VOLKSWAGEN
AKTIENGESELLSCHAFT

Group standard **VW 01134**

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Cleanliness Requirements for Engine Parts

Preface

This Volkswagen standard (VW) describes the requirements for technical cleanliness for a number of agreed-upon engine parts and engine-mounted parts. The cleanliness requirements specified in this standard are a product specification.

Previous issues

VW 01134: 2010-04, 2012-09, 2020-01

Changes

The following changes have been made to VW 01134: 2020-01:

a) Section A.1: Requirements for the cylinder head requirements revised.

Contents

1 Scope

This standard describes the requirements for technical cleanliness of engine parts such as blanks, individual components, ready-to-install parts, as well as fasteners and small parts.

NOTE 1: Separate standards exist for exclusively media-carrying add-on parts, coolant-carrying parts, and fuel lines in the high-pressure area; see section 5.

2 Definitions

Gravimetry	Designation for the mass in mg of all residues in the analytical filter that were extracted from a section of a part or a whole part during the cleanliness analysis and determined by differential weighing
Jammed chips	Jammed chips are chips that are mechanically jammed in the part (blank or finished part) due to their geometry and cannot be extracted using wet extraction.
Morphology	Designation of the geometric extension of particles in µm (longest dimension = particle length)
Particle load	Total amount of all particles occurring on a surface or in a liquid
Particles	Particles with solid consistency of organic or inorganic substance
Residual weight	Mass of the particle load that was determined as the differential weight by gravimetric analysis

3 Abbreviations

CO	Coolant-carrying area (see table 2)
H	Hard particles, see section 8.2
LP	Low pressure
N	Grinding and blasting particles, see section 8.2

4 Designation

Example of a drawing note:

Cleanliness requirements for engine parts as per VW 01134

5 General requirements

The particle residue is determined as per Test Specification PV 3347 or as per PV 3336 for lines. Alternative test methods must be agreed upon with the Quality Assurance department of the releasing plant.

Cleanliness requirements for engine parts that can clearly be assigned to one of the following areas are specified in the following standards:

Intake, charge air, and vacuum areas as per VW 01135

Fuel-carrying areas as per VW 01136

Media- and coolant-carrying areas as per VW 01137

Particle sizes as per table 1 apply to hard particles. For deviations, see the cleanliness specifications in appendix A, in the drawing, or in the Performance Specification.

Table 1 – Particle size specifications for media-carrying systems

Functional area	Particle size µm	Abbreviation
Fuel-carrying	< 200	FU
Oil-carrying (unpressurized)	< 1 000	OI
Pressurized-oil carrying (unfiltered-oil side)	< 1 000	OI
Pressurized-oil carrying (filtered-oil side)	< 600	FOI
Coolant-carrying	< 600	CO
Charge-air carrying	< 600	CA
Exhaust-gas carrying	< 600	EG
Whole part	As per drawing or Performance Specification	PA

Recommendation: The different (media) areas to be analyzed for cleanliness must be clearly marked in the drawing.

6 As-received condition

It must be ensured that no contamination occurs in the logistics chain from product manufacture to use (installation location) or to the analyzing laboratory.

Suitable packaging must be used in order to comply with the limits specified in this standard.

NOTE 2: Further recommendations on complying with the cleanliness specifications during assembly may be taken from VDA Volume 19 Part 2 by the German Association of the Automotive Industry.

7 Cleanliness specifications

7.1 General

The part cleanliness is evaluated using the particle size and class (morphology) and the particle amount (gravimetry).

If the particle count is expected to be very low, the evaluation may also use a particle count for defined size classes.

The gravimetry is ascertained by determining the mass of the total particle load of a device under test (DUT) or media-carrying area as the arithmetic mean of n parts of a random sample in mg.

The morphology is ascertained by determining and evaluating at least the largest dimension (= particle length) of a particle in µm.

The particle width must be documented if it can be determined. The two geometric values are defined as per table 2.

Table 2 – Geometric size of a particle

Geometric definition	**Measurand µm**
Particle length	$Feret_{max}$ [a)]
Particle width	Maximum inscribed circle
[a)] Designation as per VDA Volume 19 Part 1, "Photo-optical analysis" section	

7.2 For parts and ready-to-install part assemblies (ASSYs)

See section A.1 "Assembly-ready parts and ASSYs".

7.3 For fasteners and small parts

The requirements apply, e.g., to screws, bolts, nuts, washers, balls, and sealing covers in areas outside and inside the engine.

Cleanliness values as per table A.2

The quality class S1 applies unless otherwise specified.

7.4 Blanks and semi-finished products

The requirements as per section A.3 apply to blanks and semi-finished products.

In the case of blanks, the determined particle load strongly depends on the extraction method.

Extraction method As per drawing or Performance Specification

8 Particles

8.1 General

The following particle lengths are considered for determining the particle size as per this standard:

Engine parts	Particle length > 50 µm
Fuel-carrying parts	Particle length > 25 µm

8.2 Particle classes

As per table 3, particles are classified as follows:

Table 3 – Particle classification

Particle class	Designation	Description	Typical materials
M	Metallic particles	Metal particles (determination as per PV 3347)	E.g., iron, steel, aluminum alloys, copper alloys
N	Non-metallic grinding and blasting particles	Highly abrasive particles	Non-metallic blasting and grinding particle residues such as corundums (Al_2O_3), silicon carbide, ceramic materials
H	Hard particles	H = M + N + other abrasive particles	See above (M and N) and other abrasive particles such as sand, silicates, oxides, Mg/O, Si/O, minerals, hard coating materials such as wear protection coatings (e.g., Mn/P, Zn/Ni, Zn/P, P, SnP, DLC)
S	Soft particles	-	Soft coating materials and paint coat residue, plastics, soft fibers, and organic particles
A	All particles	A = H + S	All

If the particle size does not have a specification for a particle class, exclusively hard particles of class H are meant.

Manufacturing methods such as blasting, grinding, brushing, which release highly abrasive materials, must be avoided and replaced with alternative methods. If the part requirements do not permit an alternative method, the purchaser must be informed. A release by the purchaser's Development and Quality Assurance is required. Residues from manufacturing processes must be restricted to a minimum. The best possible washing or cleaning process must be used.

For all other manufacturing methods (i.e., without use/release of class N particles), the following requirement for grinding and blasting particles ("N") applies: for every 5 parts, max. 2 particles between 50 µm and 200 µm and no class N particles larger than 200 µm are permissible.

NOTE 3: The class N particles can result from cross contamination from adjacent processes (e.g., rework, construction site, adjacent manufacturing line).

NOTE 4: For certain parts, e.g., in turbochargers and injectors, soft particles may also cause part failures.

8.3 Definition of fibers

Fibers are particles with a ratio ≥ 20 of the effective length to maximum inscribed circle. The width, measured as maximum inscribed circle, must not exceed 50 µm. For a definition, see VDA Volume 19 Part 1, "Photo-optical analysis" section and annex

As per table 4, the following fiber classes are distinguished:

Table 4 – Fiber classes

Fiber class	Description	Damage potential
Cotton/polymer fiber	Soft, not resistant to deformation	Uncritical, unless marked otherwise
Metallic fiber	Hard but not resistant to deformation; fiber-like metal particles	Uncritical, unless marked otherwise
Glass fiber	Hard and resistant to deformation, straight (determination in further analysis)	Uncritical, unless marked otherwise

Upper limit for permissible metallic fiber lengths: 7 000 µm

NOTE 5: Fiber classes classified as function-influencing must be taken from the drawing.

8.4 Jammed chips

An analysis for jammed chips can be performed visually, e.g., using an endoscope.

If jammed chips are critical or their occurrence is likely, a visual inspection must be performed after the wet extraction during production monitoring.

The particles found must be removed form the part and added to the analysis (analytical filter). Jammed chips must be documented in the report.

At least in the case of process changes that may influence the formation of jammed chips, as well as for sample inspections and releases, the parts must be examined by endoscopy.

9 Outlier provision

If the maximum particle size is exceeded, the following rules apply:

– Evaluation of the test results is based on the test results of at least 5 parts (see table 7 for an example). If more than 5 parts are tested, the maximum number of outliers of 3 particles applies as well.
– Unless required otherwise, there is no particle count limit up to the specified maximum particle size.
– The following particle counts are statistically permissible in the 2 particle classes next in size (see table 5 and the example in table 6):

Key 1:

– **Outlier class 1 (OC 1)** Max. 2 particles (in 5 parts)
– **Outlier class 2 (OC 2)** Max. 1 particle (in 5 parts)

or

Key 2

– **OC 1** Max. 3 particles (in 5 parts)
– **OC 2** 0 particles (in 5 parts)

Table 5 – Outlier classes

Max. permissible particle size µm	OC 1 µm	OC 2 µm
25[a)]	50[a)]	100[a)]
50	100	200
100	200	400
200	400	600
400	600	1 000
500	800	1 500
600	1 000	2 000
800	1 500	2 500
1 000	2 000	3 000
2 000	3 000	5 000
3 000	5 000	7 000

a) Applies to fuel-carrying areas only

Assignment of key 1 and key 2

For key 2, only particles of OC 1 are permissible. For key 1, particles of OC 1 and OC 2 are permissible. See example in table 6.

Table 6 – Exemplary evaluation with a permissible particle size of 600 µm

Outlier class	Particle size	Key 1	Key 2
		Particles with a size of > 2 000 µm are not permissible.	
OC 2	≤ 2 000 µm	1 particle per 5 parts permissible	0 particles per 5 parts permissible
OC 1	≤ 1 000 µm	2 particles per 5 parts permissible	3 particles per 5 parts permissible
Particles ≤ the max. permissible particle length	≤ 600 µm	Only gravimetric particle residues restriction up to the permissible particle size.	

Table 7 shows the result of an example evaluation with 50 DUTs.

Table 7 – Example evaluation of outlier provision

		DUT									
Particle size	**Limit**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
> 2 000 µm	0 particles	0	0	0	0	0	0	1	0	0	1
OC 2 1 000 µm to 2 000 µm	1 particle per 5 components	0	0	1	1	0	2	0	1	0	2
OC 1 600 µm to 1 000 µm	2 particles per 5 components	0	2	0	2	3[a)]	0	0	2	4	3
< 600 µm	No limit	450	850	450	450	30	995	30	30	30	30
Overall result		✓	✓	✓	✓	✓	X	X	X	X	X

a) 3 particles of OC 1 and 0 particles of OC 2

10 Cleanliness analyses of individual parts, subassemblies (in as-received condition), and ASSYs

The scope of DUTs and the procedure must follow the specifications of the laboratory in agreement with Development.

The following sequence applies to determining the testability:

1. ASSYs
2. Subassemblies
3. Individual part

ASSYs and subassemblies must be tested in as-received condition if possible.

If an ASSY cannot be tested in a sensible way, the subassemblies must be checked for testability.

If a subassembly is not testable, the individual parts must be analyzed.

If in an ASSY with an ASSY cleanliness specification only the individual parts can be tested, this must be noted in the drawing.

NOTE 6: In the case of heavily lubricated or greased parts, the reproducibility of the cleanliness analysis is not ensured.

11 Applicable documents

The following documents cited are necessary to the application of this document:

Some of the cited documents are translations from the German original. The translations of German terms in such documents may differ from those used in this standard, resulting in terminological inconsistency.

Standards whose titles are given in German may be available only in German. Editions in other languages may be available from the institution issuing the standard.

PV 3336	Cleanliness of Lines and Circuit Parts; Determining Residual Particle Quantities
PV 3347	Cleanliness of Engine Components; Determination of Residual Particle Quantities
VW 01135	Engine-Mounted Parts that Convey Media; Cleanliness Requirements for Areas Used for Intake, Boost Pressure, and Vacuum Pressure
VW 01136	Engine-Mounted Parts That Convey Fuel; Cleanliness Requirements
VW 01137	Area Conveying Fluids; Cleanliness Requirements for Components that Convey Coolant
VW 82082	Direct Injection High-Pressure Gasoline Fuel Pumps; Technical Cleanliness
VW 85001	Technical Cleanliness of Piston ASSYs for Passenger Cars; Requirements and Tests
VDA Volume 19 Part 1	Prüfung der Technischen Sauberkeit - Partikelverunreinigung funktionsrelevanter Automobilteile

Appendix A (normative) Cleanliness specifications

A.1 Assembly-ready parts and ASSYs

Table A.1

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Exhaust manifold																3	< 600	H
Active Cylinder Management ACT actuator								< 600	H									
Intake air ducting	5	< 2 000[a)]	H							3	< 600	A						
Air intake port	5	< 2 000[a)]	H							3	< 600	A						
Intake manifold	5	< 2 000[a)]	H							3	< 600	A						
Drive chains							1	< 1 000	H									
Turbocharger[b)a)]							3[a)]	< 600[b)a)]	A	3[a)]	< 600[b)a)]	A	5[a)]	< 600[b)a)]	A	10[b)a)]	< 600[b)a)]	A
Turbocharger inlet connection[b)a)]	2[a)]	< 600[b)a)]	A															
Balance gear							4	< 1 000	H									
Balance shaft (ASSY)	4										< 600	H						
Thrust bearing										0,5	< 600	H						
Bush	1	< 1 000	H															
Cover	1	< 1 000	H															

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Sealing flange	5	< 1 000	H							2	< 600	H						
Charge air pipe	5	< 2 000[a)]	H							3	< 600	A						
Exhaust gas recirculation (EGR) filter[b)]	2		A														< 500[b)a)]	A
EGR cooler[b)]														< 1 000	H	2	< 500[b)a)]	A
Low-pressure EGR cooler module[b)]	2		A														< 500[b)a)]	A
Low-pressure EGR line[b)]	2		A														< 500[b)a)]	A
Intake and exhaust valves	0,3	< 600	H															
Fuel injector/injector[b)a)]				1	< 200[b)a)]	A												
Guide tube	1	< 600	H															
Alternator gear	0,2	< 600	H															
Guide rail	1	< 600	H															
High-pressure diesel pump[b)]				2	< 200[b)a)c)]	A												
High-pressure gasoline pump[b)]	As per VW 82082																	
Sprocket	1	< 1 000	H															
Chain tensioner	1	< 600	H															
Piston (ASSY)[a)c)]	As per VW 85001																	

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Piston cooling jet	0,2	< 600	H															
Piston ring[a)c)]	0,7	< 600[a)c)]	H															
Fuel filter[b)]				1	< 200[b)a)]	A												
High-pressure fuel line[b)]				1	< 200[b)a)]	A												
Vacuum fuel supply line[b)]	As per VW 01136																	
Vacuum fuel return pipe[b)]	As per VW 01136																	
Vacuum fuel return hose[b)]	As per VW 01136																	
Fuel pressure sensor[b)]				1	< 200[b)a)]	A												
Vacuum fuel rail[b)a)]	As per VW 01136																	
High-pressure fuel rail[b)a)]	As per VW 01136																	
Fuel pressure control valve[b)]				1	< 200[b)a)]	A												
Plastic coolant line	As per VW 01137																	
Thermostat	As per VW 01137																	
Cylinder block and crankcase	10	< 2 000	H							3	< 600	H						
Crankshaft	5	< 800	H								< 600	H						
Crankshaft sprocket	1,2	< 600	H															
Bearing bridge											< 600	H						

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Bearing cap	1	< 600	H															
Retaining frame	2	< 1 000	H															
Bearing insert	0,5	< 500	H															
Retaining frame	2	< 1 000	H															
Fan wheel	2	< 600	H															
Camshaft	2	< 1 000	H															
Camshaft sprocket	2	< 600	H															
Cam phaser[a)]	3	< 1 000[a)]	H															
Oil reservoir							3	< 1 000	H									
Oil filter module (ASSY)							2	< 1 000	H	2	< 600	H						
Oil pressure sensor										1	< 600	H						
Oil cooler	As per VW 01137																	
Oil line										2	< 600							
Feed oil line for turbocharger[b)a)]										2	< 200[b)a)]	H						
Oil pump							5	< 1 000	H	1	< 600[b)]	H						
Oil pump cover							0,8	< 800[b)]	H									
Oil pump housing							0,8	< 800[b)]	H	0,8	< 600[b)]	H						

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Oil intake pipe							0,8	< 800[b)]	H									
Oil pump drive gear							0,8	< 800[b)]										
Oil vacuum pump	5		H	2	< 200	A					< 600	H				3	< 600	A
Oil pan							3	< 1 000	H									
Oil pan upper part							5	< 1 000	H	2	< 600	H						
Dipstick	1	< 1 000	H															
Connecting rod	2	< 600	H															
Proportional/shift valve										0,5	< 200[a)]							
Roller	0,3	< 600	H															
Roller-type finger follower	0,3	< 600	H															
Check valve[a)]										0,2	< 600[a)]	H						
Intake manifold (aluminum cast)	3	< 2 000	H													3	< 600	A
Intake manifold (plastic)	3	< 2 000[a)]	H													3	< 600[a)]	A
Finger follower	0,8	< 600	H															
Finger follower pivot	0,4	< 600	H															
Strainer[a)]		< 200[a)]	A															
Tensioning rail	0,4	< 600	H															

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
Bucket tappet welded assembly	1	< 600	H															
Timing chain case	3	< 600	H															
Valve stem seal	0,3	< 600	H															
Valve spring	0,3	< 600	H															
Sealing cover	1	< 600	H															
Coolant pump													5	< 1 000	H			
Coolant pump gear													0,8	< 1 000	H			
Antifriction bearings and plain bearings							0,5	< 1 000	H									
Balance shaft gear	2	< 600	H															
Intermediate gear ASSY	2	< 1 000	H															
Intermediate gear	4	< 1 000	H															
Camshaft housing (aluminum)	4	< 1 000	H							2	< 600[a)]	H						
Cylinder head cover (plastic)		< 600[b)]	A															
Camshaft ASSY[a)]	2	< 1 000[a)]	H															
Integrated valve train module (IVM) end piece[a)]	1	< 600[a)]	H															
IVM trigger wheel[a)]	1	< 600[a)]	H								< 600[a)]	H						

Table A.1 (continued)

	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class	Gravimetry	Morphology	Particle class
Unit	mg	µm		mg	µm		mg	µm		mg	µm		mg	µm		mg	µm	
Part	**Whole part**			**Fuel-carrying area**			**Oil-carrying area/part**			**Pressurized-oil area/part**			**Coolant-carrying area/part**			**Gas-carrying area/part**		
IVM fuel pump cam[a)]	1	< 600[a)]	H															
IVM retaining ring	0,5	< 600[a)]	H															
IVM valve cams[a)]	1	< 600[a)]	H															
IVM base shaft ASSY[a)]	1	< 1 000[a)]	H															
Audi valvelift system (AVS) cam piece[b)a)]	1	< 2 000[b)a)]	H															
AVS fuel pump cam[b)a)]	1	< 2 000[b)a)]	H															
AVS base shaft (tube)[b)a)]	1	< 2 000[b)a)]	H															
AVS toothed belt pulley[b)a)]	1	< 2 000[b)a)]	H															
Cylinder head	7	< 3 000	H															

a) More detailed specifications as per the Performance Specification or drawing, or contents of the technical manual for purchaser

b) The outlier provision is not applied.

c) The following applies to original equipment manufacturer (OEM) parts such as bearing inserts, pistons, various parts: The OEM Performance Specification for the respective OEM part applies as of the date when the OEM Performance Specification becomes effective. The OEM cleanliness requirements must be fulfilled.

A.2 Fasteners and small parts

Table A.2 – Fasteners and small parts

Quality grade	S1[a)]						S2			S3		
Area of use	Whole part with t-surface type			Whole part with r or b-surface type			Oil-carrying, pressurized-oil carrying, coolant-carrying, and gas-carrying area/part			Fuel-carrying area		
Part surface cm²	Gravimetry mg	Morphology µm	Particle class	Gravimetry mg	Morphology µm	Particle class	Gravimetry mg	Morphology µm	Particle class	Gravimetry mg	Morphology µm	Particle class
≤ 20	3	< 2 000	H	1	< 800	H	0,3	< 600	H	0,2	< 200	A
> 20 to 50	5	< 2 000	H	2	< 800	H	0,5	< 600	H	0,4	< 200	A
> 50 to 100	10	< 2 000	H	3	< 800	H	1	< 600	H	0,6	< 200	A
> 100 to 400	25	< 2 000	H	5	< 800	H	2	< 600	H			
> 400 to 1 000	60	< 2 000	H	10	< 800	H	5	< 600	H			

a) Requirements based on the German Fasteners Association (DSV) guideline "Prüfung der Technischen Sauberkeit von Schrauben und Muttern für die Automobilindustrie" (Evaluation of the Technical Cleanliness of Screws, Bolts and Nuts for the Automotive Industry)

NOTE A.1: b, r, t surfaces correspond to coating methods as per VW 13750

A.3 Blanks and semi-finished products

Table A.3 – Cleanliness requirements for blanks and semi-finished products

Part	Whole part (functional surfaces)		
	Gravimetry mg	Morphology µm	Particle class
Crankshaft blank	50	-	
Camshaft blank	20	-	
Connecting rod blank	20	-	
Cylinder head blank	100	< 3 000 × 1 000	H
Cylinder block and crankcase blank, aluminum	300	< 2 000 × 2 000	H
Cylinder block and crankcase blank, gray cast iron	500	< 2 000 × 1 000	H
Individual part blanks/semi-finished products			
Exhaust manifold	20	-	-
Oil pump drive gear	40	-	-
Balance gear	40	-	-
Bush	40	-	-
Cover	10	-	-
Alternator gear	2	-	-
Crankshaft sprocket	12	-	-
Bearing cap	10	-	-
Retaining frame	40	-	-
Retaining frame	40	-	-
Fan wheel	20	-	-
Camshaft sprocket	20	-	-
Oil pump cover	8	-	-

Table A.3 (continued)

Part	Whole part (functional surfaces)		
	Gravimetry mg	Morphology µm	Particle class
Oil pump housing	40	-	-
Oil pan	40	-	-
Shaft (camshaft base)	8	< 1 000	
Roller	40	-	-
Roller-type finger follower	3	-	-
Intake manifold	40	-	-
Finger follower	8	-	-
Finger follower pivot	4	-	-
Bucket tappet welded assembly	12	-	-
Timing chain case	40	-	-
Fuel rail	10	-	-
Coolant pump	80	-	-
Coolant pump gear	6	-	-
Cylinder head cover	30	-	-
Intermediate gear	40	-	-
Cylinder block and crankcase, partly machined with plasma-coated cylinder walls (atmospheric plasma spraying (APS) coating)	50		

Appendix B (informative) Example templates

B.1 Technical cleanliness example test report

The example test report does not need to be adhered to in its entirety. Rather, it shows which information and DUTs must be contained in the supplier's technical cleanliness test report.

The example test report is stored on the ONE.Konzern Business Plattform (ONE.KBP) – Volkswagen Group Supply www.vwgroupsupply.com.

After logging in, the term "Musterprüfbericht" (sample test report) must be entered in the search field.

The supplier must upload a pertinent technical cleanliness test report for the initial sample inspection to the online sampling system BeOn[1)].

B.2 Checklist

The action checklist for verifying and optimizing the cleaning processes does not need to be adhered to in its entirety. Rather, it is provided as a guide.

The checklist is also stored on the ONE.Konzern Business Plattform www.vwgroupsupply.com and can be found using the search term "Maßnahmen-Checkliste-TecSa" (TecSa action checklist).

1) BeOn is a Volkswagen AG database for initial sample inspection.