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Date 25.07.2014

Dear Mr. Waldherr,

You ordered the calculations of your circuit diagram „Lasersicherheitseinrichtung SPISCU11 für externes duales Sicherheitsrelais als Bestandteil des Lasers“ according to DIN EN ISO 13849-1:2008-12 at DEKRA EXAM GmbH.

The calculation was conducted based on the provided documents and using the tool SISTAMA of the “Institutes für Arbeitsschutz der deutschen gesetzlichen Unfallversicherung” and the Siemens standards SN29500-x. The results are illustrated below:

The provided circuit diagram itself is not able to execute any safety function without the correct connection to the necessary sensors and actors to ensure the completeness of the safety function. The fact that neither the sensor nor the actors are part of the delivery and that their characteristics are unknown means that we cannot calculate the performance level of the incomplete safety function.

In order to provide a basis for engineer's calculation of a complete safety function including your circuit, we derived the following values from your circuit diagram according to DIN EN ISO 13849-1:2008-12:

- | | |
|-------------|-----------------------|
| • Category | 3 |
| • MTTFd [a] | 100 years (high) |
| • DCavg [%] | 90% (medium) |
| • CCF | 65 points (fulfilled) |

According to these values and by correct connected sensors, actors and power supply with adequate safety integrity and considering the requirements of DIN EN ISO 13849-1:2008-12 it is possible to reach for the whole safety function(s) by using the outputs relay A and relay B the following performance level:

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Bank connection:
Commerzbank AG formerly Dresdner Bank AG, Stuttgart
BIC:DRESDEFF600, IBAN: DE8160080000906613500

Managing director:
Dipl.-Ing. Jochen Titze

- Performance Level PL d
- Safety Integrity Level SIL 2 (according to DIN EN ISO 13849-1:2008-12 table 4)

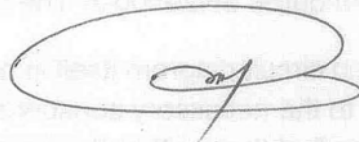
In addition to the functional safety measures applied to the control system and allocated to the technical components, there are organizational and technical measures, which have to be taken to protect eyes and body regardless of the control system. Those are: Limit of the power of the laser to maximum 1000W; Wearing protective glasses against laser beam reflections; Housing the laser in a closed and safe cabin, with protection doors and laser protective glass as well as safety related optical indication of laser power supply switch-off, whereupon the size of the cabin has to avoid that humans can be inside while protected doors are closed; Use of a pilot light to indicate an active laser; Execution of periodical training and tests in order to guarantee the correct function of the procedures and equipment; ...

Thank you for your order and we appreciate future cooperation.

Kind regards
DEKRA EXAM GmbH



Dipl.-Ing. BA Marc Kipping



B. Ing. Oussama Cherichi