MESH 8.0 – Machinery and Work Equipment Safety

Machine Safeguarding Specifications for New Equipment

January 1, 2012 – Revision 3

Scope

The specifications contained in this document apply to all industrial equipment purchased or built after June 1, 2011. Industrial equipment is defined as power-driven machines or groups of machines working in a coordinated manner from a fixed location and operating from a nominal voltage of 600 volts or less.

Industrial equipment can include associated equipment used to transfer material or tooling, including fixtures, to assemble/disassemble, to inspect or test, or to package. The associated control equipment, including the logic controller(s) and associated software or logic together with the machine actuators and sensors, are considered part of the machine.

This specification does not apply to portable, handheld equipment or cord and plug connected equipment that operate at a nominal voltage less than 120 volts (US/Canadian locations) or 230 volts elsewhere unless local regulatory regulations require inclusion.

Specifications

All industrial equipment purchased on or after June 1, 2011 must comply with all applicable legal requirements in the jurisdiction where the equipment will be used, including (but not limited to) applicable legal requirements related to risk assessment, safeguarding performance, electrical design, energy isolation devices and documentation as well as the specifications set forth below. For purposes of these specifications, the terms “industrial equipment” and “machine” are used interchangeably.

Eaton reserves the right to appoint a third party with competence and expertise in machine safety to determine if machine design and construction meets the requirements of applicable regulations, agreed international and local standards including but not limited to those listed in this specification. In the event that the designated expert determines a non-conformance with the essential requirements of such regulations and standards, the vendor agrees to implement the necessary design and construction changes within the agreed purchase costs.

Risk Assessment

The machine manufacturer must complete a documented risk assessment to ensure that all potential machine hazards are identified. In the absence of more stringent regulatory requirements, Eaton requires adherence, at a minimum, to the ISO standard listed below (as such standards may be amended and are in effect at the time the machine is purchased).

- ISO 12100:2010
  Safety of Machinery -- General Principles for Design – Risk assessment and Risk Reduction

Additional guidance on risk assessment techniques applicable to specific types of equipment may be found in the standards listed below.

- ANSI RIA R15.06-1999 (R2009)
  Safety Requirements for Industrial Robots and Robot Systems

- ANSI/PMMI B155.1-2006
  Safety Requirements for Packaging Machinery and Packaging-Related Converting Equipment

- ANSI B11.TR3-2000
  Risk Assessment and Risk Reduction - A Guideline to Estimate, Evaluate and Reduce Risks Associated with Machine Tools

Safeguarding Performance

In the absence of more stringent local regulatory requirements, performance of physical safeguards and safety control systems (electrical, mechanical, hydraulic and pneumatic) must meet, at a minimum, the applicable ISO/IEC standards below (as such standards may be amended and are in effect at the time the equipment is purchased).

- ISO 13849-1:2006
  Safety of Machinery -- Safety-Related Parts of Control Systems -- Part 1: General Principals for Design

- IEC 62061 ed1.0
  Safety of Machinery -- Functional Safety of Safety-Related Electrical, Electronic and Programmable Electronic Control Systems

- ISO 14120:2002
  Safety of Machinery -- Guards – General Requirements for the Design and Construction of Fixed and Movable Guards

- ISO 13855:2010
  Safety of Machinery -- Positioning of Safeguards with Respect to the Approach Speeds of Parts of the Human Body

- ISO 14119:1998/Amd 1:2007
  Safety of Machinery -- Interlocking Devices Associated with Guards - Principles for Design and Selection (Design to Minimize Defeat Possibilities)

- ISO 4413:2010
  Hydraulic Fluid Power -- General Rules and Safety Requirements for Systems and their Components

- ISO 4414:2010
  Pneumatic Fluid Power -- General Rules and Safety Requirements for Systems and their Components

In addition to the minimum standards listed above, the purchasing location may specify other machine-specific functional safety standards (Type “C” standards) to provide additional guidance. Examples include:

- ANSI B11.TR6-2010
  Safety Control Systems for Machine Tools

- ANSI/RIA R15.06-1999 (R2009)
  Safety Requirements for Industrial Robots and Robot Systems

- ANSI/PMMI B155.1-2006
  Safety Requirements for Packaging Machinery and Packaging-Related Converting Equipment

Electrical Design

In the absence of more stringent local regulatory requirements, Eaton requires, at a minimum, that the electrical components of the equipment adhere to the IEC or NFPA standard listed below (as such standard may be amended and is in effect at the time the equipment is purchased).

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- IEC 60204-1 ed5.1 Consol. with am1
  Safety of Machinery -- Electrical Equipment of Machines – Part 1: General Requirements

- NFPA 79 (2007)
  Electrical Standard for Industrial Machinery

Energy Isolation Devices

The manufacturer or supplier must provide appropriate energy isolating devices required for effective control of hazardous energy (electrical, mechanical, hydraulic and pneumatic). Energy isolation devices must be capable of being locked in the "off" or "safe" position. In the absence of more stringent local regulatory requirements, Eaton requires, at a minimum, that energy isolation devices adhere to the ISO standard listed below (as such standard may be amended and are in effect at the time the equipment is purchased).

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- ISO 14118:2000
  Safety of Machinery -- Prevention of Unexpected Start-up

Documentation

The manufacturer or supplier must provide the following documentation upon delivery of the machine:

a. Drawings of equipment including control circuit diagrams and mechanical layout of the equipment;

b. A description of the mitigating risk reduction techniques implemented to minimize hazards identified during the risk assessment, including the final resultant risk level and any unresolved risk that may still be present after mitigation techniques are implemented;

c. Documentation (drawings, calculations, users manual, SISTEMA software report or other evidence) demonstrating that safeguards and safety circuits adhere to the applicable performance standards and meet the defined risk reduction level;

d. Documentation – such as calculations or drawings – demonstrating that safeguarding devices are located at the appropriate safe mounting distances;

e. A copy of operating and maintenance instructions for the machine (including a copy of the instructions in the local language of the location where the machine will be used);

f. Inspection and functional testing requirements for safeguarding devices – including but not limited to light curtains, laser scanners, and pressure-sensitive mats – which end users are expected to perform. The requirements shall specify the frequency of functional testing; and

g. When required by the applicable performance standards used for the design of the safety-related parts of the control system, evidence of validation indicating that the safety circuit(s) function in accordance with applicable performance requirements.

European Union

Equipment supplied for use in the European Union shall meet all legal requirements applicable to the equipment, such as (but not limited to) the EU directives listed below (as such directives may be amended and are in effect at the time the equipment is purchased).

- 2006/42/EC Machinery Directive
- 2006/95/EC Low Voltage Equipment
- 2004/108/EC Electromagnetic Compatibility
- 94/9/EC Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres (ATEX)
- 97/23/EC Pressure Equipment Directive

The machine manufacturer is responsible for determining which directive applies to their products.

Machinery will be supplied with:

- A declaration of conformance prepared in conformance with Annex II-A of the "Machinery Directive 2006/42/EC".
- Should the equipment be considered a "*partly completed machine"* the declaration of conformance must be prepared in conformance with Annex II-B of the "Machinery Directive 2006/42/EC" The equipment must be supplied with instructions for partly completed machinery in conformance with Annex VI. The equipment supplier must notify Eaton of such a designation at the time for order placement.
- The declaration must include the name and address of the person authorized to compile the technical file who must be established in the community (e.g., EU member state). Where the equipment manufacturer does not have an affiliate established in the community, the manufacturer shall appoint an "Authorized Representative" at their own expense who under mandate from the manufacturer will compile the technical file on their behalf.
- The declarations shall include references to the relevant EU harmonized standards including harmonized equivalents of the ISO and IEC standards listed in this document.

Where conformity to applicable EU directives is required, the equipment shall bear the CE Marking as required by the applicable directives and shall be accompanied by any required declarations or other documentation under the directive.

Technical Assistance

The companies listed below can assist the machine manufacturer or supplier with the aforementioned risk assessment and design of safeguards and control circuits. The machine manufacturer or supplier is responsible for incorporating the costs associated with these services into the final purchase price of the machine.

Global Contacts

Omron-STI Machine Services	**Pilz Safety Services**	**Rockwell Automation**
Carolyn Reifsteck	John McAuliffe	Larry Rager
Carolyn_Reifsteck@sti.com	j.mcauliffe@pilz.ie	lvrager@ra.rockwell.com
+1 815 501 8021	+353 21 4346535	+ 1 330 486 6643

Country-Specific Contacts

In addition to the primary contacts listed above, **Pilz Safety Services** has provided a list country contacts that machine builders may contact for assistance with risk assessments and the design of safeguards and control circuits. The machine builder is responsible for incorporating the costs associated with these services into the final purchase price of the machine.

United States	**Austria**	**Australia/New Zealand**
Pilz Automation Safety L.P.	Pilz Ges.m.b.h	Pilz Australia
Ron Weiskittle	Gerhard Stockhammer	Paul Rawlings
r.weiskittle@pilzusa.com	g.stockhammer@pilz.at	p.rawlings@pilz.com.au
+1 734 354 0272	+43 1 7986263-0	+61 3 95446300

Belgium
Pilz Belgium
Yves Malfroot
yves.malfroot@pilz.be
+32 9 3217570

Brazil
Pilz do Brasil
Jose Carlos de Miranda Roque
j.roque@pilz.com.br
+55 11 4337 1241

Switzerland
Pilz Industrieelektronik GmbH
Beat Eugster
b.eugster@pilz.ch
+41 62 88979 30

China
Pilz Industrial Automation
Robin Huang
r.huang@pilz.com.cn
+86 21 60880878

Germany
Pilz GmbH & Co. KG
Juergen Maibach
j.maibach@pilz.de
+49 711 3409 0

Scandinavia
Pilz Skandinavien K/S
Bjarne Erichs
b.erichs@pilz.dk
+45 74436332

Spain
Pilz Industrieelektronik S.L.
Pedro Ascoz
p.ascoz@pilz.es
+34 938497433

France
Pilz France Electronic
Oliver Arbogast
o.arbogast@pilz-france.fr
+33 3 88104000

United Kingdom
Pilz Automation Technology
David Bromme
d.bromme@pilz.co.uk
+44 1536 460766

Italy
Pilz Italia Srl Automazione
Dario Colucci
d.colucci@pilz.it
+39 031 789511

Japan
Pilz Japan Co., Ltd
Takuya Takahasi
t.takahashi@pilz.co.jp
+81 45 471 2281

Korea
Pilz Korea Ltd.
Soo Young Cheon
s.cheon@pilzkorea.co.kr
+82 2 2263 9541

Mexico
Pilz de Mexico
Federico Badillo Islas
f.badillo@mx.pilz.com
+52 55 5572 1300

Netherlands
Pilz Nederland
Jan Van Der Heide
j.vanderheide@pilz.nl
+31 347 320477

Poland
Pilz Polska Sp Z.o.o
Dariusz Kowalski
d.kowalski@pilz.pl
+48 22 8847100

Russia
Pilz RUS OOO
Sergey Chernyshev
s.chernyshev@pilzrussia.ru
+7 495 665 4993

Turkey
Pilz Emniyet Otomasyon
Yavuz Copur
y.copur@pilz.co.tr
+90 216 5452910

Other Countries
Pilz Safety Services
Jamie Alonso Vallin
j.alonso@pilz.ie
+353 21 4346535