Introduction and Technical Characteristics

Profiled Monorail Systems are suitable for any type of machine requiring linear movement due to their low and uniform friction, high accuracy and reduced space requirements. They are particularly suited for high technology products such as machine tools, measuring instruments, packaging equipment etc.

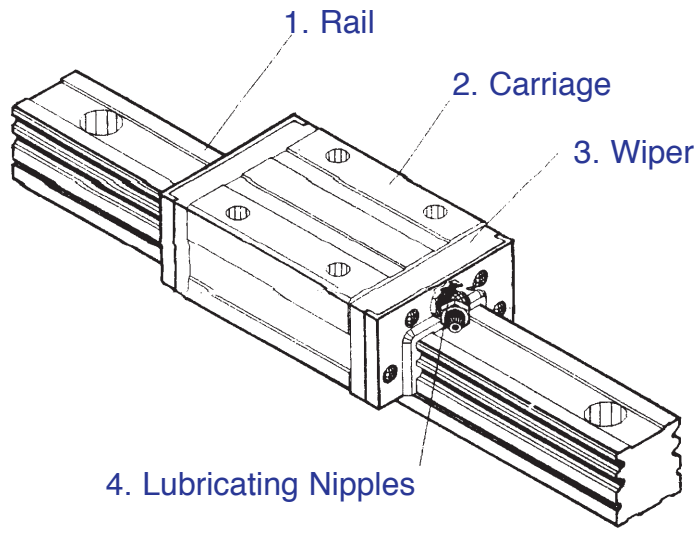
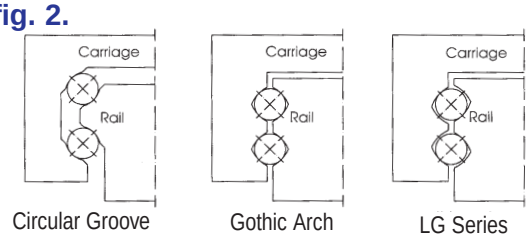


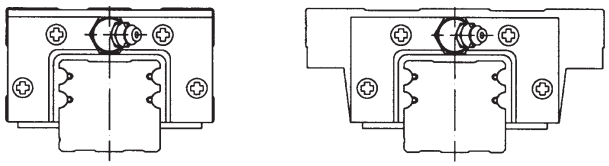
fig. 1: These components allow modular construction, utilising standard sizes which enables lower production cycles and shorter development times.

fig. 2.



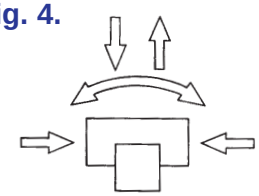
Monorail systems are classified according to the design and configuration of the raceways which can be circular grove (2 point contact) or of gothic arch design (4point contact) depending on the load magnitude and the direction of the load. See fig. 2. The LG series combines the advantages of both circular and gothic concepts to provide higher accuracies and performance

fig. 3.



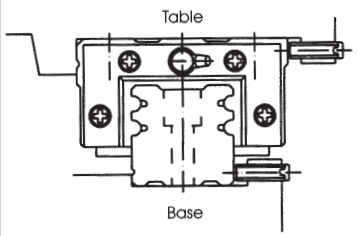
The carriages can be of two different designs, AA with threaded holes in the body, or EA with flange mounting possibility which can be offered with either threaded or through mounting holes. Both designs can be ordered in standard or long version. see fig. 3.

fig. 4.



For Higher precision applications, it is recommended to use systems with preload to eliminate unwanted motions (yaw, pitch & roll) as well as increase the system rigidity. The monorail system has equal load ratings in all directions. see fig. 4.

fig. 5.



Lubrication is an essential part of the selection process. Monorail systems can use both grease or oil. The carriages are filled with high grade lithium base grease. If oil is used, a product with a minimum viscosity of 32 Cst at the operating temperure should be used, preferably with EP characteristics.

Ordering Example: LG25 – AA – P_1 – 2x1000 – E – II – J

LG25 = Size **– AA** = Carriage Type **– P_1** = Preload **– 2x1000** Carriage no. on one rail x Rail Length **– E** = Accuracy Class**– II =** No. of guides on same plane **– J** = Reference Rail Symbol (see fig. 13)

Mounting Arrangement and Installation

Fig. 7 shows the basic mounting arrangement. Fig 8 shows the installation of the ways in a vertical position. It is possible to reverse the arrangement and use the carriage in the base and the rail on the table.

fig. 7

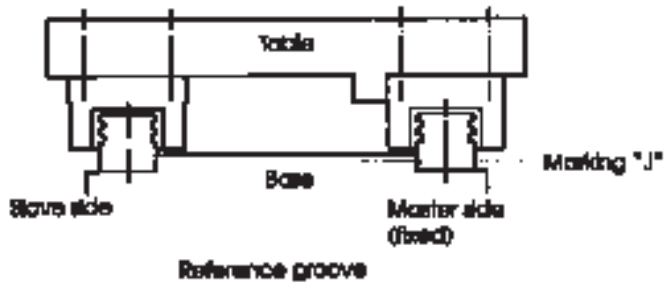


fig. 8

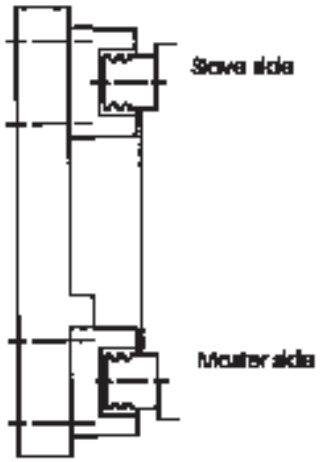


Fig. 9 and Fig 10 show mounting arrangements with opposing systems. These types of installations are more complex to align and impose additional demand on the machining of the mounting surfaces, yet they offer the benefit of a reduced section.

fig. 9

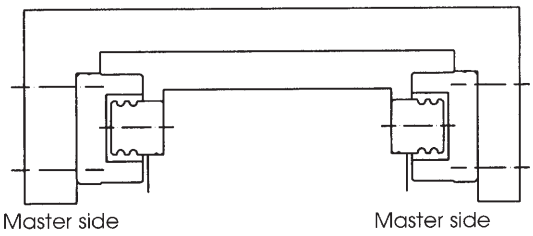
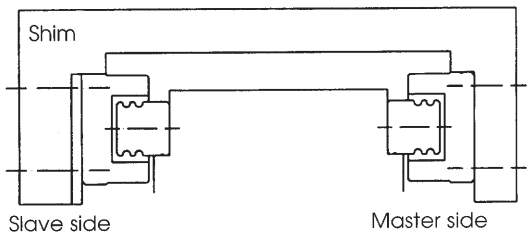


fig. 10



The typical application uses two rails with one or more carraiges. One of the rails is used as master (fixed to a reference edge) while the other is aligned using the master. The master rail has a marked J on the side oppoaite to the reference face (identified by the reference groove).

fig. 11

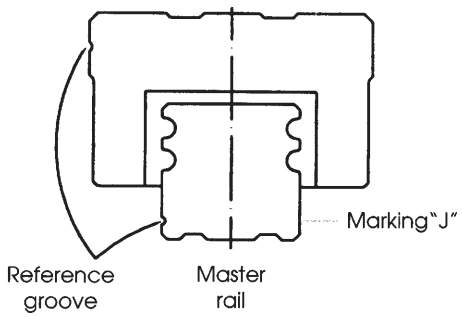
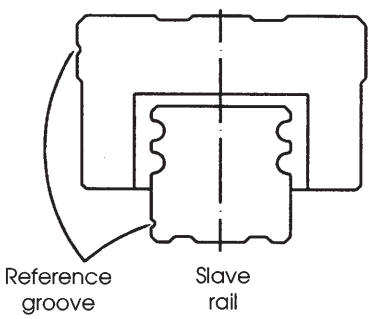
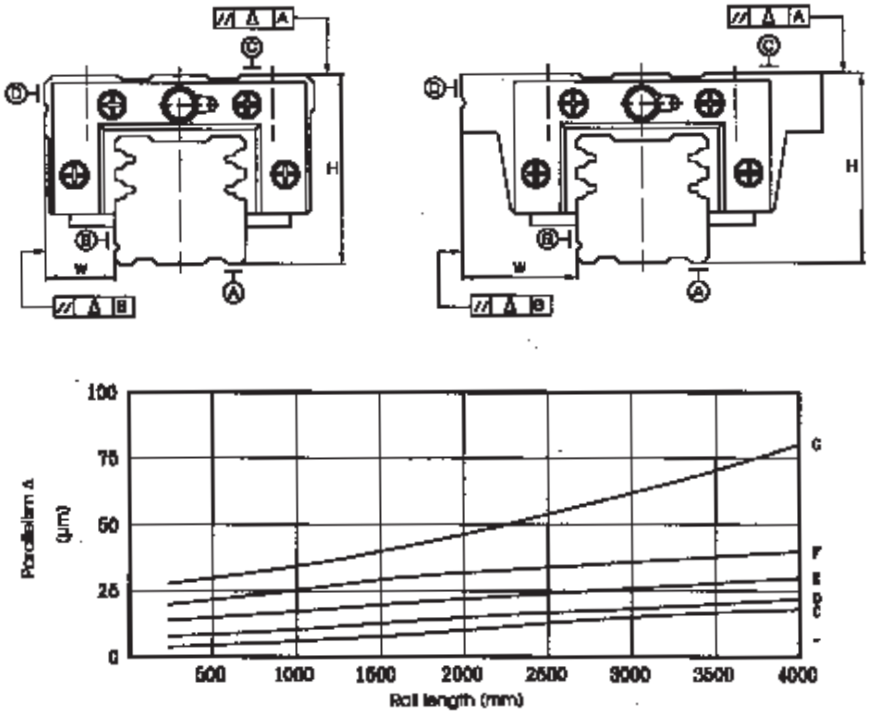


fig. 12



Accuracy Classes

fig.13



Note: Please consider: a) Parrallelism measured on the same location on the carriage.

	Dimension	C*	Accuracy Class D**	E	F	G
Tolerance of Dimension H	H	±12	±25	±50	±100	±200
2 Carriages on same rail Dim H within	H	5	7	20	40	60
Tolerance of Dimension W	W	±15	±30	±60	±120	±240
2 Carriages on same rail Dim W within	W	7	10	25	70	100

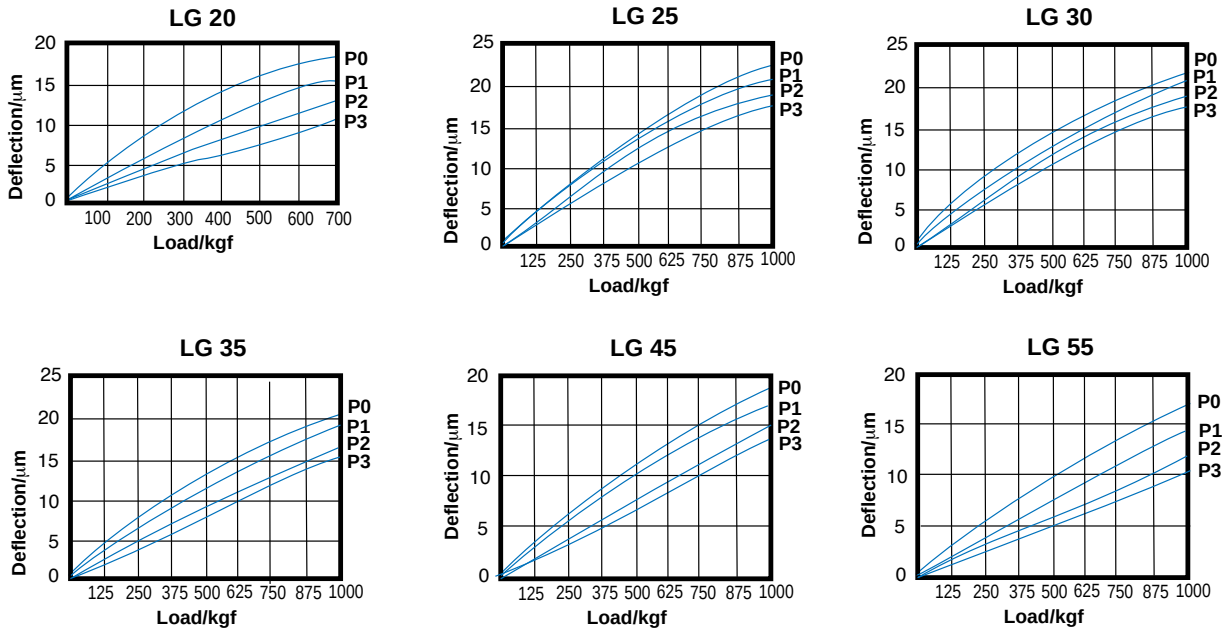
Note: Units in microns, C* For lengths <1500 mm, D** for lengths >1500mm.

To assess the most suitable accuracy class for various applications, we have prepared the following table with our recommendations

Suggested Accuracy Class For Machine Types	Axis	Accuracy Class
Milling Machines, CNC, Machining Centres	X,Y Z	CDE DEF
Grinding Machines, CNC	X,Y Z	CDE EF
Boring Machines, Horizontal Boring Mills	X,Y Z	CDE DE
EDM Machines	X,Y Z	CDE EF
Turning Centres	X,Y Z	CDF DEF
Tables	X,Y	DE
Contouring Machines	X,Y	EF
Presses Shears, Tube Bending Machines	X,Y	DEF
Other Machines	X,Y Z	EFG FG

Rigidity

The rigidity of the monorail system is an essential engineering characteristic which allows the machine to maintain it's accuracy and position. The rigidity curves, as a function of size and pre-load, can be found below.



Preload

The preload should be custom tailored to the application. Generally, the preload should not exceed 1/3 of the applied load. This will allow the system to operate at it's optimum load without affecting the preload balls and without impacting on the bearing life in any significant manner.

Type	Preload Minimum P_0 (Kgf)	Preload Light P_1 (Kgf)	Preload Medium P_2 (Kgf)	Preload High P_3 (Kgf)
LG20	8.5	21	43	—
LG25	15	35	70	90
LG30	20	50	100	140
LG35	30	70	140	190
LG45	40	100	200	280
LG55	60	155	310	430

Allowable Moments

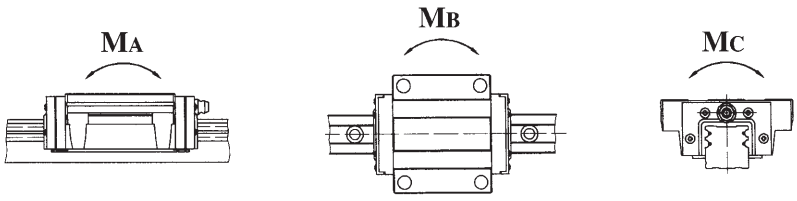


fig. 14

Size	Carriage Type	MA	MB	MC	Carriage Type	MA	MB	MC
LG20	EA AA AN	132	132	252				
LG25	EA AA AN	180	180	256	HEA HAA HAN	374	374	300
LG30	EA AA AN	310	310	459	HEA HAA HAN	520	520	495
LG35	EA AA AN	500	500	765	HEA HAA HAN	820	820	800
LG45	EA AA AN	1005	1005	1555	HEA HAA HAN	1630	1630	1590
LG55	EA AA AN	1750	1750	2660	HEA HAA HAN	2940	2940	2939

Units in Nm.

Installation Procedure

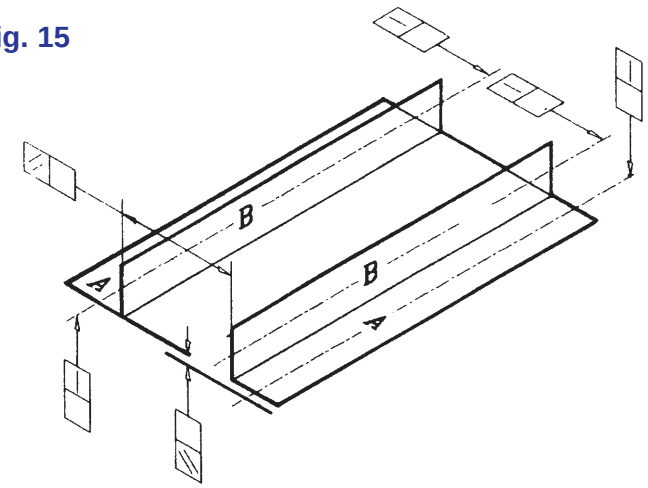
Mounting Surface Accuracy

Before installation, all of the monuting surfaces shoul be cleaned, fig 15 shows what surfaces should be inspected as well as cleaned. The tolerances of the abutting surfaces of the part should equal the system accuracy and the values can be found on the graph on page 37.

Lay the rail on the master side and slightly tighten the mounting bolts using a side clamp (fig. 16 or other means (ie. ste screws, tapared wedges etc.), press the rail into the reference shoulder.

The side calmp should have a relief to avoid pushing the rail upward (rolling of the rail). Tighten the mounting bolts in sequence with the correct tightening torque (see table).

fig. 15



Note: The side clamp is not required unless the system could be subjected to accidental shocks (ie. machine tools during a crash). In this case proceed as follows:

a) After installing the master rail. tighten the slave rail mounting bolts to 70% of the indicated value on table below. If the mounting surfaces on both the master side and the slave side are accurate, mounting procedure will provide adequate accuracy. The parrallelism should be checked with a system shown in Fig. 18

b) Place the carriages at the correct spacing on the rails and place the table on the systems

c) Tighten the bolts on the carriages on the slave side. Move the rails back and forth an tighten the bolts on slave rail while moving the carriage ensuring the parallelism of the system.

d) Tighten the bolts on the carriage on the slave side. Move the rails back and forth and tighten the bolts on the slave rail while moving the carriage, ensuring the parallelism of the system. See table below for max. allowable torque settings.

Bolt Size	Torque kgf-cm	Bolt Size	Torquekgf-cm
M2.3	3.9	**M8**	220
M2.5	5.9	**M10**	440
M3	10.8	**M12**	770
M4	25	**M14**	1240
M5	52	**M16**	2000
M6	88		

fig. 16

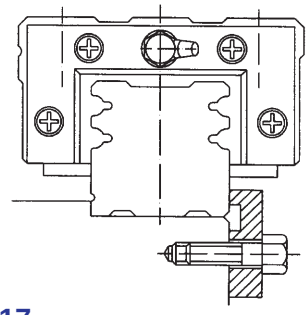


fig. 17

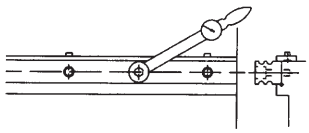


fig. 18

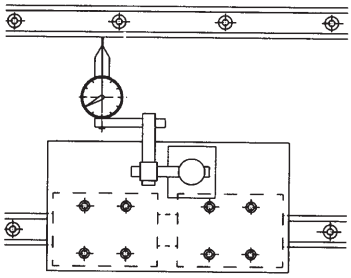


fig. 18

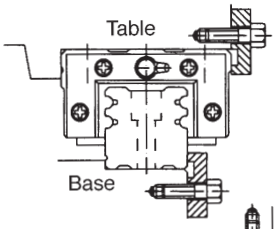


fig. 19

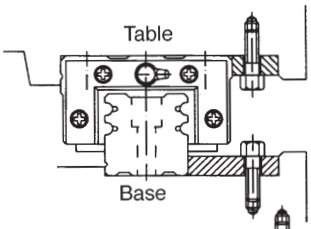


fig. 20

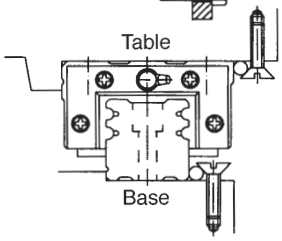
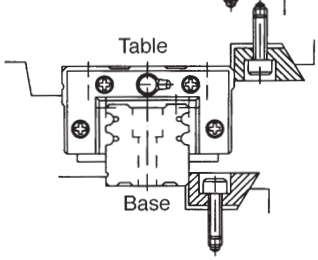
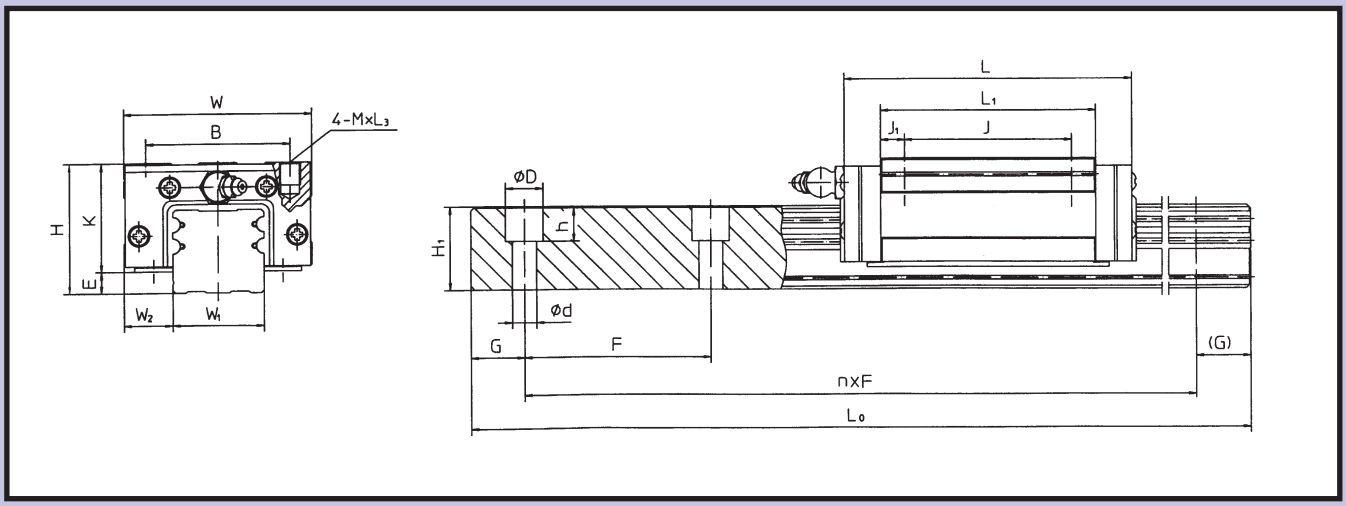


fig. 21



Type AA, AN, HAA, HAN (Narrow Carriage)



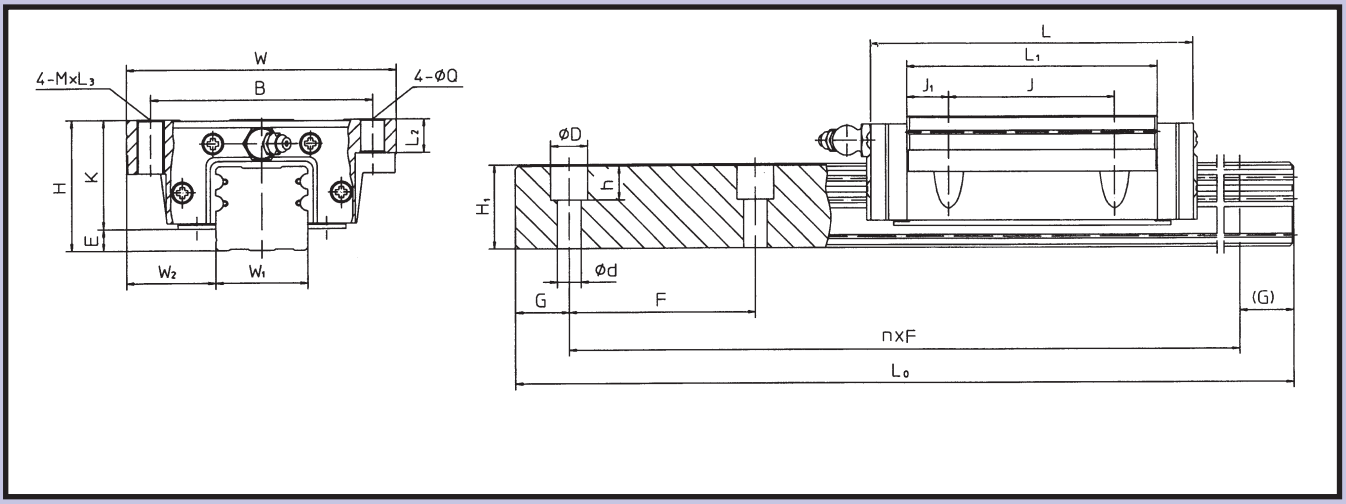
Type AA (Carriage without flanges, with threaded holes) & AN (High Version)

Type	Dimensions			Carraige Dimensions							Rail Dimensions					Load Ratings		Weight (kg)	
	H	E	W_2	W	B x J	L	L_1	J1	K	M x L_3	W_1	H_1	F	d x D x h	G	C(Kgf)	Co(N)	Carriage	Rail(kg/m)
LG20 AA	30	5	12	44	32x36	81	58	11	25	M5 x 6	20	18	60	6x9.5x8.5	20	1025	18430	0.3	2.5
LG25 AA AN	36 40	5.5	12.5	48	35 x 35	81	58	11.5	30.5 34.5	M6 x 10	23	22.5	60	7x11x9	20	1628	29310	0.46 0.65	4.0
LG30 AA AN	42 45	7	16	60	40 x 40	94	68	14	35 38	M8 x 11	28	27.5	80	9x14x12	20	2401	43220	0.87 0.97	5.9
LG35 AA AN	48 55	8	18	70	50 x 50	110	80	15	40 47	M8 x 12	34	31	80	9 x14 x12	20	3337	60060	1.2 1.5	8.0
LG45 AA AN	60 70	10	20.5	86	60 x 60	139	102	21	50 60	M10 x 16	45	37.5	105	14x20x17	22.5	4868	87620	2.3 3.0	12.8
LG55 AA AN	70 80	11	23.5	100	75 x 75	161	120	22.5	59 69	M12 x 18	53	45	120	16x23x20	30	7491	134830	3.6 4.5	18.0

Type HAA (Long Carriage without flanges, with threaded holes) & HAN (High Version)

Type	Dimensions			Carriage Dimensions							Rail Dimensions					Load Ratings		Weight (kg)	
	H	E	W_2	W	B x J	L	L_1	J_1	K	M x L_3	W_1	H_1	F	d x D x h	G	C(kgf)	Co(N)	Carriage	Rail(kg/m)
LG25 HAA HAN	36 40	5.5	12.5	48	35 x 50	103	80	15	30.5 34.5	M6 x 10	23	22.5	60	7x11x9	20	2290	41250	0.63 0.87	4.0
LG30 HAA HAN	42 45	7	16	60	40 x 60	114	88	14	35 38	M8 x 11	28	27.5	80	9x14x12	20	3251	56710	1.13 1.26	5.9
LG35 HAA HAN	48 55	8	18	70	50 x 72	133	103	15.5	40 47	M8 x 12	34	31	80	9 x14 x12	20	4347	78720	1.55 1.94	8.0
LG45 HAA HAN	60 70	10	20.5	86	60 x 80	171	134	27	50 60	M10 x 16	45	37.5	105	14x20x17	22.5	6472	116830	3.0 3.9	12.8
LG55 HAA HAN	70 80	11	23.5	100	75 x 95	201	160	32.5	59 69	M12 x 18	53	45	120	16x23x20	30	10054	182140	4.8 6.0	18.0

Type EA, FA, HEA, HFA (Wide Carriage)



Type EA (Carriage with Flanges, with Threaded Holes) & HA (with Plain Holes)

Type	Dimensions			Carraige Dimensions								Rail Dimensions					Load Ratings		Weight (kg)	
	H	E	W_2	W	B x J	L	L_1	J_1	K	Q x L_2	M x L_3	W_1	H_1	F	d x D x h	G	C(kgf)	Co(N)	Carriage	Rail(kg/m)
LG20 EA FA	30	5	21.5	63	53x40	81	58	7.5	25	6x9.5	M6x10	20	18	60	6x9.5x8.5	20	1025	18430	0.42	2.5
LG25 EA FA	36	5.5	23.5	70	57x45	81	58	6.5	30.5	7x10	M8x16	23	22.5	60	7x11x9	20	1628	29310	0.64	4.0
LG30 EA FA	42	7	31	90	72x52	94	68	8	35	9x12	M10x18	28	27.5	80	9x14x12	20	2401	43220	1.06	5.9
LG35 EA FA	48	8	33	100	82x62	110	80	9	40	9x13	M10x20	34	31	80	9x14x12	20	3337	60060	1.64	8.0
LG45 EA FA	60	10	37.5	120	100x80	139	102	11	50	11x15	M12x24	45	37.5	105	14x20x17	22.5	4868	87620	3.1	12.8
LG55 EA FA	70	11	43.5	140	116x95	161	120	12.5	59	14x17	M14x28	53	45	120	16x23x20	30	7491	134830	4.8	18.0

Type HEA (Long Carriage with Flanges, with Threaded Holes) & HFA (with Plain Holes)

Type	Dimensions			Carriage Dimensions								Rail Dimensions					Load Ratings		Weight (kg)	
	H	E	W_2	W	B x J	L	L_1	J_1	K	Q x L_2	M x L_3	W_1	H_1	F	d x D x h	G	C(kgf)	Co(N)	Carriage	Rail(kg/m)
LG25 HEA HFA	36	5.5	23.5	70	57x45	103	80	17.5	30.5	7x10	M8x16	23	22.5	60	7x11x9	20	2290	41250	0.88	4.0
LG30 HEA HFA	42	7	31	90	72x52	114	88	18	35	9x12	M10x1 8	28	27.5	80	9x14x12	20	3251	56710	1.37	5.9
LG35 HEA HFA	48	8	33	100	82x62	133	103	20.5	40	9x13	M10x20	34	31	80	9x14x12	20	4347	78720	2.11	8.0
LG45 HEA HFA	60	10	37.5	120	100x80	171	134	27	50	11x15	M12x24	45	37.5	105	14x20x17	22.5	6472	116830	4.07	12.8
LG55 HEA HFA	70	11	43.5	140	116x95	201	160	32.5	59	14x17	M14x28	53	45	120	16x23x20	30	10054	182140	6.4	18.0