Relion® 605 series

Motor protection and control / Motor protection
REM601
Product Guide

Power and productivity
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Contents

1. Description

REM601 is a dedicated motor protection relay, intended for the protection of medium voltage and low voltage asynchronous motors in manufacturing and process industry. REM601 is a member of ABB's Relion® product family and part of its 605 series.

The relay provides an optimized composition of protection, monitoring and control functionality in one unit, with the best performance usability in its class and are based on ABB's in-depth knowledge of protection and numerical technology.

2. Relay functions

REM601 offers pre-configured functionality which facilitates easy and fast commissioning of switchgear.

To emphasize the simplicity of relay's usage, only application specific parameters needs to set within the relay's intended area of application. The standard signal configuration can be altered by LHMI (local human-machine interface).

The relay is available in two alternative application configurations, as indicated in Table 2.

Table 1. Standard configurations

Description	Relay type
Motor protection and control with sensor	REM601
Motor protection and control with conventional current transformer	REM601
Motor protection with conventional current transformer	REM601

Table 2. Application configurations and supported functions

Functionality	ANSI	IEC	B	C
Protection				
Non-directional overcurrent protection, low-set stage	51	3I>	●	●
Non-directional overcurrent protection, high-set stage	50-1	3I>>	●	●
Earth-fault protection, low-set stage	51N	Io>	●	●
Earth-fault protection, high-set stage	50N	Io>>	●	●
Three-phase thermal protection for motor	49	3Ith>	●	●
Phase discontinuity / Single phasing protection	46PD	I2/I1>	●	●
Negative-sequence overcurrent protection	46	I2>	●	●
Phase reversal protection	46R	I2R>	●	●
Motor startup supervision / Stalling protection with provision of speed switch input Repetitive start up protection and restart inhibit	51LRS/ 14/48/66	I^2t n<	●	●
Locked rotor protection	50-2	3I>>>	●	●
Under current protection	37	3I<	●	●
Circuit breaker failure protection	51BF/51NBF	3I>/Io>BF	●	●

Table 3. Application configurations and supported functions, continued

Functionality	ANSI	IEC	B	C
Protection				
Master trip	86	Master Trip	•	•
Two setting group	-	-	•	•
Control				
Breaker control functionality	I <-> O CB	I <-> O CB	-	•
Emergency restart	ESTART	ESTART	•	•
Condition monitoring				
Trip circuit supervision	TCM	TCS	•	•
Measurement				
Three-phase current measurement	3I	3I	•	•
Residual current measurement	In	Io	•	•
Negative phase sequence current	I2	I2	•	•
Thermal level	ϑ	ϑ	•	•
Operation counter	-	-	•	•
Motor run time	-	-	•	•
Latest motor start up max. current	-	-	•	•
Latest motor start up time	-	-	•	•
Time to next possible motor start up	-	-	•	•

• = Included

3. Protection functions

REM601 offers complete protection functionality required for protection of motors. The relay has thermal overload, short circuit, startup supervision, negative phase sequence, loss-of phase and locked rotor protections. The relay also incorporates sensitive earth fault, under current and circuit breaker failure protection functions.

The thermal protection supervises the thermal stress of the protected object during various load conditions. The protection provides thermal prior alarm to warn the operators to take action before motor trip and when thermal level exceeds set trip level it activates trip. It also prevents the motor from being re-energized, if the motor is too hot.

The start-up supervision function protects motor during starting. The protection prevents motor from overheating during stall condition. There is a provision of accepting speed switch input for making protection suitable motors having permissible stalled time shorter than the motor starting time. The repetitive start up function protects motor from too frequent stat-up attempts, causing overheating of motor.

The negative sequence function protects motor from stress cause due to unbalance network. The phase discontinuity protection detect broken conductor single phasing condition. The phase reversal function protects motor from incorrectly connected phases, which causes motor to rotate in reverse detection.

The undercurrent function provides the protection to motors during sudden loss of load in certain applications, such as conveyors and submersible pumps.

Overcurrent as well earth fault function protects motor from short circuit and earth fault.

Locked rotor functions is use to protect motor during stall or mechanical jam situations during running state.

The emergency restart feature helps to keep essential critical motors running by allowing motor start up even though start inhibit is active.

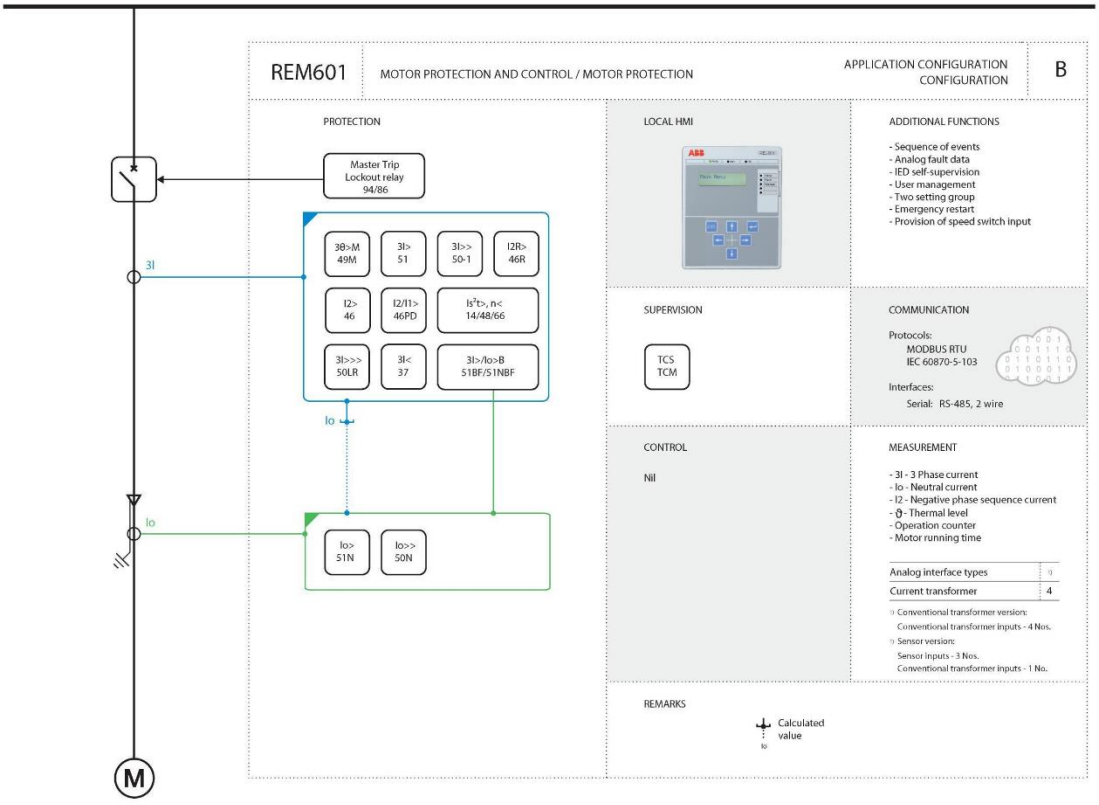

Figure 1. Functionality overview for REM601 standard configuration B with current transformer inputs

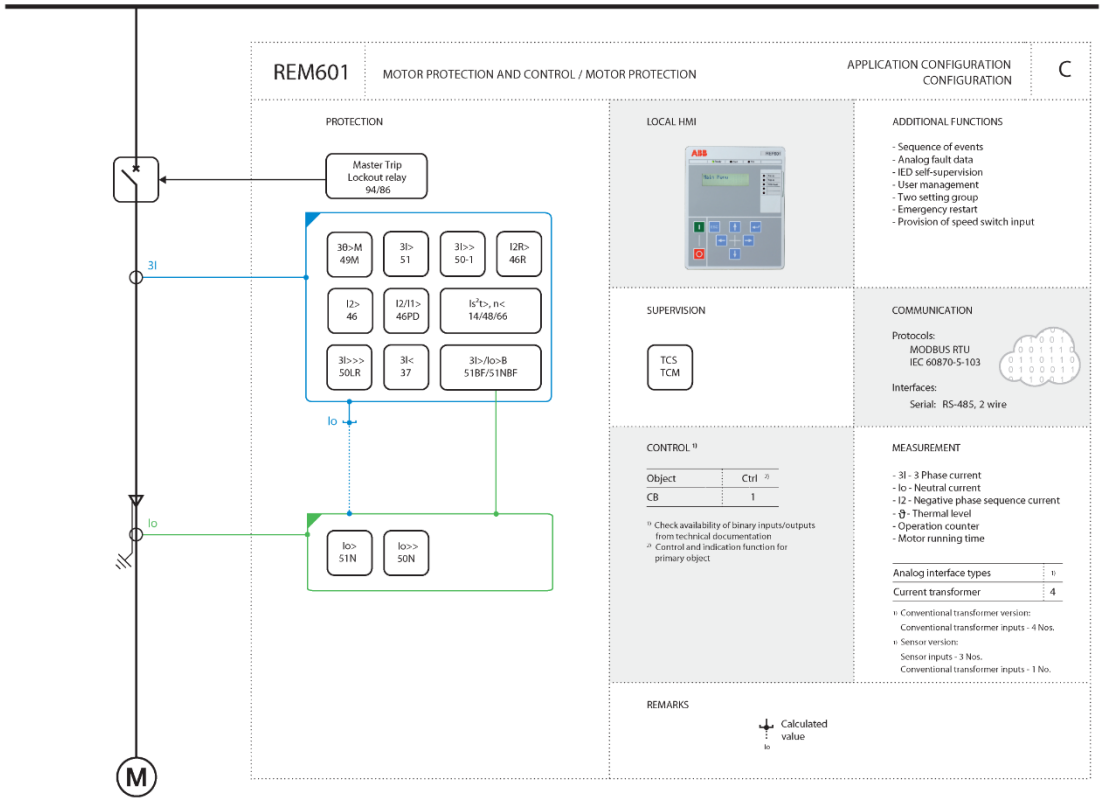

Figure 2. Functionality overview for REM601 standard configuration C with current transformer inputs

4. Application

The REM601 is a protection relay aimed at protection and control of medium voltage and low voltage asynchronous motors. The relay can be used for three phase motors in all conventional contactor or circuit breaker controlled motor drives.

The relay with application configuration B offers, thermal overload, short circuit, startup supervision, negative phase sequence, loss-of phase and locked rotor protections. The configuration B additionally incorporates sensitive earth fault, under current and circuit breaker failure protection functions.

The residual current for the earth-fault protection is derived from the phase currents. When applicable, the core-balance current transformer can be used for measuring the residual current, especially when sensitive earth-fault protection is required.

The application configuration C additionally offers built in breaker or contactor control functionality.

5. Optimised for limited space

With its compact size and unique technical features, REM601 is an ideal relay for retrofits, compact switchgears and switchgear with limited space. The relay has small mounting depth and does not have any loose mounting accessories, while the press-fit mounting arrangement makes it suitable for quick and easy installation on switchgear.

6. Control

The relay offers control of one circuit breaker with dedicated push-buttons and guidance on local HMI for opening and closing. It includes two dedicated outputs for breaker control. The breaker control is also possible through optional MODBUS / IEC 60870-5-103 communication. The control functionality is available in relay with application configuration C.

7. Measurement

The relay continuously measures phase currents and earth current. Earth current can be measured using external core balance current transformer or can be calculated internally.

During service, the default view of display shows the most loaded phase current in primary terms (Amps) and the earth current. The values measured can be accessed locally via the user interface on the relay or remotely via the communication interface of the relay.

The relay additionally continuously measures negative sequence current, thermal level, motor run time and counter values if these functions are supported as per application configurations.

The relay displys last motor start up current, motor start up time and time to next possible motor start up in case of restart inhibit function is active.

8. Event log

To collect sequence – of – events (SoE) information, the relay incorporates a non-volatile memory with a capacity of storing 100 events with associated time stamps with resolution of 1 ms. Event log includes trip circuit supervision status, protection operation status, binary I/O status and relay fault code. The event logs are stored sequentially, the most recent being first and so on. The non-volatile memory retains its data also in case the relay temporarily loses its auxiliary supply.

The event log facilitates detailed post-fault analysis of motor faults and disturbances. The SoE information can be accessed locally via the user interface on the relay front panel or remotely via the communication interface of the relay.

9. Recorded data

The relay stores fault records of analogue values for last five trip events in non-volatile memory. The fault recording is triggered by the trip signal of protection function. Each fault record includes the current values for three phases and earth current of five different instances along with time stamp. These records enable the user to analyze the five most recent power system events.

The relay records the number of phase and earth fault trip events into dedicated trip counters. These trip counters cannot be reset by the user and are stored in non-volatile memory.

The recorded information can be accessed locally via user interface on the relay front panel and can be uploaded for subsequent fault analysis.

10. Self-supervision and test function

The relay’s built-in self-supervision system continuously monitors the state of the relay hardware and the operation of the relay software. Any fault or malfunction detected will be used for alerting the operator. A permanent relay fault will block the protection functions of the relay to prevent incorrect relay operation.

The relay supports a built-in test mode which enables user to test the relay HMI and binary outputs.

11. Trip-circuit supervision

The trip-circuit supervision continuously monitors the availability and operability of the trip circuit. It provides open-circuit monitoring both when the circuit breaker is in its closed and in its open position. It also detects loss of circuit-breaker control voltage.

12. Access control

To protect the relay from unauthorized access and to maintain the integrity of information, the relay is armed with a three level, role-based user authentication system with individual password for the operator, engineer and administrator level. There is availability of 2 different password protection, one which is a combination of different navigation keys which is default one and other with Alpha-numeric password. User can select either of password depending on their requirement.

13. Local HMI

Local HMI of relay contains LCD display, LED indicators and navigation keys. The measurement, recorded data, events, setting can be viewed in display. The relay has three LED indications on LHMI which are configured for ready / IRF, protection start, protection trip. In addition relay have five configurable LEDs, three of which are default configured for phase fault trip, earth fault trip and trip circuit fault indications. Display supports built in multiple languages.

14. Inputs and outputs

The relay with conventional CT variant is equipped with four 1A or 5A analog current inputs, three for phase current and one for earth current measurement.

The relay with sensor variant is equipped with three Rogowski sensor inputs along with an additional earth-current input suitable for a 1A which can be connected to core-balanced current transformer /split core current transformer. More details of sensor provided in “Section 15 - Sensor technology”.

The relay has four binary inputs. The binary inputs can be configured for various functions like emergency start, speed switch input, blocking, protection reset, breaker position, breaker control and trip circuit supervision. In turn these signals can be mapped at binary output and LEDs for indications. Individual input can be configured either as “Inverted or “Non Inverted”.

The relay has six output contacts, two power outputs and four signalling outputs. The output contacts can be configured for different functions like routing of Protection start / trip signals, External trip /open, external close command, trip circuit supervision status etc. One dedicated output contact is available for Unit ready / IRF status indication.

All binary input and output contacts are pre-configured according to default configuration, however can be easily reconfigured by using the LHMI menu.

15. Sensor technology

Sensors based on Rogowski coil principle have been introduced in order to get benefit of improved performance like saturation of conventional current transformer and equipment size reduction. Albeit this principle is far from new, now it is possible to exploit the advantages of sensor with the advent of numerical relays like REM601.

Rogowski coil is a toroidal coil without an iron core, placed around the primary conductor in the same way as the secondary winding in a current transformer. However, the output signal from Rogowski coil is not current, but a voltage. Due to absence of ferromagnetic core, the sensor is linear up to the highest currents.

The wide measurement range of sensors with high accuracy eliminates the need for high variants of conventional instrument transformers, resulting in simplified engineering, logistics and reduced inventory. The low level voltage signals and integrated secondary cables contribute to easy and fast installation with enhanced safety.

16. Communication

The relay is available with optional communication feature with Modbus RTU protocol or IEC 60870-5-103 on RS-485 bus with two wire connection. This allows relay to connect to

control and monitoring system through serial communication for remote monitoring.

17. Application warning

In case the relay REM601 is supplied with UPS step-wave or square-wave, an interposing transformer is needed to keep the supply voltage (peak voltage) below the upper limit of the relay.

These are the recommended transformer characteristics:

- Nominal Power: 20 VA
- Secondary voltage: in the range 30...150 V AC

Table 4. Input/output overview

Relay type	Analog input	Binary inputs	Binary outputs
	CT	BI	BO
REM601 Sensor variant	3+1[1)]	4	6
REM601 CT variant	4	4	6

[1)] Support for three current sensors and one conventional current transformer input

18. Technical data

Table 5. Dimensions

Relay type Description	Value	
Width	frame	130.0 mm
	case	121.5 mm
Height	frame	160.0 mm
	case	151.5 mm
Depth	CT variant	151.5 mm
	Sensor variant	109.5 mm
Weight	CT variant	1.43 kg
	Sensor variant	1.20 kg

Table 6. Power supply

Description	Value
Uaux nominal	24...240 V AC, 50 and 60 Hz
	24...240 V DC
Uaux variation	85...110% of Uaux (20.4...264 V AC)
	70...120% of Uaux (16.8...288 V DC)
Burden of auxiliary voltage supply under quiescent (Pq)/operating condition	< 5.0 VA
Ripple in the DC auxiliary voltage	Max 12% of the DC value (at frequency of 100 Hz)
Maximum interruption time in the auxiliary DC voltage without resetting the relay	50 ms at Uaux rated

Table 7. Energizing inputs (Conventional CT variant)

Description		Value	
Rated frequency		50/60 Hz	
Current inputs	Rated current, In	1 A[1)]	5 A[1)]
	Thermal withstand capability: • Continuously • For 1 s	 4 A 100 A	 20 A 500 A
	Dynamic current withstand • Half-wave value	 250A	 1250A
	Input impedance	< 100 m Ω	< 20 m Ω

1) Ordering option for current input

Table 8. Energizing inputs (Sensor variant)

Description		Value	
Rated frequency		50/60 Hz	
Phase sensor inputs	Input type	Rogowski coil sensor	
	Rated current, In	250 A	80 A
	Base value, Ir	40, 80, 250, 1250	12.8, 25.6, 80, 400
	Rated transformation ratio, Kra	At 50Hz : 250A / 0.15V At 60Hz : 250A / 0.18V	At 50Hz : 80A / 0.15V At 60Hz : 80A / 0.18V
Earth current inputs	Input type	Current Transformer	
	Rated current, In	1 A	
	Thermal withstand capability: • Continuously • For 1 s	 4 A 100 A	
	Dynamic current withstand • Half-wave value	 250 A	
	Input impedance	< 100 m Ω	

Table 9. Binary input

Description	Value
Rated voltage	24...240 V AC / DC
Operating range	85...110% of Un for AC and 70...120% of Un for DC
Current drain	2...20 mA
Power consumption/input	<0.5 W
Input sensing time	25 ms
Trip-circuit supervision (TCS): (BI2) Control voltage range Current drain through the supervision circuit Minimum voltage over the TCS contact	 48...250 V AC / DC ~ 1.5 mA 20V AC / DC (15...20 V)

Table 10. Double-pole power output (XK2 : BO2)

Description	Value
Rated voltage	240 V AC/DC
Continuous contact carry	8 A
Make and carry for 3.0 s	15 A
Make and carry for 0.5 s	30 A
Breaking capacity when the control-circuit time constant L/R<40 ms, at 48/110/220 V DC (two contacts connected in series)	5 A / 3 A / 1 A
Minimum contact load	100 mA at 24 V AC/DC

Table 11. Single-pole power output relay (XK10 : BO1)

Description	Value
Rated voltage	240 V AC/DC
Continuous contact carry	8 A
Make and carry for 3.0 s	15 A
Make and carry for 0.5 s	30 A
Breaking capacity when the control-circuit time constant L/R<40 ms, at 35 / 220 V DC	5 A/ 0.2 A
Minimum contact load	100 mA at 24 V AC/DC

Table 12. Signal output and IRF output (XK2 : BO3, BO4, BO5, BO6)

Description	Value
Rated voltage	240 V AC/DC
Continuous contact carry	6 A
Make and carry for 3.0 s	8 A
Make and carry for 0.5 s	10 A
Breaking capacity when the control-circuit time constant L/R<40 ms, at 35 / 220 V DC	4 A/0.15 A
Minimum contact load	100 mA at 24 V AC/DC

Table 13. Degree of protection of relay

Description	Value
Front side	IP 54
Rear side, connection terminals	IP 20

Table 14. Environmental conditions

Description	Value
Operating temperature range	-25...+55ºC
Service temperature range	-25...+70ºC (<16 h)
Relative humidity	< 93%, non-condensing
Atmospheric pressure	86...106 kPa
Altitude	up to 2000 m
Transport and storage temperature range	-40...+85ºC

Table 15. Environmental tests

Description	Type test value	Reference
Dry heat test (humidity < 50%) • Working • Storing	• 96 h at +70°C • 96 h at +85°C	IEC 60068-2-2 IEC 60068-2-48
Dry cold test • Working • Storing	• 96 h at -25°C • 96 h at -40°C	IEC 60068-2-1 IEC 60068-2-48
Damp heat test, cyclic	• 2 cycles (12 h + 12 h) at +25°C…+55°C, Rh > 93%	IEC 60068-2-30
Damp heat test, steady state	• 96 h at +40°C, humidity, Rh > 93%	IEC 60068-2-78

Table 16. Electromagnetic compatibility tests

Description	Type test value	Reference
1 MHz/100 kHz burst disturbance test: • Common mode • Differential mode	 2.5 kV, 1MHz, 400 pulses/s 1.0 kV, 1MHz, 400 pulses/s	IEC 61000-4-12, class III IEC 60255-22-1
Electrostatic discharge test: • Contact discharge • Air discharge	 6 kV, 150 pF/330 Ω 8 kV, 150 pF/330 Ω	IEC 60255-22-2, class III IEC 61000-4-2
Radiated, electro-magnetic field immunity test	10 V/m f=80-1000 MHz, 1.4-2.7 GHz 10 V/m f=80, 160, 450, 900 MHz, 900 PM, 1850 PM, 2150 PM	IEC 60255-22-3, class III IEC 61000-4-3
Fast transient disturbance tests: • All ports	 4 kV, 5.0 kHz	IEC 60255-22-4, class A IEC 61000-4-4
Surge immunity test: • Common mode • Differential mode	 4.0 kV, 1.2/50 µs 2.0 kV, 1.2/50 µs	IEC 60255-22-5 IEC 61000-4-5
Power frequency magnetic field immunity test: • Continuous • Short duration (1 s)	 100 A/m 1000 A/m	IEC 61000-4-8
Conducted radio frequency interference tests:	10 V f=150 KHz...80 Mhz	IEC 60255-22-6, class III IEC 61000-4-6
AC Voltage dips and short interruptions:	30% / 25 period 60% / 10 periods 100% / 2.5 periods 100% / 250 periods	IEC 61000-4-11
DC Voltage dips and short interruptions	30% / 500 ms 60% / 200 ms 100% / 50 ms 100% / 5000 ms	IEC 61000-4-29
Power frequency immunity test: • Common mode • Differential mode	 300 V rms 150 V rms	IEC 60255-22-7, Class A
Pulse magnetic field immunity tests:	1000 A/m, 6.4/16 µs	IEC 61000-4-9

Description	Type test value	Reference
Emission tests: Conducted 150 kHz-0.5 MHz 0.5 MHz-30 MHz Radiated 30-230 MHz 230-1000 MHz	 < 66 dB (µV/m) < 60 dB (µV/m) < 40 dB (µV/m) < 47 dB (µV/m)	IEC 60255-26 EN 55011-CISPR 22

Table 17. Insulation tests

Description	Type test value	Reference
Dielectric test • Test voltage	 2 kV, 50 Hz, 1 min	IEC 60255-5 IEC 60255-27
Impulse voltage test • Test voltage	 5 kV, 1.2/50 µs, 0.5 J	IEC 60255-5 IEC 60255-27
Insulation resistance test • Isolation resistance	 > 100 M Ω at 500 V DC	IEC 60255-5 IEC 60255-27

Table 18. Mechanical tests

Description	Type test value	Reference
Vibration tests • Response • Endurance / Withstand	 10...150 Hz, 0.035 mm / 1.0g, 1 sweep / axis 10...150 Hz, 2.0 g, 20 sweeps / axis	IEC 60255-21-1, class I
Shock tests • Response • Endurance / Withstand	 10 g, 3 pulses in each direction 30 g, 3 pulses in each direction	IEC 60255-21-2, class II
Bump tests	10 g, 1000 bumps in each direction	IEC 60255-21-2, class I

Table 19. Product safety

Description	Type test value
LV directive	2006/95/IEC
Standard	EN 60255-27 (2005) EN 60255-1 (2009)

Table 20. EMC compliance

Description	Type test value
EMC directive	2004/108/IEC
Standard	EN 50263 (2000) EN 60255-26 (2007)

Table 21. RoHS compliance

Description
Complies with RoHS directive 2002/95/IEC

Table 22. Data communication (optional)

Description	Type test value
Protocol	MODBUS RTU or IEC 60870-5-103
Communication port	RS485, 2 wire

19. Protection functions

Table 23. Low-set phase overcurrent protection, stage I> / 51

Parameter	Value (Range)
Setting range of pick-up current 'I >'	0.1...2.5 x In in steps 0.001, infinite
Operation accuracy	± 5.0% of set value, ± 10.0% of set value for set value < 0.2
Operate time delay (DMT) 't >'	0.04...64 s in steps of 0.01
Operation time accuracy	± 5.0% of set value or ± 30 ms
Operating curve type	IEC 60255-3: Normal inverse, Very inverse, Extremely inverse, Long-time inverse ANSI C37.112: Moderate inverse, Normal Inverse, Very inverse, Extremely inverse Special curves: RI inverse
Time multiplier setting 'k'	0.02...1.6, in steps of 0.01
Operation time accuracy • IEC and ANSI characteristics • RI characteristics	 class E(5) or ± 30 ms, class E(7.5) or ± 30 ms for set value < 0.2 ± 5.0% of set value or ± 30 ms
Reset ratio	IDMT : 0.96 and DT : 0.98

Table 24. High-set phase overcurrent protection, stage I>> / 50-1

Parameter	Value (Range)
Setting range of pick-up current 'I>>'	0.2...25.0 x In in steps 0.001, infinite for CT variant 0.2...20.0 x In in steps 0.001, infinite for sensor variant
Operation accuracy	± 5.0% of set
Operation mode	Definite time, Instantaneous
Operate time delay (DMT) 't >>'	0.04...64 s in steps of 0.01
Operation time accuracy	± 5.0% of set value or ± 30 ms
Reset ratio	0.98

Table 25. Motor load jam / Locked rotor protection, stage I>>> / 50-2

Parameter	Value (Range)
Setting range of pick-up current 'I>>'	0.2...25.0 x In in steps 0.001, infinite for CT variant 0.2...20.0 x In in steps 0.001, infinite for sensor variant
Operation accuracy	± 5.0% of set
Operation mode	Definite time, Instantaneous
Operate time delay (DMT) 't >>>'	0.03...64 s in steps of 0.01
Operation time accuracy	± 5.0% of set value or ± 15 ms
Reset ratio	0.98

Table 26. Low-set earth-fault protection, stage Io> / 51N

Parameter	Value (Range)
Setting range of pick-up current 'Io>'	External earth measurement : 0.01...2.0 x In in steps 0.001, infinite Internal earth measurement : 0.1...2.0 x In in steps 0.001, infinite
Operation accuracy	External earth measurement : ± 5.0% of set value External earth measurement : ± 10.0% of set value, for set value < 0.05 Internal earth measurement : ± 15.0% of set value
Operate time delay (DMT) 't >'	0.04...64 s in steps of 0.01
Operation time accuracy	External earth measurement : ± 5.0% of set value or ± 30 ms Internal earth measurement : ± 10.0% of set value or ± 30 ms
Operating curve type	IEC 60255-3: Normal inverse, Very inverse, Extremely inverse, Long-time inverse ANSI C37.112: Moderate inverse, Normal Inverse, Very inverse, Extremely inverse Special curves: RI inverse
Time multiplier setting 'k'	0.02...1.6, in steps of 0.01
Operation time accuracy • IEC and ANSI characteristics • RI characteristics • IEC and ANSI characteristics • RI characteristics	 External earth measurement : class E(5) or ± 30 ms External earth measurement : class E(7.5) or ± 30 ms Internal earth measurement : ± 5.0% of set value or ± 30 ms Internal earth measurement : ± 10.0% of set value or ± 30 ms
Reset ratio	IDMT : 0.96 and DT : 0.98

Table 27. High- set earth-fault protection, stage Io>> / 50N

Parameter	Value (Range)
Setting range of pick-up current 'Io >>'	External earth measurement : 0.05...12.5 x In in steps 0.001, infinite Internal earth measurement : 0.5...12.5 x In in steps 0.001, infinite
Operation accuracy	External earth measurement : ± 5.0% of set value Internal earth measurement : ± 15.0% of set value
Operation mode	Definite time, Instantaneous
Operate time delay (DMT) 'to >>'	0.04...64 s in steps of 0.01
Operation time accuracy	External earth measurement : ± 5.0% of set value or ± 30 ms Internal earth measurement : ± 10.0% of set value or ± 30 ms
Reset ratio	0.98

Table 28. Thermal overload protection, 3Ith> / 49

Parameter	Value (Range)
Initial thermal level of apparatus $\vartheta 0$	0.0…100%, in steps of 1%
Reference current leading to thermal calculation “Ib”	0.1 … 1.5 x In, in steps of 0.1
Heating time constant of object ‘τ’	1.0…300 min, in steps of 1.0
Cooling time constant of object ‘$\tau_{\downarrow r}$‘	1.0…300 min, in steps of 1.0
Alarm value, ϑalm	50…200%, in steps of 1%
Operate value, ϑtrip	50…200%, in steps of 1%
Start inhibit value, ϑstartinhibit	50…200%, in steps of 1%
Percentage by which ϑtrip will be increased in emergency mode, ϑEM	10…100%, in steps of 1%
Options for calculating thermal value during power interruption, ϑpowerOFF	1…4[1)]
Operation time accuracy	3% of 5time constant or ± 30s
Reset ratio	0.98

[1)] Options for calculating thermal image during power interruption shall be as below

1 = On restoration of power, new value of current after power on will be considered to calculate new value of thermal image for interruption period Δt.

2 = On restoration of power, new value of thermal image is calculated for interruption period Δt considering that current has remained constant value during power interruption.

3 = Power interruption of the IED assumes no change of thermal image during interruption period.

4 = Power interruption of the IED resets the thermal image to the set value defined by setting ϑ_0.

Table 29. Motor start-up supervision protection, I²t n< / 51LRS, 14,48,66

Parameter	Value (Range)
Current value for detection of motor start, ‘Istart >’	1…10 x Ib [1)], in steps of 0.1
Restraint 68M	Yes, No
Motor start up current, ‘I startup’	1…10 x Ib, in steps of 0.1
Motor start up time, ‘t startup’	5… 120 s, in steps of 1.0
Permitted stalling time, ‘t lockrotor’	2… 200 s, in steps of 1.0
Maximum start allowed per defined supervised time, ‘Max Str’	1… 10
Supervised time allowed for maximum starts, ‘tn’	1… 180 minute, in steps of 1.0
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set or ± 30 ms

[1)] Ib: Rated current of motor defined by base current setting

Table 30. Negative sequence overcurrent protection, I2> / 46

Parameter	Value (Range)
Start value, ‘I2>”	0.1…1.5 x In, in steps of 0.01
Operate delay time, ‘tI2>’	0.1 … 300 s, in steps of 0.1
Block the protection	0 = No, 1 = Yes
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set value or ± 30ms
Reset ratio	0.98

Table 31. Phase discontinuity protection, I2/I1> / 46PD

Parameter	Value (Range)
Start value, ‘I2/I1>”	10…100%, in steps of 1%
Operate delay time, ‘tI2/I1>’	0.1 … 64 s, in steps of 0.1
Block the protection	0 = No, 1 = Yes
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set or ± 30 ms
Reset ratio	0.98

Table 32. Phase reversal protection, I2R> / 46R

Parameter	Value (Range)
Start value, ‘I2R >”	0.1…1.5 x Ib, in steps of 0.01
Operate delay time, ‘tI2R >’	0.1 … 300 s, in steps of 0.1
Block the protection	0 = No, 1 = Yes
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set or ± 30 ms
Reset ratio	0.98

Table 33. Undercurrent protection, 3I < / 37

Parameter	Value (Range)
Start value, ‘3I<”	0.12…0.80 x Ib, in steps of 0.01
Operate delay time, ‘t3I<’	0. … 30 s, in steps of 0.1
Block the phase reversal protection	0 = No, 1 = Yes
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set or ± 30 ms
Reset ratio	1.02

Table 34. Circuit breaker failure protection, 3I/IoBF / 51BF/51NBF

Parameter	Value (Range)
Operating phase current, 'ICBFP'	0.2…2.0 x In, in steps of 0.1
Operating neutral current, 'IoCBFP'	0.1…2.0 x In, in steps of 0.1
Time delay for retrip, 'tretrip'	0.06…0.5 s, in steps of 0.01
Time delay for backup protection, 'tbackup'	0.06…0.5 s, in steps of 0.01
Block the circuit breaker failure protection	0 = No, 1 = Yes
Operation accuracy	± 5.0% of set value
Operation time accuracy	3% of set value or ± 30ms

Table 35. Counter

Parameter	Value (Range)
Initial value of the counter at the start of IED, 'Value'	0…65535, in steps of 1
Binary input configured at PULSE_INPUT, 'BIconf'	1…4 (1=BI1, 2=BI2, 3=BI3, 4=BI4) '-' no selection if counter selection not needed

20. Dimensions and mounting

The REM601 have been equipped with in-built press-fit mechanism. Without using any additional mounting accessories, the REM601 can be easily flush mounted on the panel.

With appropriate mounting accessories the REM601 can be mounted on the circuit breakers type VD4 /HD4. The panel cut-out for flush mounting:

- Height : 151.5 ± 0.5 mm
- Width : 121.5 ± 0.5 mm
- Thickness of panel : 2.0 – 3.0 mm

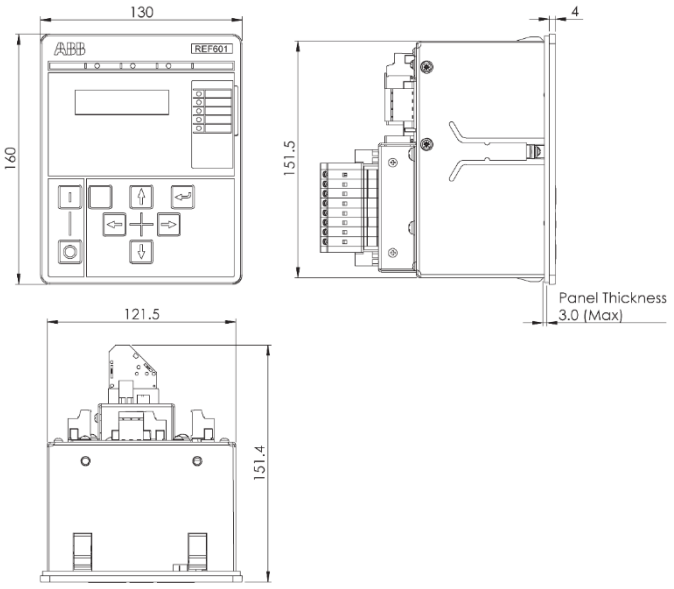

Figure 3. Dimension of REM601 – Flush mounting CT variant

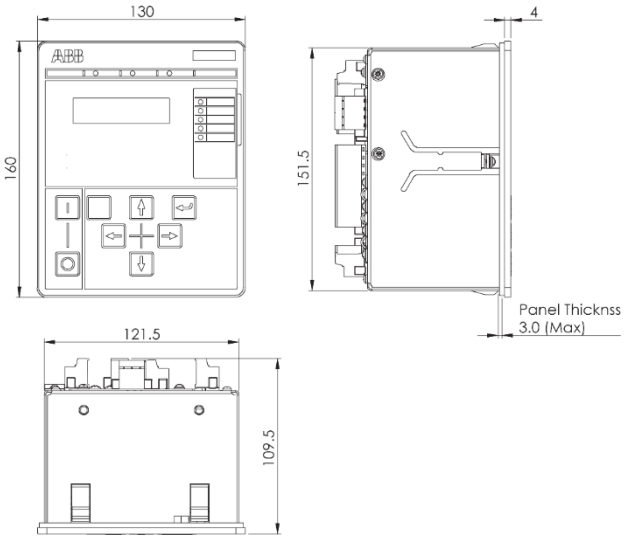

Figure 4. Dimension of REM601 – Flush mounting sensor

21. Selection and ordering data

The relay type and serial number label identifies the protection relay. An order number label is placed on the side of the relay. The order number consists of a string of codes generated from hardware and software modules of relay.

The serial number and order number label is placed on side of relay.

Use the ordering key information in Fig. 5 to generate the order number when ordering complete protection relay.

Example code	REM601	B	E4	46	B	B	1	N	H

#	Description	
1	**Relay type**	
	Motor protection with control	REM601
	Motor protection	REM601
2	**Standard**	
	ANSI	A
	IEC	B
	Chinese	C
	CEI	J
3,4	**Analog input / output**	
	3 sensor and ground current input	A4
	Phase and Earth current input – 1A	D4
	Phase and Earth current input – 5A	E4
5,6	**Binary input / output**	
	4 BI + 6 BO	46
7	**Serial communication**	
	MODBUS RTU with RS485 two wire	B
	IEC60870-5-103 with RS485 two wire	C
	None	N
8	**Application configuration**	
	Configuration 2	B
	Configuration 3	C
9	**Power supply**	
	24...240V AC / DC	1
10	**Configuration**	
	Ring lug terminals	B
	Screw terminals	N
11	**Version**	
	Product version 2.2 FP1	H

Example order code: REM601 B E4 46 B D 1 N H

Your ordering code:

Digit (#)	1	2	3 4	5 6	7	8	9	10	11
Code									

Figure 5. Ordering key for complete relay

22. Accessories and ordering data

Table 36. Accessories

Item	Order number
RE_601 communication card	CIM601BNNNNBANXG

Table 37. Compatible sensors

Item	Order number
KEVCR for integrated circuit-breakers type VD4/HD4	KEVCR24OC2R0101, 630A KEVCR24AC2R0102, 1250A
KECA for other applications where relay is panel mounted For more information please refer to the catalogue reference - no. 1VLC000584.	KECA 250 B1 : 1VL5400052V0101

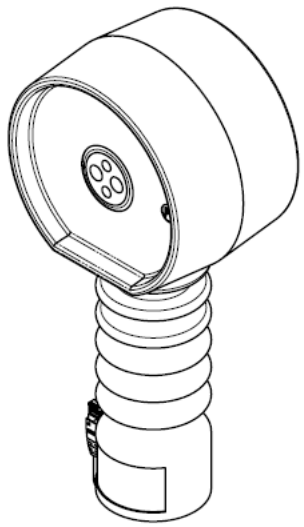

Figure 6. Outline view of KEVCR sensor

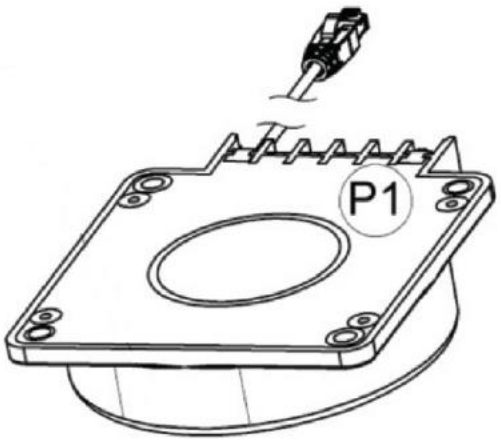

Figure 7. Outline view of KECA sensor

23. Terminal diagram

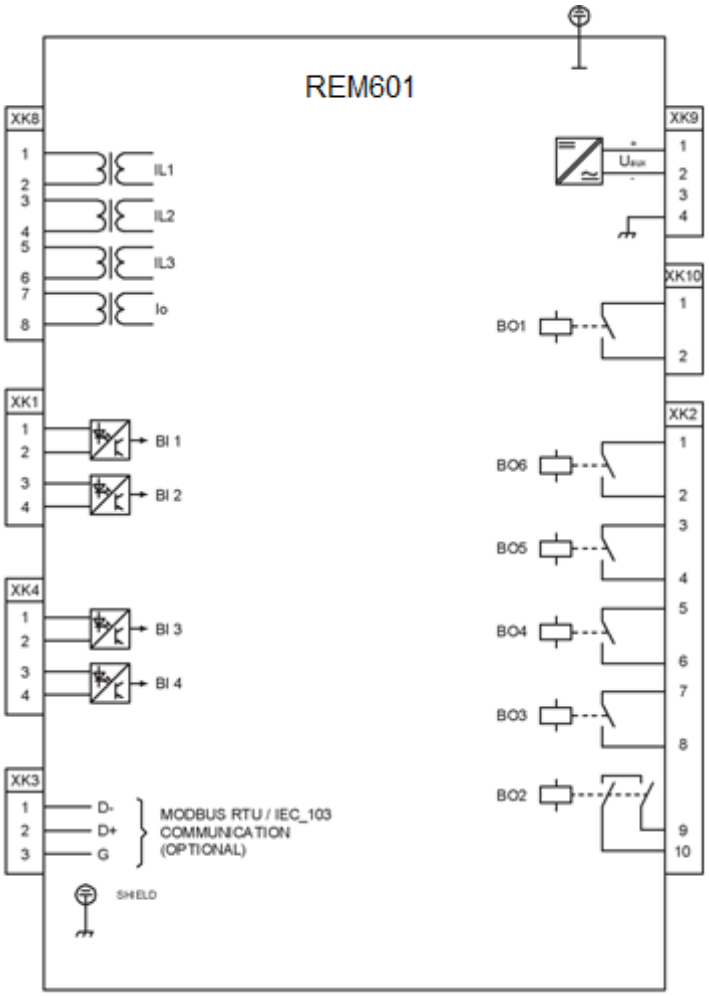

Figure 8. Terminal diagram of REM601 for CT variant

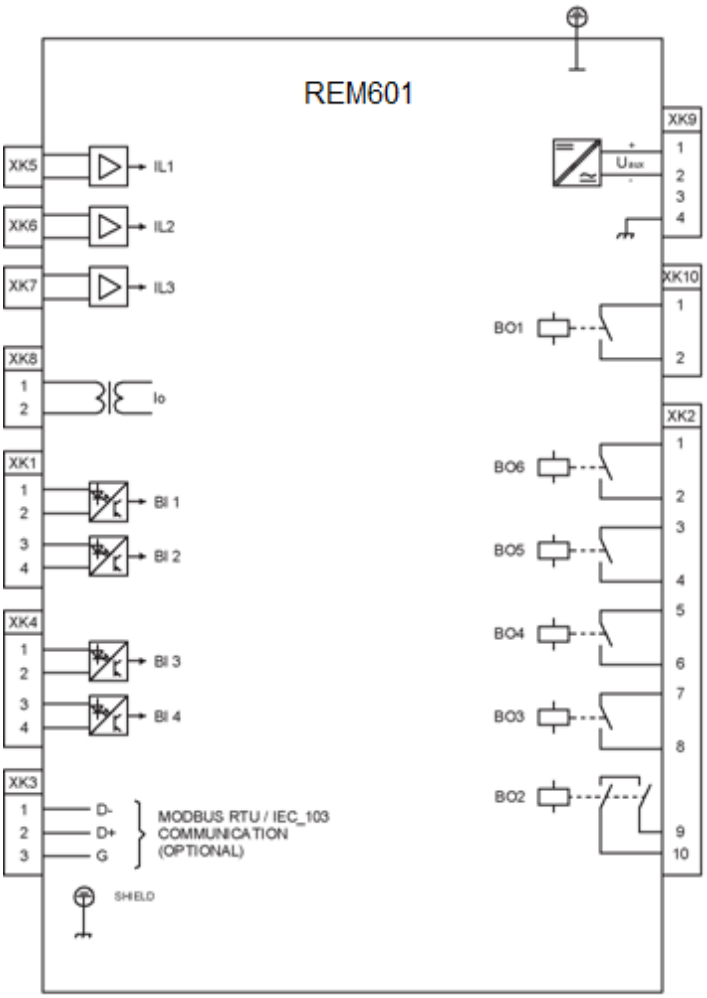

Figure 9. Terminal diagram of REM601 for sensor variant

24. References

The www.abb.com/substationautomation portal offers you information about the distribution automation product and service range.

You will find the latest relevant information on the REM601 protection relay on the product page.

The download area on the right hand side of the Web page contains the latest product documentation, such as technical reference manual, technical presentation and so on. The selection tool on the Web page helps you find the documents by the document category and language.

The Features and Application tabs contain product related information in a compact format.

25. Document revision history

Document revision / Date	Product version	History
A/2014-09-11	2.2 FP1	REM601 product release

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