# CANopen Router/B

## Datasheet

### A-CANOR/B

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# 1. PREFACE

## 1.1. ABOUT THIS DOCUMENT

This document contains the technical data for the CANopen Router/B.

## 1.2. INTRODUCTION TO THE CANOPEN ROUTER/B

The CANopen Router/B module provides intelligent data routing between either EtherNet/IP or Modbus TCP/RTU and the CANopen bus network. This allows the user to integrate CANopen devices into a Rockwell Logix platform (e.g., ControlLogix or CompactLogix) or any Modbus Master or Slave device with minimal effort.

The module can be configured to be either a CANopen Master or CANopen Slave allowing the user to not only integrate CANopen devices into a Logix or Modbus system, but to also allow the user to use EtherNet/IP or Modbus devices in an existing CANopen network (by using the CANopen Router/B in Slave mode).

**CANopen Master**
When the module operates as a CANopen Master, it can connect to a maximum of 124 CANopen Slaves. The process data (PDOs) from each CANopen Slave can be mapped to any of the operating interfaces (EtherNet/IP Target, Modbus Slave, Modbus Master, or EtherNet/IP Originator).

**CANopen Slave**
When the module is configured to be a CANopen Slave, it can emulate up to 128 Process Data Objects (PDOs) with each mapped item having the ability to be configured as a separate CANopen node.

The module can use one of four interface modes:

**EtherNet/IP Target**
As a EtherNet/IP target, the module can use one of two methods to read and write data to and from the CANopen network:

- **Direct-To-Tag technology**

  This allows the CANopen Master or Slaves to exchange data with a Logix controller without the need to write any ladder or application code in Studio 5000. The CANopen data is directly read from, or written to, Logix tags.

- **EtherNet/IP Class 1 connection**

  Here a remote EtherNet/IP device (e.g. a Logix controller) establishes a number of Class 1 connections to the module. CANopen data can be mapped into two separate

input and output class 1 cyclic connections to the Logix controller (allowing up to 1KB input and 1KB output to be exchanged at the requested packet interval – RPI).

**Modbus Slave**
The diagnostics and CANopen data (from either CANopen Master or Slaves) will be written to, or read from, the module's internal Modbus Registers (Holding or Input Registers). These registers can be accessed by a remote Modbus Master using either Modbus TCP, Modbus RTU232, or Modbus RTU485.

**Modbus Master**
The diagnostics and CANopen data (from either CANopen Master or Slaves) will be written to, or read from, the module's internal Modbus Registers (Holding or Input Registers). The Modbus Auxiliary Map can then be used to configure the Modbus data exchange between multiple remote Modbus Slave devices and the module's internal Modbus registers. The Modbus communication can be via Modbus TCP, Modbus RTU232, or Modbus RTU485.

**EtherNet/IP Originator**
As an EtherNet/IP originator, the module can use one of two methods to read and write data to and from the CANopen network:

- **EtherNet/IP Explicit Messaging**

  This allows the CANopen Master or Slaves to exchange data with up to 5 EtherNet/IP devices. The module can use either Class 3 or Unconnected Messaging (UCMM) to Get and Set data in the remote EtherNet/IP devices.

- **EtherNet/IP Class 1 connection**

  CANopen data (from either CANopen Master or Slaves) can be mapped to a max of 5 EtherNet/IP devices using input and output class 1 cyclic connections. This will allow the CANopen Router/B to "own" the EtherNet/IP target device and exchange CANopen data using the EtherNet/IP device's input and output assemblies.

The CANopen Router/B can map up to 100 Service Data Objects (SDOs) from various CANopen Slaves into any of the of the operating interfaces (EtherNet/IP Target, Modbus Slave, Modbus Master, or EtherNet/IP Originator) similar to the mapping of CANopen Slave Process Data Objects (PDOs). Additionally, the SDO map supports and option to write a static value to an SDO on start-up.

The CANopen Router/B is configured using the Aparian Slate application. This program can be downloaded from www.aparian.com free of charge.

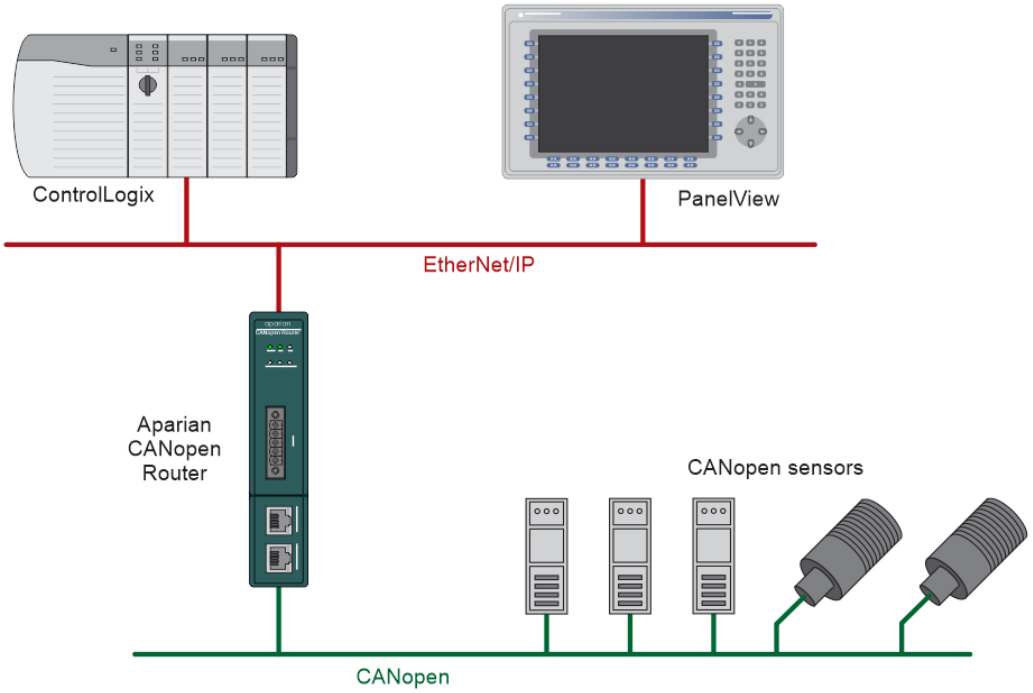



Figure 1.1. – Typical CANopen Master architecture using the CANopen Router/B

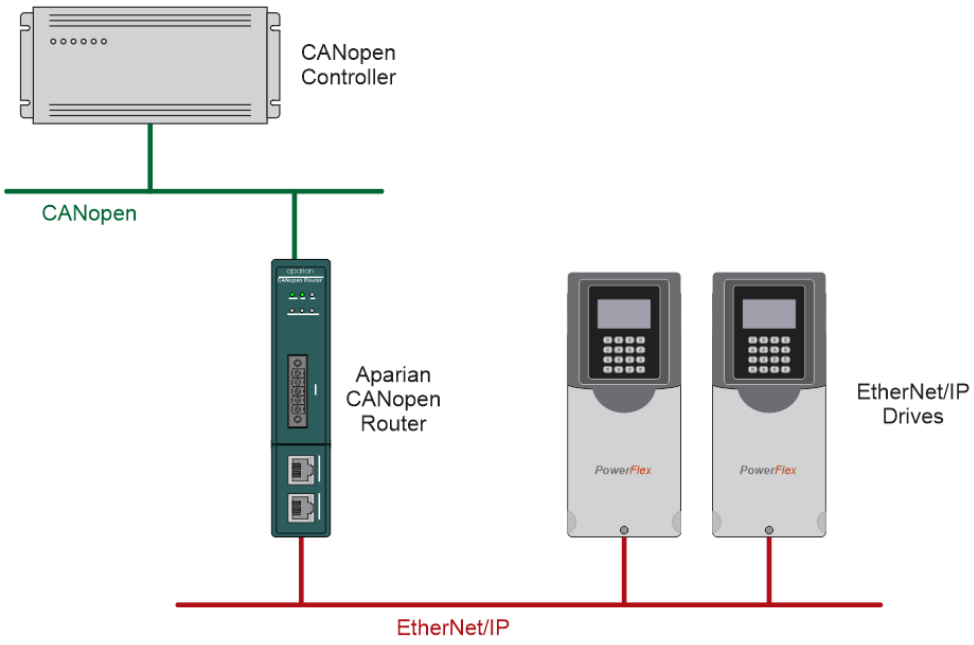



Figure 1.2. – Typical CANopen Slave architecture using the CANopen Router

When operating as a CANopen Master, Slate allows the user to map up to 32 PDOs per CANopen Slave to any of the operating interfaces (EtherNet/IP Target, Modbus Slave, Modbus Master, or EtherNet/IP Originator). The module and Slate will allow the user to parameterize each CANopen Slave according to the parameters provided in the CANopen Slave EDS file. These parameters can be saved in the CANopen Slave Device Non-Volatile memory.

The module also provides a range of statistics, CANopen and Modbus packet capture, and internal Modbus and Data table reads to simplify the diagnostic process for remote diagnosis.

The module has two Ethernet ports and supports Device-Level-Ring (DLR) architectures.

A built-in webserver provides detailed diagnostics of system configuration and operation, including the display of CANopen operation and communication statistics, without the need for any additional software.

## 1.3. FEATURES

- Module can operate as a CANopen Master or Slave.
- CANopen Master mode can configure and operate with up to 124 CANopen Slaves.
- CANopen Slave mode can emulate up to 128 PDOs with various CANopen node addresses.
- Module has various operating interfaces:
    - EtherNet/IP Target (Class 1 connection as well as Direct-To-Tag Logix tag access)
    - Modbus Slave (TCP, RTU232, and RTU485)
    - Modbus Master (TCP, RTU232, and RTU485)
    - EtherNet/IP Originator (Class 1 connection with up to 5 EtherNet/IP devices and Explicit Messaging with up to 5 EtherNet/IP devices).
- Support for up to 32 PDOs (receive and transmit) per CANopen Slave.
- Support for mapping of up to 128 SDOs to any of the operating interfaces (also supports writing of static value once off write).
- Slate software provides a CANopen and Modbus packet capture for better diagnosis of issues.
- Supports all CANopen Baud Rates (10k, 20k, 50k, 125k, 250k, 500k, 800k, 1M).
- Supports CiA 443 Bootloader Auto-enable.
- In Master Mode supports NMT message to initialize network.
- Supports CANopen LSS Node and Bit Rate assignment.
- Time Synchronization of the CANopen network.
- Master supports SYNC for PDO communication.
- Supports all error and emergency (EMCY) messages and handling.
- Dual Ethernet ports which support Device-Level-Ring (DLR).
- Network Time Protocol (NTP) supported for external time synchronization.
- Small form factor – DIN rail mounted.

## 1.4. ARCHITECTURE

The figures below provide an example of the typical network setup for connecting CANopen (as a Master or Slave) to EtherNet/IP or Modbus TCP/RTU232/RTU485.

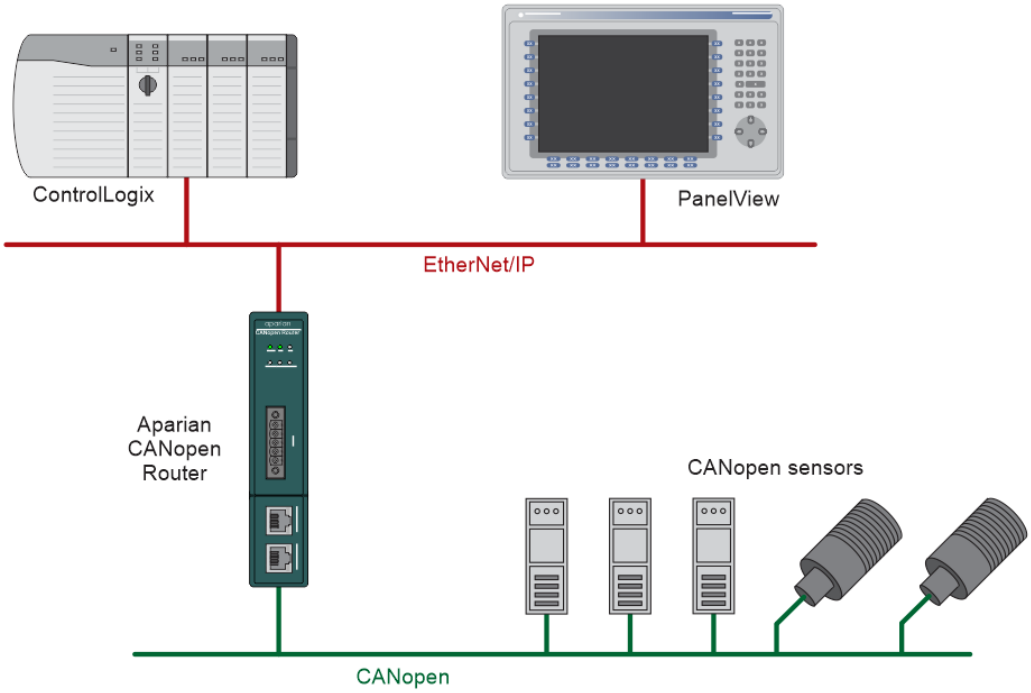



Figure 1.3. – Example of connecting CANopen Slaves to a Logix Controller

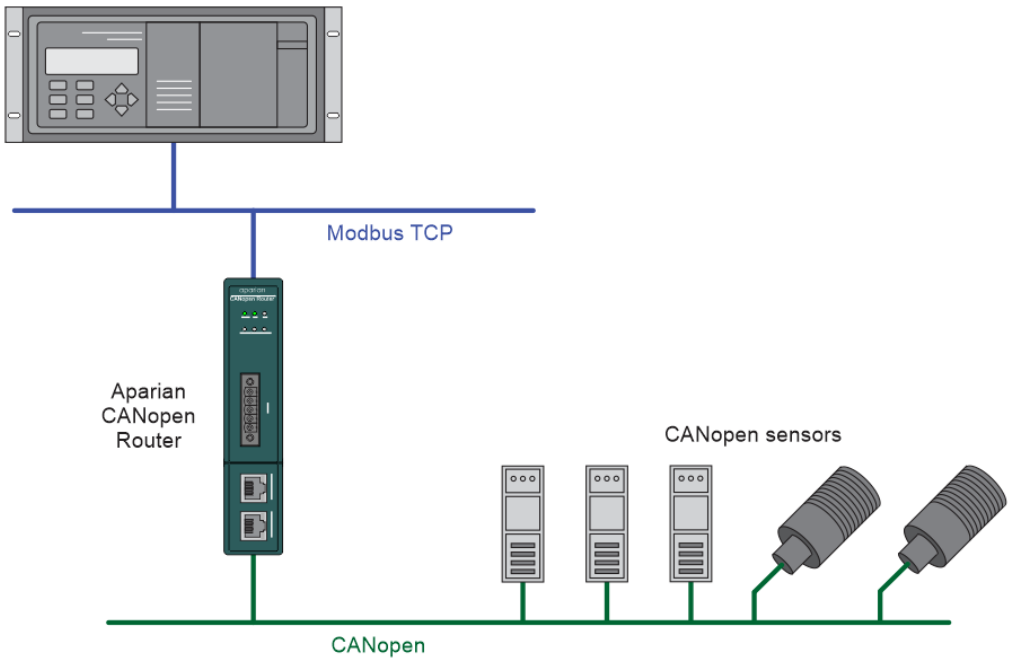



Figure 1.4. - Example of connecting CANopen Slaves to a Modbus TCP Master or Slave

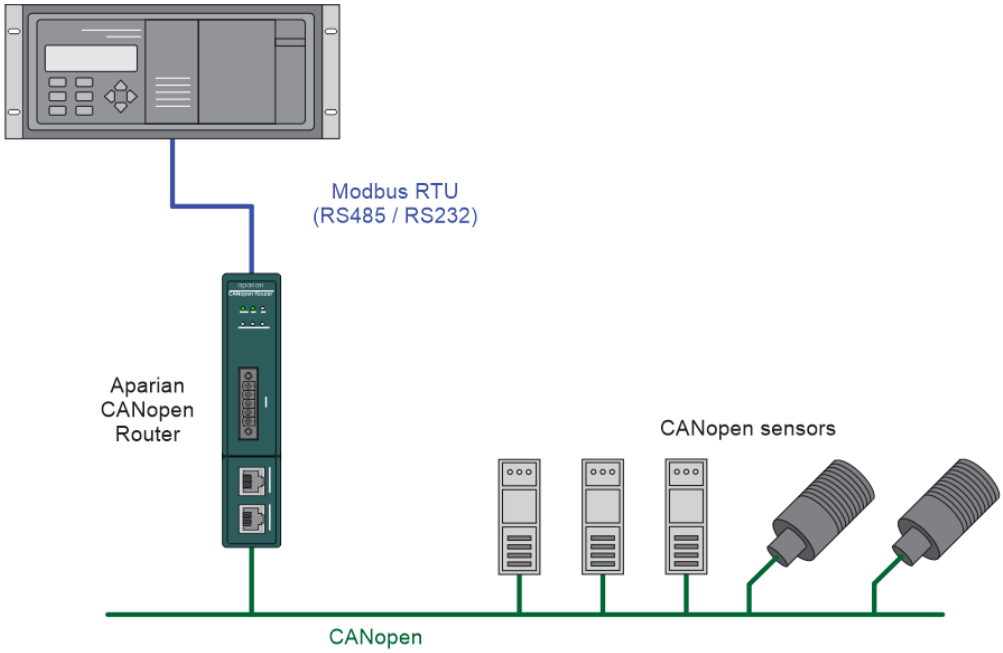



Figure 1.5. - Example of connecting CANopen Slaves to a Modbus RTU Master or Slave

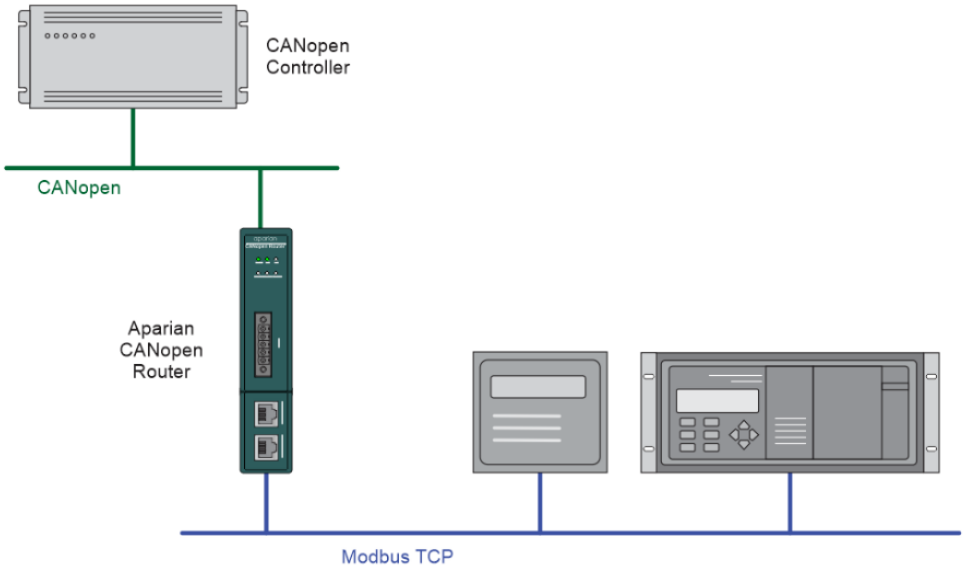



Figure 1.6. – Modbus TCP Device (Master or Slave) operating as a CANopen Slave

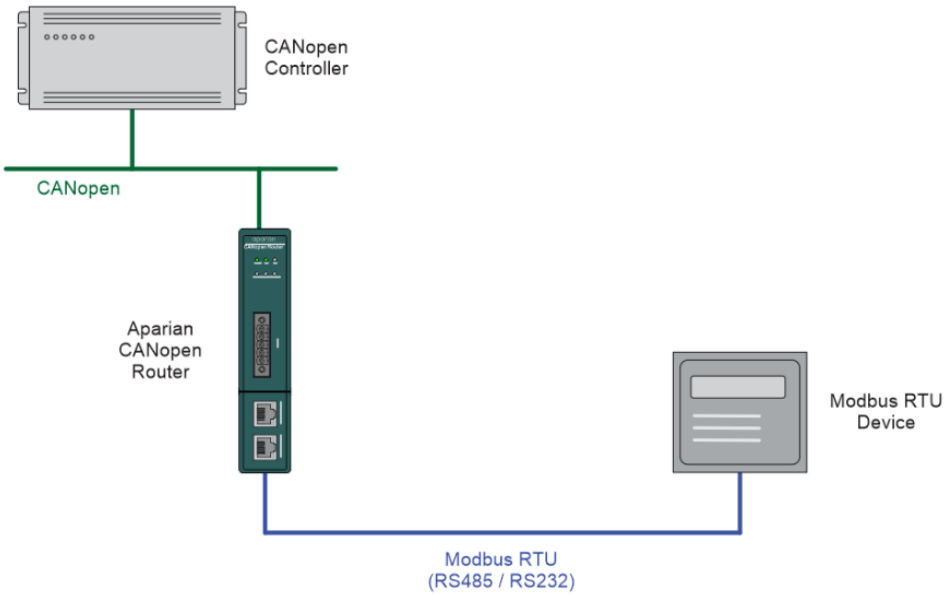



Figure 1.7. – Modbus RTU Device (Master or Slave) operating as a CANopen Slave

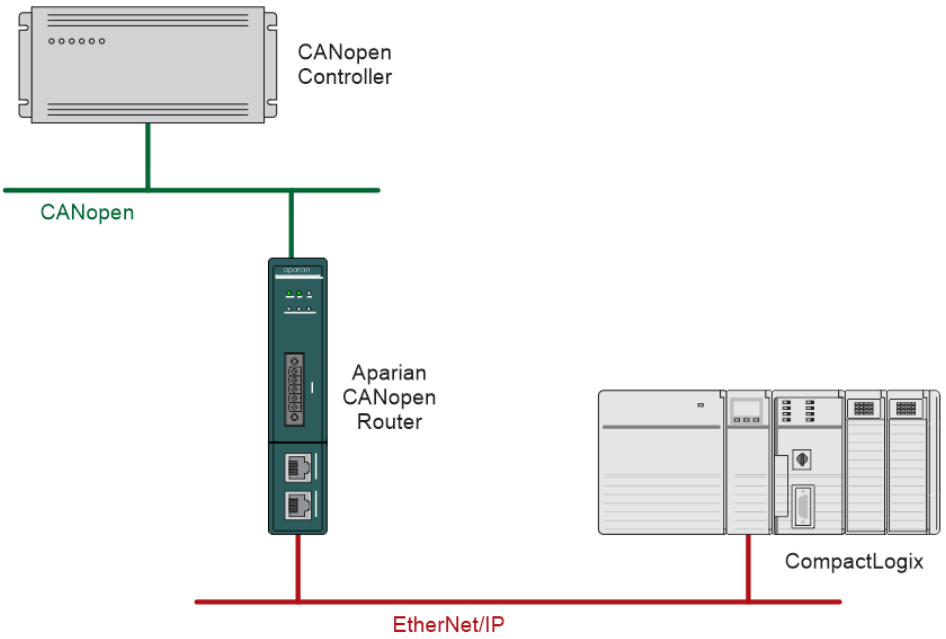



Figure 1.8. – Logix Controller operating as a CANopen Slave via the CANopen Router

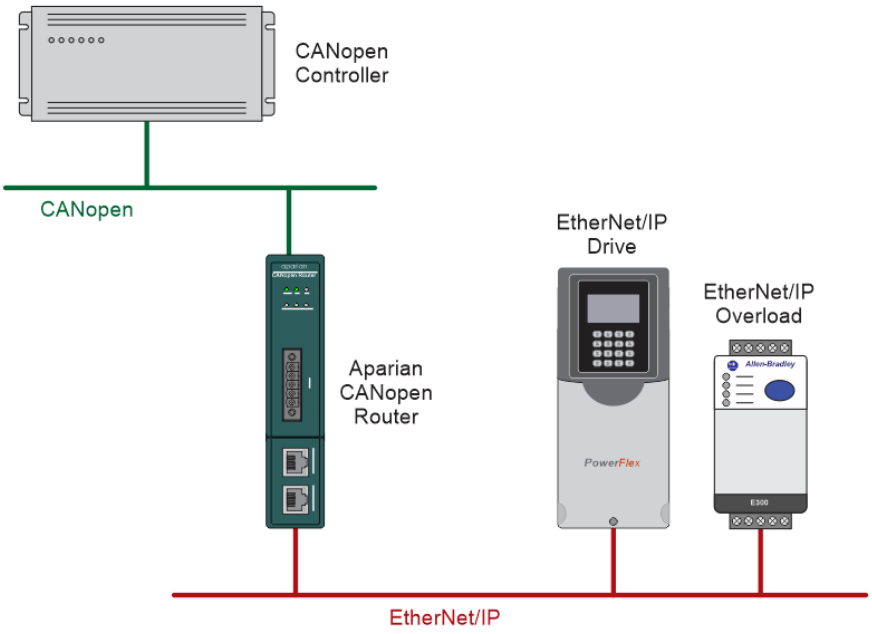



Figure 1.9. – EtherNet/IP Drive and Smart Overload operating as a CANopen Slave

# 2. TECHNICAL SPECIFICATIONS

## 2.1. DIMENSIONS

Below are the enclosure dimensions as well as the required DIN rail dimensions. All dimensions are in millimetres.

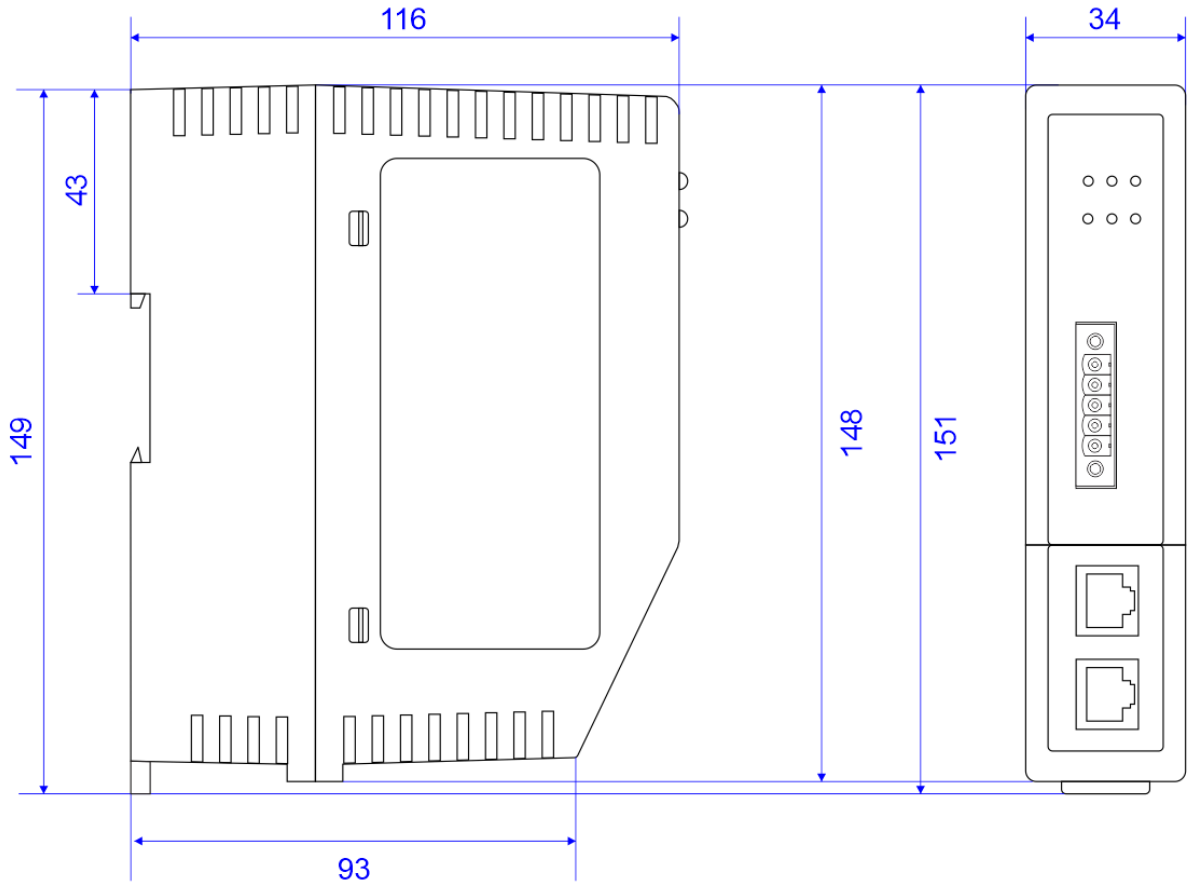



Figure 2.1 – CANopen Router/B enclosure dimensions

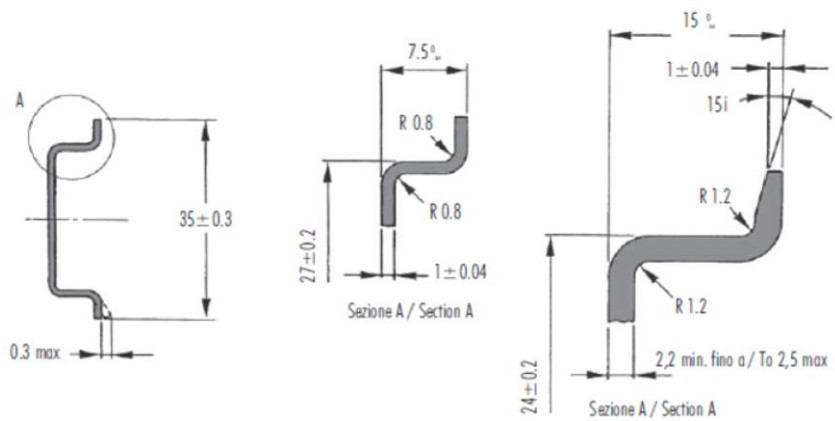



Figure 2.2 - Required DIN dimensions

## 2.2. ELECTRICAL

| Specification | Rating |
|---|---|
| Power requirements | Input: 10 – 32V DC |
| Power consumption | 2.2 W (Max.)<br>Current: 180 mA @ 10 V<br>Current: 85 mA @ 24 V |
| Connector | 3-way terminal |
| Conductors | 24 – 18 AWG |
| Enclosure rating | IP20, NEMA/UL Open Type |
| Temperature | -20 – 70 °C |
| Earth connection | Yes, terminal based |
| Emissions | IEC61000-6-4 |
| ESD Immunity | EN 61000-4-2 |
| Radiated RF Immunity | IEC 61000-4-3 |
| EFT/B Immunity | EFT: IEC 61000-4-4 |
| Surge Immunity | Surge: IEC 61000-4-5 |
| Conducted RF Immunity | IEC 61000-4-6 |

Table 2.1 - Electrical specification

## 2.3. ETHERNET

| Specification | Rating |
|---|---|
| Connector | RJ45 |
| Conductors | CAT5 STP/UTP |
| ARP connections | Max 200 |
| TCP connections | Max 200 |
| CIP connections | Max 15 |
| Communication rate | 10/100Mbps |

| | |
|---|---|
| Duplex mode | Full/Half |
| Auto-MDIX support | Yes |
| Embedded switch | Yes, 2 x Ethernet ports |
| Device Level Ring (DLR) | Supported |
| Network Time Protocol (NTP) | Supported |

Table 2.2 - Ethernet specification

## 2.4. SERIAL PORT (RS232)

| Specification | Rating |
|---|---|
| RS232 Connector | 9-way terminal (shared with RS485) |
| RS232 Conductor | 24 – 18 AWG |
| Electrical Isolation | 1000 Vdc |
| BAUD | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 |
| Parity | None, Even, Odd |
| Data bits | 8 |
| Stop bits | 1 |

Table 2.3 – RS232 Serial Port specification

## 2.5. SERIAL PORT (RS485)

| Specification | Rating |
|---|---|
| RS485 Connector | 9-way terminal (shared with RS485) |
| RS485 Conductor | 24 – 18 AWG |
| Electrical Isolation | 1500 Vrms for 1 minute. |
| BAUD | 1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200 |
| Parity | None, Even, Odd |
| Data bits | 8 |
| Stop bits | 1 |

Table 2.4 – RS485 Serial Port specification

## 2.6. CANOPEN

| Specification | Rating |
|---|---|
| Connector | 5-way terminal, 5.08mm pitch. |
| Modes | CANopen Master<br>CANopen Slave |
| Supported Baud Rates | 10k<br>20k<br>50k<br>125k<br>250k<br>500k<br>800k<br>1M |
| CANopen Terminator | 120 Ω - Software Enabled |

Table 2.5 – CANopen specification



**NOTE:** Although the CANopen Router supports the CiA443 objects, the CANopen interface is not fault-tolerant.

## 2.7. CANOPEN MASTER

| Specification | Rating |
|---|---|
| CANopen Slave Count | 124 |
| PDO Count per Device | 32 |
| SDO mapping count | 128 |
| MPDO supported | Yes |
| CANopen Slave Auto Parameterize | Supported |
| CiA 443 Bootloader auto-enable Support | Yes |
| NMT messages | Operational Control (e.g. Stopped, Pre-operational, Operational)<br>SYNC<br>TIME<br>EMCY |
| Layer Setting Services (LSS) | Node and BitRate assignment supported |
| Implementation | CiA 301 v4.2.0 |

Table 2.6 – CANopen Master specification

## 2.8. CANOPEN SLAVE

| Specification | Rating |
|---|---|
| CANopen PDO emulation count | 125 |
| CANopen Emulated devices supported | 125 |
| MPDO supported | Yes |

Table 2.7 – CANopen Slave specification

## 2.9. ETHERNET/IP TARGET

| Specification | Rating |
|---|---|
| Class 1 Cyclic connection count | 4 |
| Logix Direct-to-Tag Supported | Yes |

Table 2.8 – EtherNet/IP Target specification

## 2.10. ETHERNET/IP ORIGINATOR

| Specification | Rating |
|---|---|
| Class 1 Cyclic Connections Supported | Yes |
| Class 3 / UCMM Connections Supported | Yes |
| Class 1 Connection Count | 5 |
| Class 3 / UCMM Target Device Count | 5 |
| Class 3 / UCMM Mapping Count | 50 |

Table 2.9 – EtherNet/IP Originator specification

## 2.11. MODBUS MASTER

| Specification | Rating |
|---|---|
| Modes Supported | Modbus TCP, Modbus RTU232, Modbus RTU485 |
| Modbus RTU485 Termination | 125 Ω - Software Enabled |
| Max Modbus Slave device | 20 |
| Max Modbus Mapping | 100 |
| Mapping Ranges | Holding Register 0 – 65535 |

| | |
|---|---|
| | Input Register 0 – 65535<br>Input Status 0 – 65535<br>Coil Status 0 – 65535 |
| Base Offset | Modbus (Base 0)<br>PLC (Base 1) |
| Configurable Modbus TCP Port | Yes |
| Data Reformatting Supported | BB AA<br>BB AA DD CC<br>CC DD AA BB<br>DD CC BB AA |

Table 2.10 – Modbus Master specification

## 2.12. MODBUS SLAVE

| Specification | Rating |
|---|---|
| Modes Supported | Modbus TCP, Modbus RTU232, Modbus RTU485 (simultaneous) |
| Modbus RTU485 Termination | Software set |
| Mapping Ranges | Holding Register 0 – 65535<br>Input Register 0 – 65535<br>Input Status 0 – 65535<br>Coil Status 0 – 65535 |
| Base Offset | Modbus (Base 0)<br>PLC (Base 1) |
| Configurable Modbus TCP Port | Yes |

Table 2.11 – Modbus Slave specification

## 2.13. CERTIFICATIONS

| Certification | Mark |
|---|---|
| CE Mark | CE |
| RoHS2 Compliant | RoHS2 |

| | |
|---|---|
| UL Mark<br>File: E494895 | <br>CLASS 1, DIV 2, GROUPS A, B, C, D |
| ODVA Conformance |  |

Table 2.12 – Certifications