

Quality is more than a word



World's Largest HALT/HASS Provider

Advanced Accelerated Testing Solutions



QUALMARK | RELIABILITY TEST TECHNOLOGY

World's Largest HALT/HASS Provider

ESPEC North America is the largest manufacturer of AST (Accelerated Stress Testing) equipment worldwide. Qualmark HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screen) testing technology has been recognized as one of the fastest and most effective disciplines for design reliability testing and production screening for electronics and electromechanical devices.

Innovative System Technology

The Qualmark brand pioneered accelerated stress test technology in the early 1990s and has since consistently led the market in technology innovation. In 2009 the brand introduced the next generation vibration table – the xLF2™. The xLF2 provides the first and only “field maintainable” PSD (Power Spectral Density) table, allowing for simple maintenance procedure to restore the table to Factory PSD.

Accelerated Testing Knowledge Leader

ESPEC offers a wide range of Qualmark Applications support, Skills, and Knowledge (ASK) specifically designed so that best practices are applied to HALT/ HASS system use for maximum returns. The ESPEC Solutions Group adds to the value derived from accelerated testing by customizing services to target customer specific program optimization. The educational value of the ESPEC Solutions Group can dramatically improve reliability program outcomes and deliver faster product profitability. It's never too early or late to “ASK” the ESPEC Solutions Group for the expert support you need.

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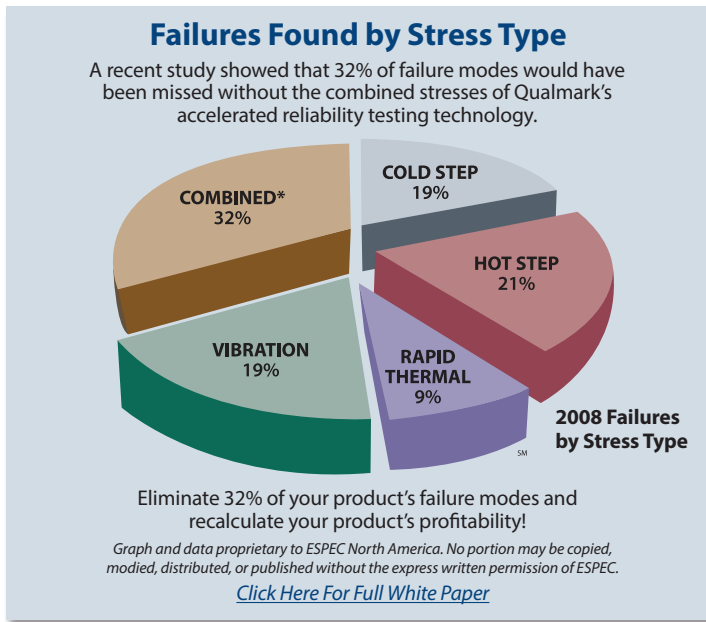
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Advanced Technology . . . Faster Testing

HALT – Highly Accelerated Life Test

HASS – Highly Accelerated Stress Screen

HALT and HASS, collectively referred to as Accelerated Stress Testing (AST), subject a product to a series of stresses, effectively forcing product weak links to emerge by accelerating fatigue. Unlike traditional single axis vibration test methods or thermal only methods, an AST program requires specialized HALT/HASS equipment to render the required stresses – random six-degree-of-freedom vibration and rapid thermal change rates – in the combined environment necessary to drive out latent failure modes.



In HALT and HASS, stresses are applied in a controlled, incremental fashion while the unit under test is continuously monitored for failures. Once the weaknesses of the product are uncovered and corrective actions taken, the limits of the product are clearly understood and the operating margins have been extended as far as possible. The result? A more mature product can be introduced much more quickly with a higher degree of reliability.

ESPEC – Accelerating Product Reliability

Because we focus on the way rapid shock technology can be utilized to support business goals, ESPEC forms strategic partnerships, provides expert services, and offers professional programs designed to deliver maximum value. Starting with client needs, ESPEC envisions the entire product testing life cycle and then offers a solution to deliver maximum tangible return on investment (ROI). ESPEC's product design and process management solutions help increase productivity, stimulate growth and build competitive advantages – measurable business values for your enterprise.

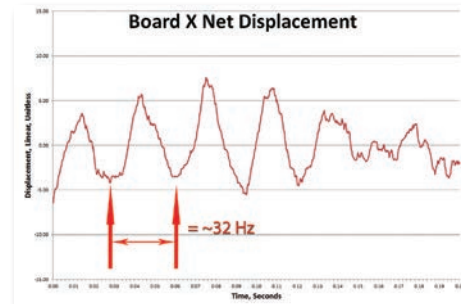
Qualmark Reliability Test Technology – An Advanced System For Accelerated Testing

Qualmark Reliability Test Technology is specifically engineered to reduce the total cost of developing and supporting product throughout its lifecycle – from prototype testing, through production, and during warranty. Since pioneering the technology, Qualmark has been the market leader in Design Support, Process Consultation, Fixture Development and state of the art Proof of Concept performing HALT (Highly Accelerated Life Tests) and HASS (Highly Accelerated Stress Screens) that:

- Shorten Design Verification Time (DVT) and expense
- Remove costly manufacturing defects
- Boost product reliability
- Reduce warranty costs
- Increase brand quality recognition

Qualmark Brand Provides	Customer Benefit
Faster Time to Market • Shorter DVT and expense	Increase Revenues • Beat competition to market
Reduced Product Failures • More rugged design	Reduced Costs • Fewer service & warranty claims
Improved Customer Satisfaction • Dependable product	Protect Brand Value • Extends to other offerings

Qualmark accelerated stress test systems, with their powerful thermal performance and six-degree-of-freedom (6DoF) repetitive-shock vibration, drives out design flaws fast while conserving energy consumption. Our vibration system delivers low frequency energy for penetrating complex products, while retaining the high frequency energy that is so effective at exposing weak solder joints and surface mount weaknesses. The advanced engineering that goes into the Qualmark T series leads the industry in fulfilling the complex task of providing effective excitation of high and low frequency vibration modes while simultaneously delivering rotation (roll, pitch and yaw) around three axes (X, Y and Z). The system's air flow technology delivers superior rapid temperature cycling – reaching set points faster and delivering stability during cold/hot dwells and ramps that out-perform other systems.



The Elements of a Successful Accelerated Stress Test (AST) Program

Successful implementation of an Accelerated Stress Testing (AST) system will yield a significant and continued Return on Investment (ROI) from HALT/HASS equipment and services. Goals, budgets, and ROI of the program can be realized with the right equipment, training, and support. Only ESPEC has developed the complete package of tools and resources you need – from RFQ tools to best practices training and guidelines – to help you realize your program goals with the fastest possible ROI.

New Analysis Techniques for Repetitive Shock Vibration

<https://youtu.be/l4Jcf3YbaoA>

Goals, Budgets, and ROI

HALT/HASS programs involve multiple business groups, varying resource requirements, and an atypical approach to product testing methodology that can affect the ROI. ESPEC works closely with your cross functional teams to align program outcomes with business goals.

Qualmark Reliability Test Technology

Qualmark Reliability Test Technology is designed with the purpose of increasing the effectiveness of HALT and HASS.

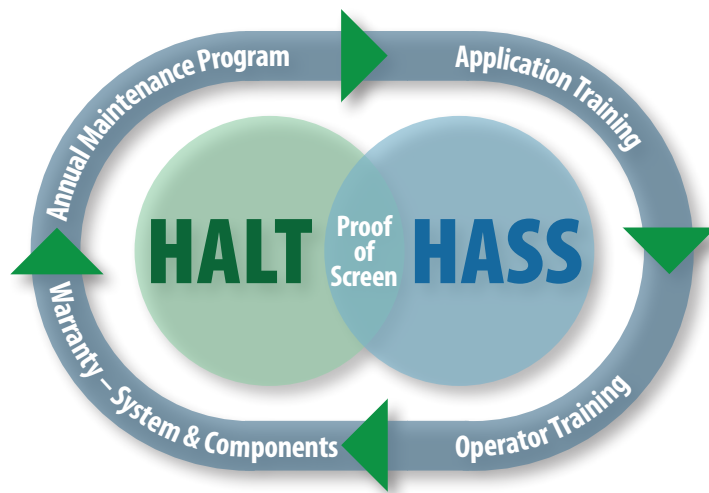
The Qualmark T series provides turbulent air flow to extract the greatest BTU change rate on a product utilizing low LN₂ and electricity. The result? A 20-40% utility cost savings (compared to previous generations) that will deliver years of ongoing savings.

The Qualmark introduction of the xLF2 vibration table in 2009 provided another breakthrough in technology with the introduction of Power Spectral Density (PSD) management.

Knowledge Support for AST Program Success

With more than 1,500 systems deployed and over 5,500 HALT and HASS performed by ESPEC in our own labs, we understand the mission critical need to educate, train, and support HALT/HASS program management, engineers, and equipment technicians. Since HALT and HASS can represent a paradigm shift in traditional reliability testing and processes are tailored product by product, the ESPEC Solutions Group is structured to impart the knowledge necessary for customers to quickly gain a thorough understanding of HALT and HASS best practices.

A HALT/HASS implementation is a success when the customer achieves a significant quality/reliability improvement and the maximum ROI. Contact ESPEC to start your successful Accelerated Stress Testing program implementation to improve product reliability.



ESPEC provides the essential HALT/HASS education, training, support, and services necessary for successful accelerated stress testing programs. In the last 30 years we have performed over 5,500 HALT/HASS tests and manufactured over 1,500 systems.

Visit the ESPEC website to learn more about Accelerated Stress Testing (AST) Programs, and how they can help you complete testing in 20% of the time!

ESPEC Solutions Group - Applications, Skills, Knowledge (ASK)

HALT and HASS: From Theory to Practice



ESPEC offers a wide range of services specifically designed to ensure best practices are applied to HALT/HASS system use for maximum returns. The objective of the ESPEC Solutions Group is to add to the value derived from

accelerated testing by tailoring services to deliver customer-specific program optimization. The educational value of the ESPEC Solutions Group can dramatically improve reliability program outcomes that will quickly drive increases in product profitability.

Contact the ESPEC Solutions Group for help in keeping accelerated stress test programs on track.

Services include:

- HALT/HASS Training
- HASS Implementation
- Proof of Concept Projects
- Customized Training Solutions

Fixture Design

Repetitive shock fixturing design is critical and can drive the success or failure of testing protocols. A good fixture can establish a level of consistency and repeatability in production screening. In a factory environment, a good fixture enables any manufacturing team member to load, unload, and maximize throughput with ease and little to no error.

ESPEC delivers experience, knowledge of the process, and knowledge of how the vibration table interacts within the technology framework.

ESPEC has been at the forefront of delivering Repetitive Shock fixturing design and training worldwide for over 30 years.

Testing Services – ESPEC Labs

Services available:

- HALT (Highly Accelerated Life Test)
- Production HASS (Highly Accelerated Stress Screen)
- Production HASA (Highly Accelerated Stress Audit)
- Customer Defined Test Services

Hobbs Engineering

HOBBS ENGINEERING | EDUCATION AND CONSULTING
a division of ESPEC North America

Hobbs Engineering Knowledge

Hobbs Engineering is an independent Education and Consulting division of ESPEC North America. They deliver renowned How-to seminars and webinars on Accelerated Reliability to companies and individuals around the world. For more than 30 years, Hobbs has gathered a select group of specialists in the various fields of study in Accelerated Reliability, who provide training opportunities for manufacturers in industries such as, Avionics, Computers, Consumer electronics, Telecommunications, Defense, Medical, Oil and Gas, and many more. These instructors extend education and training in the form of seminars, webinars, and consulting in the field of reliability improvement. There are new learning opportunities offered every month. You can learn about, register for, and follow all upcoming opportunities by navigating to the Hobbs calendar of events. You can also contact Hobbs for customized on-site or virtual training for your team.

<https://hobbsengr.com/events/category/events/learn@hobbsengr.com>

Overview

Qualmark HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screen) chamber systems are designed and manufactured by ESPEC specifically to provide the industry with accelerated reliability testing capabilities. Qualmark Reliability Test Technology has matured from a thermal chamber and a vibration table with independent controls to an integrated HALT/HASS system. The Qualmark T series is the most energy efficient on the market. Now in its 21st year of production, the T series provides the extreme stresses necessary to rapidly find design flaws missed by traditional methods.

The Qualmark brand has consistently been the market leader since introducing our HALT/HASS technology in the early 1990s. Today, the Qualmark Reliability Test Technology continues to reflect the best design in advanced HALT/HASS engineering to deliver optimum test performance for the lowest total cost of ownership in the industry.

T Series HALT/HASS Systems

The Qualmark T series systems are dual-purpose designed for performing HALT or HASS with energy efficiencies that expedite ROI. The T series' six degree of freedom, random, broadband excitation (10 Hz to above 5,000Hz) delivers a consistent Power Spectral Density (PSD) profile that eliminates picket fencing. Picket fencing refers only to discrete transforms (DFT, etc) and indicates that the frequency information is only accurate at specific, regular intervals (sometimes called "bins"); if you take the DFT of an impulse, you'll observe equal components at each frequency interval and it will appear similar to a picket fence.

The repetitive shock vibration system is capable of delivering in excess of 60 gRMS. The thermal system features vacuum jacketed liquid nitrogen injection cooling, open element nichrome heating, and offers temperature ranges of +200°C to -100°C with ramp rates of 60°C per minute. A high temperature option can extend the temperature range up to +250°C. This option provides the extreme stimulation necessary to analyze design weaknesses and extend operational margins for devices destined for use in harsh environments. The T series comes equipped with ESPEC's powerful custom control system designed for both lab and production environments.

OVTT Series Benchtop Repetitive Shock Table

The Qualmark OVTT Benchtop system provides a versatile repetitive shock vibration system that can be utilized for quick field evaluations, in-house design verification and in-line process testing. The system can be easily configured for placement inside a thermal chamber for combined stress tests.

EQ Series Non-Nitrogen Halt System

ESPEC's newest addition to the Qualmark Product line features a compressor based HALT system, bringing a whole new level of accessibility and capabilities to customers and locations where traditional HALT systems just aren't feasible. Whether LN₂ is difficult or too costly to attain and maintain, or the infrastructure just doesn't allow for LN₂, this is your answer.

QF300 HASS System

Qualmark's 2011 introduction of the QF300 system provided ground breaking technology in the reliability test equipment industry by offering, for the first time, a practical solution for integrating HASS (Highly Accelerated Stress Screening)/ HASA (Highly Accelerated Stress Auditing) into a high volume-production facility. The QF300's 6-chamber, 6-table configuration unbridles the previously limited throughput of a typical HALT/ HASS system while delivering the superior 6 degree of freedom, random shock vibration and thermal ramps necessary to detect process induced flaws in today's sophisticated electronics.

QF300 - the Industry's FIRST HASS/HASA Dedicated System https://youtu.be/w_kgiBQRW_k



Standard Features

- High Rate, High Flow
- T-series Thermal System
- xLF2 Vibration Table with PSD Management
- PLC Control
- Desktop PC with Monitor
- Typhoon Manager Software
- Optional: Vacuum Jacketed Manifold

Review Configuration Options and available Accessories with your ESPEC representative

T1.5

The T1.5, with its 18 in x 18 in vibration table, is perfect for performing Highly Accelerated Life Testing (HALT) on small products, or where limited lab space is available. This compact system is built using Qualmark Reliability Test Technology which delivers impressive thermal performance and six-degree-of-freedom repetitive-shock vibration. The T1.5 is a practical addition to any company's product reliability program.

Work Space	27.0 in x 27.0 in x 19.5 in (WxDxH) (686 mm x 686 mm x 494 mm)
Outer Dimensions	38.8 in x 47.0 in x 80.9 in (WxDxH) (985 mm x 1194 mm x 2055 mm)
Table Size	18 in x 18 in (457 mm x 457 mm)
Actuators	4 Actuators Lubricant-free
Table Capacity¹	80 lb (45 kg)
Acceleration²	5 – 65 gRMS
Temp Range	-100°C to +200°C
Thermal Ramp Rate³	70°C/min
Power Requirements	208V, 230V (1 ph), 50/60Hz, 70 A (service rating) 380V, 400V, 440V, 480V (3 ph) 50/60Hz 35A (service rating)

1. Greater load capacities can be designed; contact Qualmark for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured -65°C to 85°C in open air 3" above table center; levels vary by make and model.

Request the latest system specifications from ESPEC.



T2.0

The T2.0, with its 24 in x 24 in vibration table, is perfect for performing Highly Accelerated Life Testing (HALT) on small products, or where limited lab space is available. This compact system is built using Qualmark Reliability Test Technology which delivers impressive thermal performance and six-degree-of-freedom repetitive-shock vibration. The T2.0 is a practical addition to any company's product reliability program.

Standard Features

High Rate, High Flow
T-series Thermal System
xLF2 Vibration Table with
PSD Management
PLC Control
Desktop PC with Monitor
Typhoon Manager Software
Optional: Vacuum Jacketed Manifold

See Configuration Options on page 22
and Accessories on page 24

Work Space	27.0 in x 27.0 in x 19.5 in (WxDxH) (686 mm x 686 mm x 494 mm)
Outer Dimensions	38.8 in x 47.0 in x 80.9 in (WxDxH) (985 mm x 1194 mm x 2055 mm)
Table Size	24 in x 24 in (610 mm x 610 mm)
Actuators	5 Actuators Lubricant-free
Table Capacity¹	100 lb (45 kg)
Acceleration²	5 – 75 gRMS
Temp Range	-100°C to +200°C
Thermal Ramp Rate³	70°C/min
Power Requirements	208V, 230V (1 ph), 50/60 Hz, 70A (service rating) 380V, 400V, 440V, 480V (3 ph), 50/60 Hz 35A (service rating)

1. Greater load capacities can be designed; contact ESPEC for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured as the average rate between -65°C and 85°C in open air 3" above table center (in an empty chamber); levels vary by make and model



Standard Features

- High Rate, High Flow T-series Thermal System
- xLF2 Vibration Table with PSD Management
- Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Monitor
- Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 24. The optional Elevation Stand is highly recommended for this system.

T2.5

The Qualmark T2.5 is a popular chamber with a 30 in x 30 in vibration table. This table size is a good size for Highly Accelerated Life Testing (HALT) applications and many Highly Accelerated Stress Screening (HASS) applications. The table can be mounted in an upper or lower position, to suit different product and ergonomic requirements. A High Temperature Option is available for testing of products to be used in harsh environments.

Work Space	Lower Table Position 35.0 in x 35.0 in x 35.0 in (WxDxH) (889 mm x 889 mm x 889 mm) Upper Table Position 35.0 in x 35.0 in x 25.0 in (WxDxH) (889 mm x 889 mm x 635 mm)
Outer Dimensions	46.8 in x 61.6 in x 82.1 in (WxDxH) (1188 mm x 1565 mm x 2085 mm)
Table Size	30 in x 30 in (762 mm x 762 mm)
Actuators	8 Actuators Lubricant-free
Table Capacity¹	320 lb (145 kg)
Acceleration²	5 – 75 gRMS
Temp Range	-100°C to +200°C
Opt High Temp Range	-100°C to +250°C
Thermal Ramp Rate³	70°C/min
Power Requirements⁴	440V, 480V (3 ph) 50/60Hz, 60A (service rating) 380V, 400V (3 ph) 50/60Hz 80A (service rating)

1. Greater load capacities can be designed; contact ESPEC for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured as the average rate between -65°C and 85°C in open air 3" above table center (in an empty chamber); levels vary by make and model.
4. Power requirements for high temp option for 440V, and 480V service rating increased to 100A. For 380V and 400V service rating increases to 125A.



T3.0

The Qualmark T3.0 is designed specifically to help the customer who is performing low volume Highly Accelerated Stress Screens (HASS) and needs a chamber with a 36 in x 36 in vibration table. It is also ideal for performing Highly Accelerated Life Tests (HALT) on mid-sized and larger products. The T3.0 vibration table mounts at two different heights, so the interior chamber volume can be adjusted for the needs of the product.

Standard Features

- High Rate, High Flow
- T-series Thermal System
- xLF2 Vibration Table with PSD Management
- Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Monitor
- Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 24. The optional Elevation Stand is highly recommended for this system.

Work Space	Lower Table Position
	44.0 in x 45.0 in x 35.0 in (WxDxH) (1118 mm x 1143 mm x 889 mm)
Outer Dimensions	Upper Table Position
	44.0 in x 45.0 in x 25.0 in (WxDxH) (1118 mm x 1143 mm x 635 mm)
Table Size	56.1 in x 69.6 in x 83.6 in (WxDxH) (1425 mm x 1768 mm x 2124 mm)
Actuators	36 in x 36 in (914 mm x 914 mm)
Table Capacity ¹	10 Actuators Lubricant-free
Acceleration ²	450 lb (204 kg)
Temp Range	5 – 65 gRMS
Thermal Ramp Rate ³	-100°C to +200°C
Power Requirements	70°C/min
	380V, 400V, 440V, 480V (3 ph) 50/60Hz, 80A (service rating)

1. Greater load capacities can be designed; contact ESPEC for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured as the average rate between -65°C and 85°C in open air 3" above table center (in an empty chamber); levels vary by make and model.



T4.0

This system is designed specifically for the task of performing Highly Accelerated Stress Screening (HASS) and Highly Accelerated Life Test (HALT) on large products. Its 48 in x 48 in vibration table is capable of supporting hundreds of pounds of products, fixturing and mounts at two different heights. The Qualmark T4.0 provides optimal thermal and vibration performance to drive out failures fast, yet is amazingly quiet. A High Temperature Option is available for testing of products to be used in harsh environments.

Standard Features

- High Rate, High Flow
- T-series Thermal System
- xLF2 Vibration Table with PSD Management
- Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Monitor
- Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 26

Work Space	Lower Table Position
	53.8 in x 54.0 in x 53.6 in (WxDxH) (1367 mm x 1372 mm x 1362 mm)
	Upper Table Position
	53.8 in x 54.0 in x 34.6 in (WxDxH) (1367 mm x 1372 mm x 879 mm)
Outer Dimensions	69.8 in x 78.3 in x 103.8 in (WxDxH) (1772 mm x 1989 mm x 2673 mm)
Table Size	48 in x 48 in (1219 mm x 1219 mm)
Actuators	12 Actuators Lubricant-free
Table Capacity¹	600 lb (272 kg)
Acceleration²	5 – 75 gRMS
Temp Range	-100°C to +200°C
Opt High Temp Range	-100°C to +250°C
Thermal Ramp Rate³	70°C/min
Power Requirements⁴	380V, 400V, 440V, 480V (3 ph) 50/60Hz, 100A (service rating)

1. Greater load capacities can be designed; contact ESPEC for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured as the average rate between -65°C and 85°C in open air 3" above table center (in an empty chamber); levels vary by make and model.
4. Power requirements for high temp option for 380V, 400V, and 440V service rating increased to 150A. For 480V service rating increases to 125A.

T8.0



The Qualmark T8.0 essentially doubles the table length of our popular T4.0 chamber. The thermal system in the T Series has been carefully engineered to have superior thermal efficiency. Key design elements such as our patented blower technology, highly efficient air flow characteristics and careful choice of materials have combined to keep liquid nitrogen and electricity costs down without compromising our industry standard thermal performance. The T8.0 has the largest vibration table available in a HALT/HASS chamber.

Standard Features

- High Rate, High Flow T-series Thermal System
- xLF2 Vibration Table with PSD Management
- (2x) Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Monitor
- Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 24

Work Space	Lower Table Position
	108.7 in x 53.8 in x 53.6 in (WxDxH) (2761 mm x 1366 mm x 1362 mm)
	Upper Table Position
	108.7 in x 53.8 in x 34.6 in (WxDxH) (2761 mm x 1366 mm x 879 mm)
Outer Dimensions	123.7 in x 78.3 in x 103.8 in (WxDxH) (3143 mm x 1989 mm x 2637 mm)
Table Size	100 in x 48 in (2540 mm x 1219 mm)
Actuators	24 Actuators Lubricant-free
Table Capacity¹	1200 lb (544 kg)
Acceleration²	5 – 70 gRMS
Temp Range	-100°C to +200°C
Thermal Ramp Rate³	70°C/min
Power Requirements	380V, 400V, 440V, 480V (3 ph) 50/60Hz, 200A (service rating)

1. Greater load capacities can be designed; contact ESPEC for custom options.
2. Measured on bare table; maximum gRMS level dependent on table configuration.
3. Measured as the average rate between -65°C and 85°C in open air 3" above table center (in an empty chamber); levels vary by make and model

OVTT 18 and 24



The OVTT Benchtop series were the first stand-alone, compact, repetitive-shock vibration tables on the market and features Qualmark Reliability Test Technology. Both the OVTT18 and 24 are ideal for quick evaluation of field returns, repair verification and random vibration testing of multiple small products and can be configured for placement inside a thermal chamber for combined stress tests¹. These tables are ideal for in-production-line, broad-band spectrum vibration testing of products.

Standard Features

- OVTT18 or OVTT24 Base Assembly
- PanelView Electronic Console with PLC Controller
- xLF2 Vibration Table with PSD Management

Review Configuration Options and available Accessories with your ESPEC representative

	OVTT 18	OVTT 24
Work Space	(WxDxH) 21.7 in x 21.7 in x 8.6 in (551 x 551 x 218mm)	(WxDxH) 29.3 in x 29.2 in x 9.4 in (744 x 742 x 239mm)
Outer Dimensions¹	Base (WxDxH) 29.4 in x 34.8 in x 21.9 in (747 x 883 x 557mm)	Base (WxDxH) 36.0 in x 35.7 in x 24.6 in (915 x 906 x 625mm)
Outer Dimensions	Console (WxDxH) 28.2 in x 9.1 in x 8.3 in (711 x 232mm x 211mm)	Console (WxDxH) 28.2 in x 9.1 in x 8.3 in (711 x 232mm x 211mm)
Table Size	18 in x 18 in (457 x 457mm)	24 in x 24 in (610 x 610mm)
Table Capacity²	50 lb (23 kg)	100 lb (45 kg) 200 lb (91 kg) Optional
Actuators	4 Actuators Lubricant-free	5 Actuators Lubricant-free
Acceleration²	5 – 40 gRMS	5 – 60 gRMS
Power Requirements	120/220-240VAC 1A 50/60Hz	115VAC/230VAC 3A 50/60Hz
Air Requirements	25 SCFM @ 70 psi	40 SCFM @ 80 psi

1. With cover and console. Controller and cover are not intended for use inside a thermal chamber.

2. Measured on bare table; maximum gRMS level dependent on table configuration.



EQZ4

FUSING NON-NITROGEN REFRIGERATION AND QUALMARK RELIABILITY TEST TECHNOLOGY

This entry-level, compressor-based HALT system eliminates the need for liquid nitrogen, making basic HALT testing possible for customers and locations where traditional HALT systems just are not feasible. Whether LN₂ is too difficult or costly to attain and maintain, or just not possible, this is your answer. (This system has an option for LN₂ boost that can be used only during rapid thermal ramps, with mechanical refrigeration taking over for soak steps.)

Standard Features

- All Stainless Steel construction
- xLF2 Vibration Table with PSD Management (18 in x18 in)
- Left-hinged door with window and LED lighting
- Non-Nitrogen
- Cascade refrigeration
- Dry-air purge
- Emergency stop button
- P-300 touch screen controller

Review Configuration Options and available Accessories with your ESPEC representative

Work Space	21 in x 21 in x 16 in (WxDxH) (534 x 534 x 406 mm)
Outer Dimensions	52.7 in x 35.2 in x 76.5 in (WxDxH) (1339 x 895 x 1944 mm)
Table Size	18 in x 18 in (458 x 458 mm)
Actuators	4 Actuators Lubricant-free
Table Capacity	80 lb (36 kg)
Acceleration	5 – 60 gRMS
Temp Range	-70°C to 180°C
Power Requirements	208V/230V (1 ph) 60Hz, 60A ** 50Hz model available soon



EQGNZ27

FUSING NON-NITROGEN REFRIGERATION AND QUALMARK RELIABILITY TEST TECHNOLOGY

ESPEC announces a New Addition to the Qualmark Product line. This New compressor based HALT system, brings a whole new level of accessibility and capabilities to customers where traditional HALT systems just aren't feasible. Whether LN₂ is difficult or too costly to attain and maintain, or the infrastructure just doesn't allow for LN₂, this is your answer. Likewise, this new system serves customers who want the LN₂ boost for testing and achieving rapid thermal ramps, but perhaps don't need it all the time for all testing. For those times, you have full accessibility and integration with mechanical refrigeration. The random shock vibration table provides the complete combined environment needed for full HALT testing. This is a robust system built on the proven, quality technologies from ESPEC and the Qualmark product line, so you know you are investing in the best.

Standard Features

- All Stainless Steel construction
- xLF2 Vibration Table with PSD Management (30 x 30 in.)
- Left-hinged door with window and LED lighting
- Non-Nitrogen
- Cascade refrigeration
- Dry-air purge
- Emergency stop button
- P-300 touch screen controller

See Configuration Options on page 22 and Accessories on page 26

Since ESPEC continually improves product and service offerings, specifications are subject to change without notice. Please check with ESPEC to ensure you have the latest specification.

Work Space	39.4 in x 45.0 in x 26.1 in (WxDxH) (1000 mm x 1143 mm x 663 mm)
Outer Dimensions	EQGNZ27-6NAL 50.7 in x 98.3 in x 89.7 in (WxDxH) (1288 mm x 2497 mm x 2278 mm) EQGNZ27-12NWL2.5: 50.7 in x 98.3 in x 76.0 in (WxDxH) (1288 mm x 2497 mm x 1920 mm) EQGNZ27-15NW2.5: 50.7 in x 134.3 in x 79.3 in (WxDxH) (1288 mm x 3411 mm x 2014 mm)
Table Size	30.0 in x 30.0 in (762 mm x 762 mm)
Actuators	(8) Eight pneumatic, impulse-type Lubricant-free actuators
Table Capacity	320 lb (145 kg)
Acceleration¹	5 – 75 gRMS
Temp Range	-70°C to 180°C
Power Requirements	460V (3 ph) 60Hz, 45A (-6NAL model), 70A (-12NWL model), 100A (-15NWL model) ** 50Hz model available soon

1. Measured on bare table; maximum Grms level dependent on table loading.



QF300

FUSING BURN-IN AND HASS/HASA – A MULTI-CAPABLE SYSTEM

The Qualmark QF300 represents the latest in accelerated stress test technology – specifically addressing the reliability testing needs during production. This system is designed to perform HASS/HASA (Highly Accelerated Stress Screen/Highly Accelerated Stress Audit) and/or Burn-In on product to locate failure modes that may have been inadvertently introduced during manufacturing. QF300 technology provides maximum performance for driving out process-induced faults and detecting inferior component substitutions that could otherwise turn up in the field as costly failures. QF300's combined environment (thermal and random shock vibration) and 6 table configuration accelerates process verification and for less cost than with traditional equipment.

Standard Features

- High Rate, High Flow Thermal System
- xLF2 Vibration Tables
- Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Monitor
- QFusion Manager Software

See Configuration Options on page 22 and Accessories on page 24

Work Space	6 tables; Work space per table 27 in x 19.2 in x 11.3 in (WxDxH) (686 mm x 486 mm x 286 mm)
Outer Dimensions	81.5 in x 38.4 in x 101.9 in (WxDxH) (2070 mm x 976 mm x 2588 mm)
Table Size (Quantity-6)	23.6 in x 15.6 in / table (599 mm x 396 mm)
Actuators	12 Actuators; 2/table Lubricant-free
Table Capacity	6 tables; 100 lb (45 kg)/table
Acceleration¹	5 – 40 gRMS
Temp Range	-60°C to +120°C
Thermal Ramp Rate²	60°C/min
Power Requirements	380V, 400V (3 ph), 50/60Hz 100A (service rating) 440V, 480V (3 ph), 50/60Hz 100A (service rating)

1. Measured on bare table.

2. Measured as the average rate between -40°C and 80°C in open air 3" above table center (in an empty chamber); levels vary by make and model.

LN₂ Infrastructure

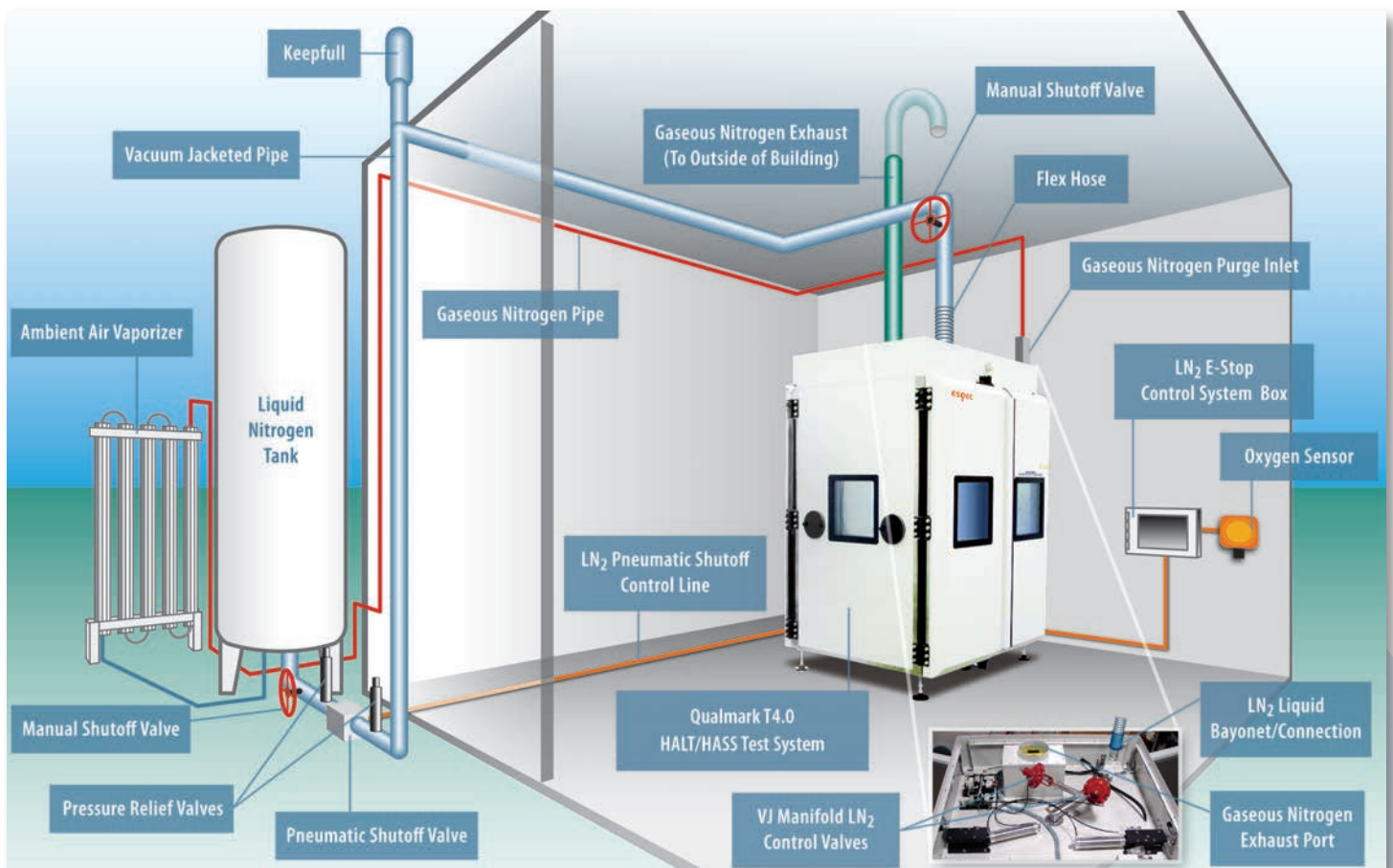
Liquid nitrogen (LN₂) is an essential element for performing HALT and HASS and its delivery method is essential for driving the outstanding rapid thermal cycling and dwell stability performance of the Qualmark T series. The quality of the liquid nitrogen supply piping for the system, therefore, is critical for proper operation. Bubbles of nitrogen vapor in the liquid supply can make the chamber cooling system difficult to control, resulting in poor cold ramp rates and temperature instability. The presence of vapor in the supply is also an indication of heat leaks in the piping that will result in wasted nitrogen, frost build-up and subsequent water drips and possible damage as the frost melts. Properly installed, high quality Vacuum Jacketed (VJ) piping dramatically reduces heat loss and the resulting vapor in the nitrogen supply. Additional 'keep cool' vapor separators can be installed as needed to further reduce vapor content.

The Qualmark product line features static vacuum-jacketed piping that can reduce thermal losses by a factor of 100 over alternative piping, representing a significant savings for our customers. The choice of static versus dynamic vacuum jacket design eliminates an additional element

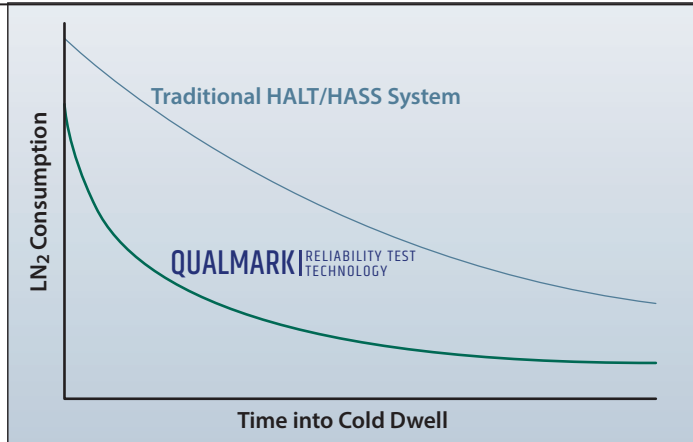
to the coolant supply that might otherwise need maintenance or repair – another way ESPEC considers customers' Total Cost of Ownership (TCO) in its advanced systems design. ESPEC specifies piping for the Qualmark product line that has double-wall construction with an inner pipe for the transfer of liquid nitrogen and an outer pipe to support and retain the vacuum insulation, both, made of stainless steel. The insulation is a low vacuum cavity with multiple layers of foil (super insulation) applied to reflect back radiant heat. Molecular sieves and getters are used with the insulation system to maintain low vacuum levels for years. All Vacuum Jacketed pipe sections are designed and built with a factory sealed vacuum and super insulation system.

ESPEC offers complete HALT/HASS system assistance from site survey, system commissioning, installation of your cryogenic liquid piping system and LN₂ tanks, to running your first HALT test. ESPEC also offers a full line of best practice services at every step to provide the quickest ROI on your testing investment. With our high standards for performance, durability, efficiency, and overall cost savings, we make sure the job is done right.

Talk to us about all of your accelerated testing needs. We've installed more HALT/HASS equipment across the globe than any other organization.



Qualmark Product Line LN₂ Efficiency



One of the key fatigue acceleration mechanisms offered by HALT is the ability to deliver extremely rapid thermal change rates. The Qualmark liquid nitrogen (LN₂) based thermal system can achieve air change rates of 90°C to 100°C/min. Airflow rates in our T series far exceed those of traditional ESS systems – allowing Qualmark systems to drive a typical board level product to change rates of 60°C/min. More importantly, Qualmark T series Systems are engineered for LN₂ use efficiencies which contribute to lowest Total Cost of Ownership (TCO). As this chart demonstrates, the thermal airflow technology of the T series system conserves liquid nitrogen use by reaching set points faster than the typical system and consuming far less LN₂ throughout the dwell.

Thermal loss for copper insulated pipe is 300 BTU/ft versus a mere 3 BTU/ft for vacuum jacketed

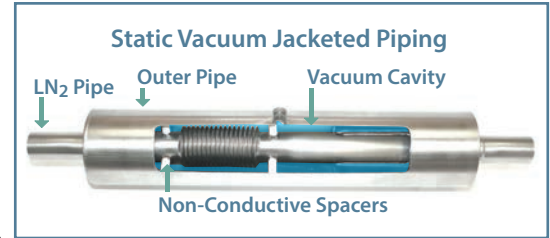


Vacuum Jacketed (VJ) Piping

Qualmark's static vacuum jacketed piping has double-wall construction with an inner pipe for the transfer of liquid nitrogen and an outer pipe to support and retain the vacuum insulation, both made of stainless steel. The insulation is a low vacuum cavity with multiple layers of foil (super insulation) applied to reflect back radiant heat. Molecular sieves and getters are used with the insulation system to maintain low vacuum levels (9 microns or less) for many years.

- VJ Piping 995-0002
- VJ Piping Installation 995-0022
- Custom Piping Contact ESPEC

Because reliable and efficient liquid nitrogen (LN₂) storage and delivery supports optimum HALT/HASS system performance and test results, ESPEC has partnered with select world class liquid nitrogen (LN₂) storage and delivery system providers. These partnerships enable turnkey provisioning of HALT lab infrastructure anywhere around the globe. Please discuss your proposed lab needs and layout options with your ESPEC representative:



LN₂ Storage

HALT/HASS test facilities typically store LN₂ in one of three ways depending on the frequency of LN₂ demand and facility size. Bulk tanks are the largest and offer efficiencies that, over time, can provide the most economical choice for storing liquid nitrogen but typically require the most up-front expense for installation. Microbulk tanks (approximately 450 - 2000 liters) offer a more flexible, yet still economical choice for LN₂ storage and can be placed inside of the facility, but with remote filling capability in most applications. Dewars are considered to be a poor option for anything other than a temporary measure. Of the 3 options, Dewars suffer the most from gas losses and do not always provide optimum LN₂ delivery for best HALT/HASS results. With Qualmark system requirements of 50psi, careful consideration must be given to the Dewar rating. Our partnership with Air Liquide internationally and Airgas domestically will provide you the expertise needed to make the most cost effective and efficient choice for your system.

LN₂ Storage Contact ESPEC for details of our partnership with Air Liquide and Airgas.

Microbulk Solution – Cost Effective Alternative



- Ideal for smaller chambers
- Microbulk can be refilled with temporary lines to nearby outside door
- Easier to install than bulk tank and VJ lines
- Lower or no capital investment
- Can be utilized instead of installing an APPS pressure reduction unit to an existing bulk tank

Airgas LN₂ Infrastructure, Supply, Safety and PPE

Airgas

an Air Liquide company

Airgas, an Air Liquide company, is a leading supplier of industrial gases, as well as gas delivery equipment systems, safety products and PPE.

With a large national footprint including production facilities throughout the U.S. and gases in any supply mode, you can depend on a continuous and reliable supply of bulk LN₂ to meet your needs.

In addition, Airgas has a network of experts including bulk gas specialists to help assess your current gas and delivery processes, and identify areas to improve your delivery system to meet your specific HALT/HASS requirements. Airgas QSSP- and OSHA 30-certified safety specialists are available to help assess safety risks and recommend the appropriate products for your team.

Together, Airgas and ESPEC work to optimize your total system including gas, installation and ongoing operations, to ensure we deliver the most efficient and reliable solutions available in the HALT industry.

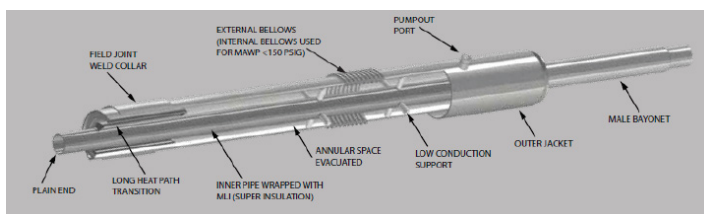
Airgas Contact ESPEC for details of our partnership with Air Liquide and Airgas.

**** Eco-origin ©, sustainable options available.**



Midwest / Acme Cryogenics VJ Piping

Midwest Cryogenics, an Acme Cryogenics Company, has long partnered with Qualmark HALT and HASS technology and have an intimate familiarity with the technology, demands of testing, and how to add acute efficiency to your overall system with the best piping logistics and products. The most cost-effective way to transfer cryogenic liquids Vacuum Jacketed Pipe (VJP) is the preferred piping solution for the safe, reliable, cost-effective transfer of LN₂.



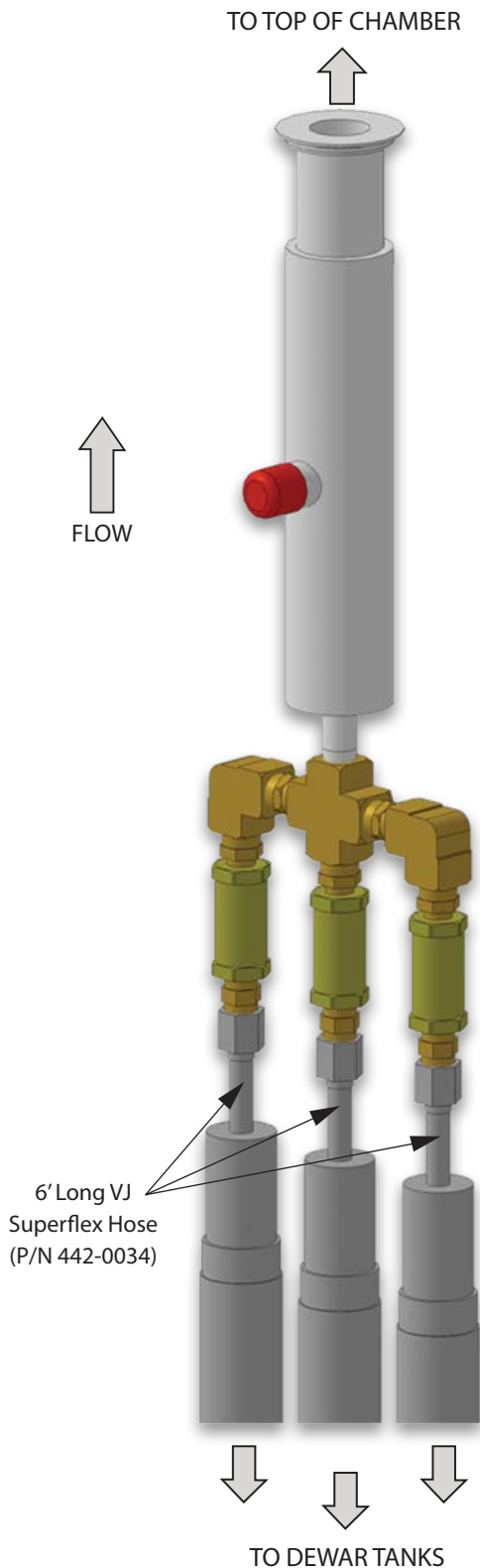
Each VJP project is managed by a sales engineer, in tandem with ESPEC, that has been trained in ASME B31.3 pipe design, cryogenic safety and VJP project management. With their nationwide field service team, installa-



tion, preventative maintenance, and repair is seamless, and can all be coordinated through your one ESPEC point of contact. Midwest brings the technical expertise full circle with ESPEC's Qualmark HALT technology and services, and Airgas' premium LN₂ supply, storage, and delivery.

Midwest/Acme Cryogenics Contact ESPEC for details of our partnership with Midwest/Acme Cryogenics.

T series Dewar Kits



T2.5/ T3.0 Dewar Kit

- Standard for 3 Dewars, Part Number: **956-0245**
- Optional for 4 Dewars, Part Number: **956-0246**
- Standard includes Female CTM Bayonet (optional threaded connection available on request)

T1.5/2.0 Dewar Kit

- Standard for 2 Dewars, Part Number: **956-0267**
- Optional for 3 Dewars, Part Number: **956-0268**
- Standard does not include Female CTM Bayonet

VJ Hoses from Dewar Kit to Dewars

- Standard (**442-0034**) 6' VJ Superflex with 1/2" flare connections to T2.5/3.0 Dewar kit and Standard threaded Dewar Connection.
- Additional length options available.

VJ Hose from Chamber to Dewar Kit/Dewar

- Standard includes 1/2" male CTM Bayonet on both ends for T2.5/T3.0 Dewar kits
- Various length options available
- Includes Relief Riser (for relief above the T2.5/T3.0 dewar kit - see photo). The relief riser end attaches to the female bayonet on the chamber.
- Custom Options for connections to previous Vacuum Jacketed Manifolds including MVIP and VBS.

Notes:

1. There are two recommended VJ Superflex Hoses for connecting the Dewar Kit to the Chamber. Select the length needed.

- 442-0050** HOSE, CTM VJ, 1/2" x 10'
- 442-0051** HOSE, CTM VJ, 1/2" x 15'



2. You must order two (2) VJ Clamps and two (2) O-rings when ordering the kit. These two items are sold separately.

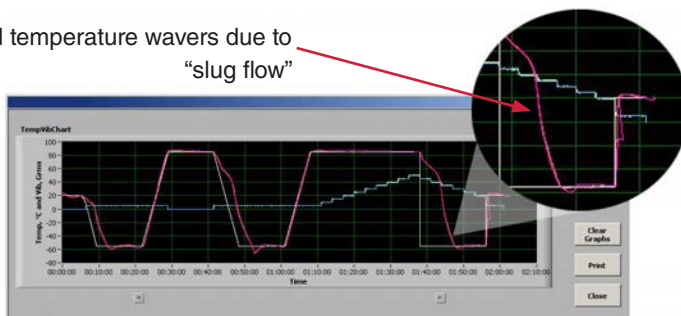
- 750-0244** Clamp, VJ, 1/2", CTM Bayonet
- 760-0217** O-Ring, VJ, 1/2", CTM Bayonet

The Value of Good Piping

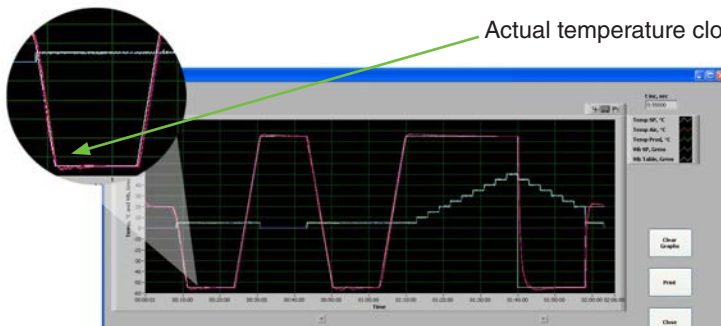
The quality of the piping you use is critical to the integrity and performance of your HALT or HASS test system and infrastructure. Vacuum Jacketed (VJ) piping is the gold standard that will help maximize test output and minimize LN₂ usage. By selecting VJ, you are receiving a product that is 40 times more insulated than foam insulated copper, which directly translates to LN₂, and money, savings. The diameter of VJ Pipe is also typically smaller than foam insulated pipe. VJ pipe allows for smooth and consistent cold ramps, preventing “slug flow” (liquid and bubbles) and poor control. Installation is simple and much quicker with the use of bayonet clamps, and the expected life without maintenance is more than 20 years.

Performance Without VJ Piping or Poor Quality VJ Piping

Actual temperature wavers due to “slug flow”



Actual temperature closely follows profile

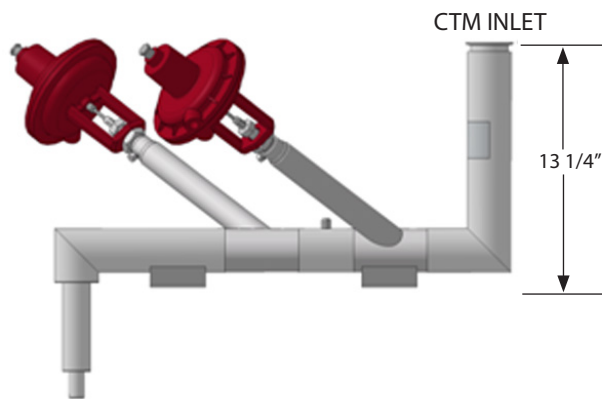


With ESPEC Provided High Quality VJ Piping

VJ Manifold

VJ Manifold – Part Number: 410-0109

- Standard on all chambers except T1.5 and T2.0.*



* Optional Vacuum Jacketed Manifold for T1.5 and T2.0
 Part number:
 785-3171 factory installed
 785-3206 field retrofit

System Configuration Options

ESPEC's Qualmark product line encompass the very latest innovations in HALT/HASS Reliability Test Technology based on our 30 years of specialized research in this discipline. We make system options available that will help you select the best configuration for delivering optimum performance for your test lab environment. Please select the following configuration options for your system.

Table

ESPEC's newest Qualmark table design – the xLF2 – improves Power Spectral Density (PSD) stability, providing superior consistency at higher gRMS and makes any adjustments for PSD drift easily manageable. Tables are configurable for metric (M-10) or standard (SAE 3/8 – 16 UNC) threads.

xLF2 Table Specify Metric or Standard

Voltage

Qualmark accelerated stress test systems are designed to deliver optimum power in support of the rigorous testing conditions necessary for effective HALT/HASS and for accommodating regional power supply configurations. Your ESPEC representative can help you select the correct option for your facility.

T2.5, T3.0, T4.0, T8.0

380V, 400V, 440V, 480V, 3Φ, 50/60Hz

T1.5, T2.0

208V, 1Φ, 50/60Hz or 230V, 1Φ, 50/60Hz or

380V, 400V, 484V, 480V, 3Φ, 50/60Hz

Voltage Specify System Requirement

Software

Securely access the Qualmark T series Manager using one of three password protected user levels which provide protection from unauthorized users and limits access to calibration and PID tuning screens. T series Manager is presented in a very easy to use “point and click” Windows® interface driving a powerful and flexible system that can be utilized by a trained technician or engineer to quickly set up the chamber for each particular requirement. The T series Manager has up to twelve thermal channels and four vibration channels that can be numerically viewed, charted or data logged by a computer. A user can set up and tune a T series system to run stress tests either manually or with a test profile. A separate HASS user screen is available for when the chamber operator only needs to run profiles.

Q-Link for Typhoon Manager

The Q-Link software has the capability to monitor an Internet connection and respond to control commands via

the TCP/IP protocol. To utilize this control, the user must be able to create programs that are capable of transmitting and receiving packets of information via TCP/IP protocol.

Q-Link Software 785-2026

QualView

QualView is a Qualmark driver set designed for advanced LabView® developers that enables Qualmark system controls to integrate with other test functions via the LabView control client. QualView permits single computer control for both the Qualmark system and other Automated Test Equipment. QualView is licensed individually per chamber.

QualView T series 785-2539

QualView QF300 785-2901

OVTT Manager

OVTT Manager provides the same easy to use “point and click” Windows interface, but designed specifically for use with the Qualmark Benchtop test system.

OVTT Software 785-1980

Certified European (CE) Kit

The CE kit adds components to meet the European Safety Directive. The typical kit contains: CE capacitor pack assembly; pneumatics lock-out, high power filter, if required, and a CE declaration of conformance.

T1.5, T2.0 785-1589

T2.5 785-3029

T3.0 785-1412

T4.0 785-1462

T8.0 785-1791

Additional Access

Qualmark T series systems can be customized to meet your specific access needs. Windows can be converted into access ports or you can order your system with additional ports, windows and cable notches. Discuss your access options with your ESPEC representative so that your system can be customized to fit your needs.

Available Access options include:

- Dual Port Window Adaptor
- Additional Front Ports
- Additional Back Ports
- Additional Windows
- Additional Cable Notches

Elevation Stand

Raises system 11¾" off floor

- T2.5 785-3005
- T3.0 785-1590

Safety Enhancements

Air Purge Kit

The Qualmark air purge system safeguards operators from invisible nitrogen by providing sufficient air purge and oxygen normalization before automatically triggering the pneumatic door interlocks allowing the system doors to be opened.

- T4.0 785-2090
- T8.0 785-1763

Air Purge Door Lock Kit

The Qualmark air purge door lock system safeguards operators from invisible nitrogen by establishing oxygen normalization before automatically triggering the pneumatic door interlocks and allowing the system doors to be opened.

- T2.5 / T3.0 785-1668
- QF300 785-2672

Door Lock Kit (T1.5 / T2.0)

The Qualmark door interlock system safeguards operators from being able to open the T series door while the system is in operation.

- T1.5 / T2.0 785-1689
- T4.0 785-2418

SSR Thermal Monitoring Alarm

Available on all T series models, the thermal alarm monitors the electrical panel and displays a warning light should temperature reach +60°C and shuts down the system and provides an audible alarm at +80°C.

Thermal Monitor Alarm . . . Contact ESPEC for Ordering

Liquid Nitrogen Delivery

Liquid Nitrogen (LN₂) is intrinsic to optimal HALT/HASS system performance. This section lists the options you should consider ordering as a part of your system for LN₂ management. The discussion on liquid nitrogen infrastructure on pages 17-18 will assist you in making decisions regarding your complete LN₂ needs.

Bayonet Adaptor

CTM LN₂ Bayonet Adaptor minimizes energy losses and provides a robust connection between the LN₂ piping supply to the chamber's inlet VJ Manifold. One Adaptor is needed for every chamber installation.

- Male Bayonet Adaptor ¾" NPT 410-0112
- VJ Line Intricate Male Adaptor 410-0113

Keepfull Vacuum Insulated Liquid Level System

The Keepfull allows the venting of vapor while maintaining the liquid level in vacuum insulated piping systems and containers. This fully mechanical part requires no electrical or pressure assistance and is designed to be installed in liquid nitrogen systems for a more efficient interface. The pipe inlet is designed for easy installation on liquid nitrogen systems. This is necessary to provide reliable cold steps and ramps.

- LN₂ Keepfull 410-0077

E-stop System

The E-stop system is an independent control system for extra safety and peace of mind. The LN₂ E-Stop System will automatically close an actuated valve on the liquid nitrogen supply system in the event of an oxygen monitor alarm or the triggering of the chamber's E-stop button.

E-stop System Contact ESPEC for Ordering



Accessories

Data Acquisition

QDaq

The Qualmark data acquisition system, QDaq, provides a flexible solution supporting expanded HALT and HASS data acquisition that provides dynamic charting and analysis capabilities. QDaq provides up to 32 thermal channels and up to 12 vibration channels of data acquisition in a single, modular design that can accommodate portability between all Qualmark systems. QDaq's compact chassis comes with an integrated signal conditioner for capturing vibration input. QDaq's software enables temperature and vibration data capture across corresponding time charts and plotting of Power Spectral Density (PSD) in a tabbed, user-friendly interface with customizable configuration settings that will streamline data file management. Thermocouples and Accelerometers sold separately.



- QDaq 956-0209
- Desktop Mounting Kit 300-0208

Data Acquisition

The Qualmark Portable Data Acquisition System comes in a compact (3.5" x 4.0" x 1.0") package with an integrated signal conditioner that captures 4 channels of vibration. This pocket-sized design permits the single user license to connect via USB with a laptop for more convenient transport between T-series HALT and QF HASS systems. The System supports Windows 10 and features easy setup and user-defined customizable settings with tabbed menu navigation for faster, more efficient access to information. Package includes chassis, vibration module, USB cable and software. Accelerometers and thermocouples sold separately.



- Portable Data Acquisition System 956-0263

Monitor And Control

Adhesive-Mount Accelerometer

Accelerometers are essential for understanding product response to the test stress extremes. These lightweight accelerometers are easily attached directly on the product under test. It includes a Qualmark 10mV/G accelerometer with BNC connector.

- Accelerometer 300-0224

Auxiliary Thermocouple Channel Kit

Kit consists of a PLC thermocouple module which adds 6 thermocouple channels to the standard 4 included on the system (Total of 10 thermocouple channels). T2.5, T3.0, T4.0, only.

- T2.5 785-3078
- T3.0 785-1452
- T4.0 785-1894
- Type TT Thermocouple 785-1537

Oxygen Sensor

An intrinsically safe 4-20mA oxygen detector. Has a single channel control panel which is an alarm only apparatus providing two independent user configurable alarm relays which can be used to control external visual or audible alarms. The models include an LCD display monitor and multiple relay outputs. It has a 10 year life Zirconium Oxide Sensor.

- Wall-Mount With LCD Display (CE) 300-0171

Status Screen

Installations running multiple chambers will appreciate the LCD Chamber Status Screen option which provides easier monitoring of system status of chamber during operation

Status Screen 956-0218

Redundant Vibration Kit Accelerometer

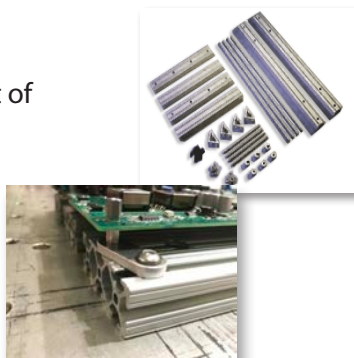
This kit contains an accelerometer and cable to monitor vibration levels. Stud-mount easily attaches to the Qualmark vibration table, providing redundant vibration control. Kit includes; BNC to BNC connection, 10 mV/G Table Control Accelerometer and 20' Accelerometer Cable.

10mV/G KIT 785-1444

Fixturing

HALT Fixture Kit

This kit includes a basic set of fixturing pieces to fixture many products for a HALT. It contains an assortment of aluminum extrusions and fasteners, all thread rods and quick-threading split nuts.



OVTT, T1.5, T2.0

SAE Halt Fixture Kit 750-0169

Metric Halt Fixture Kit 750-0170

SAE PCA Fixture Kit 956-0341

Metric PCA Fixture Kit. 956-0342

T2.5, T3.0, T4.0

SAE Halt Fixture Kit 750-0116

Metric Halt Fixture Kit 750-0163

PCA Fixture Clamps

Quick release clamps with a 6-32 or 2.5mm mounting post, used for fixturing products in the test chambers.



SAE PCA Quick Release Fixture:

With Clamp 785-1162

SAE PCA Quick Release Fixture:

Without Clamp 785-1148

Metric PCA Quick Release Fixture:

With Clamp 785-1688

Metric PCA Quick Release Fixture:

Without Clamp 785-1687

Spares Kit

Spares Kits contain commonly used components such as, fuses, filters, light bulbs, heater coils, cables, contactors, etc. ESPEC offers both Standard A and Deluxe B Kits.

Contact ESPEC to ensure you get the right kit for your application.

Upgrades

Significant enhancements to the original T series Reliability Test Technology have been released including a platform with advanced networking and diagnostic capabilities which delivers more control options, enhanced performance, increased productivity, and improved safety features. Without the proper upgrade, equipment latency looms as a financial threat to product development and production. Sophistication of current Reliability Test Technology may require additional enhancements to older systems. Please discuss your current system configuration with your nearest ESPEC representative for proper system upgrade recommendations.

PLC Upgrade

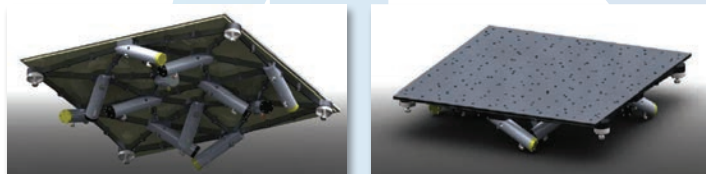
Equipment that operates on earlier platforms risk serious product development delays, production downtime, and replacement expense should the controller system fail. The latest state-of-the-art Qualmark platform is based on the Allen Bradley Compact Logix PLC series which utilizes a 14 bit A/D converter, significantly expanding capability and resulting in more precise control of both temperature and vibration, featuring:

- Programmable logic controller
- Full-support; updates and replacement parts
- Production user interface with 3 levels of password protection.
- Protection of test protocols from unauthorized people
- Allen Bradley industrial control system.
- Includes a new PC with familiar, but upgraded user interface.

Contact Support: support@espec.com

xLF2 Table

The xLF2 table introduces a new concept to the HALT/HASS industry – PSD (Power Spectral Density) management. This new Qualmark table design improves PSD stability – providing superior consistency at higher gRMS – and makes any adjustments for PSD drift easily manageable. Shipping with our top-selling T series, The new Qualmark xLF2 table helps customers achieve consistent and reliable HALT and HASS results. Upgrading to the xLF2 will most likely require an upgrade to the latest controller platform. Contact ESPEC to determine the best configuration for your system.



ESPEC Chamber Care

Rely on ESPEC to maintain your chambers

The ESPEC Chamber Care program is an affordable, comprehensive service subscription aimed at keeping your test chambers in top condition and protect you from unexpected expenses.

We have built a program that encourages chamber maintenance, while keeping costs lower and more predictable. Chamber Care is an extended warranty plan, while also ensuring reliability and uptime by including regular preventative maintenance.

For units recently out of warranty, even other brands, our Chamber Care plan will cover labor repairs if they are needed. Plans are offered in one to two year terms that always include one PM visit.

Chamber Care benefits:

- Extends standard parts and labor warranty on new units ... or covers repair labor for your recent chamber.
- Annual preventative maintenance
- ISO-17025 or NIST calibration
- Operator training
- Priority technician repair scheduling
- Labor discount on additional modification services
- Discount on parts and no minimum
- Free second-day shipping on parts
- Service of Non-ESPEC chambers

Buying a new ESPEC chamber?

Start right by selecting start-up service, then add Chamber Care. You get two years parts and one year labor warranty included in your purchase; a care plan can extend protection on your investment.

Chamber Care for new chambers:

- Extends standard parts (2 yrs) and labor (1 yr) warranty:
 - Plan #1 - 3 years parts, 2 years labor
 - Plan #2 - 4 years parts, 3 years labor
- Annual PM visit at the end of the first year
 - Technician completes preventative maintenance
 - Calibration of controllers and recorders
 - Controller software/firmware updates, if applicable
 - Installation of most purchased add-ons
 - Basic operator training
- On-site warranty service
 - Priority repair service
 - 10% labor discount on additional services

Want to protect your existing chamber?

Chamber Care for your existing chambers INCLUDES any repair services for the year, after our technician initially evaluates it for proper operation and



Our technicians receive continuous factory training on system features, components and construction, as well as, troubleshooting, maintenance and calibration procedures.

maintenance.

Chamber Care for Existing Chambers:

- Annual PM visit at start of plan
 - Chamber evaluation, after which ESPEC will cover labor for any needed repairs during the covered term.
 - Technician completes preventative maintenance
 - Calibration of controllers and recorders
 - Installation of Web Controller at no charge (for applicable models)
 - Installation of most purchased add-ons
 - Basic operator training
- On-site service
 - Priority repair service including time and travel
 - 10% labor discount on additional services
- Parts orders
 - 10% discount on parts and no minimum order
 - Free second-day shipping on in-stock parts (under 100 lbs.)

Care plans possible for Non-ESPEC chambers with some limitations.

Chamber Care is renewable and available only for the continental United States. Monthly payment arrangements available upon request with credit approval. Service performed by an ESPEC factory trained technician (excluding weekends and holidays).

Calibration is for one controller and one recorder per chamber, done to 17025 standard if the technician is qualified, otherwise to NIST. Please request training or other added services when scheduling PM. For existing chambers, the labor repair coverage will begin after evaluation during PM visit. If chamber does not meet our standards at the evaluation, additional charges for repairs will be required, or the plan can be canceled at 50% credit.

Tech Enhancement and Maintenance Program

This program has been developed specifically to provide customers the ability to upgrade their systems to the latest technology, but do so within a maintenance program and avoid the need to submit a new budget line item for the upgrades. As the Qualmark HALT/HASS Reliability Test Technology continues to evolve and as components change to meet the latest standards, it is imperative that programs have the ability keep pace with new design and manufacturing platforms. This comprehensive program includes all aspects of the Chamber Care Program plus:

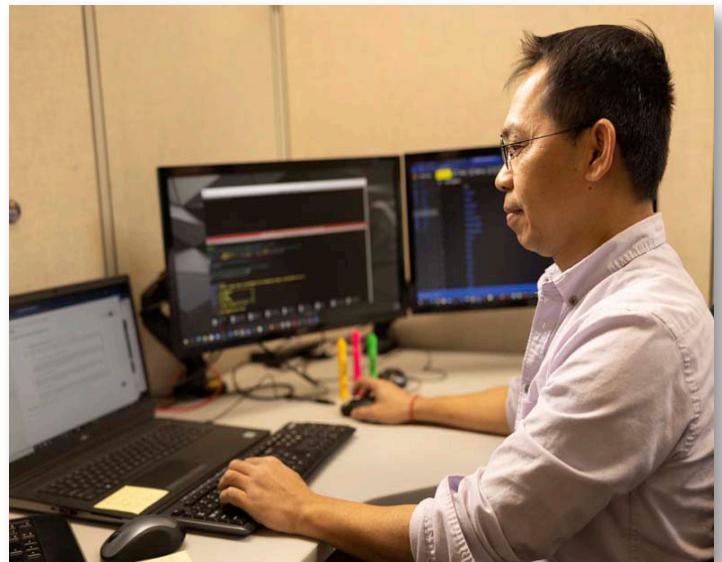
xLF2 Table Upgrade - The Qualmark table design improves PSD stability - providing superior consistency at higher gRMS - and makes any adjustments for PSD drift easily manageable.

PLC Upgrade - multi-level security is enabled with the 14-bit controller platform including: User level (HASS Screen) - limited to running and data logging profiles; Technician level - access to HASS Screen, Test Execution screen, PID's and program definition; and Administrator - access to all functions including calibration values and user manager.

Latest Revision Software - Takes advantage of xLF2 responsiveness to the PLC advanced control system

- improving granular control fivefold. Precise control enables the xLF2 to deliver execution of inputs for correct excitation and thermal stress placement on the device under test while virtually eliminating overshoots. The vibration output boost setting commands immediate response from actuators, while the throttle limit setting keeps vibration from exceeding the setting. Automated maintenance prompts with time meters keep track of the system's use.*

Tech Enhancement and Maintenance Program pricing is based on current system condition and configuration. Contact ESPEC.



* Application training, software upgrades, and all table upgrades are available to customers at a 10% discount if under an ESPEC Chamber Care contract.

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- Walk Ins
- Specialty Chambers
- Industrial Ovens

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DANGER

Not for use with specimens which are explosive or flammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or an explosion.