CiA® 414

Device profiles for weaving machines

Part 1: General definitions

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HISTORY

Date	Changes
2001-09-20	• *Publication of version 1.0* as draft standard proposal
2007-06-18	• *Publication of version 1.1.0* as draft standard (now publicly available) - Partly re-chaptered - Minor editorial changes NOTE: This document has been converted into “docx format”. The conversion caused minor layout differences to the predecessor document in “doc format”. The technical content word-by-word is the very same.

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CONTENTS

1 Scope

The device profile defines the CANopen interfaces for weaving machines. The specification comprises the following two parts:

Part 1 : General definitions
Part 2 : Feeders

Part 1 defines the operating principles for the feeder sub-systems, the error handling and the general communication parameters.

2 Normative references

/CiA301/ CiA 301 V4.1, CANopen application layer and communication profile

3 Abbreviations

CAN	Controller area network
COB	Communication object
COB-ID	COB-identifier
SDO	Service data object
PDO	Process data object
RPDO	Receive process data object

4 Operating principles

4.1 General

CANopen networks are not only used for embedded communication in weaving machines but also to integrate weaving machine sub-systems.
In weaving machines, CANopen networks are used to integrate feeder, Jacquard and other sub-systems to the loom controller. The sub-system communication interface is compliant to CANopen application layer and communication profile. The interface is specified in device profiles, which define the application objects as well as the default PDO communication and mapping parameter.

4.2 Feeder sub-systems

Regarding the feeder sub-systems there are several architectures supported by the device profile for feeders. Each feeder may be connected directly via CANopen network to the loom system or it is linked to a multi-feeder control unit. Optionally the multi-feeder control unit uses an additional embedded CANopen network to link the individual feeder devices. The device profile for feeders supports all these system architectures.
There are two main categories of feeders:

- Feeders for weaving machines with fluid insertion of the yarn (these machines can be air jet weaving machines or water jet weaving machines). They will be referred to as ‘pre-measuring feeders’.
- Feeders for weaving machines with mechanical insertion of the yarn (these machines can be: rapier weaving machines, projectile weaving machines, and others). They will be referred as ‘weft feeders’.

The main difference between these two categories is that on fluid jet machines the length of yarn to be inserted in the current insertion (also called ‘pick’) is determined by the feeder itself while on mechanical machines the length of the insertion is mechanically determined by the weaving machine.
On the pre-measuring feeders these means must be always present:

- A mechanical mean to release the yarn and to stop it. This mean is normally called ‘pin’.
- A sensor mean (typically a photocell) to detect the passage of each winding which leaves the feeder storage. By using this information feeder can command the pin in order to block the yarn passage and insert exactly the programmed number of windings.
- A mean to adjust the diameter of windings wound on the feeder spool body. By adjusting the diameter together with the number of windings for each pick it is possible to release the exact length of yarn that matches the height textile.
- A synchronized signal to indicate to the feeder, when open the pin in order to start the insertion. This signal must be synchronized with the starting of the main nozzle blow, which injects the air or the water together with the yarn.

On the weft feeders, instead, there must be means only to control and/or detect the right reserve storage on the spool body. These means can be of various types: photocell-based, piezoelectric based, mechanical feeler, etc. and they could vary a lot depending on feeders manufactures.
Typical accessories used on feeders (in general) are:

- means to adjust or vary the weft tension. These means which are commonly
- called ‘brakes’ can be mechanical only or electronically driven
- sensors to detect the absence of the yarn at the input side of the feeder

These sensors are useful for stop the machine before the weft reserve is fully emptied. It can be used also in conjunction with the automatic color selection (installed on the weaving machine) for reducing the loom stops in case of yarn breakage.

4.3 Jacquard sub-systems

To be defined

4.4 Dobby sub-systems

To be defined

4.5 Loom controller

To be defined

5 Error handling

5.1 Principle

Emergency Messages shall be triggered by internal errors in the device and they are assigned the highest possible priority to ensure that they get access to the bus without latency. By default, the Emergency Messages shall contain the error field with pre-defined error numbers and additional information.

5.2 Error behavior

If a severe device failure is detected the module shall enter by default autonomously the pre-operational state. If object 1029h is implemented, the device can be configured to enter alternatively the stopped state or remain in the current state in case of a device failure. Device failures shall include the following communication errors:

- Bus-off conditions of the CAN interface
- Life guarding event with the state ‘occurred’
- Heartbeat event with state ‘occurred’

Severe device errors also can be caused by device internal failures.

5.3 Additional error code meanings

Devices compliant to these profile specifications may use the following error codes:

Error Code	Meaning
FF10h	Feeder error

6 General communication parameters

6.1 Object 1000h: Device Type

The object at index 1000h describes the type of device and its functionality. For multiple device modules the Additional Information parameter shall contain FFFFh. In this case, the object 67FFh shall be implemented.

Additional Information		General Information
Specific functions	Device class	Device Profile Number

31 24 23 16 15 8 7 0
MSB LSB

General Information:

Device Profile Number: 414d

Device class:

Code	**Function**
00h	reserved
01h	Feeder
02h	Jacquard
03h	Dobby
04h	Loom controller
05h to FEh	reserved

Specific functions for feeder:

Code	**Function**
00h	reserved
01h	Single feeder
02h	Feeder control box
03h .. FEh	reserved

Specific functions for Jacquard:

Code	**Function**
00h	reserved
01h	To be defined
02h	To be defined
03h .. FEh	reserved

Specific functions for dobby:

Code	Function
00h	reserved
01h	To be defined
02h	To be defined
03h .. FEh	reserved

Specific functions for loom controller:

Code	Function
00h	reserved
01h	To be defined
02h	To be defined
03h .. FEh	reserved

6.2 Object 1001h: Error Register

The device-specific bit in the error register object is used to indicate a loom stop requirement. The following coding shall apply:
0 = no loom stop is required
1 = loom stop is required

6.3 Object 1029h: Error Behavior

This object specifies to which state the device shall be set, when a communication error or a device-internal error is detected.

0 = pre-operational (only if current state is operational)

1 = no state change

2 = stopped

Object Description

INDEX	1029h
Name	error_behavior
Object Code	Array
Data Type	Unsigned8
Category	Optional

Entry Description

Sub-Index	00h
Description	number_of_error_classes
Access	ro
Entry Category	Mandatory
PDO Mapping	No
Value Range	01h to 02h
Default Value	No

Sub-Index	01h
Description	communication_error
Access	rw
Entry Category	Mandatory
PDO Mapping	No
Value Range	00h to 02h
Default Value	00h

Sub-Index	02h
Description	internal_device_error
Access	rw
Entry Category	Mandatory
PDO Mapping	No
Value Range	00h to 02h
Default Value	00h

6.4 Object 67FF: Device Type

This objects shall describe the first virtual device in a multiple device module according to /CiA301/.

