**Draft Project plan for the CEN-CENELEC Workshop on “Zero Defect Manufacturing – Basic Principles and Requirements”**

**Requests to participate in the Workshop and/or comments on the project plan are to be submitted by**

**2023-08-20 to christian.grunewald@din.de[[1]](#footnote-1)**

Recipients of this project plan are kindly requested to name all patent rights known to them to be relevant to the Workshop and to make available all supporting documents.

**Berlin, 2023-05-24 (Version 1)**

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# Status of the project plan

**Draft project plan** for public commenting (Version 1.0)

This draft project plan is intended to inform the public of a new Workshop. Any interested party can take part in this Workshop and/or comment on this draft project plan. Please send any requests to participate or comments by e-mail to christian.grunewald@din.de.

All those who have applied for participation or have commented on the project plan by the deadline will be invited to the kick-off meeting of the Workshop on 2023-09-08.

**Approved project plan** for CWA development adopted at the kick-off meeting of the Workshop on **<yyyy-mm-dd>** (Version **<No.>**)

# Workshop proposer and Workshop participants

## Workshop proposer

|  |  |
| --- | --- |
| **Person or organisation** | **Short description and interest in the subject** |
| Dr. Foivos Psarommatis  Senior Researcher  University of Oslo, Norway/  Universitat Politècnica de València, Spain | Foivos Psarommatis is an engineer active in the areas of design and quality improvement of manufacturing systems. Currently, he is a senior researcher at University of Oslo (UiO) and Universitat Politècnica de València (UPV). More specifically is a pioneer in the area of Zero Defect Manufacturing (ZDM), as is the first who modernized and set the foundation of modern ZDM. His scientific interests and motivation are around Industry 4.0/5.0 and on how ZDM can be applied efficiently to production systems, focusing on the decision making, scheduling and design of systems, with ultimate goal to achieve true sustainable manufacturing. His work is also cited in IEC TR 63283‑5. |

## Other potential participants

This CWA will be developed in a Workshop (temporary body) that is open to any interested party. The participation of other experts would be helpful and is desired. It is recommended that:

* manufacturers who applied zero defects manufacturing
* manufacturers who are interested in zero defects manufacturing
* manufacturing quality experts
* I4.0 experts

take part in the development of this CWA.

## Participants at the kick-off meeting

The following persons or organisations already signed up to the kick-off meeting prior to the publication of the draft project plan.

|  |  |
| --- | --- |
| **Person** | **Organisation** |
| Foivos Psarommatis | University of Oslo/ Universitat Politècnica de València |
| Oscar Salgado | IKERLAN, Spain |
| Daryl Powell | SINTEF, Norway |
| Evangelos Kitsos | Epariston, Greece |
| Olga Meyer | Fraunhofer IPA, Germany |
| Paulo Rodrigues | Consulgal, Portugal |
| Angelo Facondini | HSD SPA, Italy |
|  | Profactor GmbH, Austria |
|  | Instituto Tecnologico de Informatica, Spain |
| João Sousa, Artem Nazarenko | UNINOVA, Portugal |
| Universitat Politècnica de València, Spain | Raul Poler, Francisco Fraile, Joan Lario, Miguel A. Mateo-Casali |
|  | Video Systems, Italy |
| Victor Azamfirei | Mälardalens universitet, Sweden |
| Jacopo Cassina | Holonix, Italy |
| Christian Grunewald | DIN |
| Yusuf Yilmaz | DIN |

## Registered Workshop participants

The following persons or organisations have registered as Workshop participants at the kick-off meeting and will actively participate in the development of the CWA.

|  |  |
| --- | --- |
| **Person** | **Organisation** |
| Workshop Chair | Workshop Chair |
| Workshop Vice-Chair | Workshop Vice-Chair |
|  |  |
|  |  |
| Workshop secretariat | Workshop secretariat |

# Workshop objectives and scope

## Background

Companies use a variety of quality management methods to improve their operational performance to attain high-quality production. The application of Industry 4.0 technological advances along the production process chain has led to a fundamental change in manufacturing quality management systems. These advances make it possible to achieve unprecedented levels of manufacturing quality and to produce high-quality products most efficiently, i.e., to realize the paradigm of zero-defect production. Zero defects manufacturing (ZDM) is the latest and most advanced approach for quality assurance. ZDM is composed of four main strategies: “Detect” and “Predict” that are the triggering ZDM strategies, and the “Repair” and “Prevent” that are the action ZDM strategies. The three ZDM pair strategies are “Detect-Repair”, “Detect-Prevent” and “Predict-Prevent”. The main difference of ZDM with the traditional quality assurance methodologies is the fact that ZDM ensures 100% of the products are inspected via any method, either detection or prediction. It is impossible to achieve ZDM if not all the products are inspected. In traditional quality improvement methods such as Six Sigma, Lean manufacturing, Lean Six Sigma, Theory of Constraints, and Total Quality Management, the analysis starts after the production has started and defects or quality issues start occurring. Modern technological advancements provided capabilities that were not possible in the past. These technological advancements initiated the emergence of another QMS method named Zero Defect Manufacturing (ZDM). One major change in ZDM is about the flow of information. Indeed, ZDM uses both historical and real-time data to prevent product from defect. Doing this, ZDM combines several quality control applications concerning production lines, machinery, automation applications, and supply chain processes. This is possible thanks to the development of IT systems and Industry 4.0. The core concept of ZDM is “Make it right at first attempt”.

Please find an overview of ZDM in [Psarommatis2020] and [Psarommatis2022a].

The objectives of the planned workshop are to define basic principles of zero defects manufacturing (ZDM), based on the terminology, which was recently created in a CEN-CENELEC Workshop and is available as CWA 17918:2022[[2]](#footnote-2). It should contain the steps on how to get to a ZDM manufacturing line and could be used by manufacturers to implement ZDM (both on existing and new manufacturing lines). A defined set of requirements will support the manufactures to ensure following the principles of ZDM.

Further information of CWA 17918:2022 can be found in [Sousa2022] and work on an Ontology based on it in [Psarromatis2023a]. Additional information to ZDM can be found in [Psarommatis2021, Psarommatis2022b, Psarommatis2023b].

## Scope

The workshop will create two CEN-CENELEC Workshop Agreements (CWA) with the proposed titles: "Zero Defects Manufacturing – Basic Principles" and "Zero Defects Manufacturing – Requirements". The WS will define the basic principles and requirements for Zero Defects Manufacturing. The ladder CWA is intended of being used as basis for conformity assessment.

The CWA Zero Defects Manufacturing – Requirements will set requirements which need to be fulfilled for manufacturers capable of implementing ZDM and producing with ZDM.

The proposed CWAs will not be management standards and will be integratable into an enterprises operating system and processes.

## Related activities

The topic of the CWA is related to the following European technical committees and initiatives:

* CEN-CENELEC-ETSI Coordination Group on Smart Manufacturing (CEN-CLC-ETSI SMa-CG)
* CLC/TC 65X Industrial-process measurement, control and automation
* CEN-CLC/JTC 1 Criteria for conformity assessment bodies

On international level the following technical committees are the most relevant ones:

* IEC/TC 65/WG 23 Smart Manufacturing Framework and System Architecture
* IEC/TC 65/WG 16 Digital Factory
* IEC/SC 65E/WG 12 Predictive Maintenance
* ISO/TC 184 - Automation systems and integration
* ISO/TC 108/SC 5 Condition monitoring and diagnostics of machine systems
* ISO/TC 69 - Applications of statistical methods
* ISO/TC 176 - Quality management and quality assurance

The Workshop shall ensure appropriate links are in place with these initiatives.

The most important existing standards for the Project Plan are listed in the following table.

| **Number** | **Title** |
| --- | --- |
| ISO 9000:2015 | Quality management systems - Fundamentals and vocabulary |
| ISO 9001:2015 | Quality management systems - Requirements |
| ISO 17359:2018 | Condition monitoring and diagnostics of machines - General guidelines |
| ISO 2859-1:1999 | Sampling procedures for inspection by attributes |
| ISO 13053-1:2011 | Quantitative methods in process improvement |
| ISO 3534-2:2006 | Statistics - Vocabulary and symbols - Part 2: Applied statistics |
| ISO 13372:2012 | Condition monitoring and diagnostics of machines - Vocabulary |
| ISO/IEEE 11073-10201:2020 | Health informatics - Device interoperability - Part 10201: Point-of-care medical device communication - Domain information model |
| ISO 15746-1:2015 | Automation systems and integration - Integration of advanced process control and optimization capabilities for manufacturing systems - Part 1: Framework and functional model |
| EN ISO 10012 (under revision) | Measurement management systems - Requirements for measurement processes and measuring equipment |
| IEC TR 63283-5 ED1 | Industrial-process measurement, control and automation – Smart manufacturing – Part 5: Market and innovation trends analysis |
| ISO/IEC 17000:2004 | Conformity assessment – Vocabulary and general principles |
| ISO/IEC 17007:2009 | Conformity assessment – Guidance for drafting normative documents suitable for use for conformity assessment |

# Workshop programme

## General

The kick-off meeting is planned to take place on 2023-09-08. A draft for public commenting will be published for 30 days.

A total of 8 Workshop meetings (kick-off meeting and Workshop meetings) and web conferences will be held, during which the content of the CWA(s) will be presented, discussed and approved.

There will be additional meetings in sub-groups as needed to organise the paperwork.

The CWA will be drawn up in **english** (language of meetings, minutes, etc.). The CWA will be written in **english**.

## Workshop schedule

**Work Items**

CWA Zero Defect Manufacturing – Basic Principles

**04-2024** First draft

**08-2024** Final draft for commenting

CWA Zero Defect Manufacturing – Requirements

**06-2024** First draft

**10-2024** Final draft for commenting

Table 1: Workshop schedule (preliminary)

The project schedule is for orientation only and is to be modified as the Workshop progresses.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CEN-CENELEC Workshop Month** |  |  |  |  | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **…** |
| **Initiation** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 1. Proposal form submission and TC and BT response |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 2. Project plan development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 3. Open commenting period on draft project plan (mandatory) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Operation** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 4. Kick-off meeting |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 5. CWA(s) development |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 6. Open commenting period on draft CWA(s) (optional) |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 7. CWA(s) finalised and approved by Workshop participants |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Publication** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8. CWA(s) publication |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Dissemination (see 7)** |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **Milestones** |  |  |  |  | **K** |  | **V** |  | **V** |  | **V** |  | **V** |  | **V** |  | **V** |  |  |  | **V/A** |  | **P** | **D** |

**B** CEN/CENELEC BT meeting deciding on establishment of a CEN/CENELEC Workshop

**K** Kick-off

**M** Workshop meeting

**V** Virtual Workshop meeting

**A** Adoption of CWA

**P** Publication of CWA

**D** Online distribution of CWA

# Resource planning

As general principle, all costs related to the participation of interested parties in the Workshop’s activities have to be borne by themselves.

Registration and participation at this CEN-CENELEC Workshop are free of charge, but each participant shall bear his/her own costs for travel, accommodation, and subsistence.

The administrative costs of the CEN-CENELEC Workshop Secretariat as well as the logistical support, such as online conference tool, will be covered by ZDMP and ZDZW through its Horizon 2020 funding (grant agreement no. 825631 and 101057404). The copyright of the CWA shall be with CEN-CENELEC.

# Workshop structure and rules of cooperation

## Participation in the Workshop

The Workshop will be constituted during the course of the kick-off meeting. By approving this project plan, the interested parties declare their willingness to participate in the Workshop and will be formally named as Workshop participants, with the associated rights and duties. Participants at the kick-off meeting who do not approve the project plan are not given the status of a Workshop participant and are thus excluded from further decisions made during the kick-off meeting and from any other decisions regarding the Workshop.

As a rule, the request to participate in the Workshop is closed once it is constituted. The current Workshop participants shall decide whether any additional members will be accepted or not.

Any new participant in the Workshop at a later date is decided on by the participants making up the Workshop at that time. It is particularly important to consider these aspects:

1. expansion would be conducive to shortening the duration of the Workshop or to avoiding or averting an impending delay in the planned duration of the Workshop;
2. the expansion would not result in the Workshop taking longer to complete;
3. the new Workshop participant would not address any new or complementary issues beyond the scope defined and approved in the project plan;
4. the new Workshop participant would bring complementary expertise into the Workshop in order to incorporate the latest scientific findings and state-of-the-art knowledge;
5. the new Workshop participant would actively participate in the drafting of the manuscript by submitting concrete, not abstract, proposals and contributions;
6. the new Workshop participant would ensure wider application of the CWA.

All Workshop participants who voted for the publication of the CWA or its draft will be named as authors in the European Foreword, including the organisations which they represent. All Workshop participants who voted against the publication of the CWA, or who have abstained, will not be named in the European Foreword.

## Workshop responsibilities

The Workshop Chair is responsible for content management and any decision-making and voting procedures. The Workshop Chair is supported by the Workshop Vice-Chair and the responsible Workshop secretariat, whereby the Workshop secretariat will always remain neutral regarding the content of the CWA(s). Furthermore, the Workshop secretariat shall ensure that CEN-CENELEC's rules of procedure, rules of presentation, and the principles governing the publication of CWA(s) have been observed. Should a Workshop Chair no longer be able to carry out her/his duties, the Workshop secretariat shall initiate the election of a new Workshop Chair. The list below covers the main tasks of the Workshop Chair. It is not intended to be exhaustive.

* Content related contact point for the Workshop
* Presides at Workshop meetings
* Ensures that the development of the CWA respects the principles and content of the adopted project plan
* Manages the consensus building process, decides when the Workshop participants have reached agreement on the final CWA, on the basis of the comments received
* Ensures due information exchange with the Workshop secretariat
* Represents the Workshop and its results to exterior

The Workshop secretariat, provided by a CEN/CENELEC national member, is responsible for organising and leading the kick-off meeting, in consultation with the Workshop proposer. Further Workshop meetings and/or web conferences shall be organised by the Workshop secretariat in consultation with the Workshop Chair. The list below covers the main tasks of the Workshop secretariat. It is not intended to be exhaustive.

* Administrative and organisational contact point for the Workshop
* Ensures that the development of the CWA respects the principles and content of the adopted project plan and of the requirements of the CEN-CENELEC Guide 29
* Formally registers Workshop participants and maintains record of participating organisations and individuals
* Offers infrastructure and manage documents and their distribution through an electronic platform
* Prepares agenda and distribute information on meetings and meeting minutes as well as follow-up actions of the Workshop
* Initiates and manage CWA approval process upon decision by the Workshop Chair
* Interface with CEN-CENELEC Management Centre (CCMC) and Workshop Chair regarding strategic directions, problems arising, and external relationships
* Advises on CEN-CENELEC rules and bring any major problems encountered (if any) in the development of the CWA to the attention of CEN-CENELEC Management Centre (CCMC)
* Administrates the connection with relevant CEN or CENELEC/TCs

## Decision making process

Each Workshop participant is entitled to vote and has one vote. If an organisation sends several experts to the Workshop, that organisation has only one vote, regardless of how many Workshop participants it sends. Transferring voting rights to other Workshop participants is not permitted. During voting procedures, decisions are passed by simple majority; abstentions do not count.

If Workshop participants cannot be present in the meetings when the CWA or its draft is adopted, an alternative means of including them in the voting procedure shall be used.

# Dissemination and participation strategy



Proposal form submission

The Workshop proposal was disseminated to the following relevant stakeholders and bodies for consultation:

* CLC/TC 65X Industrial-process measurement, control and automation
* CEN-CLC/JTC 1 Criteria for conformity assessment bodies

And to the coordination group for information:

* CEN-CENELEC-ETSI Coordination Group on Smart Manufacturing (CEN-CLC-ETSI SMa-CG)

Open commenting period on draft project plan

The project plan will be disseminated to the following relevant stakeholders and bodies for commenting:

* CLC/TC 65X Industrial-process measurement, control and automation
* CEN-CENELEC-ETSI Coordination Group on Smart Manufacturing (CEN-CLC-ETSI SMa-CG)
* IEC/TC 65/WG 23 Smart Manufacturing Framework and System Architecture
* IEC/TC 65/WG 16 Digital Factory
* IEC/SC 65E/WG 12 Predictive Maintenance
* ISO/TC 184 - Automation systems and integration
* ISO/TC 108/SC 5 Condition monitoring and diagnostics of machine systems

In addition to the CCMC website, the project plan and the date of the kick-off meeting will be advertised within the ZDM cluster of European Horizon ZDM projects to raise awareness. Interested parties are requested to contribute either through commenting of the project plan (short term) or through Workshop participation (long term).

Open commenting period on draft CWA

The draft CWA will be disseminated to the following relevant stakeholders and bodies for commenting:

* CLC/TC 65X Industrial-process measurement, control and automation
* CEN-CENELEC-ETSI Coordination Group on Smart Manufacturing (CEN-CLC-ETSI SMa-CG)
* IEC/TC 65/WG 23 Smart Manufacturing Framework and System Architecture
* IEC/TC 65/WG 16 Digital Factory
* IEC/SC 65E/WG 12 Predictive Maintenance
* ISO/TC 184 - Automation systems and integration
* ISO/TC 108/SC 5 Condition monitoring and diagnostics of machine systems

In addition to the CCMC website, the draft CWA will be advertised within the ZDM cluster of European Horizon ZDM projects to raise awareness. Interested parties are requested to contribute through commenting of the draft CWA (short term).

CWA publication

The final CWA will be disseminated to the following relevant stakeholders and bodies:

* CLC/TC 65X Industrial-process measurement, control and automation
* CEN-CENELEC-ETSI Coordination Group on Smart Manufacturing (CEN-CLC-ETSI SMa-CG)
* IEC/TC 65/WG 23 Smart Manufacturing Framework and System Architecture
* IEC/TC 65/WG 16 Digital Factory
* IEC/SC 65E/WG 12 Predictive Maintenance
* ISO/TC 184 - Automation systems and integration
* ISO/TC 108/SC 5 Condition monitoring and diagnostics of machine systems
* ZDM Horizon project Cluster

In addition to the CCMC website, the final CWA will be advertised on:

* social media, such as
  + LinkedIn
* Other relevant channels

# Contacts

* Workshop Chair (proposed):

Foivos Psarommatis Giannakopoulos

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* Workshop Secretariat:

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# Literature

Psarommatis2020

Foivos Psarommatis, Gökan May, Paul-Arthur Dreyfus & Dimitris Kiritsis (2020) Zero defect manufacturing: state-of-the-art review, shortcomings and future directions in research, International Journal of Production Research, 58:1, 1-17, DOI: 10.1080/00207543.2019.1605228

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Psarommatis2022a

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<https://www.tandfonline.com/doi/full/10.1080/00207543.2021.1987551>

Powell2022

Daryl Powell, Maria Chiara Magnanini, Marcello Colledani, Odd Myklebust, Advancing zero defect manufacturing: A state-of-the-art perspective and future research directions, Computers in Industry, Volume 136, 2022, 103596, ISSN 0166-3615, https://doi.org/10.1016/j.compind.2021.103596.

<https://www.sciencedirect.com/science/article/pii/S0166361521002037>

Sousa2022

Sousa J, Nazarenko A, Grunewald C, Psarommatis F, Fraile F, Meyer O and Sarraipa J (2022) Zero-defect manufacturing terminology standardization: Definition, improvement, and harmonization. Front. Manuf. Technol. 2:947474. doi: 10.3389/fmtec.2022.947474

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Psarommatis2021

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<https://www.sciencedirect.com/science/article/pii/S0278612521000765>

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<https://www.sciencedirect.com/science/article/pii/S2212827122002347>

Psamorratis2023a

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<https://www.sciencedirect.com/science/article/pii/S0166361522002287>

Psarommatis2023b

Foivos Psarommatis, Gökan May, A practical guide for implementing Zero Defect Manufacturing in new or existing manufacturing systems, Procedia Computer Science, Volume 217, 2023, Pages 82-90, ISSN 1877-0509, https://doi.org/10.1016/j.procs.2022.12.204.

<https://www.sciencedirect.com/science/article/pii/S1877050922022827>

1. Applications for participating in the Workshop and comments on the project plan that are not received by the deadline do not need to be taken into consideration. Once constituted, the Workshop will decide whether or not to consider the comments received in good time. [↑](#footnote-ref-1)
2. CWA 17918:2022 Zero Defects Manufacturing — Vocabulary <https://www.cencenelec.eu/get-involved/research-and-innovation/cen-and-cenelec-activities/cwa-download-area/> [↑](#footnote-ref-2)