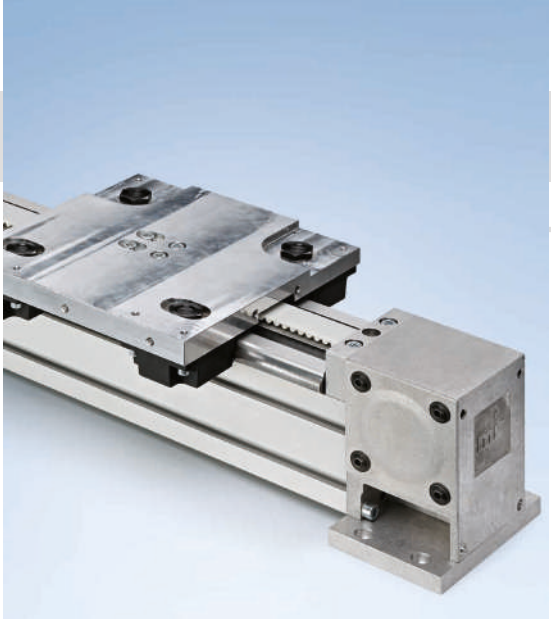


Linear Modules LZR

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.

Order designation

LZR 2025-38.20-16

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

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.

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/s^2

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
μ_{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:

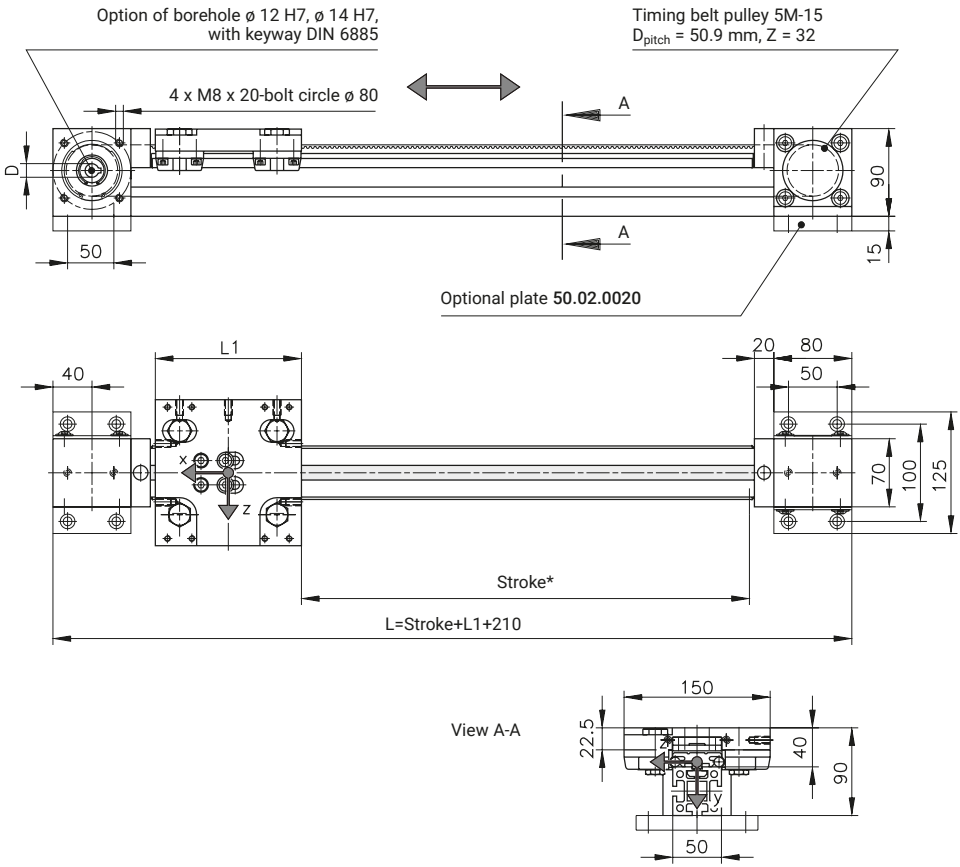
$M_{req} = \frac{F_{Drive} \cdot D_{Pitch}\ [m]}{2 \cdot \eta}$

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

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

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

LZR 2000-38.41-15 with Plate Carriage

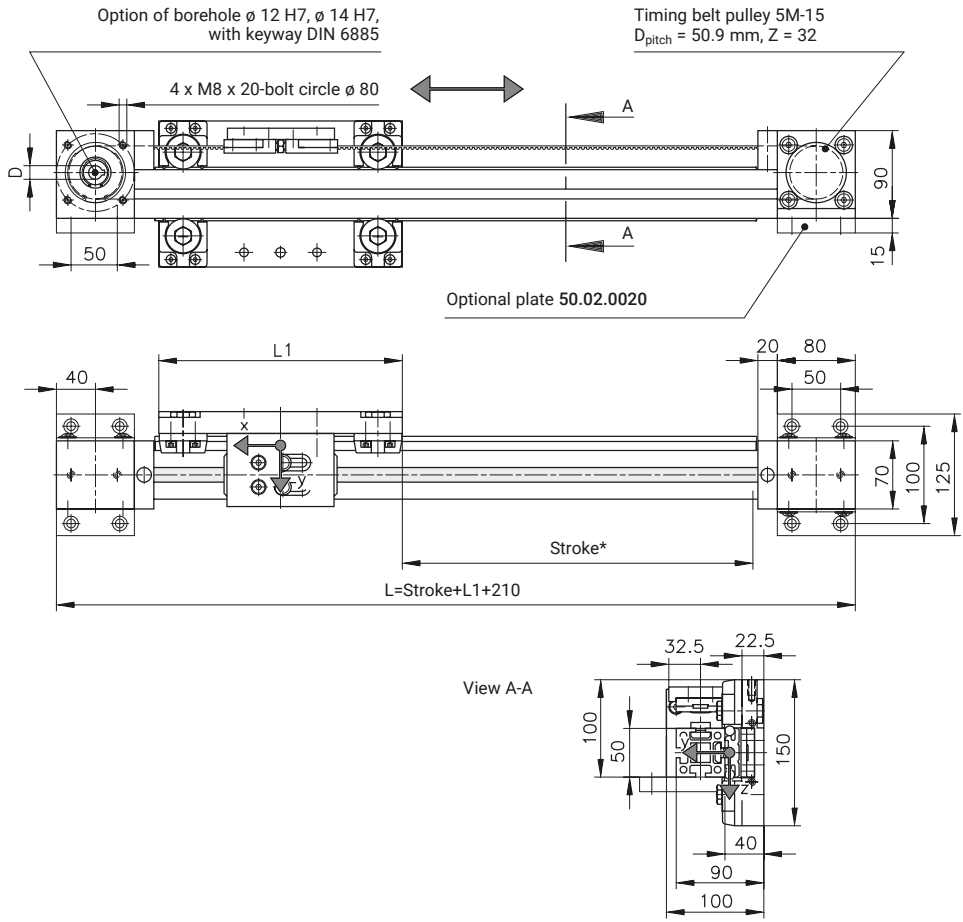


Load Specifications for LZR 2000-38.41-15 with Plate Carriage

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

LZR 2000-38.41-15 with Side Mounted Plate Carriage

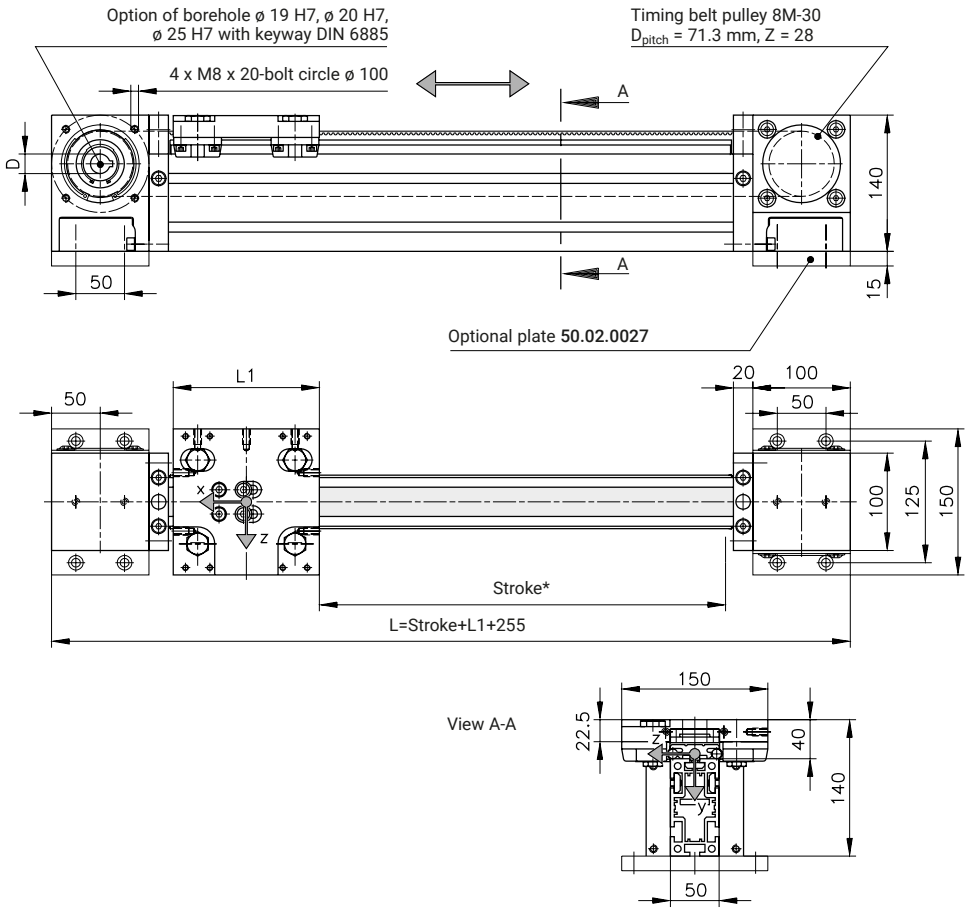


Load Specifications for LZR 2000-38.41-15 with Side Mounted Plate Carriage

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

LZR 2004-38.41-30 with Plate Carriage



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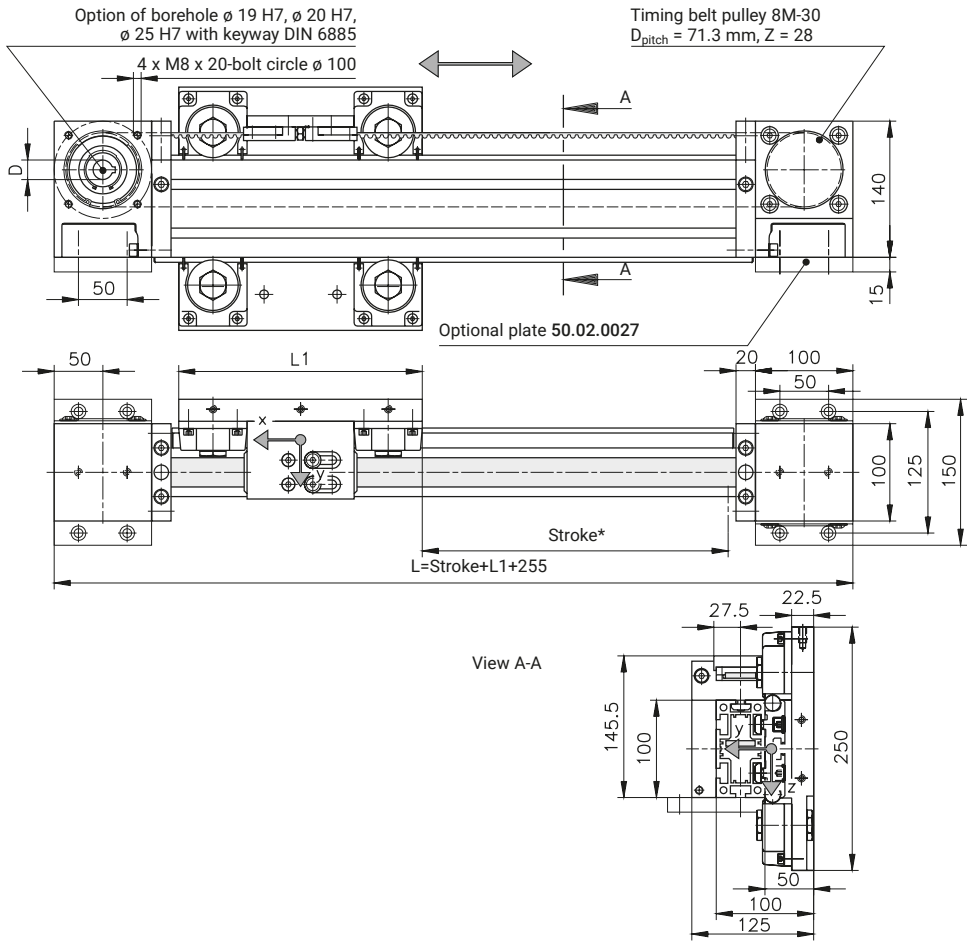
Load Specifications for LZR 2004-38.41-30 with Plate Carriage

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

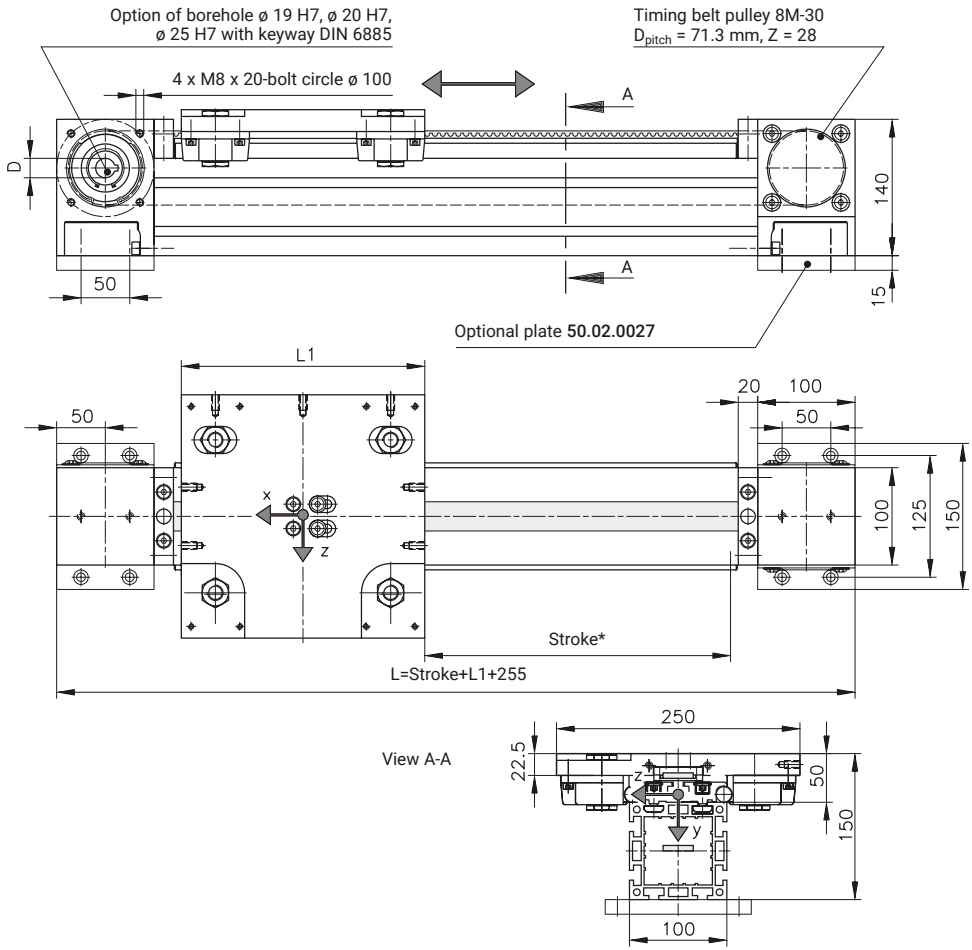


Load Specifications for LZR 2004-38.44-30 with Side Mounted Plate Carriage

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

LZR 2005-38.44-30 with Plate Carriage

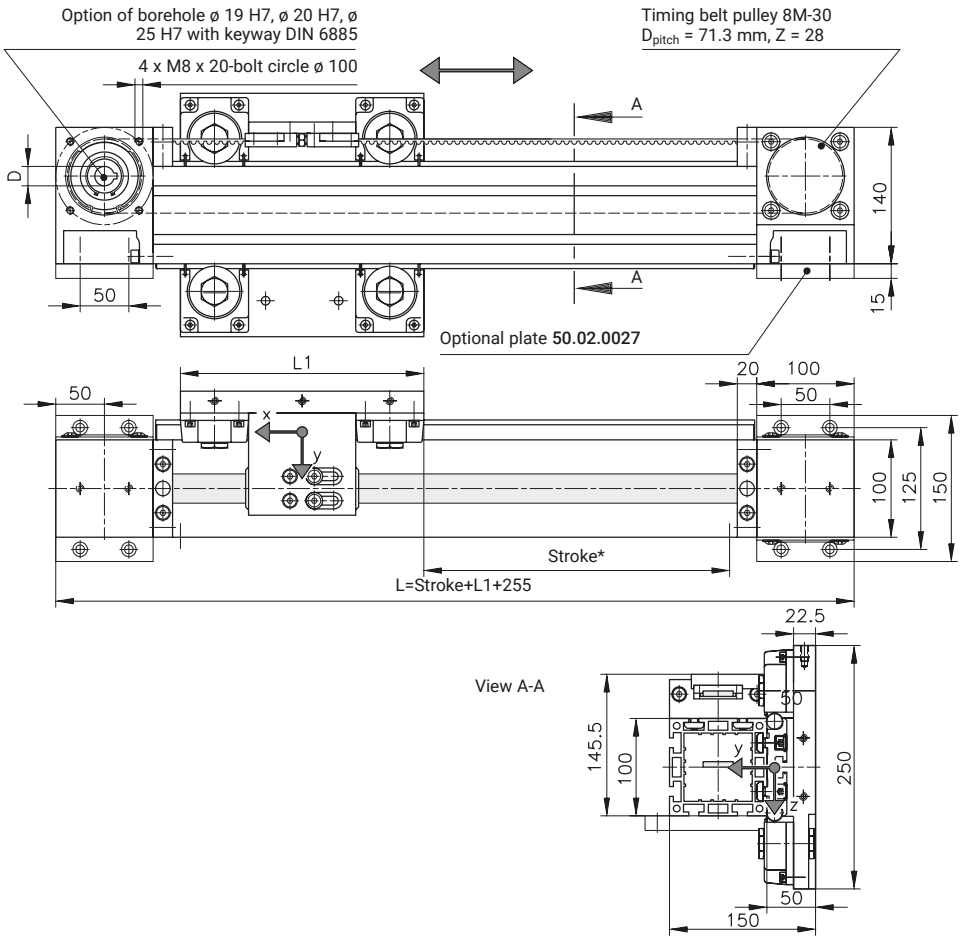


Load Specifications for LZR 2005-38.44-30 with Plate Carriage

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

LZR 2005-38.44-30 with Side Mounted Plate Carriage

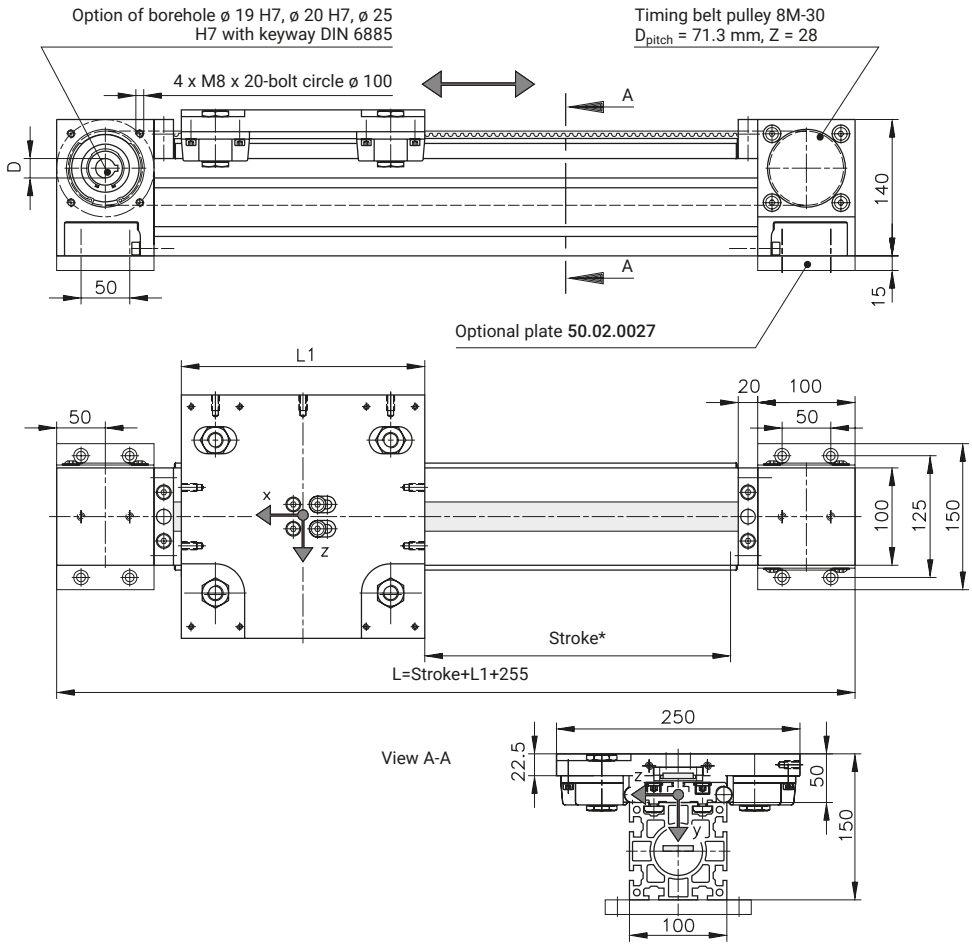


Load Specifications for LZR 2005-38.44-30 with Side Mounted Plate Carriage

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



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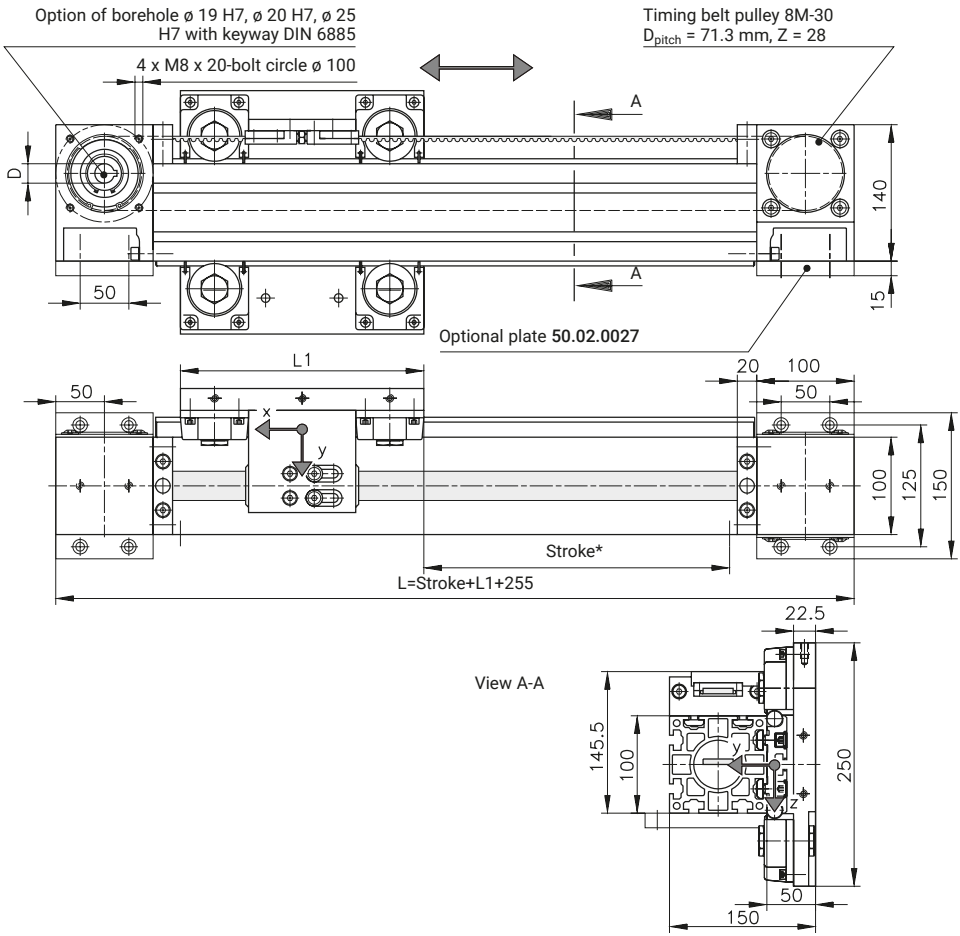
Load Specifications for LZR 2011-38.44-30 with Plate Carriage

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