Supplementary A. Requirements Profile (RP) and Reviewer Checklist

Clarification (RP vs. checklist). The *Requirements Profile (RP)* defines the minimum information items required for requirements to be consumable by intended readers in the target workflow. The *checklist* operationalizes RP (and the three reader-centric qualities) for consistent review by stating what must be present and what forms are acceptable.

Reader-centric quality tags. RI = Role-Interrogativity, A = Actionability, I = Interpretability.

ECU-level RP Satisfaction: Decision Rule (Operational Definition)

ECU-level satisfaction. An ECU is counted as *RP-satisfied* if its diagnostic requirement set satisfies all RP items below at the level required by the **SHALL** criteria.
Item-level satisfaction. An RP item is satisfied when all **SHALL** statements for that item are met in the ECU's diagnostic requirements (or via an explicitly provided local mapping/link that is practical to use in routine work). When an item is not applicable, the requirements must explicitly state this (e.g., "No warning lamp") to avoid implicit omissions.

Table S1. Operational definition of the Requirements Profile (RP): 11 evaluation items and reviewer checklist. Each item specifies the expected form/level of reader-needed information and the criteria used for consistent judgment.

Example (illustrative)

Before: "Precondition: `CF_EvRdy = 1`."
After: "Precondition: vehicle is in drivable/ready state; implement as `CF_EvRdy = 1` (mapping)."
This example illustrates how making operational meaning explicit at the point of use and providing a local mapping can shorten the interpretation path for heterogeneous readers.

Table 1: Requirements Profile (RP) checklist and quality mapping (RI/A/I).

RP item (what)	Reviewer checklist (how to judge)	Q
DTC-related system and component description	• **SHALL:** State the system and the relevant component(s) so that they are identifiable. • **SHOULD:** Describe the role/function concisely and clearly (system name + component role). • **MAY:** Use brief or generic wording if identification remains unambiguous.	RI
Detailed fault-code description	• **SHALL:** Describe the cause or situation under which the DTC occurs. • **MAY:** If trigger/behavior details are incomplete, it is acceptable to at least state the occurrence of the fault code, provided the context is not misleading.	RI

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RP item (what)	Reviewer checklist (how to judge)	Q
Diagnostic condition	• **SHALL:** Specify the vehicle state under which the DTC is diagnosed. • **SHOULD:** Include concrete state descriptors (e.g., key state, speed, operating condition). • **MAY:** Use short state labels (e.g., "EV READY", "KEY ON") if they uniquely identify the operating state.	RI
DTC confirmation condition	• **SHALL:** State a condition under which the DTC is confirmed (diagnosis decision can be made). • **SHOULD:** Describe it as concretely as possible. • **MAY:** Use commonly understood generic expressions (e.g., "CAN communication error") if they clearly represent the confirming situation. • **MAY:** If numeric thresholds/timing are unavailable, acceptance is possible when the confirmation condition is still stated clearly as a confirmation rule.	A
DTC confirmation time	• **SHALL:** Specify the time required for DTC confirmation. • **SHALL:** Include an explicit time unit (ms or s).	A
DTC clearing condition	• **SHALL:** State the clearing condition, even briefly. • **MAY:** Use a generic expression (e.g., "return to normal state"); add specifics when available.	A
DTC clearing time	• **SHOULD:** State the clearing time with an explicit unit (ms or s) when possible. • **MAY:** If a numeric time is unavailable, "immediately" is acceptable, and a concrete description of the clearing method/behavior is also acceptable.	A
Sensor/actuator reference values related to confirmation	• **SHALL:** Provide reference values of sensors/actuators that affect DTC confirmation. • **SHOULD:** Include allowable tolerances where applicable.	A
Warning lamp information	• **SHALL:** State the warning lamp name and its illumination condition when the DTC occurs. • **SHALL:** If not applicable, explicitly state "No warning lamp" (or equivalent) to avoid implicit omission. • **MAY:** If detailed illumination conditions are difficult, the lamp name alone may be accepted when it provides meaningful reader guidance.	A

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RP item (what)	Reviewer checklist (how to judge)	Q
Limp mode information	• **SHALL:** Describe major limp-mode behavior and relevant messages/effects when the DTC occurs. • **SHOULD:** Specify entry conditions and limitations; brief descriptions are acceptable if the behavioral concept is clear.	A
Fail-safe information	• **SHALL:** Describe the fail-safe behavior when the DTC occurs. • **SHALL:** State the conditions and limitations for transitioning into a safety mode.	A