



MOTION BUSINESS AREA

Global Supplier Quality Manual

Large Motors and Generators

IEC LV Motors

NEMA Motors

Traction and eMobility Motors

About ABB

ABB is a technology leader in electrification and automation, enabling a more sustainable and resource-efficient future. The company's solutions connect engineering know-how and software to optimize how things are manufactured, moved, powered, and operated.

ABB Motion keeps the world turning - while saving energy every day. We innovate and push the boundaries of technology to enable the low-carbon future for customers, industries and societies. With our digitally enabled drives, motors and services our customers and partners achieve better performance, safety and reliability. We offer a combination of domain expertise and technology to deliver the optimum drive and motor solution for a wide range of applications in all industrial segments. Through our global presence we are always close to serve our customers. Building on over 130 years of cumulative experience in electric powertrains, we learn and improve every day.

ABB values quality, customer focus and integrity. This means we strive to produce the highest possible quality of goods and services, deliver them to our customers on time and as promised, while following a robust compliance and integrity program. We always want to meet or exceed our customers' expectations.

Our ability to do this depends on our suppliers' collaboration with us. What this means in practice is that our suppliers must comply with our standards, while being committed to making continuous and sustainable improvement in a transparent way.

Supplying to ABB

ABB Large Motors and Generators (MOLM), IEC LV Motors (MOIM), NEMA Motors (MONM) and Product Group Traction and eMobility Motors purchase globally significant volumes of materials and services. To support ABB throughout the entire lifecycle of its products, clear supplier guidelines are required. The aim is to ensure that ABB's external suppliers provide the right quality, on time deliveries at optimal cost, and that they fulfill our lead time requirements. These guidelines clarify for suppliers the direction they should take to develop their systems and structure for sustaining ABB's requirements. Various elements are detailed in the following chapters.

The purpose of the Global Supplier Quality Manual is to provide a general overview of what ABB expects from its suppliers in terms of developing an understanding of the related interactions and interfaces.

The Global Supplier Quality Manual also clarifies requirements regarding ABB Supplier Code of Conduct and Sustainability strategy (e.g., statements on compliance with relevant legislation). Cooperation with existing suppliers should also be streamlined through closely linked processes, common rules and means of communication.

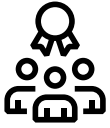
This document is applicable both for existing ABB suppliers as well as for companies desiring to become ABB's suppliers. It is intended to provide guidance on building supplier operations that meet our company requirements.

Table of contents

008	1.	ABB Supplier Code of Conduct
009	2.	Sustainability
010	2.1.	Environmental Management System
010	2.2.	Hazardous Materials
010	2.3.	Material Compliance
010	2.4.	Carbon Emissions and a Circular Economy
010	2.5.	Social Responsibility
011	2.6.	Occupational Health and Safety Management
012	3.	Supplier On-Boarding and Qualification
013	4.	Company Qualification
013	4.1.	Registration
013	4.2.	Qualification
013	4.2.1.	Supplier Audits
013	4.2.2.	Supplier Quality Process audit (SQP)
014	4.2.3.	Critical Manufacturing Process Assessments
014	4.2.4.	Sustainable Supply Base Management (SSBM) Audit
015	5.	Production & Product Qualification
015	5.1.	Purpose
015	5.2.	Scope
016	5.3.	Product Approval Process
016	5.4.	Technical capability assessment
017	5.5.	Production Part Approval Process (PPAP)

017	5.5.1.	Purpose
018	5.5.2.	Risk Levels
018	5.5.3.	PPAP Elements
020	5.6.	Procedures for Regular Production
021	5.7.	Frozen Process Change Request (FPCR)
022	5.8.	Supplier Deviation Request (SDR)
022	5.9.	Non-Conformity Report (NCR) / Quality Notification (QN) / Reclamation Process
023	5.9.1.	Problem Solving Method
023	5.9.2.	Feed Forward
023	5.9.3.	Sorting & Rework
023	5.9.4.	Cost Recovery
024	5.10.	Surveillance Audits
024	5.10.1.	Purpose
025	6.	Measure
025	6.1.	Quality Performance - Supplier PPM (SPPM)
025	6.2.	Delivery Performance - Supplier Confirmed on Time Delivery (COTD)
026	6.3.	Supplier Scorecard for Quality
027	7.	Classification
028	8.	Developement
029	9.	Desourcing
030	10.	Abbreviations

1. ABB Supplier Code of Conduct



At ABB, we work hard to conduct business that respects our employees, society, and the environment. In fact, we treat our partners as part of our “extended enterprise”, sourcing our goods and services from suppliers who are aligned with these standards. To find out more, read our [Supplier Code of Conduct](#) and the [ABB Supplier Sustainability Implementation Guide](#).

ABB requires its suppliers to go through the ABB Supplier Code of Conduct and adhere to the principles set out by ABB.

ABB has a “zero tolerance” policy when it comes to unethical business behavior, such as bribery, corruption, child and forced labor. We expect all our suppliers to adhere to similar standards and to conduct their business ethically. As a supplier, you must comply with all applicable laws and regulations, the requirements set out in this ABB Supplier Code of Conduct and your contractual obligations to us.

This [ABB Supplier Code of Conduct](#) defines the main principles underlying your business activities as one of our suppliers.

More specific guidance, including information on hazardous substances and conflict minerals and where to go for questions, is available on [Supplying to ABB](#) and [Integrity](#) web pages.



2. Sustainability



“At ABB, we embed sustainability in everything we do in order to create long-term value. This starts with helping our customers reduce their emissions and preserve resources, which is where we make the biggest impact, and extends to our own operations, to our suppliers and the communities we serve. We strive always to be an exemplary corporate citizen wherever we operate.”

Björn Rosengren, CEO

At ABB, we have always taken a sustainable approach to business. Sustainability is a key part of our company Purpose and of the value that we create for all our stakeholders.

At ABB, we believe that sustainable development means progress towards a healthier and more prosperous world for future generations. This means balancing the needs of society, the environment, and the economy. To achieve this, we act and embed

this approach to business across our value chain, creating superior value for all our stakeholders. Strong supplier performance ensuring resilient, cost-effective, and sustainable supply chains is a key factor in business success, and critical to ABB's growth plans. Furthermore, customers, investors, the media, and our employees have increasing demands on visibility related to sustainability performance and business ethics throughout the value chain.



2.1. Environmental Management System

Besides their contractual obligations, our suppliers shall follow the ABB Supplier Code of Conduct, a separate document which requires our suppliers to act environmentally sustainable with a few basic requirements for an environmental management system. We strongly encourage our suppliers to become ISO 14001 certified.

2.2. Hazardous Materials

Additional to the relevant hazardous materials regulations such as the EU Directives REACH and RoHS, ABB has their own list that prohibits or restricts certain hazardous substances in products delivered to us. Our suppliers shall inform us about any listed substance and residuals of substance in a product delivered to ABB. The “ABB List of Prohibited and Restricted Substances” can be found on ABB’s website and is updated bi-annually.

ABB expects suppliers to actively support ongoing efforts to manage and demonstrate product compliance with regulations such as REACH, RoHS, and Conflict Minerals. We encourage our suppliers and sub-contractors to adopt similar standards and to comply with regulatory requirements.

Find the ABB List of Prohibited and Restricted Substances [here](#).

2.3. Material Compliance

ABB has a duty to ensure that the materials we use do not contribute to environmental degradation or lead to conflict and exploitation in the countries that produce them. To maintain high social, environmental, and human rights standards, this duty is set out in our Policy on Health, Safety, Environment, Security and Sustainability as well as our Supplier Code of Conduct. In practice, this means that we have systems in place to monitor the source of certain minerals more closely and phase out the use of hazardous substances in ABB products and processes.

ABB supports responsible minerals sourcing and industry initiatives, while working with our

suppliers to facilitate conflict-free sourcing that contributes to economic growth. In addition, ABB is a member of the [Responsible Minerals Initiative \(RMI\)](#) and adheres to the OECD guidelines to increase the transparency of conflict minerals in our supply chain.

2.4. Carbon Emissions and a Circular Economy

ABB strives to become a carbon neutral supplier ourselves. We ask the same from our suppliers. They should evaluate and reduce their carbon emissions by setting ambitious targets. Suppliers should also consider signing up to the Science Based Targets Initiative like we have.

ABB also strives to become a contributor to a circular economy. We thus ask from suppliers to reduce their amount of waste and rejects as much as possible. Use reusable, recycled, or else recyclable materials from a sustainable material wherever possible. This also applies to packaging materials.

We encourage our suppliers to inform us regarding their efforts in sustainability and encourage them to propose opportunities for us to reduce carbon emissions and foster a circular economy in our value chain. This especially applies to direct materials, large product development initiatives and project businesses.

2.5. Social Responsibility

Supplier shall comply with all applicable international and local laws and regulations regarding human rights, labor rights, fair labor conditions, the requirements set out in ABB Supplier Code of Conduct and contractual obligations to Large Motors and Generators or IEC LV Motors. The supplier should operate in a socially responsible manner wherever they work.

ABB has a zero-tolerance policy when it comes to child labor, compulsory or forced labor, modern slavery, poor working conditions for young workers and pregnant or nursing female workers at supplier.

Supplier should abide principles contained within the Universal Declaration of Human Rights, the [UN Guiding Principles](#) on Business and Human Rights, the OECD Guidelines for Multinational Enterprises, the ILO Core Conventions on Labor Standards, the UK Modern Slavery Act and other similar laws and principles support and respect the protection of internationally proclaimed



human rights, ensure equality of opportunity, and respect the rights of workers with respect to collective bargaining.

Supplier should establish an effective mechanism have appropriate procedures to evaluate and select sub-suppliers on their ability to meet these principles and to maintain reasonable evidence that these principles are continuing to be met.

Supplier should inform ABB concerning performances in areas of social responsibility upon request.

2.6. Occupational Health and Safety Management

Suppliers should comply with all applicable international and local laws and regulations regarding occupational health and safety management,

the requirements set out in ABB Supplier Code of Conduct and contractual obligations.

Suppliers should identify occupational health and safety risks in the scope of their supply to ABB and provide their employees/contractors/customers/other stakeholders safe and healthy working conditions at supplier's premises, or any other place where they are working for the products or services supplying to ABB.

Supplier is strongly encouraged to implement an occupational health and safety management system, like ISO 45001 or similar.

Supplier should inform ABB concerning performances in areas of occupational health and safety management upon request.

3. Supplier On-Boarding and Qualification



In order to further digitalize our business interactions together with our suppliers, we are now using the Strategic Sourcing Suite (SSS) by SAP Ariba™ to handle the sourcing, supplier management and contracting process.

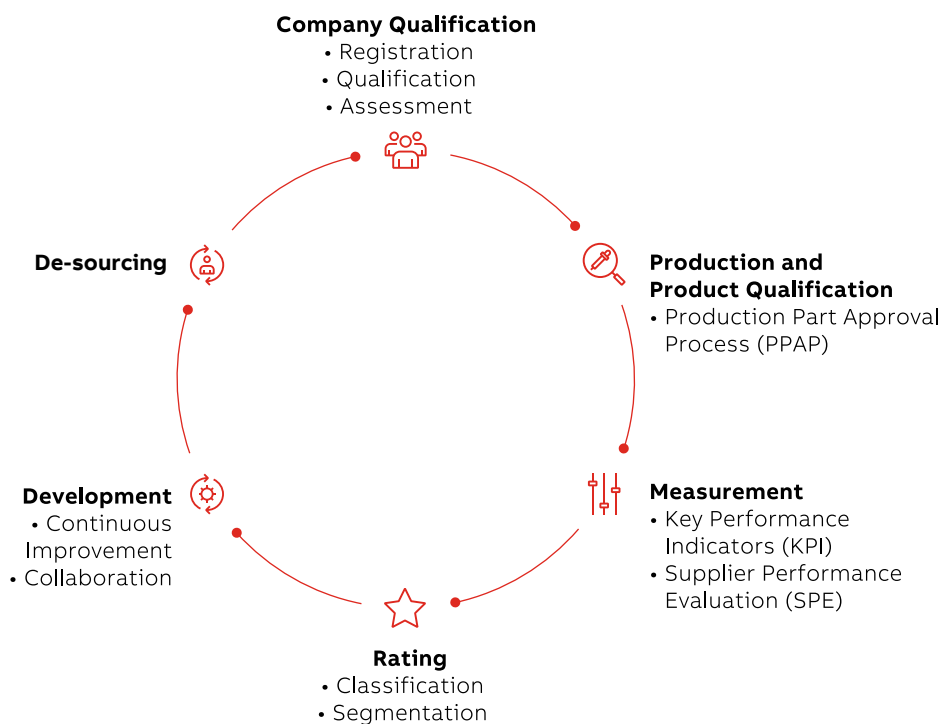
Each potential ABB supplier must undergo a two-step verification process, including registration and qualification. Participation in tenders as well as registration and qualification with ABB will be free of charge for all the suppliers.

ABB has established a process for requesting, on-boarding, and qualifying suppliers to ABB. It describes the scope and requirements related to the process to be conducted from the time a request to add a supplier is raised, to the time the supplier is available for use as a “Qualified” supplier in ABB’s supplier management system SAP Ariba™.

The process provides information and oversight to ensure that suppliers to ABB can meet requirements including but not limited to business integrity, financial stability, health and safety, performance, and product quality in line with ABB Supplier Code of Conduct.

The following chapters of this Supplier Quality Manual are arranged in the order of possible ABB interactions with a supplier. The chapters are also divided into five hierarchically defined sections to facilitate the search for information. Sections are presented in the picture below.

Find out more information on [Becoming a supplier – ABB Group](#)



4. Company Qualification



4.1. Registration

In the Registration step, the supplier is required to complete a registration questionnaire which is issued via the SAP Ariba™ system. The supplier will receive an email with instructions to first create the SAP Ariba™ account and then complete the questionnaire. Once the answer is submitted, ABB will review the response provided by the supplier.

Find out more information on [Becoming a supplier – ABB Group](#)

4.2. Qualification

The qualification process is a risk-based process that assesses the supplier for qualification at company level and is intended to be tailored to the specific risks and value chain of the supplier.

Supplier Qualification is conducted within the SAP Ariba™ system.

The objective of the qualification is to evaluate risks in the Supplier's value chain in the following areas:

- Quality Management
- Sustainability and Human Rights
- Health / Safety / Environmental
- Quality and Continuous Improvement
- Operation Excellence and Supply Chain
- Data Security

4.2.1. Supplier Audits

The goal of the audit is to identify and investigate the main risks at the supplier site and define a risk mitigation plan to systematically address these.

A supplier re-assessment and re-approval for quality is required for all suppliers who have been disqualified prior to reactivation or have not supplied ABB for 36 months.

When a supplier has multiple manufacturing sites, each site may require an own supplier quality and/or critical process audit.

When ABB buys from a distributor, the distributor is expected to have rigorous sub-tier supplier oversight of the manufacturing sites, consistent with the requirements defined in this manual.

To verify a supplier's compliance, or a distributor's, ABB reserves the right to audit and inspect supplier's operations and facilities, and upon reasonable notice, with or without support of a third party.

4.2.2. Supplier Quality Process audit (SQP)

SQP is an ABB supplier assessment method to evaluate a supplier by auditing the following fundamental process and system elements:

- Health & Safety
- Human Rights
- Quality Management System
- Product and Process Development
- Sub-supplier and Incoming Goods Management
- Production Execution
- Transportation and Handling



4.2.3. Critical Manufacturing Process Assessments

Many processes can be considered critical and can be evaluated with process-specific audits. Such critical processes include, but are not limited to:

- Casting
- Forging
- Heat treatment
- Impregnation
- Insulated copper wire
- Machining
- Permanent magnets
- Rotor die-casting
- Stamping
- Surface treatment
- Welding
- Winding Assembly

Process-specific audits can also be carried out for critical materials such as electrical steel, copper, aluminum, insulation materials, resins, etc.

4.2.4. Sustainable Supply Base Management (SSBM) Audit

During new supplier qualification through SAP Ariba™, the supplier shall receive the self-assessment questionnaire. Several sustainability questions are included in that questionnaire.

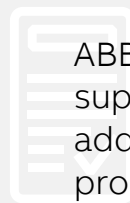


ABB shall evaluate the responses of the supplier. In case high risk is identified, additional steps shall take place in the process. It may mean that ABB chooses to conduct an SSBM audit at the supplier's premises.

Depending on the supplier country, material code and annual business volume with ABB, also existing supplier may be covered under SSBM in a 5-year cycle.

The goal is to ensure suppliers comply with the requirements of ABB Supplier Code of Conduct, to support continuous improvement of the sustainability performance of ABB suppliers and to provide our customers with a highly competitive, sustainable supply chain.

SSBM assessment is focused on six sections as mentioned below:

1. General management
2. Working hours
3. Remuneration
4. Social benefits
5. Health & safety
6. Environment

5. Production & Product Qualification



5.1. Purpose

ABB's primary process of production and product qualification is Production Part Approval Process (PPAP). It is a structured method of defining and establishing the steps necessary to ensure that the material/part satisfies the customer.

The method provides evidence that all ABB engineering design record and specification requirements are properly understood by the supplier's organization. It targets to demonstrate that supplier's manufacturing process has the capability to produce product that consistently meets all requirements during an actual production run at the quoted production rate.

5.2. Scope

Included - All Tier 1 Suppliers

- Raw material
- Direct material
- Indirect material: high-risk components
- Components purchased from external vendors for serial and/or regular production in MOIM, MOLM & MONM plants
- Components purchased from other ABB companies for serial and/or regular production in MOIM, MOLM & MONM plants
- Buy-Resale items purchased by the MOIM, MOLM & MONM businesses

Excluded – Suppliers

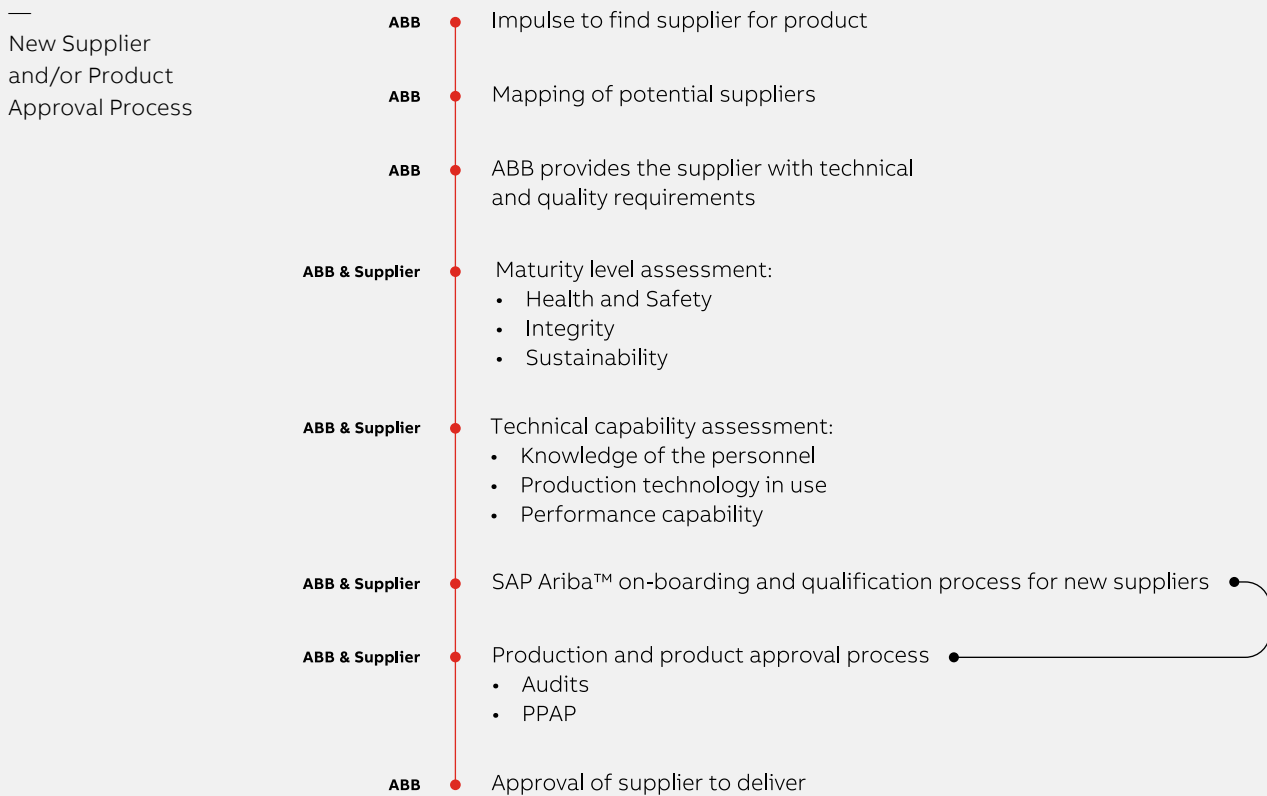
- Indirect material: low-risk components
- Components purchased from other MOIM, MOLM & MONM plants
- Tier 2, Tier 3, and all Sub-Tier suppliers – however, MOIM, MOLM & MONM Tier 1 suppliers should have a similar document and requirements in place for their supply base



5.3. Product Approval Process

The supplier must agree to introduce and maintain a quality management system according to ISO 9001 or IATF 16949, or similar certified (third-party) quality management standard, recognized by ABB. Certified suppliers must send a copy of their quality system certifications to ABB.

Suppliers who are not certified shall present to ABB their plan for ISO 9001 registration and management of Quality and will be subject to a Supplier Quality Process audit by ABB.



5.4. Technical capability assessment

This is a preliminary assessment that focuses on the supplier technical readiness and ability to manufacture certain types of components or parts for ABB. It also focuses on evaluating the supplier's ability to deliver the products in the agreed quantity with the agreed delivery reliability.

A preliminary assessment can be done on-site. During the assessment, the supplier's capabilities are examined in the following areas:

- Knowledge of the personnel
- Production technology in use
- Performance capability

5.5. Production Part Approval Process (PPAP)

5.5.1. Purpose

Production Part Approval Process (PPAP) is a rigorous process intended to ensure the supplier's ability to manufacture sustainable high-quality parts at a proven volume. PPAP focuses heavily on the supplier's processes and capability to yield conforming material.

The supplier must receive PPAP approval from ABB prior to the first regular delivery of production parts.

As a result of PPAP process, Part Submission Warrant (PSW) will be executed and documented by both ABB and the supplier.

— Production Part Approval Process (PPAP)



5.5.2. Risk Levels

The determination of risk is based on many factors, including

- critical manufacturing processes such as casting, machining, welding
- use of the product in a safety-critical application
- compliance requirements
- export
- long lead-times
- new suppliers to ABB
- plant location change
- new component designs
- transfers from vendor to vendor, or ABB to vendor
- historical performance of supplier

AIAG defines five levels of PPAP to address five levels of risk. ABB MOIM & MOLM utilizes in principle three of those levels:

- High Risk
- Medium Risk
- Low Risk (exempt from PPAP)

5.5.3. PPAP Elements

ABB SQE determines necessary elements of PPAP based on the risk analysis.

The list of standard PPAP elements along with the selection of mandatory and ABB-specific elements can be found in the table below:

PPAP Element	PPAP Deliverable	PPAP Level 4	Description
1	Design Records		Supplier is expected to assure the design records are available and up-to-date. Design records are technical drawings, bill of materials, instructions, connection diagrams. If ABB is responsible for design, this is a copy of ABB drawing and other documents that are available together with the Purchase Order (PO). If supplier is responsible for designing this is a released drawing in supplier's release system. Design records may reference other documents like specification. In this case referenced documentation must be attached too. One design record can represent multiple products.
2	Engineering Change Documents		A document that shows the detailed description of the change. Usually this document is called "Engineering Change Notice," but it may be covered by the ABB PO or any other engineering authorization.
3	Engineering Trial Approval		This approval is usually the Engineering Trial with production parts performed at the ABB plant. A "temporary deviation" usually is required to send parts to ABB before PPAP. ABB may require other "Engineering Approvals."
4	DFMEA		Design FMEA shows evidence that the potential failures modes and their associated risks have been addressed to eliminate or minimize their effects through product design changes and improvements.
5	Process Flow Diagram	Mandatory	Process Flow Diagrams are used to document and clarify all the steps and sequence involved in the manufacturing of a part. The primary process steps must match the process steps addressed in PFMEA and the Control Plan. Process flow should include the entire manufacturing process flow (receiving through shipping).
6	PFMEA	Mandatory	Supplier should apply failure mode effect analysis to all process steps which were defined earlier in the Process Flow Diagram. This should also include the processes which are subcontracted. The PFMEA follows the process steps and sequence and indicate potential process related failure modes during the manufacture and assembly of each component.
7	Control Plan	Mandatory	Control Plans identify process characteristics and help to identify their sources of variation (input variables), which cause variation in product characteristics (output variables). The Control Plan follows the PFMEA steps and sequence and provides more details on how the potential failure modes are checked. The target is ensuring that the process is under control and not causing any out of specification limit cases.

PPAP Element	PPAP Deliverable	PPAP Level 4	Description
8	Measurement System Analysis		The main expectation from Supplier to ensure that the applied measurement technique is reliable and consistent. The measurement system must be designed and validated in area of a) appropriate measurement devices in use and b) the competence of the person performing the measurement. Typically, Gage R&R or attribute gage study method is used to validate these critical characteristics. Measurement devices and gauges must be calibrated and handled properly
9	Dimensional Results	Mandatory	A list of every critical to quality (CTQ) dimensions noted on the drawing and critical factors of PFMEA. This list shows the product characteristic, specification, the measurement results, and the assessment showing if this dimension is "ok" or "not ok."
10	Approved Materials and/or Material Performance Test	Mandatory	Supplier should assure that the selected materials are in line with the specification. Performance tests simulate the conditions which product will encounter during its lifecycle. The test reports normally include each individual test, date of the test, the specifications used, test results, and the assessment pass/fail.
11	Process Studies (SPC / Cpk)		The supplier should identify, evaluate, and eliminate the special causes of variation. Usually, this section shows all Statistical Process Control charts affecting the most critical characteristics. The intent is to demonstrate that critical processes have stable variability and that is running near the intended nominal value.
12	Approval of Lab		When an external/commercial laboratory is used, the supplier shall submit the test results on the original test report. This requirement includes general laboratory qualification like ISO/IEC 17025. (Linked to element #10).
13	Appearance Approval		Appearance Approval Report (AAR) targets to eliminate potential non-conformities related to visual defects which may occur in the future. AAR is applied to the products where color, grain or surface appearance is applicable. The report should contain the part images, part marking images, painting test requirements like adhesion test report, RAL shade card color confirmation wherever applicable as per drawing and specification requirements.
14	Sample Product		Supplier should prepare sample parts which are representing standard production process. Sample quantity should be shared with the supplier and delivery plan about the samples should be planned together.
15	Master Sample		A sample ("golden sample") signed off by ABB and supplier, that usually is used to train operators on subjective inspections. Supplier should keep it to represent the production level during production part approval project.
16	Measurement Tools / Checking Aids		Supplier is responsible that measurement tools and checking aids are in line with the current design level. When there are special tools for checking parts, this section shows a picture of the tool and calibration records, including dimensional report of the tool. Checking Aids can be fixtures, gages, templates, mylars which are specifically produced for the product which is being subjected to approval process.
17.1	Reverse Engineering of Existing Parts		Required if this part is or has been in production by a different supplier or ABB. This is a part-to-drawing comparison, with the part coming from the prior manufacturer.
17.2	Compliance Requirements (RoHS, etc.)	Mandatory	Compliance requirements are defined and captured here. Requirements such as REACH, RoHS, as well as customer specific requirements
17.3	Enhanced Control Plan for Launch (GP12)		This is in-place for the first 3-months of production

PPAP Element	PPAP Deliverable	PPAP Level 4	Description
17.4	Sub-Tier Supplier Oversight		Define the oversight with sub-tier suppliers (Approve supplier, qualify parts, surveillance audits, etc.) Mandatory for Critical Manufacturing Processes like casting, forgings, heat treatment, welding, surface treatment, load critical sub-tier PSW's when required.
17.5	Production Trial Run (PTR) at ABB Plants		ABB performs and coordinates a low-volume trials at ABB plants
17.6	Run-at-Rate (GP9)		This shall be conducted when volume is critical to ABB. Run-at-Rate proves the ability to run production and yield the defined volume with the expected quality.
17.7	Packaging		This is required to prevent the failure mode of damaged delivery. The damaged deliveries are hard to address and creates direct additional cost for both sides. The packaging must be designed by the defined ABB packing standards, including HSE and circularity aspects. The packaging which will be applied shall be presented with supporting visuals.
17.8	ABB owned assets	Mandatory	List all ABB owned tooling, equipment, machines, etc. Define how those are tagged or identified. Capture pictures. Define end-of-life for all assets.
17.9	Preventive Maintenance		Define the preventive maintenance plan for both, ABB owned, and supplier owned assets.
17.10	Rework & Repair	Mandatory	Define what rework or repair requires ABB involvement or approval and/or what is allowed without ABB involvement.
17.11	Frozen Process Change Request & Approval Acknowledgement		A document signed by supplier management, stating they will request and obtain approval from ABB prior to any serial-production process changes.
17.12	Supplier Deviation Request & Approval Acknowledgement	Mandatory	A document signed by supplier management, stating they will request and obtain approval from ABB prior to shipping non-conforming parts to ABB
17.13	Other		Placeholder for other requirements identified by the qualification team
18	Part Submission Warrant (PSW)	Mandatory	PSW is the declaration of the supplier that every requirement is applicable consistently. Upon completion of all PPAP Requirements, supplier should complete the Part Submission Warrant (PSW). ABB reviews and verifies using the documents and samples received by supplier. If there is no issue detected, PSW is signed by ABB and shared signed version with supplier.

5.6. Procedures for Regular Production

This section focuses on serial and regular production. The changes concerning the frozen manufacturing processes during the PPAP process, must be communicated in advance and approved by ABB. Any parts out of specification intended to be shipped to ABB must be communicated in advance and approved by ABB.

This section also covers activities that take place when the supplier sends non-conforming material to ABB.

5.7. Frozen Process Change Request (FPCR)

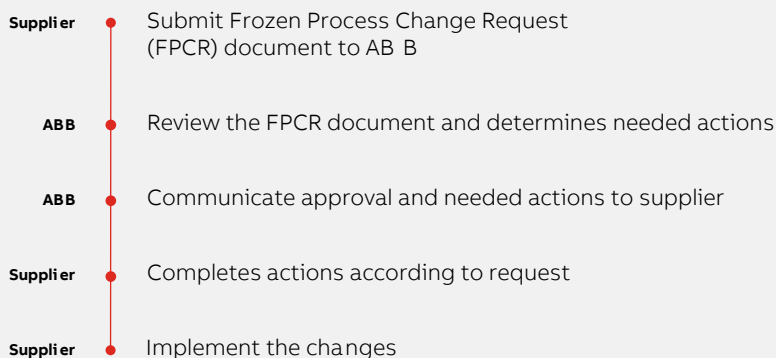
During the PPAP process ABB and Supplier together agree those manufacturing processes or process areas where the Frozen Process Change Request (FPCR) apply.

In the FPCR scope there are manufacturing processes such as impregnation process, rotor die-casting and heat treatment, and processes regarding ABB approved materials like insulation materials and electrical steel.

If, in connection with the PPAP process, it is agreed to freeze some of the manufacturing processes or parts thereof, the following FPCR process shall be followed.



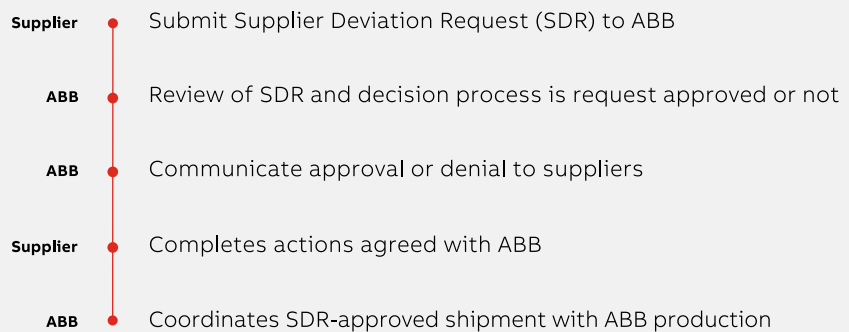
In principle, ABB encourages suppliers to continuously improve their manufacturing processes and this FPCR is not automatically valid.



5.8. Supplier Deviation Request (SDR)

It is the supplier's responsibility to send conforming parts to ABB. In case nonconforming parts could be delivered to ABB a formal Supplier Deviation Request (SDR) must be submitted to ABB.

The request will be investigated by ABB Supply Quality Management and representant of which shall approve or reject non-conforming parts prior to shipping them to ABB.



5.9. Non-Conformity Report (NCR) / Quality Notification (QN) / Reclamation Process

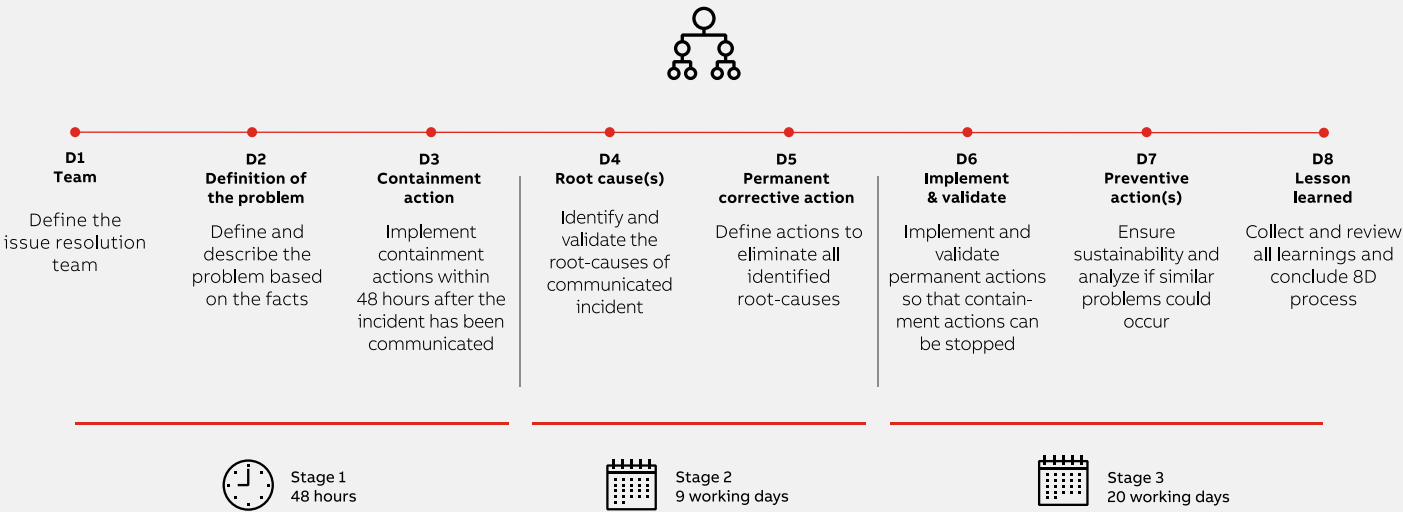
Non-conformity may involve a deviation from the drawing or purchase order requirements, such as quality, appearance, packaging material, metallurgy, labeling, quantity, handling and shipping, delivery, cleanliness, and/or dimensional or performance issues. When non-conformity has been detected in the supplier's process/product, the supplier shall inform ABB instantly and without

any delay. The supplier shall analyze the root cause and define corrective and preventive actions by using any suitable and recognized tools (example 8D). The supplier shall supply only products or material that fulfils its purchasing specifications, and/or other relevant specifications or features agreed upon.

5.9.1. Problem Solving Method

8D (Eight Disciplines) is the problem-solving method to handle supplier deviations, identified either at ABB or the supplier. The purpose of the 8D methodology is to identify, correct, and eliminate recurring problems, making it useful in product and process improvement.

The 8D problem solving model establishes a permanent corrective action based on statistical analysis of the problem and focuses on the origin of the problem by determining its root causes. Although it originally comprised eight stages, or disciplines, the eight disciplines system was later augmented by an initial planning stage.



5.9.2. Feed Forward

It is the supplier's responsibility to notify all ABB plants when they become knowledgeable of shipping non-conforming material to ABB.

5.9.3. Sorting & Rework

It is the supplier's responsibility to send the compliant parts to ABB. If, despite all inspection measures, the supplier sends non-compliant parts, ABB usually rejects the suspected material batch during the incoming inspection or the manufacturing process.

ABB is not obliged to sort these non-conforming parts. If necessary, often for scheduling reasons, ABB performs the sorting or requires the supplier to sort the material at ABB's premises. If necessary, ABB can also modify non-compliant materials.

5.9.4. Cost Recovery

ABB has the right to invoice the costs incurred for sorting, reworking, or repairing.

Cost recovery will take place for the following:

- Cost of goods for returned or scrapped non-conforming material – cost will either be auto debited in ERP system, or invoiced.
- Cost of ABB (or third party) labor and materials for sorting and/or rework of suspect material – cost recovery will be either auto debited in ERP system, or invoiced.
- The labor rate will be the impacted ABB unit standard production labor rate x 1.5, as sorting and rework typically take place on overtime.
- An administrative fee, typically around of \$100, will be charged for each Nonconformity Report

(NCR) or Quality Notice (QN) submitted. The ABB Local Division Supplier Quality Engineer determines the amount of this administrative fee on a case-by-case basis in connection with the complaint process.

- ABB Category Management is in direct contact with the supplier to agree on covering other possible special costs, like:
 - Value-add cost by ABB to the purchased component deemed to be the supplier's fault;
 - Premium Freight charges due to supplier faults;
 - Liquidated damages incurred by ABB due to supplier fault issues

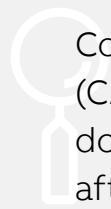
5.10. Surveillance Audits

5.10.1. Purpose

ABB Auditors will audit suppliers to ensure adherence to Quality Management System, HSE, Human Rights and Production Processes. Audits are intended to mitigate risk by confirming no degradation of the manufacturing process and witnessing continual supplier maturity.

Frequency and depth of surveillance audits is determined by many factors, including heightened risk due to critical manufacturing processes, prior audit performance, and the supplier's quality performance.

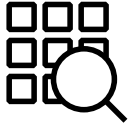
ABB will give adequate notice of audit dates and will communicate in advance the audit content. If acute or immediate quality issues occur, or other risks are identified, ABB reserves the right to perform the audit without any given advance notice. Suppliers shall allow full access to their facilities, documents, processes, and personnel during the audits. Suppliers shall also allow full access to sub-tier suppliers when necessary.



Corrective and preventive actions (CAPA) shall be completed and documented latest three months after the audit.



6. Measure



To achieve quality, delivery capability, cost efficiency and to strengthen the partnership with the supply chain, ABB expects perfect quality and on-time delivery from suppliers every time.

Supplier performance is measured and graded with key performance indicators. Quality performance is measured with defect rate parts per million (PPM) and delivery performance with Supplier Confirmed on Time Delivery (COTD).

6.1. Quality Performance - Supplier PPM (SPPM)

Measures the suppliers' PPM of components as identified at ABB facilities, or in the field (in-warranty period).

$$\text{SPPM} = \frac{\text{Parts with defects}}{\text{Parts delivered}} \times 1.000.000$$

At an ABB site, when a batch is rejected, the full batch will negatively impact the supplier's PPM. When sorted or reworked, the known non-conforming parts as received from the supplier will negatively impact the supplier's PPM.

ABB shall always make identified non-conforming material available to the supplier, either by parts or pictures or descriptions.

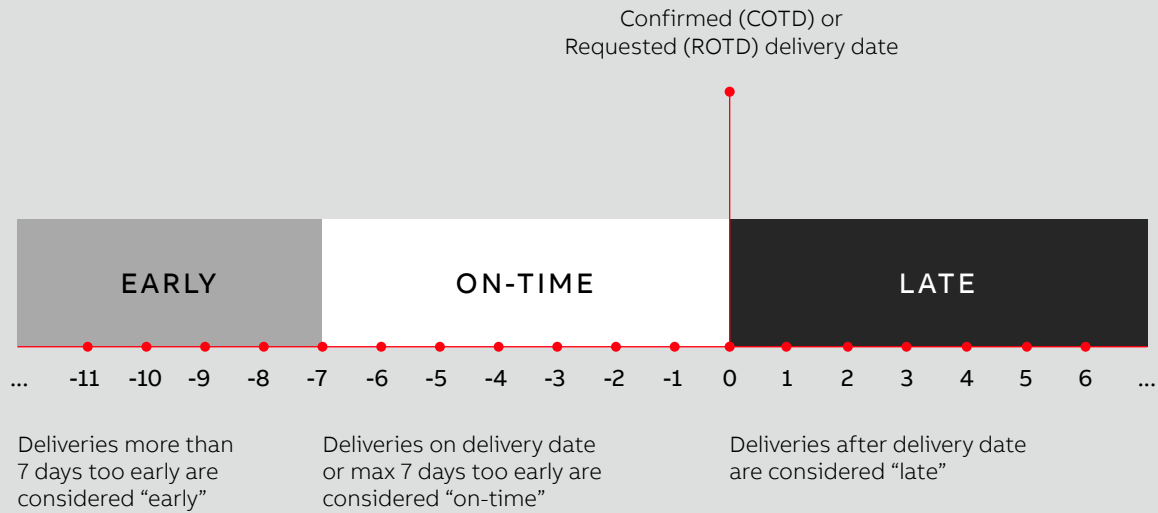
6.2. Delivery Performance - Supplier Confirmed on Time Delivery (COTD)

Supplier-COTD measures supplier performance to meet On Time Delivery, to agreed delivery location based on incoterms, which need to be considered in measurement.

There is a negative impact on the supplier's performance for early and late deliveries.

Definition of COTD measures the supplier delivery performance:

1. Against agreed delivery date
 - contractual delivery date or, if contractual not available/applicable, against
 - first confirmed date of the last (jointly) agreed delivery date
 - Note: ABB measures COTD only based on (jointly) agreed delivery dates
2. On-time window -7...0 days
3. Reference month for the measurement: Month of the Confirmed date (not month of the actual delivery date)
4. Measurement level: Purchase Order (PO) line



Definitions:

- Deliveries on delivery date or max 7 calendar days too early are considered "on-time"
- Deliveries more than 7 calendar days too early are considered "early"
- Deliveries after delivery date are considered "late"
- Category "early" is used for visualizations and process analytics
- All days are measured in calendar days, not in working days

$$\text{COTD} = \frac{\text{PO line items on time}}{\text{PO line items}} \times 100\%$$

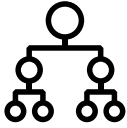
6.3. Supplier Scorecard for Quality

ABB's Supplier Performance Evaluation (SPE) process is in-place. The purpose of Supplier Performance Evaluation (SPE) is to evaluate the performance of existing suppliers, provide global internal access to the results, and provide suppliers with feedback along with proper action plan if necessary.

It is a fully integrated part of ABB's global Supply Base Management System and covers Quality, Delivery, Commercial, Technology, Sustainability and Risk Management.

Results are published internally & available for suppliers. All suppliers under overall result of 80% need to have an action plan in place. ABB's category management is responsible to follow-up this plan.

7. Classification



The main purpose of supplier classification is to bring the Category strategy into action, by channeling spend to the most competitive and best quality suppliers of the respective category, labeled as Preferred or Approved suppliers, and channeling spend away from suppliers that do not fit the strategy, labeled as blocked suppliers.

The procedure defines the various classes that can be assigned to a supplier, the requirements a supplier must meet to be assigned to a specific class, the process, and the related responsibilities within ABB to assign classes to suppliers, as well as our supporting.

The goal of supplier classification is to:

1. Bring category strategy to action, considering the organizational and category dimension within ABB, by channeling spend to "Preferred" and "Approved" suppliers.

2. Aligning ABB's supply base with strategic targets through thoughtful supplier classification efforts, we can ensure consistency in products, services, and pricing.

The suppliers of MOLM and MOIM are classified in SAP Ariba™ as follows:

- Preferred
- Approved
- Conditionally Approved
- Blocked

Preferred	<p>Preferred is the highest classification level and only a Global Category Manager is authorized to assign this</p> <ul style="list-style-type: none"> • A supplier that has been identified as a primary target for growth of business with ABB and significant strategic collaboration for the concerned MDF • A supplier has been acceptably approved by audits or supplier performance evaluation process (SPE) • A supplier has been passed the ABB supplier on-boarding and qualification process • ABB has approved supplier's production process and production parts
Approved	<p>Approved is the second highest classification level.</p> <ul style="list-style-type: none"> • A supplier determined as competitive by commercial analysis • A supplier has been acceptably approved by audits or supplier performance evaluation process (SPE) • Passed the ABB supplier on-boarding and qualification process • ABB has approved supplier's production process and production parts • Proven overall low risk (financial, sustainability, reliable delivery performance etc.)
Conditionally Approved	<p>Conditionally approved means a supplier is supported by the sourcing strategy for this MDF, but it is</p> <ul style="list-style-type: none"> • Earlier classified as Preferred or Approved but dropped substantially in performance and not managed to sustainably improve within reasonable time, or • New supplier not yet established as a Preferred or Approved supplier
Blocked	<p>Blocked supplier means that no new business is to be placed with this supplier</p>

8. Development



ABB encourages the suppliers to drive continuous improvement in their operations to ensure “first time right” quality with fewer variations, and the elimination of waste in the supply chain. Continuous improvement is also the best way to improve quality, on-time delivery, and productivity.

Continuous improvement is not possible without standardized work processes and monitoring of these processes. Standardized, uniform processes must be maintained and further developed. The goal of continuous improvement is excellent supplier relations and excellent supplier performance.

PDCA (plan-do-check-act) is a management method used in business for the control and

continuous improvement of processes and products. A fundamental principle of the scientific method and PDCA is iteration. Once a hypothesis is confirmed (or negated), executing the cycle again will extend the knowledge future. Repeating the PDCA cycle can bring its users closer to the goal, usually a perfect operation and output.



Only with deep knowledge and understanding of the area of spend does ABB gain the ability to interact with the markets / suppliers to the advantage of ABB. This knowledge enables ABB and Supplier to create Value, by either reducing Cost, or increasing the Benefit, and Speed.

$$\text{Value} = \frac{\text{Benefit (Function)}}{\text{Cost}} \times \text{Speed}$$

The development areas vary widely and below are a few examples of what ABB are trying to achieve together with a supplier:

- Continuously improve supplier capabilities that are necessary to meet ABB's expectations and requirements
- Improve operational performance KPI's as Quality, Delivery (OTD), Speed and Efficiency
- Increase supplier service and innovation capabilities (in products and processes)
- Form a relationship that helps ABB and its suppliers to compete more effectively
- Create and maintain a strong network of competent suppliers

- Increase collaboration and trust between ABB and its suppliers

We strongly believe that a sustainable business relation must develop over time. Therefore, we usually invite for quarterly business reviews to discuss both past and future, what we can do differently and what has been good.

ABB strives to continuously perform better and expect the same from the suppliers. Quality management system must ensure improvements of process, based on evaluation of data and information. As there is always a risk, as an effect of uncertainty on an expected result, ABB is interested to be informed about initiatives and results at the supplier's side, in addition give feedback on effectiveness of supplier's promotion of focus on enhanced customer satisfaction. Besides the supplier's initiatives, ABB takes its own initiatives, internally or with the suppliers to support them in their drive to improve. Examples of activities taken are:

- Supplier Development Activities
- Supplier Product Quality Improvement Workshop
- Regular Supplier Quality Process Audits

9. Desourcing



The De-sourcing process ensures that our targeted suppliers are professionally phased out and the reasons for De-Sourcing and the decision itself are properly documented, communicated to the supplier and globally available for the SCM community.

The main reasons for De-Sourcing a supplier:

- Supply base consolidation
- Supplier substantially underperforming
- Supplier compliance / integrity issues
- Legal and Integrity
- Non-compliance to the Code of Conduct
- Sustainable Supplier Base Management (SSBM)
- Material compliance (CM)

10. Abbreviations

8D	This is a structured problem-solving tool. It focuses on the eight disciplines that are needed in order to solve a problem. The steps in the 8D problem solving process are define the problem, build a team, initiate containment action, determine the root cause, verify the root cause, corrective action, preventive actions, and verification of the effectiveness of actions, congratulate the team.
AIAG	Automotive Industry Action Group
C-OTD	Confirmed on Time Delivery
CAPA	Corrective Actions and Preventative Actions
CTQ	Critical to Quality
DFMEA	Design Failure Mode and Effects Analysis is the application of the Failure Mode and Effects Analysis method (see FMEA below) specifically to product design
FMEA	Failure Mode and Effects Analysis (FMEA) is a methodology designed to identify potential failure modes for a product or process, to assess the risk associated with those failure modes, to rank the issues in terms of importance, and to identify and carry out corrective actions to address the most serious concerns. See also: Design Failure Mode and Effects Analysis, as well as: Process Failure Mode and Effects Analysis
FPCR	Frozen Process Change Request
KPI	Key Performance Indicator
MOIM	Motion Business IEC LV Motors Division
MOLM	Motion Business Large Motors and Generators Division
NCR	Non-Conformity Report
MONM	Motion Business NEMA Motors Division
PFMEA	Process Failure Mode and Effect Analysis is the application of the Failure Mode and Effects Analysis method (see FMEA above) specifically to manufacturing and assembly processes
PO	Purchase Order
PPAP	Production Part Approval Process, as defined by AIAG
PPM	Parts per Million
PTR	Production Trial Run
QN	Quality Notification
RoHS	Restriction of Hazardous Substances
SDR	Supplier Deviation Request
SPC	Statistical Process Control
SPE	Supplier Performance Evaluation
SQE	Supplier Quality Engineer (multiple titles exist in ABB, such as Regional SQE, Plant SQE, Plant Quality Engineer, Plant Quality Technician, Plant Quality Incoming Inspection Leader)
SQP	Supplier Quality Process Audit



Prepared

2023/10/01

Pasi Viitaharju, Tuomas Siltala,
Matt Hamilton

Approved

2023/10/15

Sari Huttunen, Kari Löllö,
Eric Houser

Owning organization

ABB MOLM, MOIM, MONM and
Traction and eMobility Motors