

# INVERTER CHECKER

*Equipment for testing and diagnostic of the  
**FUJITSU-GENERAL**  
inverter split systems*

# USER MANUAL

## **UTQ-TOOLBOX contains:**

UTQ-COMP - checker for DC compressors

UTQ-DCFM - checker for DC fan motors

UTQ-STPM - EEV stepper motor and louver motor checker

UTQ-COMSIM - simulation of indoor and outdoor units, monitoring of communication

UTQ-COMTEST - checker of correct unit wiring and their communication

UTQ-LOGGER - recording device for communication data

UTQ-UPGC - USB data cable for software upgrade of the inverter checker modules

UTI-FG-BT - monitoring of FGL using Bluetooth module and mobile

UTQ-CASE - carrying case

## SAFETY PRECAUTIONS

### **WARNING**

This mark indicates procedures which, if improperly performed, might lead to the death or serious injury of the user.

- All work associated with installing and connecting the checkers may be performed only by a person with qualifications in the field installation and servicing of Fujitsu air conditioning and must be licensed to work on electrical and cooling equipment.
- The compliance with installation instructions provided in this documentation is necessary for ensure technical parameters and reliable operation.
- Do not turn on the power of the unit until all installation work is complete.
- During the tests: Do not touch the exposed connectors! There is high voltage and a danger of electric shock.

### **CAUTION**

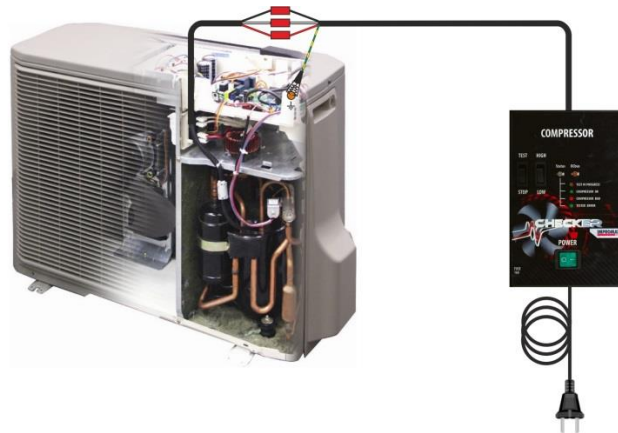
This mark indicates procedures which, if improperly performed, might possibly result in personal harm to the user, or damage to property.

- The manufacturer is not liable for damages caused by failure to comply with technical specifications, errors in installation, maintenance and improper use of the product.



# COMPRESSOR CHECKER

Functional testing of inverter DC compressors



## Preparation for testing:

- Disconnect the cables of the compressor from the outdoor unit PCB.
- Use an ohmmeter (with a range of megaohms) for checking possibility of short circuit or leakage between the connector contacts and the motor frame. All values must be outside of top of the range of the ohmmeter. Otherwise, the motor is defective. **Do not continue with testing**, the checker could be damaged.
- Check the resistance between the compressor leads with ohmmeter. The value of resistance of the motor winding can be, depending on the compressor, in the order of tenths to whole Ohms. It is essential that the resistance of all winding showed the same value. If any value is significantly different, the engine is defective. **Do not continue with testing**, the checker could be damaged.
- Connect the power cord lead to the 230VDC power supply of the tester (fused at least with 16A circuit breaker). The switch "POWER" must be in position "O", switch "TEST" in position "STOP" and the desired speed of compressor must be set by switch in position "LOW"
- Connect the cable of the checker to the three connectors of compressor windings and ground clamp to the frame or chassis of the outdoor unit.

## Test of the compressor

1. Turn on the tester by switch "POWER"
2. After pressing the TEST switcher, the compressor will start and its speed is gradually increasing from zero to 50% of the maximal speed. LED during the test alternate between red and green.
3. Please do check the running compressors check by hearing in case that shows any unusual noises.
4. After the test of the compressor, the final result is indicated by LED "Status"
  - Continuous green light ... compressor is OK
  - Red flashing ... compressor is faulty (detailed errors identification - see Table)
  - Green flashing ... checker error (detailed errors identification - see Table)






In case of a positive test result from position "LOW", the test can be repeated again with a speed switch in position "HIGH". This mode will increase speed gradually up to the maximum of 100%.



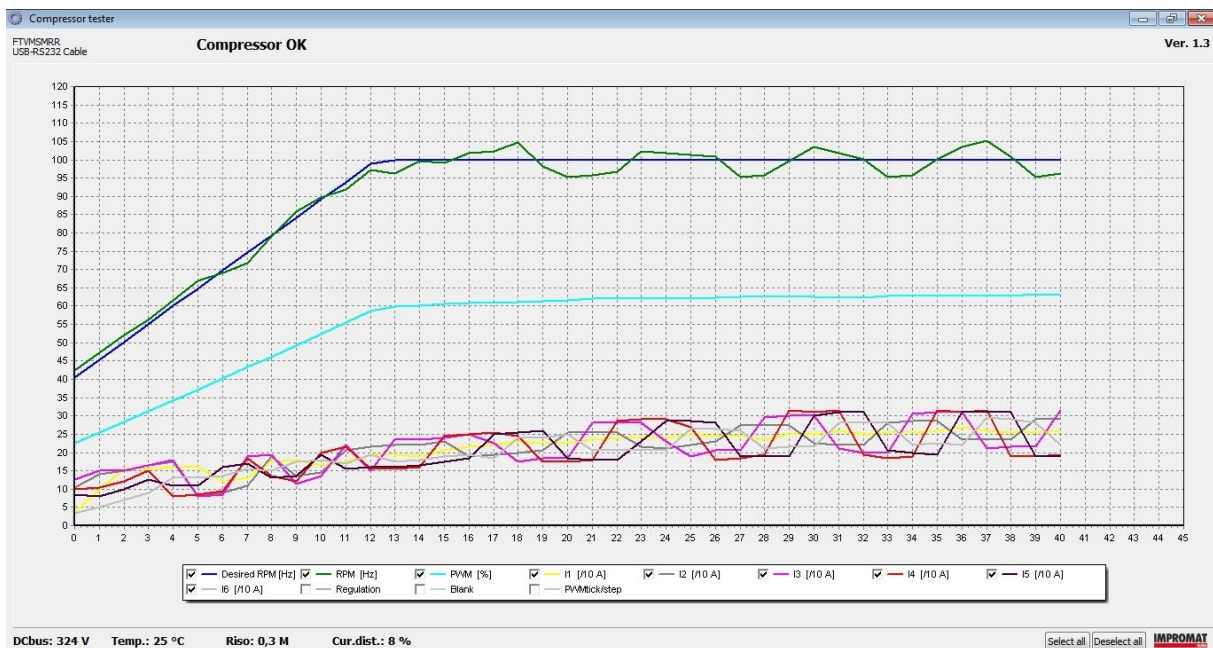
**CAUTION**

**Before each repetition of the test is necessary wait at least three minutes until the pressures in the refrigerant circuit gets balanced again!**

# COMPRESSOR CHECKER

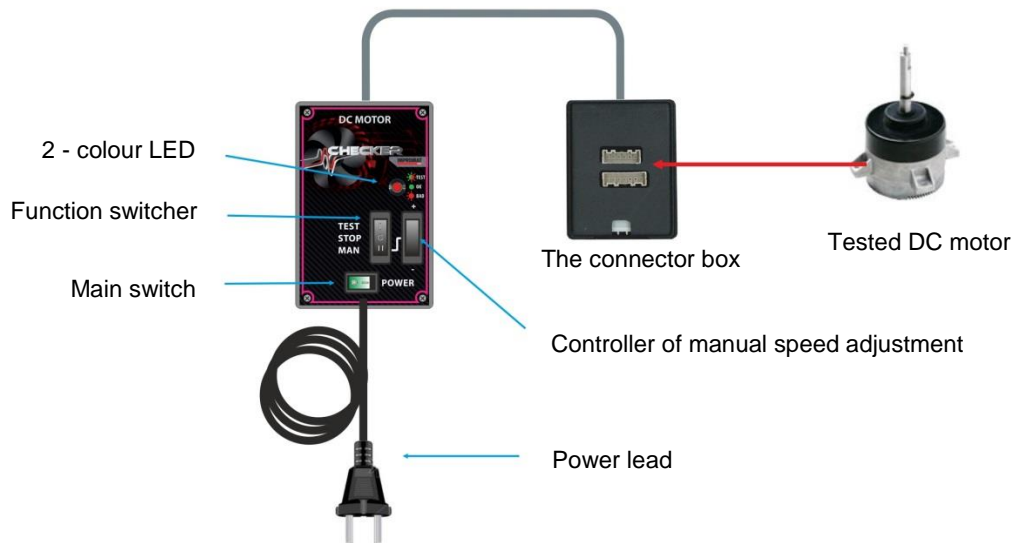
 RED and GREEN flashes alternately	The TEST is running
 GREEN lights continuously	The compressor is OK
 RED flashes	<b>ERROR of the compressor :</b> 2x it's not possible reach the maximum rotor speed 3x phase currents asymmetry - different winding resistances 4x winding insulation resistance to ground <1MOhm 5x supply current limit exceeded 6x compressor spin failed
 GREEN flashes	<b>ERROR of the Checker:</b> 2x DC bus low voltage +350 V (less than 300V) – check the power supply of the tester 3x high temperature of heat sink – please leave the tester cool down
 RED flashing rapidly	<b>Firmware of checker is faulty</b> – upgrade was not successful. In this case, it is necessary to repeat the upgrade again (see chapter - UPGRADING cable).

Testing software – see the example of testing with the result: Compressor is OK



# DC MOTOR CHECKER

Functional testing of DC fan motors of indoor and outdoor units



## Test process:

- Turn off the power of the unit and wait a few minutes for the power supply capacitors to discharge.
- Disconnect the DC motor connector from the control PCB of the unit.
- Turn the rotor of the fan by hand. If you can feel a significant resistance, the motor is faulty. In that case, **do not continue with testing**, the checker could be damaged.
- Use an ohmmeter (with a range of megaohms) for checking possibility of short circuit or leakage between some of the motor leads (red, black, white) and the motor frame. All values must be outside of top of the range of the ohmmeter. Otherwise, the motor is defective. **Do not continue with testing**, the checker could be damaged.
- **Use an ohmmeter to check the resistance between each motor power connections (red, black, white) - must not show measurable resistance. Otherwise, the motor is defective. Do not continue with testing, the checker could be damaged.**
- Connect the motor to the checker. During the connecting, the checker must be switched off by main switch and the function switcher in position 0!



**Plug the motor connector to the mating connector in connector box. Attention! Connectors of certain motor types have colour coding in reverse order. Make sure that the colour of cable wire matches the colour coding of engine connector; otherwise the engine and the checker can be damage.**

**AUTO test:** Turn on the main switch and then the function switcher to TEST mode. The motor spins continuously and then reduces speed to zero. During the test, the LED flashes in red and green alternately. Keep checking if the motor does not have any vibration, or unusual noises. If the LED after the test is lit in solid green, the engine is electrically fine. If the LED is lit in solid red or flashing red, the engine is faulty. If the automatic test is successful, the engine can be tested in a manual mode.

**MANUAL test:** Change the function switcher to MAN. In this mode, you can increase or decrease the speed by control manual settings. Test the motor gradually throughout of his speed range. If the engine does not respond correctly, or LED lights up red, the engine is defective.

# DC MOTOR CHECKER


 **WARNING**

- During the test, the motor must be properly fixed to avoid any personal injury or material damage.
- And also do not touch the connectors! There is high voltage and a danger of electric shock.
- Tester may use only competent person which is able to work with electrical equipment.

 **CAUTION**

The engine must be loaded during the test, if possible with the original fan rotor (propeller). Unloaded motor may (depending on type) show during acceleration twitching, irregular operation, vibration or engine can be evaluated by tester as faulty.

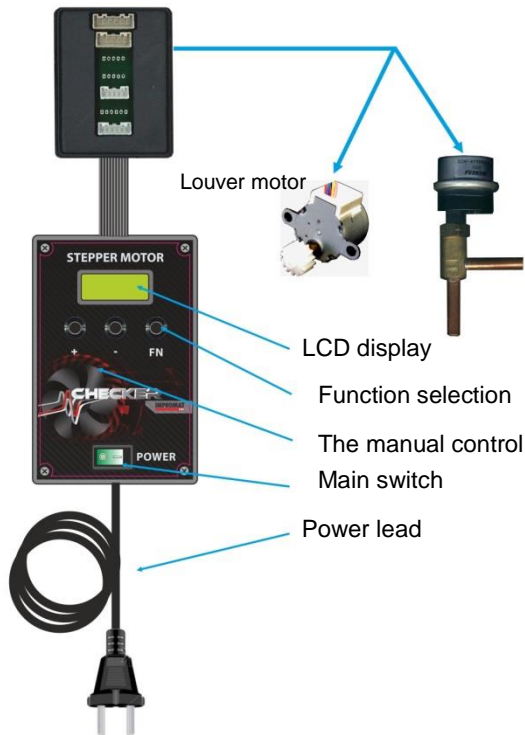
## ERROR TABLE

 Red blinking	2x breakdown of DC voltage into +15V power supply
	3x breakdown of DC voltage into PWM outlet
	4x breakdown of DC voltage into PULSE outlet
	5x low voltage + 15V is less than 14V
	6x voltage +350V is less than 200V
	7x overload of PWM
	8x exceeded the current limit

# STEPPER MOTOR CHECKER

Functionality testing of motors of electronic expansion valve (EEV) and also the louver stepper motors.

The connector box

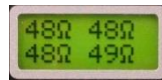


## 1. Testing and adjusting the position of stepper motors:

- Connect the stepper motor to the checker and turn on the main switch ON.

- Press the button FN and select function EL.CHECK, press +, then checker will automatically check all four motor windings.

The result is displayed on the LCD display. Any significant difference between the four results means that EEV is faulty.



- Press the button FN and select function MANUAL or FAST. Use the buttons + and - to manually control motorized rotating in both directions (e.g. close and opening EEV). Check if the motor rotates correctly.

## 2. Monitoring the operation of stepper motors controlled by PCB unit:

- Turn off power to the unit.

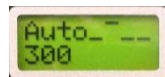
- Disconnect the stepper motor connector from PCB and connect instead the flat cable connector from the connector box.

- Cable of stepper motor is connected to corresponding connector in connector box.

- Power ON the unit and the checker.

- Press the button FN and select function AUTO. Now is possible to

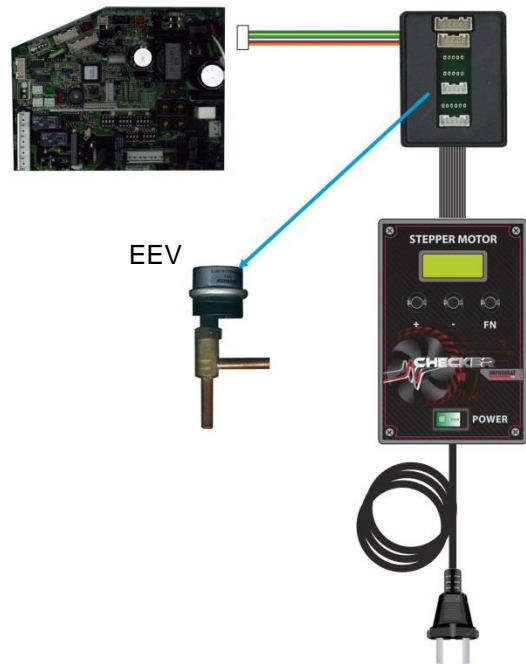
see and track the number of pulses of the stepper motor controlled by the unit.



If you need to open or close EEV more, please use for it the buttons + and -

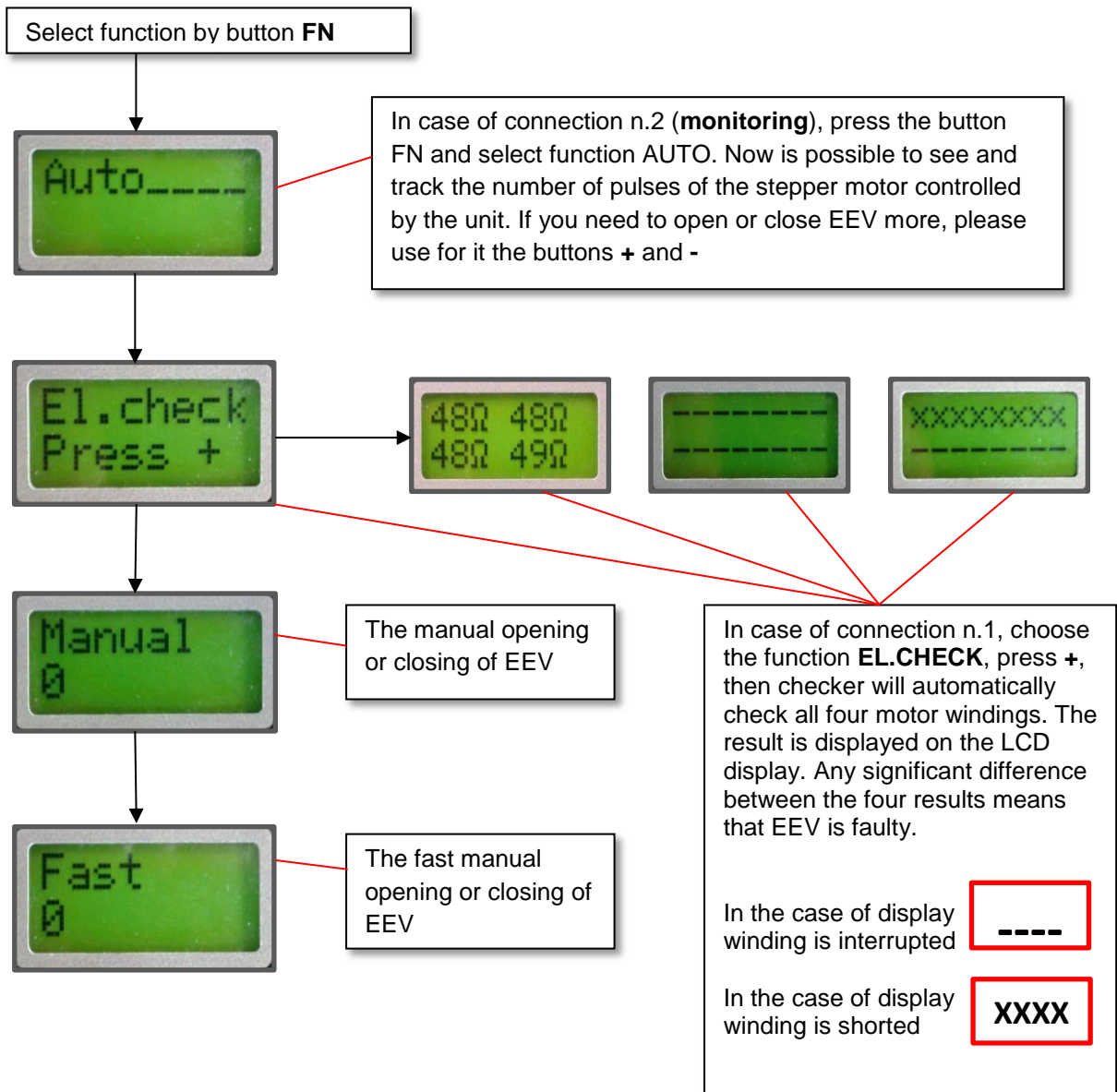
- During the monitoring is also possible to see status of the excitation pulses (- - -) but in case of any prohibited pulse combination, the checker will display symbol E.

Control PCB



# STEPPER MOTOR CHECKER

Schematic view of individual checker screens with detail explanation.



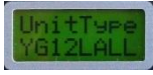


# SIMULATOR CHECKER

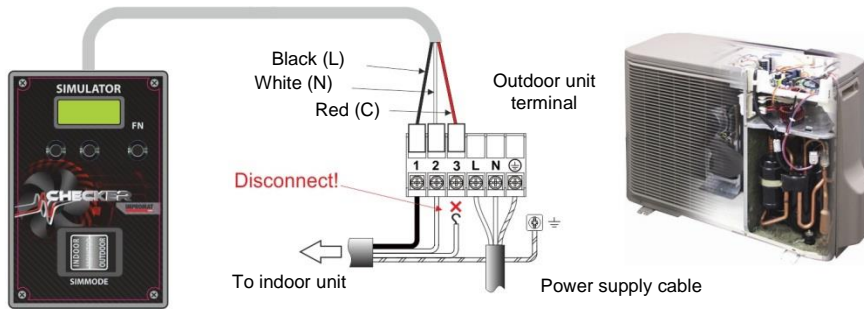
Simulator of indoor and outdoor unit, communication monitoring

## Testing of inverter outdoor units by simulations of the indoor unit (possible use with LOGGER)

- Turn off power supply of outdoor unit.
- From the terminal, designed for connecting cable, disconnect the communication cable.
- Connect the tester to the outdoor unit through a terminal intended for the connection cable.

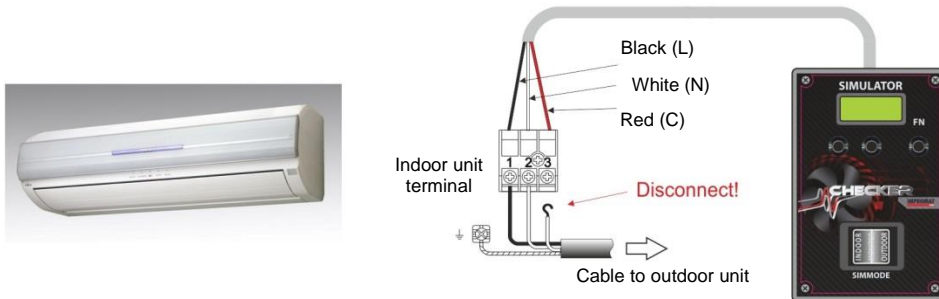


- On the tester set the function switcher to INDOOR position.
- Turn on power of outdoor unit and in the menu set the right model of the unit (or type of communication AOYA, AOYD, AOYR, AOY, DX)
- Now the outdoor unit can be controlled by SIMULATOR CHECKER



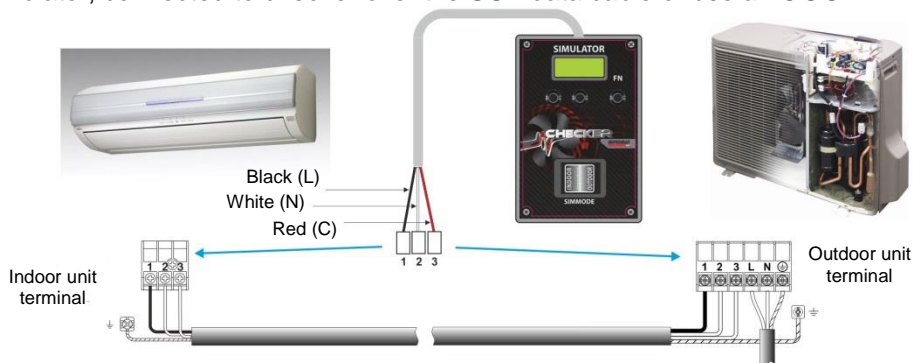
## Testing of indoor unit by simulation of outdoor unit (possibility use with LOGGER)

- Turn off power supply of outdoor unit.
- From the terminal, designed for connecting cable, disconnect the communication cable.
- Connect the tester to the indoor unit through a terminal intended for the connection cable.
- On the tester set the function switcher to OUTDOOR position.
- Turn on power of indoor unit and in the menu set the right model of the unit (same as for indoor mode)
- Now the indoor unit can be controlled by SIMULATOR CHECKER



## Monitoring of communication between indoor and outdoor unit (possibility use with LOGGER)

- Turn off power supply of outdoor unit.
- Connect the tester to the indoor unit through terminals, designed to connect the cable.
- On the tester set the function switcher to MONITOR position
- Turn on power of outdoor unit + indoor unit
- Now you can monitor the communication between the indoor and outdoor unit by program Simulator, connected to checker over the USB data cable or use a LOGGER.




Tester is possible to connect either to indoor or outdoor unit

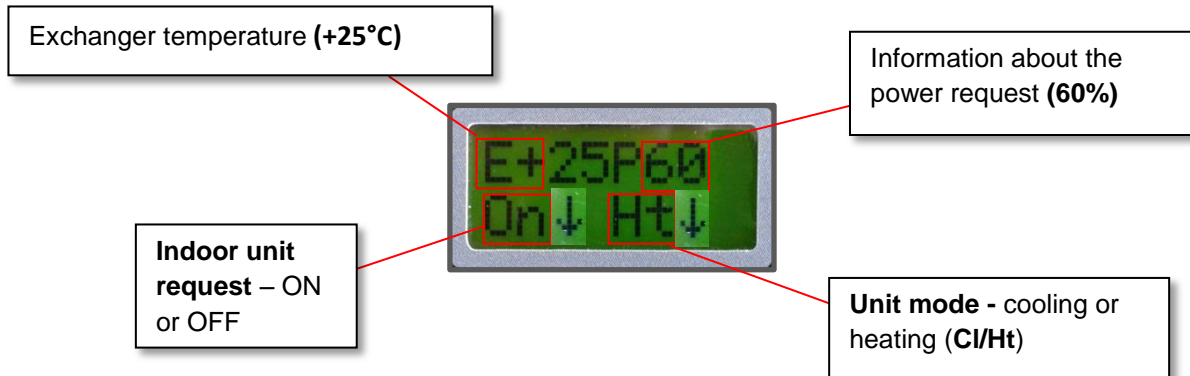
# SIMULATOR CHECKER

Description of each simulator screen with detail explanation

## 1. Screen of indoor unit (INDOOR mode ON)

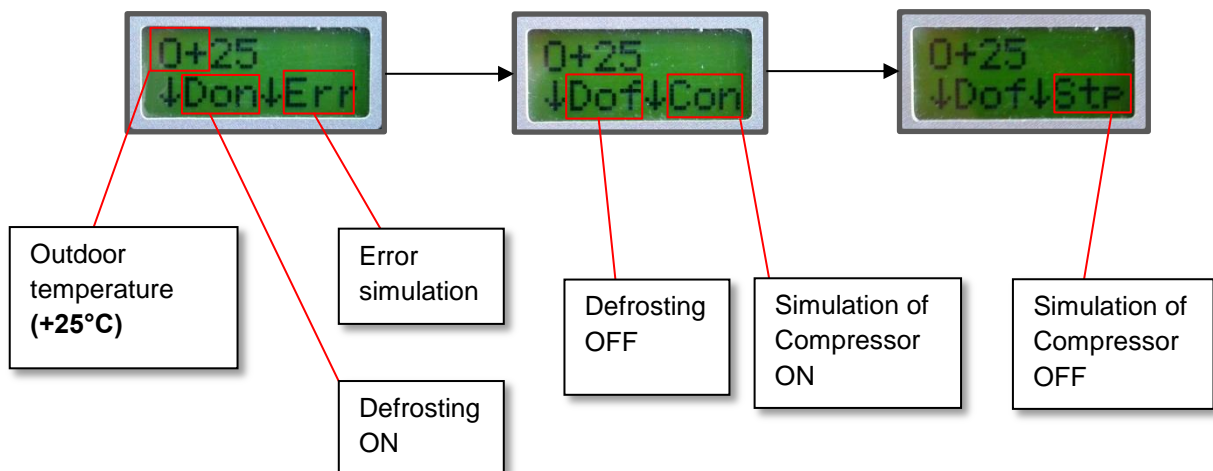
It is possible to simulate **ON / OFF** or switch **cooling / heating**

(Next to the function which is ready to be simulate is appearing a symbol of arrow) 



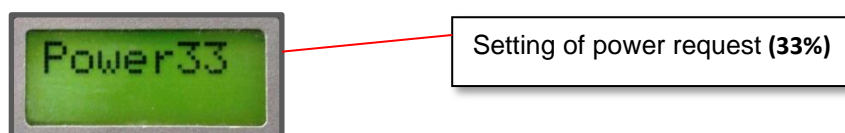
## 2. Screen of outdoor unit (OUTDOOR mode ON)

It is possible to simulate a several following operations (see screens below)



## 3. Screen for setting a power request

If is **Monitor** mode active then this screen is just informative without any possible modification

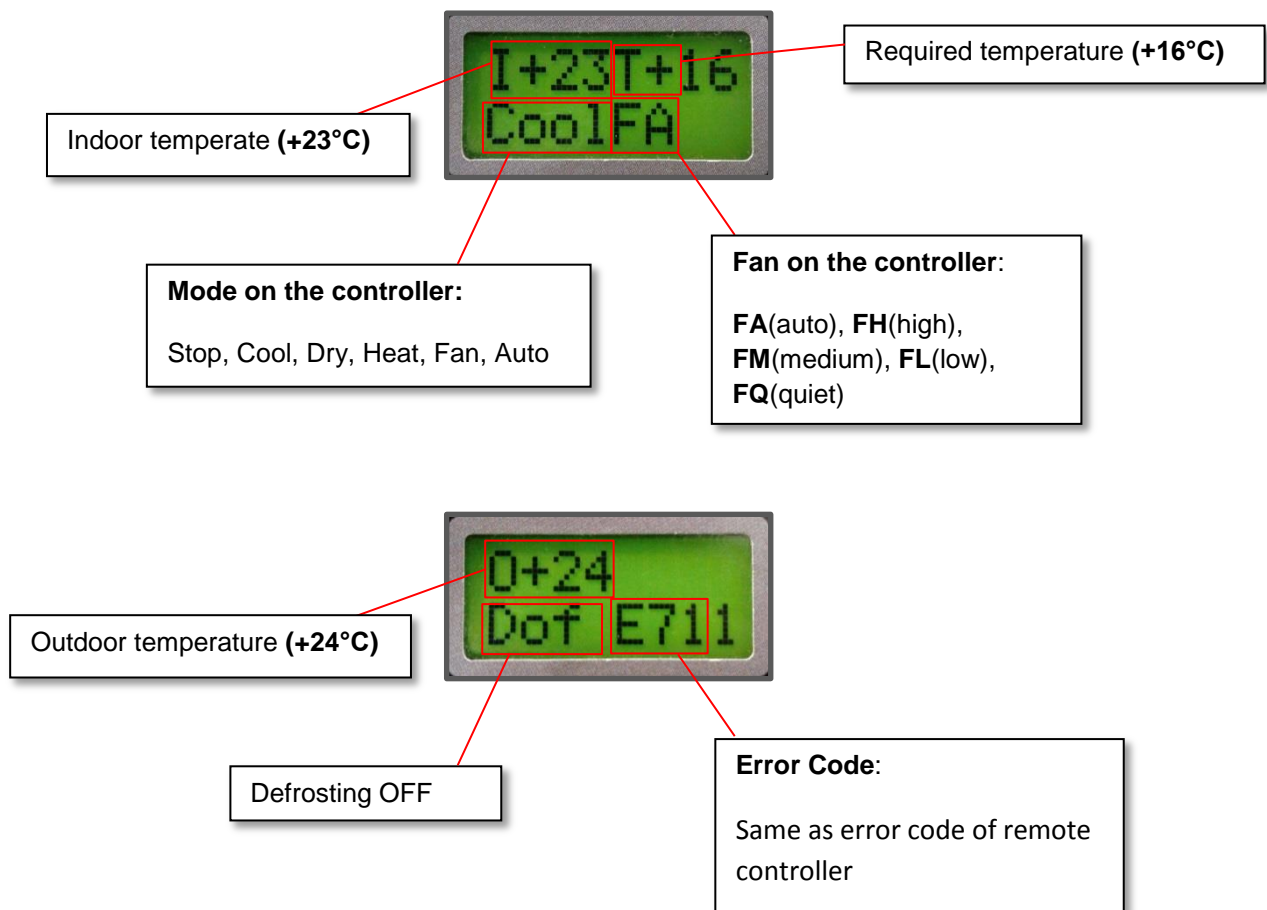


# SIMULATOR CHECKER

Description of each simulator screen with detail explanation

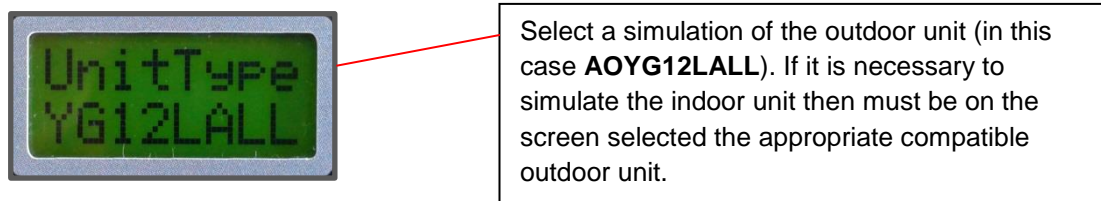
## 4. Screen display information from controller (MONITOR mode ON)

Active only with the latest series of G model units (in all modes). While you in monitoring mode the other available screen are - **Indoor, Outdoor, power req.** and **type of unit**. The screens are for information only and cannot be modify (no arrow symbol)



## 5. Screen for setting type of unit

Possible to be modify only if the **INDOOR** or **OUTDOOR** mode are active. Choose a right model of the unit or right type of communication in case of older type of units like **AOYA, AOYD, AOYR, AOY, DX**



# COMMUNICATION TESTER

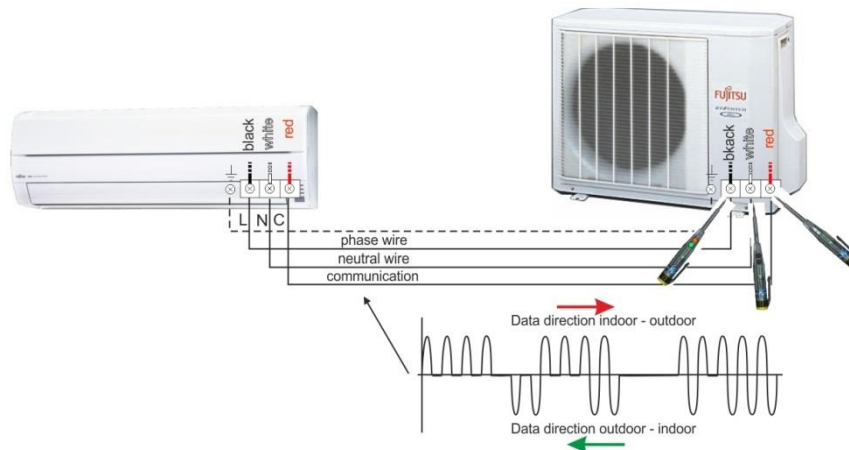
Tester of correct unit wiring and their communication

## USED FOR TESTING:

- Connection of the power supply
- The correct cable connection.
- Communication between indoor and outdoor unit in the individual directions.
- The functionality of external outputs of modules UTI-INV-xxx and UTI-EXP.



## 1. Test of connection and communication:



- Connect the crocodile clip from tester to the ground terminal or ground of the IU or OU.
- Attach the probe tip to the testing terminal.
- Watch glow of green and red LED:

**N zero terminal** (white wire from the terminal to the electronics of unit):

- LED is not lit

**L phase (black wire):**

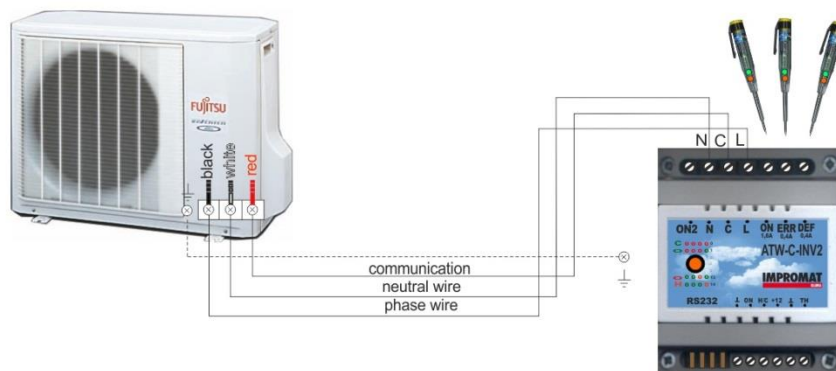
- Green and red LED lights continuously

**C communication terminal** (red wire):

- Flashing red LED: direction from inside to outside
- Flashing green LED: direction from outside to inside

## 2. Test of external outputs UTI-INV-xxx (ON ERR DEF) and UTI-EXP:

According to the current output either of the LED is off, or both LED lights continuously. Another way of indication means the malfunction.



# LOGGER

Recording device for communication data

The LOGGER scans the data from communication line and saves them on the SD memory card for future analysis, the possibilities of use are following:

- between indoor and outdoor unit with the connected Simulator checker (monitoring mode)
- between Compressor checker and connected compressor for testing
- between Simulator checker and connected indoor or outdoor unit (indoor or outdoor mode)
- from connected UTI-INV-xx module



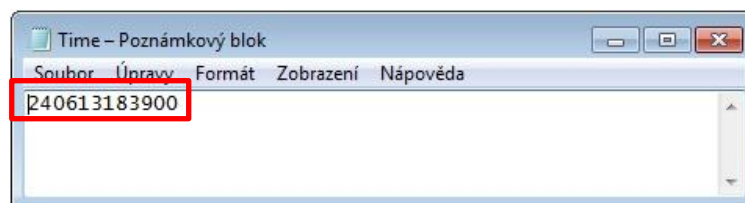
## ATTENTION:

- Whenever you connect the logger, either during testing or monitoring, then on the SD card is created a file matching a given date (see picture below **L130723** = July 23, 2013).
- And also it should be remembered that if the logger is used a several times in one day, all the data are always saved together into a same file!! (but displayable in the checker viewer in separated time subfolders)

L130707	11.7.2013 22:59	Checker file	52 kB
L130713	13.7.2013 21:36	Checker file	140 kB
L130717	18.7.2013 23:53	Checker file	58 kB
L130719	19.7.2013 7:25	Checker file	0 kB
L130722	22.7.2013 7:23	Checker file	0 kB
L130723	23.7.2013 15:20	Checker file	56 kB

## TIME SETTING

- a) if it is necessary in the logger set the current time, then you need to upload on SD card a time.txt file (could be created in windows notepad), which contains desired time and date configuration (see figure below **240613183900** = 24.6.2013,18:39:00)



- b) the next time when you are connecting the logger for testing, the time will be set automatically to required settings
- c) but it should be remembered that the LOGGER itself holds power only for two days (charging takes in about 10 minutes after the connection) and therefore it is necessary to set the time again as you need it

# SOFTWARE for INVERTER CHECKER

## SOFTWARE INSTALLATION

On the attached SD memory card can be find a INSTALL.EXE file, which is necessary for installation of all inverter checker programs into your computer.

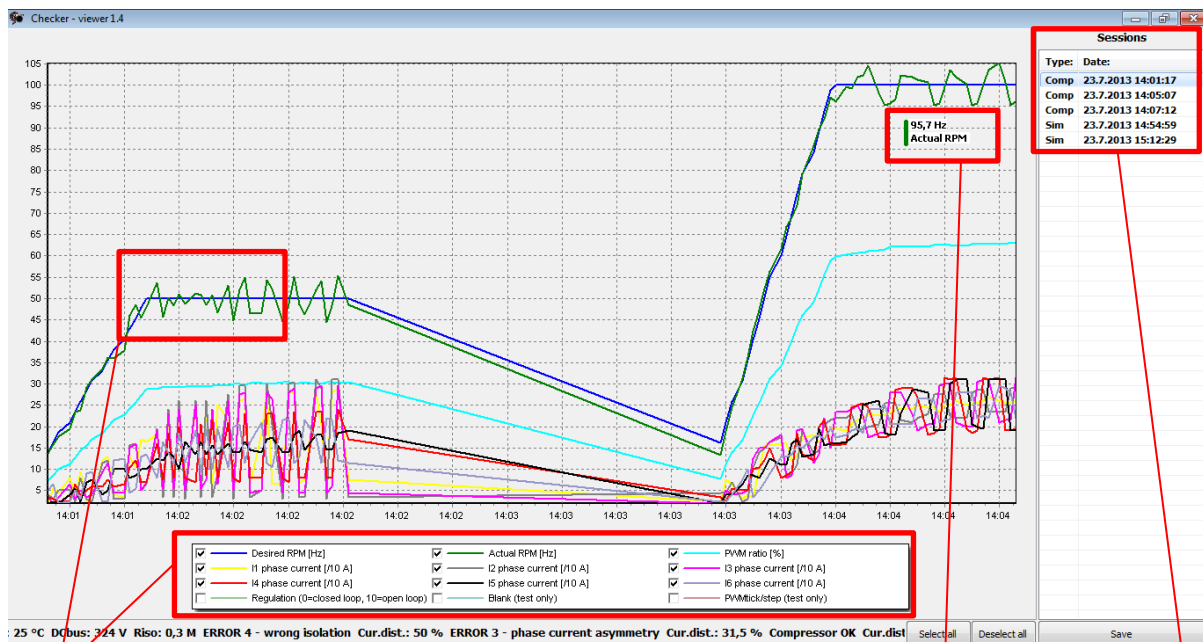
These programs are following:

- **COMPTEST**- program used for display the status information during the testing of compressor
- **SIMULATOR** – monitoring communication data between IU a OU
- **UPDATER** – possibility upgrade the modules or programs for INVERTER CHECKER
- **CHECKER viewer + FG Monitor viewer** – display all saved data from testing procedures

After the installation are on your desktop also created a following data:

- manuals (**English / Czech**)
- CHECKER data folder (for saved files from testing)

## CHECKER viewer – example of displayed saved data



### Control of CHECKER viewer (also applies to the FG Monitor viewer):

**Zoom in** – pressing the left mouse button and moving the mouse cursor to right over the desired

**Zoom out** - pressing the left mouse button and moving the mouse cursor to the left

**Move** – pressing the right mouse button and then moving the mouse cursor

**Legend** - Select desired current values

Focus mouse cursor to the appropriate place to display values

A total of five entries stored in one day. Three records are stored from testing of the compressor and two records from monitoring of communications between the units

# UPGRADING Cable

Data cable for software upgrade of the inverter tester modules

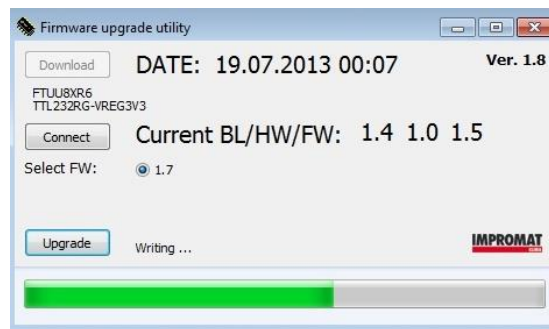
Whenever is released a new firmware update, it is possible to do upgrade by connected upgrading cable together with the updater program (needs internet connection). This information about UPDATE will be send by email to all owners of inverter checker. Due to repairs and improved functionality of INVERTER checker and programs package, this regular update is **highly recommended!!**



There is not any upgrade possible without a connected and properly installed UPGRADING cable!! (Even for the programs in the PC itself)

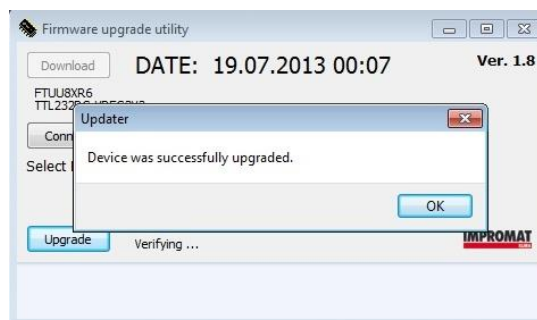
## Upgrading procedure:

1. The upgrading cable plug in to usb port on your notebook or PC and wait until is usb driver successfully installed. (in case of any trouble with installation, it is possible download a driver from internet server <http://www.ftdichip.com/Drivers/VCP.htm>).
2. Start the program **Updater** and if is any new update of the software on the server then you can press the button **Download** to start an installation of updates for the programs in your pc.
3. Second step is to check if your module has a newest firmware already installed or not. Connect the cable to the module which you need to upgrade (keep the top of cable as you see on the label).
4. Press the button **Connect** to see what is the current firmware inside of module, if is different compare to firmware on the server. Select the desirable FW and press the button **Upgrade**.
5. After the writing procedure is the module updated to latest firmware version.



**CAUTION**

During the firmware upgrade of the hardware device, do not disconnect the UPGRADING cable!! This could cause irreversible damage to the updated module!!



# FGMonitor



Diagnosis of SPLIT / MULTISPLIT inverter Fujitsu General units

FGMonitor is used for the diagnosis of FGL outdoor unit using a Bluetooth module and mobile phone (tablet) with Android system. (Newer models of series G also displayed the values from indoor units)

## CONTENS:

- Bluetooth module with 6 pin connector
- Connection cable from 6 to 10-pin connector
- The program FGmonitor (**Android** version)

## FEATURES AND BENEFITS:

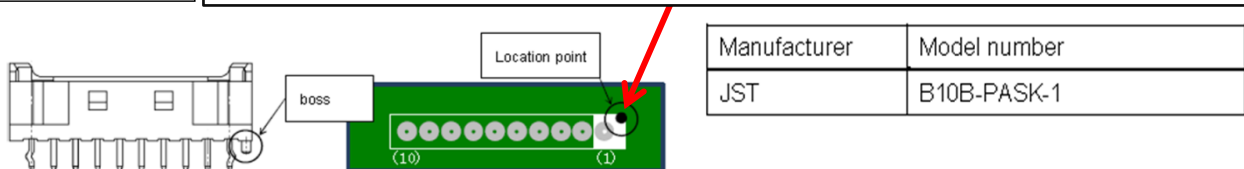
- The option of sending the relevant data via email from mobile
- Recording of all data from the connected units
- Graphical representation of saved values
- View the complete history of the errors from the EEPROM
- Bluetooth wireless connectivity with a range up to 20 m
- Ability of comfortable finding the values which are not normally available



## INSTALLATION:

1. Upload a FGmonitor application to the mobile phone with operating system Android (recommended version 4 and above). Before installing the application you need to allow in mobile setting a possibility to install applications from another sources than the Android Market. Once installation is complete, you need to start application and in FGmonitor settings input the activation key (**menu > settings > key**). This key can be found printed on the side of the Bluetooth module itself.
2. In the next step, it is necessary to connect Bluetooth module with main PCB of diagnosed units. There are two possibilities:
  - a) With newer units, it is possible a direct connection with service connector (10 or 6 pin FLASH connector version is installed on the PCB from production)
  - b) With older units if the connector is not installed from factory, it is necessary to drill and solder the appropriate version of the connector on the PCB at the location specified for the service connector, as shown below (10 and 6-pin flash connector is available on request)

 **CAUTION** It is necessary to keep the right connections; otherwise it could cause damage!!



3. After trouble-free installation, please switch on connected unit and start FGmonitor application installed in the mobile phone (tablet). Bluetooth module will ask to be paired with the appropriate mobile device. Pair key is always: **1937**
4. If the previous steps have been performed correctly, FGMonitor should be ready for use.



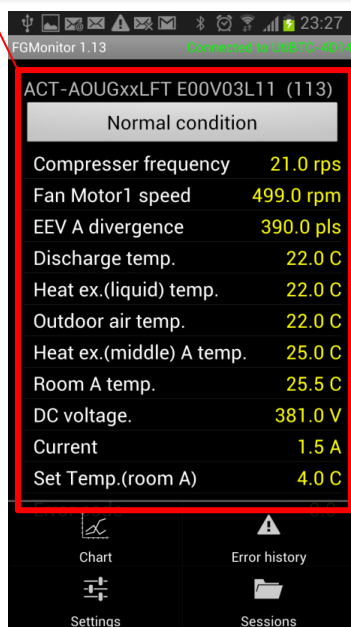
# FGMonitor - FUNCTIONS

## MANAGING SESSIONS:

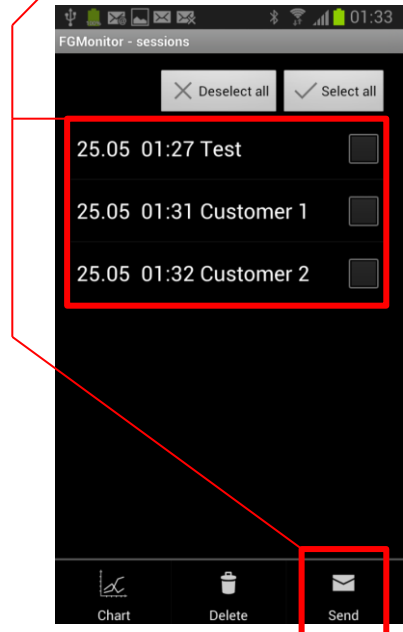
Choose name of related session to be able later identify it (customer etc.)



Record of monitoring data is saved as long as the FGmonitor application running

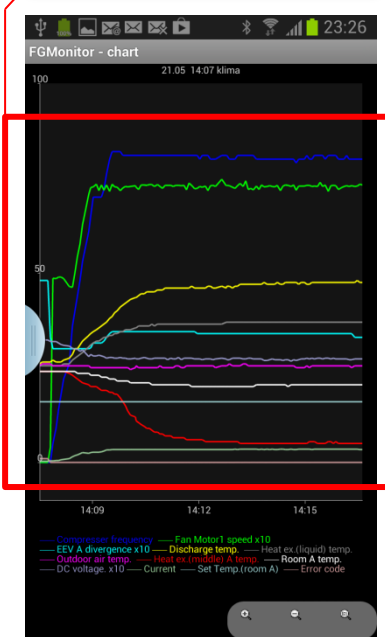


Each session is possible to send in any time from you mobile device

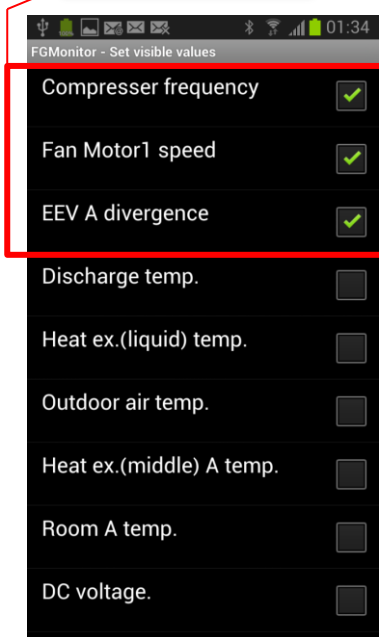


## POSSIBILITY OF GRAPHICAL DISPLAY AND UPDATE:

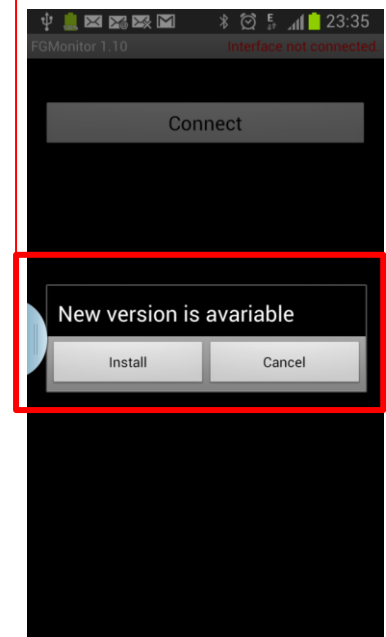
Example of saved data displayed in Chart



Select to display the required data

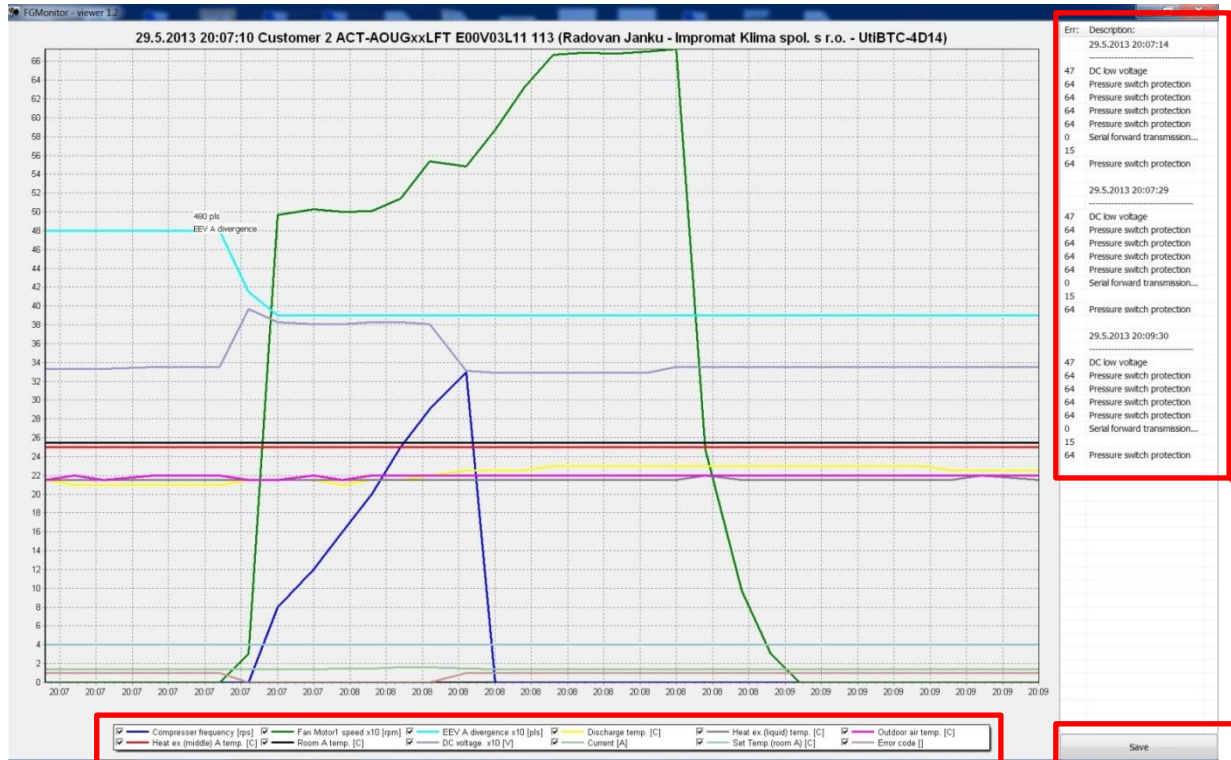


Automatic updates



# FGMonitor viewer

Data sent by emails sent for analyses can be viewed in the appropriate browser immediately after installing the software package (install.exe), which always enclosed into the Logger SD card.



LEGEND: select the desired values

Choice of save format:

- 1) Bitmap file
- 2) CSV file

The CSV file export shows a table with columns for time, error code, and error description. The data is as follows:

Time	Error Code	Error Description
2013.05.29 20:07:14	47	DC low voltage
2013.05.29 20:07:14	64	Pressure switch protection
2013.05.29 20:07:14	64	Pressure switch protection
2013.05.29 20:07:14	64	Pressure switch protection
2013.05.29 20:07:14	0	Serial forward transmission...
2013.05.29 20:07:14	15	Pressure switch protection
2013.05.29 20:07:29	47	DC low voltage
2013.05.29 20:07:29	64	Pressure switch protection
2013.05.29 20:07:29	64	Pressure switch protection
2013.05.29 20:07:29	64	Pressure switch protection
2013.05.29 20:07:29	0	Serial forward transmission...
2013.05.29 20:07:29	15	Pressure switch protection
2013.05.29 20:09:30	47	DC low voltage
2013.05.29 20:09:30	64	Pressure switch protection
2013.05.29 20:09:30	64	Pressure switch protection
2013.05.29 20:09:30	64	Pressure switch protection
2013.05.29 20:09:30	0	Serial forward transmission...
2013.05.29 20:09:30	15	Pressure switch protection
2013.05.29 20:09:30	64	Pressure switch protection

Error history stored in EEPROM memory