

EAE KNX IP ROUTER



Product Order Nr: 48015

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1. General Features

EAE KNX IP Routers are similar to TP line couplers, except that they use Ethernet for the main line. However, it is also possible to directly integrate KNX end devices via IP, making Ethernet respectively IP (Internet Protocol) a KNX medium.

EAE KNX IP Router is a tunnelling and routing device. It can be used as line- or backbone coupler and provides a data connection between the upper KNXnet/IP line (main line or backbone) and the lower TP KNX bus line (sub line). It also provides with the tunnelling protocol a connection point for ETS to enable commissioning and monitoring.

IPR100 can also connect two separate installations/systems

Following highlights are characterising EAE KNX IP Router:

- Support of long messages up to 250 byte. In combination with EAE IPR100 line coupler and USB interface "UIM-KNX 42" long messages are made possible (e.g. energy metering applications).
- It provides the tunnelling protocol, a connection point for ETS to enable commissioning and monitoring (4 parallel connections are possible).
- IPR100 can be used for replacing a line coupler or an area coupler. The best advantage of this change is using LAN as a fast medium for exchange of telegrams between the lines and/or areas.
- sending IAK on own message: sending of immediate acknowledged (IACK) on a frame that is sent by the EAE KNX device itself.

When the IPR100 sends a message and there is nobody to acknowledge this message, the it would repeat the last message up to 3 times. In case there is an IACK, there will be no repetition. The failure mechanism in case of a negative IACK or BUSY is still maintained.

- switching off the filter table with a button on the device without reconfiguring the device with ETS, necessary for fast diagnostic on site. It can temporarily disable filtering of messages by pressing a button. This eases commissioning and debugging of the system. The temporary access to other lines is possible without download from ETS.

- Automatically switching on filter tables and filtering of device oriented tables after time out. Time out is ETS configurable. No forgetting of reactivating the tables anymore.

- Routing of all physically addressed messages (no filtering of device oriented messages), no matter of own physical address, on press of a button on the device without reconfiguring the device with ETS.

- High internal amount of communication buffers capable smoothing peaks in communication load.

- Detailed possibility for diagnosis by displaying all operational states with 6 duo LEDs. (Bus OK (each line), traffic (each line), errors/faulty communication NACK, BUSY on the bus (each line), state of the filter table ...)

- UPnP available to discover the device in IP network. The ETS can discover the device as communication interface through Eibnet/IP Search Request.

- WEB interface: currently providing device settings and an opportunity to switch on to program mode.

1.1. Communication Objects

IPR100 has no KNX communication objects.

1.2. IPR1000 as Programming Interface

IPR100 can be used together with the ETS as a programming interface. The device provides an additional physical address for this purpose which can be used for a tunneling connection.

1.3. Tunneling

The presence of the Internet Protocol (IP) has led to the definition of KNXnet/IP.

KNXnet/IP provides the means for point-to-point connections -KNXnet/IP Tunnelling- for ETS and/or between a supervisory system and a KNX installation.

KNXnet/IP Device Management provides configuration of KNXnet/IP devices through the KNX network effectively reducing the time required for configuration.

1.4. Routing

Routing is how lines or areas may interconnect using IP networks via KNXnet/IP.

KNXnet/IP Routing defines how KNXnet/IP routers communicate with each other using IP networks.

1.5. Coupler

The basic functionality of IPR100 is coupling the Ethernet with KNX-TP line(s).

IPR100 provides galvanic isolation between the two connected lines.

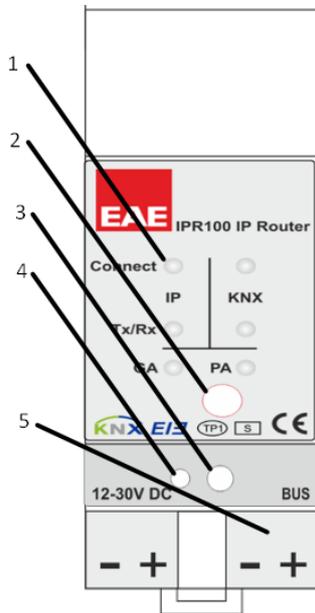
Due to the flexibility of IPR100, the coupler can be used as a line coupler e.g. to connect through Ethernet several TP lines together, as a backbone coupler to connect through Ethernet several TP areas or to connect different TP installations/systems.

The main task of IPR100 is filtering the traffic according to the installation place in the hierarchy or according to the built-in filter tables for group oriented communication.

The IPR100 provides outstanding features compared to other similar products, for example support for long messages (up to 250 byte length) and a configurable one button activation of special functions (e.g. transmit all group telegrams). These are helpful during installation, during run time and for trouble shooting. The high informative 6 duo LED display shows accurately the bus status on each line. This helps identifying common communication problems due to bus load or retransmissions on both lines.

2. Device Technology

2.1. Device Peripherals



- 1- Indicator LEDs
- 2- Function Button
- 3- Programming Button
- 4- Programming LED
- 5- KNX Connection

Indicator	Green	Blinked Green	Orange	Red	Blinked Red	Off
Connect – IP	IP line OK	-	Manual Function Active	-	-	No IP connection
Connect – KNX	KNX line OK	-	-	-	-	No KNX connection
Tx/Rx – IP	-	Traffic on IP line	-	Transmission Error on IP line	-	No traffic on IP line
Tx/Rx – KNX	-	Traffic on KNX line	-	Transmission Error on KNX line	-	No traffic on KNX line
Group Address	Filter	-	Route all	Block all	-	No route
Physical Address	Filter	-	Router all	Block all	-	No route
Programming LED	-	-	-	Programming mode active	No IP Connection	Programming mode de-active or LAN cable connected

2.2. Function Button

Long press (3 sec)

- Switch to manual override.
- Default function is set with LAN line and (KNX) line parameter.
- Manual override functionality is configured in “General parameters”.

NOTE: The latest downloaded settings (parameters) and filter table are still available after switching back from “Manual operation” to “Normal operation”.

Very long press (15s)

LEDs: LEDs are on red

- release button and press again for some sec: resets all the parameter to factory default (incl. physical address).

2.3. Addressing Mode

LED addressing mode

Off: normal operating mode

On: addressing mode

After receiving the physical address, the IPR100 automatically returns from addressing mode to the normal operating mode.

Button addressing mode

Button for switching between normal operating mode and addressing mode for assigning the physical address.

2.4. KNX Telegrams in the network

The IP Router sends telegrams from/to the KNX to/from the IP network in accordance with the KNXnet/IP protocol specification. These telegrams are sent in the default setting as multicast telegrams to the multicast IP address 224.0.23.12 port 3671. The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with the IANA. This address should stay as defined and only changed if it becomes necessary due to the existing network. By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address.

Settings can be changed in the “General Parameters”.

NOTE: Multicast IP address 224.0.23.12 may need to be enabled corresponding to the type of network and the setting of the network components.

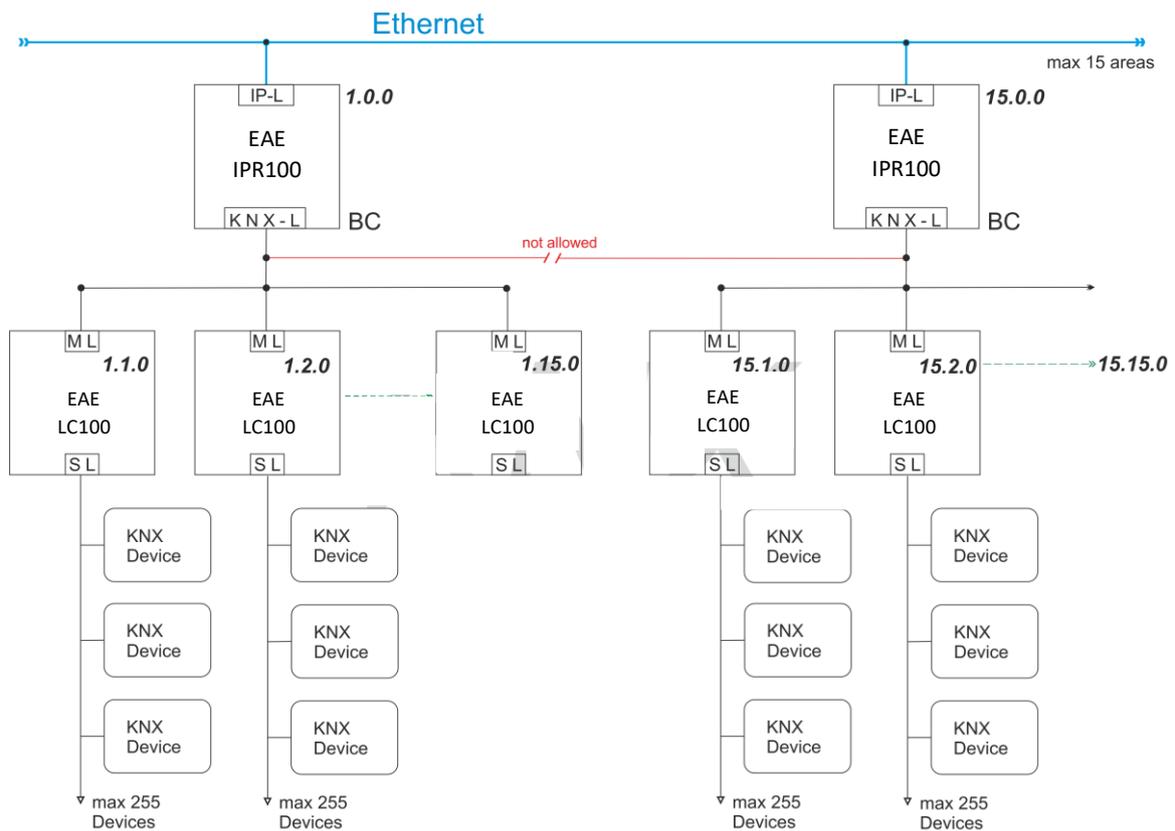
2.5. IPR100 as Area Coupler

IPR100 in a KNX system can assume the function of an **area coupler**.

For this purpose, physical address of an area coupler must be between 1.0.0 and 15.0.0 .

Up to **15 areas** can be defined with area couplers.

The following illustration shows the topology with IPR100 as area couplers and LC100 as line couplers.



IP-L: IP line

KNX-L: KNX line

BC: Backbone coupler

ML: Main line

SL: Sub line

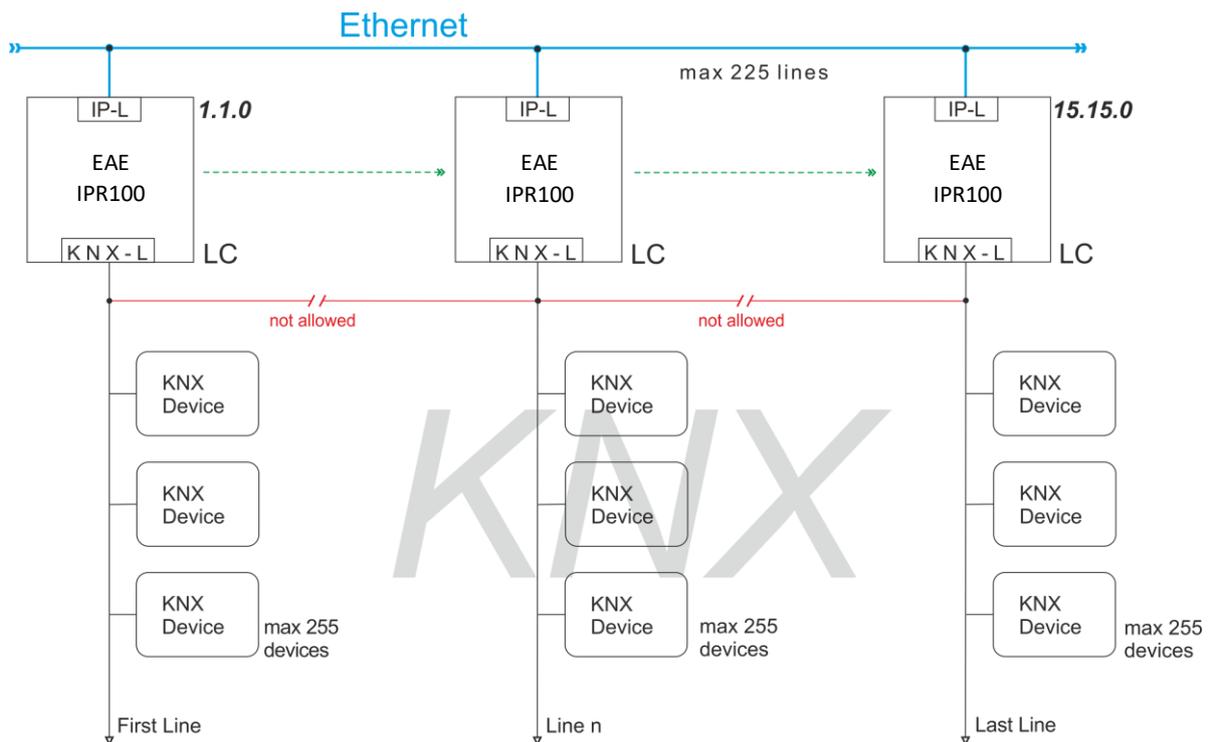
2.5. IPR100 as Line Coupler

IPR100 in a KNX system can assume the function of a **line coupler**.

For this purpose, it must receive the physical address of a line coupler (1.1.0 till 15.15.0).

Up to **225 lines** can be defined (1.1.0 till 15.15.0).

The following illustration shows the topology with IPR100 routers as line couplers.



IP-L: IP line

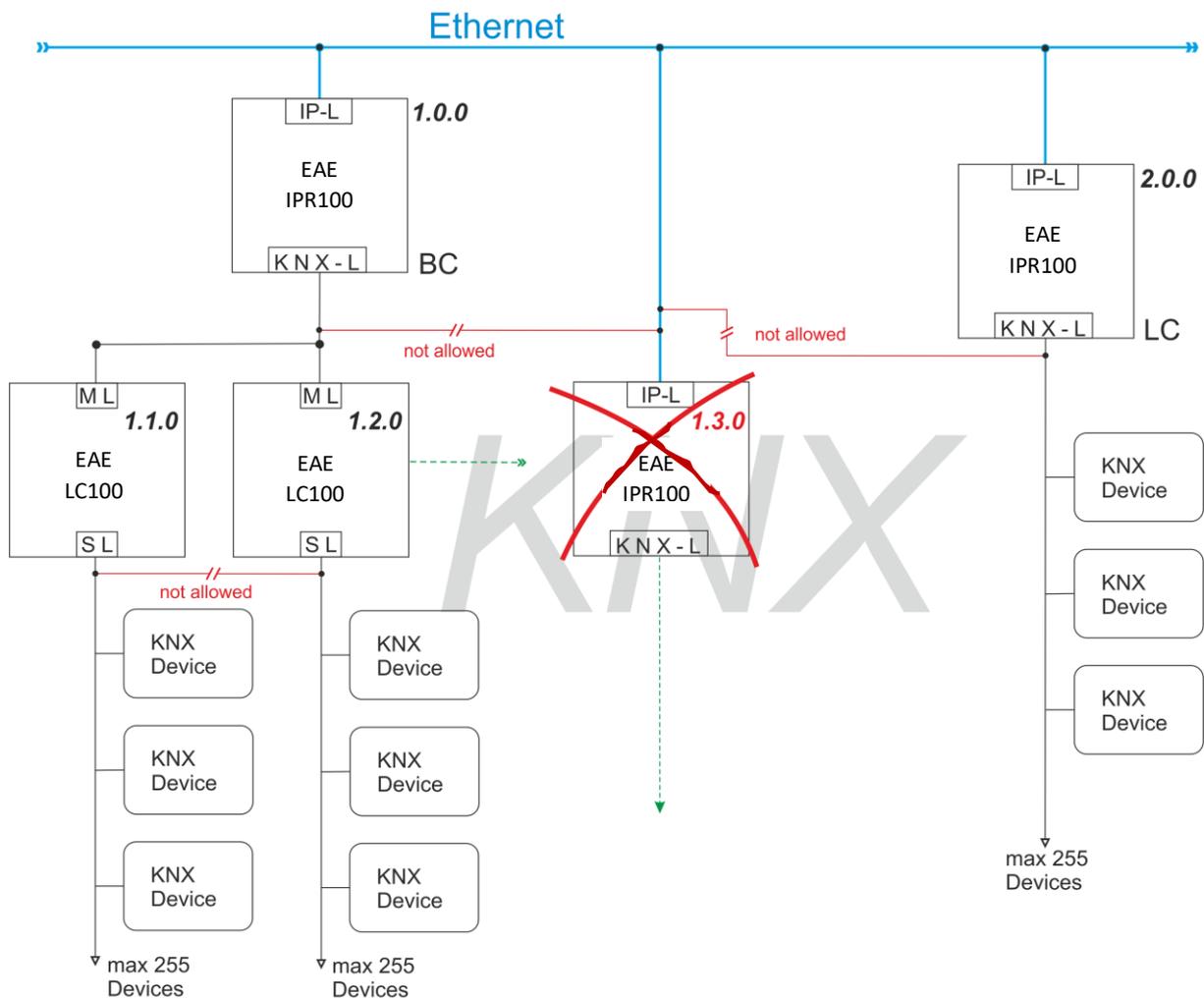
KNX-L: KNX line

LC: Line coupler

2.6. IPR100 in Mixed Systems

If it is necessary in a KNX system to use the IPR100 at one point as an **area coupler**, e.g. office complex, and at another point as a **line coupler**, e.g. a remote underground garage; this is possible.

It is only necessary to ensure that the IPR100 used as a line coupler uses a line coupler address from a free area.



IP-L: IP line

KNX-L: KNX line

BC: Backbone coupler

LC: Line coupler

ML: Main line

SL: Sub line

3. Technical Data

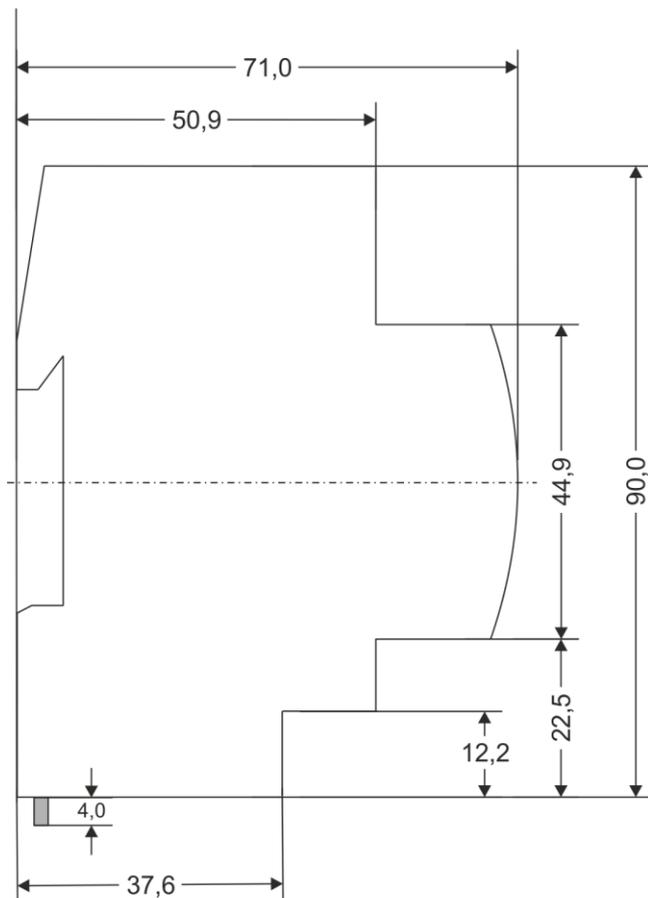
Protection Class	IP 20	EN 60 529
Safety class	II	EN 61 140
Power supply	- Voltage	21V... 30V DC, SELV
	- Current consumption	< 10 mA
Type of contact	- potential-free, bistable	
Installation	- 35mm mounting rail	EN 60 715
Operating elements	- LED (red) and button	For physical address
Temperature range	- Ambient	-5° C + 45° C
	- Storage	-25° C + 55° C
	- Transport	-25° C + 70° C
Humidity	- max. air humidity	95 % no moisture condensation
Dimensions	IPR100 90x36x70 mm	
Weight	IPR100 66g	
Box	Plastic, polycarbonate, colour grey	
CE	In accordance with the EMC guideline and low voltage	

NOTE: Device default physical address is 15.15.255. In order to configure switch actuator, ETS application file “.knxprod” is needed. It’s possible to download the file on EAE website. ETS is required for programming the device. Parameter settings can be changed by ETS. Learn more by reading ETS help file.

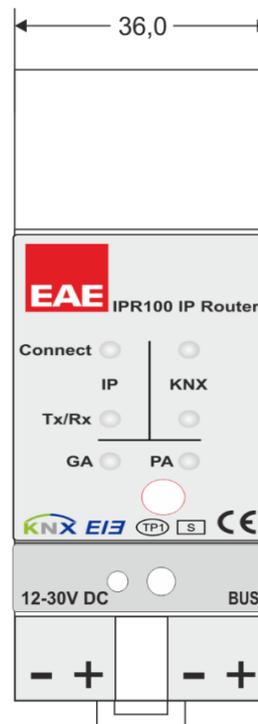
4. Factory Settings

Marking/Design	IPR100
Physical address	15.15.255
Physical address for tunneling connections	15.15.255
IP address	DHCP
IP address assignment	from DHCP service
IP routing multicast address	224.0.23.12
IP subnet mask	DHCP
IP standard gateway	DHCP
IP to KNX	
Group telegrams 0-13	Filter
Main group telegrams 14-15	Transmit all
Physical telegrams	Filter
KNX to IP	
Group telegrams 0-13	Filter
Main group telegrams 14-15	Transmit all
Physical telegrams	Filter
Physical: Repetition if errors on sub line	normal
Group: Repetition if errors on sub line	normal
Telegram confirmations on line	if routed
Send confirmation on own telegrams	no

5. Technical Drawing



Dimensions in mm
Tolerance: -0,5 mm/DIN 16742



6. Application Description

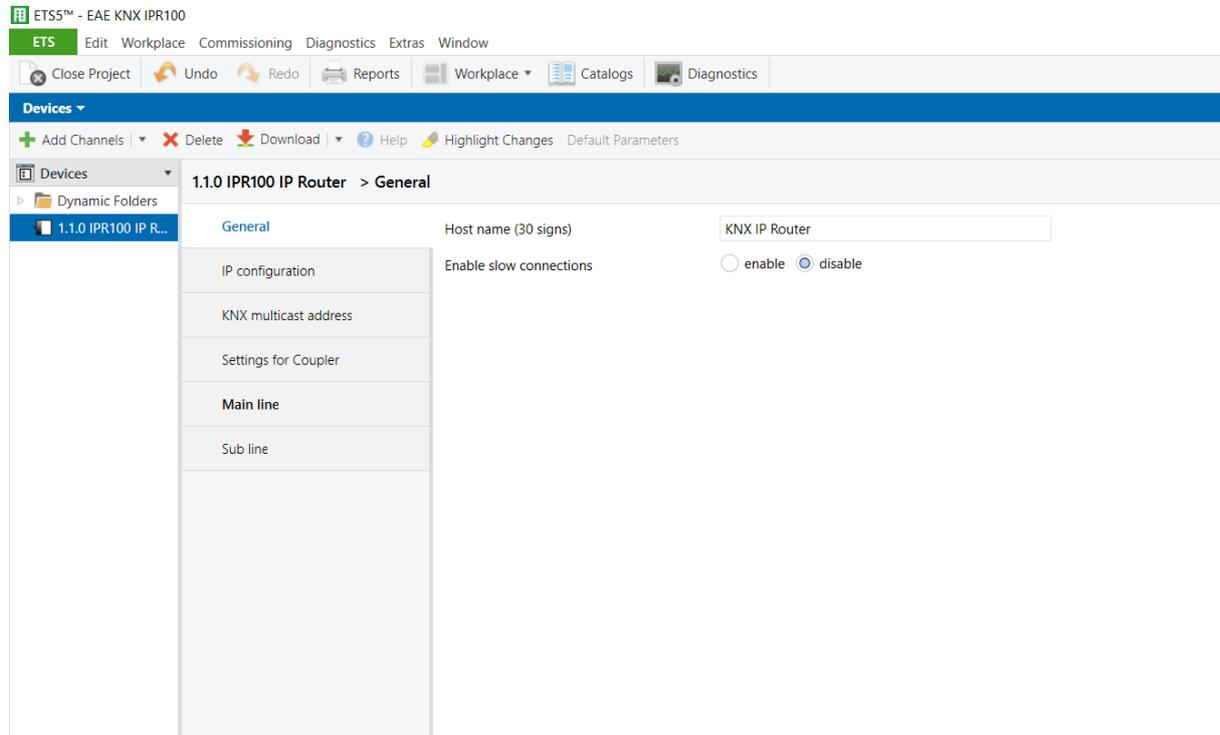
If the coupler receives telegrams (for example during commissioning) which use a physical address as destination address, it compares the physical addresses of the receiver with its own physical address and then decides whether it must route the telegrams or not.

The coupler reacts to telegrams with group addresses in accordance with its parameter settings. During normal operation (default setting), the coupler only routes those telegrams whose group addresses have been entered in its filter table.

If the coupler routes a telegram and does not receive an acknowledgement, or if a bus device finds a transmission error, the coupler repeats the telegram three times. With the parameters „Repetitions if errors...“, this behavior can be set separately for both lines. These parameters should be left in the default setting.

7. ETS Parameters

7.1. General

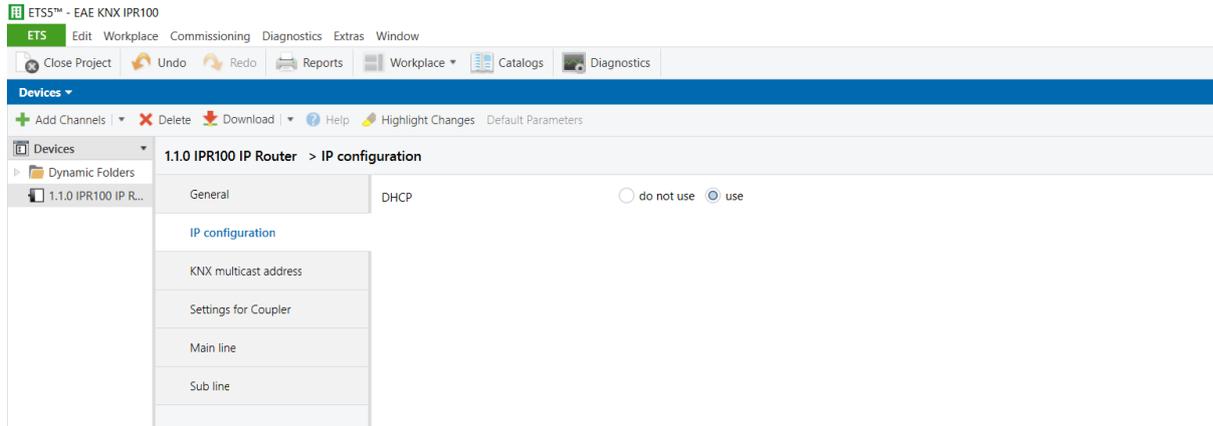


Picture 1: General

ETS-Text	Range [Default value]	Comment
Host name	30 signs [KNX IP Router]	Field to enter the IPR100 name (30 signs max.). For an easy search of the device with the ETS or with a KNXnet/IP visualization system.
Enable slow connections	enable disable [disable]	Enable to support slow tunneling connections

Table 1: Parameter General

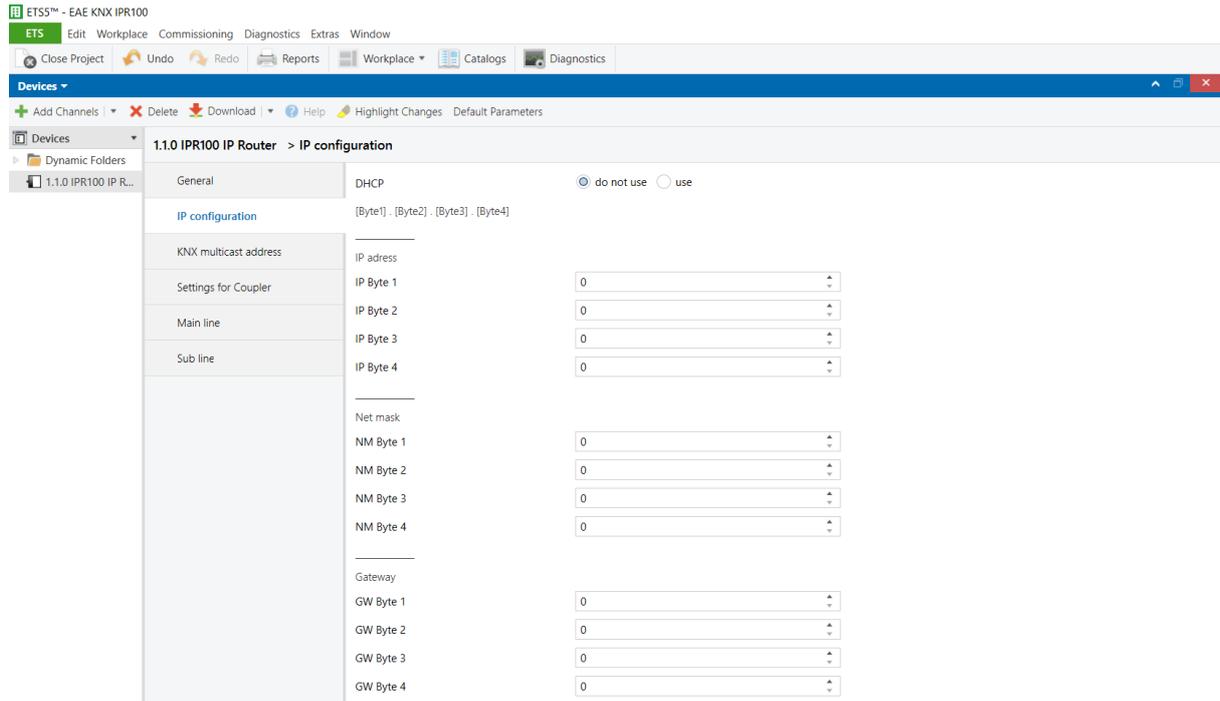
7.2. IP Configuration



Picture 2: DHCP Configuration

ETS-Text	Range [Default value]	Comment
DHCP	use do not use [use]	If DHCP is used, no parameterisation needed. If DHCP is not used, following parameters are to be set.

Table 2: DHCP Configuration

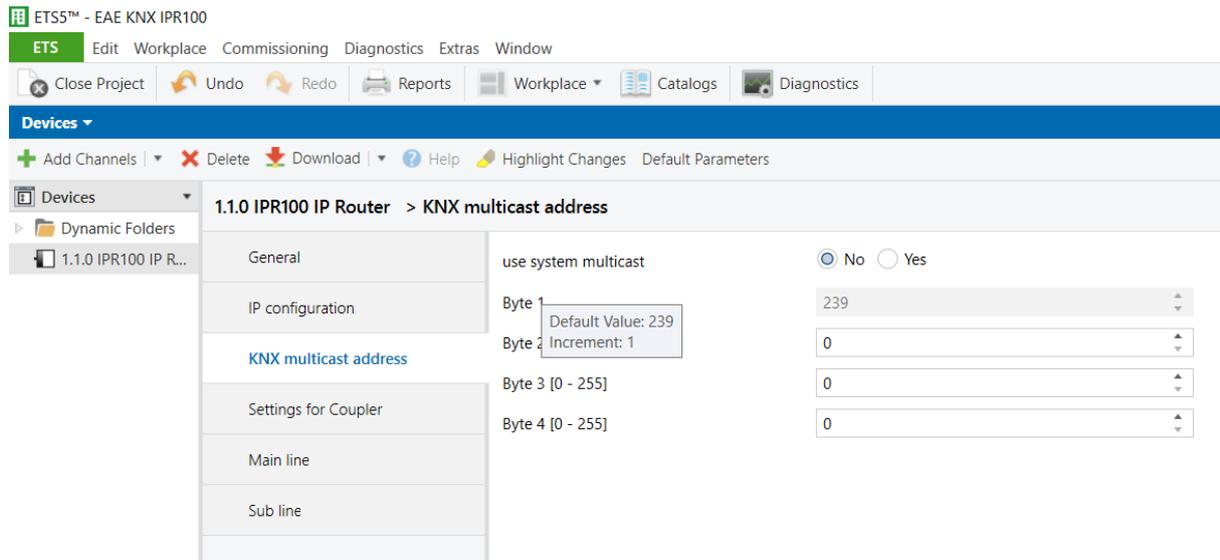


Picture 3: Manual IP Configuration

ETS-Text	Range [Default value]	Comment
DHCP configuration [Byte1]. [Byte2]. [Byte3]. [Byte4]	use do not use [use]	If DHCP is not used, following parameters are to be set.
<u>IP Address</u> IP Byte 1 IP Byte 2 IP Byte 3 IP Byte 4	0...255 0...255 0...255 0...255	IP Byte 1 to 4: manual input.
<u>Net mask</u> NM Byte 1 NM Byte 2 NM Byte 3 NM Byte 4	0...255 0...255 0...255 0...255	Net mask Byte 1 to 4: manual input.
<u>Gateway</u> GW Byte 1 GW Byte 2 GW Byte 3 GW Byte 4	0...255 0...255 0...255 0...255	Gateway Byte 1 to 4: manual input.

Table 3: Manual IP Configuration

7.3. KNX Multicast Address



Picture 4: KNX Multicast Address

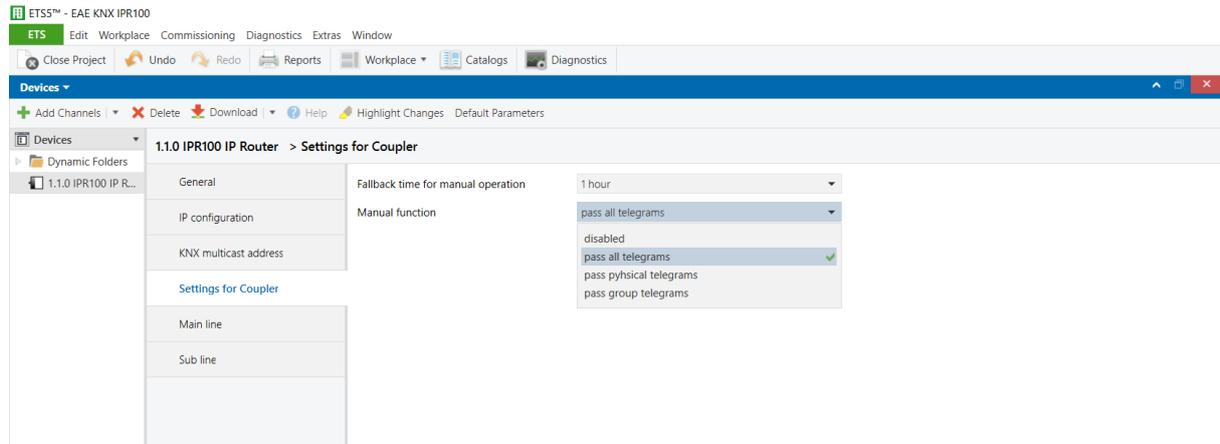
ETS-Text	Range [Default value]	Comment
Byte 1 [224 ... 239]	224...239 System: [224] Individual: [239]	First byte of the IP routing multicast address. If System multicast address used: "224" is permanently set. If Individual multicast address used: "239" is permanently set.
Byte 2 [0 ... 255]	0...255 [0]	Second byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 3 [0 ... 255]	0...255 [23]	Third byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.
Byte 4 [0 ... 255]	0...255 [12]	Fourth byte of the IP routing multicast address. Can only be set manually if an individual multicast address is used.

Table 4: KNX Multicast Address

NOTE: The Multicast IP address 224.0.23.12 is the defined address for the KNXnet/IP from the KNX Association in conjunction with the IANA. This address should stay as defined and only changed if it becomes necessary due to the existing network.

By commissioning, it should be regarded that all KNX IP devices which should communicate with one another via IP must use the same IP routing multicast address.

7.4. Settings for coupler

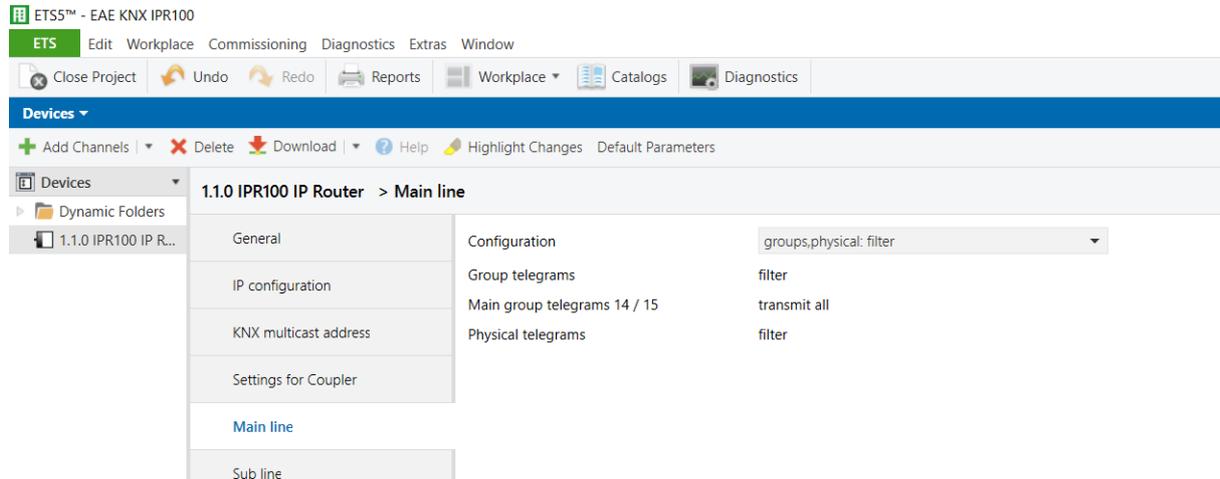


Picture 5: Parameter General

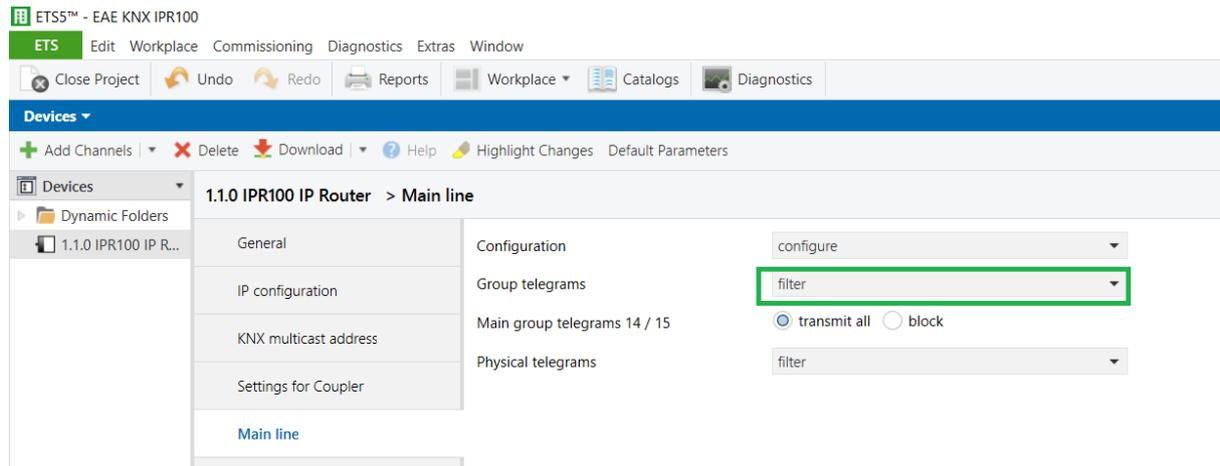
ETS-Text	Range [Default value]	Comment
Fallback time for manual operation	10 min, 1 hour, 4 hours, 8 hours [1 hour]	Time duration required to exit from “manual operation”
Manual function	Disabled Pass all telegrams Pass physical telegrams Pass group telegrams [pass all telegrams]	Telegram routing configuration for the manual function.

Table 5: Parameter General

7.5. Main Line



Picture 6: Main Line /Configuration

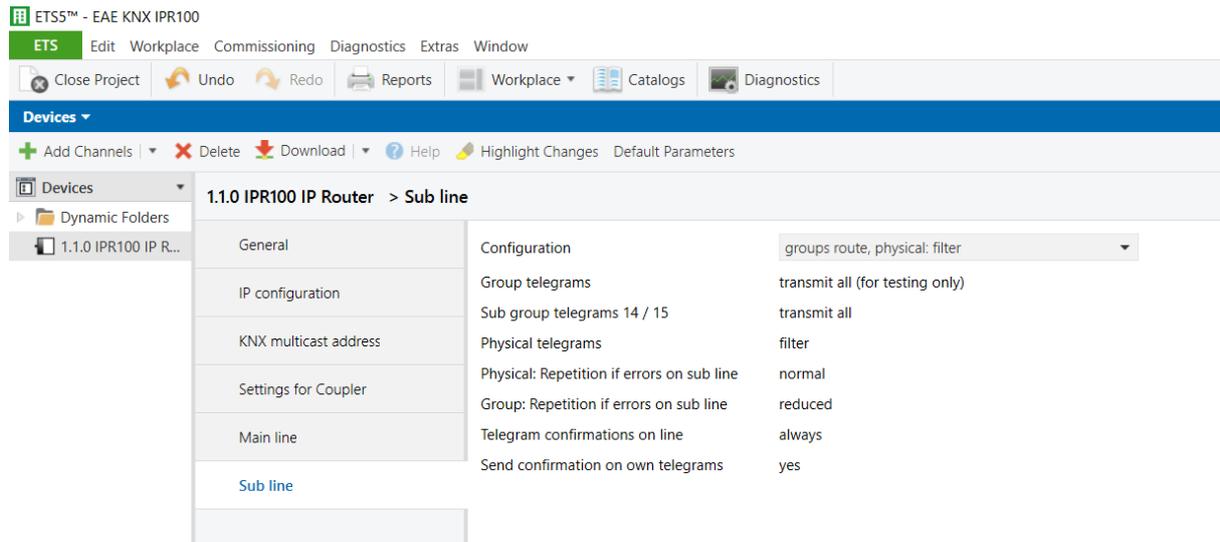


Picture 7: Main Line/Group or Physical Telegrams Individual Configuration

ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure [groups, physical: filter]	- Block : no telegram is routed. - Filter : Only telegrams are routed which are entered in the filter table. - Route : the telegrams are routed. - Configure : the following parameters can be set individually.
Group telegrams	1. transmit all (for testing only) 2. Block 3. filter [filter]	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.
Main group telegrams 14/15	1. transmit all 2. block [transmit all]	1. Group telegrams with the main group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the main group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.

Table 6: Main Line

7.6. Sub Line



Picture 8: Sub Line

NOTE: If the parameter “Send confirmation on own telegrams” is set yes, IPR100 will send an ACK systematically when sending any own routed telegram.

ETS-Text	Range [Default value]	Comment
Configuration	groups: filter, physical: block groups, physical: filter groups: route, physical: filter groups, physical: route configure [groups, physical: filter]	- Block : no telegram is routed. - Filter : Only telegrams are routed which are entered in the filter table. - Route : the telegrams are routed. - Configure : the following parameters can be set individually. This parameter is to be set depending on the planed configuration.
Group telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All group telegrams are transmitted. 2. No group telegram is transmitted. 3. Only group telegrams are routed which are entered in the filter table. The ETS 3/4 produces the filter table automatically.

ETS-Text	Range [Default value]	Comment
Sub group telegrams 14/15	1. transmit all 2. block [transmit all]	1. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are routed. 2. Group telegrams with the sub group 14 or 15 (e.g. 14/1) are not routed.
Physical telegrams	1. transmit all (for testing only) 2. block 3. filter [filter]	1. All physical telegrams are transmitted. 2. No physical telegram is transmitted. 3. Only physical telegrams are routed based on physical address.
Physical: Repetition if errors on sub line	1. no 2. normal 3. reduced [normal]	If a transmission error (e.g. due to missing receiver) is found when sending a physical telegram on the sub line: 1. The physical telegram is not repeated. 2. The physical telegram is repeated up to 3 times. 3. The physical telegram will be repeated only one time.
Group: Repetition if errors on sub line	1. no 2. normal 3. reduced [normal]	If a transmission error (e.g. due to missing receiver) is found when sending a group telegram on the sub line: 1. The group telegram is not repeated. 2. The group telegram is repeated up to 3 times. 3. The group telegram will be repeated only one time.
Telegram confirmations on line	1. if routed 2. always [if routed]	1. Only telegrams which are to be routed are confirmed on the sub line (ACK). 2. Each telegram on the sub line is confirmed (ACK).
Send confirmation on own telegrams	1. yes 2. no [no]	1. Every telegram on the sub line is confirmed with its own ACK (from the Line coupler). 2. No confirmation with own ACK

Table 7: Sub Line