Relay Retrofit Program for REX 521

Application Manual

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Conformity

This product complies with the directive of the Council of the European Communities on the approximation of the laws of the Member States relating to electromagnetic compatibility (EMC Directive 2014/30/EU) and concerning electrical equipment for use within specified voltage limits (Low-voltage directive 2014/35/EU). This conformity is the result of tests conducted by ABB in accordance with the product standard EN 60255-26 for the EMC directive, and with the product standards EN 60255-1 and EN 60255-27 for the low voltage directive. The product is designed in accordance with the international standards of the IEC 60255 series.

Safety information

Dangerous voltages can occur on the connectors, even though the auxiliary voltage has been disconnected.

Non-observance can result in death, personal injury or substantial property damage.

Only a competent electrician is allowed to carry out the electrical installation.

Only trained and qualified persons are allowed to assemble and operate the cutting tool.

National and local electrical safety regulations must always be followed.

The necessary and required earthing connections must be made according to the product guidelines and regulations..

When the plug-in unit has been detached from the case, do not touch the inside of the case. The relay case internals may contain high voltage potential and touching these may cause personal injury.

The protection relay contains components which are sensitive to electrostatic discharge. Unnecessary touching of electronic components must therefore be avoided.

Whenever changes are made in the protection relay, measures should be taken to avoid inadvertent tripping.

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Section 1 Introduction

1.1 This manual

The application manual contains an overview of Relay Retrofit Program for REX 521 and the application description. The manual describes how the program deliverables can be used in the relay retrofit application. The manual also provides information on the retrofit process and the recommendations for the supported relay types.

1.2 Intended audience

This manual addresses the service engineers and protection and control engineers responsible for planning, engineering, installing and commissioning of medium-voltage relay retrofit applications. The manual also addresses the personnel performing the replacement (installation and commissioning) of the relay.

The protection and control engineers must be experienced in electrical power engineering and have knowledge of the related technology, such as protection schemes and principles.

The installation and commissioning technicians must have basic knowledge of handling electronic equipment.

1.3 Product documentation

1.3.1 Product documentation set

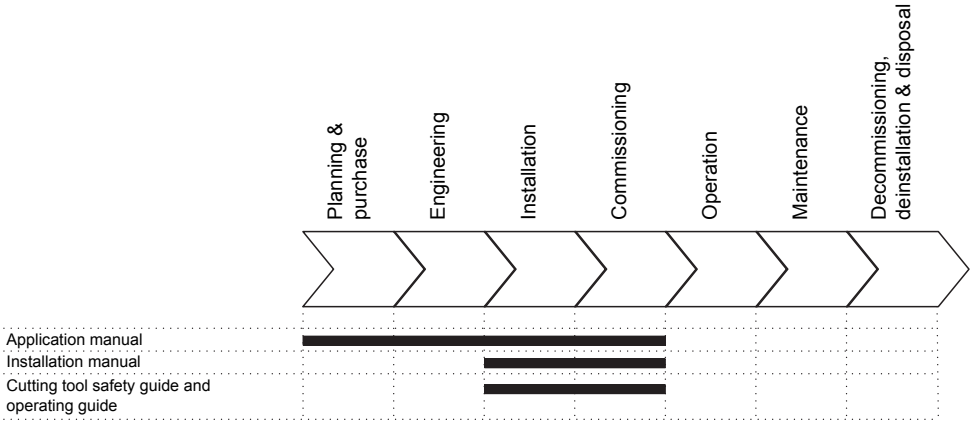

Figure 1: The intended use of documents during the product life cycle

The application manual contains an overview of Relay Retrofit Program for REX 521 and the application description. The manual describes how the program deliverables can be used in the relay retrofit application. The manual also provides information on the retrofit process and the recommendations for the supported relay types.

The configuration migration support guidelines provided in the application manual show the steps composing the process of migrating the existing REX 521 relay configuration and parameters to the replacement relay.

The installation manual contains instructions on how to install the mounting assembly with pre-wired terminals. The manual provides procedures for mechanical and electrical installation. The chapters are organized in chronological order in which REX521RRP should be installed.

Cutting tool safety guide contains safety recommendations to the user.

Cutting tool operating guide illustrates how the cutting tool is prepared for operation. The guide contains instructions on how to operate the tool during relay retrofit.

1.3.2 Document revision history

Document revision/date	History
A/2018-05-02	First release

Download the latest documents from the ABB Web site http://www.abb.com/mediumvoltage.

1.3.3 Related documentation

Name of the document	Document ID
Relay Retrofit Program for REX 521 Product Guide	1MRS758962
Relay Retrofit Program for REX 521 Installation Manual	1MRS758961
Relay Retrofit Program for REX 521 Application Manual	1MRS758960
Relay Retrofit Program for REX 521 Cutting Tool Safety Guide	1MRS758975
Relay Retrofit Program for REX 521 Cutting Tool Operating Guide	1MRS758976

See the REX 521 and 615 series documentation for detailed technical information on the relays. Product series- and product-specific manuals can be downloaded from the ABB Website http://www.abb.com/mediumvoltage.

1.4 Symbols and conventions

1.4.1 Symbols

The electrical warning icon indicates the presence of a hazard which could result in electrical shock.

The warning icon indicates the presence of a hazard which could result in personal injury.

The caution icon indicates important information or warning related to the concept discussed in the text. It might indicate the presence of a hazard which could result in corruption of software or damage to equipment or property.

The information icon alerts the reader of important facts and conditions.

The tip icon indicates advice on, for example, how to design your project or how to use a certain function.

Although warning hazards are related to personal injury, it is necessary to understand that under certain operational conditions, operation of damaged equipment may result in degraded process performance leading to personal injury or death. Therefore, comply fully with all warning and caution notices.

1.4.2 Document conventions

A particular convention may not be used in this manual.

- Abbreviations and acronyms are spelled out in the glossary. The glossary also contains definitions of important terms.
- Parameter names are shown in italics.
  The function can be enabled and disabled with the *Operation* setting.
- Parameter values are indicated with quotation marks.
  The corresponding parameter values are "On" and "Off".
- Input/output messages and monitored data names are shown in Courier font.
  When the function starts, the `START` output is set to TRUE.

Section 2 Relay Retrofit Program for REX 521

2.1 Description

ABB's life cycle extension initiative is aimed at supporting the life cycle management (LCM) of utility and industrial power distribution systems. One strategic consideration of the LCM of a power system is to extend the life cycle of a switchgear panel through retrofit programs targeted at selected switchgear equipment. A timely executed retrofit program for selected devices allows full utilization of the life cycle of the remaining switchgear components.

ABB's Relay Retrofit Program for REX 521 offers smooth and controlled replacement of existing REX 521 protection relays with new developments from the Relion® 615 series, representing the latest protection and control technology. The result is extended switchgear lifetime, full availability of relay life cycle services, and the possibility to adapt the power protection system to meet new requirements. The selected 615 series replacement devices are provided with pre-designed installation accessories. The specific tools and accessories available in the retrofit program simplify the work procedures. Thus, various retrofit phases can be accurately scheduled and timely executed to minimize the downtime of production or power distribution processes to bare minimum.

Table 1: Supported retrofit project phases

Retrofit project phase	Tools and accessories
Engineering	Configuration template for the replacement relay
	Documentation
Installation	Relion 615 series replacement relay with pre-wired terminals and mounting assembly
	Cutting tool
	Documentation
Testing	Relion 611/615 BIO-Tester[1)]

1) Can be used with a stand-alone 615 relay

2.2 Existing REX 521 relays and replacement relays

The selection of replacement relays for the existing REX 521 relays has been carefully considered based on expert knowledge of previous product generations and recent developments in protection and control technology. The selected replacement relay types belong to the 615 series and their functionality corresponds to that of the existing REX 521 relays. In addition, the 615 series offers the possibility to expand the

functionality of the power protection system further, for example, by adding an optional arc flash protection.

REX 521

The feeder 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. REX 521 is based on a multiprocessor environment. The HMI including an LCD with different views makes the local use easy and informs the user via indication messages.

Figure 2: REX 521

Depending on the application requirement, REX 521 is available in fifteen alternative standard configurations. The 615 series replacement relays, REF615 and REM615, have been chosen as replacement relays based on the availability of equivalent functions.

REF615 and REM615

REF615 is a dedicated feeder protection and control relay designed for the protection, control, measurement and supervision of utility substations and industrial power systems including radial, looped and meshed distribution networks with or without distributed power generation.

Figure 3: REX521RRP with REF615 replacement relay

REM615 is a dedicated motor protection and control relay designed for the protection, control, measurement and supervision of asynchronous motors in manufacturing and process industry.

Figure 4: REX521RRP with REM615 replacement relay

The 615 series relays are characterized by their compactness and withdrawable-unit design. Re-engineered from the ground up, the 615 series has been designed to unleash the full potential of the IEC 61850 standard for communication and interoperability

between substation automation devices. Once the standard configuration relay has been given the application-specific settings, it can directly be put into service. The replacement relay is provided with pre-wired terminals that minimize the need for re-wiring as well as reduce the need to update the existing schematic drawings.

The 615 series relays support a range of communication protocols including IEC 61850 with Edition 2 support, process bus according to IEC 61850-9-2 LE, IEC 60870-5-103, Modbus and DNP3. The Profibus DPV1 communication protocol is supported by using the protocol converter SPA-ZC 302.

The order code for a replacement relay includes a fixed part in capital letters and a non-fixed part in hashes (#). The non-fixed part can be freely selected when ordering the 615 series relay under Relay Retrofit Program for REX 521.

In Relay Retrofit Program for REX 521, standard configuration N for REF615 and standard configuration C for REM615 offer the highest functionality level of all 615 standard configurations. They are delivered from the factory as preconfigured, in the same way as other 615 standard configurations, and are typically reconfigured when taken into use. Standard configuration N for REF615 includes directional and non-directional overcurrent and earth-fault protection with multifrequency neutral admittance, voltage, frequency and power based protection and measurements, high-impedance differential protection, synchro-check and circuit-breaker condition monitoring (optional power quality, fault locator and interconnection protection). Standard configuration C for REM615 includes motor protection with voltage and frequency based protection and measurements.

Depending on the specific application, the appropriate functionality can be selected and own configurations can be created with Application Configuration in PCM600. This own template can be saved and used in other similar applications. Default configurations, connections for binary inputs, binary outputs, function-to-function connections and alarm LEDs are described in the functional diagrams of the 615 series manuals.

Table 2: Existing relay types and replacement relays

Relay type to be retrofitted[1)]	Replacement relay	Order code[2)]
REX521xBxxxB01x	REF615	HBFNAEAG#####E##1G[3)] or HBFNAFAG#####E##1G[3)]
REX521xBxxxB02x		
REX521xMxxxM01x		
REX521xMxxxM02x		
REX521xHxxxH02x		
REX521xHxxxH03x		
REX521xHxxxH04x		
REX521xHxxxH05x[4)]		
REX521xHxxxH06x		
REX521xHxxxH08x[4)]		
REX521xHxxxH09x		
REX521xHxxxH50x		
REX521xHxxxH07x	REM615	HBMCAEAG######N#1G[5)] or HBMCAFAG######N#1G[5)]
REX521xHxxxH51x		

1) Relay Retrofit Program is not available for the REX 521 sensor version.
2) The order code for a replacement relay includes a fixed part in capital letters and a non-fixed part in hashes (#). The non-fixed part can be freely selected when ordering a 615 series relay.
3) Order code Option 1 as letter E (Power Quality and Reclosing) is the minimum requirement to achieve desired functionality in REF615 relays equivalent to REX 521 functionality. If Option 1=E is selected, Option 2 cannot be configured for E and N.
4) Providing that the TOL3Dev protection function is not required
5) Power quality functions are not available in REM615.

2.3 Engineering

2.3.1 Version and compatibility information

The following software versions are the minimum requirements to support all relays released under the program. It is recommended to always use the latest available versions.

The deliverables under Relay Retrofit Program for REX 521 are compatible with the following software versions.

- CAP 505 Ver.2.4.0 or later (with communication cable 1MKC950001-2)
- Protection and Control IED Manager PCM600 Ver.2.8 or later
- ABB IED Connectivity Package REF615 Ver.5.1.6 or later
- ABB IED Connectivity Package REM615 Ver.5.1.6 or later

Download connectivity packages from the ABB Web site http://www.abb.com/mediumvoltage or directly with Update Manager in PCM600.

2.3.2 CAP 501 and CAP 505 tools

The relay setting tool CAP 501 and relay configuration and setting tool CAP 505 are aimed for commissioning, maintenance, service and monitoring of the process and its secondary equipment in distribution substations.

CAP 501 can be used for relay parametrization.

- Loading of parameters to and from the relay
- Uploading of recorded values
- Comparison of present and saved settings

CAP 505 is an IEC 1131-3 compliant programming system for programmable Logic Controllers running under Microsoft Windows. It is the programming tool for SPACOM relays, SACO annunciators, RE_500 series relays such as REX 521, REC 501/523 control terminals and 610 series relays.

- Graphical programming for control and protection units
- Graphical programming for mimic panel
- Loading parameters from the relay
- Uploading of recorded values
- Comparison of present and saved settings

2.3.3 PCM600 tool

Protection and Control IED Manager PCM600 offers all the necessary functionality to work throughout all stages of the Relion protection relay's life cycle.

- Planning
- Engineering
- Commissioning
- Operation and disturbance handling
- Functional analysis

The whole substation configuration can be controlled and different tasks and functions can be performed with the individual tool components. PCM600 can operate with many different topologies, depending on the customer needs.

For more information, see the PCM600 documentation.

2.3.3.1 Connectivity packages

A connectivity package is a software component that consists of executable code and data which enables system tools to communicate with a Relion protection relay. Connectivity packages are used to create configuration structures in PCM600. The

latest PCM600 and connectivity packages are backward compatible with older Relion protection relay versions.

A connectivity package includes all the data which is used to describe the protection relay. For example, it contains a list of the existing parameters, data format used, units, setting range, access rights and visibility of the parameters. In addition, it contains code which allows software packages that use the connectivity package to properly communicate with the protection relay. It also supports localization of text even when it is read from the protection relay in a standard format such as COMTRADE.

Update Manager is a tool that helps in defining the right connectivity package versions for different system products and tools. Update Manager is included with the products that use connectivity packages.

2.3.4 Configuration templates

Configuration templates corresponding to the REX 521 standard configurations and their default settings are available for the 615 series relays. The configuration templates are available after ordering Relay Retrofit Program for REX 521.

REX 521 protection functions are replicated by the 615 replacement relay with deviations. It is recommended to refer to the comments in the respective section of the setting parameter guidelines and then review the configured functionality to ensure the satisfactory operation of the protection function.

With PCM600 the configuration templates can be used while replacing the REX 521 variant with a corresponding 615 series relay. The template defines the configuration equivalent to the REX 521 standard configuration. Thus, using a template results in a REX 521 equivalent default configuration, with the exception of parameter setting and communication configuration. The default configuration needs to be modified as per the existing REX 521 relay configuration. Also, the functionality of the existing REX 521 configuration should be mapped to the corresponding functionality in the 615 series replacement relay.

All binary inputs and outputs contacts are freely configurable with the signal matrix or application configuration functionality of PCM600. The default single-line diagram can be modified according to user requirements by using Graphical Display Editor in PCM600. The default parameter setting values can be changed from the front panel LHMI, the WHMI or PCM600 in combination with the relay-specific connectivity package.

Table 3: Configuration templates

Relay type to be retrofitted[1)]	Replacement relay type	Configuration template
REX521xBxxxB01x	REF615	REX521 B01 to REF615 template.pcmi
REX521xBxxxB02x		REX521 B02 to REF615 template.pcmi
REX521xMxxxM01x		REX521 M01 to REF615 template.pcmi
REX521xMxxxM02x		REX521 M02 to REF615 template.pcmi
REX521xHxxxH02x		REX521 H02 to REF615 template.pcmi
REX521xHxxxH03x		REX521 H03 to REF615 template.pcmi
REX521xHxxxH04x		REX521 H04 to REF615 template.pcmi
REX521xHxxxH05x[2)]		REX521 H05 to REF615 template.pcmi
REX521xHxxxH06x		REX521 H06 to REF615 template.pcmi
REX521xHxxxH08x[2)]		REX521 H08 to REF615 template.pcmi
REX521xHxxxH09x		REX521 H09 to REF615 template.pcmi
REX521xHxxxH50x		REX521 H50 to REF615 template.pcmi
REX521xHxxxH07x	REM615	REX521 H07 to REM615 template.pcmi
REX521xHxxxH51x		REX521 H51 to REM615 template.pcmi

1) Relay Retrofit Program is not available for the REX 521 sensor version.
2) Providing that the TOL3Dev protection function is not required

2.3.5 Project preparation

2.3.5.1 Installing connectivity packages

- Install connectivity packages either by running the installer which can be downloaded on the ABB Website or by using Update Manager when a network connection is available.

Download connectivity packages from the ABB Web site http://www.abb.com/mediumvoltage or directly with Update Manager in PCM600.

Installing connectivity packages by using the connectivity package installer

1. Close PCM600.
2. Run the **ABB IED Connectivity Package RE_6xx Ver. n.msi** installer. (n = version number)
3. To install the connectivity package, follow the steps in the connectivity package installation wizard.

Installing connectivity packages by using Update Manager

1. In PCM600, click **Help** and select **Update Manager**.
   Run Update Manager with administrator rights.

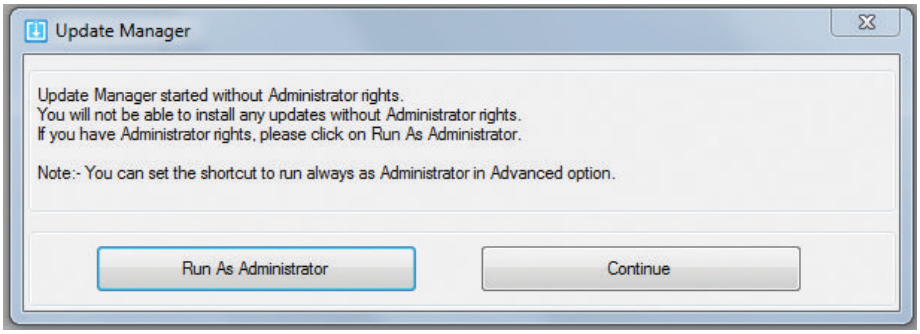

Figure 5: Running Update Manager as an administrator

2. Select **Get Connectivity Packages** from the menu on the left column.

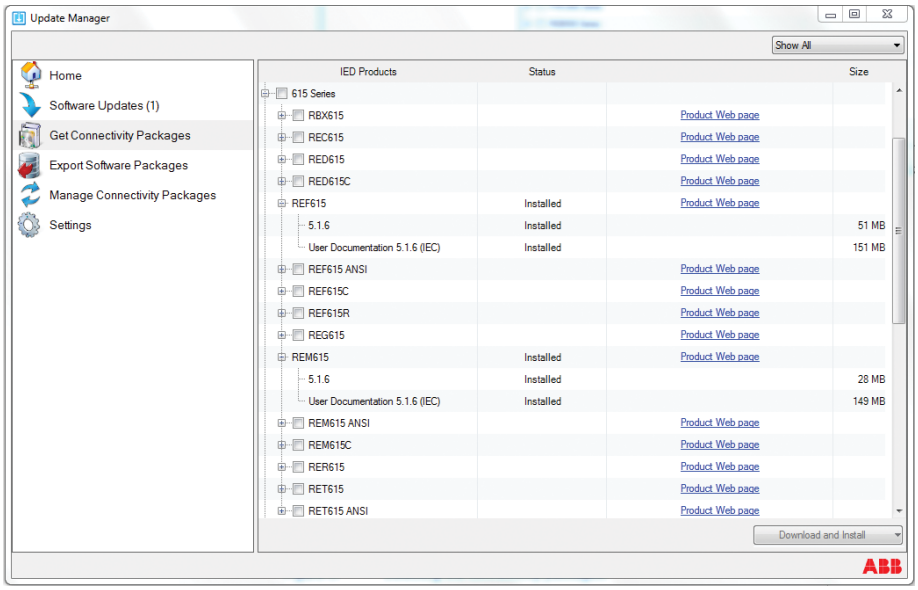

Figure 6: Selecting the connectivity packages

3. Select all the required connectivity packages.
4. Click **Download and Install**.
   The status bar shows the installation status.

2.3.5.2 Activating connectivity packages

The relay connectivity package has to be installed before it can be activated in Update Manager.

1. Select **Manage Connectivity Packages** from the menu on the left column to access the installed connectivity packages.
2. Browse the tree structure to find the correct product.
3. Select the connectivity package version from the drop-down list beside the product name.

Always use the latest version of the connectivity package.

4. Click **Apply** to activate the connectivity package.

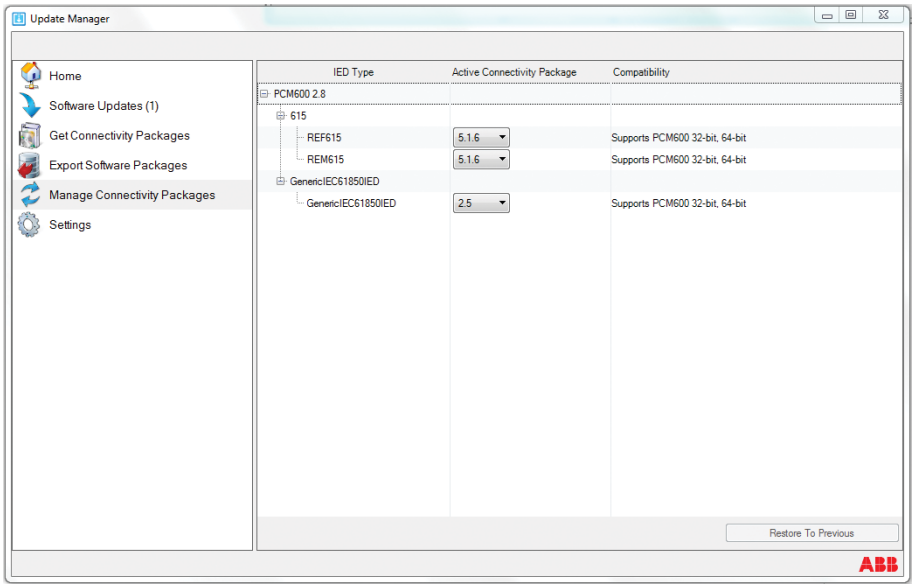

Figure 7: Selecting the connectivity package versions

PCM600 recognizes the installed connectivity packages during start-up, and the corresponding IED types are available in PCM600 when starting a new project.

2.3.5.3 Creating a new project

1. Start PCM600.
2. To see the projects that are currently available in the PCM600 database, click **File** and select **Open/Manage Project**.
   The **Open/Manage Project** dialog box opens.

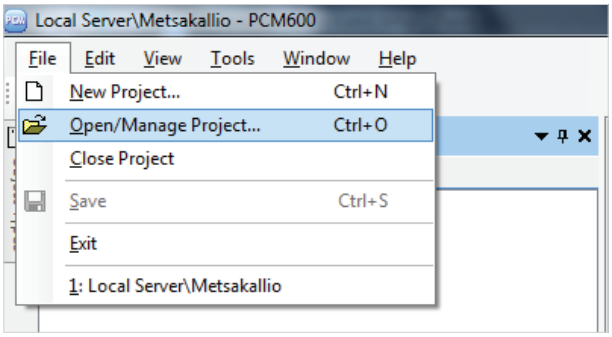

Figure 8: Managing projects

3. Select **Projects on my computer**.
   - If there are currently any projects or object tools open, close them.

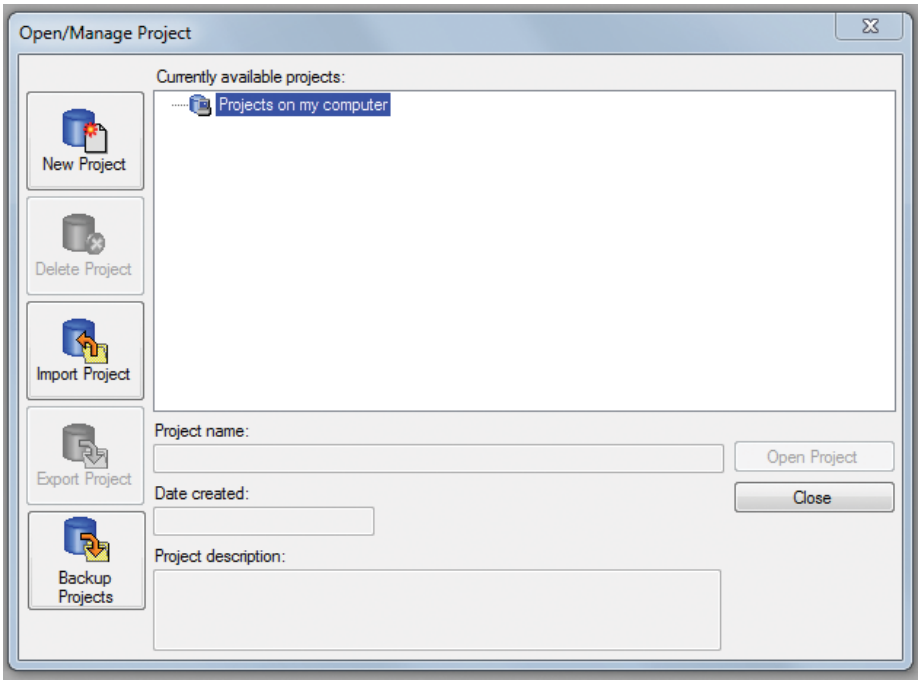

Figure 9: Selecting Projects on my computer

4. Click **New Project**.
   The **Create New Project** dialog box opens.

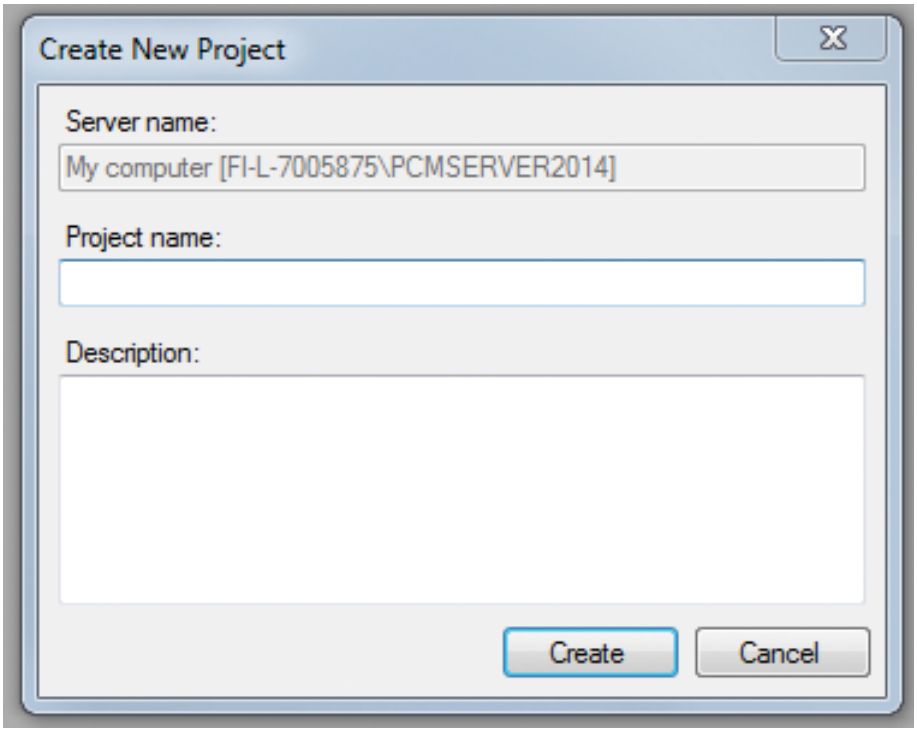

Figure 10: Creating new projects

5. In the **Project Name** box, give a name for the project.
   - Optionally, write a description of the project in the **Description** box.

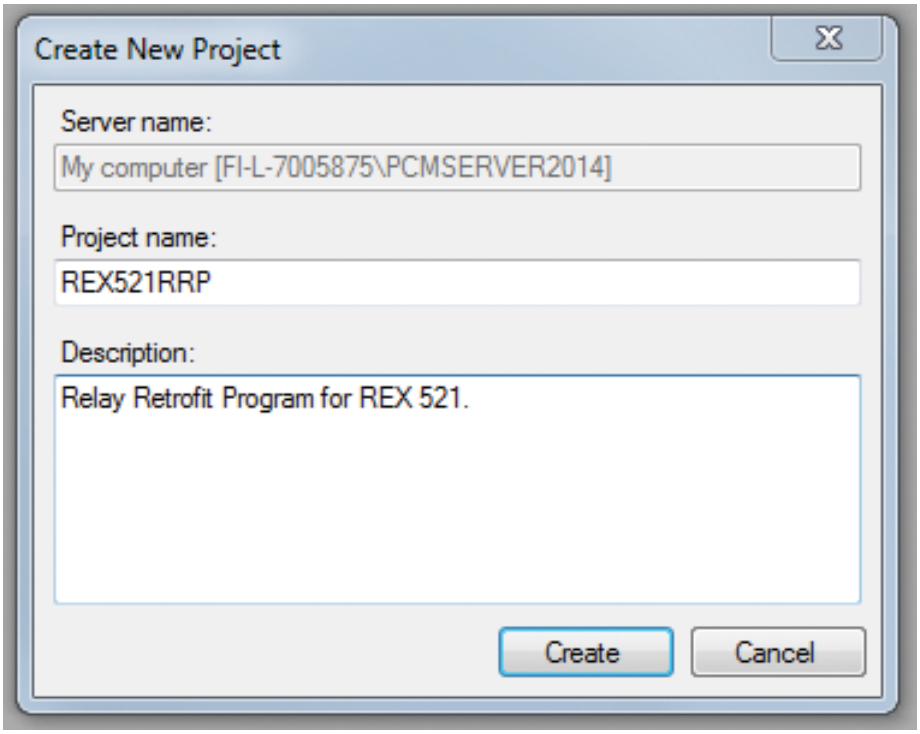

Figure 11: Naming the project

6. Click **Create**.
PCM600 sets up a new project that is listed under **Projects on my computer**.

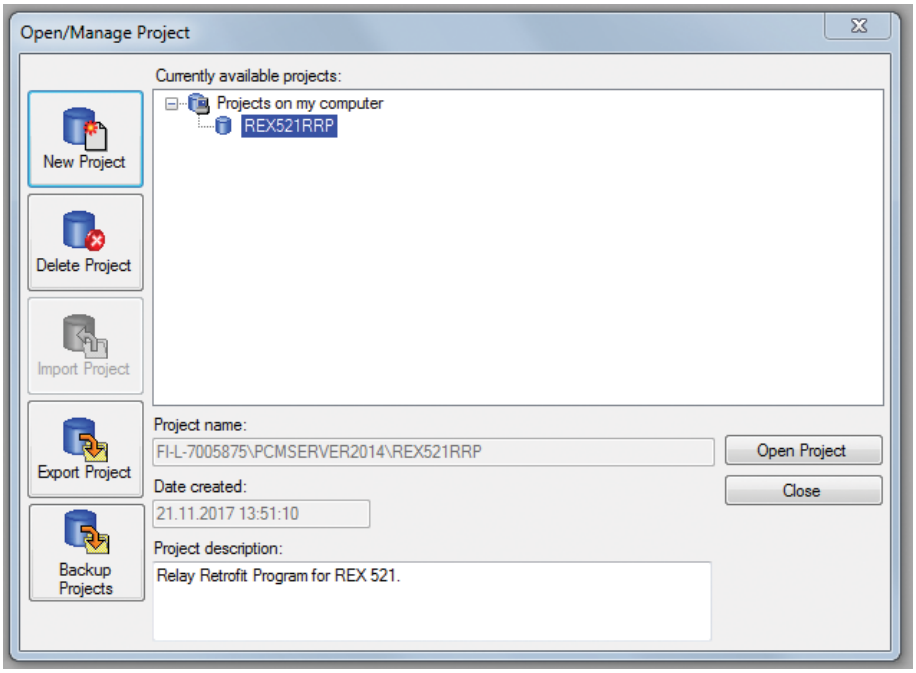

Figure 12: New project available under Projects on my computer

2.3.5.4 Building the plant structure

1. Create a new plant structure in PCM600.
   - Right-click the **Plant Structure** view, point to **New**, point to **General** and select either the **IED Group** or **Substation** element.
2. On the **View** menu, select **Object Types**.
3. Select the needed elements and drag them into the plant structure.
4. Rename each level in the structure by the names or identifications used in the grid.
   - Right-click the level and select **Rename**.
   - Rename the levels in the **Object Properties** view.

Inserting an IED in offline mode

When the IED is not available or is not connected to PCM600, engineering can be done offline. The offline configuration in PCM600 can be written to the IED later when it is connected. Working in the offline mode has an advantage over the online mode in that the preparation for the configuration can be started even though the IED is not available.

1. In the **Plant Structure** view, right-click the bay, point to **New**, point to the relay application area such as **Feeder IEDs** or **Motor Protection IEDs** and select the protection relay type to be inserted.

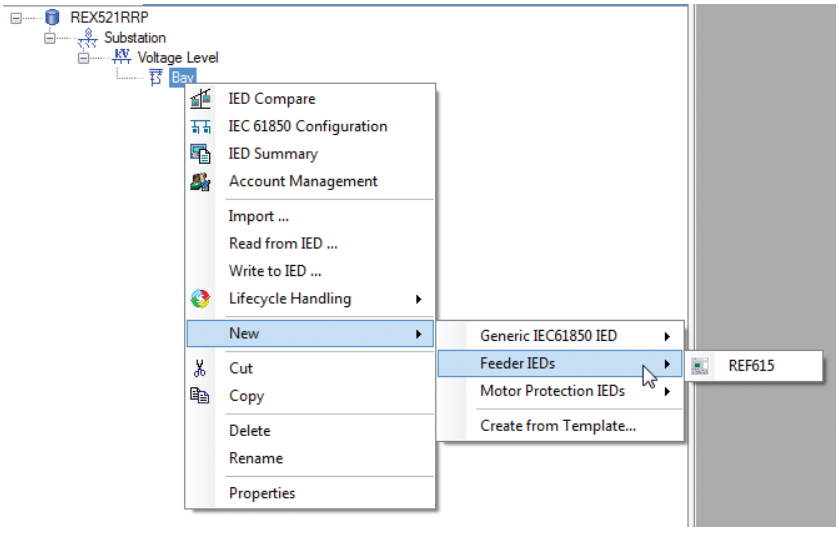

Figure 13: Selecting IED type

2. On the **Configuration mode selection page** dialog, select **Offline Configuration** and click **Next**.

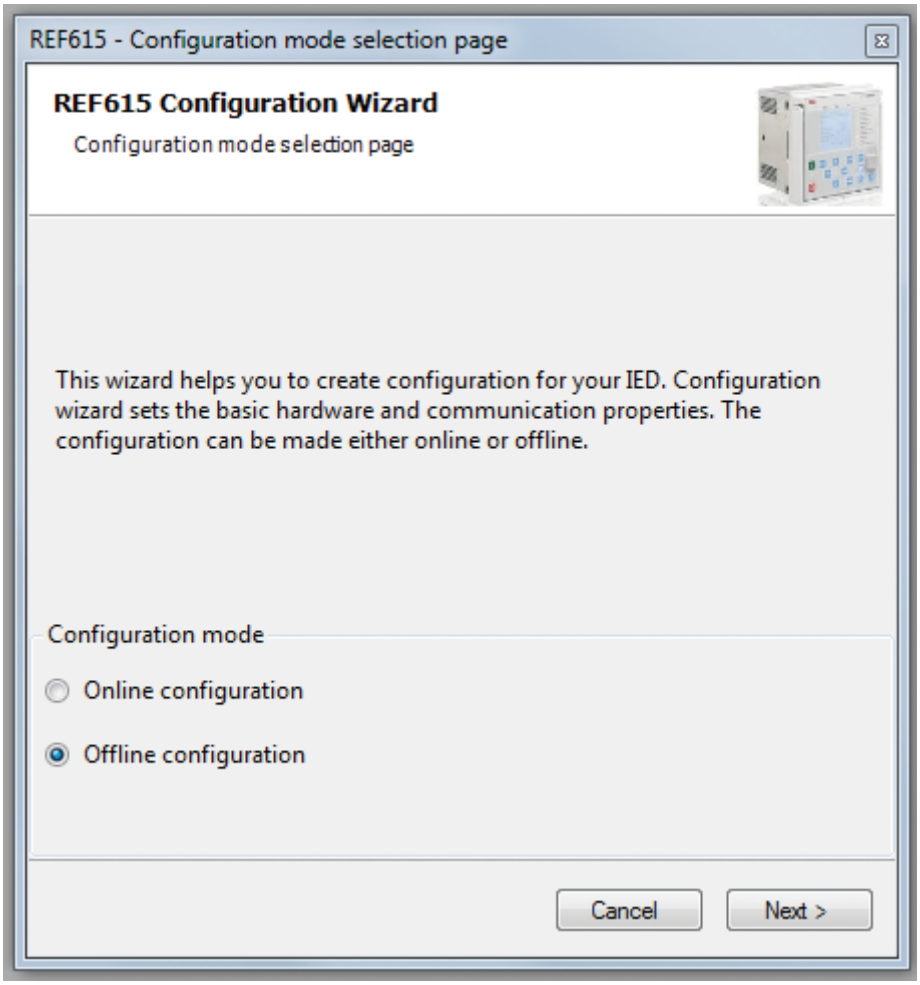

Figure 14: Selecting configuration mode

3. On the **Communication protocol selection page** dialog, select the IED communication protocol and click **Next**.

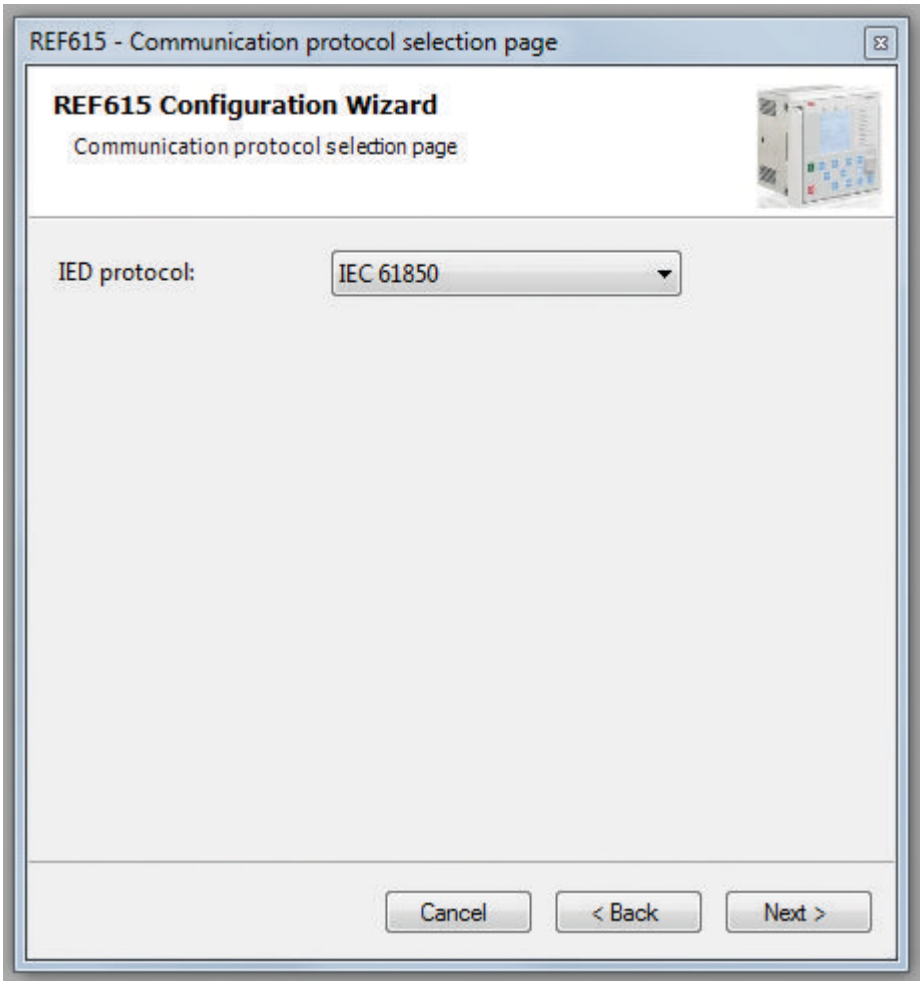

Figure 15: Selecting the IED protocol

4. On the **IEC61850 communication protocol** dialog, click **Next**.

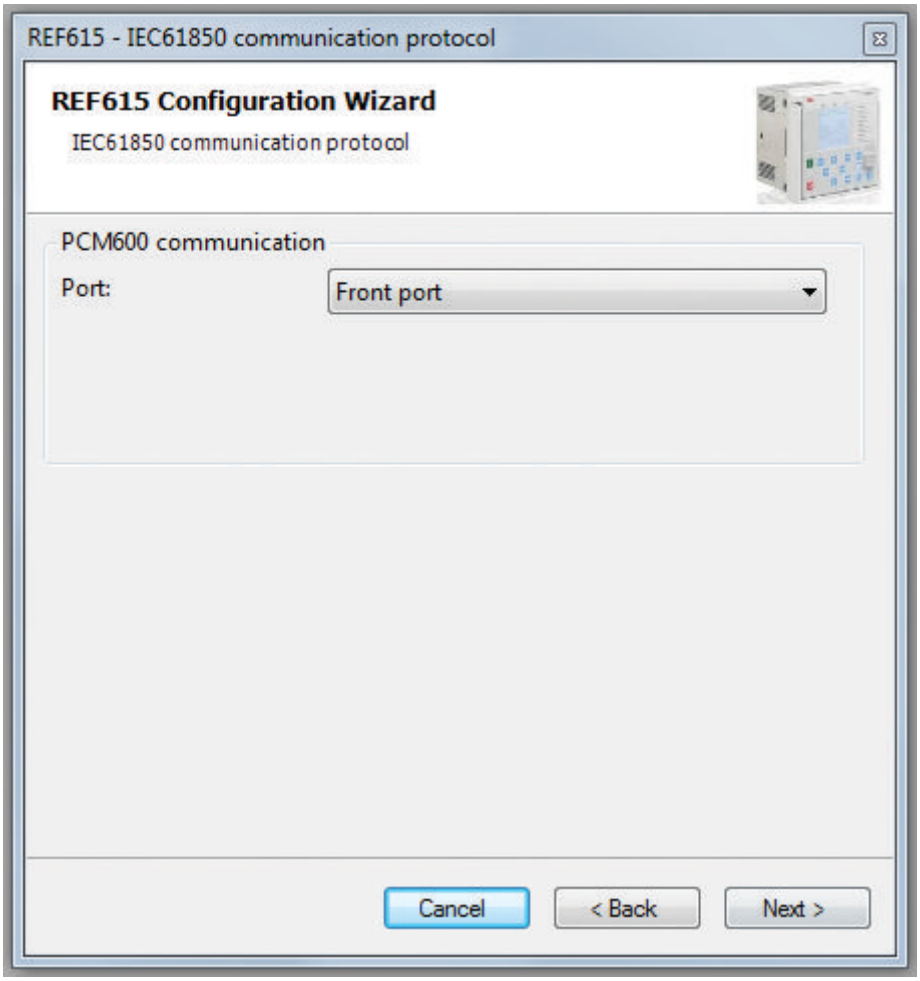

Figure 16: Selecting the communication port

5. On the **Communication configuration complete** dialog, click **Next**.

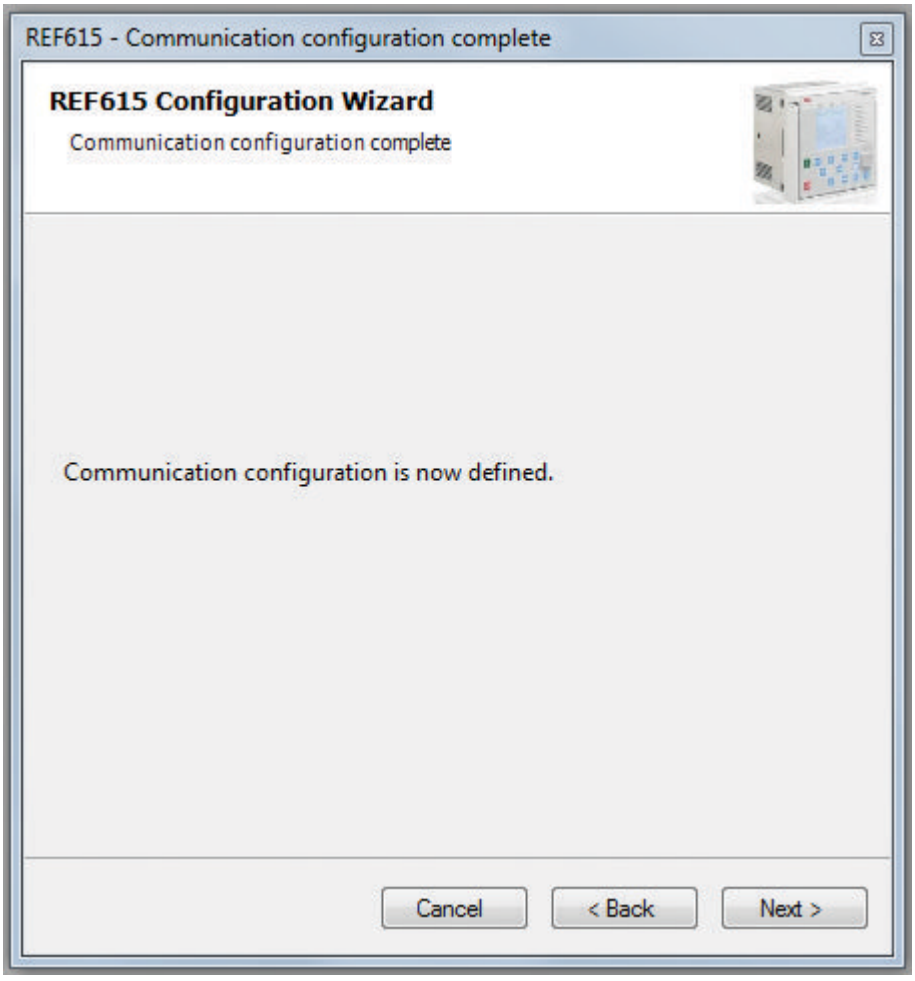

Figure 17: Viewing the communication configuration confirmation

6. On the **Order Code selection page** dialog, select the code for the ordered 615 series protection relay and click **Next**.

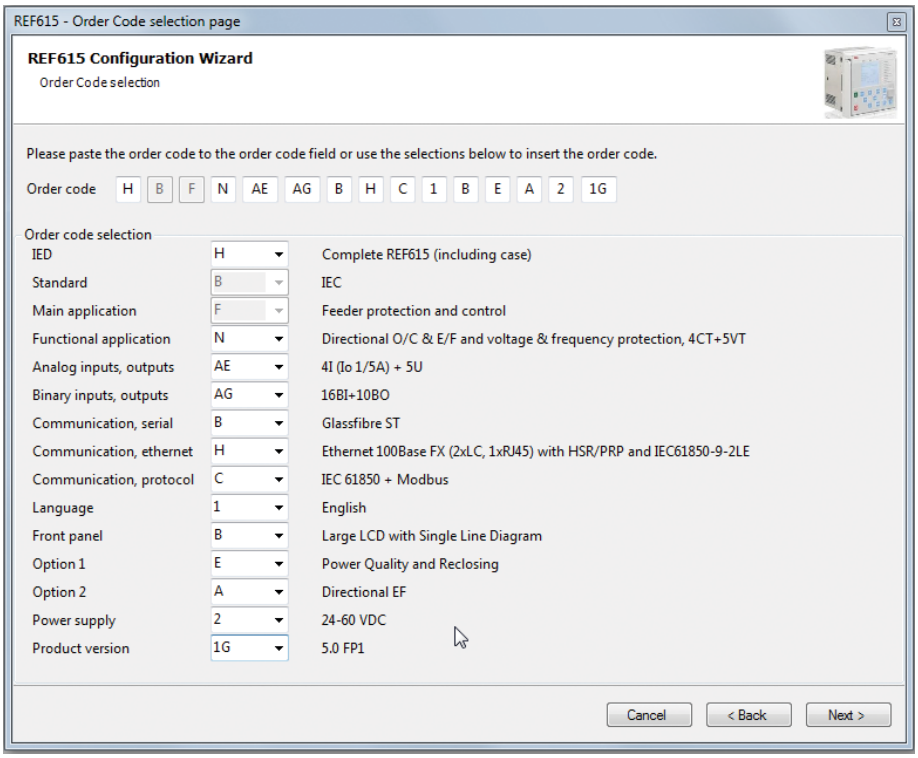

Figure 18: Selecting order codes

7. On the **Configuration selection page**, select **Example configuration**, click **Browse** to select the .pcmi file that has the example configuration, for example, REX521 B01 to REF615 template.pcmi, and click **Next**.

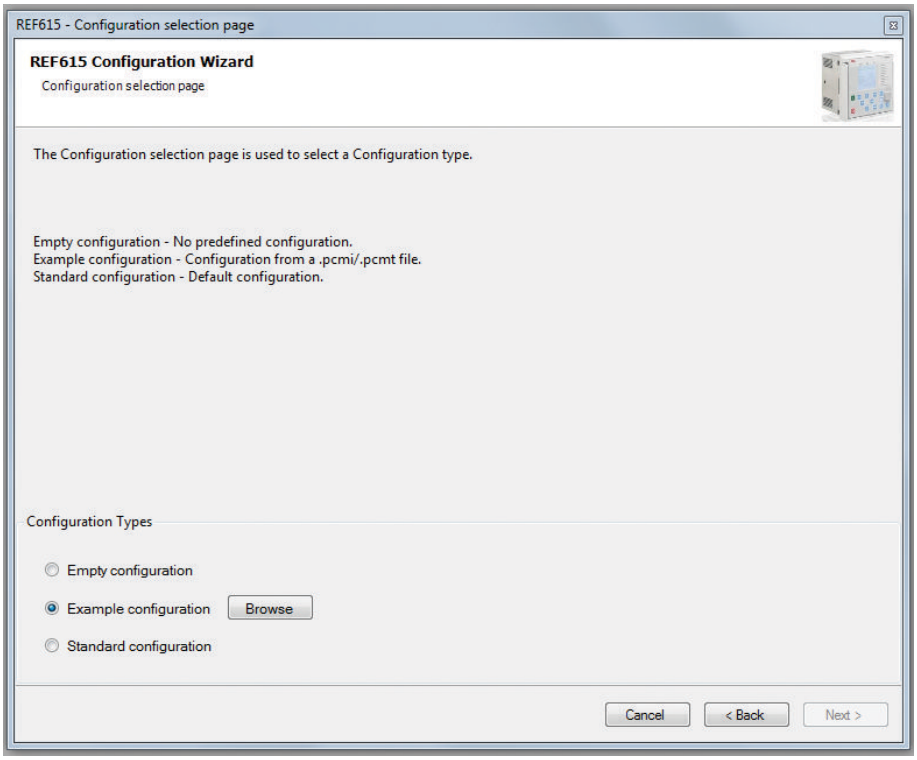

Figure 19: Selecting example configuration

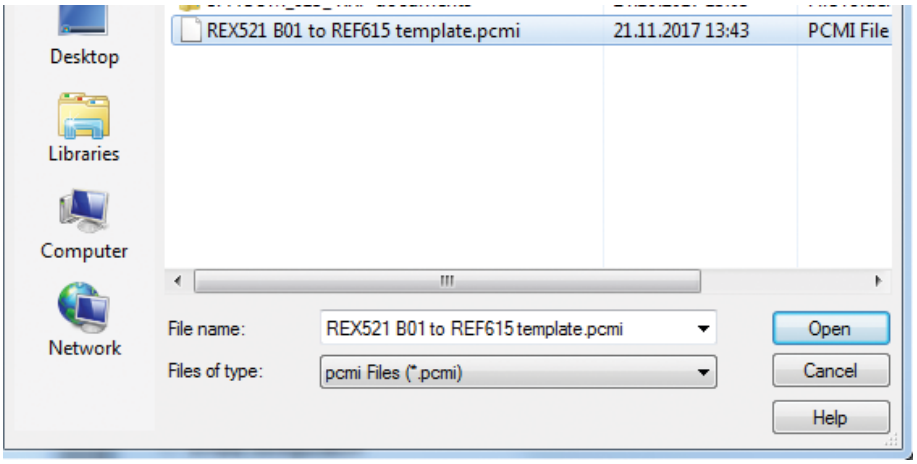

Figure 20: Selecting the configuration template

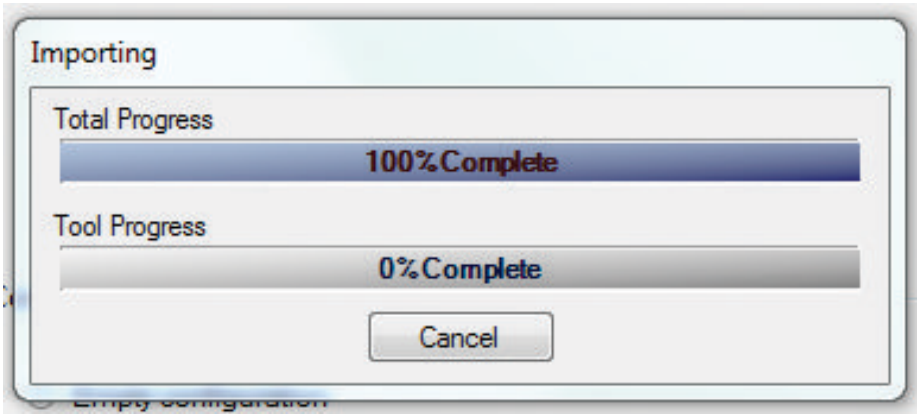

Figure 21: Importing configuration template

8. The **Setup complete** dialog shows the summary of the IED type, version, IP address and the selected order number. Click **Finish** to confirm the configuration and conduct the insertion.

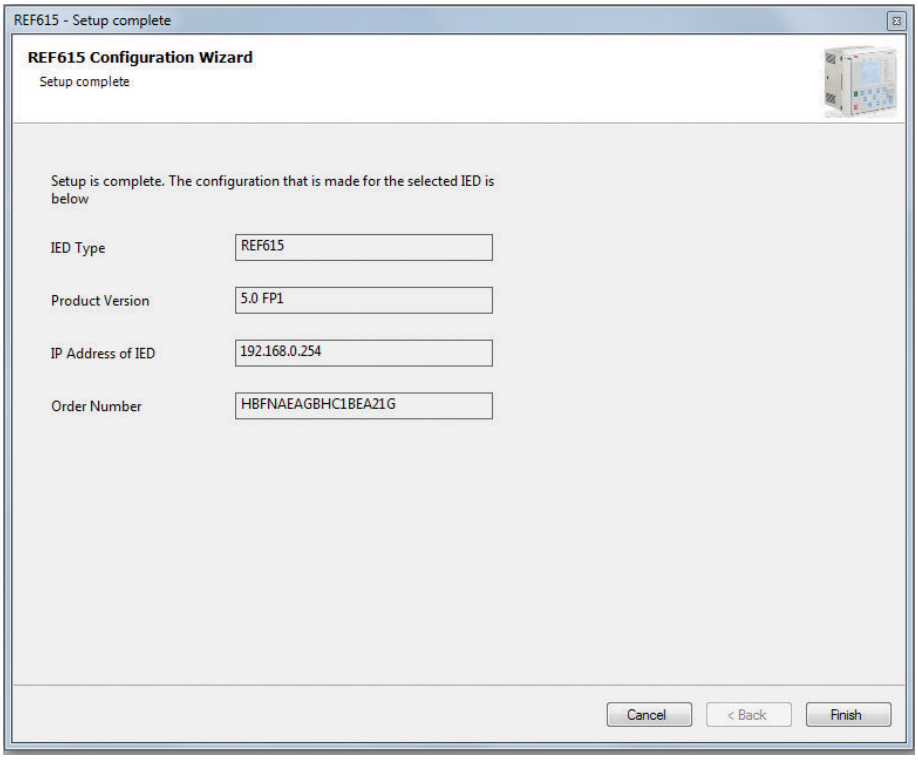

Figure 22: Viewing the summary page

9. In the **Set Technical Key** dialog, click **OK**.

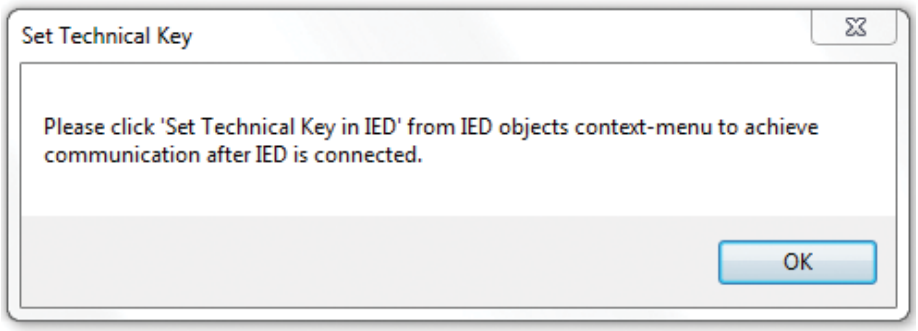

Figure 23: Acknowledging the Set Technical Key message

After all the steps are completed, the Plant Structure reflects the updates.

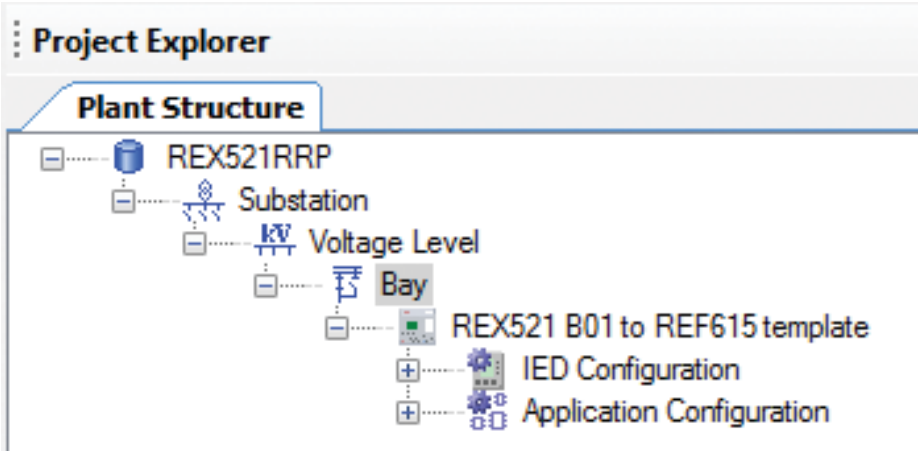

Figure 24: Updated Plant Structure

2.3.6 Migration process

The configuration template supports a migration process although several manual steps are needed to complete the relay configuration migration. Most of the steps require user input to get the information about the existing relay and the replacement relay.

- Configuring input signals
- Configuring input switchgroups
- Configuring output switchgroups
- Configuring output signals
- Configuring alarm LEDs
- Designing single-line diagram
- Changing relay parameters

The functional diagrams describe the default input, output, alarm LED and function-to-function connections in the 615 series relays. The default connections can be

viewed and changed with Application Configuration in PCM600 according to the application requirements, if necessary.

Only REX 521 migrated functions are represented in the connection diagrams. The 615 series relays also include other functions whose connections are configured according to standard configuration N in REF615 and standard configuration C in REM615. See the 615 series application manuals.

In REX 521 relays, the signals in a standard configuration can be programmed to perform various functions. Digital inputs can be connected to the different input signals, for example Blocking 1, by using selectors. Input signals can be routed to output relays, for example HSPO1, or they can be connected via the input switchgroups to inputs of the function block to perform different kinds of functions. This is done by setting the value of the input switchgroups. The output signals of the function blocks can be connected to the output relays by first selecting the needed output signals from the function blocks, for example, Trip 1 (3I>, 3I>> and so on), using the output switchgroup. Then the selected group of signals are connected to the dedicated output relays by setting the Output signal selector.

2.3.6.1 Input selectors

In REX 521, each digital input (DI1...DI9) can be routed to a specified input signal by the settings in the input signal menu (**Main menu/Configuration/Input signals**). Only one digital input per input signal can be selected.

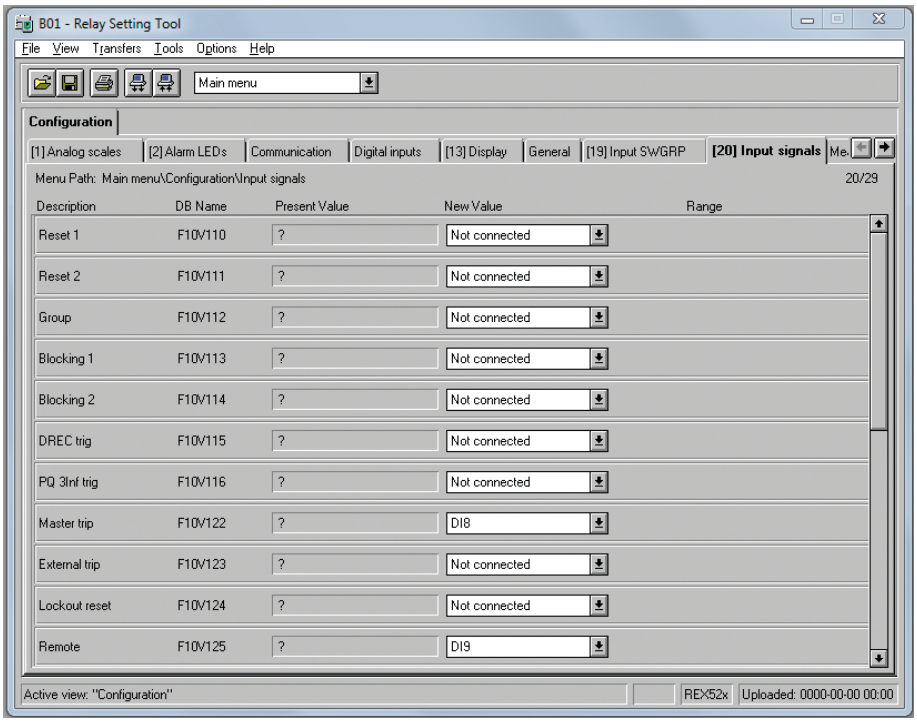

Figure 25: Input signals in REX 521

In the 615 series relay configuration templates, the same functionality can be configured in the Application Configuration Input_Signals main application.

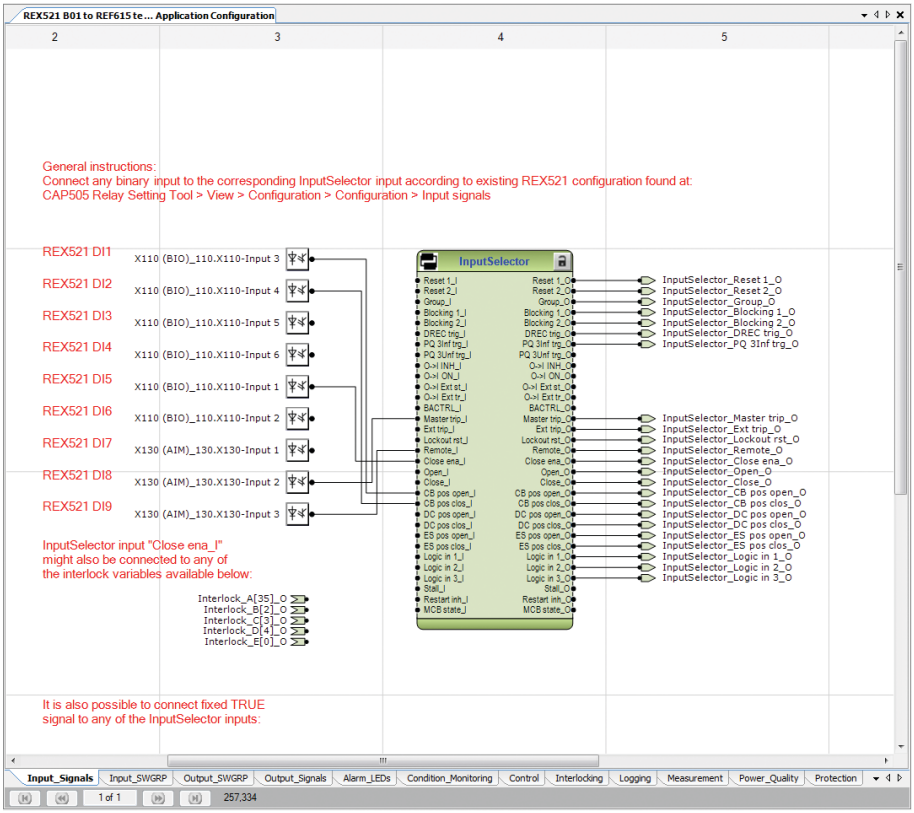

Figure 26: Input signals in the PCM600 configuration template

2.3.6.2 Input switchgroups (SWGRP)

In REX 521, switchgroups are used for connecting input signals to the inputs of the function blocks. Switchgroups allow the connection of one input signal to several function block inputs. The settings can be found in **Main menu/Configuration/Input SWGRP**.

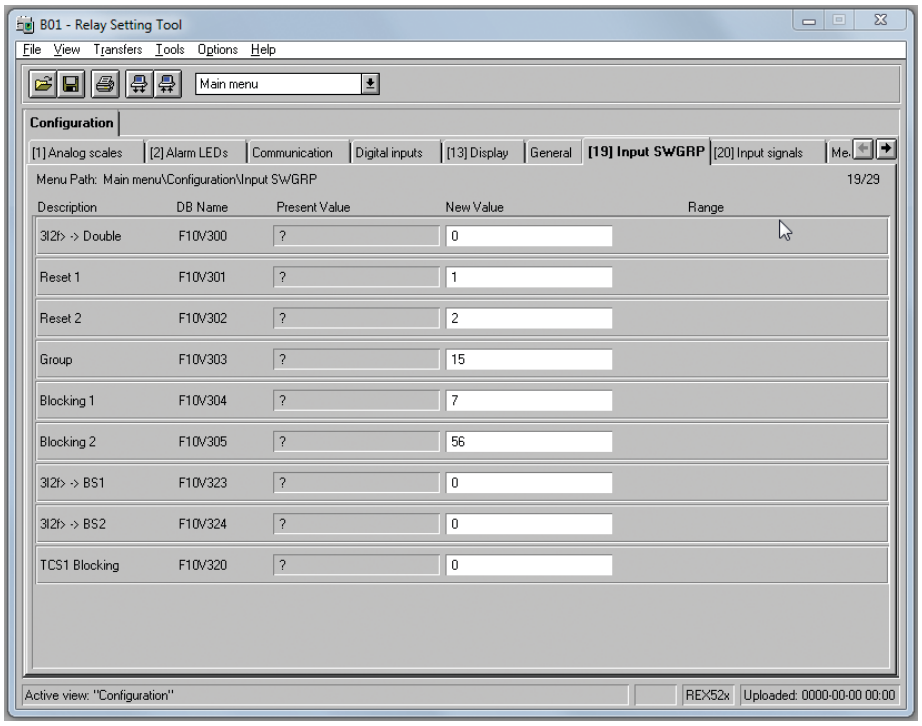

Figure 27: Input SWGRP in REX 521

In the 615 series relay configuration templates, the same functionality can be configured in the Application Configuration Input_SWGRP main application.

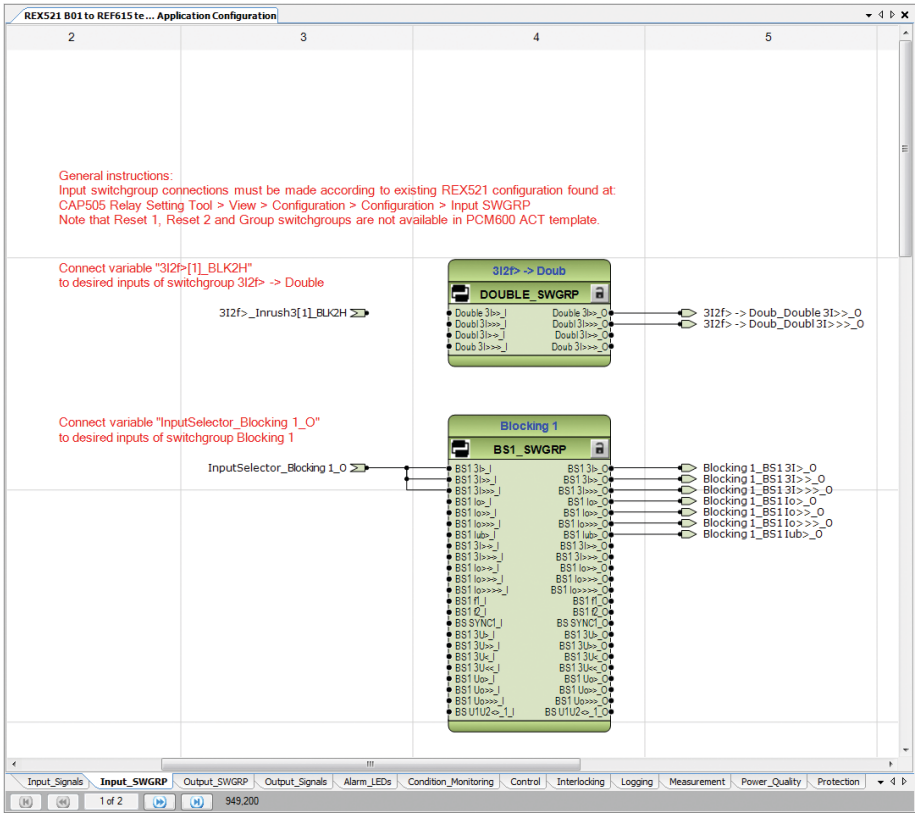

Figure 28: Input switchgroups in the PCM600 configuration template

2.3.6.3 Output switchgroups (SWGRP)

In REX 521, the outputs from the function blocks, for example start, trip and alarm signals, are routed to the output signals by using the output switchgroups. The settings can be found in **Main menu/Configuration/Output SWGRP**.

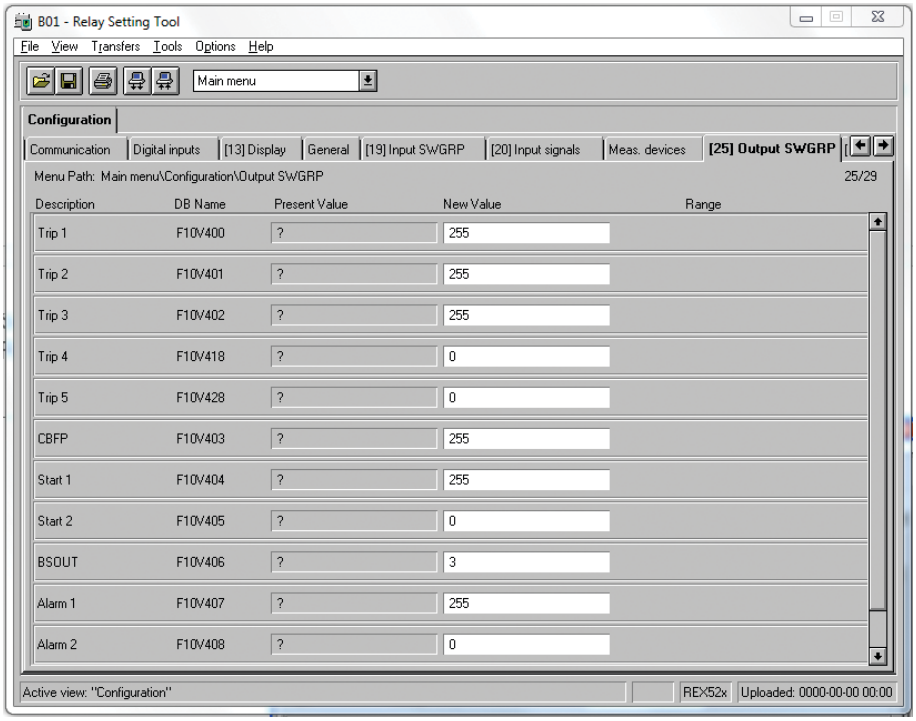

Figure 29: Output SWGRP in REX 521

In the 615 series relay configuration templates, the same functionality can be configured in the Application Configuration Output_SWGRP main application.

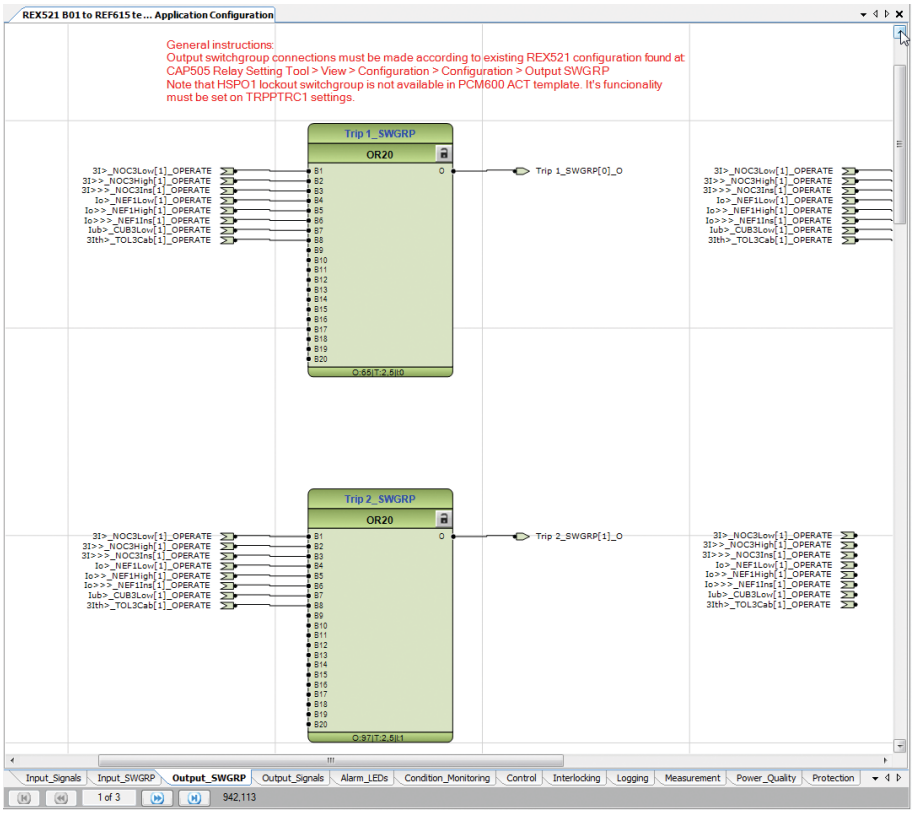

Figure 30: Output switchgroups in the PCM600 configuration template

2.3.6.4 Output signals

In REX 521, output signals, for example `Start 1` and `Trip 1`, are routed to the output relays, for example PO1, HSPO1 and SO1, by using output selectors. The settings can be found in **Main menu/Configuration/Output signals**.

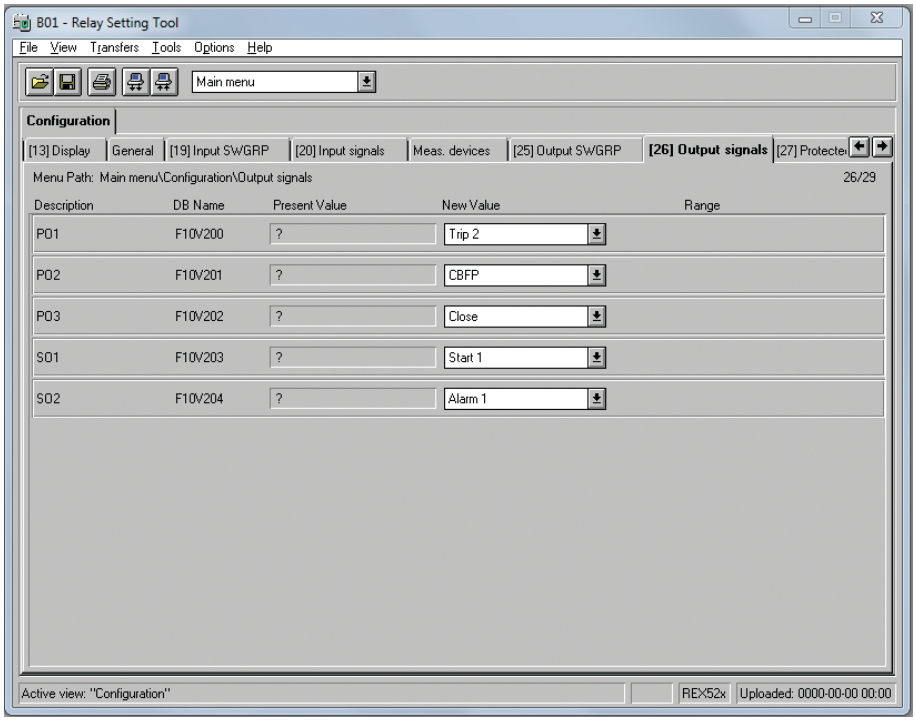

Figure 31: Output signals in REX 521

In the 615 series relay configuration templates, the same functionality can be configured in the Application Configuration Output_Signals main application.

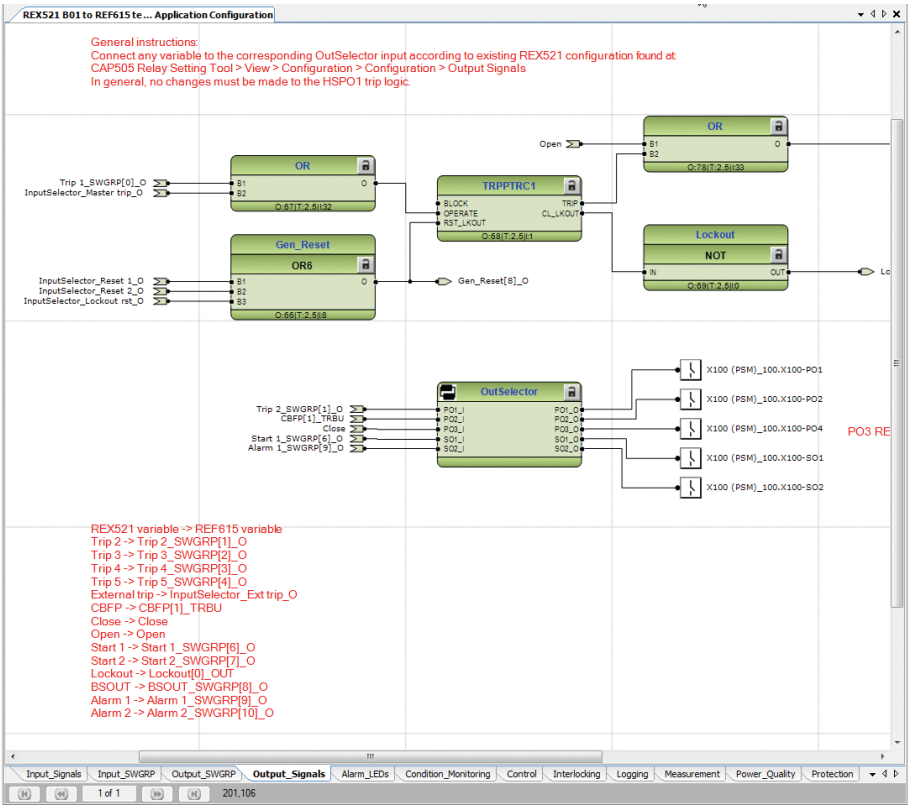

Figure 32: Output signals in the PCM600 configuration template

2.3.6.5 Alarm LEDs

In REX 521, the alarm indicating functions are used for controlling alarm LEDs. The settings can be found in **Main menu/Configuration/Alarm LEDs**.

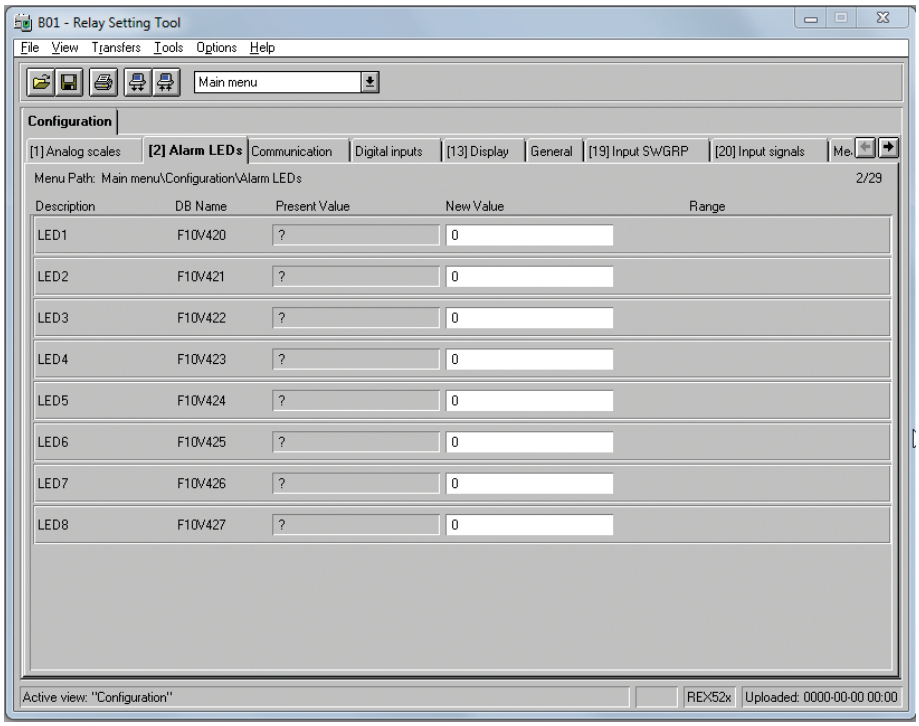

Figure 33: Alarms LEDs in REX 521

In the 615 series relay configuration templates, the same functionality can be configured in the Application Configuration Alarm_LEDs main application.

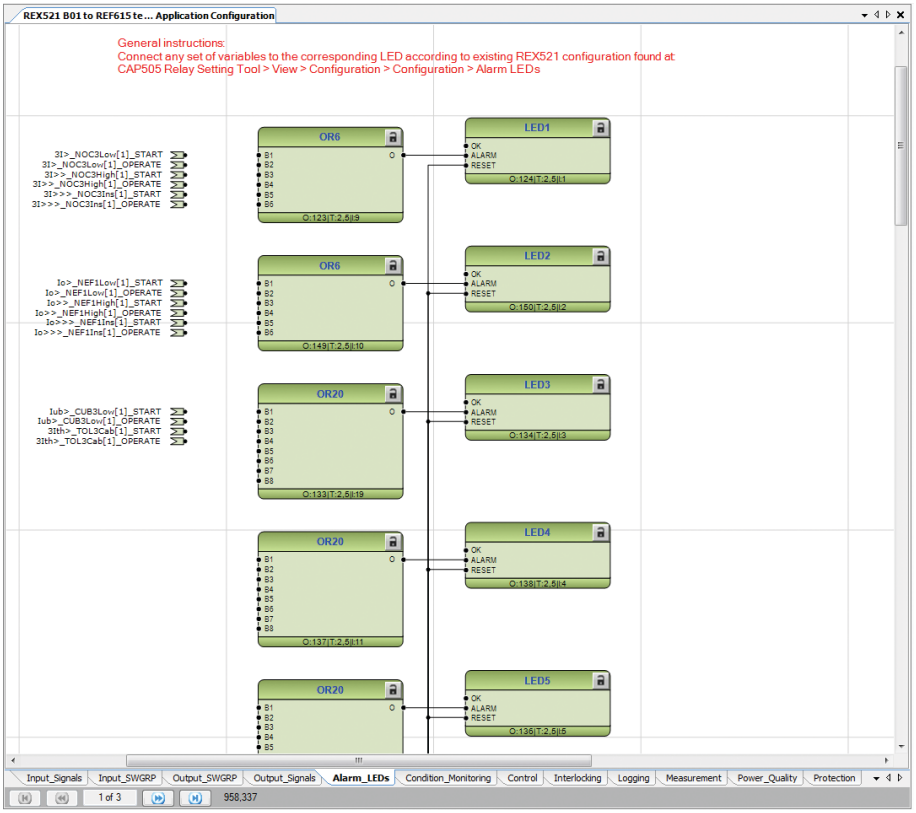

Figure 34: Alarm LEDs in the PCM600 configuration template

2.3.6.6 Single-line diagram for local HMI

A single-line diagram of the relay can be designed by using the Graphical Display Editor in PCM600. For more information, see LHMI engineering in the 615 series Engineering Manual.

2.3.6.7 Changing of relay parameter settings

After defining the correct signals, the setting parameters in the replacement relay must be set according to the settings used in REX 521.

See the REX 521 setting parameters and the corresponding 615 series functions section for details and a comparison between the existing REX 521 functions and the equivalent functions in the 615 series replacement relay.

2.4 Installation

2.4.1 Cutting tool

The cutting tool is a dedicated device used for extending the existing panel cutout in order to accommodate the new replacing relay. The tool consists of a power unit and a cutting head. The power unit is a handheld battery-operated electrohydraulic power device. The cutting head consists of three parts, a punch, a die and a gatherer. The cutting tool can be used for panel metal sheet thickness of up to 3.0 mm.

The cutting tool enables a precise quality cut. The tool guides itself during the cutting operation. The extension of the existing panel cutout can be done to the most convenient direction as the actual case requires. The cutting tool offers a safe, secure and repeatable method for cutout extension.

The cutting tool is delivered in the form of a cutting tool kit. The cutting tool kit is packed into a plastic briefcase containing the power unit, cutting head, gatherer, two batteries and a battery charger. The cutting head and new batteries are available as spare parts.

2.4.2 Mounting assembly with pre-wired terminals

An additional cutout needs to be made as the width of the existing cutout is smaller than the width of the new mounting assembly with pre-wired terminals and relay delivered under REX521RRP.

Once the required cutout has been made, the cover plate needs to be used to adjust the size of the cutout. The cover plate comes in light grey color (RAL7035 flat) and is a part of the delivered unit under Relay Retrofit Program for REX 521 relay. The relay retrofit unit is delivered with the required accessories for attachment to the panel door.

Pre-wired terminals are provided with the new 615 series replacement relay. Pre-wiring is done between the 615 series relay terminal and the orange-colored terminal set on relay retrofit unit. This facilitates remapping of I/O connections at the REX 521 terminals to the REF615 I/O terminal. Accordingly, the existing secondary wire harness of the REX 521 relay can be used.

When the terminals of the existing REX 521 relays are fitted to the pre-wired terminals, the connection is extended to the corresponding terminal of the new replacement 615 series relay. For example, when a binary input of the existing REX 521 relay is connected to the pre-wired terminals, it is referred to as being connected to the corresponding binary input of the new 615 series relay.

Apart from the secondary instrument transformer (CT and VT) wiring, the existing REX 521 relays' secondary wired terminals can be removed from and connected directly to the pre-wired terminals. Provision is made for the physical removal of CT and VT wiring from the existing REX 521 relay and its re-connection to the replacement relay.

Wire markings are provided as complete sets depending on the existing relay type. The structure of the marking is followed by the terminal numbers of the replacement relay and the terminal number of the existing relay. The press-on type markers come in white color with a printed black text.

The new wire markings have two functions. Firstly, the old markings are replaced by the new markings and the wires are connected to the right terminals of the replacement relay without wiring tables or diagrams. Secondly, in certain cases, this can eliminate the need to update the old drawings, especially if no additional wiring is added.

REF615 terminals have additional binary I/Os whose behavior does not depend on the REX 521 configuration.

The type of contacts (single or multiple pole, single or multiple throw) in the 615 series can be different from the REX 521 relays. See the REF615 standard configuration N and REM615 standard configuration C connection diagrams.

2.5 Testing and commissioning

The basic functionality of the replacement relay can be easily verified in the project laboratory before entering the site.

Always perform the final trip test (operating the circuit breaker) when the new 615 series relay is inserted into its original case as a part of the installation.

Check the current and voltage transformers' correct phasing, ratio and circuit conductivity when the 615 series relay plug-in unit is inserted into the original case as a part of the installation.

During the migration phase, the parameter settings of the existing REX 521 relay are migrated into the new replacement relay parameters and configuration. The testing phase is used to verify whether the new 615 series replacement relay is in full operation condition and the behavior corresponds to the behavior of the existing REX 521 relay.

Once the replacement relay in the PCM600 project is configured according to the existing REX 521 relay configuration and further settings specified in the replacement relay are defined correctly, the commissioning checks can be performed.

The commissioning testing of the new replacement relay ensures correctness of control and protection settings according to the existing REX 521 relay configuration and settings.

As communication configuration is not part of Relay Retrofit Program for REX 521, consider engineering and later commissioning of the communication, if needed.

Section 3 REX 521 setting parameters and the corresponding 615 series functions

3.1 Engineering tools

In retrofit applications, the target of the configuration phase is to parameterize and configure the replacement relay to reproduce the features and functions of the existing REX 521 relay. The configuration process comprises various steps with different tools depending on the project.

CAP 501/CAP 505

- Reading the configuration from REX 521 or manually reading parameter values from the HMI

PCM600

- Creating a 615 series relay under the PCM600 plant structure
  - Selecting the replacement relay type and order code
  - Importing the configuration template corresponding to the existing REX 521 relay configuration variant
  - Engineering the functionality according to the site requirement
  - Entering system parameters
- Writing configuration to the 615 series relay

Project-specific additional engineering phases

- Using Application Configuration in PCM600 to add functionality to the migrated configuration, if required
- Communication engineering with the relevant PCM600 tools, if required

No major engineering activity is required for wiring as pre-wired terminals are developed and delivered within Relay Retrofit Program for REX 521. However, it is recommended to study the existing schematic wiring diagram of REX 521.

3.2 Parametrization

The configuration of the existing REX 521 relay can be retrieved by using CAP 501 or CAP 505. Parameters can also be read from the display of REX 521.

To ensure that a protection function in the 615 series replacement relay protects the feeder in the desired manner, the default values of parameters must be checked and set before taking the function into use. These settings need to be calculated for the replacement relay. Certain basic guidelines are provided in the Setting parameter guidelines section. However, some functions need advance study depending on the application, network and protected object. These functions are recommended to be studied separately by referring to the 615 series manuals.

The parameters can be set in the replacement relays either locally over the HMI or externally using PCM600.

3.3 REX 521 functions and the corresponding 615 series functions

The configuration of REF615 contains all the functions belonging to standard configuration N and the configuration of REM615 contains all the functions belonging to standard configuration C.

After using the configuration templates delivered under Relay Retrofit Program for REX 521, only the functions that reproduce the behavior of the existing REX 521 relay configuration are available.

Table 4: Functions included in REX 521 and 615 series relays

Device number (IEC) in REX 521	Device number (ANSI) in REX 521	Function name in REX 521	Function name in 615 series relays
Protection			
3I>	51-1	NOC3Low	PHLPTOC1
3I>>	51-2	NOC3High	PHHPTOC1
3I>>>	51-3	NOC3Inst	PHIPTOC1
Io>	51N-1	NEF1Low	EFLPTOC1[1)]
Io>>	51N-2	NEF1High	EFHPTOC1
Io>>>	51N-3	NEF1Inst	EFIPTOC1
Io>-->	67N-1	DEF2Low	DEFLPDEF1
Io>>-->	67N-2	DEF2High	DEFHPDEF1[1)]
Io>>>-->	67N-3	DEF2Inst	DEFLPDEF2
3I>-->	67-1	DOC6Low	DPHLPDOC1
3I>>-->	67-2	DOC6High	DPHHPDOC1[1)]
3U>	59-1	OV3Low	PHPTOV1[1)]
3U>>	59-2	OV3High	PHPTOV2[1)]
3U<	27-1	UV3Low	PHPTUV1
3U<<	27-2	UV3High	PHPTUV2[1)]
3I2f>	68	Inrush3	INRPHAR1
Table continues on next page			

Device number (IEC) in REX 521	Device number (ANSI) in REX 521	Function name in REX 521	Function name in 615 series relays
Iub>	46	CUB3Low	PDNSPTOC1
3Ith>	49F	TOL3Cab	T1PTTR1[2)]
O-->I	79	AR5Func	DARREC1
Uo>	59N-1	ROV1Low	ROVPTOV1[1)]
Uo>>	59N-2	ROV1High	ROVPTOV2
Uo>>>	59N-3	ROV1Inst	ROVPTOV3
f1	81-1	Freq1St1	FRPFRQ1
f2	81-2	Freq1St2	FRPFRQ2
SYNC1	25-1	SCVCSt1	SECRSYN1
Is2t n<	48	MotStart	STTPMSU1
3I()	46R	PREV3	PREVPTOC1
I2>	46-1	NPS3Low	MNSPTOC1
I2>>	46-2	NPS3High	MNSPTOC2
3I<	37-1	NUC3St1	LOFLPTUC1
FUSEF	60	FuseFail	SEQSPVC1[3)]
3Ithdev>	49M/G/T	Tol3Dev	MPTTR1[2)]
U1U2<>_1	47-1	PSV3St1	PSPTUV1, NSPTOV1
Control functions			
I<->O CB1	COCB1	COCB1	CBXCBR1, SSCBR1
I<->O IND1	COIND1	COIND1	DCSXSWI1
I<->O IND2	COIND2	COIND2	ESSXSWI1
I<->O IND3	COIND3	COIND3	DCSXSWI2
I<->O POS	COLOCAT	COLOCAT	Control
ALARM1-8	ALARM1-8	MMIALAR1-8	LED1-8
Measurement			
3I	3I	MECU3A	CMMXU1
Io	Io	MECU1A	RESCMMXU1
Uo	Uo	MEVO1A	RESVMMXU1
DREC	DREC	MEDREC	RDRE1
3U	3U	MEVO3A	VMMXU1
3U_B[4)]	3U_B[4)]	MEVO3B[4)]	-
-	-	-	VMMXU2[5)]
f	f	MEFR1	FMMXU1
PQE	PQE	MEPE7	PEMMXU1
AI1[6)]	AI1[6)]	MEAI1[6)]	-
Condition monitoring			
CB wear1	CB wear1	CMBWEAR1	SSCBR1
TCS1	TCS1	CMTCS1	TCSSCBR1

Table continues on next page

Device number (IEC) in REX 521	Device number (ANSI) in REX 521	Function name in REX 521	Function name in 615 series relays
MCS 3I	MCS 3I	CMCU3	CCSPVC1[7)]
MCS 3U	MCS 3U	CMVO3	SEQSPVC1[7)]
TIME1	TIME1	CMTIME1	MDSOPT1
Power quality monitoring			
PQ 3Inf	PQ 3Inf	PQCU3H	CMHAI1[1)]
PQ 3Unf	PQ 3Unf	PQVO3H	VMHAI1[1)]
Standard			
SWGRP[8)]	SWGRP[8)]	SWGRP[8)]	-

1) Not available in REM615 standard configuration C
2) T1PTTR1 is configured in template for the Tol3Dev function in H05 and H08.
3) Also used for CMVO3
4) MEVO3B shows the calculated phase-to-phase voltages in REX 521 while in REF615, the calculated phase-to-phase voltages are shown by VMMXU1.
5) Additional measurement function in REF615 that shows U12B sync. voltage
6) Not needed, motor status seen from STTPMSU1
7) Works in a different way
8) Available as main applications Input_SWGRP and Output_SWGRP within Application Configuration in PCM600

3.4 Protection function setting migration

3.4.1 Scaling factor

The existing REX 521 relays allow scaling of the rated values of the protected unit for analog channels.

A separate scaling factor can be set for each analog channel. The factors enable differences between the ratings of the protected unit and those of the measuring device (CTs, VTs and so on). The setting value “1.00” means that the rated value of the protected unit is the same as that of the measuring device.

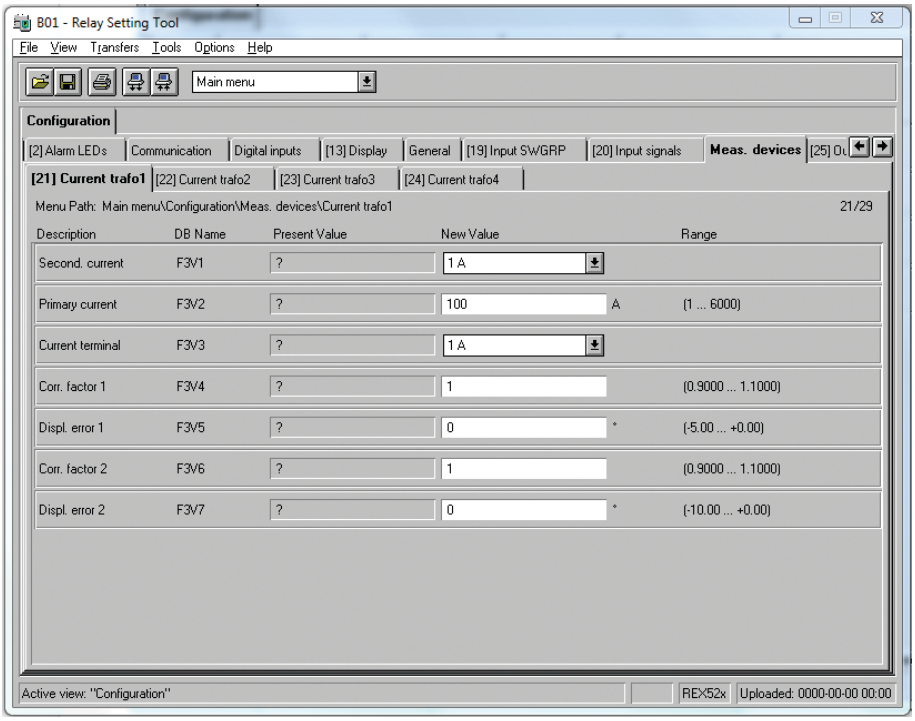

Figure 35: Current transformer ratio parameter setting in REX 521

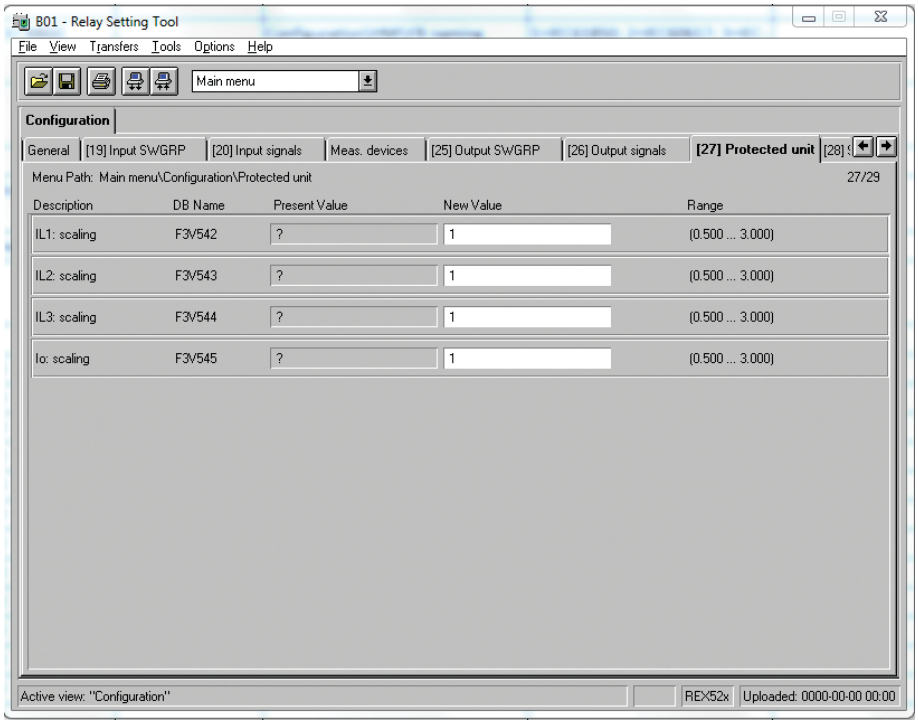

Figure 36: Scaling factor parameter setting of the protected unit in REX 521

The scaling factor is calculated channel by channel.

$$Scaling\ factor = \frac{I_{nmd}}{I_{np}}$$

(Equation 1)

I_{nmd} Rated primary current [A] of the measuring device

I_{np} Rated primary current [A] of the protected unit connected to the channel

Calculation examples

Rated primary current of current transformer I_{nmd} = 100 A

Rated current of the protected unit I_{np} = 50 A

Scaling factor for current channels is 100 A / 50 A = 2.00

The scaling factors for the analog channels can be set via the protection relay's HMI or with the Relay Setting Tool. The HMI path for the scaling factors is **Configuration/ Protected unit/ILx: scaling**. All protection functions in REX 521 consider I_n value according to this scaling factor.

Example 1

- Rated primary current of current transformer = 100 A
- Scaling factor = 1.0

Start current $1 \cdot I_n = 1 \cdot 100$ A = 100 A

Example 2

- Rated primary current of current transformer = 100 A
- Scaling factor = 2.0

Start current $1 \cdot I_n = 1 \cdot 50$ A = 50 A

The 615 series replacement relays do not allow scaling of the rated values of the protected unit for analog channels. Thus, most of the protection function settings are to be calculated in terms of the rated primary current of the current transformer.

The scaling factor can be used only in certain protection functions, for example, in Thermal overload protection for motors MPTTR and Negative-sequence overcurrent protection for machines MNSPTOC. In the 615 series relays, this is referred to as *Rated current* in those protection functions parameter settings.

The *Rated current* setting enables the difference between the rating of the protected object, that is, full load current of the motor, and that of the measuring device, that is, current transformer (CTs). The rated current I_r can be calculated using an equation.

$$I_r = \frac{IrMotor}{IrCT}$$

(Equation 2)

I_r	Rated current
IrMotor	Rated (full load) current of the motor
IrCT	Rated primary current of the current transformer

Example 3

- Current transformer ratio = 100 / 1
- Full load current of the motor = 50 A
- Relay rated secondary current, I_n = 1 A

Rated current = 50 / 100 = 0.5 · I_n

3.4.2 Parameter setting groups

The existing REX 521 relay supports two setting groups. The active setting group can be changed through the individual protections' control setting and group selection.

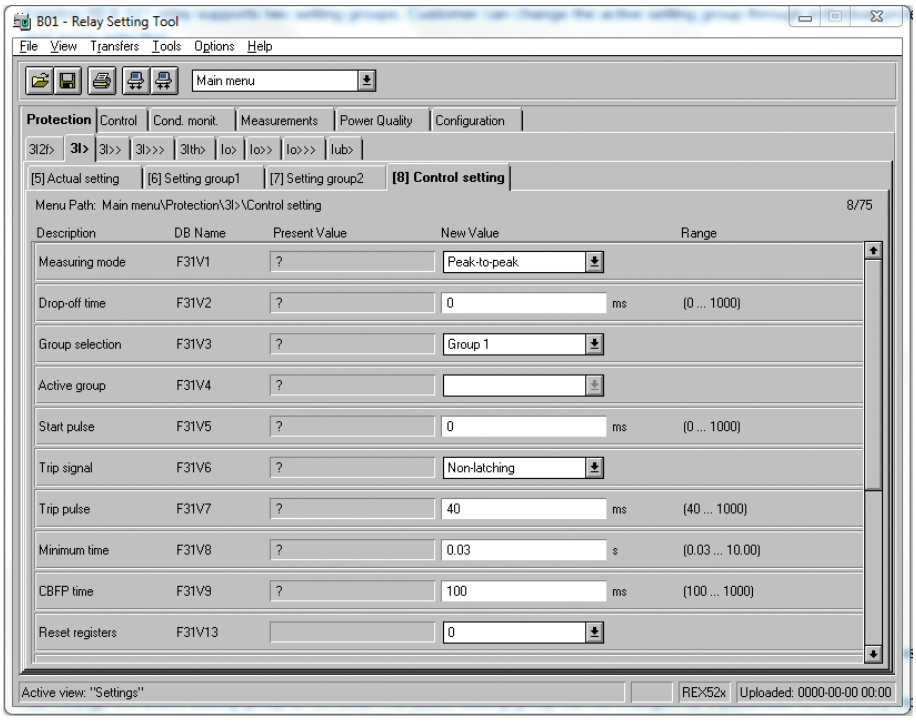

Figure 37: Group selection parameter setting in REX 521

The 615 series replacement relay supports six setting groups. Each setting group contains parameters categorized as group settings inside the application functions.

The active setting group can be changed by a parameter or via binary inputs depending on the mode selected with the *SG operation mode* setting in **Configuration/Setting Group**. This setting is applicable to all protection functions.

Check the active setting group in the existing REX 521 relay for an individual protection function and then adopt the settings accordingly in the replacement relay.

3.4.3 Common settings

The following 615 series replacement relay settings are common for all functions. However, in REX 521 they were defined for individual functions.

Table 5: Common settings

REX 521 / FB name / Setting parameter description	REX 521 function setting parameter range	REF615 (IEC) and REM615 (IEC) / FB name / Setting parameter description	REF615 (IEC) and REM615 (IEC) function setting parameter range
Group selection	0..1[0 = Group 1; 1 = Group 2; 2 = GROUP input]	Configuration\Setting group\SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2
Start pulse	0...1000 ms	Configuration\Generic timers \TPGAPC1\Pulse time	0...60000 ms
Trip signal	0..1[0 = Non-latching; 1 = Latching]	Configuration\Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout
Trip pulse	40...1000 ms	Configuration\Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms
CBFP time	100...1000 ms	Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms
-	-	Configuration/System/ Blocking mode (Behaviour for function BLOCK inputs)	1=Freeze timer 2=Block all 3=Block OPERATE output

RESET input in REX 521 and the equivalent feature in 615 series relays

In REX 521, each protection function trip output can be latched separately. For example, if the NOC3Low_ protection function operates with the latching feature on, the `TRIP` output is latched until the protection functions are reset from the HMI, over communication signal or via signal input connected to `RESET`.

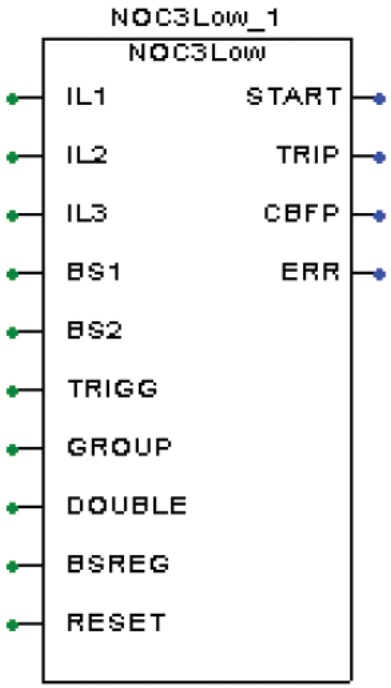

Figure 38: NOC3Low_1 function

Accordingly, the RESET input can be configured and activated separately for individual protection functions. By activating a signal to the RESET input, the protection function's TRIP signal and memorized values can be reset for an individual protection function.

In the 615 series relays, an individual protection function's TRIP signal cannot be latched, but the TRPPTRC function can be configured for latch. The activation of the signal at RST_LKOUT resets the TRPPTRC1 function block and the LEDs, but does not reset the protection functions' memorized values.

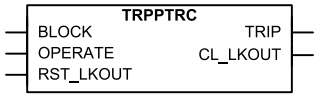

Figure 39: TRPPTRC function in 615 series relays

For example, if PHLPTOC_ protection operates, the tripping command is extended through TRPPTRC and, in this case, TRPPTRC must be reset if it is configured as latched.

3.5 Setting parameter guidelines

Table provides detailed information on the REX 521 functions and the corresponding functions in the 615 series relays. Configuration templates have been made based on

these guidelines. It is recommended to study the configuration templates in coordination with this information. The range of parameter settings is defined in the same table to provide an opportunity to study the adopted settings in the existing REX 521 relay and to calculate equivalent settings in the 615 series relay.

Functions that are not configured in templates but are supported by configurations N of REF615 and C of REM615 can be engineered separately depending on the application requirement.

Table 6: REX 521 functions and the corresponding functions in the 615 series relay configuration templates

REX 521 function	REX 521														615 series function	REF615 template	REM615 template
	B01	B02	M01	M02	H02	H03	H04	H05	H06	H07	H08	H09	H50	H51			
Protection																	
NOC3Low	x	x	x	x	x	x	x	x	x	x	x	x	x	x	PHLPTOC1	x	x
NOC3High	x	x	x	x	x	x	x	x	x	x	x	x	x	x	PHHPTOC1	x	x
NOC3Inst	x	x	x	x		x	x	x		x	x	x	x	x	PHIPTOC1	x	x
NEF1Low	x	x					x	x		x	x	x	x	x	EFLPTOC1[1)]	x	
NEF1High	x	x					x	x		x	x	x	x	x	EFHPTOC1	x	x
NEF1Inst	x	x					x	x			x	x			EFIPTOC1	x	
DEF2Low			x	x	x	x	x			x			x	x	DEFLPDEF1	x	x
DEF2High			x	x	x	x	x			x			x	x	DEFHPDEF1[1)]	x	
DEF2Inst			x	x	x	x	x								DEFLPDEF2	x	
DOC6Low					x		x						x		DPHLPDOC1	x	
DOC6High					x								x	x	DPHHPDOC1[1)]	x	
OV3Low								x	x	x	x	x	x	x	PHPTOV1[1)]	x	
OV3High								x	x	x	x	x	x		PHPTOV2[1)]	x	
UV3Low								x	x	x	x	x	x	x	PHPTUV1	x	x
UV3High								x	x	x	x	x	x		PHPTUV2[1)]	x	
Inrush3	x	x	x	x	x	x	x	x			x	x	x		INRPHAR1	x	
CUB3Low	x	x	x	x	x	x	x								PDNSPTOC1	x	
TOL3Cab	x	x	x	x	x	x	x								T1PTTR1[2)]	x	
AR5Func		x		x	x	x	x					x	x		DARREC1	x	
ROV1Low								x	x		x	x	x	x	ROVPTOV1[1)]	x	
ROV1High								x	x		x	x	x		ROVPTOV2	x	
ROV1Inst								x	x		x	x			ROVPTOV3	x	
Freq1St1					x		x		x	x		x	x	x	FRPFRQ1	x	x
Freq1St2									x			x	x	x	FRPFRQ2	x	x
SCVCSt1						x									SECRSYN1	x	
MotStart										x				x	STTPMSU1		x
PREV3										x				x	PREVPTOC1		x
NPS3Low										x				x	MNSPTOC1		x
NPS3High										x					MNSPTOC2		x
NUC3St1										x					LOFLPTUC1		x
FuseFail										x				x	SEQSPVC1[3)]		x
Tol3Dev								x		x	x			x	MPTTR1[2)]		x
PSV3St1										x			x	x	PSPTUV1, NSPTOV1	x	x
Control																	
COCB1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	CBXCBR1, SSCBR1	x	x
COIND1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	DCSXSWI1	x	x

Table continues on next page

REX 521 function	REX 521														615 series function	REF615 template	REM615 template
	B01	B02	M01	M02	H02	H03	H04	H05	H06	H07	H08	H09	H50	H51			
COIND2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	ESSXSWI1	x	x
COIND3										x				x	DCSXSWI2		x
COLOCAT	x	x	x	x	x	x	x	x	x	x	x	x	x	x	Control	x	x
MMIALAR1-8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	LED1-8	x	x
Measurement																	
MECU3A	x	x	x	x	x	x	x	x	x	x	x	x	x	x	CMMXU1	x	x
MECU1A	x	x	x	x	x	x	x	x	x	x	x	x	x	x	RESCMMXU1	x	x
MEVO1A			x	x	x	x	x	x	x	x	x	x	x	x	RESVMMXU1	x	x
MEDREC	x	x	x	x	x	x	x	x	x	x	x	x	x	x	RDRE1	x	x
MEVO3A					x	x	x	x	x	x	x	x	x	x	VMMXU1	x	x
MEVO3B[4]											x	x				x	
-						-									VMMXU2[5]	x	
MEFR1					x	x	x	x	x	x	x	x	x	x	FMMXU1	x	x
MEPE7					x	x	x	x	x	x	x	x	x	x	PEMMXU1	x	x
MEAI1[6]										x				x			x
Condition monitoring																	
CMBWEAR1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	SSCBR1	x	x
CMTCS1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	TCSSCBR1	x	x
CMCU3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	CCSPVC1[7]	x	x
CMVO3					x	x	x	x	x	x	x	x	x	x	SEQSPVC1[7]	x	x
CMTIME1										x				x	MDSOPT1		x
Power quality monitoring																	
PQCU3H	x	x	x	x	x	x	x	x	x	x	x	x	x	x	CMHAI1[1]	x	-
PQVO3H					x	x	x	x	x	x	x	x	x	x	VMHAI1[1]	x	-
Standard																	
SWGRP[8]	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x

1) Not available in REM615 standard configuration C
2) T1PTTR1 is configured in template for the Tol3Dev function in H05 and H08.
3) Also used for CMVO3
4) MEVO3B shows calculated phase-to-phase voltages in REX 521. In REF615, calculated phase-to-phase voltages are shown by VMMXU1.
5) Additional measurement function in REF615 that shows U12B sync. voltage
6) Not needed, motor status seen from STTPMSU1
7) Works in a different way
8) Available as main applications Input_SWGRP and Output_SWGRP within Application Configuration in PCM600

3.5.1 Protection functions

Table 7: Setting guidelines for the protection functions

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Three-phase non-directional overcurrent protection, low-set stage / NOC3Low			**Three-phase non-directional overcurrent protection, Low stage / PHLPTOC1**			
Operation mode	0...15 0 = Not in use 1 = Definite time 2 = Extremely inv. 3 = Very inverse 4 = Normal inverse 5 = Long-time inv. 6 = RI-type inverse 7 = RD-type inverse 8 = IEEE Ext. inv. 9 = IEEE Very inv. 10 = IEEE Inverse 11 = IEEE S.T. inv. 12 = IEEE S.T.E. inv 13 = IEEE L.T.E. inv 14 = IEEE L.T.V. inv 15 = IEEE L.T. inv.		Operation	1=on 5=off		Select “on” to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 2=ANSI Very inv. 3=ANSI Norm. inv. 4=ANSI Mod. inv. 5=ANSI Def. Time 6=L.T.E. inv. 7=L.T.V. inv. 8=L.T. inv. 9=IEC Norm. inv. 10=IEC Very inv. 11=IEC inv. 12=IEC Ext. inv. 13=IEC S.T. inv. 14=IEC L.T. inv. 15=IEC Def. Time 17=Programmable 18=RI type 19=RD type		Use the same characteristic as in NOC3Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start current	0.10...5.00 x In		Start value	0.05...5.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for PHLPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to “1.0”, use the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
IEEE time dial	0.5...15.0					Corresponds to the *Time multiplier* setting in the 615 series relays

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak 5=Wide P-to-P		Select this parameter as per requirement.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Minimum time	0.03...10.00 s		Minimum operate time	20...60000 ms		In REX 521, *Minimum time* is in seconds. In 615 series relays, *Minimum operate time* is in milliseconds.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Select this parameter as per requirement.
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Three-phase non-directional overcurrent protection, high-set stage / NOC3High			**Three-phase non-directional overcurrent protection, high stage / PHHPTOC1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 3=ANSI Norm. inv. 5=ANSI Def. Time 9=IEC Norm. inv. 10=IEC Very inv. 12=IEC Ext. inv. 15=IEC Def. Time 17=Programmable		NOC3High protection in REX 521 provides definite time and instantaneous characteristic. In 615 series relays, set “15=IEC Def. Time”.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	0.10...40.00 x In		Start value	0.10...40.00 x In		Check the value of the protected unit in REX 521 relay. This value can be seen from **Main Menu/ Configuration/Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for PHHPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. If *Operation mode* in NOC3High is set to "Instantaneous", set *Operate delay time* to 40 ms in 615 series relays.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		Time multiplier setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the start value setting is done according to scaling factor consideration.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select this parameter as per requirement.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Minimum operate time	20...60000 ms		This setting is applicable only when the IDMT curve is selected in *Operating curve type*.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Select this parameter as per requirement.
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.
Three-phase non-directional overcurrent protection, instantaneous stage / NOC3Inst			**Three-phase non-directional overcurrent protection, instantaneous stage / PHIPTOC1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	0.10...40.00 x In		Start value	1.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for PHIPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", select the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	20...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to ENA_MULT is active.
Non-directional earth-fault protection, low-set stage / NEF1Low			**Non-directional earth-fault protection, low stage / EFLPTOC1**			
Operation mode	0...15 0 = Not in use 1 = Definite time 2 = Extremely inv. 3 = Very inverse 4 = Normal inverse 5 = Long-time inv. 6 = RI-type inverse 7 = RD-type inverse 8 = IEEE Ext. inv. 9 = IEEE Very inv. 10 = IEEE Inverse 11 = IEEE S.T. inv. 12 = IEEE S.T.E. inv 13 = IEEE L.T.E. inv 14 = IEEE L.T.V. inv 15 = IEEE L.T. inv.		Operation	1=on 5=off		Select "on" to take the protection into use.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
			Operating curve type	1=ANSI Ext. inv. 2=ANSI Very inv. 3=ANSI Norm. inv. 4=ANSI Mod. inv. 5=ANSI Def. Time 6=L.T.E. inv. 7=L.T.V. inv. 8=L.T. inv. 9=IEC Norm. inv. 10=IEC Very inv. 11=IEC inv. 12=IEC Ext. inv. 13=IEC S.T. inv. 14=IEC L.T. inv. 15=IEC Def. Time 17=Programmable 18=RI type 19=RD type		Use the same characteristic as in NEF1Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	1.0...500.0 % In		Start value	0.010...5.000 x In		In REX 521, the setting is in % *In* and in 615 series relays, the setting is in x *In*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for EFLPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating depending on *Io signal Sel*. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* setting can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
IEEE time dial	0.5...15.0					Corresponds to the *Time multiplier* setting in the 615 series relays.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select this parameter as required.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Minimum time	0.03...10.00 s		Minimum operate time	20...60000 ms		In REX 521 relay, *Minimum time* is in seconds. In 615 series relays, *Minimum operate time* is in milliseconds.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Select this parameter as per requirement.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Non-directional earth-fault protection, high-set stage / NEF1High			**Non-directional earth-fault protection, high stage / EFHPTOC1**			

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 3=ANSI Norm. inv. 5=ANSI Def. Time 9=IEC Norm. inv. 10=IEC Very inv. 12=IEC Ext. inv. 15=IEC Def. Time 17=Programmable		NEF1High protection in REX 521 provides definite time and instantaneous characteristic. In 615 series relays, set "15=IEC Def. Time".
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start current	0.10...12.00 x In		Start value	0.10...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for EFHPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating depending on *Io signal Sel*. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. If *Operation mode* in NEF1High is selected as "Instantaneous", in 615 series relays, set *Operate delay time* to 40 ms.
			Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select this parameter as required.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Minimum operate time	20...60000 ms		
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Select this parameter as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Non-directional earth-fault protection, instantaneous stage / NEF1Inst			**Non-directional earth-fault protection, instantaneous stage / EFIPTOC1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
Start current	0.10...12.00 x In		Start value	1.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for EFIPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating depending on *Io signal Sel*. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operate time	0.05...300.00 s		Operate delay time	20...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *operate delay time* is in milliseconds.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Directional earth-fault protection, low-set stage / DEF2Low / Io>-->			**Directional earth-fault protection, low stage / DEFLPDEF1 / Io>-->**			
Operation mode	0...5 [0 = Not in use; 1 = Definite Time 2 = Extremely inv. 3 = Very inverse; 4 = Normal inverse; 5 = Long-time inv.]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 2=ANSI Very inv. 3=ANSI Norm. inv. 4=ANSI Mod. inv. 5=ANSI Def. Time 6=L.T.E. inv. 7=L.T.V. inv. 8=L.T. inv. 9=IEC Norm. inv. 10=IEC Very inv. 11=IEC inv. 12=IEC Ext. inv. 13=IEC S.T. inv. 14=IEC L.T. inv. 15=IEC Def. Time 17=Programmable 18=RI type 19=RD type		Use the same characteristic as in DEF2Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Oper. criteria	0...5 [0 = BasicAng & Uo; 1 = BasicAng; 2 = IoSin/Cos & Uo; 3 = IoSin/Cos; 4 = Non-dir.Io; 5 = Non-dir. Uo]		Operation mode	1=Phase angle 2=IoSin 3=IoCos 4=Phase angle 80 5=Phase angle 88		This parameter defines characteristics for directional operation. The non-directional mode can be selected in the *Directional mode* parameter setting.
Oper. direction	0...1 [0 = Forward; 1 = Reverse]		Directional mode	1=Non-directional 2=Forward 3=Reverse		Use the same setting as for *Oper. direction* in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.
Basic angle ϕb	-90...60°		Characteristic angle	-179...180°		Select the proper characteristic angle which fits the network grounding method.
Oper. charact.	0...1 [0 = IoSin(j); 1 = IoCos(j)]					This is the same as in the *Operation mode* parameter setting.
Start current	1.0...500.0 % In		Start value	0.010...5.000 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for DEFLPDEF1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521. In REX 521, the setting is in % of *In* and in 615 series relays, the setting is in x *In*.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start voltage	2.0...100.0 % Un		Voltage start value	0.010...1.000 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for DEFLPDEF1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521. In REX 521, the setting is in % of *Un* and in 615 series relays, the setting is in x *Un*.
Operate time	0.1...300.0 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
INTRPTEF	0...1 [0 = Not active; 1 = Active]					DEFxPDEF does not support intermittent earth-fault detection. For that purpose, INTRPTEF or MFADPSDE need to be used.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select as required.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as in *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Minimum time	0.03...10.00 s		Minimum operate time	40...60000 ms		In REX 521, *Minimum time* is in seconds. In 615 series relays, *Minimum operate time* is in milliseconds.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
Angle correction	0.0...10.0°		Correction angle	0.0...10.0°		The same value as in REX 521 can be used.
Oper. sector	0...1 [0 = 80°; 1 = 88°]					The parameter *Operation mode* supports both these sectors. Alternatively, use *Operation mode* = "Basic angle" and then set the sector limits (Min/Max forward/reverse angle) to 80 or 88 degrees.
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Selection of reset curve type
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.
			Allow Non Dir	0=False 1=True		"1=True" corresponds to *Oper.criteria* "4 = Non-dir".

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Enable voltage limit	0=False 1=True		"1=True" means polarizing voltage must exceed *Voltage start value*. Can be used with both directional and non-directional operation.
			Min forward angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Min reverse angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Max forward angle	0...180°		Applicable to *Operation mode* 1= Phase angle
			Max reverse angle	0...180°		Applicable to *Operation mode* 1= Phase angle
			Min operate current	0.005...1.000 x In		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small currents.
			Min operate voltage	0.01...1.00 x Un		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small voltages.
			Pol quantity	3=Zero seq. volt. 4=Neg. seq. volt.		DEF2_ function in REX 521 supported only zero sequence voltage for polarizing quantity. The same value can be used in 615 series relays.
			Pol reversal	0=False 1=True		Switch the polarizing quantity with this setting if switching of instrument transformer secondary wiring is not feasible.
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo-channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from the phase voltage channels in **Configuration/ Analog inputs/Voltage (3U,VT)**.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Directional earth-fault protection, high-set stage / DEF2High / Io>>-->			**Directional earth-fault protection, high stage / DEFHPDEF1 / Io>>-->**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 3=ANSI Norm. inv. 5=ANSI Def. Time 15=IEC Def. Time 17=Programmable		Use the same characteristic as in DEF2High *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Oper. criteria	0...5 [0 = BasicAng & Uo; 1 = BasicAng; 2 = IoSin/Cos & Uo; 3 = IoSin/Cos; 4 = Non-dir.Io; 5 = Non-dir. Uo]		Operation mode	1=Phase angle 2=IoSin 3=IoCos 4=Phase angle 80 5=Phase angle 88		This parameter defines characteristics for directional operation. The non-directional mode can be selected in the *Directional mode* parameter setting.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Oper. direction	0...1 [0 = Forward; 1 = Reverse]		Directional mode	1=Non-directional 2=Forward 3=Reverse		Use the same setting as for *Oper. direction* in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.
Basic angle ϕb	-90...60°		Characteristic angle	-179...180°		Select the proper characteristic angle which fits the network grounding method.
Oper. charact.	0...1 [0 = IoSin(j); 1 = IoCos(j)]					This is the same as in the *Operation mode* parameter setting.
Start current	1.0...500.0 % In		Start value	0.10...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for DEFHPDEF1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521. In REX 521, the setting is in % of *In* and in 615 series relays, the setting is in x *In*.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start voltage	2.0...100.0 % Un		Voltage start value	0.010...1.000 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for DEFHPDEF1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521. In REX 521, the setting is in % of *Un* and in 615 series relays, the setting is in x *Un*.
Operate time	0.1...300.0 s		Operate delay time	50...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
			Time multiplier	0.05...15.0		*Time multiplier* is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
INTRPTEF	0...1 [0 = Not active; 1 = Active]					DEFHPDEF1 does not support intermittent earth-fault detection. For that purpose INTRPTEF or MFADPSDE need to be used.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select as required.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Minimum operate time	50...60000 ms		
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
Angle correction	0.0...10.0°		Correction angle	0.0...10.0°		The same value can be used as in REX 521.
Oper. sector	0...1 [0 = 80°; 1 = 88°]					The parameter *Operation mode* supports both these sectors. Alternatively, use *Operation mode* = "Basic angle" and then set the sector limits (Min/Max forward/reverse angle) to 80 or 88 degrees.
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Selection of reset curve type
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.
			Allow Non Dir	0=False 1=True		"1 = True" corresponds *Oper.criteria* "4 = Non-dir".

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Enable voltage limit	0=False 1=True		“1 = True” means the polarizing voltage must exceed the *Voltage start value*. Can be used with both directional and non-directional operation.
			Min forward angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80...5=Phase angle 88
			Min reverse angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80...5=Phase angle 88
			Max forward angle	0...180°		Applicable to *Operation mode* 1= Phase angle
			Max reverse angle	0...180°		Applicable to *Operation mode* 1= Phase angle
			Min operate current	0.005...1.000 x In		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small currents.
			Min operate voltage	0.01...1.00 x Un		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small voltages.
			Pol quantity	3=Zero seq. volt. 4=Neg. seq. volt.		DEF2_ function in REX 521 supported only zero-sequence voltage for polarizing quantity. The same value can be used in 615 series relays.
			Pol reversal	0=False 1=True		Switch the polarizing quantity with this setting if switching of instrument transformer secondary wiring is not feasible.
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo-channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from the phase voltage channels in **Configuration/ Analog inputs/Voltage (3U,VT)**.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Directional earth-fault protection, instantaneous stage / DEF2Inst			**Directional earth-fault protection, low stage / DEFLPDEF2 / configured to achieve Io>>>--->**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 2=ANSI Very inv. 3=ANSI Norm. inv. 4=ANSI Mod. inv. 5=ANSI Def. Time 6=L.T.E. inv. 7=L.T.V. inv. 8=L.T. inv. 9=IEC Norm. inv. 10=IEC Very inv. 11=IEC inv. 12=IEC Ext. inv. 13=IEC S.T. inv. 14=IEC L.T. inv. 15=IEC Def. Time 17=Programmable 18=RI type 19=RD type		Instantaneous characteristic is not available in DEFLPDEF2 function. Select “15=IEC Def. Time”.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Oper. criteria	0...5 [0 = BasicAng & Uo; 1 = BasicAng; 2 = IoSin/Cos & Uo; 3 = IoSin/Cos; 4 = Non-dir.Io; 5 = Non-dir. Uo]		Operation mode	1=Phase angle 2=IoSin 3=IoCos 4=Phase angle 80 5=Phase angle 88		This parameter defines characteristics for directional operation. The non-directional mode can be selected in the *Directional mode* parameter setting.
Oper. direction	0...1 [0 = Forward; 1 = Reverse]		Directional mode	1=Non-directional; 2=Forward; 3=Reverse		Use the same setting as for *Oper. direction* in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.
Basic angle ϕb	-90...60°		Characteristic angle	-179...180°		Select the proper characteristic angle which fits the network grounding method.
Oper. charact.	0...1 [0 = IoSin(j); 1 = IoCos(j)]					This is the same as in the *Operation mode* parameter setting.
Start current	1.0...500.0 % In		Start value	0.010...5.000 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for DEFLPDEF2. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521. In REX 521, the setting is in % of *In* and in 615 series relays, the setting is in x *In*.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start voltage	2.0...100.0 % Un		Voltage start value	0.010...1.000 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for DEFLPDEF2. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521. In REX 521, the setting is in % of *Un* and in 615 series relays, the setting is in x *Un*.
Operate time	0.1...300.0 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. Set to 40 ms if “Instantaneous” mode is selected in the REX 521 DEF2Inst protection function. Use the same as for *Operate time* in REX 521 if “Definite time” mode is selected in the REX 521 DEF2Inst protection function.
			Time multiplier	0.05...15.0		Time multiplier setting is applicable to inverse characteristics selection in *Operating curve type*. Time multiplier setting can be the same as in REX 521 provided the start value setting is done according to scaling factor consideration.
INTRPTEF	0...1 [0 = Not active; 1 = Active]					DEFLPDEF2 does not support intermittent earth-fault detection. For that purpose INTRPTEF or MFADPSDE need to be used.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Select as required.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as in *Drop-off time* in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Minimum operate time	40...60000 ms		
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
Angle correction	0.0...10.0°		Correction angle	0.0...10.0°		Same value can be used as in REX 521.
Oper. sector	0...1 [0 = 80°; 1 = 88°]					Operation mode parameter supports both these sectors. Alternatively, use *Operation mode* = "Basic angle" and then set the sector limits (Min/Max forward/reverse angle) to 80 or 88 degrees.
Configuration \Analog scales \Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]		Io signal Sel	1=Measured Io 2=Calculated Io		For residual current Io, if "Measured Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for residual current channel **Configuration/Analog inputs/Current (Io, CT)**. If "Calculated Io" is selected, the nominal values for primary and secondary are obtained from the current transformer ratio entered for phase current channels **Configuration/Analog inputs/Current (3I, CT)**.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Selection of reset curve type
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Allow Non Dir	0=False 1=True		“1 = True” corresponds *Oper.criteria* “4 = Non-dir”.
			Enable voltage limit	0=False 1=True		“1 = True” means polarizing voltage must exceed the *Voltage start value*. Can be used with both directional and non-directional operation.
			Min forward angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Min reverse angle	0...180°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Max forward angle	0...180°		Applicable to *Operation mode* 1= Phase angle.
			Max reverse angle	0...180°		Applicable to *Operation mode* 1= Phase angle.
			Min operate current	0.005...1.000 x In		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small currents.
			Min operate voltage	0.01...1.00 x Un		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small voltages.
			Pol quantity	3=Zero seq. volt. 4=Neg. seq. volt.		DEF2_ function in REX 521 supported only zero-sequence voltage for polarizing quantity. The same value can be used in 615 series relays.
			Pol reversal	0=False 1=True		Switch the polarizing quantity with this setting if switching of instrument transformer secondary wiring is not feasible.
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from phase voltage channels given in **Configuration/Analog inputs/Voltage (3U,VT)**.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase directional overcurrent protection, low-set stage / DOC6Low			**Three-phase directional overcurrent protection, low stage / DPHLPDOC1**			
Operation mode	0...7 [0 = Not in use; 1 = Definite Time 2 = Extremely inv. 3 = Very inverse; 4 = Normal inverse; 5 = Long-time inv. 6 = RI-type inverse; 7 = RD-type inverse]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 2=ANSI Very inv. 3=ANSI Norm. inv. 4=ANSI Mod. inv. 5=ANSI Def. Time 6=L.T.E. inv. 7=L.T.V. inv. 8=L.T. inv. 9=IEC Norm. inv. 10=IEC Very inv. 11=IEC inv. 12=IEC Ext. inv. 13=IEC S.T. inv. 14=IEC L.T. inv. 15=IEC Def. Time 17=Programmable 18=RI type 19=RD type		Use the same characteristic as in DOC6Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start current	0.05...40.00 x In		Start value	0.05...5.00 x In		Max value is 40.00 x *In* in REX 521 DOC6Low protection function. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for DPHLPDOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. Use the same setting as for *Operate time* in REX 521 if “Definite Time” mode is selected in the REX 521 DOC6Low protection function.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Basic angle ϕb	0...90°		Characteristic angle	-179...180°		Select the proper characteristic angle which fits the network grounding method.
Oper. direction	0...1 [0 = Forward; 1 = Reverse]		Directional mode	1=Non-directional 2=Forward 3=Reverse		Use the same setting as for *Oper. direction* in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.
Earth fault pr.	0...1 [0 = Disabled; 1 = Enabled]					DPHLPDOC1 does not support distinguishing short circuit or earth-fault protection.
Measuring mode	0...3 [0 = Mode 1; 1 = Mode 2; 2 = Mode 3; 3 = Mode 4]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Current measurement mode to be selected according to the setting value in REX 521. No need to select whether phase-to-earth or phase-to-phase voltages are used. The function uses them both automatically depending on the *Pol. quantity* setting. See the technical manual.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched; 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Minimum time	0.03...10.00 s		Minimum operate time	20...60000 ms		In REX 521, *Minimum time* is in seconds. In 615 series relays, *Minimum operate time* is in milliseconds.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Selection of reset curve type
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to ENA_MULT is active.
			Allow Non Dir	0=False 1=True		"1 = True" corresponds *Oper.criteria* "4 = Non-dir".
			Min forward angle	0...90°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Min reverse angle	0...90°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Max forward angle	0...90°		Applicable to *Operation mode* 1= Phase angle.
			Max reverse angle	0...90°		Applicable to *Operation mode* 1= Phase angle.
			Min operate current	0.01...1.00 x In		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small currents.
			Min operate voltage	0.01...1.00 x Un		The setting is given in phase-to-phase voltage level. The function internally calculates the value for phase-to-earth voltage.
			Pol quantity	1=Self pol 4=Neg. seq. volt. 5=Cross pol 7=Pos. seq. volt.		The directional calculation compares the current phasors to the polarizing phasor. A suitable polarization quantity can be selected from the different polarization quantities, which are the positive-sequence voltage, negative-sequence voltage, self-polarizing (faulted) voltage and cross-polarizing voltages (healthy voltages).
			Voltage Mem time	0...3000 ms		The setting allows directional operation even if polarizing quantity is lost due to, for example, close fault. See the technical manual for more details.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase directional overcurrent protection, high-set stage / DOC6High			**Three-phase directional overcurrent protection, high stage / DPHHPDOC1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Instantaneous]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	1=ANSI Ext. inv. 3=ANSI Norm. inv. 5=ANSI Def. Time 9=IEC Norm. inv. 1 0=IEC Very inv. 12=IEC Ext. inv. 15=IEC Def. Time 17=Programmable		Instantaneous characteristic is not available in DPHHPDOC1 function. Select “15=IEC Def. Time”.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	0.05...40.00 x In		Start value	0.10...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for DPHHPDOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40...200000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. Set to 40 ms if “Instantaneous” mode is selected in the REX 521 DOC6High protection function. Use the same setting as for *Operate time* in REX 521 if 'def time mode is selected in the REX 521 DOC6High protection function.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Basic angle ϕb	0...90°		Characteristic angle	-179...180°		Select the proper characteristic angle which fits the network grounding method.
Oper. direction	0...1 [0 = Forward; 1 = Reverse]		Directional mode	1=Non-directional 2=Forward 3=Reverse		Use the same setting as for *Oper. direction* in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Earth fault pr.	0...1 [0 = Disabled; 1 = Enabled]					DPHHPDOC1 does not support distinguishing short circuit or earth-fault protection.
Nondir. operat.	0...1 [0 = Disabled; 1 = Enabled]		Allow Non Dir	0=False 1=True		Value = True corresponds Oper.criteria: 4 = Non-dir.
Measuring mode	0...3 [0 = Mode 1; 1 = Mode 2; 2 = Mode 3; 3 = Mode 4]		Measurement mode	1=RMS 2=DFT 3=Peak-to-Peak		Current measurement mode to be selected according to the setting value in REX 521. No need to select whether phase-to-earth or phase-to-phase voltages are used. The function uses them both automatically depending on the *Pol. quantity* setting. See the technical manual.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Use the same setting as for *Drop-off time* in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Minimum operate time	20...60000 ms		
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Type of reset curve	1=Immediate 2=Def time reset 3=Inverse reset		Selection of reset curve type.
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Start value Mult	0.8...10.0		This setting is effective only when the input signal to `ENA_MULT` is active.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Min forward angle	0...90°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Min reverse angle	0...90°		Applicable to *Operation mode* 1=Phase angle; 4=Phase angle 80; 5=Phase angle 88
			Max forward angle	0...90°		Applicable to *Operation mode* 1= Phase angle
			Max reverse angle	0...90°		Applicable to *Operation mode* 1= Phase angle
			Min operate current	0.01...1.00 x Un		Set the minimum value which allows the function to operate, that is, the function can be made insensitive to small currents.
			Min operate voltage	0.01...1.00 x Un		The setting is given in phase-to-phase voltage level. The function internally calculates the value for phase-to-earth voltage.
			Pol quantity	1=Self pol 4=Neg. seq. volt. 5=Cross pol 7=Pos. seq. volt.		The directional calculation compares the current phasors to the polarizing phasor. A suitable polarization quantity can be selected from the different polarization quantities, which are the positive-sequence voltage, negative-sequence voltage, self-polarizing (faulted) voltage and cross-polarizing voltages (healthy voltages).
			Voltage Mem time	0...3000 ms		The setting allows directional operation even if polarizing quantity is lost due to, for example, close fault. See the technical manual for more details.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase overvoltage protection, low-set stage / OV3Low			**Three-phase overvoltage protection / PHPTOV1**			

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operation mode	0...3 [0 = Not in use; 1 = Definite Time 2 = A curve; 3 = B curve]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 17=Inv. Curve A 18=Inv. Curve B 19=Inv. Curve C 20=Programmable		Use the same characteristic as in OV3Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start voltage	0.10...1.60 x Un		Start value	0.05...1.60 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for PHPTOV1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operate time	0.05...300.00 s		Operate delay time	40…300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Measuring mode	0...2 0 = Mode 1 Phase to Phase voltage / Peak to Peak measurement; 1 = Mode 2 Phase to Phase voltage / Fundamental frequency measurement; 2 = Mode 3 Phase to Earth voltage / Fundamental frequency measurement		Voltage selection	1=phase-to-earth 2=phase-to-phase		Use this setting as required.
			Reset delay time	0...60000 ms		Select this setting as required.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Oper. hysteresis	1.0...5.0 %		Relative hysteresis	1.0...5.0 %		Relative hysteresis for operation. Use the same setting as in REX 521.
			Minimum operate time	40...60000 ms		Minimum operate time for IDMT curves
			Type of reset curve	1=Immediate 2=Def time reset		Reset time functionality when the IDMT operation time curve is selected

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
			Curve Sat Relative	0.0...10.0		Tuning parameter to avoid curve discontinuities
			Type of time reset	1=Freeze Op timer 2=Decrease Op timer		Selection of time reset
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase overvoltage protection, high-set stage / OV3High			**Three-phase overvoltage protection / PHPTOV2 / configured to achieve 3U>>**			
Operation mode	0...3 [0 = Not in use; 1 = Definite Time 2 = A curve; 3 = B curve]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 17=Inv. Curve A 18=Inv. Curve B 19=Inv. Curve C 20=Programmable		Use the same characteristic as in OV3High *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start voltage	0.10...1.60 x Un		Start value	0.05...1.60 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for PHPTOV2. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40…300000 ms		In REX 521 relay, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Time multiplier	0.05...1.00		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Measuring mode	0...2 0 = Mode 1 Phase to Phase voltage / Peak to Peak measurement; 1 = Mode 2 Phase to Phase voltage / Fundamental frequency measurement; 2 = Mode 3 Phase to Earth voltage / Fundamental frequency measurement		Voltage selection	1=phase-to-earth 2=phase-to-phase		Select this setting as required.
			Reset delay time	0...60000 ms		Select this setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
Oper. hysteresis	1.0...5.0 %		Relative hysteresis	1.0...5.0 %		Relative hysteresis for operation. Use the same setting as in REX 521.
			Minimum operate time	40...60000 ms		Minimum operate time for IDMT curves
			Type of reset curve	1=Immediate 2=Def time reset		Reset time functionality when IDMT operation time curve selected
			Num of start phases	1=1 out of 3; 2=2 out of 3 3=3 out of 3		Select as required.
			Curve Sat Relative	0.0...10.0		Tuning parameter to avoid curve discontinuities
			Type of time reset	1=Freeze Op timer 2=Decrease Op timer		Selection of time reset
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase undervoltage protection, low-set stage / UV3Low			**Three-phase undervoltage protection / PHPTUV1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = C curve]		Operation	1=on 5=off		Select "on" to take the protection into use.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 21=Inv. Curve A 22=Inv. Curve B 23=Programmable		Use the same characteristic as in UV3Low *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start voltage	0.10...1.20 x Un		Start value	0.05...1.20 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for PHPTUV1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.1...300.0 s		Operate delay time	60...300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Time multiplier	0.1...1.0		Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Measuring mode	0...2 0 = Mode 1 Phase to Phase voltage / Peak to Peak measurement; 1 = Mode 2 Phase to Phase voltage / Fundamental frequency measurement; 2 = Mode 3 Phase to Earth voltage / Fundamental frequency measurement		Voltage selection	1=phase-to-earth 2=phase-to-phase		Select this setting as required.
			Reset delay time	0...60000 ms		Select this setting as required.
Voltage select.	1...7 1 = U12 2 = U23 3 = U12 & U23 4 = U31 5 = U12 & U31 6 = U23 & U31 7 = U12 & U23 & U31		Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Intern. blocking	0...1 [0 = Disabled; 1 = Enabled]		Enable block value	0=False 1=True		The low-level blocking is activated by setting “1=True” and the blocking level can be set with the *Voltage block value* parameter setting.
Oper. hysteresis	1.0...5.0 %		Relative hysteresis	1.0...5.0 %		Relative hysteresis for operation. Use the same setting as in REX 521.
			Minimum operate time	60...60000 ms		Minimum operate time for IDMT curves
			Type of reset curve	1=Immediate 2=Def time reset		Reset time functionality when IDMT operation time curve selected
			Curve Sat Relative	0.0...10.0		Tuning parameter to avoid curve discontinuities
			Type of time reset	1=Freeze Op timer 2=Decrease Op timer		Selection of time reset
			Voltage block value	0.05...1.00 x Un		In REX 521, if *Intern. blocking* is enabled then the internal blocking function is activated if at least one of the used voltage signals falls below the fixed value 0.2 x *Un*. In 615 series relays, if *Enable block value* is set to “1=True” then set *Voltage block value* to 0.2 x *Un*.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase undervoltage protection, high-set stage / UV3High			**Three-phase undervoltage protection / PHPTUV2 / configured to achieve 3U<<**			
Operation mode	0...1 [0 = Not in use; 1 = Definite time]		Operation	1=on 5=off		Select "on" to take the protection into use.

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REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 21=Inv. Curve A 22=Inv. Curve B 23=Programmable		Use the same characteristic as in UV3High *Operation mode* in REX 521.
			Curve parameter A			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter B			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter C			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter D			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
			Curve parameter E			Applicable to programmable curve selection in the *Operating curve type* setting of 615 series relays.
Start voltage	0.10...1.20 x Un		Start value	0.05...1.20 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for PHPTUV2. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.1...300.0 s		Operate delay time	60...300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *operate delay time* is in milliseconds.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Time multiplier	0.05...15.0		*Time multiplier* setting is applicable to inverse characteristics selection in *Operating curve type*. *Time multiplier* can be the same as in REX 521 provided the *Start value* setting is done according to scaling factor consideration.
Measuring mode	0...2 0 = Mode 1 Phase to Phase voltage / Peak to Peak measurement; 1 = Mode 2 Phase to Phase voltage / Fundamental frequency measurement; 2 = Mode 3 Phase to Earth voltage / Fundamental frequency measurement		Voltage selection	1=phase-to-earth 2=phase-to-phase		Select this setting as required.
			Reset delay time	0...60000 ms		Select this setting as required.
Voltage select.	1...7 1 = U12 2 = U23 3 = U12 & U23 4 = U31 5 = U12 & U31 6 = U23 & U31 7 = U12 & U23 & U31		Num of start phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Select as required.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Intern. blocking	0...1 [0 = Disabled; 1 = Enabled]		Enable block value	0=False 1=True		The low-level blocking is activated by setting “1=True” and the blocking level can be set with the *Voltage block value* parameter setting.
Oper. hysteresis	1.0...5.0 %		Relative hysteresis	1.0...5.0 %		Relative hysteresis for operation. Use the same setting as in REX 521.
			Minimum operate time	60...60000 ms		Minimum operate time for IDMT curves
			Type of reset curve	1=Immediate 2=Def time reset		Reset time functionality when IDMT operation time curve selected
			Curve Sat Relative	0.0...10.0		Tuning parameter to avoid curve discontinuities
			Type of time reset	1=Freeze Op timer 2=Decrease Op timer		Selection of time reset
			Voltage block value	0.05...1.00 x Un		In REX 521, if *Intern. blocking* is enabled, the internal blocking function is activated if at least one of the used voltage signals falls below the fixed value 0.2 x Un. In 615 series relays, if *Enable block value* is set to “1=True”, set *Voltage block value* to 0.2 x Un.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-Phase Transformer Inrush and Motor Start-Up Current Detector / Inrush3			**Three-phase inrush detector / INRPHAR**			
Operation mode	0...2 [0 = Not in use; 1 = Inrush mode; 2 = Start-up mode]		Operation	1=on 5=off		Select "on" to take the protection into use.
Ratio I2f/I1f>	5...50 %		Start value	5...100 %		Set as required OR use the same setting as in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	0.10...5.00 x In					In 615 series relays, this setting is fixed to 0.05 x *In*.
Rising time	20...60 ms		Operate delay time	20...60000 ms		
			Reset delay time	0...60000 ms		
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Phase Discontinuity Protection Function / CUB3Low			**Phase discontinuity protection / PDNSPTOC**			
Operation mode	0...1 [0 = Not in use; 1 = Definite time]		Operation	1=on 5=off		Select "on" to take the protection into use.
Start unbalance	10.0...95.0 %		Start value	10...100 %		The operation quantities differ. CUB3Low protection in REX 521 uses the relative difference of the maximum and minimum phase currents while PDNSPTOC in 615 series relays uses the relation of negative-phase sequence current to positive-phase sequence current.
Operate time	1.0...300.0 s		Operate delay time	100...30000 ms		
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay time	0...60000 ms		
			Min phase current	0.05...0.30 x In		In REX 521 CUB3Low function, this setting is fixed to 0.1 x In. Use *Min phase current* in 615 series relays as required or set it to 0.1 x In. Take the scaling factor into consideration.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Residual overvoltage protection, low-set stage / ROV1Low			**Residual overvoltage protection / ROVPTOV1**			
Operation mode	0...1 [0 = Not in use; 1 = Definite time]		Operation	1=on 5=off		Select "on" to take the protection into use.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start voltage	2.0...100.0 % Un		Start value	0.010...1.000 x Un		In REX 521, the setting is in % *Un* and in 615 series relays, the setting is in x *Un*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for ROVPTOV1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40…300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay time	0...60000 ms		Select this setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from phase voltage channels given in **Configuration/Analog inputs/Voltage (3U,VT)**.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Residual overvoltage protection, high-set stage / ROV1High			**Residual overvoltage protection / ROVPTOV2 / configured to achieve Uo>>**			
Operation mode	0...1 [0 = Not in use; 1 = Definite time]		Operation	1=on 5=off		Select "on" to take the protection into use.
Start voltage	2.0...100.0 % Un		Start value	0.010...1.000 x Un		In REX 521, the setting is in % *Un* and in 615 series relays, it is in x *Un*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for ROVPTOV2. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40…300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay time	0...60000 ms		Select this setting as required.
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from the phase voltage channels in **Configuration/ Analog inputs/Voltage (3U,VT)**.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Residual overvoltage protection, instantaneous stage / ROV1Inst			**Residual overvoltage protection / ROVPTOV3 / configured to achieve Uo>>>**			
Operation mode	0...1 [0 = Not in use; 1 = Definite time]		Operation	1=on 5=off		Select "on" to take the protection into use.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start voltage	2.0...100.0 % Un		Start value	0.010...1.000 x Un		In REX 521, the setting is in % *Un* and in 615 series relays, it is in x *Un*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for ROVPTOV3. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start voltage* in REX 521.
Operate time	0.05...300.00 s		Operate delay time	40…300000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay time	0...60000 ms		Select this setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Uo signal Sel	1=Measured Uo 2=Calculated Uo		If "Measured Uo" is selected, the voltage ratio for Uo channel is given in **Configuration/Analog inputs/Voltage (Uo,VT)**. If "Calculated Uo" is selected, the voltage ratio is obtained from the phase voltage channels in **Configuration/ Analog inputs/Voltage (3U,VT)**.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Underfrequency or Overfrequency Protection / Freq1St1 / f1			**Frequency protection / FRPFRQ1**			
			Operation	1=on 5=off		Select "on" to take the protection into use.
Operation mode	0..6 [0 = Not in use; 1 = f</f> 1 timer; 2 = f</f> 2 timers; 3 = f</f> OR df/dt>; 4 = f</f>AND df/dt>; 5 = f</f> OR df/dt<; 6 = f</f>AND df/dt<]		Operation mode	1=Freq< 2=Freq> 3=df/dt 4=Freq< + df/dt 5=Freq> + df/dt 6=Freq< OR df/dt 7=Freq> OR df/dt		The setting alternatives are different in 615 series relays. Refer to the 615 series manual for further details.
Voltage limit	0.30...0.90 x Un					
Start frequency	25.00...75.00 Hz		Start value Freq>	0.900...1.200 x Fn		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Adopt the setting according to the requirement or as per setting in REX 521 relay.
			Start value Freq<	0.800...1.100 x Fn		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Adopt the setting according to the requirement or as per setting in REX 521 relay.
Operate time 1	0.10...300.00 s		Operate Tm Freq	80...200000 ms		In REX 521, the time setting is in seconds; in 615 series relays, it is in milliseconds.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start df/dt	0.2...10.0 Hz/s		Start value df/dt	-0.2000...0.2000 x Fn/s		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Use the setting as required or as per the setting in REX 521.
Operate time 2	0.12...300.00 s		Operate Tm df/dt	120...200000 ms		In Freq1St of REX 521, the use of *Operate time 2* depends on *Operation mode*. See the REX 521 manual for more information. In REX 521, the time setting is in seconds; in 615 series relays, it is in milliseconds.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay Tm Freq	0...60000 ms		
			Reset delay Tm df/dt	0...60000 ms		
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Underfrequency or Overfrequency Protection / Freq1St2 / f2			**Frequency protection / FRPFRQ2**			
			Operation	1=on 5=off		Select "on" to take the protection into use.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operation mode	0..6 [0 = Not in use; 1 = f</f> 1 timer; 2 = f</f> 2 timers; 3 = f</f> OR df/dt>; 4 = f</f>AND df/dt>; 5 = f</f> OR df/dt<; 6 = f</f>AND df/dt<]		Operation mode	1=Freq< 2=Freq> 3=df/dt 4=Freq< + df/dt 5=Freq> + df/dt 6=Freq< OR df/dt 7=Freq> OR df/dt		The setting alternatives are different in 615 series relays. Refer to the 615 series manual for further details.
Voltage limit	0.30...0.90 x Un					
Start frequency	25.00...75.00 Hz		Start value Freq>	0.900...1.200 x Fn		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Adopt the setting according to the requirement or as per setting in the REX 521 relay.
			Start value Freq<	0.800...1.100 x Fn		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Adopt the setting according to the requirement or as per setting in the REX 521 relay.
Operate time 1	0.10...300.00 s		Operate Tm Freq	80...200000 ms		In REX 521, the time setting is in seconds; in 615 series relays, it is in milliseconds.
Start df/dt	0.2...10.0 Hz/s		Start value df/dt	-0.2000...0.2000 x Fn/s		In REX 521, the frequency setting is in Hz while in 615 series relays, it is in relation to the nominal frequency. Select the setting according to the requirement or as per the setting in REX 521.
Operate time 2	0.12...300.00 s		Operate Tm df/dt	120...200000 ms		In Freq1St of REX 521, the use of *Operate time 2* depends on *Operation mode*. See the REX 521 manual for more information. In REX 521, the time setting is in seconds; in 615 series relays, it is in milliseconds.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Reset delay Tm Freq	0...60000 ms		
			Reset delay Tm df/dt	0...60000 ms		
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Synchro-Check/Voltage-Check Function / SCVCSt1 / SYNC1			**Synchronism and energizing check / SECRSYN1**			
			Operation	1=on; 5=off		Select “on” to take the function into use.
Operation mode	0..1[0 = Command mode; 1 = Continuous mode]		Control mode	1=Continuous; 2=Command		
Energizing mode	0..4[0 = Not in use; 1 = U1->U2,U2->U1; 2 = U1->U2; 3 = U2->U1; 4 = U1>U2,U2>U1,0>0]		Live dead mode	-1=Off; 1=Both Dead; 2=Live L, Dead B; 3=Dead L, Live B; 4=Dead Bus, L Any; 5=Dead L, Bus Any; 6=One Live, Dead; 7=Not Both Live		Refer to the respective relay manuals for the correct setting criteria.
Synchro mode	0..2[0 = Not in use; 1 = Asynchr. mode; 2 = Synchr. mode]		Synchro check mode	1=Off; 2=Synchronous; 3=Asynchronous		

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REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Umax	0.50...1.00 x Un		Live line value	0.2...1.0 x Un		In REX 521, only one parameter *Umax* is available for setting. Check the value of the protected unit in the REX 521 relay. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for SECRSYN1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating.
			Live bus value	0.2...1.0 x Un		In REX 521, only one parameter *Umax* is available for setting. Check the value of the protected unit in the REX 521 relay. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for SECRSYN1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Umin	0.10...0.80 x Un		Dead line value	0.1...0.8 x Un		In REX 521, only one parameter *Umin* is available for setting. Check the value of the protected unit in the REX 521 relay. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for SECRSYN1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating.
			Dead bus value	0.1...0.8 x Un		In REX 521, only one parameter *Umin* is available for setting. Check the value of the protected unit in the REX 521 relay. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available in for SECRSYN1. Accordingly, the setting needs to be calculated in terms of voltage transformer primary rating.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Max energizing V	0.50...1.15 x Un		Refer to the manual for more information on these settings.
dU	0.02...0.60 x Un		Difference voltage	0.01...0.50 x Un		
dphase	5...90 °		Difference angle	5...90 deg		
df	0.02...5.00 Hz		Difference frequency	0.001...0.100 x Fn		
Operate time	0.1...20.0 s		Energizing time	100...60000 ms		
Check time	0.05...300.00 s		Maximum Syn time	100...6000000 ms		
			Minimum Syn time	0...60000 ms		
Close pulse	0.2...20.0 s		Close pulse	200...60000 ms		
Oper.time of CB	0.00...0.25 s		Closing time of CB	40...250 ms		
Basic angle	-90...90 °		Phase shift	-180...180 deg		
Group selection	0..1[0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator; 1=Logic mode 1; 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Voltage combine	0..1[0 = Disabled; 1 = Enabled]					
			Voltage source switch	0=False; 1=True		
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-phase Start-Up Supervision for Motors / MotStart / Is2t n<			**Motor start-up supervision / STTPMSU1**			
			Operation	1=on 5=off		Select "on" to take the protection into use.
Operation mode	0...2 [0 = Not in use; 1 = IIt; 2 = IIt & Stall]		Operation mode	1=IIt 2=IIt, CB 3=IIt + stall 4=IIt + stall, CB		The setting alternatives are different in 615 series relays. Refer to the 615 series manual for further details.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Start current	1.0...10.0 x In		Motor start-up A	1.0...10.0 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting *In* in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for STTPMSU1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating.
Start time	0.3...250.0 s		Motor start-up time	1...80 s		Use the same setting as in REX 521 or set it as per requirement.
Time limit	1.0...500.0 s		Cumulative time Lim	1...500 s		Use the same setting as in REX 521 or set it as per requirement.
Countdown rate	2.0...250.0 s/h		Counter Red rate	2.0...250.0 s/h		Use the same setting as in REX 521 or set it as per requirement.
Stall time	2.0...120.0 s		Lock rotor time	2...120 s		Use the same setting as in REX 521 or set it as per requirement.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
			Start detection A	0.1...10.0 x In		In MotStart, this is fixed to 0.9 x 1.5 x In.
			Str over delay time	0...60000 ms		In REX 521, MotStart, this is fixed to 150ms.
			Motor standstill A	0.05...0.20 x In		In REX 521, MotStart, this is fixed to 0.05 x In
			Restart inhibit time	0...250 min		Select this setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Ini start up counter	0...999999		Select this setting as required.
			Emg start Red rate	0.00...100.00 %		Select this setting as required.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Phase Reversal Protection / PREV3 / 3I()			**Phase reversal protection / PREVPTOC1**			
Operation mode	0...1 [0 = Not in use; 1 = 2-phase; 2 = 3-phase]		Operation	1=on 5=off		Select "on" to take the protection into use. All three phase currents should be connected to 615 series relays.
Operate time	0.1...10.00 s		Operate delay time	100...60000 ms		In REX 521, the time setting is in seconds; in 615 series relays, it is in milliseconds.
Rotation dir.	0...1 [0 = Forward; 1 = Reverse]					
			Start value	0.05...1.00 x In		PREV3 is based on the current phase angle comparison while PREVPTOC is based on the NPS current level.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Negative-Phase-Sequence Protection, low-set stage / NPS3Low			**Negative-sequence overcurrent protection for machines / MNSPTOC1**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Inverse time]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 17=Inv. Curve A 18=Inv. Curve B		Set “IEC Def. Time” if *Operation mode* in REX 521 is selected as “Definite time”. Check the technical manual for the selection of inverse characteristic as the inverse characteristic formula differs in 615 series relays.
Start value	0.01...0.50 x In		Start value	0.01...0.50 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for MNSPTOC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start value* in REX 521.
Operate time	0.1...120.0 s		Operate delay time	100...120000 ms		Applicable when operating curve type is selected as Definite time.
K	5.0...100.0		Machine time Mult	5.0...100.0		Use the same setting as in REX 521.
Start delay	0.1...60.0 s					

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Minimum time	0.1...120.0 s		Minimum operate time	100...120000 ms		Applicable when operating curve type is selected as inverse curves. A careful study of the particular IDMT curves is recommended.
Maximum time	500...10000 s		Maximum operate time	500000...7200000 ms		Applicable when operating curve type is selected as inverse curves. A careful study of the particular IDMT curves is recommended.
Cooling time	5...10000 s		Cooling time	5...7200 s		Use the same setting as in REX 521.
Num. of phases	2...3					All three phase currents should be connected to 615 series relays.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Dir. selection	0...2 [0 = Forward; 1 = Reverse; 2 = Input rot. dir.]		Configuration/ System/Phase rotation	1=ABC 2=ACB		A system parameter, *Phase rotation*, affects all directional protections in 615 series relays. Set the parameter according to the site requirement.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Applicable when operating curve type is selected as definite time.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Current reference	0.30...2.00 x In		Rated current (Ir) of the machine (used only in the IDMT)

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Negative-Phase-Sequence Protection, High-set stage / NPS3High			**Negative-sequence overcurrent protection for machines / MNSPTOC2 / configured to achieve I2>>**			
Operation mode	0...2 [0 = Not in use; 1 = Definite Time 2 = Inverse time]		Operation	1=on 5=off		Select "on" to take the protection into use.
			Operating curve type	5=ANSI Def. Time 15=IEC Def. Time 17=Inv. Curve A 18=Inv. Curve B		Set “IEC Def. Time” if *Operation mode* in REX 521 is selected as definite time. Check the technical manual for the selection of inverse characteristic as the inverse characteristic formula differs than in REX 521.
Start value	0.01...0.50 x In		Start value	0.01...0.50 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for MNSPTOC2. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start value* in REX 521.
Operate time	0.1...120.0 s		Operate delay time	100...120000 ms		Applicable when operating curve type is selected as Definite time.
K	5.0...100.0		Machine time Mult	5.0...100.0		Use the same setting as in REX 521.
Start delay	0.1...60.0 s					

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Minimum time	0.1...120.0 s		Minimum operate time	100...120000 ms		Applicable when operating curve type is selected as inverse curves. A careful study of the particular IDMT curves is recommended.
Maximum time	500...10000 s		Maximum operate time	500000...7200000 ms		Applicable when operating curve type is selected as inverse curves. A careful study of the particular IDMT curves is recommended.
Cooling time	5...10000 s		Cooling time	5...7200 s		Use the same setting as in REX 521.
Num. of phases	2...3					All three phase currents should be connected to 615 series relays.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Dir. selection	0...2 [0 = Forward; 1 = Reverse; 2 = Input rot. dir.]		Configuration/ System/Phase rotation	1=ABC 2=ACB		A system parameter, *Phase rotation*, affects all directional protections in REx615. Set the parameter according to the site requirement.
Drop-off time	0...1000 ms		Reset delay time	0...60000 ms		Applicable when operating curve type is selected as Definite time.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
			Current reference	0.30...2.00 x In		Rated current (Ir) of the machine (used only in the IDMT)

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Three-Phase Non-Directional Undercurrent Protection, Stage 1 / NUC3St1			**Loss of load supervision / LOFLPTUC1**			
Operation mode	0...2 [0 = Not in use; 1 = Alarm; 2= Trip]		Operation	1=on 5=off		Select "on" to take the protection into use.
Oper. criteria	0...1 [0 = 1,2,3-phase; 1 = 3-phase]					LOFLPTUC always operates with three-phase criteria, that is, the internal timer runs if all phase currents are under set "Start value high". The timer is, however, blocked if any of the phase current values is less than the set "Start value low".
Start current	0.10...0.99 x In		Start value high	0.01...1.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for LOFLPTUC1. Accordingly, the setting needs to be calculated in terms of current transformer primary rating. If the scaling factor is set to "1.0", use the same setting as for *Start current* in REX 521.
Operate time	0.1...600.0 s		Operate delay time	400...600000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Intern. blocking	0...1 [0 = Disable; 1 = Enable]					
Blocking time	0...7200 s					There is no internal blocking timer in LOFLPTUC1. For that purpose, an external blocking signal controlled by the delay timer function can be used.
			Start value low	0.01...0.50 x In		In REX 521, there is a fixed blocking current value = 0.08 x In.
Measuring mode	0...1 [0 = Peak-to-peak; 1 = Fundam.freq.]					Use as required
Drop-off time	0.00...60.00 s		Reset delay time	0...60000 ms		If the reset timer reaches the value set by Reset delay time, the operate timer resets and the START output is deactivated. Use the same setting as in REX 521.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.
CBFP time	100...1000 ms		Settings \Settings\Other protection \CCBRBRF1\CB failure delay	0...60000 ms		In 615 series relays, this setting is common to all functions.
Alarm signal	0...1 [0 = Non-latching; 1 =Latching]					

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.
Fuse Failure Supervision / FuseFail / FUSEF			**Fuse Failure Supervision / SEQSPVC1 / FUSEF**			More advanced function in 615 series relays. See the technical manual.
FuseFail	0...1 [0 = Not in use; 1 = In use]		Operation	1=on 5=off		Select "on" to take the protection into use.
Ratio U2/U1 >	10...50 %					
Ratio I2/I1 <	10...50 %					
			Min Op current delta	0.01...1.00 x In		
			Neg Seq current Lev	0.03...0.20 x In		
			Current change rate	0.01...0.50 x In		
			Change rate enable	0=False 1=True		
			Voltage change rate	0.25...0.90 x Un		
			Enable seal in	0=False 1=True		
			Min Op voltage delta	0.01...1.00 x Un		
			Seal in voltage	0.01...1.00 x Un		
			Neg Seq voltage Lev	0.03...0.20 x Un		
			Current dead Lin Val	0.05...1.00 x In		
Phase-Sequence Voltage Protection / PSV3St1			**Positive-sequence undervoltage protection / PSPTUV1 & Negative-sequence overvoltage protection / NSPTOV1**			Protection is achieved through a combination of positive-sequence undervoltage and negative-sequence overvoltage protection.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Operation mode	0..7 0 = Not in use 1 = U1< & U2> & U1> 2 = U1< & U2> 3 = U2> & U1> 4 = U1< & U1> 5 = U2> 6 = U1< 7 = U1>		Operation (PSPTUV1, NSPTOV1)	1=on 5=off		Select "on" to take the protection into use.
Start value U2>	0.01...1.00 x Un		Start value (NSPTOV1)	0.010...1.000 x Un		Use as required. Can be the same as in REX 521.
Start value U1<	0.01...1.20 x Un		Start value (PSPTUV1)	0.010...1.200 x Un		Use as required. Can be the same as in REX 521.
Start value U1>	0.80...1.60 x Un					
Operate time U2>	0.04...60.00 s		Operate delay time (NSPTOV1)	40...120000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. Use as required. Can be the same as in REX 521.
Operate time U1<	0.04...60.00 s		Operate delay time (PSPTUV1)	40...120000 ms		In REX 521, *Operate time* is in seconds. In 615 series relays, *Operate delay time* is in milliseconds. Use as required. Can be the same as in REX 521.
Operate time U1>	0.04...60.00 s					
			Reset delay time (PSPTUV1, NSPTOV1)	0...60000 ms		Select the setting as required.
Group selection	0...1 [0 = Group 1; 1 = Group 2; 2 = GROUP input]		Configuration \Setting group \SG operation mode	0=Operator 1=Logic mode 1 2=Logic mode 2		In 615 series relays, this setting is common to all functions.
Dir. selection	0...2 [0 = Forward; 1 = Reverse; 2 = Input ROT_DIR]		Configuration/ System/Phase rotation	1=ABC 2=ACB		A system parameter, *Phase rotation*, affects all directional protections in REx615. Set the parameter according to the site requirement.
Start pulse	0...1000 ms		Configuration \Generic timers \TPGAPC1\Pulse time	0...60000 ms		In 615 series relays, this setting is common to all functions.
Trip signal	0...1 [0 = Non-latching; 1 = Latching]		Configuration \Trip logic \TRPPTRC1\Trip output mode	1=Non-latched 2=Latched 3=Lockout		In 615 series relays, this setting is common to all functions.
Trip pulse	40...1000 ms		Configuration \Trip logic \TRPPTRC1\Trip pulse time	20...60000 ms		In 615 series relays, this setting is common to all functions.

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REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Intern. blocking	0...1 [0 = Disable; 1 = Enable]		Enable block value (PSPTUV1)	0=False 1=True		Select the setting as required.
			Voltage block value (PSPTUV1)	0.01...1.00 x Un		Fixed blocking voltage 0.2 x Un in REX 521
			Relative hysteresis (PSPTUV1)	1.0...5.0 %		Select the setting as required.
			Configuration/ System/ Blocking mode	1=Freeze timer 2=Block all 3=Block OPERATE output		In REX 521, the blocking feature of the protection functions can be selected separately in each function in such a way that the operation timer is frozen (BS1) or the operate output is blocked (BS2). In 615 series relays, this setting is common to all functions.

3.5.2 Control functions

Table 8: Setting guidelines for the control functions

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
COCB1 / I<->O CB1			**Circuit breaker control with indication / CBXCBR1 and SSCBR1**			
			Operation	1=on 5=off		Select "on" to take the protection into use.
			Control model	0=status-only 1=direct-with-normal-security 4=sbo-with-enhanced-security		Select the control model as required.
Fixed pulse	0...1 [0 = Variable pulse; 1 = Fixed pulse]					
Forced pulse	0...1 [0 = Single pulse; 1 = Forced pulse]					
Event delay	0.000...60.000 s		Event delay	0...10000 ms		Event delay of the intermediate position Select the setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Open pulse	0.04...100.000 s		Pulse length	10...60000 ms		Open and Close pulse length Select the setting as required.
Open alarm	0.00...100.000 s		Open alarm time (SSCBR1)	0...200 ms		Select the setting as required.
Close pulse	0.04...100.000 s					
Close alarm	0.00...100.000 s		Close alarm time (SSCBR1)	0...200 ms		Select the setting as required.
Inactive alarm	0...1825 days		Inactive Alm days (SSCBR1)	0...9999		Select the setting as required.
Cycle alarm	0...30000		Life alarm level (SSCBR1)	0...99999		Select the setting as required.
Open compens	0.000...0...20 s		Opening time Cor (SSCBR1)	-100...100 ms		Select the setting as required.
Close compens	0.000...0...20 s		Closing time Cor (SSCBR1)	-100...100 ms		Select the setting as required.
Cycle count	0...30000		Operation counter	0...10000		Select the setting as required.
Inactive time	0...3650 days		Ini inactive days (SSCBR1)	0...9999		Select the setting as required.
Alarm time	0.00...23.59		Inactive Alm hours (SSCBR1)	0...23 h		Select the setting as required.
			Adaptive pulse	0=False 1=True		
CTRL			**General parameters for control commands**			
Command timeout	50...65535 ms		Operation timeout	10...60000 ms		Use the same setting as in REX 521.
Select timeout	10...600 s		Select timeout	10000...300000 ms		In REX 521, *Select timeout* is in seconds. In 615 series relays, it is in milliseconds. Use the same setting as in REX 521.
Interl bypass	0...1 [0=Normal mode; 1=Bypass mode]					
CB close delay	0...30 s		Configuration \Control\LHMI \Close delay	5...900 s		Use the same setting as in REX 521.
COIND1 / I<->O IND1			**Object indication 1 / DCSXSWI1**			
Event delay	0.0...60.000 s		Event delay	0...60000 ms		In REX 521, *Event delay* is in seconds; in 615 series relays, it is in milliseconds. Use the same setting as in REX 521.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Cycle count	0...30000					
COIND2 / I<->O IND2			**Object indication 2 / ESSXSWI1**			
Event delay	0.0...60.000 s		Event delay	0...60000 ms		In REX 521, *Event delay* is in seconds; in 615 series relays, it is in milliseconds. Use the same setting as in REX 521.
Cycle count	0...30000					
COIND3 / I<->O IND3			**Object indication 3 / DCSXSWI2**			
Event delay	0.0...60.000 s		Event delay	0...60000 ms		In REX 521, *Event delay* is in seconds; in 615 series relays, it is in milliseconds. Use the same setting as in REX 521.
Cycle count	0...30000					
COLOCAT / I<->O POS			**Logic control position selector / Control**			Function CONTROL in 615 series relays. The function must be instantiated.
NA			LR control	1=LR key 2=Binary input		
MMIALAR1-8 / ALARM1-8			**Alarm LED 1-8 / LED1-8**			
Object mode	0...3 [0 = Nonlatched; 1 = Latched; 2 = Latched blink; 3 = Uninitialized]		Alarm mode	0=Follow-S 1=Follow-F 2=Latched-S 3=LatchedAck-F-S		See the 615 series manual and select the setting as required.
			Alarm colour	1=Green 2=Red		In 615 series relays, this setting is common to all LEDs.

3.5.3 Measurement functions

Table 9: Setting guidelines for the measurement functions

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
MECU3A / 3I			**Three-phase current measurement / CMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Phase selection	0...6 [0 = L1,L2,L3; 1 = L1,L2; 2 = L2,L3; 3 = L1,L3; 4 = L1; 5 = L2; 6 = L3]		Num of phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Number of phases required by limit supervision
Demand interval	0...5 [0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min]					The demand value calculation mode is selected with the setting parameter via **Configuration/ Measurements/A demand Av mode**. The time interval for all demand value calculations is selected with the setting parameter via **Configuration/ Measurements/Demand interval**.
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.1...25.0 % In		A deadband	100...100000		
Limit selection	0...9 [0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA]					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
High warning	80.0...500.0 % In		A high limit	0.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for CMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.
High alarm	80.0...500.0 % In		A high high limit	0.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for CMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.
Low warning	0.0...80.0 % In		A low limit	0.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for CMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Low alarm	0.0...80.0 % In		A low low limit	0.00...40.00 x In		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for CMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.
Time interval	1...600 s					615 series relays support demand interval or deadband-based intervals for updating the reported value.
			Measurement mode	1=RMS 2=DFT		Select the setting as required.
MECU1A / Io			**Neutral current measurement / RESCMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.1...25.0 % In		A deadband res	100...100000		
Limit selection	0...3 [0= Not in use; 1= HW,HA; 2= HW; 3= HA]					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
High warning	0.0...80.0 % In		A high limit res	0.00...40.00 x In		In REX 521, the setting is in % of *In*. In 615 series relays, the setting is in x *In*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for RESCMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.
High alarm	0.0...80.0 % In		A Hi high limit res	0.00...40.00 x In		In REX 521, the setting is in % of *In*. In 615 series relays, the setting is in x *In*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*In*) in REX 521 then corresponds to the rated current of the protected object. In 615 series relays, the scaling factor setting is not available for RESCMMXU1. Accordingly, the setting needs to be calculated in terms of current transformer ratio.
Time interval	1...600 s					
			Measurement mode	1=RMS 2=DFT		Select the setting as required.
MEVO1A / Uo			**Residual voltage measurement / RESVMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.1...25.0 % Un		V deadband res	100...100000		

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Limit selection	0...3 [0= Not in use; 1= HW,HA; 2= HW; 3= HA]					
High warning	2.0...100.0 % Un		V high limit res	0.00...4.00 x Un		In REX 521, the setting is in % of *Un*. In 615 series relays, the setting is in x *Un*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for RESVMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
High alarm	2.0...100.0 % Un		V Hi high limit res	0.00...4.00 x Un		In REX 521, the setting is in % of *Un*. In 615 series relays, the setting is in x *Un*. Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for RESVMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
Time interval	1...600 s					
Measuring mode	0...1 [0 = True RMS; 1 = Fundam.freq.]		Measurement mode	1=RMS 2=DFT		Select this setting as required.
MEDREC / DREC			**Transient disturbance recorder / RDRE1**			See the 615 series technical manual.
			Operation	1=on 5=off		Select "on" to take the function into use.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Periodic time	0...604800 s		Periodic trig time	0...604800 s		Select the setting as required.
Exclusion time	0...86400 s		Exclusion time	0...1000000 ms		Select the setting as required.
Operation mode	0...2 [0 = Saturation; 1 = Overwrite; 2 = Extension]		Operation mode	1=Overwrite 2=Saturation		Select the setting as required.
Pre-trg time	0...100 %		Pre-trg length	0...100 %		Select the setting as required.
Record length	10...65535 cyc.		Record length	10...500 cycles		Select the setting as required.
			Storage rate	8=8 samples / cycle 16=16 samples / cycle 32=32 samples / cycle		
			Stor. mode periodic	0=Waveform 1=Trend / cycle		
			Stor. mode manual	0=Waveform 1=Trend / cycle		
BI enable	0...65535		Operation (for Binary ch = 1...64)	1=on 5=off		Select the setting as required.
BI mode	0...65535		Level trigger mode (for Binary ch = 1...64)	1=Positive or Rising 2=Negative or Falling 3=Both; 4=Level trigger off		Select the setting as required.
			Storage mode (for Binary ch = 1...64)			
Text of BIx (x = 1...16)			Channel id text (for Binary ch = 1...64)			Select the setting as required.
Over lim. enab.	0...65535					See *High trigger level* and *Low trigger level*
Under lim. enab	0...65535					See *High trigger level* and *Low trigger level*
Over limit ILx	0.00...40.00 x In					See *High trigger level* and *Low trigger level*
Over limit Io	0.00...40.00 x In					See *High trigger level* and *Low trigger level*
Over limit Iob	0.00...40.00 x In					See *High trigger level* and *Low trigger level*
Over limit Uo	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Over limit Ux	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*
Over limit Uxy	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*
Over limit U12b	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*
Over limit IIxb	0.00...40.00 x In					See *High trigger level* and *Low trigger level*
Under limit Ux	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*
Under limit Uxy	0.00...2.00 x Un					See *High trigger level* and *Low trigger level*
AI filter time	0.000...60.000 s					
			Operation (for Analog ch = 1...64)	1=on 5=off		
AI chs used	0...15 [B0=IL1;B1=IL2;B2=IL3;B3=Io] and so on		Channel selection (for Analog ch = 1...64)	1=on 5=off		0=Disabled 1=Io 2=IL1 3=IL2 4=IL3 5=IoB 6=IL1B 7=IL2B 8=IL3B 9=Uo 10=U1 11=U2 12=U3 17=CIo 18=SI1 19=SI2 20=SU0 21=SU1 22=SU2 23=CIoB 24=SI1B 25=SI2B
Note! Read only	Text of AIx (x = 1...16)		Channel id text (for Analog ch = 1...64)			
			High trigger level (for Analog ch = 1...64)	0.00...60.00		
			Low trigger level (for Analog ch = 1...64)	0.00...2.00		
Identification	0...10000					
Main header	Default header					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
MEVO3A / 3U			**Three-phase voltage measurement / VMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Phase selection	0...6 [0 = Uch1&Uch2&Uch 3 1 = Uch1 & Uch2; 2 = Uch2 & Uch3; 3 = Uch1 & Uch3; 4 = Uch1; 5 = Uch2; 6 = Uch3]		Num of phases	1=1 out of 3 2=2 out of 3 3=3 out of 3		Number of phases required by limit supervision
Average interval	0...5 [0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min]					
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.01...1.00 x Un		V deadband	100...100000		
Limit selection	0...9 [0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA]					
High warning	0.80...1.50 x Un		V high limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
High alarm	0.80...1.50 x Un		V high high limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
Low warning	0.00...0.99 x Un		V low limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
Low alarm	0.00...0.99 x Un		V low low limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521. This value can be seen from **Main Menu/Configuration/ Protected Unit**. If it is other than "1.0", the scaling factor is considered to be adopted and setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU1. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
Time interval	1...600 s					
			Measurement mode	1=RMS 2=DFT		Select this setting as required.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
MEVO3B / 3U_B						MEVO3B shows the calculated phase-to-phase voltages in REX 521. In REF615, the calculated phase-to-phase voltages are shown by VMMXU1.
Phase selection	0..6 0 = Uch1&Uch2&Uch3 1 = Uch1 & Uch2; 2 = Uch2 & Uch3; 3 = Uch1 & Uch3; 4 = Uch1; 5 = Uch2; 6 = Uch3					
Average interval	0..5[0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min]					
Threshold select	0..3[0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.01...1.00 x Un					
Limit selection	0..9[0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA]					
High warning	0.80...1.50 x Un					
High alarm	0.80...1.50 x Un					
Low warning	0.00...0.99 x Un					
Low alarm	0.00...0.99 x Un					
Time interval	1...600 s					
			Three-phase voltage measurement / VMMXU2			Additional measurement function in REF615 that shows U12B sync. voltage
			Operation	1=on; 5=off		Select “on” to take the function into use.
			Num of phases	1=1 out of 3; 2=2 out of 3; 3=3 out of 3		Number of phases required by limit supervision
			V deadband	100...100000		

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			V high limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521 relay. This value can be seen from **Main Menu/ Configuration/Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU2. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
			V high high limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521 relay. This value can be seen from **Main Menu/ Configuration/Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU2. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
			V low limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521 relay. This value can be seen from **Main Menu/ Configuration/Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU2. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			V low low limit	0.00...4.00 x Un		Check the value of the protected unit in REX 521 relay. This value can be seen from **Main Menu/ Configuration/Protected Unit**. If it is other than “1.0”, the scaling factor is considered to be adopted and the setting (*Un*) in REX 521 then corresponds to the rated voltage of the protected object. In 615 series relays, the scaling factor setting is not available for VMMXU2. Accordingly, the setting needs to be calculated in terms of voltage transformer ratio.
			Measurement mode	1=RMS; 2=DFT		Use this setting as required.
MEFR1			**System frequency measurement / FMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Average interval	0...5 [0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min]					
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
Threshold value	0.01...5.00 Hz		F deadband	100...100000		
Limit selection	0...9 0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA					
High warning	15.00...75.00 Hz		F high limit	35.00...75.00 Hz		Select the setting as required.
High alarm	15.00...75.00 Hz		F high high limit	35.00...75.00 Hz		Select the setting as required.

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REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Low warning	10.00...60.00 Hz		F low limit	35.00...75.00 Hz		Select the setting as required.
Low alarm	10.00...60.00 Hz		F low low limit	35.00...75.00 Hz		Select the setting as required.
Voltage limit	0.30...0.90 x Un					
Time interval	1...600 s					
			Def frequency Sel	1=Nominal 2=Zero		
MEPE7 / PQE			**Three-phase power and energy measurement / PEMMXU1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Power direction	0...1 [0 = Forward; 1= Reverse]		Active power Dir	1=Forward 2=Reverse		Use the same setting as in REX 521. This also corresponds to the instrument transformer secondary connections with respect to polarity. This needs to be tested during commissioning checks.
			Reactive power Dir	1=Forward 2=Reverse		
Demand interval	0...5 [0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min]					
Energy interval	0...6 [0 = 1 min; 1 = 5 min; 2 = 10 min; 3 = 15 min; 4 = 30 min; 5 = 60 min; 6 = 120 min]					The deadband supervision is done separately for apparent power S, with the preset value of fixed 10% of Sn, and the power factor PF, with the preset values fixed at 0.10.
Threshold select	0...3 [0 = Not in use; 1 = Absolute alg.; 2 = Integrat. alg.; 3 = Time interval]					
P3 threshold	1...999999 kW					
Q3 threshold	1...999999 kVAR					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
P3 limit select.	0...9 0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA					
Q3 limit select.	0...9 0 = Not in use; 1= HW, HA, LW, LA; 2 = HW, HA; 3 = LW, LA; 4 = HW, LW; 5 = HA, LA; 6 = HW; 7 = HA; 8 = LW; 9 = LA					
P3 high warning	-999999...999999 kW					
P3 high alarm	-999999...999999 kW					
P3 low warning	-999999...999999 kW					
P3 low alarm	-999999...999999 kW					
Q3 high warning	-999999...999999 kVAR					
Q3 high alarm	-999999...999999 kVAR					
Q3 low warning	-999999...999999 kVAR					
Q3 low alarm	-999999...999999 kVAR					
Energy meas.	0...1 [0 = No energy reg.; 1 = Energy reg. on]					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
MEPEmode	0...13 0 = Not in use; 1 = U1,U2,U3 &...; 2 = U12,U23,U0 &...; 3 = U23,U31,U0 &...; 4 = U12,U31,U0 &...; 5 = U12,U23 &...; 6 = U23,U31 &...; 7 = U12,U31 &...; 8 = U1 & I1; 9 = U2 & I2; 10 = U3 & I3; 11 = U12 & I3; 12 = U23 & I1; 13 = U31 & I2					
Time interval	1...600 s					
PF Threshold	0.01...0.50					
			Power unit Mult	3=Kilo 6=Mega		
			Energy unit Mult	3=Kilo 6=Mega		
			Forward Wh Initial	0...999999999		
			Reverse Wh Initial	0...999999999		
			Forward VArh Initial	0...999999999		
			Reverse VArh Initial	0...999999999		
MEAI1 / AI1			**Analog measuring function**			Not needed, motor status seen from STTPMSU1

3.5.4 Condition monitoring functions

Table 10: Setting guidelines for the condition monitoring functions

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
CMBWEAR1 / CB wear1			**Circuit breaker electric wear 1 / SSCBR1**			See the 615 series technical manual for more details.
			Operation	1=on 5=off		Select "on" to take the function into use.
Alarm limit	1.00...30000.00		Alm Acc currents Pwr	0.00...20000.00		

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Wear L1	0.00...30000.00					
Wear L2	0.00...30000.00					
Wear L3	0.00...30000.00					
Current x/16	0.00...1000.00 kA					
Wear x/16	0.00...10000.00					
			Acc stop current	5.00...500.00 A		
			LO Acc currents Pwr	0.00...20000.00		
			Current exponent	0.00...2.00		
			Rated Op current	100.00...5000.00 A		
			Rated fault current	500.00...75000.00 A		
			Ini Acc currents Pwr	0.00...20000.00		
CMTCS1 / TCS1			**Trip-circuit supervision 1 / TCSSCBR1**			
Activation	0...1 [0 = Inactive; 1 = Active]		Operation	1=on 5=off		Select "on" to take the function into use.
Alarm delay	0...300.000 s		Operate delay time	20...300000 ms		The setting in REX 521 is in seconds whereas in 615 series relays, it is in milliseconds.
			Reset delay time	20...60000 ms		
CMCU3 / MCS 3I			**Supervision function of the energizing current input circuit / CCSPVC1 (works in a different way)**			In 615 series relays, this function works differently than in REX 521. See the 615 series manual.
Operation mode	0...1 [0 = Not in use; 1 = In use]		Operation	1=on 5=off		Select "on" to take the function into use.
Current select.	1...4 [1 = L1 & L2 & L3; 2 = L1 & L2; 3 = L1 & L3; 4 = L2 & L3]					
High limit	10...20 % In					
Low limit	2...8 % In					
Alarm delay	3.00...60.00 s					
			Start value	0.05...0.20 x In		

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
			Max operate current	1.00...5.00 x In		
CMVO3 / MCS 3U			**Supervision function of the energizing voltage input circuit / SEQSPVC1 (works in a different way)**			See the 615 series technical manual for more details.
Operation mode	0...1 [0 = Not in use; 1 = In use]		Operation	1=on 5=off		Select "on" to take the function into use.
Voltage select.	1...4 [1 = L1 & L2 & L3; 2 = L1 & L2; 3 = L1 & L3; 4 = L2 & L3]					
High limit	10...110 % Un					
Low limit	2...90 % Un					
Alarm delay	3...60 s					
			Min Op current delta	0.01...1.00 x In		
			Neg Seq current Lev	0.03...0.20 x In		
			Current change rate	0.01...0.50 x In		
			Change rate enable	0=False 1=True		
			Voltage change rate	0.05...0.90 x Un		
			Enable seal in	0=False 1=True		
			Min Op voltage delta	0.01...1.00 x Un		
			Seal in voltage	0.01...1.00 x Un		
			Neg Seq voltage Lev	0.03...0.20 x Un		
			Current dead Lin Val	0.05...1.00 x In		
CMTIME1 / TIME1			**Operation time counter / MDSOPT1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Max hours	0...87600 hours		Alarm value	0...299999 h		
			Warning value	0...299999 h		
Max mins	0...59 min					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Accum. hours	0...87600 hours		Initial value	0...299999 h		
Accum. min	0...59 min					
			Operating time hour	0...23 h		

3.5.5 Power quality monitoring functions

Table 11: Setting guidelines for the power quality monitoring functions

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
PQCU3H / PQ 3Inf			**Current waveform distortion measurement / CMHAI1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Limit THD	0.1...60.0 %		TDD alarm limit	1.0...100.0 %		
Limit 2nd harm.	0.1...40.0 % In					
Limit 3rd harm.	0.1...40.0 % In					
Limit 4th harm.	0.1...40.0 % In					
Limit 5th harm.	0.1...40.0 % In					
Limit 6th harm.	0.1...40.0 % In					
Limit 7th harm.	0.1...40.0 % In					
Limit 8th harm.	0.1...40.0 % In					
Limit 9th harm.	0.1...40.0 % In					
Limit 10th harm.	0.1...40.0 % In					
Limit 11th harm.	0.1...40.0 % In					
Limit 12th harm.	0.1...40.0 % In					
Limit 13th harm.	0.1...40.0 % In					
Cum. probability	90.0...99.5 %					
Measuring mode	0...4 [0 = Not in use; 1 = L1; 2 = L2; 3 = L3; 4 = Worst phase]					
Distort. factor	0...1 [0 = THD; 1 = TDD]					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Observation time	0...8 [0 = 1 hour; 1 = 12 hours; 2 = 1 day; 3 = 2 days; 4 = 3 days; 5 = 4 days; 6 = 5 days; 7 = 6 days; 8 = 1 week]		Demand interval	0=1 minute 1=5 minutes 2=10 minutes 3=15 minutes 4=30 minutes 5=60 minutes 6=180 minutes		
Trigger mode	0...2 [0 = Single; 1 = Continuous; 2 = Periodic]					
Trigger year	1980...2400					
Trigger month	1...12					
Trigger day	1...31					
Trigger hour	0...23					
Selected harm.	0...12 [0 = THD; 1 = 2nd harmonic; 2 = 3rd harmonic; 3 = 4th harmonic; 4 = 5th harmonic; 5 = 6th harmonic; 6 = 7th harmonic; 7 = 8th harmonic; 8 = 9th harmonic; 9 = 10th harmonic; 10 = 11th harmonic; 11 = 12th harmonic; 12 = 13th harmonic]					
			Initial Dmd current	0.10...1.0 x In		
			Demand window	1=Sliding 2=Non-sliding		
PQVO3H / PQ 3Unf			**Voltage waveform distortion measurement / VMHAI1**			
			Operation	1=on 5=off		Select "on" to take the function into use.
Limit THD	0.1...30.0 %		THD alarm limit	1.0...100.0 %		
Limit 2nd harm.	0.1...20.0 % Un					
Limit 3rd harm.	0.1...20.0 % Un					
Limit 4th harm.	0.1...20.0 % Un					
Limit 5th harm.	0.1...20.0 % Un					
Limit 6th harm.	0.1...20.0 % Un					
Limit 7th harm.	0.1...20.0 % Un					
Limit 8th harm.	0.1...20.0 % Un					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Limit 9th harm.	0.1...20.0 % Un					
Limit 10th harm.	0.1...20.0 % Un					
Limit 11th harm.	0.1...20.0 % Un					
Limit 12th harm.	0.1...20.0 % Un					
Limit 13th harm.	0.1...20.0 % Un					
Cum. probability	90.0...99.5 %					
Measuring mode	0...8 [0 = Not in use; 1 = L1; 2 = L2; 3 = L3; 4 = Worst phase; 5 = L1-L2; 6 = L2-L3; 7 = L3-L1; 8 = Worst main]					
Distort. factor	0...1 [0 = THD; 1 = TDD]					
Observation time	0...8 [0 = 1 hour; 1 = 12 hours; 2 = 1 day; 3 = 2 days; 4 = 3 days; 5 = 4 days; 6 = 5 days; 7 = 6 days; 8 = 1 week]		Demand interval	0=1 minute 1=5 minutes 2=10 minutes 3=15 minutes 4=30 minutes 5=60 minutes 6=180 minutes		
Trigger mode	0...2 [0 = Single; 1 = Continuous; 2 = Periodic]					
Trigger year	1980...2400					
Trigger month	1...12					
Trigger day	1...31					

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
Trigger hour	0...23					
Selected harm.	0...12 [0 = THD; 1 = 2nd harmonic; 2 = 3rd harmonic; 3 = 4th harmonic; 4 = 5th harmonic; 5 = 6th harmonic; 6 = 7th harmonic; 7 = 8th harmonic; 8 = 9th harmonic; 9 = 10th harmonic; 10 = 11th harmonic; 11 = 12th harmonic; 12 = 13th harmonic]					
			Demand window	1=Sliding 2=Non-sliding		

3.5.6 System software functions

Table 12: Setting guidelines for system software functions

REX 521			615 series relays			Comments
Function block / Parameter	**Setting range**	**Existing setting**	**Function block / Parameter**	**Setting range**	**Setting to be used in 615 series relays**	
MEAS			**Technical data of measuring channels**			
Rated frequency	50.00...60.00 Hz		Configuration \System\Rated frequency	1=50Hz 2=60Hz		
Select Io	0...2 [0=Io, 1/5 A; 1=Iob, 0.2/1 A; 2=Ios]					Select as per relay hardware.
DIPO			**Digital input filtering**			
Input..filter	1...65535 ms		Configuration \I/O modules \X1..\Input filtering \Input..filter time	5...1000 ms		See the installation manual for the input number. Select the filter time according to the site requirement and the existing REX 521 filter time setting.
Input..invert.	0...1		Configuration \I/O modules \X1..\Input filtering \Input..inversion	0=False 1=True		See the installation manual for the input number. Select the setting according to the site requirement and the existing REX 521 setting.
MMI			**Graphical MMI module**			

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
New trip indic.	0...999 (999=indefinite) min					
Primary values	0...1 [0=Per unit values; 1=Primary values]					
Start led latch	0...1 [0= Non-latching; 1=Latching]					
FB naming conv.	0...1 [0= IEC; 1= ANSI]		Configuration \HMI\FB naming convention	1=IEC61850 2=IEC60617 3=IEC-ANSI		Select the setting as required.
			General parameters			
Active language	0...20 [0=English; 1...20=Other language]		Language \Language selection	1=English (us,iec) 2...36=Other language		Select the setting as required.
Bay name	ABB (16 characters)		Configuration \System\Bay name	REx615 (20 characters)		Select the setting as required.
			Protected unit			See the scaling factor description.
IL1: scaling	0.500...3.000					
IL2: scaling	0.500...3.000					
IL3: scaling	0.500...3.000					
Io: scaling	0.500...3.000					
Iob: scaling	0.500...3.000					
Uo: scaling	0.500...3.000					
U1: scaling	0.500...3.000					
U2: scaling	0.500...3.000					
U3: scaling	0.500...3.000					
U12: scaling	0.500...3.000					
U23: scaling	0.500...3.000					
U31: scaling	0.500...3.000					
U12b: scaling	0.500...3.000					
TMA			Time management			
Date	Date only		Configuration \Time\System time\Date			
Time	Time only		Configuration \Time\System time\Time			

Table continues on next page

REX 521			615 series relays			Comments
Function block / Parameter	Setting range	Existing setting	Function block / Parameter	Setting range	Setting to be used in 615 series relays	
Sync. source	0...1 [0 = Net message; 1 = X3.1.2 input]		Configuration \Time \Synchronization\Synch source	0=None 1=SNTP 2=Modbus 3=IEEE 1588 5=IRIG-B 8=Line differential 9=DNP 16=IEC60870-5-101 17=IEC60870-5-103 18=IEC60870-5-104		
Sync. rounding	0...1 [0 = Full seconds; 1 = Full minutes]					
Sync.trigg.slope	0...1 [0 = Positive; 1 = Negative]					

Section 4 Glossary

615 series	Series of numerical protection and control relays for protection and supervision applications of utility substations, and industrial switchgear and equipment
COMTRADE	Common format for transient data exchange for power systems. Defined by the IEEE Standard.
DNP3	A distributed network protocol originally developed by Westronic. The DNP3 Users Group has the ownership of the protocol and assumes responsibility for its evolution.
EMC	Electromagnetic compatibility
HMI	Human-machine interface
IEC	International Electrotechnical Commission
IEC 60870-5-103	1. Communication standard for protective equipment 2. A serial master/slave protocol for point-to-point communication
IEC 61850	International standard for substation communication and modeling
IEC 61850-9-2 LE	Lite Edition of IEC 61850-9-2 offering process bus interface
LCD	Liquid crystal display
LCM	Life cycle management
LED	Light-emitting diode
LHMI	Local human-machine interface
Modbus	A serial communication protocol developed by the Modicon company in 1979. Originally used for communication in PLCs and RTU devices.
PCM600	Protection and Control IED Manager
WHMI	Web human-machine interface

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