

USER MANUAL

HIGH VOLTAGE INSULATION TESTER

S-25 DC



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HIGH VOLTAGE INSULATION TESTER S-25 DC



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S-25 DC is a modern, easy in use and safe testing device. Please acquaint yourself with this manual in order to avoid measuring errors and prevent possible problems in operation of the tester.

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1 Safety

All persons involved in the transport, installation, operation, maintenance and repair of this system must have read this user manual carefully.

The system and its accessories are in accordance with the current state of safety technology at the time of delivery. Owing to the work processes involved, however, there may be parts of the system and its peripherals which cannot be given optimum protection without an unreasonable reduction in function and usability.

The following safety instructions must be complied with:

- General instructions
 - ⇒ Work on this system and its peripherals must only be performed by qualified and/or trained staff. Other persons must be kept away.
 - ⇒ This user manual must be available for the supervisory, operating and maintenance staff to refer to.
 - ⇒ Improper use may endanger life and limb, the system and connected equipment, as well as the efficient functioning of the system.
 - ⇒ Always use correct tools in perfect condition.
 - ⇒ Checks must be made to ensure that the relevant safety regulations are being complied with.
 - ⇒ Only operate the system if it is in technically perfect condition.
 - ⇒ No non-original parts may be used for the system and its peripherals, as the necessary safety will not be guaranteed. No mode of working which detracts from the safety of the system must be used.
 - ⇒ The user is under an obligation to report any changes in the system to the supervisor responsible without delay.
- Electrotechnical instructions
 - ⇒ The system and all additional equipment must be connected properly. The relevant regulations must be complied with.
 - ⇒ Maintenance work must only be carried out when the system is switched off (dead) and then only by qualified and/or trained staff.

1.1 Warnings

Important instructions concerning personal protection, work safety and technical safety are indicated as follows:



WARNING

Warning indicates work and operating procedures which must be complied with in full to exclude the possibility of persons being put at risk. This includes instructions concerning particular dangers when handling the system.



NOTE!

Attention indicates work and operating procedures which must be complied with in full to prevent the system/peripherals from being damaged or destroyed.



The note indicates special technical requirements to which the user must pay particular attention when using the system.

2 Overview and functions

The S-25 DC is a generator of high direct voltages. The insulation of cables, electrical plant and plant components can be tested for electric strength with this set. The insulation resistance of test objects can be determined by measuring current and voltage using integrated measuring instruments according to the equation:

$$R = \frac{U}{I}$$

where:

U – measuring voltage,

I – measured current.

The S-25 DC is characterized by small size and low weight. The clear arrangement of controls and indicators makes the set comfortable to handle.

The set has an integrated rechargeable battery. A special protective ground circuit ensures a high level of safety.

2.1 Design of the set

Thanks to its size and weight the S-25 DC can be used directly on-site. State-of-the-art technique and clearly designed operation panel make application easier. The control and display elements as well as the high-voltage outlet are arranged on the control panel. A timer is provided for preselecting the testing time.

2.2 Functionality

- Before the set can be used, the S-25 DC has to be grounded properly.
- When the high-voltage adjuster is set to zero and the timer works, the test voltage can be switched on at the press of a button and increased continuously between 0 V and the nominal voltage.
- The condition of the test object with regard to electric strength and insulation quality can be determined from the values for test voltage and leakage current displayed on the operation unit.
- After testing, the object under test is discharged through the built-in discharging facility.

2.3 Application

The S-25 DC is used for electrical testing of power cables and plant with direct voltage. Areas of application include:

- testing at re-commissioning of cable systems after maintenance and repair,
- testing of newly installed cables and cable joints before commissioning,
- voltage testing at cable sheath,
- testing of electrical equipment.



WARNING

- **Owing to the high voltages which occur, special safety measures are required. These are explained in later sections of the manual (see also sec. 1).**
- **DIGITAL** The digital meters only work when the tester is powered on. In the case of power loss by an activation of the deep discharge protection for the internal battery, check with external test equipment, if the device under test is discharged. Alternatively connect the tester to a power supply by using the power cord to charge the internal battery.

3 Preparation for use

3.1 Front plate of the device

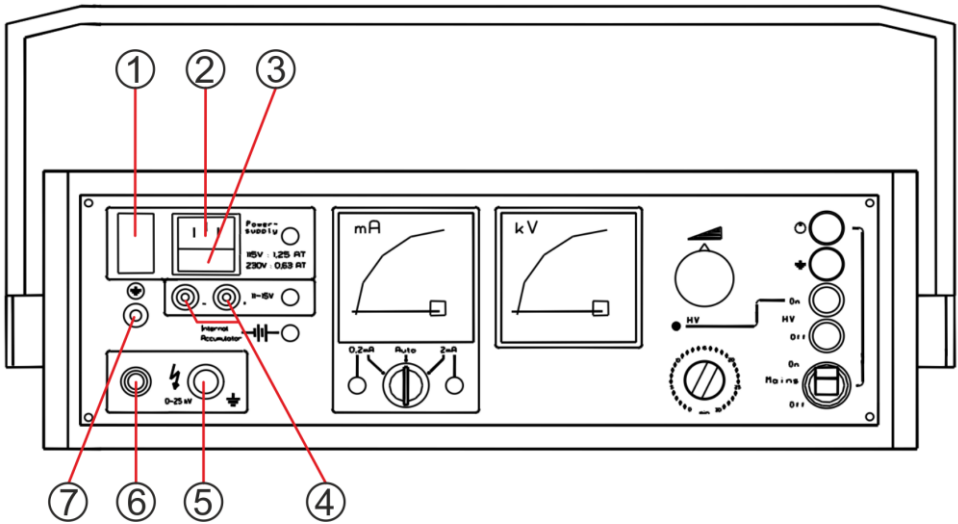


Fig. 3.1 S-25 DC tester connections

- ① Voltage selector: 120 V or 240 V
- ② Mains power supply
- ③ Fuse
- ④ Connector for connecting external battery (11...15 V)
- ⑤ Station ground
- ⑥ HV connector
- ⑦ Protective conductor terminal

3.2 Operating requirements

The carrying handle of S-25 DC is designed for one-hand operating. After putting down the device carrying handle can be locked in 30°-steps by using a pull spring. Pulling on handle unfixes the lock.



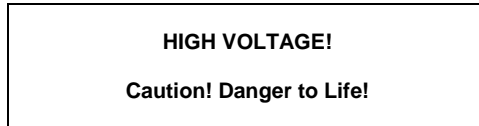
WARNING

The clearance between the high-voltage unit and grounded or live parts as stipulated in EN 50191 must be complied with EN 50191 standard.



NOTE!

During the test, warning signs with the text:



must be put up, and the area of testing must be cordoned off with a barrier. Set up the operating unit at a distance of approx. 3 m from the barrier. It should preferably be set up on a surface which is at operating height.

When the equipment is set up in the field, it must be placed outside the cable trench and protected against dirt and moisture.

3.3 Power supply

3.3.1 Internal rechargeable battery

The set has an integrated rechargeable battery. It powers the device, if the "Mains" switch is set to the "On" position", but the external power supply is not connected. The mains and external battery, if connected, take precedence, however, and cause the internal battery to be switched off.

If the voltage is too low, the colour of the LED (Fig. 4.1 [13](#)) changes from green to red. The high voltage will then be switched off after approximately 10 minutes.

3.3.2 Mains

If the set is connected to the mains, the external DC voltage and internal battery are switched off (signalled by the green LED - Fig. 4.1 [11](#)). Mains operation is accompanied by recharging / floating operation of the internal battery.

The set is switched on with the "Mains" switch, which is signalled by the white standby indicator (Fig. 4.1 [4](#)).

The S-25 DC has a monitoring circuit which switches the high voltage off if the voltage is to low.

The set remains connected to the mains even once the "Mains" switch has been turned off, allowing recharging / floating operation of the internal battery.



NOTE!

Take care of the voltage selector switch (Fig. 3.1 [1](#))!

3.3.3 External battery

The external DC voltage must be in the 11-15 V range. This is indicated by the green LED - Fig. 4.1 [12](#). If the voltage is to low, the colour changes to red. The high voltage will then be switched off after approximately 10 minutes.

3.3.4 Maintenance procedure (internal battery)

To charge the internal battery connect the mains supply to the S-25 DC (LED

Fig. 4.1 **11** lights up). The 'Mains' switch doesn't have to be switched on. It takes approx. 10 hours to fully charge the internal battery from low battery level. The current is changed automatically between recharging / floating operation of the internal accumulator.

3.4 Connecting the test equipment

Before connecting the tester you have to check in accordance with EN 50110-1, that the test object is de-energized. The requirements of EN 50191 and EN 50110-1 standards must be complied with. The test equipment should be connected in the following order:

- 1** All parts (e.g. the other 2 cores of a 3-core cable) which will currently be not tested, must be connected to ground (connect to station ground or auxiliary ground point). In the case of ungrounded test objects, the test set can only be used if an auxiliary ground is provided.
- 2** Establish a conductive connection between the station/auxiliary ground and the ground terminal **5** of the S-25 DC.
- 3** In the case of mains operation the ground safety circuit checks whether the protective ground (protective conductor terminal **7**) and station ground have the same potential. The yellow lamp indicates that the potential is the same. If the lamp does not light up, the potential of the station ground must be checked and a connection established between the protective ground terminal and the station ground. The housing of the S-25 DC has the same potential as the protective ground terminal.
- 4** In the case of internal or external batteries establish a conductive connection between the protective conductor terminal **7** and station ground.
- 5** Connect the high-voltage terminal **6** to the test object.

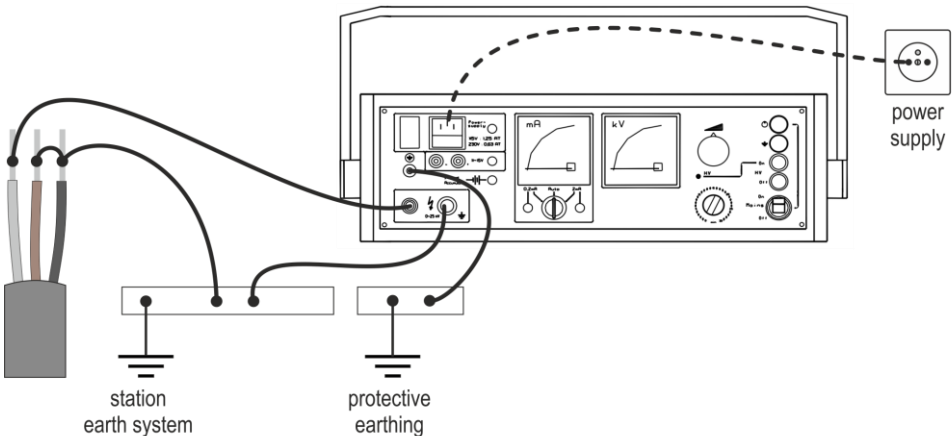


Fig. 3.2 An example of S-25 DC connection during tests

4 Operating the device

4.1 Controls and displays

The controls and displays needed to operate the S-25 DC are on the front of the operation unit.

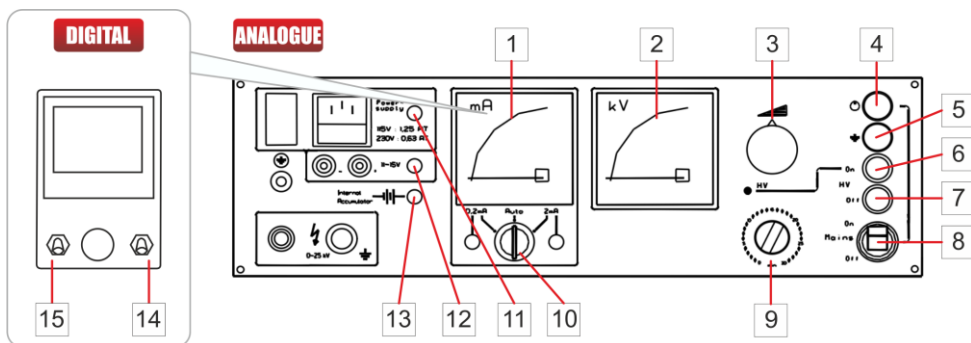


Fig. 4.1 S-25 DC interface

- 1 **Ammeter**
Displays the current flowing through the test object
- 2 **Voltmeter**
Displays the voltage connected to the test object
- 3 **HV adjuster**
Adjuster for the high-voltage. Active only if it is in the leftmost position while enabling the 6 button.
- 4 **"Unit on" lamp (white)**
Lights up when the unit is switched on with the mains switch 8
- 5 **"Ground terminal" lamp (yellow)**
Lights up when the S-25 DC is grounded properly
- 6 **Illuminated "HV On" button (green)**
Button for switching on the high voltage (lights up, when operational readiness)
- 7 **Illuminated "HV Off" button (red)**
Illuminated button for switching off the high voltage (lights up when the high-voltage is switched on)
- 8 **Mains switch**
Optional: key-switch
- 9 **Timer**
- 10 **ANALOGUE Selector switch - current measuring range**
Switches between the current measuring ranges or 'AUTO'
- 11 **LED for power supply**

12 LED for internal batteries

13 LED for external batteries

14 **DIGITAL** Display selection switch – voltmeter
Switches between meter- and graph-display, changes time base

15 **DIGITAL** Display selection switch – ammeter
Switches between meter- and graph-display, changes time base

4.2 Operating procedure

4.2.1 Performing measurements

When the mains switch is turned on, the white pilot lamp [4] lights up. If the equipment is grounded properly, the yellow pilot lamp [5] also lights up. If this does not happen, the S-25 DC still has to be grounded (protective conductor terminal).

Pilot lamp [5] signals proper connection of the station and protective grounds independently of the high voltage being connected. The equipment will only work when all three lamps are lit and the timer is in action.

The green "HV On" [6] button switches the high voltage on if the HV adjuster [3] is in zero position at left stop (second switching operation, interlock, forced zero position).



If you want to select testing times shorter than 5 min, turn the rotary knob of the timer first beyond the position "5" and then to the desired time.

The red illuminated "HV Off" [7] button lights up at the same time, indicating that the high voltage is switched on. The test voltage can now be set by slowly turning the adjuster clockwise. While doing this, remember to follow the increase in voltage and current on the instruments.

ANALOGUE

The output current can be measured in two measuring ranges (0.2 mA, 2 mA), which can be set using a selector switch [10].

- In the central switch position (AUTO), the measuring range is changed automatically.
- The relevant LED indicates the selected measuring range.



- The end stage of the S-25 DC is secured against thermal overload by a reverse voltage divider. In case of overload (e.g., short-circuit at the output), the output current is reduced to a value of about 0.5 mA.
- If the device is powered by Mains Voltage from a grounded Mains socket (the yellow control light lights on), there is no need of additional grounding by the green/yellow protection ground cable.
- If the tester is powered by:
 - ⇒ internal battery,
 - ⇒ by external DC or
 - ⇒ by an ungrounded mains,then connect the green/yellow protection ground cable to an auxiliary earth electrode (safety ground).

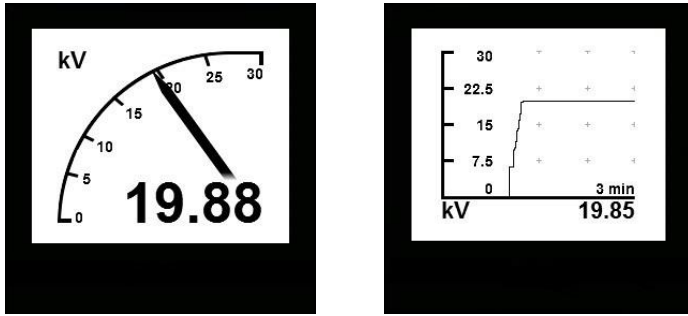


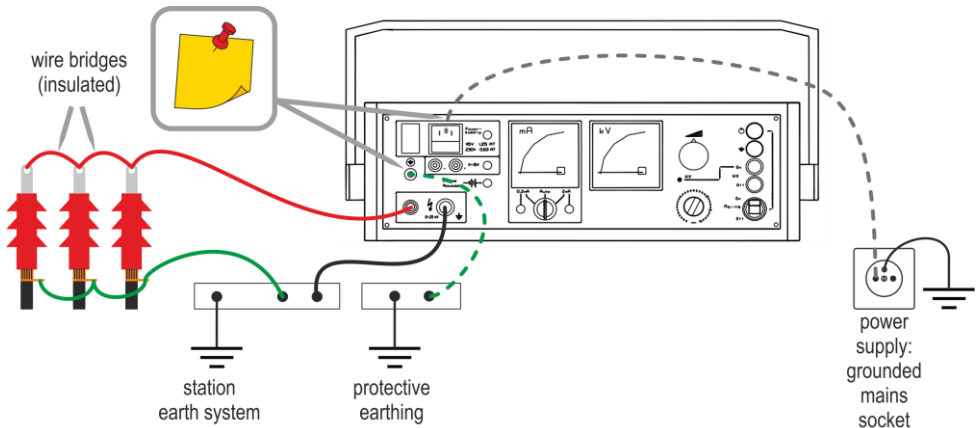
Fig. 4.2 Left: meter display. Right: graph display

During measurement both digital meters can be switched independently between a meter display and a graph display. The right switch [14] is for the voltmeter and the left switch [15] is for the ammeter.

To display the meter, keep the switch in the lower position. For the graph display switch into the middle position. The time base for the graph display can be changed by holding the switch upwards for less than 2 seconds. At the first switch the actual time base is displayed. The next switch activates the next lower time base in predefined steps: 14, 7 days; 72, 48, 24, 12, 6 hours; 60, 30, 15, 3 minutes.



Switching the time base deletes the internal memory of the digital meter. Choose a time base at the beginning of your measurement, which is equal to your expected measure time!



**Fig. 4.3 Connecting the test equipment for insulation testing:
of a 3x single-core system or a three-core cable with separate shield on each core.
All three cores can be tested at the same time**

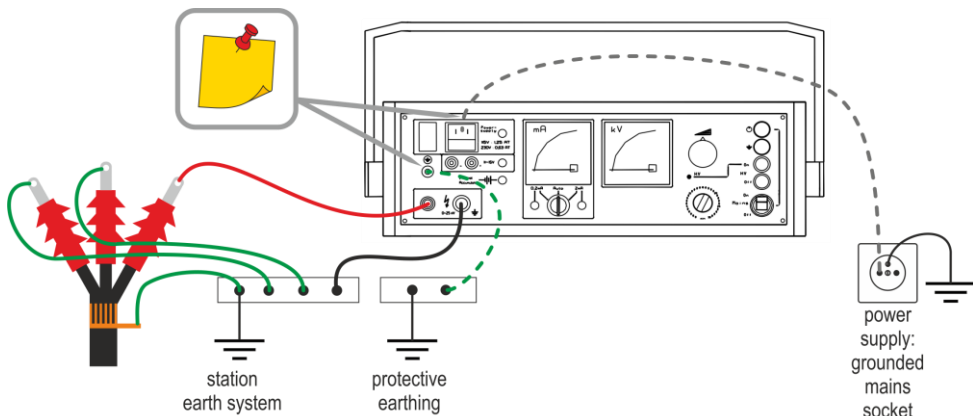


Fig. 4.4 Connecting the test equipment for insulation testing of a three-core cable with only one common shield (e.g. PILC). Each core must be tested separately, the other two cores must be shorted to ground

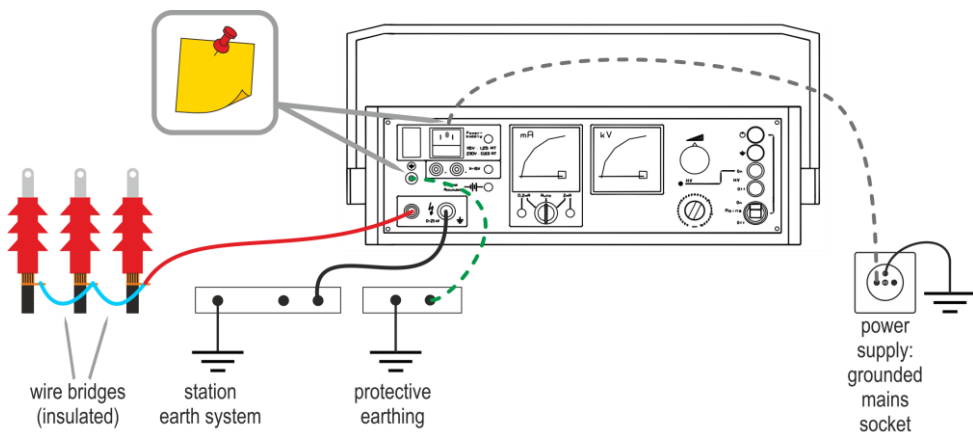


Fig. 4.5 Connecting the test equipment for sheath testing of a 3x single-core system. The sheaths of all three cores can be tested at the same time. The cable shields at the other end of the cable must be disconnected from ground too!

4.2.2 Ending testing

Once testing is complete, turn the voltage down and switch the equipment off ("HV Off" 7). When the test time expires:

- the high-voltage is switched off automatically by the timer,
- the discharge device is activated.

The discharge process of the test object can be followed on the measuring instrument.



NOTE!

After four discharge processes at a maximum, a break of about 30 minutes shall be made in order to allow the discharge resistor to cool down.

Once the displayed high-voltage reading has dropped to 0, the test object can be grounded and the S-25 DC disconnected. Finally ground/short-circuit the test object itself.



WARNING

The high-voltage connector must not be plugged in / unplugged when live.

In an emergency, the high voltage must be switched off by a second operator pressing the red "HV Off" button.

4.2.3 Safety measures

The set must only be operated by electricians in accordance with EN 50110-1. It must only be operated in areas which have been secured and/or cordoned off and marked in accordance with EN 50191 and EN 50110-1 standards. In an emergency, the high voltage must be switched off by a second operator pressing the red "HV Off" button.



Never put equipment into operation in the following conditions:

- high humidity,
- condensing water vapour,
- moisture settling the device and measured object.

Please also follow the safety instructions in **chapter 1**. Reliable grounding of the S-25 DC is always necessary in addition to adequate protection against electric shock.



WARNING

Make sure that the other end of the cable / cables is fenced before unintentional contact by unauthorized persons.

Be aware that residual charges may still be present after discharge in the case of capacitive tests or the voltage may be rebuilt. After completing the measurements, leave the wires and shield/return core grounded.



WARNING

Parallel cables may also still be charged after testing.

5 Maintenance and repair

- The repair work which can be done on the S-25 DC by the user is limited to the replacement of fuses and lamps. Fuses, lamps and tools are included in the service kit.
- The S-25 DC is test equipment and as such must be handled and looked after with care.
- Moisture, external soiling, direct sunlight and ambient temperatures in excess of 55°C must be avoided.
- The exchange of the internal accumulator has to be carried out by a service workshop.
- Don't store the S-25 DC with empty battery!
- Clean digital meters with a dry lint-free soft cloth. Do not use solvents.

6 Technical specifications

- a) power supply mains 100...127 V or 220...240 V AC
 built-in rechargeable batteries
 external DC voltage 11...15 V
- b) power consumption max 120 VA
- c) DC output voltage 0...25 kV (negative polarity, infinitely variable)
- d) output current 1.5 mA
- e) short-circuit current (1.6 ± 0.1) mA
- f) voltage measuring range 0...30 kV
- g) current measuring range
ANALOGUE 0...0.2 mA and 0...2 mA
DIGITAL 0...2000 µA
- h) discharge energy max. 3000 J
- i) operating time at full load with built-in batteries approx. 45 min
- j) operating temperature -25...+55°C
- k) output short circuit and open circuit proof
- l) weight incl. batteries
ANALOGUE approx. 13.5 kg
DIGITAL approx. 14 kg
- m) dimensions 467 x 167 x 284 mm

7 Accessories

7.1 Standard accessories

Standard set of equipment supplied by the manufacturer includes:

- S-25 DC (**ANALOGUE** or **DIGITAL**) with built in batteries and protective case,
- mains connecting cable,
- connecting cable for external battery,
- protective ground cable (green/yellow),
- operation ground cable (black),
- HV-connecting cable (shielded) incl. clamp,
- user manual / service pack,
- packing.

7.2 Optional accessories

Additionally, the following items that are not included in the scope of standard equipment may be purchased from the manufacturer or the distributors:

- AluCase (IP54) with trolley *if ordered with S-25 DC (no soft case and handle),
- Transport case with wheels – **WAWALXXL1**.

8 Manufacturer

The manufacturer of the device and provider of guarantee and post-guarantee service:

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NOTE!

Service repairs must be performed only by the manufacturer.

NOTES



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