WOODWARD L'orange

New Processes and Requirements in Supplier Management

Training Documents

Processes / Requirements in Supplier MM
Content

- Significant changes and the opportunities they bring at a glance (**Page 3**)
- Overview of further developed quality system requirements in our guideline for quality assurance of purchased parts 83-500-00234 according to WPQR-9100 (**Page 4 and 5**)
- Overview of the process for displaying process changes using PCN (process change notification) according to 3-OF-04182 (**Page 6**)
- Product and process release according to PPAP (production part approval process) - Requirements and content according to WPQR-9102 (**Page 7-19**)
- Purity requirements according to LON-114a (**Page 20-34**)
- General drawing supplements (**Page 35**)

Intern / Internal

Woodward L'Orange Supplier Quality Processes

Overview of the Implementation / Adaptation with Significant Changes

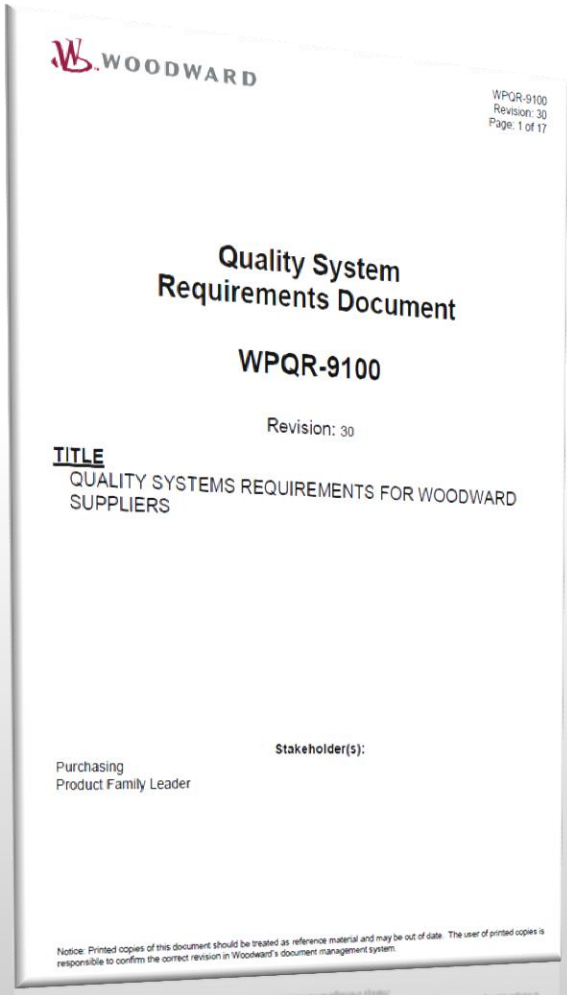
Process	Before	After	Opportunities
Supplier Guideline	General information, e.g. when displaying process changes Unclear procedures for technical cleanliness, protection against corrosion, etc.	Concrete designation of processes and requirements	Elimination of ambiguities on both sides - Reduction of friction losses / increase in the efficiency of cooperation
PCN Process Change Notification	Information obligation stipulated by Supplier Guideline - no process	Formal process of change notifications depending on 4 categories	Controlled change management with the suppliers, guaranteeing protection up to the customer
PPAP Sampling	EMPB • Component sampling	PPAP • Component sampling • Capability analysis for critical characteristics • MSA for critical characteristics	Higher process reliability at the supplier => stable delivery quality

Intern / Internal

Requirements for the Woodward QM System
Background and Scope of WPQR-9100

- Applies to Woodward suppliers

- Makes reference to the Standards:
  - ISO 9001:2015 (QMS)
  - AS9100D (QMS requirements for aerospace and defense)
  - Requires information to the supplier manager within 48 hours if the certification status of the QM system changes and
  - ... a written notification at the latest 15 days after the change, in case of drastic changes which could potentially affect the cooperation (e.g. change of ownership, changes in the company management and quality management, etc.).


WOODWARD

WPQR-9100
Revision: 30
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Quality System
Requirements Document

WPQR-9100

Revision: 30

TITLE
QUALITY SYSTEMS REQUIREMENTS FOR WOODWARD SUPPLIERS

Stakeholder(s):

Purchasing
Product Family Leader

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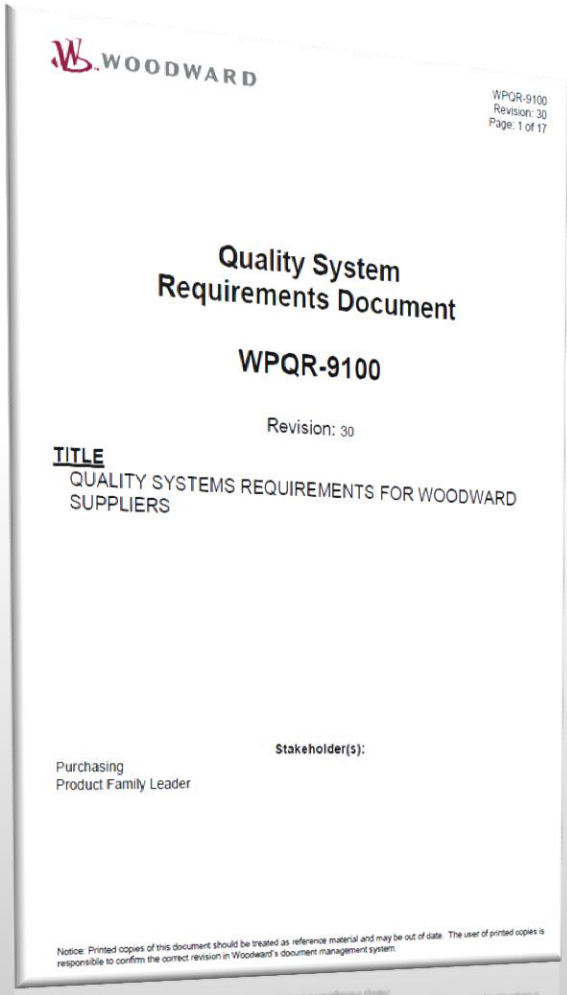
Further Developments & Innovations
... of the WLO Guideline by WPQR-9100 among others


WOODWARD

WPQR-9100
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Quality System
Requirements Document

WPQR-9100

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QUALITY SYSTEMS REQUIREMENTS FOR WOODWARD SUPPLIERS

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- **Further developments** of the WLO Guideline
  - The Production Part Approval Process (PPAP) is used for production process and product release (previously PPF, EMPB)
  - If the purity class of standard LON-114a is not specified in the drawing, class 5 of standard LON-114a must be observed. (previously no reference to LON-114a in the guideline)
- **Updates** to the WLO guideline
  - In the event of process changes on suppliers' side, Woodward L'Orange must additionally be informed via PCN (previously display via strategic buyer, possibly ÄA)
  - In addition, the generally applicable drawing supplement to technical drawings 83-500-00350 must be observed.
  - In addition to the general delivery guideline, the working instructions for handling VCI products 83-400-00013 must be observed.
  - The 8D notes 83-501-00165 are now explicitly referenced, in order to support problem analysis according to the 8D system

83-500-00234
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Woodward L'Orange-Richtlinie für Lieferanten zur Qualitätssicherung von Kaufteilen

WOODWARD L'orange

Abteilung	erstellt:	geprüft	freigegeben:
Datum	LOQL Brodbeck	LO-E Doelker	LOQL von Wachter
Unterschrift	10.04.2019	10.04.2019	

Intern / Internal

Display of Process Changes

... from the supplier by means of a form to the supplier quality engineer

- The display of process changes in the manufacturing processes of our products will from now on be displayed in a template document to the supplier manager.
- The supplier manager checks, together with you if applicable, if the category fits and if the change is plausible.
- If the reference to process change is made in accordance with our CAQ system Babtec, →the case receives a reference number
- Should our customers be informed in the course of this process change, this is done by means of a change request in our ERP system SAP, in order to involve all necessary technical subjects.
- After approval or rejection of the process change, the supplier receives back the application form completed by WLO, based on which corresponding measures are to be implemented.
- If the process change is approved, this is always a sampling according to PPAP.

4. Information and Documentation

If the supplier should notice that any quality criteria, delivery quantities or deadlines are not complied with, L'Orange shall be fully informed without delay. If the supplier should detect any non-conformity after shipment, such non-conformity shall also be communicated to L'Orange.

L'Orange shall also be informed in case of any

- change to production procedures, workflows, materials
- change to test procedures or test equipment
- relocation of production sites
- relocation of production equipment within a site
- change of subcontractors

in order to be able to determine whether such changes/relocations have a detrimental effect on the product.

Previously, the display was requested informally, processing is done via strategic purchasing and, if necessary, using a change request.

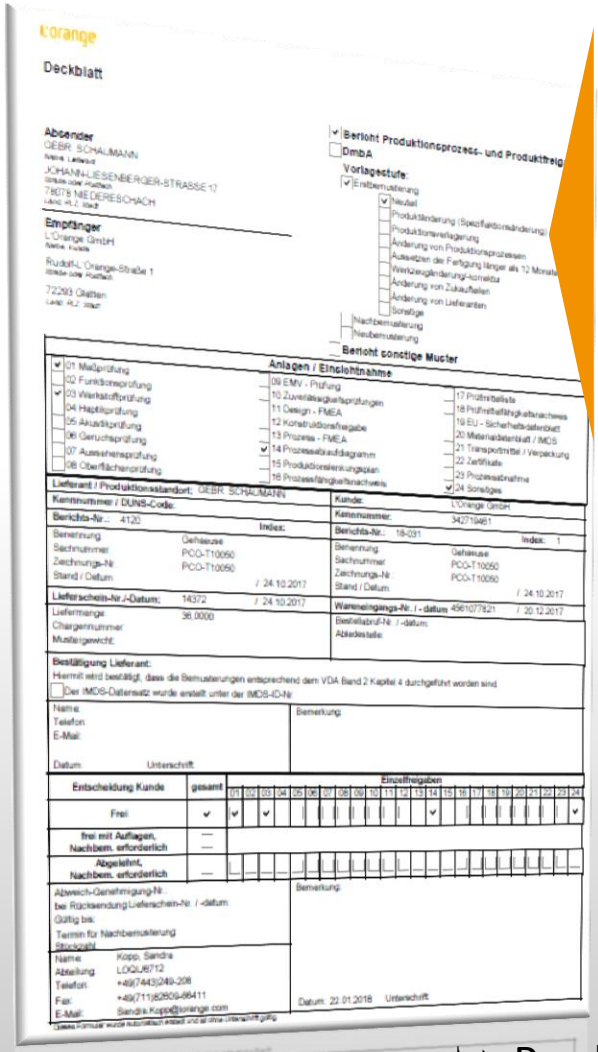
4. Information and Documentation

If the supplier should notice that any quality criteria, delivery quantities or deadlines are not complied with, Woodward L'Orange shall be fully informed without delay. If the supplier should detect any non-conformity after shipment, such non-conformity shall also be communicated to Woodward L'Orange immediately. In case of process changes on supplier side Woodward L'Orange has to be informed additionally. This is done with the PCN-Process (Process Change Notification). The supplier shows his change with the Template 4-OF-01487 ICS „Supplier Process Change Notification (PCN) Form." *(For a template, refer to: http://www.lorange.com/purchasing/downloads)* The form includes four categories based on them one category has to be selected:

Currently, the display is requested with a form, processing is done via supplier support according to PCN process in the background, if necessary with change request.

Intern / Internal

PPAP - What is Different from the EMPB ?



EMPB or PPF
according to VDA 2.0
(4 presentation levels)

EMPB at L'O

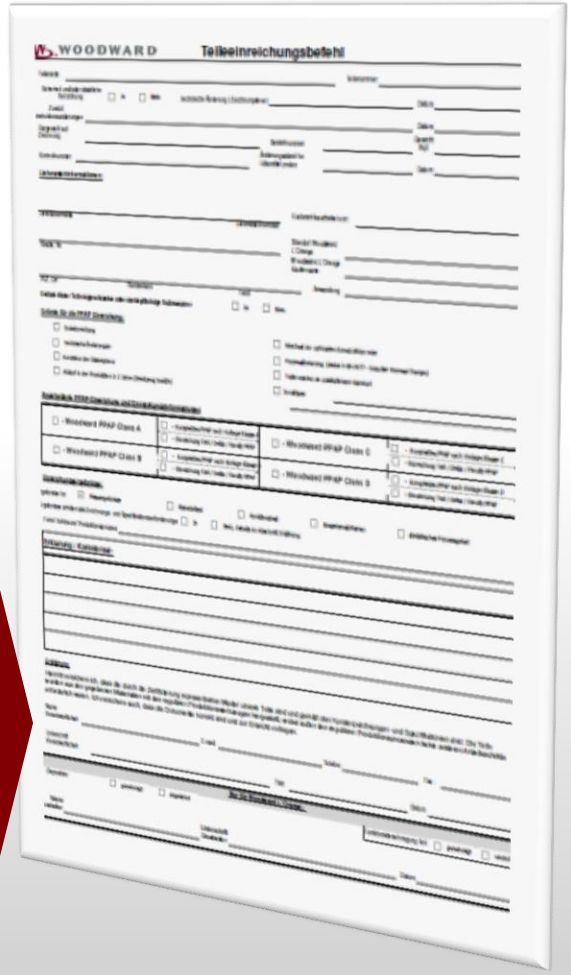
- Component sampling

➥ Product quality assurance

PPAP according to AIAG
(Automotive Industry Action Group)

PPAP with WLO

- Component sampling
- Capability analysis for critical characteristics
- MSA for critical characteristics



➥ Product and process quality assurance

Intern / Internal

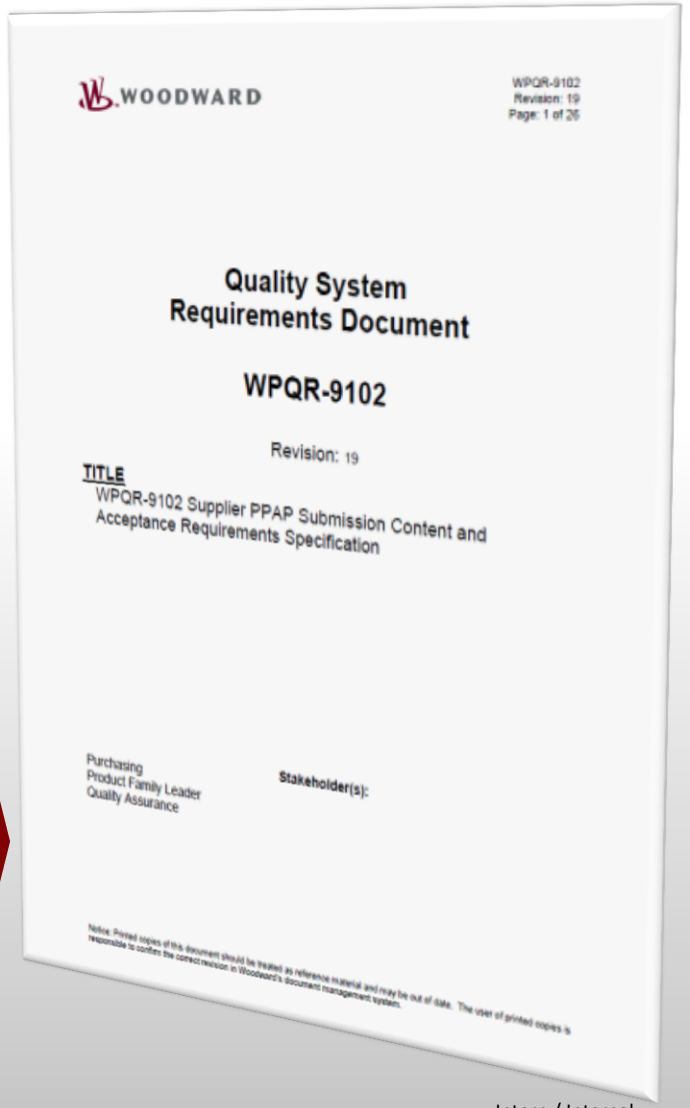
When will a PPAP be required?

- New parts and products
- To validate changes
  - Specification changes (part / product)
  - Process changes in the manufacturing process
- Re-sampling (correction of rejected samples)
- Corrections of production errors

According to which rules is a PPAP created?

WPQR-9102 Supplier PPAP Submission Content and Acceptance Requirements Specification

- Contents of PPAP
- Classes according to risk levels (A, B, C, D)
- Description of the elements of PPAP, the requirements and acceptance criteria
- Conditions of a PPAP template and its dependence on delivery



WOODWARD

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Quality System
Requirements Document

WPQR-9102

Revision: 19

TITLE
WPQR-9102 Supplier PPAP Submission Content and Acceptance Requirements Specification

Purchasing
Product Family Leader
Quality Assurance

Stakeholder(s):

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Intern / Internal

Woodward PPAP Class Matrix

Note: C of C (manufacturer / distributor) submission required per WPQR-9100 or PO regardless of PPAP class.		Low Risk Class A	Medium Risk Class B	High Risk Class C	Unknown Risk Class D
FAI Group	Part Submission Warrant	S	S	S	S
	Design Record / Balloon Drawing	S	S	S	S
	Material / Performance Test Results	S	S	S	S
	Dimensional (Inspection) Results	S	S	S	S
Woodward Special Group	Copy of Woodward PO	S	S	S	S
	Waivers – Family PPAP	S	S	S	S
	Woodward customer requirements (e.g., 5 pcs dim results), as applicable	S	S	S	S
Process Control Group	Process Capability Studies	N/A	S (Woodward defined keys only)	S Supplier process keys or Woodward defined keys)	S
	Measurement Systems Analysis	R	S (Woodward defined keys only)	S Supplier process keys or Woodward defined keys)	S (Test data for all test points.)
Process Quality Planning Group	Process Flow	R	S	S	R
	Process Control Plan	R	S	S	R
	Process FMEA	N/A	N/A	S Supplier process keys or Woodward defined keys)	R
Design Risk Group	Design FMEA – Woodward / customer designed	N/A	N/A	S – only if provided by Woodward.	N/A
	Design FMEA – Supplier designed			N/A	R – Reviewed at design review.
Comments:		*new submission definition*	*previous Base submission*	*previous Preferred submission*	*new submission definition*

Retained elements are subject to Woodward review upon request.

Definitions:

S = submit

R = retain

N/A = not applicable

C of C = Certificate of Conformance

Class B = Standard

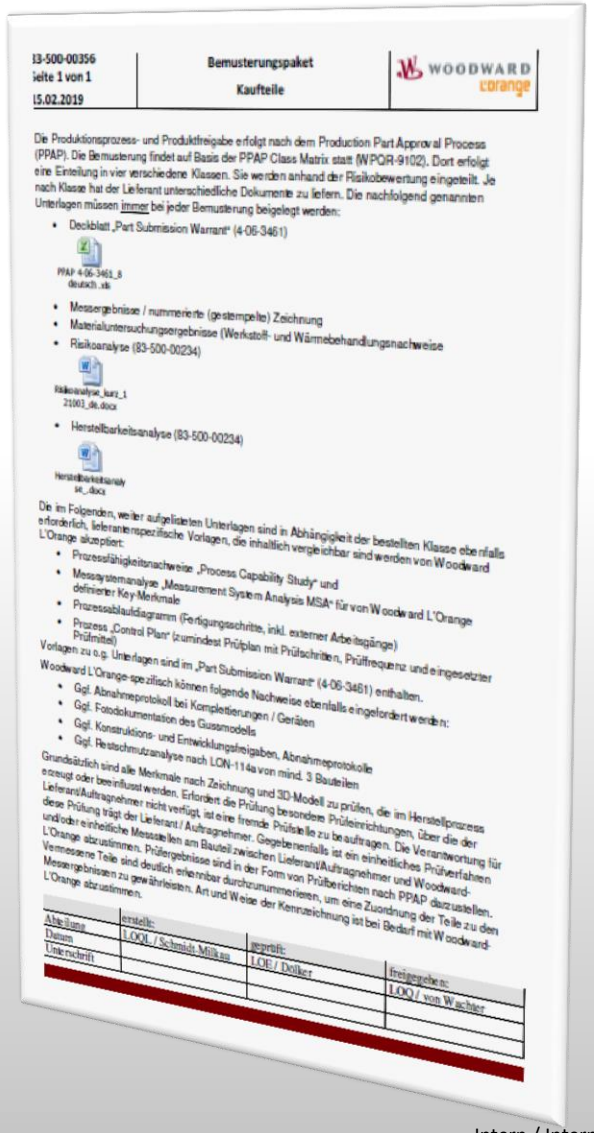
Intern / Internal

What are the integral parts of sampling?
Minimum requirements and template documents

The following documents must <u>always</u> be enclosed with each sample:

- Cover page “Part Submission Warrant” (4-06-3461)
- Measurement results / numbered (stamped) drawing
- Material testing results (material and heat treatment verification)
- Risk analysis (83-501-00163)
- Feasibility study (83-501-00164)

All the above-mentioned numbered documents are available as templates in our download area under ”Sampling Package Purchased Parts” on our homepage: https://www.woodward.com/en/about/about-woodward/woodward-lorange/downloads



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Bemusterungspaket
Kaufteile

WOODWARD L'orange

Die Produktionsprozess- und Produktfreigabe erfolgt nach dem Production Part Approval Process (PPAP). Die Bemusterung findet auf Basis der PPAP Class Matrix statt (WPQR-9102). Dort erfolgt eine Einteilung in vier verschiedene Klassen. Sie werden anhand der Risikobewertung eingeteilt. Je nach Klasse hat der Lieferant unterschiedliche Dokumente zu liefern. Die nachfolgend genannten Unterlagen müssen immer bei jeder Bemusterung beigelegt werden:

- Deckblatt „Part Submission Warrant“ (4-06-3461)

PPAP 4-06-3461_8 deutsch .xls

- Messergebnisse / nummerierte (gestempelte) Zeichnung
- Materialuntersuchungsergebnisse (Werkstoff- und Wärmebehandlungsnachweise
- Risikoanalyse (83-500-00234)

Risikoanalyse_kurz_1 21003_de.docx

- Herstellbarkeitsanalyse (83-500-00234)

Herstellbarkeitsanaly se_.docx

Die im Folgenden, weiter aufgelisteten Unterlagen sind in Abhängigkeit der bestellten Klasse ebenfalls erforderlich, lieferantenspezifische Vorlagen, die inhaltlich vergleichbar sind werden von Woodward L'Orange akzeptiert:

- Prozessfähigkeitsnachweise „Process Capability Study“ und
- Messsystemanalyse „Measurement System Analysis MSA“ für von Woodward L'Orange definierter Key-Merkmale
- Prozessablaufdiagramm (Fertigungsschritte, inkl. externer Arbeitsgänge)
- Prozess „Control Plan“ (zumindest Prüfplan mit Prüfschritten, Prüffrequenz und eingesetzter Prüfmittel)

Vorlagen zu o.g. Unterlagen sind im „Part Submission Warrant“ (4-06-3461) enthalten.

Woodward L'Orange-spezifisch können folgende Nachweise ebenfalls eingefordert werden:

- Ggf. Abnahmeprotokoll bei Komplettierungen / Geräten
- Ggf. Fotodokumentation des Gussmodells
- Ggf. Konstruktions- und Entwicklungsfreigaben, Abnahmeprotokolle
- Ggf. Restschmutzanalyse nach LON-114a von mind. 3 Bauteilen

Grundsätzlich sind alle Merkmale nach Zeichnung und 3D-Modell zu prüfen, die im Herstellprozess erzeugt oder beeinflusst werden. Erfordert die Prüfung besondere Prüfeinrichtungen, über die der Lieferant/Auftragnehmer nicht verfügt, ist eine fremde Prüfstelle zu beauftragen. Die Verantwortung für diese Prüfung trägt der Lieferant / Auftragnehmer. Gegebenenfalls ist ein einheitliches Prüfverfahren und/oder einheitliche Messstellen am Bauteil zwischen Lieferant/Auftragnehmer und Woodward-L'Orange abzustimmen. Prüfergebnisse sind in der Form von Prüfberichten nach PPAP darzustellen. Vermessene Teile sind deutlich erkennbar durchzunummerieren, um eine Zuordnung der Teile zu den Messergebnissen zu gewährleisten. Art und Weise der Kennzeichnung ist bei Bedarf mit Woodward-L'Orange abzustimmen.

Abteilung	erstellt:	geprüft:	freigegeben:
Datum	LOQL / Schmidt, Mikkas	LOE / Dolker	LOQ / von Wachter
Unterschrift			

Intern / Internal

What are the integral parts of sampling?
With focus on the manufacturing processes

Depending on the class ordered, the following documents are also required:

- "Process Capability Study" for critical characteristics defined by Woodward L'Orange
- "Measurement System Analysis MSA" for critical characteristics defined by Woodward L'Orange
- Process flow diagram (production steps, incl. external work steps)
- "Control plan" process (at least test plan with test steps, test frequency and test equipment used)

Templates for the above-mentioned documents are also available in the "Combined Supplier PPAP Form Package" in our download area on our homepage:
https://www.woodward.com/en/about/about-woodward/woodward-lorange/downloads
Supplier-specific templates with comparable content are accepted by Woodward L'Orange.

		Medium Risk Class B
FAI Group	Part Submission Warrant	S
	Design Record / Balloon Drawing	S
	Material / Performance Test Results	S
	Dimensional (Inspection) Results	S
Woodward Special Group	Copy of Woodward PO	S
	Waivers – Family PPAP	S
	Woodward customer requirements (e.g., 5 pcs dim results), as applicable	S
Process Control Group	Process Capability Studies	S (Woodward defined keys only)
	Measurement Systems Analysis	S (Woodward defined keys only)
Process Quality Planning Group	Process Flow	S
	Process Control Plan	S
	Process FMEA	N/A
Design Risk Group	Design FMEA – Woodward / customer designed	N/A
	Design FMEA – Supplier designed	

Definitions:

S = submit

R = retain

N/A = not applicable

C of C = Certificate of Conformance

Comments:

Intern / Internal

What are the further integral parts of sampling?

References and additional requirements on a case-by-case basis

Woodward L'Orange - specifically, the following proofs can also be requested:

- Acceptance protocol for completions / devices
- Photo documentation of the casting model
- Design and development approvals, acceptance reports
- Residual dirt analysis according to LON-114a of at least 3 components

IMPORTANT! All characteristics according to drawing and 3D model must be checked, which are generated or influenced in the manufacturing process.

- ➥ If the test requires special testing equipment which the supplier/contractor does not have, an external testing agency shall be commissioned.
- ➥ Test results shall be presented in the form of test reports in accordance with PPAP.
- ➥ Measured parts shall be clearly numbered in such a way that they can be assigned to the measurement results. The method of labelling must be agreed with Woodward-L'Orange, if necessary.

Intern / Internal

Presentation of PPAP documents according to class B

The cover page = Part Submission Warrant

WOODWARD L'orange

WOODWARD | Part Submission Warrant

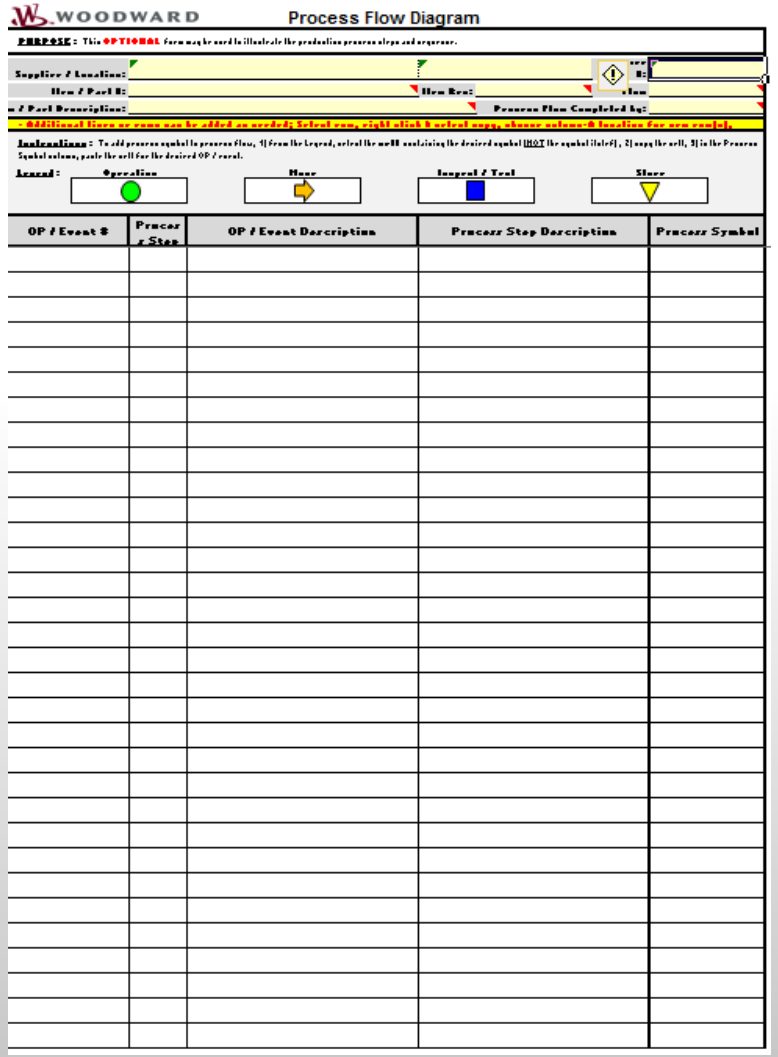
Class B templates (Standard)

- Cover page = “Part Submission Warrant” PSW
- numbered (stamped) drawing
- Material testing results (material and heat treatment verification
- Measurement results
- Copy of the WLO order
- Sampled components
- Proof of the process capability for critical characteristics
- Proof of the measuring system analysis for critical characteristics
- Process flow diagram
- Production Control Plan (PCP)

Intern / Internal

Presentation of PPAP documents according to class B

The process flow diagram


WOODWARD Process Flow Diagram

PURPOSE: This OPTIONAL form may be used to illustrate the production process steps and sequence.

Supplier / Location:

Item / Part #:

Item Rev:

Process Flow Completed by:

Additional lines or rows can be added as needed; Select row, right click & select copy, choose column & insert for new row(s).

Instructions: To add process symbol to process flow, 1) from the Legend, select the cell containing the desired symbol (NOT the symbol itself), 2) copy the cell, 3) in the Process Symbol column, paste the cell for the desired OP / event.

Legend: Operation, Move, Inspect / Test, Store

OP / Event #	Process Step	OP / Event Description	Process Step Description	Process Symbol

Describes the sequence of the production steps for manufacturing the product at the supplier's site.

- Text or graphic
- The process steps are numbered so that the other PPAP documents can make reference them, for example, the production control plan (PLP).

<u>Remark:</u> Template in "Combined supplier PPAP form package" can be used

Intern / Internal

Presentation of PPAP documents according to class B

The Production Control Plan (PCP)

WOODWARD L'orange

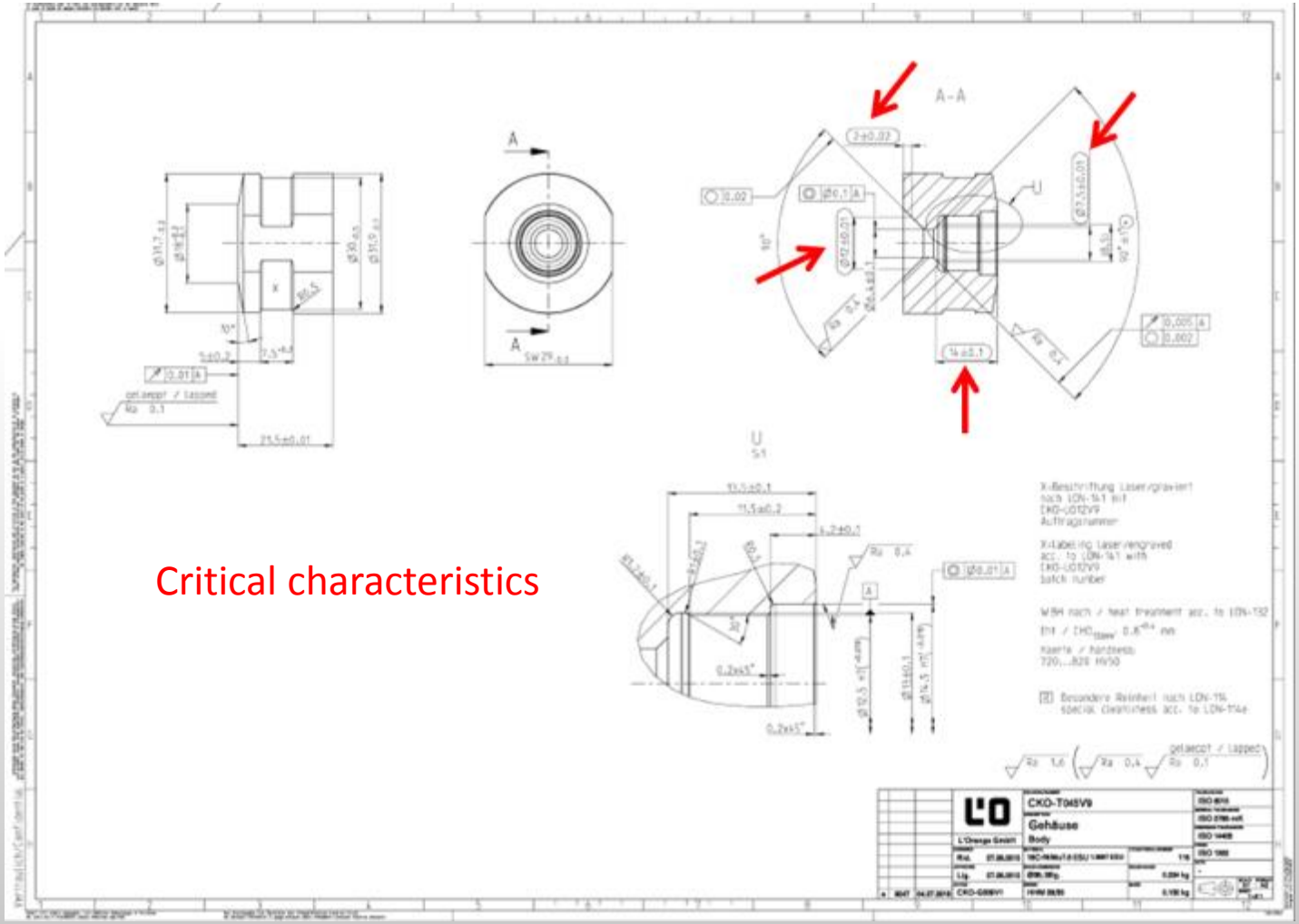
- There must be at least one test step in the PLP for all characteristics in the specification.
- The numbering must be consistent with the process flow diagram.
- The critical characteristics must be highlighted in the PLP. For this purpose, there must be proof of process capability or a 100% test must be included in the PLP
- The following must be described for each test step.
  - Reference to the process step in the production flow (see process flow diagram)
  - Description of the product characteristic with tolerances and the process variables it influences.
  - Procedures and test equipment for testing and monitoring, sample size

<u>Remark:</u> Template in “Combined supplier PPAP form package” can be used

Intern / Internal

Presentation of PPAP documents according to class B

Verification of measurement system analysis / process capability based on critical characteristics (e.g. as follows:)



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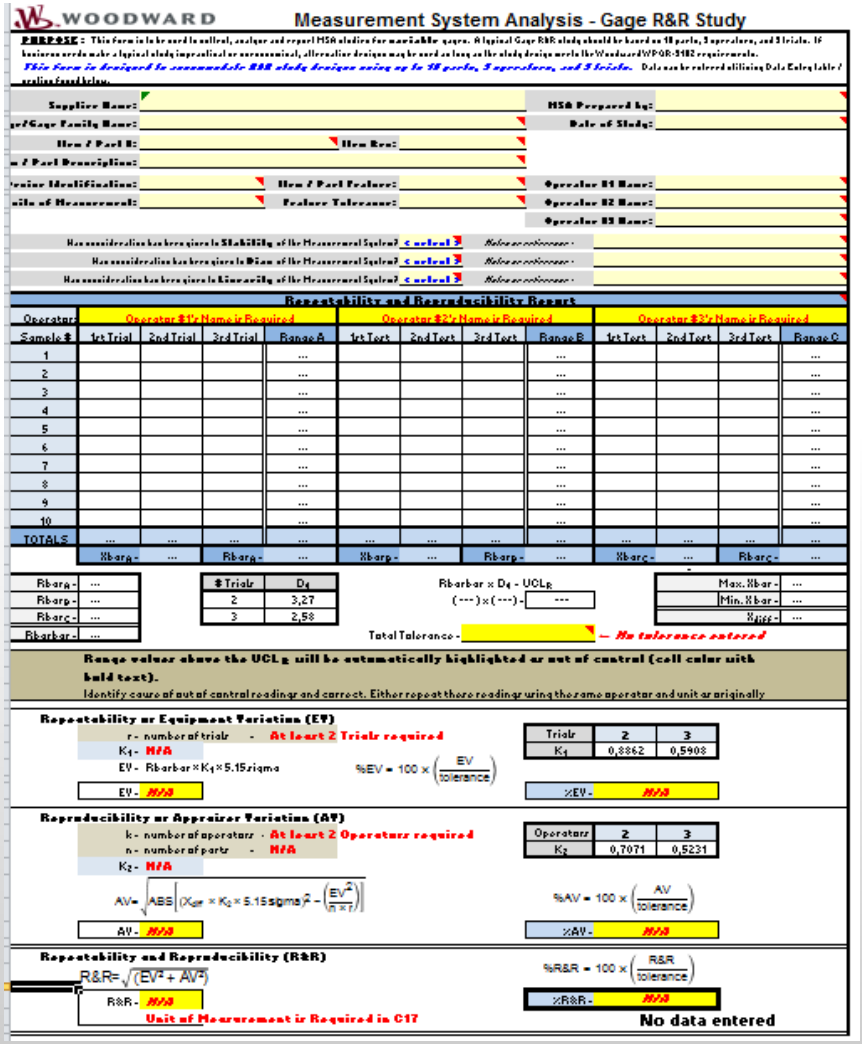
Presentation of PPAP documents according to class B

Measurement system analysis for critical features



- All critical characteristics must be verified by a MSA.
- The MSA contains all variables of a measurement
- The following sample size is proposed (90 measured values)
  - 10 parts
  - 3 testers
  - 3 repetitions

<u>Acceptance of the MSA</u>

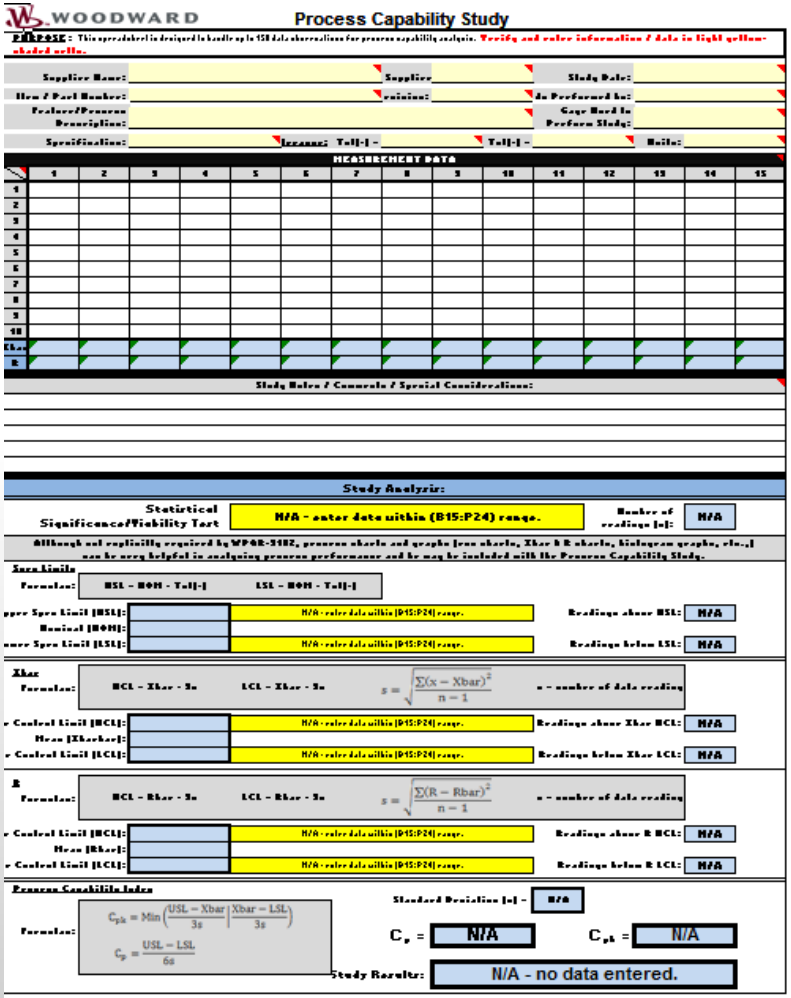
- All values are within the lower and upper tolerance limits.
- The tolerance of the repeatability and reproducibility of the measurement system (Gauge R&R as % of Tolerance) is < 30%.

<u>Remark:</u> Template in “Combined supplier PPAP form package” can be used

Intern / Internal

Presentation of PPAP documents according to class B

Process capability for critical features



- All critical characteristics must be verified by a process capability.
- The analysis of dimensional characteristics shall be based on at least 30 parts.
- For attributive characteristics (good / bad) 100% of 50 parts must be OK.

<u>Acceptance of process capability</u>

- Cpk $\geq$ 1.33
- If the process capability is not achieved, a 100% check must be initiated for this characteristic.

<u>Remark:</u> Template in “Combined supplier PPAP form package” can be used

Intern / Internal

Sampling according to PPAP

Number of parts to be sampled depending on scope of the order

Scope of the order	Number of parts to be sampled
30+ parts	10% of the sample order
3 to 30 parts	At least 3 parts
Less than 3 parts	100% of the sample order

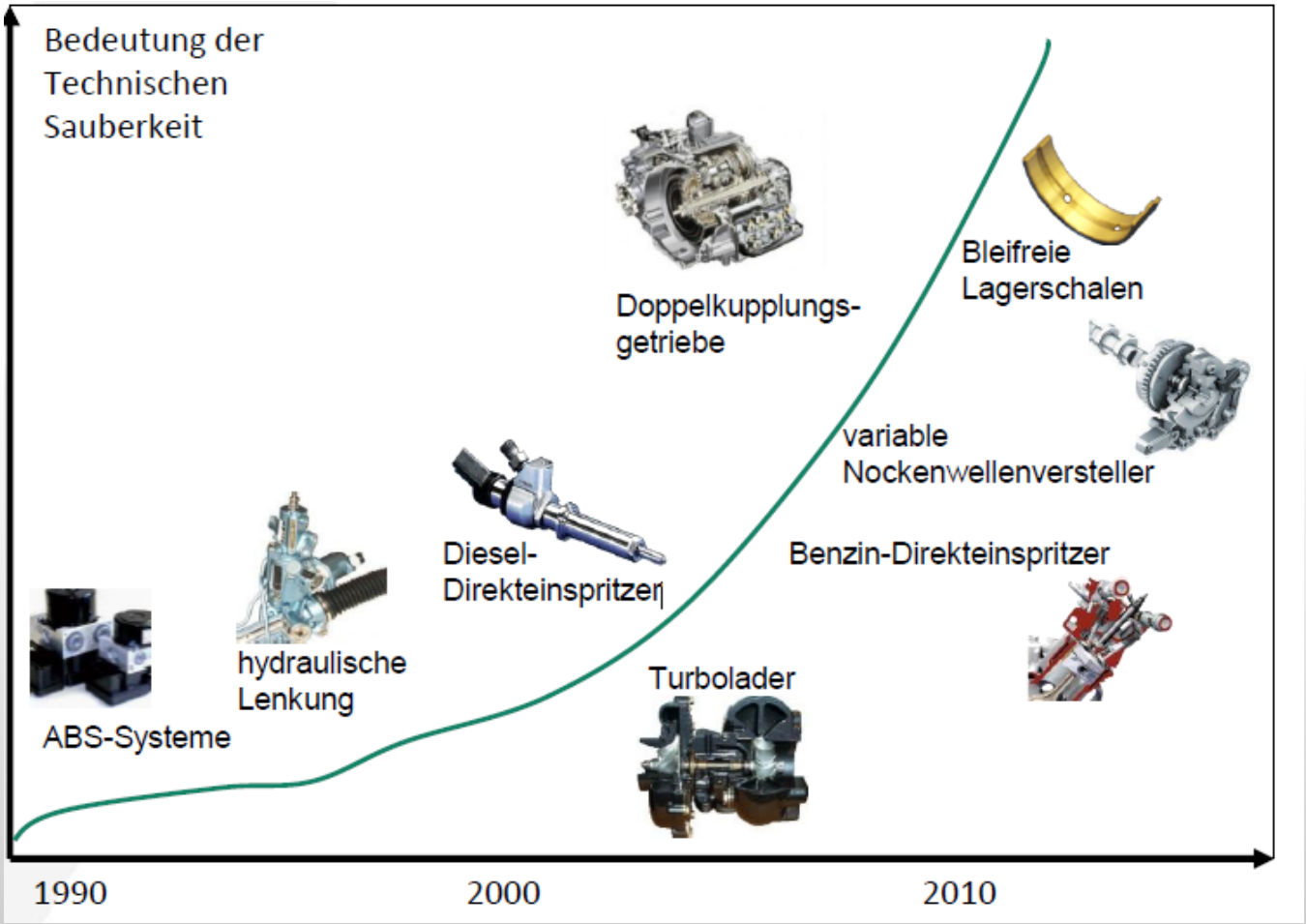
Intern / Internal

Purity requirements according to LON-114a
Content

1. General technical cleanliness
   1. Why is this important to us ?
   2. What is contamination ?
   3. How does the magnetic field strength influence the parts ?
   4. How does it affect Woodward L'Orange products ?
2. Cleanliness specification LON 114a
   1. Definition of target values
   2. Limit values for purchased parts
   3. Drawing entry
   4. VDA 19
3. Residual dirt analysis
   1. Decay curve - validation test method RSA
   2. Analysis report

Intern / Internal

1. General technical cleanliness
Importance of technical cleanliness



Intern / Internal

Purity requirements according to LON-114a
Why is this important to us?

- Customer requirements
- Specifications / Innovations (VDA 19)
- All characteristics (LON-114a) on the drawing must be confirmed.
- Prevention of errors
- Claims from analyses of devices subject to reclaim.
- Continuous improvement of products and processes
- Increasing workpiece complexity
- Tighter tolerances

→ **Partial cleanliness becomes a quality feature**

Human hair 60-80 µm

Pollen 10-20 µm

Intern / Internal

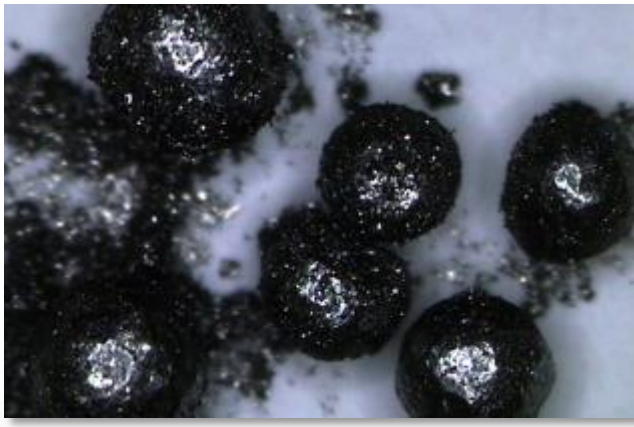
What is contamination ?
Types of contamination

<u>Definition of the residual impurity:</u>

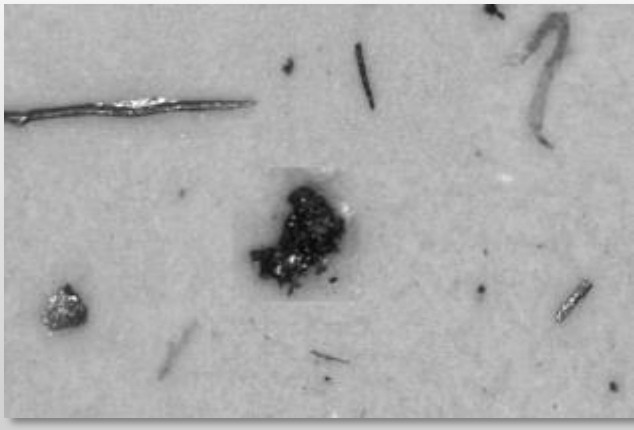
All substances that remain on a cleaned component prevent or restrict the function of that component.

Examples:

- Mineral particles (corundum, sand)
- Molding sand (foundry)
- Blasting/blasting material, burr, etc.
- Titanium particles (sandblasting)
- Metal particles
- Fibers
- Color particles
- Detergent residues
- Hardness residues



Steel shot



Metal chips

Intern / Internal

How does the magnetic field strength influence the parts?

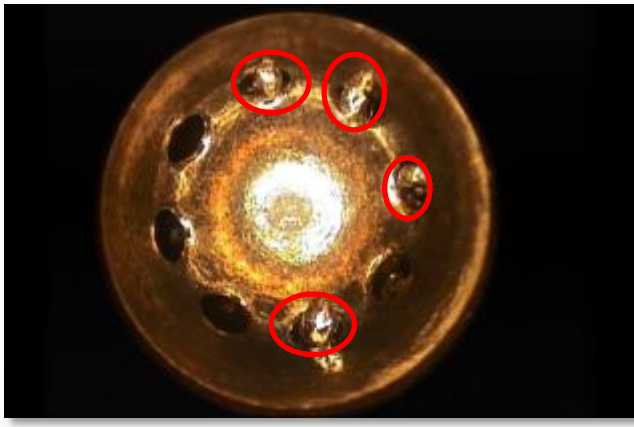
Magnetic field strength and effect

>10 A/cm	Component parts adhere to each other
>8 A/cm	Metal chips adhere
>4 A/cm	Smallest metal parts adhere
>2 A/cm	Grinding dust adheres
>1,25 A/cm	Deflection electron beam
~0,4 A/cm	Terrestrial magnetic field

Intern / Internal

Purity requirements according to LON-114a
How does it affect Woodward L'Orange products ?

- **Complete functional failure of a component**
  - e.g.: Metal chips in the injector can lead to clogging of the injection holes.
    - Injection of the injector no longer possible
- **Initial damage with long-term consequences**
  - I.e. the initial damage to a component, which does not lead to the sudden failure of the component, but often significantly reduces its service life.
    - Increased wear on the seal for the pump leads to leakage
- **Drainage restrictions or blockage of pipes and ducts**
  - Impairment of function caused by foreign particles
    - e.g.: Metal chip in the nozzle leads to changes in the spray pattern, the injection pressure and the exhaust emissions



Particles in the spray holes

Metal chip on the needle

Intern / Internal

Cleanliness specification LON 114a
Adjustments, definitions, entry on drawings

Adjustment of the LON114a

- LON114a has been revised. Revision 05 Published
- Customer requirements were taken into account in LON 114a
- Cleanliness requirements for purchased parts have been integrated into Woodward's LON 114a Revision 05

Definition of reports

- The new limit values will be taken into account in the analysis reports.

Entry of the LON 114a in the drawings

- New drawings created with LON 114a
  - Without specifying the cleanliness class with reference to area specification

LON-114a 25.03.2019 Revision Number: 05	Standard Technical Cleanliness Requirements	WOODWARD L'orange

Distribution list: LOT, LOP, LOQ, LOT

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LON 114a_Revision_05

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Cleanliness specification LON 114a
Definition of target values

10.4.2 Definition of devices and components

Application	Device/ component	Areas to be tested	Purity class
Mounted CR injec-tors & CR pumps	G	Ejected media after rinse and test run	1
CR injector (distil-lates / diesel / gas)	U / T	All fuel wetted areas All gas-conveying areas	2
CR-HD pumps (distil-lates / diesel / gas)	U / T	All fuel and lubricant wetted areas All gas-conveying areas	2
CR HD pipes and valves, such as MBV, SV (distillates / diesel / gas), etc.	U / T	All fuel wetted areas All gas-conveying areas	2
CR injector (HFO)	U / T	All fuel wetted areas	3
CR HD pumps (HFO)	U / T	All fuel and lubricant wetted areas	3
CR HD lines and valves, such as MBV, SV... (HFO)	U / T	All fuel wetted areas	3
Conventional injec-tion valves	U / T	All fuel wetted areas	4
Conventional HD pumps	U / T	All fuel and lubricant wetted areas	4
Conventional HD lines	U / T	All fuel wetted areas	4
Purchased parts (final cleaning at L'Orange)	U / T	All fuel and lubricant wetted areas	5

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Cleanliness specification LON 114a

Limit values for purchased parts

Purity class 5

Material	Largest permis-sible particle	Gravimetry (max.) per 1,000 cm²						
			J,..	I	H	G	F	E
			> – 600µm	>400 – 600µm	>200 – 400µm	>150 – 200µm	>100 – 150µm	50 – 100µm
metallic	1000 µm	10 mg	15	30	45	150	250	1500
mineral	160 µm		0	0	0	0	10	30

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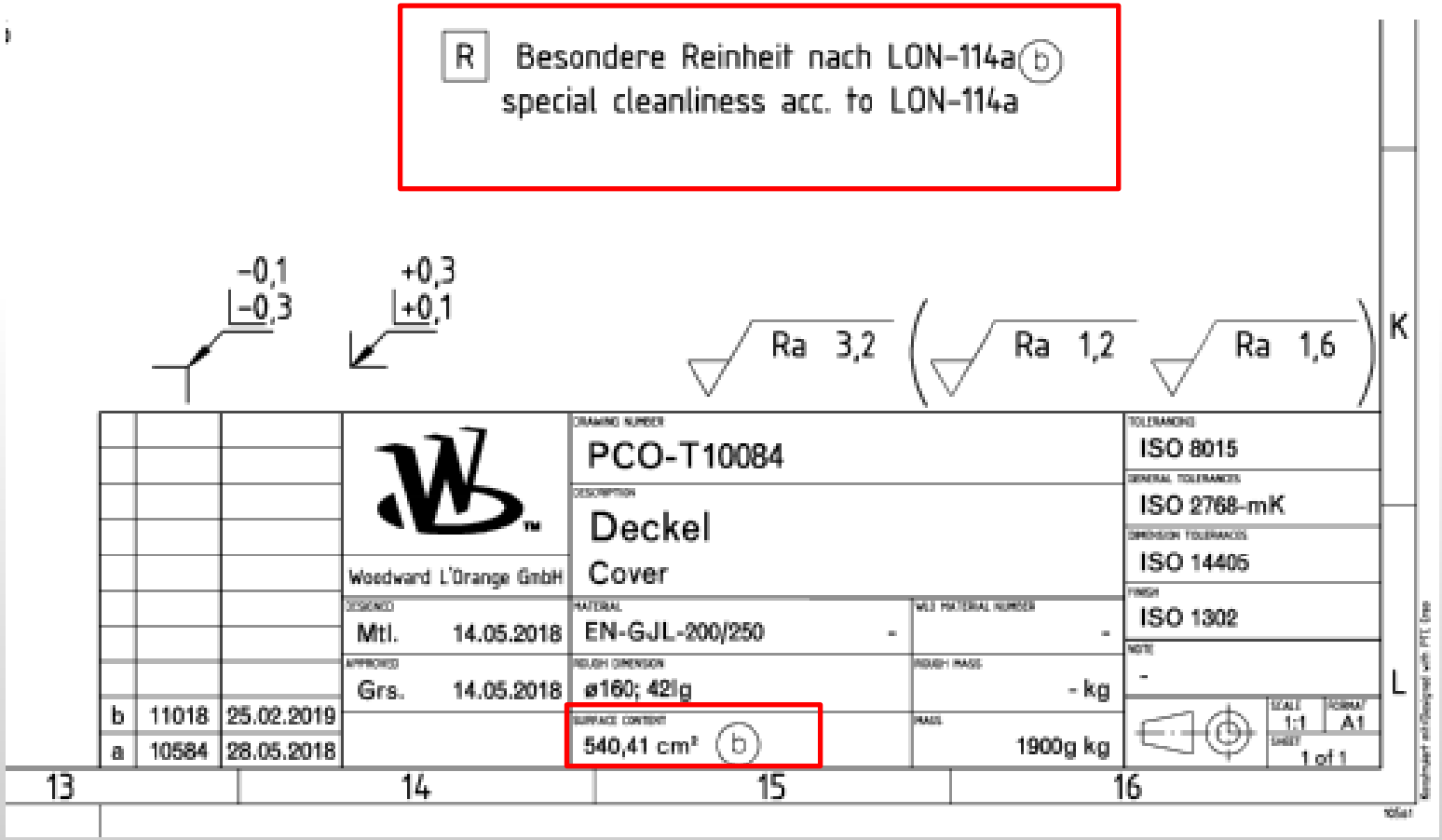
Drawing specifications

Example Woodward L'Orange Drawing



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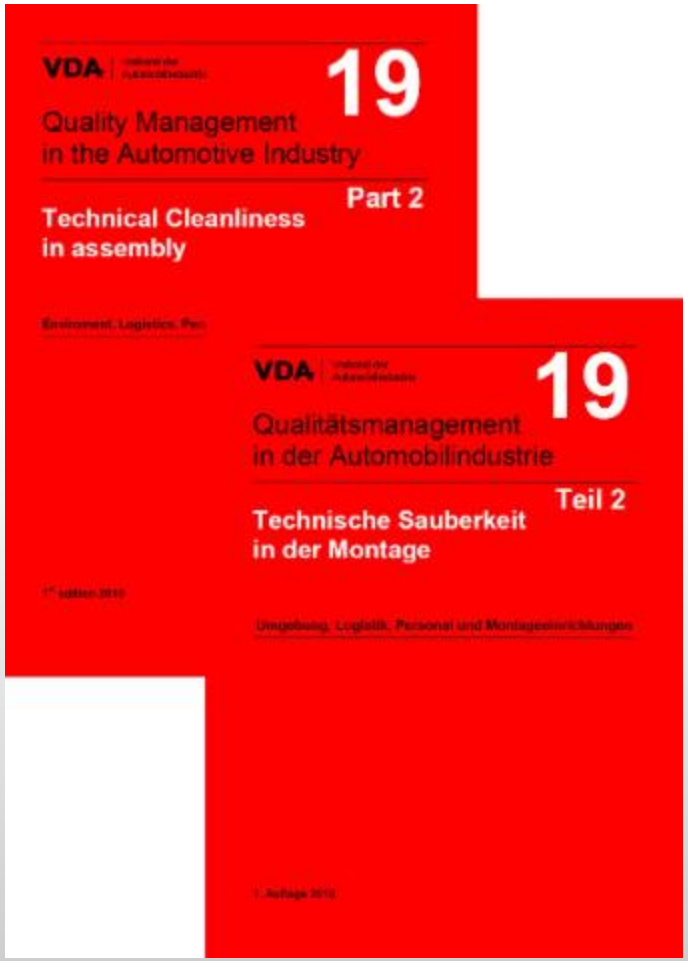
Purity requirements according to LON-114a
VDA 19



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Residual dirt analysis

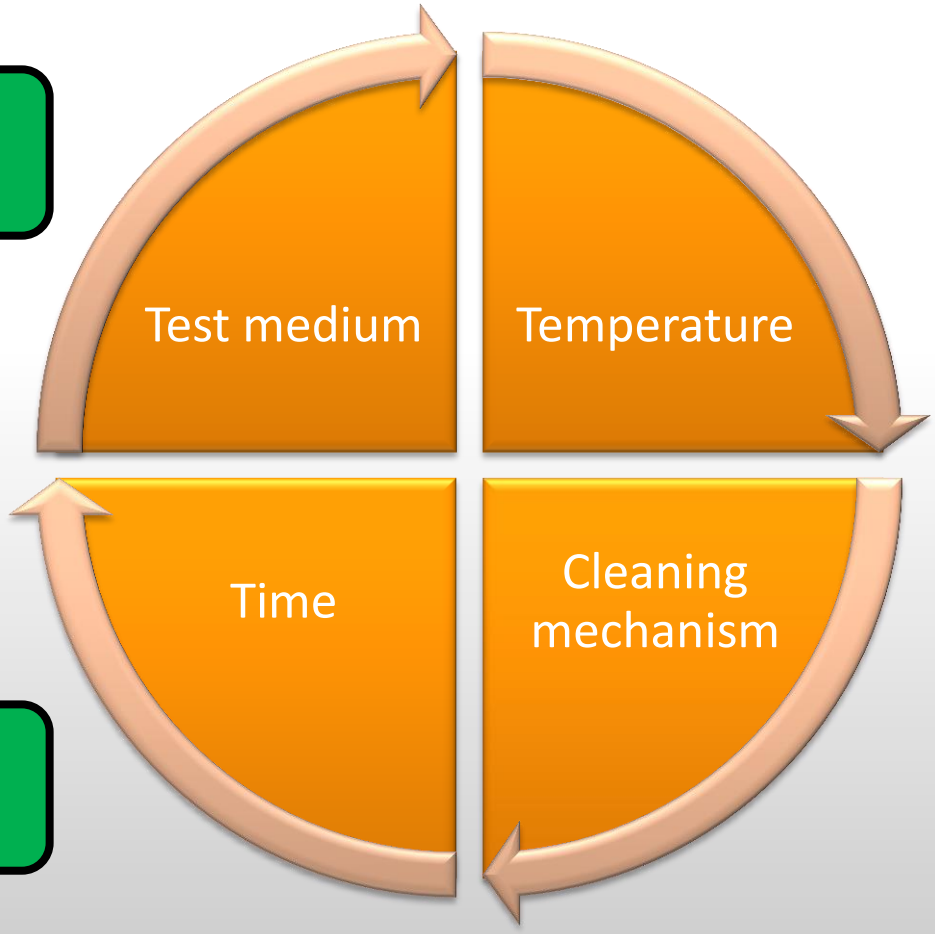
Decay curve - validation test method for RSA

1) Selection

- Fluidity
- Air

2) Selection

- Room temperature
- Deviating temperature



4) Qualification

- Syringe volume
- Ultrasonic time
- further

3) Selection

- Syringe
- Ultrasound
- further

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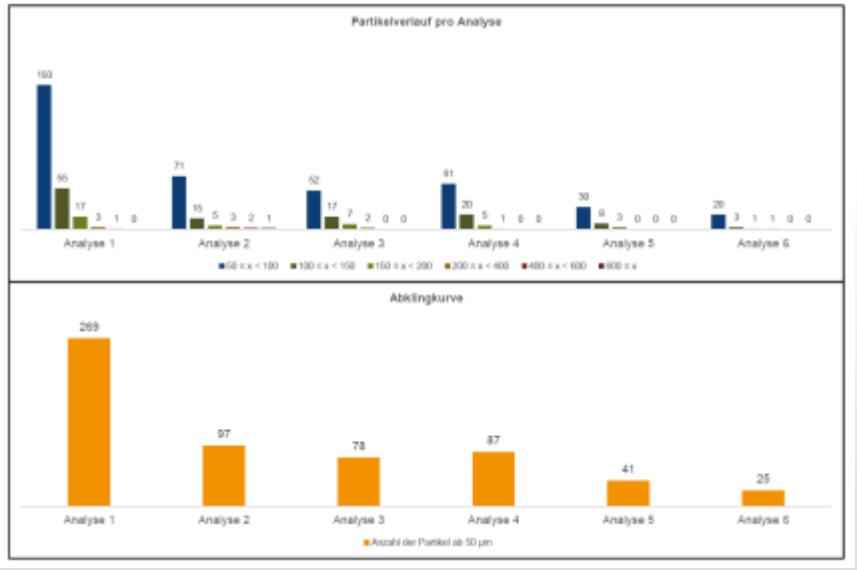
Residual dirt analysis

Decay curve - validation test method for RSA

Creation of a decay curve:

- The same part is sampled 6 times.
- The last contamination level extracted must be less than 10% of the total contamination level extracted so far → Decay criterion
- Derivation of the following parameters:
  - Total duration of extraction
  - Volume flow of the liquid used for testing
  - Total volume of the liquid used for testing
  - Frequency in Hz with ultrasound



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Residual dirt analysis
Analysis report

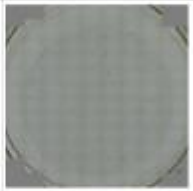
83-550-00002 Seite 1 von 2	Auswerteformular Sauberkeitsformular gemäß LON-114a	L'orange

Prüfgegenstand			
Berichts-Nr.:	16262	Sachnummer:	VTG-T409
Benennung:	Sechskantmutter	Entnahmeort:	
Verwendung:	Reinheitsanalyse	Entnahmedatum:	
Kunde:	L'Orange GmbH	Lieferant:	L'Orange GmbH
Reinheitsklasse:	2		

Extraktion			
Analysemenge:	107 [St./ml]	Oberfläche Bauteil [cm²]	1,9
Verfahren:	Ultraschall, Spülen	Spülflüssigkeit [Liter]:	4
Filterart:	Nylon 5 µm		
Gewicht [mg]:	0,66	Gewicht pro 1000 cm² [mg]:	3,2

Mikroskopische Analyse			
Maßstab:	5,9 µm/Pxl	Auswertedurchmesser [mm]:	44,0

Bauteil



Filterübersicht

Größter metallischer Partikel		Länge[µm]:	547	Breite [µm]:	19
Größter nichtmetallischer Partikel [1]		Länge[µm]:	408	Breite [µm]:	118
Faserige Anteile[2]	Länge der größten Faser [µm]:	1647	Gesamtlänge Fasern [mm]:		33,64

Ausführliche Statistik:

		Partikelanzahl auf Filtermembran		Partikelanzahl[1] pro Bauteil		Partikelanzahl[1] pro 1000 cm²	
Partikelgröße	Code	Insgesamt[1]	Metallisch	Insgesamt[1]	Metallisch	Insgesamt[1]	Metallisch
> 600	K-J	0	0	0,0	0,0	0,0	0,0
400 - 600	I	4	3	0,0	0,0	19,7	14,8
200 - 400	H	43	34	0,4	0,3	211,5	167,2
150 - 200	G	76	45	0,7	0,4	373,8	221,3
100 - 150	F	282	151	2,8	1,4	1387,1	742,7
50 - 100	E	2876	726	28,9	6,8	14146,6	3571,1

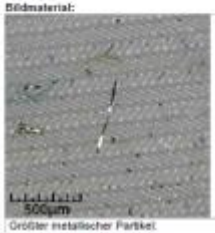
Befund Reinheitsanalyse: i.O.
Befund Restmagnetismus (Soll < 2,4 A/cm, ist 1,1 A/cm): i.O.
Befund Gravimetrie (Soll<10,0mg pro 1000cm², ist 3,2mg pro 1000cm²): i.O.

Bemerkungen:
[1] Partikel ohne Fasern gezählt
[2] Definition Faser: Nichtmetallisch, Kompaktheit < 30% oder Länge/Breite > 10

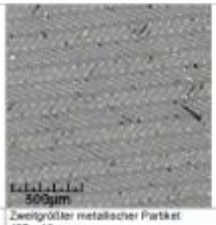
Prüfdatum:20.11.2018	Bearbeiter:Hausmann,Kim	Seite 1 von 2

83-550-00002 Seite 2 von 2	Auswerteformular Sauberkeitsformular gemäß LON-114a	L'orange

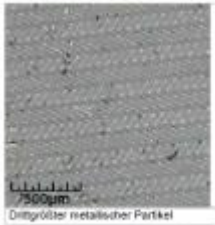
Bildmaterial:



Größter metallischer Partikel
547 x 19 µm



Zweitgrößter metallischer Partikel
407 x 13 µm



Drittgrößter metallischer Partikel

Viertgrößter metallischer Partikel

Größter nichtmetallischer (nichtfaseriger) Partikel:
408 x 118 µm

Größte Faser:
1647 µm

Prüfdatum:20.11.2018	Bearbeiter:Hausmann,Kim	Seite 2 von 2

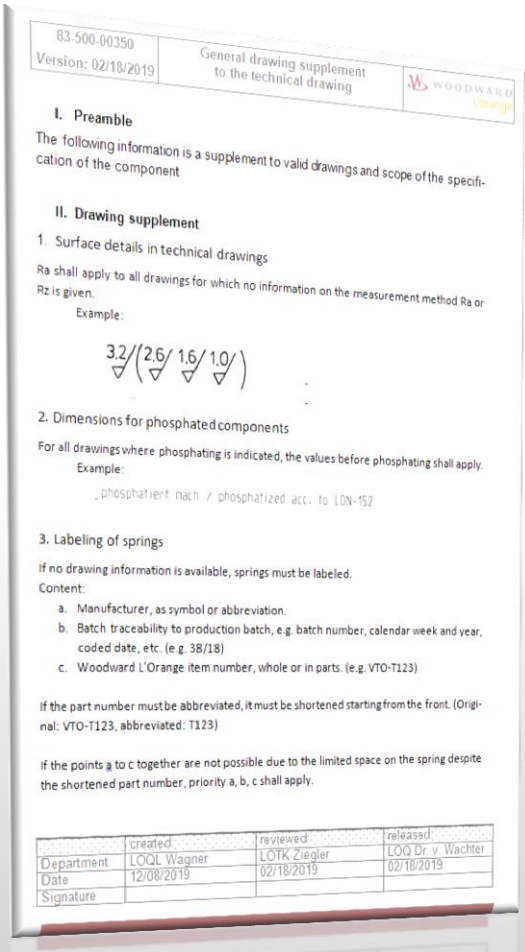
Intern / Internal

Purity requirements according to LON-114a
Outlook

- LON 114a must be confirmed once within the framework of the EMPB/PPAP by an appropriate investigation report.
- Fa. Gläser und Quality Analysis can carry out purity analyses as a service provider
- Everything else will develop in the course of the integration into Woodward and cannot yet be estimated.

Intern / Internal

General drawing supplement to technical drawings



83-500-00350
Version: 02/18/2019

General drawing supplement to the technical drawing

WOODWARD L'orange

I. Preamble

The following information is a supplement to valid drawings and scope of the specification of the component

II. Drawing supplement

1. Surface details in technical drawings

Ra shall apply to all drawings for which no information on the measurement method Ra or Rz is given.

Example:

3,2/(2,6/ 1,6/ 1,0/)

2. Dimensions for phosphated components

For all drawings where phosphating is indicated, the values before phosphating shall apply.

Example:

phosphatiert nach / phosphatized acc. to LDN-152

3. Labeling of springs

If no drawing information is available, springs must be labeled.

Content:

a. Manufacturer, as symbol or abbreviation.
b. Batch traceability to production batch, e.g. batch number, calendar week and year, coded date, etc. (e.g. 38/18)
c. Woodward L'Orange item number, whole or in parts. (e.g. VTO-T123)

If the part number must be abbreviated, it must be shortened starting from the front. (Original: VTO-T123, abbreviated: T123)

If the points a to c together are not possible due to the limited space on the spring despite the shortened part number, priority a, b, c shall apply.

	created:	reviewed:	released:
Department	LOQL Wagner	LOTK Ziegler	LOQ Dr. v. Wachter
Date	12/08/2019	02/18/2019	02/18/2019
Signature			

The information in the "General supplement to drawings to technical drawings" (83-500-00350) is a supplement to valid drawings and an integral part of the specification of the component.

It is a "living document" and available via the download area of our homepage

The document provides the possibility of

- a clear communication with the suppliers without the effort of having to make changes to drawings of old designs.
- fast communication in case of general requirements

The aim is to keep the specification for the supplier on controlled documents of the WLO development and design.

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