Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

(1) # EC-TYPE-EXAMINATION CERTIFICATE

(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-type-examination Certificate Number:

PTB 14 ATEX 3012 U

(4) Equipment: Thermal motor protection device, type MS 220 DA

(5) Manufacturer: Ziehl industrie-elektronik GmbH + Co KG

(6) Address: Daimlerstraße 13, 74523 Schwäbisch Hall, Germany

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Physikalisch-Technische Bundesanstalt, notified body No. 0102 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.

The examination and test results are recorded in the confidential test report PTB Ex 14-33257.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 60947-8, EN 60947-1, EN 60947-5-1, EN 50495, EN 61508

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design, examination and tests of the specified equipment in accordance to the Directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment. These are not covered by this certificate.

(12) The marking of the equipment shall include the following:

II (2) G [Ex e] [Ex d] [Ex n] or II (2) D [Ex tb] [Ex tc]

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Braunschweig, 23 July 2014

Dr.-Ing. F. Lienesch
Regierungsdirektor

PHYSIKALISCH-TECHNISCHE BUNDESANSTALT II

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(13) # SCHEDULE

(14) ## EC-TYPE-EXAMINATION CERTIFICATE PTB 14 ATEX 3012 U

(15) Description of the component

The TMP motor protection module of type MS 220 DA (hardware version: parts list 12030-0202-1) has been designed as a passive option interface. It cannot be operated separately. It only achieves full functionality when it is integrated into the Danfoss frequency converters of types VLT® HVAC Drive FC 102, VLT® AQUA Drive FC 202 and VLT® Automation Drive FC 302. Types MS 220 DA (designated as types MCB112 PTC- Thermistor Option B if mounted in Danfoss converters) are used for the before-mentioned Danfoss converters with the certified function SafeTorqueOFF (STO) and the certified tripping path "PTC-TMS- STO- electronic tripping circuit".

The module consists of an evaluation unit for PTC thermistor detectors with safe separation. The MS220DA meets the requirements of the interface protocol P400 *Detection of passive option modules* and is recognized automatically by the frequency converter used.

In case of failure, the module cannot switch off automatically. Therefore, it is in that case switched off via the terminal X44/12 which is connected to the safety entrance "Safety Stop" - terminal T37 of the Danfoss converter. Thereby, triggering for the IGBT is de-energized. Another logic output "terminal X44/10" serves for status detection in the case of failure. Type MS 220 DA works in accordance with the closed-circuit principle

Among the most important functions are: overtemperature detection, detection of wire interruption and short-circuit detection in the detector circuit.

All functions serve to protect non-explosion-protected motors and explosion-protected motors in routine operation and in case of failure.

On the printed circuit board for the MS 220 DA, modifications have been performed which are the object of this report.

For the mode of operation with a low demand and the architecture **1oo1**, composed of sub-systems acc. to type A and hardware fault tolerance (HFT) = 0 (see EN 61508 part 1 Table 2 and EN 61508 part 2 Table 2) the following characteristics of the functional safety were determined for the types MS220 DA at an ambient temperature of 40 °C (component temperature 60 °C):

Motor protection by means of thermistor:

Safety integrity level:	SIL 2 (type A)
Fraction of the non-hazardous failures compared to the hazardous failures (SFF):	78 %
Fraction of the undetected, gefahrbringenden Ausfälle (λ_{DU}):	76.9 x 10^{-9}/h
Fraction of the detected, dangerous failures (λ_{DD}):	0 × 10^{-7}/h
Fraction of the undetected, sicheren Ausfälle (λ_{SU}):	37.3 x 10^{-9} /h
Fraction of the detected, safe failures (λ_{SD}):	235 x 10^{-9} /h

Average probability of a dangerous failure to perform the safety function on demand (PFD) at a proof test interval T1 of 36 months (in accordance with EN 60079-17):

PFD: 1.01 x 10^{-3}/h (requirement for SIL 2 as per standard: ≥ 10^{-3} /h to < 10^{-2} /h).

The mean operating time between failures (MTBF) amounts to 179 years.

Additional information can be taken from the operating instructions MS220DA (12030-0700-02 of 23.06.2014) which are enclosed with the devices.
In addition, updated versions can be downloaded from the website: www.ziehl.de.

Note:
The data of the functional safety stated above are valid for an ambient temperature of 40 °C. Data for additional ambient temperatures can be obtained on request.

(16) Test report PTB Ex 14-33257

(17) Notes for manufacture, installation and putting into use

None

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(18) Essential health and safety requirements

The tests carried out, their positive results and the proof furnished of 23 June 2014 (12030-1601-00) have confirmed compliance with the standards and thus with Directive 94/9/EC, Annex II (in particular point 1.5). Suitably selected and adjusted safety devices of this type are necessary for the safe operation of explosion-protected motors. The devices themselves are installed outside potentially explosive atmospheres.

Zertifizierungssektor Explosionsschutz
On behalf of PTB:

Dr.-Ing. F. Lienesch
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Braunschweig, 23 July 2014