ATX power supply tester PST-64

User’s manual

Table of contents

Contents of the set

The set contains:

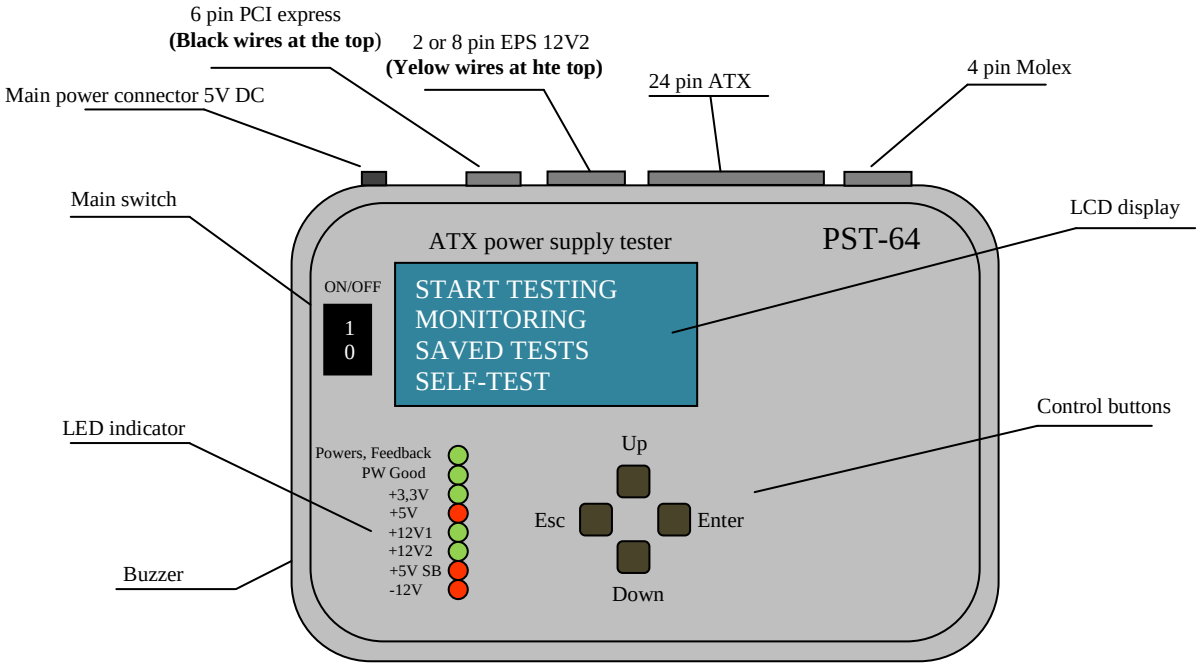
ATX power supply tester PST-64
100...240V/50...60Hz AC input/5V DC output (or 110V/60Hz AC) stabilised main adapter
Power extension cable (SATA to Molex 4 pin)
User's manual
Canvas bag

The device does not contain any batteries.

Description of the device

The PST-64 tester is intended for real, precise and professional testing of ATX power supplies. It provides an overview of all important qualities and values of the unit. PST-64 allows monitoring of voltage without loads in real time, monitoring of voltage fluctuation (Ripple), as well as noise (Noise), the latter an indicator of damaged filtration condensator or damage dealt to the electrical circuit of the power supply. Aside from the load monitoring function, the tester also contains a one-off test mode. In this mode, the device tests the source with resistor loads of a power output of up to 120W, allowing it to examine the source even more thoroughly. A very important indicator of the measured power supply's condition is its calculated rough estimate of maximum output power. The results of such a test can be saved in the internal memory of the device. It is possible to store data records from four different measurements in the memory. The device also includes the „Self-test," function, in which the user can verify the functionality of the tester and its potential basic errors, which could cause imprecise measurements. The tester has a standard power input from the measured power supply. However, in the „Self-test" mode, the tester needs to be connected to the power grid via an independent 230V AC,50Hz/5V DC power adapter, provided as a part of the set.

Main switch – for activating the device.
Power input connector – in case of power input through the adapter.
ATX output power connectors – for connecting the outputs of the measured power supply to the tester.
Display screen – displays detailed information about the measured values.
LED indicator – displays the basic states of the measured values of the individual outputs.
Control keys – for movement within the menu (Up, Down, Enter, Escape)
Buzzer – for the acoustic indication of the various states.

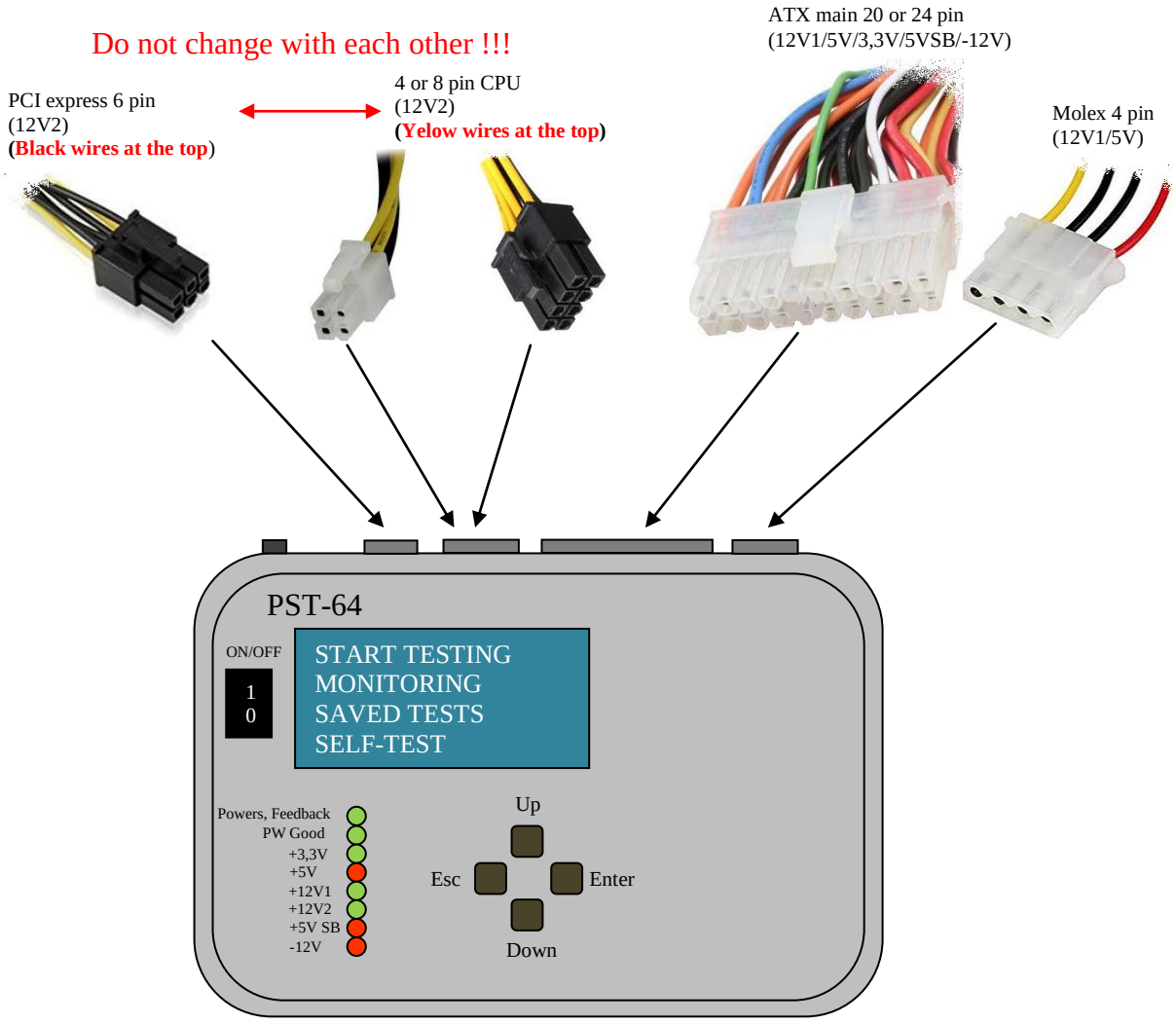


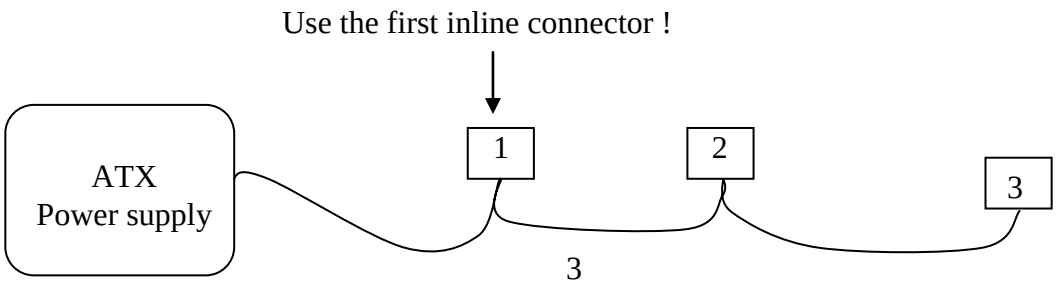
Connecting the power supply

Connect the main 24 pin (or an only 20 pin one) connector of the ATX power supply to the tester. The connector includes all the measured voltages, except for the 12V2 voltage. Subsequently, also connect the connector of the 12V2 output (4 pin or 8 pin – yellow wires at the top, black wires at the bottom). Finally, connect the PCI express connector (6 pin – black wires at the top, yellow ones at the bottom).

WARNING!
The PCI express connector has reverse polarities in contrast to the CPU connector. Be mindful of the correct connection of the connectors, in accordance with the image provided below!

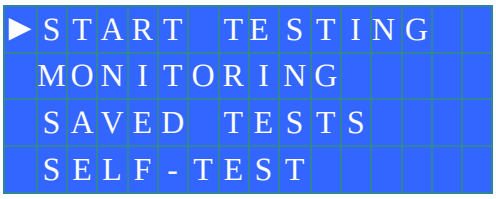
The connector wires, leading from the ATX power supply, have a non-negligible electric resistance that can significantly influence the final value of the measurement. Only connect the connector to the tester, if the connector is first in line of the wires leading from the measured ATX power supply.





Activating the device

After connnecting the ATX power supply to the PST-64 tester, connect the measured ATX power supply to the main and turn it on. Turn on the PST-64 tester by using its main switch. After the device is activated, the base menu will appear on the display screen:



Use the **Up / Down** arrow keys to select the desired mode and confirm your selection by pressing **Enter**.

TESTING – in the course of roughly 5 seconds, the device carries out a measurement of all power inputs of the source with connected resistor loads. After measurements are concluded, errors and the values of measured quantities will be displayed. After measurements are concluded, the measurement data can be saved in the device's memory.

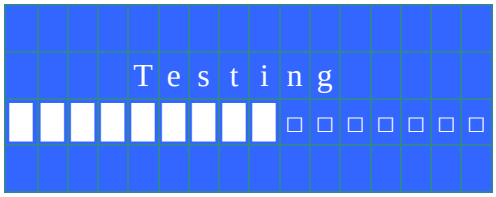
MONITORING – allows for unlimited measurement of the chosen power output without load. It displays voltage, ripple and noise.

SAVED TESTS – contains stored records of tests, measured in the TESTING mode.

SELF TEST – provides the user with the option to verify the state of the tester.

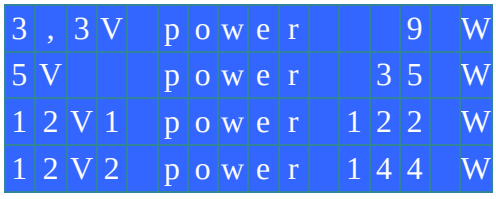
Testing

After confirming testing in the base menu, a test lasting for roughly 4 seconds is automatically initiated.



Screen 1 (LED 1)

After conducting the test, you will hear an acoustic signal consisting of two short beeps and the screen will display the maximum calculated approximative powers of the four basic outputs.

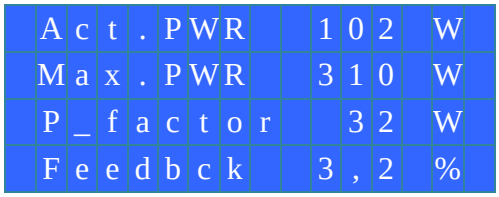


Simultaneously, the LED indicators will light up. A blinking LED indicates a actual display option. The first LED signals the display of screens 1 and 2. Every following LED is assigned to a single screen, with a specific display of quantities. All LED indicators light up in two possible colours – green and red. A green LED represents a positive status, a red LED represents the crossing of a limit or an error of a specific output.

In all of the screens displaying test results, only the following control keys are available: **Up / Down** and **Esc**. While viewing the test results, pressing **Esc** at any point will open the base menu. After pressing

Esc, it is no longer possible to return to viewing the results of the latest test, but it is possible to save the entire test into the internal memory of the device – please see the **„Saved tests“** section.
To browse through all measured and calculated values of a test, use the **Down** and **Up** keys. The records appear on the display screen, based on the selections of the user.

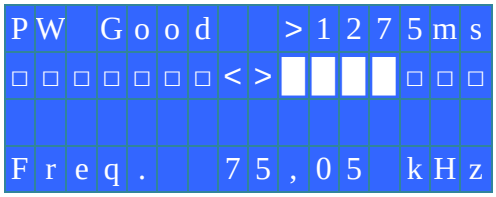
Screen 2 (LED 1)



The first LED on the LED indicator is still flashing. It represents the first two screens of the measured values, which don't contain any error announcements, only the values of individual powers and feedback. The display screen will show the following calculated and measured values:

a) ***Act. PWR*** – currently active power of the tested source - during testing.
b) ***Max. PWR*** – calculated overall approximative maximum possible power of the power supply.
c) ***P_factor*** – represents the power of the power supply while all outputs are under power resistor load and a decline of 100mV on every output. It serves as an indicator of the hardness of a power supply. The higher the **P_factor** number, the more powerfull the ATX power supply.
d) ***Feedbck*** – The last measured value is the feedback of the power supply, described in percent. The feedback of the power supply automatically increases the power of the power supply during the raising of its load. Standard feedback values range from 0,5% to 3%. Higher values represent a raised activity of the pulse generator during a higher load on the source. The feedback values of worn-out or weaker power supplies sometimes range around the level of 10% and more. Power supplies with a high power and quality stabilisation of voltages have a feedback value close to zero. The lower the **Feedbck** value, the more powerfull the ATX power supply.

Screen 3 (LED 2)

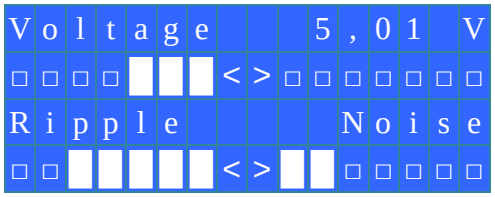


Displayed values:

a) ***PW Good*** – signal sent out by the ATX power supply shortly after its activation. The signal confirms the correct functionality of the power supply and must be sent within the limit of 100 to 500 ms. If this timeframe is shorter or longer than the allowed value, the bar graph will depict active bars, each of which represents a 10 ms length of time for the overtime/undertime. If the time is very short (undertime), the bar graph will swerve leftward, and if long, the bar graph will swerve rightward (overtime). If the time is longer than 1275 ms, the symbol > will also be displayed in front of the number, representing an overrun of that value. Crossing the permitted value will light up the LED 2 indicator of errors with a red colour.
b) ***Freq.*** Represents the working frequency of the power supply. If this frequency is non-stable, instead of a numerical value, the display screen will show: **astable**. A non-stable frequency might mean an incorrect working of the source regulation, but in some cases can be caused purely by an insufficient frequency signal. If the signal is insufficient, meaning that the tester cannot measure

the frequency at all, the display screen will show (instead of a numerical value): **no signal**. The frequency has only an informative character, and therefore doesn't affect the indication of an error.

Screen 4 - 9 (LED 3 – LED 8)



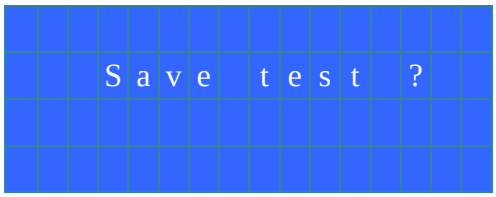
This screen depicts the values of voltage, ripple and noise, individually for each of the voltage outputs: 3,3V_5V_12V1_12V2_5V SB_-12V. Using the **Up / Down** keys, you can display the values of the desired voltage output. You can ascertain which measurement you are viewing by the position of the currently blinking led on the LED indicator.

a) ***Voltage*** – the upper line of the display screen shows the measured mean value of the voltage while under load. The bar graph of voltage shows any sort of exceeding beyond a permitted value. The left side of the upper bar graph represents undervoltage, the right side of the bar graph represent overvoltage. As soon as the permitted value is surpassed by even just 1mV, the first bar will display itself. Each bar added represents 10mV.

b) ***Ripple*** - the lower left part of the display shows the fluctuation (instability) of voltage. The bar graph for this value moves from the middle to the left, if voltage of ripple is over 30mV (3V3 and 5V) and 80mV (12V) – first bar displayed. Each next single bar represents approximately 10mV. *Ripple* shows the non-stable voltage from a frequency of 1 Hz to a frequency of 300 Hz.

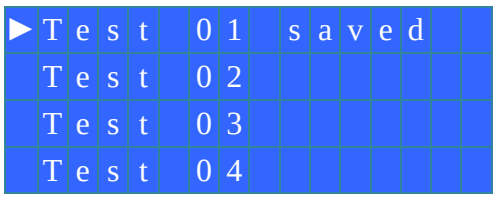
c) ***Noise*** – the lower right part of the display shows the exceeding of the noise (frequency from 20 kHz to 300 kHz) over 30mV (3V3 and 5V) and 80mV (12V) – first bar displayed. Each next single bar represents approximately 10mV. The noise is ordinarily caused by low quality or damaged filtration condensators of the individual outputs.

After concluding the viewing of current test results and pressing the **Esc** key, the following screen will be shown:



a) Another pressing of the **Esc** key will cause a return to the base menu, without the test values being saved.

b) After pressing the **Enter** key in order to save the test, a selection of the four saved tests will be displayed. The **Up / Down** arrow keys can be used to select the number of the test, and thus select in which slot to save the test.



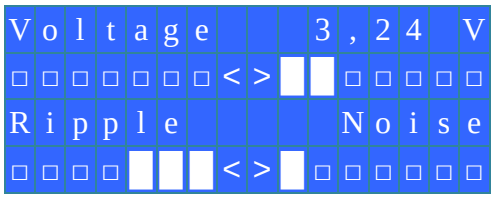
To confirm saving, press the **Enter** key. If a test is already saved in a particular line, it includes the word „saved“ next to the number of the test. By saving the current test, the previously saved test will be deleted

and overwritten by the current one. After the test is successfully saved, the word „saved“ will appear next to the number of the test and subsequently, a box confirming the test being saved will appear:

Following that, the main menu will be displayed automatically.

Monitoring

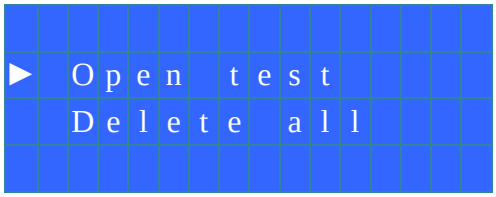
After confirming, the measurement of the individual outputs (Voltage, Ripple a Noise) will commence in real-time, and for an unlimited time period. In this manner, it is possible to monitor the power supply for an unlimited length of time. On the LED indicator, only LEDs number 3 – 8 can be active for the outputs: 3,3V_5V_12V1_12V2_5V SB_-12V, with only one LED lit up at any time, representing the currently measured output.



This display allows the viewing of the voltage value, fluctuation of voltage (Ripple) and voltage noise (Noise). If the values shown are correct, the LED will light up in green. As soon as the tester registers a crossing of the threshold of permitted values on the measured output, the relevant LED will light up in red. This status will remain in the tester memory during the entirety of the „Monitoring“ mode. Pressing the UP / DOWN keys can be used to show the values of the selected voltage output of the measured power supply. Pressing the ESC key will carry out a direct return to the main menu. It is not possible to save the values in the device’s memory while in this mode. During measurement without resistor load in the „Monitoring“ mode, the -12V voltage usually has a lower value and shows an error state. However, this state doesn’t have to represent a real malfunction. This state influences measurement without load. In the „Testing“ mode, when the source is burdened by the resistor load, it adjusts the output voltage -12V to the real value.

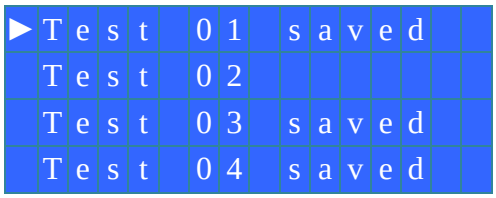
Saved tests

This mode offers the saving of four complete tests in the tester's memory, measured in the „Testing“ mode, available even with a turned off tester. Saved tests can be viewed in the same manner, as if they had been just measured in the „Testing“ mode. Confirming the „Saved tests“ selection in the main menu will show the following box:



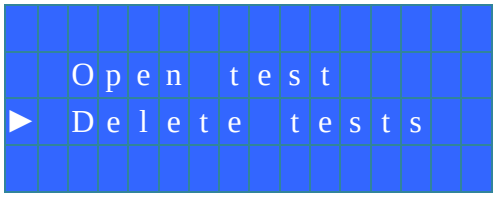
Open test

After selecting the specific saved tests and confirming **Enter**, the complete test is displayed, with all the values, as if testing had been just carried out. Browsing is conducted in the same manner as browsing the test – see the „Testing“ chapter of this manual. The difference between the two browsing modes is that, after completing the browsing of the saved test by pressing **Esc**, the user is returned directly to the main menu, without being offered the option to save the test.

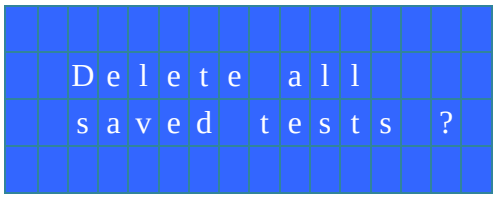


Delete tests

In order to delete all tests, select: „Delete tests“ and confirm by pressing the **Enter** key.



The program will ask one more time, whether you really want to delete all saved tests.

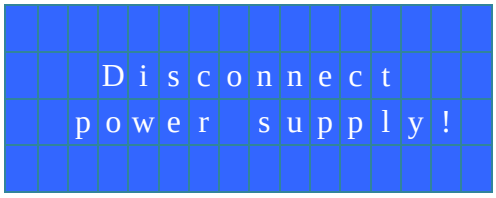


Pressing the **Enter** key will confirm the deletion of all saved tests.

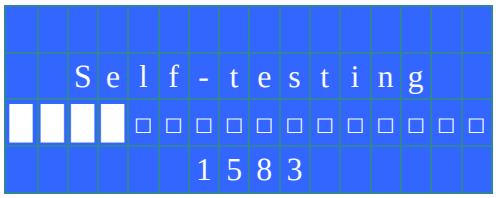
The deletion of individual tests, one by one, is pointless, as this task can be carried out by a simple, direct overwriting during the saving of the current test.

Self - test

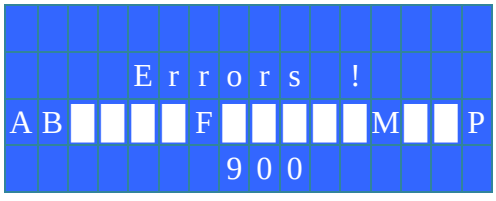
For the user to be sure that the tester is measuring reliably, the device also includes diagnostics of its basic functions. A self-test can only be activated if the device is connected to the electric mains by an AC 230V / 5V DC adapter. During testing, an ATX power supply cannot be connected to the tester !! If the tester registers the connected ATX power supply as being under voltage, it will display the following warning:



If a source not under voltage is connected to the tester, the self-test will display several errors.
Only with the correct connection of the tester to the electric mains via a power AC adapter is it possible to select „Self-test“ in the main menu and reliably verify the status of the tester. After activating the self-test, a screen will be displayed, with a gradually increasing number of white bars on the bar graph. Each bar represents a specific internal test of one of the functions or electronic parts of the device (please see the list of errors, provided below). The LED indicators are tested first, and these must be examined visually by the user. First, the LED indicators will light up red, and after a brief moment, they will light up green. After the LED indicator test, the program continues by testing the internal parameters of the device.



The test proceeds gradually, in individual steps. These individual steps follow each other in roughly 1,5 second intervals, in order to allow the user enough time to monitor the progress of the measurement procedure. During each measurement with the device, the bottom line of the display screen will show the real measured value, representing the numbers of bits, which the user can compare with the reference value (please see the list of errors, provided below). By pressing and holding down the **Enter** key, the test will be paused. After letting go of the key, the test will continue. This mode allows the user enough time to examine the values, in case of an error. After the test is carried out successfully, without errors, there will be two short beeps and the main menu will then automatically display itself.
If any divergence is found during one of the measurements, a letter will be displayed in a specific bar, representing an error in the measurement. After carrying out a whole test that contains even a single error, the display screen will show the warning text ‘Errors !’, and a longer, continuous tone (lasting 1-2 sec.) will be heard. All bars and error messages shown on the display screen, as well as the measured value from the last test, will remain on the screen.



Pressing the **Esc** key will return the user back to the main menu.

List of errors

A – reference voltage of the measurement
The basic voltage, necessary for carrying out the self-test, is missing.
Allowed range: 3900 to 4200

B – relay 3,3V.
If the value is over 1950 – the voltage relay is not activated.
If the value is under 1850 – the power transistor is still open.
Allowed range: 1850 to 1950

C – relay 5V.
If the value is over 1950 – the voltage relay is not activated.
If the value is under 1850 – the power transistor is still open.
Allowed range: 1850 to 1950

D – relay 12V1.
If the value is over 1950 – the voltage relay is not activated.
If the value is under 1850 – the power transistor is still open.
Allowed range: 1850 to 1950

E – relay 12V2.
If the value is over 1950 – the voltage relay is not activated.
If the value is under 1850 – the power transistor is still open.
Allowed range: 1850 to 1950

F – relay 5V SB.
If the value is over 1600 – the voltage relay is not activated.
Allowed range: 1500 to 1600

G – relay -12V.
If the value is over 3700 – the voltage relay is not activated.
Allowed range: 3600 to 3700

H – transistor 3,3V.
Only if the „B“ error is inactive.
Allowed range: 1490 to 1550

I – transistor 5V.
Only if the „C“ error is inactive.
Allowed range: 1490 to 1550

J – transistor 12V1.
Only if the „D“ error is inactive.
Allowed range: 1690 to 1770

K – transistor 12V2.
Only if the „E“ error is inactive.
Allowed range: 1690 to 1770

L – frequency level
Non-functioning output of a frequency level or non-functioning frequency generator of the test.
Allowed range: >900

M – frequency
Non-functioning frequency counter or a non-functioning frequency generator of the test.
Allowed range: 5090 to 5115

N – noise level
Non-functioning output of noise level or a non-functioning frequency generator of the test.
Allowed range: 610 to 690

O – idle noise level
Non-functioning signal module or a foreign electromagnetic interference.
Allowed range: 480 to 540

P – idle frequency level
Non-functioning signal module or a foreign electromagnetic interference.
Allowed range: 480 to 600

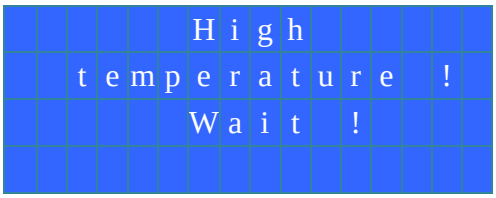
Active errors B to K might influence error messages L to P.
A stronger electromagnetic field in the vicinity of the device can negatively influence the measurements of L,M,N,O,P.

The arrangement of the error indicators.

Warning screens

The raised temperature of the resistors – 1st level

Since quality testing of the source requires measuring the power supply at a sufficient enough load, the PST-64 tester contains power resistors. During the course of the measurement, at a load, the resistors need to convert up to 115W of elektric energy to thermal energy. The duration of the source's is minimized in the tester to the lowest possible degree and during common use does not cross a temperature threshold 5°C higher, than the temperature of the surroundings. However, during repeated, successive measurements, especially in a warm surrounding environment, the temperature of the resistors can rise to a level that can shorten the lifetime of the tester device. The tester does not contain any cooling openings, in order to prevent the entry of any grime and dust into its interior, and its cooling is therefore slower. However, during common operational usage, the device cannot overheat. If the device began to overheat either way, the resistors are equipped with a safety system against overheating, which will inform the user in time about dangerous overheating, as well as simultaneously preventing the further heating up of the resistors. The resistors only grow warm during the course of a test while the device is in the „Testing" mode. Due to this, they can overheat only when the direct test of the source is repeatedly activated. If the temperature of the resistors reaches 50°C and the tester is to carry out another test, with the „Start testing" mode selected, the display screen will show a warning and the tester will let out a single long beep before the process is activated.

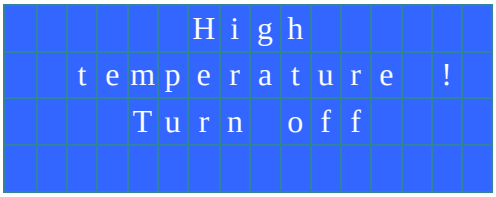


The test was rejected and the device is waiting for the resistors to cool down to 45°C. As soon as the resistors reach this level (i.e. cool down), the device will automatically initiate the user-requested test. However, if the user does not want to wait and wants to, e.g. use the „Monitoring," mode during the cooling time, it is enough to press the ESC key to return to the main menu and then select the desired mode in the menu.

Critical temperature – 2nd level

Despite the quality build of the tester, an unexpected malfunction can sometimes occur (damage to one of the power transistors or the freeze or hang of the processor), which can in turn cause a situation, in which the power input of the load resistor does not shut off. Already within the span of a few seconds, the temperature would reach dangerous level, causing damage to the tester. Therefore, the temperature of the resistance is measured during the activated state of the tester and as soon as the temperature crosses the threshold of 65°C, the measured power supply will be turned off by an independent circuit and the display

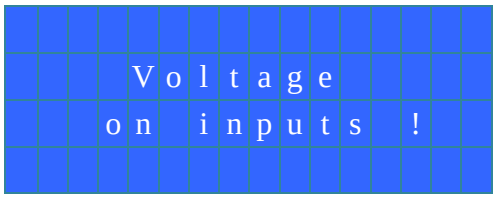
screen will show the following text. Simultaneously, the user will be notified of the overheating by constant beeping in the following intervals: beep 1s, pause 0,5s.



In this state, it is necessary to immediately turn off the tester, wait for it to cool down and then activate the tester in „Self-test“ mode, where it is possible to verify, whether the device has suffered any malfunction. In case no malfunction is found and the tester works reliably after cooling down, the device might have only suffered temporary overheating, caused by consecutively repeated tests while in a warm environment. In such a situation, the temperature of the resistors reached a critical value, though without enough time for the warning system to react.

Voltage on input

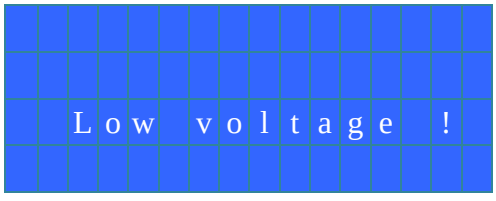
If an active power supply that has suffered a malfunction is connected to the tester, and the user simultaneously selects the „Testing“ mode, this mode will be rejected, since voltages are present on the inputs. The display screen will show the following warning, simultaneously with an acoustic beep:



This status does not occur during common usage. Nevertheless, it can develop while the tester is connected to the power supply via extension cables, allowing for the connection of the tester to a properly running computer power supply. With this type of connection, only the „Monitoring“ mode is usable.

Low power input voltage from the measured power supply

If the power supply is turned on and the warning „Low voltage“ appears on the screen, accompanied by a single long beep, it means that the measured power supply does not offer an adequate enough power input voltage of 5V SB, which could cause an imprecision in the measurement, or even the complete inability to carry out such a measurement. The warning is displayed at a voltage of 4,5V and less.



This warning display can only be cancelled by completely turning off the tester. A power supply with a voltage this low has a malfunction in the basic voltage 5V SB and is considered faulty. If, despite this, you need to test a power supply affected by such a malfunction, use the power main adapter 230V AC to 5V DC along with the ATX power supply.

Important information

1.)
The calculated maximum power of the power supply is of an informative character and is meant to provide the user with an approximate overview of the measured unit's condition.

2.)
If the power supply has hidden faults and worn out components, such a unit might not reach its maximum calculated power during real operation, even though these faults might not register during the measurement itself.

3.)
The resulting calculated value of the unit's maximum power can be influenced by the fluctuation of the voltages in the measured unit, but also the temperature of the unit. This will manifest itself by different calculated powers during repeated measurements.

4.)
While measuring higher power ATX power supplies with a separate regulation of every output, the changes in some values are so minimal, that the analog-digital converter cannot register them to an adequate extent. During repeated measurements, they can cause a divergence up to several tens of watts with each measurement.

5.)
If the ATX power supply has a non-functioning 5V SB voltage output, which simultaneously serves as a power input (source) for the tester and for activating the measured unit, it is not possible to measure the source for testing or otherwise activate it in any way.

6.)
While measuring in the „Testing" mode, a roughly 20A electric current flows through the connectors. It is therefore necessary to pay attention to a quality connection between an ATX power supply undergoing measurement and the tester. The connectors must be clean and well plugged in, in order to prevent too great a contact resistance on the electrical contacts of the connectors. It would cause an incorrect measurement.

7.)
If the measured unit is heavily damaged, it doesn't have to reach even the basic output power needed for providing power to the load resistors on the PST-64 tester and can completely fail already during the measuring process and experiencing a load.

Warning !

Never leave the tester active without oversight! It contains a source of thermal energy (load resistors).
Do not expose the tester to extreme weather, thermal, mechanical, elektromagnetic, chemical and any other conditions, which could damage it or lower its lifespan!
Do not attempt to repair the device or otherwise interfere with its contents! You could damage the device in the process or change its properties and thus lower its precision.
Use the device only for measuring of ATX power supplies!

Technical parameters

Power input:	5V DC stabilised (5V – 6V DC)
Power input adapter:	100 - 230V AC / 5V DC - 1A - 5W
Warning about low voltage:	< 4,5V on board
Infeed power:	< 50mA
Voltages' measurement resolution:	0,01V
Voltages' measurement precision:	12V ± 0,5%, 3,3V, 5V ± 1%
3V3 over Noise / Ripple bars display	>30 mV first bar + approx.10mV every next bar
5V over Noise / Ripple bars display	>30 mV first bar + approx.10mV every next bar
12V over Noise / Ripple bars display	>80 mV first bar + approx.10mV every next bar
Noise measurement precision:	± 10% from 15 kHz to 200kHz (below 15 kHz and above 200kHz, the precision declines)
Ripple measurement precision:	± 10% from 30 to 300Hz (below 30Hz and above 200Hz up to 500Hz, the precision declines)
PW Good measurement precision:	± 2%
Frequency measurement precision:	± 0,2%
Range of the measured frequency:	15kHz – 200kHz
Resistor load:	115W (3,3V – 10W, 5V – 25W, 12V1 – 40W, 12V2 – 40W)
Working temperature:	-5°C až + 35°C (a temperature below 25°C is appropriate for the resistors)
Temperature warning 1st level:	+50°C
Temperature warning 2nd level:	+55°C
Case dimensions:	H - 55mm, W - 190mm, L - 140mm

The tables below contain an overview of the maximum and minimum permitted values of voltages, ripple, noise and PWR_OK (PWR_Good) signal. The PST-64 tester respects these values and will immediately evaluate and indicate all overruns of these values.

DC output voltage regulation

Output	Range	Min.	Norm.	Max.	Unit
+3,3V	±5%	+3,14	+3,3	+3,47	Volts DC
+5V	±5%	+4,75	+5,00	+5,25	Volts DC
+12V1	±5%	+11,40	+12,00	+12,60	Volts DC
+12V2	±5%	+11,40	+12,00	+12,60	Volts DC
5V SB	±5%	+4,75	+5,00	+5,25	Volts DC
-12V	±10%	-10,80	-12,00	-13,20	Volts DC

Ripple and noise are defined as periodic or random signals over a frequency band of 10 Hz to 20 MHz.

DC output Noise / Ripple standard limits / tester PST-64 limits (clamptdown)

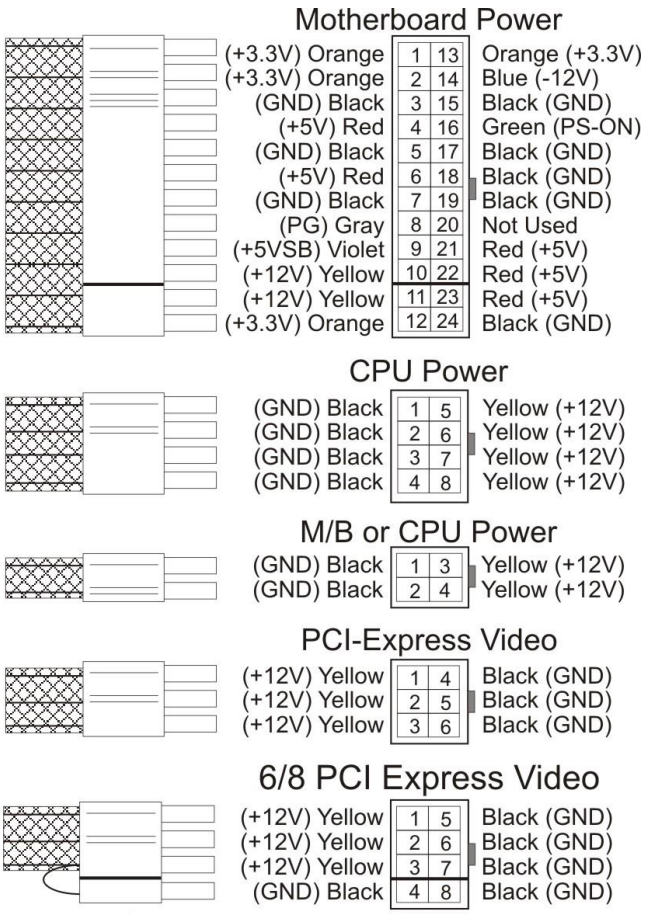
Output	Max Ripple & Noise
+3,3V	Standard 50mV / set **30mV**
+5V	Standard 50mV / set **30mV**
+12V1	Standard 120mV / set **80mV**
+12V2	Standard 120mV / set **80mV**
5V SB	Standard 50mV / set **30mV**
-12V	Standard 120mV / set **80mV**

PWR_OK signal

Input	Min.	Max.	Unit
PW Good (PWR_OK)	100	500	Miliseconds

The maximum permitted electric current loads of the ATX power supply are noted separately on every unit.

Power connectors



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