



FINAL REPORT ON THE RESULTS OF PRECISION EXPERIMENT

Proficiency Testing Program Aggregate Testing ZK 2026/1

Brno University of Technology
Proficiency testing provider at the SZK FAST
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Czech Republic

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Coordinator of PTP results assessment

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1 Introduction and Important Contacts

At the beginning of 2026, the Proficiency Testing Provider at SZK FAST (PoZZ) launched a Proficiency Testing Programme (PrZZ), designated ZK 2026/1, to verify and assess the consistency of aggregate test results. The assessment of the results of the proficiency testing programme was carried out by a committee consisting of the following PT Provider employees:

Head of the PT Provider, PTP coordinator

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The subjects of proficiency testing were the following testing procedures:

1. EN 933-1 Determination of particle size distribution - Sieving method [1],
2. EN 933-3 Determination of particle shape - Flakiness index [2],
3. EN 933-4 Determination of particle shape - Shape index [3],
4. EN 933-8 Assessment of fines - Sand equivalent test [4],
5. EN 933-9 Assessment of fines - Methylene blue test [5],
6. EN 933-10 Assessment of fines - Grading of filler aggregates (air jet sieving) [6],
7. EN 1097-1 Determination of the resistance to wear (micro-Deval) [7],
8. EN 1097-2 Methods for the determination of resistance to fragmentation - chapter 5 [8],
9. EN 1097-2 Methods for the determination of resistance to fragmentation - chapter 6 [8],
10. EN 1097-3 Determination of loose bulk density and voids [9],
11. EN 1097-5 Determination of the water content by drying in a ventilated oven [10],
12. EN 1097-6 Determination of particle density and water absorption [11],
13. EN 1097-7 Determination of the particle density of filler - Pycnometer method [12],
14. EN 1367-1 Determination of resistance to freezing and thawing [13],
15. EN 1367-2 Magnesium sulfate test [14],
16. EN 1367-3 Boiling test for "Sonnenbrand basalt" [15],
17. TP 137 - Appendix 1 and 2 – Determination of reactivity of aggregates in connection with alkalis [16],
18. ČSN 72 1179 Determination of reactivity of aggregates in connection with alkalis – chapter B [17].

Test procedures 6, 16, 17 and 18 were not opened due to low interest of participants.

The supplier, BETOTECH s. r. o. (L 1195.3), was responsible for the preparation of testing samples for the PTP. The supplier is responsible for homogeneity and stability of testing samples.

The test results from individual PTP participants were compared via a method involving the statistical analysis of all their results in a manner complying with ISO 5725-2 [18] and with EN ISO/IEC 17043 [19].

The outcome is the present final report summarizing the results of the interlaboratory comparison, including statistical evaluation.

110 laboratories took part in PTP. In order to maintain the anonymity of the PTP, each laboratory was given an identification number that will be used henceforth in this document. An integral part of the present final report is a Certificate of Participation in the Proficiency Testing Program. It is unique for each participant and includes the participant's ID used in this report. The following chart shows the participation of laboratories in individual parts of the PTP.

Table 1: Participation of individual laboratories in the PTP

ID/Method	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
cc3310	X	-	X	-	-	-	X	X	-	-	-	X	-	X	-	-	-	-
b1b0a7	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
3f2444	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
cead79	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
015f1d	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
c58a44	-	X	X	-	X	-	X	X	X	-	-	-	X	-	-	-	-	-
7d9ff4	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
c2bf7f	X	X	-	-	X	-	X	X	-	-	-	X	-	X	-	-	-	-
0e319e	-	-	-	-	X	-	-	X	-	-	-	-	-	-	-	-	-	-
6bea11	-	-	-	X	-	-	X	X	-	-	-	-	-	-	-	-	-	-
f3cece	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
b18c80	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
bca32e	X	-	X	-	-	-	-	X	X	-	X	-	-	X	-	-	-	-
ca9941	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
cff407	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
e2f492	X	X	X	X	-	-	-	X	-	-	-	X	-	-	-	-	-	-
fc13cc	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
70e54b	-	-	-	-	-	-	-	X	-	X	-	-	-	X	-	-	-	-
5755fe	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
280858	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
07d606	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
60220d	X	X	-	-	X	-	-	X	-	-	-	X	-	-	-	-	-	-
718742	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
189651	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2920fc	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
1d9aaf	X	X	X	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-
246ad1	-	-	-	-	-	-	-	-	X	-	-	-	X	-	-	-	-	-
12a3d1	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
09a574	X	-	X	-	-	-	-	-	-	X	X	X	-	-	-	-	-	-
01fb67	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
4d1c32	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
6871e7	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
87578b	-	-	X	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
f89c20	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
6231ce	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4c81c7	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
53962f	X	X	-	-	X	-	-	X	-	-	-	X	-	X	-	-	-	-
20f6cd	X	-	-	X	-	-	-	-	-	-	-	-	-	-	X	-	-	-

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ID/Method	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
885b3b	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
f3015a	X	X	X	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
7235f4	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
460a54	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
2783d6	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
163749	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
f11e22	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
c8b474	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9bc86e	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ef433d	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
7d9bc2	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
445265	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
8df163	-	-	-	-	-	-	X	X	-	-	-	-	-	X	X	-	-	-
262a38	X	-	X	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-
68aba8	X	-	-	X	X	-	X	X	-	X	X	X	X	-	-	-	-	-
daec86	-	-	X	-	-	-	X	-	-	X	-	-	-	-	X	-	-	-
f004bf	X	X	X	-	-	-	X	-	X	X	X	X	-	-	-	-	-	-
87ae94	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
0fcd1a	X	-	X	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-
8cf955	-	-	X	-	-	-	-	X	-	-	-	X	-	-	-	-	-	-
415468	X	-	X	X	-	-	-	-	-	-	X	X	X	-	-	-	-	-
1fa215	X	X	X	X	X	-	X	X	-	X	X	X	X	-	-	-	-	-
06c6f9	X	X	X	-	-	-	X	X	-	X	X	X	-	-	X	-	-	-
f41a21	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12bc15	X	-	X	X	X	-	-	-	-	-	X	-	-	-	-	-	-	-
8366ea	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
b53a36	X	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
61e079	X	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-
04ce01	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8f9b29	X	-	X	X	-	-	X	X	-	X	X	X	-	-	X	-	-	-
8e6ceb	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
9fe177	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
e033de	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
12ef17	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-
74e055	X	X	X	-	-	-	X	X	-	-	-	X	-	-	X	-	-	-
ef8b44	X	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
71265c	-	X	-	X	-	-	X	-	-	-	-	-	X	-	-	-	-	-
a56629	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	-	-	-
41cfbe	-	-	-	X	-	-	-	X	-	X	-	-	-	-	X	-	-	-
0d205e	-	-	-	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-
caece7	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
151d5e	X	-	-	-	X	-	X	-	-	-	X	-	-	-	-	-	-	-
0a07be	-	-	-	-	-	-	-	-	-	-	-	X	-	X	-	-	-	-
00bb33	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-	-	-
211051	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-

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ID/Method	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
06a4b9	-	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-
98b068	-	-	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-
083f07	X	-	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
a28465	X	-	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
28c7f5	X	-	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
e30500	X	-	X	-	-	-	-	-	-	-	X	X	-	-	-	-	-	-
c5ed17	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e79d26	-	X	-	-	-	-	X	-	-	-	-	-	-	-	X	-	-	-
49599a	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
af995d	X	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
e79754	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-
29531c	-	-	X	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
dd7bed	X	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-
146326	-	X	-	-	X	-	X	-	-	-	-	-	-	X	X	-	-	-
c0dfa6	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
f3903e	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
41f49e	X	-	-	-	X	-	-	-	-	-	X	-	-	-	-	-	-	-
a988b0	X	-	X	-	-	-	-	-	-	-	-	X	-	-	-	-	-	-
c5654d	X	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2e39b3	-	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-
f71814	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
72480e	X	-	X	-	-	-	-	-	-	-	-	X	X	-	-	-	-	-
22e916	-	-	-	-	X	-	-	-	-	-	-	-	-	-	-	-	-	-
7fed1f	-	X	X	-	-	-	-	-	-	X	-	-	-	-	-	-	-	-
9210e0	X	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5d4c88	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	-	-
fa5895	-	X	-	-	X	-	X	X	-	-	X	X	-	-	X	-	-	-

Table 2: List of participants (laboratories) – the order in the table does not correspond to the identification number in previous table

Laboratory	Address	Accreditation number
4G consite s.r.o.	Šlikova 406/29, Praha 6, 16900, Česká republika	1518
A.D. CRNAGORAPUT Sektor za laboratorijska ispitivanja - TPA	Ulica Zetskih Vladara broj 5, Podgorica, 81000, Montenegro	-
AB "HISK"	S. Kerbedžio g. 7, Panevėžys, LT-35104, Lithuania	LA.01.070
AG Institut DOO Novi Sad, Sektor za laboratorijska ispitivanja - Laboratorija Beograd	Put novosadskog partizanskog odreda 1a, Novi Sad, 21000, Republic of Serbia	01-457
AG Institut DOO Novi Sad, Sektor za laboratorijska ispitivanja - Laboratorija Novi Sad	Put novosadskog partizanskog odreda 1a, Novi Sad, 21000, Republic of Serbia	01-457

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Laboratory	Address	Accreditation number
AIK-INŽENJERING doo Banovići	Begov potok bb, Banovići, 75290, Bosna i Hercegovina	LI-128-01
ALFA TEST ANGELOU KONSTANTINA LTD	End of Stratou Str., Christoupoli, Spata, 19004, Attiki, Greece	-
ARP GmbH	Johann-Sackl-Gasse 65-67, Leoben, 8700, Österreich	-
ASCHEM di Dott. Giulio Nervi	strada Requaglia 13, ovada, 15076, italia	IT02128960065
A&A MACEDONIA LAB TEST LTD	10, MOISI STREET, CHLORAKA, PAPHOS, 8220, CYPRUS	-
Alkesta	Naujoji 118, Alytus, 62175, Lithuania	-
Asphalt Pavement Institute APIAN doo - Beograd	VRANJSKA 29/65, Beograd, 11050, Serbia	ATS-01/565
BEST, a.s. - Pracoviště Nové Hradky	Rybnice 148, Kaznějov, 33151, Česká republika	1739
BETOTECH, s.r.o. - pracoviště Ostrava	Beroun 660, Beroun, 26601, Česká republika	1195.2
BETOTECH, s.r.o. - Pracoviště Beroun	Beroun 660, Beroun, 266 01, Česká republika	1195
BETOTECH, s.r.o. - Pracoviště Jindřichův Hradec	Beroun 660, Beroun, 266 01, Česká republika	1195
BETOTECH, s.r.o. - Pracoviště Most	Beroun 660, Beroun, 266 01, Česká republika	1195
BETOTECH, s.r.o. - Pracoviště Trutnov	Beroun 660, Beroun, 266 01, Česká republika	1195
BHP Laboratories	Unit 4 New Road Enterprise Centre, Limerick, V94P9X4, Co. Limerick	5T
Banat Inzenjering LBI DOO	Makedonska 15, Zrenjanin, 23000, Republic of Serbia	01-540
Bauchemia T.B., s.r.o., Skúšobné laboratórium Žilina	Pasienkova 9, Bratislava, 821 06, Slovensko	-
Bechtel ENKA UK Limited Ogranak Beograd	Jasički put 52d, Krusevac, 37000, Serbia	-
Betotech s.r.o. - pracoviště Brno	nic se fakturovat nebude !!!, Beroun, 26601, Česká republika	1195.3
Betotech, s.r.o. - pracoviště Beroun	Beroun 660, Beroun, 26601, Česká republika	1195
Bouwkundig Labo BL	Langendonkstraat 2, Sint-Joris, 8730, Belgium	BELAC (Belgium)
Budimex S.A., odštěpný závod Česko	č. 4 vedle pekárny Nopek, Hrušova, 565 55, Česká republika	L1814
CDDI s.r.o. Vysoké Mýto	Vraclavská 163, Vysoké Mýto, 56601, Česká republika	-
CNAIR prin CESTRIN	Bulevardul Iuliu Maniu 401A, sector 6, București, 061101, Bucharest	LI220/19.09.2025
CONSULTEST s.r.o. - pracoviště ZL Brno	Medkova 974/4, Brno - Tuřany, 62700, Česká republika	L1211
CONSULTEST s.r.o. - pracoviště ZL Praha	Medkova 974/4, Brno - Tuřany, 62700, Česká republika	L1211

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Laboratory	Address	Accreditation number
CS-BETON s.r.o.	Velké Žernoseky 184, Litoměřice, 41201, Česká republika	1500
CSS d.o.o.	Savska cesta 144a, Zagreb, 10000, Croatia	1106
Cemex Czech Republic s.r.o.	Plzeňská 3217/16, Praha 5, 15500, Česká republika	1302
Centrum dopravního výzkumu, v.v.i.	Líšeňská 33a, Brno, 63600, Česká republika	1506
Concrefy B.V.	Olivier van Noortweg 10, Venlo, 5928 LX, Limburg	L216
DSP a.s.	Kostěnice 111, Kostěnice, 530 02, Česká republika	1782
Danucem Slovensko a.s., Skúšobné laboratórium Bratislava	Pestovateľská 2, Bratislava, 821 04, Slovenská republika	426/S-313
EDAFOMICHIK S.A.	19 EMM. PAPADAKI, Neo Iraklio, 14121, Greece	-
FERRIERE NORD S.P.A.	Zona Industriale Rivoli di Osoppo, Osoppo, 33010, Italy	-
Faculty of Civil Engineering, University of Belgrade	Bul. kralja Aleksandra 73, Belgrade, 11000, Serbia	-
GD Granit AD Skopje	New Delphi 17, Skopje, 1000, North Macedonia	-
GEO-TECH Dariusz Sakowski	Stara 47, Ruda Śląska, 41-712, Poland	-
GEOPET Teplice s.r.o.	Tolstého 451, Teplice, 415 01, Česká republika	1812
GEOPUT DOO BEOGRAD	Tome Rosandića 2, Belgrade (Beograd), 11010, Serbia (Srbija)	01-290
GEOTest, a.s.	Šmahova 1244/112, Brno, 627 00, Česká republika	1271
Generalna Dyrekcja Dróg Krajowych i Autostrad Oddział w Szczecinie	Al. Bohaterów Warszawy 33, Szczecin, 70-340, Poland	AB 1529
GeoTechService LLC	110 Mirian Mepe str., Tbilisi, 0159, Georgia	GAC-TL-0227
Geohidroinzenjering DOO Skopje	1606 No.8, Gjorce Petrov, Skopje, Skopje, 1000, N Macedonia	LT-096
Geoter G. Didaskalou SA	Tompazi 20, Pylaia, Thessaloniki, 55535, Greece	258
Gradezen Institut "Makedonija" AD Skopje	Drezdenska No.52, SKOPJE KARPOS, 1000, North Macedonia	LT-014
Heidelberg Materials AG	c/o HMS DE GmbH BUK 0010, Leimen, 69178, Germany	D-PL-17264-01-00
Holcim (Hrvatska) d.o.o.	Koromačno 7b, Koromačno, 52222, Hrvatska	1528
Holcim (Česko), a.s.	Čížkovice č.p. 27, Čížkovice, 41112, Česká republika	1426
Hrvatski restauratorski zavod	Grskoviceva 23, Zagreb, 10000, Croatia	-

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Laboratory	Address	Accreditation number
I2 ANALYTICAL LIMITED SPÓŁKA Z OGRANICZONĄ ODPOWIEDZIALNOŚCIĄ ODDZIAŁ W POLSCE	Pionierów 39, Ruda Śląska, 41-711, Poland	-
INSTITUTI NDERTIMIT (IN)	Myslym Keta, Brare Tufine, Albania, Tirana, 1001, Albania	-
Institut IMS a.d. - Beograd, Laboratorija za kamen i agregat	Bulevar vojvode Mišića 43, Belgrade, 11142, Serbia	ATS 01-058
Institut technologie a testování betonu, s.r.o., Zkušební laboratoř ITTBrno	Medkova 974/4, Brno - Tuřany, 627 00, Česká republika	L1778
Institute IMS, Laboratory for Roads and Geotechnics	Bulevar vojvode Mišića 43, Belgrade, 11000, Serbia	01-138
Kilsaran Concrete Unlimited Company	Piercetown, Piercetown, Dunboyne, Co.Meath, A86 W820, Ireland	241T
LABING ACG GROUP DOO Skopje	Makedonska vojska No.10, SKOPJE, 1000, North Macedonia	-
LABORATOIRE DES TRAVAUX PUBLICS DU SUD	Zone des activités Bouhraoua- PB 332 GHARDAIA, GHARDAIA, 47000, Algérie	-
LPM - LABORATORIO PROVE MATERIALI di impresa bacchi srl	via don giuseppe dossetti 19, carpiano (mi), 20074, italia	01205
Laboratoire des Travaux Publics de L'Est Direction regionale de Setif	Ltpe Zone Industrielle de Setif, Setif, 19000, Algerie	-
Laboratorijski putni centar doo Novi Sad	ABADZIJSKA 32, Veternik - Novi Sad, 21203, Srbija	01-531
MFG	Algérie, Larbaa-Blida-Algérie, 9300, Algeria	-
MTS Ltd	19 Kernanstown Ind Est, Carlow, R95V384, Co Carlow	-
MTS Ltd	19 Kernanstown Ind Est, Carlow, R93 PY67, Ireland	120T
Mirjana Cprljakovic	Bulevar oslobodilaca Čačka 141, Čačak, 32103, Serbia	-
QCONTROL s.r.o., odštěpný závod - pracoviště Děčín	Lesní 693, Bílovice nad Svitavou, 66401, Česká republika	1737
QUALIFORM SLOVAKIA s.r.o. - pracovisko Bratislava	Pasienková 9 D, Bratislava, 821 06, Slovenská republika	S-301
RO4183163	Calea Griviței 393, sector 1, București, 010719, Romania	LI 1183
S.C. GEOSTUD S.R.L.	Singerului, Bucuresti, 014617, Romania	LI 974
SG Geotechnika a.s.	Geologická 4, Praha 5, 152 00, Česká republika	1119
Sibotec	Industriepark Oost 6, Beernem, 8730, Belgium	Sibotec
Sika Srbija d.o.o.	Patrijarha Pavla 1, Šimanovci, 22310, Republika Srbija	-

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Laboratory	Address	Accreditation number
Simon Atkins	Unit 2 Site, 9 NW Business Park, Ballycoolen, Dublin, D15 EF1H, Ireland, Dublin, D15 EF1H, Dublin - Ireland	286T
TRA EOOD CTC BURGAS	Rezbarska str. №7, SOFIA, 1510, BULGARIA	-
TRA EOOD CTC KREPOST	Rezbarska str. №7, SOFIA, 1510, BULGARIA	-
TRA EOOD CTC SOFIA	Rezbarska str. №7, SOFIA, 1510, BULGARIA	-
Technický a zkušební ústav stavební Praha, s. p. - pobočka České Budějovice	Prosecká 811/76a, Praha 9, 19000, Česká republika	1018.3
Technický a zkušební ústav stavební Praha, s. p., Centrální laboratoř - zkušebna Brno	Hněvkovského 77, Brno, 617 00, Česká republika	1018.3
Technický a zkušební ústav stavební Praha, s.p.	Zahradní 2180/15, Plzeň, 326 00, Česká republika	1018.3
Technický a zkušební ústav stavební Praha, s.p., pobočka Praha	pobočka Praha, Prosecká 811/76a, Praha 9, 190 00, Česká republika	1018.3
Technický a zkušební ústav stavební Praha, s.p.-pobočka Ostrava	U Studia 14, OSTRAVA, 70030, Česká republika	1018.3
Technický a zkušební ústav stavební s.p.	5. května 1071/2, Duchcov, 41901, Česká republika	1018.3
Technische Universität Graz	Inffeldgasse 24, Graz, 8010, Austria	-
UAB Laboratoriniu bandymu centras	R. Kalantos street 85a, Kaunas, 45293, Lithuania	-
UAB Testlita - Vilniaus laboratorija	J. Basanaviciaus str. 160D-2, Šiauliai, LT-76128, Lithuania	LA.01.013
VIALAB CZ s.r.o - LOL LL1 (Těškov)	U Michelského lesa 1581/2, Praha 4, 140 00, Česká republika	1771
VIALAB CZ s.r.o - LOL LL3 (Jakubčovice)	U Michelského lesa 1581/2, Praha 4, 140 00, Česká republika	1771
VIALAB CZ s.r.o. - CL01 Krč	U Michelského lesa 1581/2, Praha 4, 140 00, Česká republika	L 1112
VIALAB CZ s.r.o. - CL07 Hradec Králové	Piletická 498, Hradec Králové, 503 41, Česká republika	L 1112
VIALAB CZ s.r.o. - CL12 Liberec	Piletická 498, Hradec Králové, 503 41, Česká republika	L 1112
VIALAB CZ s.r.o.- CL05 Kolín	U Michelského lesa 1581/2, Praha 4, 140 00, Česká republika	L 1112
VIALAB CZ, s.r.o. - Laboratoř Morava, pracoviště LM1 Zlín	U Michelského lesa 1581/2, Praha 4, 14000, Česká republika	1170
VIALAB CZ, s.r.o. - Laboratoř Morava, pracoviště LM2 Semimobilní	U Michelského lesa 1581/2, Praha 4, 14000, Česká republika	1170
VIALAB CZ, s.r.o. - Laboratoř Morava, pracoviště LM3 Brno	U Michelského lesa 1581/2, Praha 4, 14000, Česká republika	1170
VIALAB CZ, s.r.o. - Laboratoř Morava, pracoviště LM4 Ostrava	U Michelského lesa 1581/2, Praha 4, 14000, Česká republika	1170

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Laboratory	Address	Accreditation number
VIALAB SK s.r.o	Osloboditeľov 66, Košice, 040 17, Česká republika	-
VUIS - CESTY spol. s r. o.	Vlčie hrdlo 1, Bratislava, 821 07, Slovenská republika	-
Vysoké učení technické v Brně, Fakulta stavební, Zkušební laboratoř při ÚTHD FAST VUT v Brně	Veveří 331/95, Brno, 60200, Česká republika	L1396
Zavod za gradbeništvo Slovenije	Dimičeva ulica 12, Ljubljana, 10000, Slovenija	-
Zkušebna kamene a kameniva, s.r.o.	Husova 2274, Hořice, 508 01, Česká republika	1046
Zkušebna kamene a kameniva, s.r.o.	Husova 2274, Hořice, 508 01, Česká republika	1046
Zkušebna kameniva, s.r.o.	Fügnerova 64, Blatná, 38801, Česká republika	1141
sofia karamanou	22A Halkidos street,, Athens, Greece, 111 43, Greece	-
voestalpine Stahl Donawitz GmbH	Kerpelystrasse 199, Gebäude 12, Leoben, 8700, Austria	0362
Ředitelství silnic a dálnic s. p.	Čerčanská 2023/12, Praha 4 - Krč, 140 00, Česká republika	1072
Ředitelství silnic a dálnic s. p., Samostatné oddělení zkušebnictví Praha, Laboratoř Praha	Čerčanská 2023/12, Praha, 140 00, Česká republika	1734

2 Procedures used in the Statistical Analysis of Laboratory Results

The statistical analysis is based on the following steps:

1. Evaluation of intralaboratory variabilities by Cochran's C test: If 5% or 1% critical value is exceeded, the effect of the individual observations is first considered. If the results indicate that high participant variability is caused by a single observation, this value is excluded from the experiment, but the participant is not excluded as outlying. By overcoming 1% of the critical value, the participant's results can be marked as outlying and excluded from the experiment (symbol .
2. The numerical critical evaluation of the test results using Grubbs' test: By overcoming 1% critical value, the participant's results can be marked as outlying and excluded from the experiment (symbol .
3. Graphical determination of the consistency of laboratories (Mandel's statistics): The exceedance of the critical values of Mandel's statistics does not indicate that the results of the laboratories concerned are wrong; it only suggests minor inconsistencies.
4. Evaluation of descriptive statistics and, if possible, taking into account the number of observations, the repeatability and reproducibility.
5. Evaluation of the assigned value.
6. The performance evaluation: The most significant outcome of the PT Program is the so-called z-score and ζ -score (zeta-score). These characteristics assess the performance of individual participants by comparing it with the assigned value and measurement uncertainties. z-score and ζ -score are compared with limit values. The resulting ζ -score values are not taken into account during the final evaluation of the performance of participants as they are to a considerable degree dependent on the values of the measurement uncertainties of the assessed institutions. The following scales are applied for the z-score values:
 - $|z\text{-score}| < 2 \Rightarrow$ shows that the laboratory performance is **satisfactory** and generates no signal – .
 - $2 \leq |z\text{-score}| < 3 \Rightarrow$ shows that the laboratory performance is **questionable** and generates an action signal – .
 - $|z\text{-score}| \geq 3 \Rightarrow$ shows that the laboratory performance is **unsatisfactory** and generates an action signal – .

Procedures used in the statistical analysis of proficiency testing programs can be found here:
<http://ptprovider.cz/?lang=en>.

3 Conclusions of the Statistical Analysis

The present report summarizes the results of the Proficiency Testing Program ZK 2026/1 (PT Program) organized by the PT Provider at the SZK FAST. 110 participants (laboratories) took part in the PT Program. The PT program focused on ordinary standardized testing of aggregates. The test results are evaluated separately for each testing procedure examined. An evaluation of statistical characteristics is included in the Appendix, as well as test results and graphic presentations. In some cases, overcoming the critical values of the Cochran test due to incorrect rounding of test results by laboratories was not taken into account.

3.1 EN 933-1 Determination of Particle Size Distribution - Sieving Method

The test results were evaluated as multilevel experiment according to the sieve size: 4 mm, 2 mm, 1 mm, 0.5 mm, 0.25 mm, 0.125 mm and 0.063 mm. The outliers elimination and evaluation of statistical characteristics were carried out in every level of experiment. The test results are shown together with graphic presentation and evaluated statistical characteristics in part 1 of the Appendix. The test results were rated as outlying, questionable or unsatisfactory only if the limit values were exceeded in four levels at least.

The assigned value and its uncertainty was determined using the A algorithm (ISO 13528 [20]). Table 3 shows the performance evaluation and outliers for the individual sieves; testing method EN 933-1 [1].

✓ – satisfactory performance; ? – questionable performance; ! – unsatisfactory performance, X – outlier

Table 3: Evaluation of participants performance for individual sieves – ČSN EN 933-1

ID	4 mm	2 mm	1 mm	0.5 mm	0.25 mm	0.125 mm	0.063 mm	Overall
04ce01	X	!	X	?	?	✓	✓	?
06c6f9	✓	✓	✓	✓	✓	✓	✓	✓
083f07	✓	✓	✓	✓	✓	✓	✓	✓
09a574	✓	✓	✓	✓	✓	✓	✓	✓
0fcd1a	✓	✓	✓	✓	✓	✓	✓	✓
12a3d1	✓	✓	✓	✓	✓	✓	✓	✓
12bc15	✓	✓	✓	✓	✓	✓	✓	✓
151d5e	✓	✓	✓	✓	✓	✓	✓	✓
189651	!	!	?	✓	✓	✓	✓	✓
1fa215	?	?	X	!	✓	✓	✓	?
20f6cd	✓	✓	✓	✓	?	✓	✓	✓
280858	✓	✓	✓	✓	✓	✓	✓	✓
28c7f5	✓	✓	✓	✓	✓	✓	✓	✓
3f2444	✓	✓	✓	✓	✓	✓	✓	✓
415468	✓	✓	✓	✓	✓	✓	✓	✓
41f49e	✓	✓	✓	✓	✓	✓	✓	✓
445265	✓	✓	✓	✓	✓	✓	✓	✓
49599a	✓	✓	✓	✓	✓	✓	✓	✓
4c81c7	✓	✓	✓	✓	✓	✓	✓	✓

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ID	4 mm	2 mm	1 mm	0.5 mm	0.25 mm	0.125 mm	0.063 mm	Overall
4d1c32	✓	✓	!	?	✓	✓	✓	✓
53962f	✓	✓	✓	✓	✓	✓	✓	✓
60220d	✓	✓	✓	✓	✓	✓	✓	✓
61e079	✓	✓	✓	✓	✓	✓	✓	✓
6231ce	✓	✓	?	✓	✓	✓	✓	✓
6871e7	✓	✓	✓	✓	✓	✓	✓	✓
68aba8	✓	✓	✓	✓	✓	✓	?	✓
718742	✓	✓	✓	✓	✓	✓	✓	✓
7235f4	✓	✓	✓	✓	✓	✓	✓	✓
72480e	✓	✓	✓	✓	✓	✓	✓	✓
74e055	✓	✓	✓	✓	✓	✓	✓	✓
7d9bc2	✓	✓	✓	✓	✓	✓	✓	✓
8366ea	✓	✓	✓	✓	✓	✓	✓	✓
87ae94	✓	✓	✓	✓	✓	✓	✓	✓
885b3b	?	✓	✓	✓	✓	✓	✓	✓
8f9b29	✓	✓	✓	✓	✓	✓	✓	✓
9210e0	✓	✓	✓	✓	✓	✓	✓	✓
9bc86e	✓	✓	✓	✓	✓	✓	✓	✓
a28465	✓	?	✓	✓	✓	✓	✓	✓
a988b0	✓	✓	✓	✓	✓	✓	✓	✓
af995d	✓	?	✓	✓	✓	✓	✓	✓
b1b0a7	✓	✓	✓	✓	✓	✓	✓	✓
b53a36	✓	✓	✓	✓	✓	✓	✓	✓
bca32e	✓	✓	✓	✓	✓	✓	✓	✓
c2bf7f	✓	✓	✓	✓	✓	✓	✓	✓
c5654d	✓	✓	✓	✓	✓	✓	✓	✓
ca9941	X	?	✓	✓	✓	✓	!	✓
caece7	✓	✓	✓	✓	✓	✓	✓	✓
cc3310	✓	✓	✓	✓	✓	✓	✓	✓
cead79	✓	✓	✓	✓	✓	✓	✓	✓
cff407	✓	✓	✓	✓	✓	✓	✓	✓
dd7bed	✓	✓	✓	✓	✓	✓	✓	✓
e2f492	✓	✓	✓	X	✓	✓	✓	✓
e30500	?	✓	✓	✓	✓	✓	✓	✓
ef8b44	✓	✓	✓	✓	✓	✓	✓	✓
f004bf	?	✓	✓	✓	✓	✓	✓	✓
f11e22	✓	✓	✓	✓	✓	✓	✓	✓

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ID	4 mm	2 mm	1 mm	0.5 mm	0.25 mm	0.125 mm	0.063 mm	Overall
f3015a	✓	✓	✓	✓	✓	✓	✓	✓
f3903e	✓	✓	?	X	X	X	X	X
f41a21	✓	✓	✓	✓	✓	✓	✓	✓
fc13cc	✓	✓	✓	✓	✓	✓	✓	✓

3.2 Overall Performance Evaluation

Testing methods can be found in part 1 of this report. The overall performance evaluation is given in Table 4.

✓ – satisfactory performance; ? – questionable performance; ! – unsatisfactory performance, X – outlier

Table 4: Evaluation of participants performance

ID / Method	1	2	3	4	5	7	8	9	10	11	12	13	14	15
00bb33	-	-	-	-	✓	-	-	-	-	-	-	✓	-	-
015f1d	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
01fb67	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
04ce01	?	-	-	-	-	-	-	-	-	-	-	-	-	-
06a4b9	-	-	-	✓	✓	-	-	-	-	-	-	-	-	-
06c6f9	✓	✓	✓	-	-	✓	✓	-	✓	✓	?	-	-	✓
07d606	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
083f07	✓	-	✓	-	-	-	-	-	-	✓	✓	-	-	-
09a574	✓	-	✓	-	-	-	-	-	✓	✓	✓	-	-	-
0a07be	-	-	-	-	-	-	-	-	-	-	✓	-	✓	-
0d205e	-	-	-	-	-	✓	✓	-	-	-	-	-	-	-
0e319e	-	-	-	-	✓	-	✓	-	-	-	-	-	-	-
0fcd1a	✓	-	✓	-	-	-	-	-	-	-	✓	-	✓	-
12a3d1	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
12bc15	✓	-	✓	✓	✓	-	-	-	-	✓	-	-	-	-
12ef17	-	-	-	-	-	-	-	✓	-	-	-	-	-	-
146326	-	✓	-	-	✓	✓	-	-	-	-	-	-	✓	✓
151d5e	✓	-	-	-	✓	✓	-	-	-	✓	-	-	-	-
189651	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
1fa215	?	✓	✓	✓	✓	✓	✓	-	✓	?	✓	✓	-	-
20f6cd	✓	-	-	✓	-	-	-	-	-	-	-	-	-	✓
211051	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
246ad1	-	-	-	-	-	-	-	✓	-	-	-	✓	-	-
2783d6	-	-	-	✓	-	-	-	-	-	-	-	-	-	-

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ID / Method	1	2	3	4	5	7	8	9	10	11	12	13	14	15
280858	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
28c7f5	✓	-	✓	-	-	-	-	-	-	✓	✓	-	-	-
2920fc	-	-	-	-	✓	-	-	-	-	-	-	-	-	-
29531c	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
2e39b3	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
3f2444	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
415468	✓	-	✓	✓	-	-	-	-	-	✓	✓	✓	-	-
41cfbe	-	-	-	✓	-	-	✓	-	✓	-	-	-	-	✓
41f49e	✓	-	-	-	✓	-	-	-	-	✓	-	-	-	-
445265	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
460a54	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
49599a	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
4c81c7	✓	✓	-	-	-	-	-	-	-	-	-	-	-	-
4d1c32	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
53962f	✓	✓	-	-	✓	-	✓	-	-	-	✓	-	✓	-
5755fe	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
60220d	✓	✓	-	-	✓	-	✓	-	-	-	✓	-	-	-
61e079	✓	-	✓	✓	-	-	-	-	-	✓	-	-	-	-
6231ce	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
6871e7	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
68aba8	✓	-	-	✓	✓	?	✓	-	✓	✓	✓	✓	-	-
6bea11	-	-	-	✓	-	✓	✓	-	-	-	-	-	-	-
70e54b	-	-	-	-	-	-	✓	-	✓	-	-	-	✓	-
71265c	-	✓	-	✓	-	✓	-	-	-	-	-	✓	-	-
718742	✓	-	✓	-	-	-	-	-	-	✓	-	-	-	-
7235f4	✓	-	✓	-	-	-	-	-	-	-	✓	-	-	-
72480e	✓	-	✓	-	-	-	-	-	-	-	✓	✓	-	-
74e055	✓	✓	✓	-	-	✓	✓	-	-	-	✓	-	-	✓
7d9bc2	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-
7fed1f	-	?	✓	-	-	-	-	-	✓	-	-	-	-	-
8366ea	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
87578b	-	-	✓	-	-	✓	✓	-	-	-	-	-	-	-
87ae94	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-
885b3b	✓	-	✓	-	-	-	-	-	-	?	-	-	-	-
8cf955	-	-	✓	-	-	-	✓	-	-	-	✓	-	-	-
8df163	-	-	-	-	-	✓	✓	-	-	-	-	-	-	✓
8e6ceb	-	-	-	-	✓	-	-	-	-	-	-	-	-	-

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ID / Method	1	2	3	4	5	7	8	9	10	11	12	13	14	15
8f9b29	✓	-	✓	✓	-	✓	✓	-	✓	✓	✓	-	-	✓
9210e0	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
98b068	-	-	-	✓	✓	-	-	-	-	-	✓	-	-	-
9bc86e	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
9fe177	-	-	-	-	-	-	-	-	-	-	-	-	-	✓
a28465	✓	-	✓	-	-	-	-	-	-	✓	✓	-	-	-
a56629	-	-	-	-	-	-	-	-	-	-	-	✓	✓	✓
a988b0	✓	-	✓	-	-	-	-	-	-	-	✓	-	-	-
af995d	✓	-	?	✓	-	-	-	-	-	-	-	-	-	-
b18c80	-	-	-	✓	-	-	-	-	-	-	-	-	-	-
b1b0a7	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
b53a36	✓	-	✓	-	-	-	-	-	-	✓	-	-	-	-
bca32e	✓	-	✓	-	-	-	✓	✓	-	✓	-	-	✓	-
c0dfa6	-	-	-	-	-	-	-	-	-	-	✓	-	-	-
c2bf7f	✓	?	-	-	✓	✓	✓	-	-	-	✓	-	✓	-
c5654d	✓	-	✓	-	-	-	-	-	-	-	-	-	-	-
c58a44	-	-	?	-	-	-	✓	-	-	-	-	?	-	-
c5ed17	-	-	✓	-	-	-	-	-	-	-	-	-	-	-
c8b474	-	-	✓	✓	-	-	-	-	-	-	-	-	-	-
ca9941	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
caece7	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-
cc3310	✓	-	✓	-	-	✓	✓	-	-	-	✓	-	✓	-
cead79	✓	-	-	-	-	-	-	-	-	-	?	-	-	-
cff407	✓	-	-	-	-	-	✓	-	-	-	-	-	-	-
daec86	-	-	✓	-	-	✓	-	-	?	-	-	-	-	✓
dd7bed	✓	-	-	✓	-	-	-	-	-	-	-	-	-	-
e033de	-	-	-	-	-	-	✓	-	-	-	-	-	-	-
e2f492	✓	✓	✓	✓	-	-	✓	-	-	-	✓	-	-	-
e30500	✓	-	✓	-	-	-	-	-	-	?	✓	-	-	-
e79754	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
e79d26	-	✓	-	-	-	✓	-	-	-	-	-	-	-	✓
ef433d	-	-	-	-	-	-	-	-	-	✓	-	-	-	-
ef8b44	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-
f004bf	✓	✓	✓	-	-	✓	-	✓	✓	✓	?	-	-	-
f11e22	✓	-	✓	-	-	-	-	-	-	✓	-	-	-	-
f3015a	✓	✓	✓	-	-	-	✓	-	-	-	-	-	-	-
f3903e	X	-	-	-	-	-	-	-	-	-	-	-	-	-

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ID / Method	1	2	3	4	5	7	8	9	10	11	12	13	14	15
f3cece	-	-	-	-	-	-	-	-	-	-	-	-	-	✓
f41a21	✓	-	-	-	-	-	-	-	-	-	-	-	-	-
f71814	-	-	-	-	-	-	-	-	-	-	-	-	-	✓
fa5895	-	✓	-	-	?	✓	✓	-	-	✓	✓	-	-	✓
fc13cc	✓	-	-	-	-	-	-	-	-	✓	-	-	-	-

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1 Appendix – EN 933-1 Determination of particle size distribution - Sieving method

1.1 4 mm

1.1.1 Test results

Table 5: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

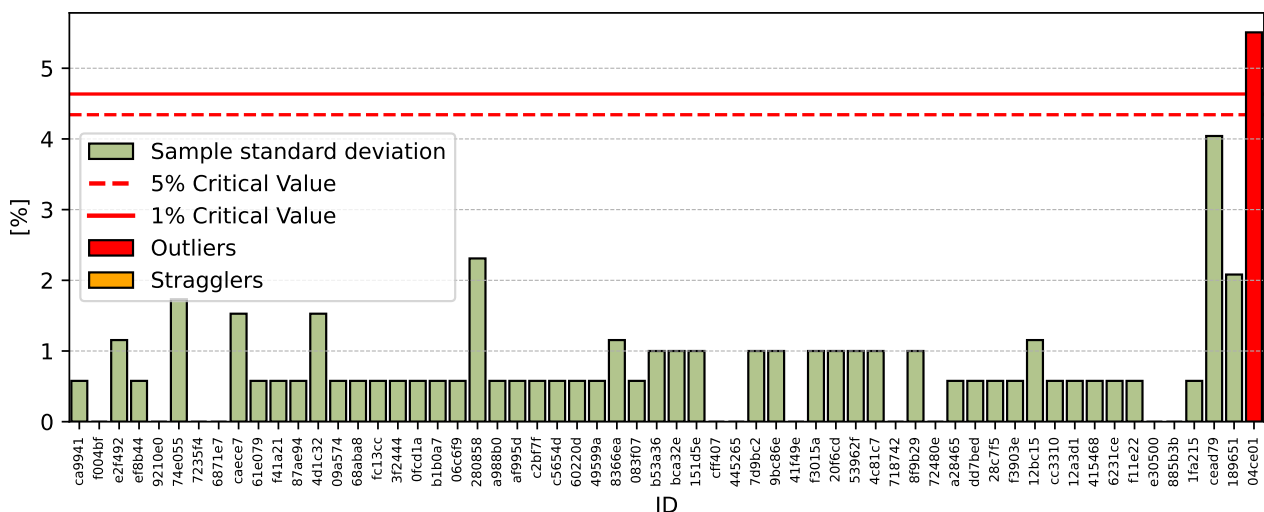
ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
ca9941	87	86	86	-	86	0.6	0.67
f004bf	89	89	89	-	89	0.0	0.00
e2f492	90	88	90	1.0	89	1.2	1.29
ef8b44	90	89	90	2.0	90	0.6	0.64
9210e0	90	90	90	0.5	90	0.0	0.00
74e055	92	89	89	4.0	90	1.7	1.92
7235f4	90	90	90	0.3	90	0.0	0.00
6871e7	90	90	90	0.9	90	0.0	0.00
caece7	90	89	92	0.3	90	1.5	1.69
61e079	91	90	90	-	90	0.6	0.64
f41a21	90	91	90	0.5	90	0.6	0.64
87ae94	90	90	91	3.5	90	0.6	0.64
4d1c32	90	92	89	4.0	90	1.5	1.69
09a574	90	90	91	0.7	90	0.6	0.64
68aba8	90	90	91	-	90	0.6	0.64
fc13cc	90	91	90	0.1	90	0.6	0.64
0fcd1a	91	90	91	0.8	91	0.6	0.64
49599a	90	91	91	-	91	0.6	0.64
c2bf7f	90	91	91	-	91	0.6	0.64
8366ea	92	90	90	-	91	1.2	1.27
af995d	91	91	90	-	91	0.6	0.64
06c6f9	91	90	91	1.0	91	0.6	0.64
b1b0a7	90	91	91	2.7	91	0.6	0.64
083f07	90	91	91	2.1	91	0.6	0.64
3f2444	91	91	90	-	91	0.6	0.64
60220d	91	91	90	1.8	91	0.6	0.64
c5654d	90	91	91	-	91	0.6	0.64
a988b0	90	91	91	-	91	0.6	0.64
280858	88	92	92	5.0	91	2.3	2.55
41f49e	91	91	91	1.4	91	0.0	0.00
8f9b29	90	91	92	0.7	91	1.0	1.10
718742	91	91	91	6.3	91	0.0	0.00
b53a36	90	91	92	-	91	1.0	1.10
4c81c7	90	91	92	0.5	91	1.0	1.10
bca32e	91	90	92	-	91	1.0	1.10
20f6cd	91	90	92	-	91	1.0	1.10
151d5e	90	91	92	3.0	91	1.0	1.10
cff407	91	91	91	1.5	91	0.0	0.00
f3015a	92	90	91	1.2	91	1.0	1.10
cead79	91	98	91	3.0	91	0.0	0.00

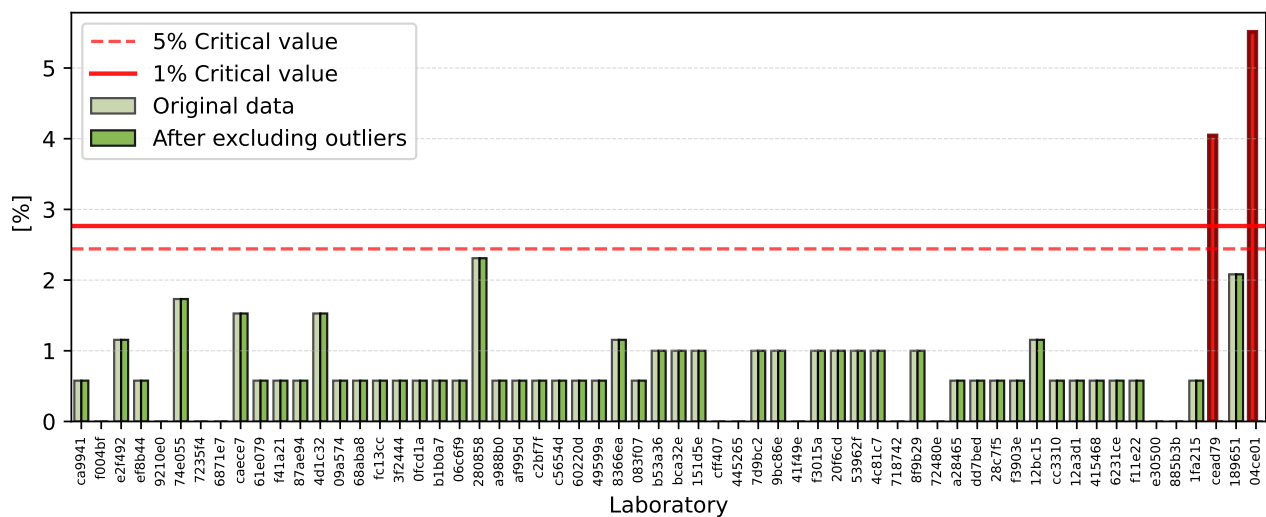
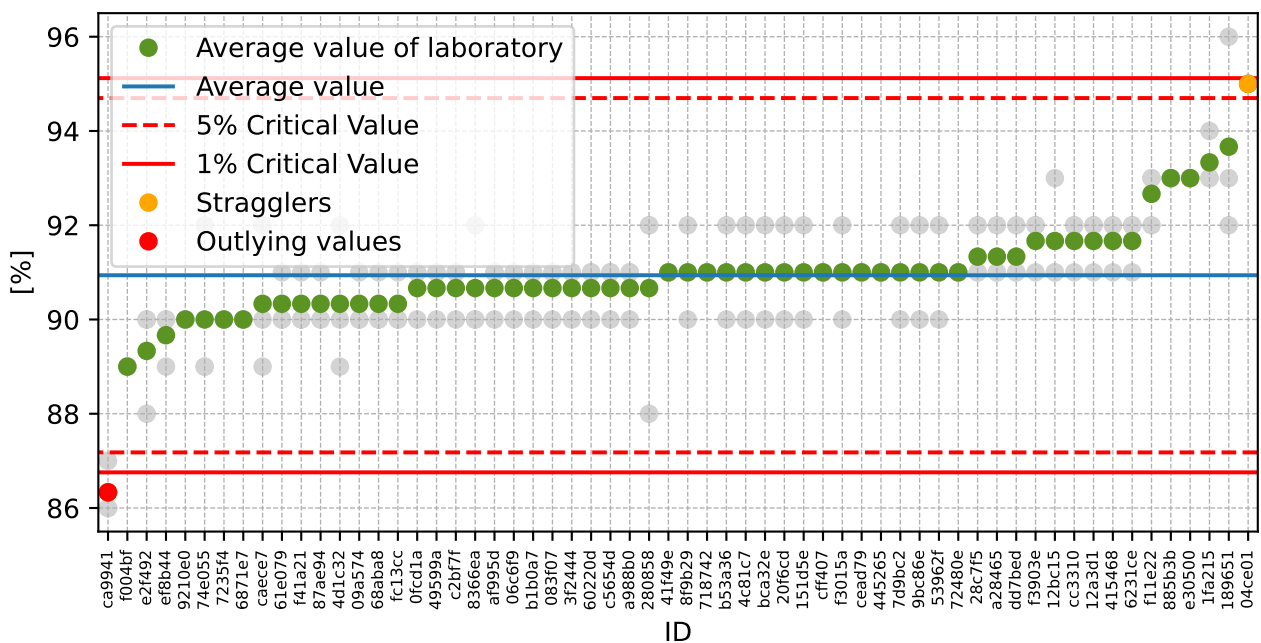
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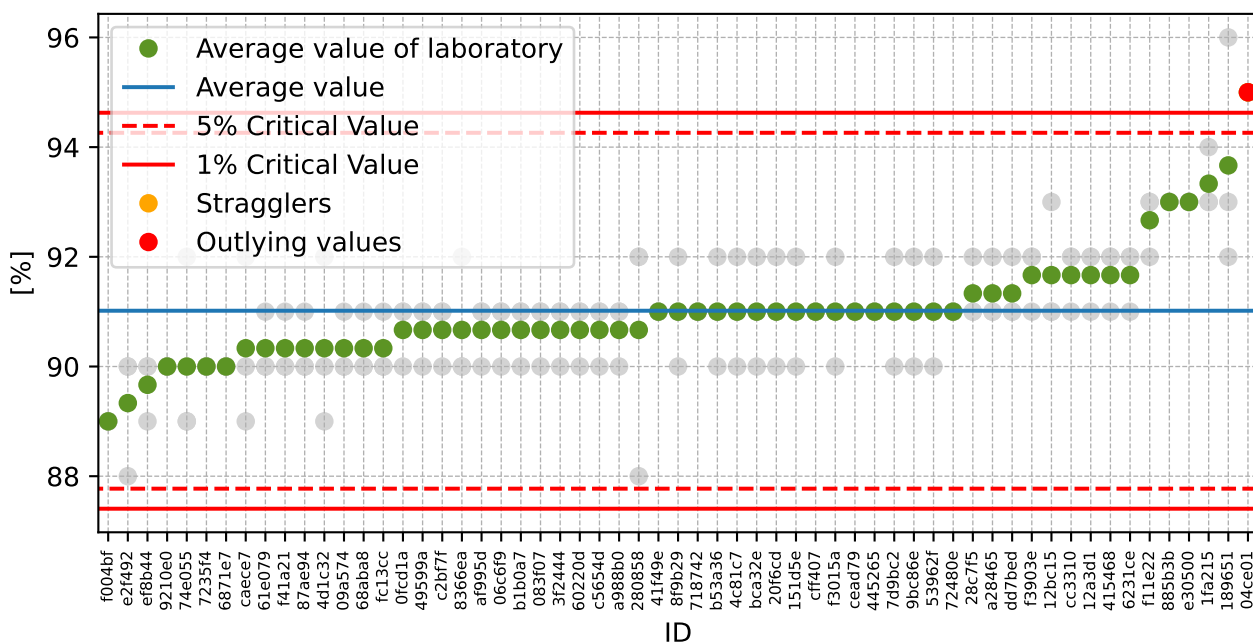
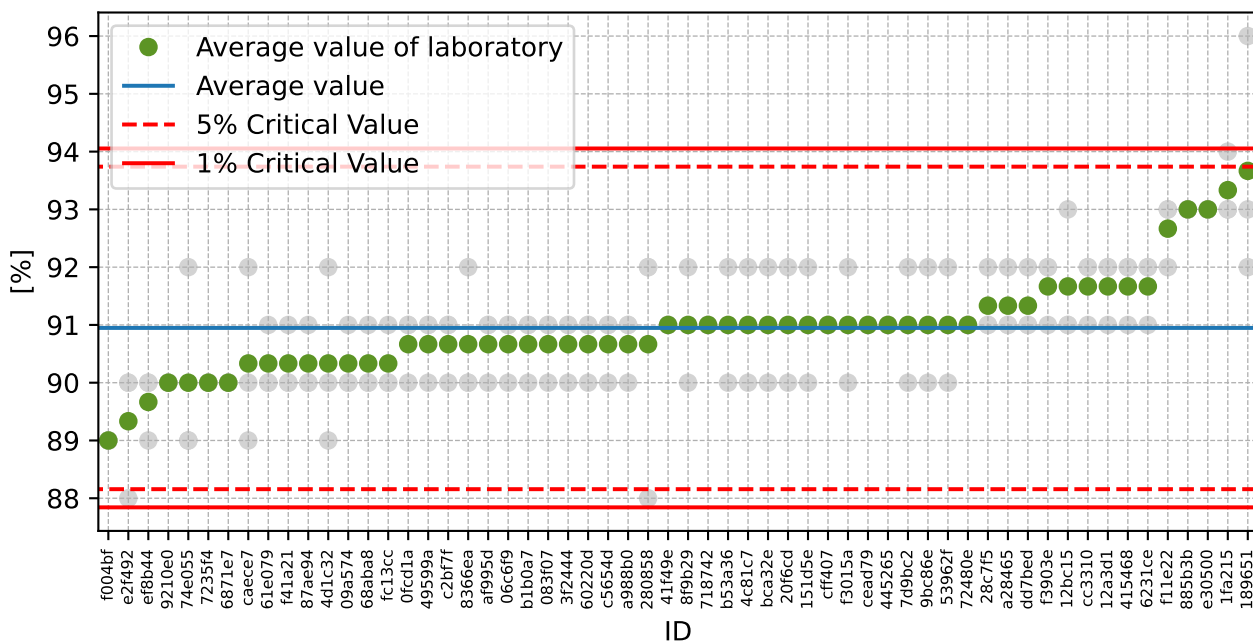
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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
445265	91	91	91	1.9	91	0.0	0.00
7d9bc2	90	91	92	1.0	91	1.0	1.10
9bc86e	92	90	91	0.1	91	1.0	1.10
53962f	90	91	92	-	91	1.0	1.10
72480e	91	91	91	0.2	91	0.0	0.00
28c7f5	91	91	92	0.2	91	0.6	0.63
a28465	91	91	92	1.0	91	0.6	0.63
dd7bed	92	91	91	-	91	0.6	0.63
f3903e	92	92	91	1.5	92	0.6	0.63
12bc15	91	93	91	-	92	1.2	1.26
cc3310	92	91	92	-	92	0.6	0.63
12a3d1	92	92	91	1.2	92	0.6	0.63
415468	91	92	92	-	92	0.6	0.63
6231ce	92	92	91	-	92	0.6	0.63
f11e22	93	92	93	2.5	93	0.6	0.62
885b3b	93	93	93	4.0	93	0.0	0.00
e30500	93	93	93	4.0	93	0.0	0.00
1fa215	93	93	94	7.0	93	0.6	0.62
189651	93	92	96	1.0	94	2.1	2.22
04ce01	100	95	89	0.1	95	-	-

1.1.2 The Numerical Procedure for Determining Outliers

Figure 1: **Cochran's test** - sample standard deviations

Figure 2: **Cochran's test** - sample standard deviations without outliersFigure 3: **Grubbs' test** - average values

Figure 4: **Grubbs' test** - average values without outliersFigure 5: **Grubbs' test** - average values without outliers

11.3 Mandel's Statistics

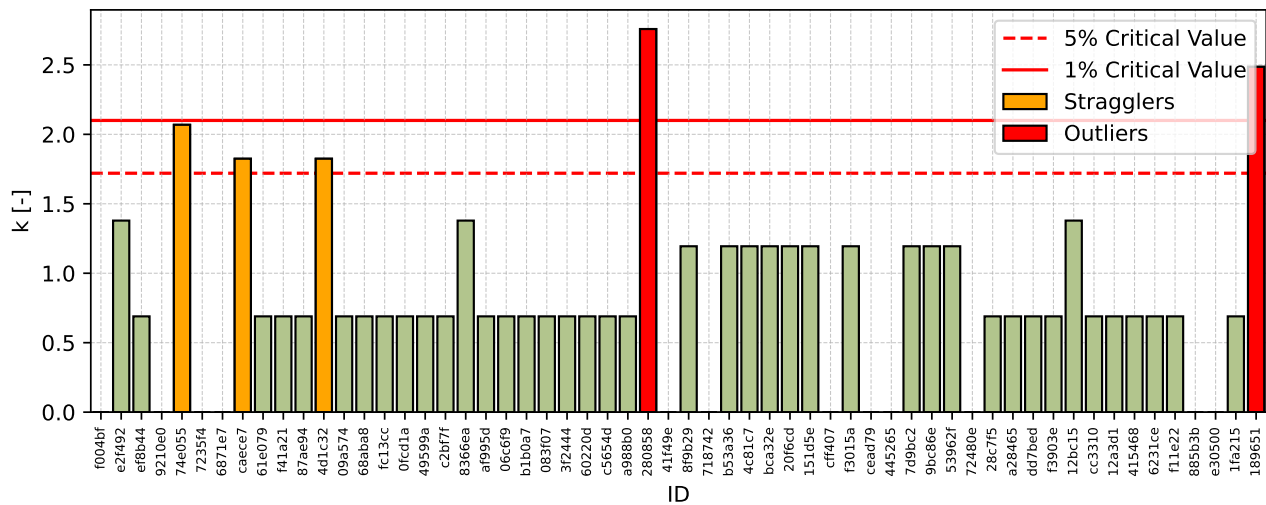


Figure 6: Intralaboratory Consistency Statistic

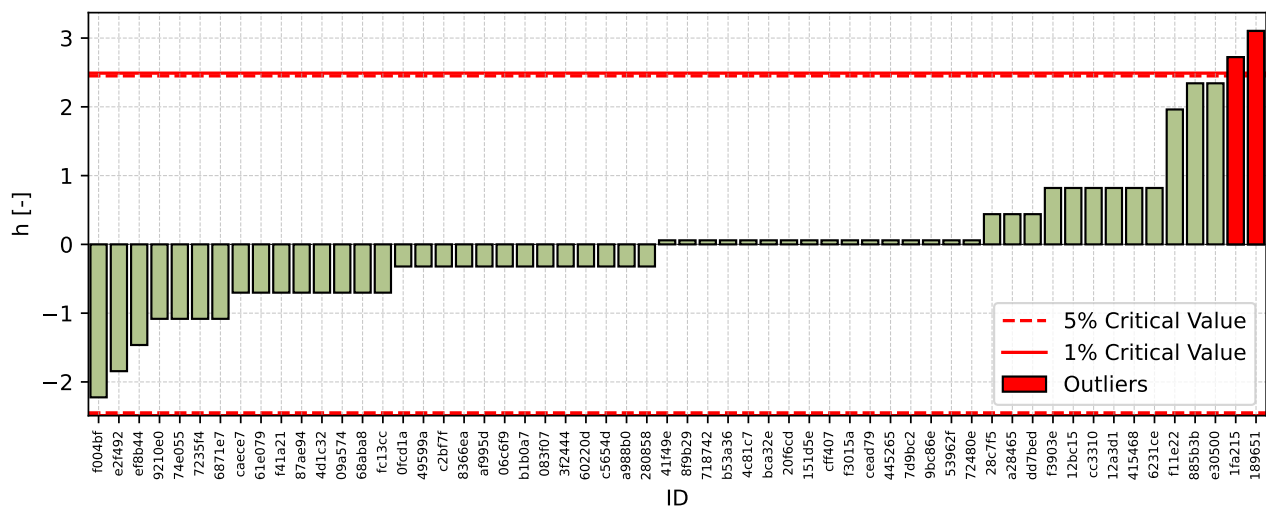


Figure 7: Interlaboratory Consistency Statistic

1.1.4 Descriptive statistics

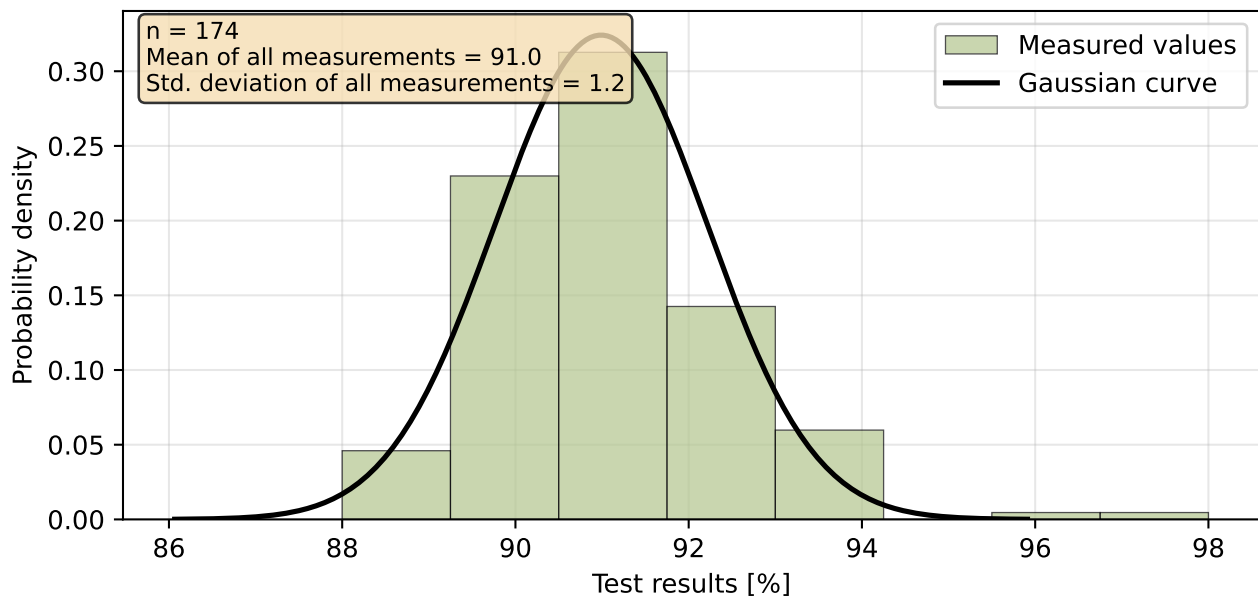


Figure 8: Histogram of all test results

Table 6: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	90.9
Sample standard deviation – s	0.9
Assigned value – x^*	90.9
Robust standard deviation – s^*	0.9
Measurement uncertainty of assigned value – u_x	0.1
p -value of normality test [-]	< 0.001

1.1.5 Evaluation of Performance Statistics

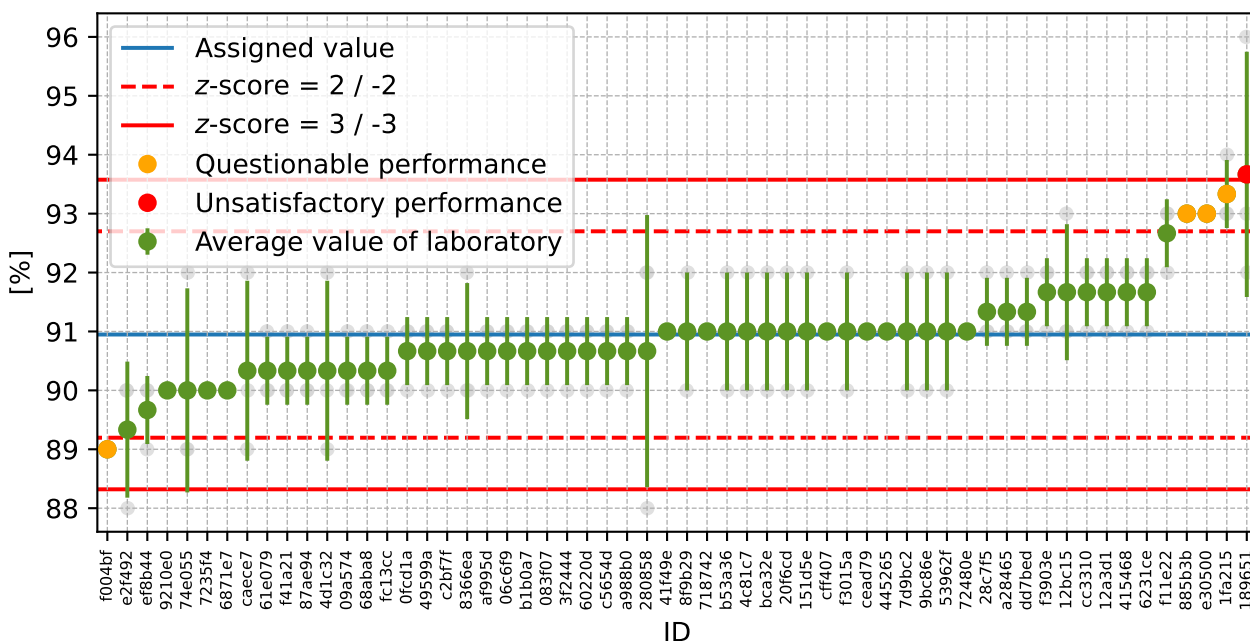


Figure 9: Average values and sample standard deviations

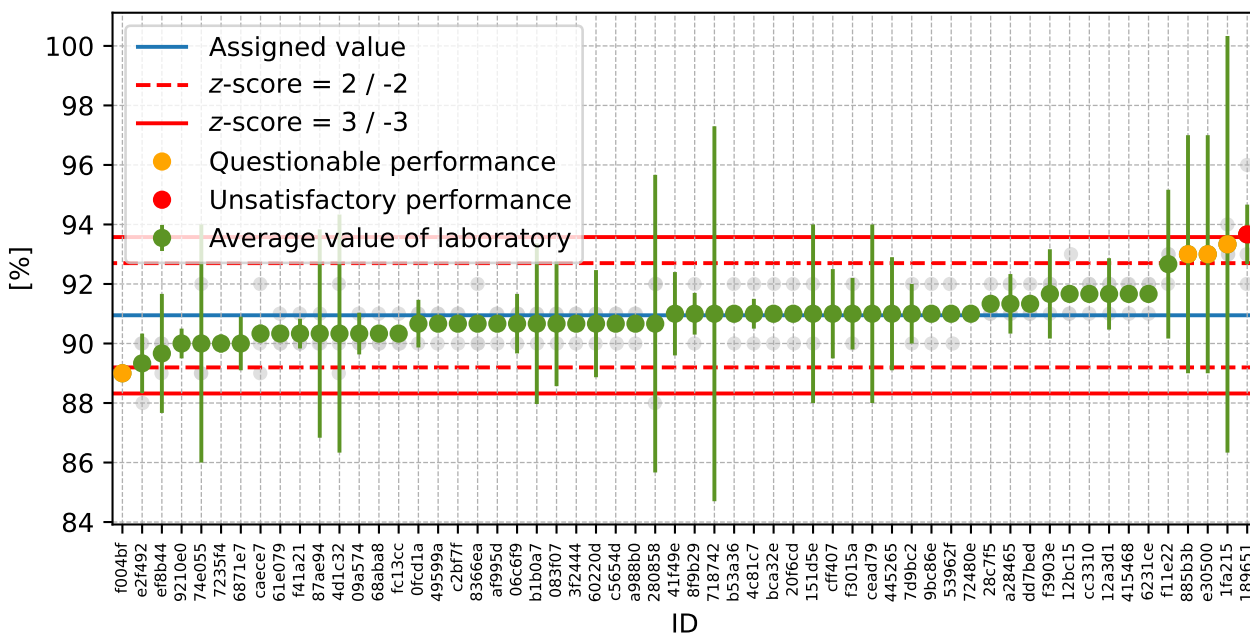


Figure 10: Average values and extended uncertainties of measurement

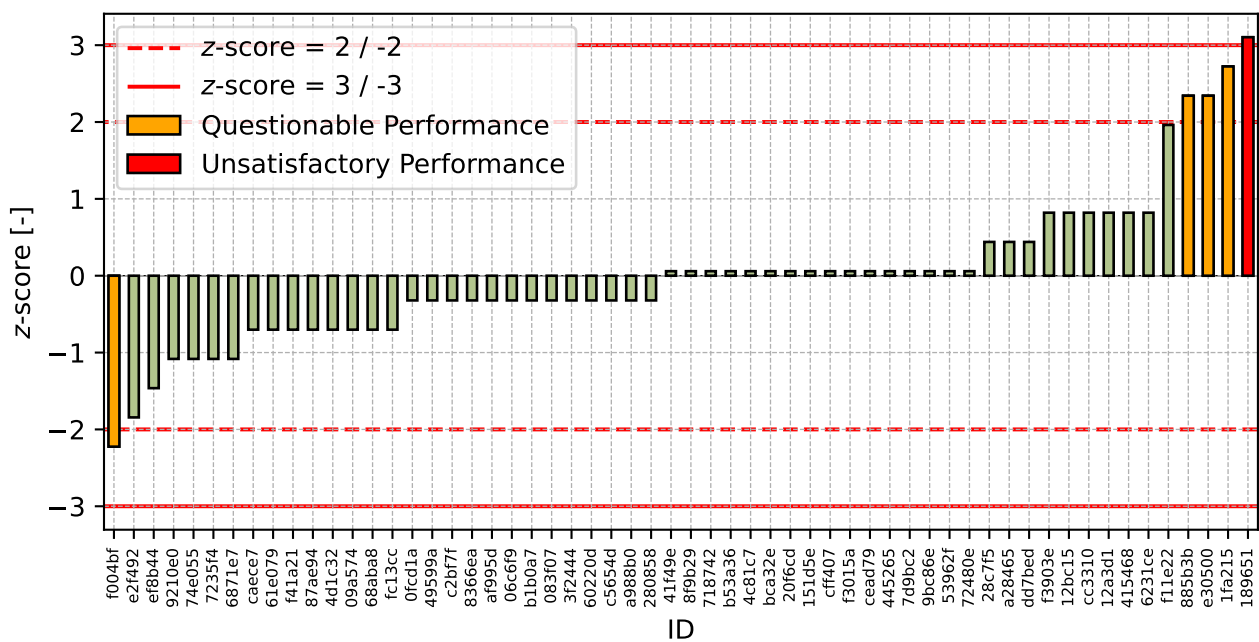
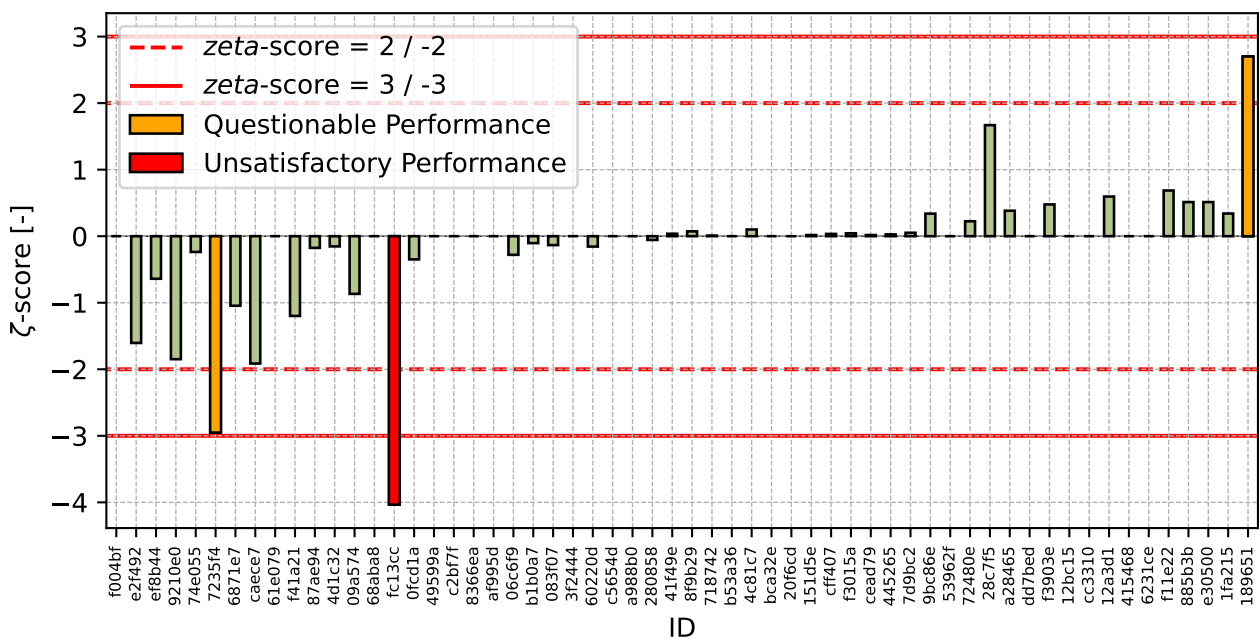


Figure 11: z-score

Figure 12: ζ -scoreTable 7: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
f004bf	-2.22	-
e2f492	-1.84	-1.60

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ID	z-score [-]	ζ-score [-]
ef8b44	-1.46	-0.64
9210e0	-1.08	-1.85
74e055	-1.08	-0.24
7235f4	-1.08	-2.95
6871e7	-1.08	-1.05
caece7	-0.70	-1.91
61e079	-0.70	-
f41a21	-0.70	-1.20
87ae94	-0.70	-0.18
4d1c32	-0.70	-0.15
09a574	-0.70	-0.87
68aba8	-0.70	-
fc13cc	-0.70	-4.03
0fcd1a	-0.32	-0.35
49599a	-0.32	-
c2bf7f	-0.32	-
8366ea	-0.32	-
af995d	-0.32	-
06c6f9	-0.32	-0.28
b1b0a7	-0.32	-0.10
083f07	-0.32	-0.13
3f2444	-0.32	-
60220d	-0.32	-0.16
c5654d	-0.32	-
a988b0	-0.32	-
280858	-0.32	-0.06
41f49e	0.06	0.04
8f9b29	0.06	0.07
718742	0.06	0.01
b53a36	0.06	-
4c81c7	0.06	0.10
bca32e	0.06	-
20f6cd	0.06	-
151d5e	0.06	0.02
cff407	0.06	0.03
f3015a	0.06	0.04
cead79	0.06	0.02
445265	0.06	0.03
7d9bc2	0.06	0.05
9bc86e	0.06	0.34
53962f	0.06	-
72480e	0.06	0.22
28c7f5	0.44	1.67
a28465	0.44	0.38
dd7bed	0.44	-
f3903e	0.82	0.48
12bc15	0.82	-
cc3310	0.82	-
12a3d1	0.82	0.60
415468	0.82	-
6231ce	0.82	-
f11e22	1.96	0.69

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ID	z-score [-]	ζ-score [-]
885b3b	2.34	0.51
e30500	2.34	0.51
1fa215	2.72	0.34
189651	3.10	2.70

1.2 2 mm

1.2.1 Test results

Table 8: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
ca9941	72	72	72	-	72	0.0	0.00
4d1c32	74	80	73	9.0	74	0.7	0.96
9210e0	74	74	74	0.2	74	0.0	0.00
f004bf	74	74	74	-	74	0.0	0.00
e2f492	75	73	74	1.0	74	1.0	1.35
12a3d1	74	75	74	0.7	74	0.6	0.78
87ae94	75	74	75	3.5	75	0.6	0.77
7235f4	74	75	75	1.1	75	0.6	0.77
b53a36	74	75	76	-	75	1.0	1.33
0fcd1a	75	75	75	1.2	75	0.0	0.00
f41a21	75	76	74	1.2	75	1.0	1.33
09a574	75	75	75	1.0	75	0.0	0.00
8366ea	76	74	75	-	75	1.0	1.33
a988b0	74	75	76	-	75	1.0	1.33
c5654d	75	74	76	-	75	1.0	1.33
cff407	75	75	75	2.6	75	0.0	0.00
f3015a	76	74	76	0.9	75	1.2	1.53
c2bf7f	75	76	75	-	75	0.6	0.77
b1b0a7	74	76	76	2.3	75	1.2	1.53
3f2444	75	75	76	-	75	0.6	0.77
61e079	76	75	75	-	75	0.6	0.77
151d5e	75	74	77	4.0	75	1.5	2.03
60220d	74	76	76	2.6	75	1.2	1.53
53962f	75	75	76	-	75	0.6	0.77
caece7	75	74	78	1.0	76	2.1	2.75
885b3b	76	76	75	3.0	76	0.6	0.76
bca32e	76	75	76	-	76	0.6	0.76
06c6f9	76	75	76	1.0	76	0.6	0.76
9bc86e	76	75	76	0.1	76	0.6	0.76
7d9bc2	75	76	76	1.0	76	0.6	0.76
74e055	79	74	74	4.0	76	2.9	3.82
e30500	76	76	75	3.0	76	0.6	0.76
cead79	75	77	75	2.0	76	1.2	1.53
ef8b44	76	76	75	2.0	76	0.6	0.76
49599a	76	76	76	-	76	0.0	0.00
41f49e	76	76	76	2.4	76	0.0	0.00
8f9b29	75	76	77	0.8	76	1.0	1.32
083f07	76	76	76	1.5	76	0.0	0.00
68aba8	76	76	76	-	76	0.0	0.00
72480e	75	76	77	1.2	76	1.0	1.32
445265	77	76	75	2.2	76	1.0	1.32
718742	76	76	76	5.1	76	0.0	0.00
12bc15	76	77	75	-	76	1.0	1.32

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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
4c81c7	76	76	77	0.3	76	0.6	0.76
dd7bed	78	76	75	-	76	1.5	2.00
280858	75	77	78	2.0	77	1.5	1.99
6231ce	77	76	77	-	77	0.6	0.75
f3903e	77	77	76	1.5	77	0.6	0.75
fc13cc	76	78	77	0.1	77	1.0	1.30
20f6cd	77	77	77	-	77	0.0	0.00
6871e7	77	77	77	0.8	77	0.0	0.00
28c7f5	77	77	78	0.2	77	0.6	0.75
cc3310	78	76	78	-	77	1.2	1.49
415468	77	78	77	-	77	0.6	0.75
f11e22	79	77	78	2.5	78	1.0	1.28
af995d	80	79	79	-	79	0.6	0.73
a28465	79	79	81	1.0	80	1.2	1.45
1fa215	80	80	81	8.0	80	0.6	0.72
189651	81	81	81	1.0	81	0.0	0.00
04ce01	88	81	73	0.2	81	-	-

1.2.2 The Numerical Procedure for Determining Outliers

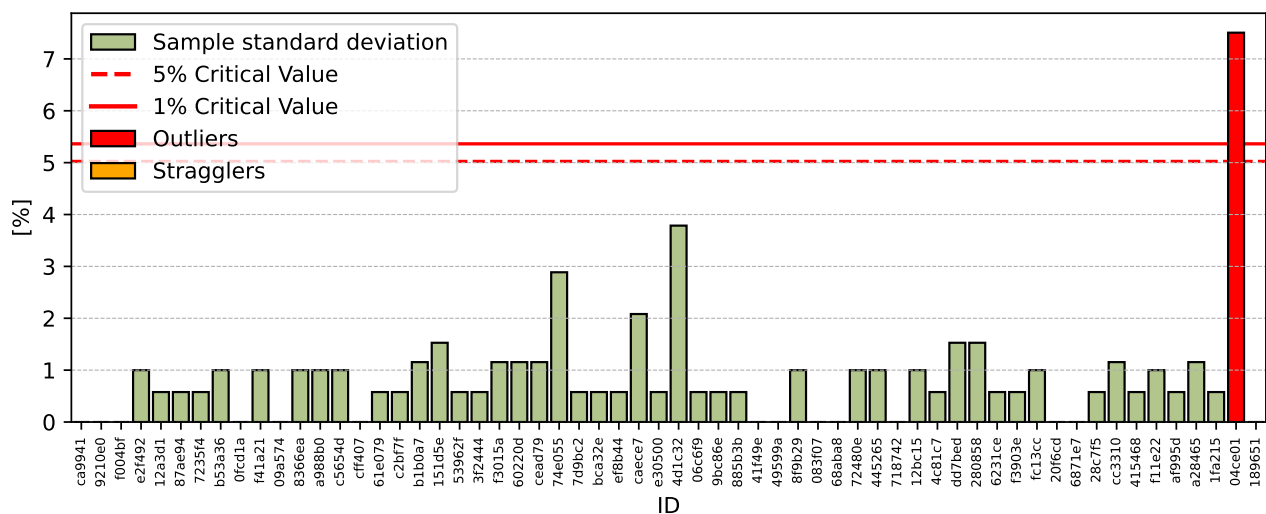
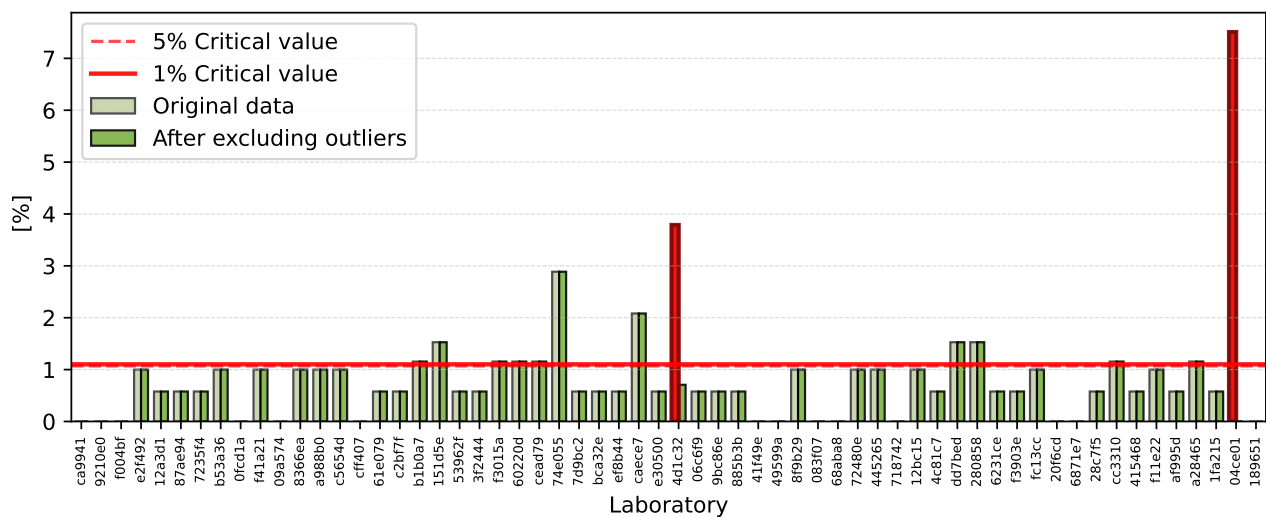
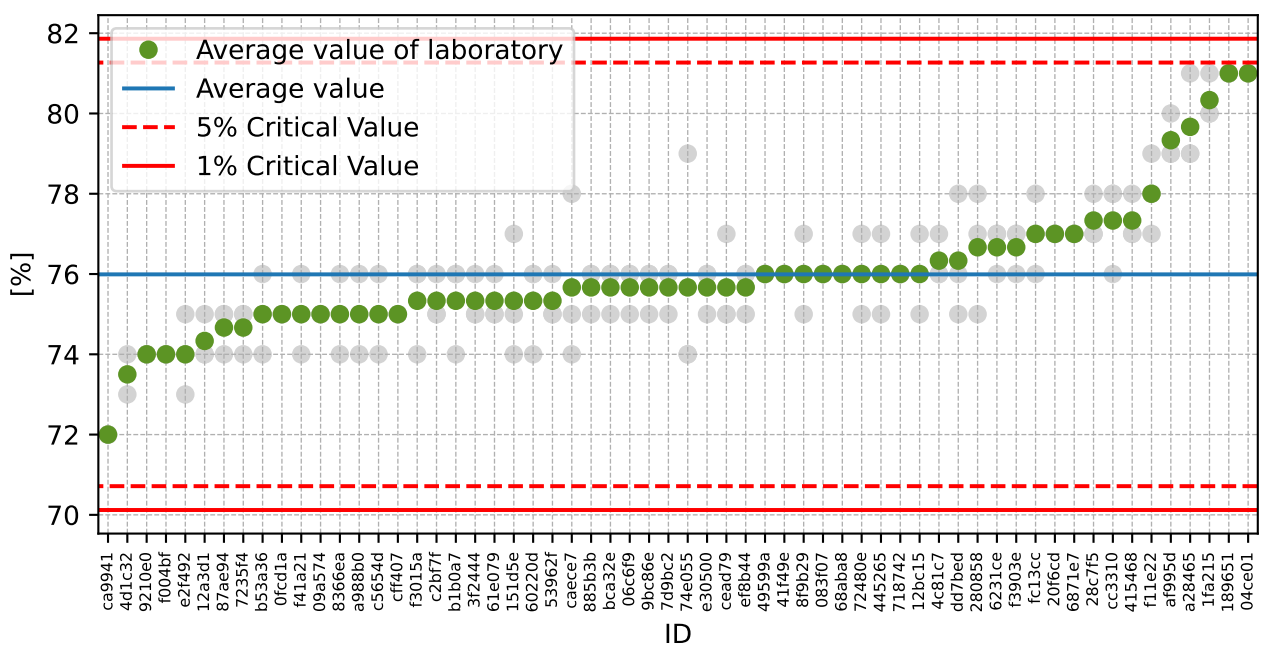


Figure 13: Cochran's test - sample standard deviations

Figure 14: **Cochran's test** - sample standard deviations without outliersFigure 15: **Grubbs' test** - average values

1.2.3 Mandel's Statistics

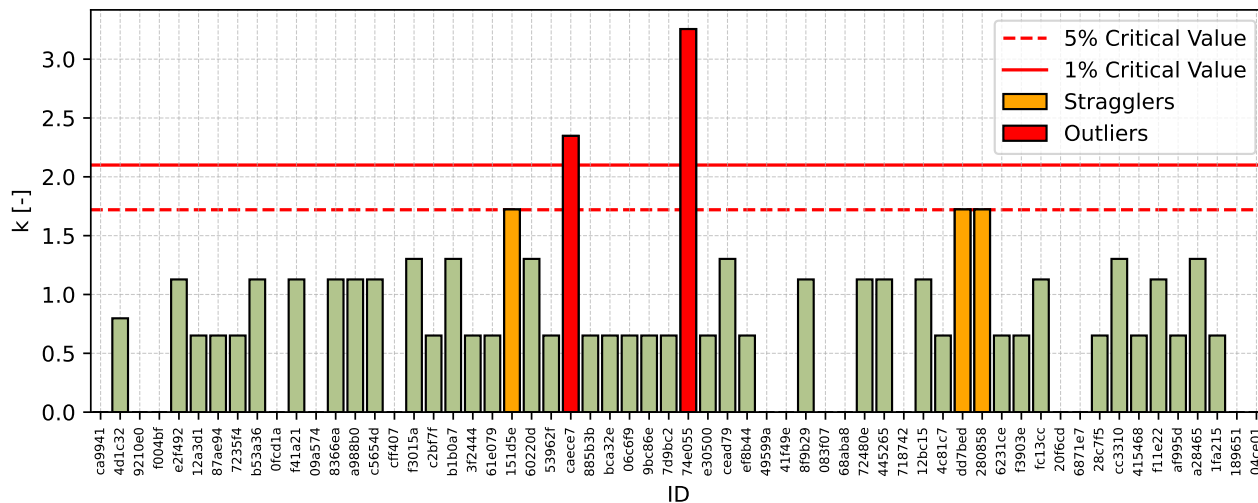


Figure 16: Intralaboratory Consistency Statistic

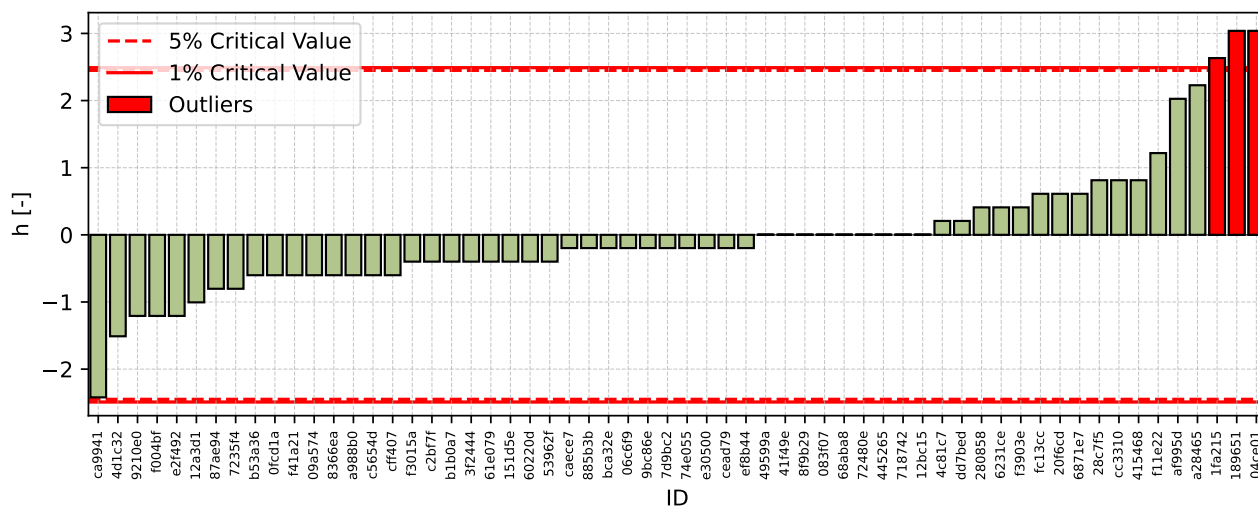


Figure 17: Interlaboratory Consistency Statistic

1.2.4 Descriptive statistics

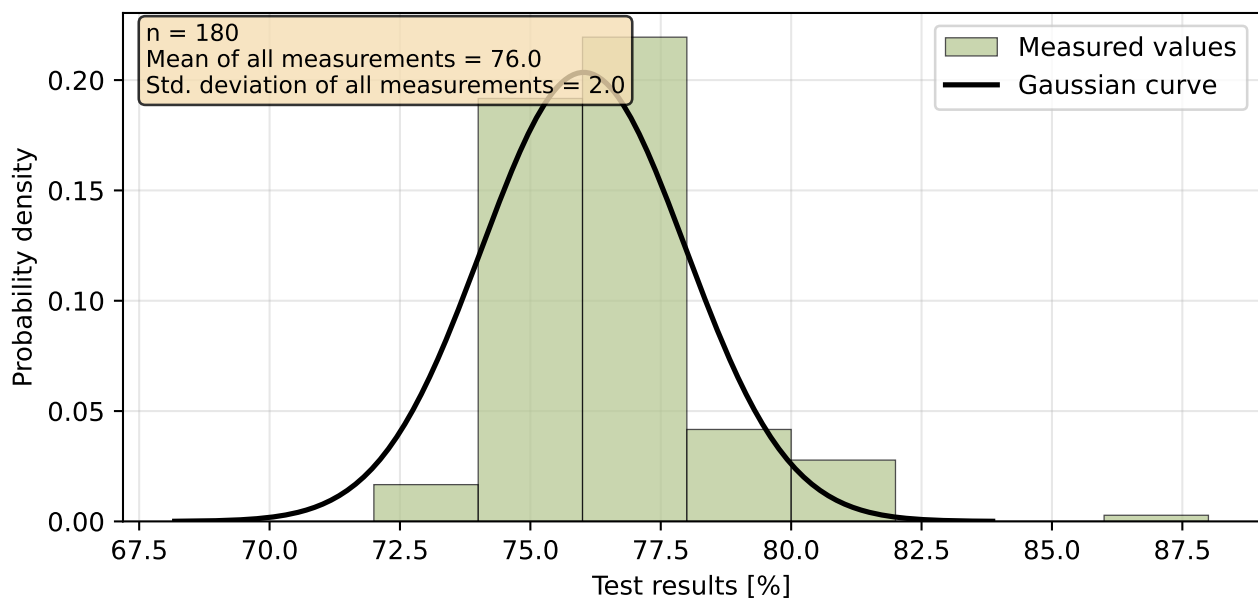


Figure 18: Histogram of all test results

Table 9: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	76.0
Sample standard deviation – s	1.6
Assigned value – x^*	76.0
Robust standard deviation – s^*	1.6
Measurement uncertainty of assigned value – u_X	0.2
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	1.6
Repeatability standard deviation – s_r	0.9
Reproducibility standard deviation – s_R	1.8
Repeatability – r	2.5
Reproducibility – R	5.0

1.2.5 Evaluation of Performance Statistics

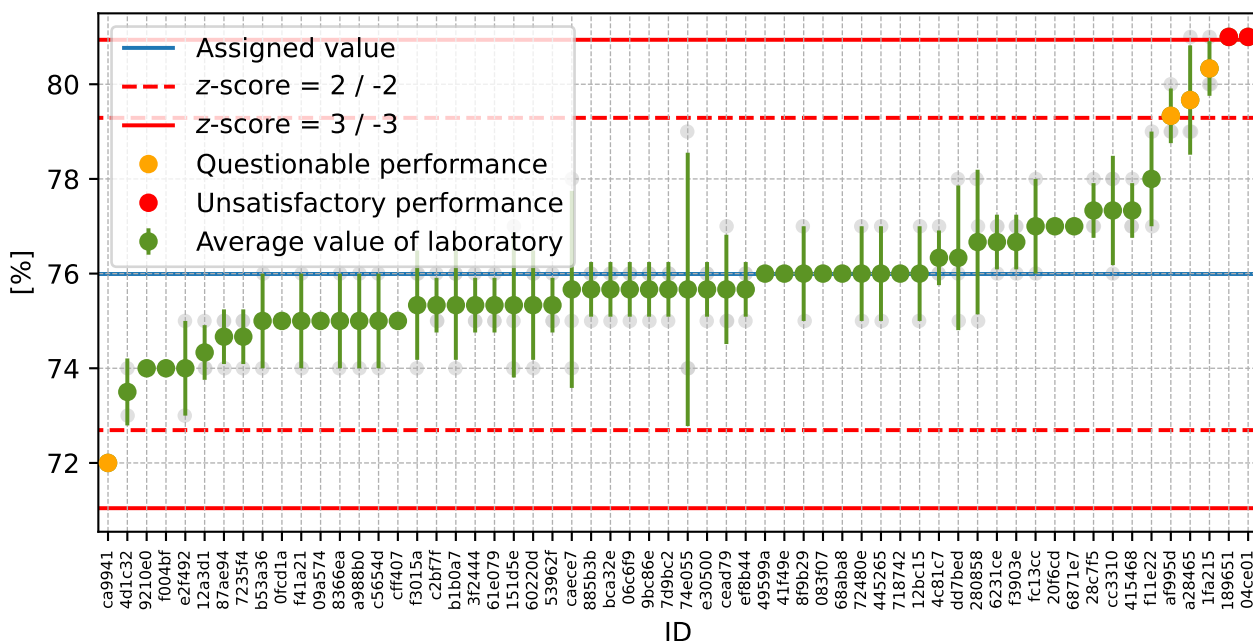


Figure 19: Average values and sample standard deviations

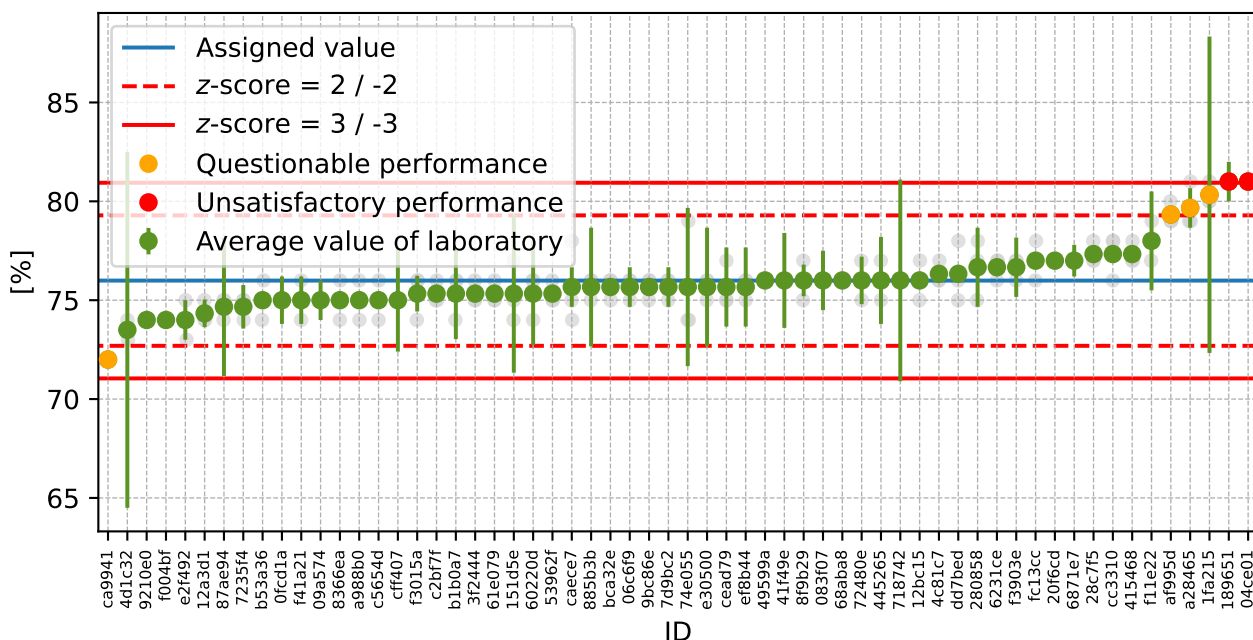


Figure 20: Average values and extended uncertainties of measurement

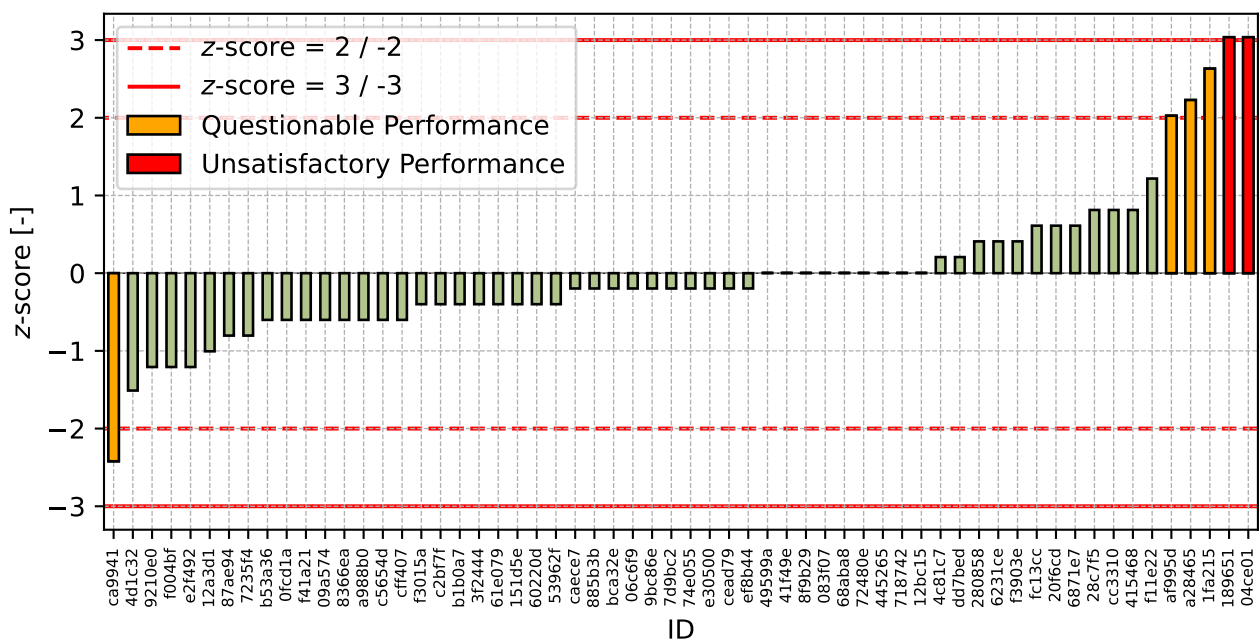


Figure 21: z-score

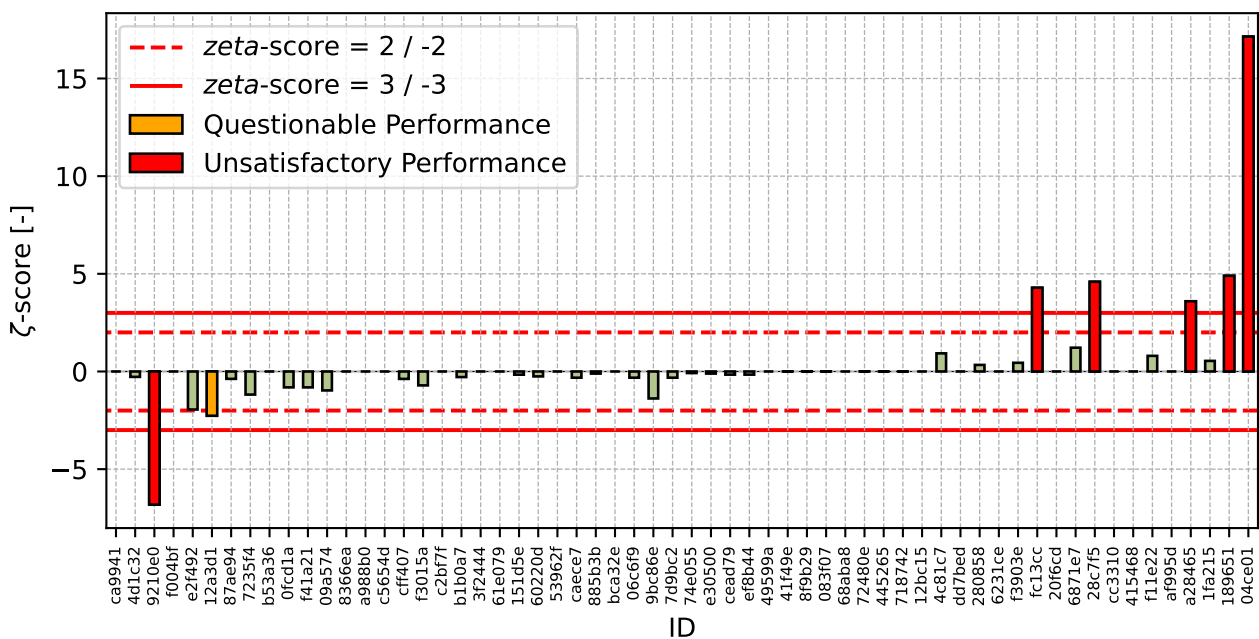


Figure 22: zeta-score

Table 10: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
ca9941	-2.42	-
4d1c32	-1.51	-0.28

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ID	z-score [-]	ζ-score [-]
9210e0	-1.21	-6.82
f004bf	-1.21	-
e2f492	-1.21	-1.95
12a3d1	-1.01	-2.27
87ae94	-0.80	-0.38
7235f4	-0.80	-1.18
b53a36	-0.60	-
0fcd1a	-0.60	-0.81
f41a21	-0.60	-0.81
09a574	-0.60	-0.97
8366ea	-0.60	-
a988b0	-0.60	-
c5654d	-0.60	-
cff407	-0.60	-0.38
f3015a	-0.40	-0.71
c2bf7f	-0.40	-
b1b0a7	-0.40	-0.29
3f2444	-0.40	-
61e079	-0.40	-
151d5e	-0.40	-0.16
60220d	-0.40	-0.25
53962f	-0.40	-
caece7	-0.20	-0.32
885b3b	-0.20	-0.11
bca32e	-0.20	-
06c6f9	-0.20	-0.32
9bc86e	-0.20	-1.38
7d9bc2	-0.20	-0.32
74e055	-0.20	-0.08
e30500	-0.20	-0.11
cead79	-0.20	-0.16
ef8b44	-0.20	-0.16
49599a	0.01	-
41f49e	0.01	0.00
8f9b29	0.01	0.01
083f07	0.01	0.01
68aba8	0.01	-
72480e	0.01	0.01
445265	0.01	0.00
718742	0.01	0.00
12bc15	0.01	-
4c81c7	0.21	0.93
dd7bed	0.21	-
280858	0.41	0.34
6231ce	0.41	-
f3903e	0.41	0.45
fc13cc	0.61	4.29
20f6cd	0.61	-
6871e7	0.61	1.22
28c7f5	0.81	4.59
cc3310	0.81	-
415468	0.81	-
f11e22	1.22	0.80

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ID	z-score [-]	ζ-score [-]
af995d	2.03	-
a28465	2.23	3.59
1fa215	2.63	0.54
189651	3.04	4.90
04ce01	3.04	17.15

1.3 1 mm

1.3.1 Test results

Table 11: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
4d1c32	48	55	48	9.0	48	0.0	0.00
e2f492	52	50	49	1.0	50	1.5	3.03
885b3b	51	51	50	2.0	51	0.6	1.14
ca9941	51	50	51	-	51	0.6	1.14
e30500	51	51	50	2.0	51	0.6	1.14
9210e0	51	51	51	0.3	51	0.0	0.00
f004bf	51	51	51	-	51	0.0	0.00
0fcd1a	50	51	52	1.3	51	1.0	1.96
b53a36	50	51	52	-	51	1.0	1.96
61e079	51	51	51	-	51	0.0	0.00
cff407	51	51	51	3.2	51	0.0	0.00
09a574	52	51	51	1.0	51	0.6	1.12
f41a21	51	53	50	2.2	51	1.5	2.98
bca32e	52	51	52	-	52	0.6	1.12
49599a	51	52	52	-	52	0.6	1.12
06c6f9	52	51	52	1.0	52	0.6	1.12
20f6cd	52	52	51	-	52	0.6	1.12
b1b0a7	50	52	53	1.5	52	1.5	2.96
7235f4	51	52	52	1.7	52	0.6	1.12
72480e	51	52	53	1.3	52	1.0	1.92
12a3d1	52	52	52	1.0	52	0.0	0.00
151d5e	52	51	53	2.0	52	1.0	1.92
3f2444	52	52	52	-	52	0.0	0.00
a988b0	52	52	53	-	52	0.6	1.10
c5654d	52	53	52	-	52	0.6	1.10
74e055	55	51	51	4.0	52	2.3	4.41
445265	53	52	52	1.3	52	0.6	1.10
cc3310	52	53	52	-	52	0.6	1.10
68aba8	52	52	53	-	52	0.6	1.10
cead79	52	53	52	1.0	52	0.6	1.10
c2bf7f	52	53	52	-	52	0.6	1.10
53962f	52	52	53	-	52	0.6	1.10
7d9bc2	52	52	53	1.0	52	0.6	1.10
280858	52	53	53	2.0	53	0.6	1.10
a28465	53	52	53	2.7	53	0.6	1.10
60220d	51	52	55	2.6	53	2.1	3.95
ef8b44	53	52	53	2.0	53	0.6	1.10
9bc86e	53	52	53	0.1	53	0.6	1.10
f3015a	53	52	53	0.7	53	0.6	1.10
87ae94	53	52	53	3.5	53	0.6	1.10
8366ea	54	52	53	-	53	1.0	1.89
41f49e	53	53	53	2.8	53	0.0	0.00
dd7bed	54	53	52	-	53	1.0	1.89

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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
fc13cc	52	54	53	0.1	53	1.0	1.89
4c81c7	53	53	53	0.2	53	0.0	0.00
083f07	53	53	53	1.2	53	0.0	0.00
8f9b29	53	53	54	0.4	53	0.6	1.08
12bc15	53	54	53	-	53	0.6	1.08
718742	54	54	53	3.4	54	0.6	1.08
caece7	53	52	56	1.0	54	2.1	3.88
28c7f5	54	54	54	0.3	54	0.0	0.00
af995d	54	54	54	-	54	0.0	0.00
6871e7	54	54	55	0.5	54	0.6	1.06
f11e22	55	54	55	2.5	55	0.6	1.06
415468	56	55	54	-	55	1.0	1.82
6231ce	55	56	55	-	55	0.6	1.04
f3903e	56	56	54	2.0	55	1.2	2.09
189651	55	55	56	1.0	55	0.6	1.04
1fa215	59	57	59	6.0	58	1.2	1.98
04ce01	58	60	50	1.5	59	1.4	2.40

1.3.2 The Numerical Procedure for Determining Outliers

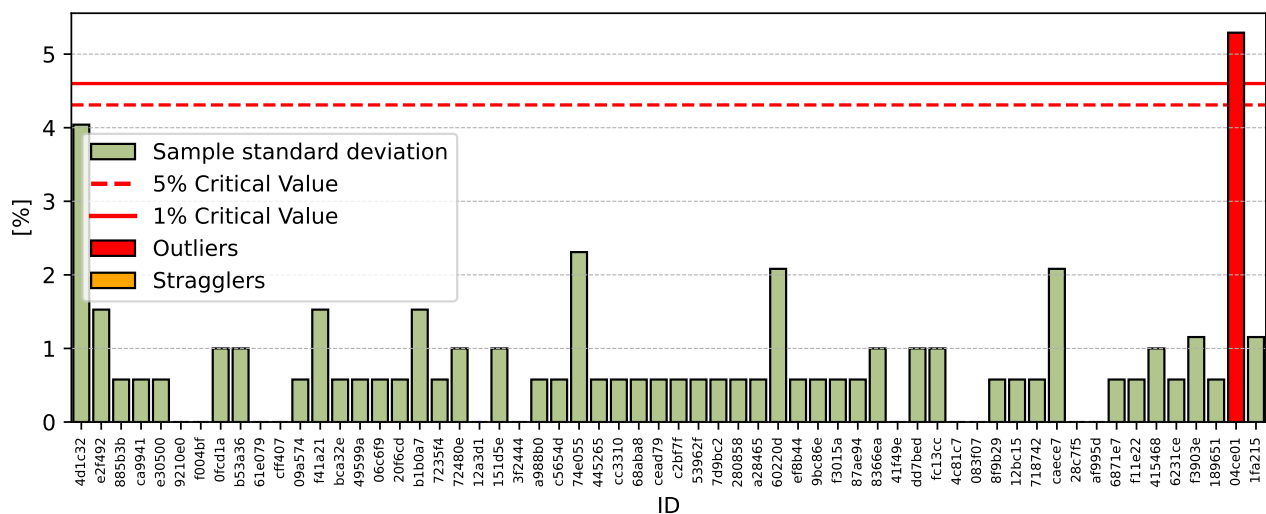
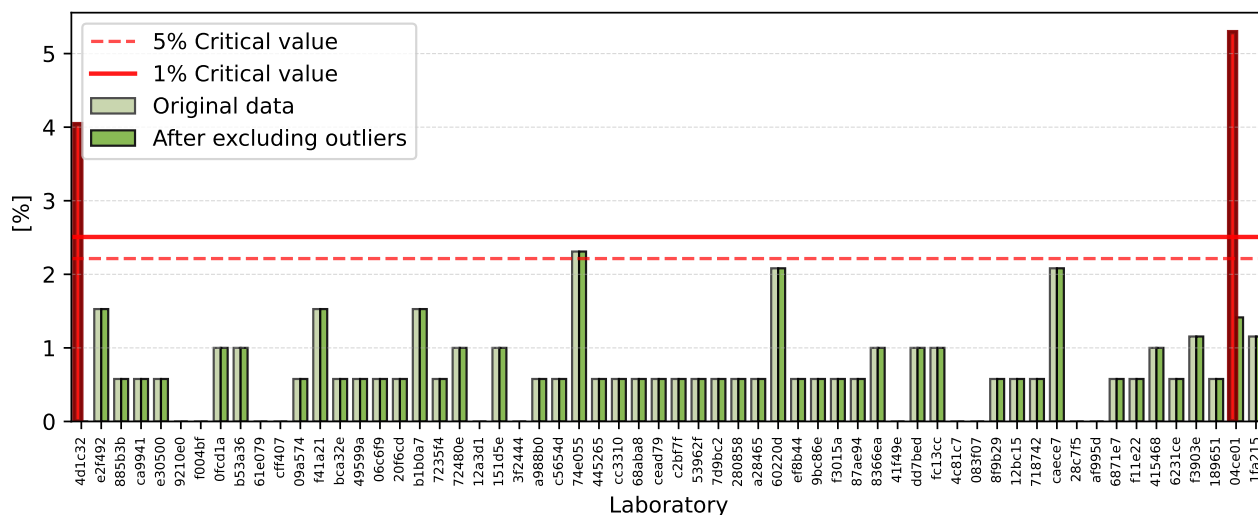
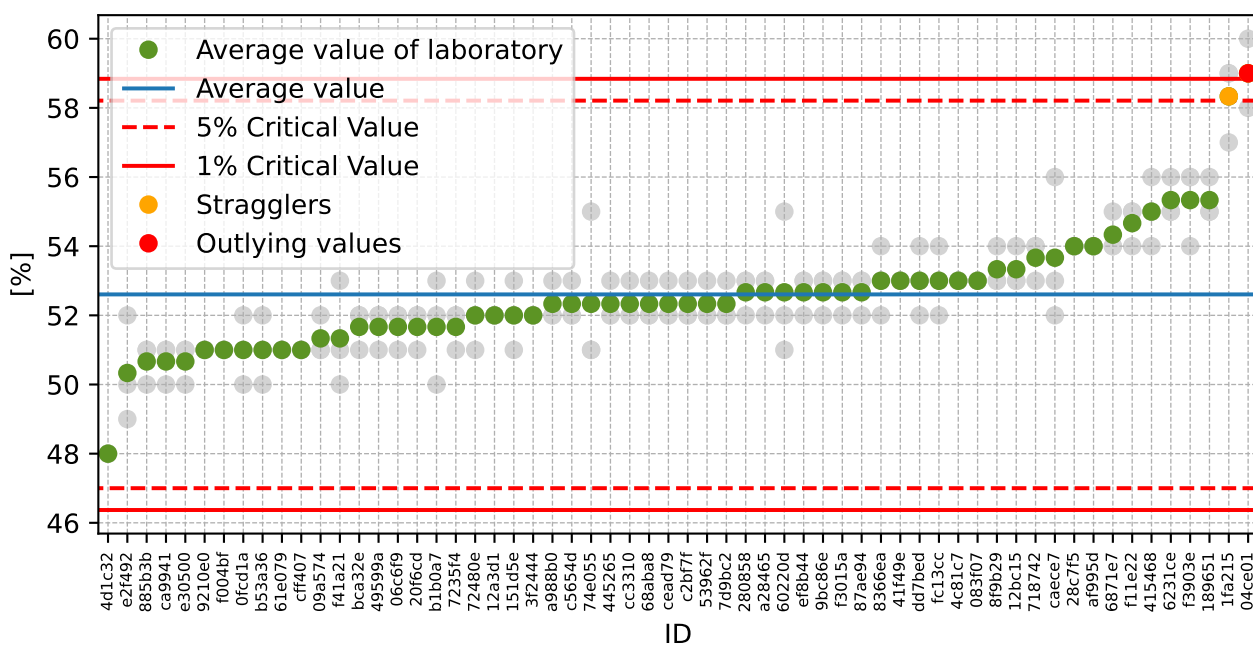
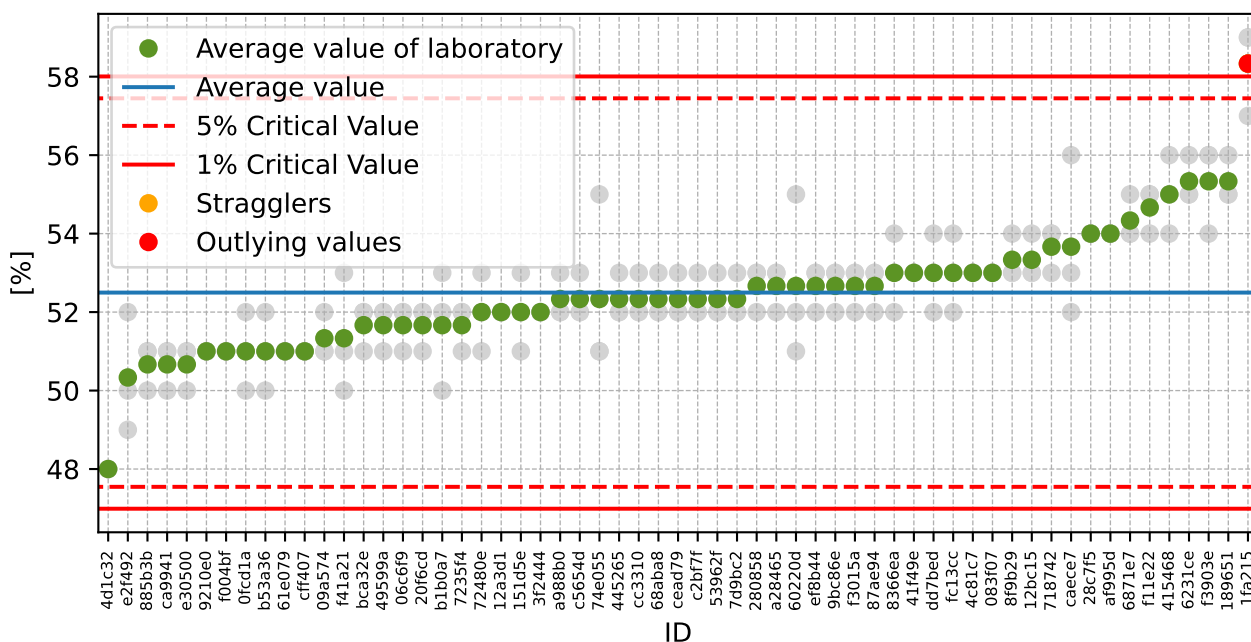
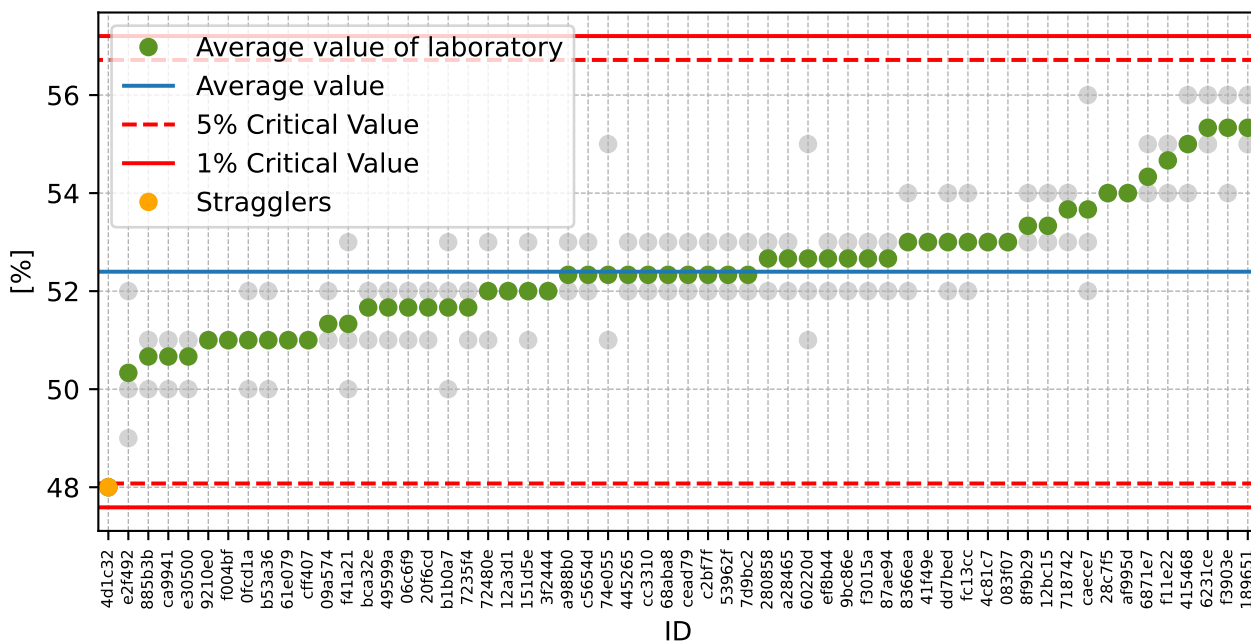


Figure 23: Cochran's test - sample standard deviations

Figure 24: **Cochran's test** - sample standard deviations without outliersFigure 25: **Grubbs' test** - average values

Figure 26: **Grubbs' test** - average values without outliersFigure 27: **Grubbs' test** - average values without outliers

1.3.3 Mandel's Statistics

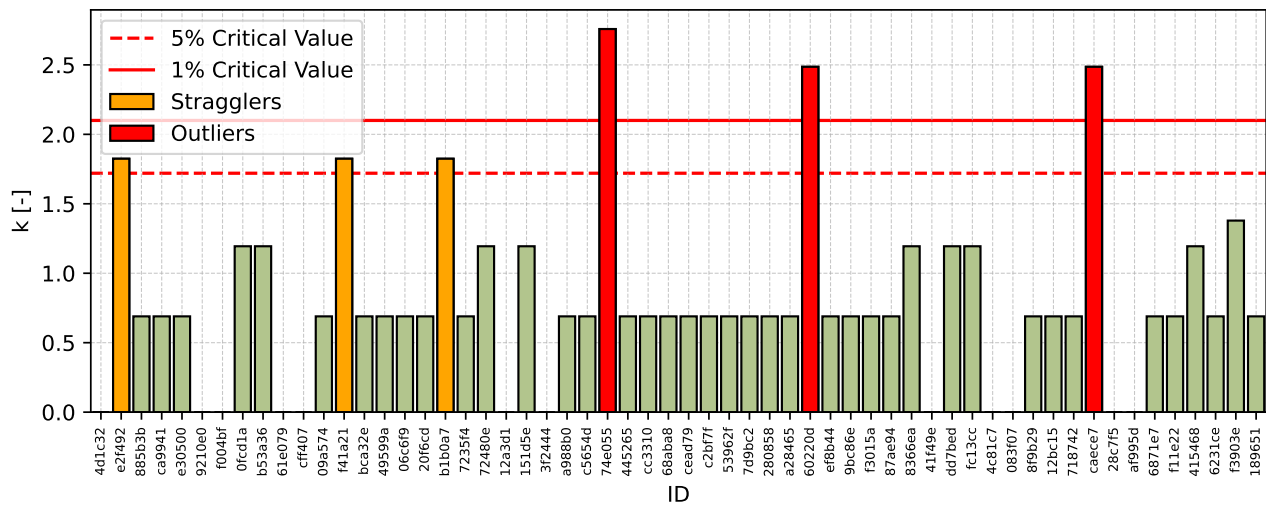


Figure 28: Intralaboratory Consistency Statistic

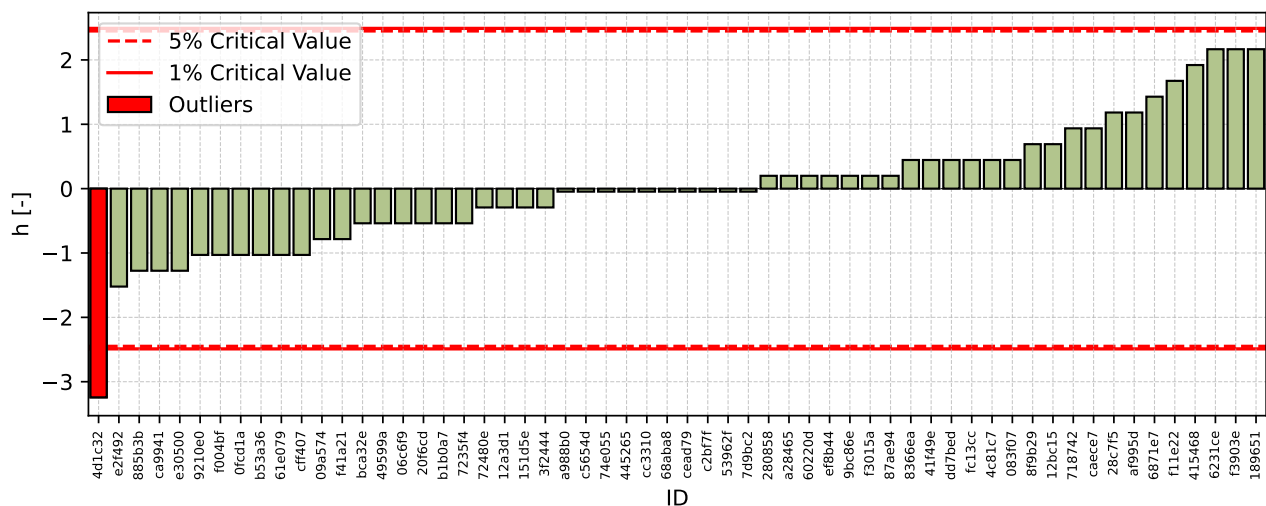


Figure 29: Interlaboratory Consistency Statistic

1.3.4 Descriptive statistics

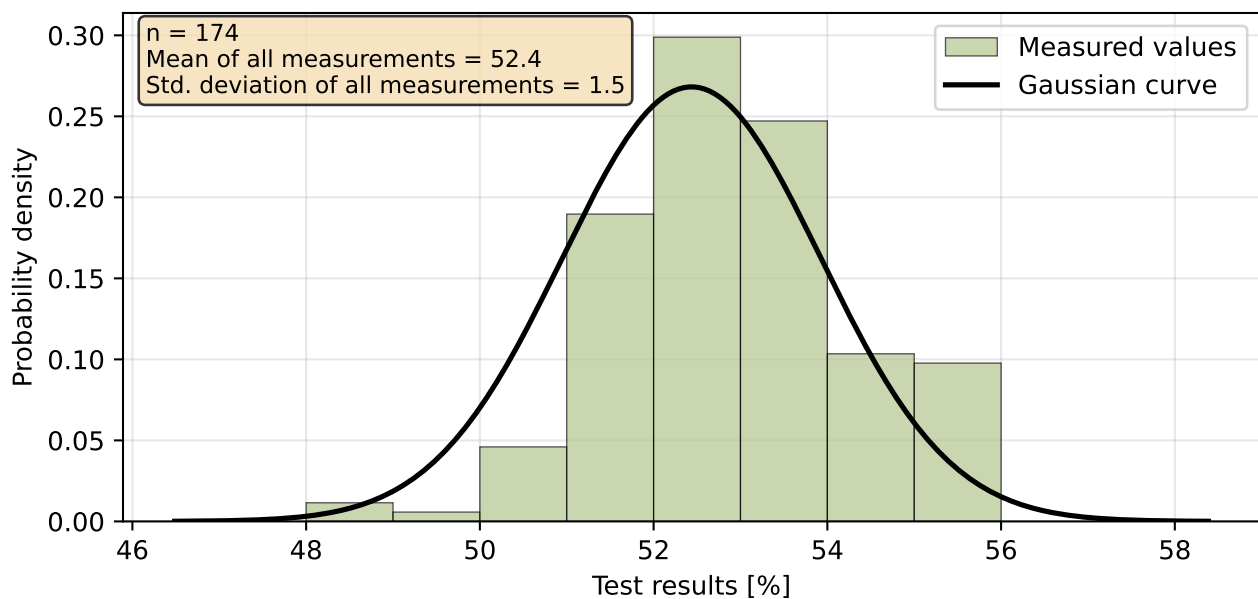


Figure 30: Histogram of all test results

Table 12: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	52.4
Sample standard deviation – s	1.4
Assigned value – x^*	52.4
Robust standard deviation – s^*	1.4
Measurement uncertainty of assigned value – u_x	0.2
p -value of normality test [-]	< 0.001

1.3.5 Evaluation of Performance Statistics

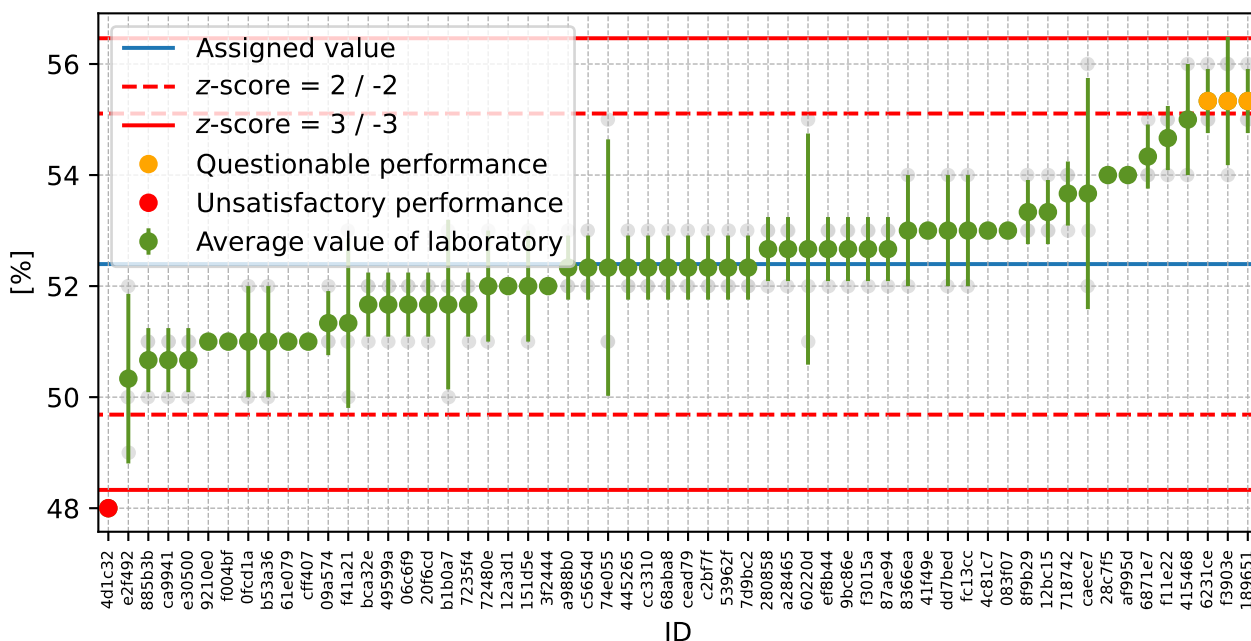


Figure 31: Average values and sample standard deviations

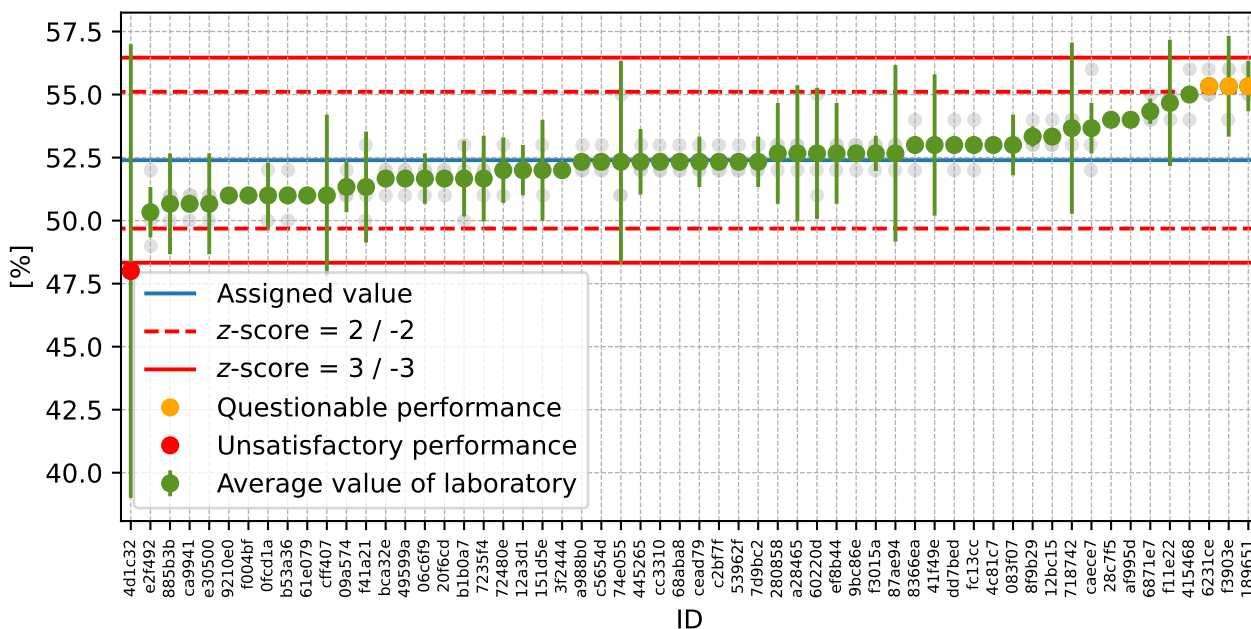


Figure 32: Average values and extended uncertainties of measurement

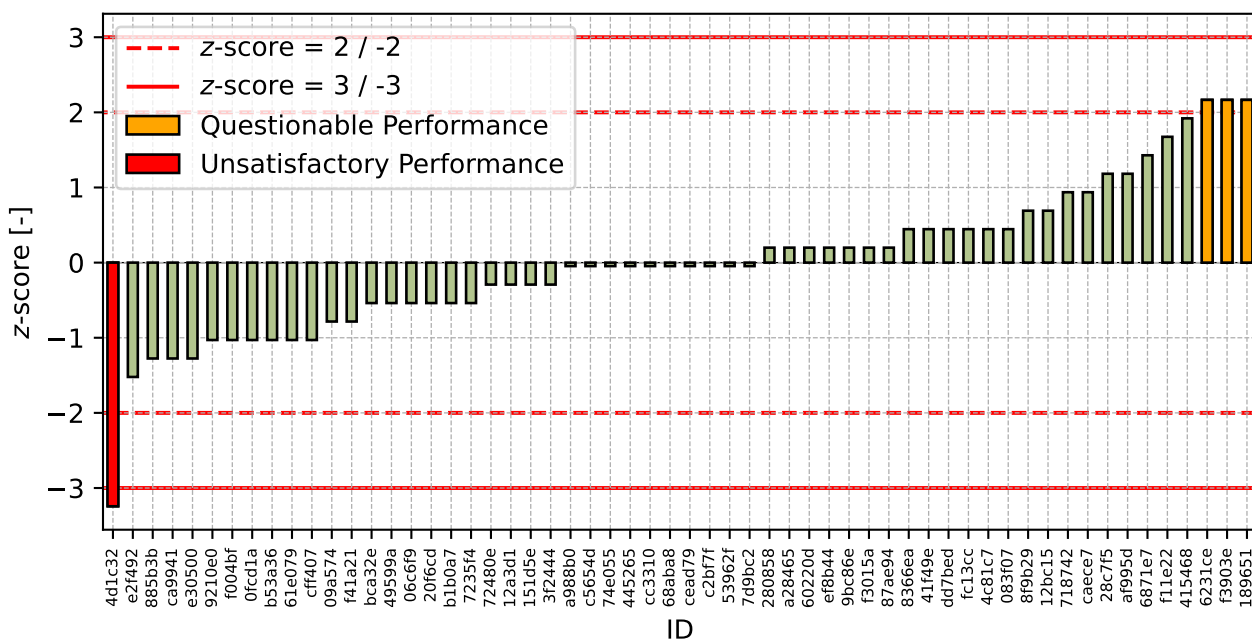


Figure 33: z-score

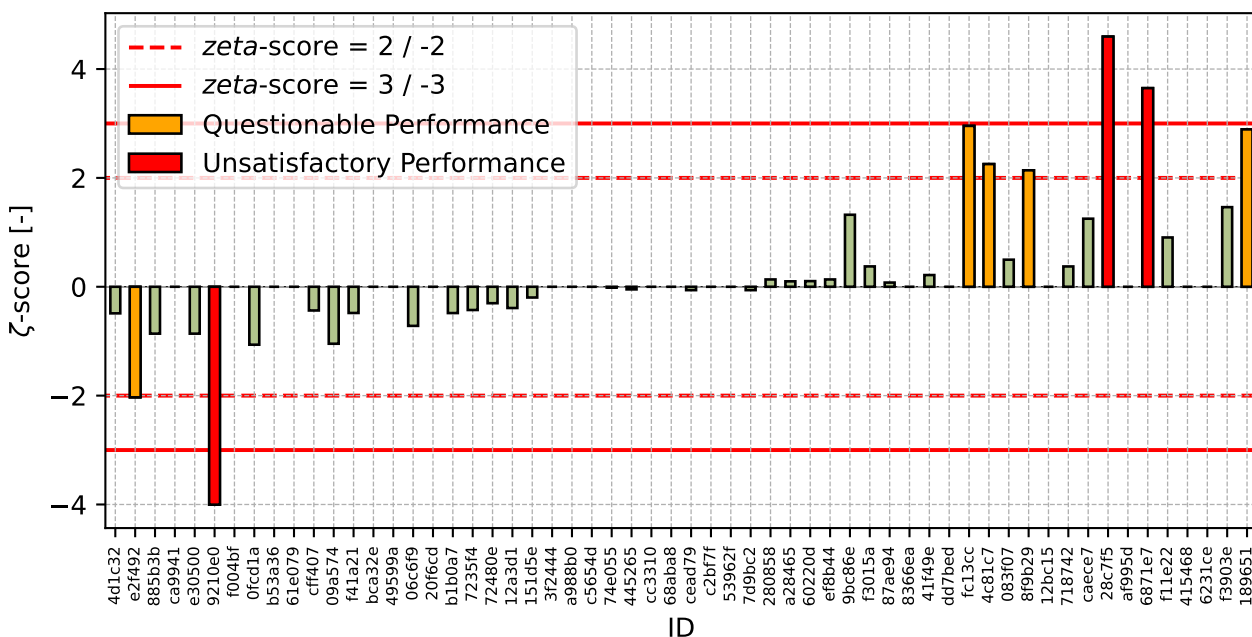


Figure 34: ζ-score

Table 13: z-score and ζ-score

ID	z-score [-]	ζ-score [-]
4d1c32	-3.24	-0.49
e2f492	-1.52	-2.03

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ID	z-score [-]	ζ-score [-]
885b3b	-1.28	-0.86
ca9941	-1.28	-
e30500	-1.28	-0.86
9210e0	-1.03	-4.00
f004bf	-1.03	-
0fcd1a	-1.03	-1.06
b53a36	-1.03	-
61e079	-1.03	-
cff407	-1.03	-0.44
09a574	-0.78	-1.05
f41a21	-0.78	-0.48
bca32e	-0.54	-
49599a	-0.54	-
06c6f9	-0.54	-0.72
20f6cd	-0.54	-
b1b0a7	-0.54	-0.48
7235f4	-0.54	-0.43
72480e	-0.29	-0.30
12a3d1	-0.29	-0.39
151d5e	-0.29	-0.20
3f2444	-0.29	-
a988b0	-0.05	-
c5654d	-0.05	-
74e055	-0.05	-0.02
445265	-0.05	-0.05
cc3310	-0.05	-
68aba8	-0.05	-
cead79	-0.05	-0.06
c2bf7f	-0.05	-
53962f	-0.05	-
7d9bc2	-0.05	-0.06
280858	0.20	0.13
a28465	0.20	0.10
60220d	0.20	0.10
ef8b44	0.20	0.13
9bc86e	0.20	1.32
f3015a	0.20	0.37
87ae94	0.20	0.08
8366ea	0.45	-
41f49e	0.45	0.22
dd7bed	0.45	-
fc13cc	0.45	2.96
4c81c7	0.45	2.25
083f07	0.45	0.50
8f9b29	0.69	2.14
12bc15	0.69	-
718742	0.94	0.37
caece7	0.94	1.25
28c7f5	1.18	4.60
af995d	1.18	-
6871e7	1.43	3.65
f11e22	1.67	0.91

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ID	z-score [-]	ζ-score [-]
415468	1.92	-
6231ce	2.17	-
f3903e	2.17	1.46
189651	2.17	2.89

1.4 0.5 mm

1.4.1 Test results

Table 14: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

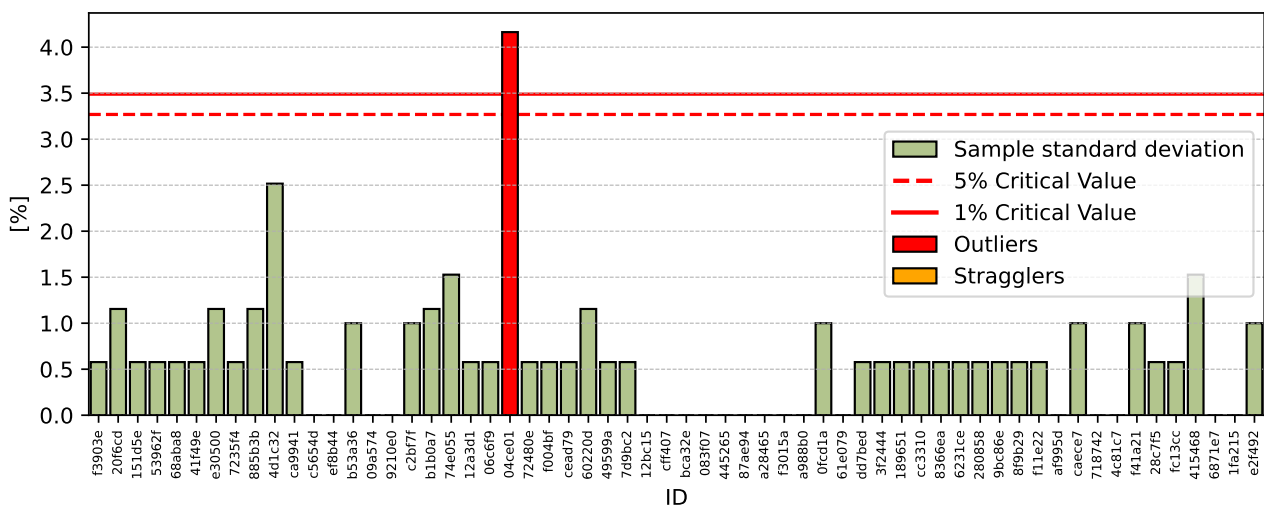
ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
f3903e	19	19	18	1.5	19	0.6	3.09
04ce01	22	30	24	4.2	23	1.4	6.15
4d1c32	24	27	22	6.0	23	1.4	6.15
20f6cd	24	24	22	-	23	1.2	4.95
151d5e	24	23	24	1.0	24	0.6	2.44
53962f	23	24	24	-	24	0.6	2.44
68aba8	24	24	25	-	24	0.6	2.37
41f49e	24	24	25	1.7	24	0.6	2.37
e30500	25	25	23	1.0	24	1.2	4.75
7235f4	24	24	25	2.0	24	0.6	2.37
885b3b	25	25	23	1.0	24	1.2	4.75
ca9941	25	24	25	-	25	0.6	2.34
c5654d	25	25	25	-	25	0.0	0.00
ef8b44	25	25	25	2.0	25	0.0	0.00
b53a36	24	25	26	-	25	1.0	4.00
9210e0	25	25	25	0.2	25	0.0	0.00
09a574	25	25	25	1.0	25	0.0	0.00
c2bf7f	24	26	25	-	25	1.0	4.00
12a3d1	26	25	25	1.0	25	0.6	2.28
f004bf	26	25	25	-	25	0.6	2.28
72480e	25	25	26	0.8	25	0.6	2.28
74e055	27	24	25	3.0	25	1.5	6.03
06c6f9	25	25	26	1.0	25	0.6	2.28
b1b0a7	24	26	26	0.8	25	1.2	4.56
49599a	25	26	26	-	26	0.6	2.25
7d9bc2	25	26	26	1.0	26	0.6	2.25
cead79	26	26	25	1.0	26	0.6	2.25
60220d	25	25	27	2.7	26	1.2	4.50
a28465	26	26	26	2.7	26	0.0	0.00
bca32e	26	26	26	-	26	0.0	0.00
cff407	26	26	26	2.6	26	0.0	0.00
a988b0	26	26	26	-	26	0.0	0.00
61e079	26	26	26	-	26	0.0	0.00
083f07	26	26	26	1.0	26	0.0	0.00
12bc15	26	26	26	-	26	0.0	0.00
0fcd1a	25	26	27	0.8	26	1.0	3.85
87ae94	26	26	26	3.5	26	0.0	0.00
445265	26	26	26	1.3	26	0.0	0.00
f3015a	26	26	26	0.5	26	0.0	0.00
cc3310	27	26	26	-	26	0.6	2.19
6231ce	26	26	27	-	26	0.6	2.19
8366ea	27	26	26	-	26	0.6	2.19
3f2444	26	27	26	-	26	0.6	2.19

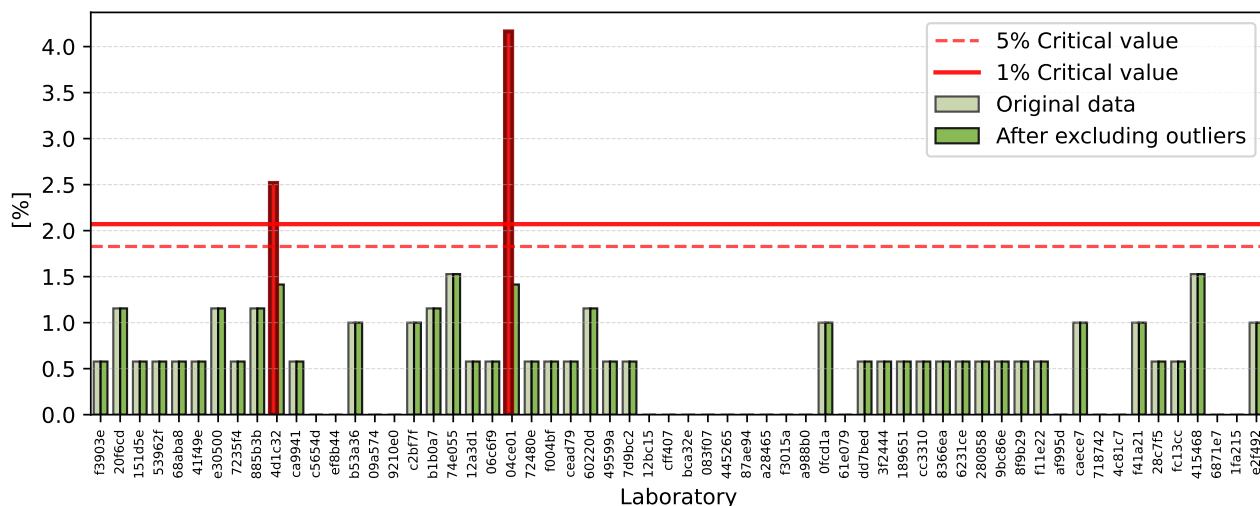
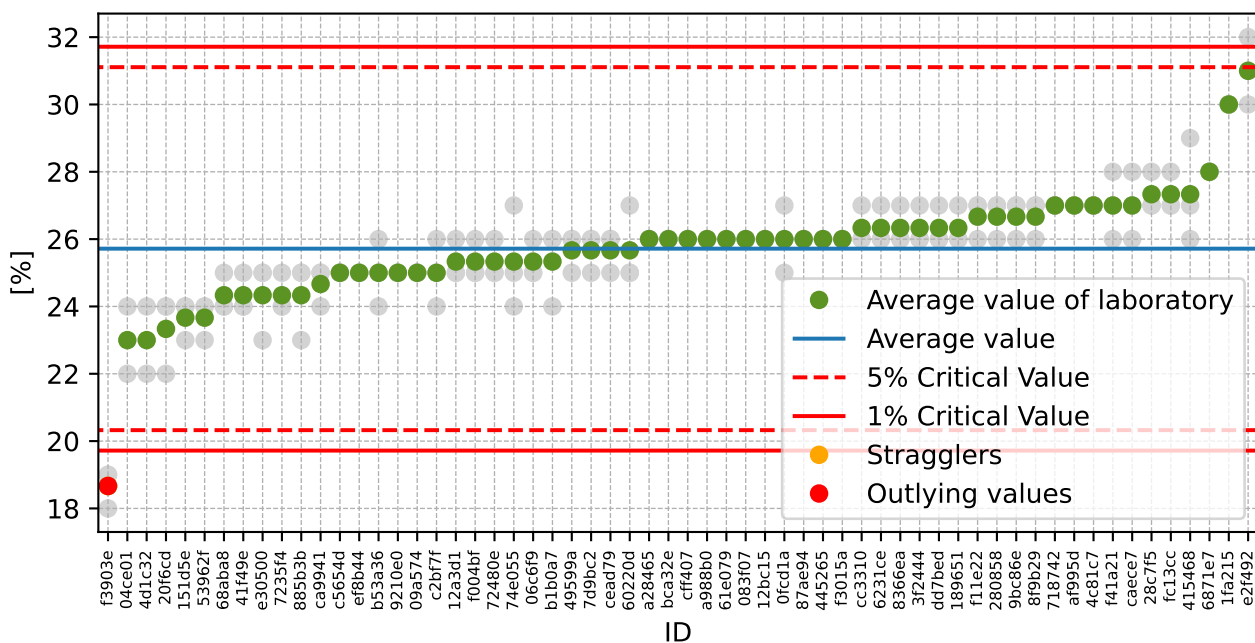
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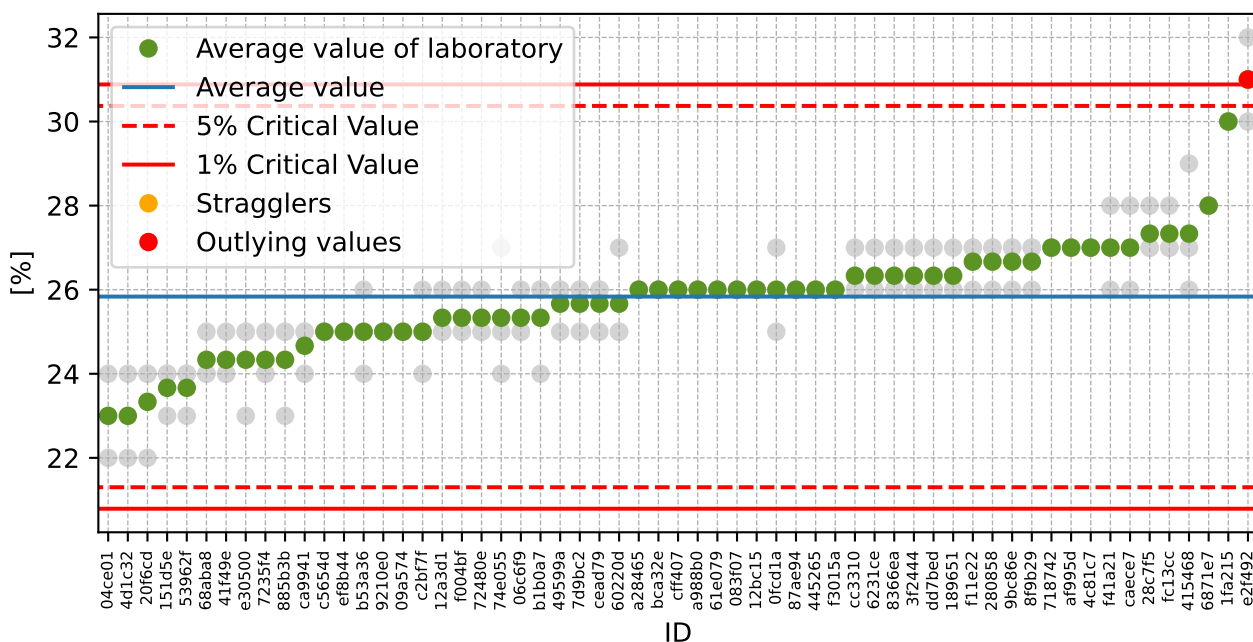
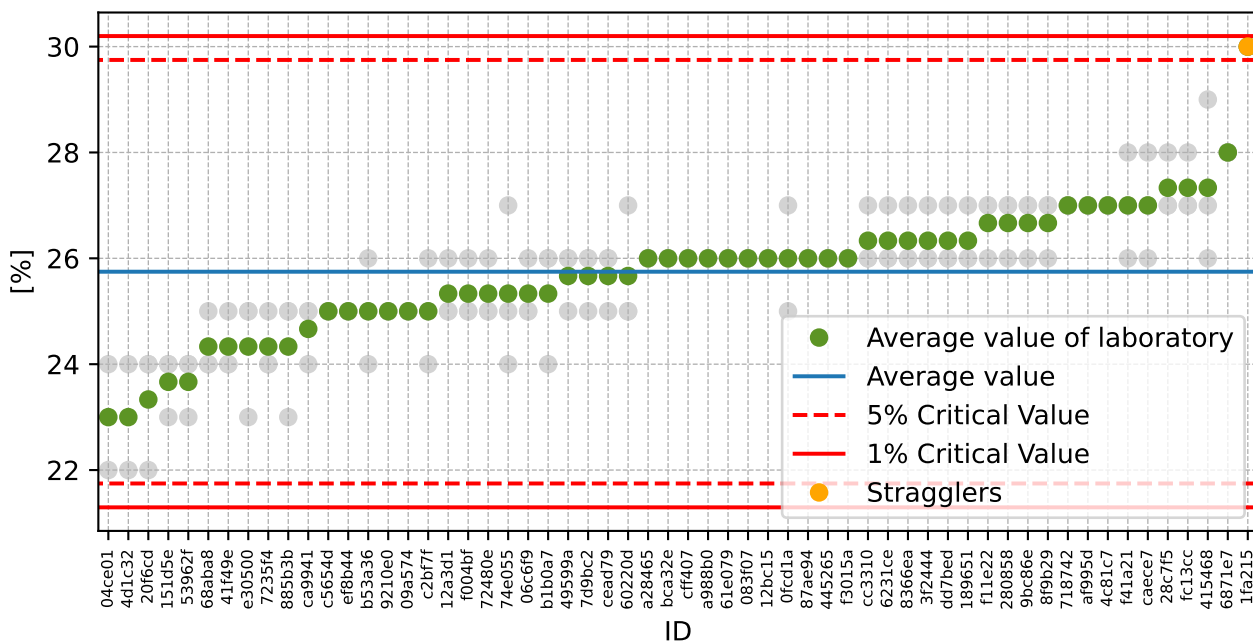
Continued from previous page

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
dd7bed	26	27	26	-	26	0.6	2.19
189651	26	26	27	1.0	26	0.6	2.19
f11e22	26	27	27	2.5	27	0.6	2.17
280858	26	27	27	2.0	27	0.6	2.17
9bc86e	27	26	27	0.1	27	0.6	2.17
8f9b29	27	27	26	0.2	27	0.6	2.17
718742	27	27	27	1.6	27	0.0	0.00
af995d	27	27	27	-	27	0.0	0.00
4c81c7	27	27	27	0.2	27	0.0	0.00
f41a21	27	28	26	1.4	27	1.0	3.70
caece7	27	26	28	0.7	27	1.0	3.70
28c7f5	27	27	28	0.3	27	0.6	2.11
fc13cc	27	28	27	0.1	27	0.6	2.11
415468	29	26	27	-	27	1.5	5.59
6871e7	28	28	28	0.3	28	0.0	0.00
1fa215	30	30	30	6.0	30	0.0	0.00
e2f492	32	31	30	1.0	31	1.0	3.23

1.4.2 The Numerical Procedure for Determining Outliers

Figure 35: **Cochran's test** - sample standard deviations

Figure 36: **Cochran's test** - sample standard deviations without outliersFigure 37: **Grubbs' test** - average values

Figure 38: **Grubbs' test** - average values without outliersFigure 39: **Grubbs' test** - average values without outliers

1.4.3 Mandel's Statistics

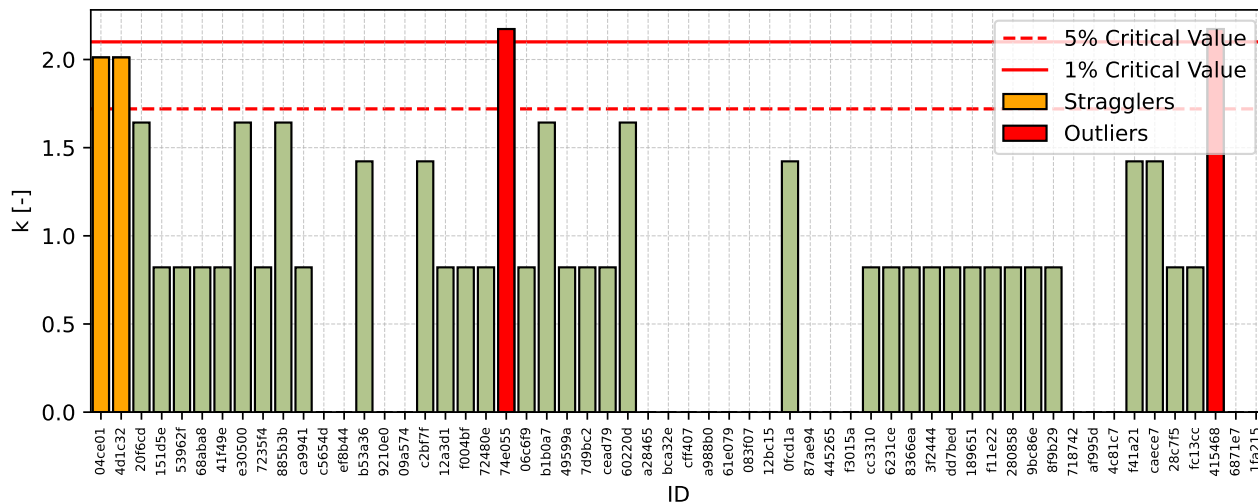


Figure 40: Intralaboratory Consistency Statistic

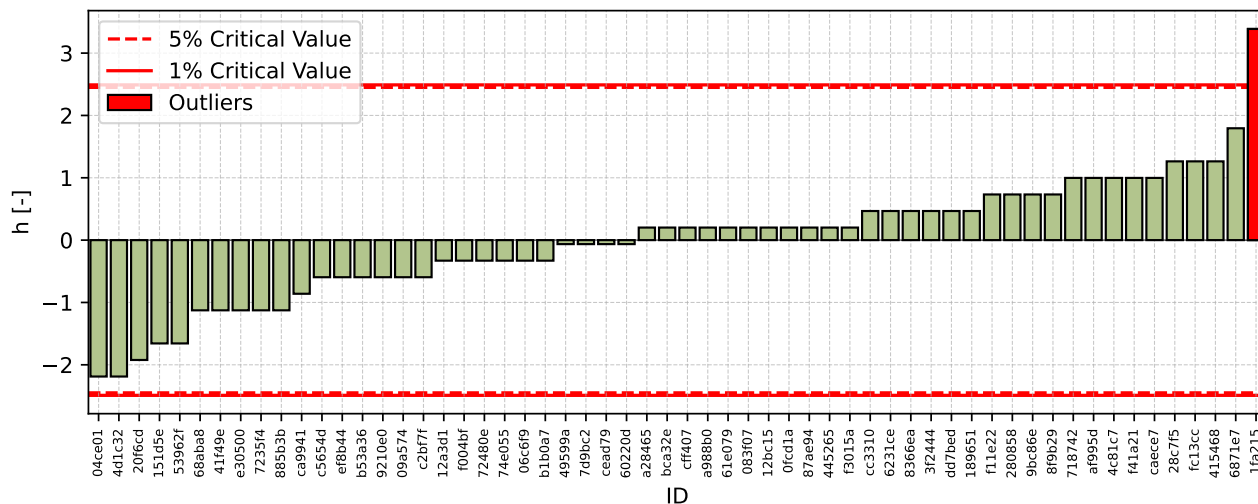


Figure 41: Interlaboratory Consistency Statistic

1.4.4 Descriptive statistics

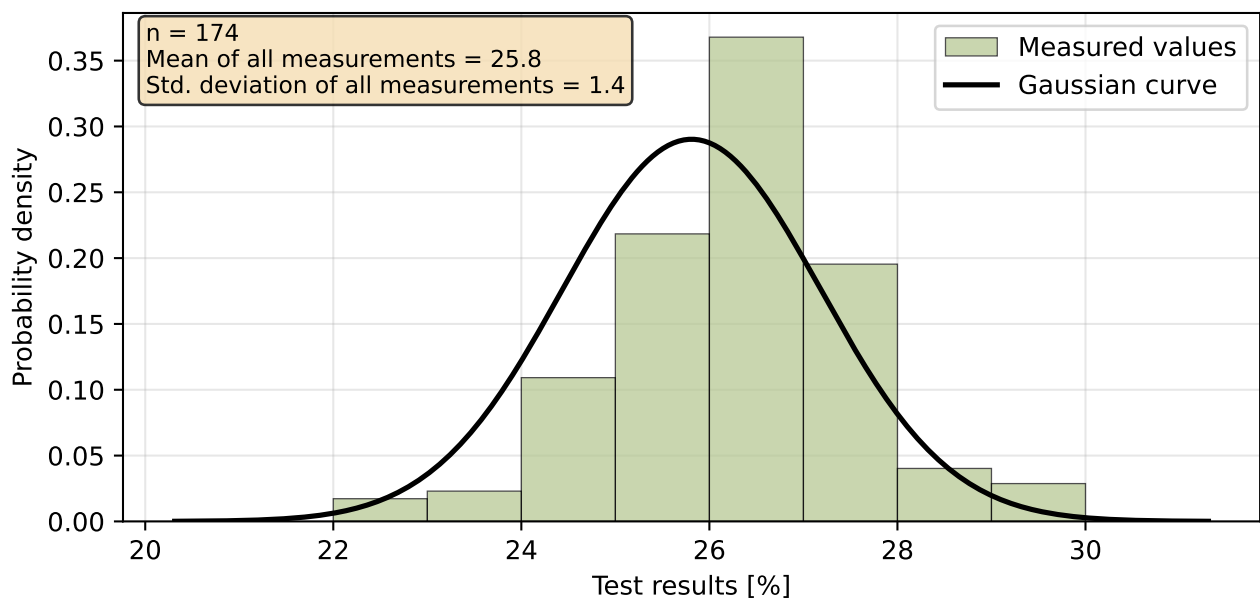


Figure 42: Histogram of all test results

Table 15: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	25.7
Sample standard deviation – s	1.3
Assigned value – x^*	25.7
Robust standard deviation – s^*	1.3
Measurement uncertainty of assigned value – u_x	0.2
p -value of normality test [-]	< 0.001

1.4.5 Evaluation of Performance Statistics

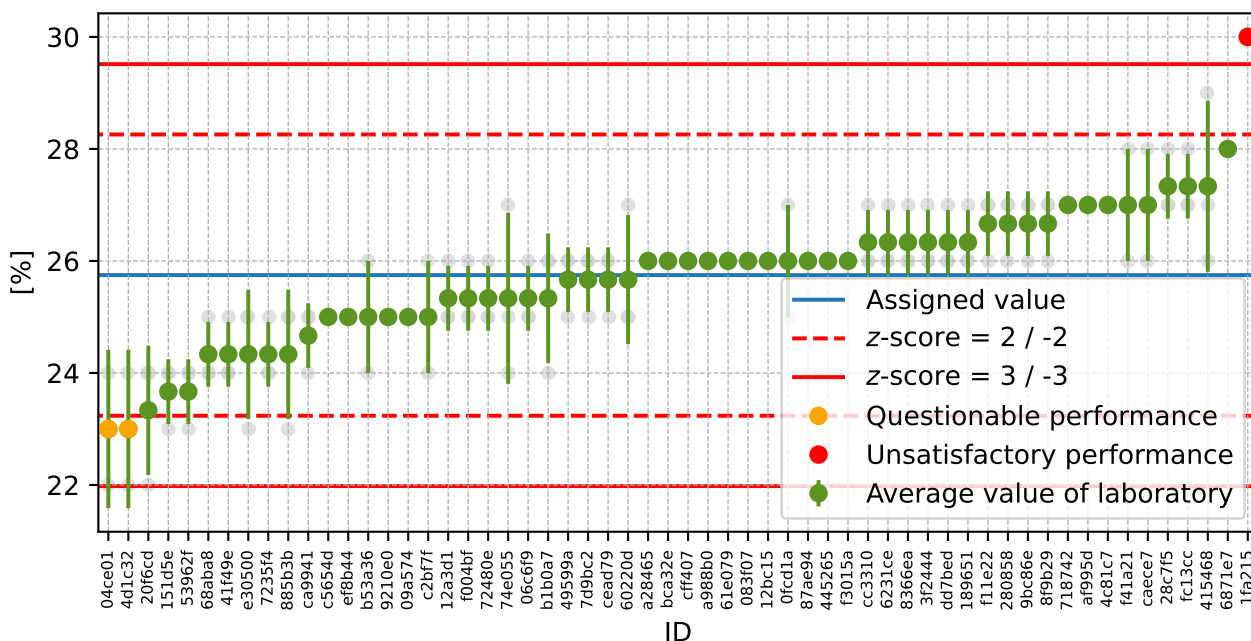


Figure 43: Average values and sample standard deviations

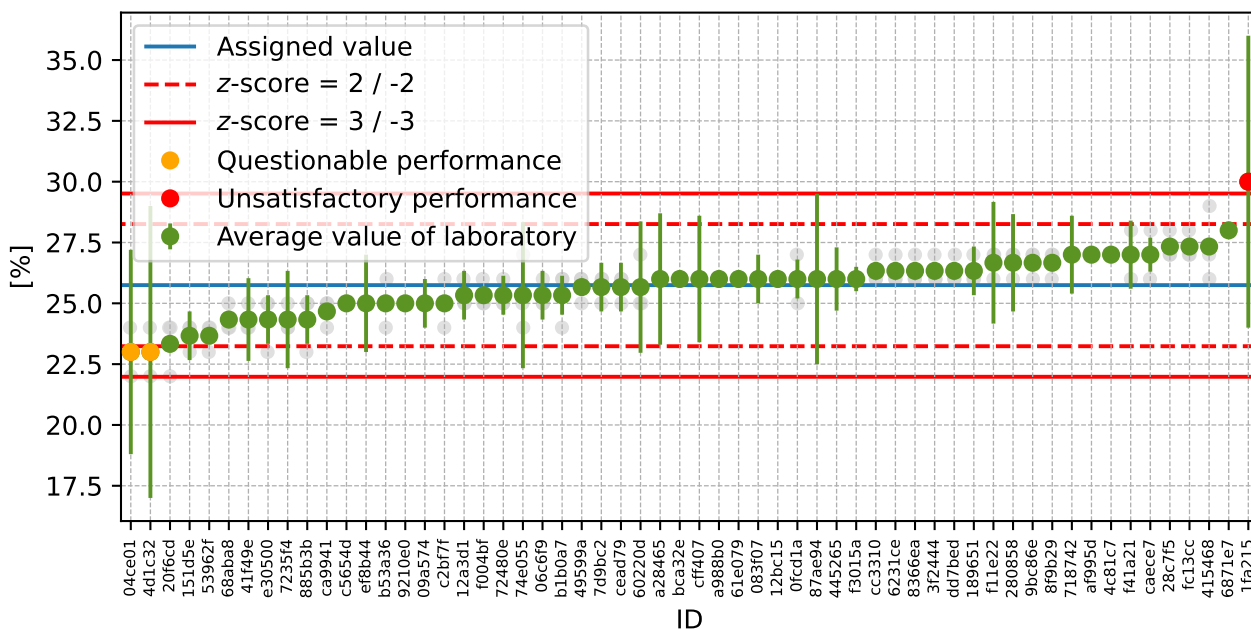


Figure 44: Average values and extended uncertainties of measurement

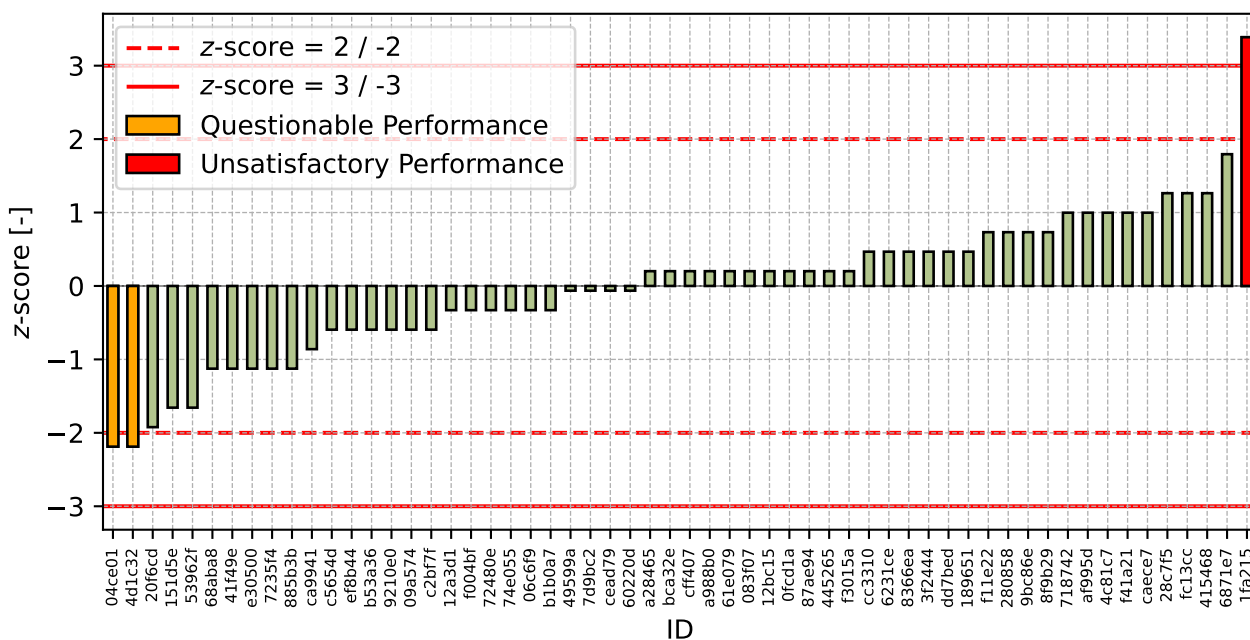


Figure 45: z-score

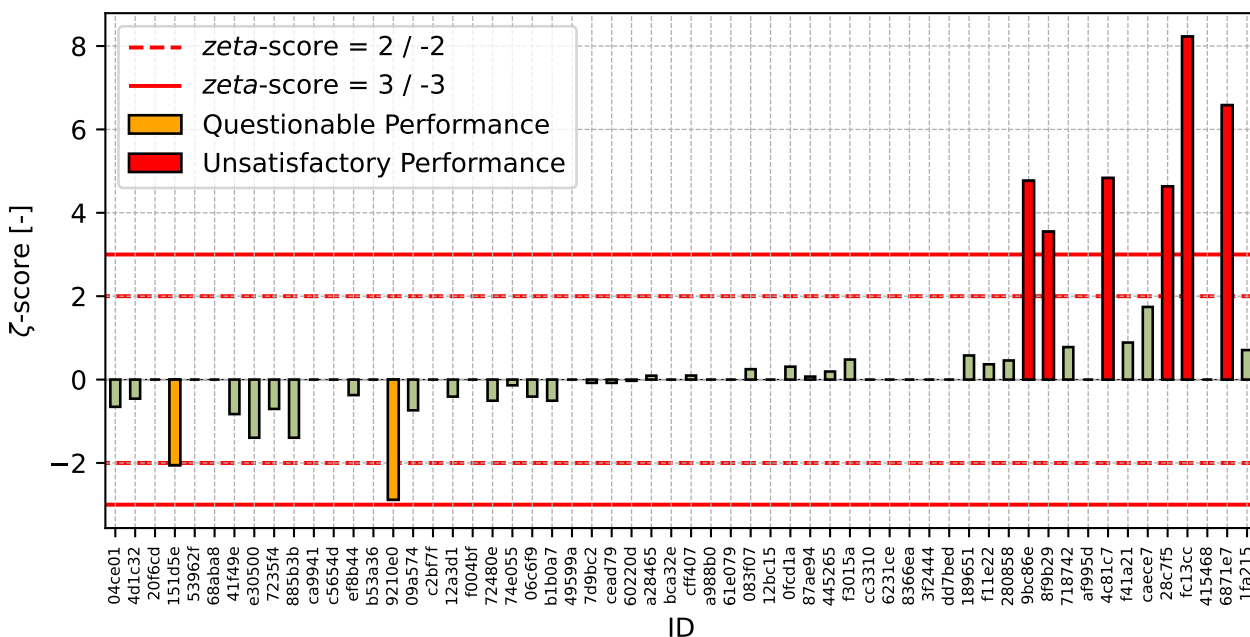


Figure 46: ζ-score

Table 16: z-score and ζ-score

ID	z-score [-]	ζ-score [-]
04ce01	-2.19	-0.65
4d1c32	-2.19	-0.46

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ID	z-score [-]	ζ-score [-]
20f6cd	-1.92	-
151d5e	-1.66	-2.05
53962f	-1.66	-
68aba8	-1.13	-
41f49e	-1.13	-0.83
e30500	-1.13	-1.39
7235f4	-1.13	-0.70
885b3b	-1.13	-1.39
ca9941	-0.86	-
c5654d	-0.60	-
ef8b44	-0.60	-0.37
b53a36	-0.60	-
9210e0	-0.60	-2.88
09a574	-0.60	-0.74
c2bf7f	-0.60	-
12a3d1	-0.33	-0.41
f004bf	-0.33	-
72480e	-0.33	-0.51
74e055	-0.33	-0.14
06c6f9	-0.33	-0.41
b1b0a7	-0.33	-0.51
49599a	-0.06	-
7d9bc2	-0.06	-0.08
cead79	-0.06	-0.08
60220d	-0.06	-0.03
a28465	0.20	0.09
bca32e	0.20	-
cff407	0.20	0.10
a988b0	0.20	-
61e079	0.20	-
083f07	0.20	0.25
12bc15	0.20	-
0fcd1a	0.20	0.31
87ae94	0.20	0.07
445265	0.20	0.19
f3015a	0.20	0.48
cc3310	0.47	-
6231ce	0.47	-
8366ea	0.47	-
3f2444	0.47	-
dd7bed	0.47	-
189651	0.47	0.58
f11e22	0.73	0.37
280858	0.73	0.46
9bc86e	0.73	4.77
8f9b29	0.73	3.55
718742	1.00	0.78
af995d	1.00	-
4c81c7	1.00	4.83
f41a21	1.00	0.89
caece7	1.00	1.74
28c7f5	1.26	4.63

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ID	z-score [-]	ζ-score [-]
fc13cc	1.26	8.23
415468	1.26	-
6871e7	1.79	6.58
1fa215	3.39	0.71

1.5 0.25 mm

1.5.1 Test results

Table 17: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
20f6cd	6	6	5	-	6	0.6	10.19
04ce01	4	7	6	6.8	6	1.5	26.96
68aba8	6	6	6	-	6	0.0	0.00
41f49e	6	6	6	0.2	6	0.0	0.00
bca32e	6	6	6	-	6	0.0	0.00
53962f	6	6	6	-	6	0.0	0.00
cff407	6	6	6	1.3	6	0.0	0.00
6231ce	6	6	6	-	6	0.0	0.00
72480e	6	6	7	0.6	6	0.6	9.12
60220d	6	6	7	1.5	6	0.6	9.12
7235f4	6	6	7	1.8	6	0.6	9.12
885b3b	7	7	6	0.3	7	0.6	8.66
0fcd1a	6	7	7	1.4	7	0.6	8.66
4d1c32	7	7	6	2.0	7	0.6	8.66
ef8b44	7	6	7	2.0	7	0.6	8.66
e2f492	7	7	6	1.0	7	0.6	8.66
e30500	7	7	6	0.3	7	0.6	8.66
af995d	7	6	7	-	7	0.6	8.66
b1b0a7	6	7	7	0.2	7	0.6	8.66
74e055	7	6	8	3.0	7	1.0	14.29
caece7	7	7	7	0.4	7	0.0	0.00
083f07	7	7	7	0.2	7	0.0	0.00
f004bf	7	7	7	-	7	0.0	0.00
49599a	7	7	7	-	7	0.0	0.00
8f9b29	7	7	7	0.0	7	0.0	0.00
7d9bc2	7	7	7	1.0	7	0.0	0.00
9210e0	7	7	7	0.2	7	0.0	0.00
189651	7	7	7	0.5	7	0.0	0.00
f3015a	7	7	7	0.2	7	0.0	0.00
ca9941	7	7	7	-	7	0.0	0.00
280858	7	7	7	1.0	7	0.0	0.00
09a574	7	7	7	1.0	7	0.0	0.00
c5654d	7	7	8	-	7	0.6	7.87
cead79	7	8	7	1.0	7	0.6	7.87
6871e7	7	7	8	0.1	7	0.6	7.87
415468	8	7	7	-	7	0.6	7.87
c2bf7f	6	8	8	-	7	1.2	15.75
06c6f9	7	7	8	1.0	7	0.6	7.87
151d5e	7	7	8	0.6	7	0.6	7.87
12a3d1	7	7	8	1.0	7	0.6	7.87
dd7bed	7	8	8	-	8	0.6	7.53
f11e22	7	8	8	2.0	8	0.6	7.53
f41a21	7	8	8	0.8	8	0.6	7.53

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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
4c81c7	8	8	7	0.3	8	0.6	7.53
445265	8	8	8	1.5	8	0.0	0.00
a988b0	8	8	8	-	8	0.0	0.00
3f2444	8	8	8	-	8	0.0	0.00
87ae94	8	8	8	3.5	8	0.0	0.00
1fa215	8	8	8	3.0	8	0.0	0.00
61e079	8	8	8	-	8	0.0	0.00
cc3310	8	8	8	-	8	0.0	0.00
a28465	8	8	8	1.8	8	0.0	0.00
fc13cc	8	8	8	0.1	8	0.0	0.00
12bc15	8	8	8	-	8	0.0	0.00
718742	8	8	8	0.5	8	0.0	0.00
9bc86e	8	8	8	0.1	8	0.0	0.00
8366ea	9	8	8	-	8	0.6	6.93
28c7f5	8	8	9	0.2	8	0.6	6.93
b53a36	8	8	9	-	8	0.6	6.93
f3903e	11	13	12	1.5	12	1.0	8.33

1.5.2 The Numerical Procedure for Determining Outliers

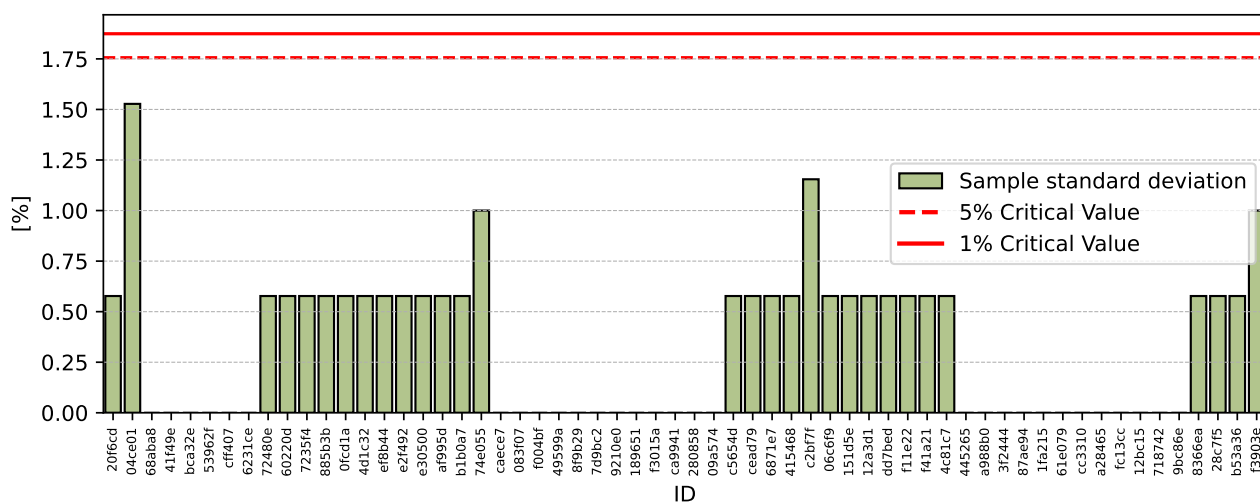
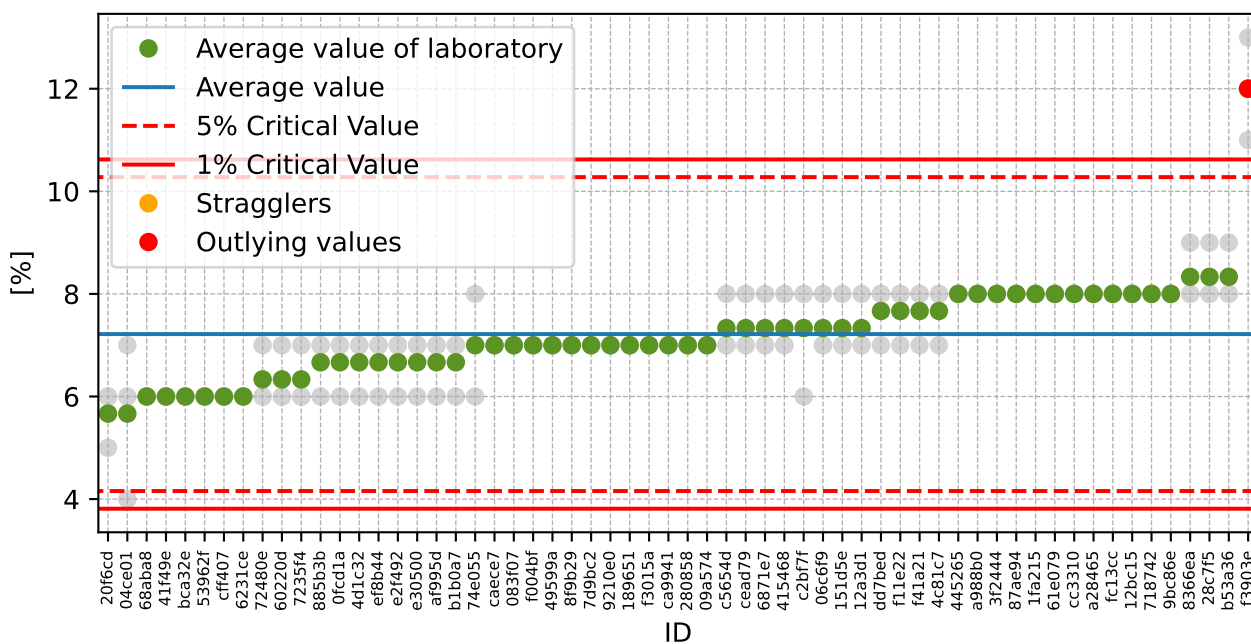
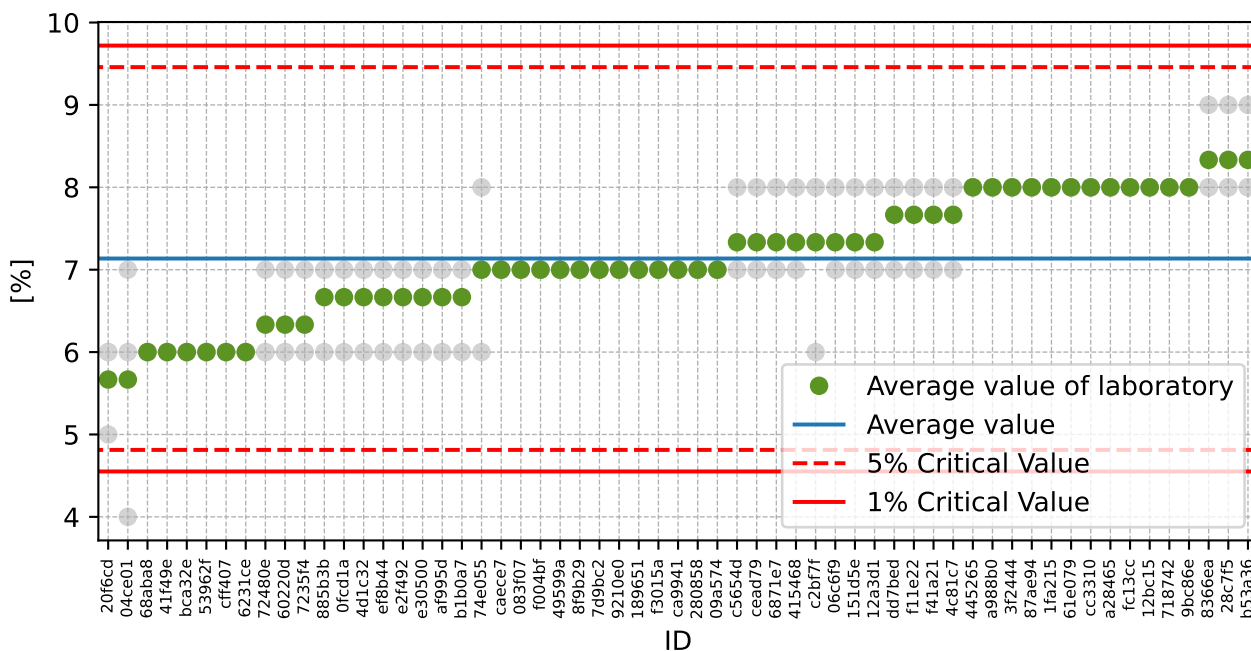


Figure 47: Cochran's test - sample standard deviations

Figure 48: **Grubbs' test** - average valuesFigure 49: **Grubbs' test** - average values without outliers

1.5.3 Mandel's Statistics

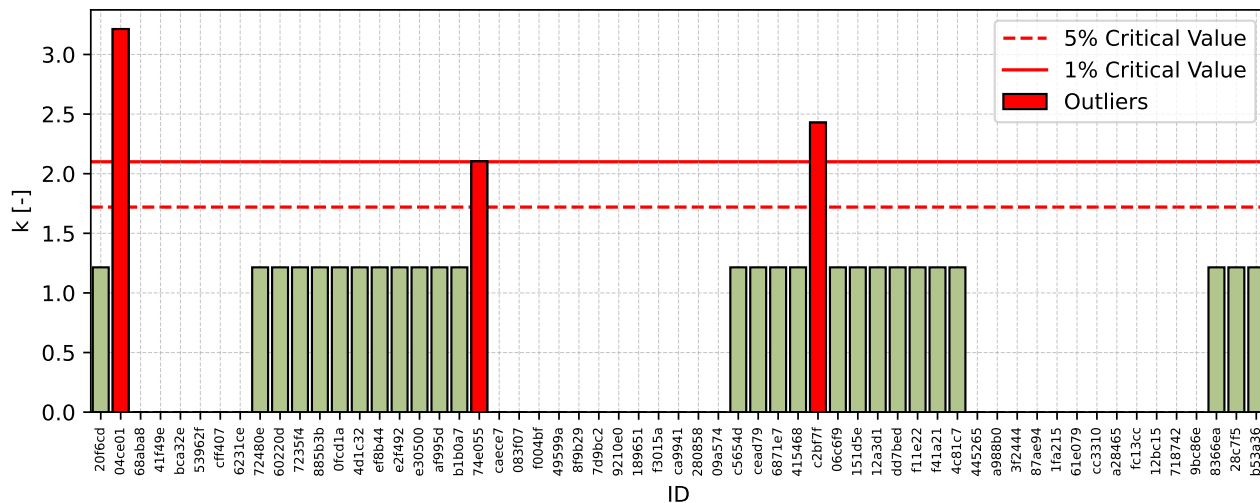


Figure 50: Intralaboratory Consistency Statistic

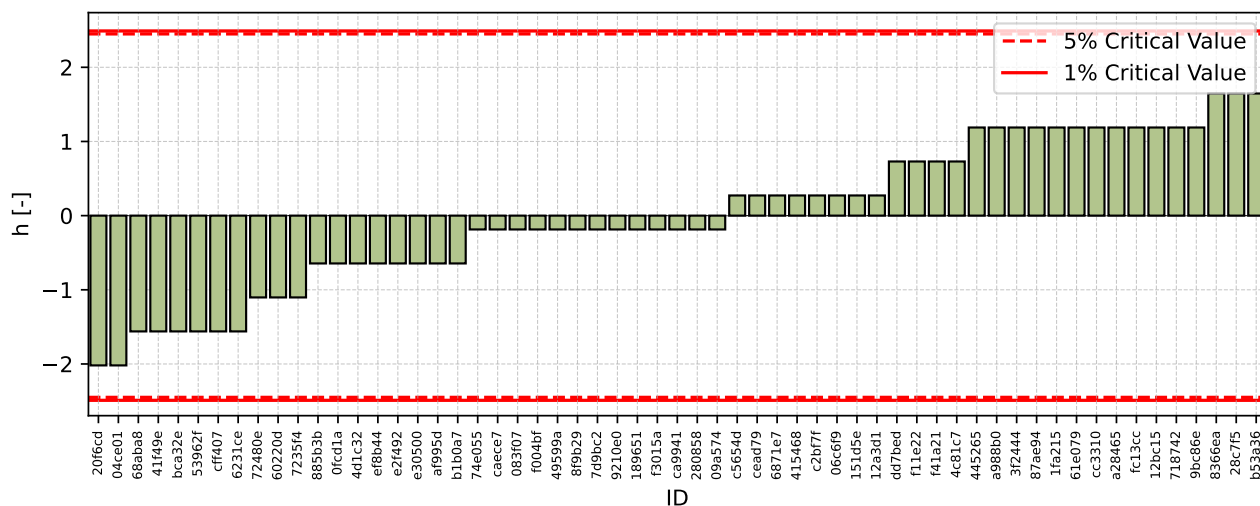


Figure 51: Interlaboratory Consistency Statistic

1.5.4 Descriptive statistics

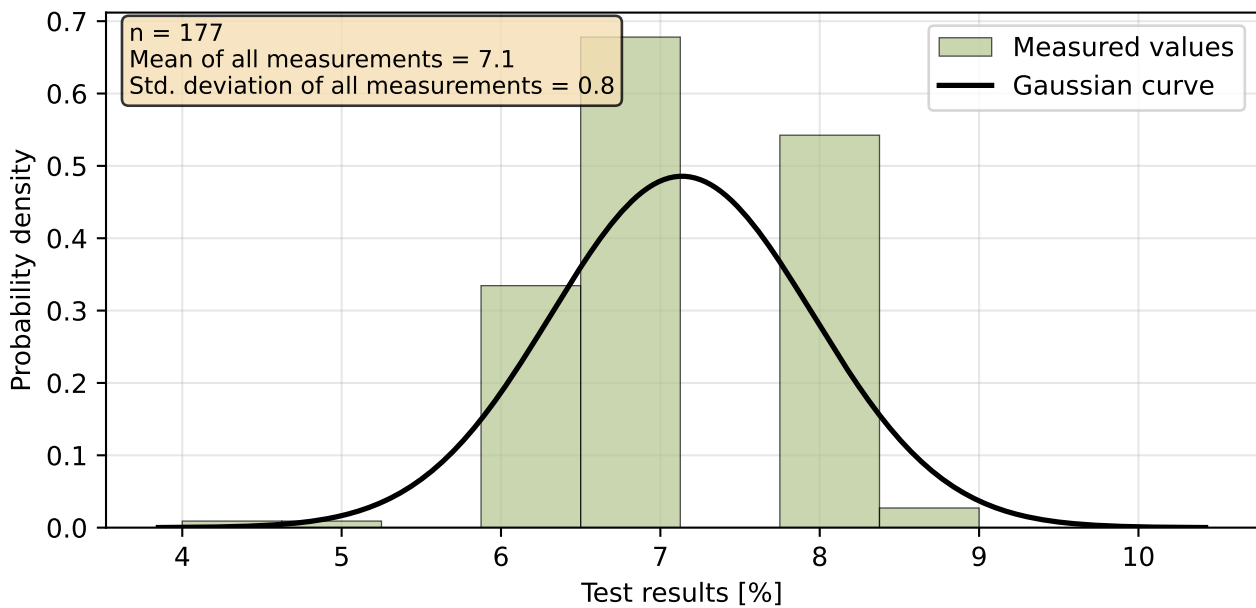


Figure 52: Histogram of all test results

Table 18: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	7.1
Sample standard deviation – s	0.7
Assigned value – x^*	7.1
Robust standard deviation – s^*	0.7
Measurement uncertainty of assigned value – u_x	0.1
p -value of normality test [-]	< 0.001

1.5.5 Evaluation of Performance Statistics

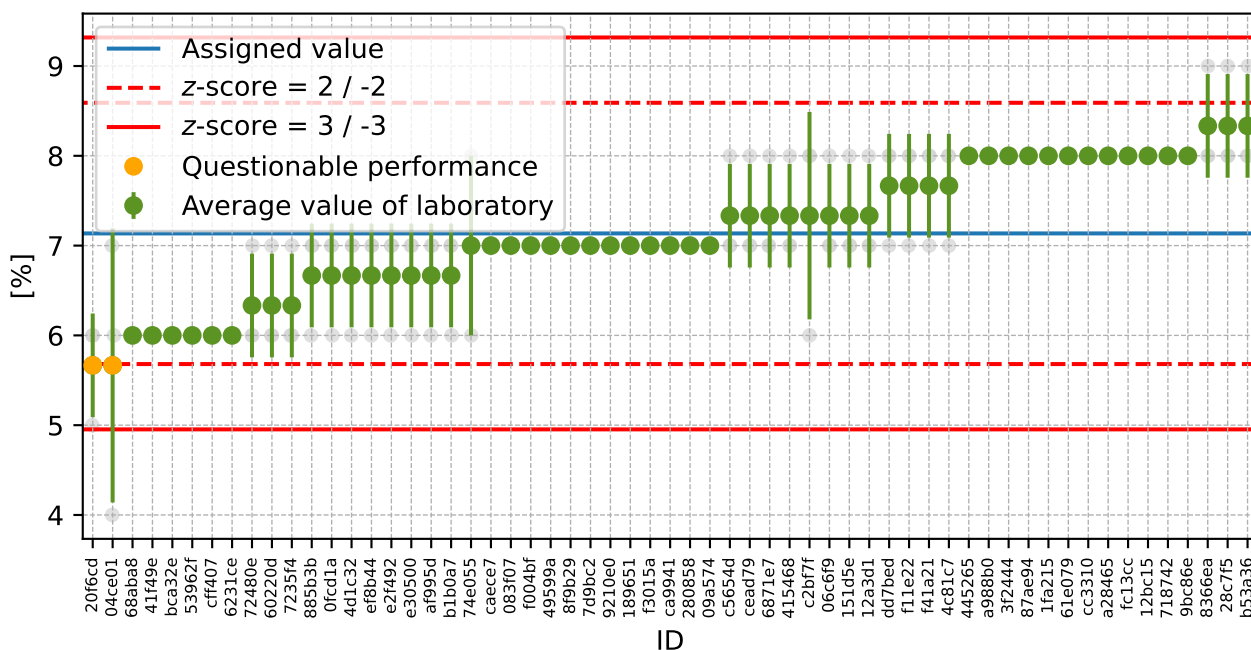


Figure 53: Average values and sample standard deviations

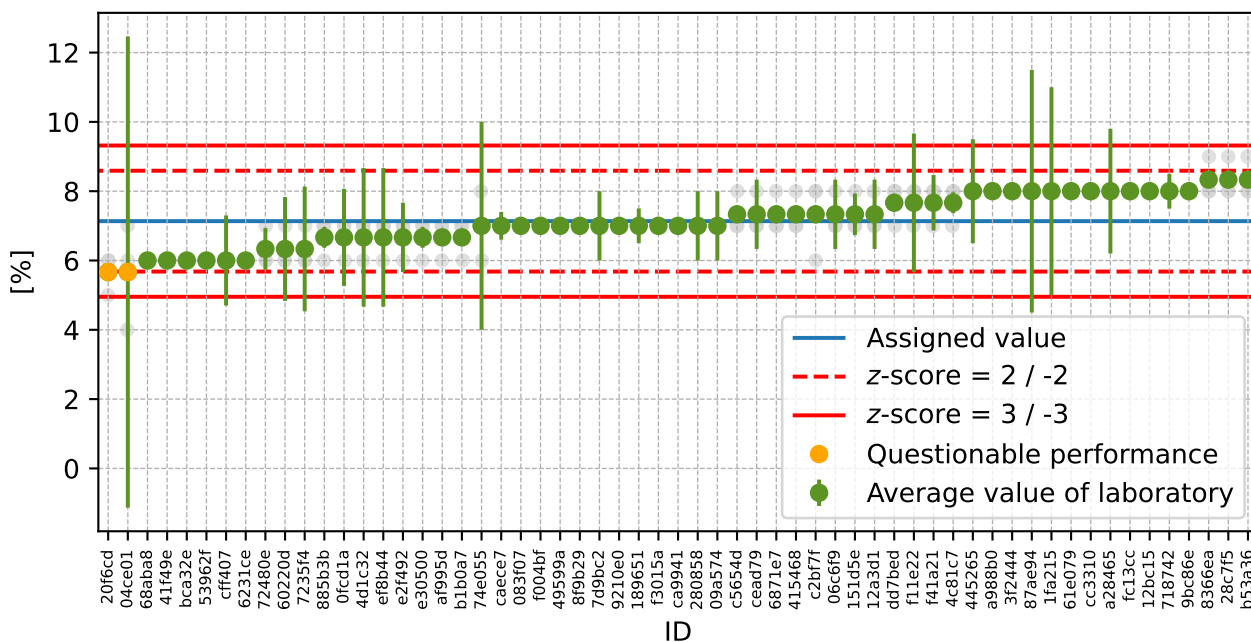


Figure 54: Average values and extended uncertainties of measurement

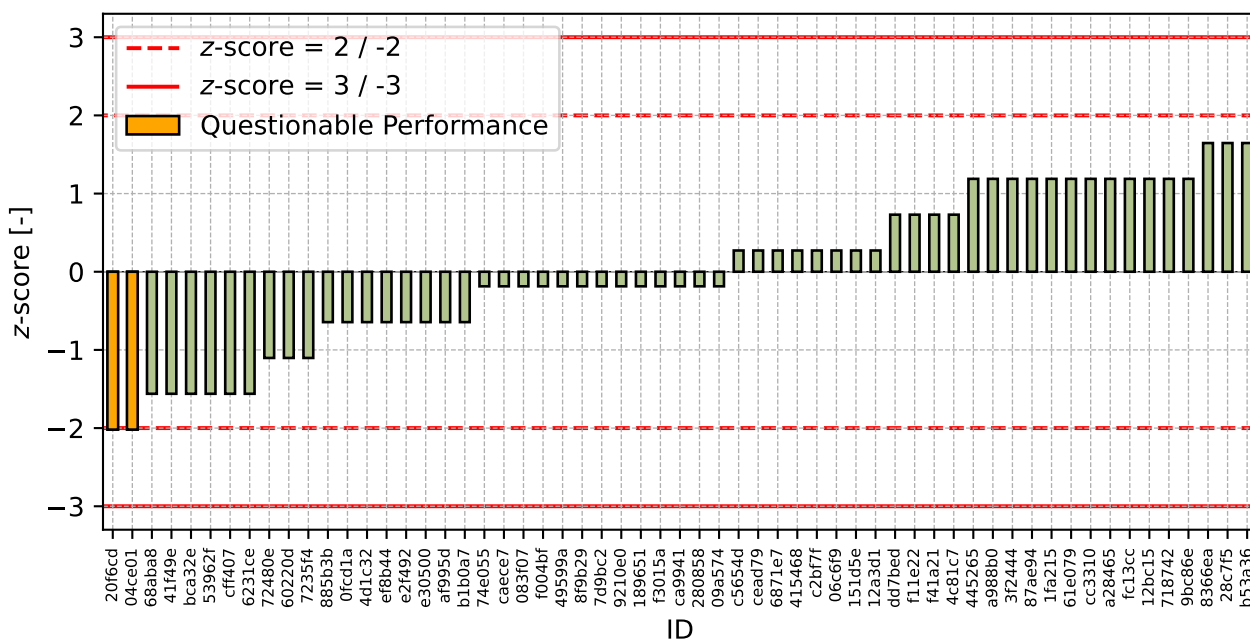
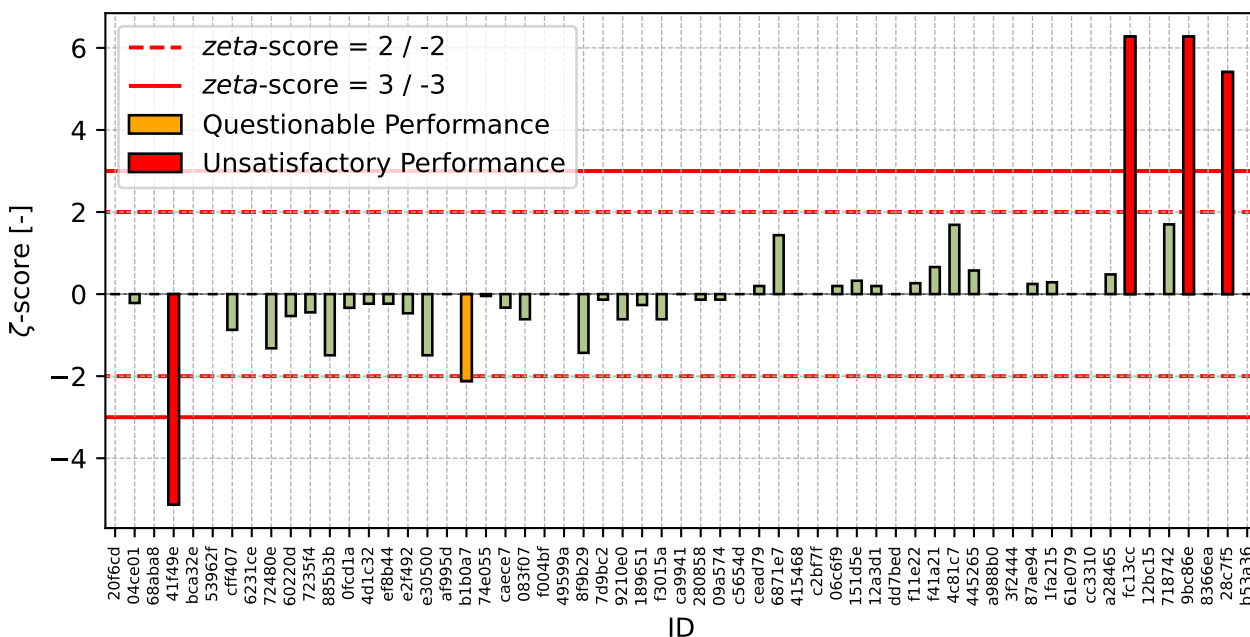


Figure 55: z-score

Figure 56: ζ -scoreTable 19: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
20f6cd	-2.02	-
04ce01	-2.02	-0.22

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ID	z-score [-]	ζ-score [-]
68aba8	-1.56	-
41f49e	-1.56	-5.13
bca32e	-1.56	-
53962f	-1.56	-
cff407	-1.56	-0.87
6231ce	-1.56	-
72480e	-1.10	-1.32
60220d	-1.10	-0.53
7235f4	-1.10	-0.45
885b3b	-0.64	-1.49
0fcd1a	-0.64	-0.33
4d1c32	-0.64	-0.23
ef8b44	-0.64	-0.23
e2f492	-0.64	-0.47
e30500	-0.64	-1.49
af995d	-0.64	-
b1b0a7	-0.64	-2.12
74e055	-0.19	-0.05
caece7	-0.19	-0.33
083f07	-0.19	-0.61
f004bf	-0.19	-
49599a	-0.19	-
8f9b29	-0.19	-1.43
7d9bc2	-0.19	-0.13
9210e0	-0.19	-0.61
189651	-0.19	-0.27
f3015a	-0.19	-0.61
ca9941	-0.19	-
280858	-0.19	-0.13
09a574	-0.19	-0.13
c5654d	0.27	-
cead79	0.27	0.20
6871e7	0.27	1.44
415468	0.27	-
c2bf7f	0.27	-
06c6f9	0.27	0.20
151d5e	0.27	0.33
12a3d1	0.27	0.20
dd7bed	0.73	-
f11e22	0.73	0.27
f41a21	0.73	0.66
4c81c7	0.73	1.69
445265	1.19	0.58
a988b0	1.19	-
3f2444	1.19	-
87ae94	1.19	0.25
1fa215	1.19	0.29
61e079	1.19	-
cc3310	1.19	-
a28465	1.19	0.48
fc13cc	1.19	6.28
12bc15	1.19	-
718742	1.19	1.70

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ID	z-score [-]	ζ-score [-]
9bc86e	1.19	6.28
8366ea	1.65	-
28c7f5	1.65	5.41
b53a36	1.65	-

1.6 0.125 mm

1.6.1 Test results

Table 20: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

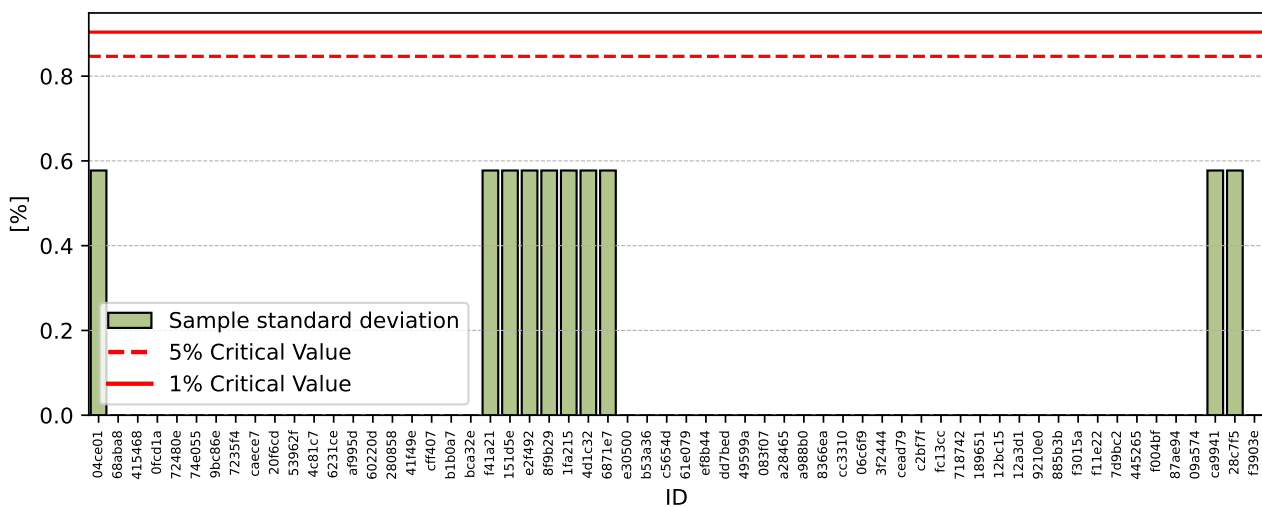
ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
04ce01	0	1	1	8.2	1	0.6	86.60
68aba8	1	1	1	-	1	0.0	0.00
415468	1	1	1	-	1	0.0	0.00
0fcd1a	1	1	1	0.6	1	0.0	0.00
72480e	1	1	1	0.1	1	0.0	0.00
74e055	1	1	1	1.0	1	0.0	0.00
9bc86e	1	1	1	0.1	1	0.0	0.00
7235f4	1	1	1	0.7	1	0.0	0.00
caece7	1	1	1	0.2	1	0.0	0.00
20f6cd	1	1	1	-	1	0.0	0.00
53962f	1	1	1	-	1	0.0	0.00
4c81c7	1	1	1	0.1	1	0.0	0.00
6231ce	1	1	1	-	1	0.0	0.00
af995d	1	1	1	-	1	0.0	0.00
60220d	1	1	1	0.6	1	0.0	0.00
280858	1	1	1	1.0	1	0.0	0.00
41f49e	1	1	1	0.1	1	0.0	0.00
cff407	1	1	1	0.8	1	0.0	0.00
b1b0a7	1	1	1	0.0	1	0.0	0.00
bca32e	1	1	1	-	1	0.0	0.00
f41a21	1	1	2	0.4	1	0.6	43.30
151d5e	1	1	2	0.2	1	0.6	43.30
e2f492	2	1	1	1.0	1	0.6	43.30
8f9b29	2	1	2	0.0	2	0.6	34.64
1fa215	1	2	2	0.3	2	0.6	34.64
4d1c32	2	2	1	2.0	2	0.6	34.64
6871e7	1	2	2	0.0	2	0.6	34.64
e30500	2	2	2	0.1	2	0.0	0.00
b53a36	2	2	2	-	2	0.0	0.00
c5654d	2	2	2	-	2	0.0	0.00
61e079	2	2	2	-	2	0.0	0.00
ef8b44	2	2	2	2.0	2	0.0	0.00
dd7bed	2	2	2	-	2	0.0	0.00
49599a	2	2	2	-	2	0.0	0.00
083f07	2	2	2	0.1	2	0.0	0.00
a28465	2	2	2	0.6	2	0.0	0.00
a988b0	2	2	2	-	2	0.0	0.00
8366ea	2	2	2	-	2	0.0	0.00
cc3310	2	2	2	-	2	0.0	0.00
06c6f9	2	2	2	1.0	2	0.0	0.00
3f2444	2	2	2	-	2	0.0	0.00
cead79	2	2	2	0.5	2	0.0	0.00
c2bf7f	2	2	2	-	2	0.0	0.00

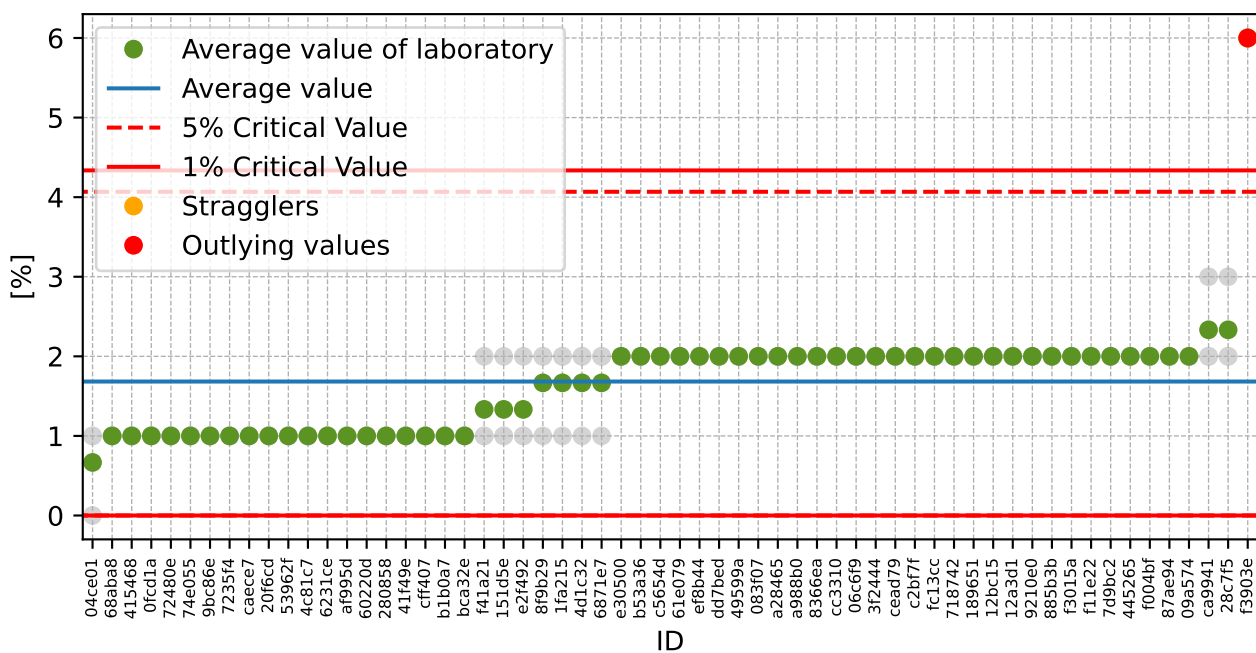
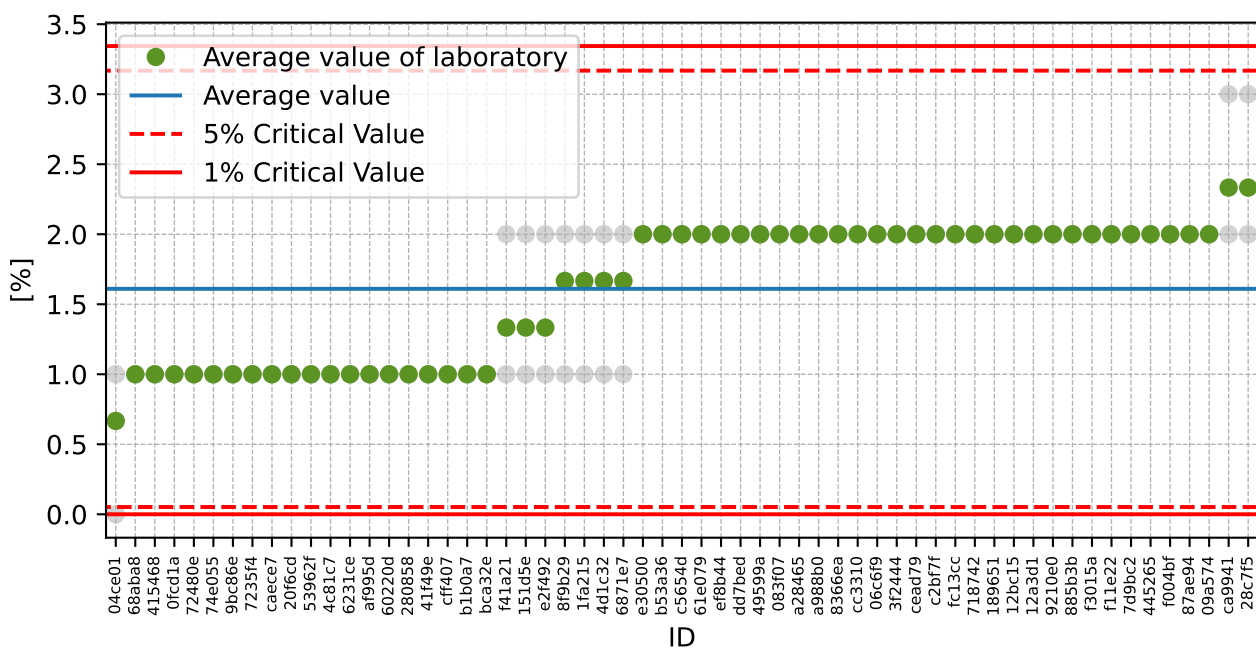
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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
fc13cc	2	2	2	0.1	2	0.0	0.00
718742	2	2	2	0.2	2	0.0	0.00
189651	2	2	2	0.5	2	0.0	0.00
12bc15	2	2	2	-	2	0.0	0.00
12a3d1	2	2	2	1.4	2	0.0	0.00
9210e0	2	2	2	0.1	2	0.0	0.00
885b3b	2	2	2	0.1	2	0.0	0.00
f3015a	2	2	2	0.1	2	0.0	0.00
f11e22	2	2	2	1.0	2	0.0	0.00
7d9bc2	2	2	2	1.0	2	0.0	0.00
445265	2	2	2	1.3	2	0.0	0.00
f004bf	2	2	2	-	2	0.0	0.00
87ae94	2	2	2	3.5	2	0.0	0.00
09a574	2	2	2	1.2	2	0.0	0.00
ca9941	2	3	2	-	2	0.6	24.74
28c7f5	2	2	3	0.1	2	0.6	24.74
f3903e	6	6	6	2.5	6	0.0	0.00

1.6.2 The Numerical Procedure for Determining Outliers

Figure 57: **Cochran's test** - sample standard deviations

Figure 58: **Grubbs' test** - average valuesFigure 59: **Grubbs' test** - average values without outliers

1.6.3 Mandel's Statistics

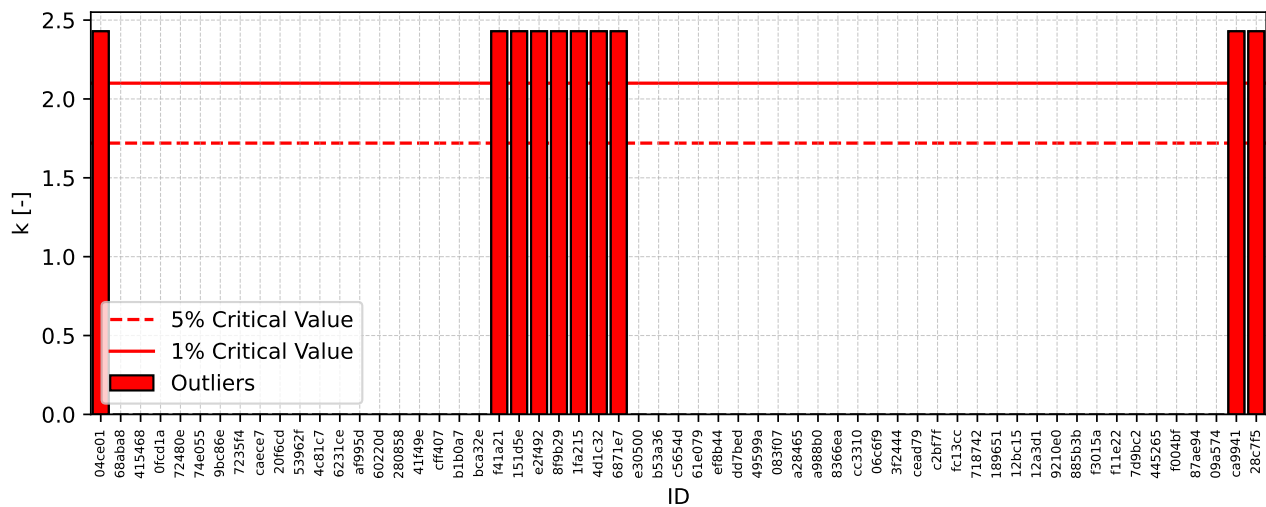


Figure 60: Intralaboratory Consistency Statistic

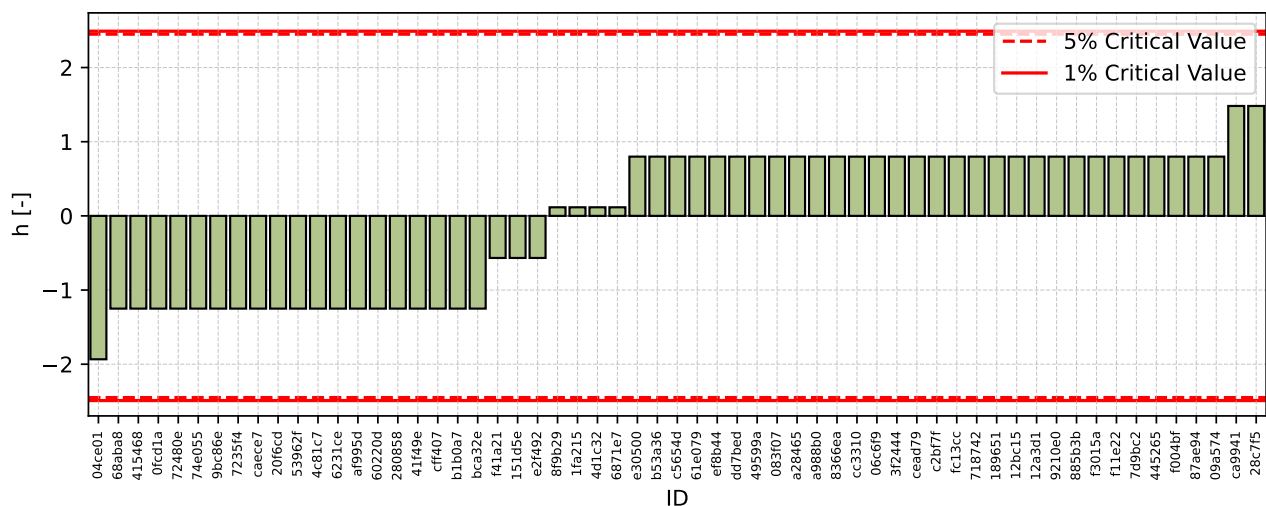


Figure 61: Interlaboratory Consistency Statistic

1.6.4 Descriptive statistics

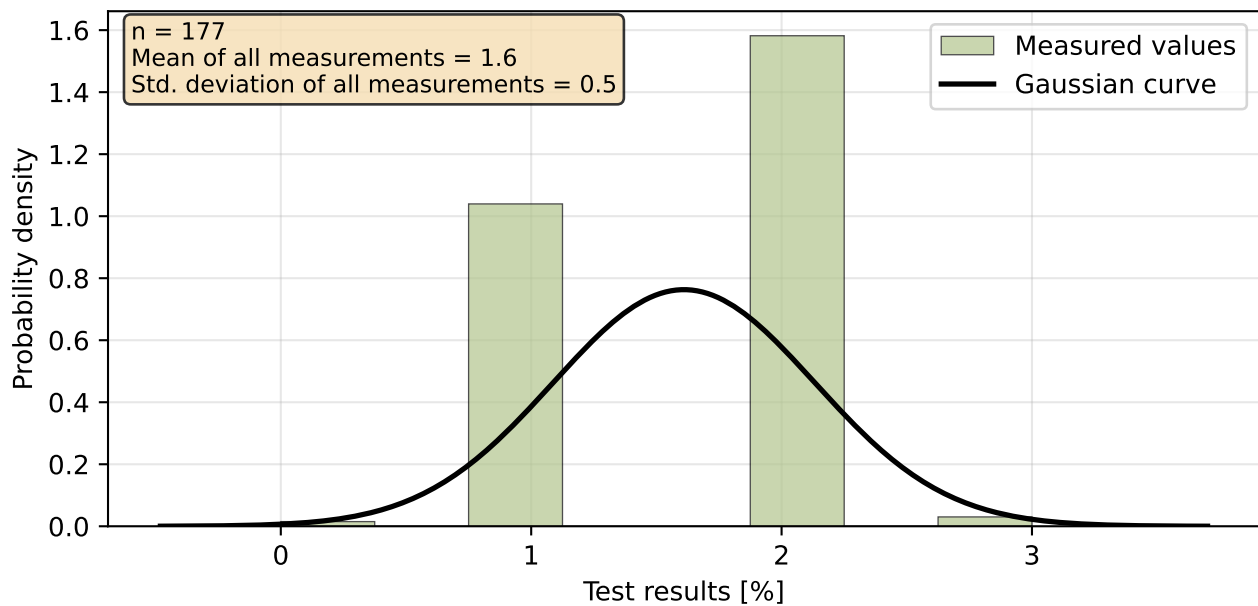


Figure 62: Histogram of all test results

Table 21: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	1.6
Sample standard deviation – s	0.5
Assigned value – x^*	1.6
Robust standard deviation – s^*	0.5
Measurement uncertainty of assigned value – u_x	0.1
p -value of normality test [-]	< 0.001

1.6.5 Evaluation of Performance Statistics

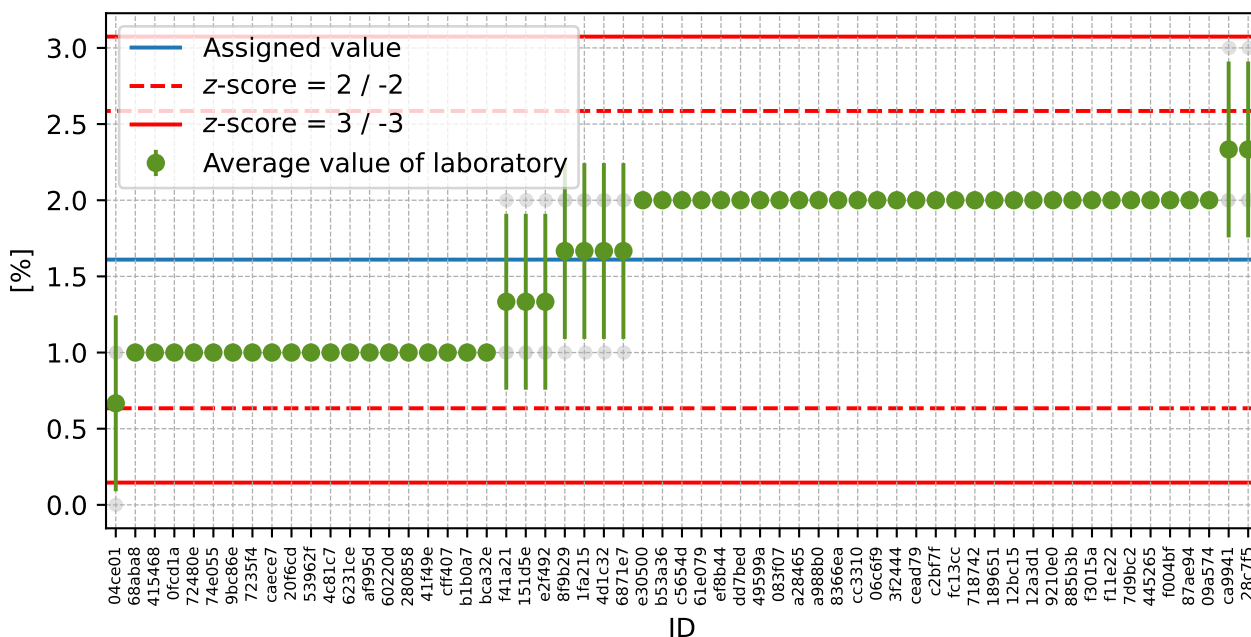


Figure 63: Average values and sample standard deviations

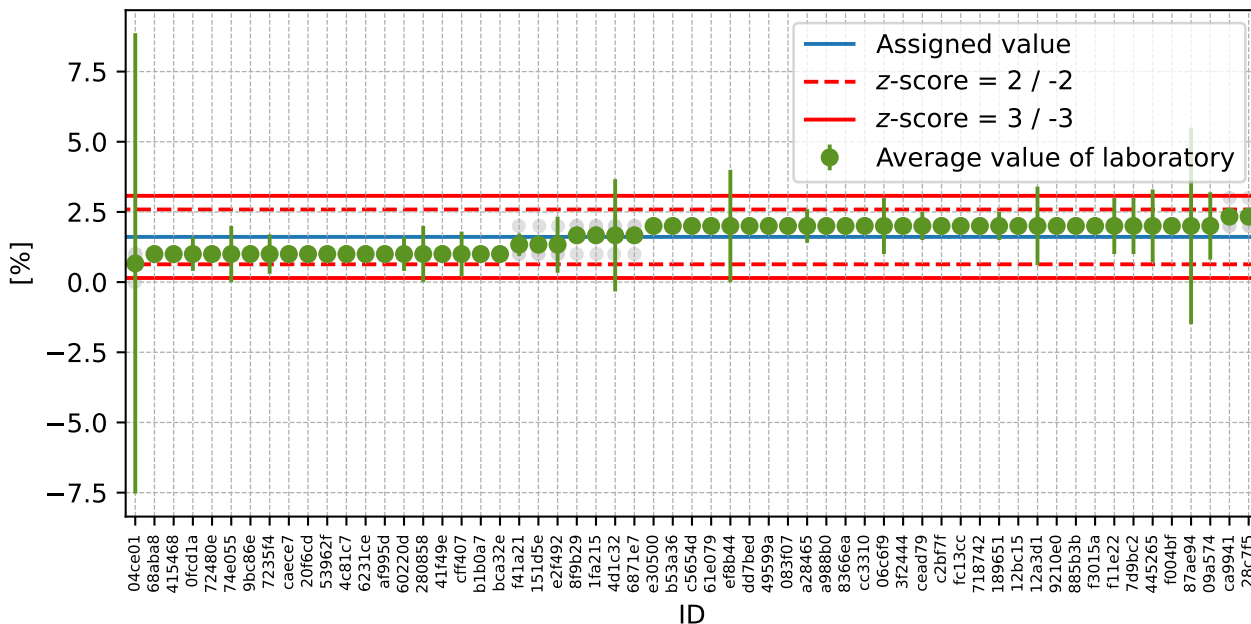


Figure 64: Average values and extended uncertainties of measurement

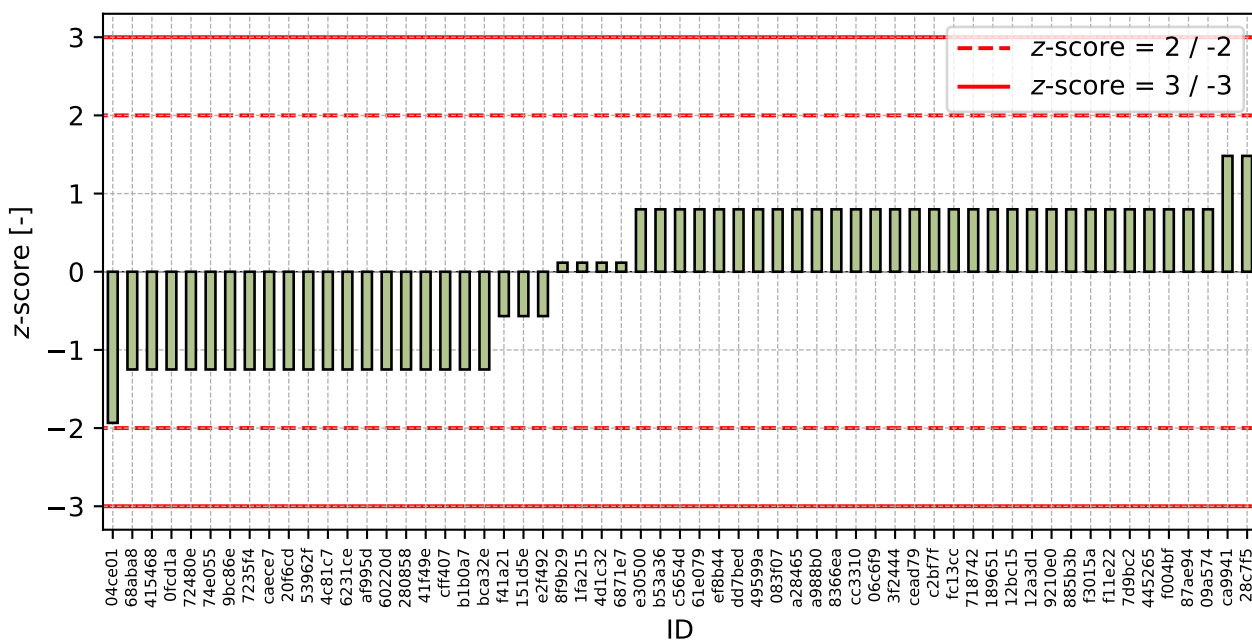
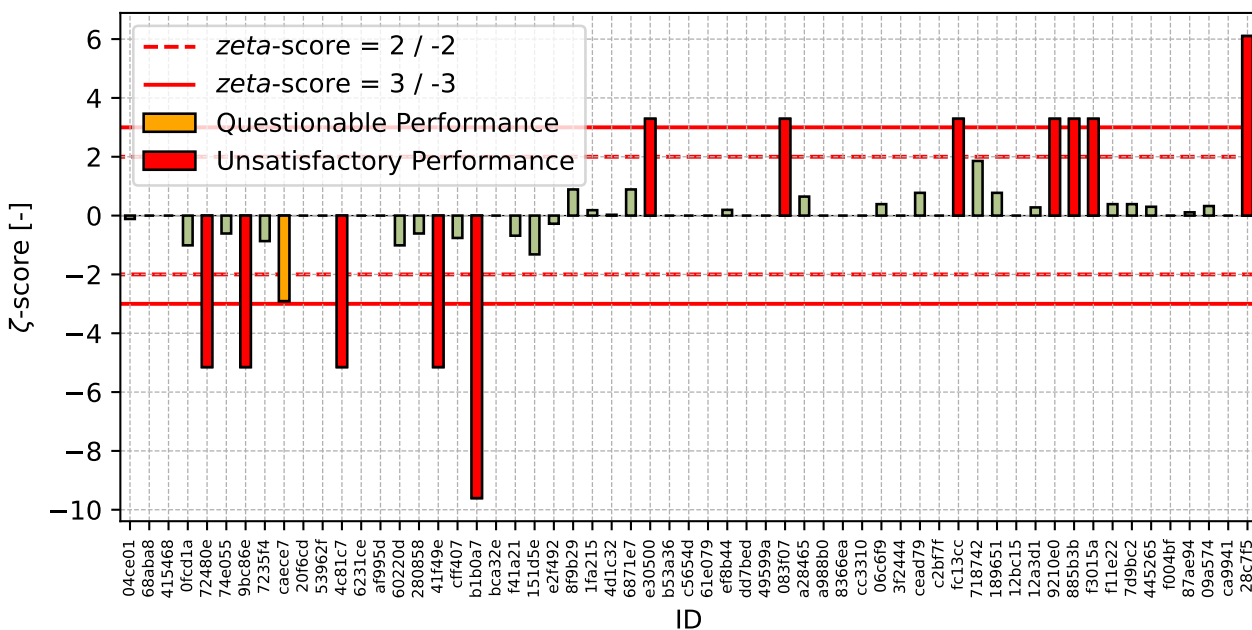


Figure 65: z-score

Figure 66: ζ -scoreTable 22: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
04ce01	-1.93	-0.12
68aba8	-1.25	-
415468	-1.25	-

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ID	z-score [-]	ζ-score [-]
0fcd1a	-1.25	-1.01
72480e	-1.25	-5.15
74e055	-1.25	-0.61
9bc86e	-1.25	-5.15
7235f4	-1.25	-0.87
caece7	-1.25	-2.91
20f6cd	-1.25	-
53962f	-1.25	-
4c81c7	-1.25	-5.15
6231ce	-1.25	-
af995d	-1.25	-
60220d	-1.25	-1.01
280858	-1.25	-0.61
41f49e	-1.25	-5.15
cff407	-1.25	-0.76
b1b0a7	-1.25	-9.60
bca32e	-1.25	-
f41a21	-0.57	-0.68
151d5e	-0.57	-1.32
e2f492	-0.57	-0.28
8f9b29	0.12	0.89
1fa215	0.12	0.18
4d1c32	0.12	0.03
6871e7	0.12	0.89
e30500	0.80	3.29
b53a36	0.80	-
c5654d	0.80	-
61e079	0.80	-
ef8b44	0.80	0.19
dd7bed	0.80	-
49599a	0.80	-
083f07	0.80	3.29
a28465	0.80	0.65
a988b0	0.80	-
8366ea	0.80	-
cc3310	0.80	-
06c6f9	0.80	0.39
3f2444	0.80	-
cead79	0.80	0.77
c2bf7f	0.80	-
fc13cc	0.80	3.29
718742	0.80	1.86
189651	0.80	0.77
12bc15	0.80	-
12a3d1	0.80	0.28
9210e0	0.80	3.29
885b3b	0.80	3.29
f3015a	0.80	3.29
f11e22	0.80	0.39
7d9bc2	0.80	0.39
445265	0.80	0.30
f004bf	0.80	-

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ID	z-score [-]	ζ-score [-]
87ae94	0.80	0.11
09a574	0.80	0.32
ca9941	1.48	-
28c7f5	1.48	6.10

1.7 0.063 mm

1.7.1 Test results

Table 23: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
68aba8	0.0	0.0	1.0	-	0.0	0.00	0.00
04ce01	0.0	0.1	0.1	2.80	0.1	0.06	86.60
9bc86e	0.2	0.0	0.1	0.10	0.1	0.10	100.00
b1b0a7	0.0	0.6	0.2	0.01	0.3	0.31	114.56
72480e	0.3	0.3	0.3	0.02	0.3	0.00	0.00
cff407	0.3	0.3	0.3	0.70	0.3	0.00	0.00
6231ce	0.3	0.3	0.3	-	0.3	0.00	0.00
41f49e	0.3	0.3	0.3	0.10	0.3	0.00	0.00
f41a21	0.3	0.3	0.4	0.09	0.3	0.06	17.32
415468	0.4	0.3	0.3	-	0.3	0.06	17.32
bca32e	0.4	0.3	0.4	-	0.4	0.06	15.75
1fa215	0.4	0.4	0.4	0.20	0.4	0.00	0.00
53962f	0.4	0.4	0.4	-	0.4	0.00	0.00
caece7	0.5	0.3	0.5	0.20	0.4	0.12	26.65
60220d	0.5	0.5	0.4	0.40	0.5	0.06	12.37
7235f4	0.5	0.5	0.4	0.06	0.5	0.06	12.37
af995d	0.5	0.4	0.5	-	0.5	0.06	12.37
4c81c7	0.4	0.5	0.5	0.10	0.5	0.06	12.37
280858	0.5	0.5	0.5	0.30	0.5	0.00	0.00
20f6cd	0.4	0.6	0.6	-	0.5	0.12	21.65
6871e7	0.5	0.6	0.5	0.01	0.5	0.06	10.83
e2f492	0.8	0.6	0.6	1.00	0.7	0.12	17.32
e30500	0.7	0.8	0.8	0.10	0.8	0.06	7.53
885b3b	0.7	0.8	0.8	0.10	0.8	0.06	7.53
8f9b29	0.6	0.8	1.0	0.00	0.8	0.20	25.00
09a574	0.9	0.9	0.8	4.31	0.9	0.06	6.66
7d9bc2	0.8	0.9	0.9	1.00	0.9	0.06	6.66
151d5e	0.9	0.8	1.0	0.20	0.9	0.10	11.11
f004bf	1.0	0.8	0.9	-	0.9	0.10	11.11
f11e22	1.0	0.9	0.9	1.00	0.9	0.06	6.19
a988b0	1.0	0.9	0.9	-	0.9	0.06	6.19
083f07	1.1	0.8	0.9	0.06	0.9	0.15	16.37
c5654d	1.0	0.9	1.0	-	1.0	0.06	5.97
49599a	0.9	1.0	1.0	-	1.0	0.06	5.97
4d1c32	1.0	1.0	0.9	0.20	1.0	0.06	5.97
f3015a	0.9	0.9	1.1	0.10	1.0	0.12	11.95
74e055	1.0	0.0	1.0	1.00	1.0	0.00	0.00
cc3310	1.0	1.0	1.0	-	1.0	0.00	0.00
9210e0	1.0	1.0	1.0	0.10	1.0	0.00	0.00

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ID	1	2	3	u_X	$\bar{x}$	s_0	V_X
	[%]	[%]	[%]	[%]	[%]	[%]	[%]
0fcd1a	1.0	1.0	1.0	0.30	1.0	0.00	0.00
3f2444	1.1	1.1	1.0	-	1.1	0.06	5.41
c2bf7f	1.2	1.0	1.0	-	1.1	0.12	10.83
b53a36	1.1	1.0	1.2	-	1.1	0.10	9.09
dd7bed	1.0	1.2	1.1	-	1.1	0.10	9.09
a28465	1.1	1.1	1.1	0.09	1.1	0.00	0.00
87ae94	1.0	1.2	1.1	3.50	1.1	0.10	9.09
06c6f9	1.0	1.2	1.6	1.00	1.1	0.14	12.86
445265	1.2	1.1	1.1	0.40	1.1	0.06	5.09
12a3d1	1.1	1.2	1.1	7.20	1.1	0.06	5.09
189651	1.1	1.2	1.1	0.50	1.1	0.06	5.09
61e079	1.1	1.1	1.2	-	1.1	0.06	5.09
ef8b44	1.1	1.1	1.2	2.00	1.1	0.06	5.09
fc13cc	1.2	1.1	1.2	0.13	1.2	0.06	4.95
cead79	1.2	1.3	1.0	0.30	1.2	0.15	13.09
12bc15	1.2	1.2	1.2	-	1.2	0.00	0.00
718742	1.1	1.2	1.3	0.10	1.2	0.10	8.33
8366ea	1.3	1.2	1.1	-	1.2	0.10	8.33
28c7f5	1.3	1.2	1.3	0.10	1.3	0.06	4.56
ca9941	2.0	2.0	2.0	-	2.0	0.00	0.00
f3903e	5.0	5.0	5.0	3.10	5.0	0.00	0.00

1.7.2 The Numerical Procedure for Determining Outliers

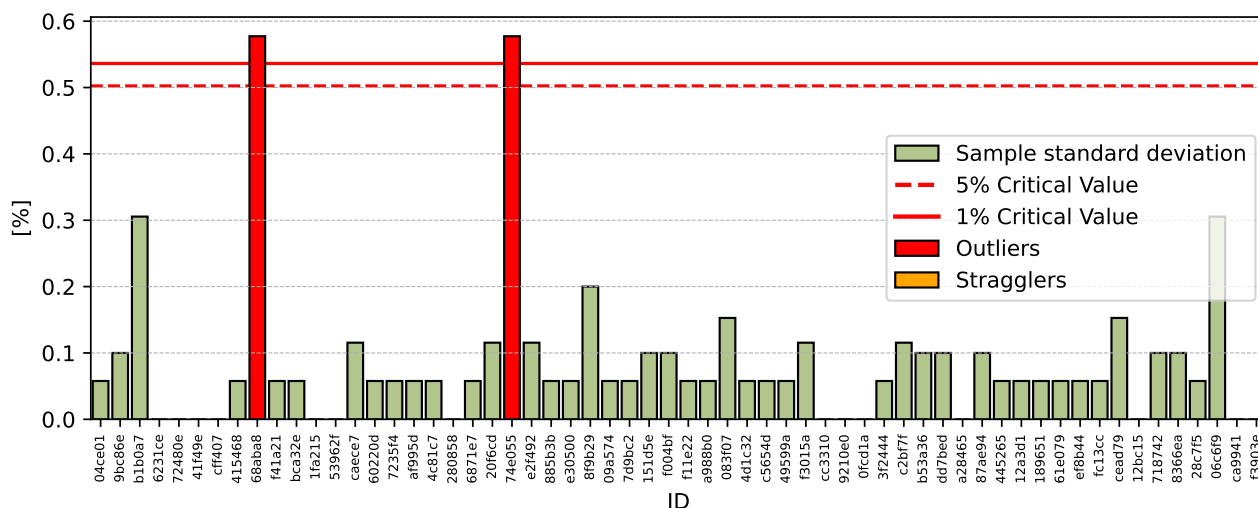
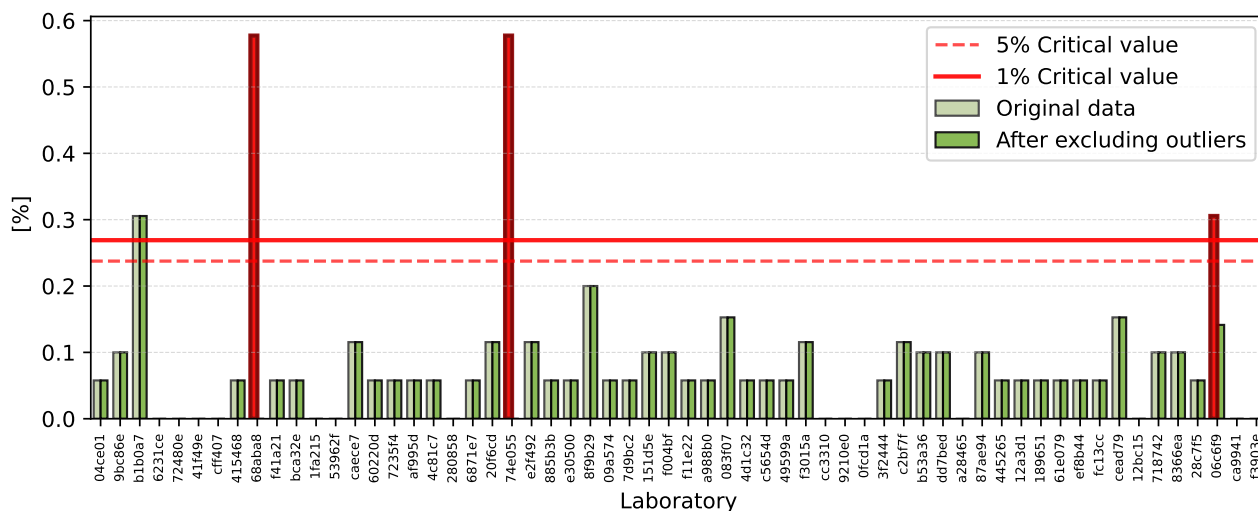
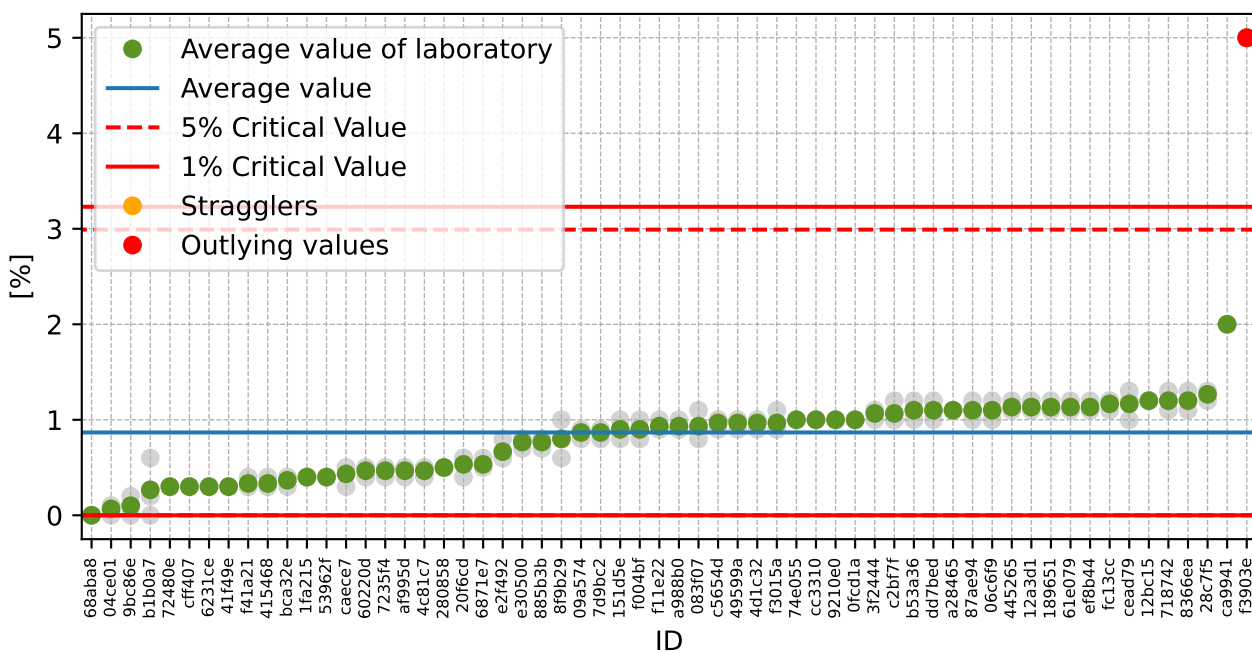
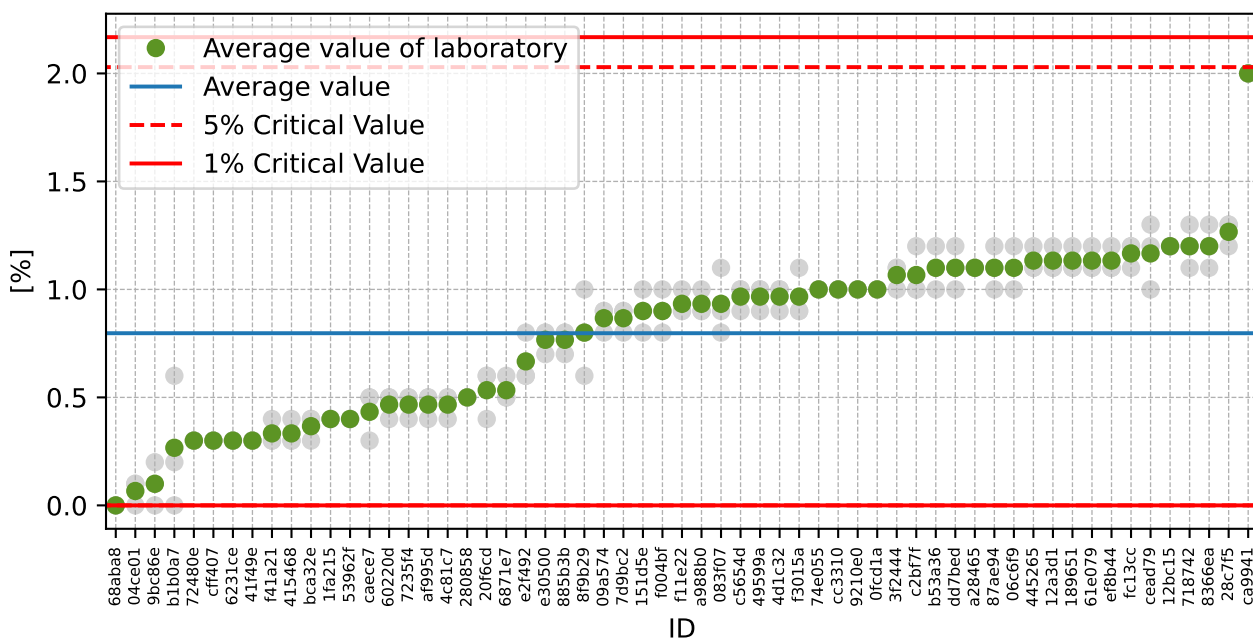


Figure 67: Cochran's test - sample standard deviations

Figure 68: **Cochran's test** - sample standard deviations without outliersFigure 69: **Grubbs' test** - average values

Figure 70: **Grubbs' test** - average values without outliers

1.7.3 Mandel's Statistics

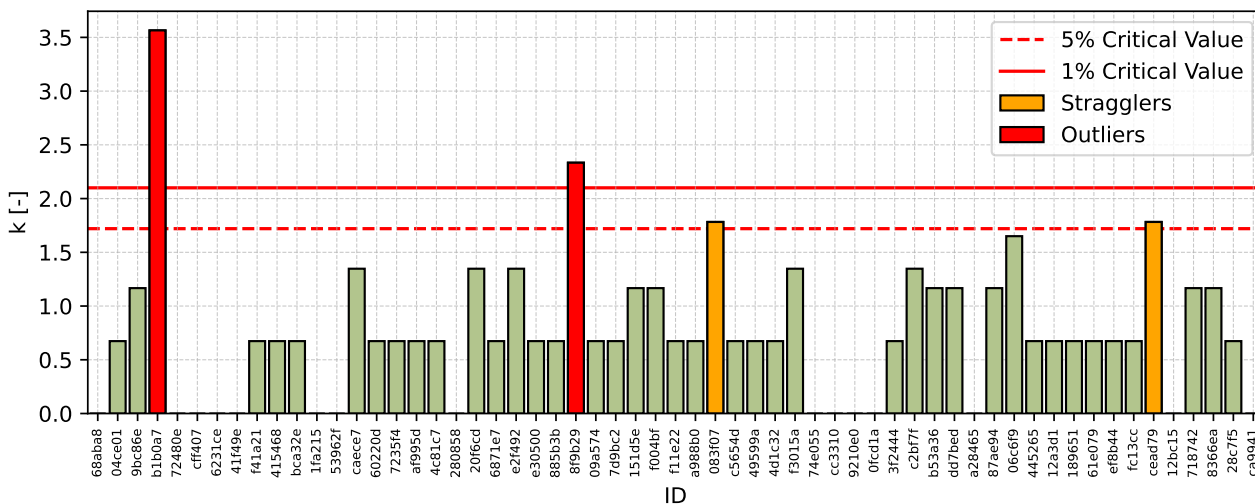


Figure 71: Intralaboratory Consistency Statistic

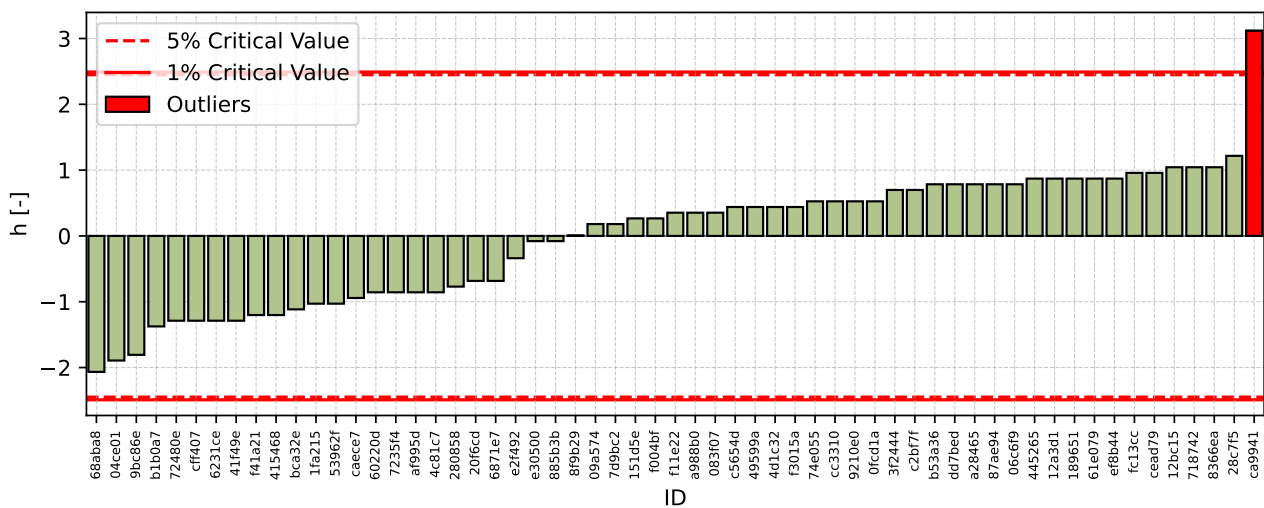


Figure 72: Interlaboratory Consistency Statistic

1.7.4 Descriptive statistics

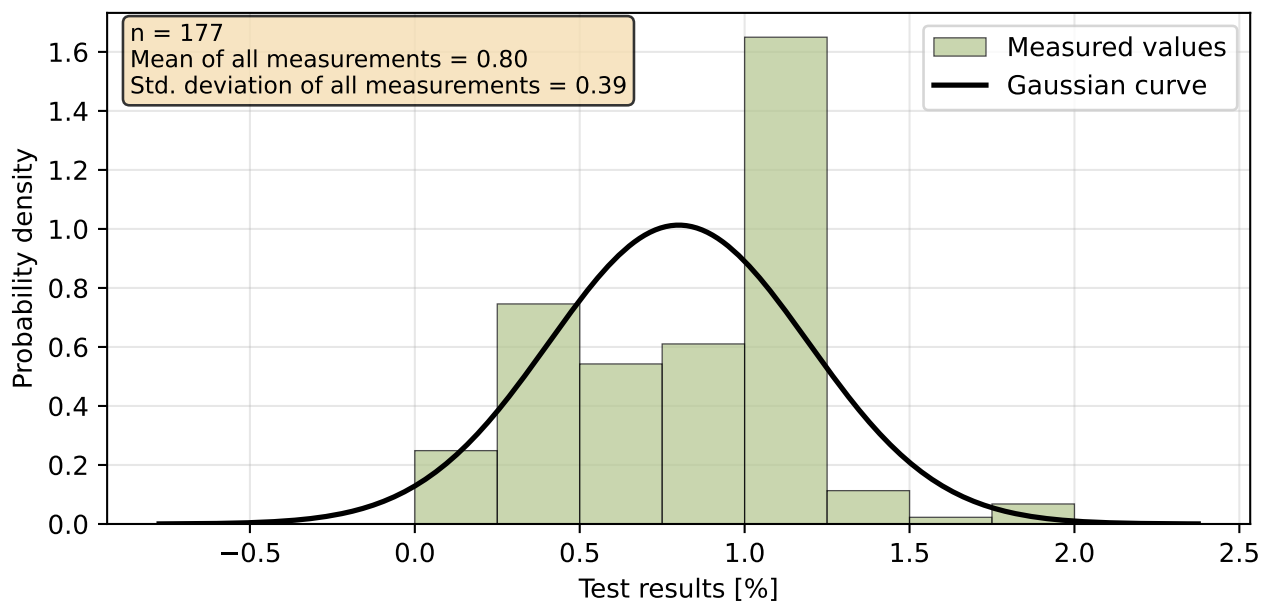


Figure 73: Histogram of all test results

Table 24: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	0.80
Sample standard deviation – s	0.39
Assigned value – x^*	0.80
Robust standard deviation – s^*	0.39
Measurement uncertainty of assigned value – u_x	0.05
p -value of normality test [-]	< 0.001

1.7.5 Evaluation of Performance Statistics

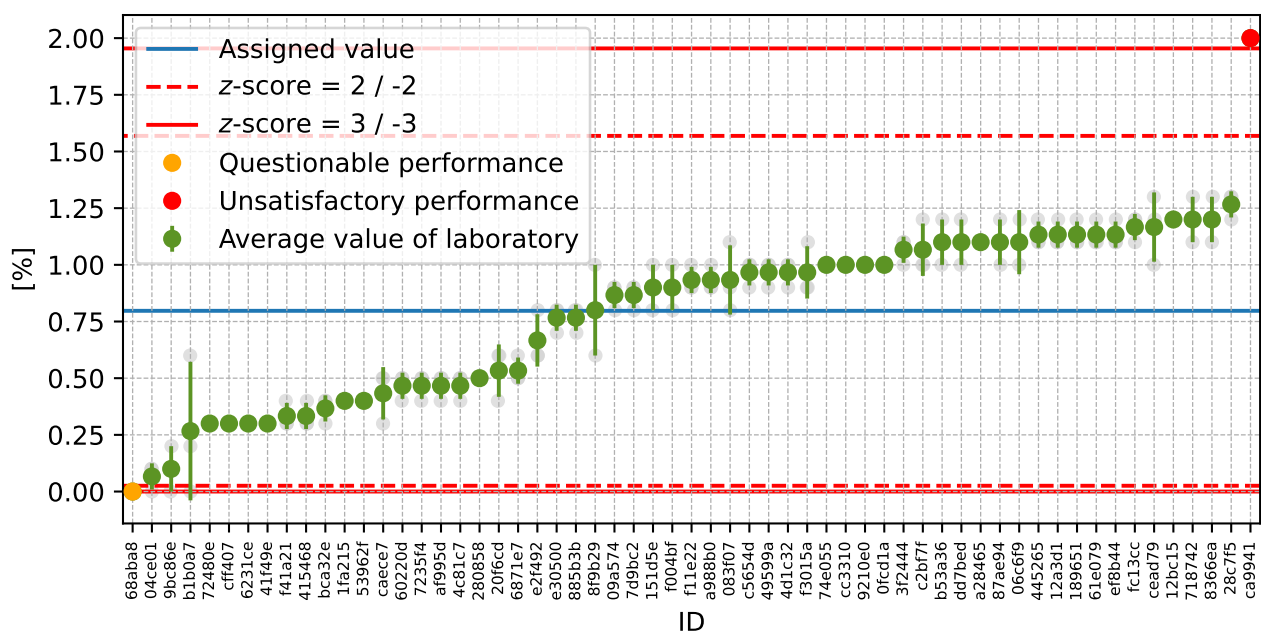


Figure 74: Average values and sample standard deviations

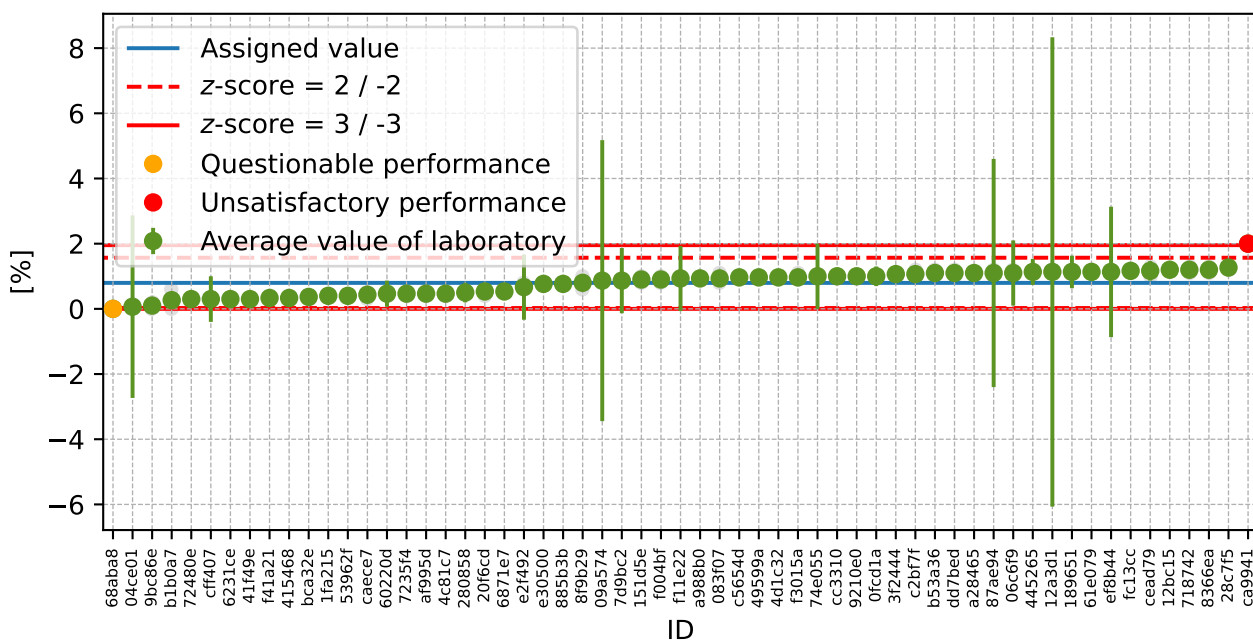


Figure 75: Average values and extended uncertainties of measurement

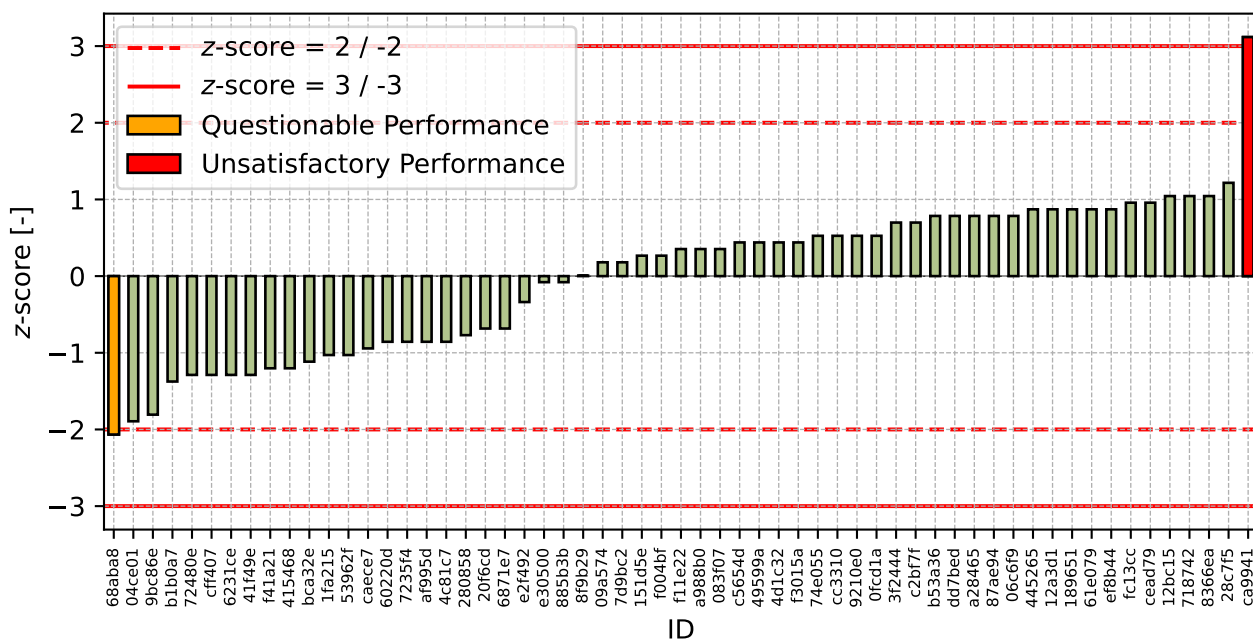
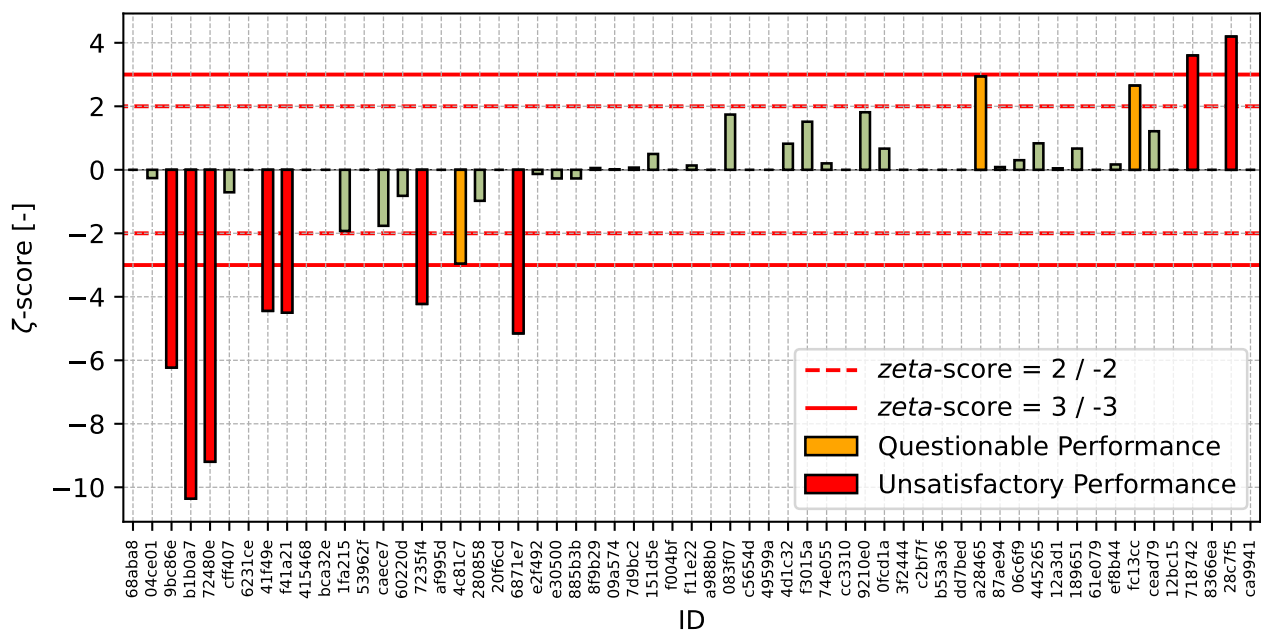


Figure 76: z-score

Figure 77: ζ -scoreTable 25: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
68aba8	-2.07	-
04ce01	-1.89	-0.26
9bc86e	-1.81	-6.23
b1b0a7	-1.37	-10.36
72480e	-1.29	-9.20
cff407	-1.29	-0.71
6231ce	-1.29	-
41f49e	-1.29	-4.44
f41a21	-1.20	-4.50
415468	-1.20	-
bca32e	-1.12	-
1fa215	-1.03	-1.93
53962f	-1.03	-
caece7	-0.94	-1.76
60220d	-0.86	-0.82
7235f4	-0.86	-4.22
af995d	-0.86	-
4c81c7	-0.86	-2.95
280858	-0.77	-0.98
20f6cd	-0.68	-
6871e7	-0.68	-5.15
e2f492	-0.34	-0.13
e30500	-0.08	-0.27
885b3b	-0.08	-0.27
8f9b29	0.01	0.06

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ID	z-score [-]	ζ-score [-]
09a574	0.18	0.02
7d9bc2	0.18	0.07
151d5e	0.27	0.50
f004bf	0.27	-
f11e22	0.35	0.14
a988b0	0.35	-
083f07	0.35	1.74
c5654d	0.44	-
49599a	0.44	-
4d1c32	0.44	0.82
f3015a	0.44	1.51
74e055	0.53	0.20
cc3310	0.53	-
9210e0	0.53	1.81
0fcd1a	0.53	0.67
3f2444	0.70	-
c2bf7f	0.70	-
b53a36	0.78	-
dd7bed	0.78	-
a28465	0.78	2.94
87ae94	0.78	0.09
06c6f9	0.78	0.30
445265	0.87	0.83
12a3d1	0.87	0.05
189651	0.87	0.67
61e079	0.87	-
ef8b44	0.87	0.17
fc13cc	0.96	2.65
cead79	0.96	1.21
12bc15	1.04	-
718742	1.04	3.60
8366ea	1.04	-
28c7f5	1.22	4.20
ca9941	3.12	-

2 Appendix – EN 933-3 Determination of particle shape - Flakiness index

2.1 Test results

Table 26: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
c2bf7f	15	17	16	1.0	16	1.0	6.25
53962f	21	21	20	-	21	0.6	2.79
60220d	22	22	22	4.2	22	0.0	0.00
06c6f9	23	22	23	0.5	23	0.6	2.55
4c81c7	23	23	23	0.2	23	0.0	0.00
f3015a	22	24	23	0.5	23	1.0	4.35
74e055	25	23	24	2.0	24	1.0	4.17
146326	24	24	24	0.2	24	0.0	0.00
e2f492	25	24	24	1.0	24	0.6	2.37
e79d26	24	24	25	0.4	24	0.6	2.37
f004bf	26	25	25	-	25	0.6	2.28
71265c	26	25	26	-	26	0.6	2.25
1fa215	26	26	26	6.0	26	0.0	0.00
fa5895	32	32	32	0.0	32	0.0	0.00
7fed1f	32	32	33	0.0	32	0.6	1.79

2.2 The Numerical Procedure for Determining Outliers

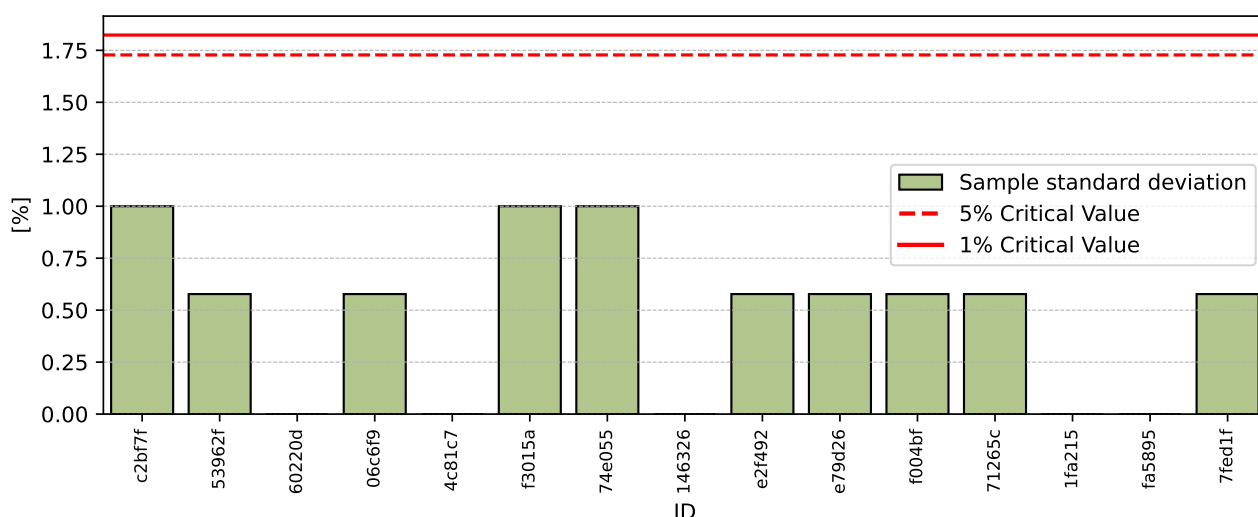
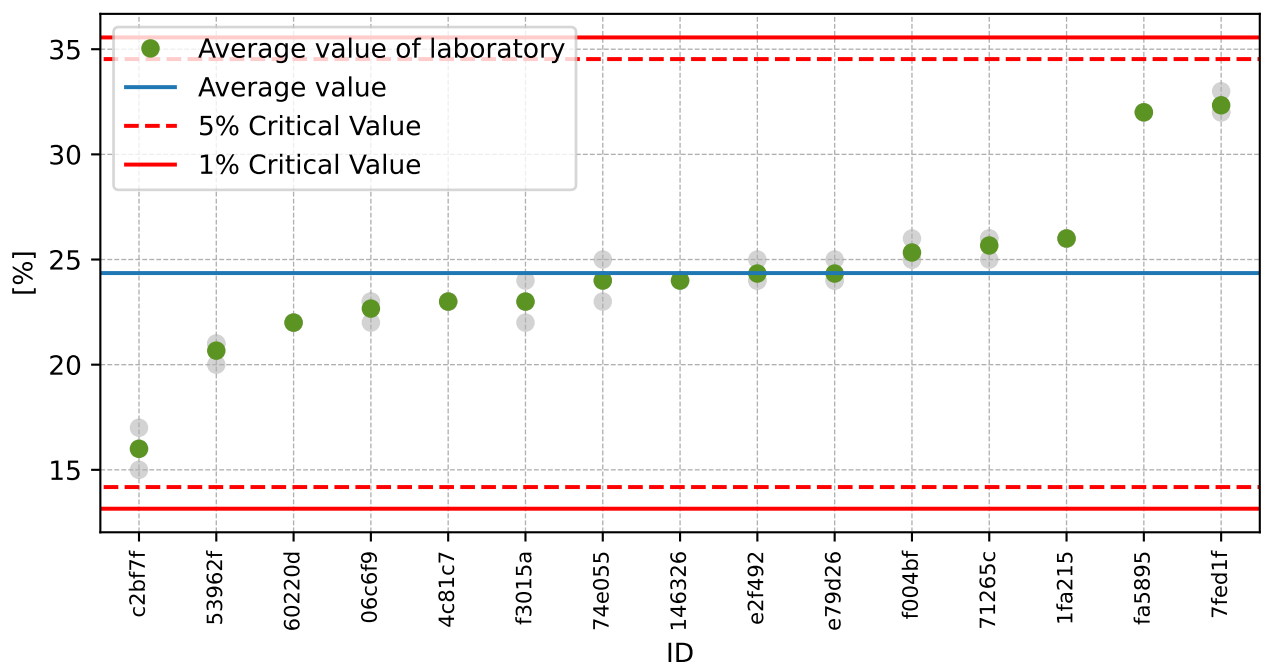


Figure 78: **Cochran's test** - sample standard deviations

Figure 79: **Grubbs' test** - average values

2.3 Mandel's Statistics

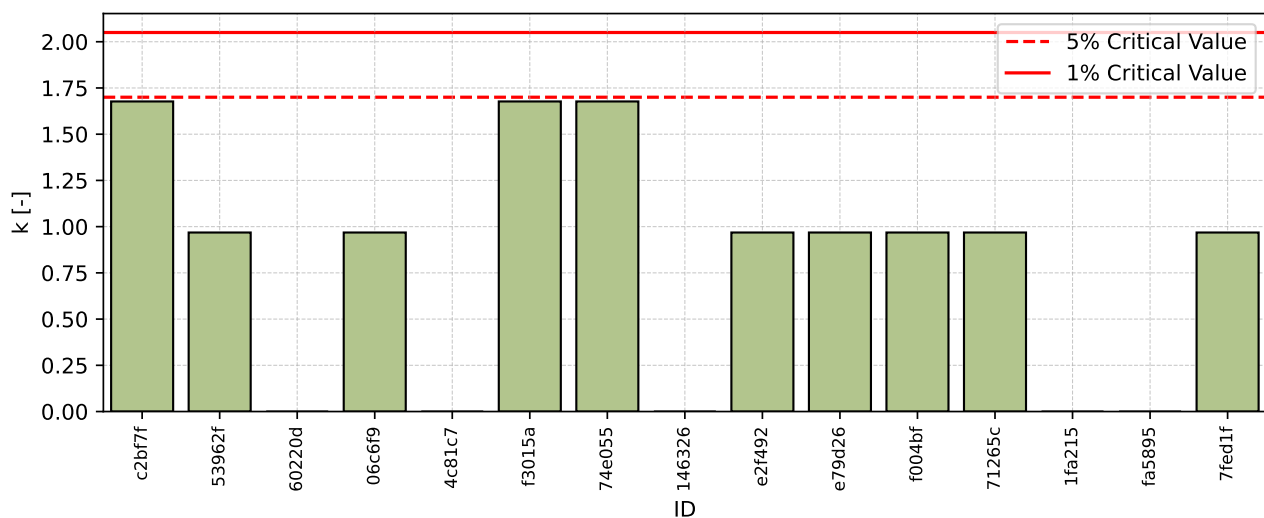


Figure 80: Intralaboratory Consistency Statistic

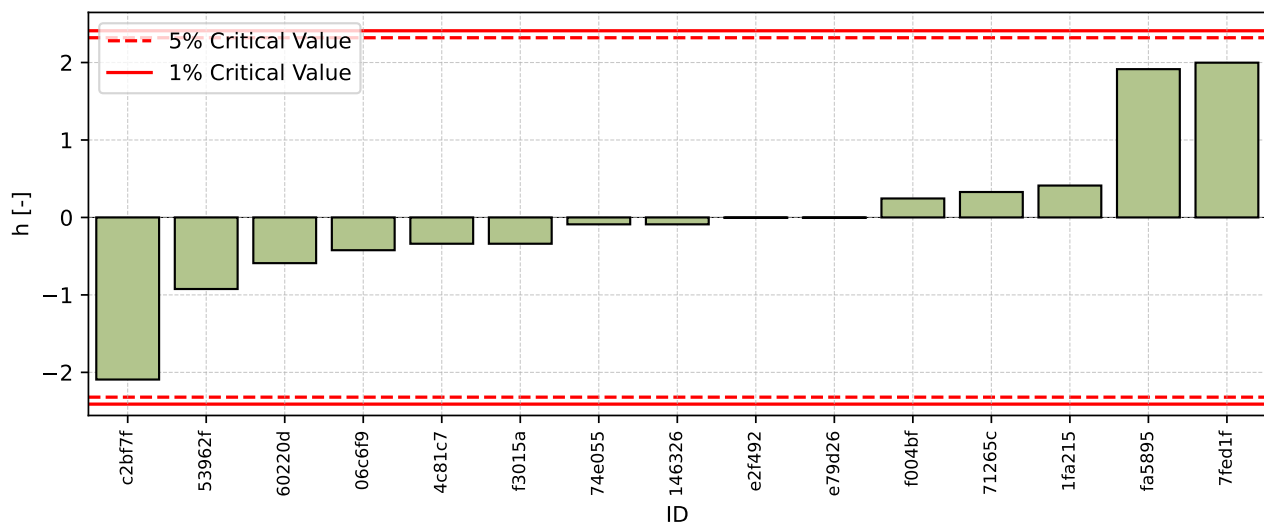


Figure 81: Interlaboratory Consistency Statistic

2.4 Descriptive statistics

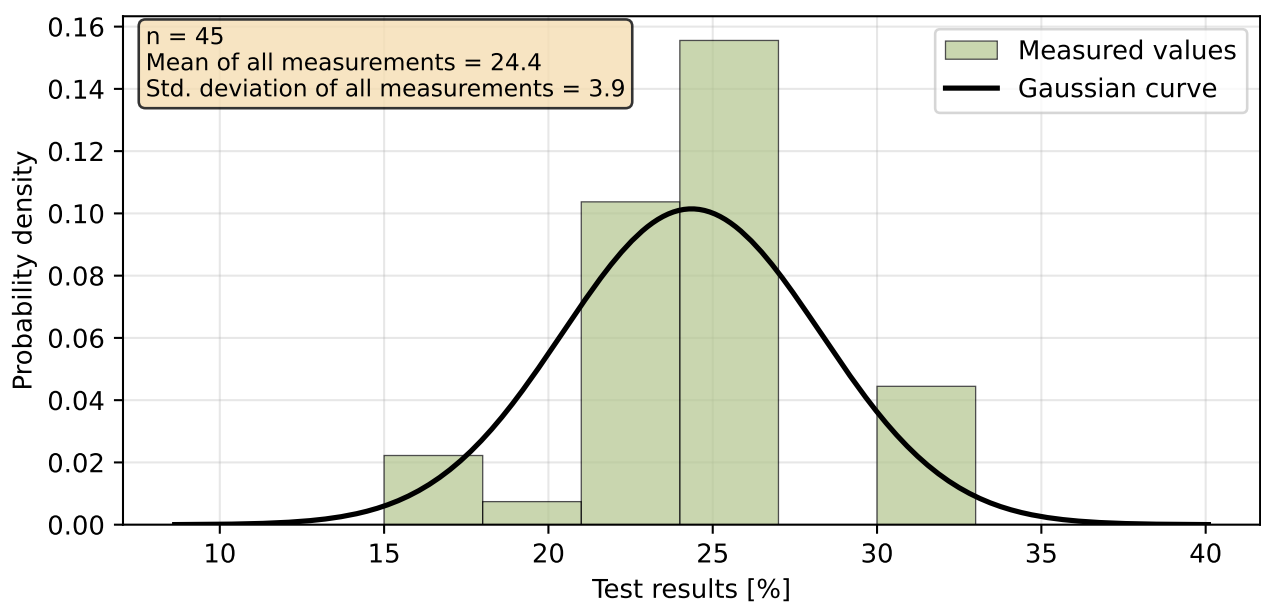


Figure 82: Histogram of all test results

Table 27: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	24.4
Sample standard deviation – s	4.0
Assigned value – x^*	24.4
Robust standard deviation – s^*	4.0
Measurement uncertainty of assigned value – u_X	1.0
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	4.0
Repeatability standard deviation – s_r	0.6
Reproducibility standard deviation – s_R	4.0
Repeatability – r	1.7
Reproducibility – R	11.3

2.5 Evaluation of Performance Statistics

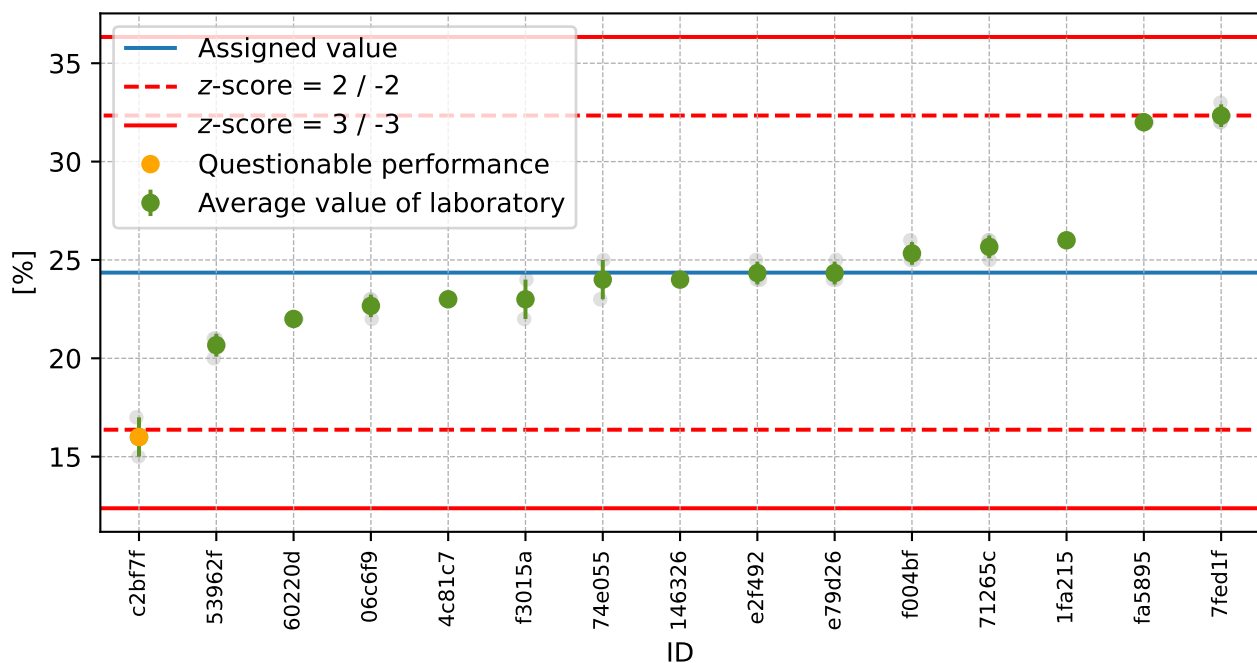


Figure 83: Average values and sample standard deviations

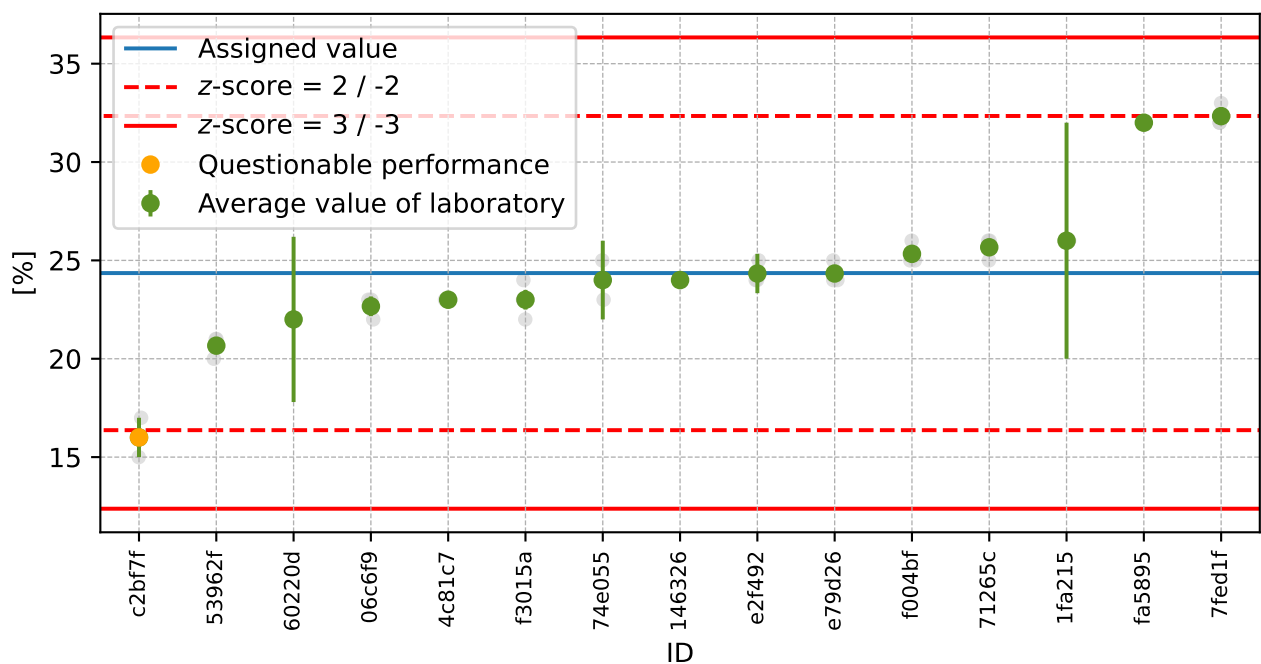


Figure 84: Average values and extended uncertainties of measurement

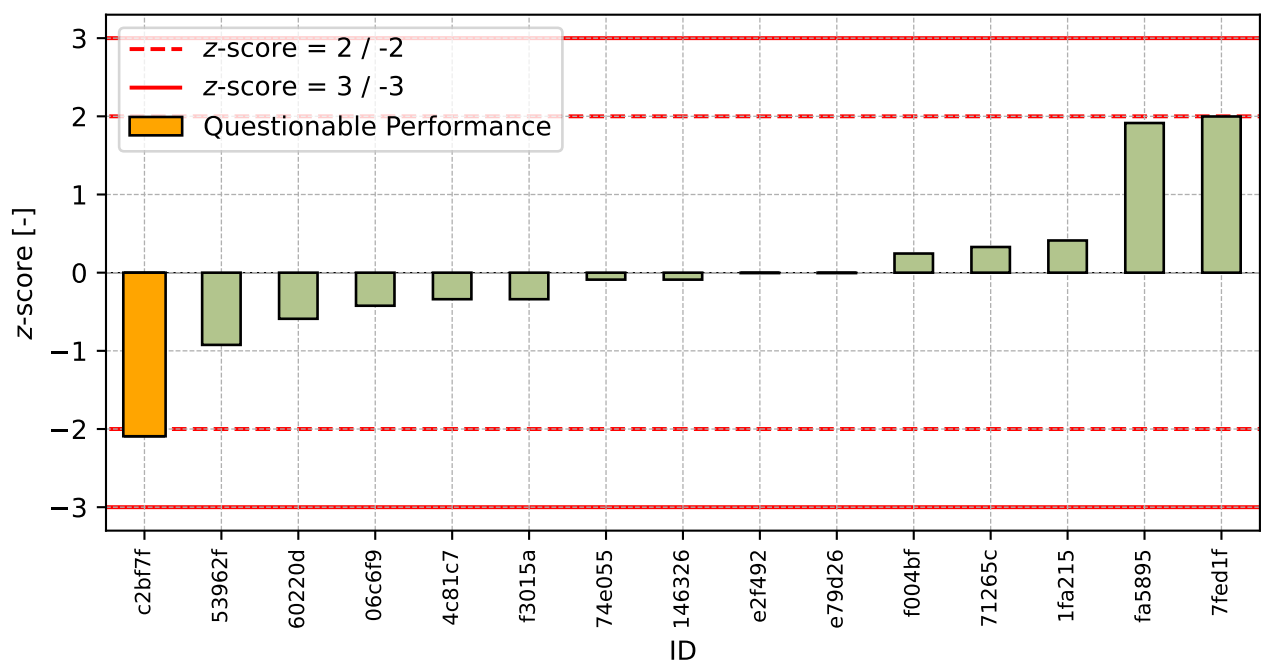


Figure 85: z-score

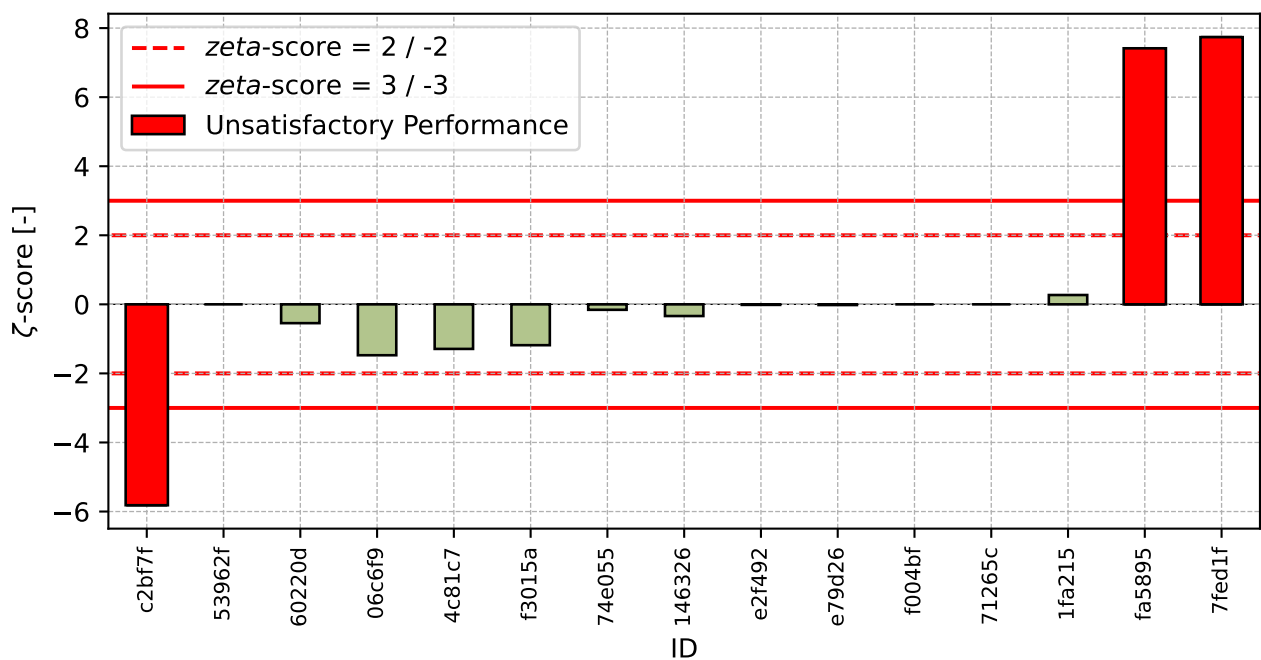


Figure 86: ζ-score

Table 28: z-score and ζ-score

ID	z-score [-]	ζ-score [-]
c2bf7f	-2.09	-5.82
53962f	-0.92	-
60220d	-0.59	-0.54
06c6f9	-0.42	-1.47
4c81c7	-0.34	-1.29
f3015a	-0.34	-1.18
74e055	-0.09	-0.16
146326	-0.09	-0.34
e2f492	-0.01	-0.02
e79d26	-0.01	-0.02
f004bf	0.24	-
71265c	0.33	-
1fa215	0.41	0.27
fa5895	1.91	7.41
7fed1f	2.00	7.74

3 Appendix – EN 933-4 Determination of particle shape - Shape index

3.1 Test results

Table 29: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
f004bf	30	31	33	-	31	1.5	4.88
c5ed17	32	31	32	2.0	32	0.6	1.82
cc3310	31	32	33	-	32	1.0	3.12
a988b0	32	32	32	-	32	0.0	0.00
c8b474	31	33	32	1.0	32	1.0	3.12
7235f4	32	32	33	1.0	32	0.6	1.79
3f2444	33	33	33	-	33	0.0	0.00
e30500	33	33	33	1.0	33	0.0	0.00
87578b	33	33	33	2.0	33	0.0	0.00
885b3b	33	33	33	1.0	33	0.0	0.00
f3015a	33	32	34	0.6	33	1.0	3.03
49599a	36	34	35	-	35	1.0	2.86
74e055	35	35	35	3.0	35	0.0	0.00
0fcd1a	35	35	35	0.7	35	0.0	0.00
7fed1f	35	35	35	0.1	35	0.0	0.00
8cf955	35	35	36	10.3	35	0.6	1.63
415468	34	36	37	-	36	1.5	4.28
daec86	36	38	34	-	36	2.0	5.56
09a574	36	36	36	0.6	36	0.0	0.00
1fa215	37	37	35	9.0	36	1.2	3.18
a28465	36	37	36	0.4	36	0.6	1.59
06c6f9	36	37	37	0.4	37	0.6	1.57
28c7f5	36	37	37	4.4	37	0.6	1.57
bca32e	37	37	37	-	37	0.0	0.00
718742	37	38	36	2.0	37	1.0	2.70
083f07	37	37	37	1.9	37	0.0	0.00
61e079	37	37	37	-	37	0.0	0.00
b53a36	37	37	37	-	37	0.0	0.00
12bc15	37	37	37	-	37	0.0	0.00
e2f492	38	37	37	1.0	37	0.6	1.55
c5654d	38	39	39	-	39	0.6	1.49
8f9b29	37	39	41	0.6	39	2.0	5.13
f11e22	40	40	39	2.5	40	0.6	1.46
72480e	40	40	40	0.3	40	0.0	0.00
29531c	39	40	41	3.0	40	1.0	2.50
9bc86e	40	40	40	0.1	40	0.0	0.00
c58a44	41	44	43	2.6	43	1.5	3.58
af995d	46	43	42	-	44	2.1	4.77

3.2 The Numerical Procedure for Determining Outliers

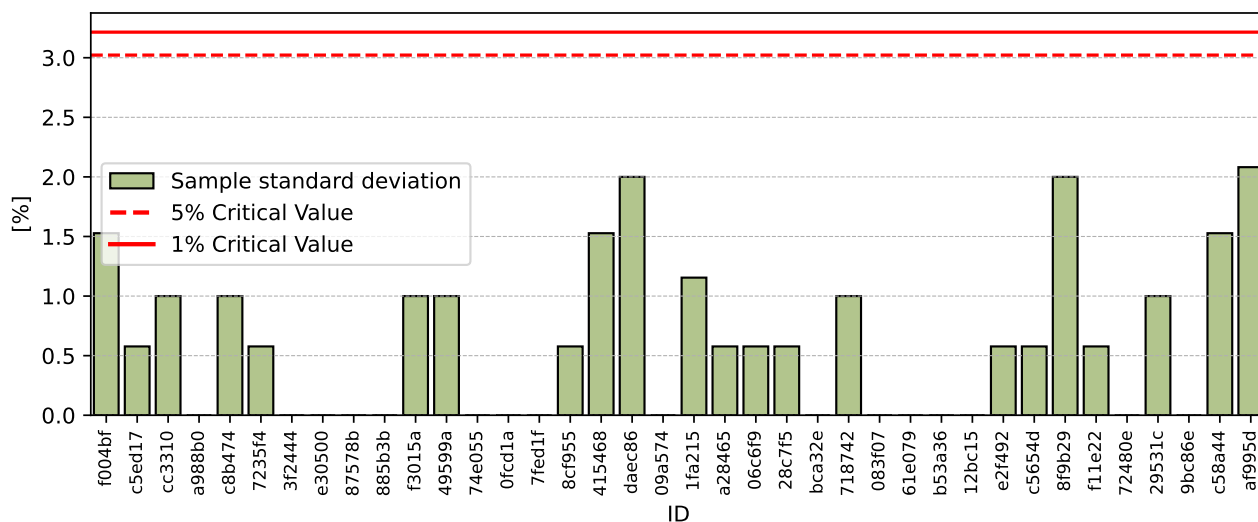


Figure 87: **Cochran's test** - sample standard deviations

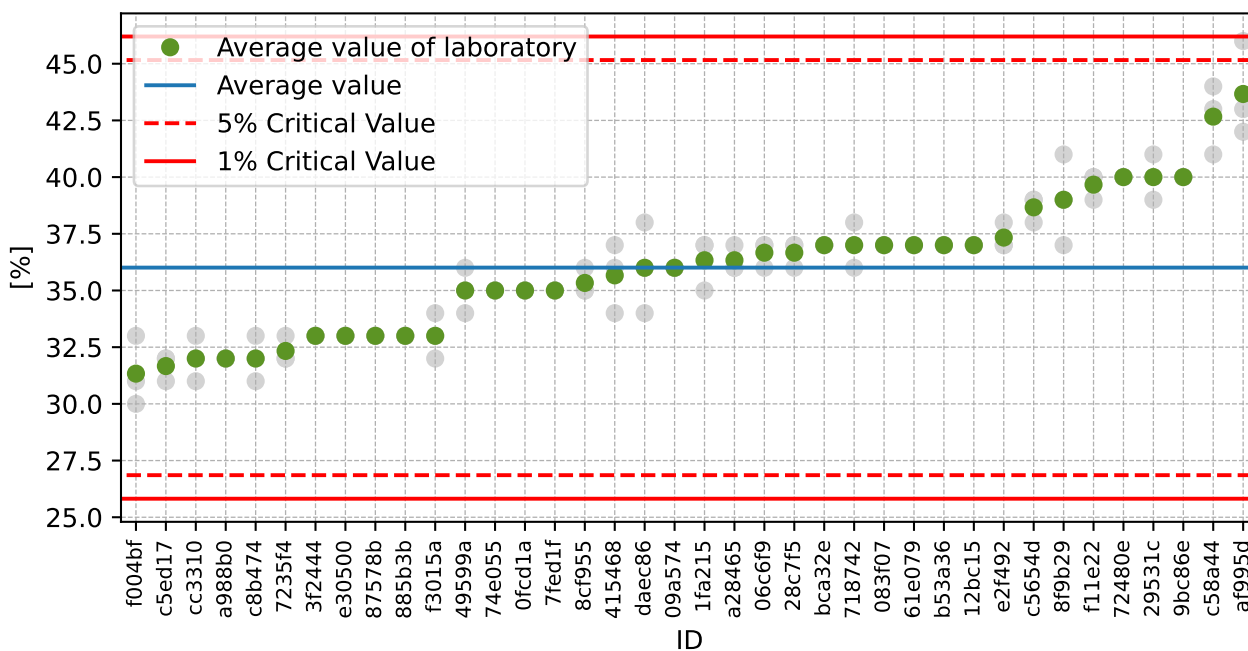


Figure 88: **Grubbs' test** - average values

3.3 Mandel’s Statistics

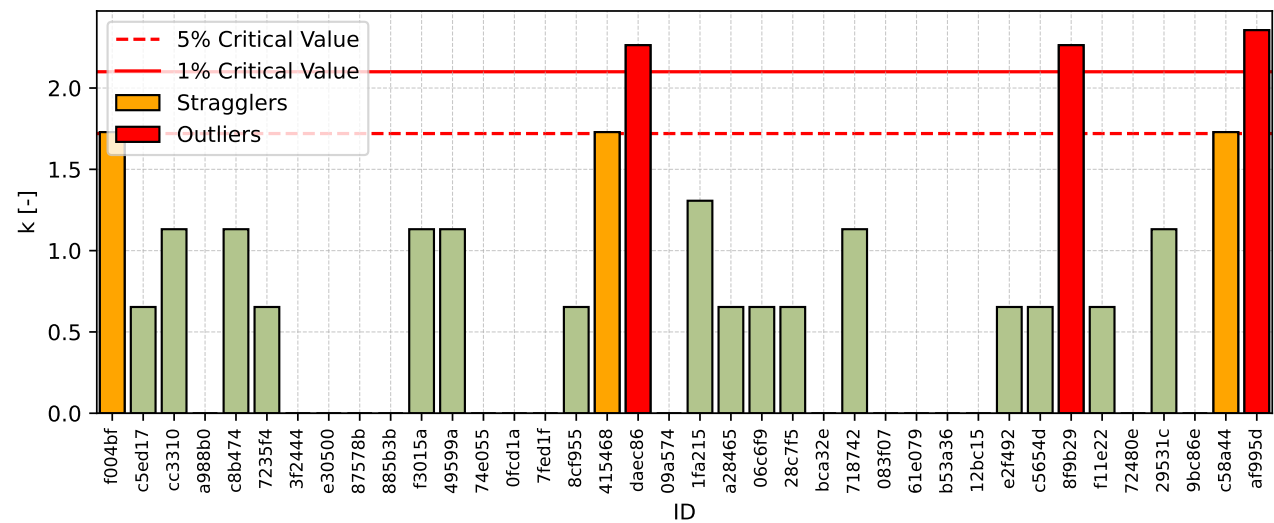


Figure 89: Intralaboratory Consistency Statistic

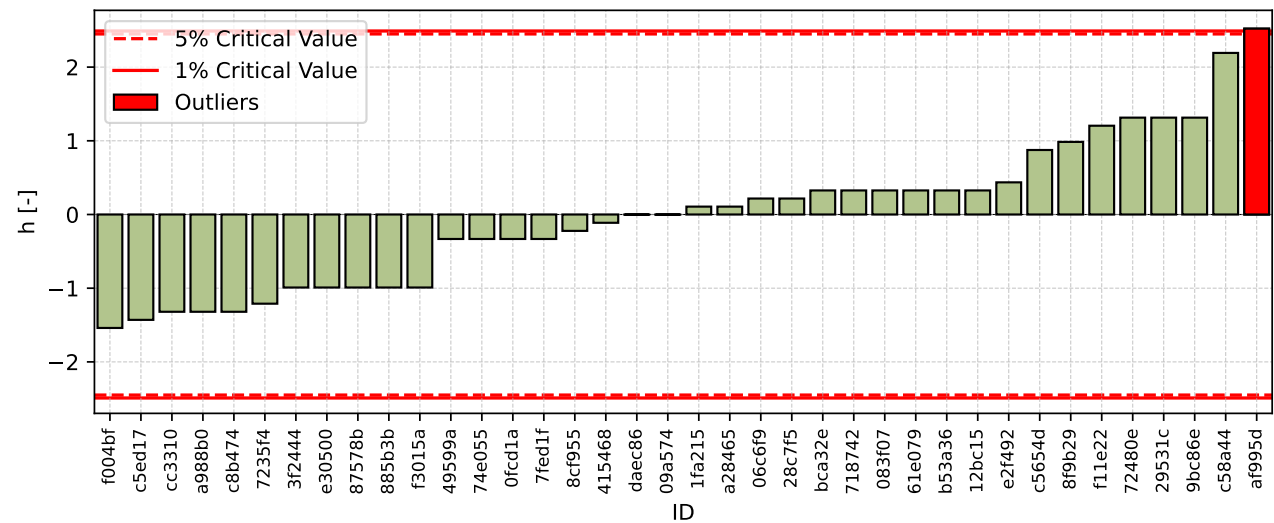


Figure 90: Interlaboratory Consistency Statistic

3.4 Descriptive statistics

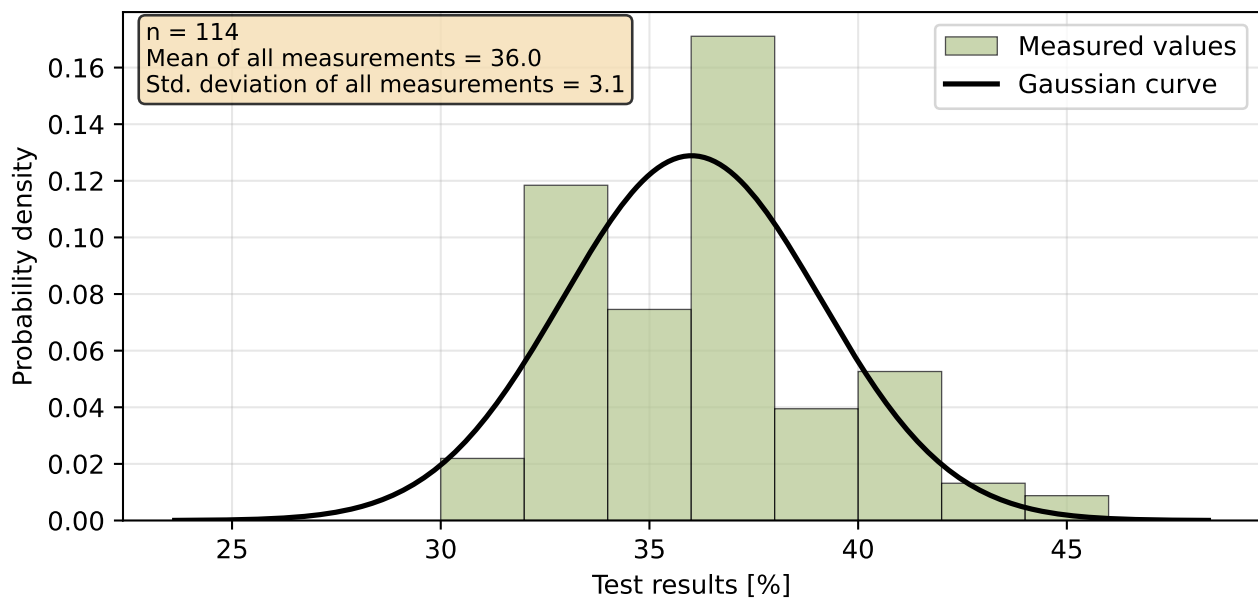


Figure 91: Histogram of all test results

Table 30: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	36.0
Sample standard deviation – s	3.0
Assigned value – x^*	36.0
Robust standard deviation – s^*	3.0
Measurement uncertainty of assigned value – u_x	0.5
p -value of normality test [-]	0.002
Interlaboratory standard deviation – s_L	3.0
Repeatability standard deviation – s_r	0.9
Reproducibility standard deviation – s_R	3.1
Repeatability – r	2.5
Reproducibility – R	8.7

3.5 Evaluation of Performance Statistics

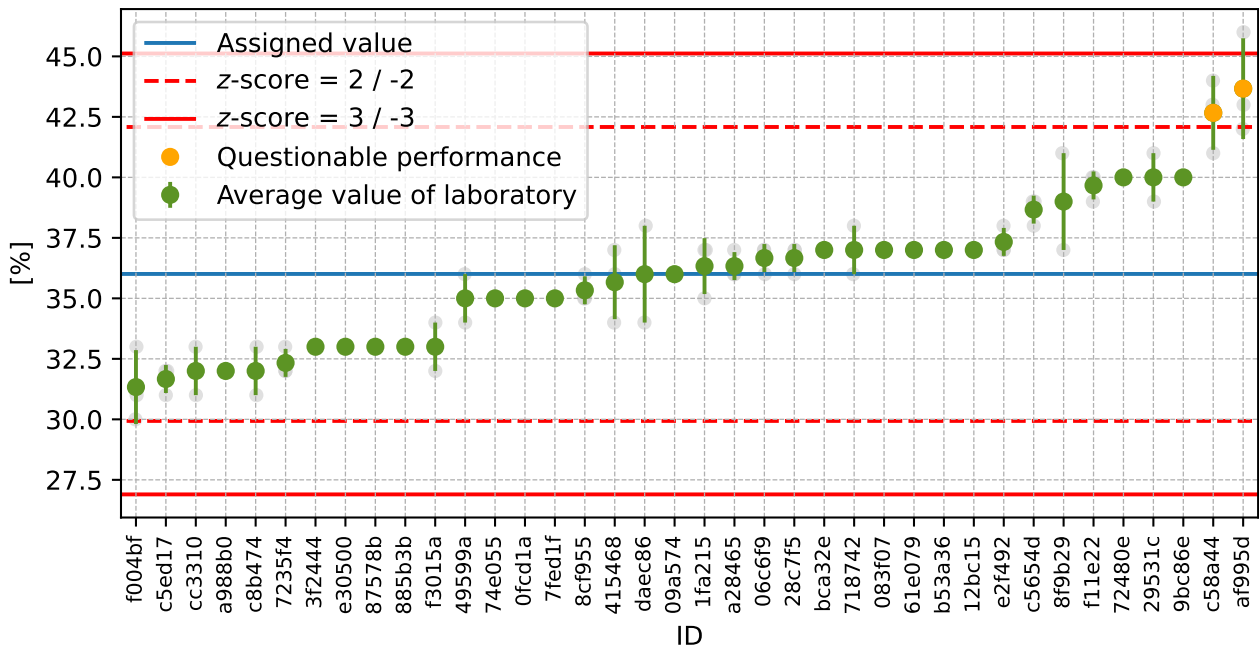


Figure 92: Average values and sample standard deviations

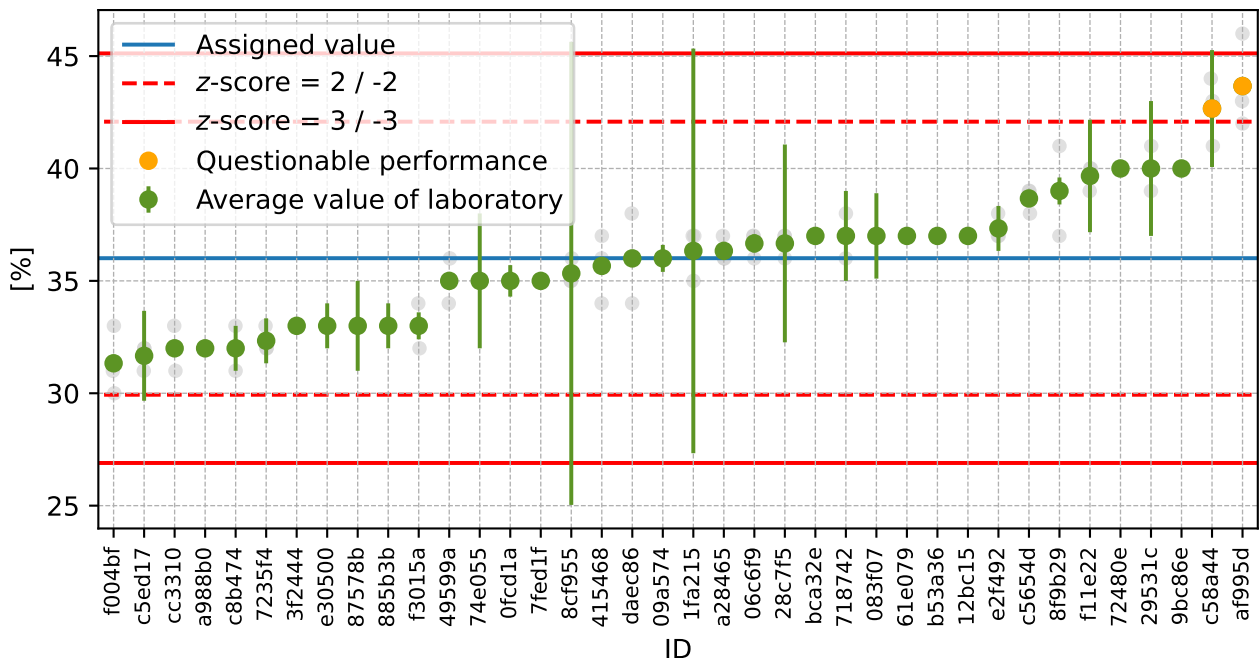


Figure 93: Average values and extended uncertainties of measurement

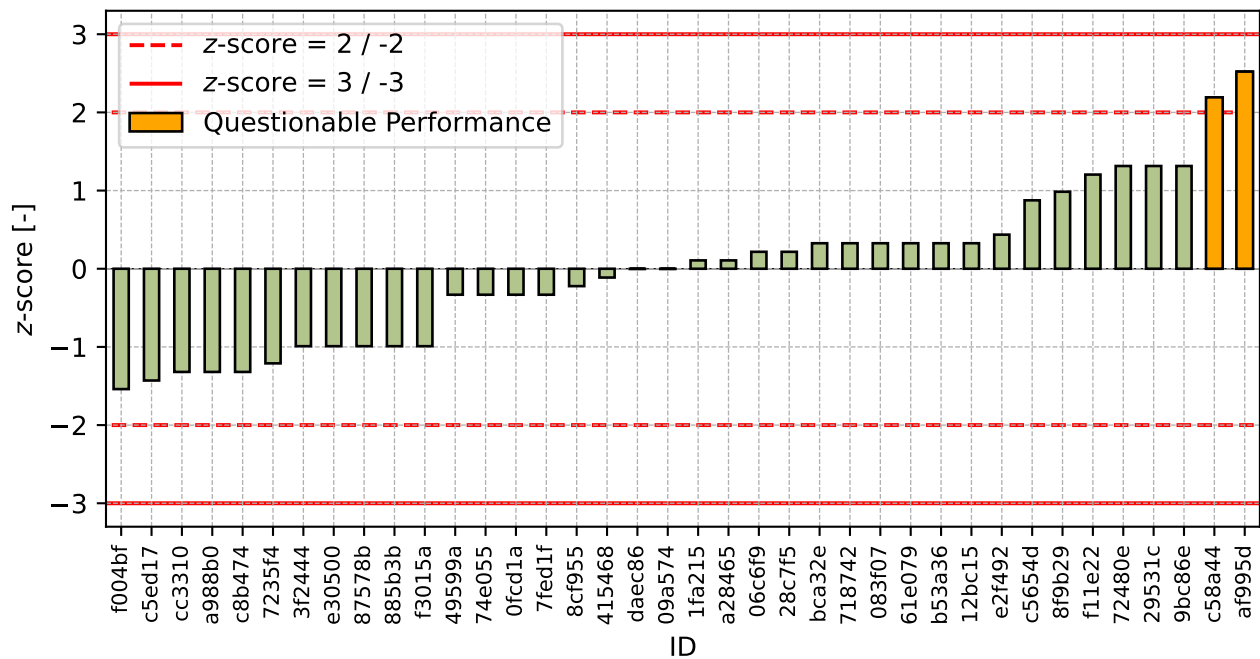


Figure 94: z-score

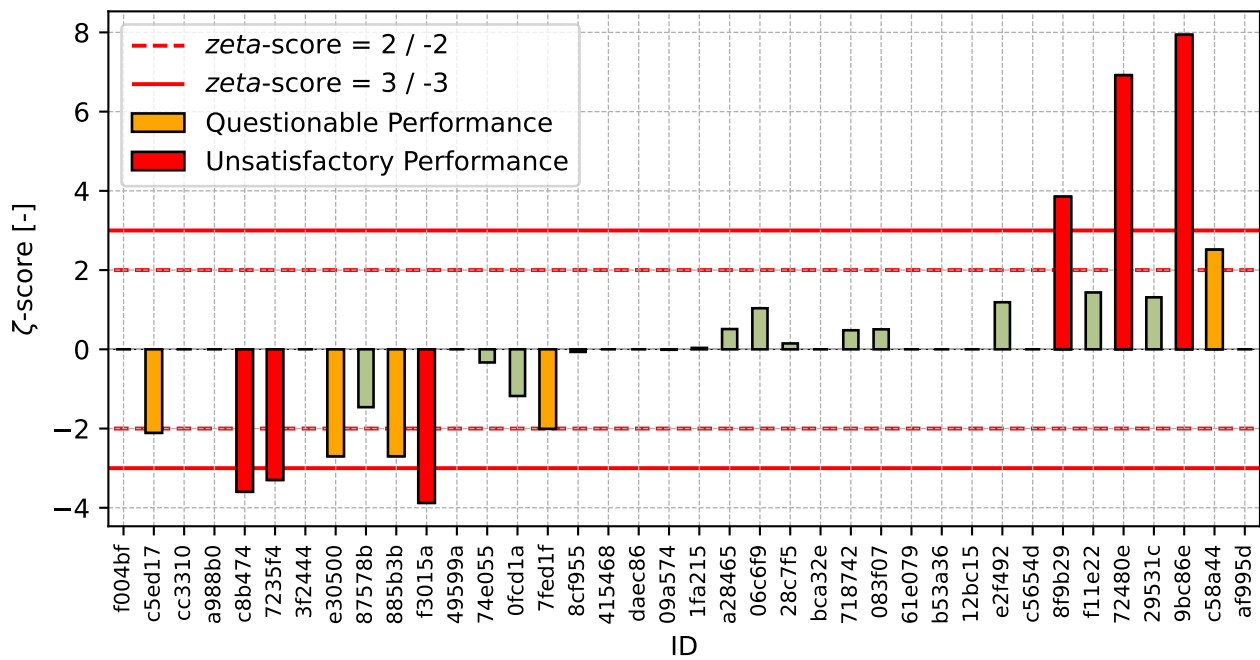


Figure 95: zeta-score

Table 31: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
f004bf	-1.54	-
c5ed17	-1.43	-2.11
cc3310	-1.32	-
a988b0	-1.32	-
c8b474	-1.32	-3.60
7235f4	-1.21	-3.30
3f2444	-0.99	-
e30500	-0.99	-2.70
87578b	-0.99	-1.46
885b3b	-0.99	-2.70
f3015a	-0.99	-3.88
49599a	-0.33	-
74e055	-0.33	-0.33
0fcd1a	-0.33	-1.18
7fed1f	-0.33	-2.01
8cf955	-0.22	-0.07
415468	-0.11	-
daec86	-0.00	-
09a574	-0.00	-0.01
1fa215	0.11	0.04
a28465	0.11	0.51
06c6f9	0.22	1.04
28c7f5	0.22	0.15
bca32e	0.33	-
718742	0.33	0.48
083f07	0.33	0.51
61e079	0.33	-
b53a36	0.33	-
12bc15	0.33	-
e2f492	0.44	1.19
c5654d	0.88	-
8f9b29	0.98	3.85
f11e22	1.20	1.44
72480e	1.31	6.92
29531c	1.31	1.31
9bc86e	1.31	7.94
c58a44	2.19	2.52
af995d	2.52	-

4 Appendix – EN 933-8 Assessment of fines - Sand equivalent test

4.1 Test results

Table 32: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
41cfbe	65	64	64	0.1	64	0.6	0.90
71265c	67	67	67	-	67	0.0	0.00
b18c80	67	68	67	1.1	67	0.6	0.86
2783d6	67	67	68	3.0	67	0.6	0.86
015f1d	68	68	67	1.1	68	0.6	0.85
dd7bed	70	69	71	-	70	1.0	1.43
29531c	71	73	71	3.0	72	1.2	1.61
e2f492	71	72	73	1.0	72	1.0	1.39
68aba8	73	72	73	-	73	0.6	0.79
6bea11	73	74	74	1.4	74	0.6	0.78
415468	73	74	75	-	74	1.0	1.35
1fa215	74	75	75	18.0	75	0.6	0.77
8f9b29	74	75	76	0.4	75	1.0	1.33
20f6cd	76	76	75	-	76	0.6	0.76
c8b474	76	77	76	2.0	76	0.6	0.76
98b068	75	76	78	-	76	1.5	2.00
06a4b9	76	77	78	-	77	1.0	1.30
7d9bc2	79	78	78	1.0	78	0.6	0.74
87ae94	79	78	79	1.2	79	0.6	0.73
12bc15	79	77	80	-	79	1.5	1.94
61e079	82	80	81	-	81	1.0	1.23
af995d	81	83	85	-	83	2.0	2.41

4.2 The Numerical Procedure for Determining Outliers

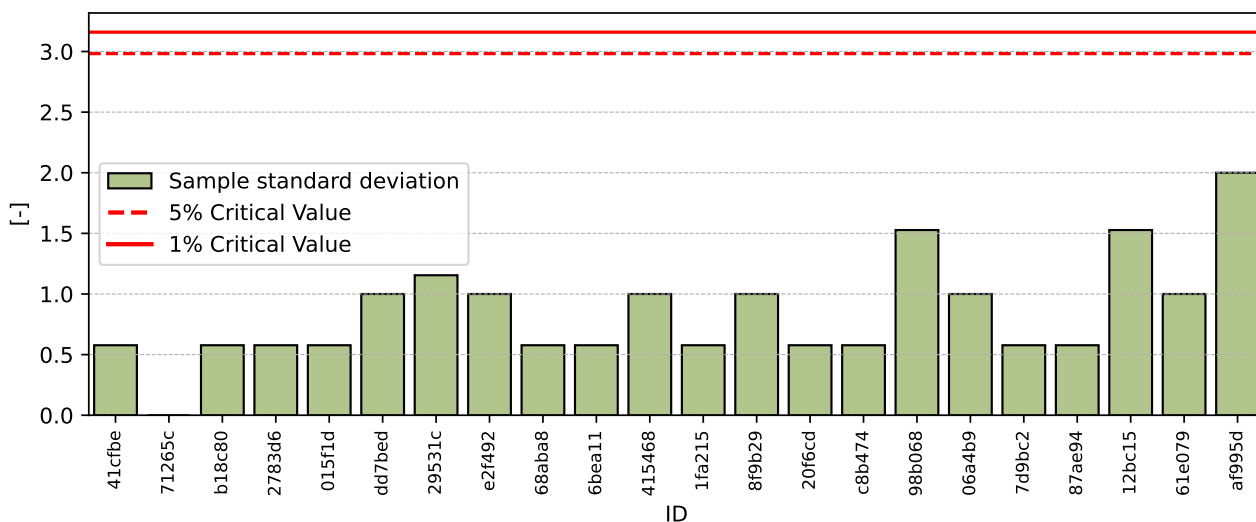


Figure 96: **Cochran's test** - sample standard deviations

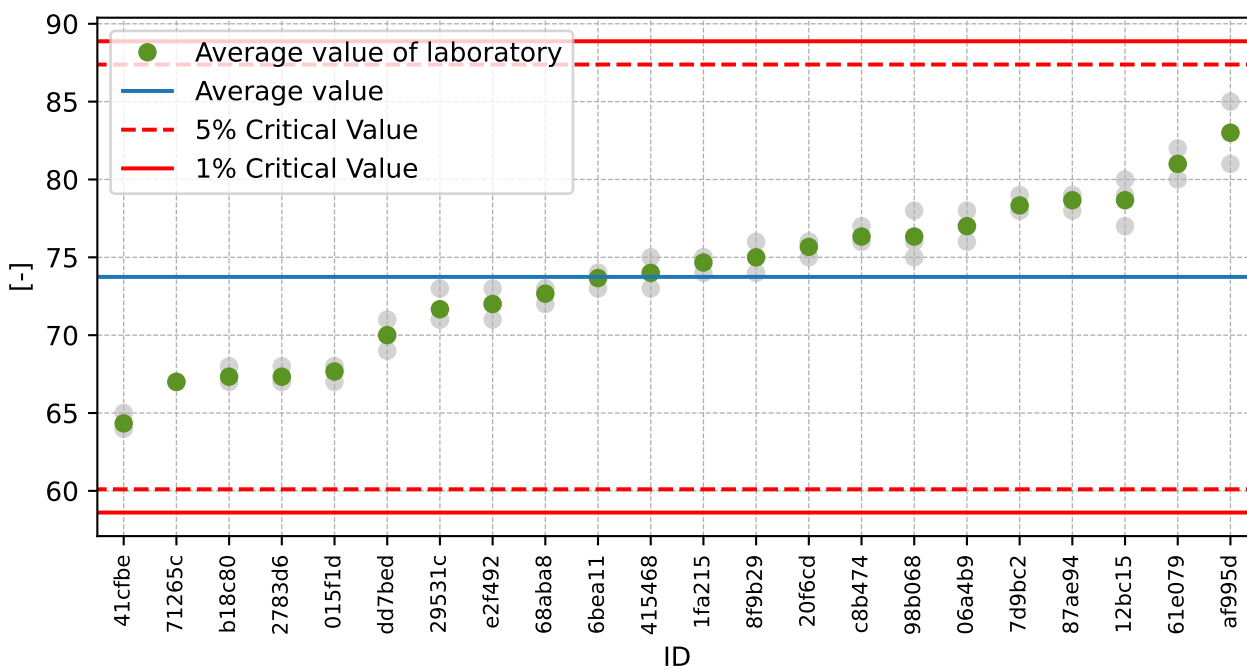


Figure 97: **Grubbs' test** - average values

4.3 Mandel’s Statistics

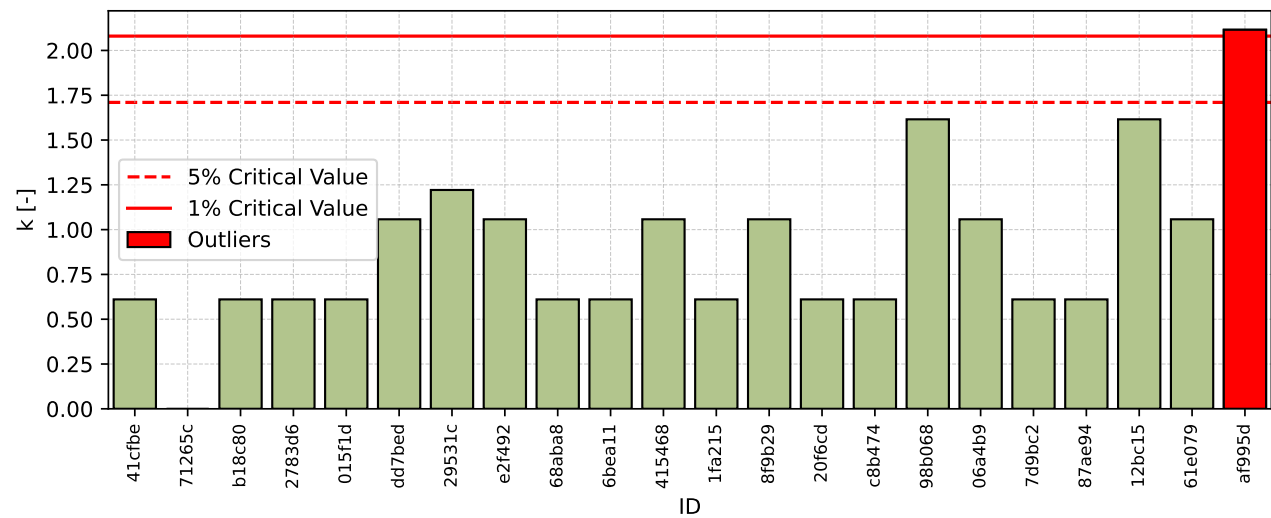


Figure 98: Intralaboratory Consistency Statistic

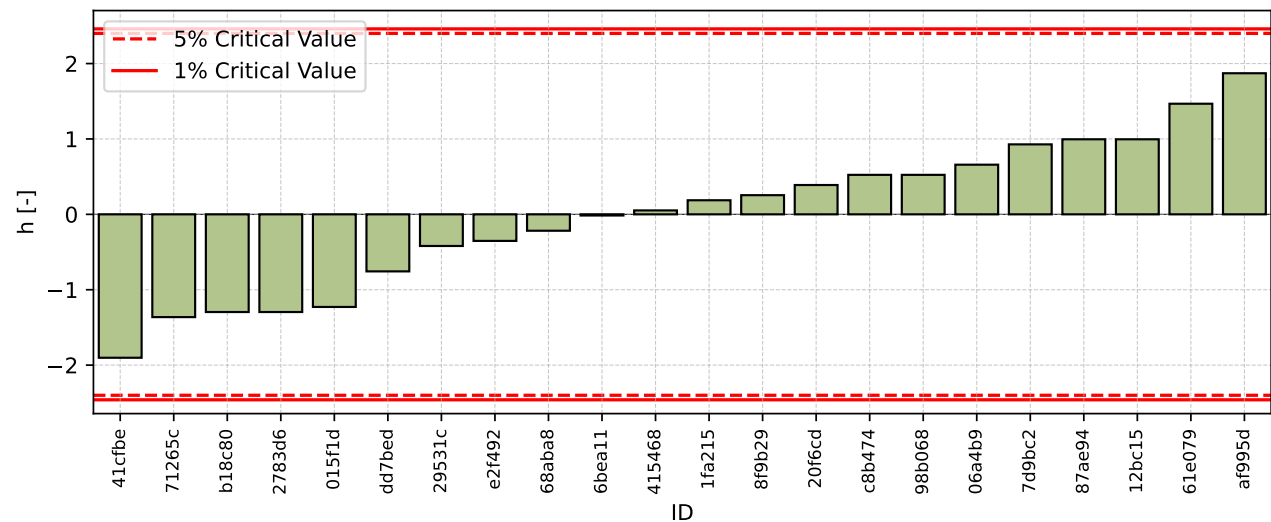


Figure 99: Interlaboratory Consistency Statistic

4.4 Descriptive statistics

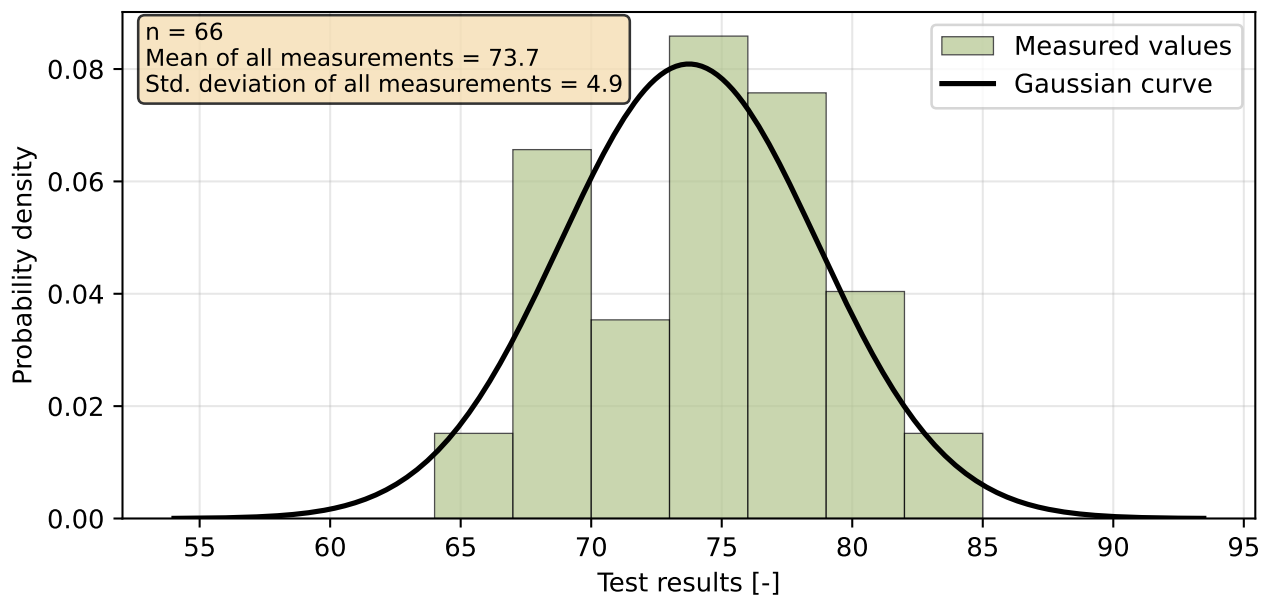


Figure 100: Histogram of all test results

Table 33: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	73.7
Sample standard deviation – s	4.9
Assigned value – x^*	73.7
Robust standard deviation – s^*	4.9
Measurement uncertainty of assigned value – u_x	1.1
p -value of normality test [-]	0.155
Interlaboratory standard deviation – s_L	4.9
Repeatability standard deviation – s_r	0.9
Reproducibility standard deviation – s_R	5.0
Repeatability – r	2.6
Reproducibility – R	14.0

4.5 Evaluation of Performance Statistics

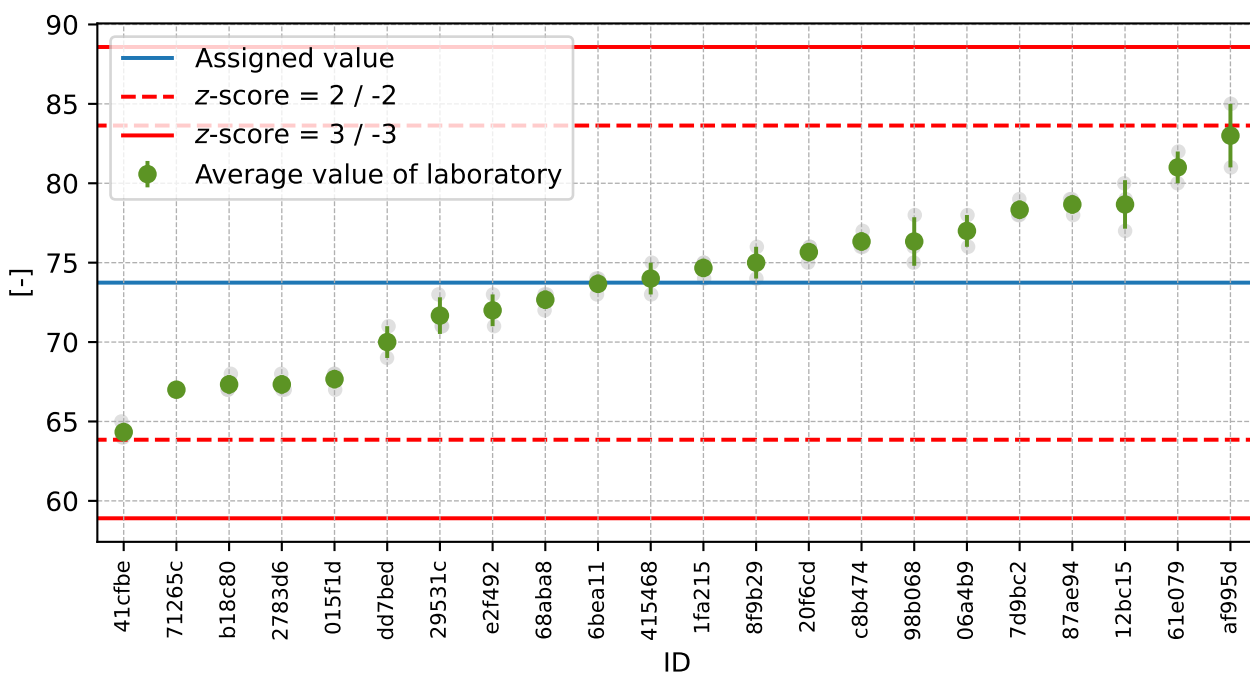


Figure 101: Average values and sample standard deviations

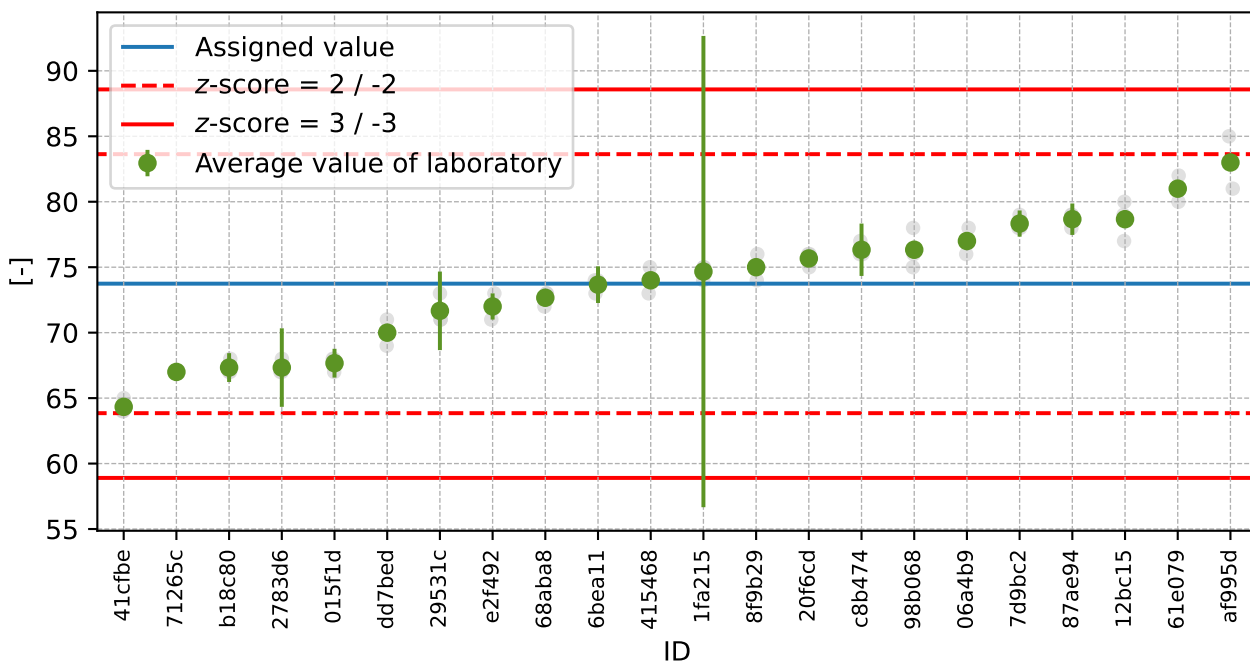


Figure 102: Average values and extended uncertainties of measurement

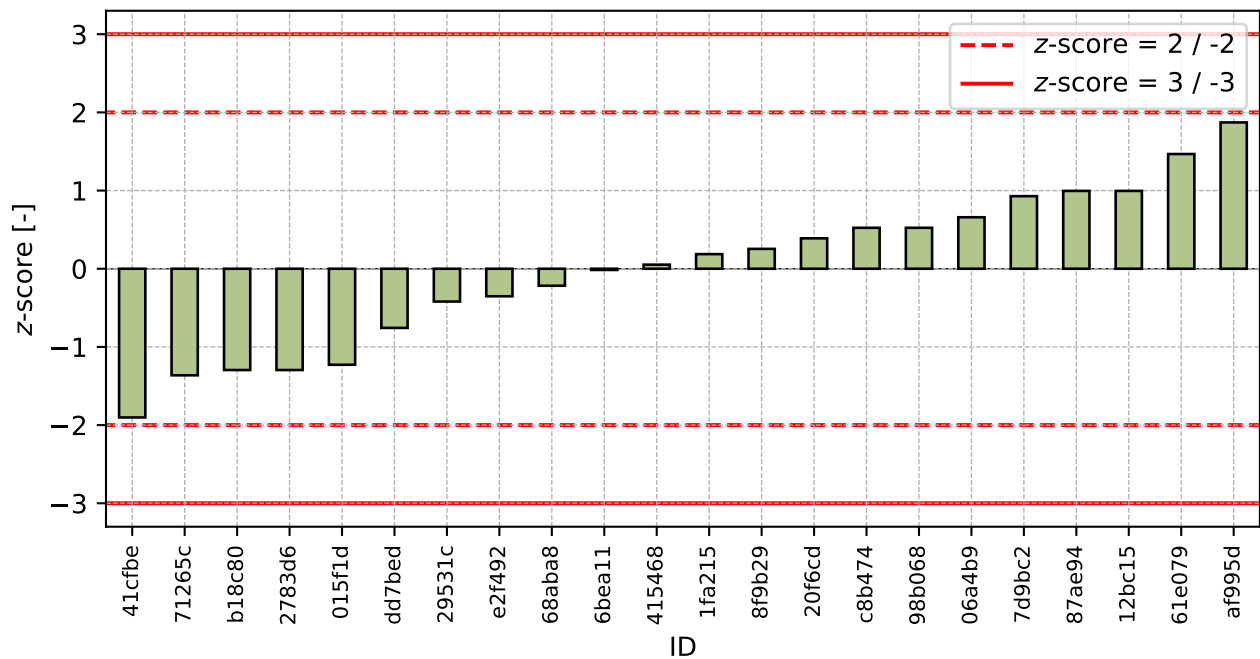


Figure 103: z-score

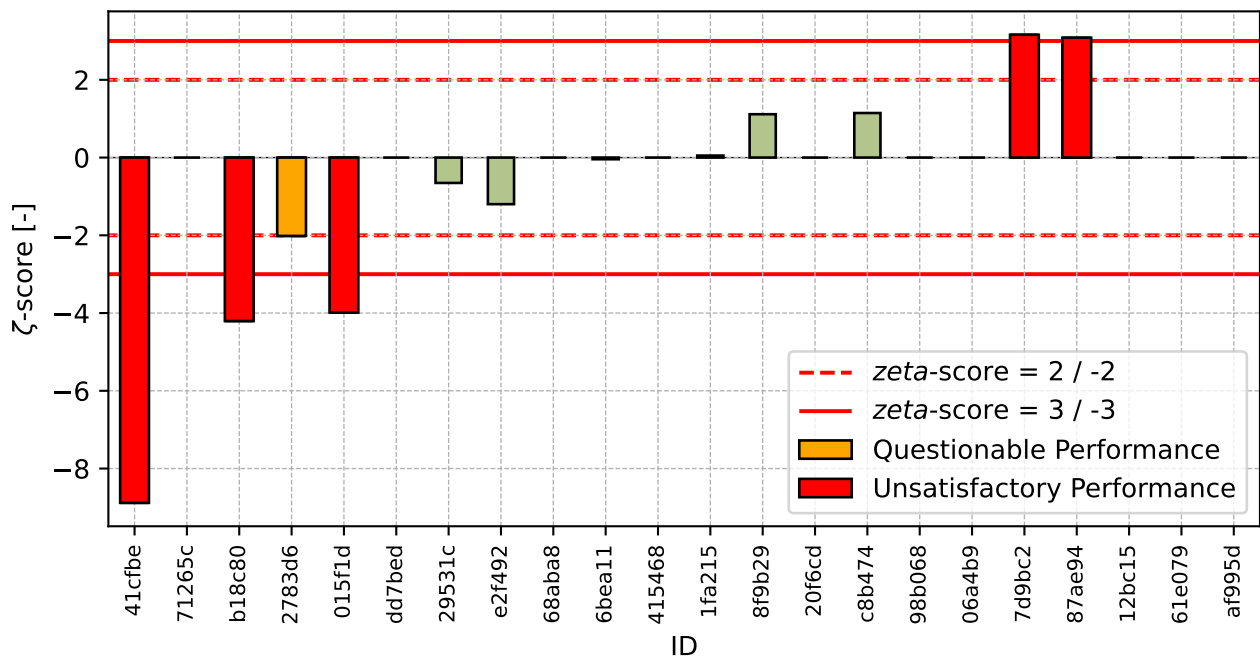


Figure 104: ζ-score

Table 34: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
41cfbe	-1.90	-8.88
71265c	-1.36	-
b18c80	-1.30	-4.21
2783d6	-1.30	-2.02
015f1d	-1.23	-3.99
dd7bed	-0.76	-
29531c	-0.42	-0.65
e2f492	-0.35	-1.20
68aba8	-0.22	-
6bea11	-0.02	-0.04
415468	0.05	-
1fa215	0.19	0.05
8f9b29	0.25	1.12
20f6cd	0.39	-
c8b474	0.52	1.15
98b068	0.52	-
06a4b9	0.66	-
7d9bc2	0.93	3.16
87ae94	1.00	3.08
12bc15	1.00	-
61e079	1.47	-
af995d	1.87	-

5 Appendix – EN 933-9 Assessment of fines - Methylene blue test

5.1 Test results

Table 35: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [g/kg]	2 [g/kg]	3 [g/kg]	u_X [g/kg]	$\bar{x}$ [g/kg]	s_0 [g/kg]	V_X [%]
fa5895	0.2	0.2	0.2	0.00	0.2	0.00	0.00
1fa215	0.5	0.5	0.5	0.30	0.5	0.00	0.00
41f49e	0.9	0.9	1.1	0.20	1.0	0.12	11.95
0e319e	1.0	1.1	1.0	0.20	1.0	0.06	5.59
00bb33	1.1	1.1	1.2	0.01	1.1	0.06	5.09
146326	1.1	1.2	1.2	0.10	1.2	0.06	4.95
c2bf7f	1.2	1.1	1.2	0.20	1.2	0.06	4.95
53962f	1.4	1.2	1.1	-	1.2	0.15	12.39
60220d	1.3	1.3	1.3	0.70	1.3	0.00	0.00
211051	1.3	1.3	1.4	0.10	1.3	0.06	4.33
151d5e	1.3	1.5	1.5	0.40	1.4	0.12	8.06
2920fc	1.5	1.5	1.4	0.08	1.5	0.06	3.94
68aba8	1.5	1.5	1.4	-	1.5	0.06	3.94
8e6ceb	1.4	1.5	1.6	0.10	1.5	0.10	6.67
06a4b9	1.5	1.5	1.6	-	1.5	0.06	3.77
98b068	1.6	1.6	1.7	-	1.6	0.06	3.53
12bc15	1.8	1.6	1.7	-	1.7	0.10	5.88

5.2 The Numerical Procedure for Determining Outliers

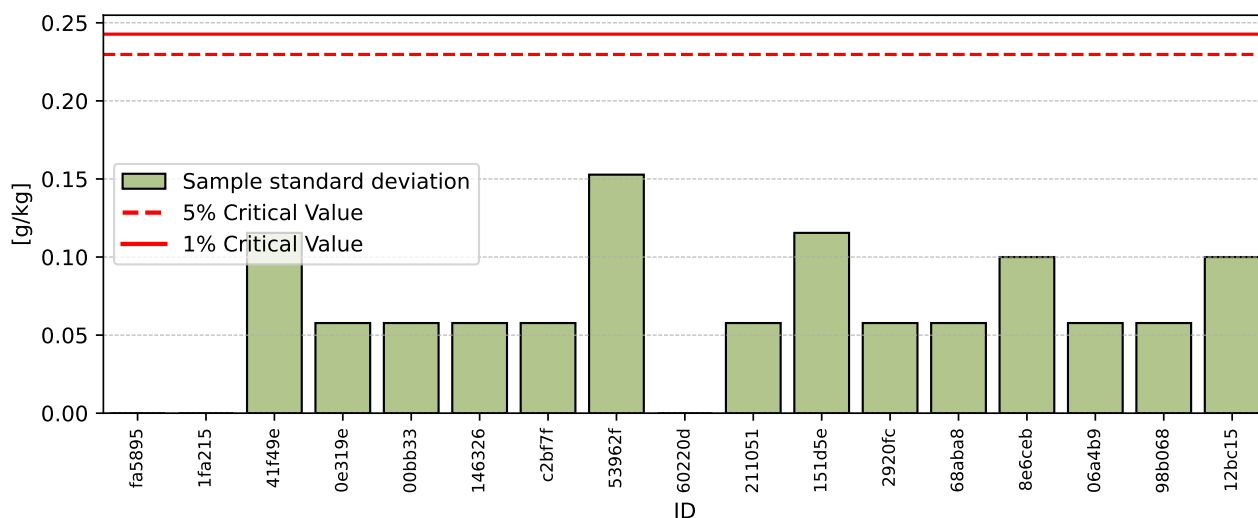
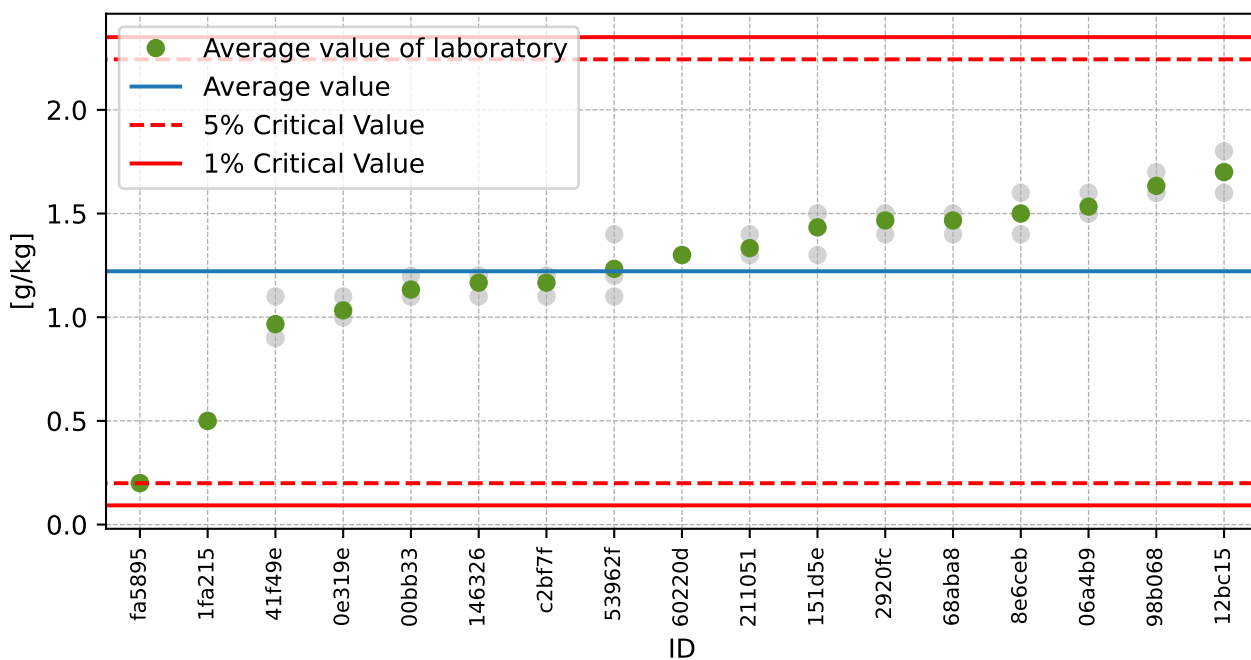


Figure 105: **Cochran's test** - sample standard deviations

Figure 106: **Grubbs' test** - average values

5.3 Mandel's Statistics

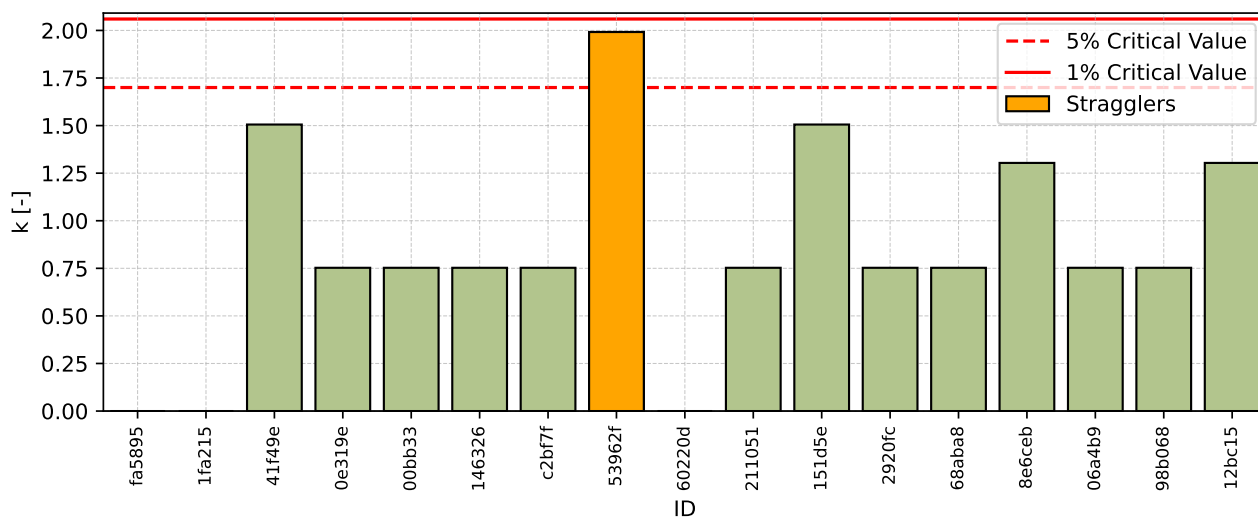


Figure 107: Intralaboratory Consistency Statistic

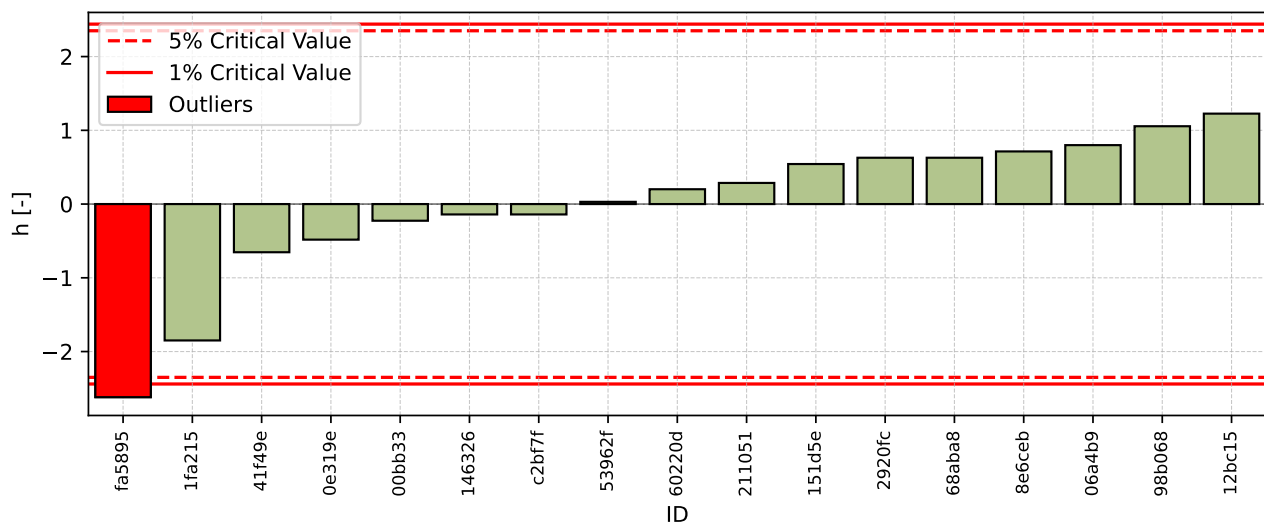


Figure 108: Interlaboratory Consistency Statistic

5.4 Descriptive statistics

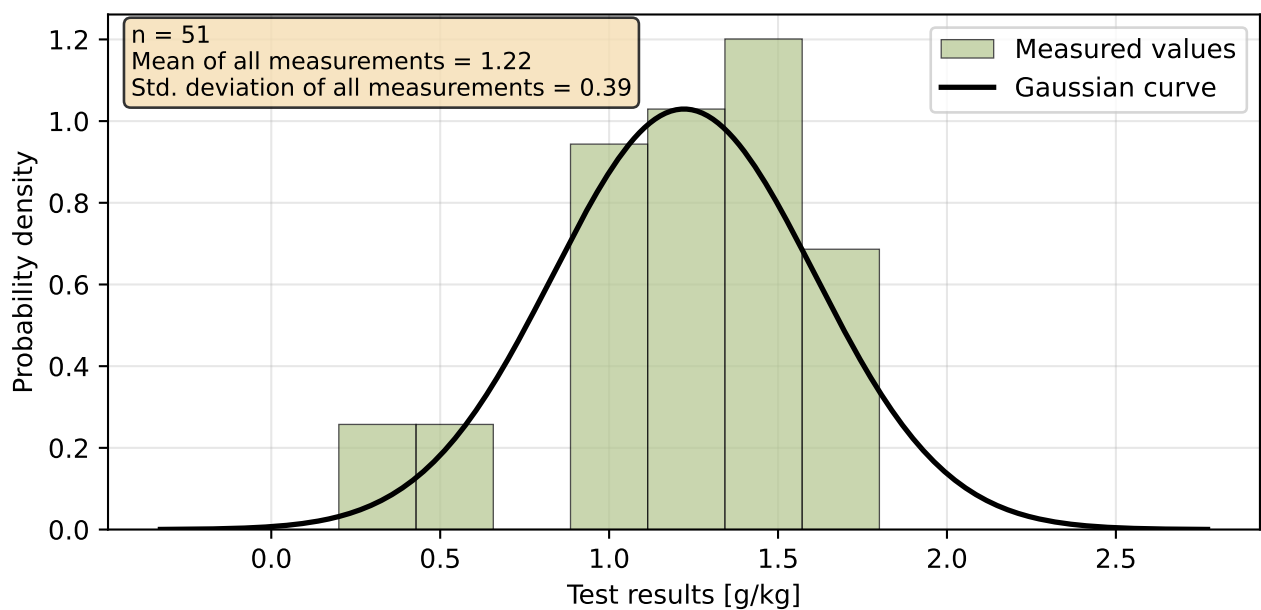


Figure 109: Histogram of all test results

Table 36: Descriptive statistics

Characteristics	[g/kg]
Average value – $\bar{x}$	1.22
Sample standard deviation – s	0.39
Assigned value – x^*	1.22
Robust standard deviation – s^*	0.39
Measurement uncertainty of assigned value – u_X	0.09
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	0.39
Repeatability standard deviation – s_r	0.08
Reproducibility standard deviation – s_R	0.40
Repeatability – r	0.21
Reproducibility – R	1.11

5.5 Evaluation of Performance Statistics

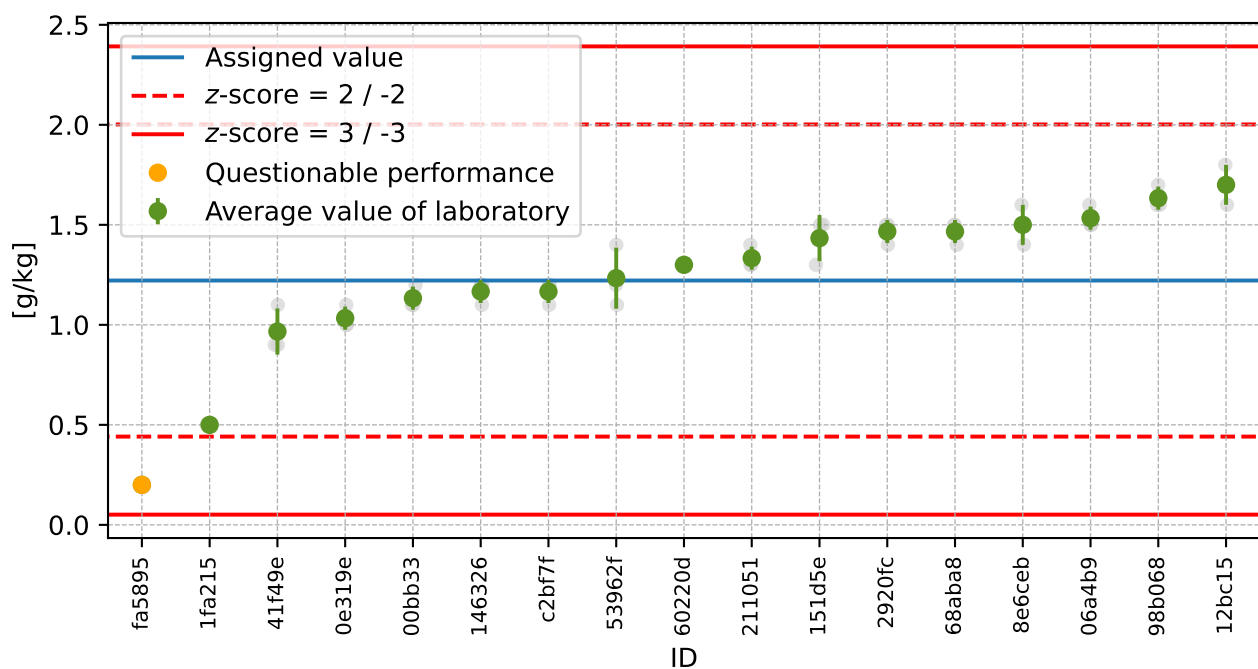


Figure 110: Average values and sample standard deviations

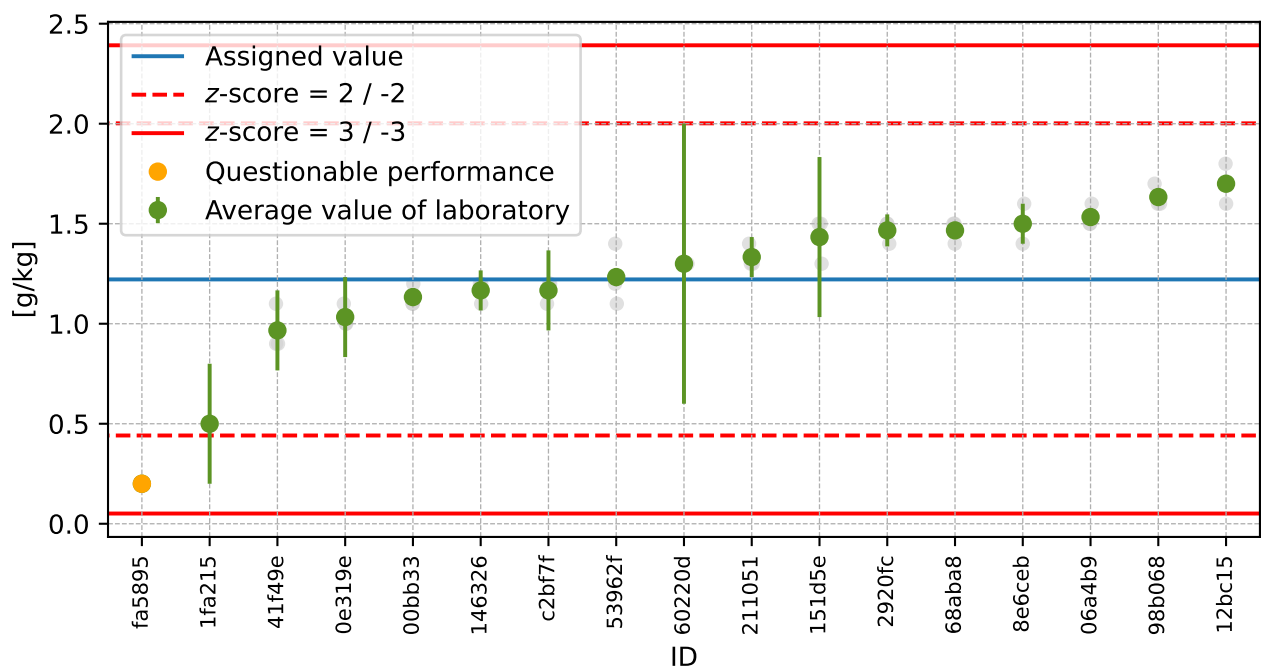


Figure 111: Average values and extended uncertainties of measurement

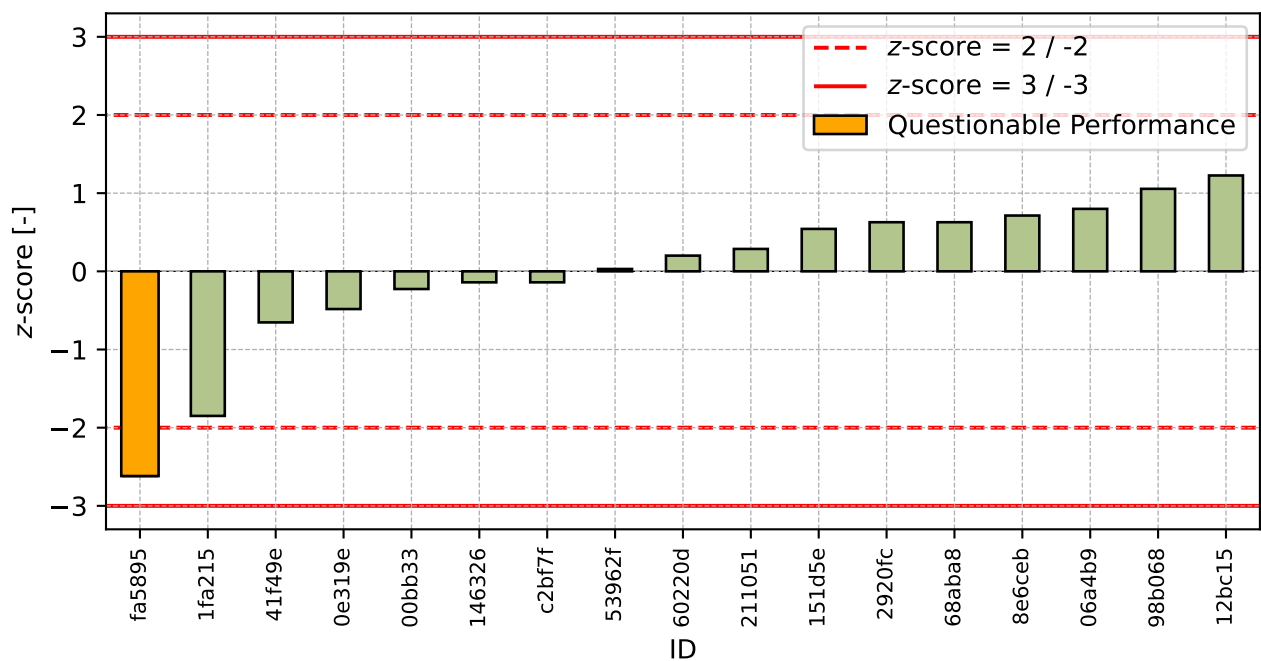
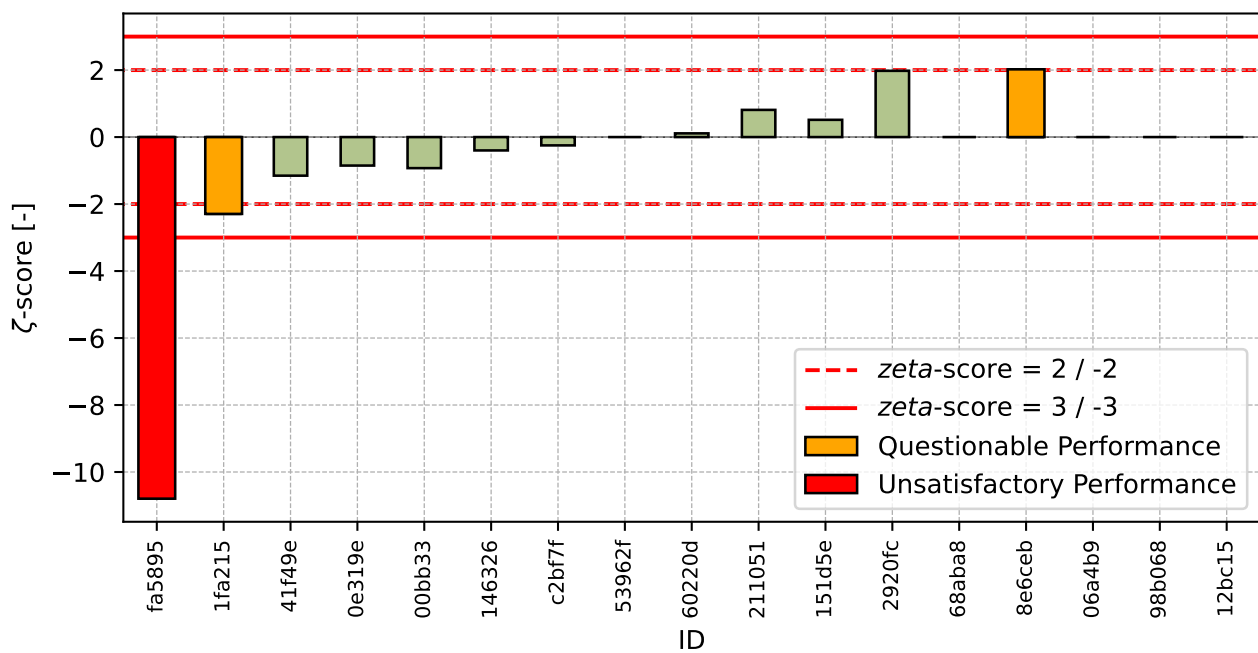


Figure 112: z-score

Figure 113: ζ -scoreTable 37: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
fa5895	-2.62	-10.80
1fa215	-1.85	-2.29
41f49e	-0.65	-1.15
0e319e	-0.48	-0.85
00bb33	-0.23	-0.93
146326	-0.14	-0.40
c2bf7f	-0.14	-0.25
53962f	0.03	-
60220d	0.20	0.11
211051	0.29	0.81
151d5e	0.54	0.52
2920fc	0.63	1.98
68aba8	0.63	-
8e6ceb	0.71	2.02
06a4b9	0.80	-
98b068	1.06	-
12bc15	1.23	-

6 Appendix – EN 933-10 Assessment of fines - Grading of filler aggregates (air jet sieving)

This part of PT programme was not open due to low number of participants.

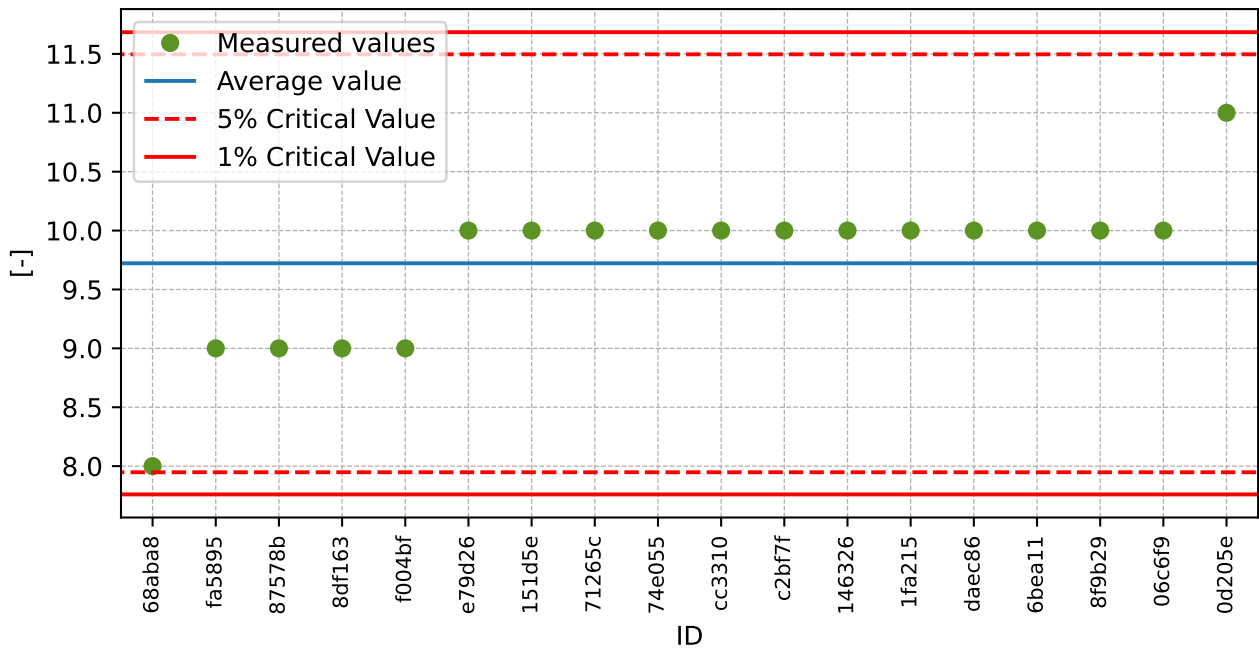
7 Appendix – EN 1097-1 Determination of the resistance to wear (micro-Deval)

7.1 Test results

Table 38: Test results – ordered by average value. Outliers are marked by red color. u_x – extended uncertainty of measurement.

ID	Result [-]	u_x [-]
68aba8	8	-
fa5895	9	0.1
87578b	9	1.0
8df163	9	0.1
f004bf	9	-
e79d26	10	0.3
151d5e	10	1.0
71265c	10	-
74e055	10	1.0
cc3310	10	-
c2bf7f	10	1.0
146326	10	0.9
1fa215	10	3.0
daec86	10	-
6bea11	10	0.5
8f9b29	10	-
06c6f9	10	0.1
0d205e	11	0.8

7.2 The Numerical Procedure for Determining Outliers

Figure 114: **Grubbs' test** - average values

7.3 Mandel's Statistics

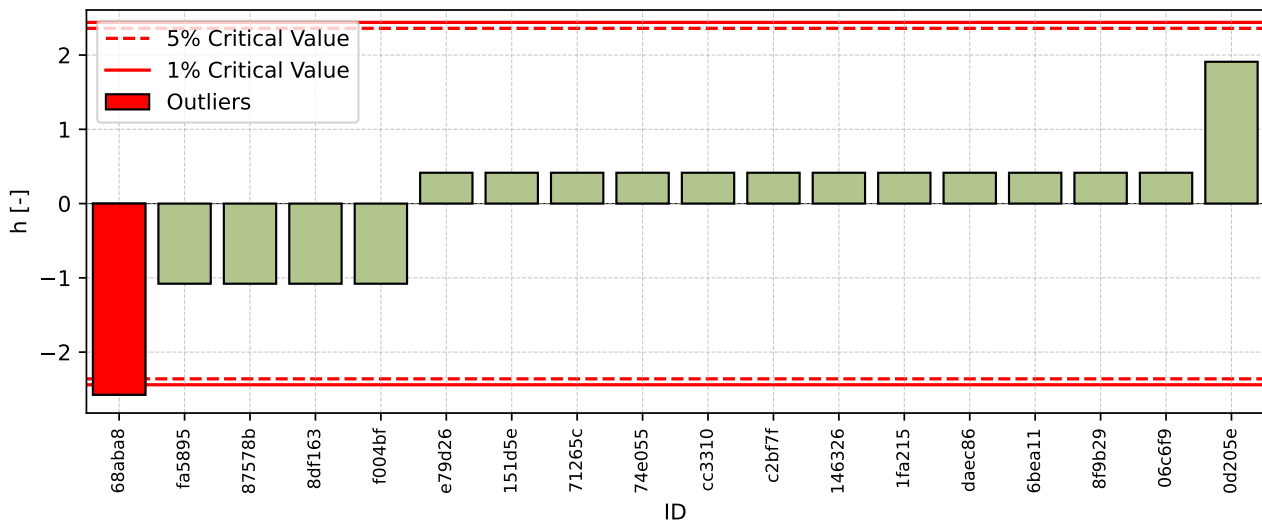


Figure 115: Interlaboratory Consistency Statistic

7.4 Descriptive statistics

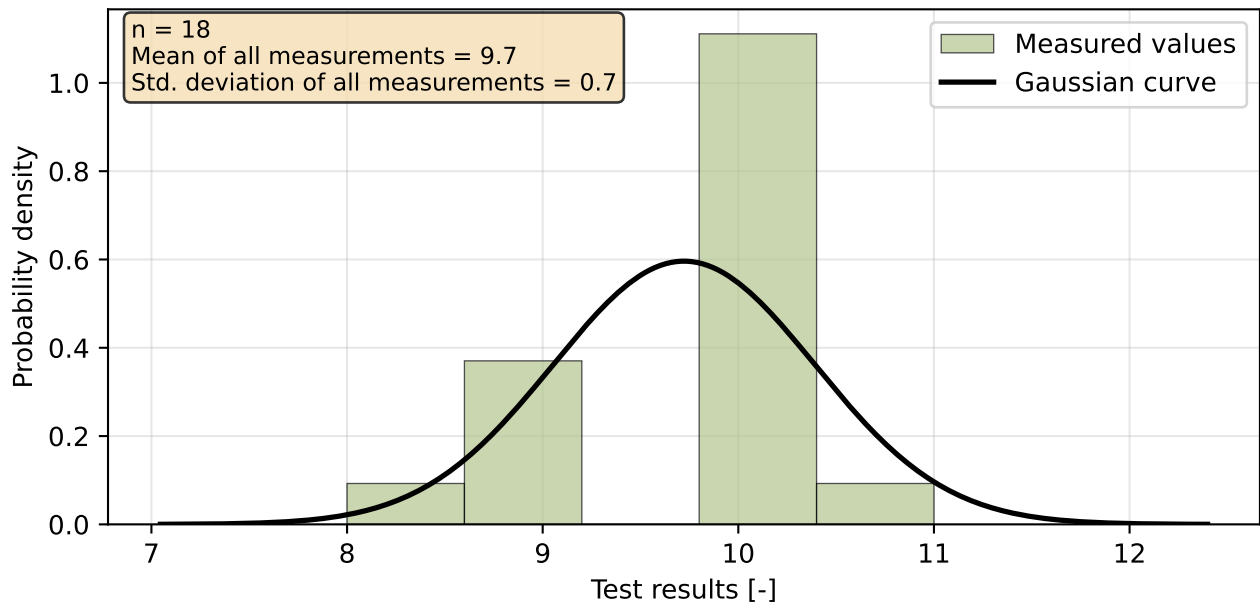


Figure 116: Histogram of all test results

Table 39: Descriptive statistics

Characteristics	[-]
Average value – $\bar{x}$	9.7
Sample standard deviation – s	0.7
Assigned value – x^*	9.7
Robust standard deviation – s^*	0.7
Measurement uncertainty of assigned value – u_X	0.2
p -value of normality test [-]	< 0.001

7.5 Evaluation of Performance Statistics

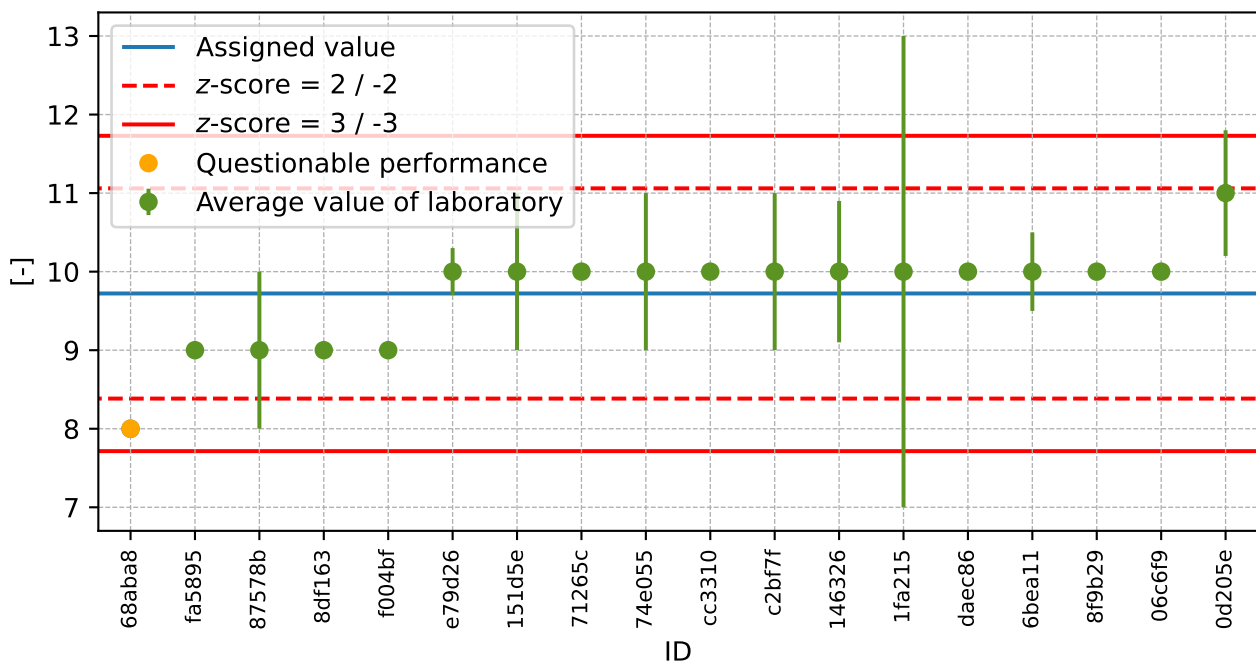


Figure 117: Average values and extended uncertainties of measurement

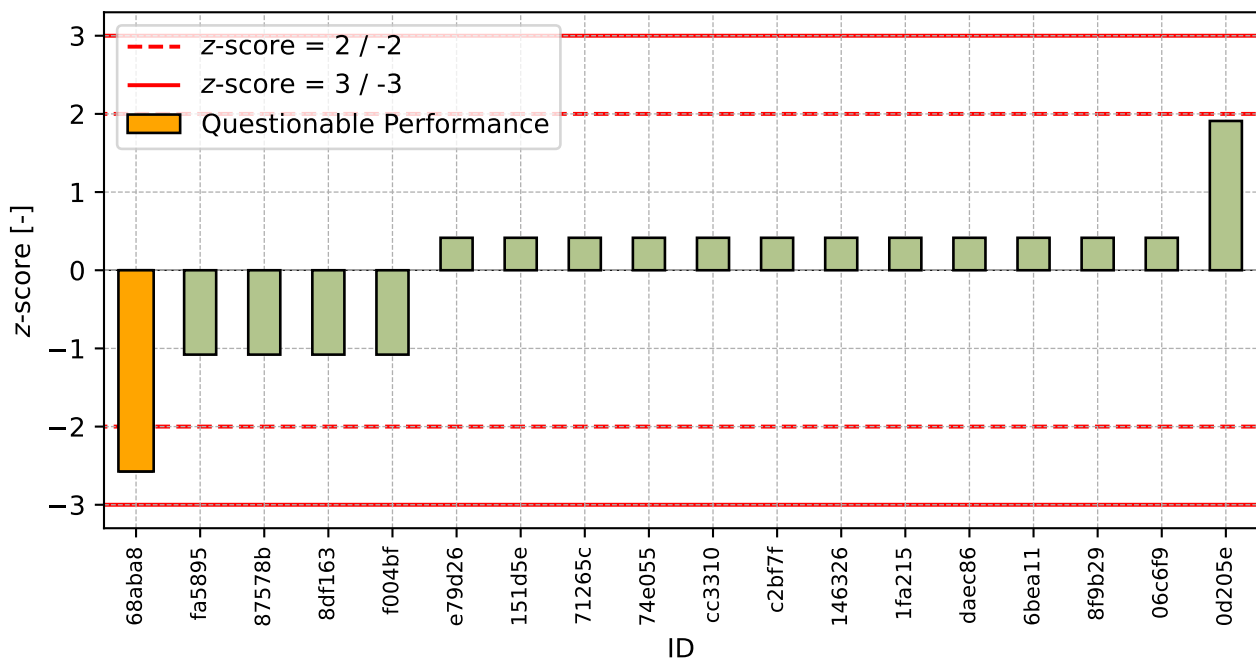


Figure 118: z-score

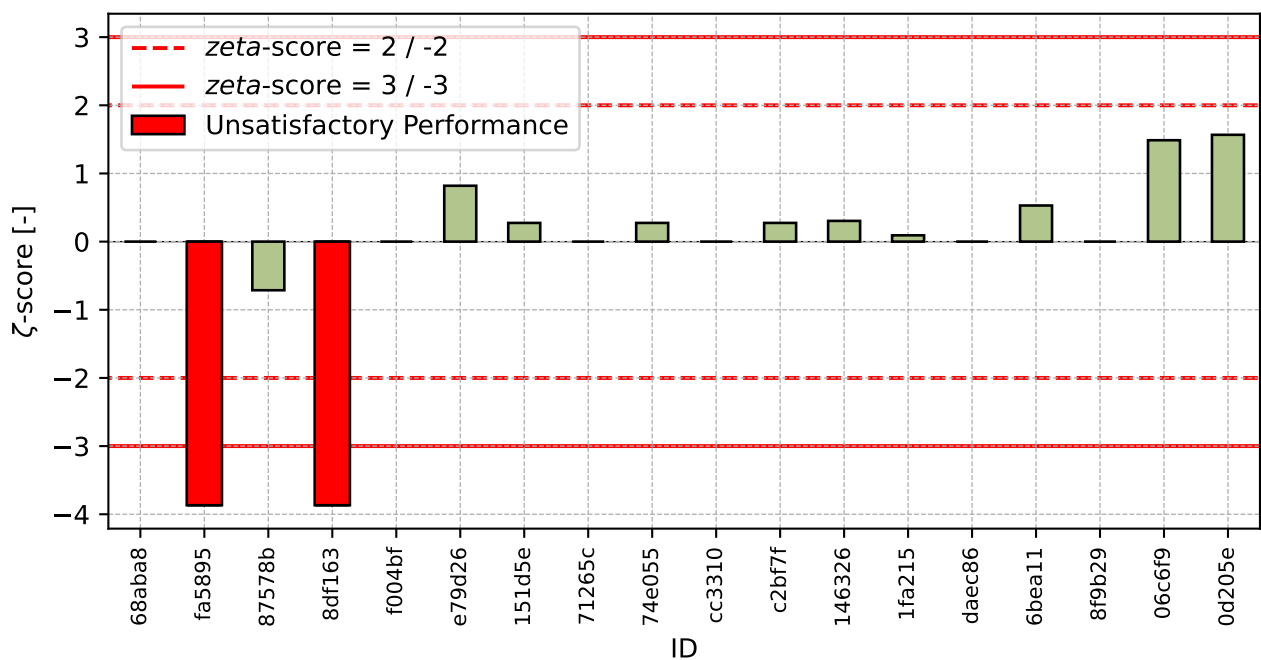


Figure 119: ζ-score

Table 40: z-score and ζ-score

ID	z-score [-]	ζ-score [-]
68aba8	-2.57	-
fa5895	-1.08	-3.87
87578b	-1.08	-0.71
8df163	-1.08	-3.87
f004bf	-1.08	-
e79d26	0.42	0.82
151d5e	0.42	0.27
71265c	0.42	-
74e055	0.42	0.27
cc3310	0.42	-
c2bf7f	0.42	0.27
146326	0.42	0.30
1fa215	0.42	0.09
daec86	0.42	-
6bea11	0.42	0.53
8f9b29	0.42	-
06c6f9	0.42	1.49
0d205e	1.91	1.57

8 Appendix – EN 1097-2 Methods for the determination of resistance to fragmentation - chapter 5

8.1 Test results

Table 41: Test results – ordered by average value. Outliers are marked by red color. u_x – extended uncertainty of measurement.

ID	Result [-]	u_x [-]
cc3310	18	-
06c6f9	18	1.0
53962f	18	-
87578b	18	1.0
60220d	18	2.2
07d606	18	0.5
460a54	18	1.0
0e319e	18	1.0
c2bf7f	18	1.0
c58a44	18	0.4
70e54b	19	0.6
0d205e	19	1.6
41cfbe	19	0.4
cff407	19	2.3
8cf955	19	2.3
e2f492	20	1.0
fa5895	20	0.0
2e39b3	20	4.0
f3015a	20	0.3
6bea11	20	0.7
bca32e	20	-
e033de	21	1.5
caece7	21	0.7
68aba8	21	-
1fa215	21	5.0
8df163	22	0.3
8f9b29	22	-
74e055	22	1.0

8.2 The Numerical Procedure for Determining Outliers

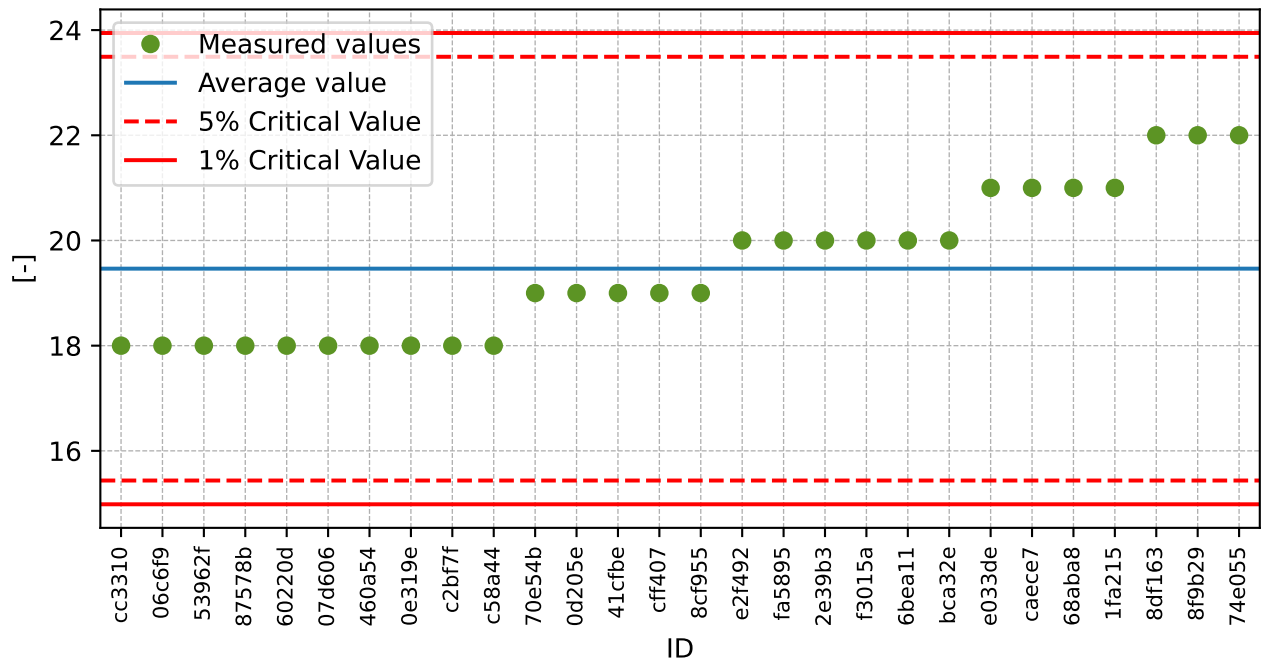


Figure 120: Grubbs' test - average values

8.3 Mandel's Statistics

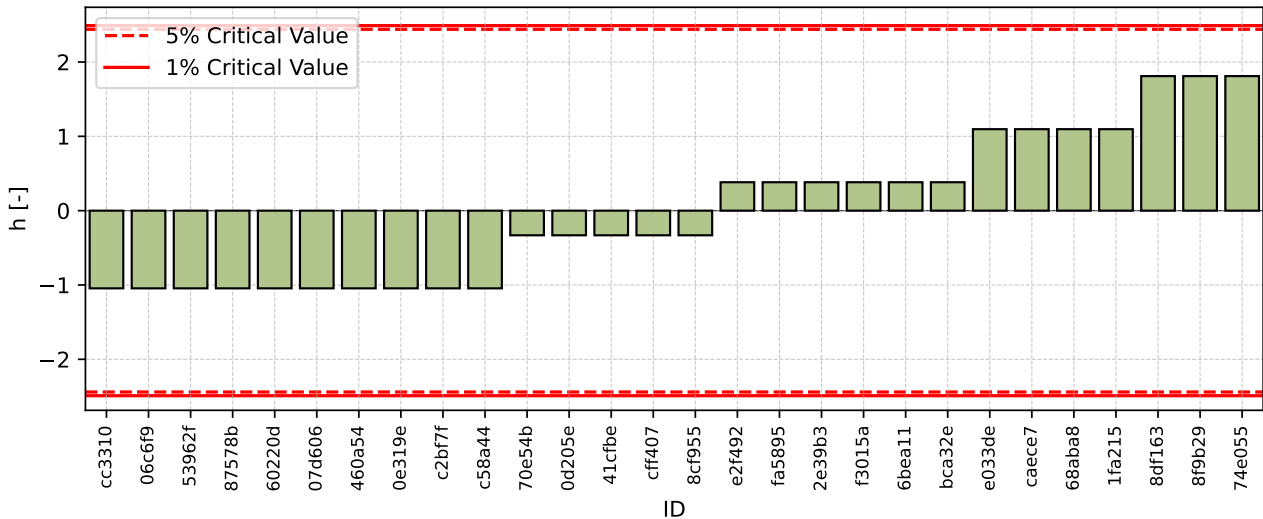


Figure 121: Interlaboratory Consistency Statistic

8.4 Descriptive statistics

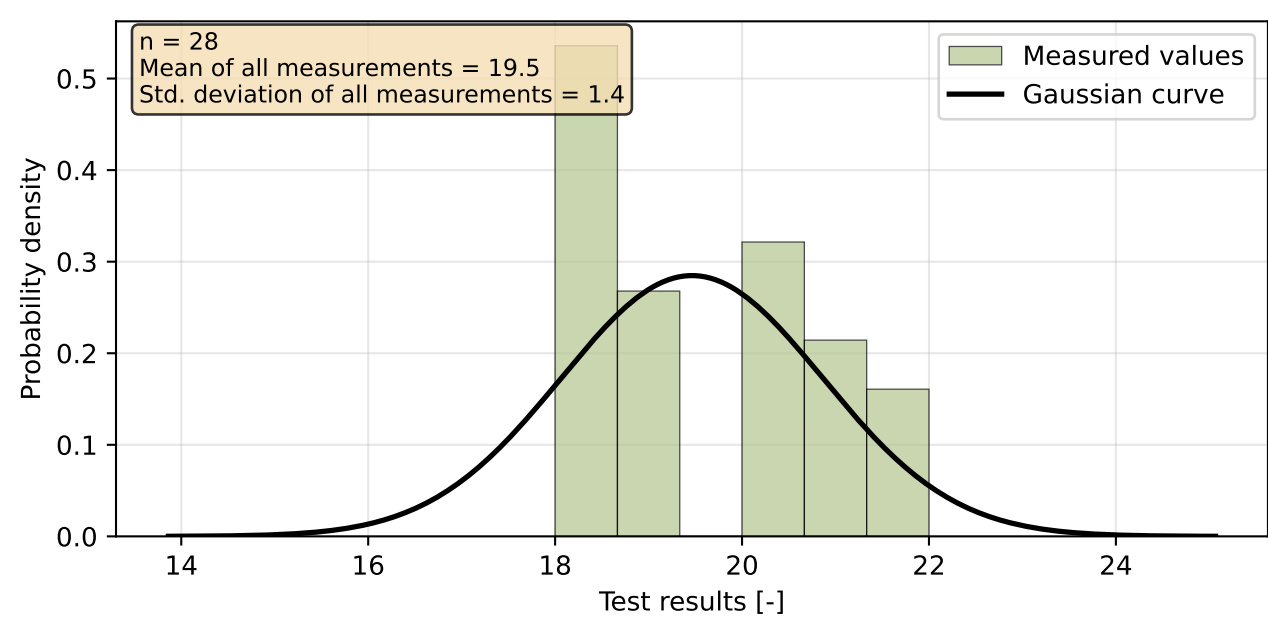


Figure 122: Histogram of all test results

Table 42: Descriptive statistics

Characteristics	[-]
Average value – $\bar{x}$	19.5
Sample standard deviation – s	1.4
Assigned value – x^*	19.5
Robust standard deviation – s^*	1.4
Measurement uncertainty of assigned value – u_X	0.3
p -value of normality test [-]	0.002

8.5 Evaluation of Performance Statistics

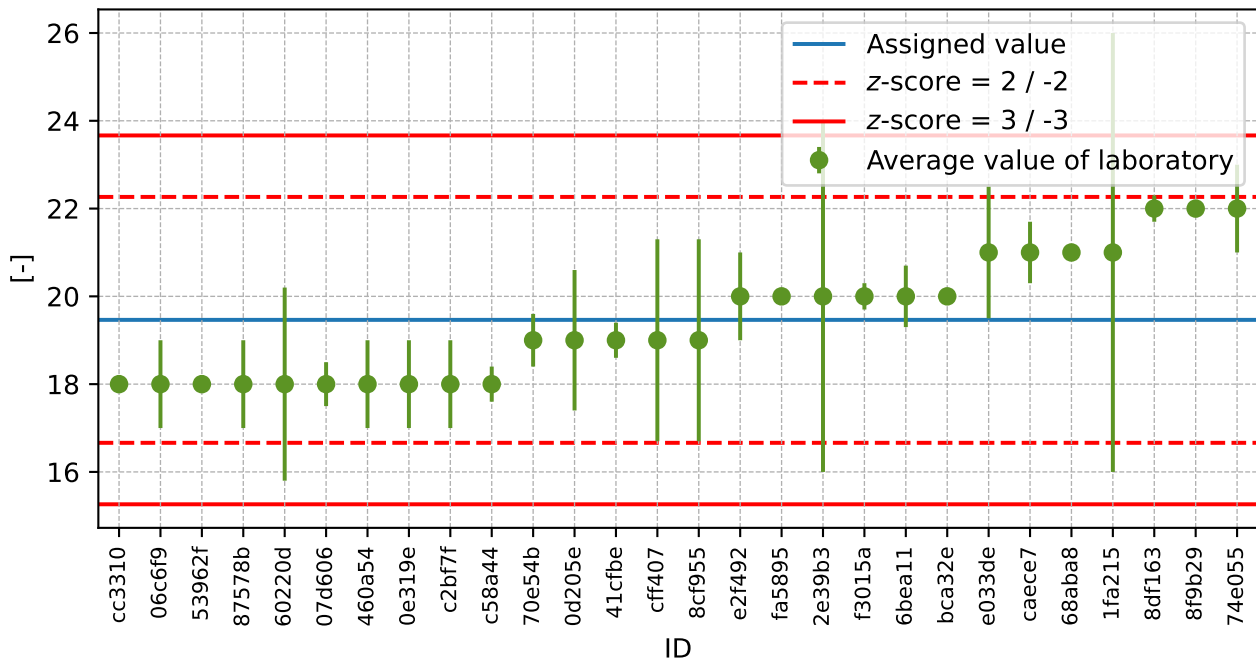


Figure 123: Average values and extended uncertainties of measurement

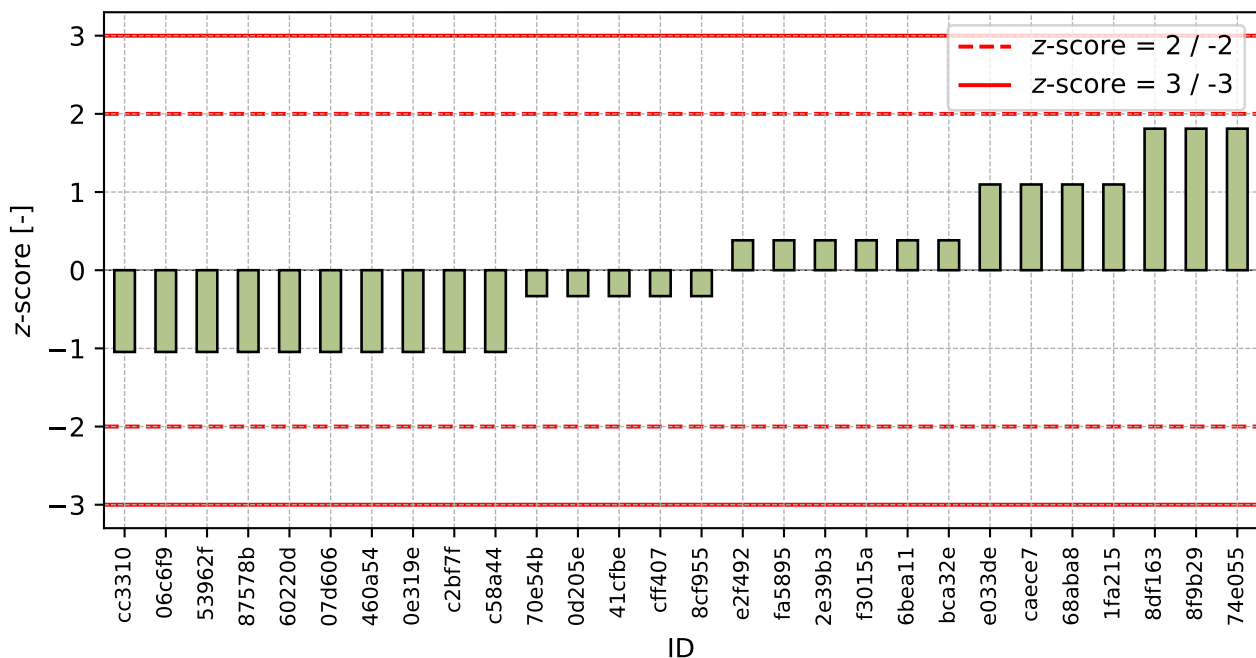
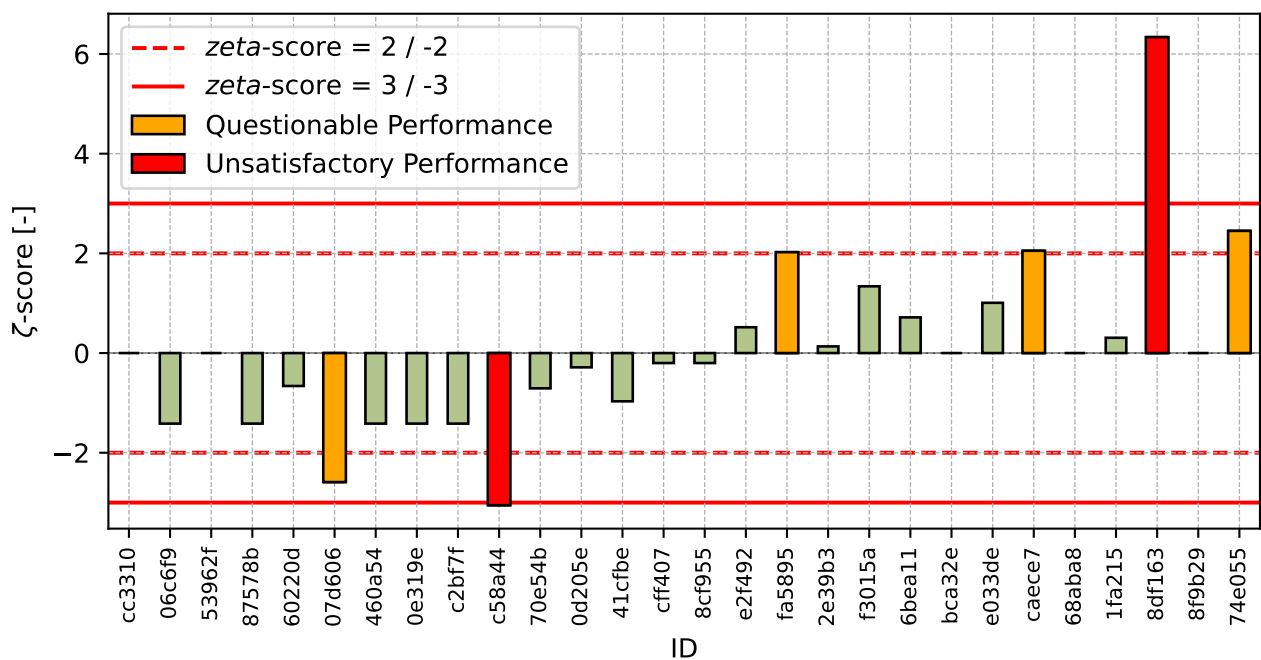


Figure 124: z-score

Figure 125: ζ -scoreTable 43: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
cc3310	-1.05	-
06c6f9	-1.05	-1.42
53962f	-1.05	-
87578b	-1.05	-1.42
60220d	-1.05	-0.66
07d606	-1.05	-2.59
460a54	-1.05	-1.42
0e319e	-1.05	-1.42
c2bf7f	-1.05	-1.42
c58a44	-1.05	-3.05
70e54b	-0.33	-0.71
0d205e	-0.33	-0.29
41cfbe	-0.33	-0.97
cff407	-0.33	-0.20
8cf955	-0.33	-0.20
e2f492	0.38	0.52
fa5895	0.38	2.02
2e39b3	0.38	0.13
f3015a	0.38	1.34
6bea11	0.38	0.72
bca32e	0.38	-
e033de	1.10	1.01
caece7	1.10	2.05
68aba8	1.10	-

Continued on next page

Continued from previous page

ID	z-score [-]	ζ-score [-]
1fa215	1.10	0.31
8df163	1.81	6.34
8f9b29	1.81	-
74e055	1.81	2.45

9 Appendix – EN 1097-2 Methods for the determination of resistance to fragmentation - chapter 6

9.1 Test results

Table 44: Test results – ordered by average value. Outliers are marked by red color. u_X – extended uncertainty of measurement.

ID	Result [-]	u_X [-]
f004bf	12.9	-
bca32e	18.7	-
246ad1	20.0	4.00
12ef17	20.2	1.30

9.2 The Numerical Procedure for Determining Outliers

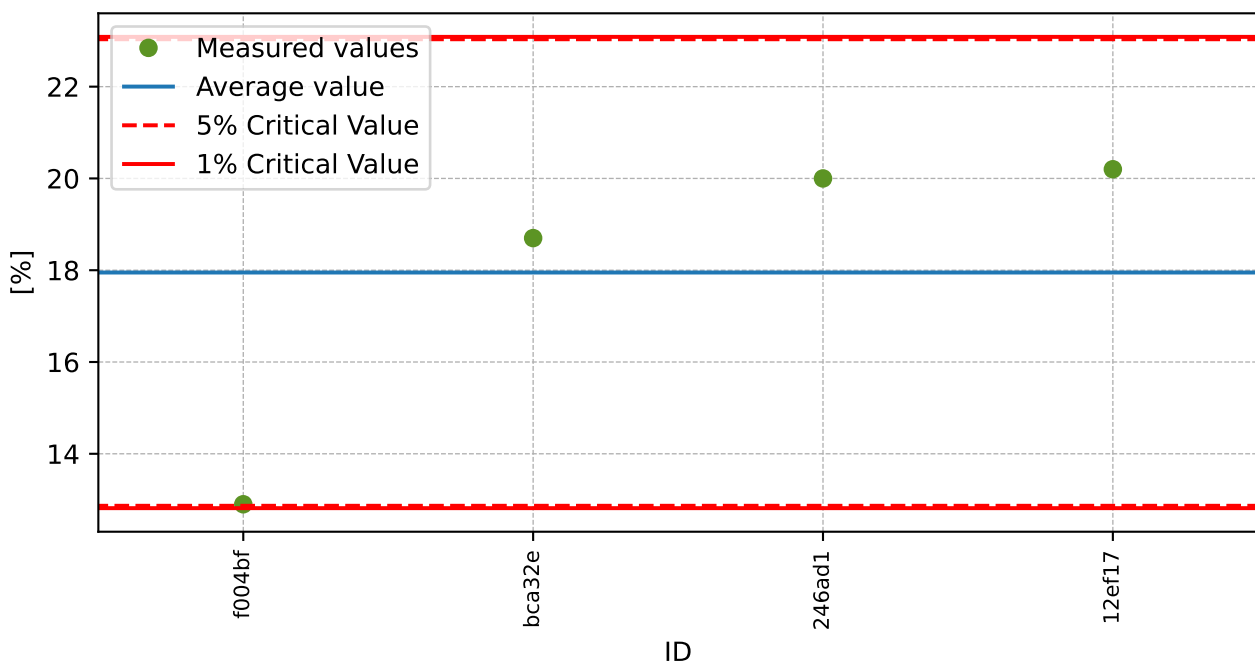


Figure 126: **Grubbs' test** - average values

9.3 Mandel's Statistics

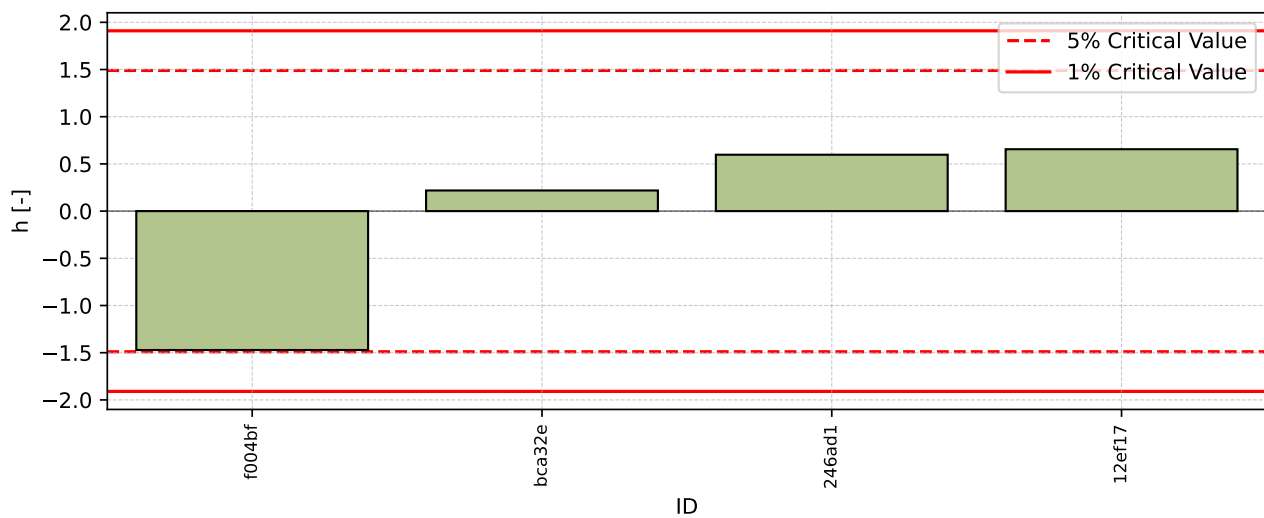


Figure 127: Interlaboratory Consistency Statistic

9.4 Descriptive statistics

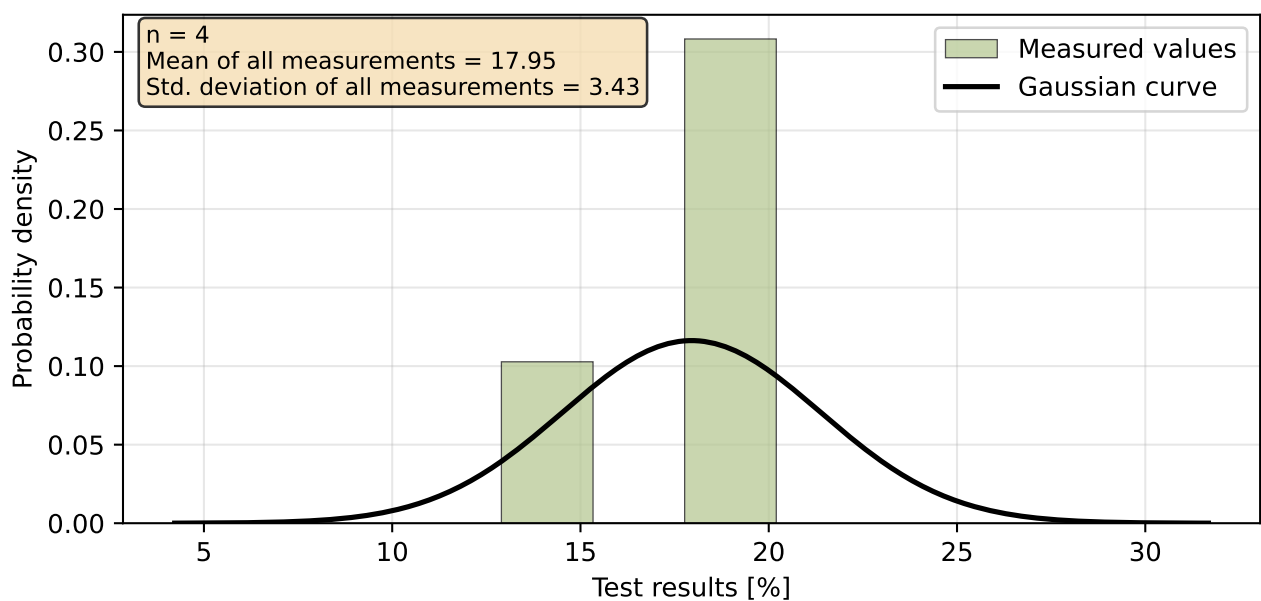


Figure 128: Histogram of all test results

Table 45: Descriptive statistics

Characteristics	[-]
Average value – $\bar{x}$	17.95
Sample standard deviation – s	3.43
Assigned value – x^*	17.95
Robust standard deviation – s^*	3.43
Measurement uncertainty of assigned value – u_x	1.72
p -value of normality test [-]	0.065

9.5 Evaluation of Performance Statistics

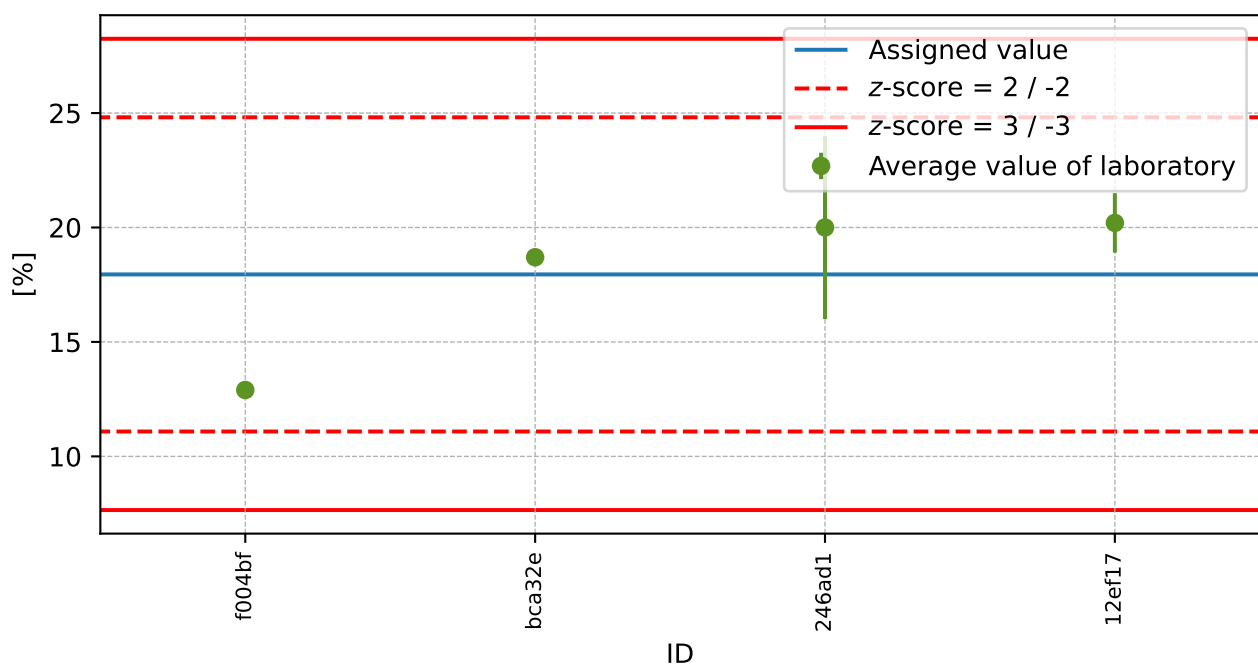


Figure 129: Average values and extended uncertainties of measurement

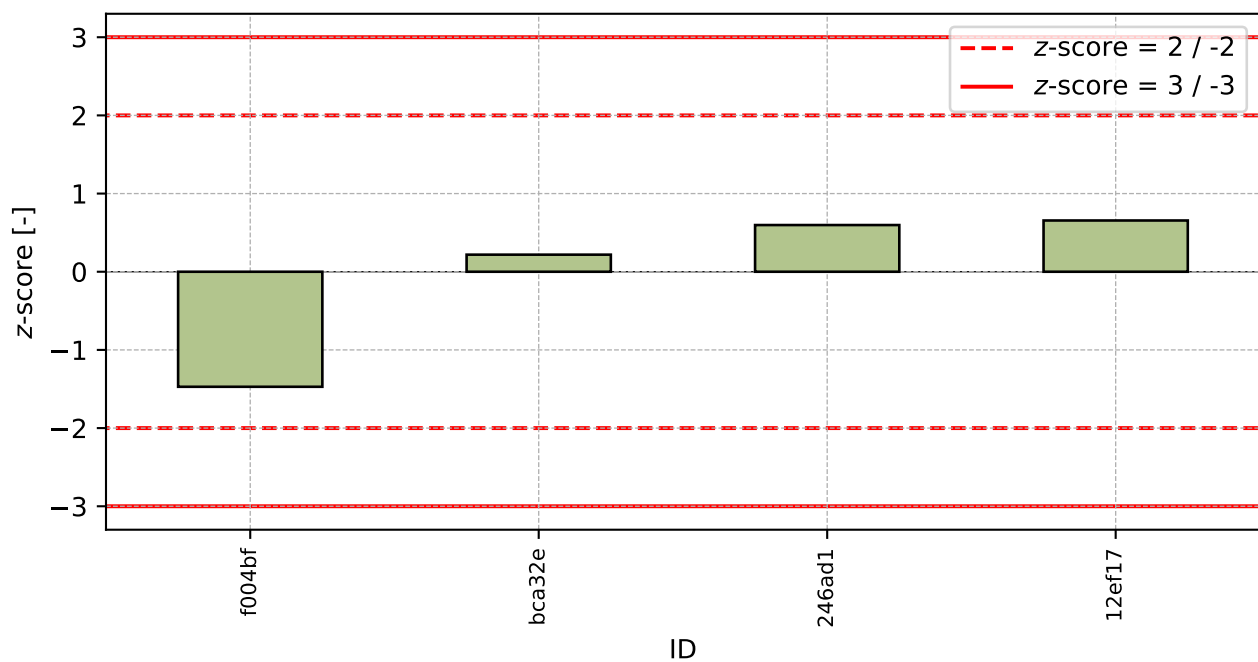


Figure 130: z-score

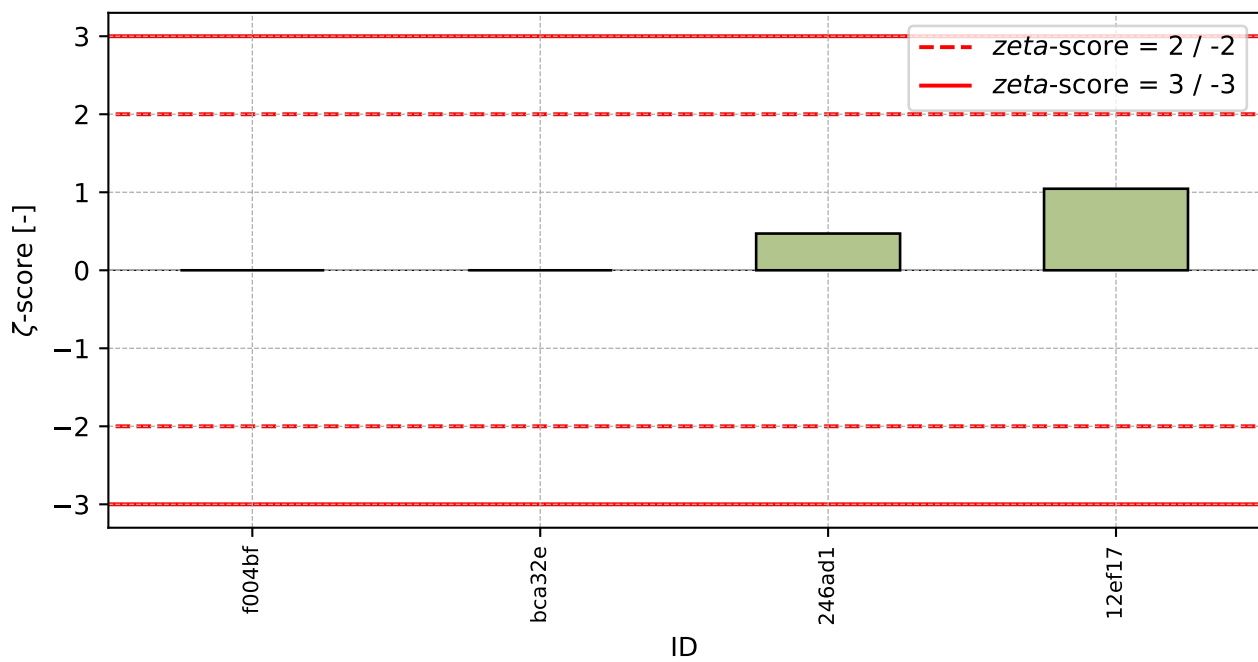


Figure 131: ζ-score

Table 46: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
f004bf	-1.47	-
bca32e	0.22	-
246ad1	0.60	0.47
12ef17	0.66	1.05

10 Appendix – EN 1097-3 Determination of loose bulk density and voids

10.1 Loose bulk density

10.1.1 Test results

Table 47: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [Mg/m ³]	2 [Mg/m ³]	3 [Mg/m ³]	u_X [Mg/m ³]	$\bar{x}$ [Mg/m ³]	s_0 [Mg/m ³]	V_X [%]
7fed1f	1.39	1.40	1.40	0.002	1.40	0.006	0.41
09a574	1.46	1.46	1.45	0.018	1.46	0.006	0.40
68aba8	1.46	1.46	1.45	-	1.46	0.006	0.40
f004bf	1.44	1.47	1.46	-	1.46	0.015	1.05
8f9b29	1.46	1.47	1.48	0.020	1.47	0.010	0.68
41cfbe	1.47	1.47	1.47	0.010	1.47	0.000	0.00
06c6f9	1.48	1.47	1.47	0.020	1.47	0.006	0.39
1fa215	1.51	1.50	1.50	0.300	1.50	0.006	0.38
daec86	1.53	1.53	1.53	-	1.53	0.000	0.00
70e54b	1.53	1.53	1.54	0.012	1.53	0.006	0.38

10.1.2 The Numerical Procedure for Determining Outliers

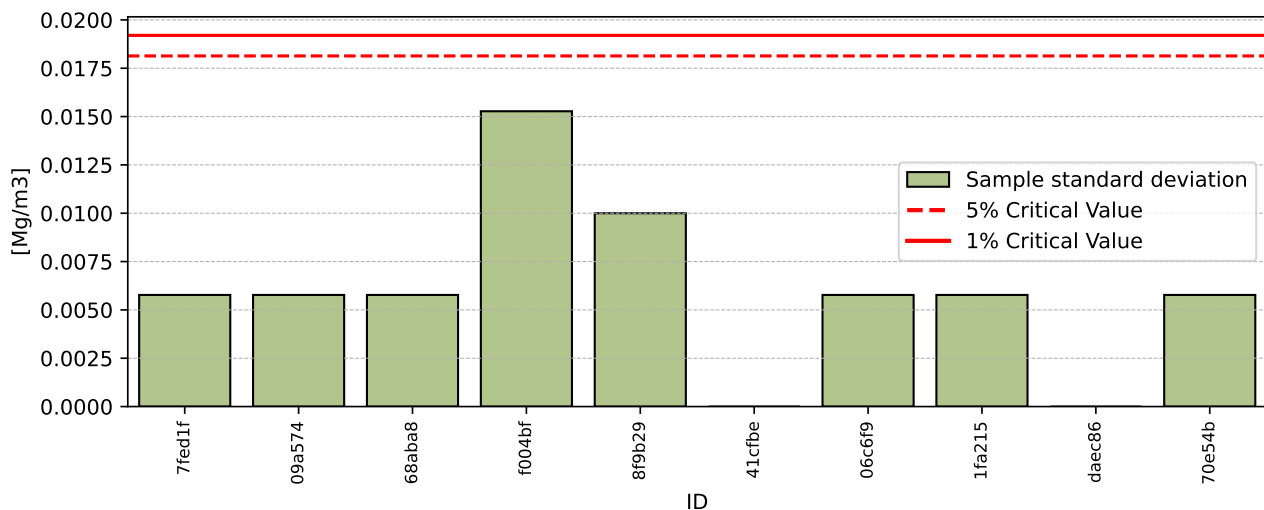


Figure 132: **Cochran's test** - sample standard deviations

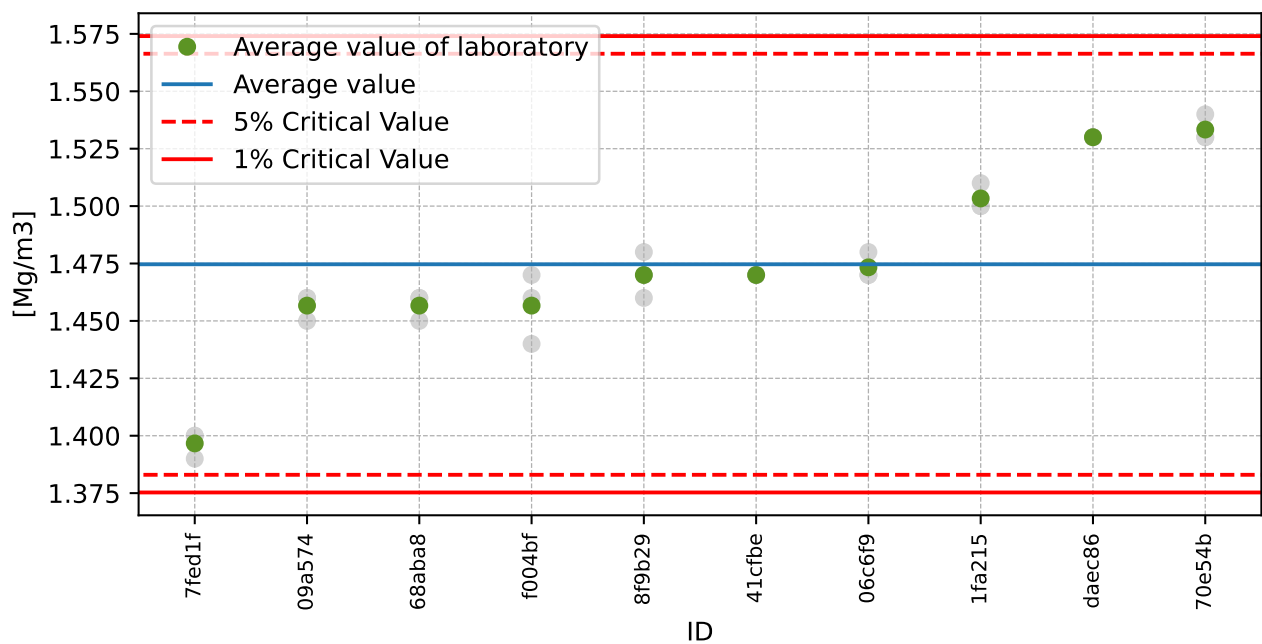


Figure 133: Grubbs' test - average values

10.1.3 Mandel's Statistics

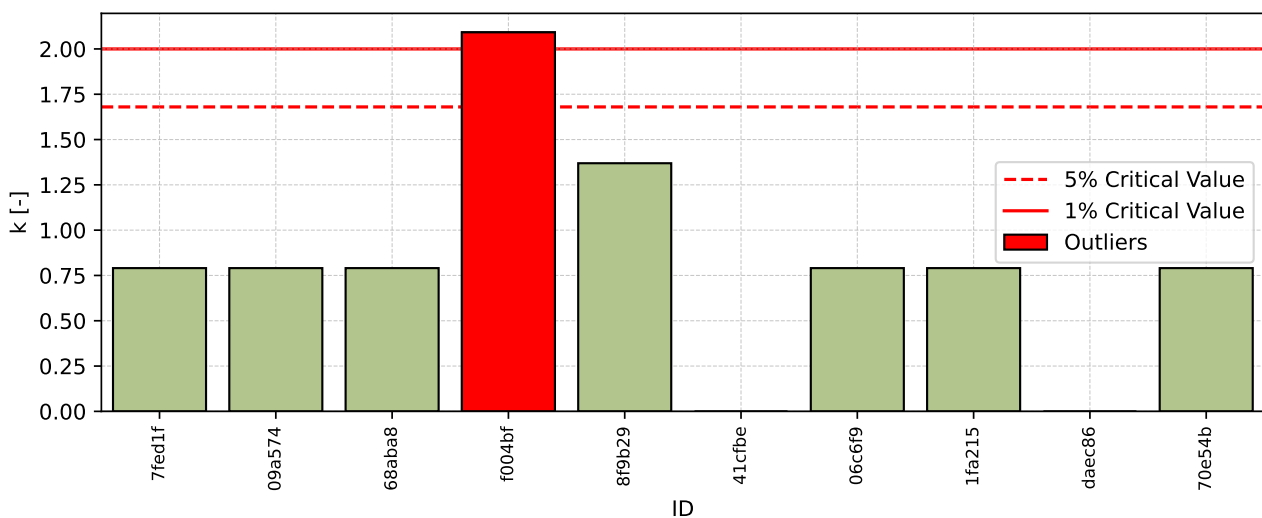


Figure 134: Intralaboratory Consistency Statistic

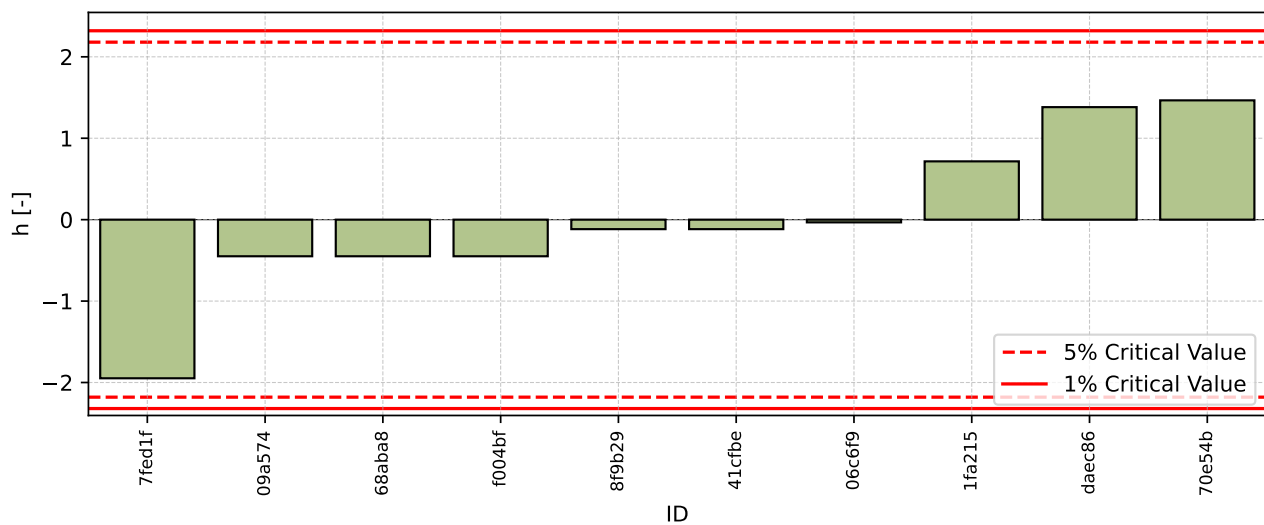


Figure 135: Interlaboratory Consistency Statistic

10.1.4 Descriptive statistics

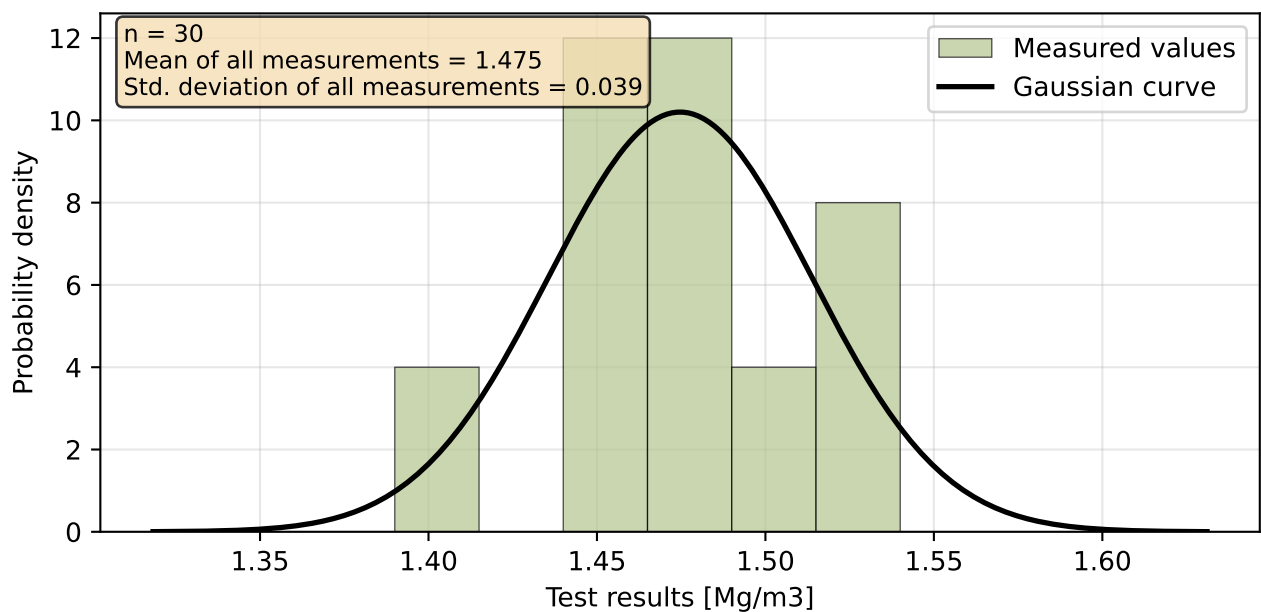


Figure 136: Histogram of all test results

Table 48: Descriptive statistics

Characteristics	[Mg/m ³]
Average value – $\bar{x}$	1.475
Sample standard deviation – s	0.040
Assigned value – x^*	1.475
Robust standard deviation – s^*	0.040
Measurement uncertainty of assigned value – u_X	0.013
p -value of normality test [-]	0.024
Interlaboratory standard deviation – s_L	0.040
Repeatability standard deviation – s_r	0.007
Reproducibility standard deviation – s_R	0.040
Repeatability – r	0.020
Reproducibility – R	0.113

10.1.5 Evaluation of Performance Statistics

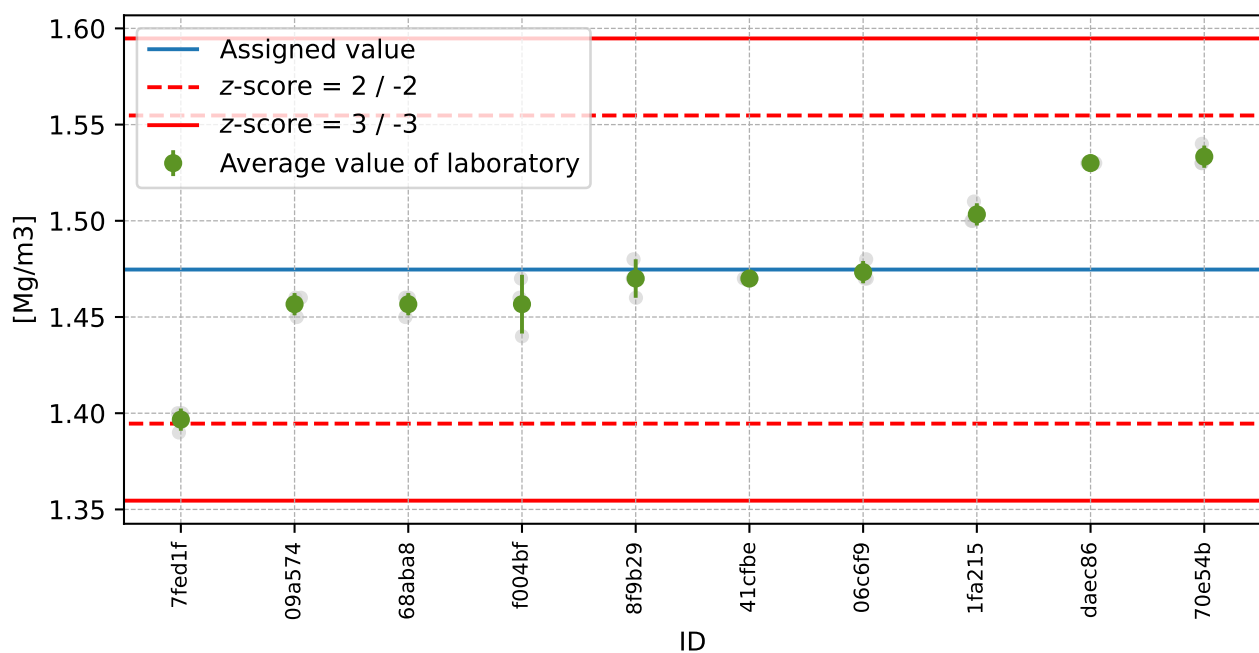


Figure 137: Average values and sample standard deviations

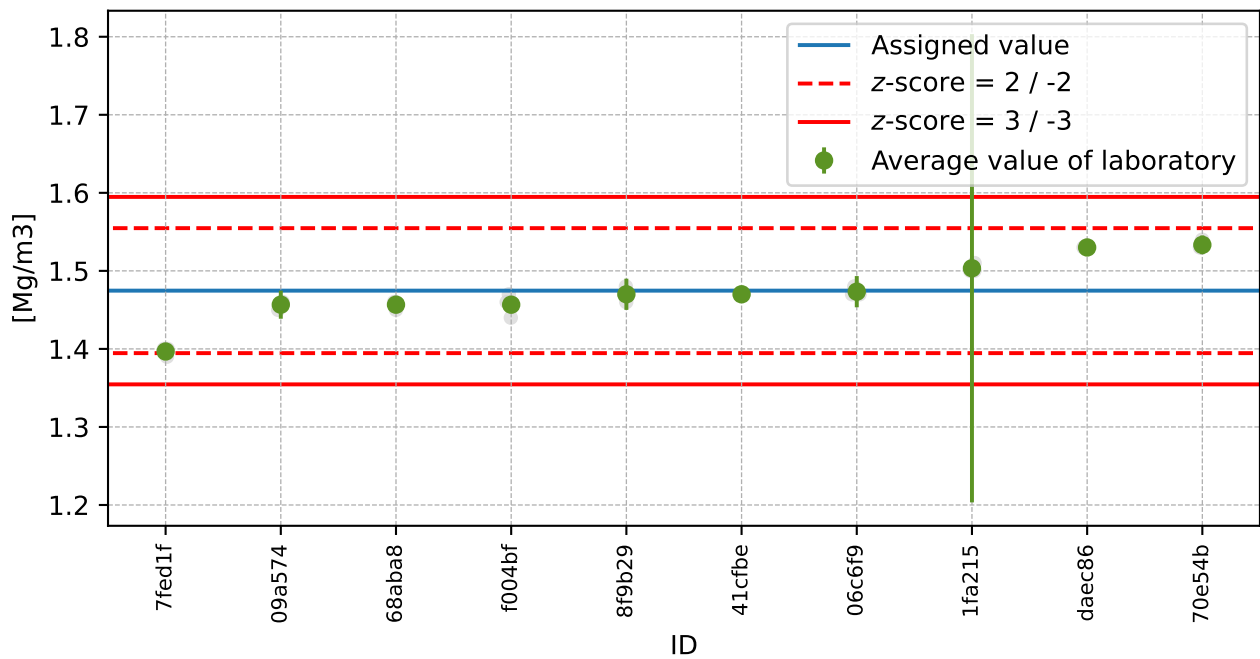


Figure 138: Average values and extended uncertainties of measurement

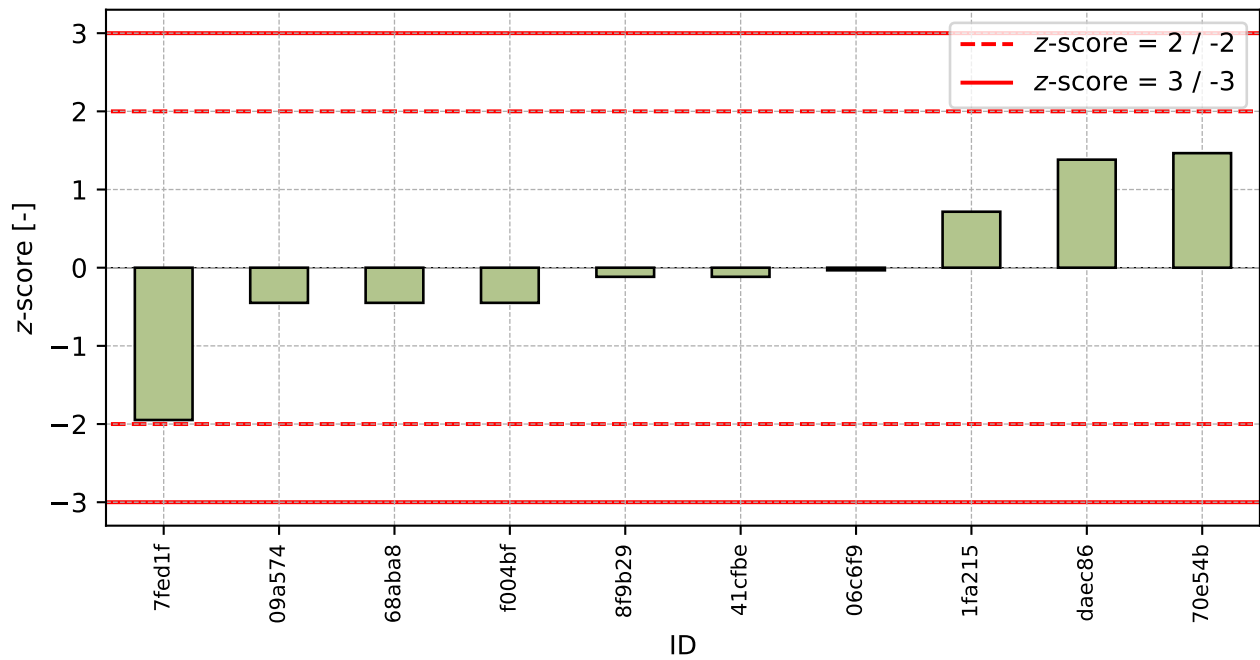
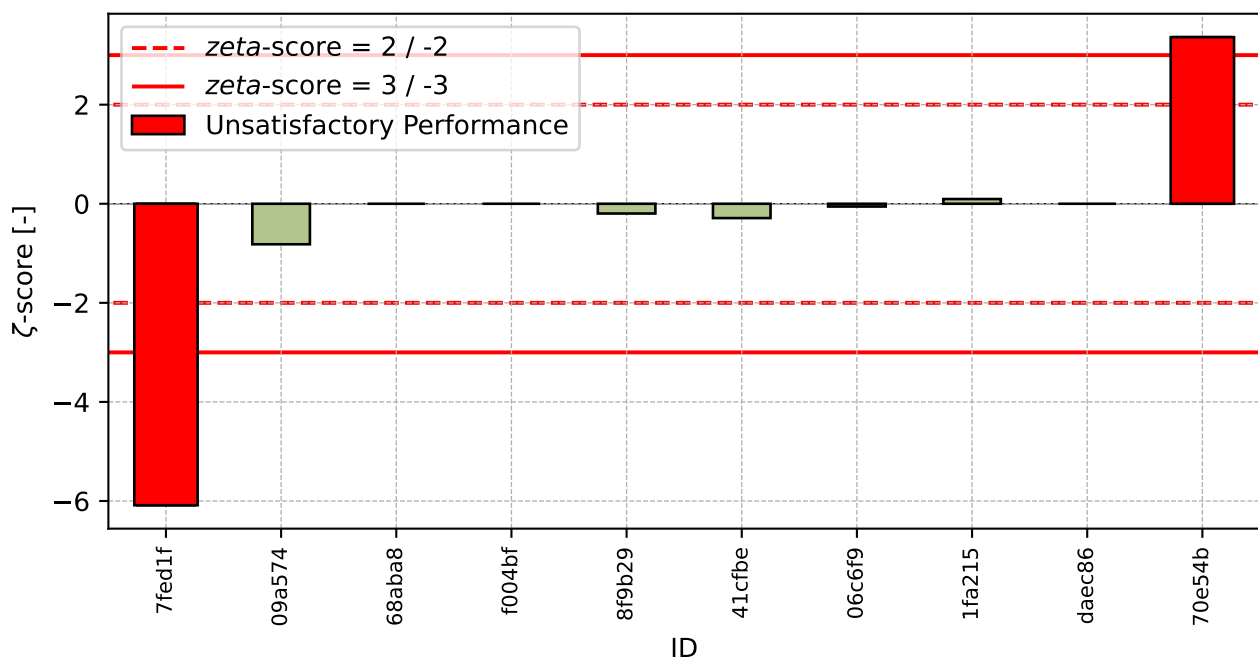


Figure 139: z-score

Figure 140: ζ -scoreTable 49: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
7fed1f	-1.95	-6.09
09a574	-0.45	-0.82
68aba8	-0.45	-
f004bf	-0.45	-
8f9b29	-0.12	-0.20
41cfbe	-0.12	-0.29
06c6f9	-0.03	-0.06
1fa215	0.72	0.10
daec86	1.38	-
70e54b	1.47	3.36

10.2 Voids

10.2.1 Test results

Table 50: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
daec86	36.1	36.2	35.9	-	36.1	0.15	0.42
70e54b	41.0	40.9	40.7	-	40.9	0.15	0.37
09a574	41.2	41.2	41.3	0.03	41.2	0.06	0.14
41cfbe	43.9	43.8	43.8	0.50	43.8	0.06	0.13
f004bf	44.6	43.6	44.0	-	44.1	0.50	1.14
06c6f9	44.3	44.4	44.8	0.40	44.5	0.26	0.59
68aba8	44.9	44.9	45.2	-	45.0	0.17	0.38
8f9b29	46.3	45.9	45.6	0.60	45.9	0.35	0.76
7fed1f	46.5	46.3	46.2	0.10	46.3	0.15	0.33

10.2.2 The Numerical Procedure for Determining Outliers

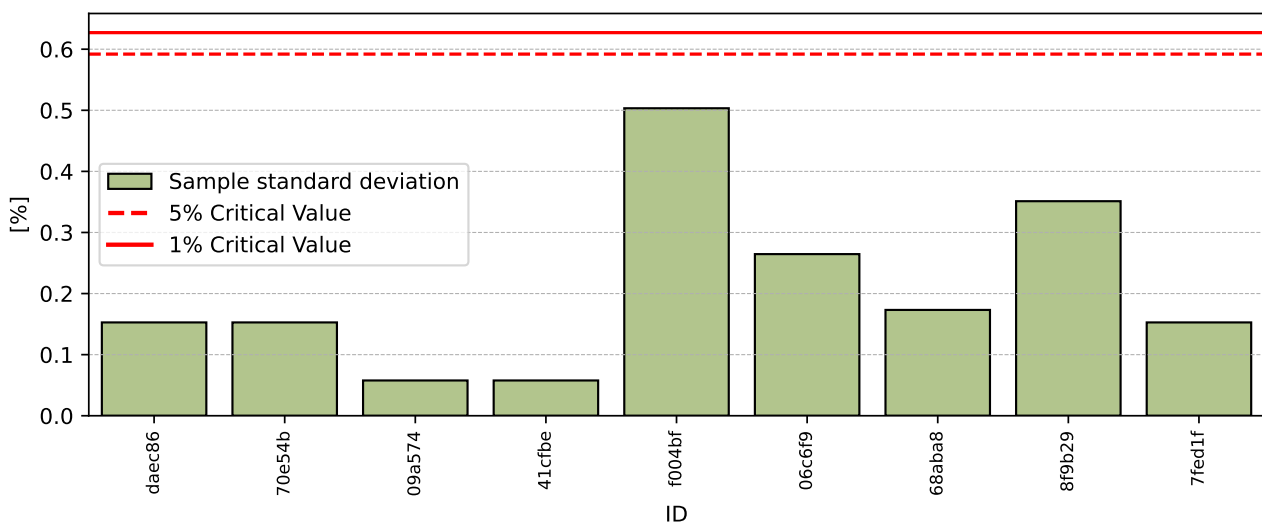


Figure 141: **Cochran's test** - sample standard deviations

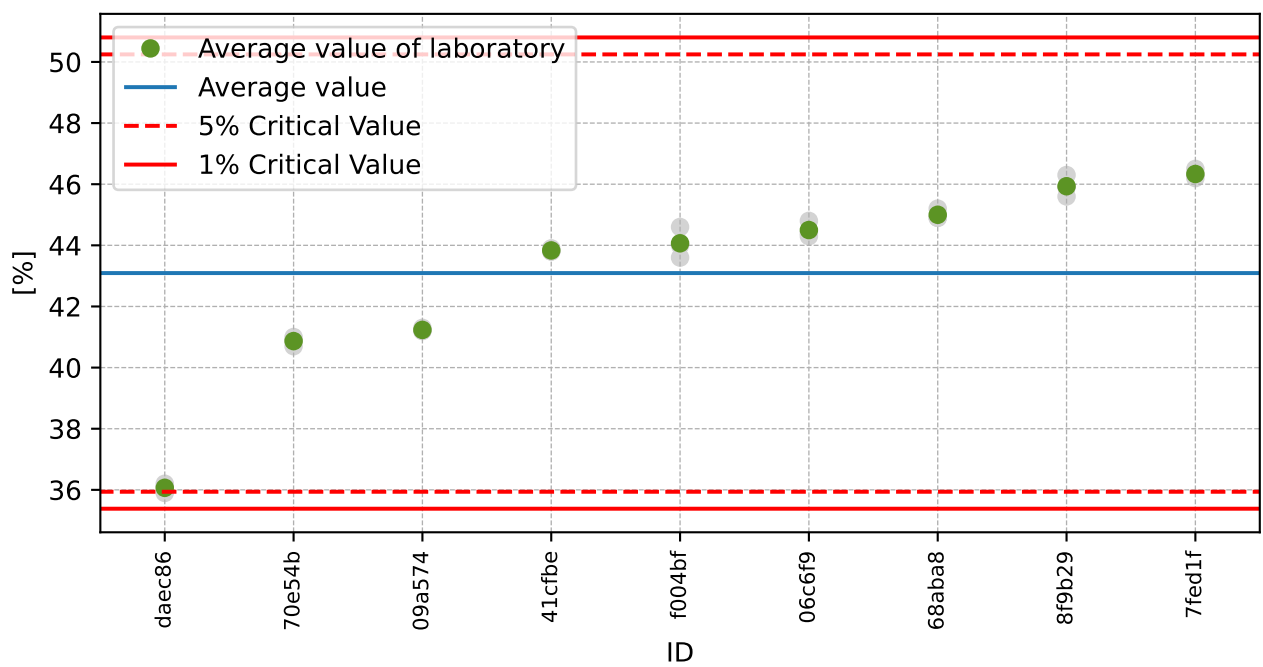


Figure 142: **Grubbs' test** - average values

10.2.3 Mandel's Statistics

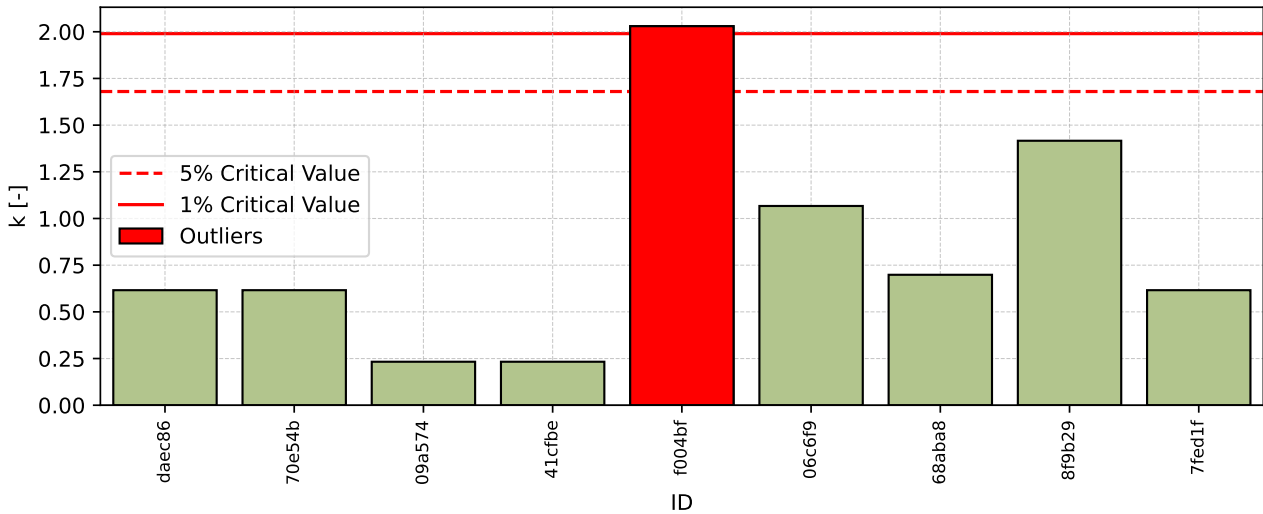


Figure 143: Intralaboratory Consistency Statistic

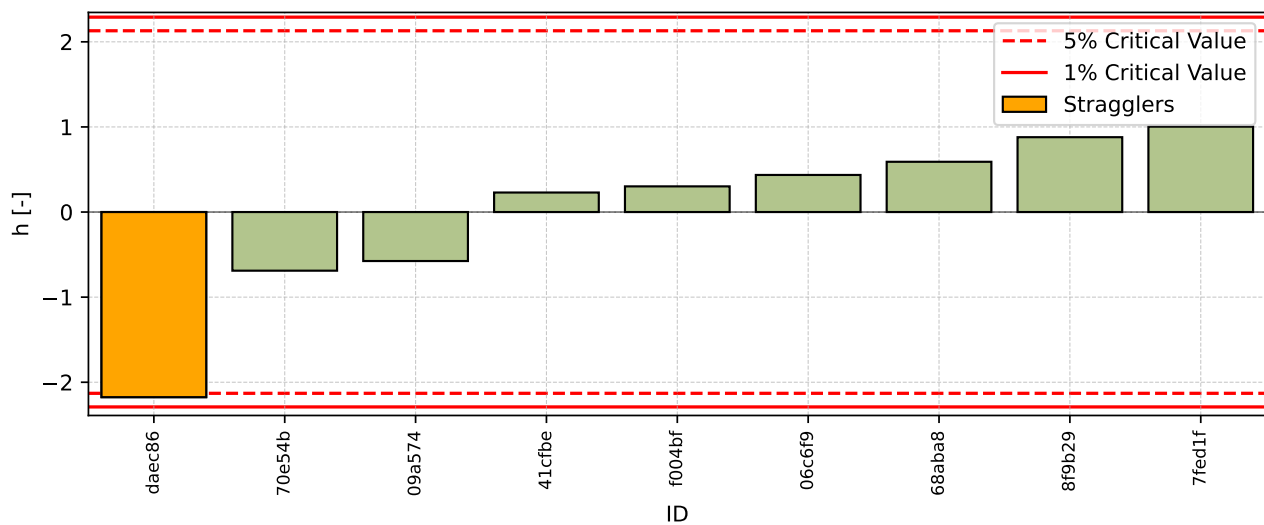


Figure 144: Interlaboratory Consistency Statistic

10.2.4 Descriptive statistics

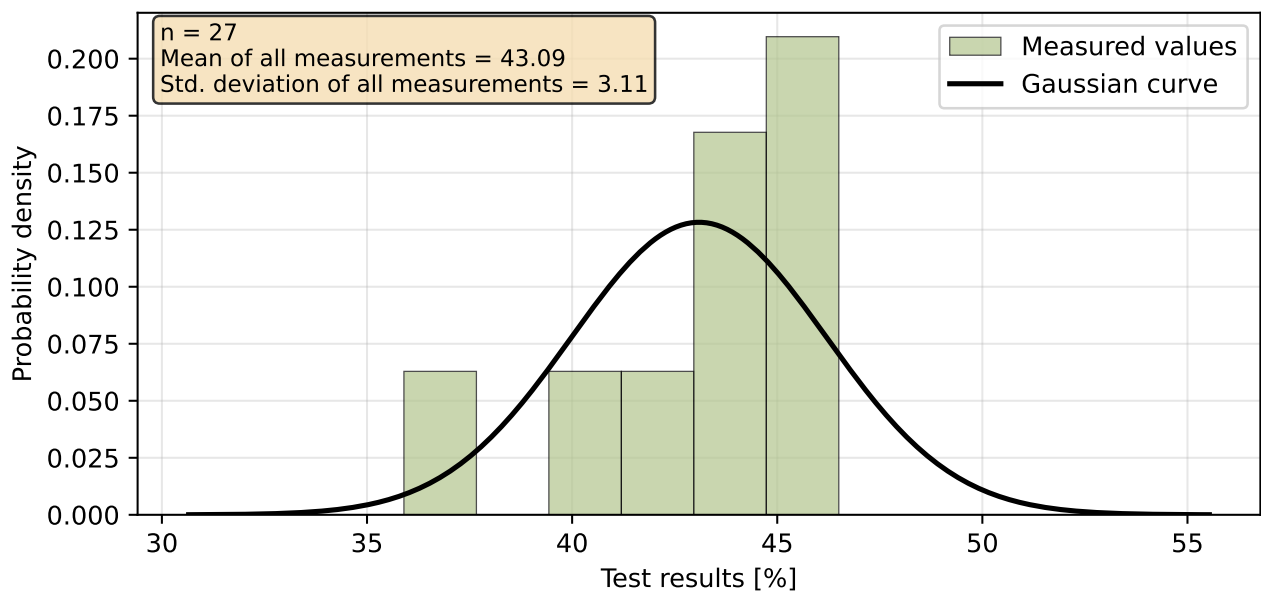


Figure 145: Histogram of all test results

Table 51: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	43.09
Sample standard deviation – s	3.23
Assigned value – x^*	43.09
Robust standard deviation – s^*	3.23
Measurement uncertainty of assigned value – u_X	1.08
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	3.23
Repeatability standard deviation – s_r	0.25
Reproducibility standard deviation – s_R	3.24
Repeatability – r	0.69
Reproducibility – R	9.06

10.2.5 Evaluation of Performance Statistics

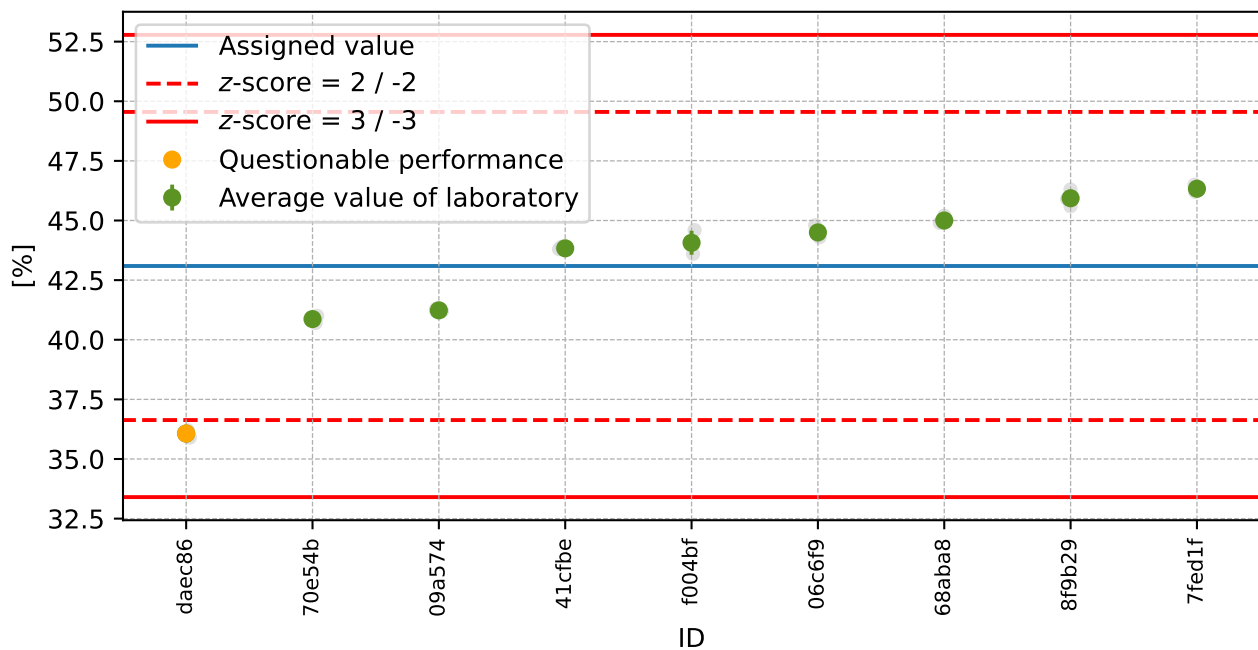


Figure 146: Average values and sample standard deviations

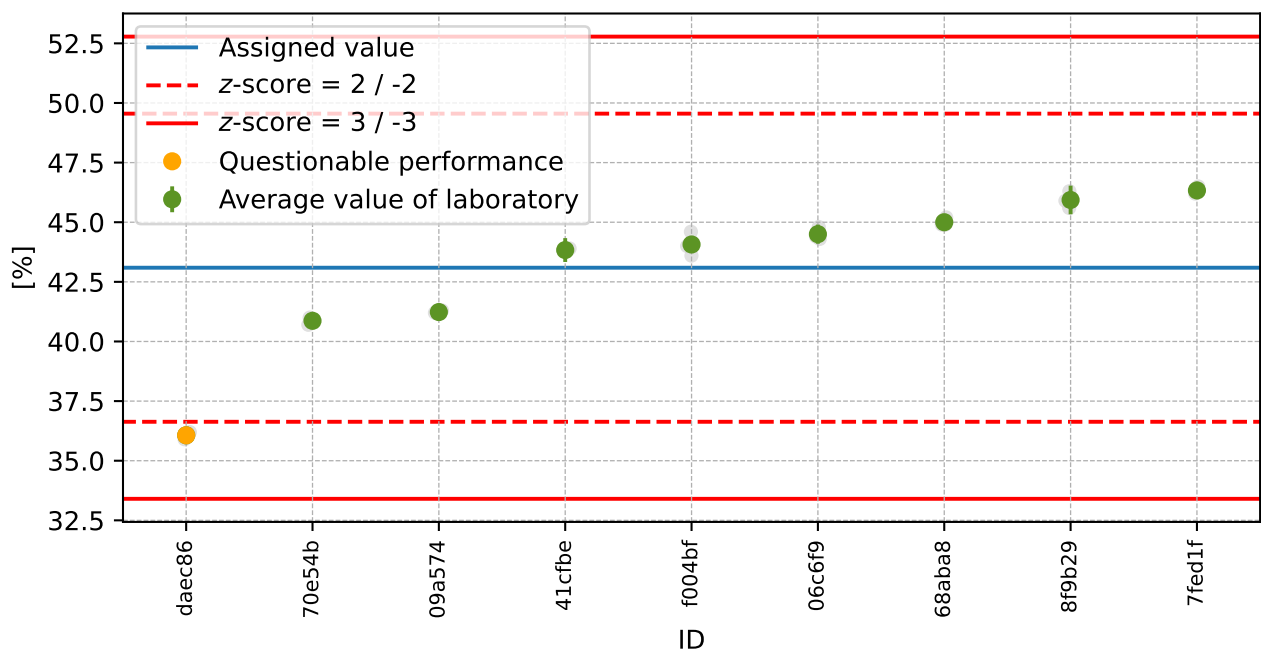


Figure 147: Average values and extended uncertainties of measurement

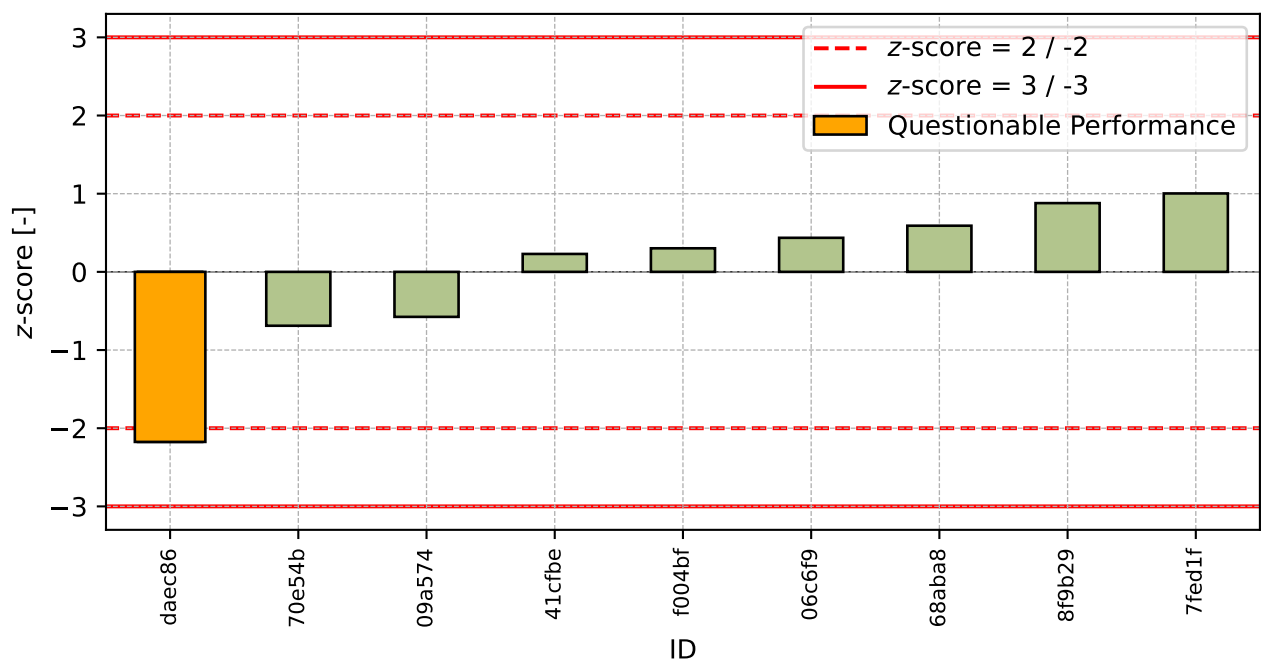
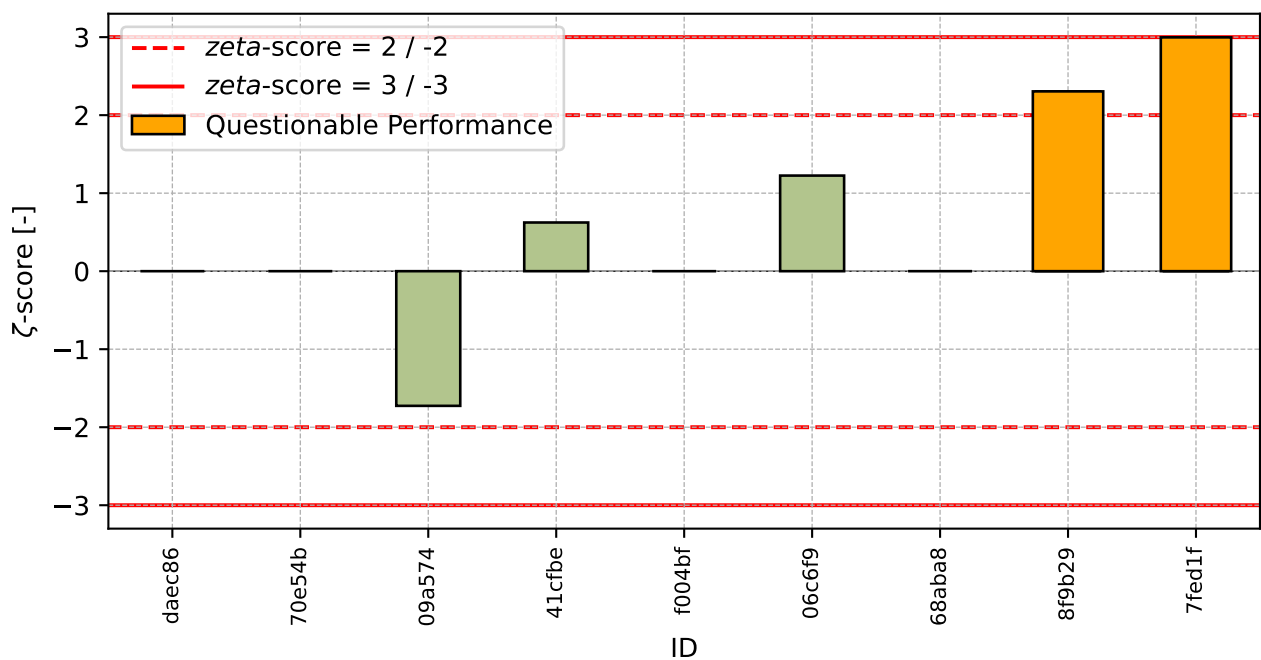


Figure 148: z-score

Figure 149: ζ -scoreTable 52: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
daec86	-2.18	-
70e54b	-0.69	-
09a574	-0.58	-1.73
41cfbe	0.23	0.62
f004bf	0.30	-
06c6f9	0.44	1.23
68aba8	0.59	-
8f9b29	0.88	2.30
7fed1f	1.00	3.00

11 Appendix – EN 1097-5 Determination of the water content by drying in a ventilated oven

11.1 Test results

Table 53: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
1fa215	5.8	5.6	5.9	1.50	5.8	0.15	2.65
ca9941	6.0	6.1	6.0	-	6.0	0.06	0.96
ef433d	5.9	6.0	6.2	0.36	6.0	0.15	2.53
445265	6.2	6.0	6.1	0.20	6.1	0.10	1.64
f11e22	6.2	6.0	6.2	0.80	6.1	0.12	1.88
a28465	6.0	6.3	6.2	0.20	6.2	0.15	2.48
151d5e	6.2	6.1	6.2	0.20	6.2	0.06	0.94
28c7f5	6.1	6.2	6.3	0.20	6.2	0.10	1.61
06c6f9	6.0	6.2	6.4	0.20	6.2	0.20	3.23
12a3d1	6.2	6.2	6.2	0.10	6.2	0.00	0.00
09a574	6.2	6.1	6.3	7.20	6.2	0.10	1.61
083f07	6.1	6.4	6.3	0.20	6.3	0.15	2.44
fa5895	6.3	6.3	6.3	0.00	6.3	0.00	0.00
8f9b29	6.2	6.3	6.4	0.10	6.3	0.10	1.59
f004bf	6.2	6.4	6.3	-	6.3	0.10	1.59
41f49e	6.3	6.3	6.4	0.60	6.3	0.06	0.91
5755fe	6.3	6.4	6.4	0.55	6.4	0.06	0.91
ef8b44	6.3	6.4	6.4	0.16	6.4	0.06	0.91
68aba8	6.5	6.4	6.4	-	6.4	0.06	0.90
b53a36	6.4	6.5	6.4	-	6.4	0.06	0.90
718742	6.5	6.4	6.5	0.20	6.5	0.06	0.89
b1b0a7	6.7	6.3	6.5	0.20	6.5	0.20	3.08
01fb67	6.5	6.5	6.5	0.55	6.5	0.00	0.00
fc13cc	6.5	6.5	6.5	0.40	6.5	0.00	0.00
8366ea	6.5	6.6	6.5	-	6.5	0.06	0.88
12bc15	6.5	6.7	6.4	-	6.5	0.15	2.34
bca32e	6.5	6.5	6.6	-	6.5	0.06	0.88
61e079	6.6	6.6	6.5	-	6.6	0.06	0.88
e79754	6.5	6.3	7.0	0.50	6.6	0.36	5.46
415468	6.6	6.8	6.6	-	6.7	0.12	1.73
885b3b	7.3	7.1	6.9	0.60	7.1	0.20	2.82
e30500	7.3	7.1	6.9	0.60	7.1	0.20	2.82

11.2 The Numerical Procedure for Determining Outliers

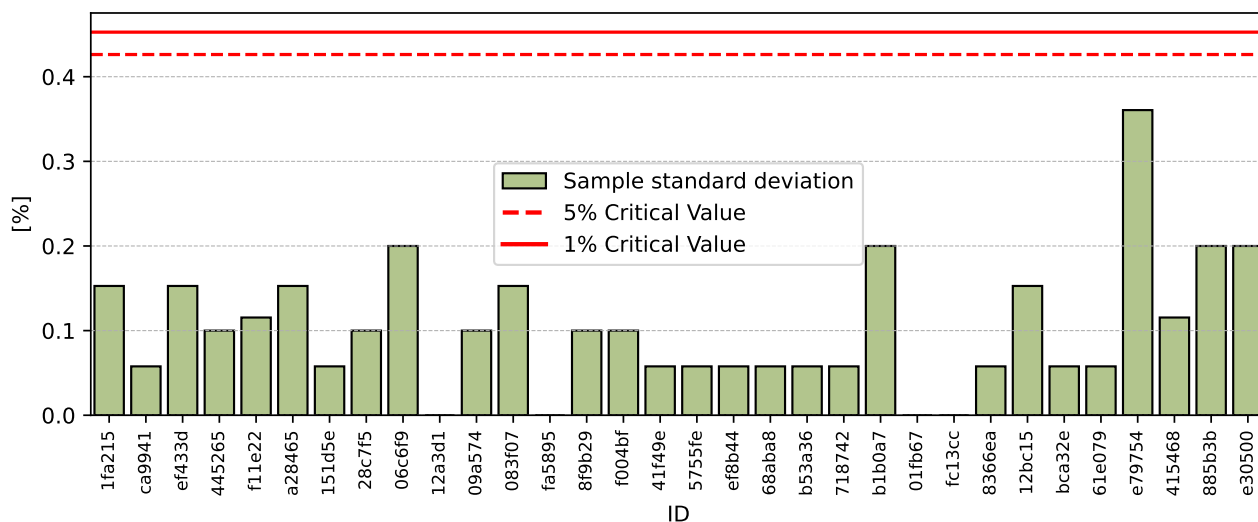


Figure 150: **Cochran's test** - sample standard deviations

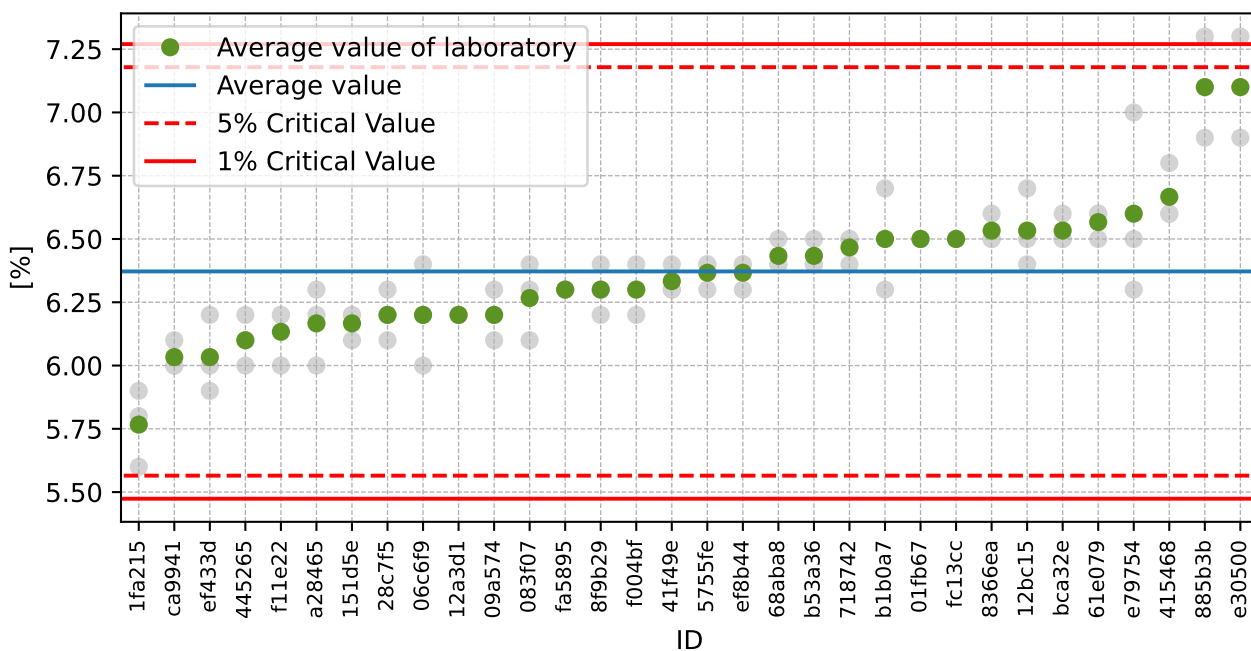


Figure 151: **Grubbs' test** - average values

11.3 Mandel’s Statistics

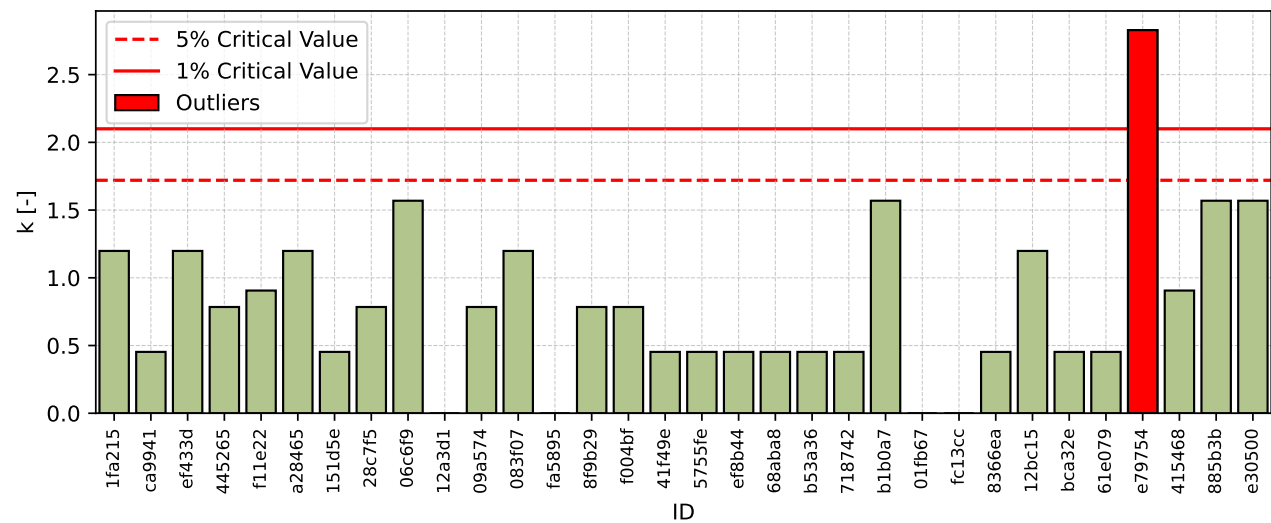


Figure 152: Intralaboratory Consistency Statistic

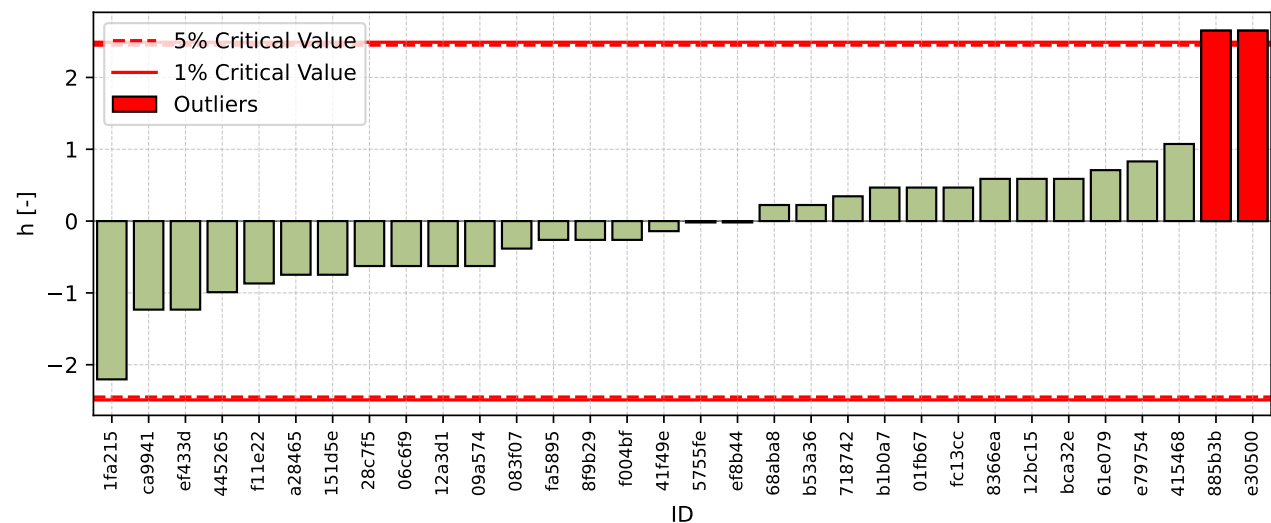


Figure 153: Interlaboratory Consistency Statistic

11.4 Descriptive statistics

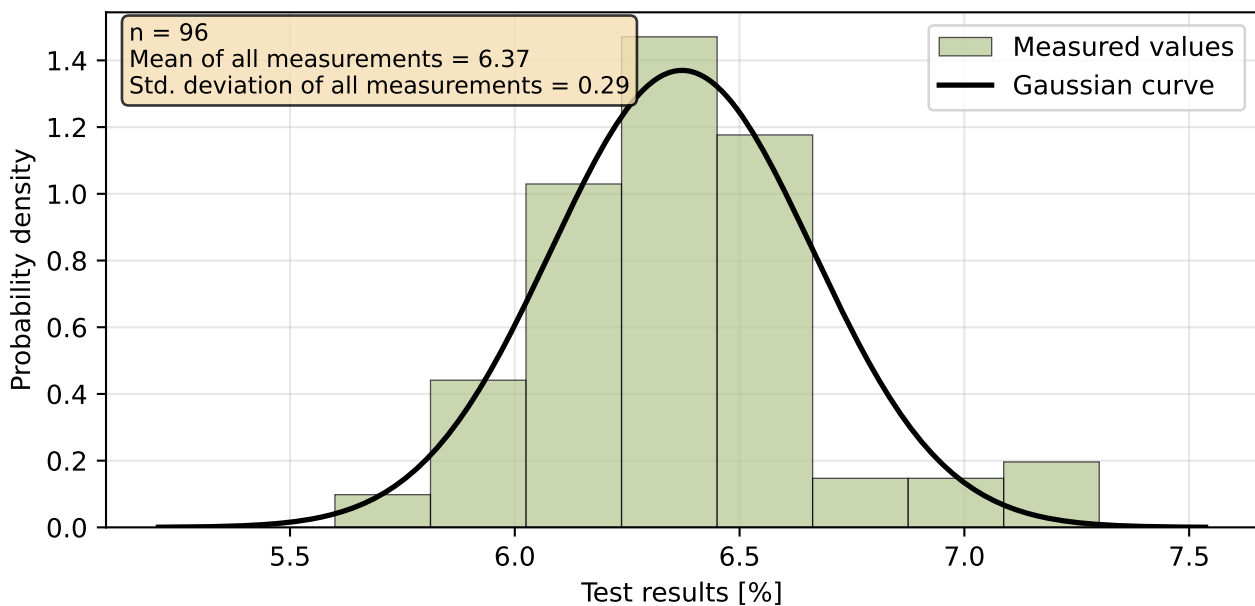


Figure 154: Histogram of all test results

Table 54: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	6.37
Sample standard deviation – s	0.27
Assigned value – x^*	6.37
Robust standard deviation – s^*	0.27
Measurement uncertainty of assigned value – u_X	0.05
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	0.26
Repeatability standard deviation – s_r	0.13
Reproducibility standard deviation – s_R	0.29
Repeatability – r	0.36
Reproducibility – R	0.82

11.5 Evaluation of Performance Statistics

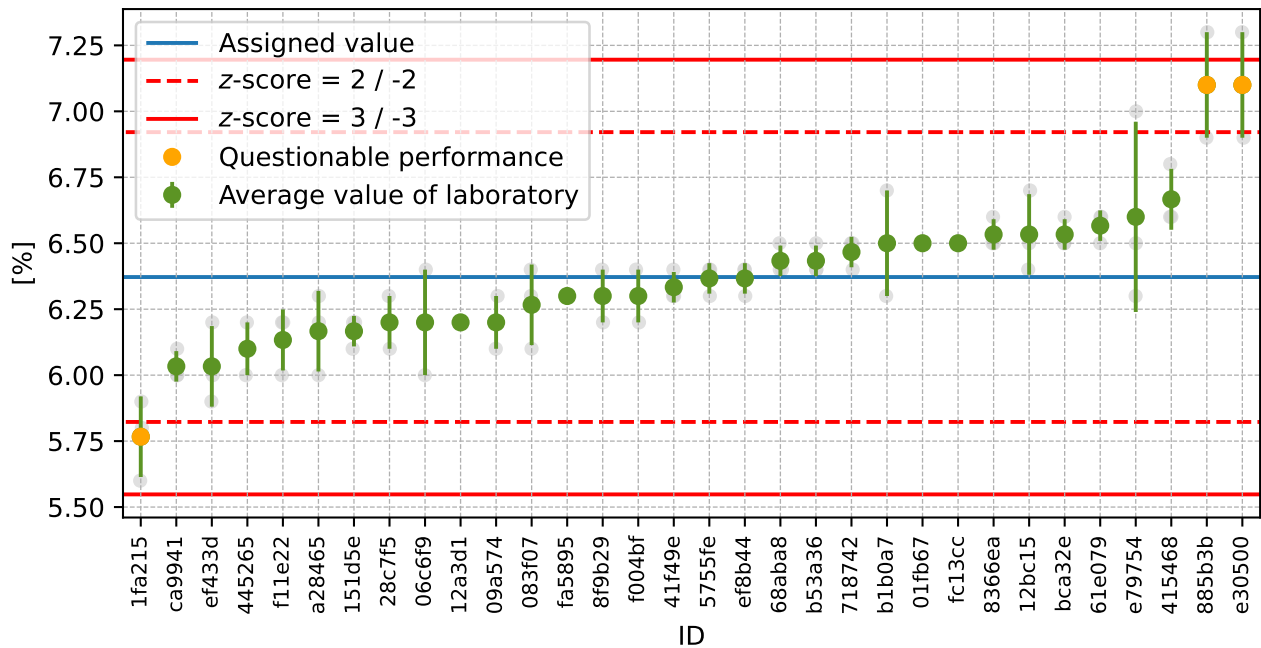


Figure 155: Average values and sample standard deviations

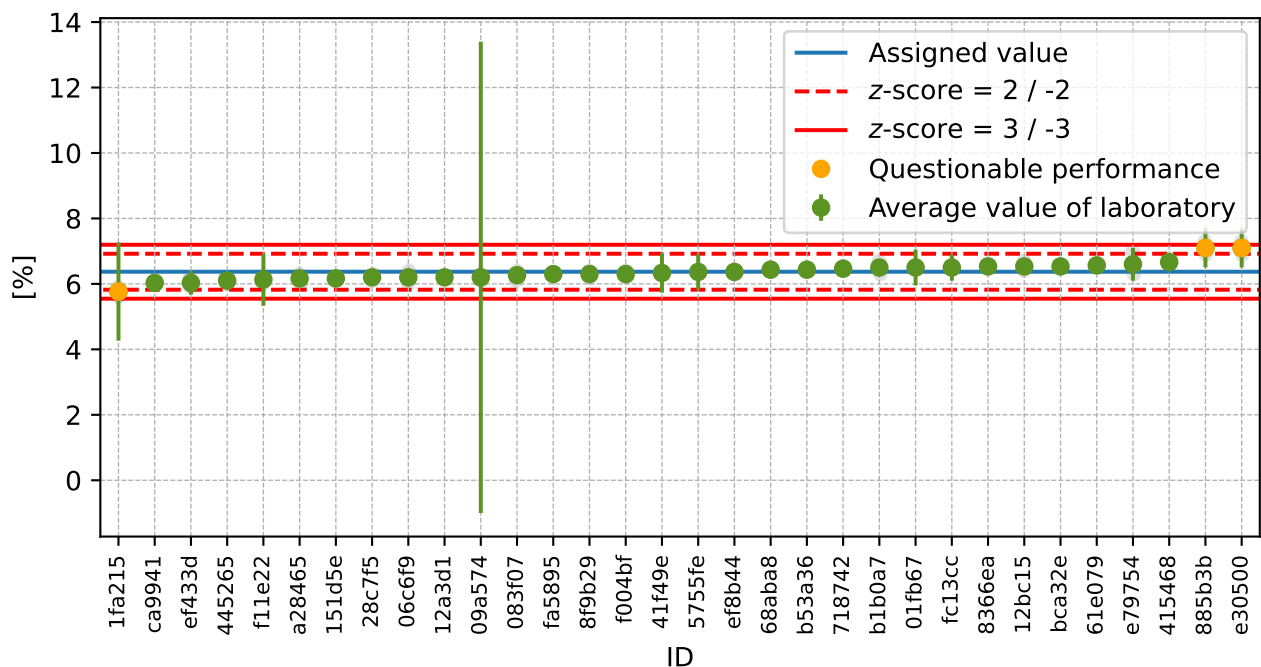


Figure 156: Average values and extended uncertainties of measurement

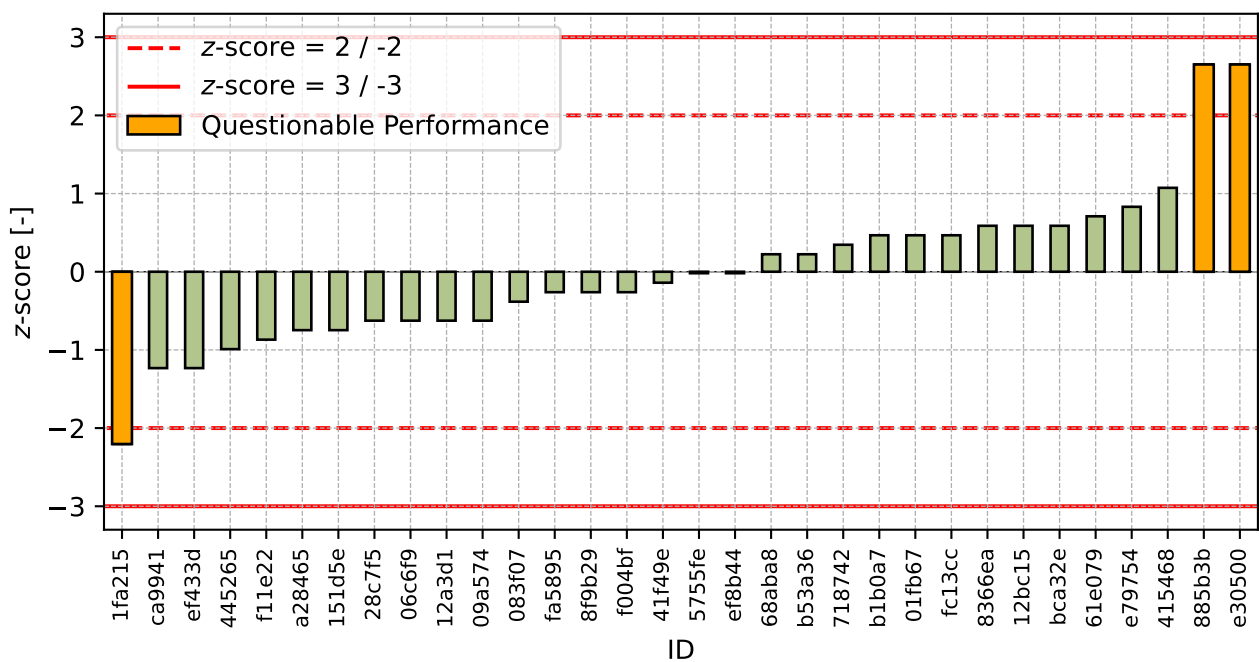


Figure 157: z-score

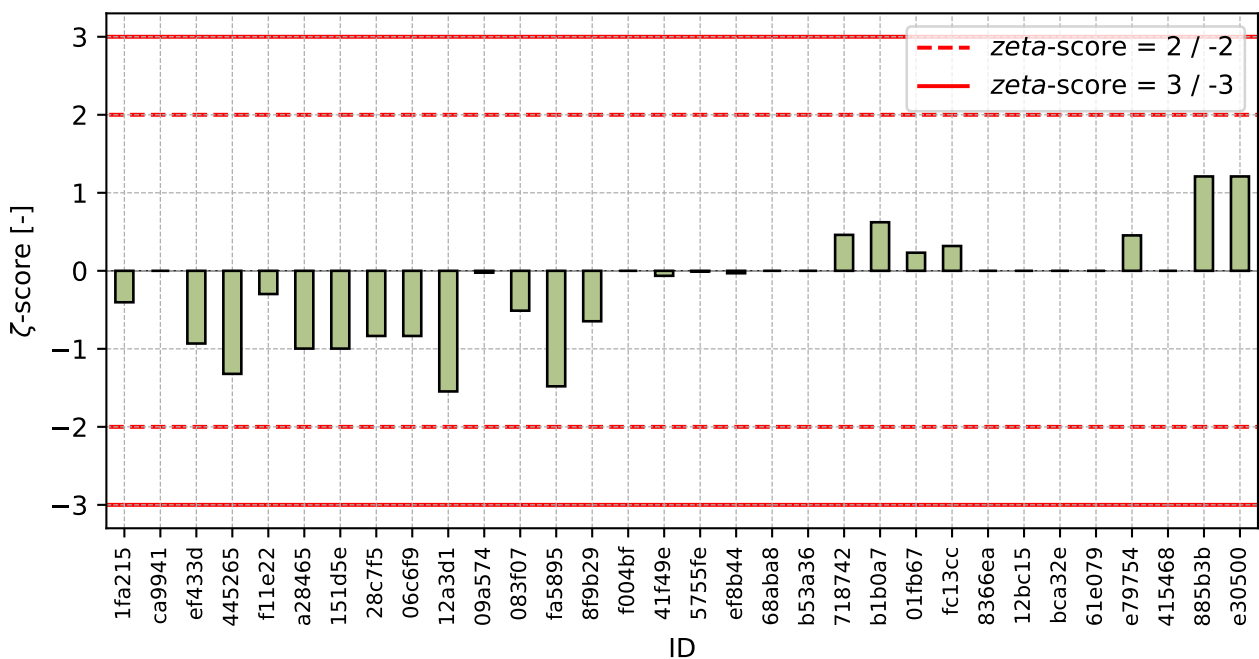
Figure 158: ζ -score

Table 55: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
1fa215	-2.20	-0.40
ca9941	-1.23	-
ef433d	-1.23	-0.93
445265	-0.99	-1.32
f11e22	-0.87	-0.30
a28465	-0.75	-1.00
151d5e	-0.75	-1.00
28c7f5	-0.63	-0.84
06c6f9	-0.63	-0.84
12a3d1	-0.63	-1.55
09a574	-0.63	-0.02
083f07	-0.38	-0.51
fa5895	-0.26	-1.48
8f9b29	-0.26	-0.65
f004bf	-0.26	-
41f49e	-0.14	-0.06
5755fe	-0.02	-0.01
ef8b44	-0.02	-0.03
68aba8	0.22	-
b53a36	0.22	-
718742	0.35	0.46
b1b0a7	0.47	0.62
01fb67	0.47	0.23
fc13cc	0.47	0.32
8366ea	0.59	-
12bc15	0.59	-
bca32e	0.59	-
61e079	0.71	-
e79754	0.83	0.45
415468	1.07	-
885b3b	2.65	1.21
e30500	2.65	1.21

12 Appendix – EN 1097-6 Determination of particle density and water absorption - chapter 8

12.1 Particle density

12.1.1 Test results

Table 56: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_x – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_x – variation coefficient

ID	1 [Mg/m ³]	2 [Mg/m ³]	3 [Mg/m ³]	u_x [Mg/m ³]	$\bar{x}$ [Mg/m ³]	s_0 [Mg/m ³]	V_x [%]
cead79	2.58	2.61	2.64	0.060	2.59	0.021	0.82
e30500	2.62	2.62	2.62	0.090	2.62	0.000	0.00
68aba8	2.63	2.64	2.64	-	2.64	0.006	0.22
fa5895	2.64	2.64	2.64	0.000	2.64	0.000	0.00
0fcd1a	2.64	2.64	2.64	0.055	2.64	0.000	0.00
98b068	2.65	2.64	2.65	-	2.65	0.006	0.22
8f9b29	2.65	2.63	2.66	0.020	2.65	0.015	0.58
74e055	2.65	2.65	2.65	0.320	2.65	0.000	0.00
c0dfa6	2.66	2.66	2.66	0.100	2.66	0.000	0.00
0a07be	2.67	2.66	2.65	1.000	2.66	0.010	0.38
cc3310	2.66	2.66	2.66	-	2.66	0.000	0.00
8cf955	2.66	2.66	2.66	0.030	2.66	0.000	0.00
415468	2.67	2.66	2.66	-	2.66	0.006	0.22
60220d	2.67	2.66	2.67	0.030	2.67	0.006	0.22
c2bf7f	2.67	2.67	2.66	0.020	2.67	0.006	0.22
f004bf	2.67	2.67	2.67	-	2.67	0.000	0.00
28c7f5	2.67	2.66	2.68	0.035	2.67	0.010	0.37
e2f492	2.67	2.67	2.67	0.010	2.67	0.000	0.00
7235f4	2.68	2.67	2.67	0.000	2.67	0.006	0.22
083f07	2.67	2.68	2.68	0.060	2.68	0.006	0.22
a988b0	2.68	2.67	2.68	-	2.68	0.006	0.22
53962f	2.67	2.68	2.69	-	2.68	0.010	0.37
72480e	2.68	2.68	2.68	0.010	2.68	0.000	0.00
1fa215	2.69	2.68	2.69	0.600	2.69	0.006	0.21
a28465	2.68	2.68	2.70	0.030	2.69	0.012	0.43
09a574	2.70	2.69	2.70	0.070	2.70	0.006	0.21
06c6f9	2.71	2.70	2.70	0.030	2.70	0.006	0.21

12.1.2 The Numerical Procedure for Determining Outliers

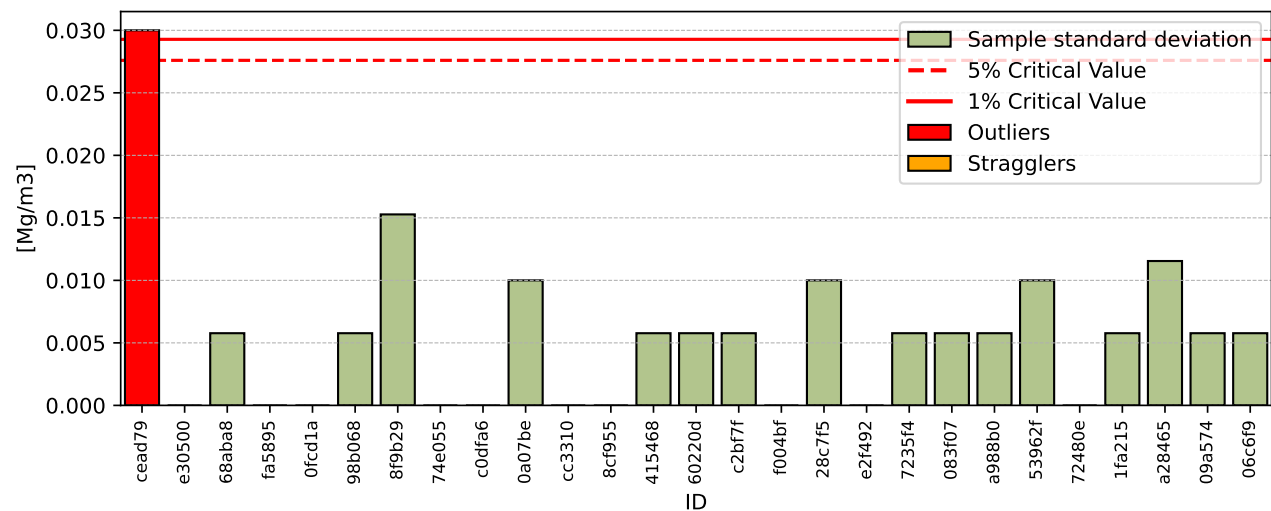


Figure 159: Cochran's test - sample standard deviations

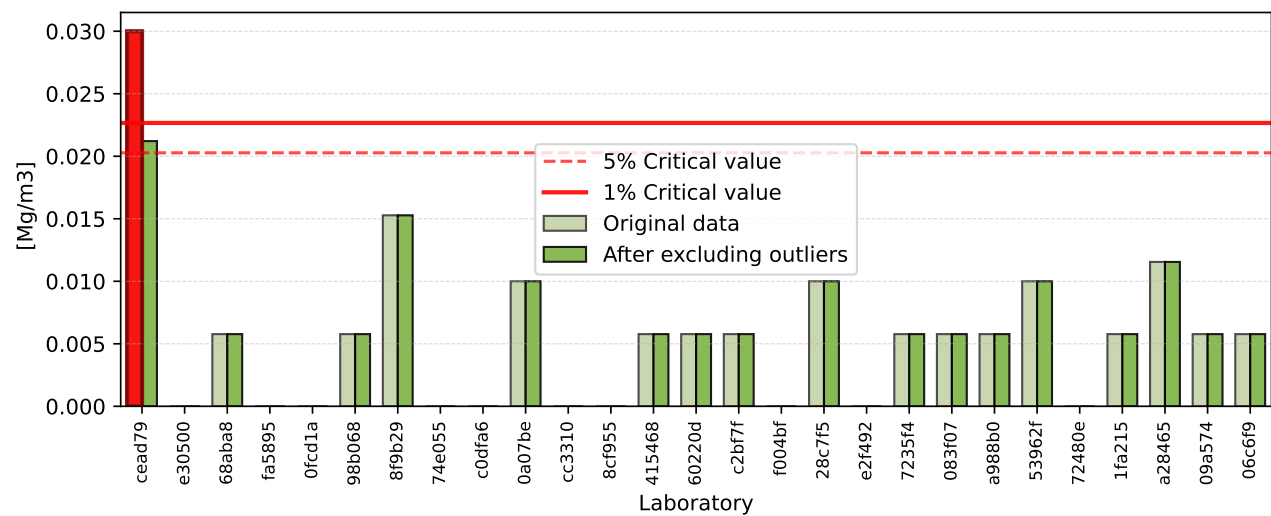
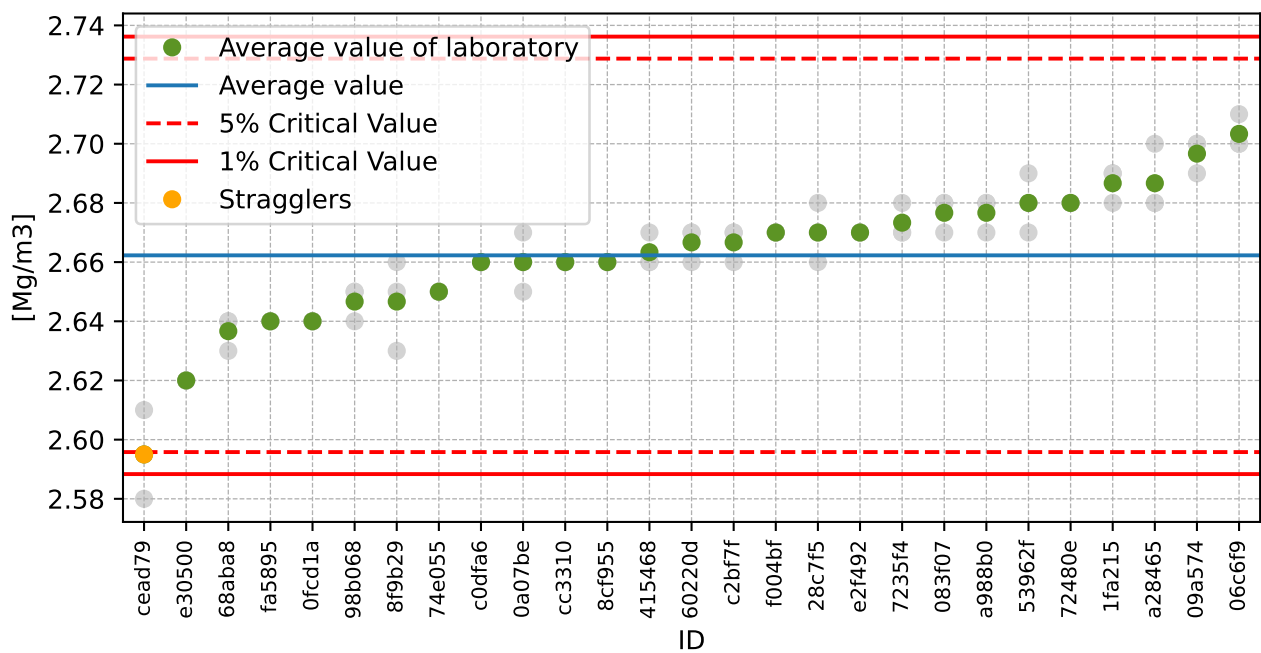


Figure 160: Cochran's test - sample standard deviations without outliers

Figure 161: **Grubbs' test** - average values

12.1.3 Mandel's Statistics

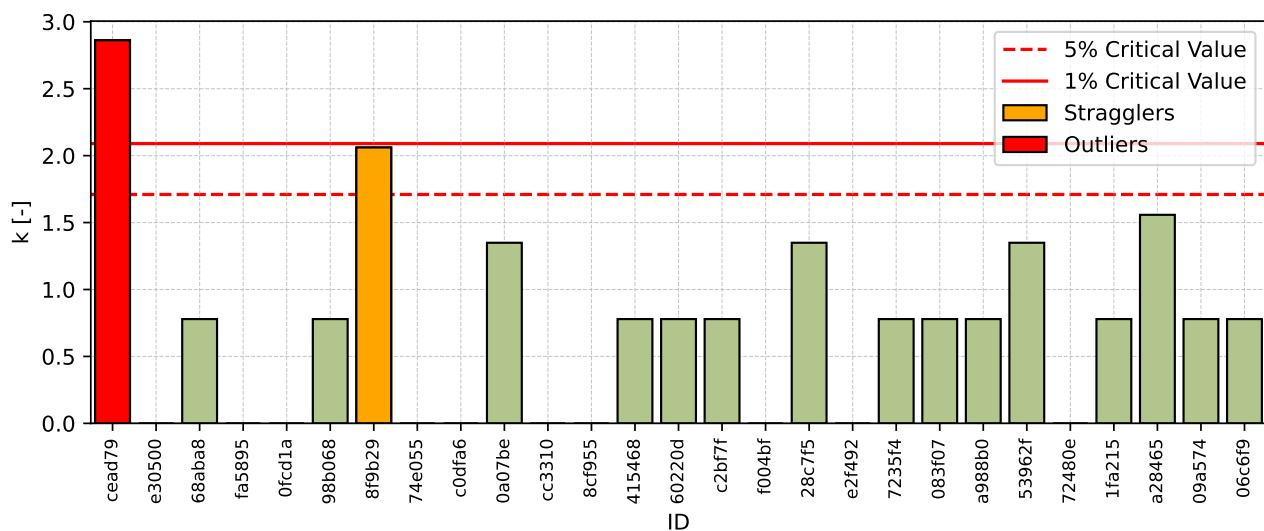


Figure 162: Intralaboratory Consistency Statistic

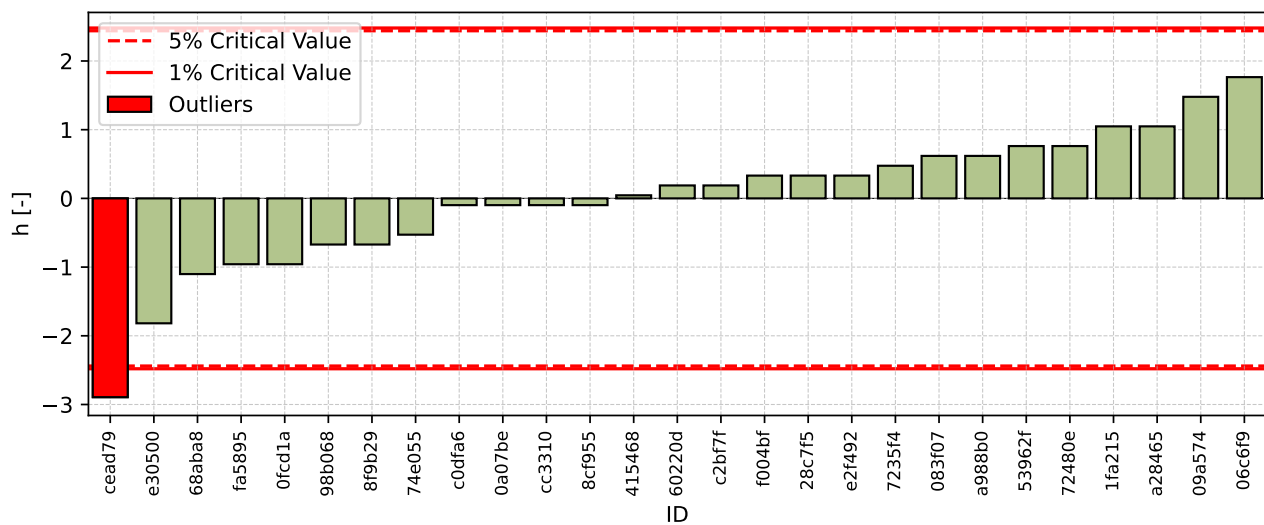


Figure 163: Interlaboratory Consistency Statistic

12.1.4 Descriptive statistics

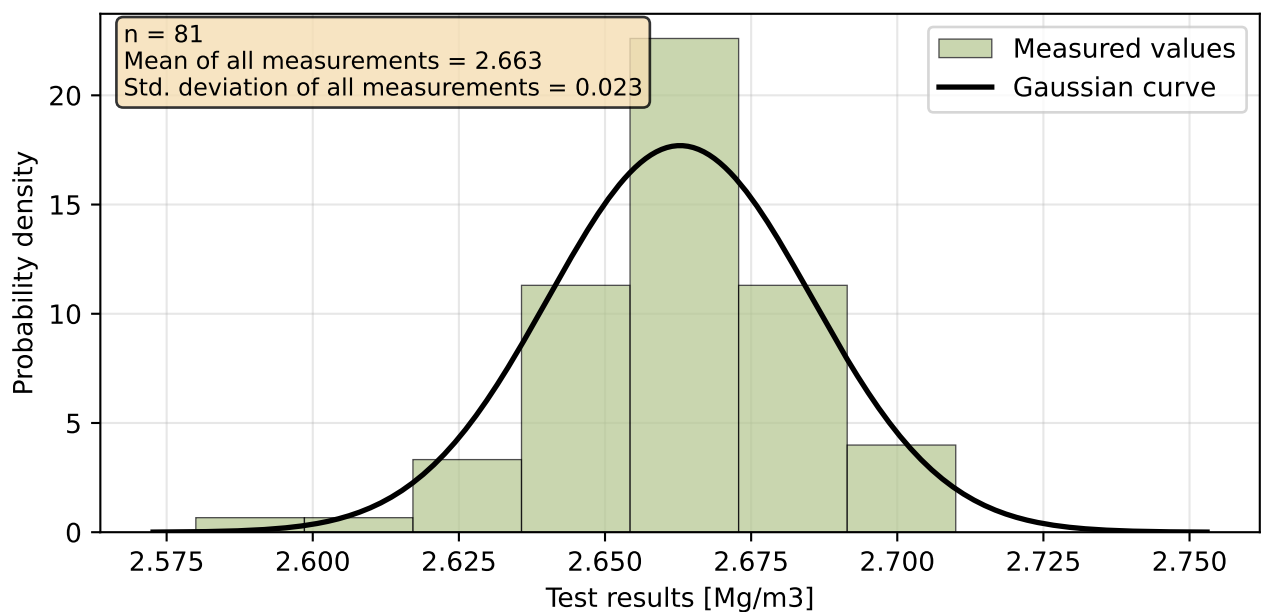


Figure 164: Histogram of all test results

Table 57: Descriptive statistics

Characteristics	[Mg/m ³]
Average value – $\bar{x}$	2.662
Sample standard deviation – s	0.023
Assigned value – x^*	2.662
Robust standard deviation – s^*	0.023
Measurement uncertainty of assigned value – u_X	0.004
p -value of normality test [-]	0.004
Interlaboratory standard deviation – s_L	0.023
Repeatability standard deviation – s_r	0.007
Reproducibility standard deviation – s_R	0.024
Repeatability – r	0.021
Reproducibility – R	0.067

12.1.5 Evaluation of Performance Statistics

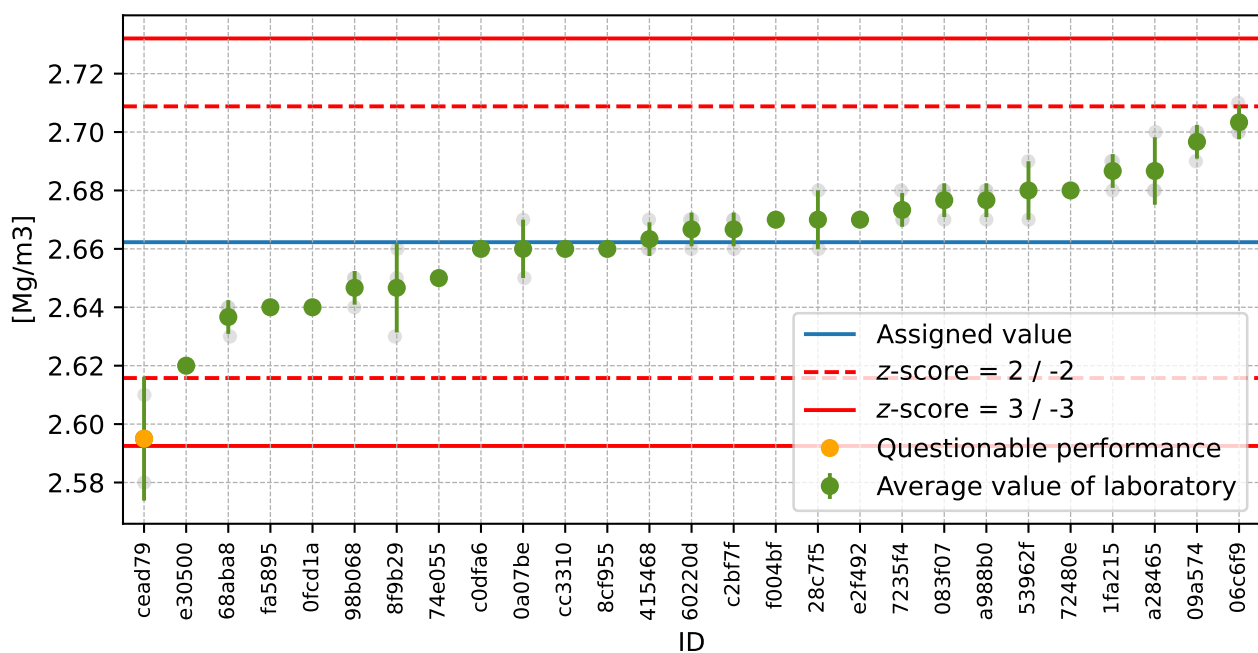


Figure 165: Average values and sample standard deviations

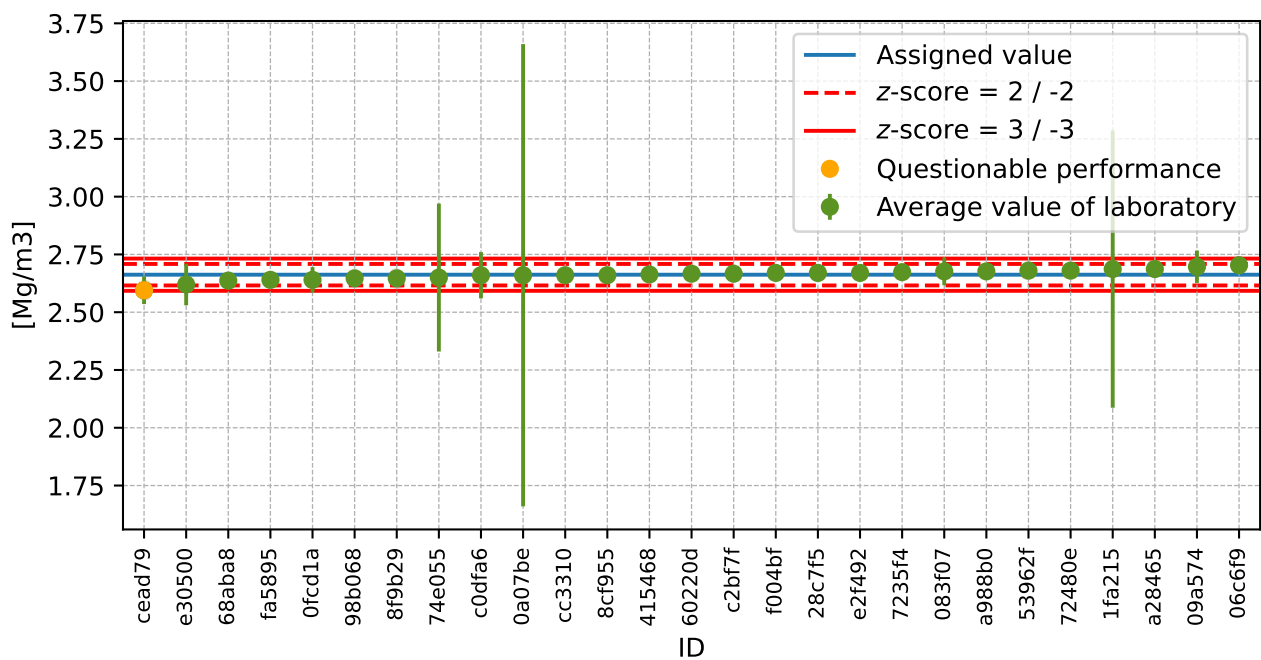


Figure 166: Average values and extended uncertainties of measurement

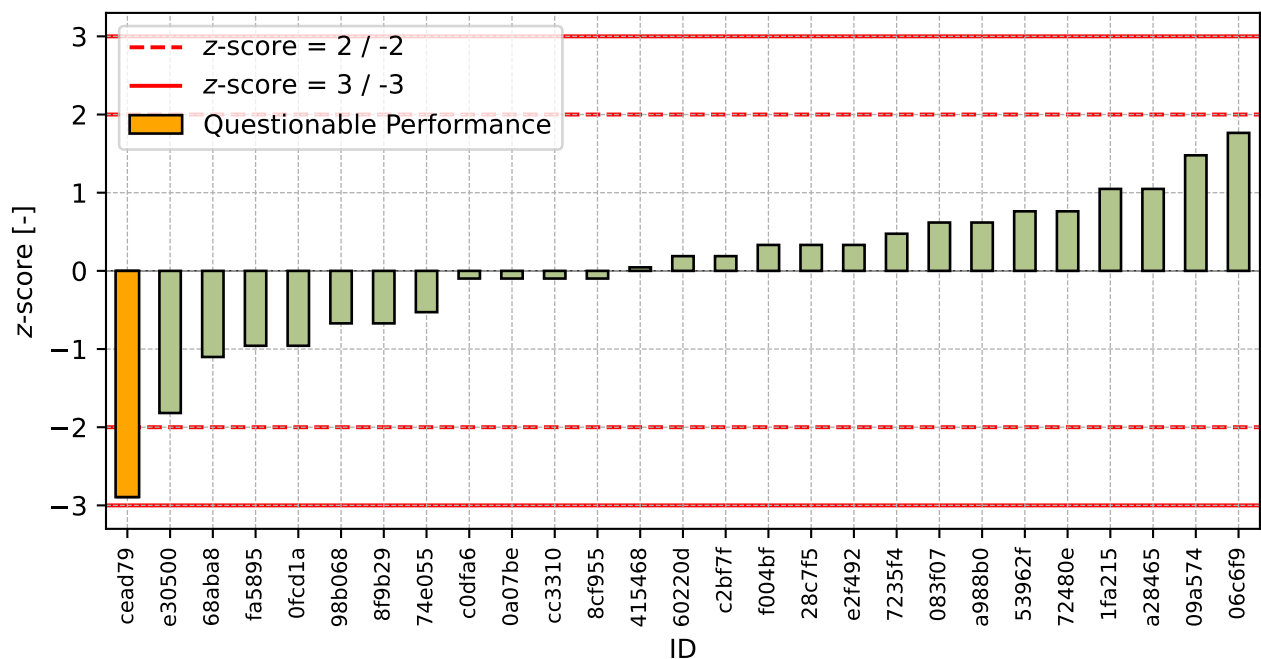
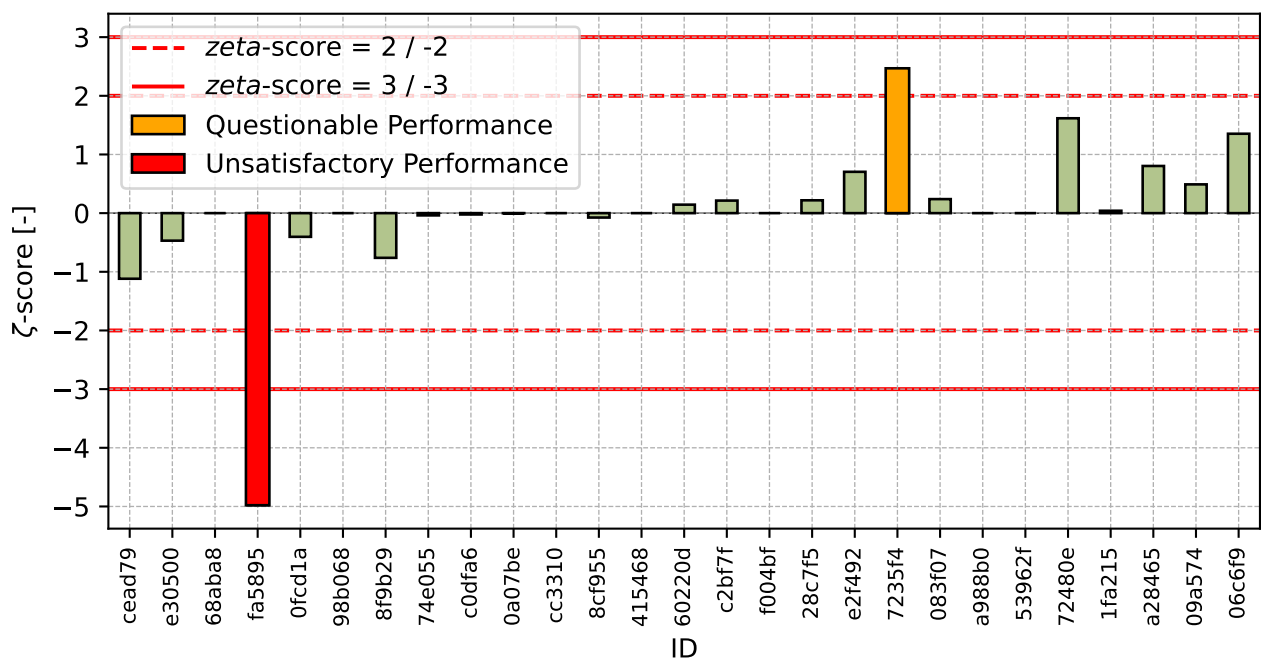


Figure 167: z-score

Figure 168: ζ -scoreTable 58: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
cead79	-2.89	-1.12
e30500	-1.82	-0.47
68aba8	-1.10	-
fa5895	-0.96	-4.98
0fcd1a	-0.96	-0.40
98b068	-0.67	-
8f9b29	-0.67	-0.76
74e055	-0.53	-0.04
c0dfa6	-0.10	-0.02
0a07be	-0.10	-0.00
cc3310	-0.10	-
8cf955	-0.10	-0.08
415468	0.05	-
60220d	0.19	0.14
c2bf7f	0.19	0.21
f004bf	0.33	-
28c7f5	0.33	0.22
e2f492	0.33	0.70
7235f4	0.48	2.47
083f07	0.62	0.24
a988b0	0.62	-
53962f	0.76	-
72480e	0.76	1.62

Continued on next page

Continued from previous page

ID	z-score [-]	ζ-score [-]
1fa215	1.05	0.04
a28465	1.05	0.80
09a574	1.48	0.49
06c6f9	1.77	1.35

12.2 Water absorption

12.2.1 Test results

Table 59: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
415468	0.3	0.3	0.3	-	0.3	0.00	0.00
c2bf7f	0.4	0.2	0.3	0.02	0.3	0.10	33.33
a28465	0.3	0.4	0.4	0.05	0.4	0.06	15.75
1fa215	0.4	0.3	0.4	0.10	0.4	0.06	15.75
e2f492	0.4	0.4	0.4	0.10	0.4	0.00	0.00
e30500	0.5	0.4	0.4	0.05	0.4	0.06	13.32
53962f	0.4	0.5	0.4	-	0.4	0.06	13.32
72480e	0.4	0.5	0.4	0.10	0.4	0.06	13.32
28c7f5	0.5	0.4	0.4	0.04	0.4	0.06	13.32
60220d	0.6	0.4	0.4	0.30	0.5	0.12	24.74
083f07	0.5	0.4	0.5	0.05	0.5	0.06	12.37
fa5895	0.5	0.5	0.5	0.00	0.5	0.00	0.00
c0dfa6	0.5	0.5	0.5	0.10	0.5	0.00	0.00
7235f4	0.5	0.6	0.5	0.00	0.5	0.06	10.83
8f9b29	0.6	0.5	0.5	0.00	0.5	0.06	10.83
a988b0	0.5	0.6	0.5	-	0.5	0.06	10.83
98b068	0.5	0.6	0.5	-	0.5	0.06	10.83
cead79	0.6	0.6	0.6	0.01	0.6	0.00	0.00
74e055	0.6	0.7	0.7	0.08	0.7	0.06	8.66
0fcd1a	0.7	0.7	0.6	0.10	0.7	0.06	8.66
8cf955	0.7	0.8	0.7	0.24	0.7	0.06	7.87
68aba8	0.7	0.8	0.8	-	0.8	0.06	7.53
0a07be	0.7	0.9	0.8	37.00	0.8	0.10	12.50
09a574	0.9	0.8	0.8	9.20	0.8	0.06	6.93
f004bf	1.0	1.0	0.9	-	1.0	0.06	5.97
06c6f9	1.0	1.0	1.0	0.10	1.0	0.00	0.00

12.2.2 The Numerical Procedure for Determining Outliers

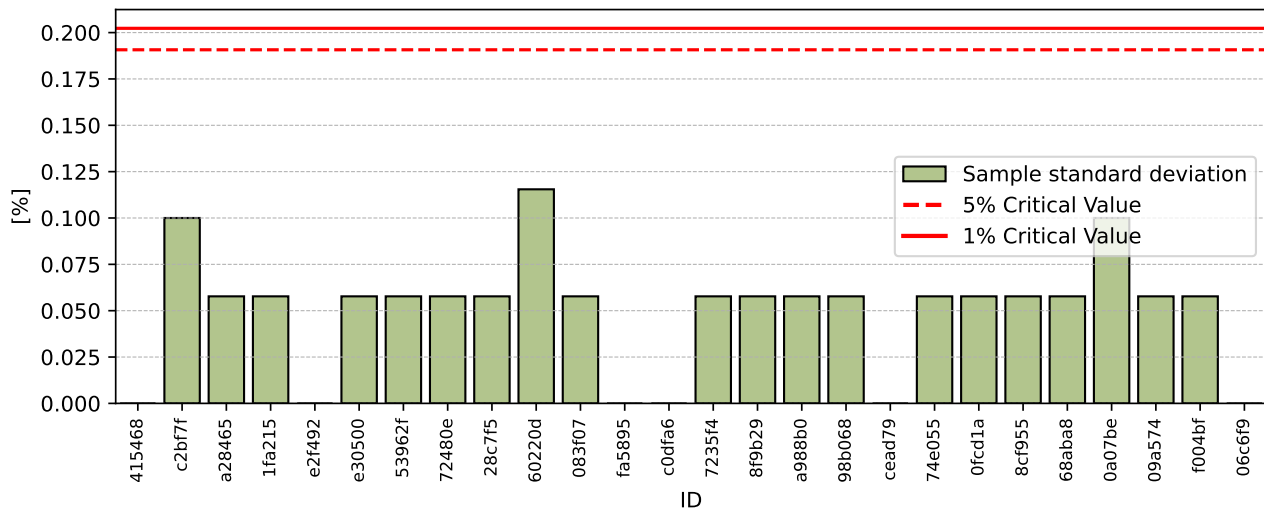


Figure 169: **Cochran's test** - sample standard deviations

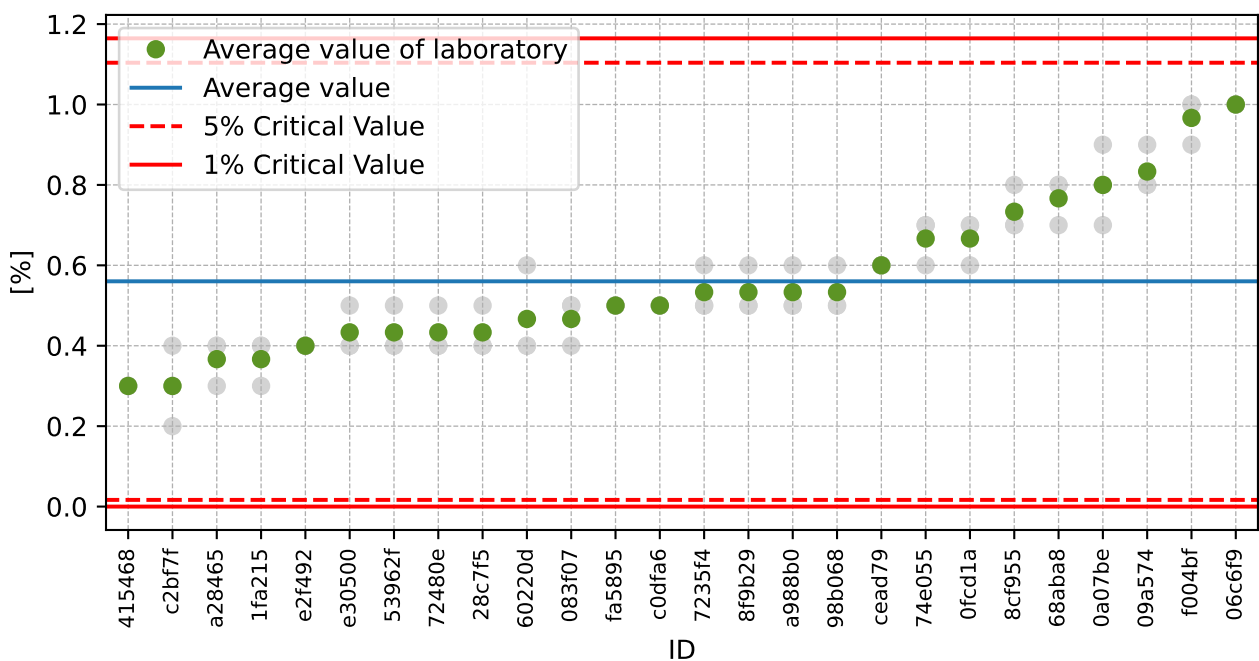


Figure 170: **Grubbs' test** - average values

12.2.3 Mandel’s Statistics

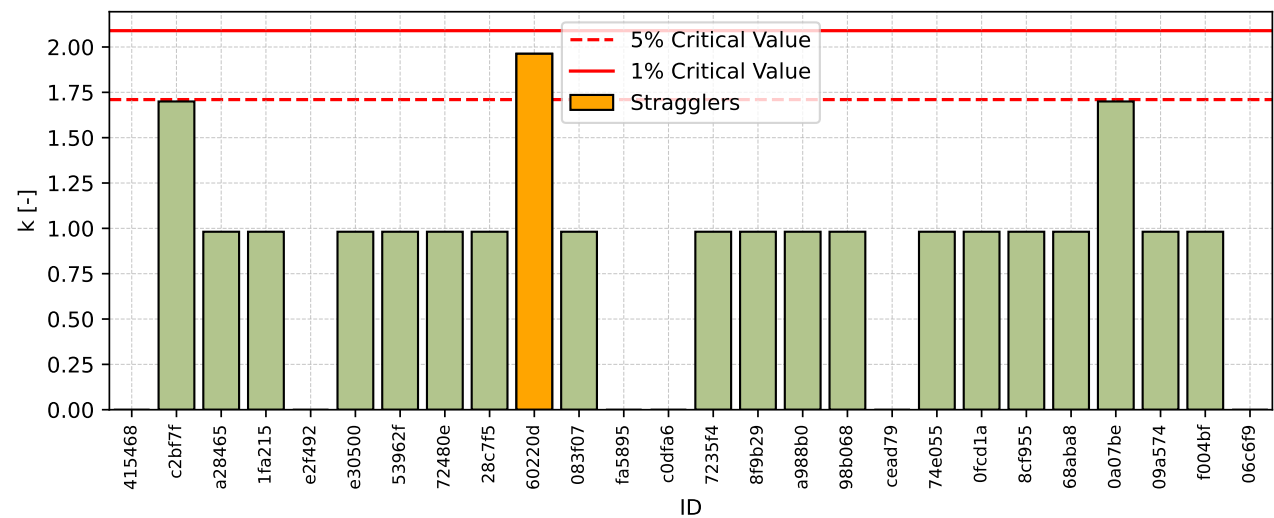


Figure 171: Intralaboratory Consistency Statistic

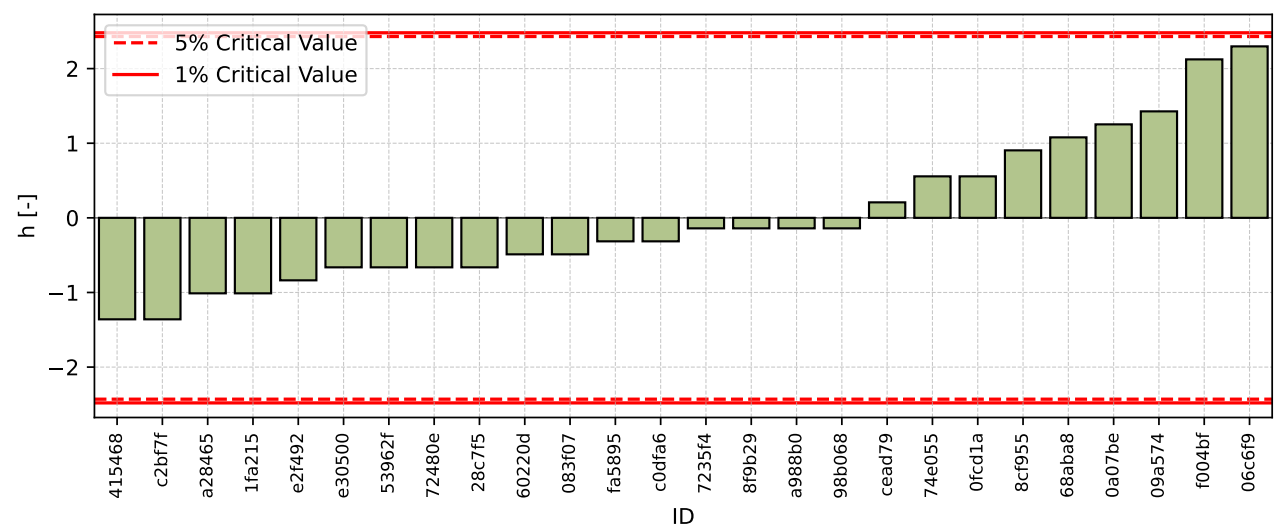


Figure 172: Interlaboratory Consistency Statistic

12.2.4 Descriptive statistics

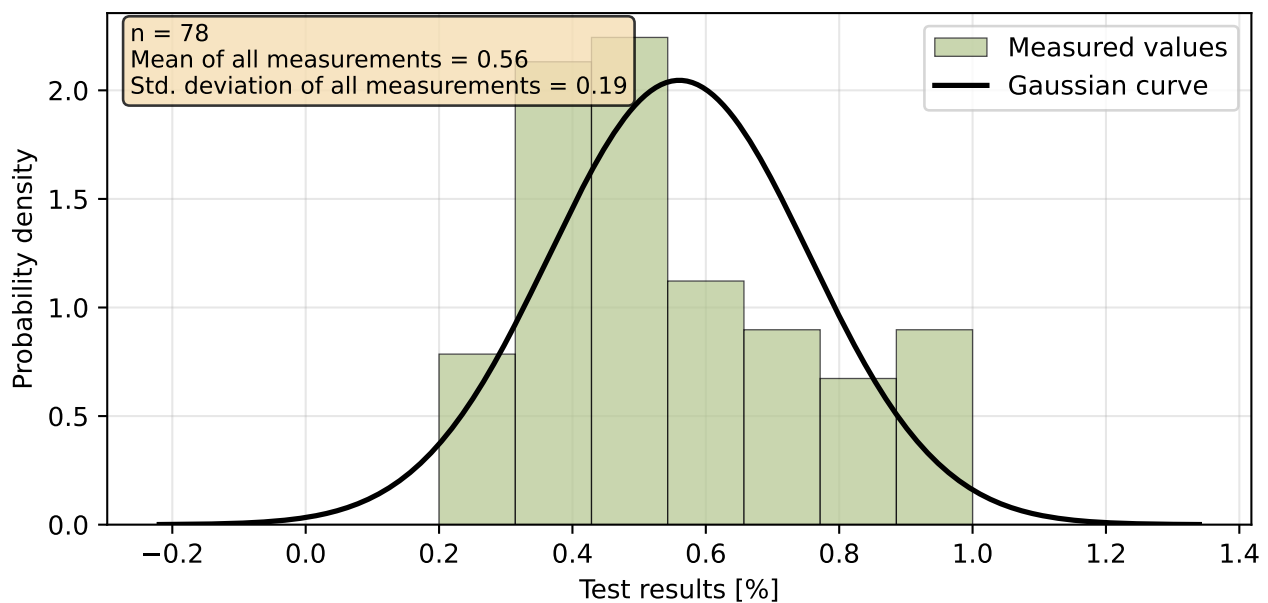


Figure 173: Histogram of all test results

Table 60: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	0.56
Sample standard deviation – s	0.19
Assigned value – x^*	0.56
Robust standard deviation – s^*	0.19
Measurement uncertainty of assigned value – u_X	0.04
p -value of normality test [-]	< 0.001
Interlaboratory standard deviation – s_L	0.19
Repeatability standard deviation – s_r	0.06
Reproducibility standard deviation – s_R	0.20
Repeatability – r	0.16
Reproducibility – R	0.55

12.2.5 Evaluation of Performance Statistics

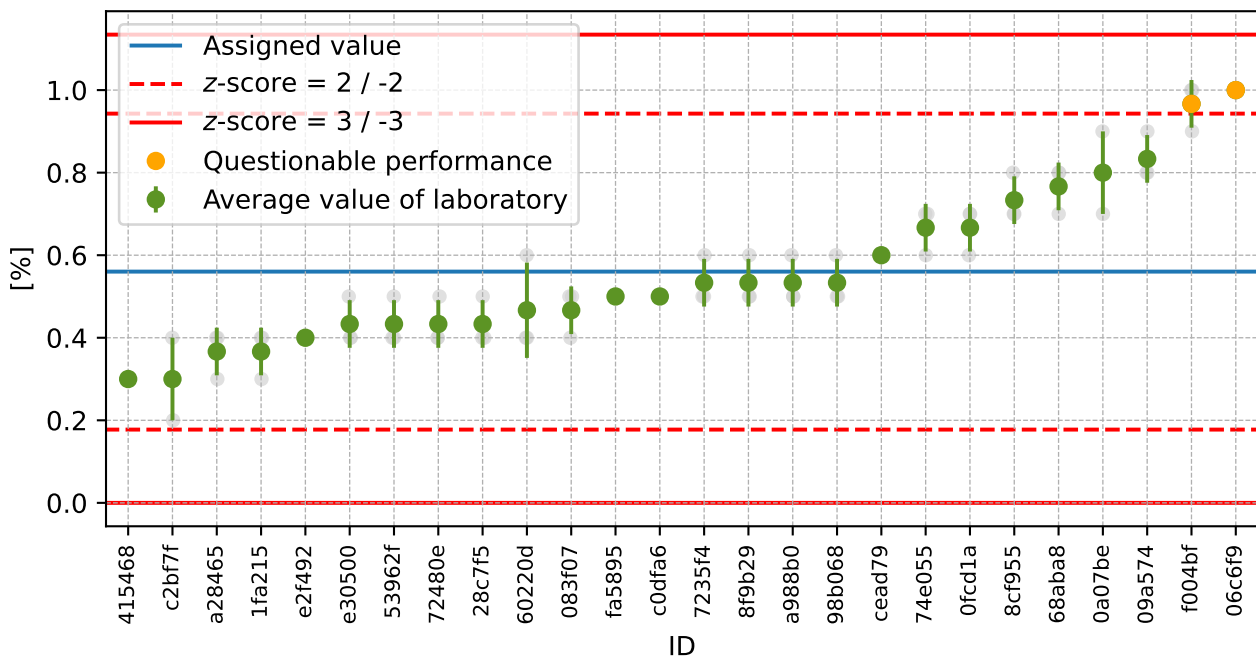


Figure 174: Average values and sample standard deviations

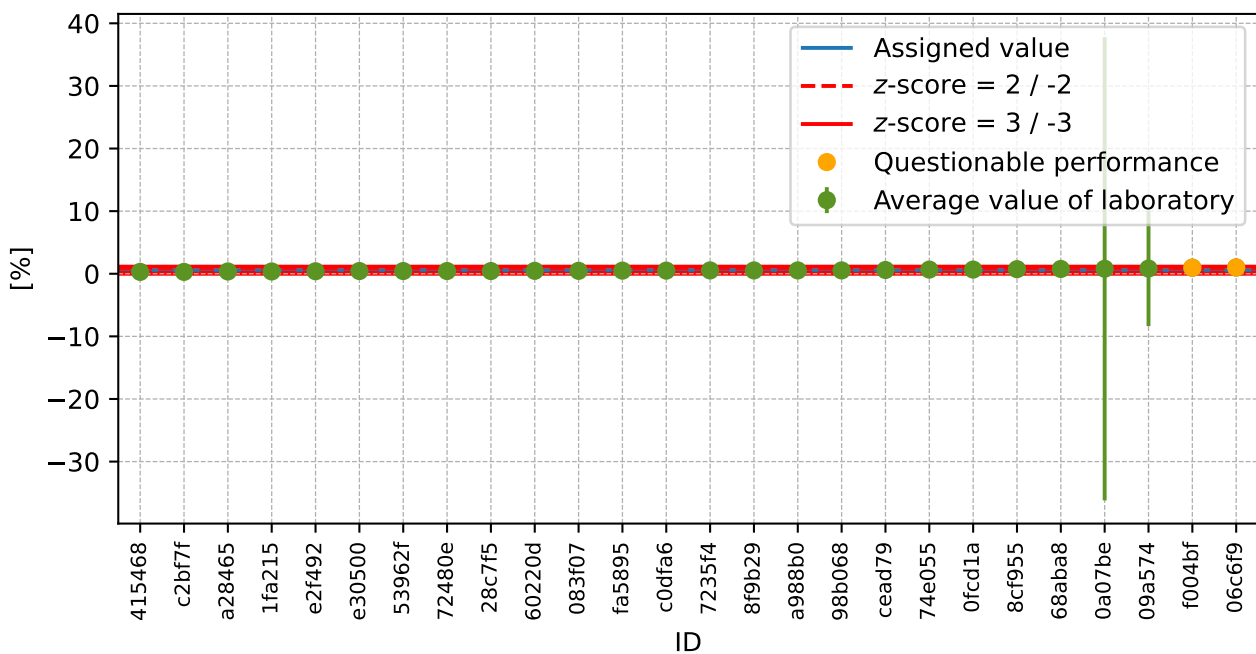


Figure 175: Average values and extended uncertainties of measurement

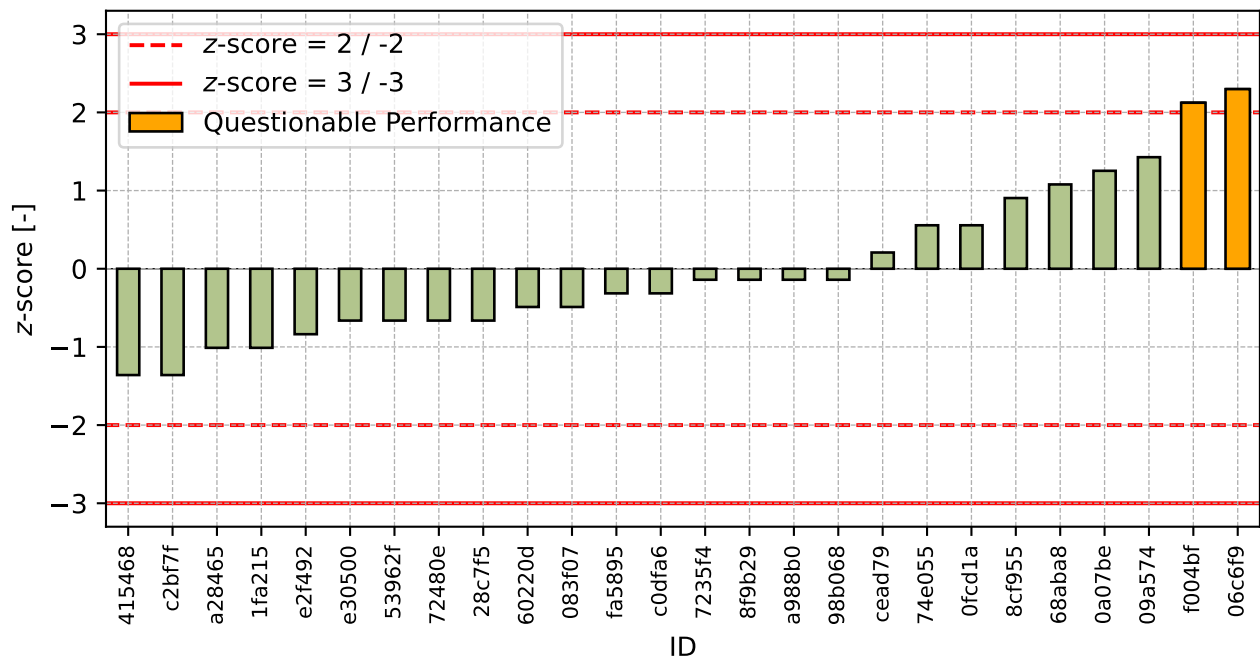


Figure 176: z-score

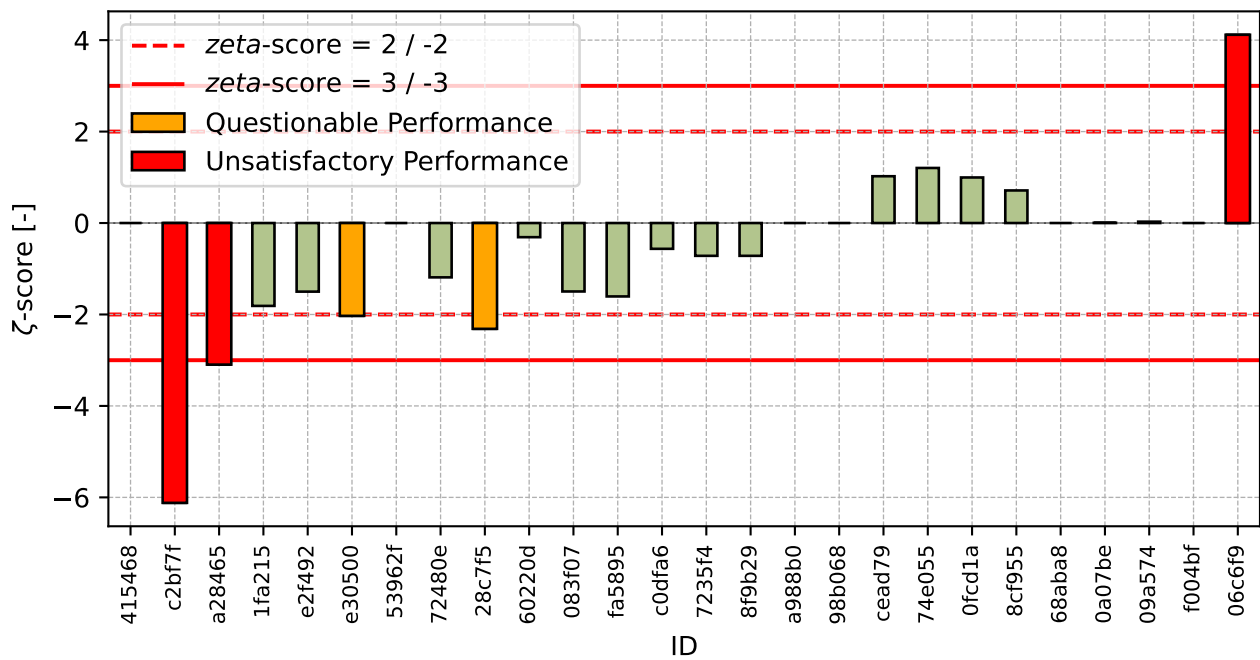


Figure 177: ζ-score

Table 61: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
415468	-1.36	-
c2bf7f	-1.36	-6.12
a28465	-1.01	-3.10
1fa215	-1.01	-1.81
e2f492	-0.84	-1.50
e30500	-0.66	-2.03
53962f	-0.66	-
72480e	-0.66	-1.19
28c7f5	-0.66	-2.31
60220d	-0.49	-0.31
083f07	-0.49	-1.50
fa5895	-0.31	-1.61
c0dfa6	-0.31	-0.56
7235f4	-0.14	-0.72
8f9b29	-0.14	-0.72
a988b0	-0.14	-
98b068	-0.14	-
cead79	0.21	1.02
74e055	0.56	1.20
0fcd1a	0.56	1.00
8cf955	0.90	0.71
68aba8	1.08	-
0a07be	1.25	0.01
09a574	1.43	0.03
f004bf	2.12	-
06c6f9	2.30	4.12

13 Appendix – EN 1097-7 Determination of the particle density of filler - Pyknometer method

13.1 Test results

Table 62: Test results – ordered by average value. Outliers are marked by red color. u_X – extended uncertainty of measurement.

ID	Result [Mg/m ³]	u_X [Mg/m ³]
72480e	2.86	0.011
246ad1	2.87	0.500
71265c	3.03	-
68aba8	3.04	-
415468	3.04	-
a56629	3.04	-
00bb33	3.04	0.002
1fa215	3.05	0.600
c58a44	3.40	0.003

13.2 The Numerical Procedure for Determining Outliers

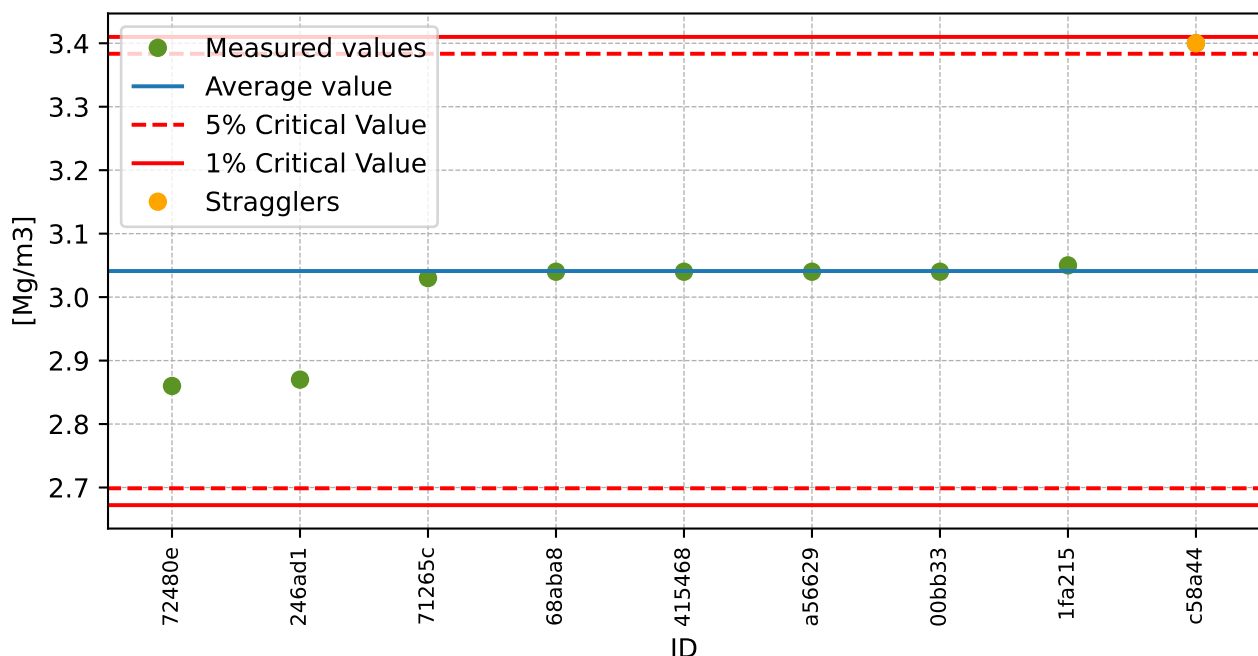


Figure 178: **Grubbs' test** - average values

13.3 Mandel's Statistics

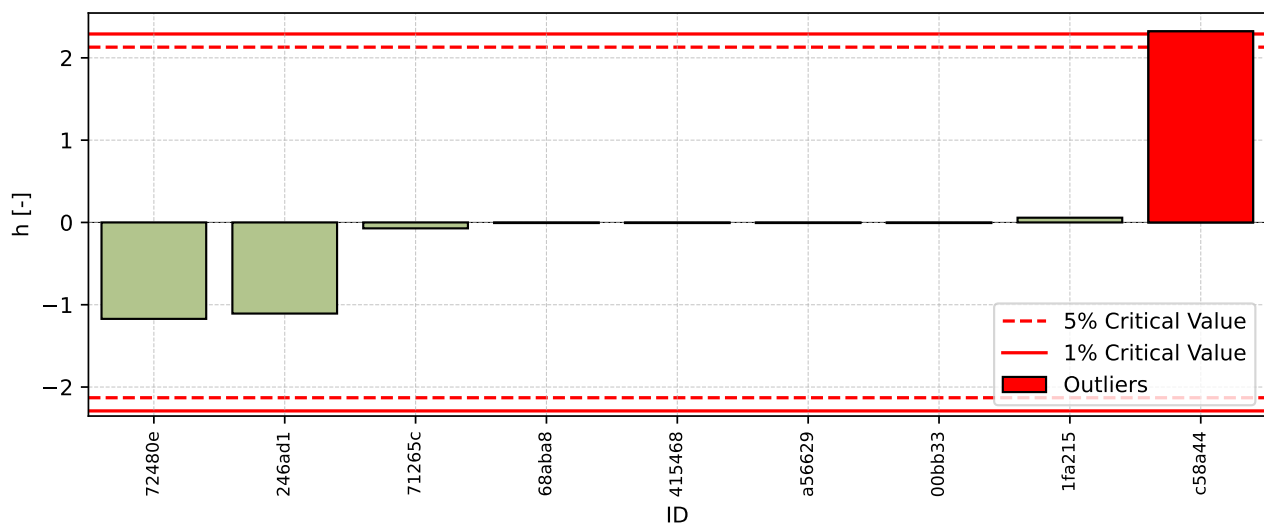


Figure 179: Interlaboratory Consistency Statistic

13.4 Descriptive statistics

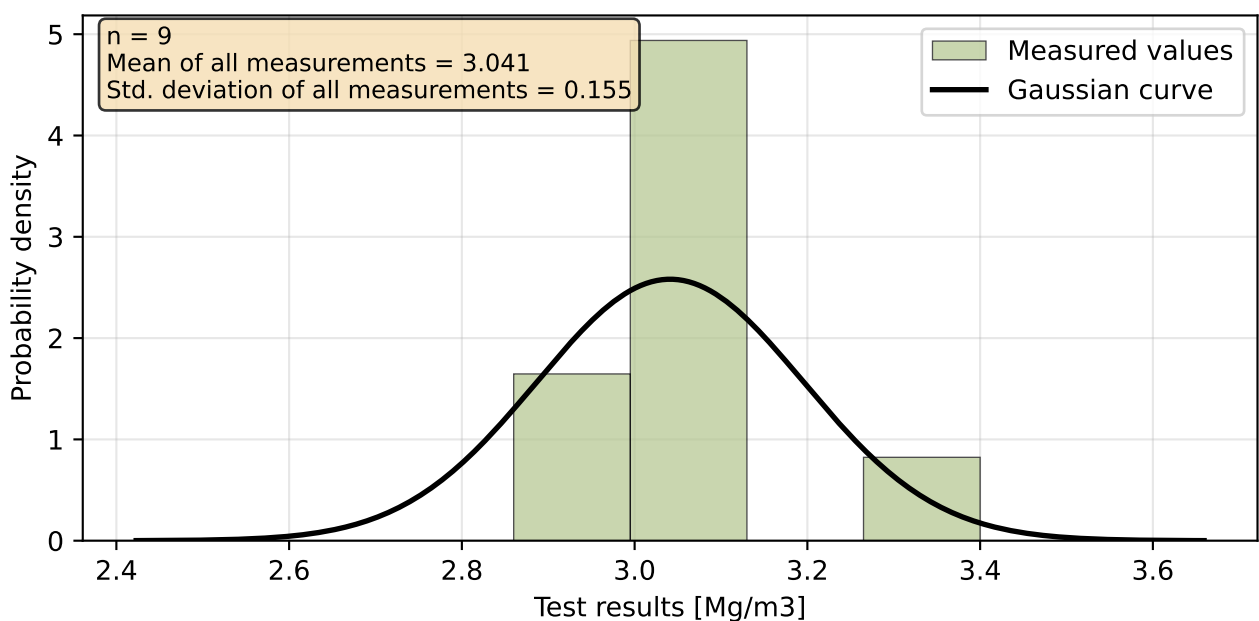


Figure 180: Histogram of all test results

Table 63: Descriptive statistics

Characteristics	[Mg/m ³]
Average value – $\bar{x}$	3.041
Sample standard deviation – s	0.155
Assigned value – x^*	3.041
Robust standard deviation – s^*	0.155
Measurement uncertainty of assigned value – u_X	0.052
p -value of normality test [-]	0.005

13.5 Evaluation of Performance Statistics

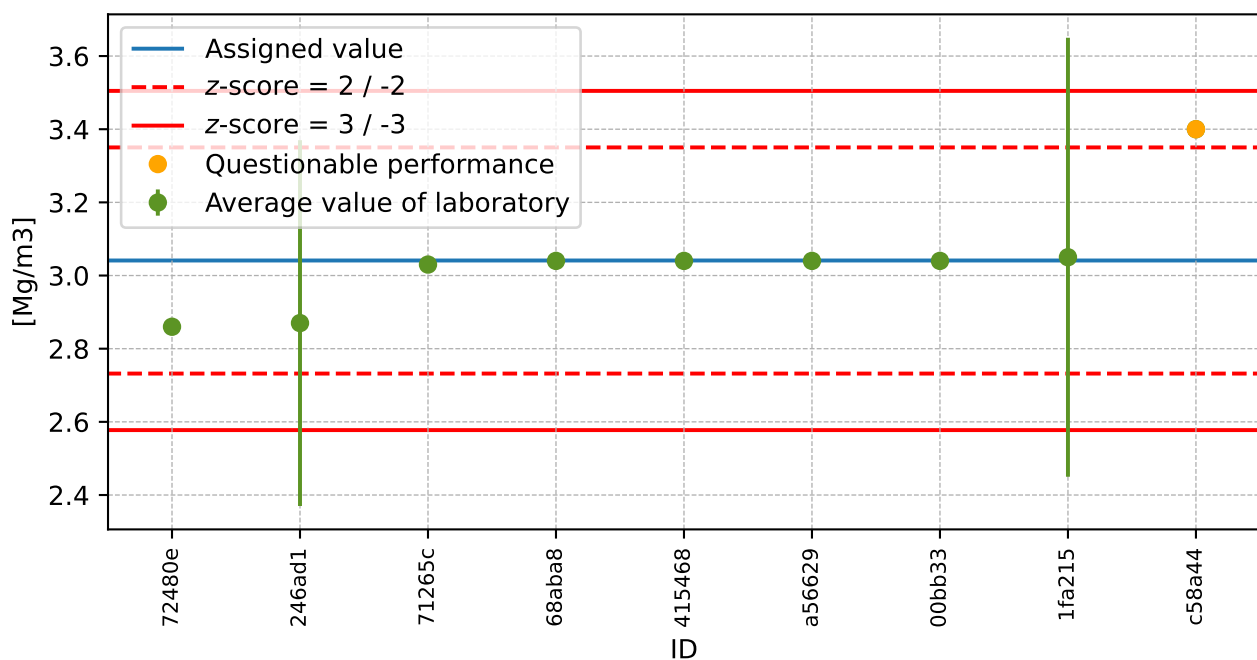


Figure 181: Average values and extended uncertainties of measurement

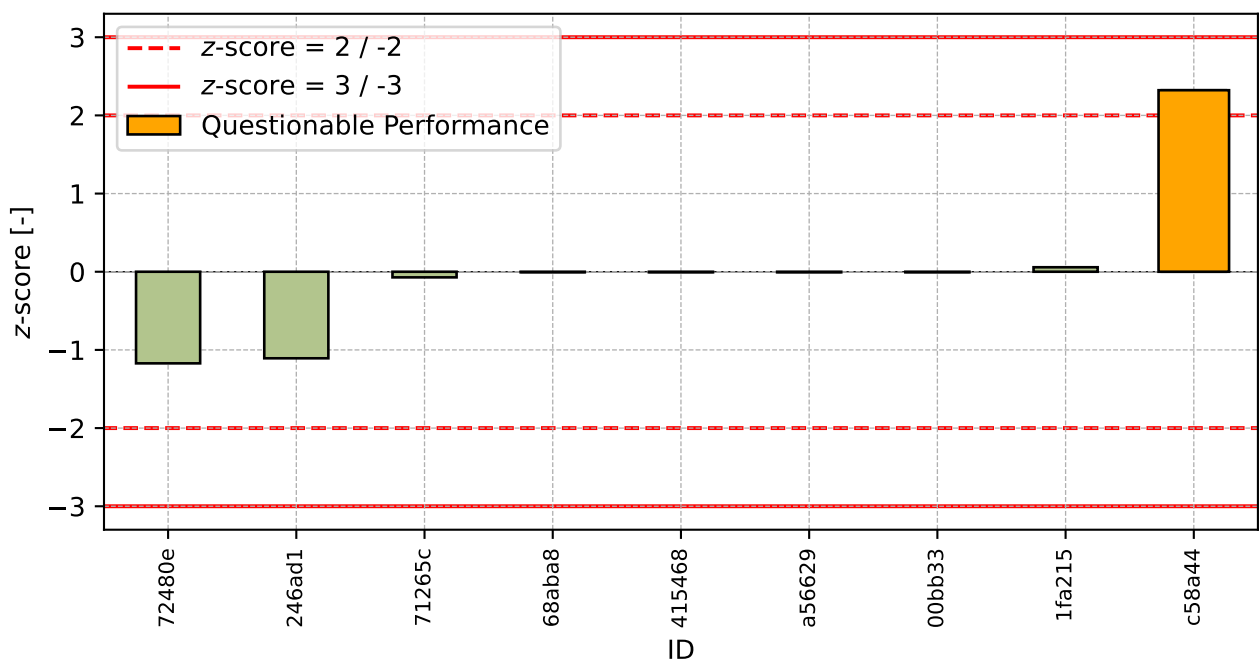


Figure 182: z-score

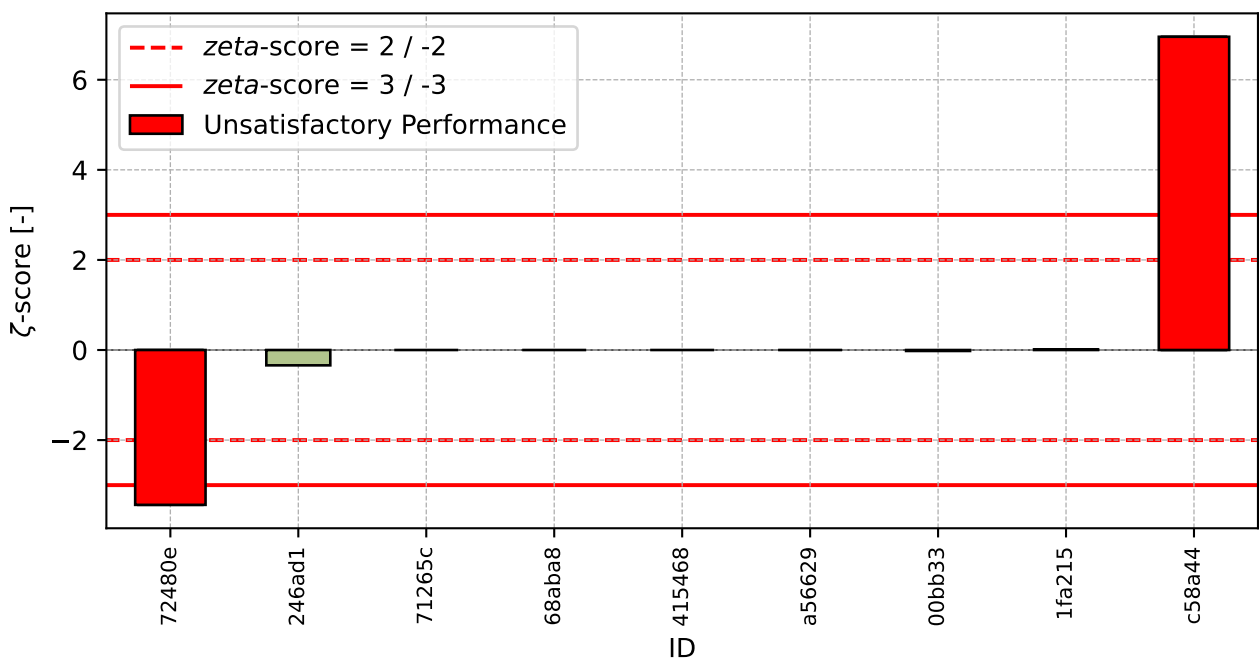
Figure 183: ζ -score

Table 64: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
72480e	-1.17	-3.44
246ad1	-1.11	-0.34
71265c	-0.07	-
68aba8	-0.01	-
415468	-0.01	-
a56629	-0.01	-
00bb33	-0.01	-0.02
1fa215	0.06	0.01
c58a44	2.32	6.95

14 Appendix – EN 1367-1 Determination of resistance to freezing and thawing

14.1 Test results

Table 65: Test results – ordered by average value. Outliers are marked by red color. Columns 1–3 are individual determinations; u_X – extended uncertainty of measurement; $\bar{x}$ – average value; s_0 – sample standard deviation; V_X – variation coefficient

ID	1 [%]	2 [%]	3 [%]	u_X [%]	$\bar{x}$ [%]	s_0 [%]	V_X [%]
a56629	0.02	0.03	0.04	-	0.03	0.010	33.33
70e54b	0.08	0.01	0.05	0.800	0.05	0.035	75.25
bca32e	0.09	0.10	0.10	-	0.10	0.006	5.97
53962f	0.10	0.10	0.10	-	0.10	0.000	0.00
0a07be	0.10	0.10	0.10	0.026	0.10	0.000	0.00
cc3310	0.10	0.10	0.20	-	0.13	0.058	43.30
146326	0.20	0.30	0.20	0.100	0.23	0.058	24.74
c2bf7f	0.29	0.28	0.29	0.050	0.29	0.006	2.01
0fcd1a	0.30	0.30	0.40	0.010	0.33	0.058	17.32

14.2 The Numerical Procedure for Determining Outliers

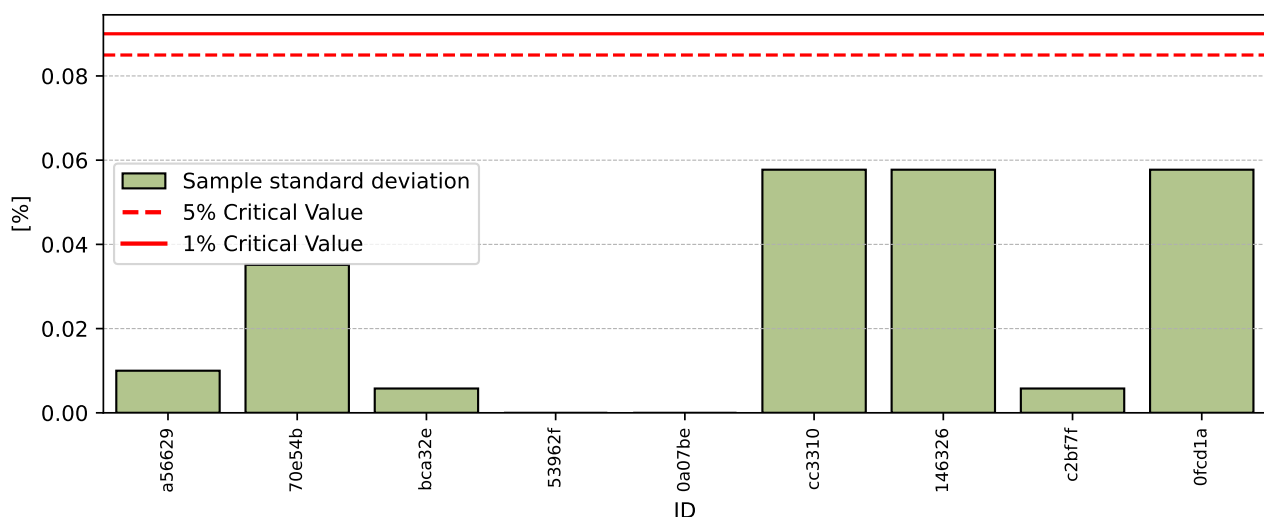


Figure 184: **Cochran's test** - sample standard deviations

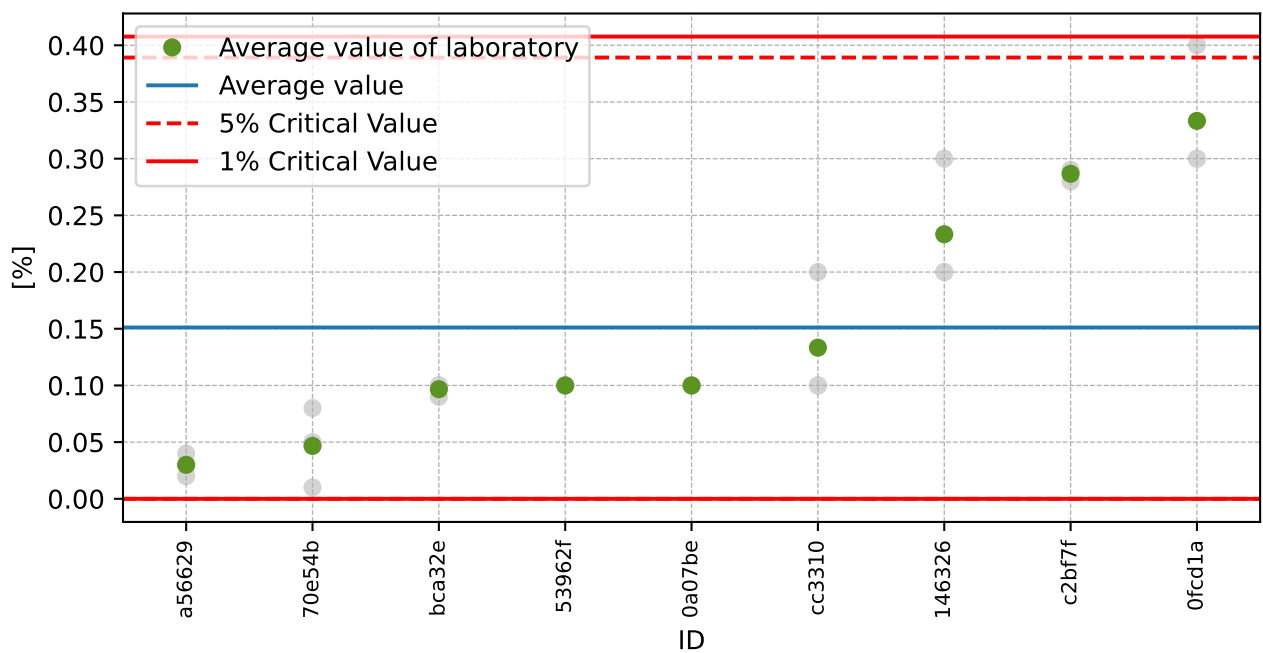


Figure 185: **Grubbs' test** - average values

14.3 Mandel's Statistics

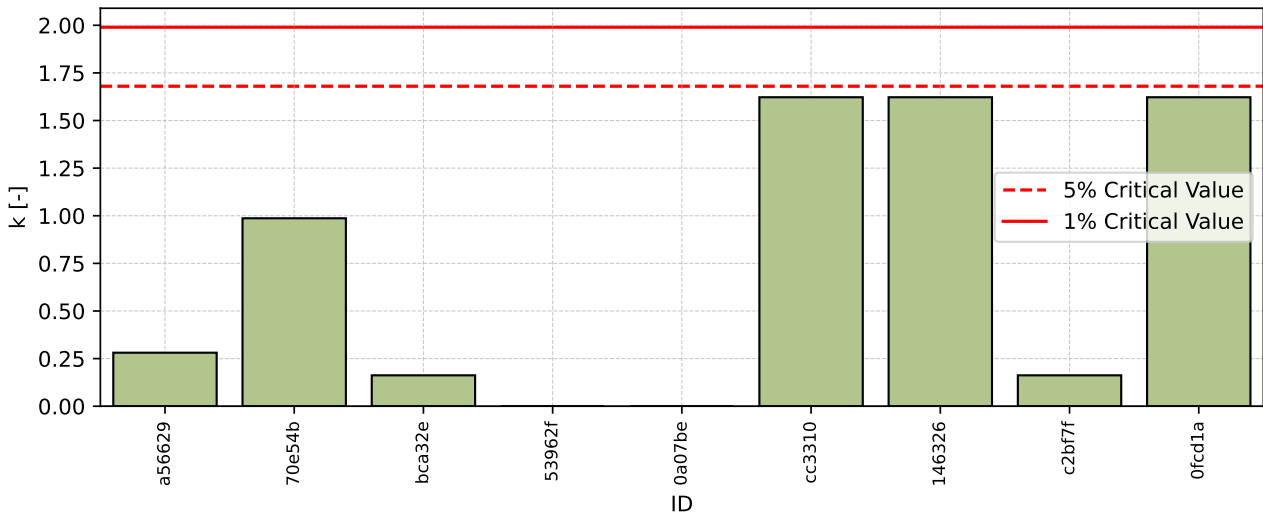


Figure 186: Intralaboratory Consistency Statistic

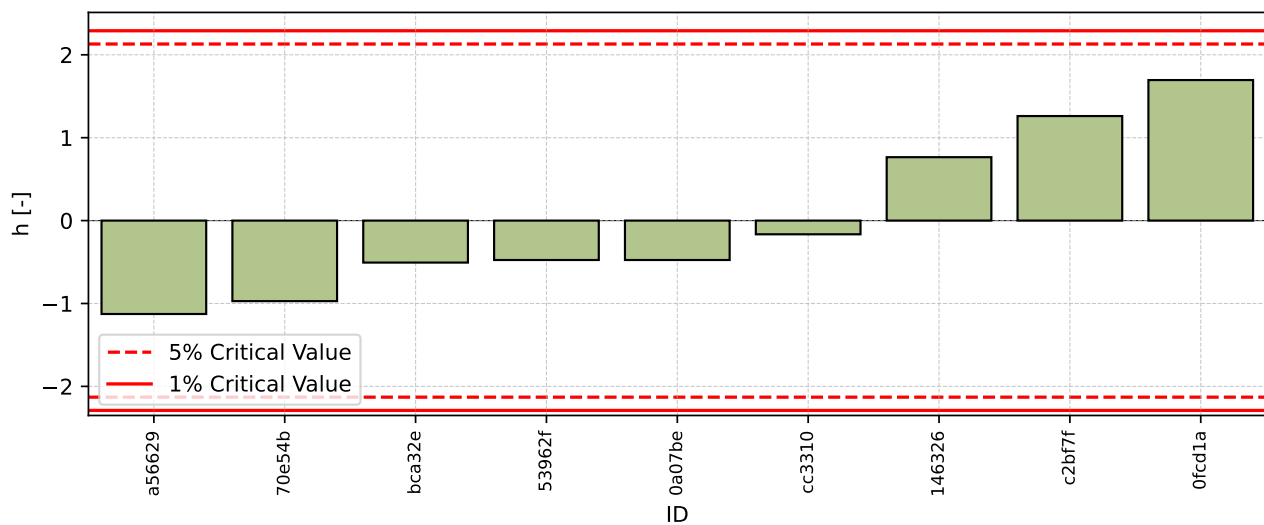


Figure 187: Interlaboratory Consistency Statistic

14.4 Descriptive statistics

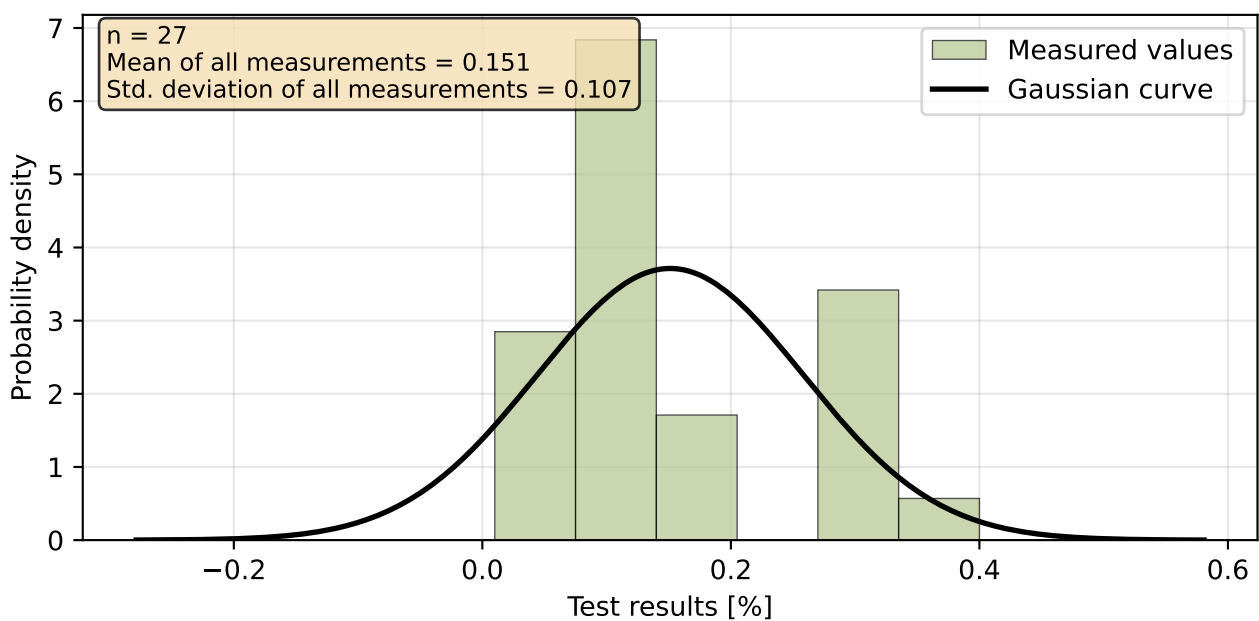


Figure 188: Histogram of all test results

Table 66: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	0.151
Sample standard deviation – s	0.107
Assigned value – x^*	0.151
Robust standard deviation – s^*	0.107
Measurement uncertainty of assigned value – u_X	0.036
p -value of normality test [-]	0.003
Interlaboratory standard deviation – s_L	0.106
Repeatability standard deviation – s_r	0.036
Reproducibility standard deviation – s_R	0.111
Repeatability – r	0.100
Reproducibility – R	0.312

14.5 Evaluation of Performance Statistics

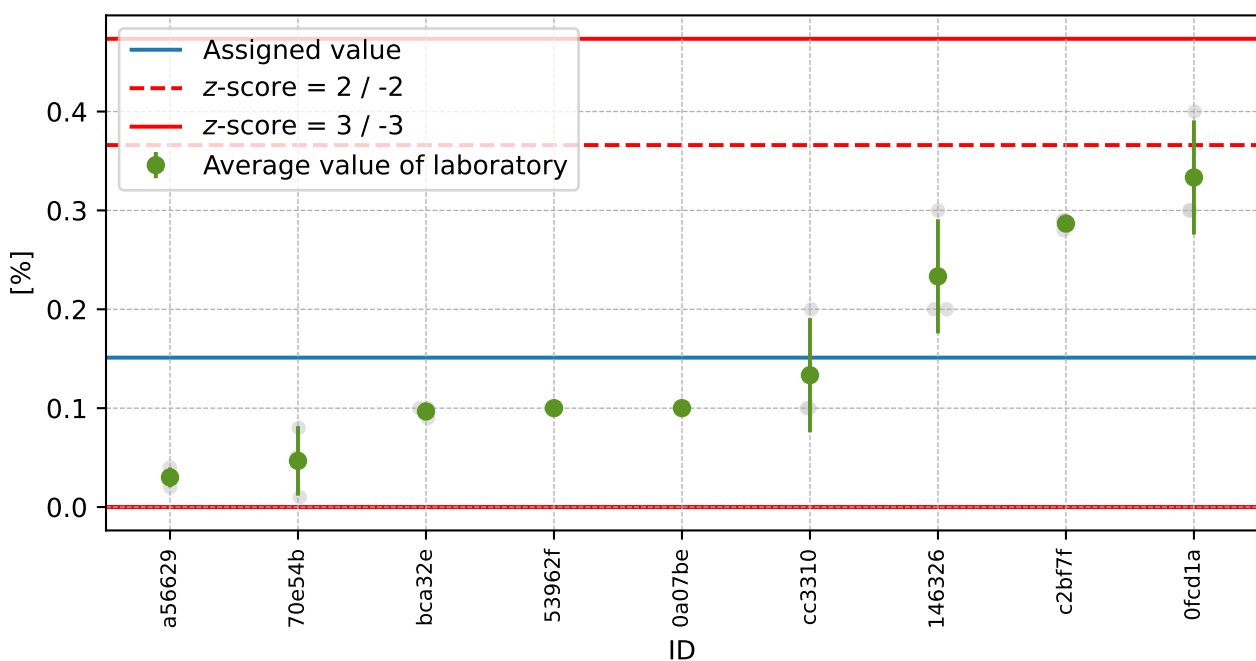


Figure 189: Average values and sample standard deviations

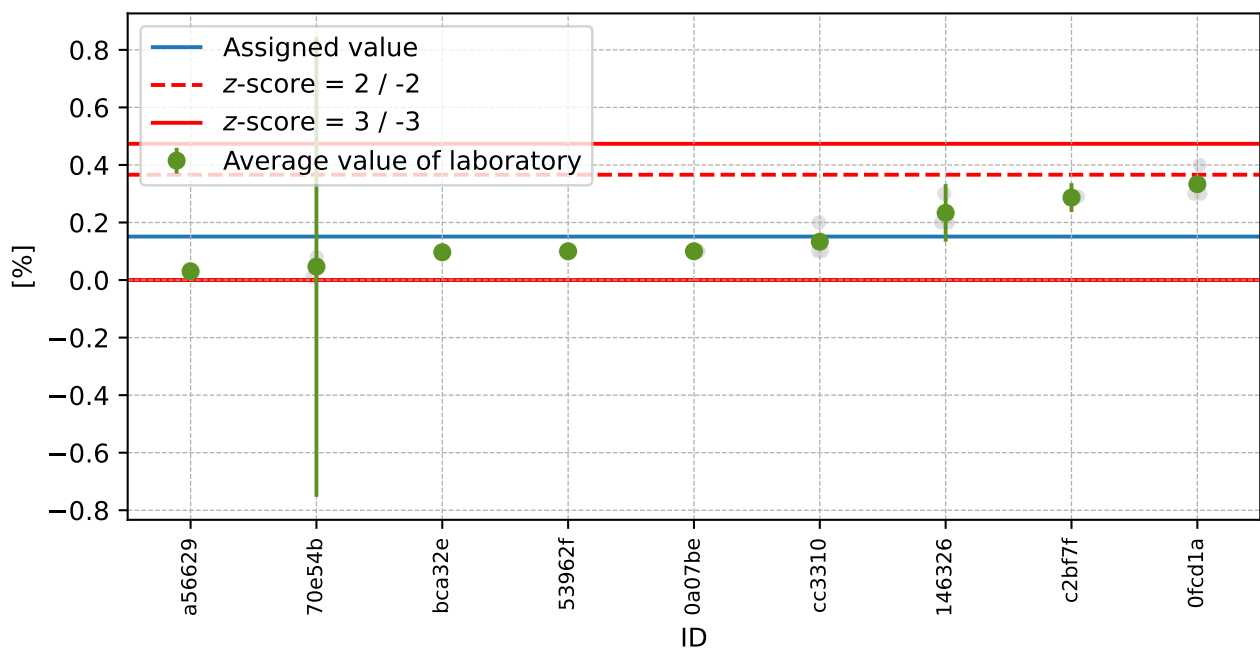


Figure 190: Average values and extended uncertainties of measurement

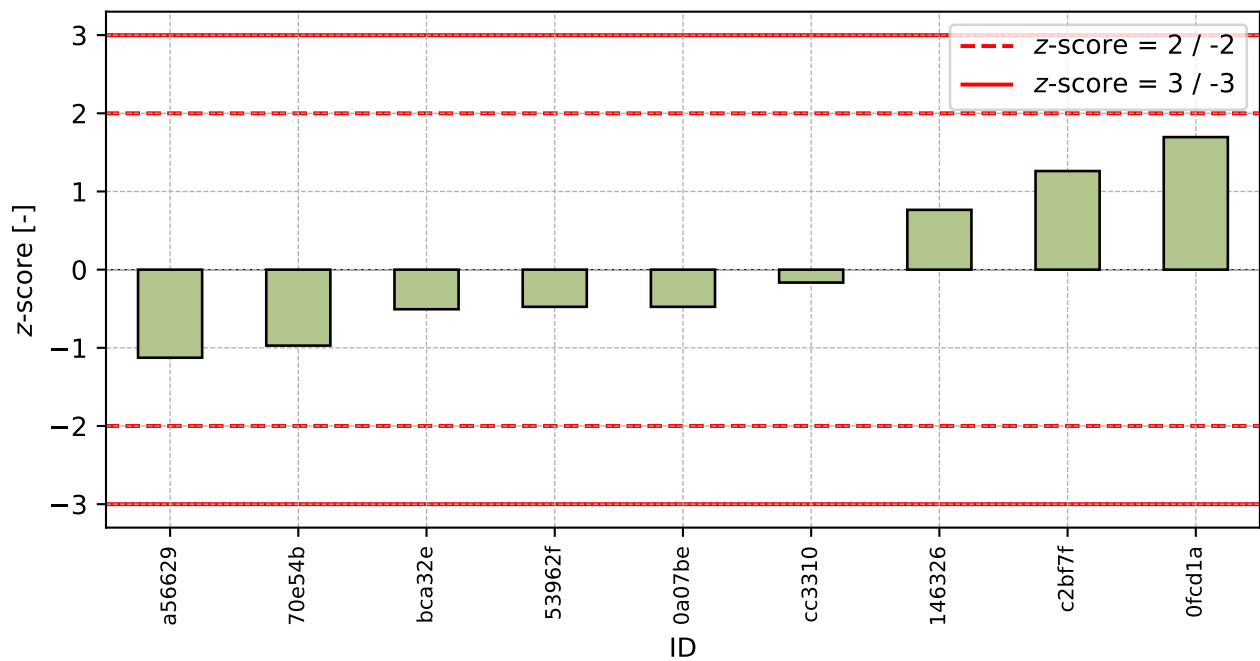
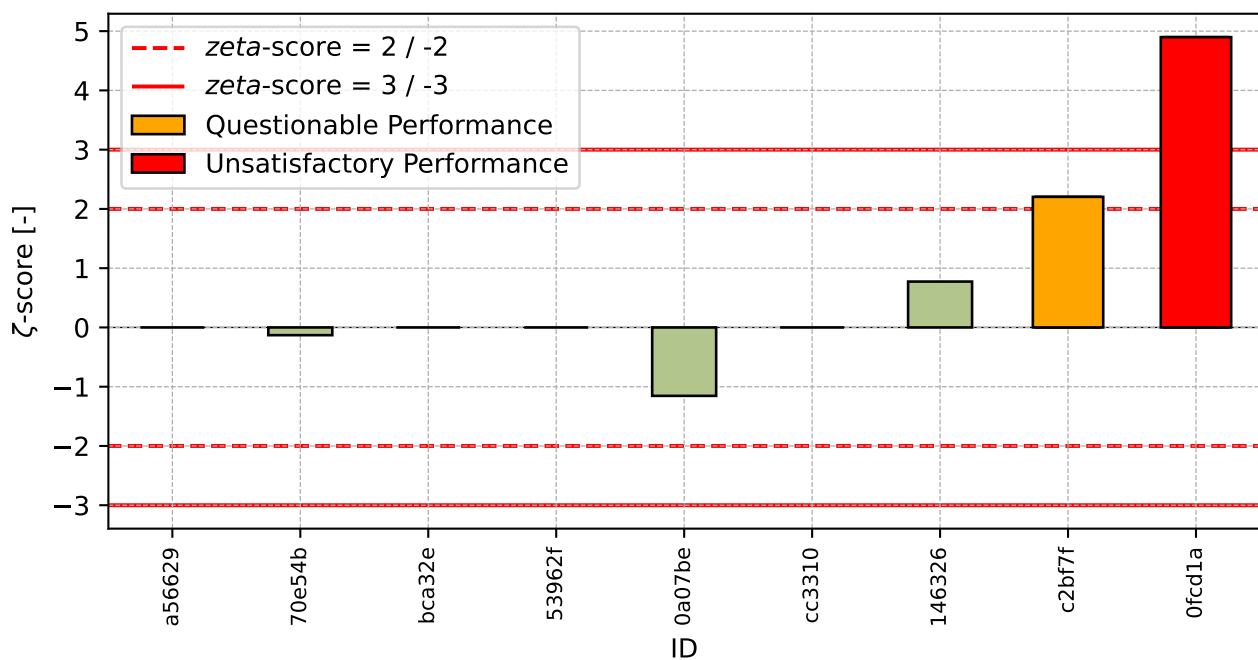


Figure 191: z-score

Figure 192: ζ -scoreTable 67: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
a56629	-1.13	-
70e54b	-0.97	-0.13
bca32e	-0.51	-
53962f	-0.48	-
0a07be	-0.48	-1.15
cc3310	-0.17	-
146326	0.76	0.77
c2bf7f	1.26	2.20
0fcd1a	1.70	4.90

15 Appendix – EN 1367-2 Magnesium sulfate test

15.1 Test results

Table 68: Test results – ordered by average value. Outliers are marked by red color. u_X – extended uncertainty of measurement.

ID	Result [%]	u_X [%]
41cfbe	2	0.1
74e055	7	1.0
fa5895	7	0.1
f71814	8	0.9
e79d26	9	0.6
06c6f9	12	0.1
f3cece	15	1.6
daec86	15	-
146326	16	0.4
a56629	18	-
9fe177	19	1.0
20f6cd	20	-
8df163	28	0.2
8f9b29	28	-

15.2 The Numerical Procedure for Determining Outliers

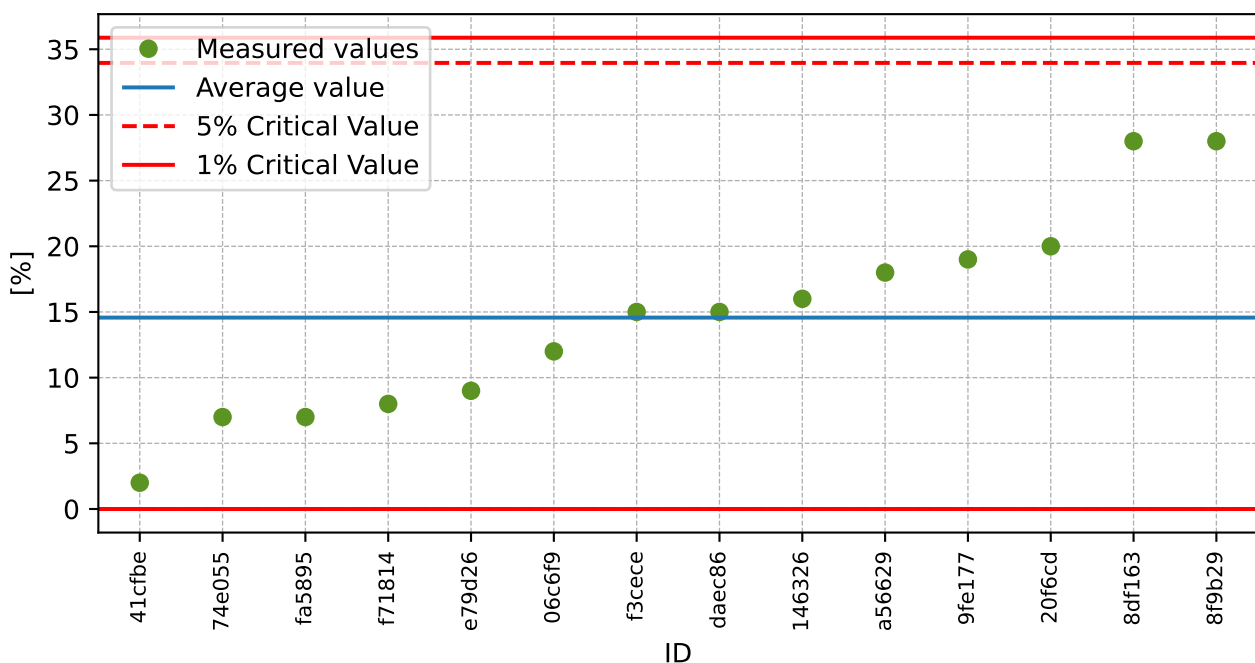


Figure 193: **Grubbs' test** - average values

15.3 Mandel's Statistics

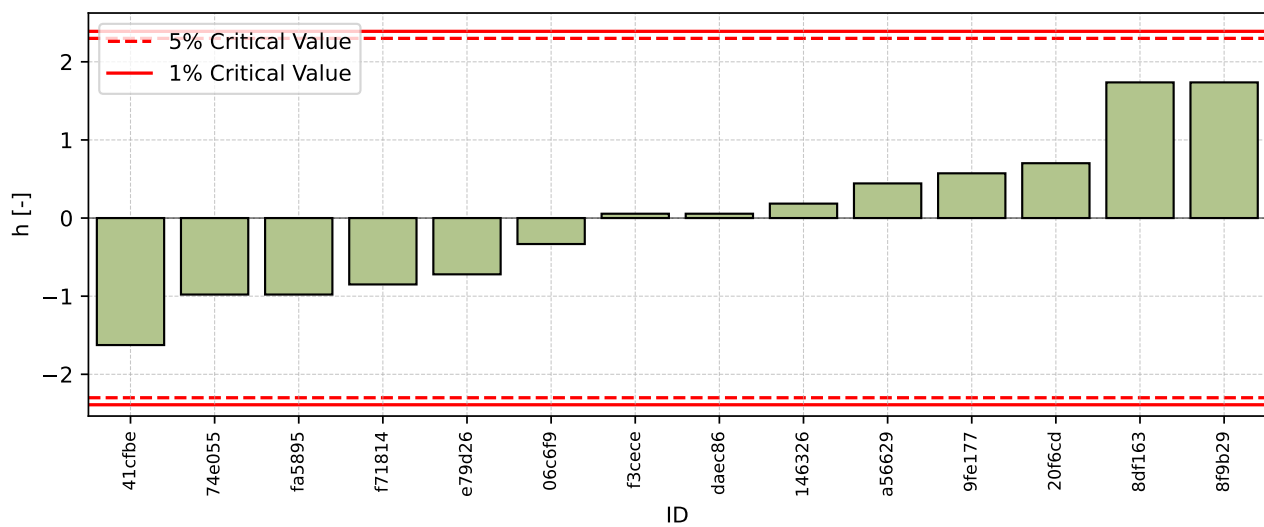


Figure 194: Interlaboratory Consistency Statistic

15.4 Descriptive statistics

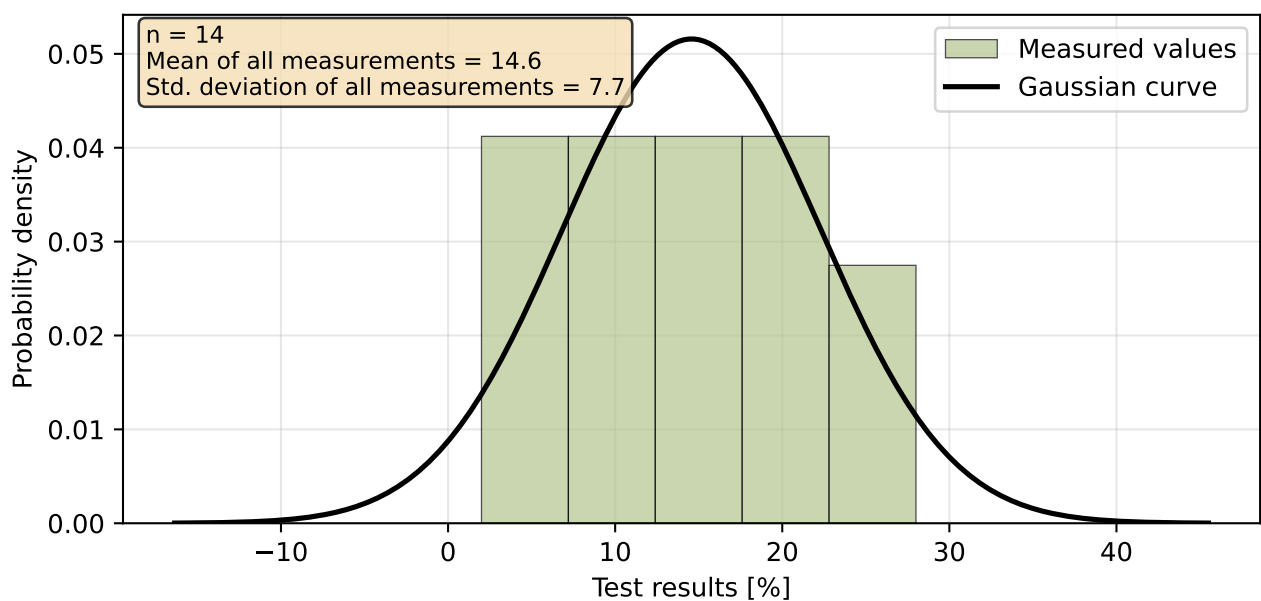


Figure 195: Histogram of all test results

Table 69: Descriptive statistics

Characteristics	[%]
Average value – $\bar{x}$	14.6
Sample standard deviation – s	7.7
Assigned value – x^*	14.6
Robust standard deviation – s^*	7.7
Measurement uncertainty of assigned value – u_x	2.1
p -value of normality test [-]	0.595

15.5 Evaluation of Performance Statistics

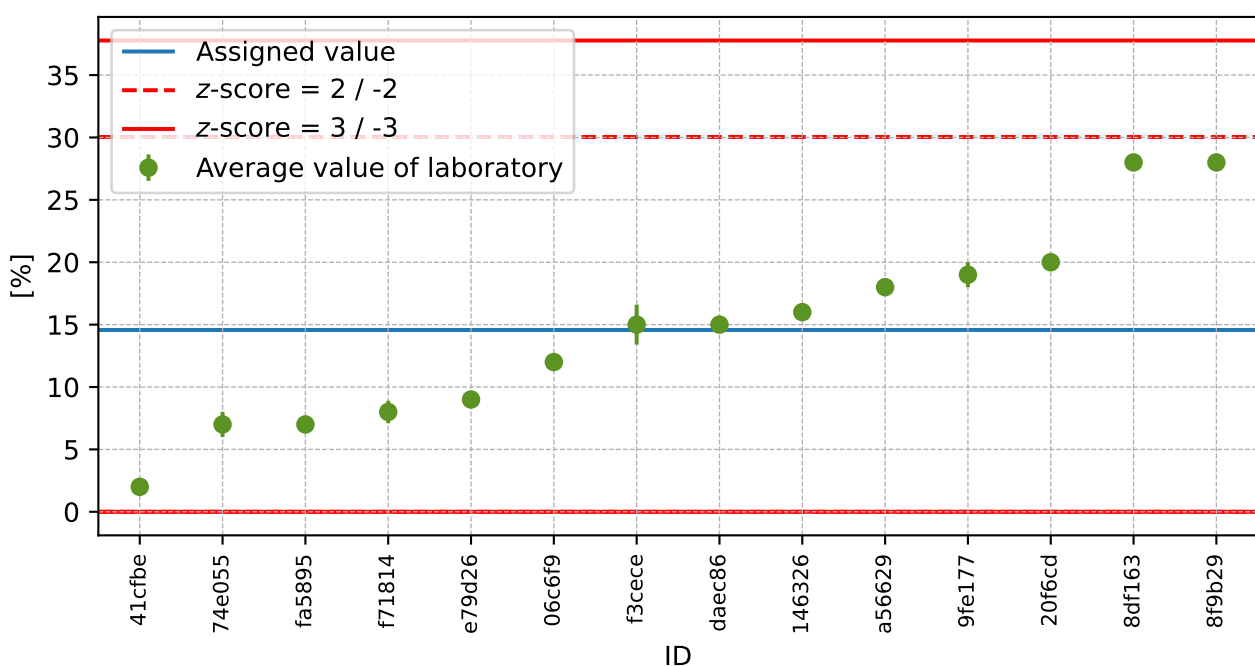


Figure 196: Average values and extended uncertainties of measurement

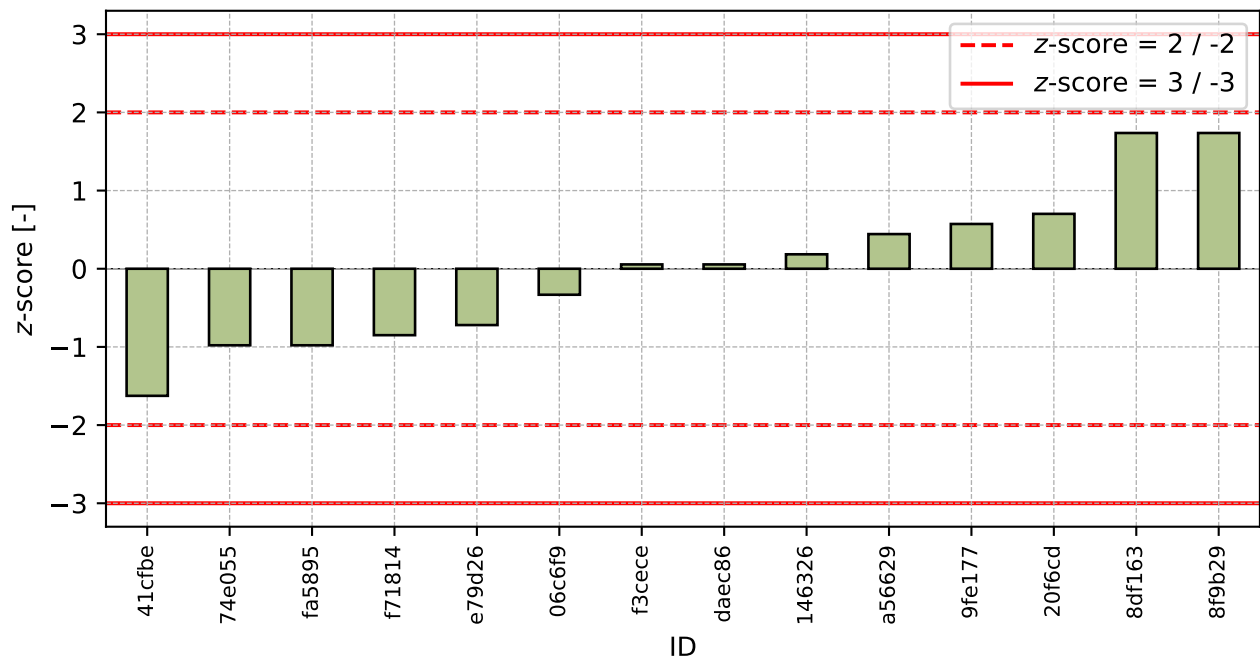


Figure 197: z-score

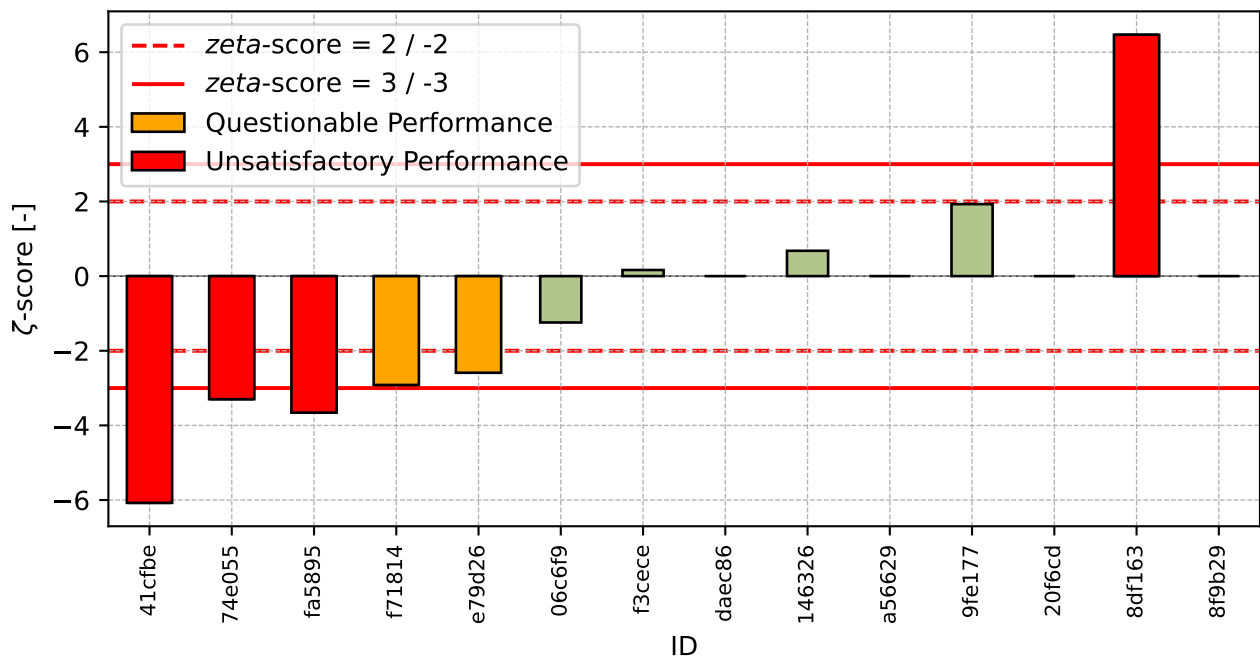


Figure 198: ζ-score

Table 70: z-score and ζ -score

ID	z-score [-]	ζ -score [-]
41cfbe	-1.63	-6.08
74e055	-0.98	-3.30
fa5895	-0.98	-3.66
f71814	-0.85	-2.92
e79d26	-0.72	-2.59
06c6f9	-0.33	-1.24
f3cece	0.06	0.16
daec86	0.06	-
146326	0.18	0.68
a56629	0.44	-
9fe177	0.57	1.93
20f6cd	0.70	-
8df163	1.74	6.47
8f9b29	1.74	-

16 Appendix – EN 1367-3 Boiling test for “Sonnenbrand basalt”

This part of PT programme was not open due to low number of participants.

17 Appendix – TP137 - Appendix 1 and 2 – Determination of reactivity of aggregates in connection with alkalies

This part of PT programme was not open due to low number of participants.

18 Appendix – ČSN 72 1179 Determination of reactivity of aggregates in connection with alkalies – chapter B

This part of PT programme was not open due to low number of participants.