

المواصفات الفنية الخاصة بالمناقصة العامة

رقم (2015/17) الخاصة بشراء وتوريد

عدد (13) أنظمة عاكسات كهربائية مختلفة القدرات مع التدريب .

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الإدارة العامة للمشتريات والمخازن

إدارة المشتريات - قسم العقود والمناقصات

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Technical Specification for Electric Power DC/AC Inverter Equipment

PTC's Specifications	Tenderer compliance statement
<p>1.Introduction:</p> <p>This specification defines the technical requirements of a Digital Continuous DC/AC Inverter Power System for PTC data center Al-ghuraf site in Sana'a.</p> <p>The Inverter should be a modular type system.</p> <p>The bidder shall furnish a completely DC/AC Inverter power system. With Redundancy Parallel Architecture (RPA) to automatically maintain the continuous regulated AC power with specified tolerances to critical loads under normal and abnormal conditions.</p> <p>All materials and equipment of this system shall be fully compatible with electric environment space conditions at the installation site.</p> <ol style="list-style-type: none"> The specification describes the continuous duty single -phase insulated gate bipolar transistor (igbt) Inverter system and Modules. The Inverter shall automatically provide continuity of electrical power within defined limits and without interruption. The continuity of conditioned DC electric power source due to rectifier failure shall be delivered by the battery system. The Inverter system is driven by vector control algorithms and dedicated digital processor (DSP) system, in intelligent double conversion configuration. The electronic automatic static bypass switch shall be integrated into the Inverter system and manual by pass switch shall also be provided. The system shall provide high quality AC power for electronic equipment loads, the Inverter systems shall be with the following features: <ol style="list-style-type: none"> Increased power quality. Full noise rejection. Full compatibility with all type of loads. Power blackout protection. High Reliability and low maintenance. Ease of installation. The system shall be capable of continuous operation. Rated output should work efficiently and smoothly. The efficiency of system output ratio should not be less than 90% with 0.9 PF. The system shall disconnect the load from batteries when Battery voltage decreased to 43.2V (site adjustable) and reconnect the load automatically when the Rectifier is back ON. The Inverter should be modular system N+1 controlled by main cabinet 	



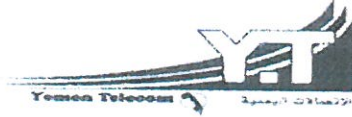
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<p><u>2. Inverter modules configuration:</u></p> <ol style="list-style-type: none">1) The Inverter system shall have Multi modules that operate simultaneously in parallel configuration with load sharing equally between the operating modules.2) The malfunction of one module should cause that module to be disconnected from the system and critical load. The remaining modules should continue to carry the total load.3) Each module shall permit setting parameters for the environment and type of usage to be specified and modified at site.4) Each module should be self diagnostic type and equipped with self test functions to verify correct system operation.5) The module self test should identify the parts of the module which require repair in case of fault.6) The Inverter system control cabinet shall control and observe all modules and all input/output devices and functions.	
<p><u>3. The Inverter system shall consist of the following major components:</u></p> <ol style="list-style-type: none">a) IGBT Modular Inverter.b) Digital signal processor DSP.c) Controlling and observing functions, meters and alarms module.d) Electronic static bypass switch.e) Manual bypass switch.f) Input/output devices and distribution.g) The DC/AC Inverter systems required in this tender are of two capacities, 20KVA and 10KVA with module capacity 2KVA for both.	
<p><u>4. General Technical Points, the DC/AC Inverter Systems shall include:</u></p> <ol style="list-style-type: none">1) Normal operation, all installed modules should operate in parallel, feeding all inverter loads..2) The module and system output should be pure sine wave.3) The inverter shall be provided with monitoring and controlling system.4) The Inverter system control cabinet provides the Modules controlling and supervisor system, alarms and protections, and input/output measurements and paralleling the output of the modules.5) The system automatic and manual bypass switches shall be fitted in the control cabinet6) All materials and components comprising the Inverter must be new and of current	



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<p>manufacture.</p> <ol style="list-style-type: none">7) Contain cable terminals should be suitable for power cables.8) Wiring shall be identified at cable ends and shall be related to the circuit diagrams.9) All wiring shall be adequately supported and shall be secured.10) Full protection shall be provided to prevent contact with surfaces subject to heat or vibration.11) The interface wiring shall be in harness with one end disconnected for shipment where its passes.12) All incoming and outgoing cable terminations shall be complete with all items, sockets...ets.13) The Inverter should start in soft starting, and gradual walk-in of the current.	
<p><u>5. Protections:</u></p> <ol style="list-style-type: none">1) System should be with complete input/output protection such as (thermal output overload, short-circuit protection...etc.)2) Led indication to indicate the normal and abnormal operation.3) EMC, surge, earth leakage and spark protection.4) Electromagnetic effects of internal or external origin shall be minimized in order to ensure that electronic loads and computer systems adversely affected by such electromagnetic effects do not affect them or the Inverter components or modules.5) The neutral for output shall be electrically isolated from the Inverter chassis except for RFI filter.	
<p><u>6. Input Condition:</u></p> <ol style="list-style-type: none">1) The Inverter input shall be -48V DC With voltage tolerance from 43--60V DC, should be site adjustable.2) Input DC power will be provided from rectifiers and/or batteries.	
<p><u>7. Output condition:</u></p> <ul style="list-style-type: none">• The module should supply the equipment by 2KVA, 230V AC, 1phase +N +G 3 wires• Frequency 50 HZ \pm 1% pure sine wave output.• The inverter system should confine with output distribution busbar with more than 20% of the total system output power and CBs not less than 8 CB, capacities: 63A, 16A, 32A and 10A.	



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<p><u>8.Environment</u></p> <p>All the equipment shall be designed to be suitable for continuous operation at:</p> <ol style="list-style-type: none">Temperature 0 °c to40 °c. 100% rated output, the equipment should be capable of operating at up to 55 °c with slight de-rating factor per deg c (to be determined by supplier)Humidity 30 to 90% R/HAltitude 2300M a.s.l (Tenderer to specify details of de-rating).Noise level of complete assembly system is not to exceed 65dB@1 M.Electromagnetic Compatibility. <p>The tenderer should supply all derating tables and curves for the offered systems (altitude, temperature and humidity).</p> <p>Cooling The INV modules and main cabinet shall be forced air cooled by internally mounted fans. The fans shall be redundant in nature to ensure maximum reliability. The fans shall be easily replaceable without the use of special tools.</p>	
<p><u>9.Instrumentation and Controls:</u></p> <ol style="list-style-type: none">Digital display and control card should be in each module to display the module operating status as input/output voltage, current, ...etc.Battery voltage, battery current.Inverter control panel and Mimic LCD shows the following measurements:<ul style="list-style-type: none">AC voltmeter for each module output.AC ammeter for output & load current for each module.Frequency meter for the output of each module.Load in KVA/KW.Inverter input DC voltmeter& DC ammeter.CBs status, active alarms and status information for:<ol style="list-style-type: none">Load on INV.Load on automatic or manual bypass switch.Module failure.Output short-circuit.Batteries low.Overload....etc.The control module shall have the facility to save and re-check at least the last 500 inverter events.Remote monitoring and controlling devices shall be provided.The system shall be connected to a Remote Monitoring Panel (RMP) that allows the possibility to monitor the parameters from the control panel and from the several different locations at the same time and Network management and monitoring	



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<p>software in a WAN system.</p> <p>8) The remote monitoring system shall be complete with fault and condition indicator lamps, audible alarm test and mute bush button.</p> <p>9) The DC/AC inverter system control module should be with multi-password levels, to limit access to system software and data.</p> <p>10) Alarms Card unit shall be extendable with free contact with no voltage (open/close contacts) to transmit the following alarms to surveillance exchange:</p> <ul style="list-style-type: none">a. Major alarmb. INV FAILERc. High Voltage Alarmd. Low Voltage Alarme. Low Voltage Disconnectf. CBs Alarmg. Minor alarm...etc.	
<p>10. Warranty:</p> <ul style="list-style-type: none">o The tenderer shall provide the manufacturer and his warranty stating that they warrant the DC/AC Inverter systems and modules are free of design and manufacturing defects for one year from installation date.o If any manufacturing fault was noticed within 12 months from date of operation at site in any part of the system, the tenderer shall replace that faulty part at his expense.o The INV and Modules shall also carry a warranty of operation of rated capacity of the INV or modules power for at least 10 years from date of operation at site. When operated in accordance with the instruction of the manufacturer.o The tenderer should provide a warranty stating that he shall provide the spare parts at any time PTC needs at a favourable cost for at least (10) ten years.	
<p>11. QUALITY ASSURANCE:</p> <ul style="list-style-type: none">• Manufacturer Qualifications: A minimum of ten year's experience in the design, manufacture, and testing of solid-state INV systems is required.• Factory Testing before shipment: The manufacturer shall fully and completely test the system to assure compliance with the specification. The test results should be supplied to PTC with the units delivery.• The country of origin certificate should be provided to PTC with the units delivery.• The PTC shall have the right to retain an inspection company – at PTC's own cost – before the supply of the required equipment.	
<p>12. Information required with the offer:</p> <ol style="list-style-type: none">1. A statement of compliance with this specification point by point shall be submitted.2. The manufacturer should fill the attached technical table with his system technical data for each type and capacity of inverter systems he supplies.3. Complete technical description of the equipment, and all main devices and	



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<p>components for the module and complete DC/AC inverter system.</p> <ol style="list-style-type: none">4. MTBF and MTTR (figures).5. Weights and dimensions of the equipment.6. Manufacturer's standard test schedule7. Manufacturer's equipment country of origin.8. The current rating of all the power cables.9. Documentation: three set of documents, electrical and electronic diagrams.10. Spare parts list and prices for three years operation for the main cabinet and power modules.11. General diagrams for all Components and Electrical Diagrams of electronic cards in the module and in the main cabinet (control module).12. Technical Specification and data of INV system performance from the manufacturer.13. The manufacture company should give an answer table for every item of the P.T.C specifications (item by item).14. The winning tenderer shall provide with the system delivery time, complete three sets of installation instructions comprising of drawing, and documents, software, modems, communication cables, and any equipment used for programming, settings and repair of any faults including four copies of operating system and troubleshooting handbook for each unit.	
<p>13. Inverter Modules Extra Technical Points:</p> <ol style="list-style-type: none">1. In addition to inverter specification each module shall be product output AC voltage and current with load sharing with other modules in the system cabinet.2. Input shall be -48V DC with site adjustable output from 43--60V DC.3. Module output shall be 2KVA output power, 230 volt AC, 1phase+N +G ± Frequency 50HZ ±4. Each module shall be with I/O Protection (thermal over load and short circuit)5. Each module shall have LED indicators, digital display for input/output metering and alarms..	
<p>14. Training:</p> <ul style="list-style-type: none">✓ The tenderer shall include as a separate item a quotation for training course for 10 working days of 3 persons on the operation, maintenance, and troubleshooting of the complete system in the manufacturing factory.<ul style="list-style-type: none">- The proposal shall clearly specify the following information about training course:<ul style="list-style-type: none">• Name of the Training Center• Place of study• Period of study• Certifications of the trainees✓ The bidder shall cover all the training program costs including air tickets, visas, accommodation, local transportation, emergency medical services, daily allowance and other facilities.	



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<p>✓ Local training course for PTC Engineers shall be available by the INV manufacturer. This training is in addition to the basic operator training conducted as a part of the system start-up. The training course shall cover INV theory, location of subassemblies, safety, INV operational procedures. The training shall include DC to AC inversion techniques as well as control and metering, Troubleshooting, fault location and isolation using alarm information and internal self-diagnostics shall be included.</p>	

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No.	Technical Item Description	PTC requirements	Tenderers specifications	Remarks
MAIN CABINET AND CONTROL SYSTEM				
1.	Quantity			
2.	Total output power of the system (KVA, KW) at site conditions (2300m asl, 40°C. 60-90r/h)			
3.	Manufacturer			
4.	Country of origin			
5.	Date of manufacture	The year of delivery		
6.	Brand name and model no.			
7.	No. of system cabinets			
8.	The efficiency of the system at:			
	Half load			
	Full load			
9.	Total no. of the modules in the system			
10.	Type of cabinet cooling			
11.	Output power of each module (KVA/KW)	2KVA/1.6KW		
12.	Input voltage	-48V DC		
13.	Input voltage range	-43 – 60V DC		
14.	Input voltage site adjustable facility	Should		
15.	Input voltage protection (type/capacity)			
16.	Output voltage/frequency			
17.	Total output current			
18.	Output protection:			
	Short-circuit			
	Overload			
	Overheat			
19.	Surge protection			
20.	Spark protection			
21.	Technique of inverting			
22.	Shape of the output wave	Pure sine wave		
23.	Output wave distortion (Ripples)	<20mV		
24.	Brand and model no. of the controlling module			
25.	Input voltage and current digital meters display			
26.	Output voltage and current digital meters display			
27.	Output frequency digital meters display			
28.	Load power consumption meters display (KVA/KW)			
29.	System last 500 events save and display			
30.	Protection degree (IP)			
31.	Noise level at 1 meter of the system	dB		
32.	Local alarms & protections:			
	- Inverter ON			
	- Load ON Inverter			
	- Input lower than the range			
	- Overload			
	- Load ON automatic static bypass			
	- Batteries low			
	- Load ON battery			

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No.	Technical Item Description	PTC requirements	Tenderers specifications	Remarks
	- Inverter out of service			
	- Cutoff/Output short-circuit			
	- Fan failure for modules			
	- Others:			
33.	Re-transmit alarms			
34.	Main cabinet dimensions mm (L/W/H)			
35.	System weight without power modules (kg)			
36.	System weight with full capacity of the power modules (kg)			
37.	Dimensions of the control module mm (L/W/H)			
38.	Weight of the control module (kg)			
39.	System remote control availability			
40.	System remote control type			
41.	Attached detailed technical specifications, diagrams, data sheets,...etc.	Must be attached		
INVERTER MODULE				
1.	Module output power at site condition (KVA/KW)	2KVA/1.6KW		
2.	Brand and model no.			
3.	Manufacturer			
4.	Country of origin			
5.	Date of manufacture			
6.	Input voltage (DC V)	-48V DC		
7.	Range of acceptable input voltage	-43--60V DC site adjustable		
8.	Maximum input DC current			
9.	Output voltage/frequency	230V AC/50Hz		
10.	Output voltage/frequency tolerance			
11.	Output wave shape	Pure sine wave		
12.	Output wave ripple	<20mV		
13.	Module digital display metering:			
	Input voltage			
	Input current			
	Output voltage			
	Output current			
	Output frequency			
	Output power			
14.	Module input/output protections:			
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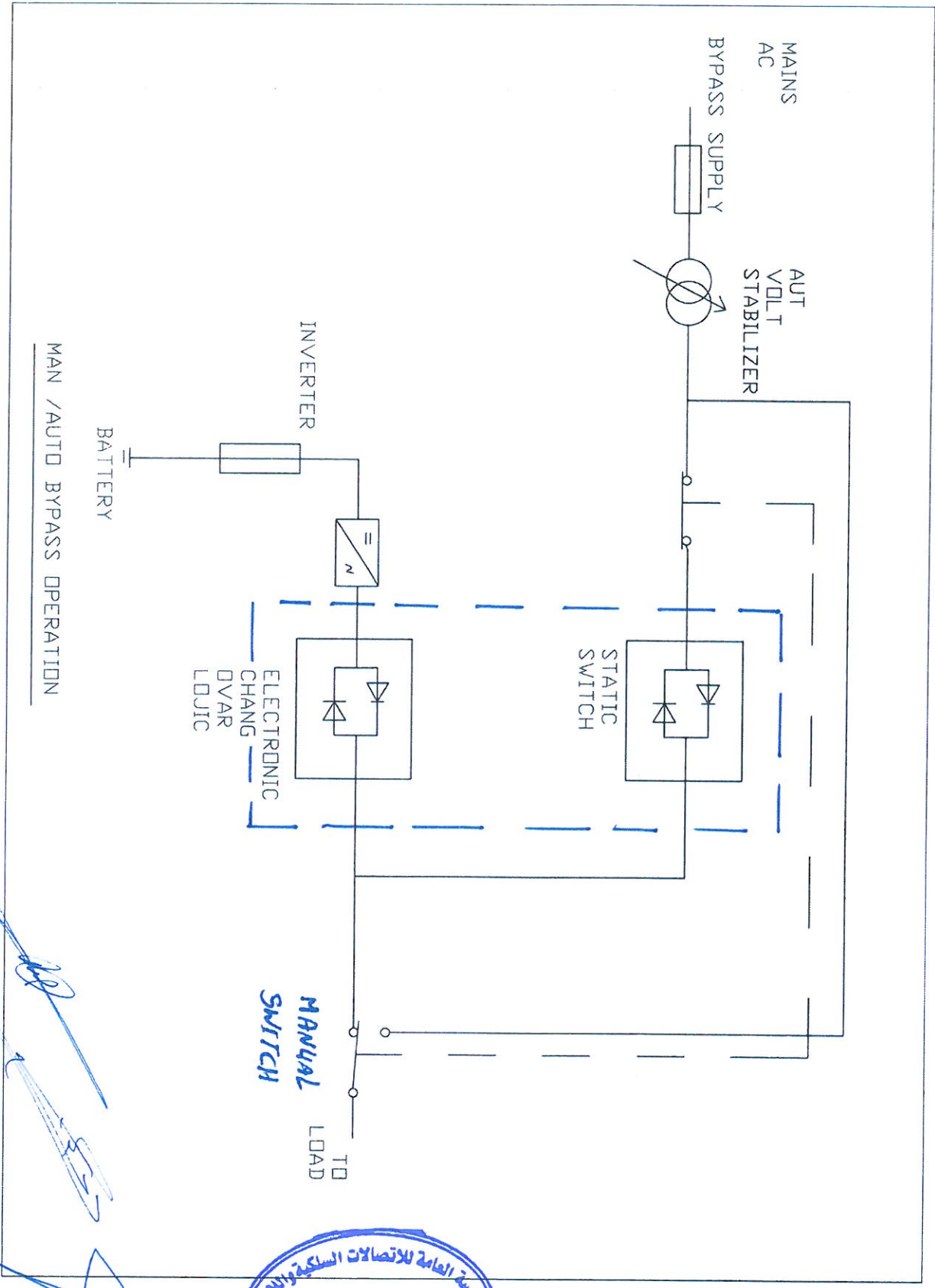
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No.	Technical Item Description	PTC requirements	Tenderers specifications	Remarks
15.	Cooling type			
16.	Protection degree (IP)			
17.	Noise level at 1 meter from module (dB)			
18.	Is it the same power for both 10KVA & 20KVA systems or not			
19.	Module dimensions mm (L/W/H)			
20.	Module weight (kg)			
21.	Attached detailed technical specifications, diagrams, data sheets,...etc.	Must be attached		
AUTOMATIC STATIC BYPASS SWITCH				
1.	Manufacturer			
2.	Type & model no.			
3.	Date of manufacture			
4.	Voltage			
5.	Acceptable voltage range			
6.	Frequency			
7.	Current capacity			
8.	Efficiency			
9.	Power capacity	$\geq 125\%$ of system capacity		
10.	Overload capacity	$\geq 150\%$ of system capacity		
11.	Transfer time (ms)			
12.	Input protection			
13.	Output protection with thermal short-circuit	MCCB		
14.	Dimensions (L/W/H)			
15.	Weight (kg)			
MANUAL STATIC BYPASS SWITCH				
16.	Manufacturer			
17.	Type & model no.			
18.	Date of manufacture			
19.	Voltage			
20.	Acceptable voltage range			
21.	Frequency			
22.	Current capacity			
23.	Efficiency			
24.	Power capacity	$\geq 125\%$ of system capacity		
25.	Overload capacity	$\geq 150\%$ of system capacity		
26.	Transfer time (ms)			
27.	Input protection			
28.	Output protection with thermal short-circuit	MCCB		
29.	Dimensions (L/W/H)			
30.	Weight (kg)			
31.	Spare part list for three years of operation for the main cabinet and power modules with unit price is attached.	Should be provided		



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