SANOK RC S.A.

A Guide To

PRODUCTION PART APPROVAL PROCESS

/PPAP/

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1. Preface

SANOK RC S.A. is the manufacturer of articles made of elastomers and their functional combinations with metals, plastics and other materials supplied to world-class car and automotive components manufacturers.

In order to meet the quality & cost requirements of SANOK RC S.A.'s Customers it is necessary to pursue a close co-operation and long-term relationships with our Suppliers.

2. Purpose

The aim of this companion is to precisely define the principles of the mode of conduct and ways of recording of actions which ensure the production part approval process to conform with the requirements imposed by SANOK RC S.A.

3. Applicability

The present guide contains requirements the production part approval process.

The requirements apply to parts coming from external suppliers as well as those produced by entities within the structure of the company.

Review and approval of product samples is obligatory for each part before the first batch of parts is shipped as well as in situations listed in point 5.1.

Parts submitted to production part approval process (PPAP) must be selected from a significant production run. In case parts are manufactured with the use of multi-cavity moulds / extrusion dies / cutters, etc., templates, instruments or patterns, measurements and tests must be performed for each cavity of the mould / extrusion die / cutter, each template, instrument and pattern.

In case of long-lasting tests it is allowed that, with the consent of the project-responsible representative of SANOK RC S.A., tests are carried out on a representative sample of a smaller volume.

The guide may be applied to other products, e.g. direct materials and semi-finished products coming from both external and internal suppliers.

4. Definitions

New part

It is a part which has not yet been manufactured by the organisation for the needs of SANOK RC S.A.

Upgraded part

A part which is currently being produced by the organisation for the needs of SANOK RC S.A., with reference to which changes have been introduced by SANOK RC S.A. which entail the necessity of introducing modifications of the production technology, change of material or tooling design. The expression „upgraded part" does not apply to cases of introduction of part design changes initiated by the Supplier. In such cases the part is defined as the "new part".

Project Development Plan

Schedule of part production launch defining tasks, deadlines and responsibilities for performance of individual actions together with tasks referring to control, tests, reviews and verifications.

Project Verification Plan

It is a part control plan executed by the organisation with regard to the prototype or product samples. The plan should define controls and tests of both parts and process, control and test equipment, evaluation criteria, number of samples as well as time limits of controls and tests which are necessary to prove that the project is capable of meeting all requirements.

Significant production run

Significant production run denotes parts obtained in a production process lasting from 1 to 8 hours while the total number of produced parts should be a minimum of 300 consecutive parts, unless defined otherwise. The quantity of parts may be changed with a written consent of the project-responsible representative of SANOK RC S.A..

This significant production run should be conducted at the production site, using the production tooling, production gaging, production materials and operating staff provided for serial production.

In well-founded cases, with a written consent of the project-responsible representative of SANOK RC S.A. it is allowed to conduct the significant production run using a temporary tooling approved by SANOK RC S.A.

Sample production parts

It is a sample of parts coming from a significant production run submitted for approval together with documents specified in a given submission level.

Sample production parts approval

It confirms that the submitted sample production parts conform with the requirements defined in the design drawings and in the specification. Sample production parts approval constitutes a permission to deliver the pre-launch production parts.

Sample production parts rejection

Sample production parts rejection means that the submitted sample production parts do not meet the requirements of SANOK RC S.A. defined in the design drawings and in the specification.

Pre-launch production parts

Pre-launch production parts are manufactured under conditions of serial production using the target production tooling and for which parts the process and part controls have been carried out based on the approved Control Plan.

Parts from the pre-launch production shall be used in SANOK RC S.A. to produce sample production parts of the final product.

Approval for Serial Production

It is a confirmation of conformity of the parts with the requirements defined in the design drawings and in the specification, it also affirms that the parts are fully fit for production of the final product in SANOK RC S.A. .

FMEA

Failure Mode and Effects Analysis. It is an effective method of problem solving and early recognition of potential failures within the design or production processes and negative impact of the production process upon the environment which allows for corrective or preventive measures to be taken.

Control Plan

The Control Plan is a document defining the actions which allow for monitoring and controlling of the process in order to assure the part quality to be on the level expected by SANOK RC S.A.
The Control Plan is an integral part of the documentation which constitutes the basis for conducting of the part production process starting with deliveries of raw materials, component parts and materials, through parts production, movement, packing, storage and including the realisation of deliveries. However, it does not replace the detailed instructions. It may be prepared for a group of similar parts produced using the same process.

Active part

It is a part which is shipped to SANOK RC S.A. for the purpose of its being used for production of the final product to be fitted as original equipment and for service purposes (spares).
The part remains active until SANOK RC S.A. grants authorisation to scrap the production tooling.
In order to deactivate the part a written authorisation of SANOK RC S.A. is required.

Organisation

A subject which directly supplies production parts to SANOK RC S.A. or provides services such as heat treatment, painting, electroplating or other directly to SANOK RC S.A..

5. Part approval requirements

5.1. Part submission for approval

Part submission for approval is required in the case of:

- a new and modified part,
- a change of production process,
- a change of testing/control methods,
- a change of instruments and tooling (new or modified),
- changes of suppliers of raw materials and direct materials,
- the resuming of production after a 12-month or longer break period,
- changes of production site location,
- other cases defined by SANOK RC S.A.

The purpose of these requirements is to define changes which may affect the Customer and the final buyer of a vehicle or component part. The requirement of the part submission for approval may only be waived with the consent of the project-responsible person at SANOK RC S.A..

In case of doubts related to approval of parts for production it is required that the project-responsible person at SANOK RC S.A. is contacted immediately.

Organisations are responsible for materials and services provided by their Suppliers.

5.2. Course of approval process – submission level

The project-responsible person at SANOK RC S.A. defines the submission level for each Organisation or for the combination including the Organisation and the part number.

The submission levels are identified below (see appendix no. 5):

Level 1 – Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to the customer.

Level 2 – Warrant with product samples and limited supporting data submitted to the customer.

Level 3 – Warrant with product samples and complete supporting data submitted to the customer.

Level 4 – Warrant and other requirements as defined by the customer.

Level 5 – Warrant with product samples and complete supporting data reviewed at the organisation's manufacturing location.

Level 3 shall be applied to all submissions unless decided otherwise by the project-responsible person at SANOK RC S.A..

5.3. Required records

In situations mentioned in point 5.1 the following documents filled based on the actual results are required:

- Drawings, specifications, sketches. All materials related to design records, e.g. CAD/CAM mathematical data,
- Project FMEA – failure mode and effects analysis is required when the Supplier is responsible for the project,
- Process FMEA – failure mode and effects analysis as well as mode of conduct analysis in case of process failures,
- Process flow chart – showing the flow of materials and the sequence of process operations. Form no. F-R2.047
- Pre-launch and Serial Production Control Plan defining all control operations related to the part and process including Key Characteristics (Critical, Important, Significant).

  Common Control Plans are allowed for "families" of similar parts, if these parts have been reviewed for commonality. Forms nos. F-R2.018.
- Actual measurement results referred to the requirements shown in the drawing of the parts manufactured in accordance with Project Approval Plan. Form no. F-R2.096
- Measurement system analysis result – measurement of repeatability and reproducibility using R&R method. Form no. F-R2.016
- Result of initial process capability (P_p, P_{pk}) testing.
- Results of all material tests carried out in accordance with the Project Approval Plan on form no. F-R2.097
- Results of performance tests carried out in accordance with the Project Approval Plan on form no. F-R2.098
- All documents related to introduction of engineering or technological changes,
- Appearance Approval Report – if appearance characteristics have been specified in the project on form no. F-R2.099
- Part / Product Submission Warrant – assurance that the part fully meets the requirements of SANOK RC S.A. declared on form no. F-R2.100

6. Production process preparation

6.1. Project Development Plan

The Organisation should, within two weeks from the date of receipt of an order for sample production parts, work out and submit for approval a schedule of actions aimed at launching the production of the part containing at least the time limits for these actions:

- Preparation of the Process Flow Diagram,
- Process/Project FMEA,
- Drawing up of process documentation (Specifications of requirements, Route Crads, operating instructions, Control Plans, design records for co-operation parts),
- Manufacturing of the production and auxiliary tooling,
- Tooling tests (evaluation of performance, dimensional control of the parts),
- Trial production run (machine & tooling capability testing, process capability evaluation, manufacturing of sample production parts, manufacturing of sample production parts, evaluation and testing of parts)
- Delivery of sample production parts,
- Delivery of pre-launch production parts.

6.2. Process Flow Chart

In case a new part is launched, the basic component of preparation works is to define the process flow chart.

The Supplier should draw up a process flow chart which clearly describes the stages of the production process and their sequence and which meets the specific needs, requirements and expectations of SANOK RC S.A. (F-R2.047) .

6.3. Project and process FMEA

The Supplier should perform the Project FMEA (if the Supplier is responsible for the project) and process FMEA as well. For a process in which a group of similar parts is manufactured a single FMEA may be applied.

6.4. Project Verification Plan (PVP)

The Organisation should work out a Project Verification Plan on form no. F-R2.013, which is supposed to describe control operations and methods of control applied within the Organisation or in accredited external institutions which ensure the fulfilment of the quality requirements assumed by SANOK RC S.A.. The employees of the Organisation who are responsible for quality assurance should verify and approve the prepared PVP.

The Organisation should check the sample production parts in accordance with the prepared PVP.

After the check has been completed the PVP must be complemented with the test results.

Individual PVP updates shoul be created by means of adding a new record. It is not allowed to delete any recorded information. The update should be made after each change in the project or before every shipment of sample production parts.

The Organisation is obliged to submit the current PVP versions at the request of the project-responsible person at SANOK RC S.A..

6.5. Control Plan (CP) preparation

The Organisation should prepare and submit the CP on form no. F-R2.018, describing the method of performance of each control operation in such a way that all control operations are easy to understand and ensure the performance of quality control of characteristics in all operations within the process without omitting any of these operations.

The Organisation should prepare the CP based on the “Process flow chart”.

The employees of the Organisation who are reposnsible for quality assurance should review and approve the prepared CP.

It is allowed that the Supplier-prepared CP forms can be used.

6.6. Auxiliary drawings and sketches

The part number, index and date of the last change of the design drawing as well as the name of the Supplier must be placed on all auxiliary documents (i.e. additional result charts, sketches, tracing paper drawings, cross sections, etc.).

Copies of auxiliary materials must be attached to dimensional results according to the table – see appendix no. 5.

6.7. Required measuring gauges

It is required that the Supplier certifies that all parameters of the measuring gauges, etc., conform with the part-related dimensional requirements.

Tests must be carried out to evaluate variability of the measuring system (repeatability and reproducibility, bias, linearity and stability studies).

In case gauges are used to check the part characteristics then the design record of the gauges is to be transferred to SANOK RC S.A. before shipment of sample production parts.

6.8. Analysis of initial process capability P_p, P_{pk}

Process capability level is to be determined before submission for approval of all characteristics specified by SANOK RC S.A. or the Organisation as related to safety or as key, critical or significant and evaluated using variables.

The purpose of this requirement is to determine whether the production process is likely to produce product which meets the requirements of SANOK RC S.A..

Initial process studies is a short-term one and does not encompass the impact of time and changes caused by human resources, materials, equipment, measurement system and external factors. Yet, even in the case of short-term tests it is necessary to collect and analyse data in a sequence conforming with the production run with the use of control charts.

It is necessary to perform the measurement system analysis in order to understand how measurement error affects on the measurements.

Samples are collected within a short time span in the quantity of at least 20 samples each having 3 to 5 readings from consecutive parts. The total number of measurements must be at least 100.

The Organisation should apply the following criteria of evaluation of initial process capability:

Results P_p, P_{pk} index value	**Interpretation**
Index ≥ 1,67	The process currently meets the customer's requirements. Production to be started in accordance with the Control Plan upon approval.
Index from 1,33 to 1,66	The process requires further improvement. Contact the customer to review the test results. This will require changes to be introduced to the Control Paln in case improvement is not effected before launch of serial production.
Index < 1,33	The process does not currently meet the acceptance criteria. Contact the authorised customer representative in order to review the test results.

With the consent of Za zgodą SANOK RC S.A. the requirements related to the initial process study data may be replaced by long term historical data from the same or simillіar processes.

If one cannot achieve an acceptable process capability within the time span assigned for the part submission, the Supplier is obliged to prepare a corrective actions plan as well as modify control plan (usually by providing 100% inspection) and submit these documents for approval to SANOK RC S.A..

Typical corrective actions include: process improvement, change of tooling and changes caused by the design-related customer's requirements.

7. Manufacturing of parts

The Organisation should conduct a significant production run conforming with the requirements of SANOK RC S.A. as defined by drawings, specifications, etc.

While conducting the significant production run, R@R initial production process capability evaluation must be made. The initial process capability analysis report written down on form no. F-R2.016 should be submitted for approval to SANOK RC S.A..

In case the sample has been manufactured using the temporary tooling approved by SANOK RC S.A. this fact must be described in detail in the “explanations/remarks” line included in the “Part Submission Warrant” from no. F-R2.100.

The Organisation should manufacture such a quantity of parts as to carry out all tests allowing the part quality evaluation to be made and self-evaluation of the production process performance to be conducted.

8. Control of parts

The Supplier should take measurements and carry out tests in accordance with the PVP approved by SANOK RC S.A. in order to verify whether the parts conform with all requirements defined in the design drawings and in the specification.

8.1. Dimensional tests requirements

The Organisation should provide evidence that the results indicate compliance with specified requirements.

In case the part is composed of a couple of components, the Organisation is obliged to measure all components according to the manufacturing drawings and the complete part according to the assembly drawing.

The Organisation verifies all shape-defining characteristics of the part (dimensions, angles, shape and placement deviations, roughness, etc.) for all tools and all cavities of the mould/die/cutter, etc.

In the contents of measurement cards for parts manufactured using a couple of tools or cavities in the moulds/dies/cutters, etc. the Organisation should state the number of the tool or cavity from which the part comes.

In case the drawing does not define the dimensions of the above mentioned parts, the manufacturer prepares a sketch of the part cross section on a scale of 1:1, and by comparing the actual part cross section with the cross section as defined in the design drawing or with the previously manufactured reference template the manufacturer prepares a measurement card describing manufacturing deviations (dimensional deviations with exception of cases when it is possible to take measurements using templates, patterns, etc.).

8.2. Material tests requirements

The Organisation should perform tests of all product parts and materials if the technical documentation requires physical properties, chemical properties, heat treatment quality and surface treatment quality (varnishing, electroplating), etc. to be verified.

The aforementioned tests must be performed on a proper sample size in the Organisation’s own test labs or accredited external institutions must be hired to conduct these tests.

Test reports must be accompanied by the test results provided by the Supplier of the component parts.

In the case of materials coming from qualified suppliers, which have previously been used by the Organisation, lab tests may be skipped and replaced by a material approval certificate issued by the Supplier.

8.3. Performance tests

The Organisation should conduct all performance tests including durability and corrosion resistance tests in accordance with specifications included in the design drawing.

The number of samples for testing should conform with the detailed description of technical requirements. In case it has not been defined, it is necessary to test each of the characteristics using at least three samples. However, if the number of samples is to be changed, it must be agreed with the project-responsible person at SANOK RC S.A..

8.4. Appearance approval

For parts which have appearance requirements (varnish layer, electroplate finish, colour, gloss, texture, etc.) it is required that appearance control be conducted on at least 10 samples in accordance with requirements stated in the design record.

8.5. Preparation of test reports

The Organisation should prepare a report including the PVP complete with test results and numbers of tests reports. Tests reports must be prepared using forms nos. F-R2.096, F-R2.097, F-R2.098 and F-R2.099.

Reports from the tests conducted by accredited external institutions (in case testing capacity of the Organisation is not sufficient) should be signed by a reprsentative of such institutions and consitutte an appendix to the protocols of the Organisation.

8.5.1. Dimensional tests

The Organisaion should mark each of the controlled characteristics with a number in the part drawing or sketches. The drawing or sketch marked in this way must be attached to the tests report.

The dimensional tests report must contain the numbering of the controlled characteristics corresponding to the numbers found in the drawing or sketch.

In case the part shape is evaluated or cross section reviewed, corresponding measurement results must be attached.

8.5.2. Material tests

In case the part is comprised of component elements, the material tests report must be prepared for each component part separately.

8.5.3. Performance tests

The supplier must include the endurance, durability, corrosion resistnace and other test results in the contents of perfromance tests report.

8.5.4. Appearance tests results

If a given part has been marked “significant appearance” by SANOK RC S.A., a separate “Appearance Approval Report” must be prepared for each part or a series of parts.

In case an appearance template exists its control number must be quoted.

If it becomes necessary to define a limit appearance template the test result must be stated based on the established template.

9. Preparation of sample production parts for shipment

The parts submitted for approval should be tested by the Organisation in full scope of requirements. The review of samples subjected to destructive and durability tests should be completed.

Unless agreed otherwise, the batch of parts for shipment should comprise:

- marked parts and component parts 5 pieces each, dimensions of which have been checked,
- 50 pieces of parts (coming from different cavities in the case of multi-cavity tools).

At the request of the Organisation the required quantity of the sample production parts may be changed if previously agreed to by the project-responsible person at SANOK RC S.A...

9.1. Packing and marking of the parts for shipment

The Organisation should sort and mark the sample production parts which have been reviewed for quality and the test results of which have been included in the test protocols. The sample production parts should be packed in such a way as to protect these parts from damage during transportation and storage and they should be marked by a yellow tag according to appendix no. 13.

Pre-launch production parts and subsequent serial production parts delivered to SANOK RC S.A. should be marked by a tag specific for the Organisation unless a different way marking has been set in the contents of the Specification of Requirements for the Part.

The Organisation is obliged to provide the special Approval Certificate „2.3” or Collection certificate „3.1.B” according to PN-EN 10204 +A1. The kind of parameters (e.g. chemical composition, material properties, dimensions, etc.) as well as frequency of inspection (e.g. each shipment, once per year) shall be defined in the Specification of Requirements for the Parts.

9.2. Part Submission Warrant

For each batch of the parts the Organisation prepares a separate form “Part Submission Warrant” – Form no. F-R2.100, signed by the authorised representative of the Organisation. This is a guarantee of a proper quality of supplied sample production parts.

For parts which differ only in colour as well as for similar parts, if previously agreed to by SANOK RC S.A., the preparation of a single form „ Part Submission Warrant” is permitted.

On each submission the supplier is obliged to determine the part weight.

The average part weight must be expressed with an accuracy of 1 gram based on weight measurements taken on 10 randomly selected parts.

9.3. Retention of records and master samples

The Organisation is obliged to retain full records of test results, master sample for each submission for approval, Statistical Process Control results and, if required, appearance approval. Records should conform with all test-related specifications.

The required documentation records include copies of the following documents:

- Tests results based on the customer-approved design records including all dimensional requirements,
- Lab tests reports,
- Initial process capability analysis results,
- Results of measuring systems analysis, process algorithm, Process FMEA (and, if required, Project FMEA), control plans, initial evaluation of process performance, certificate of manufacturing conformity from the Suppliers together with auxiliary documentation, appearance approval and master samples.

Records related to the part approval for production must be retained for a period in which the article remains active plus 1 calendar year.

Master samples must be retained for the same period of time as the records related to the part approval for production or until a new master sample has been manuafctured for the same part number in order to obtain the customer approval.

The Organisation should keep the master sample for each tool, mould/die/cutter cavity or production process, unless otherwise determined by the project-responsible representative of SANOK RC S.A..

10. Part status determination

SANOK RC S.A. notifies the Organisation of its decision regarding approval or rejection of the submitted sample production parts using form no. F-R2.100.

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Approval of sample production parts entitles the Organisation to proceed with delivery of pre-launch production parts.

Rejection means that sample production parts and/or their accompanying PPAP documentation does not meet the requirements of SANOK RC S.A.. In such case, the process and/or documentation must be adjusted accordingly and re-submitted for approval.

With the consent of the project-responsible person at SANOK RC S.A., simultaneous delivery of sample production parts and pre-launch production parts is permitted while meeting the packing and marking requirements as defined in point 9.1.

11. Part approval for serial production

SANOK RC S.A. notifies the Organisation of its decision regarding the serial production part approval using the form as shown in appendix no. 12.

11.1. "Without conditions" approval

"Without conditions" approval constitutes a confirmation that the parts meet all requirements of SANOK RC S.A.. The Organisation is simultaneously entitled to supply the manufactured parts in quantities resulting from orders placed by SANOK RC S.A..

Upon serial production part approval the Organisation becomes responsible for ensuring that the future production will continuously fulfil the customer's requirements.

11.2. "Conditional" approval

"Conditional" approval constitutes a temporary approval which allows the Organisation to deliver the parts required for production in a limited period of time or in a limited quantity. "Conditional" approval shall be accepted only if an action plan has been prepared by the Organisation with the approval of SANOK RC S.A.. In order to obtain the "without reservations" approval PPAP must be re-submitted. With the consent of the project-responsible person at SANOK RC S.A. the required submission level may be changed.

12. Appendices - forms:

1	Part Approval Process Flow Chart	
2	Standard Process Flow Chart	F-R2.047
3	Project Verification Plan	F–R2.002
4	Control Plan	F-R2.018
5	Retantion / Submission Requirements Table	
6	Dimensional Results	F-R2.096
7	Material Tests Results	F-R2.097
8	Performance Tests Results	F-R2.098
9	Appearance Approval Report	F-R2.099
10	Part Submission Warrant	F-R2.100
11	Capacity Analysis Report	F-R2.016
12	Part Approval for Serial Production	F-R2.013
13	Tag for sample production parts – yellow colour	
14	Changes incorporated into the 4th edition of PPAP Guide	