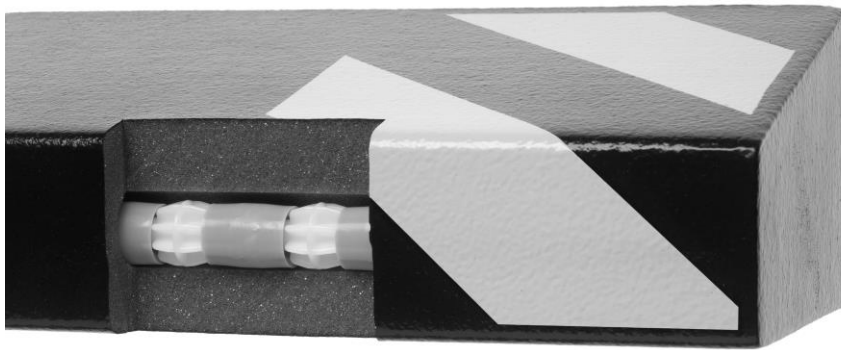


## Operating Manual

# HSB<sup>®</sup>

**Bumper**

(Translation of Original Manual)



The image may differ from the product.

**Read the operating manual before beginning any work!**

# HAAKE<sup>®</sup>

Haake Technik GmbH  
Master Esch 72  
48691 Vreden, Germany  
[info@haake-technik.com](mailto:info@haake-technik.com)  
[www.haake-technik.com](http://www.haake-technik.com)  
Tel.: +49 2564 39650  
Fax: +49 2564 396590

CE

Doc-ID: 488891  
02-2014

This installation and operating manual contains proprietary information, which is subject to copyright. No parts of this documentation may be reproduced or transferred in any manner or by any means, be it electronic or mechanical, for any purpose without obtaining prior written consent. Haake Technik GmbH assumes no liability for damage or subsequent damage, arising from the use of components or replacement parts, which are not original parts. Haake and HSB are registered trademarks of Haake Technik GmbH. All other brand and product names not mentioned here are or may be registered trademarks and are to be treated accordingly.

© Haake Technik GmbH, Master Esch 72, 48691 Vreden, Germany  
All rights reserved.

## Contents

1	Scope.....	3
2	Intended use .....	3
3	Symbol Explanation .....	3
4	Disposal .....	3
5	Foreseeable misuse .....	3
6	Identification.....	4
7	Safety related functioning .....	4
8	Fault exclusion .....	4
9	Scope of delivery .....	5
10	Structure and function .....	5
	10.1 Description .....	5
	10.2 Example .....	5
11	Safety measures .....	6
	11.1 Organisational measures.....	6
	11.2 Safety of persons.....	6
	11.3 Avoid property damage.....	6
	11.4 Operating conditions and limitations of use.....	6
	11.5 Assembly .....	6
	11.6 Repairs / Alterations .....	6
	11.7 Electrical equipment .....	6
12	Installation.....	7
	12.1 Preparation .....	7
	12.2 General approach .....	7
	12.3 Installation instructions .....	7
	12.4 Electrical connection .....	8
13	Performance check.....	9
14	Commissioning, Operation .....	9
15	Attention!.....	10
16	Cleaning.....	10
17	De-installation .....	10
18	Troubleshooting .....	10
19	Transport, handling, unpacking, storage .....	11
	19.1 Transportation and handling .....	11
	19.2 Unpacking .....	11
	19.3 Storage .....	11
20	Technical Data .....	12
21	Actuating forces and response times: .....	13
22	Selection procedure.....	14
23	Application example .....	15
24	Acceptance report.....	15
25	EC Declaration of Conformity .....	17

## 1 Scope

This operating manual is intended for persons who have been authorized to carry out tasks involving the bumper of the HSB-series. International, national and, where appropriate, regional regulations are to be observed when handling key transfer systems.

If you have any questions which are not answered in this manual, please get in touch with your regional customer service centre or else make direct contact with

### Haake Technik GmbH

Master Esch 72, 48691 Vreden, Germany

Telephone +49 2564 39650

Fax +49 2564 396590

Info@haake-technik.com

## 2 Intended use

The Bumpers HSB are used to protect joints and shear and pinch edges on machinery and equipment in accordance with the provisions of Sections 20, 21 and 23.

They are used to protect the hands, arms, legs, head and persons near e.g. Machine guards, lifting tables, lifting and tilting equipment, theatre stages and automated guided vehicle systems (AGVs).

Other applications are prohibited.

## 3 Symbol Explanation

Warnings are indicated by symbols. The notices are introduced by signal words to indicate the extent of the hazard.



### Attention!

... indicates a potentially hazardous situation, which may lead to personal injury and damage to property if it is not avoided.



### NOTE!

... highlights useful tips and recommendations as well as information for efficient and fault-free operation.

## 4 Disposal



The device must be properly disposed of in accordance with national laws and regulations.

## 5 Foreseeable misuse

Examples for reasonably foreseeable misuse

- Bumpers may not be used as climbing aids.
- Bumpers may not be connected to voltage  $\geq 50$  V AC, 75 V DC.
- Bumpers may not be stressed by voltages greater than 0.5 A.
- Bumpers may not be equipped with additional covers.
- Bumpers for not be used on fire doors.
- Connection lines may not be installed without protection.

## 6 Identification

For exact identification, you will find the type designation, serial number and year of construction on the type labels of the bumper.

Note these details (prior to installation, if necessary), so that they can be provided in case of questions or for ordering spare parts.

## 7 Safety related functioning

The bumper carries out the following safety functions:

1. Interruption of the closed circuit through force application on the sensor surface
2. The interruption of the closed circuit is maintained as long as the force is applied to the sensor surface.

## 8 Fault exclusion

Due to the construction, materials, and components used for the bumper, the faults listed in the table can be excluded:

Potential Defect	Elimination of Defect	Limitations of Use	Reason
Deformation by overload	Admissible in accordance with Table A.4. of DIN E ISO 13849-2.	See: <b>Intended use</b> in section 2 and <b>technical information</b> in section 20.	Use of carefully selected materials and manufacturing procedures; using special mounting types.
Modifications of the geometry or breakage of the contact chain	Admissible in accordance with Table A.4. of DIN E ISO 13849-2.	See: <b>Intended use</b> in section 2 and <b>technical information</b> in section 20.	Use of carefully selected materials and manufacturing procedures; use of special fastening types; overdimensioning.
Short circuit in the lines and line connections	Admissible in accordance with Table D.4. of DIN E ISO 13849-2.	See: <b>Installation</b> in section 12	Use of doubly insulated sheathed cables and protected cable installation
Welding of the contacts	Admissible in accordance with Table D.8 of DIN E ISO 13849-2.	See: <b>Installation</b> in section 12 and <b>technical information</b> in section 20.	Use of a fuse (0.5 A) in the supply circuit of the pressure-sensitive edges.

## 9 Scope of delivery

1 x bumper



### NOTE!

Means of attachment and fuse (0.5 A) are not included in the scope of the delivery.

## 10 Structure and function

### 10.1 Description

The bumpers basically have the same construction, independent of dimensions and shape.

They consist of the components:

- Haake safety contact chain HSB® (normally closed type)
- PU-foam as a support element for the signal sensor
- PU-coating as a protective skin
- Carrier plate made of aluminum, steel or MDF to mount the bumper on the to be hedged item
- A variety of line connection arrangements depending on the application
- Doubly insulated connection lines for machine control

When the bumper sensor is actuated, the current flow is interrupted by the special geometry of the chain links in the interior of the sensor. This interruption represents the OFF state of the output signal switching device and thus transmits the safety output signal to the downstream machine control.

The bumper meets the requirements for automatic resetting because they shift to ON state when the actuating force is removed.



### Attention!

If applicable, a reset function may be required.

Should work with a manual reset be required, this should be implemented by the machine control in accordance with DIN EN ISO 13856-3, Section 4.2.6.3.

The bumper can be joined together as often as required up to a length of 50 m.

Due to the closed circuit principle (forced interruption of the contact chain) no separate evaluation unit is necessary for provision of the output signal.

The bumper and downstream machine control must together meet the performance level that was determined by the risk assessment.

### 10.2 Example

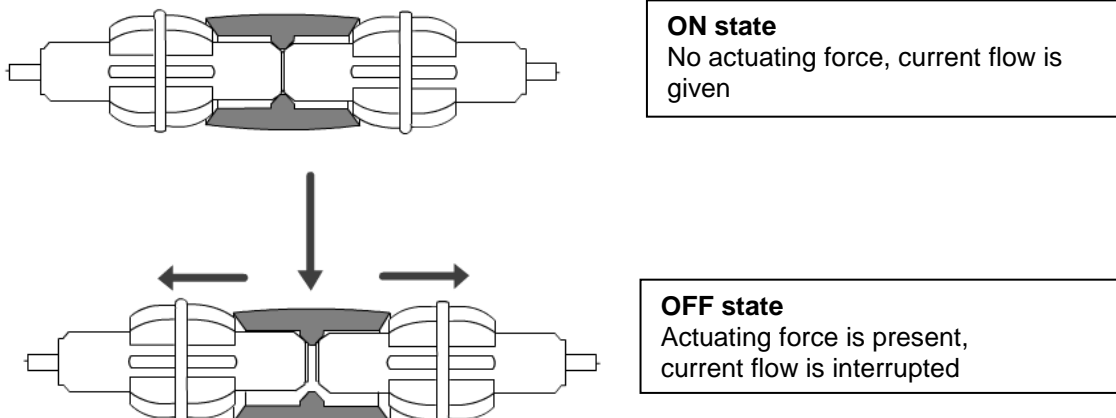


Figure shows HSB as a functional principle (sensor profile is not shown)

## 11 Safety measures

### 11.1 Organisational measures

Persons who have been authorised to carry out tasks involving the installation or removal of the bumper must have read and understood this manual prior to commencing such tasks.

The operator of the plant or machine has an obligation to ensure the installation and de-installation is carried out safely and with no hazards by implementing appropriate safety measures.

### 11.2 Safety of persons

Personnel responsible for installation or removal tasks have to be suitably skilled or else have to be instructed by suitably skilled persons. On account of their technical training and experience, such skilled persons have sufficient knowledge of the installation or machine. These persons are sufficiently familiar with the applicable domestic work protection and accident prevention regulations of relevance here, that they are able to assess the operational safety of the installation or machine.

It is necessary to implement accident- and fall-prevention measures, whenever tasks are performed or areas are traversed at height.

### 11.3 Avoid property damage

Please note the **intended use** (cf. section 2) and the **technical information** (cf. section 19) described in this manual.

### 11.4 Operating conditions and limitations of use

Please note the **intended use** described in this instruction manual (cf. section 2), **foreseeable misuse** (cf. section 5) and the **technical information** (cf. section 20). The bumper and downstream machine control must together meet the performance level that was determined by the risk assessment.



#### **Attention!**

**During a hazard, the machine must not be restarted.**

### 11.5 Assembly

Perform the assembly as described in section 12 and always carry out a function test afterwards. Do not make any alterations to the installation after the function test has been successfully carried out.

### 11.6 Repairs / Alterations

Do not carry out any repairs to the bumper. Do not replace or exchange any parts. Send damaged or faulty components to Haake Technik GmbH to be repaired.

Do not make any alterations to the component. Otherwise, this could lead to malfunctions, which can cause serious personal injury and irreparable damage to property.

In the event of non-compliance, the guarantee is invalidated and Haake Technik GmbH does not accept any liability.

### 11.7 Electrical equipment

Electrical connections may only be carried out by qualified electricians who are familiar with all international, national and, where appropriate, regional electrical engineering regulations.

Work must only be carried out when the power supply has been shut off.

Always ensure external protection of the bumper with an overcurrent fuse of 0.5 A (rated value).

## 12 Installation



### Attention!

Always select an attachment that is sufficiently secured against loosening for installation. The overall safety of the machine depends on the proper execution of the installation.

### 12.1 Preparation

When installing the bumper, you will need the following hardware that is **not** included in the scope of delivery:

- Mounting material: Screws, threaded nuts (M6 / M8) depending on the bumper type
- Screw locking (e.g. gear wheels, disc springs, wave washers or screw glue)



### Attention!

When fastening of the bumper with the screws the thread engagement of the internal thread of the bumper has to be considered. The maximum is 12 mm.

The following tools (tools) are needed to assemble the bumper:

- Drilling machine, and drill bit 6.6 mm; 9.0 mm
- Countersink 90°
- Key ring / open-end spanner or socket spanner SW 7mm, SW 8 mm, SW 10 mm, SW 13 mm, depending on the bumper type
- Crosstip screwdriver
- Voltage tester

Clean the work environment by removing dirt, grease and oil.

### 12.2 General approach

Use suitable tools when installing the bumper. Otherwise, bolts and nuts may become damaged and unusable.

Do not exceed the max. torque when tightening the nuts.

Always use one of the screw locks specified in section 12.1.

### 12.3 Installation instructions

Make the mounting holes according to the design of the bumper. The location of the mounting holes is specified by the customer's order and to take there, or to tap on the bumper.

The mounting procedure depends on local circumstances.

Observe the following basic instructions:



### Attention!

The bumper must be mounted only on a completely leveled surface. Cavities under the bumper can lead to permanent deformation and thus affect the protective effect of the system.



### Attention!

It is not permitted to shorten the bumper!

If a bumper edge must be shortened for operational reasons, this must be done exclusively by the manufacturer.

No liability is accepted in the event of improper installation!

## 12.4 Electrical connection

The integration of the bumper in the control circuits of the machine control is performed according to EN 60204-1 "Electrical equipment of machines". The core piece of the control unit creates e.g. a logical unit for safety functions which realizes the required performance level in conjunction with the bumper.

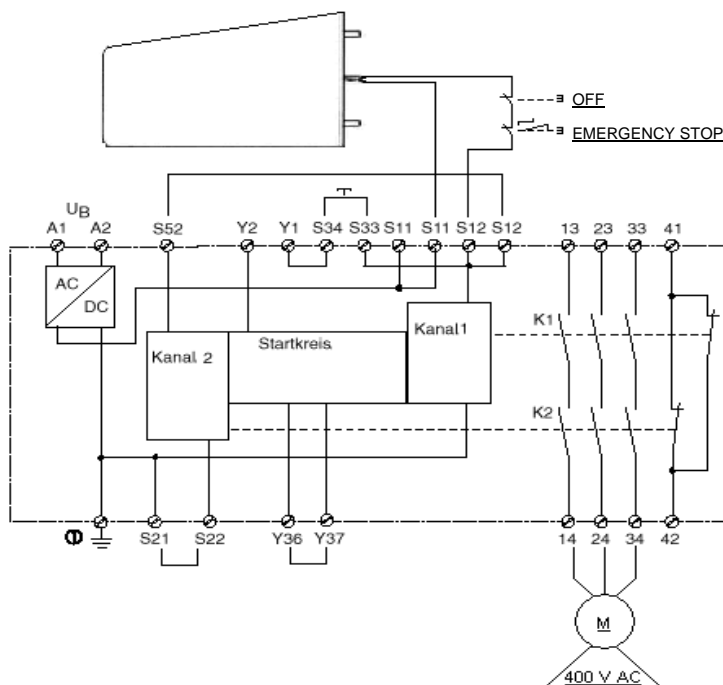
Due to the positively driven contact, it can be directly connected to a safety switching device responsible for the implementation of safety-related signals of the bumper.

The electrical connection of the bumper must be carried out according to the following instructions:

Rated voltage: < 50 V AC, 75 V DC (with safe disconnection to the grid).  
A voltage source for SELV or PELV systems according to DIN VDE 0100-410 must be used.

Rated current: < 0.5 A

The power supply of the bumper must be protected externally!  
Overcurrent protection of 0.5A (rated value)



Connection example (symbolic representation).

For information on the respective safety switching device, please refer to the operating instructions of the respective product.



Additional installation instructions for cable connections:

- After cutting to the required length, all cable ends must be provided with crimp contacts.
- The surface on which the bumper is mounted must be flat and clean.
- The bumper surface and the connection cables must not be damaged.
- All lines must be laid with protection against external mechanical influences.
- Depending on the type of cable connection, protection rating IP 65 must be ensured also at connection points, e.g. by appropriate sheaths or enclosures (cabinet installation).

No liability is accepted in the event of improper installation!

### 13 Performance check



#### **Attention!**

**The protective effectiveness of the bumper must be checked regularly**

**- at least once a year**

**or**

**- in intervals according to national operating instructions**

**Once installed, do not loosen any bolts or nuts or remove any pins; otherwise, the effectiveness of the safety-related functions is no longer guaranteed.**

Run the following tests after installation and document the results in the acceptance report (section 22):

- Check all wire connections on the machine control for proper arrangement and fixed connection.
- Check the mounting orientation and mounting of the bumper
- Check the switch strips the surface thoroughly for external damage (visual inspection).
- Check the safety function of the total system by repeated actuation of the bumper at different points of the effective actuation area, preferably by a test body of Ø 80 mm with a maximum force of 150 N.
- Check the reset function, if available.

With a high degree of pollution or at temperatures below freezing point, short test intervals (at least once before each shift) are advisable.

### 14 Commissioning, Operation

After the bumper have been properly installed, connected and tested, the technical equipment on which the bumper edge was installed can be turned on and operated in accordance with its intended use.

No further work on the bumper is required.

## 15 Attention!



### Attention!

Adapt the frequency of checks to the environmental conditions at the application site.

No maintenance of the internal parts of the bumper is required.

Damaged or defective bumper must be replaced.

## 16 Cleaning

As a rule, no cleaning is required. Bumper can be cleaned by wiping with a cloth and mild soap.



### Attention!

Only use other cleaning methods after prior consultation with the manufacturer.

## 17 De-installation



### Attention!

Only uninstall the bumper when power to the electrical system is switched off.

- Disconnect the electrical connection (section 12.4).
- Loosen the attachment of the bumper, depending on the version. (Section 12.3).

## 18 Troubleshooting

Fault	Possible cause	Remedy
No interruption of the signal	Connection cable is damaged, short-circuit	Contact Haake Technik GmbH.
No ON signal.	Defective connecting terminals	Check terminals and tighten if necessary
	Cable break	Contact Haake Technik GmbH.
	Damaged contact chain	Contact Haake Technik GmbH.
Bumper cannot be mounted.	Wrong mounting plate	Contact Haake Technik GmbH.
	Mounting plate is damaged.	Contact Haake Technik GmbH.

## 19 Transport, handling, unpacking, storage



**Attention!**

**Note the total weight of a packaging unit and always use a suitable transport means.**

Dimensions and mass of the packing can be taken from the scope of the order. The products are placed in an overpack. Depending on the number of parts to be shipped, cardboard boxes, crates, pallets or containers are used for packaging. Wooden boxes are provided with a lid.

### 19.1 Transportation and handling

If weight is unevenly distributed, the center of gravity is indicated on the wooden box. Depending on their length, pressure-sensitive edges must be handled by one or two people.

In each transport container, products are lined with filling material for loose gaps, to ensure the goods are protected in transit.

Returned goods must be similarly packed to avoid damage in transit.

Improperly packaged returns will be invoiced if the goods are damaged.

### 19.2 Unpacking

Special care is needed when opening the packaging.

Open **products in cartons** with a knife at the points where adhesive tape was used. When opening, make sure you cut with the knife away from your body.

**Cardboard rolls** have plastic covers on the end faces attached with clamps to the rolls. Pull out the clamps on one side of the roll with a pair of pliers and remove the plastic cover.

The lid of **wooden boxes** is attached by nails or screws to the box. Therefore use a claw or screwdriver when opening. Always pull nails or screws entirely out of the wood to avoid injuries.

Remove product from the filling material and place it on a clean surface.

### 19.3 Storage

Never bend or roll up sensors, always store them flat; bumper must fully lie on the surface.

If bumpers are to be stored for a long time, they should be placed in the original packaging. A dry environment with a temperature range of 5 to 55 °C must be chosen for storage. This prevents damage caused by external interferences or environmental influences.

## 20 Technical Data

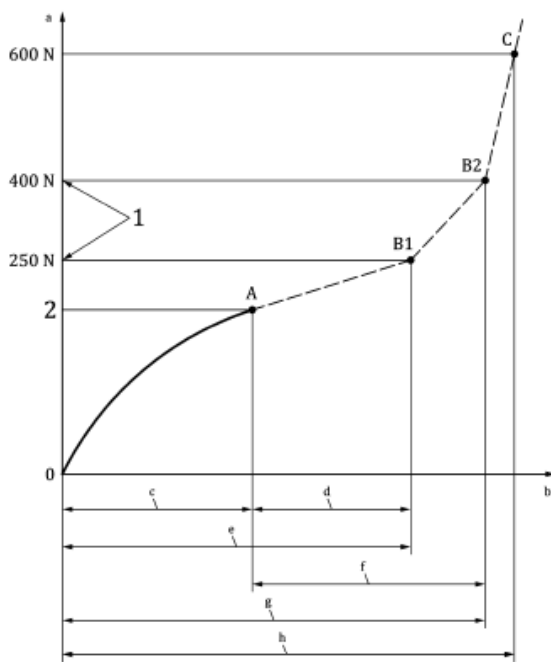
Environment:	Indoor / outdoor
Temperature range:	+5° C to +55° C
Humidity:	to 100% (standard climate)
Material:	
Sensor profile:	Polyether foam, PU skin formation
Mounting profile:	mounting plate
Connecting line:	PVC, double insulated, highly flexible single core cables, d=3.5 mm Other lines are possible after consultation with the manufacturer.
Ambient atmosphere:	industrial environments
Resistance of the sensor surface:	
Ozone resistance:	good
UV Resistance:	good
Acids	good
Alkalis	good
Water	good
Oil resistance:	low
Resistance to detergents:	good
Ammonia, liquid:	good
Methanol (<40%):	good
Service life:	10 years
Values according to DIN EN ISO 13849-1:	
B10d value:	
HSB 3700-10 (example bumper):	51444
Category:	3
Diagnostic coverage:	low
Performance Level:	up to d possible
Mean Time To Failure (MTTF <sub>d</sub> ):	Application-dependant
Protection class:	IP 54 IP 65 (as a special version)
Total length with assembled sensors:	max. 50 m
Rated voltage:	<50 V AC, 75 V DC
Rated current:	≤ 0.5 A
Load:	max. 500 N within the effective operating angle
Deformation > 24 h:	suitable

## 21 Actuating forces and response times:

bumper	Operating speed 10 mm/s	Operating speed 100 mm/s	Actuating force (bei 100 mm/s)
HSB 3700-10	Response time 1875 ms	Response time 183 ms	37 N

### Force-displacement diagrams:

Force-displacement diagrams in accordance with DIN EN ISO 13856-3 for individual operating speeds can also be obtained from the manufacturer.



#### Legend:

- A response distance (operating point and actuation force at maximum operating speed)
- B deformation (for example, the force-displacement points B1 and B2 come at a force of 250 N and 400 N at a operating speed is less than or equal to 10 mm \* s-1 in front)
- C total distance (for example at 600 N at an operating speed less or equal to 10 mm \* s-1)
- 1 reference force
- 2 lowest actuation force
- a force in Newtons (N)
- b distance in millimeters (mm)
- c response distance
- d overtravel distance at 250 N
- e deformation at 250 N
- f overtravel distance at 400 N
- g deformation at 400 N
- h total distance

#### Test parameters:

T=20°C, mounting orientation B and measurement location (see DIN EN ISO 13856-3; Fig. B1).  
Operating speed of 100 mm / sec

The following diagrams are to be used for the example Bumper (cf. section 21).

Bumper	Force (N)	c response distance (mm)	d at 250 N overtravel distance (mm)	f at 400 N overtravel distance (mm)	e at 250 N deformation (mm)	g at 400 N deformation (mm)	h total distance (mm)
HSB 3700-10	37	18,3	90	96	108,3	114,3	116,3

## 22 Selection procedure

The three most important parameters for selecting the bumper are:

- Determination of the required performance level
- Speed of the dangerous movement
- stopping distance of the dangerous elements

The evaluation proceeds stepwise as follows:

Step	Action	Remark
1	Determination of the required PL according to DIN ISO 13849-1	a) Results from the information in the C standard b) Results from the risk assessment to be carried out, based on the particular application
2	Determining the required operating speed (VB)	a) Measurement or calculation of the maximum speed of the hazardous movement (VG) b) Selection: $VB > VG$
3	Determining the required overtravel (SN)	a) Measurement of the stopping distance (SA) of the hazardous elements b) Setting the safety factor (F); at least 1.2 c) Calculation: $SN = SA \times F$
4	Setting the max. permissible force	a) Determining what people (e.g. elderly, children, etc.) and what body parts are to be protected b) Selection: Maximum permissible force is as low as possible
5	Selecting the system	a) Select a system using the determined values and respective force-displacement diagram. In doing so, ensure the overtravel force is smaller than the maximum permissible force in step 4.



### NOTE!

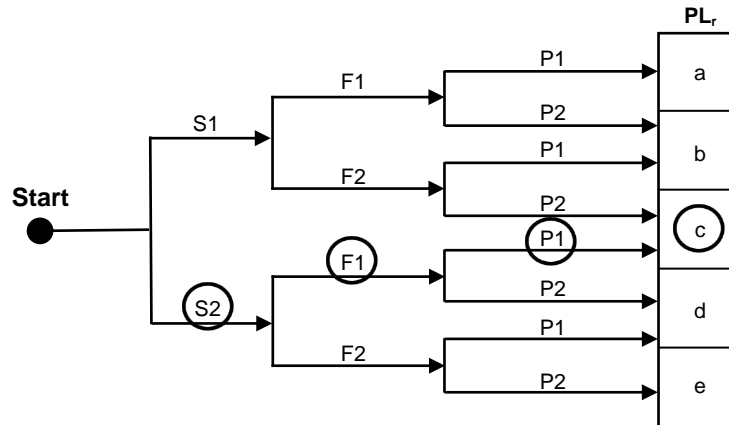
*Category and performance level of the bumper must correspond to the information obtained from the risk assessment of the machine.*

*The user has to determine the performance level for their particular application.*

### 23 Application example

In order to secure the pinch point of a lift table a bumper is required. The lift table moves automatically at a speed of 50 mm / s. The lift table is operated 8 hours per day, on 240 working days per year. Hereby he moves 6 times per hour.

#### Determining the PL<sub>r</sub> according to DIN EN ISO 13849-1



#### Risk parameters:

S	Severity of injury	F	Frequency of and/or duration of exposure to hazard	P	Possibility of avoiding the hazard
S1	slight (normally reversible injury)	F1	seldom-to-less-often and/or exposure to hazard time is short	P1	Is possible under specific conditions
S2	serious (normally irreversible injury or death)	F2	frequent-to-continuous and/or exposure to hazard time is long	P2	Is scarcely possible

#### Calculating the Mean Time Between Failures (MTTF<sub>d</sub>) according to DIN EN ISO 13849-1:


Mean operating time in days per year (d <sub>op</sub> ):	240 days/year
Mean operating time in hours per day (h <sub>op</sub> ):	8 h/day
Mean time between the start of two consecutive cycles of the bumper (t <sub>cycle</sub> ):	600 sec/cycle
Mean number of annual actuations (n <sub>op</sub> ):	11520 cycles/year (calculated)
B10 <sub>d</sub> :	51444 (for example Bumper HSB 3700-10)
MTTF <sub>d</sub> :	44 years

#### Determining the PL according to DIN EN ISO 13849-1

Category:	3
MTTF <sub>d</sub> :	44 years = high
Performance Level:	d

### 24 Acceptance report

The acceptance report must be completed by the operator:

Haake Technik GmbH Vreden		<b>Acceptance report Bumper HSB<sup>®</sup> :</b>				
Operator:		Object:		Company:		
		Pressure-sensitive edges:		Name:		
Order number:		Serial No.:		Date:		
				Signature:		
No.	Activity	Measurement		Free of defects		Remark
		Target	Actual	Yes	No	
1.0	Visual inspection, if appropriate also of the deformation chamber, with regard to penetrated objects					
1.1	Attachment of bumper					
1.2	Damage to the bumper					
1.3	Damage to the connection lines					
1.4	Damage to the cable gland					
1.5	Connection for cables					
1.6	Reset button / function					
1.7	Protective effect overall system					



## 25 EC Declaration of Conformity

### EC Declaration of Conformity in accordance with EC Directive 2006/42/EC, Annex II A.

The company **Haake Technik GmbH**  
**Master Esch 72**  
**D-48691 Vreden, Germany**

hereby declares that the safety bumpers of the series:

**HSB**

Serial number: **See identification plate**

in their delivered form comply with the following relevant provisions:

EC Directive: **Machinery Directive 2006/42/EC**

Harmonised standard: **DIN EN ISO 13856-3**

HSB safety bumpers are used to provide protection at pinching and shearing points, e.g. at machinery with long over-travel distances, automatically-guided vehicles, theatre-type stages, etc.

The authorised representative responsible for the compilation of the technical documents is:

**HAAKE Technik GmbH**  
**Herr Heinrich Chrusch**  
**Master Esch 72**  
**D-48691 Vreden, Germany**

Vreden, 12.12.2013

  
\_\_\_\_\_  
**André Haake**  
**(Managing director)**







Haake Technik GmbH  
Master Esch 72  
48691 Vreden, Deutschland  
[info@haake-technik.com](mailto:info@haake-technik.com)  
[www.haake-technik.com](http://www.haake-technik.com)  
Tel.: +49 2564 39650  
Fax: +49 2564 396590