
# Importance of process validation according to ISO

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# CONTENT

# INTRODUCTION

The reprocessing of Medical Devices is a complex task, involving different steps and processes which finally leads to a functional, clean, disinfected and/or sterile device that must be safe for the patient and users.

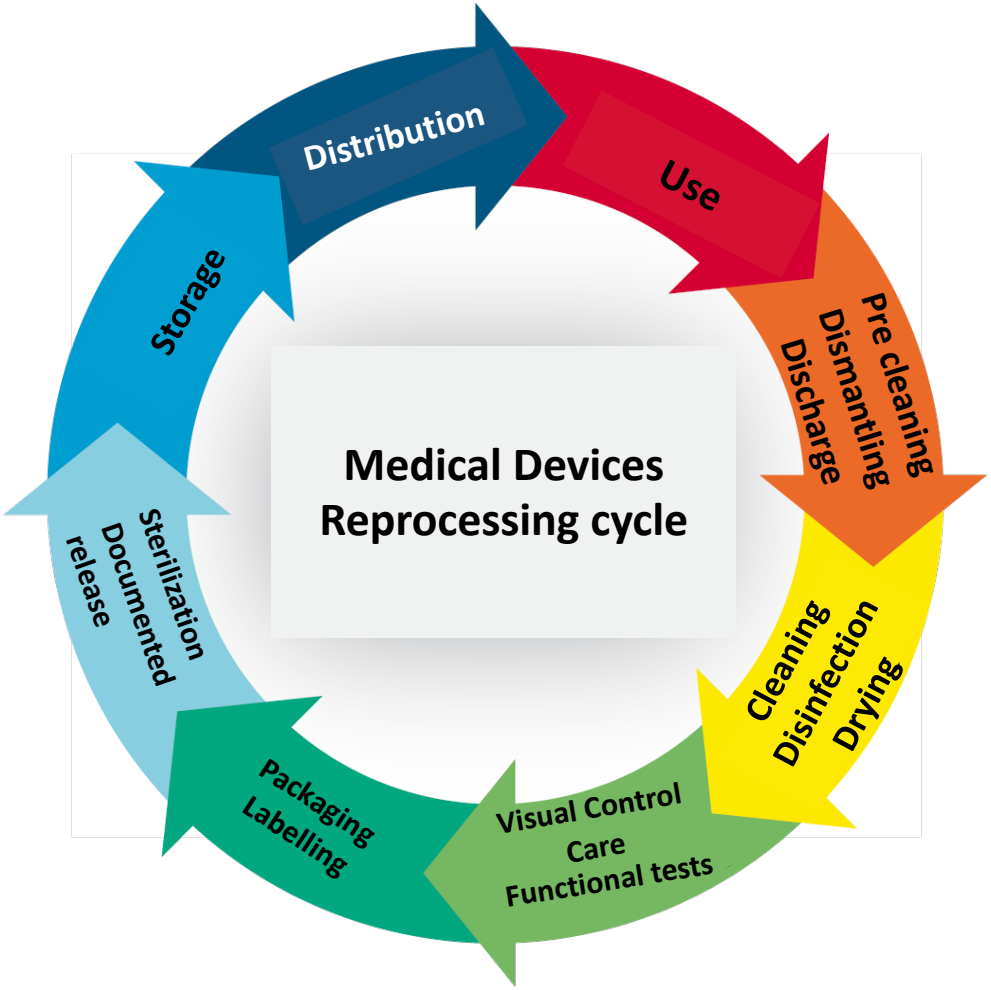


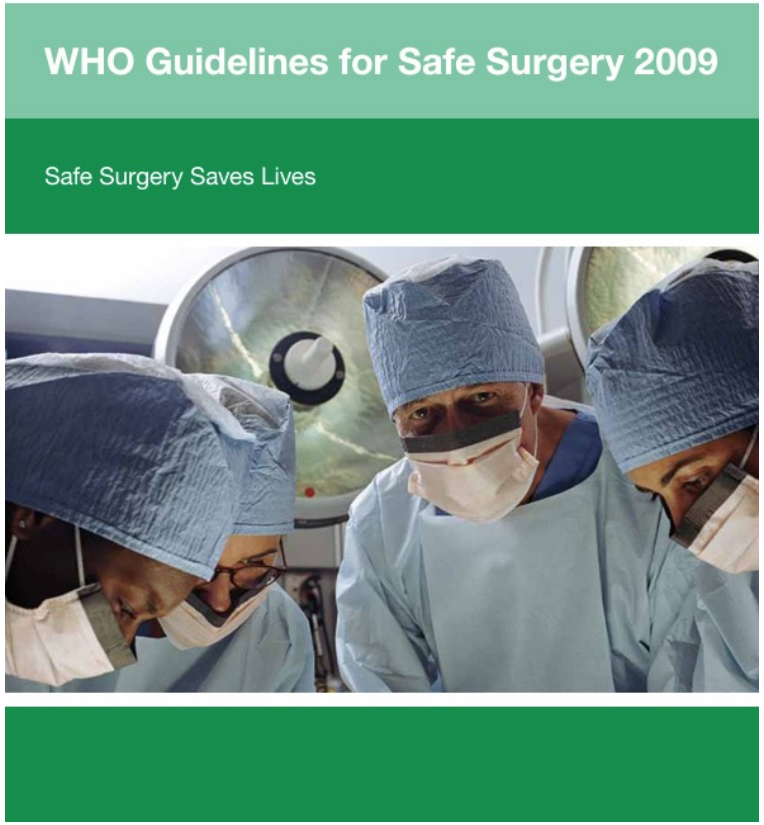

Image translated from DGSV (German Sterilization Society)

# INTRODUCTION

According to good practices from an Infection Control and Safe Surgeries perspective, Medical Devices that will come in direct contact with sterile areas of the human body must be STERILE

World Health Organization

World Health Organization | Patient Safety
A World Alliance for Safer Health Care



# INTRODUCTION

How do me measure the sterility of Medical Devices?

It´s not possible.....

# INTRODUCTION

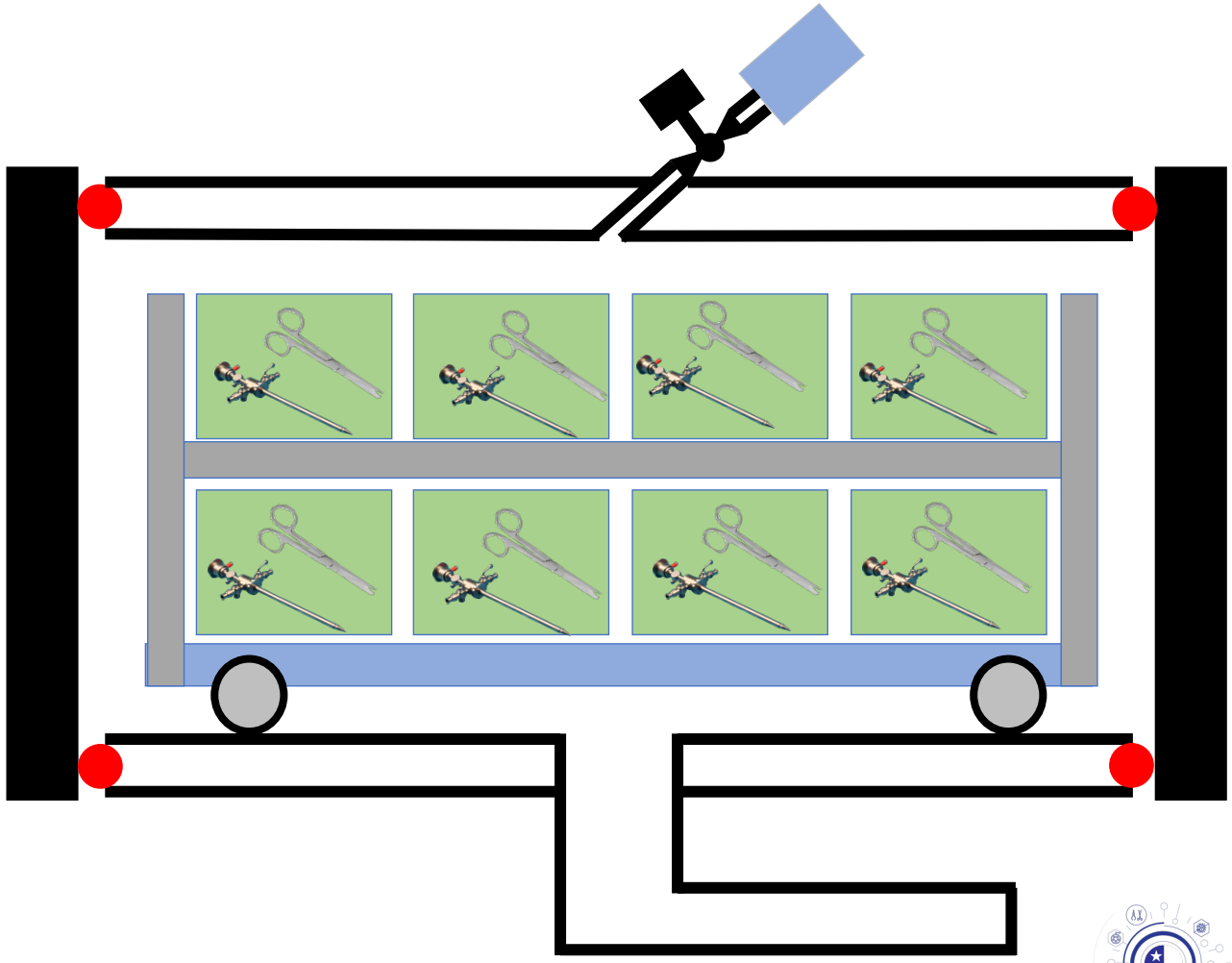
## Problem

Instruments are packed (protected) and therefore sterility cannot be checked after the instruments come out of the sterilizer.

Sterilization conditions are not homogeneous inside the sterilization chamber.

These conditions cannot be directly measured during routine practice.

Hollow instruments have a higher challenge for steam sterilization than solid instruments. The challenge depends on the material, length, diameter and wall thickness.



# BACKGROUND

## DEFINITIONS

Sterilization: validated process to deliver products free of any viable microorganism.

WHO 2016
ISO 17665:2024
AAMI ST79 2017
RKI 2012
ISPCH 2019

Sterile: Free of viable microorganisms.

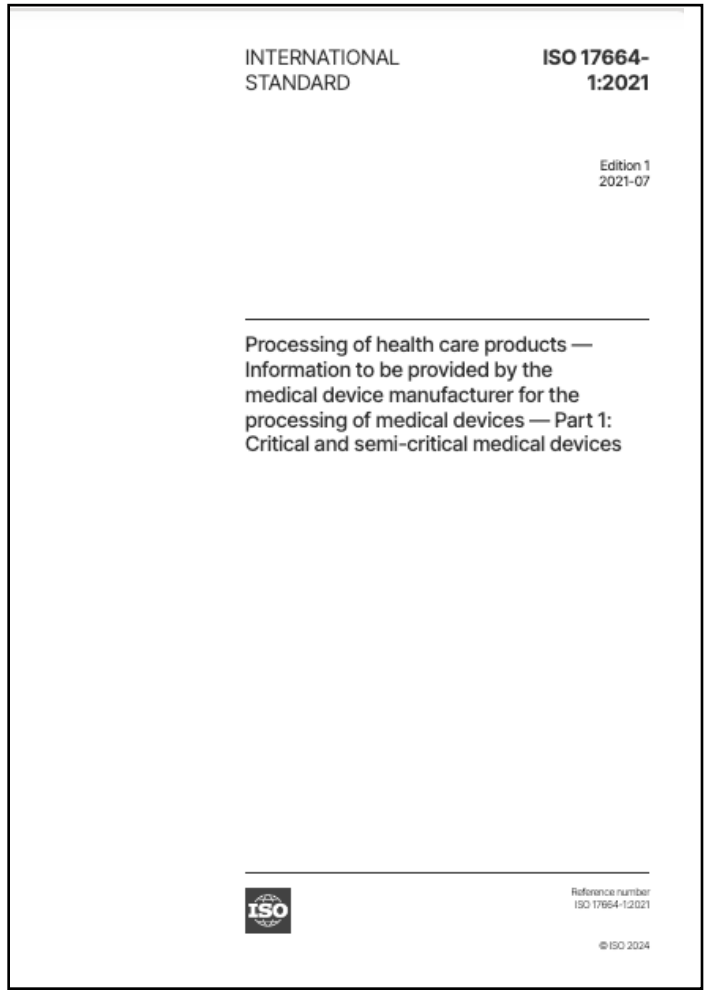
➔ EN 556: Sterile Assurance Level (SAL) < 10-6

ISO 17665:2024
AAMI ST79 2017

WHO 2016: labelling a health care product with the word "sterile" is only permissible when a validated sterilization process has been used.

# BACKGROUND

Cleaning, disinfecting and sterilizing technologies have also undergone significant change in the past decade, resulting in new systems and approaches that can be applied in the processing of medical devices. This has led to a **greater appreciation of the need for validation of processing**, including cleaning, disinfection and/or sterilization in order to ensure that medical devices are effectively processed.


INTERNATIONAL STANDARD

ISO 17664-1:2021

Edition 1
2021-07

Processing of health care products — Information to be provided by the medical device manufacturer for the processing of medical devices — Part 1: Critical and semi-critical medical devices

ISO

Reference number
ISO 17664-1:2021

© ISO 2024

From ISO 17664-1 – Introduction

# BACKGROUND

What does validation mean?

The dictionary says:
- prove that something is correct
- make something acceptable or approved
- support or show the value of something


These definitions of the dictionary are accepted in a context of language but not accepted in a context of Reprocessing of Medical Devices.

# What does validation mean?

According to ISO 11139:
confirmation process, through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled.

This definition is also used by ISO 17665, ISO 15883 and ISO 11607

# BACKGROUND

## What does validation mean?

Process validation, is the documented proof, that the process consistently achieves the intended effect:

- under the local situation
- for the reusable MD/instruments which are used locally
- with the type of consumables used on site (packaging material, process chemicals, etc.).
- defined loading patterns and worst-case loads

# BACKGROUND

## Is this something new?

Process validation is not something new. This concept came up in the 1970ies for the Pharmaceutical Industry after quality incidents with products that leads to patients' deaths.

The concept was/is exactly the same as with MDs: many critical quality specifications of the products, which has a direct influence on the safety and efficacy, cannot be directly measured.

The first version of the "mother" of validation standards (ISO 14937*) was in the year 2000.

*ISO 14937: Sterilization of health care products — General requirements for characterization of a sterilizing agent and the development, validation and routine control of a sterilization process for medical devices

# WHY IS VALIDATION NEEDED?

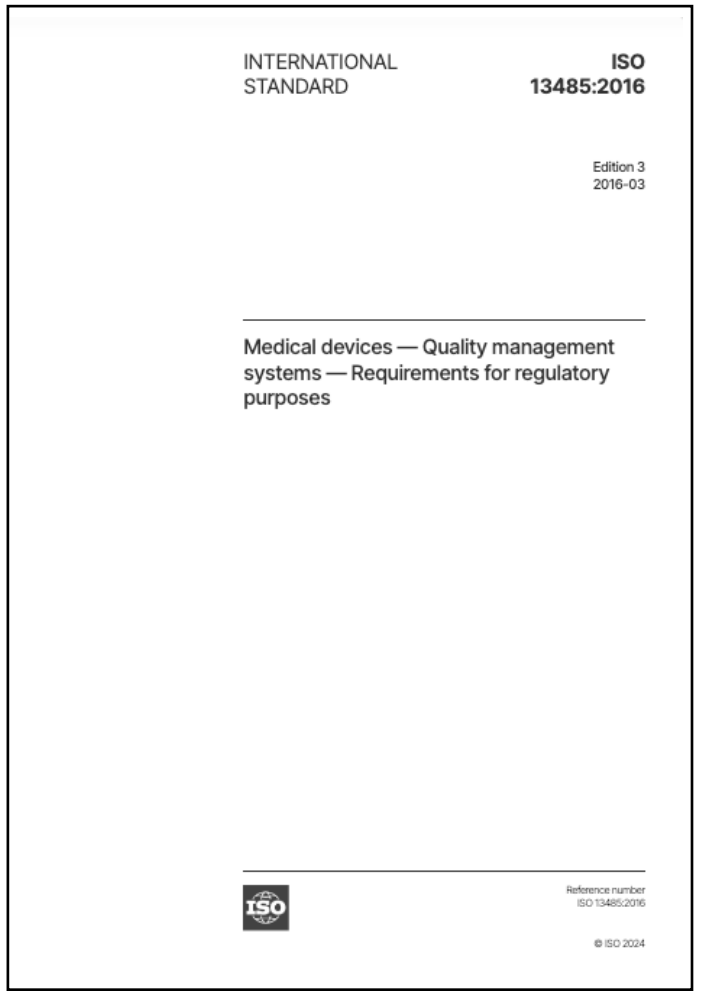
## Technical reasons

Sterilization is a so-called "special process" where the result cannot be verified without a destructive test.

It is not possible to check the sterility of a medical device after its production and before use.

According to ISO 13485 all production processes in which the resulting products cannot be verified and consequently, the possible deficiencies become apparent only when the product is in use, they shall be validated.

→ clean and sterile surgical instruments



INTERNATIONAL STANDARD

**ISO 13485:2016**

Edition 3
2016-03

Medical devices — Quality management systems — Requirements for regulatory purposes

ISO

Reference number
ISO 13485:2016

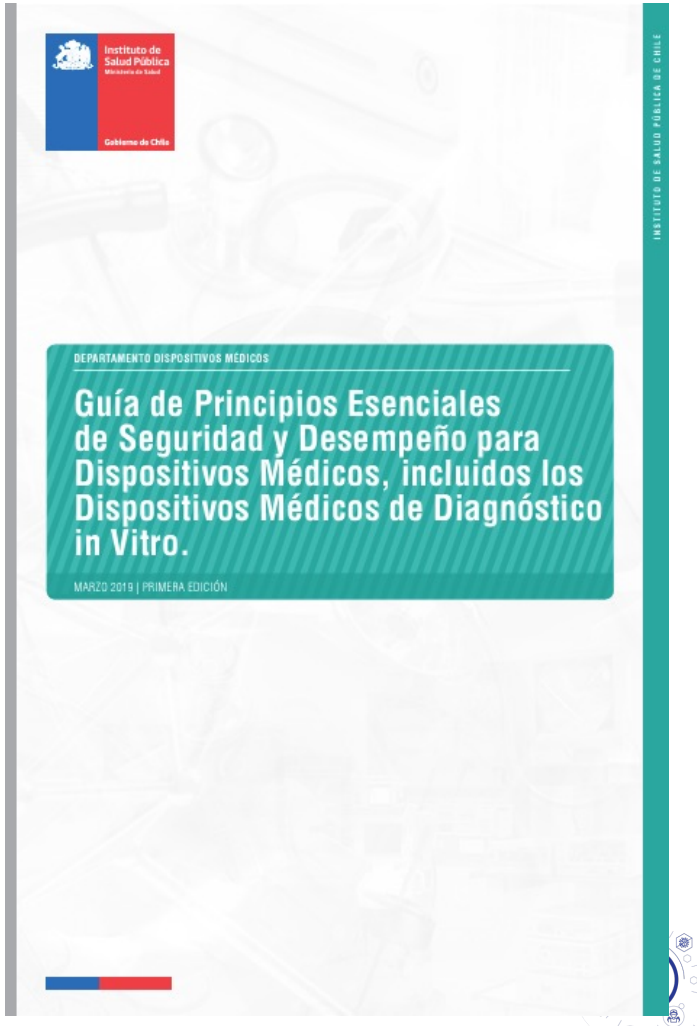
# WHY IS VALIDATION NEEDED?

Regulatory reasons

EU:
- MDR Medical Device Regulation (EU) 2017/745
- National laws/guidelines (e.g. RKI/BfArM Guideline in Germany)

Worldwide:
- Required by International Standards (ISO) and national regulations

Chile:
- Recommended by ISP (Instituto de Salud Pública)

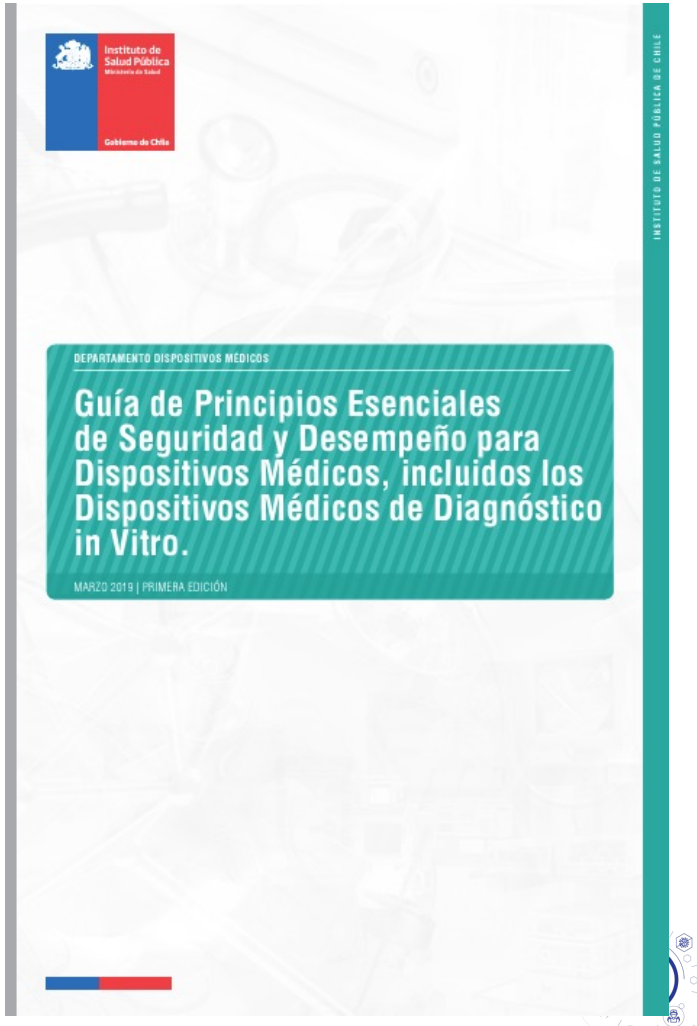


# WHY IS VALIDATION NEEDED?

## Regulatory reasons

4.4.4. Medical Devices and Invitro Medical devices labelled as sterile, must be manufactured packed and sterilized using proper and adequately validated methods. The lifetime of these MD and IVMD must be determined by appropriate validated methods.

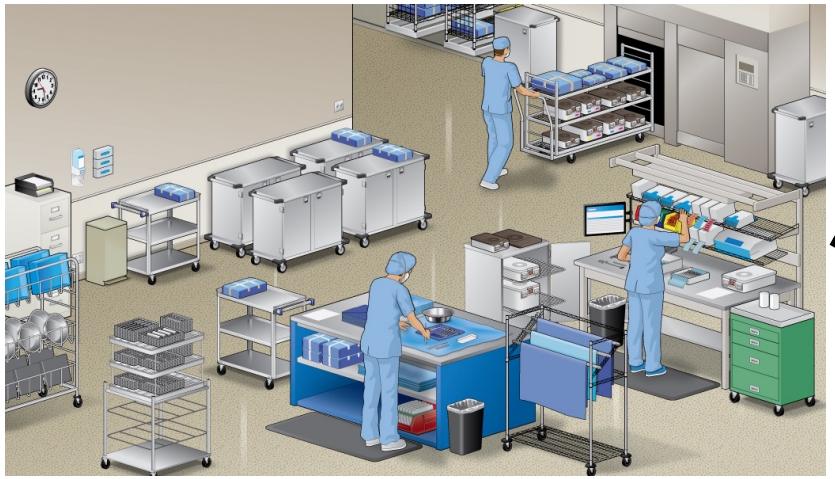
4.13.6.24 If the MD or the IVMD is reusable, the instruction of use must include information about the proper procedures that can allow the reuse, including cleaning, disinfection, packaging and, when appropriate, the validated method for re-sterilization. The information must be provided which allows to know in which moment the MD must not be used anymore, like wearing signs or the maximum allowed number of reutilizations.



# WHY IS VALIDATION NEEDED?

Medical Devices processed in a Hospital must have the same level of safety as those coming from the industry

HOSPITAL CSSD



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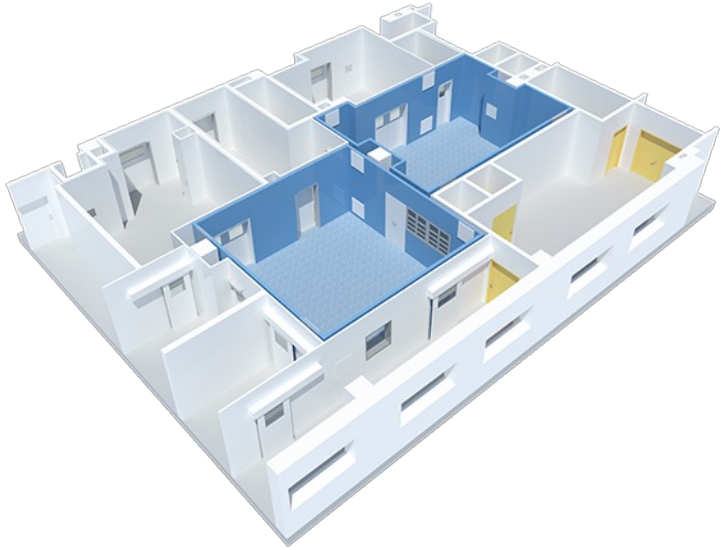
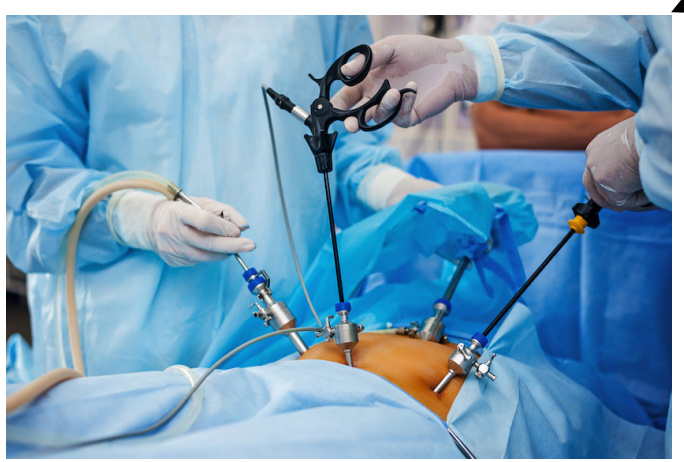
SAFETY

INDUSTRY



PATIENT



# WHY IS VALIDATION NEEDED?

The targets in process validation are to provide:

- High safety in MD reprocessing
- Patient's health and safety
- Staff protection
- Proof of efficiency of processes
- Evidence

SAFETY

Validation is necessary for quality assurance within the processing of reusable MDs

# ISO STANDARDS FOR VALIDATION

## Why ISO?

ISO is the International Organization for Standardization.

Global experts come together to find consensus on how to do certain things in a standardized way, from producing a certain product to manage a process.

Therefore, these standards provide a reliable and up-to-date guideline to implement a Quality Management System for Reprocessing Departments of Medical Devices as well as specific standards for the validation of reprocessing processes, especially those where the results cannot be checked directly on the final products.

# ISO STANDARDS FOR VALIDATION

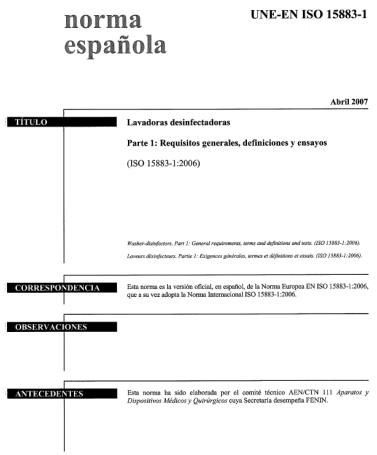
Shall all processes be validated?

All processes where the resulting product quality cannot be checked (because this would destroy it) should be validated. This includes:

- Cleaning and disinfection (manual or automatic)

- Packaging (sealing, soft pack, containers)

- Sterilization (Steam, ETO, FO, H2O2)


norma española

UNE-EN ISO 15883-1

Abril 2007

TÍTULO

Lavadoras desinfectadoras

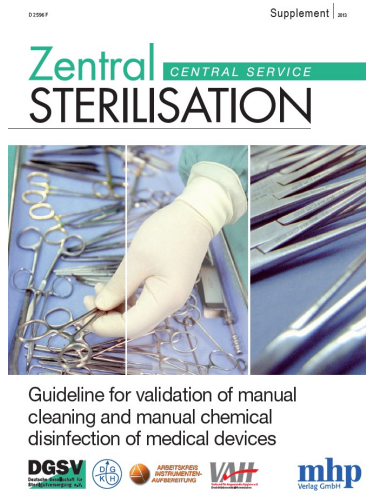
Parte 1: Requisitos generales, definiciones y ensayos

(ISO 15883-1:2006)

CORRESPONDENCIA

OBSERVACIONES

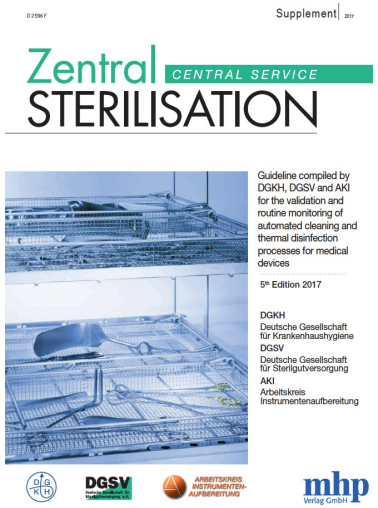
ANTECEDENTES


Zentral CENTRAL SERVICE STERILISATION

Guideline for validation of manual cleaning and manual chemical disinfection of medical devices

DGSV

mhp Verlag GmbH


Zentral CENTRAL SERVICE STERILISATION

Guideline compiled by DGKH, DGSV and AKI for the validation and routine monitoring of automated cleaning and thermal disinfection processes for medical devices

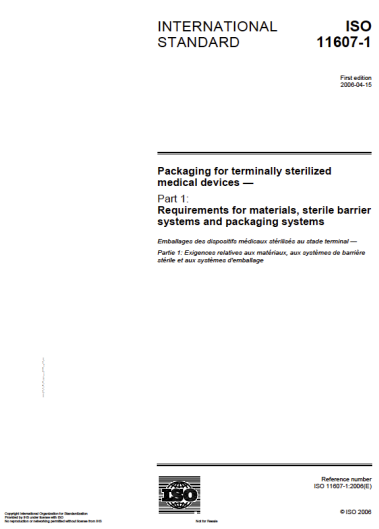
5th Edition 2017

DGKH Deutsche Gesellschaft für Krankenhaushygiene

DGSV Deutsche Gesellschaft für Sterilgutversorgung

AKI Arbeitskreis Instrumentenaufbereitung

mhp Verlag GmbH


INTERNATIONAL STANDARD

ISO 11607-1

Packaging for terminally sterilized medical devices —

Part 1:

Requirements for materials, sterile barrier systems and packaging systems


mhp_medien

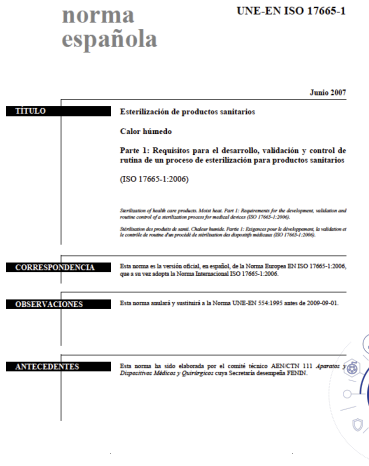
ZENTRAL STERILIZATION

Guideline for the validation of packaging processes according to ISO 11607-2:2019

Revised version 2020 / English version 2024

Supplement

DGSV


norma española

UNE-EN ISO 17665-1

Junio 2007

TÍTULO

Esterilización de productos sanitarios

Calor húmedo

Parte 1: Requisitos para el desarrollo, validación y control de rutina de un proceso de esterilización para productos sanitarios

(ISO 17665-1:2006)

CORRESPONDENCIA

OBSERVACIONES

ANTECEDENTES

# ISO STANDARDS FOR VALIDATION

Validation consists of:

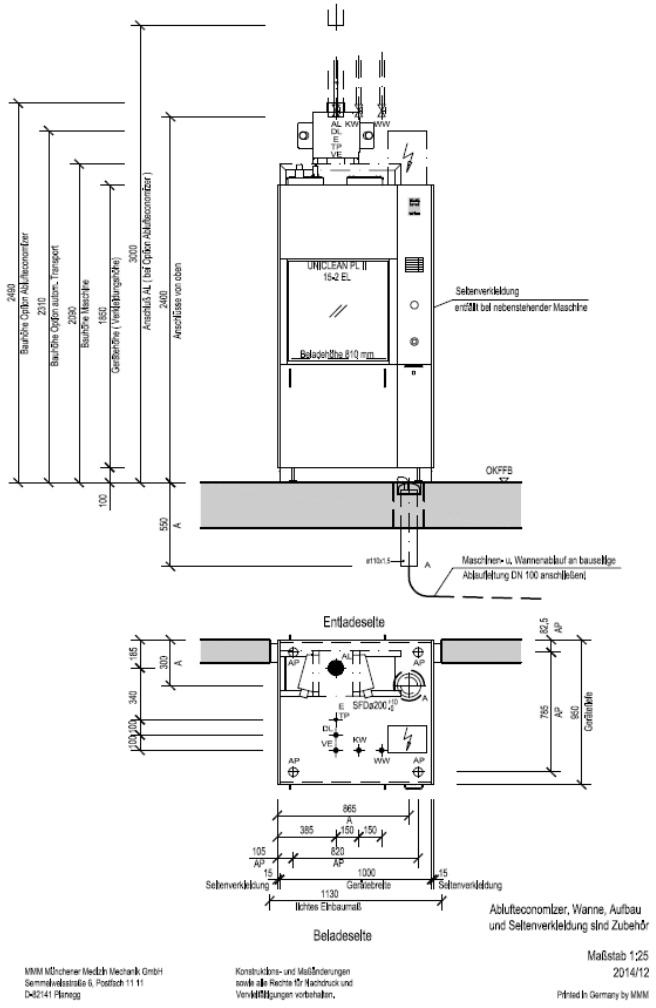
- Installation Qualification (IQ)
- Operational Qualification (OQ)
- Performance Qualification (PQ)

# HOW IT IS CARRIED OUT

## Installation Qualification (IQ)

**Definition**: process of establishing by objective evidence that all key aspects of the process equipment and ancillary system installation comply with the approved specification.*

**Interpretation**: It is a test that the equipment fulfils the specifications, operating instructions, etc., and a test of the services (water, steam, etc.).




*ISO 11139:2018 - Sterilization of health care products – Vocabulary of terms used in sterilization and related equipment and process standards

| Checklist 3: Installation Qualification | | | |
|---|---|---|---|
| Machine (description/number) | | | |
| Location | | | |
| Person responsible for the Installation Qualification | | | |
| IQ reviewer | | | |
| Date of the Test | | | |
| Type of machine: | | ❑ Serial equipment | ❑ No |
| Manufacturer: | | Serial No.: | |
| Type: | | Year of manufacture | |

| Installation Qualification | | Documentation of Order and Delivery | | |
|---|---|---|---|---|
| Ordering Information | | | Delivery Information | Damaged (2) |
| Article description (1) | Article No. | Quantity ordered | Quantity received | Yes/no |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

(1) record here if the ordered items were delivered.
(2) record here if the delivered items were visibly damaged upon receipt.

| Protocol | List of the technical documents for the WD and its accessories | | |
|---|---|---|---|
| Type/title | Present and complete yes/no | Document No./ Material No. | Storage location |
| Installation plan I (Machine) | | | |
| Installation plan II (floor-level tank) | | | |
| Installation plan III (other) | | | |
| Electrical drawings | | | |
| Instructions for Use (WD) | | | |
| Instructions for Use (Other) | | | |
| Operating Manual and Programming Manual | | | |
| Device Book per MPBetreibV | | | |

| No. (1) | Remarks/deviations/complaints | Influence on: | | Deviation resolved/ corrected |
|---|---|---|---|---|
| | | Performance Result (2) | IQ/OQ | Date/signature |
| | | | | |
| | | | | |

(1) Enter the number of the remark/deviation/complaint.
(2) Record the influence on the performance result as none, low, medium, or large. Record the internal departments or contracted firms who carried out and verified the on-site installation of the utilities for the washer/disinfector and accessories.

Source: Guideline compiled by DGKH, DGSV and AKI for the validation and routine monitoring of automated cleaning and thermal disinfection processes for medical devices



## Annex A.2: Installation qualification (IQ) checklist "pouch, reel or bag sealing"

| | | |
|---|---|---|
| Are standard operating procedures (SOPs) available? (example, see Annex A.6 or A.7) | ❑ Yes | ❑ No |

**a) General data sealing device**

| | | |
|---|---|---|
| Manufacturer | | |
| Supplier/distributor | | |
| Type of sealer | | |
| Serial number/software version | | |
| Year of manufacture | | |
| QM certificate from the manufacturer available?* [16] | ❑ Yes | ❑ No |
| Location | | |
| Date of test | | |
| Type of device | ❑ Rotary/band sealer<br>❑ Bar sealer impulse<br>❑ Bar sealer permanently heated | |
| CE conformity? [17] | ❑ Yes | ❑ No |
| ISO 11607-2 conformity? [18] | ❑ Yes | ❑ No |
| DIN 58953-7 conformity? | ❑ Yes | ❑ No |
| Service partner | | |
| Address | | |
| Phone number | | |
| Contact person | | |
| Authorized by the manufacturer/distributor? | ❑ Yes[19] | ❑ No |

**b) Installation conditions**

| **Parameters** | |
|---|---|
| Media supply according manufacturer's specifications | ❑ Yes ❑ No |

**c) Documentation**

| **Document** | **Available** | **Where? (archival site)** |
|---|---|---|
| Operating instructions | ❑ Yes ❑ No | |

16 DIN EN ISO 9001 is sufficient, because a heat sealer is neither a medical device nor an accesory to a medical device.
17 A heat sealer is neither a medical device nor an accesory to a medical device according to the Medical Device Regulation (MDR). (Source: Sterile Barrier Association: "POSITION PAPER Moving from the MDD to the MDR", Link: https://sterilebarrier.org/wp-content/uploads/2023/10/20230712_Moving-from-MDD-to-MDR-impact-on-packaging_Final.pdf (12 July 2023)
18 Conformity with ISO 11607-2 is an absolute prerequisite.
19 Authorization by the manufacturer/distributor must be available in the written form.



Source: Guideline for the validation of packaging processes according to ISO 11607-2:2019 Revised version 2020

# HOW IT IS CARRIED OUT

## Operational Qualification (OQ)

**Definition**: process of obtaining and documenting evidence that installed equipment operates within predetermined limits when used in accordance with its operational procedures.*

**Interpretation (steam sterilization)**: It is a test to demonstrate that the equipment works within the limit values defined by the manufacturer and the relevant standards. The test is performed with a standard load. The equipment must be in perfect condition, and it is important to know the deviations accepted and the tolerances informed by the manufacturer.

*ISO 11139:2018 - Sterilization of health care products – Vocabulary of terms used in sterilization and related equipment and process standards

## Checklist 4: Acceptance Test and parts of Operational Qualification

| SPECTARIS | Acceptance Test Washer-Disinfectors | Page 1 of 3 |
|---|---|---|

| | |
|---|---|
| WD type: | Serial No.: |
| Date: | Manufacturer: |
| Operator: | |
| Location: | |
| Field of use | |

| 1. Visual Inspection | | | Comments |
|---|---|---|---|
| Housing | ❑ ok | ❑ not ok | |
| Chamber | ❑ ok | ❑ not ok | |
| Door region/seals | ❑ ok | ❑ not ok | |
| Load carriers/trays | ❑ ok | ❑ not ok | |
| Dosage equipment | ❑ ok | ❑ not ok | |

| 2. 2. Functional Tests | | | Comments |
|---|---|---|---|
| Water level | ❑ ok | ❑ not ok | |
| Cold water | ❑ ok | ❑ not ok | |
| Warm water | ❑ ok | ❑ not ok | |
| Demineralized water | ❑ ok | ❑ not ok | |
| Spray arms | ❑ ok | ❑ not ok | |
| Dosage system | ❑ ok | ❑ not ok | |
| Load carrier docking | ❑ ok | ❑ not ok | |
| Steam | ❑ ok | ❑ not ok | |
| Condensate removal | ❑ ok | ❑ not ok | |
| Electrical connection | ❑ ok | ❑ not ok | |
| Compressed air | ❑ ok | ❑ not ok | |
| Exhaust | ❑ ok | ❑ not ok | |
| Drain | ❑ ok | ❑ not ok | |

**Thermoelectrical Measurements:**
Test of the disinfection parameters, e.g., 80 °C – 10 min or 90 °C – 5 min,
measured temperature setpoint –0/+5 and actual time at disinfection temperature

| Programme checked/designation: | | | |
|---|---|---|---|
| Achieves setpoint temperature °C | ❑ ok | ❑ not ok | _____ |
| Actual time at setpoint temperature mm:ss | ❑ ok | ❑ not ok | _____ |

Source: Guideline compiled by DGKH, DGSV and AKI for the validation and routine monitoring of automated cleaning and thermal disinfection processes for medical devices



## Annex A.3: Operational qualification (OQ) checklist "pouch, reel or bag sealing"

| Criterion | Lower limit (LL) | Upper limit (UL) |
|---|---|---|
| 1. Target temperature (as per packaging manufacturer = M[23]) | LLM = | ULM = |
| 2. Actual temperature during test (measured/read)[23] | LL = | UL = |
| **Verification of the quality properties** | **Compliance** | **Compliance** |
| **Intact** seal for the entire sealing seam width<br>Evidence based on<br>Test method: seal indicator (see A.7.2) | ❑ Yes ❑ No | ❑ Yes ❑ No |
| **No** channels in the sealing seam<br>Evidence based on<br>Test method: ink test (see A.7.3 and/or A.7.4) | ❑ Yes ❑ No | ❑ Yes ❑ No |
| **No** punctures or tears in the entire packaging<br>Evidence based on<br>Visual inspection | ❑ Yes ❑ No | ❑ Yes ❑ No |
| **No** material delamination or separation<br>Evidence based on<br>Test method: Peel test (see A.7.1) | ❑ Yes ❑ No | ❑ Yes ❑ No |
| **Temperature (T) defined for PQ (mean value from upper and lower limit values of actual temperature at the time of testing)**[24] | T = | |
| Switch-off tolerance in degrees Celsius according to DIN 58953-7 (max. ± 5 °C)[25] | A = | |
| Resulting lower and upper limits | T - A = | T + A = |
| **Requirements** | T - A ≥ LL | T + A ≤ UL |
| **Requirements fulfilled** | ❑ Yes ❑ No | ❑ Yes ❑ No |
| All of the above points have been fulfilled and verified | Name<br>Date, signature | |

23 In the case of special material/device constellations, it may be necessary to deviate from the manufacturer's specifications and redefine limit values.
24 The optimum value determined by the validation does not necessarily have to be the arithmetic mean. Decimals must always be rounded up.
25 If special materials are used (e. g. HDPE), narrower switch-off tolerances may have to be defined if necessary (e.g. ± 3 °C instead of ± 5 °C).
26 The calculation of the mean value is explained in detail in the standard EN 868-5.

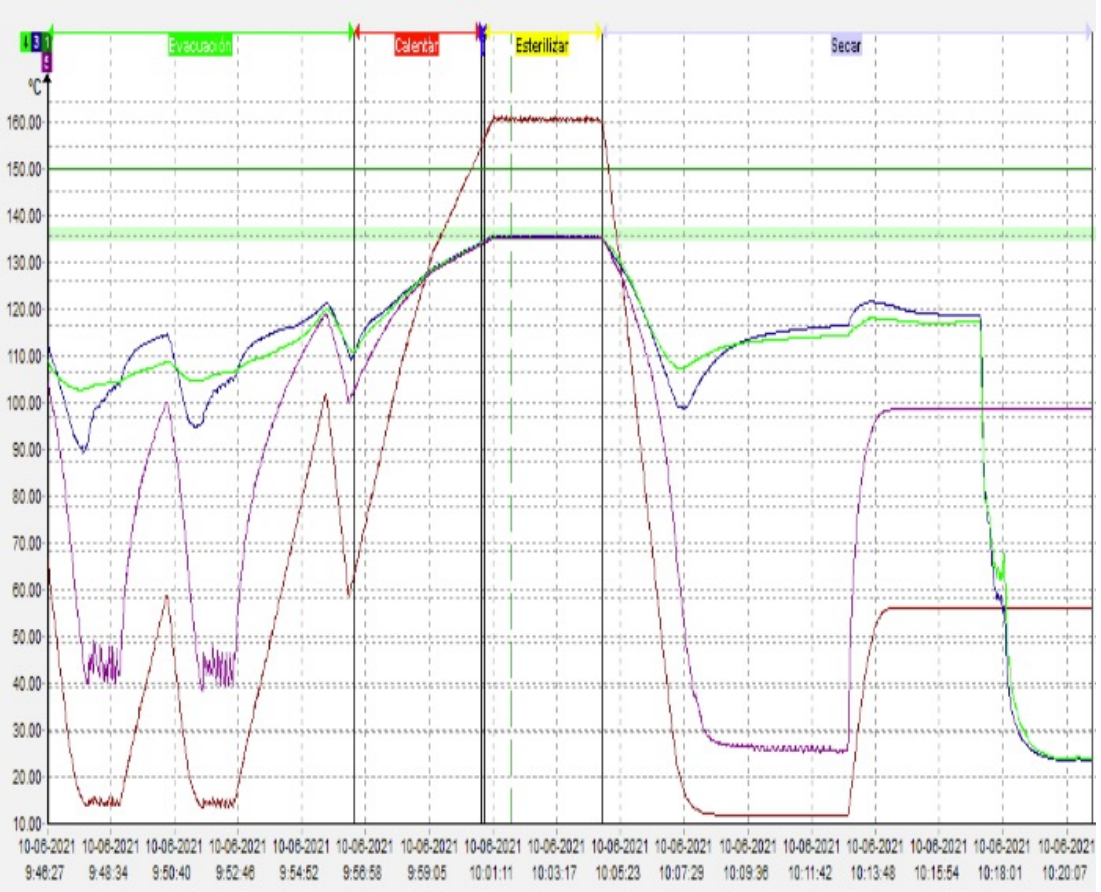


Source: Guideline for the validation of packaging processes according to ISO 11607-2:2019 Revised version 2020

# HOW IT IS CARRIED OUT

Operational Qualification (OQ)
Steam Sterilizer:

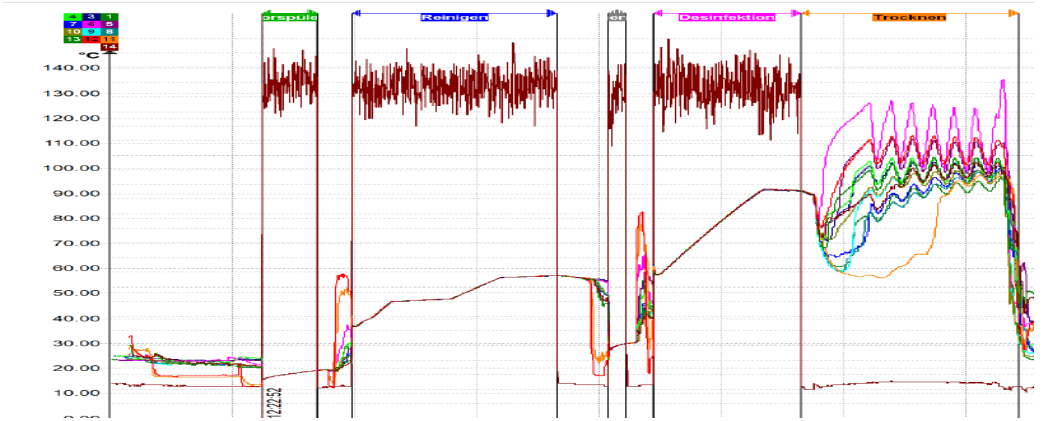
- Vacuum test according to EN 285
- Bowie & Dick test
- Minimal load test
- Other tests for Operational Qualification



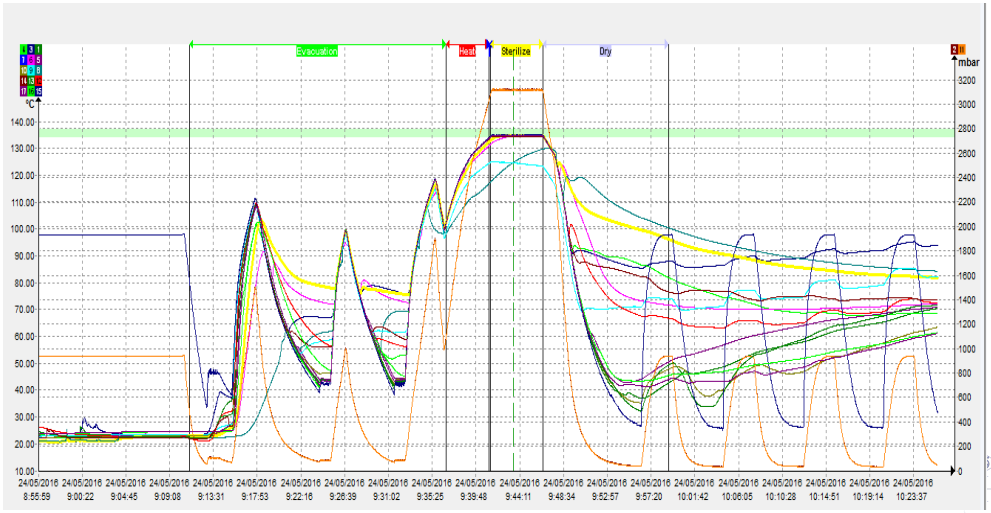
# HOW IT IS CARRIED OUT

## Performance Qualification (PQ)

**Definition**: process of establishing by objective evidence that the process, under anticipated conditions, consistently produces a product which meets all predetermined requirements.*




**Interpretation (steam sterilization)**: It is a test to record that the defined sterilization conditions are permanently achieved, and in all products. It includes the interaction between the technical equipment, the process, the product and the packaging, and confirms that the result of the OQ is valid for the actual load and its packing.




*ISO 11139:2018 - Sterilization of health care products – Vocabulary of terms used in sterilization and related equipment and process standards

# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
Steam sterilization process:

- Load definition (worst case)
- Thermometric tests (3 times)
- Microbiological tests (specific cases)
- Drying test (visual/scale)

# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
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# HOW IT IS CARRIED OUT

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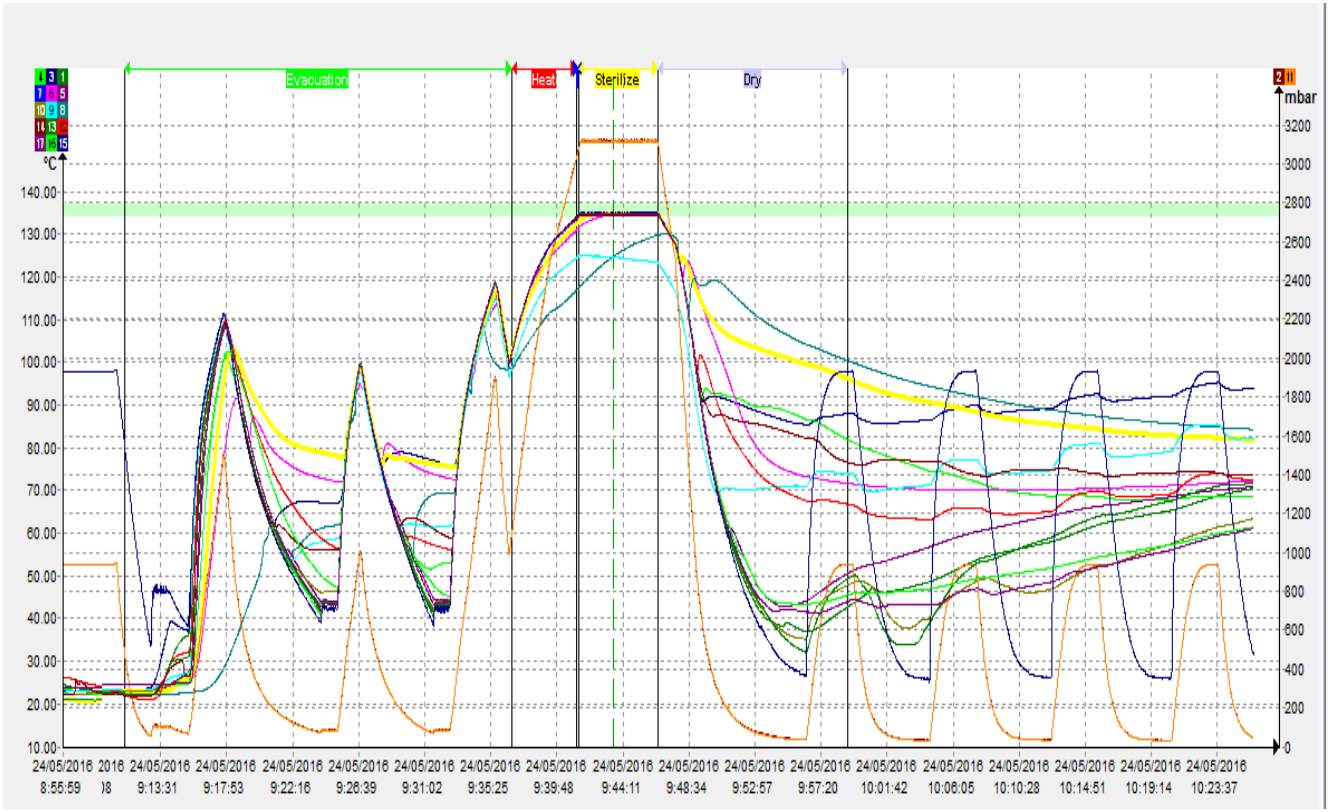


# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
Steam sterilization process:

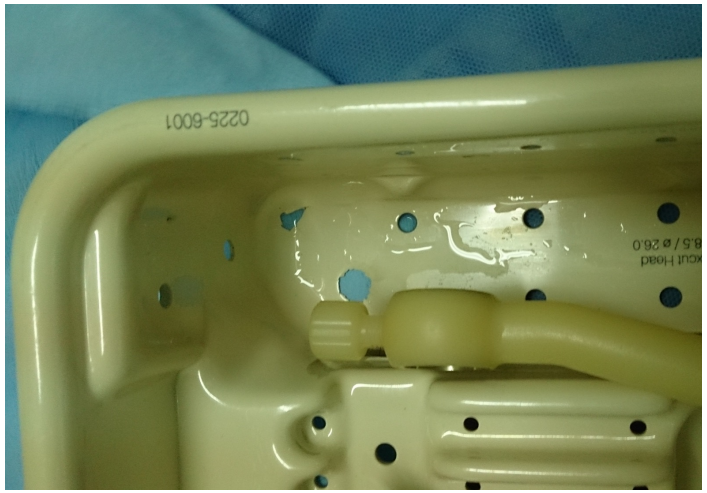
- Load definition (worst case)
- Thermometric tests (3 times)
- Microbiological tests (specific cases) *
- Drying test (visual/scale)

* e.g. in hidden areas that cannot be reached with a thermocouple

# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
Steam sterilization process:

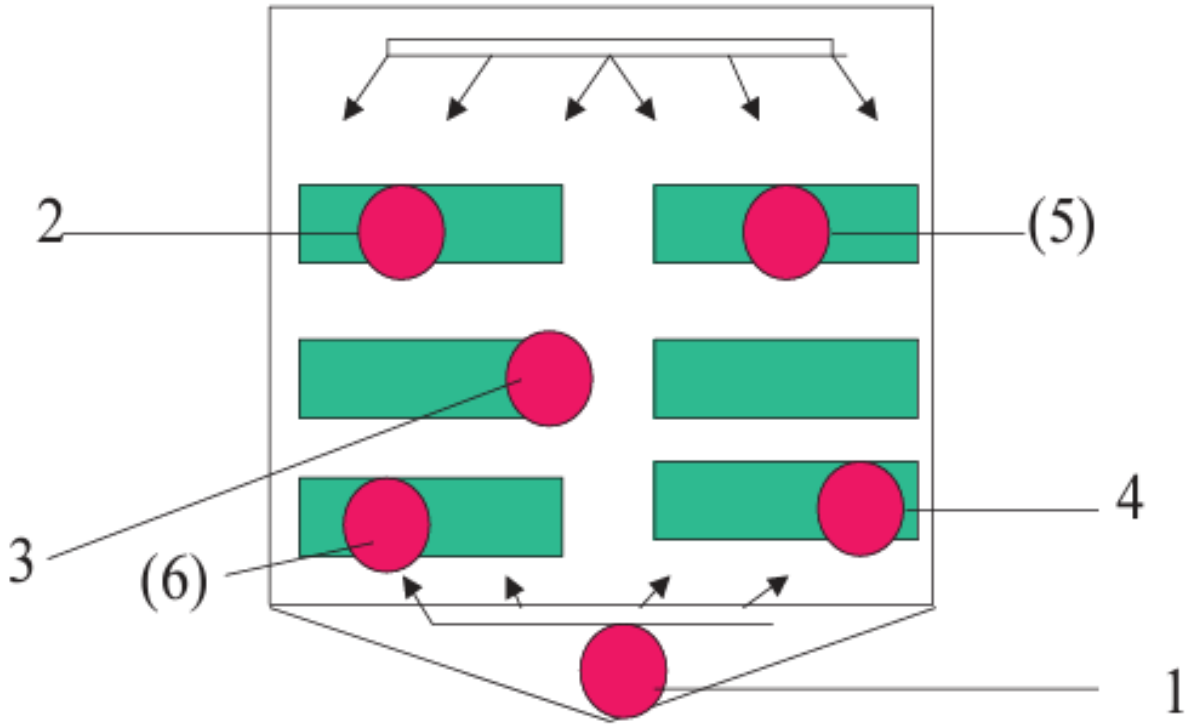
- Load definition (worst case)
- Thermometric tests (3 times)
- Microbiological tests (specific cases)
- Drying test (visual/scale)



# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
Cleaning and disinfection process:

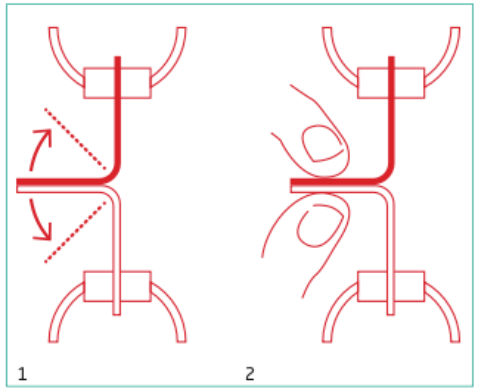
- Load definition (worst case)
- Cleaning test (3 test runs)
- Cleaning pressure test (3 test runs)
- Disinfection test (2 cycles with 6 sensors, or 3 cycles with 4 sensors)
- Drying test
- Process Chemical residues test

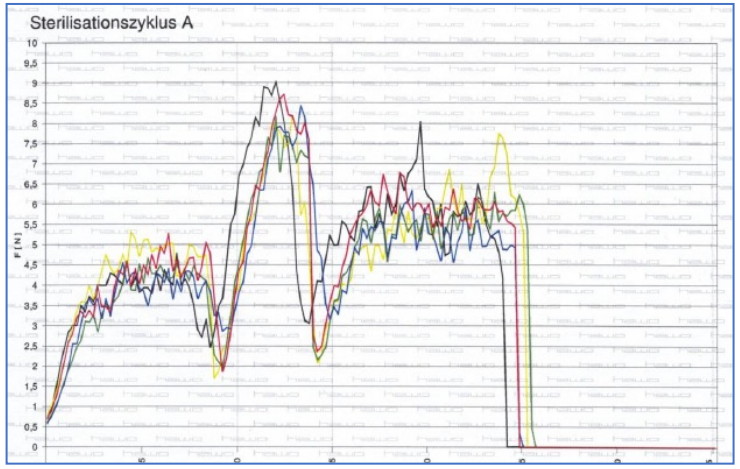



# HOW IT IS CARRIED OUT

Performance Qualification (PQ)
Sealing process:

- Critical packaging configuration (worst case)
- 3 sterilization batches
- Quality properties
  - Intact seal
  - No channels
  - No punctures
  - No delamination
- Sealing seam strength tests (3 batches)



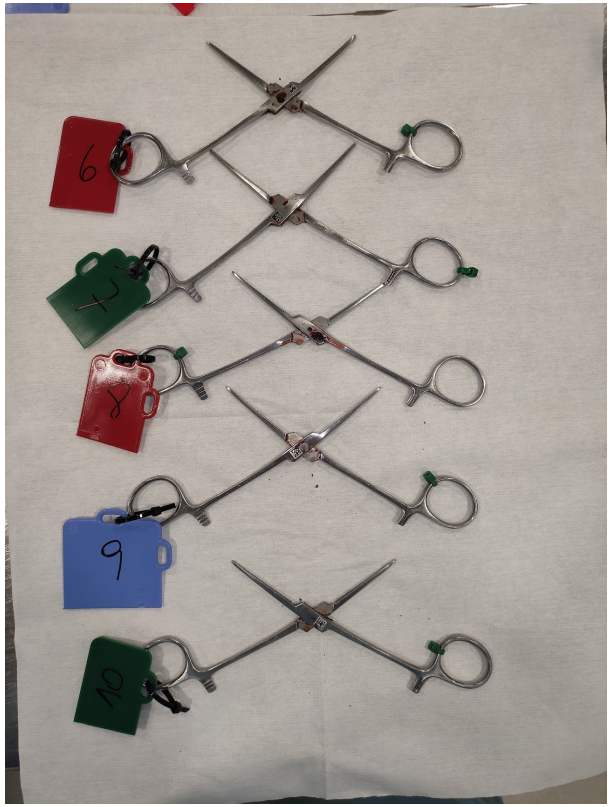



# HOW IT IS CARRIED OUT

Requalification (when?)

**Definition**: repetition of part or all of validation for the purpose of confirming the continued acceptability of a specified process.

**Interpretation**: tests required to prove that the processes remain valid in the long term. This is usually carried out annually and includes mainly the tests from the performance qualification (PQ) plus some additional tests from Operational Qualification (OQ) like safety functions or water quality tests).



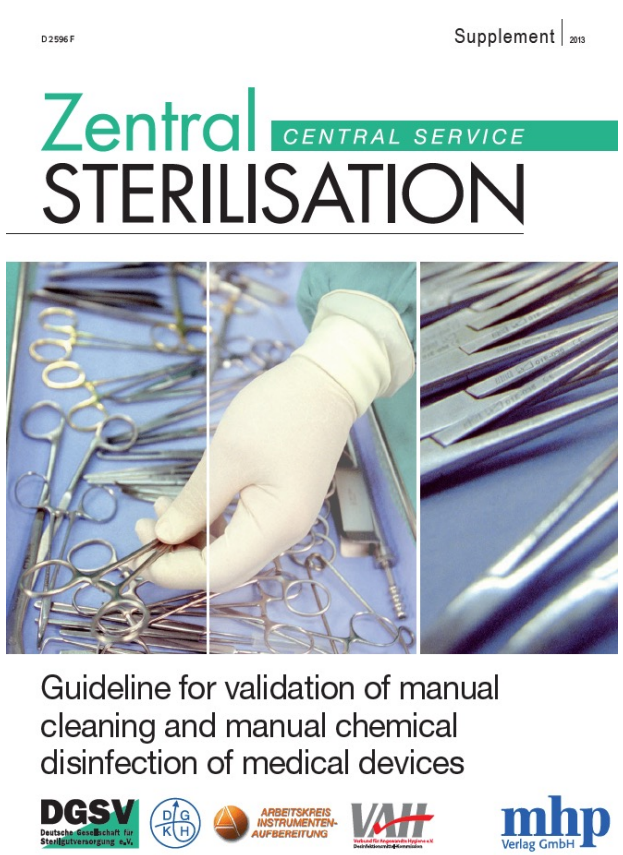

**If there are significant changes in the process (e.g. new instruments, new process chemicals, etc.), it may be necessary to carry out a requalification for a particular reason.**

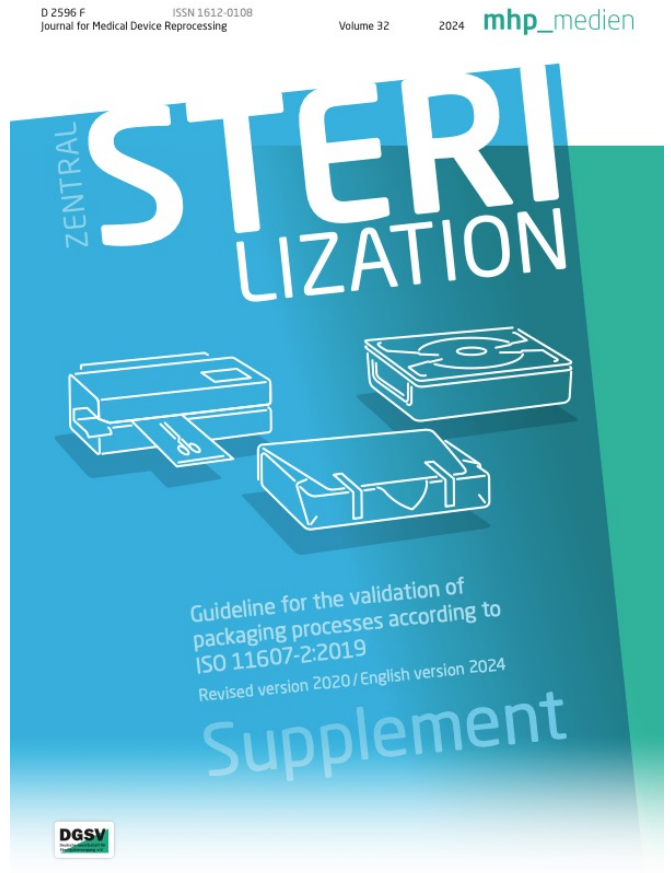
# HOW IT IS CARRIED OUT

What about manual processes?

Manual processes shall also be validated:

- Manual cleaning and disinfection
- Manual packaging
  (soft wrapping, containers)



# HOW IT IS CARRIED OUT

## Routine Monitoring (e.g. steam sterilization)

To ensure the reproducibility of the process routine checks needs to be defined.

Routine test should be run periodically to establish that the process performance remains within the limits established during validation.

The purpose of this activity is to demonstrate that the validated and specified sterilization process has been delivered to the product for each sterilization process that is carried out (ISO 17665:2024 clause 10.1.1)

Routine monitoring and control shall be performed on each operating cycle in order to demonstrate that the process variables for moist heat sterilization are attained (ISO 17665:2024 clause 10.1.2)

# CONCLUSIONS

Quality attributes for products resulting from reprocessing processes (cleaning, disinfection, packaging and sterilization) cannot be directly checked (product will be destroyed)

Therefore, these processes must be standardized, validated and controlled to ensure that the result always meets the specifications and quality attributes.

Validation is a documented procedure to provide objective evidence, that the final products **always** meet the specified requirements under the local/given conditions.

Validation consists of Installation Qualification (IQ), Operational Qualification (OQ) and Performance Qualification (PQ) and Requalification (RQ) which is done every year including some tests from OQ and a reduced version of PQ.

Validation provides high safety for patients and staff, it´s a process efficiency evidence. Thus, it is absolutely necessary for MDs processing quality assurance.

# SUMMARY

## QMS

| Before installation | Before using | | | While use |
|---|---|---|---|---|
| Production Type Testing Factory Test | Validation | | | Maintenance |
| Design Qualification | Installation Qualification | Operation Qualification | Performance Qualification | Routine Monitoring |
| DQ | IQ | OQ | PQ | Requalification (annual) |

# REFERENCES

ISO 11139:2018 - Sterilization of health care products – Vocabulary of terms used in sterilization and related equipment and process standards

ISO 17665:2024 - Sterilization of health care products — Moist heat — Requirements for the development, validation and routine control of a sterilization process for medical devices

EN 285+A1:2021 - Sterilization - Steam sterilizers - Large sterilizers

DGKH - Recommendations for the validation and routine monitoring of moist heat sterilization processes for medical devices, July 2009

ISO 15883-1:2024 - Washer-disinfectors - Part 1: General requirements, terms and definitions and tests

Guideline compiled by DGKH, DGSV and AKI for the validation and routine monitoring of automated cleaning and thermal disinfection processes for medical devices, 2017

Guideline for validation of manual cleaning and manual chemical disinfection of Medical Devices from DGKH, DGSV, AKI and VAH, 2013

# REFERENCES

ISO 11607-2:2019 - Packaging for terminally sterilized medical devices — Part 2: Validation requirements for forming, sealing and assembly processes

DGSV - Guideline for the validation of packaging processes according to ISO 11607-2:2019 Revised version 2020

ISP CHILE – Guideline of basic principles for safety and performance for Medical Devices, 2019

WHO – Decontamination and Reprocessing of Medical Devices for Health-care facilities, 2016

WHO - Guideline for Safe Surgery, 2009

ISO 17664-1:2021 - Processing of health care products — Information to be provided by the medical device manufacturer for the processing of medical devices. Part 1: Critical and semi-critical medical devices

ISO 13485:2016
Medical devices — Quality management systems — Requirements for regulatory purposes

MDR Medical Device Regulation (EU) 2017/745


# Importance of process validation according to ISO

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