



calibration & metrology



About us



Overview

- Europe`s largest owner managed metrology laboratory
- Established in 1976
- Manufacturer independent
- Accredited since 1997:
D-K-15019-01-00,
DIN EN ISO/IEC 17025:2018





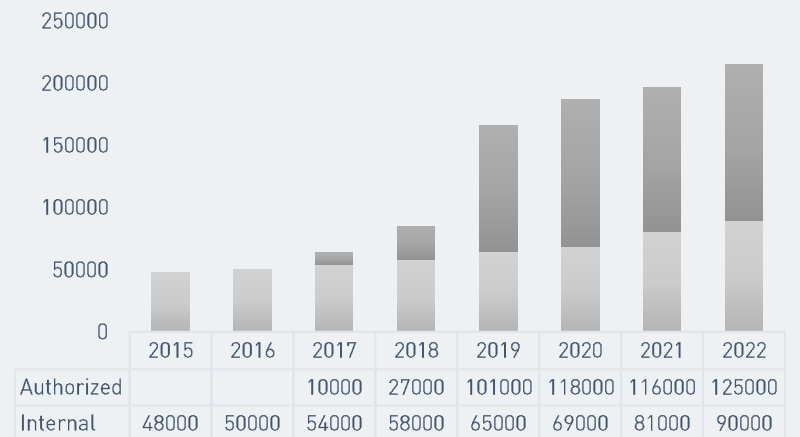
About us



esz AG in figures

- 25.000 satisfied customers
- 200.000 calibrations per year
- Over 200 accredited quantities
- 45 years of experience
- 7 locations in Europe
- 243 employees
- 2 mio Euro annual investment

Calibrations



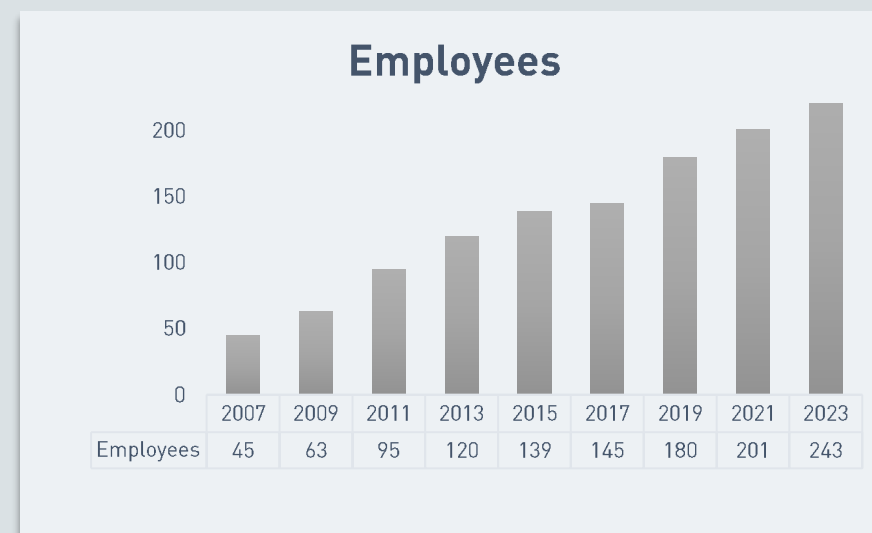


About us



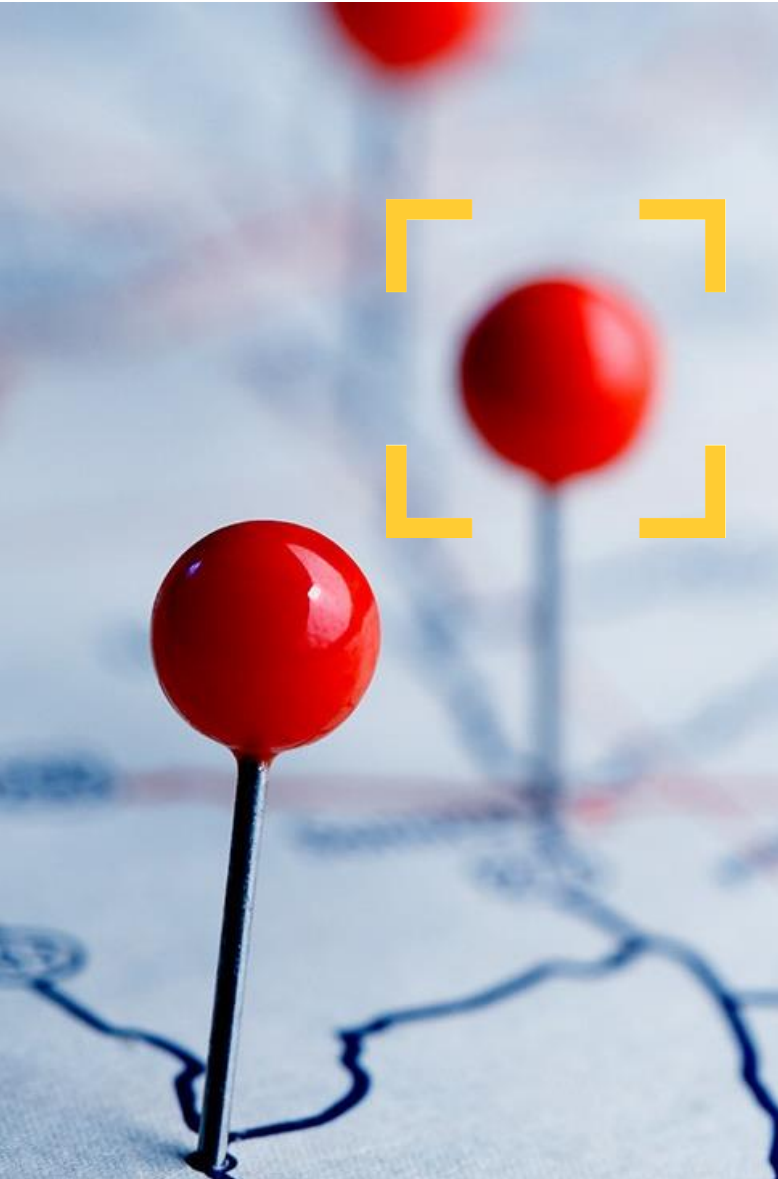
Teamwork – Our employees

- 243 employees at 7 locations
- Colleagues from 20 nations
- Continuous growth (2009: 63 > 2021: 201)
- Above-average period of employment
- High level of expertise





Our locations



Here you find esz AG

- Eichenau (Headquarter)
- Nuremberg
- Mannheim
- Steinfurt
- Berlin
- Vienna (Austria)
- Budapest (Hungary)





Business Units



Calibration

- Accredited:
DAkKS D-K-15019-01-00
DIN EN ISO/IEC 17025:2018
- Factory calibration /
ISO-compliant calibration
- Customized
- CEPS:
Calibration Expert Partner System



Software

- **calibration expert:** Calibration management
- **asset expert:** Test & Measurement equipment management



Service

- On-site
- Repair
- Safety inspection / DGUV-V3
- Consulting
- Training
- Pick-up and delivery service
- Tool Control Systems
- Equipment leasing
cooperation with





Industries



Customers & Markets



Medical Technology



Mechanical Engineering



Telecommunications



Electronics



Automotive



IT / Software



Automotive inspection bodies



Transportation / Logistics



Environment



Energy



Aviation



Accreditations



With over 200 accredited quantities, esz AG is one of the leading laboratories in Europe. The scope of accreditations is growing every year.



Deutsche Akkreditierungsstelle GmbH

Befehlene gemäß § 8 Absatz 1 AkkStelleG i.V.m. § 1 Absatz 1 AkkStelleGBV
Unterzeichnerin der Multilateralen Abkommen
von EA, ILAC und IAF zur gegenseitigen Anerkennung

Akkreditierung



Die Deutsche Akkreditierungsstelle GmbH bestätigt hiermit, dass das Kalibrierlaboratorium

esz AG calibration & metrology
Max-Planck-Straße 16, 82223 Eichenau

die Kompetenz nach DIN EN ISO/IEC 17025:2018 besitzt, Kalibrierungen in folgenden Bereichen durchzuführen:

<p>Elektrische Messgrößen Gleichstrom- und Niederfrequenzmessgrößen Zeit und Frequenz</p> <p>Hochfrequenz- und Strahlungsmessgrößen Hochfrequenzmessgrößen Optische Messgrößen</p> <p>Thermodynamische Messgrößen Temperaturmessgrößen Feuchtemessgrößen</p>	<p>Mechanische Messgrößen Druck Kraft Drehmoment Messgeräte im Kraftfahrzeugwesen (MIK) Durchflussmessgrößen</p> <p>Dimensionelle Messgrößen Länge Winkel</p>
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Die einzelnen Messgrößen sind in der Anlage enthalten.

Die Akkreditierungsurkunde gilt nur in Verbindung mit dem Bescheid vom 24.11.2020 mit der Akkreditierungsnummer D-K-15019-01. Sie besteht aus diesem Deckblatt, der Rückseite des Deckblatts und der folgenden Anlage mit insgesamt 81 Seiten.

Registrierungsnummer der Urkunde: D-K-15019-01-00

Berlin, 24.11.2020

Im Auftrag Dr. Heike Marke
Abteilungsleiterin

Die Urkunde samt Urkundenanlage gibt den Stand zum Zeitpunkt des Ausstellungsdatums wieder. Der jeweils aktuelle Stand des Geltungsbereiches der Akkreditierung ist der Datenbank akkreditierter Stellen der Deutschen Akkreditierungsstelle GmbH (DAKKS) zu entnehmen. <https://www.dakks.de/content/datenbank/akkreditierter-stellen>

Seite 19 von 81 der Anlage



Electrics



Optics



Acoustics



Mechanics



Flow



Pressure



Temperature



Humidity



Force



Mass



Torque



Acceleration



Medical Technology



KFZ test benches



Illuminance



Calibration



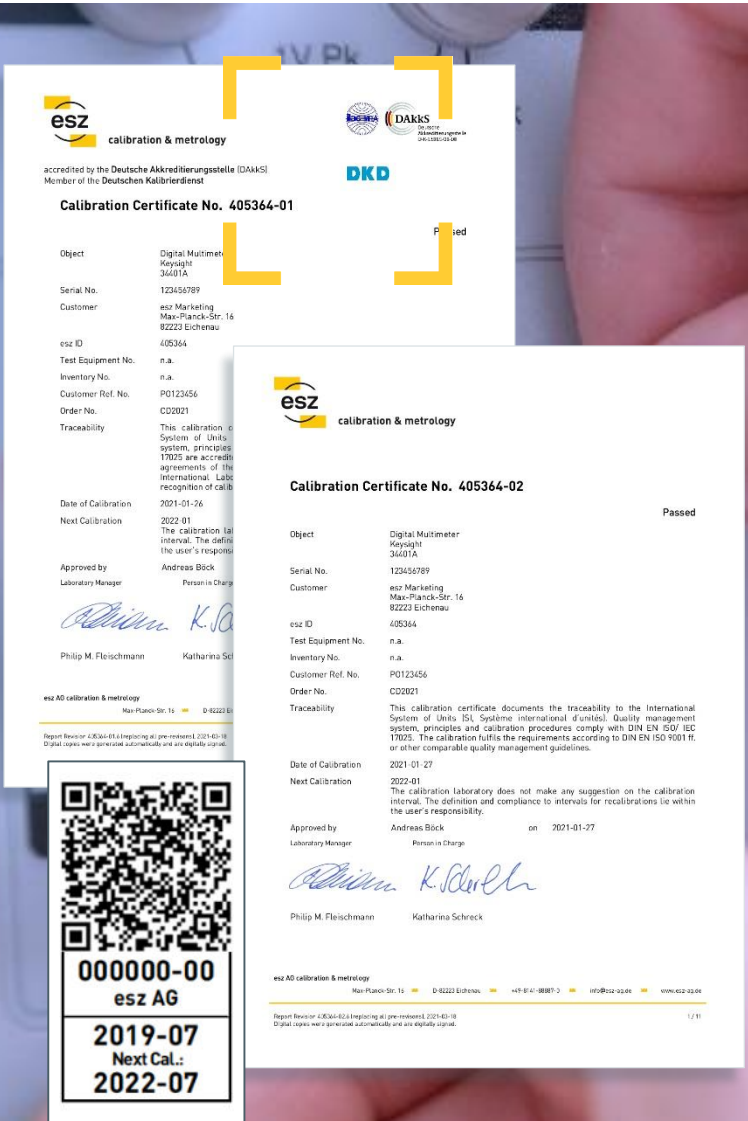
DAkkS- and ISO-Calibration

- DAkkS accredited calibration
- ISO calibration according to the requirements of DIN EN ISO/IEC 17025:2018
- Traceability, specifications and quality characteristics, conformity assessment, procedures and requirements are identical
- Fast and flexible order processing in own laboratories
- Calibration certificate available digitally as pdf document (full version) and/or as paper document (short version)





Calibration Certificate



Digital Calibration Certificate

- Full evaluation with detailed measurement data
- Download with QR code or certificate data via
 - esz-calibration certificate portal: www.esz-ag.de/kalibrierscheindownload
 - Test equipment management software asset expert

Hardcopy Calibration Certificate

- On customer request
- Content:
 - Calibration object and method
 - Ambient and measurement conditions
 - Place of calibration
 - Measurement uncertainties, traceability chain and due date
 - Evaluation, whether given results meet specified requirements or not



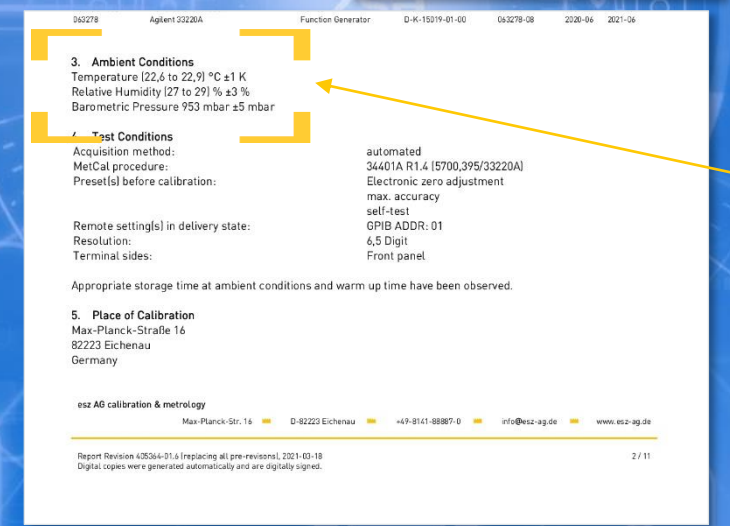
Calibration Certificate



In detail

■ Identical service level for accredited or non-accredited calibrations

- Traceability, specifications and quality characteristics, conformity assessment, procedures as well as requirements
- Difference: Cover sheet of the calibration certificate



■ Live monitoring of the ambient conditions

- Real-time readings of temperature, humidity, air pressure
- Accurate evaluation during calibration in the esz laboratory



Calibration Certificate



Calibration Mark 485344-01-D-K-15019-2021-01

1. Device Under Test
 Manufacturer: Keysight
 Model: 34401A
 Model type: Digital Multimeter
 Application(s): AC, DC
 Type: benchtop device
 Inspection equipment No.: n.a.
 Inventory No.: n.a.

All stated measurement and test results relate only to the item mentioned above.

2. Calibration Procedure

- Direct measurement procedure using fixed standards or a variable AC/DC-source according to QMH III.1
- Frequency calibration at an external synchronized generator according to esz QMH VIII.1.2

Calibration procedure revised and approved 2015-09-24 by Wilhelm Sandmeier

Calibration equipment and standards:

Standards	Manufacturer Model	Device	Traceable to	Cal. no.	Last cal.	Next cal.
034195	Fluke 5710A	Calibrator	D-K-15019-01-00	004195-14	2021-01	2022-01
018038	Precision Test Systems GPS10eR	Frequency Standard	GPS	116398-01	2019-06	2024-06
116398	esz 4-Wire-Cu Short	Short	D-K-15019-01-00	116398-01	2016-01	2026-01

Auxiliary equipment and devices:

Aux. devices	Manufacturer Model	Device	Traceable to	Cal. no.	Last cal.	Next cal.
063278	Agilent 33220A	Function Generator	D-K-15019-01-00	063278-08	2020-06	2021-06

In detail

Detailed traceability information

- Representation of the uninterrupted traceability chain of the calibration equipment and standards
- Guaranteed metrological traceability to the SI system of units or to the underlying metrological standards

Graphic chart for each specified measurement step

- Representation as a line diagram
- Compliance with the tolerances of the device under test relative to the nominal value at a glance

Calibration Mark 485344-01-D-K-15019-2021-01

DC-Resistance
 Zero Offset Tests, 4-Wire

Range	Nominal value	Measured value	Specification	Deviation	%TOL	MU	Rem.	Diagram
10 Ω	0.300 Ω	0.300 Ω	± 10%	0.000 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
1 Ω	0.3000 Ω	0.3000 Ω	± 10%	0.0000 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
10 Ω	0.3000 Ω	0.3000 Ω	± 10%	0.0000 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
100 Ω	0.300 Ω	0.300 Ω	± 10%	0.000 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
1 kΩ	0.3000 Ω	0.3000 Ω	± 10%	0 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
10 kΩ	0.3000 Ω	0.3000 Ω	± 10%	0 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK
100 kΩ	0.300 Ω	0.300 Ω	± 10%	0 Ω	0%	0.00 ± 10 ⁻⁷ Ω	13.10	OK

DC-Voltage

Range	Nominal value	Measured value	Specification	Deviation	%TOL	MU	Rem.	Diagram
100 mV	100.000 mV	100.000 mV	± 0.300 % ± 0.005 mV	0 mV	0%	1.2 × 10 ⁻⁶	13.10	OK
10 mV	10.000 mV	9.999 mV	± 0.300 % ± 0.005 mV	-0.001 mV	-1%	1.2 × 10 ⁻⁶	13.10	OK
1 V	1.0000 V	0.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.01%	1.6 × 10 ⁻⁶	13.10	OK
10 V	10.0000 V	9.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.001%	1.5 × 10 ⁻⁶	13.10	OK
100 V	100.0000 V	99.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.0001%	1.7 × 10 ⁻⁶	13.10	OK
1000 V	1000.0000 V	999.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.00001%	1.6 × 10 ⁻⁶	13.10	OK
10000 V	10000.0000 V	9999.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.000001%	1.5 × 10 ⁻⁶	13.10	OK
100000 V	100000.0000 V	99999.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.0000001%	1.6 × 10 ⁻⁶	13.10	OK
1000000 V	1000000.0000 V	999999.9999 V	± 0.300 % ± 0.005 mV	-0.0001 V	-0.00000001%	1.5 × 10 ⁻⁶	13.10	OK

esz AG calibration & metrology

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Report Revision 03044-01-01 (replacing all previous versions) 2021-03-18
 Digital copies are generated automatically and are digitally signed. 5/11



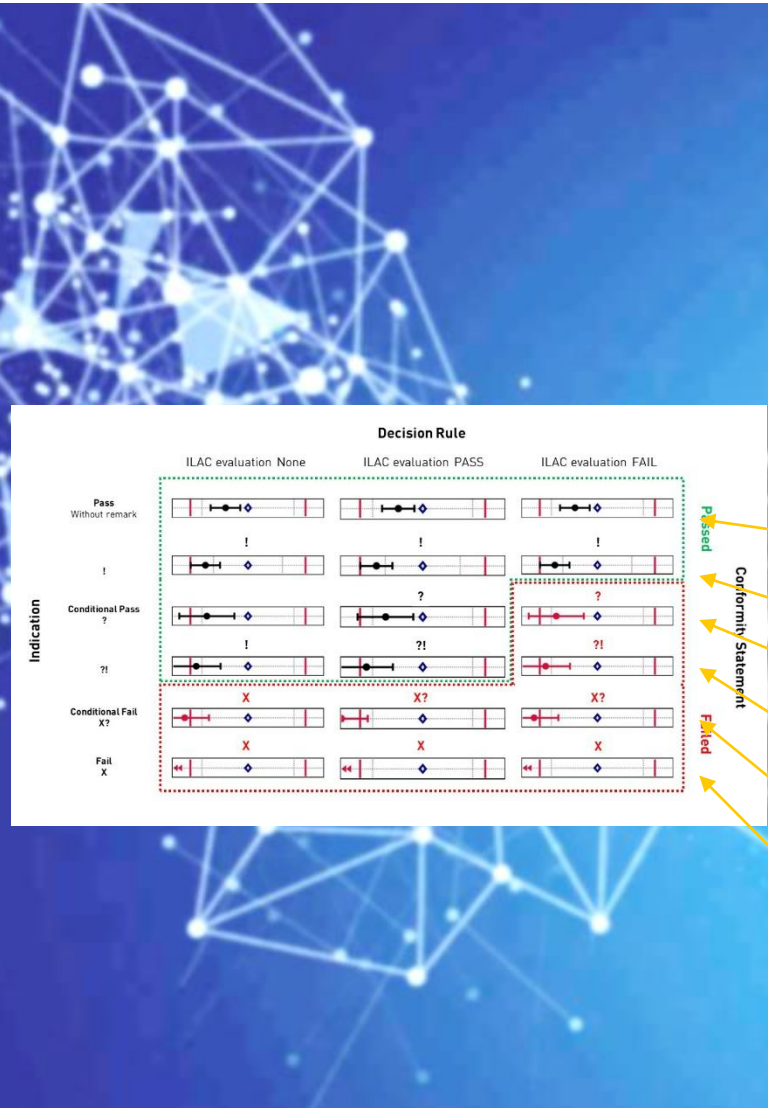
Calibration Certificate



Conformity statement

■ Detailed risk evaluation

- Verification of the specific risk of the conformity statement for each measurement step for accredited calibrations (DAkkS) or factory calibrations (ISO).
- Six cases can occur:
 - **Without remarks:** >95 % probability of being within the specification (ILAC G8:09/2019 Fig.5, Pass)
 - **!:** Warning threshold exceeded, >95 % probability of being within the specification
 - **?:** with a probability of >50% to 95% of being within the specification, taking into account the measurement uncertainty [MU] (ILAC G8:09/2019 Fig.5, Conditional Pass)
 - **?!:** above the warning threshold exceeded but with a probability of >50% to 95% of being within the specification, taking into account the MU
 - **X?:** with a probability of >50% to 95% of being outside the specification (ILAC G8:09/2019 Fig.5, Conditional Fail), taking into account the MU
 - **X:** >95% probability of being outside the specification (ILAC G8:09/2019 Fig.5, Fail)





Calibration Certificate

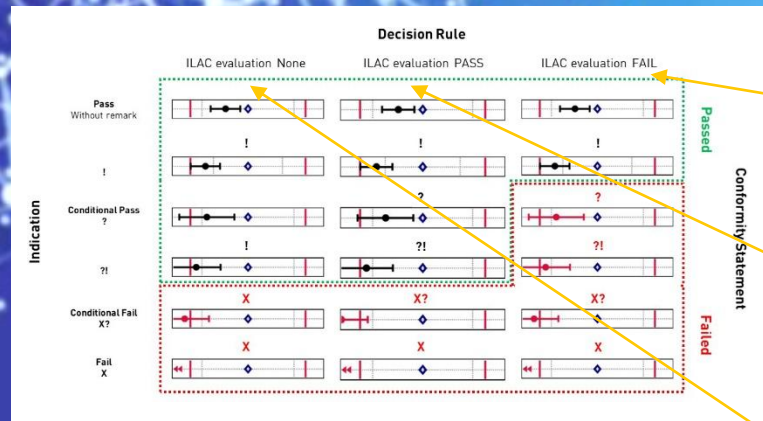
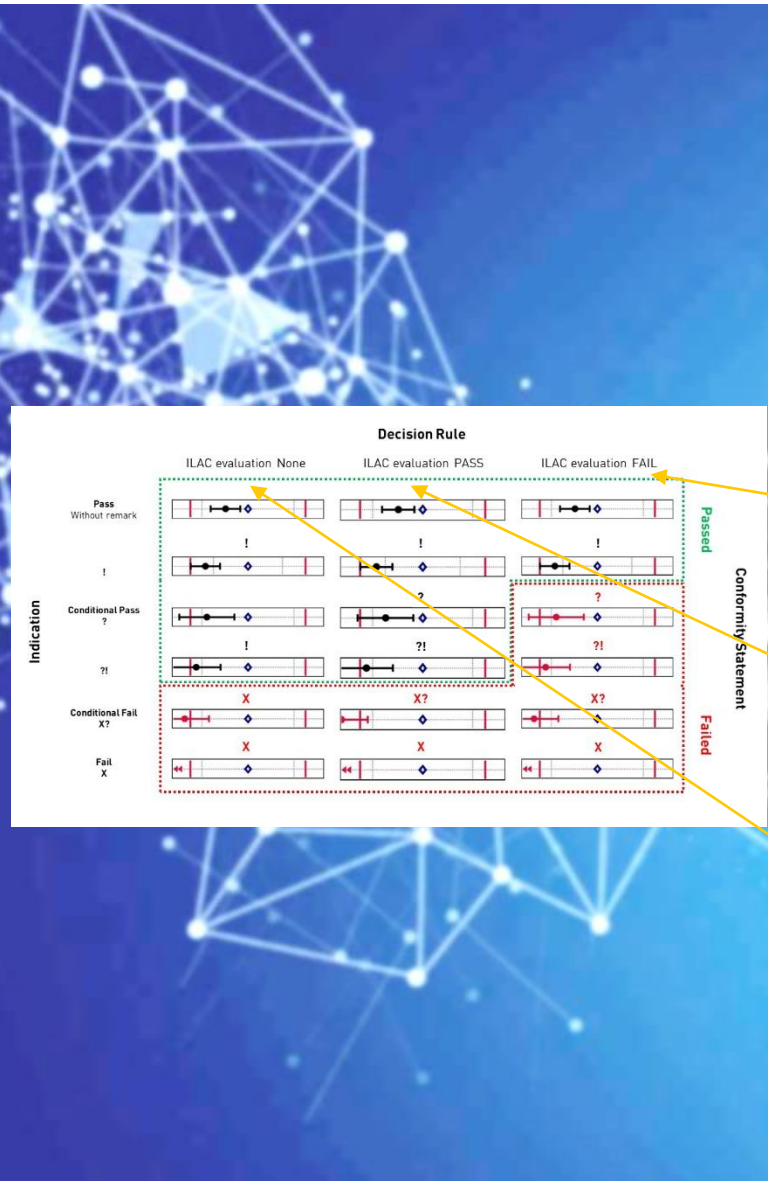


Conformity statement

Decision Rules

- Selected “ILAC evaluation” defines the decision rule and indication for each measuring step

- FAIL:** Decision rule according to DIN EN ISO 14253-1:2018-5.2 (on customer request). Measurement results according to ILAC-G8:09/2019 Fig. 5, Pass are assessed as conforming to the specifications. Cases according to ILAC-G8:09/2019 Fig. 5, Conditional Pass, Conditional Fail and Fail are not considered to comply with the specifications.
- PASS:** Standard decision rule according to the QM system of esz AG. Measurement results according to ILAC-G8:09/2019 Fig. 5, Pass und Conditional Pass are assessed as conforming to the specifications. Cases according to ILAC-G8:09/2019 Fig. 5, Conditional Fail und Fail are not considered to comply with the specifications.
- None:** Decision rule according to ILAC evaluation „PASS“ but without risking, i.e. question marks do not show during calibration and in the calibration certificate.





Additional Services



Calibration certificates with customer logo

- Available on request for accredited calibrations (DAkkS) and factory calibrations (ISO)
- Factory calibration certificates also available without esz-Logo on request

Calibration Certificate No. 405364-01

Object: Digital Multimeter Keysight 34401A
 Serial No.: 123456789
 Customer: esz Marketing, Max-Planck-Str. 16, 82223 Eichenau
 esz ID: 405364
 Test Equipment No.: n.a.
 Inventory No.: n.a.
 Customer Ref. No.: P0123456
 Order No.: C02021
 Date of Calibration: 2021-01-26
 Next Calibration: 2022-01
 Approved by: Andreas Böck
 Laboratory Manager: Person in Charge

Philip M. Fleischmann, Katharina Schreck

esz AD calibration & metrology, Max-Planck-Str. 16, D-82223 Eichenau

Calibration Certificate No. 405364-01

Object: Digital Multimeter Keysight 34401A
 Serial No.: 123456789
 Customer: esz Marketing, Max-Planck-Str. 16, 82223 Eichenau
 esz ID: 405364
 Test Equipment No.: n.a.
 Inventory No.: n.a.
 Customer Ref. No.: P0123456
 Order No.: C02021
 Date of Calibration: 2021-01-26
 Next Calibration: 2022-01
 Approved by: Andreas Böck
 Service Manager: performed by an employee of Company Name: [Redacted]

Philip M. Fleischmann, Katharina Schreck

esz AD calibration & metrology, Max-Planck-Str. 16, D-82223 Eichenau

Calibration Certificate No. 405364-02

Object: Digital Multimeter Keysight 34401A
 Serial No.: 123456789
 Customer: esz Marketing, Max-Planck-Str. 16, 82223 Eichenau
 esz ID: 405364
 Test Equipment No.: n.a.
 Inventory No.: n.a.
 Customer Ref. No.: P0123456
 Order No.: C02021
 Date of Calibration: 2021-01-27
 Next Calibration: 2022-01
 Approved by: Andreas Böck
 Laboratory Manager: Person in Charge

Philip M. Fleischmann, Katharina Schreck

esz AD calibration & metrology, Max-Planck-Str. 16, D-82223 Eichenau

Calibration Certificate No. 405364-02

Object: Digital Multimeter Keysight 34401A
 Serial No.: 123456789
 Customer: esz Marketing, Max-Planck-Str. 16, 82223 Eichenau
 esz ID: 405364
 Test Equipment No.: n.a.
 Inventory No.: n.a.
 Customer Ref. No.: P0123456
 Order No.: C02021
 Date of Calibration: 2021-01-27
 Next Calibration: 2022-01
 Approved by: Andreas Böck
 Person in Charge

Katharina Schreck

Company Name, Company Location



Drift report

- Available on customer request
- Appendix to the digital calibration certificate
 - Information on deviations of the measured values compared to previous calibrations
 - Risk estimation for the upcoming calibration interval
 - Line by line representation for each specified measurement step

Driftbericht Erstellungsdatum 24.11.2020

esz-ID: 103109 Seriennummer: 174810342
 Modell: HBM 1-P3TCP / 200 bar abs. Top Prüfmittelnummer: 3490
 Class
 Gegenstand: Drucksensor Inventarnummer: n.a.
 Kunde: RAPA Rausch & Pausch GmbH

Die Spalten enthalten die durchschnittlichen Abweichungen zum am besten zuordenbaren Kalibrierwert der jeweiligen Kalibrierung.

Eintrag **Erklärung**

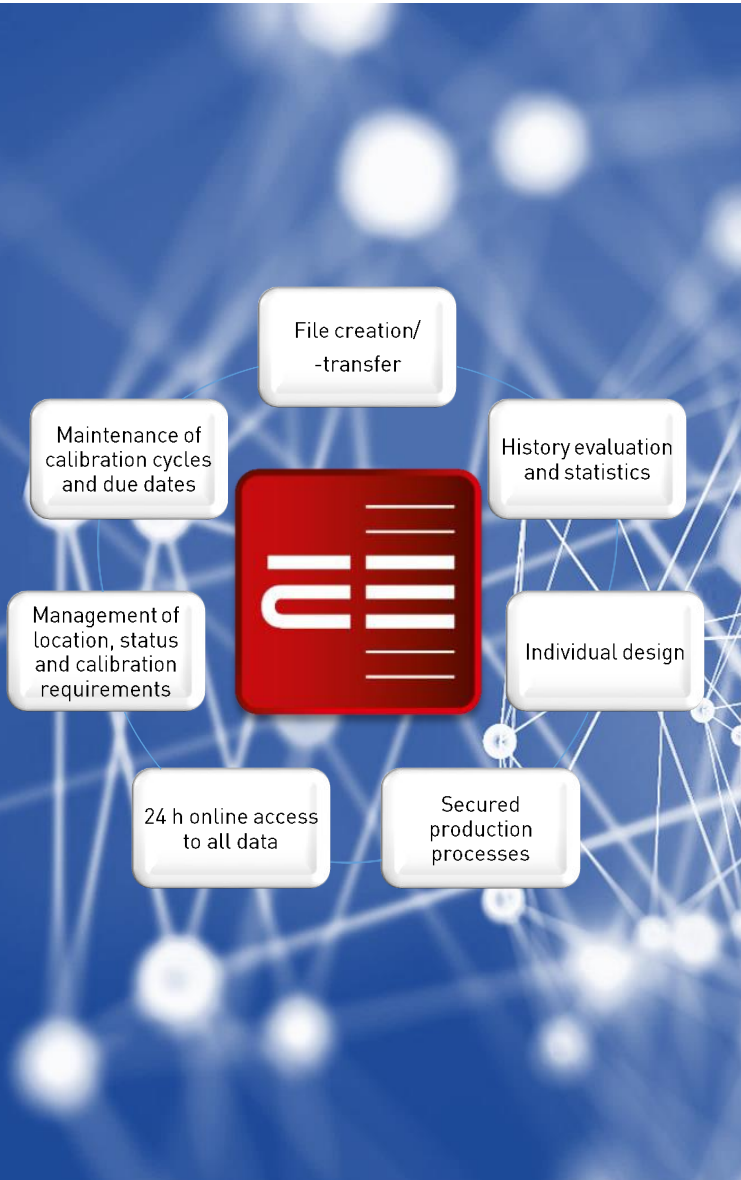
- keine Abweichung im Rahmen der Stellenauflösung des Messwertes
 n.a. keine Drift aufgrund fehlender Überschneidung der Historiendaten berechenbar
 no drift keine Drift im Rahmen der Stellenauflösung des Messwertes feststellbar
 max. betragsmäßig größter Wert aller Driften der ermittelten Historie
 Drift
 mittl. vorzeichenrichtiger Mittelwert aller Driften
 Drift
 Bem. Bemerkung zur Risikoabschätzung
 o unter Berücksichtigung der maximalen Drift liegen die zu erwartenden Werte der nächsten Folgekalibrierung außerhalb der Toleranzen
 ! unter Berücksichtigung sowohl der maximalen als auch der mittleren Drift liegen die zu erwartenden Werte der nächsten Folgekalibrierung außerhalb der Toleranz

Druck, Absolut-

Bereich	Einstellung	Kalibrierwert	103109-02	103109-03	max. Drift	mittl. Drift	Bem.
200 bar	0,3793 mV/V	40,0 bar	0,2 bar	0,1 bar	0,10 bar	-0,1 bar	
200 bar	0,3742 mV/V	80,0 bar	0,2 bar	0,1 bar	0,10 bar	-0,1 bar	
200 bar	1,1744 mV/V	120,0 bar	0,2 bar	0,2 bar	no drift	no drift	
200 bar	1,5743 mV/V	160,0 bar	0,1 bar	0,1 bar	no drift	no drift	
200 bar	1,9753 mV/V	200,0 bar	-0,1 bar	0,1 bar	0,20 bar	0,2 bar	

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Report Revision: 000929_04.2 (ersetzt alle Vorversionen) Seite 1 / 1

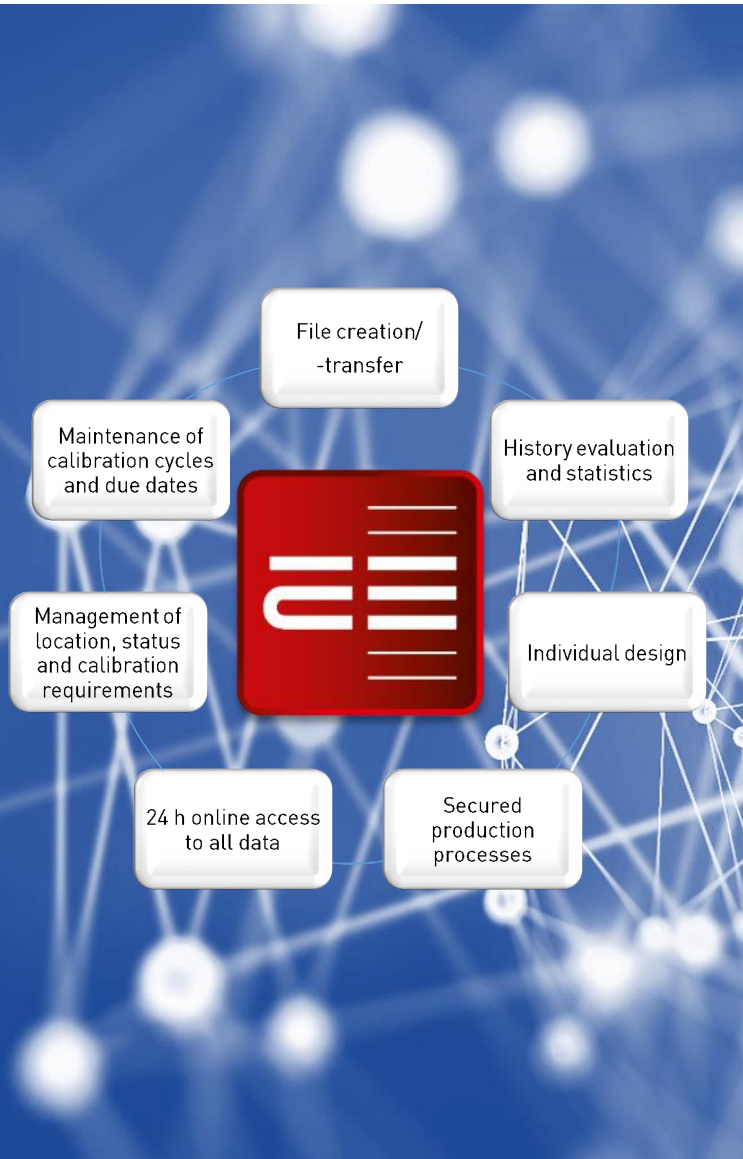


asset expert

- Web-based software solution
- Cross-company management of test equipment management
- The architecture of the software allows any access, anytime, anywhere.
- Independent of the hardware configuration
- Design and "look and feel" individually customizable.
- Hierarchy levels, user structures and rights management can be set according to user requirements.
- Demo version <https://www.esz-ag.de/software/pruefmittelmanagement.html>



Software Solutions



asset expert

asset expert

PRÜFMITTELDETAILS

INFORMATIONEN ZUM PRÜFMITTEL			
esz-ID	000001	Artikelnr.	HP-D3458A
Fälligkeitsdatum	2021-05-19	Firma	esz AG calibration & metrology
Prüfmittelnr.	KL13082	Kundennummer	60000
Inventarnr.	LAB10	Benutzername	p.fleischmann@esz-ag.de
Seriennr.	US28032894	Bemerkung	
Hersteller	Hewlett Packard	Abteilung	Ei
Gegenstand	Digitalmultimeter	Garantie	18.03.2008
Typ/Modell	3458A	Leistungsumfang	DKD
Überwacht	<input checked="" type="checkbox"/>	Bezugsnormal?	
Kalibrierscheinnr.	000001-15	Lieferant	T.O.P
Kalibrierdatum	2020-05-19	Preis	7900 EUR
Intervall	12	Lieferdatum	18.03.2007
Status	OK	Standort	LAB7
Zustand	kalibriert		

KALIBRIERHISTORIE

KALIBRIERSCHEINNR.	AUFTRAGSNR.	KALIBRIERDATUM	INTERVALL	PRÜFER	ERGEBNIS
000001-15	BK130297	2020-05-19	12	Sanktjohanser, Andreas	Erfolgreich
000001-14	BK106351	2019-05-31	12	Brzezinski, Przemyslaw	Erfolgreich
000001-13	BK085532	2018-05-28	12	Sanktjohanser, Andreas	Erfolgreich
000001-12	BK067816	2017-05-09	12	Sanktjohanser, Andreas	Erfolgreich
000001-11	BK053822	2016-05-20	12	Brzezinski, Przemyslaw	Erfolgreich

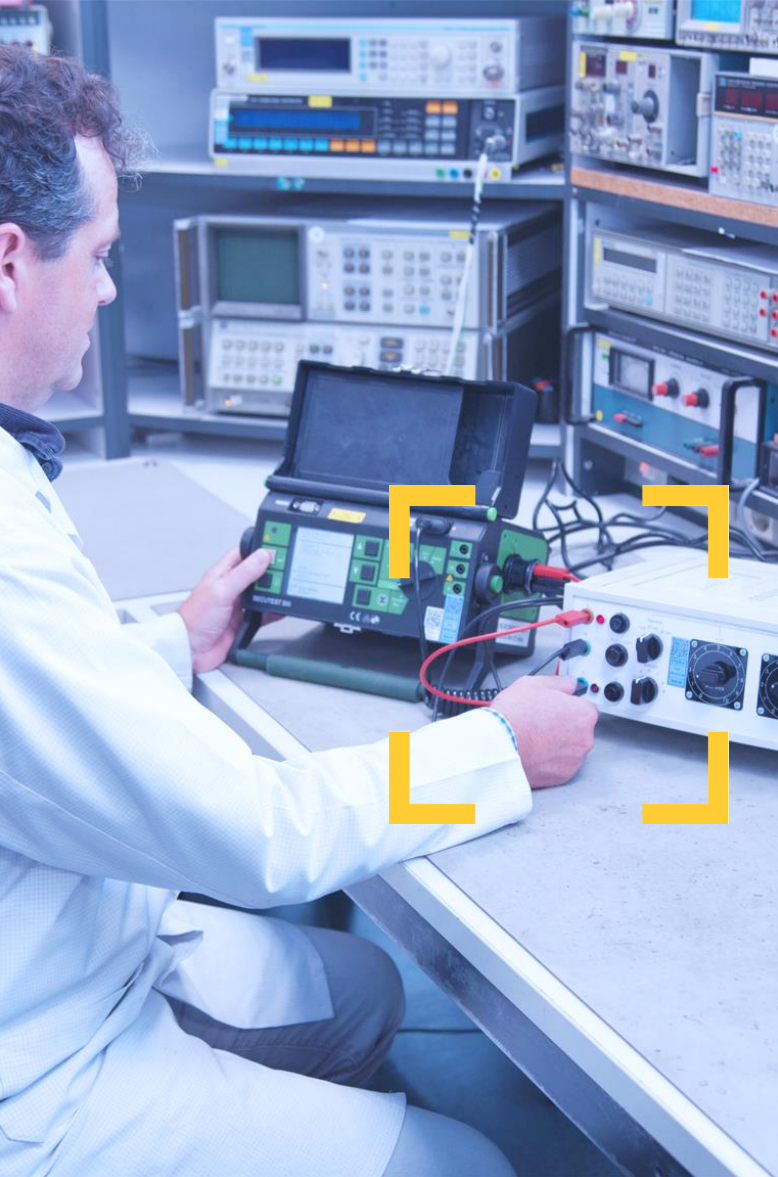
asset expert

PRÜFMITTEL SPECIEN	PRÜFMITTEL FÄLLIG
Prüfart	Überfalle
esg-ID	Fällig
Prüfmittelnr.	Nächster Monat
Kalibrierscheinnr.	Überwachungs Monat
Firma	
Überwacht	

ESZ ID	FÄLLIGKEITSDATUM	PRÜFMITTELNR.	SERIENNR.	HERSTELLER	GEGENSTAND	TYPMODELL	KALIBRIERSCHEINNR.	INTERVALL	STATUS	ABTEILUNG	LEISTUNGSUMFANG	STANDORT
000001	2021-05-19	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000002	2021-06-15	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000003	2021-09-04	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000004	2021-08-24	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000005	2021-07-06	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000006	2021-07-06	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000007	2021-07-06	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000008	2022-01-09	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000009	2021-05-17	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000010	2022-02-18	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000011	2021-06-21	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000012	2022-01-20	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7
000013	2023-10-06	KL13082	US28032894	Hewlett Packard	Digitalmultimeter	3458A	000001-15	12	OK	Ei	DKD	LAB7



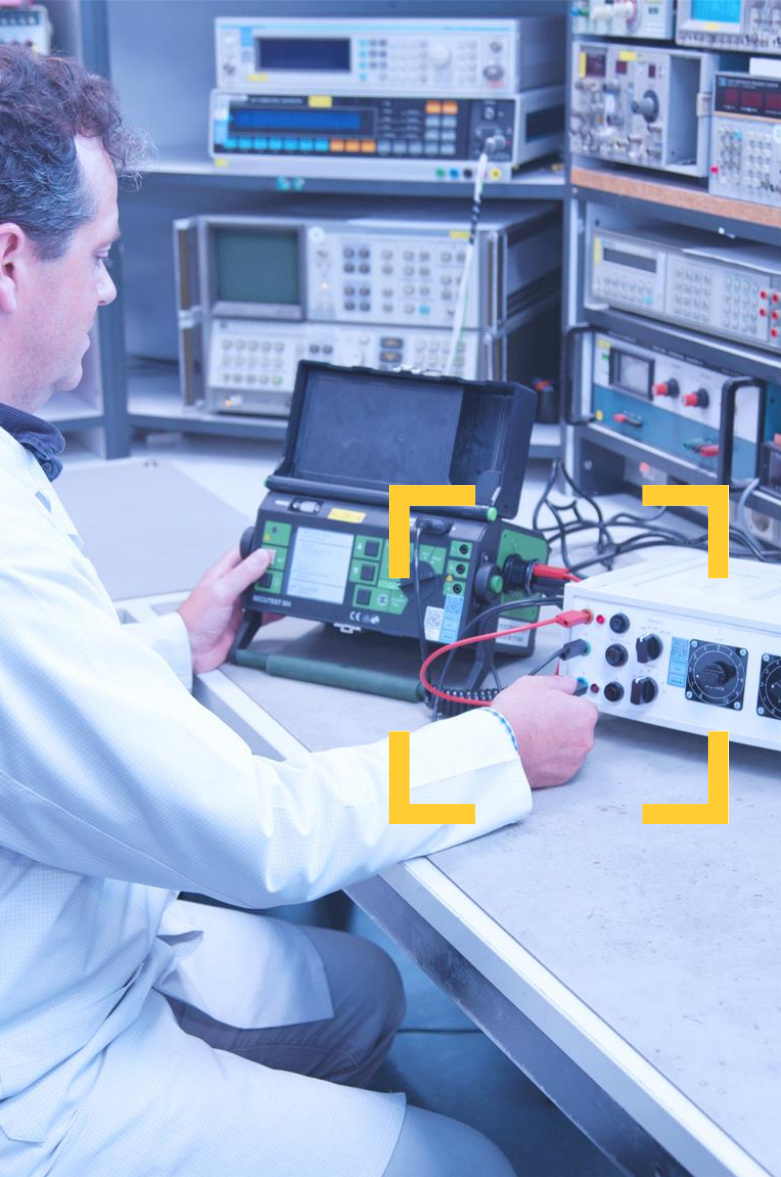
Service



Equipment service and repair

- Manufacturer-independent repair hub
- Extensive service catalog
- Archive with over 20,000 service documents/manuals
- Service cooperation with well-known manufacturers
- Transparent cost overview for repairs
- Acceleration of repairs thanks to spare parts flat rate
- Faster order placement thanks to design certificate
- esz adjustment is only charged if 100% possible





Safety test / DGUV-V3

- Manufacturer-independent safety testing of electrical measuring equipment according to DGUV V3 as part of the calibration order or as an individual order.
- Safety tests of electrical equipment in three sections according to the DGUV V3 test protocol:
 - visual inspection
 - functional test
 - measurement check
- Legally compliant test protocol
- Marking of the device with test sticker





Consulting

- Feasibility check for metrological projects
- Calibration procedure descriptions and measurement uncertainty budgets
- Implementation in calibration expert
- Training of esz departments and external partners
- Development of calibration procedures and measuring stations for esz AG
- Accreditation sharing and authorization network coordination for external organisations





Service



Trainings

- esz competence training
- Seminars
- Trainings
- Employee trainings
- Symposium: Munich Calibration Day





Service



Logistik Expert / On-site

- Professional pick-up and transport service in Germany, Austria, Hungary, Poland and Benelux
- Short downtimes
- Trained specialist personnel
- Own equipment-specific transport packaging
- Full value insurance
- Daily delivery routes
- Cost transparency for on-site service
- Onsite calibration at the customer's location:
 - at the customer's premises
 - in own laboratory containers

[Click here](#) for the detailed list of delivery routes

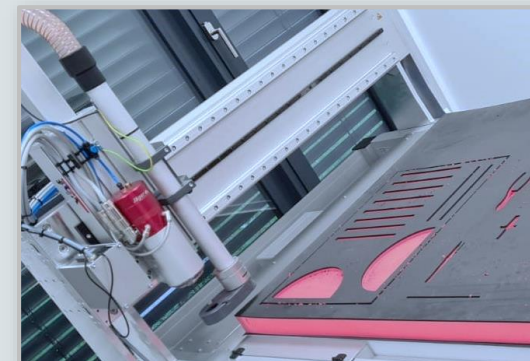




Storage and transport solutions

Best for tools, test equipment and other items

- Development and production of storage systems for any desired tool or device
- Individually milled foam boards (Shadow Boards)
- Laser engraving of tools, mats, cases
- Equipped TCS according to your specifications
- Shadow boards available in an ESD version on request.

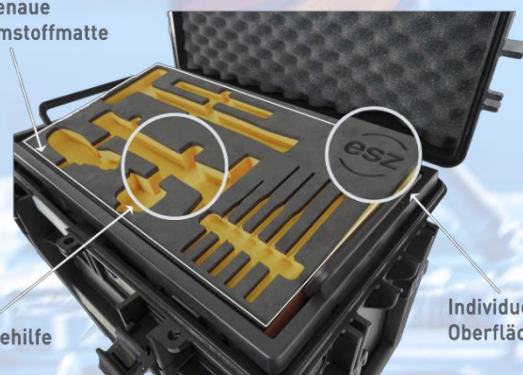


The plus in safety in workshops and on the road

- Efficient, mobile and individual solutions for all industries
- Uncompromising security thanks to optimal storage solutions
- Avoidance of Foreign Object Damage e.g. during aircraft maintenance



Passgenaue
Schaumstoffmatte



Entnahnehilfe

Individuelle
Oberflächensignatur

Safety

needs **confidence.** We make

confidence **measurable.**

For today's **decisions**

and **products**

for the **future.**