



## Prüfbericht nach Richtlinie 2014/34/EU

*Test Report*  
according to Directive 2014/34/EU

**PTB Ex 19-38163**

**Gegenstand:** Digital multi-function protection device with control system of the type  
*Object* 7SK82... of device series SIPROTEC 5 with different interfaces and  
with/without Pt100 monitoring unit

**Hersteller:** Siemens AG  
*Manufacturer*

**Anschrift:** Humboldtstr. 59, 90459 Nuremberg, Germany  
*Address*

**Auftrags-Nr.** PEX3201800163  
*Application No.*

**Anzahl der Seiten.** 11  
*Number of pages*

**Prüfspezifikation:** IEC/EN 60255-1, IEC/EN 60255-26, IEC/EN 60255-27; IEC/EN 60255-149  
*Test specification* IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 60947-5-1;  
IEC/EN 61000-6 Part 4, IEC/EN 61000-4-2 to IEC/EN 61000-4-8,  
IEC/EN 61000-4-11, IEC/EN 61000-4-18, IEC/EN 61000-4-29  
EN 50495 and IEC/EN 61508 Parts 1 to 7  
EN 60068-2 Parts 1, 2, 3, 6, 14, 27, and 29, 30 and 78  
DIN EN 60 079-7, EN 60079-17 and DIN EN 60 034-1

ZSEx10600de d

Prüflaboratorium Explosionsschutz  
On behalf of PTB

Braunschweig, August 9, 2019



Dipl.-Ing. E. Petereit

Die in diesem Prüfbericht dargelegten Ergebnisse beziehen sich ausschließlich auf den Prüfgegenstand und die vorliegenden technischen Unterlagen. Prüfberichte ohne Unterschrift und ohne Siegel haben keine Gültigkeit. Dieser Prüfbericht darf nur unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung der Physikalisch-Technischen Bundesanstalt.

*The results presented in this test report are related only to the test object and the technical documents available. Test reports without signature and official stamp shall not be valid. The test reports 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.*

**Seite 2 zum Prüfbericht PTB Ex 19-38163**  
**Page 2 to Test Report PTB Ex 19-38163**

1. Informationen zum Prüfgegenstand / Information on test item

The digital multi-function protection device with a control system of the device type 7SK82 (firmware version: V07.55, with the configuration version V07.54) of the device series SIPROTEC 5 includes the following modules:

Module	Uncoated	Coated
CP100	C53207-A601-B271-4	C53207-A601-B271-A
<b>PS101_24_48V</b>	<b>C53207-A601-B100-1</b>	<b>C53207-A601-B100-A</b>
PS101_60_250V	C53207-A601-B101-1	C53207-A601-B101-A
IO101	C53207-A601-B510-1	C53207-A601-B510-A
IO102	C53207-A601-B520-1	C53207-A601-B520-A
IO110	C53207-A601-B610-1	C53207-A601-B610-A
<b>IO111</b>	<b>C53207-A601-B600-1</b>	<b>C53207-A601-B600-A</b>

Note: 1 The component PS101 24-48V and the component IO111 are new coated flat components (bold)

as well as different device functions. These functions include, among other things:

the start-up time monitoring, the restart inhibit, the thermal overload protection (with and without taking the ambient temperature/the temperature of the cooling agent or the winding temperature into account), the load jam-protection, the voltage and frequency protection, the unbalanced-load protection and current asymmetry monitoring, the overcurrent-time protection for earth currents, the undercurrent detection, the trip circuit monitoring, the switchgear control, the circuit-breaker failure protection, the Pt100 temperature monitoring function via I/O extension, as well as diagnostic functions.

These functions of the device are designed for the protection of directly connected, rotor-critical asynchronous motors. The built-in Pt100 temperature monitoring unit, with the possibility of connecting a maximum of 12 sensors, protects the motor from thermal overload, wire interruption, and sensor short-circuit (see the error responses "SIP\_7SK82\_ATEX\_V7.55"). The devices of the type 7SK82 have an LC display which allows the process and device information to be displayed graphically in the form of a control display or in the form of a text. The digital multi-function protection device with control functions protects explosion-protected motors and standard motors.

The control system and the display can be controlled optionally via the local operation field, via the system interface to a control system (different protocols) or via the PC operator interface (USB, LAN) with the current version of the operating program 5 (from version V07.50).

The thermal memory of the preheating (e.g. no previous overload release) is maintained even if the voltage supply fails. When the power has returned, the thermal memory is loaded with the value that had been recorded last before the power failure.

When being switched on and after having been switched on, the device automatically carries out a diagnostic test of the hardware and of the software.

**Seite 3 zum Prüfbericht PTB Ex 19-38163**  
**Page 3 to Test Report PTB Ex 19-38163**

Additional information on SIPROTEC 5 can be taken in both German and English from:

- Additional description for the protection of explosion-protected motors of the type of protection Increased Safety "e", SIPROTEC 7SK82 (C53000-H5050-C070-1, version: 7.55 of May 2018) – also referred to as "Safety Manual";
- the manual "Motorschutz 7SK82/85" (C53000-G5000-C024-6, version 7.50 and higher) of November 2017;
- Description of the hardware: (C53000-G5000-C002-C, version 7.50 and higher) of October 2017;
- the operating manual (C53000-G5000-C003-8, version 7.50 and higher) of August 2017;
- the product information (C53000-B5000-C001-D, version 7.50 and higher) of August 2017;  
Website:  
<https://new.siemens.com/global/de/produkte/energie/energieautomatisierung-und-smart-grid/schutztechnik/siprotec-5/motor-und-generatorschutz/motorschutz-siprotec-7sk82.html>

2. Erläuterungen zur Prüfspezifikation / Explanations to test specification

The documents submitted were checked according to the following documents: "Inspection of electronic overload relays designed for the protection of explosion-protected electrical machines", version 2.0 of 13 December 2017 (DIN IEC 60255, EN 60 947-1 / DIN VDE 0660 Part 100, EN 60947-4-1 / DIN VDE 0660 Part 102, EN 60 947-5-1 / DIN VDE 0660 Part 200, DIN EN 60079-7, EN 60079-14 [dust explosion protection: EN 61241-14] and EN 60079-17) and on the basis of the "Testing of Pt100 resistance measuring transducers with threshold value switching device or without threshold value device (directly realized in the device) for the protection of explosion-protected electrical machines, version 2 of 15 March 2016 (EN 60079-14 / VDE 0165, EN 60751, EN 60079-7, EN 60079-14 and EN 60079-17)", as well as on the basis of the standards stated (see: test specification).

Furthermore, EN 50495 ("Safety devices required for the safe functioning of equipment with respect to explosion risks") was applied.

3. Änderungen / Modifications

3.1 Module PS101 24-48V and the module IO111 are new coated printed circuit boards (PCB) (see drawing-numbers in chapter 1).

For these modules a set of documents and additional test protocols, including among others a set of drawings, Delta-Report, function tests of the coated modules in the device and test reports about possible effects of the coating on the modules were supplemented to the ATEX certification.

3.2 The test certificates for the anomalous switching capacity "ON- and OFF" for the utilization category AC-15 and DC-13 and the behavior of the contacts at conditional short-circuit current (EN 61810-1 or EN 60947-5-1 chapter 8.3.4) has been submitted for the Tyco switching relays.

3.3 For the SIPROTEC 5-series type 7SJ82 further environmental tests were carried out for the coated printed circuit boards (PCB).



**Seite 4 zum Prüfbericht PTB Ex 19-38163**  
**Page 4 to Test Report PTB Ex 19-38163**

3.4 If changes are made to the hardware in the future, the status must be kept up to date by means of the documents submitted by the company, since the status of the hardware was not communicated to the Notified Body. In addition, acceptance tests or tests conducted at PTB must be performed on the new, modified modules if these functions are relevant to the motor protection. The same applies to modifications carried out on the firmware; only the status of the firmware is recorded in the test report.

4. Liste der technischen Unterlagen, Prüfprotokolle, Muster und sonstigen Dokumente  
*List of technical documents, test reports, samples and other documents*

Titel / Title	Nummer / Number	Issue / Rev. Level	Datum / Date
List of documents submitted by the company for the SIPROTEC 7SK82 type		1.3	16 January 2019
PTB acceptance measurements in Berlin			12 November 2018

5. Hinweise für die Herstellung / Notes for manufacturing

With each delivered SIPROTEC 5 device 7SK82, the document "Additional description for the protection of explosion-protected motors of the type of protection "Increased Safety 'e' " will be enclosed to the device or supplied to the customer in the business premises.

For the installation, commissioning and use, the respective documents which are listed in Section 1 above must be observed.

Updated versions can be downloaded from the following website:

<https://new.siemens.com/global/de/produkte/energie/energieautomatisierung-und-smart-grid/schutztechnik.html>

In addition, the specifications of the motor manufacturers and/or the specifications regarding explosion protection as stated in the EU-Type-Examination Certificate (previously: EC Type-Examination Certificate) for explosion-protected motors must be observed.

Note: In case of heavy starting of the motor that takes more than 5 s with a high starting current, special measures must be taken, e.g. speed monitoring during motor start and special adjustment setting of the SIPROTEC 5 device. Furthermore, the requirements from the EU Type-Examination Certificate of the motors or the corresponding data sheet of the engine must be observed.

For the testing and maintenance of electrical equipment, e.g. motor protection devices for explosion-protected electrical machines, EN 60079-17 should be observed. As a result of the analysis of the functional safety, shorter checking times might arise.

The characteristic values for the 7SK82 devices at an ambient temperature of 25 °C (component temperature: 40 °C) for the functional safety according to EN 61508 can be found in the Safety Manual. Characteristic values for other ambient temperatures, e.g. for the maximum permissible ambient temperature of +55 °C, can be obtained on request.



## Seite 5 zum Prüfbericht PTB Ex 19-38163

### Page 5 to Test Report PTB Ex 19-38163

If a failure in the supply voltage occurs, the thermal image will be preserved for at least 500 minutes. A maximum of 1000 fault records can be stored and in the event of a supply voltage failure, the data will be preserved by battery buffering or by storage in the flash memory.

The restart lockout function of the motor – after a thermal overload of the motor – is adjustable from 0.2 minutes to 500 minutes, depending on the axis height of the motor.

Where automatic restarting after a failure is not permitted, and if injuries to persons or property might be caused or catastrophic damage (e.g. an explosion) might occur, the user must take appropriate measures to prevent restarting.

The cable type and the conductor cross-section for the current leads are to be selected in such a way that the thermal limiting temperature of the connecting cables is not exceeded (see DIN VDE 0100-100/IEC 60364-1).

The operating temperature of the connecting cables can be taken from DIN VDE 0298, Part 4 or from the product information for SIPROTEC 5.

The type designation code of the rating plate of device 7SK82 (drawing No.: C53207-A605-C100-1W-7406, version 1W of 8 December 2017) provides information about the type, the scope of the functions, the supply voltage and the measurement values (nominal data).

Those responsible for commissioning the devices can identify the ATEX devices through the additional plate "ATEX marking".

Operating and access protection is possible by entering a password.

The characteristics sheets and the tripping-time table are part of the additional description for the protection of explosion-protected motors. The documents must be available at the place of use.

If used in ATEX applications, at least one of the motor-protection functions – temperature monitoring with Pt100 sensors or overload monitoring (including asymmetry protection) – must be activated.

The devices of the type 7SK82 must not be operated in combination with frequency inverters.

In order to record the short circuit of the Pt100 sensor or the power cut of the sensor at the function "temperature monitoring (IO111)", the routing example in the Safety Manual must be taken into account. Only appropriate routing makes it possible to recognize these error types and to ensure the protection of the motor.

A failure of the device due to an error can be indicated by activating the internal stand-by relay via the circuit breaker. For this purpose, a circuit breaker with an undervoltage tripping device must be used (see Safety Manual chapter 6).

The function "temperature monitoring with Pt100 sensors" can be checked by the user by connecting an external resistor decade or a Pt100 simulator.

The digital multifunction protection, with the control system of the type 7SK82 with or without temperature monitoring, may only be installed outside potentially explosive atmospheres to protect explosion-protected motors. When used in potentially explosive atmospheres, the devices must comply with the required type of protection, e.g. the type of protection Increased Safety "e" and the type of protection Flameproof Enclosure "d".

#### 6. Besondere Bedingungen / Tabelle der Einschränkungen / Specific conditions of use / Table of restrictions

None

**Seite 6 zum Prüfbericht PTB Ex 19-38163**  
**Page 6 to Test Report PTB Ex 19-38163**

7. Durchführung und Zusammenfassung der Evaluierung / Evaluation and summary of evaluation results

The requirements of the test specification – which is the basis for the issuing of the test report for the types 7SK82 with integrated Pt100 temperature monitoring – are listed below.

**DIN EN 60255-1/VDE 0435, part 300 (IEC 60255-1), DIN EN 60255-149/VDE 0435, part 3149, sections 3 to 6 (IEC 60255-149); DIN EN 60947-1, section 8.3.3.3 (IEC 60947-1); DIN EN 60947-4-1, sections 5.7, 7, 8.2 and 9.3.3.2.2 (IEC 60947-4-1) and DIN EN 60079-14 / VDE 0165, part 1, section 11.1 a and/or 11.1 c, 11.3 and (EN 60079-7 section 5.2.7 and Annex C) and EN 60034-1, figures 11 and 12.**

For the new coated printed circuit boards (PCB) "PS101 24-48V and IO111" of the SIPROTEC devices of the type 7SK82 no further tests of the tripping characteristic data (overload protection: with or without preload), the unbalanced-load protection, phase failure protection and the asymmetry monitoring for the different tripping classes between 2 and 50 are necessary.

The results of PTB determined in the test report PTB Ex 17-37003 for the combinations

- power frequency of the current (50 Hz and 60 Hz);
- ambient temperature (-25 °C; +20 °C and +70 °C)
- supply voltage of the devices (ACV, DCV) and
- of the tripping classes 2, 3, 5, 10A, 10, 20, 30, 40 and 50 up to 10 times the set current from the cold state,

for the tripping times comply with the permissible deviations as per standards EN 60255 and EN 60079-14 as well as EN 60079-7.

The standard requirements and the characteristic data specified for the devices [preloading with 1.05 times the set current (rated current) for an operating time of more than two hours (continuous operation) and a subsequent increase to 1.2 times the base current and switching-off of the motor within two hours] were complied with for -20 °C to +55 °C and the different classes.

A high reproducibility of the tripping times (deviation of the tripping times: classes 2 to 50:  $\leq 5\%$ , see Siemens Manual "Technical Data") is provided.

For the tripping times with the motor in the cold state at a current loading with a multiple of the set current applies that the specified tripping times are complied with at the different combinations with a deviation of less than or equal to  $\pm 5\%$ . The SIPROTEC devices of the type 7SK82 with and without coated printed circuit boards (PCB) comply with the permissible deviation of the tripping times, as required by EN 60079-14, section 11.2.1, and EN 60079-7, annexes A1-A3 ( $\pm 20\%$ ) – with the following limitation:  $t_E$  times lower than 5 s are not attested for motors of the type of protection "Increased Safety".

Phase failure and current asymmetry detection are safely identified by the SIPROTEC devices of the type 7SK82 with and without coated printed circuit boards (PCB), and the tripping times are complied with a deviation of smaller than or equal to  $\pm 5\%$ .

In the case of two-pole loading, the effectiveness of the protection for delta-connected motors is, with the outer conductors combined in different ways and with different multiples of the set current, complied with in accordance with DIN EN 60079-14 section 11.3.1.

**Seite 7 zum Prüfbericht PTB Ex 19-38163**  
**Page 7 to Test Report PTB Ex 19-38163**

The measurements with the different DIGSI versions did not indicate any significant deviations of the tripping times.

**EN 60751 (sensors of class A or B), EN 60079-7, section 4.7.5, and EN 6079-14, section 11.1 c**

The devices of the type SIPROTEC 7SK82 with the Pt100 extension module IO111 and coated printed circuit boards (PCB) protect the motor as well as uncoated printed circuit boards (PCB) from thermal overload, wire interruption, and sensor short-circuit. Twelve Pt100 sensors (class A or class B sensors, 2- or 3-conductor connection) can be connected to the extension module or, instead of the IO111, a thermobox with twelve PT100 sensors of the company *ZIEHL industrie-elektronik GmbH + Co KG* can be connected to device type 7SK82 for the protection of standard motors. In this case, only the temperature detection via Pt100 sensors is used.

**IEEE Std C37.90-2005, EN 60255-1, EN 61810-1 and EN 60947-5-1 sections 7.2.4 and 8.3.4**

The rated breaking capacity, the continuous current, and the short-time current rating of the contacts of the output relays are based on the standard.

In order to check the starting power (30 A for 0.2 s ON and 15 s OFF; 2000 switching cycles), the American standard for protective devices and protective systems IEEE C37.90.0/1989, section 6.7, and EN 60947-5-1, section 7.2.4 (DC-13: 1.1 times the start-up current) were used.

The rated breaking capacity of the command and output contacts (switching on and off at unusual load conditions) and the short circuit protection for the auxiliary contacts complies with the standard EN 60947-5-1 Section 8.3,4 and test circuit conditioned short circuit current has been proven for the standard-relay (Tyco). The rated operational current  $I_e$  and the rated operational voltage  $U_e$  for the unusual utilization category AC-15 and DC-13 may be obtained from the following documents: VDE Test- and Certification Institute mark approval/assessment with production monitoring (reference number: 4570000-4940-0044/209835 of 26 May 2016) and the measurement reports provided by Tyco (short-circuit testing at 25 °C/report number: 2019 009 029 – rev. A of 15 April 2019, electrical endurance DC 13 (normal and abnormal breaking capacity at 85 °C, report number: 2019 009 001-005-rev. A of 21 February 2019 and 2019 009 023-027-rev. A of 8 March 2019) and electrical endurance AC15 (normal and abnormal switching breaking capacity at 85°C, report number: 2019 009 017-020-rev. A of 11 March 2019).

The trip circuit of the circuit breaker shall be protected by max. 6 A tripping characteristics C (EN 60898). Resulting from rated conditional short-circuit current (EN 61810-1 resp. EN 60947-5-1 section 8.3.4).

Further information shall be obtained from the Additional description for the protection of explosion-protected motors of the type of protection Increased Safety 'e' " (Safety Document).

**EN 50495, DIN EN 61508, parts 1 to 7, and EN 13849**

The PTB test report 17-37003 was not changed as a consequence of the changes regarding the coated printed circuit boards (PCB) and switching relays, therefore the characteristic data for the functional safety remain unchanged.

**Seite 8 zum Prüfbericht PTB Ex 19-38163**  
**Page 8 to Test Report PTB Ex 19-38163**

a) Motor protection with and without Pt100 temperature monitoring function

For the mode of operation with low demand and an architecture "1oo1", consisting of subsystems in accordance with type B, and a hardware failure tolerance (HFT) = 0 (see EN 61508 Part 1 Table 2 and EN 61508 Part 2 Table 3), the following characteristic values at an ambient temperature of 25 °C (ambient temperature of the electronic assembly = 40 °C) were determined:

Safety integrity level:	SIL 1
Fraction of non-hazardous failures compared to hazardous failures (SFF):	90 %
Fraction of undetected, dangerous failures ( $\lambda_{DU}$ ):	$424 \times 10^{-9} /h$
Fraction of detected, dangerous failures ( $\lambda_{DD}$ ):	$2517 \times 10^{-9}/h$
Fraction of undetected, safe failures ( $\lambda_{SU}$ ):	$228 \times 10^{-9}/h$
Fraction of detected, safe failures ( $\lambda_{SD}$ ):	$898 \times 10^{-9}/h$
Diagnostic coverage ( $DC_{AVG}$ ):	84 %

Average probability of a dangerous failure in the case of a safety function requirement (PFD = probability of failure on demand) for a periodic retest interval T1 of 1 year:  
 PFD:  $1.4 \times 10^{-3}$  (requirement for SIL 1 according to standard:  $\geq 10^{-2}$  to  $< 10^{-1}$ ).

Note: The data stated above refer to the room temperature in an air-conditioned control room or control cabinet.

Characteristic values of the functional safety, determined for the electronic motor protection devices 7SK82 at an ambient temperature of 40 °C (ambient temperature of the module = 55 °C):

Safety integrity level:	SIL 1
Fraction of non-hazardous failures compared to hazardous failures (SFF):	92 %
Fraction of undetected, dangerous failures ( $\lambda_{DU}$ ):	$666 \times 10^{-9} /h$
Fraction of detected, dangerous failures ( $\lambda_{DD}$ ):	$5074 \times 10^{-9}/h$
Fraction of undetected, safe failures ( $\lambda_{SU}$ ):	$377 \times 10^{-9}/h$
Fraction of detected, safe failures ( $\lambda_{SD}$ ):	$1761 \times 10^{-9}/h$
Diagnostic coverage ( $DC_{AVG}$ ):	87 %

Average probability of a dangerous failure in the case of a safety function requirement (PFD = probability of failure on demand) for a periodic retest interval T1 of 1 year  
 PFD:  $2.3 \times 10^{-3}$  (requirement for SIL 1 according to standard:  $\geq 10^{-2}$  to  $< 10^{-1}$ ).



**Seite 9 zum Prüfbericht PTB Ex 19-38163**  
**Page 9 to Test Report PTB Ex 19-38163**

Characteristic values of the functional safety, determined for the electronic motor protection devices 7SK82 at an ambient temperature of 55 °C (ambient temperature of the electronic assembly = 75 °C):

Safety integrity level:	SIL 1
Fraction of non-hazardous failures compared to hazardous failures (SFF):	92 %
Fraction of undetected, dangerous failures ( $\lambda_{DU}$ ):	$989 \times 10^{-9}$ /h
Fraction of detected, dangerous failures ( $\lambda_{DD}$ ):	$7770 \times 10^{-9}$ /h
Fraction of undetected, safe failures ( $\lambda_{SU}$ ):	$560 \times 10^{-9}$ /h
Fraction of detected, safe failures ( $\lambda_{SD}$ ):	$2587 \times 10^{-9}$ /h
Diagnostic coverage ( $DC_{AVG}$ ):	87 %

Average probability of a dangerous failure in the case of a safety function requirement (PFD = probability of failure on demand) for a periodic retest interval T1 of 1 year  
 PFD:  $3.4 \times 10^{-3}$  (requirement for SIL 1 according to standard:  $\geq 10^{-2}$  to  $< 10^{-1}$ ).

- b) For the safety-related parts of control systems in accordance with EN ISO 13849, the following data were determined for the safety function "safe switch-off":

Data at an ambient temperature of 25 °C to 55 °C:

Category 2 at a performance level (PL) = b with a diagnostic coverage (DC) of < 87%.

The mean time until a dangerous failure of each channel ( $MTTF_d$ ) occurs, was determined for the device type 7SK82 to be 100 years.

**Note:** The performance level is the result of the risk assessment, related to the fraction of the risk reduction resulting from the safety-related parts of the control system.

Another detailed hardware and software failure simulation was not necessary.

For type 7SK82 V07.55 a HW- integration test has been performed based on the coated printed circuit boards (PCB) (see document IST\_7sk82\_V07\_55\_PS101\_IO111\_coted, V1.00 of 22 November 2018).

Siemens EM DG SA&P PLM&D in Berlin has submitted the document "Überwachung von Hersteller-Messungen bei Typ-Prüfungen" of 22 November 2018 for the task of certifying the SIPROTEC ATEX devices. The employees are qualified, and all measuring devices used were calibrated and traced to the national standard.

**EN 60068-2 parts 1, 2, 3, 6, 30, 42, 43, 52, 60 and 78**

For type 7SJ82 and the SIPROTEC 5-series further environmental assessments were performed with the coated printed circuit boards (PCB) based on the test reports.

**Seite 10 zum Prüfbericht PTB Ex 19-38163**  
**Page 10 to Test Report PTB Ex 19-38163**

Document_Name	Document-No./Testing Laboratory	Date
SIPROTEC 5_7SL82-7UL82_7SJ82 Cyclical humid heat and Kc-sulphur oxides zykl. feuchte Wärme und Kc-Schwefeldioxid	PB11904.01/16 AUCOTEAM/Berlin	12.05.2016
SIPROTEC5_7SL82_7UT82_7SJ82 Cyclical humid heat and Kd-hydrogen sulfide zykl. feuchte Wärme und Kd-Hydrogensulfid	PB11904.02/16 AUCOTEAM/Berlin	06.06.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Cyclical humid heat and Ke-coorosion testing with flowing mixed gas (4 components) zykl. feuchte Wärme und Ke-Korrosionsprüfung mit ström. Mischgas (4 Komponenten)	PB11904.03/16 AUCOTEAM/Berlin	05.07.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Cyclical humid heat and Kc, Kd, Ke-corrosion testing with flowing mixed gas (4 components) and zykl. feuchte Wärme und Kc, Kd, Ke-Korrosionsprüfung mit ström. Mischgas (4 Komponenten) und	PB11904.04/16 AUCOTEAM/Berlin	05.07.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Kc-sulphur oxide and Kd-hydrogen sulfide Kc-Schwefeldioxid und Kd-Hydrogensulfid	P50-16.0195_1-en RST Henningsdorf	18.04.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Dry heat, humid heat, temperature change Trockene Wärme, Feuchte Wärme, Temperaturwechsel	PB11904.05/16 AUCOTEAM/Berlin	04.05.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Dust and sand, humid heat Staub und Sand, Feuchte Wärme	PB11904.06/16 AUCOTEAM/Berlin	06.06.2016
SIPROTEC 5_7SL82_7UT82_7SJ82 Cyclical salt mist Zykl. Salznebel	PB11904.07/16 AUCOTEAM/Berlin	11.05.2016

The results of the testing laboratories showed that the devices 7SK82 (different firmware versions) sustained no damage during storage when performing the environmental tests. In practice, a connected explosion-protected or standard motor is not jeopardized.

All of the above-mentioned testing laboratories are accredited according to EN 17025

Aucoteam/Berlin: accreditation certificate D-PL-19102-01-00 dated 13 June 2018).

RST/Henningsdorf: accreditation certificate D-PL-11012-01-00 dated 14 July 2017,

**Note:**

Siemens/EM DG PRO D DS TT in Berlin investigated, whether the critical components on the coated printed circuit boards (PCB) CP100, IO102, IO110, PS101 and ETH-2FO“ do not overheat before starting with the environmental impact assessment with the coated printed circuit boards (PCB) in the devices 7SK82. Temperature measurements were carried out for this purpose. Details can be taken from the Siemens test report „TS0816-004 of 29 September 2016.

**Seite 11 zum Prüfbericht PTB Ex 19-38163**  
**Page 11 to Test Report PTB Ex 19-38163**

The document "Überwachung von Hersteller-Messungen bei Typ-Prüfungen" of 22 November 2018 for the task of certifying the SIPROTEC ATEX devices has been submitted. The employees are qualified, and all measuring devices used were calibrated and traced to the national standard.

**EN 60068-2 parts 6 (vibrations, sinusoidal) and part 27 (shock)**

The verification of the mechanical dynamic tests has been performed with type 7SK82 with coated printed circuit boards (PCB) with devices with comparable behavior of the SIPROTEC-5 series.

Document_Name	Document-No/Testing Laboratory	Date
SIPROTEC 5_7SL82_7UT82_7SJ82 FC: Schwingen	PB11904.05/16 AUCOTEAM/Berlin	04.05.2016

**EN 61000-6-4 (CISPR 11) class A, EN 61000-4 parts 2 to 6, 8 and 11, EN 60255-22 parts 3 to 6**

The verification of the EMV test reports from the PTB test report 17-37003 is also valid for the coated printed circuit boards (PCB) of the types SIPROTEC 5 7SK82 with different PCB versions and firmware. The severity levels required for the individual failure types are complied with and the monitoring of the explosion-protected motors and standard motors is not endangered.

By the Declaration of EU Conformity (number: 010/18-A of 24 July 2018), compliance with the EMC Directive 2004/108/EC was confirmed for the mot coated printed circuit boards (PCB) or protection device SIPROTEC 7SK82.

**EN 60255-27 and EN 60947-4-1 section 9.1.3**

The routine test for the devices SIPROTEC 7SK82 with and without coated printed circuit boards (PCB) is carried out in accordance with the following test specifications (also referred to as testing instructions):

TPR_CP100, version 1.02	27 March 2014
TPR-PS101, version 1.05	19 October 2017
TPR_IO1xx, version 1.05	19 November 2014
TPR_IO111, version 1.00	14 August 2017

For the design and the type of the digital multifunctional protection with control system type SIPROTEC 5 7SK82... with different interfaces and with/without PT100 monitoring unit, the above mentioned test specifications have been applied.

The evaluation was performed on the basis of the test specifications. With regard to the marking of the device which is based on the test specification

 II (2) G [Ex eb] [Ex db] [Ex pxb] or  II (2) D [Ex tb] [Ex pb],

no deviations/contradictions could be observed/detected.