

CBC DECISION/CLARIFICATION SHEET

Subject: Application of ISO 13849-1: Safety-related parts of control systems for the Certification of Wind Turbines	Standard and clause: IEC 61400-1:2005	Sheet No. CBC 7B
Status of document: Approved	Approval date: 2012-11-09	Originator of proposal: Germanischer Lloyd Industrial Services GmbH Renewables Certification Proposal date: 2012-07-27
Related document:		

I. Motivation and Introduction

If risk reduction is achieved by safety functions IEC 61400-1 states requirements. Adequate documentation is to be submitted by the applicant to the Certification Body. The motivation of this decision/clarification sheet is to comment on the application of ISO 13849-1 in the certification process.

II. Standard ISO 13849-1

The standard ISO 13849-1 “Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design” has been released in 2006 and harmonized to the European machinery directive 2006/42/EC in 2007. The new probabilistic approach of ISO 13849-1 in comparison to the deterministic approach of EN 954-1 additionally covers the use of programmable electronic components which became very common in control and safety systems in the past years.

The assessment using ISO 13849-1 is based on the following two approaches:

1. quantifiable aspects which can be measured/evaluated such as $MTTF_d$ (Mean Time To dangerous Failure), DC (Diagnostic Coverage), CCF (Common Cause Failure), structure, etc.
2. non-quantifiable aspects which give some indication of the quality of the risk reducing measures applied such as safety-related software, measures against systematic failure, etc.

III. Scope of application

ISO 13849-1 shall be applied to the extent that essential design parameters of the wind turbine are not exceeded and with this the structural integrity of the wind turbine is ensured.

“The combined safety-related parts of a control system start at the point where the safety-related input signals are initiated (including, for example, the actuating cam and the roller of the position switch) and end at the output of the power control elements (including, for example, the main contacts of a contactor).” [Source: Note 1 in section 3.1.1 on page 2 of ISO 13849-1]

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ATTENTION! The software, e.g. of pitch converter, if being part of a safety function, therefore shall be in accordance with chapter 4.6 in ISO 13849-1.

IV. Assessment

For the certification process it is recommended to submit the following information for assessment:

- 1) One table that lists up all safety functions including each required performance level (PL_r).
- 2) A safety-related block diagram including possible subsystems for each safety function.
- 3) A circuit diagram (electric, hydraulic, pneumatic) showing the wiring of all Safety-Related Parts of the Control System (SRP/CS) performing the safety functions.
- 4) A table for every safety function/subsystem which lists up the performing SRP/CS including the parameters the calculation is based on (e.g. $MTTF_d$, DC, etc.).
- 5) For reasons of clarity and comprehensibility the following evaluation results should also be listed in a table:
 - a. performance level (PL) for each safety function
 - b. subsystems belonging to each safety function, if existing
 - c. parameters the calculated PL is based on (e.g. $MTTF_d$, DC_{avg} , Category, etc.)

V. List of References

- /1/ ISO 13849-1:2006 Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- /2/ IEC 61400-1:2005 Wind turbines – Part 1: Design requirements
- /3/ EN 954-1:1996 Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
- /4/ IEC 60204-1:2005 Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- /5/ IEC 60204-1:2008 Amendment 1 Safety of machinery – Electrical equipment of machines – Part 1: General requirements
- /6/ 2006/42/EC Directive of the European Parliament and of the Council of 17 May 2006 on machinery

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