KK SYSTEMS LTD

CE

NEW
RS232-RS232
VERSION

K422-ISOL – RS232-RS422/485 Converter
K485-ISOL – RS232-RS485 (2-wire) Converter
K232-ISOL – RS232-RS232 Isolator

✔ Plugs direct into IBM PC RS232 port
✔ Very low power CMOS - powered from RTS or DTR signals, from local RS232 port only
✔ External power input optional
✔ Isolation 100% tested at >1000V AC
✔ 0 to 38400 baud, all character formats
✔ Controlled slew rate drivers for best EMC
✔ Remote port varistor surge protected

The Kxxx-ISOL range of interface converters provides isolation and interface conversion between RS232 and RS232/422/485 interfaces.

Isolation provides a high degree of equipment protection, common-mode noise immunity, and avoids ground loop currents.

The converters are protocol-transparent and support asynchronous protocols including MODBUS.

Product Overview

This data sheet covers three products based on similar hardware and same package:

K422-ISOL RS232-RS422/485 converter. **Fig 1.** This converts full-duplex between RS232 and RS422. It can also be used at the Master end of a 4-wire RS485 multidrop (sometimes incorrectly called "RS422") system - **Fig. 2**. It is powered from either RTS or DTR, at least one of which (preferably both) must be permanently in the HIGH state.

K485-ISOL RS232-RS485 (2-wire) converter. **Fig. 3.** This converts half-duplex between RS232 and 2-wire RS485. It can be used as Master or Slave. It uses RTS control; RTS must be HIGH when transmitting and LOW when receiving. It is powered from DTR which must be permanently in the HIGH state.

K232-ISOL RS232-RS232 isolator. **Fig. 4.** This simply isolates RS232. Only TX and RX signals are supported; no hardware handshakes. It is powered from either RTS or DTR, at least one of which (preferably both) must be permanently in the HIGH state.

All products have a full RS232 output voltage swing (typically -5V to +5V), have varistor protection on the isolated port, and have the circuit board conformally coated for best isolation barrier performance.

RS422/RS485 Basic Principles

RS422 is full-duplex (data can flow in both directions simultaneously) and is suitable for point-to-point applications only.

RS485 is half-duplex (data may flow in one direction at any one time) and exists in two varieties: **2-wire** and **4-wire**. RS485 systems are always Master/Slave. Each Slave has a unique address and responds only to a correctly addressed message (a "poll") from the Master. A Slave never *initiates* a communication. In a 2-wire system, all devices (including the Master) must have tri-state capability, i.e. its driver can be driving HIGH, LOW or be disabled (open-circuit). In a 4-wire system, the Slaves must have tri-state capability but the Master does not need it (i.e. it can be an RS422 device) because it drives a bus on which all other devices merely listen; this allows an RS422 device to operate as a Master on a 4-wire RS485 bus.

K485-ISOL RTS Control

The RS232 Master device must raise its RTS output before it starts to communicate, and drop it after the last bit of the message has been transmitted. The K485-ISOL uses this signal to control its RS485 tri-state driver.

Many RS485-oriented application programs provide this type of driver control. Some, particularly under Windows, do not and for such applications we can offer products with automatic driver enable functions, e.g. K485-ADE or KD485-ADE.

Power Considerations

RS485 theoretically supports up to 32 devices connected to a common bus. With special high input resistance receivers now available this can be increased to 128. These figures are determined solely by the transmitter DC drive capability, and by the receiver input resistance. In practice, several factors can reduce the maximum number of devices:

- **Termination resistors:** It is not generally possible to derive sufficient power from a PC RS232 port to drive a 100Ω terminator with RS422/485 voltage levels. A capacitor, e.g. 1000pF, must be connected in series with any such terminators, to eliminate the DC loading which a resistor alone would produce. The controlled slew rate driver used in this converter makes termination unnecessary for cables shorter than approximately 300m.

- **PC capability:** The converter draws power from the RTS and/or DTR signals. PC interfaces vary somewhat in their ability to supply power. With this product, not more than approximately 10 devices should be connected to the RS485 bus. This assumes the standard RS422/485 receiver input resistance of 12 kΩ.

- **Capacitance:** With very long cables, cable capacitance becomes significant in the power consumption. The following table is a very conservative but useful guide. RS232 cables should be limited to 2500pF (25m typically).

Baud Rate (baud)	Max total cable capacitance (pF)	Baud Rate (baud)	Max total cable capacitance (pF)
1200	250000	19200	15000
2400	120000	38400	7500
4800	60000	57600	5000
9600	30000	115200	2500

- **External supply:** If the power derived from the RTS and DTR signals is insufficient, an external 9V DC power supply can be connected to pin 9 of the local RS232 connector as shown in the Connections section. The converter then achieves the full RS422/485 specification of 1200m of twisted-pair cable at 9600 baud, and 32 standard-load devices on the RS485 bus.
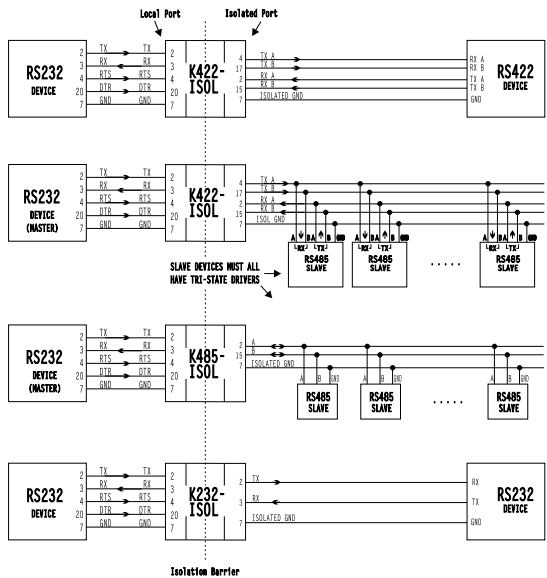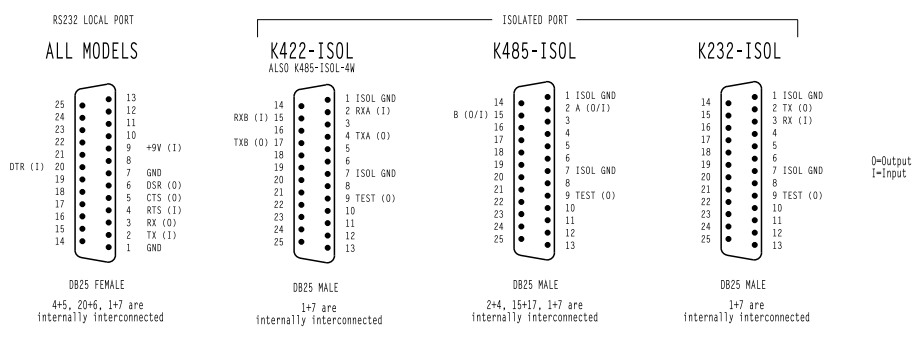
Fig. 1 RS232 to RS422
RTS or DTR (or both) must be HIGH
to power the K422-ISOL

Fig. 2 RS232 to 4-wire RS485
RTS or DTR (or both) must be HIGH
to power the K422-ISOL

Fig. 3 RS232 to 2-wire RS485
DTR must be HIGH to power the
K485-ISOL. RTS must be HIGH/LOW
to transmit/receive.

Fig. 4 RS232 to RS232
RTS or DTR (or both) must be HIGH
to power the K422-ISOL

The converter's RS232 Local Port is "DCE" and is intended to plug directly into a standard 25-way IBM PC "DTE" RS232 port. If your PC has a 9-way RS232 port, you will need the commonly available 9-25 moulded converter.

A or B: Following RS422/485 standards, the RS4xx connections above are marked **A** and **B**. They are defined as follows: When the RS232 TX input is at the RS232 HIGH level the A output is at the RS4xx HIGH level (+5V nominally) and the B output is at the RS4xx LOW level (0V nominally).

When connecting to other RS4xx equipment, you may encounter markings such as HI/LO and +/–. Such non-standard markings are ambiguous and you may need to experiment. Normally, one assumes that the KK converter's A/B corresponds to the other device's A/B, HI/LO or +/– markings respectively but sometimes this is wrong. One simple way to help establish which is which is to measure the voltages on the other product when no communications are taking place: B should be more positive than A.

RX4xx Isolated Port Grounding: A connection between the converter's Isolated GND and the other device(s) interface ground is highly desirable for proper noise immunity. See Figs 1,2,3. Due to the isolation provided by the converter, there is no risk of ground loop currents. The cable shield can be used for this connection.

RS232 Isolated Port Grounding: A connection between the converter's Isolated GND and the other device's interface ground is mandatory, as RS232 is not a differential system. See Fig. 4. Due to the isolation provided by the converter, there is no risk of ground loop currents. The cable shield can be used for this connection.

Troubleshooting

If you cannot establish communications, check the following:

● Check that the A/B connections on the converter are connected to the correct terminals of the remote device. Due to commonly non-standard markings on some equipment you may need to experiment by swapping the A/B wires. One simple way to help establish which is which is to measure the voltages on the remote device (with nothing connected to it) when no communications are taking place: B should be more positive than A.

● Check that the converter is receiving an adequate supply from the RS232 RTS,DTR signals. This can be checked either by checking the voltage levels on those signals (at least +7V under load), or by checking the voltage of the internally generated isolated supply on pin 9 (TEST) of the Isolated Port connector. The TEST voltage (which is internally generated from RTS,DTR) must be at least +5.5V at all times, measured relative to the *isolated* ground.

● Check that any termination resistors are removed, or have a series capacitor; see the Power Considerations section.

● Ensure that the grounding instructions are followed; see the Connections section.

● K485-ISOL: check that your RS232 device provides the correct type of RTS control.

Specification

Serial parameters: 0-38400 baud, any character format

Power: K422-ISOL/K485-ISOL: RTS,DTR: +7V to +13V 3mA typ. (9600 baud)
K232-ISOL: RTS,DTR: +7V to +13V 3.5mA typ. @ no load, 6.5mA typ. @Rload=4k7 (9600 baud)
External power (RS232 Local Port pin 9): +7V to +13V, currents as above.

Environmental: Operating 0 to +50C; storage –40C to +70C; RH 0 to 90% non-condensing

CE compliance: Emissions EN50081-2, immunity EN50082-2

Dimensions: 55mm (W) x 17mm (H) x 62mm (L) approx

Ordering Information

Standard products: **K422-ISOL   K485-ISOL   K232-ISOL**

Specials: **K485-ISOL-4W** This version does not have the internal TXA-RXA, TXB-RXB interconnections, and is for use on 4-wire RS485 systems where tri-state operation is required - typically on Slave devices.
K485-ISOL-4W-FD The K485-ISOL disables reception of its own transmitted data. In addition to the 4W option above, this version has a permanently enabled receiver.
K485-ISOL-TB This model has a 3-way removable screw terminal block for the isolated port.

Other Products

Shown here is a selection of other interface and protocol conversion products.

The KD485 DIN-rail converter is a robust isolated product available in 3 versions which cover most industrial applications from simple interface conversion, with a universal model with auto driver enable and addressable adapter modes, and a C–programmable protocol converter with a MODBUS virtual device library for custom protocol conversion requirements.

The "inline" units plug directly into an IBM PC serial port (25-way or 9-way) and are line-powered from the RS232 interface. All units use very low power CMOS technology and have controlled slew rate drivers.

The PPC Programmable Protocol Converter is a user-programmable device which enables a customised protocol converter to be easily produced, using its built-in extended Pascal language and 4 serial RS232/422/485 ports. The PPC can also be programmed in ANSI C.

A Eurocard 3Ux6HP rack version is also available and there are numerous options. Many PPC-based custom products have been delivered.

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