

TITLE: Instruction for FIT of Power Source Model: CHAMP 400 X

1.0 SCOPE:

Inverter based welding Rectifier type Power Source, Model: CHAMP 400 X

2.0 DETAIL OF THE INSTRUCTION:

2.0.1 Use testing panel TEP-WQ-001/TEP-WR-002.

2.0.2 Record the parameters and the result (OK/ NOT OK) in the Test report (REF: INSP4672/I5/R1) as the testing progresses.

2.0.3 In the case of any nonconformity at any stage of inspection and testing Refer to the Procedure for control of nonconforming product (REF: NCCR2001).

2.0.4 After completion of the testing refer to the Procedure for inspection and Testing and identification of inspection and test status (REF: INSP2001) for further processing.

2.1 MECHANICAL CHECK:

2.1.1 Check for tightness of all hardware and crimping of lugs.

2.1.2 Check whether heat sink compound is applied to base of all power components. (IGBT, Output Diodes, 3-ph Bridge Rectifier & 1-Ph Bridge Rectifier)

2.2 VISUAL INSPECTION (Clause no: 3.1.7 of 60974-1:2021 © IEC 2021):

2.2.1 Check as per relevant Machines wiring diagram.

2.3 CONTINUITY TEST:

2.3.1 ON / OFF Switch: "OFF".

2.3.2 Check the Isolation between IGBT HS & DIODE HS.

2.3.3 Check the Isolation between Fabricated Body & DIODE HS.

2.3.4 Check the Isolation between Fabricated Body & IGBT HS.

2.4 DIELECTRIC STRENGTH (H.V.) TEST (Clause No: 6.1.5 of 60974-1:2021 © IEC 2021):

Notes:

- 1) The equipment under HV test should be electrically isolated.
- 2) Apply test voltage for minimum 5 sec
- 3) Avoid physical contact with HT tips and the product under test
- 4) If, for any reason, it is desired to carry out HV test for the second time, then the test voltage applied should be 80% of the full test voltage.
- 5) For the operator's safety, the lowest setting of the tripping current (less than or equal to 10 mA) is typical.

A. Remove the connectors as per following table for CHAMP 400 X:

PCB	Connector to be Removed
PWM Cum IGBT Driver PCB	CN1, CN5
Display PCB	CN1, CN2
Load Resistor PCB	CN1

B. Carry out the HV test as per following procedure:

2.4.1 Primary Input Supply Short Circuit(R, Y, B)

Short circuit input supply (R, Y, B) & Take H.V. between input supply (R, Y, B shorted) & Earthing of machine by applying **1.875 KV for 5sec** (Current Limit below 30mA)

2.4.2 Output terminal Short Circuit

Remove short circuit of input supply and short circuit output terminal (+ve and –ve output) & Take H.V. between output terminal (short +ve and –ve output) & Earthing of machine by applying **1.875 KV for 5sec** (Current Limit below 30mA)

2.4.3 Primary Input Supply Short Circuit (R, Y, B) & Output terminal Short Circuit

Without removing shorted output, short circuit input supply (R, Y, B) & Take H.V. between input supply (R, Y, B shorted) & output terminal by applying **3.750KV for 5sec** (Current Limit below 30mA)

2.4.4 Apply “**HV OK**” sticker & now connect the machine to the test panel for further testing.

2.5 NO LOAD TEST:

2.5.1 RATED NO LOAD VOLTAGE (Clause No: 11.1 of 60974-1:2021 © IEC 2021):

2.5.1.1 ON / OFF Switch of power source: Put it in ‘ON’ condition

2.5.1.2 Carry out OCV (No load Voltage), no load current and power measurement.

Note: During measurement, the actual supply voltage shall not vary from the rated supply voltage by greater than $\pm 6\%$.

2.5.1.2.1 **Additional requirements** (Clause No: 11.1.5 of 60974-1:2021 © IEC 2021)

- The rated no-load voltage at all possible output settings shall not exceed DC 113V

2.5.4 FAN FLOW CHECK (BACK TO FRONT): As per test report (REF: INSP4672/I5/R1).

2.6 CALIBRATION PROCEDURE FOR MACHINE AT LOAD CONDITION:

2.6.1 PREREQUISITES

2.6.1.1 At NO LOAD condition, check voltage at TP5 wrt TP2 on **DISPLAY PCB**.

It should be **2.3V +/- 0.3VDC**. If not, adjust it using **VR2 Pot** on Display PCB

2.6.1.2 Set TP7 wrt TP2 on **PWM PCB** at **-17mV** using **P3 pot** on PWM PCB

2.6.1.3 Set **P2 pot** on **PWM PCB** at **MAX** Position.

2.6.2 CALIBRATION PROCEDURE IN MMA MODE FOR MAXIMUM CURRENT

- 2.6.2.1 Set the CURRENT POT at MAX position, HOT START POT at minimum position, and ARC FORCE POT at MIDDLE POSITION (consider as zero position).
- 2.6.2.2 Load the machine at maximum position as per below table.
- 2.6.2.3 Short the pins of JP1 connector using the jumper on Display PCB. If the actual current in clamp is lesser than set current, rotate the ARC FORCE POT clockwise to adjust the current.
- 2.6.2.4 If the actual current in clamp is greater than set current, rotate the arc force pot anticlockwise to adjust the current.
- 2.6.2.5 At load condition match the current in clamp meter and front panel display using preset 'VR1' on Display PCB
- 2.6.2.6 Once the setting is completed, remove the jumper in loading condition. Remove the load

LOAD THE MACHINE AT MINIMUM (Amp /Volt)	LOAD THE MACHINE AT MAXIMUM (Amp /Volt)
10A / 10V (+/-2A & +/-2V)	400A /36V (+/-1A & +/-2V)

2.6.3 CALIBRATION PROCEDURE IN MMA MODE FOR MINIMUM CURRENT

- 2.6.3.1 Set CURRENT POT, ARC FORCE POT, AND HOT START POT at MINIMUM POSITION.
- 2.6.3.2 Load the Machine at minimum as per given table

LOAD THE MACHINE AT MINIMUM (Amp /Volt)	LOAD THE MACHINE AT MAXIMUM (Amp /Volt)
10A / 10V (+/-2A & +/-2V)	400A /36V (+/-1A & +/-2V)

- 2.6.3.3 If not Actual load current on clamp meter is not same as set current, calibrate it by using Preset 'P3' from PWM control PCB.

AFTER THE CALIBRATION PROCEDURE IS COMPLETED, ONCE AGAIN LOAD THE MACHINE AS PER GIVEN TABLE FOR MAX & MIN CURRENT IN MMA MODE.

2.7 VRD TEST:

2.7.1 MMA MODE:

- Put the machine on MMA mode. Keep VRD Switch in VRD ON mode.
- Measure open circuit voltage (OCV)
- Ensure that the OCV becomes 8-10V after 2 sec & VRD Led will be on.
- On loading, machine will get out of VRD mode & output voltage will be available.
- On removing the load, machine will again go to VRD mode after 2 sec

2.7.2 TIG MODE:

- Put the machine on TIG mode.
- Measure open circuit voltage (OCV)
- VRD mode is not applicable.

2.7.3 VRD TIME ADJUSTMENT (AS PER CUSTOMER REQUIREMENT)

- Put the machine on MMA mode. Keep VRD Switch in VRD OFF mode.
- Short the JP1 connector using the jumper. On display “000” will be shown.
- Adjust display time to “018” by using HOT START pot. “018” will represent as **180 sec** (3 min) as the VRD time.
- Remove the Jumper. Keep HOT START pot at min position & VRD Switch in VRD ON mode.
- Measure open circuit voltage (OCV)
- Ensure that the OCV becomes 8-10V after 3 mins & VRD Led will be on.
- On loading, machine will get out of VRD mode & output voltage will be available.
- On removing the load, machine will again go to VRD mode after 3 min

2.8 LOAD TEST:

2.8.1 Set “CURRENT” POT on front panel to current at 60% DC

Load current / voltage accordingly

Record parameters (REF: INSP4672/I5/R1).

2.8.2 Set “CURRENT” POT on front panel to current at 100% DC

Load current / voltage accordingly

Record parameters (REF: INSP4672/I5/R1).

60% DC		100% DC	
Set current pot at	Load (Amp /Volt)	Set current pot at	Load (Amp /Volt)
400	400A /36V (+/-2V)	310	310A /32.4V (+/-2V)

2.8.3 Display PCB calibration check:

Confirm current reading on power source +/- 5 amps of reading on testing panel at maximum.

2.8.4 Carry out the load test including control transformer voltages as per test report

(INSP4672/I5/R1) & record the readings.

2.9 REMOTE CONTROL OPERATION TEST

2.9.1 Connect the remote to the machine.

2.9.2 Connect remote control unit (RCU-1) and put machine in load condition, then vary the Remote control potentiometer from minimum to maximum. Observe variation as per model on Digital panel meter.

MODEL	Variation on DPM
CHAMP 400 X	10-400A (+/- 2A)

2.10 SUPPLY VOLATGE IMMUNITY CHECK:

2.10.1 Supply voltage = 415 VAC and Load current / voltage = 100 A / 24 V

- 2.10.2 Vary the supply voltage: 370 VAC- 470 VAC
Load current should remain at 100 A.

2.11 SINGLE PHASING PROTECTION TEST :

- 2.11.1 Remove “Y” phase connected to the machine.
2.11.2 Display shows “Err 001”error code & machine is in protection mode & no OCV is available.
2.11.3 Conduct the same test for R & B phase after connecting the removed “Y” phase
Display does not shows any error message when all three phases are present.

2.12 OVER VOLTAGE PROTECTION TEST:

- 2.12.1 Increases the I/P supply voltage more than 485VAC (+/-10V)
2.12.2 Check that no OCV is available & Display shows an error message ‘Err 002’.
2.12.3 The error message will disappear when I/P supply voltage is decreased below the limit.

2.13 UNDER VOLTAGE PROTECTION TEST

- 2.13.1 Decreases the I/P supply voltage less than 350VAC (+/-10V)
2.13.2 Check that no OCV is available & Display shows an error message ‘Err 001’.
2.13.3 The error message will disappear when I/P supply voltage is increased below the limit.

2.14 CONNECTION ERROR TEST:

- 2.14.1 Remove connector CN9 of display PCB
2.14.2 Check that no OCV is available & Display shows an error message ‘Err 011’.
2.14.3 The error message will disappear when CN9 of display PCB is reconnected.

2.15 THERMAL PROTECTION TEST:

- 2.15.1 Remove thermostat connector CN2 from Line Filter PCB.
2.15.2 Check that no OCV is available & Display shows an error message ‘Err 003’.
2.15.3 The error message will disappear when CN2 of line filter PCB is reconnected.

Sr. No.	Error Code	Error
1	Err 001	Under Voltage Error
2	Err 002	Over Voltage Error
3	Err 003	Thermal Trip Error
4	Err 011	Connection Error

2.16 ARC FORCE OPERATION TEST:

- 2.16.1 Put the machine on MMA mode, set 100A. Put Arc Force Potentiometer on maximum position
2.16.2 Load the Machine. Measure the current flowing through the output, it should be around 175 to 200 Amperes below 30V output voltage.
2.16.3 Remove the load.

2.17 ANTISTICK OPERATION TEST:

- 2.17.1 Put the machine on MMA mode, set current at 100A
- 2.17.2 Load the machine on resistive load
- 2.17.3 Drop the output voltage below 10V
- 2.17.4 Output current will go to minimum current
- 2.17.5 Anti-stick function is active in MMA mode only.

2.18 HOT START OPERATION TEST:

- 2.18.1 Put the machine on MMA mode, set current at 100A
- 2.18.2 Put Hot start Potentiometer on maximum position & Arc Force Potentiometer on minimum position
- 2.18.3 Load the machine on resistive load
- 2.18.4 Drop the output voltage to 30V and observe that actual current is flowing equal to 200A ($\pm 20A$) approximately for initial 1.5 sec & then actual current come back equal to set current.
- 2.18.5 Hot start function is active in MMA mode only & it is active for set current less than 200A

2.19 HEAT RUN TEST:

- 2.19.1 Load the machine at 100%DC in MMA mode for 45 mins

2.20 MMA WELDING TEST:

2.20.1 POLARITY: Electrode holder: “+”

- 2.20.1.1 Electrode type = ”7018”
Diameter = 4 mm and 2.5mm
- 2.20.1.2 PARAMETER :
Current = 170A and 80A
- 2.20.1.3 WORK-PIECE :
MS plate: 10mm and 5mm.
- 2.20.1.4 JOINT: “Fillet” and/or “bead on plate”.

2.20.2 POLARITY : Electrode holder: “-”

- 2.20.2.1 Electrode type = ”6013”
Diameter = 4 mm and 2.5 mm
- 2.20.2.1 PARAMETER :
Current = 170A and 80A
- 2.20.2.2 WORK-PIECE :
MS plate: 10mm and 5 mm thick.
- 2.20.2.3 JOINT: “Fillet” and/or “bead on plate”.

2.20.3 POLARITY: Electrode holder: “+”

- 2.20.3.1 Electrode type = “6010”
Diameter = 3.2 mm and 2.5 mm
- 2.20.3.2 PARAMETER :
Current = 90A and 60A
- 2.20.3.3 WORK-PIECE :
MS plate: 5 mm thick.
- 2.20.3.4 JOINT: “Fillet” and/or “bead on plate”.

2.21 CHECK POINTS:

- 2.21.1 Arc stability
- 2.21.2 Arc striking
- 2.21.3 Spatter level
- 2.21.4 Bead shape
- 2.21.5 Slag detachability

2.22 TIG WELDING TEST:

2.22.1 LIFT ARC MODE (WITHOUT HF UNIT):

- Electrode: 4 mm, tungsten (2% Thoriated).
- Work piece: 5 mm thick mild steel.
- Ensure arc striking by touching the electrode to the work piece (for lift arc welding).
- Ensure current variations as per the setting on the power source test report.

2.22.2 WITH EXTERNAL HF UNIT :

- Connect External HF unit - HF2000 for welding trials up to 200A
- Electrode: 4 mm, tungsten (2% Thoriated).
- Work piece: 5 mm thick mild steel.
- Ensure arc striking without touching the electrode to the work piece.
- Ensure current variations as per the setting on the power source test report.