
**Passenger lifts and service lifts — Guide
rails for lift cars and counterweights —
T-type**

*Ascenseurs et monte-charges — Guides de cabine et de contrepoids —
Profils en T*



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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 7465 was prepared by Technical Committee ISO/TC 178, *Lifts, escalators and moving walks*.

This fourth edition cancels and replaces the third edition (ISO 7465:2001), which has been technically revised.

Passenger lifts and service lifts — Guide rails for lift cars and counterweights — T-type

1 Scope

This International Standard specifies the grades and quality, the dimensional characteristics, the dimensional and geometrical tolerances, and the surface finish of standardized guide rails and their fishplates.

In addition, this International Standard defines a designation system for guide rails.

This International Standard is applicable to guide rails used in passenger lift and service lift installations to provide guiding for the car and the counterweight.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 1302, *Geometrical Product Specifications (GPS) — Indication of surface texture in technical product documentation*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

guide rails

components that provide guiding for the car or the counterweight

3.2

fishplate

piece of steel used to connect the guides

4 Symbols and units

See Table 1.

Table 1 — Symbols and corresponding units of measurement used in this International Standard

Symbol	Dimension	Unit
b_1	Guide rail width	mm
b_2	Fishplate width	mm
b_3	Distance between the axes of the holes (in the transverse direction of the guide and of the fishplate)	mm
c	Width of the connecting part of the foot to the blade	mm
d	Hole diameter	mm
d_1	Countersink diameter	mm
e	Distance from the rear surface to the centre of gravity of the guide rail	cm
f	Foot depth at its connection with the blade	mm
g	Foot depth at its extremity in a transverse plane	mm
h	Guide height at the level of the machined surface for the location of the fishplate	mm
h_1	Guide rail height (for cold-drawn guide rail or on non-machined surface)	mm
I_{x-x}	Moment of inertia of the cross-sectional area of the guide rail related to the x-x axis	cm ⁴
I_{y-y}	Moment of inertia of the cross-sectional area of the guide rail related to the y-y axis	cm ⁴
i_{x-x}	Radius of gyration corresponding to the x-x axis	cm
i_{y-y}	Radius of gyration corresponding to the y-y axis	cm
k	Blade width	mm
l	Machined surface length for the location of the fishplate	mm
l_1	Fishplate length	mm
l_{2g}	Distance, in the guide rail longitudinal direction, between the axis of the farthest holes from the end of the guide rail and this end	mm
l_{2f}	Distance, in the fishplate longitudinal direction, between the axis of the farthest holes from the transverse axis of the fishplate and this axis	mm
l_{3g}	Distance, in the guide rail longitudinal direction, between the axis of the nearest holes to the end of the guide rail and this end	mm
l_{3f}	Distance, in the fishplate longitudinal direction, between the axis of the nearest holes to the transverse axis of the fishplate and this axis	mm
l_g	Length of the guide rail	mm
l_m	Maximum length for the junction area between the machined surface for the fishplate and the non-machined surface	mm
m_1	Width of the keyway for the junction of the guide rails	mm
m_2	Width of the key for the junction of the guide rails	mm
n	Blade height	mm
p	Foot depth (in the case of a flat foot)	mm
q_1	Linear density for a finished guide rail	kg/m

Table 1 (continued)

Symbol	Dimension	Unit
Ra	Surface roughness (see ISO 1302)	μm
r_s	Foot radius	mm
S	Cross-sectional area of the guide rail	cm^2
t_n	t_1 to t_n : Tolerances for geometrical dimensions	mm
u_1	Depth of the keyway for the junction of the guides rails	mm
u_2	Length of the key for the junction of the guides rails	mm
v	Fishplate thickness (when machined)	mm
W_{x-x}	Cross-sectional area modulus related to the x-x axis	cm^3
W_{y-y}	Cross-sectional area modulus related to the y-y axis	cm^3

5 Manufacture and materials

Guide rails may be cold drawn or machined. In this International Standard, the manufacturing process for each type of guide is indicated by the symbol /A for “cold drawn”, the symbol /B for “machined”, and the symbol /BE for “machined high quality”.

The tensile strength of the raw material used (steel) shall be at least 370 N/mm^2 and not more than 520 N/mm^2 . For this purpose, it is recommended to use steel grade E 235 B for cold-drawn guide rails and steel grade E 275 B for machined guides, in accordance with ISO 630:1995.

6 Guide rails

6.1 Designation

Guide rails complying with the requirements of this International Standard shall be designated as follows:

- 1st element: Number of this International Standard, followed by a hyphen: ISO 7465-;
- 2nd element: Guide rail shape: T;
- 3rd element: Rounded value of the foot width with, if necessary, the number of the variant for different profiles with the same foot width: 45; 50; 70; 75; 78; 82; 89; 90; 114; 125; 127-1; 127-2; 140-1; 140-2; 140-3;
- 4th element: Manufacturing process:
 - cold drawn: /A;
 - machined: /B;
 - machined high quality types: /BE.

EXAMPLE 1 Lift guide rail ISO 7465-T82/A.

EXAMPLE 2 Lift guide rail ISO 7465-T125/BE.

EXAMPLE 3 Lift guide rail ISO 7465-T140-1/B.

6.2 Dimensional characteristics and tolerances

6.2.1 Length

The length of the guide rail shall be indicated in millimetres, with a tolerance of ± 2 mm. It is recommended to supply bars of 5 000 mm length.

6.2.2 Dimensions

See Tables 2 to 7.

Two series of dimensions are proposed:

- preferred dimensions, designated without round brackets;

EXAMPLE T82/A.

- non-preferred dimensions, designated within round brackets.

EXAMPLE (T89/A).

Guide rails with other dimensions can be delivered on specific agreement between the guide rails manufacturer and the customer.

6.2.2.1 Cold-drawn, parallel foot-and-blade flange guide rail

See Figure 1 and Tables 2 and 3.

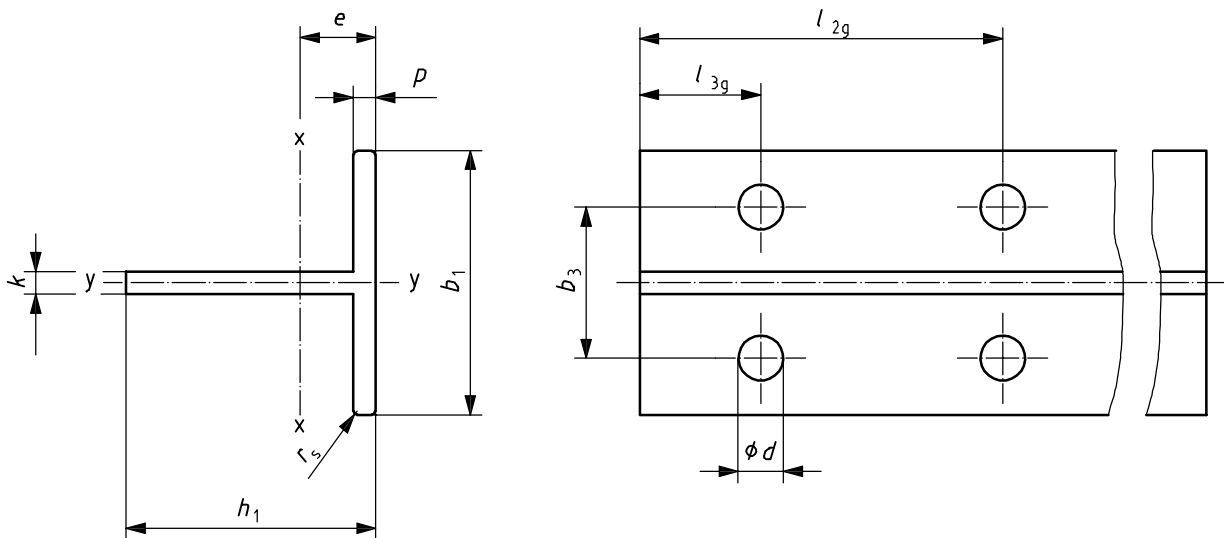


Figure 1 — Cold-drawn, parallel foot-and-blade flange guide rail

Table 2 — Technical characteristics of cold-drawn, parallel foot-and-blade flange guide rails
(see Figure 1)

Designation	<i>S</i>	<i>q</i> ₁	<i>e</i>	<i>I</i> _{x-x}	<i>W</i> _{x-x}	<i>i</i> _{x-x}	<i>I</i> _{y-y}	<i>W</i> _{y-y}	<i>i</i> _{y-y}
	cm ²	kg/m	cm	cm ⁴	cm ³	cm	cm ⁴	cm ³	cm
(T45/A)	4,25	3,34	1,31	8,08	2,53	1,38	3,84	1,71	0,95
T50/A	4,75	3,73	1,43	11,24	3,15	1,54	5,25	2,1	1,05

Table 3 — Dimensions and tolerances of cold-drawn, parallel foot-and-blade flange guide rails
(see Figure 1)

Dimensions in millimetres

Designation	b_1	h_1	k	p	r_s	l_{2g}	l_{3g}	d	b_3
(T45/A)	45	45	5	5	1	65	15	9	25
T50/A	50	50	5	5	1	75	25	9	30
Tolerances	± 1	$\pm 0,2$	$\pm 0,15$	$\pm 0,5$	—	$\pm 0,2$	$\pm 0,2$	—	$\pm 0,2$

NOTE Dimensions l_{2g} , l_{3g} , d , b_3 are identical to and have the same tolerances as fishplate dimensions l_{2f} , l_{3f} , d , b_3 .

6.2.2.2 Cold-drawn, inclined-foot flange guide rail

See Figure 2 and Tables 4 and 5.

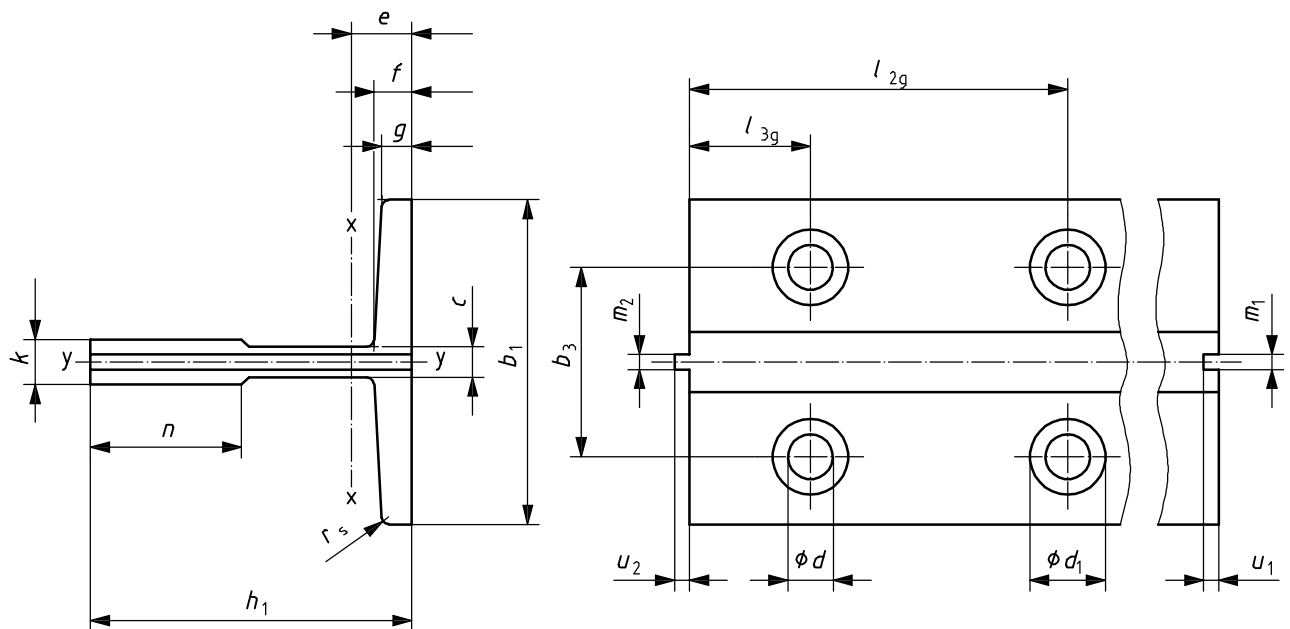


Figure 2 — Cold-drawn, inclined-foot flange guide rail

Table 4 — Technical characteristics of cold-drawn, inclined-foot flange guide rails
(see Figure 2)

Designation	S	q_1	e	I_{x-x}	W_{x-x}	i_{x-x}	I_{y-y}	W_{y-y}	i_{y-y}
	cm ²	kg/m	cm	cm ⁴	cm ³	cm	cm ⁴	cm ³	cm
T70/A	9,400	7,379	2,034	40,95	9,169	2,087	18,86	5,389	1,417
(T75/A)	10,91	8,564	1,861	40,29	9,286	1,921	26,47	7,060	1,557
T82/A	10,91	8,564	1,998	49,31	10,27	2,126	30,17	7,358	1,663
(T89/A)	15,77	12,38	2,032	59,83	14,35	1,948	52,41	11,78	1,823
(T90/A)	17,25	13,54	2,612	102,00	20,86	2,431	52,48	11,66	1,744

Table 5 — Dimensions and tolerances of cold-drawn, inclined-foot flange guide rails (see Figure 2)

Dimensions in millimetres

Designation	b_1	h_1	k	n	c	f	g	m_1	m_2	u_1	u_2	d	d_1	b_3	l_{2g}	l_{3g}	r_s
T70/A	70	65	9	34	6	8	6	3,00	2,97	3,50	3,00	13	26	42	105	25	1,5
(T75/A)	75	62	10	30	8	9	7	3,00	2,97	3,50	3,00	13	26	42	105	25	1,5
T82/A	82	68	9	34	7,5	8,25	6	3,00	2,97	3,50	3,00	13	26	50,8	81	27	3
(T89/A)	89	62	16	34	10	11,1	7,9	6,40	6,37	7,14	6,35	13	26	57,2	114,3	38,1	3
(T90/A)	90	75	16	42	10	10	8	6,40	6,37	7,14	6,35	13	26	57,2	114,3	38,1	4
Tolerances	$\pm 1,5$	$\pm 0,1$	$\begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} +3 \\ 0 \end{smallmatrix}$	—	$\pm 0,75$	$\pm 0,75$	$\begin{smallmatrix} +0,06 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0,06 \end{smallmatrix}$	$\pm 0,10$	$\pm 0,10$	—	—	$\pm 0,2$	$\pm 0,2$	$\pm 0,2$	—
NOTE Dimensions l_{2g} , l_{3g} , d , b_3 are identical to and have the same tolerances as fishplate dimensions l_{2f} , l_{3f} , d , b_3 .																	

6.2.2.3 Machined guide rail

See Figure 3 and Tables 6 and 7.

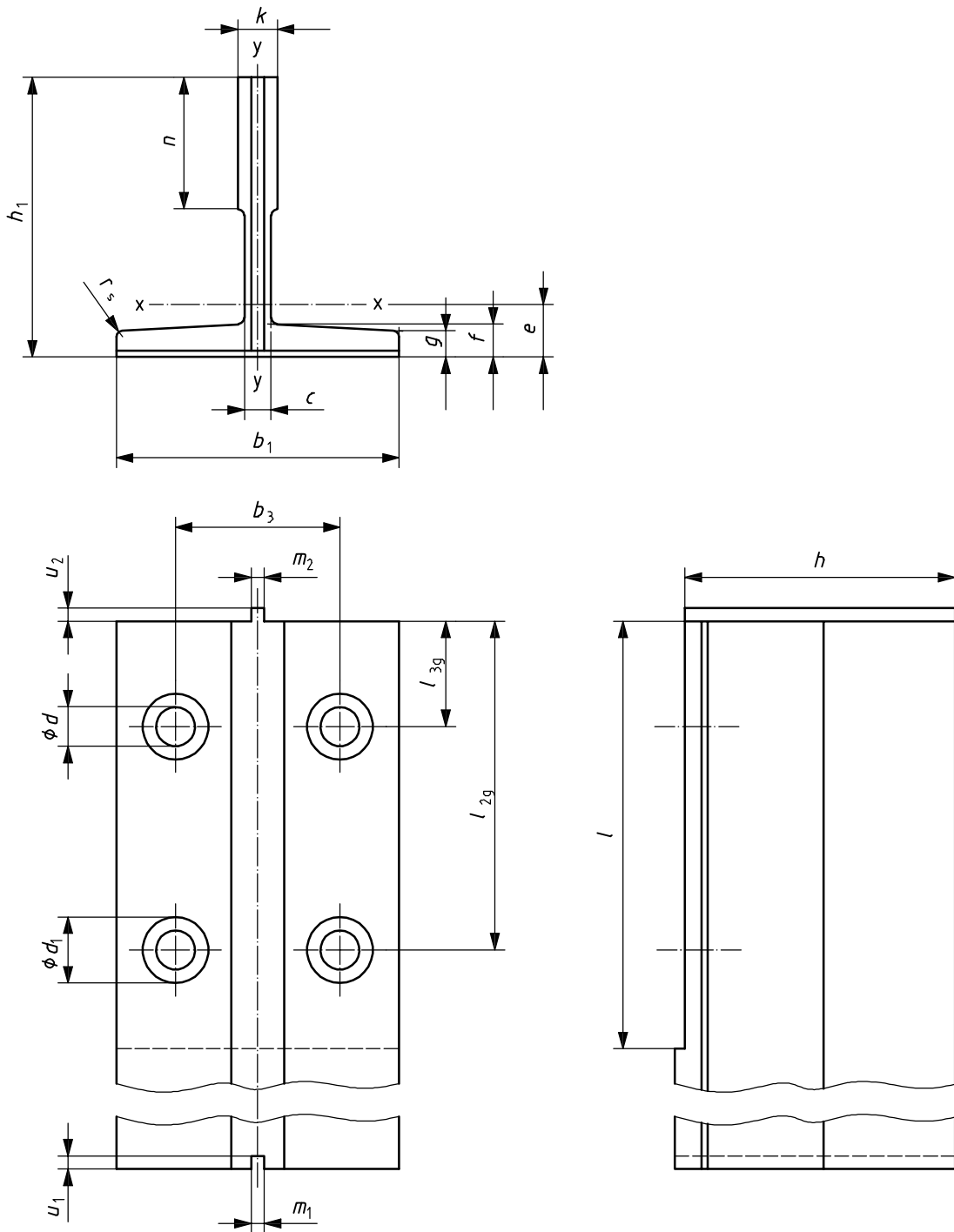


Figure 3 — Machined guide rail

Table 6 — Technical characteristics for machined guide rails (see Figure 3)

Designation	S	q_1	e	I_{x-x}	W_{x-x}	i_{x-x}	I_{y-y}	W_{y-y}	i_{y-y}
	cm ²	kg/m	cm	cm ⁴	cm ³	cm	cm ⁴	cm ³	cm
(T75/B)	10,91	8,564	1,861	40,29	9,286	1,921	26,47	7,060	1,557
(T78/B)	9,847	7,730	1,645	29,92	7,564	1,743	26,39	6,766	1,637
T89/B	15,77	12,38	2,032	59,83	14,35	1,948	52,41	11,78	1,823
(T90/B)	17,25	13,54	2,612	102,0	20,86	2,431	52,48	11,66	1,744
(T114/B)	20,89	16,40	2,865	179,3	29,70	2,930	108,6	19,05	2,280
T125/B or BE	22,82	17,91	2,430	151,0	26,16	2,572	159,1	25,46	2,641
(T127-1/B or BE)	22,74	17,85	2,770	187,9	30,65	3,065	149,9	23,61	2,361
T127-2/B or BE	28,72	22,55	2,478	201,7	31,17	2,640	229,9	36,20	2,829
T140-1/B or BE	35,15	27,59	3,236	403,3	53,32	3,387	309,7	44,24	2,968
T140-2/B or BE	43,21	33,92	3,484	456,7	68,01	3,251	358,2	51,18	2,879
T140-3/B or BE	57,52	45,15	4,418	947,5	114,4	4,059	466,7	66,67	2,848

Table 7 — Dimensions and tolerances of guide rails (see Figure 3)

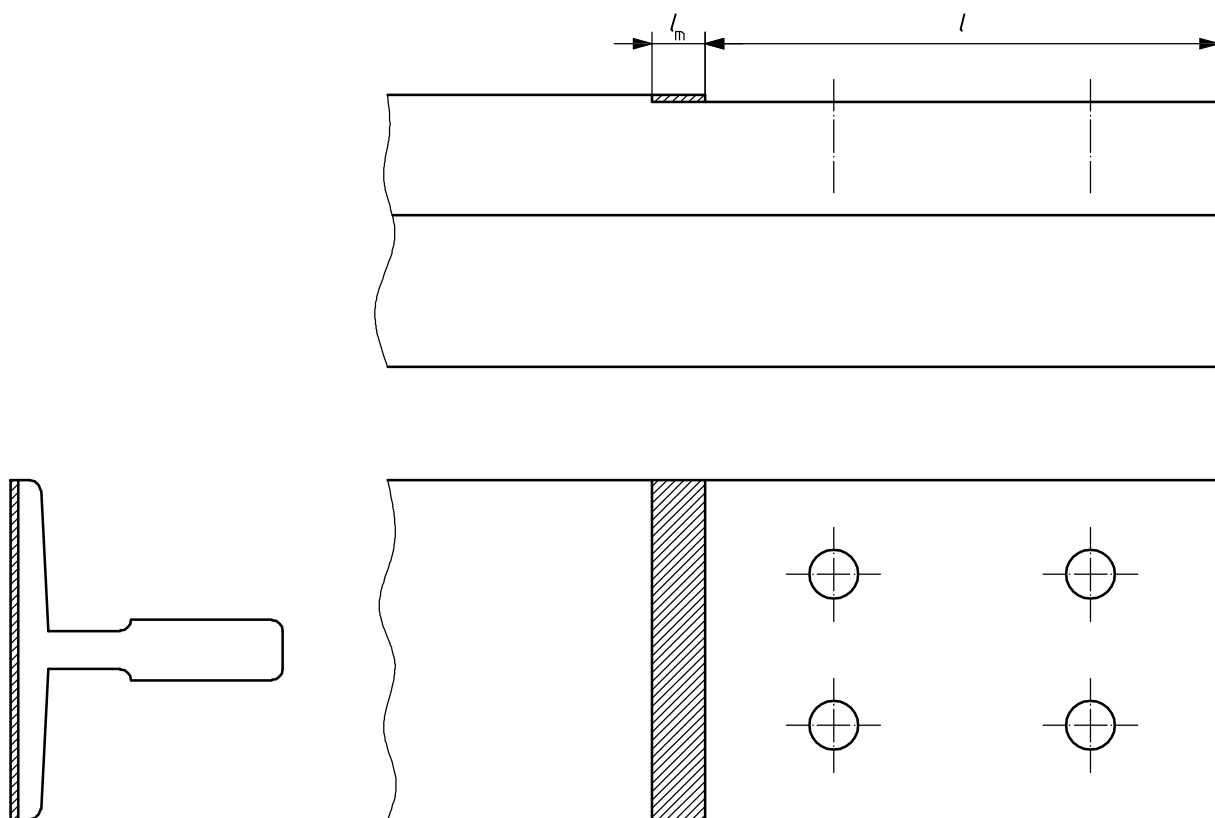
Dimensions in millimetres

Designation	b_1	h_1	k	n	c	f	g	r_s	m_1	m_2	u_1	u_2	d	d_1	b_3	l_{2g}	l_{3g}	l	h
(T75/B)	75	62	10	30	8	9	7	3	3,00	2,97	3,50	3,00	13	26	42	105	25	138	61
(T78/B)	78	56	10	26	7	8,5	6	2,5	3,00	2,97	3,50	3,00	13	26	42	105	25	138	55
T89/B	89	62	16	34	10	11,1	7,9	3	6,40	6,37	7,14	6,35	13	26	57,2	114,3	38,1	156	61
(T90/B)	90	75	16	42	10	10	8	4	6,40	6,37	7,14	6,35	13	26	57,2	114,3	38,1	156	74
(T114/B)	114	89	16	38	9,5	11	8	4	6,40	6,37	7,14	6,35	17	33	70	114,3	38,1	156	88
T125/B or BE	125	82	16	42	10	12	8	4	6,40	6,37	7,14	6,35	17	33	79,4	114,3	38,1	156	81
(T127-1/B or BE)	127	89	16	45	10	11	8	4	6,40	6,37	7,14	6,35	17	33	79,4	114,3	38,1	156	88
T127-2/B or BE	127	89	16	51	10	15,9	12,7	5	6,40	6,37	7,14	6,35	17	33	79,4	114,3	38,1	156	88
T140-1/B or BE	140	108	19	51	12,7	15,9	12,7	5	6,40	6,37	7,14	6,35	21	40	92,1	152,4	31,8	193	107
T140-2/B or BE	140	102	28,6	51	17,5	17,5	14,5	5	6,40	6,37	7,14	6,35	21	40	92,1	152,4	31,8	193	101
T140-3/B or BE	140	127	31,75	57	19	25,4	17,5	5	6,40	6,37	7,14	6,35	21	40	92,1	152,4	31,8	193	126
Tolerances Class: /B	$\pm 1,5$	$\pm 0,75$	$\begin{smallmatrix} +0,1 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} +3 \\ 0 \end{smallmatrix}$	—	$\pm 0,75$	$\pm 0,75$	—	$\begin{smallmatrix} +0,06 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0,06 \end{smallmatrix}$	$\pm 0,10$	$\pm 0,10$	—	—	$\pm 0,2$	$\pm 0,2$	$\pm 0,2$	$\begin{smallmatrix} +3 \\ 0 \end{smallmatrix}$	$\pm 0,1$
Tolerances Class: /BE	$\pm 1,5$	$\pm 0,75$	$\begin{smallmatrix} +0,05 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} +3 \\ 0 \end{smallmatrix}$	—	$\pm 0,75$	$\pm 0,75$	—	$\begin{smallmatrix} +0,03 \\ 0 \end{smallmatrix}$	$\begin{smallmatrix} 0 \\ -0,03 \end{smallmatrix}$	$\pm 0,10$	$\pm 0,10$	—	—	$\pm 0,2$	$\pm 0,2$	$\pm 0,2$	$\begin{smallmatrix} +3 \\ 0 \end{smallmatrix}$	+ 0,05

NOTE Dimensions l_{2g} , l_{3g} , d , b_3 are identical to and have the same tolerances as fishplate dimensions l_{2f} , l_{3f} , d , b_3 .

6.2.3 Machined surface for the location of the fishplate (for machined guide rails)

See Figure 4.



The junction between the machined surface for the location of the fishplate and the unmachined rear surface of the foot is located in the volume defined by the hatched zone.

l see Table 7

$l_m = 40$ mm

Figure 4 — Machined surface for the location of the fishplate

6.2.4 Blade shape

The blade shall be chamfered or rounded, taking into account the following values:

- length of the chamfer side: 1 mm maximum, or
- radius: 1 mm maximum.

6.2.5 Surface finish

Guide rails shall have the surface finish in accordance with the roughness parameters specified in ISO 1302.

6.2.5.1 Guide rail blade roughness

See Table 8.

Table 8 — Guide rail blade roughness

Guide rail class	Blade roughness	
	Direction	
	Longitudinal	Transverse
/A	$1,6 \mu\text{m} \leq Ra \leq 6,3 \mu\text{m}$	$1,6 \mu\text{m} \leq Ra \leq 6,3 \mu\text{m}$
/B	$Ra \leq 1,6 \mu\text{m}$	$0,8 \mu\text{m} \leq Ra \leq 3,2 \mu\text{m}$
/BE	$Ra \leq 1,6 \mu\text{m}$	$0,8 \mu\text{m} \leq Ra \leq 3,2 \mu\text{m}$

6.2.5.2 Foot rear surface of machined guide rails

Maximum roughness of the surface for the location of the fishplate $Ra = 25 \mu\text{m}$.

6.2.6 Machined edges

All machined edges shall be trimmed to avoid sharp edges.

6.2.7 Holes in guide rails

The holes shall be such that their machining leads to neither cracking nor deformation in the guide rail.

6.2.8 Geometrical tolerances

See Table 9 and Figure 5.

Main principle: For the guide rails, the essential geometrical tolerances concern the blade of the guide rail. For the top of the blade, the geometrical tolerances of position t_2 , and the flatness, $t_3/500$, define the tolerance zone within which the surface of the top of the blade is contained relative to the common plane, C-D. The principle is similar for the sides of the blade, with the symmetry, t_2 , and the flatness, $t_3/500$, relative to the common median plan, A-B.

The highest value of t_2 versus $t_3/500$ allows a guide rail with a long-wave deformation, but the value of $t_3/500$ limits the amplitude and the length of the short waves.

Table 9 — Geometrical tolerances for a 5 000 mm length guide rail, l_g

Symbols ^a	Tolerances ^b				Unit	Dimensions concerned
	Guide rail class					
	/A		/B	/BE		
	Parallel foot	Inclined foot				
t_1	0,2	0,2	0,1	0,05	mm	Blade and surface for fishplate flatness at the guide rail ends
t_2	7	7	5	2	mm	Blade position and symmetry
$t_3/500$	0,7	0,7	0,5	0,2	mm/mm	Blade flatness
t_4	—	0,2	0,1	0,05	mm	Key and keyway symmetry
t_5	+0,06 0	+0,06 0	+0,06 0	+0,03 0	mm	Keyway width: m_1
t_6	0 -0,06	0 -0,06	0 -0,06	0 -0,03	mm	Key width: m_2
t_7	± 0,15	+0,1 0	+0,1 0	+0,05 0	mm	Blade width: k
t_8	0,4	0,4	0,2	0,1	mm	Machined surface for fishplate perpendicularity
t_9	± 0,2	± 0,1	± 0,1	± 0,05	mm	Guide rail height: h_1 for /A class, h for /B or /BE class
t_{10}	—	0,2	0,1	0,05	mm	Keyway and key perpendicularity
t_{11}	1	1	0,5	0,5	mm	Hole axis symmetry
t_{12}	± 0,2	± 0,2	± 0,2	± 0,2	mm	Distance between the axes of the holes: b_3
t_{13}	—	0,16 ^c	0,16 ^c	0,16 ^c	mm	Width of the connecting part of the foot to the blade symmetry ^c
t_{14}	—	± 0,1	± 0,1	± 0,1	mm	Key length and keyway depth: u_1, u_2
t_{15}	± 0,2	± 0,2	± 0,2	± 0,2	mm	Distances from holes to the ends of the guide rail: l_{2g}, l_{3g}
t_{16}	± 1	± 1,5	± 1,5	± 1,5	mm	Guide rail width: b_1
t_{17}	2	3	3	3	mm	Foot symmetry: b_1
t_{18}	0,4	0,4	0,2	0,1	mm	Side and top blade perpendicularity

^a See Figure 5.
^b These tolerances are applicable for guide rails of length 2,5 m to 5 m.
^c For c values, see Tables 5 and 7.

Location of the measurements, the sampling plan, and measuring tools are not defined in this International Standard.

The measurements should be made with the guide rails horizontally supported by a plane or enough supporting points, or vertically suspended, to eliminate the deformations due to gravity.

These measurements may be done at the guide rail manufacturing site (in order to build reference measurements data and, if required, allow traceability), at the lift manufacturer's site, at a measurement laboratory site, or at the final installation site (before installation, and free of mechanical constraints), as the target is to supply guide rails with the required geometrical dimensions to the final users. With suitable packaging, and transportation with care, the guide rail characteristics are identical before and after transportation.

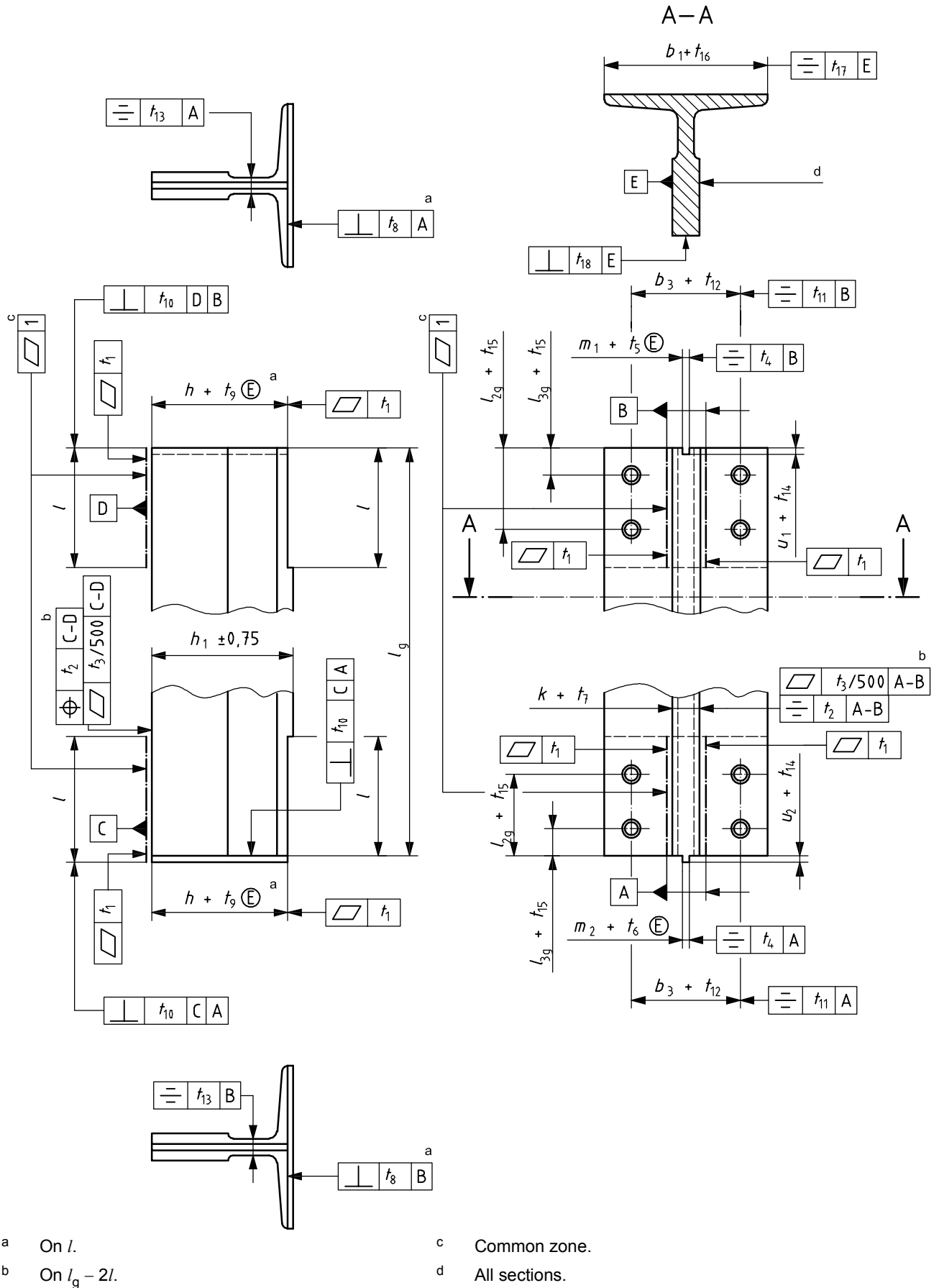


Figure 5 — Geometrical tolerances for a 5 000 mm length guide rail, l_g

6.3 Marking for /BE class

To avoid confusing /A, /B and /BE classes, the /BE class guide rails shall be marked with BE at least twice per bar near the end, on the back side or the front side of the foot. For the /A or /B class guide rails, marking is not required.

The marking for /BE class shall have a minimum height of 10 mm.

7 Fishplates

7.1 Fishplate materials

The steel grade shall be the same as for the guide rails (see Clause 5). The tensile strength of the steel raw material used shall be at least equal to the tensile strength of the steel raw material used for the guide rails.

7.2 Fishplate dimensions

See Table 10 and Figure 6.

Table 10 — Fishplate dimensions and tolerances

Dimension in millimetres

Guide rail designation	d	l_1	l_{2f}	l_{3f}	b_2	b_3	v
(T45/A)	9	160	65	15	50	25	8
T50/A	9	200	75	25	50	30	8
T70/A	13	250	105	25	70	42	10
(T75/A)	13	250	105	25	70	42	10
(T75/B)	13	250	105	25	70	42	10
(T78/B)	13	250	105	25	70	42	10
T82/A	13	216	81	27	80	50,8	10
(T89/A) T89/B	13	305	114,3	38,1	90	57,2	13
(T90/A) (T90/B)	13	305	114,3	38,1	90	57,2	13
(T114/B)	17	305	114,3	38,1	120	70	18
T125/B	17	305	114,3	38,1	130	79,4	18
T125/BE	17	305	114,3	38,1	130	79,4	28
(T127-1/B)	17	305	114,3	38,1	130	79,4	18
(T127-1/BE)	17	305	114,3	38,1	130	79,4	28
T127-2/B	17	305	114,3	38,1	130	79,4	18
T127-2/BE	17	305	114,3	38,1	130	79,4	28
T140-1/B	21	380	152,4	31,8	140	92,1	28
T140-1/BE	21	380	152,4	31,8	140	92,1	38
T140-2/B	21	380	152,4	31,8	140	92,1	28
T140-2/BE	21	380	152,4	31,8	140	92,1	38
T140-3/B	21	380	152,4	31,8	140	92,1	38
T140-3/BE	21	380	152,4	31,8	140	92,1	48
Tolerances	—	$^{+3}_0$	$\pm 0,2$	$\pm 0,2$	—	$\pm 0,2$	$^{+3}_0$

Fishplates with a higher moment of inertia (thicker or other shape) may be used when more stringent requirements are necessary for the junction between guide rails (for example, in a seismic area).

7.3 Fishplate form tolerances

See Figure 6.

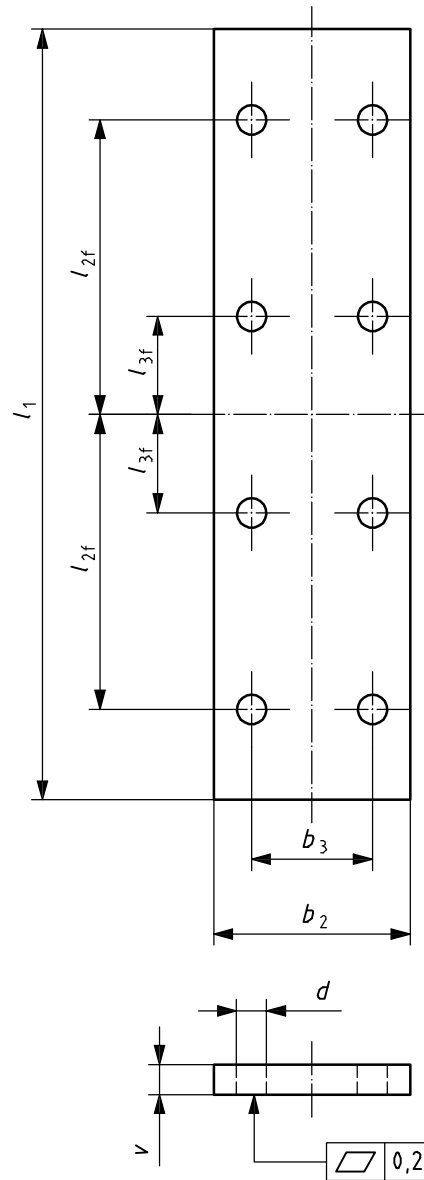


Figure 6 — Fishplate

The maximal roughness, R_a , of the side of the fishplate with the flatness tolerance of 0,2 mm shall be $\leq 25 \mu\text{m}$.

7.4 Fishplate holes

The holes shall be such that their machining leads to neither cracking nor deformation in the fishplate.

Bibliography

- [1] ISO 286-1, *ISO system of limits and fits — Part 1: Bases of tolerances, deviations and fits*
- [2] ISO 630:1995, *Structural steels — Plates, wide flats, bars, sections and profiles*
- [3] ISO 1101, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*
- [4] ISO 5458, *Geometrical Product Specifications (GPS) — Geometrical tolerancing — Positional tolerancing*
- [5] ISO 5459, *Technical drawings — Geometrical tolerancing — Datums and datum-systems for geometrical tolerances*
- [6] ISO 8015, *Technical drawings — Fundamental tolerancing principle*

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