ROLLON®
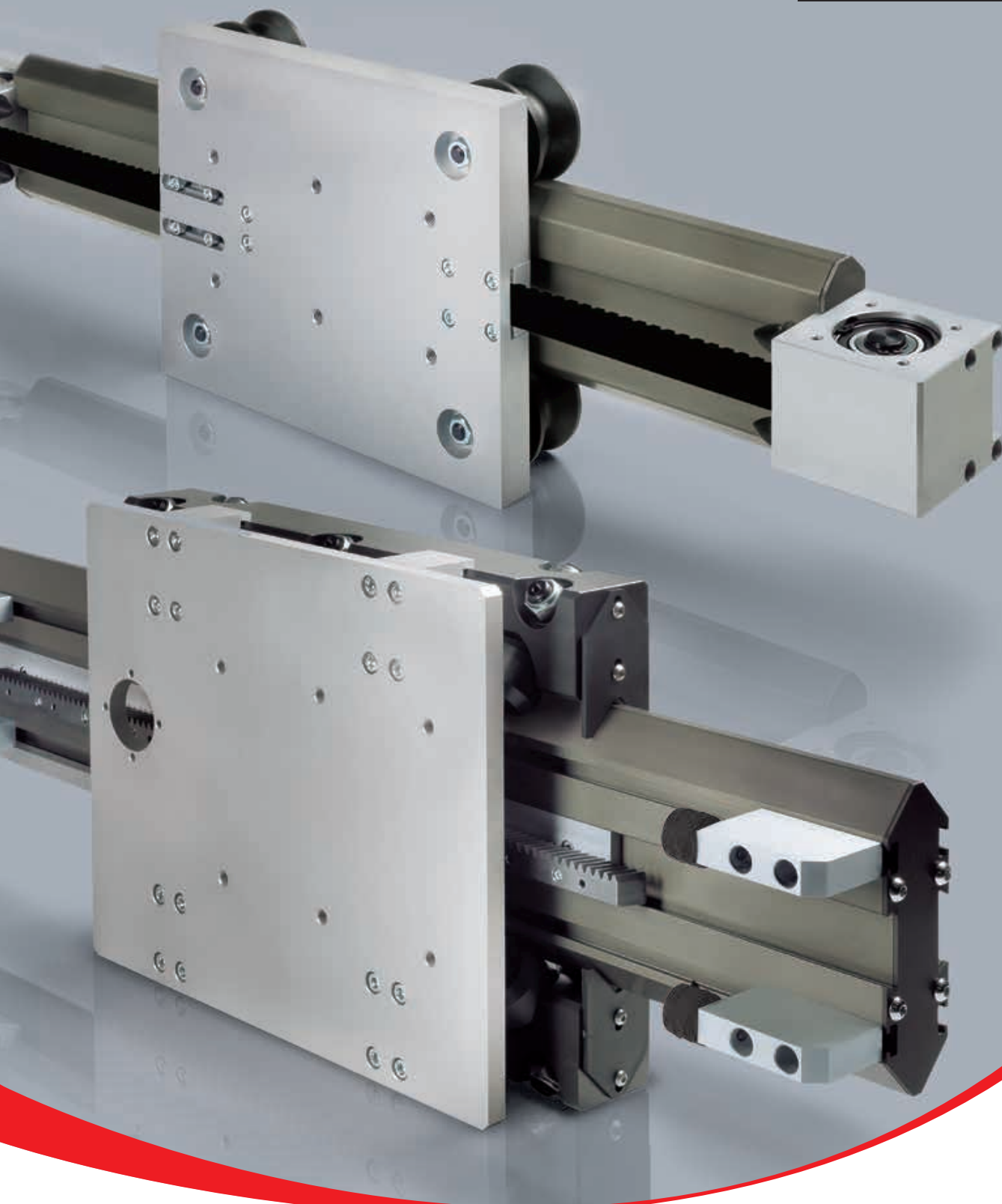
BY TIMKEN

TO SUPPORT YOU,
WE DESIGN AND PRODUCE

An industrialized process with various levels
 of customization

For over 40 years, Rollon has adopted an approach entailing responsibility and ethics in the design and production of our linear motion solutions for different industrial sectors. The reliability of an international technology group has now been combined with the availability of a local support and service network

VALUES

PERFORMANCE

Rollon's goal is to help our clients become more competitive in their markets through technological solutions, design simplification, productivity, reliability, duration, and low maintenance.

ROBOTICS

INDUSTRIAL MACHINERY

LOGISTICS

RAILWAY

COLLABORATION

High-level technical consulting and cross-competence allow us to identify the needs of our clients and transform them into guidelines for continuous exchange, while **our strong specialization in the different industrial sectors becomes an factor in developing projects and innovative applications.**
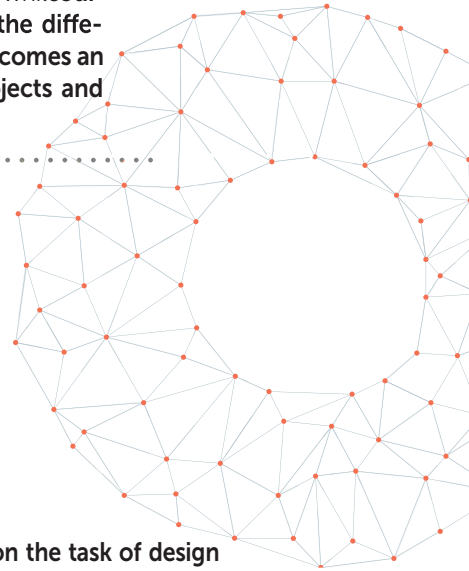
Rollon takes on the task of design and development of linear motion solutions, taking care of everything for our customers, so that they can concentrate on their core business. **We offer everything from individual components to specifically designed, mechanically integrated** systems: the quality of our applications is an expression of our technology and competence.

SOLUTIONS APPLICATIONS

INTERIORS AND ARCHITECTURE

MEDICAL

SPECIAL VEHICLES

AERONAUTICS

DIVERSIFIED LINEAR SOLUTIONS
FOR EVERY APPLICATION REQUIREMENT

## Linear and telescopic rails

Linear Line

Linear and curved rails with ball and roller bearings, with hardened raceways, high load capacity, self-alignment, and capable of working in dirty environments.

Telescopic Line

Telescopic rails with ball and roller bearings, with hardened raceways, high load capacities, low bending, resistant to shocks and vibrations. For partial, total or extended extraction up to 200% of the length of the guide.

Linear actuators and automation systems
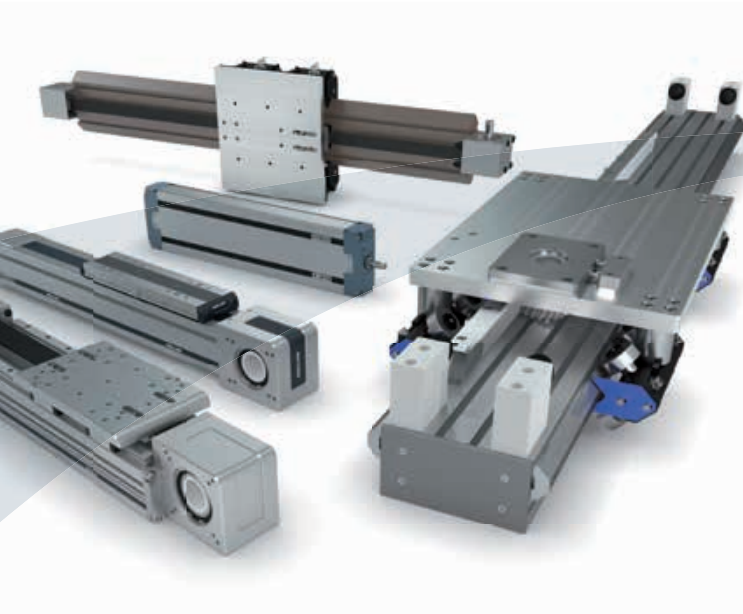
Actuator Line

Linear actuators with different rail configurations and transmissions, available with belt, screw, or rack and pinion drives for different needs in terms of precision and speed. Rails with bearings or ball recycle systems for different load capacities and critical environments.

Actuator System Line

Integrated actuators for industrial automation, used in applications in several industrial sectors: automated industrial machinery, precision assembly lines, packaging lines and high speed production lines. The Actuator Line evolves to satisfy the requests of our most discerning clients.

Speedy Rail A

SAB series ⌄

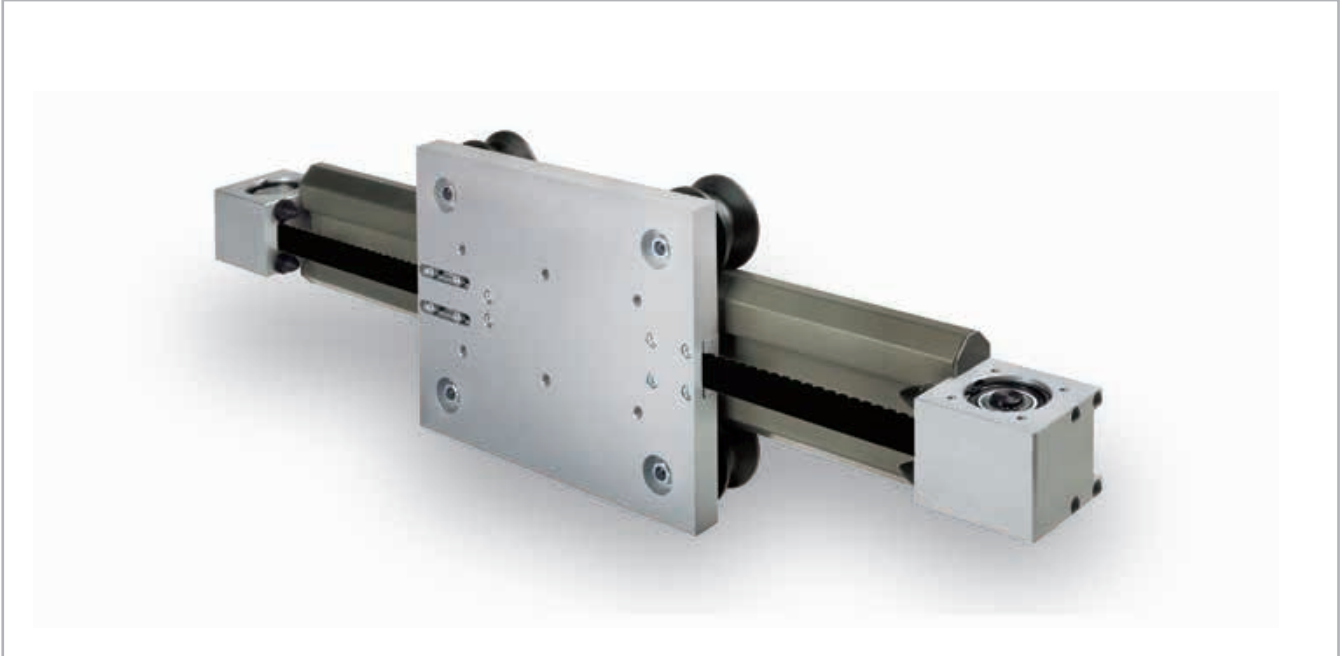> ### SAB series description

Fig. 1

SAB products are self-supporting extruded aluminum actuators driven by a polyurethane belt system. Due to their deep hard anodized surface treatment and their plastic compound coated rollers, SAB series can achieve exceptionally high performances and load capacity with no maintenance or lubrication required. They also provide total reliability even in dirty environments, with uniquely quiet operation.

SAB series is defined by the use of **guides with cylindrical and V-shaped rollers** as linear motion components. These linear motion systems are lightweight, self-supporting, easy to assemble, cost effective, modular, clean and quiet. Thanks to this kind of solution they are specifically dedicated for dirty environments and high dynamics in automation. SAB series is available with profiles of different sizes: 60 - 120 -180 - 250 mm.

Some of the main **advantages** of SAB series are:
- High reliability
- Self-supporting for greatest design freedom
- High technical performance
- High load
- Optimal reliability in dirty environments
- Absence of lubrication
- Uniquely quiet
- Self-aligning system

▶ The components

Extruded bodies

SAB beam is a heat-treated Aluminum alloy profile with hollow cross-sections which makes it very strong under torsion and deflection stresses. Beams are then subject to a special patented treatment which provides a smooth, hard surface, comparable to tempered steel, and an optimal resistance to wear, even in dirty environments.

Driving belt

The SAB series driving system consists in a polyurethane toothed belt, reinforced with high resistance steel cords. For some applications, the belt driven solution is ideal due to its high load transmission characteristics, compact size and low noise. Some of the advantages of using a belt driven system are: high speed, high acceleration, low noise and no need for lubrication.

Carriage

The carriage of the SAB series linear units is made of anodised aluminum. Different lengths of the carriages are available according to the different sizes.

General data about aluminum used: AL 6060

Chemical composition [%]

Al	Mg	Si	Fe	Mn	Zn	Cu	Impurites
Remaining	0.35-0.60	0.30-0.60	0.30	0.10	0.10	0.10	0.05-0.15

Tab. 1

Physical characteristics

Density	Coeff. of elasticity	Coeff. of thermal expansion (20°-100°C)	Thermal conductivity (20°C)	Specific heat (0°-100°C)	Resistivity	Melting point
$\dfrac{kg}{dm^3}$	$\dfrac{kN}{mm^2}$	$\dfrac{10^{-6}}{K}$	$\dfrac{W}{m \cdot K}$	$\dfrac{J}{kg \cdot K}$	$\Omega \cdot m \cdot 10^{-9}$	°C
2.7	69	23	200	880-900	33	600-655

Tab. 2

Mechanical characteristics

Rm	Rp (02)	A	HB
$\dfrac{N}{mm^2}$	$\dfrac{N}{mm^2}$	%	—
205	165	10	60-80

Tab. 3

⟩ The linear motion system

The linear motion system has been designed to meet the load capacity, speed, and maximum acceleration conditions of a wide variety of applications.

SAB with cylindrical and V-shaped rollers:

The SAB range includes a large selection of rollers both cylindrical and V-shaped, and sliders assembled with two or more rollers. SAB rollers are covered by a sintered plastic compound, resistant to pollutants and virtually maintenance-free. Ball and/or needle bearings with high performance are mounted into the rollers and can be maintained either with standard greasing procedure or lifetime lubricated. All roller boxes are equipped with concentric and eccentric pins for a quick adjustment of the contact between rollers and rail.

Supports are mounted on the frame when the rail is movable and on the trolleys when it is fixed.
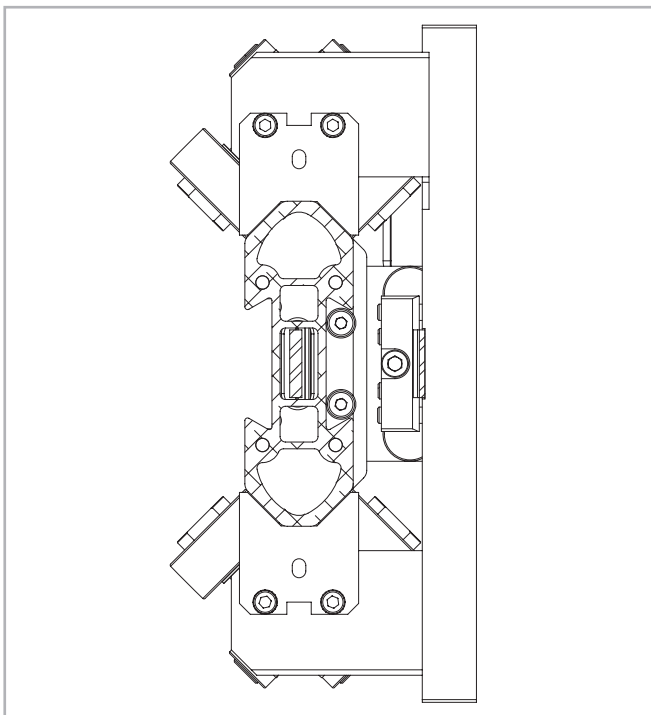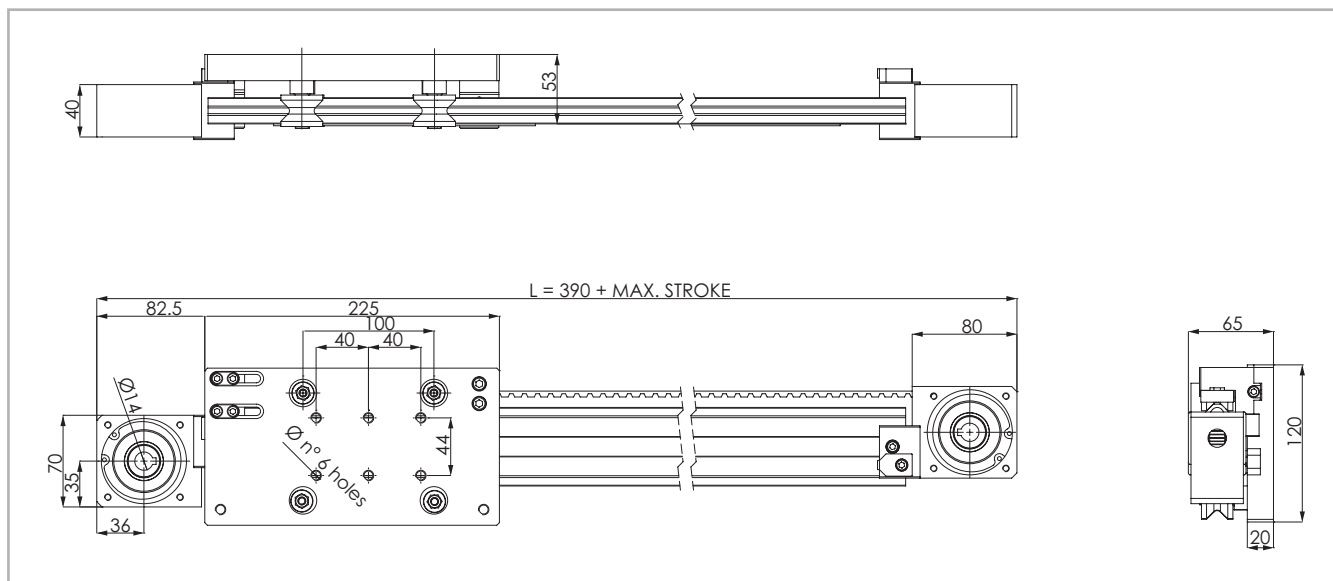
SAB section

Fig. 2

SRA-4

SAB 60V

SAB 60V Dimension

Anticorrosion version available

The length of the safety stroke is provided on request according to the customer's specific requirements.

L = 390 + MAX. STROKE

Fig. 3

Technical data

	Type
	SAB 60V
Max. useful stroke length [mm]	7250
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	7
Max. acceleration [m/s^2]	8
Type of belt	10 AT 10
Type of pulley	Z 19
Pulley pitch diameter [mm]	60.479
Carriage displacement per pulley turn [mm]	190
Carriage weight [kg]	1.7
Zero travel weight [kg]	3.8
Weight for 100 mm useful stroke [kg]	0.13
Rail size [mm]	60x20

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 4

Moments of inertia of the aluminum body

Type	I_x [10^7 mm^4]	I_y [10^7 mm^4]	I_p [10^7 mm^4]
SAB 60V	0.014	0.002	0.003

Tab. 5

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

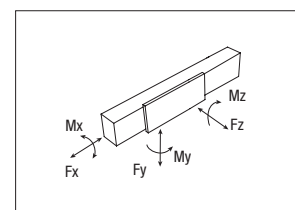| Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 60V	10 AT 10	10	0.064

Tab. 6

Belt length (mm) = 2 x L - 80

Load capacity

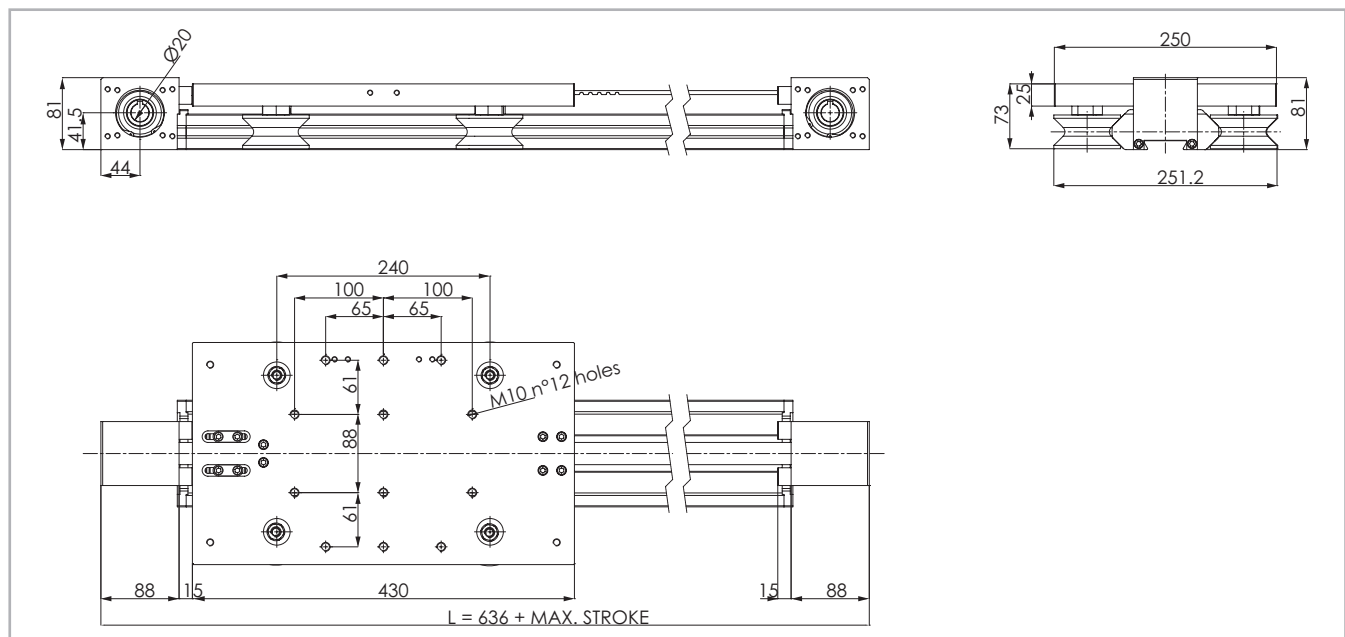| Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 60V	706	374	540	400	9	20	27

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 7

SRA

> SAB 120VX

SAB 120VX Dimension

Anticorrosion
version available

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 4

Technical data

	Type
	SAB 120VX
Max. useful stroke length [mm]	7056
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	6
Max. acceleration [m/s^2]	8
Type of belt	25 AT 10HPF
Type of pulley	Z 15
Pulley pitch diameter [mm]	47.746
Carriage weight [kg]	8.22
Zero travel weight [kg]	17.0
Weight for 100 mm useful stroke [kg]	0.472
Rail size [mm]	120x40

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 8

Moments of inertia of the aluminum body

Type	I_x [10^7 mm^4]	I_y [10^7 mm^4]	I_p [10^7 mm^4]
SAB 120VX	0.214	0.026	0.043

Tab. 9

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 120VX	25 AT 10HPF	25	0.16

Tab. 10

Belt length (mm) = 2 x L - 300

Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 120VX	1349	715	1400	800	39.3	96	168

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.
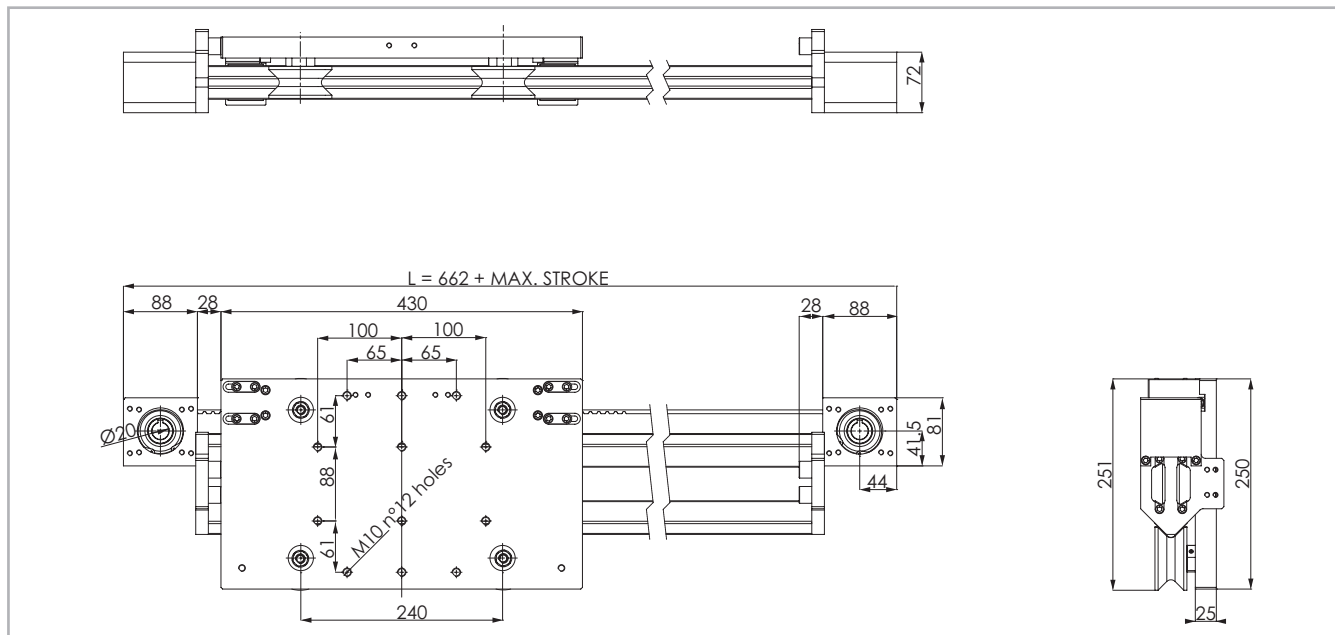
Tab. 11
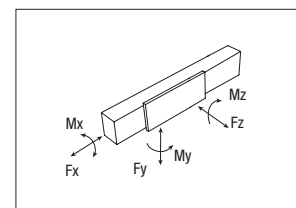
SAB 120VZ

SAB 120VZ Dimension

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 5

Technical data

	Type
	SAB 120VZ
Max. useful stroke length [mm]*1	7040
Max. positioning repeatability [mm]*2	± 0.2
Max. speed [m/s]	6
Max. acceleration [m/s²]	8
Type of belt	25 AT 10HPF
Type of pulley	Z 15
Pulley pitch diameter [mm]	47.746
Carriage displacement per pulley turn [mm]	150
Carriage weight [kg]	9.1
Zero travel weight [kg]	17.9
Weight for 100 mm useful stroke [kg]	0.472
Rail size [mm]	120x40

*1) It is possible to obtain longer strokes by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used

Tab. 12

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAB 120VZ	0.214	0.026	0.043

Tab. 13

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 120VZ	25 AT 10HPF	25	0.16

Tab. 14

Belt length (mm) = 2 x L - 310
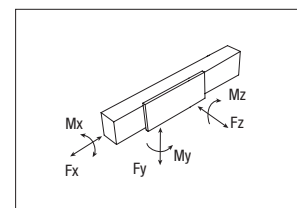
Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 120VZ	1349	715	1400	800	39.3	96	168

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 15

> SAB 120CX

SAB 120CX Dimension
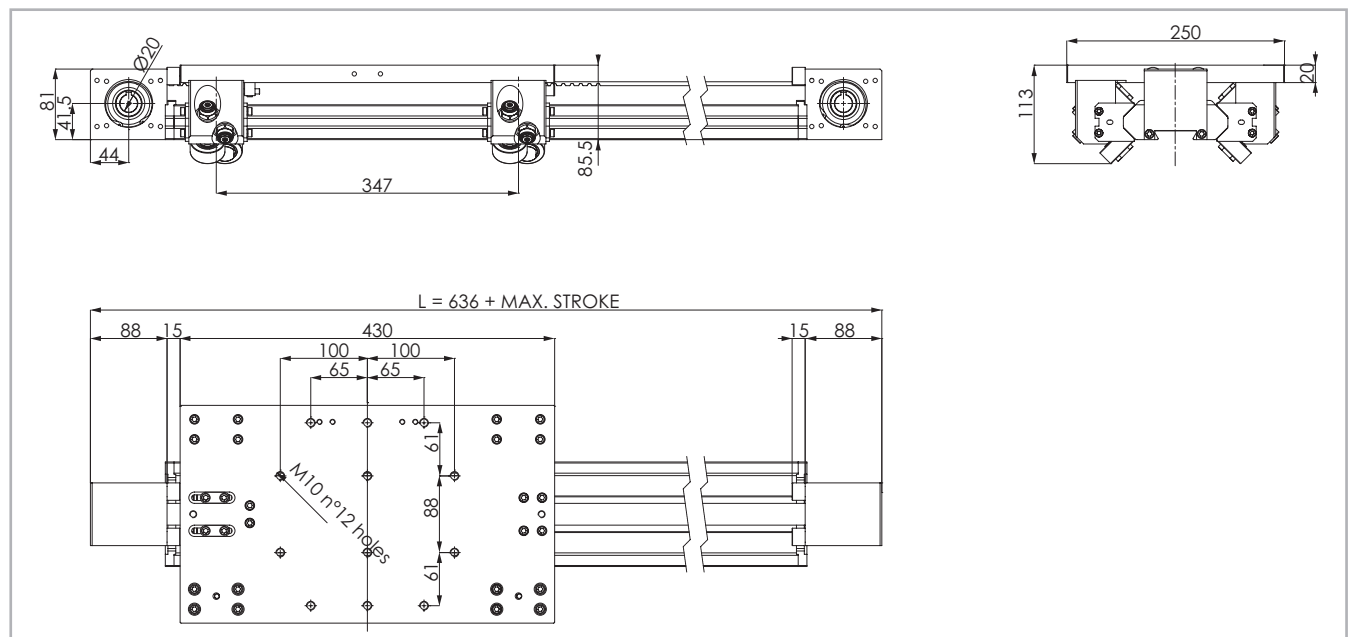
Anticorrosion version available

L = 636 + MAX. STROKE

M10 n°12 holes

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 6

Technical data

	Type
	SAB 120CX
Max. useful stroke length [mm]	7056
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	6
Max. acceleration [m/s²]	10
Type of belt	25 AT 10HPF
Type of pulley	Z 15
Pulley pitch diameter [mm]	47.746
Carriage displacement per pulley turn [mm]	150
Carriage weight [kg]	8.5
Zero travel weight [kg]	17.3
Weight for 100 mm useful stroke [kg]	0.472
Rail size [mm]	120x40

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 16

Moments of inertia of the aluminum body

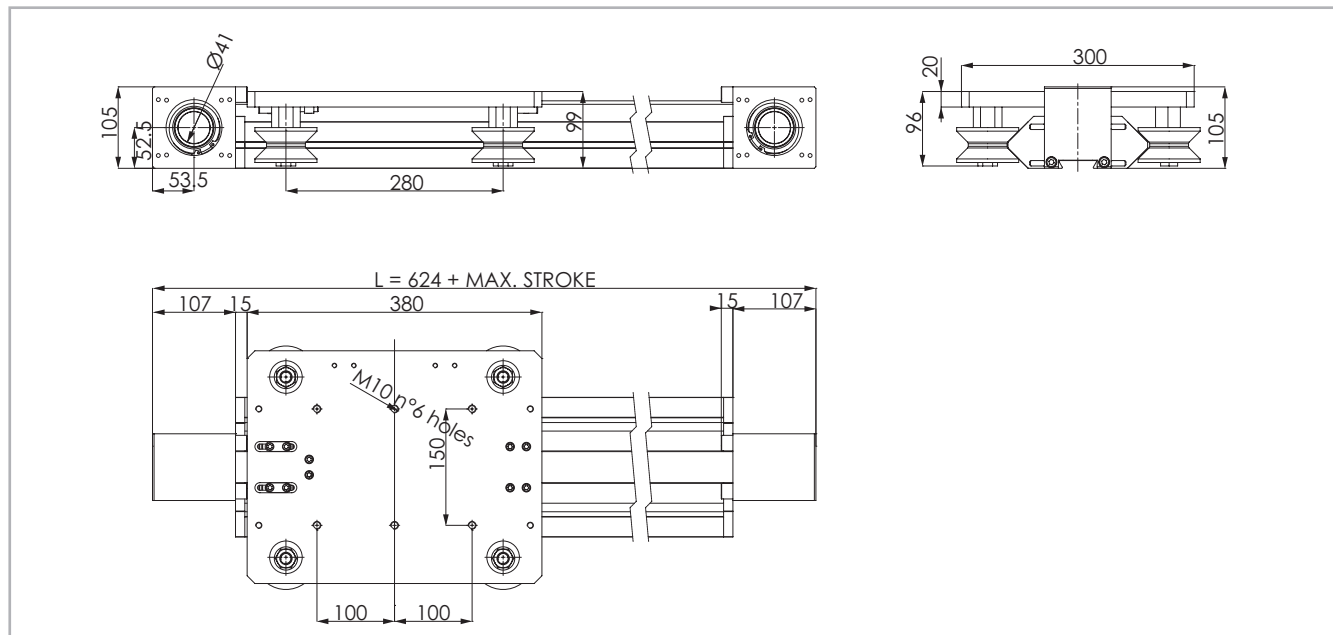| Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAB 120CX	0.214	0.026	0.043

Tab. 17

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 120CX	25 AT 10HPF	25	0.16

Tab. 18

Belt length (mm) = 2 x L - 300

Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 120CX	1349	715	2489	2489	98	432	432

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 19
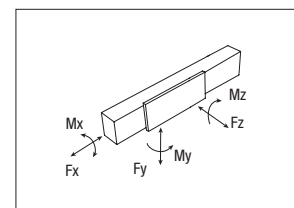
SAB 120CZ

SAB 120CZ Dimension
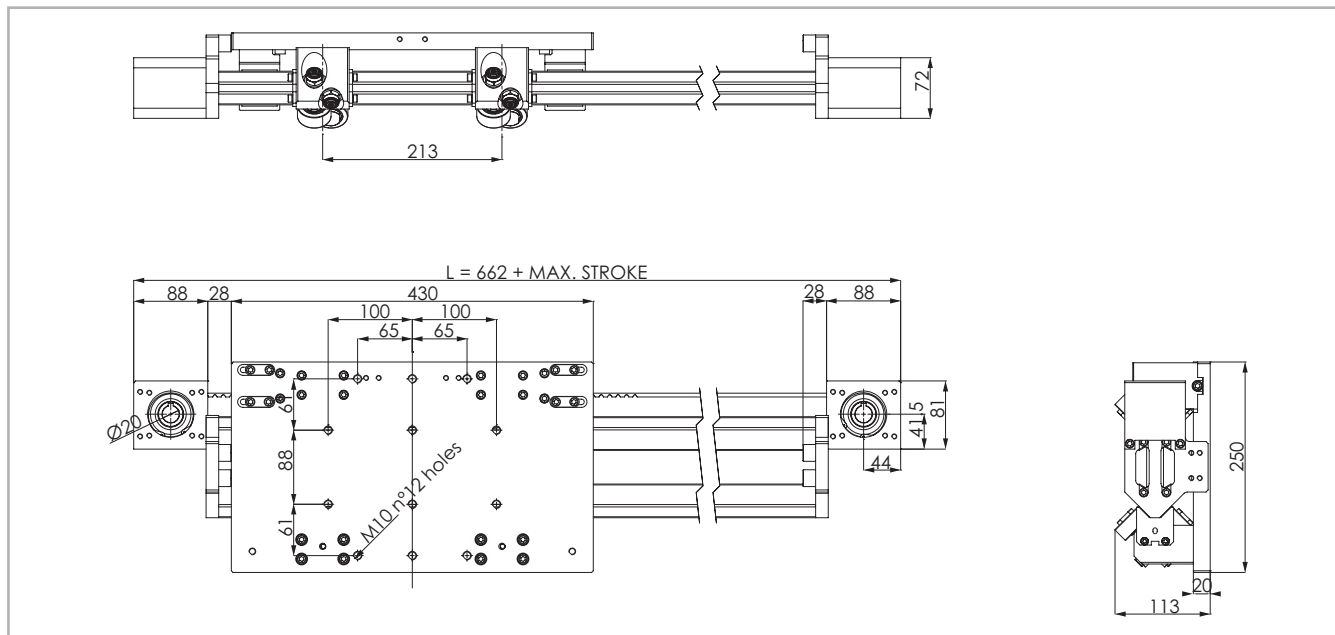
The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 7

Technical data

	Type
	SAB 120CZ
Max. useful stroke length [mm]*1	7040
Max. positioning repeatability [mm]*2	± 0.2
Max. speed [m/s]	6
Max. acceleration [m/s²]	10
Type of belt	25 AT 10HPF
Type of pulley	Z 15
Pulley pitch diameter [mm]	47.746
Carriage displacement per pulley turn [mm]	150
Carriage weight [kg]	9.4
Zero travel weight [kg]	18.2
Weight for 100 mm useful stroke [kg]	0.472
Rail size [mm]	120x40

*1) It is possible to obtain longer strokes by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used

Tab. 20

Moments of inertia of the aluminum body

Type	I_x [10^7 mm^4]	I_y [10^7 mm^4]	I_p [10^7 mm^4]
SAB 120CZ	0.214	0.026	0.043

Tab. 21

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

| Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 120CZ	25 AT 10HPF	25	0.16

Tab. 22

Belt length (mm) = 2 x L - 300
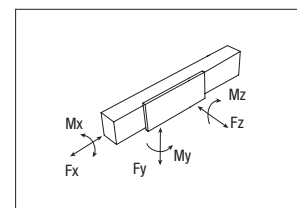
Load capacity

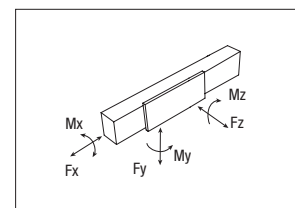| Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 120CZ	1349	715	2489	2489	98	265	265

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 23

SAB 180V

SAB 180V Dimension

♦ ● **Anticorrosion**
version available

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 8

Technical data

	Type
	SAB 180V
Max. useful stroke length [mm]	7114
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	8
Max. acceleration [m/s²]	8
Type of belt	40 AT10
Type of pulley	Z 21
Pulley pitch diameter [mm]	66.84
Carriage displacement per pulley turn [mm]	210
Carriage weight [kg]	8.3
Zero travel weight [kg]	27.6
Weight for 100 mm useful stroke [kg]	1.06
Rail size [mm]	180x60

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 24

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAB 180V	1.029	0.128	0.260

Tab. 25

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

| Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 180V	40 AT10	40	0.23

Tab. 26

Belt length (mm) = 2 x L - 220

Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 180V	3154	1671	1400	800	58	112	196

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 27
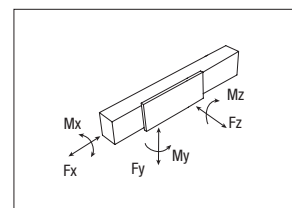
SAB 180C

SAB 180C Dimension
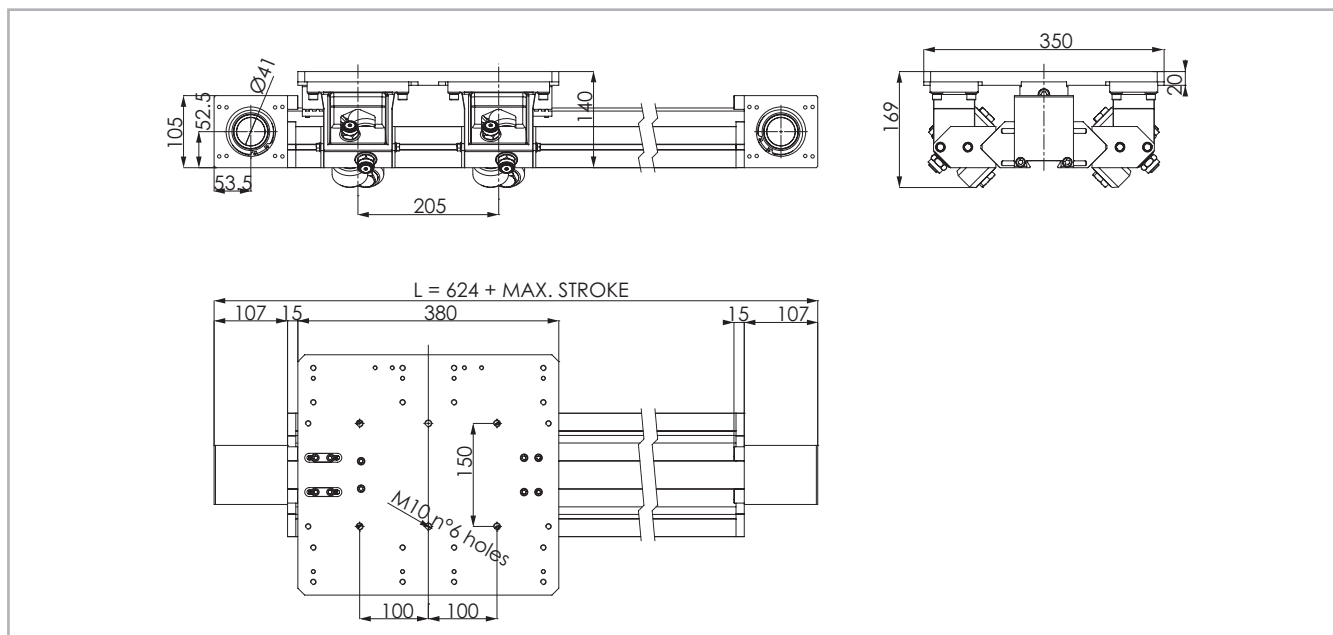
The length of the safety stroke is provided on request according to the customer's specific requirements.

L = 624 + MAX. STROKE

M10 n°6 holes

Fig. 9

Technical data

	Type
	SAB 180C
Max. useful stroke length [mm]	7114
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	8
Max. acceleration [m/s²]	10
Type of belt	40 AT10
Type of pulley	Z 21
Pulley pitch diameter [mm]	66.84
Carriage displacement per pulley turn [mm]	210
Carriage weight [kg]	16.0
Zero travel weight [kg]	30.8
Weight for 100 mm useful stroke [kg]	1.06
Rail size [mm]	180x60

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 28

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAB 180C	1.029	0.128	0.260

Tab. 29

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 180C	40 AT 10	40	0.23

Tab. 30

Belt length (mm) = 2 x L - 210

Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 180C	3154	1671	3620	3620	246	371	371

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 31

▶ SAB 250C

SAB 250C Dimension
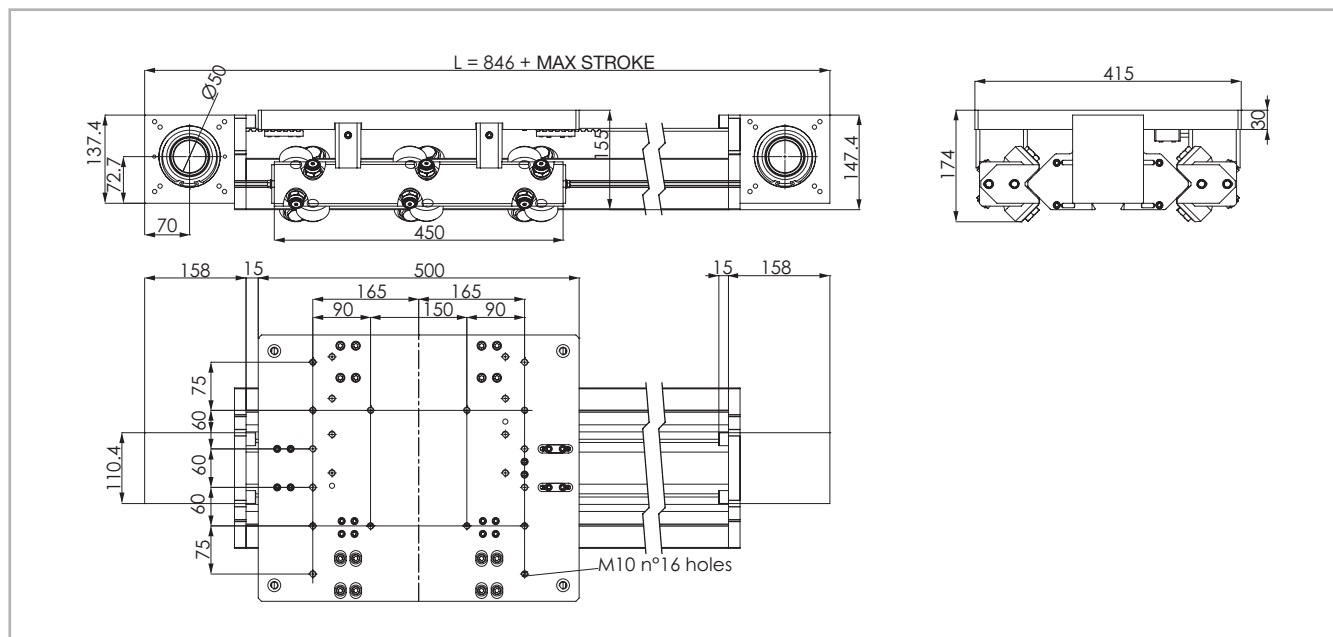
L = 846 + MAX STROKE

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 10

Technical data

	Type
	SAB 250C
Max. useful stroke length [mm]	6970
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	10
Max. acceleration [m/s²]	10
Type of belt	50 AT 10
Type of pulley	Z 27
Pulley pitch diameter [mm]	85.94
Carriage displacement per pulley turn [mm]	270
Carriage weight [kg]	32.3
Zero travel weight [kg]	57.7
Weight for 100 mm useful stroke [kg]	1.55
Rail size [mm]	250x180

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 32

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAB 250C	2.735	0.412	0,840

Tab. 33

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
SAB 250C	50 AT 10	50	0.34

Tab. 34

Belt length (mm) = 2 x L - 330

Load capacity

Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
SAB 250C	4980	2640	5431	5431	558	597	644

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 35
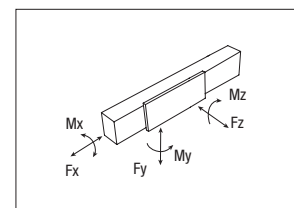
› Simple shaft version

Simple shaft type AS
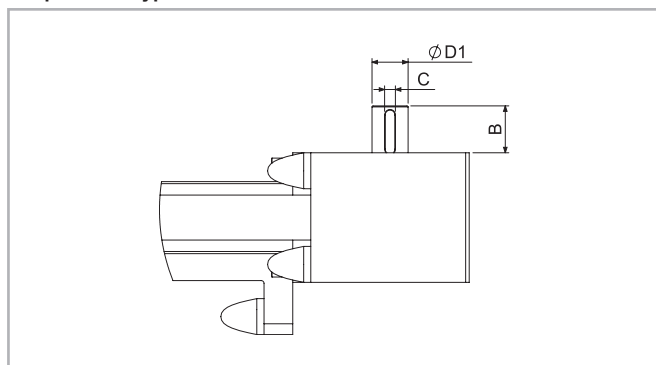
Fig. 11

Unit	Shaft type	Keyway C	B	D1	Kit Code
SAB 60	AS 14	5x5	32	14h7	G002486
SAB 120	AS 20	6x6	26	20h7	G002488

Tab. 36

Position of the simple shaft can be to the right, left, or both sides of the drive head.
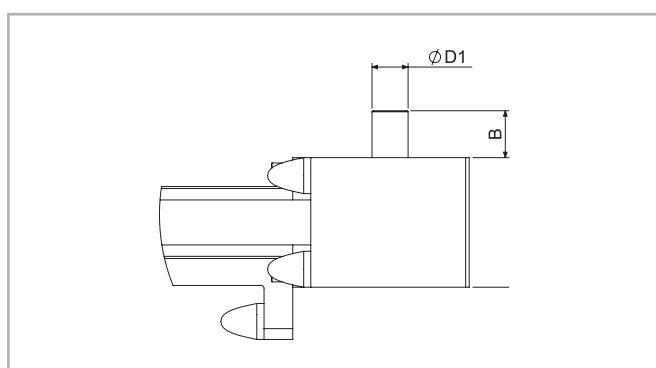
Fig. 12

Unit	Shaft type		B	D1	Kit Code
SAB 180	AS 20	Straight	36	20h7	G000828
SAB 250	AS 25	Straight	50	25h7	G000649

Tab. 37

› Double shaft version

Double shaft type AS
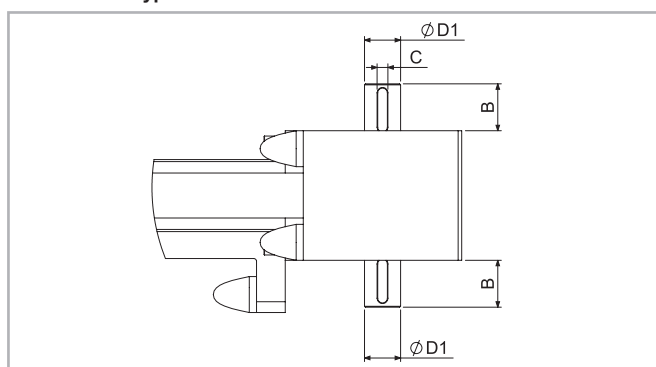
Fig. 13

Unit	Shaft type	Keyway C	B	D1	Kit Code
SAB 60	AS 14	5x5	32	14h7	G002487
SAB 120	AS 20	6x6	26	20h7	G002489

Tab. 38
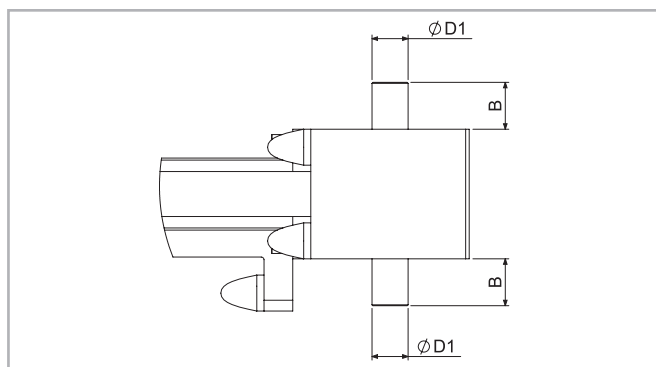
Fig. 14

Unit	Shaft type		B	D1	Kit Code
SAB 180	AS 20	Straight	36	20h7	2 x G000828
SAB 250	AS 25	Straight	50	25h7	2 x G000649

Tab. 39

Position of the simple shafts for encoder assembly to the right or to the left on the drive head.

S
R
A

Hollow shafts

Hollow shaft type AC
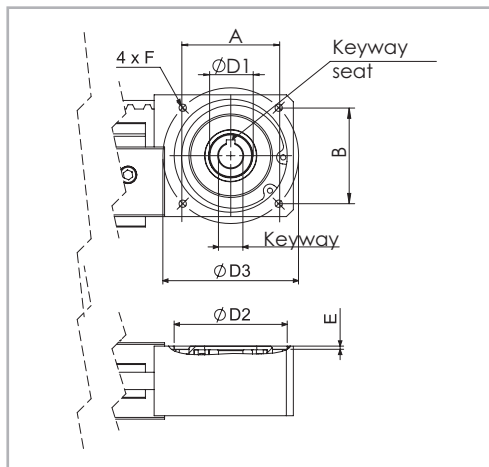
Fig. 15

Unit	Shaft type	Keyway	D1	D2	D3	E	F	A X B
SAB 60	AC 14	5 X 5	14H7	65	78	1.5	M5	-
SAB 120	AC 20	6 X 6	20H7	55	72	3.5	M6	72,8 x 59,2

Tab. 40

An (optional) connection flange is required to fit the standard reduction units selected by Rollon. For further information contact our offices

Hollow shaft type FP - Standard supply
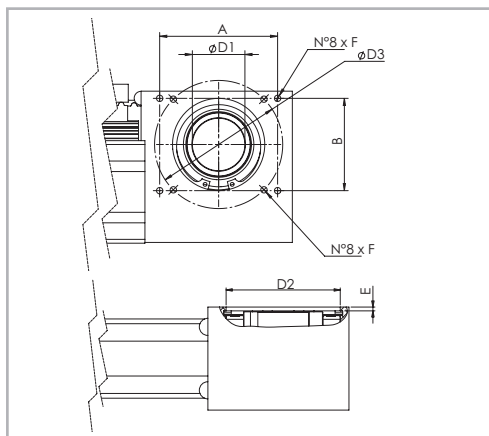
Fig. 16

Unit	Shaft type	D1	D2	D3	E	F	A X B
SAB 180	FP 41	Straight	41H7	72	100	3.5	M6	92 x 72
SAB 250	FP 50	Straight	25H7	95	130	3.5	M8	109 x 109

Tab. 41

Linear units in parallel

Synchronization kit for use of SAB linear units in parallel

When movement consisting of two linear units in parallel is essential, a synchronization kit must be used. This consists of original Rollon lamina type precision joints complete with tapered splines and hollow aluminum drive shafts.
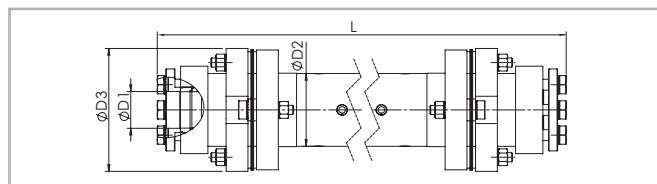
Fig. 17
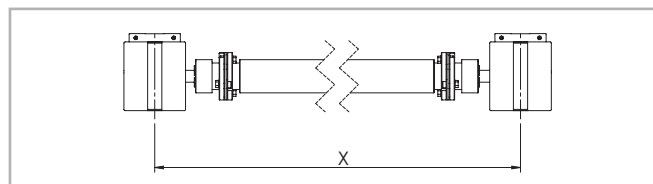
Fig. 18

Dimensions (mm)

Unit	Shaft type	D1	D2	D3	Kit Code
SAB 60	AP 15	15	40	69.5	GK15P...1A
SAB 120	AP 20	20	40	69.5	GK20P...1A
SAB 180	AP 20	20	40	69.5	GK20P...1A
SAB 250	AP 25	25	70	99	GK25P...1A

Tab. 42

▶ Accessories

Adapter flange for gearbox assembly
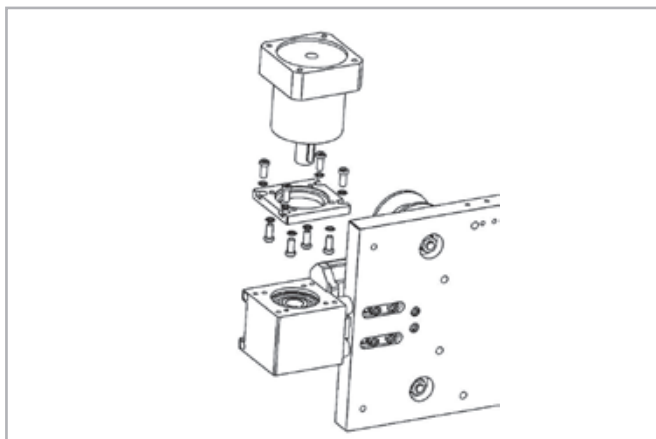
Fig. 19
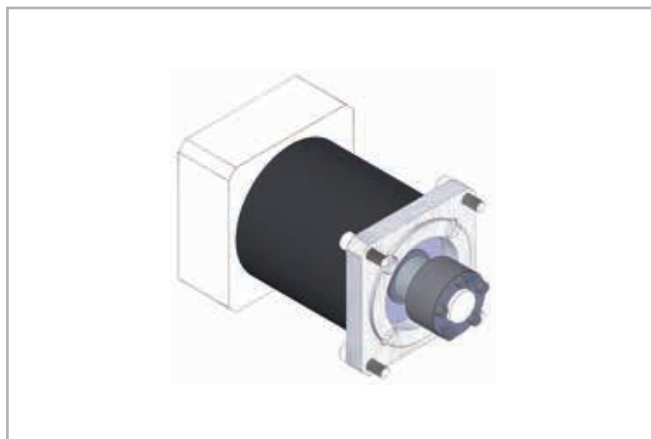
Fig. 20

Assembly kit includes: shrink disk; adapter plate; fixing hardware

Unit	Gearbox type	Kit Code
SAB60	MP060; PLE060; CP060	G002375
SAB120	PLE080	G002411
	PGII080	G002422
	MP080	G002426
	PLE060; CP060; PGII060	G002427
	MP060	G002432
SAB180	P3	G000824
	MP080	G000826
	LC90; MPV01; LP090; PE4	G000827
	MP105	G000830
	PE3; LP070; LC070	G001078
	SP060; PLN070	G000829
	SP070; PLN090	G000859
	SW040	G000866
SAB 250	MP130	G000482
	LC120; MPV02; LP120; PE5	G000483
	LC090; LP090; PE4	G000525
	MP105	G000527
	SP075; PLN090	G000526
	SW050	G000717

Tab. 43

Assembly kits
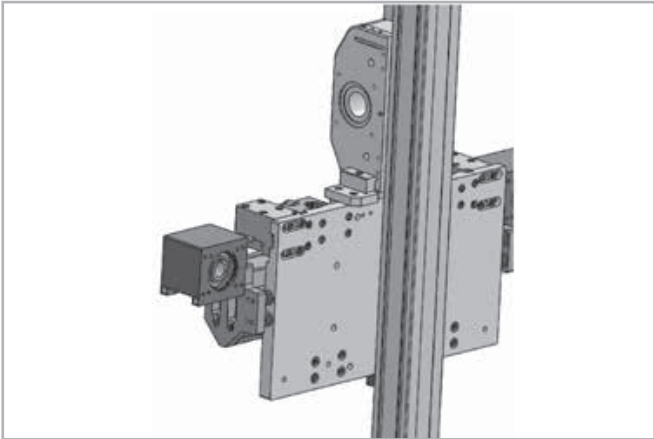
Fig. 21
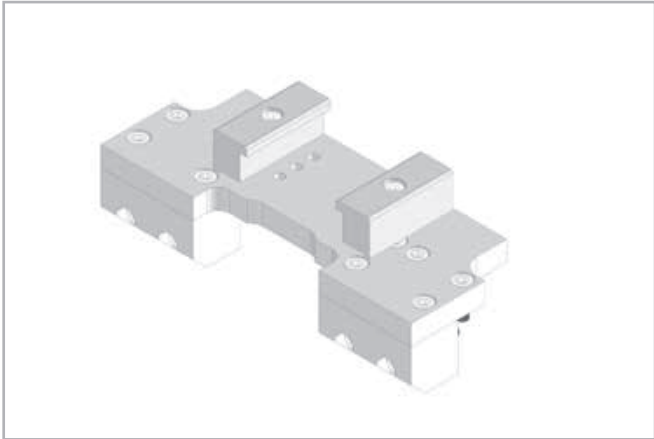
Fig. 22

While ordering two units for Y-Z assembly key has to be specified that they work together in order to drill the trolleys for the assembly of the kit.

Actuator combination Y-Z		Kit Code
	S-SMART 65 on SAB 120	G002440
	S-SMART 80 on SAB 180	G000990

Tab. 44

Connection rods
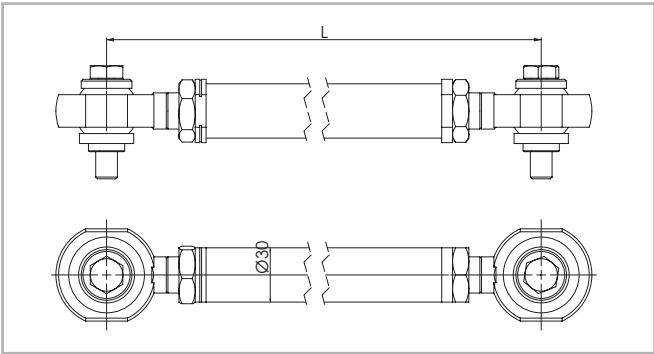
Fig. 23

Unit	Kit Code
SAB 60	
SAB 120	GT125xxxxx1A
SAB 180	
SAB 250	GT205xxxxx1A

Tab. 45

Kit spacer
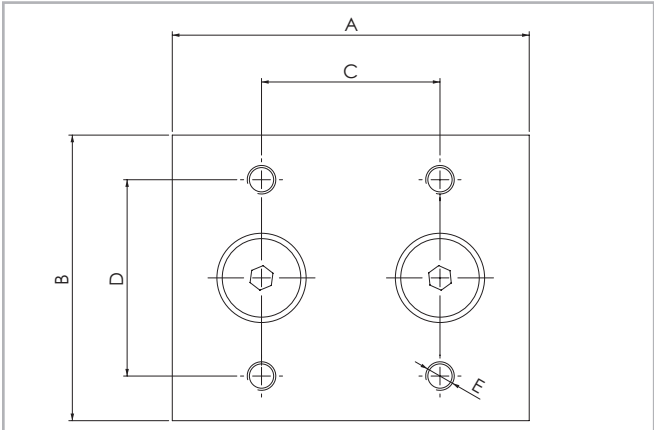
Fig. 24

Unit	A	B	C	D	E	Kit Code
SAB 60	50	40	30	25	M6	G002343
SAB 120	100	80	50	55	M8	G002362
SAB 180	100	125	50	70	M10	G002466
SAB 250	100	145	50	80	M12	G002523

Tab. 46

SRA-16

Insert for SAB 180V - SAB 180C - SAB250C
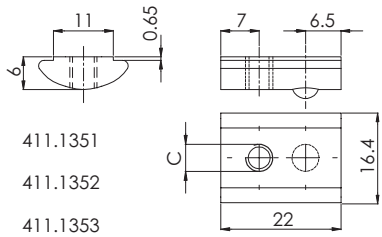
M5	Steel Std.	411.1351
M6	Steel Std.	411.1352
M8	Steel Std.	411.1353

Fig. 25

Quick insert for: SAB 180V - SAB 180C - SAB 250C
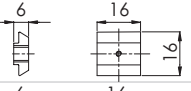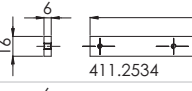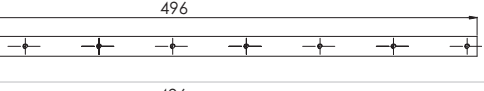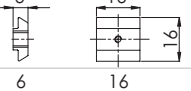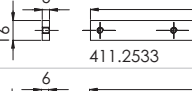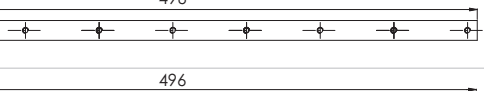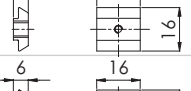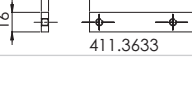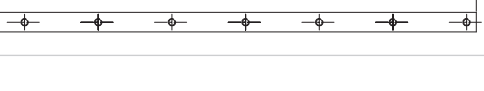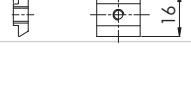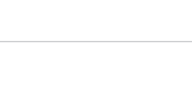
M4	Steel Std.	411.1360	411.2534
M5	Steel Std.	411.1361	411.2533
M6	Steel Std.	411.1362	411.3633
M8	Steel Std.	411.1363	

Fig. 26

Dovetails for: SAB 120C - SAB 120V - SAB 180V - SAB 180C - SAB 250C
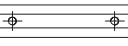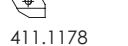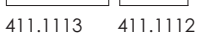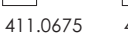
M12	Steel Std.	411.0470 411.0472 411.0588 411.0469 411.0503 411.0745 411.0845
M12	Steel Std.	411.0888 411.1185 411.1048
M10	Steel Std.	411.1120 411.1119 411.1117 411.1178
M10	Steel Std.	411.1186
M8	Steel Std.	411.1113 411.1112 411.0675 411.1111 411.1174
M6	Steel Std.	411.0682
M8	Steel Std.	411.1675

Fig. 27

Dovetails for: SAB 60V

M8	Steel Std.	411.3532
M6	Steel Std.	411.0769 411.0771 411.0754 411.0768 411.0732
M5	Steel Std.	411.2732 411.2733
M4	Steel Std.	411.1732

Fig. 28

SRA-17

Ordering key ⌄
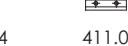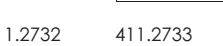
⟩ Identification codes for the SAB linear unit

SB	C V	06=60 12=120 18=180 25=250	2D	XXXXX	1X 1Z	DXX	
						Multiple carriages: D01, D02, D03, etc...	
					Belt orientation: 1X horizontal, 1Z vertical		
				L = total length of the unit			
			Hollow shaft head				
		Linear unit size					
	Roller type C=cylindrical, V=V-shaped						
SAB Series							

In order to create identification codes for Actuator Line, you can visit: **http://configureactuator.rollon.com**

[Configure Actuator]

Left/right orientation

Right

Left
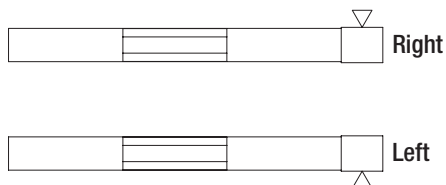
ZSY series ⌄

▸ ZSY series description

Fig. 29

ZSY products are self-supporting extruded aluminum actuators driven by a polyurethane belt system. Due to their deep hard anodized surface treatment and their plastic compound coated rollers, ZSY series can achieve exceptionally high performances and load capacity with no maintenance or lubrication required. They also provide total reliability even in dirty environments, with uniquely quiet operation.

The ZSY series linear units were designed to meet the vertical motion requirements in gantry applications or for applications where the Aluminum profile must be moving and the carriage must be fixed. It is ideal for a "Z" axis in a 3-axis system. Available in the 180mm size.

Some of the main advantages of ZSY series are:
- High reliability
- Self-supporting for greatest design freedom
- High technical performance
- High load
- Optimal reliability in dirty environments
- Absence of lubrication
- Uniquely quiet
- Self-aligning system

▷ The components

Extruded bodies

ZSY beam is a heat-treated Aluminum alloy profile with hollow cross-sections which makes it very strong under torsion and deflection stresses. Beams are then subject to a special patented treatment which provides a smooth, hard surface, comparable to tempered steel, and an optimal resistance to wear, even in dirty environments.

Driving belt

The ZSY series driving system consists in a polyurethane toothed belt with AT pitch, reinforced with high resistance steel cords. For some applications, the belt driven solution is ideal due to its high load transmission characteristics, compact size and low noise. Some of the advantages of using a belt driven system are: high speed, high acceleration, low noise and no need for lubrication.

Carriage

The carriage of the ZSY series linear units is made of anodised aluminum.

General data about aluminum used: AL 6060

Chemical composition [%]

Al	Mg	Si	Fe	Mn	Zn	Cu	Impurites
Remaining	0.35-0.60	0.30-0.60	0.30	0.10	0.10	0.10	0.05-0.15

Tab. 47

Physical characteristics

Density	Coeff. of elasticity	Coeff. of thermal expansion (20°-100°C)	Thermal conductivity (20°C)	Specific heat (0°-100°C)	Resistivity	Melting point
$\dfrac{kg}{dm^3}$	$\dfrac{kN}{mm^2}$	$\dfrac{10^{-6}}{K}$	$\dfrac{W}{m \cdot K}$	$\dfrac{J}{kg \cdot K}$	$\Omega \cdot m \cdot 10^{-9}$	°C
2.7	69	23	200	880-900	33	600-655

Tab. 48

Mechanical characteristics

Rm	Rp (02)	A	HB
$\dfrac{N}{mm^2}$	$\dfrac{N}{mm^2}$	%	—
205	165	10	60-80

Tab. 49

> The linear motion system

The linear motion system has been designed to meet the load capacity, speed, and maximum acceleration conditions of a wide variety of applications.

ZSY with V-shaped rollers:

These rollers are V-shaped and covered by a sintered plastic compound, resistant to pollutants and virtually maintenance-free. Ball and/or needle bearings with high performance are mounted into the rollers and can be maintained either with standard greasing procedure or lifetime lubricated. All roller boxes are equipped with concentric and eccentric pins for a quick adjustment of the contact between rollers and rail. Supports are mounted on the frame when the rail is movable and on the trolleys when it is fixed.
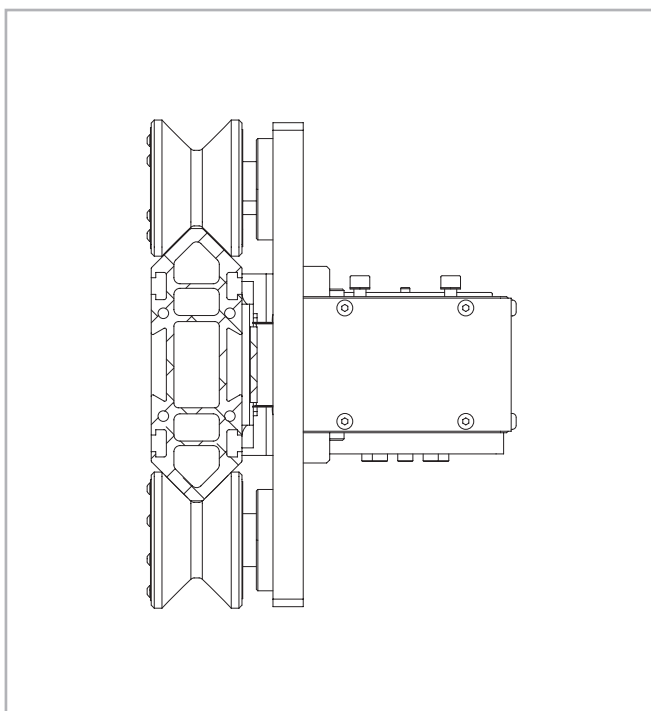
ZSY 180 section

Fig. 30

> ZSY 180V

ZSY 180V Dimension

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 31

Technical data

	Type
	ZSY 180V
Max. useful stroke length [mm]	2500
Max. positioning repeatability [mm]*1	± 0.2
Max. speed [m/s]	8
Max. acceleration [m/s²]	8
Type of belt	50 AT 10HPF
Type of pulley	Z 30
Pulley pitch diameter [mm]	95.49
Carriage displacement per pulley turn [mm]	300
Carriage weight [kg]	25.7
Zero travel weight [kg]	36
Weight for 100 mm useful stroke [kg]	1.06
Rail size [mm]	180x60

*1) Positioning repeatability is dependent on the type of transmission used

Tab. 50

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
ZSY 180V	1.029	0.128	0.260

Tab. 51

Driving belt

The driving belt is manufactured from a friction resistant polyurethane and with steel cords for high tensile stress resistance.

Type	Type of belt	Belt width [mm]	Weight [kg/m]
ZSY 180V	50 AT 10HPF	50	0.34

Tab. 52

Load capacity
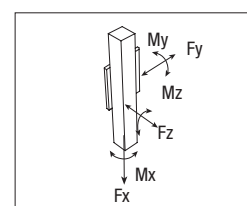
Type	F_x [N]		F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
	Stat.	Dyn.					
ZSY 180V	4980	2880	2300	2600	188	806	713

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

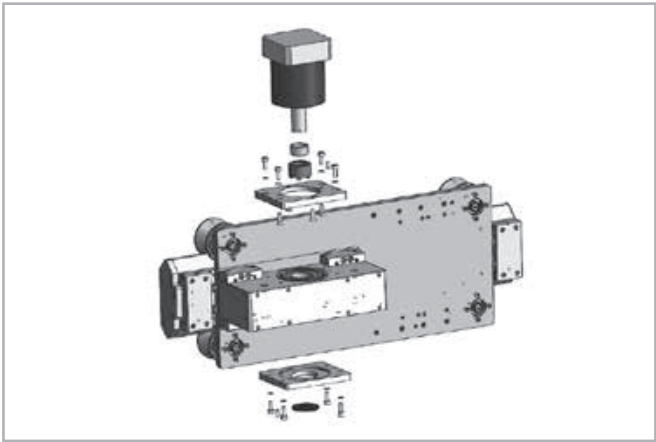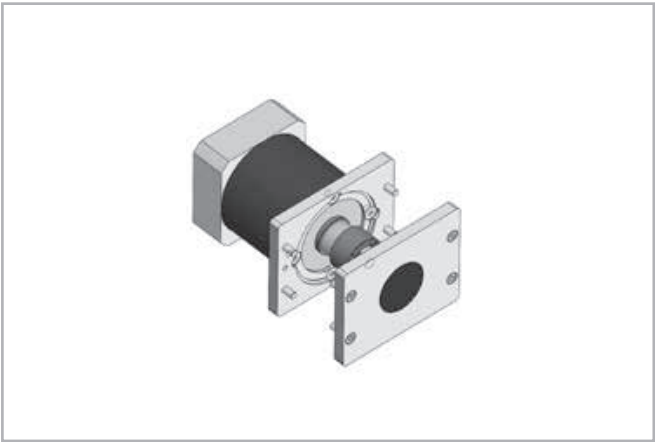Tab. 53

▸ Accessories

Adapter flange for gearbox assembly

Fig. 32

Fig. 33

Assembly kit includes: shrink disk; adapter plate; fixing hardware

Unit	Gearbox type (not included)	Kit Code
	LP120; PE5; LC120	G001856
	SP100; P5	G001857
	PSF321	G001858
ZSY 180V	PSF521	G001859
	EP120TT	G001860
	MP105	G001861
	MP080	G001951

Tab. 54

For other gearbox type ask Rollon

Kit spacer
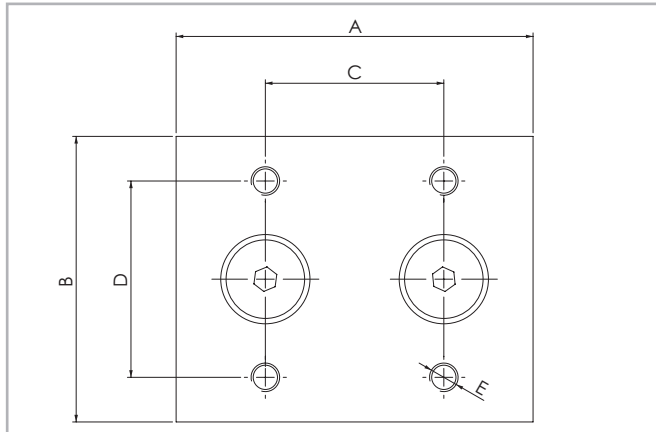
Fig. 34

Unit	A	B	C	D	E	Kit Code
ZSY 180V	100	125	50	70	M10	G002466

Tab. 55

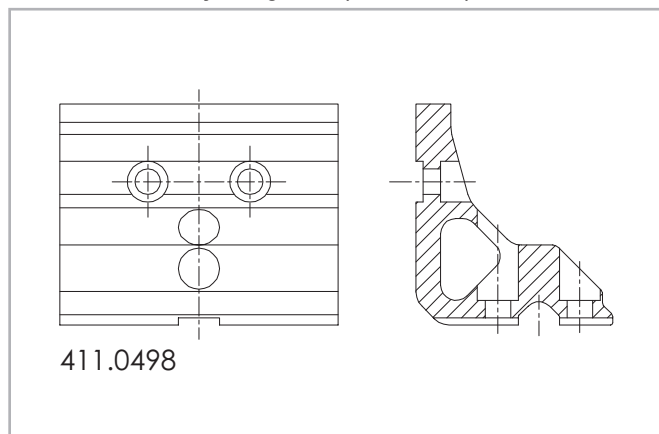Bracket for assembly - Large side (Ø12.5 - Ø20) Aluminum

411.0498

Fig. 35
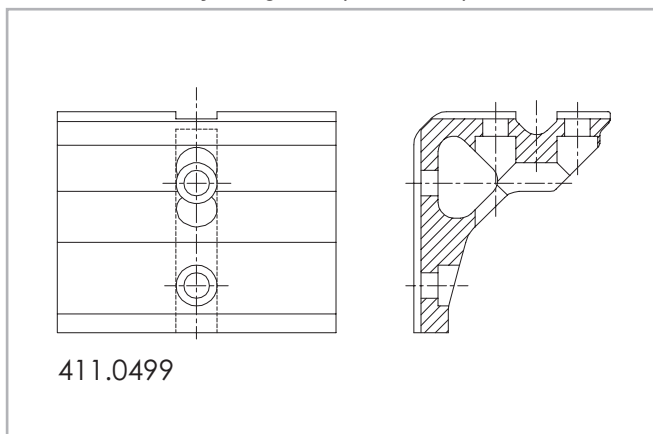
Bracket for assembly - Large side (Ø12.5 - Ø20) Aluminum

411.0499

Fig. 36

Bracket for assembly - Short side (Ø12.5 - Ø20) Aluminum
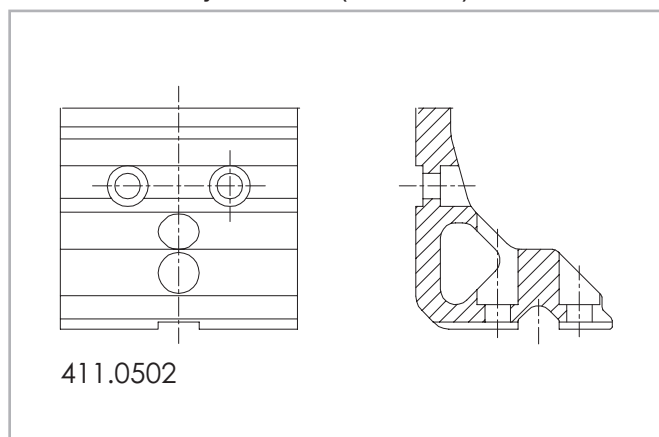
411.0502

Fig. 37
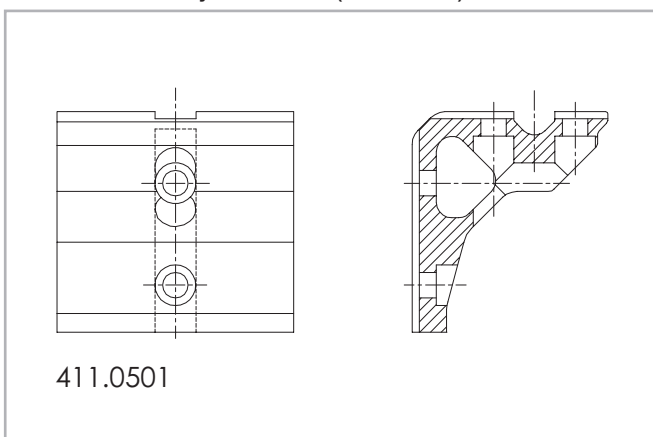
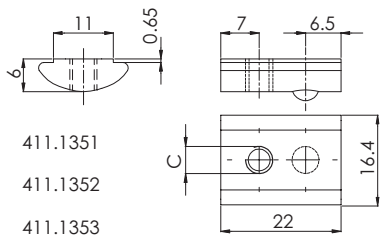Bracket for assembly - Short side (Ø12.5 - Ø20) Aluminum

411.0501

Fig. 38

Insert for: ZSY 180V

M5	Steel Std.	
M6	Steel Std.	
M8	Steel Std.	

411.1351
411.1352
411.1353

Fig. 39

Quick front insert for: ZSY 180V

M4	Steel Std.	411.1360		411.2534
M5	Steel Std.	411.1361		411.2533
M6	Steel Std.	411.1362		411.3633
M8	Steel Std.	411.1363		
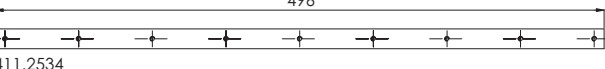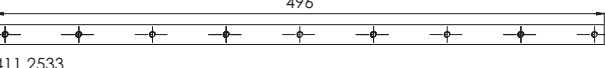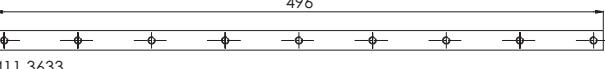
Fig. 40

Dovetails for: ZSY 180V
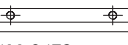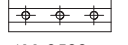
M12	Steel Std.	411.0470	411.0472	411.0588	411.0469	411.0503	411.0745	411.0845
M12	Steel Std.	411.0888	411.1185	411.1048				
M10	Steel Std.	411.1120	411.1119	411.1117	411.1178			
M10	Steel Std.	411.1186						
M8	Steel Std.	411.1113	411.1112	411.0675	411.1111	411.1174		
M6	Steel Std.	411.0682						
M8	Steel Std.	411.1675						

Fig. 41

Ordering key

> Identification codes for the ZSY linear unit

ZSY	V	18=180	2YA	XXXXX	1A	
					Solution standard	
				L = total length of the unit		
			Hollow shaft head d. 50			
		Linear unit size				
	Roller type: V=V-shaped					
ZSY Series						

In order to create identification codes for Actuator Line, you can visit: **http://configureactuator.rollon.com**

Configure Actuator

Left/right orientation

Left   **Right**
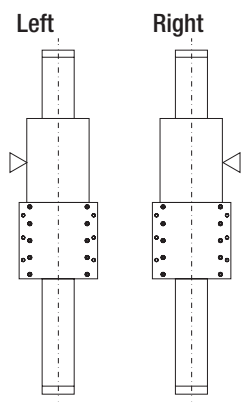
SAR series ⌄

▶ SAR series description
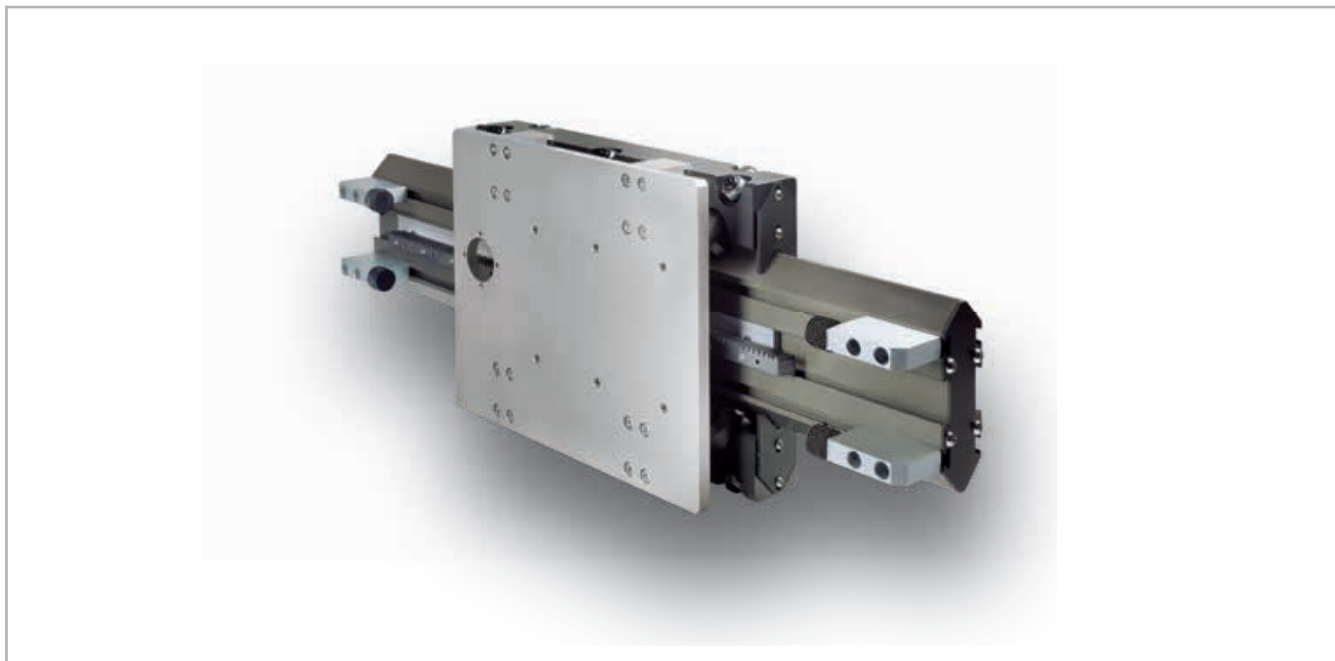
Fig. 42

SAR products are self-supporting extruded aluminum actuators driven by a rack and pinion system. Due to their deep hard anodized surface treatment and their plastic compound coated rollers, SAR series can achieve exceptionally high performances and load capacity with no maintenance or lubrication required. They also provide total reliability even in dirty environments, with uniquely quiet operation.

SAR series is defined by the use of **guides with cylindrical and V-shaped rollers** as linear motion components. These linear motion systems are lightweight, self-supporting, easy to assemble, cost effective, modular, clean and quiet. Thanks to this kind of solution they are specifically dedicated for dirty environments and high dynamics in automation. SAR series is available with profiles of different sizes: 120 -180 - 250 mm.

Some of the main **advantages** of SAR series are:
- High reliability
- Self-supporting for greatest design freedom
- High technical performance
- High load
- Optimal reliability in dirty environments
- Absence of lubrication
- Uniquely quiet
- Self-aligning system
- Potentially infinite strokes

▶ The components

Extruded bodies

SAR beam is a heat-treated Aluminum alloy profile with hollow cross-sections which makes it very strong under torsion and deflection stresses. Beams are then subject to a special patented treatment which provides a smooth, hard surface, comparable to tempered steel, and an optimal resistance to wear, even in dirty environments.

Rack and pinion drive

The SAR series is driven by a rack and pinion system. This option is suitable to achieve long strokes and enables the possibility to mount and to manage multiple carriages. Hardened racks and pinions allow the system to work better in dirty environments, while straight teeth permit high load capacity, low noise and a smooth linear movement. SAR products can be provided with a lubrication kit, to eliminate periodic greasing operations.

Carriage

The carriage of the SAR series linear units is made of anodised aluminum. Different lengths of the carriages are available according to the different sizes.

General data about aluminum used: AL 6060

Chemical composition [%]

Al	Mg	Si	Fe	Mn	Zn	Cu	Impurites
Remaining	0.35-0.60	0.30-0.60	0.30	0.10	0.10	0.10	0.05-0.15

Tab. 56

Physical characteristics

Density	Coeff. of elasticity	Coeff. of thermal expansion (20°-100°C)	Thermal conductivity (20°C)	Specific heat (0°-100°C)	Resistivity	Melting point
$\dfrac{kg}{dm^3}$	$\dfrac{kN}{mm^2}$	$\dfrac{10^{-6}}{K}$	$\dfrac{W}{m \cdot K}$	$\dfrac{J}{kg \cdot K}$	$\Omega \cdot m \cdot 10^{-9}$	°C
2.7	69	23	200	880-900	33	600-655

Tab. 57

Mechanical characteristics

Rm	Rp (02)	A	HB
$\dfrac{N}{mm^2}$	$\dfrac{N}{mm^2}$	%	—
205	165	10	60-80

Tab. 58

SRA-28

The linear motion system

The linear motion system has been designed to meet the load capacity, speed, and maximum acceleration conditions of a wide variety of applications.

SAR with cylindrical and V-shaped rollers:
The SAR range includes a large selection of rollers both cylindrical and V-shaped, and sliders assembled with two or more rollers. SAR rollers are covered by a sintered plastic compound, resistant to pollutants and virtually maintenance-free. Ball and/or needle bearings with high performance are mounted into the rollers and can be maintained either with standard greasing procedure or lifetime lubricated. All roller boxes are equipped with concentric and eccentric pins for a quick adjustment of the contact between rollers and rail.
Supports are mounted on the frame when the rail is movable and on the trolleys when it is fixed.

SAR section

Fig. 43

> SAR 120V

SAR 120V Dimension

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 44

Technical data

	Type
	SAR 120V
Max. useful stroke length [mm]*1	NO LIMITS
Max. positioning repeatability [mm]*2	± 0.15
Max. speed [m/s]	3
Max. acceleration [m/s²]	8
Rack module	m 2
Pinion pitch diameter [mm]	54
Carriage displacement per pinion turn [mm]	169.65
Carriage weight [kg]	7
Zero travel weight [kg]	12
Weight for 100 mm useful stroke [kg]	1.1
Rail size [mm]	120x40

*1) It is possible to obtain longer stroke by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used

Tab. 59

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAR 120V	0.214	0.026	0.043

Tab. 60

Rack specifications

Type	Type of rack	Rack module	Quality
SAR 120V	Straight teeth Hardened	m 2	Q10

Tab. 61
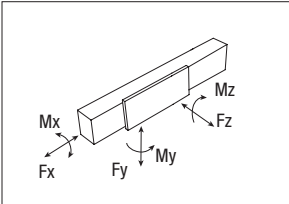
Load capacity

Type	F_x [N]	F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
SAR 120V	1633	1400	800	39.3	144	252

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 62

SAR 120C

SAR 120C Dimension

The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 45

Technical data

	Type
	SAR 120C
Max. useful stroke length [mm]*[1]	NO LIMITS
Max. positioning repeatability [mm]*[2]	± 0.15
Max. speed [m/s]	3
Max. acceleration [m/s²]	10
Rack module	m 2
Pinion pitch diameter [mm]	54
Carriage displacement per pinion turn [mm]	169.65
Carriage weight [kg]	8.4
Zero travel weight [kg]	13.5
Weight for 100 mm useful stroke [kg]	1.1
Rail size [mm]	120x40

*1) It is possible to obtain longer stroke by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used

Tab. 63

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAR 120C	0.214	0.026	0.043

Tab. 64

Rack specifications

Type	Type of rack	Rack module	Quality
SAR 120C	Straight teeth Hardened	m 2	Q10

Tab. 65
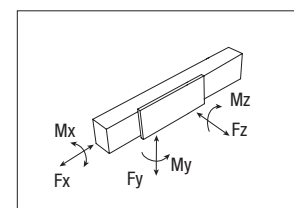
Load capacity

Type	F_x [N]	F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
SAR 120C	1633	2489	2489	98	432	432

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.
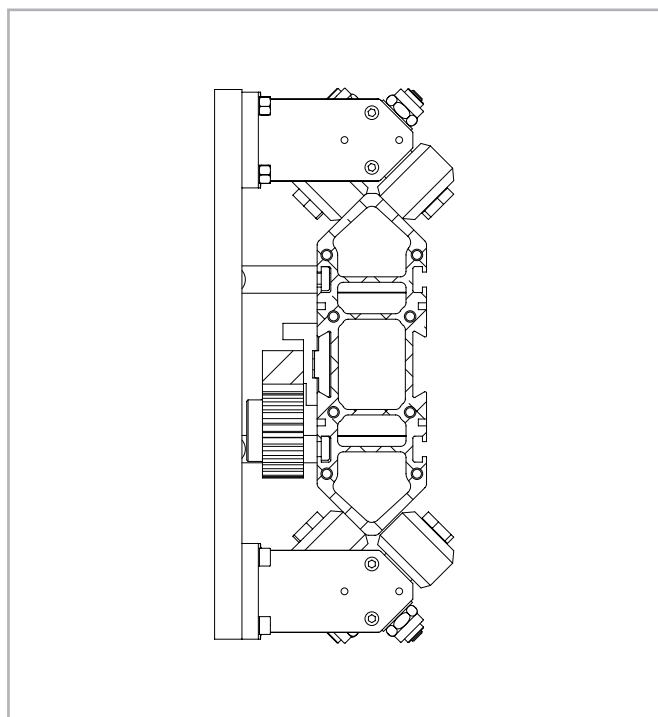
Tab. 66

SAR 180C

SAR 180C Dimension
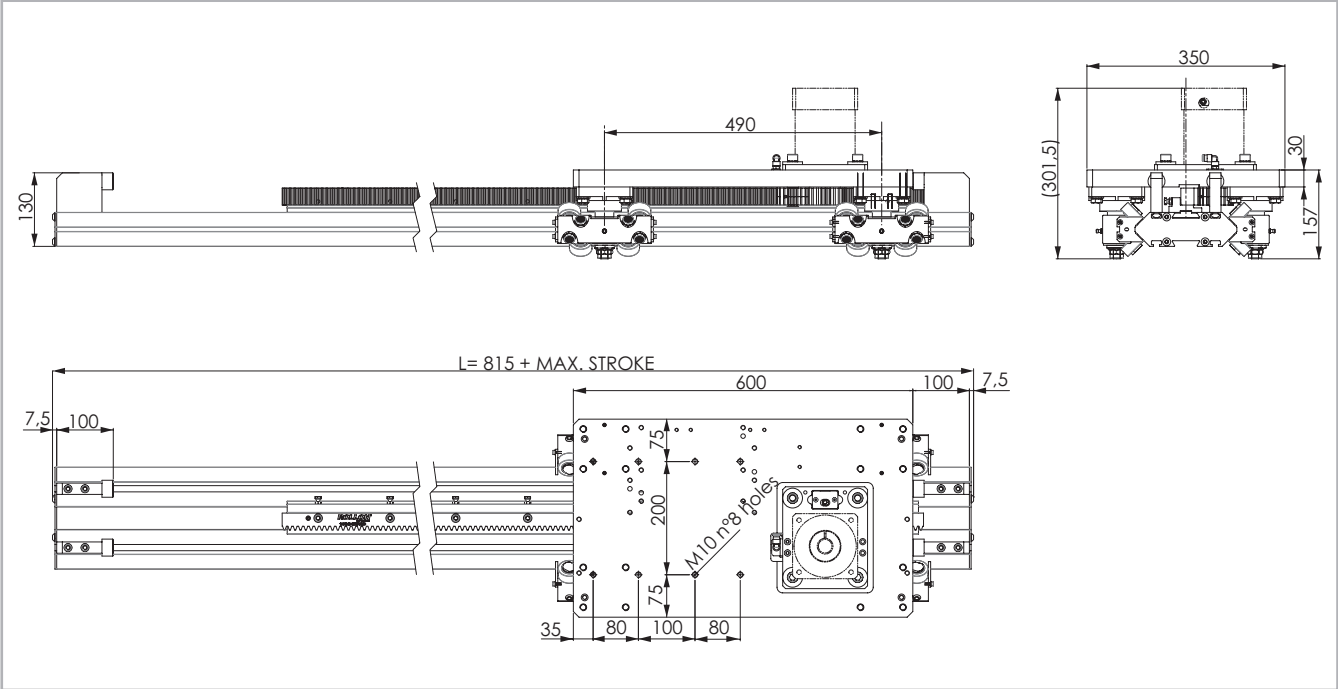
The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 46

Technical data

	Type
	SAR 180C
Max. useful stroke length [mm]*1	NO LIMITS
Max. positioning repeatability [mm]*2	± 0.15
Max. speed [m/s]	3
Max. acceleration [m/s²]	10
Rack module	m3
Pinion pitch diameter [mm]	63
Carriage displacement per pinion turn [mm]	197.92
Carriage weight [kg]	31.3
Zero travel weight [kg]	47
Weight for 100 mm useful stroke [kg]	2
Rail size [mm]	180x40

*1) It is possible to obtain longer stroke by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used

Tab. 67

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAR 180C	1.029	0.128	0.260

Tab. 68

Rack specifications

Type	Type of rack	Rack module	Quality
SAR 180C	Straight teeth Hardened	m3	Q10

Tab. 69

Load capacity

Type	F_x [N]	F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
SAR 180C	1905	4978	4978	246	1220	1220

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 70
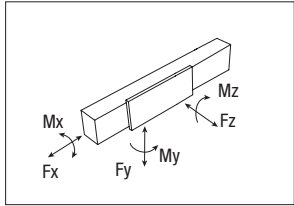
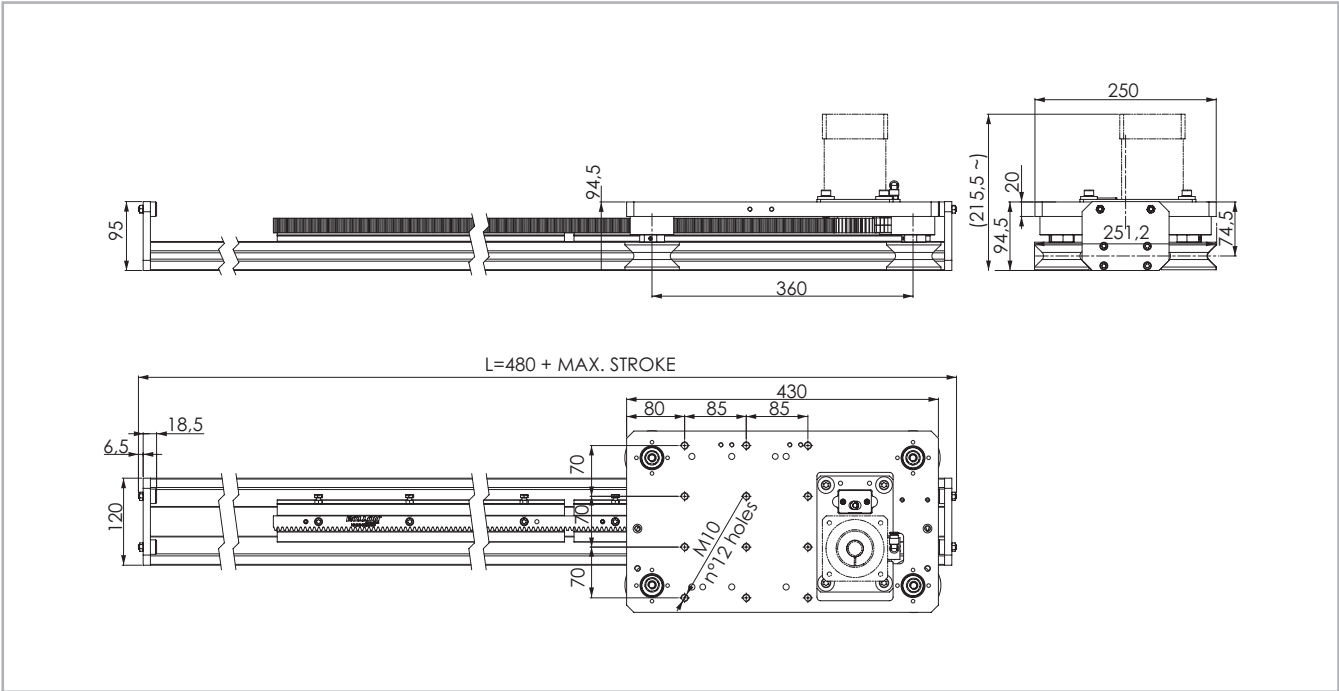## SAR 250C

SAR 250C Dimension
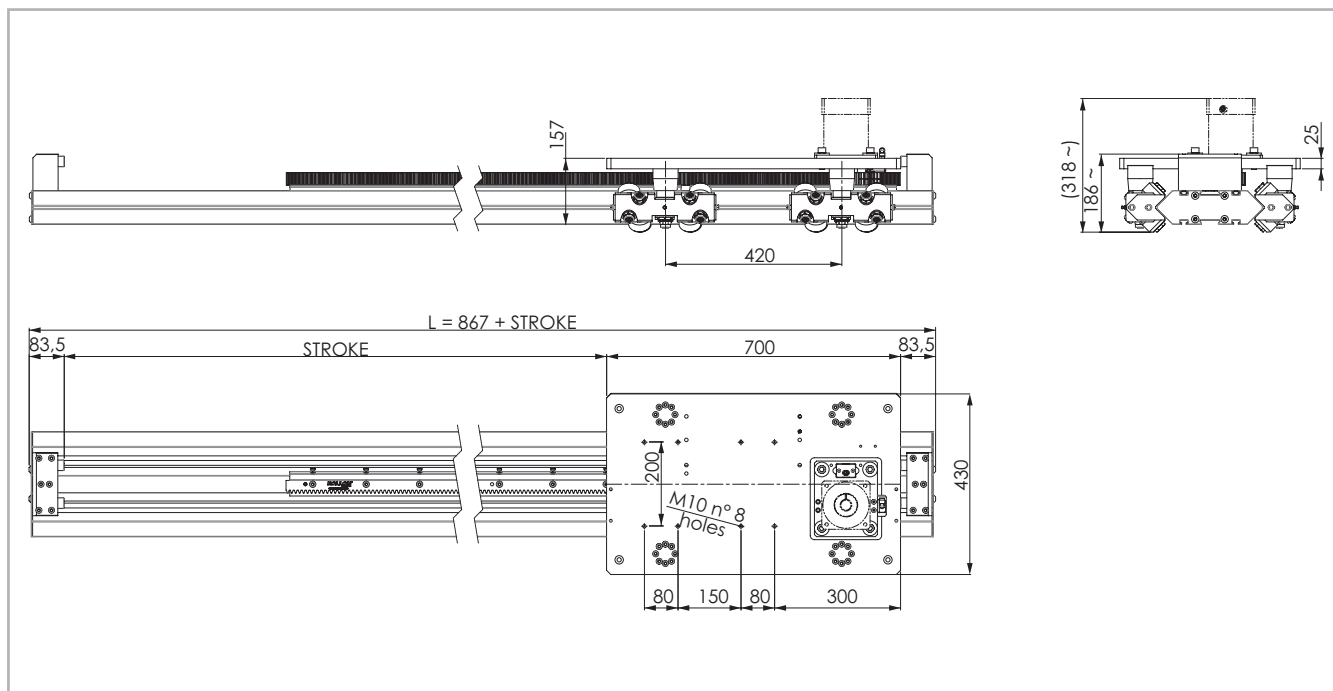
The length of the safety stroke is provided on request according to the customer's specific requirements.

Fig. 47

Technical data

	Type
	SAR 250C
Max. useful stroke length [mm]*1	NO LIMITS
Max. positioning repeatability [mm]*2	± 0.15
Max. speed [m/s]	3
Max. acceleration [m/s²]	10
Rack module	m3
Pinion pitch diameter [mm]	63
Carriage displacement per pinion turn [mm]	197.92
Carriage weight [kg]	40
Zero travel weight [kg]	64
Weight for 100 mm useful stroke [kg]	2.5
Rail size [mm]	250x80

*1) It is possible to obtain longer stroke by means of special Rollon joints
*2) Positioning repeatability is dependent on the type of transmission used
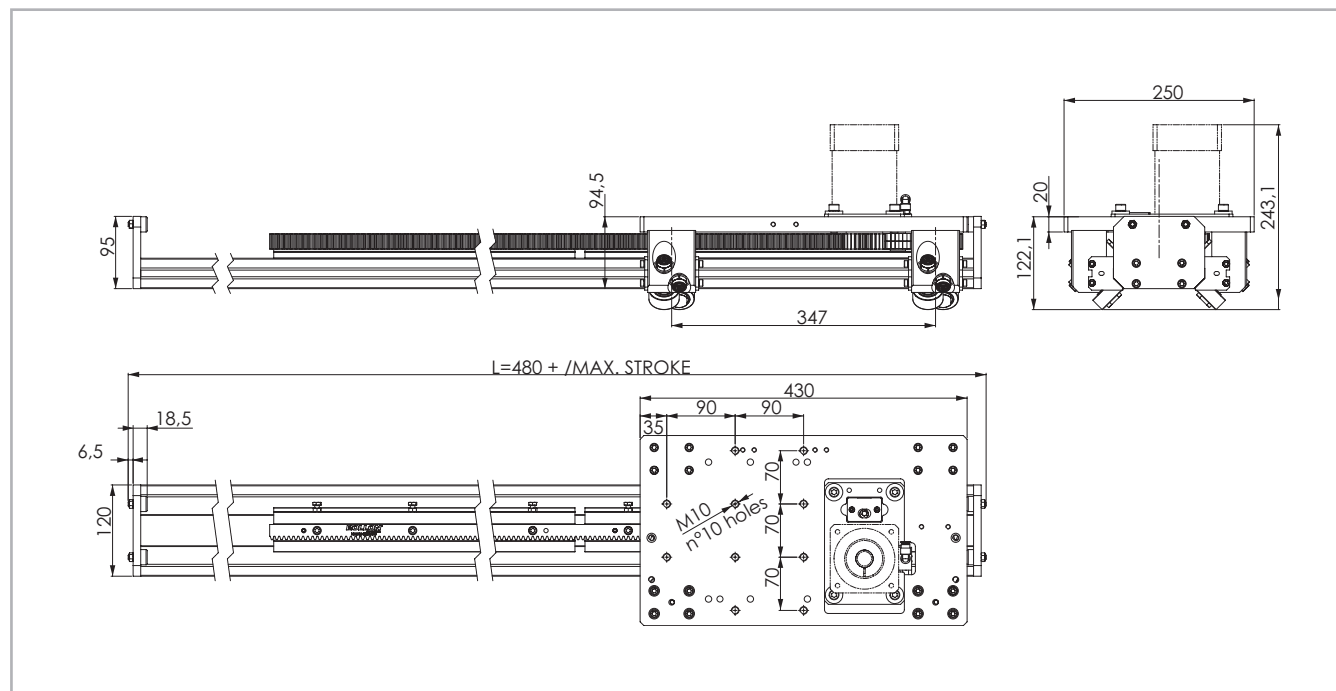
Tab. 71

Moments of inertia of the aluminum body

Type	I_x [10^7 mm⁴]	I_y [10^7 mm⁴]	I_p [10^7 mm⁴]
SAR 250C	2.735	0.412	0,840

Tab. 72

Rack specifications

Type	Type of rack	Rack module	Quality
SAR 250C	Straight teeth Hardened	m3	Q10

Tab. 73

Load capacity

Type	F_x [N]	F_y [N]	F_z [N]	M_x [Nm]	M_y [Nm]	M_z [Nm]
SAR 250C	1905	7240	7240	744	1521	1521

Non-cumulative moments referred to the median trolley axis and to a theoretical lifetime of the Speedy Rail guide and of the rollers of up to 80.000 km.

Tab. 74
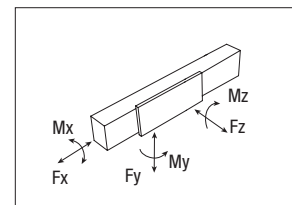
> Rack specifications
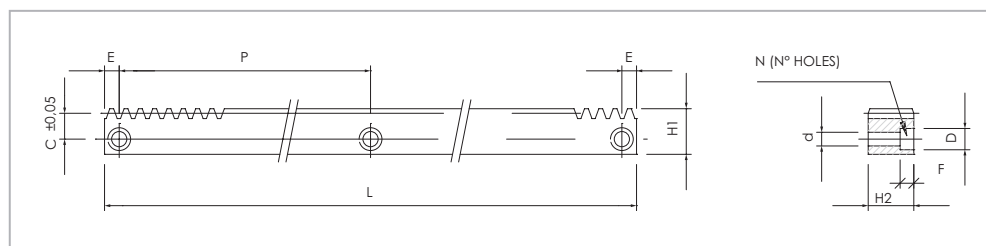
Fig. 48

Code	C	D	d	E	F	H1	H2	L	N	P	Mod.	Surface treatment / Material
1006919	10	11	7	62.8	7	20	20	1005.31	8	125.7	2	Black manganese phosphating/SAE1141
1006920	10	11	7	62.8	7	20	20	2010.6	16	125.7	2	Black manganese phosphating/SAE1141
1006430	10	11	7	19.41	7	20	20	998.82	9	120	2	Stainless steel AISI 304
1006242	18	15	10	63.6	9	30	30	1017.6	8	127.2	3	Black manganese phosphating/SAE1141
1006243	18	15	10	63.6	9	30	30	2035.2	16	127.2	3	Black manganese phosphating/SAE1141

Tab. 75

> Lubrication

Programmable automatic rack lubrication

Grease is delivered by means of a programmable cartridge (average life: ca. 1 year) (a). The grease is spread evenly on the racks through a felt pinion (1). You will need one kit per rack.
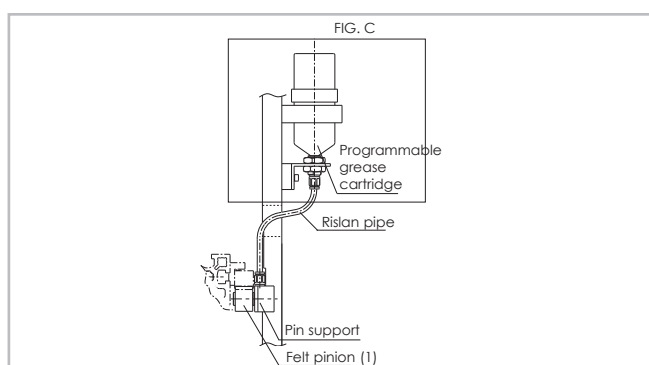

Fig. 49

> Accessories

Kit spacer
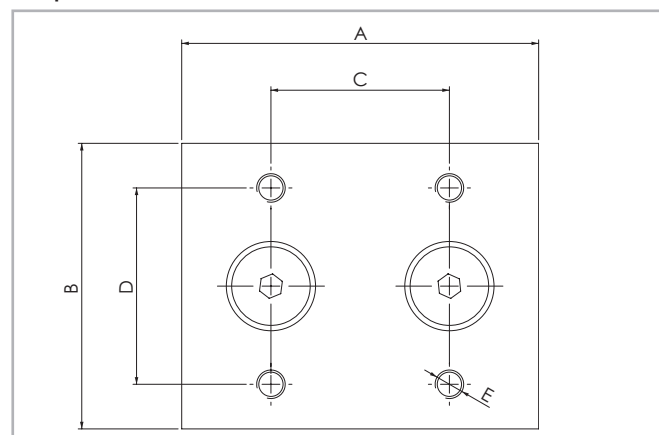
Fig. 50

Unit	A	B	C	D	E	Kit Code
SAR 120	100	80	50	55	M8	G002362
SAR 180	100	125	50	70	M10	G002466
SAR 250	100	145	50	80	M12	G002523

Tab. 76

Adapter flange for gearbox assembly
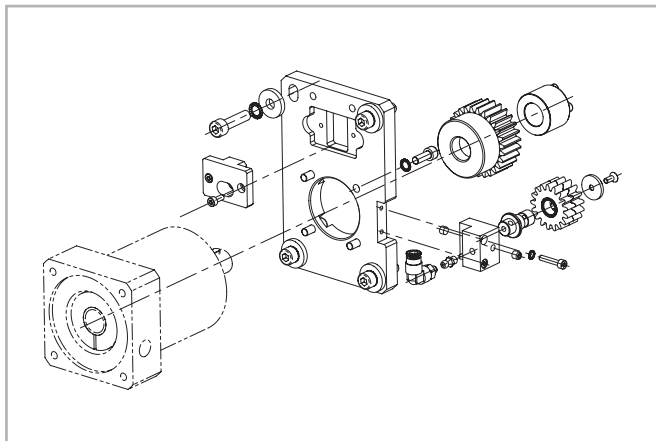
Fig. 51
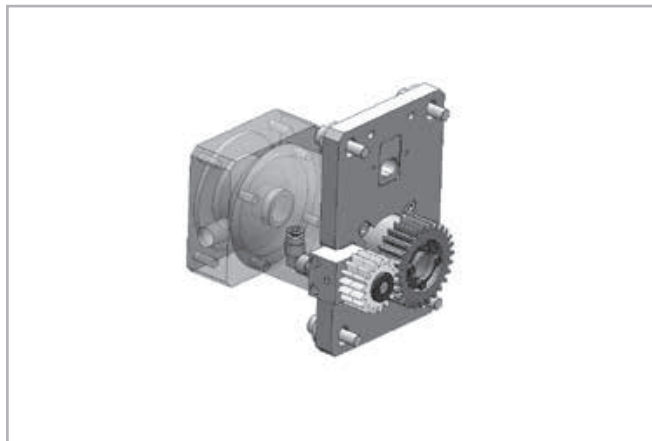
Fig. 52

Assembly kit includes: shrink disk; adapter plate; fixing hardware

Unit	Gearbox type (not included)	Kit Code
SAR 120	MP080	G002853
SAR 180 SAR 250	MP080 MP105	G003120 G002854

Tab. 77

For other gearbox type ask Rollon

S
R
A

Insert for: SAR 180C - SAR 180V - SAR 250C
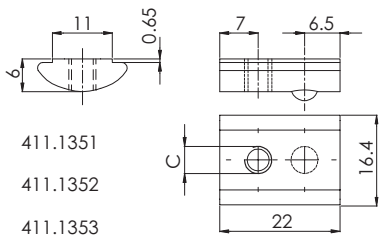
M5	Steel Std.	
M6	Steel Std.	
M8	Steel Std.	

411.1351
411.1352
411.1353

Fig. 53

Quick front insert for: SAR 180C - SAR 180V - SAR 250C
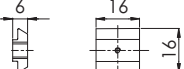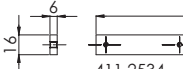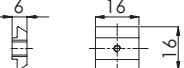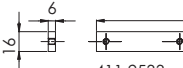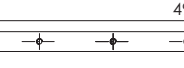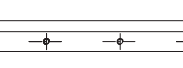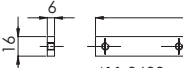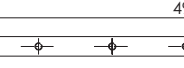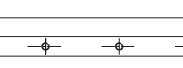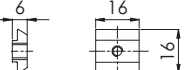
M4	Steel Std.	411.1360	411.2534
M5	Steel Std.	411.1361	411.2533
M6	Steel Std.	411.1362	411.3633
M8	Steel Std.	411.1363	

Fig. 54

Dovetails for: SAR 120C - SAR 120V - SAR 180C - SAR 180V - SAR 250C
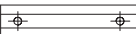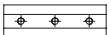
M12	Steel Std.	411.0470	411.0472	411.0588	411.0469	411.0503	411.0745	411.0845
M12	Steel Std.	411.0888	411.1185	411.1048				
M10	Steel Std.	411.1120	411.1119	411.1117	411.1178			
M10	Steel Std.	411.1186						
M8	Steel Std.	411.1113	411.1112	411.0675	411.1111	411.1174		
M6	Steel Std.	411.0682						
M8	Steel Std.	411.1675						

Fig. 55

Ordering key ⌄

Identification codes for the SAR linear unit

SR	C V	12=120 18=180 25=250	1A	02000	1A=standard 1B=inox	
					L = total length of the unit	
				Multiple carriages: 1A=1 carriage, 2A=2 carriages, ... , 9A=9 carriages		
			Linear unit size see from pg. SRA-30 to pg. SRA-33			
	Roller type C=cylindrical, V=V-shaped					
SAR Series *see pg. SRA-27*						

In order to create identification codes for Actuator Line, you can visit: **http://configureactuator.rollon.com**

🔵 **Configure Actuator**

Left/right orientation

▽ **Right**

△ **Left**
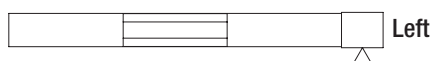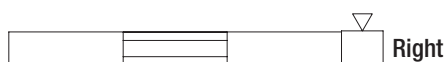
Static load and service life $\vee$

Static load

In the static load test, the radial load rating F_y, the axial load rating F_z, and the moments M_x, M_y und M_z indicate the maximum allowed load values. Higher loads will impair the running characteristics. To check the static load, a safety factor S_0 is used, which accounts for the special conditions of the application defined in more detail in the table below:

All load capacity values refer to the actuator well fixed to a rigid structure. For cantilever applications the deflection of the actuator profile must be taken in account.

Safety factor S_0

No shocks or vibrations, smooth and low-frequency change in direction High mounting accuracy, no elastic deformations, clean environment	2 - 3
Normal assembly conditions	3 - 5
Shocks and vibrations, high-frequency changes in direction, substantial elastic deformations	5 - 7

Fig. 1

The ratio of the actual to the maximum allowed load must not be higher than the reciprocal value of the assumed safety factor S_0.

$$\frac{P_{fy}}{F_y} \leq \frac{1}{S_0} \qquad \frac{P_{fz}}{F_z} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 2

The above formulae only apply to a one load case. If one or more of the forces described are acting simultaneously, the following calculation must be carried out:

$$\frac{P_{fy}}{F_y} + \frac{P_{fz}}{F_z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

P_{fy} = acting load (y direction) (N)
F_y = static load rating (y direction) (N)
P_{fz} = acting load (z direction) (N)
F_z = static load rating (z direction) (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum allowed moments in the different load directions (Nm)

Fig. 3

The safety factor S_0 can be at the lower limit given if the acting forces can be determined with sufficient accuracy. If shocks and vibrations act on the system, the higher value should be selected. In dynamic applications, higher safeties are required. For further information, please contact our Application Engineering Department.

Belt safety factor referred to the dynamic F_x

Impact and vibrations	Speed / acceleration	Orietation	Safety Factor
No impacts and/or vibrations	Low	horizontal	1.4
		vertical	1.8
Light impacts and/or vibrations	Medium	horizontal	1.7
		vertical	2.2
Strong impacts and/or vibrations	High	horizontal	2.2
		vertical	3

Tab. 1

▶ Service life

Calculation of the service life

The dynamic load rating C is a conventional quantity used for calculating the service life. This load corresponds to a nominal service life of 100 km.

The calculated service life, dynamic load rating and equivalent load are linked by the following formula:

$$L_{km} = 100 \text{ km} \cdot \left(\frac{Fz\text{-}dyn}{P_{eq}} \cdot \frac{1}{f_i} \right)^3$$

L_{km} = theoretical service life (km)
$Fz\text{-}dyn$ = dynamic load rating (N)
P_{eq} = acting equivalent load (N)
f_i = service factor (see tab. 2)

Fig. 4

The effective equivalent load P_{eq} is the sum of the forces and moments acting simultaneously on a slider. If these different load components are known, P is obtained from the following equation:

For SP types

$$P_{eq} = P_{fy} + P_{fz} + \left(\frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \right) \cdot F_y$$

Fig. 5

For CI and CE types

$$P_{eq} = P_{fy} + \left(\frac{P_{fz}}{F_z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \right) \cdot F_y$$

Fig. 6

The external constants are assumed to be constant over time. Short-term loads that do not exceed the maximum load ratings have no relevant effect on the service life and can therefore be neglected in the calculation.

Service factor f_i

f_i	
no shocks or vibrations, smooth and low-frequency changes in direction; ($\alpha < 5m/s^2$) clean operating conditions; low speeds (<1 m/s)	1.5 - 2
Slight vibrations; medium speeds; (1-2 m/s) and medium-high frequency of the changes in direction ($5m/s^2 < \alpha < 10 \text{ m/s}^2$)	2 - 3
Shocks and vibrations; high speeds (>2 m/s) and high-frequency changes in direction; ($\alpha > 10m/s^2$) high contamination, very short stroke	> 3

Tab. 2

Speedy Rail A Lifetime

The rated lifetime for SRA actuators is 80,000 Km.

Static load and service life Uniline $\vee$

Static load

In the static load test, the radial load rating F_y, the axial load rating F_z, and the moments M_x, M_y und M_z indicate the maximum allowed load values. Higher loads will impair the running characteristics. To check the static load, a safety factor S_0 is used, which accounts for the special conditions of the application defined in more detail in the table below:

Safety factor S_0

No shocks or vibrations, smooth and low-frequency change in direction High mounting accuracy, no elastic deformations, clean environment	1 - 1.5
Normal assembly conditions	1.5 - 2
Shocks and vibrations, high-frequency changes in direction, substantial elastic deformations	2 - 3.5

Fig. 7

The ratio of the actual to the maximum allowed load must not be higher than the reciprocal value of the assumed safety factor S_0.

$$\frac{P_{fy}}{F_y} \leq \frac{1}{S_0} \qquad \frac{P_{fz}}{F_z} \leq \frac{1}{S_0} \qquad \frac{M_1}{M_x} \leq \frac{1}{S_0} \qquad \frac{M_2}{M_y} \leq \frac{1}{S_0} \qquad \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

Fig. 8

The above formulae apply to a one load case. If one or more of the forces described are acting simultaneously, the following test must be carried out:

$$\frac{P_{fy}}{F_y} + \frac{P_{fz}}{F_z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \leq \frac{1}{S_0}$$

P_{fy} = acting load (y direction) (N)
F_y = static load rating (y direction) (N)
P_{fz} = acting load (z direction) (N)
F_z = static load rating (z direction) (N)
M_1, M_2, M_3 = external moments (Nm)
M_x, M_y, M_z = maximum allowed moments
in the different load directions (Nm)

Fig. 9

The safety factor S_0 can be at the lower limit given if the acting forces can be determined with sufficient accuracy. If shocks and vibrations act on the system, the higher value should be selected. In dynamic applications, higher safeties are required. For further information, please contact our Application Engineering Department.

◢ Calculation formulae

Moments M_y and M_z for linear units with long slider plate

The allowed loads for the moments M_y and M_z depend on the length of the slider plate. The allowed moments M_{zn} and M_{yn} for each slider plate length are calculated by the following formulae:

$$S_n = S_{min} + n \cdot \Delta S$$

$$M_{zn} = \left(1 + \frac{S_n - S_{min}}{K} \right) \cdot M_{z\,min}$$

$$M_{yn} = \left(1 + \frac{S_n - S_{min}}{K} \right) \cdot M_{y\,min}$$

M_{zn} = allowed moment (Nm)

$M_{z\,min}$ = minimum values (Nm)

M_{yn} = allowed moment (Nm)

$M_{y\,min}$ = minimum values (Nm)

S_n = length of the slider plate (mm)

S_{min} = minimum length of the slider plate (mm)

ΔS = factor of the change in slider length

K = constant

Fig. 10

Type	$M_{y\,min}$ [Nm]	$M_{z\,min}$ [Nm]	S_{min} [mm]	ΔS	K
A40L	22	61	240		74
A55L	82	239	310		110
A75L	287	852	440		155
C55L	213	39	310		130
C75L	674	116	440	10	155
E55L	165	239	310		110
E75L	575	852	440		155
ED75L (M_z)	1174	852	440		155
ED75L (M_y)	1174	852	440		270

Tab. 3

Moments M_y and M_z for linear units with two slider plates

The allowed loads for the moments M_y and M_z are related to the value of the distance between the centers of the sliders. The allowed moments M_{yn} and M_{zn} for each distance between the centers of the sliders are calculated by the following formulae:

$$L_n = L_{min} + n \cdot \Delta L$$

$$M_y = \left(\frac{L_n}{L_{min}} \right) \cdot M_{y\,min}$$

$$M_z = \left(\frac{L_n}{L_{min}} \right) \cdot M_{z\,min}$$

M_y	= allowed moment (Nm)
M_z	= allowed moment (Nm)
$M_{y\,min}$	= minimum values (Nm)
$M_{z\,min}$	= minimum values (Nm)
L_n	= distance between the centers of the sliders (mm)
L_{min}	= minimum value for the distance between the centers of the sliders (mm)
ΔL	= factor of the change in slider length

Fig. 11

Type	$M_{y\,min}$ [Nm]	$M_{z\,min}$ [Nm]	L_{min} [mm]	ΔL
A40D	70	193	235	5
A55D	225	652	300	5
A75D	771	2288	416	8
C55D	492	90	300	5
C75D	1809	312	416	8
E55D	450	652	300	5
E75D	1543	2288	416	8
ED75D	3619	2288	416	8

Tab. 4

Service life

Calculation of the service life

The dynamic load rating C is a conventional quantity used for calculating the service life. This load corresponds to a nominal service life of 100 km. The corresponding values for each liner unit are listed in Table 45 shown below. The calculated service life, dynamic load rating and equivalent load are linked by the following formula:

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

L_{km}	= theoretical service life (km)
C	= dynamic load rating (N)
P	= acting equivalent load (N)
f_i	= service factor (see tab. 5)
f_c	= contact factor (see tab. 6)
f_h	= stroke factor (see fig. 13)

Fig. 12

The effective equivalent load P is the sum of the forces and moments acting simultaneously on a slider. If these different load components are known, P is obtained from the following equation:

$$P = P_{fy} + \left(\frac{P_{fz}}{F_Z} + \frac{M_1}{M_x} + \frac{M_2}{M_y} + \frac{M_3}{M_z} \right) \cdot F_y$$

<p style="text-align: right;">Fig. 13</p>

The external constants are assumed to be constant over time. Short-term loads that do not exceed the maximum load ratings have no relevant effect on the service life and can therefore be neglected in the calculation.

Service factor f_i

f_i	
No shocks or vibrations, smooth and low-frequency changes in direction; clean operating conditions; low speeds (<1 m/s)	1 - 1.5
Slight vibrations; medium speeds; (1-2,5 m/s) and medium-high frequency of the changes in direction	1.5 - 2
Shocks and vibrations; high speeds (>2.5 m/s) and high-frequency changes in direction; high contamination	2 - 3.5

<p style="text-align: right;">Tab. 5</p>

Contact factor f_c

f_c	
Standard slider	1
Long slider	0.8
Double slider	0.8

<p style="text-align: right;">Tab. 6</p>

Stroke factor f_h

The stroke factor f_h accounts for the higher stress on the raceways and rollers when short strokes are carried out at the same total run distance. The following diagram shows the corresponding values (for strokes above 1 m, f_h remains 1):
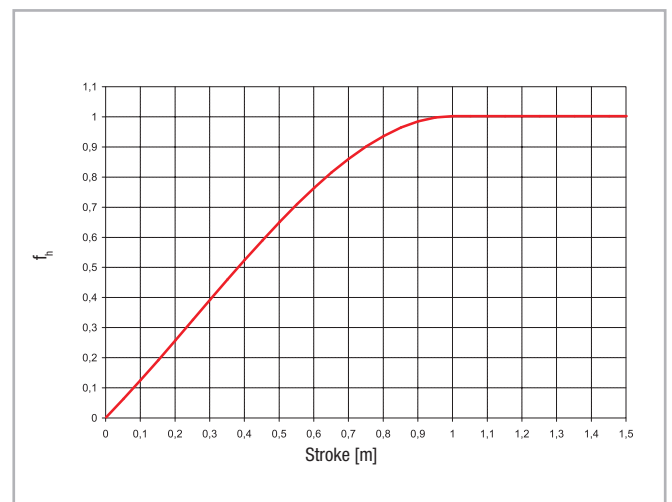
<p style="text-align: right;">Fig. 14</p>

> Determination of the motor torque

The torque C_m required at the drive head of the linear axis is calculated by the following formula:

$$C_m = C_v + \left(F \cdot \frac{D_p}{2} \right)$$

C_m = torque of the motor (Nm)
C_v = starting torque (Nm)
F = force acting on the toothed belt (N)
D_p = pitch diameter of pulley (m)

<p style="text-align: right;">Fig. 15</p>

Warnings and legal notes ⌄

Before incorporating the partly completed machinery, we recommend consulting this chapter carefully, in addition to the assembly manual supplied with the individual modules. The information contained in this chapter and in the manuals for the individual modules, is provided by highly qualified and certified personnel, possessing adequate competence in incorporating the partly completed machinery.

Precaution in installation and handling operations. Significantly heavy equipment.

When handling the axis or system of axes, always make sure that the support or anchoring surfaces do not leave room for bending.

In order to stabilize the axis or system of axes, before handling it is mandatory to securely block the mobile parts. When moving axes with vertical translation (Z AXES) or combination systems (horizontal X and/or more than one vertical Z), it is mandatory to use the vertical movement to put all of the axes at the corresponding lower limit switch.

Do not overload. Do not subject to torsion stress.

Do not leave exposed to atmospheric agents.

Before mounting the motor on the gearbox, it is advisable to perform a pre-test of the motor itself, without connection to the gear unit. The testing of this component was not carried out by the manufacturer of the machine. It will therefore be the responsibility of the customer of Rollon to perform the testing of the same, in order to verify its correct operation.

The manufacturer cannot be considered responsible for any consequences derived from improper use or any use other than the purpose the axis or system of axes was designed for, or derived from failure to comply, during incorporation phases, with the rules of Good Technique and with what is indicated in this manual.

Avoid damage. Do not operate with inadequate tools

Warning: moving parts. Do not leave objectson the axis

Special installations: check the depth of the threads on moving elements

Make sure that the system has been installed on a level floor surface.

In use, accurately comply with the specific performance values declared in the catalog or, in particular cases, the load and dynamic performance characteristics requested in the phase prior to design.

For modules or parts of modular systems with vertical movement (Z axis), it is mandatory to mount self-braking motors to neutralize the risk of the axis dropping.

The images in this manual are to be considered merely an indication and not binding; therefore, the supply received could be different from the images contained in this manual, and Rollon S.p.A has deemed it useful to insert only one example.

Systems supplied by Rollon S.p.A. were not designed/envisaged to operate in ATEX environments.

Residual risks

- Mechanical risks due to the presence of moving elements (X, Y axes).
- Risk of fire resulting from the flammability of the belts used on the axes, for temperatures in excess of 250 °C in contact with the flame.
- The risk of the Z axis dropping during handling and installation operations on the partly completed machinery, before commissioning.
- Risk of the Z axis dropping during maintenance operations in the case of a drop in the electrical power supply voltage.
- Crushing hazard near moving parts with divergent and convergent motion.
- Shearing hazard near moving parts with divergent and convergent motion.
- Cutting and abrasion hazards.

Basic components

The Partly Completed Machinery shown in this catalog is to be considered a mere supply of simple Cartesian axes and their accessories agreed when the contract is stipulated with the client. The following are therefore to be considered excluded from the contract:

1. Assembly on the client's premises (direct or final)
2. Commissioning on the client's premises (direct or final)
3. Testing on the client's premises (direct or final)

It is therefore understood that the aforementioned operations in points 1.,2., and 3. are not chargeable to Rollon.

Rollon is the supplier of Partly Completed Machinery, the (direct or final) client is responsible for testing and safely checking all equipment which, by definition, cannot be theoretically tested or checked at our facilities where the only movement possible is manual movement (for example: motors or reduction gears, cartesian axes movements that are not manually operated, safety brakes, stopper cylinders, mechanical or induction sensors, decelerators, mechanical limit switches, pneumatic cylinders, etc.). The partly completed machine must not be commissioned until the final machine, in which it is to be incorporated, has been declared compliant, if necessary, with the instructions in Machinery Directive 2006/42/CE.

Instructions of an environmental nature

Rollon operates with respect for the envirorment, in order to limit environmental impact. The following is a list of some instructions of an environmental nature for correct management of our supplies. Our products are mainly composed of:

Material	Details of the supply
Alluminum alloys	Profiles, pleates, various details
Steel with various composition	Screws, racks and pinions, and rails
Plastic	PA6 – Chains PVC – Covers and sliding block scrapers
Rubber of various types	Plugs, seals
Lubrification of various types	Used for the lubrication of sliding rails and bearings
Rust proof protectione	Rust proof protection oil
Wood, polyethylene, cardboard	Transport packaging

At the end of the product's life cycle, it is therfore possible to recover the various elements, in compliance with current regulations on waste issues.

› Safety warnings for handling and transport

- The manufacturer has paid the utmost attention to packaging to minimize risks related to shipping, handling and transport.
- Transport can be facilitated by shipping certain components dismantled and appropriately protected and packaged.
- Handling (loading and unloading) must be carried out in compliance with information directly provided on the machine, on the packing and in the user manuals.
- Personnel authorized to lift and handle the machine and its components shall possess acquired and acknowledged skills and experience in the specific sector, besides having full control of the lifting devices used.
- During transport and/or storage, temperature shall remain within the allowed limits to avoid irreversible damage to electric and electronic components.
- Handling and transport must be carried out with vehicles presenting adequate loading capacity, and the machines shall be anchored to the established points indicated on the axes.
- DO NOT attempt to bypass handling methods and the established lifting points in any way.
- During handling and if required by the conditions, make use of one or more assistants to receive adequate warnings.
- If the machine has to be moved with vehicles, ensure that they are adequate for the purpose, and perform loading and unloading without risks for the operator and for people directly involved in the process.
- Before transferring the device onto the vehicle, ensure that both the machine and its components are adequately secured, and that their profile does not exceed the maximum bulk allowed. Place the necessary warning signs, if necessary.
- DO NOT perform handling with an inadequate visual field and when there are obstacles along the route to the final location.
- DO NOT allow people to either transit or linger within the range of action when lifting and handling loads.
- Download the axes just near the established location and store them in an environment protected against atmospheric agents.
- Failure to comply with the information provided might entail risks for the safety and health of people, and can cause economic loss.
- The Installation Manager must have the project to organize and monitor all operative phases.
- The Installation Manager shall ensure that the lifting devices and equipment defined during the contract phase are available.
- The Manager of the established location and the Installation Manager shall implement a "safety plan" in compliance with the legislation in force for the workplace.
- The "safety plan" shall take into account all surrounding work-related activities and the perimeter spaces indicated in the project for the established location.
- Mark and delimit the established location to prevent unauthorized personnel from accessing the installation area.
- The installation site must have adequate environmental conditions (lighting, ventilation, etc.).
- Installation site temperature must be within the maximum and minimum range allowed.
- Ensure that the installation site is protected against atmospheric agents, does not contain corrosive substances and is free of the risk of explosion and/or fire.
- Installation in environments presenting a risk of explosion and/or of fire must ONLY be carried out if the machine has been DECLARED COMPLIANT for such use.
- Check that the established location has been correctly fitted out, as defined during the contract phase and based on indications in the relative project.
- The established location must be fitted out in advance to carry out complete installation in compliance with the defined methods and schedule.

› Note

- Evaluate in advance whether the machine must interact with other production units, and that integration can be implemented correctly, in compliance with standards and without risks.
- The manager shall assign installation and assembly interventions ONLY to authorized technicians with acknowledged know-how.
- State of the art connections to power sources (electric, pneumatic, etc.) must be ensured, in compliance with relevant regulatory and legislative requirements.
- "State of the art" connection, alignment and leveling are essential to avoid additional interventions and to ensure correct machine function.
- Upon completion of the connections, run a general check to ascertain that all interventions have been correctly carried out and compliance with requirements.
- Failure to comply with the information provided might entail risks for the safety and health of people, and can cause economic loss.

> Transport

- Transport, also based on the final destination, can be done with different vehicles.
- Perform transport with suitable devices that have adequate loading capacity.
- Ensure that the machine and its components are adequately anchored to the vehicle.

> Handling and lifting

- Correctly connect the lifting devices to the established points on the packages and/or on the dismantled parts.
- Before handling, read the instructions, especially safety instructions, provided in the installation manual, on the packages and/or on the dismantled parts.
- DO NOT attempt, in any way, to bypass handling methods and the established lifting, moving and handling points of each package and/or dismantled part.
- Slowly lift the package to the minimum necessary height and move it with the utmost caution to avoid dangerous oscillations.
- DO NOT perform handling with an inadequate visual field and when there are obstacles along the route to reach the final location.
- DO NOT allow people to either transit or linger within the range of action when lifting and handling loads.
- Do not stack packages to avoid damaging them, and reduce the risk of sudden and dangerous movements.
- In case of prolonged storage, regularly ensure that there are no variations in the storage conditions of the packages.

> Check axis integrity after shipment

Every shipment is accompanied by a document ("Packing list") with the list and description of the axes.

- Upon receipt check that the material received corresponds to specifications in the delivery note.
- Check that packaging is perfectly intact and, for shipments without packaging, check that each axis is intact.
- In case of damages or missing parts, contact the manufacturer to define the relevant procedures.

Data sheet ⌄

General data:

Address: ....

Company: ....

Phone: ....

E-Mail: ....

Date: .... **Inquiry N°:** ....

Contact: ....

Zip Code: ....

Fax: ....

Technical data:

			X axis	Y axis	Z axis
Useful stroke (Including safety overtravel)		S	[mm]			
Load to be translated		P	[kg]			
Location of Load in the	X-Direction	LxP	[mm]			
	Y-Direction	LyP	[mm]			
	Z-Direction	LzP	[mm]			
Additional force	Direction (+/-)	Fx (Fy, Fz)	[N]			
Position of force	X-Direction	Lx Fx (Fy, Fz)	[mm]			
	Y-Direction	Ly Fx (Fy, Fz)	[mm]			
	Z-Direction	Lz Fx (Fy, Fz)	[mm]			
Assembly position (Horizontal/Vertical/Transversal)						
Max. speed		V	[m/s]			
Max. acceleration		a	[m/s^2]			
Positioning repeatability		Δs	[mm]			
Required life		L	yrs			
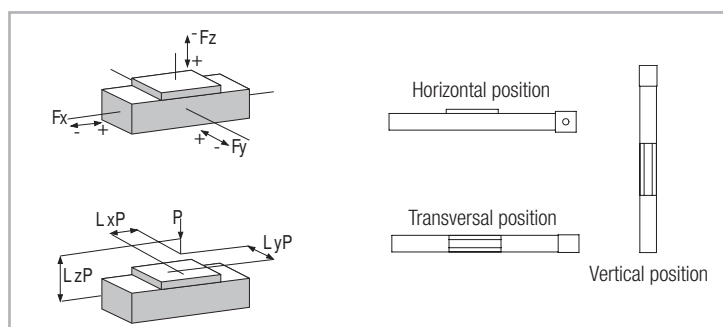
Attention: Please enclose drawing, sketches and sheet of the duty cycle

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BY TIMKEN

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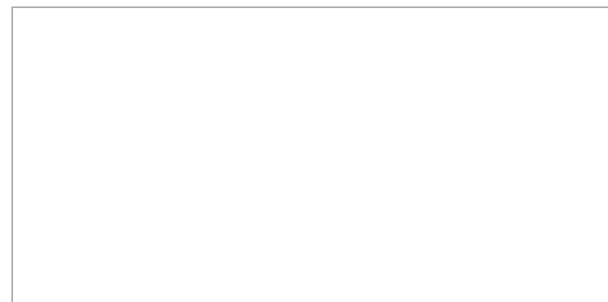www.rollonindia.in - info@rollonindia.in

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