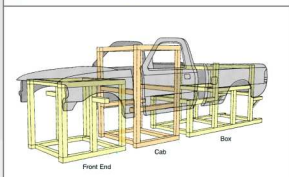
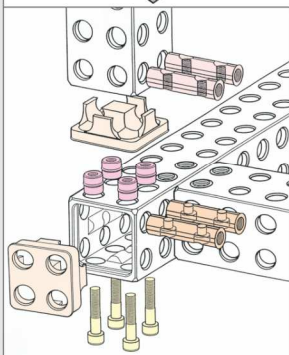
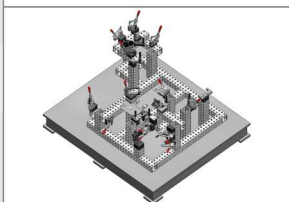
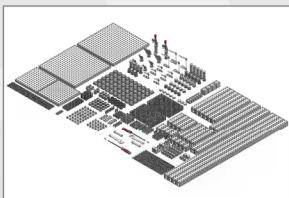


American Modular Tooling

C2
GAUGE & FIXTURE
Precision Modular Measurement & Testing Tools



**DECADES OF
EXPERIENCE**

**PROVEN
FIXTURING
EXCELLENCE**

AMERICAN MADE



C2
GAUGE & FIXTURE
American Modular Tooling

- ⊕ Established in 1991, Paul W. Marino Gages, Inc. is dedicated to providing the finest quality products and professional services to our customers.
- ⊕ In 2018 PWMG created a partnership with C2 Machining in Kentwood Michigan, C2 Gage & Fixture, to sell and manufacture American Modular Tooling as well as design and build fixtures of all types.
- ⊕ Our 5,000 sq. ft. design and 20,000 sq. ft. manufacturing facility, located in Kentwood MI, is home to our sales, design and manufacturing groups and includes a working showroom with demonstration and learning facilities.
- ⊕ Our customer service and sales groups are knowledgeable, professional and ready to assist you.
- ⊕ Our design group are specialists in several fields of design and support all typical file formats.
- ⊕ Our manufacturing and quality groups consist of knee mills, lathes, coordinate measuring systems and all associated equipment required for manufacturing with the future in mind.



C2 Gauge & Fixture, Kentwood Michigan

Widespread Acceptance

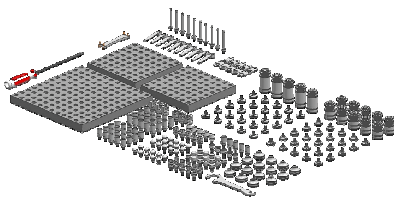
- | | | |
|------------------|-------------------|-----------------|
| ⊕ Aerospace | ⊕ Die Casting | ⊕ Ship Building |
| ⊕ Aircraft | ⊕ Electronics | ⊕ Steel |
| ⊕ Aluminum | ⊕ Instrumentation | ⊕ Tooling |
| ⊕ Automotive | ⊕ Machine Tool | ⊕ And growing |
| ⊕ Communications | ⊕ Medical | |
| ⊕ Defense | ⊕ Plastics | |

American Modular Tooling

The New Manufacturing

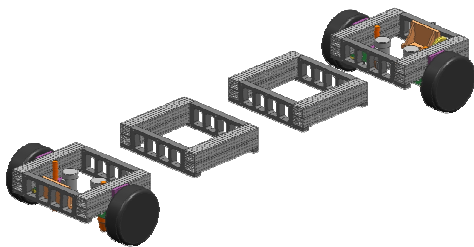
There is a worldwide movement to lean, efficient methods of manufacturing. The U.S. government is currently working with major manufacturers to implement modular, reconfigurable tooling. AMT fulfills the following:

- ⊕ Modular and reconfigurable
- ⊕ Rapid response and deployment
- ⊕ Light weight
- ⊕ Three E's...ecological, ergonomic and economic



AMT Advantages

- ⊕ Fixtures may be built rapidly and modified easily, resulting in immediate savings of time and money.
- ⊕ All components are completely reusable, unlike welded fixtures.
- ⊕ Aluminum is light in weight, resists corrosion and is ecologically sound
- ⊕ Modular elements make it easy to duplicate, or repeat, designs.
- ⊕ Large fixtures, such as body cubes, may be built in sections which can be assembled or dismantled quickly, permitting work at multiple locations.
- ⊕ A fixture may be assembled away from its site of design.



AMT is ideal for:

- | | | |
|---------------------------------------|---|--------------------------------------|
| ⊕ CMM Holding fixtures | ⊕ Checking fixtures, SPC and indicating | ⊕ Vacuum holding fixtures |
| ⊕ Attribute gages | ⊕ Body stacks, cube ups and bucks | ⊕ Multi-part pallet systems for CMMs |
| ⊕ Holding fixtures | ⊕ Armatures | ⊕ Shuttle systems |
| ⊕ Assembly fixtures | ⊕ Interior and exterior bucks | ⊕ Special machined details |
| ⊕ Welding fixtures | ⊕ Jigs and jiggling base plates | ⊕ Standard details |
| ⊕ Hand apply fixtures or gages | ⊕ Universal, multi-part holding devices | ⊕ Check rails, net pads, locators |
| ⊕ Layout fixtures | | ⊕ Clamping systems |
| ⊕ Checking fixtures, flush and feeler | | |

- ⊕ We have included several illustrations and photos of production AMT jobs throughout our catalog — refer to the Photo chapter on pages 139-150 for even more.

American Modular Tooling

Fast parts fixturing, rapid tool development, simplified machining and fast assembly make American Modular Tooling an ideal addition to the worldwide movement for lean, efficient methods of manufacturing. Every element has been designed for maximum efficiency and cross-system adaptability. Components are available individually, in kits or as custom fixtures designed and built per your part print.

Material Properties of AMT Components:

AMT "Construction Grade" Extruded Profiles and Locators

- ⊕ 6061-T6, Temper 6
- ⊕ KSI Tensile: 47,000 PSI
- ⊕ KSI Yield: 40,000 PSI
- ⊕ Hard Coat Anodized
- ⊕ Elongation Factor: 8%

AMT "Professional Grade" Extruded Profiles and Top Elements

- ⊕ 7075-T6, Temper 6
- ⊕ KSI Tensile: 78,000 PSI
- ⊕ KSI Yield: 68,000 PSI
- ⊕ Hard Coat Anodized
- ⊕ Elongation Factor: 6%

AMT "Special Duty" Extruded Profiles.

- ⊕ 6082-T6, Temper 6, Special Blend
- ⊕ KSI Tensile: 45,000 PSI
- ⊕ KSI Yield: 30,000 PSI
- ⊕ Hard Coat Anodized
- ⊕ Elongation Factor: 4.5–5.5%

AMT "Special Duty" Cast Products

- ⊕ 319, 0-T5 Sand Cast
- ⊕ KSI Tensile: 30,000 PSI
- ⊕ KSI Yield: 26,000 PSI
- ⊕ Hard Coat Anodized
- ⊕ Elongation Factor: 1.5%

AMT Connection Elements

- ⊕ 2024-T6
- ⊕ KSI Tensile: 69,000 PSI
- ⊕ KSI Yield: 57,000 PSI
- ⊕ Hard Coat Anodized
- ⊕ Elongation Factor: 10%

Benefits of the American Modular Tooling System

Manufacturing and Engineering:

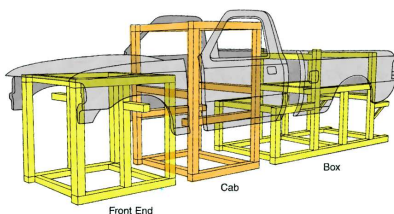
- | | |
|---------------------|--------------|
| ⊕ Facility Usage | 48% Less |
| ⊕ Lead Time | 60% Less |
| ⊕ Tooling Costs | 44% Less |
| ⊕ Tooling Labor | 60% Less |
| ⊕ Tool Design Costs | 50% Less |
| ⊕ Equipment Needs | 70% Less |
| ⊕ Reusable Material | 70% Reusable |

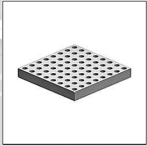
Manufacturing and Assembly:

- | | |
|-----------------------------|-------------|
| ⊕ Assembly Labor | 70% Less |
| ⊕ Through-put Increase | 45% More |
| ⊕ Accuracy of Assemblies | 50% Greater |
| ⊕ Periodic Inspection | 50% Less |
| ⊕ Reconfigurable | Priceless |
| ⊕ Modularity | Priceless |
| ⊕ Rapid Engineering Changes | Priceless |

Other Benefits:

- ⊕ Fewer corrosion problems due to hard coat aluminum
- ⊕ Lower shipping costs due to lighter weight
- ⊕ Faster setup at customers facility
- ⊕ Good ROI on leasing of tool (70% reusable)
- ⊕ Can be used as temporary rate tool
- ⊕ Less space required for storage
- ⊕ Minimal maintenance requirements
- ⊕ Environmentally correct





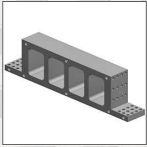
Grid Plates provide the basic structural foundation of almost any fixture.

Pages 7—16



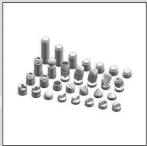
Light weight Hollows feature a channeled interior for high accuracy.

Pages 17—34



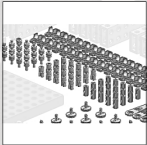
Special duty supports, gussets and foot plates provide added strength.

Pages 35—42



Locating and Clamping Elements hold and locate parts of many shapes and sizes.

Pages 43—72



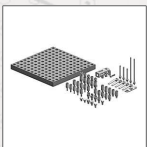
Connection Elements permit rapid assembly of fixtures.

Pages 73—86



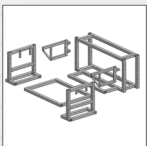
Tools and Storage Cabinets

Pages 87—92



Kits are designed to accommodate all varieties of fixturing requirements.

Pages 93—124



Studio Tools

Pages 125—138



Photos

Pages 139—150

American Modular Tooling

Testimonial of the Year:

Modular Tooling Reduces Fixturing Costs, Allows Conversion From One Make to Another.

"It's easy to learn, but there is so much there that you have to sort through it. Once you know what everything does, it's like working with one of those Erector® sets you had when you were a kid. It's very, very user friendly."

Bill Ralph, Quality Metalcraft, Inc.



Two sided modular tool converted for reuse after its initial run for a different manufacturer.

"I would recommend it to anybody. You are better off sticking with the people who know what to do with it."

"If it's going to cost us a measly \$3,000.00 to build a, say, \$100,000.00 fixture...we want to do it."



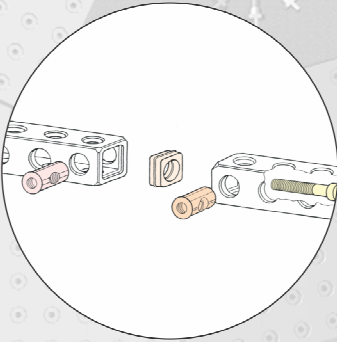
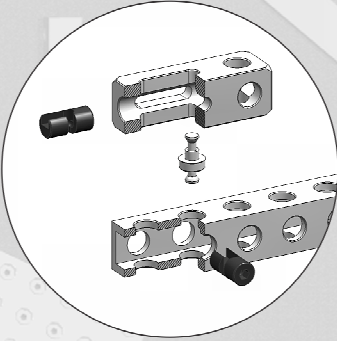
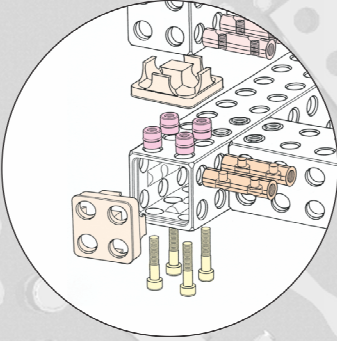
A close-up view showing a three-axis adjustable locating element holding a door in body position.

"It's part of our system now, they are definitely going to use it on the next big project. It should last for years."

Read the entire article in Quality Magazine, 2008 or online at www.qualitymag.com.

See more on our website, pmargage.com

American Modular Tooling



Grid Plates

Hollows

Special Duty

Locating & Clamping

Connection Elements

Tools & Storage

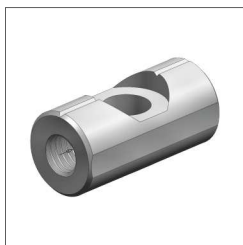
Fixturing Kits

Studio Tools

Photos



American Modular Tooling



AMT Chase, Single

Part No.	Dimensions	System
AMT-17141	12 x M6 x 25 mm	25
AMT-17241	19 x M10 x 40 mm	40
AMT-17245	19 x M12 x 40 mm	40



AMT Nut, Single

Part No.	Dimensions	System
AMT-17120	12 x M6 x 25 mm	25
AMT-17220	19 x M10 x 40 mm	40
AMT-17224	19 x M12 x 40 mm	40

Connection Elements



AMT Chase, Double

Part No.	Dimensions	System
AMT-17142	12 x M6 x 50 mm	25
AMT-17242	19 x M10 x 80 mm	40
AMT-17246	19 x M12 x 80 mm	40



AMT Nut, Double

Part No.	Dimensions	System
AMT-17121	12 x M6 x 50 mm	25
AMT-17221	19 x M10 x 80 mm	40
AMT-17225	19 x M12 x 80 mm	40



AMT Chase, Triple

Part No.	Dimensions	System
AMT-17143	12 x M6 x 75 mm	25
AMT-17243	19 x M10 x 120 mm	40
AMT-17253	19 x M12 x 120 mm	40



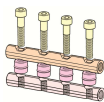
AMT Nut, Triple

Part No.	Dimensions	System
AMT-17122	12 x M6 x 75 mm	25
AMT-17222	19 x M10 x 120 mm	40
AMT-17226	19 x M12 x 120 mm	40



AMT Chase, Quadruple

Part No.	Dimensions	System
AMT-17244	19 x M10 x 160 mm	40
AMT-17254	19 x M12 x 160 mm	40



AMT Nut, Quadruple

Part No.	Dimensions	System
AMT-17223	19 x M10 x 160 mm	40
AMT-17227	19 x M12 x 160 mm	40



American Modular Tooling



Part No.	Dimensions	System
AMT-17102	12.5 mm	25
AMT-17202	20 mm	40



Shouldered Dowel

AMT Shouldered Dowel for locating. Threaded for Dowel Puller (page 89).



Part No.	Dimensions	System
AMT-17103	12.5 mm	25
AMT-17203	20 mm	40

AMT Plain Dowel. Threaded for Dowel Puller (page 89).



Screw, socket head cap, stainless steel

Part No.	Dimensions	System
AMT-17160	M6 x 15 mm	25
AMT-17161	M6 x 20 mm	25
AMT-17162	M6 x 30 mm	25
AMT-17163	M6 x 40 mm	25
AMT-17164	M6 x 50 mm	25
AMT-17165	M6 x 60 mm	25
AMT-17167	M6 x 80 mm	25
AMT-17260	M10 x 15 mm	40
AMT-17261	M10 x 20 mm	40
AMT-17262	M10 x 30 mm	40
AMT-17263	M10 x 40 mm	40
AMT-17264	M10 x 50 mm	40
AMT-17265	M10 x 60 mm	40
AMT-17267	M10 x 80 mm	40



Part No.	Dimensions	System
AMT-17173	M24 x M6	25
AMT-17273	M24 x M10	40
AMT-14073	M24 x 1/4-20	1/4-20

AMT Non-centering Disc. Special thread sizes available in minimum quantities of 100 pieces.

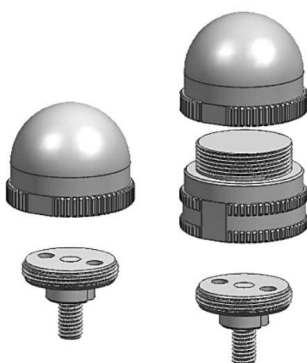


Part No.	Dimensions	System
AMT-17171	M24 x M6 x 12.5 mm	25
AMT-17271	M24 x M10 x 20 mm	40

AMT Centering Disc Locates in System 25 or 40 holes for accurate positioning of locating elements.

SOLUTIONS®

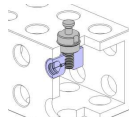
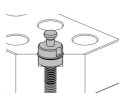
How it works



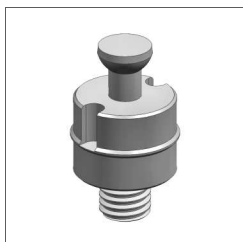
Disc connection elements are designed to attach AMT® 30 mm diameter components to plates, bars and hollows.



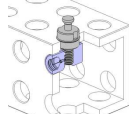
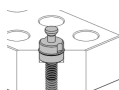
Part No.	Dimensions	System
AMT-17112	12.5 mm x M6	25
AMT-17212	20 mm x M10	40



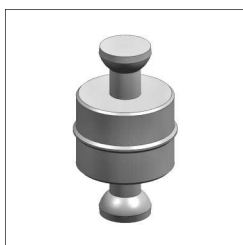
Combi Retention Bolt



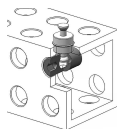
Part No.	Dimensions	System
AMT-17115	12.5 mm x M6	25
AMT-17215	20 mm x M10	40



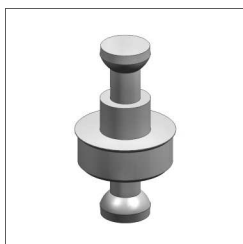
Combi Retention Bolt, shortened



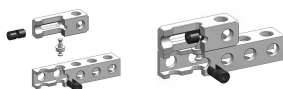
Part No.	Dimensions	System
AMT-17113	12.5 mm	25
AMT-17213	20 mm	40



Double Retention Bolt



Part No.	Dimensions	System
AMT-17118	12.5 mm x 6.7 mm	25
AMT-17218	20 mm x 10.7 mm	40



Off-Grid Retention Bolt



Part No.	Dimensions	System
AMT-17172	M24 x 12.5 mm	25
AMT-17272	M24 x 20 mm	40

Disc Type Retention Bolt with Shoulder



Part No.	Dimensions	System
AMT-17174	M24 x 6.7 mm	25
AMT-17274	M24 x 10.7 mm	40



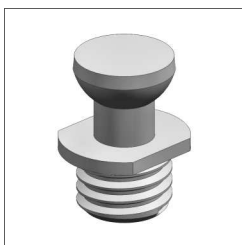
Disc Type Retention Bolt, Off-Grid



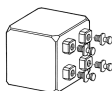
Base



Disc Retention Bolt



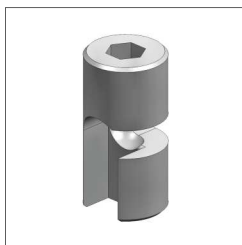
Part No.	Dimensions	System
AMT-17117	M6	25
AMT-17217	M10	40



Retention Bolt, shortened. Secure nub blocks to tools with Retention Bolt Locks.



American Modular Tooling



Part No.	Dimensions	System
AMT-17133	25 mm	25
AMT-17233	40 mm	40



Lock for Retention Bolt, Steel.

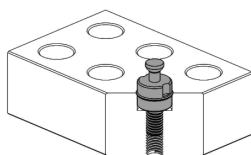
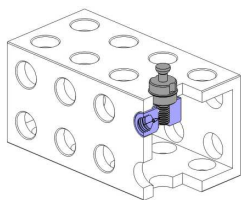


Part No.	Dimensions	System
AMT-17135	50 mm	25
AMT-17235	80 mm	40



Lock for Retention Bolt, Long, Steel.

SOLUTIONS®
How it works



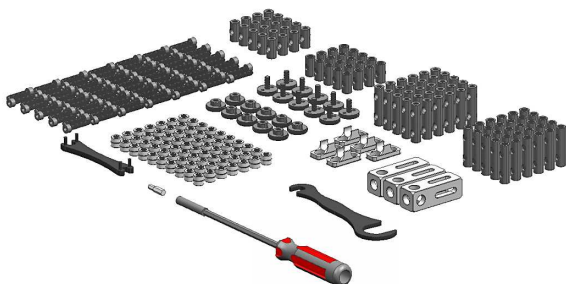
Combi Retention Bolts can be attached to an AMT Hollow using a Nut (above left) or threaded directly into a Grid Plate (above right)

Off-Grid Bars attach to AMT Grid Plates using a Combi Retention Bolt, Lock and Nut (below left). Assembly with Off-Grid Disc Retention Bolt for fixing 30 mm locator elements (below right). See pages 74–80 for bolts, locks and nuts.



SOLUTIONS®

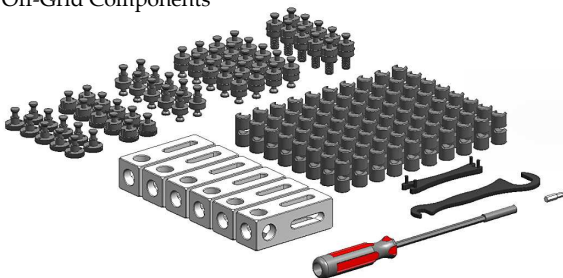
How it works

AMT-10121**AMT-10127**

Connection Element Kit, Retention Type

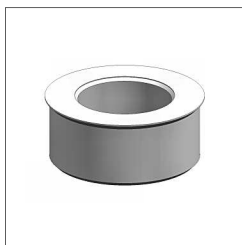


Connection Elements

AMT-10128Connection Element Kit, Retention Type with
Off-Grid Components

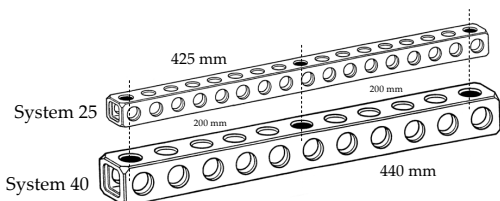
Think Modular —
Buy Kits and Save

See more in our Kits section, pages 93—124



Part No.	Dimensions	System
AMT-17205	Ø12.5mm / 20mm	40 to 25

AMT Cross-System Sleeve, AMT 40 to 25

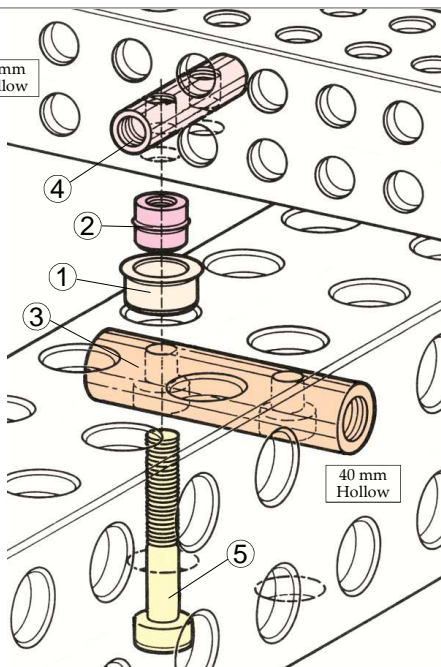


System 25 and System 40 items will line up at 200 mm intervals and may be connected with step-down elements.

SOLUTIONS® How it works

Cross-System Screw Connection using 25mm and 40mm AMT Hollows.

1. Insert cross-system sleeve into the 40mm hollow.
2. Insert shouldered dowel into reducer sleeve and put the 25mm Hollow on top of the 40mm Hollow.
3. Insert a double chase in the 40mm Hollow.
4. Insert a double nut in the 25mm Hollow.
5. Insert a hex head screw through the bottom of the 40mm Hollow and tighten.





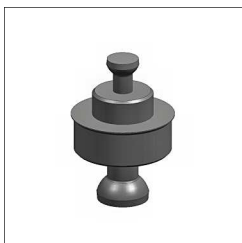
Part No.	Dimensions	System
AMT-17216	12.5mm shoulder with M6 thread / 20mm shoulder with retention knob	25 to 40

Cross-System Combi Bolt allows you to go from Systems 25 to 40 in seconds. Screw into connector on 25 component and use the Retention Lock on the 40 side.



Part No.	Dimensions	System
AMT-17116	12.5mm shoulder with retention knob / 20mm shoulder with M10 thread	40 to 25

Cross-System Combi Bolt allows you to go from Systems 25 to 40 using a 25 Retention Lock on one side and a 40 Nut on the other. Ideal for removable details.



Part No.	Dimensions	System
AMT-17219	12.5mm shoulder with retention knob / 20mm shoulder with retention knob	40 to 25

Cross-System Retention Bolt allows you to go from Systems 25 to 40 using a Retention Lock on both sides.

SOLUTIONS®
How it works

AMT 40 Solid Bar

AMT 25 Solid Bar

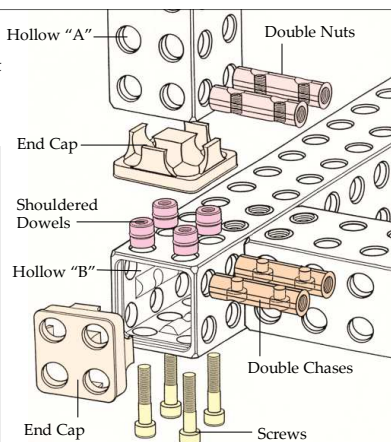
The Cross-System Retention Bolt connects two differently sized Solid Bars or Hollows. Requires one 40 and one 25 Lock to fasten.

Screw Connection

Use this method for permanent fixtures that will require little or no modification

Assembly sequence:

1. Insert end caps
2. Insert Shouldered Dowels into Hollow B
3. Place Hollow A into position over shouldered Dowels in Hollow B
4. Insert Double Nuts into Hollow A and Double Chases into Hollow B
5. Insert Screws through Hollow B

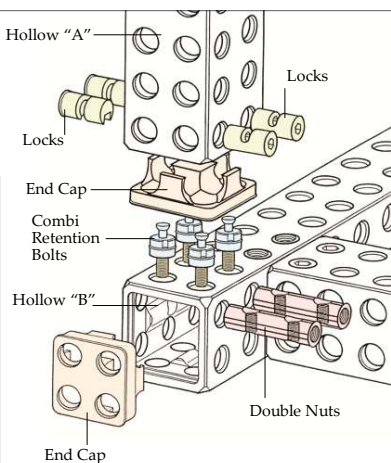


Combi Retention Connection

Useful for fixtures that require quick and easy removal of certain segments.

Assembly sequence:

1. Insert end caps
2. Insert Double Nuts into Hollow B
3. Screw Combi Retention Bolts into Hollow B
4. Place Hollow A into position over Combi Retention Bolts in Hollow B
5. Insert Locks in Hollow A

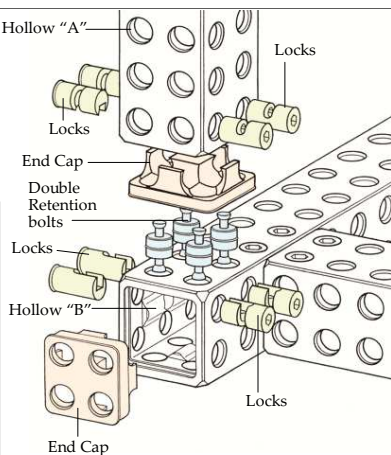


Double Retention Connection

Use this method when rapid part removal or modification is required.

Assembly sequence:

1. Insert end caps
2. Insert Double Retention Bolts into Hollow B
3. Place Hollow A into position over Double Retention Bolts in Hollow B
4. Insert Locks in Hollows A and B





Part No.	Dimensions	System
AMT-17147	25 x 25 mm	25
AMT-17247	40 x 40 mm	40

End Cap. Use in Hollow to provide a flat end for easy attachment to other Hollows or Grid Plates.



Part No.	Dimensions	System
AMT-17146	25 x 25 mm	25
AMT-17252	40 x 40 mm	40

Joining Cap, end to end. Use between two Hollows for perfectly aligned end-to-end connection. Prevents pivoting.



Part No.	Dimensions	System
AMT-17148	25 x 50 mm	25
AMT-17248	40 x 80 mm	40
AMT-17251	120 x 160 mm	40

End Cap, rectangle. Use in rectangular Hollow to provide a flat end for easy attachment to other Hollows or Grid Plates.



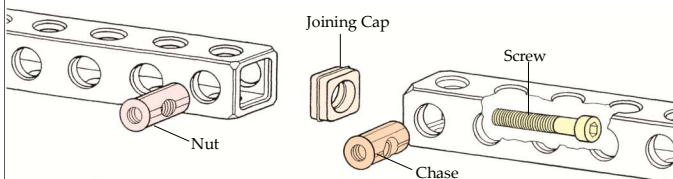
Part No.	Dimensions	System
AMT-17149	50 x 50 mm	25
AMT-17249	80 x 80 mm	40

End Cap, square. Use in large Hollow to provide a flat end for easy attachment to other Hollows or Grid Plates.

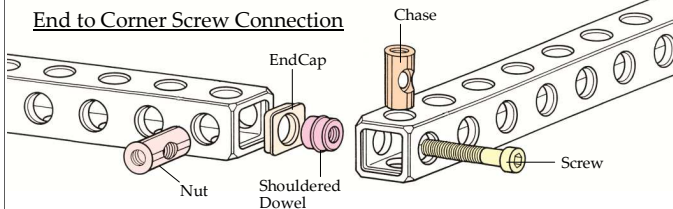
SOLUTIONS®

How it works

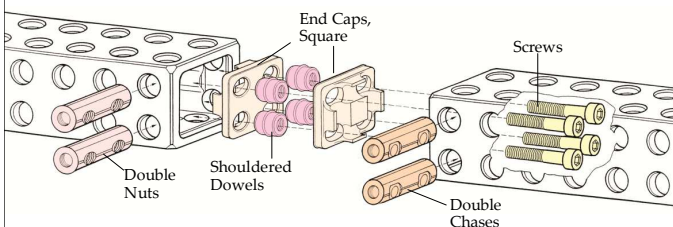
End to End Screw Connection with Double Joining Cap



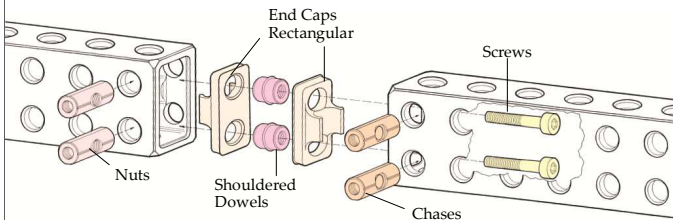
End to Corner Screw Connection



End to End Screw Connection with Square End Caps



End to End Screw Connection with Rectangular End Caps



Think modular. Simple assembly of all types of joins and corners. You can also attach square and rectangular Hollows together end-to-end.

American Modular Tooling

SYMBOL FOR:	ASME Y14.5M 1994	ISO
STRAIGHTNESS		
FLATNESS		
CIRCULARITY		
CYLINDRICITY		
PROFILE OF A LINE		
PROFILE OF A SURFACE		
ALL AROUND		
ANGULARITY		
PERPENDICULARITY		
PARALLELISM		
POSITION		
CONCENTRICITY (concentricity and coaxiality in ISO)		
SYMMETRY		
CIRCULAR RUNOUT		
TOTAL RUNOUT		
AT MAXIMUM MATERIAL CONDITION		
AT LEAST MATERIAL CONDITION		
REGARDLESS OF FEATURE SIZE	NONE	NONE
PROJECTED TOLERANCE ZONE		
TANGENT PLANE		
FREE STATE		
DIAMETER		
BASIC DIMENSION (theoretically exact dimension in ISO)		
REFERENCE DIMENSION (auxiliary dimension in ISO)		
DATUM FEATURE		
DIMENSION ORIGIN		
FEATURE CONTROL FRAME		
CONICAL TAPER		
SLOPE		
COUNTERBORE/SPOTFACE		
COUNTERSINK		
DEPTH/DEEP		
SQUARE		
DIMENSION NOT TO SCALE	15	15
NUMBER OF PLACES	8λ	8λ
ARC LENGTH		
RADIUS	R	R
SPHERICAL RADIUS	SR	SR
SPHERICAL DIAMETER	S∅	S∅
CONTROLLED RADIUS	CR	NONE
BETWEEN		NONE
STATISTICAL TOLERANCE		NONE
DATUM TARGET		
TARGET POINT		

* May be filled or not filled

About Us

We are dedicated to presenting the finest quality products to industry while providing reliability and service. Our mission is to supply the technological advances that enable the manufacturing process to work faster, with higher precision, than past practices. We utilize methods that recognize global economic, ergonomic and ecological considerations.

Over the years our highly skilled personnel, consistency in service, quality and innovative ideas have proven to be our greatest assets.

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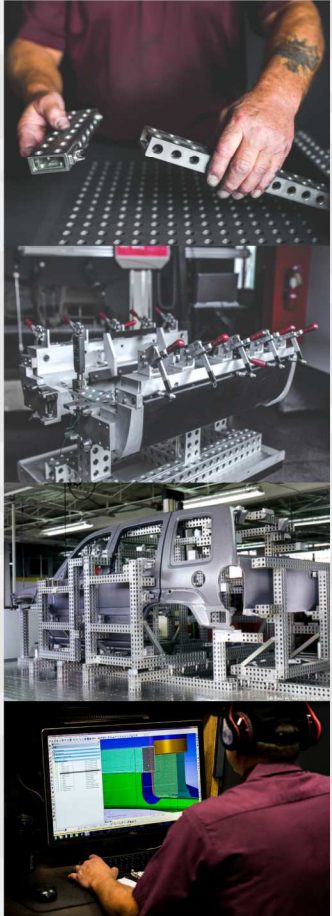
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