ICS 25.020, 25.040 TECHNICKÁ NORMALIZAČNÁ INFORMÁCIA September 2023

TNI	**Aditívna výroba kovov Surovinové materiály Korelácia merania rotačným bubnom s roztierateľnosťou prášku na strojoch PBF-LB (ISO/ASTM TR 52952: 2023)**	**TNI CEN ISO/ASTM TR 52952** 18 8516

Additive Manufacturing of metals - Feedstock materials - Correlating of rotating drum measurement with powder spreadability in PBF-LB machines (ISO/ASTM TR 52952:2023)

Táto technická normalizačná informácia obsahuje anglickú verziu CEN ISO/ASTM TR 52952:2023, ISO/ASTM TR 52952:2023.
This Technical standard information includes the English version of CEN ISO/ASTM TR 52952:2023, ISO/ASTM TR 52952:2023.

Táto technická normalizačná informácia bola oznámená vo Vestníku ÚNMS SR č. 08/23

obsahuje farebné strany

137352

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER REPORT

CEN ISO/ASTM TR 52952

July 2023

ICS 25.030

English Version

Additive Manufacturing of metals - Feedstock materials - Correlating of rotating drum measurement with powder spreadability in PBF-LB machines (ISO/ASTM TR 52952:2023)

Fabrication additive de métaux - Matières premières - Corrélation de la mesure du tambour rotatif avec la capacité d'étalement de la poudre dans les machines PBF-LB (ISO/ASTM TR 52952:2023)

Additive Fertigung von Metallen - Ausgangsmaterialien - Korrelation zwischen der Messung der rotierenden Trommel und der Pulververteilbarkeit in PBF-LB-Maschinen (ISO/ASTM TR 52952:2023)

This Technical Report was approved by CEN on 13 June 2023. It has been drawn up by the Technical Committee CEN/TC 438.

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Ref. No. CEN ISO/ASTM TR 52952:2023 E

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European foreword

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TECHNICAL REPORT

ISO/ASTM TR 52952

First edition
2023-06

Additive manufacturing of metals — Feedstock materials — Correlating of rotating drum measurement with powder spreadability in PBF-LB machines

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Reference number
ISO/ASTM TR 52952:2023(E)

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Published in Switzerland

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Foreword

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This document was prepared by Technical Committee ISO/TC 261, *Additive manufacturing*, in cooperation with ASTM Committee F42, *Additive Manufacturing Technologies*, on the basis of a partnership agreement between ISO and ASTM International with the aim to create a common set of ISO/ASTM standards on additive manufacturing, and in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 438, *Additive manufacturing,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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Introduction

Granular materials and fine powders are widely used in industrial applications. To support control and optimize processing methods, these materials have to be precisely characterized. Characterization methods are related either to the properties of the grains (granulometry, morphology, chemical composition, etc.) or to the behaviour of the bulk powder (flowability, density, blend stability, electrostatic properties, etc.). The complex behaviours of granular and powder materials have motivated the development of numerous techniques to obtain reproducible and interpretable results. Many industries are concerned in different fields: additive manufacturing, food processing, pharmaceuticals, bulk material handling. This document is focused on Additive Manufacturing (AM).

Metallic powders are widely used in AM processes involving powder bed fusion (PBF-LB/M PBF-EB/M etc.) or binder jetting. During such operations, successive thin layers of powder are deposited with a blade or with a rotating cylinder. Each layer is then fused (most commonly melted) by an energy beam or joined by an adhesive binder to build the parts. The layer thickness defines the vertical resolution of the process; a thin layer leads to a better resolution. In order to obtain a thin layer, the powder is as fine as possible. However, if it is assumed that among the cohesive forces, the Van der Waal forces are predominant, it can be stated that as the grain size decreases, cohesiveness typically increases[25]. This increase in cohesiveness could have an impact on the spreadability of a powder.

The quality of the parts built with AM is thus directly influenced by powder flow properties.

According to ISO/ASTM 52900, spreadability is the ability of a feedstock material to be spread out in layers that fulfil the requirements for the AM process; this includes the ability to form a flat powder-atmosphere interface without waves and irregularities.

Visual observation of layer homogeneity is usually the only way for operators to assess the spreadability of powders during the spreading of new layers. However, linking the powder characteristics to its spreadability during the layer deposition beforehand can provide a more cost-effective way to classify and select the optimal powder and layer deposition speed combinations.

TECHNICAL REPORT **ISO/ASTM TR 52952:2023(E)**

Additive manufacturing of metals — Feedstock materials — Correlating of rotating drum measurement with powder spreadability in PBF-LB machines

1 Scope

This document provides an example of the relation between the characterization of certain macroscopic properties of metallic powders and their spreadability in an PBF-LB/M AM machines.

This relation is based on a new technique combining measurements inside a PBF-LB/M machine and image processing developed to quantify the homogeneity of the powder bed layers during spreading.

In this document, the flowability of five metal powders are investigated with an automated rotating drum method, whose dynamic cohesive index measurement is shown to establish a correlation with the spreadability of the powder during the layer deposition operation. Furthemore, the particule size distribution (PSD) and morphology of each powder is characterized before testing by static image analysis method (according to ISO 13322-1).

The general principle of the method is described in Figure 1.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/ASTM 52900, *Additive manufacturing — General principles — Fundamentals and vocabulary*

