General instructions

IG-094-EN, version 07; 6/11/2015

ekor.rtk

Setting and assembly of the voltage detection unit
CAUTION!

When medium-voltage equipment is operating, certain components are live, other parts may be in movement and some may reach high temperatures. Therefore, the use of this equipment poses electrical, mechanical and thermal risks.

In order to ensure an acceptable level of protection for people and property, and in compliance with applicable environmental recommendations, Ormazabal designs and manufactures its products according to the principle of integrated safety, based on the following criteria:

- Elimination of hazards wherever possible.
- Where elimination of hazards is neither technically nor economically feasible, appropriate protection functions are incorporated in the equipment.
- Communication about remaining risks to facilitate the design of operating procedures which prevent such risks, training for the personnel in charge of the equipment, and the use of suitable personal protective equipment.
- Use of recyclable materials and establishment of procedures for the disposal of equipment and components so that once the end of their service lives is reached, they are duly processed in accordance, as far as possible, with the environmental restrictions established by the competent authorities.

Consequently, the equipment to which the present manual refers complies with the requirements of section 11.2 of the IEC standard 62271-1. It must therefore only be operated by appropriately qualified and supervised personnel, in accordance with the requirements of standard EN 50110-1 on the safety of electrical installations and standard EN 50110-2 on activities in or near electrical installations. Personnel must be fully familiar with the instructions and warnings contained in this manual and in other recommendations of a more general nature which are applicable to the situation according to current legislation.1.

The above must be carefully observed, as the correct and safe operation of this equipment depends not only on its design but also on general circumstances which are in general beyond the control and responsibility of the manufacturer. More specifically:

- The equipment must be handled and transported appropriately from the factory to the place of installation.
- All intermediate storage should occur in conditions which do not alter or damage the characteristics of the equipment or its essential components.
- Service conditions must be compatible with the equipment rating.
- The equipment must be operated strictly in accordance with the instructions given in the manual, and the applicable operating and safety principles must be clearly understood.
- Maintenance should be performed properly, taking into account the actual service and environmental conditions in the place of installation.

The manufacturer declines all liability for any significant indirect damages resulting from violation of the guarantee, under any jurisdiction, including loss of income, stoppages and costs resulting from repair or replacement of parts.

Warranty

The manufacturer guarantees this product against any defect in materials and operation during the contractual period. In the event that defects are detected, the manufacturer may opt either to repair or replace the equipment. Improper handling of this equipment and its repair by the user shall constitute a violation of the guarantee.

Registered Trademarks and Copyrights

All registered trademarks cited in this document are the property of their respective owners. The intellectual property of this manual belongs to the manufacturer.

In view of the constant evolution in standards and design, the characteristics of the elements contained in this manual are subject to change without prior notification.

These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal.

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1 General description

The **ekor.rtk** unit is electronic equipment developed to indicate the absence of voltage on medium-voltage (MV) lines. It is for use in local or remote control installations where information on the status of the lines is required.

The unit is built into the switchgear and uses the same capacitive current signal as the **ekor.vpis** voltage presence indicators to perform detection functions. Thus, conventional medium-voltage line coupling systems such as voltage transformers are not required, as it takes this signal directly from the capacitor dividers installed in the bushings.

The **ekor.rtk** unit is supplied duly installed, configured and factory-tested, fitted in the circuit-breaker and feeder functions of **cgmcosmos** and **cgm.3** system cubicles.
2 Functional characteristics

2.1 Operating voltages

The line voltage corresponds to the rated phase-to-phase operating voltage.

In the event that ekor.rtk takes the capacitive signal from the connecting set ormalink, the operating voltages are the same:

<table>
<thead>
<tr>
<th>System cgmos</th>
<th>Line voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>cgmos</td>
<td>3.5 - 24 kV</td>
</tr>
</tbody>
</table>

Table 2.1 Cubicle operating voltages cgmos

<table>
<thead>
<tr>
<th>Systems cgm.3</th>
<th>Line voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>cgm.3</td>
<td>3.5 - 36 kV</td>
</tr>
</tbody>
</table>

Table 2.2 cubicle operating voltages cgm.3

Note: For special applications contact Ormazabal.

2.2 Actuation times

The ekor.rtk voltage detection unit takes data from the voltages of each phase every 1.25 ms. This calculates the r.m.s. value of each voltage and compares it with certain pre-defined values to determine whether the voltage is above or below the set threshold.

Where the voltage is above the voltage presence indication threshold, a time delay of 100 ms begins. After this time, if the voltage has remained at a value above the threshold, the electromechanical indication relay for the corresponding phase is opened.

When the line voltage is below the voltage absence threshold, the relay sets at a time delay of 100 ms and closes the indication contact of the corresponding phase.

Figure 2.1: Diagram of times of output contact actuation
2.3 Input signals and output contacts

The ekor.rtk unit has three inputs, one for each line phase, associated to the voltage measurement on each of the cubicle's bushings, allowing for the individual detection of the presence or absence of voltage in each of the phases.

It also has three outputs associated to each of the aforementioned inputs. The presence or absence of voltage is indicated using volt-free contacts, one per phase.

The unit is also fitted with another contact to indicate errors or operating problems.

![Diagram of the input signals and output contacts of the ekor.rtk unit](image)

The lack of external power to the relay means that all output contacts are OFF.

The following table shows the statuses of the output contacts and an explanation of their indication.

<table>
<thead>
<tr>
<th>Output contact</th>
<th>Contact status</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>ON</td>
<td>Voltage absent on phase L1</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Voltage present on phase L1</td>
</tr>
<tr>
<td>L2</td>
<td>ON</td>
<td>Voltage absent on phase L2</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Voltage present on phase L2</td>
</tr>
<tr>
<td>L3</td>
<td>ON</td>
<td>Voltage absent on phase L3</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Voltage present on phase L3</td>
</tr>
<tr>
<td>WD</td>
<td>ON</td>
<td>Relay operational</td>
</tr>
<tr>
<td></td>
<td>OFF</td>
<td>Relay not operational. Internal error or lack of power</td>
</tr>
</tbody>
</table>

**Tabla 2.4 Statuses of output contacts**

In the event that ekor.rtk loses power, or breaks down, all the indicating contacts switch OFF.

2.4 Signalling logic for voltage presence and/or absence

The output contacts and the power supply to the unit are accessible on a "J" terminal block for on-site connection.

The signalling logic for the absence and/or presence of voltage depends on how the connections are made on the output "J" terminal block.

The logic schemes that can be obtained are indicated below:

2.4.1 Independent Logic

With this type of logic, the unit provides a contact that indicates the absence and/or presence of voltage for each phase. The terminals to be accessed to obtain the information, according to this operating logic, are given in the following figure:

![Figure 2.2: Diagram of the input signals and output contacts of the ekor.rtk unit](image)

| Phase L1 indication: terminals J1-3 and J1-4 |
| Phase L2 indication: terminals J1-5 and J1-6 |
| Phase L3 indication: terminals J1-7 and J1-8 |

2.4.2 Voltage absence AND Logic – Product (L1 x L2 x L3)

With AND logic, the unit terminal block provides the information on the absence of voltage in the event of a lack of voltage on all of the phases. Voltage presence (open contact) on any of the phases causes the circuit to open and, therefore, the unit indicates a voltage presence. Conversely, voltage absence is only indicated if it occurs on the three phases. The terminals to be accessed to obtain the information, according to this operating logic, are given in the following figure:
2.4.3 Voltage absence OR Logic – Sum (L1 + L2 + L3)

With OR logic, the unit terminal block provides the information on the absence of voltage in the event of a lack of voltage on any of the three phases. Voltage absence on any of the phases causes the \textit{ekor.rtk}, unit to indicate an absence of voltage (closed contact), while a voltage presence is only indicated if MV is present on the three phases. The terminals to be accessed to obtain the information, according to this operating logic, are given in the following figure:
3 Technical specifications

3.1 Rated values

- **Line voltage:**
  - Detection values: 3.5...36 kV
  - Measurement tolerance: +/- 10%
- **Indication time:**
  - Time delay: 50, 100 ms
  - Time tolerance: +/- 10 ms
- **Frequency:**
  - 50 Hz; 60 Hz
- **Output contacts:**
  - Voltage: 380 V ca, 230 V cc
  - Current: 16 A (ca)
  - Switching power: 500 VA (resistive load)
- **Power supply voltage:**
  - AC: 17 V...260 V
  - DC: 17 V...360 V
  - Consumption: < 2.5 W
- **Temperature:**
  - Operation: -40 ºC...+ 60 ºC
  - Storage: -40 ºC...+ 70 ºC

3.2 Mechanical design

- **IP rating:**
  - Case: IP47
  - Terminals: IP2X
  - In cubicle: IP3X
- **Dimensions:**
  - See attached diagram: 100x180x40 mm
- **Weight:**
  - 0.3 kg
- **Connection:**
  - Cable/Terminal: 0.5...2.5 mm²

3.3 Insulation tests

- **IEC 60255-5:**
  - Insulation resistance: 500 V ca: > 0.7 GΩ
  - Dielectric rigidity: 2 kV ca; 50 Hz; 1 min
- **Voltage pulses:**
  - Standard: 5 kV; 1.2/50 μs; 0.5 J
  - Differential: 1 kV; 1.2/50 μs; 0.5 J

3.4 Electromagnetic compatibility

- **IEC 60255-22-1:**
  - Damped wave: 1 MHz
    - 2.5 kV; 1 kV
- **IEC 60255-22-2:**
  - Electrostatic discharges
    - (IEC 61000-4-2, class IV)
    - 8 kV
- **IEC 60255-22-3:**
  - Radiated fields
    - (IEC 61000-4-3, class III)
    - 10 V/m
- **IEC 60255-22-4:**
  - Bursts - Fast transients
    - (IEC 61000-4-4)
    - 2 kV
- **IEC 61000-4-5:**
  - Overvoltage pulses
    - 4 kV; 2 kV
- **IEC 61000-4-6:**
  - Induced radiofrequency signals (EN 50082-2)
    - 150 kHz...80 MHz
- **IEC 61000-4-8:**
  - Magnetic fields
    - (EN 50082-2)
    - 30 A/m; 50 Hz
- **IEC 61000-4-12:**
  - Sinusoidal damped wave
    - 2 kV; 1 kV
- **EN 50081-2/55011:**
  - Radiated emissions Group 1, 150 kHz...30 MHz Class A

3.5 Climatic tests

- **IEC 60068-2-1:**
  - Slow changes. Cold
    - - 40 ºC; 960 min
- **IEC 60068-2-2:**
  - Slow changes. Heat
    - + 60 ºC; 120 min
    - + 70 ºC; 960 min
- **IEC 60068-2-30:**
  - Damp heat cycles
    - + 40 ºC; 92%; 5760 min

3.6 Mechanical tests

- **IEC 60255-21-1:**
  - Sinusoidal vibration. Response 10-150 Hz
    - 1 g
  - Sinusoidal vibration. Endurance 10-150 Hz
    - 2 g
- **IEC 60255-21-2:**
  - Impacts. Response
    - 11 ms; 5 g
  - Impact. Endurance
    - 11 ms; 15 g
  - Shock. Endurance
    - 16 ms; 10 g
4 Voltage detection relay ekor.rtk

4.1 Components of the unit ekor.rtk

The assembly required to install the ekor.rtk unit in a cubicle consists of the five parts indicated below:

1) Voltage presence relay ekor.rtk.
2) Wiring from the cubicle bushing to the ekor.rtk relay.
3) Wiring from the ekor.rtk relay to the voltage presence indicator ekor.vpis.
4) Wiring from the ekor.rtk relay to the user terminal block.
5) Support for attaching the ekor.rtk relay in the cubicle.

The necessary support for attaching the ekor.rtk voltage detection relay depends on the type of cubicle in which it is installed.

4.2 Checking the ekor.rtk relay

To test the output contacts on the ekor.rtk, press the test push-button installed on the unit for this purpose, as shown in Figure 4.3: Test push-button and indication LED. The three phase output contacts will change position while the push-button is being pressed. The green power indication LED will turn red during the test to inform the operator of the status of the unit. Once the test is completed, the LED will switch back from red (relay in test status) to green (relay in operating status).

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**Figure 4.1:** ekor.rtk unit with support for gmcosmos-v, gcm.3-v cubicles

*In the lower central part, ekor.rtk with support for gmcosmos-l cubicles*

**Figure 4.2:** Support for ekor.rtk in circuit-breaker cubicles (AV type)

**Figure 4.3:** Test push-button and indication LED
4.3 ekor.rtk relay installation

To install an ekor.rtk relay in a cubicle, you must have the ekor.rtk voltage presence relay assembly and the necessary support, depending on the type of cubicle in which it is to be fitted.

4.3.1 General instructions for the ekor.rtk relay installation

1) Loosen and remove the 2 screws (A) securing the ekor.vpis voltage presence indicator using a Philips screwdriver and pull it outwards to remove.

2) Remove the ekor.vpis voltage presence indicator connector.

3) Connect the ekor.vpis voltage presence indicator connector you have just removed to the appropriate connector of the ekor.rtk relay.

Figure 4.4: Remove ekor.vpis indicator

Figure 4.5: Remove ekor.vpis indicator connector

Figure 4.6: Connect connector to ekor.rtk relay
4) Connect the ekor.rtk relay to the ekor.vpis, voltage presence indicator using the cable supplied in the kit (to the relay and to the indicator).

5) Connect the terminations running from the ekor.rtk relay to the user terminal block (see electrical diagram Figure 6.1 on Page 17).

The user terminal block is located in a certain position depending on the cubicle used.

4.3.2 Circuit-breaker cubicles (driving mechanism (R)AV)

In the functions of automatic circuit-breaker with driving mechanism (R)AV, the ekor.rtk relay is located in the bottom right part of the cubicle’s driving mechanisms area.
4.3.3 Feeder cubicles cgmcosmos-l

In cgmcosmos-l feeder cubicles, the ekor.rt relay is located below the manometer to the left of the ekor.vpis voltage presence indicator, as shown in the following figure.

Figure 4.10: ekor.rt in cubicles cgmcosmos-v ((R)AV)

4.3.4 Feeder cubicles cgm.3-l

In cgm.3-l feeder cubicles, the ekor.rt relay is located at the bottom right, below the ekor.vpis voltage presence indicator.

Figure 4.12: ekor.rt in cubicles cgm.3-l

Figure 4.11: Location of the ekor.rt relay in cgmcosmos-l cubicles
4.4 Setting the parameters of the ekor.rt relay

The relay is factory-set in line with installation data:

► Line operating voltage
► Actuation time
► Line frequency

**Note:** For special applications contact Ormazabal.

Figure 4.13: Printed circuit board and selector S1 on the relay ekor.rt

SW1 and SW2 are used to define the line operating voltage. SW3 defines the actuation time and SW4 specifies the line frequency.

The possible configurations obtained using selector S1 are those shown below, depending on the system to which the cubicle where the ekor.rt relay is installed belongs.
cgm.cosmos system cubicles with voltage presence indication from the bushing:

<table>
<thead>
<tr>
<th>OFF</th>
<th>SW1</th>
<th>SW2</th>
<th>Voltage</th>
<th>SW3</th>
<th>Time</th>
<th>SW4</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>3.5 - 24 kV</td>
<td>X</td>
<td>100 ms</td>
<td>X</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

cgm.3 system cubicles with voltage presence indication from the bushing:

<table>
<thead>
<tr>
<th>OFF</th>
<th>SW1</th>
<th>SW2</th>
<th>Voltage</th>
<th>SW3</th>
<th>Time</th>
<th>SW4</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>3.5 - 36 kV</td>
<td>X</td>
<td>100 ms</td>
<td>X</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

cgm.cosmos system cubicles with voltage presence indication from the ormalink connecting set:

<table>
<thead>
<tr>
<th>OFF</th>
<th>SW1</th>
<th>SW2</th>
<th>Voltage</th>
<th>SW3</th>
<th>Time</th>
<th>SW4</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>3.5 - 24 kV</td>
<td>X</td>
<td>100 ms</td>
<td>X</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>

cgm.3 system cubicles with voltage presence indication from the ormalink connecting set:

<table>
<thead>
<tr>
<th>OFF</th>
<th>SW1</th>
<th>SW2</th>
<th>Voltage</th>
<th>SW3</th>
<th>Time</th>
<th>SW4</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>X</td>
<td>X</td>
<td>3.5 - 36 kV</td>
<td>X</td>
<td>100 ms</td>
<td>X</td>
<td>50 Hz</td>
</tr>
</tbody>
</table>
5 Connection diagram

Figure 5.1: Connection diagram of relay ekor rtk

A
B
C
D
E
F
W0

<table>
<thead>
<tr>
<th>A</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Outputs</td>
</tr>
<tr>
<td>C</td>
<td>Bushing output</td>
</tr>
<tr>
<td>D</td>
<td>Indicator ekor vpis</td>
</tr>
<tr>
<td>E</td>
<td>Output contacts</td>
</tr>
<tr>
<td>F</td>
<td>Power supply</td>
</tr>
<tr>
<td>G</td>
<td>Test push-button</td>
</tr>
<tr>
<td>W0</td>
<td>Error output</td>
</tr>
</tbody>
</table>

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6 Electrical diagram

The following figure shows the electrical diagram corresponding to the relay ekor.rtk. For greater detail, see diagram 996235 for cubicles cgm.3, and diagram 996414, for cubicles cgmcosmos, which are included with the unit.

![Connection diagram of relay ekor.rtk](image)

<table>
<thead>
<tr>
<th>A</th>
<th>Power supply</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-L1</td>
<td>L1 output</td>
</tr>
<tr>
<td>S-L2</td>
<td>L2 output</td>
</tr>
<tr>
<td>S-L3</td>
<td>L3 output</td>
</tr>
<tr>
<td>B</td>
<td>Bushing cgm</td>
</tr>
<tr>
<td>W0</td>
<td>Error output</td>
</tr>
</tbody>
</table>

Figure 6.1: Connection diagram of relay ekor.rtk
7 Dimensions

Figure 7.1: Dimensions in mm for relay ekor.rtk
Subject to change without prior notification.

For more information, contact Ormazabal.

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