

Operating instructions

for the welding inverter

TT 142

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1. Description

The welding machine TT 142 (next only the source) is designated for welding with the coated electrodes with average 1.6 mm to 3.2 mm, TIG welding method (with no smelting electrode in gas shielding atmosphere) at the contact ignition of the welding arc and charging of the lead accumulators with nominal voltage 12V and 24V. The source utilizes modern principles and knowledge from the sphere of power and also controlling electronics. Due to that the source is characterized by:

- high power at small dimensions and low weight
- high efficiency
- quality welding characteristics
- stability of parameters independent on the electric power voltage variation
- automatic blocking at overload or failures of the supply voltage

The source is designed on the principle of the frequency converter (inverter) working at the frequency over audible band. Transistors MOS are used as switch elements in the inverter. Electronic control ensures parameters stability and contains the circuits for the source protection and optimal welding properties.

The source is placed in metal cover with plastic faces and with strap for its transport. On the fore-face there are quick plugs for the connection of welding cables marked „+“ and „-“, potentiometer for the setting of welding (respectively charging) current size marked „A“, selector switch „HOT START“ for control of the starting current at the coated electrode welding, two buttons for the source setting and indicative display. The button on the left side of the display marked „MODE“ serves for setting of the source function, button on the right side of the display marked „A/V“ serves for setting of the displayed quantities. On the back face there are main source breaker and power supply. Source cooling is forced with ventilator.

2. Technical data

Input voltage		1x230V/50Hz
Output current I_2 (A) at	X = 100%	90A
	X = 60%	110A
	X = 35%	140A
Regulatory range of the welding current		0 - 140 A
Regulation of the welding current		continuous
Cover degree		IP 21
Open-circuit voltage (peak value)		85 V
Recommended power supply protection		16 A, delayed type
Gas voltage for nominal voltage 12V		14.4V
Gas voltage for nominal voltage 24V		28.8V
Range of charging current		1-70A
Weight		5kg
Corresponds to standard		ČSN EN 60 974-1

3. Safety regulations

Introduction:

The source is made in accordance with present technical knowledge and safety requirements. Regardless there is a danger of health or life hazard of operator or other persons, damage or destruction of the welding machine and other material values of provider at unprofessional operation or wrong use. In that fact the source operators must have relevant qualification and knowledge of the welding technology and must keep the instruction given in these operating instructions. It is necessary to remove immediately all failures, which can influence safe operation of the source.

Provider and operator duties:

Provider can allow the work with the source only to persons, who are informed about the safety regulations, trained in the source manipulation and informed about the source operating instructions. The person authorized to work with the source is obligated to keep all basic regulations about safety of operation, with special regard to warnings given in this operating instructions.

Personal protective outfit:

Source operator must have strong working shoes, which also insulate in wet environment, protective isolating gloves, shield with protective filter for eyes protection, suitable hardly flammable clothes and aural protectors at heightened noise level. When other persons are in the source neighbourhood, they must be advised about possible danger, have the protective equipment at disposal, possibly they must be protected with protective curtains or screens. When some animals move in a neighbourhood of the welding working place, it is necessary to adopt a measure for their protection against the harmful radiation with the screens.

Danger resulting from the action of harmful steams and gases:

It is necessary to exhaust the smoke and harmful steams occurring during the welding with the suitable equipment from the working area, whereas it is necessary to ensure sufficient supply of fresh air. Solvent steams must not exist in closeness of the electric arc.

Danger resulting from flying off sparks:

It is necessary to eliminate all flammable objects from the source working area. No welding works can be carried out in area serving for storage of gases, fuel, oils and similar matters, because also the remains of these matters present an explosion risk. Special regulations stand in area with fire and explosion risk – therefore their consistent keeping is necessary.

Other necessary measures:

Welding sources are generally from the point of view of unweave voltage designated for work in industrial area. When it is used in the living space, the special measures are necessary for elimination of the clutter. Therefore the user is obligated to evaluate, whether he cannot cause electromagnetic problems in a neighbourhood in case of clutter at the source installation. In the first place it is necessary to consider aspect of signal and telecommunication leads, radio and television receivers and transmitters, computers, safety equipments, health of persons in neighbourhood, e.g. at the cardiac stimulators use etc.

Welding cables must not be damaged and must be sufficiently insulated.

It is necessary to ensure regular verification of power distribution and supply cable guard wire functionality by skilled electrician.

Before the source opening the source must be disconnected from power by pulling-up of the power plug. Components, on which the electric charge is cumulated, must be discharged.

Only special trained welders can carry out the welds, on which the special safety demands are required.

Placing and installation:

Because of the stability ensuring it is necessary to place the source on flat and solid base. Overturn of the source in operation can represent a life risk. In area with fire and explosion risk it is necessary to keep the special regulations. Before the source switching-on it is necessary to check, if the other persons cannot be endangered.

Regular revisions:

The source is under the regular revisions according to ČSN 33 1500 and ČSN 05 0630. ATTENTION: If the source does not meet some of next given points in safety respect, it is necessary to stop its working immediately.

a) Inspection

To mask off the source after disconnection of the power by pulling-up of the power supply.

Procedure at the cover removing:

To unscrew the screws in the plastic faces (two in upper and one in lower part of the back face, two upper at the fore-face). To move out the back face. To move out the upper cover from the fore-face. To disconnect the guard wire from the upper cover.

To carry out the visual control, if the electric parts are not damaged (selector switches, connectors, terminal box, el. supplies, bushings etc.). To carry out the control of screw and slip connections, their possible tightening or repair. To control visually, if the mechanical parts are not released or the safe air distances and overland travels are not dislocated. **Possible defects must be removed before next use.**

b) Control of the guard wire

The guard wire must not be damaged or interrupted. To test the strength of individual interconnections on the connections and connectors by hand. Connection of the guard circuit is checked with the power supply minimally 10A from the source PELV and for the period of 1 s. Checking is carried out between clamp PE and various points, which are components of the guard circuit. Guard circuit is regarded as a compact, if the voltage drop is to 2.6V at the test current 10A.

c) Insulation resistance

Insulation resistance is measured with the voltage 500V ss. Its value according to EN 60 974-1 must not be lower than:

Input clamps (primary) – output clamps (secondary)	5 Mohm
Input clamps (primary) – frame	2,5 Mohm
Output clamps (secondary) - frame	2,5 Mohm
Control circuit (secondary transformers for power supply of the control circuit) - frame	2,5 Mohm

d) Open-circuit voltage

Voltage measured on the output clamps of the source must be in tolerance $\pm 10\%$ to value given on the machine label. Top value is given on the machine label according

to EN 60 974-1, the measurement way is defined in the given norm. In no case the value 113V must be exceeded.

Changes on the source:

Carry out no changes on the source without producer permission. Immediately change the parts, which are not in perfect state.

4. Thermal protection:

The thermal protection works at the load factor exceeding, high temperature of neighbourhood, unsuitable source placing etc. Working of the thermal protection blocks the converter function and the neutral voltage is on the source output. This state is signalled on display by „t“ lit up. Cooling ventilator is in operation also at this state. Therefore do not switch off the source, but let it connected to the power. The thermal protection automatically restores the source action after cooling, the set current is displayed and it is possible to restore the welding again.

ATTENTION!

After the thermal protection effect put the electrode holder on isolated place so that accidental short-circuit does not happen after restoring of the output voltage and thus a possible accident or damage to property.

At the normal conditions the following load factor of the welding machine is allowed:

100%	$I_2 = 90A$	$U_2 = 23.6V$
60%	$I_2 = 110A$	$U_2 = 24.4V$
35%	$I_2 = 140A$	$U_2 = 25.6V$

The load factor represents the proportion of the operation time under loading towards the total cycle time, where the cycle time is determined for 10 minutes. E.g. the loading time 6 minutes for the load factor 60% is followed with 4 minutes time of the no-load running.

5. Mains connection

Attention!

Primarily read the chapter “Safety regulations” before the first putting into operation.

The source is only determined for welding with the coated electrode possibly for TIG welding at the contact ignition of the welding arc and lead accumulators charging.

The source must not be used for defrosting of the water main.

Other source use does not correspond to its determination. Producer does not answer to damage originated in these cases.

The source can be connected only to such a supply main, which meets all safety requirements. The supply main 1x230V/50Hz is necessary for the connection. Supply main protection must be ensured with the motor fuses or circuit breaker 16A.

Generally:

After switching of the master switch the source is automatically set up to the function, in which it was last prior to its switch off. At each push a button „MODE“ on the left side of the display the individual functions are selected in the following sequence:

function	Display
welding with coated electrode	EL
welding with method TIG	tIG
charger 12V	12
charger 24V	24

Display of set up function lasts ca 5 sec, then „A“ is displayed for ca 5 sec and subsequently intensity of the set current. At the push a button „A/V“ on the right side of display it is possible to change display of the set current („A“) and display of voltage at the output of the source („U“).

Note: At the supply failure the function, which was before the supply failure, will be automatically set up after its renewing.

5.1 Welding with the coated electrode

Procedure of the connection is following:

- to switch over the master switch of the source into position „0“
- to connect the welding cables into the output quick plugs
- to plug the supply plug in the supply main
- to switch the master switch of the source into position „I“

After switching of the master switch the ventilator starts and the last set function is displayed. To select mode „EL“ (it displays for ca 5 sec) at the push a button „MODE“. After following display of „A“ (again ca 5 sec) to set up the needed welding current with the setting potentiometer – value of the set current is displayed. You find recommended current intensities and polarity on the electrode packing (box).

By reason of facilitation of the welding arc ignition it is possible to use the function „HOT START“, which is activated with the switching of this specified switch (on the left side of panel O-I) into the position I. At the activation of this function the current is increased by ca 50% in comparison with the set value during ca 0.6 sec at the welding arc start. It is possible to eliminate this function by the switching over of the switch „HOT START“ into the position 0, if this function is complication e.g. for the welding of the thin sheets

Warning!

For the welding main it is necessary to use the conductors of relevant diameter, with adequate quick plugs, ground clamps and electrode holder. Neither conductors, nor electrode holder must be damaged. It is necessary to connect the ground clamp on the weldment as near to the welded place as possible so that the current flows through electrically adequate diameter.

5.2 Welding with method TIG

Procedure of the connection is following:

- to switch over the master switch of the source into position „0“
- to connect the welding cable and torch into the output quick plugs
- to connect the gas supply into the torch
- to plug the supply plug of the source in the supply main
- to switch the master switch of the source into position „I“

After switching of the master switch the ventilator starts and the last set function is displayed.

To select the mode „tIG“ (it displays for ca 5 sec) at the repeated push the button „MODE“. To set up the needed welding current with the setting potentiometer. The

current intensity is displayed. To start the protective gas, to touch the weldment with the electrode and hold over. After holding over the current is on the value set up with the potentiometer.

5.3 Accumulators charging

Procedure of the connection is following:

- to switch over the master switch of the source into position „0“
- to plug the supply plug of the source in the supply main
- to switch the master switch of the source into position „I“

After switching of the master switch the ventilator starts and the last set function is displayed.

To select the mode „12“ for the accumulator with the nominal voltage 12V or „24“ for the accumulator with the nominal voltage 24V at the repeated push the button „MODE“. (it is displayed for ca 5 sec).

- to set up the current minimum with the potentiometer (left outside position)
- to switch over the switch „HOT START“ into position O
- to connect supply cables of the accumulator into the output quick plugs

ATTENTION! IT IS NECESSARY TO UNCONDITIONALLY KEEP THE POLARITY, i.e. „+“ of the accumulator on „+“ of the source, „-“ of the accumulator on „-“ of the source

To set up the required charging current with the potentiometer. The range of the charging current setting is 1-70A.

It is possible to select the display of actual voltage intensity of the charged battery at the push the button „A/V“, the set value of the charging current is again displayed at repeated push the button (no real mean value).

The charging is automatic, without necessity of the operator presence. The accumulator voltage is permanently monitored and the time, when the set current is supplied with the source into the accumulator, is limited in dependence on its value (the charging is in progress runs with the current pulsing of the intensity set with potentiometer, their length is shortened with increasing gas voltage). When the voltage value of the accumulator approaches the value of the gas voltage, the mean value of the supplied current is close to zero. Therefore the accumulator cannot be damaged also at the long-term connection of the source.

Warning!

-when the accumulator is connected to the source in the reversed polarity by a mistake, do not switch on the source and send it immediately for professional repair. The source can be damaged even more by connecting to power.

Keep the following instructions at the charging:

- at the charging to release the accumulator vent plugs and leave them freely in the holes to prevent the electrolyte jetting
- not to charge the accumulator in the car to prevent dangerous concentration of the explosive gases and possible electrolyte stain of the car
- to control the electrolyte level before charging, when appropriate to fill with distilled water
- to avoid the closeness of the flame or sparking-explosion possibility. Therefore first to switch off the master switch of the source after the charging end and subsequently to disconnect the clamps
- to protect the eyes with suitable glasses at the electrolyte control
- after charging to keep the accumulator to vent 2 hours at least, then to retighten the vent plugs

- recommended charging current is ca 1/10 value of the charged accumulator capacity (e.g. value 6A is for accumulator with the capacity 60Ah)
- at the charging of the damaged accumulator (short-circuit of one or more sections) the charging current will be permanently supplied without limitation because the voltage will be deep under the level of the gas voltage. Thus the total destruction of the charged accumulator can happen
- it is necessary to select well the function of the charger with the selector switch „MODE“. It can be destroyed at the setting „24“ for accumulator 12V (charging current will not be limited). This will not be charged at setting „12“ for accumulator 24V. The both type of the accumulators can be destroyed at the wrong setting of the welding mode instead of the charging
- to switch off the source with the master switch and disconnect the accumulator after the charging end (the accumulator voltage is close to the gas voltage).

The accumulator charging is in progress with intermittent current impulses, the voltage is monitored at the moment, when the current does not flow. So the voltage value, which oscillates around the gas voltage (e.g. 15-14V can be for accumulator 12V), is displayed in final phase of the charging. When the lowest displayed voltage value is lower by ca 0.4V than the gas voltage, the accumulator is already almost charged. The best thing is to carry out the charging control with the measuring of the electrolyte density in the accumulator. The density at the charged accumulator should be in range 1.27 – 1.29 g/cm³.

6. Source placing

The source must be placed on the solid and flat base to ensure the sufficient space for the cooling air supply and outlet in front of the both faces (ca 500 mm). The metal fall-out (e.g. at the grinding) must not be sucked into the machine directly.

The source is made with the cover IP 21, which means:

- protection against penetration of the foreign matters with diameter bigger than 12 mm
- protection against vertically trickling water

With regard to the cover level the source can be used and stored so it would not be exposed to direct weather effects. Especially it is not allowed use and storage in the rain.

7. Maintenance

Attention! Before the source opening to switch it off and disconnect from the power with the pull-up of the plug from the power supply and affix a warning label against repeated switching-on. Possibly also to discharge the electrolytic condensers.

To ensure long-term working life of the source it is necessary to keep the following measures:

- to carry out the revision controls in determined intervals - see the chapter "Safety regulations"

- to remove the upper cover of the source and blow settled impurities out with dry compressed air depending on the way of use and place, where the source works, but twice a year at least
- turn over removing of all possible failures to the special service or producer

8. List of spare parts

Pos.	Name	Order. no.
1	Panel quick coupler	
2	Potentiometer 5k	
3	Potentiometer button	
4	Power switch C1350AB	
5	Ventilator 24V ss 90x25	
6	Transistor STW 15NB50	
7	Thermal switch 71°C	
8	Bloc of diodes with cooler 2B079	
9	Bloc of transistors with coolers 2B078	
10	Diode DSEK 60/02	
11	Rectifier block KBPC 3510	
12	Lower varnished cover	
13	Upper varnished cover with isolation	
14	Fore-face	
15	Back face	

Wiring scheme

