



HTM02-01 Design Consulting Specialist in HTM02-01 Design.

+66(0)63 082 9692

kevin@htm02-01designconsult.com

<https://htm02-01designconsult.com/>



**ACCREDITED
ACTIVITY**
8 CPD CREDITS
#1020025

Verify @ <https://thecpdregister.com>



Course Syllabus: HTM02-01 Medical Gas Pipeline Systems – Pressure Loss Calculations & Pipeline Sizing

Course Code: MGPS-03

Total Duration: 8 Hours

Format: Online (Instructor-Led)

CPD Hours: 8

Level: Professional / Advanced

Target Audience: Healthcare Engineers, MEP Design Engineers, Medical Gas APs (Authorised Persons), Project Managers, Validation Engineers, and Technical Compliance Officers.

Course Description

This specialist course delivers a comprehensive understanding of pressure loss calculations and pipeline sizing for medical gas systems in full compliance with HTM 02-01 Appendix G. Building on foundational flow demand calculations, this course teaches the critical second step in MGPS design: determining the correct pipe diameter to ensure safe and efficient delivery of medical gases. Participants will master the use of pressure loss tables, equivalent length calculations, and system-wide verification methods to produce designs that meet the mandatory $\leq 5\%$ pressure loss requirement. Through practical worked examples and a full hospital ward sizing exercise, this course ensures engineers can confidently size pipelines for oxygen, medical air, and vacuum systems.

Learning Outcomes

Upon successful completion, participants will be able to:

- Apply the pressure loss formula from HTM02-01 Appendix G to calculate ΔP for any pipeline segment.
- Navigate and extract correct values from pressure loss tables (A2–A5) for different gases and system pressures.
- Calculate total effective pipeline length by incorporating equivalent lengths for fittings (using Tables A6 & A7).
- Design compliant pipeline systems by selecting appropriate pipe diameters to maintain pressure loss within 5% of nominal system pressure.
- Integrate system-wide pressure loss verification from plant to furthest outlet.
- Produce fully documented pipeline sizing designs that satisfy regulatory and safety standards.

Module Breakdown

Module 1 – Introduction to Pressure Loss in MGPS

Learning Objective:

Explain the importance of pressure loss calculations in medical gas systems and their direct impact on patient safety and system compliance with HTM02-01 Clause 4.6.

Summary:

This module introduces the critical role of pressure loss calculations in ensuring safe and effective medical gas delivery. Key topics include the clinical and regulatory implications of pressure loss, the HTM02-01 requirement for a maximum 5% pressure drop, and why accurate calculations are essential for patient safety and system reliability.



HTM02-01 Design Consulting Specialist in HTM02-01 Design.

+66(0)63 082 9692

kevin@htm02-01designconsult.com

<https://htm02-01designconsult.com/>



**ACCREDITED
ACTIVITY**
8 CPD CREDITS
#1020025
Verify @ <https://thecpdregister.com>



Module 2: The Pressure Loss Formula

Learning Objective:

State and apply the pressure loss formula, identifying each variable and its role in calculating ΔP for a given pipeline segment.

Summary:

This module breaks down the pressure loss formula $\Delta P = (L_{\text{actual}}/L_{\text{table}}) \times (Q_{\text{design}}/Q_{\text{table}})^2 \times \Delta P_{\text{table}}$. Participants will learn to identify and apply each variable—length, flow, and reference pressure loss—and understand how they interact to determine total pressure drop in a pipeline.

Module 3: Understanding the Pressure Loss Tables (A2–A5)

Learning Objective:

Extract correct flow rates and pressure drop values from Tables A2–A5 for specified pipe diameters, lengths, and system pressures.

Summary:

This module provides a guided tour of the pressure loss tables used in HTM02-01. Learners will understand table structure, learn to locate values for different pipe sizes and system pressures, and apply extracted data to real-world scenarios through practical examples.

Module 4: Worked Example – 15 mm Pipe

Learning Objective:

Calculate the pressure drop for a straight pipe using the formula and table values, demonstrating the complete calculation process.

Summary:

Using a 15mm pipe example, this module walks through a complete pressure loss calculation from start to finish. Participants will practice table lookup, formula application, and result interpretation, building confidence in performing basic ΔP calculations.

Module 5: Resizing the Pipe – 22 mm Example

Learning Objective:

Evaluate when pressure loss is unacceptable and recalculate ΔP using a larger pipe size to meet compliance limits.

Summary:

This module teaches when and how to resize pipes when initial calculations exceed allowable pressure loss. Using a 22mm pipe example, participants will learn to compare results against compliance limits and make informed decisions about pipe sizing adjustments.

Module 6: Practice Example – 28 mm Pipe at 400 kPa

Learning Objective:

Perform pressure loss calculations for longer pipeline runs using Table A2 and validate results against allowable loss.

Summary:

Focusing on longer pipeline segments, this module provides practice with 28mm pipe calculations at standard system pressure. Participants will apply the complete methodology to extended runs and verify compliance with HTM02-01 requirements.

Module 7: Accounting for Fittings – Equivalent Lengths

Learning Objective:

Describe how fittings affect pressure loss and apply the equivalent length method using Tables A6 and A7.

Summary:

This module introduces the concept of equivalent length for pipeline fittings. Participants will learn



HTM02-01 Design Consulting Specialist in HTM02-01 Design.

+66(0)63 082 9692

kevin@htm02-01designconsult.com

<https://htm02-01designconsult.com/>



**ACCREDITED
ACTIVITY**
8 CPD CREDITS
#1020025
Verify @ <https://thecpdregister.com>



how elbows, tees, valves, and other fittings increase resistance, and how to use standard tables to account for these components in pressure loss calculations.

Module 8: Equivalent Length Example

Learning Objective:

Calculate the total effective length of a pipeline by summing measured pipe length and equivalent lengths of fittings.

Summary:

Through a practical example, this module demonstrates how to combine actual pipe measurements with fitting equivalent lengths. Participants will calculate total effective length, a crucial step in accurate pressure loss determination for real-world installations.

Module 9: Design Shortcuts (HTM02-01 Tips)

Learning Objective:

Apply practical design shortcuts—such as adding 25–30% to pipe length—to account for uncertainties while maintaining compliance.

Summary:

This module shares industry-proven shortcuts for efficient pipeline design. Participants will learn time-saving techniques including length adjustments, conservative pressure drop allocations, and when to round up pipe sizes without compromising safety or compliance.

Module 10: Multi-Pressure Systems – Tables A3 & A4

Learning Objective:

Select and use correct pressure loss tables for systems operating at 700 kPa and 1100 kPa.

Summary:

This module covers specialized pressure loss tables for higher-pressure medical gas systems. Participants will learn to differentiate between Table A3 (700 kPa surgical air) and Table A4 (1100 kPa instrument air), applying appropriate calculations for each system type.

Module 11: Vacuum Systems – Table A5

Learning Objective:

Calculate pressure loss in vacuum systems using Table A5 and convert between mm Hg and kPa units.

Summary:

Focusing on vacuum pipeline design, this module teaches pressure loss calculations for suction systems. Participants will work with Table A5, understand its unique units and reference pressure, and apply vacuum-specific calculation methods.

Module 12: Integrated Design Scenario

Learning Objective:

Design a complete medical gas pipeline by integrating equivalent lengths, table lookups, and ΔP calculations for a clinical bay.

Summary:

This module presents a comprehensive design exercise for a 4-bed clinical bay. Participants will integrate all learned skills—from flow calculation to fitting accounting—to produce a complete, compliant medical air pipeline design with verification against the 5% maximum loss requirement.

Module 13: Common Errors & Best Practices

Learning Objective:

Identify and avoid common errors in pressure loss calculations while applying industry best practices.

Summary:

This module highlights frequent mistakes in pipeline pressure loss calculations and provides



HTM02-01 Design Consulting Specialist in HTM02-01 Design.

+66(0)63 082 9692

kevin@htm02-01designconsult.com

<https://htm02-01designconsult.com/>



strategies to avoid them. Participants will learn best practices for validation, documentation, and design verification to ensure reliable, compliant medical gas systems.

Module 14: Wards Pipe Sizing Exercise

Learning Objective:

Calculate cumulative gas flows, select appropriate pipe diameters, and verify system-wide compliance for a multi-ward hospital pipeline network.

Summary:

This capstone module challenges participants with a complete hospital ward sizing exercise. Working with a two-floor, six-ward layout, learners will size pipelines for oxygen, medical air, and vacuum systems, verify compliance with pressure loss limits, and document their engineering decisions with clear justification.

Assessment of Learning

- Final Knowledge Quiz: 15 multiple-choice questions covering formulas, table use, and compliance criteria.
- Practical Submission: Completion of the Hospital Ward Sizing Exercise with written justification of pipe selections.
- Successful Completion: Minimum score of 80% on the quiz and satisfactory completion of the practical exercise.

Course Materials & Resources

- Digital Handbook: Includes pressure loss tables (A2–A7), formula sheets, and worked examples.
- Slide Deck: Comprehensive module-by-module presentation.
- Calculation Worksheets: For use during workshops and future projects.
- Ward Sizing Exercise Pack: Full drawings, flow data, and submission template.

Prerequisites

Completion of *MGPS-01: Flow Calculations & Design Principles* or equivalent knowledge of medical gas flow demand calculations is strongly recommended. A basic understanding of engineering mathematics is required.

Certification

Upon successful completion, participants will receive a Certificate of Completion listing their name, the course title, CPD hours earned (8), and date of completion. This course is designed to meet ongoing professional development requirements for engineers working under HTM02-01.