

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 2 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

INDEX

1.	SUBJECT.....	3
2.	ABBREVIATIONS	3
3.	REFERENCE DOCUMENTS, CODES AND STANDARDS.....	3
4.	GENERAL REQUIREMENTS	3
5.	SCOPE OF SUPPLY - INSTRUMENTS	4
6.	SCOPE OF SUPPLY - TOOLS.....	17

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 3 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

1. SUBJECT

- 1.1. This document defines the technical specification of Telecommunications Tools and Instruments that shall be supplied by CONTRACTOR for PETROBRAS FPSO Unit to guarantee the telecommunications systems maintenance.

2. ABBREVIATIONS

AC	Alternate Current
AIS	Automatic Identification System
CCTV	Closed Circuit Television
CPU	Central Processor Unit
DC	Direct Current
DSC	Digital Selective Calling
DVD-RW	Digital Video Disc Rewritable
EPIRB	Emergency Position Indicating Radio Beacon
HF	High Frequency
MF	Medium Frequency
NBR	Norma Brasileira (Brazilian Standard)
PPE	Personal Protective Equipment
PTZ	Pan, Tilt Zoom
RF	radio frequency
RMS	Root Mean Square
SART	Search and Rescue Transponder
SDXC	Secure Digital Extended Capacity
VHF	Very High Frequency

3. REFERENCE DOCUMENTS, CODES AND STANDARDS

- 3.1.1. NR-10: Segurança em instalações e serviços em eletricidade.
- 3.1.2. ABNT NBR 14136/2012: Plugs and socket-outlets for household and similar purposes – Standardization.
- 3.1.3. IEC 61000: Electromagnetic compatibility (EMC) series - all parts.

4. GENERAL REQUIREMENTS

- 4.1. All electrical devices must be 220VAC/60Hz compatible and all shall have Brazilian standard 02 (two) or 03 (three) pins power plugs (NBR 14136).

 PETROBRAS	TECHNICAL SPECIFICATION	Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B	
	AREA:	-			SHEET:	4 of 24
	TITLE:	TOOLS AND INSTRUMENTS			INTERNAL	
					OI/CS	

4.2. All equipment shall be provided preferably with Brazilian Portuguese user manuals, however it will be accepted English user manuals.

4.3. All instruments shall be supply with a valid calibration certificate.

5. SCOPE OF SUPPLY - INSTRUMENTS

CONTRACTOR shall supply the instruments described in this technical specification. In case of discontinuity, a similar model with same features shall be presented to PERTOBRAS approval.

5.1. GENERAL USE INSTRUMENTS

5.1.1. 01 (one) Digital multimeter model Fluke 289 True-RMS Data Logging + TLK289 Industrial Master Test Lead Set + IR3000 FC Connector + IR189USB USB Cable adapter + carrying case.

5.1.2. 01 (one) kit for Digital multimeter model Fluke 28 II Ex Intrinsically Safe True RMS Digital Multimeter + TLK289 Industrial Master Test Lead Set + carrying case.

5.1.3. 01 (one) Digital multimeter model Fluke 376 FC True-RMS Clamp Meter with iFlex and accessories..

5.1.4. 01 (one) IR thermometer model 62max manufacturer fluke.

5.1.5. 02 (two) Digital Thermometer-Hygrometer data logger model 1620A manufacturer Fluke.

5.1.6. 01 (one) Batterie Charger for 8 AA / AAA / C / D NiMH or NiCD batteries model Maha Energy Powerex MH-C808M + 20(twenty) AA NiMH Rechargeable Batteries (1.2V, 2700mAh) model Powerex Pro MHR4A4PRO.

5.1.7. 01 (one) Digital camera Canon PowerShot G7 X Mark III 20.1 Mega Pixels + Memory card micro SDXC 128GB Sandisk Extreme Pro.

5.1.8. 01 (one) Notebook with the following requirements:

- a. Processor (CPU): Intel Core i9 or better latest generation;
- b. OS: Microsoft Windows 11 professional x64;
- c. RAM Memory: 64GB DDR5;
- d. Storage: 2TB internal Solid State Drive (SSD);
- e. Dedicated Video card with minimum of 6GB memory
- f. Network adapter: 802.11ax 2.4/5 GHz wireless;
- g. Monitor: 14” LCD monitor;
- h. I/O Ports: Bluetooth, 2x USB 3.0, 2x USB-C, 1x HDMI, 1x Audio in/out and microphone Port, micro SD card reader, 1x RJ-45 Gigabit Ethernet – 10/100/1000 Mbps;

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 5 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

- i. Web camera (HD), microphone, speakers keyboard (ABNT2 standard, retro backlight)
- j. Power AC – 100 ~ 240V / 50 ~ 60 Hz with Brazilian standard power line plug
- k. Accessories: DVD-RW (integrated or external), webcam (integrated or external), mouse and laptop case.

5.2. LABELING TOOLS

- 5.2.1. 01 (one) Label Printer model BMP21-PLUS with hard case; Li-ion Battery; Power adapter, Battery charger, Brazilian power cord, 10(ten) M21-250-595-YL external vinyl tag. Manufacturer Brady
- 5.2.2. 01 (one) Label Printer model M710-WB-PWID with hard case; M-Lion Battery; Power adapter; Battery charger; Brazilian power cord; 3 (three) multi-purpose tags part number M7-12-109, 5 (five) vinyl label part number M7-21-427-2S, 10 (ten) yellow vinyl label part number M7C-2000-595-YL, 10 (ten) white vinyl label part number M7C-2000-595-WT, 5 (five) white panel label part number M7-176-593, 5 (five) ribbon part number M7-R6200, 5 (five) ribbon part number M7-R4300. Manufacturer Brady.
- 5.2.3. 01 (one) Stainless steel and aluminum label printer model Rhino™ M1011 Embosser Kit | Dymo. Package Includes M1011 Label Embosser; Horizontal Character Wheel; Reverse Image Character Wheel; Non-Adhesive Aluminum Labels Roll 12 mm x 3.5 m; Non-Adhesive Stainless Steel Labels Roll 12 mm x 5 m; Hard Carry Case; NiMH Battery; Power adapter, Battery charger, Brazilian power cord, USB cord.

5.3. GENERAL RF TEST INSTRUMENTS

- 5.3.1. 01 (one) LMR Master S412E, Manufacturer ANRITSU with the following accessories:

Item	Description	Quantity
S412E	LMR Master; 500 kHz - 1600 MHz Land Mobile Radio Modulation Analyzer and Signal Generator; Vector Network Analyzer; Spectrum Analyzer	1
S412E-0006	Option 6; 6 GHz Coverage on Spectrum Analyzer	1
S412E-0016	Option 16; 6 GHz Coverage on Vector Network Analyzer	1
S412E-0019	Option 19; High Accuracy Power Meter (Requires USB Power Sensor; sold separately)	1
S412E-0031	Option 31; GPS Receiver (Requires GPS Antenna; sold separately)	1
2000-1528-R	Magnet Mount GPS Antenna (active 3-5V) with SMA connector and 4.6 m (15 ft) extension cable (Required for units with Option 31)	1
S412E-0025	Option 25; Interference Analyzer (Option 31 is recommended)	1
S412E-0431	Option 431; Coverage Mapping (Requires Option 31)	1

 PETROBRAS	TECHNICAL SPECIFICATION		Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B
	AREA: -				SHEET:	6 of 24
	TOOLS AND INSTRUMENTS				INTERNAL	
					OI/CS	
S412E-0444	Option 444; EMF Measurement (Requires Anritsu Isotropic Antenna; sold separately) (Requires Options 31 and 546 for demodulated LTE signals)				1	
S412E-0509	Option 509; AM/FM/PM Analyzer with Coverage Mapping (Options 31 and 431 are required for utilization of coverage mapping feature)				1	
S412E-0591	Option 591; DMR Analyzer				1	
S412E-0592	Option 592; DMR Talk-Out Coverage (Requires Options 31 and 591)				1	
S412E-0541	Option 541; LTE RF Measurements				1	
S412E-0542	Option 542; LTE Modulation Measurements				1	
S412E-0546	Option 546; LTE OTA Measurements (Option 31 required for full functionality)				1	
S412E-0551	Option 551; TDD LTE RF Measurements (Requires Option 541)				1	
S412E-0552	Option 552; TDD LTE Modulation Measurements (Requires Option 542)				1	
S412E-0556	Option 556; Option 556; TDD LTE OTA Measurements (Option 31 required for full functionality) (Requires Option 546)				1	
	Calibration kit					
TOSLN50A-8	Coaxial Calibration Kit; Type N(m); DC to 8 GHz; 50 Ohm				1	
TOSLNF50A-8	Coaxial Calibration Kit ; Type N(f); DC to 8 GHz; 50 Ohm				1	
TOSLNF50A-8-ES510	5 Year Extended Service - Return to Anritsu Repair Only				1	
	test cables					
15NNF50-1.5C	Test Port Extension Cable; Armored; 1.5 meters; DC to 6.0 GHz; N(m) - N(f); 50 Ohm				1	
15NN50-1.5C	Test Port Extension Cable; Armored; 1.5 meters; DC to 6 GHz; N(m) - N(m); 50 Ohm				1	
15N43F50-1.5C	Test Port Extension Cable; Armored; 1.5 meters; DC to 6 GHz; N(m) to 4.3-10 (f)				1	
15N43M50-1.5C	Test Port Extension Cable; Armored; 1.5 meters; DC to 6 GHz; N(m) to 4.3-10 (m)				1	
	Antennas					
2000-1487-R	Telescoping Whip Antenna; BNC(m)				1	
1091-172-R	Adapter; DC to 1.3 GHz; N(m) - BNC(f); 50 Ohm				2	
2000-1636-R	Antenna Kit (Consists of: 2000-1030-R; 2000-1031-R; 2000-1032-R; 2000-1200-R; 2000-1035-R; 2000-1361-R; and carrying pouch)				1	
2000-1751-R	LTE Dipole Antenna; 698 - 960 / 1710 -2170 / 2500 - 2700 MHz; SMA(m); 2 dBi; typical; 50 Ohm				1	
1091-27-R	Adapter; DC to 18 GHz; N(m)-SMA(f); 50 Ohm				2	
2000-2107-R	Log Periodic Antenna 20 MHz to 8.5 GHz				1	
	Connectors and Adapters					
SM/PL-1	Precision N(m) Load; 6.0 GHz; 42dB				2	
1091-26-R	Adapter; DC to 18 GHz; N(m) - SMA(m); 50 Ohm				2	
1091-417-R	Adapter; DC to 6 GHz; N(m) - QMA(f); 50 Ohm				2	

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 7 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

1091-418-R	Adapter; DC to 18 GHz; N(m) - QMA(m); 50 Ohm	2
1091-465-R	Low PIM Adapter; DC to 6 GHz; 4.3-10(f) to N(f); 50 Ohm	2
1091-467-R	Low PIM Adapter; DC to 6 GHz; 4.3-10(m) to N(f); 50 Ohm	2
510-90-R	Adapter; DC to 7.5 GHz; 7/16 (f) - N(m); 50 Ohm	2
510-91-R	Adapter; DC to 7.5 GHz; 7/16 (f) - N(f); 50 Ohm	2
510-92-R	Adapter; DC to 7.5 GHz; 7/16 (m) - N(m); 50 Ohm	2
510-102-R	Adapter; DC to 11 GHz; N(m)-N(m); 90 degrees right angle; 50 Ohm	2
34NN50A	Precision Adapter; DC to 18 GHz; N(m) - N(m); 50 Ohm	2
34NFN50	Precision Adapter; DC to 18 GHz; N(f) - N(f); 50 Ohm	2
1091-80-R	Adapter; DC to 18 GHz; N(f)-SMA(m); 50 Ohm	2
1091-81-R	Adapter; DC to 18 GHz; N(f)-SMA(f); 50 Ohm	2
	<u>Attenuators</u>	
42N50-20	Attenuator; 20 dB; 5 Watt; DC to 18 GHz; N(m) - N(f)	1
42N50A-30	Attenuator; 30 dB; 50 Watt; DC to 18 GHz; N(m) - N(f)	1
42N50A-30-ES510	5 Year Extended Service - Return to Anritsu Repair Only	1
1010-128-R	Attenuator; 40 dB; 150W; DC to 3 GHz; N(m) - N(f)	1
1010-128-R-ES510	5 Year Extended Service - Return to Anritsu Repair Only	1
	<u>Power Sensors</u>	
MA24103A	Inline Peak Power Sensor; 25 MHz - 1 GHz (Includes 2000-1606-R Cable)	1
MA24103A-ES510	5 Year Extended Service - Return to Anritsu Repair Only	1
MA24105A	Inline Peak Power Sensor; 350 MHz - 4 GHz (Includes 2000-1606-R Cable)	1
MA24105A-ES510	5 Year Extended Service - Return to Anritsu Repair Only	1
MA24106A	True-RMS USB Power Sensor; 50 MHz - 6 GHz (Includes 2000-1566-R Cable)	1
MA24106A-ES510	5 Year Extended Service - Return to Anritsu Repair Only	1
MA24218A	True-RMS Universal USB Power Sensor; 10 MHz - 18 GHz	1
	<u>Accessories</u>	
MA25100A	RF Power Indicator	1
760-243-R	Transit Case (Recommended case for all Handheld Products)	1

5.3.2. Field Master Pro Spectrum Analyzer

Item	Description	Quantity
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 PETROBRAS	TECHNICAL SPECIFICATION		Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B
	AREA:			-		
	TITLE:			SHEET: 8 of 24		
	TOOLS AND INSTRUMENTS			INTERNAL		
OI/CS						

MS2090A	Field Master Pro Spectrum Analyzer	1
MS2090A-0720	Option 720; Spectrum analyzer; 20 GHz	1
MS2090A-0031	Option 31; GPS receiver (requires GPS Antenna PN 2000-1528-R; 2000-1652-R or 2000-1760-R; sold separately)	1
2000-1528-R	Magnet Mount GPS Antenna (active 3-5V) with SMA connector and 4.6 m (15 ft) extension cable (Required for units with Option 31)	1
2000-1760-R	GPS Antenna; SMA(m); 25 dB gain; requires 2.5 VDC to 3.7 VDC	1
MS2090A-0019	Option 19; High accuracy power meter (requires USB sensor; sold separately)	1
MS2090A-0509	Option 509; AM/FM Modulation Measurements	1
MS2090A-0331	Option 331; S331P Site Master enabled (requires S331P; sold separately)	1
15NNF50-1.0B	Test Port Extension Cable; Armored; Phase Stable; 1.0 meter; DC to 18 GHz; N(m) - N(f); 50 Ohm	1
15NN50-1.0B	Test Port Extension Cable; Armored; Phase Stable; 1.0 meter; DC to 18 GHz; N(m) - N(m); 50 Ohm	1
MS2090A-0720-0097	Option 97; Accredited Calibration	1
2000-2048-R	Screen protector (for MS2090A Field Master Pro)	1
2000-1945-R	Soft case (For Model MS2090A)	1
760-243-R	Transit Case (Recommended case for all Handheld Products)	1
	Items for TESTS/Measurements	
MS2090A-0024	Option 24; Interference Finder	1
MS2090A-0199	Option 199; Real-time spectrum analysis (RTSA)	1
MS2090A-0103	Option 103; 50 MHz analysis bandwidth	1
MS2090A-0431	Coverage Mapping (Requires Option 31)	1
MS2090A-0883	Option 883; LTE FDD Measurements (Requires Option 31)	1
MS2090A-0888	Option 888; 5G NR Downlink Measurements (requires Option 31)	1
MS2090A-0444	Option 444; EMF Measurement	1
2000-1791-R	Isotropic Antenna; E-Field; 0.7 GHz - 6 GHz	1
2000-1792-R	Isotropic Antenna; E-Field; 30 MHz - 3 GHz	1
2000-1800-R	Isotropic Antenna; H-Field; 9 kHz - 300 MHz	1
MS2090A-0445	Option 445; EMF meter	1
2000-1985-R	Isotropic EMF Probe; 20 MHz to 40 GHz	1
	Conectores e adaptadores	
34NFnF50	Precision Adapter; DC to 18 GHz; N(f) - N(f); 50 Ohm	1
34NN50A	Precision Adapter; DC to 18 GHz; N(m) - N(m); 50 Ohm	1
1091-26-R	Adapter; DC to 18 GHz; N(m) - SMA(m); 50 Ohm	1
1091-27-R	Adapter; DC to 18 GHz; N(m)-SMA(f); 50 Ohm	1
1091-80-R	Adapter; DC to 18 GHz; N(f)-SMA(m); 50 Ohm	1
1091-81-R	Adapter; DC to 18 GHz; N(f)-SMA(f); 50 Ohm	1

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 9 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL OI/CS

1091-172-R	Adapter; DC to 1.3 GHz; N(m) - BNC(f); 50 Ohm	1
510-102-R	Adapter; DC to 11 GHz; N(m)-N(m); 90 degrees right angle; 50 Ohm	1
1091-467-R	Low PIM Adapter; DC to 6 GHz; 4.3-10(m) to N(f); 50 Ohm	1
1091-465-R	Low PIM Adapter; DC to 6 GHz; 4.3-10(f) to N(f); 50 Ohm	1
2000-1884-R	PIM Hunter Test Probe; 600 - 2700 MHz	1
	<u>Connectors and Adapters</u>	
1010-121-R	Attenuator; 40 dB; 100 Watt; DC-18 GHz; N(m)-N(f); Uni-Directional	1
42N50A-30	Attenuator; 30 dB; 50 Watt; DC to 18 GHz; N(m) - N(f)	1
<u>Código</u>	<u>Intereference Huter - Manopla / Antena</u>	<u>Quantidade</u>
MA2700A	InterferenceHunter Handheld Direction Finding System (Requires Directional Antenna; sold separately).	1
2000-1798-R	Port Extender; N(m) - N(f); DC to 6 GHz	1
760-261-R	Transit Case (For MA2700A Handheld Direction Finding System)	1
2000-2107-R	Log Periodic Antenna 20 MHz to 8.5 GHz	1
	<u>Cabos de testes</u>	
15NN50-1.0B	Test Port Extension Cable; Armored; Phase Stable; 1.0 meter; DC to 18 GHz; N(m) - N(m); 50 Ohm	2
15NN50-1.5C	Test Port Extension Cable; Armored; 1.5 meters; DC to 6 GHz; N(m) - N(m); 50 Ohm	2
15NN50-3.0C	Test Port Extension Cable; Armored; 3.0 meters; DC to 6 GHz; N(m) - N(m); 50 Ohm	2
15NN50-5.0C	Test Port Extension Cable; Armored; 5.0 meters; DC to 6 GHz; N(m) - N(m); 50 Ohm	2
	<u>Site Master - Cabo e antena ultra portátil</u>	
S331P	Site Master; Ultraportable Cable and Antenna Analyzer	1
S331P-0706	Option 706; 150 kHz to 6 GHz	1
OSLN50A-8	Coaxial Calibration Kit; Type N(m); DC to 8 GHz; 50 Ohm	1
OSLNF50A-8	Coaxial Calibration Kit; Type N(f); DC to 8 GHz; 50 Ohm	1
34NFN50	Precision Adapter; DC to 18 GHz; N(f) - N(f); 50 Ohm	1

- 5.3.3. 01 (one) Wattmeter model 4304A (25Mhz – 1Ghz 5W-500 Watt) manufacturer Bird + hard carrying case.
- 5.3.4. 02 (Two) RF Coaxial Termination 50ohm with N-connector, model 100-T Series, 100 Watt, Convection-Cooled manufacturer Bird.
- 5.3.5. 02 (Two) Coaxial attenuator 50ohm with N-connector bi-directional attenuator, model 300-A Series, 6dB 300W Watt, manufacturer Bird.

	TECHNICAL SPECIFICATION	Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B
	AREA:	-		SHEET:	10 of 24
	TITLE:	TOOLS AND INSTRUMENTS		INTERNAL	
				OI/CS	
5.3.6. 02 (Two) RF Coaxial attenuator 50ohm with N-connector bi-directional attenuator, model 300-A Series, 30dB 300W Watt, manufacturer Bird. 5.3.7. 01 (one) Wattmeter model 5000-XT + hard carrying case + following sensors: a. Model 5019D – 25MHz to 1000MHz, power range 100mW - 100W; b. Model 5014 – 2MHz to 2700MHz, power range 125mW – 1kW; 5.3.8. 02 (two) RF adapter kit with 41 pcs. Including 2 each of: BNC male, BNC female, TNC male, TNC female, SMA male, SMA female, N male, N female, UHF male, UHF female, mini UHF male, mini UHF female, F male, F female, RCA/Phono male, RCA/Phono female adapters, 6 Coupling adapters, 1 Double banana plug, 1 Double binding post and 1 Signal Sampler. Manufacturer POMONA. 5.3.9. 06 (six) N female to N female adaptors. 5.3.10. 02 (two) High quality fully tested Super Flexible Coax ½” Cable Jumper N Male to N Male 5ft with test certificate. 5.3.11. 02 (two) High quality fully tested Super Flexible Coax ½” Cable Jumper N Male to N Male 10ft with test certificate. 5.3.12. 02 (two) High quality fully tested Super Flexible Coax ½” Cable Jumper N Male to N Male 20ft with test certificate. 5.3.13. 01 (one) Variable attenuator with step selector from 0 to 9 dB and 10 to 100 dB, 50W n-female / n-female connectors 5.3.14. 01 (one) Handheld Spectrum Analyzer Model 6G Combo (15MHz-2.7GHz + 4.85-6.1GHz), Touchstone Pro (for Windows) Software, Silicone boot protection, carrying case, Power Limiter. Manufacturer RF Explorer, with the following accessories a. 50ohm SMA dummy load, b. 60dB SMA attenuator, c. 30dB SMA attenuator, d. 10dB SMA attenuator, e. Near Field Antenna Kit, f. 3 (three) SMA male to SMA male semi-rigid cable RG316 50 cm, g. 3 (three) SMA male to SMA male semi-rigid cable RG316 20 cm, h. SMA male to N female adapter, i. SMA female to SMA female adapter, j. Directional Coupler ZHDC-10-63-S+ (mini-circuits), carrying case. 5.3.15. 01 (one) Handheld RF signal Generator Model RFE6GEN (24Mhz – 6GHz), carrying case, Silicone boot protection, and accessories. Manufacturer RF Explorer.					

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 11 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL OI/CS

5.4. UHF INSTRUMENTS

- 5.4.1. 01 (one) UHF signal level meter: Frequency range: 300MHz up to 1GHz.
- 5.4.2. 01 (one) UHF software License for coverage mapping: Frequency range: 300MHz up to 1GHz.

5.5. GMDSS TEST INSTRUMENTS

- 5.5.1. 01 (one) All-in one test box and accessories for VHF/MF/HF DSC radios, EPIRBs and Personal Locator Beacons, NAVTEX receivers, AIS class A and B transponders, AIS transponders, AIS-SARTs, Man Over Board devices and 9 GHz Radar SARTs as laid down in SOLAS convention 74/88 and specified in IMO resolution A.948 and circulars 1040 and 1252. Reference Models: Danphone FUTRONIC MKII; AEROMARINE SRT MRTS-7M.

5.6. NETWORK TEST INSTRUMENTS

- 5.6.1. 01 (one) OptiView XG OPVXG-PROPLUS Network Analysis Tablet, manufacturer Netscout with the following accessories:
 - a. Leather carrying case with extra storage;
 - b. AC adapter/charger;
 - c. Getting Started Guide;
 - d. USB memory stick;
 - e. 2 m (6') shielded twisted-pair patch cord;
 - f. Internal removable hard drive;
 - g. All WLAN Options;
 - h. All supported SFP modules.
- 5.6.2. 02 (two) Netscout Onetouch AT G2 Network Assistant Kit, Manufacturer Netscout with the following accessories:
 - a. Li-ion battery;
 - b. power supply with regional power plugs;
 - c. WireView Cable ID #1-#6;
 - d. Inline RJ-45 coupler;
 - e. USB 2.0 to Micro USB cable;
 - f. 8 G Micro SD card;
 - g. Holster;
 - h. Accessories pouch;
 - i. IntelliTone™ 200 Probe;
 - j. Medium Soft Case;
 - k. Coupler;

	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 12 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS
l. Getting Started Guide; m. SFP-1000LX, LX Gig Fiber DDM SFP Transceiver; n. SFP-1000SX, SX Gig Fiber DDM SFP Transceiver; o. SFP-100FX, 100BASE-FX Fiber DDM SFP Transceiver; p. Wi-Fi adapter data rate : 802.11a: 6/9/12/24/36/48/54 Mbps, 802.11b: 1/2/5.5/11 Mbps, 802.11g: 6/9/12/24/36/48/54 Mbps, 802.11n (20 MHz): MCS0-23, up to 216 Mbps, 802.11n (40 MHz): MCS0-23, up to 450 Mbps, 802.11ac (80 MHz): MCS0NSS1-MCS9NSS3, up to 1.3 Gbps q. Wi-Fi adapter operating frequency: 2.412 ~ 2.484 GHz (Industrial Scientific Medical Band), 5.170 ~ 5.825 GHz r. Wi-Fi security: 64/128-Bit WEP Key, WPA/WPA2 personal, WPA/WPA2 enterprise, 802.1X; s. External antenna (RP-SMA connector) for locating devices; t. Holster with shoulder strap; u. Test Accessory for use with AirCheck G2, LinkRunner G2 or OneTouch AT. G2 5.7. <u>METALIC NETWORK INSTRUMENTS</u> 5.7.1. 01(one) Certifier and Cable Analyzer DSX2-5000QI, Manufacturer Fluke with the following accessories: a. 01 (one) Versiv Mainframe & Remote; b. 02 (two) DSX-5000 Cable Analyzer Modules; c. 02 (two) CertiFiber Quad OLTS Modules; d. Set of Cat 6A/Class EA Permanent Link Adapters; e. Set of Cat 6A/Class EA Channel Adapters; f. 02 (two) Headsets; g. 02 (two) Handstraps; h. 02 (two) Shoulder Straps; i. Carry Case; j. USB Interface Cable; k. Versiv Open Source Software CD; l. 02 (two) AC Chargers; m. 02 (two) Universal Couplers; n. USB Video Inspection Probe w/ 4 Tips; o. 02 (two) Quick Clean Cleaners (1.25/2.50 mm); p. 02 (two) LC/LC Simplex Adapters; q. SC/LC EF-Compliant MM TRC Kit 50 µm; r. SC/LC SM TRC Kit; s. TRC Carry Case; t. Integrated Wi-Fi; u. Statement of Calibration;			

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 13 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

v. Getting Started Guides.

5.7.2. 01 (one) Copper qualification tester CableIQ™ Advanced IT Kit CIQ-KIT, Manufactured by Fluke, with:

- a. CableIQ main unit with remote adapter;
- b. CableIQ Reporter software CD;
- c. IntelliTone 200 Digital Probe;
- d. Remote IDs #2-7;
- e. 02 (two) RJ45-RJ45 patch cord;
- f. USB cable;
- g. Coax 'F' push-on adapter;
- h. 75-ohm coax patch cord;
- i. RJ45/11 universal coupler;
- j. RJ11-RJ11 patch cord;
- k. 04 (four) AA batteries;
- l. bag;
- m. CIQ-COAX (CableIQ Coax Adapter Kit includes F-connector, BNC and RCA connectors);
- n. CIQ-RJA (RJ45/11 Modular Adapter);
- o. CIQ-SPKR (CableIQ Speaker Wire Adapter).

5.8. OPTICAL NETWORK INSTRUMENTS

5.8.1. 01 (one) Optical Fiber Test Kit SimpliFiber® Pro FTK1475, manufactured by Fluke, with:

- a. FI-500 FiberInspector Micro – Includes SimpliFiber Pro optical power meter,
- b. 850/1300 multimode source,
- c. 1310/1550 singlemode source,
- d. VisiFault VFL,
- e. FI-500 FiberInspector,
- f. 02 (two) FindFiber Remote ID sources,
- g. Magnetic strap attachments and carrying case;
- h. SC, ST, and LC power meter adapters,
- i. NFC-KIT-BOX fiber optic cleaning kit.

5.8.2. 01 (One) Model – MT9085B - optical reflectometer – Manufacturer ANRITSU, following accessories and options

- a. MT9085B - ACCESS Master Standard Dynamic Rang
- b. MT9085B-063 - MMF 0.85/1.3um & SMF 1.31/1.55um OTDR - 29/28 dB - 42/41dB
- c. MT9085B-040 - SC Connector

	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 14 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS
d. MT9085B-010 - Protector e. MT9085B-002 - Visual Fault Locator f. B0549 - Hard carry case for MT9083A with handle and wheels g. J0617B - REPLACEABLE OPTICAL CONNECTOR (FC). h. J0619B - REPLACEABLE OPTICAL CONNECTOR (SC). i. J1480A - USB-Ethernet converter. j. NETWORKS- NETWORKS- Windows OTDR emulation and reporting software k. G0306C - Video Inspection Probe - ZOOM 400 X - USB - with 7 tips 5.8.3. 01 (One) 5P100C-SC - Optical Power meter – Manufacturer ANRITSU, following accessories and options a. CMA5-AD-PM-ALL3 CMA5 - FC/SC/ST Power Meter set of connectors adapter for 5P100 b. Z1525A - AC Adapter for CMA5 c. CMA5-POUCH-A - Carrying pouch w/shoulder strap 5.8.4. 01 (One) 5L35-SU - Optical Light Source - SM – Manufacturer ANRITSU, following accessories and options a. CMA5-AD-LS-ALL3 - CMA5 - FC/SC/ST Light Source set of connectors adapter b. Z1525A - C Adapter for CMA5 c. CMA5-POUCH-A - Carrying pouch w/shoulder strap 5.8.5. 01 (One) 5L83-SU - Optical Light Source - MM – Manufacturer ANRITSU, following accessories and options a. CMA5-AD-LS-ALL3 CMA5 - FC/SC/ST Light Source set of connectors adapter b. Z1525A - AC Adapter for CMA5 c. CMA5-POUCH-A - Carrying pouch w/shoulder strap 5.8.6. 01 (One) MS9740B - Optical Spectrum Analyzer – Manufacturer ANRITSU, following accessories and options a. MS9740B - Optical Spectrum Analyzer b. MS9740B-001 - GPIB Interface c. J0008 - GPIB CABLE 2m. d. MS9740B-002 - Light Source For Wavelength Calibration e. MS9740B-037 - FC Connector f. J0619B - REPLACEABLE OPTICAL CONNECTOR (SC). g. J0617B - REPLACEABLE OPTICAL CONNECTOR (FC). h. B0640C - Carrying Case.			

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA: -	SHEET: 15 of 24	
	TITLE: TOOLS AND INSTRUMENTS	INTERNAL	
		OI/CS	

Items for fiber optics	Quantity
Launch coil 1 KM - SC/PC - SC/APC - (2) - fiber lanch cable	1
Launch coil 1 KM - SC/PC - SC/PC - (2) - fiber lanch cable	1
Optical cords - OTDR	
SC/PC-SC/PC-62,5-2MM-50M-SIMPLEX	1
FC/PC-SC/PC-62,5-2MM-50M-SIMPLEX	1
SC/PC-SC/PC-SM-2MM-50M-SIMPLEX	1
FC/PC-SC/PC-SM-2MM-50M-SIMPLEX	1
SC/PC-SC/APC-SM-2MM-50M-SIMPLEX	1
SC/PC-ST/PC-62,5-2MM-40M-DUPLEX	1
Optical cords - Power Meter	
SC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
FC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
SC/PC-ST/PC-SM-2MM-02,5M-SIMPLEX	1
LC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
SC/PC-LSH/PC-SM-2MM-02,5M-SIMPLEX-TIPO E2000	1
SC/PC-SC/PC-62,5-2MM-02,5M-SIMPLEX	1
FC/PC-SC/PC-62,5-2MM-02,5M-SIMPLEX	1
SC/PC-ST/PC-62,5-2MM-02,5M-SIMPLEX	1
LC/PC-SC/PC-62,5-2MM-02,5M-SIMPLE	1
Optical cords - Optical Light Source - Singlemode	
SC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
FC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
SC/PC-ST/PC-SM-2MM-02,5M-SIMPLEX	1
LC/PC-SC/PC-SM-2MM-02,5M-SIMPLEX	1
SC/PC-LSH/PC-SM-2MM-02,5M-SIMPLEX-TIPO E2000	1
Optical cords - Optical Light Source - Multimode	
SC/PC-SC/PC-62,5-2MM-02,5M-SIMPLEX	1
FC/PC-SC/PC-62,5-2MM-02,5M-SIMPLEX	1
SC/PC-ST/PC-62,5-2MM-02,5M-SIMPLEX	1
LC/PC-SC/PC-62,5-2MM-02,5M-SIMPLEX	1
Cleaning Items	
Cleaning Pen - 1,25 - Neoclean-E125 para Conectores LC/UM - (10)	10
Cleaning Pen 2,5 - Neoclean-E250 para Conectores SC/FC/ST - (10)	10
Cassette cleaner (2) - with refill (6) - Cletop-S type A – Optical Connector Cleaning Cassette	2

	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 16 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL OI/CS

Stick -ATC-NS-125 NEOCLEAN 1.25MM CLEANING STICK -1 box of 200	1
stick - P/N 14100400 Cletop Cleaning Sticks – 2.5mm Diameter - -1 box with 200	1
TOOLS	
Loose Tube and Cable Roller 45-163	1
Scissors for cutting Kevlar KS-1	1
MiniLite Strip Acrylate Stripping Pliers	1
A Optical Fiber Stripping Pliers CFS-2-900	1
MiniLite Pliers	1
Kevlar Cutting Scissors	1
OPTICAL splicing machine	
Fujikura 86S - Universal Automatic Fiber Splicer	1
CT50 - Fujikura Cleaver	1
Fujikura Active Fiber Identifier - FID-30Ro	1
Tube	100 Peças
Visual Fiber Locator - 1Mw - ~ 7KM	1

5.9. PAGA TEST INSTRUMENTS

5.9.1. 01 (one) Impedance meter for PAGA system, model Minirator MR-PRO + 70 V / 100 V manufactured by NTI-audio with Kit, including

- Minirator MR-PRO
- 70 V / 100 V Protective Adapter
- Mains Power Adapter
- Exel System Case

5.9.2. 01(one) Decibel Meter with the following requirements

- Sound pressure level (SPL) meter type 2/ class 2
- Measuring range: 30 ... 130 dB
- Resolution: 0.1 dB
- Accuracy: ±1 dB
- Frequency: 20 Hz ... 12.5 kHz
- Frequency weighting: A, C,
- Memory: Stores up to 100 groups with measuring conditions

5.9.3. 01 (one) XL2 Audio and Acoustic Analyzer + accessories + carrying case XL2 + M2230-WP: microphone. Manufacturer NTI-Audio

5.9.4. 01 (one) Portable Digital Insulation Resistance 1587 FC with accessories, manufactured by Fluke.

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 17 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

5.9.5. 01 (one) handheld oscilloscope model Rohde & Schwarz RTH-COM4US - 4/8 Channel, 500 MHz MSO with Application bundle RTH-PK1 + 8 channel logic probe RTH-B1 + Industrial bundle RTH-ZELEC or equivalent.

5.10. CCTV TEST INSTRUMENTS

5.10.1. 01 (one) IP CCTV camera test equipment, compatible with the system provided by the CONTRACTOR. The CCTV test instruments provided by the CONTRACTOR must be able to fully configure and test at least: image, PTZ, iris, focus, washer, PoE, wiring, presets and network camera connection.

5.10.2. 01 (one) ANALOGIC CCTV camera test equipment, compatible with the system provided by the CONTRACTOR. The CCTV test instruments provided by the CONTRACTOR must be able to fully configure and test at least: image, PTZ, iris, focus, washer, PoE, wiring, presets and network camera connection.

5.10.3. Reference Model: WSDcam X9, manufacturer WSDcam

5.11. TELEPHONE TEST INSTRUMENTS

5.11.1. 01 (one) Telephone Test Set Fluke TS54 TDR with the following requirements:

- a. Frequencies: Steady tone: 950 Hz Alternating tones: 950 Hz and 1480 Hz;
- b. Water resistance;
- c. Battery type: 9 V alkaline battery
- d. Belt Clip;
- e. Test Leads with Angled Bed-of-Nails Clips, Piercing Pin Clips & RJ11 Plug
- f. Test Leads with a 4 mm Banana Plug, Alligator Clips, and Test Probe
- g. Head Set

6. **SCOPE OF SUPPLY - TOOLS**

CONTRACTOR shall supply the instruments described in this technical specification.

6.1. **SCREWDRIVERS:**

All screwdrivers must be made of chrome vanadium steel and All screwdrivers must have VDE insulation certification.

- a. 1/8" x 4" Screwdriver
- b. 3/16" x 4" Screwdriver
- c. 1/4" x 4" Screwdriver

 PETROBRAS	TECHNICAL SPECIFICATION	Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B
	AREA: -			SHEET:	18 of 24
	TITLE: TOOLS AND INSTRUMENTS			INTERNAL	
				OI/CS	

d. 5/16" x 4" Screwdriver

e. 3/8" x 6" Screwdriver

f. 1/8" x 4" PH0 Phillips® Tip Screwdriver

g. 3/16" x 4" PH1 Phillips® Tip Screwdriver

h. 1/4" x 4" PH2 Phillips® Tip Screwdriver

i. 5/16" x 6" PH3 Phillips® Tip Screwdriver

j. 3/8" x 6" PH4 Phillips® Tip Screwdriver

k. 3/16" x 1.1/2" Stubby Screwdriver

l. 5/16" x 2" Stubby Screwdriver

m. 3/16" x 1.1/2" PH0 Phillips® Tip Stubby Screwdriver

n. 3/16" x 1.1/2" PH1 Phillips® Tip Stubby Screwdriver

o. 3/4" x 1.1/2" PH2 Phillips® Tip Stubby Screwdriver

p. 3/16" x 4" Cabinet Tip Screwdriver

q. 1/8" x 3" Cabinet Tip Screwdriver

6.2. PLIERS:

All pliers must have VDE insulation certification.

a. 5-3/4" Curved Jaw Locking Pliers

b. 8" Slip Joint Pliers

c. 7" Diagonal Pliers

d. 8" Lineman Pliers

e. 8" Long Nose Pliers

f. 01 (one) Crimping Pliers for Insulated Terminals (Adjustable locking mechanism, made of high carbon steel with glass fiber handle, high accuracy connector crimping pin to moderately press connector on cable wire without damaging the connector).

g. 8" Wire and Cable Cutting Pliers

h. 4" Mini Diagonal Pliers

i. 12" Groove Joint Pliers

j. 6" Diagonal Pliers

6.3. HEX AND TORX TOOLS

a. SAE Hex Key Fold-up Set (5/64", 3/32", 7/64", 1/8", 9/64", 5/32", 3/16", 7/32", 1/4")

b. Metric Hex Key Fold-up Set (1.5, 2, 2.5, 3, 4, 5, 6, 8)

 PETROBRAS	TECHNICAL SPECIFICATION	Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B
	AREA:			SHEET:	
	-			19 of 24	
	TITLE:			INTERNAL	
TOOLS AND INSTRUMENTS			OI/CS		

 PETROBRAS	TECHNICAL SPECIFICATION	Nº	I-ET-3010.00-5511-760-PPT-001	REV.	B	
	AREA:	-			SHEET:	20 of 24
	TITLE:	TOOLS AND INSTRUMENTS			INTERNAL	
					OI/CS	
c. Soldering Iron 220 V 60 W d. Soldering Iron 220 V 200 W e. Soldering iron stand f. 2000-01 VersaTip™ Precision Butane Torch. Manufacturer Dremel g. 250ml Butane gas soldering tool refilling canister with six nozzle types h. 0.6mm Solder Wire - Sn60 Pb40 Rosin flux Core 500g i. Solder wire stand j. Desoldering Braid Wick Solder Remover w/ No Residue Rosin Flux 5 FT k. Helping Third Hand Magnifier W/Magnifying Glass Tool l. Professional Silicone-Tip Solder Sucker m. Rosin Flux Soldering Paste Solder Welding Grease 150g n. Magnifier Glass Light Lens with Clamp, Dimmable 1,200 Lumens light, Daylight Spectrum, 5-Diopter, Adjustable Swivel Arm lamp for Desk Table or Workbench o. All soldering tools must be stored in a metallic toolbox with Padlock						
6.7. STRUCTURED CABLING TOOLS a. Wire Strippers RJ11 & RJ45 b. 110 IDC punch down insertion tool manufacturer AMP c. 19 pcs Network Installation and Repair Kit for RJ45/11/12 Cat5/5e Lan Cable Tester with Remote, Cable Cutter and Co-axial Stripper, Punch Down Krone Insertion Tool and Crimper Pliers in a Case. d. Modular Plug Hand Tool with CAT 5e Die + 6 Position Die + 4 Position Die + carrying case						
6.8. MESURING TOOLS a. Digital Calipers b. 5m Tape Measure c. 30m Fiberglass Long Tape						
6.9. CATV AND CCTV TOOLS a. Coaxial strippers RG6, RG59 and RG11 for F type connectors b. Compact Compression Tools for RG11 F type Coax Cable Connectors c. Compact Compression Tools for RG6 6 F type Coax Cable Connectors d. “F” Connector Insertion & Flaring Combo Tool						

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 21 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL OI/CS

e. BNC Connector Removal Tools

6.10. LADDERS

- a. 3ft fiberglass step ladder with extra-large platform, extended guardrail, 300lb Load Capacity, Type IA Duty Rating, double-riveted slip-resistant steps.
- b. 6ft Fiberglass twin step ladder, heavy gauge aluminum extruded top with thick side plates, Slip-resistant steps, extra heavy duty internal aluminum spreaders, Shoe pads riveted, Design for one or two-person jobs, Load Capacity 375lb.
- c. 8ft Fiberglass twin step ladder, heavy gauge aluminum extruded top with thick side plates, Slip-resistant steps, extra heavy duty internal aluminum spreaders, Shoe pads riveted, Design for one or two-person jobs, Load Capacity 375lb.
- d. 16ft extendable two sections fiberglass step ladder, load Capacity 350lb, 1-1/4in slip-resistant D-rung steps, feet with slip-resistant pad.

6.11. STRIPING AND CUTTING TOOLS AND SAWS

- a. Multi-Wire Stripping & Cutting Tools Miller
- b. Cable Jacket & Insulation Stripper Miller MK02 Series
- c. Snap knife with bimetal blades
- d. Hi-Visibility Retractable Knife with bimetal blades
- e. Wire Stripper Pliers
- f. 12" High-Tension Hacksaw

6.12. ELECTRIC TOOLS

- a. Retractable Power Cord Reel with 30m cord and 3 outlets Brazil standard
- b. Handheld Heater hot air blower 2000W
- c. Bi-Metal Hole Saw set 9 pcs
- d. 01 (one) High speed steel drill bit set (1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5, 5.5, 6, 6.5, 7, 7.5, 8, 8.5, 9, 9.5, 10mm)
- e. 01 (one) Cordless impact drill GSB 18 VE-EC Professional, including case, charger and two batteries. Manufacturer Bosch
- f. Screwdriving Bit Set
- g. Heavy duty electrician snips
- h. Ex flashlight Pelican 3315R-RA with accessories
- i. 4000-6/50 High Performance Rotary Tool Kit + 225-01 Flex Shaft Attachment. Manufacturer Dremel
- j. 8-1/2" Heavy Duty Hot Melt Glue Gun

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 22 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

6.13. DC Power Supply

01 (one) Triple-Channel DC Power Supply model GPP-3060 + 3 pairs silicone test leads 4mm Banana Male Plug to Alligator Clip with 1 meter 14AWG (Black and Red) + 3 pairs silicone test leads double ends alligator clip with 1 meter 14AWG (Black and Red). Manufacturer GW Instek

6.14. OTHER TOOLS

- a. 12 pcs computer repair tool kit
- b. Heavy-Duty Riveter
- c. 8 oz Soft Face Hammer
- d. Tweezers
- e. 5 Pc. 8" File Set
- f. Clamp-on Vise, Throat Depth 1-5/8" (41 mm), Jaw Width 3" (75 mm), Jaw Capacity 2" (50 mm).
- g. Jewelers Precision Screwdriver Set with 6 pcs. (1.4mm Standard, 1.8mm Standard, 2.3mm Standard, 3.0mm Standard, Opt Phillips®, 1pt Phillips®, Plastic storage case). Hardened and tempered steel blades with blued finish to resist corrosion, Swivel-head handles.
- h. Heavy Duty Raised Floor Panel Lifter dual Suction Cups.

6.15. TOOLS CABINET

- a. Large tool closet cabinet
- b. Doors and structure made of steel
- c. 05 (five) internal drawers
- d. 03 (three) adjustable shelves (capacity: 60 kg each)
- e. Key lock
- f. Minimum cabinet dimensions:
 - i. Length: 1200mm
 - ii. Width: 500mm
 - iii. Height: 1740mm

 PETROBRAS	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 23 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS



Figure 1: tool closet cabinet

6.16. ELECTRONICS BENCH

6.16.1. The electronics bench shall have, at minimum, the requirements below:

- a. Bench covered by anti-static rubber plate (minimum 5mm);
- b. Bench width: 0.80m
- c. 02 (two) shelves;
- d. Shelves width: 0.40m
- e. 05 (five) electric outlets (20A) at the bench height;
- f. 02 (two) electric outlets (20A) at each shelf height;
- g. Light with light switch;
- h. Independent circuit-breaker at the panel;
- i. Circuit-breaker at the bench;
- j. 03 (three) lateral drawers;
- k. Compartments for small materials;
- l. Bench vise;
- m. Bench magnifying lamp;

	TECHNICAL SPECIFICATION	Nº I-ET-3010.00-5511-760-PPT-001	REV. B
	AREA:	-	SHEET: 24 of 24
	TITLE:	TOOLS AND INSTRUMENTS	INTERNAL
			OI/CS

- n. Place for welding iron.
- o. LCD Monitor Holder;
- p. Chair with adjustable height, no arms, footrest, back and seat with cushion.

6.16.2. The figures below are only as examples:

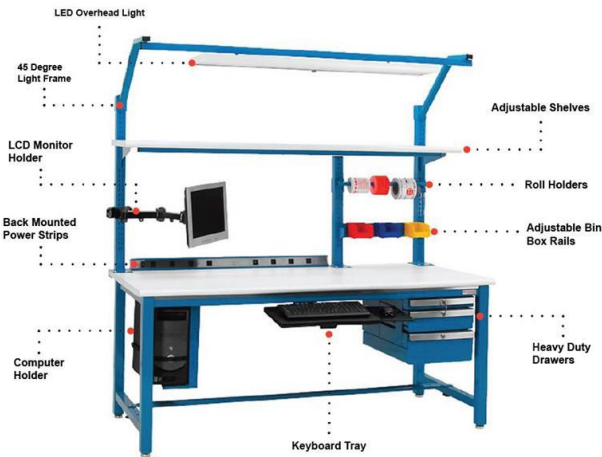


Figure 2: electronics bench samples