

CMS Certification Handbook

Coordinate Metrology
Society

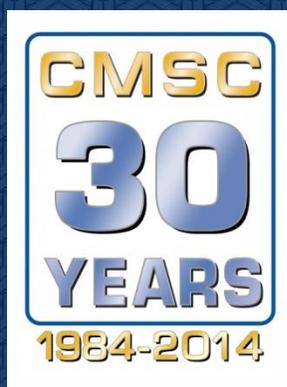




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SECTION 1: THE COORDINATE METROLOGY SOCIETY (CMS)

ORGANIZATION AND MEMBERSHIP

The Coordinate Metrology Society (CMS) is the preeminent membership association for portable measurement professionals. The CMS is driven by its charter to educate its membership about the utilization of 3D metrology solutions including traditional CMMs, laser trackers, photogrammetry, theodolites, laser projection systems, laser radar, noncontact scanning devices, GPS, and articulating arms. These systems are used for various applications such as reverse-engineering, tooling, inspection, metrology-assisted assembly, deformation analysis, robot calibration, automation and integration.

The organization has developed career-enhancing programs for professional certification in Portable 3D Metrology. The Coordinate Metrology Systems Conference (CMSC) is also sponsored by the CMS and supported by users, service providers, and OEM manufacturers of high-precision, portable coordinate measuring machine systems, software, and peripherals. The membership assembles each year in July to get a first-hand look at the latest advancements in portable measurement systems and software that produces and uses 3D coordinate data. The event is held in a different city each year.

The CMS community is encouraged to participate in many ways, from volunteering during the conference, running for a position on the Executive Committee, or serving on a sub-committee of the organization. Yearly membership dues are \$35.00, and are included in the yearly conference fee. To join the Coordinate Metrology Society or attend the yearly conference, contact the Registrar at registrar@cmssc.org. The organization's latest news and updates can be found at their www.CMSSC.org.

HISTORY OF THE ORGANIZATION

At the 1984 gathering of the American Society of Photogrammetry and Remote Sensing (ASPRS), the idea emerged to organize a society of PCMM industry professionals and host the Coordinate Metrology Systems Conference. In 1985, the first official meeting of the CMSC was held. The original intention of the event was to bring OEMs and users together to work on standardizing theodolite targets. The rest, as they say, is history. In 2014, the CMS celebrated its 30th anniversary, an exceptional accomplishment by any standards for a volunteer-based professional organization. For more information about the Coordinate Metrology Systems Conference, please reference Page 22.





SECTION 2: INTRODUCTION TO CMS CERTIFICATION

CERTIFICATION OVERVIEW

Portable 3D Metrology is being integrated into manufacturing processes at a rapid rate. Data collection technologies that were once the domain of scientists, engineers, and mathematicians are now being used by technicians and shop-floor personnel for industrial applications and beyond. Measurement equipment is calibrated and certified to performance standards, but most of the personnel operating this equipment are not accredited. There are many variables induced by an operator that can dramatically influence data collection and dimensional control. It is important for an employer to verify the knowledge and skill level of an employee, or a metrology service provider in this industry.

The Coordinate Metrology Society determined a clear need for a Certification program based on a graying workforce, new skill requirements from industry, and the ever increasing need for metrology expertise. Today, CMS Certification credentials aid in quantifying a potential employee's knowledge of metrology, which is essential to ISO certified manufacturers and companies with Quality Management Systems.

CERTIFICATION COMMITTEE

The CMS Certification Committee was formed in 2009 to assess the need and feasibility of creating a Certification program for portable metrology professionals. An established Charter was developed that defined the committee membership, the reporting responsibility and updated the CMS bylaws to make certification committee a standing committee. The group researched existing certifications, surveyed the CMS membership (2009 conference) and began developing a preliminary Body of Knowledge (BOK). The group also determined the role of the Coordinate Metrology Society as an issuing authority. The bylaws governing the committee can be found [here](#).

After nearly five years of steady development, the Coordinate Metrology Society launched the industry's first Level-One Certification for Portable 3D Metrology. The first examinations were held at the 2013 CMSC held in San Diego, CA.

The dedicated CMS Certification Committee is composed of distinguished metrology veterans and manufacturing industry professionals:

- Randy Gruver – Committee Chair, Boeing Technical Skills Instructor
- Ben Rennison – The Boeing Company
- Alan Metzler – Northrop Grumman Electronic Systems
- Bob Elliott – Lockheed Martin
- Mathew Ilardo – Brookhaven National Laboratory
- Pat Walsh – MVS Group
- Ulysses Green – The Boeing Company / GKN / RT
- Chuck Pfeffer – FARO Technologies
- Gary Confalone – East Coast Metrology
- Ron Hicks – API Services
- Ron Rode – Plant Tool & Engineering



Randy Gruver, Chair
CMS Certification Committee

A special thank you to Quality Digest for creating our logo!



DEVELOPMENT OF THE CERTIFICATION PROGRAM

In 2009, the CMS certification committee was formed to study the need for 3D Portable Metrology Certification. The original assumptions were to establish that equipment operators and data processors were the target audience. The committee investigated a partnership in administering certification, and determined training would be provided by 3rd party organizations such as manufacturers, service providers, academia, and national institutes. Conclusions drawn from the 2009 study were:

- A properly structured certification program would be of definite value.
- Equipment must be calibrated, but the operator, the greatest potential source of error, is not required to be certified.
- Certification should be multi-level to delineate degree of capability and responsibility.
- Certification should indicate mastery of a core body of knowledge with additional certifications for equipment/software.
- Hardware/software certification should demonstrate appropriate technical knowledge and proficiency.
- There should be certified examiners for each hardware group.
- There may be areas where certification would be application specific.

CMSC 2010 Skills Development Workshop

The CMS Certification committee developed the idea to perform a statistical study at CMSC. The aim of the study would identify skill gaps in the general metrology community. In addition to this, the workshops at CMSC would relate content to data developed in the study. The CMSC 2010 study was an open workshop inviting conference delegates to participate in an official Measurement Study. The core subject of the measurement study was based on a variety of 'hand tools' used in dimensional measurement. The study's objectives were to look at the importance of core measurement principles, observing behavior when dealing with measurements, instilling the right measurement strategy, and encouraging a questioning culture.

The measurement studies were conducted over two days in two separate Areas using various defined first principle tasks. The criteria of the tasks were modified to allow for various training and assessments techniques to be undertaken such as:

- Assessment of prior learning and experience
- Questioning techniques
- Practical task monitoring
- Demonstration

2011 - 2014 Measurement Studies

Since 2011, the Measurement Study theme has varied:

- 1) How Behavior Impacts your Measurement in 2011
- 2) The Importance of Practical Testing in 2012

The annual Measurement Studies have greatly contributed to the Body of Knowledge used to produce the existing Certification examinations. The 2012 measurement study was developed to support the organization's Certification Cognitive Examination development process, which culminated in the industry's first level-one personnel Certification program for portable 3D metrology. The 2013 and 2014 studies were focused on the operator experience using 3D metrology devices.





SECTION 3: CMS LEVEL-ONE CERTIFICATION

CMS LEVEL-ONE CERTIFICATION

The Level-One examination is a proctored, online assessment consisting of about 200 multiple choice questions covering foundational theory and practice common to most portable 3D Metrology devices. Candidates for this certification must submit an application, meet eligibility requirements, sign the CMS code of ethics, and pass a peer review. Qualifying candidates are notified and scheduled for an examination seat. The cost for a CMS member to take the Certification exam is \$400, non-member pricing is also available. Assessment test questions will measure knowledge of metrology fundamentals identified in five job-duty areas. But first, please review the basic requirements for the certification.

Professional Certification Requirements

In view of the wide variety of skills and disciplines studied and practiced by portable 3D metrologists, the CMS Certification Program is based primarily on evidence of demonstrated professional capability. Within prescribed limitations, experience may be substituted for education and vice versa, and requires a written examination.

Basic Requirements

The basic requirements for a Level-One Certified Portable 3D Metrologist are:

1. A professional who uses portable 3D metrology technology to collect measurements and interpret data from a variety of contact and non-contact portable 3D measurement devices. The Portable 3D Metrologist is responsible for all phases of data collection and other mensuration requirements, which include planning and supervising survey activities requirements and interpretation.
2. Two years of experience in portable 3D metrology, one year of which was in a position of responsibility demonstrating professional knowledge and competence.
3. References from three people who are holding, or who have held, responsible positions in portable 3D metrology and have first-hand knowledge of the applicant's professional and personal qualifications.
4. Declaration of compliance with the Code of Ethics (reference Page 21) of the Coordinate Metrology Society.
5. Successful completion of a written examination.

Application for CMS Level-One Certification

To apply for the CMS Level-One Certification, you must complete a [PDF application](#) and submit [Reference Forms](#). To learn more about the application process, please reference Page 15. For more information or assistance, please send an email to certification@cmssc.org, or call 425.802.5720.

Preparation for the Level-One Certification Examination

In preparation for the exam, candidates should review the Examination Matrix on Pages 7 and 8, which outlines appropriate paths of study. Knowledge in each job-duty *task* and 2 years minimum of hands-on experience with portable 3D measurement systems will prepare you for this examination.



PREPARING for the LEVEL-ONE EXAMINATION

A matrix illustrating the mix of examination questions has been prepared for applicant review.

Examination Matrix for Level-One Certification for 3D Metrology	
Knowledge Areas Assessed in Certification Examination	% of Exam
1. Interpret Design Documents and Requirements <ul style="list-style-type: none"> • Interpret Blueprints • Interpret CAD • Interpret GD&T • Convert units of measure • Reference appropriate standards • Determine accuracy and resolution 	16%
2. Measurement Device Knowledge <ul style="list-style-type: none"> • Evaluate environmental conditions • Evaluate size requirements / volume parameters • Evaluate required accuracy of resolution • Identify appropriate accessories (adapters, etc.) • Identify ergonomic issues • Evaluate material constraints • Evaluate time constraints • Evaluate accessibility • Demonstrate knowledge of types/applications of common metrology equipment 	16%
3. Pre-measurement Planning <ul style="list-style-type: none"> • Determine error budget • Optimize equipment stations (including fixturing) • Determine data collection/sampling • Plan reference system • Determine order of measurement • Estimate data collection time • Determine naming conventions • Identify safety requirements • Plan coordinate systems • Plan traceability and documentation • Create a documentation plan • Develop a mitigation plan for environmental factors • Plan subject temperature compensation strategy • Maintain equipment 	23%



PREPARING for the LEVEL-ONE EXAMINATION (continued)

Examination Matrix for Level-1 Certification for 3D Metrology	
Knowledge Areas Assessed in Certification Examination	% of Exam
4. Performing Measurement Operations <ul style="list-style-type: none"> • Verify calibration status • Setup equipment (including fixturing) • Install reference features • Perform in-situ equipment check • Determine and mitigate environmental influence on instrument • Measure reference features to create a coordinate system • Measure features of interest • Re-check reference features • Manage temperature influence on part (scale) • Perform device move if required • Perform quality assurance of data set • Manage measurement data • Establish traceability 	25%
5. Analyzing Data and Ethics <ul style="list-style-type: none"> • Compare measurement data to design specifications • Evaluate GD&T • Combine and evaluate alignment of multiple data sets • Register data sets to known reference system • Optimize data • Construct geometry • Calculate uncertainty and its impact on measurement task • Describe statistical process control (SPC) 	20%

HELPFUL RESOURCES

In addition to this handbook, you will find these resources helpful to prepare for the examination:

[The NIST Guide for the use of the International System of Units](#)

[International Vocabulary of Metrology](#)

[Guide to the Expression of Uncertainty](#)

[American Society of Quality Certified Calibration Technician Body of Knowledge](#)

[American Society of Quality - Certified Calibration Technician Brochure](#)



PREPARATORY COURSE for CMS LEVEL-ONE CERTIFICATION

A comprehensive preparatory course has been designed by ECM – Global Measurement Solutions (East Coast Metrology) and NPL (National Physical Laboratory – UK) to assist and inform students in the topics covered within the proctored CMS Level-One Certification. The two and a half day course will review the five key knowledge areas that are assessed by the examination. The course will be conducted by a metrology expert in a structured classroom setting with formal presentations, a workbook, and study materials. Through question and answer sessions, discussion of the knowledge areas will be a primary focus of the course to ensure knowledge and understanding of each topic. The course can be taken at ECM (see page 17 for location) or conducted on-site at the customer's location.

Students have the option to take the examination on the third day of the course. If a student plans to take the exam at the end of the course, they will need to register and begin the Level-One Certification application process (covered on Page 15) at least 10 weeks in advance of the course. ECM has been approved by the CMS as a certified proctor site.

Five Knowledge Areas covered in the Preparatory Course

- Basic principles in interpreting engineering documents.
- Effects of equipment and environment on measurement.
- Factors in establishing a measurement and documentation plan
- Measurement Operations
- Data analysis and Ethics

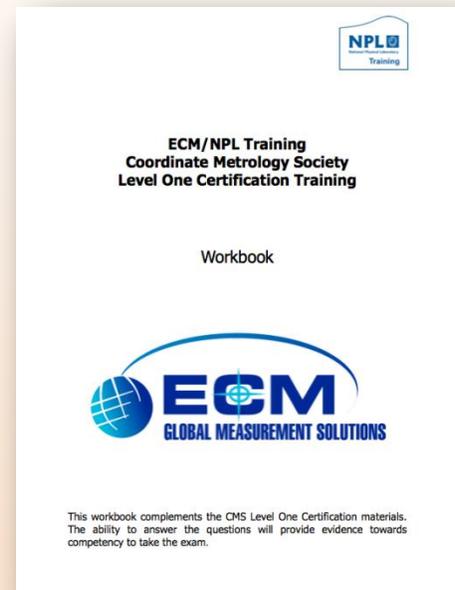
Basic Course Outline

- I. Introduction
- II. Fundamental Measurement
- III. Introduction to Dimensioning & GD&T
- IV. GD&T Part 2
- V. Measurement Uncertainty Procedure (Sources, Estimating and Calculating)
 - I. Process Control
 - II. Coordinate Measurement
 - III. Ownership

A detailed Course Outline can be found [here](#).

Registration, Course Dates and Fees

To register online for the course, [follow this link](#). For more information about course date and fees, or custom on-site training, please call (978) 887-5781 or email training@eastcoastmetrology.com.





SECTION 4: CMS LEVEL-TWO CERTIFICATION

CMS LEVEL-TWO CERTIFICATION

The Level-Two Certification examination on a PCMM (portable coordinate measuring machine) is a practical performance assessment. The candidate will use an articulating arm to collect a series of measurements on an artifact, then analyze specific features of that artifact.

Applicants for the Level-Two Certification must submit an application, meet eligibility requirements, sign the CMS Code of Ethics, and pass a peer review. Qualifying candidates are notified and scheduled for an examination seat. The cost for a CMS member to take the Certification exam is \$400, non-member pricing is also available.

Professional Certification Requirements

In view of the wide variety of skills and disciplines studied and practiced by portable 3D metrologists, the CMS Certification Program is based primarily on evidence of demonstrated professional capability. Within prescribed limitations, experience may be substituted for education and vice versa, and requires a practical (hands-on) examination.

Basic Requirements

The basic requirements for a Level-Two Certified Portable 3D Metrologist are:

- 1) Must hold a current Level-One Certification
- 2) Two years of hands-on practical experience and a minimum of 400 hundred hours use, with the requisite device (PCMM, Laser Tracker etc.)
- 3) Two references
- 4) Successful completion of a practical (hands-on) examination.

Note: Level-Two Certifications expire on same date as Level-One Certifications.

Application for CMS Level-Two Certification

To apply for the CMS Level-Two Certification, you must complete a [PDF Application](#) and submit [Reference Forms](#). To learn more about the application process, please reference Page 15. For more information or assistance, please send an email to certification@cmssc.org, or call 425.802.5720.

Preparation for the Level-Two Certification Examination

In preparation for this hands-on practical assessment, candidates should review the Assessment Matrix on Page 11, which outlines seven performance areas evaluated during the Level-Two Certification test. Knowledge in each job-duty task and 2 years minimum of hands-on experience with portable 3D measurement systems will prepare you for this examination.

PREPARING for the LEVEL-TWO EXAMINATION

A matrix illustrating the hands-on PCMM practical assessment has been prepared for applicant review. Knowledge in each job-duty *task* and 2 years minimum of experience with portable 3D measurement systems will prepare you for this examination.

Assessment Matrix for Level-Two Certification for 3D Metrology		
Job #	Performance Assessment	% of Exam
Job 1	Set up, Compensate Probe and Perform Field Checks on an Articulating Arm including Basic Operator Repeatability Test	9%
Job 2	Measure Dimensions and Angle with Print	24%
Job 3	Measure Feature Form (including Flatness, Roundness) with Print	14%
Job 4	Measure Orientation (Parallelism, Perpendicularity) with Print with GD&T	18%
Job 5	Relocation	14%
Job 6	Measure Position Features (6 Hole Pattern) using a Print including Alignment and Analysis in CAD, including Probe Change with Sheet Metal (Thin Section) Trim.	7%
Job 7	Measure Profile (CAD)	





SECTION 5: CMS RECERTIFICATION

RECERTIFICATION REQUIREMENTS

Any professional who has been certified by the CMS is certified for life unless there is cause to remove the certification for malpractice or violation of the **CMS Code of Ethics**. The Coordinate Metrology Society has a Recertification Program to assure that a certified person has maintained or improved on those skills and knowledge that allowed for certification. The Society will maintain an **Active Certification List** that requires recertification every five years. Certified persons will appear on the Active Certified list for as long as their certification is in force.

Recertification applicants are required to fill out the Recertification application (not yet available) to show the type of activity that they have practiced and their professional involvement in portable 3D metrology.

Inactive/Retired Certified Professionals

Certified Professionals who do not become **recertified** are automatically placed in either an Inactive or Retired status. Individuals in either category are not permitted to use their seal to sign plans or otherwise indicate in any way that they are active Certified Professionals. An online searchable list of all active Certified Professionals in each category is maintained.

Individuals whose Certified status is inactive or retired for a period longer than one (1) year following Active status may apply for recertification provided that, in addition to the standard recertification criteria (outlined above), they take and pass the examination in their respective certification area.

RECERTIFICATION GUIDELINES

Recertification is based upon a “Continued Professional Development Qualification” rating system of Professional Development Hours (PDH) of credit. Recertification applicants are required to fill out the Recertification Application to show the type and duration of activity that they have practiced and their professional involvement in portable 3D metrology. They must also have three References who have knowledge of the applicant’s professional and personal involvement in the **last five (5) years**.

Each applicant must have completed and documented **75 Professional Development Hours (PDH) or PDH Credits** based on the following criteria which will be evaluated by the Certification Committee.

NOTE: you may also choose to recertify by exam every five years in lieu of recertifying by PDH hours. A table outlining the evaluation activity and criteria can be found on the following page.

Level – Two Device-Specific Recertification

The following activity will be used as criteria for recertification in the Level-Two device-specific certifications.

- 1000 hours of use of Requisite device (PCMM, Laser Tracker, etc) over the past 5 years.

NOTE: Number of hours required will be pro-rated by-month for the first 5-year certification cycle. For example: A Level-One Certification is obtained on July 1, 2014. A Level-Two Certification is obtained on July 1, 2015. Therefore, only 816 hours of documented device use is needed to recertify on July 1, 2019.



RECERTIFICATION GUIDELINES* (continued)

The following are the maximum allowable CMS PDH Credits for those activities that may be used for recertification (**total PDH credits allowed during the past 5 years**). The application must be specific with clear documentation stating the activity and date(s), so the Evaluation Committee can properly evaluate applicant's activities. The application and the references are the only criteria needed for recertification. (Applicant may be asked by the Committee to submit additional information or phone interview).

	Description of Activities that may be used for Recertification	Credits
1)	Active member of an industry committee (5 PDH Credits per year)	20
(2)	Holding office on industry committee (e.g. elected or appointed CMS Executive Committee member appointed CMS subcommittee chair, appointed chair of vice-chair on other industry committees) (5 PDH Credits per year)	25
(3)	CMS Executive Committee Chair or other elected chair or vice chair on other industry committees (10 PDH Credits per year term)	50
(4)	Session Moderator at Technical Conference (1 PDH Credit each)	5
(5)	Author or co-author of a conference technical presentation, poster session, paper or panel session (5 PDH Credits each)	25
(6)	Adjunct teaching a formal class in an academic setting [when not applicant's primary occupation] (2 PDH credits per course)	10
(7)	Workshop Instructor (2 PDH credits per course for a maximum of 4 credits per year)	12
(8)	Examination Committee Contributor (2 PDH credits per instance for a maximum of 5 per year)	10
(9)	CMS/ASPRS Certification exam proctor/panel (2 PDH credits per instance for a maximum of 4 per year)	8
(10)	Community/Career extra curricular, i.e., Pro Bono involvement (3D metrology), e.g., Public Agency (3D metrology) Advisory Board, Citizens Advisory Group, (5 PDH credits per activity)	10
(11)	Author/editor of published 3D metrology-related book (15 PDH Credits per book)	20
(12)	Author (not prime) of one or more chapters of a published 3D metrology-related book (5 PDH Credits)	20
(13)	Author/Co-author of a peer-reviewed, published paper (5 PDH credits per paper)	20



RECERTIFICATION GUIDELINES* (continued)

Evaluation Activity for Recertification	Criteria	Maximum Number of PDH Allowed Within Last 5 Years	Documentation Requirement
Required Minimum Continuing Experience: Applicant has been active in providing services within their certified discipline, or has been in the academic arena involved directly with those subjects.	3 years of the past 5 years actively providing services	50 PDH Credits	Document Position(s) Description(s) and dates
Applicant has contributed and participated in activities of service to the profession and community (see list below)	See items 1 – 10 listed below for PDH Credits	50 PDH Credits	Document Titles with Referencing
Published Papers and/or professional manuals (see list below)	See items 11-13 listed below for PDH credits	20 PDH Credits	Document time spent, titles with full referencing
Applicant has attended workshops/classes or (webinars) in directly related subjects	1 PDH per hour attended (0.1 CEU = 1 PDH)	50 PDH (5 CEU)	Document Course, Titles, and Date
Applicant has attended technical conferences and other professional meetings sponsored by CMS, ASPRS, ISPRS, SPIE, and other appropriate professional organizations.	1 PDH per hour of technical session attendance	40 PDH	Document Meeting Titles



SECTION 6: APPLICATION FOR CERTIFICATION

HOW TO APPLY FOR CERTIFICATION

Getting certified by the CMS is a straightforward process. Whether you are applying for certification or recertification, please follow this procedure:

Step 1: Job Experience - Determine the number of years of actual job experience you have attained in functions that are classified as being at the professional level.

Step 2: Basic Requirements – Please read the sections (Pages 6 and 16) on Basic Requirements and Educational Credit, and ascertain if your actual work experience with or without educational credit meets the conditions listed under Basic Requirements.

Step 3: Application and Reference Forms

A. If you are applying for the Level-One Certification, please download the [PDF Application](#) and [Reference Forms](#). Save the files to your desktop and use Adobe Reader to complete the forms.

B. If you are applying for the Level-Two Certification, please download the [PDF Application](#) and [Reference Forms](#). Save the files to your desktop and use Adobe Reader to complete the forms.

C. If you are applying for Recertification, please read carefully the Recertification Criteria section on Page 12 and complete the PDF Application for Recertification and [Reference Forms](#).

NOTE: When describing experience, applicants are advised to present comprehensive work history. The CMS Evaluation Committee evaluates the application data and does not assume data not presented.

If you have any questions, please call (301) 493-0290, ext 101, or fax your request to (301) 493-0208.

Step 4: References – Please provide names and addresses of at least four persons to whom you have sent a copy of the Confidential Reference Form. To start the process, fill out the form with the person's name and complete address on the top left side of the form and forward to the respective references. Ask your references to supply, from their own personal knowledge, facts with reference to your character and information concerning your professional qualifications. Please request that they mail the completed reference form, with their name, address, and accompanying letters to:

Coordinate Metrology Society Certification Program
5410 Grosvenor Lane, Suite 210
Bethesda, MD 20814-2160

Step 5: Finalize the Application Process - Return your completed application form to the CMS/ASPRS Certification Program, along with the application fee as indicated on Page 16. Make checks payable to the American Society for Photogrammetry and Remote Sensing and mail to:

CMS/ASPRS Certification Program
5410 Grosvenor Lane, Suite 210
Bethesda, MD 20814-2160



HOW TO APPLY FOR CERTIFICATION (continued)

Step 7: Additional Information – Applicants should be prepared to furnish additional background information if requested by the CMS Evaluation Committee.

Step 8: Written Examination - Upon notification of approval by the CMS Evaluation Committee, the applicant must take a written examination within twelve months of application approval.

APPLICATION FEES

CMS Certification Application Fees			
Type of Application	Current CMS Members	Includes annual membership	Without annual membership
Level 1 Certification	\$400.00 (US)	\$435.00 (US)	\$500.00 (US)
Level 2 Certification	\$400.00 (US)	\$435.00 (US)	\$500.00 (US)
Recertification	\$200.00 (US)	\$200.00 (US)	\$250.00 (US)

(NOTE: The fees charged defray administrative costs of the Certification Program. Fees are not refundable in the event of non-certification, and are subject to change by CMS/ASPRS.)

EDUCATIONAL CREDITS

In view of the wide variety of skills and disciplines studied and practiced by portable 3D metrologists, the CMS/ASPRS Certification Program is based primarily on evidence of demonstrated professional capability. Within prescribed limitations it does permit experience to be substituted for education and vice versa and requires a written examination.

When computing the number of years of experience under basic requirements, credit may be taken, in lieu of actual job experience, for degrees in engineering, or in the natural or physical sciences, on the following basis:

Type of Degree	Years of Credit
Bachelor's	1/2
Master's	1/2



LEVEL-ONE CERTIFICATION EXAMINATION SITES

The CMS Level-One Certification examination is held each year at the annual Coordinate Metrology Systems Conference. The proctored assessment can also be scheduled throughout the year at one of the authorized CMS Assessment Facilities in various locations in the United States and Canada. Once your application has been processed and approved, please contact the facility (listed below) nearest your location. An additional fee will be collected as specified: below:

Applicant(s)	Cost per Person in addition to Application Fee
Individual (1 person)	500.00 per person
Group (3-4 people)	\$375.00 per person
Group (5-6 people)	\$300.00 per person
On-Site Assessment (up to 12 people)	\$1500.00 + travel expenses per day for two 6 person sessions

Authorized CMS Assessment Facilities

API Services

Contact: Ron Hicks, President
709 Middle Ground Blvd., Suite B-105, Newport News, VA 23606
T. 877.687.9544 | F. 877.946.5776
E. services@apitechnical.com



BuildIT Software & Solutions Ltd.

Contact: John Chan, Application Engineer, Metrology Specialist
4999 Ste-Catherine W., Suite 308, Montreal, QC, H3Z 1T3, Canada
T. 514-369-4055 ext. 245 | Toll-free 888.687-2348 | F. 514.369.2348
E. info@builditsoftware.com



ECM - Global Measurement Solutions (East Coast Metrology)

Contact: Gary Confalone, President
428-A Boston Street, Topsfield, MA 01983
T: 978-887-5781 x116 | C: 978-621-0846 | F: 978-887-5782
E: gary@eastcoastmetrology.com



FARO Technologies

Contact: Michelle Edwards, Applications Engineering Manager
250 Technology Park, Lake Mary, FL 32746
T. 800.736.0234x1004 | C. 386.846.9997 | F. 407.562.5246
E. Michelle.Edwards@faro.com



Planet Tool & Engineering

Contact: Ron Rode, Manager of CMM Services
315 S. Cool Springs Rd O Fallon, MO. 63366
T. 636.379.9800 | F. 636.379.9400
E. rgrode@ktis.net





SECTION 7: CERTIFICATION CREDENTIALS AND OTHER BENEFITS

AWARD OF CERTIFICATION and RECERTIFICATION

Successful applicants for certification will be awarded an official certificate. Those certified by the Coordinate Metrology Society may display the certificate and use one (or more as appropriate) of the following designations on business stationary and cards: **Certified Portable 3D Metrologist (CMS)**.

Successful applicants for recertification will continue to be listed on the Active Certified Roll and will be awarded a certificate to show that the applicant has maintained skills in the technology.

Searchable Online Database of Certified Metrologists

A database of all active certified metrologists is available online at the CMS website, and is searchable by name, location or certification type.

Certification Logo Guidelines

CMS Certified Metrologists in good standing may use the "CMS Certified" logo on their business cards. Use of the "CMS Certified" logo on a website requires authorization from the CMS. To receive authorization, you must email certification@cmssc.org, and provide: 1) the URL (Web address) of the site where the logo will appear, and 2) the name and ID number of at least one CMS certified metrologist employed by your company. All organizations who receive the "CMS Certified" logo must agree not to redistribute the logo to other individuals or entities for any reason.

The "CMS Certified" logo must be displayed in conjunction with a disclosure statement indicating the number or percentage of the organization's certified practicing portable metrologists. In the event that the organization has no certified personnel, the organization must immediately notify CMS of the change of status, and cease usage of the logo as reasonably possible.



The CMS reserves the right to revoke the display of a "CMS Certified" logo from a website for whatever reasons CMS may deem necessary. These include, but are not limited to: misrepresentation, fraud, significant alteration of the logo, failure to adhere to the CMS Code of Conduct, actions reflecting disrepute upon the CMS or its members, and the combination of the logo with any other corporate or organizational logo or text to infer a partnership, strategic alliance, or other business affiliation.

Seals and Stamps

An embossing seal and rubber stamp containing the certified metrologist's name and certification number may be ordered from the CMS. The cost is \$25.00 per embossing seal or rubber stamp. Certification and recertification are for individuals only. The designation of "Certified" may not be used to indicate a business firm or agency is certified as an entity. The use of a seal or stamp is not authorized for individuals holding the Certification status of "Provisional" or by those whose status has become "Inactive" or "Retired." Note: CMS certification seals and stamps can only be authorized by CMS/ASPRS and manufactured by approved vendors. Unauthorized seal or stamp production is a violation of copyright law and the [Code of Ethics](#).



SECTION 8: MISCELLANEOUS

CMS CERTIFICATION PARTNERSHIP WITH ASPRS

The Coordinate Metrology Society (CMS) has established a relationship with the American Society of Photogrammetry and Remote Sensing (ASPRS) for the purpose of administering professional certification in Portable 3D Metrology. The ASPRS Articles of Incorporation state that it will exert its influence towards the betterment of standards and ethics. On October 29, 2012, the ASPRS Board of Directors approved the addition of administering a certification program to support the CMS's portable metrology community to the ASPRS Certification Program activities.

General Information

There is a distinction between **certification** and **licensure**. Simply stated, CMS/ASPRS certification is official recognition by one's colleagues and peers that an individual has demonstrated professional integrity and competence in their field. As such, the CMS/ASPRS voluntary certification program is considered "specialty certification." It is not a substitute for licensure as, for example, a Land Surveyor. Licensure is a legal act on the part of states to protect the public health, safety and welfare. It is a procedure by which various state and local governments require the licensing of certain professions, practices, trades, etc. under formal statutes and ordinances to protect the well-being of its citizens. Licensure may be required by your local state, county, etc. whether or not you secure certification.

The CMS Certification program, as approved, is entirely voluntary. In accordance with the CMS [Code of Ethics](#) on Page 21, persons certified should decline to undertake any work within, or related to the fields of metrology that is outside their range of competence.

Purpose and Objectives

A growing number of scientific and technical disciplines depend on portable 3D metrology for reliable measurements and information. It is in the interest of those who provide portable 3D metrology services, as well as the user of these services, that such information and data be accurate and dependable. The CMS/ASPRS Certification Program has as its purpose the establishment and maintenance of high standards of ethical conduct and professional practice among portable 3D metrologists.

The primary objectives of the programs are:

- 1) To identify and recognize those persons who, after careful, just appraisal by their peers, and after passing a written examination are considered to have met the requirements established by the Society for certification.
- 2) To provide a basis for weighing the validity or allegations and complaints that involve practicing portable 3D metrologists and for taking appropriate action in connection therewith.
- 3) To encourage persons as yet not fully qualified to work towards certification as a goal of professional achievement.
- 4) To encourage certified persons, through the recertification process, to continue their professional achievements as rapid changes in technology occur.

The CMS/ASPRS Certification Program is voluntary and open to all qualified individuals, whether or not they are members of the Coordinate Metrology Society or the American Society for Photogrammetry and Remote Sensing.



CMS CERTIFICATION PARTNERSHIP WITH ASPRS (continued)

Administrative Procedures

The structure for administering the CMS/ASPRS Certification Program consists of two major elements: The CMS Certification Committee which reviews, then approves, or rejects all applications for Certification or Recertification. The CMS Professional Conduct Committee, which investigates allegations and complaints involving practicing portable 3D metrologists and recommends appropriate action to the Executive Committee. The Society's Certification Committee monitors and develops policy guidelines for the program.

The CMS Executive Committee and the ASPRS Board of Directors are the final authority on matters involving certification and professional conduct.

Applications for Certification and Recertification will, upon receipt at ASPRS Headquarters, be reviewed for completeness. When the required references have submitted Confidential Reference Forms, they are combined with the application. Applications found to be in order are sent to the Chair of the CMS Certification Committee. The Committee will meet as required to take action on all bona fide applications. Applicants for certification/recertification will be notified of action by the CMS Committee as soon as possible.

Reservations

The Coordinate Metrology Society reserves the right to change or amend the requirements for certification and recertification, the educational credits, or the administrative fee structure for review and evaluation if and when deemed appropriate by the Executive Committee.

The CMS further reserves the right to revoke a certification or recertification if, in the opinion of the Executive Committee, the person concerned has violated or shown flagrant disregard for the [Code of Ethics](#) of the Society as found on Page 21.

Since the program is entirely voluntary, the Coordinate Metrology Society assumes no responsibility for any loss or disadvantage, real or imagined, which may be alleged to have resulted from a disapproval of an application for certification, recertification, or revocation of the certificate once given.

By submitting their application, the applicant acknowledges that the Society will apply the internal standards adopted by its Executive Committee in evaluating the applicant, and that it may reject any applicant who does not meet its minimum standards for certification or recertification. In consideration of CMS/ASPRS acceptance and processing of an application, the applicant agrees to waive any and all claims of liability or responsibility against CMS/ASPRS and to indemnify and hold harmless CMS/ASPRS, its directors, officers, committee members, employees, agents and representatives against any and all such injury, damages, or claims made by or on behalf of any person, partnership, association, or corporation. Applicant further acknowledges that CMS/ASPRS, its directors, officers, committee members, employees, agents or representatives are not liable to the applicant, or to any other person, partnership, association, or corporation, in any way for any injury, damages, or claims alleged to be based upon or arising out of the approval or disapproval or the issuance, withdrawal, or termination of any certification or recertification issued by CMS/ASPRS.



CMS CODE OF ETHICS

Honesty, justice, and courtesy form a moral philosophy which, associated with mutual interest among people, should be the principles on which ethics are founded. Each person who is engaged in the use, development, and improvement of coordinate metrology should accept those principles as a set of dynamic guides for conduct and a way of life rather than merely for passive observance. It is an inherent obligation to apply oneself to one's profession with all diligence and in so doing to be guided by this Code of Ethics.

Accordingly, certified members of the Coordinate Metrology Society (CMS) shall have full regard for achieving excellence in their practice and the essentiality of maintaining the highest standards of ethical conduct in responsibilities and work for an employer, all clients, colleagues and associates, and society at large, and shall:

1. Be guided in all professional activities by the highest standards and be a faithful trustee or agent in all matters for each client or employer.
2. At all times function in such a manner as will bring credibility and respect to coordinate metrology activities.
3. Not compete unfairly with anyone who is engaged in coordinate metrology by:
 - a. Advertising in a self-laudatory manner;
 - b. Exploiting one's own or another's employment position for personal financial gain.
 - c. Criticizing other persons working in or having an interest in coordinate metrology in public or private.
 - d. Exercising undue influence or pressure, or soliciting favors through offering monetary inducements.
4. Work to strengthen coordinate metrology applications by:
 - a. Improving one's personal skills and knowledge;
 - b. Exchanging information and experience with other persons interested in and using coordinate metrology, with other professions, and with students and the public;
 - c. Providing opportunities for technical and professional development and advancement of persons working under his or her supervision;
 - d. Promoting the principle of appropriate compensation for work done by persons in their employ.
5. Undertaking only such assignments in the use of coordinate metrology for which one is qualified by education, training, and experience, and employing or advising the use of experts and specialists when and whenever clients' or employers' interests will be best served thereby.
6. Giving appropriate credit to other persons and/or firms for their technical and professional contributions.
7. Recognizing the proprietary, privacy, legal, and ethical interests and rights of others. This not only refers to the adoption of these principles in the general conduct of business and professional activities, but also as they relate specifically to the appropriate and honest application of coordinate metrology, and related technologies.
8. Subscribers to this code shall not condone, promote, advocate, or tolerate any organization's or individual's use of these technologies in a manner that knowingly contributes to:
 - a. Deception through data alteration;
 - b. Circumvention of the law;
 - c. Transgression of reasonable and legitimate expectation of privacy.

COORDINATE METROLOGY SYSTEMS CONFERENCE

The Coordinate Metrology Systems Conference (CMSC) is the world's premier event for Measurement Technology Professionals sponsored by the Coordinate Metrology Society. Established in 1984, the five-day annual conference is held each year at a different location, and attracts visitors from around the globe. CMSC is acclaimed for its large, comprehensive program of top-shelf white papers and applications presentations given by industry experts from science/research laboratories and manufacturing industries, such as aerospace, space hardware, antenna, automotive, shipbuilding, power generation, and general engineering. No other trade show rivals the high level of authoritative information provided by CMSC members and master users of portable metrology solutions for quality control, quality production, and precision assembly.

For more 30 years, the CMSC has been supported by manufacturers of close-tolerance, industrial coordinate measurement solutions and metrology service providers. Each year, the CMSC presents a packed Exhibition Hall, expert white papers, workshops, networking events and more. The event also features a popular Measurement study. In 2013, the CMS held the industry's first Level-One Certification examinations for Portable 3D Metrology. Over the years, the CMSC has attracted attendees from all over the world. In the past three years, nearly one third of all attendees are new to the conference.

In 2013, the CMSC technical presentations covered measurement accuracy and performance, metrology in aerospace tooling and manufacturing, integration of laser trackers and robotics, coordinate measurement systems, equipment optimization, 3D scanning and sensors, and other applications in quality control, production, and precision assembly. The diverse speaker roster included four academic institutions, six science laboratories, nine master technology users, four metrology service providers and four original equipment manufacturers (OEMs). Special guests from NIST and ASTM updated the audience on the progress of emerging industry standards and initiatives. The agenda included speakers from The Boeing Company, Lockheed Martin, AIP Aerospace, Electroimpact, Nuclear AMRC/Manchester University (UK), National Institute of Standards and Technology (NIST), UNC Charlotte, National Physical Laboratory (NPL - UK), Fermilab, ISRO Satellite Centre (India), University of Ontario Institute of Technology (Canada), University of Bath (UK), and other leaders in the field.





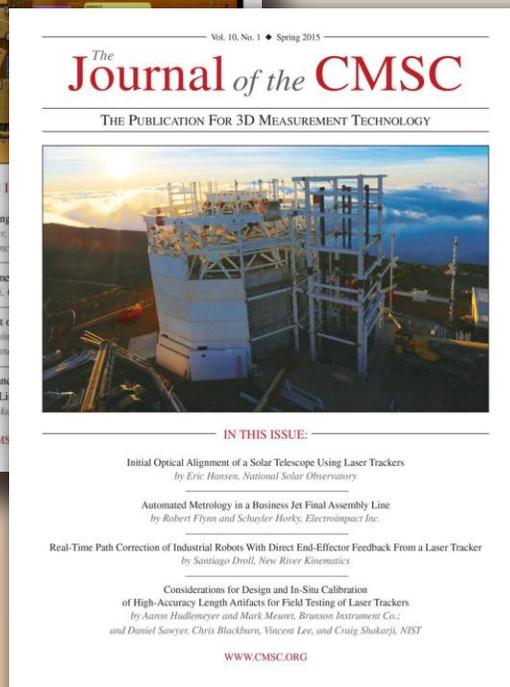
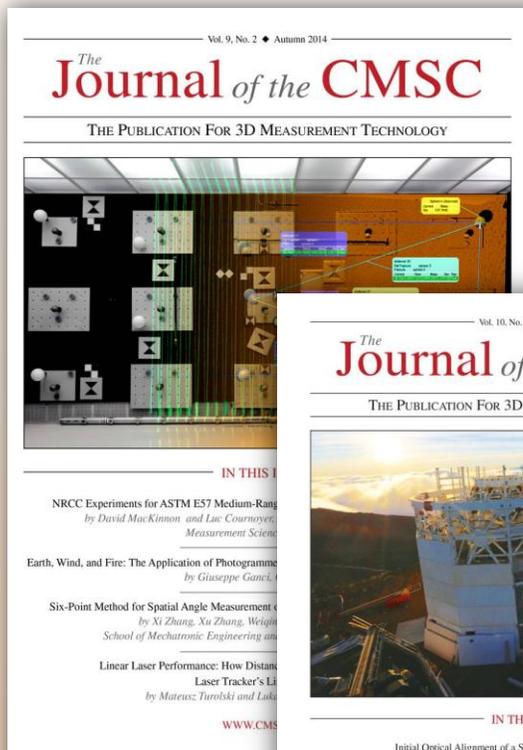
PUBLICATIONS of the COORDINATE METROLOGY SOCIETY

Journal of the CMSC

Debuting in 2006, the *Journal of the CMSC* is published twice a year in the Autumn and Spring by the Coordinate Metrology Society. Each issue devotes its pages to the finest white papers presented by industry experts each year at the Coordinate Metrology Systems Conference. Diverse applications of portable, three-dimensional measurement technology are represented in this well-read, prestigious journal. The annual subscription fee for the publication is included in the membership dues of the Society. Circulation: 6,000 +.

CMSC World eNewsletter

CMSC World is the official digital newsletter of the Coordinate Metrology Society, and is published 4 times a year. Our online publication reaches thousands of metrology professionals and executives, and provides feature articles, videos, industry news, surveys, job placement listings, new product and company announcements, case stories and more. Circulation: 37,000+.



CMSC WORLD Presented by: QUALITYDIGEST DAILY
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NEW HORIZONS
The "Light of My Life": World Metrology Day Sheds Light On Industry Advances
by Ron Rode

Featured Video:
CMSC 2015 July 20-24 in Hollywood, FL. The CMSC lets attendees get close up and personal with today's best 3D measurement hardware, software, and peripherals.

Coordinate Metrology Society Executive Committee
Executive Chairperson: Ron Rode chairman@cmso.org
Past Chair: Ron Hicks pastchairman@cmso.org
Vice Chair and Secretary-Treasurer: Rina Molari-Korgel vicechairman@cmso.org
Committee Member: Gary Confalone exhibitors@cmso.org
Committee Member:

TOP STORY
Moving Targets: PolyWorks Helps Preserve GE's Power Plant Output
by InnovMetric Software

Extreme Fab Inc. is a structural metal fabrication company that has the tools and skills to build the massive machinery that the oil and gas, power, energy, and trucking industries require. One of their key customers is GE Aero Energy, a company that gives businesses and communities around the world the ability to generate reliable and efficient power at or near the point of use, at any time—on or off the grid. [[full story](#)]

CMS MEASUREMENT STUDIES (2010 – 2014)

After the first successful Gage R&R Study in 2010, the Coordinate Measurement Society has organized large-scale, interactive studies each year in the CMSC Exhibition Hall. Garnering enthusiastic participation from conference attendees, the CMS publishes the results of this effort to its membership. Each report is peer-reviewed by the organization's Executive and Certification Committees. The objective of the 2013 and 2014 measurement studies was to engage the metrology community in practical methodology required to support certified operators and programmers.

The 2012 measurement study was developed to support the organization's Certification Cognitive Examination development process, which culminated in the industry's first level-one personnel Certification program for portable 3D metrology. The study's main focus was to test the methodology of practical testing rather than the evaluation of the measurement results. The 83-page report entitled *"The Importance of Practical Testing"* details the results and analysis of the interactive measurement study. Over a two day period, more than 90 CMSC conference attendees participated in data collection activity that provided a hands-on challenge, regardless of experience with large volume measurement systems. The study was coordinated by the National Physical Laboratory (UK) and Metrologic Group, assisted by members of the CMS Certification Committee, Coventry University, and volunteers from many OEMs and software developers in the metrology industry.

The 2011 measurement study resulted in a 30-page report entitled *"How Behaviors Impact Your Measurement"*, which focused on measurement strategies and behaviors of coordinate metrologists. More than 100 conference attendees participated in the data collection activity coordinated by the National Physical Laboratory (UK) assisted by members of the CMSC Certification Committee. The criteria of the study's measurement tasks enabled the authors to examine various training and assessment techniques, such as the evaluation of the participant's prior learning and experience level, questioning methods, practical task monitoring and demonstration. Nearly 95% of conference attendees participated in the measurement study conducted in 2011. A workshop was held on the third day of the conference to review the results and to ascertain information about future measurement studies for CMSC.

