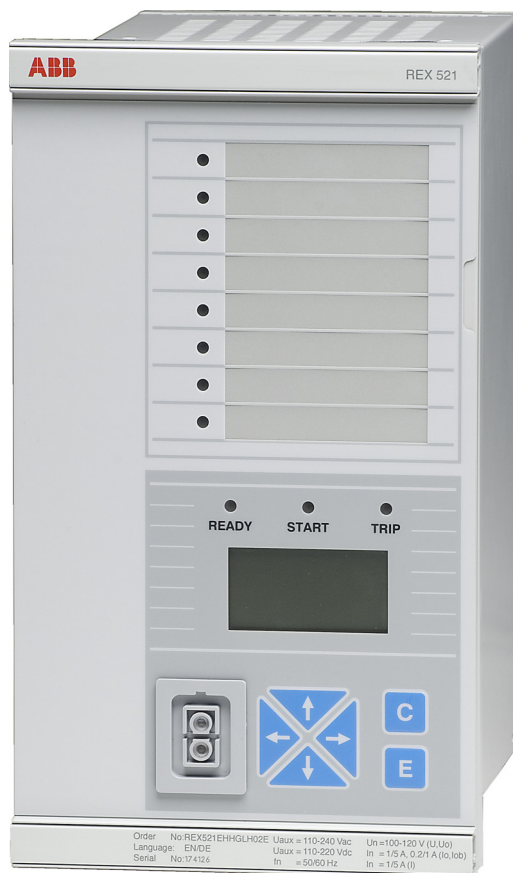


Feeder Protection Relay

REX 521

Product Guide



General

The protection relay REX 521 is designed for protection, control, measuring, and supervision in medium voltage networks. Typical applications include incoming and outgoing feeders as well as substation protection. The

protection relay is provided with energizing inputs for conventional current and voltage transformers. Also a hardware version with inputs for current and voltage sensors is available.

Design

The protection relay is based on a multiprocessor environment. The human-machine interface (HMI)¹ including an LCD display with different views makes the local use easy

and informs the user via indication messages. Modern technology is applied both in hardware and software solutions.

1. HMI is referred to as MMI in the relay and in the Relay Setting Tool.

The protection relay is part of the ABB Substation Automation system and extends the functionality and flexibility of the concept further.

Features

Standard configuration B01:

- Three-phase non-directional overcurrent protection with three stages
- Non-directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cables
- Three-phase transformer inrush and motor start-up current detector
- Supervision function for the energizing current input circuit
- Current waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

Standard configuration B02:

- Three-phase non-directional overcurrent protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Non-directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cables
- Supervision function for the energizing current input circuit
- Current waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

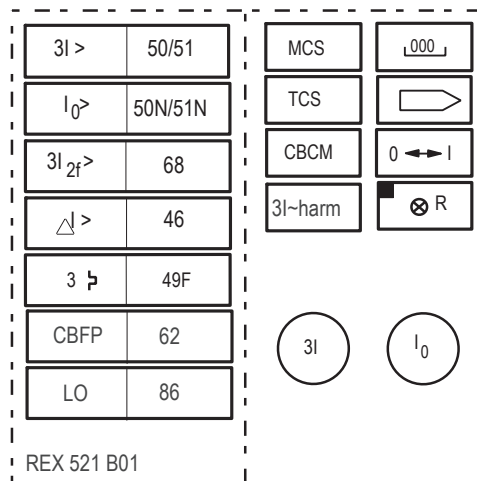


Fig. 1 Block diagram of B01

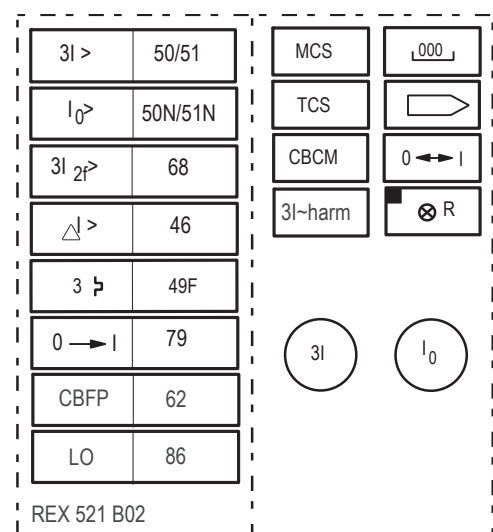


Fig. 2 Block diagram of B02

Features (cont'd)

Standard configuration M01:

- Three-phase non-directional overcurrent protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cables
- Supervision function for the energizing current input circuit
- Current waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Residual voltage measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

Standard configuration M02:

- Three-phase non-directional overcurrent protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cables
- Supervision function for the energizing current input circuit
- Current waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Residual voltage measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

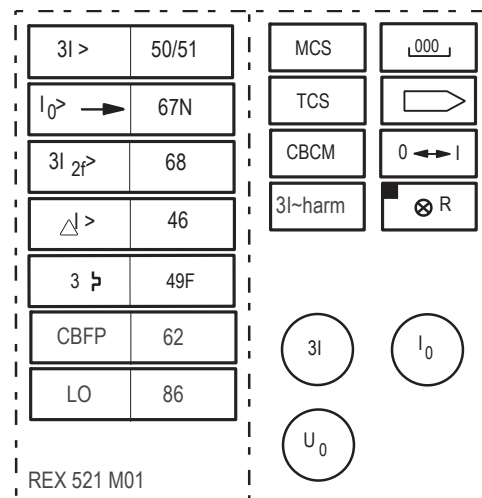


Fig. 3 Block diagram of M01

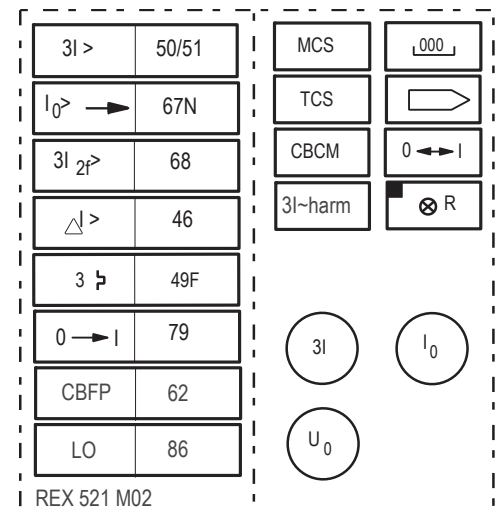


Fig. 4 Block diagram of M02

Features (cont'd)

The main difference between the standard configurations B01/B02 and standard configurations M01/M02 is the directional earth-fault protection, which is included in the standard configurations M01 and M02. The difference between configurations B01 and B02, and likewise between M01 and M02, is the auto-reclosure function in B02 and M02.

Standard configuration H01:

- Three-phase directional overcurrent protection with two stages
- Three-phase non-directional overcurrent protection with one stage
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cable
- Synchro-check/voltage-check function with one stage
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase-to-earth voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os

- Interlocking
- User-configurable alarm LEDs

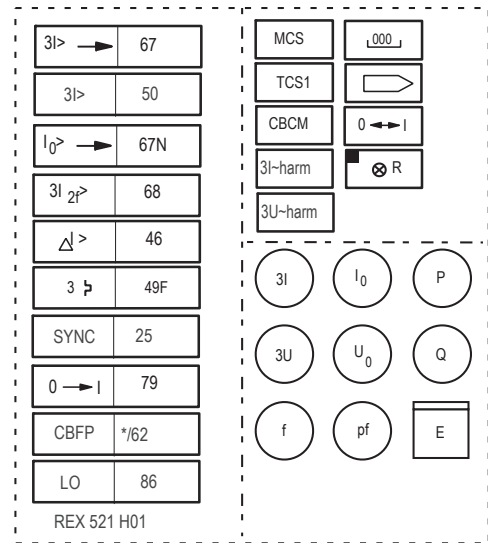


Fig. 5 Block diagram of H01

Note! The standard configuration H01 is available only with the sensor HW version.

Standard configuration H02:

- Three-phase directional overcurrent protection with two stages
- Three-phase non-directional overcurrent protection with two stages
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Underfrequency or overfrequency protection with one stage
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cables
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement

Features (cont'd)

- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs
- Synchro-check/voltage-check function with one stage
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)

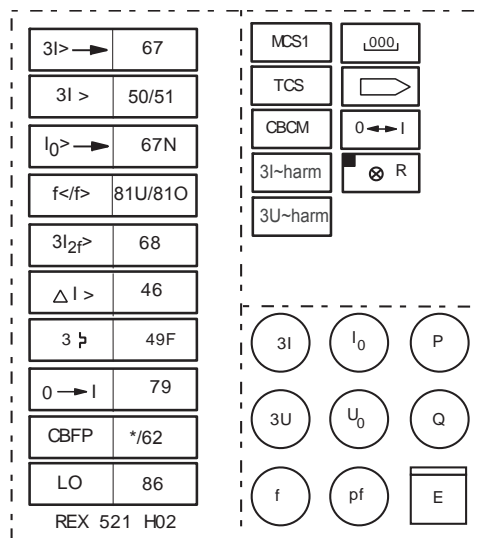


Fig. 6 Block diagram of H02

Standard configuration H03:

- Three-phase non-directional overcurrent protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cable

- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

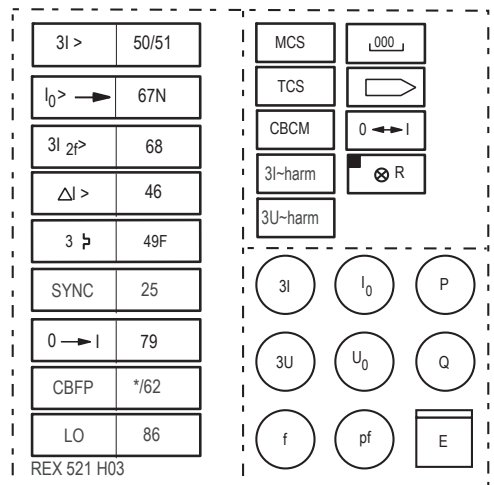


Fig. 7 Block diagram of H03

Features (cont'd)

Standard configuration H04:

- Three-phase non-directional overcurrent protection with three stages
- Three-phase directional overcurrent protection with one stage
- Underfrequency or overfrequency protection with one stage
- Three-phase transformer inrush and motor start-up current detector
- Directional earth-fault protection with three stages
- Non-directional earth-fault protection with three stages
- Phase discontinuity protection for three phases
- Three-phase thermal protection for cable
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

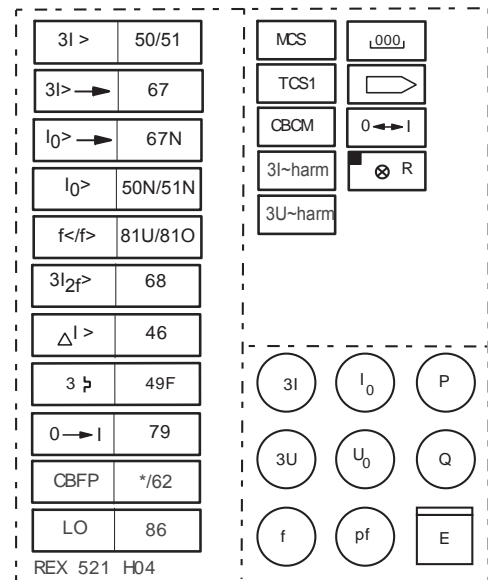


Fig. 8 Block diagram of H04

Standard configuration H05:

- Three-phase non-directional overcurrent protection with three stages
- Non-directional earth-fault protection with three stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Residual overvoltage protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Three-phase thermal overload protection for devices
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement

Features (cont'd)

- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

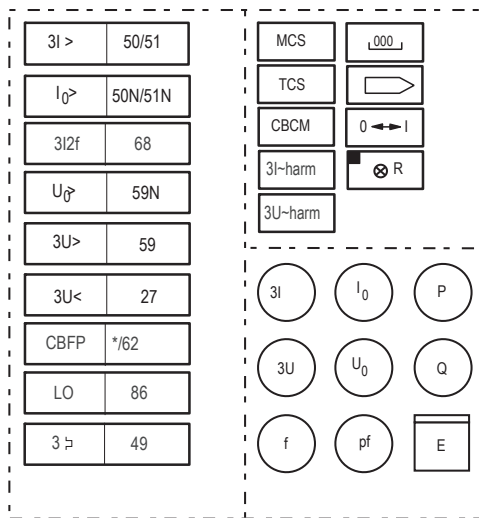


Fig. 9 Block diagram of H05

Standard configuration H06:

- Three-phase non-directional overcurrent protection with two stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Residual overvoltage protection with three stages
- Underfrequency or overfrequency protection with two stages

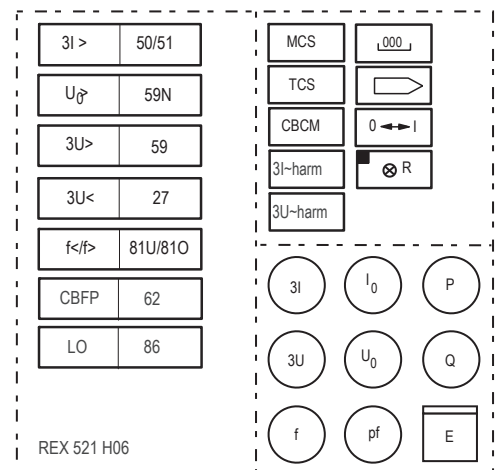


Fig. 10 Block diagram of H06

Features (cont'd)

Standard configuration H07:

- Three-phase non-directional overcurrent protection with three stages
- Non-directional earth-fault protection with two stages
- Directional earth-fault protection with two stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Underfrequency or overfrequency protection with one stage
- Negative phase sequence (NPS) protection with two stages
- Three-phase motor start-up supervision
- Three-phase thermal overload protection for devices
- Phase reversal protection
- Phase sequence voltage protection
- Fuse failure protection
- Three-phase non-directional undercurrent protection with one stage
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three-phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Operation time counter
- Lockout function
- Object indication

- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

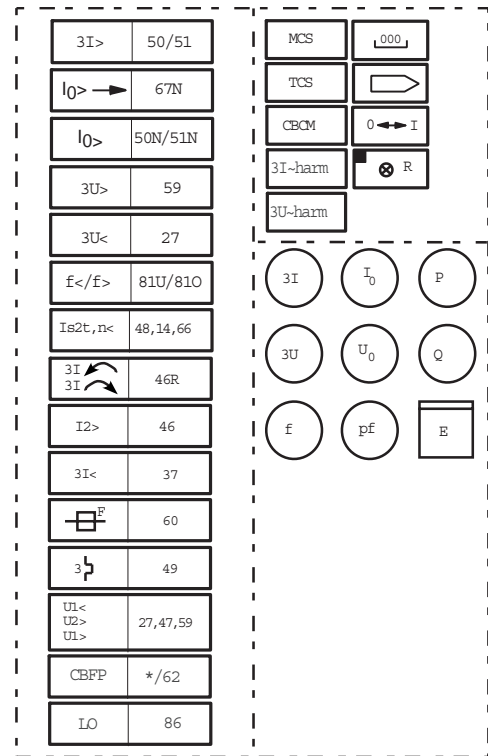


Fig. 11 Block diagram of H07

Standard configuration H08:

- Three-phase non-directional overcurrent protection with three stages
- Non-directional earth-fault protection with three stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Residual overvoltage protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Three-phase thermal overload protection for devices
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement

Features (cont'd)

- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

Standard configuration H09:

- Three-phase non-directional overcurrent protection with three stages
- Non-directional earth-fault protection with three stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Residual overvoltage protection with three stages
- Three-phase transformer inrush and motor start-up current detector
- Underfrequency or overfrequency protection with two stages
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Automatic reclosing 1...5 shots
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

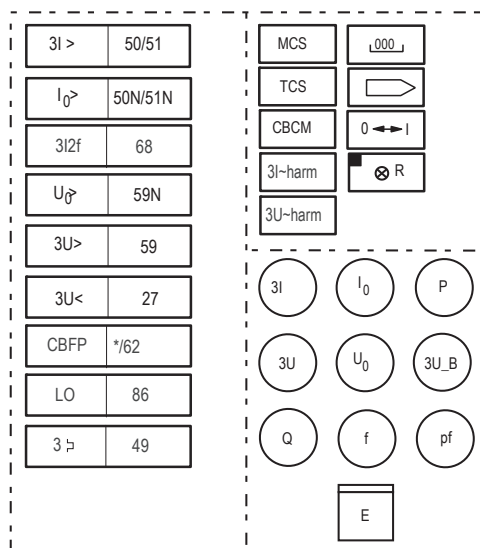


Fig. 12 Block diagram of H08

Note! The standard configuration H08 is available only with the voltage transformer (VT) HW version. VTs are used to measure phase-to-earth voltages.

Features (cont'd)

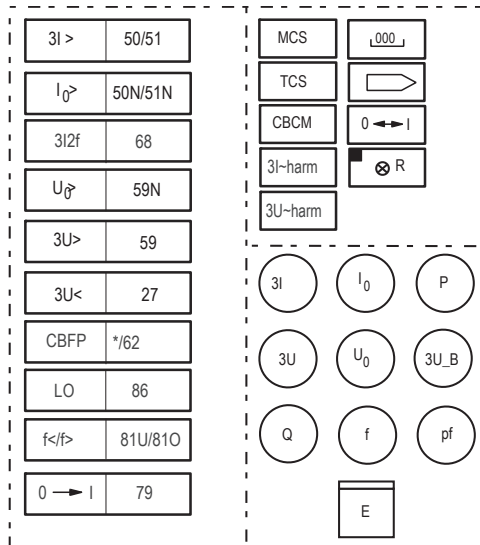


Fig. 13 Block diagram of H09

Note! The standard configuration H09 is available only with the voltage transformer (VT) HW version. VTs are used to measure phase-to-earth voltages.

Standard configuration H50:

- Three-phase non-directional overcurrent protection with three stages.
- Three-phase directional overcurrent protection with two stages
- Directional earth-fault protection with two stages
- Non-directional earth-fault protection with two stages
- Three-phase overvoltage protection with two stages
- Three-phase undervoltage protection with two stages
- Residual overvoltage protection with two stages
- Three-phase transformer inrush and motor start-up current detector
- Underfrequency or overfrequency protection with two stages
- Phase-sequence voltage protection
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement

- Three-phase current measurement
- Neutral current measurement
- Three phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)
- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit-breaker failure protection (CBFP) function
- Automatic reclosing 1...5 shots
- Circuit breaker control with indication
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

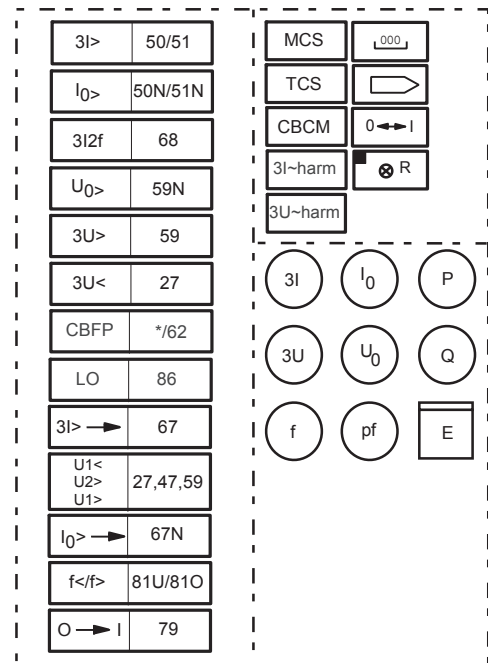


Fig. 14 Block diagram of H50

Note! The standard configuration H50 is available only with the voltage transformer (VT).

Features (cont'd)

Standard configuration H51:

- Three-phase non-directional overcurrent protection with three stages.
- Three-phase directional overcurrent protection with one stage.
- Non-directional earth-fault protection with two stages
- Directional earth-fault protection with two stages
- Three-phase overvoltage protection with one stage
- Three-phase undervoltage protection with one stage
- Underfrequency or overfrequency protection with two stages
- Negative phase-sequence (NPS) protection with one stage
- Three-phase motor start-up supervision
- Three-phase thermal overload protection for devices
- Residual overvoltage protection with one stage
- Phase-sequence voltage protection
- Fuse-failure protection
- Three-phase non-directional undercurrent protection with one stage
- Supervision function for energizing current input circuit
- Supervision function for energizing voltage input circuit
- Current waveform distortion measurement
- Voltage waveform distortion measurement
- Three-phase current measurement
- Neutral current measurement
- Three-phase voltage measurements
- Residual voltage measurement
- System frequency measurement
- Three-phase power and energy measurement
- Calculation of the accumulated electric breaker wear of the circuit breaker (CB)

- Transient disturbance recorder
- Trip-circuit supervision
- Delayed trip output for the circuit breaker failure protection (CBFP) function
- Circuit breaker control with indication
- Operation time counter
- Lockout function
- Object indication
- Logic control position selector
- User-configurable I/Os
- Interlocking
- User-configurable alarm LEDs

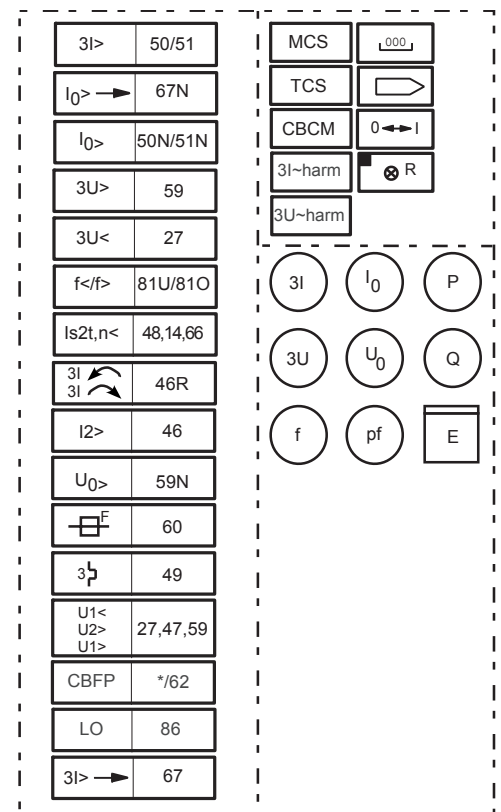


Fig. 15 Block diagram of H51

Note! The standard configuration H51 is available only with the voltage transformer (VT).

Applications

Several standard configurations are available for the protection relay. Refer to the REX 521 “Technical Reference Manual, Standard Configurations” for more detailed information.

The B01 standard configuration for REX 521 is designed to be used in single busbar systems using one circuit breaker for selective short-circuit, time overcurrent and earth-fault protection of radial isolated neutral networks, solidly earthed networks, resistant earthed networks and resonant earthed networks.

The B02 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective short-circuit protection, time-overcurrent protection, earth-fault protection and automatic reclosing. The configuration can be used in different types of networks such as radial isolated neutral networks, solidly earthed networks, resistant earthed networks and resonant earthed networks.

The M01 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective short-circuit, time overcurrent and directional earth-fault protection of radial isolated neutral networks, solidly earthed networks, resistant earthed networks and resonant earthed networks.

The M02 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective short-circuit protection, time-overcurrent protection, directional earth-fault protection and automatic reclosing. The configuration can be used in different types of networks such as of radial isolated neutral networks, solidly earthed networks, resistant earthed networks and resonant earthed networks.

The H01 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective directional and non-directional short-circuit protection, directional time-overcurrent protection, directional earth-fault protection and automatic reclosing with synchro- and voltage-check functionality.

The H02 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective directional and non-directional short-circuit protection, directional and non-directional time-overcurrent protection, directional earth-fault protection and automatic reclosing.

The H03 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, directional earth-fault protection and automatic reclosing with synchro- and voltage-check functionality.

The H04 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, directional and non-directional earth-fault protection and automatic reclosing.

The H05 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, non-directional earth-fault protection, overvoltage protection, undervoltage protection, residual overvoltage protection and thermal overload protection for devices.

The H06 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, overvoltage protection, undervoltage protection, residual overvoltage protection, underfrequency protection and overfrequency protection.

The H07 standard configuration is designed for protection of large or medium-size three-phase AC motors in circuit-breaker controlled motor drives. Due to the large number of protective functions integrated, the relay provides a complete protection against motor damage caused by electrical faults. The H07 configuration can also be applied to other objects needing thermal overload protection, such as power transformers. It can also be used in applications requiring overcurrent protection, under or overvoltage protection and/or directional or non-directional earth-fault protection.

The H08 standard configuration is designed to be used in single busbar systems using one circuit-breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, non-directional earth-fault protection, overvoltage protection, undervoltage protection, residual overvoltage protection and thermal overload protection for devices. The protection is based on

Applications (cont'd)

phase-to-earth voltages. In addition, phase-to-phase voltages are available in the measurement view.

The H09 standard configuration for REX 521 is designed to be used in single busbar systems using one circuit breaker for selective non-directional short-circuit protection, non-directional time-overcurrent protection, non-directional earth-fault protection, overvoltage protection, undervoltage protection, residual overvoltage protection, underfrequency protection, overfrequency protection and automatic reclosing.

The H50 standard configuration for REX 521 is designed to be used in single busbar systems by using one circuit breaker for selective non-directional short-circuit protection, directional and non-directional time-overcurrent protection, directional and/or non-directional earth-fault protection, overvoltage

protection, undervoltage protection, residual overvoltage protection, underfrequency protection, over-frequency protection and automatic reclosing.

The H51 standard configuration for REX 521 is designed for protection of large or medium-size three-phase AC motors in circuit breaker controlled motor drives. Due to the large number of protective functions integrated, the relay provides a complete protection against motor damage caused by electrical faults.

The H51 configuration can be applied to other objects that need the thermal overload protection (such as power transformers). It can also be used in applications requiring overcurrent protection, directional overcurrent protection, under/overvoltage protection, directional or non-directional earth-fault protection, underfrequency protection and/or overfrequency protection.

Design, hardware

Different hardware versions of REX 521 are shown in the table below.

Table 1: REX 521 hardware versions

Relay type	REX 521			
	Basic	Medium	High	Sensor
Version name	REX521xBxxx	REX521xMxxx	REX521xHxxx	REX521xSxxx
Transformer modules (MIM)	1	1	1	1
Transformers				
• Current transformers 1/5 A	4	4	4	1
• Current transformers 0.2/1 A		1	1	1
• Voltage transformers 100 V		1	4	1
Sensor channels				
• Current sensor inputs				3
• Voltage sensor inputs				3
Main CPU modules	1	1	1	1
CPU_SP (SPA/ IEC plastic)				
CPU_SG (SPA/ IEC glass)				
CPU_LP (SPA/ IEC/ LON plastic)				
CPU_LG (SPA/ IEC/ LON glass)				
Power supply modules	1	1	1	1
PS_87H (Dltresh.=80 VDC)				
PS_87L (Dltresh.=18 VDC)				
Display module	1	1	1	1
6 x 16 character display				
Digital inputs	9			
High-speed power outputs	1			
Power outputs (PO)	3			
Signalling outputs (SO)	2			
IRF outputs	1			
Trip-circuit supervision (TCS)	1			

Design, software

Functionality is available as part of the standard configurations B01, B02, M01, M02, H01, H02, H03, H04, H05, H06, H07, H08, H09, H50 and H51.

Functions available for use in the different standard configurations are listed below.

Table 2: Standard configurations for REX 521

HW versions			Basic		Medium		High/Sensor											
Standard configurations			B01	B02	M01	M02	H01 ¹	H02	H03	H04	H05	H06	H07	H08 ²³	H09 ²³	H50 ²	H51 ²	
IEC symbol	ANSI device number	FB name (CD-ROM)																
Protection																		
3I>	51-1	NOC3Low	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
3I>>	51-2	NOC3High	x	x	x	x		x	x	x	x	x	x	x	x	x	x	
3I>>>	51-3	NOC3Inst	x	x	x	x	x		x	x	x		x	x	x	x	x	
Io>	51N-1	NEF1Low	x	x						x ⁴	x		x	x	x	x	x	
Io>>	51N-2	NEF1High	x	x						x ⁴	x		x	x	x	x	x	
Io>>>	51N-3	NEF1Inst	x	x						x ⁴	x			x	x			
Io>...> ⁵	67N-1	DEF2Low			x	x	x	x	x	x			x			x	x	
Io>>...> ⁵	67N-2	DEF2High			x	x	x	x	x	x			x			x	x	
Io>>>...> ⁵	67N-3	DEF2Inst			x	x	x	x	x	x								
3I>-->	67-1	DOC6Low					x	x ⁶		x						x		
3I>>-->	67-2	DOC6High					x	x ⁶								x	x	
3U>	59-1	OV3Low									x	x	x	x	x	x	x	
3U>>	59-2	OV3High									x	x	x	x	x	x		
3U<	27-1	UV3Low									x	x	x	x	x	x	x	
3U<<	27-2	UV3High									x	x	x	x	x	x		
3I2f>	68	Inrush3	x	x	x	x	x	x	x	x				x	x	x		
Iub>	46	CUB3Low	x	x	x	x	x	x	x									
3Ith>	49F	TOL3Cab	x	x	x	x	x	x	x									
O-->I	79	AR5Func		x		x	x	x	x						x	x		
Uo>	59N-1	ROV1Low									x	x		x	x	x	x	
Uo>>	59N-2	ROV1High									x	x		x	x	x		
Uo>>>	59N-3	ROV1Inst									x	x		x	x			
f1	81-1	Freq1St1						x		x		x	x		x	x	x	
f2	81-2	Freq1St2										x			x	x	x	
SYNC1	25-1	SCVCSt1					x		x									
Is2t n<	48	MotStart											x				x	
3I()	46R	PREV3											x				x	
I2>	46-1	NPS3Low											x				x	
I2>>	46-2	NPS3High											x					
3I<	37-1	NUC3St1											x					
FUSEF	60	FuseFail											x				x	
3Ithdev>	49M/G/T	Tol3Dev									x		x	x			x	
U1U2<>_1	47-1	PSV3St1											x			x	x	
Control functions																		
I<->O CB1	COCB1	COCB1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I<->O IND1	COIND1	COIND1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
I<->O IND2	COIND2	COIND2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

Table 2: Standard configurations for REX 521 (continued)

HW versions			Basic		Medium		High/Sensor										
Standard configurations			B01	B02	M01	M02	H01 ¹	H02	H03	H04	H05	H06	H07	H08 ²³	H09 ²³	H50 ²	H51 ²
IEC symbol	ANSI device number	FB name (CD-ROM)															
I<->O IND3	COIND3	COIND3											x ⁷				x ⁷
I<->O POS	COLOCAT	COLOCAT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ALARM1-8	ALARM1-8	MMIALAR1-8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Measurement																	
3I	3I	MECU3A	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Io	Io	MECU1A	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Uo	Uo	MEVO1A			x	x	x	x	x	x	x	x	x	x	x	x	x
DREC	DREC	MEDREC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
3U	3U	MEVO3A					x	x	x	x	x	x	x	x	x	x	x
3U_B	3U_B	MEVO3B												x	x		
f	f	MEFR1					x	x	x	x	x	x	x	x	x	x	x
PQE	PQE	MEPE7					x	x	x	x	x	x	x	x	x	x	x
AI1	AI1	MEAI1											x				x
Condition monitoring																	
CB wear1	CB wear1	CMBWEAR1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
TCS1	TCS1	CMTCS1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MCS 3I	MCS 3I	CMCU3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MCS 3U	MCS 3U	CMVO3					x	x	x	x	x	x	x	x	x	x	x
TIME1	TIME1	CMTIME1											x				x
Power quality monitoring																	
PQ 3Inf	PQ 3Inf	PQCU3H	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PQ 3Unf	PQ 3Unf	PQVO3H					x	x	x	x	x	x	x	x	x	x	x
Standard																	
SWGRP	SWGRP	SWGRP	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x

¹H01 available only as sensor version

²Available only as VT version

³VTs are used to measure phase-to-earth voltages, calculated phase-to-phase voltages are shown by 3U_B

⁴Configured fixedly to the Io (1/5 A) channel or Ios if selected

⁵Can be used as Io>, Io>> and Io>>> or Uo>, Uo>> and Uo>>> function block with some limitations

⁶3I>-> and 3I>>-> cannot be set to operate as 3I>, 3I>> or 3I>>>

⁷Motor status indication

Note: Calculated Uo (Uos) is used in the Sensor versions of H01 and H03 configurations. Calculated Io (Ios) is available in H01-H05, H08, H09 and H50 configurations.

For more information, see REX 521 Technical Reference Manual, Standard Configurations.

Technical data

Table 3: Energizing inputs

Rated frequency		50.0/60.0 Hz	
Current inputs	rated current		0,2 A/1 A/5 A
	Thermal withstand capability	continuously	1.5 A/4 A/20 A
		for 1 s	20 A/100 A/500 A
	dynamic current withstand, half-wave value		50 A/250 A/1250 A
input impedance		<750 mΩ/<100mΩ/ <20 mΩ	
Voltage inputs	rated voltage		100 V/110 V/115 V/120 V (parametrization)
	voltage withstand, continuous		2 x U _n (240 V)
	burden at rated voltage		<0.5 VA
Sensor inputs	voltage range RMS		9.4 V RMS
	voltage range peak		± 12 V
	input impedance		>4.7 MΩ
	input capacitance		<1 nF

Table 4: Auxiliary power supplies

Type	PS_87H (REX521xxHxx)	PS_87L (REX521xxLxx)
Input voltage, AC	110/120/220/240 V	-
Input voltage, DC	110/125/220 V	24/48/60 V
Voltage variation	AC 85...110%, DC 80...120% of rated value	DC 80...120% of rated value
Burden	<20 W	
Ripple in DC auxiliary voltage	max. 12% of the rated DC value (IEC 60255-11)	
Interruption time in auxiliary DC voltage without resetting	<40 ms, 110 V <100 ms, 200 V	<15 ms, 24 V <50 ms, 48 V
Interruption time in auxiliary DC voltage without resetting	<40 ms, 110 V <100 ms, 200 V	<15 ms, 24 V <50 ms, 48 V
Internal overtemperature indication	+78°C (+75...+83°C)	

Technical data (cont'd)

Table 5: Digital inputs

Type	PS_87H (REX521xxHxx)	PS_87L (REX521xxLxx)
Operating range, DC	80...265 V DC (for DI9 18...265 V)	18...265 V
Input voltage, DC	110/125/220 V (for DI9 also 24/48/60 V)	24/48/60/110/125/ 220 V
Current drain	~2...25 mA	
Power consumption/input	<0.8 W	

Table 6: Signal outputs

Max system voltage	250 V AC/DC
Continuous carry	5 A
Make and carry for 0.5 s	10 A
Make and carry for 3 s	8 A
Breaking capacity when control circuit time-constant L/R <40 ms, at 48/110/220 V DC	1 A/0.25 A/0.15 A

Table 7: Power outputs

Max system voltage	250 V AC/DC	
Continuous carry	5 A	
Make and carry for 0.5 s	30 A	
Make and carry for 3 s	15 A	
Breaking capacity when control circuit time constant L/R <40 ms, at 48/110/220 V DC	5 A/3 A/1 A	
Minimum contact load	100 mA, 24 V AC/DC (2.4 VA)	
TCS (Trip-circuit supervision)	Control voltage range	20...265 V AC/DC
	Current drain through the supervision circuit	approx. 1.5 mA (0.99...1.72 mA)
	Minimum voltage (threshold) over a contact	20 V AC/DC (15...20 V)

Technical data (cont'd)

Table 8: Environmental conditions

Specified service temperature range		-10...+55°C
Transport and storage temperature range		-40...+70°C
Enclosure class	Front side, flush-mounted	IP 54
	Rear side, connection terminals	IP 20
Dry heat test		according to IEC 60068-2-2
Dry cold test		according to IEC 60068-2-1
Damp heat test, cyclic		according to IEC 60068-2-30, r.h. >93%, T = 25...55°C
Storage temperature tests		according to IEC 60068-2-48

Table 9: Standard tests

Insulation tests	Dielectric test IEC 60255-5	Test voltage	2 kV, 50 Hz, 1 min.
	Impulse voltage test IEC 60255-5	Test voltage	5 kV, unipolar impulses, waveform 1,2/50 μs, source energy 0.5 J
	Insulation resistance measurements IEC 60255-5	Insulation resistance	> 100 MΩ, 500 V DC
Mechanical tests	Vibration tests (sinusoidal)		IEC 60255-21-1, class I
	Shock and bump test		IEC 60255-21-2, class I
	Seismic test		IEC 60255-21-3, class 2

Technical data (cont'd)

Table 10: Electromagnetic compatibility tests

The EMC immunity test level fulfills the requirements listed below		
1 MHz burst disturbance test, class III, IEC 60255-22-1	common mode	2.5 kV
	differential mode	1.0 kV
Electrostatic discharge test, class III IEC 61000-4-2 and 60255-22-2	for contact discharge	6 kV
	for air discharge	8 kV
Radio frequency interference test	conducted, common mode IEC 61000-4-6, IEC 60255-22-6	10 V (rms), f = 150 kHz...80 MHz
	radiated, amplitude-modulated IEC 61000-4-3, IEC 60255-22-3	10 V/m (rms), f = 80...1000 MHz
	radiated, pulse-modulated ENV 50204, IEC 60255-22-3	10 V/m, f = 900 MHz
Fast transient disturbance test IEC 60255-22-4 and IEC 61000-4-4	power supply	4 kV
	I/O ports	2 kV
Surge immunity test IEC 61000-4-5 and IEC 60255-22-5	power supply	2 kV, common mode 1 kV, differential mode
	I/O ports	2 kV, common mode 1 kV, differential mode
Power frequency (50 Hz) magnetic field IEC 61000-4-8	100 A/m continuous 300 A/m 1 to 3 s	
Voltage dips and short interruptions IEC 61000-4-11	30%, 10 ms; 60%, 100 ms; 60%, 1000 ms >90%, 5000 ms	
Electromagnetic emission tests EN 55011 and EN 60255-25	conducted RF emission (mains terminal)	EN 55011, class A, EN 60255-25
	radiated RF emission	EN 55011, class A EN 60255-25
CE approval	Complies with the EMC directive 89/336/EEC and the LV directive 73/23/EEC.	EN 50263 EN 50081-2 EN 61000-6-2 EN 60255-6

Technical data (cont'd)

Table 11: Data communication

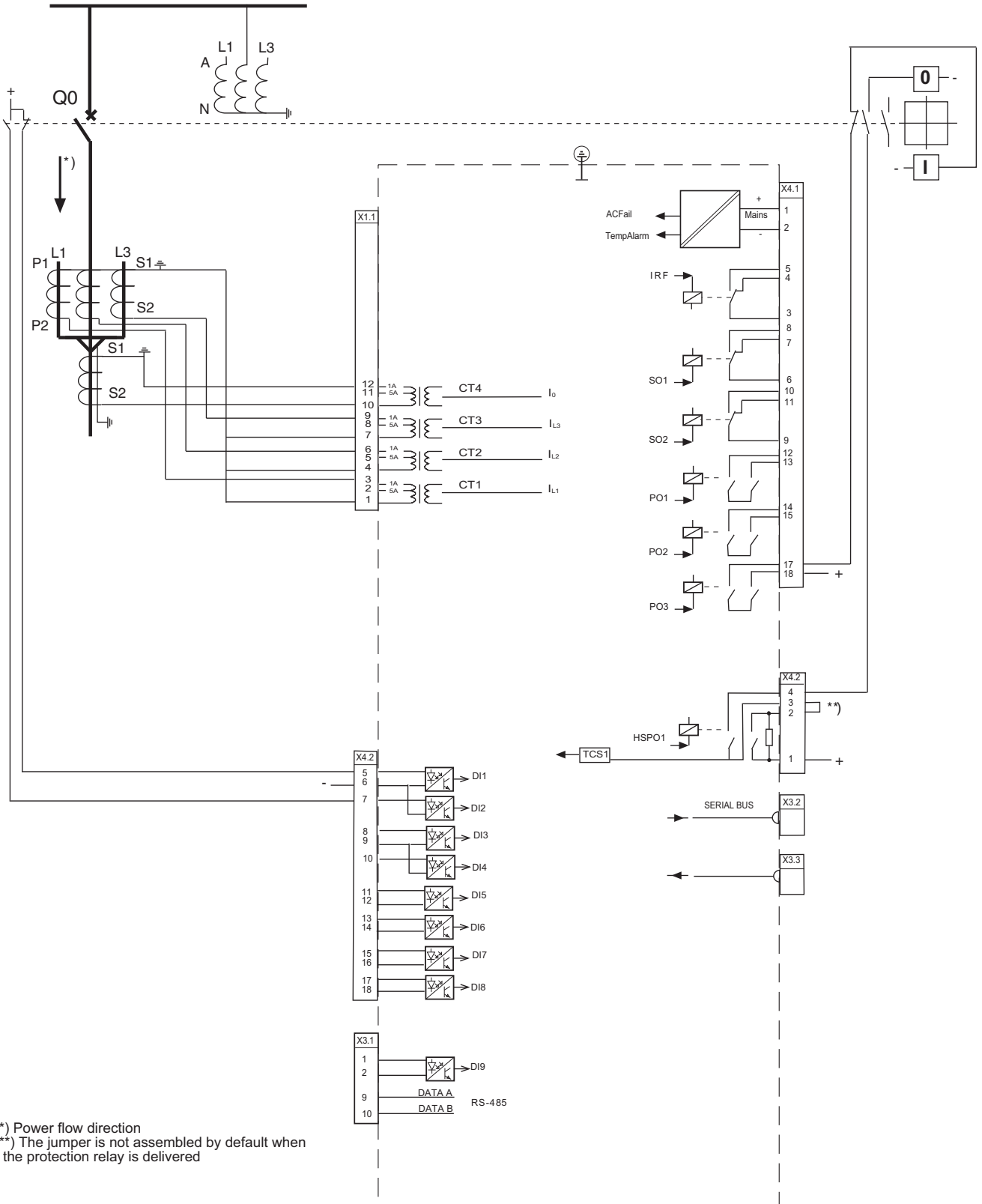
Rear interface, connector X3.2 and X3.3	Fibre-optic interface	
	protocol	SPA, IEC_103, Modbus, DNP 3.0 Also LON in the REX 521 xxxL versions.
	Using SPA-ZC 402 SPA/Ethernet adapter:	
	protocols	IEC 61850 and SPA TCP/IP
Rear interface, connector X3.1:9,10	RS-485 connection	
	protocols	SPA, Modbus, DNP 3.0
	Using SPA-ZC 302 Profibus-DPV1/SPA Gateway:	
	protocol	Profibus
Front panel	optical RS 232 connection	
	protocol	SPA
	communication cable	1MCK 950001-2
SPA protocol	baud rates	4.8/9.6/19.2 kbps
	start bits	1
	data bits	7
	parity	even
	stop bits	1
IEC_103 protocol	baud rates	9.6/19.2 kbps
	data bits	8
	parity	even
	stop bits	1
Modbus protocol	baud rates	0.6/1.2/2.4/4.8/9.6/19.2 kbps
	data bits	7/8 (ASCII/RTU)
	parity	no parity/odd/even
	stop bits	1/2
	Modbus modes	ASCII, RTU
DNP 3.0 protocol	baud rates	0.3/0.6/1.2/2.4/4.8/9.6/19.2 kbps
	data bits	8
	parity	no parity/odd/even
	stop bits	1/2
LON protocol	bit rates	78.0 kbps/1.25 Mbps

Technical data (cont'd)

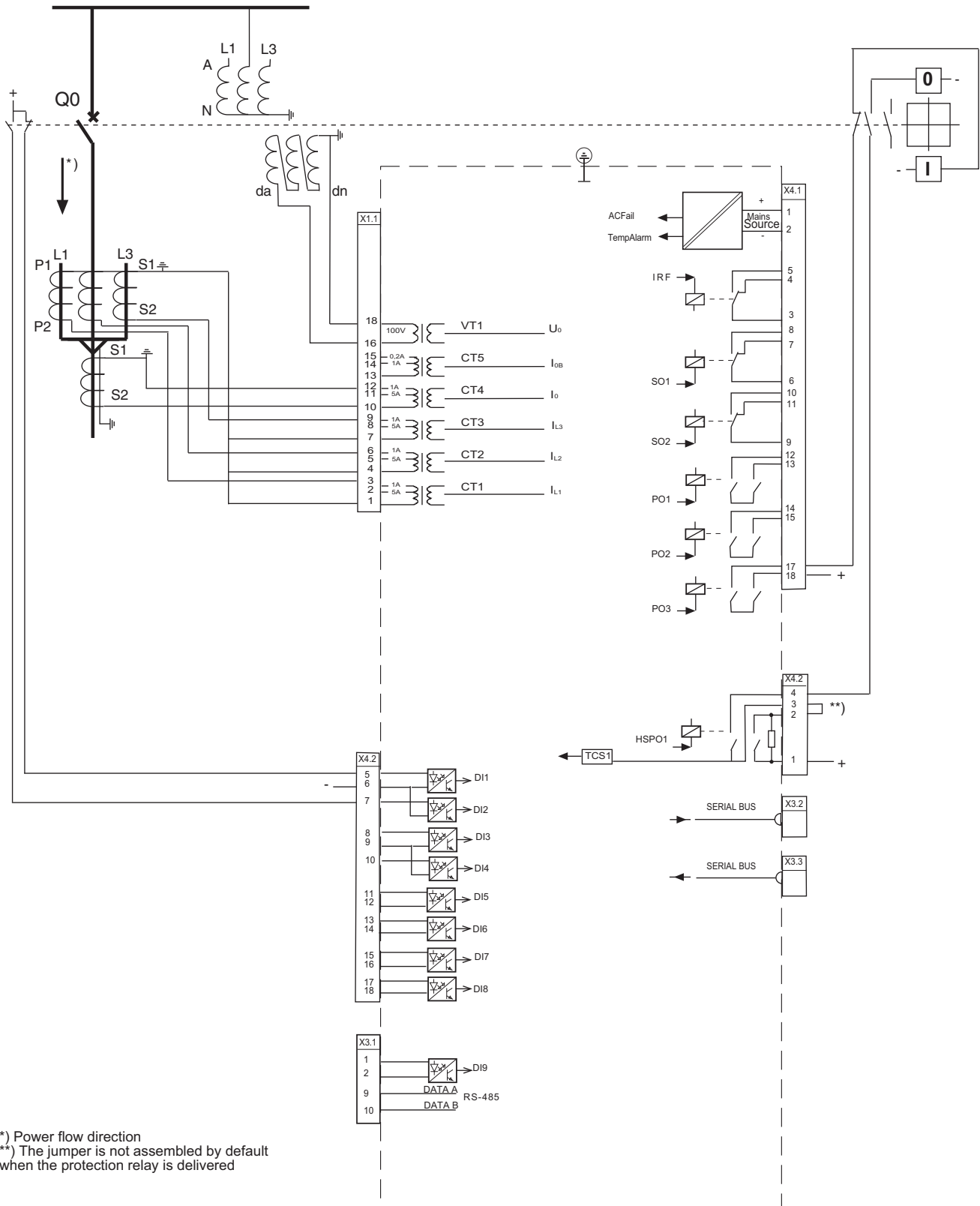
Table 12: General

Toolboxes	CAP 501, CAP 505, LIB 510, SMS 510
110	All events are recorded in higher level syntax: reason, time, date are in clear text format in the selected language. The last 50 events are recorded.
Data recording	Records operate values
Protection functions	See REX 521 Technical Reference Manual, Standard Configurations (see "References" on page 32).
Control functions	See REX 521 Technical Reference Manual, Standard Configurations (see "References" on page 32).
Condition monitoring functions	See REX 521 Technical Reference Manual, Standard Configurations (see "References" on page 32).
Measurement functions	See REX 521 Technical Reference Manual, Standard Configurations (see "References" on page 32).
Self-supervision	See REX 521 Technical Reference Manual, General (see "References" on page 32).
Mechanical dimensions	Width: 148.8 mm (1/3 of a 19" rack) Height, frame: 265.9 mm (6U) Height, box: 249.8 mm Depth: 235 mm For dimension drawings, refer to Installation Manual (see "References" on page 32).
Weight of the unit	<5 kg

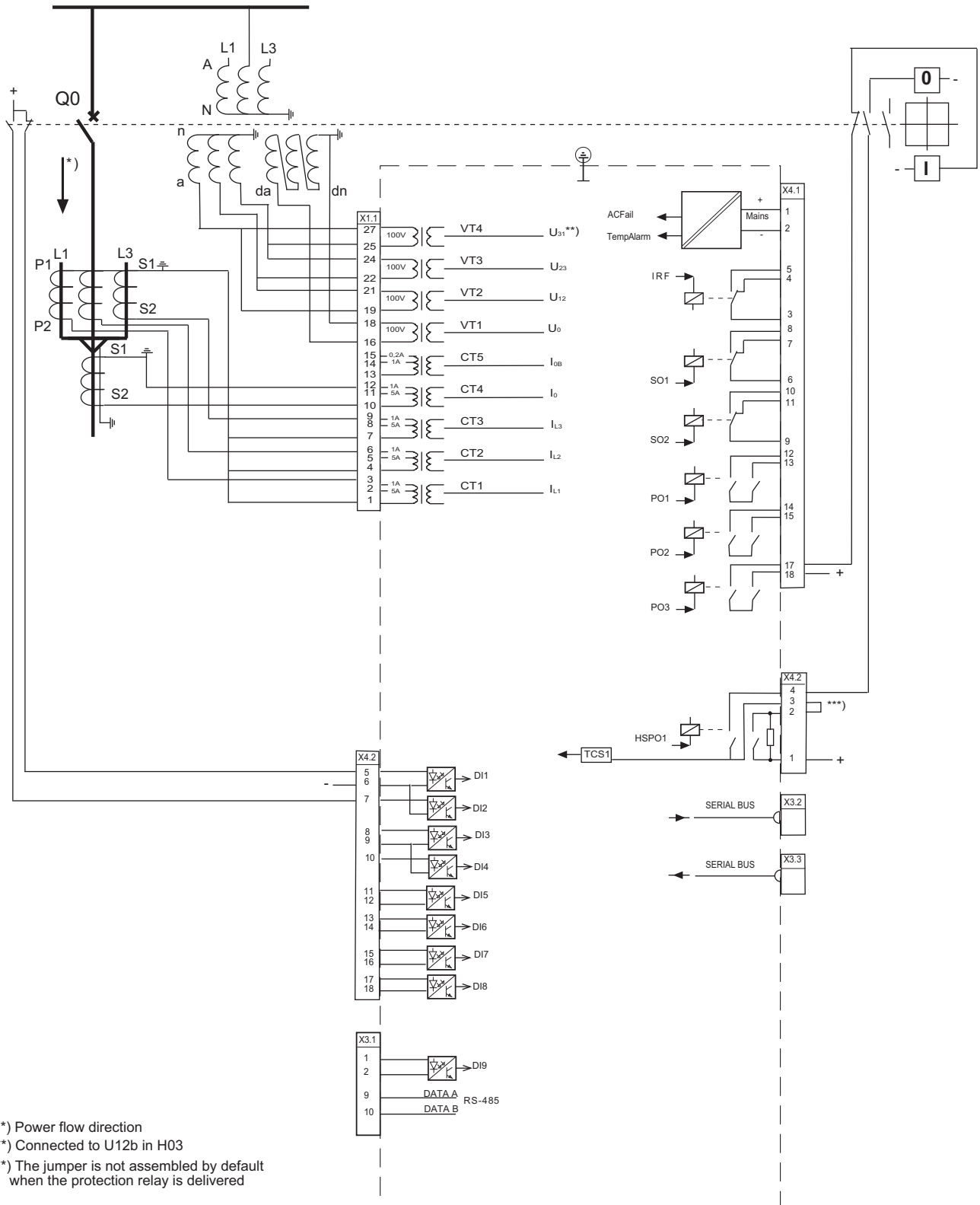
Terminal diagram of the REX 521: Basic



Terminal diagram of the REX 521: Medium



Terminal diagram of the REX 521: High, excluding H08 and H09

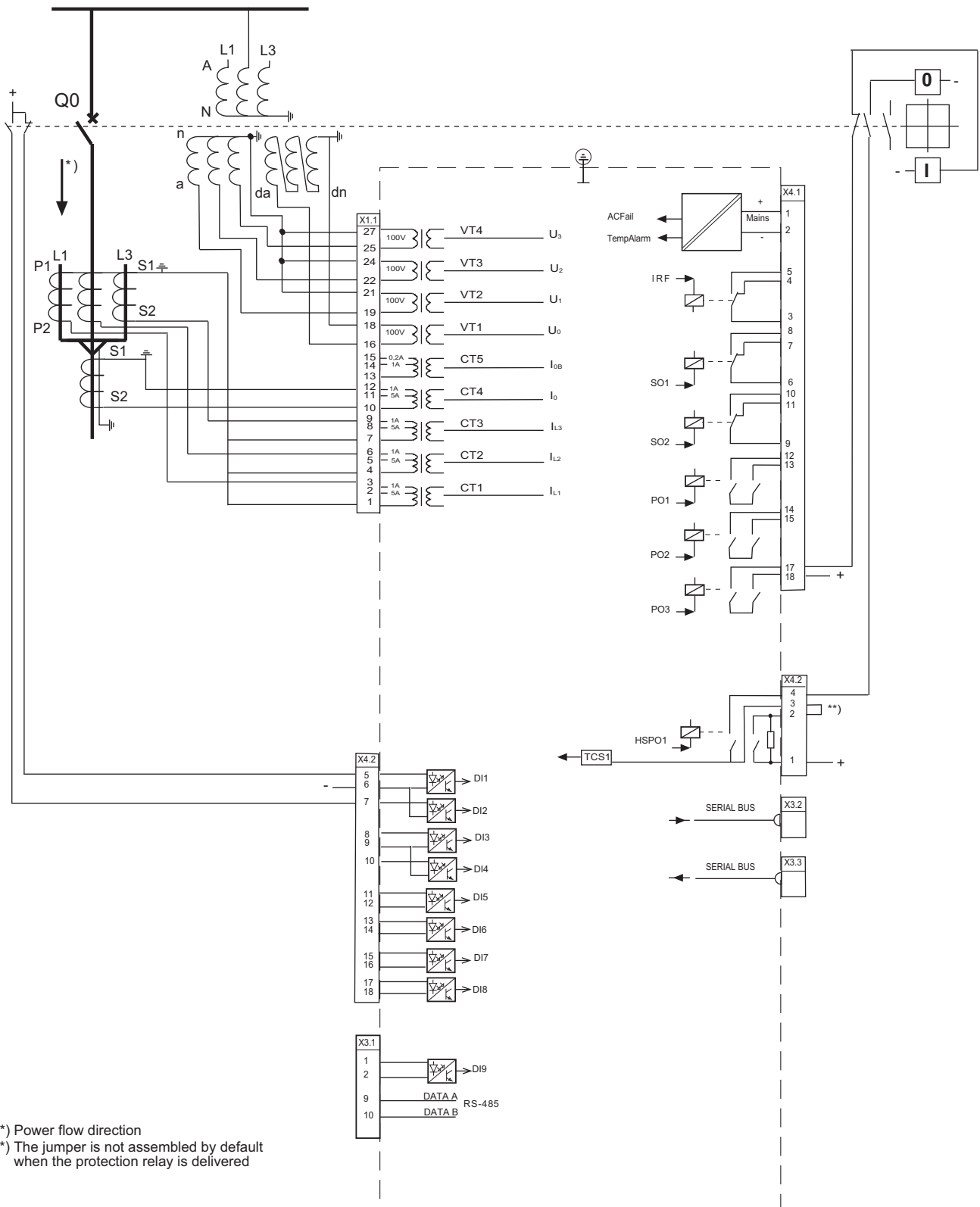


*) Power flow direction

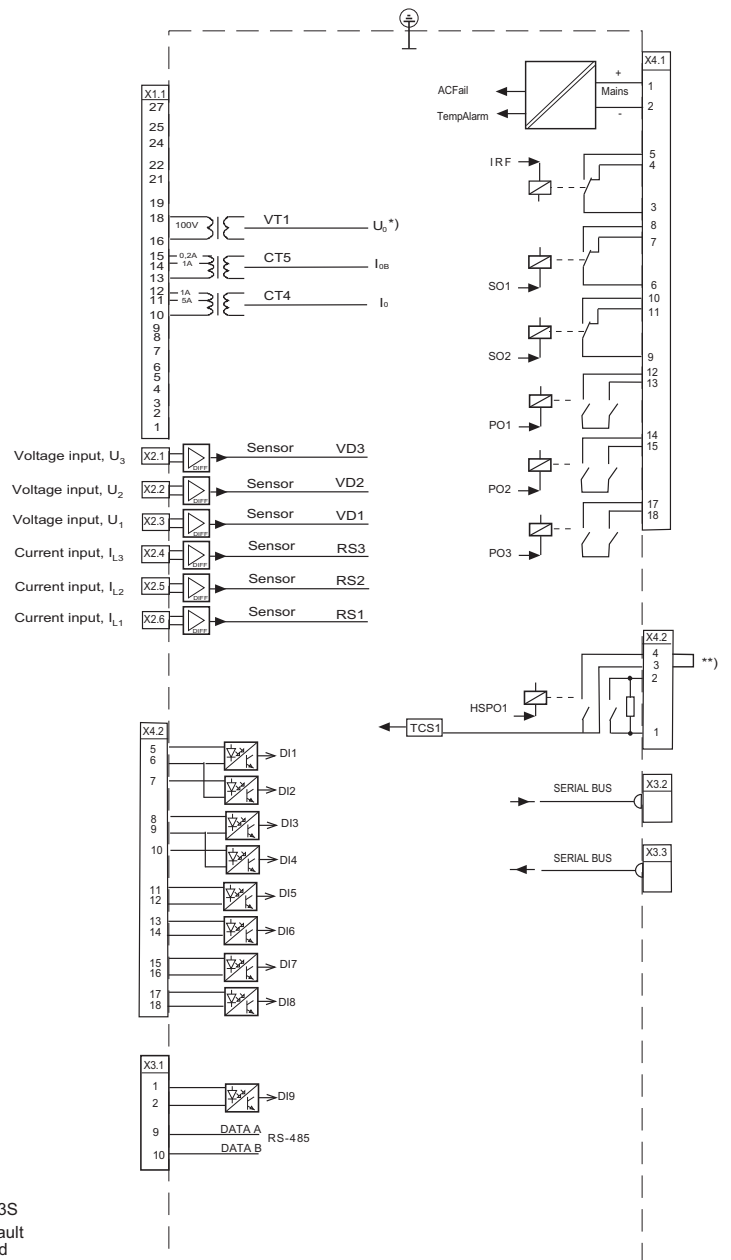
**) Connected to U12b in H03

***) The jumper is not assembled by default when the protection relay is delivered

Terminal diagram of the REX 521: High, H08 and H09



Terminal diagram of the REX 521: Sensor



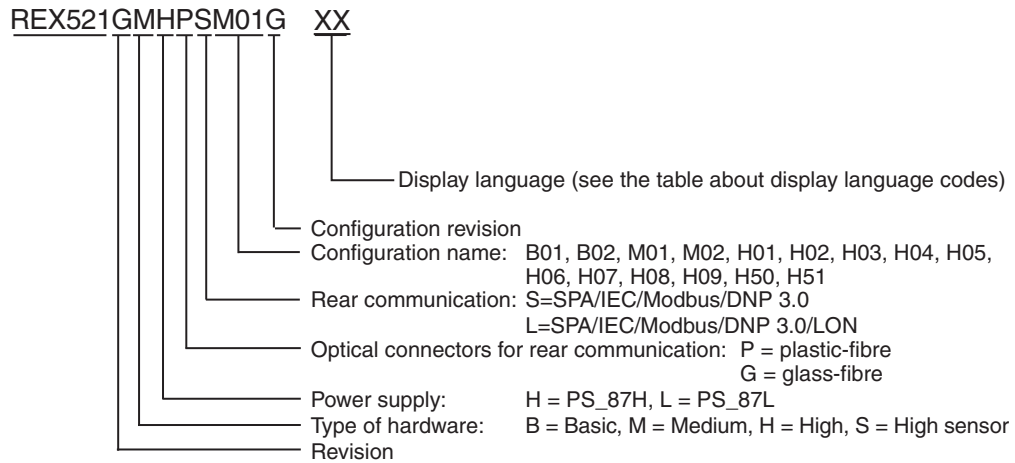
*) Connected to U12b in H01S and H03S
**) The jumper is not assembled by default when the protection relay is delivered

Ordering information

When ordering REX 521 protection relays, specify the following:

- order number
- quantity
- additional language
- optional Chinese front panel (Order No: 2RCA025000A0001)

Each protection relay has a specific order number that identifies the protection relay type as well as the hardware and the software as described in the figure below. The order number is labelled on the marking strip on the front panel of the relay delivered, for example, Order No: REX521GMHPSM01G.



A051925

English is always available in REX 521. When ordering, the additional language must be defined according to the table:

Code	Language combination
FI	English-Finnish
SE	English-Swedish
DE	English-German
ES	English-Spanish
FR	English-French
PT	English-Portuguese
PL	English-Polish
ZH	English-Chinese

Accessories

- Semi-flush mounting kit 1MRS050254
- Wall mounting kit 1MRS050240
- Rack mounting kits:

Enclosure size (x 19"):	Mounting kit order number:
1/2 + 1/3	1MRS050241 and 1MRS050238
1/3	1MRS050258
1/3 + 1/3	1MRS050241 and 1MRS050377
1/3 + 1/3 + 1/4	1MRS050241 (2 pcs) and 1MRS050381
1/4 + 1/4 + 1/3	1MRS050241 (2 pcs) and 1MRS050382
1/3 + 1/4	1MRS050609 and 1MRS050241

- Connection cable for front panel connector 1MKC950001-2

Ordering information
(cont'd)

Configuration, setting and SA system tools

The following tool versions are needed to support the new functions and features of Release Q1/2006 revisions of REX 521:

- CAP 501 Relay Configuration Tool;
CAP 501 v.2.4.0 or later
- CAP 505 Relay Configuration Tool;
CAP 505 v. v.2.4.0 or later
- LIB 500 Library for MicroSCADA Pro;
LIB 500 v.4.2-1 or later
- LIB 510 Library for MicroSCADA Pro;
LIB 510 v.4.2-1 or later
- SMS 510 v.1.3.0 or later

References
Manuals for REX 521

- Installation Manual 1MRS750526-MUM
- Operator's Manual 1MRS751107-MUM
- Technical Reference manual, General 1MRS751108-MUM
- Technical Reference Manual, Standard Configurations 1MRS751802-MUM
- Technical Descriptions of Functions (CD-ROM v. 2.10 or later) 1MRS750889-MCD
- Modbus Remote Communication Protocol for REX 521,
Technical Description 1MRS755017
- DNP 3.0 Remote Communication Protocol for REF 54_, RET
54_ and REX 521, Technical Description 1MRS755260

Parameter and event lists for REX 521

- Parameter List for REX 521 1MRS751999-RTI
- Event List for REX 521 1MRS752000-RTI
- General Parameters for REX 521 1MRS752156-RTI
- Interoperability List for REX 521 1MRS752157-RTI

Tool-specific manuals

- CAP505 Installation and Commissioning Manual 1MRS751901-MEN
- CAP505 User's Guide 1MRS752292-MEN
- CAP505 Protocol Mapping Tool Operator's Manual 1MRS755277
- CAP501 Installation and Commissioning Manual 1MRS751899-MEN
- CAP501 User's Guide 1MRS751900-MUM
- Tools for Relays and Terminals, User's Guide 1MRS752008-MUM

For more information, see:
<http://www.abb.com/substationautomation>



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