



NSAI

ANNUAL REPORT 2021

NSAI TECHNICAL COMMITTEE
NSAI/TC 49/SC 02 – ADDITIVE
MANUFACTURING

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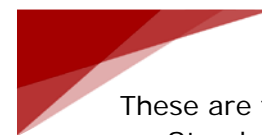
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1 Chairman's Statement

In 2020 Dr Noel Harris was appointment Chairman of this Committee by NSAI. Dr Harris is a Mechanical Engineering Lecturer at NUI Galway with teaching and research interests in Advanced Manufacturing and Materials (including Additive Manufacturing) and he is also a Funded Investigator in I-Form (SFI Advanced Manufacturing Research Centre).

2 Introduction

The ISO Standards Technical Committee [ISO/TC 261](#) was created in 2011 following an agreement with the American Industrial Standards Organisation (ASTM), and the European Standards Organisation (CEN), to have one global suite of AM Standards. [ISO/TC 261](#) and the [ASTM F42](#) work in parallel to produce the AM Standards. The Secretariat of [ISO/TC 261](#) is held by the German National Standards Body (DIN).



These are first ever Standards to be developed for Additive Manufacturing

The Standards being developed at present are the first generation of Standards for Additive Manufacturing.

3 Scope of TC

Standardization in the field of Additive Manufacturing (AM) concerning their processes, terms and definitions, process chains (Hard and Software), test procedures, quality parameters, supply agreements and all kind of fundamentals.

This committee will not produce indigenous Irish Standards. The national committee will participate in the development of International Standards at an ISO level.

The International Standards published by ISO will be adopted as European Standards. NSAI will adopt these European Standards as Irish Standards.

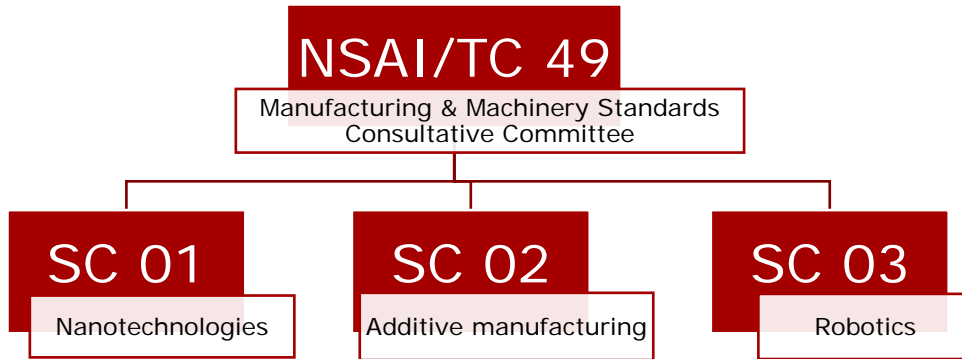
The committee mirrors the following international committees:

Committee Name	Committee Title
ISO/TC 261	Additive Manufacturing
ISO/TC 261/WG 1	Terminology
ISO/TC 261/WG 2	Processes, systems and materials
ISO/TC 261/WG 3	Test methods and quality specifications
ISO/TC 261/WG 4	Data and Design
ISO/TC 261/WG 6	Environment, health and safety
ISO/TC 261/JWG 10	Joint ISO/TC 261 - ISO/TC 44/SC 14 WG Additive manufacturing in aerospace applications
ISO/TC 261/JWG 11	Joint ISO/TC 261 - ISO/TC 61/SC 9 WG, Additive manufacturing for plastics
ISO/IEC JTC 1/WG 12	3D Printing and Scanning

4 Structure and Membership

4.1 Structure

The Figure below illustrates the structure of the National Committee:



4.2 Members

The list below are the members for the year 2021:

Organisation	Role
NSAI	Secretary Support
NSAI	Secretary
National University of Galway	Chairman
Confirm	Committee member
Nammo Ireland	Committee member
HPRA	Committee member
Dublin City University	Committee member
Technological University Dublin	Committee Member
Trinity College Dublin	Committee member
Stryker	Committee member
University College Dublin	Committee member
SteriPack Contract Manufacturing	Committee member
Domone Engineering	Committee member
IT Sligo	Committee member
Neratek	Committee member
Stryker	Committee member
NSAI NML	Committee member
Irish Manufacturing Research	Committee member
Johnson & Johnson	Committee member
University College Dublin	Committee member
Irish Manufacturing Research	Committee member
St James Hospital	Committee member
Trinity College Dublin	Committee member
HP	Committee member
Irish Manufacturing Research	Committee member
Irish Manufacturing Research	Committee member
Johnson & Johnson	Committee member
Boston Scientific	Committee member
Irish Manufacturing Research	Committee member

IT Waterford	Committee member
I-Form	Committee member
dePuy Synthetics	Committee member
IT Waterford	Committee member
Rapid Innovation Unit	Committee member
Trinity College Dublin	Committee member
Trinity College Dublin	Committee member
Laser Prototype Europe (LPE)	Committee member

5 Summary of 2021 Activities

5.1 National

5.1.1 Meetings

The meetings were conducted via web-conferencing meeting facilities due to the restrictions caused by Covid-19. Committee members attended the following national meetings as follows:

Meeting No.	Date	Minutes Reference ** optional**
1	01 st March 2021	N 139
2	06 th May 2021	N 165
3	09 th September 2021	N 199

5.1.2 National Work

The Standards Committees will not draft any National Standards. All of the ISO/TC 261 Standards are being adopted as European Standards and will therefore be published as Irish Standards.

5.2 International/Regional

5.2.1 Meetings

Committee members attended international meetings as follows:

Committee Name	Location	Date	No. of Attendees
ISO/TC 261	Online	21 st May 2021	5
ISO/TC 261	Online	17 th September 2021	3

Covid-19 disrupted Irish delegates travelling to the ISO/TC 261 meetings in 2021.

5.2.2 International/Regional Work

Ireland is committed to following and inputting into the development of the AM ISO/ASTM Standards. The National Committee reviews, comments and votes on each of the public comment drafts circulated by ISO/TC 261.

Ireland has seven experts participating in the Working Groups that are drafting the Standards. Within the International Joint Technical Committee for Information Technology, [ISO/IEC JTC 1](#), there is a Working Group, WG 12 focused on 3D printing and Scanning. Ireland is following this work.

5.2.3 International/Regional Standards Reviewed

ISO/ASTM 52900:2021 *Additive manufacturing — General principles — Fundamentals and vocabulary*

ISO/ASTM TS 52930:2021 *Additive manufacturing — Qualification principles — Installation, operation and performance (IQ/OQ/PQ) of PBF-LB equipment*

ISO/ASTM 52950:2021 *Additive manufacturing — General principles — Overview of data processing*

ISO/ASTM DIS 52920, *Additive manufacturing — Qualification principles — Requirements for industrial additive manufacturing sites*

ISO/ASTM DIS 52924, *Additive manufacturing of polymers — Feedstock materials — Qualification of materials for laser-based powder bed fusion of parts*

ISO/ASTM CD 52928, *Additive Manufacturing of Metals — Feedstock Materials — Powder Life Cycle Management*

ISO/ASTM DIS 52931, *Additive manufacturing of metals — Environment, health and safety — General principles for use of metallic materials*

ISO/ASTM DIS 52936-1, *Additive manufacturing of polymers — Powder bed fusion — Part 1: General principles and preparation of test specimens for PBF-LB*

ISO/ASTM CD 52939, *Additive Manufacturing for construction — Qualification principles — Structural and infrastructure elements*

ISO/ASTM AWI 52943-2 *Additive manufacturing for aerospace — Process characteristics and performance — Part 2: Directed energy deposition using wire and arc*

5.2.4 International/Regional Voting Results

The committee voted on twenty-six out of the sixty-five international votes in 2021.

5.3 Regulatory Development/Update

There are no European Regulations applicable to the current suite of Standards being developed.

6 Irish Publications/Reviews

6.1 Publications

National Standards will not be produced by this committee as the International Standards will be published as European Standards adopted as Irish Standards.

6.2 Reviews

The Committee reports to the Manufacturing & Machinery Standards Consultative Committee and the Chairman participates in the work of this group. It was agreed by ISO/TC 261 and ASTM

F42, that in case one organization starts to work on a new work item, it will invite the other to form a Joint Group. Only in case the other organization is not interested, the

standard will be developed “alone”. A Coordination Group has been established (members being the ISO experts in the JGs), which meets mainly by web-conference, and which intends, among other things, to achieve a quick flow of information from one JG to the other (at least for the ISO experts in the JGs), a quick response to questions from ASTM and quick nomination of additional ISO experts to new JGs.

7 Work programme for 2022 onwards

7.1 ISO/TC 261

ISO/PWI 27548, *Additive manufacturing of polymers — Environment, health and safety — Test method for the determination of particle emission rates from desktop ME printers*

ISO/ASTM DIS 52902, *Additive manufacturing — Test artifacts — Geometric capability assessment of additive manufacturing systems*

ISO/ASTM CD 52903-2 *Additive manufacturing — Material extrusion-based additive manufacturing of plastic materials — Part 2: Process equipment*

ISO/ASTM CD 52904 *Additive manufacturing of metals — Process characteristics and performance — Metal powder bed fusion process to meet critical applications*

ISO/ASTM PRF TR 52906 *Additive manufacturing — Non-destructive testing — Intentionally seeding flaws in parts*

ISO/ASTM DIS 52908 *Additive manufacturing of metals — Finished Part properties — Post-processing, inspection and testing of parts produced by powder bed fusion*

ISO/ASTM DIS 52909 *Additive manufacturing — Finished part properties — Orientation and location dependence of mechanical properties for metal powder bed fusion*

ISO/ASTM CD 52910, *Additive manufacturing — Design — Requirements, guidelines and recommendation*

ISO/ASTM DIS 52911-3, *Additive manufacturing — Design — Part 3: Standard Guideline for Electron-based powder bed fusion of metals*

ISO/ASTM DTR 52913-1, *Additive manufacturing — Feedstock materials — Part 1: Parameters for characterization of powder flow properties*

ISO/ASTM PWI 52914, *Additive Manufacturing of Polymers — Design — Material extrusion of thermoplastics*

ISO/ASTM DTR 52917, *Additive manufacturing — Round Robin Testing — General Guidelines*

ISO/ASTM CD TR 52918, *Additive manufacturing — Data formats — File format support, ecosystem and evolutions*

ISO/ASTM AWI 52919, *Additive manufacturing — Qualification principles — Test method of sand mold for metal casting*

ISO/ASTM DIS 52920 *Additive manufacturing — Qualification principles — Requirements for industrial additive manufacturing sites*

ISO/ASTM DIS 52921 *Additive manufacturing — General principles — Standard practice for part positioning, coordinates and orientation*

ISO/ASTM PWI 52922, *Additive manufacturing — Design — Directed energy deposition of metals*

- ISO/ASTM PWI 52923, *Additive Manufacturing — Design — Decision support*
- ISO/ASTM DIS 52926-1, *Additive Manufacturing of metals — Qualification principles — Part 1: General qualification of operators*
- ISO/ASTM DIS 52926-2 *Additive Manufacturing of metals — Qualification principles — Part 2: Qualification of operators for PBF-LB*
- ISO/ASTM DIS 52926-3 *Additive Manufacturing of metals — Qualification principles — Part 3: Qualification of operators for PBF-EB*
- ISO/ASTM DIS 52926-4, *Additive Manufacturing of metals — Qualification principles — Part 4: Qualification of operators for DED-LB*
- ISO/ASTM DIS 52926-5 *Additive Manufacturing of metals — Qualification principles — Part 5: Qualification of operators for DED-Arc*
- ISO/ASTM DIS 52927 *Additive manufacturing — General principles — Main characteristics and corresponding test methods*
- ISO/ASTM CD 52932, *Additive manufacturing — Environmental health and safety — Standard test method for determination of particle emission rates from desktop 3D printers using material extrusion*
- ISO/ASTM AWI 52933, *Additive manufacturing — Environment, health and safety — Consideration for the reduction of hazardous substances emitted during the operation of the non-industrial ME type 3D printer in workplaces, and corresponding test method*
- ISO/ASTM CD 52935 *Additive manufacturing of metals — Qualification principles — Qualification of coordinators for metallic parts production*
- ISO/ASTM AWI 52937, *Additive Manufacturing of metals — Qualification principles — Qualification of designers*
- ISO/ASTM AWI 52938-1 *Additive manufacturing of metals — Environment, health and safety — Part 1: Safety requirements for PBF-LB machines*
- ISO/ASTM CD 52939 *Additive Manufacturing for construction — Qualification principles — Structural and infrastructure elements*
- ISO/ASTM PWI 52940 *Additive manufacturing of ceramics – Feedstock materials – Characterization of ceramic slurry in vat photopolymerization*
- ISO/ASTM PWI 52943-1 *Additive manufacturing — Process characteristics and performance — Part 1: Standard specification for directed energy deposition using wire and beam in aerospace applications*
- ISO/ASTM PWI 52943-3 *Additive manufacturing — Process characteristics and performance — Part 3: Standard specification for directed energy deposition using laser blown powder in aerospace applications*
- ISO/ASTM PWI 52944 *Additive manufacturing — Process characteristics and performance — Standard specification for powder bed processes in aerospace applications*
- ISO/ASTM AWI 52945 *Additive manufacturing for Automotive — Qualification principles — Generic machine evaluation and specification of Key Performance Indicators for PBF-LB/M processes*
- ISO/ASTM PWI 52946 *Additive manufacturing – Feedstock materials – Stainless steel alloy UNS S31603 for powder bed fusion*
- ISO/ASTM PWI 52946 *Additive manufacturing – Feedstock materials – Stainless steel alloy UNS S31603 for powder bed fusion*

ISO/ASTM PWI 52947 *Additive Manufacturing – Feedstock materials – Nickel alloy UNS N06625 for Powder bed fusion*

ISO/ASTM PWI 52951 *Additive Manufacturing – Data – Data packages for AM parts*

ISO/ASTM PWI 52952 *Additive Manufacturing of metals – Feedstock materials – Correlating of rotating drum measurement with powder spreadability in PBF-LB machines*

ISO/ASTM PWI 52953 *Additive manufacturing – Data – Registration of Process-Monitoring and Quality-Control Data*

7.2 ISO/IEC JTC 1/WG 12 – 3D Printing & Scanning

ISO/IEC/23510:2021 *Information technology – 3D printing and scanning – Framework for an Additive Manufacturing Service Platform (AMSP)*

ISO/IEC PWI 24398 *Information technology – Overview and vocabulary on 3D printing and scanning*

ISO/IEC DIS 3532-1 *Information technology – 3D Printing and scanning – Medical image-based modelling – Part 1: General requirement*

ISO/IEC CD 3532-1 *Information technology – 3D Printing and scanning – Medical image-based modelling – Part 1: General requirement*

8 Additional Information

Ireland was due to host ISO/IEC JTC1 between the 09th to the 13th of May 2022 however, due to Covid-19 restriction this event is cancelled.

The Secretary worked with members of the committee to produce a document informative in nature and provides an overview of Additive Manufacturing (AM) from a standards perspective, following the structure of the International Organization for Standardization Technical Committee ISO/TC 261 and the joint standardization between ISO and ASTM in Joint Groups (JGs).

Findings are linked in this document from the Organization for Economic Co-operation and Development (OECD) on the importance of engaging in standards development for SMEs, the report stresses on the importance of standards by emphasizing on the connections and benefits achievable through standards, that can positively affect innovation.

In order to showcase the importance of standards for innovation a case study is employed, in this document whereby the use of standards in the collaboration between the Irish Manufacturing Research and the Atlantic Prosthetic and Orthotic Services is outlined. Standards enabled the development of a digital workflow for Computer Aided Design (CAD) and Additive Manufacture (AM) for the identification of transtibial (through the shin) prosthetic sockets from scanned patient data.

This document is publicly available from the NSAI website at [Introduction to NSAI/TC 49/SC 2 & standardization for Additive Manufacturing](#),