

Group standard

VW 2.8.1

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Elastomers

Materials Requirements and Testing

Previous issues

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Changes

The following changes have been made to VW 2.8.1: 2016-11:

- a) Section 2.1 "General requirements": notes on nitrosamines added
- b) Section 2.3 "Specifications in technical documentation": designation examples updated
- c) Table 1, consec. no. 8 and Table 2, consec. no. 8 "Glass transition temperature": requirement changed (from "as per drawing" to "as per sample")
- d) Table 1, consec. no. 14 and Table 2, consec. no. 14: requirements changed
- e) Section "Applicable documents" updated
- f) Standard edited

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Always use the latest version of this standard.

This electronically generated standard is authentic and valid without signature. A comma is used as the decimal sign.
The English translation is believed to be accurate. In case of discrepancies, the German version controls.

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1 Scope

This standard defines the materials requirements and testing for elastomer materials used for parts and technical molded parts in motor vehicles (it does not apply to vehicle tires).

2 Requirements

2.1 General requirements

Requirements for suppliers of sealing materials as per VW 01153.

Approval of first supply and changes as per Volkswagen standard VW 01155.

Material conformity as per VW 91101.

Free of di-ortho-tolyl guanidine (DOTG) and free of its cleavage product, o-toluidine.

Material components that include or exude nitrosamines as per VW 91101 with a restriction on use are not permissible. An analysis confirming the nitrosamine-free state must be provided if the nitrosamine-free state cannot be proved completely by the material composition. The analysis must be carried out by a laboratory with a corresponding accreditation.

Elastomer qualities are tested on parts, part sections, or, in exceptional cases, test plates (see section 3.2).

Samples must always be delivered with the manufacturer's quality designation.

The number of parts required for laboratory evaluation must be agreed upon with the appropriate Materials Engineering department.

Deviations from this standard must be indicated in drawings and test reports.

Parts whose grades cannot be classified on the basis of this standard require specific Technical Supply Specifications (TLs).

Recycled materials must not be used as raw materials in parts that are subject to dynamic loads during driving operation.

In this context, recycled material means mixture components that are fed back into the rubber mixture as products of a recycling process (thermal, mechanical, and chemical) from fully vulcanized rubber products (new parts or used parts, e.g., used tires). Examples of this are reclaimed rubber, regenerated rubber, rubber powder, and carbon black.

2.2 Evaluation of the measurement results

The required numerical values apply to each individual measurement.

2.3 Specifications in technical documentation

Designation example for a transmission-fluid-resistant, black hydrogenated nitrile rubber (HNBR) with increased requirements on ozone resistance (e.g., used in boots with high dynamic loads):

HNBR, VW 2.8.1, E60, black, fully hydrated (residual double bond proportion $\leq 2\%$), ozone-resistant during buckling load

Designation example for a fuel-resistant, black acrylonitrile butadiene rubber (NBR), with a preferred hardness of 75 Shore A:

NBR, VW 2.8.1 – A, black

Designation example for a transmission-fluid-resistant, black polyacrylate elastomer (ACM) with a usage temperature of max. +100 °C and a hardness of 60 Shore A:

ACM, VW 2.8.1, E60, black, temperature +100 °C

Designation example for a black ethylene propylene terpolymer resistant to sunlight, weather, ozone, and hot air up to a temperature of +100 °C, with rebound resilience and a hardness of 50 Shore A:

EPDM, VW 2.8.1, G50, black, ozone-resistant, rebound resilient $> 50\%$, resistant to hot air up to +100 °C

2.4 Marking as per German Association of the Automotive Industry (VDA) standard VDA 260

For the recycling of vehicles and powertrains, the components are marked as specified in VDA 260. The codes as per DIN ISO 1629 must be used for this purpose.

Elastomer/polymer blends:

For elastomer blends, the composition of the blends must be specified in detail and also indicated as per VDA 260.

Designation example:

NR/BR, VW 2.8.1, 90% : 10%

Examples of codes

The list of codes below does not claim to be exhaustive. Raw polymer materials for components must always be designated as specified in [DIN ISO 1629](#).

ACM	Copolymer consisting of ethyl acrylate (or other acrylates) with a small fraction of a monomer that facilitates vulcanization (usually referred to as acrylate rubber).
AEM	Copolymer consisting of ethyl acrylate (or other acrylates) and ethylene
BR	Butadiene rubber
CM	Chlorinated polyethylene
CO	Polychloromethyloxirane (typically referred to as epichlorohydrin rubber)
CR	Chloroprene rubber
CSM	Chlorosulfonated polyethylene
ECO	Copolymer consisting of ethylene oxide (oxirane) and chloromethyl oxirane (also referred to as epichlorohydrin copolymer or epichlorohydrin rubber)
EPDM	Terpolymer consisting of ethylene, propylene, and a diene with an unsaturated part of the diene in the side chain
EPM	Ethylene-propylene copolymer
FKM	Fluorinated rubber with fluorine, perfluoroalkyl, or perfluoroalkoxy groups on the polymer chain
FVMQ	Silicone rubber with methyl, vinyl, and fluorine groups on the polymer chain
IIR	Isobutene isoprene rubber (typically referred to as butyl rubber)
NBR	Acrylonitrile butadiene rubber
NR	Natural rubber
SBR	Styrene butadiene rubber
VMQ	Silicone rubber with methyl and vinyl groups on the polymer chain

2.5 Appearance

The parts must have a flawless surface texture on delivery. Tackiness, inclusions, cavities, cracks, damage, etc., are not permissible.

Part color: See drawing.

2.6 Properties, grade

See [table 1](#) and [table 2](#).

Table 1

Resistant to contact medium		Fuel		Oil			
Test temperature in °C (deviating requirements as per drawing)		23 ±2		The required temperature must be indicated.			
Test medium		Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications
Grade		A	W	T	C	E	P
No.	Properties	For notes on testing, see					
1	Thermogravimetric analysis Constituents in % as per Test Specification PV 3927 and/or pyrolysis gas chromatography mass spectrometry as an identification test	As per sample					
2	Density in g/cm ³ as per DIN EN ISO 1183-1	As per sample					
3	Hardness in Shore A DIN ISO 48-4 International Rubber Hardness Degree (IRHD) as per DIN ISO 48-2 (for o-rings)						
3.1	Preferred hardness in the as-received condition	Section 3.3	60 ±5 or 75 ±5	70 ±5	75 ±5	60 ±5	75 ±5
3.2	Change as compared to as-received condition						

Limited resistance to engine oil as per TL 52185

Oil as per drawing specifications

Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications

Engine oil as per Technical Specification TL 52185

Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214

Limited resistance to gasoline

Gasoline

Grade

Test medium

Test temperature in °C (deviating requirements as per drawing)

Resistant to contact medium

Table 1 (continued)

Resistant to contact medium			Fuel			Oil			
Test temperature in °C (deviating requirements as per drawing)			23 ±2			The required temperature must be indicated.			
Test medium			Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications	Limited resistance to engine oil as per TL 52185
Grade			A	W	T	C	E	P	U
No.	Properties	For notes on testing, see	0 to +3 ^{a)}						
3.2.1	After heat aging as per DIN 53508, the required temperature must be specified	Section 3.4							
3.2.2	After aging in contact medium	Section 3.5							
3.2.2.1	After subsequent drying	Section 3.6	-3 to +2	0 to +18	±4	-			
4	Weight change in %								
4.1	After aging in contact medium	Section 3.5	0 to +15	0 to +45	-1 to +4	-2 to +6			
4.1.1	After subsequent drying	Section 3.6	-3 to +3	0 to -20	-1 to +4	-			
5	Tensile strength in N/mm ² as per DIN 53504 or PV 3973 (for o-rings); for notes on testing, see section 3.7								
5.1	In as-received condition		> 8			> 6			
5.2	After heat aging as per DIN 53508, the required temperature must be specified	Section 3.4	> 8 ^{a)}			> 6 ^{a)}			

> 6a)

Table 1 (continued)

Resistant to contact medium		Fuel		Oil			
Test temperature in °C (deviating requirements as per drawing)		23 ±2		The required temperature must be indicated.			
Test medium		Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications
Grade		A	W	T	C	E	P
No.	Properties	For notes on testing, see					
5.3	After aging in contact medium	> 6	> 4,5			> 6	
5.3.1	After subsequent drying	> 8		> 6		-	
6	Elongation at tear in % as per DIN 53504 or PV 3973 (for o-rings); for notes on testing, see section 3.8						
6.1	In as-received condition	> 150	250 to 550	> 150	250 to 550	> 100	250 to 550
6.2	After heat aging as per DIN 53508, the required temperature must be specified	> 150 ^{a)}	200 to 550 ^{a)}	> 150	200 to 550 ^{a)}	> 100	200 to 550 ^{a)}
6.3	After aging in contact medium	> 150	> 100	> 150	200 to 550	> 100	200 to 550
6.3.1	After subsequent drying	> 150	> 200	> 150		-	
7	Low-temperature stability in °C at least	-35					

Limited resistance to engine oil as per TL 52185

Oil as per drawing specifications

Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications

Engine oil as per Technical Specification TL 52185

Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214

Limited resistance to gasoline

Gasoline

For notes on testing, see

After aging in contact medium

After subsequent drying

Elongation at tear in % as per DIN 53504 or PV 3973 (for o-rings); for notes on testing, see section 3.8

In as-received condition

After heat aging as per DIN 53508, the required temperature must be specified

After aging in contact medium

After subsequent drying

Low-temperature stability in °C at least

Table 1 (continued)

Resistant to contact medium		Fuel		Oil			
Test temperature in °C (deviating requirements as per drawing)		23 ±2		The required temperature must be indicated.			
Test medium		Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications
Grade		A	W	T	C	E	P
No.	Properties	For notes on testing, see					
8	Glass transition temperature T_G as per DIN EN ISO 11357-2	As per sample					
9	Ozone resistance	No cracks. For grades other than G: required only if "ozone-resistant" is additionally specified in the drawing.					
10	Lightfastness	No changes compared to as-received condition, e.g., discoloration, embrittlement, decomposition, cracks. For grades other than G: Required only if "lightfast" is additionally specified in the drawing.					
11	Weather resistance	No changes compared to as-received condition, e.g., discoloration, embrittlement, decomposition, cracks. For grades other than G: Required only if "weather-resistant" is additionally specified in the drawing.					
12	Paint indifference	No corona formation, no effects due to washing, slight contact discoloration permissible. Required only if "paint-indifferent" is additionally specified in the drawing.					
13	Rebound resilience in % as per DIN 53512	Required only if "rebound resilient > ...%" is additionally specified in the drawing.					

TL 52185

TL 52185

DIN EN 14214

Section 3.10

Section 3.11

Section 3.12

Section 3.13

Table 1 (continued)

Resistant to contact medium		Fuel		Oil			
Test temperature in °C (deviating requirements as per drawing)		23 ±2		The required temperature must be indicated.			
Test medium		Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) portion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications
Grade		A	W	T	C	E	P
No.	Properties	For notes on testing, see					
14	Specific volume resistance as per PV 1015	Aluminum: as per drawing, but at least > 10⁴ Magnesium: as per drawing, but at least > 10⁶ Galvanized steel: as per drawing, but at least > 10⁴ Required only if "corrosion-resistant" is additionally specified in the drawing. For components in especially corrosion-critical areas, such as grommets or cover bump stops, higher specific volume resistance values greater than those in the drawing must be specified after consultation with the responsible department.					
	or Insulation resistance as per DIN EN 62631-3-3	> 1 000 Required only if "insulation-resistant" is additionally specified in the drawing.					
15	Self-lubricating	Required only if "self-lubricating" is additionally specified in the drawing.					
16	Corrosion properties as per VDA 675 -241	Grades 1 and 2 permissible					
17	Abrasion in mm ³ as per PV 3984	< 200 Required only if "abrasion-resistant" is additionally specified in the drawing.					

Table 1 (continued)

Resistant to contact medium			Fuel		Oil				
Test temperature in °C (deviating requirements as per drawing)			23 ±2		≥ (125 ±3) The required temperature must be indicated.			23 ±2	
Test medium			Gasoline	Limited resistance to gasoline	Diesel fuel with 20 volume percent fatty acid methyl ester (FAME) proportion as per DIN EN 14214	Engine oil as per Technical Specification TL 52185	Hypoid gear oil and automatic transmission fluid (ATF) as per drawing specifications	Oil as per drawing specifications	Limited resistance to engine oil as per TL 52185
Grade			A	W	T	C	E	P	U
No.	Properties	For notes on testing, see							
18	Emission behavior as per VW 50180		Required only if "emission behavior as per VW 50180" is specified in the drawing.						
19	Plastic deformation in % as per PV 3307 O-rings as per PV 3330 Compression 40%		Required only if "plastic deformation ... h ... °C < ...%" is additionally specified in the drawing.						
20	Tear propagation resistance in N/mm as per DIN ISO 34-1 Strip specimen		Required only if "tear propagation resistance > ... N/mm" is additionally specified in the drawing.						
a) Deviating limits may be specified in justified cases.									

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