

## Reaching through regular openings with the lower limbs

The values in the table below apply solely to persons aged 14 years and over.  
Dimensions are 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
		$5 < e \leq 15$	$\geq 10$	0
Toe		$15 < e \leq 35$	$\geq 80$	$\geq 25$
Foot		$35 < e \leq 60$	$\geq 180$	$\geq 80$
		$60 < e \leq 80$	$\geq 650$	$\geq 180$
Leg (toe tip to knee)		$80 < e \leq 95$	$\geq 1100$	$\geq 650$
Leg (toe tip to crotch)		$95 < e \leq 180$	$\geq 1100$	$\geq 1100$
		$180 < e \leq 240$	Not applicable	$\geq 1100$

The colour markings indicate which body parts are limited by size for each opening. If the length of a slot opening is  $\leq 75$  mm, the safety distance can be reduced to  $\geq 50$  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 provision 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 suitable accessibility. Four aspects ought to be taken into consideration when selecting safety devices:

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

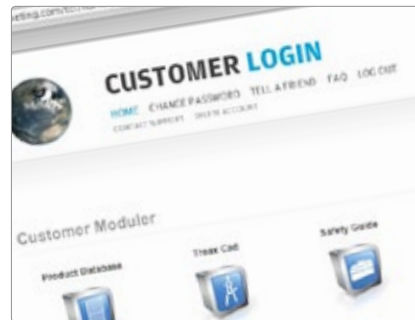
**In addition to the tables and standards mentioned in this leaflet, the following standards also offer good guidance for the selection of safety devices:**

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



Go to customer login at [www.troax.com](http://www.troax.com)

## Important!

The basis for deciding on 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 given or liability accepted for stated values. Applicable dimensions appear in the original standards and their instructions for use; this information is for guidance only.



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# Safety Distances Guide

for machine guard applications

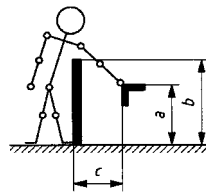
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## Reaching over protective structures

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

See also the calculation module in our Customer Login area at [www.troax.com](http://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

Dimensions are in millimetres

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

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. Dimensions are in millimetres.

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

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.

<sup>1)</sup> If the length of the slot opening is  $\leq 65$  mm, the thumb will act as a stop and the safety distance can be reduced to 200 mm.