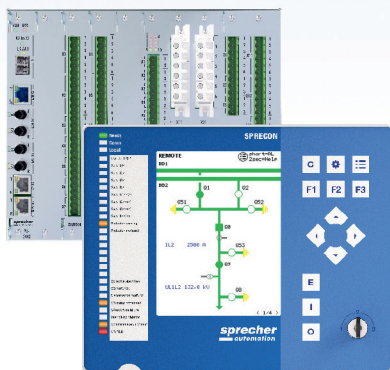




SPRECON[®]-E-P DL.6

Line differential protection with optional distance protection for cables and overhead power lines with two ends

INTRODUCTION

The main function of the SPRECON-E-P DL..6 series is the differential protection of cables and overhead power lines. Directional overcurrent protection and distance protection are available optionally. The devices include standardised hardware modules and firmware. They all provide protection functions of the same range. The series consists of:

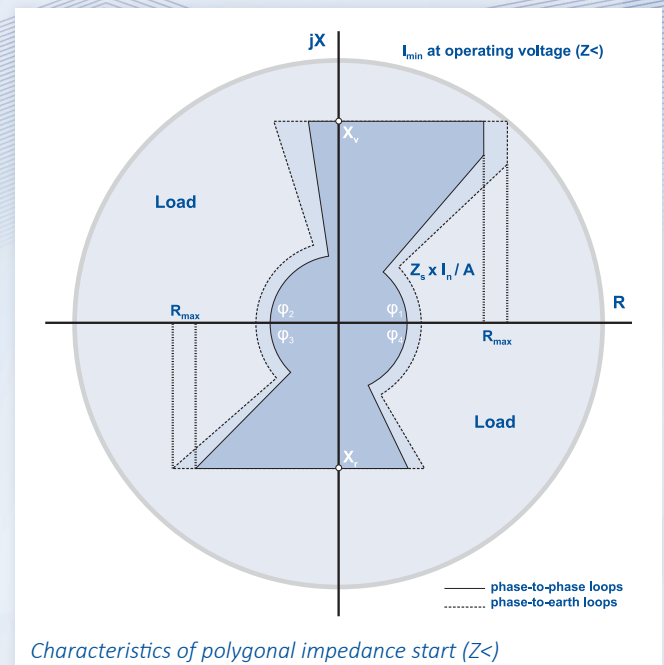
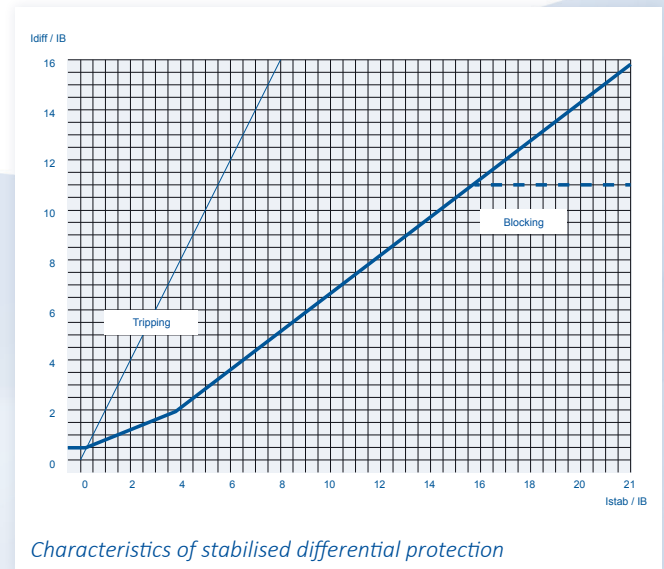
- SPRECON-E-P DL..6-1
(Protection devices with control function)
- SPRECON-E-P DL..6-2
(Modular protection and control devices)

Modular one-box solutions show higher application flexibility than protection devices with control function. Protection devices with control function have a fixed range of in- and outputs. Besides protection and measured value collection, they also feature control of up to four switching devices. Due to its modular design, the one-box solution can be easily expanded for realising comprehensive protection, measurement, control and monitoring tasks in secondary systems.

The multifunctional SPRECON-E-P devices feature a clear separation of control and protection functions:

- Separated data models
- Separated control and protection firmware
- Separated control and protection configuration
- Separated passwords
- No testing of protection function at feeder nor primary circuit disconnection required on updating control parameters or firmware

The protection interface, based on Ethernet technology, allows data exchange between the differential protection devices, which consists of synchronised-recorded measured values and parameterisable binary signals (Remote Outputs/RO). The necessary synchronisation of the measured values is realised via the communica-



tion channel without the need to support special protocols in the communication network. This protection communication interface can be used for the teleprotection of the distance protection as well.

RANGE OF FUNCTIONS

The devices are accentuated by a technologically fully developed and commercially optimised design. They allow realisations of sophisticated and compact solutions with clear economical benefits through highest possible flexibility and scalability.

APPLICATION

The SPRECON-E-P DL.6 devices are multifunctional devices for protection and automation of energy stations. They serve as line protection of two-end lines that can be fed from one or both sides concerning all neutral point connections at medium and high voltage levels. Control of the circuit breaker can act as a 1- or 3-pole automatic reclosing procedure. The devices have a single / three-pole automatic reclosing. The starting methods implemented in the distance protection are optimally suited to distinguish safely and highly sensitive between operating and fault conditions under different load conditions and with different types of grids and star point treatments.

In addition to the three- or optionally four-section characteristics of stabilised differential protection for phase currents, SPRECON-E-P DL.6 also comes with characteristics of stabilised earth current differential protection, amplitude and vector group matching, zero sequence filtering, inrush and overexcitation stabilisation for transformers in the protected zone. The protection functions are completed by additional features that allow realisation of complex protection concepts.

The implementation of standard and proprietary protocols allows close collaboration with controlling systems of various manufacturers.

CONFIGURATION

All functions can be configured separately. By separating protection configuration from control configuration, all different kinds of requirements of different applications can be met.

The protection-specific functions are separately configured or deactivated depending on the respective application. Irrelevant functions are hidden and inactive which allows simple and structured configuration of the devices.

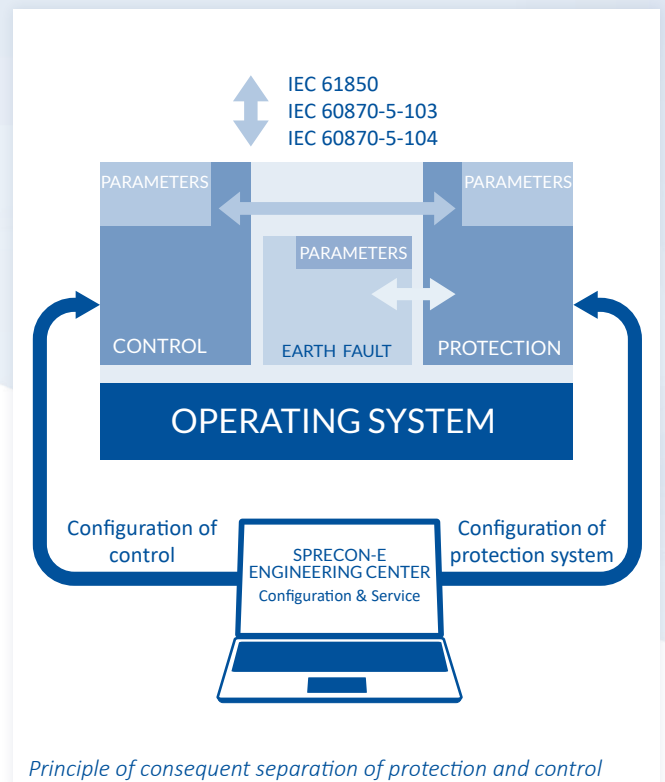
In the control application, all configured bays are type-orientedly stored in a database. They can therefore be copied and reused as well as easily readapted, which facilitates configuration of large scale systems.

OPERATING

In order to meet the requirements of efficient system management, all operations can be accomplished with the detachable HMI control panel. Hence, protection configurations can be carried out locally besides using the operating program "COMM-3".

All relevant information about the process and the device is shown on the fully graphical display of the control panel. Additionally, configurable LEDs are available for signalling.

Separated navigation keys allow clear user guidance through the various pages and submenus. Furthermore, they facilitate simple configuration of extensive protection and control functions.



SPRECON-E-P DL..6 – TECHNICAL DATA (EXCERPT)



IMPLEMENTED PROTECTION FUNCTIONS

	Reference		Type				
	IEEE C37.2	IEC 61850-7-4	DL6 3 x I _L 1 x I _E (1x)	DLRY6 3 x I _L 1 x I _E (1x), 4 x U	DLREY6 3 x I _L 1 x I _E (20x) 4 x U	DLDY6 3 x I _L 1 x I _E (1x) 4 x U	DLDEY6 3 x I _L 1 x I _E (20x) 4 x U
Line differential protection (phase-selective), power lines and overhead power lines with two ends	87L	PLDF RMXU	✓	✓	✓	✓	✓
Distance protection	21	PDIS				✓	✓
Current starting I>>, Voltage depended U-I starting		PTOC / PVOC				✓	✓
Polygonal Z< starting						✓	✓
Distance zones/overreach zones						6 / 1	6 / 1
Direct. backup time/time limit (non direct.)						X / X	X / X
I _L > DT / IDMT / (emergency or back-up operation), 4 stages	50, 51	PTOC	✓	✓	✓	✓	✓
I _L > DT / IDMT / (emergency or back-up operation), 4 stages (treatment of intermittent earth-faults)	50N, 51N, 51Ns	PTOC	✓	✓	✓	✓	✓
Switch-on protection (SOTF, SOP): I _L , I _F , I _{PH}	50, 50N	PIOC	✓	✓	✓	✓	✓
Power swing protection	78	RSPB				✓	✓
Inrush restraint (2 nd harmonic)		PHAR	✓	✓	✓	✓	✓
Short circuit direction detection	67	PTOC, RDIR		✓	✓	✓	✓
Earth fault short circuit direction detection	67N	PTOC		✓	✓	✓	✓
Phase-selective earth fault detection	64	PHIZ		✓	✓	✓	✓
Earth fault direction detection	67Ns	PSDE			✓		✓
EDIR – enhanced earth fault direction detection Transient, harmonical, stationary, pulse methods	67Ns		Option	Option	Option	Option	Option
Auto reclosing (AR), 1-/3-pole	79	RREC	✓	✓	✓	✓	✓
Teleprotection (TP)	85	PSCH	3-pole	3-pole	3-pole	1-/3-pole	1-/3-pole
Overvoltage time protection (U>, U _{NE} >), 2 stages each	59, 59N	PTOV		✓	✓	✓	✓
Undervoltage time protection (U<), 2 stages	27	PTUV		✓	✓	✓	✓
Frequency protection (4 stages f<, 2 stages f>)	81	PTUF, PTOF		✓	✓	✓	✓
ROCOF (df/dt) 4x falling, 2x rising	81R	PFRFC		✓	✓	✓	✓
Directional power protection (P, Q), 2 stages	32	PDOP, (PDUP)		✓	✓	✓	✓
Reactive power-undervoltage protection (Q-U<), 2 stages each				✓	✓	✓	✓
Frequency load shedding (FLS / UFLS)		PTUF+, PDOP		✓	✓	✓	✓
Negative sequence protection I _{PH} >DT/IDMT, 2 stages	46	PTOC	✓	✓	✓	✓	✓
Overload protection for phases/neutral earthing transformer	49, 49N	PTTR	✓	✓	✓	✓	✓
Differential protection for transformers in protected zone (ratio and vector group adapting, zero-sequence filtering)	87T	PDIF	2 sides	2 sides	2 sides	2 sides	2 sides
Ground differential protection for transformers in protected zone (ratio adaptation)	87N T	PDIF	1x	1x		1x	
Overexcitation stabilisation (5 th harmonic) for transformers			✓	✓	✓	✓	✓
Reclosing lockout	86	PMRI	✓	✓	✓	✓	✓
Circuit breaker failure protection (CBF)	50BF	RBRF	✓	✓	✓	✓	✓
Current annunciation stages (3x I _L >an, 3x I _E >an)			✓	✓	✓	✓	✓
dI annunciation stages (2x I _L >an, 2x I _E >an)						✓	✓
External trip commands (6x)		(PTRC)	✓	✓	✓	✓	✓
Synchrocheck	25	RSYN		✓	✓	✓	✓
Fault locator (FL)	21FL	RFLO		✓	✓	✓	✓
Phase-sequence reversal			✓	✓	✓	✓	✓
Phase-sequence direction	47	(PPBV)	✓	✓	✓	✓	✓
Binary signals via protection interface – outputs (PI- RO) and inputs (PI - RI)			24/24	24/24	24/24	24/24	24/24
Trip circuit supervision (3x)	74TC		✓	✓	✓	✓	✓
Parameter sets			4	4	4	4	4
Programmable Logics			✓	✓	✓	✓	✓
Measurands, short report			✓	✓	✓	✓	✓
Event logging, non-volatile		RDRE	✓	✓	✓	✓	✓
Disturbance date recording, non-volatile		RADR, RBDR	✓	✓	✓	✓	✓
Statistics			✓	✓	✓	✓	✓
Measurand checks, self supervision			✓	✓	✓	✓	✓
Assistance for testing and commissioning			✓	✓	✓	✓	✓

DIMENSIONS & WEIGHT

- Dimensions: 131/212/436x176x257 mm (WxHxD)
incl. connection cable
- Weight: < 6 kg

GENERAL FUNCTIONS

- Remote maintenance and configuration
- Time synchronisation
(NTP, DCF77, GPS, station & remote control)
- Diagnosis via Webserver
- Automatic backup on SD card without a tool
- AI, AO modules for combined devices available
- CP with a fully graphically display with 3-coloured LEDs
- Redundant power supply as option

COMMUNICATION

- IEC 60870-5-103/-104, IEC 61850
- RS232, RS422/485, fibre-optic, 10/100 Mbit Ethernet
- 2 additional optical Ethernet interfaces for redundant ring

PROTECTION INTERFACE

- Ethernet interface electrical (RJ45 socket)
- Optionally an optical Ethernet interface (LC):
singlmode 60 km or multimode 2 km

ADDITIONAL PROTECTION FUNCTIONS

- Separation of protection event recording from control data
- Nominal current selection (1/5 A) via terminal connection
- Settings via control panel and PC through menu-assisted plain text messaging
- Internal earth fault module EDIR with various earth fault detection methods
- Pulse shaper stage (programmable logic)

CONTROL FUNCTIONS

- Control and monitoring of switching devices and process elements
- Freely programmable logic (PLC)
- Control of transformer tap changers and Petersen coil
- Power output with high breaking capacity (optional)
- Limit value monitoring
- Maximum value calculation (non-return pointer)
- Metered value capturing, operating hours counter, switching operations counter
- ...

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