CiA 410

Device profile for inclinometer

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1 Scope

This specification represents the CANopen device profile for one- and two-axis inclinometers.

2 Normative references

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

3 Abbreviations and definitions

3.1 Abbreviations

The abbreviations given in /CiA301/ apply for this document as well.

3.2 Definitions

The definitions given in /CiA301/ apply to this specification as well.

4 Operating principle

4.1 Introduction

One-axis inclinometers provide only longitudinal slope axis value. Two-axis inclinometers provide additionally lateral slope axis value. These values are mapped into PDOs by default, which are transmitted synchronously. The inclinometer device may support optionally synchronisation producer, time-stamp producer/consumer, emergency producer/consumer functionality, and additional PDOs. For new designs, it is highly recommended to support heartbeat functionality.

4.2 Offset and differential offset

The slope value (displayed value) is the sum of the physical measurement (true value), differential offset and offset.

5 Error handling

5.1 Principle

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

5.2 Error behaviour

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

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

Serious device errors are caused by device internal failures, too.

5.3 Additional error code meanings

Table 1 specifies the additional error code meanings.

Table 1 – Additional error code meanings

Error code	Meaning
5010_h	Longitudinal value out of range
5020_h	Lateral value out of range
$FF01_h$	Longitudinal sensor is defect
$FF02_h$	Lateral sensor is defect

6 Predefinitions

6.1 General

This clause provides additional specifications with regard to the communication objects, which are already pre-defined in /CiA301/.

6.2 Pre-defined communication objects

6.2.1 Object 1000_h: Device type

The object at index 1000_h provides the type of device and its functionality. For multiple device modules the additional information field contains $FFFF_h$ (see /CiA 301/). In this case, the object $67FF_h$ shall be implemented. For the object and entry description see /CiA301/.

Figure 1 specifies the object structure and Table 2 specifies the value definition.

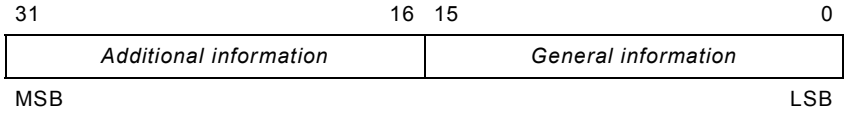

Figure 1 – Object structure

Table 2 – Value definition

Field	Value	Definition
General Information	410_d	Device profile number
Additional information	0000_h 0001_h 0002_h 0003_h 0004_h 0005_h to $FFFE_h$ $FFFF_h$	see /CiA 301/ One axis with resolution max. 16-bit Two axis with resolution max. 16-bit One axis with resolution max. 32-bit Two axis with resolution max. 32-bit reserved see /CiA 301/

6.2.2 Object 1001_h: Error register

The device-profile specific bit in the error register shall indicate the occurrence of out-of-range errors for slope values or of defect sensors. Table 3 provides the value definition.

Table 3 - Value definition for Bit 5: Device profile specific error

Bit value	Description
0	No device-profile specific error is currently active
1	Device-profile specific error is currently active
NOTE Bit 1 to 7 provide just additional error information. In any error conditions, the generic error (bit 0) is set to 1 (for details see /CiA301/)	

6.2.3 Object 1029_h: Error behaviour

This object specifies to which state the CANopen device shall be set, when a communication error is detected. Besides the specification given in /CiA301/ the following sub-indexes may be implemented additionally. If the object is not implemented the device shall behave as the default values define.

For the value definition and object description see /CiA301/. Table 4 specifies the entry description.

Table 4 – Entry description

Attribute	Value
Sub-index	02_h
Description	Sync error
Entry category	Optional
Access	rw
PDO mapping	No
Value range	00_h to 02_h
Default value	00_h
Sub-index	03_h
Description	Internal device error
Entry category	Optional
Access	rw
PDO mapping	No
Value range	00_h to 02_h
Default value	00_h

6.2.4 PDO definition

6.2.4.1 General

The inclinometer shall support the default TPDOs. It may support additional manufacturer-specific PDOs. Additional event-driven TPDOs shall be transmitted when entering the NMT operational state, and may be transmitted when a mapped process data is changing.

6.2.4.2 TPDO 1

The TPDO 1 is defined by the following parameter sets.

Table 5 specifies the object description of the PDO communication parameter and Table 6 specifies the associated entry description. The values are defined in /CiA301/. The sub-index 04_h is reserved for compatibility reasons and shall not be implemented.

Table 5 – Object description

Attribute	Value
Index	1800_h
Name	TPDO1 communication parameter
Object code	RECORD
Data type	PDO_COMMUNICATION_PARAMETER
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	02_h to 06_h
Default value	Manufacturer-specific
Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	{0000 0180_h or 4000 0180_h} + node-ID
Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	01_h
Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h
Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h

Attribute	Value
Sub-index	06_h
Description	SYNC start value
Entry category	Optional
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	Manufacturer-specific

Table 7 specifies the object description of the PDO mapping parameter and Table 8 specifies the associated entry description. The values are defined in /CiA301/.

Table 7 – Object description

Attribute	Value
Index	$1A00_h$
Name	TPDO1 mapping parameter
Object code	RECORD
Data type	PDO_MAPPING
Category	Mandatory

Table 8 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const or rw (if variable mapping is supported)
PDO mapping	No
Value range	See /CiA301/
Default value	01_h or 02_h
Sub-index	01_h
Description	1st application object
Entry category	Mandatory
Access	const or rw
PDO mapping	No
Value range	See /CiA301/
Default value	6010 00 10_h
Sub-index	02_h
Description	2nd application object
Entry category	Optional (see NOTE)
Access	const or rw
PDO mapping	No
Value range	See /CiA301/
Default value	6020 00 10_h

NOTE: Sub-index 02_h is optional depending on the device functionality as indicated in object 1000_h.

6.2.4.3 TPDO 2

The TPDO 2 is defined by the following parameter sets.

Table 9 specifies the object description of the PDO communication parameter and Table 10 specifies the associated entry description. The values are defined in /CiA301/. The sub-index 04h is reserved for compatibility reasons and shall not be implemented.

Table 9 – Object description

Attribute	Value
Index	1801_h
Name	TPDO 2 communication parameter
Object code	RECORD
Data type	PDO_COMMUNICATION_PARAMETER
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	02_h to 06_h
Default value	Manufacturer-specific
Sub-index	01_h
Description	COB-ID
Entry category	Mandatory
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	{0000 0280_h or 0400 0280_h} + node-ID
Sub-index	02_h
Description	Transmission type
Entry category	Mandatory
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	01_h

Sub-index	03_h
Description	Inhibit time
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h
Sub-index	05_h
Description	Event timer
Entry category	Optional
Access	rw
PDO mapping	No
Value range	See /CiA301/
Default value	0000_h
Sub-index	06_h
Description	SYNC start value
Entry category	Optional
Access	rw or const
PDO mapping	No
Value range	See /CiA301/
Default value	Manufacturer-specific

Table 11 specifies the object description of the PDO mapping parameter and Table 12 specifies the associated entry description. The values are defined in /CiA301/.

Table 11 – Object description

Attribute	Value
Index	$1A01_h$
Name	TPDO 2 mapping parameter
Object code	RECORD
Data type	PDO_MAPPING
Category	Mandatory

Table 12 – Entry description

Attribute	Value
Sub-index	00_h
Description	Highest sub-index supported
Entry category	Mandatory
Access	const or rw (if variable mapping is supported)
PDO mapping	No
Value range	See /CiA301/
Default value	01_h or 02_h

Attribute	Value
Sub-index	01_h
Description	1st application object
Entry category	Mandatory
Access	const or rw
PDO mapping	No
Value range	See /CiA301/
Default value	6110 00 20_h
Sub-index	02_h
Description	2nd application object
Entry category	Optional (see NOTE)
Access	const or rw
PDO mapping	No
Value range	See /CiA301/
Default value	6120 00 20_h
NOTE: Sub-index 02_h is optional depending on the device functionality as indicated in object 1000_h.	

7 Object dictionary

7.1 Introduction

Each inclinometer compliant with this device profile shall share the CANopen object dictionary entries from 6000_h to $67FF_h$. These entries are common to all inclinometers. However, each device only implements those objects relevant to its functionality. Object description and entry description are specified in /CiA301/.

Inclinometers support by default 16-bit slope values. Optionally they may support 32-bit slope values as well.

7.2 Application objects

7.2.1 Object 6000_h: Resolution

This object shall indicate the resolution of *Slope long16* (object 6010_h) and *Slope lateral16* (object 6020_h) objects based on 0,001°. This resolution is also valid for the 32-bit value objects (6110_h and 6120_h).

Table 13 specifies the value definition. If the resolution is fixed and may not be changed, the access is read only.

Table 13 – Value definition

Value	Definition
1_d	0,001°
10_d	0,01°
100_d	0,1°
1000_d	1,0°
Other	reserved

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

Table 14 – Object description

Attribute	Value
Index	6000_h
Name	Resolution
Object code	VAR
Data type	UNSIGNED16
Category	Mandatory

Table 15 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	See Table 13
Default value	1_d

7.2.2 Object 6010_h: Slope long16

This object shall provide the 16-bit slope value of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 16 specifies the object description and Table 17 specifies the entry description.

Table 16 – Object description

Attribute	Value
Index	6010_h
Name	Slope long16
Object code	VAR
Data type	INTEGER16
Category	Mandatory

Table 17 – Entry description

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

7.2.3 Object 6011_h: Slope long16 operating parameter

This object shall indicate the interpretation of the *Slope long16* value.

If scaling is enabled, the *Slope long16* value shall be calculated accordingly to the following equation:

Slope long16 = physically measured angle + *Differential slope long16 offset* + *Slope long16 offset*

If scaling is disabled, the *Slope long16* value shall be equal to the physical measured angle.

Figure 2 specifies the object structure and Table 18 specifies the value definition.

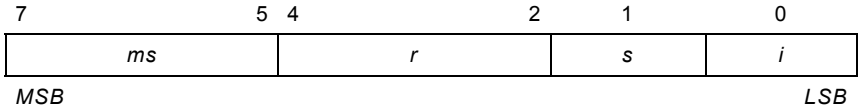

Figure 2 – Object structure

Table 18 – Value definition

Field	Value	Definition
ms		Manufacturer-specific
r	0_b	reserved
s (scaling)	0_b 1_b	Scaling not enabled Scaling enabled
i (inversion)	0_b 1_b	Inversion not enabled Inversion enabled

Table 19 specifies the object description and Table 20 specifies the entry description.

Table 19 – Object description

Attribute	Value
Index	6011_h
Name	Slope long16 operating parameter
Object code	VAR
Data type	UNSIGNED8
Category	Mandatory

Table 20 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	00_h

7.2.4 Object 6012_h: Slope long16 preset value

Accessing this object by means of SDO shall set directly the actual longitudinal slope value to a desired longitudinal slope value. The calculated application-offset of the longitudinal slope value is given in *Slope long16 offset* (object 6013_h). The *Slope long16 offset* is calculated with respect to object 6014_h. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 21 specifies the object description and Table 22 specifies the entry description.

Table 21 – Object description

Attribute	Value
Index	6012_h
Name	Slope long16 preset value
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 22 – Entry description

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

7.2.5 Object 6013_h: Slope long16 offset

This object shall indicate the application-offset of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. The following equation shall be applied:

Slope long16 offset = *Slope long16 preset value* at t_{acc} – slope physical measured at t_{acc} – *Differential slope long16 offset*

t_{acc} = *time when accessing object* 6012_h

Table 23 specifies the object description and Table 24 specifies the entry description.

Table 23 – Object description

Attribute	Value
Index	6013_h
Name	Slope long16 offset
Object code	VAR
Data type	INTEGER16
Category	Conditional; mandatory if 6012_h is implemented

Table 24 – Entry description

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

7.2.6 Object 6014_h: Differential slope long16 offset

This object shall shift the *Slope long16* value (object 6010_h) independent of *Slope long16 preset value* (object 6012_h) and *Slope long16 offset* (object 6013_h). The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 25 specifies the object description and Table 26 specifies the entry description.

Table 25 – Object description

Attribute	Value
Index	6014_h
Name	Differential slope long16 offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 26 – Entry description

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

7.2.7 Object 6020_h: Slope lateral16

This object shall provide the 16-bit slope value of the lateral axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 27 specifies the object description and Table 28 specifies the entry description.

Table 27 – Object description

Attribute	Value
Index	6020_h
Name	Slope lateral16
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 28 – Entry description

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

7.2.8 Object 6021_h: Slope lateral16 operating parameter

This object shall indicate the interpretation of the *Slope lateral16* value.

If scaling is enabled, the *Slope lateral16* value shall be calculated accordingly to the following equation:

Slope lateral16 = physically measured angle + *Differential slope lateral16 offset* + *Slope lateral16 offset*

If scaling is disabled, the *Slope lateral16* value shall be equal to the physical measured angle.

Figure 3 specifies the object structure and Table 29 specifies the value definition.

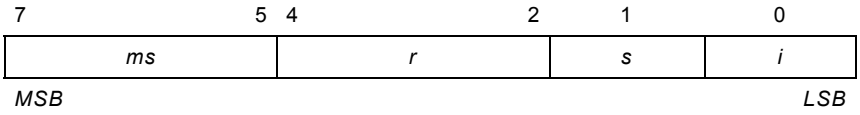

Figure 3 – Object structure

Table 29 – Value definition

Field	Value	Definition
ms		Manufacturer-specific
r	0_b	reserved
s (scaling)	0_b 1_b	Scaling not enabled Scaling enabled
i (inversion)	0_b 1_b	Inversion not enabled Inversion enabled

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

Table 30 – Object description

Attribute	Value
Index	6021_h
Name	Slope lateral16 operating parameter
Object code	VAR
Data type	UNSIGNED8
Category	Conditional; mandatory if 6020_h is implemented

Table 31 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	00_h

7.2.9 Object 6022_h: Slope lateral16 preset value

Accessing this object by means of SDO shall set the actual lateral slop value to a desired lateral slope value. The calculated application-offset of the lateral slope value is given in *Slope lateral16 offset* (object 6023_h). The *Slope lateral16 offset* is calculated with respect to object 6024_h. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 32 specifies the object description and Table 33 specifies the entry description.

Table 32 – Object description

Attribute	Value
Index	6022_h
Name	Slope lateral16 preset value
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 33 – Entry description

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

7.2.10 Object 6023_h: Slope lateral16 offset

This object shall provide the application-offset of the lateral axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. The following equation shall be applied:

Slope lateral16 offset = *Slope lateral16 preset value* at t_{acc} – slope physical measured at t_{acc} – *Differential slope lateral16 offset*

t_{acc} = *time when accessing object* 6022_h

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

Table 34 – Object description

Attribute	Value
Index	6023_h
Name	Slope lateral16 offset
Object code	VAR
Data type	INTEGER16
Category	Conditional; mandatory 6022_h is implemented

Table 35 – Entry description

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

7.2.11 Object 6024_h: Differential slope lateral16 offset

This object shall shift the *Slope lateral16* (object 6020_h) value independent of *Slope lateral16 preset value* (object 6022_h) and *Slope lateral16 offset* (object 6023_h).

The value shall be given in degree (angle) with the resolution given in object 6000_h.

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

Table 36 – Object description

Attribute	Value
Index	6024_h
Name	Differential slope lateral16 offset
Object code	VAR
Data type	INTEGER16
Category	Optional

Table 37 – Entry description

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

7.2.12 Object 6110_h: Slope long32

This object shall provide the 32-bit slope value of the longitudinal axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 38 specifies the object description and Table 39 specifies the entry description.

Table 38 – Object description

Attribute	Value
Index	6110_h
Name	Slope long32
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 39 – Entry description

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

7.2.13 Object 6111_h: Slope long32 operating parameter

This object shall indicate the interpretation of the *Slope long32* value:

If scaling is enabled, the *Slope long32* value shall be calculated accordingly to the following equation:

Slope long32 = physically measured angle + *Differential slope long32 offset* + *Slope long32 offset*

If scaling is disabled, the *Slope long32* value shall be equal to the physical measured angle.

Figure 4 specifies the object structure and Table 40 specifies the value definition.

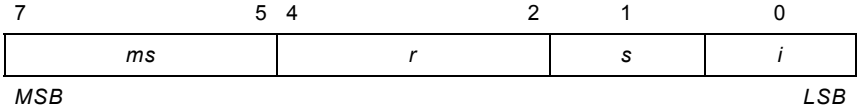

Figure 4 – Object structure

Table 40 – Value definition

Field	Value	Definition
ms		Manufacturer-specific
r	0_b	reserved
s (scaling)	0_b 1_b	Scaling not enabled Scaling enabled
i (inversion)	0_b 1_b	Inversion not enabled Inversion enabled

Table 41 specifies the object description and Table 42 specifies the entry description.

Table 41 – Object description

Attribute	Value
Index	6111_h
Name	Slope long32 operating parameter
Object code	VAR
Data type	UNSIGNED8
Category	Conditional; mandatory 6110_h is implemented

Table 42 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	No
Value range	UNSIGNED8
Default value	00_h

7.2.14 Object 6112_h: Slope long32 preset value

Accessing this object by means of SDO shall set the actual longitudinal slope value to a desired longitudinal value. The calculated application-offset of the longitudinal slope value shall be given in *Slope long32 offset* (object 6113_h). The *Slope long32 offset* shall be calculated with respect to object 6114_h. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 43 specifies the object description and Table 44 specifies the entry description.

Table 43 – Object description

Attribute	Value
Index	6112_h
Name	Slope long32 preset value
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 44 – Entry description

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

7.2.15 Object 6113_h: Slope long32 offset

This object shall provide the application-offset of the longitudinal axis. The value shall be based on the resolution given in object 6000_h. The following equation shall be applied:

Slope long32 offset = *Slope long32 preset value* at t_{acc} – slope physical measured at t_{acc} – *Differential slope long32 offset*

t_{acc} = *time when accessing object* 6112_h

The value shall be given in degree (angle) with the resolution given in object 6000_h.

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

Table 45 – Object description

Attribute	Value
Index	6113_h
Name	Slope long32 offset
Object code	VAR
Data type	INTEGER32
Category	Conditional; mandatory 6112_h is implemented

Table 46 – Entry description

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

7.2.16 Object 6114_h: Differential slope long32 offset

This object shall shift the *Slope long32* (object 6110_h) value independent of *Slope long32 preset value* (object 6112_h) and *Slope long32 offset* (object 6113_h). The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 47 specifies the object description and Table 48 specifies the entry description.

Table 47 – Object description

Attribute	Value
Index	6114_h
Name	Differential slope long32 offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 48 – Entry description

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

7.2.17 Object 6120_h: Slope lateral32

This object shall provide the 32-bit slope value of the lateral axis. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 49 specifies the object description and Table 50 specifies the entry description.

Table 49 – Object description

Attribute	Value
Index	6120_h
Name	Slope lateral32
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 50 – Entry description

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

7.2.18 Object 6121_h: Slope lateral32 operating parameter

This object shall indicate the interpretation of the *Slope lateral32* value.

If scaling is enabled, the *Slope lateral32* value shall be calculated accordingly to the following equation:

Slope lateral32 = physically measured angle + *Differential slope lateral32 offset* + *Slope lateral32 offset*

If scaling is disabled, the *Slope lateral32* value shall be equal to the physical measured angle.

Figure 5 specifies the object structure and Table 51 specifies the value definition. Table 52 specifies the object description and Table 53 specifies the entry description.

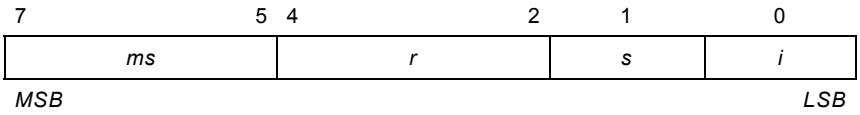

Figure 5 – Object structure

Table 51 – Value definition

Field	Value	Definition
ms		Manufacturer-specific
r	0_b	reserved
s (scaling)	0_b 1_b	Scaling not enabled Scaling enabled
i (inversion)	0_b 1_b	Inversion not enabled Inversion enabled

Table 52 – Object description

Attribute	Value
Index	6121_h
Name	Slope lateral32 operating parameter
Object code	VAR
Data type	UNSIGNED8
Category	Conditional: if 6120_h is implemented

Table 53 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	UNSIGNED8
Default value	00_h

7.2.19 Object 6122_h: Slope lateral32 preset value

Accessing this object by means of SDO shall set the actual slop lateral value to a desired lateral value. The calculated application-offset of the slope lateral shall be given in *Slope lateral32 offset* (object 6123_h). The *Slope lateral32 offset* shall be calculated with respect to object 6124_h. The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 54 specifies the object description and Table 55 specifies the entry description.

Table 54 – Object description

Attribute	Value
Index	6122_h
Name	Slope lateral32 preset value
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 55 – Entry description

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

7.2.20 Object 6123_h: Slope lateral32 offset

This object shall provide the application-offset of the lateral axis. The value shall be based on the resolution given in object 6000_h. The following equation shall be applied:

Slope lateral32 offset = *Slope lateral32 preset value* at t_{acc} – slope physical measured at t_{acc} – *Differential slope lateral32 offset*

t_{acc} = *time when accessing object* 6122_h

The value shall be given in degree (angle) with the resolution given in object 6000_h.

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

Table 56 – Object description

Attribute	Value
Index	6123_h
Name	Slope lateral32 offset
Object code	VAR
Data type	INTEGER32
Category	Conditional; mandatory if 6112_h is implemented

Table 57 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	0000 0000_h

7.2.21 Object 6124_h: Differential slope lateral32 offset

This object shall shift the *Slope lateral32* (object 6120_h) value independent of *Slope lateral32 preset value* (object 6122_h) and *Slope lateral32 offset* (object 6123_h). The value shall be given in degree (angle) with the resolution given in object 6000_h. Table 58 specifies the object description and Table 59 specifies the entry description.

Table 58 – Object description

Attribute	Value
Index	6124_h
Name	Differential slope lateral32 offset
Object code	VAR
Data type	INTEGER32
Category	Optional

Table 59 – Entry description

Attribute	Value
Sub-index	00_h
Access	rw
PDO mapping	Optional
Value range	INTEGER32
Default value	0000 0000_h

7.3 General device profile objects

7.3.1 Object $67FF_h$: Device type

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

Annex A (informative)

The Table 60 gives an overview on the application objects used by inclinometers compliant to this profile.

Table 60 – Overview on communication parameter and process data

Index	Name	Category
6000_h	Resolution	M
6010_h	Slope long16	M
6011_h	Slope long16 operating parameter	M
6012_h	Slope long16 preset value	O
6013_h	Slope long16 offset	C
6014_h	Differential slope long16 offset	O
6020_h	Slope lateral16	O
6021_h	Slope lateral16 operating parameter	C
6022_h	Slope lateral16 preset value	O
6023_h	Slope lateral16 offset	C
6024_h	Differential slope lateral16 offset	O
6110_h	Slope long32	O
6111_h	Slope long32 operating parameter	C
6112_h	Slope long32 preset value	O
6113_h	Slope long32 offset	C
6114_h	Differential slope long32 offset	O
6120_h	Slope lateral32	O
6121_h	Slope lateral32 operating parameter	C
6122_h	Slope lateral32 preset value	O
6123_h	Slope lateral32 offset	C
6124_h	Differential slope lateral32 offset	O
NOTE: M=Mandatory, O=Optional, C=Conditional		