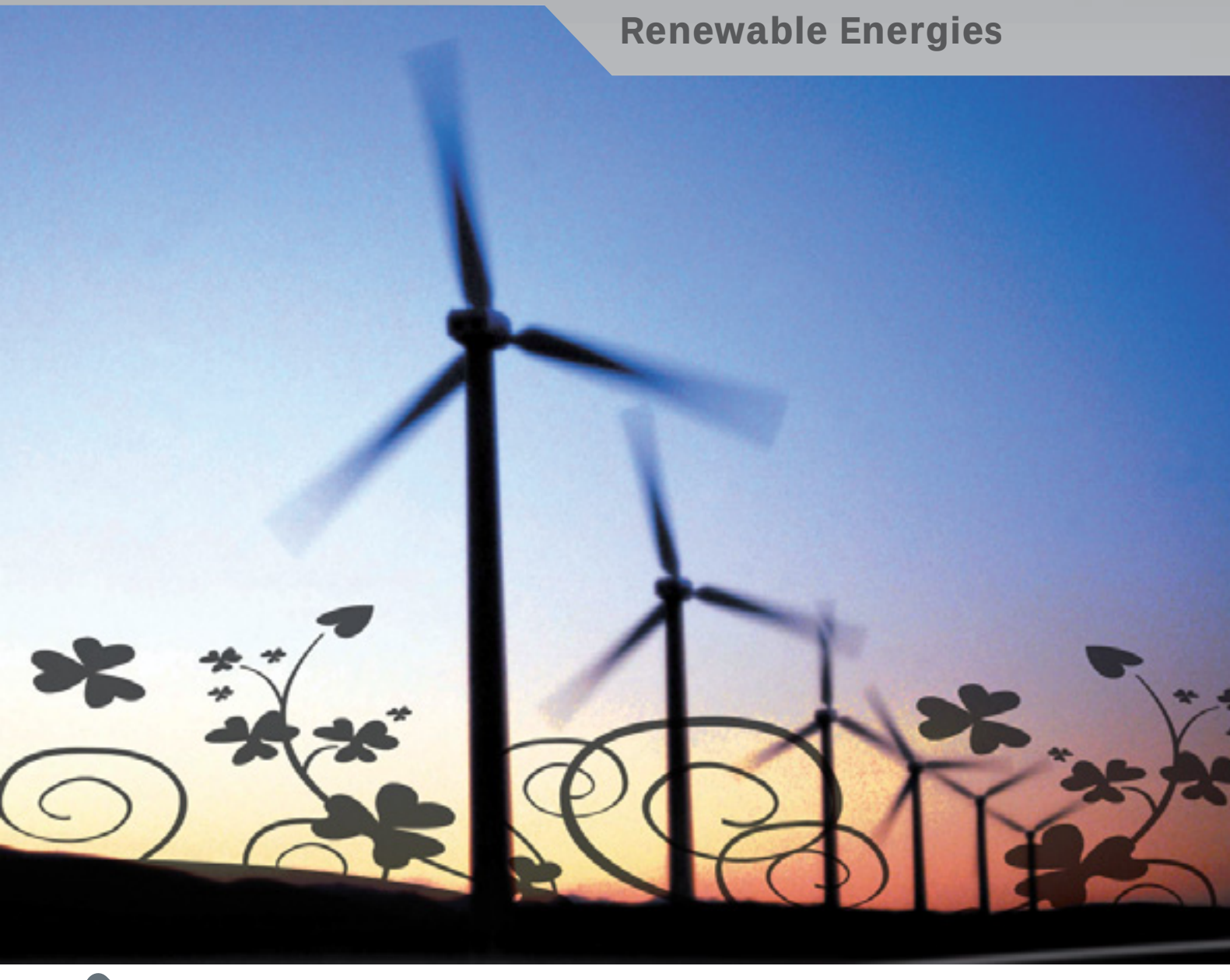
ORMAZABAL

Focus on Medium Voltage

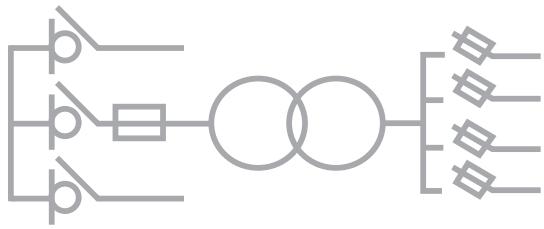
Renewable Energies



Medium voltage applications for Wind Farms

Up to 40.5 kV

The quality of designed, manufactured and installed products is underpinned by the implementation and certification of a quality management system, based on the international standard ISO 9001:2008.
Our commitment to the environment is reaffirmed with the implementation and certification of an environmental management system as laid down in international standard ISO 14001.



In view of the constant evolution in standards and design, the characteristics of the elements contained in this catalogue are subject to change without prior notification. These characteristics, as well as the availability of components, are subject to confirmation by Ormazabal's Technical - Commercial Department.

Contents

FOCUS ON MEDIUM VOLTAGE

At **Ormazabal**, we are **Medium Voltage specialists** and we offer the **best solutions** by being at the disposal of our clients and responding directly to their own individual needs.

Identifying client **needs** and collaborating closely with them enables us to design the **optimum solution** to suit them. Full client satisfaction is achieved by combining a wide range of **Medium Voltage** Electrical Distribution **products** and a whole host of personalised **services**.

Our client-oriented approach is fundamental in establishing mutually-beneficial, long-term relationships of **value to the client**. This is achieved through our highly-qualified team, able to offer both comprehensive solutions and personalized consultancy.

We have been working for over 40 years in the medium voltage market with the most renowned electrical companies. This extensive experience together with over 15 years of exchanging knowledge with major international wind turbine generator **manufacturers** and **technologists**, makes **Ormazabal** a worldwide reference: our equipment is installed in over 200 wind farms and we are **leaders** in **Offshore** installations.

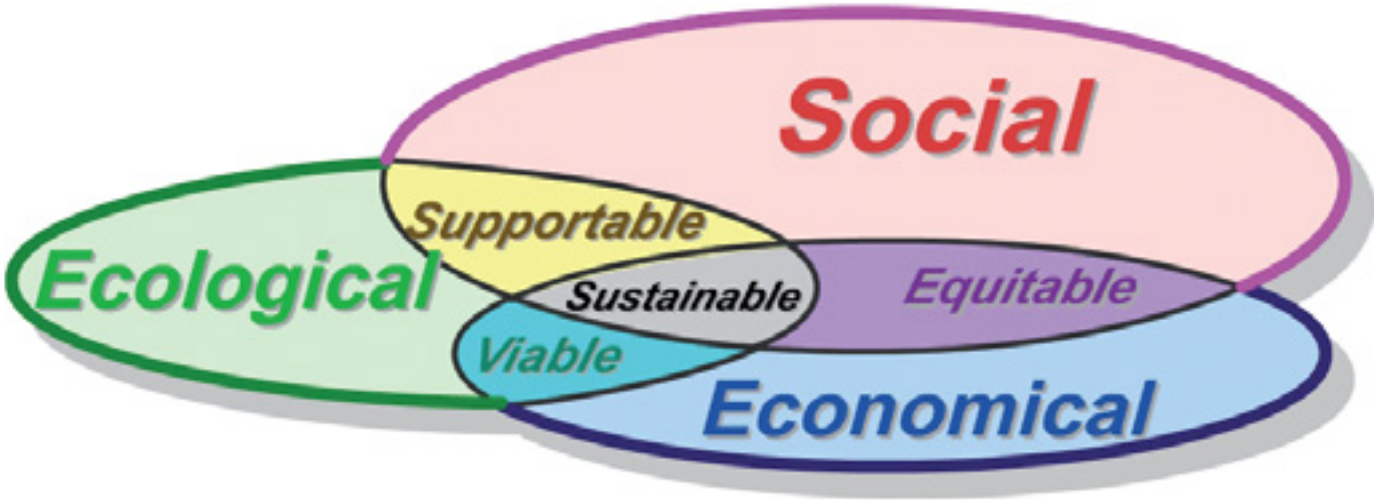
Our strong commitment to R+D+i has resulted in the creation of technologically-advanced products, developed using **in-house technology** and tested in certified and third-party laboratories, resulting in industrialised and tested solutions and thus assuring quality as a whole from the outset.

One of our main lines of activity is in the area of **Sustainability** understood as the best compromise between Satisfying Social Needs and its Environmental and Economic Impact.

- **Over 15 GW installed worldwide (Wind and Solar)**
- **Over 200 Wind Farms installed in more than 25 countries (2008)**
- **Over 15 years' experience in Wind Farms**
- **Over 600 photovoltaic installations**
- **Global leader in total power installed offshore**

ORMAZABAL:
COMMITMENT TO SUSTAINABLE DEVELOPMENT

Ormazabal is committed to Sustainable Development to improve its solutions.
Sustainability is understood as the best compromise between Satisfying Social Demands, Environmental Care and Cost Effectiveness.



SOLUTIONS

Our **solutions** are developed for use in a wide range of sectors and areas.

In the area of electrical generation, our medium voltage **applications** are prominent in the field of **Renewable Energies**:

- Wind farms
- Photovoltaic installations
- Cogenerations

We attend to the **needs** of each client, presenting ourselves as their technological partner who they can trust to provide them with custom-made solutions. We seek long-term, **mutually-beneficial** relationships.

Our **range of solutions**, products and services covers everything from from engineering and consultancy to manufacturing, simulation, testing, installation, commissioning and training.

- **Medium Voltage Applications for Wind Farms**
- **Ormazabal - A Natural Partner: Mutual benefit**
- **Value for the client: Needs met**
- **Solutions, products and services:**
  - Engineering and consultancy
  - Manufacturing, simulation and testing
  - Installation, commissioning and training

VALUE FOR THE CLIENT

Our **commitment** to our clients takes the form of a range of **solutions** including an extensive set of **products and services** that covers existing medium-voltage requirements in the development of projects for wind applications.

Ormazabal offers its clients a team of highly-qualified, experienced personnel who will study their needs, provide them with advice and design the best solution.

SERVICES

Close collaboration with the client, supported by permanent innovation with the efficient use of technology and a solid industrial foundation is reflected in a range of **services supported** by Ormazabal:

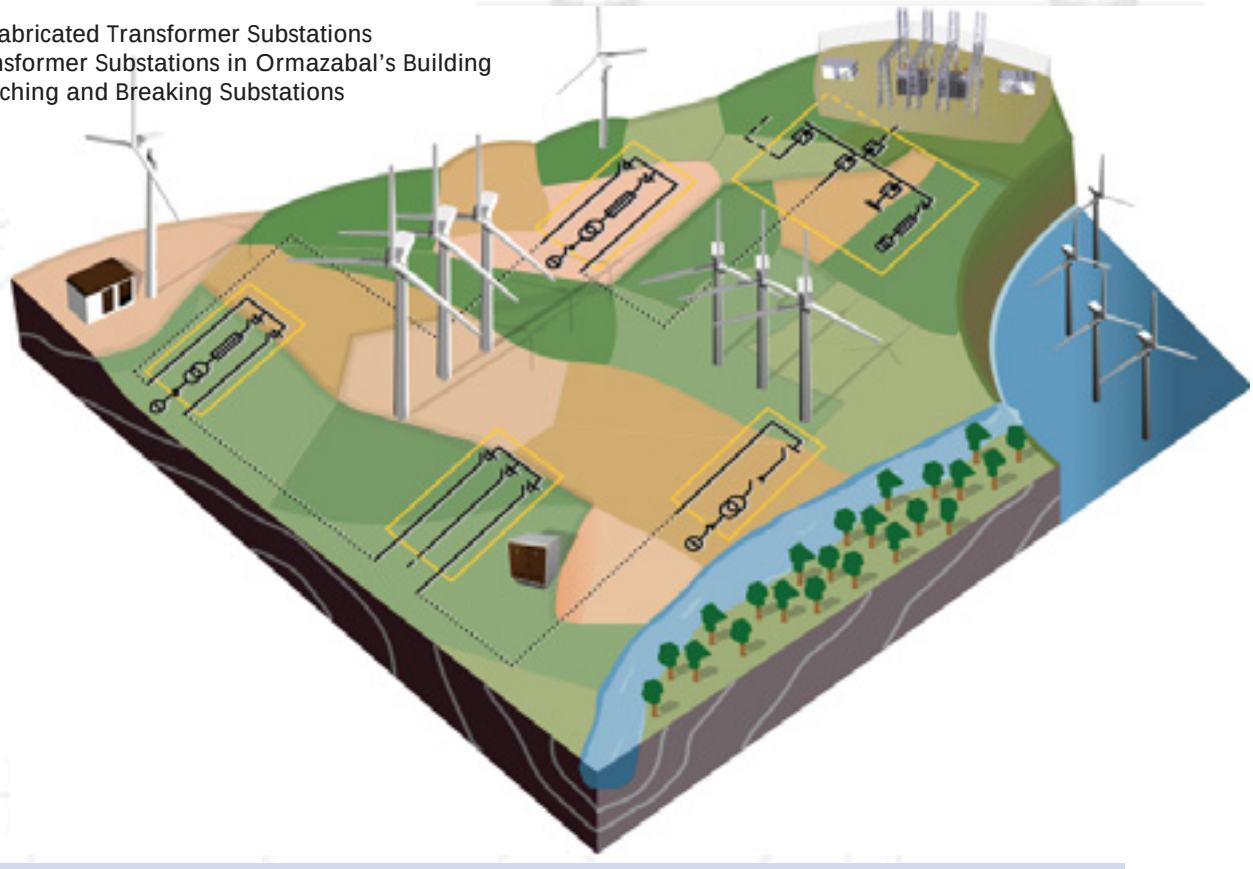
Consultancy		Technical support		Installation and assembly	
Commissioning		Aftersales service		Product end-of-life cycle	
Recycling		Renovation		Training	

(*) Please consult our Technical-Sales Department to confirm the geographical scope of the services offered.

PRODUCTS

Our range of Medium Voltage Electrical Distribution products is based on the following:

- **Medium Voltage Switchgear for Primary Distribution**
  - Gas Insulated:
    - CPG.0 Cubicles (Single Busbar): Up to 36 kV / 1600 A / 25 kA
    - CPG.0 Cubicles (Single and Double Busbar): Up to 36 kV / 2000 A / 31.5 kA
  - Air Insulated:
    - CPA-AMC Cubicles: Up to 17.5 kV / 2500 A / 31.5 kA
  - Mobile substations
    - Ormacontainer
- **Medium Voltage Switchgear for Secondary Distribution**
  - Gas Insulated: Compact and Modular:
    - CGMCOSMOS System: Up to 24 kV / 630 A / 20 kA
    - GA System: Up to 24 kV / 630 A / 20 kA
    - GAE System: Up to 24 kV / 630 A / 20 kA
    - CGM.3 System: Up to 40.5 kV / 630 A / 20 kA
- **Protection, Control and Automation**
- **Distribution Transformers**
- **Connectors and Accessories**
- **Low Voltage Boards**
- **Transformer Substations:**
  - Prefabricated Transformer Substations
  - Transformer Substations in Ormazabal's Building
  - Switching and Breaking Substations



- **Global leader in Secondary Distribution with complete gas insulation up to 40.5 kV**
- **Over 1,000,000 cubicles with complete insulation installed throughout the world**
- **Over 100,000 Transformer Substations installed throughout the world**

MEDIUM VOLTAGE SWITCHGEAR FOR PRIMARY DISTRIBUTION

- **Characteristics**
  - Insulation: gas or air.
  - Metal clad.
  - Wide range.
  - Modularity.
  - Flexibility.
  - Minimum maintenance.
  - Highly safe and flexible.
- **Application**
  - Substation
  - Switching substations
  - Installation in:
    - Civil works building
    - Tower
    - Mobile substation (on/offshore)
- **Switchgear**
  - Gas-insulated (GIS): CPG System:
    - CPG.0 Cubicles: Single Busbar.
    - CPG.1 Cubicles: Single and double busbar.
  - Air-insulated (metal-clad):
    - CPA-AMC System: Single busbar
- **Mobile Substations (Ormacontainer)**
  - Composition:
    - MV Cubicles
    - Auxiliary services transformer
    - LVB
    - Metal-clad
    - Auxiliary devices

CPG.1

CPG.0

CPA-AMC

TECHNICAL CHARACTERISTICS

	CPG.1	CPG.0	CPA-AMC
Rated voltage [kV]	24/36	24/36	17,5
Maximum Busbar Rated Current [A]	2000	1600	2500
Maximum Outgoing Rated Current [A]	2000	1600/1250	2500
Rated short-time current [kA – 1/3 s]	25/31,5	25	31,5

ORMACONTAINER

DIMENSIONS

	ORMACONTAINER-2	ORMACONTAINER-3	ORMACONTAINER-4
Length [mm]	6096 (20 feet)	9144 (30 feet)	12192 (40 feet)
Height [mm]	2896	2896	2896
Depth [mm]	2600	2600	2600

These dimensions, combined with a weight of less than 24 T, mean it can be transported on a lorry without the need for an escort vehicle.

Note: For more information, please visit Ormazabal's website: www.ormazabal.com

MEDIUM VOLTAGE SWITCHGEAR FOR SECONDARY DISTRIBUTION

- **Characteristics**

  · Modular and compact (RMU) cubicles.
  · Complete gas insulation providing protection against harsh environments.
  · Safety for persons and installations.
  · Small size and weight: easy insertion through the tower door.
  · Optimisation of exploitation costs due to its low level of maintenance.
  · Modularity and extendibility allowing for future extensions without the need to replace all the equipment.
  · IAC classification (optional).
  · Flexible configuration of electrical diagrams.
  · Easy replacement of a single functional unit, if necessary.

- **Switchgear**

  · Ormazabal has a wide range of certified cubicles in numerous markets:

  · Fully gas insulation:
    - CGMCOSMOS System (Extendible cubicles and RMU)
    - Sistema CGM.3 (Extendible cubicles and RMU)
    - Sistema GA (RMU)
    - Sistema GAE (Extendible cubicles)

(*) For other technical characteristics and the availability in different markets, please contact our Technical-Commercial department.

- **Application**

  · Transformer Substations for wind turbine generators.
  · Connection Substations for distribution networks.
  · Switching substations
  · Installation in:
    - Tower
    - Prefabricated building
    - Civil works

CGMCOSMOS

GA

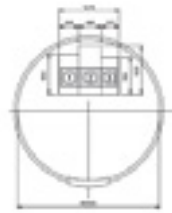
CGM.3

TECHNICAL CHARACTERISTICS

TECHNICAL CHARACTERISTICS

	CGMCOSMOS	GA	GAE	CGM.3	
Rated voltage [kV]	24	24	24	36	40,5#
Rated current [A]	400/630	630	630 / 1250	400/630	400
Rated short-time current [kA – 1/3 s]	16/20*	20	20	16/20*	20*

(*) Ensayos realizados a 21 kA
(#) The 40.5 kV series has feed cubicles and protection with fuses
At the time of publication of this catalogue, the Vacuum circuit-breaker cubicle is under development



Example:
36 kV 0L1L1P diagram inside the wind turbine generator

CONFIGURATION

Ormazabal's cubicles allow the configuration of both the most common electrical diagrams in wind farms: 0L1P, 0L1V, 0L1L1P, 0L1L1V, 0L2L1P, 0L2L1V, 0L0L1P, 0L0L1V,0L0L1P0L, 0L0L1V0L, etc; and specific diagrams that meet the technologists' particular requirements.

Example: CGMCOSMOS/ CGM.3

PHYSICAL CHARACTERISTICS

DIMENSIONS

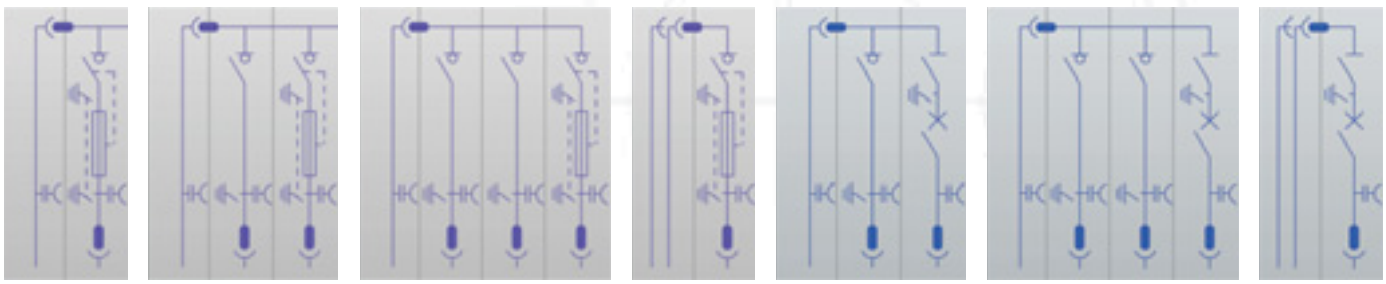
		Width [mm]	Depth [mm]	Height [mm]	Weight [kg]			Width [mm]	Depth [mm]	Height [mm]	Weight [kg]
0L1P	24 kV	835	735	1740#	180	**0L1V**	24 kV	845	850	1740	258
	36 kV	988	1010	1745	253		36 kV	963	850	1745	282
0L1L1P	24 kV	1200	735	1740#	275	**0L1L1V**	24 kV	1210	850	1740	353
	36 kV	1266	1010	1745	391		36 kV	1381	850	1745	420
0L2L1P	24 kV	1565	735	1740#	370	**0L2L1V**	24 kV	1575	850	1740	448
	36 kV	1684	1010	1745	529		36 kV	1799	850	1745	558
0L0L1P	24 kV	1020	735	1740#	200	**0L0L1V**	24 kV	1030	850	1740	278
	36 kV	1030	1010	1745	306		36 kV	1145	850	1745	379
0L0L-1P0L	24 kV	1385	735	1740#	240	**0L0L1V0L**	24 kV	1395	850	1740	318
	36 kV	1400	1010	1745	351		36 kV	1513	850	1745	421

(#) 1300 mm high cubicles available

MAXIMUM WIDTH [mm]

	24 KV	36 KV	40,5 KV
V	480	595	-
P	470	480	480

Where: L = Feeder Cubicle / Function · P = Fuse Protection Cubicle / Function · V = VCB Protection Cubicle / Function



0L1P **0L1L1P** **0L2L1P** **0L0L1P** **0L1L1V** **0L2L1V** **0L0L1V**

Examples GA / GAE

- GA2K1LSF: Compact cubicle with vacuum circuit-breaker for installation inside the tower.
- GAE: Extendible cubicles that allow a great variety of configurations for the connection of the wind farm to the network and/or MV metering.

Note: For further information please visit Ormazabal's website: www.ormazabal.com

PROTECTION, CONTROL, AUTOMATION AND REMOTE CONTROL

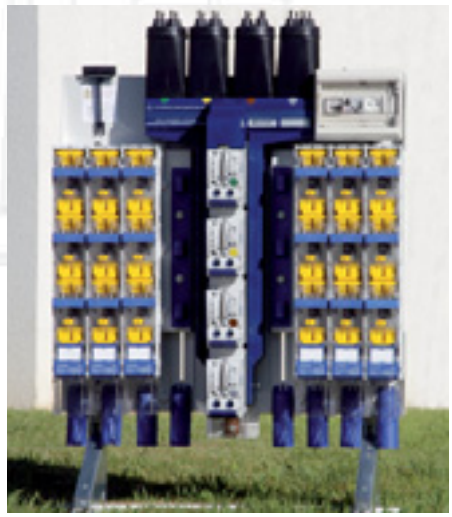
- **Characteristics**
  - Solution for distribution network requirements: Automation and protection applications and services.
  - Supply of complete medium voltage installations which include control, protection and automation functions.
  - Units in the ekorSYS family:
    - Cubicle-integrated.
    - Higher performance than conventional systems.
    - Solution for implementation in the most demanding installations.

- **Application**
  - Protection.
  - Automation and Remote Control.
  - Remote management and communication.
  - Dispatching centre.

TRANSFORMERS

- **Characteristics**
  - Wide range of distribution transformers.
  - Different dielectric liquids.
  - Specific designs.
  - Small sizes and minimum losses.
  - Safe and reliable.
  - Environmentally-respectful.

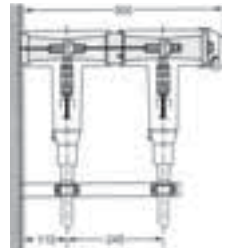
LOW VOLTAGE BOARDS



- **Characteristics**
  - Optimised designs.
  - Highly safe.
  - Quality of Service.
  - Easy to use.
  - Reinforced insulation.
  - No risk of internal arc.
  - Simple connection to auxiliary generator set.

Note: For more information, please visit Ormazabal's website: www.ormazabal.com

CONNECTORS AND ACCESSORIES



- **Characteristics**
  - Ormazabal supplies the following products for cable connection in Wind Farms:
    - Connectors,
    - Terminals
    - Adapters
    - Bushings
    - Surge arresters
    - Accessories
  - Maximum ranges
    - 1250 A and 630 mm2 for Secondary Distribution
    - 2000 A and 800 mm2 for Primary Distribution
  - Highly flexible and versatile.

- **Application**
  - Protection.
  - Automation and Remote Control.
  - Remote management and communication.
  - Dispatching centre.

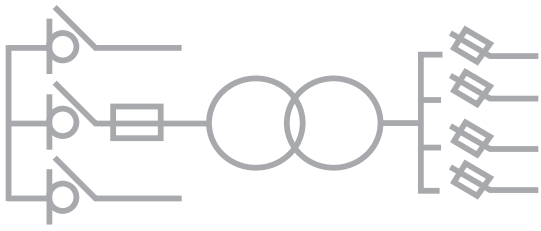
Note: Ormazabal recommends the use of Euromold connectors, for other types, values and brands please consult Ormazabal's Technical - Commercial Department.

TRANSFORMER SUBSTATIONS

- **Characteristics**
  - Wide range:
    - Prefabricated Transformer Substations
    - Transformer Substations in Ormazabal's Building
    - Switching and Breaking Substations
  - Indoor or outdoor operation.
  - Reduced risk of internal arcs.
  - Reduced environmental, visual and acoustic impact.
  - Aesthetic integration into the environment.
  - Wide range of outdoor surface finishings.
  - Factory assembly of internal equipment.
  - Protection against pollution, other environmental factors, impacts, vandalism, etc.
  - Remote control, remote metering, built-in control, remote management, etc.
  - Dielectric liquid collection pit.
  - Natural ventilation tested.

Note: For more information, please visit Ormazabal's website: www.ormazabal.com

NOTES



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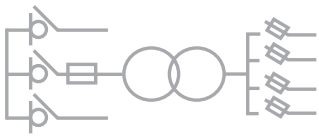

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