

NOTE

This leaflet forms part of a set which also includes :

Leaflet 555 : Electric lighting of passenger stock.

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Dimensions and connections of 40 W or 2 x 20 W inverters, version B
 - APPENDIX 2 - Dimensions and connections of 13 W/24 V inverters
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0 - GENERAL

0.1 - This leaflet contains guidelines concerning the design, manufacture and testing of transistorised inverters for supplying fluorescent lamps conforming to IEC (1) 81. They should be adhered to by all railways in order to ensure economic supply conditions.

0.2 - All the rules specified in leaflet 550-1 "Electronic equipment for coaches and wagons" (to be published) are applicable.

1 - MECHANICAL CHARACTERISTICS

1.1 - The inverters shall not exceed the dimensions indicated in the drawings Appendices 1 and 2. The dimensions relating to the mounting system shall be respected.

1.2 - The electrical connections and, where applicable, the identification characteristics shall be designed in accordance with Appendices 1 or 2 and shall conform to one of the following versions :

- flat plugs and identification characteristics ;
 - 6,35 mm for 40 W inverters
 - 5,00 mm for 13 W inverters;
- screw terminals;
- plug terminals.

(1) IEC = International Electrotechnical Committee

1.3 - Each of the inverters shall be indelibly marked with the following details :

- name of manufacturer,
- type and serial number,
- date of manufacture (year, month or week),
- nominal power,
- nominal voltage,
- circuit arrangement.

2 - ELECTRICAL CHARACTERISTICS

2.1 - General operating conditions

2.1.1 - Normally the inverters shall be fixed direct onto the lighting fitting without any insulating device being used. Otherwise, the manufacturer shall determine the size of the heat sink required once the railway has indicated the maximum temperature which the mounting surface can withstand.

2.1.2 - Special devices to facilitate starting are not permissible, with the exception of the frame of the fitting, if it is metal, or of a metal strip running along the fitting if this fitting is not metal.

2.2 - Power stage

The guidelines apply to inverters with a power of 40 W and 13 W. With 40 W units, a 40 W or 36 W lamp should be used, or two 20 W or 18 W ones.

2.3 - Input voltages

- Nominal continuous voltages 24 V 110 V
- Supply voltages 18 ... 32 V 90 ... 150 V

2.4 - Modulation of supply voltage

The static inverter should be capable of functioning direct on a three-phase rectified network without smoothing. This voltage exhibits harmonics with a peak-to-peak value of up to 20% of the nominal voltage. This modulation should not result in any damage to the inverter or to the lamps.

* 2.5 - Frequency

Regardless of the supply voltage, the temperature and the load of the inverter, its operating frequency should in no circumstances be less than 18 kHz. If, as a result of damage - a faulty lamp, for instance the load falls to zero, the inverter may stop.

2.6 - Protection

Each inverter shall be protected against :

- inversion of polarity,
- damage, when operating under no load or in the event of reduced voltage,
- damage, when a lamp does not start.

2.7 - Current peak

At 1.1 On the peak value of the lamp current shall not exceed 1.7 times the effective value.

2.8 - Ignition

2.8.1 - The inverters shall be of the delayed-start type, permitting the filaments to be put under voltage in the first phase, and the fluorescent tube to be put under voltage in the second phase.

2.8.2 - The delay between the start of preheat and ignition shall not exceed one second.

* 2.9 - Functioning range

2.9.1 - If the lamp and the inverter are within -20°C and +70°C, and also within the supply voltage limits, the lamps should light and remain properly and permanently lit.

2.9.2 - If the lamp and the inverter are in an enclosed space at a temperature of -25°C, the inverter should not sustain any damage when placed under voltage.

2.10 - Rating

At a temperature of 22°C + 5°C and with a supply voltage of 1.1 times the nominal voltage, the rating of the inverter should be greater than 75%.

2.11 - Absorbed power

Regardless of the supply voltage and for the same inverter temperature of between + 5°C and + 70°C, the electrical power absorbed by the tube should not exceed 1.1 times its nominal power and the rating should be higher than 70%.

2.12 - Luminous flux

The luminous flux of the lamp-inverter assembly at an ambient temperature of 22°C + 5°C and under a supply voltage equal to 1.1 times the nominal voltage, should be at least equal to that of the reference assembly of tube and inductive ballast 220 V/50 Hz defined in Appendix II of Publication No. 81 of the IEC at the same temperature (+ 1°C). The lamp should be the same during the two measurements. It should previously have been aged for 100 h. The measurements should be taken 15 minutes after the lamp has been heated.

2.13 - Switched life

With a new lamp at a temperature of 22°C + 5°C and for a supply voltage of 1.1 times the nominal voltage, it should be possible to execute 100 000 switch cycles.

3 - TYPE TESTS

3.1 - Number of inverters

The type tests should be carried out on a minimum of three units.

3.2 - Checking the conditions of the mechanical and electrical characteristics

The conditions of points 1 and 2 are checked.

3.3 - Climatic tests

3.3.1 - High-temperature test

With the inverter functioning at its maximum voltage for 6 h at 70°C in fanned air, the temperature is recorded at a reference point indicated by the manufacturer, that of the transformer core and that of the power semi-conductors. These temperatures should not exceed the values indicated by the manufacturer for permanent functioning.

3.3.2 - Tests of functioning in humid heat

The inverter in service, fed at its nominal voltage, is subjected for 48 h (two cycles) to the humid heat test at 55°C and with a humidity rate of 95%, defined in IEC Publication 68.2.30 (test D6). The inverter should withstand the test without damage.

3.4 - Insulation strength and dielectric stiffness

3.4.1 - After the functioning test in humid heat (point 3.3.2) the insulation strength and the dielectric stiffness are measured between :

- a) the input and output terminals
- b) the input terminals and the switchbox
- c) the output terminals and the switchbox.

The sets of terminals are short-circuited in each case.

3.4.2 - The continuous voltage used for measuring the insulation is 500 V. The insulation strength should not be less than 5 M ohms.

3.4.3 - The following continuous voltages are used for measuring the dielectric stiffness :

Nominal voltage of the specimen	Check according to		
	a	b	c
24 V	500 V	500 V	2 000 V
110 V	2 000 V	2 000 V	2 000 V

3.5 - Switched-life test

One switched cycle for checking a lamp is defined by a minimum starting time of 3 s and an extinction time of at least 10 s. The measurement of this switched life is the mean of the tests on 9 lamps, defined by IEC publication 81.

3.6 - Short-time overvoltage test

A direct overvoltage, and then an inverse one, is applied at the level of the supply source. The form of the overvoltage is as shown in figure 4, section 22 of IEC publication No. 571, with the following values :

A = 1.8 kV a = 0.9 kV D = 45 μ s and $d \leq 0.1 \mu$ s

3.7 - Vibration and impact tests

This test is carried out in accordance with section 28 of IEC publication No. 571.

4 - PRODUCTION TESTING

These tests should be carried out with all the equipment at a temperature of $22^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

4.1 - Functioning test

Using the rated voltage a functioning test should be carried out with the inverter providing its normal load (one 40 W lamp or two 20 W lamps in the case of 40 W inverters).

4.2 - Lighting test

A cycle of five consecutive illuminations and extinctions should be adopted.

4.3 - Consumption measurement

The current used should not exceed the following intensities :

- for a 40 W/24 V inverter 2.2 A
40 W/110 V 0.45 A
- for a 20 W/24 V inverter 1.1 A
20 W/110 V 0.22 A
- for a 13 W/24 V INVERTER 0.7 A.

4.4 - Dielectric test

Between the interconnected terminals of the converter and its frame a voltage of 1500 V 50 Hz should be applied for 60 s.

APPLICATION

As from 1 January 1985 for all the items to be constructed.

All railways belonging to the Union.

RECORD REFERENCES

Heading under which the question has been dealt with :

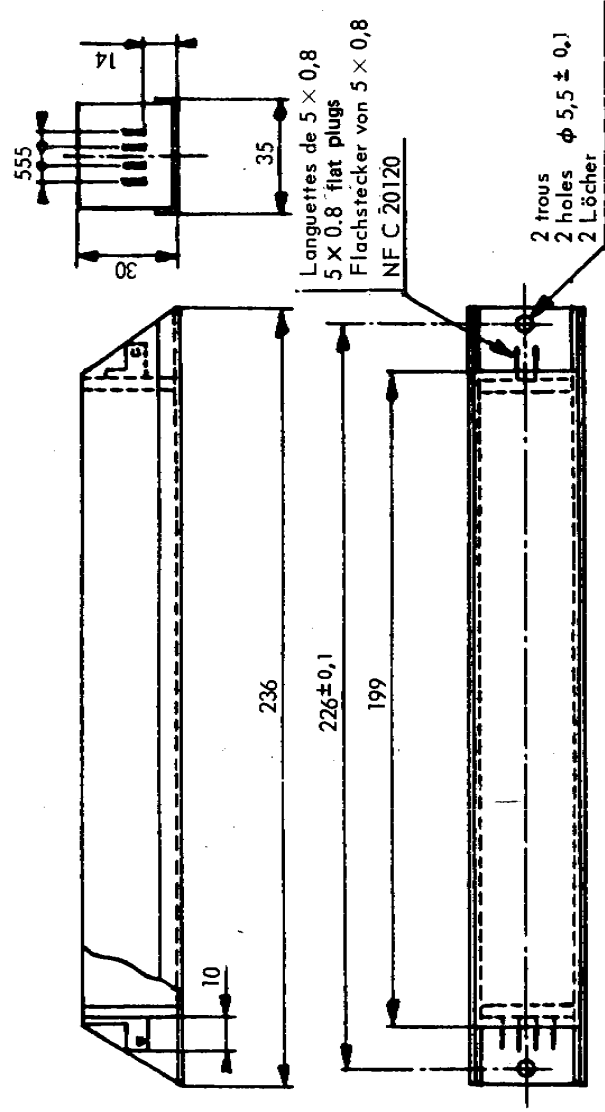
- Question 5/R/FIC. - Approval of the new Leaflet 555-1
"Transistorised inverters for supplying fluorescent lamps",

(Traction and Rolling Stock Committee : Zurich, June 1983).

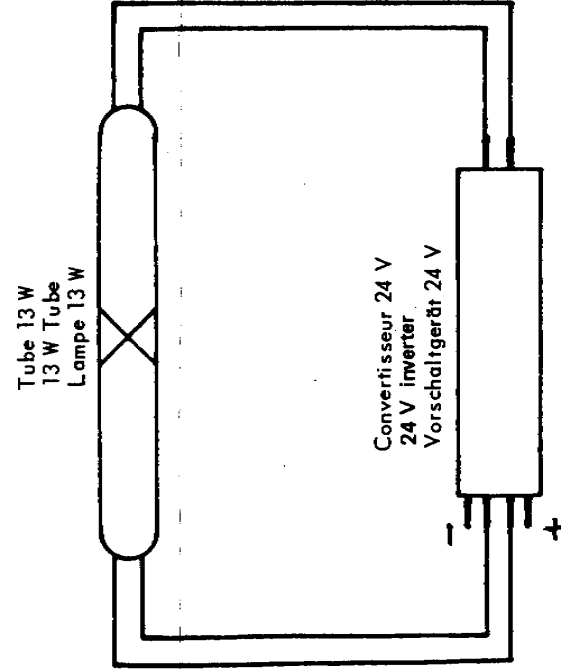
CONVERTISSEUR STATIQUE 13 W - 24 V
ENCOMBREMENT ET RACCORDEMENTS

13 W - 24 V STATIC INVERTERS
DIMENSIONS AND CONNECTIONS

TRANSISTOR-VORSCHALTGERÄT 13 W - 24 V
ABMESSUNGEN UND ELEKTRISCHE ANSCHLÜSSE



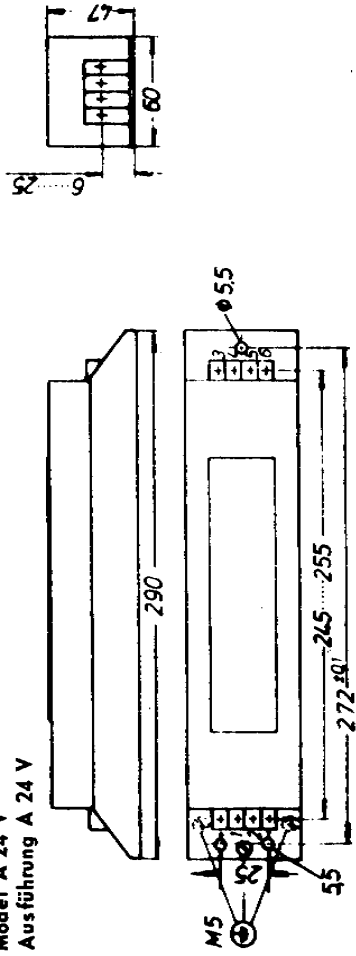
SCHEMA DE BRANCHEMENT
CONNECTIONS DIAGRAM
ANSCHLUSSSCHEMA



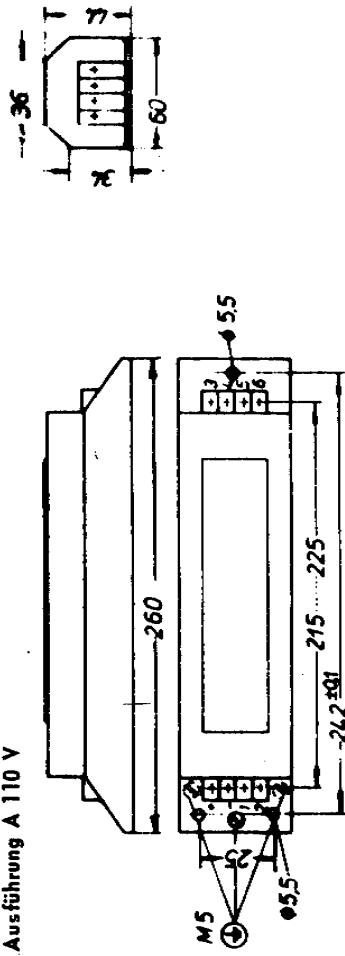
CONVERTISSEURS STATIQUES 40 W : 2 x 20 W; 24 V; 110 V
ENCUMBREMENT ET RACCORDEMENTS

40 W : 2 x 20 W 24 V; 110 V - STATIC INVERTERS
DIMENSIONS AND CONNECTIONS
TRANSISTOR - VORSCHALTGERÄTE 40 W : 2 x 20 W 24 V; 110 V
ABMESSUNGEN UND ELEKTRISCHE ANSCHLÜSSE

Réalisation A 24 V
Model A 24 V
Ausführung A 24 V



Réalisation A 110 V
Model A 110 V
Ausführung A 110 V



Réalisation B 24 V et 110 V
Model B 24 V and 110 V
Ausführung B 24 V und 110 V

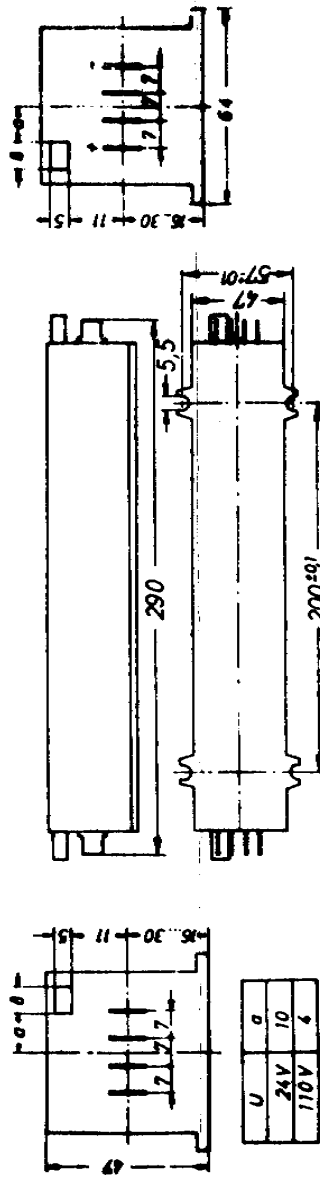


Schéma de branchement
Connections diagram
Anschlussschema

