# 1 Example: Functional Completeness

This section illustrates how the Unified Guidance Model (UGM) is applied to a single sub-attribute. The example demonstrates the instantiation of the introduced reusable skeleton, filled with the specific requirements from ISO/PAS 8800, ISO 21448 (SOTIF), and the EU AI Act.
Provider: PPR
Deployer: DPY

| Node | Definition | source | Role |
|---|---|---|---|
| G1 | Capability of a product to provide a set of functions that covers all the specified tasks and intended users' objectives | ISO/IEC 25010:2023 | |
| C6 | The system is in the safety lifecycle phase: requirement specification / verification / validation. | 9.3.1 ISO/PAS 8800 | PPR |
| G2.1 | A verification and validation strategy incl. validation targets and scenario space coverage is defined. | 9.1.a (2) ISO 21448 | PPR |
| G2.2 | The input space of the AI system is defined sufficiently to initiate the AI safety lifecycle. | 9.3.1 ISO/PAS 8800 | PPR |
| G3.1 | A justification is provided that refined AI safety requirements are reasonable to meet allocated safety requirements or mitigate functional insufficiencies. | 9.3.3 ISO/PAS 8800 | PPR |
| G3.2 | System-level argument for SOTIF release decision. | 12.1c ISO 21448 | PPR + DPY |

Table 1: Node Description of Functional Completeness

| Node | Definition | source | Role | |
|---|---|---|---|---|
| G4 | Work products resulting from SOTIF activities are reviewed for completeness, correctness, and consistency. | 12.1a ISO 21448 | PPR | |
| G4a | Cases of non-conformance or input space limitations are identified and reported to the system development process. | 9.3.5 ISO/PAS 8800 | PPR DPY | + |
| G5.1 | Test cases adequately verify the AI safety requirements of the AI component within the specified input space. | 12.3.5 ISO/PAS 8800 | PPR | |
| G5.2 | A verification and validation strategy for SOTIF, including validation targets, is defined. | 9.1 a SOTIF | PPR | |
| G6 | A verification and validation strategy for SOTIF, including validation targets, is defined. | 9 (6) AIA | PPR | |
| Sn1 | Input space definition (refined). | 9.6.1 ISO/PAS 8800 | PPR | |
| Sn2 | Documented justification report that refined AI safety requirements are adequate. | 9.6.2 ISO/PAS 8800 | PPR | |
| Sn3 | Report listing non-conformance cases and partial input space coverage cases. | 9.6.3 ISO/PAS 8800 | PPR | |
| Sn4 | AI system verification report | 12.6.1 ISO/PAS 8800 | PPR | |
| Sn5 | Definition of the verification and validation strategy | 9.4 ISO 21448 | PPR | |
| Sn6 | SOTIF release argument | 12.5 ISO 21448 | PPR DPY | + |

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| Node | Definition | source | Role |
|---|---|---|---|
| Sn7 | Continous test documentation demonstrating that the high-risk AI system has been tested. | Recital 65 AIA | PPR |
| J1 | ISO/PAS 8800 (9.3.1) and SOTIF (9.1a/2) both define system boundaries (Input Space vs Scenario Space). | 12.6.1 ISO/PAS 8800 & 9.1a/2 ISO 21448 | PPR |
| J2 | ISO/PAS 8800 provides justification at requirement level; SOTIF requires argumentation at system level. Together they form a comprehensive release decision rationale. | 9.3.3 ISO/PAS 8800 | PPR + DPY |
| J3 | The non-conformance report (8800) is a specific input that must be included in the SOTIF review (12.1a). 8800 ¡ SOTIF, because SOTIF requires a comprehensive review of all work products, while 8800 mandates specific reporting. | 9.3.5 ISO/PAS 8800 & 12.1a SOTIF | PPR + DPY |
| J4 | ISO/PAS 8800 Clause 12.3.5 specifies the design and adequacy of test cases, which operationalizes and concretizes the overarching SOTIF requirement for a defined V&V strategy (Clause 9.1 a). | 12.3.5 ISO/PAS 8800 & 9.1 a SOTIF | PPR |
| J5 | Art. 9(6) requires testing of high-risk AI systems to ensure consistent performance and compliance. To demonstrate this, complementary requirements from G5.1 8800 and G2.1 SOTIF are considered. | 12.3.5 ISO/PAS 8800 & 9.1 a SOTIF & 9(6) AIA | PPR |

Table 1: Node Description of Functional Completeness

| Node | Definition | source | Role |
|---|---|---|---|
| J6 | Only G5.1 / 12.3.5 ISO/PAS is complementary with AIA Art. 9(6). Other 8800 requirements are additional but not directly paired | 12.3.5 ISO/PAS 8800 & 9 (6) AIA | PPR |

Table 1: Node Description of Functional Completeness

The Functional Completeness model follows the complementary relationship type described in Section 3.4. A central SComp strategy node aggregates complementary and partially overlapping requirements from ISO/PAS 8800, ISO 21448, and the EU AI Act. Together, these requirements establish a unified argument that ensure complete and reliable coverage of the AI system's defined input space. The argument begins with Context C6, which anchors the model in the safety lifecycle phase of requirement specification, verification, and validation. This context activates the relevant SOTIF and ISO 8800 clauses. From there, G2.1 and G2.2 define the system-level setup. G2.1 ensures that the verification and validation strategy includes coverage of the relevant scenario space. G2.2 complements this by requiring a sufficiently refined input-space definition to initiate the AI safety lifecycle. Their relationship is justified in J1, which links scenario-space and input-space coverage as equivalent boundary-defining concepts.

Subsequent goals address requirement refinement and validation reasoning. G3.1 and G3.2 combine ISO 8800 and SOTIF requirements, integrating requirement-level justification with system-level release argumentation. J2 documents this complementarity.

The verification and testing layer includes G5.1, G5.2, and G6, which collectively demonstrate compliance across all three frameworks. Evidence nodes (Sn1–Sn7) provide the concrete verification outputs supporting these claims. The aggregated structure demonstrates that functional completeness is interpreted as a full and justified coverage of the defined input or scenario space and is verified through harmonized evidence across all three regulatory sources. The complementary integration of ISO 8800, SOTIF, and AI Act requirements ensures that both domain-specific safety and cross-industry compliance are met within a single assurance argument.


Figure 1: Legend of node and role representations used in the Unified Guidance Model (UGM). Node types (G, C, S, Sn, J, A) are distinguished by shape, while border colors denote responsible roles: green for Provider (PPR), blue for Deployer (DPY), and no border for shared responsibility.

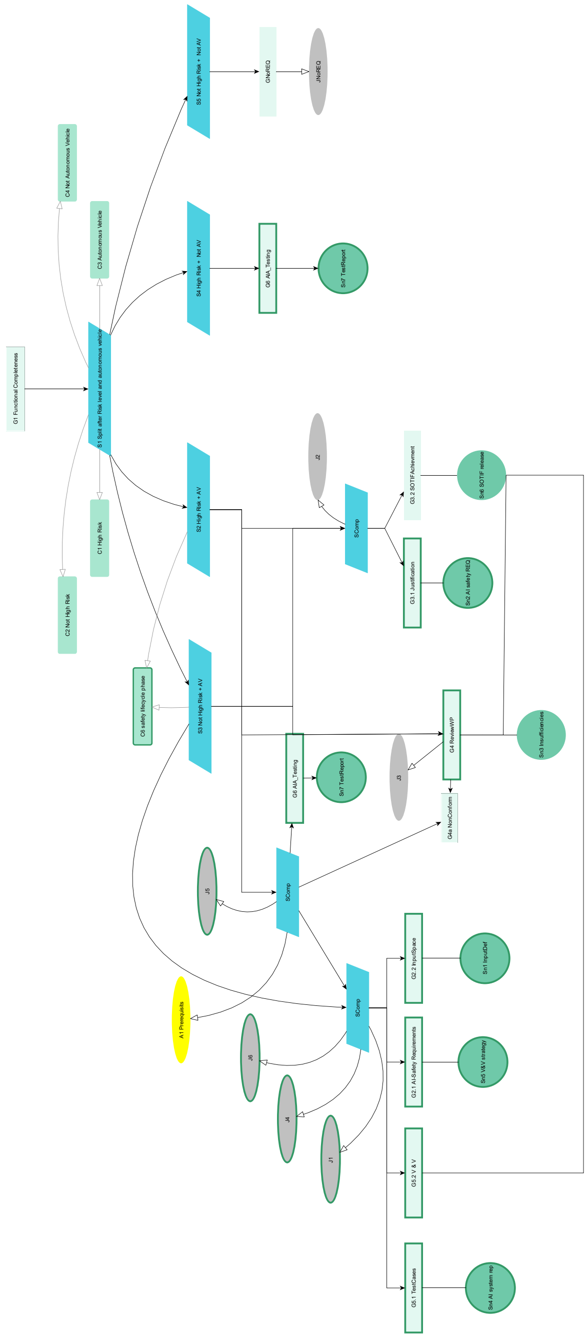

Figure 2: Overview of the application of the UGM on Functional Completness