

Reaching through regular openings with the lower limbs

The values in the table below apply solely to persons aged 14 years and over.
Dimension in millimetres

Appendix B of EN ISO 13857 details special cases for safety devices that solely prevent access for persons in a standing position. As there is a risk of slipping or sliding through – something that cannot be ruled out in a normal industrial environment – the specified values are deemed to be of little use. We have therefore not included these.

Part of lower limb	Illustration	Opening	Safety distance, S_r	
			Slot	Square or round
Toe tip		$e \leq 5$	0	0
		$5 < e \leq 15$	≥ 10	0
Toe		$15 < e \leq 35$	≥ 80	≥ 25
Foot		$35 < e \leq 60$	≥ 180	≥ 80
		$60 < e \leq 80$	≥ 650	≥ 180
Leg (toe tip to knee)		$80 < e \leq 95$	≥ 1100	≥ 650
Leg (toe tip to crotch)		$95 < e \leq 180$	≥ 1100	≥ 1100
		$180 < e \leq 240$	Not applicable	≥ 1100

The colour markings indicate which body parts are limited by size for each opening. If the length of a slot opening is ≤ 75 mm, the safety distance can be reduced to ≥ 50 mm. Slot openings $e > 180$ mm and square and round openings $e > 240$ mm permit full body access. Additional safety measures must be taken.

Max. permitted floor opening

According to EN ISO 11161:2007, 8.5.2, openings between protective structures and floors must not exceed 200 mm.

Guidelines for the selection of safety devices

The manufacture of safety devices for a machine requires consideration. Generally there are no problems in removing all risk through protection. The problem is to protect against the risk whilst at the same time maintaining the machine's ease of use and accessibility. Four concepts ought to be taken into consideration when selecting safety devices:

- Accessibility
- Safety
- Cost
- The requirements of the Machinery Directive

In addition to the tables and standards mentioned in this leaflet, the following standards also offer good guidance for the manufacture of safety devices:

Standard/Directive	Description
EN 2006/42/EC	This is the Machinery Directive, valid from 29 December 2009
EN 953	This is the standard for the design of guards.
ISO 13855	Specifies the distances to hazard zones that apply for light curtains, laser scanners etc.

Customer Login

To ensure as high a level of service as possible, we have developed several useful modules to guide and assist you. These include:

- Product Database
- Troax CAD (Products in 8 CAD formats)
- Safety Guide
 - The Calculator (EN ISO 13857:2008 table 2)
 - Risk Assessments
 - Machinery Directive
- Safe Lock manuals



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Important!

The basis for choosing safety measures must always be a risk assessment. For example, if there is a risk of fluid spraying out, you must choose a protective enclosure of an impenetrable material. No guarantee is accepted for stated values. Applicable dimensions appear in the original standards and their instructions for use.



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for safety guard applications

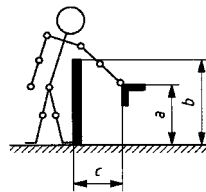
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Reaching over protective structures

The dimensions and distances stated below are taken from EN ISO 13857:2008, Table 2 - High risk. Dimension in millimetres

See also the calculation module in our Customer Login area at www.troax.com



Height of hazard zone, a	Height of protective structure, b									
	1000	1200	1400	1600	1800	2000	2200	2400	2500	2700
	Horizontal safety distance to hazard zone, c									
2700	0	0	0	0	0	0	0	0	0	0
2600	900	800	700	600	600	500	400	300	100	0
2400	1100	1000	900	800	700	600	400	300	100	0
2200	1300	1200	1000	900	800	600	400	300	0	0
2000	1400	1300	1100	900	800	600	400	0	0	0
1800	1500	1400	1100	900	800	600	0	0	0	0
1600	1500	1400	1100	900	800	500	0	0	0	0
1400	1500	1400	1100	900	800	0	0	0	0	0
1200	1500	1400	1100	900	700	0	0	0	0	0
1000	1500	1400	1000	800	0	0	0	0	0	0
800	1500	1300	900	600	0	0	0	0	0	0
600	1400	1300	800	0	0	0	0	0	0	0
400	1400	1200	400	0	0	0	0	0	0	0
200	1200	900	0	0	0	0	0	0	0	0

Protective structures lower than 1400 mm should not be used without additional safety measures.

Reaching around with limitation of movement

Dimension in millimetres

Limitation of movement	Safety distance, S_r	Illustration
Limitation of movement only at shoulder and armpit	≥ 850	
Arm supported up to elbow	≥ 550	
Arm supported out to wrist	≥ 230	
Arm and hand supported up to knuckle joint	≥ 130	

A = The range of movement of the arm
 S_r = The radial safety distance

a = This is either the diameter of a round opening, or the side of a square opening, or the width of a slot opening.

Reaching through regular openings

The values in the table below apply solely to persons aged 14 years and over. Dimension in millimetres.



Part of body	Illustration	Opening	Safety distance, S_r		
			Slot	Square	Round
Fingertip		$e \leq 4$	≥ 2	≥ 2	≥ 2
		$4 < e \leq 6$	≥ 10	≥ 5	≥ 5
Finger up to knuckle joint		$6 < e \leq 8$	≥ 20	≥ 15	≥ 5
		$8 < e \leq 10$	≥ 80	≥ 25	≥ 20
or hand		$10 < e \leq 12$	≥ 100	≥ 80	≥ 80
		$12 < e \leq 20$	≥ 120	≥ 120	≥ 120
		$20 < e \leq 30$	$\geq 850^{1)}$	≥ 120	≥ 120
Arm up to junction with shoulder		$30 < e \leq 40$	≥ 850	≥ 200	≥ 120
		$40 < e \leq 120$	≥ 850	≥ 850	≥ 850

The colour markings indicate which body parts are limited by size for each opening. For openings >120 mm the safety distances for reaching over are used or other safety measures are taken.

¹⁾ If the length of the slot opening is ≤ 65 mm, the thumb will act as a stop and the safety distance can be reduced to 200 mm.