

TR 92 : 2021
(ICS 25.030)

TECHNICAL REFERENCE

Design guidelines for additive manufactured parts



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Defence Science and Technology Agency
DNV GL Singapore
Nanyang Technological University
National Metrology Centre
National University of Singapore
Setsco Services Pte Ltd
Singapore Armed Forces
Singapore Centre for 3D Printing
Singapore Precision Engineering and Technology Association
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Foreword

This Technical Reference was prepared by the Working Group on Military Additive Manufacturing set up by the Technical Committee on Additive Manufacturing under the purview of MSC.

This Technical Reference aims to provide information for designers and engineers regarding design for various additive manufacturing processes, such as features of material extrusion, laser-based powder bed fusion of metals (PBF-LB/M) and directed energy deposition (DED). Information provided within this document would offer designers guidelines on how design could affect the performance of parts and the success rate of each process. Specific design solutions and process-specific or material-specific data are not provided in this document.

This TR is a provisional standard made available for application over a period of three years. The aim is to use the experience gained to update the TR so that it can be adopted as a Singapore Standard. Users of the TR are invited to provide feedback on its technical content, clarity and ease of use. Feedback can be submitted using the form provided in the TR. At the end of the three years, the TR will be reviewed, taking into account any feedback or other considerations, to further its development into a Singapore Standard if found suitable.

Acknowledgement is made to the following organisations for their kind permission to reproduce their materials into this TR:

1. Thales Alenia Space (Figure 2 of this TR)
2. 3D Hubs B.V. (Figure 7 of this TR)
3. Strasys Ltd (Figure 8 and 7.2.5.2 of this TR)

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Design guidelines for additive manufactured parts

1 Scope

The scope of this Technical Reference (TR) is to provide users with specific design considerations and information for the commonly used additive manufacturing (AM) processes such as laser-based powder bed fusion of metals (PBF-LB/M), fused deposition modelling (FDM), and direct energy deposition (DED).

This TR predominantly focuses on PBF-LB/M while including information on FDM and DED to ensure comprehensiveness. Users can refer to TR 70 and SS 666 for information on AM parts testing and qualification requirements.

Apart from the general pros and cons of AM processes, this TR also provides additional details such as operating conditions and design considerations for safety and reliability critical items to mitigate or remove any design risk at the pre-design phase. This information helps to reduce the lead time, reduce the cost for design including amendments after finalising the design and prevent design errors which may cause serious injuries.

This TR aids the target audience in identifying the general guidelines and identification of issues. Design specifications have not been included in this TR as they should be decided by professionals such as designers and engineers in accordance with their part applications.

2 Normative references

There are no normative references cited in this TR.