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, Acronyms and Initialisms	s	
Alternate Current Central Processing I Control and Safety S Direct Current Drawing (Portuguese Electromagnetic Con Electro-Optical Conv Technical Specificat Factory Acceptance Fire and Gas System Flow Metering Syste Historical Data Serve Hull Fire and Gas Sy Human Machine Inte Hull Shut Down Syst Input / Output Non-intrinsically safe Ingress Protection Intrinsically safe inst Keyboard, Video, Me Liquid Crystal Displa	Unit (controllers, comput System e: <i>Desenho</i>) mpatibility version Panel tion (Portuguese: <i>Espect</i> Test m em er ystem erface tem e instrumentation grounding ouse ay er	:ers) ificação Técnica) ding
	Factory Acceptance Fire and Gas Syster Flow Metering Syste Historical Data Serv Hull Fire and Gas S Human Machine Inte Hull Shut Down Sys Input / Output Non-intrinsically safe Ingress Protection Intrinsically safe insi Keyboard, Video, M Liquid Crystal Displa Light-emitting Diode List Multi-cable Transit Portuguese: <i>Ministé</i>	Factory Acceptance Test Fire and Gas System Flow Metering System Historical Data Server Hull Fire and Gas System Human Machine Interface Hull Shut Down System Input / Output Non-intrinsically safe instrumentation ground Ingress Protection Intrinsically safe instrumentation grounding Keyboard, Video, Mouse Liquid Crystal Display Light-emitting Diode List Multi-cable Transit Portuguese: <i>Ministério do Trabalho e Empre</i> Portuguese: <i>Norma Regulamentadora</i>

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			AUTOMATION TANLES	ESUP
	PE PLC RMS PSD PSL RTDS SAT SIT SOS UCP UPS VAC VCI	Pr Pr Rr Pr Lo Rr Si Si Si U U U U	ersonal protection (safety) grounding rogrammable Logic Controller oot Mean Square rocess Shut Down System ow Pressure Switch eal Time Data Server ite Acceptance Test ite Integration Test upervision and Operation System nit Control Panel ninterruptible Power Supply Iternate Current Voltage olatile Corrosion Inhibitor	ESOF
	VDC	D	irect Current Voltage	
2	REFERE		IENTS, CODES AND STANDARDS	
2	2.1 External	references		
	2.1.1 Intern	ational Codes,	Recommended Practices and Standard	S
	ASTM – /	AMERICAN SO	CIETY FOR TESTING AND MATERIALS	
	ASTM	G21	STANDARD PRACTICE FOR E RESISTANCE OF SYNTHETIC MATERIALS TO FUNGI	ETERMINING POLYMERIC
	ASTM	E662	STANDARD TEST METHOD FO OPTICAL DENSITY OF SMOKE GE SOLID MATERIALS	OR SPECIFIC
	DLA [IS] ITEMS O	– DEFENSE S F SUPPLY	SUPPLY CENTER, PHIL-GENERAL AND	INDUSTRIAL
	MIL	C-24643	CABLE, ELECTRICAL – ALL PARTS	3
	IEC - INT	ERNATIONAL	ELECTROTECHNICAL COMMISSION	
	IEC IEC IEC	60068 60079 60092-350	ENVIRONMENTAL TESTING – ALL PAI EXPLOSIVE ATMOSPHERES - ALL PA ELECTRICAL INSTALLATIONS IN SHIF	RTS RTS PS – PART 350
	IEC	60092-376	- GENERAL CONSTRUCTION AND TE OF POWER, CONTROL AND INSTR CABLES FOR SHIPBOARD AND APPLICATIONS ELECTRICAL INSTALLATIONS IN SHIF - CABLES FOR CONTROL AND INSTR CIRCUITS 150/250 V (300 V)	ST METHODS UMENTATION OFFSHORE PS – PART 376 UMENTATION

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		ACTOMATION FAREES	ESUP
IEC	60092-504	ELECTRICAL INSTALLATIONS IN SHIF	'S - PART 504: LIMENTATION
IEC	60529	DEGREES OF PROTECTION PROVIDE	ED BY
IEC	60533	ELECTRICAL AND ELECTRONIC INST. SHIPS - ELECTROMAGNETIC CO	ALLATIONS IN OMPATIBILITY
IEC	61000	ELECTROMAGNETIC COMPATIBILITY	′ (EMC) - ALL
IEC	61086	COATINGS FOR LOADED PRINTED W	IRE BOARDS
IEC	61892	MOBILE AND FIXED OFFSHORI	E UNITS –
IEC	62381	AUTOMATION SYSTEMS IN THI INDUSTRY - FACTORY ACCEPTANCE SITE ACCEPTANCE TEST (SAT) INTEGRATION TEST (SIT)	E PROCESS TEST (FAT), AND SITE
IEEE - IN	STITUTE OF EL	ECTRICAL AND ELECTRONICS ENGIN	EERS
IEEE	802.3D	FIBER-OPTICAL INTER-REPEATER LIN	ΙK
NFPA - N	IATIONAL FIRE	PROTECTION ASSOCIATION	
NFPA	79 ELE	ECTRICAL STANDARD FOR INDUSTRIA	_ MACHINERY
NFPA	496 STA ENG	ANDARD FOR PURGED AND PRESSURI CLOSURES FOR ELECTRICAL EQUIPME	ZED ENT
TIA – TE		ATIONS INDUSTRIES ASSOCIATION	
TIA	568	COMMERCIAL BUILDING TELECO	
TIA	758	CUSTOMER-OWNED OUTSIDE PL TELECOMMUNICATIONS INFRAST	ANT RUCTURE
TIA/EIA	598	OPTICAL FIBER CABLE COLOR CO	DDING
2.1.2 Brazil	ian Codes and	Standards	
	D - INSTITUTO ADE INDUSTRIA	NACIONAL DE METROLOGIA, NORM	IALIZAÇÃO E
PORTAR (21/MARC	IA № 115 REQ ÇO/2022) EQU EXP	UISITOS DE AVALIAÇÃO DA CONFORM IPAMENTOS ELÉTRICOS PARA / LOSIVAS - CONSOLIDADO.	MIDADE PARA ATMOSFERAS
2.1.2.1	All <i>MTE – Minis</i> followed.	stério do Trabalho e Emprego regulation	s (NRs) shall be

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PETROBRAS		ATION PANELS	11	NTERNA	۹L
				ESUP	
2.1.3 Class	ification Society				
2.1.3.1	Project's documentation, Engineering Design Phas Society.	in all phases (Basic Engineering D ses), will be submitted to approval	esign by Cla	and D Issifica	etail ation
2.1.3.2	The design, installation a strictly follow the Classific with the specific requirem referenced documents' referenced documents referenc	and operation of the panels herein cation Society requirements and c nents identified in this document, i equirements.	menti comme ncludi	oned s ents, a ng als	shall long o all
2.2 Internal	References				
2.2.1 Typic	al Documents				
2.2.1.1	Typical Documents are description of a system specification to be used i	e those that contain functional or equipment. They shall be us n the Project.	and ed as	techr the n	nical nain
2.2.1.2	Typical Document List				
I-ET-301	0.00-1200-940-P4X-002	GENERAL TECHNICAL TERMS	5		
I-ET-301	0.00-1200-800-P4X-013	GENERAL CRITERIA FOR INS PROJECTS	TRUM	IENTA	
I-ET-301	0.00-5520-861-P4X-001	CONTROL AND SAFETY SYST	EM –	CSS	
I-ET-301	0.00-5520-861-P4X-002	SUPERVISION AND OPERAT SOS	ION 3	SYSTI	EM –
I-ET-301	0.00-1200-800-P4X-002	AUTOMATION, CONTROL AND INSTRUMENTATION ON PACK) (AGE (JNITS	5
I-ET-301	0.00-5140-700-P4X-003	ELECTRICAL REQUIREM PACKAGES FOR OFFSHORE	IENTS JNITS	;	FOR
I-ET-301	0.00-5140-700-P4X-002	SPECIFICATION FOR ELECTR FOR OFFSHORE UNITS	RICAL	ΜΑΤΕ	ERIAL
I-ET-301	0.00-5140-741-P4X-004	SPECIFICATION FOR GENERIC ELECTRICAL OFFSHORE UNITS	LOW PANE	'-VOL ⁻ LS	TAGE FOR
I-ET-301	0.00-5520-861-P4X-003	VIRTUALIZATION OF AUTOM	IOITAI	N SYS	STEM
I-ET-301	0.00-5520-800-P4X-004	AUTOMATION NETWORK REC	UIRE	MENT	S
I-ET-301	0.00-5520-800-P4X-001	SUPERVISION AND OPERA (SOS) SCREENS	ATION	SYS	STEM

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BR		·		SHEET 7 of 30
PETROBRAS	TITLE:			INTERNAL
		AUTOMATION	ANLLO	ESUP
2.2.2 Spec	ific Project Doc	uments		
2.2.2.1	This section me are part of a sp slightly from on consulted in orc	ntions documents t becific Project. The le Project to anoth ler to verify the cor	hat are referenced alc documents title and er. Project's DOCUM rect document numbe	ong the text and that I number may vary IENT LIST shall be er and title.
2.2.2.2	Project Docume	ent List		
TECHNIC TECHNIC	AL SPECIFICA AL REQUIREME	.TION (ET) - IN ENTS	ISTRUMENTATION	ADDITIONAL
TECHNIC	AL SPECIFICAT	ION (ET) - FIELD	INSTRUMENTATION	
DRAWING	G (DE) - AUTOM	ATION AND CONT	ROL ARCHITECTUF	۶E
DESCRIP FUNCTIO	TIVE MEMORAN NS	NDUM (MD) – AUT	OMATION AND COM	NTROL SYSTEM
LIST (LI) -	- DOCUMENT L	IST		
LIST (LI) -	EQUIPMENT LI	ST		
DRAWING	G (DE) - CENTRA	AL CONTROL ROO	OM LAYOUT	
2.2.3 PETR	OBRAS Refere	nce Documents		
DR-ENGP	-M-I-1.3	SAFETY ENGIN	EERING	

2.3 Brazilian regulation (MTE section) and INMETRO regulation superpose all codes and regulations listed in item 2.2, since they are enforced by Brazilian Law.

3 ENVIRONMENTAL AND OPERATIONAL CONDITIONS

3.1 For environmental and operating conditions and/or any requirements regarding this topic, refer to project's technical specification entitled "INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS".

4 DESIGN PREMISES

- 4.1 The panels will be installed on an offshore UNIT and shall continuously operate in industrial environment requiring high performance, reliability and availability (24 hrs/day and 7 days/week).
- 4.2 The panels and their components shall be designed and supplied to ensure optimum performance, ease of maintenance, safe operation and durability.

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PETR	OBRAS		INTERNAL
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4.3	All Auto shall be hookup conditio extensiv	mation panels, including those that will be located in air-co designed to operate for long periods without air conditioni period and the onshore and offshore tests, under advers ns, subject to a damp, salty atmosphere with temperatures re range and inclinations.	nditioned rooms, ng, including the e environmental varying over an
4.4	Automa Thus, d shall be	tion panels shall not be installed in areas classified as Zo uring Detail Engineering Design Phase, location of all Au confirmed.	one 1 or Zone 0. Itomation Panels
4.5	All Auto frequen	omation Panels shall be designed with mechanisms t cy and electromagnetic interferences.	o prevent radio
4.6	The doo prevent due to t	ors shall be fitted with lockable swing handles and door sto the doors from opening away from their intended design an he vessel angular motions (roll, pitch and yaw).	ppers in order to d/or from moving
4.7	Cable a	ccess shall be from the bottom of the panels (Indoors and C	utdoors Panels).
4.8	All pane docume	els shall be supplied with locks and keys, as well as inte ents and manuals.	rnal drawers for
4.8.	1 This it These easily	em is not valid for Emergency panels located in CCR-OA a panels shall never be lockable with keys, so that opera access their interior.	nd Radio Room. tors may always
4.9	Optical switche 3010.00	fibers, optical cables, patch panels, patch cords, op s, routers and any other network element and accessory s 0-5520-800-P4X-004 – AUTOMATION NETWORK REQUI	tical converters, shall follow I-ET- REMENTS.
4.10	All pane containi EQUIPI regulatie EQUIPA be in Br	els shall clearly be identified by means of a stainless stee ng identification (tag name) and description, accordi MENT LIST and containing identification according to Br on NR-12 - SEGURANÇA NO TRABALHO EM AMENTOS. Internal components shall also be identified. Ic azilian Portuguese. External nameplates shall be adequate	l engraved plate ng to Project's razilian standard <i>MÁQUINAS E</i> lentification shall for external use.
4.11	Complia proposa (FAT, S	ance with this Technical Specification shall be presented al, item by item, in a spreadsheet format, and then attested AT and SIT). Deviations shall also be presented in the sam	in the Technical I during the tests ne spreadsheet.
5 N	IECHAN	NICAL CHARACTERISTICS	
5.1	This ch PACKA and PA SAFET CONTR	apter stands for CSS Panels (controllers and REMOTE GE UNITS' Control Panels (UCP) and EOCPs. For more inf CKAGE UNITS, see I-ET-3010.00-5520-861-P4X-001 - Y SYSTEM – CSS and I-ET-3010.00-1200-800-P4X-002 - COL AND INSTRUMENTATION ON PACKAGE UNITS, res	E I/O PANELS), ormation on CSS CONTROL AND AUTOMATION, pectively).

		TECHNICAL SPECIFICATION " I-ET-30"	0.00-5520-888-P4>	K-001	REV.	Ν	
Bi				SHEET Ç) of	30	
PETRO	BRAS			IN	ITERNA	ERNAL	
AUTOMATION PANELS			ESUP				
5.2 Co	5.2 Construction						
5.2.1	Maxim width > a maxi	um size of each section shall be 800 mm x (height). For EOCP dimensions, see item 9 mum of three modular sections are allowed	800 mm x 2,00 5. For shipping to be fixed toge	00 mm 3 purpo ether.	(leng oses, o	ith x only	
5.2.2	2 Panels' structures shall be constructed of standardized beams, girders and struts with square holes used to accommodate bolts and nuts for the modular assembly and accessories mounting.				ruts nbly		

- 5.2.3 Each panel shall be supplied with sub-base and fixing holes to allow secure fixing of the panel to the floor. Incoming and outgoing cables as well as internal wiring shall be supported and routed through plastic gray ducts with covers. In case of intrinsically safe field wiring, the cables shall run through blue plastic ducts with protective cover.
- 5.2.4 Processors and I/O cards shall be installed at panel's front section. Marshalling terminal strips and field interconnection shall be installed at panel rear section.
- 5.2.5 Side plates shall not be used between panel sections. Standardized beams and/or struts shall be used for section reinforcement.
- 5.2.6 Doors shall be of single type and constructed with a 14 gauge (or thicker) steel plate, "U" beam reinforcement, grounding bolts, internal hinges, locks and handles. Locks, handles and hinges shall be designed to allow changing of door opening direction without any further piece of equipment.
- 5.2.7 Retractable monitors, HMIs or rack mounted notebooks, monitors, keyboards and mouse (located in panels or UCPs with local operation) shall be ergonomically placed in order to allow their use by a person in sit-down position (typically 800 mm above floor).
- 5.2.8 Where local HMIs are used, they shall be ergonomically placed in order to allow their use by a standing person.
- 5.2.9 Ergonomics requirements for operation and maintenance listed in I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS shall also be followed.

5.3 Accessories

5.3.1 Connections

5.3.1.1 Panels with more than one section shall be provided with standardized connections between sections, such as standardized angle brackets.

5.3.2 Struts

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5.3.2.1	Standardized struts shall be supplied as required for cat struts shall be of the same type as the ones used for pan the length and width may vary in accordance with SUPPI Typical values (length x width) are 400 mm x 75 mm up to mm.	el trays. These el structure, but _IER standards. 1,200 mm x 650			
5.3.3 Bolt	s, Nuts and Washers				
5.3.3.1	5.3.3.1 20 % of spare standardized bolts, nuts and washers, per panel section, shall be supplied.				
5.3.4 Lifti	5.3.4 Lifting Lugs				
5.3.4.1	4 (four) lifting lugs shall be supplied for each panel section attached to the "T" beams of the panel.	, removable and			
5.3.4.2	Panel SUPPLIER shall be responsible for stress calculation	n for lifting.			
5.3.4.3	Panel structures shall be such that they can be lifted in vertice eye bolts without causing resultant distortion.	ical position with			
5.4 Identif	cation of Devices and Accessories				
5.4.1 Nam etc., so t pane	neplates shall be provided for all devices, accessories, equip installed on the front plate or inside the panels, adjacent to e that when the components is replaced, the nameplates sha el.	ment, switches, ach component, Il remain in the			
5.4.2 The man sect used	panels shall be identified on the front and rear plate in a clear ner by a nameplate attached to the outside, high up in the ion, in case of multiple sections or on one of the doors if de d. Nameplate dimension is 200 x 75 mm.	and permanent center of each ouble doors are			
5.4.3 Pan nam	els with front and rear access shall be identified with "FRON eplates on their respective front and back sides.	IT" and "REAR"			
5.4.4 All ir cont <i>INS</i>	nscriptions or legends shall be engraved in Brazilian Portugues ents shall follow Brazilian standard regulation NR-10 - SE TALAÇÕES E SERVIÇOS EM ELETRICIDADE.	se language; the GURANÇA EM			
5.4.5 Eve iden	n if devices on the front plate have their own identification in tification shall not be used in place of the nameplates.	corporated, this			
5.4.6 All d doct	ables shall be clearly identified with their tag names accord	ling to Project's			
5.4.7 Ider regu EQU	tification of panels and internal equipment shall follow Bra lation NR-12 - SEGURANÇA NO TRABALHO EM JIPAMENTOS.	azilian standard <i>M</i> ÁQUINAS E			

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		AUTOMATION PANELS		ESUP)
5.5 In 5.5.1	ternal The ir mainte items conne	Lay-Out Internal layout shall be designed in order to ensure en enance, calibration and tests. Proper circulation of air am to avoid overheating shall also be taken into accour ctions identification tags shall be clearly visible.	ough iong tl it. Thi	space ne vai e terr	e for rious ninal
5.5.2	Device shall b future	e MANUFACTURER recommendations related to the sup be followed. Supports installation shall avoid interference v devices.	ports i with pr	nstalla esent	ation and

- 5.5.3 Removal of any device shall not interfere with operation of adjacent devices.
- 5.5.4 High-density layout (terminal blocks, trays, cables etc.) shall be avoided.

5.6 Heat Dissipation and Ventilation

- 5.6.1 Ventilation systems shall be designed considering the environmental conditions and internal devices heat dissipation.
- 5.6.2 If necessary, high heat dissipation devices shall be distributed to sections and racks to avoid heat concentration.
- 5.6.3 The fans shall be of low noise type. Panel's design shall take into account noise levels emission.
- 5.6.4 Panel SUPPLIER is responsible for providing heat dissipation calculation and to ensure that the internal devices are adequate for the minimum and maximum temperature specified in project's INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS, considering the panel final location.
- 5.6.5 Solar radiation for outdoor panels shall be taken into account. Sun shields shall be provided if necessary.
- 5.6.6 Air flow inside panel shall such that cold air intake is done though panel's front while the hot air is exhausted though panel's rear, as shown on Figure 1.



Front to Rear (F-R)

Figure 1 – Expected air flow on automation panels

5.6.7 Panels Rooms Layout shall be such that allows the creation of hot and cold aisle as shown on Figure 2, avoiding air short circuits that leads to loss of efficiency in heat dissipation.



5.7 Working Space

- 5.7.1 For both front and rear accesses, it shall be left at least 1,000 mm of working space for access to the internal components of the panels. These distances shall be measured from the panel door up to the worker location. As side doors are not required, this working space is not required at the sides, however, it shall be assured that all internal components are accessible from the front or rear door without need to take any component out. The working space height shall be measured from the floor up to, at least, the panel height.
 - 5.7.1.1 For panels that house local retractable workstations (KVM or notebooks), working space shall incorporate the space needed for a person to work in front of the workstation in its non-retracted position.
 - 5.7.1.2 These working spaces shall not be used for any other purpose (storage, for instance).
 - 5.7.1.3 When enclosed live parts are exposed for inspection or servicing, the working space, if in a passageway or general open space shall be suitably guarded.
 - 5.7.1.4 Control panels located across from other control panels or electric panels (e.g., switchgears, motor control centers) may share working space areas as long as it is assured that the doors of both equipment will not be open at the same time. In this case, the largest defined working space shall be adopted.

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	nacifia	characteristics for Automation indeer papels	ESOF
J.O J	pecific	characteristics for Automation indoor panels	
5.8.1	Plates	constructed in painted carbon steel are accepted for inc	loor panels.
5.8.2	Autom to IEC be IP 2	ation Panels located indoors shall have protection degr -60529, as a minimum. If perforated doors are used, prot 20 according to IEC-60529.	ee IP 22 according ection degree shall
5.8.3	Doors lower	shall be provided with ventilation slots and air filtering de part.	vices at upper and
5.8.4	When double rear fix doors	ever physical arrangement is possible, indoor panels e doors at both front and rear. In case it is not possible ked mount plate. For cabinets with width less than or equa are acceptable.	shall be fitted with , it shall be used a al to 800 mm, single
5.8.5	Front resin v applica	doors can be composed by a full height steel plate or he window located at approximately 1,000 mm from bottom ation, perforated doors may be required.	ave a 4 mm acrylic . Depending on the
5.8.6	Panels thermo	s shall be supplied with exhausting fans with filte	ers, controlled by
5.9 S	pecific	characteristics for Automation outdoor panels	
5.9.1	Outdo	or panels shall comply with IEC 61892-1.	
5.9.2	Degre	e of protection shall be IP 56 as a minimum, according to	o IEC 60529.
5.9.3	Even shall I accord pressu (which	if not located in hazardous areas, all Automation panel be suitable and certified for Zone 2, Group IIA, Tem ding to IEC-60079 and IEC 61892-1, and shall hav urization type according to NFPA 496 requirements. Pre- in is generally attached to the outside of the panel) an	s located outdoors perature class T3, ve purge and "Z" essurization system d any other of the

- panel's external accessories shall be certified for Zone 2 Group IIA Temperature Class T3. It is SUPPLIER's responsibility to achieve required class approval of outdoor panels for use in hazardous area as specified at design documentation. Protection degree shall also be taken into account during commissioning phase.
- 5.9.4 Panels shall be provided with hazardous area certificates as established by INMETRO in the regulation presented in item 2.1.2.
- 5.9.5 Construction plates shall be in ASTM 316L stainless steel, with minimum thickness 2.5 mm.
- 5.9.6 Panels located outdoors shall have full height steel plate doors, not windows or holes.
- 5.9.7 The doors of each section of outdoors panels shall be equipped with two limit switches for doors status indication (Open, close) available in CSS for indication

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	voltage free contact interconnected in series in order to provide one alarm sigr by panel. If these limit switches are related to a CSS REMOTE I/O PANEL itse the signals shall be sent to the corresponding control subsystem input ca (PCS/HCS). If the signals are not related to a CSS REMOTE I/O PANEL, they sh be sent to the nearest CSS-PSD or HSD input card.				
5.9.8	5.9.8 As outdoors panels shall have internal pressurization, each pane one section or more) shall be equipped with one low internal air switch (PSL) generated by a pressure transmitter. For pane ventilation, high air temperature alarm shall also be provided. All the shall be available in CSS-PSD for indication and alarm in the Supe		el (composed by pressure logical els with forced nese information ervisory System.		
5.9.9	5.9.9 Each outdoor panel shall be fitted with a pressurization/purge shall be pre-certified by an international standard defir Engineering Design Phase. The panels shall be fitted wit describing pressurization/purging operational procedure.		ntrol unit, which during Detail nstruction plate		
5.9.9	9.1	Instrument air shall be used for panel pressurization.			
5.9.9).2	For each outdoor panel, an independent and dedicated ai shall be provided for pressurization/purge as a back-up supply. This feature shall be provided in order to avoid caused by a failure in the main air supply. This dedicated a shall be composed of one air reservoir with all necessary accessories such as block and drain valves, check valves, and safety relief valves.	r supply system for the main air l consequences ir supply system instruments and pressure gages		
5.9.9	9.3	These air reservoirs shall comply with NR-13 - CALDEIRA PRESSÃO requirements. For air reservoir sizing, the foll technical requirements shall be taken into account:	S E VASOS DE owing minimum		
		 Maximum air leakage flow: For preliminary dimension leakage shall be considered 2 L/min per panel section flow shall be confirmed by appropriate testing of each shall be done with MCT and/or cable glands installed air leakage flow shall also be guaranteed during SAT transiting through the MCT and/or cable glands; 	oning, minimum n. This leakage n panel. Testing . The requested , with all cables		
		 Minimum air pressure at the inlet of the air reser (4.9 kgf/cm2); 	voir: 480.5 kPa		
		• Air volume of the reservoir shall be sized in order to pro the panel for, at least, thirty (30) minutes;	perly pressurize		
		 Air supply piping volume and/or other reservoirs' volur used in the calculations to reduce the air reservoir vo minutes requirement. 	nes shall not be olume or the 30		
5.9.9).4	Panel SUPPLIER shall provide all the necessary device pressurization control system (e.g., low air pressure switch limit switches, manometer, filter-regulators, relief valves, ma	s related to the es, timer, doors' anual valves and		

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	electromechanical lock), in order to prevent energization before complete purging of initial internal atmosphere, and other items required by the Classification Society. These devices shall be fitted and terminated to the same panel where they are assembled.						
5.9.10 Each protec doors will be shall b	5.9.10 Each outdoor panel shall have a shelter in order to allow maintenance. This protection over the panel shall be constructed in such a way that whenever the doors are open, the arrangement becomes a protected area, e.g., the open doors will be the side protections. Suitable fixing points among doors, floor and shelter shall be provided. The shelter material shall be the same as the panel material.						
5.9.11 Remove cable of and c accom anti-vil	vable gland plates or Multi-cable Transits (MCT) shall be entry. Gland plates shall be strong enough to support the ne ables. The panels shall have mounting legs of 300 modate installation and cable glands or MCTs. Panels shall pration mats to be mounted between panel and mounting le	fitted for bottom ecessary glands mm height to be supplied with gs.					
5.9.12 lf more be use	e than two rows (see Figure 3) of cables are needed, cable ed, only MCTs.	glands shall not					
5.9.13 If MCT classif panel model entry,	solution is adopted, it shall have all the necessary certification, including panel airtight certification, in order to a pressurization. The MCT frame shall be fixed using bolts shall be adequate for the cable installation (e.g. in case of a proper frame shall be selected).	tion for the area ssure adequate s. The selected of angular cable					
	GLAND PLATE CABLE GLAND						
ROW 1 -							
ROW 2 -							
ROW 3 -	E NOT ALLOWED						
Figure 3 – Cab	ble gland arrangement on gland plate illustration. The arrangement pres two rows) is not allowed.	sented (more than					
5.9.14 The lo Safety	cation of outdoor panels shall be taken into account in the f Studies: EXPLOSION ANALYSIS, FIRE PROPAGATION	ollowing Project N AND SMOKE					

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DISPERSION ANALYSIS and DROP OBJECTS STUDY. Panel SUPPLIER shall comply with all the recommendations presented in these studies regarding panel physical location.

5.9.15 Base plate for outdoor panels shall be according to item 17.5 of I-ET-3010.00-1200-800-P4X-013 - GENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.

6 ELECTRICAL CHARACTERISTICS

6.1 General

- 6.1.1 All electronic and electrical components shall be conditioned in order to withstand environmental conditions.
- 6.1.2 This chapter shall be taken into account, where applicable, for all types of panels mentioned in this Specification.
- 6.1.3 **ATTENTION**: As the panels will be fed by UNIT power supply, all parts at a voltage greater than or equal to 50 VAC RMS or 60 VDC shall be adequately insulated and means shall be provided to prevent unintentional human contact with these parts. These parts shall be clearly identified with the voltage and a warning sign. Openings to these live parts shall not permit the entry of a 12.5 mm diameter rod. Special attention shall be given to the supplied voltage of the UNIT.
- 6.1.4 All panel components and cables shall be adequately sized in order to assure proper power, voltage and current supply when all panel components are demanded (maximum current / power consumption case). For the CSS REMOTE I/O PANELS, the panel's internal components and cables shall be sized for all the wired I/Os, plus all the spare I/O cards and expansion cards being simultaneously activated and the maximum current being demanded.
- 6.1.5 Besides the necessary internal power socket outlets, each panel shall have an internal extra power socket outlet to feed electrical tools, such as lamps, notebooks etc. In this power socket outlet, the ground pin shall be connected to the safety ground. This power socket outlet shall be according to I-ET-3010.00-5140-700-P4X-002 SPECIFICATION FOR ELECTRICAL MATERIAL FOR OFFSHORE UNITS and shall comply with ABNT NBR 14136.
- 6.1.6 Dehumidifier heating resistors shall be supplied inside each panel for adequate preservation. These resistors shall be according to I-ET-3010.00-5140-741-P4X-004 SPECIFICATION FOR LOW-VOLTAGE GENERIC ELECTRICAL PANELS FOR OFFSHORE UNITS.
- 6.1.7 For CSS, independent redundant power supplies shall be provided for PSD, HSD, HCS, FGS, HFGS and PCS systems (i.e. power for processor and I/O modules), within each CSS cabinet.

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6.1.8	6.1.8 All instruments, sensors and any additional hardware required in order to implement the panel-related alarms and indications required in document I-ET- 3010.00-5520-800-P4X-001 - SUPERVISION AND OPERATION SYSTEM (SOS) SCREENS shall be supplied, installed and commissioned in every Automation panel.					
6.2 E	xternal	Wiring				
6.2.1	All ext termin suppo accep	ernal connections to the panels sl al blocks of the type permitting ac rting metal rails. Double deck terr table. Terminal connectors shall l	hall be carried out through E ddition of extra terminals co ninal blocks for terminal co be:	DIN rail mounted onnectors on the nnectors are not		
	 M A F Ir C 	Ade of non-hygroscope material dequate for conductors with 2.5 flame retardant; nsulated to 300 V; Of disconnect type (knife type).	; and 1.5 mm ² cross section	;		
6.2.2	The te and sh	erminal blocks location shall perr nall be placed at least at 300 mm	nit easy interconnection ar up from the base.	nd cable routing		
6.2.3	The te discre to ass	erminal blocks shall be segregate te input, discrete output, analog in ure proper segregation of signals	ted by each type of electinnput, analog output, power	rical signal, i.e., supply, in order		
6.2.4	Panels each s	s with bottom access shall have a section (at least 300 mm and acc	removable finishing plates ording to the panel design)	in the bottom of		
6.2.5	Panels outsid	s wiring shall terminate at inside e.	of the terminal blocks an	d field wiring at		
6.2.6	All terr and 10	minal blocks shall be provided w 0% of extra terminal connectors,	ith 20% of wired extra term for future use.	ninal connectors		
6.2.7	Cable termin	shielding shall be individually o al block.	connected to a terminal c	onnector in the		
6.2.8	Weldle with ir identif polarit	ess pressure type terminal conne nsulation sleeving, and with sui ied with the field device, equipr y.	ectors shall be used at the e table identification. All ter nent or accessory tag, an	and of the wires, minals shall be d the phase or		
6.2.9	The e that ca	xternal cables shall enter at the ables enter at a panel section and	related panel section. It is be interconnected in anot	not acceptable her section.		

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6.3 Inter	nal Wiring	
6.3.1 Al us	cable trays shall be sized in such a way that at maximum 60% ed, considering all spare and future I/O.	of their width are
6.3.2 Al bl	panel wiring shall be identified in both ends, by plastic rings on both number.	with the termina
6.3.3 O cc be	nly one conductor shall be connected to each side of each nnector. If more conductors in parallel connection are needed, a used.	terminal block fixed jump shal
6.3.4 W	iring derivations outside the terminal connectors are not allowed	d.
6.3.5 Po te sh	ower supply cables shall run in cable trays segregated from mination wiring, low voltage wiring and communication wiring. all be covered with protective plastic covers and shall have wa	the marshalling These terminals rning signs.
6.3.6 AI	electrical circuits shall be completely wired to the terminal bloc	xks.
6.3.7 In sł	erconnections between sections that need to be separated for all be suitably prepared for subsequent reassembly at the field.	or transportatior
6.3.8 So op ex	ome excess cable shall be installed inside the panels so that future relations may be performed without the need for installing n cess cable shall be considered in the cable tray sizing of item 6	ure maintenance ew cables. This 3.3.1.
6.3.9 Pa id G	anels' internal conductors shall follow external cable co entification and polarity, as defined in I-ET-3010.00-1200 ENERAL CRITERIA FOR INSTRUMENTATION PROJECTS.	nductors' color -800-P4X-013

- 6.4.1 The available power supplied by the UNIT to be used by the Automation panels is defined in I-ET-3010.00-5140-700-P4X-003 ELECTRICAL REQUIREMENTS FOR PACKAGES FOR OFFSHORE UNITS. It is part of the panel SUPPLIER's scope to convert and redundantly distribute the different power supplies inside panels, including, where necessary, redundant AC/DC or DC/DC stabilized power supply units for cabinet's internal distribution of 24 VDC.
- 6.4.2 Where necessary due to the internal equipment, incoming power supplies from the UNIT shall be converted inside each panel to a common 24 VDC and connected to a 24 VDC distribution copper bus bar in the panel. AC/DC or DC/DC conversion provided shall be within the tolerances required by the internal hardware.
- 6.4.3 Each 24 VDC power converter shall be sized to supply all modules and all I/O devices, including full spare capacity, and shall be provided with galvanic isolation between incoming power supply and 24VDC system.
- 6.4.4 Internal redundant power supplies shall be according to the following items:

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	•	 The 2 (two) supply voltages provided by the UNIT to the panel, as per item 6.4.1, shall be converted to 24 VDC for the panel internal devices and for feeding field instruments such as solenoid valves and relays; For discrete output circuits that require a higher power supply, greater than 24 VDC and/or current greater than 2A (normally associated to inductive loads of a higher consumption) independent redundant power supplies shall be provided; 				
	•					
	•	The power supplies shall operate in parallel;				
	•	Each power supply shall have input protection against ove	rvoltage;			
	•	Each power supply shall have circuit-breakers at incomin circuits;	ng and outgoing			
 Each 24 VDC power supply shall have the following signaling, to be for alarm in the Supervisory System: malfunction, ground fault and circuit. These signals shall be available through independent voltag contacts to be sent to the respective CSS panel. Interconnection among the power converters and bus distribution bal be made through individual static devices. A single failure shall not the whole system to fail. 			aling, to be used I fault and short lent voltage-free			
			ibution bar shall shall not cause			
	 The calculated load capacity of each power supply and its component take into account the electrical power consumption of the installed de and the foreseen spare and future expansions: 					
	•	24 VDC positive and negative poles shall not be grounded (floating system);			
	•	The power supplies and systems with battery shall have a ripple less than 200 mV peak-to-peak (pp) (70 mV RMS).	n output voltage			
6.4.5	All pa operat	nel internal devices, components and accessories shall the with the following power supply specification:	be adequate to			
	•	Voltage: 24 VDC, +10% / -15%.				
	•	Ventilation system and internal lighting: see item 6.4.1 for and frequency and item 6.6 for internal lighting. These the linked to a voltage supervision relay in order to feed the exh ventilation) and internal panel lighting.	r supply voltage feeders may be aust fans (panel			
6.4.6 [- - - -	Each p These supply solate 10% c	powered device (DC or AC) shall be individually protected by devices shall be installed in the front of the corresponding distribution shall be designed in such a manner that each ed (de-energized) even if the other sections are still in serv f spare circuits shall be provided.	circuit breakers. y section. Power o section can be vice (energized).			
6.4.7 	For CS HCS, within supply	SS, independent redundant power supplies shall be provided FGS, HFGS and PCS systems (i.e. power for processor an each CSS cabinet. For digital output circuits that require (normally associated to inductive loads of a highe	d for PSD, HSD, nd I/O modules), a higher power r consumption)			

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indepe FGS, I	endent redundant powe HFGS and PCS.	er supplies shall	be provided for	PSD, HSD, HCS,	
6.4.8 AC Po	wer wiring shall be seg	regated from DC	C power and sign	al I/O wiring.	
6.4.9 After a withou	a power supply failure, out the need for restarting	on reactivating t g, resetting or ma	he system, the p aintenance activit	anels shall operate ies.	
6.4.10 A norn energi resisto	nal external power sour zing the power socket or (item 6.1.6). This exte	rce shall be supp outlet (see item ernal power supp	blied from the UN 6.1.5) and the d bly does not need	IT to the panels for ehumidifier heating I to be redundant.	
6.4.11 Interco made the wh	onnection among the p through individual station nole system.	oower converter c devices. A sing	s and bus distrik Jle failure shall no	oution bar shall be ot cause a failure in	
UPSA UF	PS B		TV	PICAL REMOTE PANEL	
24 Vdc POWER SUPPLY	24 Vdc POWER SUPPLY 24 Vdc POWER SUPPLY 24 Vdc POWER SUPPLY		24 Vdc POWER SUPPLY		
PCS SE	CTION PSD SECTION 1	PSD SECTION 2	FGS SECTION 1	FGS SECTION 2	
Figure 4 - Typ 6.4.12 The de isolate 6.4.13 Interna	Redundancy modules bical remote panel with one papplies to C edicated sections of ea ed and the power supply ally to each CSS REM(pair of redundant po SS PROCESSORS ach CSS REMC / for each dedica	ower supplies per su S PANELS. OTE I/O PANEL s ated section shall . and CSS PROC	bsystem. Figure also shall be electrically be independent. CESSORS PANEL,	
the external power shall be converted to 24 VDC, using two redundancy modules. There shall be at least one pair of redundant 24 VDC power supplies for each subsystem (PCS, HCS, PSD, HSD, FGS and HFGS), to feed all internal CSS components. Subsystems shall not share their 24VDC power supplies (Figure 4).					
6.4.14 Internally to each panel section, it shall be included two diode modules between the external power supplied by the UNIT and each internal 24 VDC power converter.					
6.5 Groundii	ng				
6.5.1 Panel and th GENE	grounding shall comply ne specific grounding i RAL CRITERIA FOR IN	with the require requirements of NSTRUMENTAT	ments of IEC 618 I-ET-3010.00-12 ION PROJECTS	392 and IEC-60079 200-800-P4X-013 -	

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6.5.2 Three cross of the instrui (IS) at insula	(03) independent bars of electrolytic copper measuring a section mounted on insulators/supports shall be installed insignanels in order to segregate three types of circuit grout mentation grounding (IE), intrinsically safe (Ex-i) instrument and personal protection (safety) grounding (PE). The distance tors/supports shall be 600 mm.	t least 1" x 1/4" ide each section inding: non-Ex-i tation grounding between these				
6.5.3 The g Brazil white INSTF "ATEF "ATEF groun	rounding bars shall be clearly and permanently identified wit ian Portuguese. The nameplates shall be made of black acry lettering. The identifications to be engraved shall be "ATEF RUMENTAÇÃO NÃO EX-i (IE)" for non-Exi instrumenta RRAMENTO DE SEGURANÇA (PE)" for personal protection RRAMENTO DE SEGURANÇA INTRÍNSECA (IS)" for Ex-i ding.	h nameplates in vlic material and RAMENTO DE tion grounding, n grounding and instrumentation				
6.5.4 Grour sectio	nding bars shall have the following connecting capacity n:	for each panel				
I. 1 II. U	I (one) connector of 50 mm ² section for external grounding; Jp to 12 (twelve) connectors of 1.5 mm2 cross section to de	vice grounding.				
6.5.5 For pa only o coppe	anels up to 2,000 mm height, each section structure shall ne point (bottom), with grounding weldless connector type, by er wire. For panels higher than 2,000 mm, PETROBRAS sha	be grounded at y a 50 mm ² bare Ill be consulted.				
6.5.6 Adjac twiste	ent sections shall be bonded by a 50 mm ² bare copper v d wires, using earthing mechanical connector.	wire, formed by				
6.5.7 All pa have	nel metallic parts such as structural components, frames a electrical continuity among them.	and plates shall				
6.5.8 Hinge	d doors shall be bonded to the main enclosure with flexible g	rounding straps.				
6.5.9 Grour	nding straps shall be provided for all non-fixed surfaces.					
6.5.10 Each order active respe	panel section shall be supplied with ground fault active dete to announce alarm in the Supervisory System. Each ground device shall be connected to a voltage free contact interc ctive CSS subsystem input card.	ction devices in d fault detection onnected to the				
6.5.11 It shal instru GENE	l be taken into account cables shield interconnection for disc mentation in panel side, defined in I-ET-3010.00-1200- ERAL CRITERIA FOR INSTRUMENTATION PROJECTS.	rete and analog ·800-P4X-013 -				
6.5.12 Perso	6.5.12 Personal protection Grounding (PE)					
6.5.12.1	Ground connection for panel body electrical safety is require Two (02) 8 mm stainless steel grounding bolts shall be fitte	ed for all panels. d in each panel.				
6.5.12.2	Personal protection (Safety) grounding shall be used to pr from electric shock by providing a secure fault current path	otect personnel in the event that				

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	metallic components become energized. All powered equipment enclosures shall be connected to this grounding armor shall also be connected to this bar.	instrument and J. Armored cable
6.5.13 Instru	Imentation Grounding (IE)	
6.5.13.1	Copper made instrument signal ground bar, isolated from the bar, shall be provided for each panel section, with s (including spares) for wires termination, considering only connection.	ne PE grounding ufficient screws ly one wire per
6.5.13.2	Instrumentation grounding consists of the grounding instruments and signals cable shields. This ground has reducing false signals or noise in instrument circuits electrical interference.	of all non-Ex-i the objective of due to induced
6.5.13.3	The cable shields shall be floating in the field end. It sha continuous from the field equipment and connected to grounding bar in the panel.	Ill be electrically the instrument
6.5.14 Ex-i i	nstrumentation Grounding (IS)	
6.5.14.1	Copper made Intrinsic Safety Grounding bar shall be provid This bar shall be isolated from the safety and non-Ex-i instru- bars (PE and IE). Also, this bar shall be equipped with s (including spares) for wire terminations.	ed for all panels. Iment grounding Sufficient screws
6.5.14.2	Intrinsic Safety Grounding shall follow the requirements of IE 60079-14 and IEC 60079-11.	EC 61892-7, IEC
6.6 Internal	Lighting	
6.6.1 For speci	nternal lighting, only LED lamps are accepted, with fications:	ı the following
 7.5 W Moun Provid opende Powe 	' each lamp; ted on panel struts distributed throughout all panel sections; ded with limit switch to automatically turn on the lights whed; r supply: see item 6.4.1.	nen any door is





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8.1.2	In orde belone	er to prevent damage to computers' CPUs due to dust, espe g to SOS, they shall be located inside panels, named CPU	ecially th PANELS	ose that
8.1.3	8.1.3 These panels shall be located in safe non-classified enclose Control Room – Equipment Ambiance and/or Automation and Room - AEPR).		I areas Electrical	(Central Panels
8.2 C	PU PA	NELS main characteristics		
8.2.1	The C operat	CPUs of SOS Servers, HMIs and other Automation com tion shall be allocated in CPU PANELS.	puters u	ised for
8.2.2	For in 3010.0 COMF	ternal distribution of CPU PANELS used for virtualized on 00-5520-861-P4X-003 - VIRTUALIZATION OF AUTOMA PUTERS shall be consulted.	omputer	s, I-ET- YSTEM
8.2.3	Non-v CPUs MEMC	irtualized Automation computers shall be allocated in To Panels, according to the Project document DRANDUM AUTOMATION AND CONTROL SYSTEM FUN	psides a "DESCF CTIONS	ınd Hull RIPTIVE ".
8.2.4	When sectio	ever there are redundant equipment, they shall be loo ns.	ated in	distinct
8.2.5	Minim	um characteristics of each section:		
	 D in R P F W F U O N S O 	imensions: Height 2,000 mm (44 u), external length 800 iternally), width 1,100 mm; apid rail; erforated doors (hole diameter 10 mm) ; ront and rear doors, side panels; /eight support capability: 0.2 ton; orced air ventilation (internal fans); eveling feet; pen bottom; linimum protection degree IP 20 according to IEC-60529; pace for ventilation between equipment; one power socket for each equipment, in Brazilian standar	mm (19 d. Socke	t gauge
8.2.6	Each s monito compu contai	section shall be supplied with a built-in rack console, compose or, keyboard, optical mouse and one integrated KVM switch uters configuration and maintenance. This integrated KV n as many ports as the quantity of CPUs located in the pan	ed of ret in order √M swite el sectio	ractable to allow ch shall n.
8.2.7	The re with a 1u.	etractable video monitor shall have 15", be composed of L t least 1280×1024 @ 60/75 Hz resolution. Preferably, hei	ED back ght shall	lit LCD, occupy
8.2.8	The in a 1u d	ternal keyboard shall be a USB 104-key ABNT-2 and shall I rawer.	oe moun	ted over

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8.2.	9 The ir	ntegrated KVM switch height shall occupy at maxin	num 2u.
8.2.	10 The r placed mm al	etractable monitors, keyboards and optical mice d in order to allow their use by a person in sit-do bove floor).	e shall be ergonomically wn position (typically 800
8.2.	11 Each KVM (the C extend	section of the panels that hold non-virtualized CP extenders. These KVM extenders will be used to a PUs from the operators' consoles. There shall der pair (transmitter/receiver) per CPU.	Us shall be supplied with llow remote connection to be one individual KVM
8.2.	12 Minim	um characteristics of the KVM extenders:	
	 S A U C B T M b 	Support for Display Port++ Dual Mode video; Audio capabilities (stereo loudspeakers); USB ports for at least keyboard and mouse; Connection with CPU through CAT5 UTP cable; Se fed by a dedicated power supply inside the pane The transmitters and receivers shall be of the same Maximum distance between panel location and the e observed for installation of KVM extenders' trans	el; manufacturer and model; operators' consoles shall smitters/receivers.
8.2.	13 Comp choos	atibility between KVM extender and video monito sing the KVM model (typically 1920 x 1080 in dual	rs shall be verified before monitor configuration).
8.3	The inte the neo section	ernal arrangement of each sub-section shall be des cessary ventilation and the necessary equipmen	signed taking into account t contained in each sub-
8.4	The fina accordi	al layout shall be defined during project's Detail E ng to the type and quantity of the chosen equipme	ngineering Design Phase ent.
8.5	Other r	equirements listed in items 5 and 6 shall also apply	y to the CPU PANELS.
9 E	LECTR	RICAL-TO-OPTICAL CONVERSION PANE	LS (EOCP)
9.1	The E exclusiv which c sense, environ	lectrical-to-Optical Conversion Panels (EOCPs vely to the conversion of electrical signals to optic occurs when there is a change of ambient from in an EOCP is an interface panel between an iment.) are panels dedicated al signals and vice versa, doors to outdoors. In this indoor and an outdoor
9.2	There s panel s	shall be at least one EOCP for the Topsides and hall be placed indoors.	one for the Hull and each
9.3	These	panels shall be located in safe non-classified end	closed areas, indicated in

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9.4	Each E of all op to the o	OCP shall be composed of as ma tical cables that enter the ambient ther panels in the room or adjace	any sections as needed for to electrical cables that sha nt rooms.	r the conversion all be connected
9.5	Overall	characteristics of each EOCP se	ction:	
	 D m S F 4 W F L O N S O sl 	imensions: Height 2,100 mm (44 m; tandard 19" mounting rack; ront and rear doors, side panels; mm acrylic resin window; /eight support capability: 0.2 ton; orced air ventilation (internal fans eveling feet; pen bottom; linimum protection degree IP 22 a pace for ventilation between equi ne power socket for each equipment	(u), external length 800 m according to IEC-60529; pment; ment, in Brazilian standard nt.	hm, depth 1,100
9.6	Each section of an EOCP shall be capable of housing a standard 19-inch rack panel with power supplies, ventilation and any other equipment necessary for adequate performance of the electro-optical converters.			
9.7	Electro- least 1u	optical converters shall be 1u 19 I free between each converter.	9-inch rack mounted and	they shall be at
9.8	Electro- AUTOM	optical converters shall be accord IATION NETWORK REQUIREM	ding to I-ET-3010.00-5520 ENTS.	-800-P4X-004 –
9.9	When d margins convert	limensioning the EOCP and the n s for future expansions shall be ers plus 10% of this total value as	umber of electro-optical co e taken into account: 20 s additional free space.	onverters, safety % of additional
9.10	The parce of the cable in	nels internal layout shall foresee terconnection without risks to the	the necessary space for fibers integrity.	the field optical
9.11	The fination to the ty	al layout shall be defined during p /pe and quantity of the chosen ec	project's Detailing Design F juipment.	Phase according
9.12	Other requirements listed in items 5 and 6 shall also apply to the EOCPs.			

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10 TESTS					
10.1 All devi Accepta accordir	ations and anomalies found during ince Test (SAT) and Site Integration ng to punch list control system defin	g Factory Acceptance ⁻ Test (SIT) shall be adeq ed in contract.	Test(FA uately re	T), Sit gistere	
10.2 Factory	Acceptance Tests (FAT)				
10.2.1 Facto requi	ory Acceptance Tests (FAT) sha rements, including the following test	II be in accordance v s:	vith IEC	6238	
• [Mechanical tests;				
• [Electrical tests; Eunctional tests:				
•	Temperature-cycling tests;				
•	RFI & EMI tests;				
•	Pressurization/purge tests for the pr Painting inspection.	essurized panels;			
10.2.2 FAT SUPI PETF	shall be witnessed, to be agre PLIER during Project. FAT repo ROBRAS.	ed between PETROBF rt tests shall be signe	RAS and ed and	d Pane sent t	
10.2.3 Prior PETF and p modi	to the witnessed FAT, SUPPLIE ROBRAS, according to Project's sc present the documentation to PETRO fications during FAT.	R shall send the Tests hedule, and shall execu OBRAS, in order to reduc	proceed te previo ce repair	dings t us test s and/c	
10.2.4 The repla durin draw	FAT shall be fully documented, inc cements. The FAT procedure shall g the construction period such a ings, calibration certificates and any	cluding any equipment fat include handling over a s test results, list of c other documentation.	ailure, re all recorc hanges,	pairs c ls mad as-bui	
10.2.5 All do	ocumentation (project and tests) sha	all be sent in digital medi	a.		
10.2.6 Testi Class	ng methods and accuracy of the sification Society and PETROBRAS	measurement shall be approval.	e subject	to th	
10.2.7 Any i SUPI corre	malfunctions of the equipment shal PLIER'S expenses, and to PET ction shall be presented.	I be rectified and tested ROBRAS approval. Ev	again, a vidences	at Pane of th	
10.2.8 In FA powe cond ventil	T location, all facilities such as instr supplies shall be available. An itioning) required for the complet lation control, internal power supplie	rument air supply and re- mbiance temperature (e panels testing (pres es) shall be controlled.	dundant with/with surizatio	externa out ai n/purge	

10.2.9 The FAT staging shall be set up so that each panel is fed from two power supplies, simulating the two power supplies provided by the UNIT to the panel. Power supply

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switch	over will be tested.			
10.2.10 The enviro large °C).	FAT facility shall include adequate air conditioning to ensure onment (where there are numerous screens and other equip amounts of heat) is maintained at a comfortable temperatu	e that th ment ge ire (less	e tes enera thar	sting ating n 25
10.2.11 The	mechanical tests shall encompass, at least, the following to	pics or e	essa	ys:
\ <i>/</i> :			: .	n of

- Dimensional check;
- Rigidity and structures self-supporting;
- Shock, vibration and inclination (procedures according to Classification Society Rules).

10.2.13 Functional Tests shall be as described below:

- Complete system functional test, with simulation of all input situations and observation of expected outputs; the overall reaction time shall be verified;
- Input / Output Tests;
- Devices shall be tested according to test and operation device manuals.

10.2.14 Pressurization/Purge Tests

- The panels shall be tested in order to verify compliance with all conditions and devices foreseen in the NFPA 496 or IEC 60079-2 (latest versions).
- The air supply flowrate shall be measured; the leakage compensation sequence shall be checked; all the interlocks and alarms shall be tested; the internal pressure shall be tested considering the air supply pressure varying from 70 psig up to 113 psig; other tests foreseen in the NFPA 496 or IEC 60079-2 and by the Classification Society shall be carried out.
- The pressurization/purge shall assure a controlled air flow at low pressure, as required by NFPA 496 or IEC 60079-2, in order to maintain the interior of the panel lightly pressurized, avoiding the ingress of external explosive atmosphere gas and the ingress of saline atmosphere.
- 10.2.15 FAT report shall include a punch list with all non-impeditive deviations and anomalies that will be treated in field, including the date for treatment deadline.
- 10.2.16 During FAT, all Ex certificates of each panel component and of the assembly shall be verified and validated.

^{10.2.12} Electrical, Temperature-Cycling and RFI & EMI Immunity tests shall be according to project's "INSTRUMENTATION ADDITIONAL TECHNICAL REQUIREMENTS" technical specification.

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10.2.17 During FAT, inventory shall be kept of all panel components and spare parts in order to guarantee traceability and availability.

10.3 Site Acceptance Test (SAT)

- 10.3.1 All tests performed at the factory (FAT) shall be repeated at the installation site (SAT). IEC 62381 requirements shall also be taken into account.
- 10.3.2 Panel functioning shall be tested at full load, i.e. at maximum power / current consumption. It shall be verified that during full load test, the system's capacity is not at its maximum and that enough capacity is available for all spare and future expansion components to be installed.
- 10.3.3 During SAT, any necessary design modifications after FAT shall be tested and FAT punch list items shall be treated.

10.4 Site Integration Test (SIT)

10.4.1 For Site Integration Tests (SIT) refer to IEC-62381 – AUTOMATION SYSTEMS IN THE PROCESS INDUSTRY – FACTORY ACCEPTANCE TEST (FAT), SITE ACCEPTANCE TEST (SAT) AND SITE INTEGRATION TEST (SIT).

11 PACKING REQUIREMENTS

- 11.1 On completion of FAT, all equipment shall be prepared for shipment and storage.
- 11.2 Equipment supplied loose shall be packed and crated for transportation. In addition, if some rack equipment is susceptible to transportation damage, it shall be removed from the system rack for separate packing and crating.
- 11.3 In order to prevent corrosion, VCI shall be used adequately, where applicable, as part of preparation for shipment and storage instead of desiccants such as silica gel. The latter shall be used only in cases where VCI is not applicable. Both VCI and desiccants shall not be used together for protecting the same compartment.