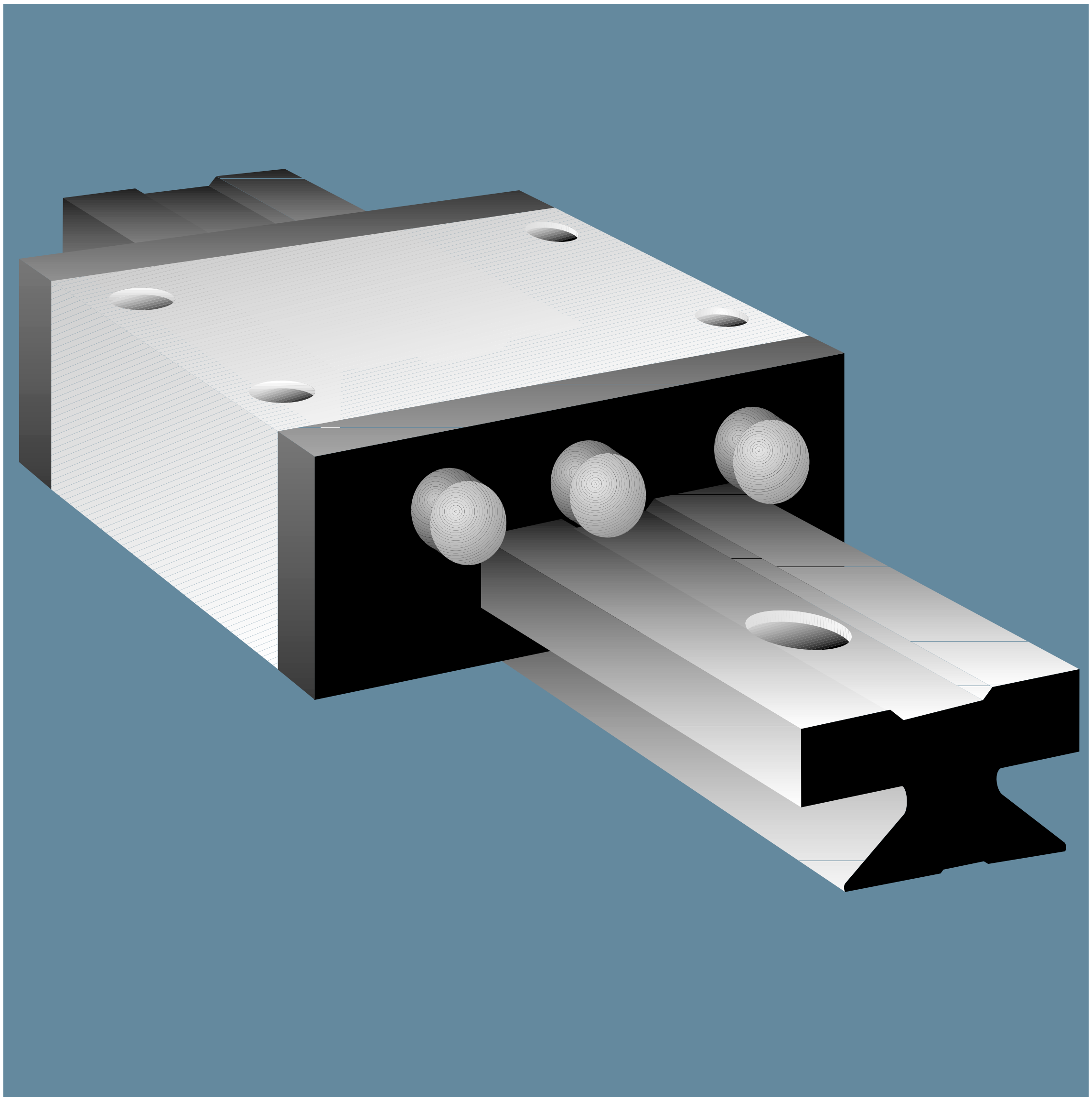

DryLin® T Linear Guide System – Maintenance-Free, Adjustable and Quiet

- Corrosion resistant
- Wear resistant
- Low coefficient of friction
- Extremely quiet operation
- No lubrication necessary

DryLin® T

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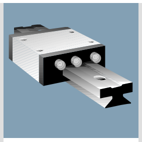
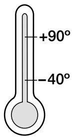
mm





DryLin® T – Linear Guide System

DryLin® T linear guide systems were originally developed for applications in both automation and materials handling. The goal was to create a high performance, maintenance-free linear guide for use in the most diverse, even extreme environments.

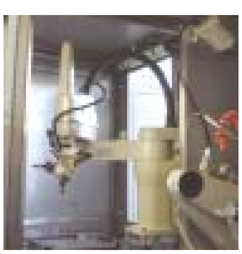
Technical Data

Sliding elements:	Maintenance-free
Material:	iglidur® J*
Max. surface speed:	15 m/s
Temperature range:	-40 °C to +90 °C

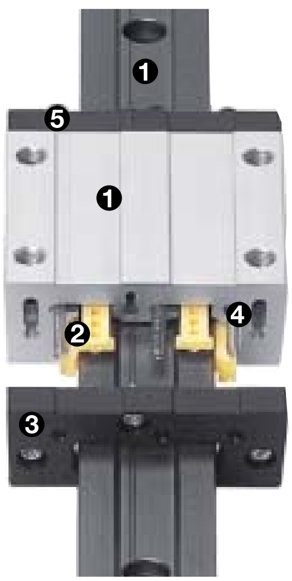
* Other materials upon request

DryLin® linear guide system in a treatment machine

Valve machining produces an extreme environment



DryLin® T linear guide system in pneumatic doors of tool changers



1. Profile rails and base structures of the carriages manufactured from aluminium Al Mg Si 0.5
   The rail is hard anodized, the aluminium housing of the carriage is clear anodized
2. 6 sliding iglidur® J/J200 elements act as guide bearings, which are set in pairs opposite each other and act as three guide bearings altogether
3. Each of the three guide bearings can be adjusted manually or automatically
4. All steel parts are galvanized or of stainless steel
5. The end plate is solid plastic

Technical Data

Guide rails	
Material	Aluminium, extruded section
Substance	Al Mg Si 0,5
Coating	Hard anodized aluminium, 50 µm
Hardness	500 HV
Sliding carriage	
Base structure	Aluminium, extruded section
Material	Al Mg Si 0,5
Coating	Anodized aluminium
Sliding elements	Maintenance-free plain bearing iglidur® J
Bolts, springs	Stainless steel, galvanized steel
Cover	Plastic
Max. surface speed	15 m/s
Temperature range	-40 °C to +90 °C

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DryLin® T – Technical Information

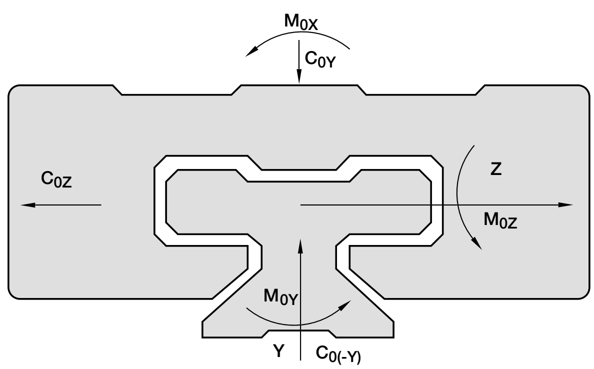
Special properties

- With a low rate of inertia, high accelerations and short term extreme speeds up to 30 m/s are possible
- DryLin®T linear guide systems run dry. Dirt cannot settle in lubricants
- Recommended for use in food, medical, and clean room technologies, since no lubricants are present
- DryLin® T linear guide systems are also suited for underwater use due to corrosion resistance
- High pressure washdown does not damage the system
- Vibration dampening and extremely quiet operation
- The aluminium rail provides good thermal dissipation. The aluminium only retains heat at continuously high speeds
- The combination of aluminium and iglidur® J results in a low initial breakaway force
- DryLin® T is dimensionally interchangeable with the standard ball bearing systems

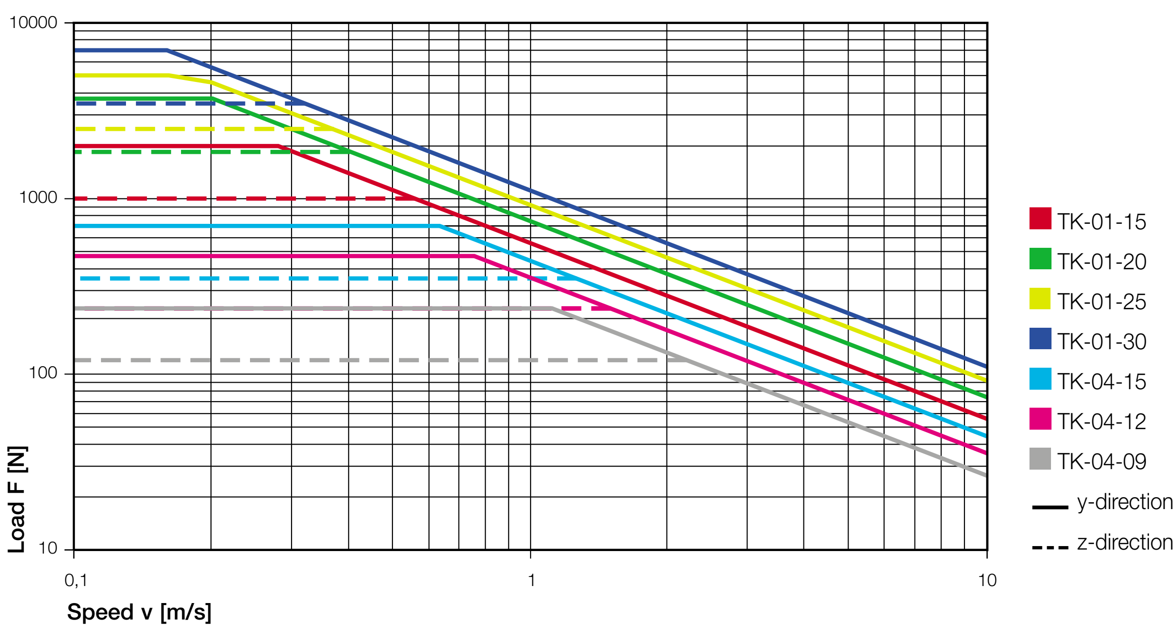
DryLin® T in demanding use in the packaging industry

Type	C_{0Y} [kN]	$C_{0(-Y)}$ [kN]	C_{0Z} [kN]	M_{0X} [Nm]	M_{0Y} [Nm]	M_{0Z} [Nm]
04-09	0,48	0,48	0,24	3,4	1,8	1,8
04-12	0,96	0,96	0,48	9,2	4,4	4,4
04-15	1,4	1,4	0,7	17	8	8
01-15	4	4	2	32	25	25
01-20	7,4	7,4	3,7	85	45	45
01-25	10	10	5	125	65	65
01-30	14	14	7	200	100	100

Table 3.2: DryLin® T-01 – Permissible static load capacity



Graph 3.3: Designation of load directions



Graph 3.2: DryLin® T – Permissible dynamic load

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DryLin® T – Guide Rails

DryLin® T – Variations

The DryLin® T system can be delivered with extended manual clearance adjustment, automatic version or in the miniature-profile design.

DryLin® T – Adjustable clearance

DryLin® T is delivered preset. The user can adjust the clearance manually. Therefore, it is possible to compensate for height differences in the position of the mating surfaces.

DryLin® T – Automatic

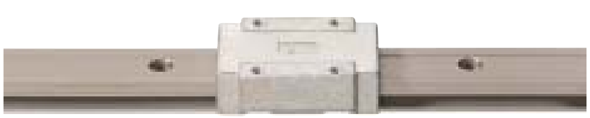
After mounting, DryLin® T Automatic carriages are self-adjusting. In operation, the clearance of this type of carriage can be automatically reduced again, when the applied load is relieved.

DryLin® T – Manual clamping

The DryLin® T series with manual clamping was developed for simple functions. A clamped polymer has a tendency to creep which causes a decrease in clamping force over time (up to 70%). Therefore, applications for DryLin® T with a clamp are restricted. Please contact our technical experts if you need other alternatives for clamping DryLin® linear systems.

DryLin® T – Heavy Duty

The Heavy Duty series is used with most extreme conditions like dirt, sticking arrears, splinters, mud etc. The Polymer sliding elements of iglidur® J are fixed by the metal end caps and cannot be lost.
This system is compatible with many standard ball bearing systems and is available in the following sizes: TW-01-20, TW-01-25, and TW-01-30.



DryLin® T – Miniature

The clearance of DryLin® T miniature systems is not adjustable. The sliding elements are mounted with positive locking (form-fitted) into the chromated zinc slide carriages. This simple, effective design makes the rails robust and at the same time cost-effective.

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DryLin® T – Adjusting and Installation

Installation notes

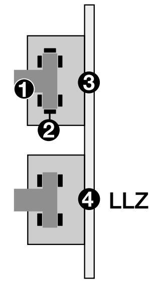
When designing systems with 2 parallel rails, one side must be used with floating bearings. For each mounting version, there is a recommended fixed floating bearing solution. This installation method prevents binding or a locking of the guide when there are parallelism errors between the rails.

The floating bearing is created by the removal of the static sliding elements. The maximum compensation of parallelism errors between the mounted rails is 0.5 mm. In the installation, care must be taken that the floating bearing has equal play in both directions. You can see our recommended design of the fixed floating bearing system in the adjacent drawings.

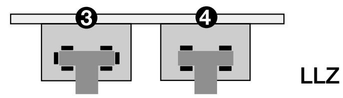
The mounting surfaces for the rails and guide carriages should have a very flat surface (e.g. machined face), in order to prevent binding in the system. Variations in the mating surfaces can also be compensated up to a certain amount (0.5 mm) by a larger adjusted clearance. The clearance adjustment is only effective without load.

Please contact our technical experts if you have any questions on the engineering design and/or installation.

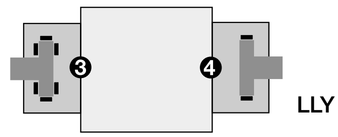
1. Rail
2. Sliding elements
3. Fixed bearing
4. Floating bearing LLZ or LLY



Lateral/vertical installation with floating bearing in the z-direction



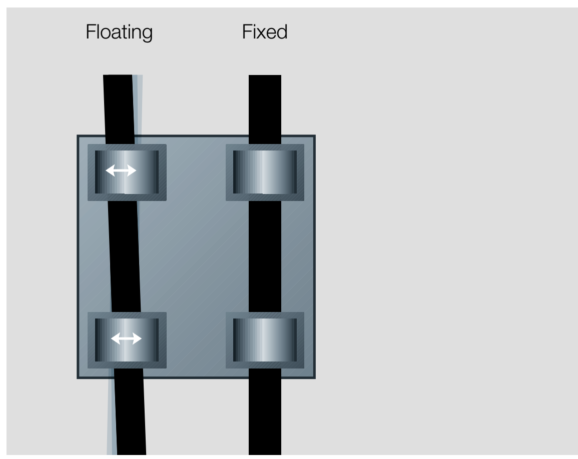
Horizontal installation with floating bearing in the z-direction



Horizontal mounting version with floating bearing in the y-direction and lateral mounting carriage

Floating bearings for linear slide guides

In the case of a system with two parallel guides, one side needs to be configured with floating bearings.
A suitable solution comprising fixed & floating bearings is available for every installation position, whether horizontal, vertical or lateral. This type of assembly prevents jamming and blockage on the guides resulting from discrepancies in parallelism. Floating bearings are realized through a controlled extension of play in the direction of the expected parallelism error. This creates an additional degree of freedom on one side.
During assembly, it must be ensured that the floating bearings exhibit a similar degree of play in both directions. The systems of fixed & floating bearings we recommend are represented in various related chapters.
The contact surfaces on the guides and carriages should be sufficiently even (for instance, milled down) to prevent strains from occurring in the system.

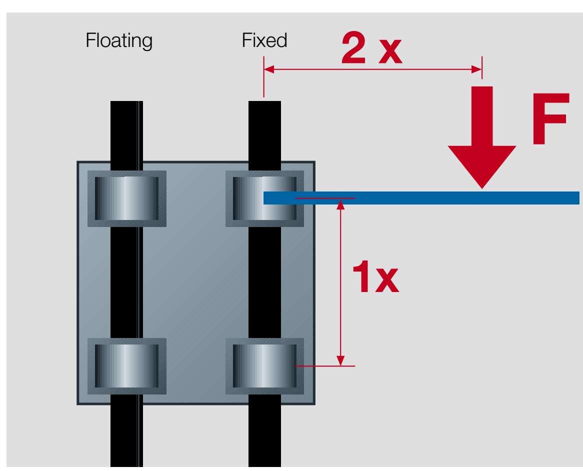


Automatic compensation of parallelism errors

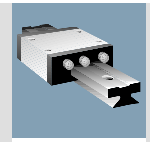
Eccentric Forces

To ensure successful use of maintenance-free DryLin® linear bearings, it is necessary to follow certain recommendations:
If the distance between the driving force point and the fixed bearings is more than twice the bearing spacing (2:1 rule), a static friction value of 0.25 can theoretically result in jamming on the guides. This principle applies regardless of the value of the load or drive force.

The friction product is always related to the fixed bearings. The greater the distance between the drive and guide bearings, the higher the degree of wear and required drive force.
Failure to observe the 2:1 rule during a use of linear slide bearings can result in uneven motion or even system blockage. Such situations can often be remedied with relatively simple modifications.
If you have any questions on design and/or assembly, please contact our application engineers.



The 2:1 Rule



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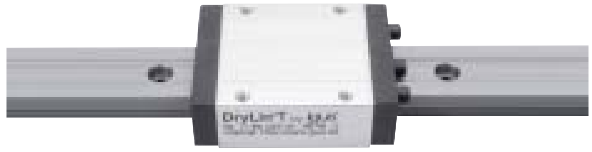
DryLin® T – Adjusting and Installation

Adjusting the clearance: DryLin® T

DryLin® T is delivered ready for installation. Clearance of the carriage is adjusted at the factory. The preadjustment is determined by the acting forces on each individual system. If you have special requirements, please indicate in your order whether particularly limited or extended bearing clearance is required. If necessary, clearance of the DryLin® T linear guide system can be readjusted. This should always take place when there is no load on the carriage.



1 After removing the protective cover, loosen the locknuts – Width across flats:

- SW 5 for TW-01-15 and TW-01-20
- SW 7 for TW-01-25 and TW-01-30

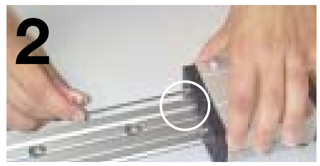
2 Adjust the bearing clearance for the 3 guide points with an Allen key – Allen key size:

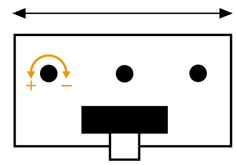
- 1.5 mm for TW-01-15 and TW-01-20
- 2.0 mm for TW-01-25 and TW-01-30

3 Check the clearance of the carriage after adjusting the 3 levels. If it is sufficient, tighten the locknuts and put on the cover.

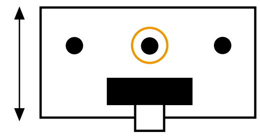
4 There is a danger that excessive reduction of the clearances can seize the gliding elements and that the clearance cannot be reset simply by loosening the adjustment screws. The gliding elements are then released by pressing the reset button on the opposite side. Press hard against the readjusting spring. You must have already loosened the respective adjustment screws. Use the correct size pin for this purpose:

- 2.5 mm for TW-01-20 and TW-01-15
- 3.0 mm for TW-01-25
- 3.0 mm for TW-01-30

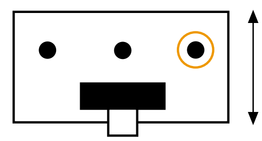




lateral guide:
– less clearance
+ more clearance



vertical guide left



vertical guide right

Adjusting the clearance: DryLin® T Automatic

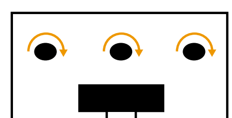
The DryLin® T Automatic series offers you an automatic adjustment of the clearance. A readjustment can take place automatically in steps of 0.1 mm. Springs tighten the regulating wedge immediately as soon as the clearance is bigger than 0.1 mm and the system is unloaded.

1 The system will be delivered with 3 spanners which are already plugged in. They are necessary for mounting the carriage onto the rail. In case these spanners are removed they need to be replugged into the openings and turned right by 90°.

2 When the carriage is on the rail, loosen the spanners by turning them left 90° and remove them. The clearance will be adjusted automatically.

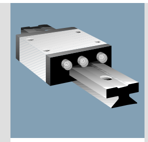
3 Check the clearance of the carriage. A fine adjusting can be done at this point.

4 You can remove the carriage at any time. In order to do so, simply plug the spanners back into the openings (see step 1).



locked

unlocked



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mm

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DryLin® T – System Design

For the exact calculation of the DryLin® T Linear Guide System it is essential to find out whether the position of the forces is
within the allowable limits, and if the gliding element where the highest forces occur is not overloaded. The calculation of the necessary driving force and the maximum speed allowed is important. Each mounting version requires a different formula for calculation. Factors concerning shocks and acceleration forces are not included in the calculation, therefore the maximum load and allowable load must be monitored.

Variables in the calculations:

Fa	: Drive Force	[N]
Fs	: Applied Mass	[N]
Fy, Fz	: Bearing Load	[N]
	in y- or z-direction	[mm]
sx, sy, sz	: Distance of the mass force	
	in x-, y- or z-direction	[mm]
ay, az	: Distance of the mass force	
	in y- or z-direction	[mm]
wx	: Distance between carriages	
	on a rail	[mm]
LX	: Constant from table below	[mm]
Zm	: Constant from table below	[mm]
Y0	: Constant from table below	[mm]
b	: Distance between	
	guide rails	[mm]
µ	: Coefficient of friction,	
	µ = 0 for static loads,	
	µ = 0.2 for dynamic loads	
ZW	: Number of carriages per rail	

The constant values:

Part No.	Lx [mm]	Zm [mm]	Yo [mm]
TW-01-15	29	16	11,5
TW-01-20	35	23	15,0
TW-01-25	41	25	19,0
TW-01-30	49	29	21,5

Recommended procedure:
1st step:

Select the mounting version

- **horizontal**
  - 1 rail and 1 carriage ▶ Page 61.14
  - 1 rail and 2 carriages ▶ Page 61.14
  - 2 rails and 4 carriages ▶ Page 61.14
- **lateral**
  - 1 rail and 1 carriage ▶ Page 61.15
  - 1 rail and 2 carriages ▶ Page 61.15
  - 2 rails and 4 carriages ▶ Page 61.15
- **vertical**
  - 1 rail and 1 carriage ▶ Page 61.16
  - 1 rail and 2 carriages ▶ Page 61.16
  - 2 rails and 4 carriages ▶ Page 61.16

2nd step:
Check to see whether the offset distances of the applied forces are within the permissible values
▶ Pages 61.14 to 61.16

3nd step:
Calculate the necessary drive force
▶ Page 61.14 to 61.16

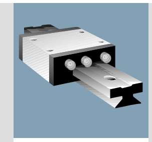
4nd step:
Calculate the maximum bearing load in y- and z-directions
▶ Page 61.14 to 61.16

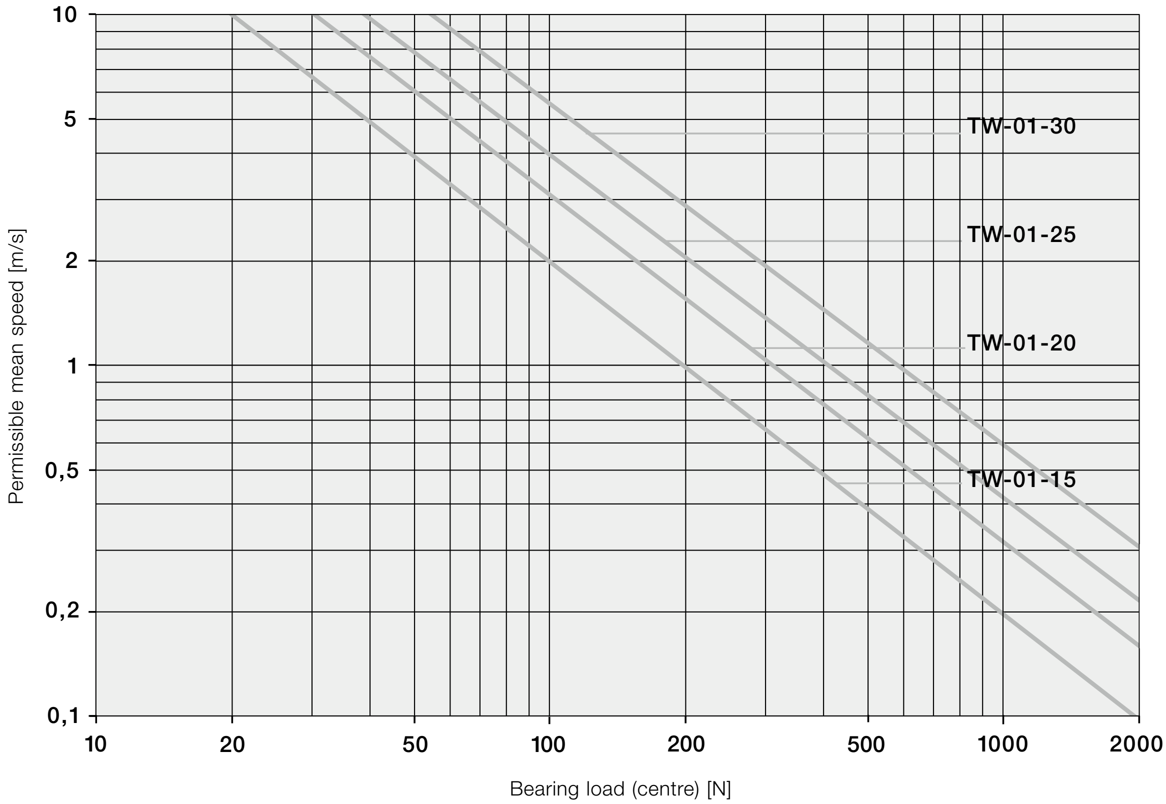
5nd step:
Check calculated load for both y and z with the table on page 37.11 - Maximum permissible load for Fymax & Fzmax
▶ Page 61.13, table 61.2

6nd step:
Check calculated mean speed for the load from step 5 with the graph on page 37.11
▶ Page 61.13, Graph. 61.4

Coefficients:

	1 rail, 1 carriage	1 rail, 2 carriages	2 rails, 3–4 carriages
K_1	l(ay+Y0)/Lxl	l(ay+Y0)/Wxl	l(ay+Y0)/Wxl
K_2	(sy+Y0)/Lx	(sy+Y0)/Wx	(sy+Y0)/Wx
K_3	laz/Lxl	laz/Wxl	laz/Wxl
K_4	lsx/Lxl	lsx/Wxl	lsx/Wxl
K_5	sz/Lx	lsz/Wxl	lsz/Wxl
K_6	l(sy+Y0)/Zml	l(sy+Y0)/Zml	l(sy+Y0)/bl
K_7	lsz/Zml	lsz/Zml	l(sz/b)-0,5l





Graph 61.4: Diagram for determining the maximum permissible speed for the calculated bearing load

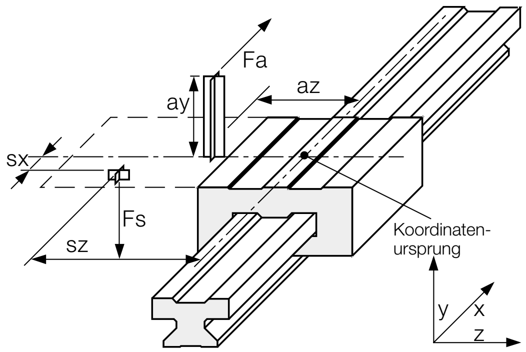
Part No.	Fy_{max}, Fz_{max} [N]
TW-01-15	2000
TW-01-20	3700
TW-01-25	5000
TW-01-30	7000

Table 61.2: Maximum permissible load

DryLin® T – Mounting Version Horizontal

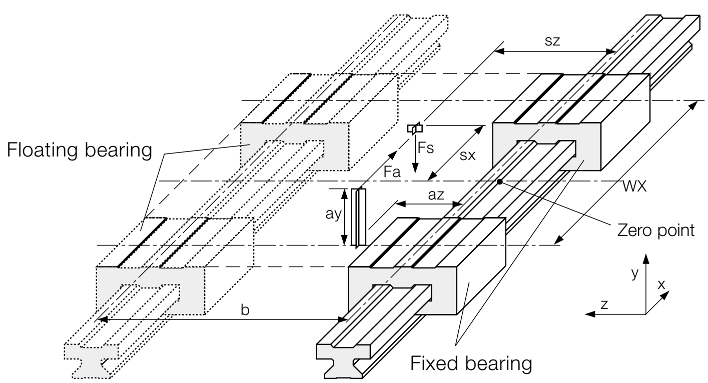
Maximum permissible distances between applied forces:

Variation: 1 rail, 1 carriage		
sy + sz	<	2 Lx - Y_0
ay + az	<	2 Lx - Y_0
sy	<	5 Z_m
sz	<	5 Z_m



Maximum permissible distances between applied forces:

Variation: 1 rail, 2 carriages Variation: 2 rails, 4 carriages		
sy + sz	<	2 wx - Y_0
ay + az	<	2 wx - Y_0



2nd step:

Check to see whether the maximum distances of the applied forces are within the permissible values. (See maximum permissible distances)

3nd step:

Calculate the necessary drive force

3.1 Centre of gravity in **x-** and **z-direction** **inside** the carriage(s)

$$Fa_1 = \frac{\mu}{1-2\mu K_3} \cdot Fs$$

3.2 Centre of gravity in **z-direction** **outside of** the carriage(s)

$$Fa_2 = \frac{2\mu K_7}{1-2\mu K_3} \cdot Fs$$

3.3 Centre of gravity in **x-direction** **outside of** the carriage(s)

$$Fa_3 = \frac{2\mu K_4}{1-2\mu K_3 - 2\mu K_1} \cdot Fs$$

If the position of the centre of gravity is not specified:

$$Fa = MAX\,(Fa_1, Fa_2, Fa_3)$$

4nd step:

Calculate the maximum bearing load

4.1 Maximum bearing load in **y-direction**

$$Fy_{max} = \frac{2\,Fs}{Zw}\left(\frac{2\,K_4}{Zw} + 0{,}5\right) \cdot \left(K_7 + 0{,}5\right) + \frac{2\,Fa\,K_1}{Zw^2}$$

4.2 Maximum bearing load in **z-direction**

$$Fz_{max} = \frac{4\,Fa\,K_3}{Zw^2}$$

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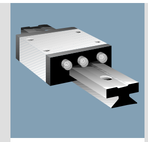
DryLin® T – Mounting Version Lateral



2nd step:

Check to see whether the maximum distances of the applied forces are within the permissible values. (See maximum permissible distances)

3nd step:

Calculate the necessary drive force

First two calculations must be made:

$$Fa_1 = \frac{(1+2K_6)\mu}{1-2\mu K_1} \cdot Fs$$

$$Fa_2 = \frac{(2K_4+2K_6)\mu}{1-2\mu K_1-2\mu K_3} \cdot Fs$$

The drive force Fa corresponds to the calculated maximum value

$$Fa = MAX\,(Fa_1, Fa_2)$$

4nd step:

Calculate the maximum bearing load

4.1 Maximum bearing load in **y-direction**

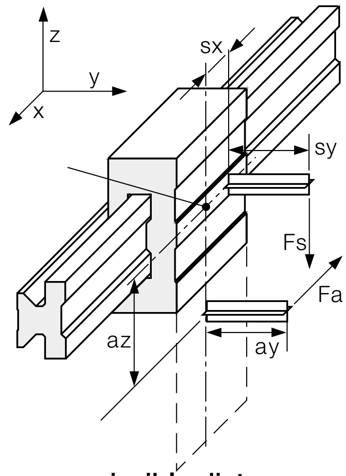
$$Fy_{max} = \frac{Fs\,K_6}{Zw} + \frac{2\,Fa\,K_1}{Zw^2}$$

4.2 Maximum bearing load in **z-direction**

$$Fz_{max} = \frac{2\,Fs}{Zw}\left(\frac{2K_4}{Zw} + 0{,}5\right) + \frac{4\,Fa\,K_3}{Zw^2}$$

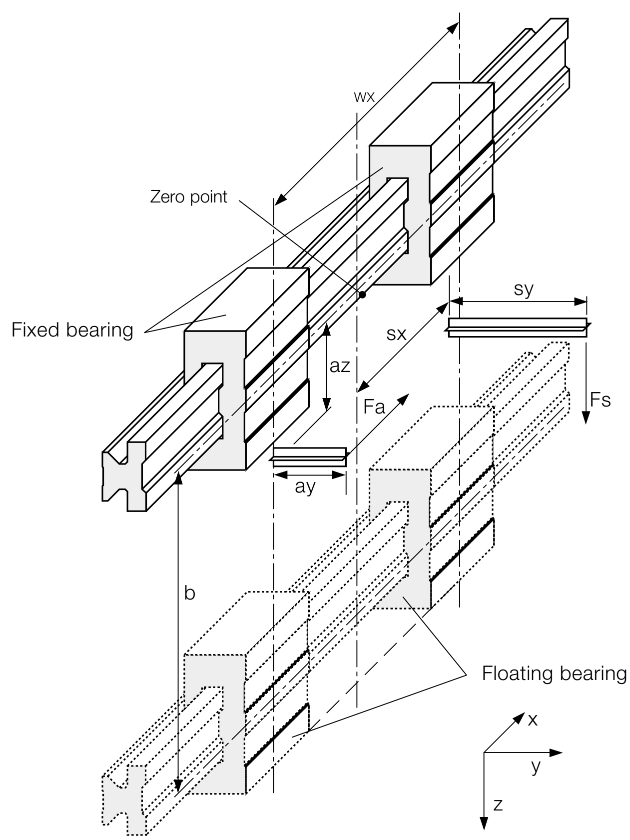
Maximum permissible distances between applied forces:

Variation: 1 rail, 1 carriage		
sy + sz	<	2 Lx - Y0
ay + az	<	2 Lx - Y0
sy	<	5 Zm
sz	<	5 Zm



Maximum permissible distances between applied forces:

Variation: 1 rail, 2 carriages Variation: 2 rail, 4 carriages		
sy + sz	<	2 wx - Y0
ay + az	<	2 wx - Y0



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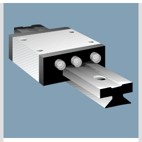

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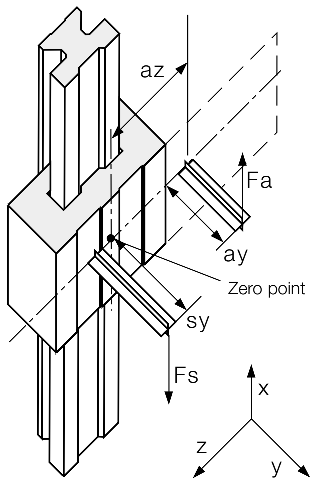
DryLin® T – Mountig Version – Vertical

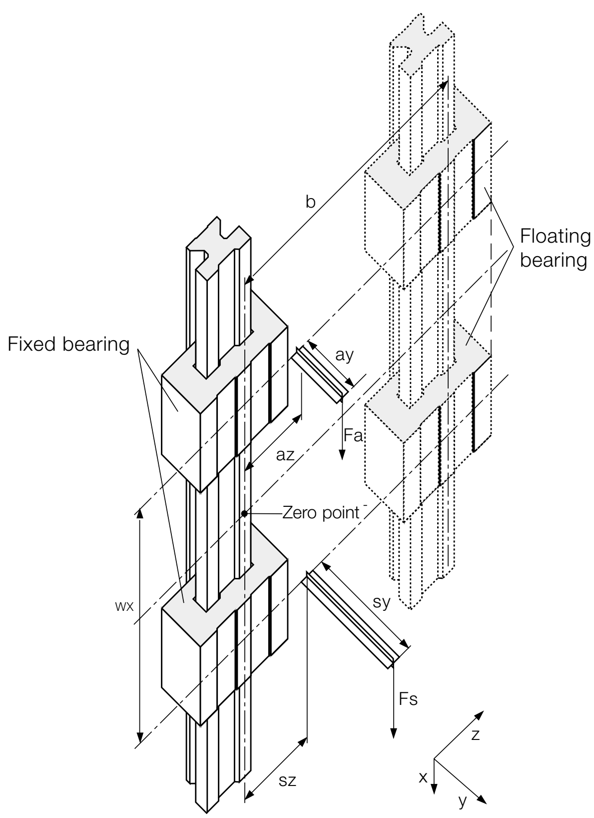
Maximum permissible distances between applied forces:

Variation: 1 rail, 1 carriage		
sy + sz	<	2 Lx - Y_0
ay + az	<	2 Lx - Y_0
sy	<	5 Zm
sz	<	5 Zm



Maximum permissible offset distances between applied forces:

Variation: 1 rail, 2 carriages Variation: 2 rails, 4 carriages		
sy + sz	<	2 wx - Y_0
ay + az	<	2 wx - Y_0



2nd step:

Check to see whether the maximum distances of the applied forces are within the permissible values. (See maximum permissible distances)

3nd step:

Calculate the necessary drive force

First, four calculations must be made:

$$Fa_1 = \frac{2\mu\,(sz+sy+Y_0)-wx}{2\mu\,(az+ay+Y_0)-wx} \cdot Fs$$

$$Fa_2 = \frac{2\mu\,(-sz+sy+Y_0)-wx}{2\mu\,(-az+ay+Y_0)-wx} \cdot Fs$$

$$Fa_3 = \frac{2\mu\,(sz-sy-Y_0)-wx}{2\mu\,(az-ay-Y_0)-wx} \cdot Fs$$

$$Fa_4 = \frac{2\mu\,(sz+sy+Y_0)+wx}{2\mu\,(az+ay+Y_0)+wx} \cdot Fs$$

The drive force Fa corresponds to the calculated maximum value

$$Fa = MAX\,(Fa_1, Fa_2, Fa_3, Fa_4)$$

4nd step:

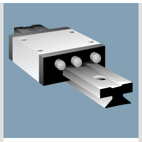
Calculate the maximum bearing load

4.1 Maximum bearing load in **y-direction**

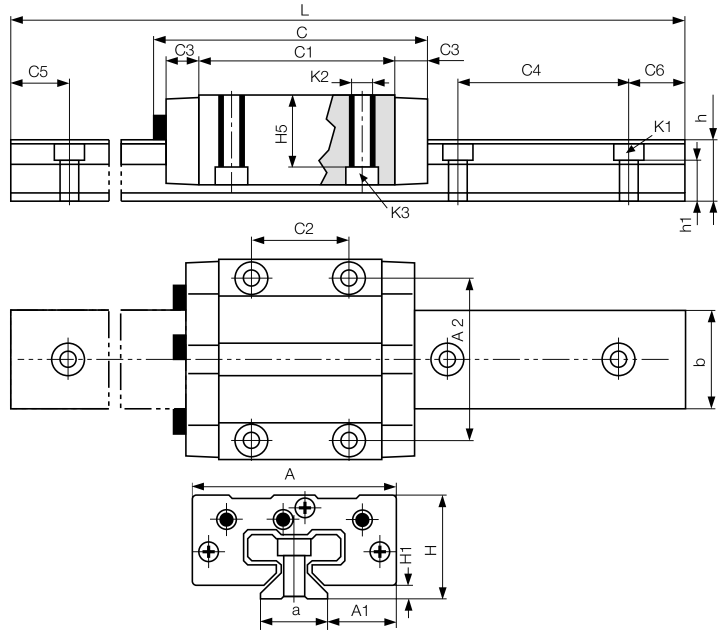
$$Fy_{max} = \left| Fa \frac{ay+Y_0}{wx} - Fs\,K_2 \right| \cdot \frac{2}{Zw^2}$$

4.2 Maximum bearing load in **z-direction**

$$Fz_{max} = \left| Fa \frac{az}{wx} - Fs\,K_5 \right| \cdot \frac{4}{Zw^2}$$



DryLin® T – Adjustable clearance – TK-01...



- Slide carriage with manual adjustable clearance
- Maintenance-free, dry operation
- Resistant to corrosion
- Hard anodized aluminium rails
- Standard bore pattern symmetrical C5 = C6

DryLin® T Guide Rails

Part No.	Weight [kg/m]	L Max. [mm]	a -0,2 [mm]	C4 [mm]	C5 Min. [mm]	C5 Max. [mm]	C6 Min. [mm]	C6 Max. [mm]	h	h1	K1 for Screw DIN 912	b [mm]	Iy [mm⁴]	Iz [mm⁴]	Wby [mm³]	Wbz [mm³]
TS-01-15	0,6	3960	15	60	20	49	20	49	15,5	10,0	M 4	22	6440	4290	585	488
TS-01-20	1,0	3960	20	60	20	49	20	49	19,0	12,3	M 5	31	22570	11520	1456	1067
TS-01-25	1,3	3960	23	60	20	49	20	49	21,5	13,8	M 6	34	34700	19300	2041	1608
TS-01-30	1,9	3960	28	80	20	59	20	59	26,0	15,8	M 8	40	70040	40780	3502	2832

Order example: TS-01-15, 2000 for a guide rail TS-01-15 of 2 m length
For rails without mounting holes, please use bearing suffix “without mounting hole”

DryLin® T Guide Carriages

Part No.	Weight [kg]	H ±0,35 [mm]	A [mm]	C [mm]	A1 ±0,35 [mm]	A2 [mm]	C1 [mm]	C2 [mm]	C3 [mm]	H1 ±0,35 [mm]	H5 [mm]	K2 Thread	Torque Max. [Nm]	K3 for Screw DIN 912
TW-01-15	0,11	24	47	74	16,0	38	50	30	9	4,0	16,0	M 5	1,5	M 4
TW-01-20	0,19	30	63	87	21,5	53	61	40	10	5,0	19,8	M 6	2,5	M 5
TW-01-25	0,29	36	70	96	23,5	57	68	45	11	5,0	24,8	M 8	6,0	M 6
TW-01-30	0,50	42	90	109	31,0	72	79	52	12	6,5	27,0	M 10	15,0	M 8

Order examples: TW-01-20 for a guide carriage
TW-01-20, LLy for a guide carriage with floating bearing in y-direction
TW-01-20, LLz for a guide carriage with floating bearing in z-direction

DryLin® TK Complete System

Structure – part no.

TK	-01	-15	-2	,500

- ,500 – Length of rail (mm)
- -2 – Number of carriages
- -15 – Size
- -01 – Type
- TK – Complete set

This order example (TK-01-15-2, 500) corresponds to a complete DryLin® system of size 15 with 2 carriages and 500 mm rail length.
Order TK-01-15-2, 500, LLy for a complete system with floating bearing in y-direction.

Lifetime calculation, CAD files and much more support ► www.igus.de/en/DryLinT

DryLin® T

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