SLOVENSKI STANDARD
SIST EN 50024:1998

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Low-voltage switchgear and controlgear for industrial use - Mounting rails - C-profile and accessories for the mounting of equipment

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Industrielle Niederspannungs-Schaltgeräte - Tragschienen - C-Schiene und Zubehör zur Befestigung von Geräten

Appareillage industriel à basse tension - Profilés supports - Profilé C et accessoires pour la fixation des appareils

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English version

Low voltage switchgear and controlgear for industrial use

Mounting rails

C-profile
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Appareillage industriel à basse tension. Profilés supports. Profilé C et accessoires pour la fixation des appareils

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CENELEC General Secretariat or to any CENELEC member.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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This European Standard has been prepared by CENELEC Technical Committee 17X.

1. General

To promote the universal use of mounting rails for the mounting of equipment certain types of rail are being standardized.

Two types of rail are specified in European Standard EN 50 022, 'Top hat rails 35 mm wide for the *snap-on mounting* of equipment'.

For equipment which is either too large or too heavy for either of the 35 mm rails, a top hat rail 75 mm wide is specified in European Standard EN 50 023 for *snap-on mounting* of equipment.

A G-profile rail is specified in European Standard EN 50 035 for the *snap-on mounting or screw fixing* of terminal blocks.

This European Standard specifies requirements for C-profile rails and accessories for the screw fixing of equipment by means of screws.

2. Scope

This European Standard specifies requirements for certain sizes of C-profile steel rail and accessories for the screw fixing of equipment.

3. C-profile

3.1 Dimensions. The dimensions of C-profile rails shall be as shown in figure 1 and detailed in table 1.

These dimensions shall apply over the whole length of the C-profile rail. Verification of these dimensions shall not be made less than 10 mm from each end of the rail.

3.2 Designation. The designation of a C-profile rail, rated size C 40, shall be as follows:

C-profile rail EN 50 024-C 40.

3.3 Material. The material used shall be cold rolled carbon steel and shall have the following characteristics:

- skin passed after annealing,
- bright surface finish,
- tensile strength between 320 and 420 N/mm^2
- elongation at least 30 %,
- 180° bend tested horizontally and transversally with regard to the direction of rolling.

Each country may indicate its corresponding national standard.

3.4 Finish. The finish shall be zinc-plating and chromating, with a layer thickness of at least 6 µm, except for cut surfaces resulting from cutting to length. Other finishes may be used by agreement between manufacturer and user.

3.5 Availability. C-profile rails shall be supplied either in manufactured lengths of at least 2 m or in ready-cut lengths.

3.6 Tolerances on form. The tolerances on form shall be as shown in figure 2 and shall be in accordance with ISO/R 1101*.

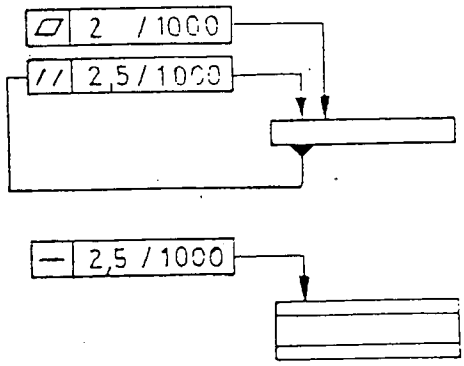


Figure 2. Tolerances on form

4. Accessories

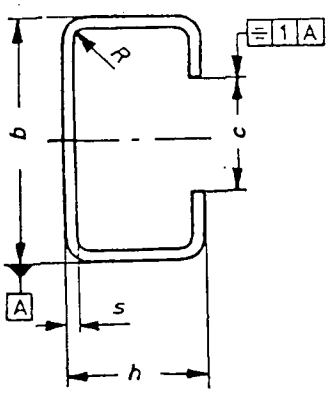
4.1 Types. The following types of accessories are specified for the mounting of equipment on C-profile rails, by means of screws:

- sliding nuts,
- T-head bolts,
- hooked head bolts.

4.2 Requirements

4.2.1 Accessories shall be insertable at any point of the rail and shall be able to slide along the rail.

Rated sizes C20, C30



Rated sizes C40, C50

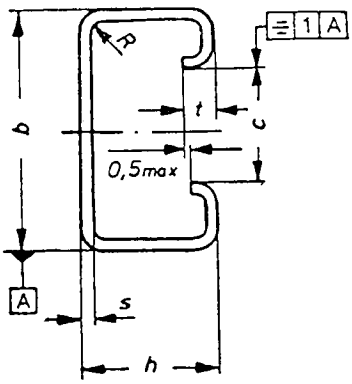


Figure 1. C-profile rails

*... Reference of corresponding national standard (see national appendix B).

Table 1. Dimensions of C-profile rails

Dimensions are in millimetres

Rated sizes	*b* ± 0.75	*h* ± 0.75	*c*	Perm. tol.	*R* max	*s*	*t* ± 1.2
C 20	20	10	11	± 0.3	1	1	–
C 30	30	15	16	± 0.5	1.5	1.5	–
C 40	40	22,5	18	± 0.5	2	2	5.5
C 50	50	30	22	± 0.5	3	3	7

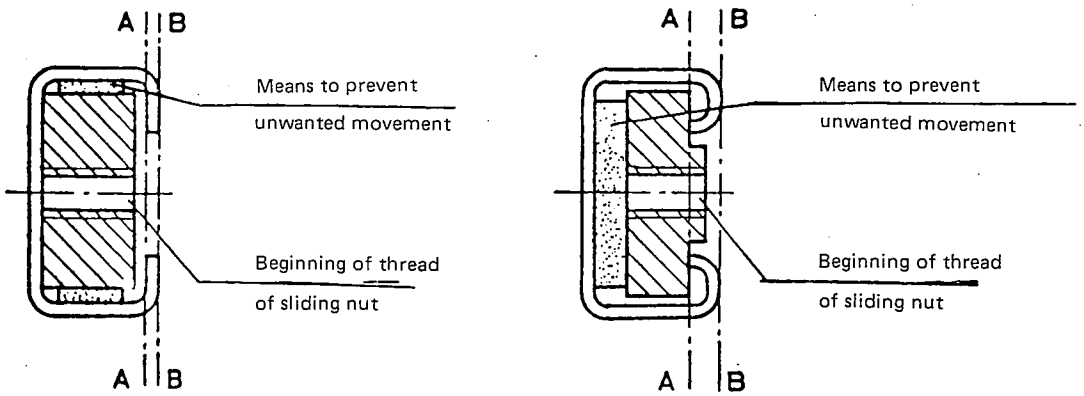


Figure 3. Requirements for sliding nuts according to 4.2.2

4.2.2 Sliding nuts shall be so designed that the thread entrance shall be neither more than 1 mm behind plane A-A, nor be in front of plane B-B, as shown in figure 3.

Furthermore, means shall be provided to prevent any unwanted movement of sliding nuts inside the rail.

4.2.3 When fixing the device on the rail, only a limited amount of rotation is permissible.

4.2.4 When loaded in accordance with this standard, accessories shall comply with the mechanical characteristics of ISO/R 898-1* — Mechanical class 4.6.

4.2.5 Accessories shall be adequately protected against corrosion.

4.3 Dimensions. In addition to the requirements of **4.2**, only thread diameters and thread lengths for accessories complying with this standard are given in table 2.

4.4 Examples of designations of accessories

Sliding nut for a C-profile rail-size C 20-thread M4 :

Sliding nut EN 50 024-C 20/M4.

T-head bolt for a C-profile rail-size C 30-thead M6 and a bolt thread length 30 mm:

T-head bolt EN 50 024-C 30/M6 x 30.

Hookhead bolt for a C-profile rail-size C 50-thread M6 and a bolt thread length 40 mm:

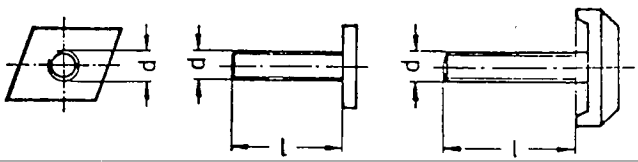
Hook-head bolt EN 50 024-C 50/M10 x 40.

NOTE. The designation of accessories only gives information on their use in accordance with this standard.

No indication is given of their form and construction.

Table 2. Dimensions of accessories

All dimensions are in millimetres.



C-profile rated sizes	Sliding nuts	T-head bolts		Hooked-head bolts	
	d	*d*	*l*	*d*	*l*
C 20	M4,M5,M6, M8	M4, M5	20		
		M6, M8	30		
			40		
C 30	M4,M5,M6 M8,M10, M12	M4, M5	30		
		M6, M8	40		
		M10,M12	50		
C40, C50	M4,M5,M6, M8, M10, M12, M16			M6, M8	30
				M10, M12	40
				M16	50

* . . . Reference of corresponding national standard (see national appendix B).

Appendix A

Guidance for use of C-profile rails

To determine the permissible load of rails, correctly used, the twisting deformation is always the most important factor. The sagging stress, on the other hand, is small and can be disregarded.

Research has shown that, as a result of the current practice of fixing rails by means of two screws, a torsion stress $\tau > 50$ N/mm^2 can cause permanent deformation of the rail.

The maximum permissible torque, according to table 3 for that stress, is independent of the distance between rail fixing points.

Table 3. Maximum torque M_{max}

C-profile	C 20	C 30	C 40	C 50
M_{max} in N mm	700	2 400	6 400	20 000

For distances between fixing points used in practice, with this force an excessive deflection occurs generally in the middle of the rail.

A method for assessing this deflection is shown in figure 4.

Using this method the maximum permissible torque, M_E, as a function of the distance, L, between fixing points has been calculated for the deflection h = 1 mm and is shown in figure 5.

For other values of h, (e.g. h_*) the torque M_{E*} may be calculated proportionally:

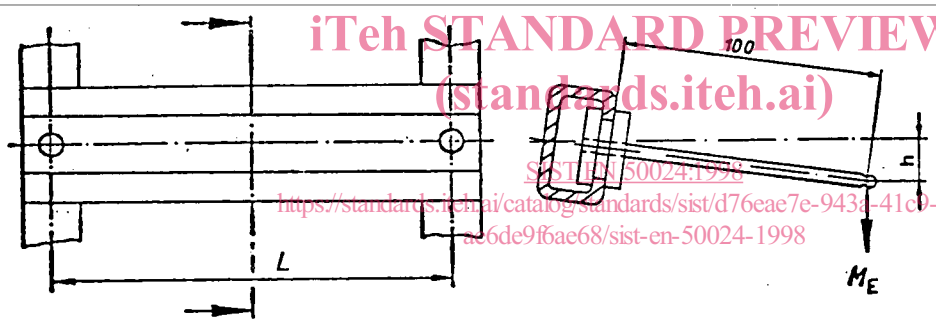
$$\frac{M_E}{M_{E*}} = \frac{h}{h_*}$$

at any rate without exceeding the value M_{max}, to avoid a permanent deformation of the rail.

In practice deviations from the theoretical values may occur.

Measurements have shown that the deflection h = 1 mm is reached for moments M_E shown in figure 5 for distances, L, from 800 to 1 000 mm.

For shorter distances, the deflection, h, may be reduced to 0,5 mm and, for greater distances, increased to 2 mm.



M is the torque due to the force from the equipment mounted on the rail, which equals force times the distance between the centre of gravity and the mounting plane of the device, in N mm (possibly supplemented to take shock into account)

M_E is the moment, in N mm, of the equivalent torque acting in the middle of the rail for a number of individual moments, M, of similar equipments:

$$M_E = \frac{\Sigma M}{2}$$

J_p is the polar moment of inertia of the rail (in mm^4)

G is the sliding modulus (steel plate 80 000 N/mm^2)

L is the distance between fixing points (in mm)

h is the deflection (in mm) of the rail at 100 mm from the fixing surface of the equipment:

$$h = \frac{M_E \times L}{4 J_p \times G} \times 100$$

Figure 4. Assessment of deflection of a rail

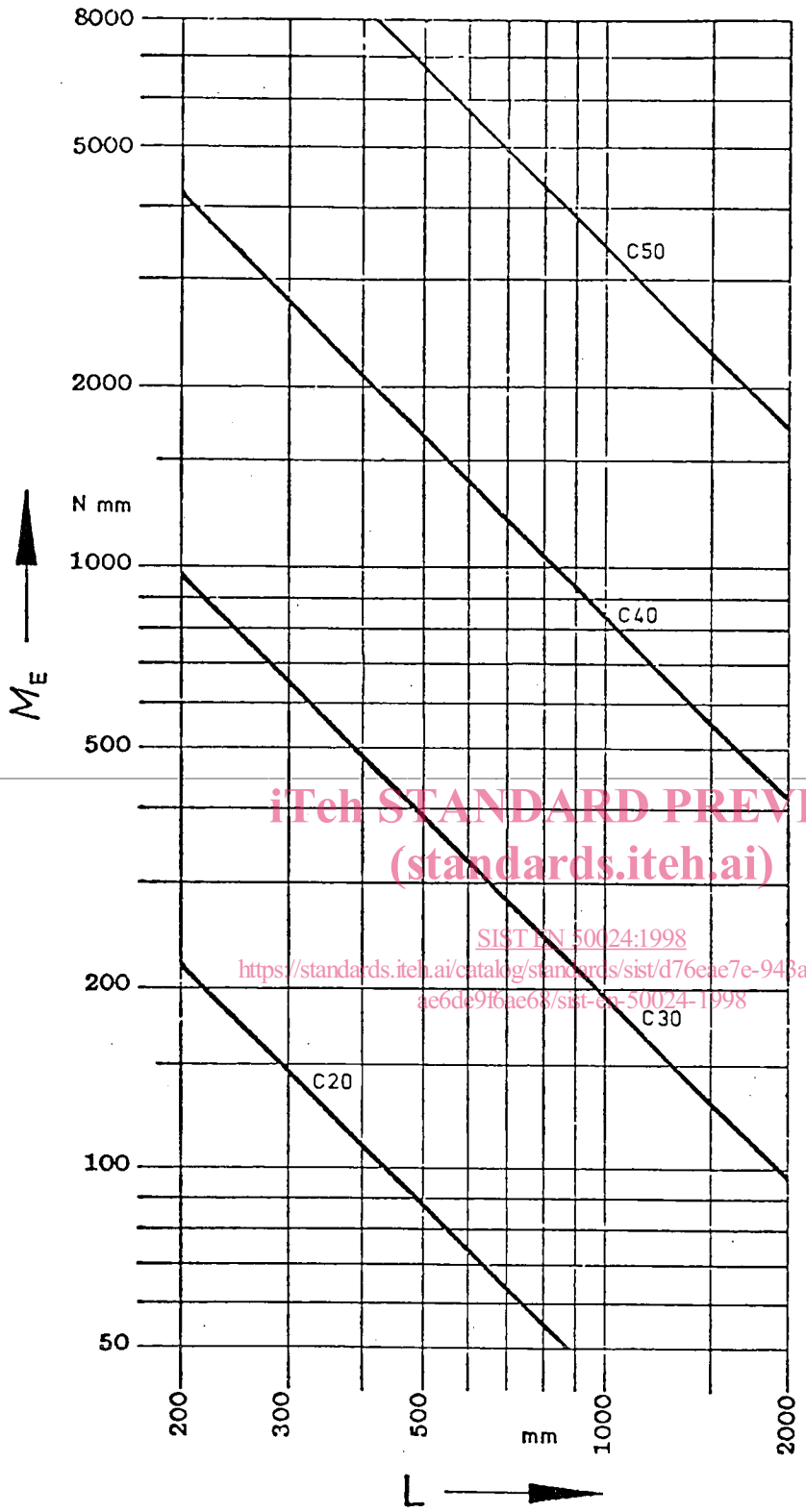


Figure 5. Load capacity $M_E = f(L)$

Appendix B

Guidance for use of an assembly of two C-profile rails

To determine the load capacity of an assembly of two identical C-profile rails, correctly used, the twisting deformation of the assembly resulting from the horizontal torsion, f, of each individual rail is always the most important factor.

The vertical deformation on the other hand is small and can be disregarded.

Research has shown that, as a result of the current practice of fixing each rail by two screws, a torsion stress $\tau > 50$ N/mm^2 can cause a permanent deformation of the rail.

The maximum permissible torque for that stress, according to figure 7, is independent of the distance, L, between rail fixing points.

A method for assessing the deflection of the assembly is shown in figure 6.

Using this method for an assembly with a distance, H, of 100 mm, the permissible stress, M_E, has been calculated and is shown in figure 7 as a function of the distance, L, between fixing points of rails and for the deflection $h = 1$ mm.

According to the number, the lateral distance and the quality of the screwed connection between devices and rails, deflections slightly different from 1 mm can result for the assembly.

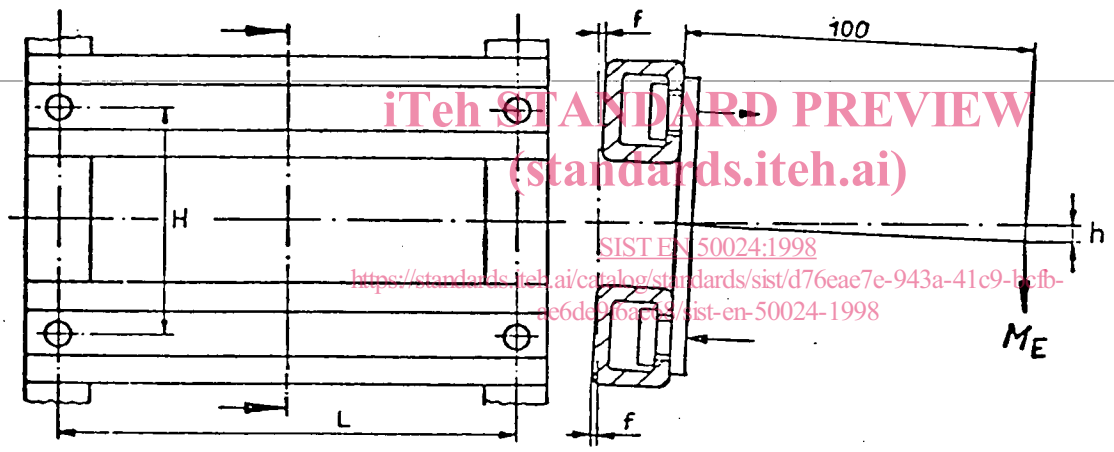
For different distances H_* the permissible stress, M_{E*}, and the maximum stress, M_{max*}, can be computed by the formula:

$$\frac{M_E}{M_{E*}} = \frac{M_{max}}{M_{max*}} = \left(\frac{H}{H_*}\right)^2$$

For a smaller or a greater deflection, h_*, the stress, M_{E*}, can be obtained by the ratio :

$$\frac{M_E}{M_{E*}} = \frac{h}{h_*}$$

still without exceeding the corresponding maximum stress M_{max} or M_{max*}, to avoid any permanent deformation of rails.



M_E As defined in appendix A, figure 4.

J is the moment of inertia of individual rails in mm^4.

E is the elasticity modulus (steel plate 210 000 N/mm^2).

L is the distance between fixing points.

H is the distance between two rails.

f is the deflection of individual rails.

h is the value of the deflection of the assembly at 100 mm from the fixing surface of the device.

Figure 6. Assembly of two identical C-profile rails. Assessment of the deflection