



AIS Academy Training Center

Bolt Joint Assembly Principles & Torque + Tensioner Training Program



In the training, Bolter individual will learn to inspect, assemble, disassemble and tighten bolted joints in an effective and safe manner and demonstrate his / her capabilities in Fundamentals, Piping Endorsement, Powered Equipment Endorsement, Heat Exchanger Endorsement and Special Joint Endorsement. Training and Assessment Method are conducted with class room and practical demonstration.

How to qualified:

Individuals with current legacy training / qualification certificates may use the classroom and practical examinations to complete or update their qualification certification.

Certification:

Satisfactory completion of training is recognized by award of an AIS “Training Certificate” which proves trained status only and not qualification or competence.

Successful completion of academic and practical examinations is recognized by award of an AIS “Qualification Certificate” which is valid for 3 years.



Course 1: Describe of Bolting Basic (1 HOUR)

- Introduction to Bolting
- Bolting Principles
- Threaded Fasteners
- Bolt Forces
- Preload and Clamping Load
- Bolting Concepts
- Tension and Compression
- Summary & Assessment



Course 2: Flange Fastener and Gaskets (3 HOURS)

- The Primary Components of a Bolted Flange Joint
- Forces Acting on a Joint Under Pressure
- The Bolt Load Range
- Flange Identification and Standards
- Flange Misalignment
- Excessive Flange Rotation,
- Tightening piping joints on Pressure Relief devices
- Flange Surface Defects, Flange Surface Finish
- How Bolts Create Tension
- Bolt History
- Thread Terminology
- Coarse and Fine Threads
- Bolts, Studs, and Nuts Terminology
- Bolt Strength Grades
- Nut Strength
- Washers
- Conical Spring Washers (Belleville)
- Gasket Seal
- The Proper Gasket
- Gasket Material
- Metallic and Semi-Metallic Gaskets
- Kammprofile Gasket
- RTJ Gaskets
- RTJ Gasket Installation Tips
- Spiral Wound Gaskets
- PTFE Gaskets
- Compressed Sheet Gaskets
- Rubber Gaskets
- Double Jacket (DJ) Gaskets
- Insulating Gaskets and Kits
- Gasket Failure Examples
- Installing the Gasket
- Pressure Relief devices - Piping Specific





- Shaft Alignment
- Nozzle Loads
- Inspection hold point for blockage of relief path
- Restraining Cold Set Spring Hangers
- Flange Fastener and Gaskets Summary & Assessment

Course 3: Torque, Tension, Bolt Loosening, Corrosion, Galling, and Seizing (3 HOURS)

- Torque Tightening
- Clamp Force from Load
- Applying Torque
- Torque is Easy to Measure
- Torque and Bolt Yield
- Factors Affecting Torque
- Bolt Diameter
- Bolt Strength
- Bolt Condition
- Lubrication
- Coefficient of Friction
- Calculating Torque
- Using the Torque Chart
- Direct Tensioning Methods and Measurements
- Hydraulic Tensioning
- Hydraulic Tensioning: Advantages and Disadvantages
- Hydraulic Tensioning: Safety Considerations
- Heat Tensioning
- Load Indicating Bolts
- Direct Tensioning Measurement
- Ultrasonic Elongation Measurement
- Other Methods of Measuring Load
- Bolting Patterns
- Bolt Interdependency
- Method of Tightening
- Gradual Tightening
- Simultaneous Multi Bolt Tightening





- Disassembly Procedure
- Records: 1. Joint Tagging
- Records: 2. Multi-Part Joint Tagging
- Records: 3. Flange Management System
- Bolt Self-Loosening: Overview
- Bolt Self-Loosening: Common Causes
- Initial Under-Tightening
- Initial Over-Tightening
- Vibration and Shear Movement
- Misalignment and Joint Instability
- Component Creep
- Elastic Interaction
(Lack of Chase Passes)
- Thermal Change
- Bolt Self-Loosening: Solutions
- Solutions for Problem Joints
- Corrosion, Galling, and Seizing: Overview
- Corrosion
- Corrosion: Solutions
- Galling and Seizing
- Galling and Seizing: Solutions
- Torque, Tension, Bolt Loosening,
- Corrosion, Galling, Seizing Summary & Assessment

Flange Assembly Tag

Joint ID: _____ Fitter ID: _____

Tightened by: _____
(PRINT NAME)

Sign: _____ Date: _____

New Gasket Used: Yes / No

New Bolts Used: Yes / No

Bolt Lubricant Used: Yes / No

Lubricant Type: _____

Flange Aligned within Tolerance: Yes / No

Method of Tightening Bolts

Torque Tightened	Hydraulic Tensioned
Torque Applied (Nm)	Pressure (Bar)

Comments: _____

Front

Unique sequential numbering

NO: _____

FLANGE CHECKLIST

Date: _____

Piping Class: _____

Work Order / Pack: _____

Special Requirements Y/N _____ (see over if Y)

NO: _____

FLANGE TESTED

Name: _____

Signed: _____

Date: _____

RETURN TO _____

NO: _____

FLANGE TIGHTENED

(In case more than one tag is to be filled out after completion of operation)

Name: _____

Signed: _____

Date: _____

RETURN TO _____

NO: _____

FLANGE ASSEMBLED

Name: _____

Signed: _____

Date: _____

RETURN TO _____

NO: _____

FLANGE BROKEN

Name: _____

Signed: _____

Date: _____

RETURN TO _____

Back

Flange Broken
 Removal of blue tag indicates joint has been broken or affected. Joint should NOT be reoperated being pressure applied or be returned to service.

Flange Assembled
 Removal of red tag indicates joint is in good condition, but must be inspected by a competent person for the full range of parameters. Joint should NOT be reoperated as being pressure applied or be returned to service.

Flange Tightened
 Removal of yellow tag indicates joint is in good condition, but must be inspected by a competent person but has NOT been tested. Joint should NOT be reoperated as being pressure applied or be returned to service.

Flange Tested
 Removal of green tag indicates joint has undergone satisfactory inspection or returned service. Joint can be returned to service and monitored.

Special Requirements: _____

GENERAL NOTE: Multipart tag courtesy of Regal Tag Global Ltd, Little Barford, United Kingdom.

Course 4: Planning, Safety, Torque, Tension Tools (3 HOURS)

- The Importance of Bolting Safety
- Bolting Hazards and Risks
- Bolting Safety in Three Key Areas
- Planning and Preparation
- Why Plan and Prepare?
- Make a Plan
- Use a Pre-Job Checklist
- Communicate
- Tool Handling
- Bolting Tools
- Manual Torque Tools
- Types of Manual Torque Wrenches





- Manual Torque Wrenches
- Manual Torque Multipliers
- Pneumatic Tools
- Hydraulic Wrenches
- Low Profile Wrenches
- Hydraulic Torque Wrenches
- Hydraulic Tensioners
- Summary & Assessment.



Course 5: Final Examination (1.5 HOURS)

Upon completion of the 4 courses, learners will need to submit an application to enroll in the Final Exam. In the application, a professional reference is required to complete a form which verifies applicant's completion of at least 6 months of work experience in bolted joint assembly. Once the application is approved, the candidate will be enrolled in the Final Exam which consists 60 multiple choice questions. A passing grade of at least 90% is required to qualify for the hands-on training and skills assessment. Candidates are allowed multiple attempts to pass the Exam. There is no limit on the number of times to re-take the Exam.

Course 6: Hand On (3 HOURS)

Working both individually and in small groups, learners will:

- Observe and practice proper procedures as modeled by the instructor
- Perform the key competencies required in each exercise within expected tolerances
- Be able to explain the technical principles underlying the practical competencies

Agenda:

- Administrative Check-in
- Safety/PPE Discussion
- Torque/Load Measurement
- Gasket Identification/Analysis
- Manual Torquing Demonstration
- Hydraulic Torque Tool Review
- Hydraulic Torquing Demonstration
- Hydraulic Tensioner Tool Review
- Hydraulic Tensioner Operation
- Q&A, Evaluations, Feedback



AIS Academy Training Center



Qualification & Certificate (AIS Certificate)

Bolter / Leader / QC Level : Course 1 - 6 (2 - 2.5 DAYS)

Each class : 8 - 10 persons