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Technical Report

for the testing of the

Safe Operating Mode Selection System PITmode flex

Applicant

Pilz GmbH & Co. KG

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Report No.: PO103400T

Version 1.2 of 2025-07-08

Testing Laboratory for Safety Components

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Template: TR_RA_F_04.08_v27

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Modification History

Rev.	Status	Date	Author	Modification / Description
1.0	Active	2024-07-24	Dr. Julian Wolf	Initial version
1.1	Active	2024-08-05	Dr. Julian Wolf	Adaptions based on customer feedback: - corrected SIL and PL - corrected reference to manual - addition of three more reports (PO86101T, PO96865T, PO98556T) in Table 3
1.2	Active	2025-07-08	Dr. Julian Wolf	- Update of standards /N4/ and /N5/ - Addition of project number 717531839 - Adaption of section 1 (“Maximum SIL”) - Addition of modification report PO105144T to Table 3 - Updated reference to safety manual (07) - Updated Table 5 according to new report template - Change of address of TÜV SÜD Rail GmbH

Table 1: Modification history

List of Abbreviations

Abbreviation	Description
CAT	Category
PL	Performance Level
QMS	Quality Management System
SIL	Safety Integrity Level
ToE	Target of Evaluation

Table 2: Abbreviations

1 Target of Evaluation (ToE)

In July 2019 the company Pilz GmbH & Co. KG requested TÜV SÜD Rail GmbH to test and certify the safe operating mode selection system PITmode flex according to the standards listed in clause 3 of this report. The related project number is 717519419 / 717522265 / 717529418 / 717531839.

The ToE is a product used in safety related applications and its system concept is intended to be approved for

- SIL 2 according to IEC 61508
- Maximum SIL 2 according to IEC 62061
- PL d, Cat. 3 according to ISO 13849-1

More details can be found in the following technical reports:

Report No.	Version	Description
PO86101T	1.34	Addition of PITreader function blocks to the list for tracking the version releases of safety related modules of the automation system PSSu / PSS 4000
PO95229T	1.0	Subtask 1: "FB PITtouch and PITFlex" Subtask 2: "MSO Flex System"
PO95881T	1.1	Subtask 1: "Function Block PITmode flex"
PO96250T	1.0	Subtask 1: "MSO Flex System related to PSS 4000 and PSS universal (PSSu)"
PO96865T	1.0	Subtask 1: "PITreader base unit" memory extension Subtask 2: New product variant "PITreader S base unit"
PO97989T	1.0	Subtask 1: "Update of PNOZ mB1 (FW 01.08.00)"
PO98556T	1.0	Subtask 1: New product variants "PITreader Card Unit" and "PITreader S Card Unit"
PO105144T	1.0	Subtask 1: "Certification update for PITmode flex / PITmode flex visu"

Table 3: Related reports

In addition, the following manual from company Pilz GmbH & Co. KG provides more details:

- System description "PITmode flex" (PITmode_flex_System_description_1005276-DE07.pdf, 1005276-DE-07)

2 Scope of Testing

2.1 Test Specimen

“PITmode flex” is a system for the safety-related selection of modes of safe operation (MSO) by Pilz GmbH & Co. KG. For example, these include operating modes such as automatic, setting, test run, process monitoring and service. Up to 8 modes of safe operation can be selected. In the PITmode flex system, access restrictions are guaranteed by the authentication system PITreader.

The system comprises:

- Authentication system PITreader
- Pushbutton for selecting the operating mode (e.g. PIT oe 4S)
- Display elements for displaying the selected operating mode (as integrated in PIT oe 4S)
- Safety controller to evaluate and activate the selected operating mode e.g. PNOZmulti or the safety controller from the automation system PSS 4000
- Elements/components from Pilz

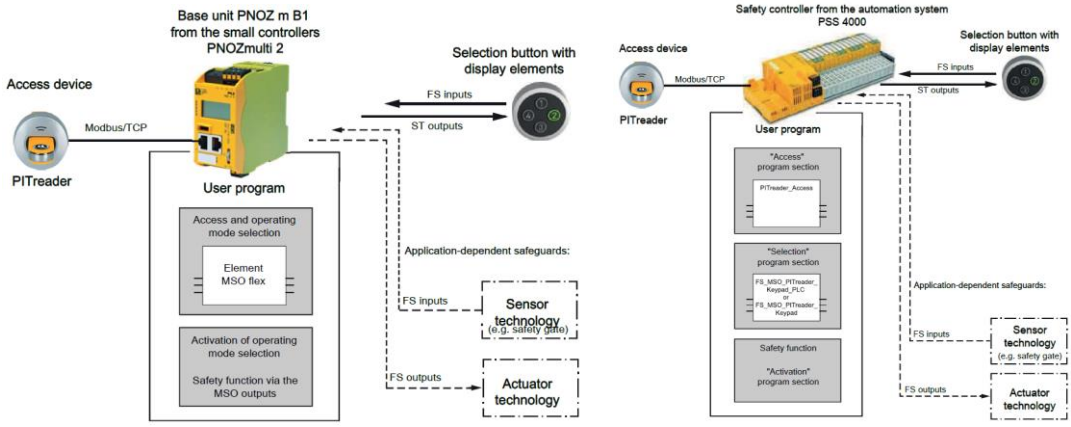

Figure 1: System overview of PITmode flex with FS-PLCs by Pilz

The system PITmode flex includes the following safety features:

- If no data or invalid data is received from the PITreader, the behaviour is the same as if no transponder is present or the transponder has been removed.
- The operating mode can only be selected under the following conditions:
  - Besides the pushbuttons, a PITreader is connected, a transponder is positioned and the transponder contains the relevant permission.

  or

  - The system is configured to automatically switch to the operating mode MSO1 when the transponder is removed.

- An operating mode can only be selected with the required permission from the assigned PITreader. The permission on the transponder must be greater than or equal to the selection on the operating mode selector switch.
- Operating mode selection will only be carried out if a pushbutton is operated for a certain time and several pushbuttons are not operated simultaneously.
- It is ensured that only one mode of safe operation is selected at a time.
- When restarting, the FS-PLC function block will either output the mode of safe operation 1 (MSO1) or the most recently selected mode of safe operation, depending on the configuration.

2.2 Nomenclature and Identification of PITmode flex

The product tested is identified by the nomenclature as follows:

Safe operating mode selection system "PITmode flex"

2.3 Tests

The safe operating mode selection system PITmode flex was examined with respect to the following testing operations:

I. Functional Safety including
   - Analysis of the system specification
   - Analysis of the system architecture (Block-Diagram-FMEA)
   - Analysis and testing of the FS-PLC function blocks PSS 4000
   - Analysis and testing of the FS-PLC function blocks PNOZmulti

3 Standards and Guidelines

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

3.1 Functional Safety

No.	Reference	Description
/N1/	IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements
/N2/	IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/ programmable electronic safety-related systems
/N3/	IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 3: Software requirements
/N4/	EN IEC 62061:2021	Safety of machinery - Functional safety of safety-related control systems
/N5/	EN ISO 13849-1:2023	Safety of machinery - Safety-related parts of control systems Part 1: General principles for design

Table 4: Basic safety standards

3.2 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 5: Quality Management System

4 Summary

The test results of the reports listed in Table 3 showed that the safe operating mode selection system PITmode flex (see ToE), as specified in clause 2.1, is able to fulfil the requirements of the standards and guidelines referenced in clause 3.

Technical Certifier

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