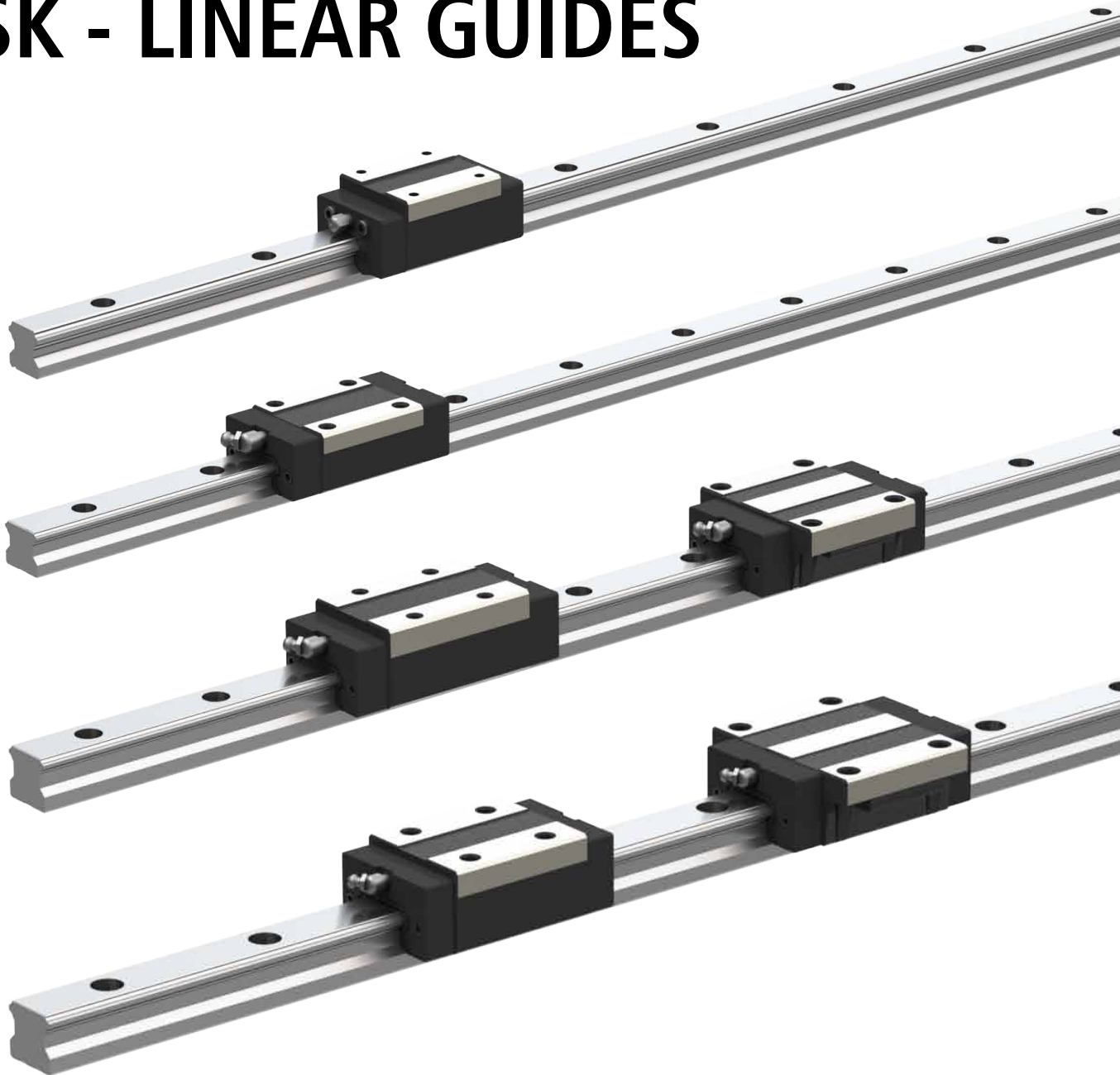
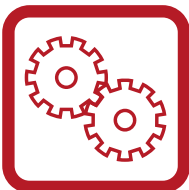


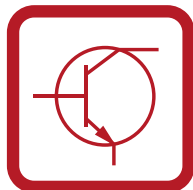
LSK - LINEAR GUIDES



MECHANICS



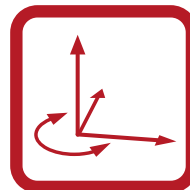
ELECTRONICS



SOFTWARE



SYSTEMS



DISPLAY



LIFESTYLE



LSK LINEAR GUIDES

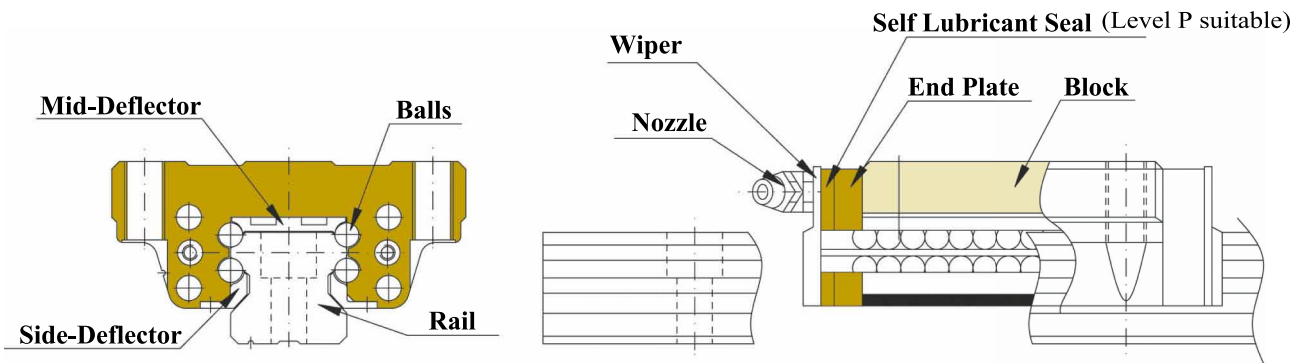
- 01 Advantages of LSK Linear Guideway
- 02 Types of LSK Linear Guideway
- 04 Mounting Procedures
- 05 Choices of Accessories
- 07 Accuracy Classification of LSK Linear Guideway
- 08 Load rating and Service Life of Linear Guideway
- 12 MTA series - Flange Model FL – CA, HA
- 14 MTA series - Square Model GL – CA, HA
- 16 INA series - Flange Model FR – TC, SC
- 18 INA series - Square Model GR – TA, SA



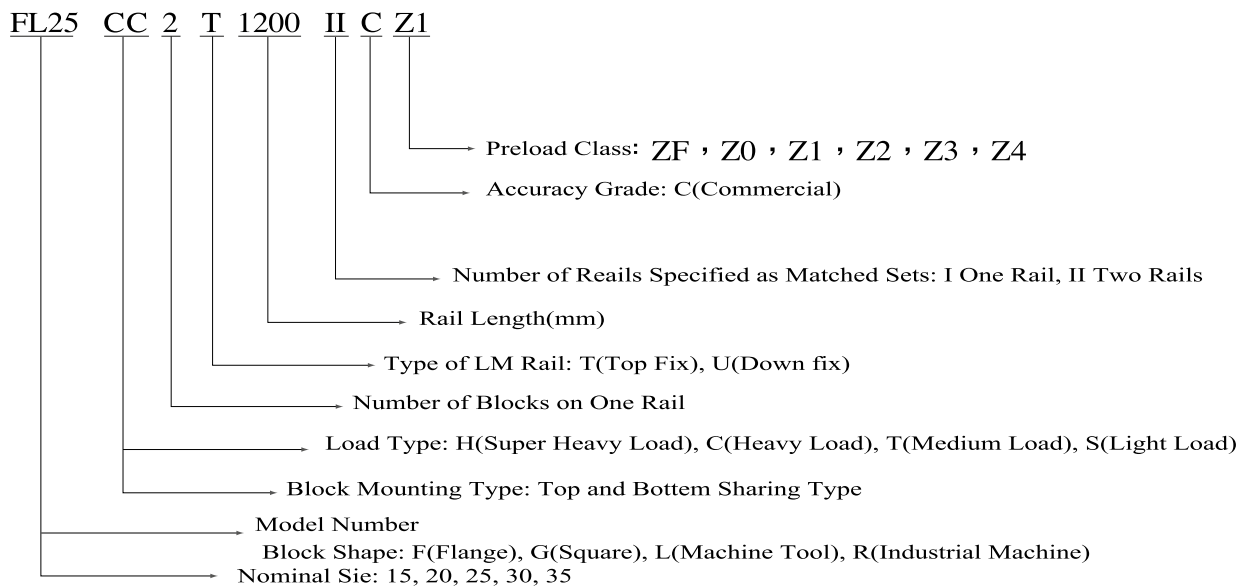


Advantages of LSK Linear Guideway

- Four Way Equal Load Rating
- Restrict on Quality Control
- Products are Interchangeabilities
- Smooth Makes Less Noise
- High Parallel Accuracy of Rails and Blocks
- High Precision, High Rigidity, High Efficiency
- Lower Attitude Makes Smaller
- Low Friction Maintains Accuracy to Extend Longer Lifetime of Products



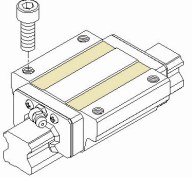
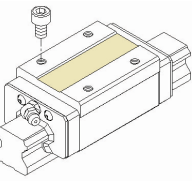
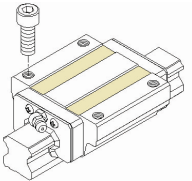
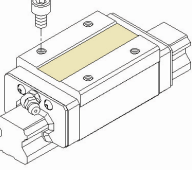
LSK Nomenclature



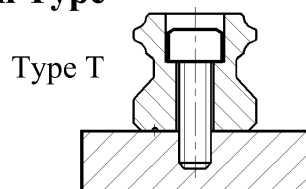
Types of LSK Linear Guideway

LSK provides machinery and industrial types, and uses either Flanges or Square models.

1. Block Shape

Type	Model	Shape and Direction	Height (mm)	Characteristic	Main Application
Machinery	FL-HC FL-CC (#15~#30)		24 ┆ 60	<ul style="list-style-type: none"> ◎ Ideal Four Raceway, Circular -Arc Groove, Two-Point Contact Structure ◎ Large Permissible Load and High Rigidity can extend lifetime ◎ Able to be preloaded, in order to achieve high rigidity and high precision under 0μ gap 	<ul style="list-style-type: none"> • Machine Centers • CNC Lathe • Plain Grinder • Heavy Cutting Machines • Automation Devices • Measuring Equipment
	GL-HA GL-CA (#15~#30)		28 ┆ 70		
Industrial	FR-TC FR-SC (#15~#30)		24 ┆ 48	<ul style="list-style-type: none"> ◎ Smaller Compact suitable to bear load: ◎ Smooth Movement and Low Noise ◎ Standard Type: (FR-TC, GR-TA Types) Shorter Blocks, Non-Taking Space Type: (FR-SC, GR-SA Types) 	<ul style="list-style-type: none"> • Industrial Automation Machine • Semiconductor Machinery • Laser Engraving Machine • Packaging Machine • Transfer Equipment • EDM
	GR-TA GR-SA (#15~#30)		24 ┆ 48		

2. Rail Type



Types of LSK Linear Guideway

3.Preload Grade

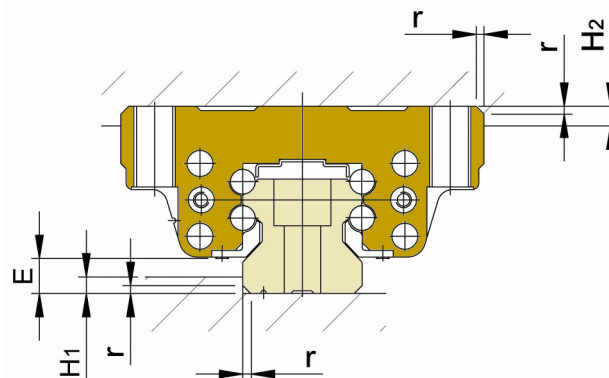
Preload Grade	Marked	Preload	Accuracy Grade	Application
Normal Gap	ZF	Gap Value 0~0.01mm	C	Industrial Automation Machine
Non Preload	Z0	0	C~UP	Transfer Equipment, Packaging Machine
Light Preload	Z1	0.02C	C~UP	XY Axis of Ordinary Industrial Machine, Welding Machine, Fusing Machine
Medium Preload	Z2	0.05C	H~UP	Z Axis of Ordinary Industrial Machine, EDM, CNC Lathe, Percision XY Table, Measuring Equipment

Note: The preload is the percentage of basic dynamic load rating(C)

LSK Mounting Procedures

1. Shoulder Angle and Height

Installing rails, you must focus on setting up shoulder part. When shoulder angle is too big or too over, it will make the rail less accurate or interfere the block movement. Please follow the chart below to install.



Specification	Shoulder Largest Chamfer r(mm)	Rail Shoulder Height H ₁ (mm)	Block Shoulder Height H ₂ (mm)	Rail Bottom Height E(mm)
15	0.3	3	4	5
20	0.3	4	5	5.5
25	0.5	5	5	7
30	0.5	5	5	8
35	0.5	6	6	9

LSK Mounting Procedures

2. Torsion Rate

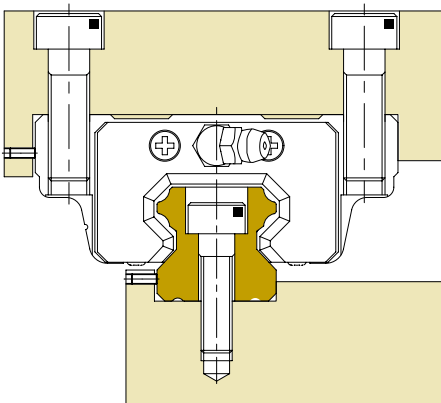
The torsion rate of installing rails.

Specification	Screw Specification	Torsion Rate [kgf/cm]
15	M4 x 0.70P x 16L	42
20	M5 x 0.80P x 16L	90
25	M6 x 1.00P x 20L	140
30, 35	M8 x 1.25P x 25L	310

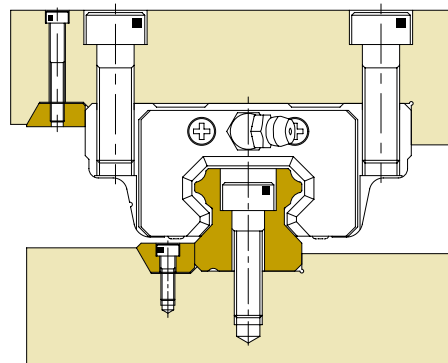
3. Mounting rails and blocks methods

The blocks and the rails may be displaced when machine is subjected to vibrations or impacts. Suggesting to follow the methods below to install. (Mounting the blocks can only imited on baseline side when usage of two parallel rails)

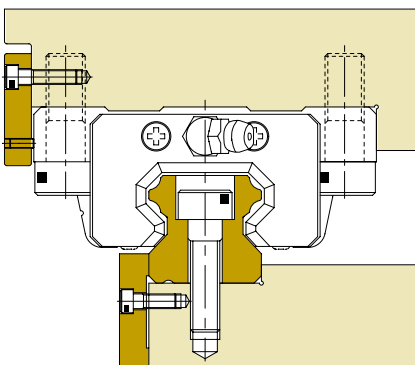
P1: Mounting with push screw



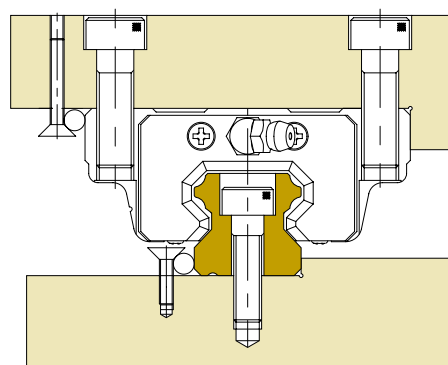
P2: Mounting with wedge briquetting



P3: Mounting with push plate



P4: Mounting with locating pin



LSK Choice of Accessories

1. Lubrication

It is necessary to provide effective lubrication. Using the product without lubrication may increase wear of the rolling elements or shorten the service life. Therefore, properly using lubrication can prevent rolling friction and corrosion, in order to extend lifetime.

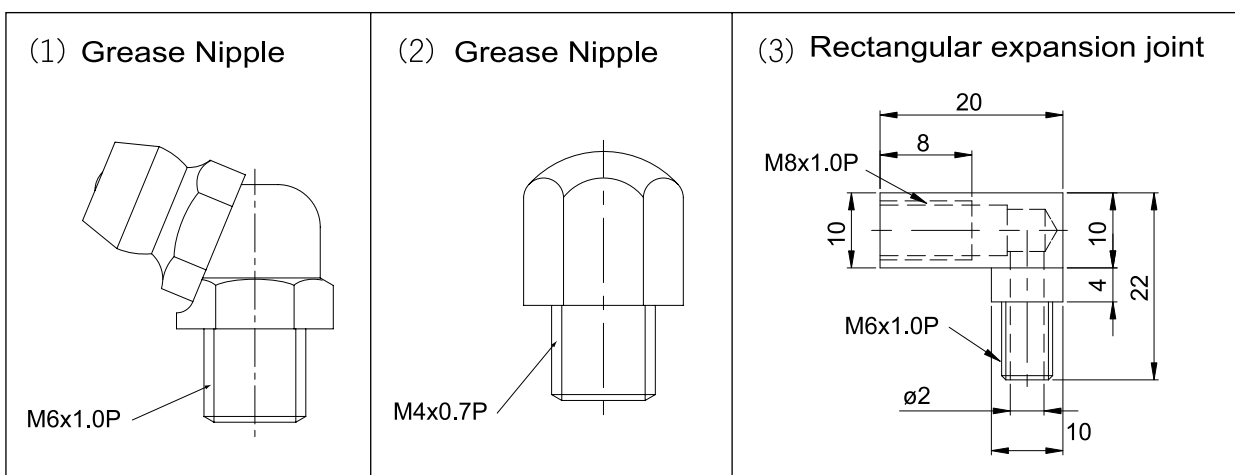
1 Grease

- Re-lubricated every 100km
- Re-lubricated every 3-6 months
- Depending on conditions and environment to lubricate

2 Oil

- Initial Amount : Fulfilling whole space inside of blocks
- Recommending viscosity is about 30 ~ 150 cst to lubricate the guideway
- Supplying Oil : $Q = n/150$, Q: Oil amount expectation, N: Width of rails,
Oil feed rate is about 0.3³ cm /hr

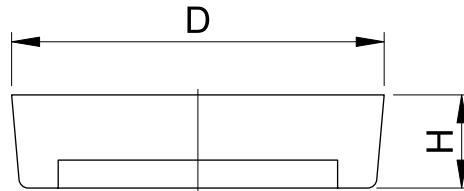
3 Nipple Types



LSK Choice of Accessories

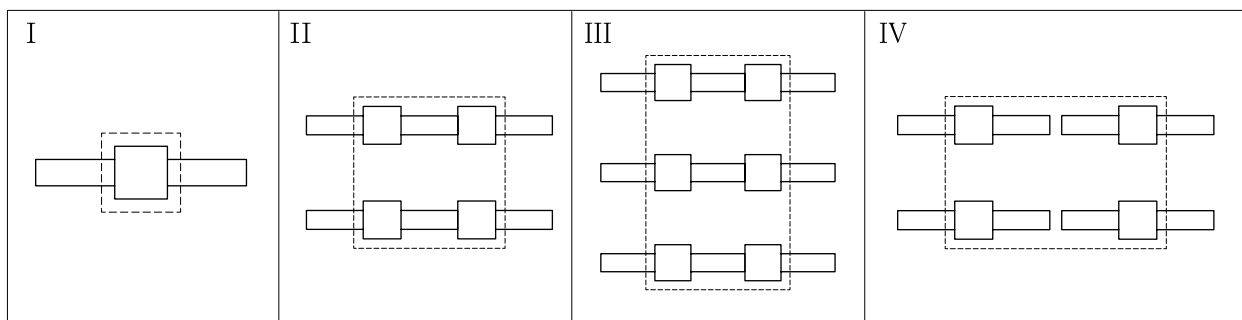
4 Manhole Covers

The cutting powder and foreign body can fill in the holes on the rails. Which means, those can be inside of blocks as well. To prevent this phenomenon, LSK uses particular manhole covers to protect the rails.



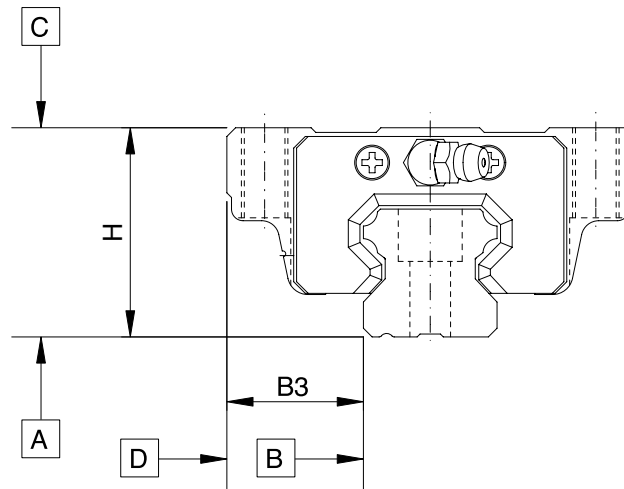
Model Type	Screw aperture	Bolts	Main dimensions(mm)	
			D	H
15	7.5	M4	7.8	1.2
20	9.5	M5	9.8	2.2
25	11	M6	11.4	2.5
30/35	14	M8	14.4	3.4

5 Guideway arrangement methods marks





Accuracy Classification of LSK Linear Guideway



Unit /mm		FL、GL、FR、GR-15/20/25/30
Inspecting Items		Normal(C)
Tolerance for height M		±0.1
Tolerance for distance B3		±0.1
Differences in pairs	Height M Width B3	0.02
Preload Grade		ZF,Z0,Z1
Running parallelism of surface D with surface B		See Accuracy Table of Running Parallelism Values for details
Running parallelism of surface D with surface B		See Accuracy Table of Running Parallelism Values for details

2. Accuracy table of Running Parallelism Values

Rail Length (mm)	Accuracy Grade (μm)
	C
~100	12
100~200	14
200~300	15
300~500	17
500~700	20
700~900	22
900~1100	24
1100~1500	26
1500~1900	28
1900~2500	31
2500~3100	33
3100~3600	36
3600~4040	37

Load Rating and Service Life of Linear Guideway

1. Basic Load Rating

A. Basic Static Load Rating C_0

If a guideway receives an excessively large load or a large impact when it is stationary or operative, permanent deformation occurs between the raceway and the rolling element. The basic static load rating (C_0) refers to a static load in a given direction with a specific magnitude applied at the contact area under the most stress where the sum of permanent deformation develops between the raceway and rolling elements is 0.0001 times of the diameter of rolling ball.

B. Basic Dynamic Load Rating (C)

The basic dynamic load rating (C) indicates the load with constant direction and magnitude, under which the rated life (L) is $L = 50$ km for a guideway using balls, also, it used to calculate the service life.

2. Calculation of Nominal Life (L)

Without considering the conditions, the formula is shown below :

$$L = \left(\frac{C}{P} \right)^3 \cdot 50$$

L = Nominal life (km)

C = Basic dynamic load rating (N)

P = Applied load (N)

The hardness of the raceway and the temperature of the guideway unit greatly affect the service life. With these conditions considered, the practical service life calculation formulas as follows. :

$$L = \left(\frac{F_h \cdot F_t \cdot F_c}{F_w} \cdot \frac{C}{P_c} \right)^3 \cdot 50$$

L = Nominal life (km)

C = Basic dynamic load rating (N)

P_c = Applied load (N)

F_h = Hardness factor

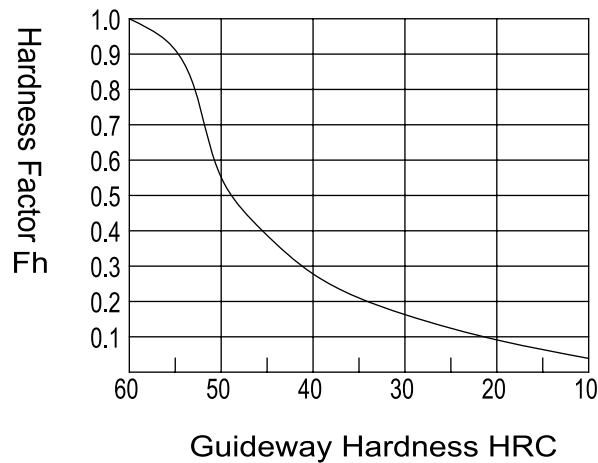
F_t = Temperature factor

F_c = Contact factor

F_w = Load factor

1 Hardness Factor (Fh)

To maximize the load capacity of the guideway, the hardness of the raceways needs to be between 58 and 62 HRC. If the hardness is lower than this range, it will reduce load rating and lifetime of guideway.



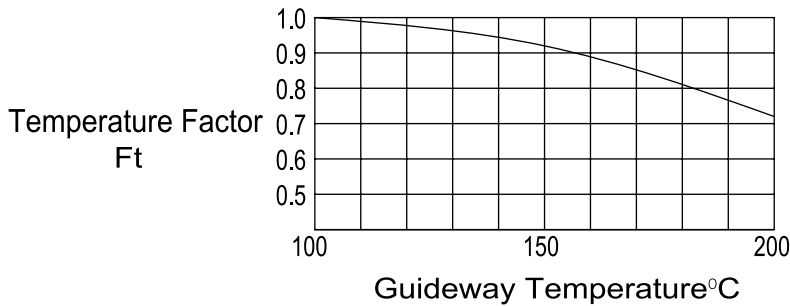
2 Contact Factor (Fc)

If multiple guide blocks are closely arranged with each other, it is difficult to achieve uniform load distribution due to a moment load and the accuracy of the mounting surface. In such applications, multiply basic load ratings “C” and “C 0” by the corresponding contact factors in below:

Number of blocks used in close contact	Contact factor FC
1	1.00
2	0.81
3	0.72
4	0.66
5	0.61

3 Temperature Factor (Ft)

If the temperature of the environment surrounding the operating guideway exceeds 100°C, take into account the adverse effect of the high temperature and multiply the basic load ratings by the temperature factor indicated in below:



4 Load Factor (Fw)

It is extremely difficult to accurately determine vibrations generated during high-speed operation and impact during frequent start and stop. Therefore, where the effects of speed and vibration are estimated to be significant. Using calculated load rating times load factor below:

Vibrations/ Impact	Speed (V)	Fw
Faint	V ≤ 15m/min	1 ~ 1.5
Medium	15 < V ≤ 60m/min	1.5 ~ 2.0
Strong	V ≥ 60m/min	2.0 ~ 3.5

3. Applied Load

Only blocks are loaded, calculation as below :

1. Horizontal Usage

$$P = F + \frac{C_0}{M_c} (F \times L_r) + \frac{C_0}{M_a} (F \times L_p)$$

2. Transverse Usage

$$P = F + \frac{C_0}{M_c} (F \times L_r) + \frac{C_0}{M_b} (F \times L_y)$$

P : Applied Load (N)

F : Downward Load (N)

C₀ : Basic Static Load Rating

M_a : Allowed Pitching torque (N.m)

M_b : Allowed Yawing torque (N.m)

M_c : Allowed Rolling torque (N.m)

L_p : Distance of Pitching direction load (m)

L_y : Distance of Yawing direction load (m)

L_r : Distance of Rolling direction load (m)

4. Calculation of the Mean Load

When a linear guideway system receives varying loads, the service life could be calculated in consideration of varying loads of the host-system operation conditions. Calculation of Mean load as below:

$$P_m = \sqrt[3]{\frac{1}{L} \cdot \sum_{n=1}^n (P_n^3 \cdot L_n)}$$

P_m : Mean load(kgf)

P_n : Varying load(kgf)

L : Total running distance(mm)

L_n : Running distance under load P_n (mm)

5. Calculation of the Equivalent Load

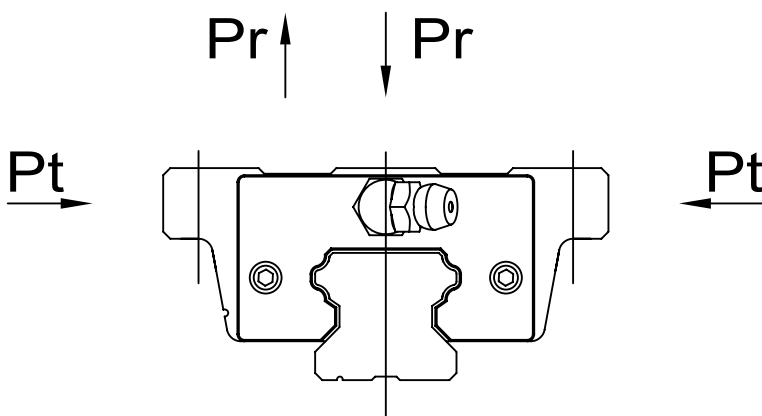
The linear guideway system can take up loads and moments in all four directions those are radial load, reverse-radial load, and lateral load simultaneously. Calculating formula as below:

$$P_e = P_r + P_t$$

P_e = Equivalent load (kgf)

P_r = Radial or reverse-radial load (kgf)

P_t = Transverse Load (kgf)



FLANGE MODEL FL-CC,HC

MTA Series Machine Tool Application



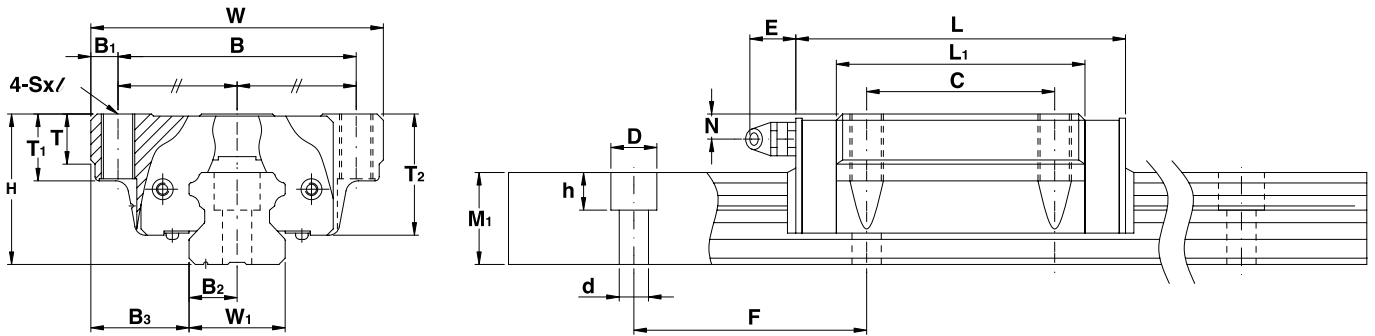
LSK Block Dimensions / mm

Model	Width (W)	Length (L)	Height (H)	B	B ₁	L ₁	C	T	T ₁	T ₂	Sx/	N	E	Grease Fitting
FL 15CC	47	56.2	24	38	4.5	38.2	30	7	11	19.5	M5x 7	4.5	7	M4x0.7P
FL 20CC	63	76.5	30	53	5	50.5	40	9.5	10	24.5	M6x9.5	5	12	M6x1.0P
FL 20HC	63	92.5	30	53	5	66.5	40	9.5	10	24.5	M6x9.5	5	12	M6x1.0P
FL 25CC	70	84	36	57	6.5	58	45	12	16	29.0	M8x12	6	12	M6x1.0P
FL 25HC	70	103	36	57	6.5	77	45	12	16	29.0	M8x12	6	12	M6x1.0P
FL 30CC	90	100.5	42	72	9	70.5	52	12	18	34.0	M10x12	7	12	M6x1.0P
FL 30HC	90	122.5	42	72	9	92.5	52	12	18	34.0	M10x12	7	12	M6x1.0P
FL 35CA	100	105.5	48	82	9	80.5	62	13	21	39.0	M10x21	8	12	M6x1.0P
FL 35HA	100	130.5	48	82	9	105.5	62	13	21	39.0	M10x21	8	12	M6x1.0P



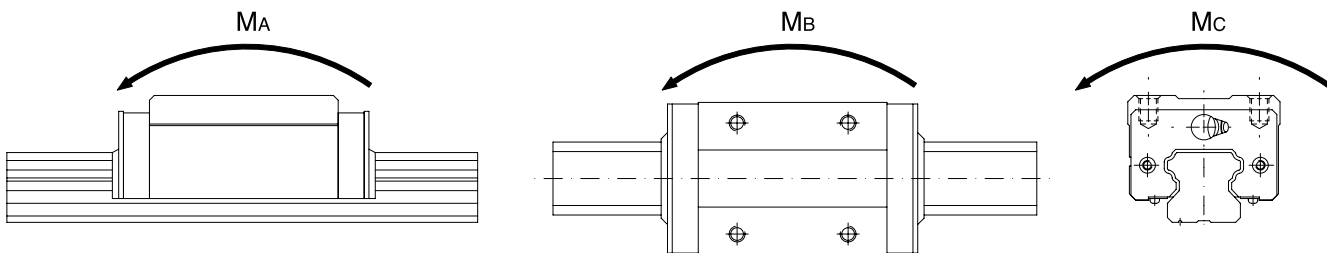
FLANGE MODEL FL-CC,HC

MTA Series Machine Tool Application



LSK Rail Dimensions/ mm

Width (W1)	Height (M1)	Pitch (F)	B2	B3	dxDxh	C kgf	C0 kgf	MA kgf-M	MB kgf-M	MC kgf-M	Block Kg/piece	Rail Kg/M
15	15	60	7.5	16	4.7x7.5x5.5	850	1380	7.3	7.3	10.1	0.2	1.7
20	18	60	10	21.5	6x9.5x8.5	1410	2430	15.9	15.9	23.7	0.35	2.5
20	18	60	10	21.5	6x9.5x8.5	2170	3240	27.5	27.5	31.6	0.47	2.5
23	22	60	11.5	23.5	7x11x9	2030	3510	27.5	27.5	40.0	0.59	3.6
23	22	60	11.5	23.5	7x11x9	2770	4680	46.8	46.8	51.8	0.75	3.6
28	26	80	14	31	9x14x12	2860	4770	43.8	43.8	65.8	1.1	5.1
28	26	80	14	31	9x14x12	3800	6370	74.4	74.4	87.7	1.3	5.1
34	29	80	17	33	9x14x12	3800	6230	65.4	65.4	104.7	1.6	6.9
34	29	80	17	33	9x14x12	5120	8310	111.1	111.1	139.9	2.0	6.9



SQUARE MODEL GL-CA,HA

MTA Series Machine Tool Application



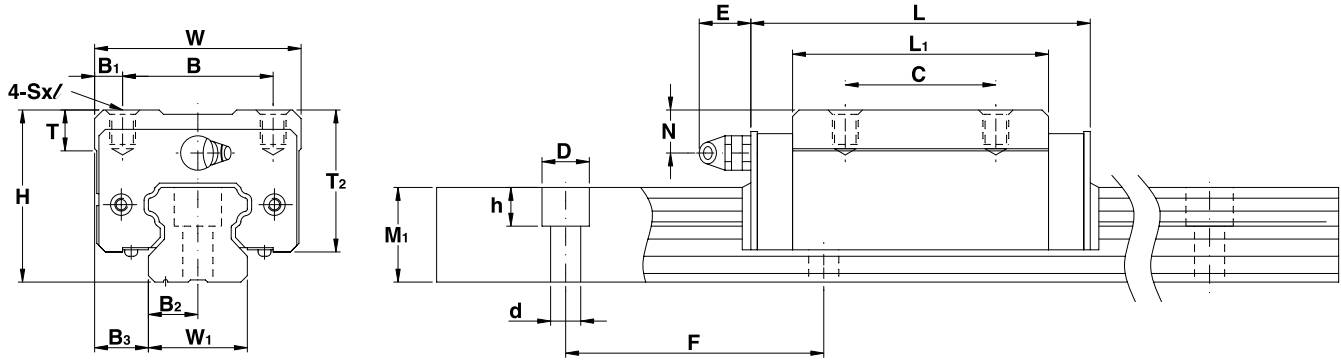
LSK Block Dimensions / mm

Model	Width (W)	Length (L)	Height (H)	B	B ₁	L ₁	C	T	T ₂	Sx/	N	E	Grease Fitting
GL 15CA	34	56.2	28	26	4	38.2	26	6	23.5	M4x5	8.5	7	M4x0.7P
GL 20CA	44	76.5	30	32	6	50.5	36	8	24.5	M5x6	5	12	M6x1.0P
GL 20HA	44	92.5	30	32	6	66.5	50	8	24.5	M5x6	5	12	M6x1.0P
GL 25CA	48	84	40	35	6.5	58	35	12	33.0	M6x8	10	12	M6x1.0P
GL 25HA	48	103	40	35	6.5	77	50	12	33.0	M6x8	10	12	M6x1.0P
GL 30CA	60	100.5	45	40	10	70.5	40	12	37.0	M8x10	10	12	M6x1.0P
GL 30HA	60	122.5	45	40	10	92.5	60	12	37.0	M8x10	10	12	M6x1.0P
GL 35CA	70	105.5	55	50	10	80.5	50	12	46	M8x12	15	12	M6x1.0P
GL 35HA	70	130.5	55	50	10	105.5	72	12	46	M8x12	15	12	M6x1.0P



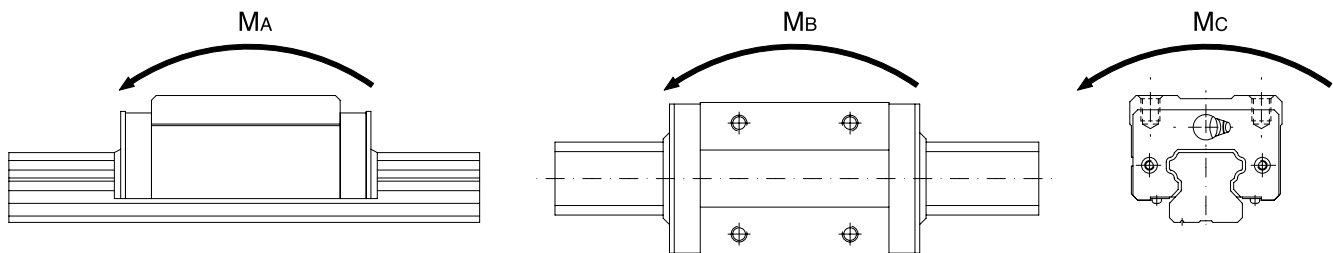
SQUARE MODEL GL-CA,HA

MTA Series Machine Tool Application



LSK Rail Dimensions/ mm

Width (W1)	Height (M1)	Pitch (F)	B2	B3	dxDxh	C kgf	C0 kgf	MA kgf-M	MB kgf-M	MC kgf-M	Block Kg/piece	Rail Kg/M
15	15	60	7.5	9.5	4.7x7.5x5.5	850	1380	7.3	7.3	10.1	0.18	1.7
20	18	60	10	12	6x9.5x8.5	1410	2430	15.9	15.9	23.7	0.25	2.5
20	18	60	10	12	6x9.5x8.5	2170	3240	27.5	27.5	31.6	0.35	2.5
23	22	60	11.5	12.5	7x11x9	2030	3510	27.5	27.5	40.0	0.54	3.6
23	22	60	11.5	12.5	7x11x9	2770	4680	46.8	46.8	51.8	0.67	3.6
28	26	80	14	16	9x14x12	2860	4770	43.8	43.8	65.8	0.9	5.1
28	26	80	14	16	9x14x12	3800	6370	74.4	74.4	87.7	1.1	5.1
34	29	80	17	33	9x14x12	3800	6230	65.4	65.4	104.7	1.6	6.9
34	29	80	17	33	9x14x12	5120	8310	111.1	111.1	139.9	2.0	6.9



FLANGE MODEL FR-TC,SC

INA Series Industrial Application



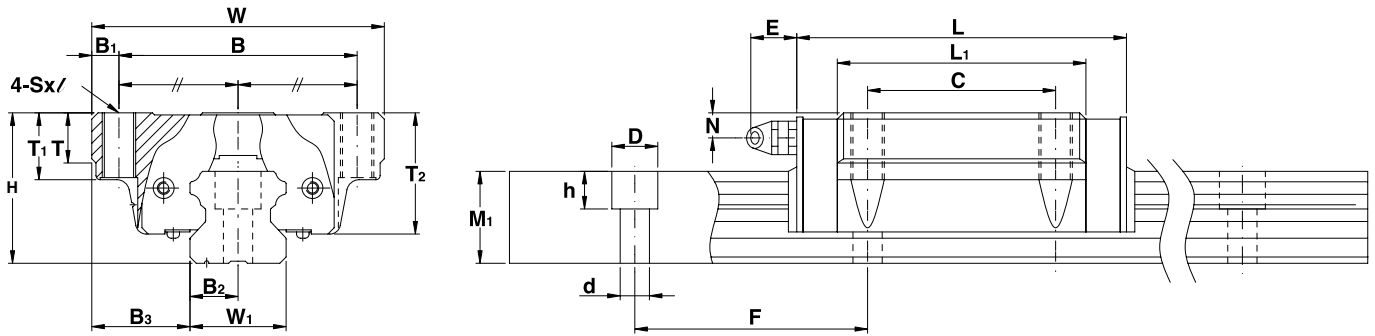
LSK Block Dimensions / mm

Model	Width (W)	Length (L)	Height (H)	B	B ₁	L ₁	C	T	T ₁	T ₂	Sx/	N	E	Grease Fitting
FR 15TC	52	56.2	24	41	5.5	38.2	26	7	11	19.5	M5x 7	4	7	M4x0.7P
FR 15SC	52	39.3	24	41	5.5	21.3	–	7	11	19.5	M5x 7	4	7	M4x0.7P
FR 20TC	59	67.2	28	49	5	47.2	32	9.5	10	22	M6x9.5	4	12	M6x1.0P
FR 20SC	59	47.5	28	49	5	27.5	–	9.5	10	22	M6x9.5	4	12	M6x1.0P



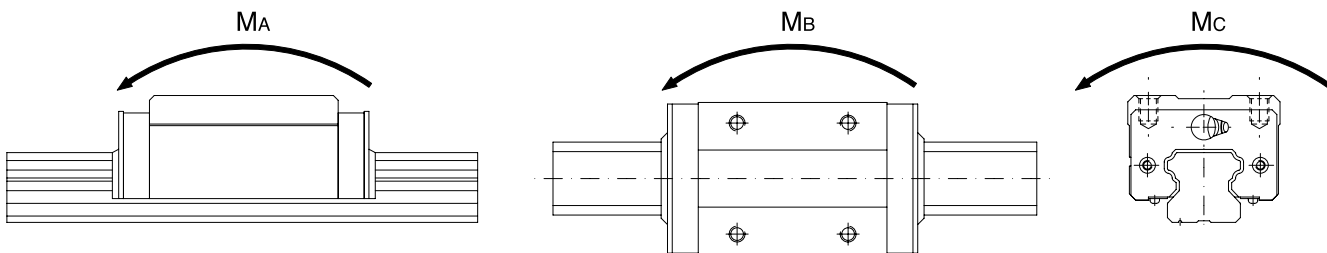
FLANGE MODEL FR-TC,SC

INA Series Industrial Application



LSK Rail Dimensions/ mm

Width (W1)	Height (M1)	Pitch (F)	B2	B3	dxDxh	C kgf	C0 kgf	MA kgf-M	MB kgf-M	MC kgf-M	Block Kg/piece	Rail Kg/M
15	15	60	7.5	18.5	4.7x7.5x5.5	850	1380	7.3	7.3	10.1	0.2	1.7
15	15	60	7.5	18.5	4.7x7.5x5.5	550	1132	2.04	2.04	4.08	0.15	1.7
20	18	60	10	19.5	6x9.5x8.5	1410	2430	15.9	15.9	23.7	0.42	2.5
20	18	60	10	19.5	6x9.5x8.5	730	1468	3.06	2.04	7.14	0.35	2.5



SQUARE MODEL GR-TA,SA

INA Series Industrial Application



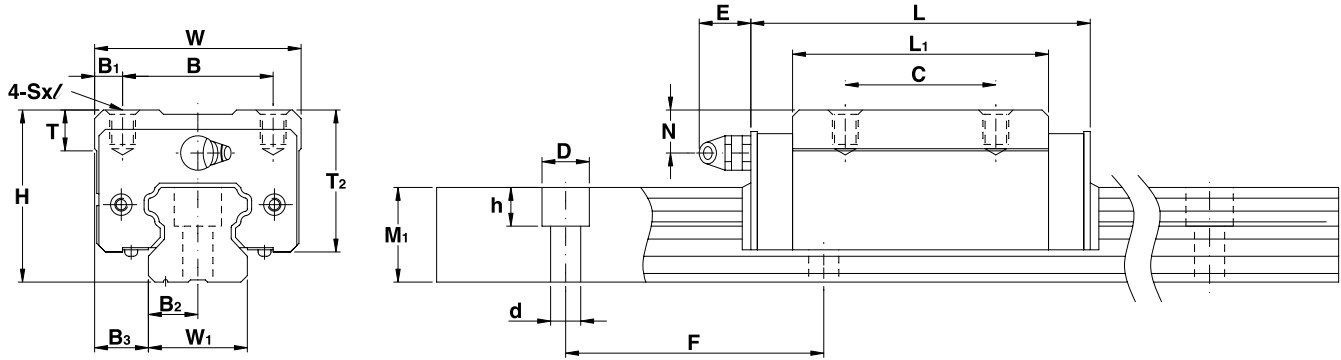
LSK Block Dimensions / mm

Model	Width (W)	Length (L)	Height (H)	B	B1	L1	C	T	T2	Sx/	N	E	Grease Fitting
GR 15TA	34	56.2	24	26	4	38.2	26	6	19.5	M4x5	4	7	M4x0.7P
GR 15SA	34	39.5	24	26	4	21.3	-	6	19.5	M4x5	4	7	M4x0.7P
GR 20TA	42	67.2	28	32	5	47.2	32	7.5	22	M5x6	4	12	M6x1.0P
GR 20SA	42	47.5	28	32	5	27.5	-	7.5	22	M5x6	4	12	M6x1.0P
GR 25TA	48	79.5	33	35	6.5	59.5	35	8	26	M6x8	4.5	12	M6x1.0P
GR 25SA	48	55.0	33	35	6.5	35.0	-	8	26	M6x8	4.5	12	M6x1.0P



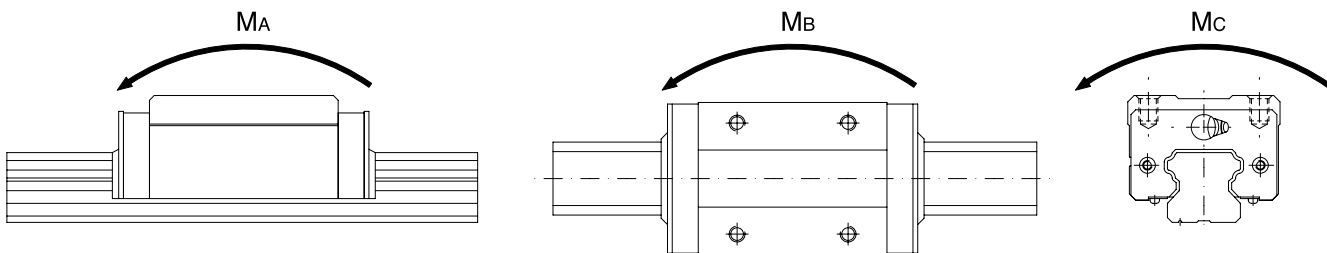
SQUARE MODEL GR-TA,SA

INA Series Industrial Application



LSK Rail Dimensions/ mm

Width (W1)	Height (M1)	Pitch (F)	B ₂	B ₃	dxDxh	C kgf	C ₀ kgf	M _A kgf-M	M _B kgf-M	M _C kgf-M	Block Kg/piece	Rail Kg/M
15	15	60	7.5	9.5	4.7x7.5x5.5	850	1380	7.3	7.3	10.1	0.18	1.7
15	15	60	7.5	9.5	4.7x7.5x5.5	550	1132	2.04	2.04	4.08	0.11	1.7
20	18	60	10	11	6x9.5x8.5	1410	2430	15.9	15.9	23.7	0.25	2.5
20	18	60	10	11	6x9.5x8.5	730	1468	3.06	2.04	7.14	0.23	2.5
23	22	60	11.5	12.5	7x11x9	2030	3510	27.5	27.5	40.0	0.54	3.6
23	22	60	11.5	12.5	7x11x9	1190	2295	5.1	4.08	12.24	0.45	3.6



GENERAL DELIVERY, PAYMENT AND SOFTWARE USE CONDITIONS

I. Area of application

1 The following conditions of sale shall apply to all goods delivery contracts concluded between the purchaser and ourselves. The ordering and acceptance of goods delivered by us shall constitute knowledge and/or confirmation of the customer's agreement with our conditions. These conditions shall apply to all future business relations, even where no further agreement has been expressly concluded. Any conflicting conditions on the part of the purchaser that have not been expressly acknowledged by us shall not be binding, even where we have made no express objection to them. Any such conflicting conditions are hereby expressly repudiated in advance. The following sales conditions shall also apply where we implement customer orders in the knowledge that conflicting or diverging conditions stipulated by the purchaser exist.

2 Any agreement, alteration or arrangement shall be made in writing.

3 Any agreements made between ourselves and the customer and relating to the purchasing contracts shall be confirmed in writing.

II. Quotation and conclusion of contract

1 Purchasing contracts shall be concluded on the basis of a customer purchase order. The acceptance of a purchase order shall be confirmed either by the forwarding of an order confirmation document to the customer or by the delivery of the goods ordered, within a period of two weeks in both cases.

2 Our offers are subject to change and are non-binding, unless expressly stated otherwise. The scope of our responsibilities is established exclusively in our written order confirmation document.

3 Any drawings or illustrations included in our quotation or order confirmation documentation and any information issued with respect to weights or dimensions shall be understood as approximate, unless stated to the contrary.

4 All drawings, illustrations, calculations and other documents, materials, models, patterns and specifications are subject to property, copyright and other trade mark rights. These must be treated as confidential and may not be transferred to any third party without our written permission, irrespective of whether they are accompanied by any comment to that effect.

5 We accept no liability for any printing or calculation errors appearing in our literature or documentation and we shall entertain no claims for damages linked thereto.

6 We reserve the right to make any necessary changes in product construction, technical specifications and performance features, provided they constitute a technical improvement.

III. Prices and payment condition

1 Our prices are based on CIP clause of the Incoterms 2010 of the ICC (carriage and insurance paid to the agreed place of destination in accordance with Point V.1. of these Terms and Conditions) including standard packaging and excluding VAT. Our calculations are made on the day on which the invoice is issued and are shown on the invoice.

2 Delivery shall be made following advance payment of invoice in „Euros“.

3 All orders are based on the prices and price reductions valid at the time of delivery. Discounts shall only apply whereby an agreement to that effect has been made between ourselves and the purchaser. This is a written agreement, which shall also be shown in our order confirmation document.

4 Payment on delivery terms must be expressly agreed in advance. The purchase price is shown as net (with no deduction) with immediate payment by the purchaser following receipt of invoice, provided no other payment arrangements are shown in the order confirmation document. Payment is deemed to be fulfilled when we have access to the funds transferred. Payment by cheque is deemed to be fulfilled once the cheque is cleared and the funds have been transferred to us as credit. We are not bound to accept bills of exchange.

5 Legal provisions shall apply if a purchaser falls into payment arrears.

6 All claims against the purchaser shall immediately become due if the purchaser fails to make a payment on time, breaches any other agreement made with us, or where we have reason to doubt his creditworthiness. We shall also be entitled in such cases to withhold any outstanding deliveries until such time as payment or satisfactory payment assurance has been received, even where agreement has been previously made to the contrary. Following the setting of an appropriate period, we shall also be entitled in such cases to withdraw from the contract and/or to seek damages due to non-fulfilment of contract. We shall also be entitled to waive the purchaser's right to dispose of any goods delivered and, subject to retention of title, to demand their return or transfer at the purchaser's expense and direct debit authorization shall be revoked.

7 The purchaser shall only be entitled to compensation, even where notification of defect or counter claim has been made, where such claims are legally binding, are acknowledged by us or are undisputed. The purchaser shall only be entitled to withhold payment if his counter claims relate to the same contractual relationship.

IV. Delivery and delivery times

1 Delivery dates or periods shall be understood as non-binding provided no express agreement to the contrary has been made. The delivery times specified by us shall only commence once all relevant technical and implementation issues have been resolved.

2 The purchaser shall be obliged to implement all necessary requirements correctly and promptly. The agreed delivery period shall be extended - provided our rights have not been infringed by any purchaser payment arrears - by a period equal to the payment backlog that the purchaser has on the

given (or any other) account. This shall also apply when a fixed delivery date has been agreed.

3 In the case of purchase contracts based on fixed date delivery as stipulated in Art. 286 Para. 2 No. 4 of the German Civil Code or Art. 376 of the German Commercial Code, we accept liability in accordance with current statutory provisions. The same shall apply where the purchaser, following delayed delivery for which we are responsible, is entitled to discontinue his interest in the further fulfillment of the contract. In this case, our liability shall be limited to foreseeable, typically-occurring damage. No liability limitations shall apply where delayed delivery is related to any breach of contractual conditions caused by our representatives or associates.

We also accept liability in accordance with current statutory provisions for any negligence in respect of contractual conditions caused by our representatives or agents. Where delayed delivery is not related to any breach of contractual conditions, our liability shall be limited to foreseeable, typically-occurring damage.

4 Where delayed delivery relates to a breach of contractual conditions caused by our representatives or agents, we accept liability in accordance with current statutory provisions, provided that compensation liability is restricted to foreseeable, typically-occurring damage.

5 In the event of delayed delivery for which we are responsible, the purchaser shall be entitled, for each full week of non-delivery, to a one-off compensation payment of 0.5% of the value of the delivery (valid to a maximum of 5 %).

6 We shall accept no additional liability for delay in delivery. Any further legal claims or purchaser rights above and beyond those relating to damage compensation and made in respect of delays in delivery for which we are responsible shall remain unaffected.

7 We shall be entitled to make partial delivery at any time, provided this is acceptable to the customer.

8 Delivery times are considered as fulfilled if the goods have been dispatched from our factory on time.

9 Under the onset of any conditions beyond our control, we shall be entitled to reschedule delivery or retire from any delivery contract, non-fulfilment notwithstanding. Conditions beyond our control shall be taken to mean strikes, lock-outs or any other conditions that hinder delivery or make delivery impossible, irrespective of whether the said conditions affect us directly or affect our suppliers. The purchaser shall be entitled to receive a declaration from us, as to whether we continue to deliver within a set period or retire from the delivery contract. In the absence of any such declaration, the purchaser himself shall be entitled to withdraw from the contract.

10 In the event of delays in acceptance on the part of the purchaser, we shall be entitled to claim compensation for any damage incurred and any additional expenditure. The same shall apply where the purchaser culpably infringes any obligation to cooperate. In the event of delays in acceptance and debtor default, the risk of accidental deterioration or loss of the goods shall transfer to the purchaser.

V. Transfer of risk - shipment/packaging - delivery

1 Delivery shall be implemented by CIP clause in accordance with Incoterms 2010 of the ICC for:

-- standard domestic deliveries or deliveries to EU countries to agreed delivery address (place of destination)

-- standard deliveries to third party countries to the customs departments of ports and airports as agreed places of destination

We reserve the right to make a surcharge for express shipment and shipment by air.

2 The risk is transferred to the customer with the delivery of the goods to the first forwarding agent or carrier, at the latest however on leaving the factory or warehouse.

3 With regard to deliveries involving goods to be installed or assembled at the purchaser's premises, risk shall transfer on the day on which the goods are commissioned into use, or at the end of a given trial period where the said period has been agreed beforehand. In the event of any delay occurring during shipment or delivery to the purchaser, any delay in the commencement or implementation of installation or assembly, any delay in commissioning or testing at the purchaser's premises or, where any delay occurs for whatever reason in the acceptance of the goods by the purchaser, risk shall be considered to have already transferred to the purchaser at the moment the goods were made available to him.

4 In accordance with packaging regulations and with the exception of pallets, we will not accept the return of any packaging used for transportation or any other purpose. The purchaser shall be responsible for the proper disposal of any packaging delivered.

5 Where shipment is delayed at the request of the purchaser, or occurs due to his negligence, any subsequent warehousing costs and risks shall be the responsibility of the purchaser. The same shall apply in the case of notification of readiness for shipment.

6 With regard to the delivery of customer orders, the minimum order values shall be 50 EUROS (domestic) and 250 EUROS (abroad). These costs do not include VAT. The preparation costs for small deliveries below the minimum value for delivery within Germany shall be 50 EUROS (excluding VAT). These costs do not include postage and packing. We are unable to ship orders below the above-stated minimum value to addresses outside Germany.

7 Special orders, including goods ordered in quantities or with dimensions not stated in our catalogue, must be made in writing by the purchaser. Such orders may be subject to an agreed advance payment. Where one-off production orders in very large quantities are accepted by us, we reserve the

right to deliver the goods with an appropriate quantity margin (normally $\pm 10\%$). Packaging charges are, as a general rule, calculated in accordance with manufacturing costs.

VI. Guarantee / liability

1 In contractual relationships with registered traders, we guarantee our products defect free for a period of one year from arriving at the place of destination in accordance with V.1 of these Terms.

2 Milling spindles and other consumables are guaranteed defect free for a period of 6 months. This 6-month guarantee period also applies to milling spindles already integrated into machine systems.

3 The technical advice we give is based on the best of our knowledge. However, we accept no liability for any information relating to the suitability and application of our goods and the purchaser is not exempt from the responsibility of conducting his own calculations, tests and trials. The purchaser shall be solely responsible for complying with any statutory provisions and regulations applying to the use of the goods. Liability with regard to the suitability of our goods for any given application shall only be accepted where previously expressed in writing.

4 We accept liability for material defects, excluding any further claims - subject to the following provisions and those given under VIII. and IX - as follows:

5 Any claims relating to defects submitted by the purchaser as registered trader shall only be upheld if the purchaser has properly carried out the necessary inspection and has fulfilled notification obligations in accordance with Article 377 of the German Commercial Code. Other purchasers shall forward their complaints to us in writing within 10 days of receipt of the goods. With regard to business with non-trade personnel, this shall only apply where the defects are apparent. Complaints shall only be considered where the goods are still in „as delivered“ condition.

6 With regard to justified complaints relating to defects we shall be entitled, in excluding purchaser rights, to withdraw from the contract, to reduce the sales price or to honour our supplementary performance obligations unless, in accordance with statutory provisions, we are justified in refusing to honour our supplementary performance obligations. The purchaser shall allow us a reasonable period in which to provide supplementary performance. With regard to supplementary performance, we shall be entitled to choose whether to correct the defect (rectification) or deliver replacement goods. If we choose to correct the defect, we shall bear any costs (provided these do not increase) incurred due to the object of agreement being located at a location other than the delivery address. In the event of our failure to provide this supplementary performance, the purchaser shall be entitled to choose either a reduction in the purchase price or withdrawal from the contract. Supplementary performance is deemed to have failed following a second unsuccessful attempt, unless further supplementary performance attempts are appropriate and acceptable to the purchaser on the basis of the object of agreement. Claims for damage compensation under the following conditions and with regard to defects may only be issued by the purchaser after supplementary performance is deemed to have failed. The purchaser's right to claim damage compensation shall remain unaffected under the following conditions.

7 Goods may only be returned to us with our consent. Goods shall be returned in their original packaging or in packaging of similar value. The purchaser shall bear the full costs of shipment. Compensation shall only be made where the defect complaint is deemed justified. Where the customer allows us to test the goods and a defect is discovered, we accept liability; where no defect is found, we shall be entitled to issue a charge for each component tested.

8 Warranty claims may be lodged by the purchaser up to one year after the goods are delivered, except in the case where we have knowingly hidden the fault, whereby statutory provisions shall apply. Our responsibilities, as stipulated in Section VI, 9 and Section VI, 10 shall in this case remain unaffected.

9 We are required in accordance with current legal provisions to accept the return of new goods delivered or to reduce the purchase price without the setting of any requisite period if the purchaser's customer, as the end user of the new goods (sale of consumer goods), demands the return of the goods or a price reduction from the purchaser due to a defect or asserts a claim for recourse against the purchaser. In this case, we shall also be liable for compensating the purchaser's expenses, including transportation, travel, labour and material, incurred with respect to the end user due to the replacement of the defective goods on the basis of transfer of risk from us to the purchaser. No claim made by the purchaser with regard to defect shall be supported, where the purchaser has failed to carry out the inspection and to fulfill notification obligations in accordance with Article 377 of the German Commercial Code.

10 No liability under Section VI, 9 shall be accepted where the defect relates to any advertising slogan or any contractual agreements not originating with us, or where the purchaser himself affords the end user any special guarantees. Liability shall also be denied where, based on statutory provisions, the purchaser himself has no warranty obligations in respect of the end user or where the complaints have not been made in respect of any claim made by him. The above shall also apply, where the purchaser has afforded the end user guarantees above and beyond the legal limit.

11 We shall be liable, independent of the following liability limitations and in accordance with the statutory provisions covering loss of life, bodily injury and damage to health caused by the deliberate or negligent actions of ourselves, our legal representatives or our agents, as well as for any

damage covered by the German Product Liability Act. We shall be liable in accordance with statutory provisions for any damage not included in Clause 1 caused by the deliberate act, gross negligence or due to any breach of contract committed by us, our legal representatives or our agents. In this case, compensation liability shall be limited to foreseeable, typically-occurring damage, in so far as we, our legal representatives and our agents are not deemed to have acted wilfully. We shall also be liable in the context of this warranty and in respect of the goods or their components for the properties and/or life span guarantees we have given. We shall only be liable for damage relating to defects affecting the guaranteed quality or life span, but not directly relating to the goods themselves, where the risk of such damage is apparent from the quality and life span warranty.

12 No further liability will be accepted without examination of the claims made; this shall apply in particular to tort claims or claims for the compensation of wasted expenses in lieu of performance; our liability as stipulated in Section IV, 6 - Section 6, 10 of this contract shall remain unaffected. Where our liability is limited or excluded, the same shall also apply to that of our employees, sub-contractors, representatives and agents.

13 Purchaser claims for defect damage compensation shall lapse one year after initial delivery of the goods. This shall not apply where we, our legal representatives or our agents are responsible for loss of life, bodily injury or damage to health or where we or our legal representatives have acted wilfully or negligently, or where our vicarious agents have acted wilfully.

14 In general, we accept no liability for any damage resulting from the following: incorrect or inappropriate use or storage, faulty installation by the customer or by a third party, damage resulting from the customer's own attempts at servicing or modification, natural instances of wear, faulty or negligent handling, chemical attack, electrical faults, etc. over which we have no control, or damage resulting from improper use or the failure to comply with operating instructions or information sheets. Furthermore, our warranty conditions shall not apply where the customer or a third party makes any modification without prior written approval from us and without justification (any delay on our part in the removal of defects), especially where such modifications relate to controls / software and even where the fault appears in an unmodified component.

15 In the event that use of the delivered goods infringes German Copyright or Trade Mark Law, we will bear the costs of either providing the customer with the respective rights or of modifying the goods in a way acceptable to the customer, such that no further breach of copyright law exists. Where it is not possible to restore appropriate commercial conditions within an acceptable period, the customer shall be entitled to withdraw from the contract. Under these conditions, we also reserve the right to withdraw from the said contractual obligations. In addition thereto, we will exempt the customer from any incontestable or legally established claims.

16 Our acceptance of liability shall be subject to current statutory provisions governing liability for infringements of copyright and trade mark law. Any liability under Article 15 shall only be accepted by us provided the customer immediately notifies us of the infringement of any copyright or trade mark law, provided he supports us to a reasonable extent in the defence of any claims made or allows us to make any relevant modification, provided all defensive measures, including extra-judicial provisions, are available to us, provided not based on the customer's instruction and where there has been no breach of the law and provided the customer has made no modification to the delivered goods or used them in any way contrary to the provisions of the contract.

VII. Repairs and the return of goods

1 When requested, the purchaser shall be provided with cost estimates prior to any repair being undertaken. All costs relating to shipment and packaging shall be borne by the purchaser. Invoices for repair work shall be paid in full, with no deductions and immediately upon receipt. All repairs, including those made under warranty shall, under normal circumstances, be carried out in our repair facility, unless agreed to the contrary in writing.

2 Delivered goods will only be taken back with our consent and once any relevant fees have been agreed. Under normal circumstances, we will not accept the return of any specially-prepared goods or software! Goods dispatched or returned must always be accompanied by delivery documents or copies of invoice. The costs of returning goods shall be borne by the purchaser under „free to door“ conditions.

VIII. Assembly

1 Installation work will be charged separately unless agreed to the contrary in writing. Installation costs shall include travel costs and accommodation allowances, as well as the normal rates of payment for the work including supplements for overtime, night work, work carried out on Sundays and holidays and work carried out under difficult conditions, as well as for planning and commissioning.

2 We shall invoice for all costs incurred in respect of preparatory work, travel, waiting times and commuting time. The customer shall compensate us for any further waiting time, travelling time and travelling costs incurred due to any delay in the starting or final commissioning of the said works, where the causes of such delays are beyond our control.

3 The customer shall bear all costs relating to the provision of any necessary auxiliary personnel and shall ensure that any tools needed are available in the required quantities. The customer shall also ensure the provision of suitably-sized, dry premises for the storage of machinery parts, apparatus, materials, tools, etc. The customer shall take appropriate measures to protect our property and that of our service personnel, equal to those he would

take for the protection of his own property. Where the customer's operating conditions require the use of special clothing or protective equipment, he shall ensure that these are made available to our service personnel.

4 Our service personnel and auxiliary staff shall not be required to undertake any tasks not directly related to the implementation of our delivery and installation duties, unless prior agreement has been reached with us. Where such tasks are agreed, we accept no liability for any works implemented by our personnel beyond the scope of our contractual responsibilities. Any installation works carried out by the customer, or by any third party commissioned by him, must meet our current operating and installation requirements.

IX. Software, software use and additional guarantee and defect claims

1 With regard to any software supplied by us and all documentation belonging thereto, the customer shall be provided, in return for payment, with a non-expiring, non-exclusive, non-transferable user rights on an established or, in certain cases, yet to be specified hardware product. We shall remain the owner of the copyright and all associated trade marks. Any entitlement to produce copies shall be granted solely for the purposes of securing data. Copyright information must not be removed.

2 Instructions for installation and commissioning shall be supplied by us in a printed format together with safety advice relating to your software. All other documentation shall be supplied exclusively by us, in a software data format. Following the release of new software, all necessary software data relevant to the release will be sent together with the new software. Furthermore, we reserve the right to deliver such documentation in the form of online help or online documentation.

3 Transfer to any third party may only be effected subject to our prior written consent. Acknowledgement of this condition must be obtained prior to the transfer of software to a third party. No modifications shall be permitted.

4 Each and every infringement of these provisions shall be subject to a penalty amounting to 10 times the total value of the customer order. Any entitlement to further claims for compensation shall remain unaffected. Contractual penalties shall be levied separately and in addition to any potential further claims for damage compensation. The customer shall be entitled to provide evidence in support of any claim of reduced or negligible damage. The software and all documentation belonging thereto shall, in this case, be returned to us.

5 These conditions shall not apply to exclusive, customer-specific software developed and provided to meet individual customer requirements. Under the contract-related provision of control software, developed by us using modular multi-application software components (standard software modules), these are to be fitted and adapted in accordance with customer-specific and contractual performance requirements (customer-specific applications program).

6 On payment of the full purchase price for the customer-specific application program, we shall provide the customer with exclusive, spatially- and temporally-unrestricted user rights. The customer will not be afforded any rights with regard to the standard software module on which the customer-specific adaptations are based, irrespective of the type of module.

7 We shall be entitled, irrespective of these provisions and on the basis of other customer orders, to prepare and offer for sale the resulting customer-specific software solutions developed. We shall in each and every case retain non-exclusive user rights to customer-specific solutions for internal operational purposes.

8 Subject to the provisions in VI, we undertake the guarantee for the correct duplication of our software. Our software is designed to run on hardware products specified by us. Our warranty obligations shall be fulfilled through the delivery of replacement parts. We undertake no guarantee for the fault-free operation of the software or its data structure, unless we have agreed to the contrary in writing. Regarding customer-specific software, we guarantee compliance with the specific function and performance features outlined in the operational specifications, the order confirmation document and the established function / operating sequence documentation. We accept no liability for the fault-free functioning of programs in all the customer's planned applications and, in particular, with regard to any applications not mentioned or tested at the time of program creation / acceptance.

X. Retention of title

1 The goods delivered (goods subject to the retention of title) shall remain our property until such time as all debts, including all current account balance claims, accrued by the purchaser both now and in the future, have been paid in full. In the event of any infringement of contractual conditions on the part of the purchaser, e.g. payment arrears, we shall be entitled, after setting and upon culmination of a reasonable period, to repossess goods subject to the retention of title. The repossession of goods subject to the retention of title shall constitute our withdrawal from the contract. The seizure of goods subject to the retention of title by us shall constitute our withdrawal from the contract. Following repossession, we shall be entitled to dispose of goods subject to the retention of title. Following the deduction of an appropriate amount for the costs of the disposal, the proceeds from the disposal shall be deducted from the outstanding amounts owed to us by the purchaser.

2 The purchaser shall be responsible for the proper handling of goods subject to the retention of title and shall insure these at his own expense to their full value against damage by fire, water and theft. The costs of inspecting and servicing the goods at their appropriate intervals shall be borne by the purchaser.

3 The purchaser shall be entitled to use and/or dispose of goods subject to the retention of title in the course of his normal business activities, pro-

vided he is not in payment arrears. Pawning or chattel mortgaging shall not be permitted. Any existing claims (including all current account balance claims) with respect to goods subject to the retention of title arising due to resale or for other legal reasons (insurance, tort) shall be assigned by the purchaser by way of security and in their entirety to us; we hereby accept assignment. The purchaser has our (revocable) authorisation to collect the claims assigned to us for his invoices in his own name. We reserve the right to revoke authorisation at any time, should the purchaser not be able to meet his payment obligations. The purchaser shall not be entitled to assign the claim even for the purposes of collecting the debts by way of factoring, unless an obligation is simultaneously imposed on the factor to transfer the collected amounts directly to us, provided we still have outstanding claims against the purchaser.

4 Any processing or modification of goods subject to the retention of title shall be carried out on our behalf. Where goods subject to the retention of title are modified using items not belonging to us, we shall become co-owners of the new commodity in the ratio of the value of the goods subject to the retention of title (total amount of invoice including VAT) to the other items used, at the time of modification. The same shall apply to the processing of new products created as applies to goods subject to the retention of title. In the case of an inseparable mix of goods subject to retention of title and items not belonging to us, we shall become co-owners of the new commodity in the ratio of the value of the goods subject to retention of title (total amount of invoice including VAT) to the other items used, at the time of creation of the mix. Where the purchaser's item is the major component of the mix, the purchaser shall agree to assign co-ownership to us on a proportional basis; we hereby accept the assignment. The purchaser shall ensure that a record of sole- and co-ownership on a single item is kept on our behalf.

5 Where a third party gains access to goods subject to retention of title and in particular to pledged goods, the purchaser shall provide notification of our ownership and shall notify us immediately, so that we can assert our rights of ownership. Where the third party is unable to compensate us for the in-court and out-of-court costs incurred in respect thereof, liability shall fall to the purchaser.

6 We undertake to release the securities due to us in so far as their value exceeds the claims to be secured by more than 10%, the choice being ours as to which securities to release.

XI. Applicable law, court of jurisdiction and location

1 All legal relationships between the parties are exclusively subject to German law, to the exclusion of the United Nations Convention on Contracts for the International Sales of Goods, unless if the buyer has its usual place of residence or abode abroad or delivery is being made abroad. The same applies if the buyer transfers their usual residence to another country at a later time or is unavailable.

2 If you do not have a place of residency in Germany at the time of ordering or you move your place of residency to another country following the conclusion of the contract or your place of residency is not known at the time that a claim is made, legal jurisdiction for all disputes arising from and in relation to the contractual relationship is Fulda.

3 If the customer is a merchant under the provisions of paragraph 1 section 1 of the Commercial Code (Handelsgesetzbuch, HGB), a legal person under public law or a special fund under public law, the courts in Fulda will be exclusively responsible for all disputes arising from or in connection with the relevant contractual relationship. In all other cases the customer or we are permitted to bring claims before any court that is legally cognisant.

4 Should individual provisions of this contract be wholly or partly invalid or void then the validity of the rest of the contract will not be affected. The parties undertake to replace the invalid or void provision with a valid provision that is closest to the intended commercial purpose. The same applies in cases of gaps. Changes and amendments to these General Conditions must be agreed in writing. The suspension of this requirement of the written form must also be made in writing.

