

Certification and Periodic Verification of 3D Laser Scanners Used in Criminal Proceedings

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The purpose of this article is to analyze the presence or absence in current legislation of requirements for the certification and calibration of laser 3D scanners used in Ukrainian criminal proceedings, as well as to determine which national and international standards such devices must (or may) comply with. To achieve this goal, linguistic, formal-legal, formal-logical, comparative-legal methods, and forecasting were used. Current procedures for metrological control and supervision are highlighted. It has been determined that certain types (model lines, series) of measuring devices are subject to certification (approval of the type of measuring equipment). A list of legally regulated measuring equipment used to perform work on behalf of criminal justice authorities is provided. It is argued that under current legislation, laser 3D scanners used in criminal proceedings are not regulated measuring instruments and do not require specific certification and periodic verification. Such devices may be subject to voluntary certification and verification at the initiative of their manufacturers, suppliers, or users. National (ДСТУ) and international (ISO) standards are provided, according to which voluntary certification of laser 3D scanners used in criminal proceedings can be carried out.

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Keywords: *criminal proceedings; forensic technology; scientific and technical means; laser 3D scanner; measuring instrument; certification; verification; standard.*

Research Problem Formulation

Modern 3D laser scanning technologies make possible to quickly, accurately and efficiently capture the dimensional and spatial characteristics of many material objects. Already today, the degree of detail of scanning and measuring of modern 3D laser scanners reaches 5 microns (0.0005 mm), and the repeatability (permissible error between measurements) is 2 microns (0.0002 mm) ¹. Accurate measurements are regulated by legislation in the field of metrology and metrological activities; sometimes such devices require certification, periodic verification or other control measures.

In criminal proceedings, laser 3D scanners can be used both for visual recording of forensically significant objects and for measuring their dimensional and spatial characteristics. In case of fixing objects, these scientific and technical means do not require certification and verification. With the introduction of modern scientific and technical means into practice, some participants in criminal proceedings (primarily lawyers) have doubts about the accuracy of such devices, the repeatability of measurements, their compliance with standards, etc. That is why the issues of legal regulation of metrological control of laser 3D scanners and the mandatory nature of their certification and verification are extremely relevant.

Article Purpose

Analyze availability or lack in the current legislation of requirements for certification and verification of laser 3D scanners as scientific and technical means in criminal proceedings and the introduction of national and international standards to which these devices should (can) comply.

Research Methods

For studying current legislation provisions on grounds and procedure for certification and verification of measuring instruments, methods of linguistic analysis and formal legal analysis were used. Formal logical method and a set of methods of logic (analysis, synthesis, deduction, induction) allowed the authors to identify measuring instruments that require mandatory certification and verification. The comparative legal method contributed to the comparison of the practice of manufacturers and users of 3D scanners regarding the initiative verification and certification of such devices. With the help of forecasting method, further prospects for scientific research in this field are formulated.

Analysis of Essential Researches and Publications

In recent years, Ukrainian scientists have repeatedly focused on specific issues related to the certification and calibration

1 Artec Micro II. Automated desktop 3D scanner for digitizing parts in 5-micron accuracy / Artec3d : web. URL: <https://www.artec3d.com/portable-3d-scanners/artec-micro> (date accessed: 18.12.2025).

of field forensic equipment. In particular, O. Dufeniuk ², A. Poltavskyi, O. Ruvin ³, and Yu. Poliak ⁴ determined which international standards (ISO) can be applied to such devices; S. Svirydenko and V. Piaskovskyi ⁵ argued for the benefits of involving representatives of forensic institutions as specialists in procedural actions due to their possession of certified equipment; R. Stepaniuk and S. Perlin ⁶ considered the possibilities of introducing international standards in the field of digital forensics, etc. However, questions regarding the mandatory nature and procedure for certification and verification of laser 3D scanners for use in criminal proceedings remain open, confirming relevance of the proposed research.

Main Content Presentation

The branches of legally regulated metrology and the list of metrological control

and supervision measures that must be applied to measuring equipment are defined by the Law of Ukraine: *On Metrology and Metrological Activity* ⁷ (hereinafter referred to as the *Law on Metrology*).

In particular, the main measure of metrological control is the verification (verification of metrological characteristics) of measuring instruments is “set of operations, including verification and marking and/or issuance of a document on the verification of measuring instruments, which establish and confirm that this instrument meets the established requirements” (paragraph 18 of Part 1 of Article 1 of the Law on Metrology) ⁸. According to this Law:

“Legislatively regulated measuring instruments in operation are subject to periodic verification and verification after each repair.

<...>

- 2 Дуфенюк О. М. Забезпечення судово-експертної діяльності у кримінальному провадженні: системна парадигма. *Вісник Львівського торговельно-економічного університету. Юридичні науки*. 2019. Вип. 8. С. 163—173. DOI: [10.36477/2616-7611-2019-08-18](https://doi.org/10.36477/2616-7611-2019-08-18) (date accessed: 18.12.2025).
- 3 Полтавський А. О. До питання стандартизації технології огляду (дослідження) місця події. *Криміналістика і судова експертиза*. 2019. Вип. 64. С. 331—349. DOI: [10.33994/kn-disse.2019.64.29](https://doi.org/10.33994/kn-disse.2019.64.29) (date accessed: 18.12.2025) ; Рувін О. Г., Полтавський А. О. Стандартизація техніко-криміналістичного та судово-експертного забезпечення правосуддя в Україні: праксеологічний аспект. *Там само*. 2017. Вип. 62. С. 51—60. URL: http://nbuv.gov.ua/UJRN/krise_2017_62_9 (date accessed: 18.12.2025).
- 4 Поляк Ю. П. Застосування технічних засобів при проведенні слідчих (розшукових), негласних слідчих (розшукових) дій та використання його результатів під час досудового розслідування : дис. ... д-ра філос. в галузі права. Львів, 2022. С. 97. URL: <http://dspace.lvduvs.edu.ua/handle/1234567890/4812> (date accessed: 18.12.2025).
- 5 Свириденко С., Пясковський В. Щодо питання залучення до участі в слідчих (розшукових) діях працівників МВС України як спеціалістів. *Підприємництво, господарство і право*. 2021. № 6. С. 205—209. DOI: [10.32849/2663-5313/2021.6.33](https://doi.org/10.32849/2663-5313/2021.6.33) (date accessed: 18.12.2025).
- 6 Степанюк Р. Л., Перлін С. І. Цифрова криміналістика й удосконалення системи криміналістичної техніки в Україні. *Вісник Луганського державного університету внутрішніх справ ім. Е. О. Дідоренка*. 2022. Вип. 3 (99). С. 283—284. DOI: [10.33766/2524-0323.99.283-284](https://doi.org/10.33766/2524-0323.99.283-284) (date accessed: 18.12.2025).
- 7 Про метрологію та метрологічну діяльність : Закон України від 05.06.2014 р. № 1314-VII (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).
- 8 Там само.

Regarding legally regulated measuring equipment in operation, extraordinary, expert and inspection verification may also be carried out” (paragraphs 1 and 5 of Part 1 of Art. 17) ⁹.

Within the verification, the tool is calibrated, namely: determination and calculation of deviations of its indicators from the approved standard.

Verification of measuring instruments is carried out by authorized metrological centers and verification laboratories. The initiative to conduct periodic and post-repair checks, as well as payment for services for their implementation, should come from enterprises, institutions or organizations operating the relevant devices ¹⁰.

Similarly, certain types (model lines, series) of measuring devices are subject to certification: in the terminology of clause 7 of Part 1 of Art. 1 of the Law on Metrology: *“approval of the type of measuring instrument and approval of the type of measuring instrument is a decision of the designated conformity assessment body, made on the basis of a type assessment report, that the type of measuring instrument meets the established requirements and can be used in the field of legally regulated metrology in a way*

in which it is expected to provide reliable measurement results within a certain period of time” ¹¹. As a result of approval of a certain type of measuring instrument, a certificate is issued, information about which is entered in the relevant open register ¹².

Measuring instruments used in the field of legally regulated metrology are subject to mandatory certification and verification. Such areas, among others, include measuring *“works carried out on behalf of pre-trial investigation bodies, prosecution bodies and courts”* (paragraph 12 of Part 1 of Article 3 of the Law on Metrology) ¹³, id est performed in the field of criminal justice.

The list of legally regulated measuring instruments used during such work and subject to periodic verification is outlined in the annex to the Resolution of the Cabinet of Ministers of Ukraine dated 04.06.2015 No. 374 ¹⁴ (hereinafter referred to as the *Annex to the Resolution № 374*). These tools include, but are not limited to:

“13. Measurements of alcohol content in blood and exhaled air

<...>

25. Weights [the way of using this category of devices in modern conditions is difficult for us to imagine.]

9 Про метрологію та метрологічну діяльність ... URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

10 Порядок проведення повірки законодавчо регульованих засобів вимірювальної техніки, що перебувають в експлуатації, та оформлення її результатів : затв. наказ. Мінекономрозвитку України від 08.02.2016 р. № 193 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0278-16#Text> (date accessed: 02.12.2025).

11 Про метрологію та метрологічну діяльність ... URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

12 Порядок ведення Реєстру затверджених типів засобів вимірювальної техніки : затв. наказ. Мінекономрозвитку України від 13.07.2016 р. № 1161. URL: <https://zakon.rada.gov.ua/laws/show/z1081-16#Text> (date accessed: 04.12.2025).

13 Про метрологію та метрологічну діяльність ... URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

14 Перелік категорій законодавчо регульованих засобів вимірювальної техніки, що підлягають періодичній повірці : дод. до постанов. КМУ від 04.06.2015 р. № 374 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/374-2015-%D0%BF#Text> (date accessed: 02.12.2025).

<...>

50. *Non-automatic weighing instruments*

<...>

74. *Thermometers (for food control, safety of working conditions and conducting forensic examinations on behalf of pre-trial investigation bodies, prosecutor's offices and courts)*¹⁵.

Consequently, all other measuring instruments used in criminal proceedings (including 3D laser scanners) are not legally regulated and do not require certification, regular verification and calibration¹⁶.

Instruments for measuring length and area (in particular, rulers and tape measures, which are integral components of any set of forensic tools) are subject to periodic verification only if they are used to monitor the state of the environment, conducting trade and commercial transactions and settlements, determining the parameters of buildings, structures, and built-up areas, as well as registering national and international sports records (clauses 3, 7, 9, 13 of Part 1 of Article 3 of the Law on Metrology¹⁷). It should be noted that digital cameras, which, together with linear metric standards (most often, scale rulers), are used for measuring

(monophotogrammetric) photography (in particular, during forensic examinations), are not subject to any certification or verification.

The closest scientific and technical means to 3D scanners mentioned in the annex to Resolution No. 374, is a total station theodolite: "geodetic device designed to measure horizontal and vertical angles, distances and excesses *id est* to perform plan-altitude (tachometric) survey of the terrain in a polar way"¹⁸ (its modern samples are based on 3D technologies). At the same time, periodic verification of such devices is required only for topographic, geodetic, cartographic and hydrometeorological works, land management and determination of the parameters of buildings, structures and the territory of development (clauses 6, 9 of Part 1 of Article 3 of the Law on Metrology)¹⁹.

Considering the above, we should note that certification and mandatory periodic verification are required based on 3D -total station technologies, which are used to record the parameters of buildings and land plots during forensic engineering construction and technical, construction and evaluation, land and technical, evaluation and land examinations, and research on land management issues, the tasks of

15 Перелік категорій законодавчо регульованих засобів ... URL: <https://zakon.rada.gov.ua/laws/show/374-2015-%D0%BF#Text> (date accessed: 02.12.2025).

16 Коваленко А. В. До питання сертифікації та періодичної повірки засобів вимірювальної техніки, які використовуються у кримінальному судочинстві. *Актуальні питання судової експертології, криміналістики та кримінального процесу* : мат-ли VII міжнар. наук.-практ. конф. (Київ, 10.12.2025). Київ, 2025. С. 171. URI: <http://repository.ukd.edu.ua/xmlui/handle/123456789/1905> (date accessed: 02.12.2025).

17 Про метрологію та метрологічну діяльність ... URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

18 Тахеометр / Альохін В. І. та ін. Мала гірнича енциклопедія. У 3 т. / за ред. В. С. Білецького. Т. 3 : С — Я / Донецьк, 2013. С. 247. URI: <https://repository.kpi.kharkov.ua/handle/KhPI-Press/37398> (date accessed: 10.12.2025).

19 Про метрологію та метрологічну діяльність ... URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

which include ²⁰, by the way, includes the works mentioned in the Law on Metrology.

For example, *Leica ScanStation P30/P40/P50*, *Leica RTC360* laser scanners (which can be used as total stations) were certified by the National Scientific Center “Institute of Metrology” in 2020 for the period up to 2030 (inspection certificate *NN UA.TR.113-0301-20*), however, in 2024 this certificate was canceled ²¹. At the time of writing, the Register of Approved Measuring Instrument Types does not contain other references to 3D laser scanners.

At the same time, as O. Maletska notes, not only legally regulated measuring instruments ²² can be subject to verification. Other devices are certified and verified by authorized bodies at the initiative of enterprises, institutions, or organizations that operate and/or supply them. That is why manufacturers and suppliers of 3D scanners today certify and calibrate such devices in accordance with the regulatory requirements of other countries or in preparation for possible changes in Ukrainian legislation in the field of metrology and metrological activities. In addition, there are widespread proposals in

scientific circles to expand the list of forensic scientific and technical means that should be certified in accordance with certain standards ²³. In view of the above, as well as the obvious inconsistency of the list of legally regulated measuring instruments (included in the appendix to Resolution № 374) to the current state of scientific and technological development, we consider it appropriate to determine which national and international standards laser 3D scanners can meet as measuring instruments in Ukrainian criminal proceedings.

In accordance with Part 7 of Art. 17 of the Law on Metrology, “*verification of legally regulated measuring instruments in operation is carried out according to the methods determined by the normative legal acts of the central executive body, which ensures the formation of state policy in the field of metrology and metrological activities, or national standards, to which there are relevant references in the normative legal acts of this central executive body*” ²⁴.

Similarly, calibration of measuring instruments (calculation of deviations of the device indicators from the approved

20 Інструкція про призначення та проведення судових експертиз та експертних досліджень та Науково-методичні рекомендації з питань підготовки та призначення судових експертиз та експертних досліджень : затв. наказ. Мін'юсту України від 08.10.1998 р. № 53/5 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/laws/show/z0705-98#Text> (date accessed: 10.12.2025).

21 Реєстр затверджених типів засобів вимірювальної техніки / ДП «Укрметртестстандарт» : вебсайт. URL: <https://legalvzt.kiev.ua> (date accessed: 07.12.2025).

22 Малецька О. Є. Повірка та калібрування засобів вимірювальної техніки на підприємстві: розв'язання наявних проблем / Інститут підвищення кваліфікації і перепідготовки спеціалістів з метрології : вебсайт. 06.01.2022. URL: <https://www.ipkm.org.ua/services> (date accessed: 01.12.2025).

23 Дуфенюк О. М. Зазнач. твір. DOI: 10.36477/2616-7611-2019-08-18 (date accessed: 18.12.2025); Полтавський А. О. Зазнач. твір. DOI: 10.33994/kndise.2019.64.29 (date accessed: 18.12.2025); Рувін О. Г., Полтавський А. О. Зазнач. твір. URL: http://nbuv.gov.ua/UJRN/krise_2017_62_9 (date accessed: 18.12.2025); Поляк Ю. П. Зазнач. твір. URI: <http://dspace.lvduvs.edu.ua/handle/1234567890/4812> (date accessed: 18.12.2025).

24 Про метрологію та метрологічну діяльність URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

standard) is carried out in accordance with national standards harmonized with the relevant international and European standards, and documents adopted by international and regional metrology organizations (Part 3 of Art. 27 of the Law on Metrology²⁵).

Until 01.01.2026, ДСТУ ГОСТ ISO 5725-1:2005, 5725-2:2005, 5725-3:2005, 5725-4:2005, 5725-5:2005, 5725-6:2005 “Accuracy (correctness and precision) of measurement methods and results” (parts 1–6)²⁶, the basis of which was the interstate standard ISO 5725-1:2023²⁷). Note: this interstate Standard was repeatedly updated (in particular, in 2023), which in no way affected the changes to the national standards, so we see the need to update the national standards in accordance with the current version of their international counterpart.

At the international level, a series of ISO 10360 standards²⁸ are used to regulate the requirements for measuring equip-

ment. In particular, these international standards are used by the German company *Zeiss*²⁹, which produces, in particular, 3D laser scanners, to certify its own measuring equipment. In Ukraine, ДСТУ ISO 10360-2:2006 “Technical requirements for product geometry (GPS)” has been adapted and approved. Acceptance and control tests of coordinate measuring machines. Part 2: Coordinate measuring machines for measuring dimensions (ISO 10360-2:2001, IDT)”³⁰.

The Chinese company *Shining 3D* has certified its laboratories in accordance with German national standards and calibrates its own 3D scanners according to the German engineering association standard VDI/VDE 2634, developed specifically for the certification of optical 3D measuring devices³¹. Similarly, the Luxembourg made *Artec Micro 2*³² 3D scanner is certified according to the international standard ISO 12836 “Dentistry — Digitizing devices for CAD/CAM systems for indirect

25 Про метрологію та метрологічну діяльність URL: <https://zakon.rada.gov.ua/laws/show/1314-18#Text> (date accessed: 02.12.2025).

26 Про надання чинності в Україні міждержавним стандартам, змінам до міждержавних стандартів та скасування нормативних документів : наказ Держспоживстандарту України від 30.12.2005 р. № 387 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/rada/show/v0387609-05#Text> (date accessed: 02.12.2025).

27 ISO 5725-1:2023 Accuracy (trueness and precision) of measurement methods and results. Part 1: General principles and definitions / ISO : web. URL: <https://www.iso.org/standard/69418.html> (date accessed: 05.12.2025).

28 DIN EN ISO 10360 Standard Series for Coordinate Measuring Machines / Zeiss : web. URL: <https://www.zeiss.com/metrology/en/explore/topics/din-en-iso-10360.html> (date accessed: 05.12.2025).

29 Ibid.

30 Про затвердження національних стандартів України, скасування нормативних документів та внесення змін до наказу Держспоживстандарту України від 11.01.2005 № 10 : наказ Держспоживстандарту України від 29.06.2006 р. № 180 (зі змін. та допов.). URL: <https://zakon.rada.gov.ua/rada/show/v0180609-06#Text> (date accessed: 05.12.2025).

31 Accuracy Certification Pathway: From CNAS Accreditation to VDI/VDE 2634 Calibration Certificate / Shining 3d : web. Jul. 15th 2024. URL: <https://www.shining3d.com/accuracy-certification-pathway-from-cn-as-accreditation-to-vdi/vde-2634-calibration-certificate> (date accessed: 05.12.2025).

32 Artec Micro II URL: <https://www.artec3d.com/portable-3d-scanners/artec-micro> (date accessed: 18.12.2025).

dental restorations — Test methods for accuracy assessment,”³³ although this scanner is for general use and is not directly used in dentistry.

Consequently, as international as national standards can be applied for voluntary certification and verification of 3D laser scanners.

Conclusions

Summing up, we note that according to the current legislation of Ukraine, 3D laser scanners used for the needs of criminal proceedings do not belong to regulated measuring instruments and do not require specific certification and periodic verification. Perhaps the only exception to this rule is based on 3D total station theodolites that can be used to measure and record the parameters of buildings or land plots during forensic construction and technical, appraisal and construction, land and technical, appraisal and land forensic examinations and land management researches.

At the same time, manufacturers and suppliers of 3D scanners can certify and calibrate such devices in accordance with the regulatory requirements of other countries or in preparation for possible changes in Ukrainian legislation in the field of metrology and metrological activities. Until January 1, 2026, Ukraine was guided by ДСТУ ГОСТ ISO 5725-(1–6):2005 “Accuracy (trueness and precision) of measurement methods and results,” as well as ISO 5725-1:2023 Accuracy (trueness and precision) of measurement methods and results. From January 1, 2026, ДСТУ ISO 10360-2:2006 “Technical requirements for product geometry (GPS). Acceptance

and control tests of coordinate measuring machines. Part 2. Coordinate measuring machines for dimensional measurement (ISO 10360-2:2001, IDT)” and its international counterpart ISO 10360 Geometrical product specifications (GPS) — Acceptance and reverification tests for coordinate measuring machines. During certification and verification of 3D scanners, more specific international standards for engineering, construction, medicine and other industries may also be applied.

Сертифікація та періодична повірка лазерних 3D-сканерів, якими користуються в кримінальному судочинстві

Артем Коваленко,
Володимир Коваленко

Мета статті — проаналізувати наявність або відсутність в чинному законодавстві вимог до сертифікації та повірки лазерних 3D-сканерів, якими користуються в українському кримінальному судочинстві, а також з’ясувати, яким національним і міжнародним стандартам мають (або можуть) відповідати такі пристрої. Для досягнення поставленої мети застосовано лінгвістичний, формально-юридичний, формально-логічний, порівняльно-правовий методи, прогнозування. Висвітлено поточні процедури метрологічного контролю й нагляду. Визначено, що сертифікації (затвердженню типу засобу вимірювальної техніки) підлягають певні типи (модельні лінійки, серії) вимірювальних пристроїв. Наведено перелік законодавчо регульованих засобів вимірювальної техніки, які застосовують для виконання робіт за дорученням органів кримінальної юстиції. Аргументовано, що за чинного законодавства

33 ISO 12836:2015 Dentistry — Digitizing devices for CAD/CAM systems for indirect dental restorations — Test methods for assessing accuracy. ISO : web. URL: <https://www.iso.org/standard/68414.html> (date accessed: 05.12.2025).

лазерні 3D-сканери, якими послуговуються в кримінальному судочинстві, не належать до регульованих засобів вимірювальної техніки й не потребують специфічної сертифікації та періодичної повірки. Такі пристрої можуть підлягати добровільній сертифікації й повірці за ініціативи їхніх виробників, постачальників або користувачів. Наведено національні (ДСТУ) і міжнародні (ISO) стандарти, за якими можна здійснювати ініціативну сертифікацію лазерних 3D-сканерів, якими користуються в кримінальному судочинстві.

Ключові слова: кримінальне провадження; криміналістична техніка; науково-технічний засіб; лазерний 3D-сканер; засіб вимірювальної техніки; сертифікація; повірка; стандарт.

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Declaration of Competing Interest

Author declares no conflict of interest.

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