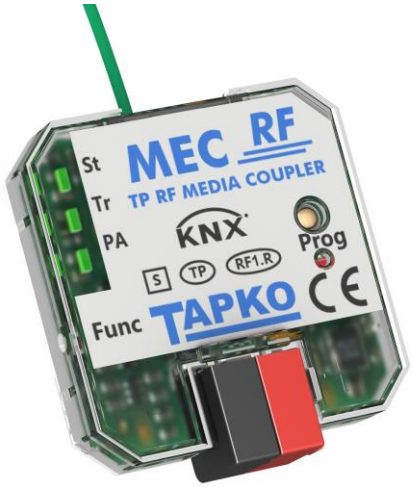
TAPKO
TECHNOLOGIES GMBH



MECrf

KNX RF Coupler

Technical & Application Description

Content

1 Product Description

The KNX RF Coupler MECrf works as a TP RF media coupler to provide a bi-directional data connection between KNX TP main line and KNX RF subline. MECrf is also able to extend RF ranges by usage of its retransmitter function.

MECrf is ideally suitable for programming RF devices. With the ETS (or compatible commissioning tool), MECrf can also work as a KNX RF S-mode programming interface having no KNX communication objects for itself.

Every bus device in the bus system can be accessed. Extended frames and long messages with up to 201 byte APDU length are supported. Telegram filtering is accomplished according to the installation place in the hierarchy (Physical Telegrams) and according to the built in filter tables for group communication (Group Telegrams). For detailed diagnosis, all operational modes/states are shown by a duo-LED display. Programming on main line from RF side can be suppressed. Number of repetitions on main line can be reduced.

To ease commissioning and troubleshooting, special routing/repetition/confirmation ETS settings and a configurable Manual Function for short-time telegram filter switch-off are available. E.g. “transmit all group telegrams” can be activated by a single button press. After the set time period, MECrf switches back to normal operation automatically. Another feature to increase the data throughput is the ability to send IACKs (on TP side) on own telegrams.

MECrf conforms to KNX-AN161 with all options (Filtering, Raw mode).


In this document, individually addressed telegrams are named Physical Telegrams.


In this document, group oriented telegrams are named Group Telegrams.

1.1 Front Panel and Back Side

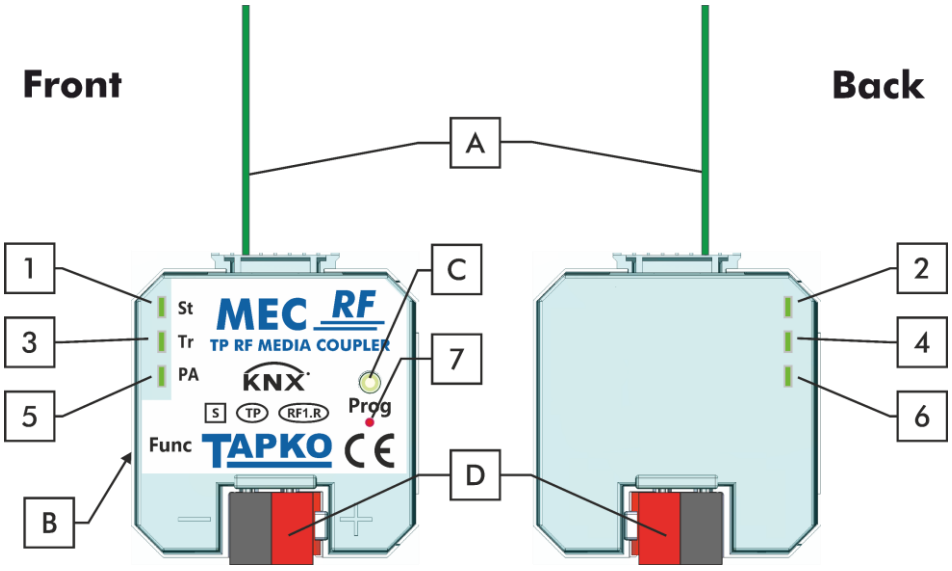


Figure 1: Front View

Table 1: Front Panel and Back Side Elements

LEDs		Buttons / Connectors	
1	Bus State KNX RF (Subline)	A	RF Antenna
2	Bus State KNX TP (Main Line)	B	Function Button
3	Telegram Traffic KNX RF (Subline)	C	Programming Button
4	Telegram Traffic KNX TP (Main Line)	D	KNX TP Connector
5	Physical (Individual) Address Routing		
6	Group Address Routing*		
7	Programming LED		

* only group telegrams with main groups 0…13

1.2 LED Indication

Table 2: LEDs Colours

Number	LED	Colour	Explanation / Range
1	**Bus State KNX RF (Subline)**	green	Subline OK
		< off >	Subline not connected
2	**Bus State KNX TP (Main Line)**	green	Main Line OK
		orange	Manual Function active
		< off >	Main Line not connected
3	**Telegram Traffic KNX RF (Subline)**	blinking green	Telegram traffic extent indicated by blinking
		blinking red	Transmission error
		< off >	No telegram traffic
4	**Telegram Traffic KNX TP (Main Line)**	blinking green	Telegram traffic extent indicated by blinking
		blinking red	Transmission error
		< off >	No telegram traffic
5	**Physical (Individual) Address Routing**	green	Filter table active
		yellow	Route all
		orange	Block all
		< off >	Routing of Group Telegrams is different on main line and subline
6	**Group Address Routing**	green	Filtering active
		orange	Route all
		red	Block all
		< off >	Routing of Physical telegrams is different on main line and subline
7	**Programming LED**	red	Programming Mode active
		< off >	Programming Mode not active

1.3 LED Indication of Special Functions

Table 3: LED Status Display for Manual Function

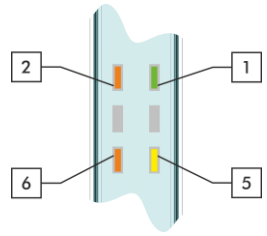
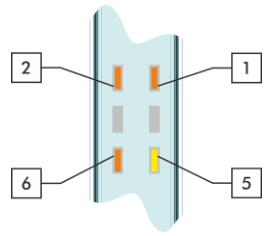
Number	LED	Colour	Comment	
1	**Bus State KNX RF**	green		 (side view)
2	**Bus State KNX TP**	orange		
5	**Physical (Indiv.) Address Routing**	yellow: route all orange: block all		
6	**Group Address Routing**	orange: route all red: block all		

Table 4: LED Status Display for Factory Reset after first Button Press

Number	LED	Colour	Comment	
1	**Bus State KNX RF**	orange		 (side view)
2	**Bus State KNX TP**	orange		
5	**Physical (Indiv.) Address Routing**	yellow: route all orange: block all		
6	**Group Address Routing**	orange: route all red: block all		

1.4 Instructions for Commissioning and Safety

MECrf is a polite device. To determine if the transmission channel is free, its internal functioning contains channel sensing before transmission. Concerning any end user application, the duty cycle has to be kept below 1%.

Please note for commissioning with default settings:

- All telegrams are blocked because the filter table is not defined
- The Manual Function switch-off time is 60 min
- Individual Address is 15.15.0

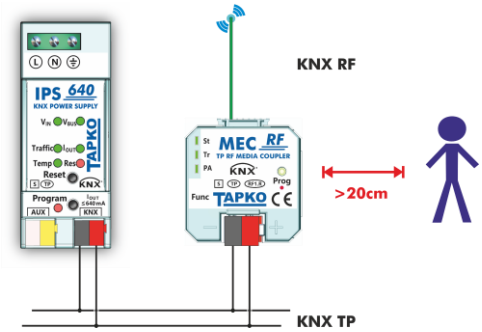


Figure 2: Connection Scheme

Please read carefully before first use:

- After connection to KNX, the device works with its default settings as intended
- Warning: Do not connect to 230 V. The device is supplied by the KNX bus and does not require any additional external power supply
- The device may only be installed and put into operation by a qualified electrician or authorized person
- For planning and construction of electric installations the appropriate specifications, guidelines and regulations in force of the respective country have to be complied
- Do not mount directly on a metal rail or a metal fastener
- Make sure that during operation a minimum distance of 20 cm to the human body, conducting surfaces and objects is kept
- Connect the KNX bus line as for common KNX bus connections with a KNX bus cable, to be stripped and plugged into the KNX TP connector
- Do not damage electrical insulations when connecting
- Installation only in dry locations
- Accessibility of the device for operation and visual inspection must be provided
- For changing the configuration use the ETS
- The housing must not be opened
- Protect the device from moisture, dirt and damage
- The device needs no maintenance
- If necessary, the device can be cleaned with a dry cloth
- In the case of damage (at storage, transport) no repairs may be carried out by unauthorized persons

1.5 Feature Summary

- MECrf supports long telegrams with up to 201 bytes APDU length. (Every product of both the MEC coupler series and the UIM interface series is able to process long messages e.g. for energy metering applications and visualization purposes.)
- MECrf favourably replaces a line coupler in a wireless sub network.
- MECrf works without external power supply.
- The retransmitter function is supported.
- IACK sending on sent out messages (on TP side) is ETS configurable.
- When there is no IACK response on the main line, MECrf is able to repeat messages up to three times. Repetition can be configured for both Physical Telegrams and Group Telegrams via ETS (to ease troubleshooting). E.g. after an IACK response no repetition is following and the negative IACK/BUSY failure mechanism is maintained.
- For an ETS configurable time period, it is possible to switch off telegram filtering by only pressing a button on the device front panel. Without additional ETS download filtering is suspended. This is necessary for running fast diagnostics on site.
- Temporarily suspending telegram filtering eases commissioning and debugging. Without ETS download temporary access to other lines becomes possible.
- Automatic function for switching back to run-time telegram filtering after configurable suspension period (see Manual Mode). This avoids forgetting the reactivation of filtering.
- In networks with high busload the internal amount of communication buffers are capable of smoothing peeks in the communication load course.
- MECrf's ETS database entries are available for ETS5.

2 Operational Description

In network installations MECrf can be used as KNX RF line coupler and retransmitter. After connecting to KNX TP, MECrf operates with its default settings. Setting the correct Individual Address is necessary to include MECrf in the present KNX bus system. Only Individual Addresses x.y.0 are allowed to be set.

2.1 RF Coupler Application

When MECrf receives telegrams (for example during commissioning) that use Individual Addresses as destination addresses, it compares the Individual Addresses of the receiver with its own Individual Address and decides on that whether it has to route the telegrams or not.

When MECrf receives telegrams that use group addresses as destination addresses, it reacts in accordance with the parameter settings. During normal operation (with Group Telegram routing set to filter), MECrf only routes telegrams whose group addresses are entered in its filter table.

If a telegram is routed by MECrf without receiving the corresponding acknowledgement, i.e. due to a missing receiver or to a transmission error, the telegram will be repeated up to three times (depending on the ETS setting). With the parameters „Repetitions if errors...“, this function can be configured separately for each line and both kinds of telegrams. It is recommended to use the default parameter setting.

2.2 Programming

2.2.1 Programming of Individual Address and Application

To download Individual Address and/or ETS application, the Programming Mode must be activated. Successive pressing the Programming Button will turn on and off Programming Mode. LED 7 lighting in red colour indicates Programming Mode is active.

To make a download and configure the device, an interface connection (IP, USB) to the KNX bus system is required. When Programming Mode is activated, the ETS is able to start the download. With the parameter "Configuration from subline (KNX RF)" set to allow, also a KNX RF Interface can be used.

To program devices of a line different to which the device used as ETS Current Interface is connected, a correct topology is mandatory.

The Individual Address can be assigned to the device by setting the desired address in the properties window of the ETS. After starting the ETS download and then pressing the Programming Button the device restarts itself.

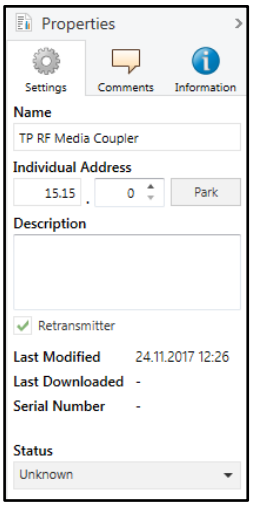


Figure 3: ETS Properties Window

The device is supplied with the Individual Address 15.15.0 (Factory Default Setting).

The KNX product database entry (available for ETS5) can be downloaded from the TAPKO website and from the KNX Online Catalog.

2.3 Special Functions

The Function Button activates MECrf´s special functions. Manual Function and Factory Reset can be activated. Device settings of MECrf can be reset to manufacturer default values with the Factory Reset function. During the Firmware Update procedure, the Function Button has to be pressed. Activation status of every special function is indicated by the LED display (see chapter 1.3 LED Indication of Special Functions).

Figure 4: Side View and Function Button

2.3.1 Manual Function

During normal operation a rather short press (≈ 3 sec) activates and deactivates the Manual Function. LED 5 and LED 6 show the current filtering states.

When the Manual Function is active, either all Physical Telegrams or all Group Telegrams or both pass the MECrf without filtering. After the Switch-off time period has elapsed, MECrf automatically switches back to normal operation. To configure the Manual Function and set the Switch-off time, use the parameter tab General like shown in chapter 3.1 General. After switching back from Manual Function to normal operation, the latest downloaded parameter setting / filter table entries are active again.

2.3.2 Factory Reset

A long press (≈ 15 sec) of the Function Button soon followed by a short press (≈ 3 sec) executes the Factory Reset. After the first press, the LED display lights like described in Table 4: LED Status Display for Factory Reset after first Button Press. After the second press, the LEDs go off and parameters (incl. Individual Address) will be set to factory default (since version 1.3 also incl. domain address). Subsequently, LEDs indicate normal operation again.

3 ETS Database Parameters

Screenshots are related to the MECrf database file R1-1 in ETS5.

3.1 General

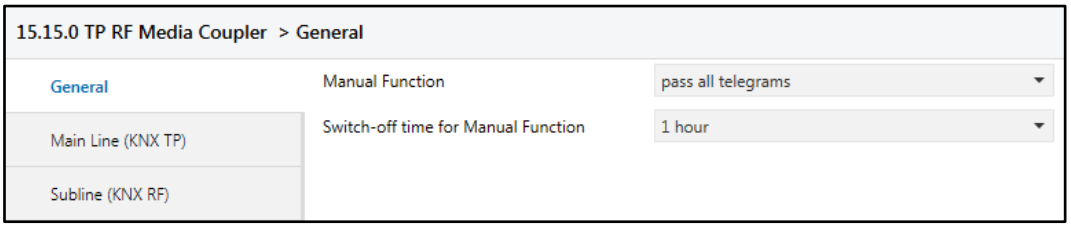


Figure 5: General Tab Parameters

Table 5: General Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment
Switch-off time for Manual Function	10 min, 1 hour, 4 hours, 8 hours **[1 hour]**	After expiry of this time period the Manual Function is switched off automatically.
Manual Function	disabled pass all telegrams pass all Physical telegrams pass all Group telegrams **[pass all telegrams]**	Configuration setting for telegram routing when the Manual Function is active.

3.2 Main Line (KNX TP)

For Group Telegrams and Physical Telegrams the setting “transmit all” is intended only for testing purposes. Please do not use for normal operation.

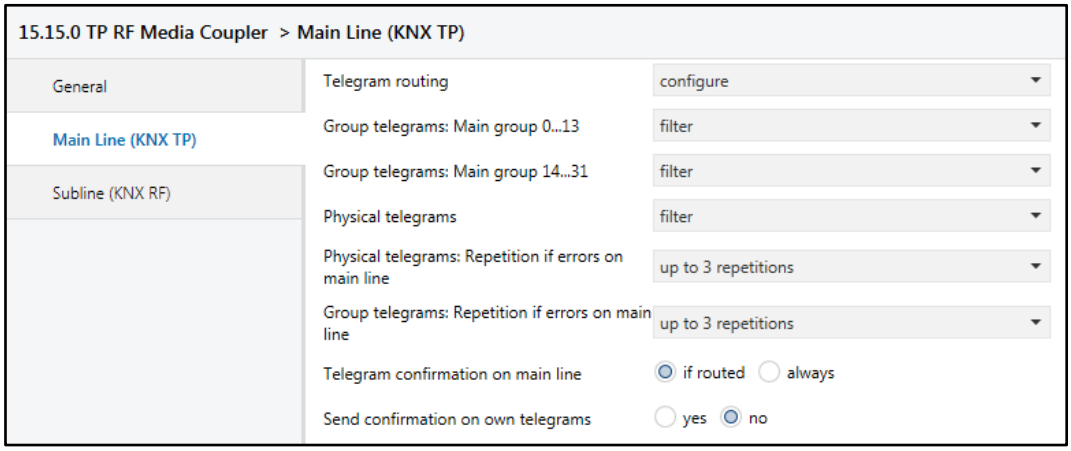


Figure 6: Main Line (KNX TP) Tab Parameters

Table 6: Main Line (KNX TP) Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment	
Telegram routing	Group: filter, Physical: block Group and Physical: filter Group: route, Physical: filter Group and Physical: route configure **[Group and Physical: filter]**	block:	no telegrams are routed.
		filter:	telegrams entered in the filter table are routed.
		route:	all telegrams are routed.
		configure:	the following parameters must be set manually.
Group telegrams: Main group 0…13	transmit all (not recommended) block filter **[filter]**	• Group telegrams (main group 0…13) are all routed. • Group telegrams (main group 0…13) are all blocked. • Group telegrams (main group 0…13) are routed if entered in the filter table.	
Group telegrams: Main group 14…31	transmit all (not recommended) block filter **[filter]**	• Group telegrams (main group 14…31) are all routed. • Group telegrams (main group 14…31) are all blocked. • Group telegrams (main group 14…31) are routed if entered in the filter table.	
Physical telegrams	transmit all (not recommended) block filter **[filter]**	• Physical telegrams are all routed. • Physical telegrams are all blocked. • Depending on the Individual Address Physical telegrams are routed.	
Physical telegrams: Repetition if errors on main line	no up to 3 repetitions one repetition **[up to 3 repetitions]**	After main line transmission error (e.g. due to missing receiver) Physical telegrams • are not repeated. • are repeated max. 3 times. • are repeated once.	

ETS Parameter	Settings [Default Parameter]	Comment
Group telegrams: Repetition if errors on main line	no up to 3 repetitions one repetition **[up to 3 repetitions]**	After main line transmission error (e.g. due to missing receiver) Group telegrams • are not repeated. • are repeated max. 3 times. • are repeated once.
Telegram confirmation on main line	if routed always **[if routed]**	• Routed telegrams to RF subline are confirmed by an ACK on the main line. • Each telegram on the main line is confirmed by an ACK.
Send confirmation on own telegrams	yes no **[no]**	• Telegrams sent out to the mainline are confirmed by added ACK. • No ACK confirmation.

3.3 Subline (KNX RF)

For Group Telegrams and Physical Telegrams the setting “transmit all” is intended only for testing purposes. Please do not use for normal operation.

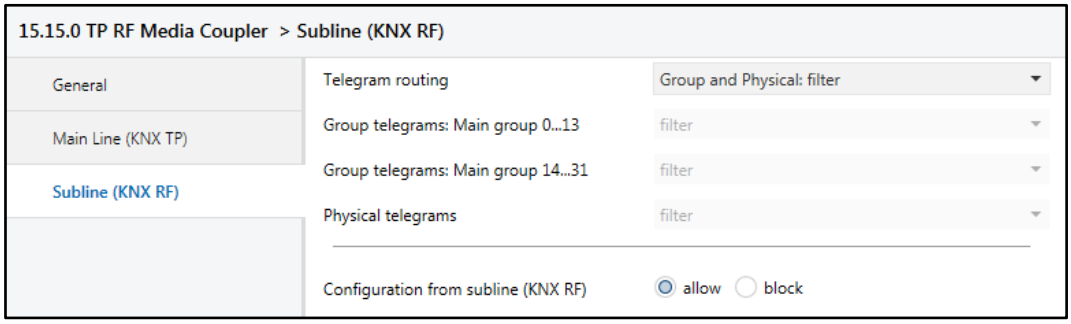


Figure 7: Subline (KNX RF) Tab Parameters

Table 7: Subline (KNX RF) Tab Parameter Settings

ETS Parameter	Settings [Default Parameter]	Comment	
Telegram routing	Group: filter, Physical: block Group and Physical: filter Group: route, Physical: filter Group and Physical: route configure **[Group and Physical: filter]**	block:	no telegrams are routed.
		filter:	telegrams entered in the filter table are routed.
		route:	all telegrams are routed.
		configure:	the following parameters must be set manually.
Group telegrams: Main group 0…13	transmit all (not recommended) block filter **[filter]**	• Group telegrams (main group 0…13) are all routed. • Group telegrams (main group 0…13) are all blocked. • Group telegrams (main group 0…13) are routed if entered in the filter table.	
Group telegrams: Main group 14…31	transmit all (not recommended) block filter **[filter]**	• Group telegrams (main group 14…31) are all routed. • Group telegrams (main group 14…31) are all blocked. • Group telegrams (main group 14…31) are routed if entered in the filter table.	
Physical telegrams	transmit all (not recommended) block filter **[filter]**	• Physical telegrams are all routed. • Physical telegrams are all blocked. • Depending on the Individual Address Physical telegrams are routed.	
Configuration from subline (KNX RF)	allow block **[allow]**	If blocked an ETS download to the MECrf can occur only via TP main line.	

4 Technical

4.1 State of Delivery

Table 8: Factory Default Setting

General	
Individual Address	15.15.0

KNX TP (KNX TP Main line to KNX RF Subline)	
Group telegrams (main group 0…13)	filter (filter table is empty)
Group telegrams (main group 14…31)	route all
Physical telegrams	filter
Physical: Repetition if errors on main line (KNX TP)	up to 3 repetitions
Group: Repetition if errors on main line (KNX TP)	up to 3 repetitions
Telegram confirmations on main line (KNX TP)	if routed
Send confirmation on own telegrams	no

KNX RF (KNX RF Subline to KNX TP Main line)	
Group telegrams (main group 0…13)	filter (filter table is empty)
Group telegrams (main group 14…31)	route all
Physical telegrams	filter
Configuration from subline (KNX RF)	allow

4.2 Datasheet

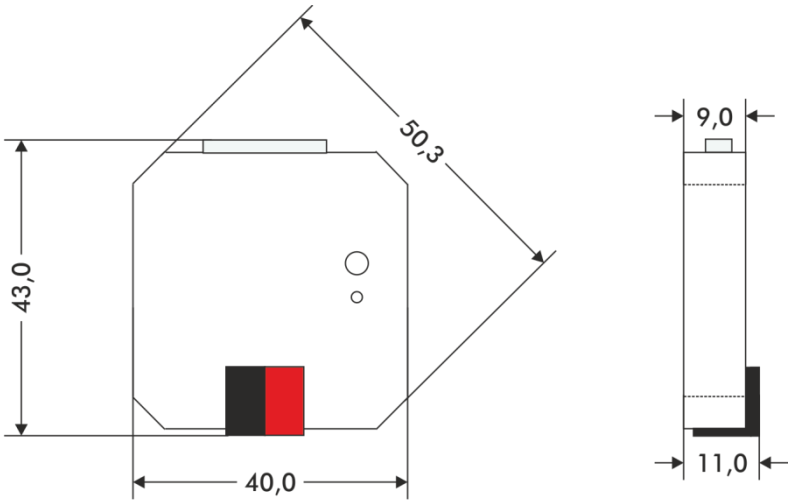
Marking/Design	MECrf	
Current consumption	< 10 mA	
Connections	KNX TP line: KNX TP connector (red/black), screwless, for single-core cable Ø 0.6…0.8 mm	
LED Display elements	State (RF and TP) Traffic (RF and TP)	Routing (GA and PA) Programming LED
Control elements	Function Button Programming Button	
Protection type	IP20 according to IEC60529	
Pollution degree	2 according to IEC60664-1	
Protection class	III according to IEC61140	
Overvoltage category	II according to IEC60664-1	
Approbation	KNX-certified according to ISO/IEC14543-3	
CE Marking	In compliance with directives 2014/35/EU (LVD), 2014/30/EU (EMC), 2011/65/EU (RoHS), 2014/53/EU (RED)	
Standards	ETSI EN300220-1, ETSI EN300220-2, EN301489-1, EN301489-3, EN50491-5-2, EN50581, EN50663, EN61000-6-2, EN61000-6-3, EN62368-1, EN62479	
Voltage supply	KNX: 21…30V DC (SELV)	
Housing colour	Plastic PA66 housing, transparent	
Housing dimensions	H = 43 mm, W = 40 mm, D = 11 mm	
Weight	15 g	
Operating temperature	-5…45 °C	
Storage temperature	-10…70 °C	
Ambient humidity	5…93 %, non-condensing	

4.3 Communication Data

KNX RF	**KNX Ready**	RF1.R (with Listen Before Talk medium access)
	KNX Multi	Hardware is ready for KNX Multi
	Configuration mode	S-mode
	Bibat	Not supported
	max. APDU length	201 bytes
	Mask version	2920
RF Performance	**RF antenna**	External
	RF range	Max. 100m
	Frequency range	868.3 MHz +/- 300KHz
	Modulation	FSK
	Tx transmit power	+5.9 dBm

4.4 Technical Drawings

Dimensions shown here are specified in mm.



Dimensions in mm
Tolerance: +/- 0.5 mm

Figure 8: Dimension Drawings

5 Simplified EU Declaration of Conformity

Hereby, TAPKO Technologies GmbH declares that the radio equipment type MECrf is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity is available at the following internet address: www.tapko.de/ce

MECrf

Product:	KNX RF Coupler
Doctype:	Technical & Application Description
Release Number / Release Date:	R1.10 / October 2019
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