

SIPROTEC 5 Devices and Fields of Application

Transformer Differential Protection – SIPROTEC 7UT82

Description

The SIPROTEC 7UT82 transformer differential protection has been designed specifically for the protection of two-winding transformers. It is the main protection for the transformer and contains many other protection and monitoring functions. The additional protection functions can also be used as backup protection for protected downstream objects (such as cables, line). In this process, you are also supported by the modular expandability of the hardware. With its modular structure, flexibility and the powerful DIGSI 5 engineering tool, SIPROTEC 7UT82 offers future-oriented system solutions with high investment security and low operating costs.

Main function	1 differential protection function (standard or auto transformer) with additional stabilization; up to 2 ground fault differential protection functions
Usable measuring points	2 x 3-phase current measuring points, 2 x 1-phase current measuring points
Inputs and outputs	1 predefined standard variant with 8 current transformers, 7 binary inputs, 7 binary outputs
Hardware flexibility	The 1/3 base module is available with the IO103 module, it is not possible to add 1/6 expansion modules, available with large and small display
Housing width	1/3 x 19"

Benefits

- Compact and low-cost transformer differential protection
- Safety due to powerful protection functions
- Data security and transparency over the entire lifecycle of the plant save time and money
- Purposeful and simple operation of the devices and software thanks to user-friendly design
- Increased reliability and quality of the engineering process
- Consistent implementation of high safety and security mechanisms
- Powerful communication components ensure safe and effective solutions
- Full compatibility between IEC 61850 Editions 1 and 2
- Highly available Ethernet communication due to integrated Ethernet redundancy protocols PRP and HSR

Functions

DIGSI 5 permits all functions to be configured and combined as required.

- Transformer differential protection for two-winding transformers with versatile, additional protection functions
- Transformer differential protection for phase-angle regulating transformers of the single core type
- Universal usability of the permissible measuring points
- Applicable from average up to extra-high voltage
- Protection of standard power transformers, auto transformers and motors



[SIP5_7xx82_GD_W3, 1, --, --]

Figure 2.11/2 SIPROTEC5 7UT82 transformer differential protection (1/3 device = standard variant W1)

- Increased sensitivity with near-neutral-point ground faults through a separate ground fault differential protection
- Flexible adaptation to the transformer vector group
- Controlling closing and overexcitation processes
- Safe behavior in current-transformer saturation with different degrees of saturation
- Adaptive adaptation of the operate curve to the transformer tap position
- Arc protection
- Graphical logic editor to create powerful automation functions in the device
- Single line representation in small or large display
- Integrated electrical Ethernet RJ45 for DIGSI 5 and IEC 61850 (reporting and GOOSE)
- Up to 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))
- Serial protection data communication via optical fibers, two-wire connections and communication networks (IEEE C37.94, and others), including automatic switchover between ring and chain topology
- Redundancy protocols PRP and HSR
- Cyber security in accordance with NERC CIP and BDWE White-paper requirements
- Time synchronization using IEEE 1588
- Powerful fault recording (buffer for a max. record time of 80 s at 8 kHz or 320 s at 2 kHz)
- Auxiliary functions for easy tests and commissioning.

Applications

Application templates are available in DIGSI 5 for standard applications. They contain basic configurations and default settings. These can be used directly or as a template for application-

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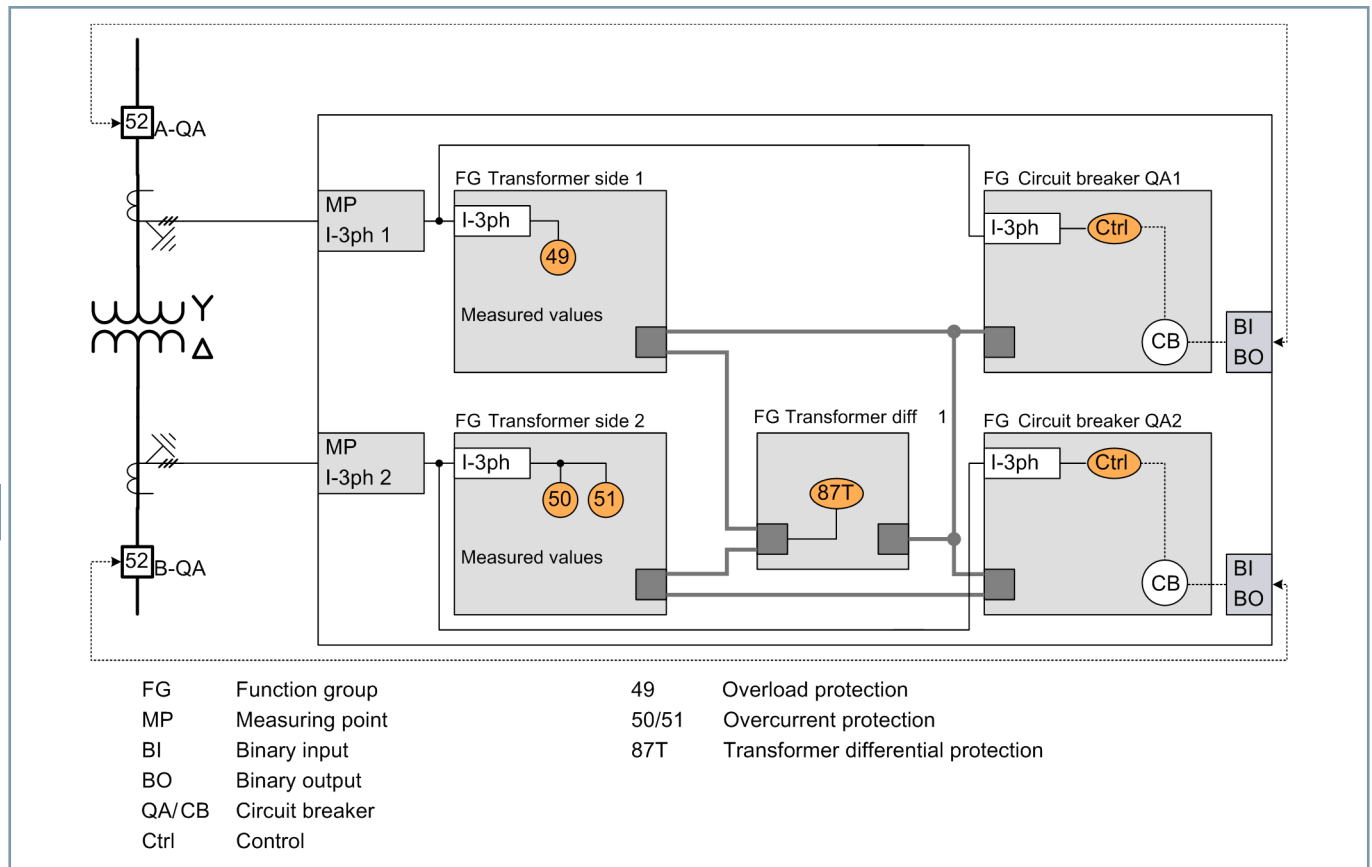
related adaptation. The available measuring points make varied applications possible. Prior to ordering a device, please configure the application with DIGSI 5. Table "Functions and application templates" shows the scope of functions of the device. Use the configurator to determine the necessary function points.

Application examples

Two-winding transformer basis

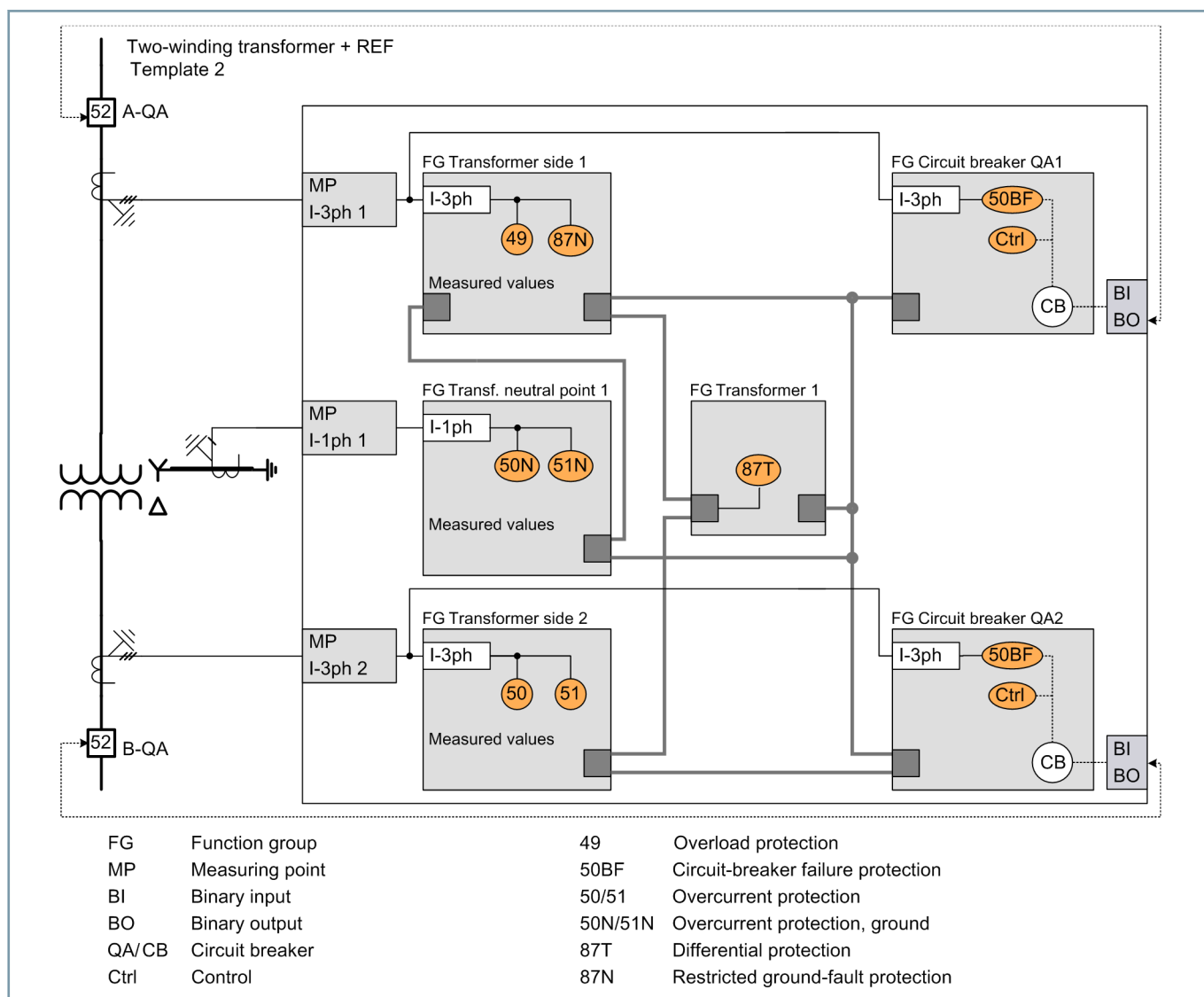
- Differential protection
- Overload protection, backup protection for the downstream electrical power system

The **Figure 2.11/3** shows the typical structure of an application template, the measuring points used, the function groups used, their internal interconnection, and the predefined functions. The example shows the two-winding transformer with ground fault differential protection.



[dw_two-winding-temp_01_2_en_US]

Figure 2.11/3 Application example: Protection of a Two-Winding Transformer



[dw_two-winding-temp_02, 2, en_US]

Figure 2.11/4 Application example: Protection of a two-winding transformer with ground fault differential protection

Two-winding transformer with restricted ground-fault protection (REF)

- Differential protection
- Ground fault differential protection on the star side
- Overload protection, backup protection for the downstream electrical power system
- Circuit-breaker failure protection.

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Functions and application templates

ANSI	Functions	Abbr.	Available	Template		
				1	2	3
37	Undercurrent	I<	■			
38	Temperature Supervision	θ>	■			
46	Negative sequence overcurrent protection	I2>	■			
46	Unbalanced-load protection (thermal)	I2 ² t>	■			
49	Thermal overload protection	θ, I ² t	■	■	■	■
49H	Hot spot calculation	θh, I ² t	■			
50/51 TD	Overcurrent protection, phases	I>	■	■	■	■
50N/ 51N TD	Overcurrent protection, ground	IN>	■		■	
50HS	High speed instantaneous overcurrent protection	I>>>	■			
	Instantaneous tripping at switch onto fault	SOTF	■			
50N/ 51N TD	Overcurrent protection, 1-phase	IN>	■			
50Ns/ 51Ns	Sensitive ground-current protection for systems with resonant or isolated neutral	INs>	■			
	Intermittent ground fault protection	lie>	■			
50BF	Circuit-breaker failure protection, 3-pole	CBFP	■		■	
50RS	Circuit-breaker restrike protection	CBRS	■			
74TC	Trip circuit supervision	TCS	■	■	■	■
86	Lockout		■	■	■	■
87T	Transformer differential protection	ΔI	■	■	■	
87T	Transformer differential protection for phase angle regulating transformer (single core)	ΔI	■			
87T Node	Differential protection (Node protection for Auto-transformer)	ΔI Node	■			
87N T	Restricted ground-fault protection	ΔIN	■		■	
87M	Motor differential protection	ΔI	■			■
87G	Generator differential protection	ΔI	■			
AFD	Arc-protection (only with plug-in module ARC-CD-3FO)		■			
	Measured values, standard		■	■	■	■
	Measured values, extended: Min, Max, Avg		■			
	Switching statistic counters		■	■	■	■
	Circuit breaker wear monitoring	ΣIx, I ² t, 2P	■			
	CFC (Standard, Control)		■	■	■	■
	CFC arithmetic		■			
	Switching sequences function		■			
	Inrush current detection		■	■	■	■
	External trip initiation		■			
	Control		■	■	■	■
	Fault recording of analog and binary signals		■	■	■	■
	Monitoring and supervision		■	■	■	■
	Protection interface, serial		■			
	Circuit Breaker		■	■	■	■
	Disconnecter		■			
Function-points class:				0	30	0
The configuration and function points for your application can be ascertained in the SIPROTEC 5 order configurator under: www.siemens.com/siprotec						

Table 2.11/1 SIPROTEC 7UT82 - Functions and application templates

- 1 Two winding transformer basic (87T)
- 2 Two winding transformer (87T, 50BF, 87N)
- 3 Motor DIFF (87M)