INTERNATIONAL STANDARD

ISO 13849-1

Second edition 2006-11-01

Safety of machinery — Safety-related parts of control systems —

Part 1: **General principles for design**

Sécurité des machines — Parties des systèmes de commande relatives à la sécurité —

Partie 1: Principes généraux de conception



Reference number ISO 13849-1:2006(E)

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below

© ISO 2006

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office Case postale 56 • CH-1211 Geneva 20 Tel. + 41 22 749 01 11 Fax + 41 22 749 09 47 E-mail copyright@iso.org Web www.iso.org

Published in Switzerland

Contents

Page

Forewordv		
Introductionvi		
1	Scope	1
2	Normative references	1
3 3.1 3.2	Terms, definitions, symbols and abbreviated terms Terms and definitions Symbols and abbreviated terms	2
4 4.1 4.2 4.2.1 4.2.2 4.3 4.4 4.5 4.5.1	Design considerations Safety objectives in design Strategy for risk reduction General Contribution to the risk reduction by the control system Determination of required performance level (PL _r) Design of SRP/CS Evaluation of the achieved performance level PL and relationship with SIL Performance level PL	9 11 11 14 14
4.5.2 4.5.3 4.5.4	Mean time to dangerous failure of each channel (MTTF _d)	17 18 18
4.6 4.6.1 4.6.2 4.6.3	Software safety requirements	21 21 22
4.6.4 4.7	Software-based parameterization Verification that achieved PL meets PL,	
4.8	Ergonomic aspects of design	
5 5.1 5.2 5.2.1 5.2.2 5.2.3 5.2.4 5.2.5 5.2.6 5.2.7 5.2.8	Safety functions Specification of safety functions Details of safety functions Safety-related stop function Manual reset function Start/restart function Local control function Muting function Response time Safety-related parameters Fluctuations, loss and restoration of power sources	26 28 29 30 30 30
6	Categories and their relation to MTTF _d of each channel, DC _{avg} and CCF	31
6.1 6.2 6.2.1 6.2.2 6.2.3	General Specifications of categories General Designated architectures Category B	31 32 32
6.2.4	Category 1	33
6.2.5 6.2.6 6.2.7	Category 2 Category 3 Category 4 Combination of SRP/CS to achieve overall PL	35 36
6.3	Compination of SRP/CS to achieve overall PL	39