Compact remote control unit

General instructions
IG-151-EN, version 07, 27/09/2016
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 Standard IEC 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.

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[1] For example, in Spain the “Regulation on technical conditions and guarantees for safety in high-voltage electrical installations” – Royal Decree 337/2014 is obligatory.
Index

1. General description .................................................. 4

2. Components of the compact remote control unit ............................................. 5
   2.1. Power supply ................................................. 7
   2.2. Remote terminal unit ........................................ 8
   2.3. Local/remote selector ....................................... 10
   2.4. Communications compartment ............................. 11
   2.5. Telemanagement section ................................... 12
   2.6. Other components .......................................... 12

3. Technical specifications ............................................... 14
   3.1. Rated values ................................................ 14
   3.2. Mechanical design .......................................... 14
   3.3. CE Conformity ............................................. 14

4. Installation ........................................................... 15
   4.1. Installation of ekor.uct-m ................................ 15
   4.1.1. Installing the battery extension kit.................. 16
   4.2. Installation of ekor.uct-s ................................ 17
   4.2.1. Mounting ekor.uct-s on cgmcosmos system cubicles ............... 18
   4.2.2. Mounting ekor.uct-sg on cgmcosmos system cubicles ............. 22
   4.2.3. Mounting ekor.uct-s on cgm.3 system cubicles .................. 31
   4.3. General connections of ekor.uct ......................... 33
   4.4. Interconnections between the substation components .................. 34

5. Relay and RTU configuration ........................................ 35
   5.1. Relay configuration ........................................ 35
   5.2. RTU configuration ......................................... 35

6. Checks .................................................................... 36
   6.1. Local installation checks ................................. 36
   6.1.1. Power Supplies ......................................... 36
   6.1.2. Battery Charging ....................................... 36
   6.1.3. Presence of personnel ................................. 36
   6.1.4. Interconnections in the cubicle ...................... 36
   6.1.5. Watch dog .............................................. 37
   6.2. Checking the installation and telecontrol tests .................. 37
   6.2.1. General substation signals ......................... 37
   6.2.2. Position check ......................................... 39

7. Maintenance recommendations ...................................... 41
1. **General description**

Automation of the medium voltage distribution network has been of clear benefit in improving supply quality for the majority of Utilities. To facilitate integration of this functionality, Ormazabal has developed the ekor.uct compact remote control unit, designed for automation of transformer and switching substations. It is distinguished by the fact that it includes the following functions in a single device: remote terminal unit, communications, uninterruptible power supply and low voltage isolation. Designed principally to manage cubicles equipped with integrated control, the ekor.uct unit is independent of the number of cubicles in the Substation and their configuration, ensuring a high degree of standardisation.

There are two formats available: ekor.uct-s (cubicle mounted) which allows it to be used in substations where the space available is required for access points or operational clearance, and ekor.uct-m (wall-mounted) for installation on a wall.

The ekor.uct compact remote control unit can be used for remote control and automation applications in transformer and switching substations by means of integrated control, offering the following advantages over conventional remote controls:

1. Independence between ekor.uct and the number of automated cubicles in the installation. This means that a single device can be used for remote control of any substation. In addition, it does not affect the growth of the installation, since extensions can be added without modifying the existing hardware.
2. The wiring normally required to be carried out in the field between the control devices and the cubicles is reduced to simple interconnection using standard connectors. This drastically cuts down on assembly and testing time in the field.

3. All the components are factory-assembled and factory-tested, guaranteeing the quality of the equipment from the outset and leading to fewer errors in the field.
4. Ease of commissioning without the need for medium voltage power cuts before carrying out the telecontrol tests.
5. Avoids the need to install racks for control and protection sheaths.

The compact ekor.uct-sg remote control and telemanagement unit allows remote control and automation applications of transformer and switching substations via integrated control, adding the development produced to incorporate substation telemanagement. Thus in a single solution all smart meter measuring and management equipment is integrated, as well as the use of a single communications system common to the remote control and the telemanagement.
2. **Components of the compact remote control unit**

The *ekor.uct* compact remote control unit includes all the components necessary for remote control and automation of transformer and switching substations.

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Distribution compartment</td>
</tr>
<tr>
<td>2</td>
<td>Communications compartment</td>
</tr>
<tr>
<td>3</td>
<td>Independent power supplies: motors, control, communications</td>
</tr>
<tr>
<td>4</td>
<td>Communications RTU</td>
</tr>
<tr>
<td>5</td>
<td><em>ekor</em>.bat battery charger</td>
</tr>
<tr>
<td>6</td>
<td>Auxiliary terminal block: 230 V, Presence of personnel</td>
</tr>
<tr>
<td>7</td>
<td>Battery</td>
</tr>
<tr>
<td>8</td>
<td>Space available in COMMS compartment: 368 x 237 x 285 mm</td>
</tr>
</tbody>
</table>

These components are located in two separate areas of the *ekor.uct* unit:

1. **Distribution (RTU and Battery):** This area contains the components via which the Substation's switchgear and control gear are powered: power supply of the cubicle motors, control elements, control and communications elements. It therefore includes the *ekor*.bat unit, *Ormazabal* battery rectifier-charger, separate batteries and miniature circuit breakers for each component.

2. **Communications (COMMS):** Space for accommodating communications devices, such as radio, modem, cables, etc.

![Figure 2.1. Components of *ekor*.uct-s](image)

![Figure 2.2. Appearance of *ekor*.uct-s mounted on cubicles of the *cgmcosmos* and *cgmj* systems](image)

In addition, this area includes the communications RTU.

![Figure 2.3. Appearance of *ekor*.uct-m](image)
The **ekor.uct-sg** compact remote control unit has three variants that complete the range of automation boxes for configurations: 2LP, 3L and 1L.

The following diagram shows the distribution of units in **ekor.uct-sg-3L**:

![ekor.uct-sg 3L](image)

And the following image shows the distribution of units in **ekor.uct-sg-1L**:

![ekor.uct-sg-1L](image)
2.1. Power supply

The **ekor.uct** compact remote control unit delivers uninterruptible power supply to all the equipment in the transformer or switching substation.

For this purpose, it has a power supply and energy storage circuit, meaning that when line voltage is present, power is supplied to the equipment from this rectified line voltage. In the absence of alternating voltage and faced with peak demand, it is the batteries which supply the various substation components.

The **ekor.uct** unit is made up of the following components to provide uninterruptible power supply to the equipment:

**Single-phase isolating transformer**

The **ekor.uct** supply voltage is the substation low voltage, which is referenced via the zero-sequence earth. On the other hand, the **ekor.uct** unit is connected to the protective earth, like the rest of the metal enclosures in the installation. To avoid damage caused by possible potential differences that may exist, the **ekor.bat-200** unit incorporates an isolating transformer, ensuring a power frequency insulation level of 10 kV and of 20 kV in the event of lightning impulses (1.2/50 μs), so that overvoltages do not affect the remote control.

**Uninterruptible Power Supply**

The characteristics of the uninterruptible power supply are as follows:

3. Input power supply voltage: $230 \text{ V}_{\text{ac}} \pm 15 \%$ in sinusoidal consumption, reducing the harmonic component for supply from the voltage transformers.

4. Output power supply voltage: $48 \text{ V}_{\text{ac}}$ and $12 \text{ V}_{\text{ac}}$ for the communications power supply (maximum power at $12 \text{ V}_{\text{dc}}$ 120 W or up to 150 W if the **ekor.bat** unit is used).

5. Power supply voltage frequency: 50/60 Hz.

6. Battery charging time: 10 h.

7. Over 18 h standalone operation (standard installation with 4 telecontrolled cubicles).

8. LED indication:
   a. “Mains”: indicating that the battery charger is sending voltage and current to the output.
   b. A red LED in “Defecto” (“Fault”) indicates that there is a fault in the rectifier-charger.

7. Charger-rectifier alarms: the module reports the following alarms by means of volt-free contacts:
   a. End of battery life.
   b. Charger fault.
   c. Line voltage fault.

8. Battery test (optional).

**Batteries**

4 monoblock units, 12 V and 12 or 18 Ah, connected in series, installed on a frame, which is withdrawable on the **ekor.uct** model.

The frame makes it easier to perform battery maintenance and replacement tasks. This frame is released from its normal location by undoing a single screw, allowing removal of the whole assembly (frame plus batteries).

These batteries are lead-acid, sealed and maintenance free.

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(2) To maintain the batteries correctly, follow the instructions outlined in section “7. Maintenance recommendations”.
However, this type of battery does have limitations:

1. The batteries’ service life is determined by their manufacturer. In any case, the batteries age more quickly at temperatures outside the recommended operating range.
2. Batteries also age whilst in storage. Take care not to store batteries for an extended period without recharging them, since this type of battery will not survive being fully discharged.
3. The battery life may also vary depending on the conditions in which they are charged and discharged.
4. It is difficult to predict the end of the battery’s service life[3].

Independent miniature circuit breakers for protecting the power supply to the cubicle motors, driving mechanisms (or relays) and control devices. In addition, the 230 V$_{ac}$ input supply voltage is also protected by a miniature circuit breaker.

The existence of independent miniature circuit breakers for supplying the motors and driving mechanisms means that any problems in the motor do not affect the driving mechanism, since both supply poles (positive and negative) are broken. Also, it enables telecontrol tests to be carried out without the commands being executed.

Figure 2.9. Independent miniature circuit breakers

Power is supplied to the whole equipment very simply by direct connection of 230 V$_{ac}$ from the installation low voltage board to the ekor.uct power supply terminals (terminals CA1 and CA2).

This cable sheath connecting the low voltage board and the ekor.uct unit must be isolated from the metal parts of the substation.

### 2.2. Remote terminal unit

The RTU (or remote terminal unit) performs the following functions:

1. **Communication with the dispatching centre.** This communication reports all the events or incidents that have occurred in the installation. Similarly, commands are received from the dispatching centre to be executed on each of the functional units. This communication takes place via a communications device (modem, radio, cable, etc), using a specific communications protocol, such as MODBUS, IEC-870- 5-101, PID1, GESTEL, SAP20, 6802, etc.

2. **Communication with the Integrated Control Units** installed in each of the substation cubicles. In this way, the RTU receives any event or incident that has occurred at any functional unit in the installation via communications and operates each functional unit remotely. This communication takes place by means of the MODBUS, PROCOME or other communications protocol and via an RS-485 bus or Fibre optic medium.

<table>
<thead>
<tr>
<th>Feeder Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch-disconnector closed</td>
</tr>
<tr>
<td>Switch-disconnector open</td>
</tr>
<tr>
<td>Earthing switch closed</td>
</tr>
<tr>
<td>Earthing switch open</td>
</tr>
<tr>
<td>Adjacent transformer position closed</td>
</tr>
<tr>
<td>Adjacent transformer position open</td>
</tr>
<tr>
<td>Phase fault</td>
</tr>
<tr>
<td>Zero-sequence fault</td>
</tr>
<tr>
<td>Sectionaliser automation on</td>
</tr>
<tr>
<td>Sectionaliser automation off</td>
</tr>
<tr>
<td>Sectionaliser automation disconnected indication</td>
</tr>
</tbody>
</table>

Continues on the next page

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[3] The ekor.uct unit has an alarm which activates when the battery is considered to have reached the end of its service life.
### General instructions

**ekor.uct**

#### Components of the compact remote control unit

**Continuation**

#### Position signals

<table>
<thead>
<tr>
<th>Feeder function</th>
<th>Circuit-breaker function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocking due to control in local mode</td>
<td>Blocking due to control in local mode</td>
</tr>
<tr>
<td>Sectionaliser automation blocking due to control in local mode</td>
<td>Sectionaliser automation not enabled</td>
</tr>
<tr>
<td>Indication of voltage fault on one or two phases</td>
<td>Switch-disconnector opening command</td>
</tr>
<tr>
<td>Switch-disconnector closing command</td>
<td>Sectionaliser automation shut-down command</td>
</tr>
<tr>
<td>Sectionaliser automation start-up command</td>
<td>Communications fault</td>
</tr>
<tr>
<td>Locking due to low gas pressure (hydrometer)</td>
<td>Circuit-breaker closed position</td>
</tr>
<tr>
<td></td>
<td>Circuit-breaker open position</td>
</tr>
<tr>
<td></td>
<td>Line disconnector closed</td>
</tr>
<tr>
<td></td>
<td>Line disconnector open</td>
</tr>
<tr>
<td></td>
<td>Earthing switch closed</td>
</tr>
<tr>
<td></td>
<td>Earthing switch open</td>
</tr>
<tr>
<td></td>
<td>Recloser automation status on</td>
</tr>
<tr>
<td></td>
<td>Springs unloaded</td>
</tr>
<tr>
<td></td>
<td>Anti-pumping relay</td>
</tr>
<tr>
<td></td>
<td>Operation error: Error during the opening or closing</td>
</tr>
<tr>
<td></td>
<td>Supervision of the opening coil</td>
</tr>
<tr>
<td></td>
<td>Supervision of the closing coil</td>
</tr>
<tr>
<td></td>
<td>Reclosing command</td>
</tr>
<tr>
<td></td>
<td>Reclosing cycle in progress</td>
</tr>
<tr>
<td></td>
<td>End of reclosing cycle (final trip)</td>
</tr>
<tr>
<td></td>
<td>Cumulative breaking current setting exceeded</td>
</tr>
<tr>
<td></td>
<td>Timed phase overcurrent pick-up</td>
</tr>
<tr>
<td></td>
<td>Instantaneous phase overcurrent pick-up</td>
</tr>
<tr>
<td></td>
<td>Timed zero-sequence overcurrent pick-up</td>
</tr>
<tr>
<td></td>
<td>Instantaneous zero-sequence overcurrent pick-up</td>
</tr>
<tr>
<td></td>
<td>Timed phase overcurrent trip</td>
</tr>
<tr>
<td></td>
<td>Instantaneous phase overcurrent trip</td>
</tr>
<tr>
<td></td>
<td>Timed zero-sequence overcurrent trip</td>
</tr>
<tr>
<td></td>
<td>Instantaneous zero-sequence overcurrent trip</td>
</tr>
<tr>
<td></td>
<td>Cold load trip</td>
</tr>
<tr>
<td></td>
<td>External trip indication</td>
</tr>
<tr>
<td></td>
<td>Oscillograph recording</td>
</tr>
<tr>
<td></td>
<td>Circuit-breaker opening command</td>
</tr>
<tr>
<td></td>
<td>Circuit-breaker closing command</td>
</tr>
<tr>
<td></td>
<td>Recloser automation shut-down command</td>
</tr>
<tr>
<td></td>
<td>Recloser automation start-up command</td>
</tr>
<tr>
<td></td>
<td>Phase current</td>
</tr>
<tr>
<td></td>
<td>Communications fault</td>
</tr>
</tbody>
</table>

**Table 2.1. Position signals**

3. Direct connection to the RTU via the DB-9 connector on the **ekor.uct** cover, which allows updating and configuration of the equipment from the front (database loading) without the need to remove any of the equipment connections. In addition, it can act as a connection for a local maintenance terminal.

**Figure 2.10. Location of the DB-9 connector on **ekor.uct-m**
4. Acquisition of digital inputs corresponding to the general signals in the substation. These signals, detected by the RTU, are as follows:

<table>
<thead>
<tr>
<th>General substation signals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Miniature circuit breaker alarms</strong></td>
</tr>
<tr>
<td>- Miniature circuit breaker for supply</td>
</tr>
<tr>
<td>voltage (230 Vca) down alarm</td>
</tr>
<tr>
<td>- Miniature circuit breaker for 'Motores'</td>
</tr>
<tr>
<td>('Motors') down alarm</td>
</tr>
<tr>
<td>- Miniature circuit breaker for 'Mandos'</td>
</tr>
<tr>
<td>('Driving mechanism') down alarm</td>
</tr>
<tr>
<td><strong>Uninterruptible Power Supply System Alarms</strong></td>
</tr>
<tr>
<td>- Battery charger fault</td>
</tr>
<tr>
<td>- Charger line voltage fault alarm</td>
</tr>
<tr>
<td>(timed signal after four hours)</td>
</tr>
<tr>
<td>- End of battery service life</td>
</tr>
<tr>
<td><strong>General Alarms</strong></td>
</tr>
<tr>
<td>- General substation 'Watch Dog' signal</td>
</tr>
<tr>
<td>- Presence of personnel</td>
</tr>
<tr>
<td>- Selector switch in LOCAL position</td>
</tr>
<tr>
<td>- Selector switch in REMOTO (REMOTE) position</td>
</tr>
<tr>
<td>- Additional alarm indication (fire, water, etc.)</td>
</tr>
</tbody>
</table>

Table 2.2. General Substation Signals

5. Storage capability for events occurring in the substation. Log registered in a non-volatile memory.

6. Real-time clock. Synchronisation option to avoid problems caused by clock drift.

The following RTUs can be integrated within the ekor.uct compact remote control unit:

1. ekor ccp by Ormazabal
2. SETIS
3. MRC-100
4. adaTECH OSC
5. CRINOR

2.3. Local/remote selector

The ekor.uct unit has a selector switch marked 'LOCAL/REMOTO' (LOCAL/REMOTE) on the RTU section cover. This is used to determine whether the installation is under commands from the remote control, or under REMOTE CONTROL, in which case it allows execution of control instructions from the remote control unit.

This selector switch can be in the form of a key or a knob. The key option allows operators intending to carry out work or maintenance on the installation, to set the installation to the LOCAL CONTROL position and carry the key with them so that nobody else can set this installation to REMOTE CONTROL and execute operations from the remote control. The inclusion of this key in the ekor.uct unit contributes to the safety of people and property, eliminating risks when operating on the installation.

Once the installation is set to the LOCAL CONTROL position, this signal is received by both the RTU and the various units available on the installation, (ekor.rci, ekor.rpg, ekor.rps and others). In these conditions, any command from the remote control which reaches any of the components will be blocked and so not executed. Therefore the RTU or the integrated control units will give the corresponding indication.

Moreover, the hardware is also blocked, so that when the installation is in LOCAL CONTROL, the power supply is cut to the cubicle motors. Again, this contributes to the safety provided by the ekor.uct unit. In models with an Ormazabal’s ekor ccp unit, and operation from display, the operation can be executed.

\[\text{For other types of RTUs, please contact Ormazabal}\]
A variant of this functionality is to have the local-remote switch by remote-controlled cubicle position rather than a general one for the whole installation. Therefore each cubicle is controlled independently.

2.4. Communications compartment

The COMMS area of the ekor.uct unit is a generous space, specially designed to accommodate the communications components required to establish communication between the dispatching centre and the transformer or switching substation where the unit is installed.

The communications compartment contains two sets of 48 Vdc power supply terminals and another two sets of 12 Vdc power supply terminals.

The wiring from one of the RTU ports is brought into the communication compartment, allowing the RTU to communicate with the dispatching centre. This wiring has DB-9 termination (for connection with communications (usually for connection to a radio modem, fibre optic modem, PSTN modem, etc).

There is also a feedthrough in the space dedicated to communications to allow access for the antenna and other types of cable.

On the ekor.uct-sg boxes on the door of the right section (telemanagement) a volume has been defined in which to install communications, making them compatible with the equipment installed. Depending on the kit, the protections and antennas are installed.

For ease of installation of the communication components in this compartment, there is a withdrawable rack with a device to clamp the components installed in it. All the wiring reaching the communications section does so via a connector that can be used to release the rack fully, allowing it to be withdrawn so that the communications components can be installed outside the substation.
2.5. Telemangement section

The area defined for the telemangement within the ekor.uct unit is the right section. The telemangement units are mounted on insulating methacrylate.

The space designed is based on the volumes specified to house the different variants of existing telemangement units in the different companies.

As an example, the Gas Natural Fenosa telemagement version integrates the following elements:

1. Transformer connections terminal block (BCT).
2. Prime communication circuit-breaker (PMC).
4. Isolation transformer for power circuit protection against overvoltages of 10 kV.
5. Back-up terminals: (BAE) for connecting the units.
6. Unit protection circuit-breaker (PDG).
7. Multicolor terminals for digital inputs (BSD).

2.6. Other components

The ekor.uct unit also includes the following components:

1. Two terminals for wiring the 'Presence of personnel' signal from the contact available on the door of the transformer or switching substation (terminals AC1 and AC2).
2. Two or four terminals, depending on the model, to which any additional alarms you wish to have can be connected (terminals AC3, AC4, AC5 and AC6): alarm for level, fire, etc.
3. A green multi-LED pilot light on the ekor.uct cover which indicates that line voltage is present.
4. Bus connector via which both the substation cubicles and the communications are fed. This connector is fixed to the first cubicle on the medium voltage diagram, via the cable sheath to which it is connected.
5. Connection terminals for the 230 V<sub>ac</sub> input supply voltage (terminals CA1 and CA2).
The ekor.uct-sg unit also includes the following components:

1. External fastening hooks for doors, with the possibility of fastening the doors at different angles.
2. A red LED pilot lamp associated with functionality on the ekor.uct door indicating alarm activation due to low gas pressure indicated by the cubicle hydrometer.
3. Specific side and rear accesses to communicate and feed the power of the boxes.

Figure 2.18. Frontal ekor.uct-sg

Figure 2.19. Specific side and rear accesses ekor.uct-sg
3. Technical specifications

3.1. Rated values

<table>
<thead>
<tr>
<th>Power supply</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>AC: 230 Vac ± 15 %</td>
</tr>
<tr>
<td></td>
<td>Insulation: 10 kV</td>
</tr>
<tr>
<td></td>
<td>Max. consumption: 100 W</td>
</tr>
<tr>
<td></td>
<td>Cubicle consumption: 1.5 W (disconnecter charging), 7 W (circuit-breaker)</td>
</tr>
</tbody>
</table>

| Frequency | 50 Hz; 60 Hz ± 1 % |
| Output power supply voltages | 48 Vdc and 12 Vdc |

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>-20 °C to +70 °C</td>
</tr>
<tr>
<td>Storage</td>
<td>-25 °C to +70 °C</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Communications</th>
<th>LAN protocols</th>
<th>WAN protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MODBUS (RTU)</td>
<td>PROCOME</td>
</tr>
<tr>
<td></td>
<td>MODBUS (RTU)</td>
<td>MODBUS (RTU)</td>
</tr>
<tr>
<td></td>
<td>PID1</td>
<td>GESTEL</td>
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<td>GESTEL</td>
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<td>PIK</td>
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<td>IEC-870-5-104</td>
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<tr>
<td></td>
<td>VIESGO protocol</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.1. Rated values**

3.2. Mechanical design

<table>
<thead>
<tr>
<th>Maximum dimensions (width x height x depth)</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall-mounted box</td>
<td>584 x 877 x 320 mm</td>
</tr>
<tr>
<td>Cubicle-mounted</td>
<td>1096 x (288.5 + supplements) x 465 mm</td>
</tr>
<tr>
<td>Cubicle-mounted (small version)</td>
<td>1096 x (230 + supplements) x 465 mm</td>
</tr>
<tr>
<td>Cubicle-mounted with telemangement</td>
<td>1183 x 560 x 413 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal dimensions of the communications compartment</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>wall-mounted box (ekor.uct-m)</td>
<td>570 x 170 x 280 mm</td>
</tr>
<tr>
<td>cubicle-mounted (ekor.uct-s)</td>
<td>300 x 290 x 440 mm</td>
</tr>
<tr>
<td>cubicle-mounted, small version (ekor.uct-sr)</td>
<td>300 x 227 x 435 mm</td>
</tr>
<tr>
<td>Cubicle-mounted with telemangement</td>
<td>1183 x 560 x 413 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weight</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>80 kg</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>External connections</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power from low voltage board</td>
<td></td>
</tr>
<tr>
<td>Installation alarms</td>
<td></td>
</tr>
<tr>
<td>LV8 measurements for telemangement</td>
<td></td>
</tr>
<tr>
<td>External signalling box</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3.2. Mechanical design**

3.3. CE Conformity

This product complies with the European Union directive 2014/30/EU on electromagnetic compatibility, and with the IEC 60255 international regulations. The unit has been designed and manufactured for use in industrial areas, in accordance with EMC standards. This conformity is a result of the test carried out in accordance with article 7 of the Directive.
4. Installation

4.1. Installation of ekor.uct-m

The wall-mounted version of the ekor.uct-m compact remote control unit can be mounted on any of the walls, independently of the substation cubicle assembly. The location of the box must be chosen carefully in order to comply with the safety guidelines relating to access by personnel and operational clearance to be maintained in the substation.

When installing the ekor.uct-m unit, the following sequence must be adhered to:

1. Make the drilled holes indicated in Figure 4.1, taking as the lower reference point a height of 1 m from the substation floor. On both sides of the wall-mounted box a minimum distance of 350 mm must be left from the other substation components (walls, medium voltage cubicle assemblies, etc). Thus, a free space equivalent to the shaded area in Figure 4.3 is left, to allow connection of the 230 Vac power supply from the low voltage board, as well as connection of the communications antenna on the left of ekor.uct and the interconnecting cable sheath between ekor.uct and medium voltage cubicles on the right.

![Figure 4.1. Drill diagram for ekor.uct-m](image)

2. Use a bradawl to mark the points where the holes are to be made.

3. Use an M10 bit to drill the two points where the ekor.uct-m unit will be attached from the top.

4. Fit M10 wallplugs in each of the holes.

5. Insert M10 screws in each of the wallplugs. Take care not to tighten the screws fully so that the compact unit can be supported on the two screws.

6. Lift and hang ekor.uct-m using the appropriate mechanical equipment and finish by tightening both screws.

Due to the weight of the ekor.uct-m unit, the use of slings or chains when lifting it is recommended. Attach these to the upper anchoring pieces of ekor.uct-m as shown in Figure 4.2.

![Figure 4.2. Raising ekor.uct-m](image)

7. Once the unit is in position, drill the lower holes (on the bottom left and bottom right).

8. Fit an M10 wallplug in each of the holes and screw tightly into each of them.

![Figure 4.3. Fitting distances ekor.uct-m](image)

Maximum weight of ekor.uct-m: 80 kg
### 4.1.1. Installing the battery extension kit

The ekor.uct-m unit allows installation of a battery extension module:

1. Break the pre-punched aperture in the box base (from the underside).

   ![Figure 4.4. Pre-punched underside ekor.uct-m](image)

2. Screw the base plate sent with the battery extension kit at the 8 points indicated, taking care to position it correctly as indicated in Figures 4.5 and 4.6:

   ![Figure 4.5. Area corresponding to the front of the ekor.uct-m unit](image)

   ![Figure 4.6. Base plate screws for the battery kit](image)

   The base plate has two sliding rails which make it easier to insert and remove the batteries.

3. Release the male connector from the cable sheath available on the ekor.uct-m unit for expanding the batteries. The male connector is usually connected to the female connector of this cabling.

   ![Figure 4.7. Battery kit base plate](image)

   ![Figure 4.8. Base plate for battery kit fitted](image)

   ![Figure 4.9. Battery extension connector](image)
4. Pass the female connector into the base of the remote control unit.

![Figure 4.10. Female connector of the extension cable](image)

5. Fit the battery kit, using the rails to move it into position.
6. Fix the battery pack to the sides of the base with four screws.

![Figure 4.11. Battery kit fitted](image)

7. Connect the battery pack to the female connector installed on the base in point 4. Make sure the battery polarity is correct, i.e. B1+ and B2–.

![Figure 4.12. Battery connection pack](image)

8. The battery extension kit must be mounted as indicated in Figure 4.13.

![Figure 4.13. ekor.uct-m with battery extension kit](image)

### 4.2. Installation of ekor.uct-s

The cubicle-mounted version of the ekor.uct-s compact remote control unit can be mounted either on Ormazabal’s cgmcosmos system cubicles (up to 24 kV) or on cgm.3 system cubicles (up to 40.5 kV).

The design of the ekor.uct-s unit was prompted by the existence of substations in which the installation of a wall-mounted box interferes with other components or operational clearance in the installation.

The components needed to install the ekor.uct, unit are supplied with it[6].

[6] It is possible that references supplied within one kit correspond to different cubicle systems. Only use the references for the corresponding system.
4.2.1. **Mounting ekor.uct-s on cgmcosmos system cubicles**

The figures below show how to assemble the different components in the integrated control kits which must already have been installed in each of the medium voltage cubicles:

- **1** Supporting frame
- **2** Relay terminal block and motorised driving mechanism
- **3** Mixed power supply and communications connector installed on the supporting frame
- **4** Relay ekor.rci

**Figure 4.14. cgmcosmos-l feeder cubicle**

- **1** Terminals to which the transformer position status needs to be wired

**Figure 4.15. cgmcosmos-p fuse protection cubicle**

**Tools required:**

1. For correct assembly, ensure beforehand that the following basic tools are available:
   - Medium-size flat screwdriver
   - 13 mm L-shaped lug wrench

**Figure 4.16. Tools required**

**Kit contents for the cgmcosmos system**

For correct assembly, you must ensure beforehand that the following tools are included in the kit. In the figure below you can see the various components. The nuts and bolts are close to the position where they will be fitted.

The following components are needed to install ekor.uct-s on cgmcosmos system cubicles, whether modular or compact:

- **1** ekor.uct-s lifting assembly (3TEK0017)
- **2** ekor.uct-s left-hand and right-hand supports (3TEK0016)
- **3** 6 DIN-933 M8 x 30 screws (101203) with conic washer
- **4** 8 DIN-933 M8 x 20 screws (101200) with conic washer
- **5** M8 square nut (104400-89), 8 units

**Figure 4.17. Components required for Ormazabal’s cgmcosmos system cubicles**

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*To ensure correct mounting, follow the directions in the Unit spares and accessories instruction document ekor.rci in the Ormazabal cgmcosmos (RA-145) system.*
**Assembly Process for cgmcosmos system**

1. Fit the M8 square nuts (a) on the right-hand support (b) (Figure 4.18).

![Figure 4.18. Fitting the M8 square nuts on the right-hand support](image)

2. Repeat this operation for the left-hand support.

3. Fit the M8 square nuts (a) on the right-hand support, ensuring they can move freely along the guide rails. Insert each square nut in the support through the groove (c) provided (Figure 4.19).

![Figure 4.19. Fitting the M8 square nuts on the guide rails](image)

4. Repeat this operation on the left-hand support.

5. Fit two M8 x 20 screws with conic washer (a) on the bottom of the right-hand support to allow it to be levelled on the medium voltage cubicle.

![Figure 4.20. Fitting the screws for levelling the support](image)

6. Repeat this operation for the left-hand support on the medium voltage cubicle.

   **Tool:** 13 mm L-shaped lug wrench

7. Fit the right support over the upper right hand side (a) of the right medium voltage cubicle.

8. Fit the left support over the upper left hand side (b) of the right medium voltage cubicle.

![Figure 4.21. Location of the supports over the medium voltage cubicle.](image)

9. Adjust the level of the right-hand and left-hand supports by adjusting the M8 x 20 screws (a) until the supports are parallel with the medium voltage cubicles.

![Figure 4.22. Levelling the support on medium voltage cubicles](image)
10. Fit the ekor.uct-s right lifting support (a) on top of the medium voltage cubicle and bolt it to the cubicle with 3 M8 x 30 screws with conic washer (b) (Figure 4.24).

![Figure 4.23. Fixing the right-hand ekor.uct-s lifting support](image1)

11. Repeat this operation with the ekor.uct-s left lifting support on the left-hand side of the medium voltage cubicle.

![Figure 4.25. Position of the square nuts on the right-hand support](image2)

12. The connection cable sheaths between cubicles (corresponding to the power supply and communication bus) must be connected before installing the ekor.uct. As a general rule, the left-hand connector in the first medium voltage cubicle in the assembly should be connected to ekor.uct ekor.uct.

The rest of the connections are made from one medium voltage cubicle to the next so that they form a BUS.

![Figure 4.26. Distance between the fixing supports](image3)

13. Position the M8 square nuts (a) close to the middle of the right-hand support, as indicated in Figure 4.25.

14. Using the square nuts (a) already positioned on the right-hand support as reference, measure a distance of 1024 mm and position the square nuts (b) on the left-hand support at the same distance from them.

![Figure 4.24. Connecting the cable sheaths](image4)
15. Lift the ekor.uct-s unit (a) onto the medium voltage cubicle assembly. Due to the weight of the device, the top is recommended.

Before fitting the ekor.uct-s unit onto the medium voltage cubicles, pay special attention to the two following points:

a. Do not damage the medium voltage cubicle connectors when fitting the ekor.uct-s unit on them.

b. Never drag the ekor.uct-s unit onto the medium voltage cubicles; it must be lifted into its final position on the medium voltage cubicles.

![Figure 4.27. Lifting eyebolts on ekor.uct-s](image)

Maximum weight of ekor.uct-s: 80 kg

16. Open the covers of the ekor.uct-s unit.

![Figure 4.28. Opening of the ekor.uct-s](image)

17. Fix the ekor.uct-s to the right-hand support (3TEK0016) from the inside of the ekor.uct-s, using two M8 x 20 screws with conic washer (a).

If necessary, slide the M8 square nuts along the support guide rails (3TEK0016) until they are aligned with the M8 x 20 screws.

![Figure 4.29. Fixing inside the right-hand side of the ekor.uct-s unit](image)

Tool: 13 mm L-shaped lug wrench

18. Fix the ekor.uct-s to the left-hand support from the inside of the ekor.uct-s, using two M8 x 20 screws with conic washer (a).

If necessary, slide the M8 square nuts along the support guide rails (3TEK0016) until they are aligned with the M8 x 20 screws.

![Figure 4.30. Fixing inside the left-hand side of the ekor.uct-s unit](image)

19. The final position of the ekor.uct-s on the medium voltage cubicles must look as central as possible with respect to the medium voltage cubicle assembly.

![Figure 4.31. Final mounting of the ekor.uct-s unit on cgmcosmos system cubicles](image)

20. Remove all four M8 eyebolts from the top of the ekor.uct-s.
4.2.2. **Mounting ekor.uct-sg on cgmcosmos system cubicles**

The mounting of the ekor.uct-sg automation boxes in their different variants is performed in a similar way.

**Material required**

1000/1 A toroidal transformers and homopolar transformer.

1. Four two-way connectors
2. LV voltage presence indicator with inputs and outputs
3. A four-way female connector
4. Protective sheath
5. 12 metres (8 x 1.5 m) cable 2.5 mm²
6. 6 metres (4 x 1.5 m) cable 1 mm or 1.5 mm²
7. Flanges
8. Spikes

**Mounting components outside the cabinet**

**Mounting toroidal transformers**

*Figure 4.32. Toroidal transformers*

**Mounting the sheath**

We recommend the sheaths are mounted first to significantly simplify the installation process. This way, the sheath is ready for when the box is cubicle-mounted.

1. Connect each sheath connector where appropriate.

2. If it is the right-hand motorised feeder cubicle we must feed the sheath through the lower side hole on the methacrylate dividing the remote control part from the telemanagement part, extending the sheath along the communication box and inserting it in the lower opening of the tray to later connect it to the motor control.

**Mounting the components of the box**

**Initial situation of the box**

The box is mounted ready for installation of the following components:

1. Sheath
2. Charger
3. Remote control fastenings
4. Remote
5. ekor.vpis voltage presence indicator
6. Telemanagement unit
7. Communications modem
8. Communications kit
Mounting the remote control section

Before lifting the telemanagement box to the top of the compact cubicle the following components must be mounted:

Mounting the remote control

1. Mount the **ekor ccp** remote control on the two side fasteners using screws. Once the **ekor ccp** unit has been secured fit the front cap.

2. Connect the sheaths at the top, with the connection from the lower conduit, through a side of the **ekor ccp** unit.

3. Wire the **ekor rci** unit integrated in the **ekor ccp** wire by wire according to the wiring diagram.

---

**Figure 4.35.** Detail of feeding the sheath through to the telemanagement section

**Figure 4.36.** Detail of the layout in the telemanagement section

**Figure 4.37.** Situation of the sheath

**Figure 4.38.** Detail of feeding the sheath through

**Figure 4.39.** Mounting the **ekor ccp** remote control unit

**Figure 4.40.** Sheath connection

**Figure 4.41.** **ekor rci** functionality wiring
**Mounting the telemanagement section**

Before lifting the telemanagement box to the top of the compact cubicle the following components must be mounted:

- Concentrator
- DI Module
- Securing the DI module
- Modem
- Voltage presence indicator
- Antenna

* Depending on the type of telemanagement box (primary or secondary, i.e. master or slave) not all the components will be installed.

**Mounting the GCTP telemanagement section**

**Mounting the modem**

1. Mount and secure the modem on the door track.
2. The sheaths are prepared to connect via the bottom of the unit.
3. The antenna is placed on the vertical bracket at the bottom of the door.

![Figure 4.42. Mounting the Teldat modem](image1)

* It is recommended to connect it wire by wire according to the wiring diagram.

**Mounting the concentrator**

1. Mount the concentrator on the corresponding track (screwed on).
2. To ensure the correct connection we recommend wire by wire wiring according to the wiring diagram.

![Figure 4.43. Detail of securing the concentrator](image2)

**Mounting the DI module.**

1. Fit the fastener or metallic belt on the concentrator's bracket.
2. Screw the DI module onto the fastener or metallic belt.

![Figure 4.44. Detail of securing the ID module](image3)
**Mounting the transformer**

1. Mount the transformer on the track at the bottom of the cabinet, on the left side, next to the terminal block.
2. Wire wire-by-wire according to wiring diagram.

![Figure 4.45. Detail of the transformer's position](image)

**Mounting the GCTS telemanagement section**

**Mounting the concentrator**

1. Screw the concentrator's brackets on to this unit.
2. Mount the concentrator on the corresponding track.
3. To ensure the correct connection we recommend wire by wire wiring according to wiring diagram.

![Figure 4.46. Detail of securing the concentrator](image)

**Mounting the box on the cubicle**

**Starting position for mounting the ekor.uct-sg**

It is part of the initial situation in which the cells have:

1. Motorised driving mechanism in the right feeder position (preferably) or the left.
2. Relay kit with toroidal transformers mounted on motorised feeder cubicle.
3. Cover removed where the ekor.sas are housed, maintaining the ekor.sas connected but not screwed in.

![Figure 4.48. Starting position of the cubicles](image)

**Fit the nylon spacers**

Fit the nylon spacers included in the kit in their position.

![Figure 4.49. Spacers on bracket](image)

![Figure 4.50. Position of the spacers](image)
Preparing the mounting brackets

1. Fix the cage nuts in the three grooves with brackets, where they will be secured to the box.
2. Screw the bracket on to the flanges of the unit’s cubicles.

Figure 4.51. Mounting brackets

3. Prepare box mounting brackets by fitting the cage nuts in the front and middle slots.
4. For the left bracket fit the cage nuts at 3.5 cm in the front groove and the middle groove according to the figure.

Figure 4.52. Position of the cage nuts in the left bracket (front and middle groove)

5. For the right bracket fit the cage nuts at 4 cm in the front groove and 4.5 cm in the middle groove.

Figure 4.53. Position of the cage nuts in the right bracket (front and middle groove)

Position the mounting brackets

1. Fix the left and right brackets on the cubicle.

Figure 4.54. Detail of fixing the left bracket to the cubicle

2. Adjust the bracket screws so that the box is level.

Figure 4.55. Detail of fixing the right bracket to the cubicle

3. The brackets must be regulated using the screws provided for this purpose, to level the box.

Figure 4.56. Detail of the levelling
Preparing the ekor.uct-sg box

1. Check the ekor.uct-sg box before mounting on the cubicles. The main points to check are:
   a. Position and diameter of the rear feedthroughs on the box.
   b. Checking that the cage nuts are in place.

Lifting the ekor.uct-sg

1. Lift the ekor.uct-sg box to the top of the cubicle, manually or using a crane.

   ![Lifting with a crane](image)

   Figure 4.59. Lifting with a crane

   It is recommended to check the correct installation of all cage nuts in the box prior to lifting.

Screw the ekor.uct-sg onto the cubicles

1. The kit contains the necessary screws.

   ![Screw kit](image)

   Figure 4.60. Screw kit
2. Secure the inside of the ekor.uct-sg box.

![Figure 4.61. Detail of the internal securing of the box](image1)

3. Screw the ekor.uct-sg to the compact cubicle or set of cubicles. The number of securing points depends on access to the screw-in points, with 4 points the minimum required for correct securing.

![Figure 4.62. Detail of the lower securing of the box](image2)

**Fit the ekor.sas acoustic indication alarm to the inside of the ekor.gid-sg**

1. Screw the ekor.sas acoustic alarm onto the brackets of the ekor.gid-sg.

![Figure 4.64. Detail of the brackets in the box (left and right)](image3)

**Mounting the charger**

1. The charger is secured on the tray with four screws.

![Figure 4.65. Detail of the charger bracket and its fastening points](image4)

*The charger must be mounted after mounting the box on the set of cubicles. Otherwise, it is impossible to screw in the fastening point inside the box.*
Connecting the sheaths

Driving mechanism sheath kit

1. Motorised right feeder cubicle: Insert the sheath through the lower opening on the tray towards the driving mechanism.

2. Motorised left feeder cubicle: Insert the sheath through the lower metallic opening on the tray towards the driving mechanism.

3. Connect the other end of the hose to the operating mechanism, according to wiring diagram.

V/I signals sheath kit

1. Insert the sheath in the box through the opening on the lower part of the tray.

2. Extend the sheath along the whole of the communications box and insert it through the lower side hole of the methacrylate dividing the remote control part from the telemanagement part.

3. Connect the wires of the other end of the sheath to the corresponding terminals according to the box's wiring diagram.
**Final steps of the installation**

**Modifying the covers of the cubicles’ driving mechanism**

1. Fit the tool on the top of the covers (Centred) and mark the ends.

   ![Fitting the tool](image1)

   **Figure 4.72. Fitting the tool**

2. Cut the cover along the previously marked ends and return the tool to its position.

3. With this tool, bend the top of the cover.

   ![Marking the ends](image2)

   **Figure 4.73. Marking the ends**

   ![Bending the covers](image3)

   **Figure 4.74. Bending the covers**

4. Final view of the unit.

   ![Bent covers](image4)

   **Figure 4.75. Bent covers**

   ![Components of ekor.uct-sg](image5)

   **Figure 4.76. Components of ekor.uct-sg**
4.2.3. **Mounting ekor.uct-s on cgm.3 system cubicles**

**Contents of the kit for cgm.3 system**

The following components are needed to install ekor.uct-s on cgm.3 system cubicles, whether modular or compact:

- Support assembly 3PEK0044
- Nuts and bolts:
  - M8 x 30 captive screw and washer, 8 units
  - Hexag. screw M8 x 60 DIN-933, 2 units
  - Thin nut M8, 4 units
  - Nut

**Assembly Process for cgm.3 system**

The mounting sequence is as follows:

1. Attach the fixing clips to the inner face of the upper left and right supports.
   a. The end of the rail is wider to make it easier to attach the clip.

2. Remove the driving mechanism covers from the end cubicles on which the ekor.uct-s unit will rest to make subsequent operations easier.

3. Fix the right-hand and left-hand supports in their corresponding positions, on the end cubicles on which the ekor.uct unit will rest, at the top on the outside.
4. Place and fix the strengthening plate fastening screws to the top right-hand and left-hand supports.

- **Figure 4.82. Bolt position**
  - a. M8 x 60 hexagonal screw
  - b. M8 x 30 captive screw and washer

4a. On the left-hand side (looking from the front of the cubicle assembly), fasten 3 of the supplied M8 x 30 screws with captive washers onto the inserted nuts available for this purpose.

- **Figure 4.83. Left side fastening**

4b. On the right-hand part, it is fastened with a screw and nut.

- **Figure 4.85. Right side fastening**
  - a. M8 x 60 DIN-933 hexagonal screw
  - b. M8 captive nut and washer

5. The connection cable sheaths between cubicles (corresponding to the power supply and communication bus) must be connected before installing the ekor.uct. As a general rule, the left-hand connector in the first medium voltage cubicle in the assembly should be connected to ekor.uct. The rest of the connections are made from one medium voltage cubicle to the next so that they form a BUS.

- **Figure 4.86. Connecting the cable sheaths**

6. Lift the ekor.uct-s unit (a) onto the medium voltage cubicle assembly. Due to the weight of the device, the use of slings or chains fastened to the eyebolts (b) on the top is recommended.

Before fitting the ekor.uct-s unit onto the medium voltage cubicles, pay special attention to the two following points:

- **Tool: 13 mm socket wrench**

a. Do not damage the medium voltage cubicle connectors when fitting the ekor.uct-s unit on them.
b. Never drag the ekor.uct-s unit onto the medium voltage cubicles; it must be lifted into its final position on the medium voltage cubicles.

Figure 4.87. Eyebolts on the ekor.uct-s

7. Position the ekor.uct unit, taking care to centre it.

Figure 4.88. Position of ekor.uct-s

8. Screw the unit to the lateral supports at the following 4 points:
   a. Right-hand front part of ekor.uct.
   b. Right-hand rear part of the ekor.uct.

Figure 4.89. Fixing inside the right-hand side of the ekor.uct-s unit.

Pull out the communications rack to make it easier to insert the right-hand screws.

Tool: 13 mm socket wrench

   c. Left-hand front part of ekor.uct.
   d. Left-hand rear part of the ekor.uct unit.

Figure 4.90. Fixing inside the left-hand side of the ekor.uct-s units

Tool: 13 mm socket wrench L-shaped wrench for the rear part

9. Fit the driving mechanism covers.

4.3. General connections of ekor.uct

Once the ekor.uct unit has been installed in either of its versions: wall or cubicle-mounted, the general connections are carried out:

1. Connect the 230 V_ac alternating current supply to terminals CA1 and CA2 on ekor.uct.

2. Connect the presence of personnel signal to terminals AC1 and AC2 on ekor.uct.

3. If there are additional alarms in the Substation, these should be connected to terminals AC3, AC4, AC5 or AC6 on ekor.uct, depending on the model.
4.4. Interconnections between the substation components

After making the general connections, make the interconnections within the Substation, between ekor.uct and the cubicle assembly, and between cubicles.

1. Using the cable sheath provided for the purpose, connect the ekor.uct unit to the first cubicle in the assembly.

   In the case of the ekor.uct-m unit (wall-mounted version), this connection is from the connector on the right of the box to the nearest cubicle in the assembly.

   Figure 4.91. Connection of ekor.uct-m

   In the case of the ekor.uct-s unit (cubicle-mounted version), the cable from the left-hand connector on the first cubicle is connected to the connector at the top of ekor.uct.

   Figure 4.92. Connection of ekor.uct-s

2. Make a visual check that the interconnections between cubicles have been made correctly.

3. If the Substation has a fuse protection cubicle which does not have a relay for detecting the switchgear status, the switch status (switch closed and switch open) is wired to the adjacent cubicle, onto the relay inputs provided for the purpose. These connections correspond to:
   a. Adjacent transformer position switch closed indication on terminal A7.
   b. Adjacent transformer position switch open indication on terminal A6.

   As a general rule, it is advisable to wire the transformer protection cubicles to the adjacent feeder cubicle on the left. If there is no feeder cubicle on the left, wire it to the adjacent one on the right. Where there are two consecutive transformer protection cubicles the following order should be respected: penultimate transformer protection cubicle to the penultimate feeder cubicle and last transformer protection cubicle to last feeder cubicle. These are general recommendations and must be guaranteed before generating the database.

   The figure below shows the interconnections to be made between cubicles and also between the first cubicle and the ekor.uct unit in the case of a 2LP equipment.

   Figure 4.93. Interconnections between cubicles and ekor.uct
5. Relay and RTU configuration

5.1. Relay configuration

The integrated control units in the installation can be configured in two ways: manually or via the ekor.soft configuration program.

To set the relay manually, press the SET key on the relay to access its settings and modify whichever prove necessary⁽⁸⁾.

The ekor.soft setting and monitoring program can be used to configure these units via a PC. The settings are then modified on the computer screen and subsequently sent to the relays. ekor.soft can configure the relays in two ways: in connection mode, when connected directly to the relay you wish to set, and in emulation mode, when there is no need to be connected to a relay. The setting files generated in emulation mode can be retrieved and dumped onto the relays at a later time, once connected to the relays in the substation⁽⁹⁾.

5.2. RTU configuration

RTU configuration means generating and dumping a database to the RTU.

A database corresponds to the concrete particularisation of available signals and controls accepted in the transformer or switching substation for which it is configured. These particularisations correspond to the general signals available in the substation, number of relays with which the RTU will communicate, signals detected by each of the relays, commands that can be executed on each of the functional units, etc.

The database is generated via an application which generates the binary file sent to the RTU. As previously mentioned, the distribution of the substation to which the database is to be dumped will be specified on generating the database (in terms of number of cubicles, name of each one, specification of signals detected by each cubicle, specification of general signals detected by the RTU itself, etc.).

⁽⁸⁾ For more information, consult the General instructions document corresponding to each of the Ormazabal units: IG-158 or IG-152 for ekor.rci, IG-157 in the case of ekor.rpci or IG-150 for ekor.rps.

⁽⁹⁾ For more information relating to the ekor.soft program, see Ormazabal’s IG-155 document.
6. Checks

6.1. Local installation checks

Once the ekor.uct unit has been installed and the necessary interconnections made, it is vital to check that all these connections have been made correctly. These checks should be performed in order to ensure the ekor.uct unit is started-up correctly.

6.1.1. Power Supplies

Push up the ‘Red’ ('Line') miniature circuit breaker and check that the green pilot light on the ekor.uct unit cover comes on. Also check that the battery charger ‘En Carga’ ('Charging') green pilot light comes on\(^{10}\).

6.1.2. Battery Charging

The battery charge must be measured to avoid starting up ekor.uct units with batteries that have not been maintained correctly. If the voltage measured at the ends of the battery pack is less than 42 V, the batteries should be replaced.

6.1.3. Presence of personnel

Activate the presence of personnel detector located on the installation access door. Check that the input corresponding to this indication is activated according to the type of RTU being used: Also check that the aforementioned inputs remain deactivated if the detector is not activated.

<table>
<thead>
<tr>
<th>Type of RTU digital input to be updated</th>
<th>Entrada digital a actualizar</th>
</tr>
</thead>
<tbody>
<tr>
<td>ekor.ccp</td>
<td>E9</td>
</tr>
<tr>
<td>SETIS</td>
<td>BE1</td>
</tr>
<tr>
<td>CRINOR</td>
<td>ED9</td>
</tr>
<tr>
<td>MRC-100</td>
<td>Led 9</td>
</tr>
</tbody>
</table>

Table 6.1. Type of RTU

6.1.4. Interconnections in the cubicle

**Relay Power Supply**

With the miniature circuit breaker for ‘Mando’ ('Driving mechanism') in the up position, check that the power is supplied to each of the substation relays; in other words, the ‘V on’ LED indicator must be activated.

**Communications**

Check that all the substation units are communicating with the RTU correctly. To do this, remove all the units (ekor.rci, ekor.rpg y ekor.rpt) from the bus and access the password screen via the SET key.

\(^{10}\) By following the recommendations indicated in section 7.
Under these conditions, check that the port on the RTU which communicates with the slaves is not functioning.

Activate the relays on the units in the communications bus one by one (by pressing the ESC key) and check that the RTU communicates correctly under these conditions.

If the RTU is a SETIS unit, this communication is checked in the blink frequency of the COM 3 communications port.

If the Ormazabal ekor ccp unit is being used, the communications fault is shown on the graphic display.

### 6.1.5. Watch dog

Go into the output screen on each unit and activate S2. Check that the input corresponding to this indication is activated, depending on the type of RTU being used:

<table>
<thead>
<tr>
<th>Type of RTU</th>
<th>Digital input to be updated</th>
</tr>
</thead>
<tbody>
<tr>
<td>ekor ccp</td>
<td>E9</td>
</tr>
<tr>
<td>SETIS</td>
<td>BE1</td>
</tr>
<tr>
<td>CRINOR</td>
<td>ED9</td>
</tr>
<tr>
<td>MRC-100</td>
<td>LED 9</td>
</tr>
</tbody>
</table>

| Table 6.2. Type of RTU |

### 6.2. Checking the installation and telecontrol tests

The ekor uct compact remote control unit has been designed so that a complete check of the installation can be made, including when it is operating, without the need for power cuts from the telecontrol.

**ekor uct-sg** is a variant of the ekor uct unit designed with its own database for signalling according to the specifications of the different companies. When performing the signalling testing, the diagram and the databases must be taken into account.

#### 6.2.1. General substation signals

Check that all the general substation signals are detected correctly in the RTU. To do this, generate each of the alarms independently and check that indication is correct. Then stop generating the alarm and check that the initial conditions are restored (disappearance of alarms).

In the table below, each of the general substation signals is listed, along with how to generate and check them:

<table>
<thead>
<tr>
<th>Signal</th>
<th>How to generate it</th>
<th>Check to be performed (activating inputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miniature circuit breaker for line voltage, 230 Vca, down</td>
<td>Push the ‘RED’ (‘LINE’) miniature circuit breaker down</td>
<td>1st input</td>
</tr>
<tr>
<td>Miniature circuit breaker for motors down</td>
<td>Push the ‘MOTORES’ (‘MOTORS’) miniature circuit breaker down</td>
<td>2nd input</td>
</tr>
<tr>
<td>Miniature circuit breaker for driving mechanism down</td>
<td>Push the ‘MANDO’ (‘DRIVING MECHANISM’) miniature circuit breaker down</td>
<td>3rd input</td>
</tr>
<tr>
<td>Battery charger fault This is an internal alarm for the rectifier-battery charger</td>
<td>This is triggered by creating a bridge between terminals D and C of the terminal block inside the charger, under its cover</td>
<td>4th input</td>
</tr>
<tr>
<td>Charger line voltage fault alarm (timed signal after four hours) This is an internal alarm for the rectifier-battery charger, which is indicated 4 hours after the line voltage is lost (230 Vca)</td>
<td>This is triggered by creating a bridge between terminals R and C of the terminal block inside the charger, under its cover</td>
<td>5th input</td>
</tr>
<tr>
<td>End of Battery Service Life This is an alarm for the battery pack (charger + batteries) which indicates the end of battery life.</td>
<td>This is triggered by creating a bridge between terminals B and C of the terminal block inside the charger, under its cover.</td>
<td>6th input</td>
</tr>
<tr>
<td>Installation general Watch Dog signal</td>
<td>Activate Output 2 on each relay.</td>
<td>7th input</td>
</tr>
</tbody>
</table>
Continuation

<table>
<thead>
<tr>
<th>Signal</th>
<th>How to generate it</th>
<th>Check to be performed (activating inputs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of personnel</td>
<td>The ‘Presence of personnel’ alarm is triggered in two ways:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. By activating the presence of personnel detector located on the installation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>access door</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. By creating a bridge between contacts AC1 and AC2 on the ekor.uct terminal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>block</td>
<td></td>
</tr>
<tr>
<td>Selector switch in LOCAL position</td>
<td>Installation key in 'local' position</td>
<td></td>
</tr>
<tr>
<td>Selector switch in REMOTO (REMOTE) position</td>
<td>Installation key in 'remote' ('remote') position</td>
<td></td>
</tr>
<tr>
<td>Additional Substation alarm</td>
<td>The ekor.uct unit has two contacts so that additional Substation alarm indications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>can be wired in and the alarm is triggered by creating a bridge between</td>
<td></td>
</tr>
<tr>
<td></td>
<td>terminals AC3 and AC4 of the ekor.uct terminal block.</td>
<td></td>
</tr>
</tbody>
</table>

Table 6.3. General signals of the substation and how to generate them and check them

In addition, check that all the signals mentioned above have been correctly received in the dispatching centre.

<table>
<thead>
<tr>
<th>Field/calculated signals</th>
<th>Description</th>
<th>Component</th>
<th>Number</th>
<th>Identifier</th>
<th>Switchgear terminal block</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communication with unit</td>
<td>Remote</td>
<td></td>
<td></td>
<td>DIC</td>
<td>Digital calculated top syst.</td>
</tr>
<tr>
<td>Polarisation to return to digital inputs 1, 2, 3</td>
<td>ac/dc failure</td>
<td>3</td>
<td>DI2</td>
<td>Digital input 2 field</td>
<td></td>
</tr>
<tr>
<td>Secure power supply failure</td>
<td>INT</td>
<td>4</td>
<td>DI3</td>
<td>Digital input 3 field</td>
<td></td>
</tr>
<tr>
<td>Switch open</td>
<td>INT locked</td>
<td>6</td>
<td>DI4</td>
<td>Digital input 4 field</td>
<td></td>
</tr>
<tr>
<td>Switch closed</td>
<td>Fire</td>
<td>7</td>
<td>DI5</td>
<td>Digital input 5 field</td>
<td></td>
</tr>
<tr>
<td>Polarisation to return to digital inputs 4, 5, 6</td>
<td>Low gas pressure</td>
<td>9</td>
<td>DI6</td>
<td>Digital input 6 field</td>
<td></td>
</tr>
<tr>
<td>Polarisation to return to digital inputs 7, 8</td>
<td>Prot. cubic open</td>
<td>10</td>
<td>DI7</td>
<td>Digital input 7 field</td>
<td></td>
</tr>
<tr>
<td>Polarity switch to remote control</td>
<td>Remote control</td>
<td>11</td>
<td>DI8</td>
<td>Digital input 8 field</td>
<td></td>
</tr>
<tr>
<td>Protective switch to remote control</td>
<td>Protective switch</td>
<td>12</td>
<td>DI9</td>
<td>Digital input 9 field</td>
<td></td>
</tr>
<tr>
<td>High temperature transformer</td>
<td>High temp.</td>
<td>14</td>
<td>ED10</td>
<td>Digital input 10 field</td>
<td></td>
</tr>
<tr>
<td>Open switch</td>
<td>SWI</td>
<td>31</td>
<td>DO1.1A</td>
<td>Digital output 1 field</td>
<td></td>
</tr>
<tr>
<td>Open switch</td>
<td>SWI</td>
<td>32</td>
<td>DO1.1B</td>
<td>Digital output 1 field</td>
<td></td>
</tr>
<tr>
<td>Close switch</td>
<td>SWI</td>
<td>33</td>
<td>DO2.1A</td>
<td>Digital output 2 field</td>
<td></td>
</tr>
<tr>
<td>Close switch</td>
<td>SWI</td>
<td>34</td>
<td>DO2.1A</td>
<td>Digital output 2 field</td>
<td></td>
</tr>
<tr>
<td>Internal fault</td>
<td>Unit fault</td>
<td></td>
<td></td>
<td></td>
<td>Digital calculated</td>
</tr>
<tr>
<td>Fault towards feeder</td>
<td>Directional to feeder</td>
<td></td>
<td></td>
<td></td>
<td>Digital calculated</td>
</tr>
</tbody>
</table>

In the case of ekor.uct-sg, the signalling is prepared according to the following database:
Position check

The position check consists of generating each of the possible position indications, and checking that they have been correctly received in the dispatching centre.

The signals for each position correspond both to the physical signals detected, and to the digital status of internal relay events, phase or zero-sequence fault indication, or trip by phase timer, sectionaliser, etc.

For a feeder cubicle, the signals and controls available are as follows:

<table>
<thead>
<tr>
<th>Signals for each of the positions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Switch-disconnector closed</td>
</tr>
<tr>
<td>Switch-disconnector open</td>
</tr>
<tr>
<td>Earthing switch closed</td>
</tr>
<tr>
<td>Earthing switch open</td>
</tr>
<tr>
<td>Adjacent transformer position closed</td>
</tr>
<tr>
<td>Adjacent transformer position open</td>
</tr>
<tr>
<td>Phase fault</td>
</tr>
<tr>
<td>Zero-sequence fault</td>
</tr>
<tr>
<td>Sectionaliser automation on</td>
</tr>
<tr>
<td>Sectionaliser automation off</td>
</tr>
<tr>
<td>Sectionaliser automation disconnected</td>
</tr>
<tr>
<td>Blocking due to control in local mode</td>
</tr>
<tr>
<td>Sectionaliser automation blocked due to control in local mode</td>
</tr>
<tr>
<td>Medium voltage phase fault (timed indication after 3 minutes of voltage absence on one or two phases)</td>
</tr>
</tbody>
</table>

Table 6.5. Available signals
The position check is performed using the ekor.soft configuration program. This software can simulate the signals available on the relay by means of its test mode, independently of the signals it is detecting and the events it has available. It also has the option of not executing those orders received from the remote control. In this way, the indications simulated via the software can be sent to the dispatching centre without the need to cut off the supply.

Use the input test mode to test the functionality of all the signals and indications available to the relay by simulation. On accessing this option, a snapshot of the relay status at that time is indicated on screen. From this moment on, these values can be forced to states opposite to the ‘actual’ state of the switchgear; the indications can also be modified, generating even states that are not occurring at this time.

Use the output test mode to test the outputs by simulation. On accessing this option, a snapshot of the relay status at that time appears. From this moment on, the commands received from the dispatching centre are displayed without assigning them to the corresponding physical outputs\(^{[11]}\).

\(^{[11]}\) For more information relating to the ekor.soft program, see Ormazabal’s IG-155 general instructions document.
7. Maintenance recommendations

Remotely-controlled transformer and switching substations are key elements in improving the quality of the medium voltage distribution network supply. Effective management of these elements is the fundamental way to achieve optimum operation. For this reason, it is recommended to observe the following maintenance practices:

1. **Operate the switchgear** once a year with or without power cuts. These operations can be commanded from the dispatching centre or performed locally.

2. It is recommended to **replace the batteries periodically** according to the diagram below or whenever the ‘End of Battery Service Life’ alarm activates.

In Substations where the ventilation recommendations are not adhered to (i.e. that the ambient air temperature in the area destined to accommodate the remote control batteries does not exceed 10 °C more than room temperature), the batteries must be replaced at least every 3 years.

To replace the batteries, disconnect the **ekor.uct unit miniature circuit breaker**.

The standard batteries in the **ekor.uct unit** should be replaced with batteries with similar characteristics:

In Substations where the ventilation recommendations are not adhered to (i.e. that the ambient air temperature in the area destined to accommodate the remote control batteries does not exceed 10 °C more than room temperature), the batteries must be replaced at least every 3 years.

To replace the batteries, disconnect the **ekor.uct unit miniature circuit breaker**.

The standard batteries in the **ekor.uct unit** should be replaced with batteries with similar characteristics.

After replacing the batteries, and before reconnecting the miniature circuit breakers, it is recommended to measure the voltage at the end of each of the batteries must be over 10.5 V. If this is not the case, it is recommended to replace the battery.

Next, connect the 230 V ac miniature circuit breakers and check that the charger ‘Red’ (‘Line’) LED is lit.

If after connecting the **ekor.uct unit** to the 230 V ac power supply, it is necessary to shut it down, it is recommended to disconnect the batteries so that the DC equipment does not discharge them completely.

If the batteries are in storage, it is recommended to follow the manufacturer’s instructions with regard to storage. These instructions recommend recharging the batteries every 6 months. In addition, it is recommended to check that the voltage of each battery is never less than 10.5 V.

1. With regard to maintenance of the medium voltage cubicles (feeder, busbar, circuit-breaker), it is recommended to follow the maintenance procedures indicated in the corresponding General Instructions documents.

If circuit-breakers are used as protection, it is recommended to trip every protection at least once every 3 years.

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(12) To perform correct maintenance, follow the directions in Ormazabal’s General Instructions documents for the cgmcosmos (IG-078) and cgm.3 (IG-136) systems.