



TEST REPORT

Nr. TR00026

1. Appointed Test Laboratory

Company:

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Contact Person:

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frantisek.brettl@siemens.com

2. Customer

Company:

TR-Electronic GmbH
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Trossingen
D-78647
Germany

Contact Person:

Jürgen Köhler
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Juergen.Koehler@tr-electronic.de

3. Tested Product

Name of Model	CMx36M
Manufacturer	TR-Electronic GmbH
FW Version	V01.00.00.00
FW Name	dqeja0.ufw
EFS Version	V00.01.06.13
HW Revision	A
Serial Number	J0000000003, J0000000005
Product Type	Absolute Rotary Encoder
Application	DQ100 based DRIVE-CLiQ Encoder
Resolution	12-bit multiturn and 12-bit singleturn
Safety Integrated Supported	<input type="checkbox"/>

4. Summary

Suggested to be certified Restrictions (see 7.) Suggested not to be certified

Conformance tests for DQ100 based DRIVE-CLiQ encoder were executed in accordance with:
DQ Conformance Test Specification V2.0

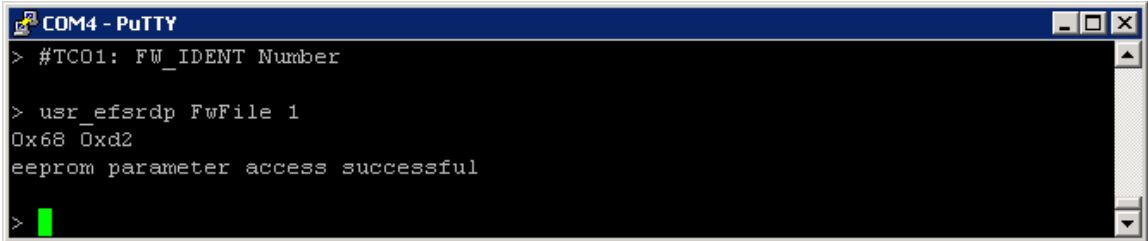
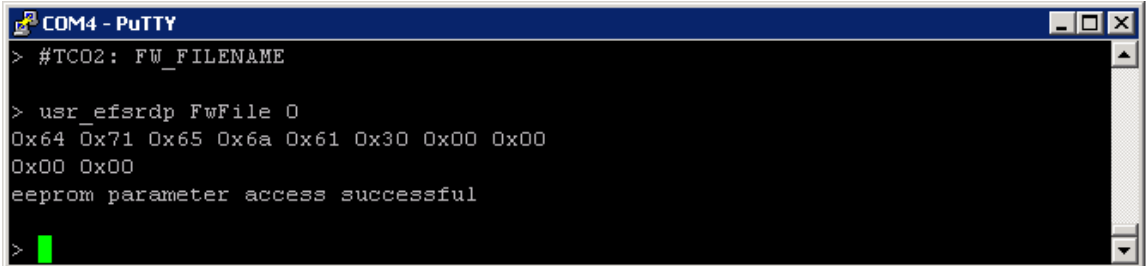
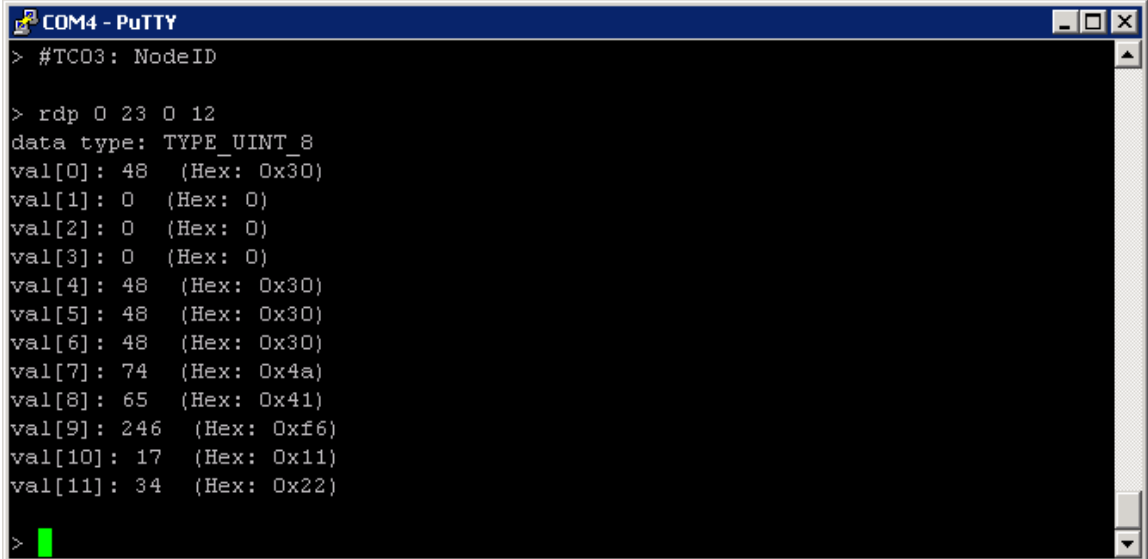
5. Test Results

Date of Test	07.08.-09.08.2013	Used Software	
Date of Report	09.08.2013	STARTER	V04.03.02.00 (68.33.00.00)
Tested Device	CMV36M-00005	SINAMICS	V4.4 HF4 (04.40.23.15)
Tested by	Frantisek Brettl	SINUMERIK	V4.4 SP1 HF3 (04.04.01.03.005)

Nr.	Name of Test Case	Passed	Failed	N/A*
TC01	FW_IDENT Number	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC02	FW_FILENAME	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC03	NodeID	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC04	EFS Consistency Check	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC05	Internal Encoder Parameter and Behavior Check	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC06	Error Provocation of Configurable Alarms	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC07	Provocation of Other Errors	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC08	Forced Test	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC09	Power ON Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC10	Plug/Unplug Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC11	Test after Switch ON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC12	Absolute Position after Switch OFF/ON	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC13	EPOS	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC14	Position and Speed Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC15	Commutation Angle Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC16	Frequency Response Test	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC17	Parking and Unparking Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC18	Different Sampling Time Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC19	Long Term Stability Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC20	SINAMICS FW Update / Regression Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC21	SLS Test (dbSI)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC22	SOS Test (dbSI)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC23	SINUMERIK Basic Operation Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
TC24	SINUMERIK Safety Integrated Test (ncSI)	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
TC25	RDY LED Test	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

* Not tested or skipped (detail is shown in chapter 6)

6. Comments

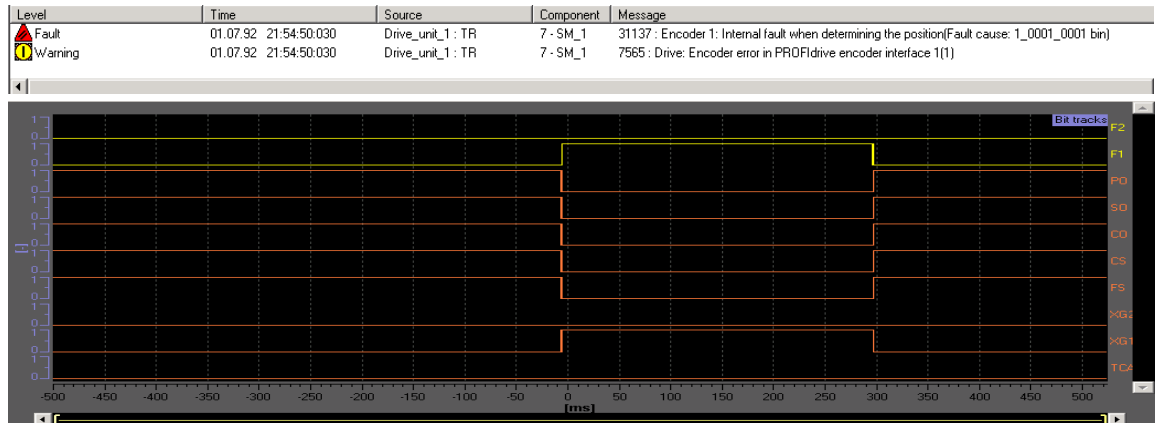
Nr.	Comment																																																	
TC01	<p>Correct FW_IDENT number 53864 (0xD268) assigned by DRIVE-CLiQ Support Center is used in firmware as well as in EFS.</p>  <pre> COM4 - PuTTY > #TC01: FW_IDENT Number > usr_efsrdp FwFile 1 0x68 0xd2 eeprom parameter access successful > </pre>																																																	
TC02	<p>Correct FW_FILE name “dqeja0.ufw” assigned by DRIVE-CLiQ Support Center is used.</p>  <pre> COM4 - PuTTY > #TC02: FW_FILENAME > usr_efsrdp FwFile 0 0x64 0x71 0x65 0x6a 0x61 0x30 0x00 0x00 0x00 0x00 eeprom parameter access successful > </pre>																																																	
TC03	<p>Correct NODE_ID is used. NodeID contains correct Device Type = 0x221, DSA Port = 1, Vendor ID = 0xF6 (TR-Electronic), Version = “A”, Vendor Letter = “J” (TR-Electronic) and Serial Number = “J0000000003”.</p>  <pre> COM4 - PuTTY > #TC03: NodeID > rdp 0 23 0 12 data type: TYPE_UINT_8 val[0]: 48 (Hex: 0x30) val[1]: 0 (Hex: 0) val[2]: 0 (Hex: 0) val[3]: 0 (Hex: 0) val[4]: 48 (Hex: 0x30) val[5]: 48 (Hex: 0x30) val[6]: 48 (Hex: 0x30) val[7]: 74 (Hex: 0x4a) val[8]: 65 (Hex: 0x41) val[9]: 246 (Hex: 0xf6) val[10]: 17 (Hex: 0x11) val[11]: 34 (Hex: 0x22) > </pre> <p>STARTER Component Overview:</p> <table border="1"> <thead> <tr> <th>Component</th> <th>No.</th> <th>FW version</th> <th>Type</th> <th>Order no.</th> <th>HW version</th> <th>Serial no.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>Actual</td> <td>Actual</td> <td>Actual</td> </tr> <tr> <td>Control_Unit.Control_Unit_1</td> <td>1</td> <td>4402315</td> <td>Closed-loop control module</td> <td>6SL3040-1MA00-0AA0</td> <td>B</td> <td>T-A56051455</td> </tr> <tr> <td>B_INF_02.Line_Module_2</td> <td>2</td> <td>4402313</td> <td>Supply</td> <td>6SL3130-1TE22-0AA0</td> <td>A</td> <td>T-A52049262</td> </tr> <tr> <td>TR.SM_1</td> <td>7</td> <td>1000000</td> <td>DRIVE-CLiQ encoder</td> <td>CMV36M-00005</td> <td>A</td> <td>J0000000003</td> </tr> <tr> <td>SERVO_03.Motor_Module_3</td> <td>3</td> <td>4402313</td> <td>Power_unit</td> <td>6SL3420-1TE13-0AA0</td> <td>A</td> <td>T-A46054179</td> </tr> <tr> <td>SERVO_03.SMI20_4</td> <td>4</td> <td>4402313</td> <td>SMI20/DGI</td> <td>6SL3055-0AA00-5MA3</td> <td>M</td> <td>T-C78242848</td> </tr> </tbody> </table>	Component	No.	FW version	Type	Order no.	HW version	Serial no.					Actual	Actual	Actual	Control_Unit.Control_Unit_1	1	4402315	Closed-loop control module	6SL3040-1MA00-0AA0	B	T-A56051455	B_INF_02.Line_Module_2	2	4402313	Supply	6SL3130-1TE22-0AA0	A	T-A52049262	TR.SM_1	7	1000000	DRIVE-CLiQ encoder	CMV36M-00005	A	J0000000003	SERVO_03.Motor_Module_3	3	4402313	Power_unit	6SL3420-1TE13-0AA0	A	T-A46054179	SERVO_03.SMI20_4	4	4402313	SMI20/DGI	6SL3055-0AA00-5MA3	M	T-C78242848
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TC04 No problem was discovered during EFS consistency check in EFS00.01.06.13
See TC04_J00003.txt and TC_04_J00005.txt

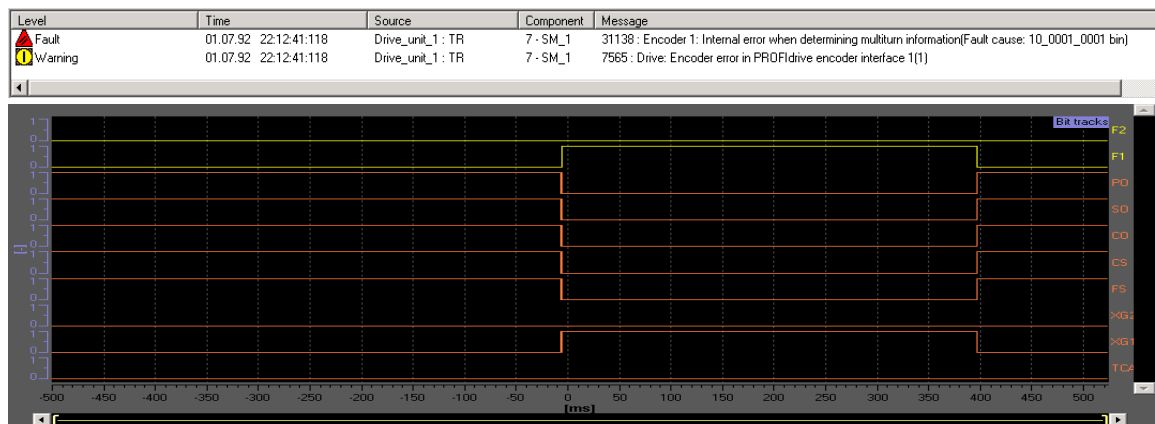
TC05 Test case passed. See TC05_J00003.txt and TC05_J00005.txt

TC06 Whole alarm handling procedure (including setting of TCA bit and alarm acknowledge) was tested with positive test result. Fault bit 0 generates alarm F3x137 and Fault bit 1 alarm F3x138 with appropriate error code, XG1 bit is set and SE bits (PO, SO, CO, CS and FS) are cleared as required.

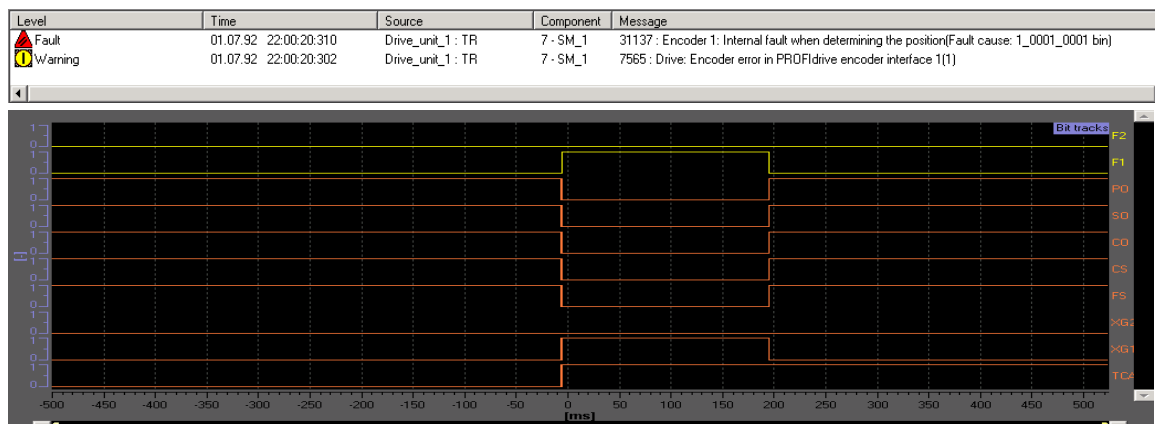
Fault bit 0:



Fault bit 1:

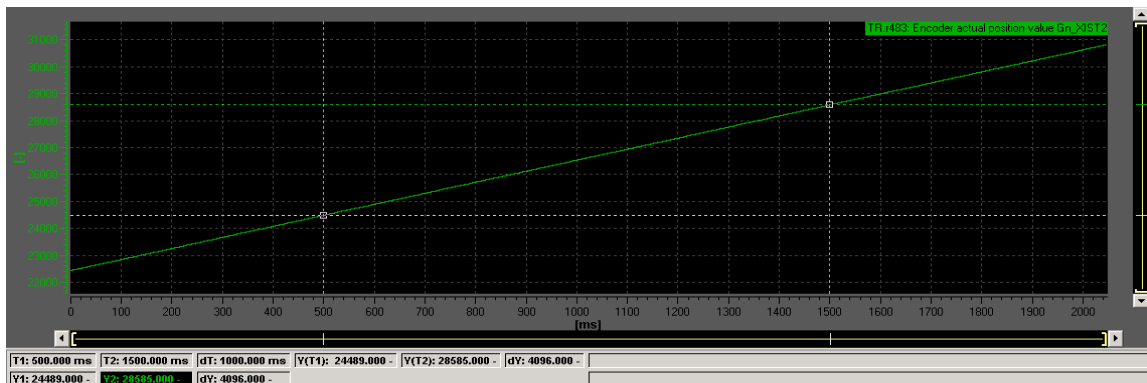


TCA bit:



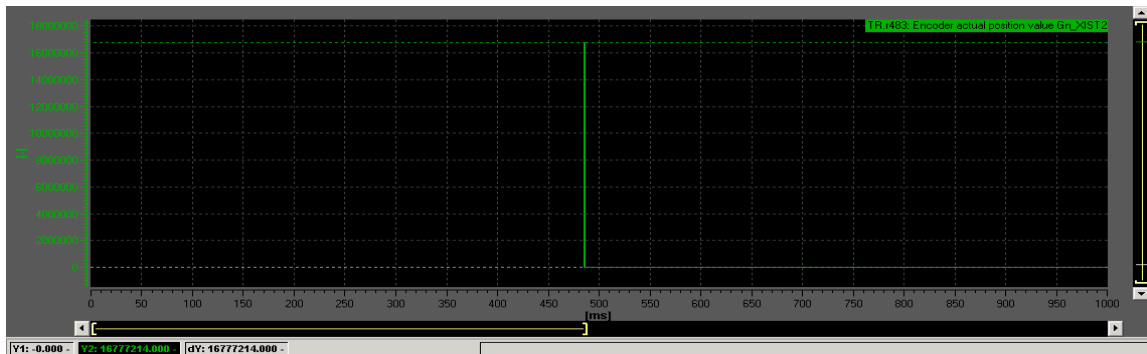
TC07	Not supported by tested devices.
TC08	This testcase was skipped. The tested device does not support the functional safety feature.
TC09	Power-ON test tested with positive result without any problems. See TC09.log
TC10	Plug/Unplug test tested with positive result without any problems. See TC10.log.
TC11	All tested parameters have expected value after Power ON. See TC11_J00003.pdf and TC11_J00005.pdf

TC12 Absolute Gn_XIST2 position is provided correctly. During this test case, Gn_XIST2 fine bit resolution was set to value 9 to provide the absolute value with the finest resolution (3 rough + 9 fine bits).



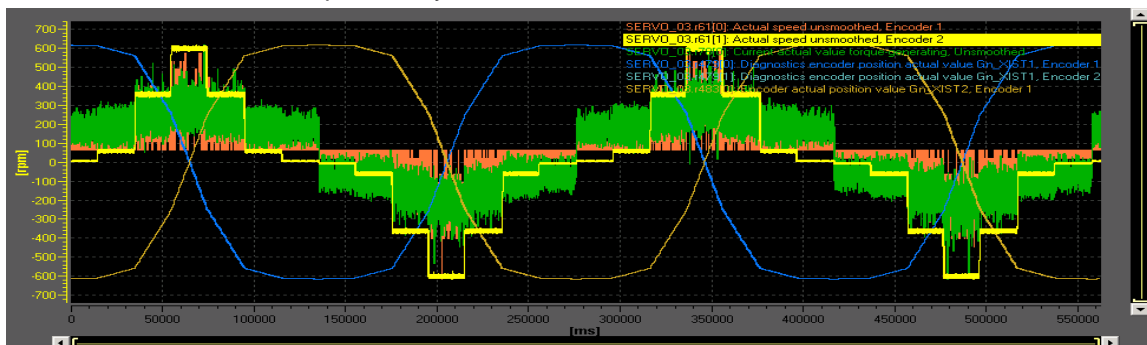
See TC12.trc and TC12.log.

Multiturn overflow test was completed with a positive test result. Bit 24 of Gn_XIST2 was expected to stay zero.



See TC12_MT.trc

TC13 EPOS was tested with positive test result between two positions using traversing blocks. Trace data was checked for their plausibility.



Trace is stored in TC13.trc.

TC14 No problem appeared during the speed and position test.

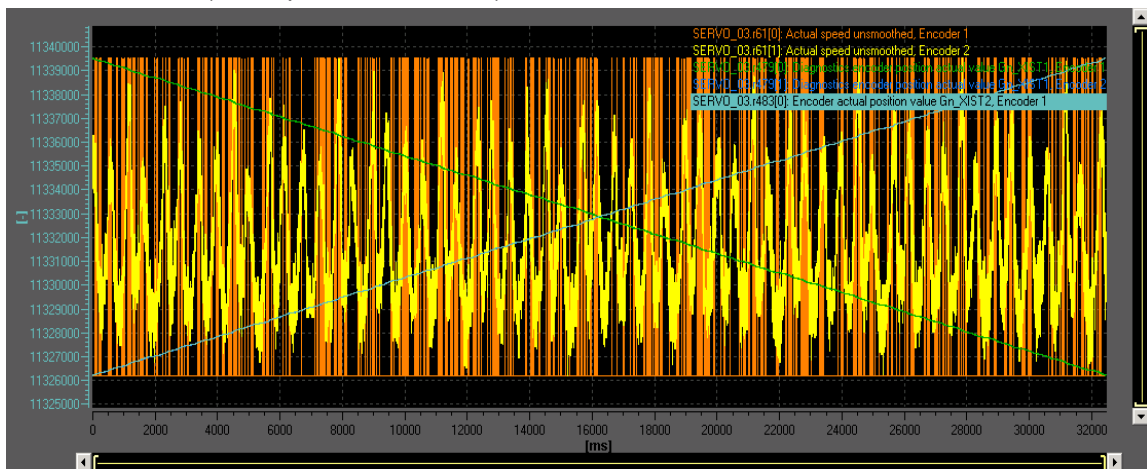
Due to lower encoder resolution, smoothing time in p1441 was set to 1 ms to smooth the speed value provided from the encoder.

Maximum speed value calculated inside DQ100 ALU at slowest cycle 1 ms is based on provided EFS with number of singleturn rough bits equal to 3 (total 12 singleturn bits - 9 fine bits).

$$m_speed_{ALU} = (2^{13} / 0.001) \times (1 / 2^3) = 1024000 \text{ rev/s}$$

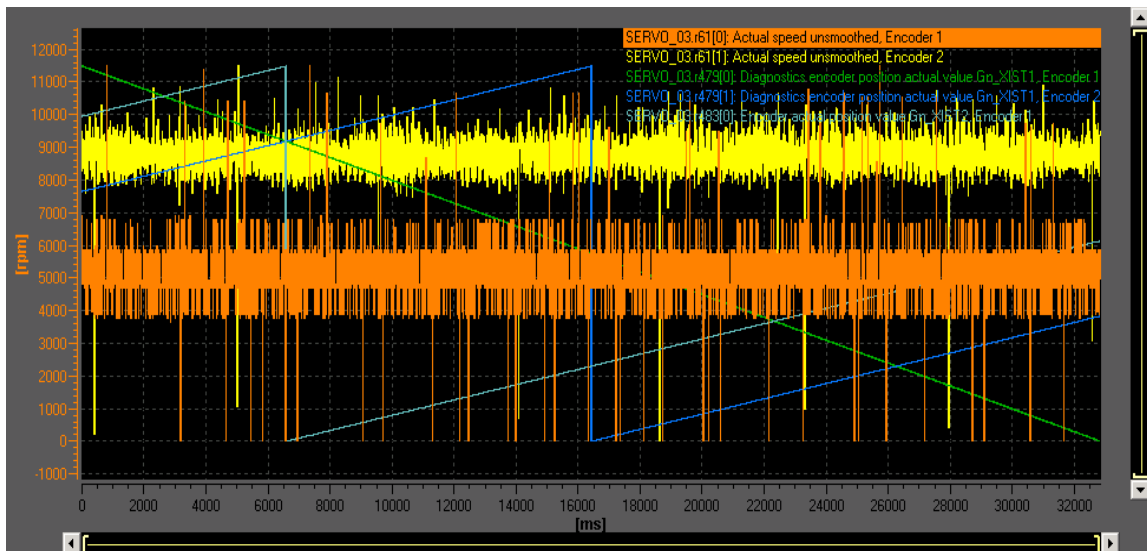
This value sufficiently exceeds maximum possible speed of the tested encoder in real applications.

STARTER trace (Low Speed Test 6 RPM):



Trace is stored in TC14_L.trc.

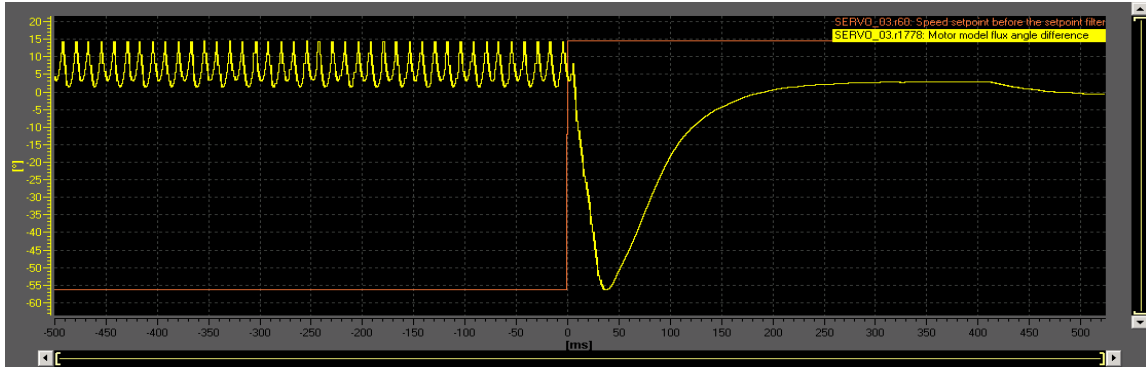
STARTER trace (High Speed Test 5000 RPM):



Trace is stored in TC14_H.trc.

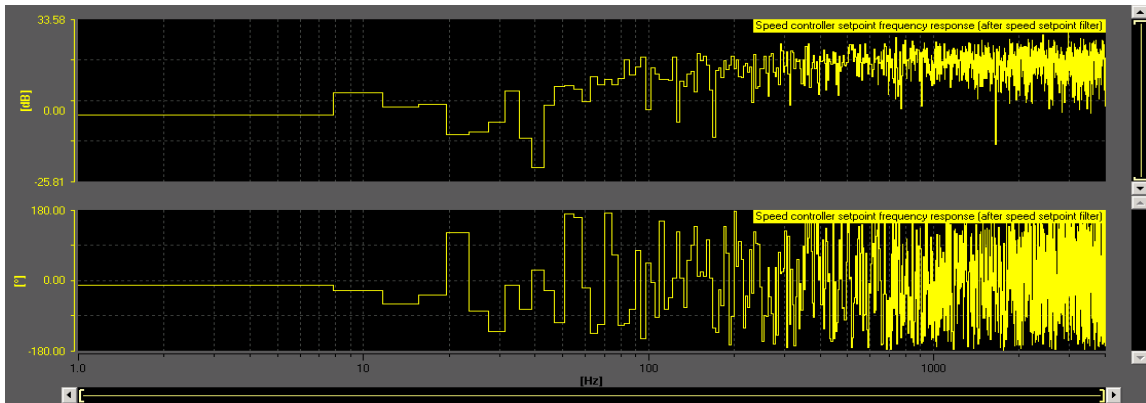
Variations in the actual unsmoothed speed of the tested encoder are caused by lower singleturn resolution and have no influence on the test result.

TC15 Motor model flux angle difference was around zero value as expected.



Trace is stored in TC15.trc

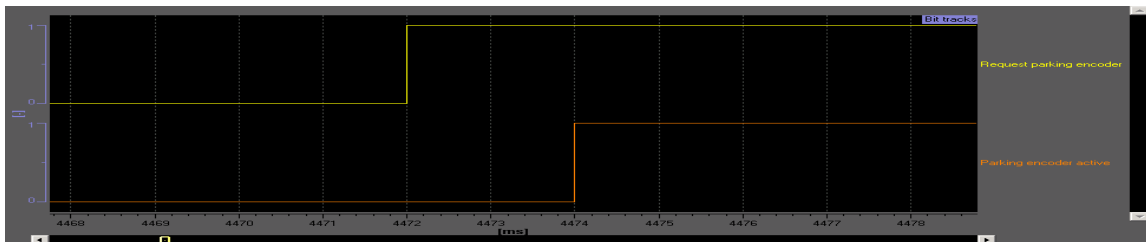
TC16 Frequency response test skipped. This test case cannot provide meaningful results due to lower resolution of the tested encoder.



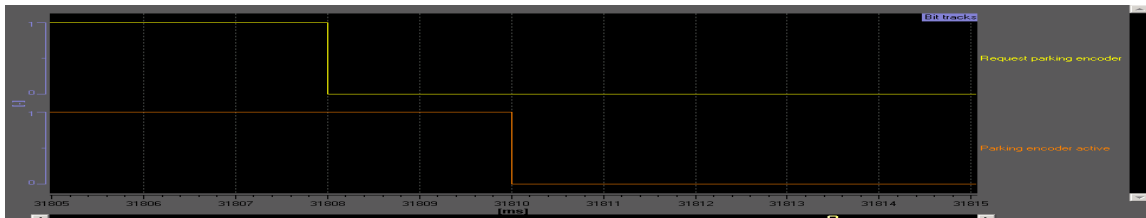
Trace is stored in TC16.trc

TC17 Parking/Unparking test tested with positive result and without any problems.

STARTER trace (parking activated):



STARTER trace (parking deactivated):



Deactivated component again present:

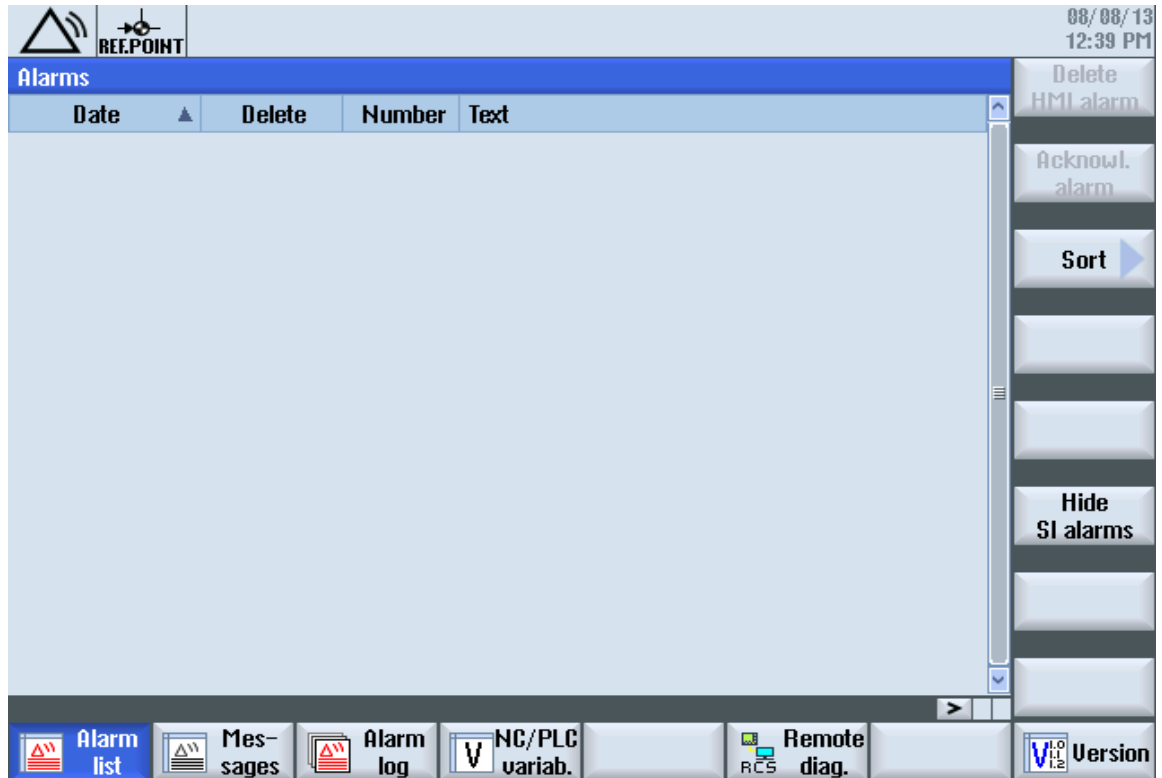
Level	Time	Source	Component	Message
Warning	01.07.92 18:38:54:630	Drive_unit_1: SERVO_03	7 - SM_2	1317 : De-activated component again present

Trace is stored in TC17.trc.

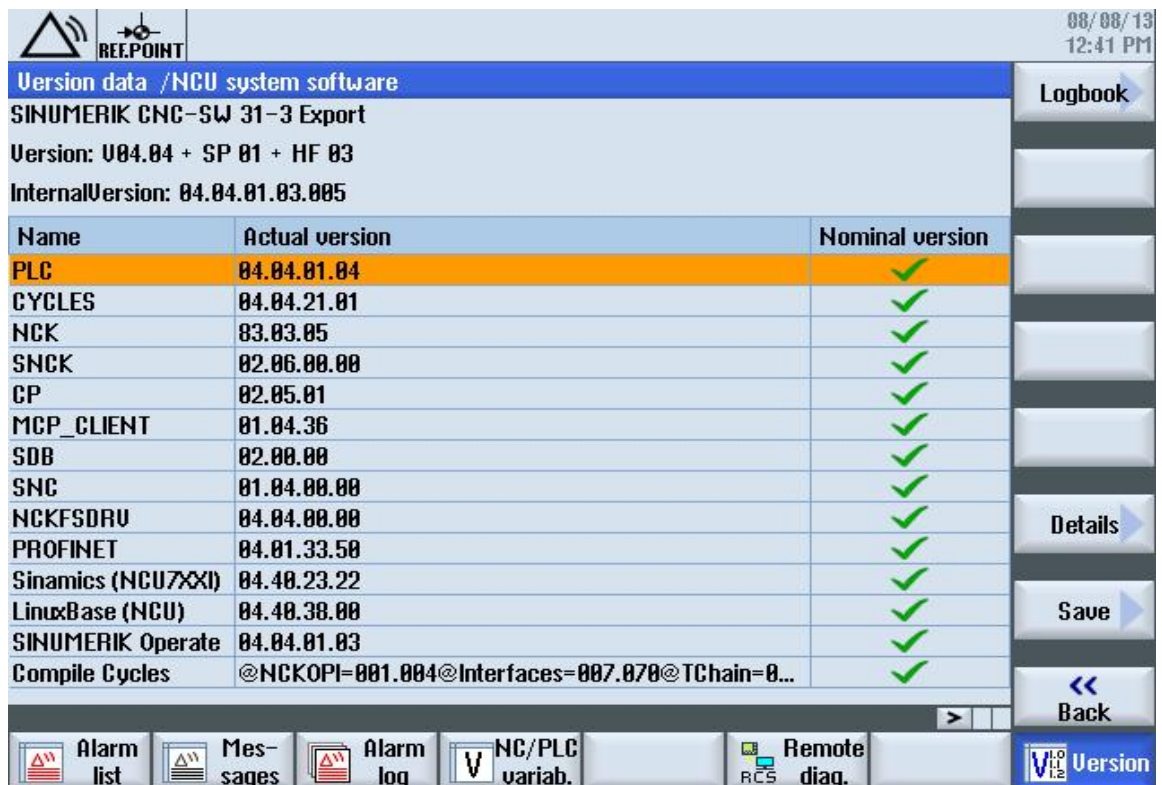
TC18	<p>Project with activated EPOS was tested with sampling times below without any problems:</p> <ul style="list-style-type: none"> • 250usec (parameter p112 set to [2]: xLow) <table border="1" data-bbox="277 315 1428 376"> <tr> <td>p112</td> <td>Sampling times pre-setting p0115</td> <td>[1] xLow</td> </tr> <tr> <td>⊕ p115[0]</td> <td>Sampling times for internal control loops, Current controller</td> <td>250.00</td> </tr> </table> • 125usec (parameter p112 set to [3]: Standard) <table border="1" data-bbox="277 427 1428 488"> <tr> <td>p112</td> <td>Sampling times pre-setting p0115</td> <td>[3] Standard</td> </tr> <tr> <td>⊕ p115[0]</td> <td>Sampling times for internal control loops, Current controller</td> <td>125.00</td> </tr> </table> • 62,5usec (parameter p112 set to [4]: High) <table border="1" data-bbox="277 539 1428 600"> <tr> <td>p112</td> <td>Sampling times pre-setting p0115</td> <td>[4] High</td> </tr> <tr> <td>⊕ p115[0]</td> <td>Sampling times for internal control loops, Current controller</td> <td>62.50</td> </tr> </table> • 31,25 usec (parameter p112 set to [5]: xHigh) <table border="1" data-bbox="277 651 1428 712"> <tr> <td>p112</td> <td>Sampling times pre-setting p0115</td> <td>[5] xHigh</td> </tr> <tr> <td>⊕ p115[0]</td> <td>Sampling times for internal control loops, Current controller</td> <td>31.25</td> </tr> </table> 	p112	Sampling times pre-setting p0115	[1] xLow	⊕ p115[0]	Sampling times for internal control loops, Current controller	250.00	p112	Sampling times pre-setting p0115	[3] Standard	⊕ p115[0]	Sampling times for internal control loops, Current controller	125.00	p112	Sampling times pre-setting p0115	[4] High	⊕ p115[0]	Sampling times for internal control loops, Current controller	62.50	p112	Sampling times pre-setting p0115	[5] xHigh	⊕ p115[0]	Sampling times for internal control loops, Current controller	31.25																																																																																																																				
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⊕ p115[0]	Sampling times for internal control loops, Current controller	31.25																																																																																																																																											
TC19	<p>The tested sample was working with project with EPOS activated without any problems over a period of 12 hours.</p>																																																																																																																																												
TC20	<p>Regression test was executed using following SINAMICS SW:</p> <ul style="list-style-type: none"> • V4.5 HF14 (V04.50.30.19) <table border="1" data-bbox="268 913 1417 1227"> <thead> <tr> <th colspan="7">Overview Version overview Safety checksums</th> </tr> <tr> <td colspan="7"> <input type="checkbox"/> Project set <input type="checkbox"/> Specified <input checked="" type="checkbox"/> Actual </td> </tr> <tr> <td colspan="7"> Device version: CU320-2 DP FW version: 4.5.0.14 Int. supplied vers.: 4503019 Memory card serial no.: </td> </tr> <tr> <th>Component</th> <th>No.</th> <th>FW version</th> <th>Type</th> <th>Order no.</th> <th>HW version</th> <th>Serial no.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>Actual</td> <td>Actual</td> <td>Actual</td> </tr> <tr> <td>CU_S_008.Control_Unit_1</td> <td>1</td> <td>4503019</td> <td>Closed-loop control module</td> <td>6SL3040-1MA00-0AA0</td> <td>B</td> <td>T-A56051455</td> </tr> <tr> <td>B_INF_02.Line_Module_2</td> <td>2</td> <td>4503019</td> <td>Supply</td> <td>6SL3130-1TE22-0AA0</td> <td>A</td> <td>T-A52049262</td> </tr> <tr> <td>SERVO_03.Motor_Module_3</td> <td>3</td> <td>4503019</td> <td>Power_unit</td> <td>6SL3420-1TE13-0AA0</td> <td>A</td> <td>T-A46054179</td> </tr> <tr> <td>SERVO_03.SMI20_4</td> <td>4</td> <td>4503019</td> <td>SMI20/DQI</td> <td>6SL3055-0AA00-5MA3</td> <td>M</td> <td>T-C78242848</td> </tr> <tr> <td>SERVO_03.SM_2</td> <td>7</td> <td>1000000</td> <td>DRIVE-CLiQ encoder</td> <td>CMV36M-00005</td> <td>A</td> <td>J0000000005</td> </tr> </tbody> </table> <p>Test results: Encoder startup, Speed & Position, EPOS ...OK</p> • V4.6 HF3 (V04.60.21.06) <table border="1" data-bbox="268 1352 1417 1666"> <thead> <tr> <th colspan="7">Overview Version overview Safety checksums</th> </tr> <tr> <td colspan="7"> <input type="checkbox"/> Project set <input type="checkbox"/> Specified <input checked="" type="checkbox"/> Actual </td> </tr> <tr> <td colspan="7"> Device version: CU320-2 DP FW version: 4.6.0.3 Int. supplied vers.: 4602106 Memory card serial no.: </td> </tr> <tr> <th>Component</th> <th>No.</th> <th>FW version</th> <th>Type</th> <th>Order no.</th> <th>HW version</th> <th>Serial no.</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td>Actual</td> <td>Actual</td> <td>Actual</td> </tr> <tr> <td>CU_S_008.Control_Unit_1</td> <td>1</td> <td>4602106</td> <td>Closed-loop control module</td> <td>6SL3040-1MA00-0AA0</td> <td>B</td> <td>T-A56051455</td> </tr> <tr> <td>B_INF_02.Line_Module_2</td> <td>2</td> <td>4602105</td> <td>Supply</td> <td>6SL3130-1TE22-0AA0</td> <td>A</td> <td>T-A52049262</td> </tr> <tr> <td>SERVO_03.Motor_Module_3</td> <td>3</td> <td>4602105</td> <td>Power_unit</td> <td>6SL3420-1TE13-0AA0</td> <td>A</td> <td>T-A46054179</td> </tr> <tr> <td>SERVO_03.SMI20_4</td> <td>4</td> <td>4602105</td> <td>SMI20/DQI</td> <td>6SL3055-0AA00-5MA3</td> <td>M</td> <td>T-C78242848</td> </tr> <tr> <td>SERVO_03.SM_2</td> <td>7</td> <td>1000000</td> <td>DRIVE-CLiQ encoder</td> <td>CMV36M-00005</td> <td>A</td> <td>J0000000005</td> </tr> </tbody> </table> <p>Test results: Encoder startup, Speed & Position, EPOS ...OK</p> 	Overview Version overview Safety checksums							<input type="checkbox"/> Project set <input type="checkbox"/> Specified <input checked="" type="checkbox"/> Actual							Device version: CU320-2 DP FW version: 4.5.0.14 Int. supplied vers.: 4503019 Memory card serial no.:							Component	No.	FW version	Type	Order no.	HW version	Serial no.					Actual	Actual	Actual	CU_S_008.Control_Unit_1	1	4503019	Closed-loop control module	6SL3040-1MA00-0AA0	B	T-A56051455	B_INF_02.Line_Module_2	2	4503019	Supply	6SL3130-1TE22-0AA0	A	T-A52049262	SERVO_03.Motor_Module_3	3	4503019	Power_unit	6SL3420-1TE13-0AA0	A	T-A46054179	SERVO_03.SMI20_4	4	4503019	SMI20/DQI	6SL3055-0AA00-5MA3	M	T-C78242848	SERVO_03.SM_2	7	1000000	DRIVE-CLiQ encoder	CMV36M-00005	A	J0000000005	Overview Version overview Safety checksums							<input type="checkbox"/> Project set <input type="checkbox"/> Specified <input checked="" type="checkbox"/> Actual							Device version: CU320-2 DP FW version: 4.6.0.3 Int. supplied vers.: 4602106 Memory card serial no.:							Component	No.	FW version	Type	Order no.	HW version	Serial no.					Actual	Actual	Actual	CU_S_008.Control_Unit_1	1	4602106	Closed-loop control module	6SL3040-1MA00-0AA0	B	T-A56051455	B_INF_02.Line_Module_2	2	4602105	Supply	6SL3130-1TE22-0AA0	A	T-A52049262	SERVO_03.Motor_Module_3	3	4602105	Power_unit	6SL3420-1TE13-0AA0	A	T-A46054179	SERVO_03.SMI20_4	4	4602105	SMI20/DQI	6SL3055-0AA00-5MA3	M	T-C78242848	SERVO_03.SM_2	7	1000000	DRIVE-CLiQ encoder	CMV36M-00005	A	J0000000005
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TC21	<p>This testcase was skipped. The tested device does not support the functional safety feature.</p>																																																																																																																																												
TC22	<p>This testcase was skipped. The tested device does not support the functional safety feature.</p>																																																																																																																																												

TC23 The tested device worked with SINUMERIK 840D sl in both speed and position control.

SINUMERIK alarm list: no alarms.



SINUMERIK SW version information:



Name	Actual version	Nominal version
PLC	04.04.01.04	✓
CYCLES	04.04.21.01	✓
NCK	03.03.05	✓
SNCK	02.06.00.00	✓
CP	02.05.01	✓
MCP_CLIENT	01.04.36	✓
SDB	02.00.00	✓
SNC	01.04.00.00	✓
NCKFSDRV	04.04.00.00	✓
PROFINET	04.01.33.50	✓
Sinamics (NCU7XXI)	04.40.23.22	✓
LinuxBase (NCU)	04.40.38.00	✓
SINUMERIK Operate	04.04.01.03	✓
Compile Cycles	©NCKOPI=001.004@Interfaces=007.070@TChain=0...	

Axis MD parameters for CMV36M-00005 rotary encoder:

08/08/13
12:38 PM

User views AX1:X1 DP3.SLAUE3:SERVO_3.3:3 (3)

View: Axis MD for CMV36M-00005 ▾

30240[0]	\$MA_ENC_TYPE	4	po	*AX1:X1
31000[0]	\$MA_ENC_IS_LINEAR	0	po	*AX1:X1
31020[0]	\$MA_ENC_RESOL	8	po	*AX1:X1
31025[0]	\$MA_ENC_PULSE_MULT	2048	po	*AX1:X1
34200[0]	\$MA_ENC_REFP_MODE	0	po	*AX1:X1
34210[0]	\$MA_ENC_REFP_STATE	2	im	*AX1:X1

Encoder type of actual value sensing (actual position value).

^
>

General MD
Channel MD
Axis MD
User views
Control unit parameter
Infeed parameter
Drive parameter

Insert data

Insert text

Delete line

Properties

Up

Down

<< Back

TC24 This testcase was skipped. The tested device does not support the functional safety feature.

TC25 Testcase skipped. The tested device does not have RDY LED.

7. Restrictions

No restrictions.

8. Validity of Test Results

A new DRIVE-CLiQ conformance test and certification is necessary for new versions of the tested encoder (HW or FW).

9. Conclusion

Tested samples of CMV36M-00005 encoder passed all required conformance test cases and can be used as encoders with the DRIVE-CLiQ interface. The customer confirms that all models within the family CMx36M are equipped with the same electronic "CMV36M-DQ-V0001" and therefore all these models are suggested to be certified as encoders with the DRIVE-CLiQ interface.

Some test cases were affected by the lower resolution of the encoder and its internal position evaluation which becomes apparent in operations with higher speed or higher dynamics. Nevertheless, these limitations are only application specific and have no influence on the results of the conformance tests.

Following DRIVE-CLiQ logo should be used in technical documentation and catalogs as well as on all certified products:



DRIVE-CLiQ

10. Test Stand Assembly



11. Annexes

- [1] TC04_J00003.txt
- [2] TC04_J00005.txt
- [3] TC05_J00003.txt
- [4] TC05_J00005.txt
- [5] TC09.log
- [6] TC10.log
- [7] TC11_J00003.pdf
- [8] TC11_J00005.pdf
- [9] TC12.log
- [10] TC12.trc
- [11] TC12_MT.trc
- [12] TC13.trc
- [13] TC14_L.trc
- [14] TC14_H.trc
- [15] TC15.trc
- [16] TC16.trc
- [17] TC17.trc

Prague, 9 August 2013

Signature



Frantisek Brettl
DRIVE-CLiQ Support Center