COL GROUP COL GIOVANNI PAOLO S.p.A.

EPD ITALY

ENVIRONMENTAL PRODUCT DECLARATION

PRODUCT NAME:
RIO UP 8 Channels

PRODUCTION SITE:
Via Pindaro, 19, 20128
Milano (MI)

in compliance with ISO 14025 and EN 50693

Program operator	EPDItaly
Publisher	EPDItaly

Declaration number	COL-TW-510087
Registration number	EPDITALY0503

Issue date	07.09.2023
Valid to	07.09.2028

1. GENERAL INFORMATION

EPD owner	Col Giovanni Paolo S.p.A. (www.colgp.it) Via Antonio Chiribiri, 1, 10028 Trofarello (TO)
Reference production site	TW-TeamWare SRL (www.teamware.it) Via Pindaro, 19, 20128 Milano (MI)
Scope of application	This is a product-specific EPD referring to the RIO UP 8 channels device manufactured by TW-TeamWare SRL for use as a remote input/output (RIO) device for interfacing with physical and existing power components, within the geographical scope of Italy.
Programme operator	EPDItaly – info@epditaly.it Via Gaetano De Castillia, 10, 20124 Milano (MI)
Independent verification	This declaration has been developed in accordance with the regulations of EPDItaly; further information and the same regulations are available at: www.epditaly.it Independent verification of the declaration and data carried out in accordance with ISO 14025: 2010 ☐ Internal ☑ External Third party verification done by: ICMQ S.p.A. (www.icmq.it), Via Gaetano De Castillia, 10, 20124 Milano (MI) – Italia. Accredited by ACCREDIA, Accreditation number 002H REV. 19
CPC code	4621 "Electricity distribution or control apparatus"
Company contact	Ivana RIZZI, Tender Manager, COL GROUP e-mail: ivana.rizzi@colgp.it
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PCR – Product Category Rules	Core PCR: EPDItaly007 – PCR for Electronic and Electrical Products and Systems, REV. 3.0 Issue date 13/01/2023
Reference documents	EN ISO 14025:2010, Environmental labels and declarations – Type III environmental declarations – Principles and procedures EN 50693:2019 - Product category rules for life cycle assessments of electronic and electrical products and systems Regulations of the EPDItaly Programme. Revision 5.2. Issue date 16/02/2022
Comparability	EPDs published within the same product category though originating from different programs may not be comparable. Full conformance with a PCR allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible.

Liability	The EPD owner relieves EPDItaly from any non-compliance with the environmental legislations. The holder of the declaration will be liable for the supporting information and evidence. EPDItaly disclaims any liability regarding the manufacturer's information, data, and results of the life cycle assessment.

2. THE COMPANY

Col Giovanni Paolo S.p.A. (COL GROUP) is a leading Italian company owned by Oaktree Capital Management, L.P. in the fast-growing global energy transmission and distribution market. It specializes in the development and production of critical components and advanced solutions for smart grid applications in medium and high voltage electrical infrastructure with sustainability at the heart of all its activities. COL GROUP has been working to support the sustainable future of our planet and the long-term success of its customers as well as the company's own business. Testament to that are the ambitions embodied in two of COL GROUP's Strategy 2030 goals i.e., to lead with low-carbon circular economy solutions, and to enhance sustainability across the value chain. The company possesses numerous certifications according to international standards, among which are UNI EN ISO 9001:2015, UNI EN ISO 14001:2015, UNI ISO 45001:2018, UNI EN ISO 50001:2018, and ISO 27001: 2013. Established in 1920, COL GROUP has amassed over 100 years of valuable experience in the electro-technical and plant engineering fields, and it is one of the few authorized suppliers for major utility companies in Europe, Middle East, South America, and Southeast Asia. The company has developed a highly innovative technology portfolio in medium voltage switchgear, substation automation, battery control systems and several other smart grid and high-voltage applications in collaboration with other dominant global utilities and industrial players. Two years back, COL GROUP acquired TW-TeamWare SRL to accelerate its progress towards power quality, cyber security, and electric distribution remote control. The company now has production sites in Torino, Catania, Milano, and Cremona, with over 150 highly skilled, specialized, and efficient employees led by an adept management team.

3. THE PRODUCT

RIO UP 8 channels is a RIO device for interfacing with field equipment in secondary substations (SS), and it was derived from modifying the sub-assemblies of the UE8 module by incorporating Enel group technical specifications as stipulated under GSTR004. The main function of the RIO UP 8 device is to enable the Quantum Edge (QEd) which is a new ENEL device used for protection, control and monitoring of the MV/LV Substations, to interact with the physical and existing power components, such as switch disconnectors or circuit breakers. The RIO UP 8 device comprises of the following ports/interfaces: 1 RJ45 Ethernet port; 8 SG ports used to control and command the OdM; 8 FPI ports used for connection to fault detectors; 1 terminal board TS with 8 digital inputs (Dig-In), 12 ÷ 24 Vdc; 1 terminal board for power supply named MP, 1 reset button for returning the device to default factory settings when pushed for at least 10 seconds or performing a software (SW) reset when pushed for less than 10 seconds; and several status

LEDs. The RIO UP 8 device is also accompanied by a configuration application program that runs under Windows ©, and it supports firmware (FW) update and remote configuration. The data exchange profile between the RIO (server) and virtual UP (client) is based on the IEC 61850 MMS communication protocol. Structurally, the RIO UP 8 device is housed in a standard rack box 19" 4U, and it has 8 OdM connectors on the front panel. The photograph on the cover of this EPD document shows a fully assembled RIO UP 8 device, and **Table 1** summarizes some of the technical features of the product and its packaging.

Table 1. Technical specifications for the RIO UP 8 device as per GSTR004, plus the packaging materials

TW-TEAMWARE SRL Product code	TW149-PFEL-0016-00	
GRIDSPERTISE Material code	510087	
Product model	RIO UP 8 channels	
Product weight	3,292 kg	
Packaging materials	**Cardboard box**	0,2502 kg
	Polyethylene (PE) film	0,0324 kg
	Wooden Pallet	0,1712 kg
Status LED	**RUN/ERR**	Red/Green bi-colour LED
	LOCAL	Yellow LED
	CONNECTION	Green LED
1 Ethernet port	Connector: RJ45	
Power supply	24Vdc provided by the Power Supply Battery Charger (PSBC) of the MV/LV SS	
8 SG Connectors (12-pin)	Tyco 207528-9 (or equivalent)	
8 FPI Connectors (9-pin)	Tyco 207526-9 (or equivalent)	
MP Power supply terminal board	Extractable type, with a 5.08mm pitch	
MI_Indoor Terminal board	Extractable type, with a 5.08mm pitch	
MI_Outdoor terminal board	Extractable type, with a 5.08mm pitch	
Digital input terminal board (TS)	+24V input terminal, All the 8-pin Dig-In are programmable	

Material composition

The declaration on the content of materials for the product was done by the manufacturer in accordance with EN IEC 62474. The unique ID and percentage mass share of all the materials and declarable substances contained in the fully assembled product plus its packaging are reported in **table 2.**

Table 2. Material composition for the fully assembled RIO UP 8 device plus its packaging

Material class name	ID	Mass share
Other ferrous alloys, non-stainless steels	M-119	66,5989%
PolyEthylene (PE)	M-201	0,8650%
Other unfilled thermoplastics	M-249	1,3931%
Wood	M-340	4,5707%
Paper	M-341	6,6798%
Other	OTHER	19,8924%

Reference service life

The reference service life (RSL) of the product was regarded as 10 years.

4. SCOPE AND TYPE OF EPD

This is a product-specific EPD for RIO UP 8 channels which is a RIO device for interfacing with power equipment in the field, produced by TW-TeamWare SRL, a COL GROUP company, in compliance with ISO 14025 and EN 50693 under the EPDItaly program regulations. It is based on a cradle to grave life cycle assessment (LCA) methodology in accordance with the ISO 14040 and 14044 standards. The spatio-temporal scope for the data used in this study are summarized in **table 3** basing on the current global level of technology. The results were automatically generated using the excel-based LCA tool "LCA-COL GROUP Tool 2.1" of 01.09.2023., and they were intended for internal R&D, as well as external B2B and B2C communication. In effect, these results facilitated prudent corporate decisions through comparison of the environmental attributes of products that have similar functional requirements.

Table 3. The spatio-temporal scope of the LCA study

Representativeness	Scope
Spatial	Italy
Temporal	January to December, 2021

Functional unit

The functional unit (FU) was a fully assembled, tested, and packaged RIO UP 8 channels device with the technical specifications stated in **table 1**, distributed to a client within Italy, installed and used for enabling interaction between the QEd and the physical and existing power components, such as switch disconnectors or circuit breakers, during a RSL of 10 years, operating nonstop.

System boundary

The system boundary implemented in this LCA covered the entire lifecycle of the product i.e., from cradle to grave as shown in **table 4** with the life cycle stages and the geographical scopes for all the major activities involved, grouped into three distinct modules i.e., upstream, core, and downstream with reference to EN 50693. The product life cycle and inventory analysis describing all the activities, simplifying assumptions, and modelling scenarios used in the LCA has been exhaustively conducted under **section 5** of this document.

Table 4. The life cycle stages, geographical scope, and modules declared in the system boundary

Manufacturing			Distribution	Installation	Use	End of life
CN	IT	IT	IT	IT	IT	IT
Upstream		Core	Downstream			
✓		✓	✓	✓	✓	✓

CN = China**, IT** = Italy**,** ✓ = Lifecycle stages and modules declared in the LCA

Cut-off criteria

The mandatory cut-off for mass and energy flows in this LCA study was set at 1% as defined and modelled in the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023. All the material and energy flows within the system boundary known to have potential to cause significant impacts on the LCA results have been accounted for. However, cut-off was applied to the potential impacts that could have resulted from production and disposal of the packaging materials of all the semi-finished products included in the BOMs (e.g., sheets, electronics, screws, etc.) transported to TW-TeamWare SRL for processing and later assembling of the final product as it was assumed that such impacts were negligible owing to the reuse agreement for such materials existing between TW-TeamWare SRL and the external suppliers. Furthermore, a cut-off was similarly applied to the impacts associated with the skilled labour required during installation before use and dismantling of the product at its end-of-life. Potential impacts that could have arisen from ordinary or extraordinary maintenance were also ignored since the product was assumed to be maintenance free for the entire expected service life.

Allocation rules

The allocation criteria adopted for the LCA model was guided by the PCR of the reference product. Since many other products are produced at the reference site, the "multi-output" allocation rule was applied to calculate the environmental impact of the product being studied. The primary data relating to waste generation, water, and energy consumption (petrol, electricity, and natural gas) used was provided for the reference year, and these were allocated based on economic value (revenue generated in millions of euros) using the total annual revenue of the company, annual revenue from selling the product being studied, and the number of the studied product sold in the reference year, to get the allocation factor.

Data quality

The most recent and verifiable site-specific data collected in 2021 was used in this study, and the International System of Units (SI) was adopted while recording the data. The initial primary data forming the basis for the LCA were the production specifications i.e., BOMs, mechanical drawings, and technical information from the client provided by TW-TeamWare SRL to its external suppliers for each sub-assembly of the final product, and these were analyzed using Microsoft excel. In instances where data was missing for some individual electronic components, approximations were made in the BOMs and proxy data with the nearest equivalence in terms of functionality and mass was used for modelling such components. The weight and surface area of the structural components were calculated using the Solid Edge software. For the electronic components, information from product datasheets obtained from the websites of Farnell Italia and Mouser Electronics were used, these were complimented with data from Altium and Microarea Mago4 software. Additional primary data used included the water and energy (petrol, electricity, and natural gas) consumption for the core activities at TW-TeamWare SRL premises during the reference year, and these were downloaded from the company's reference production site account on the website of the service providers. A similar approach was applied to download annual data for fuel consumption by company vehicles from the Q8 online portal which documents electronic fuel vouchers. In addition to that, the distances from the manufacturing sites of all the external suppliers to TW-TeamWare SRL were

evaluated with the aid of Google Maps and Ports.com for transport by road and sea, respectively. The same technique was applied to determine the distributing distance from TW-TeamWare SRL to the client's location within Italy, and justification was provided for all the simplifying assumptions stated. In terms of secondary data, databases from legitimate sources already embedded in the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023 were used to obtain generic data for some up- and down-stream processes in the life cycle of the product.

5. PRODUCT LIFE CYCLE AND INVENTORY ANALYSIS

The life cycle inventory (LCI) lists and quantifies all the flows entering and leaving all the declared life cycle stages of the product within the system boundary considered in relation to the scope of the study. The reference flow for the LCI is 1 piece of a fully assembled and packaged RIO UP 8 channels device, weighing **3,746 kg** altogether.

Manufacturing

This first life cycle stage covers all the activities spanning across the upstream and core modules. The supply chain processes commence with the extraction of raw materials to produce sub-assemblies comprising of electronic and structural components which are constituents of the final RIO UP 8 channels device, and the packaging materials for the final product. The electronic components ordinarily are made of cables and printed circuit boards (PCB) on which smaller components are mounted, whereas the structural component consists of metallic panels, bolts, and screws. The production of these various components was done by external suppliers on their manufacturing sites whose distances from TW-TeamWare SRL were obtained using Google Maps. The electronic components were made in China and assumed to be shipped to the port of Genova, and then transported by road in a 16 - 32 tonne EURO5 lorry to TW-TeamWare SRL premises. Along similar lines, the structural components and packaging materials manufactured within Italy were transported in a 16 - 32 tonne EURO5 lorry to the reference production site where the core activities of assembling, testing, and final packaging of the RIO UP 8 channels devices were done. The fully assembled product was then packaged by the application of a double-layered technique, starting by covering the product in a PE-film, and thereafter placing it in a cardboard box to minimize any potential damage on the wooden pallet during distribution. All the wastes generated on-site from these activities (except packaging) are documented by category in the production site register and declared annually in the MUD "*Modello Unico di Dichiarazione ambientale*" following the applicable regulations and deadlines. Furthermore, these wastes were assumed to be transported periodically in a 16 - 32 tonne ACI mix lorry to a waste treatment plant located **50 km** away.

Distribution

From this point forth, all the activities are classified under the downstream module. The fully assembled and packaged product on the pallet is loaded onto a 16 - 32 tonne EURO5 lorry for last mile delivery to the single client. Accordingly, the distribution of the product was homogeneous because all the products were transported to the same location within the Italian territory as requested by the sole client, and the distribution distance from TW-TeamWare SRL was determined to be **72,1 km** from Google Maps.

Installation

Upon arrival at the client's location, the product is unloaded, carefully removed from its packaging, and installed by skilled technicians. It is immediately after this process that the packaging materials are returned for reuse as per the reduction of packaging waste agreement between TW-TeamWare SRL and its external suppliers. At the end of life of the packaging materials, they are assumed to be transported in a 7 - 16 tonne EURO5 lorry to a waste treatment plant **50 km** away.

Use

The perfectly installed product consumes **126,144 kWh** of electricity, $\mathbf{E_{use}}$ during its **RSL** of 10 years, operating constantly, and this was computed using **Equation 1** with **8760** representing the number of hours in a year; and **1000** is the conversion factor that allows the energy consumed in kWh over the product's service life to be expressed. The nominal power of the device (in Watts), $\mathbf{P_{use}}$ was obtained by multiplying current and voltage whose values were determined after connecting the device to a D.C. regulated bench power supply unit with three banana connectors (i.e., positive, ground, and negative) and a digital display showing current, and voltage measured in amps and volts respectively.

$$E_{use}[\mathbf{kWh}] = \frac{P_{use} * \mathbf{8760} * \mathbf{RSL}}{\mathbf{1000}} \qquad (\mathbf{1})$$

The device does not have any batteries, instead, it is powered at 24Vdc provided by the Power Supply Battery Charger (PSBC) of the MV/LV SS at the installation site. In addition to that, it was assumed that no periodic or extraordinary maintenance works were required throughout the use phase because device failure is improbable thanks to the numerous quality control tests performed during and after assembling to ensure robustness. An additional environmental information is that during the installation and use stages, the device does not emit any pollutants or substances which are dangerous for the environment and health.

End of life

At the end of the RSL of the product, the dismantling process and separation of the device components is done following guidelines given by the manufacturer, and the resulting wastes were assumed to be transported using a 7,5 - 16 tonne EURO5 lorry to a waste treatment plant located **50 km** away from the installation site.

6. LCA RESULTS

The environmental performance results of the product for the different lifecycle stages per FU accounting for all the mandatory environmental impact indicators **(Table 5)** and descriptive parameters for resource use **(Table 6)** and waste production **(Table 7)** calculated as per Core PCR: EPDItaly007 and EN 50693 were automatically generated using the LCA TOOL "LCA-COL GROUP Tool 2.1" of 01.09.2023.

Environmental impacts

Table 5. LCA results for the environmental impact indicators

Impact categories	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
GWP-total	kg CO_2 eq.	5,38E+01	4,23E-02	8,08E-02	4,99E+01	3,25E+00	1,07E+02
GWP-fossil	kg CO_2 eq.	5,35E+01	4,23E-02	5,56E-02	4,91E+01	3,24E+00	1,06E+02
GWP-biogenic	kg CO_2 eq.	1,53E-01	3,07E-06	2,52E-02	7,45E-01	4,46E-04	9,23E-01
GWP-luluc	kg CO_2 eq.	1,18E-01	8,08E-07	9,72E-07	3,35E-03	3,69E-04	1,22E-01
ODP	kg CFC-11 eq.	1,38E-06	8,91E-10	1,88E-10	1,02E-06	3,21E-09	2,41E-06
AP	mol H^+ eq.	5,10E-01	1,07E-04	9,22E-05	1,63E-01	1,60E-03	6,74E-01
EP-freshwater	kg P eq.	9,52E-03	3,24E-08	7,56E-08	8,15E-04	8,14E-06	1,03E-02
EP-marine	kg N eq.	7,97E-02	4,20E-05	6,28E-05	2,56E-02	5,81E-04	1,06E-01
EP-terrestrial	mol N eq.	1,14E+00	4,45E-04	4,72E-04	3,10E-01	5,98E-03	1,46E+00
POCP	kg NMVOC eq.	2,84E-01	1,73E-04	1,31E-04	1,36E-01	1,60E-03	4,23E-01
ADP-min & met	kg Sb eq.	2,42E-02	1,42E-09	1,58E-09	7,32E-07	3,82E-08	2,42E-02
ADP-fossil	MJ	8,43E+02	5,38E-01	9,24E-02	8,75E+02	3,67E+00	1,72E+03
WDP	m^3 eq. deprived	1,58E+01	5,04E-04	2,99E-03	3,08E+01	7,42E-02	4,67E+01

Caption: GWP-total = Climate change – total; **GWP-fossil** = Climate change – fossil; **GWP-biogenic** = Climate change – biogenic; **GWP-luluc** = Climate change – land use and land use change; **ODP** = Ozone Depletion; **AP** = Acidification; **EP-freshwater** = Eutrophication aquatic freshwater; **EP-marine** = Eutrophication, marine; **EP-terrestrial** = Eutrophication, terrestrial; **POCP** = Photochemical ozone formation; **ADP-min & met** = Depletion of abiotic resources – minerals and metals; **ADP-fossil** = Depletion of abiotic resources – fossil fuels; **WDP** = Water use.

Resource use

Table 6. LCA results for the environmental parameters describing resource use

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
PENRE	MJ	8,38E+02	5,54E-01	9,46E-02	8,78E+02	3,71E+00	1,72E+03
PERE	MJ	8,20E+01	1,44E-03	5,63E-03	1,96E+02	2,41E-01	2,78E+02
PENRM	MJ	1,39E+01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,39E+01
PERM	MJ	4,89E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,89E+00
PENRT	MJ	8,52E+02	5,54E-01	9,46E-02	8,78E+02	3,71E+00	1,73E+03
PERT	MJ	8,69E+01	1,44E-03	5,63E-03	1,96E+02	2,41E-01	2,83E+02
FW	m^3	3,05E+03	8,57E-02	2,38E-01	1,77E+04	1,24E+01	2,08E+04
MS	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
RSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
NRSF	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption: PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw material; **PERE** = Use of renewable primary energy excluding renewable primary energy resources used as raw material; **PENRM** = Use of non-renewable primary energy resources used as raw material; **PERM** = Use of renewable primary energy resources used as raw material; **PENRT** = Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials); **PERT** = Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials); **FW** = Net use of fresh water; **MS** = Use of secondary materials; **RSF** = Use of renewable secondary fuels; **NRSF** = Use of non-renewable secondary fuels.

Waste production

Table 7. LCA results for the environmental parameters describing waste production

Parameters	Unit of measurement	Manufacturing	Distribution	Installation	Use	End of life	TOTAL
HWD	kg	2,01E-02	0,00E+00	0,00E+00	0,00E+00	0,00E+00	2,01E-02
NHWD	kg	0,00E+00	0,00E+00	9,85E-02	0,00E+00	1,08E+00	1,18E+00
RWD	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
MER	kg	0,00E+00	0,00E+00	4,37E-02	0,00E+00	2,61E-02	6,98E-02
MFR	kg	5,86E-02	0,00E+00	3,13E-01	0,00E+00	2,18E+00	2,55E+00
CRU	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
ETE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
EEE	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Caption: HWD = Hazardous waste disposed; **NHWD** = Non-hazardous waste disposed; **RWD** = Radioactive waste disposed; **MER** = Materials for energy recovery; **MFR** = Material for recycling; **CRU** = Components for reuse; **ETE** = Exported thermal energy; **EEE** = Exported electricity energy

7. BIBLIOGRAPHY

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