CiA 412

Profiles for medical devices

Part 6: Dose measurement system

Version: 1.1.0

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HISTORY

Date	Changes
2005-09-30	*Publication of Version 1.0* as draft standard proposal
2008-09-01	*Publication of Version 1.1 as draft standard*
	- Editorial changes
	- Usage of device profile specific bit in object 1001_h corrected

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CONTENTS

1 Scope

This specification defines the CANopen device profile for dose measurement systems.

A prerequisite for the conformity to this CANopen device profile is conformity with the CANopen communication profile. Additionally, in the case that the module is programmable conformance to the framework for programmable CANopen devices is required. It is recommended to consulted these specifications in parallel to this device profile specification.

2 References

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

/CiA303-2/ CiA 303, CANopen additional specifications – Part 2: Representation of SI unit and prefix

/CiA404/ CiA 404, CANopen profile for measuring devices and closed-loop controllers

/CiA412-1/ CiA 412, CANopen profiles for medical devices – Part 1: General definitions

3 Abbreviations and definitions

3.1 Abbreviations

DAP Dose area product

DAPR Dose area product rate

DMS Dose measurement system

FSA Finite state automata

FV Field value

FP Focal point

IT Irradiation time

MC Metering chamber

MD Measured distance

PV Process value

PP Patient plane

RD Reference distance

The abbreviations given in /CiA412-1/ apply for this document as well.

3.2 Definitions

The definitions given in /CiA412-1/ apply for this document as well.

4 Physical layer specification

The definitions given in /CiA301/ and /CiA412-1/ apply for this document as well.

5 General information

5.1 Introduction

The CANopen dose measurement system measures the x-ray dose and dose area product. In addition to that, the following values are measured:

- dose area product rate
- dose rate
- RD entrance/skin dose
- RD entrance/skin dose rate
- MD entrance/skin dose
- MD entrance/skin dose rate
- irradiation time
- chamber temperature
- air pressure

5.2 Conversion field value to process value

Examples for *field values* are:

- actual measured values given in pC or pA by dose measurement

These field values are converted to the real physical dimension of the measured quantity and the result is called “process value”. Examples for *process values* are:

- value in μGym^2 for DAP measurement
- value in °C for chamber temperature measurement
- value in mGy for dose measurement

The conversion from field value to process value is described as a linear transformation as shown in Figure 1. This is defined by two pairs of field values and corresponding process values (Input Scaling 1 FV / Input Scaling 1 PV and Input Scaling 2 FV / Input Scaling 2 PV) called calibration point 1 and 2.

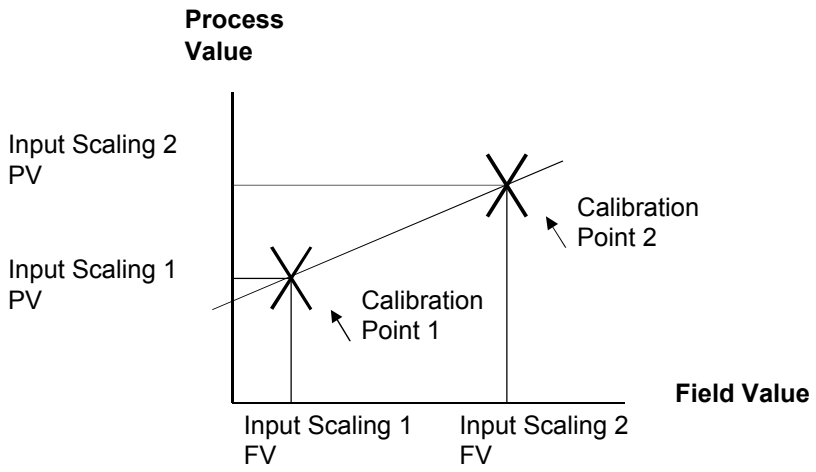

Figure 1 – Scaling

As illustrated in Figure 2, the calibration characteristic is shifted by an additional “*input offset*” value.

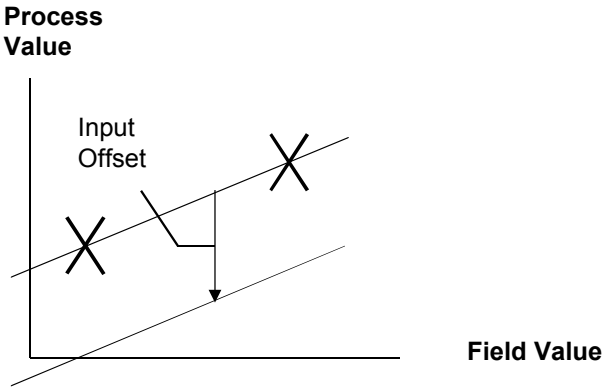

Figure 2 – Offset

Activating *autozero* will set the zero offset value so that the instantaneous measured process value becomes zero.

5.3 Object coherences

Figure 3 illustrates the coherences between the objects corresponding to a certain measured value. “X” represents a certain measured value (e.g. DAP, dose rate, etc.). “n” represents the digit of the object range of the corresponding measured value (e.g. n=1 for the objects corresponding to DAP measurement).

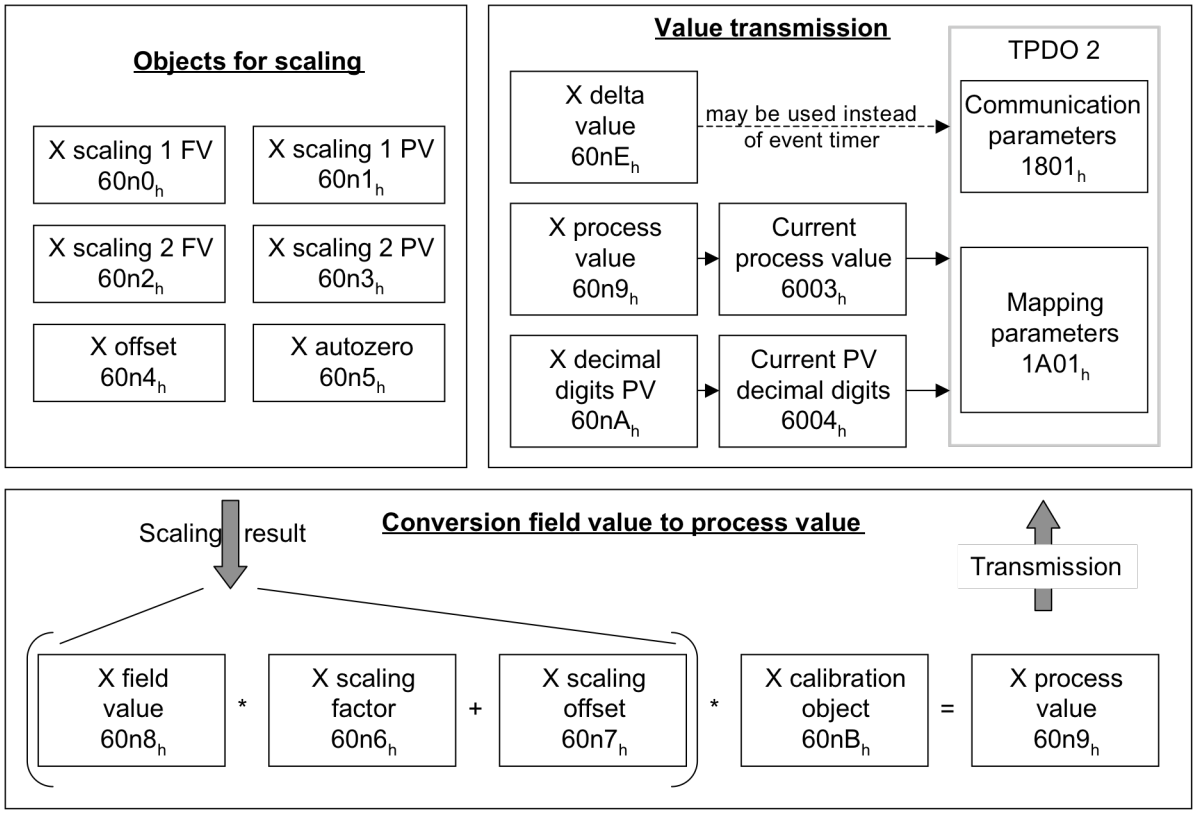

Figure 3 – Object coherences

5.4 Distance description for entrance/skin dose and -dose rate measuring

The entrance/skin dose is the dose at the patient plane. It can be calculated by the DMS from the dose at the metering chamber, using the distances from focal point to metering chamber and patient plane and or from the DAP at the metering chamber, using the irradiated area at the chamber plane also. If the RD entrance/skin dose/dose rate is measured, the distance between *focal point* and *patient plane/reference plane* is received form the CANopen network. For MD entrance/skin dose/dose rate measuring, the DMS measures the distance between *metering chamber* and *patient plane/reference plane*. The distance between *focal point* and *patient plane/reference plane* is therefore not received from the CANopen network, but calculated by the DMS. Figure 4 illustrates the schematic structure of an X-ray system and the described distances.

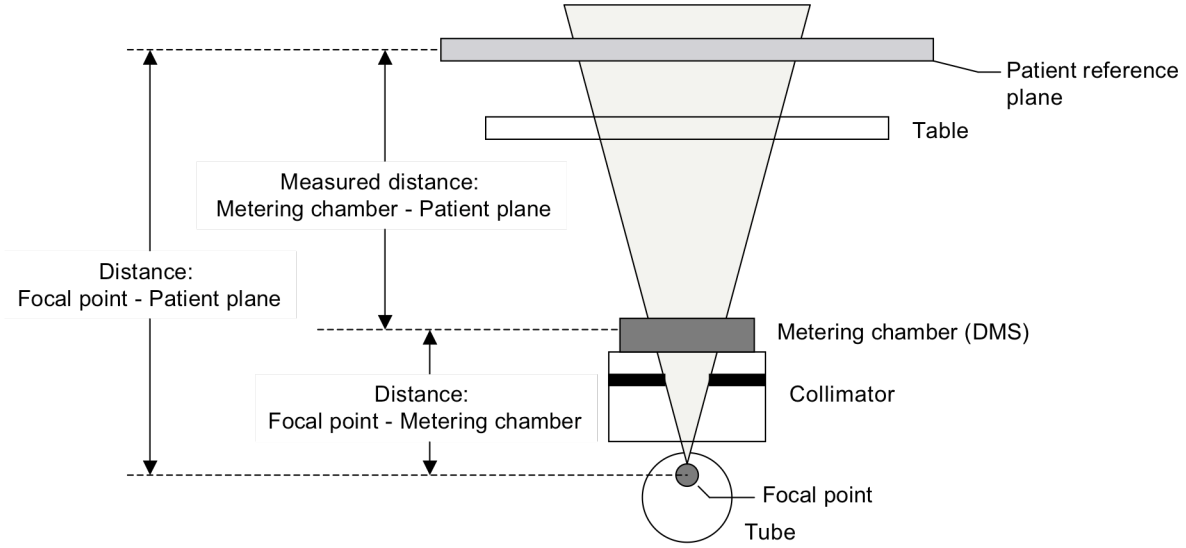

Figure 4 – Schematic structure of an X-ray system

6 Error handling

6.1 Emergency object usage

General definitions are given in /CiA301/. The emergency message data structure (8 byte) for dose measurement systems shall be as defined in Figure 5:

Byte 0 to Byte 1	Byte 2	Byte 3 to Byte 7
Error code	**Error register**	**Manufacturer-specific**
See /CiA301/ and table in chapter 6.2.	See object 1001_h in /CiA301/.	-

Figure 5 – Emergency object

6.2 Error code definition

In addition to the error codes defined in /CiA301/ the additional error codes given in Table 1 shall be used if appropriate.

Table 1 – Additional error codes

Error code	Meaning
$F010_h$	Internal dose measurement system error
$F020_h$	Power-on self-test (POST) error

7 Finite state automata

7.1 Introduction

An FSA is an abstraction to describe the behaviour of a black box as external devices experience it. The dose measurement system FSA defines the application behaviour of the dose measurement system device.

7.2 Dose measurement system FSA

7.2.1 State of the dose measurement system FSA

The dose measurement system FSA as shown in Figure 6 shall provide the following states with the described behaviour:

- START: This shall be a state, indicating the start when the FSA is activated during the start-up sequence of the dose measurement system's application software.

- IDLE: The communication between the DMS and the CANopen network shall be established. In addition to that, the DMS shall be configured with the parameters, which are required for the measurement.

- TEST: In this state the DMS shall perform an internal test to check that the measurement accuracy is within the limits. The final result of this test is evaluated by the DMS internally, by that taking into account e.g. required warm-up phases, before setting the corresponding bit in the statusword. If implemented, the test result in percent shall be stored in the test value object.

- MEASURE: In this state, the DMS shall support the following functions:
  - Measuring by using the parameters configured in the ERROR/CONFIG state
  - Transmission of the measured values together with the resolution of the measured values.

- ERROR/CONFIG: This state may be entered from each state of the FSA. It shall be entered automatically, when the DMS detects a non-recoverable error. Furthermore this state shall be entered for (re-) configuration purposes of the DMS.

- FINAL: This shall be a pseudo state indicating the end, when the FSA is destroyed due to the DMS being powered off, etc.

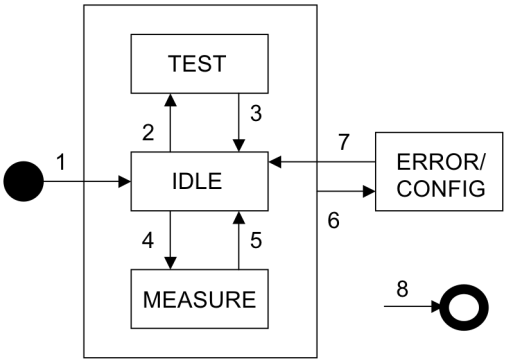

Figure 6 – Finite state automata

7.2.2 Events of the dose measurement system FSA

The DMS FSA shall support the following events:

- Power-on or hardware reset
- Completion of the processing in some states (volatile state)
- Command word received via CANopen
- Detection of a non-recoverable error
- Application reset received by the NMT message
- Device internal events (e.g. local control)

7.2.3 Transitions of the dose measurement system FSA

The DMS shall support the transitions, which are defined in Table 2.

Table 2 – Events and actions

Transition	Event(s)	Action(s)
1	Due to the start-up sequence of the embedded software of the DMS device, e.g. after power-on or hardware reset	-
2	Command enter TEST state	Perform self-test
3	Automatically if test was finished	-
4	Command enter MEASURE state	Perform commanded measurements
5	Command enter IDLE state	Application reset
6	Command enter ERROR/CONFIG state or due to internal events.	Send EMCY message; DMS may be (re-) configured;
7	Command enter IDLE state	Application reset
8	Power off or hardware reset	-

8 Predefinitions

8.1 General

For general definitions see /CiA301/ and /CiA404/.

8.2 Pre-defined communication objects

The pre-defined objects in /CiA301/ apply for this part of the specification as well.

8.2.1 Object 1001_h: Error register

In case the device profile specific *Bit 5* is set to 1, the *DMS error register* object 6002_h contains additional error information.

8.2.2 RPDO 1

The first RPDO shall be received asynchronously. The mapped objects shall be updated immediately after successful RPDO reception.

8.2.2.1 Object 1400_h: RPDO1 communication parameter

This object shall indicate the communication parameters for the first RPDO. The value definition is given in /CiA301/. Object description and entry description are provided in Table 3 and Table 4.

Table 3 – Object description

Attribute	Value
INDEX	1400_h
Name	RPDO1 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 4 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	05_h
Default value	05_h
Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	4000 0200_h + node-ID
Default value	4000 0200_h + node-ID
Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	FF_h
Sub-index	05_h
Description	Event timer
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	00_h

8.2.2.2 Object 1600_h: RPDO1 mapping parameter

This object shall indicate the mapping parameters for the first RPDO. The value definition is given in /CiA301/. Object description and entry description are provided in Table 5 and Table 6.

Table 5 – Object description

Attribute	Value
INDEX	1600_h
Name	RPDO1 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 6 – 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
Default value	01_h
Sub-index	01_h
Description	Controlword
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6000 00 18_h
Default value	6000 00 18_h

8.2.3 TPDO 1

The first TPDO shall be sent asynchronously. The TPDO shall be transmitted, if a change in the status word occurs.

8.2.3.1 Object 1800_h: TPDO1 Communication parameter

This object shall indicate the communication parameters for the first TPDO. The value definition is given in /CiA301/. Table 7 and Table 8 provide the object description and the entry description.

Table 7 – Object description

Attribute	Value
INDEX	1800_h
Name	TPDO1 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 8 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	05_h
Default value	05_h
Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	ro
PDO mapping	No
Value range	4000 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	No
Value range	See /CiA301/
Default value	FF_h
Sub-index	03_h
Description	Inhibit time
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h
Sub-index	05_h
Description	Event timer
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	00_h

8.2.3.2 Object $1A00_h$: TPDO1 mapping parameter

This object shall indicate the mapping parameters for the first TPDO. The value definition is given in /CiA301/. Object description and entry description are provided in Table 9 and Table 10.

Table 9 – Object description

Attribute	Value
INDEX	$1A00_h$
Name	TPDO1 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 10 – 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
Default value	01_h
Sub-index	01_h
Description	Statusword
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6000 00 20_h
Default value	6000 00 20_h

8.2.4 TPDO 2

The second TPDO shall be sent asynchronously. The transmission of the second TPDO shall be triggered either by the use of the event timer or the delta value corresponding to the mapped process value (part of object 6003_h).

8.2.4.1 Object 1801_h: TPDO 2 Communication parameter

This object shall indicate the communication parameters for the second TPDO. The value definition is given in /CiA301/. Table 11 and Table 12 provide the object description and the entry description.

Table 11 – Object description

Attribute	Value
INDEX	1801_h
Name	TPDO2 communication parameter
Object code	RECORD
Data type	PDO communication parameter record
Category	Mandatory

Table 12 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	05_h
Default value	05_h
Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	ro
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	No
Value range	See /CiA301/
Default value	FF_h
Sub-index	03_h
Description	Inhibit time
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h

Sub-index	05_h
Description	Event timer
Entry category	Mandatory
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	00_h

8.2.4.2 Object $1A01_h$: TPDO2 mapping parameter

This object shall indicate the mapping parameters for the second TPDO. The value definition is given in /CiA301/. Object description and entry description are provided in Table 13 and Table 14.

Table 13 – Object description

Attribute	Value
INDEX	$1A01_h$
Name	TPDO2 mapping parameter
Object code	RECORD
Data type	PDO mapping parameter record
Category	Mandatory

Table 14 – 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	Current process value
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6003 00 28_h
Default value	6003 00 28_h
Sub-index	02_h
Description	Current pv decimal digits
Entry category	Mandatory
Access	const
PDO mapping	No
Value range	6004 00 08_h
Default value	6004 00 08_h

9 Detailed object definitions

The following values shall be defined for the DMS device compliant to this profile specification.

9.1 General object

9.1.1 Object 6000_h: Controlword

This object shall indicate the received command to control the DMS state machine. The object structure is illustrated in Figure 7 and Figure 8. Table 15 specifies the value definition. Table 16 and Table 17 provide the object description and the entry description.

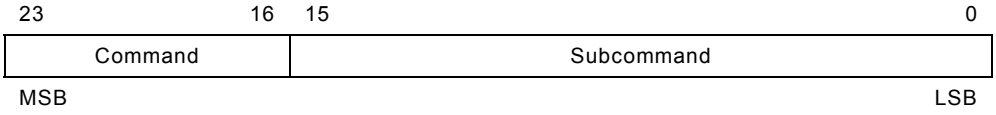

Figure 7 – Object structure of controlword

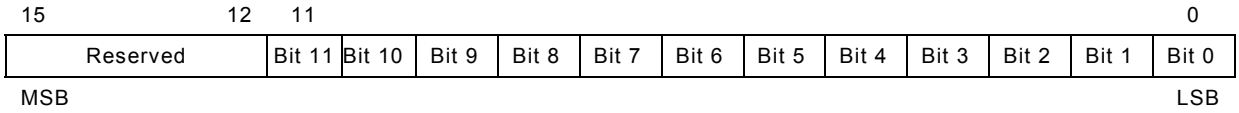

Figure 8 – Structure of Subcommand

Table 15 – Value definition

Command value [hex]	Description	Bit	Value	Subcommand
00	No operation			
01	Enter IDLE state	Bit 0	0	do not reset all measured values
			1	reset all measured values
		Bit 1	0	do not reset all configured values
			1	reset all configured values
		All other values shall be reserved (always 0)		
02	Enter TEST state	Bits of Subcommand shall be reserved (always 0)		
03	Enter MEASURE state	Bit 0	0	stop/do not start DAP measuring
			1	start DAP measuring
		Bit 1	0	stop/do not start DAPR measuring
			1	start DAPR measuring
		Bit 2	0	stop/do not start dose measuring
			1	start dose measuring
		Bit 3	0	stop/do not start dose rate measuring
			1	start dose rate measuring
		Bit 4	0	stop/do not start RD entrance/skin dose measuring
			1	start RD entrance/skin dose measuring
		Bit 5	0	stop/do not start RD entrance/skin dose rate measuring
			1	start RD entrance/skin dose rate measuring
		Bit 6	0	stop/do not start irradiation time measuring
			1	start irradiation time measuring

Command value [hex]	Description	Bit	Value	Subcommand
		Bit 7	0	stop/do not start chamber temperature measuring
			1	start chamber temperature measuring
		Bit 8	0	stop/do not start air pressure measuring
			1	start air pressure measuring
		Bit 9	0	stop/do not start MD entrance/skin dose measuring
			1	start MD entrance/skin dose measuring
		Bit 10	0	stop/do not start MD entrance/skin dose rate measuring
			1	start MD entrance/skin dose rate measuring
		Bit 11	0	do not transmit TPDO2 immediately
			1	transmit TPDO2 immediately for one time
		All other values shall be reserved (always 0)		
04	Enter ERROR/CONFIG state	Bits of Subcommand shall be reserved (always 0)		
FF	Shut down	Bits of Subcommand shall be reserved (always 0)		
05 to FE	reserved (always 0)			

Table 16 – Object description

Attribute	Value
INDEX	6000_h
Name	Controlword
Object code	VAR
Data type	UNSIGNED24
Category	Mandatory

Table 17 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Default
Value range	*See value definition*
Default value	$00\ 0000_h$

9.1.2 Object 6001_h: Statusword

This object shall provide information on the actual DMS FSA status and currently status information on running tests and measurements. Furthermore this object shall provide information if the last test was performed successfully. The object structure is illustrated in Figure 9, Figure 10 and Figure 11. Table 18 and Table 19 specify the value definition. Table 20 and Table 21 provide the object description and the entry description.

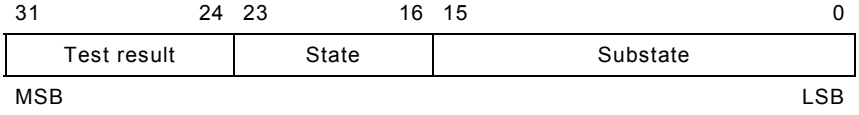

Figure 9 – Object structure of statusword

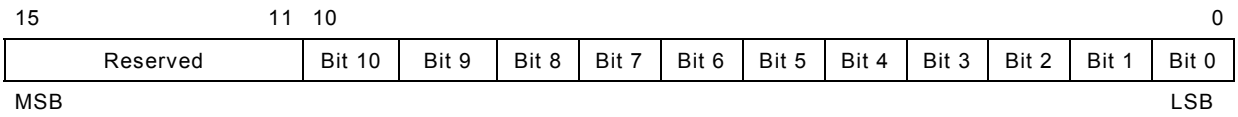

Figure 10 – Object structure of substate field

Table 18 – Value definition for state and substate field

State value [hex]	Description	Bit	Value	Substate
00	Power on			
01	IDLE state	Bit 0	0	measured values are not reset
			1	all measured values are reset
		Bit 1	0	configured values are not reset
			1	all configured values are reset
		All other values shall be reserved (always 0)		
02	TEST state	Bit 0	0	no test is running
			1	test is running
		All other values shall be reserved (always 0)		
03	MEASURE state	Bit 0	0	DAP measuring not activated
			1	DAP measuring activated
		Bit 1	0	DAPR measuring not activated
			1	DAPR measuring activated
		Bit 2	0	dose measuring not activated
			1	dose measuring activated
		Bit 3	0	dose rate measuring not activated
			1	dose rate measuring activated
		Bit 4	0	RD entrance/skin dose measuring not activated
			1	RD entrance/skin dose measuring activated
		Bit 5	0	RD entrance/skin dose rate measuring not activated
			1	RD entrance/skin dose rate measuring activated
		Bit 6	0	irradiation time measuring not activated
			1	irradiation time measuring activated
		Bit 7	0	chamber temperature measuring not activated
			1	chamber temperature measuring activated
		Bit 8	0	air pressure measuring not activated
			1	air pressure measuring activated
		Bit 9	0	MD entrance/skin dose measuring not activated
			1	MD entrance/skin dose measuring activated
		Bit 10	0	MD entrance/skin dose rate measuring not activated
			1	MD entrance/skin dose rate measuring activated
		All other values shall be reserved (always 0)		
04	ERROR/CONFIG state	Bits of Substate shall be reserved (always 0)		
FF	Shut down	Bits of Substate shall be reserved (always 0)		
05 to FE	reserved (always 0)			

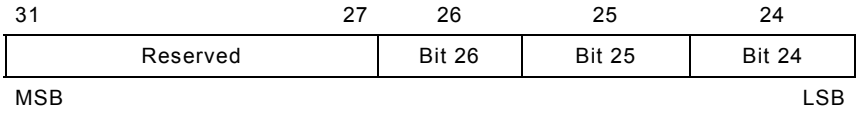

Figure 11 – Object structure of test result field

Table 19 – Value definition for test result field

Bit field	Value	Description
Bit 24	0	last test was successful
	1	last test was not successful
Bit 25	0	as yet no test performed since power up
	1	at least one test performed since power up
Bit 26	0	test reasonable (DMS warmed up)
	1	test unreasonable (DMS not warmed up yet)
Reserved	All other values shall be reserved (always 0)	

Table 20 – Object description

Attribute	Value
INDEX	6001_h
Name	Statusword
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 21 – Entry description

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

9.1.3 6002_h: DMS error register

This object shall provide an error status register for a dose measurement system. Each bit shall indicate, whether the corresponding measured value shall be valid or invalid. Bit 15 provides the information, whether at least one *process value* is below zero.

The object structure is illustrated in Figure 12. Table 22 specifies the value definition. Table 23 and Table 24 provide the object description and the entry description.

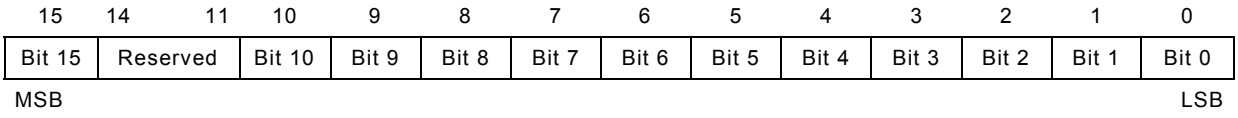

Figure 12 – Object structure DMS error register

Table 22 – Value definition for DMS error register

Bit field	Value	Description
Bit 0	0	DAP invalid
	1	DAP valid
Bit 1	0	DAPR invalid
	1	DAPR valid
Bit 2	0	Dose invalid
	1	Dose valid
Bit 3	0	Dose rate invalid
	1	Dose rate valid
Bit 4	0	RD entrance/skin dose invalid
	1	RD entrance/skin dose valid
Bit 5	0	RD entrance/skin dose rate invalid
	1	RD entrance/skin dose rate valid
Bit 6	0	Irradiation time invalid
	1	Irradiation time valid
Bit 7	0	Chamber temperature invalid
	1	Chamber temperature valid
Bit 8	0	Air pressure invalid
	1	Air pressure valid
Bit 9	0	MD entrance/skin dose invalid
	1	MD entrance/skin dose valid
Bit 10	0	MD entrance/skin dose rate invalid
	1	MD entrance/skin dose rate valid
Bit 15	0	At least one negative process value occurred
	1	No negative process value occurred
Reserved	All other values shall be reserved (always 0)	

Table 23 – Object description

Attribute	Value
INDEX	6002_h
Name	DMS error register
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 24 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	Optional
Value range	*See value definition*
Default value	No

9.1.4 6003_h: Current process value

This object shall be divided in two parts, the *indicator* and the *process value*. The *process value* shall provide the measured value to be transmitted via TPDO. This value shall be given in the SI unit corresponding to the mapped process value. The *indicator* shall provide, which measured value is mapped to *process value* and whether the *process value* is already corrected according to air pressure and temperature. The current process value shall be transmitted within the second TPDO.

The object structure is illustrated in Figure 13 and Figure 14. Table 25 and Table 26 specify the value definition. Table 27 and Table 28 provide the object description and the entry description.

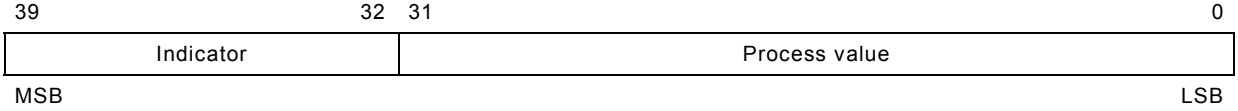

Figure 13 – Object structure of current process value

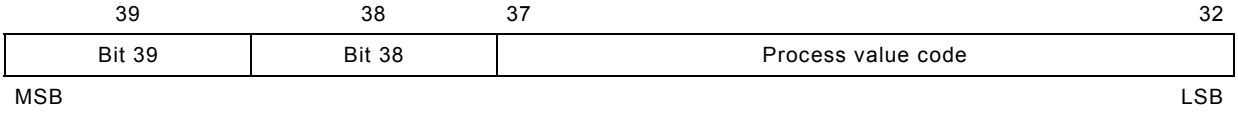

Figure 14 – Object structure of indicator field

Table 25 – Value definition for indicator field bit 38 and 39

Bit field	Value	Description
Bit 38	0	Mapped process value is not corrected according to temperature
	1	Mapped process value is corrected according to temperature
Bit 39	0	Mapped process value is not corrected according to air pressure
	1	Mapped process value is corrected according to air pressure

Table 26 – Value definition for indicator field process value code

Process value code [hex]	Indicated process value
00	No object mapped to process value
01	DAP mapped to process value
02	DAPR mapped to process value
03	Dose mapped to process value
04	Dose rate mapped to process value
05	RD entrance/skin dose mapped to process value
06	RD entrance/skin dose rate mapped to process value
07	Irradiation time mapped to process value
08	Chamber temperature mapped to process value
09	Air pressure mapped to process value
0A	MD entrance/skin dose mapped to process value
0B	MD entrance/skin dose rate mapped to process value
All other values shall be reserved.	

Table 27 – Object description

Attribute	Value
INDEX	6003_h
Name	Current process value
Object code	VAR
Data type	UNSIGNED40
Category	Mandatory

Table 28 – Entry description

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

9.1.5 6004_h: Current PV decimal digits

This object shall provide the number of decimal digits following the decimal point for interpretation of the data type of the *process value,* which is a part of object 6003_h *current process value*. For a detailed value definition refer to the value definition of object *decimal digits PV*, corresponding to the measured value mapped to object 6003_h.

Table 29 and Table 30 provide the object description and the entry description.

Table 29 – Object description

Attribute	Value
INDEX	6004_h
Name	Current pv decimal digit
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 30 – Entry description

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

9.1.6 6005_h: Negative process value indicator

In case bit 15 in object 6002_h *DMS error register* is set, this object shall provide the information, which *process value* contains a value below zero.

The object structure is illustrated in Figure 15. Table 31 specifies the value definition. Table 32 and Table 33 provide the object description and the entry description.

15 … 11	10	9	8	7	6	5	4	3	2	1	0
Reserved	*Bit 10*	*Bit 9*	*Bit 8*	*Bit 7*	*Bit 6*	*Bit 5*	*Bit 4*	*Bit 3*	*Bit 2*	*Bit 1*	*Bit 0*
MSB											LSB

Figure 15 – Object structure of negative process value indicator

Table 31 – Value definition for DMS error register

Bit field	Value	Description
Bit 0	0	DAP process value
	1	DAP process value
Bit 1	0	DAPR process value
	1	DAPR process value
Bit 2	0	Dose process value
	1	Dose process value
Bit 3	0	Dose rate process value
	1	Dose rate process value
Bit 4	0	RD entrance/skin dose process value
	1	RD entrance/skin dose process value
Bit 5	0	RD entrance/skin dose rate process value
	1	RD entrance/skin dose rate process value
Bit 6	0	Irradiation time process value
	1	Irradiation time process value
Bit 7	0	Chamber temperature process value
	1	Chamber temperature process value
Bit 8	0	Air pressure process value
	1	Air pressure process value
Bit 9	0	MD entrance/skin dose process value
	1	MD entrance/skin dose process value
Bit 10	0	MD entrance/skin dose rate process value
	1	MD entrance/skin dose rate process value
Reserved	All other values shall be reserved	

Table 32 – Object description

Attribute	Value
INDEX	6005_h
Name	Negative pv indicator
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 33 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	Optional
Value range	*See value definition*
Default value	No

9.1.7 6006_h: Distance focal point metering chamber

This object shall indicate the distance between the focal point and the metering chamber. The value shall be given in mm. Table 34 and Table 35 provide the object description and the entry description.

Table 34 – Object description

Attribute	Value
INDEX	6006_h
Name	Distance FP_MC
Object code	VAR
Data type	UNSIGNED16
Category	Conditional; mandatory if at least one type of entrance/skin dose measuring or entrance/skin dose rate measuring is supported

Table 35 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	Manufacturer specific

9.1.8 6007_h: MD metering chamber patient plane

This object shall provide the distance between the metering chamber and the patient plane. The value shall be measured by the DMS. The value shall be given in mm.

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

Table 36 – Object description

Attribute	Value
INDEX	6007_h
Name	MD MC_PP
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 37 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	Optional
Value range	UNSIGNED16
Default value	No

9.1.9 6008_h: RD focal point patient plane

This object shall indicate the reference distance between the focal point and the patient plane received from the CANopen network. The value $FFFF_h$ shall indicate an invalid entry. The value shall be given in mm.

Table 38 and Table 39 provide the object description and the entry description.

Table 38 – Object description

Attribute	Value
INDEX	6008_h
Name	RD FP_PP
Object code	VAR
Data type	UNSIGNED16
Category	Conditional; mandatory if RD entrance/skin dose measuring or RD entrance/skin dose rate measuring is supported

Table 39 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	Optional
Value range	UNSIGNED16
Default value	$FFFF_h$

9.1.10 6009_h: MD focal point patient plane

This object shall provide the calculated distance between the focal point and the patient plane based on the measured distance provided by object 6007_h: MD metering chamber patient plane 6007_h. The value shall be given in mm and shall be calculated as follows:

(MD focal point patient plane) =
= (Distance metering chamber patient plane) + (Distance focal point metering chamber)

Table 40 and Table 41 provide the object description and the entry description.

Table 40 – Object description

Attribute	Value
INDEX	6009_h
Name	MD FP_PP
Object code	VAR
Data type	UNSIGNED16
Category	Conditional; mandatory if MD entrance/skin dose measuring or MD entrance/skin dose rate measuring is supported

Table 41 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	Optional
Value range	UNSIGNED16
Default value	No

9.1.11 $600A_h$: Irradiated area

This object shall indicate the irradiated area. The value may be either calculated by the DMS or received from the CANopen network. The value $FFFF_h$ shall indicate an invalid entry. The value shall be given in cm^2.

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

Table 42 – Object description

Attribute	Value
INDEX	$600A_h$
Name	Irradiated area
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 43 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	UNSIGNED16
Default value	$FFFF_h$

9.2 Dose area product measurement

9.2.1 General information

The dose area product (DAP) is the actual measured value by DAP measuring. The measured value shall be integrated, up to a controlled overflow. The real entity related DAP shall be calculated as follows:

DAP = (DAP process value) * (DAP decimal digits pv)

9.2.2 6010_h: DAP scaling 1 FV

This object shall indicate the field value of the first calibration point for the *DAP*. The value shall be given in the SI unit of the field value. Table 44 and Table 45 provide the object description and the entry description.

Table 44 – Object description

Attribute	Value
INDEX	6010_h
Name	DAP scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 45 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.2.3 6011_h: DAP scaling 1 PV

This object shall indicate the process value of the first calibration point for the *DAP*. The value shall be given in μGym^2. Table 46 and Table 47 provide the object description and the entry description.

Table 46 – Object description

Attribute	Value
INDEX	6011_h
Name	DAP scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 47 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.2.4 6012_h: DAP scaling 2 FV

This object shall indicate the field value of the second calibration point for the *DAP*. The value shall be given in the SI unit of the field value. Table 48 and Table 49 provide the object description and the entry description.

Table 48 – Object description

Attribute	Value
INDEX	6012_h
Name	DAP scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 49 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.2.5 6013_h: DAP scaling 2 PV

This object shall indicate the process value of the second calibration point for the *DAP*. The value shall be given in μGym^2. Table 50 and Table 51 provide the object description and the entry description.

Table 50 – Object description

Attribute	Value
INDEX	6013_h
Name	DAP scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 51 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.2.6 6014_h: DAP offset

This object shall indicate the additional offset for the *DAP process value 1 and 2*. The value shall be given in μGym^2. Table 52 and Table 53 provide the object description and the entry description.

Table 52 – Object description

Attribute	Value
INDEX	6014_h
Name	DAP offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 53 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.2.7 6015_h: DAP autozero

Writing a signature value of zero to this object shall cause a modification of the *DAP offset* in the way that the *DAP process value* becomes 0. The autozero function shall be performed for one time.

Figure 16 provides the value definition. Table 54 and Table 55 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6f	72	65	7A

Figure 16 – DAP autozero write access signature

Table 54 – Object description

Attribute	Value
INDEX	6015_h
Name	DAP autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 55 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.2.8 6016_h: DAP scaling factor

This object shall indicate the *DAP scaling factor* by which the *DAP field value* needs to be multiplied to get a *DAP process value*. This value shall be dimensionless and shall be given in multiples of $0{,}001_d$.

Table 56 and Table 57 provide the object description and the entry description.

Table 56 – Object description

Attribute	Value
INDEX	6016_h
Name	DAP scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 57 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.2.9 6017_h: DAP scaling offset

This object shall provide the *DAP scaling offset*, which is needed to calculate the *DAP process values* from the *DAP field values*. The value shall be given in μGym^2.

Table 58 and Table 59 provide the object description and the entry description.

Table 58 – Object description

Attribute	Value
INDEX	6017_h
Name	DAP scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 59 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.3.10 6018_h: DAP field value

This object shall provide the converted value of the DAP measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value.

Table 60 and Table 61 provide the object description and the entry description.

Table 60 – Object description

Attribute	Value
INDEX	6018_h
Name	DAP field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 61 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.3.10 6019_h: DAP process value

This object shall provide the results of the DAP input scaling and gives the measured quantity of the *DAP process value*. The value shall be given in µGym^2. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. In case of DAP measurement, DAP process value shall be mapped to the corresponding part of object 6003_h.

(DAP process value) = (DAP field value * DAP scaling factor) + (DAP scaling offset)

In case the *DAP calibration object* is implemented, the *DAP process value* shall be calculated as follows:

(DAP process value) =
= (DAP calibration object) * [(DAP field value * DAP scaling factor) + (DAP scaling offset)]

Table 62 and Table 63 provide the object description and the entry description.

Table 62 – Object description

Attribute	Value
INDEX	6019_h
Name	DAP process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 63 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.3.10 $601A_h$: DAP decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the DAP process value.

Table 64 provides the value definition. Table 65 and Table 66 provide the object description and the entry description.

Table 64 – Value definition

Value [hex]	Description
FA	1
F9	0,1
F8	0,01
F7	0,001
Other values shall be reserved	

Table 65 – Object description

Attribute	Value
INDEX	$601A_h$
Name	DAP decimal digit pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 66 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FA_h

9.2.10 $601B_h$: DAP calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 67 and Table 68 provide the object description and the entry description.

Table 67 – Object description

Attribute	Value
INDEX	$601B_h$
Name	DAP calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 68 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.2.11 $601C_h$: DAP physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 17 illustrates the object structure. Table 69 and Table 70 provide the object description and the entry description.

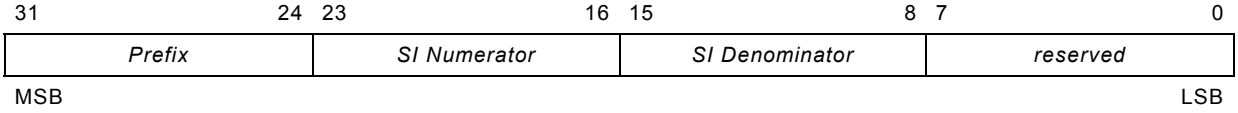

Figure 17 – Object structure DAP physical unit FV

Table 69 – Object description

Attribute	Value
INDEX	$601C_h$
Name	DAP physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 70 – Entry description

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

9.2.12 $601D_h$: DAP test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific "expected value". The threshold value for regarding a test as successful or not is application specific as well. The *DAP test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *DAP test value* shall be calculated as follows:

(DAP test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 71 and Table 72 provide the object description and the entry description.

Table 71 – Object description

Attribute	Value
INDEX	$601D_h$
Name	DAP test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 72 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.2.13 $601E_h$: DAP delta value

This object shall indicate a delta value for DAP measuring. If the absolute value of the difference between current *DAP process value* and last transmitted *DAP process value* exceeds the *DAP delta value* and if the *DAP process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in μGym^2. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *DAP process value* based on delta-values shall be de-activated.

Table 73 and Table 74 provide the object description and the entry description.

Table 73 – Object description

Attribute	Value
INDEX	$601E_h$
Name	DAP delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 74 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.3 Dose area product rate measurement

9.3.1 General information

The dose area product rate (DAPR) is the actual measured value by DAPR measuring. The real entity related DAPR shall be calculated as follows:

DAPR = (DAPR process value) * (DAPR decimal digits pv)

9.3.2 6020_h: DAPR scaling 1 FV

This object shall indicate the field value of the first calibration point for the *DAPR*. The value shall be given in the SI unit of the field value. Table 75 and Table 76 provide the object description and the entry description.

Table 75 – Object description

Attribute	Value
INDEX	6020_h
Name	DAPR scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 76 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.3.3 6021_h: DAPR scaling 1 PV

This object shall indicate the *process value* of the first calibration point for the *DAPR.* The value shall be given in $\mu Gym^2/s$. Table 77 and Table 78 provide the object description and the entry description.

Table 77 – Object description

Attribute	Value
INDEX	6021_h
Name	DAPR scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 78 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.3.4 6022_h: DAPR scaling 2 FV

This object shall indicate the field value of the second calibration point for the *DAPR*. The value shall be given in the SI unit of the field value. Table 79 and Table 80 provide the object description and the entry description.

Table 79 – Object description

Attribute	Value
INDEX	6022_h
Name	DAPR scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 80 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.3.5 6023_h: DAPR scaling 2 PV

This object shall indicate the process value of the second calibration point for the *DAPR*. The value shall be given in $\mu Gym^2/s$. Table 81 and Table 82 provide the object description and the entry description.

Table 81 – Object description

Attribute	Value
INDEX	6023_h
Name	DAPR scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 82 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.3.6 6024_h: DAPR offset

This object shall indicate the additional offset for the *DAPR process value 1* and *2*. The value shall be given in $\mu Gym^2/s$. Table 83 and Table 84 provide the object description and the entry description.

Table 83 – Object description

Attribute	Value
INDEX	6024_h
Name	DAPR offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 84 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.3.7 6025_h: DAPR autozero

Writing a signature value of zero to this object shall cause a modification of the *DAPR offset* in the way that the *DAPR process value* becomes 0. The autozero function shall be performed for one time.

Figure 18 provides the value definition. Table 85 and Table 86 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6f	72	65	7A

Figure 18 – DAP autozero write access signature

Table 85 – Object description

Attribute	Value
INDEX	6025_h
Name	DAPR autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 86 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	*See value definition*
Default value	No

9.3.8 6026_h: DAPR scaling factor

This object shall indicate the *DAPR scaling factor* by which the *DAPR field value* needs to be multiplied to get a *DAPR process value*. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 87 and Table 88 provide the object description and the entry description.

Table 87 – Object description

Attribute	Value
INDEX	6026_h
Name	DAPR scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 88 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.3.9 6027_h: DAPR scaling offset

This object shall indicate the *DAPR scaling offset*, which is needed to calculate the *DAPR process values* from the *DAPR field values*. The value shall be given in $\mu Gym^2/s$. Table 89 and Table 90 provide the object description and the entry description.

Table 89 – Object description

Attribute	Value
INDEX	6027_h
Name	DAPR scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 90 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.3.10 6028_h: DAPR field value

This object shall provide the converted value of the DAPR measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 91 and Table 92 provide the object description and the entry description.

Table 91 – Object description

Attribute	Value
INDEX	6028_h
Name	DAPR field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 92 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.3.11 6029_h: DAPR process value

This object shall provide the results of the DAPR input scaling and gives the measured quantity of the *DAPR process value*. In case of DAPR measurement, *DAPR process value* shall be mapped to the corresponding part of object 6003_h. The value shall be given in $\mu Gym^2/s$. The value of FFFF $FFFF_h$ shall indicate an invalid measurement.

(DAPR process value) = (DAPR field value * DAPR scaling factor) + (DAPR scaling offset)

If the *DAP calibration object* is implemented, the *DAP process value* shall be calculated as follows:

(DAPR process value) =
= (DAPR calibration object) * [(DAPR field value * DAPR scaling factor) + (DAPR scaling offset)]

Table 93 and Table 94 provide the object description and the entry description.

Table 93 – Object description

Attribute	Value
INDEX	6029_h
Name	DAPR process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 94 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.3.12 $602A_h$: DAPR decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *DAPR process value*.

Table 95 provides the value definition. Table 96 and Table 97 provide the object description and the entry description.

Table 95 – Value definition

Value [hex]	Description
FA	1
F9	0,1
F8	0,01
F7	0,001
Other values shall be reserved	

Table 96 – Object description

Attribute	Value
INDEX	$602A_h$
Name	DAPR decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 97 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FA_h

9.3.13 $602B_h$: DAPR calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 98 and Table 99 provide the object description and the entry description.

Table 98 – Object description

Attribute	Value
INDEX	$602B_h$
Name	DAPR calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 99 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.3.14 $602C_h$: DAPR physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 19 illustrates the object structure. Table 100 and Table 101 provide the object description and the entry description.

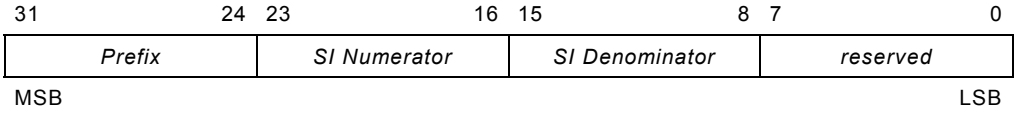

Figure 19 – Object structure DAPR physical unit FV

Table 100 – Object description

Attribute	Value
INDEX	$602C_h$
Name	DAPR physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 101 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.3.15 $602D_h$: DAPR test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *DAPR test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *DAPR test value* shall be calculated as follows:

(DAPR test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of $0,1_d$.

Table 102 and Table 103 provide the object description and the entry description.

Table 102 – Object description

Attribute	Value
INDEX	$602D_h$
Name	DAPR test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 103 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.3.16 $602E_h$: DAPR delta value

This object shall indicate a delta value for DAPR measuring. If the absolute value of the difference between current *DAPR process value* and last transmitted *DAPR process value* exceeds the *DAPR delta value* and if the *DAPR process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted. The value shall be given in $\mu Gym^2/s$. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *DAPR process value* based on delta-values shall be de-activated.

Table 104 and Table 105 the object description and the entry description.

Table 104 – Object description

Attribute	Value
INDEX	$602E_h$
Name	DAPR delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 105 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.4 Dose measurement

9.4.1 General information

The dose is the actual measured value by dose measuring, defined as the dose by the metering chamber. The real entity related dose shall be calculated as follows:

(Dose) = (Dose process value) * (Dose decimal digits pv)

9.4.2 6030_h: Dose scaling 1 FV

This object shall indicate the field value of the first calibration point for the *dose*. The value shall be given in the SI unit of the field value. Table 106 and Table 107 provide the object description and the entry description.

Table 106 – Object description

Attribute	Value
INDEX	6030_h
Name	Dose scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 107 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.4.3 6031_h: Dose scaling 1 PV

This object shall indicate the process value of the first calibration point for the *dose*. The value shall be given in mGy. Table 108 and Table 109 provide the object description and the entry description.

Table 108 – Object description

Attribute	Value
INDEX	6031_h
Name	Dose scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 109 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.4.4 6032_h: Dose scaling 2 FV

This object shall indicate the field value of the second calibration point for the *dose*. The value shall be given in the SI unit of the field value. Table 110 and Table 111 provide the object description and the entry description.

Table 110 – Object description

Attribute	Value
INDEX	6032_h
Name	Dose scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 111 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.4.5 6033_h: Dose scaling 2 PV

This object shall indicate the process value of the second calibration point for the *dose*. The value shall be given in mGy. Table 112 and Table 113 provide the object description and the entry description.

Table 112 – Object description

Attribute	Value
INDEX	6033_h
Name	Dose scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 113 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.4.6 6034_h: Dose offset

This object shall indicate the additional offset for the *dose process value 1* and *2*. The value shall be given in mGy. Table 114 and Table 115 provide the object description and the entry description.

Table 114 – Object description

Attribute	Value
INDEX	6034_h
Name	Dose offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 115 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.4.7 6035_h: Dose autozero

Writing a signature value of zero to this object shall cause a modification of the *dose offset* in the way that the *dose process value* becomes 0. The autozero function shall be performed for one time.

Figure 20 provides the value definition. Table 116 and Table 117 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6f	72	65	7A

Figure 20 – Dose autozero write access signature

Table 116 – Object description

Attribute	Value
INDEX	6035_h
Name	Dose autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 117 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.4.8 6036_h: Dose scaling factor

This object shall indicate the *dose scaling factor* by which the *dose field value* needs to be multiplied to get a *dose process value*. This value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 118 and Table 119 provide the object description and the entry description.

Table 118 – Object description

Attribute	Value
INDEX	6036_h
Name	Dose scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 119 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.4.9 6037_h: Dose scaling offset

This object shall indicate the dose scaling offset, which is needed to calculate the *dose process values* from the *dose field values*. The value shall be given in mGy. Table 120 and Table 121 provide the object description and the entry description.

Table 120 – Object description

Attribute	Value
INDEX	6037_h
Name	Dose scaling offset
Object code	VAR
Data type	Integer32
Category	Optional

Table 121 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.4.10 6038_h: Dose field value

This object shall provide the converted value of the dose measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 122 and Table 123 provide the object description and the entry description.

Table 122 – Object description

Attribute	Value
INDEX	6038_h
Name	Dose field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 123 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.4.11 6039_h: Dose process value

This object shall provide the results of the dose input scaling and gives the measured quantity of the *dose process value*.

(Dose process value) = ((Dose field value) * (Dose scaling factor)) + (Dose scaling offset)

This object shall provide the results of the dose input scaling and gives the measured quantity of the *dose process value*. In case of dose measurement, *dose process value* shall be mapped to the corresponding part of object 6003_h.

(Dose process value) = (Dose field value * Dose scaling factor) + (Dose scaling offset)

If the *dose calibration object* is implemented, the *dose process value* shall be calculated as follows:

(Dose process value) =
= (Dose calibration object) * [(Dose field value * Dose scaling factor) + (Dose scaling offset)]

The value shall be given in mGy. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. Table 124 and Table 125 provide the object description and the entry description.

Table 124 – Object description

Attribute	Value
INDEX	6039_h
Name	Dose process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 125 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.4.12 $603A_h$: Dose decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *dose process value*.

Table 126 provides the value definition. Table 127 and Table 128 provide the object description and the entry description.

Table 126 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001
Other values shall be reserved	

Table 127 – Object description

Attribute	Value
INDEX	$603A_h$
Name	Dose decimal digit pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 128 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	See value definition
Default value	FD_h

9.4.13 $603B_h$: Dose calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$. Table 129 and Table 130 provide the object description and the entry description.

Table 129 – Object description

Attribute	Value
INDEX	$603B_h$
Name	Dose calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 130 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	$0000\ 03E8_h$

9.4.14 $603C_h$: Dose physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 21 illustrates the object structure. Table 131 and Table 132 provide the object description and the entry description.

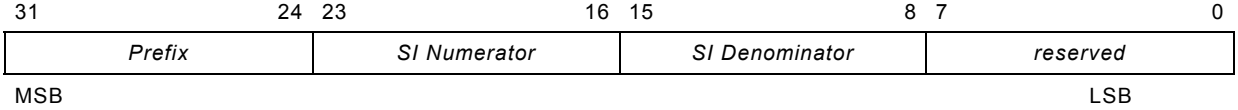

Figure 21 – Object structure

Table 131 – Object description

Attribute	Value
INDEX	$603C_h$
Name	Dose physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 132 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.4.15 $603D_h$: Dose test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *Dose test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *Dose test value* shall be calculated as follows:

(Dose test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of $0,1_d$. Table 133 and Table 134 provide the object description and the entry description.

Table 133 – Object description

Attribute	Value
INDEX	$603D_h$
Name	Dose test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 134 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.4.16 $603E_h$: Dose delta value

This object shall indicate a delta value for dose measuring. If the absolute value of the difference between current *dose process value* and last transmitted *dose process value*

exceeds the *dose delta value* and if the *dose process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted. The value shall be given in mGy. A *value* of FFFF FFFF$_h$ shall indicate that the automatic transmission for the *dose process value* based on delta-values shall be de-activated.

Table 135 and Table 136 provide the object description and the entry description.

Table 135 – Object description

Attribute	Value
INDEX	603E$_h$
Name	Dose delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 136 – Entry description

Attribute	Value
Sub-index	00$_h$
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.5 Dose rate measurement

9.5.1 General information

The dose rate is the actual measured value by dose rate measuring, defined as the dose rate by the metering chamber. The real entity related dose rate shall be calculated as follows:

(Dose rate) = (Dose rate process value) * (Dose rate decimal digits pv)

9.5.2 6040$_h$: Dose rate scaling 1 FV

This object shall indicate the field value of the first calibration point for the *dose rate*. The value shall be given in the SI unit of the field value. Table 137 and Table 138 provide the object description and the entry description.

Table 137 – Object description

Attribute	Value
INDEX	6040$_h$
Name	Dose rate scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 138 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.5.3 6041_h: Dose rate scaling 1 PV

This object shall indicate the process value of the first calibration point for the *dose rate.* The value shall be given in mGy/s. Table 139 and Table 140 provide the object description and the entry description.

Table 139 – Object description

Attribute	Value
INDEX	6041_h
Name	Dose rate scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 140 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.5.4 6042_h: Dose rate scaling 2 FV

This object shall indicate the field value of the second calibration point for the *dose rate*. The value shall be given in the SI unit of the field value. Table 141 and Table 142 provide the object description and the entry description.

Table 141 – Object description

Attribute	Value
INDEX	6042_h
Name	Dose rate scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 142 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.5.5 6043_h: Dose rate scaling 2 PV

This object shall indicate the process value of the second calibration point for the *dose rate*. The value shall be given in mGy/s. Table 143 and Table 144 provide the object description and the entry description.

Table 143 – Object description

Attribute	Value
INDEX	6043_h
Name	Dose scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 144 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.5.6 6044_h: Dose rate offset

This object shall indicate the additional offset for *dose rate process value 1* and *2*. The value shall be given in mGy/s. Table 145 and Table 146 provide the object description and the entry description.

Table 145 – Object description

Attribute	Value
INDEX	6044_h
Name	Dose rate offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 146 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.5.7 6045_h: Dose rate autozero

Writing a signature value of zero to this object shall cause a modification of the *dose rate offset* in the way that the dose rate process value becomes 0. The autozero function shall be performed for one time.

Figure 22 provides the value definition. Table 147 and Table 148 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 22 – Dose rate autozero write access signature

Table 147 – Object description

Attribute	Value
INDEX	6045_h
Name	Dose rate autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 148 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.5.8 6046_h: Dose rate scaling factor

This object shall indicate the *dose rate scaling factor* by which the *dose rate field value* needs to be multiplied to get a *dose rate process value*. This value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 149 and Table 150 provide the object description and the entry description.

Table 149 – Object description

Attribute	Value
INDEX	6046_h
Name	Dose rate scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 150 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.5.9 6047_h: Dose rate scaling offset

This object shall indicate the dose rate scaling offset, which is needed to calculate the *dose rate process values* from the *dose rate field values*. The value shall be given in mGy/s. Table 151 and Table 152 provide the object description and the entry description.

Table 151 – Object description

Attribute	Value
INDEX	6047_h
Name	Dose rate scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 152 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.5.10 6048_h: Dose rate field value

This object shall provide the converted value of the dose rate measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 153 and Table 154 provide the object description and the entry description.

Table 153 – Object description

Attribute	Value
INDEX	6048_h
Name	Dose rate field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 154 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.5.11 6049_h: Dose rate process value

This object shall provide the results of the dose rate input scaling and gives the measured quantity of the *dose rate process value*. In case of dose rate measurement, *dose rate process value* shall be mapped to the corresponding part of object 6003_h. The value shall be given in mGy/s. The value of FFFF $FFFF_h$ shall indicate an invalid measurement.

(Dose rate process value) =
= (Dose rate field value * Dose rate scaling factor) + (Dose rate scaling offset)

If the *dose rate calibration* object is implemented, the *dose rate process value* shall be calculated as follows:

(Dose rate process value) =
= (Dose rate calibration object) * [(Dose rate field value * Dose rate scaling factor) + (Dose rate scaling offset)]

Table 155 and Table 156 provide the object description and the entry description.

Table 155 – Object description

Attribute	Value
INDEX	6049_h
Name	Dose rate process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 156 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.5.12 $604A_h$: Dose rate decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the dose rate process value.

Table 157 provides the value definition. Table 158 and Table 159 provide the object description and the entry description.

Table 157 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001
Other values shall be reserved	

Table 158 – Object description

Attribute	Value
INDEX	$604A_h$
Name	Dose rate decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 159 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FD_h

9.5.13 $604B_h$: Dose rate calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$. Table 160 and Table 161 provide the object description and the entry description.

Table 160 – Object description

Attribute	Value
INDEX	$604B_h$
Name	Dose rate calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 161 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.5.14 $604C_h$: Dose rate physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 23 illustrates the object structure. Table 162 and Table 163 provide the object description and the entry description.

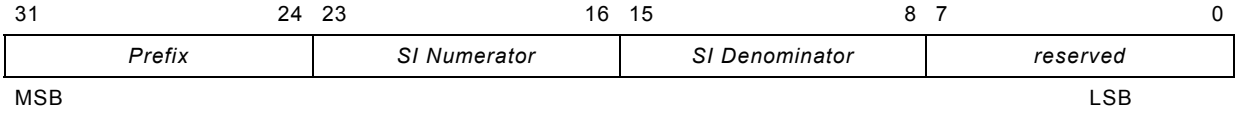

Figure 23 – Object structure for dose rate physical unit FV

Table 162 – Object description

Attribute	Value
INDEX	$604C_h$
Name	Dose rate physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 163 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.5.15 $604D_h$: Dose rate test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific "expected value". The threshold value for regarding a test as successful or not is application specific as well. The *dose rate test value* shall provide the deviation of the measured value to the expected value in percent. The value shall be dimensionless. The value shall be given in multiples of $0,1_d$ and shall be calculated as follows:

(Dose rate test value) = 100 * (Measured value during test) / (Expected value)

Table 164 and Table 165 provide the object description and the entry description.

Table 164 – Object description

Attribute	Value
INDEX	$604D_h$
Name	Dose rate test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 165 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.5.16 $604E_h$: Dose rate delta value

This object shall indicate a delta value for dose rate measuring. If the absolute value of the difference between current *dose rate process value* and last transmitted *dose rate process value* exceeds the *dose rate delta value* and if the *dose rate process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted. The value shall be given in mGy/s. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *dose rate process value* based on delta-values shall be de-activated.

Table 166 and Table 167 provide the object description and the entry description.

Table 166 – Object description

Attribute	Value
INDEX	$604E_h$
Name	Dose rate delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 167 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.6 RD entrance/skin dose measurement

9.6.1 General information

The entrance/skin dose is the actual measured value by entrance/skin dose measuring, defined as the dose at the patient plane. It may be calculated by the DMS from the dose or DAP at the metering chamber, using the distances from focal point to metering chamber and patient plane and or from the DAP at the metering chamber, using the irradiated area at the chamber plane also. For calculation of the *RD es dose process value*, the corresponding distances provided by object 6006_h and object 6008_h shall be used.

The real entity related RD entrance/skin dose shall be calculated as follows:

(RD es dose) = (RD es dose process value) * (RD es dose decimal digits pv)

As the distances provided by the objects 6006_h and 6008_h are currently not measured by the DMS but provided as a reference distance (RD), the measured value is called *RD entrance/skin dose*.

9.6.2 6050_h: RD entrance/skin dose scaling 1 FV

This object shall indicate the *RD entrance/skin dose field value* of the first calibration point for the *RD entrance/skin dose*. The value shall be given in the SI unit of the field value. Table 168 and Table 169 provide the object description and the entry description.

Table 168 – Object description

Attribute	Value
INDEX	6050_h
Name	RD es dose scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 169 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.6.3 6051_h: RD entrance/skin dose scaling 1 PV

This object shall indicate the process value of the first calibration point for the *RD entrance/skin dose.* The value shall be given in mGy. Table 170 and Table 171 provide the object description and the entry description.

Table 170 – Object description

Attribute	Value
INDEX	6051_h
Name	RD es dose scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 171 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.6.4 6052_h: RD entrance/skin dose scaling 2 FV

This object shall indicate the field value of the second calibration point for the *RD entrance/skin dose*. The value shall be given in the SI unit of the field value. Table 172 and Table 173 provide the object description and the entry description.

Table 172 – Object description

Attribute	Value
INDEX	6052_h
Name	RD es dose scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 173 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.6.5 6053_h: RD entrance/skin dose scaling 2 PV

This object shall indicate the process value of the second calibration point for the *RD entrance/skin dose*. The value shall be given in mGy. Table 174 and Table 175 provide the object description and the entry description.

Table 174 – Object description

Attribute	Value
INDEX	6053_h
Name	RD es dose scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 175 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.6.6 6054_h: RD entrance/skin dose offset

This object shall indicate the additional offset for the *RD entrance/skin dose process value 1* and *2.* The value shall be given in mGy. Table 176 and Table 177 provide the object description and the entry description.

Table 176 – Object description

Attribute	Value
INDEX	6054_h
Name	RD es dose offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 177 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.6.7 6055_h: RD entrance/skin dose autozero

Writing a signature value of zero to this object shall cause a modification of the *RD entrance/skin dose offset* in the way, that the actual *RD entrance/skin dose process value* becomes 0. The autozero function shall be performed for one time.

Figure 24 provides the value definition. Table 178 and Table 179 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 24 – RD entrance/skin dose autozero write access signature

Table 178 – Object description

Attribute	Value
INDEX	6055_h
Name	RD es dose autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 179 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.6.8 6056_h: RD entrance/skin dose scaling factor

This object shall indicate the RD entrance/skin dose scaling factor by which the RD entrance/skin field value needs to be multiplied to get a RD entrance/skin process value. This value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 180 and Table 181 provide the object description and the entry description.

Table 180 – Object description

Attribute	Value
INDEX	6056_h
Name	RD es dose scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 181 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.6.9 6057_h: RD entrance/skin dose scaling offset

This object shall indicate the RD entrance/skin dose scaling offset, which is needed to calculate the RD entrance/skin dose process values from the RD entrance/skin dose field values. The value shall be given in mGy.

Table 182 and Table 183 provide the object description and the entry description.

Table 182 – Object description

Attribute	Value
INDEX	6057_h
Name	RD es dose scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 183 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.6.10 6058_h: RD entrance/skin dose field value

This object shall provide the converted value of the RD entrance/skin dose measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 184 and Table 185 provide the object description and the entry description.

Table 184 – Object description

Attribute	Value
INDEX	6058_h
Name	RD es dose field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 185 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.6.11 6059_h: RD entrance/skin dose process value

This object shall provide the results of the RD entrance/skin dose input scaling and gives the measured quantity of the *RD entrance/skin dose process value*. In case of RD entrance/skin dose measurement, *RD entrance/skin dose process value* shall be mapped to the corresponding part of object 6003_h. The value shall be given in mGy. The value of FFFF $FFFF_h$ shall indicate an invalid measurement.

(RD es dose process value) =
= (RD es dose field value * RD es dose scaling factor) + (RD es dose scaling offset)

If the *RD es dose calibration object* is implemented, the *RD es dose process value* shall be calculated as follows:

(RD es dose process value) =
= (RD es dose calibration object) * [(RD es dose field value * RD es dose scaling factor) +
+ (RD es dose scaling offset)]

Table 186 and Table 187 provide the object description and the entry description.

Table 186 – Object description

Attribute	Value
INDEX	6059_h
Name	RD es dose process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 187 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.6.12 $605A_h$: RD entrance/skin dose decimal digit PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *RD entrance/skin dose process value*.

Table 188 provides the value definition. Table 189 and Table 190 provide the object description and the entry description.

Table 188 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001

Value [hex]	Description
Other values shall be reserved	

Table 189 – Object description

Attribute	Value
INDEX	$605A_h$
Name	RD es dose decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 190 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FD_h

9.6.13 $605B_h$: RD entrance/skin dose calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$. Table 191 and Table 192 provide the object description and the entry description.

Table 191 – Object description

Attribute	Value
INDEX	$605B_h$
Name	RD es dose calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 192 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.6.14 $605C_h$: RD entrance/skin dose physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 25 illustrates the object structure. Table 193 and Table 194 provide the object description and the entry description.

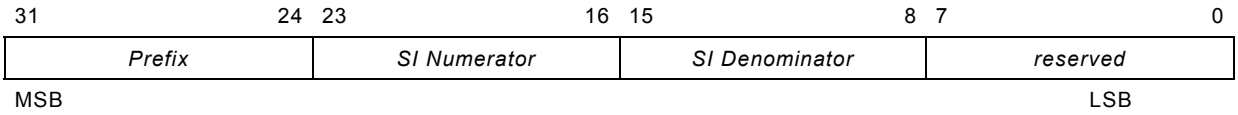

Figure 25 – Object structure for RD entrance/skin dose physical unit FV

Table 193 – Object description

Attribute	Value
INDEX	$605C_h$
Name	RD es dose physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 194 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.6.15 $605D_h$: RD entrance/skin dose test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *RD entrance/skin dose test value* shall provide the deviation of the measured value to the expected value in percent. The value shall be dimensionless. The value shall be given in multiples of $0,1_d$. The *RD entrance/skin dose test value* shall be calculated as follows:

(RD entrance/skin dose test value) = 100 * (Measured value during test) / (Expected value)

Table 195 and Table 196 provide the object description and the entry description.

Table 195 – Object description

Attribute	Value
INDEX	$605D_h$
Name	RD es dose test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 196 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.6.16 $605E_h$: RD entrance/skin dose delta value

This object shall indicate a delta value for RD entrance/skin dose measuring. If the absolute value of the difference between current *RD entrance/skin dose process value* and last transmitted *RD entrance/skin dose process value* exceeds the *RD entrance/skin dose delta value* and if the *RD entrance/skin dose process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in mGy. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *RD entrance/skin dose process value* based on delta-values shall be de-activated.

Table 197 and Table 198 provide the object description and the entry description.

Table 197 – Object description

Attribute	Value
INDEX	$605E_h$
Name	RD es dose delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 198 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.7 RD entrance/skin dose rate measurement

9.7.1 General information

The entrance/skin dose rate is the actual measured value by entrance/skin dose rate measuring, defined as the dose rate at the patient plane. It may be calculated by the DMS from the dose rate or DAPR at the metering chamber, using the distances from focal point to metering chamber and patient plane and or from the DAPR at the metering chamber, using the irradiated area at the chamber plane also. For calculation of the *RD es dose rate process value*, the corresponding distances provided by object 6006_h and object 6008_h shall be used.

The real entity related RD entrance/skin dose rate shall be calculated as follows:

(RD es dose rate) = (RD es dose rate process value) * (RD es dose rate decimal digits pv)

As the distances provided by the objects 6006_h and 6008_h are currently not measured by the DMS but provided as a reference distance (RD), the measured value is called *RD entrance/skin dose rate*.

9.7.2 6060_h: RD entrance/skin dose rate scaling 1 FV

This object shall indicate the field value of the first calibration point for the *RD entrance/skin dose rate*. The value shall be given in the SI unit of the field value. Table 199 ad Table 200 provide the object description and the entry description.

Table 199 – Object description

Attribute	Value
INDEX	6060_h
Name	RD es dose rate scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 200 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.7.3 6061_h: RD entrance/skin dose rate scaling 1 PV

This object shall indicate the process value of the first calibration point for the *RD entrance/skin dose rate.* The value shall be given in mGy/s. Table 201 and Table 202 provide the object description and the entry description.

Table 201 – Object description

Attribute	Value
INDEX	6061_h
Name	RD es dose rate scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 202 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.7.4 6062_h: RD entrance/skin dose rate scaling 2 FV

This object shall indicate the field value of the second calibration point for the *RD entrance/skin dose rate*. The value shall be given in the SI unit of the field value. Table 203 and Table 204 provide the object description and the entry description.

Table 203 – Object description

Attribute	Value
INDEX	6062_h
Name	RD es dose rate scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 204 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.7.5 6063_h: RD entrance/skin dose rate scaling 2 PV

This object shall indicate the process value of the second calibration point for the *RD entrance/skin dose rate*. The value shall be given in mGy/s. Table 205 and Table 206 provide the object description and the entry description.

Table 205 – Object description

Attribute	Value
INDEX	6063_h
Name	RD es dose rate scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 206 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.7.6 6064_h: RD entrance/skin dose rate offset

This object shall indicate the additional offset for the *RD entrance/skin dose rate process value 1* and *2.* The value shall be given in mGy/s. Table 207 and Table 208 provide the object description and the entry description.

Table 207 – Object description

Attribute	Value
INDEX	6064_h
Name	RD es dose rate offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 208 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.7.7 6065_h: RD entrance/skin dose rate autozero

Writing a signature value of zero to this object shall cause a modification of the *RD entrance/skin dose rate offset* in the way, that the *RD entrance/skin dose rate process value* becomes 0. The autozero function shall be performed for one time.

Figure 26 provides the value definition. Table 209 and Table 210 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
Hex	6F	72	65	7A

Figure 26 – RD entrance/skin dose rate autozero write access signature

Table 209 – Object description

Attribute	Value
INDEX	6065_h
Name	RD es dose rate autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 210 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.7.8 6066_h: RD entrance/skin dose rate scaling factor

This object shall indicate the RD entrance/skin dose rate scaling factor by which the RD entrance/skin dose rate field value needs to be multiplied to get a RD entrance/skin dose rate process value. This value shall be dimensionless. The value shall be given in multiples of $0{,}001_d$.

Table 211 and Table 212 provide the object description and the entry description.

Table 211 – Object description

Attribute	Value
INDEX	6066_h
Name	RD es dose rate scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 212 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.7.9 6067_h: RD entrance/skin dose rate scaling offset

This object shall indicate the RD entrance/skin dose rate scaling offset, which is needed to calculate the RD entrance/skin dose rate process values from the RD entrance/skin dose rate field values. The value shall be given in mGy/s.

Table 213 and Table 214 provide the object description and the entry description.

Table 213 – Object description

Attribute	Value
INDEX	6067_h
Name	RD es dose rate scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 214 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.7.10 6068_h: RD entrance/skin dose rate field value

This object shall provide the converted value of the RD entrance/skin dose rate measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value.

Table 215 and Table 216 provide the object description and the entry description.

Table 215 – Object description

Attribute	Value
INDEX	6068_h
Name	RD es dose rate field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 216 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.7.11 6069_h: RD entrance/skin dose rate process value

This object shall provide the results of the RD entrance/skin dose rate input scaling and gives the measured quantity of the *RD entrance/skin dose rate process value*. In case of RD entrance/skin dose rate measurement, *RD entrance/skin dose rate process value* shall be mapped to the corresponding part of object 6003_h

(RD es dose rate process value) =
=(RD es dose rate field value * RD es dose rate scaling factor) + (RD es dose rate scaling offset)

If the *RD es dose rate calibration object* is implemented, the *RD es dose rate process value* shall be calculated as follows:

(RD es dose rate process value) =
= (RD es dose rate calibration object) * [(RD es dose rate field value * RD es dose rate scaling factor) + (RD es dose rate scaling offset)]

The value shall be given in mGy/s. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. Table 217 and Table 218 provide the object description and the entry description.

Table 217 – Object description

Attribute	Value
INDEX	6069_h
Name	RD es dose rate process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 218 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.7.12 $606A_h$: RD entrance/skin dose rate decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the data type of the *RD entrance/skin dose rate process value*.

Table 219 provides the value definition. Table 220 and Table 221 provide the object description and the entry description.

Table 219 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001
Other values shall be reserved	

Table 220 – Object description

Attribute	Value
INDEX	$606A_h$
Name	RD es dose rate decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 221 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FD_h

9.7.13 $606B_h$: RD entrance/skin dose rate calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 222 and Table 223 provide the object description and the entry description.

Table 222 – Object description

Attribute	Value
INDEX	$606B_h$
Name	RD es dose rate calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 223 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	$0000\ 03E8_h$

9.7.14 $606C_h$: RD entrance/skin dose rate physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 27 provides the object structure. Table 224 and Table 225 provide the object description and the entry description.

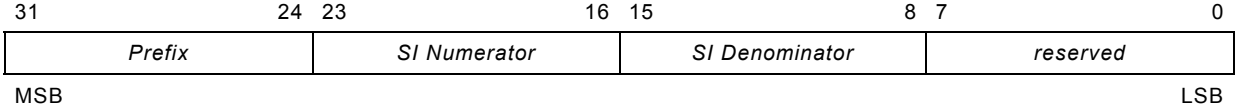

Figure 27 – Object structure

Table 224 – Object description

Attribute	Value
INDEX	$606C_h$
Name	RD es dose rate physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 225 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.7.15 $606D_h$: RD entrance/skin dose rate test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific "expected value". The threshold value for regarding a test as successful or not is application specific as well. The *RD entrance/skin dose rate test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *RD entrance/skin dose rate test value* shall be calculated as follows:

(RD es dose test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 226 and Table 227 provide the object description and the entry description.

Table 226 – Object description

Attribute	Value
INDEX	$606D_h$
Name	RD es dose rate test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 227 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.7.16 $606E_h$: RD entrance/skin dose rate delta value

This object shall indicate a delta value for RD entrance/skin dose rate measuring. If the absolute value of the difference between current *RD entrance/skin dose rate process value* and last transmitted *RD entrance/skin dose rate process value* exceeds the *RD entrance/skin dose rate delta value* and if the *RD entrance/skin dose rate process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in mGy/s. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *RD entrance/skin dose rate process value* based on delta-values shall be de-activated. Table 228 and Table 229 provide the object description and the entry description.

Table 228 – Object description

Attribute	Value
INDEX	$606E_h$
Name	RD es dose rate delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 229 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.8 Irradiation time measurement

9.8.1 General information

The irradiation time is the actual measured value by irradiation time measuring. The real entity related irradiation time shall be calculated as follows:

(Irradiation time) = (Irradiation time process value) * (Irradiation time decimal digits pv)

9.8.2 6070_h: Irradiation time scaling 1 FV

This object shall indicate the field value of the first calibration point for the *irradiation time.* The value shall be given in the SI unit of the field value. Table 230 and Table 231 provide the object description and the entry description.

Table 230 – Object description

Attribute	Value
INDEX	6070_h
Name	IT scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 231 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.8.3 6071_h: Irradiation time scaling 1 PV

This object shall indicate the process value of the first calibration point for the *irradiation time.* The value shall be given in s. Table 232 and Table 233 provide the object description and the entry description.

Table 232 – Object description

Attribute	Value
INDEX	6071_h
Name	IT scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 233 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.8.4 6072_h: Irradiation time scaling 2 FV

This object shall indicate the field value of the second calibration point for the *irradiation time*. The value shall be given in the SI unit of the field value. Table 234 and Table 235 provide the object description and the entry description.

Table 234 – Object description

Attribute	Value
INDEX	6072_h
Name	IT scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 235 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.8.5 6073_h: Irradiation time scaling 2 PV

This object shall indicate the process value of the second calibration point for the *irradiation time*. The value shall be given in s. Table 236 and Table 237 provide the object description and the entry description.

Table 236 – Object description

Attribute	Value
INDEX	6073_h
Name	IT scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 237 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.8.6 6074_h: Irradiation time offset

This object shall indicate the additional offset for the *irradiation time process value 1* and *2.* The value shall be given in s. Table 238 and Table 239 provide the object description and the entry description.

Table 238 – Object description

Attribute	Value
INDEX	6074_h
Name	IT offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 239 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.8.7 6075_h: Irradiation time autozero

Writing a signature value of zero to this object shall cause a modification of the *irradiation time offset* in the way that the actual *irradiation time process value* becomes 0. The autozero function shall be performed for one time.

Figure 28 provides the value definition. Table 240 and Table 241 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 28 – Irradiation time autozero write access signature

Table 240 – Object description

Attribute	Value
INDEX	6075_h
Name	IT autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 241 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.8.8 6076_h: Irradiation time scaling factor

This object shall indicate the irradiation time scaling factor by which the *irradiation time field value* needs to be multiplied to get an *irradiation time process value*. This value shall be dimensionless. The value shall be given in multiples of 0.001_d.

Table 242 and Table 243 provide the object description and the entry description.

Table 242 – Object description

Attribute	Value
INDEX	6076_h
Name	IT scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 243 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.8.9 6077_h: Irradiation time scaling offset

This object shall indicate the irradiation time scaling offset, which is needed to calculate the irradiation time process values from the irradiation time field values. The value shall be given in s. Table 244 and Table 245 provide the object description and the entry description.

Table 244 – Object description

Attribute	Value
INDEX	6077_h
Name	IT scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 245 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.8.10 6078_h: Irradiation time field value

This object shall provide the converted value of the irradiation time measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 246 and Table 247 provide the object description and the entry description.

Table 246 – Object description

Attribute	Value
INDEX	6078_h
Name	IT field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 247 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.8.11 6079_h: Irradiation time process value

This object shall provide the results of the irradiation time input scaling and gives the measured quantity of the *irradiation time process value*.

IT process value = (IT field value * IT scaling factor) + IT scaling offset

This object shall provide the results of the irradiation time input scaling and gives the measured quantity of the *irradiation time process value*. In case of irradiation time measurement*, irradiation time process value* shall be mapped to the corresponding part of object 6003_h

(IT process value) = (IT field value * IT scaling factor) + (IT scaling offset)

If the *IT calibration object* is implemented, the *IT process value* shall be calculated as follows:

(IT process value) =
= (IT calibration object) * [(IT field value * IT scaling factor) + (IT scaling offset)]

This value shall be given in s. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. Table 248 and Table 249 provide the object description and the entry description.

Table 248 – Object description

Attribute	Value
INDEX	6079_h
Name	IT process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 249 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.8.12 $607A_h$: Irradiation time decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *irradiation time process value*.

Table 250 provides the value definition. Table 251 and Table 252 provide the object description and the entry description.

Table 250 – Value definition

Value [hex]	Description
00	1
FF	0,1
FE	0,01
FD	0,001
Other values shall be reserved	

Table 251 – Object description

Attribute	Value
INDEX	$607A_h$
Name	IT decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 252 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	*See value definition*
Default value	00_h

9.8.13 $607B_h$: Irradiation time calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d.

Table 253 and Table 254 provide the object description and the entry description.

Table 253 – Object description

Attribute	Value
INDEX	$607B_h$
Name	IT calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 254 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.8.14 $607C_h$: Irradiation time physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 29 illustrates the object structure. Table 255 and Table 256 provide the object description and the entry description.

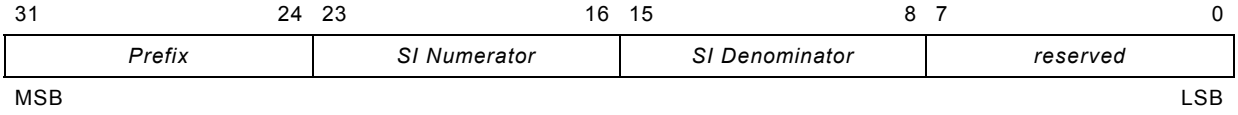

Figure 29 – Object structure

Table 255 – Object description

Attribute	Value
INDEX	$607C_h$
Name	IT physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 256 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.8.15 $607D_h$: Irradiation time test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific "expected value". The threshold value for regarding a test as successful or not is application specific as well. The *irradiation time test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *irradiation time test value* shall be calculated as follows:

(IT test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 257 and Table 258 provide the object description and the entry description.

Table 257 – Object description

Attribute	Value
INDEX	$607D_h$
Name	IT test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 258 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.8.16 $607E_h$: Irradiation time delta value

This object shall indicate a delta value for irradiation time measuring. If the absolute value of the difference between current *irradiation time process value* and last transmitted *irradiation time process value* exceeds the *irradiation time delta value* and if the *irradiation time process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in s. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *irradiation time process value* based on delta-values shall be de-activated.

Table 259 and Table 260 provide the object description and the entry description.

Table 259 – Object description

Attribute	Value
INDEX	$607E_h$
Name	IT delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 260 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.9 Chamber temperature measurement

9.9.1 General information

The chamber temperature is the actual measured value by chamber temperature measuring, in order to revise all other measured values depending on temperature. The real entity related chamber temperature shall be calculated as follows:

(Chamber temp) = (Chamber temp process value) * (Chamber temp decimal digits pv)

9.9.2 6080_h: Chamber temperature scaling 1 FV

This object shall indicate the field value of the first calibration point for the *chamber temperature*. The value shall be given in the SI unit of the field value. Table 261 and Table 262 provide the object description and the entry description.

Table 261 – Object description

Attribute	Value
INDEX	6080_h
Name	Chamber temp scaling 1 fv
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 262 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	Manufacturer specific

9.9.3 6081_h: Chamber temperature scaling 1 PV

This object shall indicate the process value of the first calibration point for the *chamber temperature*. The value shall be given in °C. Table 263 and Table 264 provide the object description and the entry description.

Table 263 – Object description

Attribute	Value
INDEX	6081_h
Name	Chamber temp scaling 1 pv
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 264 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	Manufacturer specific

9.9.4 6082_h: Chamber temperature scaling 2 FV

This object shall indicate the field value of the second calibration point for the *chamber temperature.* The value shall be given in the SI unit of the field value. Table 265 and Table 266 provide the object description and the entry description.

Table 265 – Object description

Attribute	Value
INDEX	6082_h
Name	Chamber temp scaling 2 fv
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 266 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	Manufacturer specific

9.9.5 6083_h: Chamber temperature scaling 2 PV

This object shall indicate the process value of the second calibration point for the *chamber temperature.* The value shall be given in °C. Table 267 and Table 268 provide the object description and the entry description.

Table 267 – Object description

Attribute	Value
INDEX	6083_h
Name	Chamber temp scaling 2 pv
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 268 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	Manufacturer specific

9.9.6 6084_h: Chamber temperature offset

This object shall indicate the additional offset for the *chamber temperature process value 1* and *2*. The value shall be given in °C. Table 269 and Table 270 provide the object description and the entry description.

Table 269 – Object description

Attribute	Value
INDEX	6084_h
Name	Chamber temp offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 270 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	0000_h

9.9.7 6085_h: Chamber temperature autozero

Writing a signature value of zero to this object shall cause a modification of the chamber temperature offset in the way that the actual chamber temperature process value becomes 0. The autozero function shall be performed for one time.

Figure 30 provides the value definition. Table 271 and Table 272 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 30 – Chamber temperature autozero write access signature

Table 271 – Object description

Attribute	Value
INDEX	6085_h
Name	Chamber temp autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 272 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.9.8 6086_h: Chamber temperature scaling factor

This object shall indicate the chamber temperature scaling factor by which the chamber temperature field value needs to be multiplied to get a chamber temperature process value. This value shall be dimensionless. The value shall be given in multiples of 0.001_d.

Table 273 and Table 274 provide the object description and the entry description.

Table 273 – Object description

Attribute	Value
INDEX	6086_h
Name	Chamber temp scaling factor
Object code	VAR
Data type	UNSIGNED24
Category	Optional

Table 274 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED24
Default value	00 $03E8_h$

9.9.9 6087_h: Chamber temperature scaling offset

This object shall indicate the chamber temperature scaling offset, which is needed to calculate the chamber temperature process values from the chamber temperature field values. The value shall be given in °C. Table 275 and Table 276 provide the object description and the entry description.

Table 275 – Object description

Attribute	Value
INDEX	6087_h
Name	Chamber temp scaling offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 276 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	0000_h

9.9.10 6088_h: Chamber temperature field value

This object shall provide the converted value of the chamber temperature measurement. The value shall be given in the SI unit of the field value. Table 277 and Table 278 provide the object description and the entry description.

Table 277 – Object description

Attribute	Value
INDEX	6088_h
Name	Chamber temp field value
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 278 – Entry description

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

9.9.11 6089_h: Chamber temperature process value

This object shall provide the results of the chamber temperature input scaling and gives the measured quantity of the *chamber temperature process value*. In case of chamber

temperature measurement, *chamber temperature process value* shall be mapped to the corresponding part of object 6003_h

(Chamber temp process value) =
(Chamber temp field value * Chamber temp scaling factor) +(Chamber temp scaling offset)

If the *chamber temperature calibration object* is implemented, the *chamber temperature process value* shall be calculated as follows:

(Chamber temp process value) =
= (Chamber temp calibration object) * [(Chamber temp field value * Chamber temp scaling factor) + (Chamber temp scaling offset)]

The value shall be given in °C. The value of $FFFF_h$ shall indicate an invalid measurement. Table 279 and Table 280 provide the object description and the entry description.

Table 279 – Object description

Attribute	Value
INDEX	6089_h
Name	Chamber temp process value
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 280 – Entry description

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

9.9.12 $608A_h$: Chamber temperature decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the chamber temperature process value.

Table 281 provides the value definition. Table 282 and Table 283 provide the object description and the entry description.

Table 281 – Value definition

Value [hex]	Description
00	1
FF	0,1
FE	0,01
Other values shall be reserved	

Table 282 – Object description

Attribute	Value
INDEX	$608A_h$
Name	Chamber temp decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 283 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	00_h

9.9.13 $608B_h$: Chamber temperature calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 284 and Table 285 provide the object description and the entry description.

Table 284 – Object description

Attribute	Value
INDEX	$608B_h$
Name	Chamber temp calibration object
Object code	VAR
Data type	UNSIGNED24
Category	Optional

Table 285 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED24
Default value	00 $03E8_h$

9.9.14 $608C_h$: Chamber temperature physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 31 illustrates the object structure. Table 286 and Table 287 provide the object description and the entry description.

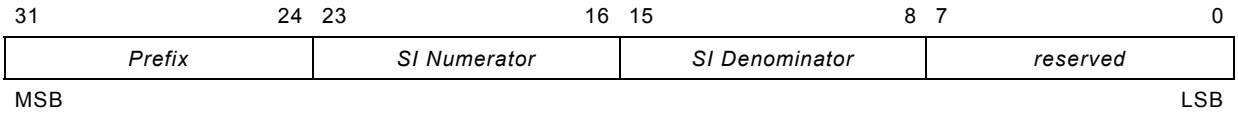

Figure 31 – Object structure

Table 286 – Object description

Attribute	Value
INDEX	$608C_h$
Name	Chamber temp physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 287 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.9.15 $608D_h$: Chamber temperature test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *Chamber temperature test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *Chamber temperature test value* shall be calculated as follows:

(Chamber temp test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 288 and Table 289 provide the object description and the entry description.

Table 288 – Object description

Attribute	Value
INDEX	$608D_h$
Name	Chamber temp test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 289 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.9.16 $608E_h$: Chamber temperature delta value

This object shall indicate a delta value for chamber temperature measuring. If the absolute value of the difference between current *chamber temperature process value* and last transmitted *chamber temperature process value* exceeds the *chamber temperature delta value* and if the *chamber temperature process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in °C. A *value* of $FFFF_h$ shall indicate that the automatic transmission for the *chamber temperature process value* based on delta-values shall be de-activated. Table 290 and Table 291 provide the object description and the entry description.

Table 290 – Object description

Attribute	Value
INDEX	$608E_h$
Name	Chamber temp delta value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 291 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.10 Air pressure measurement

9.10.1 General information

The air pressure is the actual measured value by air pressure measuring, in order to revise all other measured values depending on air pressure. The real entity related air pressure shall be calculated as follows:

(Air pressure) = (Air pressure process value) * (Air pressure decimal digits pv)

9.10.2 6090_h: Air pressure scaling 1 FV

This object shall indicate the field value of the first calibration point for the *air pressure*. The value shall be given in the SI unit of the field value. Table 292 and Table 293 provide the object description and the entry description.

Table 292 – Object description

Attribute	Value
INDEX	6090_h
Name	Air pressure scaling 1 fv
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 293 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.10.3 6091_h: Air pressure scaling 1 PV

This object shall indicate the process value of the first calibration point for the *air pressure.* The value shall be given in hPa. Table 294 and Table 295 provide the object description and the entry description.

Table 294 – Object description

Attribute	Value
INDEX	6091_h
Name	Air pressure scaling 1 pv
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 295 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.10.4 6092_h: Air pressure scaling 2 FV

This object shall indicate the field value of the second calibration point for the *air pressure.* The value shall be given in the SI unit of the field value. Table 296 and Table 297 provide the object description and the entry description.

Table 296 – Object description

Attribute	Value
INDEX	6092_h
Name	Air pressure scaling 2 fv
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 297 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.10.5 6093_h: Air pressure scaling 2 PV

This object shall indicate the process value of the second calibration point for the *air pressure.* The value shall be given in hPa. Table 298 and Table 299 provide the object description and the entry description.

Table 298 – Object description

Attribute	Value
INDEX	6093_h
Name	Air pressure scaling 2 pv
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 299 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.10.6 6094_h: Air pressure offset

This object shall indicate the additional offset for the *air pressure process value 1* and *2.* The value shall be given in hPa. Table 300 and Table 301 provide the object description and the entry description.

Table 300 – Object description

Attribute	Value
INDEX	6094_h
Name	Air pressure offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 301 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	0000_h

9.10.7 6095_h: Air pressure autozero

Writing a signature value of zero to this object shall cause a modification of the air pressure offset in the way that the actual air pressure process value becomes 0. The autozero function shall be performed for one time.

Figure 32 provides the value definition. Table 302 and Table 303 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 32 – Chamber temperature autozero write access signature

Table 302 – Object description

Attribute	Value
INDEX	6095_h
Name	Air pressure autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 303 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.10.8 6096_h: Air pressure scaling factor

This object shall indicate the air pressure scaling factor by which the air pressure field value needs to be multiplied to get a air pressure process value. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 304 and Table 305 provide the object description and the entry description.

Table 304 – Object description

Attribute	Value
INDEX	6096_h
Name	Air pressure scaling factor
Object code	VAR
Data type	UNSIGNED24
Category	Optional

Table 305 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED24
Default value	00 $03E8_h$

9.10.9 6097_h: Air pressure scaling offset

This object shall indicate the air pressure scaling offset, which is needed to calculate the air pressure process values from the air pressure field values. The value shall be given in hPa. Table 306 and Table 307 provide the object description and the entry description.

Table 306 – Object description

Attribute	Value
INDEX	6097_h
Name	Air pressure scaling offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 307 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER16
Default value	0000_h

9.10.10 6098_h: Air pressure field value

This object shall provide the converted value of the air pressure measurement. The value shall be given in the SI unit of the field value. Table 308 and Table 309 provide the object description and the entry description.

Table 308 – Object description

Attribute	Value
INDEX	6098_h
Name	Air pressure field value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 309 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.10.11 6099_h: Air pressure process value

This object shall provide the results of the air pressure input scaling and gives the measured quantity of the *air pressure process value*. In case of air pressure measurement, *air pressure process value* shall be mapped to the corresponding part of object 6003_h

(Air pressure process value) =
(Air pressure field value * Air pressure scaling factor) + (Air pressure scaling offset)

If the *air pressure calibration object* is implemented, the *air pressure process value* shall be calculated as follows:

(Air pressure process value) =
= (Air pressure calibration object) * [(Air pressure field value * Air pressure scaling factor) +
+(Air pressure scaling offset)]

The value shall be given in hPa. The value of $FFFF_h$ shall indicate an invalid measurement. Table 310 and Table 311 provide the object description and the entry description.

Table 310 – Object description

Attribute	Value
INDEX	6099_h
Name	Air pressure process value
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 311 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.10.12 $609A_h$: Air pressure decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *air pressure process value*.

Table 312 provides the value definition. Table 313 and Table 314 provide the object description and the entry description.

Table 312 – Value definition

Value [hex]	Description
02	1
01	0,1
Other values shall be reserved	

Table 313 – Object description

Attribute	Value
INDEX	$609A_h$
Name	Air pressure decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 314 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	*See value definition*
Default value	02_h

9.10.13 $609B_h$: Air pressure calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 315 and Table 316 provide the object description and the entry description.

Table 315 – Object description

Attribute	Value
INDEX	$609B_h$
Name	Air pressure calibration object
Object code	VAR
Data type	UNSIGNED24
Category	Optional

Table 316 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED24
Default value	00 $03E8_h$

9.10.14 $609C_h$: Air pressure physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 33 illustrates the object structure. Table 317 and Table 318 provide the object description and the entry description.

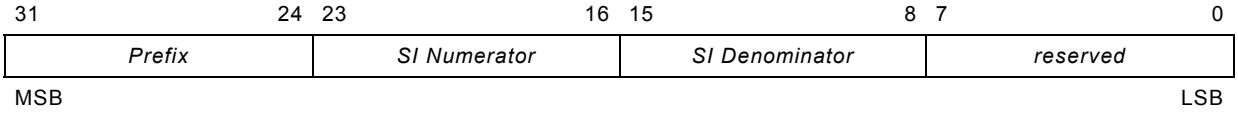

Figure 33- Object structure

Table 317 – Object description

Attribute	Value
INDEX	$609C_h$
Name	Air pressure physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 318 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.10.15 $609D_h$: Air pressure test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific "expected value". The threshold value for regarding a test as successful or not is application specific as well. The *air pressure test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *air pressure test value* shall be calculated as follows:

(Air pressure test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 319 and Table 320 provide the object description and the entry description.

Table 319 – Object description

Attribute	Value
INDEX	$609D_h$
Name	Air pressure test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 320 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.10.16 $609E_h$: Air pressure delta value

This object shall indicate a delta value for air pressure measuring. If the absolute value of the difference between current *air pressure process value* and last transmitted *air pressure process value* exceeds the *air pressure delta value* and if the *air pressure process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in hPa. A *value* of $FFFF_h$ shall indicate that the automatic transmission for the *air pressure process value* based on delta-values shall be de-activated. Table 321 and Table 322 provide the object description and the entry description.

Table 321 – Object description

Attribute	Value
INDEX	$609E_h$
Name	Air pressure delta value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 322 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED16
Default value	Manufacturer specific

9.11 MD entrance/skin dose measurement

9.11.1 General information

The entrance/skin dose is the actual measured value by entrance/skin dose measuring, defined as the dose at the patient plane. It may be calculated by the DMS from the dose or DAP at the metering chamber, using the distances from focal point to metering chamber and patient plane and or from the DAP at the metering chamber, using the irradiated area at the chamber plane also. For calculation of the *MD es dose process value*, the corresponding distances provided by object 6006_h and object 6009_h shall be used.

The real entity related MD entrance/skin dose shall be calculated as follows:

(MD es dose) = (MD es dose process value) * (MD es dose decimal digits pv)

The measured value is called *MD entrance/skin dose*, because it is calculated corresponding to the currently measured distance (MD) between the metering chamber and the patient plane. The result of that distance measuring shall be provided by object 6007_h.

9.11.2 $60A0_h$: MD entrance/skin dose scaling 1 FV

This object shall indicate the *MD entrance/skin dose field value* of the first calibration point for the *MD entrance/skin dose*. The value shall be given in the SI unit of the field value. Table 323 and Table 324 provide the object description and the entry description.

Table 323 – Object description

Attribute	Value
INDEX	$60A0_h$
Name	MD es dose scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 324 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.11.3 $60A1_h$: MD entrance/skin dose scaling 1 PV

This object shall indicate the process value of the first calibration point for the *MD entrance/skin dose.* The value shall be given in mGy. Table 325 and Table 326 provide the object description and the entry description.

Table 325 – Object description

Attribute	Value
INDEX	$60A1_h$
Name	MD es dose scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 326 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.11.4 $60A2_h$: MD entrance/skin dose scaling 2 FV

This object shall indicate the field value of the second calibration point for the *MD entrance/skin dose*. The value shall be given in the SI unit of the field value. Table 327 and Table 328 provide the object description and the entry description.

Table 327 – Object description

Attribute	Value
INDEX	$60A2_h$
Name	MD es dose scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 328 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.11.5 $60A3_h$: MD entrance/skin dose scaling 2 PV

This object shall indicate the process value of the second calibration point for the *MD entrance/skin dose*. The value shall be given in mGy. Table 329 and Table 330 provide the object description and the entry description.

Table 329 – Object description

Attribute	Value
INDEX	$60A3_h$
Name	MD es dose scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 330 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.11.6 $60A4_h$: MD entrance/skin dose offset

This object shall indicate the additional offset for the *MD entrance/skin dose process value 1* and *2.* The value shall be given in mGy. Table 331 and Table 332 provide the object description and the entry description.

Table 331 – Object description

Attribute	Value
INDEX	$60A4_h$
Name	MD es dose offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 332 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.11.7 $60A5_h$: MD entrance/skin dose autozero

Writing a signature value of zero to this object shall cause a modification of the *MD entrance/skin dose offset* in the way, that the actual *MD entrance/skin dose process value* becomes 0. The autozero function shall be performed for one time.

Figure 34 provides the value definition. Table 333 and Table 334 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 34 – MD entrance/skin dose autozero write access signature

Table 333 – Object description

Attribute	Value
INDEX	$60A5_h$
Name	MD es dose autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 334 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.11.8 $60A6_h$: MD entrance/skin dose scaling factor

This object shall indicate the MD entrance/skin dose scaling factor by which the MD entrance/skin field value needs to be multiplied to get a MD entrance/skin process value. This value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 335 and Table 336 provide the object description and the entry description.

Table 335 – Object description

Attribute	Value
INDEX	$60A6_h$
Name	MD es dose scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 336 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.11.9 $60A7_h$: MD entrance/skin dose scaling offset

This object shall indicate the MD entrance/skin dose scaling offset, which is needed to calculate the MD entrance/skin dose process values from the MD entrance/skin dose field

values. The value shall be given in mGy. Table 337 and Table 338 provide the object description and the entry description.

Table 337 – Object description

Attribute	Value
INDEX	$60A7_h$
Name	MD es dose scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 338 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.11.10 $60A8_h$: MD entrance/skin dose field value

This object shall provide the converted value of the RD entrance/skin dose measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 339 and Table 340 provide the object description and the entry description.

Table 339 – Object description

Attribute	Value
INDEX	$60A8_h$
Name	MD es dose field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 340 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.11.11 $60A9_h$: MD entrance/skin dose process value

This object shall provide the results of the MD entrance/skin dose input scaling and gives the measured quantity of the *MD entrance/skin dose process value*. In case of MD entrance/skin dose measurement, *MD entrance/skin dose process value* shall be mapped to the corresponding part of object 6003_h

(MD es dose process value) =
= (MD es dose field value * MD es dose scaling factor) + (MD es dose scaling offset)

If the *MD entrance/skin dose calibration object* is implemented, the *MD entrance/skin dose process value* shall be calculated as follows:

(MD es dose process value) =
= (MD es dose calibration object) * [(MD es dose field value * MD es dose scaling factor) +
+ (MD es dose pressure scaling offset)]

The value shall be given in mGy. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. Table 341 and Table 342 provide the object description and the entry description.

Table 341 – Object description

Attribute	Value
INDEX	$60A9_h$
Name	MD es dose process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 342 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	Unsigned32
Default value	No

9.11.12 $60AA_h$: MD entrance/skin dose decimal digit PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the *MD entrance/skin dose process value*.

Table 343 provides the value definition. Table 344 and Table 345 provide the object description and the entry description.

Table 343 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001
Other values shall be reserved	

Table 344 – Object description

Attribute	Value
INDEX	$60AA_h$
Name	MD es dose decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 345 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FD_h

9.11.13 $60AB_h$: MD entrance/skin dose calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 346 and Table 347 provide the object description and the entry description.

Table 346 – Object description

Attribute	Value
INDEX	$60AB_h$
Name	MD es dose calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 347 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	$0000\ 03E8_h$

9.11.14 $60AC_h$: MD entrance/skin dose physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 35 illustrates the object structure. Table 348 and Table 349 provide the object description and the entry description.

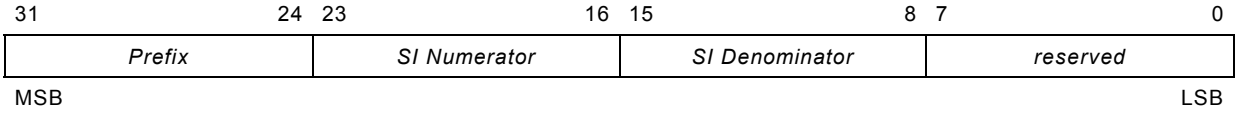

Figure 35 – Object structure

Table 348 – Object description

Attribute	Value
INDEX	$60AC_h$
Name	MD es dose physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 349 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.11.15 $60AD_h$: MD entrance/skin dose test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *MD entrance/skin dose test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *MD entrance/skin dose test value* shall be calculated as follows:

(MD es dose test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 350 and Table 351 provide the object description and the entry description.

Table 350 – Object description

Attribute	Value
INDEX	$60AD_h$
Name	MD es dose test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 351 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.11.16 $60AE_h$: MD entrance/skin dose delta value

This object shall indicate a delta value for MD entrance/skin dose measuring. If the absolute value of the difference between current *MD entrance/skin dose process value* and last transmitted *MD entrance/skin dose process value* exceeds the *MD entrance/skin dose delta value* and if the *MD entrance/skin dose process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in mGy. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *MD entrance/skin dose process value* based on delta-values shall be de-activated. Table 352 and Table 353 provide the object description and the entry description.

Table 352 – Object description

Attribute	Value
INDEX	$60AE_h$
Name	MD es dose delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 353 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.12 MD entrance/skin dose rate measurement

9.12.1 General information

The entrance/skin dose rate is the actual measured value by entrance/skin dose rate measuring, defined as the dose rate at the patient plane. It may be calculated by the DMS from the dose rate or DAPR at the metering chamber, using the distances from focal point to metering chamber and patient plane and or from the DAPR at the metering chamber, using the irradiated area at the chamber plane also. For calculation of the *MD es dose rate process value*, the corresponding distances provided by object 6006_h and object 6009_h shall be used.

The real entity related MD entrance/skin dose rate shall be calculated as follows:

(MD es dose rate) = (MD es dose rate process value) * (MD es dose rate decimal digits pv)

The measured value is called *MD entrance/skin dose rate*, because it is calculated corresponding to the currently measured distance (MD) between the metering chamber and the patient plane. The result of that distance measuring shall be provided by object 6007_h.

9.12.2 $60B0_h$: MD entrance/skin dose rate scaling 1 FV

This object shall indicate the field value of the first calibration point for the *MD entrance/skin dose rate*. The value shall be given in the SI unit of the field value. Table 354 and Table 355 provide the object description and the entry description.

Table 354 – Object description

Attribute	Value
INDEX	$60B0_h$
Name	MD es dose rate scaling 1 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 355 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.12.3 $60B1_h$: MD entrance/skin dose rate scaling 1 PV

This object shall indicate the process value of the first calibration point for the *MD entrance/skin dose rate.* The value shall be given in mGy/s. Table 356 and Table 357 provide the object description and the entry description.

Table 356 – Object description

Attribute	Value
INDEX	$60B1_h$
Name	MD es dose rate scaling 1 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 357 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.12.4 $60B2_h$: MD entrance/skin dose rate scaling 2 FV

This object shall indicate the field value of the second calibration point for the *MD entrance/skin dose rate*. The value shall be given in the SI unit of the field value. Table 358 and Table 359 provide the object description and the entry description.

Table 358 – Object description

Attribute	Value
INDEX	$60B2_h$
Name	MD es dose rate scaling 2 fv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 359 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.12.5 $60B3_h$: MD entrance/skin dose rate scaling 2 PV

This object shall indicate the process value of the second calibration point for the *MD entrance/skin dose rate*. The value shall be given in mGy/s. Table 360 and Table 361 provide the object description and the entry description.

Table 360 – Object description

Attribute	Value
INDEX	$60B3_h$
Name	MD es dose rate scaling 2 pv
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 361 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

9.12.6 $60B4_h$: MD entrance/skin dose rate offset

This object shall indicate the additional offset for the *MD entrance/skin dose rate process value 1* and *2.* The value shall be given in mGy/s. Table 362 and Table 363 provide the object description and the entry description.

Table 362 – Object description

Attribute	Value
INDEX	$60B4_h$
Name	MD es dose rate offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 363 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	$0000\ 0000_h$

9.12.7 $60B5_h$: MD entrance/skin dose rate autozero

Writing a signature value of zero to this object shall cause a modification of the *MD entrance/skin dose rate offset* in the way, that the *MD entrance/skin dose rate process value* becomes 0. The autozero function shall be performed for one time.

Figure 36 provides the value definition. Table 364 and Table 365 provide the object description and the entry description.

	MSB			LSB
/ISO646/	o	r	e	z
hex	6F	72	65	7A

Figure 36 – MD entrance/skin dose rate autozero write access signature

Table 364 – Object description

Attribute	Value
INDEX	$60B5_h$
Name	MD es dose rate autozero
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 365 – Entry description

Attribute	Value
Sub-index	00_h
Access	wo
PDO mapping	No
Value range	*See value definition*
Default value	No

9.12.8 $60B6_h$: MD entrance/skin dose rate scaling factor

This object shall indicate the MD entrance/skin dose rate scaling factor by which the MD entrance/skin dose rate field value needs to be multiplied to get a MD entrance/skin dose rate process value. This value shall be dimensionless. The value shall be given in multiples of 0.001_d.

Table 366 and Table 367 provide the object description and the entry description.

Table 366 – Object description

Attribute	Value
INDEX	$60B6_h$
Name	MD es dose rate scaling factor
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 367 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	0000 $03E8_h$

9.12.9 $60B7_h$: MD entrance/skin dose rate scaling offset

This object shall indicate the MD entrance/skin dose rate scaling offset, which is needed to calculate the MD entrance/skin dose rate process values from the MD entrance/skin dose rate field values. The value shall be given in mGy/s.

Table 368 and Table 369 provide the object description and the entry description.

Table 368 – Object description

Attribute	Value
INDEX	$60B7_h$
Name	MD es dose rate scaling offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 369 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	INTEGER32
Default value	0000 0000_h

9.12.10 $60B8_h$: MD entrance/skin dose rate field value

This object shall provide the converted value of the MD entrance/skin dose rate measurement. The value shall be integrated up to the controlled overflow. The value shall be given in the SI unit of the field value. Table 370 and Table 371 provide the object description and the entry description.

Table 370 – Object description

Attribute	Value
INDEX	$60B8_h$
Name	MD es dose rate field value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 371 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.12.11 $60B9_h$: MD entrance/skin dose rate process value

This object shall provide the results of the MD entrance/skin dose rate input scaling and gives the measured quantity of the *MD entrance/skin dose rate process value*. In case of MD entrance/skin dose rate measurement, MD entrance/skin dose rate process value shall be mapped to the corresponding part of object 6003_h.

(MD es dose rate process value) =
= (MD es dose rate field value * MD es dose rate scaling factor) + (MD es dose rate scaling offset)

If the *MD entrance/skin dose rate calibration object* is implemented, the *MD entrance/skin dose rate process value* shall be calculated as follows:

(MD es dose process value) =
= (MD es dose calibration object) * [(MD es dose field value * MD es dose scaling factor) +
+ (MD es dose pressure scaling offset)]

The value shall be given in mGy/s. The value of FFFF $FFFF_h$ shall indicate an invalid measurement. Table 372 and Table 373 provide the object description and the entry description.

Table 372 – Object description

Attribute	Value
INDEX	$60B9_h$
Name	MD es dose rate process value
Object code	VAR
Data type	UNSIGNED32
Category	Mandatory

Table 373 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED32
Default value	No

9.12.12 $60BA_h$: MD entrance/skin dose rate decimal digits PV

This object shall provide the number of decimal digits following the decimal point for interpretation of the data type of the *MD entrance/skin dose rate process value*.

Table 374 provides the value definition. Table 375 and Table 376 provide the object description and the entry description.

Table 374 – Value definition

Value [hex]	Description
FD	1
FC	0,1
FB	0,01
FA	0,001
Other values shall be reserved	

Table 375 – Object description

Attribute	Value
INDEX	$60BA_h$
Name	MD es dose rate decimal digits pv
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 376 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro (rw in ERROR/CONFIG)
PDO mapping	No
Value range	*See value definition*
Default value	FD_h

9.12.13 $60BB_h$: MD entrance/skin dose rate calibration object

This object shall indicate a calibration factor, which is sent to the device via the CANopen network. The value shall be dimensionless. The value shall be given in multiples of 0.001_d. Table 377 and Table 378 provide the object description and the entry description.

Table 377 – Object description

Attribute	Value
INDEX	$60BB_h$
Name	MD es dose rate calibration object
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 378 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	$0000\ 03E8_h$

9.12.14 $60BC_h$: MD entrance/skin dose rate physical unit FV

This object shall provide the physical unit of the field value. For representation of the SI units the codes given in /CiA303-2/ shall be used.

Figure 37 illustrates the object structure. Table 379 and Table 380 provide the object description and the entry description.

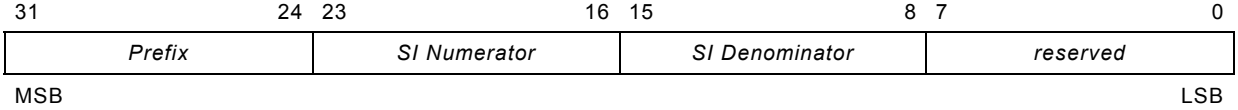

Figure 37 – Object structure

Table 379 – Object description

Attribute	Value
INDEX	$60BC_h$
Name	MD es dose rate physical unit fv
Object code	VAR
Data type	UNSIGNED32
Category	Conditional; mandatory if objects representing field values are used

Table 380 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	*See value definition*
Default value	Manufacturer specific

9.12.15 $60BD_h$: MD entrance/skin dose rate test value

To decide, whether the self-test (during *test state*) was successful or not, the measured value during self-test shall be compared with an application specific “expected value”. The threshold value for regarding a test as successful or not is application specific as well. The *MD entrance/skin dose rate test value* shall provide the deviation of the measured value to the expected value in percent. Therefore the *MD entrance/skin dose rate test value* shall be calculated as follows:

(MD es dose rate test value) = 100 * (Measured value during test) / (Expected value)

The value shall be dimensionless. The value shall be given in multiples of 0.1_d. Table 381 and Table 382 provide the object description and the entry description.

Table 381 – Object description

Attribute	Value
INDEX	$60BD_h$
Name	MD es dose rate test value
Object code	VAR
Data type	UNSIGNED16
Category	Optional

Table 382 – Entry description

Attribute	Value
Sub-index	00_h
Access	ro
PDO mapping	No
Value range	UNSIGNED16
Default value	No

9.12.16 $60BE_h$: MD entrance/skin dose rate delta value

This object shall indicate a delta value for MD entrance/skin dose rate measuring. If the absolute value of the difference between current *MD entrance/skin dose rate process value* and last transmitted *MD entrance/skin dose rate process value* exceeds the *MD entrance/skin dose rate delta value* and if the *MD entrance/skin dose rate process value* is mapped to the *current process value*, the 2nd TPDO shall be transmitted.

The value shall be given in mGy/s. A *value* of FFFF $FFFF_h$ shall indicate that the automatic transmission for the *MD entrance/skin dose rate process value* based on delta-values shall be de-activated. Table 383 and Table 384 provide the object description and the entry description.

Table 383 – Object description

Attribute	Value
INDEX	$60BE_h$
Name	MD es dose rate delta value
Object code	VAR
Data type	UNSIGNED32
Category	Optional

Table 384 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED32
Default value	Manufacturer specific

