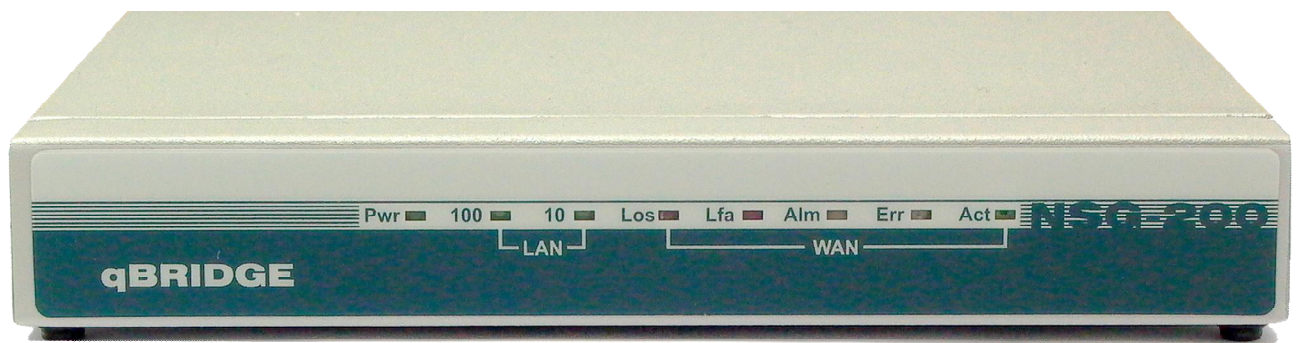# High performance access device "qBRIDGE"

## User's Manual

## qBRIDGE-101
## Ethernet to E1 Converter/Bridge

# Contents

Attention      When you receive devices you need to check your box and make sure that all items are inside (see Appendix B). Especially check the presence of all required cables and certificate of guarantee. The absence of certificate of guarantee with mark of distributor is a reason for refusal in after-sales service and technical support from NSGate LTD.

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# Revision history

- 10.05.2006 First release of this document
- 12.10.2006 Paragraph 2.3 and ordering information have been reviewed
- 03.03.2007 Ordering information has been reviewed

# 1. Introduction

## 1.1. Purpose and area of application

**qBRIDGE** – is a series of low cost and high performance access devices (modems/ converters) functioning in "Bridge connection" mode.   They are meant for connecting together distant segments of Ethernet 10/100Base-TX LANs using different technologies of data transmission over copper or fiber lines. qBRIDGE is a high performance bridge that encapsulates Ethernet frames into HDLC frames and visa versa. Peak performance is 90000 frames per second. Frame buffer capacity is 340 frames.  It's possible to use any synchronous serial interface as a WAN port. WAN interface speed is up to 50 Mbps. User can choose WAN interface type from a set of already available interfaces. There is a possibility of manufacturing devices with WAN interface by customer request. The "Bridge connection" mode provides transport for any protocol including TCP/IP, IPX and so on. qBRIDGE supports transparent transmission of "long" Ethernet frames with VLAN tag.

All qBRIDGE modifications can be used for point to point connection of distant LAN segments. Moreover it's possible to use some modifications for point-multipoint connection for example to connect remote users to ISP. qBRIDGE-105 [sdsl] can be used as a CPE for 8-port mini-DSLAM NSG-800/maxS-8. qBRIDGE-106 [g.shdsl] can be used as a CPE for 24-port Ethernet-based mini-DSLAM NSG-800/maxS-24.

qBRIDGE series include modifications listed below:

qBRIDGE-100 : Bridge with one port 10/100M Ethernet & one port G.703 (E1 Unframed)
qBRIDGE-101 : Bridge with one port 10/100M Ethernet & one port E1 (E1 Framed/ Unframed)
qBRIDGE-201 : Bridge with one port 10/100M Ethernet & two ports E1 (E1 Framed/ Unframed)
qBRIDGE-401 : Bridge with four ports 10/100M Ethernet &  four ports E1 (E1 Framed)
qBRIDGE-102 : Bridge with one port 10/100M Ethernet & one port E2
qBRIDGE-103 : Bridge with one port 10/100M Ethernet & one port E3
qBRIDGE-105 : Bridge with one port 10/100M Ethernet & one port SDSL
qBRIDGE-106 : Bridge with one port 10/100M Ethernet & one port G.SHDSL
qBRIDGE-206 : Bridge with one port 10/100M Ethernet & one/two/four ports G.SHDSL.bis

**qBRIDGE-101** is a high performance converter/bridge. It's suitable for connecting distant LAN segments using standard E1 lines (E1 Framed/Unframed). qBRIDGE-101 has Framed/Unframed 2.048 Mbps G.703 interface with maximum rich 2 km over 24AWG cable. Furthermore it can be used on dedicated lines. qBRIDGE-101 supports all functionality of qBRIDGE-100 with additional features: line speed selection from 64 to 2048 Kbps with 64 Kbps (one time-slot) step; automatic alarm generation; fractional E1 mode; remote loopback. All configuration is done using DIP-Switches. No terminal emulation program is needed.

The product is available as a standalone unit in metal case or as a card for 19" rack 6U.

### 1.2. Advantages

- Simple configuring using DIP-switches
- Ethernet 10/100Base-TX with auto-negotiation & auto-MDIX
- VLAN Support: VLAN tag pass-through
- High performance: Filtering and Forwarding- 90,000 pct/s; Frame Buffer- 340 frames
- Small-size metal case or card for 19" rack 6U form factor

### 1.3. Features

#### LAN

- IEEE 802.3/802.3u; IEEE 802.3x flow control
- Half / Full duplex: 10/100Mbps - Half Duplex / 20/200Mbps - Full duplex
- Auto-negotiation 10/100 Mbps & Auto-MDIX
- Connector: RJ-45

#### "Bridge connection" mode

- IEEE 802.1D transparent learning bridge
- 256 MAC-address table
- IEEE 802.1q VLAN pass-through
- Filtering and Forwarding: 90,000 packets/sec; Delay: 1 frame
- Frame Buffer size – 340 frames

#### WAN port: E1 Framed/Unframed

- ITU–T G.703
- Line speed: 64÷2048 Kbps ± 0,005% with 64 Kbps step full duplex
- Line coding: HDB3
- Line: 120Ω two-pair twisted cable
- Fractional E1 mode
- Automatic alarm generation
- Remote loopback
- Jitter tolerance according to ITU–T G.823
- Improved receiver sensitivity: -43 dB at 1024 KHz
- Selectable G.703 transmit clock source: local oscillator or recovery from E1 line
- Connector: RJ-45

#### Other features

- LED indicators
- Dimensions: 182×140×30 mm
- Power: 36÷72V DC or external 100÷240V AC to 9V DC adapter
- Power consumption: 2W
- Temperature: 0 ÷ 45 ºC
- Humidity: 0 ÷ 95% without condensation

## 1.4. Connectors, LED indicators and DIP-switches

**LEDs**: LED indicators show state of qBRIDGE.

**LEDs description:**

| | |
|---|---|
| **PWR**: | On when power is applied to the device |
| **LAN 100M**: | ON/Blinking when LAN port is in 100 Mbps mode |
| **LAN 10M**: | ON/Blinking when LAN port is in 10 Mbps mode |
| **WAN LOS**: | ON when the E1 line interface detects a loss of carrier |
| **WAN LOF**: | ON when the E1 synchronizer is searching for the frame FAS/NFAS (LOF, loss of frame) and multiframe CAS MFAS (CAS LOMF, loss of CAS multiframe), CRC4 (CRC4 LOMF, loss of CRC4 multiframe) |
| **WAN ALM**: | This LED is refreshed every second. |
| | ON (green) when RAI (ITU-T O.162 2.1.4) received |
| | ON (red) when AIS (ITU-T O.162 1.6.1.2) received |
| | ON (yellow) in remote loopback mode |
| **WAN ERR**: | This LED is refreshed every second. |
| | ON (green) when there was less than 1E-3 line coding violations |
| | ON (red) when there was more than 1E-3 line coding violations |
| | ON (yellow) in remote loopback mode |
| **WAN ACT**: | Blinking when receiving/transmitting data through WAN port |
| **Connectors**: | Device has LAN connector (RJ-45), WAN connector (RJ-45) and power connector on the rear panel |

| | |
|---|---|
| **DC-IN:** | 9 V or 36÷72 V DC power supply (see ordering information) |
| **LAN:** | Ethernet 10/100BaseT (RJ–45 connector) |
| **WAN:** | E1  WAN port (RJ–45) |

### 1.5. Application information
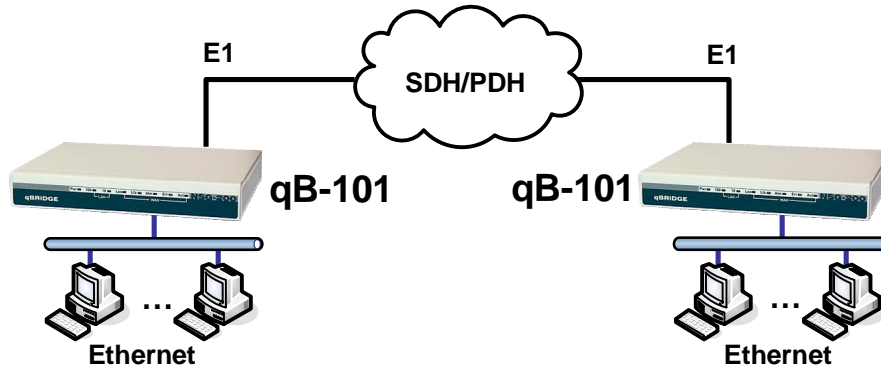


Application 1. Connection of remote LANs over E1 channel

## 2. Device Configuration

### 2.1. Powerup

1. Configure qBRIDGE according paragraphs 2.2 – 2.13 of this manual.

2. Connect LAN port of the device to HUB/Switch or to a PC using a Patch Cord. Device supports auto-MDIX therefore Patch Cords cable may be any type (cross or straight).

3. Connect WAN port (connector with "WAN" mark) to E1 channel. Use a cable with RJ–45 connector.

4. Connect power adapter (DC 9 V) or 36 ÷ 72 DC power supply (see ordering information) to the connector with "DC–IN" mark.


**ATTENTION!**      Do not use 36 ÷ 72 V DC power supply for qBRIDGE-101 device which is shipped with external 100÷240V AC to 9V DC power adapter. It can cause permanent device damage.

**ATTENTION!**      Connect 36 ÷ 72 V DC power supply to the qBRIDGE-101-DC using special cable shipped with the device. Connect terminal with red wire to positive pole and terminal with black wire to negative pole. Wrong polarity can cause permanent device damage.

**ATTENTION!**      You must turn off the power of the device before making any DIP-switch configuration changes. Turn the power on again when configuration is complete.

To access Dip-switches **SW1- SW6** you need to remove the cover of the device's case. For this purpose twist two screws on the bottom of the case and remove cover. Figure below shows the disposition of DIP-switches on the PCB inside the case.
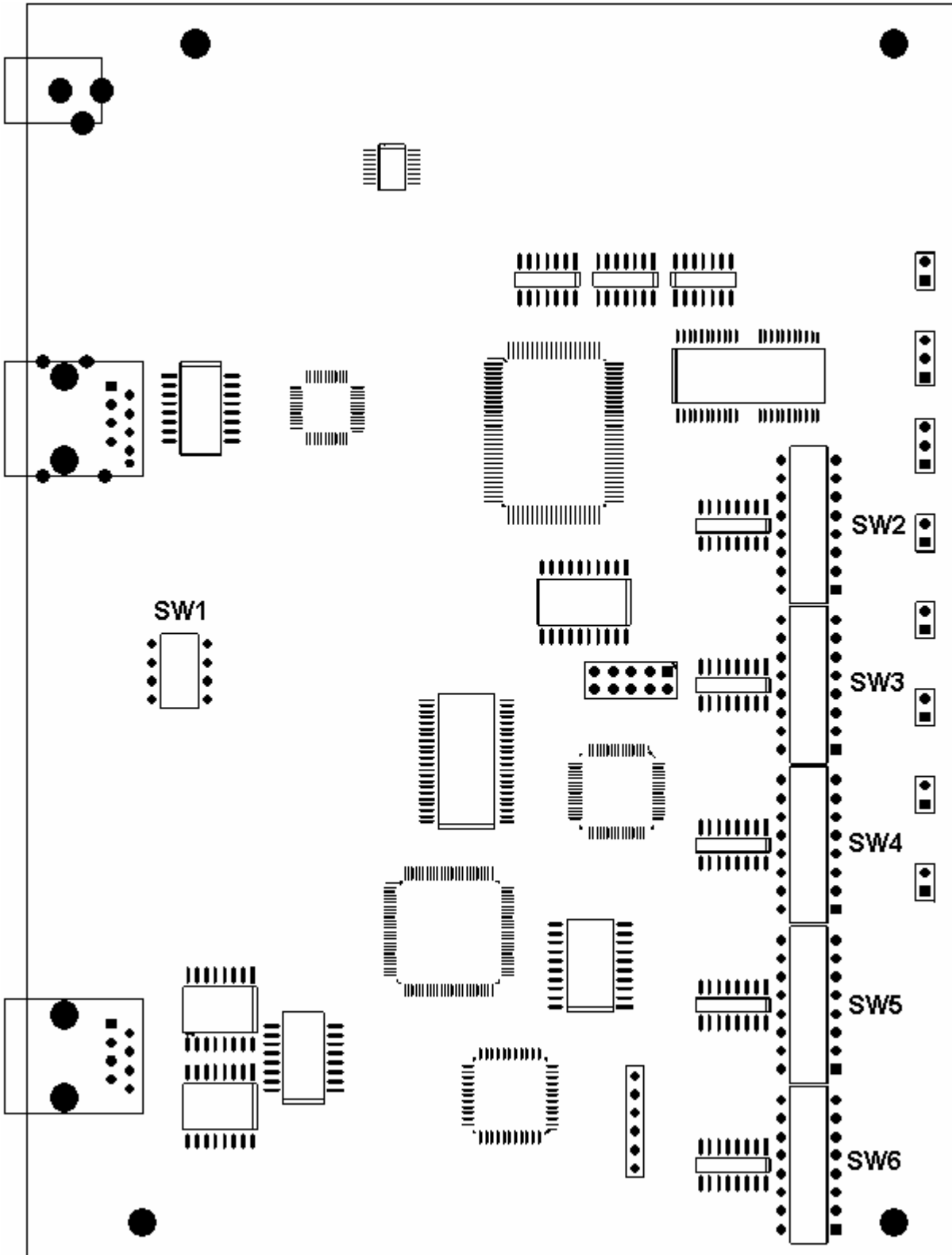
## 2.2. LAN: Frame buffer configuration (SW1.4 – SW1.3)

**qBRIDGE** has internal RAM (Frame Buffer) to store Ethernet frames. The entire Frame Buffer capacity is 340 frames. One part of the Frame Buffer is used to store frames passing from LAN to WAN port and the second part is used to store frames passing from WAN to LAN port. To increase device performance user can configure the way of dividing of the Frame Buffer. Use DIP-switches **SW1.3-SW1.4** for this purpose.

| SW1.3 | SW1.4 | LAN-to-WAN buffer capacity | WAN-to-LAN buffer capacity |
|-------|-------|----------------------------|----------------------------|
| on    | on    | 308 packets                | 32 packets                 |
| on    | off   | 170 packets                | 170 packets                |
| off   | on    | 32 packets                 | 308 packets                |
| off   | off   | reserved                   | reserved                   |

## 2.3. LAN: Filtering mode (SW1.2)

qBRIDGE supports Real-time MAC-address filtering with 256 address table and Automatic address learning and aging. If filtering is enabled, only broadcast, multicast and destined for remote LAN frames are forwarded to WAN. The address table can store up to 256 MAC-addresses and is automatically updated. The individual address will be aged and deleted from address table if frames with this address have not been received within 5 minutes. User can enable or disable filtering using DIP-switch **SW1.2**.

| SW1.2 | Filtering                |
|-------|--------------------------|
| on    | enabled (default value)  |
| off   | disabled                 |

## 2.4. LAN: IEEE 802.3x flow control (SW1.1)

qBRIDGE provides IEEE 802.3x flow control for more effective packet forwarding. If the number of packets buffered in memory exceeds the predefined value, qBRIDGE transmits the PAUSE frame to pause the data flow. When qBRIDGE receives the PAUSE frame it pauses the transmission until the requested time is expired. User can enable or disable flow control support using DIP-switch **SW1.1**.

| SW1.1 | Flow control             |
|-------|--------------------------|
| on    | enabled                  |
| off   | disabled (default value) |

## 2.5. WAN (E1): Mode selection (SW2.8)

WAN interface of qBRIDGE-101 can work both in framed (E1) and unframed (E12) mode. The difference between E1 and E12 stream is (according to G.703.6)  that E12 stream transmits bit sequence at speed 2048 Kbit/s and have no structure while E1 stream has frame structure that is described in ITU-T G.704 specification. Mode selection of WAN interface is controlled by DIP-switch **SW2.8**.

| SW2.8 | WAN interface mode |
|-------|--------------------|
| on    | framed             |
| off   | unframed           |

### 2.6. WAN (E1): Time slots selection (SW2.7 – SW5.1)

When WAN interface is in framed mode user can select time slots that are used for Ethernet frames transmission. Time slot 0 is always used for FAS, NFAS, international bits, CRC4 reminder and so on. Each of 31 alternate timeslots has corresponding DIP-switch and can be used for transmission of Ethernet frames. Whet DIP-switch is <u>on</u> corresponding timeslot is <u>not used</u> for Ethernet transmission. Whet DIP-switch is <u>off</u> corresponding timeslot is <u>used</u> for Ethernet transmission. If WAN interface is in unframed mode (**SW2.8** off) the state of **SW2.7 – SW5.1** is ignored and all 2048 Kbit/s bit stream is used for transmission of Ethernet frames.

| Dip-switch | Timeslot | Dip-switch | Timeslot |
|:---:|:---:|:---:|:---:|
| SW2.7 | 1 | SW4.7 | 17 |
| SW2.6 | 2 | SW4.6 | 18 |
| SW2.5 | 3 | SW4.5 | 19 |
| SW2.4 | 4 | SW4.4 | 20 |
| SW2.3 | 5 | SW4.3 | 21 |
| SW2.2 | 6 | SW4.2 | 22 |
| SW2.1 | 7 | SW4.1 | 23 |
| SW3.8 | 8 | SW5.8 | 24 |
| SW3.7 | 9 | SW5.7 | 25 |
| SW3.6 | 10 | SW5.6 | 26 |
| SW3.5 | 11 | SW5.5 | 27 |
| SW3.4 | 12 | SW5.4 | 28 |
| SW3.3 | 13 | SW5.3 | 29 |
| SW3.2 | 14 | SW5.2 | 30 |
| SW3.1 | 15 | SW5.1 | 31 |
| SW4.8 | 16 | | |

### 2.7. WAN (E1): Receive equalizer gain limit (SW6.8)

It's possible to adjust WAN interface receive equalizer gain limit using DIP-switch **SW6.8**. WAN interface receive equalizer gain can be -12 or -43dB. When receive equalizer gain limit is -43 dB the maximum rich over 24 AWG cable is up to 2 km.

| SW6.8 | Receive equalizer gain limit |
|:---:|:---:|
| off | -12 dB |
| on | -43 dB(default value) |

### 2.8. WAN (E1): CAS signaling (SW6.7)

To enable/disable CAS signaling use DIP-switch **SW6.7**. Timeslot 16 is used to transmit CAS signaling. So when CAS signaling is enabled timeslot 16 can't be used for Ethernet frames transmission.

| SW6.7 | CAS signaling |
|:---:|:---:|
| on | disabled (default value) |
| off | enabled |

### 2.9. WAN (E1): CRC4 multiframe (SW6.6)

DIP-switch **SW6.6** is used to control CRC4 multiframe.

| SW6.6 | CRC4 multiframe |
|:---:|:---:|
| on | disabled (default value) |
| off | enabled |

### 2.10. WAN (E1): Transmit clock source selection (SW6.5)

**qBRIDGE-101** supports two modes of operation. Mode 1: E1 transmit clock is driven by local oscillator. Mode 2: E1 transmit clock is driven by recovered receive clock. User can select mode of operation using DIP-switch **SW6.5**. User should choose Mode 2 (default) when connecting qBRIDGE-101 to E1 channels. When using two qBRIDGE-101 to communicate over media transparent in terms of synchronization or over dedicated copper line one of them must be in Mode 1 and another – in Mode 2.

| SW6.5 | E1 Transmit clock mode |
|-------|------------------------|
| on | Mode 1 (internal): E1 Transmit clock is driven by local oscillator |
| off | Mode 2 (recovered): E1 transmit clock is driven by recovered receive clock |

### 2.11. WAN (E1): Automatic remote alarm indication (SW6.4 - SW6.3)

Use DIP-switches **SW6.4 - SW6.3** to control remote alarm indication.

| SW6.4 | SW6.3 | Remote alarm indication |
|-------|-------|-------------------------|
| on | on | disabled (default value) |
| off | on | transmit RAI |
| on | off | transmit AIS |
| off | off | transmit AIS |

### 2.12. WAN (E1): Idle code (SW6.2)

Use DIP-switches **SW6.2** to select idle code that is inserted to timeslots that are not used for Ethernet transmission.

| SW6.2 | Idle code |
|-------|-----------|
| on | 0x55 |
| off | 0x7E |

### 2.13. WAN (E1): Remote loopback (SW6.1)

Use DIP-switches **SW6.1** to enable or disable remote loopback functionality. When remote loopback is enabled all data received from E1 interface is looped back into the line. This feature is used for testing and troubleshooting and isn't enabled normally. LED indicators **WAN ALM** and **WAN ERR** are ON (yellow) in remote loopback mode.

| SW6.1 | Remote loopback |
|-------|-----------------|
| on | disabled (default value) |
| off | enabled |

WAN E1
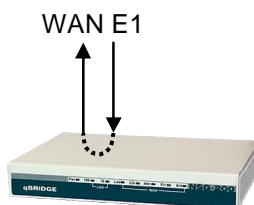
## Appendix A. Connector pin-outs

**QBRIDGE-101. WAN (RJ-45)**

| Pin | Name | Description |
|---|---|---|
| 1,2 | XMT (tip, ring) | Transmit Data - out |
| 4,5 | RCV (tip, ring) | Receive Data - in |
| 3,6 | Chassis | |

## Appendix B. Ordering information

| | |
|---|---|
| P/N: 36BEU101 (qBRIDGE-101) | 100÷240V AC to 9V DC adapter |
| P/N: 36BED101 (qBRIDGE-101-DC) | DC power supply 36÷72 V |
| P/N: 36BER101 (qBRIDGE-101-R) | Card for 19" rack 6U |

## Appendix C. Checking in the box

| | |
|---|---|
| P/N: 36BEU101   (qBRIDGE-101) | 1 (according to the order) |
| P/N: 36BED101   (qBRIDGE-101-DC) | 1 (according to the order) |
| P/N: 36BER101   (qBRIDGE-101-R) | 1 (according to the order) |
| Power adapter (100÷240V AC to 9V DC) | 1 (with qBRIDGE-101 only) |
| Cable for DC 36 ÷ 72 power supply connection | 1 (with qBRIDGE-101-DC only) |
| Certificate of guarantee | 1 |
| User's manual | 1  for two devices |
| Patch Cord cable  "Straight RJ-45" or "Crossover RJ-45" | 1 |