Linear Modules LZR

Order designation

LZR 2025-38.20-16

- System designation
- Mounting profile
- Clamping profile
- Timing belt width

Sample order

Linear module	LZR 2025-38.20-16
Item no.	**B38.25.001**
Stroke	= .....mm
Length	L = ...mm
Roller carriage length	L1 = ...mm
Drive shaft borehole	ø = ...mm
Travel speed	v = ...m/s
Acceleration	a = ...m/s²

Linear modules with timing belts (LZR) have a modular design and are installed on the track roller assemblies. Their basic components include the mounting profile, profile guide and carriage plate and the timing belt drive components required to transmit power, such as the pulleys and connectors.

The LZR design facilitates the attachment of motors as standard. With the appropriately drilled shafts, the pulleys allow the motor to be attached directly on any side. In addition, shaft ends for flanged mounting of a gearmotor with a hollow shaft, adaptations with a motor flange and coupling and an indirect drive are available on request.

For electromotive drives using a stepper motor or servomotor, we recommend using the optional single-piece drive shafts.

The linear modules can be combined in two-axis and three-axis systems and in area gantries and three-dimensional gantries.

Level of Accuracy that can be achieved by Linear Modules with Timing Belts

The LZR with a 8M-30-type timing belt can achieve the following values without a load:

Repeatability:	0.1 mm
Positioning accuracy:	± 0.2 mm
Reversal error:	0.2 mm

These values vary depending on the stroke length and application.

11

Notes on the Load Specifications

For information about load specifications for track roller assemblies, refer to the information beginning on page 42.

Notes on the Load Specifications for Timing Belts
The standard timing belts used are PU (polyurethane) with steel cord tension members. Other types, including conductive belts, are available on request.

The maximum track roller assembly travel speed of v = 10 m/s can be achieved using timing belts with no reduction of the load capacities.

From a > 10 m/s² onwards, the values must be reduced by the usual load factors (e.g. without load peaks s = 1 to high load peaks s = 2.5).

The allowable tension loads are based on a 0.4% elongation of the timing belt.

The breaking strength of the belts is significantly higher. The normal usable belt pull strength (Fu) and required pretension (Fv) is approximately:

$F_{allowable} = F_v + F_u$ with $F_v = F_u$

Timing Belts	AT 5-16	5M-15	8M-30
$F_{breaking}$	3900 N	3600 N	14900 N
$F_{allowable}$	1200 N	1150 N	4000 N
$F_v = F_u$	600 N	575 N	2000 N

The usable starting torque results from the maximum usable belt pull strength, of the engaged teeth and the pitch diameter of the timing belt pulley.

The values for the mk LZR modules are:

Timing belt	AT 5-16	5M-15	8M-30
D_{Pitch}	41.4 mm	50.9 mm	71.3 mm
Z	26	32	28
M_{Drive}	12 Nm	15 Nm	70 Nm

Motor Selection/ Drive Design

For the drive selection, several factors must be considered, including the timing belt (especially the allowable belt pull strength and required stiffness) and the motor (especially the starting torque, the revolutions per minute and the resulting performance). The most important consideration is the required driving force. As a simple starting point for the calculations, the transition point from acceleration to constant speed can be used.

Constant acceleration (a = constant):

$v = a \cdot t = \sqrt{2 \cdot a \cdot s}$

Constant speed (v = constant):

$v = \frac{s}{t}$

Max. driving force:

$F_{Drive} = F_a + F_{Roll} + F_{Empty} + F_{Additional}$
$F_a = m \cdot (a+g)$

with m = moving mass in kg
a = const. acceleration in m/s²
g = 10 m/s², for vertical travel
g = 0 m/s², for horizontal travel

$F_{Roll} = F_N \cdot \mu_{Roll}$

with $F_N = F_G$ for horizontal travel
$\mu_{Roll} = 0.05$ for lightly preloaded track roller

F_{Empty} = 50 to 100 N depending on the module and pre-tension of the timing belt

$F_{Additional}$ = additional loads from the application

$F_{Drive} = m \cdot (a+g) + FN \cdot 0.05 + 100\ N + F_{Additional}$

For timing belt selection:

Indicated $F_{Drive} < F_u$

For motor selection:

$M_{req} = \frac{F_{Drive} \cdot D_{Pitch}\,[m]}{2 \cdot \eta}$

$n_{req} = \frac{v \cdot 60}{D_{Pitch}\,[m] \cdot \pi}$

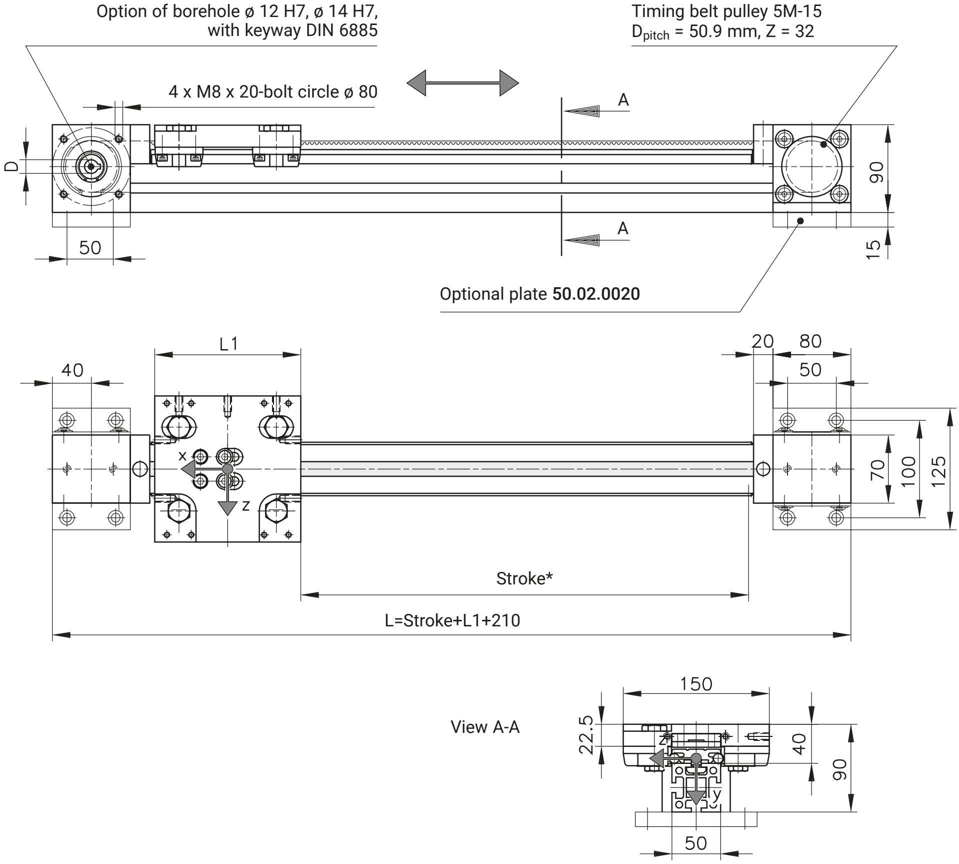
$P_{req} = \frac{F_{Drive} \cdot v}{\eta}$

With D_{Pitch} in m of timing belt pulley η = 50 too 75% depending on selected drive (gearbox, motor, etc.)
v in m/s

11

Linear Modules LZR

LZR 2000-38.41-15 with Plate Carriage



Load Specifications for LZR 2000-38.41-15 with Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.003	150	1150	1000	2000	25	100	50
B38.02.003	250	1150	1000	2000	25	200	100

* Maximum stroke between the mechanical stops. Note the discharge section!
** $F_x = F_{allowable}$; F_u = 575 N = F_v

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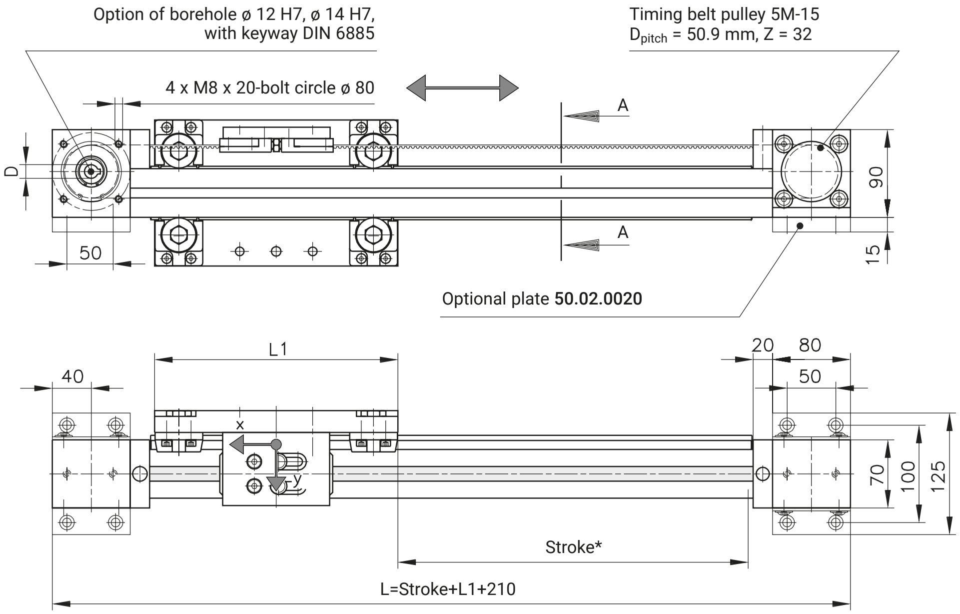
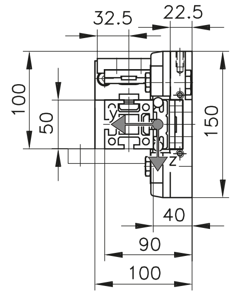
LZR 2000-38.41-15 with Side Mounted Plate Carriage



View A-A



Load Specifications for LZR 2000-38.41-15 with Side Mounted Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.007	250	1150	1000	2000	25	200	100

* Maximum stroke between the mechanical stops. Note the discharge section!
** $F_x = F_{allowable}$; F_u = 575 N = F_v

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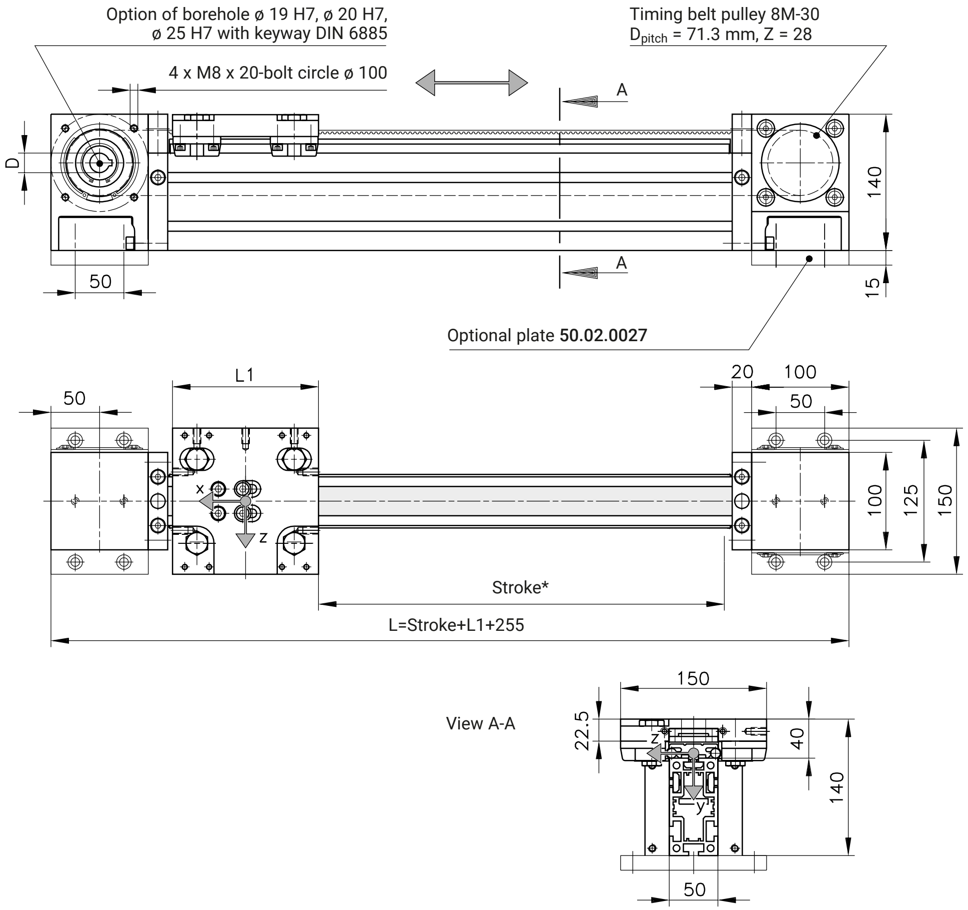
LZR 2004-38.41-30 with Plate Carriage



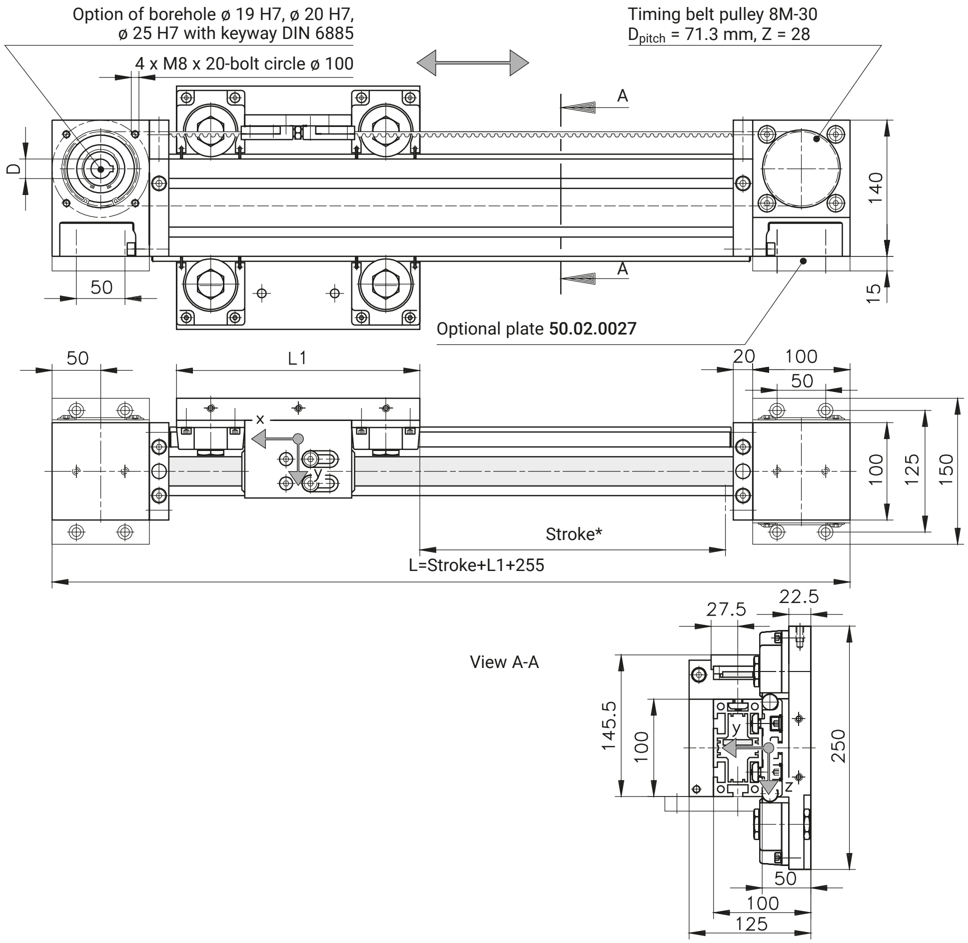
Load Specifications for LZR 2004-38.41-30 with Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.004	150	4000	1000	2000	25	100	50
B38.02.004	250	4000	1000	2000	25	200	100

* Maximum stroke between the mechanical stops. Note the discharge section!

** $F_x = F_{allowable}$; F_u = 2000 N = F_v

LZR 2004-38.44-30 with Side Mounted Plate Carriage



Load Specifications for LZR 2004-38.44-30 with Side Mounted Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.005	250	4000	1600	4000	80	350	150
B38.02.005	450	4000	1600	4000	80	760	300

* Maximum stroke between the mechanical stops. Note the discharge section!

** $F_x = F_{allowable}$; $F_u = 2000$ N $= F_v$

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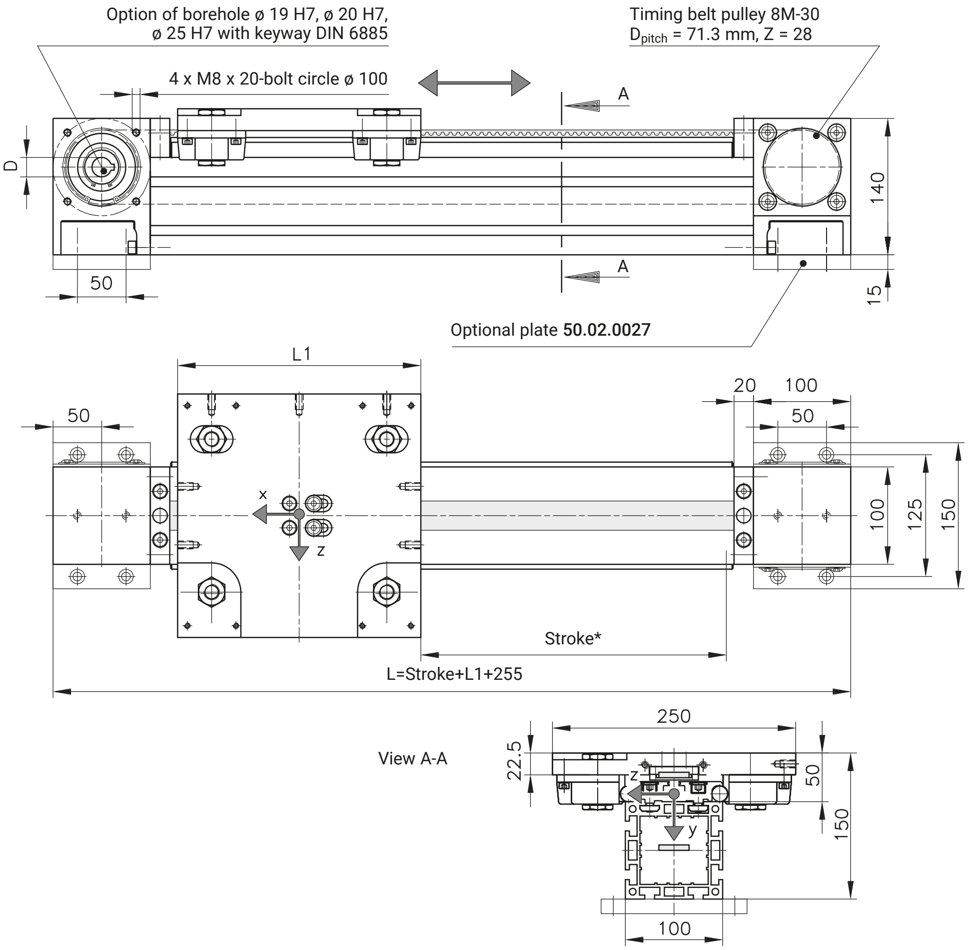
Linear Modules LZR

LZR 2005-38.44-30 with Plate Carriage



Load Specifications for LZR 2005-38.44-30 with Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.006	250	4000	1600	4000	80	350	150
B38.02.006	450	4000	1600	4000	80	760	300

* Maximum stroke between the mechanical stops. Note the discharge section!
** $F_x = F_{allowable}$; F_u = 2000 N = F_v

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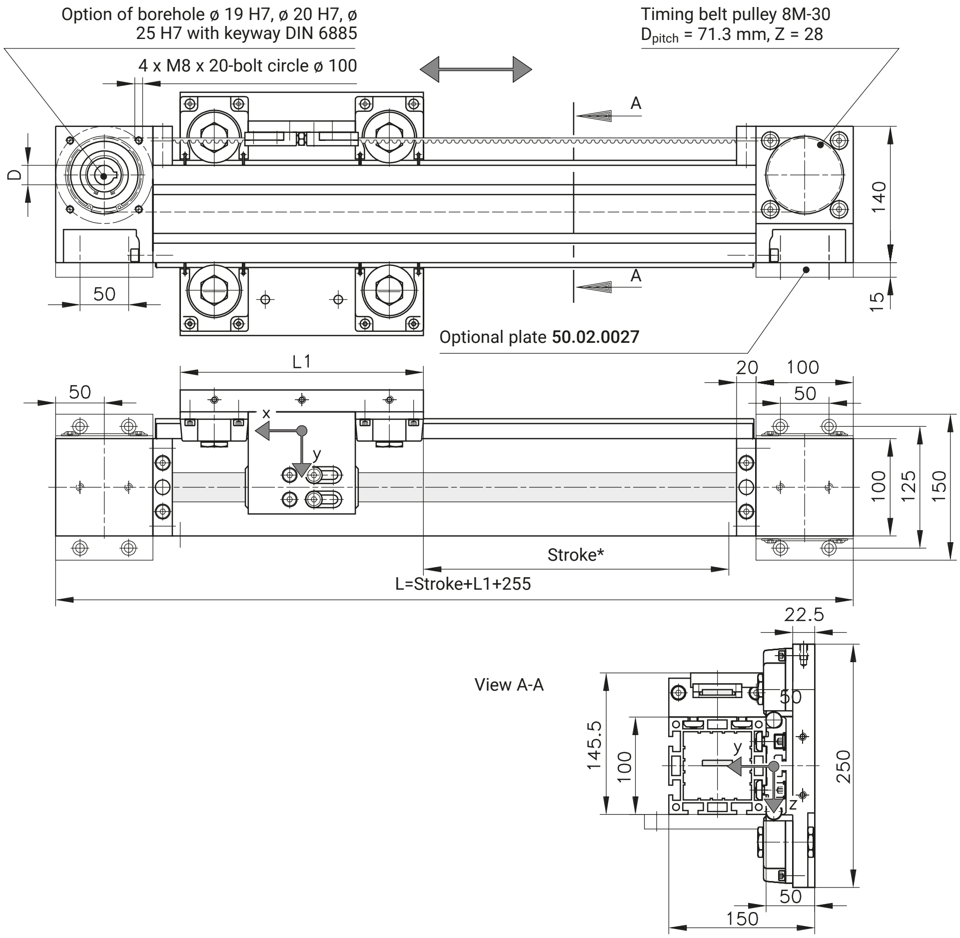
LZR 2005-38.44-30 with Side Mounted Plate Carriage



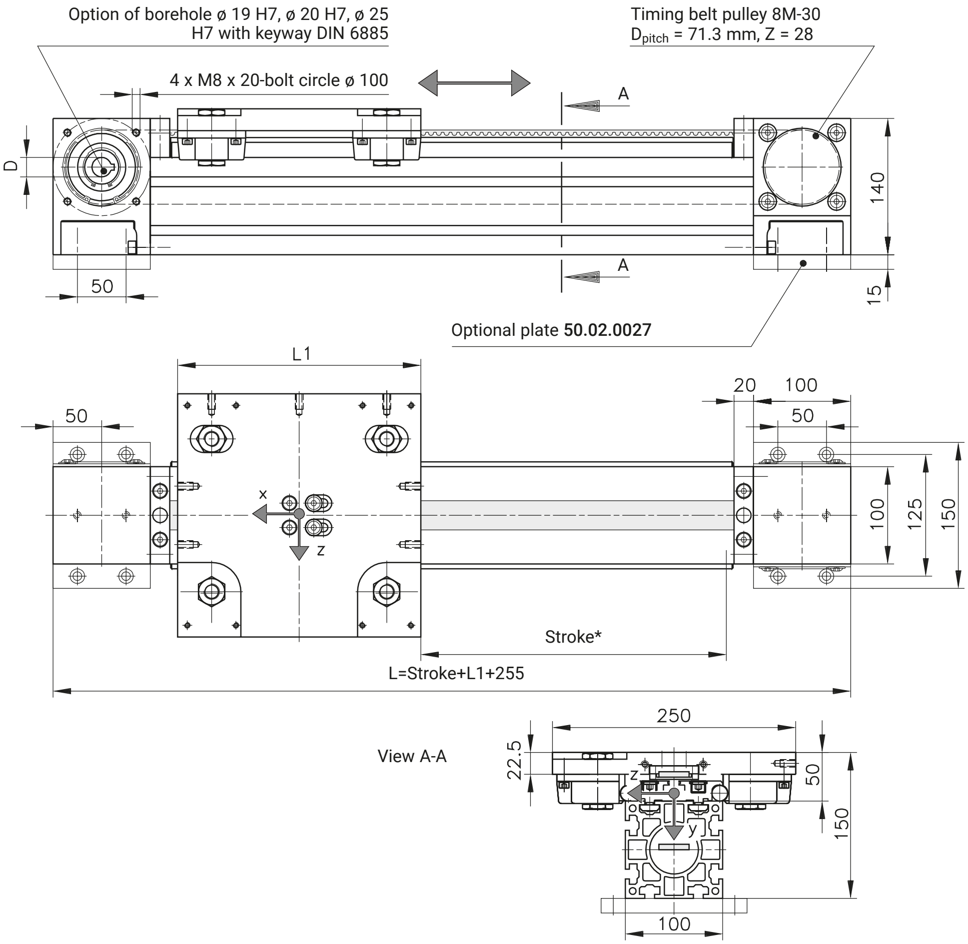
Load Specifications for LZR 2005-38.44-30 with Side Mounted Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.009	250	4000	1600	4000	80	350	150
B38.02.009	450	4000	1600	4000	80	760	300

* Maximum stroke between the mechanical stops. Note the discharge section!

** $F_x = F_{allowable}$; F_u = 2000 N = F_v

LZR 2011-38.44-30 with Plate Carriage

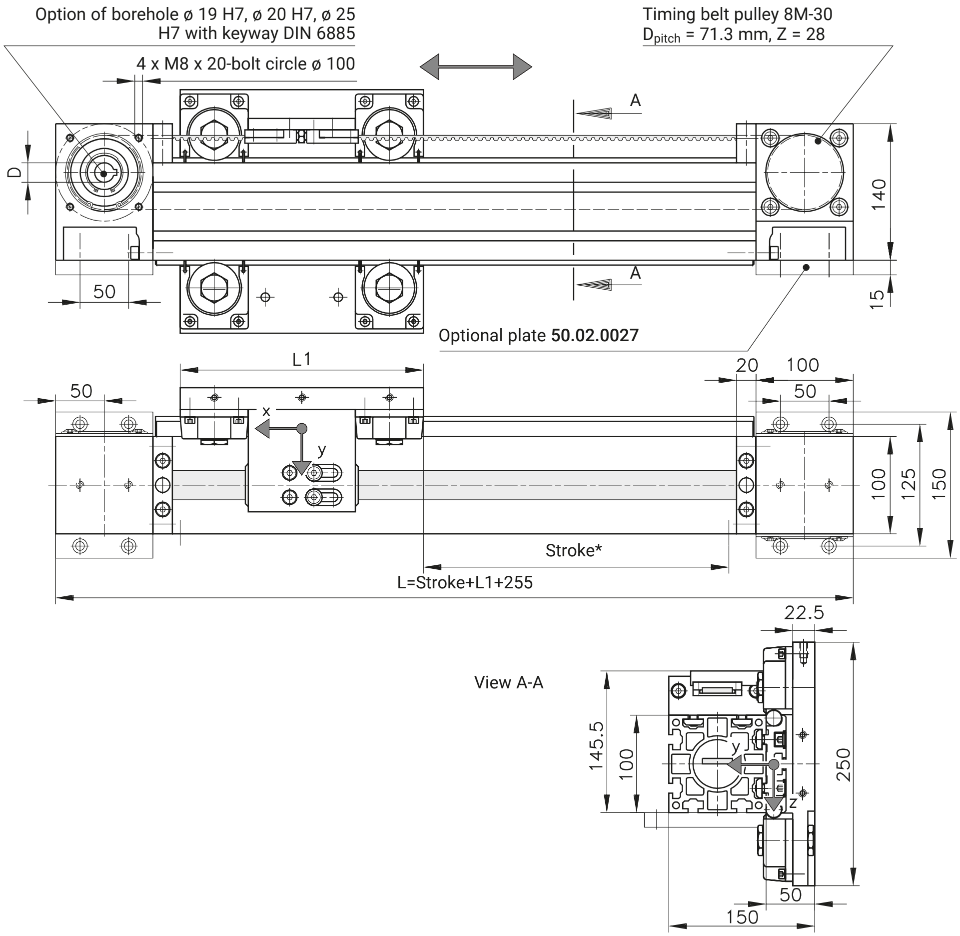


Load Specifications for LZR 2011-38.44-30 with Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.011	250	4000	1600	4000	80	350	150
B38.02.011	450	4000	1600	4000	80	760	300

* Maximum stroke between the mechanical stops. Note the discharge section!
** $F_x = F_{allowable}$; F_u = 2000 N = F_v

LZR 2011-38.44-30 with Side Mounted Plate Carriage

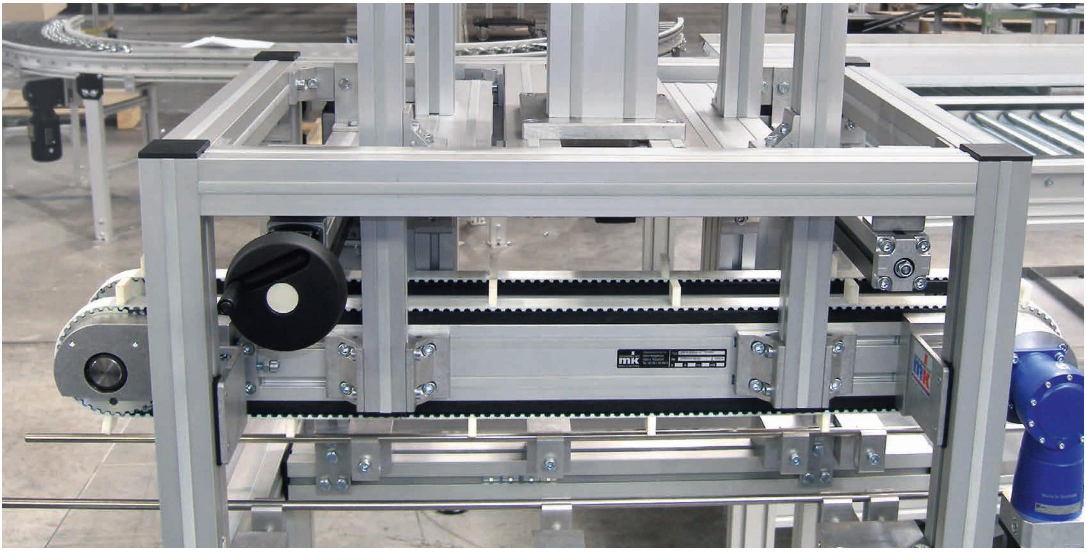


Load Specifications for LZR 2011-38.44-30 with Side Mounted Plate Carriage

Item no.	L1 [mm]	Fx** [N]	F_{y0} [N]	F_{z0} [N]	M_{x0} [Nm]	M_{y0} [Nm]	M_{z0} [Nm]
B38.02.010	250	4000	1600	4000	80	350	150
B38.02.010	450	4000	1600	4000	80	760	300

* Maximum stroke between the mechanical stops. Note the discharge section!
** $F_x = F_{allowable}$; F_u = 2000 N = F_v

Application Examples



Dual VST 2015 with coupling via timing belts for width adjustment of the ZRF-P 2040.02 cycle conveyor

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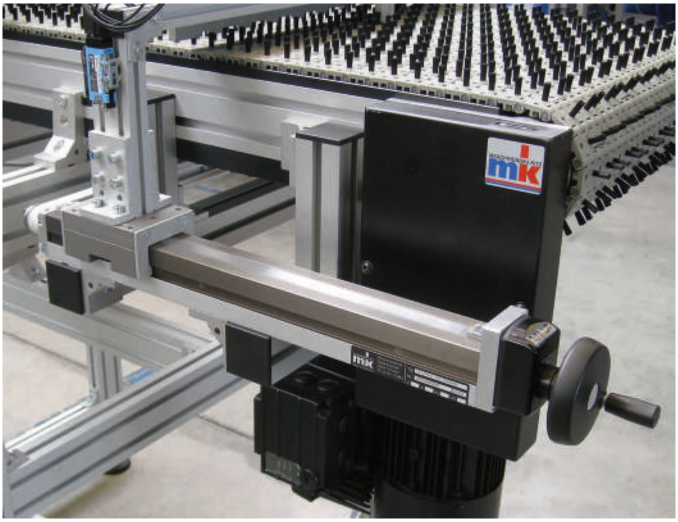
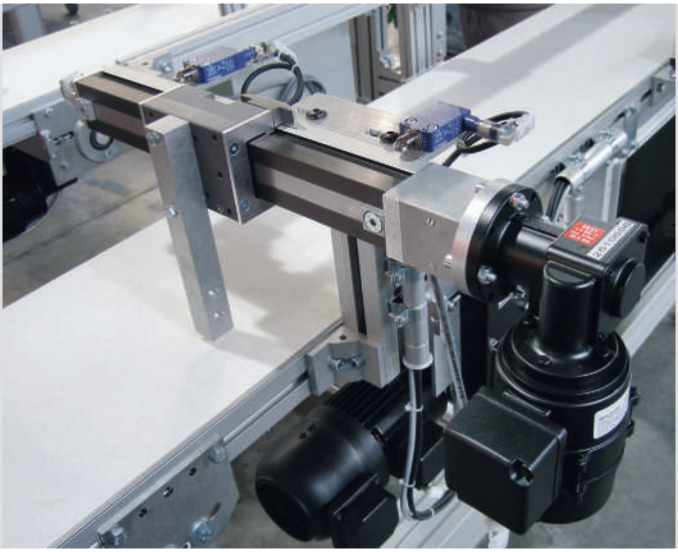


Dual VST 2015 with manual digital display for adjusting the stop bar

System 2015 adjusting units with handwheel and scale

Electromotive VST 2015 with
recirculating ball bearing guide

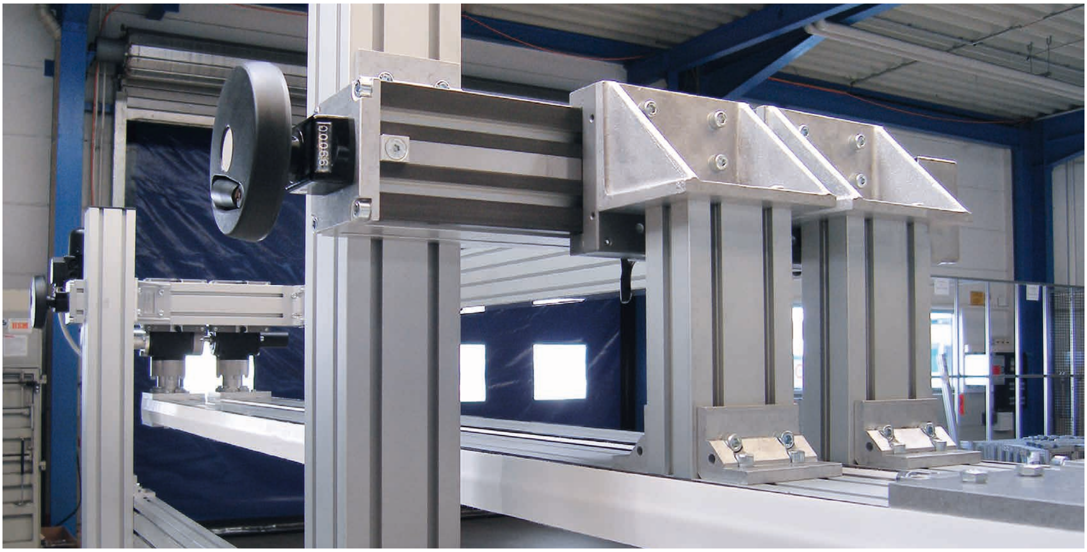


Dual electromotive VST 2015 for automatic width
adjustment with scanning via safety limit switch

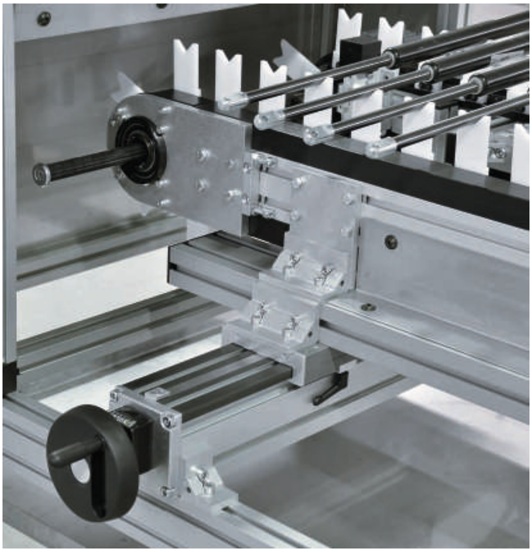
Dual VST 2015 with parallel recirculating
ball bearing guide for supporting the load

Manual two-axis adjustment system for
holding a marking device with VST 2015

Application Examples

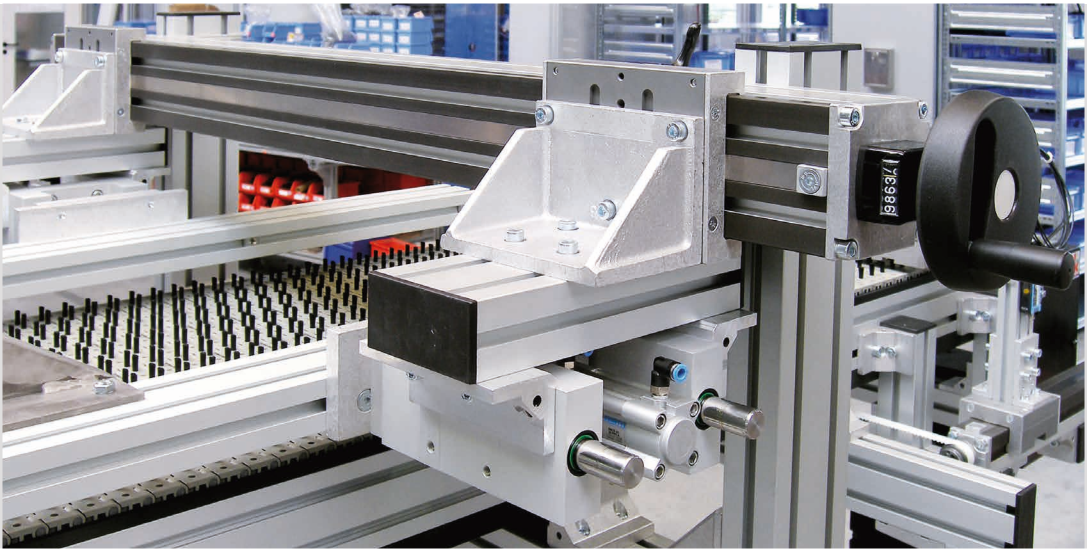


Dual VST 2011 for manual lane width adjustment on a side conveyor



VST 2011 adjusting unit used for semi-automatic conveyor width adjustment in a chain conveyor system

Electromotive VST 2011 with custom measuring system on LZR 2005-38.44-30



VST 2011 with two counter-rotating slide carriages and digital display for adjusting the width of the pneumatic centring unit on the modular belt conveyor

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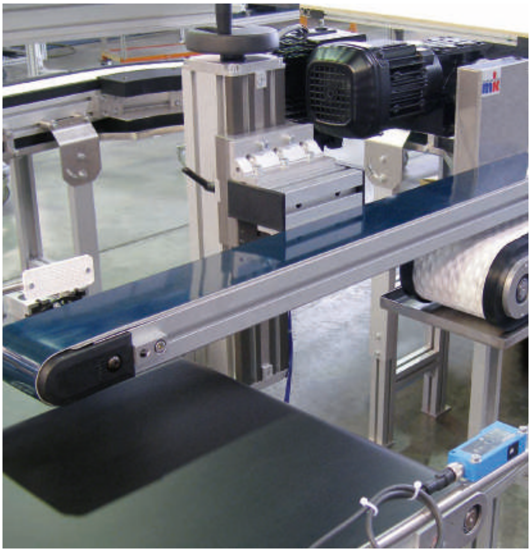
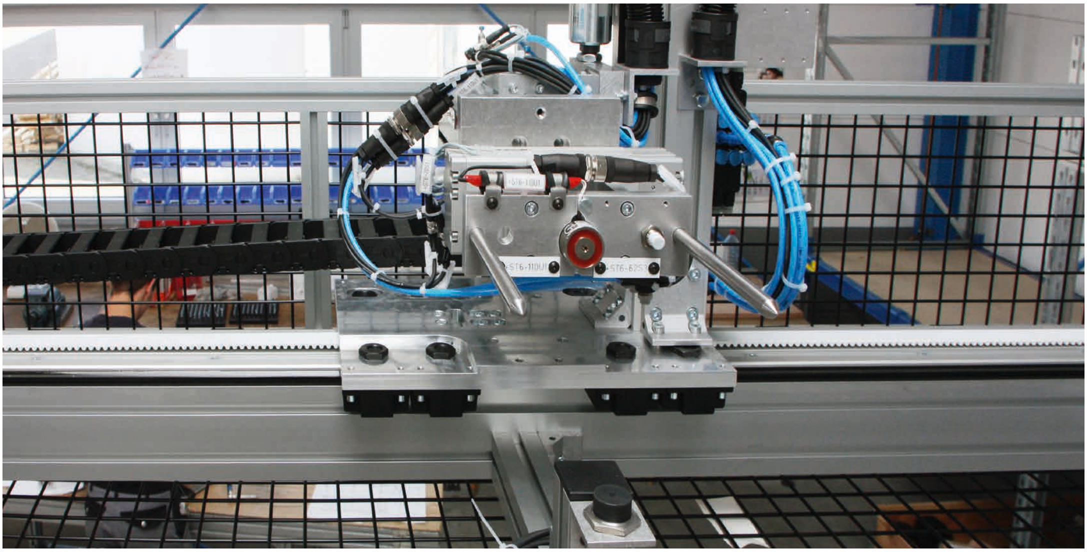


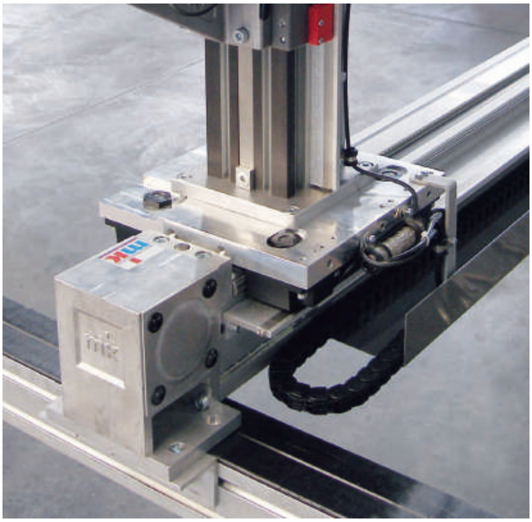
VST 2011-H with handwheel as add-on kit for the belt conveyor with incline adjustment

System mk 2011 adjusting unit for brush cantilever

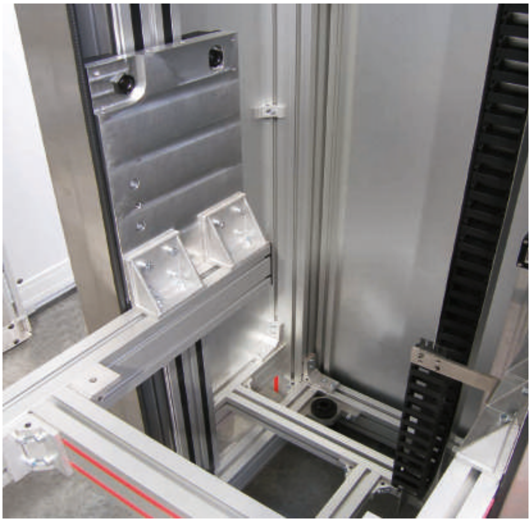
Application Examples



Horizontal slides comprised of linear module type LZR 2005-38.44-30 with fork grippers and swivel unit for moving and emptying workpiece baskets

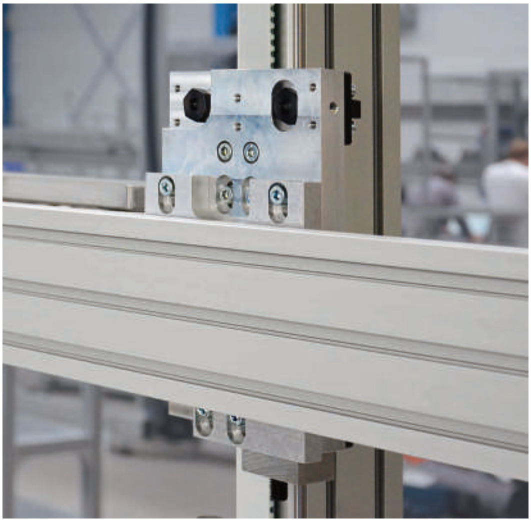


Linear module type LZR 2005-38.44-30 as a direct length measuring system with measuring head on the roller carriage

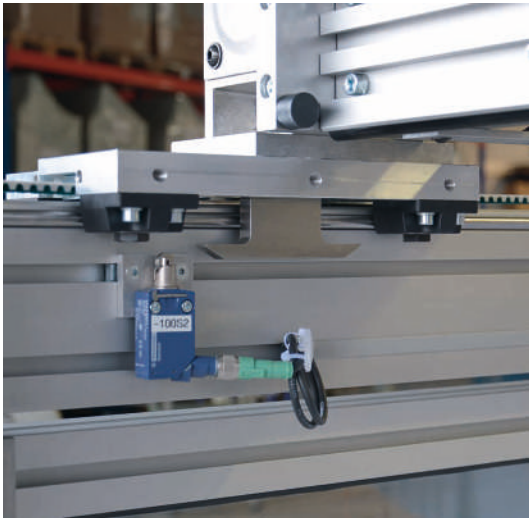


Double-LZR 2005-38.44-30 with side mounted carriage plate and cantilever for conveyor as lift

Pneumatic linear module with PF 38.77 and LW 38.77-44 as a transfer unit with 10 vacuum suction grippers

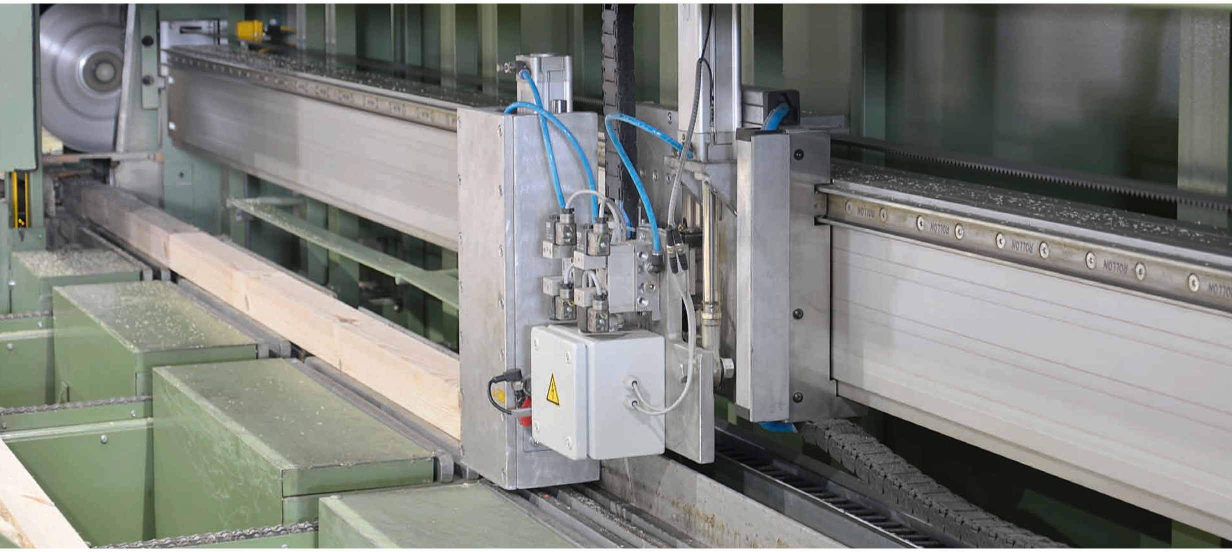


Linear unit LZR 2004-38.41-30 as a height adjustment unit for an assembly and testing workstation

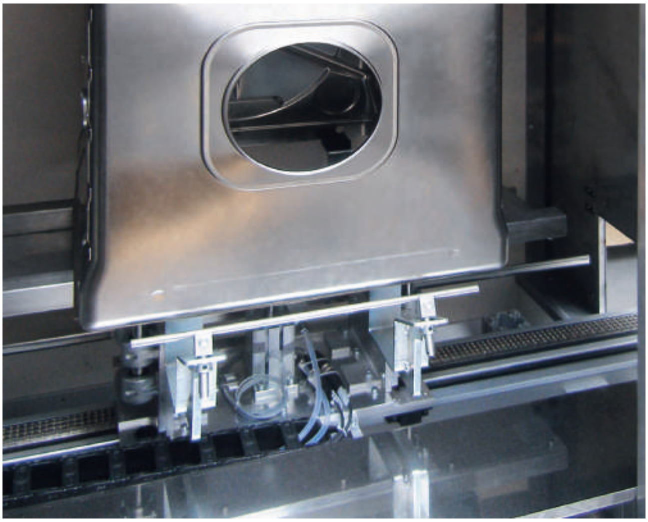


Linear unit LZR 2004-38.41-30 drive coupled via a slip clutch

Application Examples



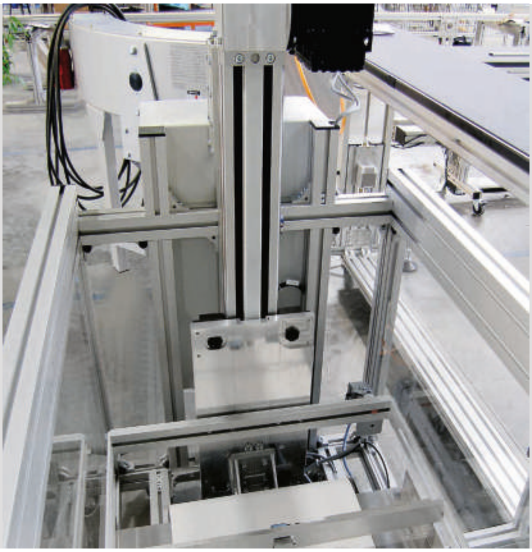
LZR Series 60 linear module based on the mk 2060.07 profile with track rollers and rails from Rollon



Linear module with chain for HT range and in ESD version Product intake with pneumatic lift for lifting/depositing before, in and after the oven

Gantry with LZR 2005 on foamed combined profile Roller carriage with support rollers as cross-carriage with LZR 2005 and Omega drive as X-Z surface gantry

Base LZR 2005-38.44-30 with side roller carriage on foamed combined profile as gantry, with support rollers for torque loads and manual VST 2011 as Z axis



Linear module type LZR 2005-38.44-30 with motor and controller as a lift with a belt conveyor

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Linear module type LZR 2004-38.41-30 with absolute value rotary encoder mounted on the tail

Application Examples

Dual LZR 2005-38.44 with cantilever for dual ZRF-P 2010 for lift and transfer from a dual ZRF-P as a lift-and-transfer module

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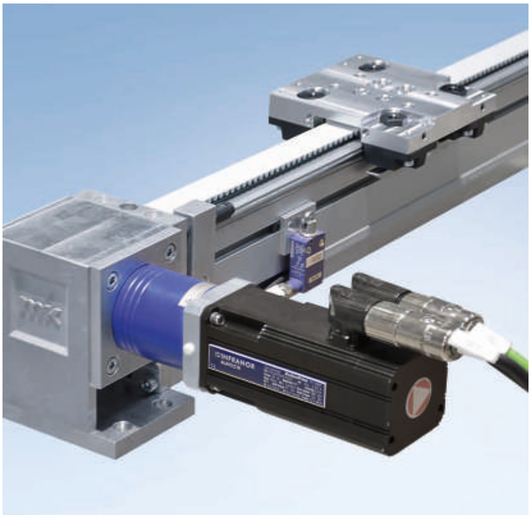
Dual-axis linear module comprising LZR 2011-38.44.30 with side mounted carriage plate



LZR 2004-38.41-30 with servo gearmotor from Infranor

Dual LZR 2005 as lift in steel rack

Dual linear module type LZR 2005-38.44-30 with cantilever for conveyor as a lifting unit

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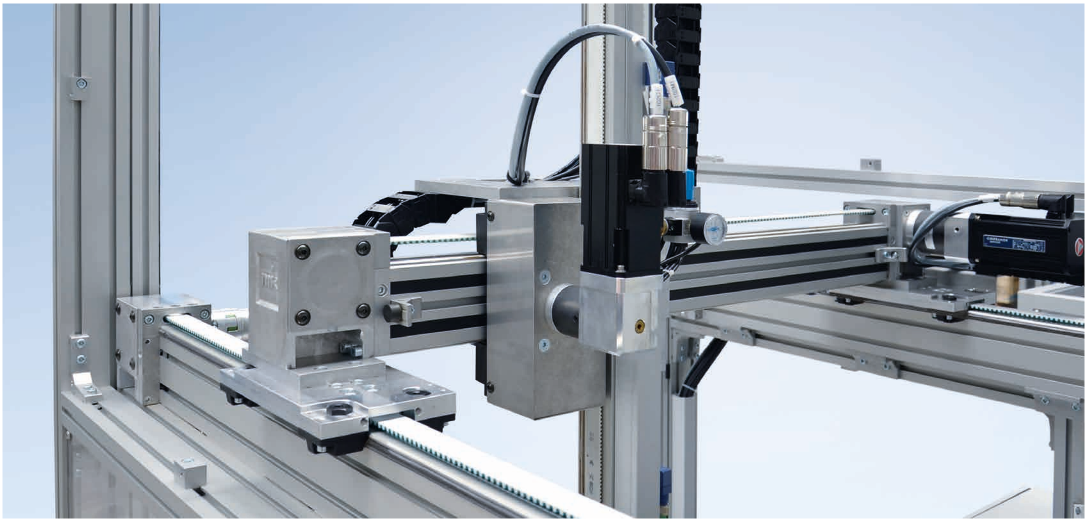

Three-axis gantry with driven linear modules, gripper and controller

Application Examples

Two-dimensional gantry with vacuum gripper as a handling and loading system for steel. Two independent loading systems on a common X axis with gear rack with track rollers and riding rack drive

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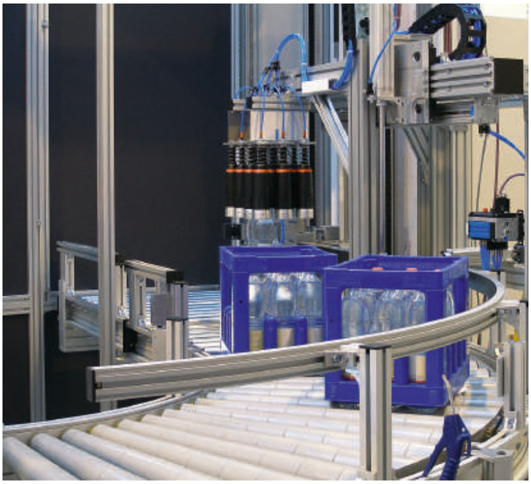
X-Z gantry with gripper for transferring crankshafts. X axis as LZR with support roller and timing belts, Z axis with timing belt Omega drive and fall arrest

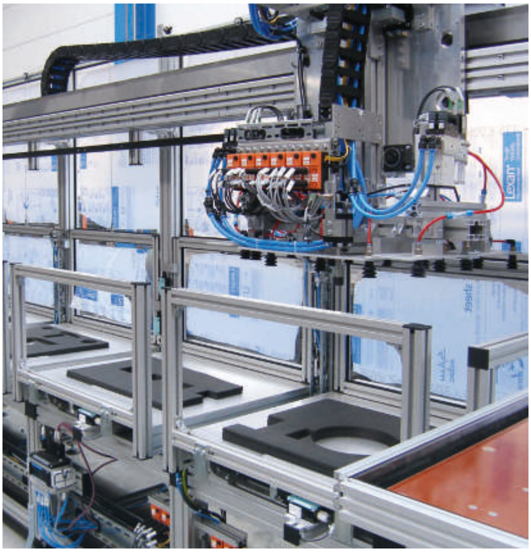


X-Z axis combination with pneumatic drive and vacuum grippers for loading and unloading beverage crates

Gantry stand with telescopic gripper unit

Horizontal axis with foamed combined profile for reinforcement

Lift for storage system



X-Z gantry with additional pneumatic weight balancing as a holder for a vacuum gripping system

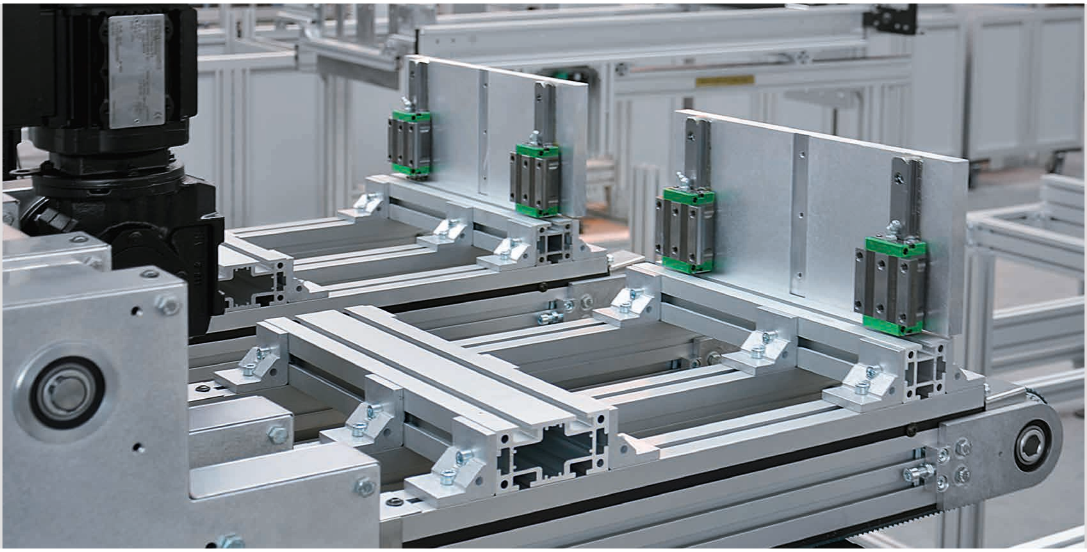
Short stroke lift based on PF-38.44 linear guide system

Application Examples

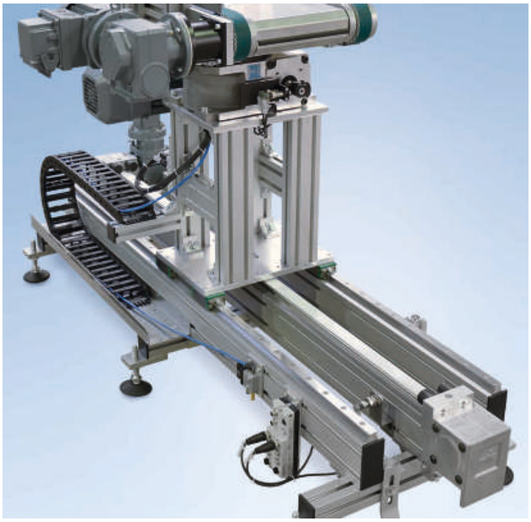
Lift station for lifting and lowering conveyors on two conveyor levels. Cross-conveyor unit with recirculating ball bearing guides positioned horizontally in the frame

11

Recirculating ball bearing guide for manual lane width adjustment and for clamping the pneumatic centring device and electromotive rotating unit



Lifting unit with KU 25 recirculating ball bearing guide and angle bracket

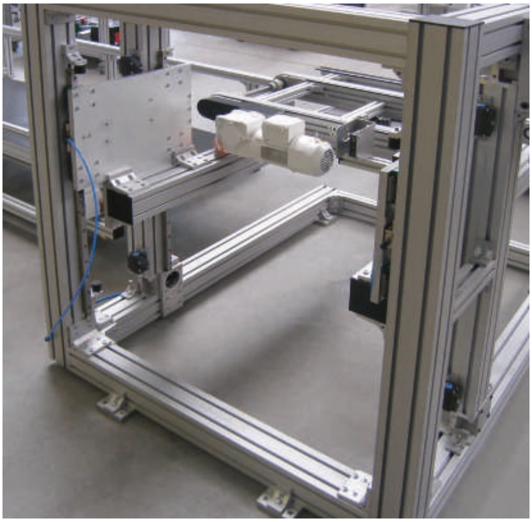


Shuttle system with rotary indexing table for pallet transport, guided via a double linear axis with recirculating ball bearing guide

Frame for stress testing based on KU 30.10 recirculating ball bearing guide

Application Examples

Gantry for handling sleeves. The X axis is moved by a dual linear module with a KU 30.30 recirculating ball bearing guide



Lifting unit with LZR with recirculating ball bearing guide KU 25 with profile cantilever for supporting the ZRF-P 2010 conveyor

Two-track feed for machine loading. The separator can be adjusted for various diameters using a recirculating ball bearing guide

Timing chain conveyor with alignment unit for camshafts using recirculating ball bearing guide

Transfer shuttle with pallet carriers, carriage with recirculating ball bearing guide

LZR with recirculating ball bearing guide

11