PAS 3100:2014

Remanufactured automotive parts – Specification for a process control system

REBUILT

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Publishing and copyright information

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Foreword

This PAS was sponsored by Honest Co. Ltd. Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It came into effect on 30 September 2014.

Acknowledgement is given to the following organizations that were involved in the development of this PAS as members of the Steering Group:

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- Aviva UK;
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- Japan Automotive Parts Recyclers Association;
- Japan Automotive Products Association;
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Acknowledgement is also given to members of a wide review panel who were consulted in the development of this PAS.

This PAS is not to be regarded as a British Standard. It will be withdrawn as a PAS upon publication of its content in or as a British Standard.

The PAS process enables a specification to be rapidly developed in order to fulfil an immediate need in industry. A PAS can be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or International Standard.

Use of this document

This PAS specifies a process management system for the remanufacturing of reclaimed automotive parts and also includes requirements for their preparation for sale or reinstallation in a vehicle. It has been prepared by an international group of industry experts to provide a means of demonstrating that remanufactured automotive parts placed on the market in accordance with its provisions are of a standard in line with relevant legislative requirements and currently recognized good practice, and are likely to function safely and reliably with performance comparable to that of the vehicle manufacturers original specification. This PAS has been drafted in a manner that permits its application as a specification in its own right. However, its approach is considered to be compatible with that of a formal quality management system (e.g. ISO 9001; ISO/TS 16949) and organizations already operating such a system may find it beneficial to integrate their application of this PAS within their overall quality management system.

Following the correct application of this PAS it will be the remanufacturing process, not the vehicle remanufacturer or the remanufactured part, for which conformity with the requirements of this PAS can be claimed.

It has been assumed in the preparation of this PAS that the execution of its provisions will be entrusted to a competent person or persons for whose use it has been produced.

Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall". Its recommendations are expressed in sentences in which the principal auxiliary verb is "should". The use of the auxiliary verb "can" indicates that something is technically possible and the auxiliary verb "may" indicates permission.

Commentary, explanation and general informative material is presented in italic type, and does not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

BSI has taken all reasonable measures to ensure the accuracy of this translation but regrets that no responsibility can be accepted for any errors, omissions or inaccuracy. In cases of doubt or dispute, the original language text only is valid.

Introduction

PAS 3100:2014 sets out a process for the remanufacture of automotive parts that is uniformly applicable, reliably repeatable and objectively verifiable.

The remanufacturing of automotive parts is growing quickly on a global basis as a practical means of contributing to efforts to protect the environment. Reduction of waste and CO2 emissions can be effectively promoted by the remanufacturing of suitable parts.

Currently, remanufactured automotive parts, even ostensibly identical parts carrying the same part number, can differ greatly in performance and durability because the pattern and length of previous use varies considerably. Another significant influence is that some are placed on the market as "remanufactured" parts after only cursory refurbishment, often involving little more than cleaning and re-painting, without the application of any remanufacturing processes.

In principle, "remanufactured" parts that have been processed so as to include initial component inspection and test, some re-machining processes where necessary and where function testing and final inspection have been applied, should be capable of delivering performance equal to that of the original parts although it is acknowledged that the residual life may be less than that forecast for an original part. This will however be recognized in the warranty that will be issued with any part claimed to have been remanufactured using a process in compliance with this PAS.

Because the quality level of remanufactured automotive parts in the market is currently very wide, it can be difficult to distinguish between those remanufactured parts that are likely to deliver value for money and those that are not. Hitherto, the incidence of such remanufactured parts not meeting expectations has inhibited growth in the remanufactured parts market, to the detriment of achieving the looked for environmental benefits and at unacceptable cost to consumers.

The objective for PAS 3100 is that it should clearly and unambiguously define the terminology used to describe "remanufactured automotive parts" and specify an objectively verifiable process, with its constituent methods and tasks, that is capable of ensuring the remanufacture of automotive parts to a standard equivalent to that of manufacturers' original parts.

PAS 3100 has been developed for application independently of other quality management systems or standards (e.g. ISO 9001; ISO/TS 16949) but is recommended for application in conjunction with such a system by automotive parts remanufacturers already operating or intending to operate in that manner.

Whether applied independently or as part of a quality management system, PAS 3100 has the potential to enhance the performance and reputation of the automotive parts remanufacturing industry, increase the satisfaction of end users and contribute meaningfully to both the improvement in the global environment and to the effective use of resources.

1 Scope

This PAS specifies requirements for a process control system for the remanufacturing of automotive parts in a manner that will support the issue of the warranty specified within its requirements.

This PAS is intended for use by entities undertaking the remanufacturing of used automotive parts for sale and use, and includes requirements for a generally applicable remanufacturing process for automotive parts, including:

- methods and constituent tasks;
- competence of personnel;
- tools and equipment;
- materials and controlled consumables;
- remanufacturing process management;
- quality control;
- health and safety of personnel;
- control of environmental impact of remanufacturing processes.

This PAS also includes requirements setting out the content of the required warranty and of declarations of conformity to its provisions.

It is applicable to the remanufacture of all used automotive parts for which remanufacture is technically possible on a uniformly repeatable basis, with the exception of tyres, which are the subject of existing specification.

2 Normative references

This PAS does not require the use of other documents for its application but attention is drawn to the documents listed in the bibliography which may be found to assist in ensuring efficient, effective operation.

3 Terms and definitions

For the purposes of this PAS, the terms and definitions given in BS 8887-2:2009 and the following apply.

3.1 Terms characterizing automotive parts

3.1.1 (automotive) component

piece or element of an automotive device that, on its own or assembled with others, in accordance with a specification, constitutes an (automotive) part

3.1.2 (automotive) assembly

number of components fitted together in a specified way so as to constitute an (automotive) part

3.1.3 (automotive) part

single component or assembly, with a specified identity and function, that can be fitted together with other (automotive) parts in accordance with a particular specification, to build an automotive device

3.1.4 core

used (automotive) part that is retained with the intention of either restoring its original functionality, and performance, or for use as a source of components or material for the remanufacture of other (automotive) parts

3.1.5 equivalent (automotive) part

(automotive) part that is identical in terms of fit, form, materials and performance, to an original (automotive) part

3.1.6 original (automotive) part

(automotive) part that an automotive device manufacturer specifies for use in building a particular automotive device or that it approves for separate sale for that purpose

3.1.7 remanufactured (automotive) part

(automotive) part that has been restored to original functionality in terms of fit, form, materials and performance through the application of a sequence of pre-identified process stages to components and assemblies

3.1.8 used (automotive) part

(automotive) part that has been subject to a period of operation in an automotive device from which it has subsequently been removed

NOTE *The removal of the part from its source automotive device can be in order to replace it, when the device is the subject of repair or be the result of a decision to scrap the device.*

3.1.9 modified (automotive) part

(automotive) part or assembly to which changes have been made e.g. to widen its range of application or to improve its performance

NOTE *In the use of the terms **3.1.1** to **3.1.9** in PAS 3100, for reasons of brevity and readability, the word (automotive) is not actually used in expressing the term and its meaning is therefore to be implied.*

3.2 Other terms

3.2.1 remanufacturer

entity that performs the remanufacturing of used automotive parts or assemblies through the application of a specified remanufacturing process

3.2.2 competent person (for remanufacturing)

person who has been approved and authorized by the remanufacturer as having the industrial competence sufficient to undertake specific automotive parts remanufacturing tasks to the remanufacturer's specified standard

3.2.3 industrial competence

publicly defined knowledge and skill required to perform specified automotive parts remanufacturing tasks, for which industry-approved formal training is available and has been undertaken

3.2.4 reverse engineering

reproduction of a part or component on the basis of detailed examination of its construction and composition to establish the essential criteria for its functionality and performance

4 Remanufacturing process

4.1 Remanufacturing process overview

4.1.1 Process requirements

The remanufacturing process of an automotive part requires the application of a series of different remanufacturing stages with each consisting of relevant stage-specific methods and/or constituent tasks. For each part type, the identification and sequence of the applicable stages and the detailed specification of each of the related methods and tasks shall be specified and documented by the remanufacturer, to include:

a) the remanufacturing process flow plan setting out the nature and sequence of required process stages (see **4.1.2** and Figure 1);

b) applicable regulations and rules (see **4.1.3** and **4.1.5**);

c) safety precaution and environmental protection methods to be applied (see **4.1.4** and **4.1.5**);

d) remanufacturing method(s) to be applied at each stage including the identification and sequence of stage-related tasks (see **4.1.5**);

e) inspection method and testing method (see **4.1.5**);

f) competence required of those authorized to participate in the process (see **4.2**);

g) equipment and tools to be used (see **4.4**);

h) materials and replacements of perishable component (see **4.5**);

i) quality control (see **4.6**);

j) use of subcontractors (see **4.7**);

k) remanufacturing process management (see Clause **5**); and

l) warranty (see Clause **6**).

4.1.2 Remanufacturing process flow plan

The PAS 3100 remanufacturing process consists of 11 different stages illustrated in Figure 1 as a basic remanufacturing process flow plan. Each stage of the remanufacturing process shall consist of the relevant remanufacturing method(s) and all constituent tasks, taking account of any applicable regulations, safety and/or environmental protection requirements.

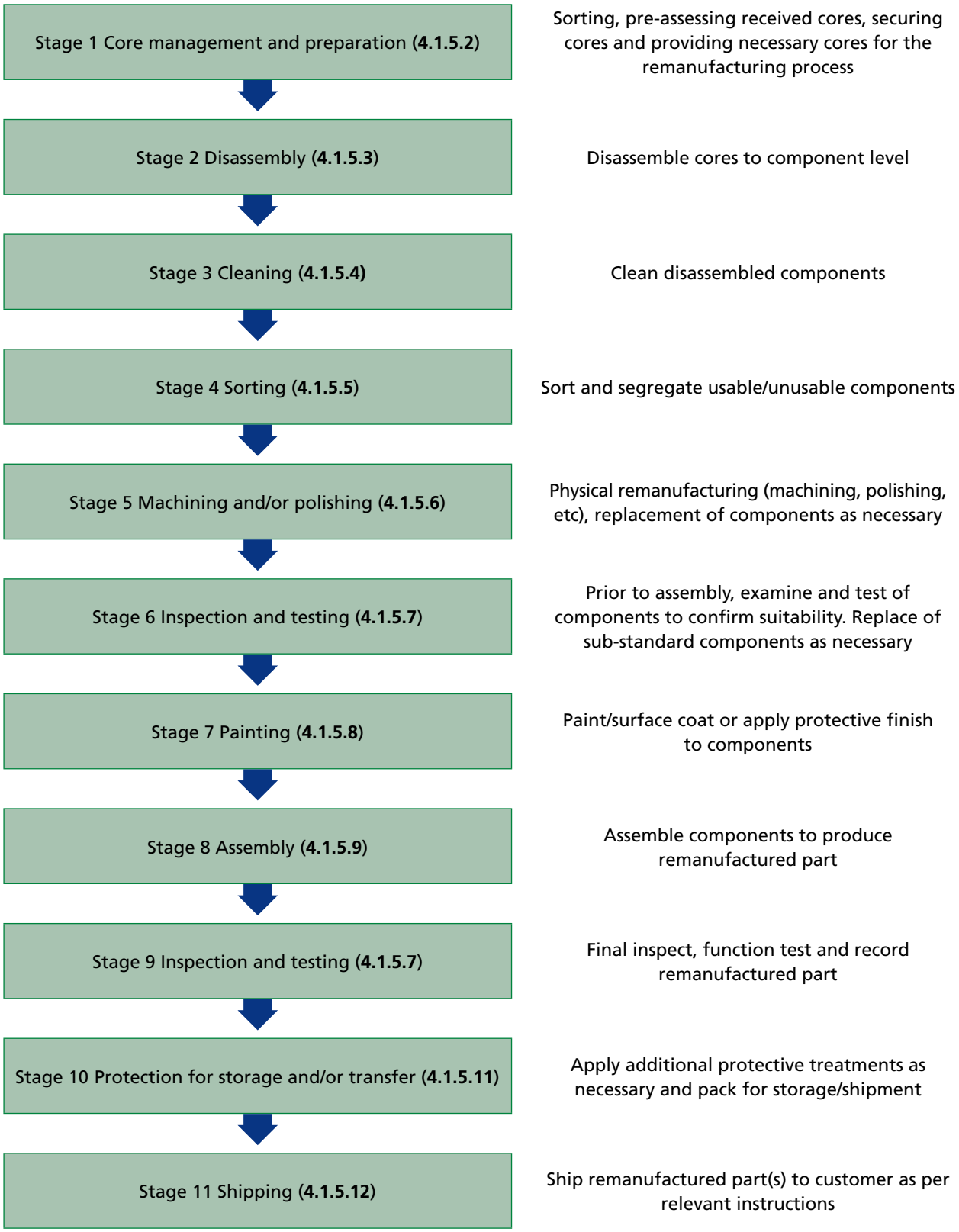
All remanufactured automotive parts that are claimed to be remanufactured in compliance with this PAS shall have followed this plan, including at least stages 1, 2, 4, 6, 8, 9 and 10.

Any of stages 3, 5, 7 and 11 may be omitted when, in the judgement of the remanufacturer, such omission will not have negative impact on the performance or appearance of the remanufactured part. The decision to omit shall be made by a competent person authorized by the remanufacturer to do so and a record of that decision shall be included in the remanufacturing record for the part and made available for inspection upon request.

Applicable stages can be undertaken in accordance with the remanufacturer's preference, i.e. discretely or as a semi-continuous process. The remanufacturer shall be able to substantiate the completion of each included stage, confirming that the purpose for each stage has been fulfilled and outcomes recorded, as specified in the work instructions.

NOTE *Additional stages can sometimes also be required and may be added at the remanufacturer's discretion.*

Figure 1 – Basic remanufacturing process flow plan



4.1.3 Regulations and rules

Since each stage of the remanufacturing process can require different methods and tasks, the regulations and rules to be followed can be different at each stage of the process. For this reason, the remanufacturer shall establish a procedure for identifying applicable regulations and rules and incorporate them on the process description and work instruction manual for each stage of the process.

4.1.4 Safety and environmental protection

Since each stage of the remanufacturing process requires different tasks, safety precautions and methods of environmental protection can be different at each stage of the process. For this reason, the remanufacturer shall include relevant safe working instructions and methods of environmental protection in the process description and work instruction manual for each stage of the process.

4.1.5 Methods and constituent tasks

4.1.5.1 General

The remanufacturer shall provide work manuals for each stage of the remanufacturing process. Each stage manual shall include:

- the purpose of the work;
- a detailed work method;
- the required competency;
- the necessary tools and equipment;
- applicable regulations and rules;
- required segregation and cleanliness of the work environment;
- safety precautions;
- the procedures to be followed for environmental protection;

and include at least the stage-related instruction listed in the stage description provided in 4.1.5.2 to 4.1.5.12.

In preparing instructions for the remanufacturing process, reverse engineering on target parts for which the original manufacturer's specification is not available shall be carried out to ensure that all necessary information for remanufacturing is available.

4.1.5.2 Core management and preparation

To provide for sorting and pre-assessing all received cores, including returned cores, and the identification and storing of qualified cores to ensure a supply of suitable cores for the remanufacturing process, the documentation shall include instruction for:

a) Operational requirements:
   i) handling and storing cores in a manner that protects them from damage, e.g. as a result of load shift or fall, and that minimizes degradation, e.g. as a result of corrosion;
   ii) application of classified storage method of cores by category, by part No. or by manufacturer for easy and efficient retrieving of cores for remanufacturing;
   iii) procedures for examining, identifying and making a preliminary assessment of the potential usability of received cores, including the preparation of relevant records and initiating the required remanufacturing documents. This shall include the identification of cores containing parts that have been the subject of recall by original manufacturers to enable an informed decision as to their suitability for remanufacture;

   NOTE *The remanufacturer should make arrangements to ensure that information concerning original parts that have been the subject of recall by the original manufacturer is made known to operatives undertaking core management tasks.*

   iv) undertaking pre-cleaning on the prepared cores as necessary.

b) Safety and environmental protection requirements:
   i) preventing environmental contamination during handling, storing and transporting cores;
   ii) use of handling methods for the transfer and storage of cores to preparation and through the remanufacturing stages, that do not put operatives or others at risk;
   iii) the safe disposal of any rejected cores using the organization's approved procedures;
   iv) ensuring that the washing liquids and waste materials resulting from pre-washing are disposed of in accordance with manufacturer's instructions;

v) provision of adequate protection for personnel working with chemicals, ensuring that they are used in accordance with manufacturer's instructions.

4.1.5.3 Disassembly

To provide for disassembly of prepared cores and the functionality monitoring of components, the documentation shall include instruction for:

a) Operational requirements:
   i) ensuring the type and quantity of the core to be disassembled is matched to the instruction on the work instruction sheet before commencing disassembly;
   ii) disassembling cores without damaging parts to be used again, including the use of appropriate tools, fixtures and equipment in the correct way following manufacturer's instructions;
   iii) disassembly of each core to the designated limit;
   iv) for cores that cannot be disassembled any further, requirements for inspection to confirm they can be functional throughout the warranty period.
b) Safety and environmental protection requirements:
   i) awareness of the nature of the cores to be disassembled and avoidance of any negative impact on operatives or the environment during disassembly;
   ii) following specified safety precautions and paying attention to prohibited matters, the use of appropriate personal protection equipment and the use of tools and equipment;
   iii) observing fire precautions when flammable agents or spray is used;
   iv) sorting and storing wastes generated during the disassembly process, then recycling them, if applicable, or disposing of them in accordance with the organization's specified procedures.

   NOTE *Attention is drawn to the fact that there may be national or local legislative or regulatory requirements for the disposal of waste materials and remanufacturers should ensure that they remain aware of their responsibilities in this respect.*

4.1.5.4 Cleaning

To provide for cleaning of disassembled parts (e.g. by washing, media cleaning and/or buffing) the documentation shall include instruction for:

a) Operational requirements:
   i) maintaining the washing agent, cleaning media and buffing wheel in good condition and replacing them periodically in accordance with the organization's procedures or manufacturer's instructions;
   ii) washing all washable parts and removing dirt and grease from the washed parts;
   iii) restoring the parts to an acceptable cleanness for the next process stage;
   iv) removing of all residual cleaning media and buffing powders from cleaned parts.
b) Safety and environmental protection requirements:
   i) managing any solvent or chemical used in the washing process so as to avoid any risk to personnel or the environment;
   ii) avoiding contamination of solvent, acid or alkaline used in the washing process in order to prevent generation of poisonous gas or explosion;
   iii) the avoidance of fire where flammable agents are used;
   iv) the safe use of high pressure spray washing systems or steam washing systems particularly where used in enclosed spaces in order to prevent injury to personnel or negative impact on the environment;
   v) the use of safety equipment where required;
   vi) maintaining clean floor areas around media cleaning locations;
   vii) disposing of surplus and waste washing liquids after use in accordance with manufacturer's instructions and taking account of currently applicable legislative requirements.

4.1.5.5 Sorting

To provide for sorting of cleaned parts and components into categories, e.g. usable, not usable and usable after rework, the documentation shall include instruction for:

a) Operational requirements:
   i) segregation of categorized parts and components using visual inspection, under magnification where required, to separate parts or components with obvious technical faults, and parts requiring 100% replacement (e.g. where they have been the subject of recall by the original manufacturer). Using gauges and measurement to separate parts or components where visual inspection alone is not sufficient;

ii) the use of approved part samples or photographs as a reference to identify acceptable items for remanufacture;

iii) procedures for separating rejected parts or components, including any rejected as having been the subject of original manufacturer's recall, in order to avoid unintentional use as approved parts or submission for remanufacturing;

iv) procedures for ensuring that a component identified as "usable after rework" cannot be inadvertently be made available as a usable component before the necessary rework is completed;

v) parts or components identified as acceptable for remanufacture are stored in a suitable (e.g. clean) area and remain uncontaminated/ undamaged while waiting for reassembly.

b) Safety and environmental protection requirements:

i) adopting clean and orderly working procedures at all times;

ii) ensuring that parts or components identified as "not to be used" are recycled where practicable, or are disposed, in accordance with current legislative requirements and the organization's approved procedure(s);

iii) ensuring that parts and/or components that are potentially harmful to people and/or the environment are rendered safe, prior to disposal, in accordance with current industry good practice and the organization's policies.

4.1.5.6 Machining and/or polishing

To provide for machining and/or polishing of the sorted parts, the documentation shall include instruction for:

a) Operational requirements:

i) machining, polishing or reworking the parts as required, referring to the process instruction manual to obtain the specified results;

ii) performing machining, polishing or reworking operations in a manner that maintains quality, strength and function of the part;

iii) recording the methods applied when a part has been repaired, e.g. by welding, thermal spraying or other methods, including the detail and outcome of in-process inspection;

iv) segregation of parts that are rejected during machining, polishing, reworking or during in-process inspections so as to ensure that they cannot be misused as approved parts.

b) Safety and environmental protection requirements:

i) the safe use of tools, fixtures and equipment, in accordance with organizational guidelines and/or manufacturer's instructions so as to avoid injury to personnel or damage to property;

ii) recycling or disposal of waste materials, e.g. metal scraps and swarf as appropriate, in accordance with current legislative, industry and the organization's environmental procedures, in order to avoid damage to the environment;

iii) ensuring that parts and/or components that are potentially harmful to people and/or the environment are rendered safe, prior to disposal, in accordance with current industry good practice and the organization's policies.

4.1.5.7 Inspection and testing

To provide for inspection and testing of parts or components categorized as reusable or usable after machining, polishing or reworking, the documentation shall include instruction for:

a) Operational requirements:

i) the removal and segregation from the remanufacturing line of parts that fail inspection or testing in order to avoid their misidentification as usable parts and to ensure that they are disposed of using approved procedures;

ii) procedures for visual inspection, using magnification where required, and the use of gauges and measurement to differentiate between parts, where visual inspection alone is not sufficient;

iii) replacing worn or damaged components on parts as determined by inspection and testing;

NOTE *The replacement of components found to be unusable during in-process inspection can be undertaken as part of the inspection stage of the process or following return to an earlier process stage.*

iv) replacing perishable components [(see note to iv)] and replacing time-limited components in accordance with their specified limits, including:

- belt, oil seal, O-ring and gasket;
- Supporting element of rotating body such as bearing, plane bearing (metal) or bush;
- constantly or frequently contacting element such as brush, slip ring, contact point;

- synthetic material components that show sign of deterioration shall be replaced unless refurbishment can be achieved, e.g. by the use of filling compound or other repairing material.

  ***NOTE** If refurbishment can provide a component functionally and cosmetically equivalent to a new component, it can be accepted as a usable component.*

***NOTE** Where the remanufacturer specifies the reuse of perishable components, this should be on the basis of assessment against objectively verifiable criteria.*

v) using and maintaining instruments and equipment used for inspection in accordance with the organization's procedures and/or manufacturer's instructions.

b) Safety and environmental protection requirements:

i) using instruments and equipment for inspection and testing in accordance with the organization's procedures and/or manufacturer's instructions in order to prevent injury to personnel or negative impact on the environment;

ii) recycling, or disposal as applicable, of waste materials, e.g. plastic, rubber, metal, in accordance with current legislative, industry and the organization's environmental procedures in order to avoid negative impact on the environment.

4.1.5.8 Painting

To provide for painting or coating, e.g. to prevent corrosion or degradation of insulation properties or surface deterioration, or for cosmetic reasons, the documentation shall include instruction for:

a) Operational requirements:

i) the selection of paints or other surface coating materials for their compatibility with the materials to be coated (e.g. to ensure correct adhesion and minimize the risk of deterioration in use, through exposure to heat, ultraviolet light or aging);

ii) the avoidance of colour contamination when switching equipment to a different colour;

iii) the preparation and matching of colour samples to judge the applied colour and gloss level.

b) Safety and environmental protection requirements:

i) the selection and preparation of the area to be used for painting, to ensure cleanliness and absence of flying particles;

ii) ensuring that only paints and other materials for surface treatment materials that meet current legislative, industry and environmental requirements shall be selected;

iii) using and storing paints and other materials for surface treatment in accordance with the organization's procedures and/or manufacturer's instructions in order to prevent injury to personnel or negative impact on the environment;

iv) precautionary measures to be taken to prevent unintended paint or other coating material deposits on adjacent objects and surrounding areas;

v) the handling, storage and recycling or disposal as applicable, of surplus paint or coating materials and other fluids used in the coating process in accordance with the organization's procedures and/or manufacturer's instructions in order to prevent injury to personnel or negative impact on the environment;

vi) handling procedures and precautionary measures to be applied when using high temperature equipment, e.g. as used for baking finish.

***NOTE** Attention is drawn to the fact that there may be national or local, legislative or regulatory requirements relating to the use of paints and/or coating materials and remanufacturers should ensure that they remain aware of their responsibilities in this respect.*

4.1.5.9 Assembly

To provide for assembly of all cleaned and inspected parts, the documentation shall include instruction for:

a) Operational requirements:

i) the selection and preparation of the area to be used for assembly, to provide an appropriate environment (e.g. clean and free from flying particles) that will not compromise the quality of the assembly process and be of a size sufficient to permit safe working practices;

ii) ensuring that all parts presented for assembly are the correct parts for the assembly to be undertaken [see also **4.1.5.5** a)];

iii) the application of lubricants or protective products, e.g. oils, grease or chemical products, in accordance with the organization's procedures and, where fluids and lubricants are subject to reuse, their maintenance in serviceable, uncontaminated condition;

iv) the tightening of fasteners, e.g. bolts, nuts and screws to the specified extent by using torque-controlled tools or devices in accordance with the organization's procedures and/or manufacturer's instructions;

v) the correct installation of ball, roller or plane bearings, avoiding the use of excessive force and ensuring correct orientation and secure location without giving excessive clearance;

vi) the correct fitting of sealing devices, e.g. gaskets and O-rings, in accordance with manufacturer's instructions, preventing dust adhering to the sealing surface and the even application of specified torques to securing bolts across component surfaces to ensure correct functionality, e.g. adequate sealing and/or prevention of leakage (of liquids or gases);

vii) the correct use, maintenance and replacement of tools (e.g. hammers, drifts or punches);

viii) the appointment of competent persons to undertake tasks requiring particular skills e.g. soldering to make physical and electrical connections;

ix) where defective assemblies are identified during the assembly process, their separation and removal in entirety from the assembly area.

***NOTE** Refer to earlier notes (**4.1.5.2**) regarding special care in respect of parts that have been the subject of an original manufacturer's recall.*

b) Safety and environmental protection requirements:

i) the use of tools (Including power tools), fixtures and equipment, in accordance with the organization's procedures and/or manufacturer's instructions to prevent injury to operatives;

ii) procedures to be followed when handling and/or storing oils, diluents or chemicals to prevent negative impact on the health of personnel or damage to the environment;

iii) ensuring that parts and/or components that are potentially harmful to people and/or the environment are rendered safe, prior to disposal, in accordance with current industry good practice and the organization's policies.

4.1.5.10 Final inspection and function testing

To provide for inspection after final assembly, the documentation shall include instruction for:

a) Operational requirements:

i) the use of calibrated test devices and measuring instruments, in accordance with the organization's procedures and/or manufacturer's instructions;

ii) consistent assessment of the acceptability of products and/or product characteristics by the provision of relevant assessment criteria, e.g. samples or photographs for comparison purposes;

iii) any requirements for undertaking and assessing waterproofing or submergence testing;

iv) ensuring that for products intended to contain oils or other liquids, all openings are sealed after function testing to prevent leakage during subsequent storage and/or transport to the intended recipient;

v) where measurement of the vibration and noise levels generated by the part is required, the use of specified measuring instruments and recording of readings;

vi) segregation of rejected products by faults detected, e.g. cosmetic or functional, to facilitate reworking and re-inspection;

vii) actions required to isolate any product that has failed final inspection from products that have passed, and to prevent their subsequent use;

viii) preparing and maintaining records of all inspection findings;

***NOTE** Inspection reports could be shipped with the product or could be submitted at a later date, upon request.*

ix) where unfinished parts or assemblies are inspected and placed in store for subsequent use, arrangements for ensuring re-inspection after final assembly;

***NOTE** It is not acceptable to rely on the inspection findings of the half-finished part.*

x) attaching a traceable identifying mark (see **6.5**) to the finished product to indicate that the part has been approved as having been remanufactured in accordance with this PAS;

xi) where a part has been intentionally modified, provision for unambiguous identification of any deviation from the specification of the original part, either attached to the part or accessible as required.

b) Safety and environmental protection requirements:
   i) the use of final inspection and testing equipment, in accordance with the organization's procedures or manufacturer's instructions, to prevent injury to personnel or damage to the working area;

      NOTE *Attention is drawn to the need during pressure testing (e.g. for air tightness), to take precautions that will ensure the protection of personnel in the event that parts collapse under test.*

   ii) the provision and use of either personal protective equipment or instrument guarding to prevent injury to personnel or negative impact on the environment;
   iii) ensuring that operators and testers are protected from electric shock when carrying out electrical tests.

4.1.5.11 Protection for storage and/or transfer

To provide for protecting the completed remanufactured part from contamination and/or deterioration during storage prior to shipment, the documentation shall include instruction for:

a) Operational requirements:
   i) the application of appropriate prevention treatment to product areas prone to contamination or deterioration (e.g. rust), either as soon as possible after the final inspection process or during the packaging process;
   ii) the availability of all necessary documentation such as test certificate, warranty certificate, instruction manual, in a manner that will ensure their delivery with the remanufactured part or assembly;
   iii) checking for indications that the product may have suffered damage or deterioration prior to packing;
   iv) the use of packaging materials and/or methods appropriate for the protection of remanufactured parts or assemblies in all known or reasonably foreseeable conditions of transport and storage;
   v) where products contain liquids, ensuring that all openings are sealed and that leak-proof packaging is provided and used;
   vi) the maintenance of records sufficient to provide traceability for remanufactured parts or assemblies;
   vii) the determination of appropriate storage conditions and duration and the arrangements necessary to ensure their application, e.g. to take account of anticipated functionality of rust prevention procedures and/or moisture exclusion materials used in the packaging;
   viii) periodic inspection of stored products to check for deterioration and establish the potential for longer periods of storage.
b) Safety and environmental protection requirements:
   i) processes and procedures to prevent injury to personnel, e.g. by shifting or falling packages during packing, transportation and storage;
   ii) recycling, if applicable, or disposal of waste materials generated during packaging process, e.g. packing materials, rust preventing materials in accordance with the organization's procedures within the current legislative and industry environmental requirements.

4.1.5.12 Shipping

To provide for shipment of remanufactured parts to customers, in accordance with the organization's standard procedures or any particular customer's requests, the documentation shall include instruction for:

a) Operational requirements:
   i) checking packaged product for indication of mistreatment or damage and arranging for contents check and repackaging, as required;
   ii) confirming and maintaining shipping procedures and processes as necessary, e.g. updating inventory lists;
   iii) confirming that customer shipping requests have been complied with and that all necessary documentation is shipped with the consignment, e.g. test certificate, warranty certificate, instruction manual.

      NOTE *For the purpose of effective use of resources, it is recommended that remanufacturers do whatever they can to encourage the purchasers of their remanufactured parts to return replaced parts for remanufacture, e.g. through the provision of arrangements for return.*
b) Safety and environmental protection requirements:
   i) prevention of injury to personnel due to displaced or falling packages during
   ii) handling and transportation;
   iii) avoidance of injury to personnel and/or negative impact on the environment from waste materials, e.g. discarded packaging removed from returned cores or resulting from re-packaging.

4.2 Personnel – engagement, competence and responsibilities

4.2.1 Description of required competency and recruitment

The remanufacturer shall establish and communicate to all personnel, an unambiguous structure of responsibility and competence for the personnel engaged in automotive parts remanufacturing, e.g. supervisor, foreman, currently competent person, operative and apprentice.

The remanufacturer shall establish, implement and document the work and role to be undertaken for each level of the hierarchy employed, including:

a) methods and tasks to be undertaken for each stage of the remanufacturing process, including range of work, role to be taken and skills and competencies required;

b) recruitment procedures, including required competence for the work the recruit is to be engaged in, the knowledge of relevant safety and quality issues and a process for verification of the competence and the knowledge of applicants.

Each stage of the remanufacturing process shall be undertaken with the oversight of at least one individual assessed by the remanufacturer as a currently competent person for that stage of the remanufacturing process.

__NOTE__ Competency for a currently competent person is defined at in __4.2.3__ of this PAS.

The role definition for each stage-related, currently competent person shall include health and safety, product quality, environmental protection and performance criteria relevant to that stage and as required for the various part types to be processed.

4.2.2 Induction and training

For each individual filling a role identified as part of the remanufacturing process referred to in **4.1**, the remanufacturer shall establish, implement and document procedures for:

a) training necessary for the intended role of the individual, including awareness of the relevant parts of this PAS;

b) the identification and delivery of current and on-going training needs;

c) the evaluation of delivered training and its effectiveness;

d) assessing current competence in the remanufacturing tasks undertaken, including any evidence required;

e) periodically undertaking a review of the skills required to apply the relevant remanufacturing methods (at least annually);

f) maintaining a documented and authenticated record of the training and development undergone by each employee.

4.2.3 Currently competent person

An individual who is identified by the remanufacturer as a 'currently competent person' shall be able to demonstrate all of a) through e), as follows:

a) the skill and knowledge to undertake one or more of the remanufacturing process stages defined in this PAS to the standard specified by the remanufacturer;

b) the ability to undertake their allocated duty at the level of responsibility assigned to them;

c) the capability to employ all the tools and equipment used for the relevant remanufacturing process stage;

d) the knowledge and experience required to detect technical defects in the work undertaken (or in the tool and/or equipment used) or omissions in its completion;

e) the ability to assess operating situations or conditions (e.g. through the undertaking of risk assessments) in respect of implications for the health and safety of personnel or negative environmental impact and to initiate any corrective action necessary.

4.2.4 Remanufacturing – competence and oversight

4.2.4.1 Undertaking of remanufacturing tasks

Remanufacturing tasks in each stage of the remanufacturing process addressed in **4.1.5** (see also Figure 1) shall be undertaken by a currently competent person or by persons under the oversight of a currently competent person who shall be responsible for ensuring compliance with the relevant remanufacturing stage procedures and specifications (see also **5.2**).

4.2.4.2 Ratio of currently competent person

The ratio of currently competent persons to others (inclusive of apprentices) engaged in the remanufacturing tasks shall not be less than one in ten (1:10) with at least one person currently competent in each relevant remanufacturing process stage.

4.3 Availability of documentation

4.3.1 Documented work instructions

4.3.1.1 Access to work instructions

Documented work instructions for each stage of the remanufacturing process shall be readily accessible at the work location.

4.3.1.2 Compliance with work instructions

Evidence that the work instructions provided have been accessed and applied in undertaking particular remanufacturing processes shall be available on request.

4.3.1.3 Relevance of work instructions

The remanufacturer shall be able to demonstrate that all work instructions and remanufacturing methods have been periodically reviewed to ensure currency and that any changes made have been correctly recorded.

4.4 Equipment, tools and fixtures

4.4.1 Availability

Specialist equipment required for the remanufacturing undertaken shall be available either on-site or via suitable subcontracted facilities.

4.4.2 Suitability and capability

The selection and use of equipment, tools and fixtures shall be based upon evidence of suitability, relevance to the remanufacturing process being undertaken and proven capability.

In the event that any item of equipment, tools or fixtures has lost its function, the remanufacturer shall provide a replacement or alternative items of equivalent functionality, confirming and recording that the introduced item will not detrimentally influence process quality. The record shall include traceability to the quality of remanufactured parts produced using a replacement or alternative item.

4.4.3 Calibration

4.4.3.1 Validity period

Remanufacturing and measuring equipment, including employee-owned equipment, shall be registered and calibrated or verified at intervals specified by the remanufacturer, or prior to use. The interval between such calibrations shall not exceed that recommended by the equipment manufacturer.

4.4.3.2 Calibration and record

Calibration and verification records for equipment, gauges, measuring and test equipment, including employee-owned and subcontracted equipment, shall include:

a) equipment identification, including the measurement reference standard against which the equipment is calibrated;

b) changes to calibrated equipment following remanufacturing specification changes;

c) any out-of-specification readings when equipment is submitted for calibration;

d) a statement of conformity to specification after each calibration or verification.

4.4.3.3 Procedures to be followed when equipment is out of calibration

In the event that an item is found to be out of calibration, the remanufacturer shall:

- undertake an assessment of the likely impact of that finding on the quality of remanufactured parts processed during the period since the last correct calibration; and
- where it is found that the calibration failure may result in possible failure of remanufactured parts during the warranty period, ensure that customers who have received those parts are notified accordingly.

4.4.4 Maintenance

4.4.4.1 Maintenance of equipment

Each item of equipment required for the remanufacturing stages undertaken shall be identified and included in the maintenance system required at **4.4.4.2**.

The remanufacturer shall ensure the availability of sufficient knowledge to handle and maintain all equipment, tools and fixtures and keep them in good condition with documented maintenance records.

4.4.4.2 Preventive maintenance

A planned total preventive maintenance system shall be developed and implemented to include:

a) scheduled maintenance on machines and equipment;

b) confirmation of the functionality of machines and equipment after installation or after a prolonged period of not being used;

c) reviewing the effectiveness of planned maintenance;

d) recording of maintenance method, including manufacturer's data (e.g. specification, function and operating programme for each item) and modifications introduced by the remanufacturer.

4.5 Replacement materials and controlled consumables

4.5.1 Replacement materials

Usage and quality of replacement materials shall be either:

a) as used in the original manufacture of the part to be remanufactured; or

b) equivalent to that used in the original manufacture of the part to be remanufactured.

The specifications and quality of replacement materials shall be supported by declaration of conformity from the material supplier, receiving inspection/testing by the remanufacturer or independent third party certification.

Where remanufactured assemblies are temporarily filled with fluid or lubricants for the purpose of testing only, those materials shall comply with **4.5.1** a) and b).

4.5.2 Receiving, handling and storage

4.5.2.1 Management of replacement materials

Replacement materials, displaced components and controlled consumables for which the manufacturer specifies particular storage, handling or application techniques shall be treated in accordance with the manufacturer's instructions.

NOTE *For example, perishable materials such as bonding materials should be stored with their 'use by' date prominently displayed and arrangements should be in place to ensure that they are withdrawn from use no later than that date. It is recommended that the remanufacturer should make storage conditions materials handling and application techniques the subject of a periodic inspection scheme and manage the materials accordingly.*

4.5.2.2 Receiving inspection

Replacement materials and controlled consumables shall be checked for conformity to purchase specification.

4.5.2.3 Traceability

All replacement materials received and used for remanufacturing shall be identified and remain traceable to their origin.

NOTE *Production should be sequenced to ensure that batches of replacement new components or remanufactured components, will be linked by record to completed assembly: batch No., part No. or sequential serial No.*

4.5.2.4 Handling

Replacement materials, displaced components, controlled consumables and agents or media, such as oil, solvent etc., used on equipment, tools and fixtures for the remanufacturing process shall be handled in accordance with manufacturer's instructions, taking account of their particular characteristics and hazardous nature.

4.6 Quality control

The remanufacturer shall have in place and operate a documented quality control procedures capable of confirming that the remanufactured part meets the definition at **3.1.7** in accordance with the requirements of this PAS.

Record of the remanufactured part quality control outcomes for each remanufactured part shall be made and signed off by a currently competent person authorized to do so on behalf of the remanufacturer.

4.7 Use of subcontractors

4.7.1 Specification of subcontracted work

Parts remanufactured under subcontract arrangement with a party not controlled by the remanufacturer shall be specified for completion in accordance with this PAS, and be subject to a specific agreement in this respect between the remanufacturer and its subcontractor.

4.7.2 Subcontracting agreements

Agreements between the remanufacturer and its subcontractor shall require that:

a) the current competency of person(s) undertaking the subcontracted remanufacturing tasks is as specified in this PAS;

b) the subcontractor works to the requirements of this PAS in respect of the:
   - remanufacturing methods;
   - technical data;
   - tools and equipment;
   - materials and controlled consumables;
   - environmental requirements;
   - used for the subcontracted remanufacturing process.

c) quality control procedures are in place and operated to ensure that work is completed to the agreed specification;

d) the results of the remanufacturing process carried out are documented and made available to the remanufacturer by the subcontractor at completion of the subcontracted remanufacturing;

e) the remanufacturer completes their own audit on any subcontractors to ensure compliance to this PAS. This is in addition to any quality control process that the subcontractor has in place.

NOTE *The responsibility for assurance that the subcontracted items meets specification remains with the remanufacturer.*

5 Remanufacturing process management

5.1 Remanufacturing process change

5.1.1 Introduction of new or modified remanufacturing processes

New or modified remanufacturing processes shall be evaluated to verify process capability, reliability, maintainability and availability, and the results shall be recorded.

NOTE *The specification for the remanufacturing process should have been developed using a planned, organized and recorded product development process subject to risk assessment.*

5.1.2 Compatibility of remanufacturing process change

Any change in a remanufacturing process shall be accompanied by a review of related tasks and methods to ensure compatibility.

5.1.3 Internal feedback

All internally generated feedback on the remanufacturing process, whether positive or negative, shall be documented and acknowledged by the management or person appointed by the management to do so prior to being investigated and corrected where judged beneficial. Any decision not to take corrective action shall be documented including the reasons for reaching that decision.

5.2 Remanufacturing process control

The remanufacturer shall have in place a documented remanufacturing process control procedure capable of demonstrating that the requirements of this PAS have been met for each remanufactured part including the completion of the remanufacturing quality control procedure (see **4.6**). A record of the application of the remanufacturing process control procedure shall be maintained for each remanufactured part and signed off by the management, person appointed by the management or a currently competent person authorized to do so on behalf of the remanufacturer.

NOTE *The appointment of currently competent persons authorized to sign off remanufacturing quality control records and remanufacturing process control records is the prerogative of the remanufacturer who is entitled to decide the breadth of current competence required.*

5.3 Internal audit and corrective action

5.3.1 Procedure

A procedure for internal auditing of remanufacturing processes by the remanufacturer shall be established, implemented and documented to ensure that over the course of a 12-month period the remanufacturing process applicable to each remanufactured part type is audited at least once to check conformity to the requirements of this PAS.

5.3.2 Investigation

The cause and consequences of issues raised during internal audit shall be identified, systematically examined, and the findings documented.

5.3.3 Corrective action

Corrective action shall include rectification of the particular occurrence and initiation of measures to prevent recurrence.

5.3.4 Verification of corrective action

The effectiveness of corrective actions undertaken shall be assessed by the remanufacturer and the findings documented.

5.4 Remanufacturing process records

In relation to each remanufactured product, at least the following information shall be documented prior to release of the part for sale and retained for not less than the duration of warranty period, plus one year:

a) name and address of the remanufacturer;

b) date remanufacturing completed;

c) part No., model No., code No. or sequential serial No. that is traceable to remanufacturing history;

d) identification of operative(s) involved in the remanufacturing process;

e) record of inspection/testing and confirmation that the remanufacturing process has been undertaken in accordance with this PAS.

6 Provision and conditions of warranty

6.1 Warranty provision

For any part claimed to have been remanufactured in accordance with this PAS, the remanufacturer shall set a warranty period that is indicative of the expected on-going life of the remanufactured part. The remanufacturer shall guarantee the remanufactured part will deliver equivalent performance to an original product for the duration of the warranty period. The duration of the warranty period shall be clearly specified when the remanufactured part is made available for sale. Equivalent warranty conditions shall be applied to all component parts used in the remanufactured part.

NOTE *The remanufacturing process should aim to restore the part or assembly to perform correctly constituent with its original design life.*

6.2 Compensation for defective parts

In the event that a remanufactured part is claimed to be defective during the warranty period, the remanufacturer shall investigate the nature and cause of the defect and unless the defect is caused by accident or misuse, the remanufacturer shall provide compensation or correction in accordance with the terms of the warranty provided for that part.

6.3 Investigation of defect

The remanufacturer shall investigate and record the nature and cause of the defect for all returned products. Where the defect is found to be caused by fault with the process, including component part quality and/or operator error, the remanufacturer shall use the information gained to improve the performance of the relevant process stage(s) and record the outcome in sufficient detail to enable demonstration that the findings of such investigation have been used to reduce the likelihood of repetition of the defect.

6.4 Investigation report

The remanufacturer shall make copy of defect investigation reports available to customers, upon request.

6.5 Identification and mark

To provide traceability for products under warranty, the remanufacturer shall affix an identification mark to each remanufactured part, providing the following information:

a) identification of the remanufacturer or supplier into the market;

b) name, nomenclature or function of the part;

c) part No., model No., code No. or sequential serial No. that is traceable to the part's remanufacturing history including the number of instances of remanufacture for the particular part and reference to compliance with this PAS.

This information shall be displayed in a manner that is readable for at least the duration of the warranty period.

NOTE *The number of instances of remanufacture for a particular part can be significant especially for parts subject to loading in use. Longer-term deterioration due to materials fatigue is not readily discernible and the record of the number of instances of remanufacture should be taken into account when assessing the potential suitability of a part of component for remanufacture.*

7 Claims of conformity

7.1 Types of claim

This PAS provides for claims of conformity by the remanufacturer on the basis of self-assessment and for certification by an independent, third party certification body that is able to demonstrate compliance with BS EN ISO/IEC 17021 and has access to technical competence sufficient to support assessment of compliance with this PAS.

7.2 Self-declaration of conformity to PAS 3100

Remanufacturing processes for which conformity with this specification is claimed shall be evidenced by the inclusion of the following information in associated documentation, including any documentation and record specific to the remanufacturing, to be issued to the customer:

a) the number of this PAS (i.e. PAS 3100:2014);

b) the name or trademark of the remanufacturer.

7.3 Certified conformity to PAS 3100

Declaration that a manufactured part has been remanufactured in a process conforming to this PAS can be certified by a certification body that meets the requirements specified in **7.1**. Certified conformity to this PAS shall be evidenced by the inclusion of the following information in associated documentation, including any documentation and record specific to the remanufacturing, to be issued to the customer:

a) the number of this PAS, i.e. PAS 3100:2014;

b) the name or trademark of the remanufacturer;

c) the number and date of the certificate that shows conformity to this PAS;

d) the name or mark of the body issuing the certificate.

Bibliography

BS 8887-2, *Design for manufacture, assembly, disassembly and end-of-life processing (MADE), Part 2: Terms and definitions*

BS 8887-220, *Design for manufacture, assembly, disassembly and end-of-life processing (MADE), Part 220: The process of remanufacture – Specification*

BS EN ISO/IEC 17021, *Conformity assessment – Requirements for bodies providing audit and certification of management systems*

ISO/TS 16949 *Quality management systems – Particular requirements for the application of ISO 9001:2008 for automotive production and relevant service part organizations*

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