

CiA 303



Recommendation

Part 3: Indicator specification

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HISTORY

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2001-07-01	<i>Publication of version 1.0 as draft recommendation</i>
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2006-08-14	<i>Publication of version 1.3 as draft recommendation</i>
2012-04-27	<i>Publication of version 1.4 as public recommendation</i> <ul style="list-style-type: none">- <i>re-structured;</i>- <i>minor editorial changes</i>

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1 Scope

This recommendation describes the communication-related indicators. Additional application-related indicators are either described in the appropriate device profile or are manufacturer-specific.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

/CiA301/ CiA 301, CANopen application layer and communication profile

3 Terms and definitions

For the purpose of this document, the following terms and definitions and those given in /CiA301/ apply.

4 Symbols and abbreviated terms

For the purpose of this document, the following symbols and abbreviated terms and those given in /CiA301/ apply.

LED Light emitting diode

ERR Error

I/O Input/output

4.1 Pre-definitions

4.1.1 General

The definitions given in /CiA301/ apply to this document as well. The corresponding of the two following definitions shall apply, because a manufacturer is free to use one bicolor LED or two single LEDs.

4.1.2 Using two CANopen LEDs

In case of using two single CANopen LEDs, the following definitions shall apply:

- One LED shall be red and shall be labeled as ERR LED. This LED shall be called the error LED;
- The other LED shall be green and shall be called and labeled as RUN LED.

4.1.3 Using one bicolor CANopen LED

In case of using one bicolor CANopen LED the following definitions shall apply:

- The colors provided by the LED shall be red and green;
- The LED shall be labeled as STATUS LED

5 Indicators

5.1 General

It is either recommended to support two single CANopen LEDs or one bicolor LED. Additional LEDs for power indication, I/O functionality etc. may also exist.

5.2 Indicator states and flash rates

The defined indicator states are provided in Table 1. Figure 1 illustrates the indicator states and flash rates.

Table 1 – Indicator states

LED state	Description
LED on	The LED shall be constantly on.
LED off	The LED shall be constantly off.
LED flickering	That shall indicate the iso-phase on and off with a frequency of approximately 10 Hz: on for approximately 50 ms and off for approximately 50 ms.
LED blinking	That shall indicate the iso-phase on and off with a frequency of approximately 2,5 Hz: on for approximately 200 ms followed by off for approximately 200 ms.
LED single flash	That shall indicate one short flash (approximately 200 ms) followed by a long off phase (approximately 1000 ms).
LED double flash	That shall indicate a sequence of two short flashes (approximately 200 ms), separated by an off phase (approximately 200 ms). The sequence is finished by a long off phase (approximately 1000 ms).
LED triple flash	That shall indicate a sequence of three short flashes (approximately 200 ms), separated by an off phase (approximately 200 ms). The sequence is finished by a long off phase (approximately 1000 ms).
LED quadruple flash	That shall indicate a sequence of four short flashes (approximately 200 ms), separated by an off phase (approximately 200 ms). The sequence is finished by a long off phase (approximately 1000 ms).

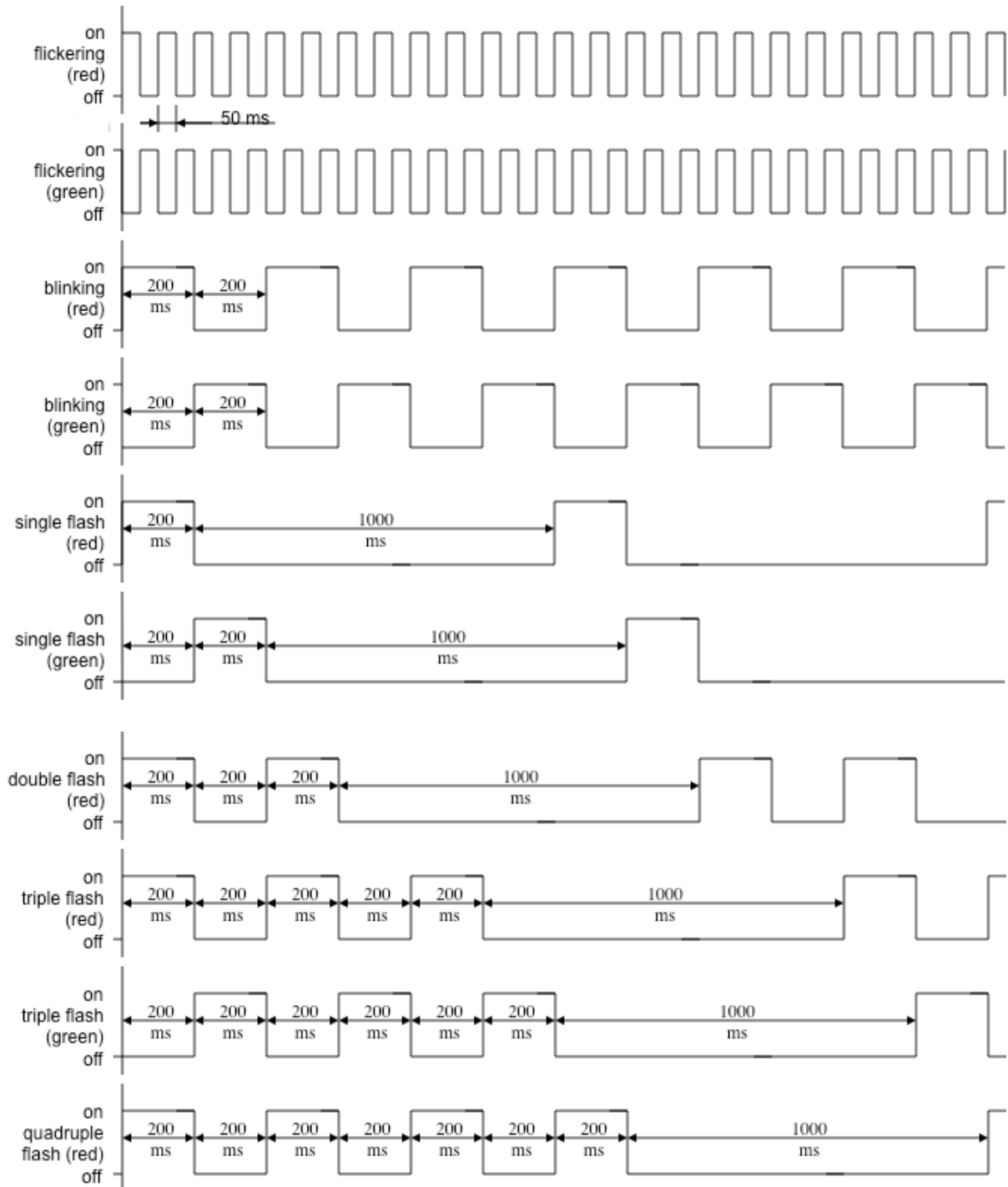


Figure 1 – Indicator states and flash rates

5.3 CANopen error LED

The CANopen error LED shall indicate the status of the CAN physical layer and errors due to missing CAN messages (sync, guard or heartbeat). Table 2 provides the CANopen error LED truth table.

Table 2 – CANopen error LED truth table

ERR LED	State	Description	Category
Off	No error	The device is in working condition	Mandatory
Flickering	AutoBitrate/ LSS	The auto-bitrate detection is in progress or LSS services are in progress (alternately flickering with run LED)(See NOTE.)	Optional
Blinking	Invalid Configuration	General configuration error	Optional
Single flash	Warning limit reached	At least one of the error counters of the CAN controller has reached or exceeded the warning level (too many error frames)	Mandatory
Double flash	Error control event	A guard event (NMT-slave or NMT-master) or a heartbeat event (heartbeat consumer) has occurred	Mandatory
Triple flash	Sync error	The sync message has not been received within the configured communication cycle period time out (see object dictionary entry 1006 _h)	Conditional; Mandatory if object 1006 _h is supported
Quadruple flash	Event-timer error	An expected PDO has not been received before the event-timer elapsed	Optional
On	Bus off	The CAN controller is bus off	Mandatory
NOTE An LSS master shall flicker its ERROR and RUN LED whilst executing LSS services.			

5.4 CANopen run LED

The CANopen run LED shall indicate the status of the CANopen network state machine. Whilst the device is executing a reset the CANopen run LED shall be off. Table 3 provides the CANopen Run LED truth table.

Table 3 – CANopen Run LED truth table

CAN Run LED	State	Description	Category
Flickering	AutoBitrate/LSS	The auto-bitrate detection is in progress or LSS services are in progress (alternately flickering with error LED)	Optional
Blinking	PRE-OPERATIONAL	The device is in state PRE-OPERATIONAL	Mandatory
Single flash	STOPPED	The device is in state STOPPED	Mandatory
Double flash		Reserved for further use	
Triple flash	Program/ Firmware download	A software download is running on the device	Optional
On	OPERATIONAL	The device is in state OPERATIONAL	Mandatory

5.5 CANopen status LED

If one bicolor status LED is used instead of two single color LEDs, this LED shall indicate both the physical bus status and the status of the CANopen state machine. In case, there is a conflict between turning the LED on green versus red, the LED may be turned on red. Apart from this situation, the bicolor status LED shall combine the behavior of the CAN error LED and those of the CAN run LED. Figure 2 and Figure 3 illustrate the examples for behavior of bicolor CANopen status LED:

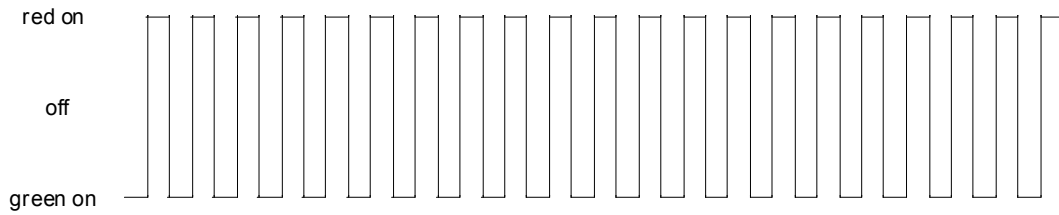


Figure 2 – Flickering green/red: Auto-bitrate/LSS

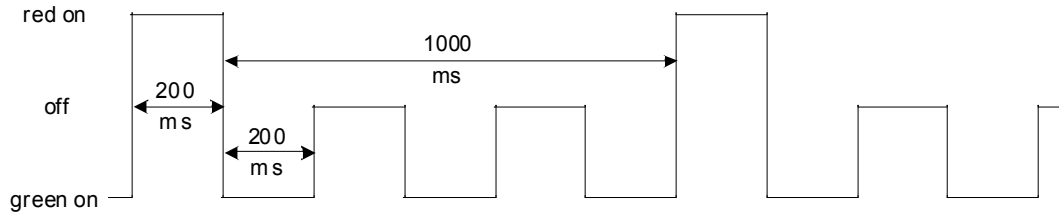


Figure 3 – Single flash red combined with blinking green: “CAN warning limit reached” during pre-operational state.