



Power Innovation
Stromversorgungstechnik GmbH

QUALITY MANUAL



About Power Innovation

The company Power Innovation Stromversorgungstechnik GmbH belongs to the leading developers and producers of innovative power supplies for industrial applications. Amongst others our customers are from the telecommunication and the railway sector.

Power Innovation was founded in 1987 in Bremen as medium-sized business. At the present time about 40 employees work in the new company building in Achim.

From the very first developed uninterruptible power supply to our current modular and intelligent inverter systems, which can be parameterized and electronically controlled during operation, we have systematically extended our competences and have achieved widespread acceptance and confidence from our longtime customers.

Each new step in technology results in increasing power demands and additional reliability - it is our ambition to be always one step ahead.

Quality management, including this manual, depends on proposals and remarks for continuous improvement, but also on suggestions concerning mistakes and ambiguities. Information referring to this is expressively requested.

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Management commitment

The top management of the company has the direct responsibility for the Power Innovation quality management system. This quality manual formulates the general principles, the objectives and the evaluation procedures of the system, that corresponds to DIN EN ISO 9001:2004 and is mandatory for all employees and processes of the company.

The top management commits all employees to perform their functions corresponding to the defined processes, process instructions and further applicable documents. Motivation and training of the employees shall guarantee comprehension, realization and continual improvement of the quality policy on all levels of the company.

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Bernhard Böden
Director

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Albert Janssen
Director

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1 Structure and amendment of the quality manual

1.1 Structure of the QMH

The quality manual (QMH) formulates the quality objectives given by the management, describes the implemented QM system and defines the quality relevant processes.

Chapter 2 describes the quality management systems objectives and implementation, chapters 3 to 5 explain the quality relevant processes, differentiated in managing processes, main processes and supporting processes and finally the appendix lists the corresponding process instructions.

1.2 Amendment and distribution of the QMH

The management approved original quality manual is archived by the quality management representative, who is also responsible for writing and updating the quality manual.

The quality manual's latest revision is accessible as a pdf-file in the intranet for all employees and is regularly updated.

Printed quality manuals are not subject to change services. In-house print versions can be replaced upon request, the affected departments will be informed about updates.

The revision history is documented separately.

2 Quality management system

2.1 Quality policy

Any company activity focusses on the management's commitment to guarantee process and product quality and continuous improvement.

The main issue of quality politics and maintenance is the customer's satisfaction which results from process and product quality.

All employees take part in the realization of quality policy which represents a personal responsibility for the customer's satisfaction.

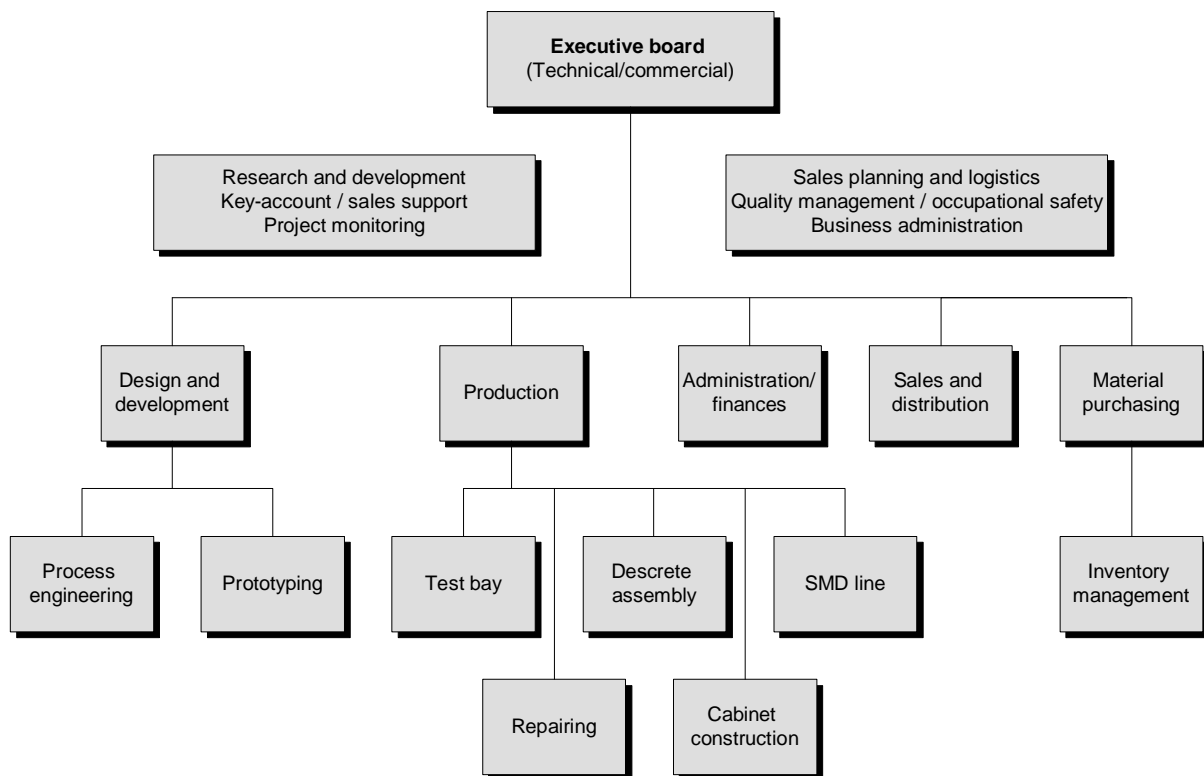
2.2 Quality management representative (QMB)

The management assigns the accomplishment of quality policy to the quality management representative. This includes authoring the process instructions and the organization of employee trainings as well as the implementation of preventive and control actions.

The quality management representative is authorized to give directives to the departments, he is subordinate to the top management who receive regular reports about the quality management's development.

2.3 Company organization

The chart below shows the company's organization structure. It is laid out as a flat hierarchy, which enables the employees to communicate directly with the management and to take part in the continuous improvement of the work processes, especially concerning quality management and policy.



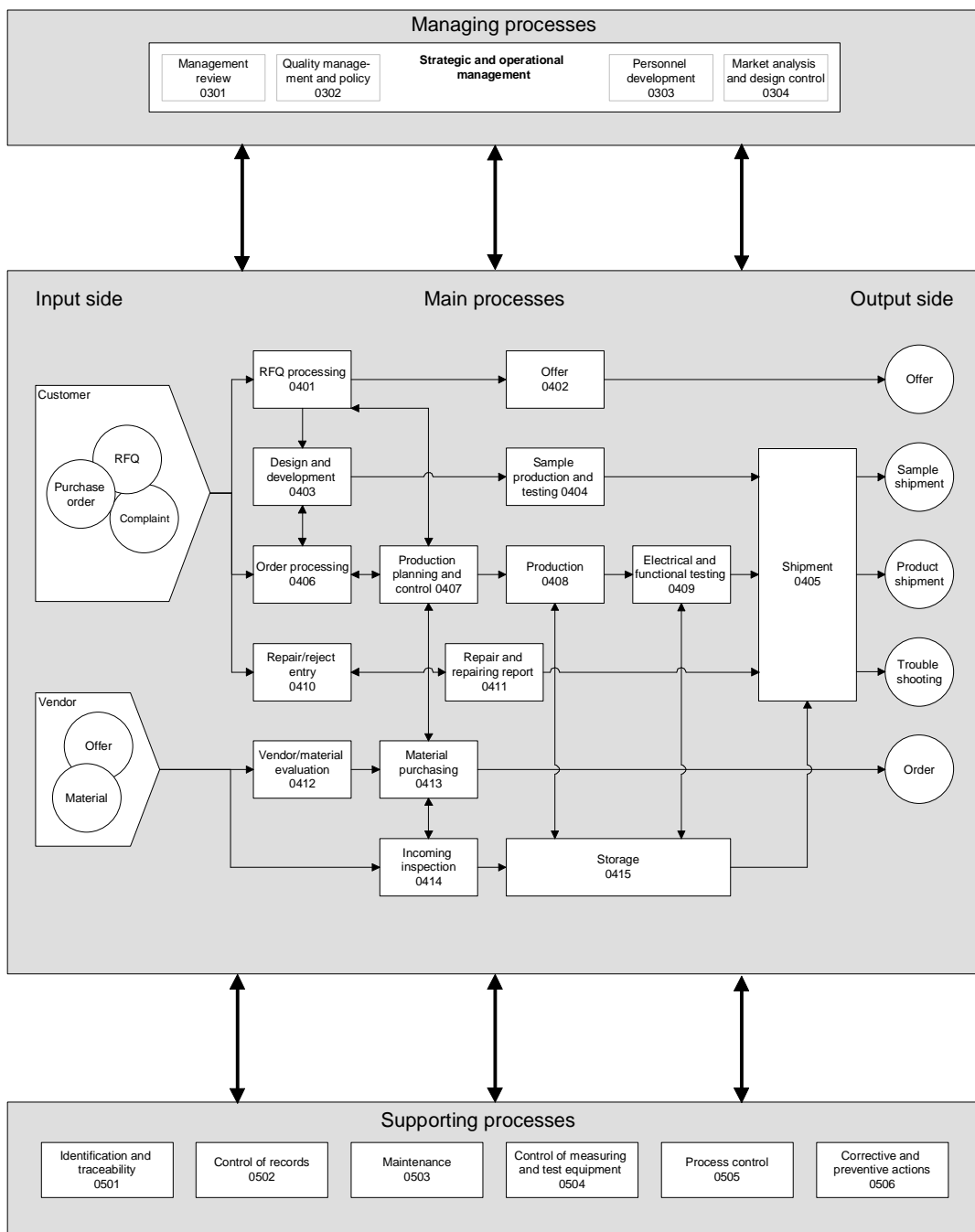
2.4 Main processes of the quality management system

Different from the organization structure shown above, the company's structure is process orientated for the quality management system (QMS). This includes a bundle of processes with direct effects on internal and external purchasers and customers.

The company's processes are classified into three categories, the managing processes which control process development and continuous improvement, the main processes and the supporting processes, which provide for a united communication and cooperation structure for the processes.

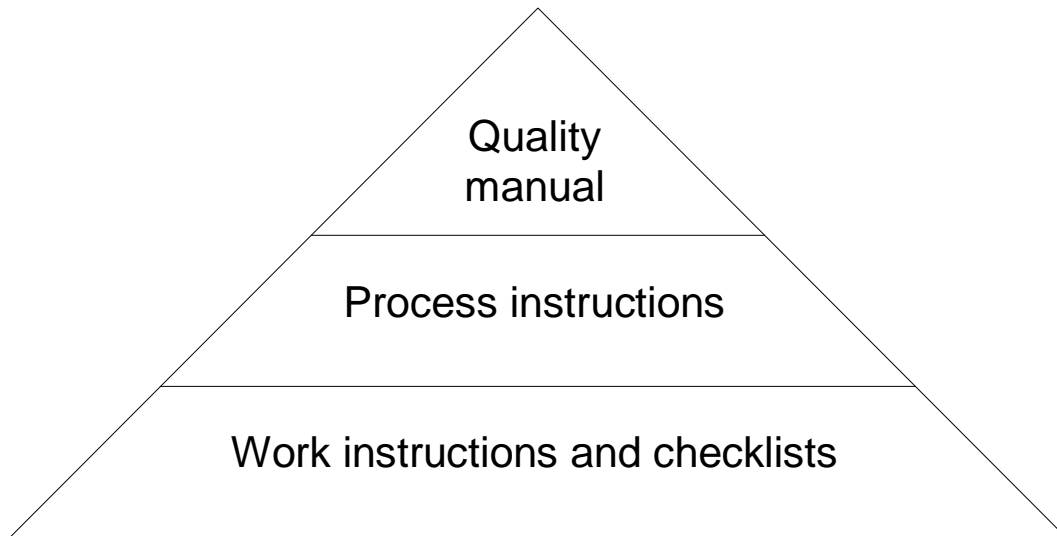
The process flow chart below shows the quality relevant processes of the company. The numbering corresponds to the order of chapters in this manual and to the corresponding process instructions.

The process objectives and contents are described in the following chapters.



2.5 QMS documentation

The documentation of the quality management systems is structured as follows:



The quality manual describes general aims and structures of the quality management, they are concretized by the subordinated process instructions defining the specific scope, objectives and process flow. On the third level, special requisitions or work steps are specified by work instructions and check lists as well as possible test instructions, standard forms or other documents.

3 Managing processes

3.1 Management review

The top management complies with its responsibility for the realization and improvement of the quality management and the defined processes by regular controls, internal and external audits, customer and employee surveys for example. Depending on the results, the quality policies and process instructions will be evaluated and reworked, if necessary.

The process and work instructions, especially the management process „Quality management and policy“ describe character and frequency of the above mentioned controls.

3.2 Quality management and policy

The aims of quality management and policy are described in chapter two of this quality manual. The quality management representative is responsible for their realization, his terms of reference are defined in this process instruction. This particularly includes performance of regular internal audits, the main quality instrument.

Quality management has to be shared and developed by every employee to reach the aims defined. Therefrom, the engagement of the executive board and the QMB is to verify and criticize quality process in interactive communication.

3.3 Personnel development

The company's main resource is the qualification of the employees. Because of the continuous technical progress, the employees as well as the company are engaged to improve their technical skills by continuous education and trainings.

As the single departments make different demands on the employees' knowledge and skills, the department manager is responsible for the determination of education and training needs.

Besides professional education and training, the employees are involved in the company processes, especially processes concerning work and health safety and quality management, to promote independence and comprehension in order to support a collective organizational culture.

3.4 Market analysis and design control

For the development of customer-specific devices, a comprehensive market analyze and design control is required from the project initialization by the sales department's to the research and development departments cooperation with the customers.

For the initialization of a development order, defined product specifications from the (internal) customer are the minimum requirements to fulfill the process quality. As a management process, the design control is responsible for the communication and control of the subject terms of contract, for example the authorization of alterations, also during the development process.

According to a comprehensive and reliable development process, the design control concerning open subject terms of contract should be completed, before the initialization of the development process.

4 Main processes

4.1 RFQ processing

Incoming requests should be economically checked and answered in written form within 24 hours. The RFQ processing includes the classification in one of four defined categories, which specify the information needed and departments involved, and the preparation of a written offer. The determination and documentation of the information required should expressively be made in cooperation with the customer.

Depending on the request, the sales department coordinates the integration of other departments, such as the design and development, the production planning and the material purchasing.

The standardized RFQ guarantees clearly defined customer specifications and the preparation of an optimized offer.

4.2 Commercial offer

The sales department is responsible for commercial offers, based on the RFQ processing. Offers are created and documented in written form. Minimum requirements for the contents of offers are defined, complying with the RFQ categories.

The objective of the commercial offer is to create the optimum offer for the customer within the given time.

4.3 Design and development

Based on a mandatory project management, the design and development department accomplishes internal and external development orders within the given timeframe and financial scope. The process starts with the project initialization and ends with the technical release for production of the finished product.

The process section ‚sample production and testing‘ is defined as an independent, subsequent process, to take the cooperative responsibility of the departments involved into account. It is described in the following chapter 4.4 „Sample production and testing“.

The design and development process is divided into hard- and software development. The software development process is subordinated to the hardware development and is therefore initiated and controlled by the project leader of the hardware development process.

4.3.1 Hardware development

The defined production steps of hardware development are:

- 1. Project initialization**
The R&D management assigns the project leading developer and other involved employees to a new project in a kick-off meeting.
- 2. Feasibility study**
The creation of a first circuit design and test specifications.
- 3. Basis device construction**
The mechanical realization of the conception as a functional base device, fulfilling all critical specifications.
- 4. Prototype development**
Development of a prototype for prototype construction, which fulfils all technical specifications and the demands for later series production.
- 5. Prototype construction**
Production of a first small series in the production and test bay department, where instructions for building the device are tested and optimized and the test specifications are verified.
- 6. Technical release for production**
Completion of the project, following successful prototype construction and finishing of all obligatory test requirements.

4.3.2 Software development

The software development is a sub-process of the hardware development and is chronologically and organizationally integrated in that process flow.

The software development is divided into the following steps:

- 1. Project initialization**
Software development initialization by developer in charge, analogous to the hardware development's kick-off-meeting.
- 2. Software planning**
„Top down“ development and planning of the software corresponding to a company specific project model.
- 3. Source code generation**
Generation and annotation of the source code based on defined coding standards.
- 4. Project completion**
Technical and formal verification in the prototype of the hardware project, followed by release and archiving of the software.

4.4 Sample production and testing

Within the development process, after finishing the prototype production, a batch series is produced in the „sample production and testing“ process, to approve the device for series production. During this series which is handled as a common series production in the product planning process, the technical characteristics for series production are tested and the manufacturing instructions are generated.

This means, that the production and test bay department must create the manufacturing instructions in the production process. That documentation has to be generated by the employees responsible who have been specially trained. This provides constant communication and cooperation with the project leading developer.

4.5 Shipment

The shipments objective is a reliable and fast delivery of products, goods for resale and repaired devices.

The sales and distribution department is responsible for the organization of delivery dates and forwarders. The inventory management department is responsible for the packaging, preparation and commissioning of the deliveries. The accomplishment of the shipment is an alternating process which involves a structured communication.

4.6 Order processing

Incoming orders are checked for correctness and completeness of the data in the order processing. After consultation of the production planning, the customer gets a confirmation of the order.

If order specifications differ from the standard product range, the order must be compared with the quotation and the sales department must be consulted.

4.7 Production planning and control

The production planning creates internal production orders for the production and test bay departments. The department managers are responsible for the planning of the order sequence and the personnel allocation. By using the EDP based production planning system the availability of the resources and the production schedule is monitored by the production planning.

Because of the high criticality of potential production shortages and delays, the production planning and control is directly subordinated to the executive board.

4.8 Production

The production of boards and modules for products requires an meticulous and failure optimized working method. The specified organization of the production is essential for the achievement of the defined quality aims.

The production process consists of seven work steps. In this process, each board and each module is at least controlled once by a visual/final inspection.

The production steps are:

1. Production preparation
2. SMD mounting
3. Subassembly
4. Discrete mounting
5. PCB soldering
6. Visual inspection and rework
7. EDP confirmation

4.9 Electrical and functional testing

The work flow of the electrical and functional testing includes the mechanical and electronic assembly, the functional testing of products and finally the release for shipment. Documented instructions for electrical and functional testing guarantee the achievement of the quality aims, including a 100% functional test and a final long-term test for every single product.

All employees of the test bay department are certified electricians and have been instructed in the test procedure for all products and the EDP handling of production orders.

4.10 Repair and reject entry

The repair and reject entry is divided into two steps, the receipt and registration of repair orders in the inventory management department and the order processing in the sales department. Analogous to the order processing, the sales department communicates with the customer and sets a delivery date.

The objective of this process is a fast and structured service for the customer.

4.11 Repair and repairing report

After approval of the repair order by the sales department, it has to be completed and shipped within the specified timeframe, following the quality standards.

To comply with the quality standards, any repair includes a complete functional test and a long-term test.

4.12 Vendor and material evaluation

The vendor and material evaluations purpose is to provide and analyze statistical data to ensure delivery reliability and cost efficiency in the material purchasing department.

The structured rating, including the periodical evaluation of letter of complaints, enables an objective selection of distributors.

The statistical evaluation of material defects and distributor deficits is a main part of the minimization of serial manufacturing errors.

4.13 Material purchasing

The material purchasing department buys the planned need of components and services for actual production orders and the reorder level, reaching a high delivery reliability and optimized prices. The determination of demands takes places via the electronic planning system, based on the production orders and the reorder level preset.

The quality relevant duties of the material purchasing department also include the processing and documentation of delivery faults, in direct interrelation with the ‚vendor and material evaluation‘ process.

4.14 Incoming inspection

The incoming inspection is the basis for the subsequent production flow. The inspection of the purchased parts package and possible transport damages takes place with every shipment and is documented in the EDP production planning system.

Furthermore, a control sample is taken to detect material faults and serial defects of components before storage or later usage in the production. The material purchasing department is responsible for the fault processing and the definition of the scope of random sample inspections.

4.15 Storage

The storage is based on a EDP based storage system, including a strict batch splitting. The specified goals are the traceability of each component from arrival to product shipment and the optimum usage of stock capacity.

Besides the above mentioned tasks, the inventory management department is responsible for:

1. pre-treatment of components,
2. storage treatment,
3. picking of production orders,
4. return transfer of residual material,
5. packaging of shipping orders and
6. organization of storage area for blocked stock.

5 Supporting processes

5.1 Identification and traceability

In addition to the general definitions for identification and traceability, the product status is specified in a special process instruction. The product status informs all employees via the product planning system to gain information about potential blockings or releases of the product.

5.1.1 Process spanning identification and traceability

The realization of the identification and traceability principle is fundamental for the product and process quality. Due to the company-wide scope, this principle is embedded in the production processes as well as in the administration and supporting process and work instructions.

Identification and traceability in the production

From the registration of incoming material, via the booking of production orders to the serial number generation after the long-term test, the identification and traceability is completely implemented. The serial number of each produced article can be used to retrace the charge data of modules and components used.

Especially blocked devices are clearly labeled and booked in the product planning system with the corresponding status ‚blocked‘.

General traceability (refer to ‚Control of records‘)

The traceability principle is implemented in all business processes. Analogous to the specifications and documentation of development orders, this principle is embedded in the process and work instructions of the material purchasing, the sales and distribution and the administration department.

The company-wide defined control of records ensures the quality relevant documentation and traceability of decision-making processes. Any documentation not especially specified must at least comply with this basic standard.

5.1.2 Status definition of devices and modules

Every product and module series has a status, saved in the product planning system, which shows the present development step, the release for series production or possible blockings.

Each device status is automatically connected to a production status, which defines, whether a production order can be started in the production planning process. Therefore, blocked devices or devices which have not yet reached the sample production status, cannot get an production order in the product planning system.

5.2 Control of records

The handling and specification of documents and records is defined in the process and work instructions.

General definitions of minimum requirements for written and electronic documentation, such as identification, layout or deletion of documents, are specified in the supporting process instruction 'control of records'.

5.3 Maintenance

Machines and tools which need a certain technical or time-consuming maintenance, are especially critical for quality management, but also for occupational health. Each department has a maintenance plan that lists all machines and tools and which documents the periodic measurements.

5.4 Control of measuring and test equipment

Test equipment for the control of product specifications and quality relevant processes must be periodically verified, as far as they can be calibrated. An inspection equipment plan lists all test equipment, which has to be calibrated periodically.

5.5 Process control

Especially in the technical main processes, quality key figures are used to avoid structural and serial faults. The statistical instruments are implemented in the process and work instructions. For example in the planning process the repair data base has been designed to include significant failure categories, which makes possible a widespread statistical analysis.

Besides quantitative analysis, also qualitative surveys, such as customer and employee surveys, are made. Corresponding specifications for qualitative surveys are defined in the process instruction quality management and policy.

Especially with the selection of statistical tools, it is mandatory to prove the relevance and significance of the information expected with regard to the problem. Depending on that, the analysis have to be comparable to previous surveys or should give a new perspective on present or possible problems.

5.6 Corrective and preventive action

The implemented corrective and preventive actions are useful for the company's continuous improvement, especially the improvement of the product quality and the quality management system.

Faults and deficiencies may occur in any company's department and will be eliminated in the departments or processes involved. Measures for failure correction are correspondingly implemented in the process descriptions. Beyond the corrective actions, the employees who are responsible for the process must initiate and support preventive measures which result from the faults occurred.

This means particularly, to analyze the character of maybe every failure, whether it is serial or structural.

The preventive actions required can be divided into two categories:

Technical preventive actions

Preventive measures concerning technical failures are based on analysis of deficiencies and evaluations, if the failures previously can be avoided.

Organizational preventive actions

Preventive measures concerning organizational deficiencies are based on evaluations of internal audits and on information by the employees. Therefore, the evaluation of internal audits always includes the analysis of potential organizational preventive actions.

6 Exhibit

6.1 Register of process instructions

Since the process instructions are not translated into English, the register refers to the German documentation. The four-digit number in the document's name refers to the corresponding chapter in this manual. (VA_0301_01 to the chapter 3.1 Management review for example.)

VA_0301_01 Managementbewertung
 VA_0302_01 Qualitätsmanagement und –politik
 VA_0303_01 Personalentwicklung
 VA_0304_01 Marktanalyse und Designlenkung
 VA_0401_01 Anfragebearbeitung
 VA_0402_01 Angebotserstellung
 VA_0403_01 Entwicklung – Hardware
 VA_0403_02 Entwicklung – Software
 VA_0404_01 Musterbau und –prüfung
 VA_0405_01 Versand
 VA_0406_01 Auftragsbearbeitung
 VA_0407_01 Produktionsplanung
 VA_0408_01 Fertigung
 VA_0409_01 Inbetriebnahme
 VA_0410_01 Reparaturauftragsbearbeitung
 VA_0411_01 Reparatur
 VA_0412_01 Bewertung
 VA_0413_01 Einkauf
 VA_0414_01 Warenannahme
 VA_0415_01 Lagerung
 VA_0501_01 Prozessübergreifende Kennzeichnung und Rückverfolgbarkeit
 VA_0501_02 Statusdefinitionen von Geräten
 VA_0502_01 Verwaltung und Lenkung von Dokumenten und Aufzeichnungen
 VA_0503_01 Instandhaltung
 VA_0504_01 Prüfmittelverwaltung
 VA_0505_01 Qualitätsmessung durch Kennzahlen
 VA_0506_01 Korrektur- und Vorbeugemaßnahmen

6.2 List of abbreviations

AA work instruction (**A**rbeits**a**nweisung)
 EDP electronic data processing
 QM quality management (**Q**ualitäts**m**anagement)
 QMB quality management representative (**Q**ualitäts**m**anagement**b**eauftragter)
 QMH quality manual (**Q**ualitäts**m**anagement**h**andbuch)
 QMS quality management system (**Q**ualitäts**m**anagement**s**ystem)
 RFQ request for quotation
 VA process instruction (**V**erfahren**s**anweisung)