Weighing Bridges
Inspection in use Screening Project

WELMEC Working Group 5

Project Report
November 2022

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1 Contents

1 Project Description

A project regards non-automatic weighing instruments of class III or IIII used in the industry, in trade, and by the services sector (weighing bridges). The main aim of this project is the determination of compliance with the requirements of 2014/31/EU.
The weighing bridges inspection in use screening project was carried out as a joint action of countries cooperating in WELMEC WG5. The main objective of this operation was to verify that weighing bridges fulfil the specific regulations at a European level. The study is intended to broaden the knowledge about compliance within the Member States, in order to share information with one another about the method of inspection, etc, in the European Union.

2 Project Background

In practice, weighing bridges are used for both the purchase of goods between businesses (B2B) and between businesses and consumers (B2C). The use of inaccurate or unsuitable weighing equipment could be a reason for a very serious error of measurement. Particularly, we should bear in mind that weighing bridges are used for the measurement of extra-large amounts of goods. Incorrect results of measurement directly influence business trade. The most frequently occurring irregularities regard the controlled non-automatic weighing instruments of the maximum permissible errors (MPE) calculated in accordance with point 4.2 of Annex I of the Directive 2014/31/EU of the European Parliament and of the Council of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of non-automatic weighing instruments. In Poland, the maximum permissible errors (MPE) were the most commonly occurring irregularities identified as a result of carried out controls of weighing bridges (88,9% - results from 2018).

The UK found a non-compliance rate of 16% of the weighing bridges in 2012-2013. The Netherland 14% in 2016, 13% in 2017 and 17% in 2018, Austria 22% in 2018 and Poland found a non-compliance rate of 30% in 2018. The consequences of non-compliance of these instruments could have especially negative effects concerning consumer protection, business trade safety and road safety. Moreover, such incompatibilities can lead to incorrect measurements and in turn upset many fields of economy.

This project, under WELMEC Working Group 5, explores these issues with the aim of helping the businesses improve their standards by raising the importance of weighing equipment in trade. An additional objective is to facilitate comparing results with one another at present and in the future by creating a usable template.

Directive 2014/31/EU, the NAWI-directive relating to the making available on the market of non-automatic weighing instruments applies to all non-automatic weighing instruments, but only when used or intended to be used for the applications listed in points (a) to (g) of Article 1. In these cases, they shall satisfy the essential requirements set out in Annex I of the NAWI-directive.

3 Joint Action

The above findings have convinced the members of WELMEC WG55 to agree to this joint action proposal. This project was the first joint action taken in Europe in the field of weighing bridges and can help all interested members of WELMEC WG5 pool unique data. Flexible approach to the project allowed participation countries which preferred only formal control and countries which decided to conduct formal inspection and metrological tests. This approach enabled many countries to participate in the action.

4 Project Justification

The justifications of the project are

- To make the business aware of the requirements of 2014/31/EU;
- Many non-conformities were found, for example, markings required by the directive are missing;
- Poland found 30% of non-compliance, Austria 22%, the Netherlands 17% and the UK 16% of non-compliance of weighing bridges. This high number can have the consequence of incorrect measurement, which could affect the trade and income of State Treasury;
- To be able to compare results within the EU.

5 Project Objectives/Deliverables

The objectives or deliverables of the project are

- To determine the compliance of non-automatic weighing instruments used for trade in EU;
- To raise the profile of legal metrology;
- To make users of weighing bridges aware of the legal requirements through EU;
- Create awareness of 2014/31/EU within the sector.

6 Project Participants

The following countries have participated in this project: Denmark, France, Germany, Ireland, Poland and Switzerland. France participated only for the formal checks. The project coordination has been carried out by Poland.

7 Relevant Legislation

7.1 Regulations

- The Directive 2014/31/EU on non-automatic weighing instruments, annex I, preliminary observation requires compliance with the essential requirements for any device connected to a scale used for direct sale to the public.
- Regulation (EC) No 765/2008 of the European Parliament and the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and the repealing Regulation (EEC) No 339/93.

7.2 Harmonized Standards

EN 45501: 2015 Metrological aspects of non-automatic weighing instruments.

8 Instrument Types and Location

This project will focus on NAWI's interpreted as weighing bridges for weighing all kind of goods for the purposes of determination of mass for commercial transactions. The project covers weighing bridges used for weighing in B2B and B2C.

This project does not cover weighing bridges used for the calculation of all manner of administrative charges (tariff and tax). The project does not cover weighbridges used for weighing actions in administration to business (A2B) and from administration to consumer (A2C).

As decided, each country declared number of NAWI's which they planned to inspect. These NAWI's should have been placed on the market within the last 4 years.

There are two classes of weighing instruments used at present: Class III and Class IIII (less sensitive, greater divisions) – see Table 1.

Inspections may take place at locations where NAWI's are in use for their stated purpose, i.e. fuel storages, grain collection points, scrap recycling centre, warehouses of building materials etc.

9 Visual Inspection and Metrological Testing

The visit/surveillance included a visual inspection and a metrological test to determine the accuracy of the instrument as per elements of EN 45501. Before the visual inspection and metrological test will be carried out, the following information shall be recorded:

- Line of business (branch)
- Usage for the sale of (type of goods)
- Usage for B2B and, B2C
- Instrument manufacturer
- Instrument Type
- Instrument Model
- Instrument Serial Number
- Min & Max Capacity
- Verification Scale Interval e
- Scale interval d
- Accuracy Class
- Units of Measurement
- Software Version (if applicable)

Class	Verification scale interval (e)	Number of verification scale intervals n = Max/e		Minimum capacity (Min)
		Minimum	Maximum	
III	0.1 g ≤ e ≤ 2 g 5 g ≤ e	100 500	10 000 10 000	20e 20e
IIII	5 g ≤ e	100	1000	10e

Table 1: Instrument Class Specifications

9.1 Visual Inspection

The following NAWI visual inspection should be carried out, before conducting the metrological test:

9.1.1 Instrument Setup

- The instrument is affixed to/sitting on a suitably stable platform that does not promote movement. ***Record Pass / Fail***
- The instrument is in serviceable condition. Confirm the instrument is adequately protected against abnormal dust, air movement, vibrations, atmospheric conditions, or any other influence likely to affect performance. ***Record Pass / Fail***

9.1.2 Conformity to type

- Determine if the instrument has a valid (when the instrument has been put on the market) type of examination certificate where appropriate (if applicable).
  Record Pass / Fail
- Determine if the instrument has a declaration of conformity. ***Record Pass / Fail***
- All of the modules making up the instrument and their configuration conform to the approval certificate (if applicable). ***Record Pass / Fail***

9.1.3 Inscriptions

- **Check if the following inscriptions are visible, legible and indelible :**
  - the number of the EU-type examination certificate where appropriate;
  - the manufacturer's name, registered trade name or registered trade mark;
  - the accuracy class, enclosed in an oval or in two horizontal lines joined by two half circles;
  - maximum capacity, in the form Max …;
  - minimum capacity, in the form Min …;
  - verification scale interval, in the form e = …;
  - type, batch or serial number
- Check if the declared e value conforms with the stated accuracy class. **Record Pass / Fail**
- Check if Min value matches with the accuracy class. **Records Pass / Fail**

9.1.4 Marks

- Ensure that the instrument bears the correct CE mark. ***Record Pass / Fail***
- Ensure that the instrument bears the correct Metrological markings. ***Record Pass / Fail***
- Ensure that the instrument bears a Notified Body number. ***Record Pass / Fail***

9.1.5 Security, marks and seals

- Security mark(s)/seal(s) in place and show no signs of tampering. ***Record Pass / Fail***
- Mark(s)/Seal(s) are applied correctly, as per the instrument type approval document. ***Record Pass / Fail***

9.2 Metrological Inspection

All metrological tests should be completed.

9.2.1 Repeatability

i. With the load receptor empty, set the instrument to zero
ii. Add the test load *L* and record the indicated value *I*
iii. Remove test load L
iv. Repeat steps (i to iii) twice
v. Calculate and record the difference of the results of 3 weights
vi. Check if the calculated result is not greater than MPE
vii. **Record Pass / Fail**

NOTE: Test load *L* should be about 0,8 Max.

9.2.2 Digital Indicating instruments

i. Turn the instrument's indicator to zero.
ii. Apply test load and record the indicated value
iii. Remove the test load.
iv. Turn the instrument's indicator to zero.
v. Repeat steps (i to iv) three times for each test load
vi. Compare results against MPE.
vii. **Record Pass / Fail**

9.2.3 Accuracy

i. Set the instrument to zero and add the first test load.
ii. Record the indicated value *I*
iii. Add weights to reach the second load value.
iv. Record the indicated value *I*
v. Repeat steps iv and v for each additional load value.
vi. Upon completion of steps i - vi, the process is reversed i.e. mass is incrementally removed from the load platform to reach test load values.
vii. This process is repeated until the initial test weight is reached
viii. Compare results against MPE
ix. **Record Pass / Fail**

Test conducted at the following loads:

1) T1 = Min, T2 = 500e, T3 = An intermediate value based on availability, the value should not be less than T2 or greater than T4, T4 = 2000e and T5 = Max (class III), or
2) T1 = Min, T2 = 50e, T3 = An intermediate value based on availability, the value should not be less than T1 or greater than T4, T4 = 200e and T5 = Max (class IIII).

9.2.4 Eccentricity

i. With the load receptor empty, set the instrument to zero.
ii. Determine the error E_0, calculated at zero or at load close to zero (e.g. 10*e*)
iii. Zero the instrument indicator, and add the test load *L* at first point of support.
iv. Record the indicated value *I*
v. Successively add additional weights equivalent to 1/10*e* until the indication of the instrument increased unambiguously by one scale interval (*I* + *e*)

vi. Record the additional load ΔL
vii. Determine and record the error prior to rounding $E = I + 0{,}5\ e - \Delta L - I$
viii. Calculate and record the corrected error $E_c = E - E_0$
ix. Compare results with MPE
x. Repeat steps (iii to x) for each subsequent point of support
xi. **Record Pass / Fail**

NOTE 1 The zero error E_0 used for correction is the value determined prior to each measurement but normally it is sufficient to determine the zero error only at the beginning of the measurement. However, if the MPE is exceeded, the test with zero error prior to each loading is necessary.

NOTE 2 Test load *L* should be equal to 1/3 of the sum of the maximum capacity and the corresponding maximum additive tare. On an instrument with a load receptor having ***n*** points of support, with $n>4$, the fraction $1/(n-1)$ of the sum of the maximum capacity and the maximum additive tare effect shall be applied to each point of support.

NOTE 3 Where two points of support are too close together for the test load to be distributed as indicated above, the load should be doubled and distributed twice over the area on both sides of the axis connecting the two points of support.

9.2.5 Shifting test (if applicable)

i. With the load receptor empty, set the instrument to zero.
ii. Apply a load *L* at one of the ends of the load receptor in the normal driving direction *L1*
iii. Record the indicated value *I*
iv. Successively add additional weights equivalent to 1/10*e* until the indication of the instrument is increased unambiguously by one scale interval ($I + e$)
v. Record the additional load ΔL
vi. Determine and record the error prior to rounding $P = I + 0{,}5\ e - \Delta L - I$
vii. Move the load *L* to the middle of the load receptor M1
viii. Record the indicated value *I*
ix. Successively add additional weights equivalent to 1/10*e* until the indication of the instrument is increased unambiguously by one scale interval ($I + e$)
x. Record the additional load ΔL
xi. Determine and record the error prior to rounding $P = I + 0{,}5\ e - \Delta L - I$
xii. Move the load *L* to the other end of the load receptor R1
xiii. Record the indicated value *I*
xiv. Successively add additional weights equivalent to 1/10*e* until the indication of the instrument is increased unambiguously by one scale interval ($I + e$)
xv. Record the additional load ΔL
xvi. Determine and record the error prior to rounding $P = I + 0{,}5\ e - \Delta L - I$
xvii. Compare results with MPE
xviii. Repeat steps (*i* to *xvii*) in the reverse direction if the application in both directions is possible
xix. **Record Pass / Fail**

NOTE 1 If the load receptor consist of several sections, the test shall be applied to each section
NOTE 2 Load *L* should not exceed 0,8 times the sum of the maximum capacity and the maximum additive tare.

MPE (Inspection)	**For loads m expressed in inspection scale intervals e**	
	Class III	**Class IIII**
± 1.0 e	0 ≤ m ≤ 500	0 ≤ m ≤ 50
± 2.0 e	500 < m ≤ 2 000	50 < m ≤ 200
± 3.0 e	2 000 < m ≤ 10 000	200 < m ≤ 1 000

Table 2: NAWI MPE Table (Inspection)

10 Recovery of Available Data

During the visit, it will be necessary to recover as much information as possible in order to complete the control report, the model of which is given in Annex of the Project Report. This data can be recovered through the examination of available documents (possibly copy of declaration of conformity, etc.), the visible markings on the various materials present and the information of the holders or users concerning the NAWI.

11 Project results

The project results are presented in the table 3 and figures 1 – 18.

Participant	Formal control	Formal and Metrological control	Total
Denmark	--	4	4
France	14	--	14
Germany	1	16	17
Ireland	11	--	11
Poland	--	30	30
Switzerland	--	6	6
Total	26	56	82

Table 3: Instrument Count

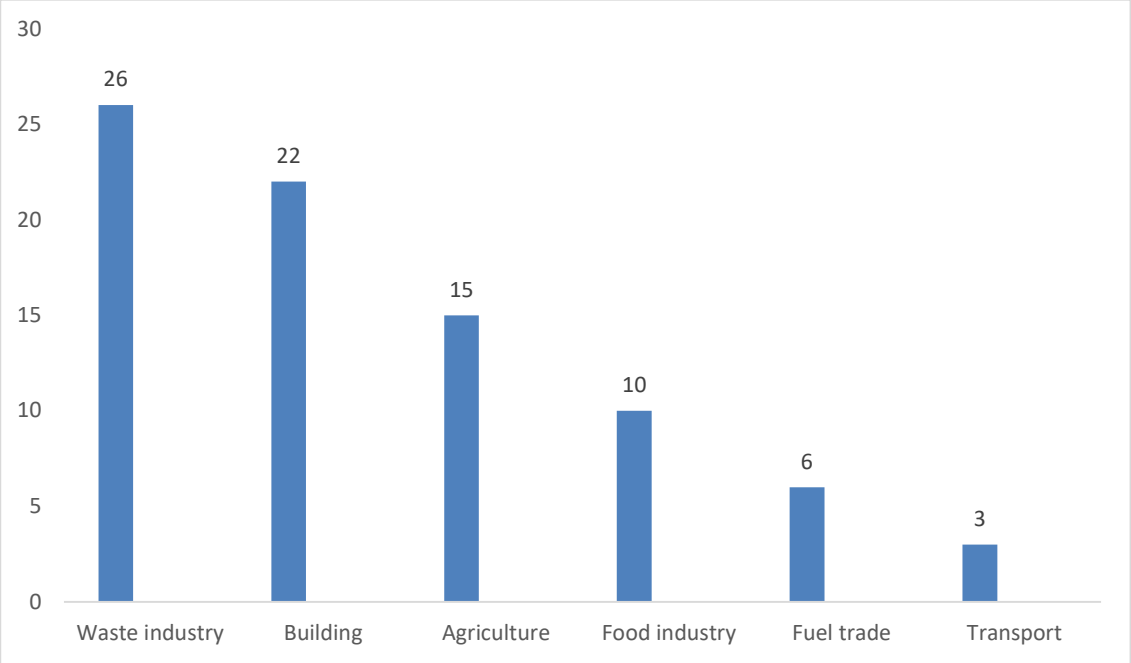

Figure 1: Use of inspected weighing bridges - business

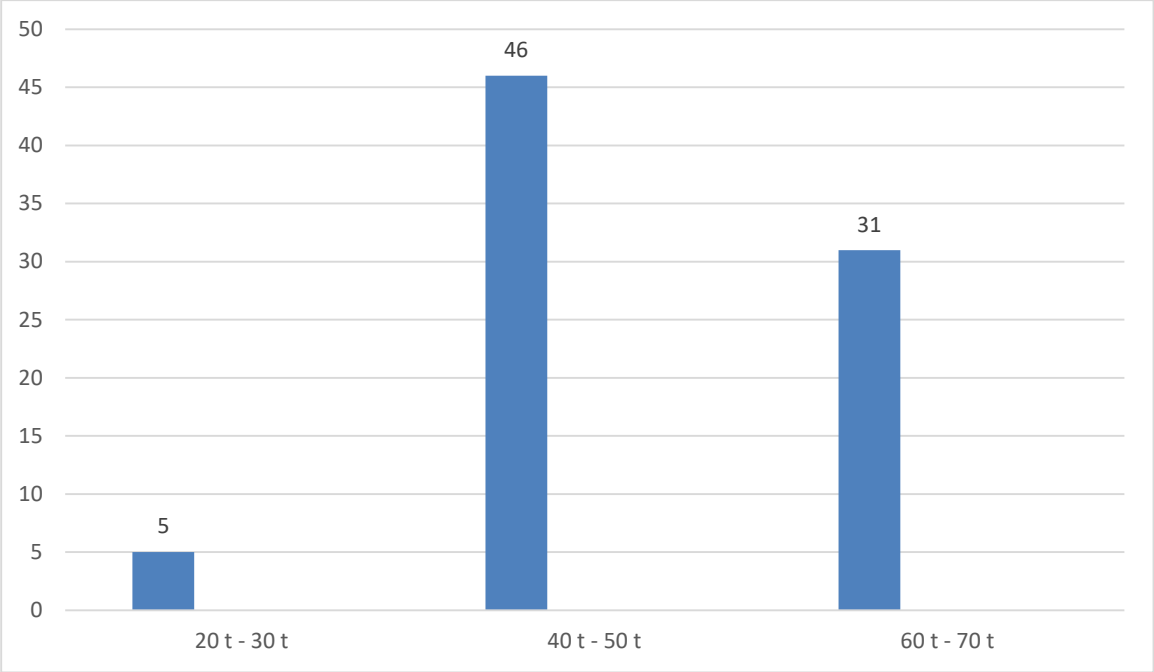

Figure 2: Measuring range

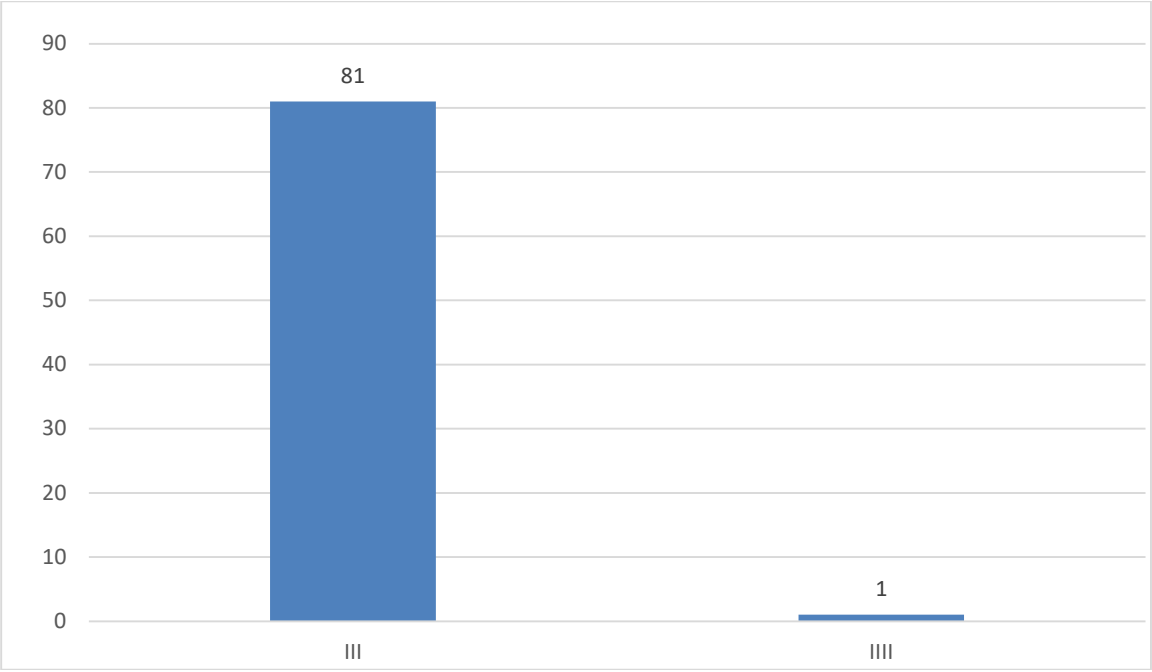

Figure 3: Accuracy Class

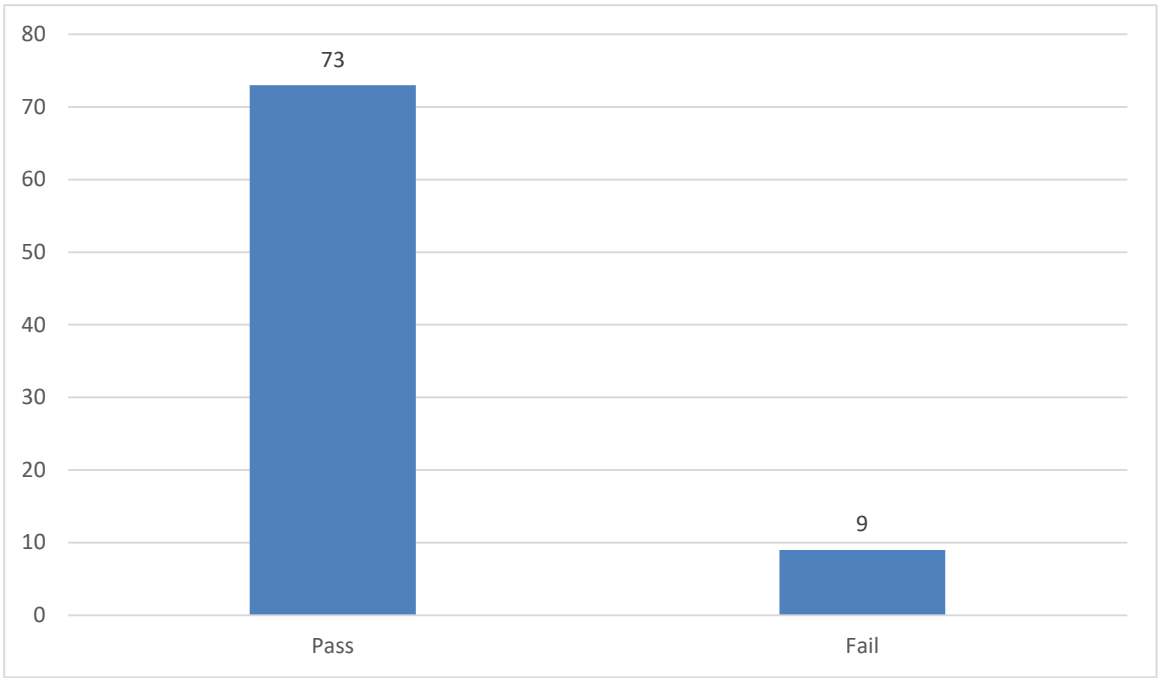

Figure 4: Visual Inspection Result

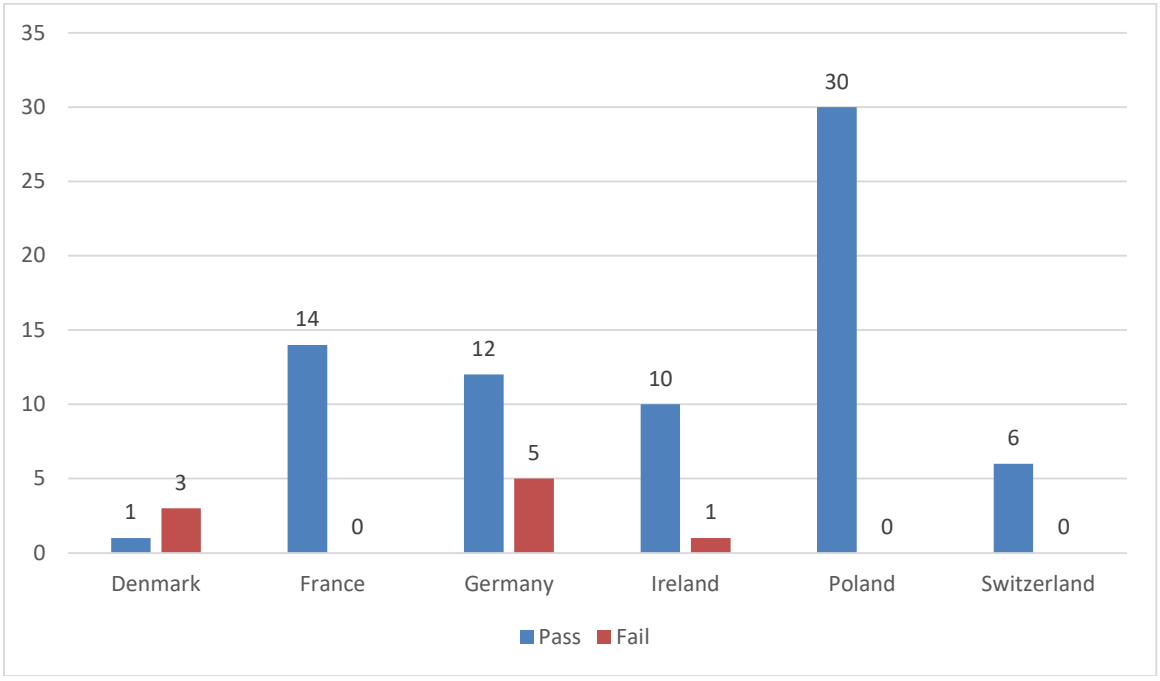

Figure 5: Visual Inspection Result by Country

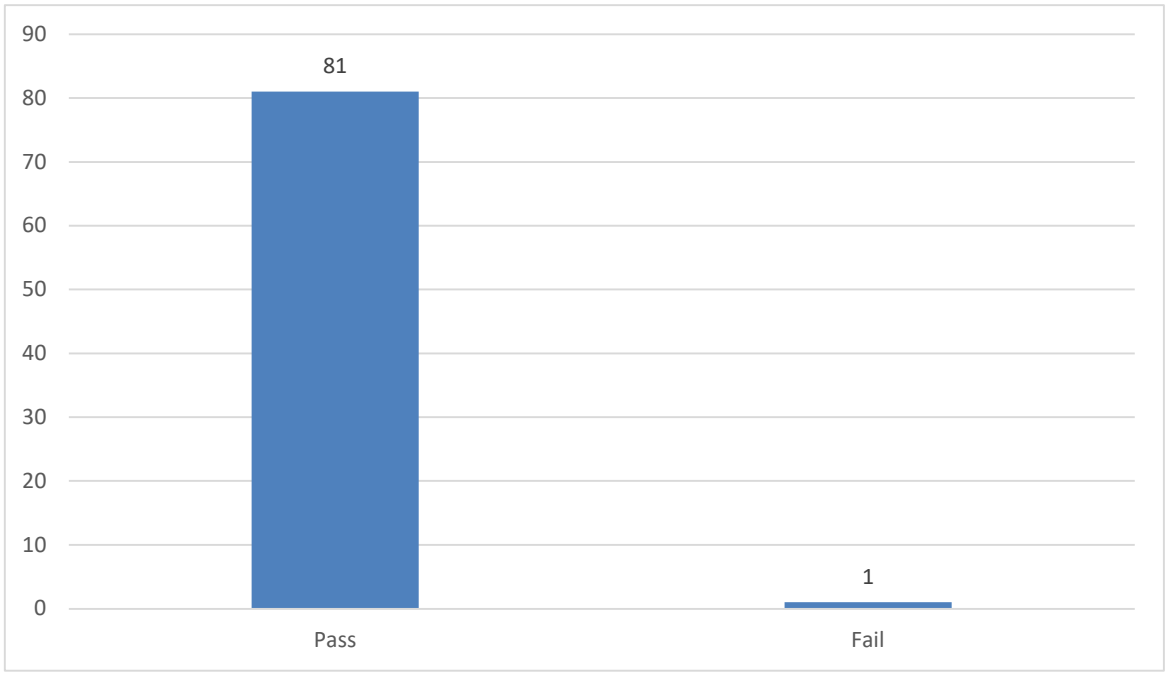

Figure 6: Instrument setup

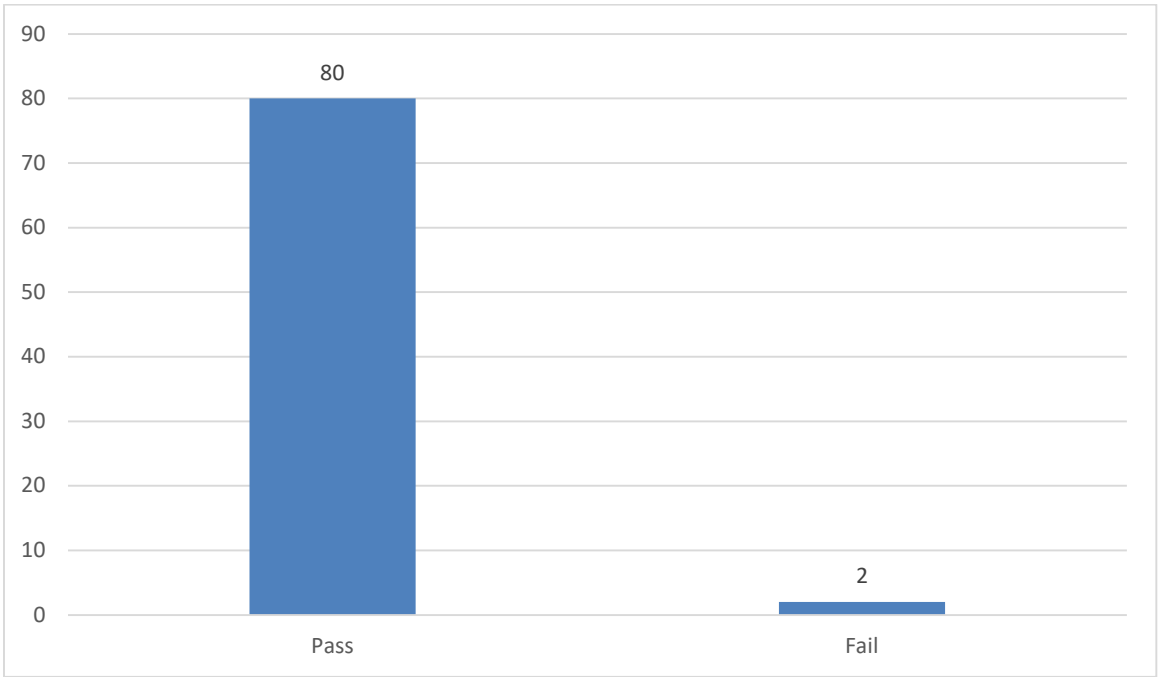

Figure 7: Conformity to type

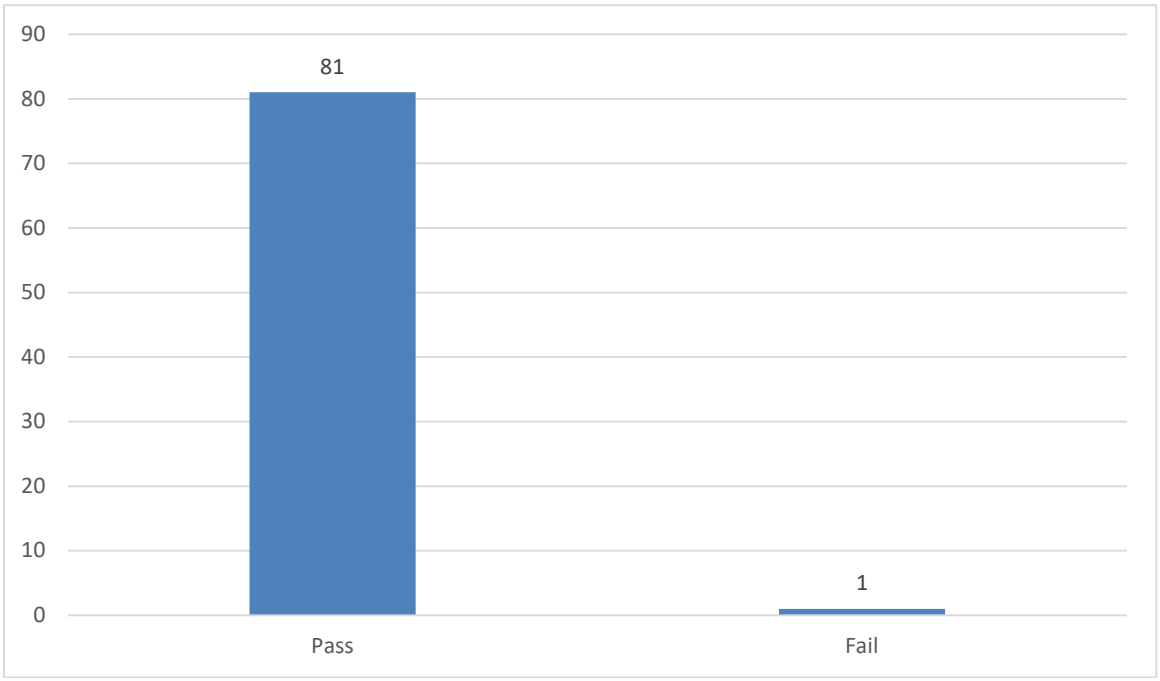

Figure 8: Inscriptions

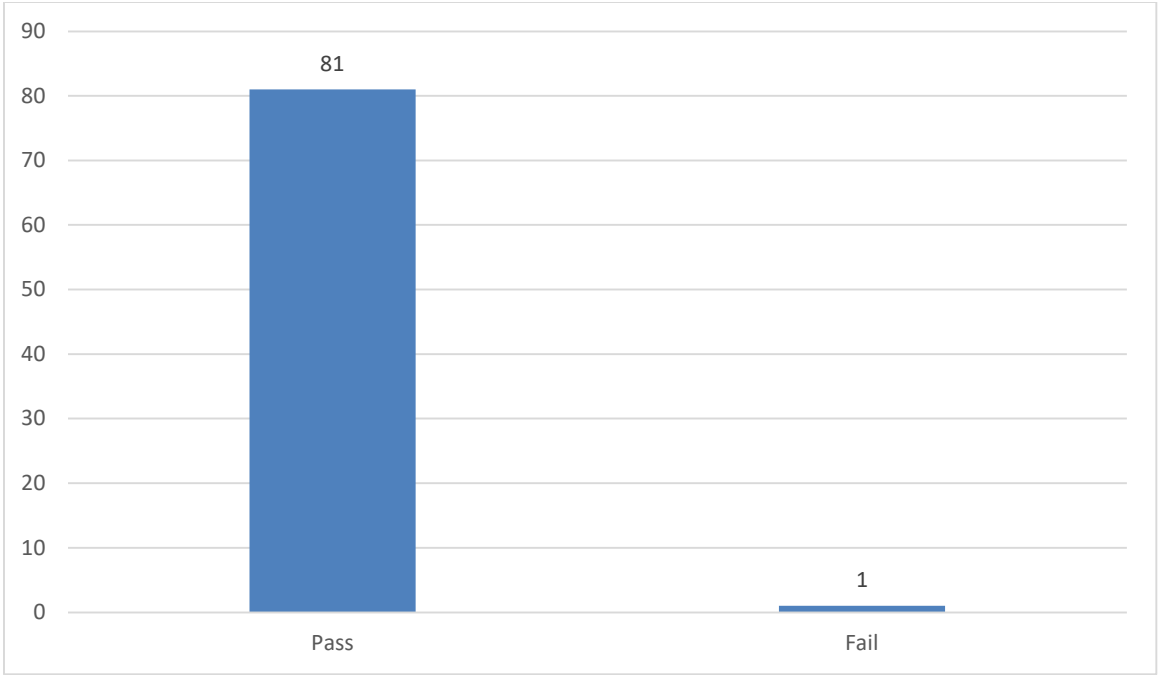

Figure 9: Marks

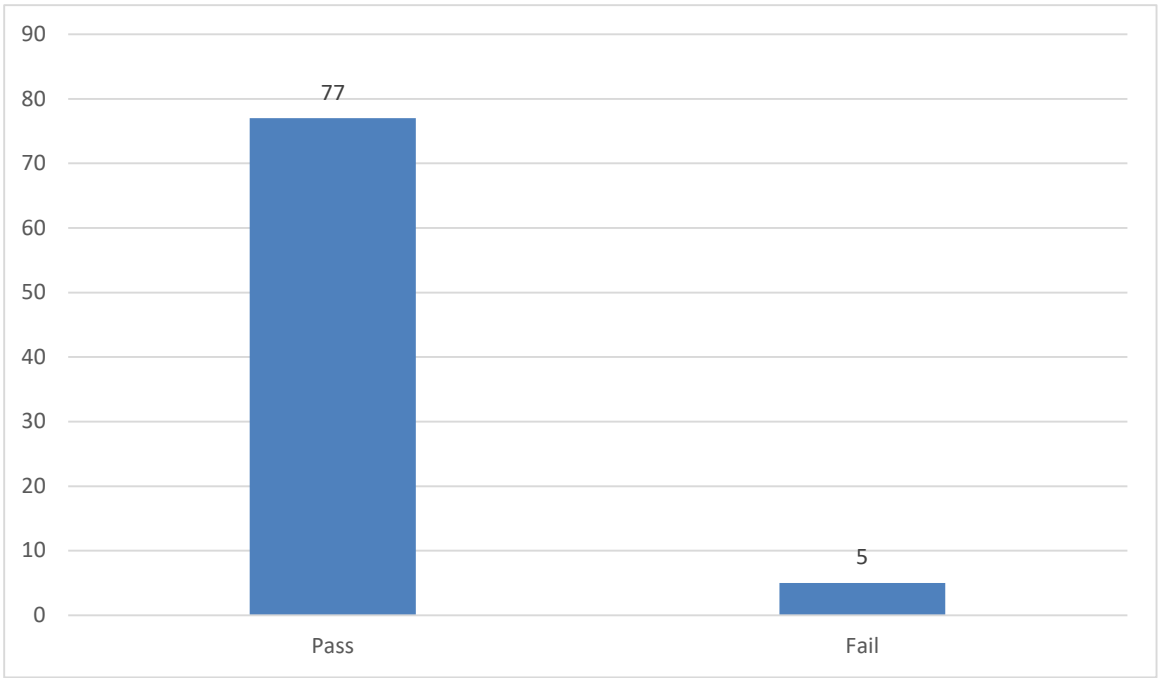

Figure 10: Security marks and seals

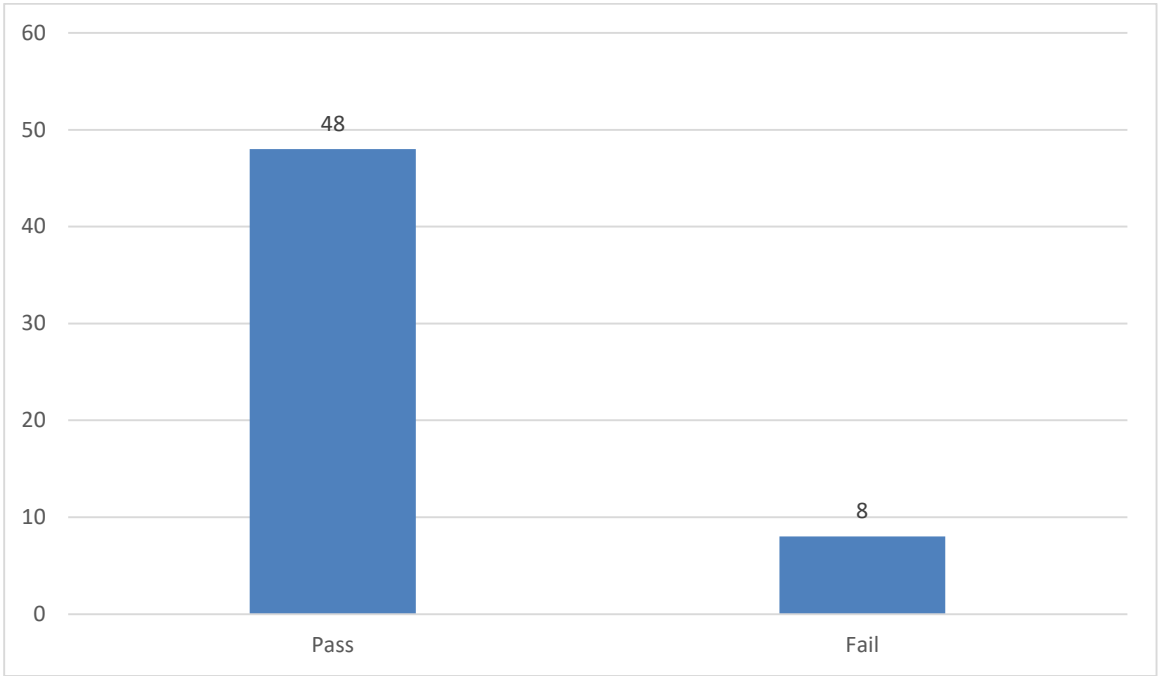

Figure 11: Metrological Inspection Result

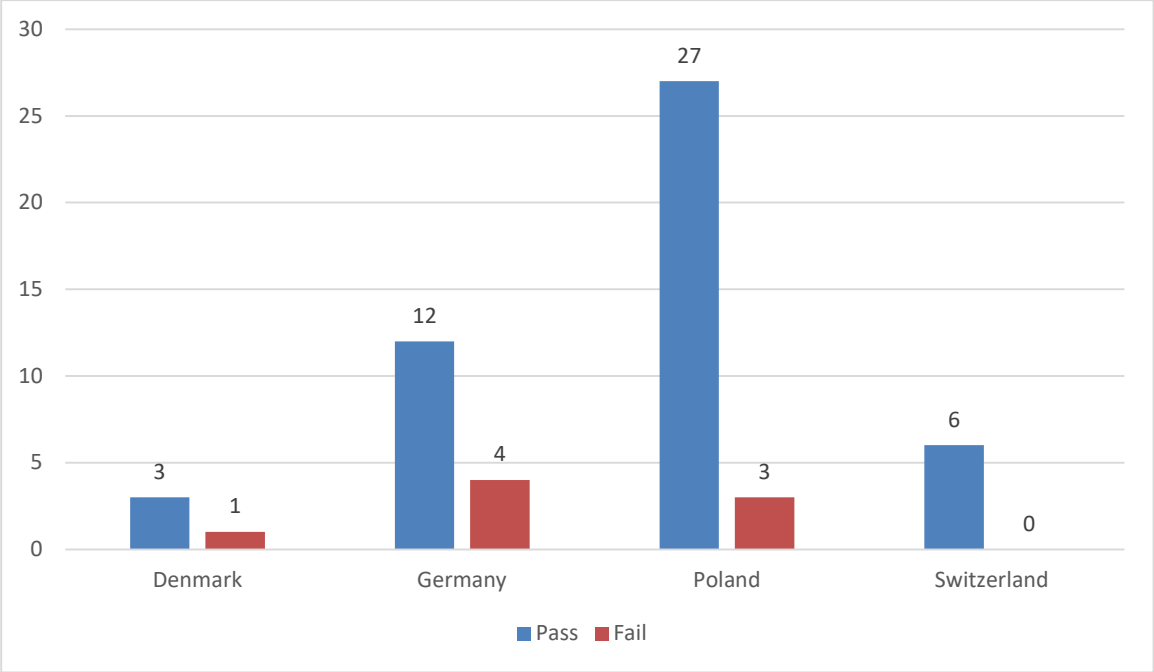

Figure 12: Metrological Inspection Result by Country

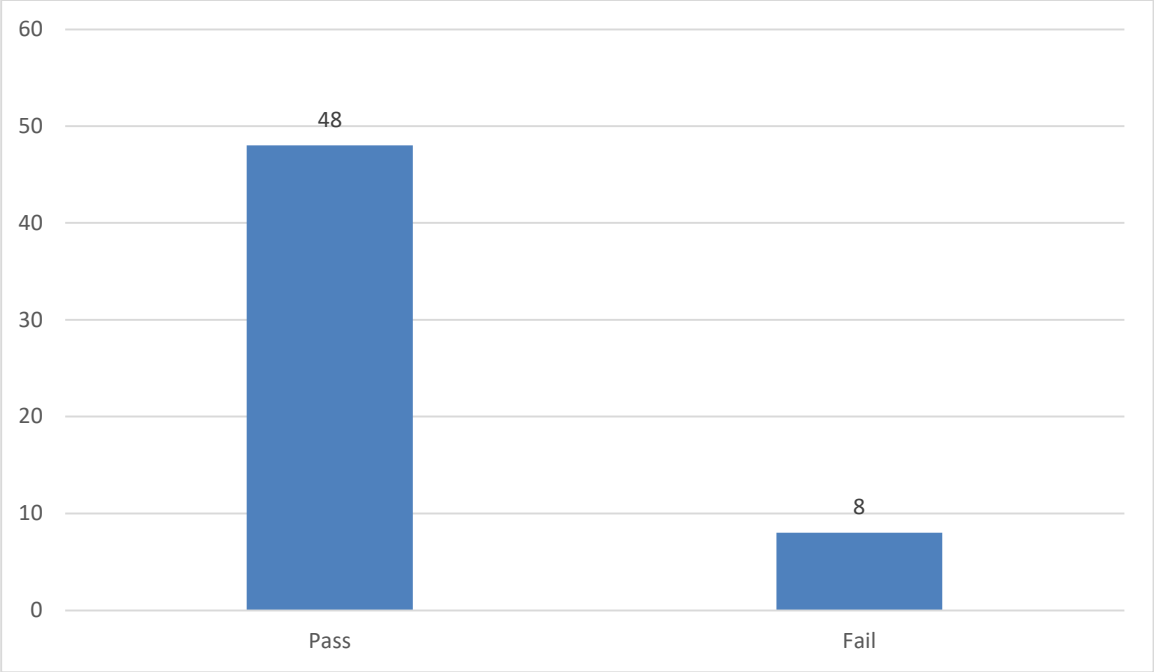

Figure 13: Accuracy

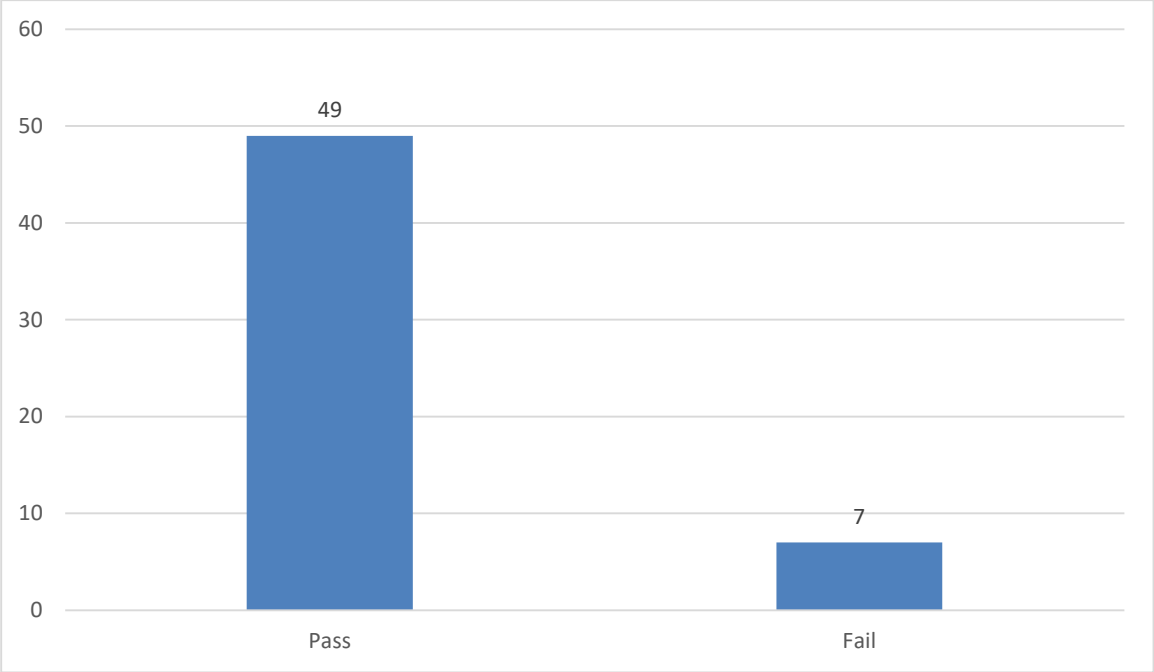

Figure 14: Eccentricity

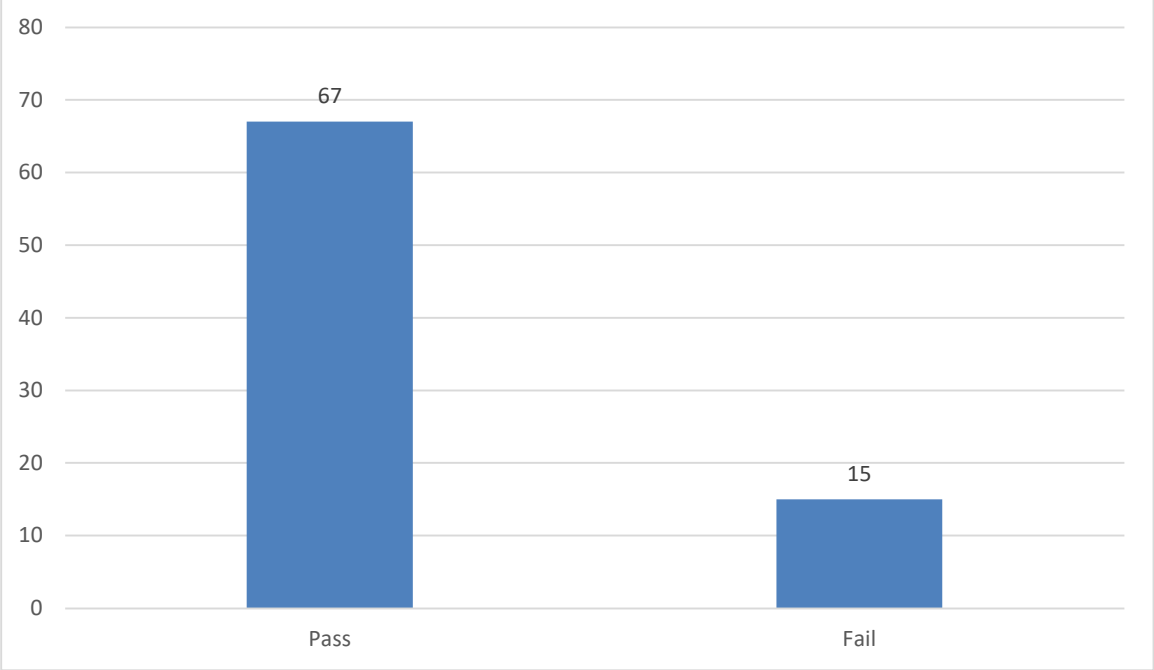

Figure 15: Overall Project Result

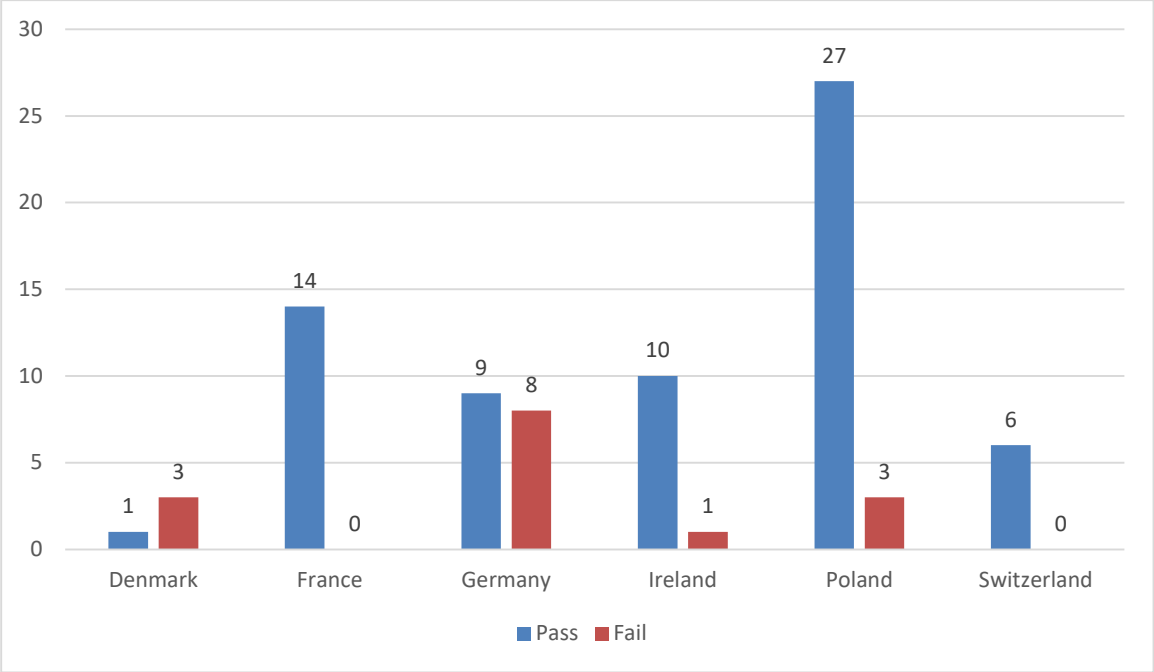

Figure 16: Overall Project Result by Country

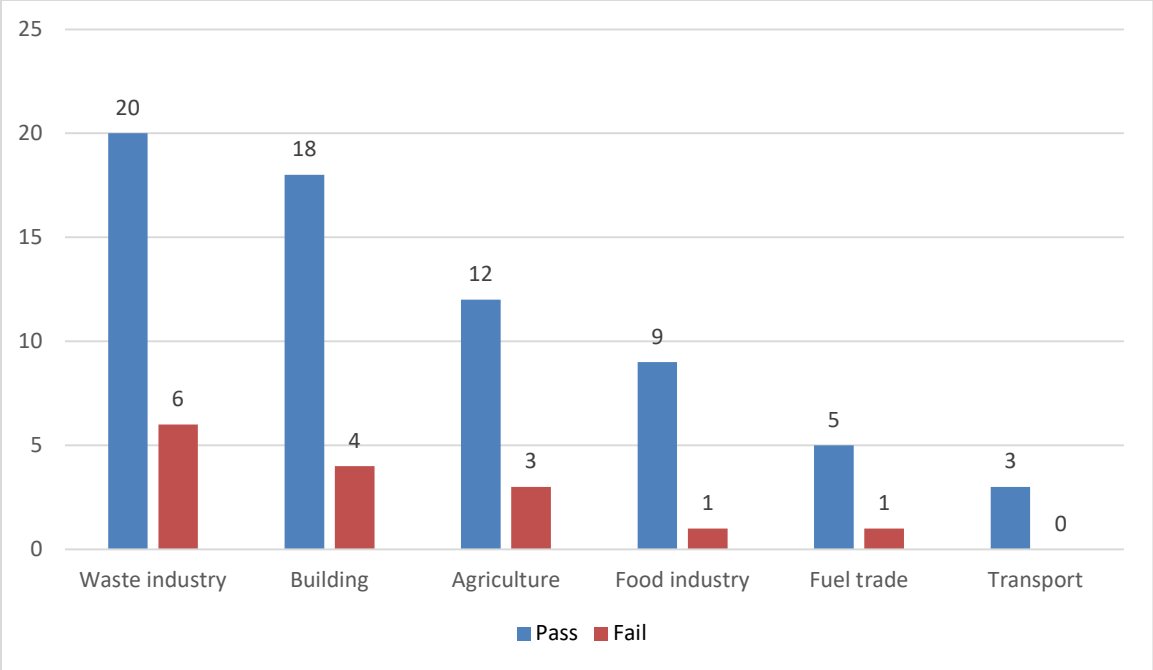

Figure 17: Overall Project Result - business

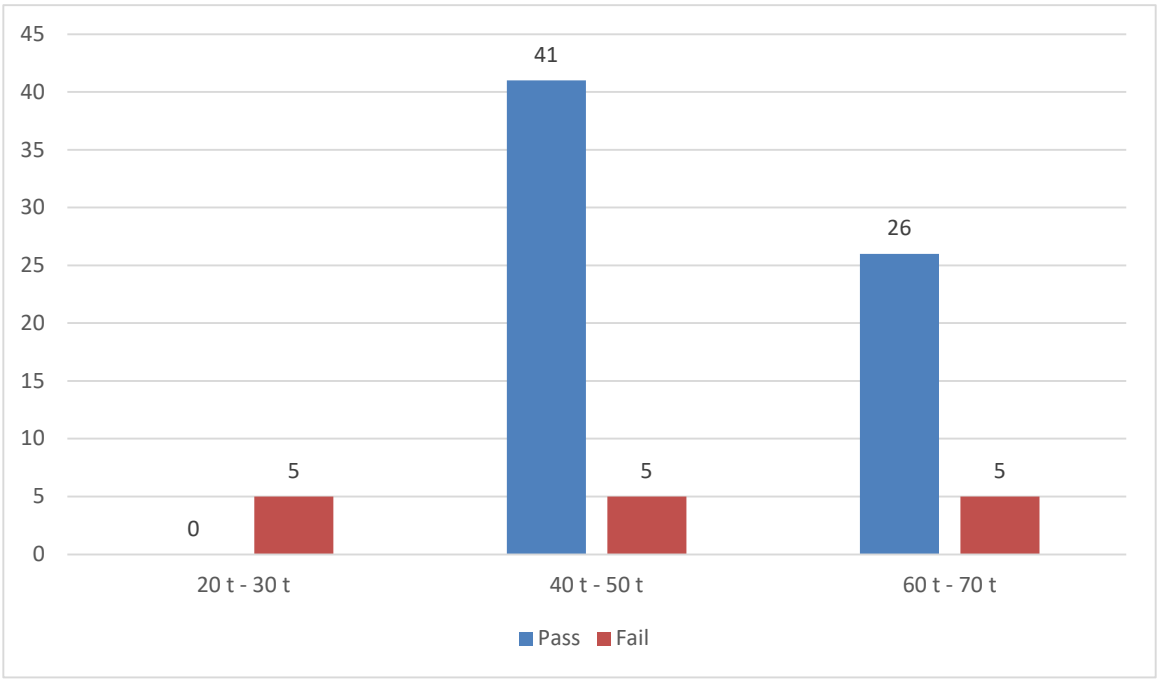

Figure 18: Overall Project Result – measuring range

12 Taken Actions

Individual countries addressed detected non-compliance in accordance with their national legislation and procedures.

Action	Denmark	Germany	Ireland	Poland
Re-verification	2	5	1	2
Withdraw	1	1	--	1
DoC Correction	--	2	--	--
Total	3	8	1	3

Table 5: Taken Actions by Country

13 Project Summary

In total, 82 NAWI's were inspected in this project with an overall 82 % pass rate. In six countries participating in the project, pass rate was estimated between 25 % and 100 %.

14 Project Control Report

The protocol was prepared with MS Excel file and is added as an annex of this document.