

2nd SUPPLEMENT
according to Directive 94/9/EC Annex III.6
to EC-TYPE-EXAMINATION CERTIFICATE PTB 10 ATEX 3016
(Translation)

Equipment: Universal Motor Controller, type UMC100.3

Marking:  II (2) G [Ex e] [Ex d] [Ex px] or  II (2) D [Ex t] [Ex p]

Manufacturer: ABB STOTZ KONTAKT GmbH

Address: Eppelheimer Straße 82, 69123 Heidelberg, Germany

Description of supplements and modifications

The three-phase electronic universal motor-protective circuit-breakers, types UMC100.3 with communication interfaces serve to monitor explosion-protected electric motors in accordance with Directive 94/9/EC group II of categories 2 and 3 (gas: zones 1 and 2; dust: zones 21 and 22).

Compared to the preceding version (type UMC100-FBP), the hardware changes mainly in relationship to the new AC supply and to the redesign of the printed circuit boards, to new relays and new triggering of the relays, to the coupling of the field bus adapters, the single-phase operation, to the measurement and display of the single-phase currents, the new panel with larger display and to an USB port. The software changes between version 30.04 and 40.00 relate to the current measurement in single-phase operation, the calculation of the current imbalance and to the processor load with possibly changed time response.

By means of FieldBusPlug (FBP), the Universal Motor Controllers can be used in the different field bus networks. They can also be operated as an independent device without FBP. The digital inputs, the diagnostic information and the parameters can be read out via the field bus. The parameters of the device can be set via the field bus systems, the LCD control panel UMC-PAN 100 and via a Device Type Manager (DTM).

The internal logic is freely programmable. For this purpose, functional modules are available.

The LED displays on the device signalize "Operation" (green LED), "Warning" (yellow LED) and "Overload / Fault (red LED)".

A self-checking test and the consistency test of the configuration data are performed when the UMC100.3 is switched on. It is important that this is done with the motor switched off. In the self-

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checking test, the most important functions of the device's hardware and software are checked and only if the self-checking test is successfully passed the motor can be switched on.

The thermal memory of the preheating of the device UMC100.3 is maintained even when the voltage supply fails (e.g. without previous overload release: as soon as the power has returned, the thermal memory is charged with the last value before the power failure). After the non-explosion-protected motor or the explosion-protected motor has been switched off by the Universal Motor Controller due to overload, the thermal motor model calculates the cooling-off time. It depends on the parameterized value below which the thermal capacitance must fall or on the fixed cooling time which the user determines, for example, from the size of the motor. Only then the motor can be switched on again.

For the mode of operation with low demand and the architecture "1001", composed of subsystems in accordance with types A and B (see EN 61508 part 1 Table 2 and EN 61508 part 2 Table 3), the following characteristic data of the functional safety were determined for the Universal Motor Controller UMC100.3 at an ambient temperature of 40 °C (component temperature 55 °C) and AC loads with RC element. The component failure probability calculation (MTBF) was performed in accordance with standard SN29500.

a) Safety function: overload protection

Safety integrity level: SIL 1

Characteristic values	UMC100.3 DC	UMC100.3 UC
Fraction of the non-hazardous failures compared to the hazardous failures SFF [%]	84.9	88.1
Fraction of the undetected, dangerous failures λ_{DU} [FIT]	146	175
Fraction of the detected, dangerous failures λ_{DD} [FIT]	390	399
Fraction of the undetected, safe failures λ_{SU} [FIT]	308	770
Fraction of the undetected, safe failures λ_{SD} [FIT]	128	130

Note: 1 FIT corresponds to $10^{-9}/h$

Mean probability of a dangerous failure in the case of the safety function requirement (PFD) (PFD = Probability of failure on demand) and an interval of the periodic retest T1 of 10 years: PFD = $6.42 \times 10^{-3}/h$ for UMC100.3 DC and PFD = $7.66 \times 10^{-3}/h$ for UMC100.3 UC

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(requirement for SIL 1 as per standard: $\geq 10^{-2}/h$ to $< 10^{-1}/h$).

According to EN 60079-17, the periodic retest of facilities for Ex protection is required after maximally 3 years:

PFD = $1.9 \times 10^{-3}/h$ for UMC100.3 DC and PFD = $2.3 \times 10^{-3}/h$ for UMC100.3 UC.

For the safety-related parts of control systems in accordance with EN ISO 13849, the following data have been determined at an ambient temperature of 40 °C and AC loads with quenching element:

Category 2 for a Performance Level (PL) = c with diagnostic coverage (DCavg) > 60 % and as mean time until a dangerous failure of each channel (MTTF_d) takes place for the types UMC100.3: 100 years

b) Safety function: overload protection and PTC

Safety integrity level: SIL 1

Characteristic values	UMC100.3 DC	UMC100.3 UC
Fraction of the non-hazardous failures compared to the hazardous failures SFF [%]	84.8	87.8
Fraction of the undetected, dangerous failures λ_{DU} [FIT]	164	192
Fraction of the detected, dangerous failures λ_{DD} [FIT]	411	420
Fraction of the undetected, safe failures λ_{SU} [FIT]	373	835
Fraction of the undetected, safe failures λ_{SD} [FIT]	131	132

Note: 1 FIT corresponds to $10^{-9}/h$

Mean probability of a dangerous failure in the case of the safety function requirement (PFD)

(PFD = Probability of failure on demand) and an interval of the periodic retest T1 of 10 years:

PFD = $7.18 \times 10^{-3}/h$ for UMC100.3 DC and PFD = $8.42 \times 10^{-3}/h$ for UMC100.3 UC

(requirement for SIL 1 as per standard: $\geq 10^{-2}/h$ to $< 10^{-1}/h$).

According to EN 60079-17, the periodic retest of facilities for Ex protection is required after maximally 3 years:

PFD = $2.2 \times 10^{-3}/h$ for UMC100.3 DC and PFD = $2.5 \times 10^{-3}/h$ for UMC100.3 UC.

For the safety-related parts of control systems in accordance with EN ISO 13849, the following data have been determined at an ambient temperature of 40 °C and AC loads with quenching element:

Category 2 for a Performance Level (PL) = c with diagnostic coverage (DCavg) > 60 %

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and as mean time until a dangerous failure of each channel ($MTTF_d$) takes place for the types UMC100.3 : 100 years

Note: The performance level is the result of the risk assessment, related to the ratio of the risk reduction due to the safety-related parts of the control system. $MTTF_d$ is the mean time of each channel until a dangerous failure λ_{DU} .

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

Additional information can be taken from:

- Technical description "Universal Motor Controller UMC100.3 with the safety and commissioning notes for motors in the Ex range (2DC135033 D02xx); as of: July 2015
- The mounting instructions UMC100.3 (2CDC135038M9901/from 20.07.2015)
- Updates under the Internet page: <http://www.abb.de/stotzkontakt> → Switching and Control Technique → English → FBP Field bus devices → Universal Motor Controller UMC → downloads

Standards applied

EN 60947-1, EN 60947-4-1, EN 60947-5-1, EN 50495, EN 61508 und EN 13849,

Test report: PTB Ex 15-35119

Special conditions

None

Essential health and safety requirements

The tests carried out and their positive results, as well as the proof furnished of 14.07.2015 (see "UMC100-3_Safety Validation Report_RevC"), have confirmed compliance with the standards and, thus, with Directive 94/9/EC, Annex II (in particular 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 to be installed outside potentially explosive atmospheres.

Konformitätsbewertungsstelle, Sektor Explosionsschutz Braunschweig, November 12, 2015

On behalf of PTB


Dr.-Ing. Lienesch
Regierungsdirektor



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EC-type-examination Certificates without signature and official stamp shall not be valid. The certificates may be circulated only without alteration. Extracts or alterations are subject to approval by the Physikalisch-Technische Bundesanstalt. In case of dispute, the German text shall prevail.