Test Report issued under the responsibility of:

DEKRA

TEST REPORT
ISO 13849-1
Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)

Report Number. .....:	**2254839.50**
Date of issue .....:	26-11-2021
Total number of pages .....:	24
Name of Testing Laboratory preparing the Report .....:	Dekra Certification B.V. Meander 1051, 6825 MJ Arnhem, the Netherlands
Applicant's name .....:	**Incosa Solutions BVBA**
Address .....:	Molenberglei 21, 2627 Schelle, Belgium
Test specification:	
Standard .....:	ISO 13849-1:2015
Test procedure .....:	Customer specific test
Non-standard test method .....:	N/A
Test Report Form No. .....:	ISO 13849-1 (V3)
Test Report Form(s) Originator .....:	DEKRA
Master TRF .....:	Date (2020-02)

General disclaimer:

The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the Testing laboratory, responsible for this Test Report.

Test item description..... :	Load limiter for cranes
Trade Mark..... :	Incosa solutions
Manufacturer..... :	E.D.&A. NV, Franseweg 20, 2920 Kalmthout, Belgium
Model/Type reference..... :	PD-84CLL1-T1 (PCB 57460V3)
Ratings..... :	24VDC, 0.6A, -10 to 60°C, OV Cat III (4000 V), PD2
Software version(s)..... :	V1.1.0.1.0

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
Testing Laboratory:	Dekra Certification B.V	
Testing location/ address..... :	Meander 1051, 6825 MJ Arnhem, the Netherlands	
Tested by (name, signature) ..... :	J.H. Beenen	
Approved by (name, signature)..... :	A. Bergervoet	

List of Attachments:

Not applicable.

Summary of testing:

Controls are tested to ISO 13849-1 and are intended for integration in hoists/cranes under the scope of EN 14492-2:2019. EN 14492-2, clause 5.2.5 requires PLc and category 2 for safety related functions.

The text of ISO 13849-1:2015 has been approved as EN ISO 13849-1:2015 without any modification.

Summary of compliance with National Differences:

List of countries addressed: European group differences.

☒ **The product fulfils the requirements of EN ISO 13849-1:2015 used in conjunction with EN ISO 13849-2:2012.**

Marking:

Trademark, manufacturer and type are marked on the PCB (copper/white print).

TEST ITEM PARTICULARS:

Test samples.....:	N/A
Classification of installation and use .....:	For integration in a cabinet
Supply connection .....:	Permanent connection
Over voltage category (OVC) .....:	OVC III
Control type.....:	PD2

POSSIBLE TEST CASE VERDICTS:

- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)

GENERAL REMARKS:

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Throughout this report the following abbreviations are used:

SR = Safety relevant
NSR = Non-safety relevant
DC_{avg} = Average diagnostic coverage
FMEA = Failure modes and effects analysis
MTTF = Mean time to failure
$MTTF_D$ = Mean time to dangerous failure
PL = Performance level
PL_r = Required performance level
SIL = Safety integrity level
SRASW = Safety-related application software
SRESW = Safety-related embedded software
SRP/CS = Safety-related part of a control system
See ISO 13849-1, Table 1 for other abbreviations.

GENERAL PRODUCT INFORMATION:

Control acts as load/capacity limiter and is intended for integration in hoists/cranes under the scope of EN 14492-2:2019 (clause 5.2.5 indicates at least PLc and category 2 for safety-related functions).

Description:

An external load cell is connected to U9 by CAN bus (J4/J5 and U4/U5). Performance level of external load cell is not examined as part of this report. CAN communication (address/data integrity and loss of communication) is examined as part of logic.

Micro-controller U9 drives relays REL12 and REL13 at request of functional controller MOD1. First REL12 is closed (no load), then REL13 is closed. If requested by MOD1 first REL13 is opened, then REL12 is opened. REL12 does not make or break current under normal conditions. REL12 is driven by U9 through Q3 (transistor) and U8/Q8 (buffer/mosfet). REL13 is driven by U8 through Q4 (transistor) and U8/Q9 (buffer/mosfet).

REL12/REL13 normally open contacts are connected in series to J3-7/8. Depending on end application (required power and performance level) one or more external relays may be connected to J3-7/8. Performance level of external relay(s) is not examined as part of this report.

Diagnostic coverage:

Contact of REL13 is monitored continuously by U9 through an additional contact (positively mechanical linked) that is supplied by a dynamic signal generated by U9/Q7.

Q3/Q4, U8/Q8/Q9 are checked before and after activation of REL12/REL13 by a test that (de)activates Q3/Q4/Q8/Q9 in turn and monitors the relay coil voltage through feedbacks.

In case of internal U9 faults (e.g. registers, clock, RAM, ROM) internal independent watchdog is no longer triggered, resulting is U9/U8 reset. In case of faults external to U9 (on control) clocks logic 0 to all U8 output pins.

Model differences:

PD-84CLL1-T1 includes automatic variant recognition through resistors R37 (placed for T1) and R36 (placed for T2). Variant PD-84CLL1-T2 does not include REL13 (shorted by R83). PD-84CLL1-T2 is not examined as part of this report. If variant T2 assumes that it is T1 then REL13 will not be powered, resulting in a safe situation (R83 is not present). If variant T1 assumes that it is T2 then the REL13 transistor/relay check will fail, resulting in a safe situation.

Report History:

26-11-2021 (project 225483900): Initial release of report no 2254839.50.

Conditions of acceptance:

Performance levels and MTTFd values of several components were accepted on bases of self-declaration of component manufacturers. These levels/values have not been verified by Dekra Certification BV and are at the responsibility of component manufacturers and applicant.

External load cell and external relay(s) have not been examined as part of this report. Performance level of overall system shall be examined as part of end appliance.

DESCRIPTION OF SAFETY FUNCTION(S)

Examined functions		Performance level	
No	Description	Declared	Realized
SF1	Sensing of overload	c	d

Notes:

- Declared: minimum PL to be realized, based on EN 14492-2:2019, clause 5.2.5.
- PD-84CLL1-T1 (including micro-controller and on-board relays) is considered as logic channel.
  Calculated MTTFd=139 y (DCavg=medium, Category 2).
- External load cell is considered as input channel (not examined).
  Note: CAN communication to load cell has been examined (hart-beat message and CRC address/data).
- External relay(s) are considered as output channel (not examined).

SOFTWARE MODULE(S) AND ASSOCIATED VERSION(S)

MOD1 software is classified as Class A (in the meaning of IEC 60730-1).

U9 includes both Class A and Class B software that are separated clearly. Communication between A/B is performed by a single module (‘InterfaceA’).

Software identifier: V1.1.0.1.0 (first digit refers to hardware version, next two digits to Class B software version, last two digits to Class A software version).

See D04, chapter 3.2 for a list of all software modules.