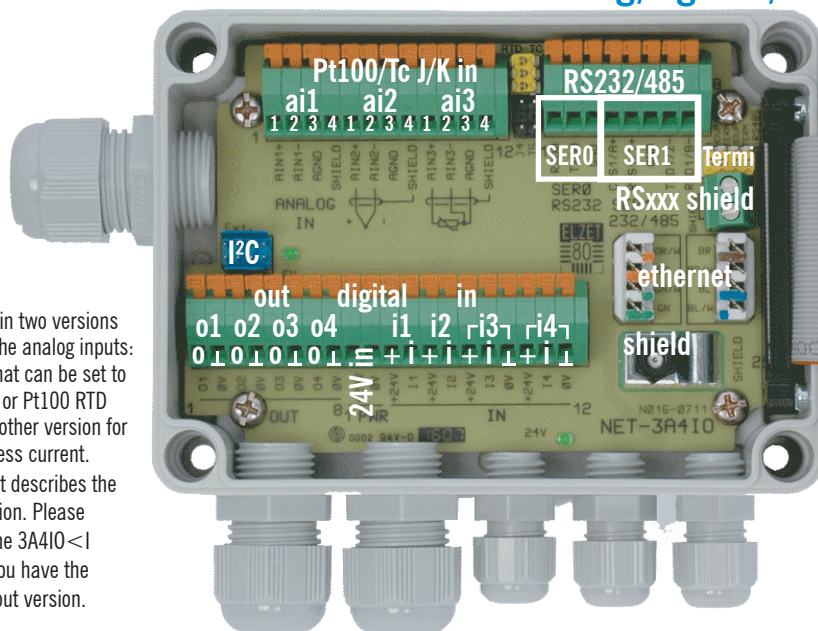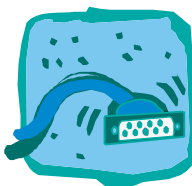# How to install the

ETH-K60-3A4IO

ethernode® analog/digital i/o

3A4IO comes in two versions that differ in the analog inputs: One version that can be set to thermocouple or Pt100 RTD inputs and another version for 4..20mA process current. This document describes the Pt100/Tc version. Please look/ask for the 3A4IO<I document if you have the 0/4..20mA input version.

Ethernet
Use a common LSA punch tool to connect either patch cable or wiring cable to the two LSA terminal strips provided. Colour assignment is per TIA-568B, only the left strip connections (1/2+3/6) are used on ethernode for data. The right strip can be used for non-standard remote powering, applying 48V AC or DC to the brown and blue terminals (either polarity) for a PoE supply.

SER0: RS232, SER1: RS232 or RS422/485
SER0 (in fact SER4 of the K60) is RS232 only with no handshake signals. This is the default debug port (fnDebugMsg). SER1 (K60: SER5) can be factory assembled to RS232 with a handshake pair or RS422/485 full duplex. By default the port is shipped as RS232. In RS485 mode the two jumper switches marked "HDUP" can be set (please set both!) to ON to use the A/B or Y/Z pair for both transmit and reception (**half duplex** operation). Do **NOT** set to half duplex for RS232 (shorts lines)! If you are at the physical end of a cable in RS485 mode, please set the "TERM" jumper switch(es) to ON to **terminate** the line properly: One switch for half duplex, both for full duplex.
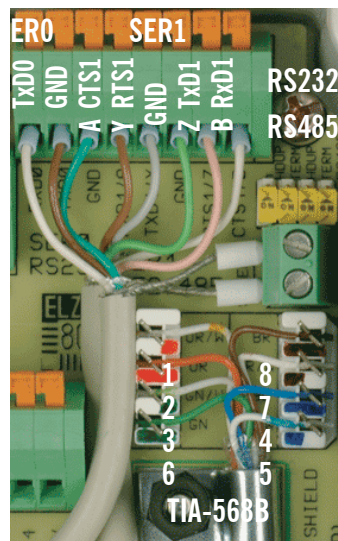
Power and digital i/o
All terminals named 24V are interconnected as all terminals named 0V are.

In the center of the lower terminal row there's a pair of terminals marked PWR and +24V/0V. This is the power input from an external 24V supply or, in the PoE ethernet powered version, the 24V power output of the PoE supply. Please note that only 150 to 200mA are available from PoE, depending on ambient temperature. Supply external relays, intelligent sensors or standard initiators. A foldback regulator limits the available current. If you need more power, then you might feed external power into the same pins. Please note that excessive voltages fed into this port (>28V) might destroy the PoE power supply.

To the left of the PWR are the four **outputs** that supply 24V from the 24V power "rail" into an external grounded load. Terminals (0V) are provided for the ground return. Outputs are short-circuit-proof FET switches BTS721L1 with auto current-limiting.

To the right are four digital **inputs**, all with an associated +24V-terminal to supply a mechanical switch, but two (I3, I4) only with a 0V (GND) terminal needed for electronic initiators (a space constraint).
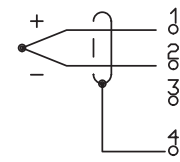
Analog inputs

Pt100 (RTD) input: Apply the two sensor leads to either the leftmost terminals and the compensation lead to the third terminal. Shield goes to the fourth terminal.
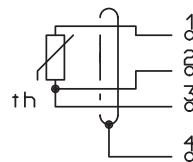
Thermocouple input: Apply the positive lead to the leftmost terminal and the negative to the second. Shield goes to the fourth terminal.

Jumpers J3..J5 are all open for Pt100/RTD, for thermocouples J3s are closed/on, J4 and J5 are open.

Technical data
Power input: 24V +/-15%@150mA, fused 10A max. Or PoE power supply option according to IEEE802.3af: 44..57V@240mA in turn supplying 24V at 150..200mA max. to external sensors.
Ambient temperature: -40..+50°C.
24V digital **outputs**: Opto-isolated BTS721L1 high side driver, 1A+ per channel, can be joined for higher current. Current and overtemperature limited. Max. switching time $400\mu s$.
24V digital **inputs**: Opto-isolated inputs 18..30V DC. Input low-pass filter to catch spikes $<100\mu s$.

Analog inputs Pt100(RTD): 3-wire sensor input (2-wire needs jumper wire between pins 2 and 3). Standard range -200..+800°C (other ranges on request). Gain error $<0.01\%$ ($\sim0.1°C$). Gain drift typ. < 25ppm (0.025°C/K @ 800°C). ADC resolution ~0.05°C/bit.

Analog inputs thermocouple type J or K: 2-wire sensor input with cold junction compensation. Standard ranges -270..+1372°C (type K NiCr-Ni, -6.458mV..54.886mV), -50..+760°C (type J, Fe-CuNi, -8.095mV@-210°C..42.919mV). Gain error $<0.01\%$ ($\sim0.1°C$@1000°C type K). Gain drift typ. < 100ppm (0.1°C/K @ 1000°C type K). ADC resolution ~0.06°C/bit type K.

Software setup
Import the project „uTasker_3A4IO_NET_K60" into Kinetis Design Studio. Click on the arrow right of the hammer symbol and choose „EK60FullDemo_NETK60-BM" to build the project for use with the preflashed bootloader. After the build is finished you will find the newly created binary in the „Upload"-folder in the project directory.
To upload the binary to the device you have to put it in bootloader-mode:
Download and install „ELZET80 Network Device Discovery".
Connect ethernet to the device and to your PC. Press on „Discover Devices (UDP)". Right-click the device and choose „Set to bootloader mode". A browser window should open showing the bootloader upload page where you can upload your binary.