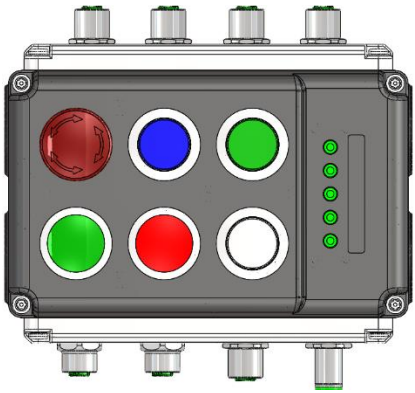
IDEM Safety Switches

NET-BOX-CS

Safety IO, Standard IO, and Integrated EtherNet/IP with CIP Safety.

Operating Instructions



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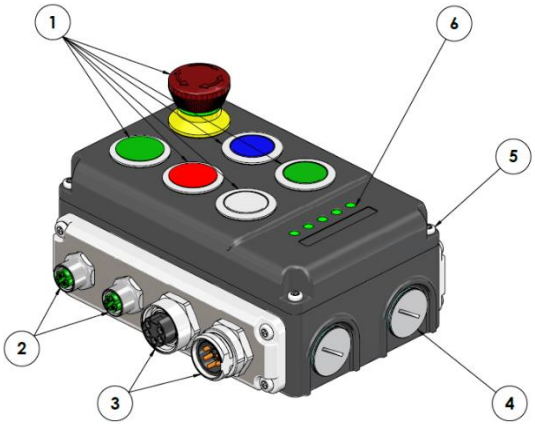
1 System Overview

NET-BOX Housing



Key

1. Pilot Devices
2. Data Ports
3. Power Ports
4. Blanking Plugs for Cable Entry
5. Lid Screws
6. Indication LEDs

2 Safety Functions

IMPORTANT

- It is the responsibility of the user to ensure the correct overall functionality of its systems and machines. IDEM its subsidiaries and affiliates are not in a position to guarantee all of the characteristics of a given system or product not design by IDEM.
- All relevant safety regulations and standards are to be observed.

The NET-BOX-CS complies with the requirements of Cat. 4 / PL e and SIL 3 in accordance with ISO 13849-1, IEC 62061 and IEC 61508. The device implements the following safety functions:

- **Emergency stop** function (optional, see part number options).
- **Safe Inputs** monitoring of up to 3 additional safety devices, OSSD inputs or voltage free contacts (with test pulses).
- **Safe Outputs** control of single dual channel output.

3 Installation & Maintenance

Principle

The NET-BOX device is designed to be fitted near a guarded access point where a mix of safe and standard IO control functions are required. The NET-BOX is fitted with an (optional) E-Stop and can monitor external dual channel safety devices that are equipped with either voltage-free contacts (NET-BOX provides test pulses) or OSSD outputs. A single dual channel output is also provided for safe control of an actuator.

WARNING
DO NOT DEFEAT, TAMPER, OR BYPASS THE SAFETY FUNCTION.
FAILURE TO DO SO CAN RESULT IN DEATH OR SERIOUS INJURY.

NE PAS DESACTIVER, MODIFIER, RETIRER, OU CONTOURNER CETI, INTERVERROUILLAGE
IL PEUT EN RESULTER DES BLESSURES GRAVES DU PERSONNEL UTILISATEUR.

- Observe the county-specific regulations when installing the device.
- Repair or modification of the NET-BOX is not allowed unless authorised by IDEM and carried out according to operating guidelines.
- Safety critical failures which do not lead to the safe state shall be reported to IDEM immediately.
- Replace a malfunctioning NET-BOX immediately.

NOTES REGARDING c UL us **:**
- Maximum Temperature 40°C

Fastening

IMPORTANT
- The tightening torque to ensure reliable fixing is 4.0Nm.

Maintenance Activities

IMPORTANT
- To achieve the target safety level, it is required to routinely check the safety functions are operating correctly. For applications targeting PLe a check should take place once per month, for PLd applications a check should take place once per year.
- If any part of the NET-BOX displays mechanical damage then remove and replace.
- IDEM will not accept responsibility for failure of the device functions if the installation and maintenance requirements shown in this document are not correctly implemented.

4 Electrical Connection

	WARNING • The device shall be supplied by a 24V SELV/PELV power supply acc. to IEC 61131-2 which limits the maximum voltage in case of failure to 60V. • Function Earth must be connected. **NOTES REGARDING** c UL us **:** • To meet the requirements for UL a class 2 power supply must be used.
	INFORMATION • When multiple devices are used in a daisy-chain arrangement the power bus may be forwarded via the NET-BOX device. See technical specification and ensure the total current through each device does not exceed the specified maximum current.
	INFORMATION • Not all connections are required for all applications, the minimum requirement to operate the device is one data connection and one power connection. All 4 ports are utilised when the NET-BOX is used a 'daisy chain' configuration.

5 Protocol Setup

IMPORTANT

- The minimum time between the change of a single safe digital input and the transmission to the CIP Safety is 32ms. In the case of an input level change at both safe inputs at the same time the maximum safe application reaction time is 42ms for Interlock/Lock and Estop.
- Clear any pre-existing configuration from any safety device before installing it onto a safety network.
- Commission all safety devices with IP address prior to installing it onto a safety network.
- When a SIL3 device is configured directly from a workstation, the user should compare the transferred SCID and configuration data with the SCID and configuration data originally viewed in the workstation.
- The configuration software shall assume an ASYNC parameter value of 1.
- Configuring an originator with connection data and/or target configuration data must be downloaded to the target so it can be tested and verified. Only then can SCIDs from the target be confirmed.
- Status-Bits reported by the device via CIP Safety messages shall not be used to trigger the safety function of a device or system.
- The safety-related parts of the EDS (Electronic Data Sheet) of the NET-BOX-CIP device shall not be altered.
- Each safety device shall have a single physical address that is unique on the devices segment.
- The maximum operation time (proof-test interval) of the NET-BOX shall not exceed 20 years. When reaching the proof test interval, the NET-BOX shall be replaced and put permanently out of order.
- After the detection of a safety critical error, the NET-BOX shall not be kept in fail-safe state for more than 1 hour.

INFORMATION

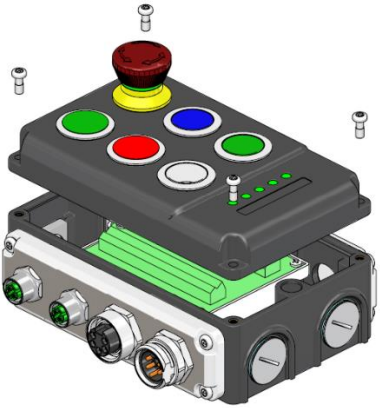
- The device EDS file can be found via the NET-BOX product page of the IDEM website www.idemsafety.com/products or alternatively please contact technical@idemsafety.com

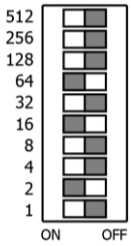
Network Address – Setup/Initial Setting
The NET-BOX IP address can be set via DHCP server or statically via the device DIP switches.

The NET-BOX in its out-of-the-box state will have DHCP enabled (All DIP switches OFF, no IP address set).

Setting via DIP Switch
To manually assign a static IP the DIP switches located inside the NET-BOX are used. The following steps can be performed with the device powered on or off, note the final step if the device is powered.

- Remove the lid screws and turn over the NET-BOX Lid to locate the DIP switches (see below).
- Using a small tool push the required switches to the 'ON' position to set the corresponding bit.
- The address is given by adding the values of the DIP switches in the ON position.
- Cycle power to the NET-BOX or press and hold the reset button until the LEDs turn red then release to reset the device.
- The NET-BOX will restart with the configured IP address and with DHCP disabled.
- Replace the NET-BOX Lid and Lid screws, ensuring a tight seal of the lid.

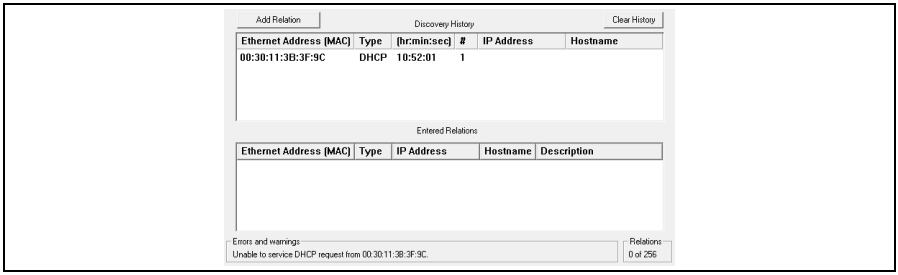




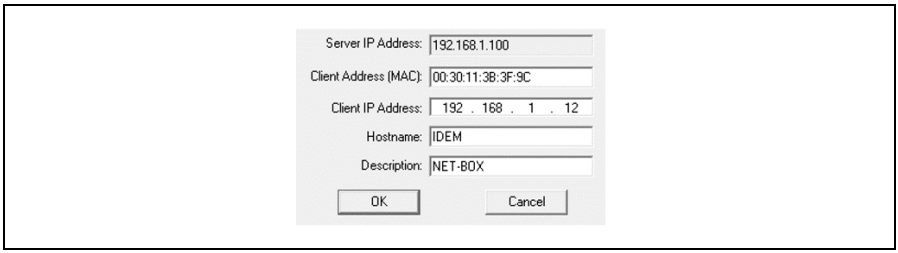
INFORMATION
- The example given in the image above shows only switches 2, 16 and 64 set to the 'ON' position. The resulting IP address is: 192.168.1.**82**

Setting via DHCP

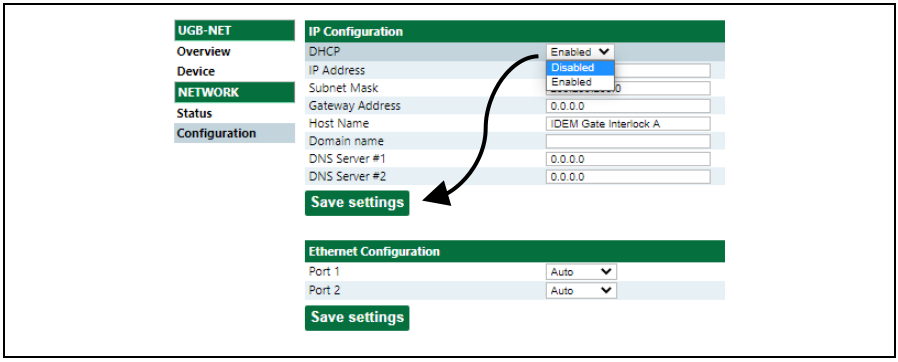
1. Apply power to the NET-BOX, after a start-up period the 'MS' LED should be flashing green.
2. Using a PC station that is configured on the same network as the NET-BOX, run the BOOTP/DHCP tool.
3. Using the MAC address to identify the NET-BOX, select the NET-BOX in the 'Discovery History' window and click 'Add Relation'.



4. Configure the required IP address setting in the pop-up window and click OK.



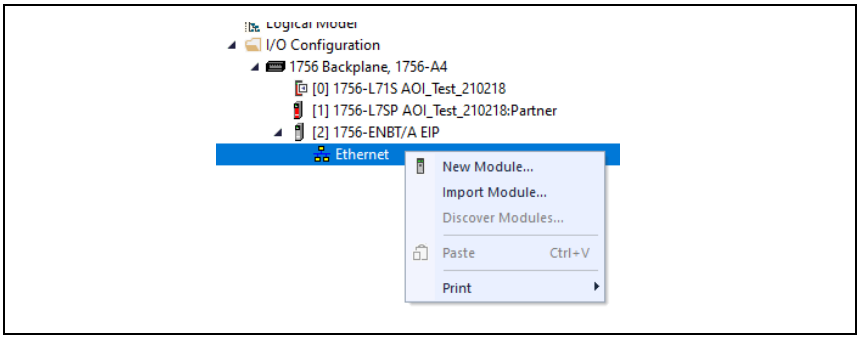
5. Open an internet browser and type in the IP address of the NET-BOX.
6. Navigate to 'Configuration' under the 'NETWORK' menu.
7. Set DHCP to 'Disabled' and click 'Save settings'



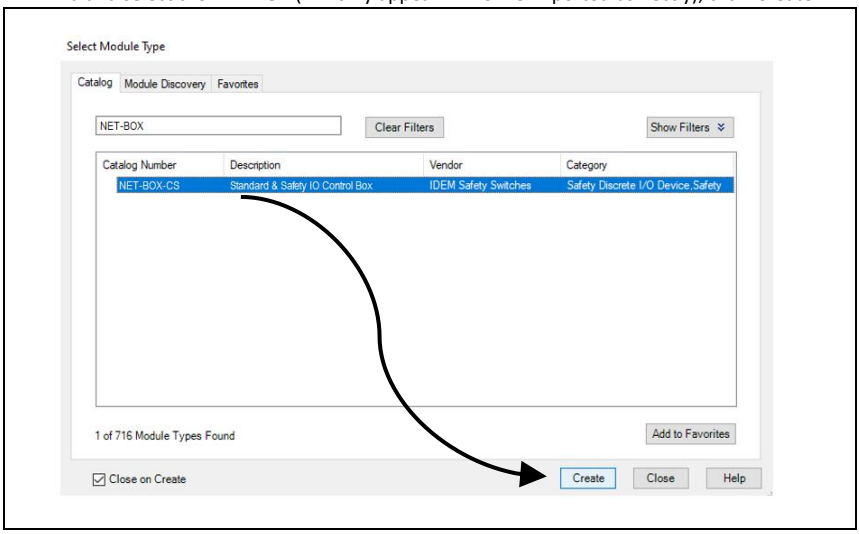
8. Cycle power to the NET-BOX or press and hold the reset button until the LEDs turn red then release to reset the device. The NET-BOX will restart with the configured IP address and with DHCP disabled.

Studio 5000 Ethernet/IP Configuration

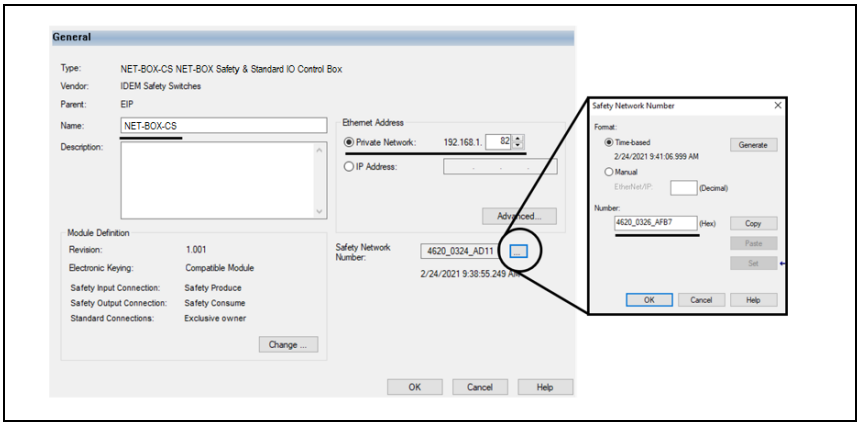
1. Download the EDS file for the NET-BOX and import to application control software.
2. Open or create a project with the PLC CPU, Partner and Ethernet/IP modules added.
3. Right click the Ethernet module and select 'New Module…'



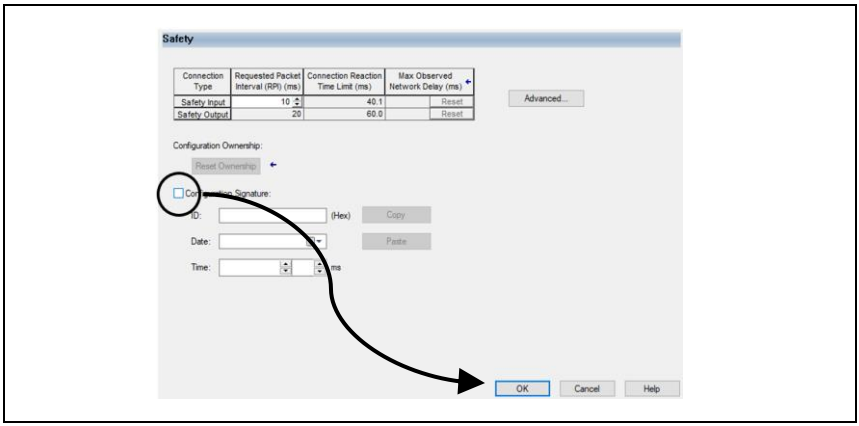
4. Find and select the NET-BOX (will only appear if EDS file imported correctly), click 'Create'.



5. Set the device name (customisable – 'NET-BOX-CS' used as example only) and set the previously configured IP address.
6. Change the Safety Network Number (SNN) to match that of the controller/PLC.



7. On the 'Safety' tab, uncheck the 'Configuration Signature' box, press OK.



8. The NET-BOX can now be utilised in the PLC program according to the NET-BOX data mapping.

Factory reset
Please consult the instruction manual of the application control software or for further assistance please contact technical@idemsafety.com

Functional Tests
Once the device has been installed and setup within the EtherNet IP / CIP Safety application control software the following checks are necessary to ensure correct operation of the system.

- Secure mounting of NET-BOX with lid screws correctly tightened.
- Confirm correct operation of each safety input device including the lid mounted E-Stop (if fitted).
- Expected operation of all control circuits.

6 Data Map

See technical datasheet supplied with product. For assistance please contact:
technical@idemsafety.com

7 Diagnostic Indication

LED	Function	Colour
DS	Device Status	Red/Green
PS	Module Status	Red/Green
PN	Network Status	Red/Green
L1	Link 1	Amber/Green
L2	Link 2	Amber/Green

LED	LED State	Comment
DS	Green	Device running
	Red	Internal fault detected
MS	Green	Connection to PLC, Run state
	Green Flash	Connection to PLC, Idle state
	Red	Major Fault
	Red Flashing	Recoverable fault, check PLC/NET-BOX configuration
NS	Off	No IP address set
	Green	Online, connection(s) established
	Green flash 1Hz	Online, no connections established
	Red	Network fault
	Red flash	Connection timed out.
L1/L2	Off	No Ethernet link detected
	Amber	Ethernet link detected
	Amber flash	Ethernet data transfer

- Diagnostic LED's are not reliable indicators and cannot be guaranteed to provide accurate information. They should only be used for general diagnostics during commissioning or troubleshooting. Do not attempt to use LEDs as operational indicators.

8 Technical

Device Characteristics

Response time (Safety Inputs)	36 ms max. (Change of input state -> transmission to field bus)
Response time (Safety Outputs)	7.7 ms max. (field bus telegram recvd -> change of output state)

Electrical Data

Operating voltage	24 V DC +10%/-15% (SELV/PELV)
Power Supply UL Requirements	Class 2 power supply must be used.
Current consumption, max.	250 mA (excluding Standard Outputs and Safety Outputs).
Allowed through current (daisy-chain)	5 A

Standard Inputs

Input Rated Voltage	24V DC
Input Rated Current	2 mA

Standard Outputs

Output Rated Voltage	24V DC (sourced from power connectors)
Output Maximum Current	500 mA single / 1.5 A group (OUT1..4 / OUT5..8)

Test Outputs

Parameter	Unit	Min	Typ.	Max
Voltage Test Output High	V	19.2	24	30
Voltage Test Output Low	V	--	High Z	--
Current Test Output High	mA	--	100	100
Current Test Output Low	mA	--	--	0.5
Short Circuit Peak	A	9	17	28

Safety Inputs

Parameter	Unit	Min	Typ.	Max
Voltage Digital Input High	V	15	24	30
Voltage Digital Input Low	V	-3	0	5
Current Digital Input High	mA	2	5	15
Current Digital Input Low	mA	0	--	15

Safety Outputs

Parameter	Unit	Min	Typ.	Max
Voltage Digital Output High	V	19.2	24	30
Current Digital Output High	mA	--	--	500
Current Digital Output Low	mA	--	--	0.5
Inductive Load	H	--	--	0.5
Capacitive Load	uF	--	--	1
Short Circuit Peak	A	2	5	8

Mechanical Data

Body material (Plastic)	PBT
Body Material (Stainless Steel)	Stainless Steel 316

Environmental Data

Operating temperature	-20 °C to 40 °C
Enclosure Protection	IP 65
Maximum operating altitude	2000 m
Shock and Vibration	Tested in accordance with: IEC 60068-2-6 and IEC 60068-2-27
Pollution Degree	Degree 2 (EN 60664) (Storage and Operation)

Reliability / Safety Data (EN ISO 13849-1)

Category	4
Performance Level	e
MTTFd	High
DC	>90%

Reliability / Safety Data (EN 62061 / IEC 61508)

Mission Time	20 years
SIL CL	SIL 3
PFHd (Emergency Stop Function)	2.3E-9
PFHd Safety Inputs (voltage free contacts with test pulses)	2.4E-9
PFHd Safety Inputs (OSSD inputs to device)	2.4E-9
PFHd Safety Outputs	2.4E-9

NOTES:

EC / EU Declaration of Conformity

	MANUFACTURER:	EU REPRESENTITIVE:
ADDRESSES:	IDEM SAFETY SWITCHES LIMITED Hindley Industrial Estate Hindley Green Wigan Lancashire WN2 4HR United Kingdom	IDEM SAFETY SWITCHES Ro SRL Bloc OD6, nr. 35 Bulevardul Timișoara București 061344 Romania

DEVICE(s): NET-BOX

THE LISTED DEVICES CONFORM TO THE ESSENTIAL HEALTH AND SAFETY REQUIREMENTS OF THE FOLLOWING EUROPEAN DIRECTIVES AND STANDARDS

DIRECTIVES:	Machinery Directive	2006/42/EC
	EMC Directive	2014/30/EU
STANDARDS:	EN 13849-1	:2015
	EN 13849-2	:2012
	EN 62061	:2015
	EN 61508 (Parts 1-7)	:2010
	EN ISO 14119	:2013
	IEC 60947-5-3	:2013

THIRD PARTY APPROVALS:

TUV Rheinland Industrie Service GmbH
Am Grauen Stein
51105 Köln / Germany

(Notified Body for Machinery, NB 0035)

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M.Mohtasham **Managing Director**
Dec 2022