

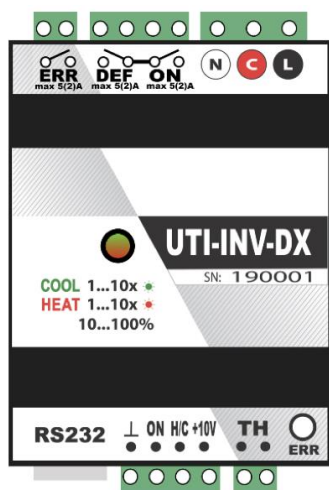
# INSTALLATION MANUAL

## Module for controlling of FUJITSU GENERAL inverter outdoor units AOYG and WOYx type (refrigerant R410a or R32)

### USE

The UTI-INV-DX module (hereinafter „module“) is used for control of FUJITSU GENERAL LTD. outdoor inverter units connected to heat exchangers of different producer or of different construction.

### PACKAGE CONTENTS



UTI-INV-DX module



Temperature sensor



This manual

### INSTALLATION

- The module with IP20 protection is designed to be attached to the DIN rail situated inside the electrical switchboard or the installation box. In the outdoor environment, it must be used only in facilities with adequate protection. It is also possible to install the module inside the outdoor unit (only if there is enough space for installation).
- By installing the module properly, ensure that the air is perfectly circulating so that the maximum allowed working temperature of the module is not exceeded in the case of continuous operation and higher ambient temperatures.

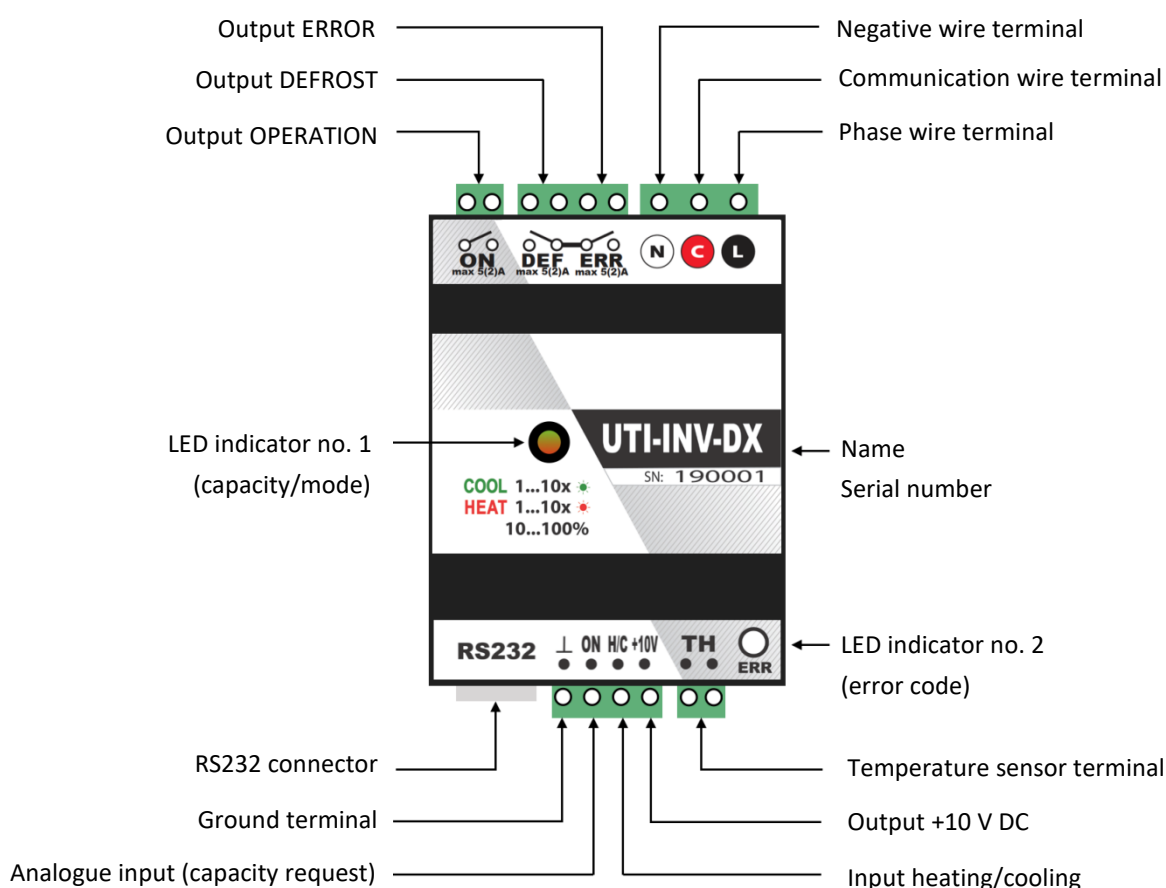
### WARNING

- If you find any signs of damage, deformation or malfunction, do not install this module and return it to your dealer.
- Pay extra attention to the wire connection between the module and the outdoor unit! There's a risk of possible destruction of the module and electronics of the outdoor unit, if incorrectly connected!
- The power and communication terminal of the module must not be used as a power supply of the outdoor unit!
- The module may be powered only from the outdoor unit to which it is connected. Power supply from another source is unacceptable.
- Use of the module in any other way than described in this manual may reduce the level of protection.

## ELECTRICAL CONNECTION

- General wiring of the supplied module can be found in the enclosed scheme.
- Before starting installation, make sure that the module is not energized and the main switch is in the "OFF" position.
- The module is designed for connection to single-phase alternating voltage supply network (AC) 230 V and must be installed in accordance with regulations and norms applicable in the particular country.
- Installation, connection, adjustment and operation may only be carried out by a person with adequate electrical engineering skills allowing them to work with equipment up to 1000V, who is fully familiar with this manual and functionality of this device.
- The module is a permanently connectable device and does not have its own power disconnection device. A switch or circuit breaker must be included as a part of the installation. It must be easily accessible by the operator and must be marked as the disconnect device. The device is protected as a set with the air conditioning unit. The circuit breaker values are determined by the unit type and are listed in the installation manual for the air conditioning unit. The switches or circuit breakers used as the disconnect device must comply with the relevant requirements of IEC 60947-1 and IEC 60947-3.
- **WARNING:** The installation manual for the air conditioning unit also requires an installation of residual-current device (RCD), in addition to the circuit breaker.
- The device includes protection against overvoltage peaks and disturbing impulses in the power supply. However, for the proper functioning of these protections, appropriate higher level of protection (A, B, C) must be provided in the installation and the interference of the switching devices (contactors, motors, inductive loads, etc.) must be ensured according to the standard.
- Do not install the module near the sources of excessive electromagnetic interference.

## CONNECTION



## DESCRIPTION OF THE TERMINALS

Description of the top bus terminals:

- L** phase wire terminal (connection to the outdoor unit)
- N** negative wire terminal (connection to the outdoor unit)
- C** communication wire terminal (connection to the outdoor unit)
- ERR** output (max. load 5A) – the relay is activated in case of malfunction of the outdoor unit or controlling module (NC/NO can be set using the UTI-TOOL software)
- DEF** output (max. load 5A) – the relay is activated during the defrost operation of the outdoor unit. Using the UTI-TOOL software, this period can be extended by 5 minutes or until the exchanger reaches 28°C
- ON** output (max. load 5A) – the relay is activated when the outdoor unit compressor is in operation (NC/NO can be set using the UTI-TOOL software). Using the UTI-TOOL software, the relay can be made inactive during defrost operation and 5 minutes afterwards or until the exchanger reaches 28°C

Description of the bottom bus terminals:

- TH** temperature sensor terminal
- +10** output +10 V DC
- H/C** input Cooling/Heating  
Cooling: the H/C terminal is inactive or at a voltage of 0 V to 1.5 V against ground terminal  
Heating: connecting to +10 V terminal or applying voltage of 10 V to 24 V against ground terminal
- ON** outdoor unit capacity request - In the range from 0 to 10V it serves as an analogue input of the capacity request in the range of 0 - 100% of the nominal power of the unit. If the ON terminal is connected to the + 10V terminal using a dry contact (e.g. a thermostat), the system can operate in the ON-OFF mode (with continuous compressor start). The + 10 V voltage can be lowered by an external voltage divider to limit compressor performance.
- ⊥** the ground terminal is used to connect the minus analogue signal from the higher-level controller.

**DO NOT connect to the PE protective wire!**

### RS232 connector

The 4-pin connector used to connect the module to a PC using the UTI-USB cable

The module can be set and updated using the UTI-TOOL software

DO NOT USE any other cable to connect the module.

DO NOT CONNECT any other device to the connector.

## INSTALLATION OF THE CABLE BETWEEN MODULE AND AIR CONDITIONING UNIT

- Use a cable as specified in the installation manual for air conditioning unit.
- Do not use a damaged cable
- When placing a cable in an environment with electromagnetic interference, we recommend using the Anti-EMI ferrite elements with minimum impedance of min. 200 Ohm/100Mhz (eg. type FLF-65B).

Connection cable between the device and the air-conditioning unit:	
Cross-section of connecting wires (mm <sup>2</sup> )	min 3x 1.5 max. 3x 2.5
Temperature range	-30°C to +60°C
Code number	IEC: 60245 IEC 57 / CENELEC: H05RN-F

## INSTALLATION OF TEMPERATURE SENSOR

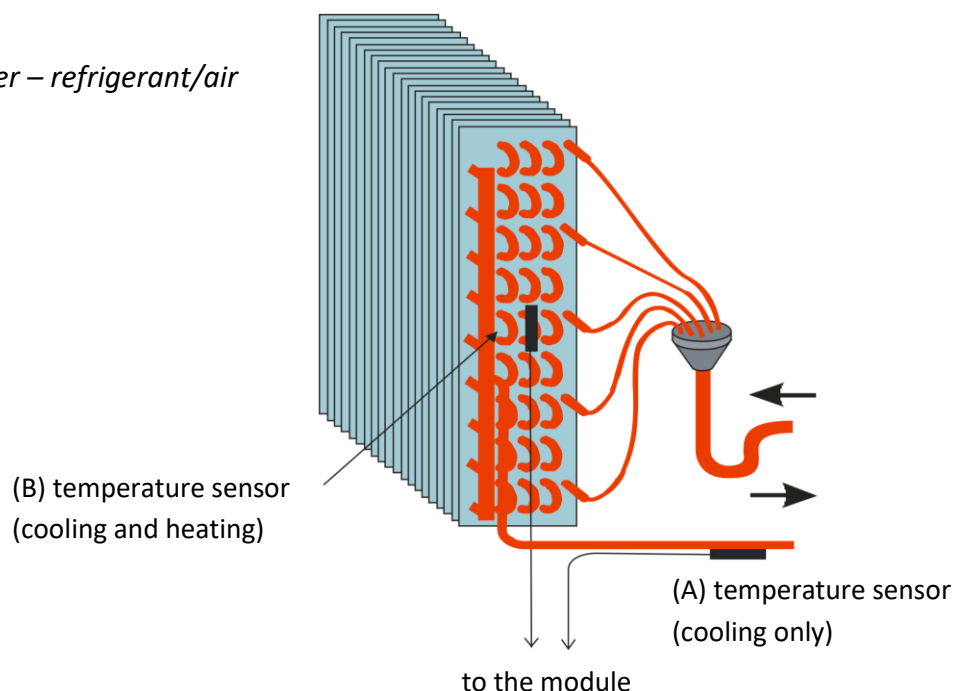
The use of a temperature sensor is essential for the module to function properly. Please follow these installation instructions:

- The location and method of sensor installation must ensure its perfect thermal contact with the measured surface.
- Secure the sensor on the piping with the securing tape attached to it. If necessary, use additional insulation.
- When installing into a tank, carefully cut the plastic protection and remove the sensor.
- The sensor must always be electrically connected to the module. The module does not work without the connected sensor.
- The maximum cable length of the sensor is 3m. If you need to extend the length of the original cable, please follow the current grounding principles to avoid current loops.
- If sensor is located in an environment with electromagnetic interference, we recommend using the Anti-EMI ferrite elements with minimum impedance of min. 200 Ohm/100Mhz (e.g. type FLF-65B).

### Sensor location:

- Sensors in systems that are used only for cooling should be placed on the coldest part of the evaporator or on the refrigerant return pipe (gas pipe) – position A.
- For air exchangers with cooling and heating functions, the best sensor location is approximately in the middle of the length of the exchanger tube (position B).

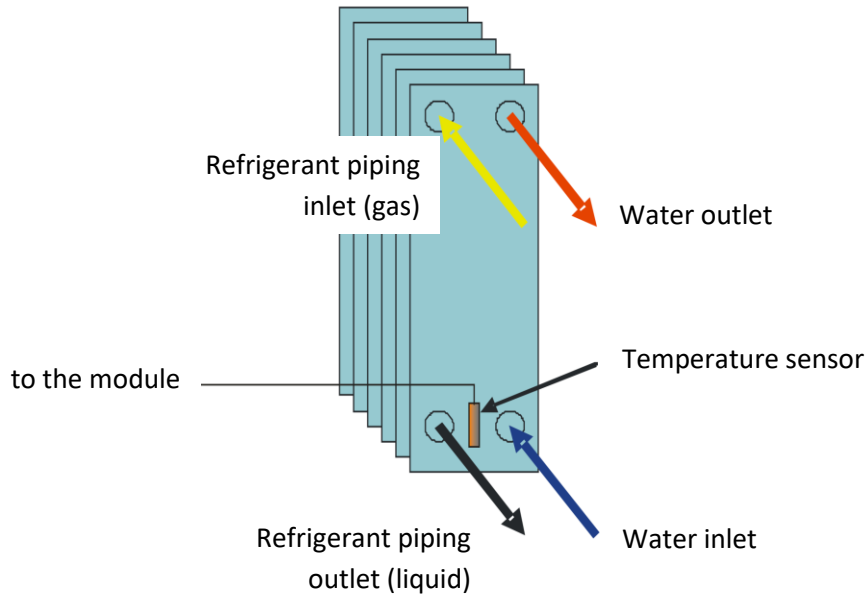
*Example: AHU heat exchanger – refrigerant/air*



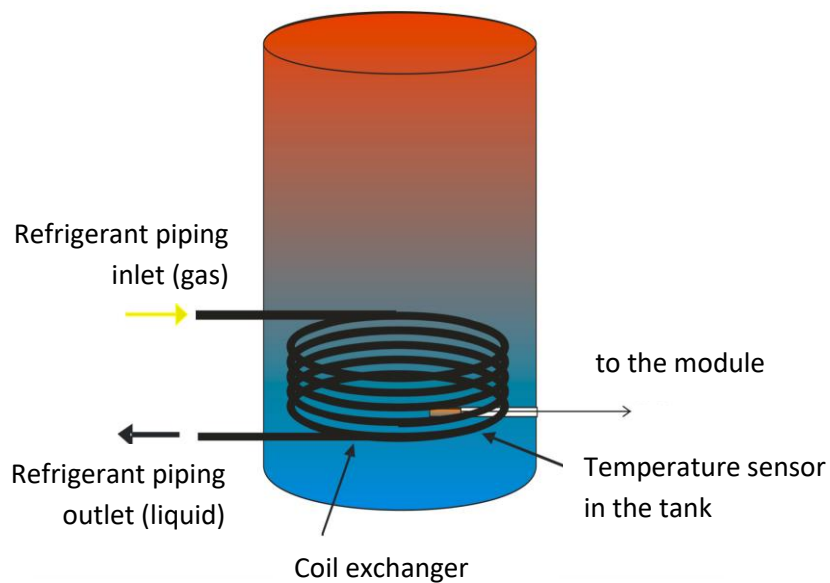
The sensor location in **air-to-water heat pumps** depends on the structural design:

- When using the plate heat exchanger, it is suitable to place the sensor to its lower part, in the middle between the water inlet and the liquid refrigerant outlet.
- When using the coil heat exchanger, which is integrated into a storage tank, place the sensor inside the tank in the bottom of the spiral of the heat exchanger.

*Example: Plate heat exchanger – refrigerant/water*



*Example: Coil heat exchanger – refrigerant/water*



## HEAT EXCHANGER SELECTION

The correct dimension of the heat exchanger connected to the outdoor unit is extremely important.

Exchanger with unsuitable volume will not be able to ensure a proper energy transfer, the whole technology might not work properly, and in extreme cases, there is a risk of damage to the outdoor unit. It is necessary to observe the parameters mentioned below.

Outdoor unit		AOYG07L	AOYG09L	AOYG12L	AOYG14L	AOYG18L	AOYG24L
Refrigerant	Type	R410a					
Min. volume (exchanger)	cm <sup>3</sup>	746	746	746	746	1 370	1 370
Max. volume (exchanger)	cm <sup>3</sup>	746	746	746	746	1 480	1 480

Outdoor unit		AOYG30L	AOYG36L (1f)	AOYG45L (1f)	AOYG54L (1f)	AOYG72LRLA	AOYG90LRLA
Refrigerant	Type	R410a					
Min. volume (exchanger)	cm <sup>3</sup>	1 490	1 640	2 270	2 270	3 170	3 170
Max. volume (exchanger)	cm <sup>3</sup>	1 630	2 260	2 730	2 810	4 100	4 100

Outdoor unit		AOYG36L (3f)	AOYG45L (3f)	AOYG54L (3f)	AOYG60L (3f)
Refrigerant	Type	R410a			
Min. volume (exchanger)	cm <sup>3</sup>	1 370	1 590	1 940	2 556
Max. volume (exchanger)	cm <sup>3</sup>	1 870	2 730	2 810	2 556

Outdoor unit		AOYG07K	AOYG09K	AOYG12K	AOYG14K	AOYG18K	AOYG22K
Refrigerant	Type	R32					
Min. volume (exchanger)	cm <sup>3</sup>	670	670	670	690	960	1 270
Max. volume (exchanger)	cm <sup>3</sup>	680	680	740	830	1 480	1 480

Outdoor unit		AOYG24K	AOYG30K	AOYG36K (1f)	AOYG45K (1f)	AOYG54K (1f)
Refrigerant	Type	R32				
Min. volume (exchanger)	cm <sup>3</sup>	1 270	1 370	1 370	1 830	2 270
Max. volume (exchanger)	cm <sup>3</sup>	1 480	1 630	2 260	2 420	2 420

Outdoor unit		AOYG36K (3f)	AOYG45K (3f)	AOYG54K (3f)
Refrigerant	Type	R32		
Min. volume (exchanger)	cm <sup>3</sup>	1 370	1 830	2 270
Max. volume (exchanger)	cm <sup>3</sup>	2 260	2 420	2 420

## LED INDICATORS

The module is equipped with a pair of LED indicators that visually show the status of the device.

### LED No. 1 (Capacity / Mode)

- the LED indicator is located in the middle of the module at the front
- the indicator uses red and green lights

- explanation of the signalization:

Number of flashes	Green	Red
not flashing	no capacity request	
1x	10% cooling	10% heating
2x	20% cooling	20% heating
3x	30% cooling	30% heating
4x	40% cooling	40% heating
5x	50% cooling	50% heating
6x	60% cooling	60% heating
7x	70% cooling	70% heating
8x	80% cooling	80% heating
9x	90% cooling	90% heating
10x	100% cooling	100% heating
permanently lit	–	ERROR

### LED No. 2 (error code)

- the LED indicator is located at the bottom on the right side
- if the module is built into a rack, this indicator may be covered
- the outdoor unit error code is signalled by RGB LED (1x - 9x flashes = 1 - 9, 10x flashes = A code).
- explanation of the signalization:

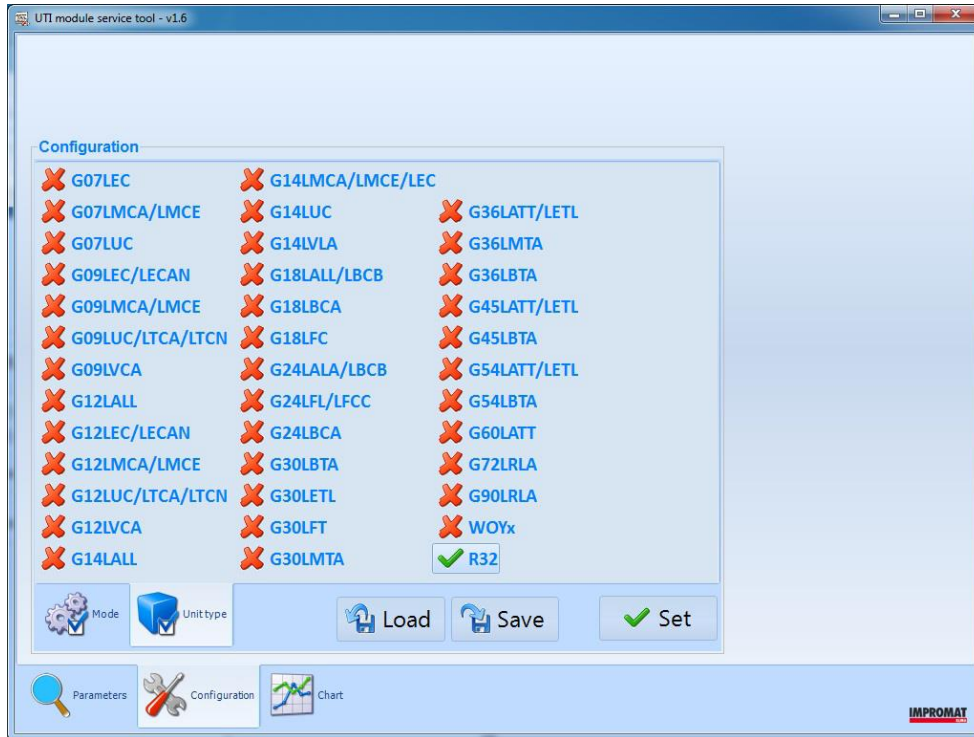
Red	Green	Blue	Error code
1x	1x	3x	E. 11.3
2x	1x	2x	E. 21.3
6x	10x	1x	E. 6A.1
10x	1x	1x	E A1.1

- refer to the documentation of the outdoor unit for the meaning of the error code
- the description of errors can also be found in the Mobile Technician application (iOS, Android)
- the module also signals errors evaluated by its own program
- explanation of the signalization:

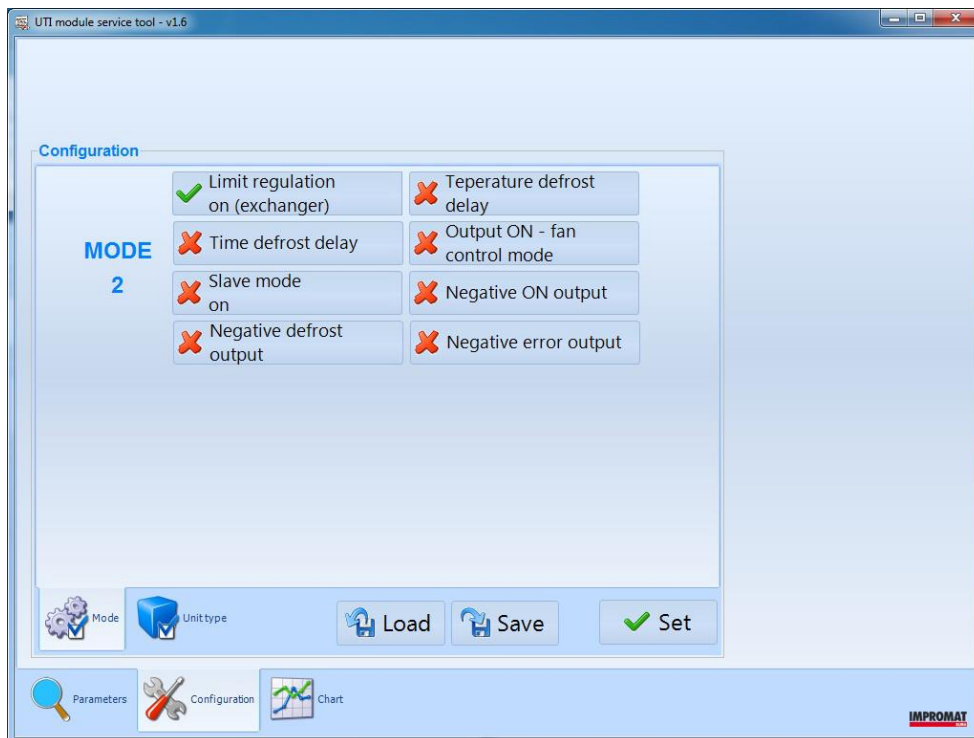
Red	Green	Blue	Error code	Description
1x	1x	1x	111	Communication error – no communication from outdoor unit
5x	1x	1x	511	High temperature measured by sensor / Temperature sensor error

## SETTING

The module's default communication setting is for the AOYG model with R32 refrigerant. To change the settings, use the UTI-TOOL software. Use version 1.6 and higher to set up the UTI-INV-DX module.



*UTI-TOOL program - setting the type of outdoor unit (default setting - R32 models)*



*UTI-TOOL program - setting the outputs (factory default)*



You can change the values of the following outputs and customize the module behaviour to your installation. The overall setting is evaluated by the MODE checksum. The factory setting is 2, where all modes are set to OFF, except for "Limit regulation on", which is set to ON.

### **Limit regulation on (exchanger)**

- ✓ = respects the set limits of temperature and capacity, time constant determines the speed of regulation (default 2 = regulatory intervention every 5 sec)
- ✗ = respects only capacity limits, reacts immediately

### **Slave mode on**

- ✓ = 3 - 10 V = 0% - 100%
- ✗ = 0 - 10 V = 0% - 100%

The slave mode is used to control two modules with the same analogue signal. The outdoor master unit operates in the basic mode, where the 0 - 10 V analogue input signal linearly generates a power demand of 0% - 100%. The slave starts to operate when the input signal reaches a voltage of + 3V and at + 10V a 100% request is generated.

In addition to parallel connection of inputs, the circuits of all systems must be separated from each other (i.e. each system has its own power and communication cable and its own heat exchanger temperature sensor).

### **Time defrost delay**

- ✓ = the defrost relay is still activated 5 minutes after the end of defrost operation
- ✗ = the defrost relay is only activated during the defrost operation

### **Temperature defrost delay**

- ✓ = the defrost relay is activated till the exchanger reaches 28°C
- ✗ = the defrost relay is only activated during the defrost operation

In case both options are on, the defrost relay is activated till whichever happens first (28°C or 5 minutes)

### **Output ON - fan control mode**

- ✓ = the ON relay is inactive during the defrost operation, and also afterwards, till the exchanger reaches 28°C
- ✗ = the ON relay is activated while the unit is running

### **Negative defrost output, Negative error output, Negative ON output**

- ✓ = the output relay function is negated (active = disconnected)
- ✗ = standard function of the output relay (active = connected)

## TEST RUN

Before first turning the power on, please check if the module and the outdoor unit are correctly connected.

If the outdoor unit is equipped with an error indication with LED lamps or alphanumeric display, check if the error status is not indicated. To decode the errors, use the Fujitsu-General service documentation (Installation manual, Service manual, Service Instructions).

### Starting the outdoor unit:

Determine the outdoor unit mode using the H/C input by the master control system. Then send an outdoor unit operation command using the analogue signal on the ON terminal. We recommend changing the outdoor unit mode only when there is no requirement for outdoor unit power.

### CAUTION!

If the heat offtake from the indoor unit is not provided (for example, if the indoor heat exchanger is not connected, the indoor fan or circulation pump is not running), the compressor may only operate for maximum of 1 minute!

## SAFETY PRECAUTIONS, MAINTENANCE AND CLEANING

For security reasons, do not interfere with the module. For any possible repairs, please return to the manufacturer. Do not expose this device to excessive humidity, do not immerse it in the water and do not expose it to the vibrations, shocks or direct sunlight. The device requires no maintenance. Use only soft, slightly moistened cloth to clean the case of the module. Do not use any scouring or chemical solvents.

## RECYCLING

Electronic and electrical products must not be disposed as a household waste. Dispose the waste at the end of its lifetime in accordance with the applicable legal provisions.

## TECHNICAL SPECIFICATIONS

Supply voltage	AC 230 V / 50 Hz
Power consumption	max. 1,5W
Operating temperature	-20°C to +40°C
Storage temperature	-30°C ... +60°C
Operation position	any
Mounting	DIN rail EN 60715
Protection	IP20
Overvoltage category	II.
Pollution degree:	2
Dimensions:	88 x 69 x 62 mm

## **MANUFACTURER**

**IMPROMAT KLIMA spol. s r. o.**

Tř. T. Bati 5267, 760 01 Zlín, Czech Republic

tel.: + 420 577 004 141 (148)

e-mail: [info@impromat-klima.cz](mailto:info@impromat-klima.cz)

[www.impromat-klima.cz](http://www.impromat-klima.cz)

This device is in conformity with the following EC directives:

- EC Council Directive 2014/35/EU (Government Regulation No. 118/2016 Coll.) Safety requirements for electrical equipment
- EC Council Directive 2014/30/EU (Government regulation No. 117/2016 Coll.) Electromagnetic compatibility (EMC)