

# User manual

20.4.2005  
V1.0

## DCS770 USB-to-RS-485 converter



**Nokeval**

---

# INTRODUCTION

---

DCS770 is used to add an RS-485 connection in a PC computer. It is connected in a USB port, and the drivers create a virtual COM port that can be used just as an ordinary COM port. Even the baud rates and bit configuration can be changed in Windows port settings – these require no jumper settings. DCS770 can be used with a variety of protocols, including Nokeval SCL and Modbus ASCII and RTU.

To aid troubleshooting, DCS770 is equipped with three indicator LEDs. It is small in size, and it has screw terminals eliminating the need to make solder joints on cables.

Due to individual serial number on every device, these devices retain the COM port number if detached and replugged, even in a different USB port. This increases reliability.

---

# SPECIFICATIONS

---

## USB connection

Connection:	USB 1.1 or 2.0
Bus chip:	FTDI FT232BM
Consumption:	100 mA
Connector:	USB-B (USB-A-B lead included).

## RS-485 bus

Baud rates	Any up to 115200 bit/s
Data bits	5..8
Parity	All modes supported
Stop bits	1, 1.5, 2
Bus length	1000 m
Devices on bus	max 32 normal load devices or 128 1/4 load devices
Load	1/4 load

## General

Dimensions:	56x31x25 mm
Operating temp:	0...60 °C
Galvanic isolation:	No

## Regulations

### EMC immunity

EN 61326

### EMC emissions

EN 61326 class B

---

# THE DRIVERS

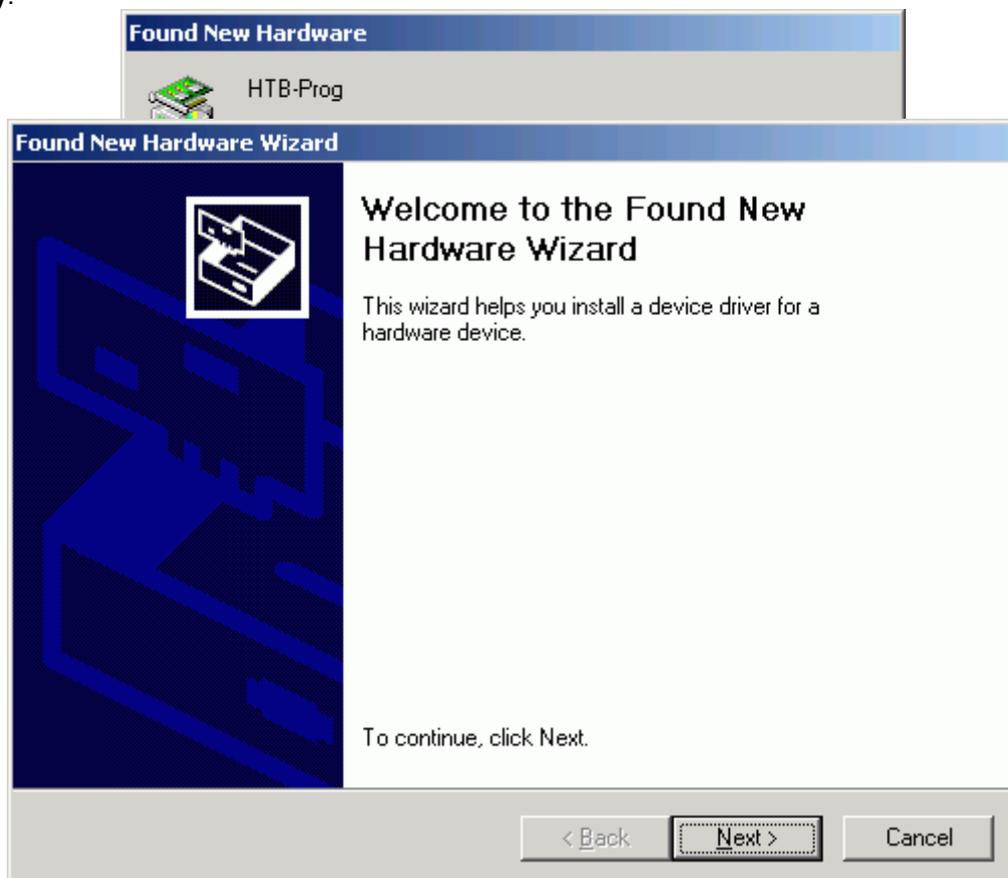
---

## Drivers

The USB interface chip needs two drivers: one for USB bus and the other to create a virtual serial port.

The drivers can be obtained from a Nokeval Software CD or downloaded from the USB chip manufacturer: [www.ftdichip.com](http://www.ftdichip.com) (Drivers, FT232BM). The installation below assumes using CD, but using downloaded drivers is quite similar.

Insert the Nokeval Software CD and plug in the device. Windows should detect it and start installing automatically:



**Found New Hardware Wizard**

**Install Hardware Device Drivers**

A device driver is a software program that enables a hardware device to work with an operating system.



This wizard will complete the installation for this device:

 HTB-Prog

A device driver is a software program that makes a hardware device work. Windows needs driver files for your new device. To locate driver files and complete the installation click Next.

What do you want the wizard to do?

- Search for a suitable driver for my device (recommended)
- Display a list of the known drivers for this device so that I can choose a specific driver

< Back    Next >    Cancel

**Found New Hardware Wizard**

**Locate Driver Files**

Where do you want Windows to search for driver files?



Search for driver files for the following hardware device:

 HTB-Prog

The wizard searches for suitable drivers in its driver database on your computer and in any of the following optional search locations that you specify.

To start the search, click Next. If you are searching on a floppy disk or CD-ROM drive, insert the floppy disk or CD before clicking Next.

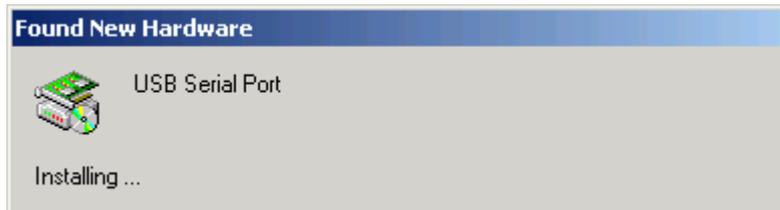
Optional search locations:

- Floppy disk drives
- CD-ROM drives
- Specify a location
- Microsoft Windows Update

< Back    Next >    Cancel

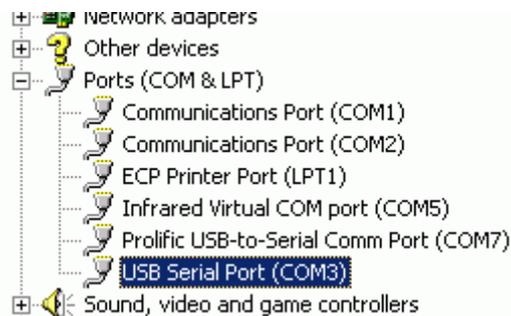


When USB bus driver ftdibus.inf is installed, Windows wants to install the virtual serial port driver, that makes the device to look like an ordinary COM port.



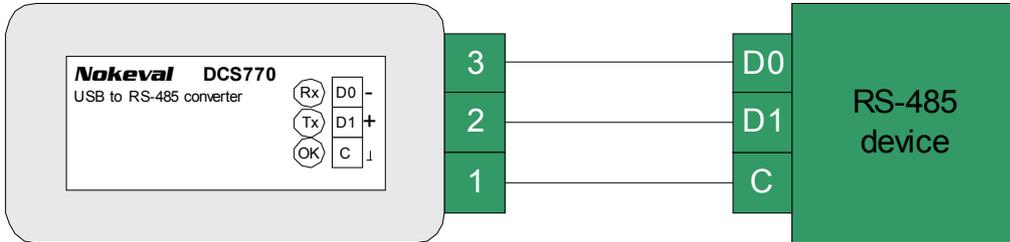
Install in the same way as the bus driver. When all is complete, the OK indicator on the device should be lit.

Finally it is necessary to find out, which COM port represents the device. Open Control Panel, System, Hardware, Device Manager. In the device tree, expand Ports, and there should be USB Serial Port (COM3), for an example.

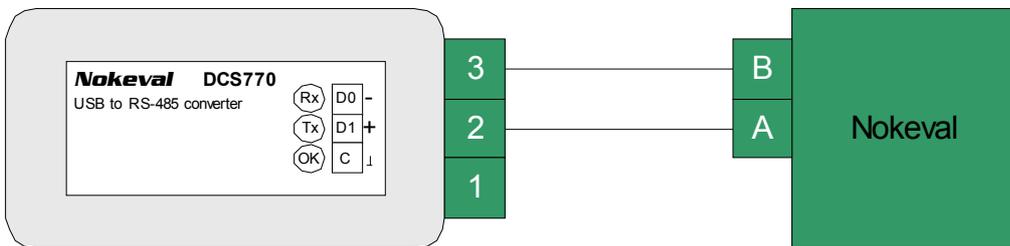


# CONNECTING

## Basic connection



## Old Nokeval devices



DCS770 has three terminals for RS-485 bus: D1, D0, and Common. These are connected 1:1 to the target device(s). D1 and D0 carry the bits in both directions (one direction at a time, i.e. half-duplex), and Common wire is used to equalize the ground potential of the bus devices.

Older Nokeval devices do not have Common terminal available – in that case connect only D1 and D0 (formerly called as A and B).

There has been quite rich use of names for the signal lines. Even EIA/TIA recommended "A" and "B" have been used with two meanings. Nokeval has decided to use the names defined by Modbus standard, D1 and D0. The table below shows typical names for the lines:

D1	D0
+	-
B	A
A	B

The cable should be of a twisted pair, minimum diameter 0.5 mm (24 AWG). A shielded cable may be used to increase immunity to disturbances. The shield should be grounded at one end only.

# TERMINATING AND FAIL-SAFES

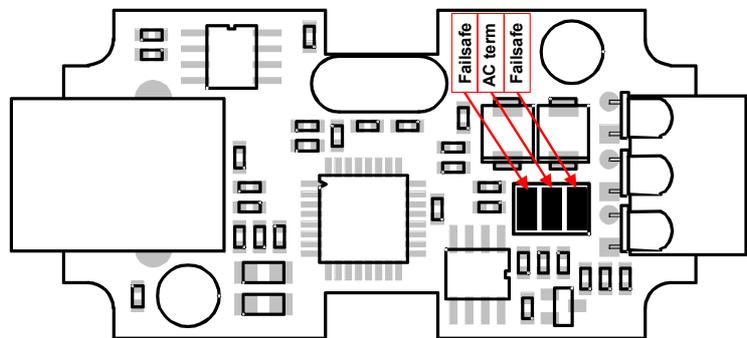
If the bus is longer than some dozens of meters or if high baud rates are used, the bus must be terminated in order to avoid reflecting the signal from the bus ends. The reflections will cause bit errors.

The bus topology should be daisy-chain, although short stubs (a couple of meters) are acceptable. The first and the last device on the bus should be terminated. Most RS-485 devices provide some means of terminating without external components, typically closing a jumper or a DIP switch.

Fail-safe resistors are needed to ensure the correct state on the bus when nobody is transmitting. They make at least 0.2 V voltage between lines D1 and D0. Modbus specification recommends that the bus has only one device fail-safing. So it is natural to have the fail-safe on the master of the bus.

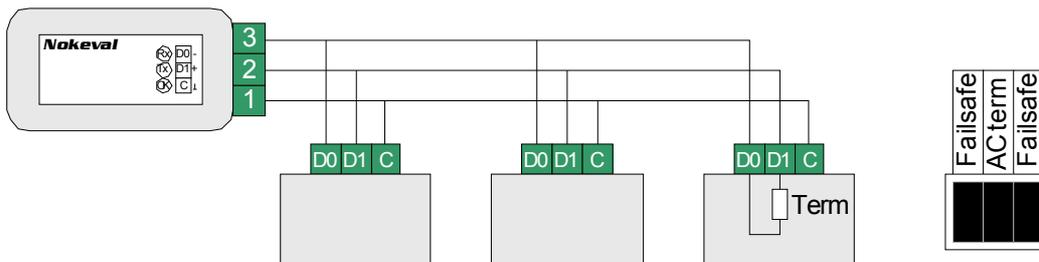
DCS770 can do both terminating and fail-safing with jumper settings. Their default setting is on. They may be changed by opening the case – squeeze its sides between your fingers and the case pops open.

The termination provided by DCS770 is an AC termination (there is a resistor 110 ohms and a capacitor 1 nF in series). It is enabled by closing the middle jumper inside the case. It should be enabled, if DCS770 is the first or the last device on the bus.

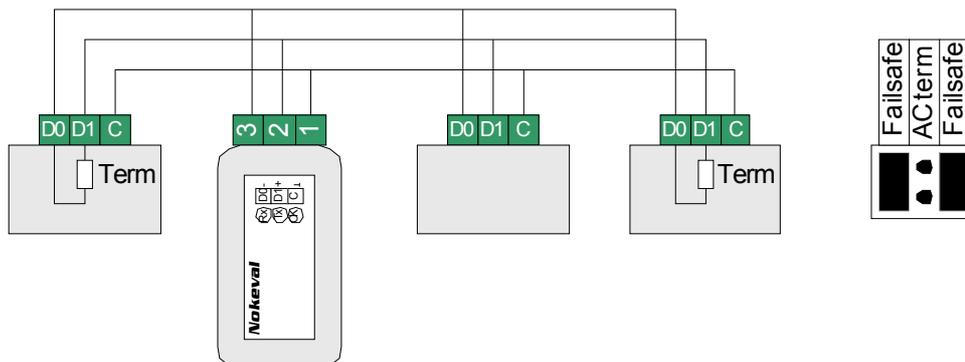


The fail-safe resistors are 500 ohms to 5 V, as recommended in Modbus specifications. They are enabled by closing the first and the third jumper. They should be closed, if there is no other fail-safing devices on the bus.

## Termination: DCS770 at the end of the bus



## Termination: DCS770 in the middle of the bus



---

# TROUBLESHOOTING

---

The indicator LEDs in the DCS770 are very helpful when something is wrong with the communications.

## **Step 1: Drivers**

Check if the OK LED is lit in the DCS770. If not, reinstall the drivers.

## **Step 2: Transmission**

Start your PC application and check that the Tx LED is blinking on the DCS770. If not, there is something wrong with your application – a wrong COM port probably.

## **Step 3: Reception**

If the Tx LED is blinking but Rx is not, then your slave device is not responding. Check that it is powered up, it is wired correctly, and that the serial settings are correct.

## **Step 4: Bus voltage**

Use a multimeter to measure the voltage between D1 and D0 lines. It should be at least 0.2 V, D1 being more positive. If it is 0 V, there is a short-circuit, or wire break, or no fail-safe enabled on any device.

Measure the voltage at every device, ensuring the polarity is still correct.

## **Nokeval**

Yrittäjätu 12  
37100 Nokia  
Finland

Tel +358 3 3424800  
Fax +358 3 3422066  
[www.nokeval.com](http://www.nokeval.com)