

ANNEXURE -1

CNC ,DRIVE & MOTOR UPGRADATION OF AMADA TURRET PUNCH MACHINE ITEM NO. (9/A/2084) OF SWM DIVISION.

A. BRIEF DESCRIPTION OF MACHINE

Amada Turret Punch Press VELA II Item no. (9/A/2084) of SWM Division is a special purpose CNC machine (SPM) used for punching of sheets. There are two linear axes (X, Y) and one Turret Axis (T). Presently this machine is interfaced with FANUC 6M B CNC system with FANUC DC Servo Drive / DC Servo motors for X,Y, and T axes . Punch press Crank shaft is driven by AC induction motor. Details of existing system of machine as per **Annexure II**

The CNC system decodes the input command and the corresponding instruction is transmitted to DC servo motors which drive the table and the carriage to position the work sheet for punching. At the same time, the turret is driven by a DC servo motor to select the desired tool .Upon completion of these operations, punching is performed. The CNC system, Drives / Motors are to be upgraded with Fanuc 0i FS PC or Siemens Sinumerik 840D CNC system & Fanuc / Siemens make motors / drives.

B ERECTION & COMMISSIONING

Following works to be undertaken for the erection & commissioning of supplied material.

S.N	WORK DESCRIPTION	REMARK
B1	Dismantling of the existing CNC system, PLC , DC Drives & Servo motors, switchgear in the operator panel/electrical cabinets, cables(power and signal) etc.	
B2	Installation of the new Electrical panels & operator pendant.	
B3	Mounting of X, Y & T axes drives / Motors etc.	
B4	Interfacing of Encoders to control system.	
B5	Development of PLC Logic/Ladder diagram & interlocks for complete machine operation and interface drawings.	
B6	Interfacing of controls to the axes drives/motors, Turret drive /motor, Press and machine.	
B7	Complete wiring of the new electrical and operator panel. Ferrules should be put on all wires.	
B8	Engineering, commissioning including any mechanical/ electrical/electronic modifications wherever / if required is to be done.	
B9	Design, Manufacturing and mounting of bracket, couplings/ pulleys for X, Y & T axes Servomotors.	

B10	The existing accuracy & repeatability of the machine will be restored based on present mechanical condition and Prove out of two component of (Present accuracy check list to be provided by BHEL)	
B11	Supplier has to prove out all the functions of CNC system including PLC logic with necessary modifications, functioning of all axes drives/axes motors and demonstrate working of the machine to the satisfaction of BHEL.	
B12	Job prove out : 2 Types of Job:	

C. Ambient conditions in BHEL Bhopal; Temperature: 5-50 °C Humidity: 0-95% RH ,Power available: 415 V +/-10%, 50Hz +/- 3%, 3 phase 3 wire system without neutral.

D. COMPLETION PERIOD

The above project including job prove out should be completed within 30 days from the date of release of the machine. Failure to complete the project within 30 days will attract penalty @0.5% of P.O.value per week subjected to 10% maximum.

E. TRAINING:

Training on CNC Controller , Drives, Programming & Operation at supplier works for 1 week .One person from Maintenance & 1 person from Operation.

F. WARRANTY:

Vendor shall stand guarantee for smooth functioning of the machine, including all the items and parts employed in retrofitting, for a period of one year from the date of successful commissioning of the machine.

G. QUALIFYING CRITERION:

Vendor should have supplied & commissioned Fanuc 0i-PC or Siemens Sinumerik 840D CNC on at least one Turret Punch machine / 3 axis CNC machine & the machine must be working satisfactory for at least one year .Details of such work done to be furnished .The project executed must be working for 1 year & in case supplied to BHEL it should be minimum six months.

H. INSPECTION OF THE MATERIAL BEFORE DISPATCH:

Supplier should mount all switchgears & wire up Electrical and Operator panel. BHEL Engineer will inspect the material before dispatch.

I. PAYMENT TERMS

50% of total PO value payment will be paid after receipt & acceptance of the material at BHEL, Bhopal & rest 50% after satisfactory commissioning & job prove out. Failure to complete the project within 30 days will attract penalty @0.5% of P.O. value per week subjected to 10% maximum.

J. INSPECTION OF THE MACHINE

Suppliers are advised to visit BHEL, Bhopal on any working day between 9:00 hrs to 16:00 hrs to see the machine working & features.

ANNEXURE - II

DETAILS OF EXISTING SYSTEM:

S.N.	ITEM	SPECIFICATION
1	Machine Specification	AMADA CNC TURRET PUNCH PRESS MODEL-VELA -II
2	CNC SYSTEM FANUC Make	Fanuc 6M B
3	Control 3-Axes	X , Y & T
4	X,Y & T axes Motor , Fanuc Make	DC FANUC MODEL 10L, 49 Nm, 16A, 2000 rpm FOR X & Y DC FANUC MODEL 30M, 37 Nm, 24A, 1200 rpm FOR T
5	Press Motor	AC INDUCTION MOTOR, 3.7Kw, 4 Pole, Hitachi make
6	Existing feedback for X ,Y & T Press crank	Resolver in built with motor Through proximity switches
7	Press capacity	30 Ton
8	Maximum Traverse	1270 mm X 1270 mm
9	Stroke per minutes	350
10	Turret speed	30 rpm
11	Maximum sheet thickness Material MS, SS & Copper	5 mm,
12	Maximum feed rate	50000 mm/min

ANNEXURE –III

Detailed specifications of CNC Control System

1. Operation features: A Three axis CNC system with 3 axes simultaneous Interpolation.
 - 1.1. Selectable operation modes: (Through a MODE selector switch)
 - 1.1.1 Automatic/Single block.
 - 1.1.2 Continuous and incremental jog.
 - 1.1.3 Dry run
 - 1.1.4 Input/output of Part program, Machine data, PLC program, zero Offsets, tool offsets etc.
 - 1.1.5 Manual data automatic for part program execution.
 - 1.1.6 Automatic referencing of all axes.
2. Display features:
 - 2.1 10.4 " LCD screen for data display.
 - 2.2 Graphic tool path display (Static) with color graphics.
 - 2.3 Display of:
 - 2.3.1 Actual position display of all axes w.r.t. program zero.
 - 2.3.2 Command (difference to go) display of all axes.
 - 2.3.3 Actual feed rate display.
 - 2.3.5 Active G, M, S & T codes display.
 - 2.3.6 Three line program window for displaying the current block in Automatic / Single block mode.
 - 2.3.7 Alarm texts from NC and machine PLC.
 - 2.3.8 Display of actual and parameter values variables
3. Part-program input/output, editing and storage.
 - 3.1. Part program input via:
 - 3.1.1. Key board (Manual entry) with automatic block numbering Facility.
 - 3.1.2. RS232C interface for bilateral communication with external devices (2 ports to be provided). One RS-232 port shall be brought out on the operator console.
 - 3.2. Part-program editing with the following facilities:
 - 3.2.1 Block/Word deletion.
 - 3.2.2 Block/Word insertion
 - 3.2.3 Block/Word modification.
 - 3.2.4 Block search facilities.
 - 3.2.5 Block / Word Copy paste etc.
 - 3.2.6 Program re- numbering
 - 3.2.7 256 KB memory for part program storage.
 - 3.3. Facility to store up-to 99 subroutines and 100 programs.
 - 3.4. Locking of specific part programs for storage of permanent Sub routines.
 - 3.5. Background programming.
 - 3.6. Locking of machine parameters as well as part programs to prevent

- 12.9 Programmable skip.
- 12.10 Facility of inclusion of message in the part-program.
- 12.11 Job clamp/unclamp.
- 12.12 Tool length offset along selectable axes/plane.

13 **SPECIAL FUNCTIONS FOR PUNCH PRESS**

- 13.1 Cycle press
- 13.2 Manual press
- 13.3 Positioning and press off
- 13.4 Setting for press start signal
- 13.5 Press start lock
- 13.6 Press start wait
- 13.7 Nibbling
- 13.8 Safety zone check
- 13.9 Changeable rapid traverse rate and time constant according to positioning distance (7 steps)
- 13.10 Changeable position loop gain 7 steps
- 13.11 Multi piece machining
- 13.12 Bending compensation
- 13.13 Pattern function
- 13.14 Pattern based input command.

14 **Additional Features of CNC System**

- 14.1 Servo waveform display by waveform diagnostics
- 14.2 One shot tuning
- 14.3 Reference point shift
- 14.4 Custom Macro function
- 14.5 Enriched Diagnostics features like Alarm guide, PLC trace function, Operation history, diagnostics screens, maintenance history, CNC, servo info screens, operator history
- 14.6 RS 232 data transfer
- 14.7 NC controlled Axes
- 14.8 Feed stop
- 14.9 Work piece co ordinate system
- 14.10 Run hour and parts count display
- 14.11 Background editing
- 14.12 PLC ladder display and editing feature