



KTM AG PRODUCT DEVELOPMENT

2022



FEASIBILITY PHASE



P0 Vehicle		
Description	<p>Usage:</p> <ul style="list-style-type: none">➤ Development/visualization of product vision➤ Securing functional concept➤ Identification of development risks➤ Securing long-run parts➤ Requirements detailing➤ Feasibility check of new production technologies➤ Make or buy / pre-selection of suppliers	<p>Vehicle for project release</p> <p>Prototype tools & auxiliary devices</p>
Product	<p>At least A-sample for:</p> <ul style="list-style-type: none">➤ circumferences to be checked for technical feasibility➤ Long-runner circumferences➤ Powerpack	<p><u>Description A-sample</u></p>
Components	<p>At least A-sample for:</p> <ul style="list-style-type: none">➤ circumferences to be checked for technical feasibility➤ Long-runner circumferences➤ Maturity of engine: Min. A-pattern No torque donor	<p><u>Description A-sample</u></p>



CONCEPT PHASE



P1 Vehicle		
Description	<p>Usage:</p> <ul style="list-style-type: none">➤ Supplier release SE & main components➤ First endurance run of the EMS base application➤ Check/test homologation relevant topics➤ Creation of test planning - who tests what? (Internal vs. supplier)➤ Define/develop service & production routines	<p>Vehicle for project release</p> <p>Prototype tools & auxiliary devices</p>
Product	<p>At least A-sample for:</p> <ul style="list-style-type: none">➤ Powerpack <p>B-sample for:</p> <ul style="list-style-type: none">➤ selected, exhaust-relevant components (proof of initial durability)	<p><u>Description A-sample</u></p>
Components	<p>At least A-sample for:</p> <ul style="list-style-type: none">➤ Circumferences to be checked for technical feasibility➤ Long-runner circumferences➤ Maturity of the engine: Min. A pattern No torque donor	<p><u>Description A-sample</u></p>



DEVELOPMENT PHASE



P2 Vehicle		
Description	<p>Usage:</p> <ul style="list-style-type: none">➤ Safeguarding of the series geometry and functional scope➤ Assurance of the technical safety concept according to ISO26262➤ Verification of legal and homologation requirements➤ Diagnostic and test concept functional➤ EOL scope for vehicle and component functions functional➤ Start basic application series; emission/ verification durability➤ Verification buildability, joining sequence, accessibility for tools/jigs/screwdrivers, production and maintenance geometry, serviceability (diagnostics and special tools) and routing of cables and pulls➤ Validation of the B-patterns	<p>Vehicle for project release</p> <p>Prototype tools & auxiliary devices</p>
Product	<p>At least B-sample</p> <p>C-sample for:</p> <ul style="list-style-type: none">➤ Powerpack	<p><u>Description B-Sample</u></p> <p><u>Description C-Sample</u></p>
Components	<p>Tool release</p>	



INDUSTRIALIZATION PHASE



P3 Vehicle		
Description	<p>Usage:</p> <ul style="list-style-type: none">➤ Verification of durability (test bench/driving operation).➤ Verification of C-/D-samples➤ Validation of buildability, production & maintenance geometry, serviceability (diagnostics and special tools), routing of cables & trains➤ Validation of final design➤ Application and verification of the legally required OBD diagnostics➤ Verification FUSI➤ Start of sampling → preparation of early EMPB➤ Preparation of production systems (procurement, disposition, etc.)➤ Obtaining the development release	<p>Vehicle for P3 BOM release, production BOM release, development release.</p> <p>Series tools, equipment & auxiliary devices</p>
Product	<p>At least C-sample</p> <p>D-sample for:</p> <ul style="list-style-type: none">➤ Powerpack➤ CTG-relevant scopes (for CTG reference vehicles)	<p>Description C-Sample</p> <p>Description D-Sample</p>
Components	<p>At least C-sample</p> <p>D-sample for:</p> <ul style="list-style-type: none">➤ CTG reference vehicles	<p>Description C-Sample</p> <p>Description D-Sample</p>



INDUSTRIALIZATION PHASE



M Vehicle		
Description	<div>Usage:</div> <ul style="list-style-type: none">➤ Review of series parts BOM➤ Completion of sampling → Achievement of series release➤ Review of production & procurement logistics (series scheduling).➤ Availability/verification of importance parameters for series vehicles➤ Validation material disposition	<div>Vehicle for validation of series parts BOM release</div> <div>Series tools, equipment & auxiliary devices</div>
Product	series parts	<u>Description series</u>
Components	series parts	<u>Description series</u>



LAUNCH PHASE



V Vehicle		
Description	Usage: <ul style="list-style-type: none">➤ Review of series production and operating equipment➤ Verification of series logistics➤ Completion of the inspection planning	Vehicle for production release Series tools, equipment & series devices
Product		
Components		



SERIESPRODUCTION



S Vehicle		
Description	Usage: <ul style="list-style-type: none">➤ Ramp-up of production on assembly line➤ Optimization of series production and logistics processes	Vehicle for series accompanied endurance run Series tools, equipment & series devices
Product		
Components		



KTM AG MATURITY MODEL

2022



DESCRIPTION A-SAMPLE

A-Sample (Functional sample / minimum maturity for A-sample engine or P1-vehicle)				
Use	Manufacturing	Quality	Acceptance criteria	Remark
<ul style="list-style-type: none">➤ Illustration of the overall function➤ Confirmation of the feasibility of a technical solution approach (concept)➤ Development of specification➤ Implementation of an FMEA➤ Test part numbers possible (V-numbers)➤ Inquiry or checking of feasibility with suppliers➤ Evaluation of possible production processes and technologies	<ul style="list-style-type: none">➤ From various materials; no series-manufactured material required➤ Production in sample workshop at suppliers or in prototype workshop in-house➤ Machining, joining or additive manufacturing processes➤ Modification of existing modules and components	<ul style="list-style-type: none">➤ Limited functional scope with focus on essential criteria for developing the specification of:<ul style="list-style-type: none">1) Customer function2) Integration/ interfaces3) Performance characteristics4) Test criteria➤ Correct standard quality assurance agreement (QSVSTD) and standard quality assurance agreement classification is on the drawing	<ul style="list-style-type: none">➤ Function:<ul style="list-style-type: none">1) Customer function2) Integration/ interfaces3) Performance characteristics4) Test criteria	<ul style="list-style-type: none">➤ Date and Timeline agreed in the project kick-off meeting➤ Forwarding of drawing including 2D/3D data and standard quality assurance agreement
A-Sample (Sheet Metal Parts)				
<ul style="list-style-type: none">➤ Used for package tests➤ Used for vehicle testing		<ul style="list-style-type: none">1) Customer function (rough component geometry)2) Integration / interfaces (package study, installation test)3) Performance characteristics (strength calculation)	<ul style="list-style-type: none">Function:<ul style="list-style-type: none">1) Customer function (rough component geometry)2) Integration / interface (package study, installation test)3) Performance characteristics (strength calculation)	



DESCRIPTION B-SAMPLE

B-Sample (Prototype / minimum maturity for B-sample engine or P2-vehicle)				
Use	Manufacturing	Quality	Acceptance criteria	Remark
<ul style="list-style-type: none">➤ Verification of full functional scope and all technical requirements➤ Achievement of tool release➤ Testing of durability for defined functions➤ Achievement of functional release➤ Test part numbers possible (V-numbers)➤ Inquiry or checking of feasibility with suppliers➤ Evaluation of possible production processes and technologies	<ul style="list-style-type: none">➤ Production in sample workshop at suppliers or in prototype workshop in-house using prototype tools and devices➤ From series-manufactured material or material alternatives with similar properties	<ul style="list-style-type: none">➤ Unlimited range of functions➤ Durable in defined load cases / test environments➤ Appearance similar to series production <p>* Final geometry</p> <p>* Non-final surfaces possible</p> <ul style="list-style-type: none">➤ Correct standard quality assurance agreement (QSVSTD) and standard quality assurance agreement classification is on the drawing	<ul style="list-style-type: none">➤ Function:<ul style="list-style-type: none">1) Customer function2) Integration/ interfaces3) Performance characteristics4) Test criteria➤ Durability: Durable (limited)	<ul style="list-style-type: none">➤ Date and Timeline agreed in the project kick-off meeting➤ Forwarding of drawing including 2D/3D data and standard quality assurance agreement
B-Sample (Sheet Metal Parts)				
<ul style="list-style-type: none">➤ Verification of manufacturability in the series process			<p>Function:</p> <ul style="list-style-type: none">1) Customer function (rough component geometry)2) Integration / interfaces (package study, installation test)3) Performance characteristics (strength calculation)4) Test criteria (strength tests)	



DESCRIPTION C-SAMPLE

C-Sample (Tooling sample / minimum maturity for C-sample engine or P3-vehicle)				
Use	Manufacturing	Quality	Acceptance criteria	Remark
<ul style="list-style-type: none">➤ Confirmation of the final design➤ Verification of unlimited durability➤ Achievement of the development release➤ No test part numbers possible (final part number available)➤ Official inquiry drawing for obtaining a series quotation	<ul style="list-style-type: none">➤ Parts manufactured from series production tool➤ Tool finish not yet final➤ From near-series production process* Series systems* No series cycle* Manual assembly permitted➤ From series-manufactured material➤ Supplier is intended series supplier	<ul style="list-style-type: none">➤ Appearance similar to series production* Final geometry* Non-final surfaces possible (except for technically relevant surfaces)➤ Correct standard quality assurance agreement (QSVSTD) and standard quality assurance agreement classification is on the drawing	<ul style="list-style-type: none">➤ Function:<ul style="list-style-type: none">1) Customer function2) Integration/ interfaces3) Performance characteristics4) Test criteria➤ Durability: Durable (unlimited)➤ Process:<ul style="list-style-type: none">1) Tools2) Systems	<ul style="list-style-type: none">➤ Date and Timeline agreed in the project kick-off meeting➤ Forwarding of drawing including 2D/3D data and standard quality assurance agreement
C-Sample (Sheet Metal Parts)				
<ul style="list-style-type: none">➤ Used for operational stability testing			<p>Function:</p> <ul style="list-style-type: none">1) Customer function (function of the component)2) Integration / interfaces (installability)3) Performance characteristics (strength calculation, weight analysis)4) Test criteria (strength tests) <p>Possible component tests KTM R&D:</p> <ul style="list-style-type: none">* Endurance testing* Operational stability testing	



DESCRIPTION D-SAMPLE

D-Sample (Initial sample / used for PPAP, to be used for series production when released)

Use	Manufacturing	Quality	Acceptance criteria	Remark
<ul style="list-style-type: none">➤ Validation of the production process➤ Carrying out sampling (PPAP)➤ Validation of the product➤ Achievement of series release➤ Use for pre-series and series production only with special release➤ Use for QM reference sample	<ul style="list-style-type: none">➤ Parts manufactured from final series production tool➤ Manufactured in the series process in a representative batch size➤ Parts order for sampling via QM-APAQ-PPAP➤ Parts order for sample series, pre-series and series production via series process/systems (according to delivery schedule)➤ From series-manufactured material	<ul style="list-style-type: none">➤ All requirements and specifications are met with process reliability➤ Appearance final➤ Complete initial sampling possible➤ Correct standard quality assurance agreement (QSVSTD) and standard quality assurance agreement classification is on the drawing	<ul style="list-style-type: none">➤ Function:<ul style="list-style-type: none">1) Customer function2) Integration/ interfaces3) Performance characteristics4) Test criteriaDurability:<ul style="list-style-type: none">Durable (Unlimited)Process:<ul style="list-style-type: none">1) Tools2) Systems3) Logistics4) WorkersInitial sample test report:<ul style="list-style-type: none">1) Fully completed sampling2) Validation of the product fully completed	<ul style="list-style-type: none">➤ Date and Timeline agreed in the project kick-off meeting➤ Forwarding of drawing including 2D/3D data and standard quality assurance agreement



DESCRIPTION SERIES

Series (Part released for series production)				
Use	Manufacturing	Quality	Acceptance criteria	Remark
➤ Series production	<ul style="list-style-type: none">➤ Parts manufactured from final series production tool➤ From series process➤ From series-manufactured material➤ Parts order for sample series, pre-series and series production via series process/systems (according to delivery schedule)	<ul style="list-style-type: none">➤ All requirements and specifications are met with process reliability➤ Appearance final➤ Correct standard quality assurance agreement (QSVSTD) and standard quality assurance agreement classification is on the drawing	<ul style="list-style-type: none">➤ Serial release available	<ul style="list-style-type: none">➤ Forwarding of drawing including 2D/3D data



**WORK HARD
IN SILENCE,
LET SUCCESS
MAKE THE NOISE**