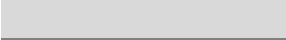



Need	Explanation
Must have	Needed to ensure intended functionality
Should have	May support quality of outcome and thus can support intended functionality
Could have	Does not directly influence functionality, but may be useful, e.g., for future extensions
See other phase	Addressed in other phase of this component
See other component	Addressed in other component
See below	Decomposed below
See above	Summarized above
Not in scope	Not in scope
Not possible	Not possible to be addressed in this phase
Not needed	Not needed for this phase

Color List	Meaning
	Must/Should/Could have
	Not provided as not needed or addressed below/above
	Not provided as overarching attribute not provided

Troubleshooting Assistant		Provide troubleshooting steps for product based on user request and context information														
AT-#	Attribute	PH-4.1: Initial Request			PH-4.2: Processed Request			PH-4.3: Function Call			PH-4.4: Initial Response			PH-4.5: Processed response		
		Need	Troubleshooting request provided by user Justification	Metrics/Measures	Need	User request appended with relevant information of product history Justification	Metrics/Measures	Need	Management of tools for additional context Justification	Metrics/Measures	Need	Initial LLM response based on request and aggregated context Justification	Metrics/Measures	Need	Processed LLM response provided to user Justification	Metrics/Measures
1	Availability	Must have	Request must be provided to initiate troubleshooting support	Training Certificate	Must have	Functionality must be available	Timeout	Must have	Tools must be available	Timeout	Must have	Functionality must be available	Timeout	Should have	Functionality should be available to ensure improved LLM response	Timeout
2	Reliability	Must have	Request must have sufficient quality to ensure sufficient troubleshooting outcome	Training Certificate	See below	Quality of outcome must be ensured		See other component	Addressed in KG, RAG, MD, HD		See below			See below		
2.1	Correctness	See above			See below	Outcome must be correct					See below			See below		
2.1.1	Truthfulness	See above			Must have	Selected product for which information is provided must be correct	LLM Judge				Not possible	Truthfulness cannot directly be measured		Not needed	See PH-4.4	
2.1.2	Relevance	See above			Must have	Only products relevant to the request must be included	LLM Judge				Should have	Only information relevant to the request and context should be provided to avoid too much cognitive load	LLM Judge	Should have	See TA:PH-4.4	See TA:PH-4.4
2.1.3	Faithfulness	See above			Must have	Appended product information must be faithful to provided product history	LLM Judge				Must have	Information must be faithful to context provided by the tools	LLM Judge	Must have	See TA:PH-4.4	See TA:PH-4.4
2.1.4	Consistency	See above			Not in scope	Question-answer history not considered in system; Can be evaluated in testing or offline for documented cases					Not in scope	Question-answer history not considered in system; Can be evaluated in testing or for documented cases		Must have	See TA:PH-4.4	See TA:PH-4.4
2.1.5	Calibration	See above			Could have	Confidence value could be provided for transparency or improved decision making	Self-evaluation				Could have	Response could provide confidence estimate that aligns with faithfulness, relevance, and completeness estimate	Self-evaluation	Could have	See TA:PH-4.4	See TA:PH-4.4
2.1.6	Objectivity	See above			See other component	Correctness and objectivity of product information ensured in development					Must have	Response must be grounded in facts provided by context	LLM Judge	Must have	See TA:PH-4.4	See TA:PH-4.4
2.1.7	Completeness	See above			Must have	Provided product information must be complete	LLM Judge				Must have	Response must be complete regarding request and provided context	LLM Judge	Must have	See TA:PH-4.4	See TA:PH-4.4
2.2	Fairness	See above			Not needed	Fairness does not apply					Not needed	Fairness addressed in TA:PH-4.5		Must have	Response should consider fairness principles	
2.3	Data Quality	See above			Not needed	Data quality does not apply					Not needed	Data quality does not apply		Not needed	Data quality does not apply	LLM Judge
3	Safety	Must have	Safety must be ensured by ensuring correct human behavior and compliance of request with respect to regulations, social norms, and laws	Training Certificate	Not needed	Safety addressed in TA:PH-4.5		See other component	Addressed in KG, RAG, MD, HD		Not needed	Safety addressed in TA:PH-4.5		See below		
3.1	Behavior	See above												Must have	Response does not encourage harmful behavior or provide such information	LLM Judge
3.2	Harm Prevention	See above												Must have	Response does not provide information that leads to harm to machines, workers, excessive costs, or violation of regulations	LLM Judge
4	Integrity	See below			See below	Not addressed here		See other component	Addressed in KG, RAG, MD, HD		See below			See below		
4.1	Robustness	Could have	Consistent request could lead to consistent LLM system responses	Training Certificate	Not in scope	Question-answer history not considered in system; Can be evaluated in testing or for documented cases					Not in scope	Question-answer history not considered in system; Can be evaluated in testing or for documented cases		Must have	See TA:PH-4.4	See TA:PH-4.4
4.2	Scrutiny	Should have	User should validate issue exists before submission to avoid unnecessary interactions	Training Certificate	See other component	Addressed during development					Should have	LLM system should consider in response that some information may be incorrect	Aggregated score of component metrics	Should have	See TA:PH-4.4	See TA:PH-4.4
5	Maintainability	See below	Transparency can support identification of weaknesses		See below	Transparency can support identification of weaknesses		See other component	Addressed for individual Addressed in KG, RAG, MD, HD		See below	Transparency can support identification of weaknesses		See below	Transparency can support identification of weaknesses	
5.1	Transparency	Should have	Cases should be documented	Documentation	Could have	Step could be documented	Documentation				Could have	Step could be documented, reasoning could be provided	Documentation, reasoning	Should have	Cases should be documented, reasoning could be provided	Documentation, reasoning

Knowledge Graph		Provide summary text of relevant issue-cause-solution chains based on request														
AT-#	Attribute	PH-4.1: Initial Request			PH-4.2: Processed Request			PH-4.3: Function Call			PH-4.4: Initial Response			PH-4.5: Processed response		
		Need	Request provided by troubleshooting assistant Justification	Metrics/Measures	Need	Extract list of quality issues to query from request Justification	Metrics/Measures	Need	Query to graph data base with knowledge graph Justification	Metrics/Measures	Need	Provide list of issue-cause-solution chains per issue Justification	Metrics/Measures	Need	Aggregation of issue-cause-relationship chains in single text object Justification	Metrics/Measures
1	Availability	Must have	Request must be provided		Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout
2	Reliability	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in graph data base component		See below			See other phase	Deterministic aggregation; addressed in development of component	
2.1	Correctness				See below						See below					
2.1.1	Truthfulness				Must have	Identified issues must be correct to ensure correct recommendations	LLM Judge				Not possible	Truthfulness cannot directly be measured; assumption: correctness ensured through engineering of query in development phase				
2.1.2	Relevance				Must have	Only issues relevant to the request must be extracted to avoid confusing recommendations	LLM Judge				Must have	Only entries relevant to extracted issue list must be provided	LLM Judge			
2.1.3	Faithfulness				Not needed	Faithfulness not needed for extraction of issues					See other phase	Faithfulness not needed for deterministic data base queries; assumption: addressed in development phase				
2.1.4	Consistency				Not in scope	Consistency is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase					See other phase	Assumption: consistency ensured through deterministic data base queries				
2.1.5	Calibration				Could have	Likelihood of issue could be provided for transparency and informed decision making	Self-evaluation				See other phase	Assumption: ensured through deterministic data base queries				
2.1.6	Objectivity				See other component	Assumption: Objectivity of request addressed in TA					See other phase	Assumption: objectivity ensured through deterministic data base queries				
2.1.7	Completeness				Must have	Extracted list of issues must be complete	LLM Judge				Must have	Output must contain entries for all issues in extracted issue list; assumption: completeness of each entry ensured through deterministic data base query	LLM Judge			
2.2	Fairness				Not needed	Fairness does not apply					Not needed	Fairness does not apply				
2.3	Data Quality				Not needed	Data quality does not apply					Not needed	Data quality does not apply				
3	Safety	See other component	Addressed in TA:PH-4.2		Not needed	Safety addressed in TA:PH-4.5		See other component	Addressed in graph data base component		See other component	Safety addressed in TA:PH-4.5		Not needed	No harm can occur at this stage	
3.1	Behavior															
3.2	Harm Prevention															
4	Integrity	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in graph data base component		See other phase	Assumption: integrity ensured through deterministic data base queries		See other phase	Deterministic aggregation; addressed in development of component	
4.1	Robustness				Not in scope	Robustness is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase										
4.2	Scrutiny				See other component	Assumption: Validity of request addressed in TA										
5	Maintainability	See other component	Addressed in TA:PH-4.2		See below	Transparency can support identification of weaknesses		See other component	Addressed in graph data base component		See below	Transparency can support identification of weaknesses		See below	Transparency can support identification of weaknesses	
5.1	Transparency				Could have	Step could be documented	Documentation				Could have	Step could be documented	Documentation	Should have	Outcome of component should be documented for case documentation	Documentation

Machine data		Provide machine specifications used for the production of the product referred to in the request														
AT-#	Attribute	PH-4.1: Initial Request			PH-4.2: Processed Request			PH-4.3: Function Call			PH-4.4: Initial Response			PH-4.5: Processed response		
		Need	Request provided by troubleshooting assistant Justification	Metrics/Measures	Need	Extract used machines for product from request Justification	Metrics/Measures	Need	Query MES for machine used for product Justification	Metrics/Measures	Need	Provide list of machine configuration for machine-product pairs Justification	Metrics/Measures	Need	Provide used machine configurations in text object Justification	Metrics/Measures
1	Availability	Must have	Request must be provided		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout	
2	Reliability	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in MES component		See below			See other phase	Deterministic aggregation; addressed in development of component	
2.1	Correctness				See below						See below					
2.1.1	Truthfulness				Must have	Extracted machine and product IDs must be correct LLM Judge					Not possible	Truthfulness cannot directly be measured; Note: truthfulness can be supported in development phase				
2.1.2	Relevance				Must have	Only relevant IDs must be extracted LLM Judge					Must have	Dictionary must only contain machines and products with IDs from extracted list of IDs (in correct combination) LLM Judge				
2.1.3	Faithfulness				Not needed	Faithfulness not needed for extraction of IDs Consistency is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase					See other phase	Deterministic outcome for query; addressed in development of component				
2.1.4	Consistency				Not in scope	Likelihood of IDs could be provided for transparency and informed decision making					See other phase	Deterministic outcome for query; addressed in development of component				
2.1.5	Calibration				Could have	Self-evaluation					See other phase	Deterministic outcome for query; addressed in development of component				
2.1.6	Objectivity				See other component	Assumption: Objectivity of request addressed in TA					See other phase	Deterministic outcome for query; addressed in development of component				
2.1.7	Completeness				Must have	List of IDs must be complete LLM Judge					Must have	Output must contain all IDs from list of extracted IDs; assumption: completeness of each entry ensured through deterministic MES query LLM Judge				
2.2	Fairness				Not needed	Fairness not applicable					Not needed	Fairness does not apply				
2.3	Data Quality				Not needed	Data quality not applicable					Not needed	Data quality does not apply				
3	Safety	See other component	Addressed in TA:PH-4.2		Not needed	Safety addressed in TA:PH-4.5		See other component	Addressed in MES component		Must have	Provided information must clearly indicate which machines and product specifications the information relates to avoid incorrect usage LLM Judge		See other phase	Deterministic aggregation; addressed in development of component	
3.1	Behavior										See above					
3.2	Harm Prevention										See above					
4	Integrity	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in MES component		See other phase	Deterministic outcome for query; addressed in development of component		See other phase	Deterministic aggregation; addressed in development of component	
4.1	Robustness				Not in scope	Robustness is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase										
4.2	Scrutiny				See other component	Assumption: Validity of request addressed in TA										
5	Maintainability	See other component	Addressed in TA:PH-4.2		See below	Transparency can support identification of weaknesses		See other component	Addressed in MES component		See below	Transparency can support identification of weaknesses		See below	Transparency can support identification of weaknesses	
5.1	Transparency				Could have	Step could be documented Documentation					Could have	Step could be documented Documentation		Should have	Outcome of component should be documented for case documentation Documentation	

RP		Provide machine specifications required for the production of the product referred to in the request														
AT-#	Attribute	PH-4.1: Initial Request			PH-4.2: Processed Request			PH-4.3: Function Call			PH-4.4: Initial Response			PH-4.5: Processed response		
		Need	Justification	Metrics/Measures	Need	Justification	Metrics/Measures	Need	Justification	Metrics/Measures	Need	Justification	Metrics/Measures	Need	Justification	Metrics/Measures
1	Availability	Must have	Request must be provided		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout		Must have	Functionality must be available Timeout	
2	Reliability	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in vector data base		See below			See other phase	Deterministic aggregation; addressed in development of component	
2.1	Correctness				See below						See below					
2.1.1	Truthfulness				Must have	Extracted machine and product specification must be correct LLM Judge					Not possible	Truthfulness cannot directly be measured; assumption: correctness of chunks ensured in development phase				
2.1.2	Relevance				Must have	Only relevant information must be extracted LLM Judge					Must have	Provided chunks must be relevant to request and extracted information LLM Judge				
2.1.3	Faithfulness				Not needed	Faithfulness not needed for extraction of information Consistency is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase					See other phase	assumption: addressed in development phase				
2.1.4	Consistency				Not in scope	Likelihood of information extracted being correct could be provided for transparency and informed decision making	Self-evaluation				See other phase	assumption: addressed in development phase				
2.1.5	Calibration				Could have		Self-evaluation				Should have	Similarity score provided with chunks should be aligned with relevance and completeness estimate for transparency and informed decision making Self-evaluation				
2.1.6	Objectivity				See other component	Assumption: Objectivity of request addressed in TA					See other phase	assumption: addressed in development phase				
2.1.7	Completeness				Must have	Information being extracted must be complete LLM Judge					Must have	All extracted machines and product specifications must be provided in chunks LLM Judge				
2.2	Fairness				Not needed	Fairness not applicable					Not needed	Fairness does not apply				
2.3	Data Quality				Not needed	Data quality not applicable					Not needed	Data quality does not apply				
3	Safety Behavior	See other component	Addressed in TA:PH-4.2		Not needed	Safety addressed in TA:PH-4.5		See other component	Addressed in vector data base		Must have	Chunks must clearly indicate which machines and product specifications the information relates to avoid incorrect usage LLM Judge		Not needed	No harm can occur at this stage	
3.1	Behavior										See above					
3.2	Harm Prevention										See above					
4	Integrity	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in vector data base		See other phase	assumption: addressed in development phase		See other phase	Deterministic aggregation; addressed in development of component	
4.1	Robustness				Not in scope	Robustness is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase										
4.2	Scrutiny				See other component	Assumption: Validity of request addressed in TA										
5	Maintainability	See other component	Addressed in TA:PH-4.2		See below	Transparency can support identification of weaknesses		See other component	Addressed in vector data base		See below	Transparency can support identification of weaknesses		See below	Transparency can support identification of weaknesses	
5.1	Transparency				Could have	Step could be documented Documentation					Could have	Step could be documented Documentation		Should have	Outcome of component should be documented for case documentation Documentation	

Name		Provide historic cases that are similar to the current case																			
AT-#	Attribute	PH-4.1: Initial Request			PH-4.2: Processed Request			PH-4.3: Function Call			PH-4.4: Initial Response			PH-4.5: Processed response							
		Request provided by troubleshooting assistant; Machine Data context	Justification	Metrics/Measures	Need	Purpose case summary with relevant information	Justification	Metrics/Measures	Need	Query historic data base for similar cases	Justification	Metrics/Measures	Need	Provide list of similar cases with summary	Justification	Metrics/Measures	Need	Aggregation of similar cases in single text object	Justification	Metrics/Measures	
1	Availability	Must have	Request must be provided		Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout	Must have	Functionality must be available	Timeout	Must have	Functionality must be available;	Timeout		
2	Reliability	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in historic data base		See below			See other phase			See other phase	Deterministic aggregation;	addressed in development of		
2.1	Correctness				See below																
2.1.1	Truthfulness				Must have	Case summary must contain correct information	LLM Judge						Not possible	Truthfulness cannot directly be measured; assumption: addressed in development phase							
2.1.2	Relevance				Must have	Case summary must only contain relevant information	LLM Judge						Must have	Provided historic cases must be relevant for current case	Judge LLM						
2.1.3	Faithfulness				Must have	Case summary must be faithful	LLM Judge						Must have	Provided historic cases must be faithful to case summary	Judge LLM						
2.1.4	Consistency				Not in scope	Consistency is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase							See other phase	assumption: addressed in development phase							
2.1.5	Calibration				Could have	Summary could provide confidence estimate that aligns with truthfulness, faithfulness, relevance, and completeness; estimate	Self-evaluation						Should have	Similarity score provided with cases should be aligned with relevance estimate for transparency and informed decision making	Self-evaluation						
2.1.6	Objectivity				Must have	Case summary must only contain objective facts from the request	LLM Judge						See other phase	assumption: addressed in development phase							
2.1.7	Completeness				Must have	Summary must be complete	LLM Judge						Not possible	Cannot be validated							
2.2	Fairness				Not in scope	Fairness is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase							Not needed	Fairness not applicable							
2.3	Data Quality				Not needed	Data quality does not apply							Not needed	Data quality not applicable							
3	Safety	See other component	Addressed in TA:PH-4.2		Not needed	Safety addressed in TA:PH-4.5		See other component	Addressed in historic data base		See other component	Addressed in historic data base		Must have	Provided historic cases must clearly indicate which machines and product specifications the information relates to avoid incorrect usage	Judge LLM			Deterministic aggregation;	addressed in development of	
3.1	Behavior																				
3.2	Harm Prevention																				
4	Integrity	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in historic data base		See other phase	assumption: addressed in development phase							Deterministic aggregation;	addressed in development of	
4.1	Robustness				Not in scope	Robustness is not assessed during operation for single-turn system; Note: can be assessed in development or maintenance phase															
4.2	Scrutiny				See other component	Assumption: Validity of request addressed in TA															
5	Maintainability	See other component	Addressed in TA:PH-4.2		See below			See other component	Addressed in historic data base		See below								Transparency can support	identification of weaknesses	
5.1	Transparency				Could have	Step could be documented; reasoning for summary could be provided (if generated)	Documentation, reasoning						Could have	Step could be documented	Documentation				Outcome of component should be	documented for case	Documentation