BHARAT HEAVY ELECTRICAL LIMITED, JHANSI	
SPECIFICATION NO.	7068 (R7)
ITEM NO.	ME-1/1/2696 TO ME-1/1/2725
LOCATION	FABRICATION SHOP
QUANTITY	30 NOS.

SPECIFICATION CUM COMPLIANCE CERTIFICATE OF MIG/MAG WELDING MACHINE

NOTE :

1	BIDDER must submit complete information against clause Part – B (Qualifying condition). Only those offers meeting this clause will be processed.
2	The "offer by BIDDER" Column and where applicable, the " Deviations" Column of this format shall be filled in by the BIDDER and submitted along with the offer. Technical details also submitted with the offer. Inadequate / incomplete, ambiguous, or unsustainable information against any of the clauses of the specification / requirements shall be treated as non - Compliance.
3	The offer and all documents enclosed with offer should be in English language only.
4	Only those Models to be quoted which are working satisfactorily in rugged environment for continuous operation in heavy duty fabrication shop for more than three years after commissioning and of current capacity 500 A at 60% duty cycle (10 minutes cycle time) or higher capacity. Vendor to submit document supporting the same.

PART - A

TECHNICAL SPECIFICATIONS FOR INVERTER CONTROLLED MIG / MAG FLUX CORED ARC (CO_2 GAS SHIELDED) WELDING MACHINE

AA. APPLICATION :

Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
AA.1	Purpose:- (Operations /jobs involved): inverter Microprocessor based Digital Soft switching IGBT MIG welding machine to do spatter free and heavy duty flux cored/solid wire CO2(Mixed gas) Argon welding on mild steel, Alloy steel, stainless steel, and aluminium. The model most be rugged and suitable for continuous work in heavy fabrication shop in rough environment.		
AA.2	The offered equipment shall be portable and suitable for semi-automatic FCAW/MIG/MAG welding process using flux-cored and solid wires of carbon steel, low-alloy steel and stainless steel.		
AA.3	The equipment shall be suitable for welding in all positions with pure argon, carbon-di-oxide or argon plus carbon di-oxide gas mixture as shielding gas and also for welding with self-shielded flux-cored wires.		

BB. MACHINE CONFIGURATION : [The scope of supply shall consist of the following, for each machine]

Sl.No.	FEATURES /BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
BB.1	Welding Power source with Transport Trolley and Wheels		
BB.2	Wire Feeder Unit		
BB.3	Welding Torch		
BB.4	Remote Control Unit		
BB.5	Gas Regulators for (Ar + CO_2) Gas Mixture or CO_2 Gas		
BB.6	CO_2 Gas Pressure Regulator, Flow–Meter and Heater Unit		
BB.7	Set of inter-connecting cables/hoses with quick-fix end couplings		
BB.8	Consumables & Spares for Welding Torches		
BB.9	Electrical & Mechanical Spares for Power source and Wire-Feeder		
BB.10	Operation & Maintenance Manuals – Three Copies per Machine		
BB.11	Commissioning of Equipment at BHEL Works and Performance Prove-out of the offered equipment by Supplier's representative		

CC. EQUIPMENT SPECIFICATION : POWERSOURCE FEATURES				
Sl.No.	**FEATURES**	**BHEL SPECIFICATION**	**OFFER BY BIDDER**	**DEVIATIONS**
CC.1	MAKE	Make of the power source should be OTC/ KEMPPI/ ESAB/ FRONIOUS/ MILLER/ LINCOLN only.		
CC.1.1	Type	Inverter Controlled with IGBT and Constant Potential type, even with a fluctuation of ±10 % in the Input Voltage		
CC.1.2	Control	The equipment must be IGBT inverter based with full bridge soft switching technology. It has to be a Digital microprocessor based machine so as to meet the following functions / features:		
		1-The inverter section must have full bridge configuration		
		2-IGBT modules must be used in the inverter section		
		3-It must also indicate whether any program is already stored in that location to avoid rewriting of a useful program.		
		4-The equipment must have the adjustment to increase or decrease the molten metal droplet transfer force		

CC.2	Switching Frequency	BIDDER has to indicate the Switching Frequency of the Inverter Circuit and the make of IGBT used		
CC.3	Current Rating	The equipment has to deliver 500 Amps. @ 60 % Duty Cycle and 387 Amps. @100% Duty Cycle (10 Minutes at 40degree C).		
CC.4	Operating Range : b) Current	50 Amps. to 500 Amps. (continuous control)		
CC.5	Open Circuit Voltage	BIDDER to mention the Open Circuit Voltage for the offered Power source		
CC.6	Current Setting	The variation in the set value of the welding current to the actual value shall not exceed 1 %.		
CC.7	Voltmeter & Ammeter	Factory Installed digital indication (current, voltage and wire speed) on the front panel with easy removal and replacement (i.e., without lifting the top cover of the Power source/ wire feeder) for instrument calibration.		
CC.8	Power Input	415 ± 10% V AC, 3 Phase, 50 ± 2% Hz, through a 3 Wire System [4th wire for EARTHING] – No Neutral Conductor		
CC.9	Degree of protection	IP23		
CC.10	P.F	>0.87		
CC.11	Gas-Heater for CO_2 - Shielding Gas	Provision of one Single Phase AC tapping point in the Power source, for the gas heater input power supply [110 V or 230 V – AC Supply]		
CC.12	Auxiliary Power for Wire-Feeder Unit	Low voltage (like 48 V/110V) auxiliary power tapping point in the Power source		
CC.13	Arc Strike (F.A.S.)	Instantaneous Arc Striking facility (Fresh Arc Strike)		
CC.14	Weld Stop Condition	No globule formation at the wire tip , at the time of weld stopping		
CC.15	Gas Flow Setting	Gas Flow Check Push Button for Gas Solenoid Valve actuation in weld switch in “OFF” position.		
CC.16	Compulsory Features	The Power source shall have Features like a) Gas / Wire Inching Facility b) Spatter Control Facility c) Gas Pre-flow / Post-flow Facility d) Crater Control & Fill e) In built programmed for welding of: Carbon and alloy steel, Stainless steel and ALUMINIUM		
CC.17	Insulation	Class "H"		
CC.18	Machine Cooling	Forced Air Cooling with interlock for tripping of the welding machine.		

CC.19	Protection [BIDDER has to specifically furnish technical details on how these protective measures are addressed in the Machine Design]	a) Inbuilt protection for the IGBT/Power source against Thermal / Overload / Short-Circuit conditions.The machine should have protection against over heat and over current.		
		b) Over heat protection & over current protection, under voltage protection		
		c) All PCBs shall be sprayed with mould coating to prevent damage from dust and grinding particles.		
		d) Machine Design to ensure proper earthing for the machine and its peripherals		
		e) Measures to nullify the effects of EMI (Electro-Magnetic Induction) generated:		
		f) Input surge suppressor must provide for protection against input surge voltage.		
CC.20	Portability	Under-Carriage with hard rubber lined wheels for portability of the power source by manual pushing		
CC.21	Programme	The machine must have built in program's to weld MS,SS,AL and other materials with different gas mixtures and selection through touch panel.		
CC.22	Ambient Conditions	- Forced Air Cooled - Temp. Variation 3 to 45 degree - 95% relative humidity - Dusty fabrication shop		
CC.23	Load Compensation	Output variation due to line voltage fluctuation, cable heating or drift due to the use of long cable, to be eliminated.		
CC.24	Power Rating	BIDDER to indicate the Maximum Power Rating [in kVA] of the Power source and the NO-LOAD Power Consumption in Watts.		
CC.25	Power Source Model	To Specify the Model of Power source Offered		

DD. EQUIPMENT SPECIFICATION : WIRE-FEEDER UNIT FEATURES				
Sl.No.	**FEATURES**	**BHEL SPECIFICATION**	**OFFER BY BIDDER**	**DEVIATIONS**
DD.1	Make	Make of the wire feeder should be OTC/ KEMPPI/ ESAB/ FRONIOUS/ MILLER/ LINCOLN only suitable for offered power source		
DD.2	Type	-4-Roll Drive [All Powered Drive Wheels] with quick release system. - The wire feeder must be a closed type so that the dusty layer is not formed on the wire spool.		

DD.3	Motor	Motor should be an encoder motor with feed back signal & following features: 1- Drive should be geared motor should be work on feed back for constant wire feed. 2- Wire feeder should be with automatic soft start control. 3- IN built easily accessible wire coil compartment should be provided in wire feeder. 4- Digital display of wire feed rate in meter per minute should be provided on the Power Source/wire feeder. 5- Independent inching of gas and wire. 6- Forward feeding facility	.	
DD.4	Burn-Back Control	Compulsorily to be provided		
DD.5	Wire Sizes/Solid	0.8 mm to 1.6 mm (Solid Wires)		
DD.6	Wire Sizes/Cored	1.2 mm to 1.6 mm (Self-Shielded and Flux Cored Wires also)		
DD.7	Wire Feed Speed	1.0 to 18.0 meter / min. Wire feeder should be capable to feed wire through cable length of 4 to 4.5 meter		
DD.8	Wire Feeder Motor	BIDDER has to indicate the Type of Motor used for wire feeding		
DD.9	Wire Spool Weight	Facility to hold wire spools of 15 to 20 kgs. of weight and spool diameter of 300 mm		
DD.10	Brake Torque on Wire Feeder Hub	Shall be of adjustable type.		
DD.11	2 / 4 Track Facility	Torch latching facility to be provided compulsorily		
DD.12	Feed Rolls & Guides	Suitable for 1.2mm & 1.6mm Solid/Cored wires Suitable for 2.0 mm & 2.4 mm Self-Shielded Flux- Cored Wires		
DD.13	Connector for Torch	Euro connection		
DD.14	Inter-connecting cables/hoses assembly	10 metres long power & control cables and gas hose assembly with plug-in and quick-fix end connectors to connect the power source and the wire-feeder.		
DD.15	Wire-feeding capacity	Shall be suitable for feeding welding wire through Welding Torches with 4 to 4.5 meter long cables [without the use of additional push or pull motor in the wire-feed line]		
DD.16	Wire Feeder Model	To specify the Wire-Feeder Model & Weight		

EE. EQUIPMENT SPECIFICATION : WELDING TORCH FEATURES				
Sl.No.	**FEATURES**	**BHEL SPECIFICATION**	**OFFER BY BIDDER**	**DEVIATIONS**
EE.1	Make	Make of welding torch should be OTC/ KEMPPI/ ESAB/ FRONIOUS/ MILLER/ LINCOLN only suitable for offered power source		
EE.2	Type	Goose-Neck, Air cooled. Goose Neck 360 DEGREE ROTATABLE		
EE.3	Shielding Gas	CO_2 , Argon or Mixture of CO_2 & Argon		
EE.4	Cable & Connector	Polymedium Cable, Euro Connector		
EE.5	Wire Sizes/Solid	0.8 mm to 1.6 mm		
EE.6	Wire Sizes/Cored	1.2 mm to 2.0 mm (Self-Shielded / Flux-Cored Wires)		
EE.7	Wire Material	Carbon & Low Alloy Steel, Stainless Steel, Aluminium		
EE.8	2 / 4 Track Facility	Compulsorily to be provided in the Torch		
EE.9	Current Rating	Current rating of the torch should be 500 amps @ 60% duty cycle and 387 Amp. @100% duty cycle Torch.		
EE.10	Torch length	Length of the torch should be not less than 4 meter.		
EE.11	Torch Models & Weight	To specify the Models and the Torch Weight for 500 Amp. ratings, in the OFFER. It shall meet the following specifications: 1- Torch should be suitable for Steel welding with 1.2 and 1.6 mm dia wire and should work continuously at full rated capacity i.e. 100% duty cycle. 2- Torch should be such that replacement on nozzle, contact tubes, liner, spatters guard etc. Is quick and easy from operation and maintenance angle.		

FF. EQUIPMENT SPECIFICATION : REMOTE CONTROL UNIT FEATURES				
Sl.No.	**FEATURES**	**BHEL SPECIFICATION**	**OFFER BY BIDDER**	**DEVIATIONS**
FF.1	Make	Make of remote control unit should be OTC/ KEMPPI/ ESAB/ FRONIOUS/ MILLER/ LINCOLN only suitable for offered power source		
FF.2	Type	Hand Operated with 10 meter long control cable with end connectors		
FF.3	Control	Step less Variation of Welding Current & Voltage		
FF.4	Connection	Remote Control Unit to be connected to the Wire-Feeder		

GG. EQUIPMENT SPECIFICATION : GAS REGULATOR, FLOW METER & HEATER

Sl.No.	FEATURES	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
GG.1	Function	To regulate CO_2 Gas Pressure, Flow Rate and for Heating the CO_2 Gas, to avoid ice formation.		
GG.2	Power	To draw from Single Phase AC Power Supply from Power source (110 V or 230 V - AC) through a 2 M Cable		
GG.3	Pressure Gauges	Preferred to have 2 Nos. – To indicate independently cylinder pressure and gas delivery pressure		
GG.4	Accessories	Double glass covered flow-meter, power cable with end-connectors, electrical heating unit, gauges, etc.		

HH. SPARES :

S.No.	ITEMS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
HH.1	Power Source	All type of Spares including IGBTs, PCBs (Printed Circuit Board) Control-Transformers, Cooling Fans, etc. recommended for 2 years of operation on THREE shift basis (for 365 Days) shall be offered. **To be LISTED ITEMWISE**		
HH.2	Wire-Feeder Unit	Spares such as feed-rolls (suitable for 1.2 and 1.6 mm dia. suitable for Solid & Cored Wires), wire-feed motor, wire guides, control PCB cards, etc. shall be offered. **To be LISTED ITEMWISE**		
HH.3	Remote Control Unit	Complete Set of Remote Control Unit **to be OFFERED**		
HH.4	Welding Torch	Consumables & Spares such as Liners & Contact Tip (suitable for 1.2 Wires), Contact Tip Body, Gas Nozzles, Insulator, Orifice, 'O' Ring, etc. shall be offered for the torch (10 Nos. each). **To be LISTED ITEMWISE.**		

II. O & M MANUALS :

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
II.1	No. of Copies	3 (Three) for Each Machine		
II.2	Language	English		
II.3	Manual Details :	a. Manual shall contain all instructions for machine installation and welding trial testing, in sequence		

		b. Manual to give general circuit diagrams, showing the interconnection of various elements and also details on PCBs [Printed Circuit Board] like tapping voltages, main electronic elements' specifications and ratings, etc.		
		c. Manual to give other details like trouble shooting chart, weld parameters selection for various base metals, etc.		
		d. Master List of Parts & Spares used in the machine with Make, Model, Rating, etc.		

JJ. GENERAL POINTS :

S.No.	PARTICULARS	BHEL SPECIFICATION	OFFER BY BIDDER	DEVIATIONS
JJ.1	Inspection	The equipment shall be offered for inspection at supplier's works for performance evaluation by BHEL Engineers prior to despatch.		
JJ.2	Commissioning	The equipment shall be commissioned at free of cost by the supplier's representative at BHEL Works.		
JJ.3	Training	The Supplier's SERVICE ENGINEER shall give training in the Operation and Maintenance (mainly on electric/electronic troubleshooting) of the Machine for BHEL Staff, after the successful commissioning of the Welding Machines.		
JJ.4	Guarantee	The equipment shall be guaranteed for a minimum of twenty-four months from the date of commissioning.		
JJ.5	Bought-Out Items	a) The Bought-Out Items - like Motors, ICs, Relays, Contactors, Switches, Electronic Elements, etc., used in the Power source & Wire-feeder shall be of Internationally Reputed Manufacturers only.		
		b) BIDDER has to furnish the MAKE of Bought-Out Items used in the Welding Machine, with the OFFER.		

PART- B

QUALIFYING CRITERIA FOR THE SUPPLY OF INVERTER CONTROLLED MIG/MAG/FCAW WELDING MACHINES

SECTION – I

The BIDDER is expected to give complete details against each clause in the table given below and wherever necessary an additional sheet may be attached (given clear reference number) to cover the required details

S.NO.	PARTCULARS	BIDDER RESPONSE
1.0	Number of years of experience of the BIDDER (Original equipment manufacturer) in the field of design, manufacturing and supply of ' INVERTER CONTROLLED MIG/MAG/ FCAW- CO2 WELDING MACHINS' for radiographic quality welding applications for Loco parts fabrication. Order will be placed only on OEM.	
2.0	Year of launch of the MODEL quoted against the enquiry	
3.0	Number of 'Inverter controlled MIG/MAG/ FCAW- CO2 welding machines' supplied, till date in the quoted model.	
4.0	Number of 'Inverter controlled MIG/MAG/ FCAW- Co2 welding machines – 500 Amp. rating with 60% duty cycle' supplied and commissioned till date for the following category of CUSTOMERS a) High Pressure Boiler Industries b) Ship Building Industries. c) Heat exchangers/ pressure vessel manufacturing industries. d) Heavy Engineering Industries.	
5.0	Details on International standards followed in Design and testing of welding machines.	
6.0	Comprehensive details, on performance testing of welding machines carried out at the Factory, to be furnished with the technical offer.	
7.0	Details of SERVICE- AFTER SALES Set – up in India including the addresses of Agents / service centers in India, to be furnished compulsorily.	
8.0	BIDDER to indicate the country of origin for the supply of welding machines.	

SECTION – II

The BIDDER has to compulsorily meet the following requirements to get qualified for submitting an offer for the Inverter Controlled MIG/MAG/FCAW CO2 welding machine.

S.NO.	REQUIREMENTS	BIDDER COMMENTS
9.0	The BIDDER shall have a minimum of ten years of continuous experience in the design; Manufacturing & Supply of Inverter controlled MIG/ MAG/ FCAW – CO2 welding machines.	
10.0	The BIDDER should have supplied a minimum 30 number of Inverter Controlled MIG/MAG/FCAW – CO2 welding machine with rating 500 amps. (@60% Duty cycle to customers in India. Indicate the number of such welding machines sold in India.	
11.0	Reference list of customers and Performance certificate from minimum three customers (please refer clause No. – 4.0 of qualifying criteria) with full contact details of CONTACT PERSON, who are the end users of the Model (given under clause No. 10.0) of Inverter Controlled MIG/MAG/FCAW – CO2 welding machines.	
12.0	List of customers and performance certificate from the minimum one customer with full contact details of CONTACT PERSON, whom BIDDER have supplied offered model in past three years (please refer clause No.-3).	

SECTION – III

The BIDDER has to comply with the following, for accepting the technical offer for security by purchaser:

S.NO.	REQUIREMENTS	BIDDER COMPLIANCE
13.0	The BIDDER shall submit offer in TWO PARTS- Technical & Commercial and Price Bid	
14.0	The offer shall contain a comparative statement of technical specifications given by BHEL and the offer details submitted by the Bidder, against each clause. A just CONFIRMED or COMLIES or YES or NO- DEVIATION or similar words in the technical comparative statement may lead to disqualification of the technical offer.	
15.0	The BIDDER shall assure a continuous support for SPARES and SERVICE for TEN years, from the date of commissioning of the equipment at BHEL Works.	
16.0	The technical offer shall be supported by Product catalogue and Data sheets in ORIGINAL and complete technical details/ literature on the QUOTED MODELS.	
17.0	The commercial offer (given with the technical offer) shall contain the scope of supply and the Un-priced part of the Price-Bid for confirmation for the scope of supply.	
18.0	Earlier performance & field experience (service support) with BHEL (if any) will be a reckoning factor for the technical qualification of the offer.	
19.0	The expected delivery period (including the time for pre-dispatch inspection clearance by BHEL) for the welding machines is not more than **three months** from the date of issue of BHEL purchase order/LOI.	

Prepared by		**Approved by**	
Inder Mathur Sr. Mgr.(WE&S)	B.K.Manjhi Sr. Mgr (FBM)	S.J.Chakraborty Sr. DGM (WE&S)	R.N.Jha AGM (FBM)