WIRELESS RFOX SERIES PERIPHERAL MODULES

TXV 004 14.01

Wireless Rfox series peripheral modules

TXV 004 14.01

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CONTENT

1. INTRODUCTION

The guide´s aim is to introduce to the user of the PLC Tecomat RFox with wireless RF modules that create together wireless communication Rfox bus. The guide offers information about basic parameters of RF modules and their maintance.

1.1. Rfox bus

RFox bus (Radio Foxtrot) is a wireless radio bus. It is operation within **unlicensed** radio band 868 MHz and for its operating it is not necessary any other authorisation.

Rfox bus is always constituted by one control bus master and up to 64 slave peripheral modules. Bus master can be realized as an internal module of the central unit or as an external module for an assembly to the switchboard´s bar. RF peripheral modules are realized in several modifications (interior installation, assembly to the switchboard´s bar modification, hand remote controls, ...).

Table 1.1 Basic parameters of the RFox bus

Frequency band	868.35 MHz (license free ISM band) CEPT ERC/REC 70-03 General License
RF modulation type	FSK (frequency-shift-keyed)
Communication type	bidirectional (with packet confirmations)
Bit rate	19,2 kb/s
Range	100m direct visibility, 25m assembly

Further specifications and examples of RFox modules assembly, see *The guide of the system designer of RFox systems*.

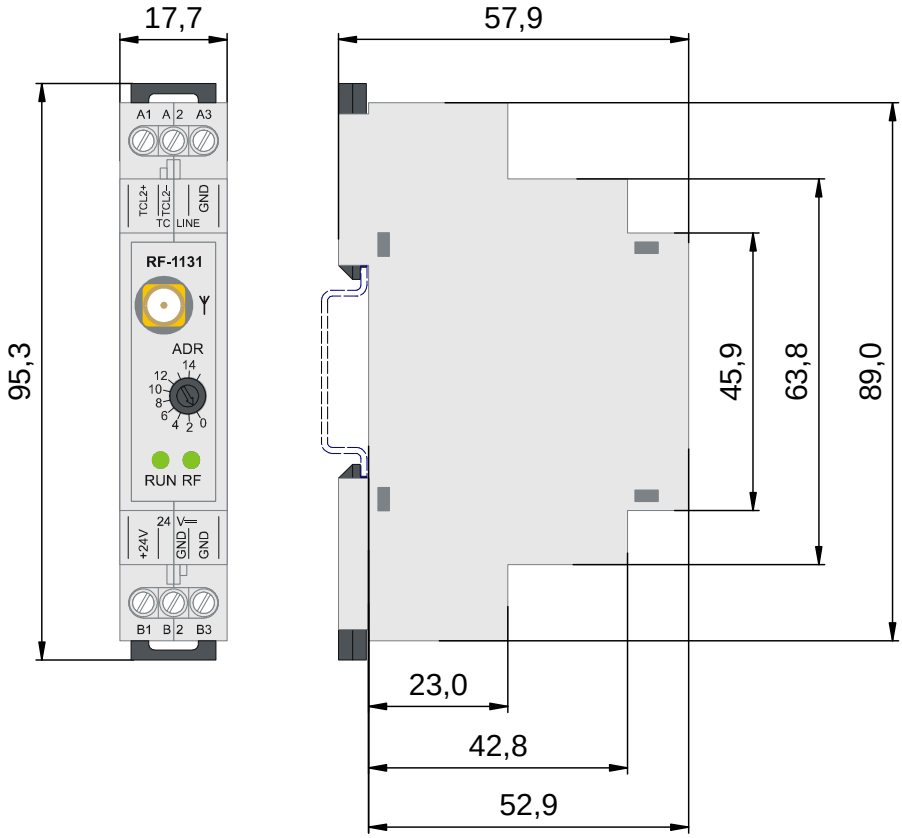
NOTE : In connection with the RFox bus is the description of RF *peripheral module* identical and equivalent to the description of RF *peripheral unit.*

2. RF MASTER

2.1. Basic parameters

RF master executes communication with RF peripheral modules and transfer gained data via the system communication bus (TCL2) to the master central unit (CPU). Master is realized in two forms. Either as an internal peripheral module of central units CPU Tecomat RFox (CP-10xx) where it is marked as a module RF-1130. Or as an external peripheral module of the system communication bus TCL2, with marking RF-1131.

One RF master enables to serve up to 64 peripheral RF modules. CPU Tecomat RFox allows to serve one internal RF master and up to 4 external RF masters.



Pic. 2.1 View and measures of RF-1131module

Table 2.2 Basic parameters of RF-1131 module

RF-1131	
System bus	TCL2
Bus for RF	1 x RFox, for 64 units
Input rated current (SELV) / internal load	24V and 27.2V DC / 25mA
Input voltage tolerance	20.4 ... 30V DC
Max. input	2.5W
Galvanic isolation	No
Measures	95.3 × 57.9 × 17.7 mm
Weight	75g

Operational temperature	-20 .. +55℃
Storage temperature	-30 .. +70℃
Dielectric rigidity	According to EN 60950
Shielding level	IP 30
Overvoltage category	III
Contamination level ČSN EN 61131-2	2
Operational position	optional
Instalation	onto DIN bar
Connection	Screw clamps
Conductor cross section	max. 2.5mm^2

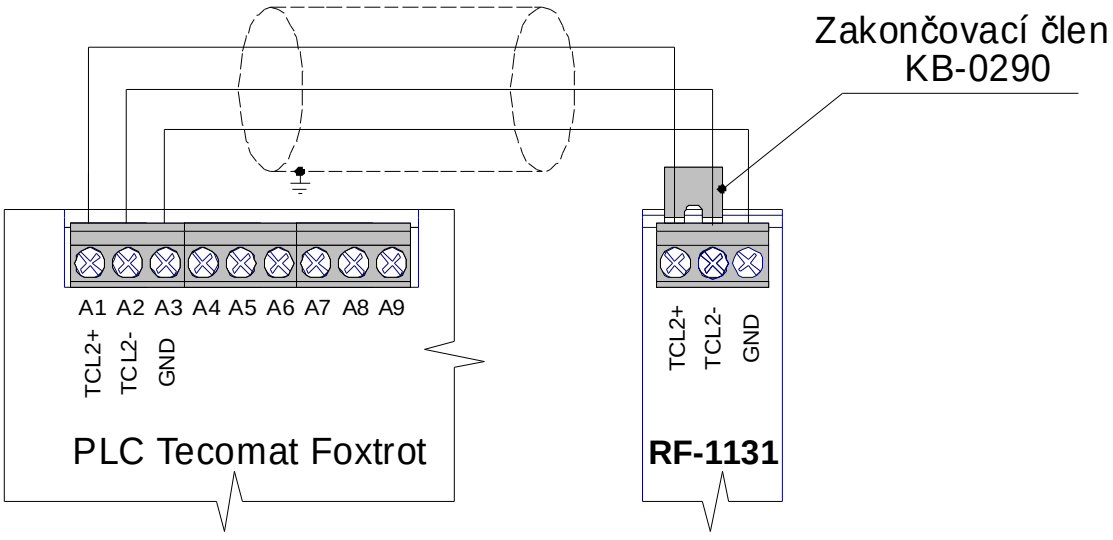
Table 2.3 Connection of distributional frames of the module RF-1131

Signal	Description
TCL2+	Data signal of the system bus TCL2
TCL2-	Data signal of the system bus TCL2
GND[1)]	Ground clamp
24V+	Power supply +24V

[1)] GND signals on clamps A3, B2, B3 are internaly interconnected

Module connection to the PLC TECOMAT Foxtrot

Connection of internal master RF-1130 is realized via internal circuits of the CPU without other interconnective requirements. External master RF-1131 is connected to the PLC Tecomat Foxtrot using interface coupled circuits brought out onto clamps A1 to A3 of the distributional frame marked TC LINE.



Pic. 2.2 Connection of module RF-1131 to the PLC TECOMAT Foxtrot

On the PLC side there is a communication line TCL2 impedantly terminated inside the PLC. On the RF-1131 side it is neccessary to undertake the impedance termination. The termination is undertaken via the terminator KB-0290 (TXN 102 90, 120Ω), integrated between clamps TCL2+ and TCL2-. This terminator is a part of PLC Tecomat Foxtrot pack

If there are other modules on the communication line TCL2, the termination is always realized at the **end** of the whole line!

Module power supply

RF master requires the power supply 24V DC. The same power supply can be used as for the supply of CPU. Internal RF master is supplied directly via internal circuits of the CPU, the power supply of an external master is connected onto clamps +24V and GND.

RFox line connection

Wireless RFox line is realized via spiral aerial. It is possible to use either the aerial screwed directly on the module or alternatively the aerial with a shielding cable for location outside the area of the switchboard.

Communication parameters for TCL2

RF master communicates with the CPU using messages of the system communication line TCL2. Communication parameters are firmly set according to the specification of the TCL2 line.

In light of addressing, the RFox line of the internal master RF-1130 is firmly mapped into the rack number 0, rack position 4.

For extenal master RF-1131 the setup of communication address is undertaken via turn switch on the front cover of the module. By the address setup the distinct addressing into the communication bus TCL2 is done. This addressing is neccessary to be done in cooperation with the knowledge of the addresses of other participants (peripheral modules) on the TCL2 bus so, that the address collision is avoided. Then, in the connected PLC Tecomat, the module RF-1131 will be always mapped into the rack number 3, rack possition will be similar to the setup address on the turn address switch.

Indication

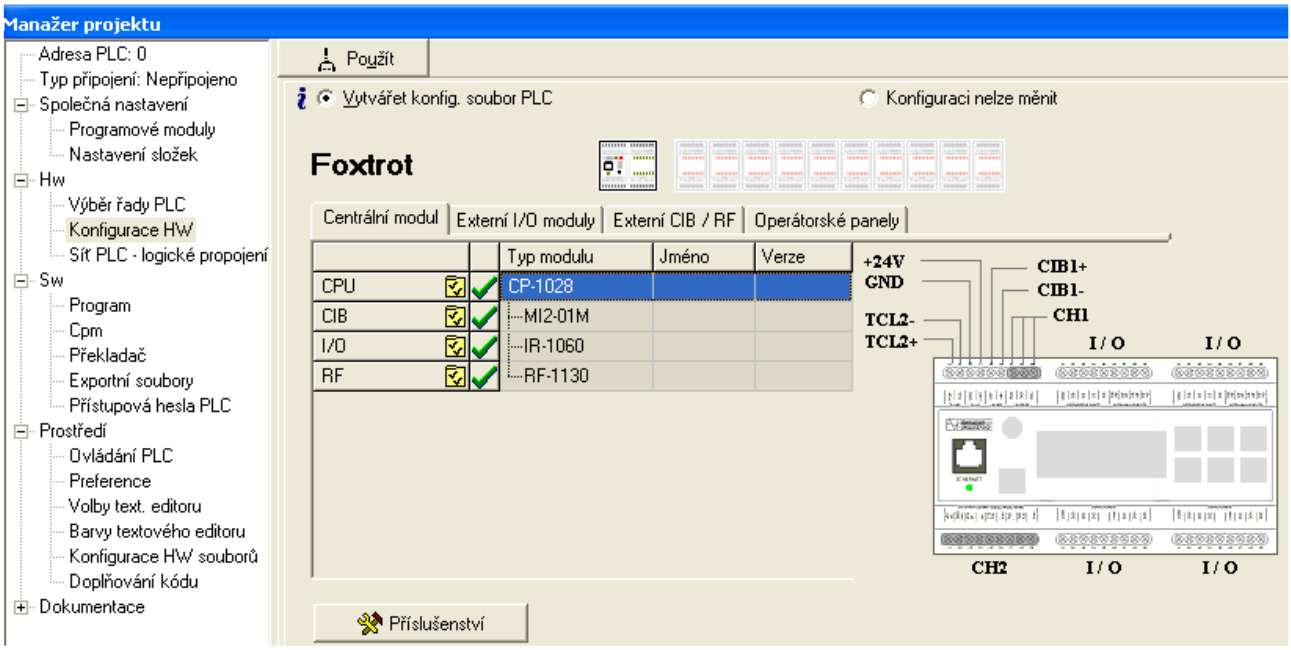
There are no indication elements on the CPU for internal master.

On the external master there are on the front panel of the module two indication LEDs RUN and RF located. If the RUN LED is green permanently, then the master is in the HALT mode (does not operate RF units). If the RUN LED flashes periodically green, then the master is in the RUN mode (operates RF units). If the RF LED flashes green, it indicates radio operation on the RFox bus (master transmits RF packet). If the RF LED flashes or is red permanently, it indicates communication failure with one of the operated RF units.

2.2. Master configuration

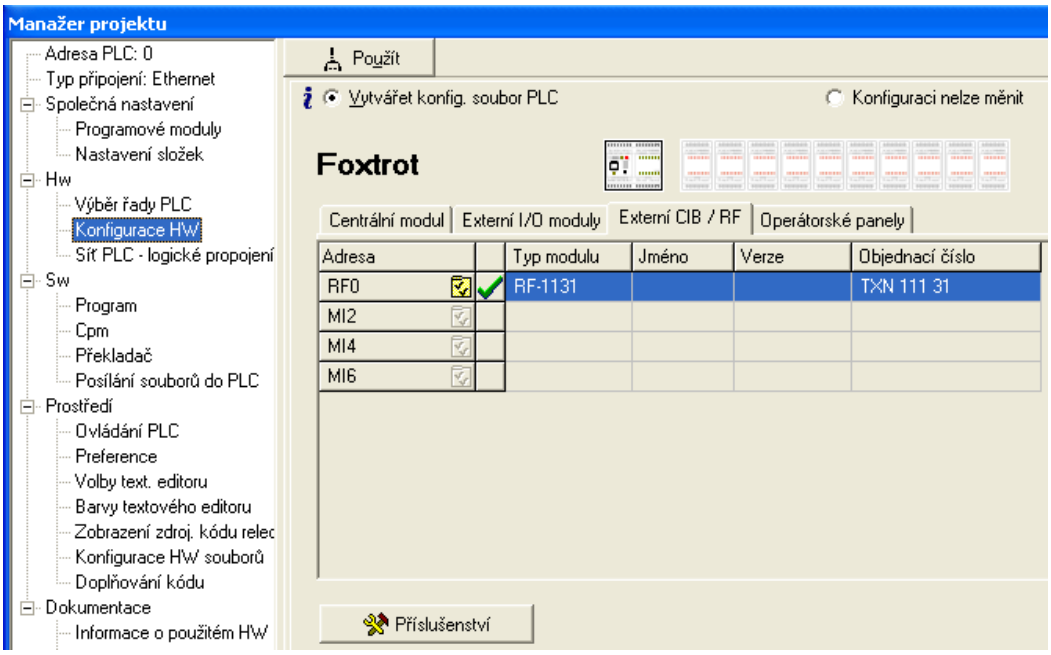
Master addition into the configuration of PLC is done via the dialogue *Configuration HW* in the project manager. CPU Tecomat RFox enables to operate one RFox line via internal master RF-1130 and up to four RFox lines via external masters RF-1131.

Activation of operation of internal master RF-1130 is undertaken in the bookmark *Central module*.



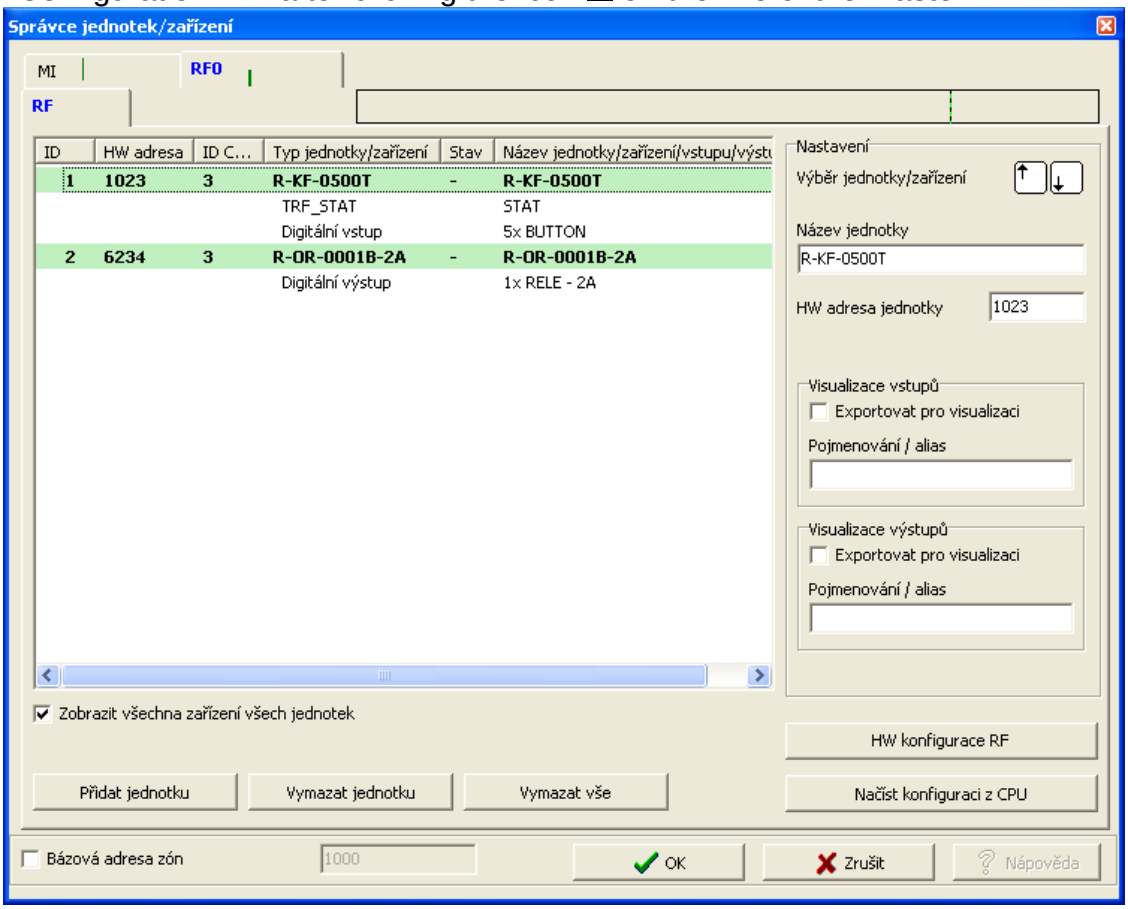
Pic. 2. 3 Activation of operation of internal RF master

Addition and activation of operation of external master RF-1131 is done in the bookmark *External CIB / RF* of the same dialogue.



Pic. 2.4 Addition and activation of operation of external RF master

SW configuration of the master for operation of RF modules on the RFox bus is undertaken via the dialogue Unit/device manager. The dialogue is accessible from the window Configuration HW after clicking the icon on the line of the master.



Pic. 2.5 SW configuration of RF master

Individual RF modules can be added to the list manually using the button *Add unit*, nebo automatically according to the connected CPU using the button *Upload configuration from CPU* (details on configuration upload, see further). The RF module removal can be done using the button *Delete unit*, removing of all modules from all CIB and RFox lines (!!!!) can be done using the button *Delete all*.

HW address of the unit

HW address is in the RF module firmly associated during the production and corresponds to its production number přiřazena (serial number) that is marked on the module cover. The address is 4-digit code.

Unit name

Module identification can be set. Entered text will be used as a prefix of module data structures.

Advanced settings

For modules that allow extended user configuration is available the button Advanced Settings. By pressing the button a dialogue is activated in which additional features of the module are offered.

.

Designation / alias

A symbolic name can be entered under which the structure of inputs/outputs of relevant module will be accessible within the user program (also in the visualization environment).

Export for visualization

When ticking the item, the relevant data structure will be sequenced into the export *public* file that serves as an input file for visualization SW (Reliance).

Every RF module is, from the operation point of view, divided into devices (input, output, binary, analog,....) and devices are further divided into the concrete inputs/outputs (binary input, binary output, analog input,....).

Display all devices of all units

By ticking the item the tree structure of RF modules will expand for branches of devices. In optional devices there can be determined their activity or non-activity by thicking the item *Use device*.

Base address zone

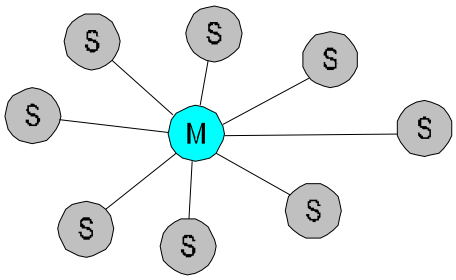
By thicking the item, the absolute location of the beginning of the RFox line data zone into the notepad can be set.

HW configuration of RF

Button *HW configuration RF* activates the dialogue where the basic HW configuration of RFox network is undertaken. It concerns in particular the pairing operations and evaporation required for proper operation of the RF modules that communicate with the RF master. For details see chapter *Principle of RF communication*.

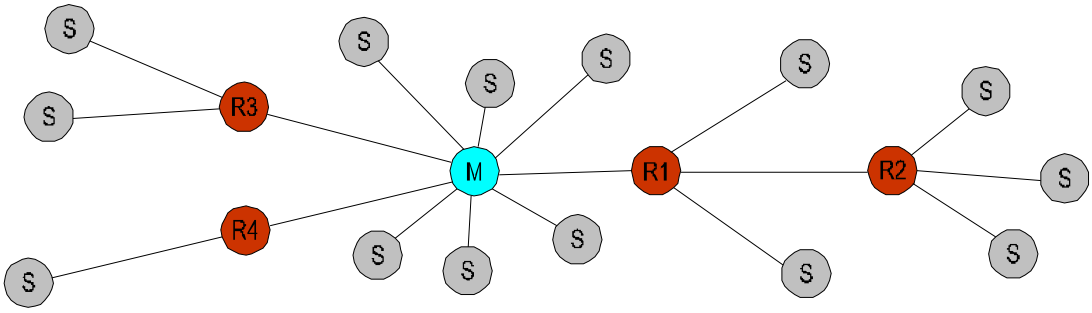
2.3. RF communication principles

Communication between RF master and RF module is supported within topologies of the type star and topologies of the type mesh. The topology of the star type represents direct communication range between master and RF module, master has always the direct communication range with all slave RF modules.



Pic. 2.6 Example of star type topology

Mesh type topology represents such dislocation of operated units where master has a direct communication range with only some units. It can reach remaining units by using so called routers. Router (repeater) is a device that will receive the incoming RF packet, intensify it and forward it. By using routers, the basic communication master range can be increased.

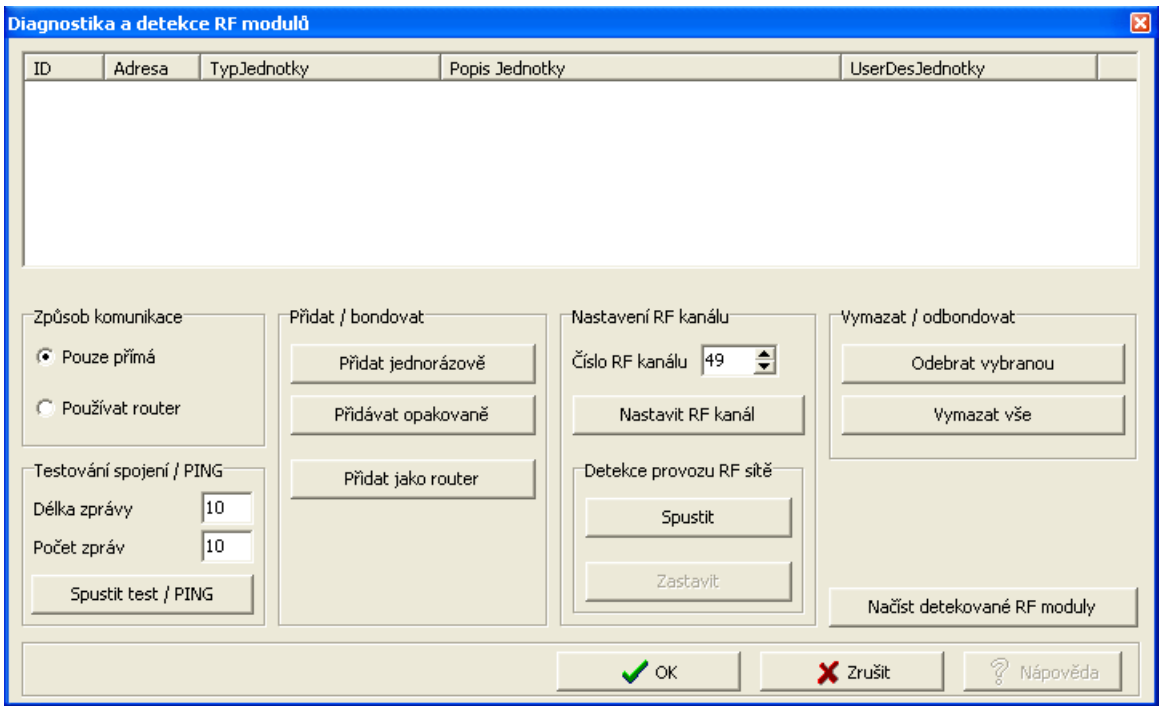


Pic. 2.7 Example of mesh type topology

Within one mesh network can be used **max 4 routers**. Sent RF packet must reach the recipient with the use of max 5 hops. Each hop represents increase of time delay between broadcasting and receiveng of the RF packet (the reaction period between command and action is prolonged). For the router function either, one-dedicated RF route can be used, or, any RF module in the permanent operation (router function is designated to the module during configuration of the module into the RFox network).

From the operation point of view, there can appear, within the RFox network, modules with **permanent** operation and modules with **interrupted** operation. Modules with permanent operation are able to react to master commands anytime (mostly permanently supplied modules). Modules with interrupted operation pass to the „sleep“ mode during which they do not react to the master commands (mostly battery charged modules). The sleep mode is interrupted on the basis of the user action (e. g. pressing of the module button), or on the basis of time action (time delay expiration).

Each RF module must be for the communication with the RF master firstly physically **paired** (bonded). Pairing is undertaken via the dialogue *Diagnostics and detection of RF modules* accessible after the press of the button *HW configuration of RF* from *Unit/device manager*. Pairing is a **two-sided** mode during which, on one side, the RF master notes identification data of paired module and, on the other side, the RF module notes identification data of its RF master.



Pic. 2.8 HW configuration of RF

After the pairing mode activation in the master, it is neccessary also to activate the pairing mode in the RF module. Each module is for the pairing equipped with bonding button (described further in chapter RF modules). When pairing the RF master and RF module the **direct** communication range is required between both participants. It is not possible to pair participants without a direct range. After successful pairing, it is possible to operate the module (communicate with it) also via routers.

Communication method

For RF modules that pass to the sleep mode (sleep mode for the battery energy saving), it is neccessary to determine when pairing whether they should during operation communicate with the master via direct packets (direct communication range) or via router packets (communication via routers). Therefore, it is neccessary, before bonding mode start up, to tick for these modules the required communication method, which, during the pairing mode, will be entered into the RF module. For modules that do not pass to the sleep mode, the mentioned option of communication method selection does not have any influence.

In conjunction with *connection testing* is the selected way of communication used for sending of test packets.

Generally, it can be said, that the reaction time of direct packets is faster than the reaction time of routed packets. Every routed packet means time delay in tens or hundreds of miliseconds. With regards to this fact, it is recommended to prioritise the use of the direct communication method instead of routed.

One-time addition

By pressing the button, there is, in the master, activated for cca 10s one-time pairing mode, during which the master tries to pair with the RF module. The pairing mode is terminated either by the time expiration or by succesfull pairing to the RF module.

Repeated addition

By pressing the button, there is, in the master, activated the pairing mode repeatedly. The 10s interval of pairing mode is automatically restored in the master until the button *Halt* is pressed.

During the pairing mode (one-time or repeated) the red RF LED flashes on the master (external). To ensure the pairing is successful, it is neccessary to activate the pairing mode in the RF module, too. Mostly, it is undertaken by pressing of the pairing (bonding) button (the detailed description, see description of RF modules). After successfull bonding, the new RF module will appear in the list of modules.

Add as a router

Activates the pairing mode for router addition. In the router function it is possible to use either singlepurposed RF router or any RF module that does not pass to the sleep mode. Maximum of 4 routers (routed RF modules) can be added to one master. When using more routers, it is **neccessary,** from the view of topology, to place routers distinctly ascending from the master.

Remove selected

Will remove the selected RF module from the list of paired modules in the master. If the RF module is active, the automatic reset of pairing is undertaken within the master and RF module. If the module is not active (is in the sleep mode), it is neccessary to undertake the pairing reset manually (for procedure see the description of particular RF module).

Delete all

Will remove all paired RF modules from the list of modules in the master. Simultaneously, the pairing reset from the master is undertaken within all active RF modules. Within non active modules (modules in sleep mode), it is neccessary to undertake the pairing reset manually.

RF channel setting

Master and its slave RF network can operate on an optional radio channel. The required channel is set before the start of the pairing mode when the master does not have any peripheral modules paired to. The acceptation of set channel number is done by pressing the button *Set RF channel*.

Detection of RF operation

After the required number of RF channel is set up, the detection of radio operation can be activated by pressing the button *Run*. The detection is active until the button *Finish* is pressed. Then the output of detection is displayed.

Load the detected RF modules

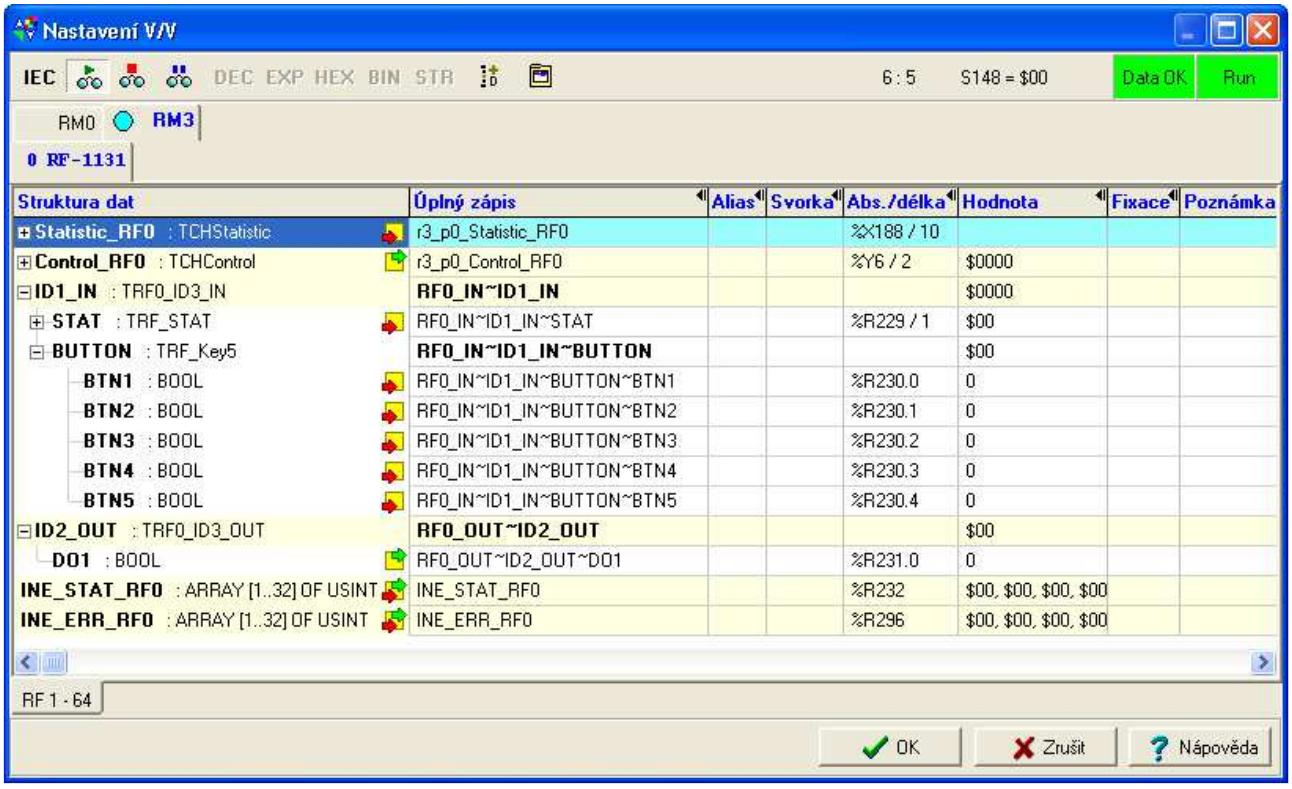
Will load the actual list of paired modules from the RF master (loading of HW configuration of the RFox network). Modules that passes to the sleep mode have on the end of the identification line the symbol *[S]*.

Connection testing

Via connection testing the availability of particular RF module in the RFox network can be checked. After pressing the button *Run test* the master will send the required number and lenght of RF messages (packets) for which it waits for return confirmation from the RF module. The result of the connection test is displayed in the info window. Here is stated the number of required outgoing messages, number of incoming (confirmed) messages and the number of actualy sent messages. In case the message (packet) was not delivered, the master undertakes automatic repeat of the same message. The connection test can be undertaken with active modules only (i. e. with modules that are not in the sleep mode).

2.4. Transferred data structure

RF master reserves data section in the CPU notepad where are accessible the transmitted data fron/to RF modules, status and error zone of RF modules. Structure of data section is apparent from the panel *Settings V/V* within the Mosaic environment. The panel is accessible after the pressing the icon on the tool bar.



Pic. 2.9 Transferred data structure

RFx_IN[ ], RFx_OUT[ ]

Zone of input datat *RFx_IN[]* and zone of output data *RFx_OUT[]* is structured into items *IDx_IN* a *IDx_OUT* in sequence in which RF modules are entered during the RFox line configuration. Data are for the user program accessible both under automatic generated names of variables (column *Full entry)* and also under the user name entered in *Units/devices manager* during the configuration (column *Alias).*

Some input/output data are before the transmission from/to RFox bus converted automatically from/to saving data formats used for RFox bus transmission. Then in the notepad they are available always in the usual format.

INE_STAT_RFx[ ]

Status zone *INE_STAT_RFx[ ]* contains communication statuses of individual RF modules.

	NET	-	SLP	-	-	-	COM	INI
Bit	7	6	5	4	3	2	1	0

INI - module initialization status
1 - module initialized

0 – module not initialized

COM - status on communication with module
1 - module communicates
0 – module does not communicate

SLP - module sleep mode option
1 - module can pass to the sleep mode
0 - module does not pass to the sleep mode

NET - module operation status
1 – module is operated (present in HW configuration)
0 – module is not operated (not present in HW configuration)

INE_ ERR_RFx[ ]

Error zone *INE_ERR_RFx[]* states number of faul communication with individual RF modules. Variables *INE_ERR_RFx* are of a byte type, number of errors is thus counted up to the value 255 then the counter is turned round and new error counting from 0 value starts.

3. RF MODULES

In this chapter the RF module´s parameters are described as well as their connection, configuration procedure and description of module´s transmitted data structure. Dialogues of modules configuration are accessible from the window *Units/devices manager* after pressing the button *Advanced settings*.

Structures of transmitted data are apparent from the panel *Settings V/V* in the Mosaic environment, see pic. 2.9. The panel is accessible after pressing the icon on the tool bar.

Items of the structure have appointed symbolic names that always begins with characters IDx_*IN* a *IDx_OUT*, where x is a number corresponding to the module sequence in the module (column ID in the unit manager). In the column *Full entry* is always stated a particular symbolic name for the relevant unit. If we want to use the date in the user program, we can use either this symbolic name or, in the column *Alias,* we will enter our own symbolic name that can be then used. In no case do we use absolute operands as they can be altered after new program compilation.

Bonding

Each RF module must be, for communication with the RF master, physically bonded to the relevant master. For the use of bonding, each module is equipped with a bonding button.

General procedure of bonding of **one RF module** :

1) Activate bonding mode from the programming environment (for 10s).
2) By pressing the bonding button on the RF module undertake bonding to the master.
3) Newly bonded module will show up in the programming environment in the module list, master will terminate the bonding mode automatically.

General procedure of bonding of **more RF modules** :

1) Activate repeatable bonding mode from the programming environment.
2) By pressing the bonding button on the RF module undertake bonding to the master.
3) Newly bonded module will show up in the programming environment in the module list.

For bonding of other RF modules follow the point 2).

4) End the bonding mode from the programming environment (bonding will be terminated after the 10s bonding interval is finished).

Detailed description of bonding is described in the chapter *2.3. Principle of RF communications*, detailed description of operation of bonding button fo RF modules is described in the description of particular RF modules (see further).

3.1. R-HC-0201F

Module of thermostat is used for the control of the heating vents of the central heating. Module contains internal temperature sensor, LED indicator and a control button. Further, it is possible to connect to the module the external temperature sensor. Alternatively, a potential-free window contact can be connected instead of external temperature sensor. Module is equipped with the function of automatic adaptation of the drive according to the vent used and according to functions of regular vent track spinning (prevention of vent stiffening). Module is supplied from a pair of batteries and during the opreration it turns to sleep mode in which the module consumption is decreased (elongation of supply battery life). During the sleep mode, the module is not able to communicate with the RF master.

For the need of **bonding** of module the SET button is given that is located under the rib´s holes of the plastic cover of the module. After the initial battery insertion, the green LED indicator will light up which is signalling the non-bonded status (module is not paired with the RF master). The green LED will switch off after pressing and releasing the bonding button, the red LED is still flashing. Thus, the module transmit to the bonding mode is indicated. The module stays in this mode until it is succesfully bonded to the RF master which is indicated by a double flash of green LED (simultaneously, the module sill appear in the list of paired modules to the master). Triple flash of the green LED (indication of bonding mode continuation) is repeated after cca 9s. After successful bonding, the module will automatically turn to sleep mode.

If, after the battery insertion, the module is not bonded or it stays in the bonding mode, the battery is permanently burden. With regard to the battery lifetime, it is reccomended to reduce this state to minimum.

Table 3.1 Basic parameters R-HC-0201F

Operation and installation conditions	
Indication	3x LED, green, red
Button	1x SET (bonding)
Communication	RFox
Range of RF signal	100 m (25m in-built)
Operation temperature	–20 ÷ +55 ℃
Storing temperature	–30 ÷ +70 °
Installation	Vent assembly
Stroke[1)]	1.5 mm
Adaptation	automatic + manual
Vent turn	automatic
Data recovery interval[2)]	7 min
Window contact evaluation interval	1 min
Power supply	
Battery	2 x 3,6 V
Battery type	ER-14505M, lithium
Measures and weight	
Measures	49 × 49 × 26 mm
Weight	g

[1)] Vent must not have the restriction of stroke preset

[2)] During the change of the status of the window contact, the interval is decrease to 1 min

Pic. 3.1 Module preview

Bonding of the module is kept even after the battery removal (exhastion). The manual unbonding of the module (without the direct connection to the master) is undertaken by pressing the bonding button and simultaneous insertion of the battery into the holder. With regards to the minimum consumption of the module in the sleep mode, it is neccessary, after the removal of both batteries, to hold the pressed button SET for at least 10s (all module ghost capacities will be exhausted) and only after this procedure one battery can be inserted. The second battery can be inserted afterwards, now, withnout the neccessity of pressing the button.

The battery changeover is undertaken after the plastic module cover removal. The procedure of the changeover, see basic documentation of the module (part of the module supply). During the operation both batteries are loaded (exhausted) equally, therefore, they are changed together.

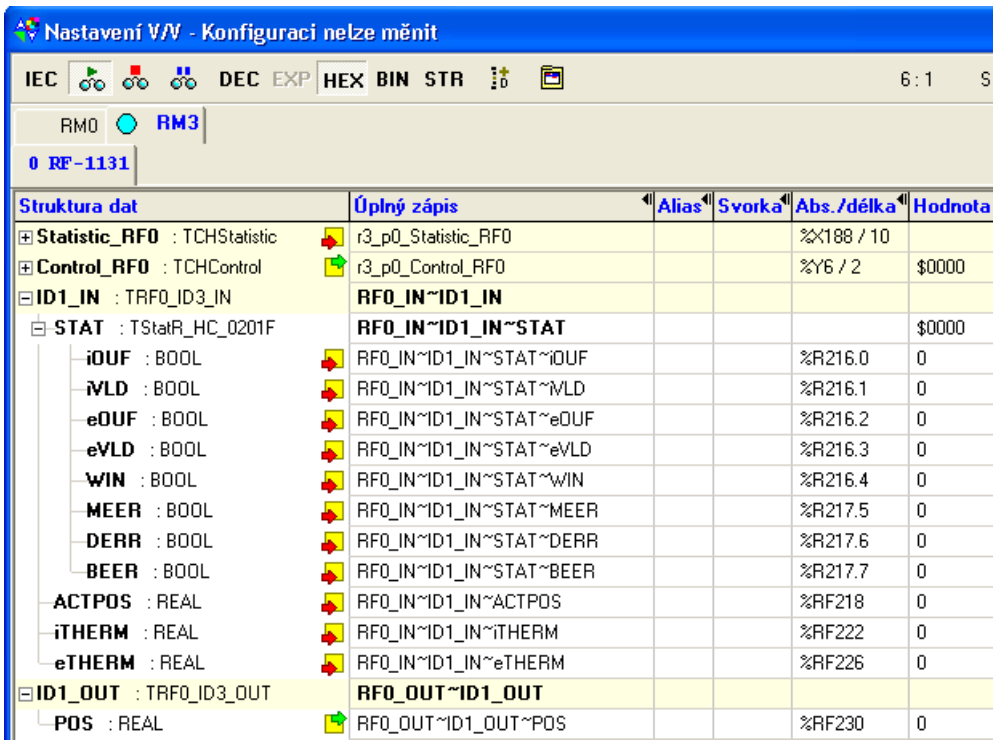
Module operation

After the battery insertion (in the bonded status), the module undertakes the automatic adaptation of the drive with the vent. After the adaptation is finished, the module turn to the operation mode in which it periodically awaken and communicates with the master. During the awaking mode, the green LED is on. During the module transmition to the sleep mode, the green LED switch off. For manual intervention into the module, the SET button is given. After this button is pressed and released within the interval of 1,5s after the required number of flashes of green LED, one of the actions can be initiated that is described in the following table.

Number of flashes	Action
1	Initiation of the module communication with the master
2	Vent opens to 100% (designed for disassembly of the module from the vent)
3	Undertaking of the adaptationof the drive with the vent

3.1.1. Transferred data structure

Transferred data structure is apparent from the panel *Settings V/V* in the Mosaic environment. Panel is accessible after the pressing of the icon 10 on the tool bar.



Struktura dat	Úplný zápis	Alias	Svorka	Abs./délka	Hodnota
Statistic_RF0 : TCHStatistic	r3_p0_Statistic_RF0			%X188 / 10	
Control_RF0 : TCHControl	r3_p0_Control_RF0			%Y6 / 2	$0000
ID1_IN : TRF0_ID3_IN	RF0_IN~ID1_IN				
STAT : TStatR_HC_0201F	RF0_IN~ID1_IN~STAT				$0000
iOUF : BOOL	RF0_IN~ID1_IN~STAT~iOUF			%R216.0	0
iVLD : BOOL	RF0_IN~ID1_IN~STAT~iVLD			%R216.1	0
eOUF : BOOL	RF0_IN~ID1_IN~STAT~eOUF			%R216.2	0
eVLD : BOOL	RF0_IN~ID1_IN~STAT~eVLD			%R216.3	0
WIN : BOOL	RF0_IN~ID1_IN~STAT~WIN			%R216.4	0
MEER : BOOL	RF0_IN~ID1_IN~STAT~MEER			%R217.5	0
DERR : BOOL	RF0_IN~ID1_IN~STAT~DERR			%R217.6	0
BEER : BOOL	RF0_IN~ID1_IN~STAT~BEER			%R217.7	0
ACTPOS : REAL	RF0_IN~ID1_IN~ACTPOS			%RF218	0
iTHERM : REAL	RF0_IN~ID1_IN~iTHERM			%RF222	0
eTHERM : REAL	RF0_IN~ID1_IN~eTHERM			%RF226	0
ID1_OUT : TRF0_ID3_OUT	RF0_OUT~ID1_OUT				
POS : REAL	RF0_OUT~ID1_OUT~POS			%RF230	0

Pic. 3.2 Transferred data structure

Input data

STAT	ACTPOS	iTHERM	eTHERM

STAT - module status (8x type bool)
- *iOUF* - overflow/underflow of the range of the internal temp. sensor
- *iVLD* - bearing validity of the internal temp. sensor
- *eOUF* - overflow/underflow of the range of the external temp. sensor
- *eVLD* - bearing validity of the external temp. sensor
- *WIN* - input status of the window contact
- *MERR* - engine error (over-voltage detected)
- *DERR* - turns detection error
- *BERR* - battery error

ACTPOS - actual position of the drive [0÷100%](type real)

iTHERM - internal sensor temperature [℃](type real)

eTHERM - external sensor temperature [℃](type real)
If there is the window contact connected instead of the external temperature sensor, the variable eTHERM take the values of minimum and maximum of the temperature range.

Output data

POS

POS - required drive possition [0÷100%](type real)

3.1.2. Module specification

When operation the module, it is neccessary to bear in mind the fact, that the module turns to the sleep mode during which it does not communicate with the RF master. After awaking, it undertakes the data transmittion with the master and again turns to the sleep mode. This means that the value entered into the output data will be accepted by the module after it´s awaking. The same is valid for the content of the input data.

When operation the window contact, the immediate reaction of module to the input change does not take place. The module undetakes sampling of the window contact within the time rastr of 1min.

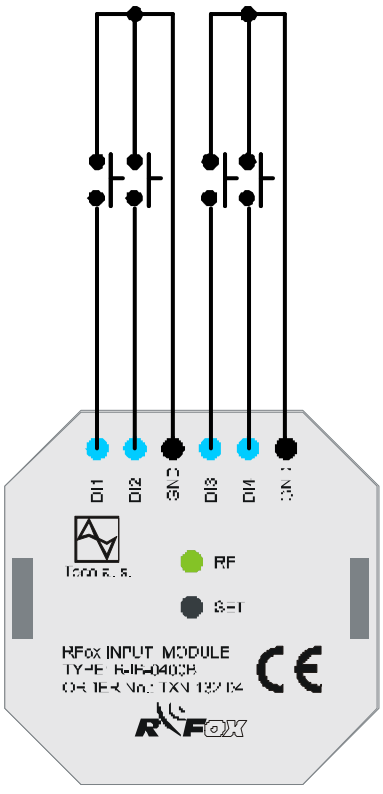
3.2. R-IB-0400B

Battery input module for built-in into the install box. It contains 4 binary inputs, indicating green LED and bonding button. Module, during operation, pass to the sleep mode in which the module consumption is decreased (prolongation of supply battery lifetime). By status change of any of DIx inputs the module will wake up, communicates with the RF master and pass back to sleep mode. During the sleep mode the module is not able to communicate with the RF master. Binary inputs are designated for connection of switch buttons. Permanent switch on of inputs is not reccomended (battery lifetime is shortened).

For the use of module **bonding** the button SET is destined. After the initial battery insertion, the green LED is flashing which signalizes the unbonded status (module is not paired with the RF master). By pressing and releasing the bonding button the LED will shines for 1s and consequently flashes three times. This way the module bonding mode is indicated. In this mode the module stays until successfull bonding with the RF master is finished which is signalized by double flash of the LED (simultaneously, the module will appear in the list of paired modules in the master). The triple flash of the LED (indication remains in the bonding mode) is repeated within cca 9s. When the bonding is successful, the module will pass to the sleep mode automatically.

If the module is not bonded after battery insertion or stays in the bonding status, the battery is permanently under the load. With regards to the battery lifetime, it is reccomended to shorten this state to minimum.

The battery release does not unbond the bonded module. The manual module unbonding (without the direct connection to the master) is undertaken by pressing the bonding button simultaneously with the battery insertion to the holder.



Pic. 3.3 Example of connection

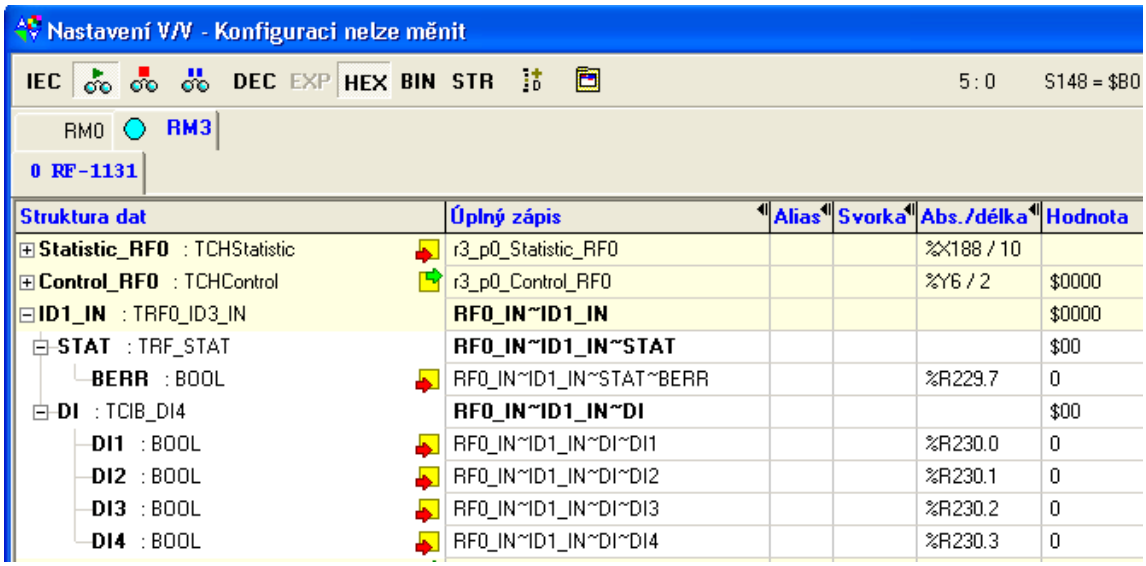
Table 3.1 Basic parameters R-IB-0400B

Binary inputs	
Number	4
Type	Potential-free button
Operation and installation conditions	
Indication	1x RF LED, green
Button	1x SET (bonding)
Communication	RFox
Range of RF signal	100 m (25m in-built)
Operation temperature	–20 ÷ +55 ℃
Storage temperature	–30 ÷ +70 °
Installation	Into the installing box
Connection of power conductors	6x conductor CY
Power conductors cross-section	2.5 mm^2, lenght 90 mm
Power supply	
Battery	3,6 V
Battery type	ER-14250M, lithium
Measures and weight	
Measures	49 × 49 × 26 mm
Weight	g

Battery change is undertaken by disassembly of bottom cover of the module. The description of the battery change is in the Basic module documentation (part of the module supply).

3.2.1. Transferred data structure

Transferred data structure is apparent from the panel *Settings V/V* in the Mosaic environment. Panel is accessible after pressing the icon on the tool bar.



Struktura dat	Úplný zápis	Alias	Svorka	Abs./délka	Hodnota
Statistic_RF0 : TCHStatistic	r3_p0_Statistic_RF0			%X188 / 10	
Control_RF0 : TCHControl	r3_p0_Control_RF0			%Y6 / 2	$0000
ID1_IN : TRF0_ID3_IN	**RF0_IN~ID1_IN**				$0000
STAT : TRF_STAT	**RF0_IN~ID1_IN~STAT**				$00
BERR : BOOL	RF0_IN~ID1_IN~STAT~BERR			%R229.7	0
DI : TCIB_DI4	**RF0_IN~ID1_IN~DI**				$00
DI1 : BOOL	RF0_IN~ID1_IN~DI~DI1			%R230.0	0
DI2 : BOOL	RF0_IN~ID1_IN~DI~DI2			%R230.1	0
DI3 : BOOL	RF0_IN~ID1_IN~DI~DI3			%R230.2	0
DI4 : BOOL	RF0_IN~ID1_IN~DI~DI4			%R230.3	0

Pic. 3.4 Transferred data structure

Input data

STAT	DI

STAT - module status (8x type bool)
BERR – exhausted battery

DI - binary inputs status (8x type bool)
DI1 - input DI1
DI2 - input DI2
DI3 - input DI3
DI4 - input DI4

3.2.2. Module specifics

During assembly, it is neccessary to adhere to the three-dimensional orientation of the module (UP/DOWN) marked on the plastic cover. The shown orientation defines the possition of integrated aerial and ensures the maximum radio range within the horizontal direction.

3.3. R-KF-0500T

Battery powered key ring with 5 buttons and one indicating LED is used as a remote control. Module during operation pass to the sleep mode in which the module consumption is decreased (prolongation of battery lifetime). By pressing any of the buttons the module wakes up, communicates with the master and passes to the sleep mode again. During the sleep mode the module is not able to communicate with the RF master.

For the use of module **bonding** the center button (*BTN5*) is designated. After the initial battery insertion, the green indicating LED flashes which indicates unbonded status (module is not paired with the RF master). By pressing and releasing of bonding button the LED will shines for 1s consequently flashes three times. This way the module bonding mode is indicated. In this mode the module stays until successfull bonding with the RF master is finished which is signalized by double flash of the LED (simultaneously, the module will appear in the list of paired modules in the master). The triple flash of the LED (indication remains in the bonding mode) is repeated within cca 9s. When the bonding is successful, the module will pass to the sleep mode automatically.

If the module is not bonded after battery insertion or stais in the bonding status, the battery is permanently under the load. With regards to the battery lifetime, it is reccomended to shorten this state to minimum.

The battery release does not unbond the bonded module. The manual module unbonding (without the direct connection to the master) is undertaken by pressing the bonding button simultaneously with the battery insertion to the holder. With regards to the minimal module consumption during the sleep mode, it is neccessary, after the battery removal, to hold the bonding button for at least 10s (all residual capacities will be exhaused) and only after that insert the battery.

Pic. 3.5 Module lookup

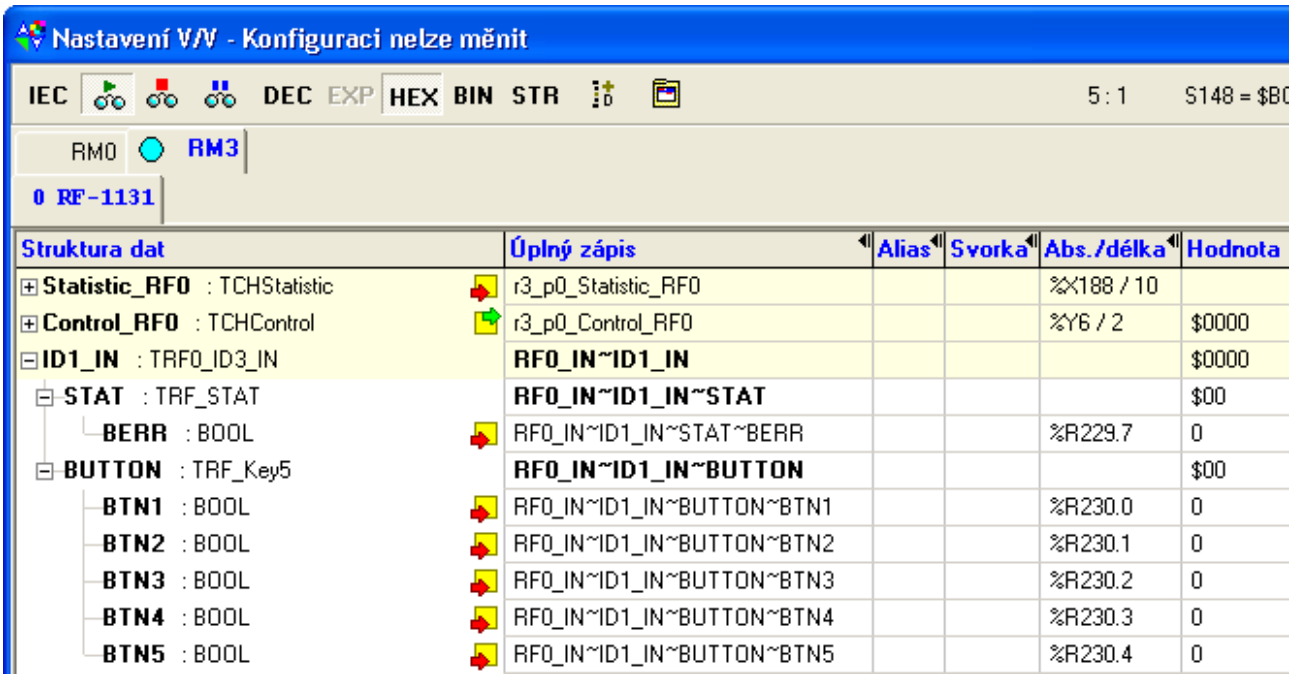
Table 3.1 Basic parameters R-KF-0500T

Parameters	
Buttons	5
Indication	1 LED, green
Communication	RFox
Range of RF signal	100 m (25m in-built)
Operational and installation conditions	
Operational temperature	–20 ÷ +55 ℃
Storing temperature	–30 ÷ +70 ℃
Power supply	
Battery	3,0 V
Battery type	CR-2032, lithium
Measures and weight	
Measures	× × mm
Weight	g

The battery changeover is undertaken after the bottom part of the plastic cover of the key ring is detached from the upper part. Detailed description is described in the module basic documentation (part of the module supply).

3.3.1. Transferred data structure

Transferred data structure is apparent from the panel *Settings V/V* in the Mosaic environment. Panel is accessible after pressing the icon on the tool bar.



Struktura dat	Úplný zápis	Alias	Svorka	Abs./délka	Hodnota
Statistic_RF0 : TCHStatistic	r3_p0_Statistic_RF0			%X188 / 10	
Control_RF0 : TCHControl	r3_p0_Control_RF0			%Y6 / 2	$0000
ID1_IN : TRF0_ID3_IN	**RF0_IN~ID1_IN**				$0000
STAT : TRF_STAT	**RF0_IN~ID1_IN~STAT**				$00
BERR : BOOL	RF0_IN~ID1_IN~STAT~BERR			%R229.7	0
BUTTON : TRF_Key5	**RF0_IN~ID1_IN~BUTTON**				$00
BTN1 : BOOL	RF0_IN~ID1_IN~BUTTON~BTN1			%R230.0	0
BTN2 : BOOL	RF0_IN~ID1_IN~BUTTON~BTN2			%R230.1	0
BTN3 : BOOL	RF0_IN~ID1_IN~BUTTON~BTN3			%R230.2	0
BTN4 : BOOL	RF0_IN~ID1_IN~BUTTON~BTN4			%R230.3	0
BTN5 : BOOL	RF0_IN~ID1_IN~BUTTON~BTN5			%R230.4	0

Pic. 3.6 Transferred data structure

Input data

STAT	BUTTON

STAT - modulu status (8x type bool)
BERR – baterry exhausted

BUTTON - button status (8x type bool)
BTN1 - button 1 (upper left)
BTN2 - button 2 (upper right)
BTN3 - button 3 (bottom left)
BTN4 - button 4 (bottom right)
BTN5 - button 5 (center)

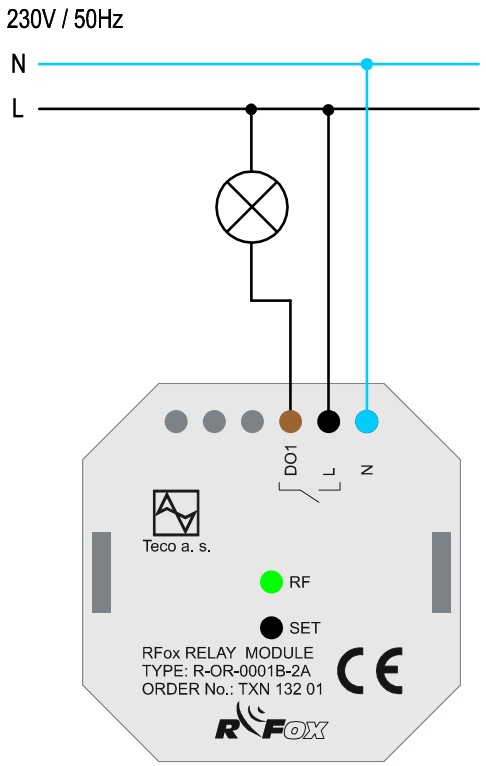
3.4. R-OR-0001B-2A

Relay module for an assembly into the installation box. It contains one relay (switching contact), indication green LED and bonding button. Module is permanently supplied by line voltage 230V / 50Hz.

For the use of module **bonding** the button SET is designated. After the initial power supply connection, the green indicating RF LED flashes which indicated unbonded status (module is not paired with the RF master). By pressing and releasing of bonding button SET, the LED will shines for 1s and consequently flashes three times. This way the module bonding mode is indicated. In this mode the module stays until successfull bonding with the RF master is finished which is signalized by double flash of the LED (simultaneously, the module will appear in the list of paired modules in the master). The triple flash of the LED (indication remains in the bonding mode) is repeated within cca 9s. After successful bonding the module is ready to communicate with the master and remains permanently in the active mode (module is supplied continuously).

The power supply disconnection does not invoke the module unbonding. The manual module unbonding (without the direct connection to the master) is done by pressing the bonding button and simultaneous connection of the module to the power supply. Unbonding of the module with the direct connection to the master, see chapter *2.3. RF communication principles*.

RF LED indicated by permanent shine the module active mode (module is bonded), short flash of the LED indicated radio operation of the module.

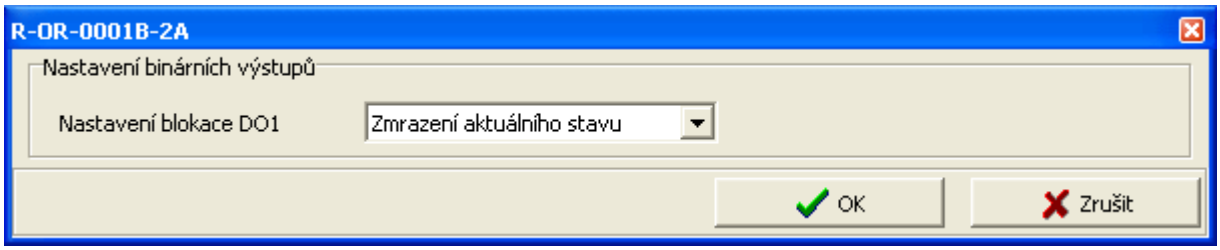


Pic. 3.7 Example of connection

Table 3.1 Basic parameters R-OR-0001B-2A

Relay output	
Number, type	1x switch contact 16A
Operational and installation conditions	
Indication	1x RF LED, green
Button	1x SET (bonding)
Communication	RFox
Range of the RF signal	100 m (25m in-built)
Operational temperature	–20 ÷ +55 ℃
Storing temperature	–30 ÷ +70 °
Instalation	Into the installation box
Power conductor connection	3x conductor CY
Power conductor cross-section	2.5 mm^2, lenght 90 mm
Power supply	
Supply	230V / 50 Hz
Rated take-off	mA
Measures and weight	
Measures	49 × 49 × 26 mm
Weight	g

3.4.1. Configuration



Pic. 3.8 Module configuration

Setting of blockage DO

By selection of an item, the behaviour of the binary output can be treated during the module transfer to the HALT mode. The freeze of the actual status or opening of the binary output can be.

3.4.2. Transferred data structure

Transferred data structure is apparent from the panel *Settings V/V* in the Mosaic environment. Panel is accessible after pressing the icon on the tool bar.

Pic. 3.9 Transferred data structure

Output data

DO1

DO1 - binary output status DO1 (type bool)

3.4.3. Module specifications

During assembly it is neccessary to adhere to the three dimensional orientation of the module (UP/DOWN) marked on the plastic cover. Described orientation defines the position of integrated aerial and ensures the maximum radio range within the horizontal direction.

3.5. R-RC-0001R

Battery module in the interior design for offices and residential premises is designated for display and entry of required values as Room Control Manager. It contains LCD display for value indication and a number of graphic icons used withing the branch of heating, ventilation and air-conditioning. For the movement within the menu and editation of values, it contains the turn knob with confirmation (button). The internal sensor of the temperature is a part of the unit. The unit also contains input for conductive connection of external NTC sensor of temperature.

Module during operation pass to the sleep mode in which the consumption is decreased (prolongation of the battery lifetime). However, the text on the display remains shown even during the sleep mode. The module wakes up itself periodacally. During this time it communicates with the RF master and then pass to the sleep mode again. The module can also be wakened by pressing the button. The waking up is indicated by display flash. If, afterwards, the turn knob remains still for a certain set period, the module again by display flash indicates the transfer to the sleep mode.

For the use of module **bonding** the button of the turn knob is designated. After the initial battery insertion the text with the number of version of the module program will appear (firmware version) and consequently appears the text *„ERROR No. Bond“* which indicates unbonded status (module is not paired with the RF master). By pressing and releasing of the bonding button, the text *„SETTING Bond“* is displayed. This indicates the module transfer to the bonding mode. The module remains in this mode until successful pairing with the RF master which is indicated by 1s flash of the text *„Bond“* and symbol „*sun“*. Afterwards, the whole display is switched off and module pass to the sleep mode.

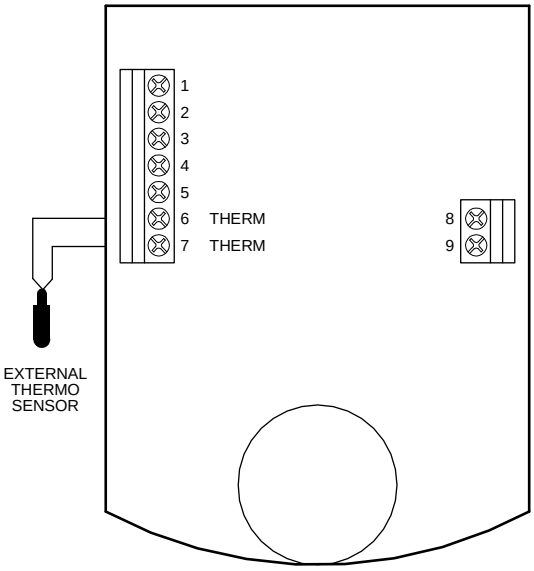
The battery release does not unbond the bonded module. The manual module unbonding (without the direct connection to the master) is undertaken by pressing the bonding button simultaneously with the battery insertion to the holder. With regards to the minimal module consumption during the sleep mode, it is neccessary, after the battery removal, to hold the bonding button for at least 10s (all residual capacities will be exhaused) and only after that insert the battery. Unbonding of the module with the direct connection to the master, see chapter *2.3. RF communication principles*.

After the battery insertion, all display symbols flashes shortly and, afterwards, the version of the module program is displayed (firmware) (E.g. v1.0).

Pic. 3.10 Module lookup

Table 3.1 Basic parameters R-RC-0001R

Display	
Type	LCD (value display + graphic symbols)
Control unit	Turn knob
Delay before sleep mode	5s
Analog input	
Number	2
Input type	Temperature sensor (internal, external)
Sensor type	Termistor NTC 12k
Range	-20 ÷ +100 ℃
Accurancy	0,8 ℃
Power supply	
battery	3,6 V
Battery type	ER-14505M, lithium, 2.2 Ah
Battery lifetime	2 years
Measures and weight	
Measures	90 × 116 × 44 mm
Weight	130 g

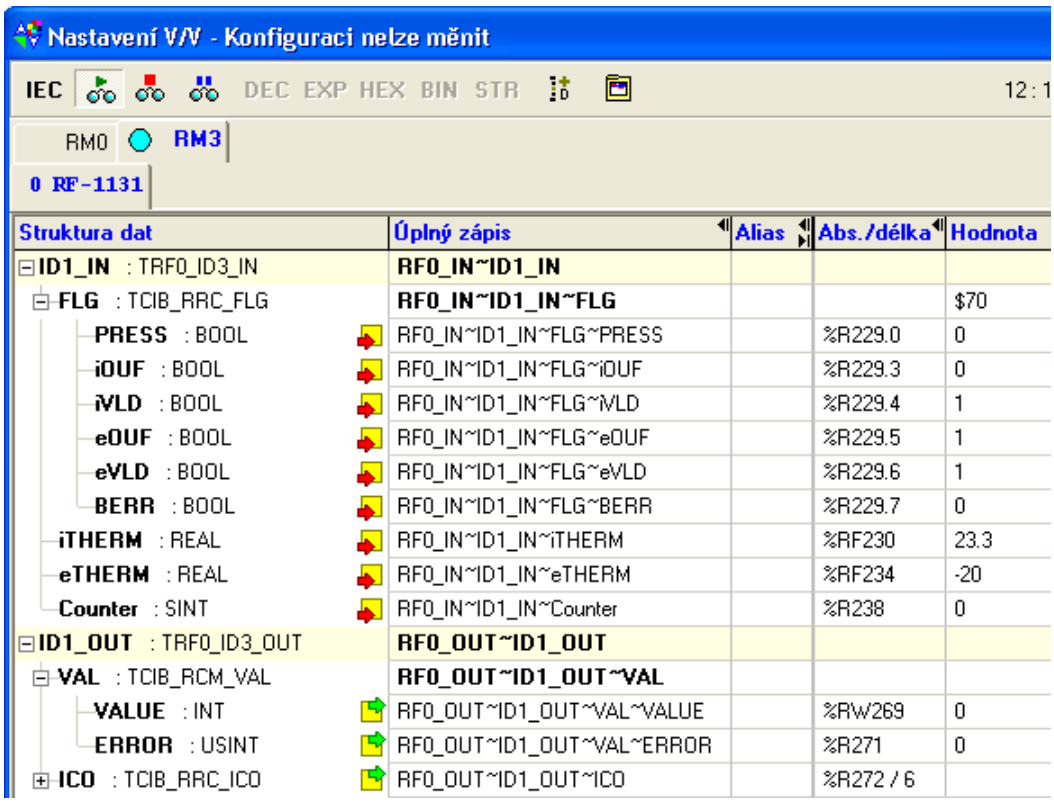


Pic. 3.11 Example of connection

Operational and installation conditions	
Communication	RFox
RF signal range	100 m (25m in-built)
Shielding	IP10B
Operational temperature	0 ÷ +55 ℃
Storing temperature	–25 ÷ +70 ℃
Operation type	Permanent
Operational position	Vertical (turn knob down)
Mechanic construction	Plastic module
Instalation	On the wall, onto the assembly box
Adjustement	Screw clamps
Conductors cross-section	max. 1,5 mm^2

3.5.1. Transferred data structure

Transferred data structure is apparent from the panel *Settings V/V* in the Mosaic environment. Panel is accessible after pressing the icon on the tool bar.



Struktura dat	Úplný zápis	Alias	Abs./délka	Hodnota
ID1_IN : TRF0_ID3_IN	**RF0_IN~ID1_IN**			
FLG : TCIB_RRC_FLG	**RF0_IN~ID1_IN~FLG**			$70
PRESS : BOOL	RF0_IN~ID1_IN~FLG~PRESS		%R229.0	0
iOUF : BOOL	RF0_IN~ID1_IN~FLG~iOUF		%R229.3	0
iVLD : BOOL	RF0_IN~ID1_IN~FLG~iVLD		%R229.4	1
eOUF : BOOL	RF0_IN~ID1_IN~FLG~eOUF		%R229.5	1
eVLD : BOOL	RF0_IN~ID1_IN~FLG~eVLD		%R229.6	1
BERR : BOOL	RF0_IN~ID1_IN~FLG~BERR		%R229.7	0
iTHERM : REAL	RF0_IN~ID1_IN~iTHERM		%RF230	23.3
eTHERM : REAL	RF0_IN~ID1_IN~eTHERM		%RF234	-20
Counter : SINT	RF0_IN~ID1_IN~Counter		%R238	0
ID1_OUT : TRF0_ID3_OUT	**RF0_OUT~ID1_OUT**			
VAL : TCIB_RCM_VAL	**RF0_OUT~ID1_OUT~VAL**			
VALUE : INT	RF0_OUT~ID1_OUT~VAL~VALUE		%RW269	0
ERROR : USINT	RF0_OUT~ID1_OUT~VAL~ERROR		%R271	0
ICO : TCIB_RRC_ICO	RF0_OUT~ID1_OUT~ICO		%R272 / 6	

Pic. 3.12 Transferred data structure

Input data

FLG	iTHERM	eTHERM	COUNTER

FLG - status byte of the module (8x type bool)
- *PRESS* - turn knob pressed (button function)
- *iOUF* - overflow/underflow of the range of the internal sensor for temperature
- *iVLD* - validity of the internal sensor for temperature bearing
- *eOUF* - overflow/underflow of the range of the external sensor for temperature
- *eVLD* - validity of the internal sensor for temperature bearing
- *BERR* - battery exhausted

iTHERM - internal sensor temperature (type real) [℃]

eTHERM - external sensor temperature (type real) [℃]

COUNTER - ring counter of the turn knob possition (type sint)

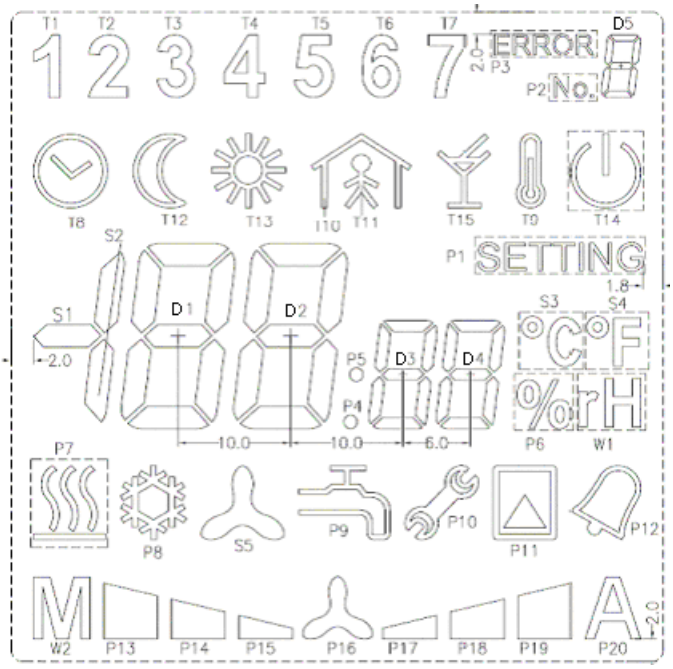
Output data

VALUE	ERROR	ICO

VALUE - value for display on the main segment (type int)
Value display is determined by visibility S1 - S2 and D1 - D4

ERROR - value for display on the subsidiary segment (type usint)
Value display is determined by visibility of the segment D5

ICO - visibility tags of symbols/ segments on the display (48* type bool)
(see following picture and table)



Pic. 3. 13 Symbols and segments lay-out on the display R-RC-0001R

Icon / segment	Symbolic name
T1	ONE
T2	TWO
T3	THREE
T4	FOUR
T5	FIVE
T6	SIX
T7	SEVEN
P3	ERROR
P2	No
T8	Clock
T12	Moon
T13	Sun
T10	House
T11	Figure
T15	Drink
T9	Thermometer
T14	Power
P1	Setting
S3	Celsius
S4	Fahrenheit
P6	Percent
W1	rH
P5	dotUp
P4	dotDown
P7	Heating
P8	Cooling
S5	Ventilation
P9	Water
P10	Spanner
P11	P11
P12	Bell
W2	Manual
P13	LN3
P14	LN2
P15	LN1
P16	Rotation
P17	LP1
P18	LP2
P19	LP3
P20	Automatic
S1	Minus
S2	S2
D1	D1
D2	D2
D3	D3
D4	D4
D5	DE

Notes :

Objednávky a informace:
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