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8.1 Overview, Important Basic Safety, Group and Specialist Standards* under the Machinery Directive

The hierarchic European Standards for the safety of machinery is structured so that the Safety Product Standards (Type C Standards), regarding general safety aspects and general safety equipment for machinery construction, refer to the Basic Standard (Type A Standard) and to specific Group Standards (Type B Standard). They also refer to specific definitions or categories as long as these are applicable for the machines defined in the validity area of the product Standard and if the responsible design engineer or the competent Standards committee considers these as solution.

A European Standard can be applied after it has been ratified as EN (in some cases, even as prEN). However, these Standards (those identified in the table as “ratified”) only have the so-called “presumption effect” if they were published in a Council Journal EEC Archive. …/C…). Example: EN 418, Safety of Machinery - EMERGENCY STOP equipment, functional aspects, design principles, council document 93/C229/03, published 10-1992.

Note: The following list of Standards does not claim to be complete. It only provides a selection of Standards for engineers designing machines and plants and also for authors of Product Standards (Type C Standards) as decision-making support for Standards which are already available, partially already implemented in “DIN EN” (EN) and Drafts (prEN or IEC. Sec). Additional Standards and the actual status are available from the following web site: http://www.NewApproach.org/directiveList.asp

<table>
<thead>
<tr>
<th>Standard</th>
<th>Title</th>
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<tbody>
<tr>
<td>EN 292-1</td>
<td>Safety of Machinery – Basic concepts, general principles for design Part 1: Basic terminology, methodology</td>
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<td>EN 292-1</td>
<td>Safety of Machinery – Basic concepts, general principles for design Part 2: Technical principles and specifications</td>
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<td>EN 292-2/A1</td>
<td>Safety of Machinery – Basic concepts, general principles for design Part 2: Technical principles and specifications</td>
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<td>Safety of Machinery – Safety distances to prevent danger zones being reached by the upper limbs</td>
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<td>EN 294</td>
<td>Safety of Machinery – Minimum gaps to avoid crushing of parts of the human body</td>
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<td>EN 418</td>
<td>Safety of Machinery – EMERGENCY STOP equipment, functional aspects – Principles for design</td>
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<tr>
<td>EN 457</td>
<td>Safety of Machinery – Auditory danger signals – General requirements, design and testing (ISO 7731:1986 modified)</td>
</tr>
<tr>
<td>EN 457-1</td>
<td>Safety of Machinery – Human body measurements – Part 1: principles for determining the dimensions required for openings for whole body access into machinery</td>
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<td>EN 574</td>
<td>Safety of Machinery – Two-hand control devices – Functional aspects – Principles for design</td>
</tr>
<tr>
<td>EN 614-1</td>
<td>Safety of Machinery – Ergonomic design principles Part 1: Terminology and general principles</td>
</tr>
<tr>
<td>EN 626-1</td>
<td>Safety of Machinery – reduction of risks to health from hazardous substances emitted by the machinery – Part 1: Principles and specifications for machinery manufacturers</td>
</tr>
<tr>
<td>EN 692</td>
<td>Mechanical presses – Safety 7 Reference: 89/392/EEC &lt;M&gt;</td>
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* The above mentioned standards are only an excerpt of the valid A, B and C Standards. We do not claim that these standards are complete.
Type A Standards (Basic Standards) and Type B Standards (Group Standards)

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<th>Standard</th>
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<td>Safety of Machinery – Safety distances to prevent danger zones being reached by the lower limbs</td>
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<td>Safety of Machinery – Safety-related parts of control systems – Part 1: General principles for design</td>
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Type C Standards (Specialist or Product Standards)

Lifts

- Revision 1994-02 Safety rules for the construction and installation of lifts – Part 1: Electric lifts EN 81-1
- Revision 1994-02 Part 2: Hydraulic lifts EN 81-2
- 1995-06 Part 3: Electric and hydraulic lifts EN 81-3
- Safety rules for the construction and installation of escalators and passenger conveyors EN 115

Lifting platforms

- 1995-01 Suspended access equipment EN 1908

Safety of woodworking machines

- 1992-04 Woodworking machinery prEN 691
- 1997-07 Planing machines EN 859 since 13.3.98
- 1995-01 Band sawing machines EN 1807
- 1995-03 Circular sawing machines - Part 1: Circular saw benches (with and without sliding table) and dimension saws EN 1870-1
- 1997-0 One-side molding machines with rotating tool – Part 1: Single-spindle vertical molding machines EN 848-1
- 1997-05 Combined woodworking machines EN 940

Machine tools – Safety

- 1996-06 Mechanical presses – Safety EN 692
- 1992-03 Hydraulic presses – Safety prEN 693
### Type C Standards (Specialist or Product Standards)

#### Machine tools – Safety
- 1996-10 Hydraulic bending presses
- 1996-06 Safety requirements for bonded abrasive products
- 1996-05 Small numerically controlled turning machines and turning centers
- Large numerically controlled turning machines and turning centers
- 1996-05 – Machining centers
- 1996-12 – Drilling machines
- Manually controlled turning machines
- Spark erosion machines
- Permanently installed grinding machines
- Horizontal (single and) multi-spindle turning machines
- Dimensioning separating protective equipment (Annex A of EN 12415)
- Transfer and single-purpose or special-purpose machines

**Standards for Machine Tools**
- EN 12622
- EN 12413
- EN 12415
- EN 12478
- EN 12417
- EN 12717
- EN 12840
- EN 12957
- prEN 13218
- prEN 13788
- prEN 12415
- prEN 14070

#### Agriculture and forestry machine safety
- rev: 1994-11 Mobile lifting platforms
- 1995-01 Suspended working platforms

**Standards for Agriculture and Forestry Machines**
- prEN 280
- EN 1808

#### Woodworking machines – Safety
- 1994-06 Guards for power take-off (PTO) drive shafts – wear and strength tests (DIN EN 1152 : 1994-12)
- 1997-07 Power take-off drive shafts and their guards

**Standards for Woodworking Machines**
- EN 1152
- prEN 12965

#### Rubber and plastics machinery – Safety
- 1997-02 Injection molding machines
- 1993-10 Compression and transfer molding presses for rubber and plastic
- 1996-10 Extruders and extrusion lines - Part 1: Extruders
- 1995-06 Size reduction machines - Part 1: Blade granulators
- 1996-02 Internal mixer
- 1997-08 Metering and mixing units

**Standards for Rubber and Plastics Machinery**
- EN 201
- EN 289
- EN 1114-1
- EN 12012-1
- prEN 12103
- EN 1612-1

#### Packaging machines – Safety
- 1995-09 , Part 2: Pre-formed rigid container packaging machines
- 1997-03 Part 4: Palletizers and depalletizers

**Standards for Packaging Machines**
- prEN 415-1
- EN 415-2
- EN 415-4

#### Cranes - Safety
- Part 2 Limiting and indicating devices

**Standards for Cranes**
- EN 12077-2
### Type C Standards (Specialist or Product Standards)

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<tr>
<td><strong>Rail-dependent storage and retrieval equipment – Safety</strong></td>
<td>1996-08 Rail-dependent storage and retrieval equipment – Safety</td>
<td>EN 528</td>
</tr>
<tr>
<td><strong>Industrial trucks – Safety</strong></td>
<td>1988-12 Self-propelled industrial truck sit-down rider-controlled; Rules for the construction and layout of pedals</td>
<td>EN 281</td>
</tr>
<tr>
<td><strong>Industrial trucks – Safety</strong></td>
<td>1993-08 - Part 1: Electrical requirements for battery-powered industrial trucks</td>
<td>EN 1175-1</td>
</tr>
<tr>
<td><strong>Industrial trucks – Safety</strong></td>
<td>1993-08 - Part 3: Electrical requirements for the electric power transmission systems of internal combustion engine powered trucks</td>
<td>EN 1175-3</td>
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<tr>
<td><strong>Industrial trucks – Safety</strong></td>
<td>1994-11 Safety of industrial trucks</td>
<td>EN 1726-1</td>
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<tr>
<td><strong>Pile driving equipment</strong></td>
<td>1995-01 Piling equipment – Safety requirements</td>
<td>EN 996</td>
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<tr>
<td><strong>Pile driving equipment</strong></td>
<td>1995-06 Drill rigs – Safety</td>
<td>EN 791</td>
</tr>
<tr>
<td><strong>Tunnel boring machines</strong></td>
<td>1996-06 Safety of unshielded tunnel boring machines and rodless shaft boring machines for rock</td>
<td>EN 815</td>
</tr>
<tr>
<td><strong>Tunnel boring machines</strong></td>
<td>1995-08 Air locks – Safety requirements</td>
<td>prEN 12110</td>
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<tr>
<td><strong>Tunnel boring machines</strong></td>
<td>1995-08 Road headers, continuous miners and impact rippers – Safety requirements</td>
<td>prEN 12111</td>
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<td><strong>Tunnel boring machines</strong></td>
<td>1996-02 Shield machines, horizontal thrust-boring machines, lining erection equipment – Safety requirements</td>
<td>prEN 12336</td>
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<tr>
<td><strong>Road construction machinery</strong></td>
<td>1995-09 Mobile construction machinery – Safety Part 1: Common requirements</td>
<td>EN 500-1</td>
</tr>
<tr>
<td><strong>Processing machines and equipment for building materials</strong></td>
<td>1997-08 Portable, handheld, internal combustion cutting-off machines – Safety</td>
<td>EN 1454</td>
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<tr>
<td><strong>Processing machines and equipment for building materials</strong></td>
<td>1996-03 Core drilling machines on stands – Safety</td>
<td>EN 12348</td>
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<tr>
<td><strong>Processing machines and equipment for building materials</strong></td>
<td>1996-05 Masonry and stone cutting-off machines for job site – Safety</td>
<td>EN 12418</td>
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<tr>
<td><strong>Processing machines and equipment for building materials</strong></td>
<td>1996-10 Floor sawing, grooving and milling machines – Safety</td>
<td>prEN 12638</td>
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<td><strong>Processing machines and equipment for building materials</strong></td>
<td>Wood saws – Safety</td>
<td>WI 151054</td>
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<tr>
<td><strong>Processing machines and equipment for building materials</strong></td>
<td>Stone splitting equipment – Safety</td>
<td>WI 151056</td>
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## Type C Standards (Specialist or Product Standards)

### Machines and systems to produce and transport concrete
- 1995-06 Conveying, spraying and distributing machines for concrete and mortar – Safety requirements  prEN 12001
- 1996-09 Truck mixer – Safety requirements  prEN 12609
- 1996-19 Concrete compactors and floating machines – Safety requirements  prEN 12649

### Machines and systems to produce cement, line, plaster
- 1997-07 Feeding, crushing, milling, sizing, and sorting machines for mechanical processing or minerals and similar solid materials – Safety – Part 1: General  prEN 1009-1
- 1997-07 Thermal installations for the cement, line and gypsum industry – Safety requirements  prEN 12950

### Machines for the manufacturer of concrete and calcium silicate
- 1996-10 Machines for the manufacture of constructional products from concrete and calcium-silicate - Part 1: Common requirements  EN 12629-1
- 1997-04 Safety requirements for diamond wire saws  prEN 12866
- 1997-04 Safety requirements for chain and belt slotting machines  prEN 12867

### Machines and systems to produce ceramics
- 1996-11 Ceramic machines – Safety – Sorting and glazing of fine clay tiles  prEN 12651
- 1996-12 Ceramic machines – Safety – Presses  prEN 12692

### Food processing machinery - Safety and hygiene requirements
- 1994-12 Food processing machinery – Safety and hygiene requirements – Basic concepts – Part 1: Safety requirements  EN 1672-12

### Thermo-processing technique – Safety
- 1997-03 Industrial thermo-processing equipment – Part 1: General safety requirements for industrial thermo-processing equipment  EN 746-1
- 1997-03-, Part 2: Safety requirements for combustion and fuel handling systems  EN 746-2
- Part 3: Safety requirements for the generation and use of protective gases  pEN 746-3

### Machines for underground mines – Safety
- 1996-02 Safety requirements for armored scraper conveyors  prEN 12321

### Pumps
- 1992-09 Pumps and pump units for liquids - Common safety requirements  EN 809
### Type C Standards (Specialist or Product Standards)

#### Printing and paper machines – Safety

**Printing and paper finishing machines**
- 1993-02 Technical safety requirements for the design and construction of printing and paper converting machines: prEN 1010

#### Paper producing machines
- 1993-03 Safety requirements for the design and construction of paper making and finishing machines: EN 1034

#### Leather and imitation leather goods and footwear manufacturing machinery – Safety
- 1995-07 Cutting and punching: prEN 12044
- 1997-08 Roughing, scouring, polishing and trimming machines: EN 930
- 1995-02 Footwear molding machines: EN 1845

#### Foundry machinery
- 1997-◊ Safety requirements for high-pressure metal die casting units: EN 869
- 1997-◊ Safety requirements for foundry molding and core-making machinery and plant-associated equipment: EN 710
- 1993-11 Safety requirements for ladles, pouring equipment, centrifugal casting machines, continuous and semi-continuous casting machines: prEN 1247
- Safety requirements for abrasive blasting equipment: prEN 1248

#### Textile and associated machines
- 1995-09 Safety requirements for textile machinery: EN 11111
- 1995-03 Safety requirements for dry-cleaning machines using perchloroethylene: EN ISO 8230
- 1994-12 Safety requirements for industrial laundry machinery – Part 1: Common requirements: EN ISO 10472

#### Compressors – Safety
- 1996-04 Compressors and vacuum pumps – Safety requirements Part 1: Compressors: EN 1012-1

#### Aircraft ground support equipment
- 1996-08 Centrifuges – Common safety requirements: prEN 12547
- 1995-05 Aircraft ground support equipment – General requirements – Part 1: Basic safety requirements: prEN 1915-05

#### Industrial robots

#### Sewing machines
- 1990-+08 Electrical equipment – Part 3: Particular requirements for sewing machines, units and systems: EN 60204-3-1
- 1990-+10 Part 2: Particular requirements for sewing machines: prEN 60335-2-28
### 8.2 Important Addresses

#### 1. CEN Members = sources for the national editions of EN + prEN

<table>
<thead>
<tr>
<th>Member</th>
<th>Address Details</th>
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</table>
| **AENOR** | Asociación Española de Normalización y Certificación (AENOR)  
Génova, 6  
E-28004 Madrid  
Phone: + 34 91 432 60 00  
Fax: + 34 91 310 40 32  
e-mail: info@aenor.es |
| **ELLOT** | Hellenic Organization for Standardization  
313, Acharnon Street  
GR-11145 Athens  
Phone: + 30 1 212 01 00  
TX: (0601) 219670 elot gr  
Fax: + 30 1 228 62 19  
e-mail: info@elot.gr |
| **ON** | Österreichisches Normungsinstitut  
Postfach 130  
Heinestraße 38  
A-1021 Vienna  
Phone: + 43 1 213 00  
Fax: + 43 1 213 00 650  
e-mail: infostelle@on-norm.at |
| **AFNOR** | Association Française de Normalisation  
11, Avenue Francis de Pressensé  
F-93571 Saint-Denis La Plaine Cédex  
Phone: + 33 1 41 62 80 00  
Fax: + 33 1 41 62 00 00  
e-mail: contact@afnor.fr |
| **IBN/BIN** | Institut Belge de Normalisation/  
Belgisch Instituut voor Normalisatie  
Avenue de la Brabançon 29  
Brabançonnelaan 29  
B-1000 Bruxelles/Brussel  
Phone: + 32 2 378 01 05  
Fax: + 32 2 373 42 64  
e-mail: info@ibn.be |
| **SEE** | Service de L’Energie de l’Etat  
Organisme Luxembourgois de Normalisation  
B.P. 10  
L-2010 Luxembourg  
Phone: + 352 46 97 46 1  
Fax: + 352 46 97 46 39  
e-mail: see.normalisation@etat.lu |
| **BSI** | British Standards Institution  
389 Chiswick High Road  
GB-London W4 4AL  
Phone: + 44 20 8996 90 00  
Fax: + 44 20 8996 74 00  
e-mail: info@bsi-global.com |
| **COSMIT** | Czech Standards Institute  
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CZ-110 02 Praha 1  
Phone: + 42 02 218 02 100  
Fax: + 42 02 218 02 311  
e-mail: info@csni.cz |
| **FRENCH** | Association Française de Normalisation  
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F-93571 Saint-Denis La Plaine Cédex  
Phone: + 33 1 41 62 80 00  
Fax: + 33 1 41 62 00 00  
e-mail: contact@afnor.fr |
| **IPQ** | Instituto Português da Qualidade  
Rua António Gião, 2  
P-2829-513 Caparica  
Phone: + 351 21 294 81 00  
Fax: + 351 21 294 81 01  
e-mail: ipq@mail.ipq.pt |
| **SFS** | Suomen Standardisoinisliitto  
PO Box 116  
FIN-00241 Helsinki  
Finland  
Phone: + 358 9 149 93 31  
Fax: + 358 9 146 49 25  
e-mail: sfs@sfs.fi |
| **DIN** | Deutsches Institut für Normung e. V.  
D-10772 Berlin  
Phone: + 49 30 28 06 01 0  
Fax: + 49 30 28 06 12 31  
e-mail: postmaster@din.de |
| **SIS** | Standardiserings i Sverige  
Box 6455  
S-113 81 Stockholm  
Phone: + 46 8 610 30 00  
Fax: + 46 8 610 77 57  
e-mail: info@sis.se |
| **DS** | Dansk Standard  
Kollegienvej 6  
DK-2920 Charlottenlund  
Phone: + 45 39 96 61 01  
Fax: + 45 39 96 61 02  
e-mail: dansk.standard@dsk.dk |
| **SNV** | Schweizerische Normen-Vereinigung  
Bürglistraße 29  
CH-8400 Winterthur  
Phone: + 41 1 254 54 54  
TX: (045) 756931 snv ch  
Fax: + 41 1 254 54 74  
e-mail: info@snv.ch |
| **NSAI** | The National Standards Authority of Ireland  
Glasnevin  
IRL-Dublin 9  
Phone: + 353 1 807 38 00  
Fax: + 353 1 807 38 38  
e-mail: nsai@nsai.ie |
| **STRI** | Icelandic Council for Standardization  
Laugavegur 178  
IS-105 Reykjavik  
Phone: + 354 520 71 50  
Fax: + 354 520 71 71  
e-mail: stri@stri.is |
2. DIN – Deutsches Institut für Normung e.V., important Standards committees with reference to machines

NAM
Normenausschuss Maschinenbau (NAM) im DIN
Postfach 71 08 64
60498 Frankfurt/M.
Phone: 0 69/66 03-13 41
Fax: 0 69/66 03-15 57

WNM
Normenausschuss Werkzeugmaschinen
Corneliusstraße 4
60325 Frankfurt
Phone: 0 69/75 60 81 25
Fax: 0 69/75 60 81 11

AGSA, FNErg, FNFW, FNL, NAL, NALS, NAS, Nsg, NI, NKT, NMP, Textilnorm
DIN Deutsches Institut für Normung e.V.
10772 Berlin
Phone: 0 30/26 01-0
Fax: 0 30/26 01-12 31

3. Sources for technical regulations in Germany

For EC Directives as well as legislation and regulations
Bundesanzeiger-Verlags GmbH
Amsterdamer Straße 192
50667 Cologne
Phone: (02 21) 97668-0
Fax: (02 21)

For DIN Standards and VDM Sheets
Beuth Verlag GmbH
Burggrafenstraße 6
10787 Berlin
Phone: (0 30) 26 01-0
Fax: (0 30) 26 01-12 60

FNCA, FNKä, FWS, Naa, NAD, NL, NÖG, NRK, NUA
DIN Deutsches Institut für Normung e.V.
Zweigstelle Köln
Kamekestraße 8
50672 Köln
Phone: 02 21/57 13-0
Fax: 02 21/57 13-4 14

NA EBM
Normenausschuss Eisen-, Blech- und Metallwaren
Kaiserwerther Str. 137
40474 Düsseldorf
Phone: 0 211/45 64 274/276
Fax: 0 211/45 64 277

NA FuO
Normenausschuss Feinmechanik und Optik
Turnplatz 2
75172 Pforzheim
Phone: 0 72 31/81 88 22
Fax: 0 72 31/81 88 33

FAKAU
Normenausschuss Kautschuktechnik
Postfach 90 03 60
60443 Frankfurt/M.
Phone: 0 69/79 36-0/117
Fax: 0 69/79 36 165

DKE
Deutsche Kommission Elektrotechnik, Elektronik, Informationstechnik im DIN und VDE
Stresemannallee 15
60596 Frankfurt/M.
Phone: 0 69/63 08 26 0
Fax: 0 69/63 08 26 0

For VDE Regulations as well as DKE and IEC Standards
VDE-Verlag GmbH
Bismarkstraße 33
10625 Berlin
Phone: (0 30) 34 80 01-16
Fax: (0 30) 34 17 09 3

For accident prevention regulations and ZH-1 documents from the Trade Associations
Carl Heynemanns Verlag KG
Luxemburger Straße 449
50939 Cologne
Phone: (02 21) 94 373-0
Fax: (02 21) 94 373-901

Information about Standards, Regulations, Directives
Deutsches Institut für technische Regeln (DITR) im DIN (Deutsches Institut für Normung)
Burggrafenstraße 6
10787 Berlin
Phone: (0 30) 26 01-0
Fax: (0 30) 26 28 125
8.3 Terminology and Abbreviations

8.3.1 Terminology

Actuator
An actuator converts electrical signals into mechanical or other non-electrical quantities.

Blanking
Using blanking, a specified section or area is suppressed from a protective field, e.g. a light curtain or light grid, i.e. it is disabled. There are two types of blanking: Fixed and floating blanking.

Fixed blanking
For fixed blanking, the selected area or range is fixed. This function is used, for example, if fixed objects protrude into the protective field.

Floating blanking
Floating blanking permits that normally one or two light beams in a protective field are interrupted without a stop signal being output from a light curtain. This function is required if the “permissible” interruption of the light beams does not refer to a fixed position in the protective field, e.g. if a moving cable enters the protective field.

Category
In EN 954-1, this is used to “classify the safety-related parts of a control with reference to their immunity to faults and their behavior under fault conditions which is achieved as a result of the structural arrangement of the parts and/or their reliability.”

Channel
Element or group of elements which executes a function independently.

2-channel structure
Structure which is used to achieve fault tolerance.

For example, a 2-channel contactor control can be achieved if at least two enable circuits are available and the main current can be redundantly switched off or a sensor (e.g. EMERGENCY OFF switch) is interrogated using two contacts which are separately connected to an evaluation unit.

Danger
Potential source of damage. (taken from EN 292-1)

E.g. danger due to electric shock, danger due to crushing, ...

EMERGENCY STOP
An operation in an emergency which is designed to stop a process or movement which is potentially dangerous (from EN 60204-1 Annex D).

EMERGENCY SWITCHING-OFF
Arrangement of components which are intended to implement an EMERGENCY SWITCHING-OFF function (EN 418-1992). (Note: Today, a differentiation is made between “Stopping in an emergency” and “Power off in an emergency.”

Stopping in an emergency
A function which either avoids or minimizes approaching or existing danger for persons, damage to the machine or when carrying out work;
– initiated by the single action of a person.
(latitude 292-1 2000)

Power off in an emergency
Power off in an emergency is achieved by disconnecting the machine from the supply subsequent to a Category 0 stop (EN 60204 1997). Power off in an emergency should be provided, in compliance with EN 60204-1 1997, where there is possibility of danger due to electricity (i.e. electric shock).

EMERGENCY SWITCHING-OFF equipment
Arrangement of components which are intended to implement an EMERGENCY SWITCHING-OFF function (EN 418-1992). (Note: Today, a differentiation is made between “Stopping in an emergency” and “Power off in an emergency.”

Failure / Fault
Failure
When a piece of equipment or a device is no longer capable of executing a specified function.

Fault
Unintentional status of a piece of equipment or device which is characterized by the fact that it is not capable of executing a specified function.

Note: “Failure” is an event and “Fault” is a condition.

Feedback circuit
Circuit to monitor controlled contactors.

The function of contactors can be monitored by reading back the positively driven auxiliary contacts by an evaluation unit. If the contactor contacts are welded, the evaluation unit prevents a restart.
Fault
Refer to “Failure / Fault”.

Fault tolerance
Fault tolerance N means that a piece of equipment or device can still execute the specified task even when N faults/errors are present. For N+1 faults, the piece of equipment or device fails when executing the specified function.

Load group
A group of motor starters which is supplied through a power bus. A load group can be located within a potential group or can include parts of two potential groups.

Motor starter (MS)
Motor starters include direct and reversing starters. Starting and direction of rotation are determined using a motor starter.

Direct starter
A direct starter is a motor starter for one direction of rotation, which directly powers up or powers down a motor. It comprises a power switch and a contactor.

Reversing starter
A reversing starter is a motor starter for two directions of rotation. It comprises a circuit-breaker and two contactors.

Muting
Muting disables one or several safety functions for a limited time in-line with specifications.

Partial potential group
A partial potential group exists if within a potential group, the auxiliary voltage can be partially switched out.

Potential group
A group of motor starter and/or electronic modules which is supplied from a power module.

Redundancy
Availability of resources or equipment more than is actually required for its execution.

Requirement Class (AK)
Measure of the safety-related performance of control equipment. Defined in DIN V 19250 and DIN V VDE 0801.

Risk
Combination of the probability of the occurrence of damage and the extent of the damage.

Safety
Freedom from unacceptable risk.

Safety function
Function (e.g. of a machine or a control) whose failure (or breakdown) can increase the risk(s).

Safety functions of controls (EN 954)
“A function, initiated by an input signal and processed by safety-related parts of controls which allows the machine to achieve a safe condition (as system).”

Safety goal
To keep the potential hazards for man and the environment as low as possible without restricting industrial production, the use of machines or the production of chemicals as far as is absolutely necessary.

Safety Integrity Level (SIL)
In IEC 61508, this is defined as the measure for the safety performance of electrical or electronic control equipment. (-> Section 1)

Safety-relevant control function
Slightly differing definitions are provided in the various Standards.

Safety-relevant control function (draft IEC 62061)
Control function which is executed by a safety-relevant control system in order that a system goes into a safe condition (e.g. machine) or to avoid hazardous conditions occurring.

Stop Category
A term which is used in EN 60204-1 to designate three different stopping functions.

Stopping
This is a function which is intended to avoid or minimize hazards to personnel, damage to the machine or the execution of operational processes. It has priority over every other operating mode.

Two-hand circuit
Control device which requires that it is simultaneously actuated by both hands in order to activate hazardous machine functions and also maintain them.
### 8.3.2 Abbreviations

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<td>Handheld unit</td>
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<td>BWS</td>
<td>Contactless device</td>
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<td>Computerized Numerical Control</td>
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<td>CPU</td>
<td>Central Processing Unit</td>
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<td>DMS</td>
<td>Direct measuring system</td>
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<td>Driverless transportation system</td>
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<td>Human Machine Interface</td>
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8.4 Contact – Internet & Hotlines

**Internet address:**

General information
http://www.siemens.de/safety
http://www.siemens.de/automation/mall
AS-Interface
http://www.siemens.de/as-interface
SIGUARD
http://www.siemens.de/siguard
SIMATIC
http://www.siemens.de/simatic-controller
http://www.siemens.de/simatic-dp
SIMODRIVE 611, SIMODRIVE POSMO, SIMOVERT MASTERDRIVES
http://www.siemens.de/simodrive
SINUMERIK
http://www.siemens.de/sinumerik

**Hotlines:**

SIMATIC
++ 49 (0) 91 1-8 95-7 0 0 0
SIGUARD
++ 49 (0) 91 3 1-7 4 3 8 3 3
SINUMERIK
++ 49 (0) 1 8 0-5 2 5 8 0 0 8

8.5 Seminars on Safety Technology, Standards and Directives

The Training Center of the Automation and Drives Group can train and qualify your personnel so that they can handle innovative technology. Well-trained employees are motivated and play their role in creating optimum automation solutions.

The training courses are held using training equipment which has been especially developed for this purpose and is optimally equipped. The actual racks can be separately ordered.

The courses are modular and are aligned to the various target groups as well as individual customer requirements. We offer courses for decision-makers and managers as well as for operating personnel, programmers, configuring engineers, service specialists and maintenance personnel.

In addition to standard courses, we also offer individual courses tailored to the special requirements and demands of our customers. When requested, these courses can also be held at the customer’s facility.

Please refer to the SITRAIN catalog for more information on the courses.
### SIGUARD Safety Integrated – basic course

**Safety for man and machine**

How can safety be optimized for production/manufacturing cells and islands? You get to know important aspects such as: Machinery Directive and risk analysis, reliable system solutions using sensors, safety combinations, actuators and drives – with the configuration for a customized safety control system.

**Contents**

- Standards according to EEC legislation (CE marking)
- Harmonized machine standards (Group and Specialist Standards)
- Product liability legislation
- Risk analysis
- Risks related to the electrical design
- Overview of Siemens safety technology
- Overview of Siemens devices, equipment and system solutions
- Practical exercises

**Participants/ type of training**

Engineers responsible for safety, design engineers, commissioning and maintenance personnel; training course

**Prerequisites**

Knowledge about electronic and electrical engineering

**Duration**

1 day

**Course fee**

On request

**Location and time**

On request

**More info and course registration**

e-mail: Safety_Integrated@siemens.com

### SIMATIC S7-400F system course

This course is aimed at everybody who wants to learn how to handle, engineer and commission the fail-safe SIMATIC S7-400F automation system as well as the philosophy of fail-safe controllers, diagnostics and troubleshooting.

**Contents**

- Overview of the various redundancy techniques (H/F difference, availability, redundant systems, regulations)
- AS S7-400F (principle, system configuration and I/O)
- Configuring using the STEP7/F tool (system parameterization, system handling, fault diagnostics, documentation, acceptance)
- Fail-safe communications
- Exercises in configuring I/O, communications, troubleshooting, examples of programming, programming features

**Prerequisites**

SIMATIC STEP7 knowhow

**Duration**

3 days

**Course fee**

EUR 1,140 (plus Value Added Tax)

**Location and time**

On request

**More info and course registration**

www.sitrain.com
Fail-safe automation system SIMATIC S7-300F

This course is aimed at everybody who wants to learn how to handle, engineer and commission the fail-safe SIMATIC S7-300F automation system as well as the philosophy of fail-safe controllers, diagnostics and troubleshooting.

Contents
- AS S7-300F (principle, system configuration and I/O)
- Configuring with STEP7/F tool (system parameterization, system handling, fault diagnostics, documentation, acceptance)

Prerequisites
- SIMATIC STEP7 knowhow

Duration
- 2 days

Course fee
- On request

Location and time
- On request

More info and course registration
- www.sitrain.com

Safety Integrated NC-84D SIW

This course addresses configuring engineers, service-specialists and commissioning engineers who configure, engineer and commission machines with SINUMERIK 840D and Safety Integrated functionality. This course builds on the knowhow which you require to commission an 840D system. This knowhow can be obtained by participating in the NC-84D SIP Service Course.

Contents
- General information on safety technology
- System prerequisites
- Description of the following safety-related functions:
  - Safety-related inputs and outputs
  - Safe standstill
- Safe operating stop
- Safely reduced speed
- Safe software limit switch
- Safe software cam
- Safe stopping process
- Safe programmable logic
- Integrating sensors/actuators
- Safe communications
- Safe brake management
- Description of machine data and interface signals
- Commissioning and troubleshooting procedures
- Evaluating diagnostics and alarm displays
- Circuit examples for Safety Integrated
- Practical exercises relating to commissioning and service

Duration
- 5 days

Course fee
- On request

Location and time
- The current dates are available through the Internet under: http://www.sitrain.com

More info and course registration
- www.sitrain.com
### Safety Integrated NC-84D SIS

This course targets maintenance personnel who service/maintain machines equipped with SINUMERIK 840D and Safety Integrated. This course builds on the knowhow which you require to service/maintain a SINUMERIK 840D. This knowhow can be obtained by participating in the NC-84D SK Service Course.

**Contents**
- General information on safety technology
- System prerequisites
- Description of the following safety-related functions:
  - Safety-related inputs and outputs
  - Safe standstill
  - Safe operating stop
  - Safely reduced speed
  - Safe software limit switch
  - Safe software cam
  - Safe stopping process
  - Safe programmable logic
  - Integrating sensors/actuators
  - Description of machine data and interface signals
  - Fault finding procedures
  - Evaluating diagnostics and alarm displays
  - Circuit examples for Safety Integrated
  - Practical service exercises

**Duration**
On request

**Course fee**
On request

**Location and time**
The current dates are available through the Internet under: http://www.sitrain.com

**More info and course registration**
www.sitrain.com

### National and International Standards:
**Low-voltage switchgear according to DIN EN 60947 (VDE 0660, IEC 60947)**

As markets grow together and merge – in addition to the domestic standards – international standards are also becoming increasingly more important for product quality. For low-voltage switchgear, IEC 60947 defines the standard for the basic requirements. Our training course explains exactly what is regulated and what this involves for the product groups.

**Contents**
- Series of standards:
  - Structure and general definitions
  - Product standards
  - Actual status and a look to the future
- VDE 0660 – Part 100:
  - Terminology, contents, new aspects
  - Test requirements and testing
- Product standards for low-voltage devices
- EC Directives, testing and certification:
  - EMC Directive
  - Low-Voltage Directive
  - ALPHA/LOVAG

**Duration**
1 day

**Course fee**
On request

**Location and time**
On request

**More info and course registration**
e-mail: Safety_Integrated@siemens.com

**Participants/ type of training**
Training course for customers and Siemens employees

**Prerequisites**
Knowledge about electronic and electrical engineering
Training course for contactless SIGUARD protective devices

Do you want to bring yourself or your personnel up-to-speed about the application and use of contactless protective devices, then this is the optimum workshop for you.

Contents

- European Directives
- Safety-related parts of controls acc. to EN 945-1
- SIGUARD safety light curtain
- Calculating safety clearances acc. to EN 999
- Evaluation units
- Checking contactless protective devices
- Diagnostics

Participants/ type of training
Training course

Prerequisites
Knowledge about basic electrical and electronic engineering

Duration
2 days

Course fee
EURO 400.– plus Value Added Tax.

Location and time
After prior discussion (min. 6 participants)

More info and course registration
e-mail: Safety_Integrated@siemens.com
8.6 Type Test Certificates

8.6.1 Certificates for SIMATIC Safety Integrated
Certificate

No.: Z2 02 03 20411 009

Siemens AG
A & D AS
Gleiwitzer Straße 555
90475 Nürnberg

with production facilities
20411

is authorized to label the following products with the certification mark

as shown in the certification mark list. See also notes overleaf.

Product: Safety-Related Programmable System
Model: SIMATIC S7 Distributed Safety

Parameters:
- Logic solver: 1oo1D with coded processing
  and comparison by safety-related output
  modules
- Fieldbus: 1oo1 PROFIsafe
- I/O modules: 1o2 with normally energized outputs

Remarks: For the certification mark the following text is assigned:

"Functional Safety"

The product meets the relevant safety requirements and above mentioned properties
and was tested according to:

- 93/68/EEC Low Voltage Directive
- IEC 61508:2000, parts 1 to 4, SIL 1-3
  (to the extend applicable)
- DIN V 19250:1994
- DIN V VDE 0801:1990 with
  Amendment A1:1994, AK 1-6
- EN 50159:2001 (to the extend
  applicable)
- VDIVDE 2190:2000, part 2
- DIN VDE 0118:1986, Chapter 8.7
  - EN 296:1993, Chapters 9.10
  - EN 954-1:1997, pr EN 954-2
  Safety Categories 2-4 (to the extend
  applicable)
- EN 61131-2:1995
- EN 60204-1:1997
  (to the extend applicable)

The report no. 70013590, is a mandatory part of this certificate. The product complies
with the above listed safety requirements only, if the specifications documented in the
currently valid revision of this report are met.

Released with No. of Certificate by the
Certification Body of TÜV PRODUCT SERVICE GmbH.

Organization unit: TA-ES/MUC / Müller
Date: 26th March 2002

TÜV PRODUCT SERVICE GMBH - Zertifizierstelle - Riderstrasse 65 - D-80339 München
BIA
Berufsgenossenschaftliches Institut für Arbeitssicherheit
Hauptverband der gewerblichen Berufsgenossenschaften

Baumusterprüfbescheinigung

Name und Anschrift des Bezeichnungsinhabers:
Firma Siemens AG, AUT E 2
Frauenauracher Straße 80
D-91056 Erlangen

Name und Anschrift des Herstellers:
Firma Siemens AG, AUT E 2
Frauenauracher Straße 80
D-91056 Erlangen

Zeichen des Auftraggebers:
AUT 2 QM/Sch/Mi

Zeichen der Prüf- und Zertifizierungsstelle:
9907364 R/Sch/Gz

Ausstellungsdatum:
24.07.1996

Produktbezeichnung:
Sicherheits-Absturzsteuerung für Maschinen

Typ:
SINUMERIK 840 C safety integrated mit SIMOdrive 611D safety integrated

Nähere Angaben zur Hart- und Softwarestätten siehe Anlage.

Bestimmungsgröße
Verwendung:
Realisierung sicherer Maschinenfunktionen wie sicherer Halte, sicherer Betriebsfall, sicher reduzierte Geschwindigkeit, sicher begrenzte Abschaltung und sichere Ein/Ausgangssignale.

Prüfgrundlage:
[1] DIN V VDE 0801 mit Änderung A1; (10'/94)
[3] prEN 954-1: 11.94

Bemerkungen:
Gültig für Steuerungen mit den in der Anlage näher bezeichneten Versionsstandorten entspricht Anforderungsstellen 4 nach DIN V VDE 0801 und Kategorie 3 nach prEN 954-1; 11.94. Siehe auch Prüfzeugnis Nr. 9907364.

Das geprüfte Baumuster entspricht den einschlägigen Bestimmungen der Richtlinie 89/392/EWG (Maschinen), geändert durch die Richtlinien 91/368/EWG und 93/44/EWG.

Weitere Bedingungen regeln die Prüf- und Zertifizierungsordnung vom Januar 1993.
Prüf- und Zertifizierungsstelle
im BSG-PRÜFZERT

BIA
Berufsgenossenschaftliches
Institut für
Arbeitssicherheit
Hauptverband der gewerblichen
Berufsgenossenschaften

Baumusterprüfbescheinigung

Name und Anschrift des Auftraggebers:
Siemens AG A&D MC
Frauenauracher Str. 80, D-91056 Erlangen

Name und Anschrift des Herstellers:
Siemens AG A&D MC
Frauenauracher Str. 80, D-91056 Erlangen

Zeichen des Auftraggebers: Zeichen der Prüf- und Zertifizierungsstelle:
A&D MC 612 2000 23147 Apfl/Schulz

Produktbezeichnung: Sicherheits-Antriebssteuerung für Maschinen

Typ: SINUMERIK 840 D und 840 DE safety integrated mit SIMODRIVE 611 D safety integrated

Bestimmungsgemäßes Verwendung: Realisierung sicherer Maschinenfunktionen: Halte, Betriebshalt, reduzierte Geschwindigkeit, begrenzte Absolutlage, Ein-/Ausgangssignale, programmierbare Logik, Bremsrampe, Stillsetzen über sicherheitsgerichtete Eingänge

Prüfgrundlage:
[1] DIN V VDE 0801 mit Änderung A1; (10/94)

Bemerkungen:

Das geprüfte Baumuster entspricht den einschlägigen Bestimmungen der Richtlinie 98/37/EG (Maschinen).

Weitere Bedingungen regeln die Prüf- und Zertifizierungsordnung vom Oktober 1997

Leiter der Zertifizierungsstelle

Fechzertifizierer

Postadresse: 63764 Borken Augustin
Haustrasse: 53764 Borken Augustin
Tel: 0 22 03 31-02
Fax: 0 22 03 31-23 30

8/21 Safety Integrated Application Manual Siemens AG
The Czech Machine Testing Institute, effective 22.06.2000, recognised the current BIA certificate of SINUMERIK Safety Integrated.
8.6.3 Certificate for SIMOVERT Masterdrive
8.6.4 Certificate for SIMODRIVE 611 U

BG-Prüfbescheinigung

Name und Anschrift des Bescheinigungsinhabers: Siemens AG Automatisierungs- und Antriebstechnik 
Frauenauracher Str. 80, D-91056 Erlangen

Name und Anschrift des Herstellers: siehe oben

Zeichen des Auftragnehmers: Zeichen der Prüf- und Zertifizierungsstelle: 612.17-EM II 
Auszugdatum: 28.09.2001

Produktbezeichnung: Anlaufsperr für Antriebsreglergeräte
Typ: SIMODRIVE 611 U

Bestimmungsgemäß Verwendung: Verhinderung von unerwartetem Anlauf, Kraftlos schalten des Antriebs

Prüfgrundlage: DIN EN 60204-1 "Elektrische Ausrüstung von Maschinen-Teil 1: Allgemeine Anforderungen" 
DIN EN 6054-1 Sicherheit von Maschinen - Sicherheitsbezogene Teile von Steuerungen Teil 1: Allgemeine Gestaltungsaussetzungen

Bemerkungen: Prüfbericht Nr.: 3012-4/01
Die Anlaufsperr für Antriebsreglergeräte genügt den Anforderungen von DIN EN 6054-1, Kat. 3 
und kann in Verbindung mit Maschinensteuerungen, die Kat. 3 genügen, eingesetzt werden.

Das geprüfte Bauprodukt entspricht den oben angegebenen Prüfgrundlage. 
Der Bescheinigungsinhaber ist berechtigt, das umseitig abgebildete BG-PRÜFZERT-Zeichen an den mit dem geprüften 
Bauprodukt übereinstimmenden Produkten anzubringen, und zwar mit dem unter 'Bemerkungen' genannten Hinweis. 
Diese Bescheinigung wird spätestens ungültig am:

30.09.2006

Weitere über die Gültigkeit, einschließlich Verlängerung und andere Bedingungen regelt die Prüf- und Zertifizierungsbe- 
ondruck vom Oktober 1997.
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