Bharat Heavy Electricals Limited

(A Government of India Undertaking)
Electronics Division
P B NO 2606, Mysore Road, Bangalore - 560026
Tel 080 26746117 / 26998366 Fax 080 26740137

Tender document for supply of SMT AUTOMATIC OPTICAL INSPECTION SYSTEM

R F Q Number : TRSM900012

Tender Qty : **One Set**

Tender Due Date and Time : 13.08.2008 13.00 Hrs
Tender Opening Date and Time : 13.08.2008 13.30 Hrs
Place of opening of Tender : SA – MM Conference hall

Scope:

Supply, Installation, Commissioning of SMT-Automatic Optical Inspection System consisting of 2 nos of Automatic Optical Inspection machines, one each as per the specification under Table A and Table B.

1. Two part Bid - Tender shall be submitted in two parts :

a. Part I – Techno commercial bid without prices.
b. Part II – Price bid

Tender (quotation) shall be submitted in a sealed envelope super scribed with **RFQ NUMBER /** and **DUE DATE** on it and the same must reach our office on or before the due date by **13:00 hrs.** Quotation can also be dropped in the tender box with caption **"Sub Assembly - TRS".** Late quotations are liable to be rejected.

Tender shall be addressed to **Sr.DGM / EM - Coml,** Electronics Division, Bharat Heavy Electricals Ltd., Mysore road, Bangalore 560026.

2. Earnest Money Deposit : EMD of Rs 1,75,000/- (rupees one lakh seventy five thousand only) shall be submitted in the form of DD along with the Techno-commercial bid in a separate sealed cover in favor of "**Bharat Heavy Electricals Limited**". EMD in the form of DD / Pay order only is acceptable & any other form is not acceptable and the bid is liable for rejection. EMD amount doesn't carry any interest. The same will be converted as Security Deposit for the successful bidders and for unsuccessful bidders the same will be refunded after finalization of the order. For successful bidders EMD will be refunded after submission of PBG.

3. Delivery Period: Equipment shall be delivered, within 4 months from the date of placement of technically & commercially clear purchase order.

4.0 Warrantee period : Equipment shall have a comprehensive warrantee of 12 months from the date of installation / acceptance and accordingly PBG shall be for 12 months from date of acceptance.

5. Terms and conditions:

1. All the Bidders shall meet the **pre-qualification criteria** and Comply with **Technical Specification** mentioned in this specific tender.

2. Indian Bidders are required to comply with the **general terms and conditions** as per **SA – 01 (Annexure –I)**

3. Foreign Bidders are required to comply with the **general terms and conditions** as per **SA – 02. (Annexure –II)**

Pre qualification criteria

1. The vendor shall be an Original Equipment Manufacturer (OEM)
    a. Based in India
    b. Foreign OEM with Authorized Indian dealer(s) / representative(s) for sales & service. The authorization letter for the dealer/ representative shall be provided.
    c. Offer can be submitted by the OEM or their authorized dealers in India along with an authorization letter. However Purchase Order will be placed on the lowest technically acceptable bidder on the OEM only.
    d. If the offer is from an authorized representative in India , the Indian representative cannot quote for the same equipment from 2 or more different OEM's
2. The offer shall be only for new equipment and not for any refurbished / used equipment. A declaration to the above effect to be furnished.
3. All the parts used in the machine shall also be new and not used / refurbished ones. A declaration to the above effect to be furnished.
4. The vendor should have already supplied and installed 5 nos. of similar machines in India and operating satisfactorily for at least one year during the last three years. The details of the customers with contact details, machines installed, date of installations etc. to be provided. The systems supplied should have been used for both post-print and post reflow applications.
5. The vendor shall be in a position to provide service and spares support for the installations in India.
6. The vendor or their authorized service representatives should have trained engineers in India for commissioning & service for the offered equipment. A declaration to the above effect to be furnished.
7. The vendor shall be in a position to undertake AMC for the equipment with BHEL after the expiry of the warranty/ guarantee period either directly or through a service representative. The vendor should have successfully completed AMC for similar machines for at least one year in India and necessary proof to be furnished.
8. The vendor shall arrange for a demonstration of the machine or a similar system operating in India, as required by BHEL.
9. The vendor shall furnish a comprehensive warranty for at least 12 months from the date of commissioning or 18 months from the date of delivery, whichever is early.
10. The vendor shall guarantee the performance of the equipment for at least 12 months from the date of commissioning.

NOTE:
1. Pre qualification evaluation will be carried out based on the details furnished by the vendor / feedback from their customers / inspection of the company / product if required by BHEL and at its sole discretion.
2. Pre qualification criteria are mandatory requirements and the technical bids will be evaluated only when the Pre Qualification criteria are met.

Specifications:

The Automatic Optical Inspection machines (2 nos) shall be corresponding to the parameters under the specifications below or better. As a mandatory requirement, the 2 machines offered shall be of the same make (OEM) and will be considered as a composite system.

Table A

Post Reflow Automatic Optical Inspection Machine (one no.)

Sl No	PARAMETER	REQUIREMENT
1	**GENERAL**	
1.1	Type	In line automatic optical inspection
1.2	Position of AOI	After Reflow Oven
1.3	Direction of module movement	Left to Right
1.4	Rail movement for conveyor	Front fixed and rear adjustable and automatic
1.5	Compatibility	SMEMA with bypass capability
1.6	ESD compliance	The entire system should be ESD safe
2	**Board handling**	
2.1	PCB size	Shall handle PCB size from 50mm*80mm to 400 mm * 350mm or better
2.2	PCB thickness	Upto 6 mm
2.3	Warpage handling	Capable of handling and compensating board warpage of up to 1% or better
2.4	Board weight	Shall be capable of handling a board weight up to 4 kgs.
2.5	Minimum inspectable board area	50mm * 70mm

2.6	PCB CLEARANCE TOP BOTTOM EDGE	➢ 25 mm (Minimum) ➢ 25 mm(Minimum) ➢ 2.5 mm(Minimum)
2.7	Board identification Reading	A bar code reader and provision for manual entry of Serial number meant for reading the PCB's identification and shall have a link to test report generation.
2.8	PCB support	Edge belt conveyor and pin supports
2.9	Board position	Board to be stationary during inspection
3	**Inspection Coverage**	
3.1	Components inspected	Algorithms/ modules for all components like Chip components of various sizes from 01005 onwards, MELF, PQFP, SOJ, SOP, SSOP, TSOP, SOIC, SOT , CONNECTORS ETC.
3.2	Defects to be detected	Missing, polarity reversal , shorts, opens, misalignment, insufficient solder, excess solder, solder balls, bill board, lifted leads, tombstones, IC's wrong placement surface defects, solder joint defects for gull-wing & J leads, over turned components , mis-registration, damaged parts , blow holes, solder wetting defects etc.
3.3	Component presence / absence detection	Ability to detect presence as well as absence of components. Ability to be programmed for detection of presence/ absence
3.4	Capability for inspection with lead free soldering	Shall be capable of detecting the defects with lead free solders also. The programs developed for the regular tin – lead alloy solders to be migrated to lead free solders by automatic conversions.
3.5	Capability to visualize the components in 3D	Shall be able to generate 3D images of the components inspected for better visualization
3.6	Visual display of defects actual and based on algorithms/library	Visual display of the actual image shall be available to the operator apart from the image generated through the algorithm.

3.7	OCR/OCV/logo verification capability	Shall be capable of reading Characters and logos for verifications. Shall be capable of storing many variants of the same for inspection.
3.8	Minimum feature recognition	Shall be capable of detecting small components like 01005 chip size & 10 mil lead pitch.
4	**VISION SYSTEM**	
4.1	Board positioning	Based on 3 fiducials (reference marks on the PCB). The fiducials shall be programmable
4.2	CAMERA	Digital colour CCD with multiple zoom capability.
4.3	Inspection method	Full colour highlight system
4.4	Accuracy	+/- 5 microns @ 3 sigma
4.5	System Repeatability	+/- 5 microns @ 3 sigma
4.6	Image Resolution- Area	20 micron or better
4.7	Image Resolution - Height	5 micron or better
4.8	Field of view	Multiple FOV from 0.4” to 0.6” multiple images for each FOV
4.9	X-Y table movement	Linear motors & coders
4.10	X-Y axis movement accuracy	1 micron or better
4.11	Lighting method	Ultra Bright LED
4.12	Lighting type	Axial and peripheral
4.13	Lighting / Illumination	Programmable system controlled with multiple colour/ intensity
4.14	Inspection speed	100000 components / hr typical or 5 sq inch per sec
4.15	Software	Necessary vision software shall be part of the system
5	PROGRAMMING	
5.1	Board Inspection programming	On line and offline programming capability
5.2	Teach mode capability	Capability of programming with known good board
5.3	CAD interface	Capable of Import of CAD data , placement data from pick & place machine etc for Inspection data programming
5.4	Program development	Capable for graphical program development

5.5	Library	Standard component library, package library , algorithms for defects for each type of component etc. to be part of the system
5.6	Programming for variants	Capable of programming for at least 10 variants for a component/ joint.
5.7	Program repeatability & transportability	The program developed shall be fully repeatable on any machine of same make and transportable to any machine.
5.8	Program storage & retrieval	Ability to upload/download at least 250 program in the system program with computer HDD computer HDD
6	REWORK HANDLING	
6.1	Display	Rework requirements to be made available as visual/generated image to the rework operator through an independent display monitor.
6.2	Identification	A suitable bar code reader and provision for reading/entering unique identification number to retrieve rework requirements data
6.3	Operator feedback capability	Ability to capture rework operator feedback.
6.4	False defects flagging	Capability to flag false defects
7	**SPC TOOLS**	Necessary software for data logging, compiling , analyzing and diagnostic software tools to be offered for SPC purposes to generate Histograms, Pareto charts for component/defect, yield fault sequence charts etc.
8	**COMPUTER SYSTEM**	
a	System	A suitable PC System with about 3 GHz processor, 2 GB RAM, 250 GB HDD, 17” LCD display with network compatibility (Ethernet 10/100), USB to be provided for data exchange.

b	Language	English
9	OPERATING ENVIRONMENT	
9.1	Power supply	230V,1 phase, 50 Hz or 415 V 3 phase, 50 HZ.
9.2	Power failure management	Graceful Shutdown feature shall be provided as part of the system with built in UPS for the controllers. UPS for the machines will be in BHEL's scope and UPS configurations/ requirement for the machine to be spelt out
9.3	Air supply	< 6 bar pressure. The requirements of air quality & volume to be specified.
9.4	TEMPERATURE RANGE	Upto 40 deg C & Rh 60%. Requirements of AC to be specified.
10	**SAFETY & OTHER FEATURES**	a)Emergency stop function with buttons provided at front & rear of the machine b)Safety cover to be provided both at front and rear c) Multi colour signal tower to be provided c)The machine shall comply with CE mark specifications
11	**SPARES**	Spares for 2 years operation & maintenance to be quoted with the list of spares.

Table B

Post-Print Automatic Optical Inspection Machine (one no.)

Sl No	PARAMETER	REQUIREMENT
1	**GENERAL**	
1.1	Type	In line automatic optical inspection
1.2	Position of AOI	Post print
1.3	Direction of module movement	Left to Right
1.4	Rail movement for conveyor	Front fixed and rear adjustable and automatic
1.5	Compatibility	SMEMA with bypass capability
1.6	ESD compliance	The entire system should be ESD safe
2	**Board handling**	
2.1	PCB size	Shall handle PCB size from 50mm*80mm to 400 mm * 350mm or better
2.2	PCB thickness	Upto 6 mm
2.3	Warpage handling	Capable of handling and compensating board warpage of up to 1% or better
2.4	Board weight	Shall be capable of handling a board weight up to 4 kgs.
2.5	Minimum inspectable board area	50mm * 70mm
2.6	PCB CLEARANCE BOTTOM EDGE	 ➢ 25 mm(Minimum) ➢ 2.5 mm(Minimum)
2.7	Board identification reading	A bar code reader and provision for manual entry of Serial number meant for reading the PCB's identification and shall have a link to test report generation.
2.8	PCB support	Edge belt conveyor and pin supports
3	**Inspection Coverage**	
3.1	Solder paste inspection	Solder paste coverage, solder paste height, solder paste smear, bridge, paste missing, presence/absence of paste.

3.2	Capability to visualize the components in 3D	Shall be able to generate 3D images of the components inspected for better visualization
3.3	Visual display of defects actual and based on algorithms/library	Visual display of the actual image shall be available to the operator apart from the image generated through the algorithm.
4	**VISION SYSTEM**	
4.1	Board positioning	Based on 3 fiducials (reference marks on the PCB). The fiducials shall be programmable.
4.2	CAMERA	Digital colour CCD with multiple zoom capability.
4.3	Inspection method	Full colour highlight system
4.4	Accuracy	+/- 5 microns @ 3 sigma
4.5	Image Resolution	20 micron or better
4.6	System Repeatability	+/- 5 microns @ 3 sigma
4.7	Field of view	Multiple FOV from 0.4" to 0.6" multiple images for each FOV
4.8	X-Y table movement	Linear motors & coders
4.9	X-Y axis movement accuracy	1 micron or better
4.10	Lighting method	Ultra Bright LED
4.11	Lighting type	Axial and peripheral
4.12	Lighting / Illumination	Programmable system controlled with multiple colour/ intensity
4.13	Inspection speed for solder paste	>15000 contacts / min or 5 sq inch per sec or better
4.14	Software	Necessary vision software shall be part of the system
5	PROGRAMMING	
5.1	Board Inspection programming	On line and offline programming capability
5.2	Teach mode capability	Capability of programming with known good board
5.3	CAD interface	Capable of Import of CAD data , Gerber data , stencil design data etc for Inspection data programming
5.4	Program development	Capable for graphical program development
5.5	Library	Algorithms for defects for each type of pads etc. to be part of the system

5.6	Programming for standard apertures and special apertures like home plating etc.	The inspection program shall cater to both standard apertures as well as special apertures like home plating.
5.7	Programming for variants	Capable of programming for at least 5 variants for a pad.
5.8	Program repeatability & transportability	The program developed shall be fully repeatable on any machine of same make and transportable to any machine.
5.9	Program storage & retrieval	Ability to upload/download at least 250 program in the system program with computer HDD
6	REWORK HANDLING	
6.1	Display	Rework requirements to be made available as visual/generated image to the rework operator through an independent display monitor.
6.2	Identification	A suitable bar code reader and provision for entering unique identification no to retrieve rework requirements data
6.3	Operator feedback capability	Ability to capture rework operator feedback.
6.4	False defects flagging	Capability to flag false defects
7	SPC TOOLS	Necessary software for data logging, compiling , analyzing and diagnostic software tools to be offered for SPC purposes to generate Histograms, Pareto charts for printing defects, yield fault sequence charts etc.
8	**Computer system**	
a	System	A suitable PC System with about 3 GHz processor, 2 GB RAM, 250 GB HDD, 17” LCD display with network compatibility (Ethernet 10/100), USB to be provided for data exchange.
b	Language	English
9	OPERATING ENVIRONMENT	

9.1	Power supply	230V, 1 phase, 50 Hz or 415 V 3 phase, 50 HZ.
9.2	Power failure management	Graceful Shutdown feature shall be provided as part of the system with built in UPS for the controllers. UPS for the machines will be in BHEL's scope and UPS configurations/ requirement for the machine to be spelt out
9.2	Air supply	< 6 bar pressure. The requirements of air quality & volume to be specified.
9.3	TEMPERATURE RANGE	Upto 40 deg C & Rh 60%. Requirements of AC to be specified.
10	**SAFETY & OTHER FEATURES**	a)Emergency stop function with buttons provided at front & rear of the machine b)Safety cover to be provided both at front and rear c) Multi colour signal tower to be provided c)The machine shall comply with CE mark specifications
11	**SPARES**	Spares for 2 years operation & maintenance to be quoted with the list of spares.

Note:

1. Machine parameters with brief explanation of features.
2. If more than one model is quoted, separate offer with complete technical details shall be submitted.
3. Additional Accessories, which will enhance the performance of the system, shall be quoted separately with price break up.
4. A clause wise deviation, if any, has to be brought out clearly. If there are no deviations, the vendor has to positively certify compliance to the specifications in toto.
5. The complete technical information and catalogue shall be given.

GENERAL TERMS :

1. Operation , Maintenance , Service & spare parts manual have to be supplied in hard copy and soft copy along with the equipment. Detailed Hydraulic, Pneumatic , Electrical and Electronic circuit diagram have to be provided as part of the manuals. The lubrication points are to be identified on the machine with respect to O & M manual. The schedules for lubrications are to be provided in the manual.
2. Details of service agents in India to be furnished.
3. All commissioning / service requirements such as power, compressed air, water, lubricants, coolants, any civil requirements like special foundation arrangements etc. have to be listed and intimated well in advance.
4. The equipment shall be installed & commissioned at BHEL / EDN by the vendor.
5. The vendor shall coordinate with other vendors of related equipment of SMT line, which will be installed at BHEL-EDN, during installation & commissioning.
6. Training shall be provided for operation & maintenance for BHEL personnel. The training details to be furnished.
7. Service Engineers are to be deputed during initial pilot run and commissioning period at no extra cost to BHEL.
8. Initial Calibration certificates shall be furnished. The subsequent calibration schedules, process and periodicity shall be furnished along with the authorized calibration agencies, if any.
9. Test certificates of the equipment shall be furnished to BHEL along with the equipment.
10. The software upgrades during the warranty / guarantee period shall be provided free of cost.