# Development and Demonstration of Waste Electrical & Electronic Equipment (WEEE) Prevention and Reuse Paradigms

## Action B.6- Promoting and Supporting WEEE Prevention Culture in Greece

## Deliverable B6.2 Quick Repair Guide for Electronic Appliances

## -Part 1-

**LIFE Environment and Resource Efficiency-LIFE14 ENV/GR/000858**

**ATHENS**

**English version submitted November 2020**

(Original Greek Version submitted June 2017)

**The LIFE RE-WEEE project was 60% co-funded by the LIFE+ programme of European Commission.**
**With the financial contribution of the Hellenic Green Fund**

# Contents



# Table of figures

# 8. Transfer Cables (Sound, Image & Data)

## 8.1. General-Operation Principles

The power supply cables and all their accessories constitute standard equipment of electrical and electronic appliances/devices, regardless of their size or use. Therefore, they constitute a common source of malfunction that the user/owner is able to repair. In this section, and with regard to electronic devices of informatics and communication (TIC), the most common malfunctions that concern the transfer sound, image and data cables are presented.

These particular cable categories are characterized by low or very low voltage currents and are not used to transfer electrical power. Instead, they are used to transfer signals. The cable categories that are used to transfer music, images and data are the following:

- PSTN telephone cables, to transfer voice as electrical signals (low fidelity).
- Sound transfer cables, to transfer sound (high fidelity, such as the one speakers and microphones have).
- Data cables for local networks (LAN) that transfer computer data to relatively medium distances. The basic difference between those and the internal wiring of the computer is that signal variations are more abrupt the latter category in order to reach the highest possible transmission speed. On the contrary the data transfer cables used in local networks, the data that is transferred is configured on an analog signal focusing on a trustworthy signal transfer rather than on the transmission speed.
- WAN (ISDN or ADSL) network cables, that transfer network and internet information to large distances. Like the data transfer cables for local networks, WAN cables use analog configuration in order to achieve transferring to even larger connection distances.
- Electronic device cables, that transfer signals from peripheral devices (printers, screens, etc.) to computers.
- Signal transfer cables, used in televisions, radios, and antennas etc.
- Optical Fibers, that transfer light rather than electrical current. These are considered as cables because of their appearance and construction which are similar to regular cables. Optical fibers transfer light to be used in another part of the source or as a signal.

## 8.2. Indications of Malfunction-Possible Damages

The most common malfunction indications and possible damages of transfer cables (sound, image, data) that may be home-repaired, are cited in the table below:

**Table 8 Malfunction Indications & Possible Damages of Transfer cables (Sound, Image, Data)**

| Malfunction | | Possible Damage | |
|---|---|---|---|
| No | Indication | No | Possible Cause |
| 1 | Cellphone-Smartphone charging failure | 1 | Charging cable's malfunction |
| 2 | External Hard Drive irresponsiveness | 2 | Malfunction of a Standard A type USB 3.1 port |
| | | 3 | Malfunction of Type C USB 3.1 port |
| 3 | Computer screen irresponsiveness | 4 | Malfunction of a VGA port |
| 4 | Router Incapacity to Connect-Network Router | 5 | Malfunction a UTP port |
| | | 6 | Malfunction on one of the Ethernet ports of the terminal wiring connection to computer's network card |

**Figure 1 USB port transfer cable**

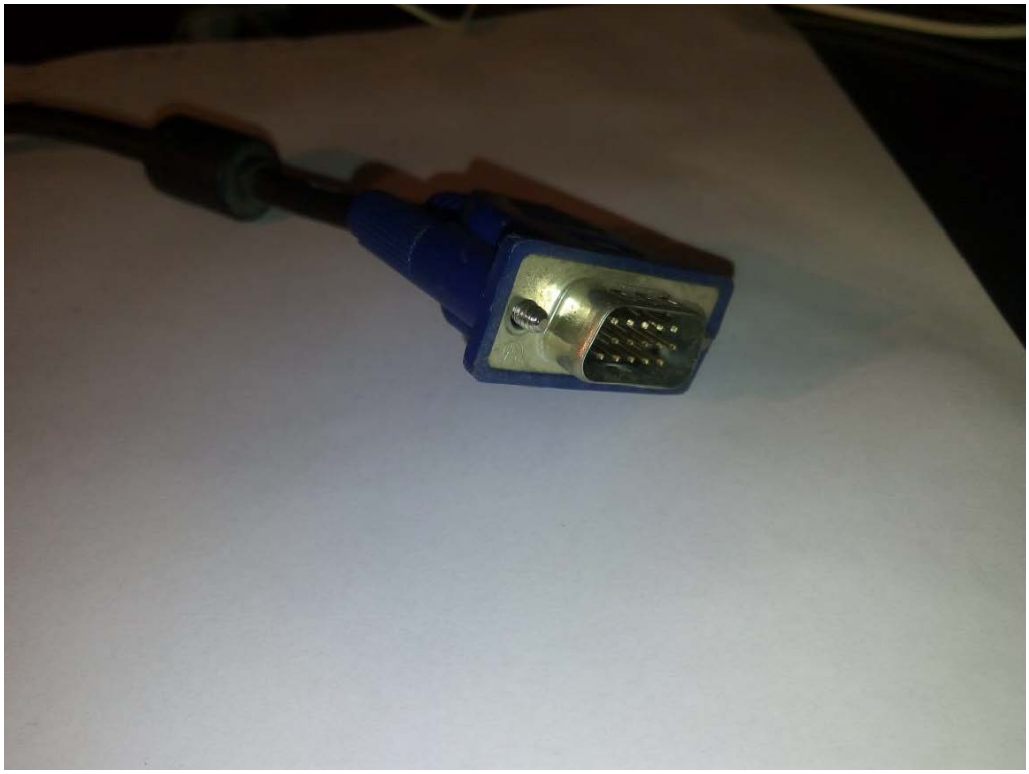


**Figure 2 VGA port transfer cable**

**Figure 3 UTP port transfer cable**

**Figure 4 Ethernet port transfer cable**

## 8.3. Repair Steps

The repair steps that concern the damages cited in Table 8 have already been presented in the following sections of this concise guide:

- Damage No 1: Section 3.3.2
- Damage No 2: Section 5.3.1
- Damage No 3: Section 5.3.2
- Damage No 4: Section 6.3.1
- Damage No 5: Section 7.3.1
- Damage No 6: Section 7.3.2

# 9. Power supply cables - sockets

## 9.1 General-Operation Principles

The power supply cable and its accessories constitute standard equipment of every electrical and electronic appliance/device, regardless of their size or use. Therefore, it constitutes a common source of malfunction that user/owner is able to repair.

Several types of cables exist that serve different causes:

- High voltage cables, to transfer electrical power from the power plants to facilities.
- Low voltage cables, to transfer electrical power to buildings.
- Built-in cables, to transfer electrical power inside the buildings as permanent electrical installations.
- Underground cables, to transfer electrical power underground.
- Undersea cables.
- Appliance-Device cables, to transfer electrical power from the power supply plug.

Cables for domestic-use appliances are the focus of this quick repair guide. The terminal of the particular cables is called the plug. The electrical power is transferred from the plug via the device's/appliance's socket. The other end of the cable, the terminal that connects the table to the device, gives the appliance/device motor or thermal power, depending on the appliance's/device's function.

Concerning electronic devices of domestic-use in Greece (and in EU generally), the most common power cables are the Type C and/or Type F that connect to 220-240 V power supply sockets.

Every power supply has two terminals (phase and neutral) that are inserted in the power supply socket. Type C cables are double stranded, with copper acting as transition material, protected by a plastic enclosure along their length. The first strand (the phase) concerns the transition conductor of the electrical power, whereas the second strand (the neutral) concerns the medium that is related to a closed circuit. Type F cables are triple stranded. The third strand is a safety conductor (grounding). Note that Type F cables are necessary for appliances and/or devices with a metallic protective frame or other external metallic construction parts on/in their bodies.

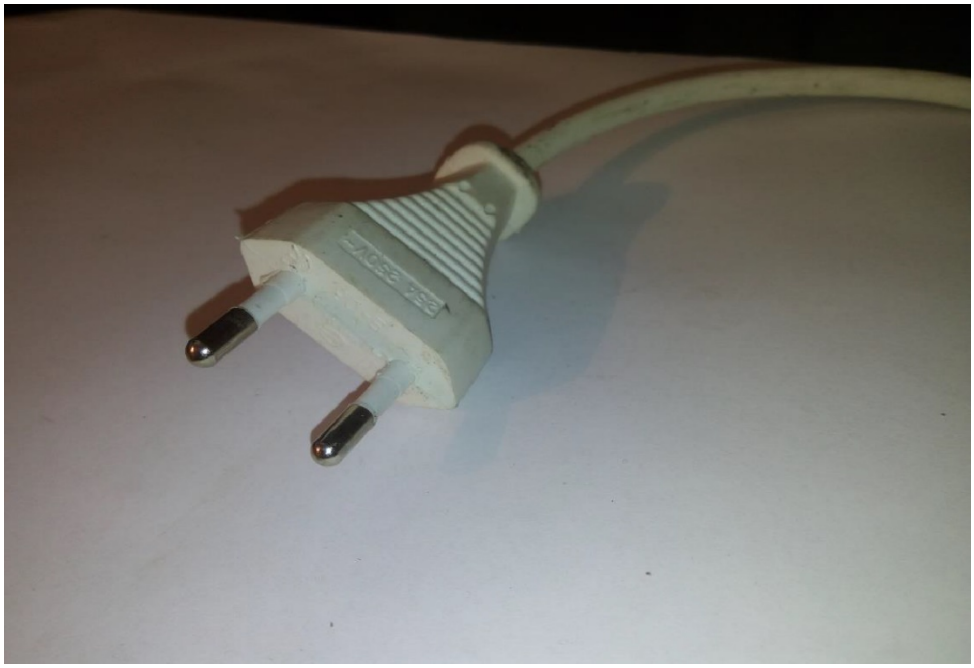


**Figure 5 Type C plug**

**Figure 6 Type F plug ("schuko" socket)**

## 9.2. Indications of Malfunction-Possible Damages

The most frequent malfunction indications and the most common possible damages are cited below in Table 9:

**Table 9 Malfunction Indications & Possible Damages of power supply cables**

| Malfunction | | Possible Damage | |
|---|---|---|---|
| No | Indication | No | Possible Cause |
| 1 | Incapacity to Respond | 1 | Degradation around the plug area |
| | | 2 | Degradation around the terminal socket connecting the cable to the device/appliance |

## 9.3. Repair Steps

For every single damage that is being cited in Table 9, a number of repair steps is presented below. Every repair step is accompanied with infographic material (photos) in order to provide the user with an overview of the repair process.

In order to home-repair the cables, the personal protection equipment required is the following:

- Safety gloves, in order to protect the hands from edgy or sharp elements of the construction parts.

### 9.3.1 Repairing degradation around the plug

In order to repair damage No 1, the required equipment is the following:

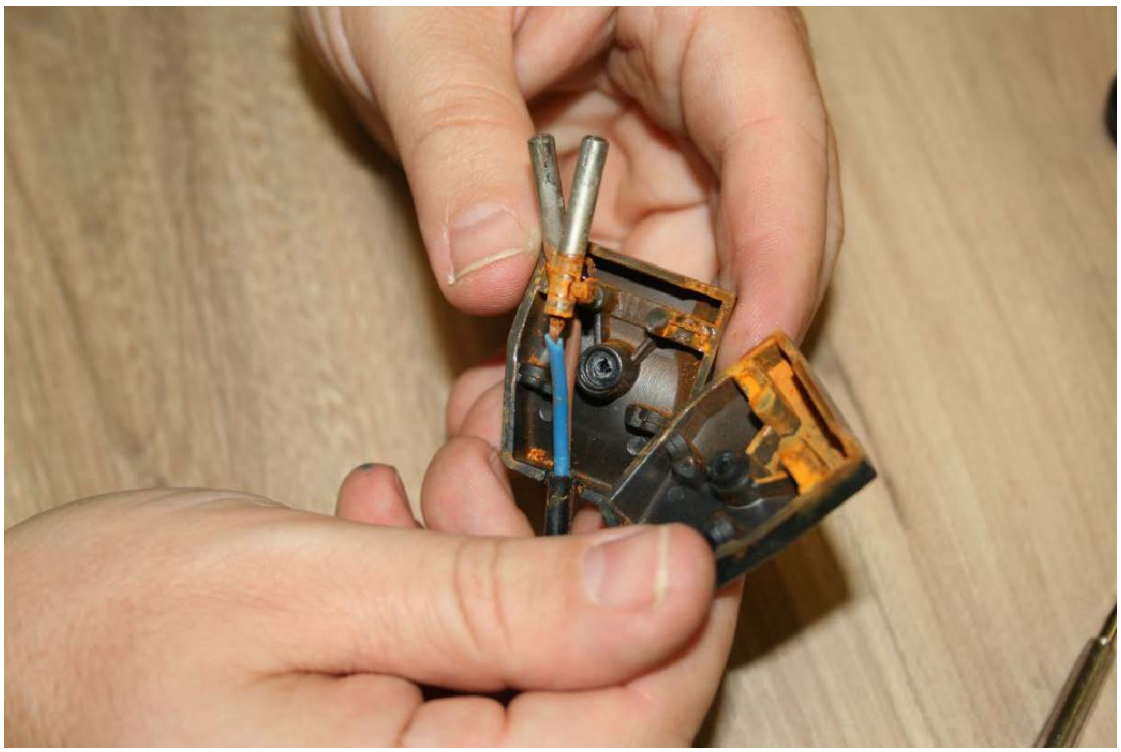
- A cutter/box cutter
- Screwdriver

Malfunction: Incapacity to respond, possibly caused by degradation around the plug's area

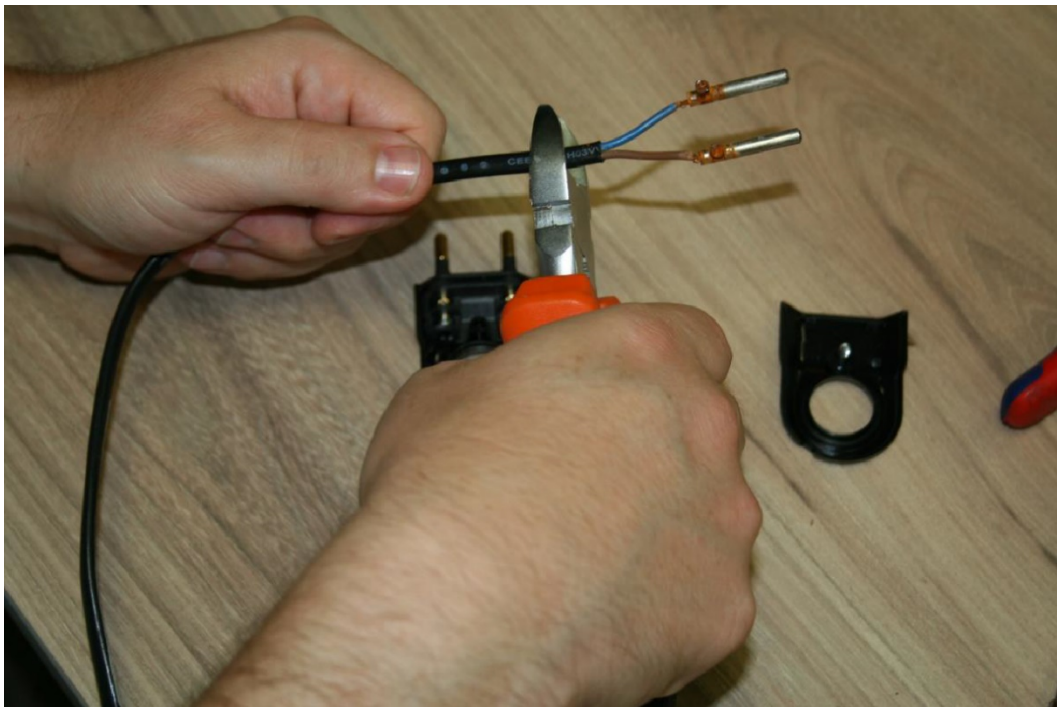
Step 1: Disconnect the cable from the power supply socket.

Step 2: Using the screwdriver disassemble the plug into 2 parts.

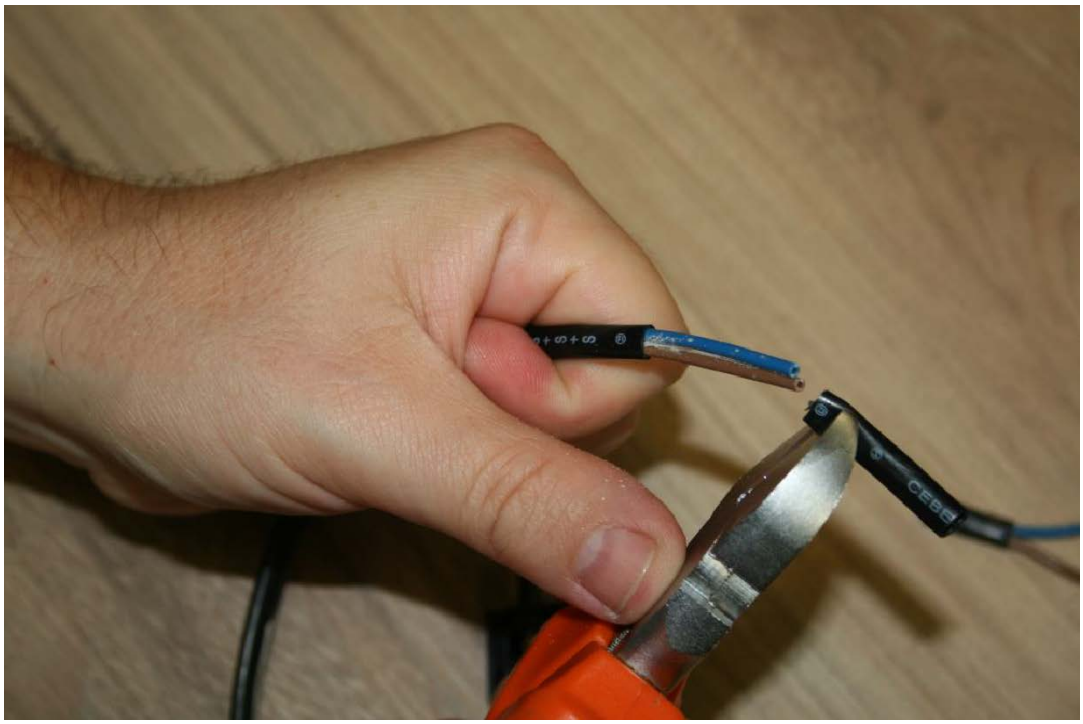
Step 3: Remove the plug's plastic case.



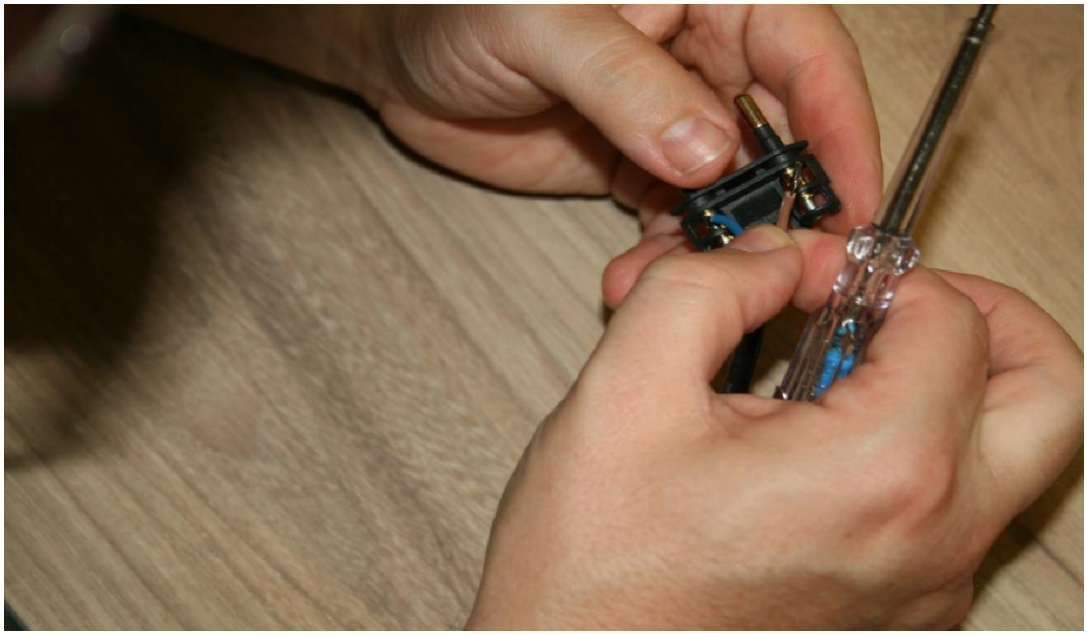
Step 4: Cut the cable a few centimeters before the plug, using the cutter.



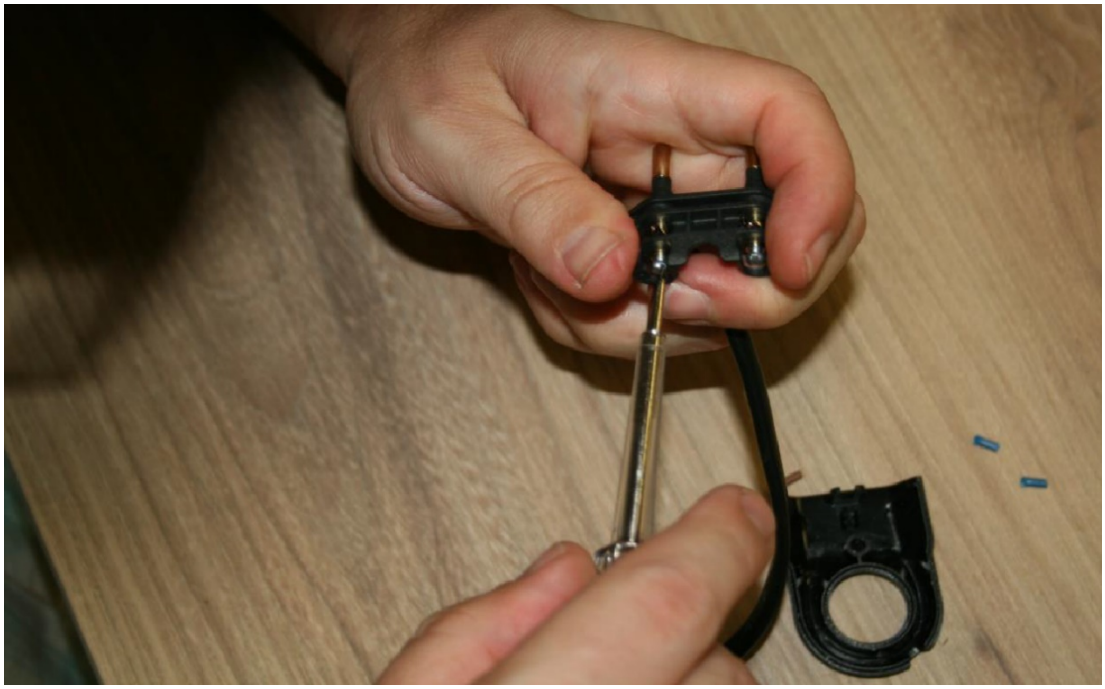
Step 5: Using the cutter, remove the cable's insulation (stripping) in order to access the 2 or 3 strands stored within.



Step 6: After accessing the strands continue removing the plastic enclosure/insulation of the cable. Be careful, proceed gently in order to prevent any unnecessary cuts.



Step 7: Rotate the 2 strands and place them in the corresponding terminals. Screw in 2 small screws in order to bind them well. If a 3rd strand exists, connect it to the appropriate terminal in the plug.



Step 8: Reassemble the components of the plug and connect the 2 parts of the plastic cover by screwing them together with the screwdriver.

### 9.3.2 Repairing damaged cables

In order to repair damage No 2 the following equipment is required:

- Cutter/box cutter
- Screwdriver

Malfunction: Incapacity to respond, possibly caused by around the terminal socket connecting the cable to the device/appliance.

Step 1: Disconnect the appliance from the power supply.

Step 2: Use the screwdriver to disassemble the device's case.

Step 3: Cut the cable a few centimeters before the connection to the "on-off" switch.

Step 4: Use the screwdriver to take out the screws that contain the 2 cable strands of the "on-off" switch.

Step 5: Use the cutter to remove the insulation of the cable (stripping), in order to access the 2 or 3 conductors in it.

Step 6: Remove the plastic enclosure/insulation of the cable. Be careful, proceed gently in order to prevent any unnecessary cuts.

Step 7: Rotate the 2 strands and place them in the terminals of the socket accordingly. Screw in 2 small screws in order to bind them well. If a 3rd strand exists, connect it to the appropriate terminal.

Step 8: Reassemble the protective case of the appliance's body.

# 10. Power outlets

## 10.1. General-Operation Principles

The most common power outlets for domestic-use appliances/devices are sockets with double or triple input ports. Every electrical appliance has a cable that ends up in a plug. The plug has two or three strands that are inserted in the input ports of the outlet. This way electrical power is transferred to the appliance and therefore, a closed circuit is created which is necessary for an appliance to function.

In particular, every power supply socket usually has three input ports, two that serve the electrical power transfer and one for grounding. In Europe, the power outlets provide 220V (380V triphasic) with 50Hz frequency. Until recent years, in Greece, the power outlets mostly had three terminals, that were creating an equilateral triangle. Since 2003 it was decided to not use the particular power outlets anymore, because of the frequency of accidents. Since the early beginnings of 2004 in every European Union's member state schuko type outlets are used, for safety reasons.

The schuko type power outlet has two input ports and two lateral connections. The grounding is connected to the two lateral connections. In modern buildings schuko type sockets are used exclusively, as power supply sources for all the electrical and electronic equipment.

## 10.2. Indications of Malfunction-Possible Damages

The most common malfunction indications and possible damages of a power outlets, that may be home-repaired, are cited in the table below:

**Table 10 Malfunction Indications & Possible Damages of a power outlet**

| Malfunction | | Possible Damage | |
|---|---|---|---|
| No | Indication | No | Possible Cause |
| 1 | Outlet's Incapacity to Respond | 1 | Faulty connectivity among the conductors of the central electrical power network and the input ports of the outlet |

**Figure 7 Schuko power outlet**

## 10.3. Repair Steps

For the damage cited in Table 10, a number of repair steps are mentioned below. Every repair step is accompanied with infographic material (photos) in order to provide the user with an overview of the repair process.

In order to home-repair a socket, the personal protection equipment required is the following:

- Safety gloves in order to protect the hands from edgy or sharp elements of the construction parts.

- Safety goggles.

### 10.3.1. Repairing Incapacity to Respond (faulty connectivity)

In order to repair damage No 1 the following equipment is required:

- Screwdriver
- Impact Driver

Malfunction: Outlet's incapacity to respond, possibly caused by incorrect connectivity among the conductors of the central electrical power network and the input ports of the outlet.

Step 1: Turn off the main power from the fuse box.

Step 2: Test if the outlet is inactive by using the impact driver. Insert the impact driver in both holes of the outlet. If the impact river's indication light remains off then the central electrical power circuit is inactive.

Step 3: Disassemble the protective case of the outlet using the screwdriver.

Step 4: Extract the outlet's body from the wall.

Step 5: Using the screwdriver, disassemble the screws that hold the conductors of the central electrical power supply network to the input ports of the outlet. Extract the two conductors (phase and neutral).

Step 6: Remove the cable's insulation/enclosure using a cutter, in order to access the metallic-copper wire of the two conductor (phase and neutral).

Step 7: Then, remove the insulation/enclosure of the cable at the front end. You need to be very careful in order to avoid any unnecessary cuts.

Step 8: Insert the metallic part of the two conductors (copper wires) in the two input ports. Every input port has a metallic plate that needs be in contact the metallic part of the conductor in order to allow the electrical power tranfer.

Step 9: Using the screwdriver, gently screw in the screws that hold the metallic area of the conductors in place, in order to achieve the necessary contact between them and the metallic plate of the according input port.

Step 10: Place the body of the outlet back into the wall.

Step 11: Screw in the outlet and make sure that is stable.

Step 12: Turn on the main power and use the impact driver. If the indication light turns on, the electrical power passes through the outlet.