

CiA[®] 420



Profiles for extruder downstream devices

Part 3: Corrugator

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HISTORY

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2002-10-22	<i>Publication of version 1.0</i> as draft standard proposal
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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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CAN in Automation e. V.
Kontumazgarten 3
DE - 90429 Nuremberg, Germany
Tel.: +49-911-928819-0
Fax: +49-911-928819-79
Url: www.can-cia.org
Email: headquarters@can-cia.org

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1 Scope

The CANopen application profile for extruder downstream devices include several parts:

- Part 1 specifies general definitions
- Part 2 specifies the device profile for the puller downstream device
- Part 3 specifies the device profile for the corrugator downstream device
- Part 4 specifies the device profile for the saw downstream device
- Part 5 specifies the device profile for the co-extruder device
- Part 6 specifies the device profile for the calibration-table downstream device

NOTE All parts of this specification have been developed jointly with the European Committee of Machinery Manufacturers for the Plastics and Rubber Industries (Euromap) and is documented there as Euromap 27.

This part specifies the CANopen interface for the corrugator downstream device.

2 References

/CiA420-1/: CiA 420, CANopen profile for extruder downstream devices — Part 1: General definitions

The references given in /CiA420-1/ apply to this specification as well.

3 Abbreviations and definitions

3.1 Abbreviations

The abbreviations given in /CiA420-1/ apply to this specification as well.

3.2 Definitions

The definitions given in /CiA420-1/ apply to this specification as well.

4 Operating principles

4.1 General

The corrugator downstream device interface shall support all mandatory functions of /CiA301/ and /CiA420-1/ as well as all mandatory functions defined in this specification.

5 PDO specification

5.1 Overview

Table 1 shows the process data mapped into TPDOs and RPDOs.

Table 1 – TPDO and RPDO mapping

PDO number	Index/sub-index	Name/description
TPDO 1	6030 00 _h	Status word
	6000 00 _h	Corrugator speed actual value
	6006 00 _h	Corrugator load actual value
	(See note)	Manufacturer-specific process data
TPDO 2	6004 00 _h	Corrugator speed set echo
	6008 00 _h	Product speed
RPDO 1	6020 00 _h	Control word
	6002 00 _h	Corrugator speed set value
	(See note)	Manufacturer-specific process data
NOTE The TPDO1 and RPDO1 are able to map one and only one manufacturer-specific process data.		

5.2 First TPDO

This TPDO shall be transmitted to the master-extruder. It contains by default the *status word*, the *corrugator speed actual value*, and the *corrugator load actual value*.

Table 2 specifies the object description of the PDO communication parameter and Table 3 specifies the associated entry description. The values are defined in /CiA301/. The sub-index 04_h is reserved for compatibility reasons and shall not be implemented.

Table 2 — Object description

Attribute	Value
Index	1800 _h
Name	TPDO 1 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 3 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h to 06 _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	COB-ID
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	4000 0180 _h + node-ID or C000 0180 _h + node-ID
Default value	4000 0180 _h + node-ID
Sub-index	02 _h
Description	Transmission type
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See /CiA301/
Default value	01 _h
Sub-index	03 _h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h

Attribute	Value
Sub-index	05 _h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h
Sub-index	06 _h
Description	Sync start value
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h

Table 4 specifies the object description of the PDO mapping parameter and Table 5 specifies the associated entry description. The values are defined in /CiA301/. The unused bytes in the data field shall only be used for a manufacturer-specific second status word.

Table 4 — Object description

Attribute	Value
Index	1A00 _h
Name	TPDO 1 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 5 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw (constant in NMT operational state)
PDO mapping	No
Value range	00 _h , 03 _h to 04 _h
Default value	Manufacturer-specific

Attribute	Value
Sub-index	01 _h
Description	1 st application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6030 00 10 _h
Default value	6030 00 10 _h
Sub-index	02 _h
Description	2 nd application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6000 00 10 _h
Default value	6000 00 10 _h
Sub-index	03 _h
Description	3 rd application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6006 00 10 _h
Default value	6006 00 10 _h
Sub-index	04 _h
Description	4 th application object
Entry category	Optional
Access	const
PDO mapping	No
Value range	See /CiA301/
Default value	Manufacturer-specific

5.3 Second TPDO

This TPDO shall be transmitted to the master-extruder. It contains by default the *corrugator speed set echo*, and the *product speed*.

Table 6 specifies the object description of the PDO communication parameter and Table 7 specifies the associated entry description. The values are defined in /CiA301/. The sub-index 04_h is reserved for compatibility reasons and shall not be implemented.

Table 6 — Object description

Attribute	Value
Index	1801 _h
Name	TPDO 2 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 7 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h to 06 _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	COB-ID
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	4000 0280 _h + node-ID
Default value	4000 0280 _h + node-ID
Sub-index	02 _h
Description	Transmission type
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	See /CiA301/
Default value	01 _h
Sub-index	03 _h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h

Attribute	Value
Sub-index	05 _h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h
Sub-index	06 _h
Description	Sync start value
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h

Table 8 specifies the object description of the PDO mapping parameter and Table 9 specifies the associated entry description. The values are defined in /CiA301/.

Table 8 — Object description

Attribute	Value
Index	1A01 _h
Name	TPDO 2 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 9 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h
Default value	02 _h
Sub-index	01 _h
Description	1 st application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6004 00 10 _h
Default value	6004 00 10 _h

Attribute	Value
Sub-index	02 _h
Description	2 nd application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6008 00 20 _h
Default value	6008 00 20 _h

5.4 First RPDO

This RPDO shall be received from the master-extruder. It contains by default the *control word*, and the *corrugator speed set value*.

Table 10 specifies the object description of the PDO communication parameter and Table 11 specifies the associated entry description. The values are defined in /CiA301/. The sub-index 04_h is reserved for compatibility reasons and shall not be implemented.

Table 10 — Object description

Attribute	Value
Index	1400 _h
Name	RPDO 1 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 11 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	02 _h to 05 _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	COB-ID
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	4000 0200 _h + node-ID or C000 0200 _h + node-ID
Default value	4000 0200 _h + node-ID

Attribute	Value
Sub-index	02 _h
Description	Transmission type
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	See /CiA301/
Default value	01 _h
Sub-index	03 _h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h
Sub-index	05 _h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000 _h

Table 12 specifies the object description of the PDO mapping parameter and Table 13 specifies the associated entry description. The values are defined in /CiA301/. The unused bytes in the data field shall only be used for a manufacturer-specific second control word.

Table 12 — Object description

Attribute	Value
Index	1600 _h
Name	RPDO 1 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 13 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	rw (constant in NMT operational state)
PDO mapping	No
Value range	00 _h , 02 _h to 03 _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	1 st application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6020 00 10 _h
Default value	6020 00 10 _h
Sub-index	02 _h
Description	2 nd application object
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6002 00 10 _h
Default value	6002 00 10 _h
Sub-index	03 _h
Description	3 rd application object
Entry category	Optional
Access	const
PDO mapping	No
Value range	See /CiA301/
Default value	Manufacturer-specific

6 Application object specification

6.1 Object 6000_h: Corrugator speed actual value

This object shall provide the actual speed value of the corrugator. The value shall be given in 0,01% of the maximum speed. Negative value shall be given if the direction is reversed.

Table 14 specifies the object description and Table 15 specifies the entry description.

Table 14 — Object description

Attribute	Value
Index	6000 _h
Name	Corrugator speed actual value
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 15 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	Default
Value range	-10000 _d to +10000 _d
Default value	No

6.2 Object 6001_h: Corrugator speed real maximum

This object shall provide the maximum speed value of the corrugator based on the real maximum corrugator speed at 100% set value. The value shall be given in 1 mm/min.

Table 16 specifies the object description and Table 17 specifies the entry description.

Table 16 — Object description

Attribute	Value
Index	6001 _h
Name	Corrugator speed real maximum
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 17 — Entry description

Attribute	Value
Sub-index	00 _h
Access	const
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific

6.3 Object 6002_h: Corrugator speed set value

This object shall indicate the speed set value send by the master-extruder. The value shall be given in 0,01% of the maximum speed. Negative value shall be given if the direction is reversed.

Table 18 specifies the object description and Table 19 specifies the entry description.

Table 18 — Object description

Attribute	Value
Index	6002 _h
Name	Corrugator speed set value
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 19 — Entry description

Attribute	Value
Sub-index	00 _h
Access	rw
PDO mapping	Default
Value range	-10000 _d to +10000 _d
Default value	0 _d

6.4 Object 6003_h: Corrugator speed set maximum

This object shall indicate the maximum speed set value of the corrugator device. The value shall be given in 1 mm/min.

Table 20 specifies the object description and Table 21 specifies the entry description.

Table 20 — Object description

Attribute	Value
Index	6003 _h
Name	Corrugator speed set maximum
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 21 — Entry description

Attribute	Value
Sub-index	00 _h
Access	rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Value as given in object 6001 _h

6.5 Object 6004_h: Corrugator speed set echo

This object shall provide the corrugator speed set value after recovering from bus-off state. The value shall be given in 0,01% of the maximum speed. Negative value shall be given if the direction is reversed. Scaling is given in object 6003_h.

Table 22 specifies the object description and Table 23 specifies the entry description.

Table 22 — Object description

Attribute	Value
Index	6004 _h
Name	Corrugator speed set echo
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 23 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	Default
Value range	-10000 _d to +10000 _d
Default value	No

6.6 Object 6005_h: Corrugator speed step

This object shall indicate the size of the first speed change at using increase or decrease key requested by the master-extruder. The value shall be given in 0,01% of the maximum speed. The scaling is given in object 6003_h.

Table 24 specifies the object description and Table 25 specifies the entry description.

Table 24 — Object description

Attribute	Value
Index	6005 _h
Name	Corrugator speed step
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 25 — Entry description

Attribute	Value
Sub-index	00 _h
Access	rw
PDO mapping	Optional
Value range	0 _d to 10000 _d
Default value	0 _d

6.7 Object 6006_h: Corrugator load actual value

This object shall provide the actual value of the corrugator load. The value shall be given in 0,01% of the maximum load. Negative value shall be given if the load is negative.

Table 26 specifies the object description and Table 26 specifies the entry description.

Table 26 — Object description

Attribute	Value
Index	6006 _h
Name	Corrugator load actual value
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 27 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	Default
Value range	INTEGER16
Default value	No

6.8 Object 6007_h: Scaling factor

This object shall indicate the default factor between counted pulses and length. The value shall be given in pulse/m.

NOTE Pulse/mm does not allow the necessary scaling resolution that is required for calibration.

Table 28 specifies the object description and Table 29 specifies the entry description.

Table 28 — Object description

Attribute	Value
Index	6007 _h
Name	Scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 29 — Entry description

Attribute	Value
Sub-index	00 _h
Access	rw
PDO mapping	Optional
Value range	UNSIGNED32
Default value	Manufacturer-specific

6.9 Object 6008_h: Product speed

This object shall provide the actual value calculated from measuring wheel or motor encoder pulses and time. The accuracy of this value shall be better than 0,3%. The value shall be given in 0,1 mm/min. Negative values shall be given if the direction is reversed.

Table 30 specifies the object description and Table 31 specifies the entry description.

Table 30 — Object description

Attribute	Value
Index	6008 _h
Name	Product speed
Object code	VAR
Data type	INTEGER32
Category	Mandatory

Table 31 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	Default
Value range	INTEGER32
Default value	No

6.10 Object 6009_h: Height adjustments

This object shall indicate an array for height adjustment values configured by the extruder (e.g. the distance from the center-line to the bottom of the product). The values shall be given in 0,1 mm. Positive values shall be given if the distance is above the centerline, and negative values shall be given if the distance is below the centerline.

Table 32 specifies the object description and Table 33 specifies the entry description.

Table 32 — Object description

Attribute	Value
Index	6009 _h
Name	Height adjustments
Object code	ARRAY
Data type	INTEGER16
Category	Optional

Table 33 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 0A _h
Default value	Manufacturer-specific

Attribute	Value
Sub-index	01 _h
Description	Height adjustment 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	INTEGER16
Default value	0000 _h
Sub-index	02 _h
Description	Height adjustment 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER16
Default value	0000 _h
to	
Sub-index	0A _h
Description	Height adjustment 10
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	INTEGER16
Default value	0000 _h

6.11 Object 600A_h: Pressure set values

This object shall indicate the pressure set values configured by the master-extruder (e.g. for upper caterpillar). The value shall be given in 0,01% of the maximum pressure.

Table 34 specifies the object description and Table 35 specifies the entry description.

Table 34 — Object description

Attribute	Value
Index	600A _h
Name	Pressure set values
Object code	ARRAY
Data type	UNSIGNED16
Category	Optional

Table 35 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 0A _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	Pressure set value 1
Entry category	Mandatory
Access	rw
PDO mapping	Optional
Value range	0 _d to 10,000 _d
Default value	0 _d
Sub-index	02 _h
Description	Pressure set value 2
Entry category	Optional
Access	rw
PDO mapping	Optional
Value range	0 _d to 10,000 _d
Default value	0 _d
to	
Sub-index	0A _h
Description	Pressure set value 10
Entry Category	Optional
Access	rw
PDO mapping	Optional
Value range	0 _d to 10,000 _d
Default value	0 _d

6.12 Object 600B_h: Actual temperatures

This object shall provide the actual temperatures at the corrugator. The value shall be given in 0,1°C. Negative values shall indicate temperatures below 0°C.

Table 36 specifies the object description and Table 37 specifies the entry description.

Table 36 — Object description

Attribute	Value
Index	600B _h
Name	Actual temperature array
Object code	ARRAY
Data type	INTEGER16
Category	Optional

Table 37 — Entry description

Attribute	Value
Sub-index	00 _h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	01 _h to 0A _h
Default value	Manufacturer-specific
Sub-index	01 _h
Description	Actual temperature 1
Entry category	Mandatory
Access	ro
PDO mapping	Optional
Value range	-2732 _d to +32767 _d
Default value	No
Sub-index	02 _h
Description	Actual temperature 2
Entry category	Optional
Access	ro
PDO mapping	Optional
Value range	-2732 _d to +32767 _d
Default value	No
to	
Sub-index	0A _h
Description	Actual temperature 10
Entry Category	Optional
Access	ro
PDO mapping	Optional
Value range	-2732 _d to +32767 _d
Default value	No

6.13 Object 6010_h: Configuration word

This object shall provide the configured functionality.

Figure 1 specifies the object structure and Table 38 defines the values.



Table 38 — Value definition

Signal	Value	Definition
s (speed measuring)	0 _b 1 _b	Speed measuring not available Speed measuring available
ha (height adjustment)	0 _b 1 _b	Height adjustment not available Height adjustment available
ps (pressure set values)	0 _b 1 _b	Pressure set values not available Pressure set values available
ta (actual temperatures)	0 _b 1 _b	Temperature measuring system not available Temperature measuring system available
f1, f2, f3 (auxiliary function)	0 _b 1 _b	Auxiliary function not available Auxiliary function available
r (reserved)	Reserved; always 0	

Table 39 specifies the object description and Table 40 specifies the entry description.

Table 39 — Object description

Attribute	Value
Index	6010 _h
Name	Configuration word
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 40 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	No
Value range	See Table 38
Default value	No

6.14 Object 6020_h: Control word

This object shall indicate the commands transmitted by the master-extruder. The master-extruder shall set the bits to 1_b if the corresponding button is pressed but not shorter than 100 ms.

Figure 2 specifies the object structure and Table 41 defines the values.

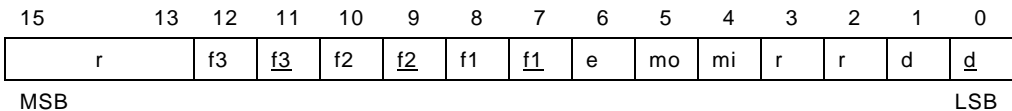


Figure 2 — Object structure

Table 41 — Value definition

Signal	Value	Definition
<u>d</u> (drive stop)	0 _b 1 _b	No command (default value) Stop drive (start prevention)
d (drive start)	0 _b 1 _b	No command (default value) Start drive
mi (move in)	0 _b 1 _b	No movement (default value) Corrugator shall move in
mo (move out)	0 _b 1 _b	No movement (default value) Corrugator shall move out
e (extruder run)	0 _b 1 _b	Extruder stopped (default value) Extruder is running
<u>f1</u> , <u>f2</u> , <u>f3</u> (function stop)	0 _b 1 _b	No command (default value) Stop function (start prevention)
f1, f2, f3 (function start)	0 _b 1 _b	No command (default value) Start function
r (reserved)	Reserved; always 0	

Table 42 specifies the object description and Table 43 specifies the entry description.

Table 42 — Object description

Attribute	Value
Index	6020 _h
Name	Control word
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 43 — Entry description

Attribute	Value
Sub-index	00 _h
Access	rw
PDO mapping	Default
Value range	See Table 41
Default value	See Table 41

6.15 Object 6030_h: Status word

This object shall provide the status transmitted to the master-extruder. The corrugator downstream device shall set the bits to 1_b if the corresponding button is pressed but not shorter than 100 ms.

Figure 3 specifies the object structure and Table 44 defines the values.

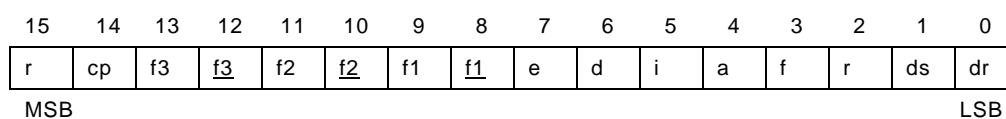
**Figure 3 — Object structure**

Table 44 — Value definition

Signal	Value	Definition
dr (drive run)	0 _b 1 _b	Drive is not running (drive controller disabled) (See Note 1) Drive is running (drive controller enabled) (See Note 2)
ds (drive ready to start)	0 _b 1 _b	Drive is not ready to start Drive is ready to start
f (fault downstream equipment)	0 _b 1 _b	No fault Fault (corrugator switched-off and start prevention of corrugator)
a (alarm downstream equipment)	0 _b 1 _b	No alarm Alarm (corrugator not switched-off, corrugator start still permitted)
i (increase set value)	0 _b 1 _b	No request Increase speed request (Example: Is the signal shorter than 1 s only one step takes place. A longer signal activates one step and after the first second the selected ramp is used to increase the speed)
d (decrease set value)	0 _b 1 _b	No request Decrease speed request (Example: Is the signal shorter than 1 s only one step takes place. A longer signal activates one step and after the first second the selected ramp is used to decrease the speed)
e (enable master-extruder)	0 _b 1 _b	Master-extruder shall stop and shall not start Master-extruder is enabled to run
f1, f2, f3 (function run)	0 _b 1 _b	Function is not running Function is running
f1, f2, f3 (function ready to start)	0 _b 1 _b	Function is blocked Function is ready to start
cp (start cut pulse)	0 _b 1 _b	No request Start cut pulse
r (reserved)	Reserved; always 0	
NOTE 1	Independent of the actual speed.	
NOTE 2	Independent of the speed settings.	

Table 45 specifies the object description and Table 46 specifies the entry description.

Table 45 — Object description

Attribute	Value
Index	6030 _h
Name	Status word
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 46 — Entry description

Attribute	Value
Sub-index	00 _h
Access	ro
PDO mapping	Default
Value range	See Table 44
Default value	No