TECHNICAL REPORT

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Best practices for the creation/ evaluation of fingerprint analysis in accordance with the ISO 28199 series

Bonnes pratiques pour la création/l'évaluation de l'analyse des empreintes digitales conformément à la série ISO 28199

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 35, *Paints and varnishes*, Subcommittee SC 9, *General test methods for paints and varnishes*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Best practices for the creation/evaluation of fingerprint analysis in accordance with the ISO 28199 series

1 Scope

This document gives technical descriptions of X-Y measuring tables together with sample applications, sample evaluations and practical recommendations for visual and metrological evaluation as a supplement to the ISO 28199 series. This document intends to provide further information on this subject to interested parties.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Review of previous developments

After the successful introduction of this prediction method for the process behaviour of automobile series paints and an application for a patent in 1994, the ISO 28199 series up to 2009 was developed and published in the years 1999 to 2009, initially in the form of a EUCAR pre-standard within the framework of a EUCAR project (from 2006 onwards, originally initiation of a DIN standard – the DIN 55993 series– which in the meantime has been replaced by the ISO 28199 series).

X-Y measuring tables (scanners) that were innovative at the time were developed to the point of being ready for series production from the mid-1990s onwards. The first fully automated X-Y measuring table was put into service in 1996.

After pre-development in the early 1990s, the first measuring tables were subsequently made ready for series production. Standardization of the evaluation of measurements was very soon demanded by the automotive industry. The aim was that paint suppliers provide process-reliable and suitable coating systems to paint users as early as possible in the approval process for new base coats. In particular, the needs of the automotive industry increasingly demanded the ability to demonstrate process compatibility already in the design phase for new base coats. Further components of and results from X-Y measuring tables included not just the demonstration of process compatibility for coating systems awaiting approval, but also the ability to carry out process compatibility studies for new coating lines, for example.

A new method was developed to ensure the process compatibility of new paints in base coats already in advance of the actual paint approval. This method essentially consists of the application of a film thickness wedge of the base coat (BC, now also a two-layer structure with BC 1 and BC 2) onto standardized steel sheets that have been coated with a particular coil-coating-PUR paint and that have a particular defined substrate structure (visual appearance of a very smooth coil-coating painting). This is followed by coating with clear coat (series clear coat or with a new clear coat that is to be investigated) with a constant film thickness. The film thickness wedge of a paint system that is to be

investigated (e.g. new base coat/paint) covers the range of film thicknesses of the series coating process that the new paint is to be used in. A sufficiently high number of measurements are carried out with various optical measuring devices so as to satisfy the requirements of statistical evaluation methods. The film thickness measurement in comparison with the measurements from the optical measuring devices is an important control parameter for an X-Y measuring table.

In the next step, suitable laboratory application systems (initially with pneumatic/pneumatic application, later with special high-rotation bell electrostatic paint sprayguns/pneumatic) were acquired. Today, modern high-rotation bell processes are simulated. Such is the progress that has been made, the various existing high-rotation bell and their coating processes can be simulated with "replacement bells" in laboratory systems in the case of central worldwide approval for various factories, for example. It was of course initially difficult to transfer the correlation of series coating to laboratory applications. Ultimately, success was achieved with the aid of so-called "practical fingerprint panels" also coated onto the bodywork at a suitable location in a frame in series production.

The demands from automotive manufacturers for standardization of evaluation, as mentioned above, resulted in a European Council for Automotive R&D (EUCAR) project with precisely this aim.

EUCAR is an umbrella body of automotive manufacturers that aims to jointly promote research and development in the areas of mobility, technology and processes. Suppliers and/or parties from other sectors also participate alongside automotive manufacturers on projects for these purposes.

The result of this joint project is the former DIN 55993 series, which was published as a draft version in 2006 and which in the meantime has been replaced by the ISO 28199 series.

5 General quality requirements for the creation of a standard test panel

It is important in terms of the predictability of process compatibility that the coating systems to be investigated are coated/produced in a manner as close as possible to the real process onto the standard panels of dimensions 300 mm × 570 mm (see ISO 28199-1) in laboratory systems, for example. Suitable methods for this are described in Clause 9.

The evaluation of the measurement values of various optical measuring devices (e.g. colour, coating structure, gloss, mottling, haze, sparkling) and the classification of the relevant film thicknesses provides information about important process characteristics such as colour stability, gloss and mottling behaviour, and coating structure (e.g. microstructure and 'orange peel' texture, depending on the selected measurement method) of the coating systems to be investigated.

This supplies results that allow conclusions to be drawn regarding:

— the properties of base metallic coats, for example, such as those of the effect pigments that are used;

— the hiding power of paints on coloured fillers, for example;

— the colour tone stability in the process film thickness range;

— the wetting behaviour;

— the sagging behaviour;

— the bubble behaviour;

— re-dissolving by a particular clear coat (series standard clear coat or test clear coat);

— the overspray absorption;

— the pinhole behaviour;

— many other base coat or clear coat properties.