

Description

The SIPROTEC 7SK82 motor protection has been designed specifically for a cost-optimized and compact utilization of small-sized to medium-sized motors. With its flexibility and the high-performance DIGSI 5 engineering tool, SIPROTEC 7SK82 offers future-oriented solutions for protection, control, automation, monitoring, and Power Quality – Basic.

For motors in explosive environments, the SIPROTEC 7SK82 is also available with EN 60079-14 or VDE (Verband der Elektrotechnik, Elektronik und Informationstechnik) 0165, Part 1 (ATEX) certification.

Main function	Motor protection for small-sized to medium-sized motors (100 kW to 2 MW)
Inputs and outputs	4 current transformers, 4 voltage transformers (optional), 11 or 23 binary inputs, 9 or 16 binary outputs, 12 RTD inputs (optional)
Hardware flexibility	Different hardware quantity structures for binary inputs and outputs are available in the 1/3 base module. Adding 1/6 expansion modules is not possible; available with large or small display.
Housing width	1/3 × 19 inches

Benefits

- Compact and low-cost motor protection
- Safety due to high-performance protection functions
- Purposeful and easy handling of devices and software thanks to a user-friendly design
- Cybersecurity in accordance with NERC CIP and BDEW Whitepaper requirements
- Highest availability even under extreme environmental conditions by standard coating of the modules
- Full compatibility between IEC 61850 Editions 1, 2.0, and 2.1

Functions

DIGSI 5 permits all functions to be configured and combined as required and as per the functional scope that has been ordered.

- Motor protection functions: Starting time supervision, thermal overload protection for stator and rotor, restart inhibit, unbalanced-load protection, load-jam protection
- Stator and storage-temperature monitoring via temperature sensors with optional temperature inputs or with external RTD unit.
- Sensitive ground-fault protection (non-directional, directional) to detect stator ground faults
- Directional and non-directional overcurrent protection (short-circuit protection) with additional functions
- Detection of ground faults of any type in compensated or isolated electrical power systems using the following functions: $3I_0>$, $V_0>$, transient ground fault, $\cos \phi$, $\sin \phi$, dir. detection of intermittent ground faults, harmonic detection, and admittance measurement
- Ground-fault detection using the pulse-detection method
- Overvoltage and undervoltage protection



[SIP5_GD_W3, 2, --, --]

Figure 2.12/2 SIPROTEC 7SK82 Motor Protection

- Arc protection
- Power protection, configurable as active or reactive-power protection
- Detection of current and voltage signals up to the 50th harmonic with high accuracy for selected protection functions (such as thermal overload protection) and operational measured values
- PQ – Basic: Voltage unbalance; voltage changes: overvoltage, dip, interruptions; TDD, THD, and harmonics
- Control, synchrocheck, and switchgear interlocking protection
- Graphical logic editor to create high-performance automation functions in the device
- Single-line representation in the small or large display
- Fixed integrated electrical Ethernet RJ45 interface for DIGSI 5 and IEC 61850 (reporting and GOOSE)
- 2 optional pluggable communication modules, usable for different and redundant protocols (IEC 61850, IEC 60870-5-103, IEC 60870-5-104, Modbus TCP, DNP3 serial and TCP, PROFINET IO)
- Reliable data transmission via PRP and HSR redundancy protocols
- Certification for use in environments at risk of explosion (EN 60079-14 or VDE 0165, Part 1, ATEX)
- Extensive cybersecurity functionality, such as role-based access control (RBAC), logging of security-related events, signed firmware, or authenticated IEEE 802.1X network access.
- Simple, fast, and secure access to the device via a standard Web browser to display all information and diagnostic data, vector diagrams, single-line and device display pages
- Secure serial protection communication, also over great distances and all available physical media (optical fiber, two-wire connections, and communication networks)

SIPROTEC 5 Devices and Fields of Application

Motor Protection – SIPROTEC 7SK82

- Detecting operational measured variables and protection-function measured values to evaluate of the systems, to support commissioning, and to analyze faults
- Integrated RTD inputs (optional) for thermal motor monitoring
- Phasor Measurement Unit (PMU) for synchrophasor measured values and IEEE C37.118 protocol
- High-performance fault recording (buffer for a max. record time of 80 s at 8 kHz or 320 s at 2 kHz)
- Auxiliary functions for simple tests and commissioning

Applications

- Protection against thermal overload of the stator from overcurrent, cooling problems, or pollution
- Protection against thermal overload of the rotor during startup due to frequent startups, excessively long startups, or blocked rotor
- Monitoring for voltage unbalance or phase outage
- Monitoring the thermal state and the storage temperatures with temperature measurement
- Detection of idling drives of pumps and compressors, for example
- Detection of ground faults in the motor
- Protection against motor short circuits
- Protection against instability due to undervoltage
- Detection and recording of power-quality data in the medium-voltage and subordinate low-voltage power system

Application Templates

DIGSI 5 provides application templates for standard applications. They include basic configurations and default settings.

The following application templates are available:

- Current measurement
 - Thermal overload protection for stator and rotor
 - Starting time supervision
 - Restart inhibit
 - Unbalanced-load protection (thermal)
 - Temperature supervision

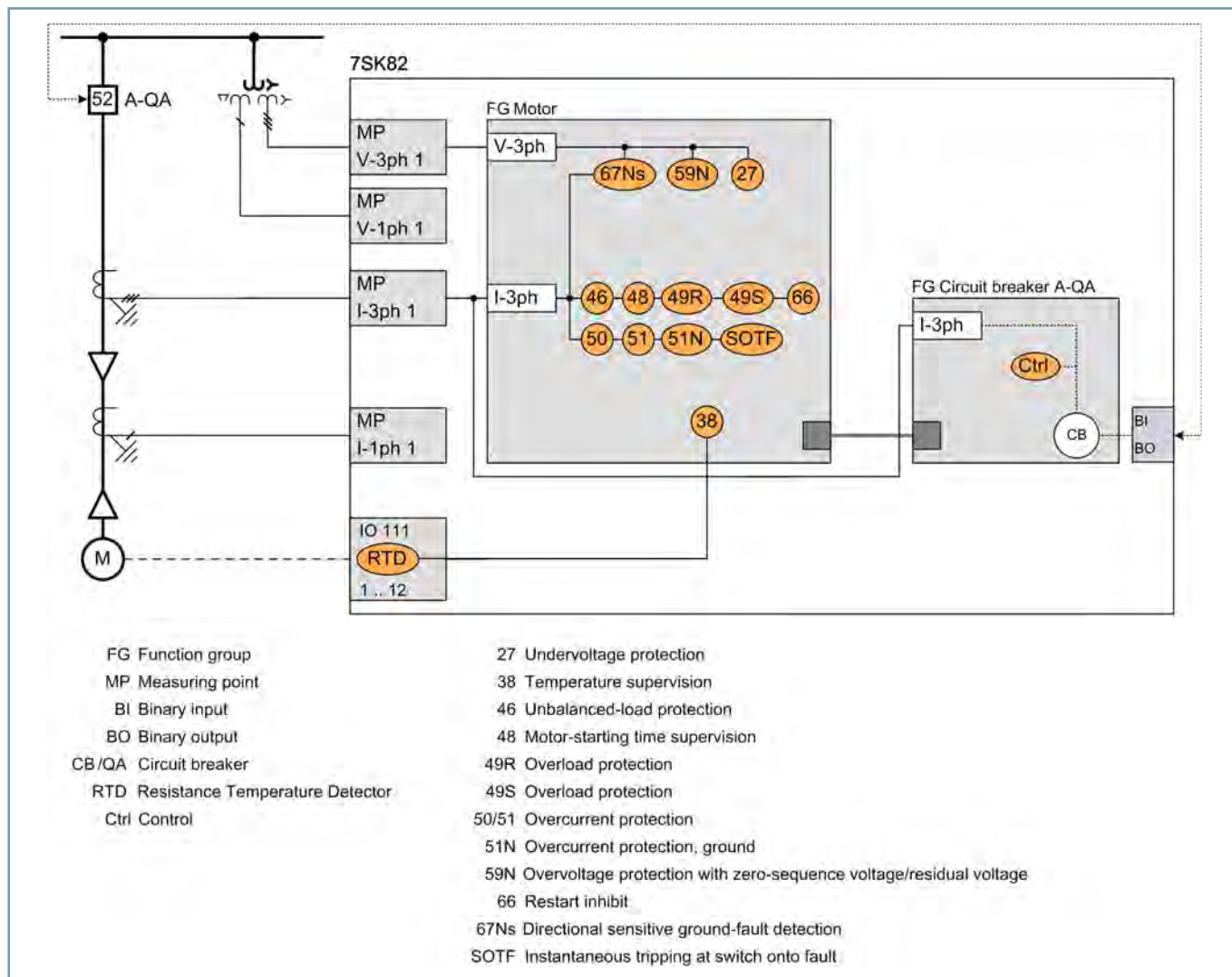
- Load-jam protection
- Overcurrent protection (non-directional) for phases and ground
- Transformer inrush-current detection
- Current and voltage measurement
 - Thermal overload protection for stator and rotor
 - Starting time supervision
 - Restart inhibit
 - Unbalanced-load protection (thermal)
 - Temperature supervision
 - Load-jam protection
 - Overcurrent protection (non-directional) for phases and ground
 - Transformer inrush-current detection
 - Directional sensitive ground-fault detection for isolated or grounded power systems and for detection of stator ground faults
 - Overvoltage protection with zero-sequence system V0
 - Undervoltage protection with positive-sequence system V1
 - Measuring-voltage failure detection

Application Example

SIPROTEC 7SK82 – Protection of a medium-power Motor

The motor protection functions and the overcurrent protection of the SIPROTEC 7SK82 protect an asynchronous motor of medium power (up to approximately 2 MW) against thermal and mechanical overload and short circuits. The directional sensitive ground-fault detection and the overvoltage protection with zero-sequence voltage V0 detect stator ground faults in the motor. Integrated temperature measuring inputs allow the thermal state of the motor and the storage temperatures to be captured and monitored. The temperature sensors (for example PT100) are connected directly to the integrated RTD measuring inputs.

[Figure 2.12/3](#) shows the functional scope and the basic configuration of a SIPROTEC 7SK82 for this application. It is based on the application template "Current and voltage measurement". In addition, the device must be equipped with a plug-in module for communication with the RTD unit.



[dw_motor-protection-7SK82, 2, en_US]

Figure 2.12/3 Protection of a Medium-Power Motor

SIPROTEC 5 Devices and Fields of Application

Motor Protection – SIPROTEC 7SK82

ANSI	Function	Abbr.	Available	Application Templates	
				1	2
	Protection functions for 3-pole tripping	3-pole	■	■	
14	Locked rotor	$I > + n <$	■	■	■
24	Overexcitation protection	V/f	■		
25	Synchrocheck, synchronization function	Sync	■		
27	Undervoltage protection: "3-phase" or "positive-sequence system V1" or "universal Vx"	$V <$	■		■
27R, 59R	Voltage change protection (starting with V8.30)	dV/dt	■		
	Undervoltage-controlled reactive power protection	$Q > / V <$	■		
32, 37	Power protection active/reactive power	$P < >, Q < >$	■		
32R	Reverse-power protection	$- P <$	■		
37	Undercurrent	$I <$	■		
38	Temperature supervision	$\theta >$	■	■	■
46	Negative-sequence system overcurrent protection	$I2 >$	■		
46	Unbalanced-load protection (thermal)	$I2^2 t >$	■	■	■
46	Negative-sequence system and overcurrent protection with direction	$I2 >, \angle(V2, I2)$	■		
47	Overvoltage protection, negative-sequence system	$V2 >$	■		
47	Overvoltage protection: "Negative-sequence system V2" or "negative-sequence system V1/positive-sequence system V1"	$V2 >; V2/V1 >$	■		
48	Starting time monitoring for motors	$I^2 \text{start}$	■	■	■
49	Thermal overload protection	$\theta, I^2 t$	■	■	■
49	Thermal overload protection, user-defined characteristic curve	$\theta, I^2 t$	■		
49R	Thermal overload protection, rotor (motor)	θR	■	■	■
50/51 TD	Overcurrent protection, phases	$I >$	■	■	■
	Instantaneous tripping at switch onto fault	SOTF	■		
50HS	Instantaneous high-current tripping	$I >>>$	■		
50/51 TD	Overcurrent protection with positive-sequence current I1 (from V7.9)	$I1 >$	■		
50N/ 51N TD	Overcurrent protection, ground	$IN >$	■	■	■
50N/ 51N TD	Overcurrent protection, 1-phase	$IN >$	■		
50 Ns/ 51Ns	Sensitive ground-fault detection for grounded arc suppression coils and isolated power systems including a) $3I0 >$ b) admittance $Y0 >$, c) $3I0\text{-harm} >$ (from V7.8)	$INs >$	■		
	Sensitive ground-fault detection via pulse detection; hint: this stage also requires the function 50Ns/51Ns or 67Ns "sensitive ground-fault detection for grounded arc suppression coils and isolated power systems"	IN pulse	■		
	Intermittent ground-fault protection	$IIE >$	■		
50BF	Circuit-breaker failure protection, 3-pole	CBFP	■		
50RS	Circuit breaker restrike monitoring	CBRM	■		
50L	Load-jam protection	$I > L$	■	■	■
51V	Voltage-controlled overcurrent protection	$t = f(I, V)$	■		
59, 59N	Overvoltage protection: "3-phase" or "zero-sequence system V0" or "positive-sequence system V1" or "universal Vx"	$V >$	■		
60	Voltage-comparison supervision	$\Delta V >$	■		
66	Restart inhibit for motors	$I^2 t$	■	■	■
67	Directional overcurrent protection, phases	$I >, \angle(V, I)$	■		
67N	Directional overcurrent protection, ground	$IN >, \angle(V, I)$	■		

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ANSI	Function	Abbr.	Available	Application Templates	
				1	2
67 Ns	Sensitive ground-fault detection for grounded arc suppression coils and isolated power systems including a) $3I_0$, b) V_0 , c) $\cos/\sin \Phi$, d) transient ground fault, e) $\Phi(V, I)$, f) admittance		■		■
	Directional tripping stage with one harmonic; hint: this stage also requires the function "67Ns sensitive ground-fault detection for grounded arc suppression coils and isolated power systems"	$\angle(V_0h, I_0h)$	■		
	Directional Intermittent Ground-Fault Protection	IIEdir	■		
74TC	Trip-circuit supervision		■		
74CC	Single circuit monitoring (from V7.9)		■		
79	Automatic reclosing, 3-pole	AREC	■		
81	Frequency protection: "f" or "f<" or "df/dt"	f<> / df/dt<>	■		
81U	Underfrequency load shedding	f<(ULS)	■		
	Vector-jump protection	$\Delta\varphi$	■		
86	Lockout		■	■	■
87N T	Restricted ground-fault protection	ΔI_N	■		
90 V	Voltage controller for two-winding transformer		■		
90 V	Voltage controller for two-winding transformer with parallel control		■		
	Number of two-winding transformers with parallel control (hint: only together with the function "voltage controller for two-winding transformer with parallel control")		■		
FL	Fault Locator, single-side	FL-one	■		
PMU	Synchrophasor measurement	PMU	■		
AFD	Arc protection (only with plug-in module ARC-CD-3FO)		■		
	Measured values, standard		■	■	■
	Measured values, extended: Min, max, average		■		
	Switching statistics counter		■		
	PQ – Basic measured values: THD (Total Harmonic Distortion) and harmonic component (starting with V8.01) and THD voltage average values (starting with V8.40)		■		
	PQ – Basic measured values: Voltage unbalance (starting with V8.40)		■		
	PQ – Basic measured values: Voltage changes – monitoring of voltage dips, overvoltages and voltage interruptions (starting with V8.40)		■		
	PQ – Basic measured values: TDD - Total Demand Distortion (starting with V8.40)		■		
	CFC (standard, control)		■	■	■
	CFC arithmetic		■		
	Circuit-breaker wear monitoring	$\Sigma I_x, I^2t, 2P$	■		
	Switching sequence function		■		
	Inrush-current detection		■	■	■
	External trip initiation		■		
	Control		■	■	■
	Circuit breaker		■	■	■
	Disconnectors/grounding conductor		■		
	Fault recording of analog and binary signals		■	■	■
	Monitoring		■	■	■
	Protection interface, serial		■		
	Frequency group tracking (from V7.8)		■		

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ANSI	Function	Abbr.	Available	Application Templates	
				1	2
	Cyber security: Role-Based Access Control (from V7.8)		■		
	Temperature recording via communication protocol		■		
	Cyber security: Authenticated network access using IEEE 802.1X (starting from V8.3)		■		
Function point class:				0	40
The configuration and function point class for your application can be determined in the SIPROTEC 5 order configurator at www.siemens.com/siprotec .					

Table 2.12/1 SIPROTEC 7SK82 – Functions, Application Templates

- (1) Current measurement
- (2) Current and voltage measurement

SIPROTEC 5 Devices and Fields of Application

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Standard Variants for SIPROTEC 7SK82		
T1	1/3, 11 BI, 9 BO, 4 I Housing width 1/3 x 19", 11 binary inputs 9 binary outputs (1 life contact, 8 standard) 4 current transformers Contains the following modules: base module with PS101 and IO101	
T2	1/3, 23 BI, 16 BO, 4 I Housing width 1/3 x 19", 23 binary inputs 16 binary outputs (1 life contact, 15 standard) 4 current transformers Contains the following modules: base module with PS101, IO101, and IO110	
T3	1/3, 11 BI, 9 BO, 2 I, 12 RTDs Housing width 1/3 x 19" 11 binary inputs 9 binary outputs (1 life contact, 8 standard) 4 current transformers 12 temperature inputs Contains the following modules: base module with PS101, IO101, and IO111	
T4	1/3, 11 BI, 9 BO, 4 I, 4 V Housing width 1/3 x 19" 11 binary inputs 9 binary outputs (1 life contact, 8 standard) 4 current transformers 4 voltage transformers Contains the following modules: base module with PS101 and IO102	
T5	1/3, 23 BI, 16 BO, 4 I, 4 V Housing width 1/3 x 19" 23 binary inputs 16 binary outputs (1 life contact, 15 standard) 4 current transformers 4 voltage transformers Contains the following modules: base module with PS101, IO102, and IO110	
T6	1/3, 11 BI, 9 BO, 4 I, 4 V, 12 RTDs Housing width 1/3 x 19" 11 binary inputs 9 binary outputs (1 life contact, 8 standard) 4 current transformers 4 voltage transformers 12 temperature inputs Contains the following modules: base module with PS101, IO102, and IO111	

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Table 2.12/2 Standard Variants for SIPROTEC 7SK82 Motor Protection Devices

You can find the technical data in the manual
www.siemens.com/siprotec