

Dear Reader,

Having racked up over 25 years of experience, the COMBIFLEX<sup>®</sup> mounting and engineering system for relay and control panels now has been revitalized with a number of new products, new production lines, new pricing and distribution. New possibilities have opened up in conjunction with retrofit, extensions and rebuilding of plants. New technology based on microprocessors have resulted in new products. Old trusted friends have been updated. More efficient relays now replace several earlier types. The new range offers modular plug-in relays for all power system needs. You only pay for what you need, from the basic auxiliary relay to more complex combinations of protection and control functions.

Our new production technology result in lower prices, faster deliveries and a higher service degree. In addition you get our best possible service and support before and after delivery. As always, COMBIFLEX<sup>®</sup> provides more than just relays to our customers.

During the last few years a lot of new products have been created in the COMBIFLEX range in order to suit existing and also new installations. As a consequence, some older relay types have been discontinued. This is a continuing process. We have created a listing at the end of the Buyer's Guide to show the obsoleted types and their modern replacements.

In some cases we have included both the old relay and the new relay in the catalogue. In order to facilitate the transition to the new auxiliary relay range, we are providing in the catalogue for RXMB/RXMC auxiliary relays, a replacement list with ordering numbers for new auxiliary relays that are pin-compatible with old types, i.e. the RXMA 1, RXMM 1 and the RXMK 1.

The new range of relays are providing adequate substitutes in the general case, but there may be some rating deviations requiring a detailed comparison to judge suitability for an individual special application. In fact, more functionality as well as more flexibility are often available with the new designs.

New smarter timers are available. RXKL 1 handles the 24-250V range and provides time settings from 20 milliseconds to 99 hours in one relay model. The RXKA 1 is a lower cost pick-up or drop-out timer. The RXKM 2H is our top-of-the-line timer having elapsed time indication as well as the possibility of measuring integrated time intervals.

### NEW & VITALIZED PRODUCTS IN THE COMBIFLEX<sup>®</sup> RANGE

Several new and vitalized products have been added to the COMBIFLEX<sup>®</sup> range since the 96/97 Buyer's Guide.

Vitalization is a method of improving the production and refining earlier products as far as economically possible using new materials, new components and new production technologies. The new products are using the best possible technology available in order to secure best possible cost/performance per function. Many new mounting alternatives have been added e.g. DIN-rail and direct mounting onto a wall or a steel panel.

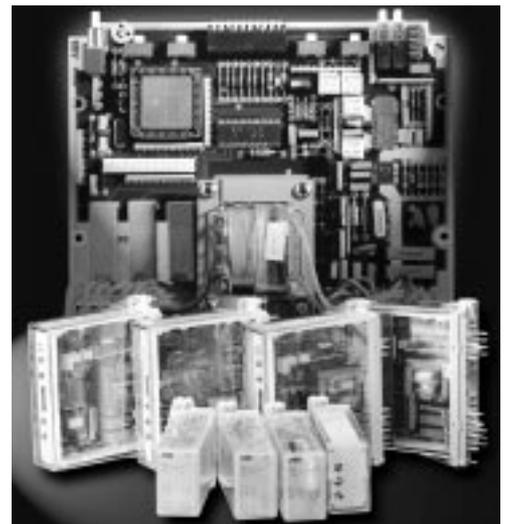


Fig. 1 Some modules in the new range

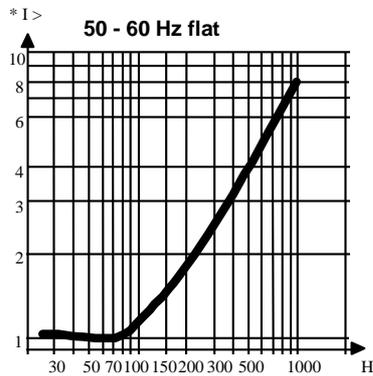
The new modular protective relay products are based on the use of micro-processor platforms in three modular sizes. E.g. one uses a single analogue input for current or voltage. An other uses two analog inputs for current and voltage. A third uses up to 4 analog inputs.

Many new features as well as an attractive price/performance ratio make these products a better choice than the earlier models they replace. They are also more compact, requiring only one modular COMBIFLEX "seat" position, two vertically positioned "seats" or four "seats".

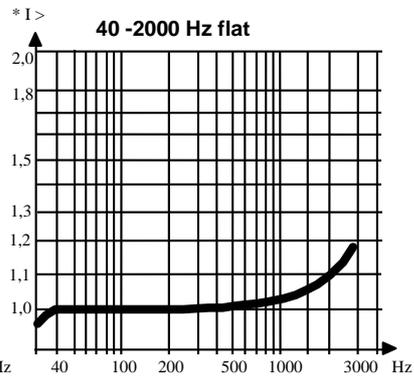
Some current and voltage relays can be fitted with filters to provide special application features. The following curves show the response of the four possibilities.

The new single analog input relays are;	
RXEDA 1	one-stage time-overvoltage relay for AC or DC
RXIDK 2H	two-stage overcurrent - all standard IEC curves
RXIDG 2H	two-stage overcurrent - logarithmic inverse curve
RXVK 2H	thermal over-load relay
RXEDK 2H	two-stage over/under-voltage relay
RXFK 2H	two-stage frequency and dF/dt relay
RXLK 2H	V/Hz over-excitation relay

Standard

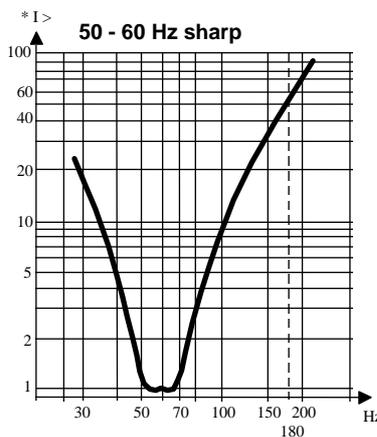


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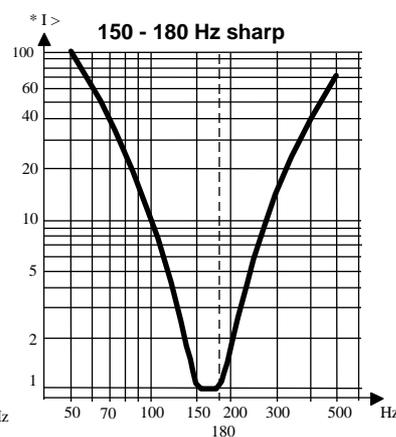


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Optional



Optional



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Fig. 2 Frequency response

It is now possible and easier to select a standard relay characteristic to suit the requirements of the application from the standpoint of needed frequency response.

There are also models of the new current and voltage relays suitable for 16Hz railroad applications. On request other frequencies may be "tuned in" for COMBIFLEX relay measurement.

The new dual analog input relays are;

RXPDK 21H	directional overcurrent relay (phase)
RXPDK 22H & RXPDK 23H	directional ground overcurrent relay
RXISK 2H	voltage restraint overcurrent relay
RXZK 21H	single zone directional impedance relay
RXZK 22 H	two-zone directional impedance relay
RXZK 23H	out of step impedance relay
RXPPK 2H	reverse power relay

#### Directional relays

The directional relays RXPDK 21H provide the same current setting range as the RXIDK 2H i.e. 375 to 16.25A for the 5A version. All IEC inverse curves and the RI-curve or three fixed time delay ranges can be selected from the front of the relay. The directional relay characteristic "maximum torque angle", i.e. the angle of maximum response, can be set from 0 to 120 electrical degrees, positive or negative rotation. This means it is now easier to use this relay to solve different application problems than what was the case with earlier directional overcurrent models. One relay replaces thirty earlier models of RXPE42 combined with RXIDF or RXIDK. The relay contains a memory function upon loss of voltage. There is also a directional ground-fault relay RXPDK 22H for high-impedance grounded networks and the RXPDK 23H for low impedance grounded networks.

For three-phase and ground directional overcurrent relay applications, the new RXPDK 2H relays save space compared to earlier solutions. Only a 4S (7inch) high

standard 19" equipment is needed instead of 8S (14inch) using the earlier relay types. COMBIFLEX customers and our engineering centers will thus save space and cost as a result. It is easier to retrofit earlier stations since more functions can be housed in the same and earlier delivered COMBIFLEX panels. The reduction in life-cycle cost for the plant adds customer value. The new relays replace the old types but maintain and increase the value of the COMBIFLEX modular plug-in mounting system.

#### Impedance relays

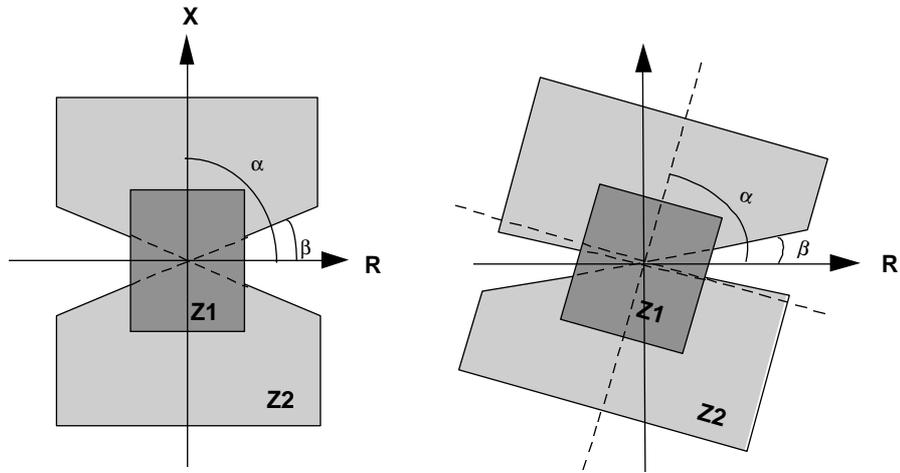
Three new models are introduced. A single zone relay, a two zone relay and an out of step relay. Quadrilateral impedance characteristic is used.

RXZK 21H is a single zone quadrilateral characteristic relay. See zone 1 in the figure below.

The new two-zone impedance relay RXZK 21H can be set in both resistive and reactive direction in the impedance plane. See figure below. It is also possible to set a load-blinder for zone two based on an additional angular setting that prevents relay from load-encroachment tripping under heavy resistive load conditions, thus assuming the fault is more reactive. The characteristic angle may be set on the relay from 0 to 120 electrical degrees, yielding application-flexibility.

The RXZK 23H version of the relay is intended for out of step applications mainly for synchronous machines. The characteristic is a single zone impedance quadrilateral having a directional element to distinguish between stable and unstable swing conditions and providing tripping only upon leaving the quadrilateral upon unstable swing detection, in order to provide a minimum stress on the breaker. I.e. interruption takes place on the swing out of the impedance element when the voltage across the breaker is normalizing from higher values during the extreme swing condition.

The RXISK 2H provides a voltage restraint inverse or fixed delayed time overcurrent function. This is a non-directional "impedance" measurement within a defined voltage and current operating range set on the relay.



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Fig. 3 The impedance characteristic for RXZK 2xH can be set for different "line angles  $\alpha$ " and R and X individually adjusted.

**More "Vitalized" protective relays**

RAGCX modular generator protection combines the new measuring elements to perform all functions required for small to medium size machines, e.g. 5-150MVA.

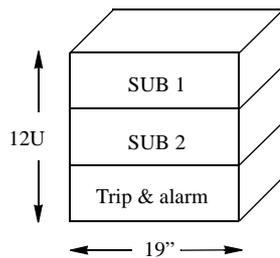


Fig. 4 The complete RAGCX generator protection can be housed in a 12 rack unit high 19" rack, allowing for redundant SUB 1 and SUB 2 sets of protection and trip matrix and alarm functions in the third tier.

Options are available to provide complete generating station protection in a very small over-all package, suitable for different sized

generating plants. For more details we refer to the BG describing the COMBIFLEX generator protection.

The venerable 100% stator earth-fault relay RAGEA has been replaced by RAGEK. The relay uses the third harmonic voltage measurement at the generator neutral as a measuring signal to determine if a ground-fault is located near the neutral of the generator or if the neutral connection is interrupted. The relay also uses the fundamental 50/60Hz neutral voltage to detect faults higher up in the generator winding, including faults at the terminal. The RAGEK vitalized product uses three voltage elements of the RXEDK 2H type.

The ability to include harmonic filters inside the new measuring units makes possible a size reduction as well as improvements in range and performance.

RAGPK is a new version of the RAGPC loss of excitation relay.

**New star-four platform with communication as option**

Communication with the new microprocessor based COMBIFLEX range will be introduced for the new 4-seat series. First in this series is the RXIDK 4 time-overcurrent relay for three-phase and earth faults, see 1MRK 509 035-BEN. This relay is provided with a graphical front HMI and text-window for setting and displaying functions.



Fig. 5 The new RXIDK 4 relay, using the star-four platform.

**New Design Tools**

In order to simplify the design of relay and control systems using the COMBIFLEX and also the 500 series terminals, we offer schematic diagrams suitable for CAD systems of different types e.g. AUTO-CAD. In addition technical information on the products and assembly components are available on CD and Internet. Please contact the sales organization for further details.

Using this technique it is easier to design custom schemes. In a 19" equipment frame it is for example possible to mount up to 10 two-seat COMBIFLEX modules. E.g. mount three complete three-phase sets of RXIDK 2H or RXEDK 2H or thermal overcurrent relay RXVK 2H, directional overcurrent RXPDK 2H or frequency relay RXFK 2H, volt/hertz relay RXLK 2H with auxiliary DC power from one DC/DC converter type RXTUG 2H, see Fig. 6.

The space-saving concept allows integration of a test-switch for secondary injection testing as well.

The new RTXP 8 and the RTXP 18 and RTXP 24 are used depending on the needed number of contacts.

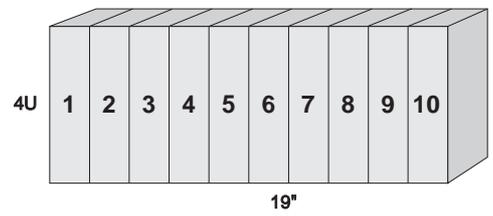


Fig. 6 Up to 10 two-seat modules in one 4U rack

**Summary**

Many of our earlier protection schemes have been vitalized using the new efficient and more compact microprocessor components. This provides user benefits as well as productivity improvements. A reduction in delivery times has been achieved for the new COMBIFLEX relays. We are presently delivering on a 4 week schedule for the loose components and 6 weeks for the new protection assemblies. We will keep you posted on the coming developments. In the meantime, happy COMBIFLEX relaying!

Gunnar Stranne  
 SENET/Product Manager COMBIFLEX



The COMBIFLEX® team for development, production sales, marketing and support

### The COMBIFLEX® team

The new COMBIFLEX® modular relays are produced in new modern lines of production and supported by a dedicated group of people.

During the past few years, information about the new products has been released in media and technical conferences.

Below are some advertisements used to illustrate some ideas behind the New COMBIFLEX®.



### Without COMBIFLEX® Sweden Blacks Out.

Since introduction in 1969 about 5 million COMBIFLEX® relays have been installed in power generation, transmission and distribution plants and also in the nuclear stations & various industrial and communication systems. Without these relays Sweden would Black Out.

COMBIFLEX® is a simple, flexible and reliable building block system, for protective and auxiliary relays, that permit rapid installation, service and extensions of simple as well as larger more complex equipment.

The system combines plug-in apparatus and other pieces of equipment to form complete product packages for protection and control, delivered in full compliance with the power industry standards including the newest EC regulations.

### COMBIFLEX® keeps the power coming.

COMBIFLEX® is a product-line within the PANORAMA concept, ABB's solution for the efficient and reliable service of electrical power systems. PANORAMA offers open solutions in all directions through the use of innovative information technology IT, and makes it possible for the user to exert full control of the power system process from production to consumption. Today and in the future.

### COMBIFLEX® makes relaying and control simple.