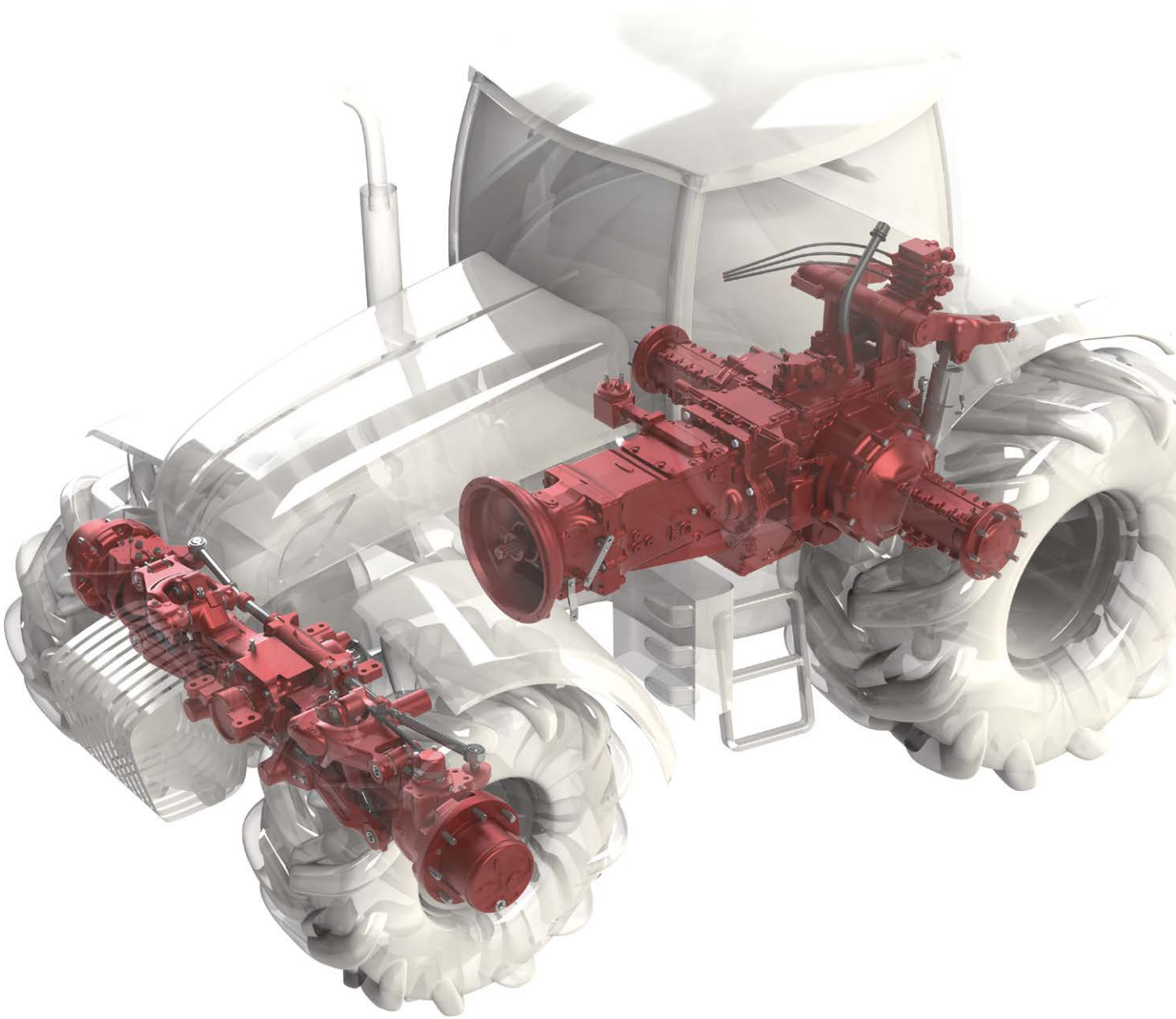
Supplier Quality Manual



CARRARO

Dear Supplier,

The Carraro Group is pleased to present its **Supplier Quality Manual, 2019 revision**, the sixth since 1998.

This revision includes a complete review of chapters 12.3.3, 14.1 (Heat treatment) and 14.3 (Welding) and introduces the Supplier PPAP Submission Matrix (Carraro Standard 8-00002).

This Manual demonstrates Carraro's will to establish and maintain a relationship of mutual benefit with its suppliers. In preparing this Manual we have tried to create a tool to clarify in advance Carraro's expectations and requirements, in order to facilitate the communication with current and potential suppliers and to ensure optimal performance of the supply chain.

Our products are to a large extent constituted by purchased materials and components whose quality significantly affects the quality of the final product. Carraro expects its suppliers to adhere to the contents of this Manual and incorporate them in their own activities.

Should you require further clarification, please do not hesitate to contact the Supplier Quality Engineer (SQE) of the Carraro plant to which you supply your products.

Yours sincerely,

Alessandro Gigli
Purchasing Director

Massimo Del Gobbo
Quality Director

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1. Introduction

The Supplier Quality Manual is an integral part of the supply contract in force. The purpose of the Supplier Quality Manual is:

- to communicate to suppliers in a clear and consistent manner Carraro's expectations, guidelines and quality requirements;
- to indicate to suppliers the necessary tools and methods for the development, implementation and testing of products in accordance with such requirements.

The contents of the Supplier Quality Manual represent the minimum procedures that must be effectively implemented by all suppliers.

The requirements of the Supplier Quality Manual apply to suppliers of:

- production materials (raw materials, moulded products, semi-finished goods, cast products, etc.);
- production items or spare parts (components and assemblies);
- mechanical processes, heat treatments, surface treatments, welds and paintings.

The Supplier Quality Manual applies to suppliers of all Carraro plants.

In the future, additional requirements for specific Carraro plants may be developed. These requirements will be managed in separate documents with respect to the Supplier Quality Manual, the requirements of which will nevertheless still be applicable, unless explicitly waived.

Carraro's objective is to provide its customers with compliant products, provide these products globally and be a competitive supplier in all markets. This objective can only be achieved with the support and commitment of its suppliers. Clear and concise expectations and requirements will make the supplier-customer relationship more profitable for all.

2. Carraro Private Network (CPN)

The main means of communication between Carraro and its suppliers is Carraro Private Network (CPN), a web-based application designed to manage on-line purchases and the relationship with suppliers.

CPN connection is a mandatory requirement to become and remain a Carraro supplier.

Suppliers can access CPN via the link on the Carraro website www.carraro.com upon acceptance of the terms of use.

CPN user manuals can be found in the Documents section of CPN.

Should you need further support, you can phone CPN Help Desk at the numbers you can find in CPN or send an e-mail to cpnsupporto@carraro.com.

Through CPN suppliers will be able to:

- receive requests for quotation;
- submit quotations, starting from a document already partially compiled by Carraro;
- receive closed orders and subsequent changes;
- receive the agreed changes to price lists;
- receive orders from automatic planning;
- receive payment notices from the Accounting Department;
- manage non-conformity reports on-line;
- consult quality and service performance indicators;
- exchange and consult documentation.

3. Code of Ethics

Carraro operates having as a reference the provisions of a Code of Ethics.

The Carraro Group Code of Ethics is based on the principles of compliance with current legislation, loyalty, fairness and professional rigour in order to preserve the integrity of the Group's assets and safeguard its reputation and image, maintaining relationships based on clearness and transparency with its shareholders and stakeholders in general.

Carraro does not entertain business relationships with anyone whose activities are not inspired by principles representing the cornerstones of the said Code; all Carraro suppliers are therefore required to explicitly accept it, undertaking to align their conduct with the provisions contained therein. Acceptance shall be in writing in the form and manner prescribed by Carraro. Failure to accept or a breach of the same shall entitle Carraro not to establish or to discontinue business relationships with the supplier.

The Carraro Group Code of Ethics can be found in the Corporate Governance section of the website www.carraro.com.

4. Quality Management System

To become a Carraro supplier it is necessary to be third party registered to ISO 9001 by an accredited third party certification body. Moreover, suppliers of products for the automotive industry shall structure their quality management system with a view to conformity with IATF 16949.

5. Environmental Management System

An effective environmental management system ensuring conformity to applicable statutory and regulatory requirements and promoting continuous improvement of the supplier's environmental performance is an essential element of supplier evaluation.

All supplied products shall conform to applicable environmental statutory and regulatory requirements. Moreover, Carraro expects its suppliers to respect the following principles:

- accurate handling during production processes;
- elimination and/or reduction of polluting production processes;
- monitoring of and compliance with environmental statutory and regulatory requirements applicable in the manufacturing and receiving country.

6. Supplier Monitoring and Assessment

6.1. Preliminary Supplier Assessment

The potential supplier shall complete a questionnaire aimed at collecting information about its company in a structured manner.

Depending on the answers to the questionnaire, Carraro decides whether to send a request for quotation to the potential supplier.

If the quotation submitted by the supplier is competitive, Carraro defines the activities to be carried out to qualify the supplier. Such activities include the execution of an audit to the supplier (PSA – Potential Supplier Assessment).

Once qualification activities have been completed, Carraro decides whether the potential new supplier can be included in the supplier list.

6.2. Production Process Assessment

Carraro Supplier Quality assesses the production process of all new potential suppliers through the PSA (Potential Supplier Assessment).

The production process of suppliers already acquired is assessed using the PCPA (Process Control Plan Audit).

Depending on the score obtained, the following activities shall be carried out.

PCPA Score		Activity
🟢	**5**	None.
🟢	**4**	None.
🟡	**3**	Corrective action plan to be agreed with Carraro. If the corrective actions are not implemented effectively within the established deadlines (maximum 6 months) → New Business Hold (NBH).
🔴	**2**	Immediate containment actions. Corrective action plan to be agreed with Carraro with verification of effectiveness within 60 days. If the corrective actions are not implemented effectively within the established deadlines → New Business Hold (NBH).
🔴	**1**	Production stoppage for the audited process. New Business Hold (NBH) and definition of expulsion plan.

To achieve the qualified supplier status, the supplier shall obtain a score of at least 4 for all the points in the PCPA.

The supplier may start delivering if it has obtained a score of at least 3 for all points of the PCPA, provided it has submitted an improvement plan aimed at achieving the score of 4 to Carraro Supplier Quality within the deadline specified by the latter.

Existing suppliers with a score less than or equal to 1 can no longer continue delivering.

6.3. Assignment of New Products to Existing Suppliers

Carraro Purchasing can issue a sample order for a new product to an existing supplier providing that its PCPA score is ≥ 3.

If the production process is new for the supplier, Carraro Supplier Quality carries out a Process Control Plan Audit (PCPA) and manages any corrective action plans.

Once the production part approval process has been successfully completed (see § 12), Carraro Purchasing can assign the product.

6.4. Supplier Monitoring and Development

Carraro notifies its suppliers annually of the quality and service improvement targets to be achieved, taking into account the corporate objectives defined.

Suppliers shall regularly consult their quality and service performance data in CPN. Each Carraro plant may adopt assessment criteria other than those present in CPN which will be notified to the supplier.

Carraro Supplier Quality identifies which suppliers to include in improvement programs and manages their improvement plans. If the supplier does not reach the targets agreed in the improvement program, Carraro Supplier Quality will propose to Carraro Purchasing to stop purchasing from the same.

7. Documentation

7.1. AIAG Manuals

The supplier shall be in possession of the latest versions of the following AIAG (Automotive Industry Action Group) manuals:

- APQP – Advanced Product Quality Planning
- PPAP – Production Part Approval Process
- FMEA – Failure Modes Effects Analysis
- SPC – Statistical Process Control

› MSA – Measurement Systems Analysis

The above manuals can be purchased on the website www.aiag.org.

7.2. Carraro Technical Information

All technical information provided by Carraro are subject to the provisions of the supply contract in force with regard to confidentiality and patent rights and to the confidentiality agreement.

Carraro makes available to its suppliers the technical information necessary to supply the products. Should the documentation provided be incomplete or not sufficient, the supplier shall request Carraro Purchasing for the information necessary to supply products compliant with the requirements.

Carraro standards can be consulted in CPN (Carraro Private Network).

The supplier shall ensure that the relevant versions of the above mentioned documents are available at the time and in the place where production and product testing is carried out.

7.3. Supplier Technical Documentation

The supplier shall prepare and keep updated all documentation necessary to make sure product requirements are met and to give evidence of their conformity with the acceptance criteria (working drawings, manufacturing cycles, control plans, quality plans, material specifications, test reports, etc.).

These documents shall be promptly made available upon Carraro's request.

7.4. Documentation Demonstrating Conformity with Safety and Environmental Legislation

All items supplied (materials, semi-finished goods, components, assemblies, etc.) shall comply with safety and environmental standards applicable in the receiving country. The supplier shall provide evidence of conformity with the applicable standards.

Regulation (EC) No. 1907/2006 – REACH

Regulation (EC) No. 1907/2006 – REACH (acronym for Registration, Evaluation, Authorisation of Chemicals) establishes specific duties and obligations for manufacturers, importers and downstream users of substances, in their own right or as components of preparations or articles (as defined in Article 3 of the Regulation).

The Regulation is in force in the 30 European Economic Area countries, including the 27 European Union member states (Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, United Kingdom, Romania, Slovakia, Slovenia, Spain, Sweden, Hungary) and Norway, Iceland and Liechtenstein.

Circulation of chemicals within the REACH area of application is free, this being assimilated to the domestic market, whereas there are still restrictions on imports from other countries (Switzerland, Turkey, China, India, USA, Brazil, etc.). Exporters to REACH area may continue their activities only by registering chemicals directly via one of their companies with registered offices in it or by appointing an Only Representative having registered offices in it.

Suppliers of articles (materials, semi-finished goods, components, assemblies, etc.) falling within the scope of the REACH regulation shall comply with the applicable restrictions required by the standard and provide, during product approval process (see § 12), evidence of having carried out the registration or notification procedure for the substances therein contained and communicate information on the possible presence of SVHC (Substances of Very High Concern).

Safety Data Sheets

In accordance with the provisions of Regulation (EC) No. 1907/2006, REACH, and Regulation (EU) No. 453/2010, suppliers are required to provide, together with the first consignment of goods, safety data sheets for every substance and mixture contained in the goods supplied so as to enable their safe use.

Safety data sheets shall be compiled in conformity with the above mentioned Regulations; non-conforming safety data sheets will not be accepted.

If a safety data sheet is updated, the new, updated version for all the products supplied in the previous 12 months shall be sent automatically without delay.

Directives 2011/65/UE and 2012/19/UE

Directive 2011/65/UE on the restriction of the use of certain hazardous substances in electrical and electronic equipment (RoHS – Restriction of Hazardous Substances Directive) and Directive 2012/19/UE on waste electrical and electronic equipment (WEEE) govern the use of hazardous substances such as lead, mercury, cadmium, hexavalent chromium, polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE), and the recovery and disposal of waste equipment.

Suppliers of goods falling within the scope of application of the aforementioned Directives shall provide, during product approval process (see §12), certification of their conformity with the requirements of said Directives.

Directive 2000/53/EC

The aim of Directive 2000/53/EC and its following changes, on end-of-life vehicles is to reduce the environmental impact of end-of-life vehicles by restricting the use of hazardous substances in vehicles, in particular the use of heavy metals such as lead, mercury, cadmium and hexavalent chromium. The objective of the Directive is to ascertain that the recycling target of 95% of end-of-life vehicles by weight is met.

Suppliers of goods falling within the scope of application of the aforementioned directive shall provide certification of their conformity with its requirements during product approval process (see §12).

In addition, where requested by the Quality Department of the receiving Carraro manufacturing plant, suppliers are required to register the materials they supply in the International Material Data System (IMDS), a database containing information collected from the automotive supply chain in order to facilitate the identification of the chemical composition of materials used and the verification of their conformity with regulations introduced under Directive 2000/53/EC.

Directive 2003/122/Euratom and Directive 2006/117/Euratom

Council Directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources and Council Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel require radiometric control on the import, collection, storage and melting of metal scrap and other metal wreckage (ferrous and non-ferrous) and on the import of semi-finished goods.

Suppliers of metals and semi-finished goods that are subject to radiometric control requirements shall provide proof of radiometric testing, in conformity with the provisions of Council Directive 2006/117/Euratom, via electronic mail prior to the delivery of supplies.

Conflict Minerals

Section 1502 of the Dodd-Frank Wall Street Act, US Federal Law, introduced the concept of Conflict minerals, defined as gold, columbite-tantalite, cassiterite, wolframite and their

derivatives (tantalum, tin and tungsten) from the Democratic Republic of the Congo (DRC) and its neighbours (Rwanda, Burundi, Angola, Central African Republic, Sudan, Tanzania, Uganda and Zambia) whose related activities (extraction, processing, etc.) finance armed conflicts.

With the Dodd Frank Act, the United States has approved legislation that intends to regulate the use of Conflict Minerals. The law does not prohibit the use of these minerals, but imposes the obligation to companies operating in the US or exporting to the US to inform consumers about the origin of the minerals and to put it in the condition to choose the products of which companies buy. In order to allow this, companies have the obligation to trace the origin of any Conflict Minerals used in their products along their supply chain.

7.5. Retention of Documentation, Records and Reference Samples

Suppliers are required to set forth retention periods for documents, for records established to provide evidence of conformity to requirements and of the effective operation of the quality management system, and for reference samples.

Unless otherwise indicated, the minimum retention requirements are to be set as follows.

Type of documentation/record	Start of retention period	Type of product	Retention period
Documents prepared during product and process development (e.g. drawings, working cycles, technical standards, control plans inspection or test procedures).	Product phase–out or document modification.	Safety. Subject to legal, homologation or mandatory restrictions.	15 years
		Other products.	3 years
Records made during product and process development and during series production (e.g. test reports, control charts, audit reports, reviews, evaluation reports).	Shipment data of the product to which the records relate.	Safety. Subject to legal, homologation or mandatory restrictions.	15 years
		Other products.	3 years
Documents and records relating to product approval process (PPAP), including reference samples.	Product phase–out.	Safety. Subject to legal, homologation or mandatory restrictions.	15 years
		Other products.	3 years

The supplier shall ascertain that record retention requirements are complied with also by its possible sub-suppliers.

All records, including those of sub-suppliers, shall be promptly made available to Carraro and anyway within forty-eight hours of the request.

8. Feasibility Studies

The supplier shall review all documentation provided by Carraro (drawings, technical specifications, supply specifications, process performance requirements, etc.) before undertaking to supply a new or modified product.

Such review has the objective of ensuring that the supplier is able to deliver the products in conformity with the technical requirements, volumes and manufacturing process capacity required by Carraro.

On such occasion, the supplier shall also verify its ability to implement product and process quality planning as described in paragraph 9.

8.1. Production System Planning

The supplier, while designing autonomously its own production process, shall use means of production appropriate to make sure products meet quality and reliability requirements.

The supplier shall ascertain in advance to be able to obtain and maintain constant over time the product characteristics required in the technical documentation by measuring process capability according to the methods illustrated in the AIAG manual Statistical Process Control (SPC).

9. Advanced Product Quality Planning APQP

Advanced Product Quality Planning (APQP) is a structured method for defining the activities necessary to ascertain that a product complies with customer requirements during development and launch.

The supplier, without prejudice to its autonomy in selecting and developing its processes, shall carry out advanced product quality planning in conformity with the provisions of the AIAG manual Advanced Product Quality Planning and Control Plan (APQP).

Upon receipt of the sample order, the supplier shall consult the Supplier PPAP Submission Matrix (Carraro Standard 8-00002) where for each commodity are indicated:

- which advanced product quality planning activities to carry out;
- when it is necessary to demonstrate such activities have been carried out by submitting the corresponding documentation (e.g. process flow diagram, FMEA, capability studies, etc.) during the product approval process (see § 12).

Some of the main activities of advanced product quality planning are listed in the following paragraphs.

9.1. Process Flow Diagram

The supplier shall prepare a process flow diagram clearly describing the production process steps and sequence, from receipt of materials to shipping of finished products, including subcontracted processes and control, handling and packaging activities.

Process flow diagrams shall include the names or the codes of sub-suppliers.

There shall be one-to-one linkage by process or operation between process flow diagrams, PFMEAs and control plans.

9.2. FMEA

FMEA (Potential Failure Mode & Effects Analysis) is a disciplined review and analysis conducted to anticipate, resolve or monitor potential product or process problems by systematic assessment of potential failure modes according to probability of occurrence, severity of effects and possibility of detection via controls. Potential problems shall be minimised through implementation of appropriate corrective actions.

FMEA is a tool to be applied to the design of both products (DFMEA – Design Failure Mode and Effect Analysis) and production processes (PFMEA – Process Failure Mode and Effect Analysis).

The supplier shall conduct FMEAs using the AIAG manual Potential Failure Mode & Effects Analysis (FMEA) as reference.

When applicable, the supplier can prepare FMEAs for product families.

Process FMEA shall analyse the potential failure modes that may occur in all phases of the process described in the process flow diagram (keeping the same numbering) and pay particular attention to critical and safety characteristics specified in Carraro technical documentation.

FMEA shall be reviewed whenever products or processes are modified, production is transferred or new failure modes are discovered.

On request, the supplier shall participate in drafting Carraro product or process FMEAs.

9.3. Control Plan

The supplier shall make sure manufacturing processes are effectively managed by controlling production process parameters and product characteristics. These activities shall be documented in control plans.

Control plans shall be developed following the instructions and template which can be found in the AIAG manual Advanced Product Quality Planning and Control Plan (APQP).

In preparing control plans, the supplier shall take into account the process flow diagram, process FMEA outputs and experience on similar products. Continuous process improvement methods shall be applied.

Control plans shall be developed for all production phases and shall include the control of all product and process safety and key characteristics (critical and important) shown in the drawings and in the applicable technical specifications or deriving from the FMEA analysis.

There shall be an unambiguous link between control plans and process flow diagram and FMEA phases.

Control plans shall be developed, where applicable, for prototypes, pre-launch and series production.

Control plans shall be reviewed and possibly updated when any change occurs affecting product, manufacturing process, measurement, logistics, supply sources or FMEA.

Without prejudice to its responsibility for product quality, the supplier undertakes not to make modifications to control plans that may result in reduced effectiveness of controls (e.g. control phases, frequencies or less accurate control methods) without prior notice to the Quality Department of the Carraro plant which approved the product (see § 12).

9.4. Monitoring and Measurement Equipment

The supplier shall have monitoring and measurement equipment adequate for the execution of all controls and tests needed to provide evidence of conformity of product characteristics and process parameters referred to in control plans.

These devices, including those owned by Carraro, shall be adequately identified and included in a calibration program.

Should the equipment be used to verify product safety or key characteristics, the supplier shall perform measurement system analyses which shall include R&R studies, in accordance with the AIAG manual Measurement System Analysis (MSA).

Where applicable, personnel performing non-destructive testing shall be qualified in accordance with current international legislation (e.g. EN 473, ISO 9712, ASNT TC 1A).

External laboratories used for inspection and tests on safety or key characteristics or on automotive products shall be accredited to ISO/IEC 17025 standard or national equivalent.

9.5. Process Capability Studies

The supplier shall plan process capability studies (Pp, Ppk, Cp and Cpk measurement), to be carried out as described in the AIAG Manual Statistical Process Control (SPC), to monitor and control the production process in order to ascertain that it operates at its full potential to produce products compliant with requirements.

The supplier shall carry out capability studies on the safety and key characteristics shown in the drawings and in the applicable technical specifications or deriving from the FMEA analysis.

Safety characteristics are product characteristics or production process parameters which may affect end user safety and/or conformity of the product with statutory and regulatory requirements.

Key characteristics are product characteristics or production process parameters which may affect product functionality and performance or subsequent phases of the production process, without affecting safety or conformity of the product with statutory and regulatory requirements.

Unless more stringent requirements are stated in the drawing or technical specifications referred to therein, the supplier shall comply with the requirements specified in the following table.

Characteristic	Pre-series capability	Series production capability
Safety characteristics	Pp – Ppk > 2	Cp – CpK > 1,67
Key characteristics	Pp – Ppk > 1,67	Cp – CpK > 1,33

Should the supplier be unable to obtain the required values, 100% inspection and/or poka-yoke control system are required.

9.6. Handling, Packaging and Transportation

Handling, packaging and transportation procedures have a significant impact on product quality and user safety.

The supplier shall pack products as specified in the packaging instructions provided by Carraro.

In the absence of specific instructions, the supplier shall design a package which ensures that product characteristics remain unchanged during storage, transportation and unpacking and therefore that products arrive at the point of use without causing danger to users and without dents, rust, scuffing or any other defect that might affect their conformity with requirements.

Any changes to packaging instructions developed by suppliers shall be agreed with Quality and Logistics Departments of the receiving Carraro plant.

10. Subcontracted Processes

Should some processes be subcontracted, the supplier shall:

- determine in advance the suitability of the subcontractor through a documented process audit;
- ensure that the subcontractor complies with the requirements of this Supplier Quality Manual;
- activate reinforced controls to ascertain conformity of the product in the event of the subcontractor's deficiencies;
- ensure timely implementation of corrective actions if non-conforming products are detected.
- Carraro Supplier Quality reserves the right to carry out, at any time, verification at subcontractors' premises.

Any changes in subcontractors shall be considered as process changes. The supplier shall therefore:

- obtain prior approval from the Quality Department of the receiving Carraro plant;
- request product approval as specified in § 12.

Failure to communicate these changes to the Quality Department of the receiving Carraro plant will cause the New Business Hold (NBH) procedure to be invoked.

11. Product Identification and Traceability

The supplier shall have a system that guarantees:

- identification of raw materials and semi-finished products in its warehouses;

› identification of product status with respect to monitoring and measurement requirements throughout product realisation;
› identification of non-conforming products to avoid their unintentional use or delivery;
› identification of finished and conforming products.

When applicable, in the case of products also manufactured for other customers, the supplier shall properly label Carraro safety stock containers.

The supplier shall identify each container of products to be shipped to Carraro with a label containing at least the following information:

› supplier name;
› product part number;
› delivery note number;
› quantity of products in the container;
› total weight of the container;
› tare of the container.

The supplier shall have a system to unambiguously identify and trace, for each production batch, the date of manufacture, the results of controls and tests carried out on the products and any corrective actions taken. This requirement also applies to products supplied and processes carried out by subcontractors.

When required in the drawings or technical specifications, the supplier shall mark the products and monitor and record their unambiguous identification.

12. Product Approval

12.1. Products for Which Approval Shall Be Obtained Before Production of Pre-Series Batch

12.1.1. Casts and Machined Parts Made From Casts

The supplier, before starting to develop new casts, shall submit to Carraro Purchasing the drawing of the pattern containing the following information:

› pattern line;
› size (mm^2) and location of ingate riser necks and runners;
› any areas not to be deburred;
› any changes made to Carraro's pattern 3D file shown by overlapping Carraro's and the supplier's patterns; lacking Carraro's pattern 3D file, the 3D file used by the supplier to prepare the pattern shall be submitted for approval;
› positioning of supplier traceability markings (cast number, revision number, casting date, pattern number, etc.);
› machining stock allowance;
› core support (chaplets) location and their type/size.

The supplier shall obtain the approval of Carraro Purchasing before starting the construction of the patterns.

12.1.2. Steel Forgings

The supplier, before starting to develop new forgings, shall submit to Carraro Purchasing the drawing of the forging with the following information:

› steel grade and reference standards;
› heat treatment performed, mechanical characteristics, finishing;
› flash line;

› overlap between the drawing of the product having undergone the first machining operation following forging (e.g.: turning) and that of the forging to permit stock allowance assessment;
› positioning of traceability markings to ensure traceability to supplier, forging part number and corresponding engineering change level, heat and die number;
› dimensional and draft angle tolerances and reference standards for their determination.

The supplier shall obtain the approval of Carraro Purchasing before starting the construction of the dies.

12.1.3. Products With Aesthetic Requirements

The supplier, before starting production of the pre-series batches of products whose drawings contain the wording "aesthetic relevant product", shall prepare the samples for appearance features and the Appearance Approval Report as indicated in the AIAG Manual Production Part Approval Process (PPAP) and submit them to the Quality Department of the receiving Carraro plant for approval.

The Appearance Approval Report, complete with Carraro's part disposition and authorised representative signature, shall be submitted during product approval process (see § 12.3).

It may be agreed that no sample is to be provided and approved before the submission of the production part approval process file. In that case the sample products are to be also the master samples for the appearance approval inspection process and the appearance approval will occur concurrently with sample product inspection and testing. This shall be clearly stated by the supplier in the Appearance Approval Report.

12.2. Prototype Approval

Carraro considers prototypes the products which need to comply with the specified requirements, but can be produced with processes other than those used for series production.

Unless otherwise specified, the supply of prototypes shall be accompanied by:

› the dimensional test report concerning all characteristics measured on one part;
› the certificate attesting material conformity;
› the certificates attesting suitability of heat and surface treatments, welding and painting (where applicable).

When requested, the supplier shall conduct experimental tests on prototypes in accordance with Carraro and/or supplier specifications, the results of which will contribute to the technical approval of the product.

12.3. Production Part Approval Process (PPAP)

Purpose

The purpose of the production part approval process (PPAP) is to determine whether the supplier has properly understood all the customer requirements contained in the drawings and specifications and whether its process has the potential to produce products which consistently comply with those requirements during an actual production run, at the quoted production rate.

When to Request Product Approval

The supplier shall obtain approval from the Quality Department of the receiving Carraro plant for:

› the supply of a new product;
› the supply of a product modified by an engineering change to drawings, specifications or materials;
› the correction of a non-conformity of a previously supplied sample batch.

In addition, should it plan to modify:

› the product;
› the process;
› the production site;
› a subcontractor

the supplier shall:

› obtain prior approval from the Quality Department of the receiving Carraro plant (except for changes aimed at improving process safety which can be implemented without prior authorisation);
› obtain approval for the supply subsequent to change implementation from the Quality Department of the receiving Carraro plant, unless otherwise specified.

Carraro may require the supplier to carry out the product approval process following the discovery of a serious non-conformity during mass production.

How to Obtain Product Approval

Upon receipt of the sample order, the supplier shall consult the Supplier PPAP Submission Matrix (Carraro Standard 8-00002) where for each commodity are indicated:

› the documents to prepare in order to obtain product approval;
› which documents need to be submitted to the receiving Carraro plant during the product approval process and which can be retained at appropriate locations and submitted to Carraro on request.

Unless otherwise specified, the supplier shall submit the number of samples required in the Supplier PPAP Submission Matrix taken from a batch produced with the tooling, gaging, materials and process planned for series production.

The supplier shall ascertain the conformity of all product characteristics with the requirements through appropriate controls and tests prior to shipment of the sample batch.

Carraro may request to be present during the execution of such controls and tests at the supplier's premises.

In the event of non-conforming characteristics, the supplier shall notify the Quality Department of the receiving Carraro plant. The supplier shall receive approval from Carraro before shipping the sample batch.

The supplier shall submit the required documentation prior to shipment of the sample batch or, if agreed with the Quality Department of the receiving Carraro plant, at the latest at the same time of the shipment.

The sample batch shall be properly identified with a label specifying the name of the supplier, the customer drawing number, the drawing revision number and the purchase order reference.

Samples shall be individually identified. Traceability to the corresponding measurements and tests in the PPAP documentation shall be ensured.

Product approval and supply authorisation will be granted by the Quality Department of the receiving Carraro plant on the basis of the conformity of the documentation provided and of the results of the controls and tests carried out. The supplier shall not ship series production batches in the absence of such approval.

Should non-conformities be detected, the Quality Department of the receiving Carraro plant will not grant production approval. Carraro Purchasing will therefore issue a new sample order. At the following delivery the product approval process shall be repeated. The new samples shall be provided free of charge. The supplier will be charged the cost of additional initial sample inspection (for example costs of personnel and of measuring equipment use).

12.3.1. Casts and Machined Parts Made From Casts

During the product approval process, the supplier, in addition to the documentation listed in the Supplier PPAP Submission Matrix, shall submit the following documentation:

- 2D (2 dimensions) or 3D (3 dimensions) inspection report, depending on the specifications requested in the drawing;
- thickness inspection report for each cavity and core-box combination;
- average weight calculated on 5 casts taken from various cavities;
- any notes or technical approvals received from Carraro;
- drawing showing cutting sections;
- pictures of the cast sections, showing their integrity;
- pictures of patterns and core-boxes;
- material certificate;
- painting certificate;
- paint technical and safety data sheets;
- 5 bonderised plates painted with the same paint as the cast or as the machined parts made from casts.

12.3.2. Forgings

The supplier of forgings, in addition to the documentation listed in the Supplier PPAP Submission matrix, may be required to submit the following documentation during the product approval process:

- controls carried out in 2D (2 dimensions) or 3D (3 dimensions), depending on the specifications indicated in the drawing;
- average weight calculated on 5 forgings taken, where applicable, from different figures;
- any technical notes/approvals received from Carraro;
- pictures of part sections to verify grain flow;
- pictures of the dies;
- record of heat treatment parameters.

12.3.3. Heat Treatment

During product approval process suppliers of heat treatment or products including heat treatments shall submit a heat treatment certificate including the following information:

- test report number and date;
- inspection laboratory name and address;
- customer (name and address);
- part number, description and material of the inspected product;
- reference to Carraro purchase order (for the supply of semi-finished or finished products) or production order (for the supply of heat treatments only);
- delivery note number;
- heat treatment performed;
- heat treatment date;
- heat treatment load number (if applicable);
- number of pieces per load;
- heat treatment furnace;
- inspections performed;
- number of pieces inspected;
- if the inspection was performed directly on the product (non-destructive testing), on a part of the product (destructive testing) or on a coupon;

- coupon dimensions (if applicable);
- if inspections such as surface hardness or case depth were performed on a ground or not ground surface (if applicable);
- instructions/reference standards for the inspections performed;
- inspection equipment used;
- test results and acceptance criteria;
- sentence indicating the heat treatment result (conforming/non-conforming) based on the acceptance criteria required and reported in the certificate (see previous point).

Furthermore, on request, the supplier shall communicate:

- information on the quenching bath used (for hardened or case hardened products);
- information on actual heat treatment parameters (diagram of temperature and carbon potential against time).

The above mentioned information shall be available at the supplier's even though it does not need to be submitted during production part approval.

If required, the inspection samples shall also be submitted.

13. Change Management

Without prejudice to the supplier being required to repeat the sampling process in the event of a change in the product, production site or a subcontractor (see § 12.3), the supplier shall have a system to identify the date on which changes to the product (e.g. material, machining, heat or surface treatments) are implemented.

Should it be required to give the product a serial number, the supplier shall record the serial number of the first product on which the change was introduced.

The supplier shall:

- properly identify the first supply of modified products;
- insert the wording Modified batch in the delivery note.

This also applies to changes to sub-contracted products.

14. Special Processes

14.1. Heat Treatment

The supplier shall have a laboratory equipped to verify that the technical requirements are met. Should this not be available or should it be necessary to carry out tests at an external laboratory, the supplier shall only use laboratories accredited to ISO/IEC17025, or equivalent national standard.

Dedicated heat treatment suppliers shall submit for each heat treated batch a heat treatment certificate containing all the information specified in § 12.3.3.

At Carraro's request, the supplier shall also promptly submit:

- information on the quenching bath used (for hardened or case hardened products);
- information on actual heat treatment parameters (diagram of temperature and carbon potential against time);
- the inspection samples.

In the case of supply of products which, on top of being machined are also heat treated, at Carraro's request, the supplier shall submit promptly (in any case within 2 working days) for each batch delivered:

- the heat treatment certificate including all the information specified in § 12.3.3;

› information on the quenching bath used (for hardened or case hardened products);
› information on actual heat treatment parameters (diagram of temperature and carbon potential against time);
› the inspection samples.

When required, the supplier shall carry out a self-assessment as per standard AIAG CQI-9, Special Process: Heat Treat System Assessment (HTSA), and communicate the results to the Quality Department of the receiving Carraro Plant.

14.2. Surface Coating

The supplier shall have a laboratory equipped to verify that the technical requirements (e.g. corrosion resistance, surface coating thickness, grid testing) are met. Should this not be available or should it be necessary to carry out tests at an external laboratory, the supplier shall only use laboratories accredited to ISO/IEC17025, or equivalent national standard.

14.3. Welding

The supplier shall ascertain the integrity of welded joints by certifying its production process and the operators involved in welding operations.

Welding is a special process regulated by international standards that establish quality requirements (ISO 3834 part 1, 2, 3, 4) and define general rules for the specification and qualification of welding procedures for metallic materials (ISO 15607).

Welders shall be qualified according to standard EN 9606-1, operators shall be qualified according to standard EN 14732 and solderers shall be qualified according to standard EN 13585.

Welding procedure specifications (pWPS or WPS) shall be formulated according to standard EN ISO 15609 part 1, 2, 3, 4, 5, 6.

In order to verify welded joint conformity, weld beads shall undergo laboratory tests, as specified in standard EN ISO 15614 part 1, 2, 3, 4, 5, 6, 7 , 8 , 9 , 10 , 11, 12, 13, 14.

Non-destructive testing of welded joints shall be carried out by qualified personnel in accordance with standard EN 9712 or national equivalents.

Should it not be possible to carry test out internally, the supplier shall use laboratories accredited to ISO/IEC17025, or equivalent national standard, for production process qualification tests and monitoring.

15. Certificate of Quality and Conformity (CQC)

When required by the Quality Department of the receiving Carraro plant, supplies shall be accompanied by a Certificate of Quality and Conformity (CQC) in which the supplier shall certify the quality of the supplied product and declare its conformity with the requirements.

The information to be included in the CQC will be agreed with the Quality Department of the receiving Carraro plant.

16. Special Concession to Supply Non-Conforming Products

The supplier shall not deliver products which do not conform to specified requirements without obtaining formal concession from the Quality Department of the receiving Carraro plant.

Any costs arising from non-conformities will be charged to the supplier.

Each container of products accepted in concession shall be properly identified by means of a label with the wording Material accepted in concession and a copy of the concession issued by the Quality Department of the receiving Carraro plant. Moreover, products accepted in concession shall be specified in the delivery note.

The above does not apply in the case of non-conformities regarding safety features or features

subject to legal, homologation or mandatory restrictions for which no concession can be granted.

17. Reference Samples

Reference samples (masters) are prepared for some products with binding characteristics which cannot be expressed or qualified in drawings or technical specifications (e.g. colour, appearance).

These samples are used by the supplier and by Carraro to verify product conformity by comparison and in the event of dispute.

Reference samples shall be replaced whenever the product characteristics they represent are changed.

Samples which are perishable or subject to ageing shall be renewed as agreed between the supplier and the Quality Department of the receiving Carraro plant.

18. Carraro Property

Carraro property provided to the supplier for use or incorporation into the products shall be:

- recorded in order to have an updated list at any time;
- properly identified (tools and manufacturing, test and inspection equipment shall be permanently marked so that the ownership of each item is visible and can be determined);
- carefully preserved, protected, safeguarded and verified;
- included, when applicable, in calibration and maintenance programs.

Suppliers shall be responsible for routine maintenance and partial or total refurbishment of Carraro property due to any problems they may have caused.

Should Carraro property require extraordinary maintenance due to deterioration or wear, the supplier shall promptly notify Carraro Purchasing in writing and shall start the activities only after receipt of formal authorisation.

The use of Carraro property does not relieve the supplier of the responsibility for ensuring the quality of supplied products.

19. Verification of Conformity of Supplies

Carraro reserves the right to carry out verification of conformity on products supplied:

- at the supplier and/or at its subcontractor site;
- by receiving inspection and/or testing using sampling plans based on supplier performance; if a non-conforming product is found, the entire batch will be considered as such;
- in the sales network;
- at end customers.

20. Management of Non-Conforming Products

Carraro is not obliged to carry out incoming material checks, except for detecting damage due to transport and visible product defects. The supplier is therefore fully responsible for the products supplied and undertakes to carry out all necessary checks to ascertain that they are free from design and manufacturing faults or defects (also hidden).

Non-conforming product management will be carried out as indicated below.

20.1. Raw Materials, Moulded Materials, Semi-Finished Products or Products Whose Non-Conformity Was Caused by Non-Conforming Purchased Material, Moulded Parts or Semi-Finished Products.

The Quality Department of the receiving Carraro plant may decide, in agreement with the supplier, to:

› return the entire potentially non-conforming batch to the supplier, with or without a request for replacement, according to necessity;
› have the supplier sort the products in its plant; non-conforming products found during sorting are then returned to the supplier or reworked in the Carraro plant or by third party suppliers at the expense of the supplier;
› sort potentially non-conforming products using its own personnel or third party suppliers in its plant at the expense and risk of the supplier; non-conforming products found during sorting are then returned to the supplier or reworked in the Carraro plant or by third party suppliers at the expense of the supplier.

20.2. Contract Work

The supplier shall detail in the delivery note the quantities of all the products delivered divided into:

› number of conforming products;
› number of products returned without being worked;
› number of scraps due to the operations performed (machining scraps);
› number of scraps due to the material supplied by Carraro (material scraps).

The number of products indicated in the delivery note shall coincide with the number of products physically delivered.

20.2.1. Non-Conforming Products Detected by the Supplier

I. Suspect Products

If the supplier detects “suspect “ products, i.e. non-conforming, but which in its opinion could be accepted, it shall inform the Quality of the receiving Carraro plant detailing the problem and asking if the products can be accepted.

In case of a positive answer, the supplier shall:

› indicate in the delivery note the “suspect “ products as conforming;
› indicate in the delivery note that the “suspect “ products must be brought to the attention of the Quality Department;
› identify the “suspect” products by spraying them with yellow paint and/or with a yellow card indicating that they are non-conforming products to be evaluated;
› place the “suspect” products in the containers keeping them separate from the conforming ones.

II. Scraps

Both machining and material scraps detected by suppliers shall be returned to the receiving Carraro plant, which is their owner.

They shall be delivered together with the production order they belong to. Therefore, scraps belonging to different production orders shall not be accumulated and periodically returned.

Both machining and material scraps shall be:

› sprayed individually with red paint to avoid their unintended use;
› delivered in containers separate from those containing the conforming products; if scraps belonging to different production orders are delivered together, these can be placed in a single container, but each individual production order shall be kept separate and appropriately identified to prevent it from being mixed with the others.

20.2.2. Non-Conforming Products Detected by Carraro or Its Customers

The Quality Department of the receiving Carraro plant may decide, in agreement with the supplier, to:

- return potentially non-conforming products to the supplier for sorting and possible reworking; the supplier shall then return all products (both conforming and nonconforming) suitably identified;
- carry out sorting and possible reworking in its plant or outsource them to third party suppliers at the expense of the supplier.

21. Corrective Action Management

Upon detection of a non-conformity, the receiving Carraro plant issues a non-conformity report via CPN.

The supplier shall determine the causes of non-conformity and implement appropriate actions to eliminate them and prevent their recurrence.

When requested in the non-conformity report, the supplier shall fill in a corrective action report (8D). The supplier shall use Carraro form or its own form containing at least the same information.

Unless otherwise requested, the supplier shall send the Quality Department of the receiving Carraro plant:

- confirmation of receipt of the non-conformity report within 1 working day, even though an 8D has not been requested;
- evidence of application of containment actions within 2 working days from the receipt of the non-conformity report;
- 8D containing a long-term corrective action plan within 14 days from the receipt of the non-conformity report; should the supplier be unable to meet these deadlines, alternative deadlines shall be agreed with the Quality Department of the receiving Carraro plant;
- 8D documenting the effectiveness of long-term corrective actions on the first batch following their implementation.
- Should corrective actions not be effective or repeated non-conformities occur, Carraro reserves the right to implement containment processes in order to:
- ascertain the conformity of supplies;
- support the supplier in solving the qualitative problems causing the non-conformity.

Such containment processes are called Controlled Shipping Levels (CSL) and are structured into three different levels: CSL 1, CSL 2 and CSL 3. The choice of which CSL level to apply depends on the severity and repetition of non-conformities found in the supplies.

CSL 1 requires the supplier to perform, for a predetermined – possibly extendible – period, process controls supplementary to those normally implemented to detect non-conforming products and thus prevent their shipment.

CSL 2 requires the same inspection activities as CSL 1. However, these shall be performed by a qualified third party certifying body appointed by the supplier.

CSL 3 requires, in addition to CSL 2 activities, that a qualified third party certifying body supports the supplier in improving its process and in eliminating the causes of nonconformities.

In the most serious cases of quality problems, Carraro may invoke the New Business Hold (NBH) procedure, which involves blocking the allocation of new products to the supplier for the entire period of its implementation.

22. Recovery of Non-Conformity Costs Caused by Suppliers

The supplier will be charged with all costs and expenses incurred by Carraro due to non-conforming products (found during incoming material inspection, during production or reported by customers) as well as logistic non conformities it may have caused.

These costs may include, but are not limited to:

- non-conformity management costs;
- costs of non-conforming products or process operations which have caused the non-conformity;
- costs of forgings or semi-finished products on which the operations which generated the non-conformity have been carried out;
- costs of non-conforming product management, such as selection, testing, reworking, disassembly, assembly, handling, transportation, etc.;
- any line stoppages caused by the impossibility of using the non-conforming products;
- cost of any materials damaged by the non-conforming products;
- costs of any operations carried out by Carraro or other suppliers before the detection of the non-conformity;
- any costs charged by Carraro customers for the management of the non-conformity, including but not limited to, selection, testing, reworking, disassembly, assembly, handling, transportation;
- warranty costs.

23. Sample Forms

Unless it is explicitly required to use Carraro forms, the supplier may also use its own forms containing at least the same information required by the AIAG reference manuals.