ROLLON®
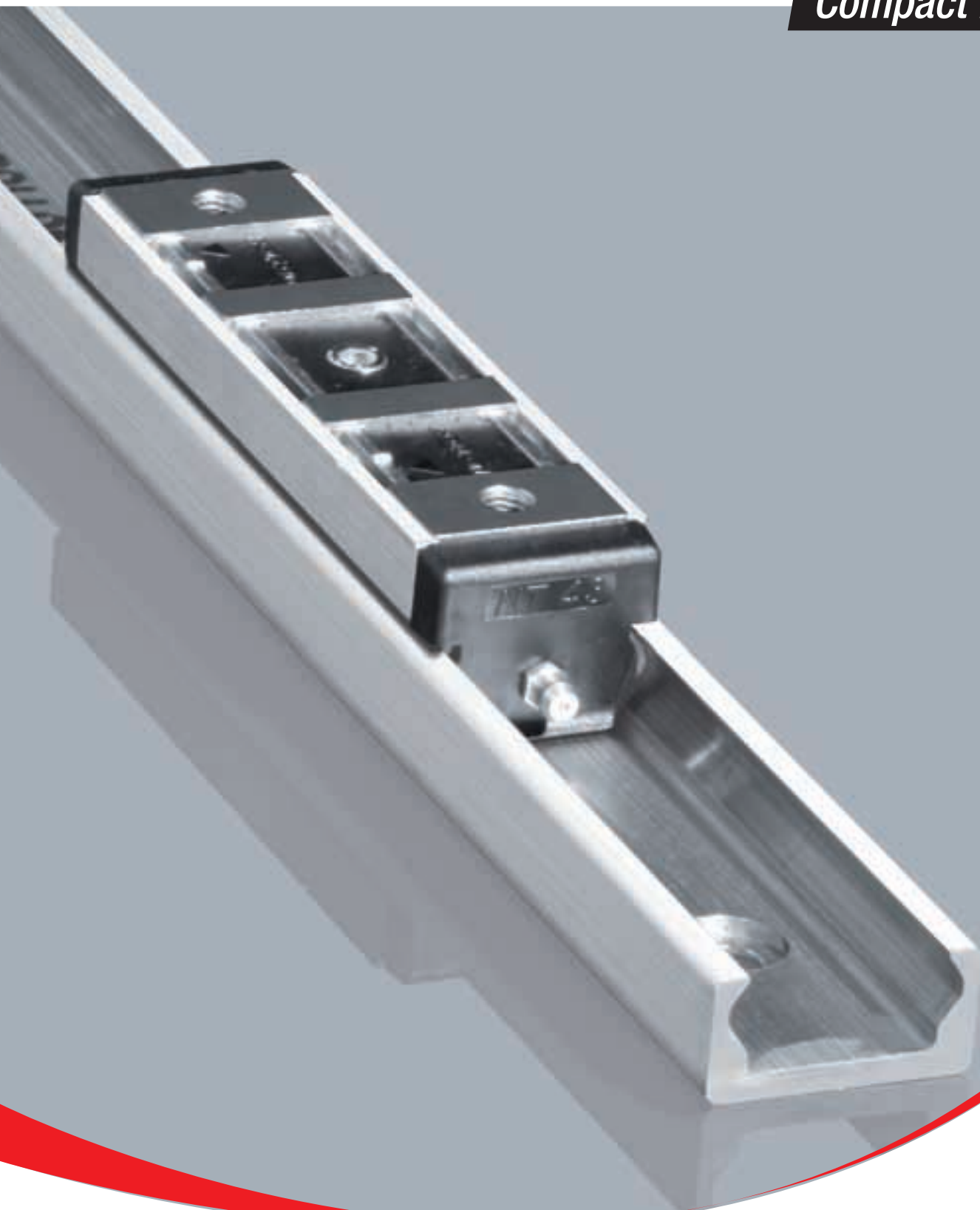
L i n e a r E v o l u t i o n

Product explanation ⌄

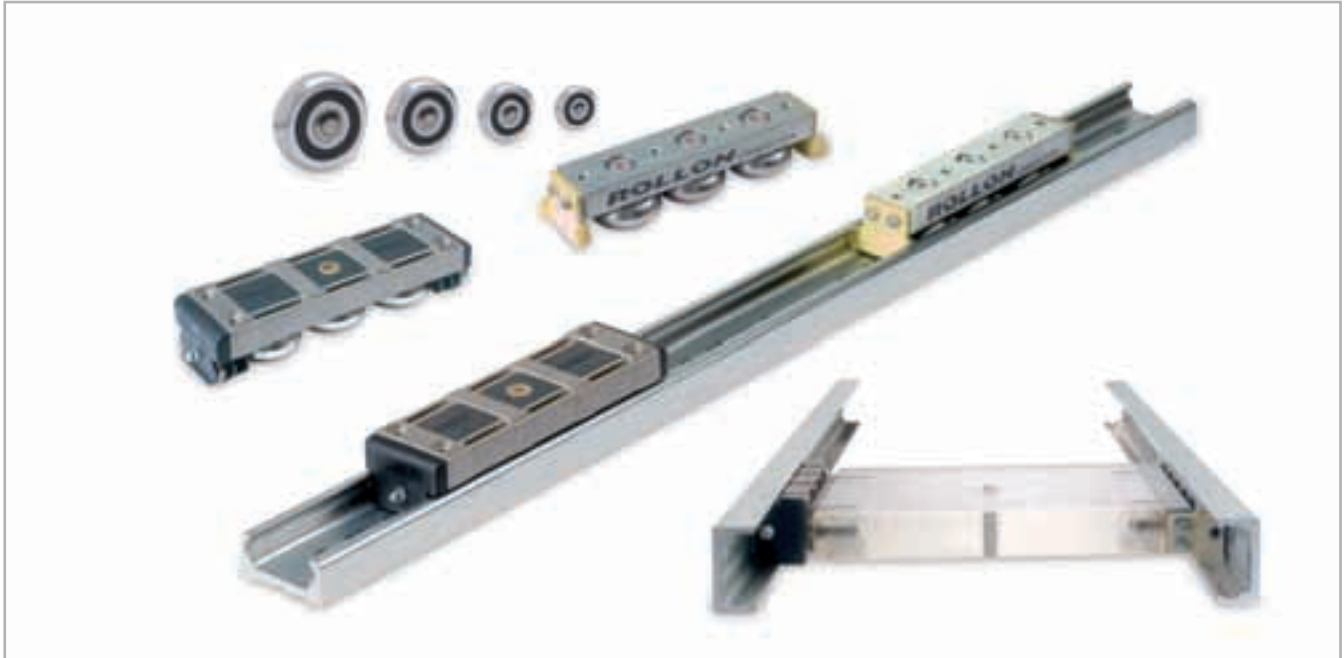## Compact Rail is the product family of roller slider systems

Fig. 1

Compact Rail is the product family of guide rails consisting of roller sliders with radial bearings which slide on the internal, induction hardened and ground raceways of a C-profile made from cold-drawn roller bearing carbon steel.

Compact Rail consists of three product series: the fixed bearing rail, the compensating bearing rail and the floating bearing rail. All products are available in zinc plating, with nickel plating also available as an option. There are five different sizes of guide rails and many different versions and lengths of the slide bearings.

Preferred areas of application:
- Cutting machines
- Medical technology
- Packaging machines
- Photographic lighting equipment
- Construction and machine technology (doors, protective covers)
- Robots and manipulators
- Automation
- Handling

The most important characteristics:
- Compact size
- Corrosion resistant surface
- Not sensitive to dirt due to internal tracks
- Hardened and ground raceways
- Custom design TR-rail, also ground on the back of the rail and one side surface
- Self-aligning in two planes
- Quieter than recirculating ball systems
- High operating speeds
- Wide temperature range
- Easy adjustment of slider in the guide rail
- Zinc plated surface, on request chemically nickel plated

Fixed bearing rails (T-rails)

Fixed bearing rails are used as the main load bearing in radial and axial forces.

Fig. 2

Fixed bearing rails (TR-rails)

The TR rail is available as a custom design. The TR rail is ground on the back of the rail and one side surface to allow for a precision mounting onto a surface.

Fig. 3

Floating bearing rails (U-rails)

The floating bearing rails are used for load bearing of radial forces and, in combination with the fixed bearing T-rail or compensation K-rail, as a support bearing for occurring moment loads.

Fig. 4

Compensation bearing rails (K-rails)

The compensation bearing rails are used for the load bearing of radial and axial forces. Tolerance compensation in two planes can be implemented in combination with the U-rail.

Fig. 5

System (T+U-system)

The combination of fixed bearing rail and floating bearing rail allows for deviations in parallelism.

Fig. 6

System (K+U-system)

The combination of compensation rail and floating bearing rail allows for deviations in parallelism and height offset.

Fig. 7

CR-3

N-slider

Constructed from a, chemically nickel plated aluminum die cast body that is available for sizes 18, 28, 43 and 63. Spring preloaded wipers and a self-lubrication kit are integrated in the end caps (except for size 18, see pg. 58). Configurable with three rollers as standard, in sizes 28 and 43. A longer carriage with up to five rollers is also available.

Fig. 8

CS-slider

Constructed with zinc-plated steel body and sturdy wipers (optional) made of polyamide. Available for all sizes. Depending on the load requirement, slider is configurable with up to six rollers.

Fig. 9

CD-slider

Constructed with asymmetrical zinc-plated steel body and sturdy wipers (optional) made of polyamide. With this design it is possible to mount your moving element to the bottom or top of the slider body. The Slider is available for sizes 28, 35 and 43. Available with three or five rollers, depending on load case and load direction set with the corresponding configuration.

Fig. 10

Rollers

Also available individually in all sizes. Available as eccentric or concentric rollers. Optionally available with splash-proof plastic seal (2RS) or with steel cover disc (2Z).

Fig. 11

Wipers

Wipers are available for slider types CS and CD and are made of sturdy polyamide. They keep the raceways free of contamination and thus ensure a longer service life.

Fig. 12

Alignment fixture

The alignment fixture AT / AK is used during installation of joined rails for precise alignment of the rail transition from one to another.

Fig. 13

Technical data ∨
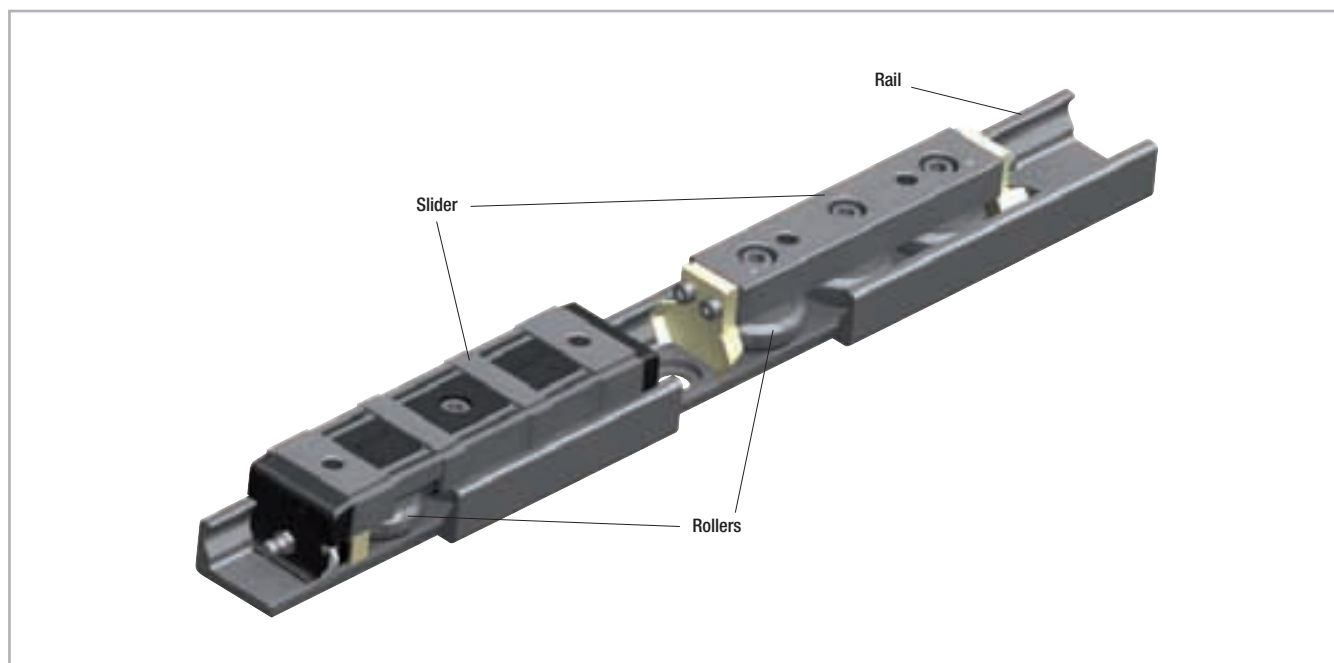

Rail

Slider

Rollers

Fig. 14

Performance characteristics:

- Available sizes for T-rail, TR-rail, U-rail: 18, 28, 35, 43, 63
- Available sizes for K-rail: 43, 63
- Max. operating speed: 9 m/s (354 in/s)
  (depending on application)
- Max. acceleration: 20 m/s^2 (787 in/s^2)
  (depending on application)
- Max. radial load capacity: 15,000 N (per slider)
- Temperature range: -30 °C to +120 °C (-22 °F to +248 °F)
  briefly up to max. +170 °C (+338 °F)
- Available rail lengths from 160 mm to 3,600 mm (6.3 in to 142 in)
  in 80-mm increments (3.15 in),
  longer single rails up to max. 4,080 mm (160.6 in) on request
- Roller pins lubricated for life
- Roller seal/shield: 2RS (splash-proof), 2Z (steel cover disk)
- Roller material: steel 100Cr6
- Rail raceways are induction hardened and ground
- Rails and slider bodies are standard zinc-plated according to
  ISO 2081
- Rail material of T- and U-rails in sizes 18:
  cold-drawn roller bearing carbon steel C43 F
- Rail material of K-rails, as well as T- and U-rails in size 28 to 63:
  CF53

Notes:

- The sliders are equipped with rollers that are in alternating contact with both sides of the raceway. Markings on the body around the roller pins indicate correct arrangement of the rollers to the external load
- With a simple adjustment of the eccentric rollers, the desired clearance or preload on the rail and slider can be set.
- Rails in joined design are available for longer transverse distances (see pg. CR-64)
- The K rails are not suitable for vertical installation
- Screws of property class 10.9 must be used
- Differences in screw sizes must be observed
- When mounting the rails, it is crucial to ensure that the mounting holes in the structure are properly chamfered. (see pg. CR-58, tab. 41)
- The general illustrations show N-sliders as an example

Configurations and behavior of the slider under yawing moment M$_z$

Individual slider under M$_z$ moment load

When an overhanging load in an application with a single slider per rail causes an M$_z$ moment in one direction, a 4 to 6 roller Compact Rail slider is available. These sliders are available in both configuration A and B in regards to the roller arrangement to counter the acting M$_z$ moment load. The moment capacity of these sliders in the Mz-direction varies significantly through spacing L$_1$ and L$_2$ in accordance with the direction of rotation of M$_z$. Especially in the use of two parallel rails, for example with a T+U-system, it is extremely important to pay attention to the correct combination of the slider configuration A and B, in order to use the maximum load capacities of the slider.

The diagrams below illustrate this concept of the A and B configuration for sliders with 4 and 6 rollers. The maximum allowable M$_z$-moment is identical in both directions for all 3 and 5 roller sliders.
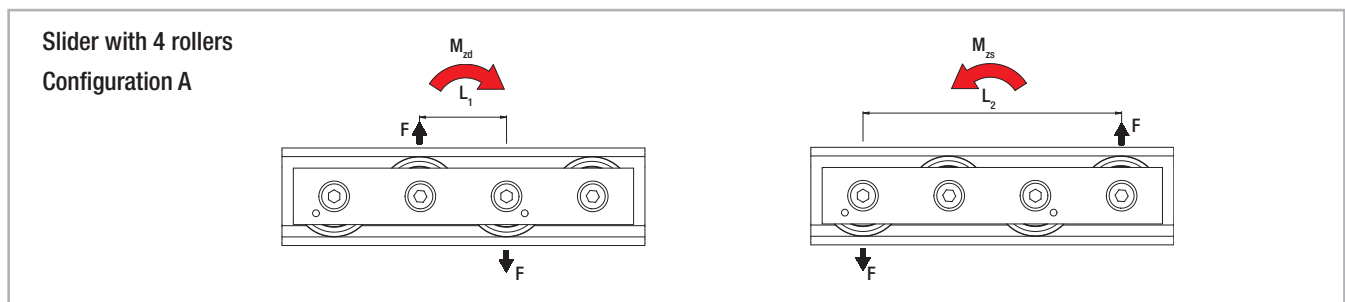

Slider with 4 rollers
Configuration A
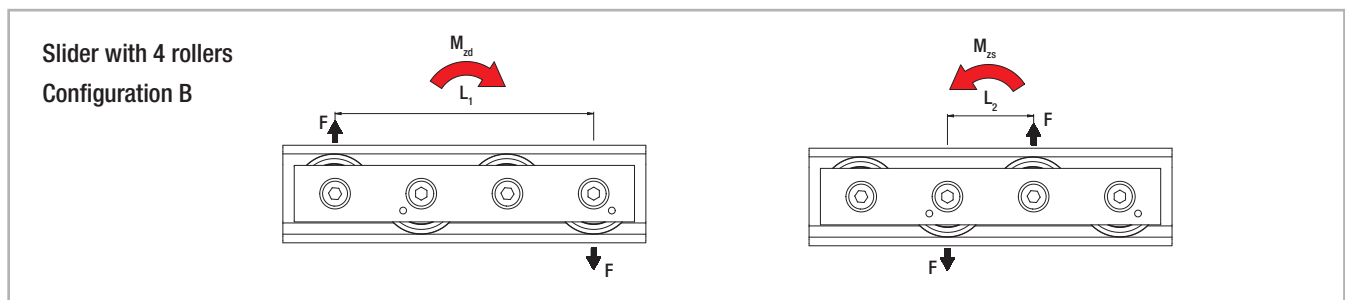
Fig. 15

Slider with 4 rollers
Configuration B

Fig. 16

Two sliders under M$_z$ moment load

When an overhanging load acts on an application with two sliders per rail and causes an M$_z$-moment in one direction, there are differing support reactions with the two sliders. For this reason, an optimal arrangement of different slider configurations to reach the maximum load capacities must be achieved for this type of application. In practice this means, when using NTE-, NUE- or CS-sliders with 3 or 5 rollers, both sliders are installed rotated by 180° so that the slider is always loaded on the side with the most rollers (with NKE-sliders this is not possible due to the different raceway geometry). For an even number of rollers this has no effect. The CD-slider with installation option from above or below cannot be installed due to the position of the rollers in reference to the installation side therefore they are available in the configurations A and B (see fig. 18).
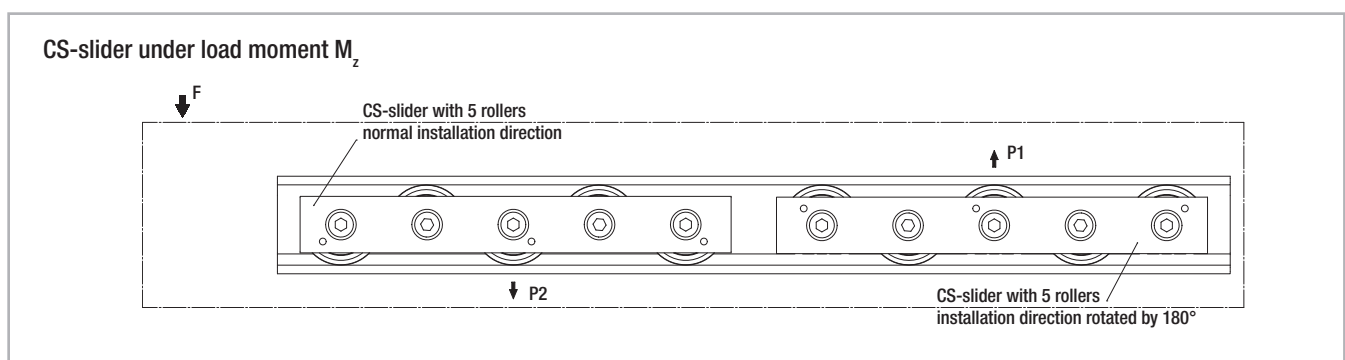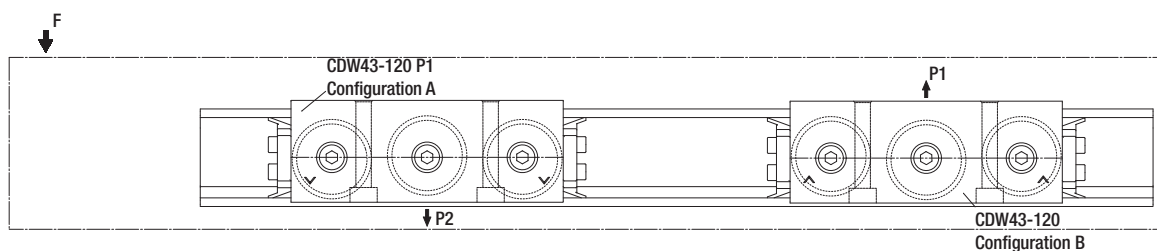

CS-slider under load moment M$_z$

CS-slider with 5 rollers
normal installation direction

CS-slider with 5 rollers
installation direction rotated by 180°

Fig. 17

CD-slider under load moment M_z

CDW43-120 P1
Configuration A

P1

P2

CDW43-120
Configuration B

F

Fig. 18

Slider configurations for various load cases

Arrangement DS

This is the recommended arrangement for use of two sliders under M_z-moment when using one rail. Also see previous page: Two sliders under M_z moment load.
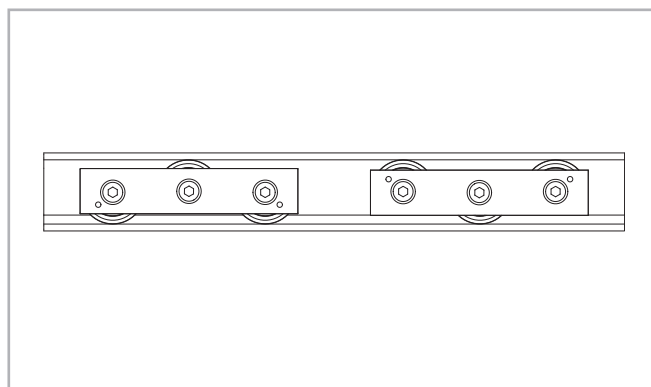

Fig. 19

Arrangement DD

For using a pair of guide rails with two sliders each under M_z moment load, the second system should be designed in arrangement DD. This results in the following combination: One guide rail with two sliders in arrangement DS and the other guide rail with 2 sliders in arrangement DD. This allows even load and moment distribution between the two parallel rails.
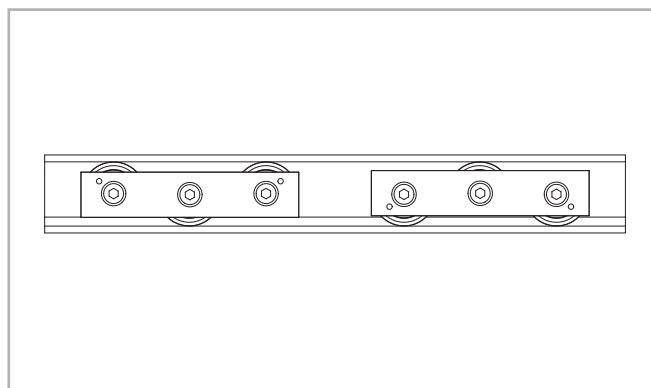

Fig. 20

Arrangement DA

Standard arrangement if no other information is given. This arrangement is recommended if the load point is located within the two outside points of the sliders.
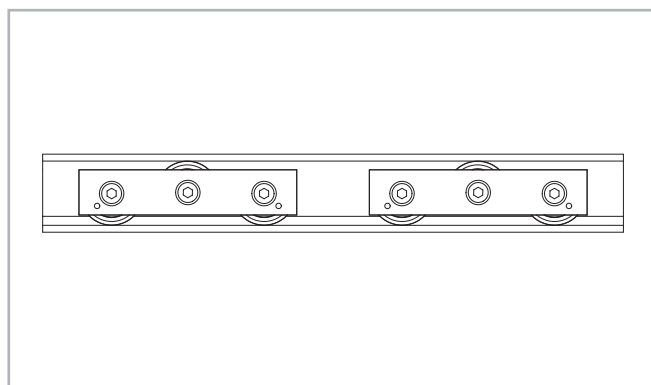

Fig. 21

Load capacities

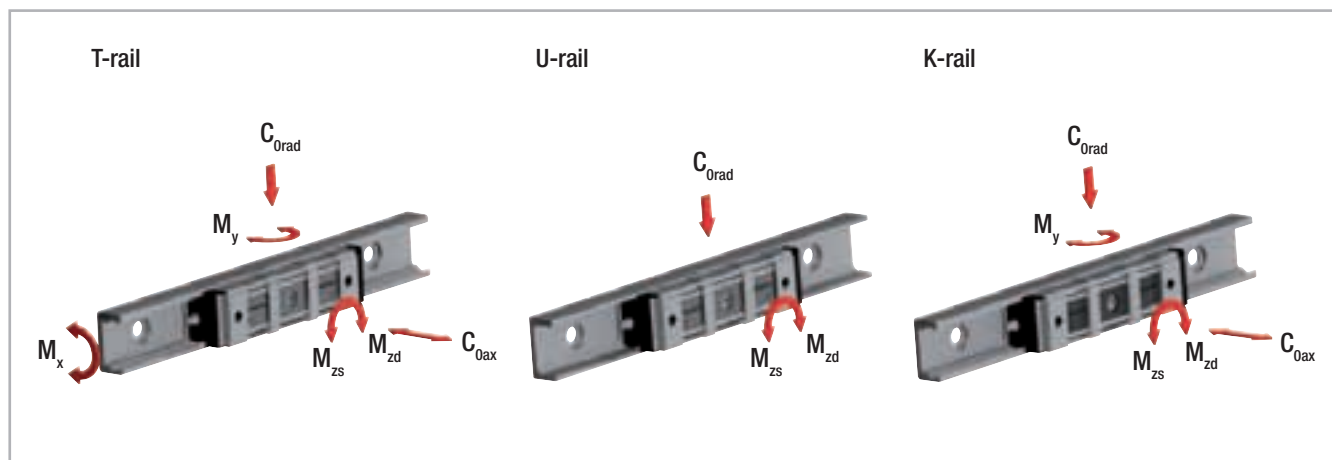**Slider**

| T-rail | U-rail | K-rail |

Fig. 22

The load capacities in the following tables each apply for one slider.

When using the slider in U-rails (floating bearing rails) the values are C_{0ax} = 0, M_x = 0 and M_y = 0. When using the sliders in K-rails (compensation rails) the value is: M_x = 0.

Type	Number of rollers	Load capacities and moments							Weight
		C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]		
							M_{zd}	M_{zs}	[kg]
NT18	3	1530	820	260	1.5	4.7	8.2	8.2	0.03
NU18	3	1530	820	0	0	0	8.2	8.2	0.03
CS18-060-...	3	1530	820	260	1.5	4.7	8.2	8.2	0.04
CS18-080-...-A	4	1530	820	300	2.8	7	8.2	24.7	0.05
CS18-080-...-B	4	1530	820	300	2.8	7	24.7	8.2	0.05
CS18-100-...	5	1830	975	360	2.8	9.4	24.7	24.7	0.06
CS18-120-...-A	6	1830	975	440	3.3	11.8	24.7	41.1	0.07
CS18-120-...-B	6	1830	975	440	3.3	11.8	41.1	24.7	0.07

Tab. 1

Type	Number of rollers	Load capacities and moments							Weight
		C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]		
							M_{zd}	M_{zs}	[kg]
NTE28	3	4260	2170	640	6.2	16	27.2	27.2	0.115
NUE28	3	4260	2170	0	0	0	27.2	27.2	0.115
NTE28L-3-A	3	4260	2170	640	6.2	29	54.4	54.4	0.141
NTE28L-4-A	4	4260	2170	750	11.5	29	54.4	108.5	0.164
NTE28L-4-B	4	4260	2170	750	11.5	29	108.5	54.4	0.164
NTE28L-4-C	4	4260	2170	750	11.5	29	81.7	81.7	0.164
NTE28L-5-A	5	5065	2580	900	11.5	29	81.7	81.7	0.185
NTE28L-5-B	5	6816	3472	640	6.2	29	54.4	54.4	0.185
NUE28L-3-A	3	4260	2170	0	0	0	54.4	54.4	0.141
NUE28L-4-A	4	4260	2170	0	0	0	54.4	108.5	0.164
NUE28L-4-B	4	4260	2170	0	0	0	108.5	54.4	0.164
NUE28L-4-C	4	4260	2170	0	0	0	81.7	81.7	0.164
NUE28L-5-A	5	5065	2580	0	0	0	81.7	81.7	0.185
NUE28L-5-B	5	6816	3472	0	0	0	54.4	54.4	0.185
CS28-080-...	3	4260	2170	640	6.2	16	27.2	27.2	0.155
CS28-100-...-A	4	4260	2170	750	11.5	21.7	27.2	81.7	0.195
CS28-100-...-B	4	4260	2170	750	11.5	21.7	81.7	27.2	0.195
CS28-125-...	5	5065	2580	900	11.5	29	81.7	81.7	0.24
CS28-150-...-A	6	5065	2580	1070	13.7	36.2	81.7	136.1	0.29
CS28-150-...-B	6	5065	2580	1070	13.7	36.2	136.1	81.7	0.29
CD28-080-...	3	4260	2170	640	6.2	16	27.2	27.2	0.215
CD28-125-...	5	5065	2580	900	11.5	29	81.7	81.7	0.3
CS35-100-...	3	8040	3510	1060	12.9	33.7	61.5	61.5	0.27
CS35-120-...-A	4	8040	3510	1220	23.9	43.3	52.7	158.1	0.33
CS35-120-...-B	4	8040	3510	1220	23.9	43.3	158.1	52.7	0.33
CS35-150-...	5	9565	4180	1460	23.9	57.7	158.1	158.1	0.41
CS35-180-...-A	6	9565	4180	1780	28.5	72.2	158.1	263.4	0.49
CS35-180-...-B	6	9565	4180	1780	28.5	72.2	263.4	158.1	0.49
CD35-100-...	3	8040	3510	1060	12.9	33.7	61.5	61.5	0.39
CD35-150-...	5	9565	4180	1460	23.9	57.7	158.1	158.1	0.58

Tab. 2

Type	Number of rollers	Load capacities and moments							Weight
		C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]		[kg]
							M_{zd}	M_{zs}	
NTE43	3	12280	5500	1570	23.6	60	104.5	104.5	0.385
NUE43	3	12280	5500	0	0	0	104.5	104.5	0.385
NKE43	3	12280	5100	1320	0	50.4	96.9	96.9	0.385
NTE43L-3-A	3	12280	5500	1570	23.6	108.6	209	209	0.45
NTE43L-4-A	4	12280	5500	1855	43.6	108.6	209	418	0.52
NTE43L-4-B	4	12280	5500	1855	43.6	108.6	418	209	0.52
NTE43L-4-C	4	12280	5500	1855	43.6	108.6	313.5	313.5	0.52
NTE43L-5-A	5	14675	6540	2215	43.6	108.6	313.5	313.5	0.59
NTE43L-5-B	5	19650	8800	1570	23.6	108.6	209	209	0.59
NUE43L-3-A	3	12280	5500	0	0	0	209	209	0.45
NUE43L-4-A	4	12280	5500	0	0	0	209	418	0.52
NUE43L-4-B	4	12280	5500	0	0	0	418	209	0.52
NUE43L-4-C	4	12280	5500	0	0	0	313.5	313.5	0.52
NUE43L-5-A	5	14675	6540	0	0	0	313.5	313.5	0,59
NUE43L-5-B	5	19650	8800	0	0	0	209	209	0.59
NKE43L-3-A	3	12280	5100	1320	0	97.7	188.7	188.7	0.45
NKE43L-4-A	4	12280	5100	1320	0	97.7	188.7	377.3	0.52
NKE43L-4-B	4	12280	5100	1320	0	97.7	377.3	188.7	0.52
NKE43L-4-C	4	12280	5100	1320	0	97.7	283	283	0.52
NKE43L-5-A	5	14675	6065	1570	0	97.7	283	283	0.59
NKE43L-5-B	5	19650	8160	1820	0	97.7	188.7	188.7	0.59
CS43-120-...	3	12280	5500	1570	23.6	60	104.5	104.5	0.53
CS43-150-...-A	4	12280	5500	1855	43.6	81.5	104.5	313.5	0.68
CS43-150-...-B	4	12280	5500	1855	43.6	81.5	313.5	104.5	0.68
CS43-190-...	5	14675	6540	2215	43.6	108.6	313.5	313.5	0.84
CS43-230-...-A	6	14675	6540	2645	52	135.8	313.5	522.5	1.01
CS43-230-...-B	6	14675	6540	2645	52	135.8	522.5	313.5	1.01

Tab. 3

Type	Number of rollers	Load capacities and moments							Weight
		C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]		
							M_{zd}	M_{zs}	[kg]
CSK43-120-...	3	12280	5100	1320	0	50.4	96.9	96.9	0.53
CSK43-150-A	4	12280	5100	1320	0	54.3	96.9	290.7	0.68
CSK43-150-B	4	12280	5100	1320	0	54.3	290.7	96.9	0.68
CSK43-190-...	5	14675	6065	1570	0	108.7	290.7	290.7	0.84
CSK43-230-A	6	14675	6065	1570	0	108.7	290.7	484.5	1.01
CSK43-230-B	6	14675	6065	1570	0	108.7	484.5	290.7	1.01
CD43-120-...	3	12280	5500	1570	23.6	60	104.5	104.5	0.64
CD43-190-...	5	14675	6540	2215	43.6	108.6	313.5	313.5	0.95
CDK43-120-...	3	12280	5100	1320	0	50.4	96.9	96.9	0.64
CDK43-190-...	5	14675	6065	1570	0	108.7	290.7	290.7	0.95
NTE63	3	30750	12500	6000	125	271	367	367	1.07
NUE63	3	30750	12500	0	0	0	367	367	1.07
NKE63	3	30750	11550	5045	0	235	335	335	1.07
CS63-180-2ZR	3	30750	12500	6000	125	271	367	367	1.66
CS63-235-2ZR-A	4	30750	12500	7200	250	413	367	1100	2.17
CS63-235-2ZR-B	4	30750	12500	7200	250	413	1100	367	2.17
CS63-290-2ZR	5	36600	15000	8500	250	511	1100	1100	2.67
CS63-345-2ZR-A	6	36600	15000	10000	350	689	1100	1830	3.17
CS63-345-2ZR-B	6	36600	15000	10000	350	689	1830	1100	3.17
CSK63-180-2ZR	3	30750	11550	5045	0	235	335	335	1.66
CSK63-235-2ZR-A	4	30750	11550	5045	0	294	335	935	2.17
CSK63-235-2ZR-B	4	30750	11550	5045	0	294	935	335	2.17
CSK63-290-2ZR	5	36600	13745	6000	0	589	935	935	2.67
CSK63-345-2ZR-A	6	36600	13745	6000	0	589	935	1560	3.17
CSK63-345-2ZR-B	6	36600	13745	6000	0	589	1560	935	3.17

Tab. 4

Product dimensions ⌄

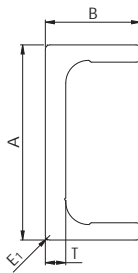## ▶ Rail T, U, K

Size 18 - 43
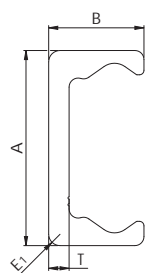
T-rail   U-rail   K-rail (Size 43)
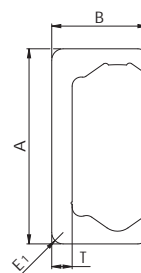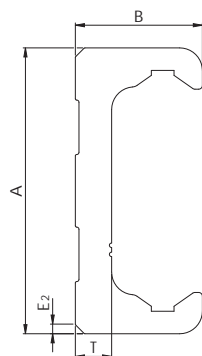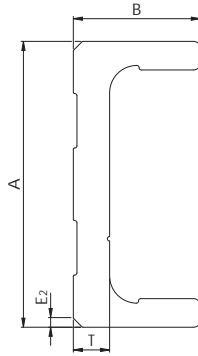
Fig. 23

Size 63
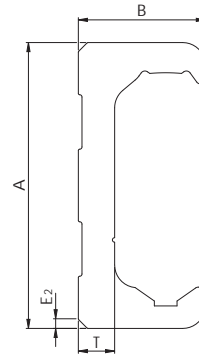
T-rail   U-rail   K-rail

Fig. 24

Holes

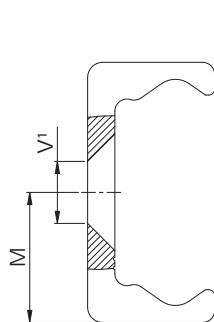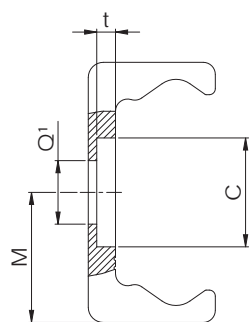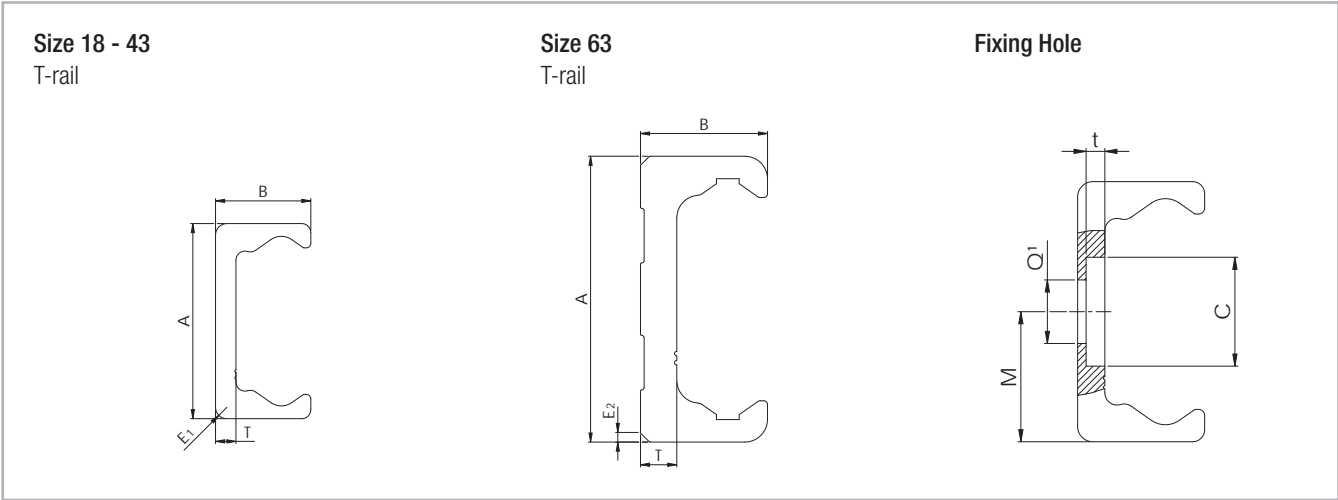Rail with C-hole   Rail with V-hole

Fig. 25

Q^1 Fixing holes for Torx® screws with low head (custom design)
    included in scope of supply
V^1 Fixing holes for countersunk head screws according to DIN 7991

Type	Size	A [mm]	B [mm]	M [mm]	E_1 [mm]	T [mm]	C [mm]	Weight [kg/m]	E_2 [°]	t [mm]	Q^1 [mm]	V^1 [mm]
TLC TLV	18	18	8.25	9	1.5	2.8	9.5	0.55	-	2	M4	M4
	28	28	12.25	14	1	3	11	1.0	-	2	M5	M5
	35	35	16	17.5	2	3.5	14.5	1.65	-	2.7	M6	M6
	43	43	21	21.5	2.5	4.5	18	2.6	-	3.1	M8	M8
	63	63	28	31.5	-	8	15	6.0	2x45	5.2	M8	M10
ULC ULV	18	18	8.25	9	1	2.6	9,5	0.55	-	1.9	M4	M4
	28	28	12	14	1	3	11	1.0	-	2	M5	M5
	35	35	16	17.5	1	3.5	14.5	1.65	-	2.7	M6	M6
	43	43	21	21.5	1	4.5	18	2.6	-	3.1	M8	M8
	63	63	28	31.5	-	8	15	6.0	2x45	5.2	M8	M10
KLC KLV	43	43	21	21.5	2.5	4.5	18	2.6	-	3.1	M8	M8
	63	63	28	31.5	-	8	15	6.0	2x45	5.2	M8	M10

Tab. 5

▸ Rail TR (ground custom design)

Size 18 - 43
T-rail

Size 63
T-rail

Fixing Hole

Q^1 Fixing holes for Torx® screws with low head (custom design) included in scope of supply

Fig. 26

Type	Size	A [mm]	B [mm]	M [mm]	E_1 [mm]	T [mm]	C [mm]	Weight [kg/m]	E_2 [°]	t [mm]	Q^1 [mm]
	18	17.95	8	8.95	1.5	2.8	9.5	0.55	-	2	M4
	28	27.83	12.15	13.83	1	2.9	11	1.0	-	2	M5
TRC	35	34.8	15.9	17.3	2	3.4	14.5	1.6	-	2.7	M6
	43	42.75	20.9	21.25	2.5	4.4	18	2.6	-	3.1	M8
	63	62.8	27.9	31.3	-	7.9	15	6.0	2x45	5.2	M8

Tab. 6

⊳ Rail length
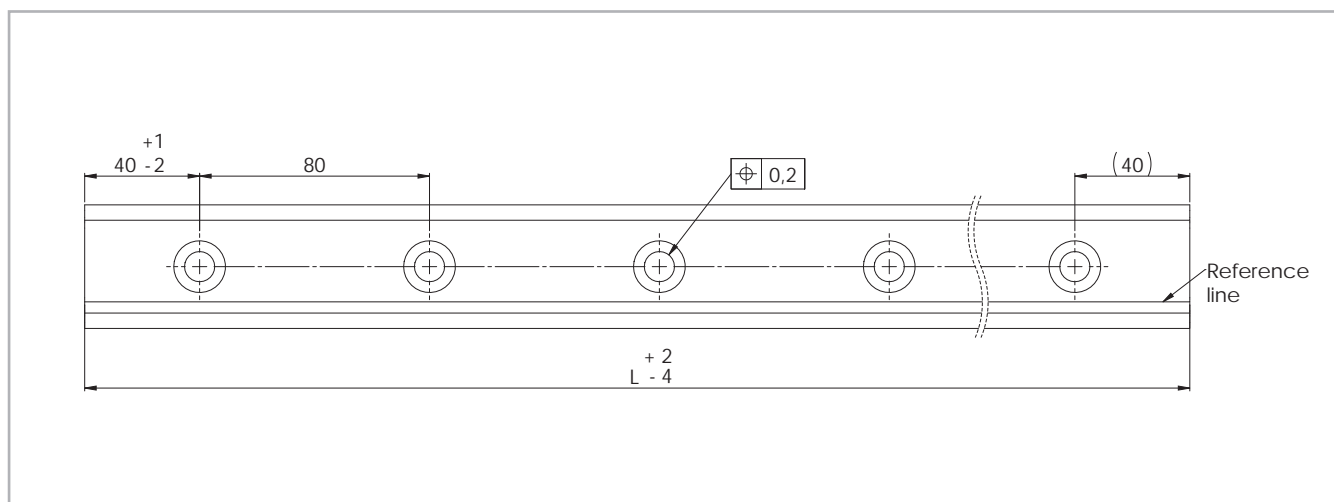
Fig. 27

Type	Size	Min length [mm]	Max length [mm]	Available standard lengths L [mm]
TLC **TLV** **ULC** **ULV**	18	160	2000	160 - 240 - 320 - 400 - 480 - 560 - 640 - 720 - 800 - 880
	28	240	3200	
	35	320	3600	- 960 - 1040 - 1120 - 1200 - 1280 - 1360 - 1440
	43	400	3600	
	63	560	3600	
KLC **KLV**	43	400	3600	- 1520 - 1600 - 1680 - 1760 - 1840 - 1920 - 2000 - 2080
	63	560	3600	- 2160 - 2240 - 2320 - 2400 - 2480 - 2560 - 2640
TRC	18	160	2000	- 2720 - 2800 - 2880 - 2960 - 3040 - 3120 - 3200 - 3280
	28	240	2000	
	35	320	2000	- 3360 - 3440 - 3520 - 3600
	43	400	2000	
	63	560	2000	

Longer single rails up to max. 4,080 mm on request
Longer rail systems see pg. CR-66 Joined rails

Tab. 7

N-version slider, normal

N-series

Size 18

Slider NT

Slider NU
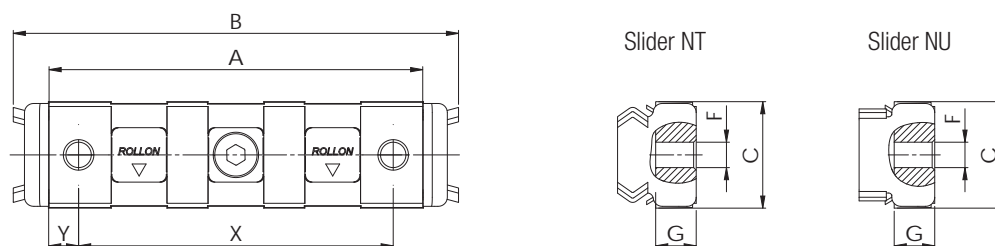
Fig. 28

Sizes 28 and 43 (not available in size 35)

Slider NTE

Slider NUE

Slider NKE

Size 43

Fig. 29

Size 63

Slider NTE

Slider NUE

Slider NKE
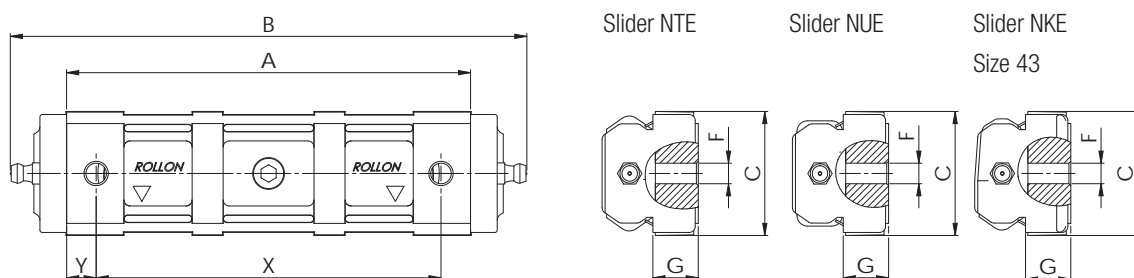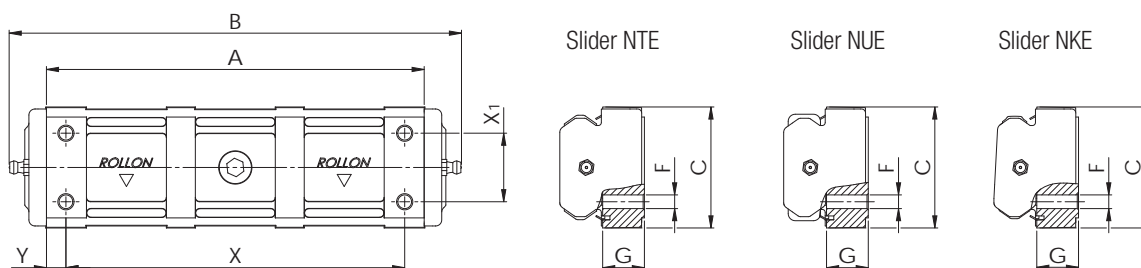
Fig. 30

Type	Size	A [mm]	B [mm]	C [mm]	G [mm]	F [mm]	X [mm]	Y [mm]	X$_1$ [mm]	No. of holes	Roller type used*	Number of Rollers
NT NU	18	62	74	17.6	6.4	M5	52	5	-	2	CPA18-CPN18	3
NTE NUE	28	88	124	26,5	9.3	M5	78	5	-	2	CPA28-CPN28	3
NTE NUE	43	134	170	40	13.7	M8	114	10	-	2	CPA43-CPN43	3
NKE	43	134	170	40	13.7	M8	114	10	-	2	CRA43-CRN43	3
NTE NUE	63	188	225	60	20.2	M8	168	10	34	4	CPA63-CPN63	3
NKE	63	188	225	60	20.2	M8	168	10	34	4	CRA63-CRN63	3

* Information about the roller type, see pg. CR-29, tab. 18

Tab. 8

N-version slider, long

N...L-series

Sizes 28 and 43

Slider NTE

Slider NUE

Slider NKE
Size 43
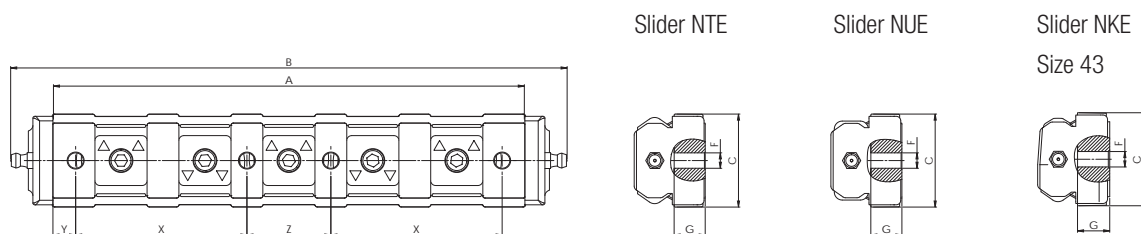
Fig. 31

Slider configurations N...L

N...L-3-A
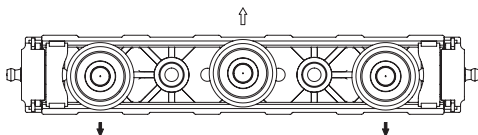
N...L-4-C
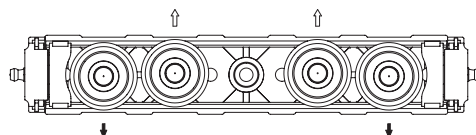
N...L-4-A
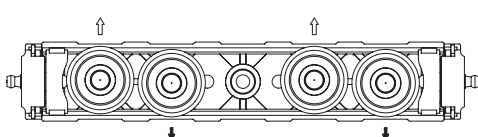
N...L-5-A
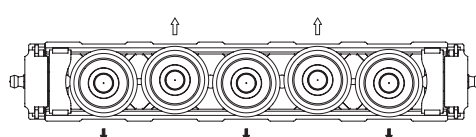
N...L-4-B
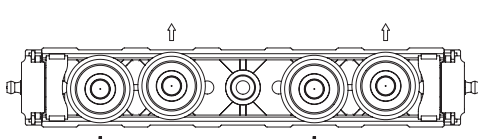
N...L-5-B
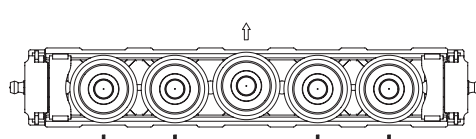
Fig. 32

Type	Size	A [mm]	B [mm]	C [mm]	G [mm]	F [mm]	X [mm]	Y [mm]	Z [mm]	No. of holes	Roller type used*	Number** of Rollers
NTE28L NUE28L	28	140	176	26.5	9	M5	52	5	26	4	CPA28	3 4 5
NTE43L NUE43L	43	208	245	41	13.7	M8	75.5	10	37	4	CPA43	3 4 5
NKE43L											CRA43	

* Information about the roller type, see pg. CR-29, tab. 18

** The number of roller varies according to the configuration, see pg. CR-18, fig. 32

Tab. 9

C-version slider

CS-series

Configuration A

Configuration A

Configuration B

Configuration B

Representation of slider with wiper

Fig. 33

CS-slider with prismatic rollers for use in T- and U-rails
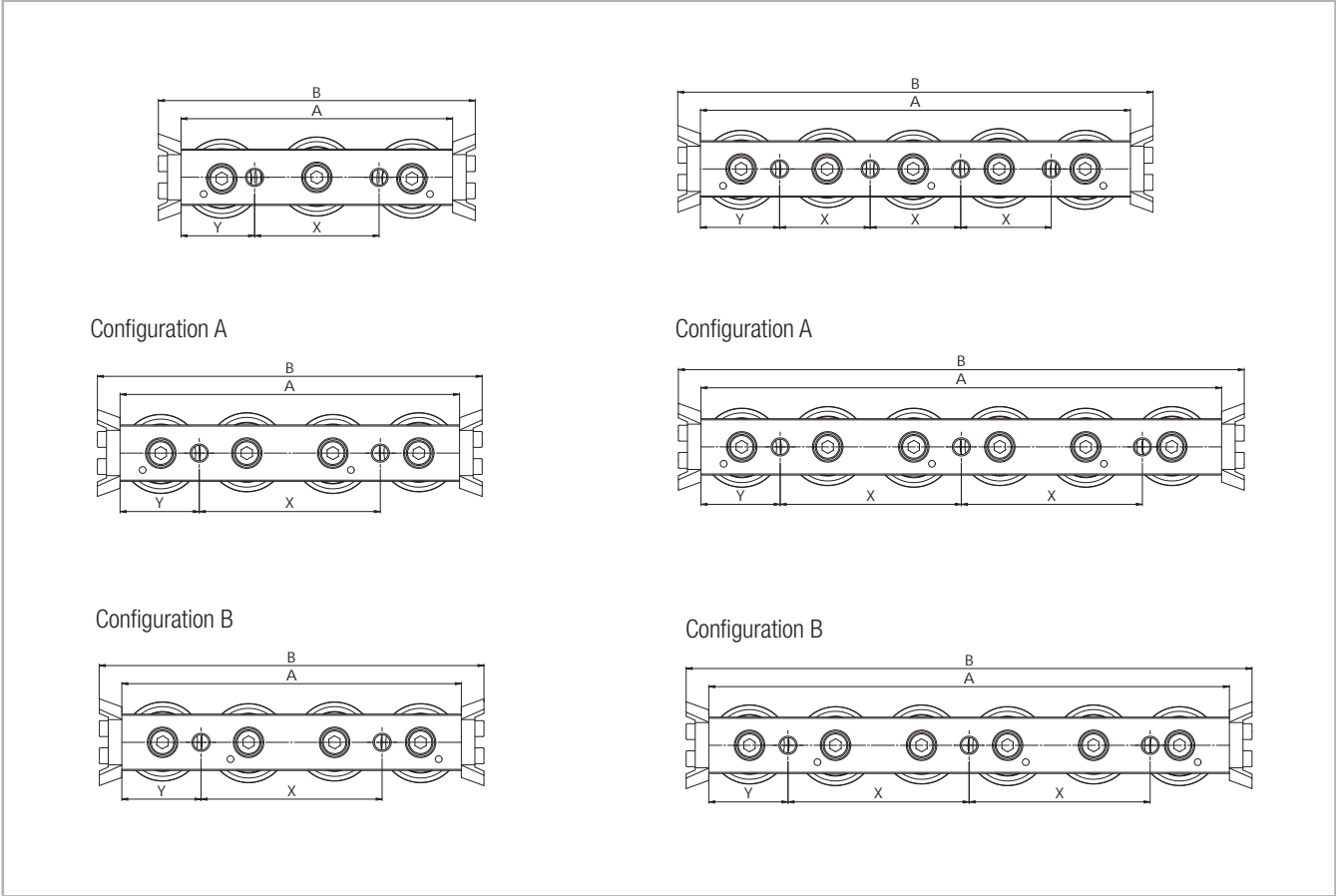
CSK-slider with crowned rollers for use in K-rails
Sizes 43 and 63
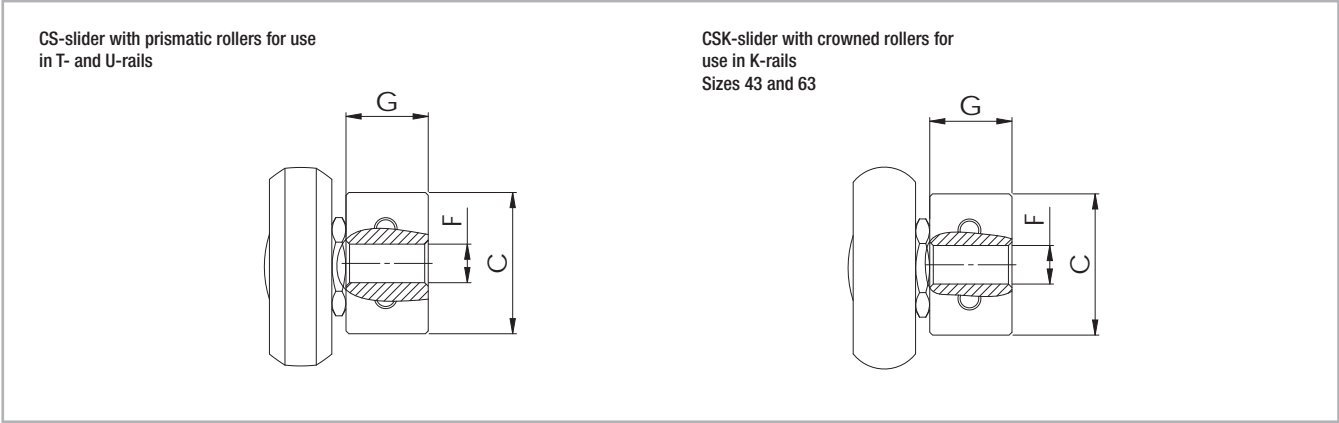
Fig. 34

Type	Size	A [mm]	B [mm]	C [mm]	G [mm]	F [mm]	X [mm]	Y [mm]	No. of holes	Roller type used*	Number of Rollers
CS	18	60	76	9.5	5.7	M5	20	20	2	CPA18-CPN18	3
		80	96	9.5	5.7	M5	40	20	2	CPA18	4
		100	116	9.5	5.7	M5	20	20	4	CPA18	5
		120	136	9.5	5.7	M5	40	20	3	CPA18	6
	28	80	100	14.9	9.7	M5	35	22.5	2	CPA28-CPN28	3
		100	120	14.9	9.7	M5	50	25	2	CPA28	4
		125	145	14.9	9.7	M5	25	25	4	CPA28	5
		150	170	14.9	9.7	M5	50	25	3	CPA28	6
	35	100	120	19.9	11.9	M6	45	27.5	2	CPA35-CPN35	3
		120	140	19.9	11.9	M6	60	30	2	CPA35	4
		150	170	19.9	11.9	M6	30	30	4	CPA35	5
		180	200	19.9	11.9	M6	60	30	3	CPA35	6
	43	120	140	24.9	14.5	M8	55	32.5	2	CPA43-CPN43	3
		150	170	24.9	14.5	M8	80	35	2	CPA43	4
		190	210	24.9	14.5	M8	40	35	4	CPA43	5
		230	250	24.9	14.5	M8	80	35	3	CPA43	6
	63	180	200	39.5	19.5	M8	54	9	4	CPA63	3
		235	255	39.5	19.5	M8	54	9.5	5	CPA63	4
		290	310	39.5	19.5	M8	54	10	6	CPA63	5
		345	365	39.5	19.5	M8	54	10.5	7	CPA63	6
CSK	43	120	140	24.9	14.5	M8	55	32.5	2	CRA43-CRN43	3
		150	170	24.9	14.5	M8	80	35	2	CRA43	4
		190	210	24.9	14.5	M8	40	35	4	CRA43	5
		230	250	24.9	14.5	M8	80	35	3	CRA43	6
	63	180	200	39.5	19.5	M8	54	9	4	CRA63	3
		235	255	39.5	19.5	M8	54	9.5	5	CRA63	4
		290	310	39.5	19.5	M8	54	10	6	CRA63	5
		345	365	39.5	19.5	M8	54	10.5	7	CRA63	6

* Information about the roller type, see pg. CR-29, tab. 18

Tab. 10

CD-series

Configuration A

Configuration A

Configuration B

Configuration B

Representation of slider with wiper

Fig. 35

**CD-slider with beveled rollers
for use in T- and U-rails**

**CDK-slider with crowned rollers
for use in K-rails
Size 43**

Hole S for screw
according to DIN 912

Hole S for screw
according to DIN 912
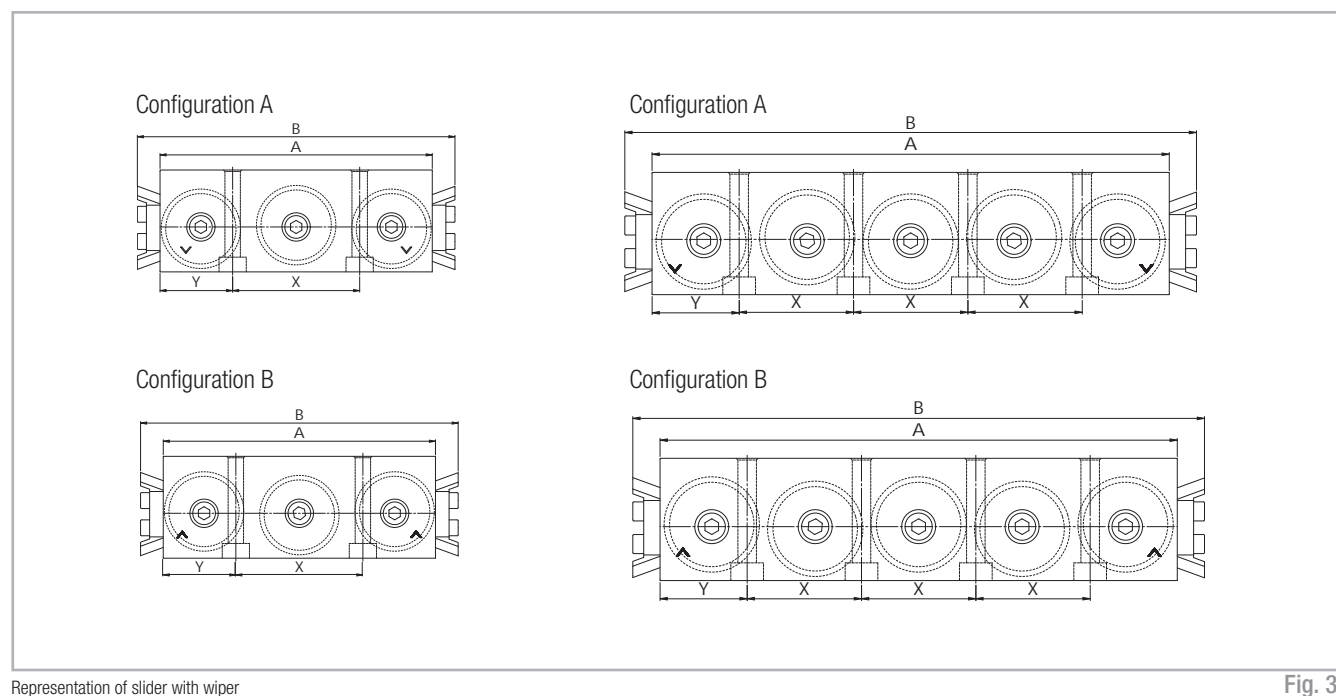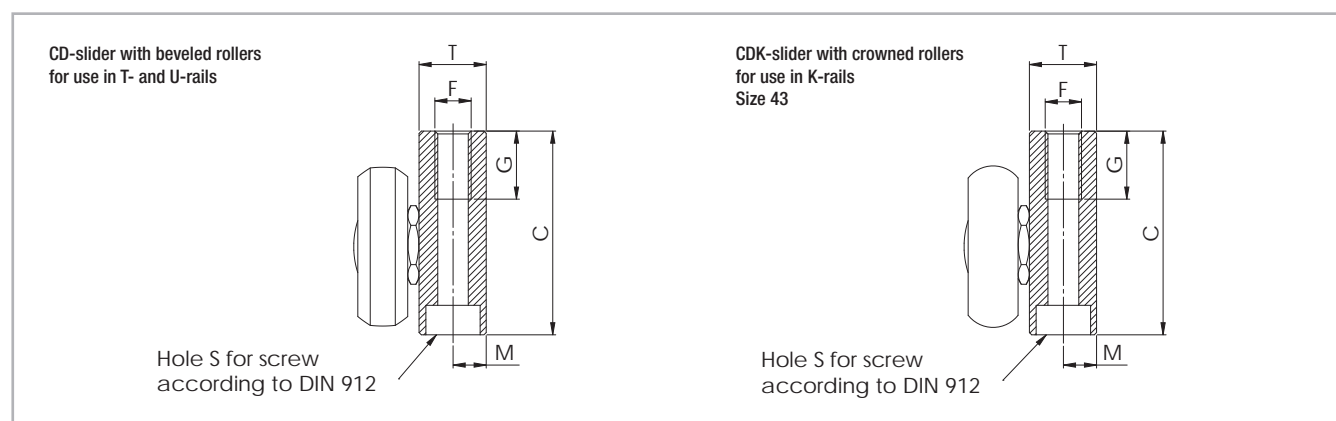
Fig. 36

Type	Size	A [mm]	B [mm]	C [mm]	T [mm]	M [mm]	S	G [mm]	F	X [mm]	Y [mm]	No. of holes	Roller type used*	Number of Rollers
CD	28	80	100	29.9	9.9	4.9	M5	15	M6	36	22	2	CPA28	3
		125	145	29.9	9.9	4.9	M5	15	M6	27	22	4	CPA28	5
	35	100	120	34.9	11.8	5.9	M6	15	M8	45	27.5	2	CPA35	3
		150	170	34.9	11.8	5.9	M6	15	M8	30	30	4	CPA35	5
	43	120	140	44.9	14.8	7.3	M6	15	M8	56	32	2	CPA43	3
		190	210	44.9	14.8	7.3	M6	15	M8	42	32	4	CPA43	5
CDK	43	120	140	44.9	14.8	7.3	M6	15	M8	56	32	2	CRA43	3
		190	210	44.9	14.8	7.3	M6	15	M8	42	32	4	CRA43	5

* Information about the roller type, see pg. CR-29, tab. 18   Tab. 11

T-rail with N- / C-slider

T-rail with N-slider   T-rail with CS-slider   T-rail with CD-slider
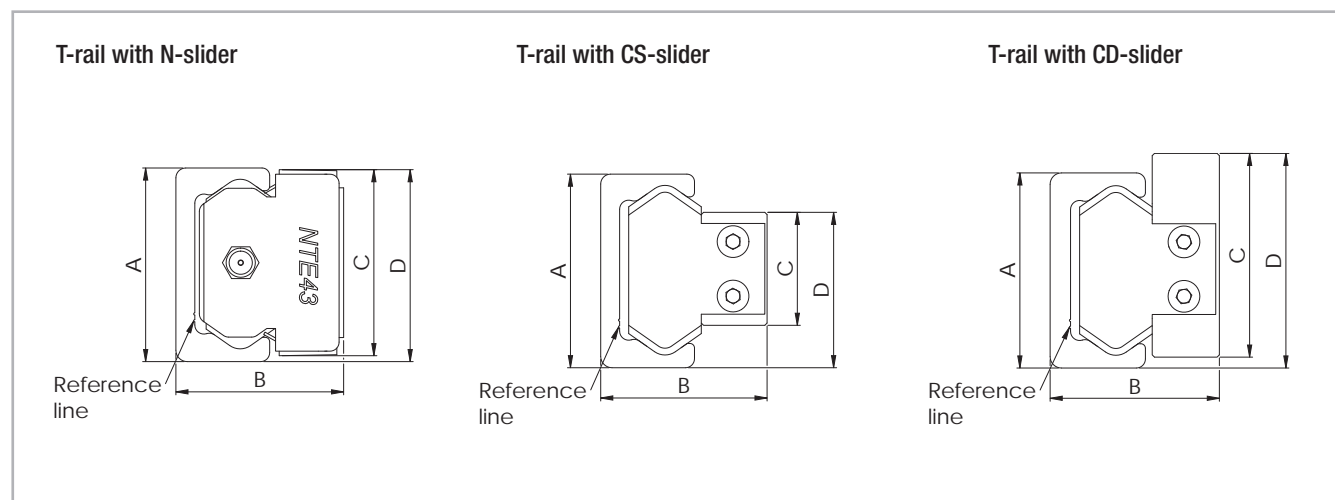
Fig. 37

Configuration	Size	A [mm]		B [mm]		C [mm]		D [mm]	
TL... / NT	18	18	+0.25 -0.10	16.5	+0.15 -0.15	17.6	0 -0.20	18.3	+0.25 -0.25
TL... / NTE	28	28	+0.25 -0.10	24	+0.25 -0.10	26.5	+0.10 -0.20	28	+0.15 -0.35
	43	43	+0.35 -0.10	37	+0.25 -0.10	40	0 -0.30	41.9	+0,20 -0.35
	63	63	+0.35 -0.10	50.5	+0.25 -0.10	60	+0.10 -0.20	62	0 -0.50
TL... / NTE...L	28	28	+0.25 -0.10	24	+0.25 -0.10	26.5	+0.10 -0.20	28	+0.15 -0.35
	43	43	+0.35 -0.10	37	+0.25 -0.10	41	0 -0.30	42.4	+0.20 -0.35
TL... / CS	18	18	+0.25 -0.10	15	+0.15 -0.15	9.5	0 -0.05	14	+0.05 -0.25
	28	28	+0.25 -0.10	23.9	+0.15 -0.15	14.9	0 -0.10	21.7	+0.05 -0.35
	35	35	+0.35 -0.10	30.2	+0.10 -0.30	19.9	+0.05 -0.15	27.85	+0.10 -0.30
	43	43	+0.35 -0.10	37	+0.15 -0.15	24.9	0 -0.15	34.3	+0.10 -0.30
	63	63	+0.35 -0.10	49.8	+0.15 -0.15	39.5	+0.15 0	51.6	+0.15 -0.30
TL... / CD	28	28	+0.25 -0.10	24.1	+0.20 -0.20	29.9	0 -0.50	32	+0.05 -0.35
	35	35	+0.35 -0.10	30.1	+0.20 -0.20	34.9	0 -0.50	37.85	+0.10 -0.30
	43	43	+0.35 -0.10	37.3	+0.20 -0.20	44.9	0 -0.50	47	+0.10 -0.30

Tab. 12

▶ TR-rail with N- / C-slider

TR-rail with N-slider   TR-rail with CS-slider   TR-rail with CD-slider

Reference line
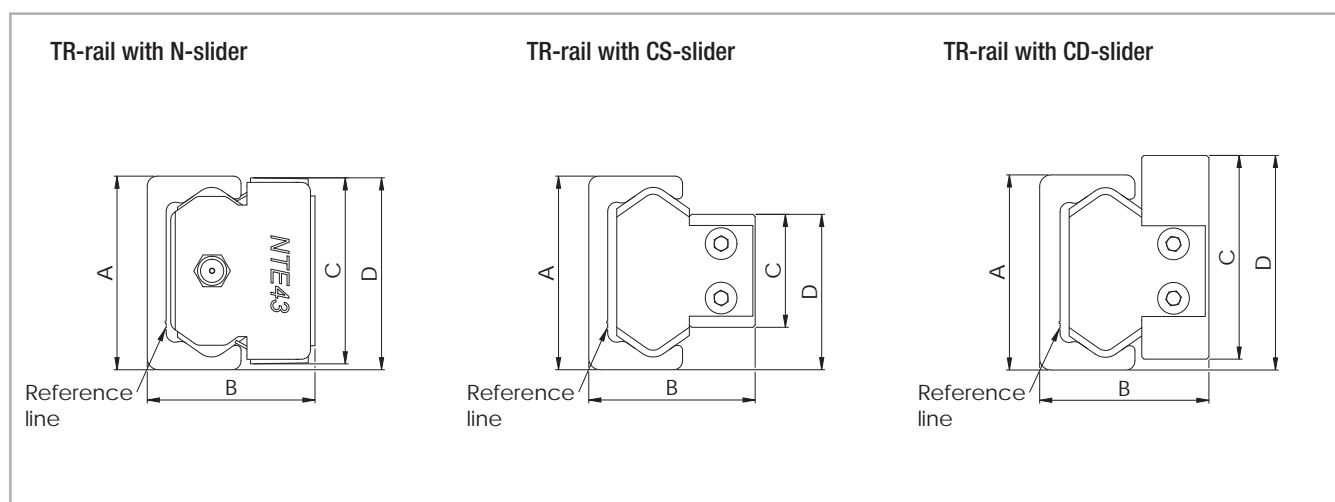
Fig. 38

Configuration	Size	A [mm]		B [mm]		C [mm]		D [mm]	
TR... / NT	18	17.95	+0.10 -0.05	16.4	+0.10 -0.05	17.6	0 -0.20	17.9	+0.15 -0.15
TR... / NTE	28	27.83	+0.10 -0.05	23.9	+0.15 -0.10	26.5	+0.10 -0.20	27.2	+0.15 -0.15
	43	42.75	+0.10 -0.05	36.9	+0.15 -0.10	40	0 -0.30	41.3	+0.15 -0.20
	63	62.8	+0.10 -0.05	50.4	+0.20 -0.10	60	+0,10 -0.30	61.3	+0.15 -0.20
TR... / NTE...L	28	27.83	+0.10 -0.05	23.9	+0.15 -0.10	26.5	+0.10 -0.20	27.2	+0.15 -0.15
	43	42.75	+0.10 -0.05	36.9	+0.15 -0.10	41	0 -0.30	41.8	+0.15 -0.20
TR... / CS	18	17.95	+0.10 -0.05	14.9	+0.10 -0.10	9.5	0 -0.05	13.8	+0.15 -0.15
	28	27.83	+0.10 -0.05	23.8	+0.10 -0.10	14.9	0 -0.10	21.3	+0.10 -0.20
	35	34.75	+0.10 -0.05	30.1	+0.10 -0.30	19.9	+0,05 -0.15	27.35	+0.10 -0.20
	43	42.75	+0.10 -0.05	36.9	+0.15 -0.10	24.9	0 -0.15	33.5	+0.10 -0.20
	63	62.8	+0.10 -0.05	49.7	+0.10 -0.15	39.5	+0.15 0	51.05	+0.15 -0.10
TR... / CD	28	27.83	+0.10 -0.05	24	+0.10 -0.20	29.9	0 -0.50	31.63	+0.10 -0.20
	35	34.75	+0.10 -0.05	30	+0.10 -0.20	34.9	0 -0.50	37.35	+0.10 -0.20
	43	42.75	+0.10 -0.05	37.2	+0.10 -0.20	44.9	0 -0.50	46.4	+0.10 -0.20

Tab. 13

U-rail with N- / C-slider

U-rail with N-slider   U-rail with CS-slider   U-rail with CD-slider

Reference line
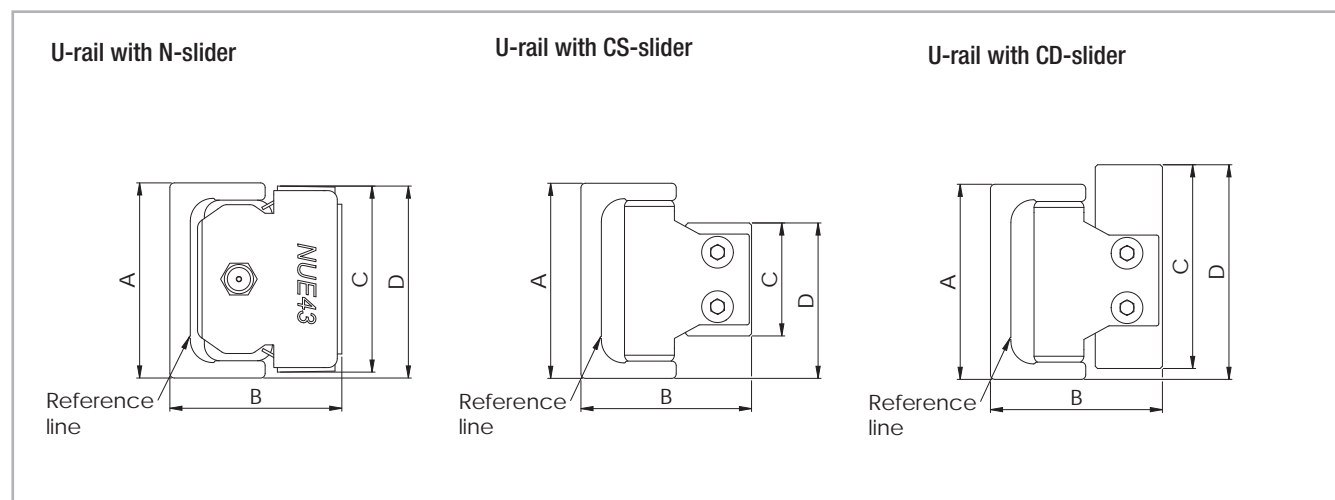
Fig. 39

Configuration	Size	A [mm]		B_nom* [mm]	C [mm]		D [mm]	
UL... / NU	18	18	+0.25 -0.10	16.5	17.6	0 -0.20	18.3	+0.25 -0.25
UL... / NUE	28	28	+0.25 -0.10	24	26.5	0 -0.20	28	+0.15 -0.35
	43	43	+0.35 -0.10	37	40	0 -0.30	41.9	+0.20 -0.30
	63	63	+0.35 -0.10	50.5	60	-0.20	62	0 -0.50
UL... / NUE...L	28	28	+0.25 -0.10	24	26.5	0 -0.20	28	+0.15 -0.35
	43	43	+0.35 -0.10	37	41	0 -0.30	42.4	+0.20 -0.35
UL... / CS	18	18	+0.25 -0.10	15	9.5	0 -0.05	14	+0.05 -0.25
	28	28	+0.25 -0.10	23.9	14.9	0 -0.10	21.7	+0.05 -0.35
	35	35	+0.35 -0.10	30.2	19.9	+0.05 -0.15	27.85	+0.10 -0.30
	43	43	+0.35 -0.10	37	24.9	0 -0.15	34.3	+0.15 -0.30
	63	63	+0.35 -0.10	49.8	39.5	+0.15 0	51.6	+0.15 -0.30
UL... / CD	28	28	+0.25 -0.10	24.1	29.9	0 -0.50	32	+0.05 -0.35
	35	35	+0.35 -0.10	30.1	34.9	0 -0.50	37.85	+0.10 -0.30
	43	43	+0.35 -0.10	37.3	44.9	0 -0.50	47	+0.10 -0.30

* see pg. CR-40 Offset T+U-system
  see pg. CR-43 Offset K+U-system

Tab. 14

K-rail with N- / C-slider

K-rail with N-slider   K-rail with CS-slider   K-rail with CD-slider
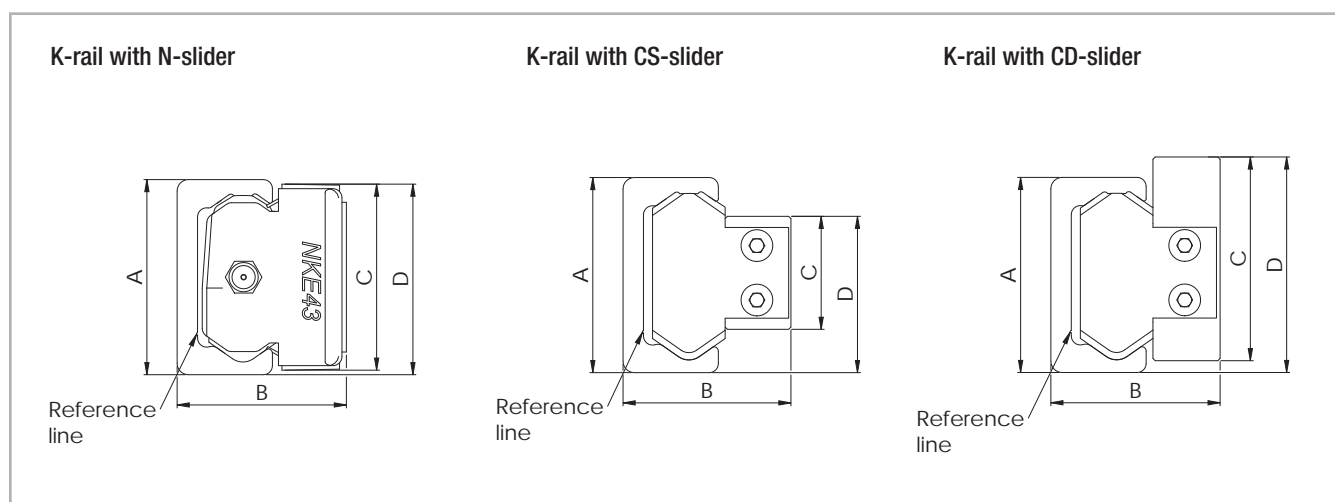
The K-rail enables the slider to rotate around its longitudinal axis (see pg. CR-42)   Fig. 40

Configuration	Size	A [mm]		B [mm]		C [mm]		D [mm]	
KL... / NKE	43	43	+0.35 -0.10	37	+0.25 -0.10	40	0 -0.30	41.9	+0.20 -0.35
	63	63	+0.35 -0.10	50.5	+0.25 -0.10	60	+0.10 -0.20	62	0 -0.50
KL... / NKE...L	43	43	+0.35 -0.10	37	+0.25 -0.10	41	0 -0.30	42.7	+0.20 -0.35
KL... / CSK	43	43	+0.35 -0.10	37	+0.15 -0.15	24.9	0 -0.15	34.3	+0.10 -0.30
	63	63	+0.35 -0.10	49.8	+0.15 -0.15	39.5	+0.15 0	51.6	+0.15 -0.30
KL... / CDK	43	43	+0.35 -0.10	37.3	+0.20 -0.20	44.9	0 -0.50	47	+0.10 -0.30

Tab. 15

Offset of fixing holes

Principle representation of offset with T-rails
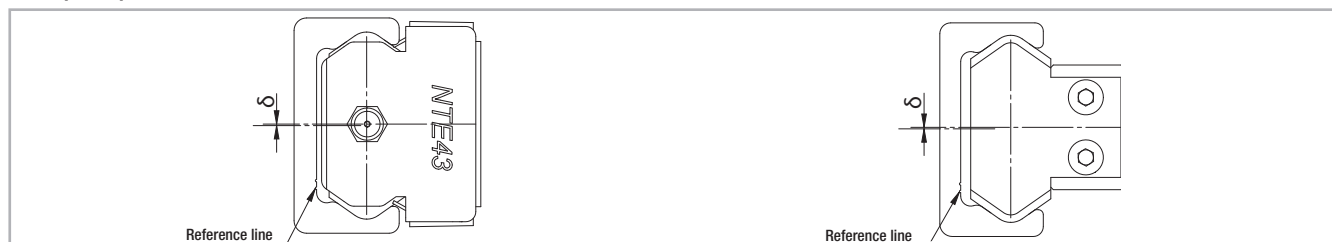
Fig. 41

Configuration	Size	δ nominal [mm]	δ maximum [mm]	δ minimum [mm]
TLC / NT	18	0.45	0.95	-0.25
	28	0.35	0.85	-0.4
TLC / NTE	43	0.35	0.9	-0.5
	63	0.35	0.8	-0.55
KLC / NKE	43	0.35	0.9	-0.5
	63	0.35	0.8	-0.55
ULC / NU	18	0.4	0.9	-0.25
	28	0.4	0.85	-0.3
ULC / NUE	43	0.4	0.85	-0.45
	63	0.35	0.8	-0.45
TLV / NT	18	0.45	0.8	-0.2
	28	0.35	0.7	-0.35
TLV / NTE	43	0.35	0.75	-0.45
	63	0.35	0.65	-0.55
KLV / NKE	43	0.35	0.75	-0.45
	63	0.35	0.65	-0.55
ULV / NU	18	0.4	0.75	-0.2
	28	0.4	0.7	-0.25
ULV / NUE	43	0.4	0.7	-0.4
	63	0.35	0.65	-0.45
	18	0.35	0.75	-0.2
	28	0.25	0.6	-0.35
TLC / CS	35	0.35	0.7	-0.35
	43	0.35	0.8	-0.35
	63	0.35	0.6	-0.35
KLC / CSK	43	0.35	0.8	-0.35
	63	0.35	0.6	-0.35

Tab. 16

Configuration	Size	δ nominal [mm]	δ maximum [mm]	δ minimum [mm]
	18	0.3	0.7	-0.2
	28	0.3	0.6	-0.3
ULC / CS	35	0.35	0.7	-0.35
	43	0.4	0.75	-0.35
	63	0.35	0.6	-0.25
	18	0.35	0.6	-0.15
	28	0.25	0.45	-0.3
TLV / CS	35	0.35	0.55	-0.3
	43	0.35	0.65	-0.3
	63	0.35	0.45	-0.35
KLV / CSK	43	0.35	0.65	-0.3
	63	0.35	0.45	-0.35
	18	0.3	0.55	-0.15
	28	0.3	0.45	-0.25
ULV / CS	35	0.35	0.55	-0.3
	43	0.4	0.6	-0.3
	63	0.35	0.45	-0.25
TRC / NT	18	0.15	0.65	-0.2
	28	0.15	-0.5	-0.25
TRC / NTE	43	0.05	0.4	-0.3
	63	0	0.4	-0.4
	18	0.05	0.45	-0.2
	28	0.05	0.3	-0.25
TRC / CS	35	0.1	0.35	-0.2
	43	0.05	0.35	-0.25
	63	0	0.2	-0.2

Tab. 17

Accessories ⌄

▸ Rollers

Version 1
Prismatic (T- and U-rail)

CPN
Concentric roller

CPA
Eccentric roller
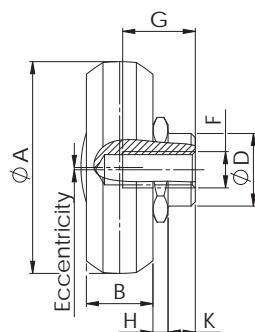
Version 2
Crowned (K-rail)

CRN
Concentric roller

CRA
Eccentric roller
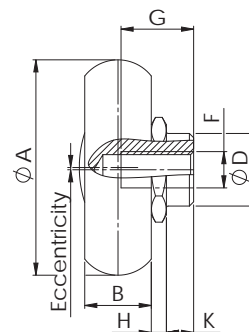
Seals: 2RS is the splash-proof seal, 2Z (2ZR for size 63) is the steel cover disc
Note: The rollers are lubricated for life

Fig. 42

Type	A [mm]	B [mm]	D [mm]	e [mm]	H [mm]	K [mm]	G [mm]	F	C [N]	C_{0rad} [N]	Weight [kg]
CPN18-2RS	14	4	6	-	1.55	1.8	5.5	M4	765	410	0.004
CPN18-2Z	14	4	6	-	1.55	1.8	5.5	M4	765	410	0.004
CPA18-2RS	14	4	6	0.4	1.55	1.8	5.5	M4	765	410	0.004
CPA18-2Z	14	4	6	0.4	1.55	1.8	5.5	M4	765	410	0.004
CPN28-2RS	23.2	7	10	-	2.2	3.8	7	M5	2130	1085	0.019
CPN28-2Z	23.2	7	10	-	2.2	3.8	7	M5	2130	1085	0.019
CPA28-2RS	23.2	7	10	0.6	2.2	3.8	7	M5	2130	1085	0.019
CPA28-2Z	23.2	7	10	0.6	2.2	3.8	7	M5	2130	1085	0.019
CPN35-2RS	28.2	7.5	12	-	2.55	4.2	9	M5	4020	1755	0.032
CPN35-2Z	28.2	7.5	12	-	2.55	4.2	9	M5	4020	1755	0.032
CPA35-2RS	28.2	7.5	12	0.7	2.55	4.2	9	M5	4020	1755	0.032
CPA35-2Z	28.2	7.5	12	0.7	2.55	4.2	9	M5	4020	1755	0.032
CPN43-2RS	35	11	12	-	2.5	4.5	12	M6	6140	2750	0.06
CPN43-2Z	35	11	12	-	2.5	4.5	12	M6	6140	2750	0.06
CPA43-2RS	35	11	12	0.8	2.5	4.5	12	M6	6140	2750	0.06
CPA43-2Z	35	11	12	0.8	2.5	4.5	12	M6	6140	2750	0.06
CPN63-2ZR	50	17.5	18	-	2.3	6	16	M8	15375	6250	0.19
CPA63-2ZR	50	17.5	18	1.2	2.3	6	16	M10	15375	6250	0.19
CRN43-2Z	35.6	11	12	-	2.5	4.5	12	M6	6140	2550	0.06
CRA43-2Z	35.6	11	12	0.8	2.5	4.5	12	M6	6140	2550	0.06
CRN63-2ZR	49.7	17.5	18	-	2.3	6	16	M8	15375	5775	0.19
CRA63-2ZR	49.7	17.5	18	1.2	2.3	6	16	M10	15375	5775	0.19

Tab. 18

▶ Wipers for C-slider

Wiper WT for T-rail   Wiper WU for U-rail   Wiper WK for K-rail
                                                          Sizes 43 and 63
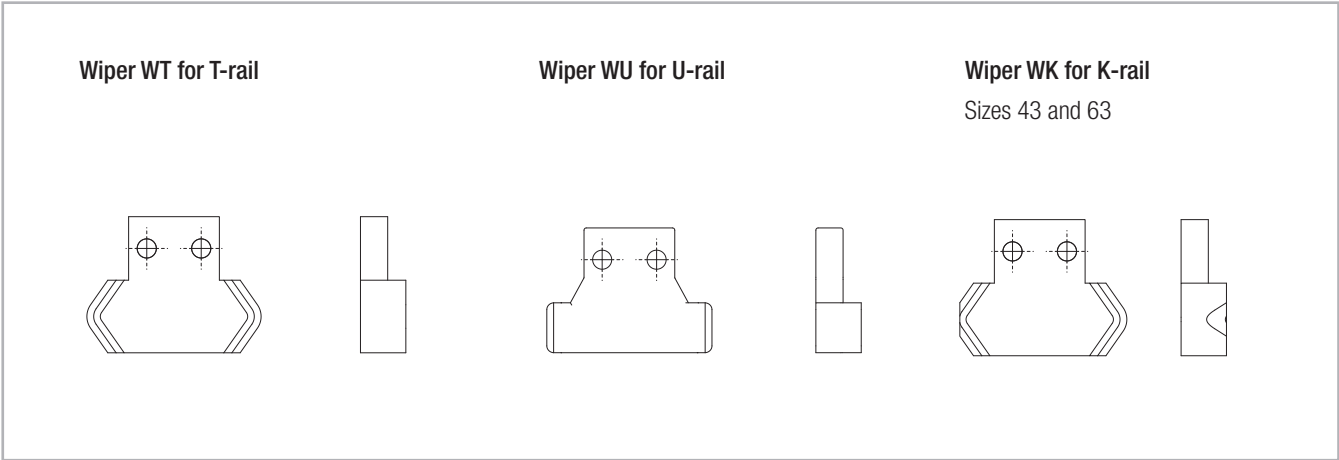
Fig. 43

▶ Alignment fixture AT (for T- and U-rail)
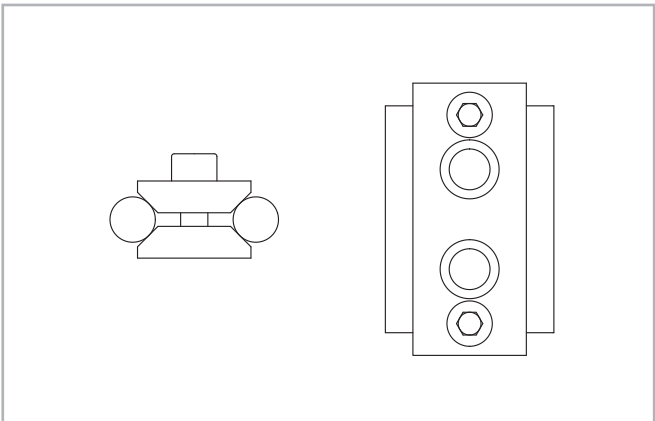
Fig. 44

Rail size	Alignment fixture
18	AT 18
28	AT 28
35	AT 35
43	AT 43
63	AT 63

Tab. 19

▶ Alignment fixture AK (for K-rail)
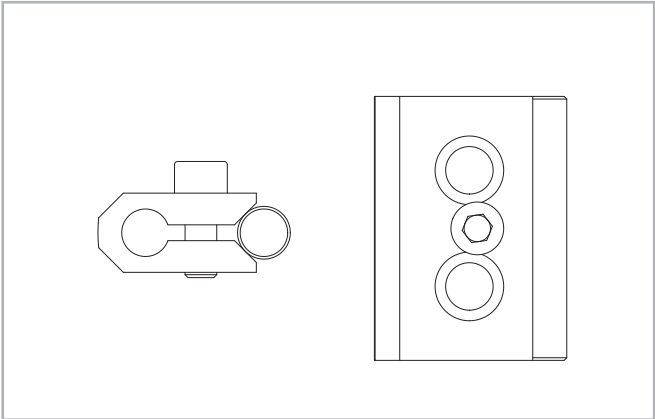
Fig. 45

Rail size	Alignment fixture
43	AK 43
63	AK 63

Tab. 20

Fixing screws
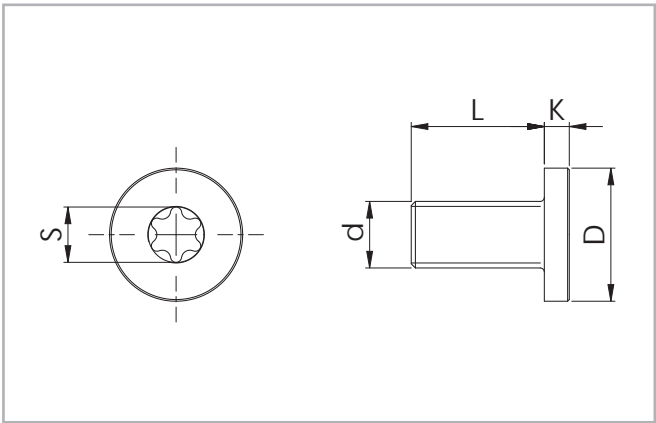
Fig. 46

Rail size	d	D [mm]	L [mm]	K [mm]	S	Tightening torque [Nm]
18	M4 x 0.7	8	8	2	T20	3
28	M5 x 0.8	10	10	2	T25	9
35	M6 x 1	13	13	2,7	T30	12
43	M8 x 1.25	16	16	3	T40	22
63	M8 x 1.25	13	20	5	T40	35

Tab. 21
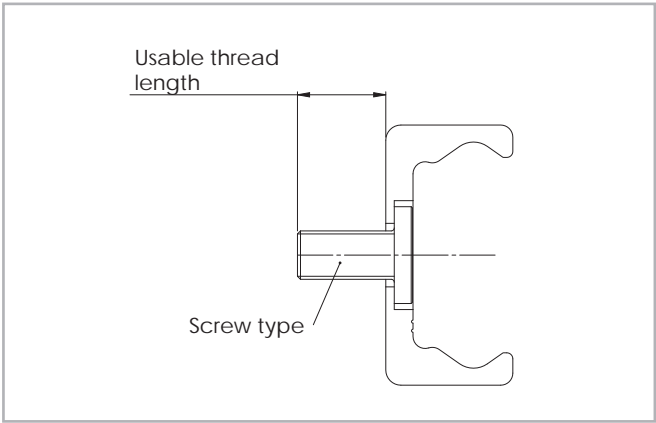
Fig. 47

Rail size	Screw type	Usable thread length [mm]
18	M4 x 8	7.2
28	M5 x 10	9
35	M6 x 13	12.2
43	M8 x 16	14.6
63	M8 x 20	17.2

Tab. 22

Manual clamp elements

Compact Rail guides can be secured with manual clamping elements. Areas of application are:

- Table cross beams and sliding beds
- Width adjustment, stops
- Positioning of optical equipment and measuring tables

The HK series is a manually activated clamping element. By using the freely adjustable clamping lever (except for HK 18, which uses hexagon socket bolt M6 DIN 913 with 3 mm drive) press the contact profile synchronously on the free surfaces of the rail. The floating mounted contact profiles guarantee symmetrical introduction of force on the guide rail.

HK 18
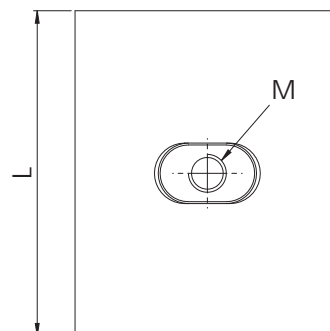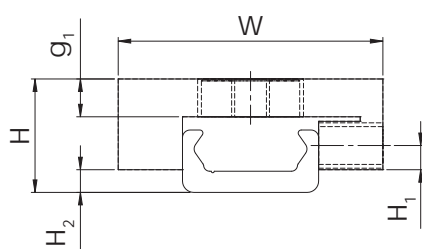
Fig. 48

HK 28-63 (except for size 35)
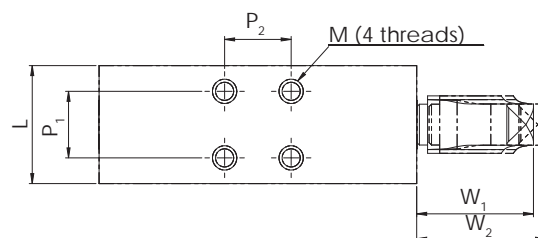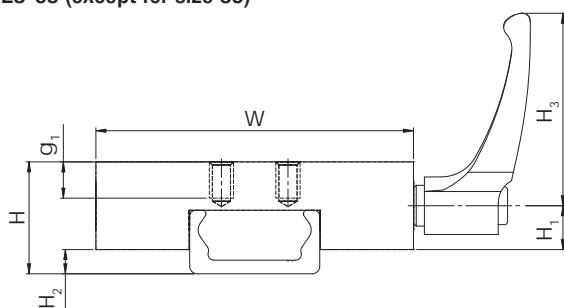
Fig. 49

Type	Size	Holding force	Tightening torque	Dimensions [mm]											M
		[N]	[Nm]	H	H_1	H_2	H_3	W	W_1	W_2	L	P_1	P_2	g_1	
HK1808A	18	150	0.5	15	3.2	3	-	35	-	-	43	0	0	6	M5
HK2808A	28	1200	7	24	17	5	64	68	38.5	41.5	24	15	15	6	M5
HK4308A	43	2000	15	37	28.5	8	78	105	46.5	50.5	39	22	22	12	M8
HK6308A	63	2000	15	50.5	35	9.5	80	138	54.5	59.5	44	26	26	12	M8

Tab. 23

Technical instructions ⌄

› Linear accuracy

Linear accuracy is defined as the maximum deviation of the slider in the rail based on the side and support surface during straight line movement.

The linear accuracy, depicted in the graphs below, applies to rails that are carefully installed with all the provided screws on a level and rigid foundation.
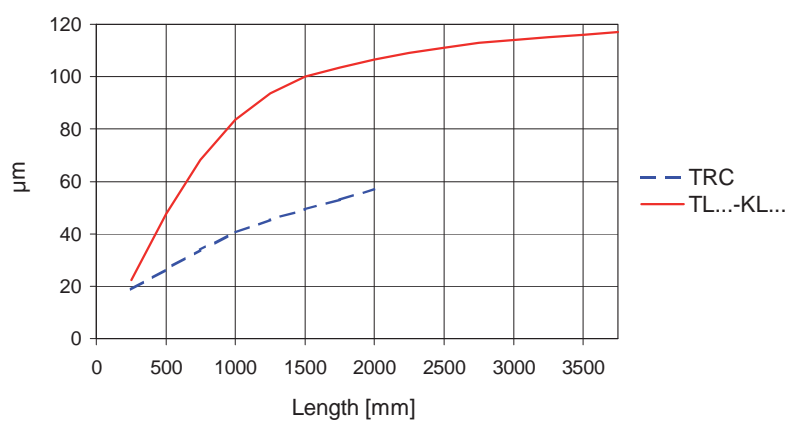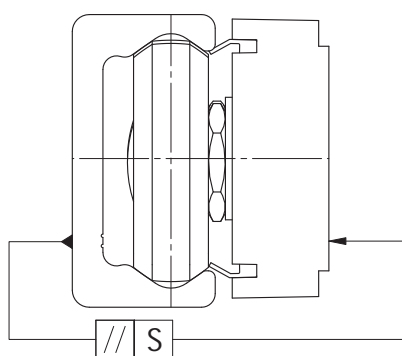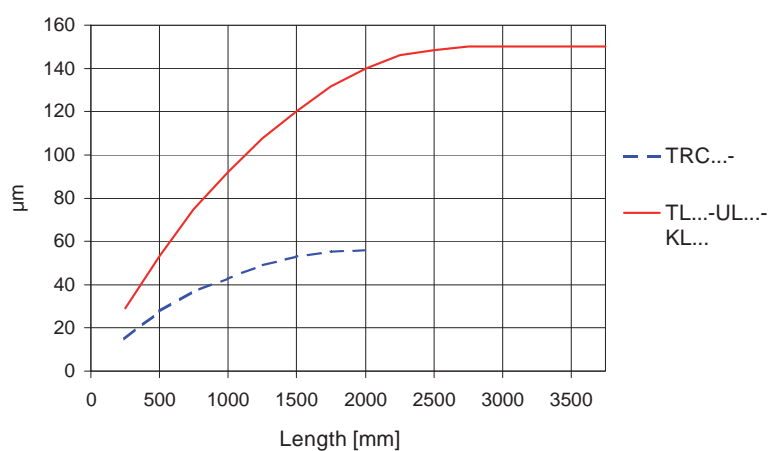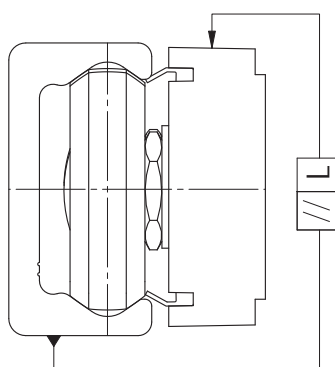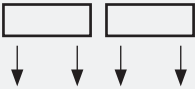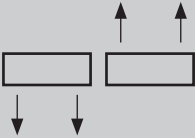
Fig. 50

Deviation of accuracy with two 3 roller sliders in one rail

Type	TL..., UL..., KL... TRC
ΔL [mm] Slider with equal arrangement	0.2
ΔL [mm] Slider with opposite arrangement	1.0
ΔS [mm]	0.05

Tab. 24

▶ Rigidity

Total deformation

In the following deformation diagrams the total deviation of the linear guide is indicated under the effect of external loads P or moments M. As seen from the graphs, the rigidity can be increased by supporting the sides of the rails. The graph values indicate only the deformation of the linear guide, the supporting structure is assumed infinitely rigid. All graphs refer to sliders with 3 rollers and K1 preload (standard setting). An increased preload, K2, reduces the deformation values by 25 %.

Size 18 - 43

Radial load

Fig. 51

CR-35
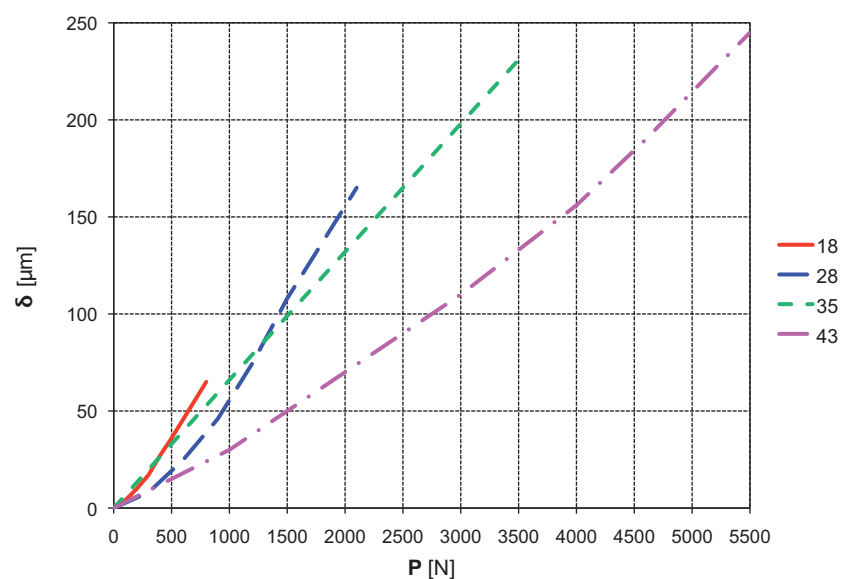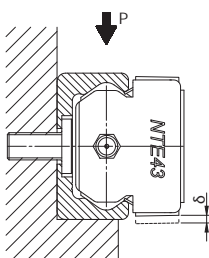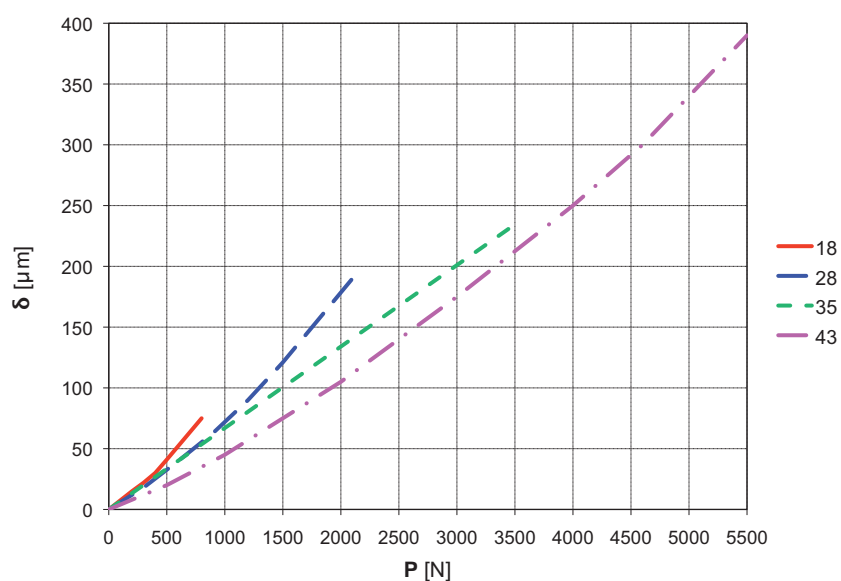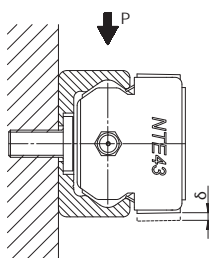
Axial load

Moment Mx

Fig. 52

CR-36
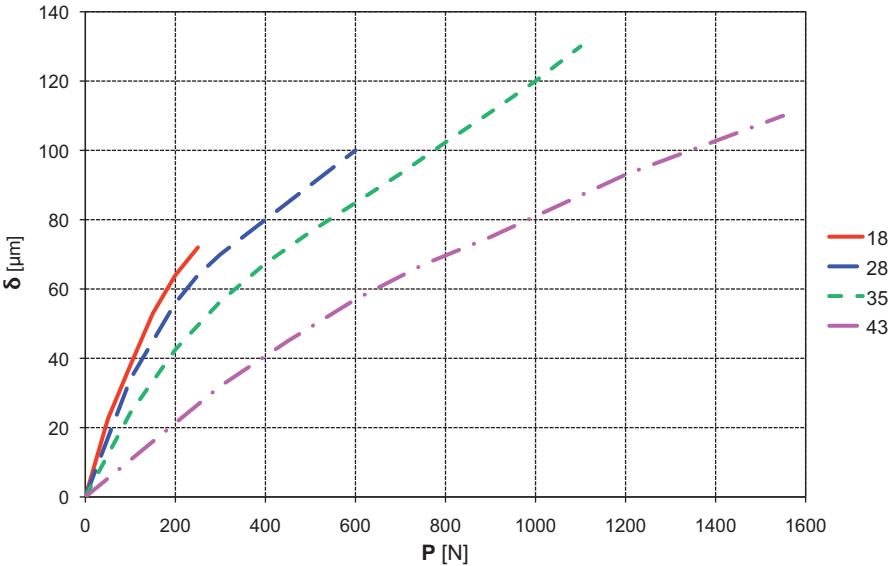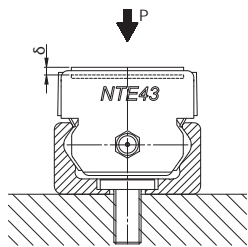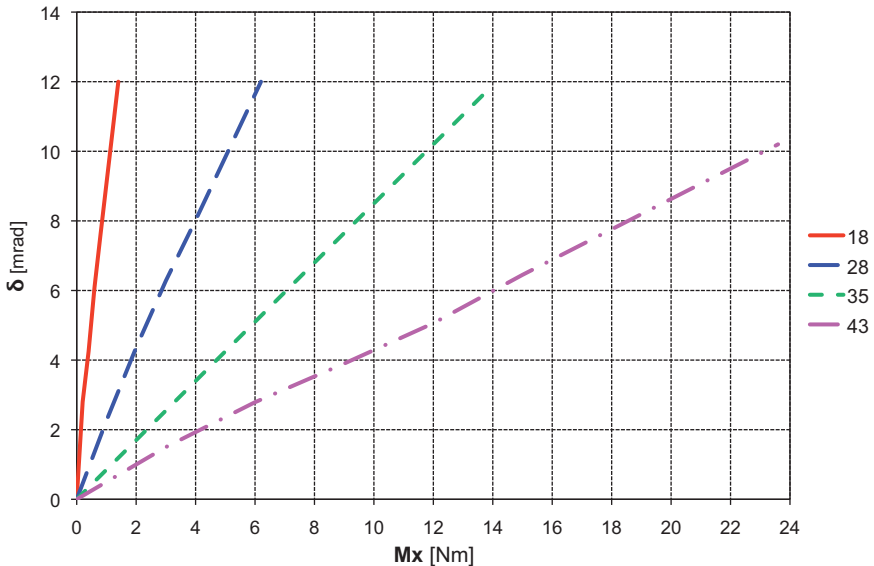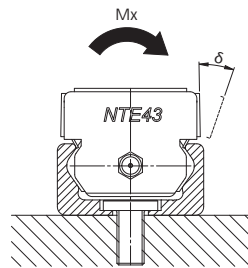
Size 63

Radial load

Fig. 53

CR-37
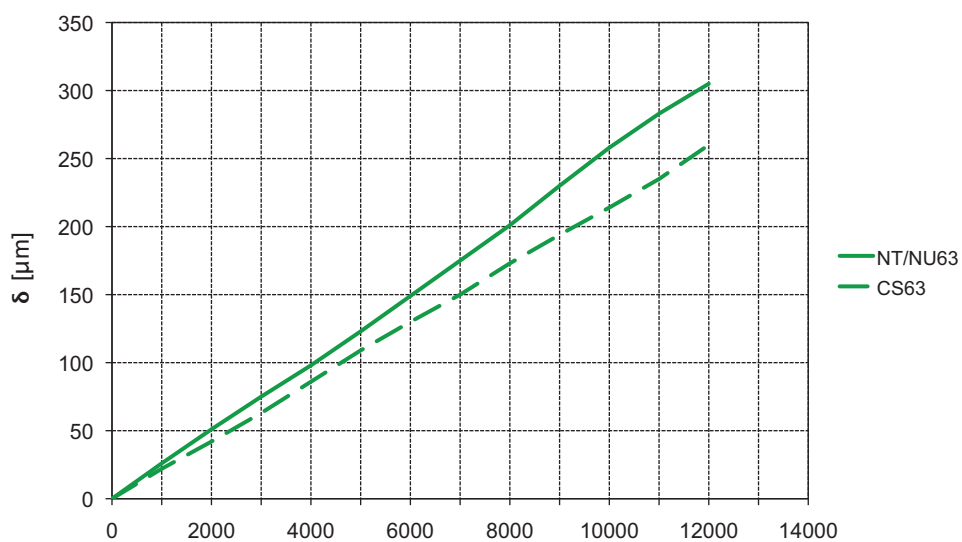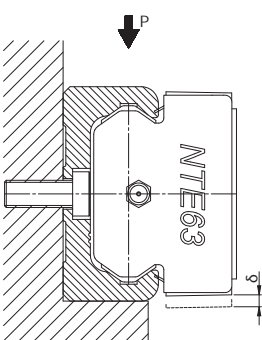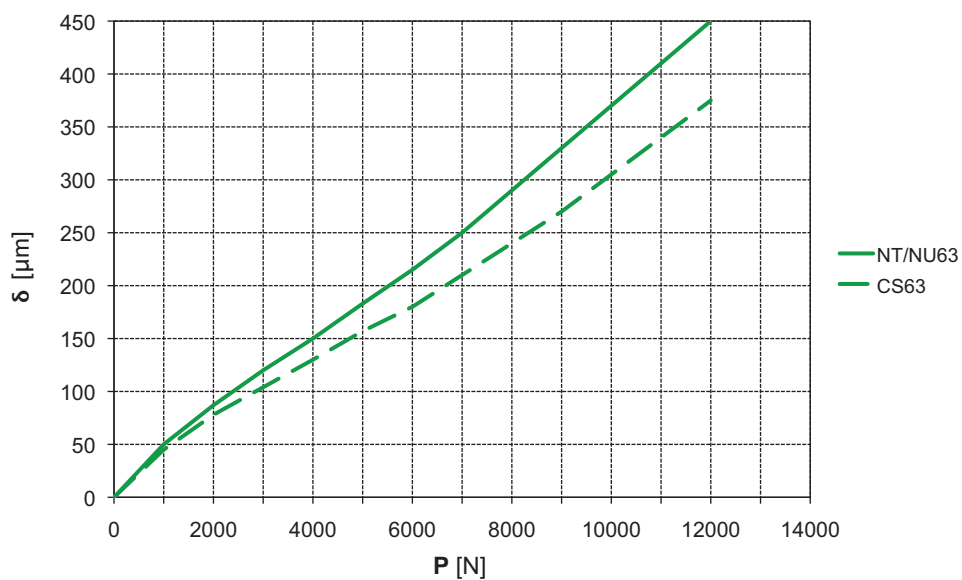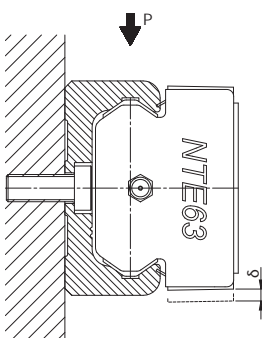
Axial load
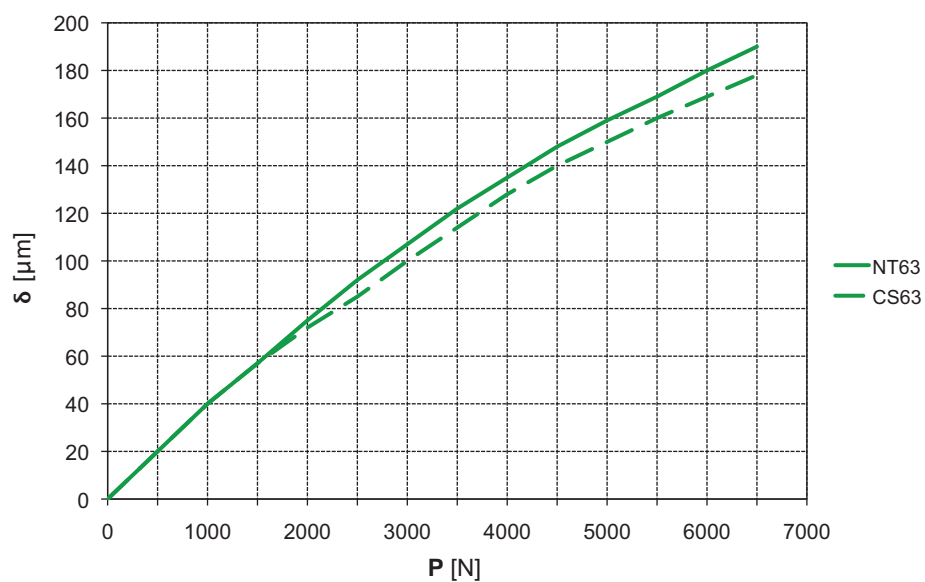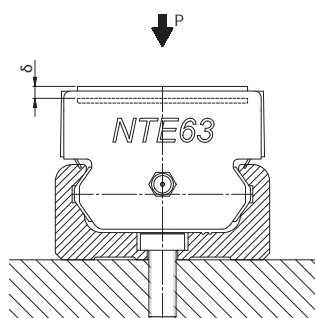
Moment Mx
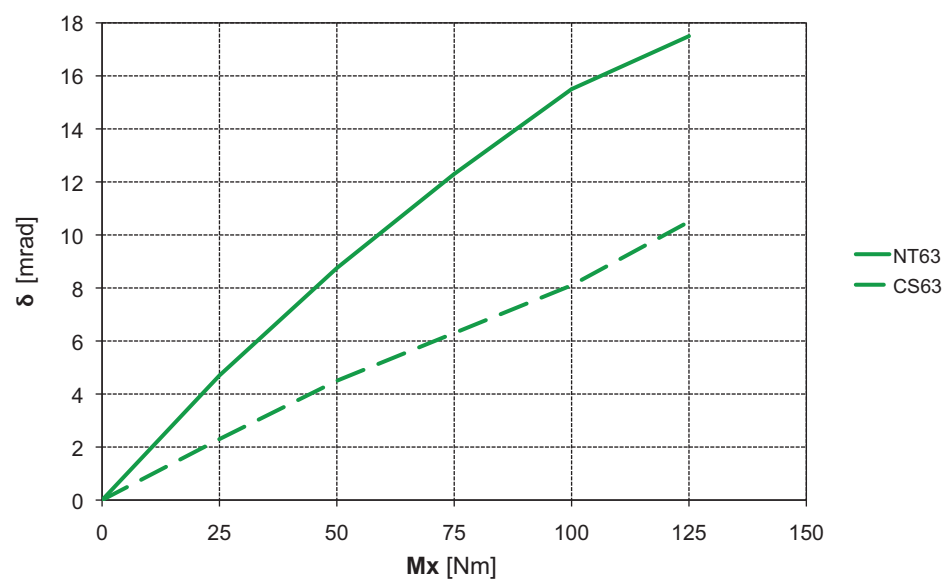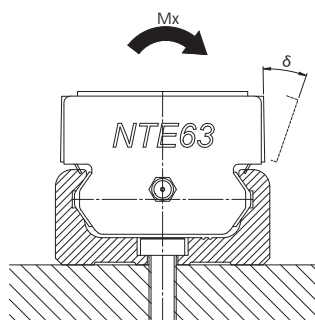
Fig. 54

> Supported sides

If a higher system rigidity is required, a support of the rail sides is recommended, which can also be used as the reference surface (see fig. 55). The minimum required support depth can be taken from the adjacent table (see tab. 25).
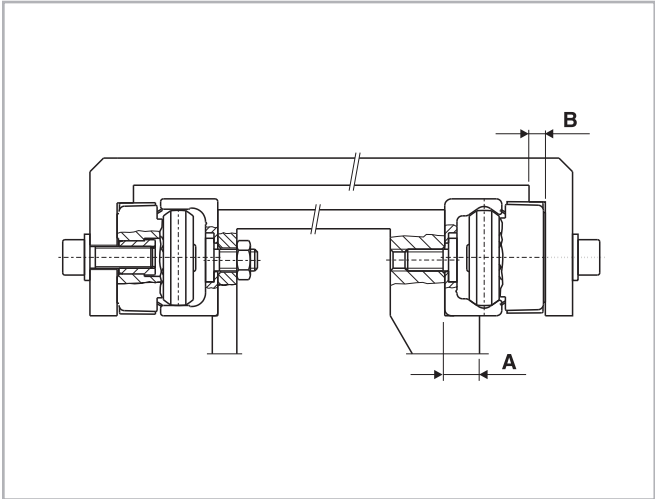
Fig. 55

Rail size	A [mm]	B [mm]
18	5	4
28	8	4
35	11	5
43	14	5
63	18	5

Tab. 25

T+U-system tolerance compensation

Axial deviations in parallelism

This problem occurs fundamentally by insufficient precision in the axial parallelism of the mounting surfaces, which results in an excessive load on the slider and thus causes drastically reduced service life.

The use of fixed bearing and compensating bearing rail (T+U-system) solves the unique problem of aligning two track, parallel guide systems. By using a T+U-system, the T-rail takes over the motion of the track while the U-rail serves as a support bearing and takes only radial forces and M_z moments.

Fig. 56
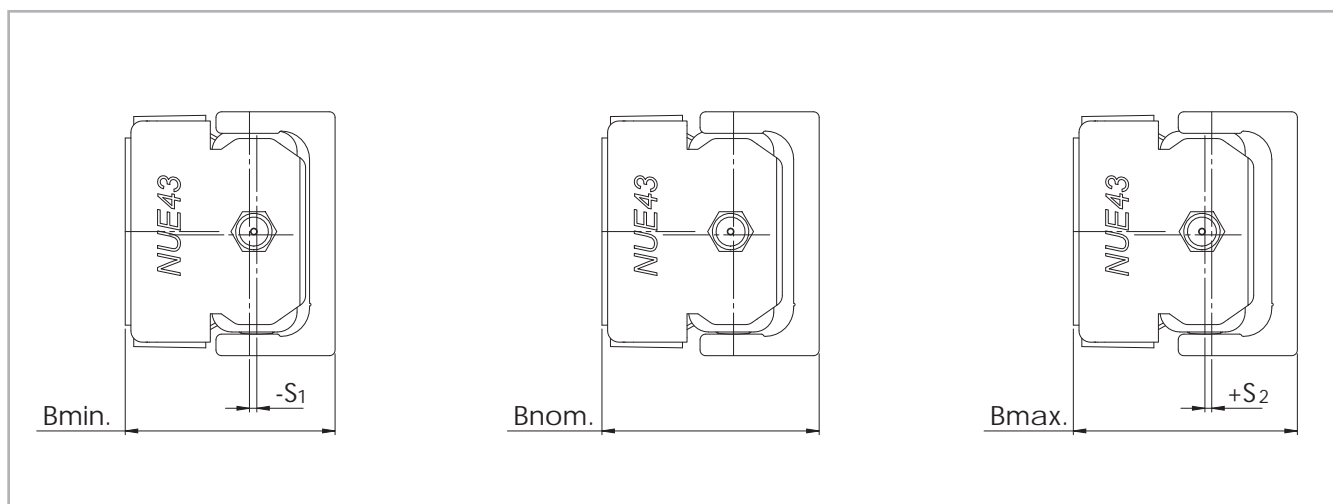
Fig. 57

T+U-system maximum offset

U-rails have flat parallel raceways that allow free lateral movement of the sliders. The maximum axial offset that can be compensated for in each slider of the U-rail is made up of the combined values S_1 and S_2 listed in table 26. Considered from a nominal value B_{nom} as the starting point, S_1 indicates the maximum offset into the rail, while S_2 represents the maximum offset towards the outside of the rail.

Slider type	S_1 [mm]	S_2 [mm]	B_{min} [mm]	B_{nom} [mm]	B_{max} [mm]
NU18	0	1.1	16.5	16.5	17.6
CS18	0.3	1.1	14.7	15	16.1
NUE28 NUE28L	0	1.3	24	24	25.3
CS28 CD28	0.6	1.3	23.3	23.9	25.2
CS35	1.3	2.7	28.9	30.2	32.9
CD35	1.3	2.7	28.8	30.1	32.8
NUE43 NUE43L	0	2.5	37	37	39.5
CS43	1.4	2.5	35.6	37	39.5
CD43	1.4	2.5	35.9	37.3	39.8
NUE63	0	3.5	50.5	50.5	54
CS63	0.4	3.5	49.4	49.8	53.3

Tab. 26

The application example in the adjacent drawing (see fig. 59) shows that the T+U-system implements a problem-free function of the slider even with an angled offset in the mounting surfaces.

If the length of the guide rails is known, the maximum allowable angle deviation of the screwed surfaces can be determined using this formula (the slider in the U-rail moves here from the innermost position S_1 to outermost position S_2):

$$\alpha = \arctan\frac{S^*}{L}$$

S^* = Sum of S_1 and S_2
L = Length of rail

Fig. 58

The following table (tab. 27) contains guidelines for this maximum angle deviation α, achievable with the longest guide rail from one piece.

Size	Rail length [mm]	Offset S [mm]	Angle α [°]
18	2000	1.4	0.040
28	3200	1.9	0.034
35	3600	4	0.063
43	3600	3.9	0.062
63	3600	3.9	0.062

Tab. 27

The T+U-system can be designed in different arrangements (see fig. 60). A T-rail accepts the vertical components of load P. A U-rail attached underneath the component to be guided prevents the vertical panel from swinging and is used as moment support. In addition a vertical offset in the structure, as well as possible existing unevenness of the support surface, is compensated for.
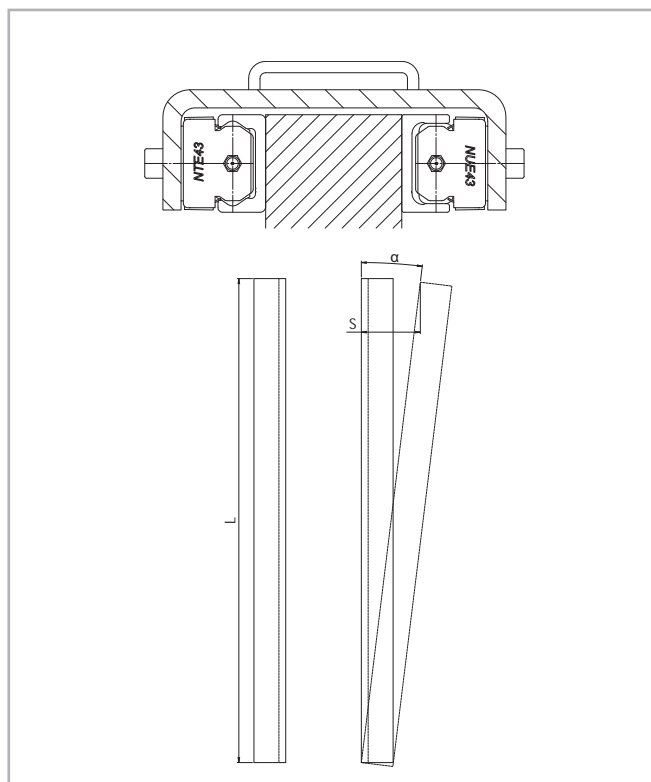
Fig. 59

Fig. 60

❯ K+U-system tolerance compensation

Deviations in parallelism in two planes

The K+U-system, like the T+U-system, can compensate for axial deviations in parallelism. Additionally, the K+U system has the option of rotating the slider in the rail, which will compensate for other deviations in parallelism, e.g. height offset.

The unique raceway contour of the K-rail allows the slider a certain rotation around its longitudinal axis, with the same linear precision as with a T-rail. With the use of a K+U-system, the K-rail accounts for the main loads and the motion of the track. The U-rail is used as a support bearing and takes only radial forces and M_z moments. The K-rail must always be installed so that the radial load of the slider is always supported by at least 2 load bearing roller sliders, which lie on the V-shaped raceway (reference line) of the rail.

Fig. 61

K-rails and sliders are available in both sizes 43 and 63.

The custom NKE-slider may only be used in K-rails and cannot be exchanged with other Rollon sliders. The maximum allowable rotation angle of the NKE- and NUE-sliders are shown in the following table 28 and figure 62. α_1 is the maximum rotation angle counterclockwise, α_2 is clockwise.

Slider type	α_1 [°]	α_2 [°]
NKE43 and NUE43	2	2
NKE63 and NUE63	1	1

Tab. 28
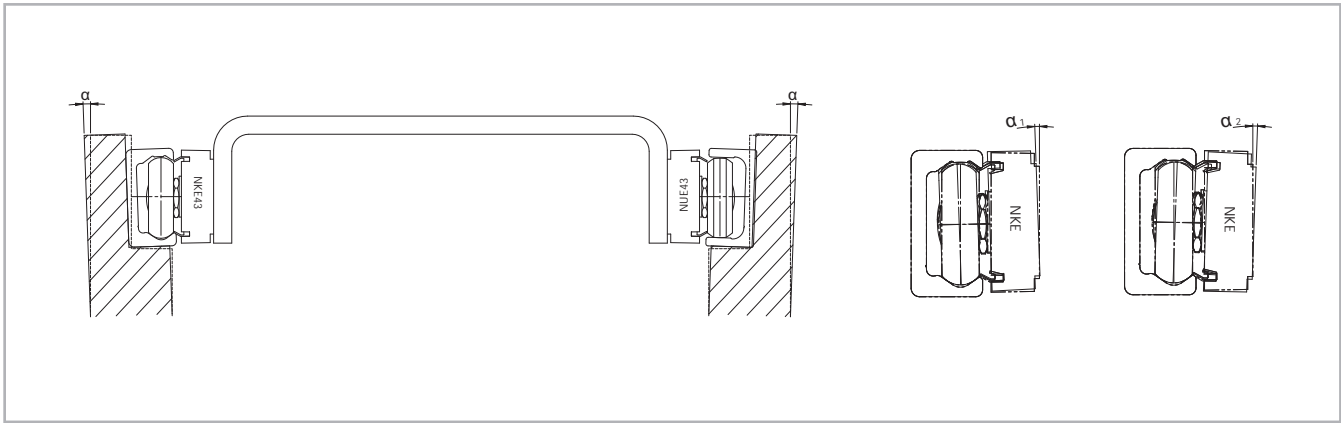
Fig. 62

K+U-system maximum offset

It must be noted that the slider in the U-rail will turn during the movement and rotation of the slider in the K-rail to allow an axial offset. During the combined effect of these movements, you must not exceed the maximum values (see tab. 29). If a maximum rotated NUE- slider is observed (2° for size 43 and 1° for size 63), the maximum and minimum position of the slider in the U rail results from the values B_{0max} and B_{0min}, which are already considered by the additional rotation caused axial offset. B_{0nom} is a recommended nominal starting value for the position of a NUE-slider in the U-rail of a K+U-system.
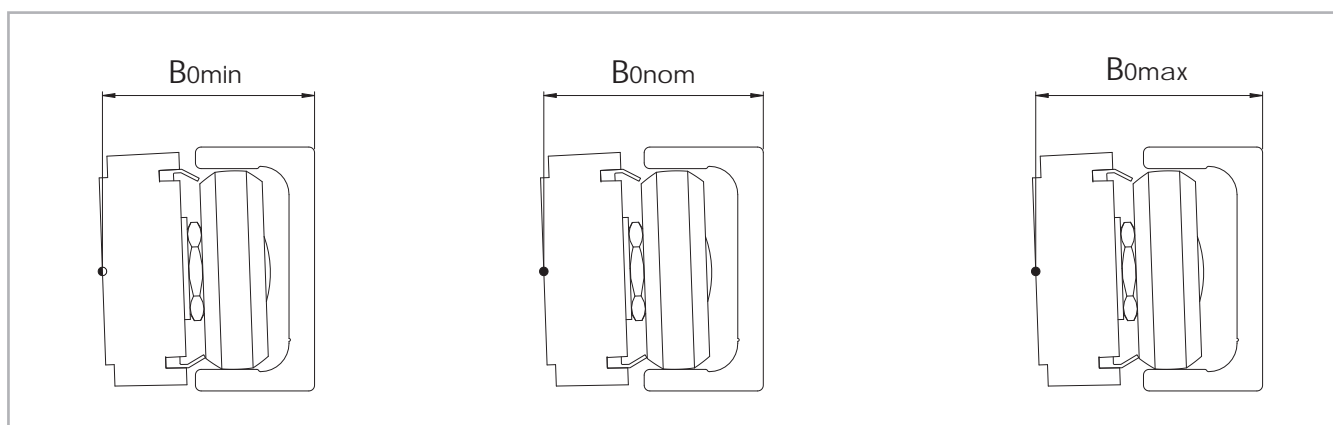
Fig. 63

Slider type	B_{0min} [mm]	B_{0nom} [mm]	B_{0max} [mm]
NUE43 NUE43L	37.6	38.85	40.1
CS43	37.6	38.85	40.1
CD43	37.9	39.15	40.4
NUE63	50.95	52.70	54.45
CS63	49.85	51.80	53.75

Tab. 29

If a K-rail is used in combination with a U-rail, with guaranteed problem-free running and without extreme slider load, a pronounced height difference between the two rails can also be compensated for. The following illustration shows the maximum height offset b of the mounting surfaces in relation to the distance a of the rails (see fig. 64).
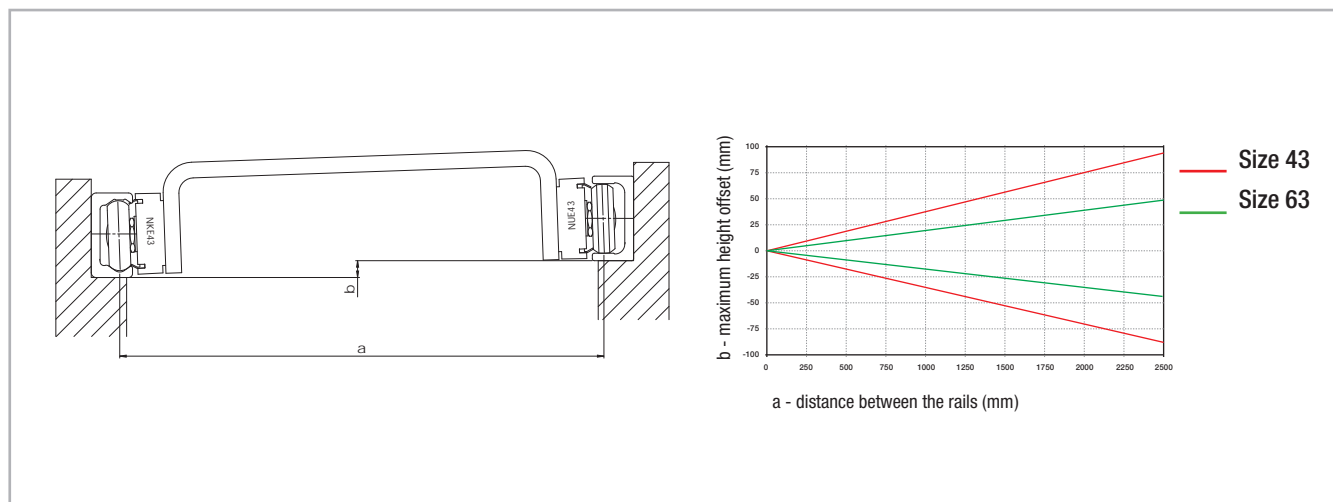
Fig. 64

Even the K+U-system can be used in different arrangements. If the same example as with the T+U-system is observed (see pg. CR-41, fig. 60), this solution, in addition to the prevention of vibrations and moments, also enables the compensation of larger deviations in parallelism in the vertical direction, without negative consequences to the guide. This is particularly important for longer strokes as it is more difficult to obtain a correct vertical parallelism.

Fig. 65

Preload

Preload classes

The factory installed systems, consisting of rails and sliders, are available in two preload classes:

Standard preload K1 means a rail-slider combination with minimum preload which means the rollers are adjusted free of clearance for optimal running properties.

Usually preload K2 is used for rail-slider systems for increasing the rigidity (see pg. CR-35). When using a system with K2 preload a reduction of the loading capacities and service life must be taken into consideration (see tab. 30).

Preload class	Reduction y
K1	-
K2	0.1

Tab. 30

This coefficient y is used in the calculation formula for checking the static load and lifetime (see pg. CR-50, fig. 75 and pg. CR-54, fig. 92).

The interference is the difference between the contact lines of the rollers and the raceways of the rail.

Preload class	Interference* [mm]	Rail type
K1	0.01	all
K2	0.03	T, U...18
	0.04	T, U...28
	0.05	T, U...35
	0.06	T, U, K...43, T, U, K...63

* Measured on the largest interior dimension between the raceways   Tab. 31

External preload

The unique design of the Compact Rail product family enables applying a partial external preload on selected locations along the entire guide.

An external preload can be applied by pressure along the side surfaces of the guide rail according to the drawing below (see fig. 66). This local preload results in higher rigidity only at the locations where it is necessary (e.g. on reversing points with high dynamic auxiliary forces).

This partial preload increases the service life of the linear guide by avoiding a continually increased preload over the entire length of the guide. Also the required drive force of the linear carriage in the non-preloaded areas is reduced.

The amount of the externally applied preload is determined using two dial indicators by measuring the deformation of the rail sides. These are deformed by thrust blocks with pressure screws. The external preload must be applied when the slider is not directly located in the pressure zone.

Size	A [mm]
18	40
28	55
35	75
43	80
63	120

Tab. 32
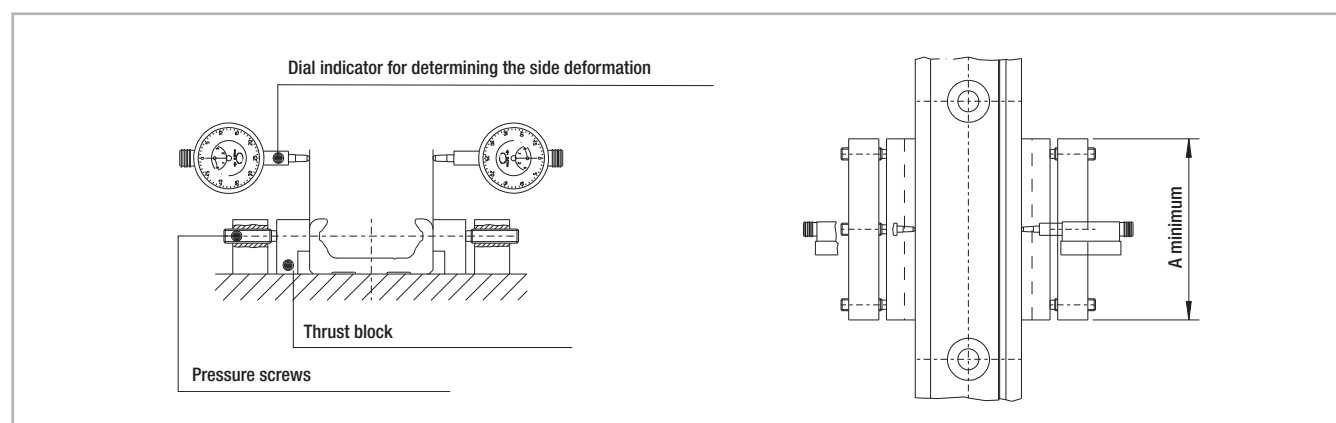
Fig. 66

The graph below indicates the value of the equivalent load as a function of the total deformation of both rail sides. The data relates to sliders with three rollers (see fig. 67).
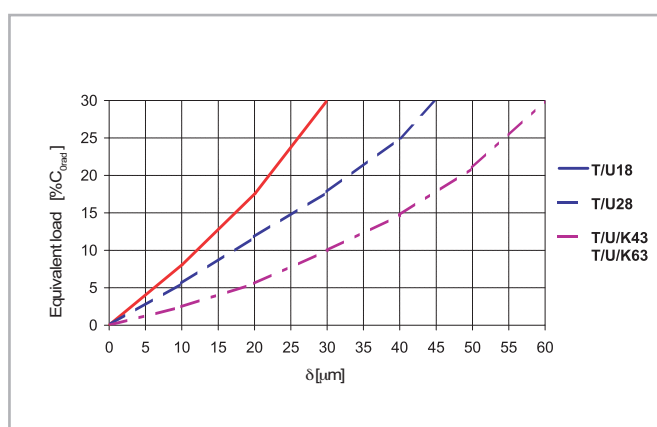
Fig. 67

◢ Drive force

Frictional resistance

The drive force required for moving the slider is determined by the combined resistance of the rollers, wipers and seals.

The ground raceways and rollers have a minimal coefficient of friction, which remains almost the same in both the static and dynamic state. The wiper and longitudinal seals are designed for an optimum protection of the system, without a significant negative influence on the quality of motion. The overall friction of the Compact Rail also depends on external factors such as lubrication, preload and additional forces. Table 33 below contains the coefficients of friction for each slider type (for CSW and CDW sliders no friction occurs to μ_s).
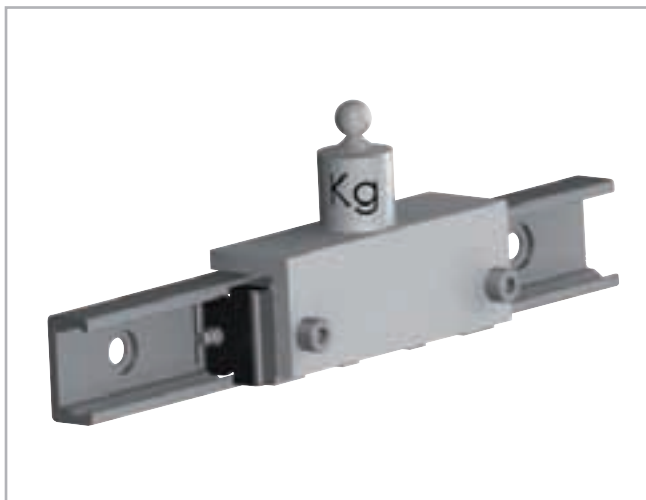
Fig. 68

Size	µ Roller friction	μ_w Wiper friction	μ_s Friction of longitudinal seals
18	0.003	$\dfrac{\ln (m \cdot 1000)^*}{0.98 \cdot m \cdot 1000}$	0.0015
28	0.003		
35	0.005	$\dfrac{\ln (m \cdot 1000)^*}{0.06 \cdot m \cdot 1000}$	$\dfrac{\ln (m \cdot 1000)^*}{0.15 \cdot m \cdot 1000}$
43	0.005		
63	0.006		

* Kilograms must be used for load m

Tab. 33

The values given in Table 33 apply to external loads, which, with sliders with three rollers, are at least 10 % of the maximum load rating. For calculating the driving force for lower loads, please contact our Application Engineering Department.

Calculation of drive force

The minimum required drive force for the slider is determined with the coefficients of friction (see tab. 33) and the following formula (see fig. 69):

$$F = (\mu + \mu_w + \mu_s) \cdot m \cdot g$$

m = mass (kg)
g = 9.81 m/s²

Fig. 69

Example calculation:

If a NTE43 slider is used with a radial load of 100 kg, the result is $\mu = 0.005$; from the formula the following is calculated:

$$\mu_s = \frac{\ln (100000)}{0.15 \cdot 100000} = 0.00076$$

$$\mu_w = \frac{\ln (100000)}{0.06 \cdot 100000} = 0.0019$$

Fig. 70

This is the minimum drive force for this example:

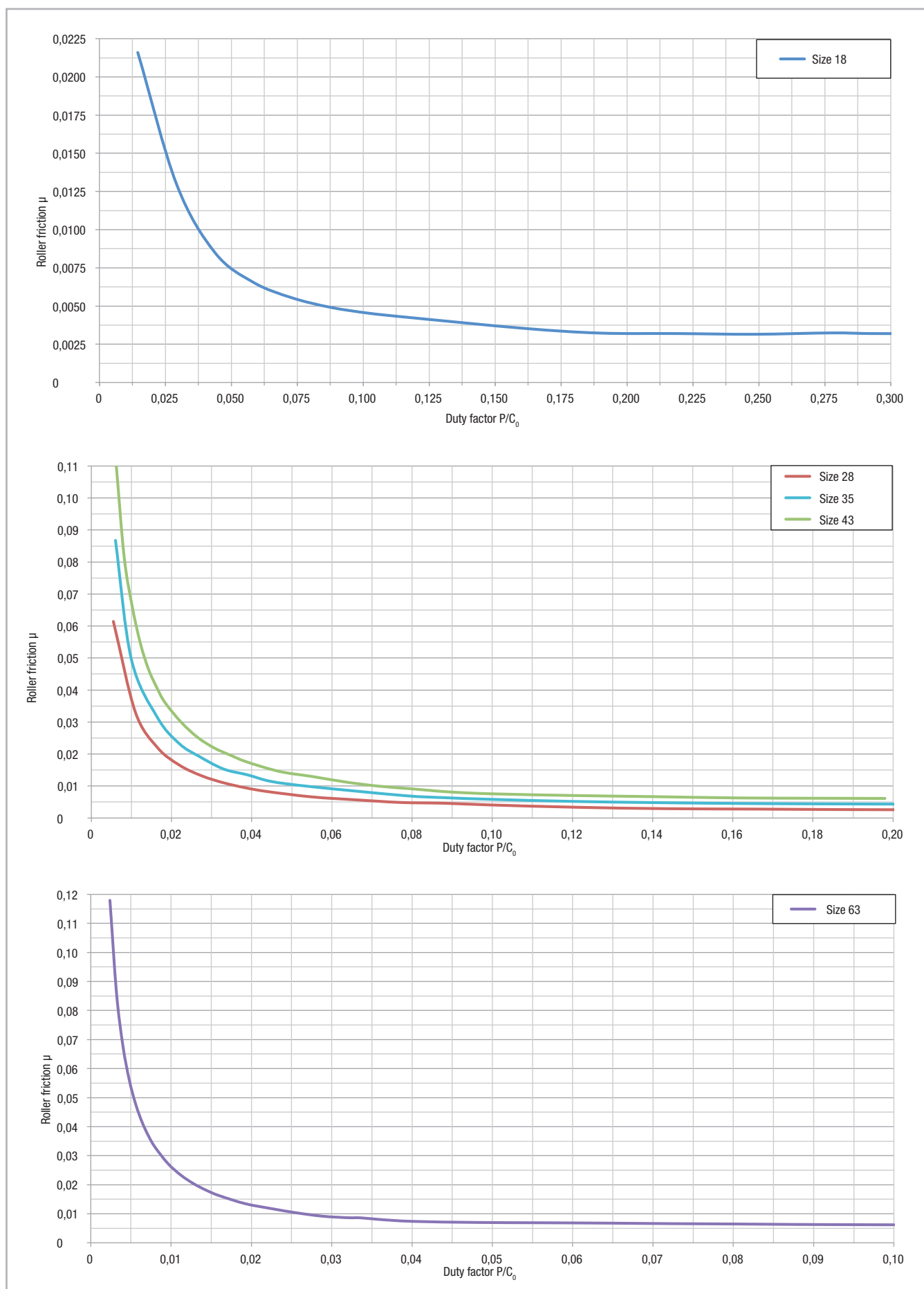$$F = (0.005 + 0.0019 + 0.00076) \cdot 100 \cdot 9.81 = 7.51 \, N$$

Fig. 71

Fig. 72

❯ Static load

The radial load capacity rating, C_{0rad} the axial load capacity rating C_{0ax}, and moments M_x, M_y, M_z indicate the maximum permissible values of the load (see pg. CR-9ff), higher loads will have a detrimental effect on the running quality. A safety factor, S_0, is used to check the static load, which takes into account the basic parameters of the application and is defined more in detail in the following table:

Safety factor S_0

No shock nor vibration, smooth and low-frequency reverse, high assembly accuracy, no elastic deformations	1 - 1.5
Normal installation conditions	1.5 - 2
Shock and vibration, high-frequency reverse, significant elastic deformation	2 - 3.5

Fig. 73

The ratio of the actual load to maximum permissible load may be as large as the reciprocal of the accepted safety factor, S_0, at the most.

$$\frac{P_{0rad}}{C_{0rad}} \leq \frac{1}{S_0} \qquad \frac{P_{0ax}}{C_{0ax}} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 74

The above formulas are valid for a single load case.
If two or more forces are acting simultaneously, please check the following formula:

$$\frac{P_{0rad}}{C_{0rad}} + \frac{P_{0ax}}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} + y \leq \frac{1}{S_0}$$

P_{0rad}	= effective radial load (N)
C_{0rad}	= permissible radial load (N)
P_{0ax}	= effective axial load (N)
C_{0ax}	= permissible axial load (N)
M_1, M_2, M_3	= external moments (Nm)
M_x, M_y, M_z	= maximum permissible moments in the different loading directions (Nm)
y	= reduction due to preload

Fig. 75

The safety factor S_0 can lie on the lower given limit if the occurring forces can be determined with sufficient precision. If shock and vibration are present, the higher value should be selected. For dynamic applications higher safety is required. Please contact the Application Engineering Department.

▷ Calculation formulas

Examples of formulas for determining the forces on the most heavily loaded slider

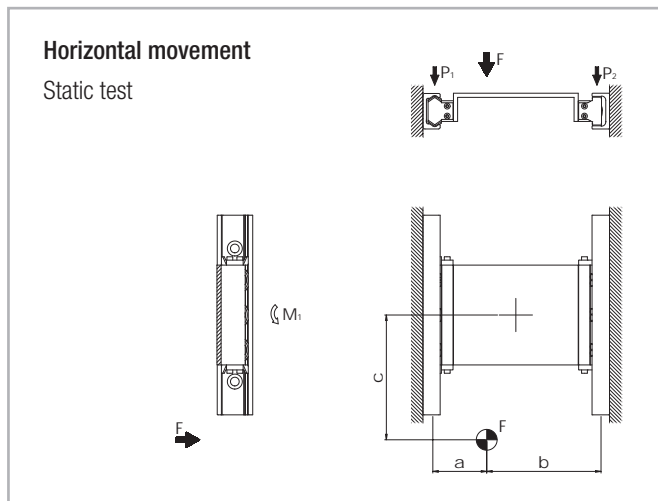For an explanation of the parameters in the formulas see pg. CR-53, fig. 90

Horizontal movement

Static test

Fig. 76

Slider load:

$$P_1 = F \cdot \frac{b}{a+b}$$

$$P_2 = F - P_1$$

in addition each slider is
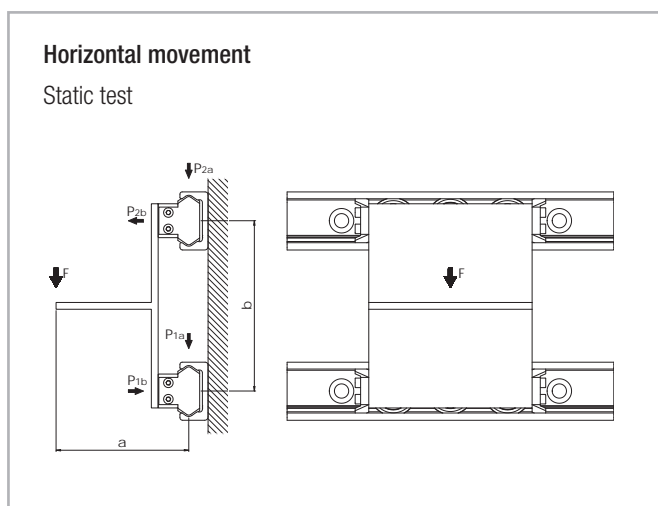loaded by a moment:

$$M_1 = \frac{F}{2} \cdot c$$

Fig. 77

Horizontal movement

Static test

Fig. 78

Slider load:

$$P_{1a} \cong P_{2a} = \frac{F}{2}$$

$$P_{2b} \cong P_{1b} = F \cdot \frac{a}{b}$$

Fig. 79

Horizontal movement
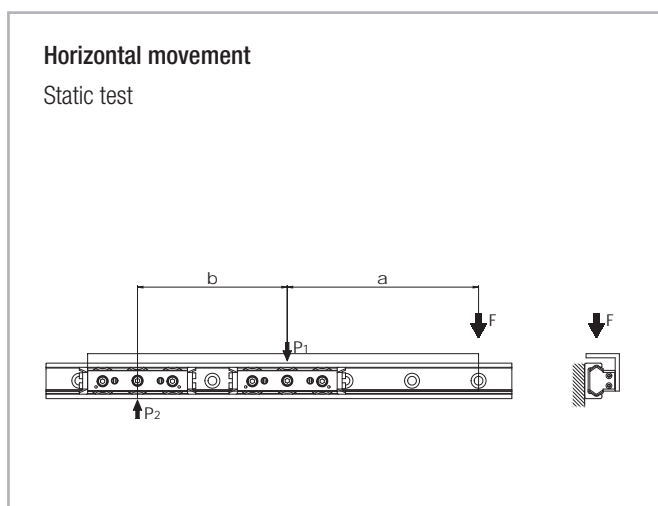
Static test

Fig. 80

Slider load:

$$P_2 = F \cdot \frac{a}{b}$$

$$P_1 = P_2 + F$$

Fig. 81

Note: Applies only if the distance between centers of the sliders b > 2x
slider length

Horizontal movement

Static test

Fig. 82

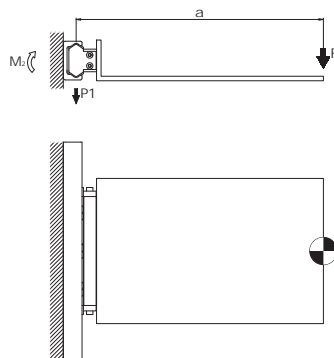Slider load:

$$P_1 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c}\right) - \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

$$P_2 = \frac{F}{4} - \left(\frac{F}{2} \cdot \frac{b}{c}\right) + \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

$$P_3 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c}\right) - \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$
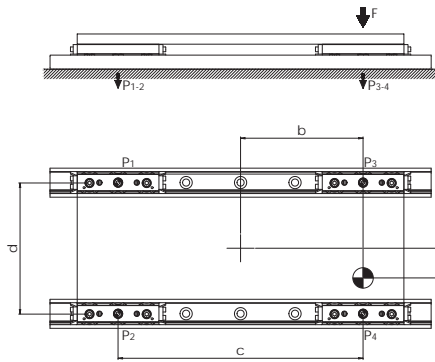
$$P_4 = \frac{F}{4} + \left(\frac{F}{2} \cdot \frac{b}{c}\right) + \left(\frac{F}{2} \cdot \frac{a}{d}\right)$$

Fig. 83

Note: It is defined that slider no. 4 is always located closest to the point where the force is applied.

Vertical movement

Static test
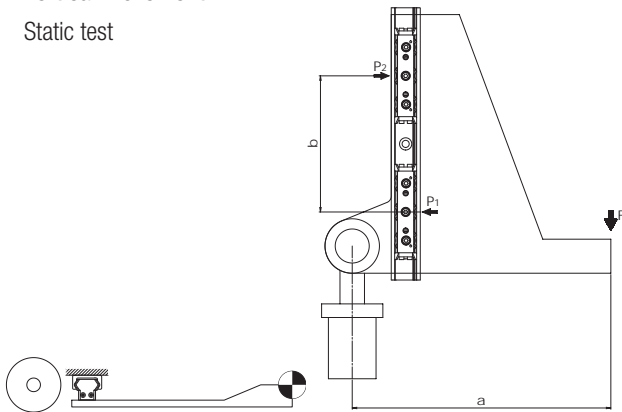
Fig. 84

Slider load:

$$P_1 \cong P_2 = F \cdot \frac{a}{b}$$

Fig. 85

Note: Applies only if the distance between centers of the sliders b > 2x slider length

Horizontal movement

Static test

Fig. 86

Slider load:

$$P_1 = F$$

$$M_2 = F \cdot a$$

Fig. 87
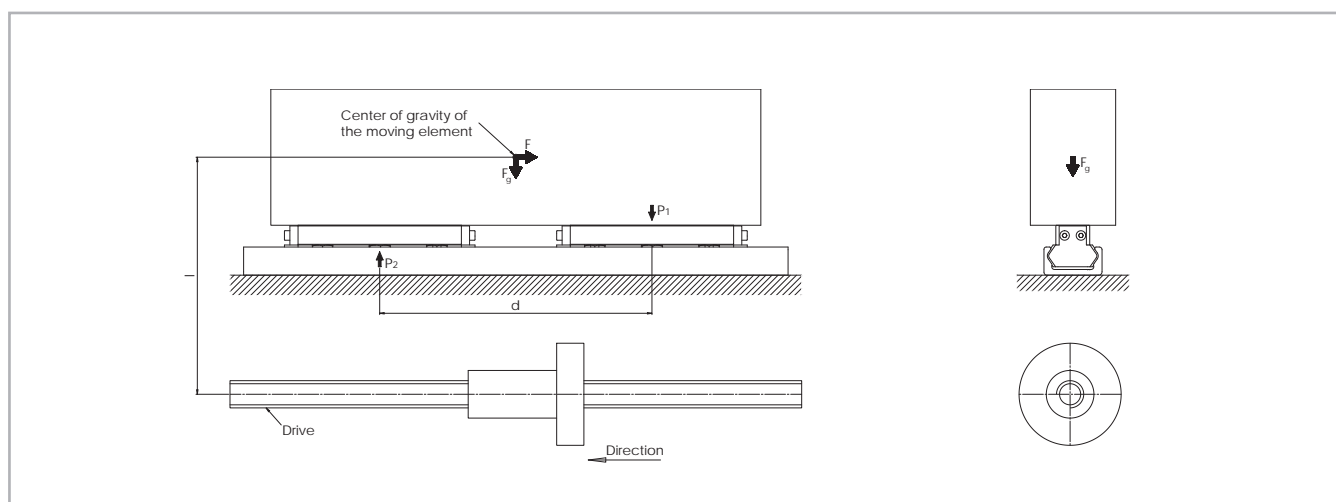
Fig. 88

Horizontal movement

Test with a moving element of the weight-force F_g at the instant the direction of movement changes

Inertial force

$$F = m \cdot a$$

Slider load at time of reverse

$$P_1 = \frac{F \cdot l}{d} + \frac{F_g}{2}$$

$$P_2 = \frac{F_g}{2} - \frac{F \cdot l}{d}$$

Fig. 89

Explanation of the calculation formula

F	=	effective force (N)
F_g	=	weight-force (N)
P_1, P_2, P_3, P_4	=	effective load on the slider (N)
M_1, M_2	=	effective moment (Nm)
m	=	mass (kg)
a	=	acceleration (m/s²)

Fig. 90

▷ Service life calculation

The dynamic load capacity C is a conventional variable used for calculating the service life. This load corresponds to a nominal service life of 100 km. For values of the individual slider see pg. CR-9. Load capacities. The following formula (see fig. 91) links the calculated theoretical service life to the dynamic load capacity and the equivalent load:

$$L_{Km} = 100 \cdot \left(\frac{C}{P} \cdot \frac{f_c}{f_i} \cdot f_h \right)^3$$

L_{km} = theoretical service life (km)

C = dynamic load capacity (N)

P = effective equivalent load (N)

f_c = contact factor

f_i = application coefficient

f_h = stroke factor

Fig. 91

The equivalent load P corresponds in its effects to the sum of the forces and moments working simultaneously on a slider. If these different load components are known, P results as follows:

$$P = P_r + \left(\frac{P_a}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} + y \right) \cdot C_{0rad}$$

y = reduction due to preload

Fig. 92

Here the external loads are assumed as constant in time. Brief loads, which do not exceed the maximum load capacities, do not have any relevant effect on the service life and can therefore be neglected.

The contact factor f_c refers to applications in which several sliders pass the same rail section. If two or more sliders move over the same point of a rail, the contact factor according to table 34 to be taken into account in the formula for calculation of the service life.

Number of sliders	1	2	3	4
f_c	1	0.8	0.7	0.63

Tab. 34

The application coefficient f_i takes into account the operational conditions in the service life calculation. It has a similar significance to the safety factor S_0 in the static load test. It is calculated as described in the following table:

f_i	
Neither shocks nor vibrations, smooth and low-frequency direction change; clean operating conditions; low speeds (<1 m/s)	1 - 1.5
Slight vibrations, average speeds (1 - 2.5 m/s) and average frequency of direction change	1.5 - 2
Shocks and vibrations, high speeds (> 2.5 m/s) and high-frequency direction change; extreme dirt contamination	2 - 3.5

Tab. 35

The stroke factor f_h takes into account the higher load of the raceways and rollers during short strokes on the same total length of run. The corresponding values are taken from the following graph (for strokes longer than 1 m, $f_h = 1$):
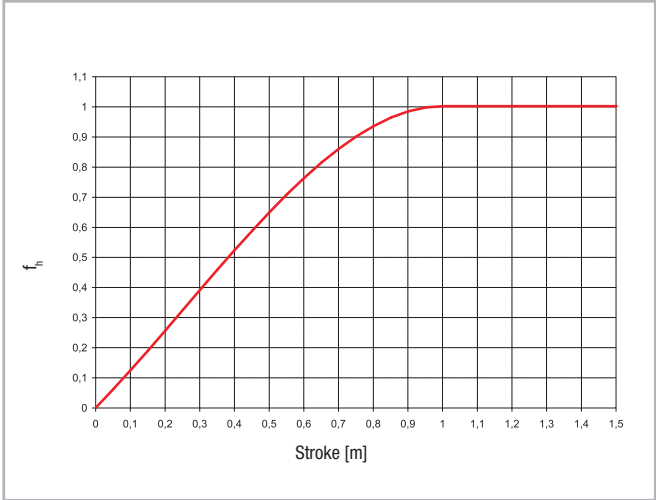
Fig. 93

Lubrication

Roller pin lubrication

The bearings inside the Rollers are lubricated for life. Custom lubrication of the roller sliders for use in high temperature environments or in the food industry is available upon request. For more information, please contact the Rollon Application Engineering department.

Lubrication of the raceways

Proper lubrication during normal conditions:

- reduces friction
- reduces wear
- reduces the load of the contact surfaces through elastic deformations
- reduces running noise

To reach the calculated service life (see pg. CR-54), a film of lubricant should always be present between the raceway and roller, this also serves to protect against corrosion of the ground raceways.

N-slider lubrication

Lubrication when using N-sliders

NTE-, NUE- and NKE-sliders (except for types NT/NU18) are equipped with a self-lubrication kit for periodic lubrication of the slider.

This provides a progressive release of lubricant (see tab. 36) on the raceway during operation of the slider. The expected service life is up to 2 million cycles, depending on the type of application. The zerk fittings (see fig. 94) provide the lubrication.

Lubricant	Thickening agent	Temperature range [°C]	Dynamic viscosity [mPas]
Mineral oil	Lithium soap	-30... to +120	< 1000

Tab. 36
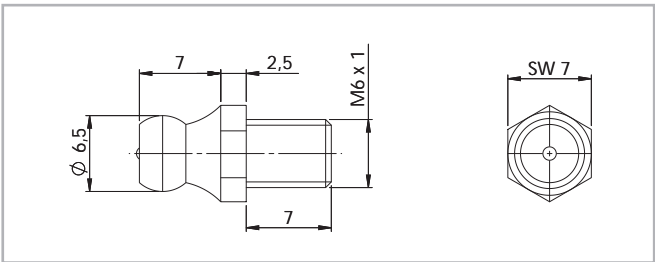
Fig. 94

Replacement of N-slider wiper head

Sliders NTE, NUE and NKE are equipped with a safety system made of longitudinal sealing lips and rigid, spring-preloaded, and therefore self-adjusting, wipers on both sides of the head for automatic cleaning of the raceways. The slider heads can be removed for replacement. To do this it is necessary to loosen the zerk fittings (except for types NT/NU18), which should be refastened after installing the new heads with the following tightening torque:

Slider type	Tightening torque [Nm]
NTE, NUE28	0.4 - 0.5
NTE, NUE, NKE43 and 63	0.6 - 0.7

Tab. 37

C-slider lubrication

Lubrication when using C-sliders

The C series sliders can be provided with wipers made of polyamide, to remove contaminants on the raceways. Since the sliders do not have a self-lubrication kit, manual lubrication of the raceways is required. A guideline is to lubricate the raceways every 100 km or every 6 months.

We recommend a roller bearing lubricant with a lithium base of average consistency as a lubricant (see tab. 38).

Lubricant	Thickening agent	Temperature range [°C]	Dynamic viscosity [mPas]
Roller bearing lubricant	Lithium soap	-30 to +170	4500

Tab. 38

Corrosion protection

The Compact Rail product family has a standard corrosion protection system by means of electrolytic-zinc plating according to ISO 2081. If increased corrosion protection is required, application-specific surface treatments are available upon request, e.g. as nickel-plated design with FDA approval for use in the food industry. For more information contact the Rollon Application Engineering Department.

Speed and acceleration

The Compact Rail product family is suitable for high operating speeds and accelerations.

Size	Speed [m/s]	Acceleration [m/s²]
18	3	10
28	5	15
35	6	15
43	7	15
63	9	20

Tab. 39

Operating temperatures

The temperature range for continuous operation is: -30 °C / +120 °C with occasional peaks up to +150 °C.
Peaks up to +170 °C can also be reached with the use of C-series sliders (except size 63) not equipped with polyamide wipers.

Installation instructions ⌄

› Fixing holes

V-holes with 90° bevels

The selection of rails with 90° countersunk holes is based on the precise alignment of the threaded holes for installation. Here the complex alignment of the rail to an external reference is omitted, since the rail aligns during installation by the self-centering of the countersunk screws on the existing hole pattern.
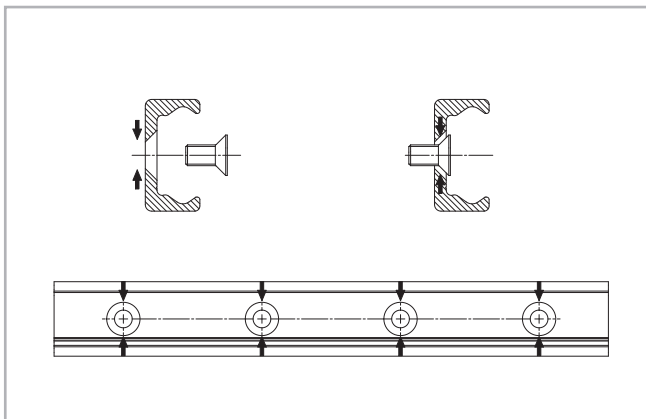
Fig. 95

C-holes with cylindrical counterbore

The cylindrical screw has, as shown, some play in the countersunk fixing hole, so that an optimum alignment of the rail can be achieved during installation (see fig. 96).

The area T is the diameter of the possible offset, in which the screw center point can move during the precise alignment.
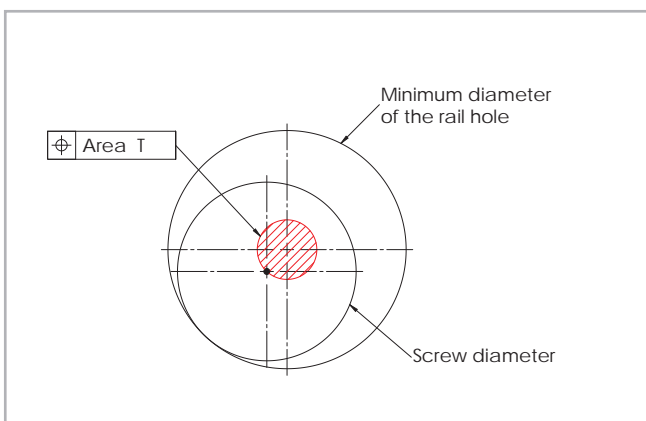
Fig. 96

Rail type	Area T [mm]
TLC18 - ULC18	⌀ 1.0
TLC28 - ULC28	⌀ 1.0
TLC35 - ULC35	⌀ 1.5
TLC43 - ULC43 - KLC43	⌀ 2.0
TLC63 - ULC63 - KLC63	⌀ 1.0

Tab. 40

The minimum chamfers on the fixing threads are listed on the table below.

Size	Chamfer [mm]
18	0.5 x 45°
28	0.6 x 45°
35	0.5 x 45°
43	1 x 45°
63	0.5 x 45°

Tab. 41

Example for fixing with Torx® screws (custom design)

Chamfer
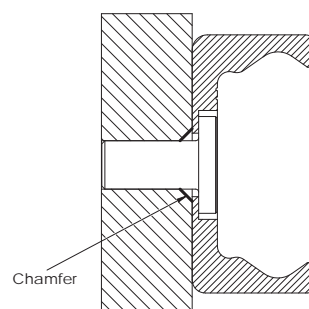
Fig. 97

Adjusting the sliders

Normally the linear guides are delivered as a system consisting of rail and adjusted sliders.

If rail and slider are delivered separately or if the slider is installed in another raceway, the preload must be set again.

Setting the preload:

(1) Check the cleanliness of the tracks.

(2) Insert the slider in the rail (CSW and CDW sliders should be inserted without wipers). Slightly loosen the fixing screws of the roller pins (no marking) to be adjusted.

(3) Position the slider on one end of the rail.

(4) For the U rails there must be a thin support (e.g. set key) under the ends of the slider body to ensure the horizontal alignment of the slider in the flat raceways.

(5) Insert the included special flat wrench from the side between the rail and the slider and slip it onto the hexagon of the eccentric roller to be adjusted.

(6) By turning the flat key clockwise, the roller to be adjusted is pressed against the upper track and the slider is then without play. Avoid a preload that is too high. It generates increased wear and reduces the service life.

(7) While holding the correct position of the roller with the adjustment key, the fixing screw can be carefully tightened. The exact tightening torque will be checked later (see fig. 98 and tab. 42).

(8) Move the slider in the rail and check the preload over the entire length of the rail. It should move easily and the slider should not have play at any location of the rail.

(9) For sliders with more than 3 rollers, repeat this process with each eccentric roller. Always start with each roller to be adjusted. Make sure that all rollers have even contact to the tracks.

(10) Now tighten the fixing screws with the specified tightening torque from the table while the flat key holds the angle adjustment of the pin. A special thread in the roller pin secures the set position.

(11) Now install the wiper of the CSW- and CDW-sliders and ensure a proper lubrication of the raceways.
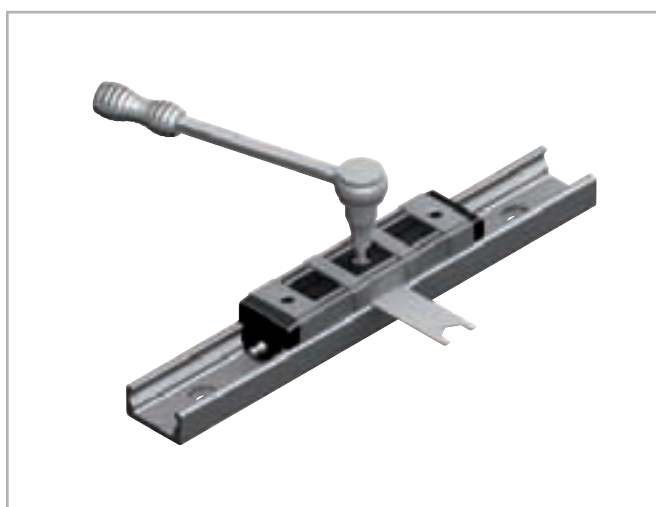

Fig. 98

Slider size	Tightening torque [Nm]
18	3
28	7
35	12
43	12
63	35

Tab. 42

> Installing the single rail

The T- and K-rails can be installed in two positions relative to the external force. For axial loading of the slider (fig. 99. pos. 2), the load capacity is reduced because of the decline in contact area caused by the change in position. Therefore, the rails should be installed in such a way that the load on the rollers acts in the radial direction (fig. 99, pos. 1). The number of fixing holes in the rail in combination with screws of property class 10.9 is dimensioned in accordance with the load capacity values. For critical applications with vibrations or higher demand for rigidity, a support of the rail (fig. 99, pos. 3) is advantageous.

This reduces deformation of the sides and the load on the screws. The installation of a rail with countersunk holes requires an external reference for alignment. This reference can also be used simultaneously as rail support if required. All information in this section on alignment of the rails, refers to rails with counterbored holes. Rails with countersunk holes self-align using the specified fixing hole pattern (see pg. CR-58, fig. 95).
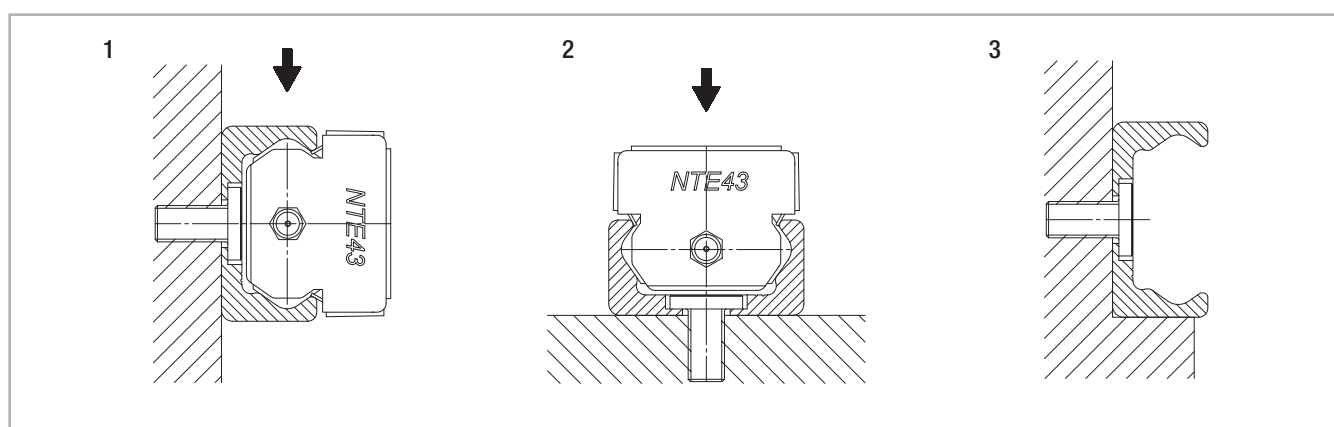
Fig. 99

Rail installation with reference surface as support

(1) Remove unevenness, burrs and dirt from the support surface.

(2) Press the rail against the support surface and insert all screws without tightening them.

(3) Start tightening the fixing screws to the specified torque on one end of the rail while continuing to hold pressure on the rail against the support surface.

Screw type	Tightening torque [Nm]
M4 (T..., U... 18)	3
M5 (T..., U... 28)	9
M6 (T..., U... 35)	12
M8 (T..., U..., K... 43)	22
M8 (T..., U..., K... 63)	35

Tab. 43
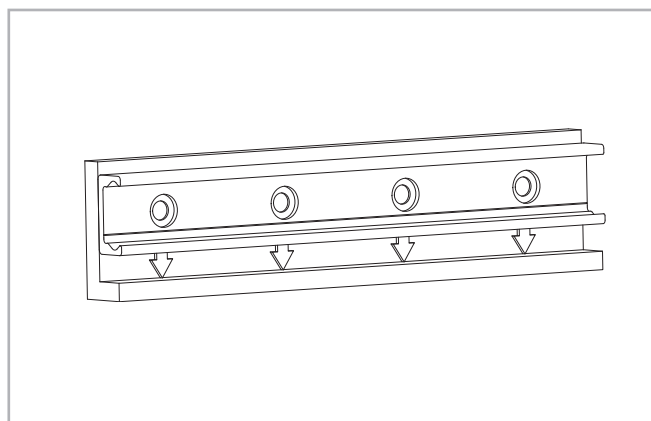
Fig. 100
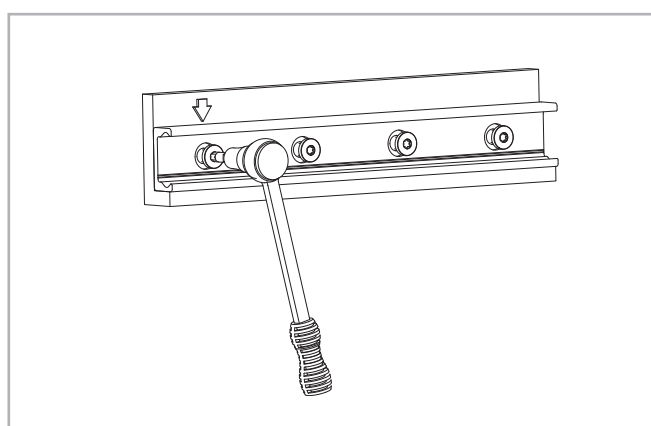
Fig. 101

Rail installation without support

(1) Carefully lay the guide rail with installed slider on the mounting surface and slightly tighten the fixing screws so that the guide rail lightly touches the mounting surface.
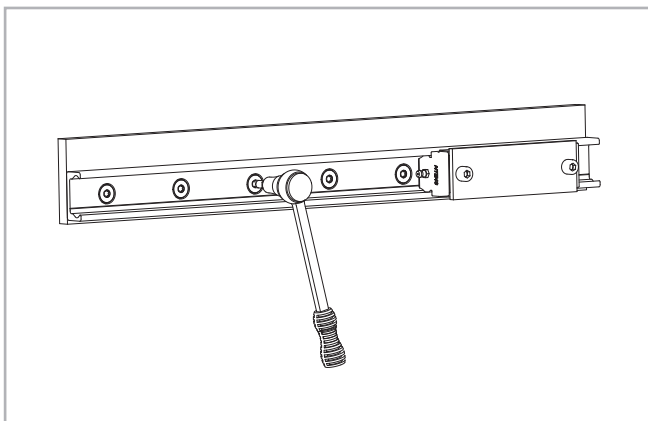
Fig. 102

(2) Install a dial indicator so that the offset of the rail to a reference line can be measured. Now position the slider in the center of the rail and set the dial indicator to zero. Move the slider back and forth between each two hole spacings and carefully align the rail. Fasten the three center screws of this area now with the the specified tightening torque, see pg. fig. 103.

(3) Now position the slider on one end of the rail and carefully align the rail to zero on the dial indicator.
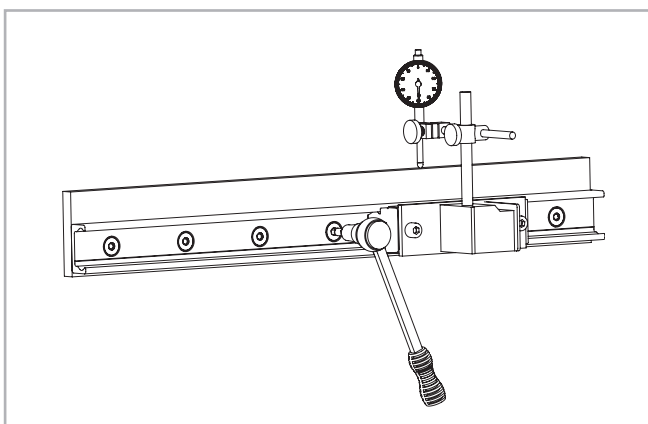
Fig. 103

(4) Begin to tighten the screws as specified while moving the slider together with the dial indicator. Make sure that it does not show any significant deflection. Repeat this procedure from the other end of the rail.
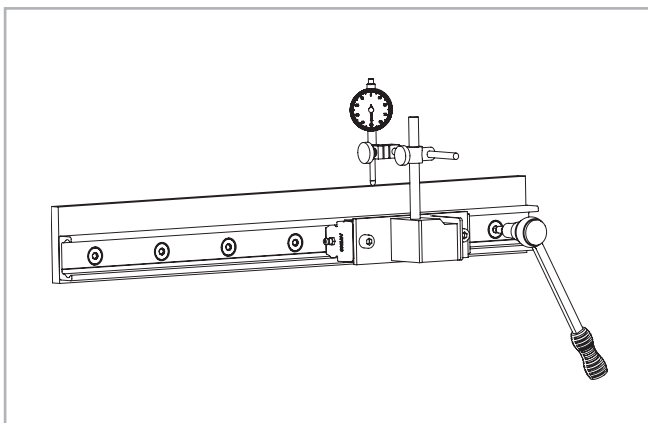

Fig. 104

Parallel installation of two rails

If two T-rails or a T+U-system are installed, the height difference of the two rails must not exceed a certain value (obtainable from the table below) in order to ensure proper guiding. These maximum values result from the maximum allowable twisting angle of the rollers in the raceways (see tab. 44). These values account for a load capacity reduction of 30% on the T-rail and must absolutely be maintained in every case.
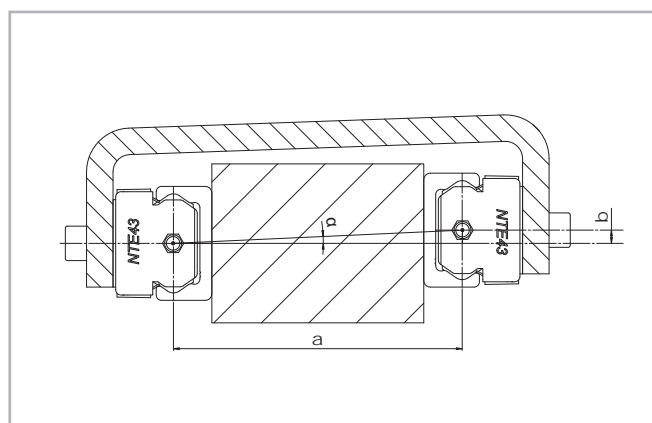

Fig. 105

Size	α
18	1 mrad (0.057°)
28	2.5 mrad (0.143°)
35	2.6 mrad (0.149°)
43	3 mrad (0.171°)
63	5 mrad (0.286°)

Tab. 44

Example:

NTE43: if a = 500 mm; b= a*tanα = 1.5 mm

When using two T-rails, the maximum parallelism deviation must not be exceeded (see tab. 45). Otherwise stresses can occur, which can result in a reduction in load capacity and service life.

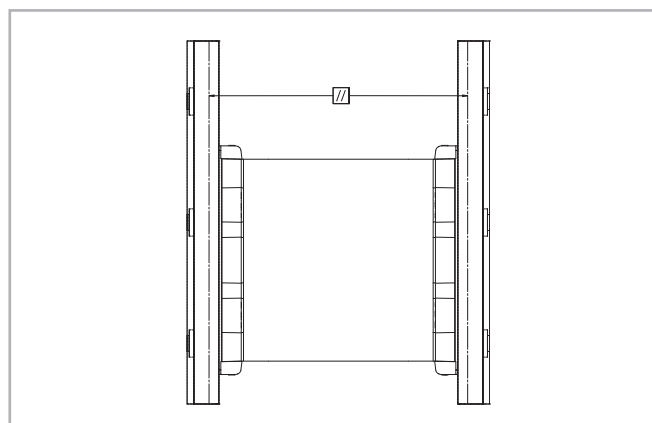| Rail size	K1	K2
18	0.03	0.02
28	0.04	0.03
35	0.04	0.03
43	0.05	0.04
63	0.06	0.05

Tab. 45

Fig. 106

Note: For parallelism problems, it is recommended to use a T+U or K+U system, since these combinations compensate for inaccuracies (see pg. CR-40, or CR-42).

Parallel installation of two T-rails

(1) Clean chips and dirt from the prepared mounting surfaces and fasten the first rail as described in the section on installation of a single rail.

(2) Fasten the second rail on the ends and the center. Tighten the screws in Position A and measure the distance between the raceways of the two rails.
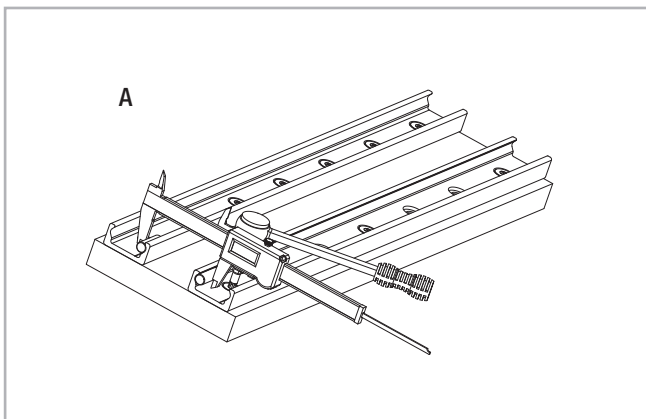

Fig. 107

(3) Fasten the rail in Position B so that the distance between the raceways does not exceed the measured values in Position A while maintaining the tolerances (see pg. CR-63, tab. 45) for parallel rail installation.
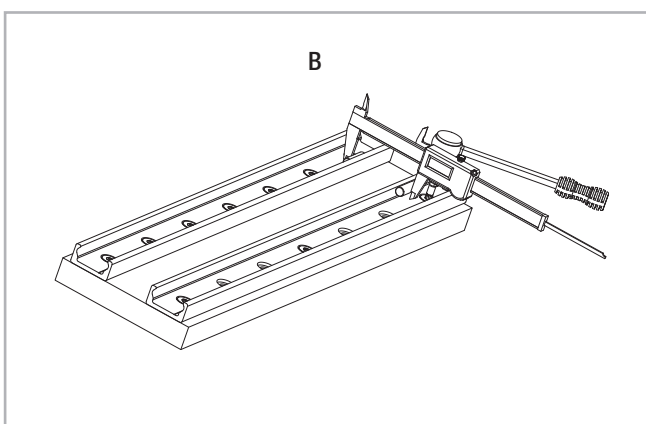
Fig. 108

(4) Fasten the screw in Position C so that the distance of the raceways is as close to an average between the two values from A and B as possible.

(5) Fasten all other screws and check the specified tightening torque of all fixing screws (see pg. CR-61, tab. 43).
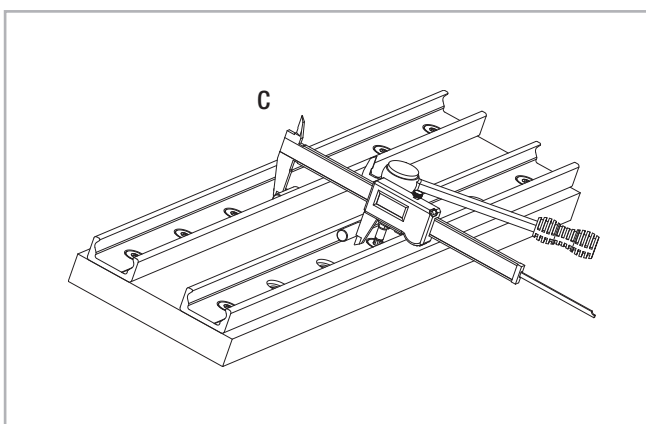

Fig. 109

▷ Installation of the T+U- or the K+U-system

When using a two-track parallel linear guide we recommend the use of a fixed bearing / compensating bearing system: The combination of T+U-rails for compensation of deviations in parallelism or the K+U-system to compensate for deviations in parallelism in two planes.

Installation steps

(1) For a fixed bearing / compensating bearing system the fixed bearing rail is always installed first. This is then used as a reference for the compensating bearing rail.

Then proceed as described in the section on installation of a single rail (see pg. CR-60).

(2) Install the compensating bearing rail and only tighten the fixing screws slightly.

(3) Insert the sliders in the rails and install the element to be moved, without tightening its screws.

(4) Insert the element in the center of the rails and tighten it with the correct tightening torque (see pg. CR-59, tab. 42).

Fig. 110

(5) Tighten the center rail fixing screws to the specified torque (see fig. 111).

Fig. 111

(6) Move the element to one end of the rail and start tightening the rest of the screws in the direction away from the slider.
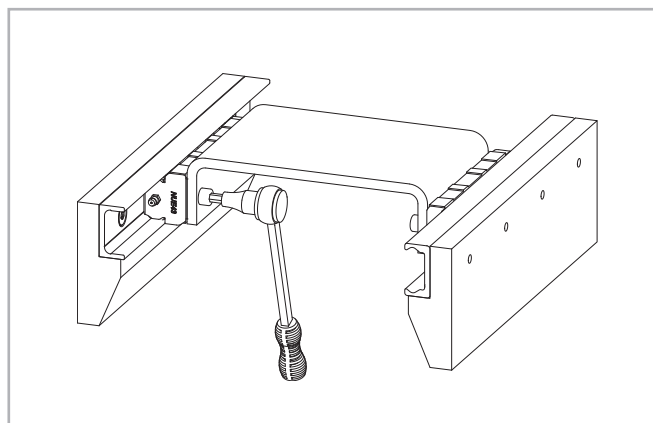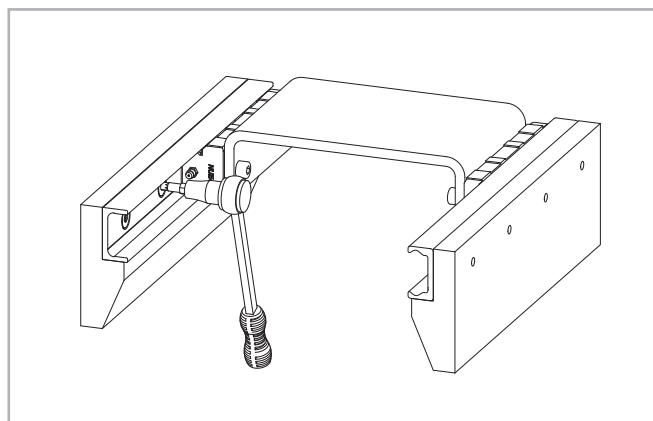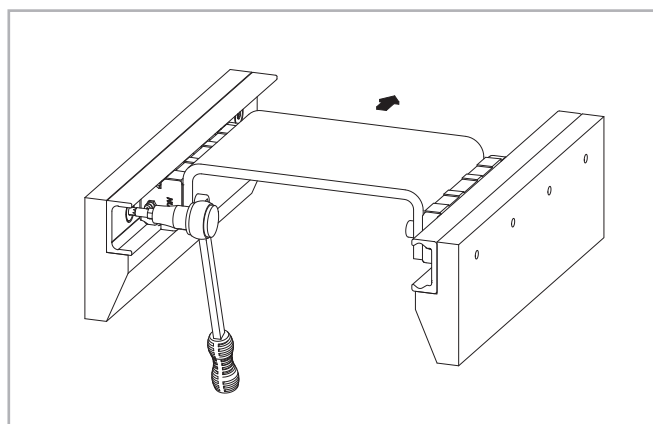

Fig. 112

> Joined Rails

If long guide rails are required, two or more rails can be joined to the desired length. When putting guide rails together, be sure that the register marks shown in fig. 113 are positioned correctly.

These are fabricated asymmetric for parallel application of joined guide rails, unless otherwise specified.
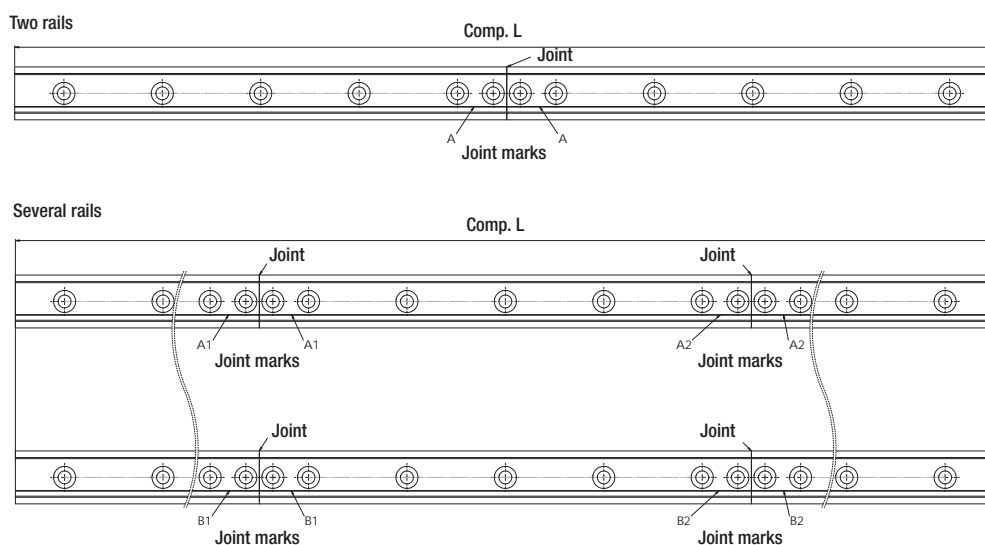
Fig. 113

General information

The maximum available rail length in one piece is indicated in table 7 on page CR-16. Longer lengths are achieved by joining two or more rails (joined rails).

Rollon then machines the rail ends at a right angle to the impact surfaces and marks them. Additional fixing screws are included with the delivery, which ensure a problem-free transition of the slider over the joints, if the following installation procedures are followed. Two additional threaded holes (see fig. 114) are required in the load-bearing structure. The included end fixing screws correspond to the installation screws for the rails for cylindrical counterbores (see pg. CR-58).

The alignment fixture for aligning the rail joint can be ordered using the designation given in the table (see pg. CR-30, tab. 19 and 20).
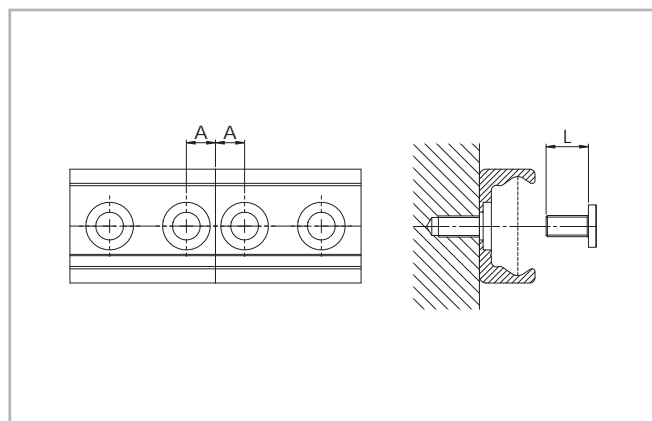

Fig. 114

Rail type	A [mm]	Threaded hole (load-bearing structure)	Screw type	L [mm]	Alignment fixture
T..., U...18	7	M4	see pg. CR-31	8	AT18
T..., U...28	8	M5		10	AT28
T..., U...35	10	M6		13	AT35
T..., U...43	11	M8		16	AT43
T..., U...63	8	M8		20	AT63
K...43	11	M8		16	AK43
K...63	8	M8		20	AK63

Tab. 46

Installation of joined rails

After the fixing holes for the rails are made in the load-bearing structure, the joined rails can be installed according to the following procedure:

(1) Fix the individual rails on the mounting surface by tightening all screws except for each last one on the rail joint.

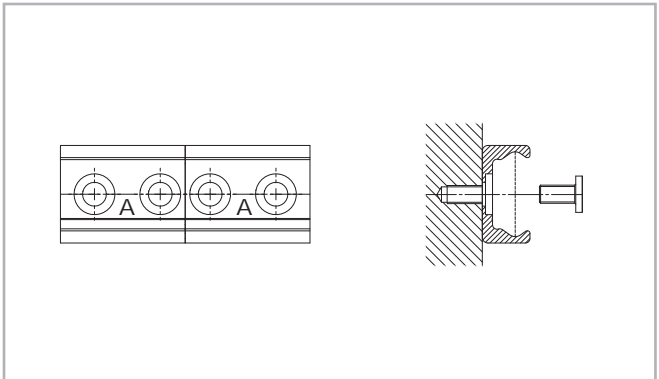(2) Install the end fixing screws without tightening them (see fig. 115).

Fig. 115

(3) Place the alignment fixture on the rail joint and tighten both set screws uniformly, until the raceways are aligned (see fig. 116).

(4) After the previous step (3) it must be checked if both rail backs lie evenly on the mounting surface. If a gap has formed there, this must be shimmed.
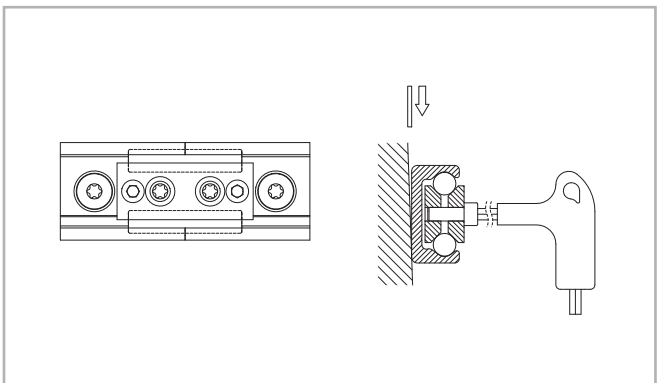

Fig. 116

(5) The bottom of the rails should be supported in the area of the transition. Here a possible existing gap must be looked for, which must be closed if necessary for correct support of the rail ends by shims.
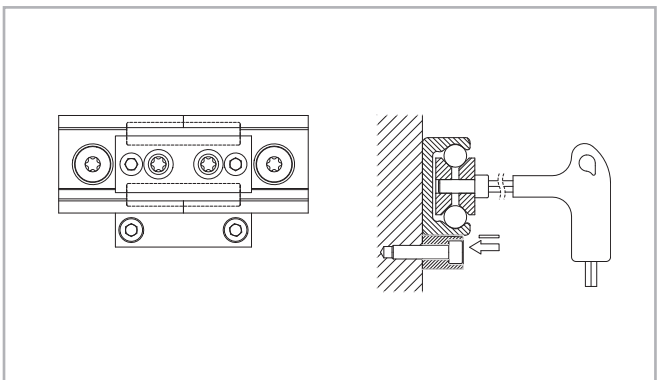

Fig. 117

(6) Insert the key through the holes in the alignment fixture and tighten the screws on the rail ends.

(7) For rails with 90° countersunk holes, tighten the remaining screws starting from the rail joint in the direction of the rail center. For rails with cylindrical counter-sunk holes, first adjust the rail to an external reference, then proceed as described above.
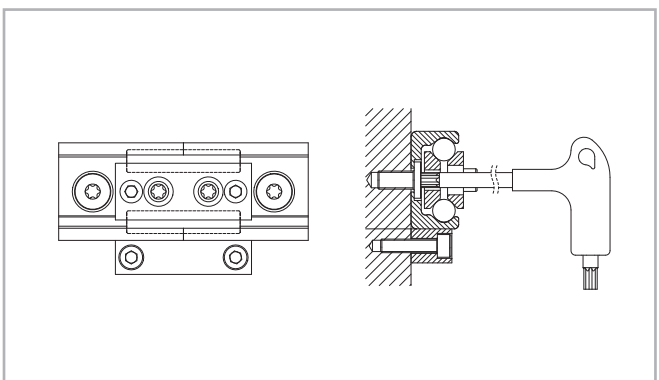
(8) Remove the alignment fixture from the rail.

Fig. 118

Ordering key ⌄

› Rail / slider system

TLC	4560	/2/	CD	W	28	-125	-2Z	-B	-NIC	
									Expanded surface protection if deviation from Standard ISO 2081 *see pg. CR-57*	
								Configuration *depending on type of slider* *see pgs. CR-20 and CR-23*		
							Roller seal *see pg. CR-29*			
						Slider length Dimension A *see pg. CR-16, tab. 8-11*				
					Size *see pg. CR-16*					
				Wiper optional *see pg. CR-30, fig. 43*						
			Slider type *see pg. CR-16*							
		Number of sliders in one rail								
	Rail length in mm *see pg. CR-15, tab. 7*									
Rail type *see pg. CR-12*										

Ordering example: TLC-04560/2/CDW28-125-2Z-B-NIC

Rail composition: 1x3280+1x1280 (only for joint processed rails)

Hole pattern: 40-40x80-40//40-15x80-40 (please always specify the hole pattern separately)

Notes on ordering: The rail length codes are always 5 digits, the slider length codes are always 3 digits; use zeroes as a prefix when lengths are shorter

› Rail

TLV	-43	-5680	-NIC	
			Expanded surface protection if deviation from Standard ISO 2081 *see pg. CR-57*	
		Rail length in mm *see pg. CR-15, table 7*		
	Size *see pg. CR-12*			
Rail type *see pg. CR-12*				

Ordering example: TLV-43-05680-NIC

Rail composition: 1x880+2x2400 (only for joint processed rails)

Hole pattern: 40-10x80-40//40-29x80-40//40-29x80-40 (please always specify the hole pattern separately)

Notes on ordering: The rail length codes are always 5 digits; use zeroes as a prefix when lengths are shorter

> Slider

CS	28	-100	-2RS	-B	-NIC	
					Expanded surface protection if deviation from Standard ISO 2081 *see pg. CR-57*	
				Configuration *depending on type of slider*	*see pgs. CR-20 and CR-23*	
			Roller seal	*see pg. CR-29*		
		Slider length Dimension A	*see pg. CR-16, table 8-11*			
	Size	*see pg. CR-16*				
Slider type	*see pg. CR-16*					

Ordering example: CS28-100-2RS-B-NIC

Notes on ordering: The slider length codes are always 3 digits; use zeroes as a prefix when lengths are shorter

> Wipers

WT	28	
	Size	*see pg. CR-16*
Wiper type	*see pg. CR-30, fig. 43*	

Ordering example: WT28