TITANS OF CNC
INSTRUCTION MANUAL

ACADEMY.TITANSOFCNC.COM

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THE ACADEMY DIFFERENCE

DEVELOPED BY CNC EXPERTS

Our unique approach to manufacturing education teaches students to machine real parts up to 95% faster than other programs. We have had students with no prior machining experience design, program, and machine their first part in just 6 weeks.

PROJECT-BASED LEARNING

We teach students the fundamentals of CNC machining, fixturing, live tooling, inspection, and advanced 5-axis machining through repetition and stacking techniques. Each video tutorial walks students step-by-step through the entire manufacturing process—from dimensioned art to finished part.

STANDARDIZED MATERIAL

Each unique Academy part is designed to fit within a standardized work envelope. Students can efficiently create multiple parts and achieve the level of comprehension that is needed to solve industry problems and realize success in the real world.

STANDARDIZED TOOLING

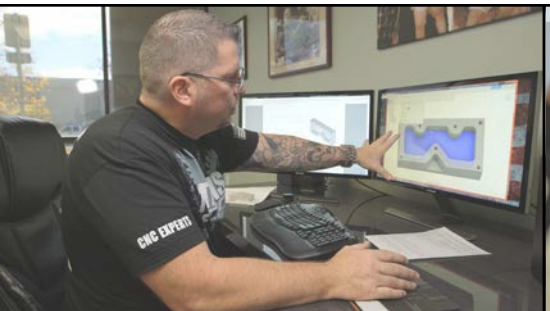
To reduce costs for education programs and promote student confidence with fundamental tooling we standardized the tooling requirements in each part series. Through our incredible partnerships with Kennametal and Mitee-Bite we assembled advanced carbide tooling kits and workholding kits and made them available at affordable prices. What's more, each kit can be expanded and upgraded as students advance in their understanding of manufacturing.

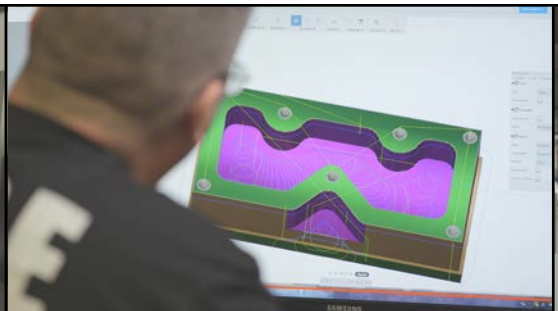
LEARN ANYWHERE

Students can learn how to design, program, and machine complete parts that meet print specifications in the classroom or in their own home. This modernized approach gives users a head-start in their careers and prepares them to make parts that matter in real CNC production environments.

CERTIFIED BY TITANS OF CNC

Students can certify their Academy projects on CNC EXPERT, the world's only certification platform backed by industry leaders like Kennametal, Heller, DN Solutions, Mastercam, Solidworks, and many others. Our certifications validate student's knowledge and opens up exciting opportunities for their future careers.






START HERE

1. REGISTER for a FREE TITANS of CNC: ACADEMY account.
2. VISIT the RESOURCES PAGE to access special offers on SOLIDWORKS, MASTERCAM, and FUSION 360.
3. DESIGN fully 3D Solid Models in the TITAN BUILDING BLOCKS MILL and the TITAN ROCKET LATHE series.
4. PROGRAM the completed 3D Solid Models in the TITAN BUILDING BLOCKS MILL and the TITAN ROCKET LATHE series.
5. MACHINE each part in the TITAN BUILDING BLOCKS MILL and the TITAN ROCKET LATHE series to completion.
6. INSPECT completed parts using the DIMENSIONED PRINTS and record the results on the FINAL INSPECTION REPORT for each part.
7. CERTIFY your CAD, CAM, and CNC projects by submitting them for review on CNC EXPERT.

COMPUTER AIDED DESIGN

Students will learn step-by-step how to design their own 3D model. They will learn to read a dimensioned print and draw solid models using either Solidworks, Mastercam, or Fusion 360 software. By beginning with CAD, students become deeply familiar with the critical features of their part.

SKILLS DEMONSTRATED

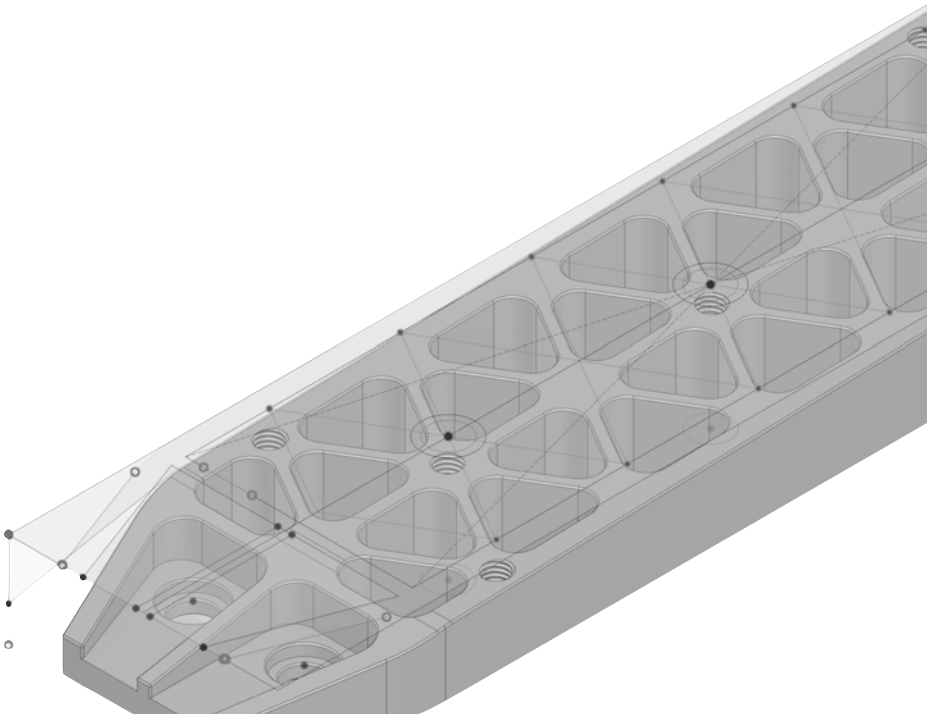
- sketch shapes
- create features
- modify features
- create assemblies
- inspect model geometries
- efficient sketching techniques
- and more

REQUIREMENTS

- desktop or portable computer
- CAD software
- part specifications (print)

RECOMMENDED

- 3D CAD/CAM mouse
- Solidworks



COMPUTER AIDED MANUFACTURING

Students will learn step-by-step how to program the solid model they created in the design step. They will learn to control a CNC machine using Mastercam or Fusion 360 software. Running the CAM simulation will give students the competence they need to understand tool paths and machine with confidence.

SKILLS DEMONSTRATED

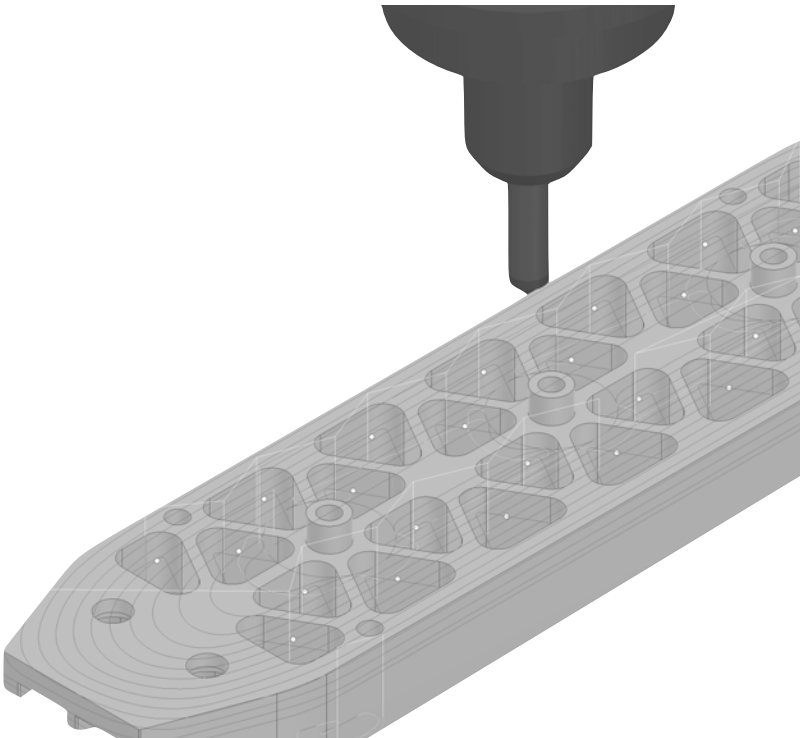
- define and orient stock material
- establish coordinate system (program's point of origin)
- apply tool paths to a solid model
- verify operation through 3D simulation
- post final code to specified CNC machine
- and more

REQUIREMENTS

- desktop or portable computer
- CAM software
- part specifications (print)
- tool library
- setup sheet

RECOMMENDED

- 3D CAD/CAM mouse
- Mastercam



COMPUTER NUMERICAL CONTROL

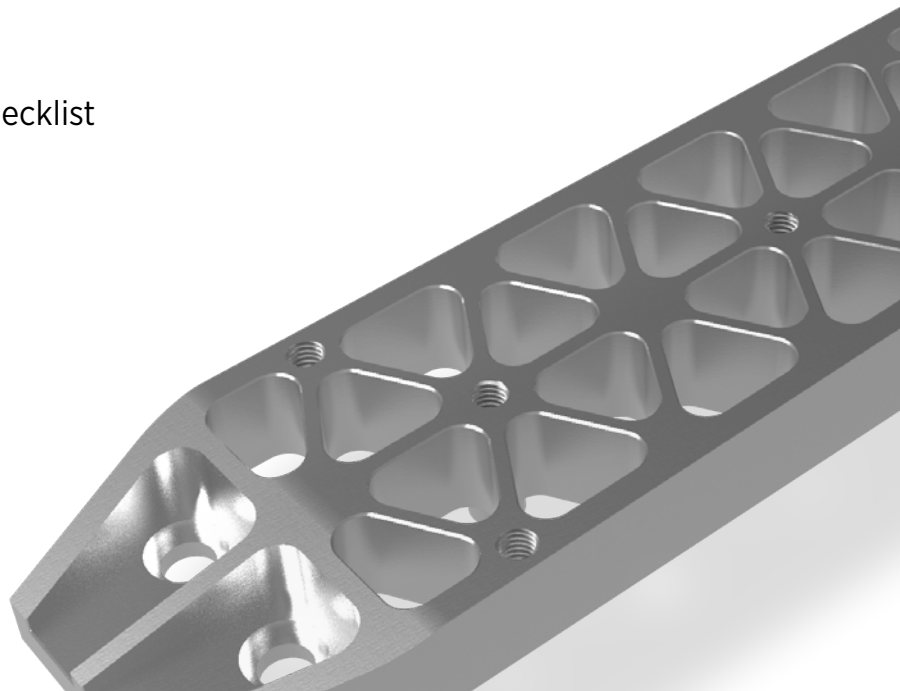
Students will learn step-by-step how to machine the model they designed and programmed. They will learn set-up, tooling, and operation of a CNC machine. When students finish their parts, they will verify all dimensions and tolerances and validate their work using a Final Inspection Report.

SKILLS DEMONSTRATED

- geometric dimensioning & tolerancing (GD&T) competence
- facing
- profiling (series of complex shapes)
- pocketing (closed, open & through)
- chamfering (multi-level, adjusted off-set)
- o-ring grooves (top & ID radial)
- key cutter slots
- counter bores
- tapping & threading
- 3D multi-axis surfacing
- aerospace honeycomb
- metrology
- and more

REQUIREMENTS

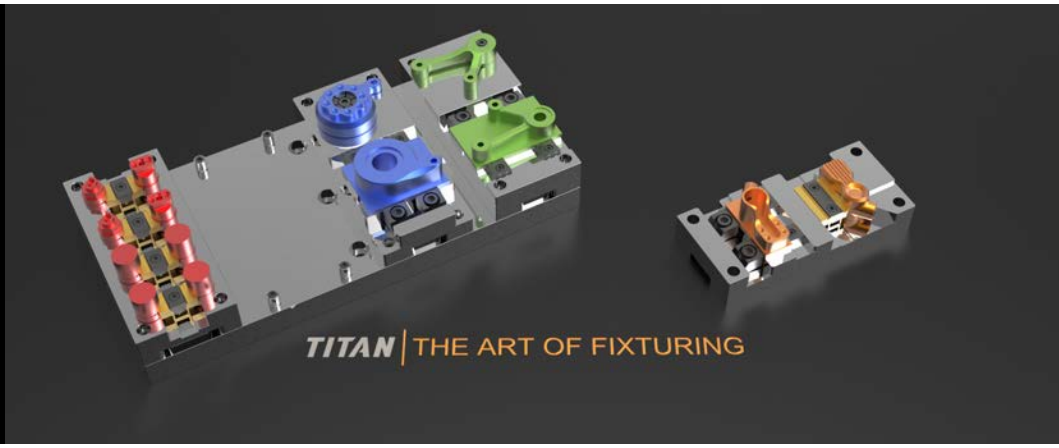
- properly trained instructor
- TITAN Fundamentals Mill or Lathe checklist
- Final Inspection Report
- CNC machine
- standardized material
- standardized tooling
- inspection tools



TITANS OF CNC: MILL CURRICULUM

M101
3-AXIS

M201
3-AXIS



M301
5-AXIS

Academy Requirements & Materials

PART SERIES: TITAN BUILDING BLOCKS Mill
MACHINE TOOL: 3-Axis Mill

OVERVIEW:

Everything you need to start teaching the TITANS of CNC: Academy Digital Apprenticeship Program in your classroom, Small Group, or employee training.

SOFTWARE:

- *Minimum*
  - Autodesk Fusion 360
- *Recommended*
  - 3DEXPERIENCE Solidworks for Makers
  - Mastercam Educational Multi-Axis Suite

TUTORIALS:

- *CAD*
  - TITAN BUILDING BLOCKS Mill in Fusion 360
  - TITAN BUILDING BLOCKS Mill in Solidworks
  - TITAN BUILDING BLOCKS Mill in Mastercam
- *CAM*
  - TITAN BUILDING BLOCKS Mill in Fusion 360
  - TITAN BUILDING BLOCKS Mill in Mastercam
- CNC
  - CNC Mill Fundamentals
  - TITAN BUILDING BLOCKS Mill

RELATED FILES:

- Dimensioned Prints
- Operation and Setup Sheets
- First Article Inspection Reports

MILL SPECIFICATIONS:

- 3-Axis Machining Center
- 1HP Spindle (*Minimum*)
- Spindle with Reverse/Forward direction (*Recommended*)

MILL TOOLING:

- *Machine Setup*
  - Lubricant
  - Machinist Stone
  - 1-2-3 Block
  - 1/4” Precision-Machined Puck[1]
  - 1/2” Drive Torque Wrench
  - 2-4lb Dead Blow Hammer
  - Dial Indicator
  - Tool Probe or Haimer 3D Sensor[2]
- *Workholding*
  - VISE
  - Soft Jaw Blanks[3]
  - Parallels
  - End Stop

TOOLING:

- Tool Holders
- TITAN BUILDING BLOCKS MILL Tool Kit by Kennametal
  - 3” Shell Mill with Inserts
  - 1/2” x 1 ¼” X 3” End Mill
  - 3/8” X 1” X 1” End Mill
  - 1/4” X 1” X 3” End Mill
  - 1/16” X 0.1875” X 3” End Mill
  - 1/2” X 1” X 3” Ball End Mill
  - 1/2” Solid Carbide Drill
  - 1/4” Solid Carbide Drill
  - 0.2283” Solid Carbide Drill
  - 0.1772” Solid Carbide Drill
  - 1/4-20 UNC Roll Tap
  - 10-32 UNC Roll Tap
  - 3/8” Chamfer Mill
  - 1/4” Chamfer Mill
  - 1/8” X 1” Key Cutter

[1] Necessary only if your machine has no tool probe.
[2] Necessary only if your machine has no machine probe.
[3] Recommend 4 sets of 1" wide blanks and 1 set of 1.5" wide blanks (TITAN-7M).

COOLANT & FILTRATION SYSTEM:

- Coolant 101 Tutorials
- *Minimum*
    - Coolant
    - Coolant Filtration System
    - Flood or Mist Coolant
- *Recommended*
    - Mist Collector
    - Spray Cabin

INSPECTION TOOLS:

- Inspection 101 Tutorials
- Caliper
- Micrometer
- Go/No-Go Threads
- Radii Gage

STANDARDIZED MATERIAL:

- 4’ of 1” X 2” 6061 Bar Stock per person

TITANS OF CNC: LATHE CURRICULUM

L101
2-AXIS

L201
LIVE
TOOLING

L301
LIVE
TOOLING

Academy Requirements & Materials

PART SERIES: TITAN ROCKET Lathe
MACHINE TOOL: 2-Axis Turning Lathe

OVERVIEW:

Everything you need to start teaching the TITANS of CNC: Academy Digital Apprenticeship Program in your classroom, Small Group, or employee training.

SOFTWARE:

- *Minimum*
  - Autodesk Fusion 360
- *Recommended*
  - 3DEXPERIENCE Solidworks for Makers
  - Mastercam Educational Multi-Axis Suite

TUTORIALS:

- *CAD*
  - TITAN ROCKET Lathe in Fusion 360
  - TITAN ROCKET Lathe in Solidworks
  - TITAN ROCKET Lathe in Mastercam
- *CAM*
  - TITAN ROCKET Lathe in Fusion 360
  - TITAN ROCKET Lathe in Mastercam
- CNC
  - CNC Lathe Fundamentals
  - TITAN ROCKET Lathe

RELATED FILES:

- Dimensioned Prints
- Operation and Setup Sheets
- First Article Inspection Reports

LATHE SPECIFICATIONS:

- 2-Axis Turning Center
- 10HP Spindle (*Minimum*)

LATHE TOOLING:

- *Machine Setup*
  - Lubricant
  - Torque Wrench Set
  - 2-4lb Dead Blow Hammer
  - Tool Probe[1]
- *Workholding*
  - 3-Jaw Chuck (*Minimum*)
  - Collet Chuck (*Recommended*)

TOOLING:

- Tool Holders[2]
- TITAN ROCKET LATHE Tool Kit by Kennametal
  - 55° Top Notch OD Turning & Profiling
  - 35° Top Notch OD Turning & Profiling
  - Lay-Down Partial Profile 8-48 Tip OD Threading
  - Part-Off Tool 0.118" Wide
  - OD Full Radius Groover 0.079" Wide
  - OD Groover 0.063" Wide
  - Face Groover 0.0807" Wide
  - Boring Bar ¼" DIA with 3/4" Shank
  - ID Groover Micro Bar 1/2"
  - 5/16" Drill for Cut Tap
  - 3/8-16 2B Cut Tap
  - 27/64" Drill for Cut Tap
  - 1/2-13 2B Cut Tap

COOLANT & FILTRATION SYSTEM:

- Coolant 101 Tutorials
- *Minimum*
  - Coolant
  - Coolant Filtration System
- *Recommended*
  - Through-Coolant

[1] Necessary only if your machine has no machine probe.
[2] Holder IDs available on the TITAN ROCKET LATHE Tool List.

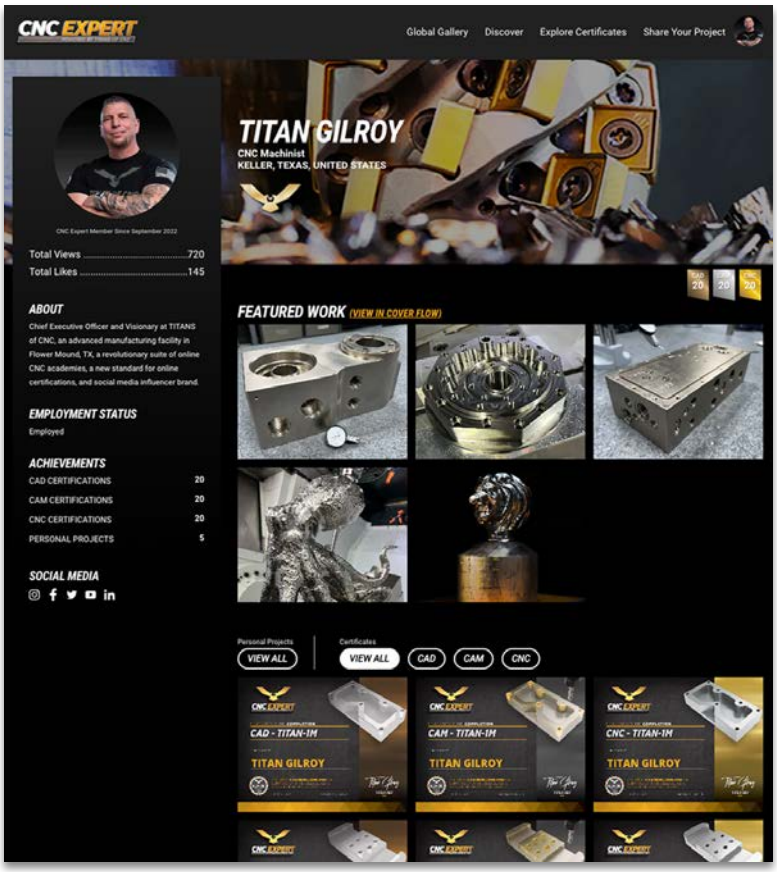
INSPECTION TOOLS:

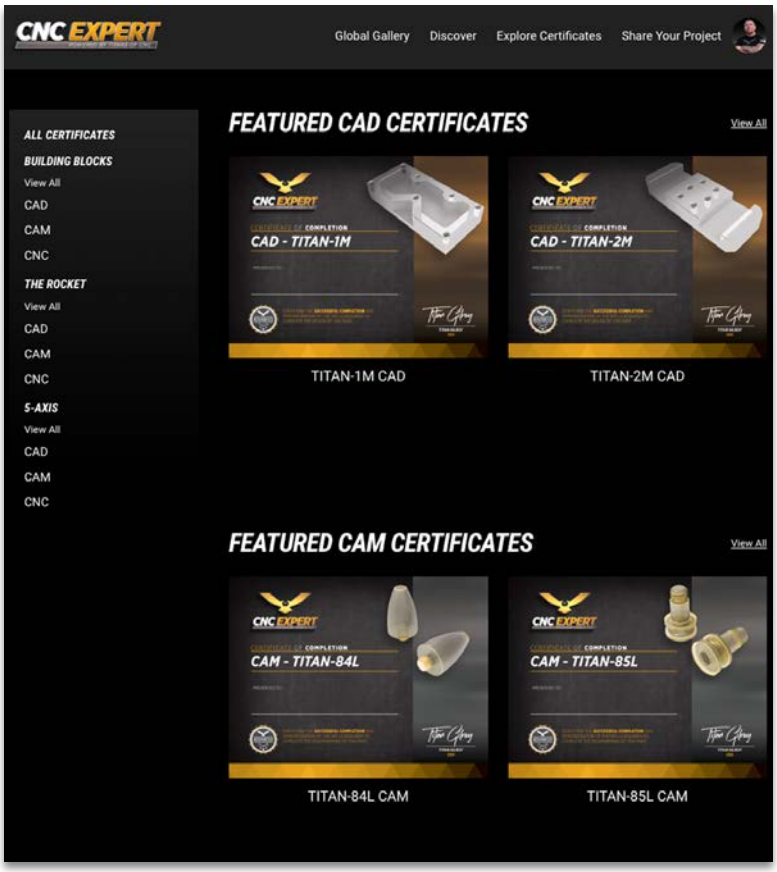
- Inspection 101 Tutorials
- Caliper
- Micrometer
- Go/No-Go Threads
- Radii Gage

STANDARDIZED MATERIAL:

- 4’ of 1” 6061 Round Stock per person

THE NEW STANDARD: CNC EXPERT





"CNC EXPERT is the best place to Get Certified, Get Hired, Hire People, Find Customers, and Find Vendors... all for FREE!"

TITANS OF CNC: ACADEMY CASE STUDY

"WE'VE GONE FROM A PROGRAM THAT TEACHES STUDENTS HOW TO MACHINE, TO ONE THAT CREATES MACHINISTS."

DAN FRANK | Rocklin High School

JOIN THE REVOLUTION

- **Sign up for your FREE account on the TITANS of CNC: Academy**
- **Exclusive Offers on CAD/CAM software from Mastercam or Solidworks**
- **Start your learning journey with the TITAN Building Blocks**
- **Find an Academy Small Group in your area to begin machining today**
- **See why over 1,000 companies and institutions have endorsed the Academy**
- **Join the conversation on the TITANS of CNC Machining Group on Facebook**
- **Connect with other Academy members on the TITANS Forum**
- **Subscribe to our YouTube channel for the latest TITAN videos**
- **Watch all 3 seasons of the TITANS of CNC television series**
- **Shop for TITANS of CNC merchandise at the TITANS of CNC store**

MADE POSSIBLE BY

KENNAMETAL
HELLER
Mastercam
DN SOLUTIONS
UNITED GRINDING
TORNOS
Blaser SWISSLUBE
TRUMPF
SOLIDWORKS
Markforged
TYROLIT
Mitutoyo
HAIMER
SCHUNK