

## Group Standard

**TL 227**

Issue 2011-11

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Descriptors: corrosion protection, surface protection, paint, cathodic electrocoating, zinc

## Single-Layer Paint of Zinc-Coated Metal Surfaces Surface Protection Requirements

### Previous issues

TL 227: 1980-11, 1986-12, 1992-07, 1995-12, 1996-07, 2004-04

### Changes

The following changes have been made compared with TL 227: 2004-04:

- Title changed
- Section 2 "Description" changed
- New surface protection type introduced
- Requirements for the cutting burr added
- Section 3.8 "Paint coat thickness" changed
- Section 3.12 "Resistance to chemicals" changed
- Section "Applicable documents" updated

## 1 Scope

These Technical Supply Specifications (TL) define the surface protection requirements for organic coatings (single-layer liquid paint or cathodic electrocoating) on hot-dip-galvanized or electrolytically-galvanized parts with the following protection types:

- OfI-x632 for zinc coating of individual parts
- OfI-x633 for parts made from zinc-coated semi-finished products
- OfI-x640 for After-Sales Service body components (doors, covers, fenders, roofs, etc.) made from hot-dip-galvanized or electrolytically-galvanized semi-finished products

Verify that you have the latest issue of the Standard before relying on it.

This electronically generated Standard is authentic and valid without signature.

The English translation is believed to be accurate. In case of discrepancies, the German version is alone authoritative and controlling.

Numerical notation acc. to ISO/IEC Directives, Part 2.

Page 1 of 6

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**Note:** For cathodic electrocoating of body skin parts made from aluminum semi-finished products, see TL 178.

## 2 Description

As per Volkswagen Standard VW 13750, section 2.

On principle, cathodic electrocoating is required. If the coating method is not specified, "liquid paint" (spray or dip painting) is added in the drawing.

Example:

**Ofl-x632 liquid paint**

## 3 Requirements

### 3.1 General requirements

Approval of first delivery and changes as per VW 01155.

Avoidance of hazardous substances as per VW 91101.

Individually zinc-coated parts that are not painted immediately after zinc coating (e.g., if zinc-coated parts are shipped to the painting plant) must not be phosphated or sealed and must correspond to protection type Ofl-c310, Ofl-c340, or Ofl-c330 as per TL 217. Any required transport or storage protection of zinc-coated parts, e.g., oiling, must be agreed upon with the painting plant. If painting is carried out at a plant in the Volkswagen Group, the transport or storage protection must correspond to Quality Specification QP A001.

The cutting burr on components must correspond at least to the manufacturing precision "fine" as per VW 01088.

Eight parts are required for complete testing.

### 3.2 Conditioning

If air-drying coating systems are used and/or the paint system is not burned in at elevated temperatures ( $> 60\text{ }^{\circ}\text{C}$ ), the components must be conditioned for 24 h at  $60\text{ }^{\circ}\text{C}$  before the tests and then cooled to room temperature ( $18\text{ to }28\text{ }^{\circ}\text{C}$ ).

### 3.3 Base material

As per drawing.

### 3.4 Zinc coating

For Ofl-x632 = Ofl-c310, Ofl-c330, in exceptional cases Ofl-c340 as per TL 217<sup>1)</sup>.

For Ofl-x633 = Zinc coatings as per DIN EN 10152 or as per DIN EN 10346 or as per drawing.

For Ofl-x640 = As per drawing.

<sup>1)</sup> An electrolyte with the lowest possible amount of brighteners must be used for electroplated zinc coating to ensure optimal adhesion of the paint finish.

### 3.5 Pretreatment

- For OfI-x632 = Zinc phosphating, preferably tri-cation phosphating (zinc, nickel, and manganese); in exceptional cases for electrolytic zinc coating OfI-c340 with additional Cr(VI)-free passivation layer.
- For OfI-x633 = Zinc phosphating, preferably tri-cation phosphating (zinc, nickel, and manganese).
- For OfI-x640 = Tri-cation phosphating (zinc, nickel, and manganese).

### 3.6 Paint finish

Cathodic electrocoating; if necessary, single-layer liquid paint is possible.

**Note:** A paint structure based on alkyd resin is not permissible (aging results in problems with the adhesion of the paint coat to zinc layers).

### 3.7 Color

Black or as per drawing (as per color combination table).

### 3.8 Paint coat thickness

- 15 to 35 µm for cathodic electrocoating,
- 15 to 50 µm for single-layer liquid paints,
- for OfI-x640 (cathodic electrocoating) of the external or internal area, 17 to 22 µm and cavities > 10 µm.

### 3.9 Adhesion

Cross-cut test as per DIN EN ISO 2409. Requirement: characteristic value < 1.

### 3.10 Stone-chip resistance

Testing as per DIN EN ISO 20567-1, method B. If the test cannot be performed on the components, for example, due to their geometry, a reference examination must be performed on correspondingly painted sheets.

Requirement: characteristic value ≤ 2 (visually evaluated).

### 3.11 Corrosion resistance

#### 3.11.1 Corrosion cycle test

Testing as per Test Specifications PV 1210 with scribing line as per DIN EN ISO 9227, section C.4, evaluation as per DIN EN ISO 4628-8.

Requirements:

- After test duration of 5 cycles:  
No change of the surface, including cut edges and welds.
- After test duration of 15 cycles:

No blistering and no zinc corrosion on the surface; isolated occurrences of zinc corrosion and blistering are permissible at cut edges and welds, loss of adhesion d at scribing line < 1,5 mm.

- After test duration of 30 cycles:

No blistering and no zinc corrosion on the surface outside of the scribing line; slight blistering and zinc corrosion are permissible at the cut edges. For Ofl-x633 and Ofl-x640, isolated occurrences of base metal corrosion are permissible at cut edges up to a max. adjacent zone of 1,5 mm.

Cross-cut test as per DIN EN ISO 2409: characteristic value < 1.

### 3.11.2 Condensation atmosphere with constant humidity

Test in CH test atmosphere as per DIN EN ISO 6270-2, test duration 240 h; the specimens are then acclimatized for 30 minutes at (18 to 28) °C.

Requirements:

- No blistering, no zinc corrosion; cross-cut test as per DIN EN ISO 2409: characteristic value < 1.

### 3.12 Resistance to chemicals

The resistance to chemicals must be tested and ensured by the paint supplier.

Testing in oils and brake fluid only for parts used in the engine compartment.

In first-sample testing, the resistance to chemicals can also be demonstrated by a certificate issued by the coating material manufacturer.

For test media and requirements, see table 1.

Testing is performed as per DIN EN ISO 2812. Evaluation as per DIN EN ISO 4628-1.

Table 1

No.	Test medium	Requirement	
		Single-layer liquid paint	Cathodic electrocoating
1	For all parts		
1.1	E10 gasoline as per DIN 51626-1, ethanol content 9 to 10% (V/V): Testing as per DIN EN ISO 2812-3, room temperature, 10 minutes, filter	Characteristic value ≤ 2, but characteristic value ≤ 1 after rest period of 5 h	Characteristic value ≤ 1
1.2	Diesel fuel B7 as per TL 788-B: Testing as per DIN EN ISO 2812-3, room temperature, 60 minutes, filter		
2	For engine compartment parts only		

No.	Test medium	Requirement	
		Single-layer liquid paint	Cathodic electrocoating
2.1	Reference engine oil as per TL 52185 (Lubrizol OS 206 304): Testing as per DIN EN ISO 2812-4, room temperature, 16 h, dripping	Characteristic value $\leq 2$ , but characteristic value $\leq 1$ after rest period of 5 h	Characteristic value $\leq 1$
2.2	Hydraulic fluid as per TL 52146: Testing as per DIN EN ISO 2812-3, room temperature, 16 h, filter		Characteristic value $\leq 1$ ; swellings that have disappeared after 24 h are permissible.
2.3	Brake fluid as per TL 766: Testing as per DIN EN ISO 2812-3, room temperature, 60 minutes, filter		
3	Only for coolant pipes		
3.1	Coolant as per TL 774: 500 h aging at 130 °C	-	Detachment or blistering of the coating and fading of the coating to gray are not permissible.

#### 4 Applicable documents

The following documents cited in this Standard are necessary to its application.

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 1210	Body and Add-on Parts; Corrosion Test
QP A001	Prelube, Hot Melt, Blank Washing Oil, Drawing Oil, Slushing Oil (General); Quality Requirements
TL 178	Kathodische Elektrottauchlackierung (KTL) von Karosserieaußenhautteilen aus Aluminiumhalbzeug; Oberflächenschutzanforderungen
TL 217	Zinc Coatings; Surface Protection Requirements
TL 52146	Central Hydraulic System Fluid; Lubricant Requirements
TL 52185	Reference Engine Oil SAE 5W-30 for Testing of Compatibility with Respect to Elastomer Materials; Lubricant Requirements
TL 766	Brake Fluid; Material Requirements
TL 774	Ethylene Glycol-Based Coolant Additive; Material Requirements
TL 788	Diesel Fuel; Fuel Requirements
VW 01088	Workpiece Edges; Definitions, Drawing Specifications
VW 01155	Vehicle Supply Parts; Approval of First Supply and Changes

VW 13750	Surface Protection of Metal Parts; Surface Protection Types, Codes
VW 91101	Environmental Standard for Vehicles; Vehicle Parts, Materials, Operating Fluids; Avoidance of Hazardous Substances
DIN 51626-1	Automotive fuels - Requirements and test methods - Part 1: Petrol E10
DIN EN 10152	Electrolytically zinc coated cold rolled steel flat products for cold forming - Technical delivery conditions
DIN EN 10346	Continuously hot-dip coated steel flat products - Technical delivery conditions
DIN EN ISO 20567-1	Paints and varnishes - Determination of stone-chip resistance of coatings - Part 1: Multi-impact testing
DIN EN ISO 2409	Paints and varnishes - Cross-cut test
DIN EN ISO 2812-3	Paints and varnishes - Determination of resistance to liquids - Part 3: Method using an absorbent medium
DIN EN ISO 2812-4	Paints and varnishes - Determination of resistance to liquids - Part 4: Spotting methods
DIN EN ISO 4628-8	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance - Part 8: Assessment of degree of delamination and corrosion around a scribe
DIN EN ISO 6270-2	Paints and varnishes - Determination of resistance to humidity - Part 2: Procedure for exposing test specimens in condensation-water atmospheres
DIN EN ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests