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ROLLON

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COMPACT RAIL:
THE LINEAR MOTION SOLUTION

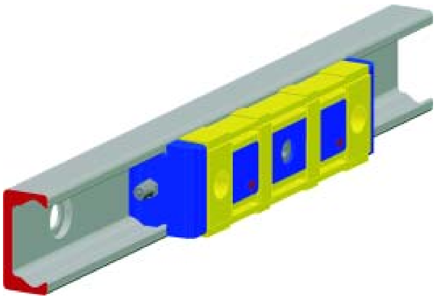
ROLLON's COMPACT RAIL is different from all other linear bearing systems available in the market. Compact Rail solves problems.
Whereas most linear bearings are descendents of heavy machine tool bearings and therefore by nature tend to be slow, recirculating-ball carriages mounted on simple round or profiled shafts, **ROLLON** started from scratch and designed a linear bearing system based on the needs of modern design engineers. We realized that while most linear bearings are applied in applications requiring good linear precision, few require machine tool-like, ultra-high precision. High precision grade rails (most popular round or profiled shafting fall into this category) are difficult, time consuming, and expensive systems that require machining of the mounting surfaces (a cost which often cannot be passed on to the customer).

- **COMPACT RAIL** is a simple, precision, linear bearing system that is easy and inexpensive to mount to all - even non-machined- surfaces. What's more, **COMPACT RAIL** will self-align to another rail if mounting surfaces are not perfectly parallel.
We found that many linear bearing applications were in dirty or contaminated environments and that engineers were forced to specify external bellows or other costly protective devices.

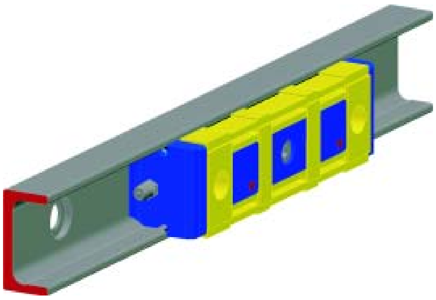
- **COMPACT RAIL** is a well-protected system. The sliders run inside the hardened steel rails where they are protected. They have spring-loaded wipers which protect the shielded or sealed bearings from debris and damage.
Many engineers told us that recirculating ball sliders were slow and noisy and this effected the quality of their machines.

- **COMPACT RAIL** is a fast (up to 9 m/s) and silent system (much quieter than recirculating ball systems).
Our customers told us of their need to make their new machinery as maintenance free as possible.

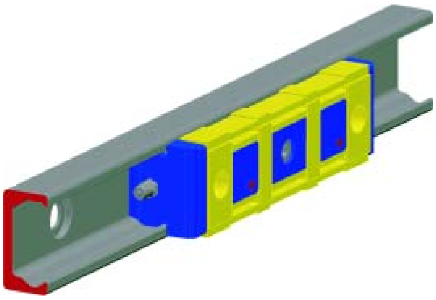
- **COMPACT RAIL** has "lubed for life" bearings with patented wiper technology that lubricates the system as it runs. Even while we have achieved our goals and manufactured the most comprehensive linear bearings available, we will continue to strive to build the best products and surpass the needs of linear motion for the future.



"T" RAIL



"U" RAIL



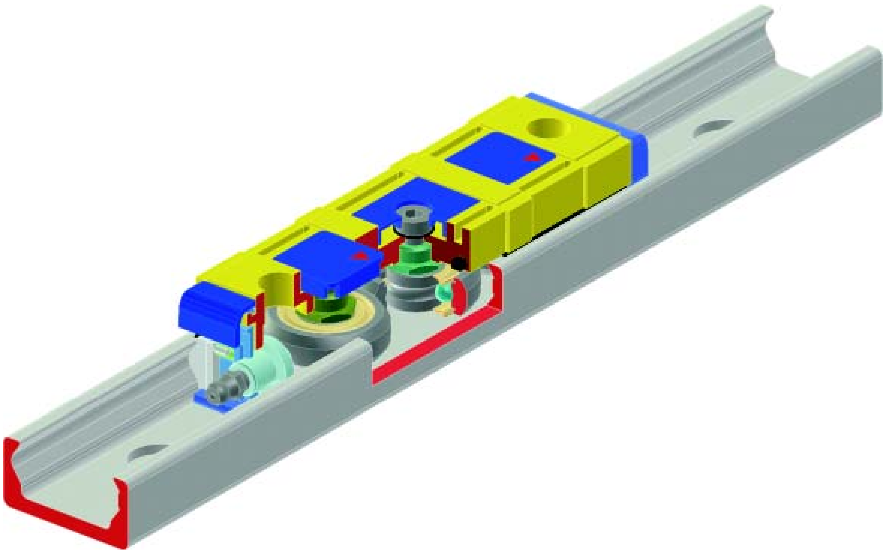
"K" RAIL

ADVANTAGES OF COMPACT SYSTEM

The original design of **ROLLON's COMPACT RAIL** products allow them to offer many unique advantages. The compactness of the products, the protection offered by the internal raceways, the high operating speeds, and the extreme ease in mounting are just of few of them.

INTERNAL RACEWAYS PROVIDE A COMPACT AND WELL PROTECTED SOLUTION

Compactness is an important advantage in those applications where compact linear bearings would be of clear benefit to the ease of construction and of immeasurable benefit to the design. Our unique design places the raceways on the inside of the rails where they are protected from bumps or shocks. The sliders, which are protected from debris and impurities with their incorporated spring-loaded wipers run inside of the rails. The **COMPACT RAIL** system fits into an extremely limited space and offers the best protected solution available for even the most for critical environments.



MAINTENANCE FREE

The self-lubricating wipers available for the NT series sliders continually applies a thin layer of lubrication to the system. This constant lubrication assures **2 millions cycles** before additional maintenance or substitution is required. The cost savings of this system when compared to other systems are incredible. The kits can also be refilled by using the grease nipples on the heads. This advance in lubrication technology does not add any length to the sliders as it fits into the same dimensions as the standard heads.

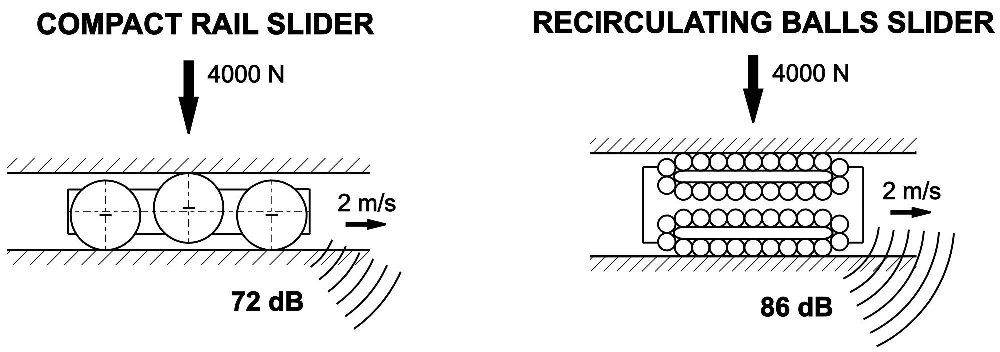
HIGH SPEED - HIGH PRODUCTIVITY

For a wide range of applications and especially in the automation field, the most important bearing feature is often speed, as the speed determines the productivity.
Higher working-speed results is higher output.
The **COMPACT RAIL** system offer solutions which can be run at nearly 9m/s; an incredibly high speed compared to common systems.

Size	Speed [m/s]
18 series	3
28 series	5
43 series	7
63 series	9

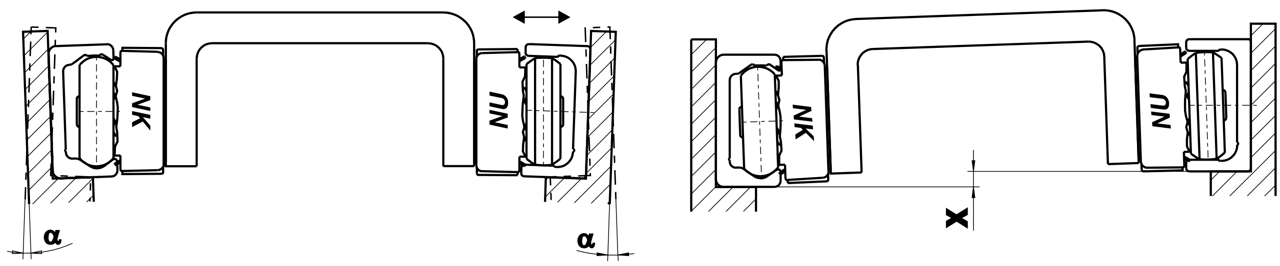
SILENT OPERATION LEVEL

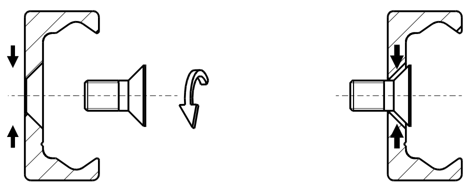
With today's restrictive regulations for admissible working noise levels, it's become more and more important to keep a machine's operation noise level as low as possible.
The **COMPACT RAIL** system offers very low operation noise level, even when working with high loads and high speed. This is the opposite of recirculating ball sliders that become much noisier as the speed and load increases.
Below figure indicates a typical comparison of operation noise level.

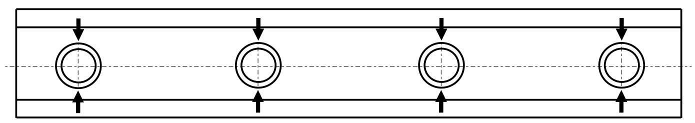


QUICK AND EASY ASSEMBLYING

The cost of assembly-time is often neglected during the designing stage as many engineers assume that the time for assembly is a fixed factor, equal for all linear bearings.
The **COMPACT RAIL** system has been studied to facilitate in mounting and to offer high cost savings on assembly-time. In addition, substantial cost savings is also gained due to low requirement of the accuracy of the mounting surface finish.
The main time saving characteristics are offered by the self-aligning rail combinations T/U and K/U, the self-aligning rails with C'sunk fixing holes, and the small number of fixing screws due to the large pitch of the rails.







OPTIMUM PRELOAD SETTING

For applications where the stiffness or low friction is very critical, the **COMPACT RAIL** system offers the unique possibility of allowing the preload on standard sliders to be set according to the exact needs of the application.
All sliders are interchangeable, by just simply resetting the preload.

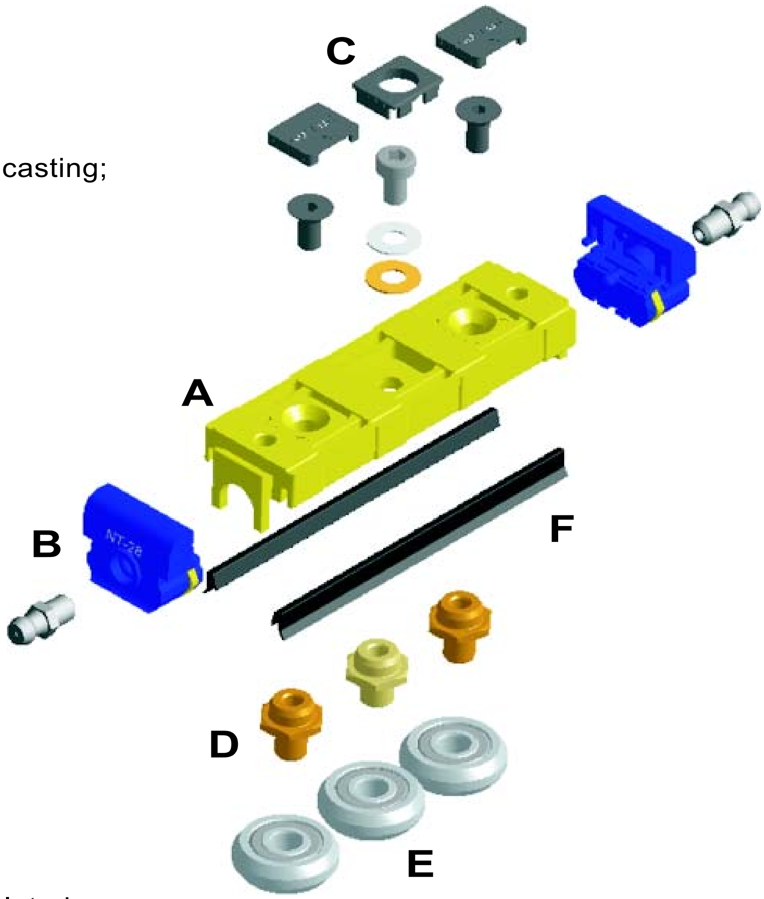
ROLLON

MAIN COMPONENTS

SLIDERS

- N... SERIES

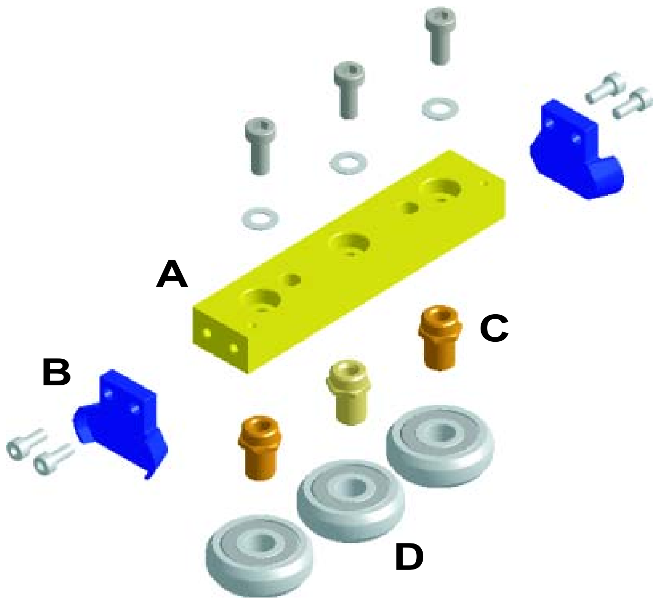
Materials:
A. Slider body: Aluminium alloy die casting;
B. Heads: Polyester,
Wipers: Modified Polyamide;
C. Caps: Polyester;
D. Pins: Steel;
E. Rollers: 100Cr6 (52100) Steel;
F. Lateral seals: Nytrilic rubber;



Surface treatment:
The slider body is chemical nickel plated.

- C.. SERIES

Materials:
A. Slider body: Steel;
B. Wipers: Modified Polyamide;
C. Pins: Steel;
D. Rollers: 100Cr6 (52100) Steel;

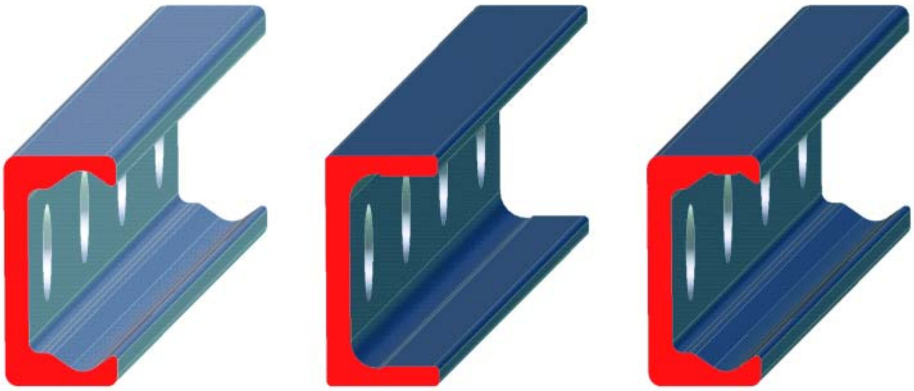


Surface treatment:
The slider body is zinc plated according to ISO 2081.

ROLLON

RAILS

Three different type rails - each with a particular raceways shape- are available: T, U and K.



- GENERAL CHARACTERISTICS

Material:
Carbon bearing steel;
Raceways:
Induction hardened;
Tolerances:
See page A31;
Surface treatment:
Electrolytic zinc-plating according to ISO 2081 standard (not present on the raceways).
See also page A37;

- FIXING HOLES

The rails are supplied in two versions, according to the hole type of the fixing screws. C'sunk holes indicated by suffix **..V** and counter-bored holes indicated by the suffix **..C**. (see page A26 for details). I.e. a size 43 T-rail with honed raceways and cylindrical fixing holes is indicated by the code TLC43.

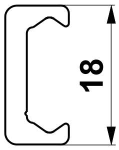
- RACEWAYS PRECISION GRADE

The rails are supplied with **honed raceways**.

GENERAL PERFORMANCE

LOAD CAPACITIES PER SLIDER

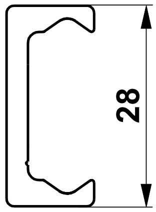
- 18 SERIES



Slider type	No. of rollers	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
NT18	3	820	260	1.5	4.7	8.2
CSW18-60	3	820	260	1.5	4.7	8.2
CSW18-80	4	820	300	2.8	7.0	24.7
CSW18-100	5	975	360	2.8	9.4	24.7
CSW18-120	6	975	440	3.3	11.8	41.1

Note: for details about size 18, see page A12

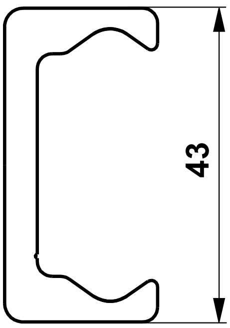
- 28 SERIES



Slider type	No. of rollers	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
NT28	3	2170	640	6.2	16.0	27.2
NT28L-5-A	5	2580	900	11.5	29.0	81.7
CSW28-80 CDW28-80	3	2170	640	6.2	16.0	27.2
CSW28-100	4	2170	750	11.5	21.7	81.7
CSW28-125 CDW28-125	5	2580	900	11.5	29.0	81.7
CSW28-150	6	2580	1070	13.7	36.2	136.1

Note: for details about size 28, see page A16

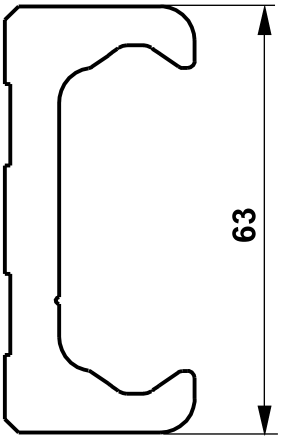
- 43 SERIES



Slider type	No. of rollers	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
NT43	3	5500	1570	23.6	60.0	104.5
NT43L-5-A	5	6540	2215	43.6	108.6	313.5
CSW43-120 CDW43-120	3	5500	1570	23.6	60.0	104.5
CSW43-150	4	5500	1855	43.6	81.5	313.5
CSW43-190 CDW43-190	5	6540	2215	43.6	108.6	313.5
CSW43-230	6	6540	2645	52.0	135.8	522.5

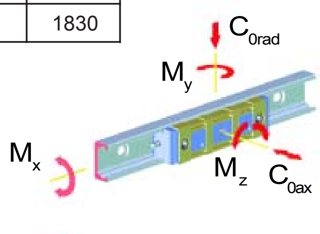
Note: for details about size 43, see pages A20 and A21

- 63 SERIES



Slider type	No. of rollers	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
NT63	3	12500	6000	125	271	367
CSW63-180	3	12500	6000	125	271	367
CSW63-235	4	12500	7200	250	413	1100
CSW63-290	5	15000	8500	250	511	1100
CSW63-345	6	15000	10000	350	689	1830

Note: for details about size 63, see page A24

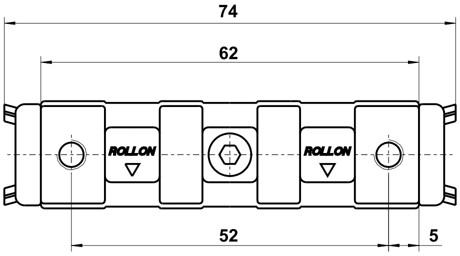


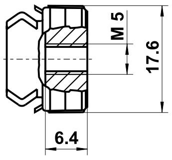
ROLLON

18 SERIES

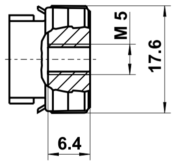
SLIDERS

- N... SERIES





Type: NT18
to be utilized
with TL.18 rails

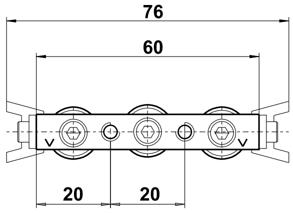


Type: NU18
to be utilized
with UL.18 rails

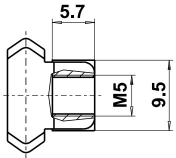
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
NT18 - NU18	3	CPA18 - CPN18	2	30	CK18

** For roller characteristics see page A25*

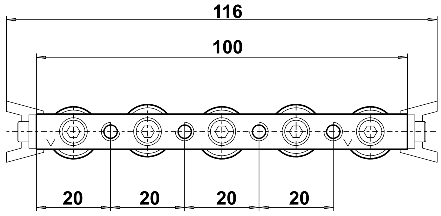
- CSW.. SERIES



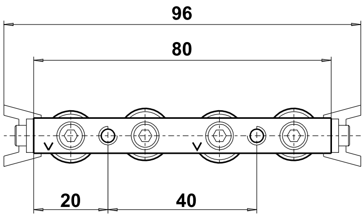
CSW18-60



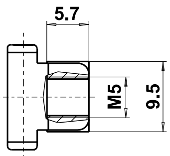
CSW18-T
To be utilized
with TL.18 rails



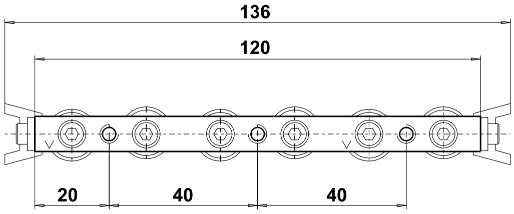
CSW18-100



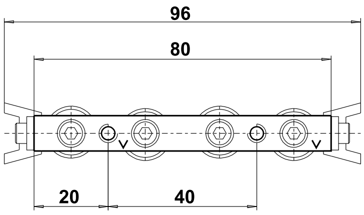
CSW18-80
configuration A



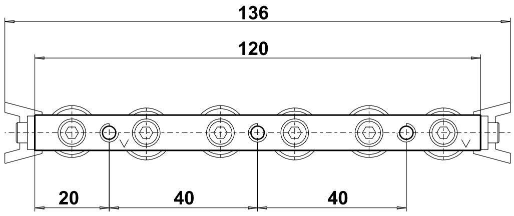
CSW18-U
To be utilized
with UL.18 rails



CSW18-120
configuration A



CSW18-80
configuration B



CSW18-120
configuration B

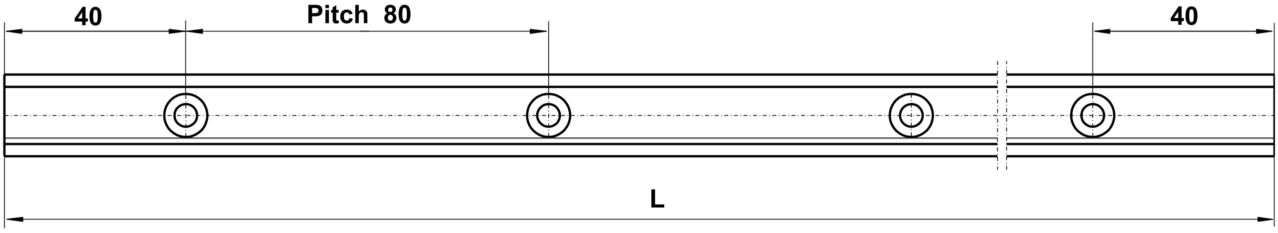
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CSW18-60-2Z **CSW18-60-2RS**	3	CPA18 - CPN18	2	40	CK18
CSW18-80-2Z **CSW18-80-2RS**	4	CPA18	2	50	CK18
CSW18-100-2Z **CSW18-100-2RS**	5	CPA18	4	60	CK18
CSW18-120-2Z **CSW18-120-2RS**	6	CPA18	3	70	CK18

** For roller characteristics see page A25*

18 SERIES

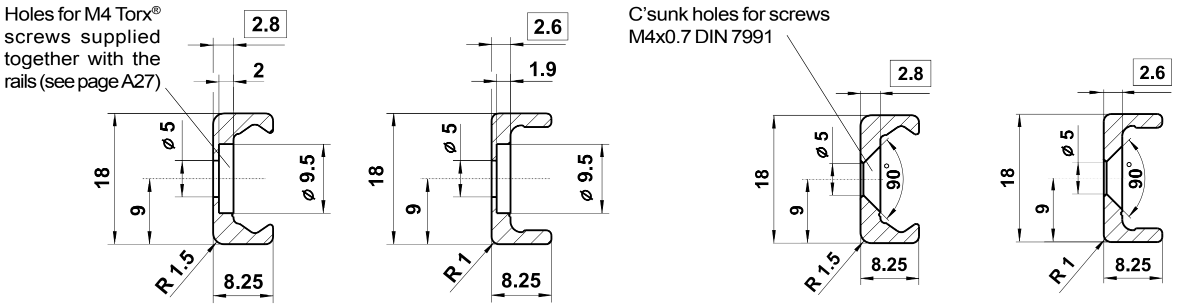
RAILS

Rail weight: 550 g/m



With counterbored holes

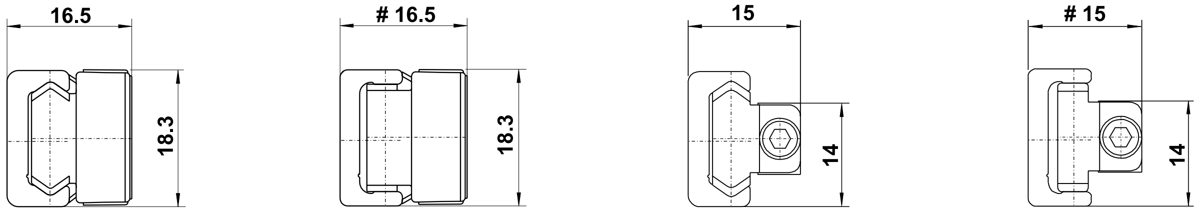
With countersunk holes



Rail type	Standard lengths **L** [mm]
TLC18 - ULC18 **TLV18 - ULV18**	160 - 240 - 320 - 400 - 480 - 560 - 640 - 720 - 800 - 880 960 - 1040 - 1120 - 1200 - 1280 - 1360 - 1440 - 1520 1600 - 1680 - 1760 - 1840 - 1920 - 2000

MOUNTED RAIL/SLIDER

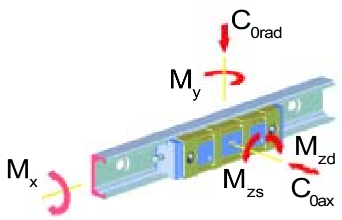
TL.../NT18 **UL.../NU18** **TL.../CSW18-T** **UL.../CSW18-U**



 # min. 16.5
max. 17.6

 # min. 14.7
max. 16.1

LOAD CAPACITY



The load capacities indicated in this paragraph, refer to the "standard" positioning of the slider into the rail with the direction of the fixed rollers corresponding to that of the radial load.

Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_Y [Nm]	M_z [Nm]	
						M_{zd}	M_{zs}
NT18	1530	820	260	1.5	4.7	8.2	
NU18	1530	820	0	0	0	8.2	
CSW18-60-..	1530	820	260	1.5	4.7	8.2	
CSW18-80-..-A	1530	820	300	2.8	7.0	8.2	24.7
CSW18-80-..-B	1530	820	300	2.8	7.0	24.7	8.2
CSW18-100-..	1830	975	360	2.8	9.4	24.7	
CSW18-120-..-A	1830	975	440	3.3	11.8	24.7	41.1
CSW18-120-..-B	1830	975	440	3.3	11.8	41.1	24.7

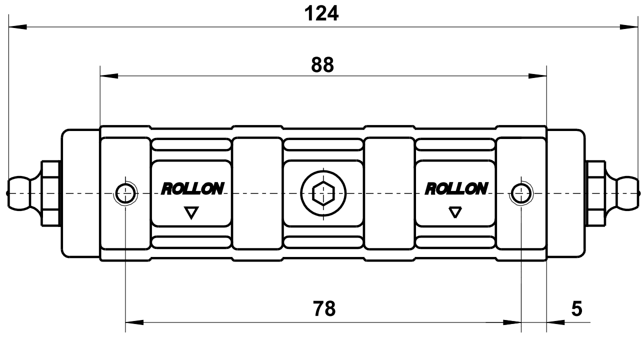
Note: *The load capacities indicated in the table refer to CSW sliders utilized with T.. rails; the values of C_{0ax}, M_x and M_y are equal to 0 if used in U-rails.*

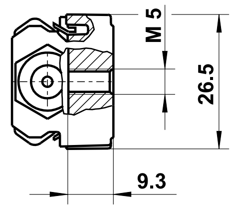
ROLLON

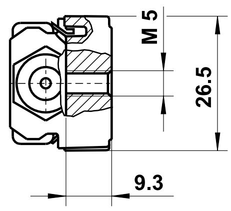
28 SERIES

SLIDERS

- N... SERIES







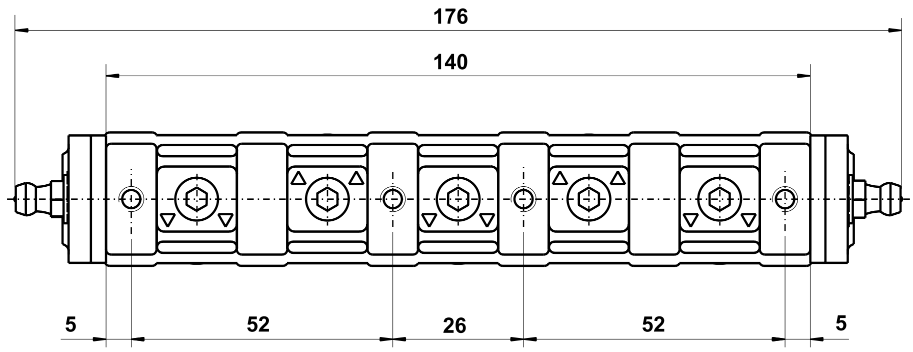
Type: **NT28**
To be utilized
with TL.28 rails

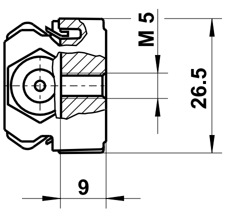
Type: **NU28**
To be utilized
with UL.28 rails

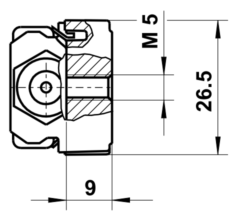
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
NT28 - NU28	3	CPA28 - CPN28	2	115	CK28

** For roller characteristics see page A25*

- N...L SERIES







Type: **NT28L**
To be utilized
with TL.28 rails

Type: **NU28L**
To be utilized
with UL.28 rails

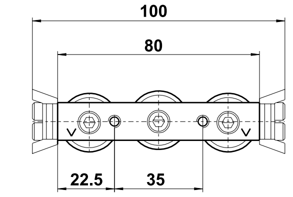
Slider type	No. of rollers*	Type of roller**	No. of fixing holes	Weight [g]	Adjustment key
NT28L - NU28L	3 - 5	CPA28	4	200	CK28

** The number of rollers varies according to the configuration (see page A16)*

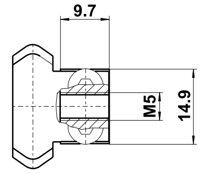
*** For roller characteristics see page A25*

28 SERIES

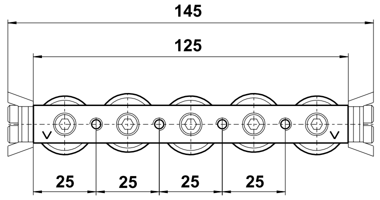
- CSW.. SERIES



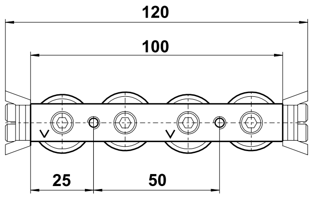
CSW28-80



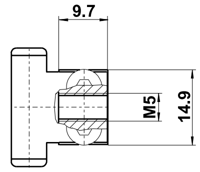
CSW28-T
To be utilized
with TL.28 rails



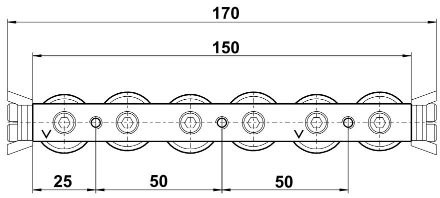
CSW28-125



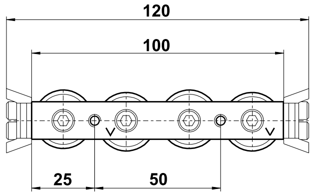
CSW28-100
configuration A



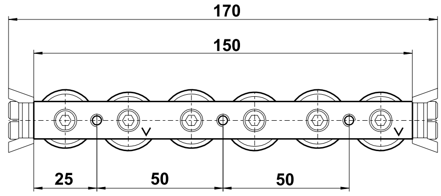
CSW28-U
To be utilized
with UL.28 rails



CSW28-150
configuration A



CSW28-100
configuration B

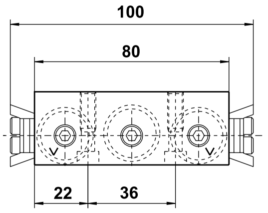


CSW28-150
configuration B

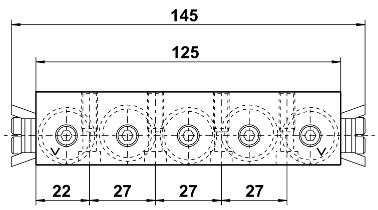
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CSW28-80-2Z **CSW28-80-2RS**	3	CPA28 - CPN28	2	155	CK28
CSW28-100-2Z **CSW28-100-2RS**	4	CPA28	2	195	CK28
CSW28-125-2Z **CSW28-125-2RS**	5	CPA28	4	240	CK28
CSW28-150-2Z **CSW28-150-2RS**	6	CPA28	3	290	CK28

** For roller characteristics see page A25*

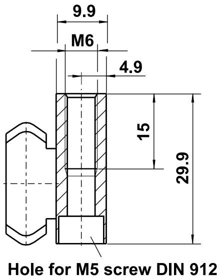
- CDW.. SERIES



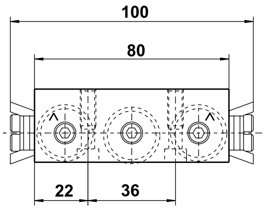
CDW28-80
configuration A



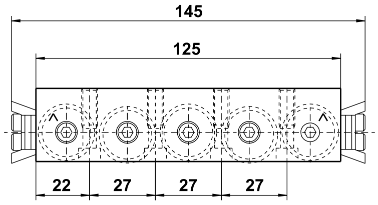
CDW28-125
configuration A



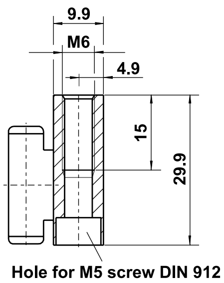
CDW28-T
to be utilized
with TL.28 rails



CDW28-80
configuration B



CDW28-125
configuration B



CDW28-U
to be utilized
with UL.28 rails

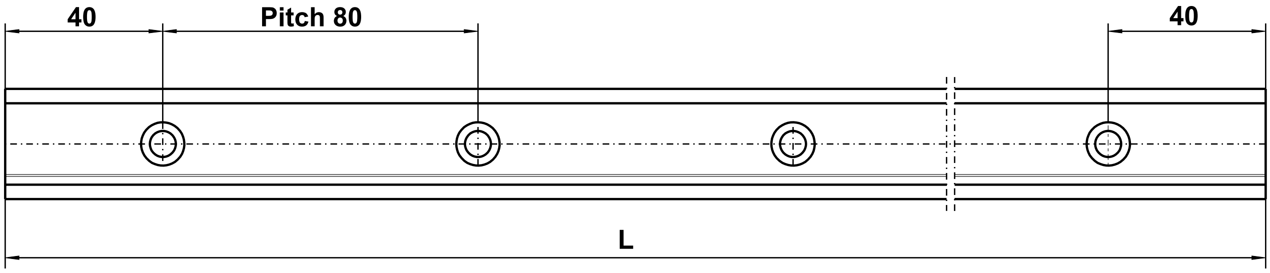
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CDW28-80-2Z **CDW28-80-2RS**	3	CPA28	2	215	CK28
CDW28-125-2Z **CDW28-125-2RS**	5	CPA28	4	300	CK28

** For roller characteristics see page A25*

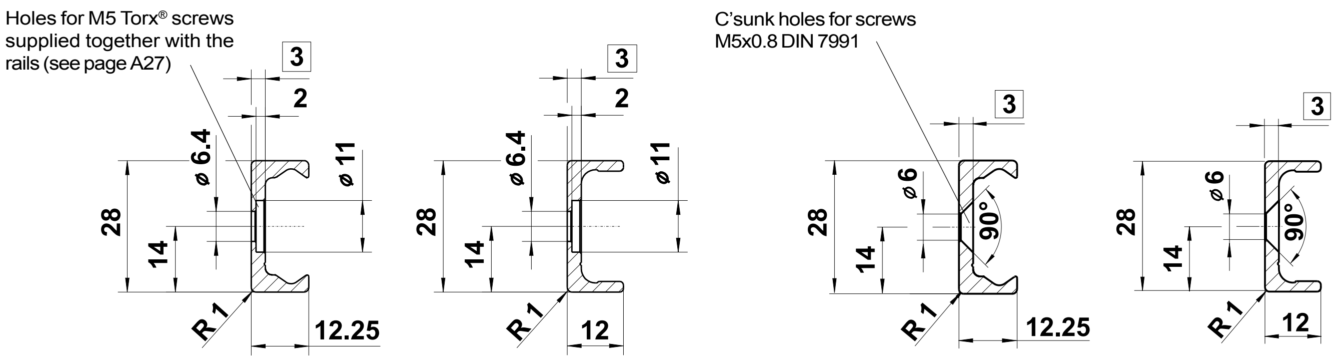
28 SERIES

RAILS

Rail weight: 1000 g/m



With counterbored holes / With countersunk holes

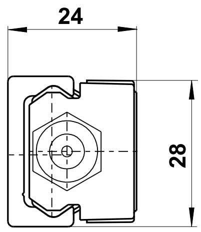


TLC28 **ULC28** **TLV28** **ULV28**

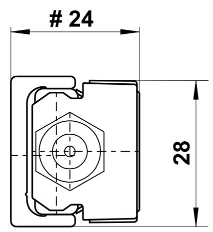
Rail type	Standard lengths **L** [mm]
TLC28 - ULC28 **TLV28 - ULV28**	240 - 320 - 400 - 480 - 560 - 640 - 720 - 800 - 880 - 960 - 1040 1120 - 1200 - 1280 - 1360 - 1440 - 1520 - 1600 - 1680 - 1760 1840 - 1920 - 2000 - 2080 - 2160 - 2240 - 2320 - 2400 - 2480 2560 - 2640 - 2720 - 2800 - 2880 - 2960 - 3040 - 3120 - 3200

MOUNTED RAIL/SLIDER

TL.../NT28
TL.../NT28L

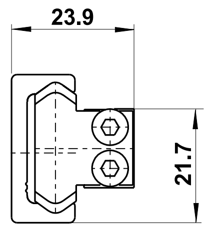


UL.../NU28
UL.../NU28L

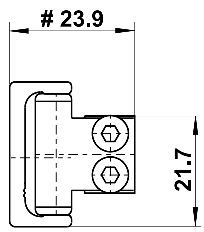


 # min. 24
max. 25.3

TL.../CSW28-T

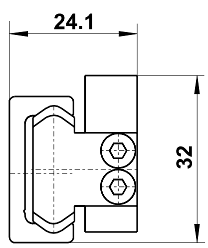


UL.../CSW28-U

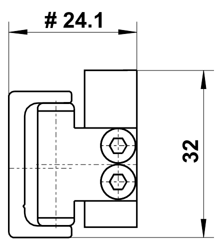


 # min. 23.3
max. 25.2

TL.../CDW28-T



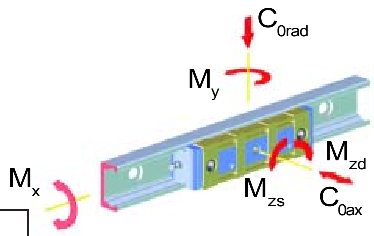
UL.../CDW28-U



 # min. 23.5
max. 25.4

LOAD CAPACITY

The load capacities indicated in this paragraph, refer to the "standard" positioning of the slider into the rail with the direction of the fixed rollers corresponding to that of the radial load.



Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_Y [Nm]	M_z [Nm]	
						M_{zd}	M_{zs}
NT28	4260	2170	640	6.2	16.0	27.2	
NU28	4260	2170	0	0	0	27.2	
CSW28-80-..	4260	2170	640	6.2	16.0	27.2	
CSW28-100-..-A	4260	2170	750	11.5	21.7	27.2	81.7
CSW28-100-..-B	4260	2170	750	11.5	21.7	81.7	27.2
CSW28-125-..	5065	2580	900	11.5	29.0	81.7	
CSW28-150-..-A	5065	2580	1070	13.7	36.2	81.7	136.1
CSW28-150-..-B	5065	2580	1070	13.7	36.2	136.1	81.7
CDW28-80-..	4260	2170	640	6.2	16.0	27.2	
CDW28-125-..	5065	2580	900	11.5	29.0	81.7	

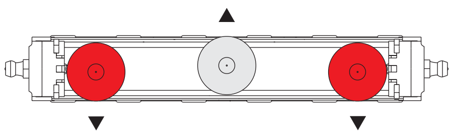
Note: The load capacities indicated in the table refer to CSW and CDW sliders utilized with T.. rails; the values of C_{oax}, M_x and M_y are equal to 0 if used in U-rails.

The sliders of N.28L series are available in six configurations studied to offer great versatility of use.

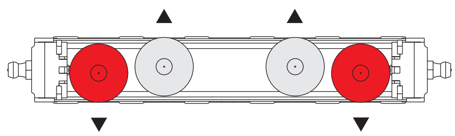
Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_Y [Nm]	M_z [Nm]	
						M_{zd}	M_{zs}
NT28L-3-A	4260	2170	640	6.2	29.0	54.4	
NT28L-4-A	4260	2170	750	11.5	29.0	54.4	108.5
NT28L-4-B	4260	2170	750	11.5	29.0	108.5	54.4
NT28L-4-C	4260	2170	750	11.5	29.0	81.7	
NT28L-5-A	5065	2580	900	11.5	29.0	81.7	
NT28L-5-B	6816	3472	640	6.2	29.0	54.4	
NU28L-3-A	4260	2170	0	0	0	54.4	
NU28L-4-A	4260	2170	0	0	0	54.4	108.5
NU28L-4-B	4260	2170	0	0	0	108.5	54.4
NU28L-4-C	4260	2170	0	0	0	81.7	
NU28L-5-A	5065	2580	0	0	0	81.7	
NU28L-5-B	6816	3472	0	0	0	54.4	

SLIDER CONFIGURATIONS

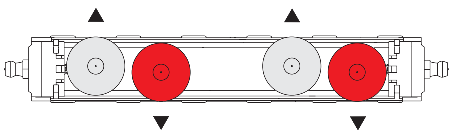
NT28L-3-A / NU28L-3-A



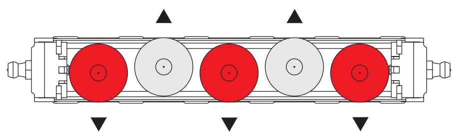
NT28L-4-C / NU28L-4-C



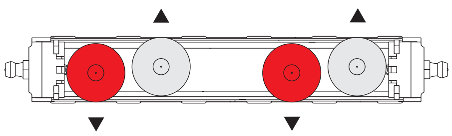
NT28L-4-A / NU28L-4-A



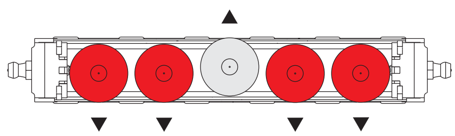
NT28L-5-A / NU28L-5-A



NT28L-4-B / NU28L-4-B



NT28L-5-B / NU28L-5-B

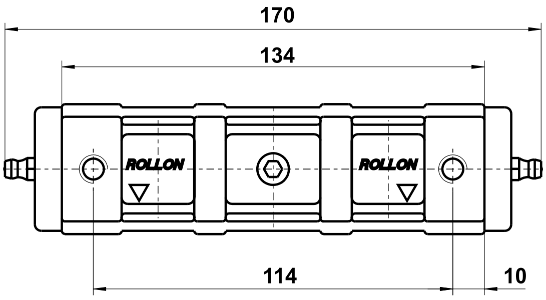


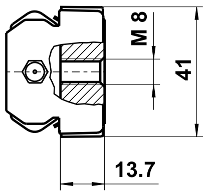
ROLLON

43 SERIES

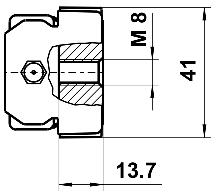
SLIDERS

- N... SERIES

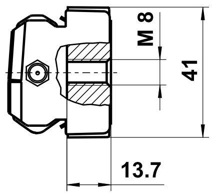




Type: T **NT43**
To be utilized with TL.43 rails



Type: U **NU43**
To be utilized with UL.43 rails

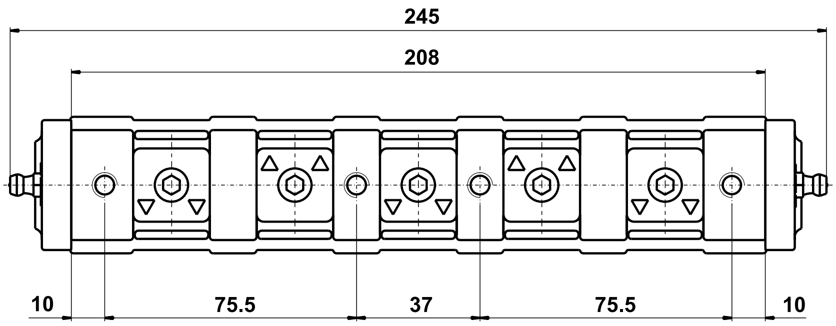


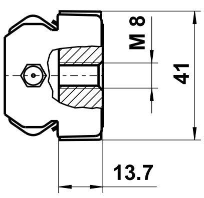
Type: K **NK43**
To be utilized with KL.43 rails

Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
NT43 - NU43	3	CPA43 - CPN43	2	385	CK43
NK43	3	CRA43 - CRN43	2	385	CK43

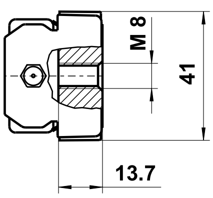
** For roller characteristics see page A25*

- N...L SERIES

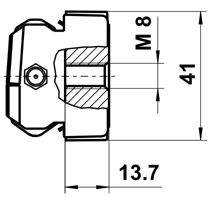




Type: T **NT43L**
To be utilized with TL.43 rails



Type: U **NU43L**
To be utilized with UL.43 rails



Type: K **NK43L**
To be utilized with KL.43 rails

Slider type	No. of rollers*	Type of roller**	No. of fixing holes	Weight [g]	Adjustment key
NT43L - NU43L	3 - 5	CPA43	4	600	CK43
NK43L	3 - 5	CRA43	4	600	CK43

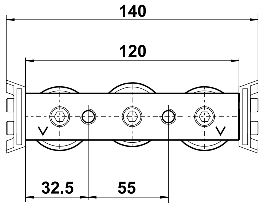
** The number of rollers varies according to the configuration (see page A21)*

*** For roller characteristics see page A25*

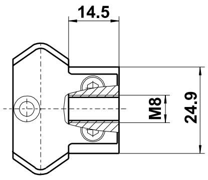
ROLLON

43 SERIES

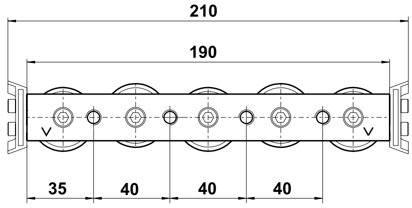
- CSW.. SERIES



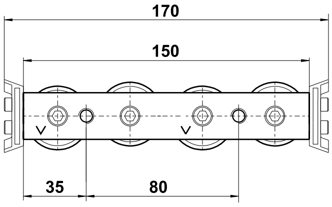
CSW43-120



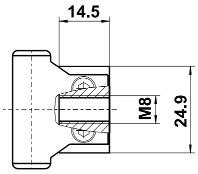
CSW43..-T
To be utilized
with TL.43 rail



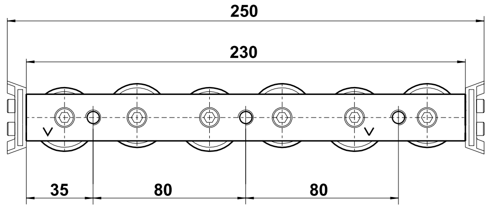
CSW43-190



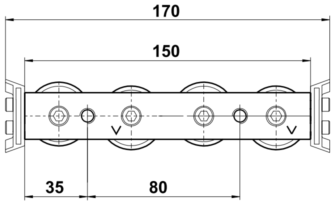
CSW43-150
configuration A



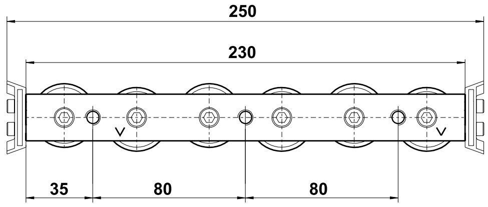
CSW43..-U
To be utilized
with UL.43 rail



CSW43-230
configuration A



CSW43-150
configuration B

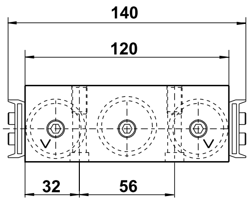


CSW43-230
configuration B

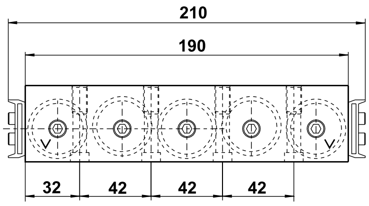
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CSW43-120-2Z **CSW43-120-2RS**	3	CPA43- CPN43	2	530	CK43
CSW43-150-2Z **CSW43-150-2RS**	4	CPA43	2	680	CK43
CSW43-190-2Z **CSW43-190-2RS**	5	CPA43	4	840	CK43
CSW43-230-2Z **CSW43-230-2RS**	6	CPA43	3	1010	CK43

** For roller characteristics see page A25*

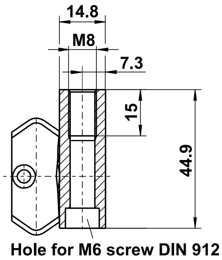
- CDW.. SERIES



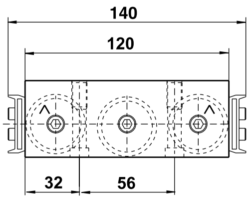
CDW43-120
configuration A



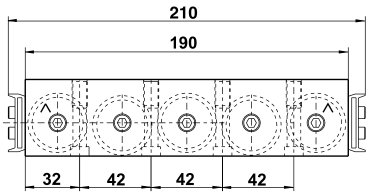
CDW43-190
configuration A



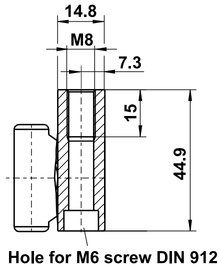
CDW43-T
To be utilized
with TL.43 rails



CDW43-120
configuration B



CDW43-190
configuration B



CDW43-U
To be utilized
with UL.43 rails

Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CDW43-120-2Z **CDW43-120-2RS**	3	CPA43	2	640	CK43
CDW43-190-2Z **CDW43-190-2RS**	5	CPA43	4	950	CK43

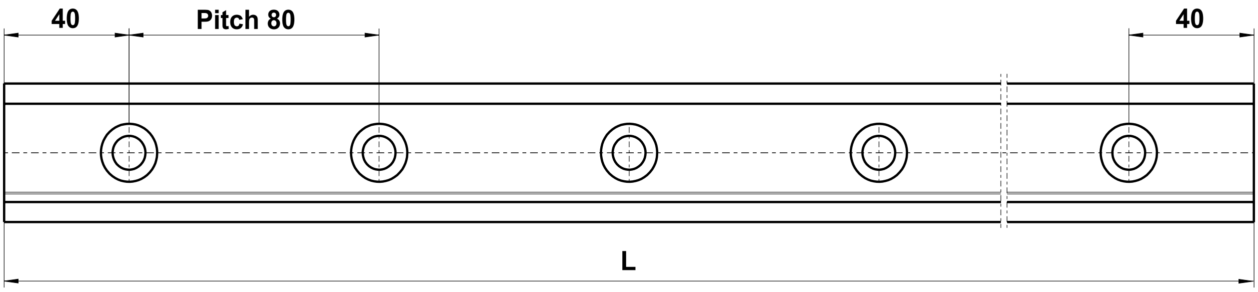
** For roller characteristics see page A25*

ROLLON

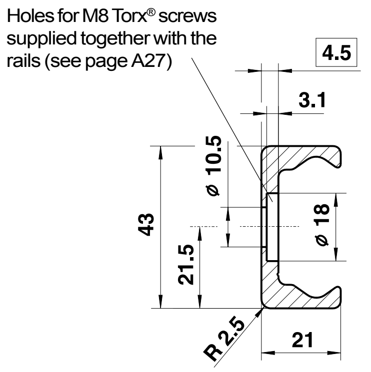
43 SERIES

RAILS

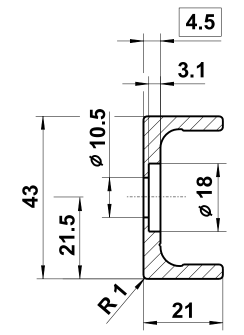
Rail weight: 2600 g/m



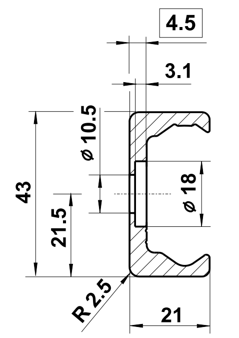
With counterbored holes



TLC43

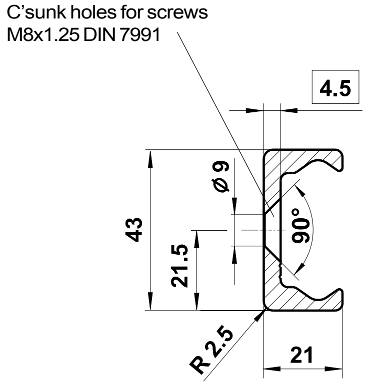


ULC43

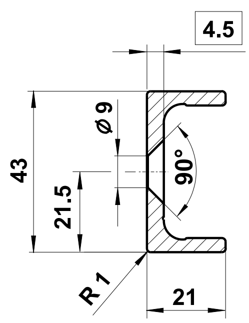


KLC43

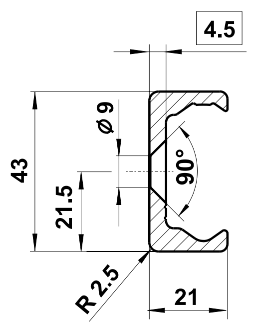
With countersunk holes



TLV43



ULV43



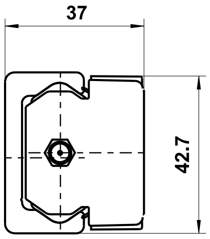
KLV43

Rail type	Standard lengths **L** [mm]
TLC43 - TLV43 **ULC43 - ULV43** **KLC43 - KLV43**	400 - 480 - 560 - 640 - 720 - 800 - 880 - 960 - 1040 - 1120 - 1200 - 1280 - 1360 - 1440 - 1520 - 1600 - 1680 - 1760 - 1840 - 1920 - 2000 - 2080 - 2160 - 2240 - 2320 - 2400 - 2480 - 2560 - 2640 - 2720 - 2800 - 2880 - 2960 - 3040 - 3120 - 3200 - 3280 - 3360 - 3440 - 3520 - 3600

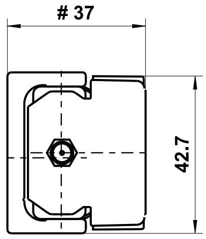
43 SERIES

MOUNTED RAIL/SLIDER

TL.../NT43
TL.../NT43L

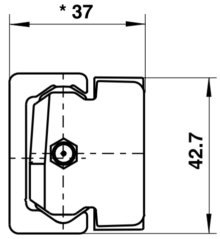


UL.../NU43
UL.../NU43L

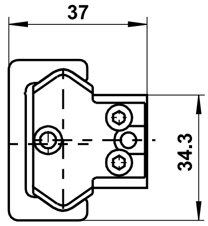


 # min. 37
max. 39.5

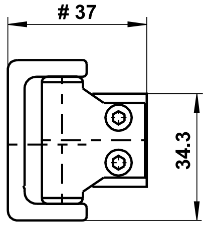
KL.../NK43
KL.../NK43L



TL.../CSW43-T

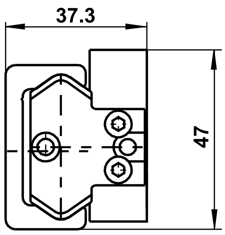


UL.../CSW43-U

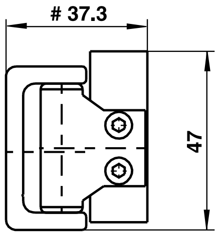


 # min. 35.6
max. 39.5

TL.../CDW43-T



UL.../CDW43-U

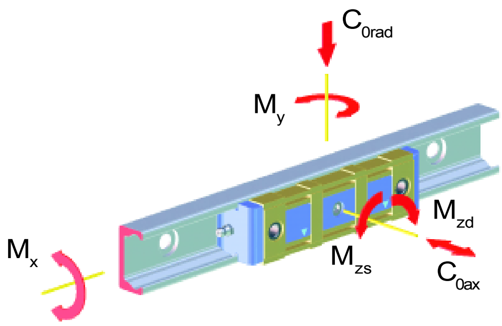


 # min. 35.9
max. 39.8

* The K-rail allows the K-slider to rotate, therefore this dimension will change under rotation.
For more details see page A34.
The K-rail **must be** mounted in such a way that the radial load is always carried by the rollers on the slider in contact with the **"V"** shaped raceway.

LOAD CAPACITY

The load capacities indicated in this paragraph, refer to the "standard" positioning of the slider into the rail with the direction of the fixed rollers corresponding to that of the radial load.



Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_y [Nm]	M_z [Nm] M_{zd}	M_{zs}
NT43	12280	5500	1570	23.6	60.0	104.5	
NU43	12280	5500	0	0	0	104.5	
NK43	12280	5100	1320	0	50.4	96.9	
CSW43-120-..	12280	5500	1570	23.6	60.0	104.5	
CSW43-150-..-A	12280	5500	1855	43.6	81.5	104.5	313.5
CSW43-150-..-B	12280	5500	1855	43.6	81.5	313.5	104.5
CSW43-190-..	14675	6540	2215	43.6	108.6	313.5	
CSW43-230-..-A	14675	6540	2215	52.0	135.8	313.5	522.5
CSW43-230-..-B	14675	6540	2215	52.0	135.8	522.5	313.5
CDW43-120-..	12280	5500	1570	23.6	60.0	104.5	
CDW43-190-..	14675	6540	2215	43.6	108.6	313.5	

Note: The load capacities indicated in the table refer to CSW and CDW sliders utilized with T.. rails; the values of C_{0ax}, M_x and M_y are equal to 0 if used in U-rails.

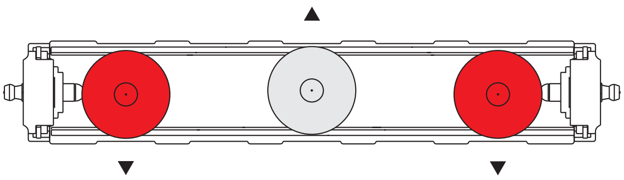
43 SERIES

The sliders of N.43L series are available in six configurations studied to offer great versatility of use.

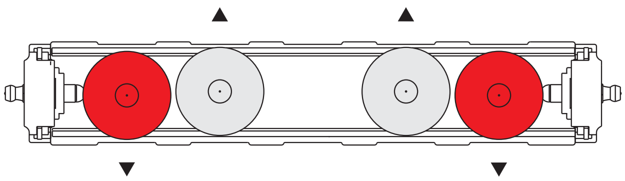
Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_Y [Nm]	M_z [Nm]	
						M_{zd}	M_{zs}
NT43L-3-A	12280	5500	1570	23.6	108.6	209	
NT43L-4-A	12280	5500	1855	43.6	108.6	209	418
NT43L-4-B	12280	5500	1855	43.6	108.6	418	209
NT43L-4-C	12280	5500	1855	43.6	108.6	313.5	
NT43L-5-A	14675	6540	2215	43.6	108.6	313.5	
NT43L-5-B	19650	8800	1570	23.6	108.6	209	
NU43L-3-A	12280	5500	0	0	0	209	
NU43L-4-A	12280	5500	0	0	0	209	418
NU43L-4-B	12280	5500	0	0	0	418	209
NU43L-4-C	12280	5500	0	0	0	313.5	
NU43L-5-A	14675	6540	0	0	0	313.5	
NU43L-5-B	19650	8800	0	0	0	209	
NK43L-3-A	12280	5100	1320	0	97.7	188.7	
NK43L-4-A	12280	5100	1320	0	97.7	188.7	377.3
NK43L-4-B	12280	5100	1320	0	97.7	377.3	188.7
NK43L-4-C	12280	5100	1320	0	97.7	283	
NK43L-5-A	14675	6065	1980	0	97.7	283	
NK43L-5-B	19650	8160	1320	0	97.7	188.7	

SLIDER CONFIGURATIONS

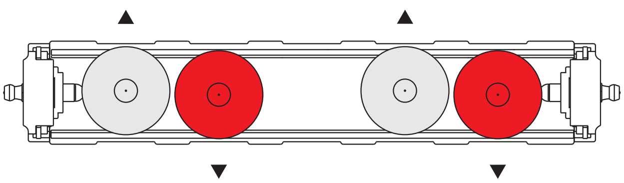
NT43L-3-A / NU43L-3-A / NK43L-3-A



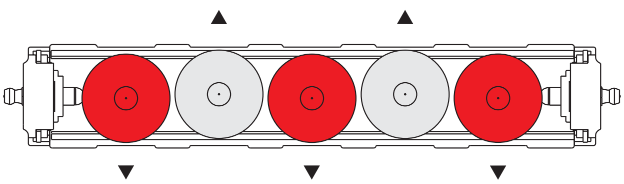
NT43L-4-C / NU43L-4-C / NK43L-4-C



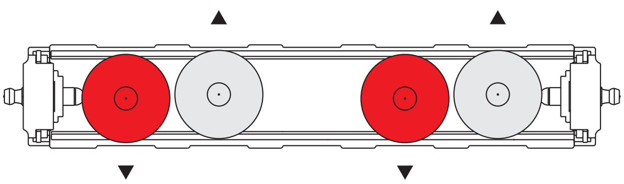
NT43L-4-A / NU43L-4-A / NK43L-4-A



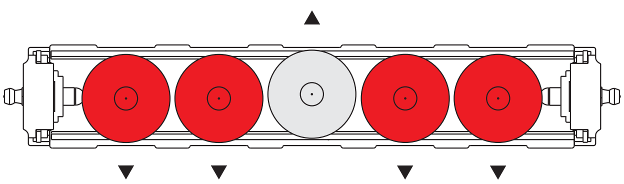
NT43L-5-A / NU43L-5-A / NK43L-5-A



NT43L-4-B / NU43L-4-B / NK43L-4-B



NT43L-5-B / NU43L-5-B / NK43L-5-B

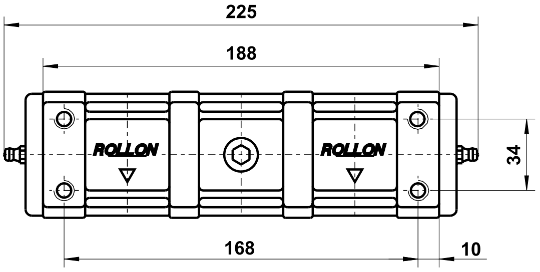


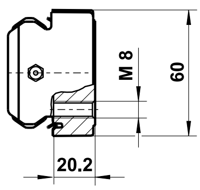
ROLLON

63 SERIES

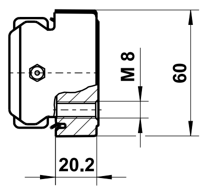
SLIDERS

- N... SERIES

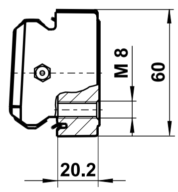




Type: NT63
To be utilized with TL.63 rails



Type: NU63
To be utilized with UL.63 rails

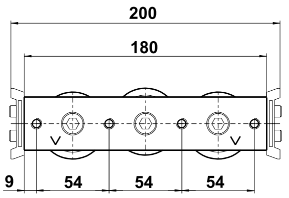


Type: NK63
To be utilized with KL.63 rails

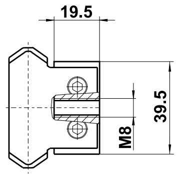
Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
NT63 - NU63	3	CPA43 - CPN63	4	1070	CK63
NK63	3	CRA63 - CRN63	4	1070	CK63

** For roller characteristics see page A25*

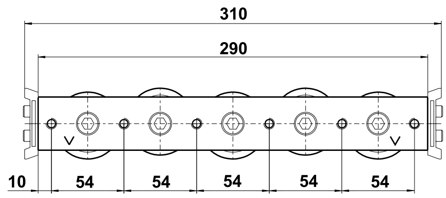
- CSW.. SERIES



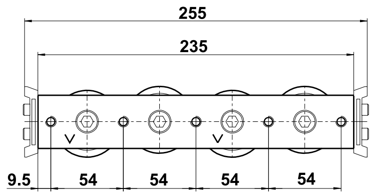
CSW63-180



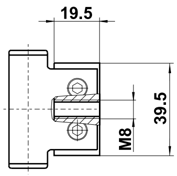
CSW63-T
To be utilized with TL.63 rails



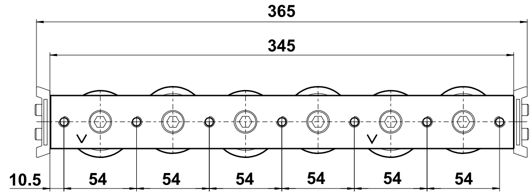
CSW63-290



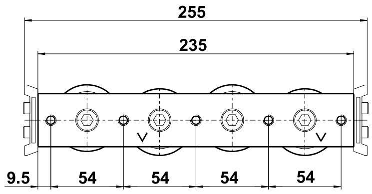
CSW63-235 configuration A



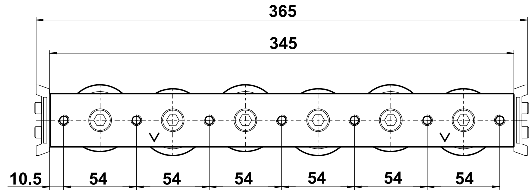
CSW63-U
To be utilized with UL.63 rails



CSW63-345 configuration A



CSW63-235 configuration B



CSW63-345 configuration B

Slider type	No. of rollers	Type of roller*	No. of fixing holes	Weight [g]	Adjustment key
CSW63-180-2ZR	3	CPA63	4	1660	CK63
CSW63-235-2ZR	4	CPA63	5	2170	CK63
CSW63-290-2ZR	5	CPA63	6	2670	CK63
CSW63-345-2ZR	6	CPA63	7	3170	CK63

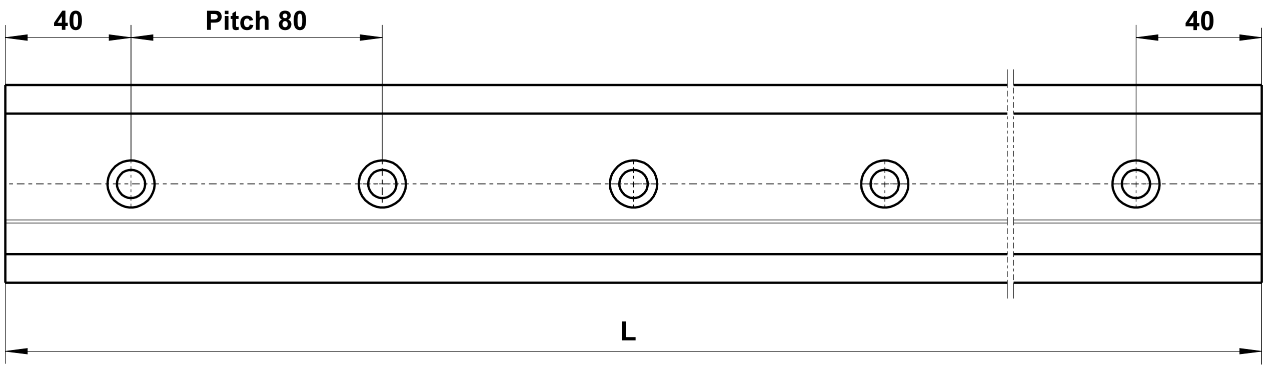
** For roller characteristics see page A25*

ROLLON

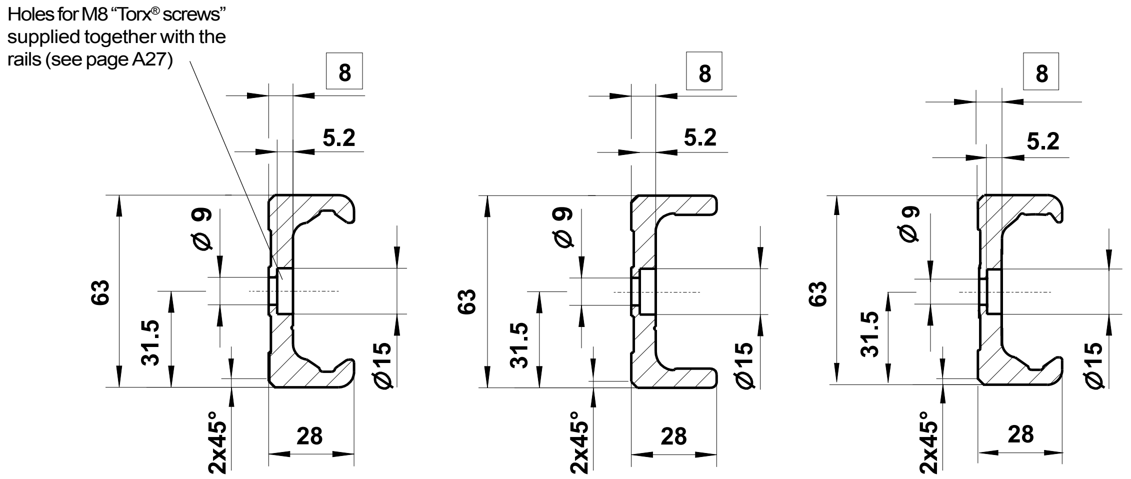
RAILS

63 SERIES

Rail weight:
6000 g/m

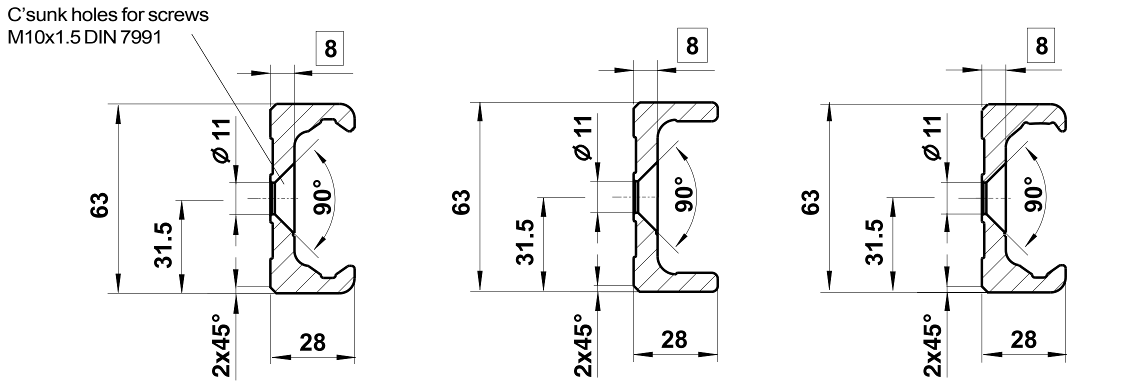


With counterbored holes



TLC63 ULC63 KLC63

With countersunk holes



TLV63 ULV63 KLV63

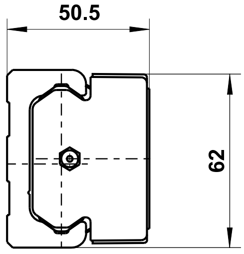
Rail type	Standard lengths **L** [mm]
TLC63 - TLV63 **ULC63 - ULV63** **KLC63 - KLV63**	560 - 640 - 720 - 800 - 880 - 960 - 1040 - 1120 - 1200 - 1280 - 1360 - 1440 - 1520 - 1600 - 1680 - 1760 1840 - 1920 - 2000 - 2080 - 2160 - 2240 - 2320 - 2400 - 2480 - 2560 - 2640 - 2720 - 2800 - 2880 - 2960 - 3040 - 3120 - 3200 - 3280 - 3360 - 3440 - 3520 - 3600

ROLLON

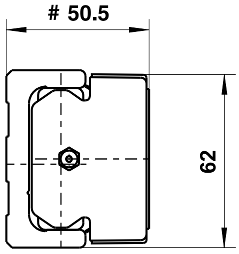
63 SERIES

MOUNTED RAIL/SLIDER

TL.../NT63

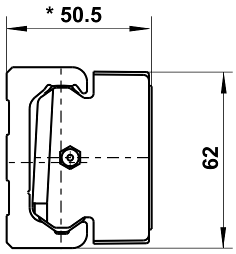


UL.../NU63

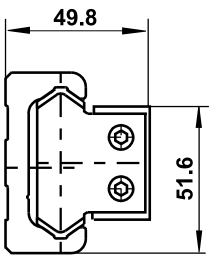


 # min. 50.5
max. 54

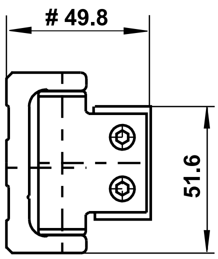
KL.../NK63



TL.../CSW63-T



UL.../CSW63-U

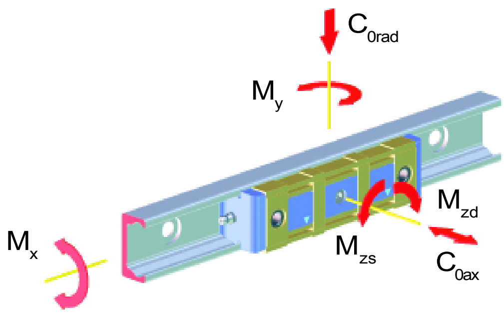


 # min. 49.4
max. 53.3

* The K-rail allows the K-slider to rotate, therefore this dimension will change under rotation. For more details see page A34. The K-rail **must be** mounted in such a way that the radial load is always carried by the rollers on the slider in contact with the **"V"** shaped raceway.

LOAD CAPACITY

The load capacities indicated in this paragraph, refer to the "standard" positioning of the slider into the rail with the direction of the fixed rollers corresponding to that of the radial load.



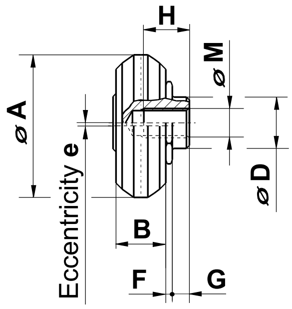
Slider type	C [N]	C_{0rad} [N]	C_{0ax} [N]	M_x [Nm]	M_Y [Nm]	M_z [Nm]	
						M_{zd}	M_{zs}
NT63	30750	12500	6000	125	271	367	
NU63	30750	12500	0	0	0	367	
NK63	30750	11550	5045	0	235	335	
CSW63-180-..	30750	12500	6000	125	271	367	
CSW63-235-..-A	30750	12500	7200	250	413	367	1100
CSW63-235-..-B	30750	12500	7200	250	413	1100	367
CSW63-290-..	36600	15000	8500	250	511	1100	
CSW63-345-..-A	36600	15000	10000	350	689	1100	1830
CSW63-345-..-B	36600	15000	10000	350	689	1830	1100

Note: The load capacities indicated in the table refer to CSW sliders utilized with T.. rails; ihe values of C_{0ax}, M_x and M_y are equal to 0 if used with U-rails.

ROLLERS

CPA / CPN ROLLERS

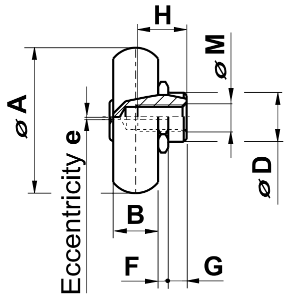
The CPA is the eccentric roller used for the preload setting while the CPN is the non-eccentric roller. Both the CPN and the CPA rollers are designed for T and U rails.
The internal thread of the pivot has a special antiloosening shape, suitable for standard screws.



Type	Dimensions [mm]								C [N]	C_{0rad} [N]	Weight [g]
	A	B	F	G	D	M	H	e			
CPA18-2Z CPA18-2RS	14	4	1.55	1.8	6	M4	5.5	0.4	765	410	4
CPA28-2Z CPA28-2RS	23.2	7	2.2	3.8	10	M5	7	0.6	2130	1085	19
CPA43-2Z CPA43-2RS	35	11	2.5	4.5	12	M6	12	0.8	6140	2750	60
CPA63-2ZR	50	17.5	2.3	6	18	M10	16	1.2	15375	6250	190
CPN18-2Z CPN18-2RS	14	4	1.55	1.8	6	M4	5.5	-	765	410	4
CPN28-2Z CPN28-2RS	23.2	7	2.2	3.8	10	M5	7	-	2130	1085	19
CPN43-2Z CPN43-2RS	35	11	2.5	4.5	12	M6	12	-	6140	2750	60
CPN63-2ZR	50	17.5	2.3	6	18	M8	16	-	15375	6250	190

CRA / CRN ROLLERS

The CRA is the eccentric roller used for the preload setting while the CRN is the non-eccentric roller. Both the CRA and the CPN rollers are designed for K rails.
The internal thread of the pivot has a special antiloosening shape, suitable for standard screws.



Type	Dimensions [mm]								C [N]	C_{0rad} [N]	Weight [g]
	A	B	F	G	D	M	H	e			
CRA43-2Z	35.6	11	2.5	4.5	12	M6	12	0.8	6140	2550	60
CRA63-2ZR	49.7	17.5	2.3	6	18	M10	16	1.2	15375	5775	190
CRN43-2Z	35.6	11	2.5	4.5	12	M6	12	-	6140	2550	60
CRN63-2ZR	49.7	17.5	2.3	6	18	M8	16	-	15375	5775	190

SPECIAL SLIDERS

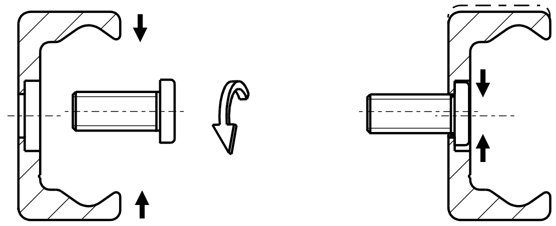
By utilizing the rollers shown above, **ROLLON** can supply special CSW sliders with lengths, holes, and roller positions different from the standard versions.
Contact our Technical Department for more information.

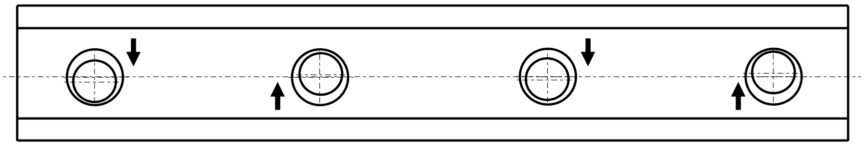
RAIL MOUNTING-HOLE CRITERIA

ROLLON offers two rail mounting hole systems for the **COMPACT RAIL** system: counterbored and countersunksunk.
In the two paragraphs below the criteria for which system should be selected is explained.

COMPACT "C" - Rails with counterbored holes

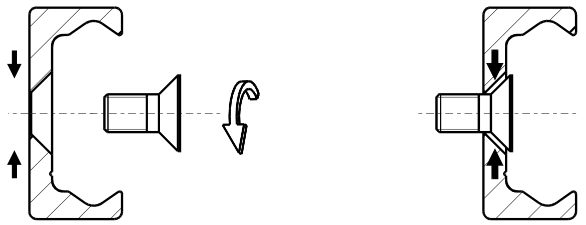
There are two main reasons for choosing counterbored mounting holes.
1) High linear precision, which implies precise rail mounting, can only be offered by counterbored fixing holes. Counterbored fixing holes allow precise rail positioning according to an external reference which assures and controls the required precision tolerances.
2) The need to mount a rail using fixing holes which are not aligned is a common situation when having only one rail and low precision requirements. In this case the counterbored holes are needed because, having a larger diameter when compared to the screws, they allow the rail to adjust slightly during mounting.

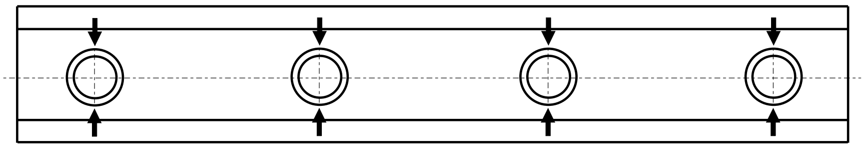




COMPACT "V" - Rails with countersunk holes

Selection of rails with c'sunk holes is often based on the application's low requirement for linear precision and the decent alignment of the fixing holes. The use of countersunk fixing holes eliminates the necessity of time consuming rail reference positioning, as the rail aligns itself according to the average hole position. The use of countersunksunk mounting holes could be used in many handling or automation applications or most applications where the rail is mounted to a T-slot.



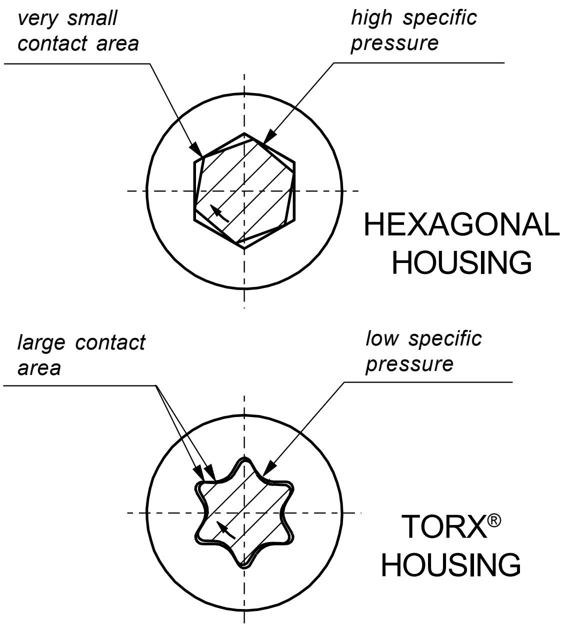


ROLLON

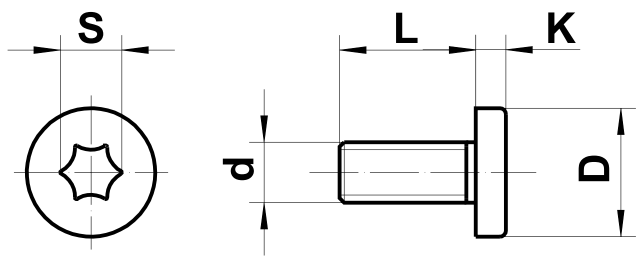
TORX® HEAD SCREWS

CHARACTERISTICS

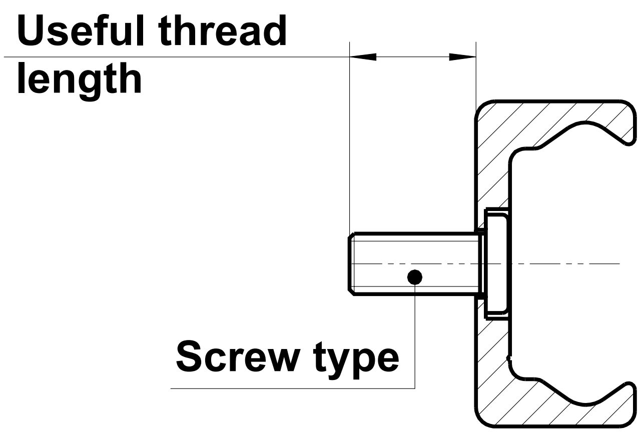
For the **COMPACT RAIL** counterbored hole rails, special dimension screws have been designed with **TORX®** fixing housing.
The **TORX®** socket shallow head screws guarantee high tightening torque without plastic deformation or cracks. This increased torque allows the rails to remain well fixed even in the presence of vibrations. Tightening torque is transmitted with safety because the guide angle of 15° is very similar to the optimal value of torque transmission of gears. The large contact area - even with a reduced depth - eliminates any chance of concentrated stress and deformations, with consequent reduction of the wear of housing and key, minimalizing the risk of the key sliding and “stripping” the housing.
The six vertical contact surfaces maintain the key in the right position, avoiding damage and working without peak loads.



TECHNICAL DATA



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



Rail type	Screw type	Useful thread length
18	M4 x 8	7.2 mm
28	M5 x 10	9 mm
43	M8 x 16	14.6 mm
63	M8 x 20	17.2 mm

Note: all rails with counterbored fixing holes will be supplied with these **TORX®** screws. Extra **TORX®** screws and inserts can be ordered. See table at right.

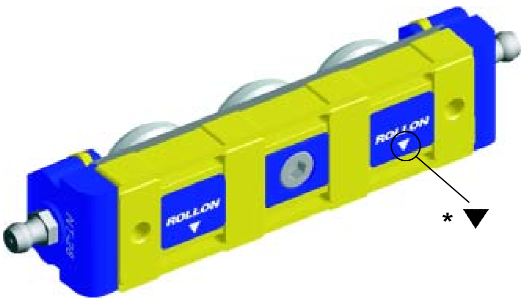
Order code	Rail type	“Kit” contents
31-30	18	100 M4 screws + 4 inserts T20
31-31	28	100 M5 screws + 4 inserts T25
31-32	43	50 M8 screws + 2 inserts T40
31-33	63	50 M8 screws + 2 inserts T40

ROLLON

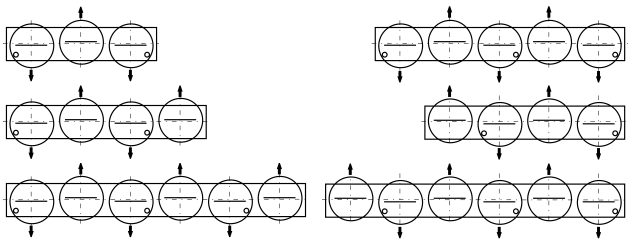
GENERAL INSTRUCTIONS FOR THE USE OF SLIDERS

POSITION OF THE ROLLERS

The sliders NT, NU and NK are equipped with rollers which are alternately in contact with the two raceways.
A **triangular symbol*** engraved on the plastic caps covering the pivots, identifies their contact side on the rail.



The sliders CSW and CDW are equipped with three, four, five or six rollers, arranged as follows (as shown in the figure, the fixed rollers are identified by a **"o"** symbol stamped on the bar in connection with the fixed rollers):

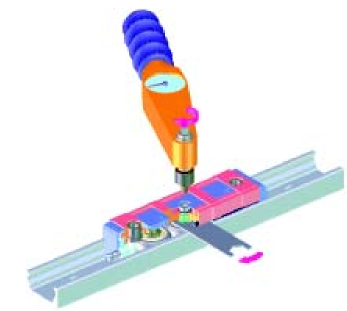


IMPORTANT !
Check that the direction of the rollers corresponds to that of the external loads.

PRELOADING THE SLIDERS

Correct preload setting is very important to the quality of movement and to the lifetime of the system. Normally the sliders are supplied mounted and preloaded in the rails. When supplied separately, the preload must be set by the user. This simple operation must also be carried out if the slider is removed from one rail and mounted in another.

PRELOAD SETTING PROCEDURE:
(1) Assure that the raceways are clean.
(2) Insert the slider into the rail. CSW and CDW sliders must be inserted without wipers. Slightly loosen only fixing screws of the rollers to be set.
(3) Position the slider at one end of the rail.
(4) For the U-rails a thin, strong support (i.e preload key) must be inserted under the ends of slider body to maintain the slider horizontal in the flat raceways.
(5) Insert the special flat preload key between the rail and slider on the side with the triangular symbol (NT, NU, NK), triangular symbol associated to a red screw's head (NT..L, NU..L, NK..L) or circular symbol (CSW, CDW).
(6) Carefully turn the preload key clockwise until the eccentric roller is in contact with the upper raceway and until any clearance is eliminated. Only a small preload is needed. High preload setting increases friction which reduces the lifetime.
(7) While holding the position of the rollers firm with the preload key, carefully tighten the fixing screw. The correct tightening torque of the screws will be applied later. See **(10)** and drawing below.
(8) Move the slider along the rail to verify the preload setting. The movement should be smooth and at no point of the rail should the slider have any clearance.
(9) For sliders with more than 3 rollers, repeat this procedure for each eccentric roller. Start preload setting with the first roller **after** the one indicated with red paint. Make sure that all rollers have the correct contact with the raceways.

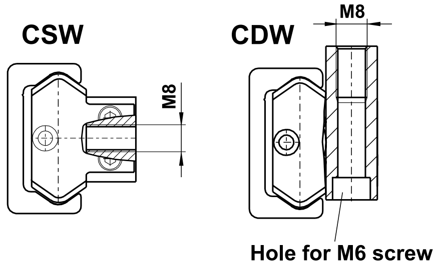


Slider type	Tightening torque [Nm]
18 series	3
28 series	7
43 series	12
63 series	35

(10) Using the correct tightening values, tighten all fixing screws. Make sure to block the roller with the preload key while doing this. A special locking thread inside the pivot guarantees that the roller will remain in the set position.
(11) Mount then the CSW and CDW's wipers and check that raceways are correctly lubricated.

POSSIBILITIES IN SLIDER MOUNTING

COMPACT RAIL sliders offer a complete range of fixing possibilities. In fact, NT, NU, NK and CSW sliders give the possibility to fix the moving element to the lateral side. In addition, N. 63 can be fixed from behind. CDW sliders have wider body to allow for top or bottom side mounting.

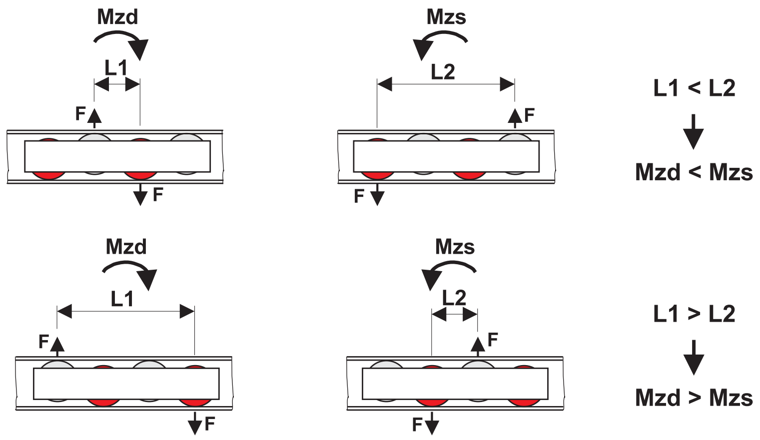


SLIDERS UNDER YAWING MOMENT

For applications where an overhanging load acts on a single slider in one rail, and thereby creates a yawing moment (Mz) in one direction, the **COMPACT RAIL** system offers sliders with 4 or 6 rollers in different configurations, each one determined by the roller position available in two configurations, **“A”** or **“B”**, determined by the roller positions. The Mz moment capacity of these sliders changes significantly according to the direction of the moment: clockwise or counterclockwise. Therefore it is very important to choose the correct combination of slider configuration in a pair of rails when a higher Mz moment is required. Since 3 and 5 rollers sliders are symmetrical, the Mz moment is the same in both directions.

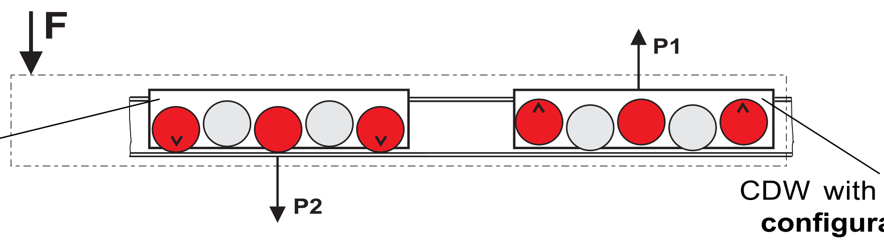
CSW with 4 rollers
configuration A
and
N...L-4-A

CSW with 4 rollers
configuration B
and
N...L-4-B



SLIDERS UNDER OVERHANGING LOAD

For applications where an overhanging load is supported by two sliders in the same rail creating an overhanging load in one direction and consequently an opposite load reaction on each of the sliders, it is important to ensure that the correct configurations of the slider are properly positioned. This means that when using: NT, NU and CSW sliders with 3 and 5 rollers, one of the sliders has to be mounted inverted so that the slider is loaded on the side with most rollers (this is not possible with NK sliders, due to different raceway shape). CSW sliders with 4 or 6 rollers and the same radial load capacity are mounted with the same load direction. The top mounting CDW sliders cannot be inverted due to the positioning of the rollers in respect to the top of the rail and are therefore offered in **“A”** and **“B”** configurations. See figure below.



CDW with 5 rollers
configuration A

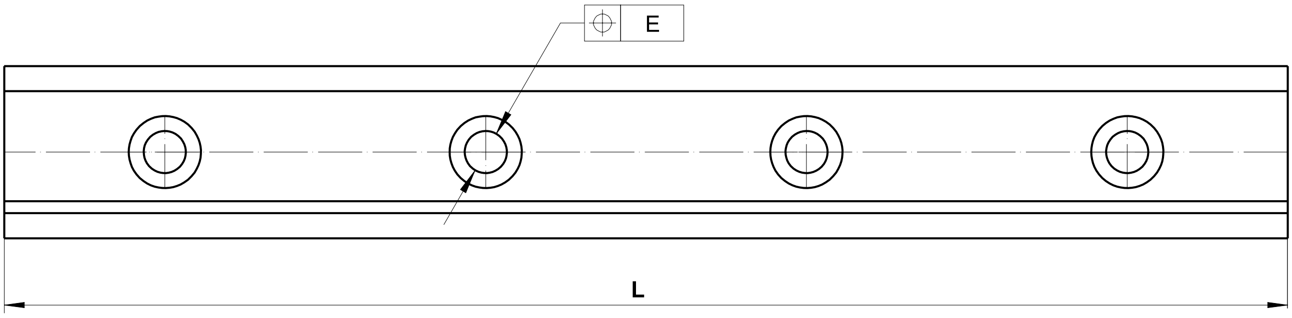
CDW with 5 rollers
configuration B

WORKING TEMPERATURE

The continuous working temperature range is -30°C/+120°C (-22°F/+248°F), with peaks of 150°C (302°F). Higher peak temperatures (160°C/+170°C) (+320°F/+338°F) can be reached by C..series sliders (sizes 18, 28, 43 only), by dismounting the wipers.

GENERAL TOLERANCES

RAIL TOLERANCES

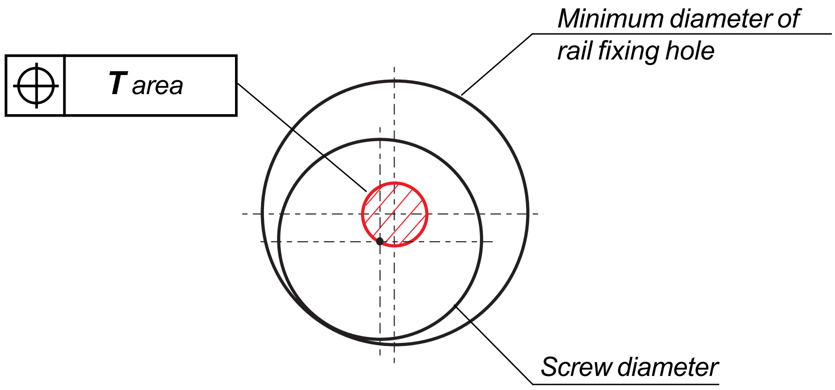


Rail type	L [mm]	E [mm]
T..18 and U..18	+2 -4	∅ 0.2
T..28 and U..28		
T..43 - U..43 - K..43		
T..63 - U..63 - K..63		

L - Dimensional Tolerance on length
E - True-position Tolerance:
the tolerance area is limited from a circle of **E** diameter, whose center is in the exact theoretical center of the considered point.

- Notes for rail mounting with counterbored fixing screws:

As indicated on page A26, the c'sunk screw head fits into the countersink and does not permit any adjustment of the rail. The counterbored hole in the rail permits the counterbored fixing screw head a certain degree of displacement for optimal rail positioning as shown in the figure below.



Rail type	T area [mm]
TLC18 and ULC18	∅ 0.4
TLC28 and ULC28	∅ 0.8
TLC43 - ULC43 - KLC43	∅ 1.2
TLC63 - ULC63 - KLC63	∅ 0.6

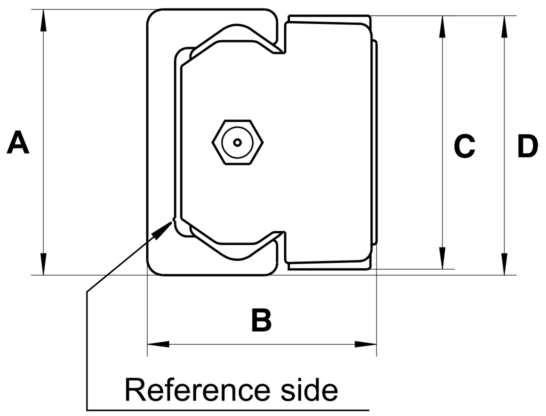
T area - is the diameter of the displacement area that the screw center can be moved within, while still assuring correct alignment.

IMPORTANT !
Due to the design of our counterbored screws and holes in the rails, it is necessary to chamfer the mounting holes of the mounting structure. For more details see page A47.

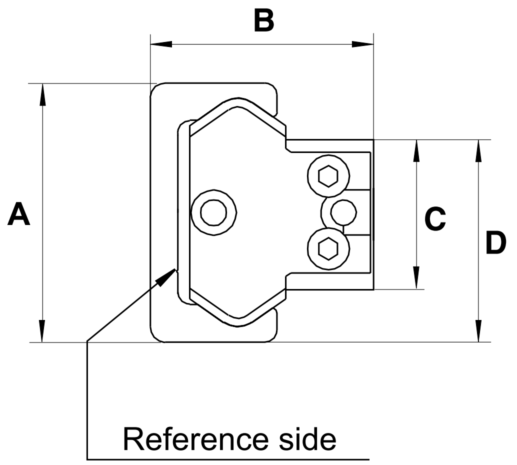
ROLLON

ASSEMBLY TOLERANCES

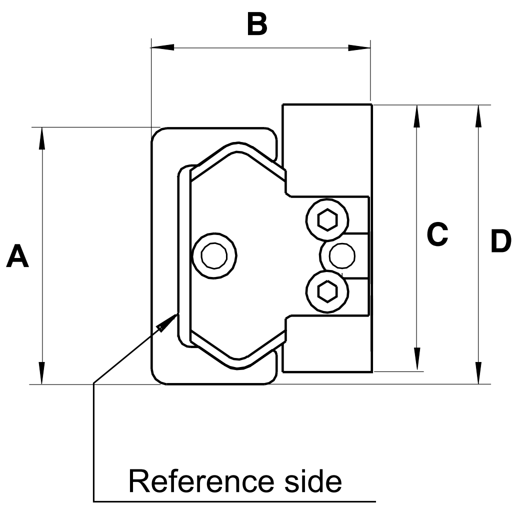
- Rails with N.. sliders:



	TL.../ NT... UL.../ NU... KL.../ NK...			
	18	28	43	63
A	+0.25 -0.10		+0.35 -0.10	
B	+0.15 -0.15	+0.25 -0.10		
C	0 -0.20		0 -0.30	
D	+0.25 -0.25	+0.15 -0.35	+0.20 -0.35	0 -0.50



	TL../ CSW-..T UL../ CSW-..U			
	18	28	43	63
A	+0.25 -0.10		+0.35 -0.10	
B	+0.15 -0.15			
C	0 -0.05	0 -0.10	0 -0.15	+0.15 0
D	+0.05 -0.25	+0.05 -0.35	+0.10 -0.30	+0.15 -0.30



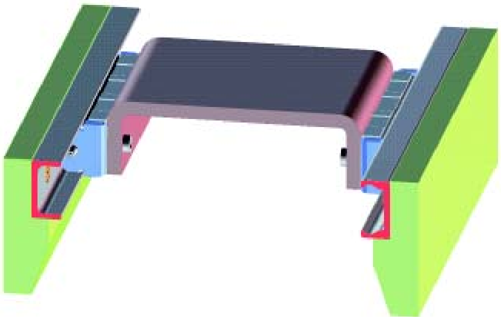
	TL../ CDW-..T UL../ CDW-..U	
	28	43
A	+0.25 -0.10	+0.35 -0.10
B	+0.20 -0.20	
C	0 -0.10	0 -0.15
D	+0.05 -0.35	+0.10 -0.30

ROLLON

T+U SYSTEM

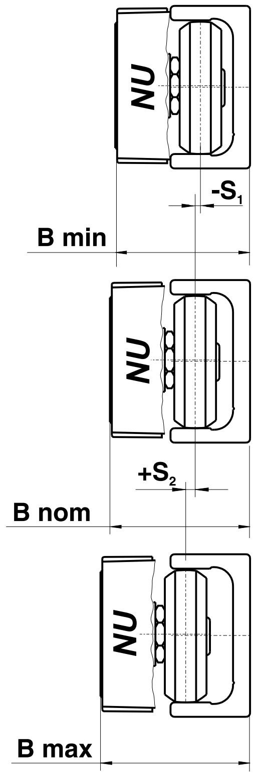
AXIAL PARALLELISM PROBLEMS

Mounting two linear bearing rails in a parallel manner is always important but rarely easy. **ROLLON** offers a unique solution for the problem of aligning rails. Useful anytime two rails are mounted together, our T+U system is indispensible where there are axial parallelism errors. This generally occurs because of insufficient parallelism of the mounting surfaces which causes high slider stress and drastically reduces the lifetime. The T+U rail combination easily solves this problem without expensive machining. Even if the mounting planes are parallel, great mounting time savings can be had with the T+U system since they do not have to be mounted perfectly parallel to fuction properly.



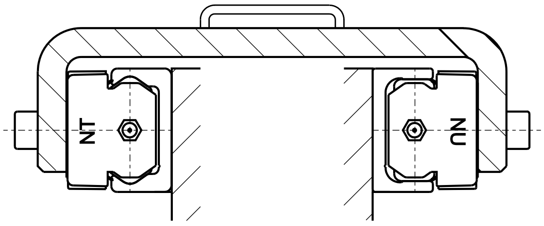
The rails of the U-series have flat raceways, offering lateral freedom to the slider. The maximum axial movement of the slider in a U-rail is given by **S_1** and **S_2** in the table below. **S_1** is the maximum available displacement of the slider toward the inner part of the rail, while **S_2** is the maximum displacement toward the outer, considering the nominal dimension **B nom** as the starting point:

Slider type	S_1 [mm]	S_2 [mm]	B nom min | [mm] | max
NU18	0	1.1	See page A12
CSW18	0.3	1.1	See page A12
NU28 NU28L	0	1.3	See page A15
CSW28 CDW28	0.6	1.3	See page A15
NU43 NU43L	0	2.5	See page A20
CSW43 CDW43	1.4	2.5	See page A20
NU63	0	3.5	See page A24
CSW63	0.4	3.5	See page A24

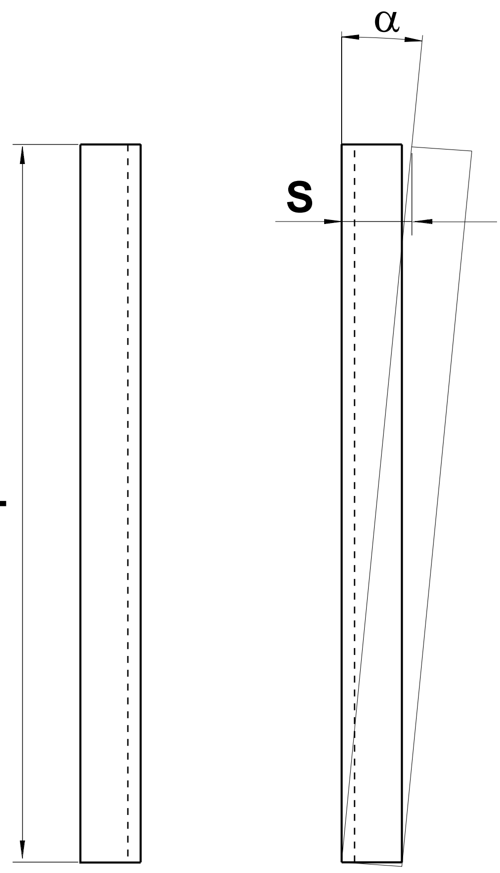


When a T+U rail combination is used, the slider in the T-rail guides the movement and supports loads, while the slider in the U-rail absorbs structural or assembly parallelism errors while still sharing its part of the radial load or Mz moment. The load capacities of sliders mounted in U-rails are listed on pages A12, A16, A20, A21 and A24.
The sliders mounted in U-rails differ from those used in T-rails only in the shape of the wiper. When CSW or CDW sliders are ordered separately the suffix-U must be stated if they are intended for use in U-rails (see **Order Codes** on page A66).

An example of application is shown in the figure; a pair of T-U rails allow the sliders to function correctly even if the angle between the two mounting planes is not equal to 0.
Knowing the length of the rails, it is possible to calculate the maximum value of the angle that the two mounting planes can have (the slider in U-rail can move from the maximum inner position S_1 to the maximum outer position S_2), by using the following formula:



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

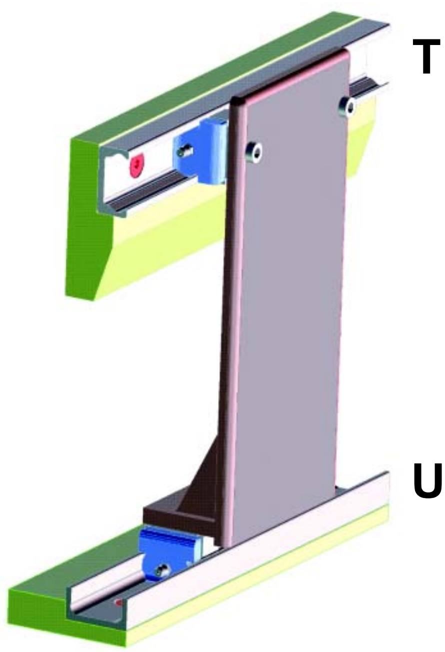


where:
- **S*** is the sum of S_1 and S_2 (see previous page)
- **L** in the length of the rail.

The maximum values of α reachable with the maximum unjoined rail lengths are listed below:

Rail type	Rail length [mm]	Displacement S [mm]	Angle α [°]
18 series	2000	1.4	0.040
28 series	3200	1.9	0.034
43 series	3600	3.9	0.062
63 series	3600	3.9	0.062

The T+U system can be used in different configurations.
In the figure at right, the T-rail carries the radial load and the U-rail is positioned below the moving element to avoid any possible oscillation or overturning moments while also absorbing any differences in surface parallelism.
This solution is particularly advantageous when the supporting surface of the rail is not precise.

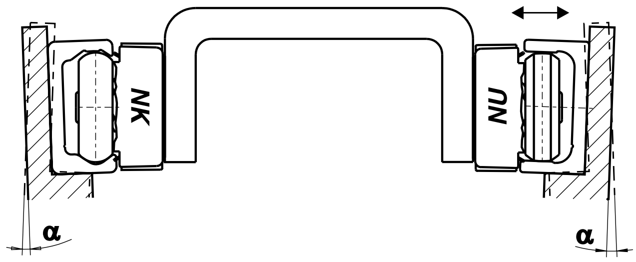


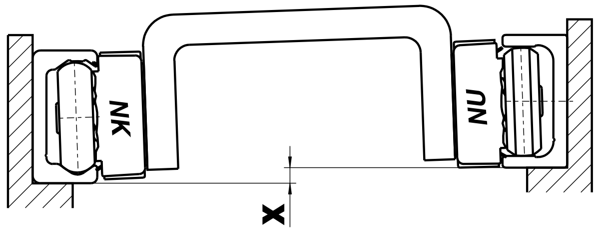
ROLLON

K+U SYSTEM

PARALLELISM PROBLEMS IN ALL DIRECTIONS

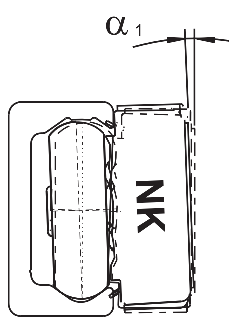
With the K-rail, the **COMPACT RAIL** system introduce the world's only linear bearing solution capable of solving parallelism errors in two axes. The K+U system, like the T+U system, absorbs axial parallelism errors. What's more, since both the K and U sliders can easily rotate in the rail (during mounting only), they will absorb other parallelism errors. Once fixed, the sliders will run along this non parallel path without binding or causing additional preload or play.
The slider in the K-rail guides the movement, carries the load, and absorbs structural and assembly errors. The slider in the U-rail shares its part of the radial load or Mz moment while also absorbing the structural or assembly errors. The K-rail's unique raceways offer the same linear precision as the T-rail while also allowing a certain slider rotation during mounting. The load capacities for the NK sliders are almost identical to the those of the NT.

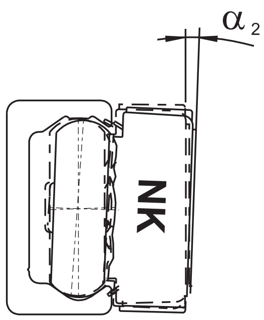




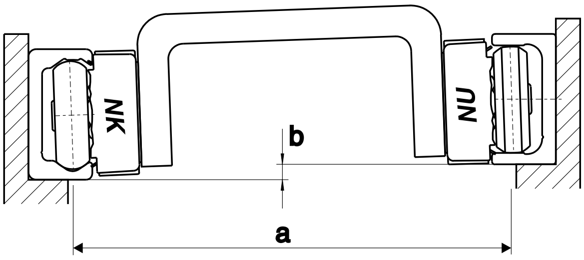
K-rails and NK sliders are available in two sizes, 43 and 63. The NK sliders are the only ones designed for the K-rail and are not interchangeable with other **ROLLON** sliders.
In the following table and drawing the maximum rotation angles for NK and NU sliders are shown: α_1 is the maximum counter-clockwise angle and α_2 is the max. clockwise angle rotation.

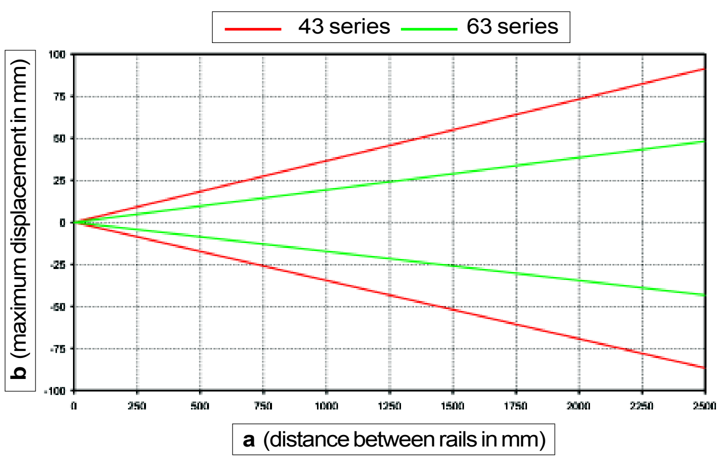
Slider type	α_1 [°]	α_2 [°]
NK43 and NU43	2	2
NK63 and NU63	1	1



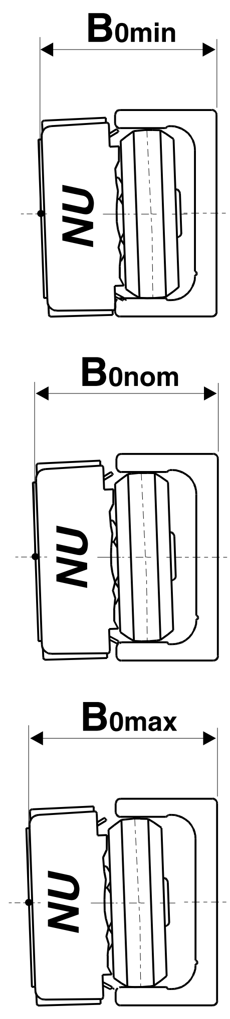


When mounting a K and U rails, a substantial error in rail height can be absorbed while still guaranteeing the smooth movement and not stressing the sliders.
In the figure and table below, the difference in height **"b"** between the rails can be derived by locating distance **"a"** between the rails.



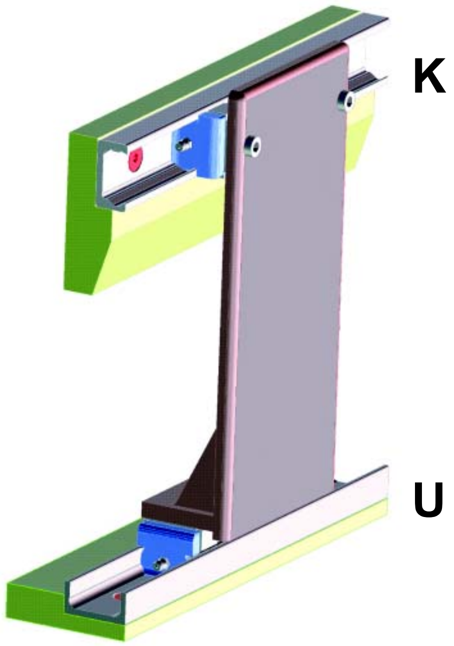


In order to obtain the best results with K+U system, it's advisable to utilize NU.. sliders in the U-rails.
All the following data about U-rails refer to this solution.
It's important to consider that during the movement, while the slider in the K-rail rotates, the slider in the U-rail rotates and offers an axial displacement. The combination of these corrective movements must not exceed the maximum values listed below.
Considering the NU.. slider competely rotated at its maximum value (2° for 43 size and 1° for 63), the maximum and minimum axial positioning are identified by the values of $\mathbf{B_{0max}}$ and $\mathbf{B_{0min}}$, which already take into consideration the axial displacement due to the rotation. $\mathbf{B_{0nom}}$ is the suggested value for the "nominal" starting position of NU.. slider in the U-rail, to be utilized for the K+U system:



Rail type	B_{0min} [mm]	B_{0nom} [mm]	B_{0max} [mm]
U...43	37.4	38.7	40
U...63	51	52.8	54.6

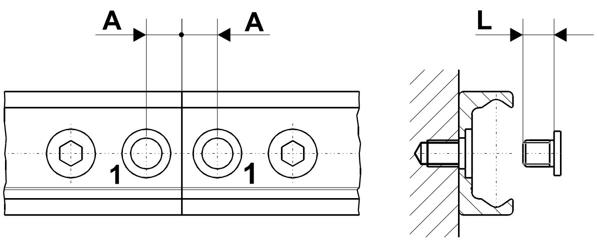
The K+U system can be used in different configurations.
Considering the same example made in the previous chapter, this solution, besides to avoid oscillations an consequent overturning moments, allows to absorb large errors of vertical parallelism between the rails, without compromising the sliding quality. This is very important because of the difficulties to guarantee good values of vertical parallelism, especially when the distance between the rails is very great.



JOINED RAILS

GENERAL INFORMATIONS

The maximum lengths of track-rails in one single piece are given on pages A12, A15, A19 and A23. Joined rails obtained by connecting two or more rails can be ordered. Joined rails are squared, marked, and supplied with additional mounting holes on the ends of the rails to be connected. The rails are supplied with the two supplementary screws which, providing that this description of the procedure is followed, enable the slider to run smoothly over the joint.
Extra threaded holes have to be drilled in the element supporting the rail according to the table. The end-screws for all types are supplied with the joined rails and they consist of the same screws utilized for the fixing of rails with counterbored holes (see page A27).
The alignment device can be ordered with the code indicated in table.



Rail type	A [mm]	Threaded hole (on fixed element)	Screw type	L [mm]	Aligning device
T..,U..18	7	M4	See page A27	8	AT18
T..,U..28	8	M5		10	AT28
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

DIRECTION FOR THE ASSEMBLY OF JOINED RAILS

Once holes for screws are drilled in a straight line on the supporting element, joined rails must be assembled by following this procedure:

(1) Fix the pieces of the rail to the supporting element by tightening all the fixing screws except the ones close to the end to be joined (do not set the rails on a fixed external reference plane as you must align the internal raceways first);

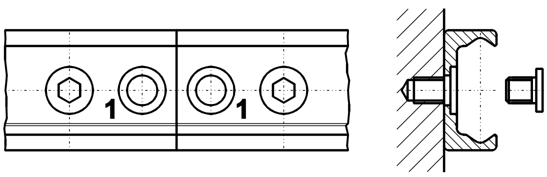


Fig. A

(2) Insert the special end screws, without tightening (see Fig. A);

(3) Place the alignment device on the joint and tighten uniformly both expanding-screws until alignment the raceways is obtained (see Fig.B);

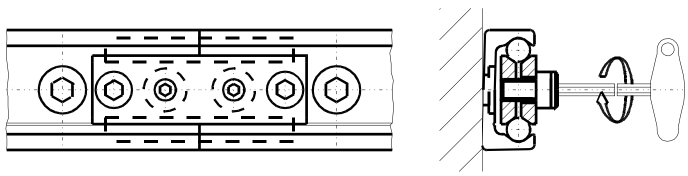


Fig. B

(4) After step **(3)**, the bases of the two rails may not be coplanar and there may be a gap between rail and fixing surface. In this case the support of the ends of the rails must be assured by inserting shims in the gaps;

(5) The lower side of the rail must be supported along the joint. If this side also appears to be misaligned then shims have to be used here also in order to give correct support to the ends (see Fig. C);

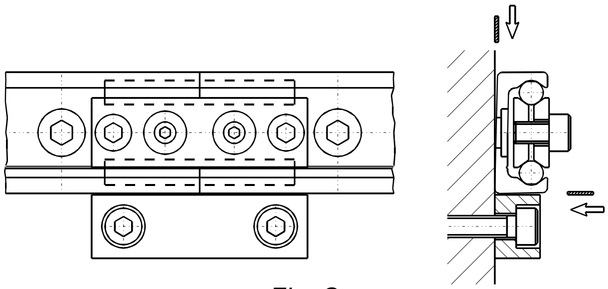


Fig. C

(6) Tighten thoroughly the special end screws by inserting the key through the holes of the alignment device (see Fig. D);

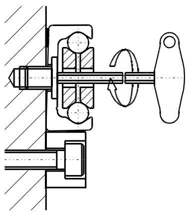


Fig. D

(7) For c'sunk fixing holes, first tighten the screws close to the joined ends then the screws moving towards the center of the rail. For counterbored fixing holes, first adjust the rail in accordance to the reference side (see page A50), then follow the same procedure;

(8) Remove the device.

PROTECTION SYSTEMS

ANTICORROSION PROTECTION

The rails are protected against corrosion through electrolytic zinc-plating, according to ISO 2081 standards. The honing of raceways of all rails eliminates the zinc-plating on these surfaces. The raceways are protected by a film of grease.
If the application requires linear bearings with a greater degree of protection, it is possible to order them with chemical nickel plating.
In such cases the nickel plating is present on the whole rail surface.

PROTECTION AGAINST IMPURITIES

The life calculation (see page A41) presumes that the working environment of the linear bearing is clean. In order to achieve clean working conditions, the sliders are equipped with adequate protection system. NT, NU, NK are equipped with a protection systems composed of lateral seals and strong spring loaded wipers in both heads, for automatically cleaning the raceways. The slider heads can be changed for replacement, or in order to make the same slider utilizable on both T and U rails ,while NK sliders can only be used with K-rails. In these cases, except for NT18 and NU18, which have snap on heads without grease-nipples, it's necessary to loosen the grease-nipple, mount the new heads and re-tighten the grease-nipples using the following torque values:

Slider type	Torque [Nm]
NT, NU 28	0.4 - 0.5
NT, NU, NK 43 and 63	0.6 - 0.7

CSW and CDW are equipped with strong and flexible wipers which clean the raceways.

ROLLON

PRELOAD

CLASSES OF PRELOAD

The sliders which are adjusted and mounted in the rails at our factory are available in two preload classes:

- **K1 standard preload**, corresponds to a slider/rail combination without clearance or with a minimum preload, in order to obtain the smoothest run;
- **K2 medium preload**, corresponds to a slider/rail combination with preload, in order to increase the stiffness (see from page A42 to A45).

When sliders with K2 preload are used, a reduction of load capacity and life must be taken into consideration according to the following table:

Class of preload	Reduction "y"
K1	-
K2	0.1

"y" coefficient has to be used in expression (1) on page A40 (verification under static load).

If the setting is made by the user or in case it should be modified from the original setting, the preload can either estimated empirically or by setting the slider outside the rail and measuring the interference that is the distance across the contact lines of the rollers minus the distance between the raceways (see table below).

Class of preload	Interference* [mm]	Rail type
K1	0.01	all
K2	0.03	T,U..18
	0.04	T,U..28
	0.06	T,U,K..43, T,U,K..63

** measured at the point of maximum distance between the raceways.*

The precise adjustment of the slider preload outside the rail requires a special device, available upon request. **Remember that the preload influences the life of linear bearing** (see page A41).

EXTERNAL PRELOAD

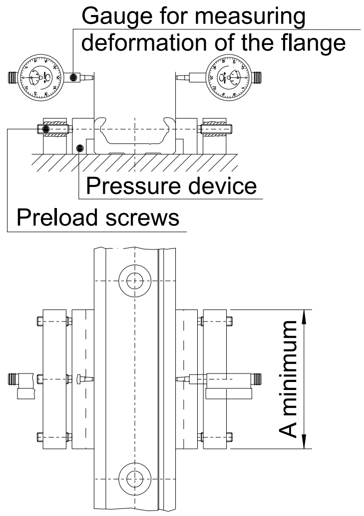
The unique construction of the **ROLLON** linear bearing also permits preloading of the slider from the outside at selected point along the length of the rail.

Preload can be obtained by compressing the flanges of the rail as indicated in the picture in this page.

This "local" preload enables higher stiffness to be obtained only at the points of the rail where it's necessary (for example at the reversing points where higher dynamics load occur). This selective preload may increases the life of the linear bearing by avoiding the necessity to have a constant higher preload applied over the whole length of the rail. Furthermore the force required to move the slider is reduced at those points where a higher preload is not necessary.

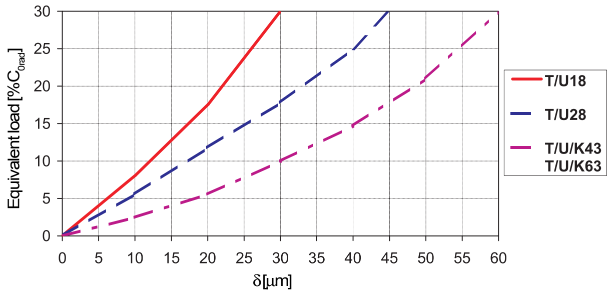
It is possible to check the value of externally applied preload through two gauges which measure the deformation of the rail flanges. These are deformed by a pressure device which acts on them (see drawing at the bottom right).

The operation must be made after removing the slider from the area to be preloaded.



Size	A [mm]
18	10
28	55
43	80
63	120

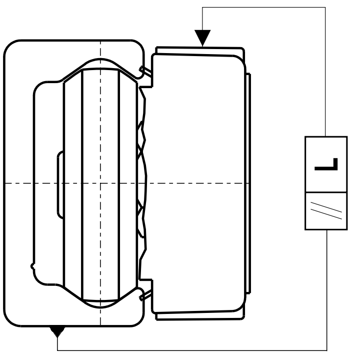
From the diagram below, it is possible to obtain the value of the equivalent load as a function of the total deformation of the two flanges. All figures refer to sliders with three rollers.

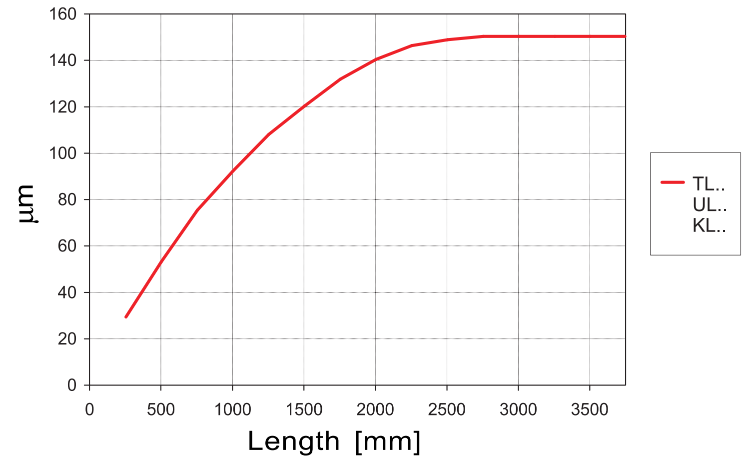


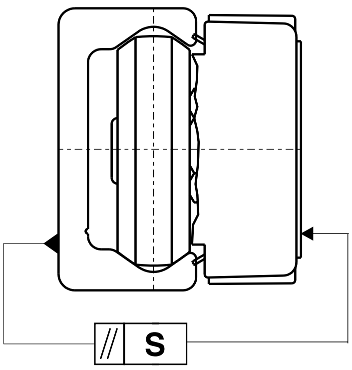
LINEAR PRECISION

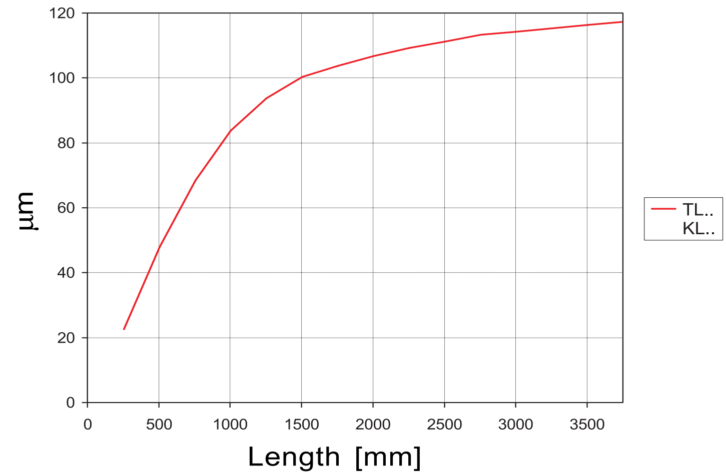
RUNNING PARALLELISM

The precision of the **COMPACT RAIL** system is determined by the precision of the raceways. **Linear precision** means the running parallelism of the slider i.e. the maximum deviation of the slider referred to the lateral surface and to the supporting one, during it's run along the rail.
The values indicated refer to a rail properly mounted to a rigid surface using all the mounting holes. While the rail may not seem straight before mounting this will not effect the precision.









Variation of the dimensions between two 3 roller slider in the same rail:

Type	TL.., UL.., KL..
ΔL [mm] Sliders oriented in the same direction	0.2
ΔL [mm] Sliders oriented in opposite direction	1.0
ΔS [mm]	0.05

VERIFICATION UNDER STATIC LOAD

CALCULATION

The values of static load rating given on pages A12, A16, A20, A21 and A24 for each slider, represent the maximum allowable loads, above which a permanent deformation of the raceways could occur and consequently the running quality could be compromised.
The verification is made:
- by calculating the forces and the moments acting simultaneously on each slider
- by comparing these values with the corresponding load ratings.

If:
P_r, P_a are the radial and axial resultants of the external forces, in N;

M_1, M_2, M_3 are the external moments, in Nm;

C_{0rad}, C_{0ax}, M_x, M_y, M_z are the load ratings in the various directions, given on pages A12, A16, A20, A21 and A24;

z is the security factor (see relative table),
the result should be:

$$\frac{P_r}{C_{0rad}} < \frac{1}{z} \qquad \frac{P_a}{C_{0ax}} < \frac{1}{z} \qquad \frac{M_1}{M_x} < \frac{1}{z} \qquad \frac{M_2}{M_y} < \frac{1}{z} \qquad \frac{M_3}{M_z} < \frac{1}{z}$$

Security factor **z**:

	z
neither shocks nor vibrations; smooth and low frequency reverse; high precision in assembly; no elastic yielding	**1 – 1.5**
Normal addembly condition; parallelism errors within the maximum limits;	**1.5 – 2**
Chocks and vibration; high elastic yeld; high reverse frequency	**2 – 3.5**

The safety factor z should be lowest when the dynamic forces to be added to the loads can be determined accurately, and higher when overloads may occur, especially dynamic loads such as shocks and vibrations.
Please contact our Application Engineering Department if further information is required.

If two or more of the described loads act together, the result should be:

$$\frac{P_r}{C_{0rad}} + \frac{P_a}{C_{0ax}} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{z} \qquad [1]$$

If the slider is preloaded, when:

$$y > \frac{P_R}{C_{0rad}}$$

Class of preload	**Rail size**	**reduction "y"**
K1 standard preload	all	-
K2 medium preload	all	0.1

the value of **y** (see the table) should be added in formula [1].

ROLLON

LIFETIME

LIFE CALCULATION

The dynamic load rating **C** is a conventional load rating used in life calculations. The life to which this load rating is related is 100 km.
The values of **C** are given for the different series of sliders on pages A12, A16, A20, A21 and A24. Life, load rating and equivalent external load are related to each other by the formula:

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

where:
$\mathbf{L_{km}}$ is the theoretical life in km;

C is the dynamic load rating in Newton;

P is the equivalent external load in Newton;

$\mathbf{f_c}$ is the contact factor;

$\mathbf{f_i}$ is the service factor;

$\mathbf{f_h}$ is the stroke factor;

The equivalent external load **P** is the load whose effect is equivalent to the sum of the effects of the forces and moments acting simultaneously on the slider. Knowing the various load components acting on the slider (see page A40), the value of **P** can be calculated according to the expression:

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

In the above expression the loads are considered as constant in time. Instantaneous forces not exceeding maximum capacities, do not influence the life and can therefore be disregarded.

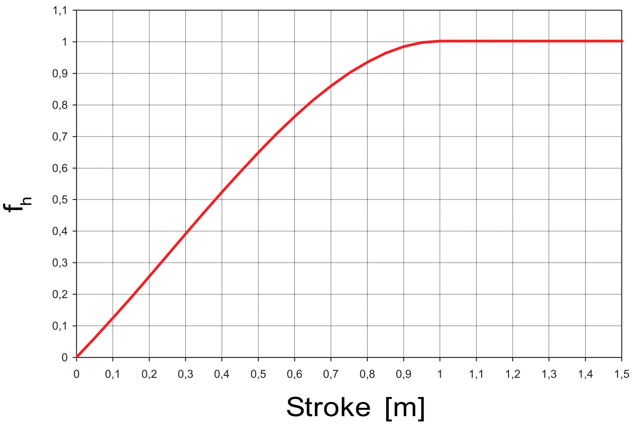
The factor f_c refers to applications where more than one slider pass over the same point in the rail, i.e. when the sliders do not pass the same point no reduction factor shall be used. The $\mathbf{f_c}$ factor has the following values:

No. of sliders	1	2	3	4
f_c	1	0.8	0.7	0.63

The service factor $\mathbf{f_i}$ has a similar meaning to that of the safety factor **z** in the verification under static load, and is equal to:

f i	
neither shocks nor vibrations; smooth and low frequency reverse; clean working environment; low speed (<1 m/s)	**1 – 1.5**
light vibrations; medium speed (between 1 and 2.5 m/s) and medium reverse frequency	**1.5 – 2**
shocks and vibrations; high speed (>2.5 m/s) and high reverse frequency; very polluted working environment	**2 – 3.5**

The stroke factor $\mathbf{f_h}$ takes account of the fact that the raceways are stressed more frequently when the slider runs short strokes, with equal total run. The graph gives the values of $\mathbf{f_h}$ (with strokes longer than 1 m, $\mathbf{f_h}$ remains equal to 1):



ROLLON

STIFFNESS

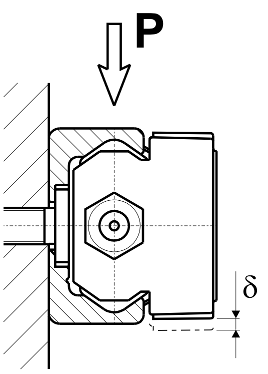
TOTAL DEFORMATION

The total deformation of the linear bearing under loads P or Moments M (M_x applied on one slider only) is indicated below.
As shown in the graphs, the stiffness of the slide can be increased by supporting the flanges of the rail. The values given in the diagrams refer only to the deformation of the linear bearing, while the structure to which the linear bearing is fixed is considered non-deformable.

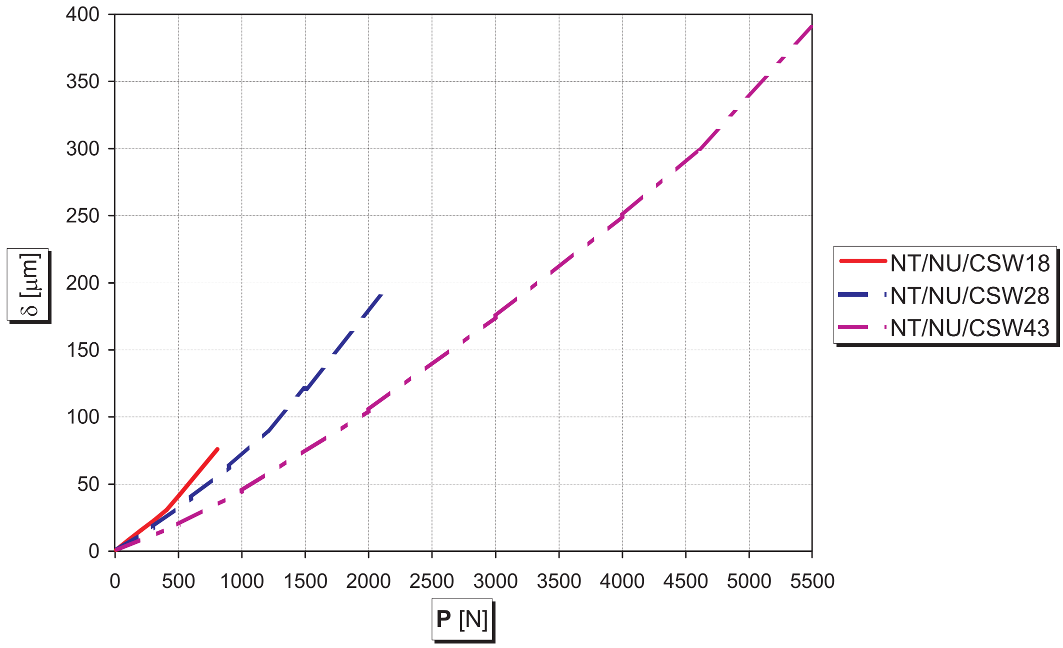
18, 28, 43 SERIES

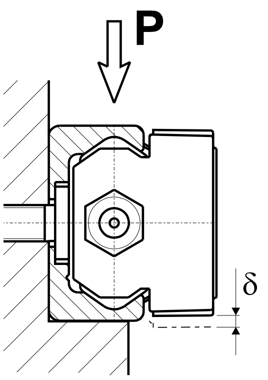
The deformations given in the diagrams refer to sliders with three rollers and K1 preload.
These values are reduced by 25% in case of K2 preload.

- Radial load

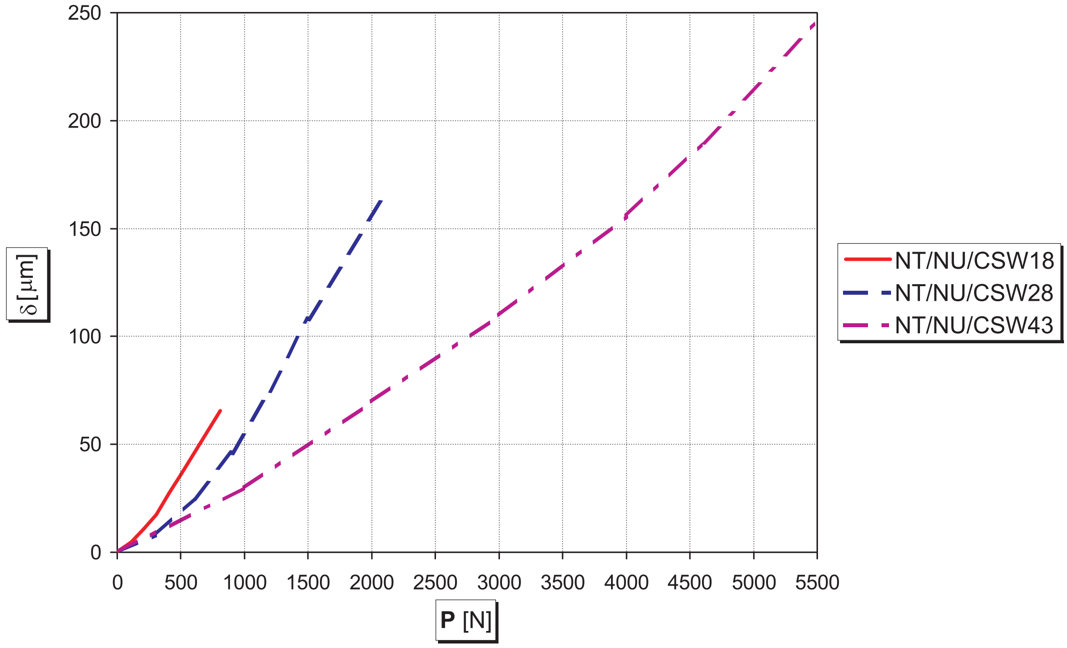


Not supported flange

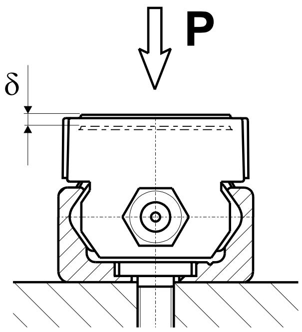


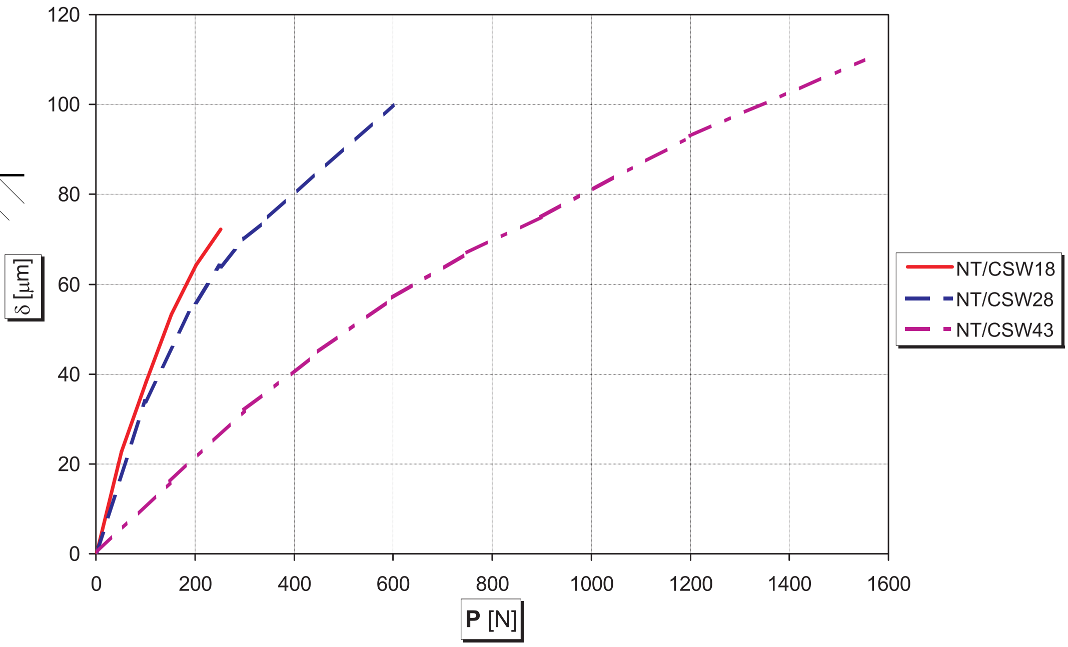


Supported flange

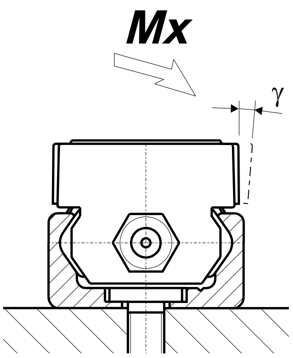


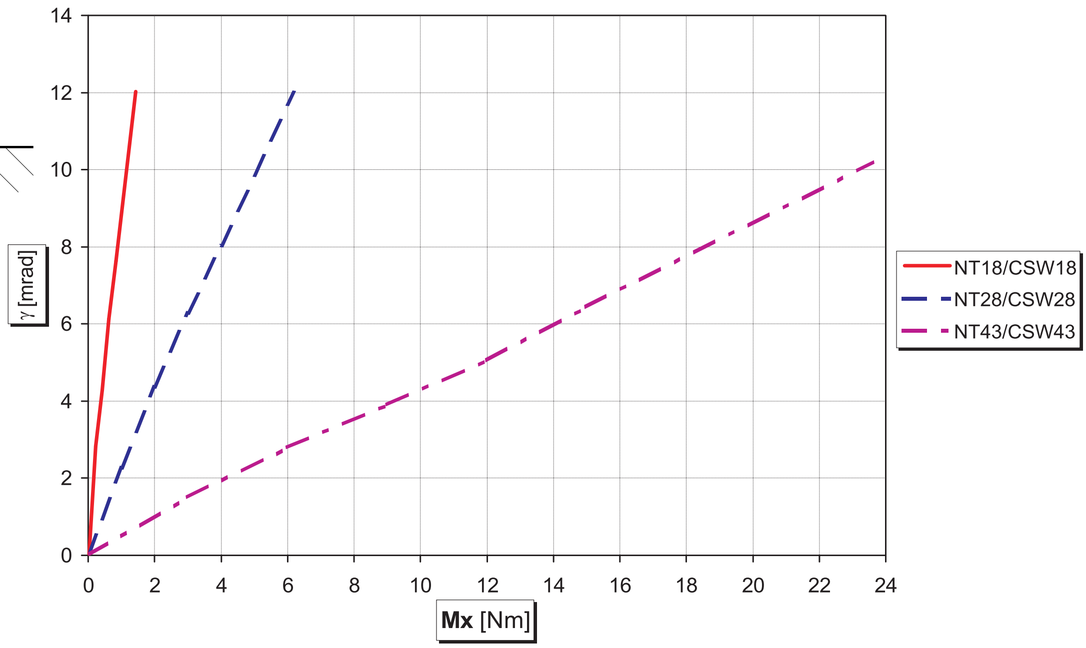
- Axial load

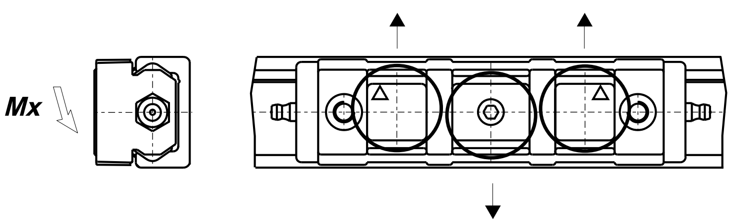




- Mx moment







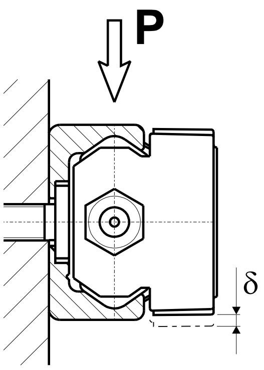
When the slider supports a moment Mx, higher stiffness is obtained by placing the slider with the rollers positioned as indicated in the picture. The diagrams refer to this orientation.

ROLLON

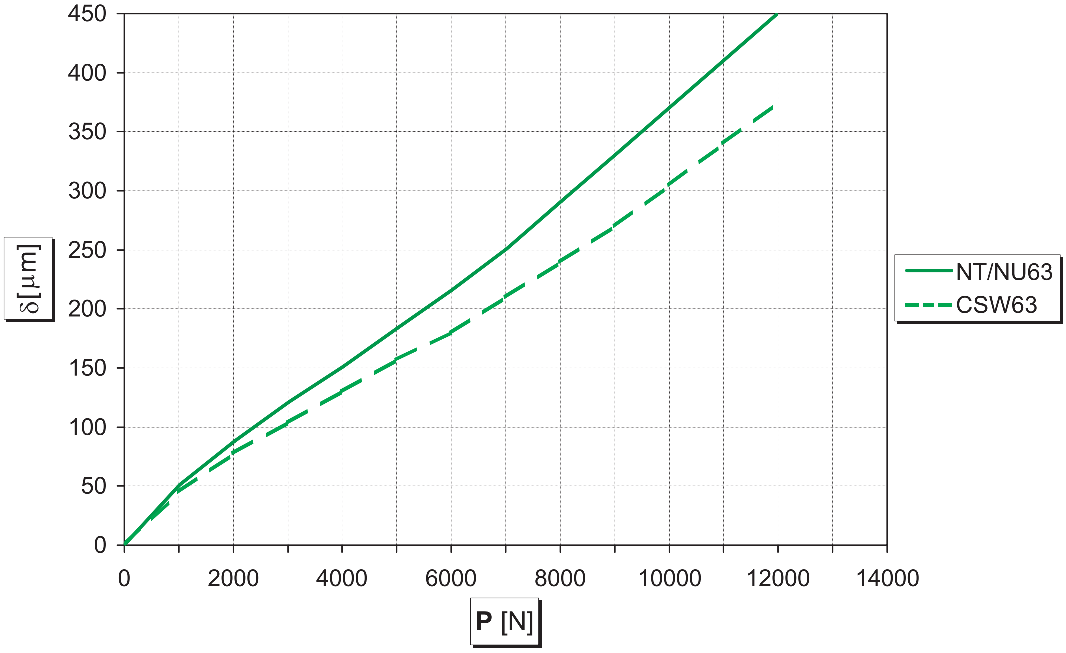
63 SERIES

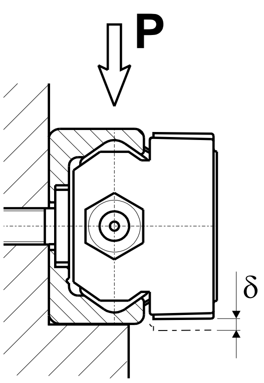
The deformations given in the diagrams refer to sliders with three rollers and K1 preload. These values are reduced by 25% in case of K2 preload.

- Radial load

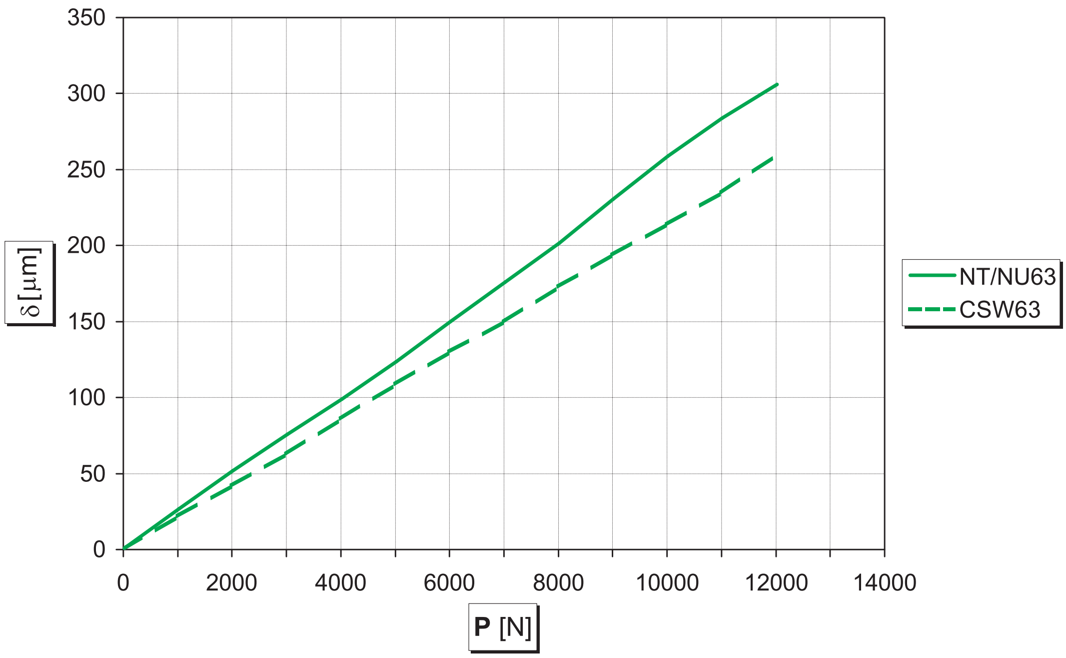


Not supported flange

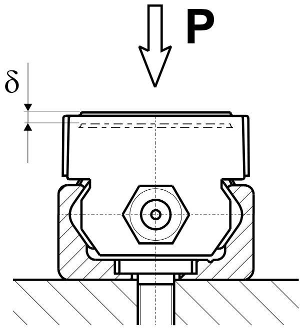


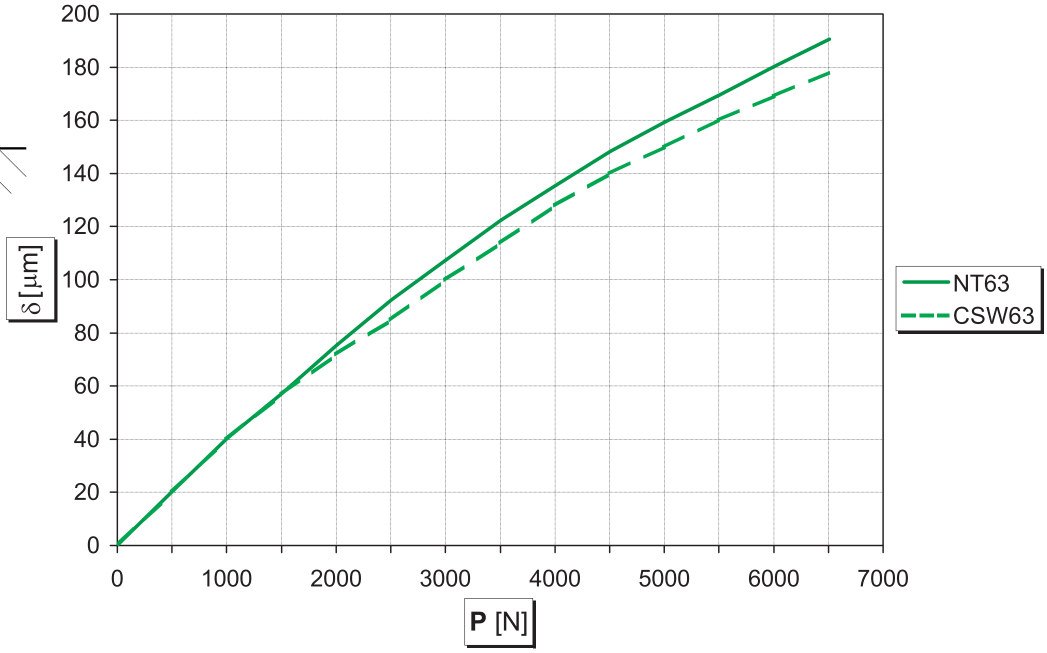


Supported flange

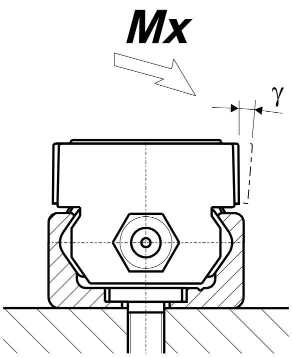


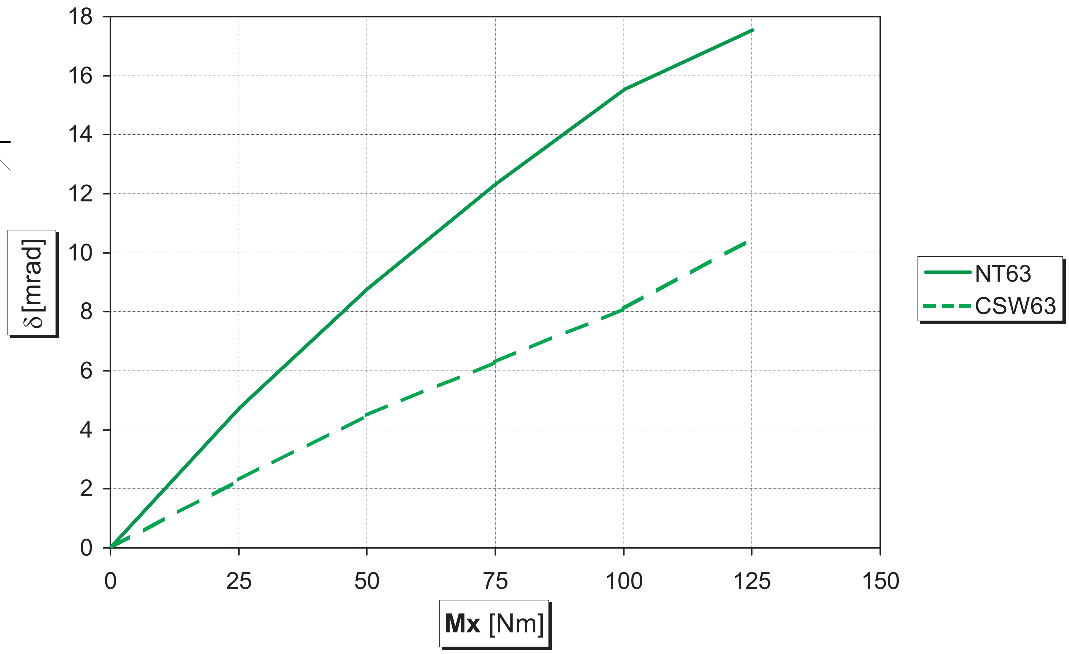
- Axial load

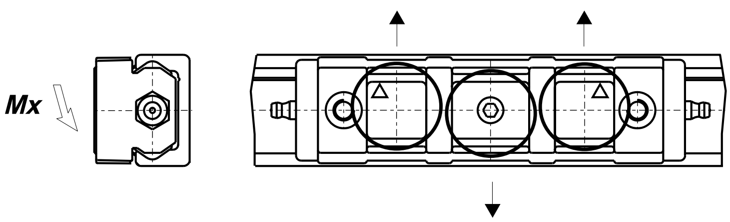




- Mx moment







When the slider supports a moment Mx, higher stiffness is obtained by placing the slider with the rollers positioned as indicated in the picture. The diagrams refer to this orientation.

ROLLON

LUBRICATION

ROLLER LUBRICATION

The rollers are lubricated for life.

RACEWAY LUBRICATION

It is necessary to have a thin film of lubrication that does not allow direct contact of the rollers and the raceway surfaces. The use of a lubricating grease during normal operation:
- minimalizes reduces the friction;
- reduces the wear;
- reduces the stress on the contact surfaces caused by elastic deformations.
- Allows the achieving of the life indicated on page A41.
- **Contributes to the protection of metal surfaces against corrosion.**

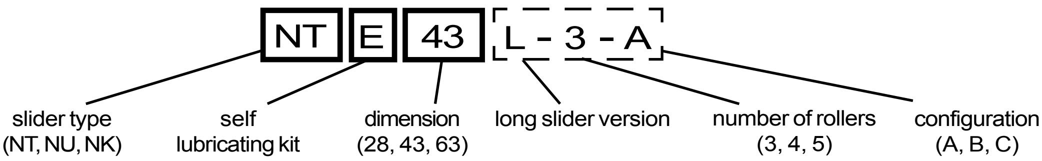
- Maintenance free auto lubrication system

With optional heads available for N series sliders of the 28, 43, and 63 sizes, it is possible to eliminate periodic lubrication maintenance. The heads have a strong felt-like material loaded with liquid grease that is gradually released during the constant contact with the races. These wipers last 2 millions cycles (for the slider lifetime see page A41). Through the grease nipples (see below), it is possible to reload the wipers with a liquid grease (characteristics below).

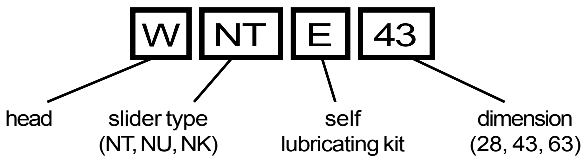
Base oil	Thickener	Temperature range [°C]	Dynamic viscosity [mPas]
Mineral oil	Lithium soap	-30... / +120	< 1000

The heads can be ordered apart or already mounted to the slider. **The dimensions of the lubricating heads and the standard heads are the same.**

Already mounted to the slider order code:



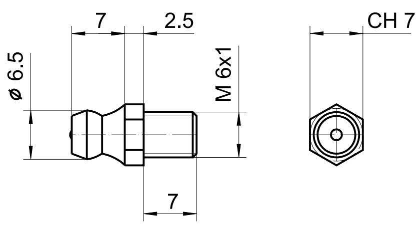
Head order code:



- Periodic lubrication

The lubrication interval depends on many factors, such as working conditions, speed and temperature. As a guideline, **lubrication every 50,000 cycles, or every six months, is recommended.** NT, NU and NK sliders (except the type NT / NU18) are equipped with grease-nipples for periodical lubrication.
The grease used must be lithium soap grease of medium consistency:

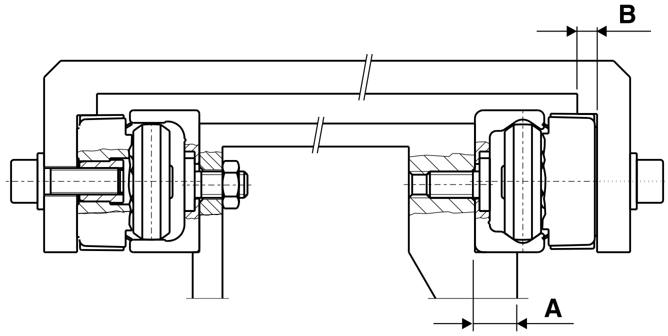
Base oil	Thickener	Temperature range [°C]	Dynamic viscosity [mPas]
Mineral oil	Lithium soap	-30... +160 / +170	4500



With thread UNI 5541-65

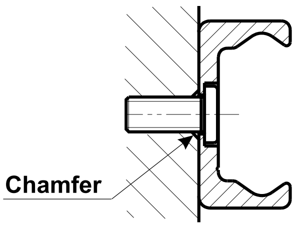
RAIL MOUNTING DIMENSIONS

Certain minimum and maximum dimensions must be respected to assure correct rail mounting. The following paragraphs and tables list these dimensions.
The minimum width of any eventual rail support cannot be less than **A**. If the load rests on the side of the slider, the minimum contact width cannot be less than **B**.



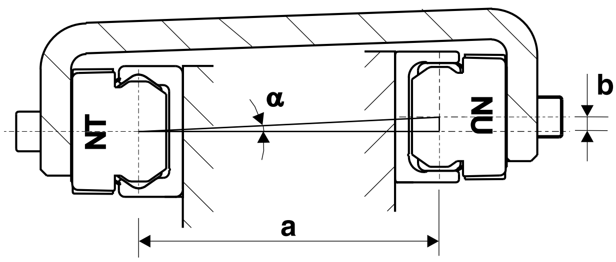
Size	A [mm]	B [mm]
18	5	4
28	8	4
43	14	5
63	18	5

When rails with counterbored holes are used, it is also necessary to make a chamfer of the dimensions shown in the fixing holes of the mounting structure.



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

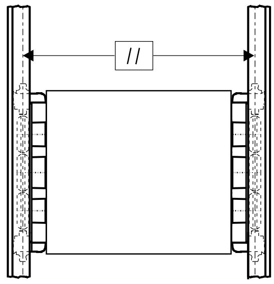
When applying T+T or T+U rails, differences in height of the two rails must be small to avoid slider stress and guarantee correct function. The maximum allowed height displacement for two parallel rails is determined by the maximum rotation that the rollers can make within the raceways. The maximum rotation values are shown in table below. These values, however, imply a 30% reduction of the sliders' load capacities in the T-rail. It's not advisable to increase these values.



Slider type	α
18 series	1 mrad (0.057°)
28 series	2.5 mrad (0.143°)
43 series	3 mrad (0.171°)
63 series	5 mrad (0.286°)

Example: NT43: if **a** = 500 mm; **b**= a*tgα= 1.5 mm

When using two T-rails it is important not to exceed the maximum parallelism error values listed in the table below in order to avoid slider stress and to preserve load capacity and lifetime.



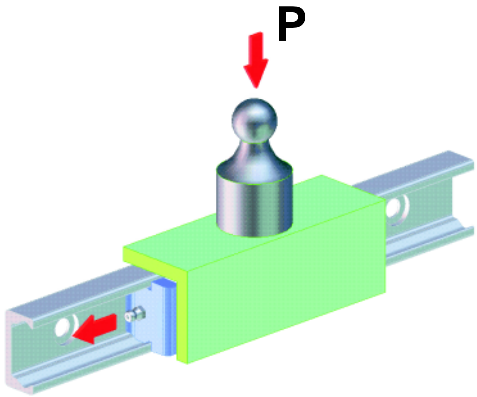
Rail size	K1	K2
18	0.03	0.02
28	0.04	0.03
43	0.05	0.04
63	0.06	0.05

IMPORTANT !
Whenever parallelism errors are present, it is always preferable to apply the unique T+U or K+U-rails solutions (see pages A32 and A34) to absorb these errors.

THRUST FORCE

FRICTIONAL RESISTANCE

The force that is necessary to move a slider is determined by the friction coefficient of the rollers and by the friction of the wipers and lateral seals.
The finishing of the raceway surface and rollers allows to be obtained a very low friction coefficient, with a value of first separation very similar to the dynamic one. The wipers and lateral seals have been studied to ensure high levels of protection, without compromising too much the sliding quality.
The friction resistance of **COMPACT RAIL** system depends also on external factors, such as lubrication, preload and the presence of moments. In the following tables the friction coefficients of each slider type (for CSW and CDW sliders, the factor μ_s has not to be considered) are shown.



Slider type	μ (Rollers friction)	μ_w (Wipers friction)	μ_s (Lateral seals friction)
18 SIZE	0.003	$\frac{\ln(P)}{0.98 \cdot P}$ *	0.0015
28 SIZE	0.003	$\frac{\ln(P)}{0.06 \cdot P}$ *	$\frac{\ln(P)}{0.15 \cdot P}$ *
43 SIZE	0.005		
63 SIZE	0.006		

* *the load **P** is in grams.*

The values indicated in the table are valid with an applied load greater than the 10% of the maximum.
For lower values, it's possible to calculate the values of μ from the graphs on the following page (referred to three roller sliders), the formulas of the above table are still valid.

CALCULATION OF THRUST FORCE

With the data shown on the table above, and by utilizing the following formula: it is possible to calculate the value of the minimum force necessary to move the slider.

$$F = (\mu + \mu_w + \mu_s) \cdot P \cdot 9.81$$

where μ_w and μ_s must be calculated with the formulas shown on the same table.

Example of calculation:

Considering a NT43 with an applied radial load of 100 Kg, from the table we obtain a μ of 0.005, while from the formulas we have:

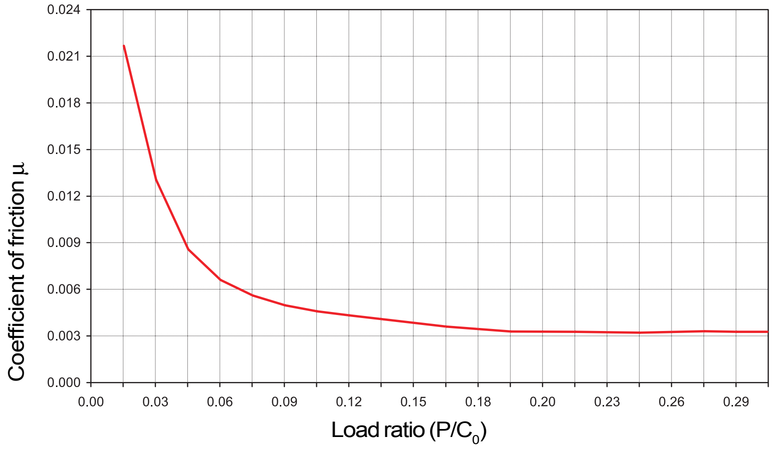
$$\mu_s = \frac{\ln(100000)}{0.15 \cdot 100000} = 0.00076 \qquad \mu_w = \frac{\ln(100000)}{0.06 \cdot 100000} = 0.0019$$

from this, the minimum thrust force is:

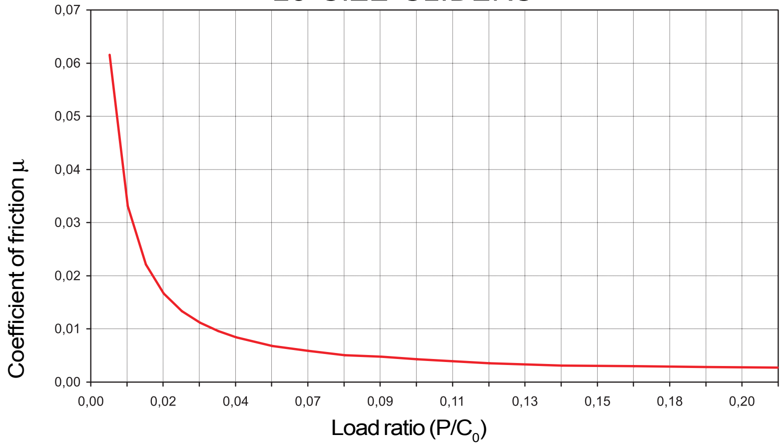
$$F = (0.005 + 0.0019 + 0.00076) \cdot 100 \cdot 9.81 = 7.51 \text{ [N]}$$

ROLLON

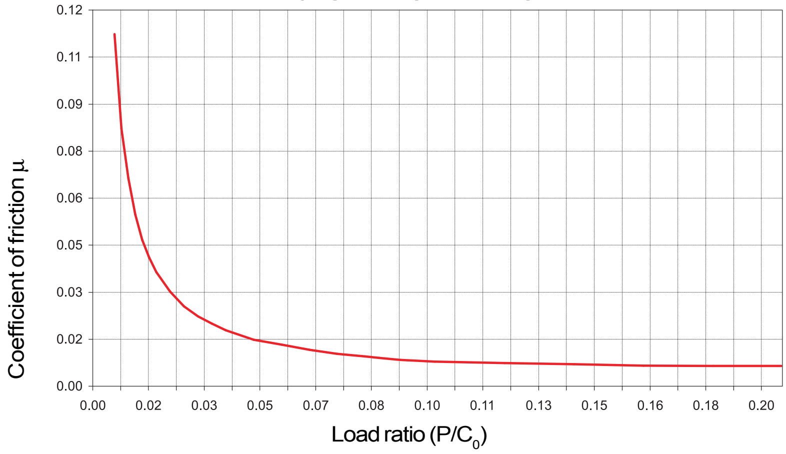
18 SIZE SLIDERS



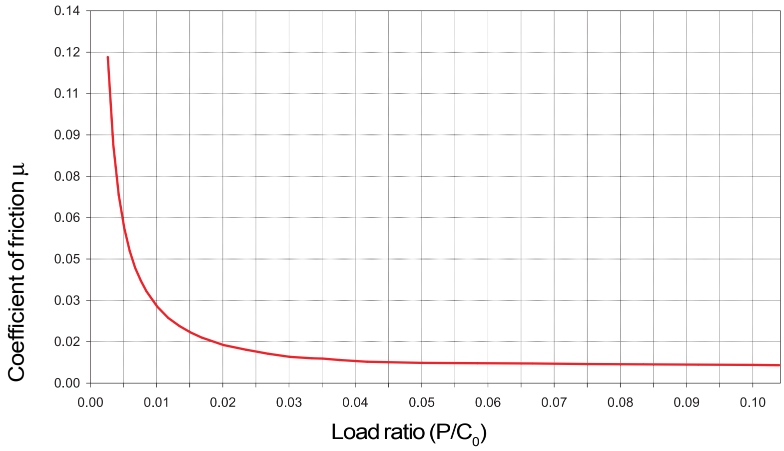
28 SIZE SLIDERS



43 SIZE SLIDERS



63 SIZE SLIDERS



ROLLON

MOUNTING INSTRUCTIONS

SINGLE RAIL MOUNTING

Referring to the external applied load, the rail can be mounted in the two different positions, as shown in fig. A.
It is necessary to remember that when the rail is used in pos. **2** "axially", the load capacity is reduced because the sliders utilize radial contact ball bearings.
Therefore, whenever possible, the rail should be mounted in such a way that the external loads acting on the rollers are mainly radial.
The number of fixing holes for the standard track-rails, using screws of resistance class 10.9, is sufficient to support the stated loads.
For critical applications where vibrations are present and/or high stiffness is required, it is suggested to provide a rail support as shown in fig B. to reduce the stress on the screws and eliminate flange movements.
The mounting of the rails with counterbored holes requires the presence of alignment reference, this reference can be used directly as a supporting plane for the rails or not.
All the alignment instructions indicated in this chapter refer to rails with counterbored holes, because the rail alignment with c'sunk holes is determined by the alignment degree of the fixing holes; see also page A26.

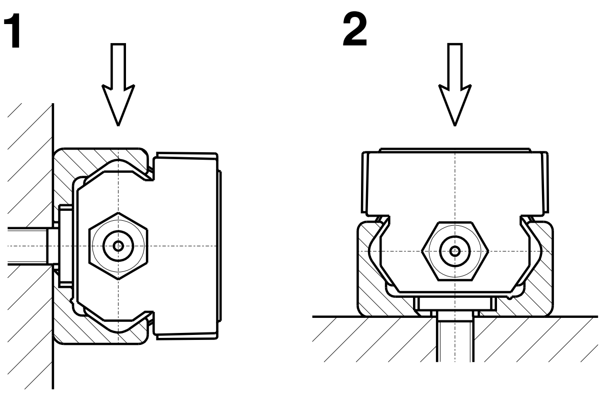


Fig. A

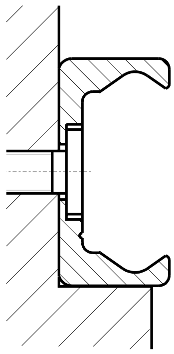


Fig. B

- Rail mounting by utilizing the reference plane as support

(1) Drill the holes on the fixing structure and be sure that the supporting plane is clean and burr-free.

(2) Press the rail against the plane, and insert all the screws, without tightening them. See fig. C;

(3) Maintaining the rail firmly pressed against the plane, tighten the screws, beginning from one of the two rail ends, with the torque indicated in the table. See fig. D.

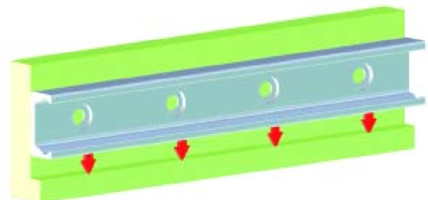


Fig. C

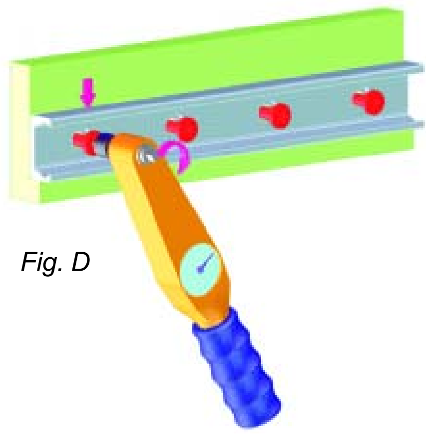


Fig. D

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

- Rail mounting without any support

(1) Drill the holes on the fixing structure and then position the rail, insert the slider and the screws without tightening them. See fig. E;

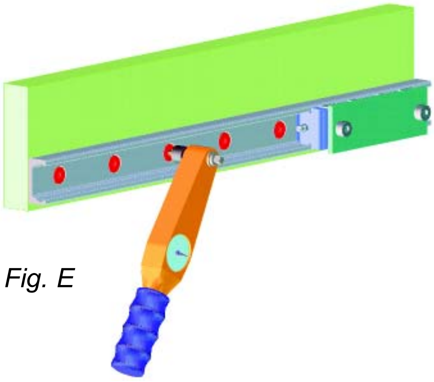


Fig. E

(2) Mount a gauge on the slider (so as to measure the difference of the distance between the slider and the reference plane), move it to the rail center and set gauge to zero. Move the slider backwards and forwards for a length equal to two hole pitches and carefully adjust the rail till the hand of gauge indicates "0" along this whole length.
Tighten the three screws positioned in this rail central part with the correct torque. See fig. F;

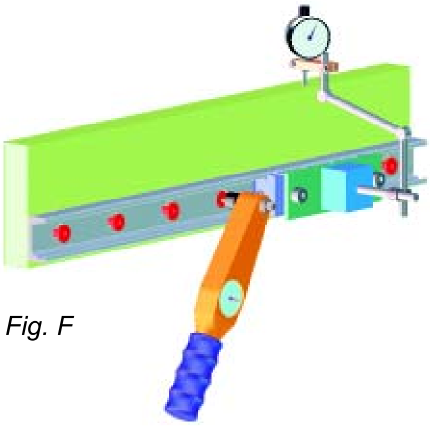


Fig. F

(3) Position the slider at one rail end, and carefully adjust the rail till the hand of gauge indicates "0". Tighten the last screw of the rail with the correct torque and then repeat the operation for the other rail end. See fig. G;

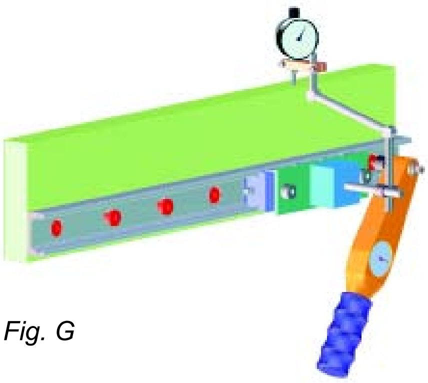


Fig. G

(4) Starting from one rail end, move the slider towards the rail centre, tighten all the other screws, taking care of adjusting the rail so as to read on the gauge a value always very close to "0". Then repeat the operation, starting from the other rail end.

ROLLON

MOUNTING OF TWO "T" PARALLEL RAILS

(1) Prepare the supporting plane, cleaning it from metallic parts and dirt, fix then the first rail, following the instructions for the mounting of a single rail, as indicated in previous paragraph.

(2) Mount the second rail, by utilizing only the screws positioned at the rail ends and central part. Tighten the screw in position **A** and measure the distance between the raceways of the two rails. See fig. H;

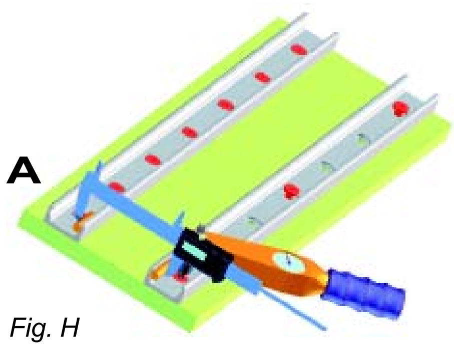


Fig. H

(3) Fix the screw in position **B**, in a way that the raceways distance has a value very similar to the one measured in **A** (max. difference: 0.1 mm). See fig. I;

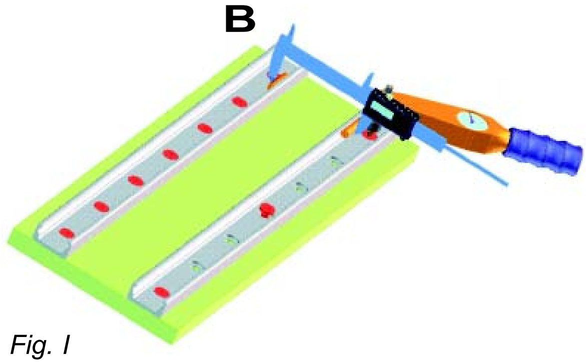


Fig. I

(4) Fix the screw in position **C**, in a way that the raceways distance has an intermediate value between **A** and **B** ones, or with a maximum difference of 0.1 mm. (Example: if **A**=0 and **B**=+0.1, **C** must be inside to the interval: +0.2mm, -0.1mm). See fig. L;

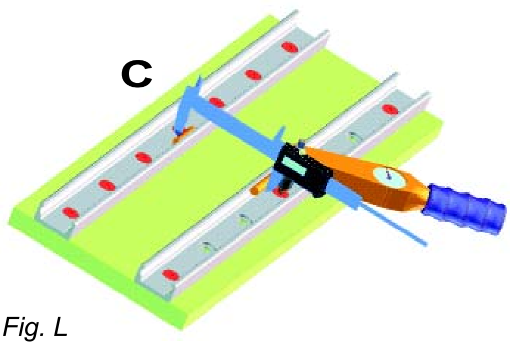


Fig. L

(5) Fix all other screws. See fig. M.

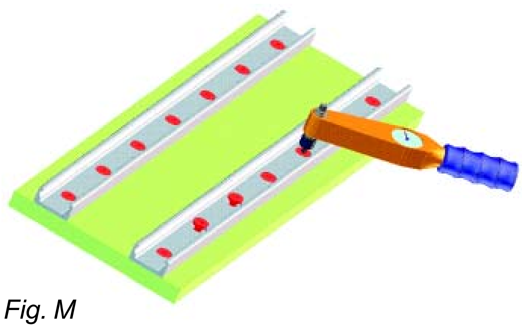


Fig. M

ROLLON

MOUNTING OF "T+U" SYSTEM

The mounting of the rails can be made following two different methods, the first is quicker, but less precise:

- Method 1

It is advisable to use this procedure when the distance between the rails is less than 350 mm; exceeding this value, utilize METHOD 2.

(1) Fix the T... rail to the structure, by following the alignment instructions, described on pages A50 and A51.

(2) Fix the U.. rail, without tightening the screws.

(3) Insert the sliders into the rails and mount the moving table, without tightening its fixing screws.

(4) Move the table towards the rail centre, and tighten its fixing screws with the correct torque.

(5) Tighten the centre screws of the rail with the correct torque. See fig. N.

(6) Move the table to one rail end and tighten the rest of the rail screws, beginning from this end towards the other one. See fig. O.

Fig. N

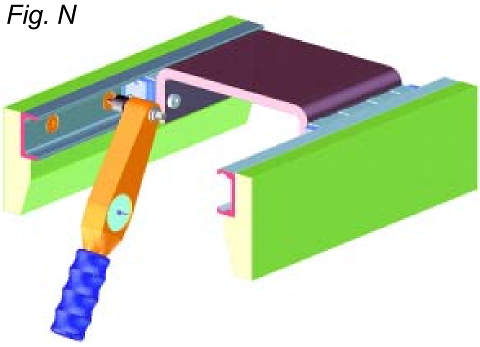
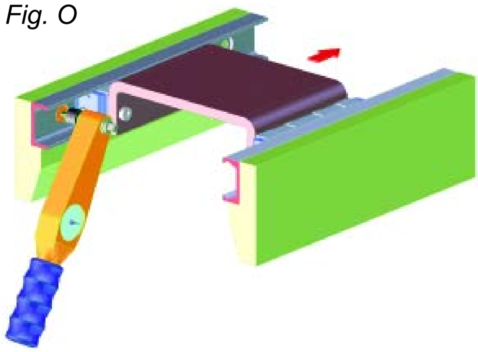


Fig. O



- Method 2

This procedure guarantees high precision of the rails mounting.

(1) Fix the T... rail to the structure, by following the alignment instructions, described in the previous pages (see pages A50 and A51).

(2) Fix the U.. rail, with the same procedure. You must use the same reference plane utilized for the T rail alignment.

(3) Mount the table on the sliders and tighten its fixing screws.

MOUNTING OF "K+U" SYSTEM

Considering that K+U system has been studied to absorb errors of parallelism in all directions when two rails are utilized (see also page A34 for details), the easiest method of mounting is offered given by the use of c'sunk screws, because in this way, the possible errors of disalignment would not represent a any problem, thanks to the flexibility of the system.
On the contrary, when a good final alignment quality of the rails is required or when the holes are poorly aligned, it is suggested to utilize rails with counterbored holes and follow a particular procedure of mounting, that will be described in these pages. Due to the fact that K and U sliders can rotate around their longitudinal axis, it's necessary to utilize an external reference plane so as to reach the desired alignment. In the following example, the two reference planes for K and U rails are also utilized to support the rails.

- Mounting procedure

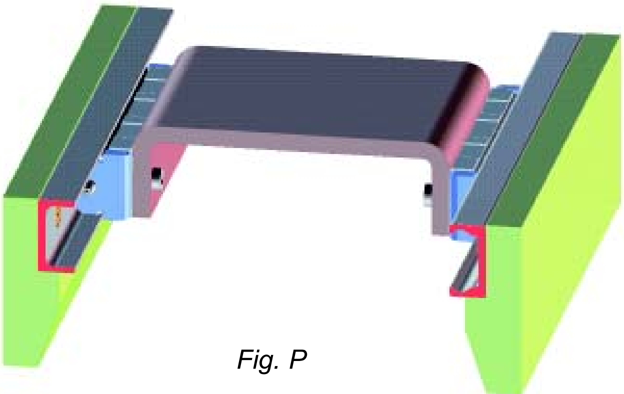


Fig. P

(1) Fix the K.. rail to the structure, by following this procedure:
drill the holes on the fixing structure of the K rail and be sure that the supporting plane is clean and burr-free;

(2) Lean the rail, putting it against the plane, and insert all the screws, without tightening them. See fig. Q;

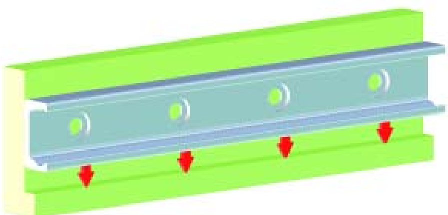


Fig. Q

(3) Mantaining the rail firmly pressed against the plane, tighten the screws, beginning from one of the two rail ends, with the torque indicated on the table. See fig. R;

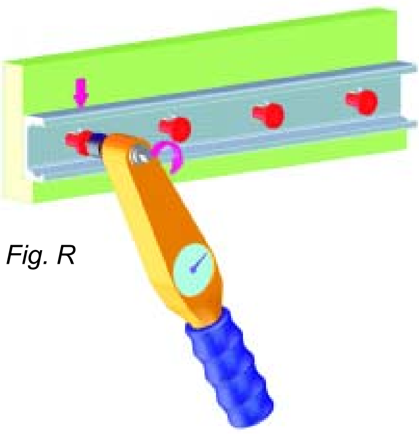


Fig. R

Screw type	Tightening torque
M8 (K.., U.. 43)	22 Nm
M8 (K.., U.. 63)	35 Nm

(4) Fix the U.. rail, following the procedure of the previous items **1** and **2**;

(5) Insert the sliders into the rails and mount the moving table, without tightening its fixing screws;

(6) Move the table toward the rail center, and tighten its fixing screws with the correct torque

(7) Tighten the center screws of the rails with the correct torque. See fig. S;

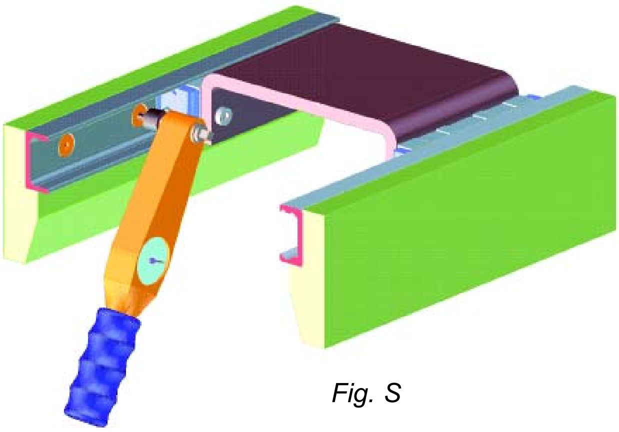


Fig. S

(8) Move the table toward the rail ends and tighten the rest of the rail screws, beginning from this end toward the other one. See fig. T.

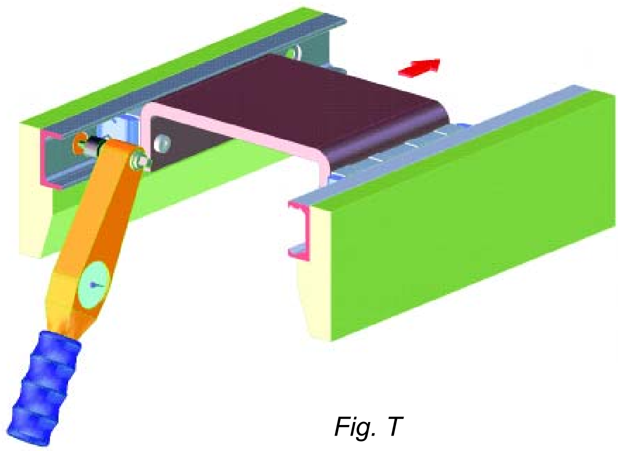
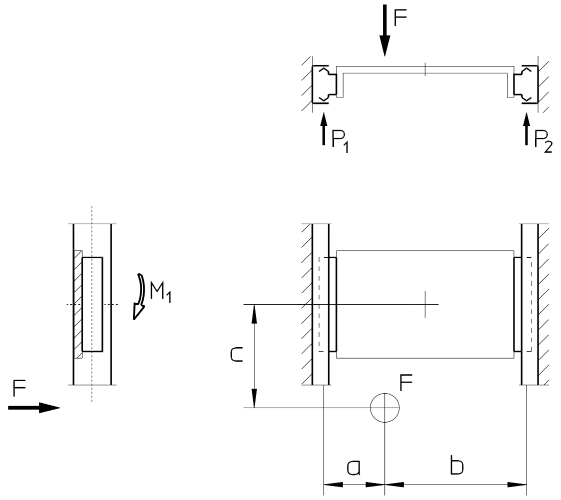


Fig. T

FORMULAE FOR DETERMINING THE LOAD ON THE SLIDER



HORIZONTAL MOVEMENT
STATIC VERIFICATION

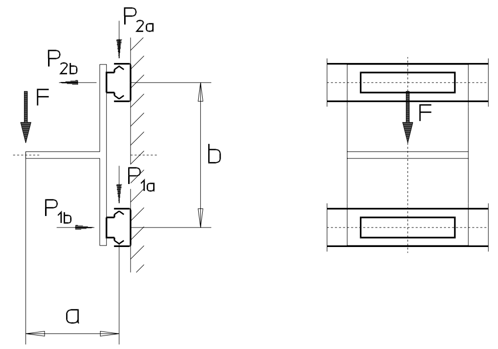
Load on the sliders:

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

$$P_2 = F - P_1$$

in addition each slider in stressed by a moment:

$$M_1 = \frac{F}{2} \times C$$

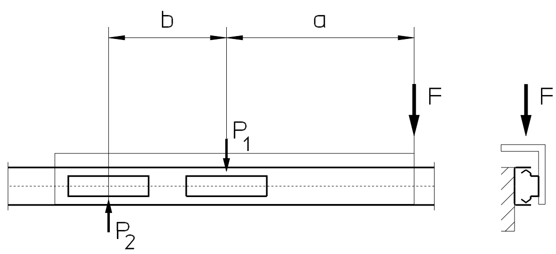


HORIZONTAL MOVEMENT
STATIC VERIFICATION

Load on the sliders:

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

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

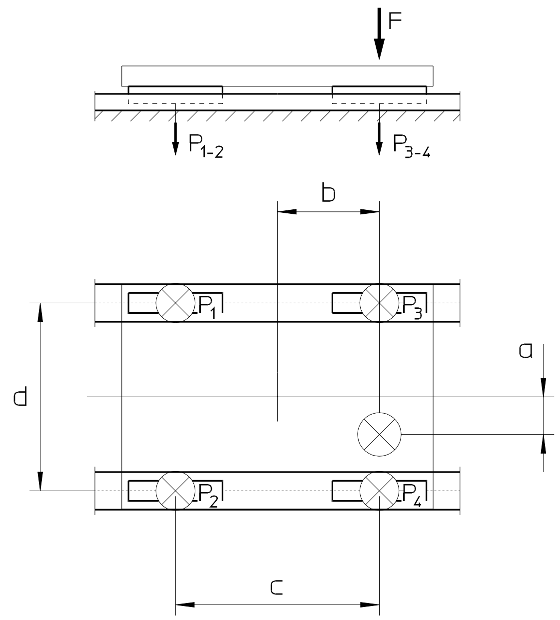


HORIZONTAL MOVEMENT
STATIC VERIFICATION

Load on the sliders:

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

$$P_1 = P_2 + F$$



HORIZONTAL MOVEMENT
STATIC VERIFICATION

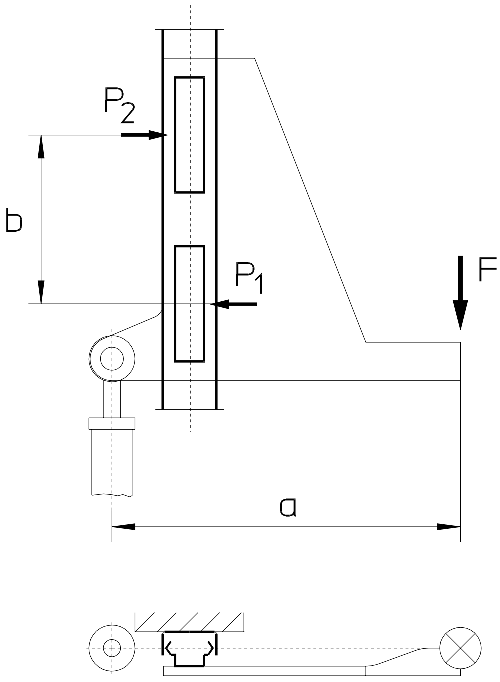
P.S. It is intended that the slider nr.4 is always the one nearest to the application point of the load

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

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

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

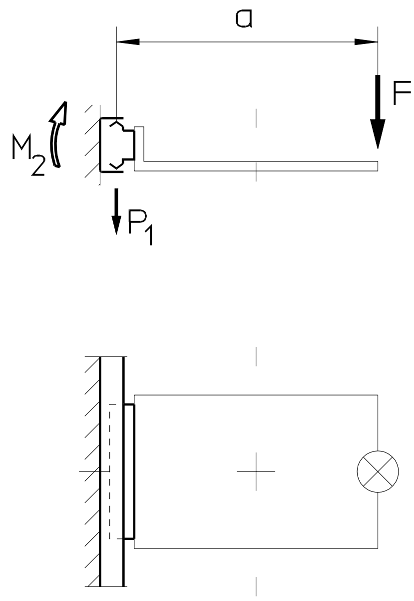
$$P_4 = \frac{F}{4} + \left(\frac{F}{2} \times \frac{b}{c}\right) + \left(\frac{F}{2} \times \frac{a}{d}\right)$$



VERTICAL MOVEMENT
STATIC VERIFICATION

Load on the sliders:

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

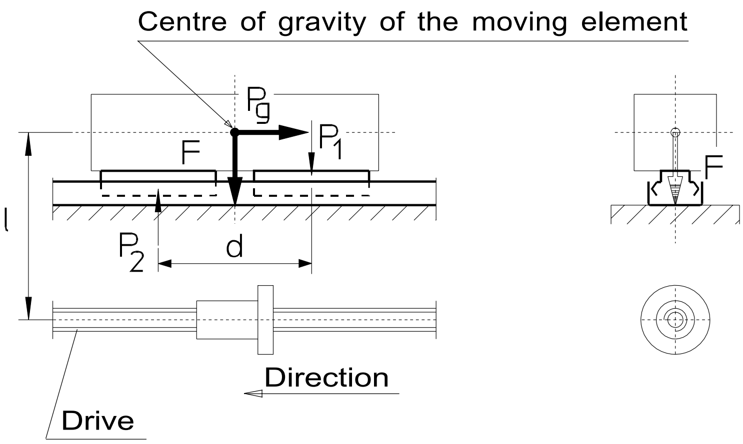


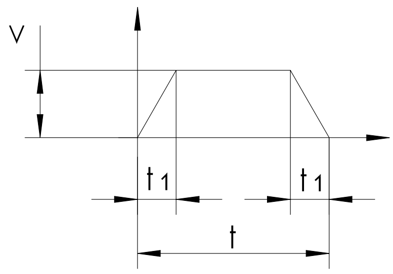
HORIZONTAL MOVEMENT
STATIC VERIFICATION

Load on the sliders:

$$P_1 = F$$

$$M_2 = F \times a$$





HORIZONTAL MOVEMENT
Verification with moving element of weight F when the movement reverses.

Inertial force -- $P_g = \frac{F}{g} \times \frac{V}{t_1}$

where ***g*** *-- gravity acceleration*
v *-- speed of the moving element*
t_1 *-- acceleration and deceleration time*
t *-- total time*

Load on the sliders when the movement reverses:

$$P_1 = \frac{P_g \times l}{d} + \frac{F}{2} \qquad P_2 = \frac{F}{2} - \frac{P_g \times l}{d}$$

SELECTION CRITERIA FOR THE CORRECT COMPACT RAIL SOLUTION

THE IMPORTANCE OF THE CORRECT CHOICE

The choice of the best product to use for an application is always important and many aspects of the application must be carefully analyzed and evaluated before the final decision can be made. **COMPACT RAIL** offers a large range of sizes and types of rail and sliders - each with the same time and money saving advantages: reduced assembly time, absorbsion of mounting and structural errors and the fuctionality of the compact design. These products can be combined in many ways giving the perfect solution for most applications.
The following paragraphs list some of the most important criteria needed in choosing which **COMPACT RAIL** solution is best for a particular application.

DESCRIPTION OF THE SELECTION CRITERIA

The criteria listed below and in the flow-chart on the next page are common to all applications. Knowledge of these is sufficient for selecting the correct **COMPACT RAIL** solution.

ACTING LOADS: The first step is always to define the different loads (radial, axial, moments etc) acting on the sliders. All data about the weight, position of the center of gravity, drive forces, and distances of external forces must be known or at least carefully estimated. Dynamic forces must also be calculated, making sure that they do not exceed the admissible capacities. Once this data and the number of rails and sliders needed is known, the loads on the most stressed slider (see pages A56 and A57) can be calculated and this information can be used to determine the lifetime.

SPEED: Since the different size rails offer different maximum speeds, this factor can be decisive when choosing the solution. (see page A6)

STIFFNESS: When high stiffness is required, larger sized rails/sliders should be used (see page A42)

LINEAR PRECISION: Linear precision of **COMPACT RAIL** system is shown on page A39.

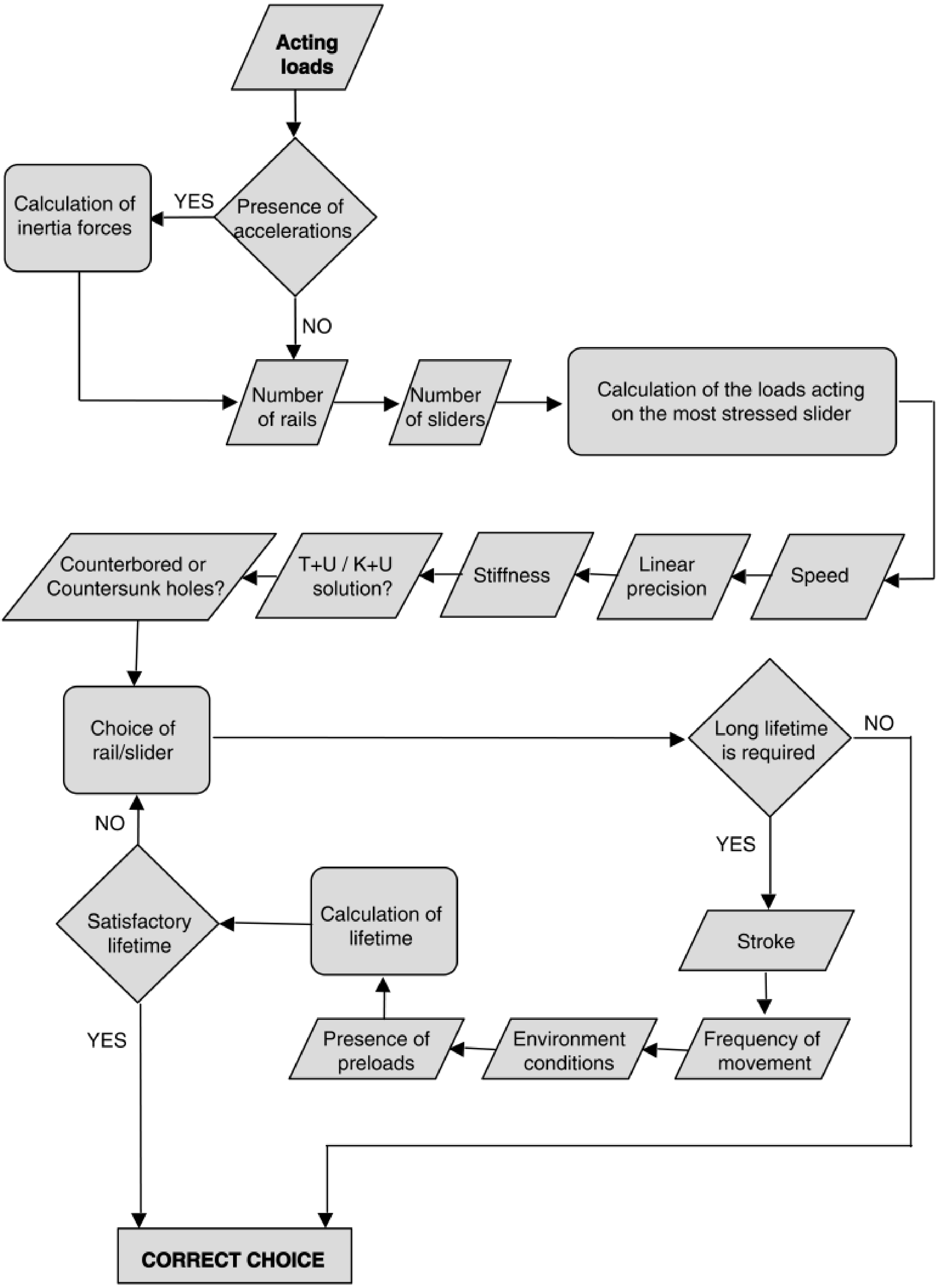
SELF-ALIGNMENT: It is always of great importance to verify the parallelism errors of the fixing structure or the real possibility of mounting rails precisely before choosing which system. If a certain axial assembly error can be expected, a solution that can absorb parallelism errors like the T+U system is recommended. If the expected assembly error is not only axial, then the K+U systemis the best choice. (see pages A32 and A34)

COUNTER-BORED / C'SUNK FIXING HOLES:
Based on the required linear precision and the alignment of the fixing holes, the type of fixing screw system is chosen; one with counter-bored or c'sunk fixing holes. When there are no particular requirements, the c'sunk rails offer the quickest and easiest assembly due to their self-aligning properties (see page A26)

LIFETIME: Very often a certain lifetime of the linear bearing must be met or exceeded so the theoretical lifetime of the bearing become the most important factor. Important parameters in the lifetime calculation are the stroke, frequency of movement, environment conditions and the presence of preloads.
Short strokes and high frequency stresses the raceways much more than long strokes and low frequency. The selection of a larger rail/slider combination will improve the lifetime in these applications.
Polluted environments can cause a reduction in the lifetime. In these cases the well protected N.. sliders and nickel plated rails offer an excellent solution (see page A41).

SELECTION FLOW-CHART

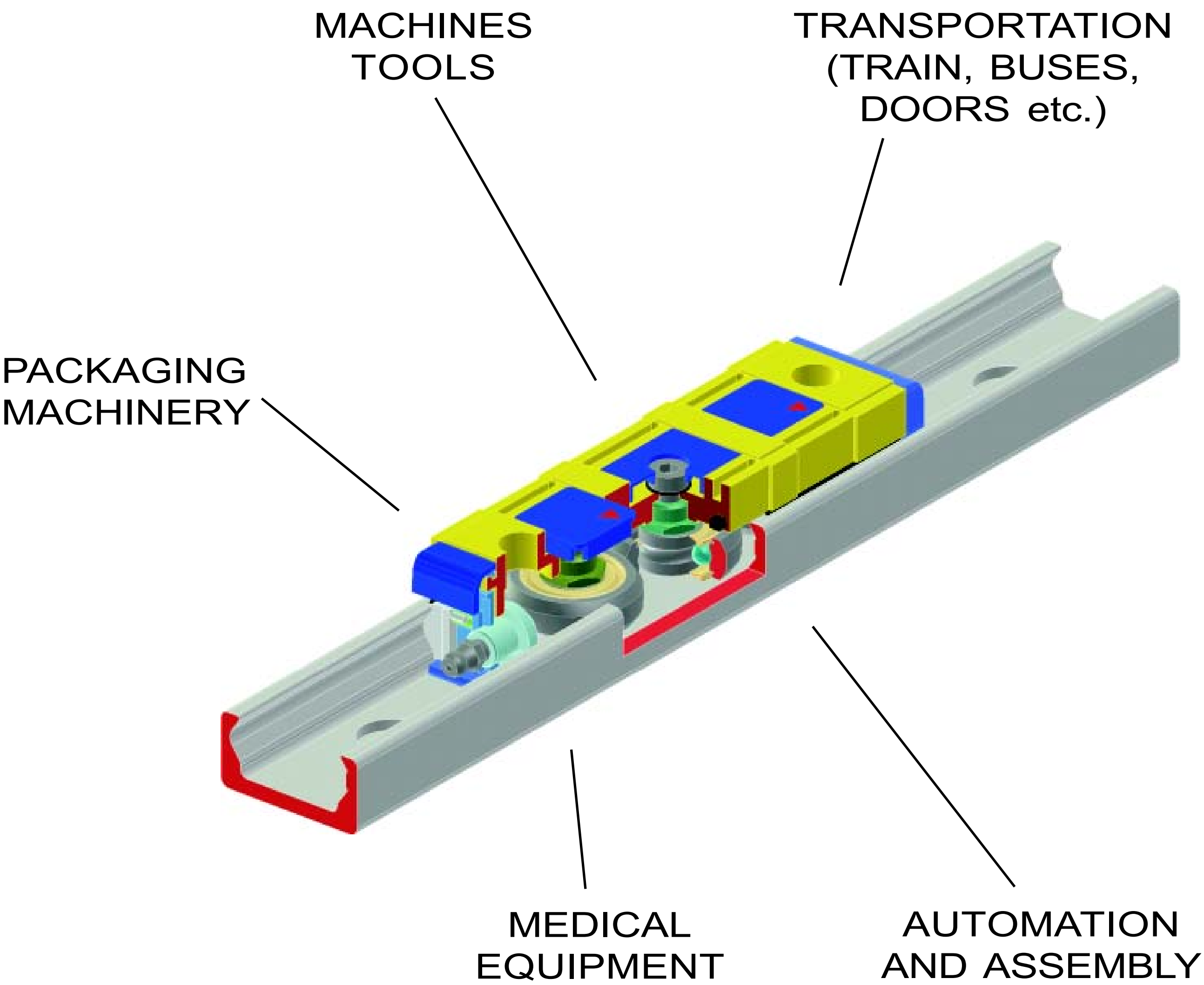
The following flow-chart will guide you through the necessary selection criteria in choosing the correct **COMPACT RAIL** solution of rail/slider combination.



ROLLON

FIELDS OF APPLICATION

The application fields where the **COMPACT RAIL** system have been applied successfully are innumerable. However, some of the most common are listed below and in the next pages.



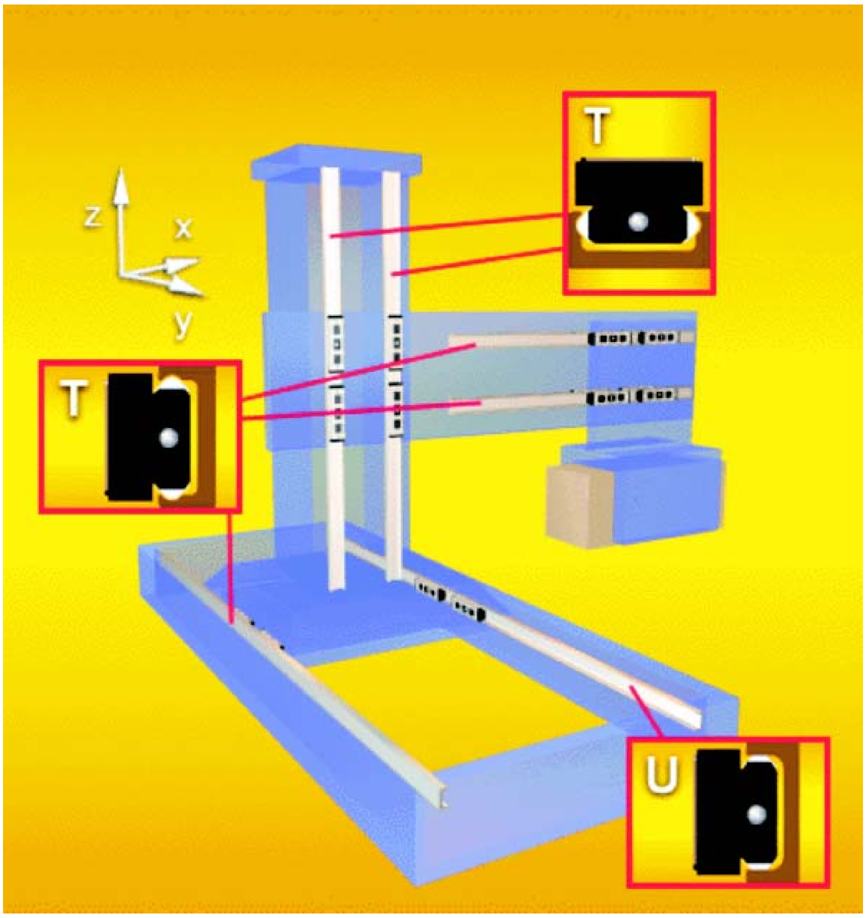
Other important applications fields are:

- Robotics and automatic manipulation
- Photographic exposure device
- Handling
- Manufacturing
- Graphic printing equipment
- General mechanical constructions
- Doors and safety guards in general

EXAMPLES OF APPLICATION

3 AXES PALLETIZER

The palletizer below moves wooden or plastic boxes by the means of an adjustable clamp. All three axes use a pair **COMPACT RAIL** rails, dimensioned in accordance to the requirements indicated in the table below. A system of size 63 T+U rails with c'sunk fixing holes is used for the Y-axis to assure easy assembling of the considerably long stroke.
For the other axes, pairs of T-rails with counter-bored fixing holes are used to obtain the required stiffness and assembly precision. Simple construction and assembly are important, together with a reliable problem-free operation despite a certain degree of impurities in the environment.

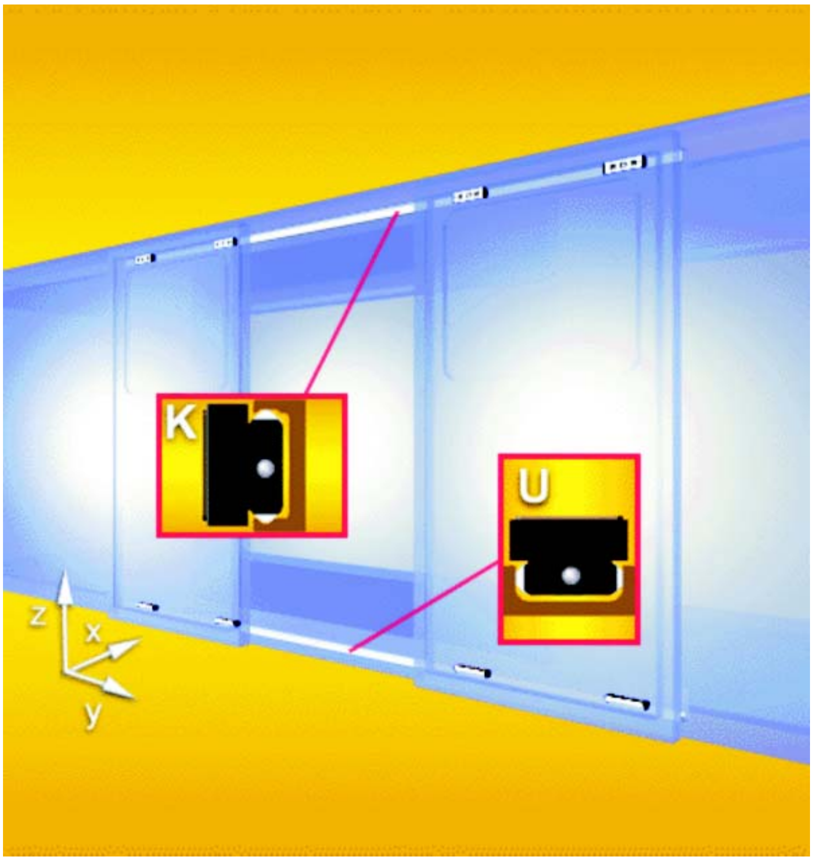


Application data	X Axis	Y Axis	Z Axis
Weight of moving part [N]	1000	2500	1200
Dimensions of moving part [mm]	300x700	500x2000	300x1500
Stroke [mm]	1000	3600	1400
Speed [m/s max]	1.5	2.5	1.8
Frequency of movement [cycles/min]	25	10	25
Precision of movement [mm/m]	0.1	0.2	0.1
Environment conditions	Normal	Normal	Normal
Other special requirements			
Product used	N°2 **TLC28-1360/2/NT28**	**TLV63-4160(3600+560) /2/NT63** **ULV63-4160(3600+560) /2/NU63**	N°2 **TLC43-1840/2/NT43L**

ROLLON

TRAIN DOORS

Applications for the transportation industry like the external train and bus door shown below have used **COMPACT RAIL** solutions for many years due to the long lifetime and high resistance to strong vibrations.
In this case, the upper part of the two doors is supported by a K-rail with four NK43 sliders which allow a smooth movement while absorbing alignment errors between the top fixing supports and the bottom ones. The lower doors utilize a U-rail with four NU43 sliders which take any overturning moments. Both rails use c'sunk fixing screws for easy rail assembly and self-alignment.
The rails are chemical nickel plated for high corrosion resistance since they are exposed to the outside environment.



Application data	X Axis	Y Axis	Z Axis
Weight of moving part [N]		800	
Dimensions of moving part [mm]		700x2200	
Stroke [mm]		700	
Speed [m/s max]		1.2	
Frequency of movement [cycles/min]		1	
Precision of movement [mm/m]		0.2	
Environment conditions		Outside environment	
Other special requirements		Long lifetime required, resistance to vibrations	
Product used		**KLV43-2960/4/NK43 ULV43-2960/4/NU43**	

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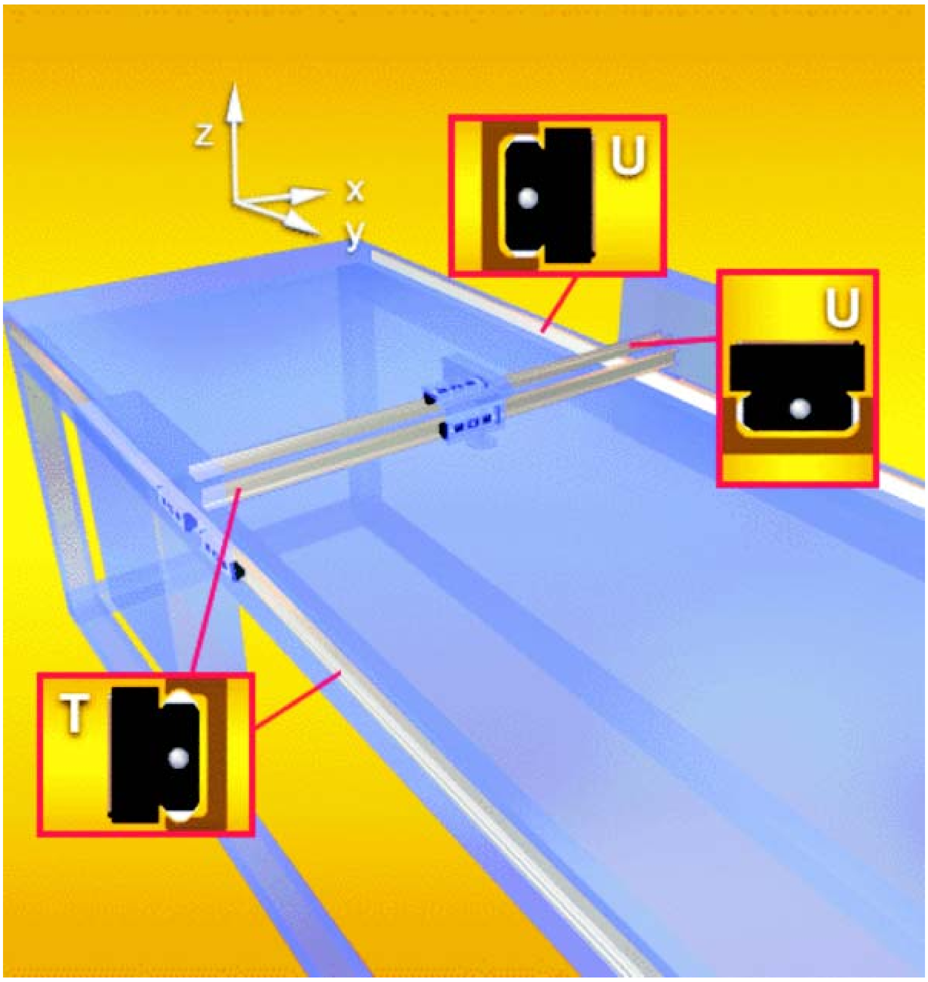
PLASMA CUTTING MACHINE

This machine obtains various plate shapes, cut from steel or metallic plates, by the means of a plasma arch. The long Y-axis utilizes a pair of T+U rails with c'sunk fixing holes for easy rail assembling.
The X axis takes advantage of the precise mounting of counter-bored holes for the pair of T+U rails which are used for cutting. The main requirements for this application are that it be silent, quick, and precise.



Application data	X Axis	Y Axis	Z Axis
Weight of moving part [N]	200	600	
Dimensions of moving part [mm]	250x350	500x2200	
Stroke [mm]	1800	4600	
Speed [m/s max]	2	2	
Frequency of movement [cycles/min]	20	10	
Precision of movement [mm/m]	0.1	0.2	
Environment conditions	Normal	Normal	
Other special requirements			
Product used	**TLC28-2160/2/NT28L-D ULC28-2160/2/NU28L-D**	**TLV43-5120(3600+1520) /2/NT43 ULV43-5120(3600+1520) /2/NU43**	

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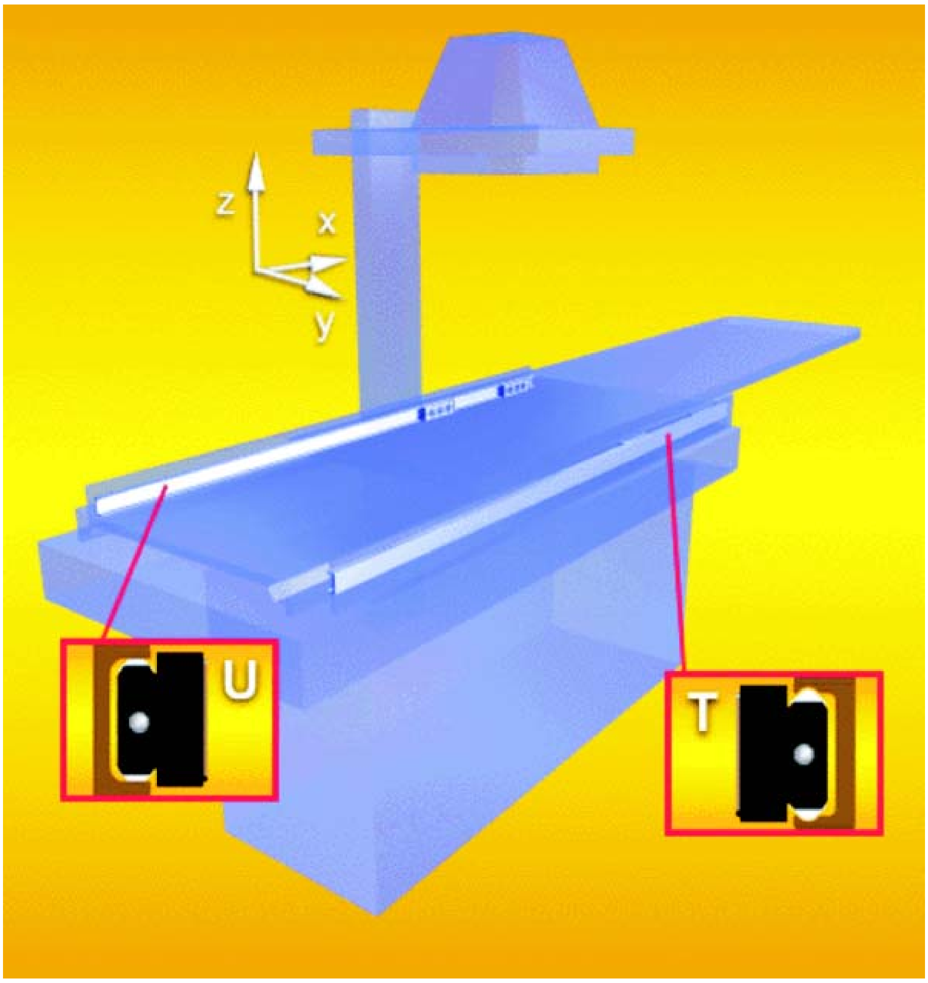
X-RAY TABLE

The **COMPACT RAIL** system has been successfully applied in the medical equipment field for years. The following an **X-ray table** is a good example.
The table moves forwards and backwards along the desired length. A pair of T+U rails with counter-bored mounting holes absorbs the parallelism errors while offering a smooth, maintenance free, low friction movement.



Application data	X Axis	Y Axis	Z Axis
Weight of moving part [N]	2000 (till 5000 for safety reasons)		
Dimensions of moving part [mm]	1200x700		
Stroke [mm]	900		
Speed [m/s max]	low		
Frequency of movement [cycles/min]	5		
Precision of movement [mm/m]	0.1		
Environment conditions	Hospital		
Other special requirements	Maintenance free		
Product used	**TLC43-1440/2/NT43 ULC43-1440/2/NU43**		

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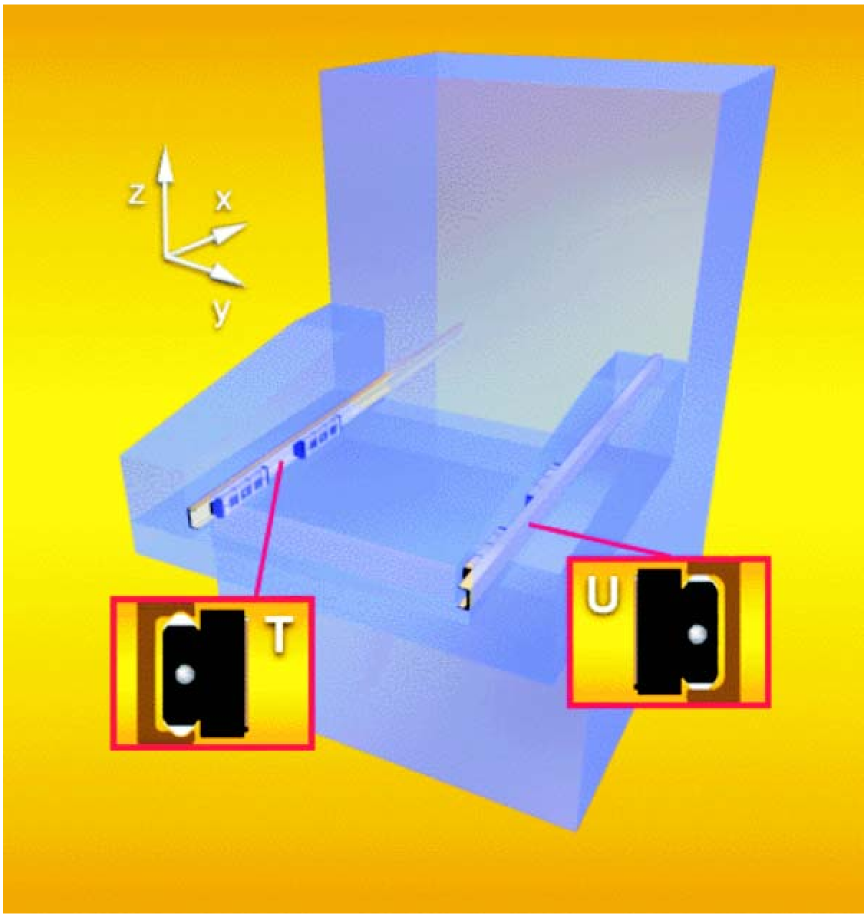
EXPOSURE UNIT

In the photographic application below, the pair of T+U-rails move the exposed plates towards the development device.
A linear system that absorbs large parallelism errors is needed since the welded mounting structure offers very low precision.
In addition, smooth and silent movement with no lubrication in order to maintain the very clean environment is required.



Application data	X Axis	Y Axis	Z Axis
Weight of moving part [N]	1000		
Dimensions of moving part [mm]	800x800		
Stroke [mm]	800		
Speed [m/s max]	1.5		
Frequency of movement [cycles/min]	30		
Precision of movement [mm/m]	0.1		
Environment conditions	Completely dust free		
Other special requirements	No lubrication		
Product used	**TLV28-1680/2/NT28** **ULV28-1680/2/NU28**		

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ORDER CODES

Sliders can be ordered separately or already mounted and preloaded in the rail.
The order codes for the different possibilities are listed below.

SLIDERS

- N... SERIES

NT E 28

- NT: slider type (NT, NU, NK)
- E: optional self lubricating kit
- 28: dimension (18, 28, 43, 63)

NT E 43 L - 4 - C

- NT: slider type (NT, NU, NK)
- E: optional self lubricating kit
- 43: dimension (28, 43)
- L: long slider version
- 4: Number of rollers (3, 4, 5)
- C: configuration (A, B, C)

- C.. SERIES

CSW 43 - 230 - 2RS - B - U

- CSW: slider type (CSW or CDW)
- 43: dimension (18,28,43,63)
- 230: slider body length
- 2RS: rollers protection shield type (2Z, 2RS or 2ZR for “63” size)
- B: configuration (A or B, only when necessary)
- U: type of wiper (T or U)

RAILS

T L V 43 - 4640 (3600+1040)

- T: rail shape (T, U, K)
- L: surface finishing (L)
- V: fixing-holes type (C or V)
- 43: dimension (18,28,43,63)
- 4640: total length (mm)
- (3600+1040): length of each single piece (mm) (in case of joined rails)

MOUNTED RAILS AND SLIDERS

ULC63 - 7200 (3600+3600) - 2 - NU63 - K2

- ULC63: rail type and size
- 7200: total length (in mm)
- (3600+3600): length of each single piece (in mm)
- 2: No. of slider
- NU63: slider type
- K2: class of preload (standard K1 can be omitted)