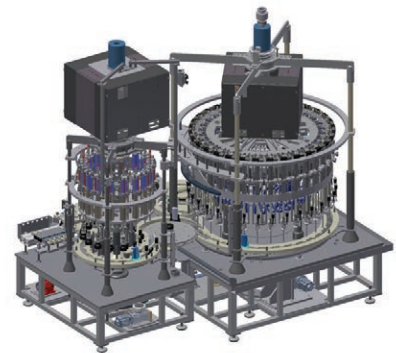
right parameter sets for the programmed motion sequence, or by invoking a pre-defined recipe, the motion of the linear motor can be designed as needed and optimally adapted to the individual requirements of the application.”

FREELY PROGRAMMABLE MOTION SEQUENCES

This means that different types of closures, including screw-on and press-on caps, can be processed on the same machine. Even different press forces or thread pitches, such as are found on containers with and without safety caps, can be handled by a linear drive without any mechanical reconfiguration.

In addition, a linear-rotary motor like the PR01, with its two independently controlled axes, can start the rotary motion during the linear stroke, decoupled from the position of the turntable. The machine builder thus has more freedom when designing the machine, allowing the cycle time to be shortened.

The mechanical decoupling of the closing process from the carousel or turntable was used by the engineers at Tölke to promote the modularization of the machine. If a screwing station is damaged, it can now be replaced in a short time, so the machine can get back to work much faster after a crash. In addition, because they are decoupled, the closing process can be completed for all containers in the line prior to a planned machine stop. In order to further reduce the downtime and monitor the screwing process, the information produced by the linear-rotary drive for each individual screwing process (torque, speed, angle, vertical position, speed, and force) can be analyzed. “We can use the data provided by the drive to determine the number of revolutions actually performed, so that a separate check of the height of the closed container in order to monitor the screwing process can also be eliminated,” adds Franz-Josef Patzelt, citing a practical example. The drive data for snap-on caps can also be usefully applied for monitoring purposes. An error message



Flexible filling and closing machine from Tölke for output capacity of up to 300 bottles/min and a filling volumes of up to 250 ml.

can be generated if a prescribed value for the snap-on force is exceeded due to an interfering injection point.

LINEAR-ROTARY MOTOR FROM LINMOT: COMPACT AND ROBUST

Due to these many advantages, Tölke had already developed a solution prior to the use of the PR01 linear-rotary motor, wherein the linear motion was generated by a servomotor in conjunction with a ballscrew spindle. The ballscrew, however, had to be protected against dust, which requires additional design effort that is not necessary for the fully assembled linear-rotary motor. “The linear-rotary motor from LinMot is much simpler to use, as an integrated unit, and takes up less space,” says Markus Kröger. “The PR01 is thus the ideal solution for lines like our high-performance closing machines, where the rotary screwing process must be as flexible and efficient as possible.”

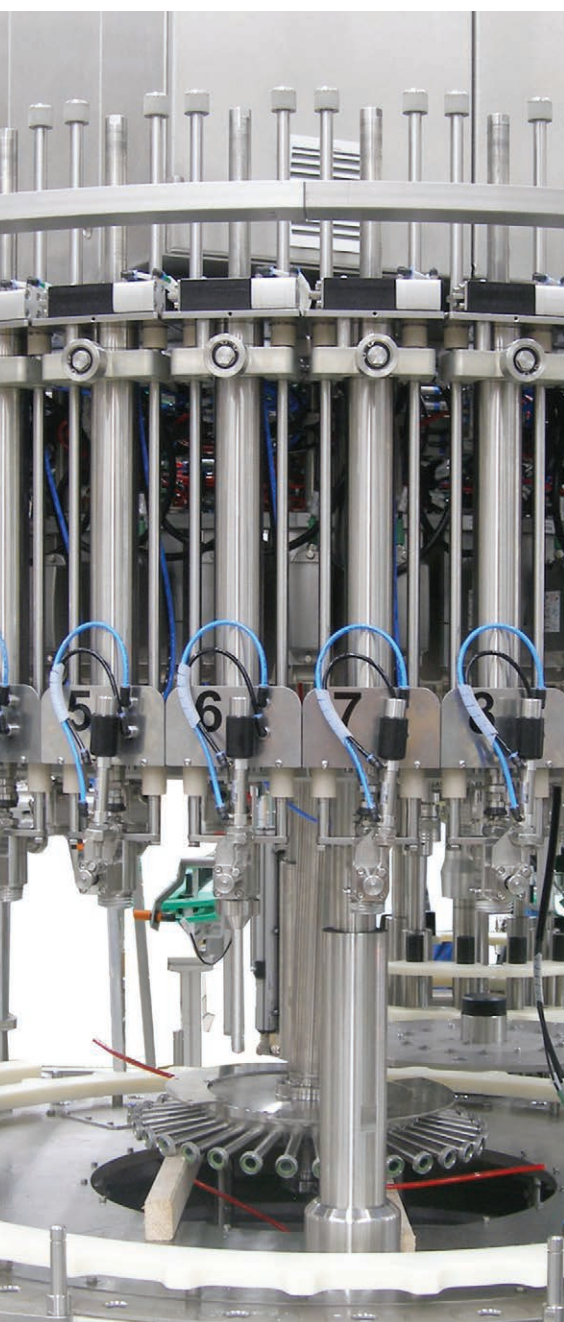


The electric motors, part of the PR01 series from LinMot, were specially developed for the closing and screwing process. They combine both a linear motor and a rotary direct drive in a compact housing.

Fast and flexible filling

Rotary indexing machine combines advantages of piston and flow-rate metering

Many users wish they could combine the advantages of flow-rate metering and piston metering in one rotary filling machine. Tölke, a specialist in packaging machinery, has pulled off this feat by using LinMot linear motors. The operator of the system benefits from short changeover times, less scrap, shorter downtime, and a more flexible machine.



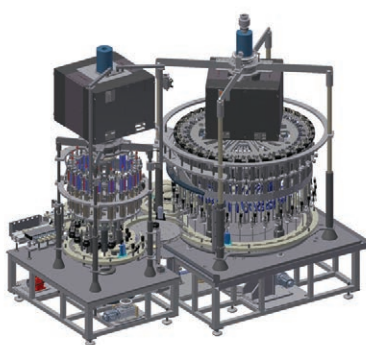
Previously, metering in simpler rotary filling machines was typically provided by pistons, where the stroke of the piston was controlled by a mechanical cam disc. The advantage of piston filling is that the volume that has already been dispensed during the filling process is always known. This is applied for media that tend to foam up, for example, by using the cam disc to raise the filling needle synchronously as the fill level rises, so that it does not dip below the surface of the medium. Despite this appealing advantage, there are also some disadvantages to the piston approach. The piston is hard to clean, simply because of the seal it requires, and is not very well suited to CIP/SIP. The mechanical force applied by the piston also causes changes in some products. Another disadvantage is that large fill volumes require large

pistons, which means that a change in the amount dispensed is difficult to implement without a time-consuming changeover of the machine.

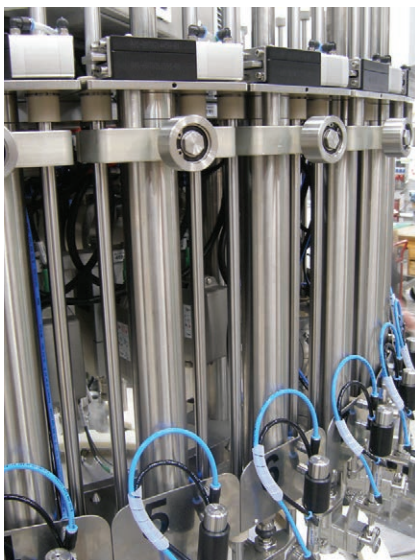
As an alternative to piston metering, therefore, the fill level can be determined by measuring the flow rate of the pumped volume. The advantage of this method is that the fill level can be modified easily when the product is changed. The mechanical forces on the medium are also minimal, and there are no mechanical parts that require maintenance. CIP/SIP cleaning is not a problem.

DECOUPLING THE MOTION SEQUENCES

“With a carousel with fill-level metering based on the flow rate, the filling speed is decoupled from the cam-controlled motion of the filling needle,” considers Franz-Josef Patzelt. This means that when the machine is running slower or faster than its nominal speed, the containers will be filled sooner, or not until later. “Depending on the speed, the machine would then need 270° or just 30° of the rotation of the dial table,” says the Tölke director, explaining the problem. “This means that the filling needles can dip into the product during the filling process, or the drop height above the surface is too great and there is a risk that the machine will be contaminated with dripping



Flexible filling and closing machine from Tölke for handling up to 300 bottles/min at a fill volume of up to 250 ml.



By using linear motors from LinMot, Tölke has been able to decouple the filling process from the motion of the dial table, which increases modularity. This enables a filling station to be changed out much more quickly in case of damage.

product residue or air bubbles will get into the product.” In the past, this has forced bottlers to return to linear machines when working with products that tend to foam up. In these systems, the filling needles can be mechanically coupled and raised synchronously with the fill level relatively simply, using an electric motor. Due to their construction, however, linear filling machines can handle only small to medium filling rates of several thousand bottles an hour. For hourly filling rates of over 10,000 bottles, only rotary machines can be used. Here, however, every needle must be raised individually at the right time in order to avoid submersion at different machine speeds and to keep the drop height to a minimum. There is no alternative but to precisely control the position of the axes. Tölke has now managed to do just that with high-performance linear motors from LinMot.

FLEXIBLE CAROUSEL WITH LINEAR MOTORS

The users of a carousel machine with electrically driven filling needles enjoy a whole series of additional advantages.

Product changes require nothing more than an adjustment of the stroke of the filling needle and can be managed with the push of a button. This eliminates the need for time-consuming and costly reconfiguration of mechanical cams. A wide range of travel profiles can also be implemented, so that differently shaped bottles can be filled without changing the entire structure of the machine. The precise position-measurement system of the linear motors also allows the motion of the filling needle

to be controlled with an accuracy in the range of tenths of a millimeter above the product surface. The acceleration levels for lowering and raising the filling needles can also be adjusted to meet individual needs, in order to reduce the loads on the mechanical systems and optimize the handling of the filling medium. “Even highly dynamic raising of the needles is possible with linear motors, unlike with mechanical cams, as there are no damaging forces acting on the bearing shafts,” explains Markus Kröger, the responsible project manager at Tölke.

RESUME PRODUCTION QUICKLY AFTER A DEFECT

Every filling module is now an autonomous unit consisting of a flow meter, linear motor, servo controller, and filling valve. If a filling station is damaged, it can now be replaced in a short time, so the machine can get back to work much faster after a crash, for example. Decoupling has also made it possible to finish the filling process for all of the containers on the machine prior to a planned machine stop and to place the machine in a safe state. The technology also makes it possible to design the machine controls so that if a single filling station fails, the affected filling heads move to a safe position and are removed from the active filling process. This reduces machine downtime to a minimum.

READY FOR INDUSTRY 4.0

The use of linear motors has even more advantages that optimally support the modern concept of “Industry 4.0”. Information provided by the servo controller, such as the current motor temperature or the acceleration curve, can be used to monitor the filling process and detect problems with the mechanical systems (condition monitoring) or collisions at an early stage.

The machines that Tölke has equipped with this new technology include a blocked filling and closing machine with 36 filling stations and 16 closing stations, where the strokes of the filling needles are each perfumed by linear motors from LinMot (series PS01-48 stators with series PL01-27 sliders).

These direct drives are made entirely of stainless steel (1.4404/316L) and are notable for their high protection class, IP69K. Gaskets were deliberately eliminated from the motor design. All connections are welded. The motors are also fully potted in order to prevent condensation from forming.

Thanks to these features and the closed, easy-to-clean stainless steel surface, the INOX motors are an excellent match for use in machinery and equipment that processes food products, cosmetics, or pharmaceutical goods. This was not the only reason, however, that Tölke decided to use these stainless steel motors from the Swiss company. The low space requirements of LinMot motors was another deciding factor, as the available space on the rotary table is tight.



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