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Report

on the

Certificate

M6A 020196 0271 Rev. 01

of the

**Safety components
Kxl - Inductive Kit Encoder**

Applicant

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Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	Replaced	2020-09-10	M. Braun	Initial
1.1	Replaced	2021-09-28	M. Braun	Update Certificate
1.2	Replaced	2022-11-02	M. Braun	Update for KCI 1xx Dplus - AE04
1.3	Replaced	2023-03-22	M. Braun	Update for KCI 1xx Dplus - AE07 / Kxl 1xx HW40/30
1.4	Replaced	2024-09-02	M. Braun	Update for Kxl 1xx HW55
1.5	Replaced	2025-07-17	M. Braun	Update for KBI 1xx Dplus – AE04 with TK and Kxl 13xx HW 25 Gen. 1.1
1.6	Active	2025-10-08	M. Braun	Update for Kxl 11xx HW12

Table 1: Modification history



1 Target of Evaluation (ToE)

In June 2020, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the Kxl - Inductive Kit Encoder according to the standard listed in clause 4 of this report. The project number related to Rev. 1.0 of this Technical Report is 717521184.

In September 2021, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the Kxl 13xx HW 25 according to the standard listed in clause 4 of this report and to issue an new certificate. The project number related to Rev. 1.1 of this Technical Report is 717523291.

In May 2022, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the KCI 1xx Dplus - AE04 according to the standard listed in clause 4 of this report. The project number related to Rev. 1.2 of this Technical Report is 717525650.

In January 2023, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the KCI 1xx Dplus - AE07 and Kxl 1xx HW40/30 according to the standard listed in clause 4 of this report. The project number related to Rev. 1.3 of this Technical Report is 717526964.

In April 2024, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the Kxl 1xx HW55 according to the standard listed in clause 4 of this report. The project number related to Rev. 1.4 of this Technical Report is 717530043.

In June 2025, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the KBI 1xx Dplus – AE04 with TK and Kxl 13xx HW 25 Gen. 1.1 according to the standard listed in clause 4 of this report. The project number related to Rev. 1.5 of this Technical Report is 717532086.

In July 2025, Dr. JOHANNES HEIDENHAIN GmbH requested TÜV SÜD Rail GmbH to test and certify the Kxl 11xx HW 12 according to the standard listed in clause 4 of this report. The project number related to Rev. 1.6 of this Technical Report is 717532907.

The ToE is a product used in safety related applications. The Kxl - Inductive Kit Encoder is a Safety Encoder approved for

- SIL 2 according to IEC 61508
- PL d, Cat. 3 according to ISO 13849-1



2 Scope of Testing

2.1 Test Specimen

The safety functions of the Kxl - Inductive Kit Encoder covered by this certificate are listed in the Annex A to this report.

2.2 Nomenclature of Kxl - Inductive Kit Encoder

The certified variants of the Kxl - Inductive Kit Encoder covered by this certificate are listed in the Annex A to this report.



3 Certification Requirements

The certification of the Kxl - Inductive Kit Encoder will be according to the regulations and standards listed in clause 4 of this document. This will certify the successful completion of the following test segments.

- I. Functional Safety including
 - Functional safety management (FSM) and safety lifecycle
 - Applied safety development process
 - Analysis of the product structure / architecture (Block-Diagram-FMEA)
 - Analysis of the hardware (FMEDA on component or block level, quantitative analysis)
 - Verification and validation procedures/activities
 - Fault simulations and tests
 - Approval of fault avoidance measures
 - Functional tests
- II. Electrical Safety
- III. Susceptibility to environmental errors including
 - Climate and temperature
 - IP degree of protection
 - Mechanical effects
- IV. Electromagnetic compatibility (EMC)
 - Immunity
- V. Safety information in the product documentation (safety manual, user manual, installation and operating instructions).
- VI. Product-Related Quality Assurance in Manufacture and Product Development



3.1 Certification Documentation

The detailed technical evaluation is documented in the most recent version of the Technical Report:

Technical Report No.	Description	Project number
HT95584T, Rev. 1.1	Technical Report Kxl 1xx Dplus AE01 – Inductive Kit Encoder	717521184, 717522914
HT84061T, Rev. 1.2	Technical Report Concept of SIL 3 safety functions with Heidenhain measurement instruments	717518371
HT95585C-A	Annex in the current valid revision.	717532086

Table 2: Technical Report

Modifications have been evaluated and tested and are documented in the most recent version of the Technical Report of Modifications (TRM):

TRM No.	Modification Description	Project number
HT97572T, Rev. 1.0	Kxl 13xx HW 25 Electronics	717523291
HT99612T, Rev. 1.0	KCI 1xx Dplus - AE04	717525650
HT100424T, Rev. 1.0	KCI 1xx Dplus - AE07 / Kxl 1xx HW40/30	717526964
HT103370T, Rev. 1.0	Kxl 1xx HW55	717530043
HT105086T, Rev. 1.0	KBI 1xx Dplus – AE04 with TK and Kxl 13xx HW 25 Gen. 1.1	717532086
HT105640T, Rev. 1.0	Kxl 11xx HW12	717532907
DT95385T, Rev. 1.4	Technical Report on Mechanics KCI 118Dplus / KCI 120Dplus	717521184, 717522914, 717525650, 717526964, 717532086
DT97259T, Rev. 1.5	Kxl 13xx HW 25 mm / Kxl 1xx HW 40/30/55 mm/ Kxl 11xx HW 12 mm Mechanics	717523291, 717525650, 717526964, 717530043, 717532086, 717532907
Safety related requirements, conditions and restrictions can be found in the following user documentation		
1381290	Operating Instructions KCI 120 Dplus, KBI 136 Dplus, AE04, FS	
1364844	Operating Instructions KCI 1xx DPlus	
1386464	Operating Instructions KCI 118 Dplus	
1357580	Operating Instructions AE/TKN/TK Kxl 13xx FS	
1375948	Operating Instructions TKN KCI 120 Dplus max AE07	
1394882	Operating Instructions AE KCI 120 Dplus AE 07 FS	
1395973	Operating Instructions AE KCI 120, AE KBI 136 HW30/40, FS	



TRM No.	Modification Description	Project number
1388511	Operating Instructions TK/TKN KCI 120, KBI 136 HW30/40	
1423990	Operating Instructions AE KCI 120, AE KBI 136 - HW55, Functional Safety	
1424003	Operating Instructions TK/TKN KCI 120, TK/TKN KBI 136 - HW55	
1432069	Operating Instructions TK KCI 120Dplus, KBI 136 Dplus // FOABA3: AE04, FOROA1: 02H, 02I	
1438013	Operating Instructions AE KCI 1319, AE KBI 1335, FOABA3 AE09; FS	
1438014	Operating Instructions TKN Kxl 13xx, TK Kxl 13xx	
1438001	Operating Instructions AE KCI 1119, AE KBI 1135 // HW12, FS	
1438002	Operating Instructions TK/TKN KCI 1119, TK/TKN KBI 1135 // HW12	

Table 3: Report on Modifications

Based on the specified purpose of use of the Kxl - Inductive Kit Encoder in safety critical process applications, the certification is based on the set of standards listed in clause 4 of this document. The issuance of the certificate states compliance with these references unless specifically noted otherwise.



4 Standards and Guidelines

The regulations and guidelines which form the basis of the type testing are listed below.

4.1 Guidelines and Directives

No.	Reference	Description
/N1/	2006/42/EC	Directive 2006/42/EC of the European Parliament and of the Council of 2006-05-17 on machinery

Table 4: Directives

4.2 Functional Safety

No.	Reference	Description
/N2/	IEC 61508-1:2010 EN 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
/N3/	IEC 61508-2:2010 EN 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems
/N4/	ISO 13849-1:2023 EN ISO 13849-1:2023	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design

Table 5: Basic safety standards

No.	Reference	Description
/N5/	IEC 61800-5-2:2016 EN 61800-5-2:2017	Adjustable speed electrical power drive systems Part 5-2: Safety requirements – Functional
/N6/	IEC 61800-5-3:2021 EN 61800-5-3:2023	Adjustable speed electrical power drive systems Part 5-3: Safety requirements - Functional, electrical and environmental requirements for encoders

Table 6: Associated safety standards

No.	Reference	Description
<i>Remark: The following standards were approved by other testing services.</i>		
/N7/	-	-

Table 7: Other product related standards

4.3 Susceptibility to Environmental Errors

Remark: The following standards were approved by other testing services.

4.3.1 Mechanical Compatibility and IP Code testing

No.	Reference	Description
/N8/	Functional Safety_Mechanical components_2.0_2020-12	Grundsätzliche Vorgehensweise für die Bewertung mechanischer und mechatronischer Systeme im Umfeld der „Funktionalen Sicherheit“
/N9/	FKM Richtlinie: 2020	Rechnerischer Festigkeitsnachweis für Maschinenbauteile
/N10/	VDI 2230 / Blatt 1: 2015	Systematische Berechnung hochbeanspruchter Schraubenverbindungen
/N11/	EN 60529:1989/ A2:2013/ AC:2019	Degrees of protection provided by enclosures (IP Code)
/N12/	EN 61800-5-1:2007 / A1:2017	Adjustable speed electrical power drive systems - Part 5-1: Safety requirements - Electrical, thermal and energy

Table 8: Mechanical Compatibility and IP Code testing standards

4.3.2 Basic Safety, Environmental testing

No.	Reference	Description
/N13/	EN 61800-5-1:2007/ A1:2017	Adjustable speed electrical power drive systems – Part 5-1: Safety requirements – Electrical, thermal and energy

Table 9: Basic Safety, Environmental testing standards

4.3.3 Electromagnetic Compatibility

No.	Reference	Description
/N14/	EN IEC 61000-6-2:2019 (IEC 61000-6-2:2016)	Electromagnetic compatibility (EMC) - Part 6-2: Generic standards - Immunity standard for industrial environments
/N15/	EN 61800-5-2:2017 Annex E	Adjustable speed electrical power drive systems – Part 5.2: Safety requirements -Functional

Table 10: Electromagnetic compatibility standards



4.4 Safety Information in the Product Documentation (safety manual, operating instructions, labelling)

No.	Reference	Description
/N16/	ISO 13849-1:2023 EN ISO 13849-1:2023	Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design
/N17/	IEC 61800-5-2:2016 EN 61800-5-2:2017	Adjustable speed electrical power drive systems - Part 5-2: Safety requirements – Functional
/N18/	IEC 61800-5-3:2021 EN IEC 61800-5-3:2023	Adjustable speed electrical power drive systems - Part 5-3: Safety requirements - Functional, electrical and environmental requirements for encoders

Table 11: Safety information standards

4.5 Quality Management System

No.	Reference	Description	
[M1]	QMS	Quality Management System TÜV SÜD Rail GmbH	
	TR_RA_P_04.50	Test Program Functional Safety & Cybersecurity	
		TR_RA_P_04.51	Definition Scope of testing
		TR_RA_P_04.52	Concept Phase & Safety Lifecycle
		TR_RA_P_04.53	Detail Phase Hardware
		TR_RA_P_04.54	Detail Phase Software
		TR_RA_P_04.55	Safety Manual
TR_RA_P_04.56	Result of Testing		
[M2]	D-PL-11190-08-00	DAkkS accreditation according to DIN EN ISO 17025:2018 / EN ISO/IEC 17025:2017	

Table 12: Quality Management System



5 Results

5.1 Functional Safety

The tests performed and quality assurance measures implemented by the Dr. JOHANNES HEIDENHAIN GmbH have shown that the Kxl - Inductive Kit Encoder complies with the testing criteria specified in clause 4 subject to the conditions defined in clause 6 and is suitable for safety-related use in applications up to

- SIL 2 in accordance with IEC 61508¹ and
- category 3 PL d according to ISO 13849-1¹.

6 Implementation Conditions and Restrictions

The use of the Kxl - Inductive Kit Encoder shall comply with the current version of the safety parts of the user manual, and the following implementation and installation requirements have to be followed, if the Kxl - Inductive Kit Encoder is used in safety-related installations.

- The guidelines and requirements specified in the user documentation shall be followed. Only modules certified for safety-related operation shall be used for safety-critical functions.
- Timing aspects like reaction times, test intervals or test execution times have to be considered by the implementation of the final Safety function.
- The operating conditions like operating temperature or IP Code as specified in the user documentation shall be met.

¹ With additional measures suitable for safety-related applications up to SIL 3, category 4 PL e, see HT84061T



7 Certificate Number

This report specifies technical details and implementation conditions required for the application of Kxl - Inductive Kit Encoder to the certificate:

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Technical Certifier