It is obvious: Mandatory parameters specified in the CiA 301 application layer have to be implemented. Some parameters are conditional. For example, if you implement PDO communication parameters you also have to provide the corresponding PDO mapping parameters. Optional parameters may be supported. Of course, if a CANopen device provides the optional function, it must follow the specification.

But what happens, if you don’t implement an optional parameter. If the default value attribute is “none” or “manufacturer-specific”, your device behaves, as you want. If this attribute has a specified value, your product needs to follow this specification. An example: The error behavior parameter (index 1029h) is an array-type object specifying the local NMT finite state automaton (FSA) transitions in case of severe errors. It is optional. Sub-index 1 (communication error) specifies a default value of “00h,” (data type: Unsigned8) meaning that the device must transit into NMT pre-operational state, if it is in NMT operation state when the severe error occurs. Severe errors include Heartbeat events or bus-off conditions of the CAN controller. If this object is not implemented, the device must behave as specified: It shall transit into the specified NMT state. Only when implemented, the system designer can configure another behavior (for example to keep the NMT state or to transit into NMT stopped state).

Optional parameters in profiles

Optional parameters in CANopen device, application, and interface profiles follow the same interpretation as described above. In CiA 401 (CANopen device profile for generic I/O modules), the “polarity digital input 8-bit” parameter (index 6002h) is optional. The default value is specified as “00h” meaning inputs are not inverted. This means, it is not allowed to provide an input inversion function, if this object is not implemented. In case of CiA 401, this is also clearly described in the profile specification: “If an optional parameter is not implemented, the device shall behave as specified in the default value attribute.”

Other profile specifications don’t mention this explicitly. Nevertheless, optional parameters with dedicated default values determine the device’s behavior. For example, CiA 402 (CANopen device profile for drives and motion control) specifies for the “quick stop option code” parameter (index 605Ah) a default value of “+2” meaning “slow down on quick stop ramp and transit into switch-on-disabled”. This behavior is mandatory, even if the parameter is not implemented. It is not allowed to behave differently.

To summarize, CANopen devices must behave as specified in the default value after power-on. This is also valid for optional parameters. Optional does not mean your device may behave any way. It is also not allowed implementing a congruent functionality using manufacturer-specific parameters. This would decrease interoperability of CANopen devices, an important feature of CANopen device profile specifications.

In CANopen, there are specified mandatory, conditional, and optional parameters. If you don’t implement optional ones, your device still has to behave as specified.

Good to know: Optional is not “don’t care”
The new PCAN-Router FD has two CAN channels that support the CAN FD standard in addition to the conventional CAN 2.0 specification. The module behavior and the data exchange between the two channels are freely programmable. For example, a conversion of CAN to CAN FD and vice versa is possible and new CAN FD applications can be integrated into existing CAN 2.0 networks.

- ARM Cortex M4 microcontroller
- 4 kByte On-chip EEPROM and 4 MByte SPI flash
- Two High-speed CAN channels (ISO 11898-2)
- Comply with CAN specifications 2.0 A/B and FD
- CAN FD support for ISO and Non-ISO standard
- CAN FD bit rates for the data field up to 12 Mbit/s
- CAN bit rates from 25 kbit/s up to 1 Mbit/s
- 1 I/O-connection: digital input and output
- RS232 serial data transfer, alternatively 2 digital inputs
- Available in aluminum casing with two 9-pin D-Sub connectors or one 10-pole screw terminal strip (Phoenix)
- Extended operating temperature range from -40 to 85 °C
- Scope of supply includes a development package for C and C++ with a library and programming examples
- Custom firmware can be uploaded via CAN using a PC CAN interface from PEAK-System
The non-profit CiA organization promotes CAN and CAN FD, develops CAN FD recommendations and CANopen specifications, and supports other CAN-based higher-layer protocols.

**Join the community**

to proof interoperability of your ISO CAN FD implementations and products.

**Members may attend:**

<table>
<thead>
<tr>
<th>CAN FD plug fests</th>
<th>DETROIT (USA)</th>
<th>NUREMBERG (GERMANY)</th>
</tr>
</thead>
<tbody>
<tr>
<td>April 6 and 7, 2016</td>
<td>Detroit (USA)</td>
<td>Nuremberg (Germany)</td>
</tr>
<tr>
<td>June 2 and 3, 2016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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