

**World's Largest HALT/HASS Provider
Innovative System Technology
Accelerated Testing Knowledge Leader**



**Advanced Accelerated Testing Solutions to Help the World
Make Better Products**

www.qualmark.com



*Smarter Solutions.
Proven Results.*

www.W5engineering.com

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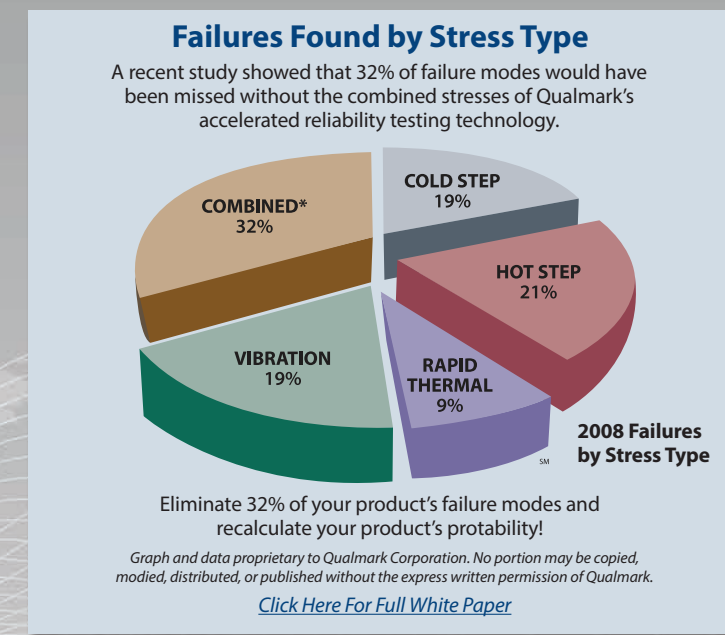
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Advanced Technology . . . Faster Testing

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.



Qualmark Technology – An Advanced System For Accelerated Testing
 Qualmark 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 delivering accelerated stress test technology for performing HALT (Highly Accelerated Life Tests) and HASS (Highly Accelerated Stress Screens) that will:

- Shorten design verification time and expense
- Remove costly manufacturing defects
- Boost product reliability
- Reduce warranty costs
- Increase brand quality recognition

Qualmark 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's 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 patented 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 Qualmark's Typhoon series leads the industry in fulfilling the complex task of providing effective excitation of high and low frequency modes while simultaneously delivering rotation (roll, pitch and yaw) around three axes (X, Y and Z) vibration. 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.

World's Largest HALT/HASS Provider
 Qualmark is the largest manufacturer of AST equipment worldwide. Qualmark's patented HALT (Highly Accelerated Life Test) and HASS (Highly Accelerated Stress Screen) 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.

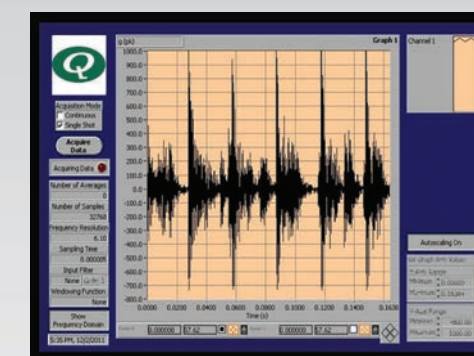
Innovative System Technology
 Qualmark pioneered accelerated stress test technology in the early 1990s and has since consistently led the market in technology innovation. In 2009 Qualmark introduced the next generation table – the xLF2™. The xLF2 provides the first and only "field maintainable" PSD table, allowing for simple maintenance procedure to restore the table to Factory PSD.

Accelerated Testing Knowledge Leader
 Qualmark offers a wide range of professional services and training specifically designed so that best practices are applied to HALT/ HASS system use for maximum returns. Qualmark Professional Services adds to the value derived from accelerated testing by customizing services to target customer specific program optimization. The educational value of Qualmark's Professional Services can dramatically improve reliability program outcomes and deliver faster product profitability.



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. Result? A more mature product can be introduced much more quickly with a higher degree of reliability.

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



High acceleration real time peaks typical of Qualmark's Repetitive Shock system.

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

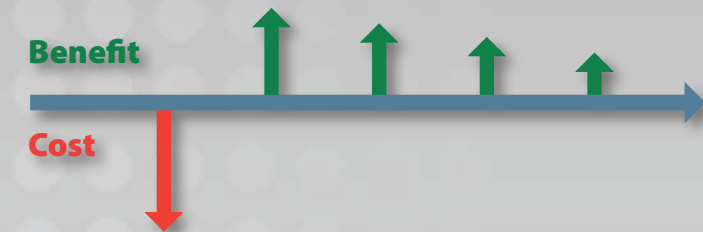
Successful implementation of an Accelerated Stress Testing (AST) system will yield a significant and continued Return on Investment (ROI) from HALT/HASS equipment and services. Goals, budgets, and ROI of the program can be realized with the right equipment, training, and support. Only Qualmark has developed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

New Analysis Techniques for Repetitive Shock Vibration

<https://youtu.be/14Jcf3YbaoA>

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 Return on Investment and Total Cost of Ownership (TCO) of the program. Qualmark works closely with your cross functional teams to align program outcomes with business goals – beginning with our proprietary ROI calculator which helps to guide the budget allocation and justification phase of the initiative.



$$ROI = (\sum PV(\text{Benefits}) - \sum PV(\text{Costs})) / \sum PV(\text{Costs})$$

Equipment, Technology, and TCO

Qualmark technology is designed with the purpose of increasing the effectiveness of HALT and HASS and reducing the Total Cost of Ownership to deliver rapid ROI. The Institute for Supply Management recommends a TCO

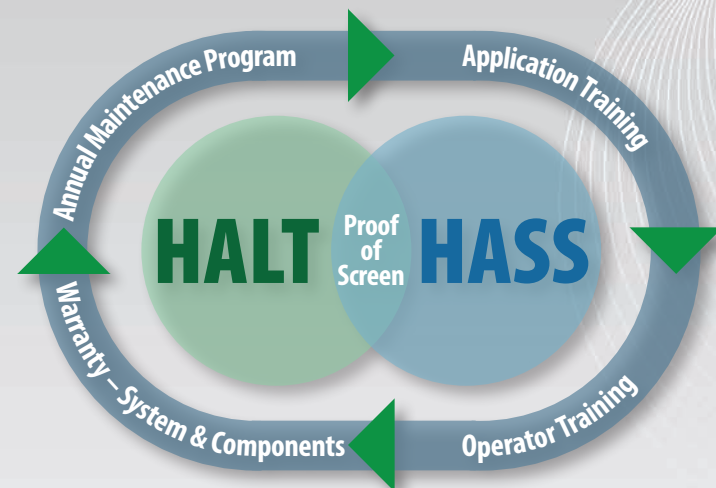
Qualmark provides the essential HALT/HASS education, training, support, and services necessary for successful accelerated stress testing programs. Over 19 years in business, 5,000 HALT/HASS tests completed. 1,000 systems manufactured & serviced.

evaluation be applied to capital equipment purchases as the ongoing cost of utilities, infrastructure, and user training can exceed the initial purchase price in two years. Qualmark's Typhoon series has the overall lowest Total Cost of Ownership available in the AST industry. With its patented Typhoon airflow technology, Qualmark introduced turbulent air flow to extract the greatest BTU change rate on a product utilizing the least LN2 and electricity. The result? A 20-40% utility cost savings compared to previous generation and competing systems that will deliver years of ongoing savings. (LN2 consumption data and evaluation methodology available from Qualmark). Qualmark's release of the xLF2 in 2009 provided another breakthrough in technology which further reduced TCO with the introduction of Power Spectral Density (PSD) management – key to providing AST program consistency.

Knowledge Support for AST Program Success

With more than 1,000 systems deployed and over 5,000 HALT and HASS performed by Qualmark 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, Qualmark's Professional Services are designed to impart the knowledge necessary for customers to quickly gain a thorough understanding of HALT and HASS best practices to maximize ROI and minimize TCO.

A HALT/HASS implementation is a success when the customer achieves a significant quality/reliability improvement and the maximum Return on Investment is realized by utilizing the lowest Total Cost of Ownership system. Contact Qualmark to start your successful Accelerated Stress Testing program implementation to improve product reliability.



Professional Services

Qualmark offers a wide range of services, from Web Based Education (WBE) to customized on site consulting and training, to maximize your return on investment. Because AST (Accelerated Stress Test) technology is unlike customary burn-in testing, the approach is unique to test engineers trained in traditional methods. Like any new technology, acceptance often entails training and full understanding of AST goals to derive full benefit. The aim of Qualmark Professional Services is to add to the value derived from accelerated testing by customizing services to target customer specific program optimization. The educational value of Qualmark's Professional Services can dramatically improve reliability program outcomes and deliver faster product profitability.

Educational Services

Qualmark's Professional Services offers general education for those considering adding HALT, HASS, and/or HASA to a reliability program. Customer-specific education on correct implementation and best practices are tailored to meet customer and product needs and will facilitate program success. Educational services range from a portion of a day to several days of in-depth practical training. We encourage all new customers to also consider registering for our convenient online courses at www.QualmarkTraining.com. These WBE (Web Based Education) courses are an excellent way to prepare reliability teams for chamber commissioning. See page 17 for more information on Qualmark's WBE curriculum.

Application Training

Application training is particularly valuable with a recently implemented HALT system and for training new personnel in proper system operation and HALT practices. Qualmark's Professional Services team helps prepare engineers and technicians for a first HALT test on a customer prototype, provides recommendations for fixturing and monitoring, and provides a deeper understanding of system controls.

Popular Education And Training Programs

Qualmark offers a wide variety of standard and customized training curriculum's. Please contact Qualmark to tailor a training program for your needs. A few of the more popular training programs include:

HALT Boot Camp

This training is a must have for all new HALT/HASS system owners. Held on site at the time of chamber commissioning, this training takes practitioners beyond textbook theory to provide a practical understanding of product-specific approaches to fixturing and testing. Instruction includes placing product in the chamber, how placement and fixturing can affect results, and the importance of monitoring for failure detection. An overview of recommended lab equipment is discussed along with other highly practical aspects of running a successful HALT.

HALT Training

This 3 – 5 day training is particularly useful with a recently purchased HALT system so that personnel are fully trained in proper system operation and HALT practices and how to apply HALT best practices to customer products for optimum outcomes. Qualmark's Professional Services team will help execute the first prototype test based on product-specific characteristics so that all aspects of the testing are properly performed.

HALT Documentation Support

As a part of any HALT or HASS implementation, it is typically necessary to create controlled documentation; HALT process description, HALT report template, failure tracking process, and other related procedures. Qualmark Professional Services can provide guidance, templates and examples that assist in the creation of these documents, or provide a solution customized for customer applications.

HASS Development

The process of developing and implementing HASS in a production environment can be complex, especially during initial implementation. Qualmark's Professional Services team can perform all or portions of the HASS process instructing your employees in best practices along the way. Critical training for creating an effective screen is provided to keep processes running smoothly. Key components of the HASS screen implementation include fixture design and qualification, on site HASS installation qualification, screen development and proof of screen.

HALT/HASS/HASA Auditing Services

Utilize Qualmark experts to provide independent audits of any accelerated stress test program. The audit provides the confirmation needed by some customers to validate the correct implementation of a HALT/HASS/HASA program. Qualmark auditing services also provide a very effective way to keep programs running seamlessly following personnel or product changes. During the audit, Qualmark's Professional Services team will examine every aspect of an accelerated testing program, comparing procedures against Qualmark's recommended practices. A full audit report is provided, detailing any recommended changes.

Professional Consulting	980-0161
Educational Services	980-0155
Application Training	980-0036
Support Boot Camp	980-0166
HALT Training	980-0156
HALT Documentation Support	980-0165
HASS Development	980-0140
HALT/HASS/HASA Auditing	980-0031

For online HALT/HASS educational opportunities please see page 25

Industries

Qualmark's customers are some of the biggest manufactures of consumer products, encompassing the majority of the Fortune 500. Companies such as Ericsson, Hewlett Packard, Honeywell, IBM, Samsung, Sony and others have partnered with Qualmark to implement and manage corporate-wide testing programs in order to meet market demand to provide reliable products whose timely releases keep pace with technology advancements.



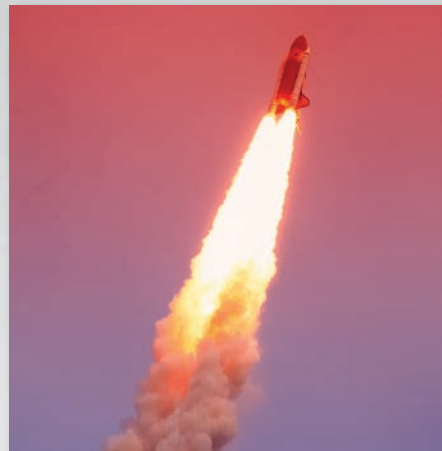
Automotive

Business mandates, governmental regulation and consumer demand for safety, performance, fuel efficiency, and reliability has driven rapid introduction of new, densely packaged, inter operable multi-purpose systems in the automotive industry. Automotive design now incorporates some 70 to 100 networked microprocessor-based electronic control units (ECUs) per vehicle and some predict that by 2015 electronics will account for as much as 40% of production costs.



Avionics

Commercial and Defense Avionics are some of the earliest adaptors and innovators of Accelerated Stress Testing. Product flaws and poor reliability can result in fatal and catastrophic and mission altering consequences as well as financial penalties for contractual violations. To have greater insurance against disaster from product flaws, the Commercial Aircraft Manufacturers and the World's defense agencies have come to rely on HALT and HASS to the point of requiring these accelerated reliability tests from Avionics Original Equipment Manufacturers.



Defense

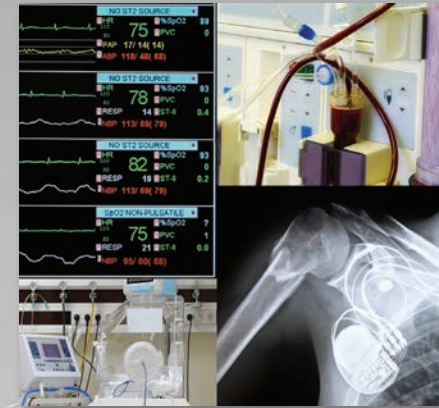
Defense contractors like Raytheon, Lockheed Martin, BAE Systems, Honeywell, and L3, and their suppliers have found Qualmark's technology to be an essential and cost-effective addition to their reliability programs.

Product reliability engineering is rapidly evolving, superseding military standards, handbooks, and references established decades ago and the military now seeks more modern, even commercially available solutions. Key Congressional Defense Committees and the Missile Defense Agency (MDA) have focused greater attention on Highly Accelerated Life Testing and Highly Accelerated Stress Screening (HALT/HASS) methodologies and processes to improve the reliability of critical U.S. missile defense programs.



Electronics

The effects of the exponential advances in electronics capabilities are perhaps most clearly seen in Consumer Electronics. Consumers routinely enjoy entertainment, communications and computing devices that were only dreamed of a few years ago, and they have developed an insatiable appetite for more. Competitive forces drive consumer electronics companies to bring the latest and greatest technologies into the hands, kitchens, living rooms and laundry rooms of people around the world in record time. They are continuously incorporating immature, cutting edge technologies into new products that are being pushed into mass production faster and faster.



Medical

Device robustness, reliability and safety over the life of medical products are key concerns for the medical industry, particularly when it comes to active implantable medical devices, devices that administer drugs, or provide life support functions. The business needs to reduce time to market and stay ahead of the competition creates pressures to shorten design cycles while still complying with diverse safety and regulatory directives. Costly product recalls and liability litigation creates a particularly precarious arena for new product introduction - or even affecting minor design changes to existing products. As medical equipment design innovations become more complex, how can product reliability and ruggedness be assured without becoming cost prohibitive?



Oil & Gas Exploration

Qualmark's accelerated reliability test systems deliver the extreme environmental stresses needed to ruggedize equipment used in oil and gas exploration and downhole instrumentation. Sensitive electronics and sensors must withstand geothermal conditions up to, and sometimes beyond, 200°C and still provide precise geosteering, accurate and dependable well logging, and real time downhole monitoring and valve control. Long life requirements, complex communication between high-performance components and high remediation costs demand Design for Reliability (DFR) approaches that can identify failure modes susceptible to hostile environments before deployment.



Renewable Energy

As engineers, scientists and manufacturers strive to develop new commercial and consumer products to serve the rapidly expanding sustainable energy marketplace, product robustness and reliability should be carefully addressed. Electronic components introduced into alternative energy applications have little or no proven legacy designs showing they can withstand the abusive environments in which they are expected to operate. The industry is still considered to be in its infancy and suppliers whose product falls short in operational reliability face long term consequences in costs of failure, both in repair expense and reputation.

Overview

Qualmark HALT testing (Highly Accelerated Life Test) and HASS testing (Highly Accelerated Stress Screen) chamber systems are designed and manufactured by Qualmark specifically to provide the industry with accelerated reliability testing capability. The technology has matured from a thermal chamber with a vibration table and independent controls to an integrated HALT/HASS system. Qualmark's Typhoon series is the most energy efficient on the market. Now in its 18th year of production, the technology has matured to provide the extreme stresses necessary to rapidly find design flaws missed by traditional methods. The Typhoon's Omni-Axial™ six degree of freedom, random, broadband excitation (10 Hz to above 5,000Hz) delivers a consistent power spectral density profile that eliminates picket fencing. 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. The Typhoon comes equipped with Qualmark's powerful custom control system designed for both lab and production environments.

Qualmark has consistently been the market leader since introducing our copyrighted HALT/HASS technology in the early 1990s. Today, Qualmark 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.

The QFusion System

Qualmark's 2011 introduction of QFusion® 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. Qfusion'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.

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

The Typhoon Series

Qualmark Typhoon™ systems are dual-purpose designed for performing HALT or HASS with energy efficiencies that expedite return on investment. The Typhoon's Omni-Axial™ six degree of freedom, random, broadband excitation (10 Hz to above 5,000Hz) delivers a consistent power spectral density profile that eliminates picket fencing. 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. The Typhoon comes equipped with Qualmark's powerful custom control system designed for both lab and production environments.

The Inferno System

Qualmark's Inferno™ amplifies the Typhoon platform with extended capabilities specifically designed for testing the durability of instrumentation, tools and electronics that will face harsh environments. With it's vibration system capable of delivering in excess of 60 gRMS and extended thermal range of +250°C to -100°C, the Inferno provides the extreme stimulation necessary analyze design weaknesses and extend operational margins for devices destined for use in hostile conditions.

HawQ (Patent Pending)

Thousands of companies embrace Highly Accelerated Life Testing (HALT) to rapidly improve the reliability of their electronic product designs. Conducting HALTs early in the product development process are most beneficial, as reliability can most easily be improved early in the development process. Qualmark's new Portable HALT System is a cost effective, portable solution that is available for purchase or lease to utilize in, or near, product development groups. Qualmark's Portable HALT System provides an easy to use solution with Ethernet/WiFi options to allow for remote monitoring by development teams. This entry-level HALT System features a quiet, vibration-isolated, and easy to use system for virtually all development teams, University, R&D, and Reliability Labs

Watch the 3 minute HawQ video by [Clicking Here NOW!!](#)

The OVTT Series

Qualmark's compact OVTT™ (Omni Axial Vibration Table Top) 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.



QFusion™ 300

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

Qualmark's patented QFusion* 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. QFusion 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. QFusion's combined environment (thermal and random shock vibration) and 6 table configuration accelerates process verification and for less cost than with traditional equipment.

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

Part Number: 971-7000

Standard Features

- High Rate, High Flow Thermal System
- Six Quake™ Vibration Tables
- Vacuum Jacketed Manifold
- PLC Control
- Desktop PC with Flat Panel Monitor
- QF Manager Software

Patent Numbers: 5493944 and 6105433

See Configuration Options on page 22 and Accessories on page 26

Work Space	6 tables; Work space per table 27" w x 19.2" d x 11.3" h (686 x 486 x 286mm)
Outer Dimensions	81.0" w x 38.4" d x 102.0" h (2056 x 976 x 2591mm)
Table Size (Quantity 6)	23.6" x 15.7" / table (600 x 400mm)
Actuators	12 Actuators; 2/table Lubricant-free
Table Capacity	6 tables; 100 lbs (45 kg)/table
Acceleration	5 - 40gRMS typical
Temp Range	+120°C to -60°C
Thermal Ramp Rate	60°C/min average
Power Requirements	380V, 400V, 480V 3Φ 50/60Hz 100A (Service Rating)



Typhoon 8.0

The Typhoon 8.0 offers a 100' x 48" table, the largest vibration table available in a HALT/HASS chamber. The Typhoon 8.0 doubles the table size of our popular Typhoon 4.0 chamber. The thermal system in the Typhoon series has been carefully engineered to provide 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.

Part Number: 971-4008

Standard Features

High Rate, High Flow
Typhoon Thermal System
xLF2 Vibration Table with
PSD Management
(2x) Vacuum Jacketed Manifold
Allen-Bradley PLC Control
Desktop PC with a 17" Monitor
Typhoon Manager Software

See Configuration Options on page 22 and
Accessories on page 26

Work Space	Lower Table Position 108.7" w x 54" d x 53.6" h (2761 x 1372 x 1362mm) Upper Table Position 108.7" w x 53.8" d x 34.6" h (2761 x 1366 x 879mm)
Outer Dimensions	79.1" w x 123.7" d x 108.4" h (2093 x 3142 x 2618mm)
Table Size	100" x 48" (2540 x 1220mm)
Actuators	24 Actuators Lubricant-free
Table Capacity¹	1200 lbs (544 kg)
Acceleration²	5- 75 gRMS typical >100 gRMS special order
Temp Range	+200°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	380V, 400V, 440V, 480V 3Φ 50/60Hz 200A (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 Qualmark.



Typhoon 4.0

This system is designed specifically for the task of performing Highly Accelerated Stress Screening (HASS) and HALT on large products. Its 48" x 48" vibration table is capable of supporting hundreds of pounds of products, fixturing and mounts at two different heights. The Typhoon 4.0 provides optimal thermal and vibration performance to drive out failures fast, yet is amazingly quiet. For truly intense product end-use operating environments, this system is available with the Inferno™ that can deliver temperatures up to 250°C.

Part Number: 971-4006

Standard Features

High Rate, High Flow
Typhoon Thermal System
xLF2 Vibration Table with
PSD Management
Vacuum Jacketed Manifold
Allen-Bradley PLC Control
Desktop PC with a 17" Monitor
Typhoon Manager Software

Inferno™ (250°C)

Where harsh operating environments will present the ultimate challenge for sophisticated equipment, turn your Typhoon 4.0 into an Inferno by adding the 250°C option to your order.

Part Number: 971-4250

See Configuration Options on page 22 and
Accessories on page 26

Work Space	Lower Table Position 53.8" w x 54" d x 53.6" h (1366 x 1372 x 1362mm) Upper Table Position 53.8" w x 54" d x 34.6" h (1366 x 1372 x 879mm)
Outer Dimensions	69.2" w x 78.8" d x 108.4" h (1759 x 2003 x 2753mm)
Table Size	48" x 48" (1220 x 1220mm)
Actuators	12 Actuators Lubricant-free
Table Capacity¹	600 lbs (272 kg)
Acceleration²	5 – 75 gRMS typical >100 gRMS special order
Temp Range³	+200°C to -100°C +250°C to -100°C (Inferno™ Option)
Thermal Ramp Rate⁴	70°C – 100°C/min average
Power Requirements	380V, 400V, 440V, 480V 3Φ 50/60Hz, 100A (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 Qualmark.



Typhoon 3.0

The Typhoon 3.0 is specifically designed to help the customer who is performing low volume HASS and needs a chamber with a 36" x 36" vibration table. It is also ideal for performing HALT on mid-sized and larger products. Like our Typhoon 4.0, the Typhoon 3.0 vibration table mounts at two different heights, so the interior chamber volume can be adjusted for the needs of the product.

Work Space	Lower Table Position 44" w x 45" d x 35" h (1118 x 1143 x 889mm) Upper Table Position 44" w x 45" d x 25" h (1118 x 1143 x 635mm)
Outer Dimensions	56.1" w x 68.8" d x 88.1" h (1425 x 1748 x 2237mm)
Table Size	36" x 36" (914 x 914mm)
Actuators	10 Actuators Lubricant-free
Table Capacity¹	450lbs (204 kg)
Acceleration²	5 – 70 gRMS typical >100 gRMS special order
Temp Range	+200°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	380V, 400V, 440V, 480V 3Φ 50/60Hz, 80A (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 Qualmark.



Typhoon 2.5

The Typhoon 2.5 is a popular chamber with a 30" x 30" 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.

Work Space	Lower Table Position 44" w x 45" d x 35" h (1118 x 1143 x 889mm) Upper Table Position 44" w x 45" d x 25" h (1118 x 1143 x 635mm)
Outer Dimensions	56.1" w x 68.8" d x 88.1" h (1425 x 1748 x 2237mm)
Table Size	30" x 30" (762 x 762mm)
Actuators	8 Actuators Lubricant-free
Table Capacity¹	320lbs (145kg)
Acceleration²	5 – 75 gRMS typical >100 gRMS special order
Temp Range	+200°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	380V, 400V, 440V, 480V 3Φ 50/60Hz, 80A (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 Qualmark.

Part Number: 971-4030

Standard Features

High Rate, High Flow
Typhoon Thermal System
xLF2 Vibration Table with
PSD Management
Vacuum Jacketed Manifold
Allen-Bradley PLC Control
Desktop PC with a 17" Monitor
Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 26. The optional Elevation Stand is highly recommended for this system.

Part Number: 971-4026

Standard Features

High Rate, High Flow
Typhoon Thermal System
xLF2 Vibration Table with
PSD Management
Vacuum Jacketed Manifold
Allen-Bradley PLC Control
Desktop PC with a 17" Monitor
Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 26. The optional Elevation Stand is highly recommended for this system.



Typhoon 2.0

The Typhoon 2.0, with its 24" x 24" 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's Typhoon system technology which delivers impressive thermal performance and six-degree-of-freedom repetitive-shock vibration. The Typhoon 2.0 is a practical addition to any company's product reliability program.

Work Space	27" w x 27" d x 19.5" h (686 x 686 x 496mm)
Outer Dimensions	38.8" w x 46.1" d x 79.9" h (985.2 x 1171.3 x 2030mm)
Table Size	24" x 24" (610 x 610mm)
Actuators	5 Actuators Lubricant-free
Table Capacity¹	100lbs (45kg)
Acceleration²	5 – 75 gRMS typical >100 gRMS special order
Temp Range	+200°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	208V, 230V (1Φ), 380V, 400V, 440V, 480V (3Φ) 50/60Hz, 70A (1Φ), 25A (3Φ) (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 Qualmark.

Part Number: 971-4020
971-4022 (3 Phase)

Standard Features

- High Rate, High Flow
- Typhoon Thermal System
- xLF2 Vibration Table with PSD Management
- Allen-Bradley PLC Control
- Desktop PC with a 17" Monitor
- Typhoon Manager Software

See Configuration Options on page 22 and Accessories on page 26



Typhoon 1.5

The Typhoon 1.5, with its 18" x 18" 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's Typhoon system technology which delivers impressive thermal performance and six-degree-of-freedom repetitive-shock vibration. The Typhoon 1.5 is a practical addition to any company's product reliability program.

Work Space	27" w x 27" d x 19.5" h (686 x 686 x 496mm)
Outer Dimensions	38.8" w x 46.1" d x 79.9" h (985.2 x 1171.3 x 2030mm)
Table Size	18" x 18" (457 x 457mm)
Actuators	4 Actuators Lubricant-free
Table Capacity¹	80lbs (45kg)
Acceleration²	5 – 70 gRMS typical >100 gRMS special order
Temp Range	+200°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	208V, 230V (1Φ), 380V, 400V, 440V, 480V (3Φ) 50/60Hz, 70A (1Φ), 25A (3Φ) (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 Qualmark.

Part Number: 971-4019
971-4021 (3 Phase)

Standard Features

- High Rate, High Flow
- Typhoon Thermal System
- xLF2 Vibration Table with PSD Management
- Allen-Bradley PLC Control
- Desktop PC with a 17" Monitor
- Typhoon Manager Software

Review Configuration Options and available Accessories with your Qualmark representative



Typhoon 4.0 Inferno®

Qualmark's Inferno® series has been specifically designed for accelerated testing of sophisticated devices that are destined for harsh operating environments. Our Infernos combine extreme thermal capability (+250°C to -100°C) with 6 degree of freedom random vibration to provide the stimulation necessary to analyze design weaknesses and extend operational margins for mechanisms expected to withstand severe physical hardships.

Work Space	Lower Table Position 53.8" w x 54" d x 53.6" h (1366 x 1372 x 1362mm) Upper Table Position 53.8" w x 54" d x 34.6" h (1366 x 1372 x 879mm)
Outer Dimensions	69.2" w x 78.8" d x 108.4" h (1759 x 2003 x 2753mm)
Table Size	48" x 48" (1220 x 1220mm)
Actuators	12 Actuators Lubricant-free
Table Capacity¹	600 lbs (272 kg)
Acceleration²	5 – 75 gRMS typical >100 gRMS special order
Temp Range	+250°C to -100°C
Thermal Ramp Rate³	70°C – 100°C/min average
Power Requirements	380V, 400V, 440V 3Φ 50/60Hz, 150A (Service Rating) 480V 3Φ 50/60Hz 125A (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 Qualmark.



OVTT 24

The OVTT™, OmniAxial™ Vibration Table Top, series introduced the first stand-alone, compact, repetitive-shock vibration system on the market and features Qualmark's patented six-degree-of-freedom vibration technology. The OVTT 24 system provides 77% more table surface area than the OVTT 18 which makes it an ideal tool for in-production-line, broadband spectrum vibration testing of product. It is also 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.

Part Number: 971-5200

Standard Features

OVTT 24 Base with Removable Lid and Controller

PLC Electronic Console with Touch Control Display

xLF2 Vibration Table with PSD Management

Review Configuration Options and available Accessories with your Qualmark representative

Work Space	24" w x 24" d x 9.5" h (610 x 610 x 241mm)
Outer Dimensions	Base 33.7" w x 33.7" d x 24.56" h (856 x 856 x 622mm) Console 28" w x 8.75" d x 8.3" h (711 x 222mm x 211mm)
Table Size	24" x 24" (610 x 610mm)
Table Capacity²	100 lbs. (45 kg) 200 lbs. (91 kg) Optional
Actuators	5 Actuators Lubricant-free
Acceleration	5 – 60 gRMS typical
Power Requirements	115VAC/230VAC 3A 50/60Hz
Air Requirements	40 SCFM @ 80 PSI

1. With cover and console removed. Controller and cover are not intended for inside a thermal chamber.
2. Greater load capacities can be designed, contact Qualmark for custom options.

See Qualmark product catalog for configuration options, accessories, and post warranty service and maintenance plans. All specifications are subject to change without notice.

Request the latest system specifications from Qualmark.



OVTT 18

The OVTT™, Omni-Axial Vibration Table Top System, is the first stand-alone, compact, repetitive-shock vibration system on the market. The OVTT 18 system is ideal for quick evaluation of field returns, repair verification and random vibration test of small products. The OVTT 18 utilizes Qualmark's patented six-degree-of-freedom vibration technology and is designed with reduced air requirements and low noise levels. The OVTT 18 system can be easily configured for placement inside a thermal chamber for combined stress tests.

Part Number: 971-5001

Standard Features

OVTT Base Assembly
 PLC Electronic Console with Panel View Controller
 xLF2 Vibration Table with PSD Management

Review Configuration Options and available Accessories with your Qualmark representative

Work Space	20" w x 20" d x 9.5" h (508 x 508 x 242mm)
Outer Dimensions	27" w x 34.76" d x 21.91" h (686 x 883 x 557mm)
Table Size	18" x 18" (457 x 457mm)
Table Capacity¹	50lbs (23kg)
Actuators	4 Actuators Lubricant-free
Acceleration²	5 – 40 gRMS typical
Power Requirements	120VAC/220-240 3A 50/60Hz
Air Requirements	30 scfm at 90 psi

1. Greater load capacities can be designed; contact Qualmark for custom options.
 2. Recommended; measured on bare table. 3 With cover and console removed.

Request the latest system specifications from Qualmark.



HawQ (Patent Pending)

Thousands of companies embrace Highly Accelerated Life Testing (HALT) to rapidly improve the reliability of their electronic product designs. Conducting HALTs early in the product development process are most beneficial, as reliability can most easily be improved early in the development process. Qualmark's new Portable HALT System is a cost effective, portable solution that is available for purchase or lease to utilize in, or near, product development groups. Qualmark's Portable HALT System provides an easy to use solution with Ethernet/WiFi options to allow for remote monitoring by development teams. This entry-level HALT System features a quiet, vibration-isolated, and easy to use system for virtually all development teams, University, R&D, and Reliability Labs

Watch the 3 minute HawQ video by [Clicking Here NOW!!](#)

Part Number: 1Φ System 971-7500

Part Number: 3Φ System 971-8000

Standard Features

Entry Level HALT System provides combine Environment Accelerated Testing:
 – Rapid Thermal changes from +200° C to -100° C
 – Six Degree of Freedom Repetitive Shock Vibration
 Portable for easy movement between departments
 Easy to use with preset programs & remote monitoring
 xLF2 Vibration Table with PSD Management

Review Configuration Options and available Accessories with your Qualmark representative

Work Space	19.0" w x 16.0" d x 10.5" h (483 x 406 x 267mm)
Outer Dimensions	32.8" w x 44.8" d x 56.1" h (833 x 1138 x 1425mm)
Temperature Range	+200°C to -100°C
Table Size	16.0" w x 12.0" d (406 x 304mm)
Table Capacity	50 lbs (23 kg)
Actuators	2 Lubricant-free Actuators
Acceleration	4 – 40 gRMS typical
Power Requirements	208VAC / 40A / 1Φ 50/60Hz 208VAC / 25A / 3Φ 50/60Hz
Air Requirements	20 scfm at 80 psi
Thermal Ramp Rate	Up to 40°C / min

Request the latest system specifications from Qualmark.

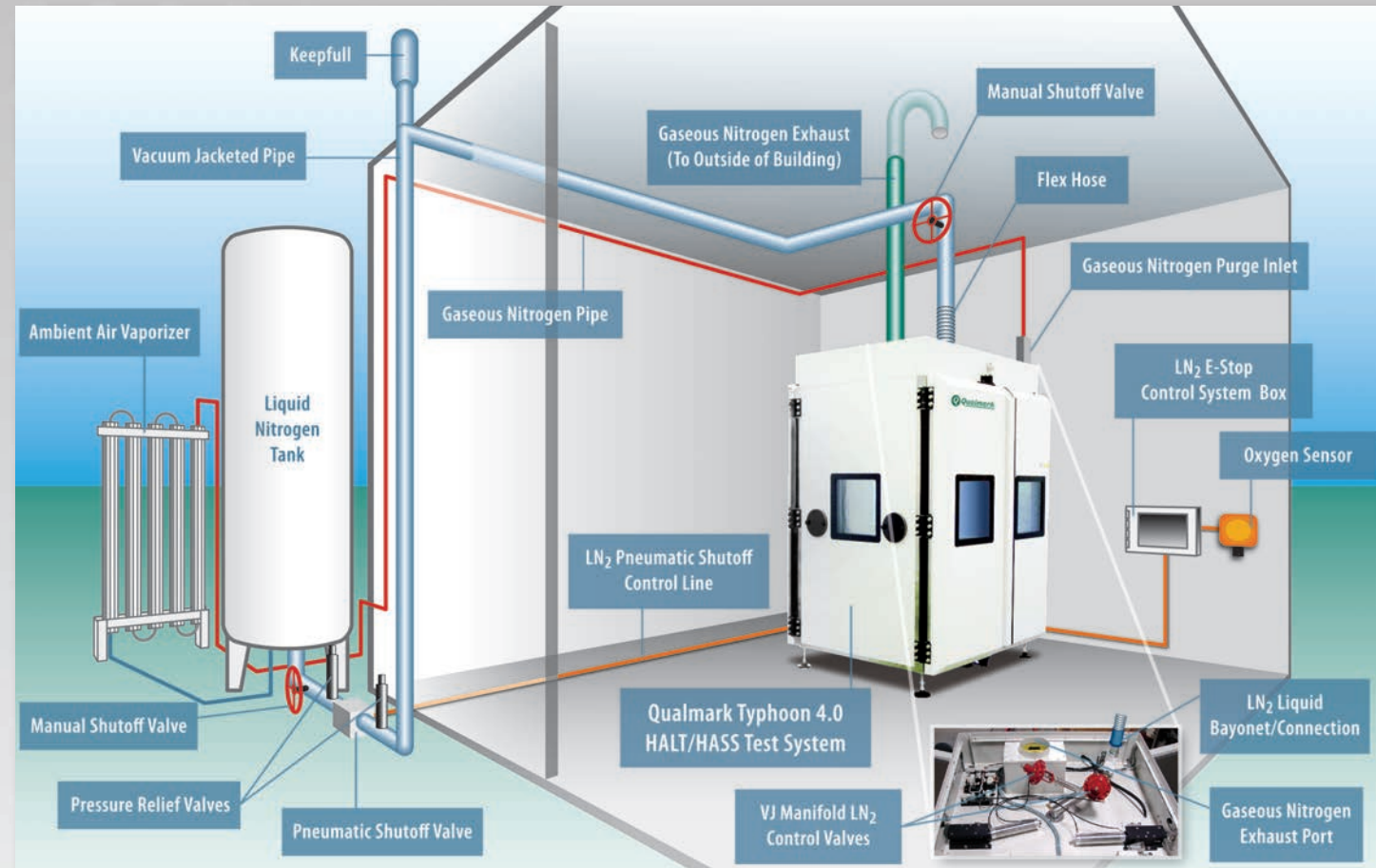
LN₂ Infrastructure

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 Qualmark's Typhoon system. The quality of the liquid nitrogen supply piping for the Qualmark 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 buildup 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.

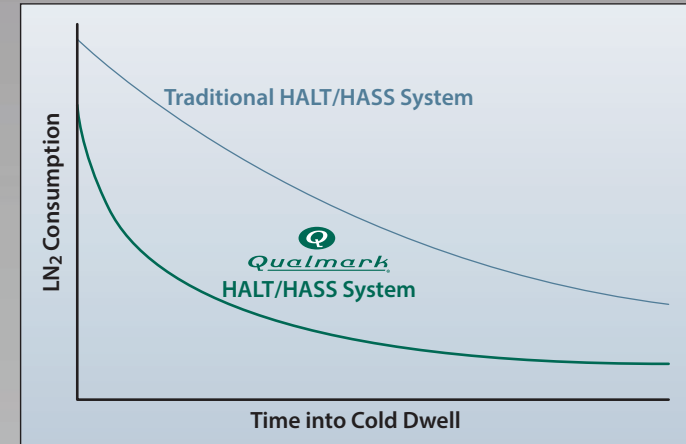
Qualmark's static vacuum-jacketed piping can reduce thermal losses by a factor of 100 over alternative piping, representing a significant savings for our customers. The choice of static versus dynamic vacuum jacket design eliminates an additional element to the coolant supply

that might otherwise need maintenance or repair – another way Qualmark considers customer Total Cost of Ownership (TCO) in its advanced systems design. Qualmark 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 for years. All Vacuum Jacketed pipe sections are designed and built with a factory sealed vacuum and super insulation system.

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

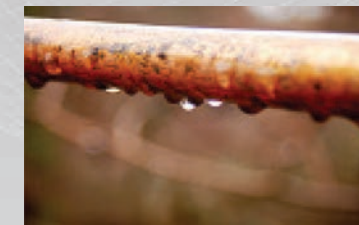


Qualmark LN₂ Efficiency



One of the key fatigue acceleration mechanisms offered by HALT is the ability to deliver extremely rapid thermal change rates. Qualmark's liquid nitrogen (LN₂) based thermal system can achieve air change rates of 90°C to 100°C/min. Airflow rates in our Typhoons 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's Typhoons are engineered for LN₂ use efficiencies which contribute to Qualmark's overall lowest Total Cost of Ownership (TCO). As this chart demonstrates, the thermal airflow technology of the Typhoon 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



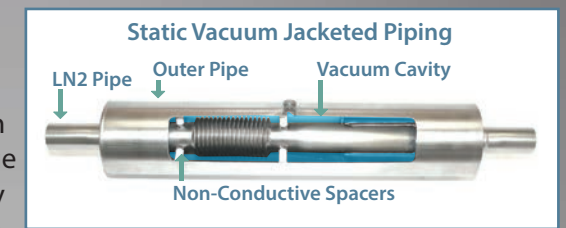
Microbulk Solution – Cost Effective Alternative



- 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

Liquid Nitrogen Infrastructure

Because reliable and efficient liquid nitrogen (LN₂) storage and delivery supports optimum HALT/HASS system performance and test results, Qualmark 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 Qualmark representative:



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 Qualmark

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 as they suffer the most of the 3 choices from gas losses and do not always provide optimum LN₂ delivery for best HALT/HASS results. With Qualmark system requirement of 50psi, careful consideration must be given to the Dewar rating.

- LN₂ Storage Contact Qualmark

Typhoon - 2.5/3.0 3 Position MVIP™ Dewar Kit

- 3 Dewars – Part Number: 956-0271
- 4 Dewars – Part Number: 956-0272
- T-1.5/2.0 (without MVIP Bayonet)
- 2 Dewars – Part Number: 956-0267
- 3 Dewars – Part Number: 956-0268

Multiple Dewar Kit

- Standard for 3 Dewars, Part Number: 956-0271
- Optional for 4 Dewars, Part Number: 956-0272
- Standard with Female Bayonet, optional threaded connection

Typhoon – 1.5/2.0 Dewar Kit (without MVIP Bayonet)

- 2 Dewars, Part Number: 956-0267
- 3 Dewars, Part Number: 956-0268

Hose from Chamber to Dewar Kit/Dewar

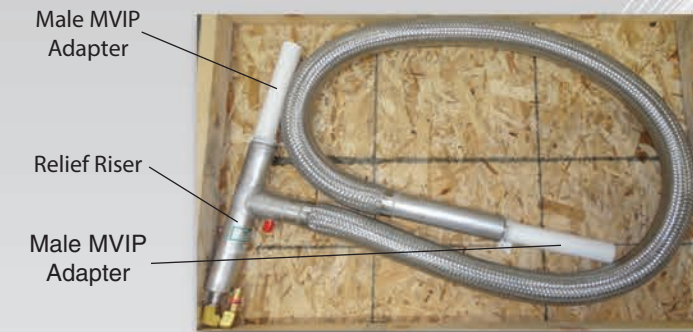
- Standard with MVIP Bayonet for new chamber and MVIP bayonet for Multiple Dewar kit connect. Various Length options. Includes Relief. (dimensions for relief above the multi dewar kit)
- Custom Options.
 - i. Connection to previous Vacuum Insulated Manifolds including CTM and VBS

Hoses from Multi Dewar Kit to Dewars

- Standard (442-0034) 6' VJ Superflex with xyz connectors to Multi Dewar kit and Standard threaded Dewar Connection.
- Additional length options available.

Notes:

1. There are two recommended VJ Flex Hoses for connecting the Dewar Kit to the Chamber. Select the length required.
 - a. 442-0057 HOSE, MVIP VJ, 1/2" x 10', T-2.5/3
 - b. 442-0058 HOSE, MVIP VJ, 1/2" x 15', T-2.5/3
 - i. These VJ Hoses have a 1/2" MVIP male bayonet on each end with on relief riser (See photo). The relief riser end attaches to the female bayonet on the chamber.



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

- a. 750-0303 Clamp, VJ, 1/2", MVIP Bayonet
- b. 760-0273 O-Ring, VJ, 1/2", MVIP Bayonet

Modular Vacuum Insulated Pipe

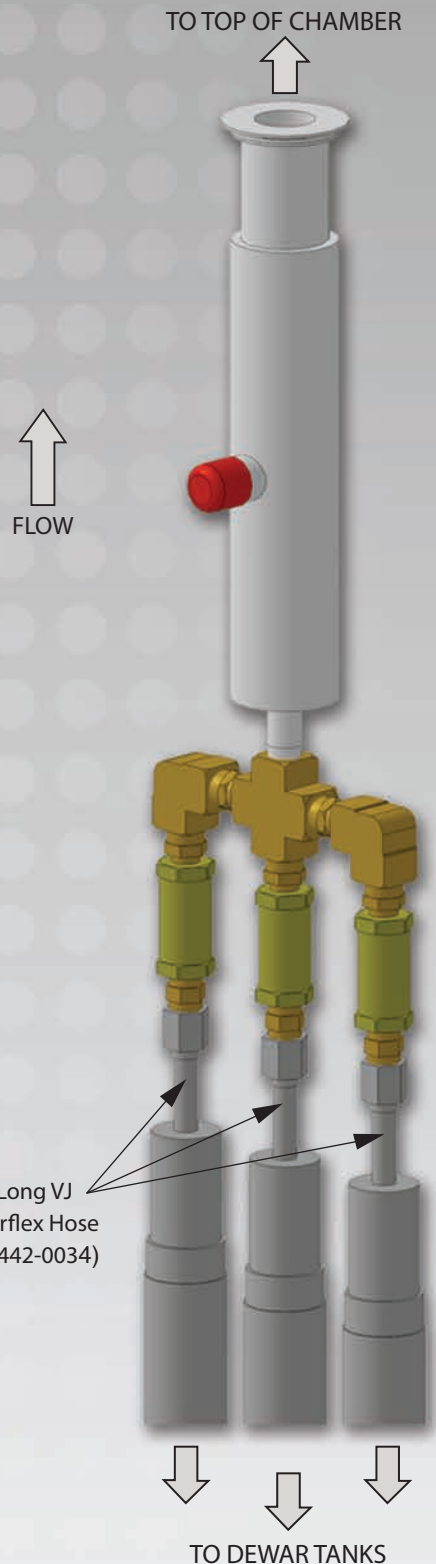
MVIP™ - Superiority Through Experience

Chart is the world's leading designer, manufacturer and installer of standard and custom vacuum insulated pipe (VIP) systems. Qualmark is an Authorized Reseller and Distributor of Chart Products, including MVIP™ and other vacuum jacketed products and services to provide you with a total, state-of-the-art solution.

Categories	Pro
Top Three Benefits	1. Easy – Use the online Modulator to configure, price and deliver your VIP modules and accessories. 2. Reliable – Long-term maintenance-free reliability that will not degrade, drip or leak with time. 3. High Performance – Reduce your LN2 losses by a factor of 10 over foam insulated copper designs.
MAWP*	150 psig
Liquid Service	LN2, LAR
Nominal Inner Diameters	1/2", 1", 1 1/2", 2"
Configuration	Modular. Pre-engineered standard sections for easy construction and flexible arrangement.
Typical Lead Time**	Raw materials and components in stock: 3 to 4 weeks
VIP Price	\$\$
Installation Price	\$
Cool Down Relative Cost	\$
Installation Consideration	No welding or field cutting required. Reconfigurable. Field measurements are not as critical.
Reusability	Yes. No cutting & welding.
Bellows to allow for up to 400°F internal / external differential	Internal for improved protection.
Design Effort	Low
Project Schedule	Reduced project schedule duration
Design Platform	Internal Bellows
Connections	MVE "Shrink Fit" Bayonet
Material	• 304 stainless steel (rigid) • 316L or 321 stainless steel (flex) • Invar Bayonet design
Vacuum gauge and retention test prior to shipment	Yes
Engineering Capability	Design your own system with the online Modulator. Inside Sales is available for consultation.

* MAWP = Maximum Allowable Working Pressure

** Lead times vary depending upon market conditions. Always consult factory for lead time confirmation.



System Configuration Options

Qualmark systems encompass the very latest innovations in HALT/HASS technology based on our 20+ 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

Qualmark's newest 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 Qualmark representative can help you select the correct option for your facility.

Typhoon 8.0, Typhoon 4.0, Typhoon 3.0, Typhoon 2.5

480V, 50/60Hz or 400V, 50/60Hz

Typhoons 2.0, 1.5

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

480V 3 Phase or 400V 3 Phase

Voltage Specify System Requirement

Software

Securely access Qualmark's Typhoon Manager using one of three password protected user levels which provide protection from unauthorized users and limits access to calibration and PID tuning screens: User level – HASS screen access limited to running and data logging profiles; Technician level – access to HASS Screen, Test Execution screen, PID's and program definition; and Administrator level – access to all functions including calibration values and user manager. Typhoon 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, whether it be for HALT testing in Engineering or HASS testing on the production line. The Typhoon 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 Typhoon system to run stress tests either manually or with a test profile. A separate HASS user screen is available for when the chamber operator needs only 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 Typhoon Manager 5.3 VI driver set designed for advanced LabView® developers that enables Qualmark Typhoon system controls to integrate with other test functions via the LabView control client. QualView permits single computer control for both the Typhoon system and other Automated Test Equipment (ATE). QualView is licensed individually per chamber.

QualView Software 785-2539

QualView QFusion 785-2901

QualView HawQ 785-2902

OVTT Manager

OVTT™ Manager provides the same easy to use "point and click" Windows interface, but designed specifically for use with Qualmark's 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.

Typhoon: 8.0 785-1791

Typhoon: 4.0 785-1462

Typhoons: 3.0, 2.5 785-1412

Typhoons: 2.0, 1.5 785-1589

Typhoons: 2.0, 1.5 (3 Phase) 785-1931

Additional Access

Qualmark Typhoon 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 Qualmark 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

Typhoons 2.5, 3.0 785-1590

Safety Enhancements

Air Purge Kit

Qualmark's 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.

Typhoon 4.0 785-2090

Typhoon 4.0 Inferno 785-2119

Typhoon 8.0 785-1763

Air Purge Door Lock Kit

Qualmark's 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.

Typhoon 2.5/3.0 785-1668

QFusion 300 785-2672

Door Lock Kit (Typhoons 2.0 & 1.5)

Qualmark's door interlock system safeguards operators from being able to open the Typhoon door while the system is in operation.

Typhoons 2.0, 1.5 785-1689

Door Override Typhoon 4.0 785-2418

SSR Thermal Monitoring Alarm

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

Thermal Monitor Alarm XXX-XXXX

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 the following pages will assist you in making decisions regarding your complete LN2 needs

Bayonet Adaptor

MVIP 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 3/4" NPT 410-0132

VJ Line Intricate Male Adaptor 410-0133

Keepfull Vacuum Insulated Liquid Level

The Keepfull allows the venting of vapor while maintaining the liquid level in vacuum insulated piping systems and containers. This fully mechanical system 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

Upgrades

Significant enhancements to the original Typhoon technology have been released including a new 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 technology may require additional enhancements to older systems. Please discuss your current system configuration with Qualmark or your nearest 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. Qualmark's latest state-of-the-art 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
- Industry standard Allen Bradley industrial control system.
- Includes a new PC with familiar, but upgraded user interface.

Typhoon 4.0

USA – 480V, 60Hz956-0190
 Outside USA – 380V/400V, 50/60Hz956-0192

OVS 4.0

USA – 480V, 60Hz956-0129
 Outside USA – 380V/400V, 50/60Hz956-0172

OVS 3.0

USA – 480V, 60Hz956-0126
 Outside USA – 380V/400V, 50/60Hz956-0171

OVS 2.5

USA – 480V, 60Hz956-0125
 Outside USA – 380V/400V, 50/60Hz956-0170

OVS 2.0

USA – 480V, 60Hz956-0128
 Outside USA – 380V/400V, 50/60Hz956-0169

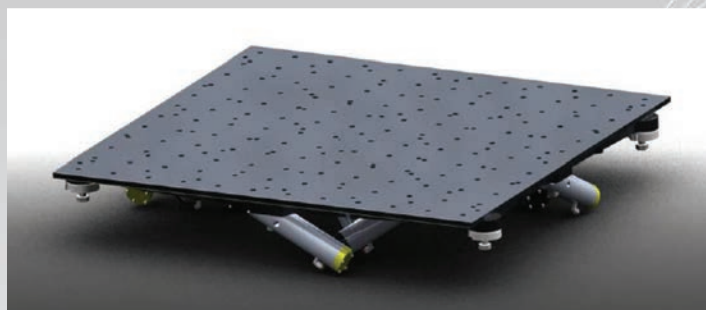
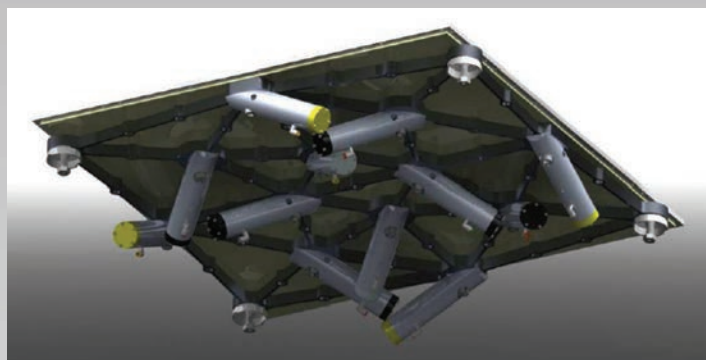
OVS 1.5

USA – 480V, 60Hz956-0130
 Outside USA – 380V/400V, 50/60Hz956-0168

xLF2 Table

The xLF2 table introduces a new concept to the HALT/HASS industry – PSD (Power Spectral Density) management. Qualmark's new table design improves PSD stability – providing superior consistency at higher gRMS – and makes any adjustments for PSD drift easily manageable. Now shipping with our top-selling Typhoon series, Qualmark's new 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 Qualmark to determine the best configuration for your system.

Typhoon 8.0	956-0189
Typhoon 4.0	956-0188
Typhoon 3.0	956-0187
Typhoon 2.5	956-0186
Typhoon 2.0	986-0185
Typhoon 1.5	986-0184
OVRTT	986-0184



*...in about 20 hours of test time
 Qualmark identified all major issues
 that had required hundreds of hours
 of testing using traditional methods
 to discover. "*
 – Medtronics

Web Based Education

Web Based Education (WBE), Qualmark's online training curriculums, enable our customers to rapidly learn accelerated testing methodology, become certified in the correct operation of HALT (Highly Accelerated Life Testing) systems, and enjoy a faster return on investment. These professionally delivered, online, self paced classes are accessible from your Internet connected computer 24/7 and are ideal for training new test personnel and maintaining a proper knowledge base as HALT/HASS resources change. WBE is a cost-effective solution for training test engineers and technicians deployed in various locations throughout the world. WBE is available by individual module, site license, or perpetual site license.

Site License

Available across a company with domestic and or global divisions. Includes up to 25 seats for 1 year unlimited access to all three modules.

Available Courses

HALT Best Practices

This course clarifies the correct methodologies, definitions and practices for planning and implementing a HALT and analyzing the results. This course is highly recommended for anyone interested in gaining general knowledge about HALT or considering implementing accelerated testing.

Mandarin Edition, HALT Best Practices

Presented in traditional Mandarin, this course is especially popular with contract manufacturers seeking to deliver proper HALT testing for their customers. This course clarifies the correct methodologies, definitions and practices for planning and implementing a HALT, and analyzing the results.

Site License	985-0033
Perpetual Site License.....	985-0037
HALT Best Practices (Specify English or Mandarin)	985-0032



Qualmark's interactive learning environment requires students to demonstrate proficiency before progressing to the next module.

"The HALT-HASS-HASA training convinced several people that this is something we need to incorporate into every new product we design. Using this extended training, we have been able to convince upper management to buy into the program. Also, we feel that with future HALT data results, we can convince them to use HASA as a quality check in our production facilities."

– Henry Fisher, Electronics Lab Supervisor,
 Siemens Industry

Accessories

Data Acquisition

QDaq

Qualmark's state-of-the-art 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 8 vibration channels of data acquisition in a single, modular design that can accommodate portability between 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 Spectrum Density (PSD) in a tabbed, user-friendly interface with customizable configuration settings that will streamline data file management. QDaq leverages the power of Windows 7 operating system and maintains compatibility with XP and connects with any PC or laptop via USB. QDaq software must be ordered separately. Order part numbers 956-0209 and 785-2478 for the complete QDaq package. Thermocouples and Accelerometers sold separately.

- Qualmark QDaq 956-0209
- QDaq Software 785-2478
- Desktop Mounting Kit 300-0208

Analyzers

Qualmark Spectrum Analyzer

Essential for monitoring the Unit Under Test (UUT), this economical, high quality unit can acquire, process and display up to six channels of vibration data in both time and frequency domains. The user interface offers intuitive menus for managing functions and data capture. User selection vibration averaging and one-click data capture can be saved as specified in user defined custom configurations. Package includes



PCIe Daq card, signal conditioner, analyzer software and cable from card to signal conditioner. May be installed on a Qualmark Standard User Interface PC Control System, or on a separate PC. Accelerometers are sold separately.

- SA Kit [6 channels] 785-2534
- Software 785-2559

Qualmark Portable Spectrum Analyzer

Qualmark's Portable Spectrum Analyzer 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 Typhoon and QFusion systems. Qualmark's Portable Spectrum Analyzer supports Windows 7 and maintains compatibility with XP, but with an updated look and feel that provides a highly intuitive interface. The new features offer 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. Accelerometers and thermocouples sold separately.

- Qualmark Portable Spectrum Analyzer 785-2600
- Software 785-2559



Monitor And Control

Adhesive-Mount Accelerometer Kit

Recommended! Effective HALT and HASS require knowledge of vibration stress experienced by the Unit Under Test (UUT). Accelerometers are essential for understanding product response to the test stress extremes. These lightweight and robust accelerometers are easily attached directly on the product under test. The Kit can be used for redundant vibration control or data collection. Kit includes a Qualmark 10mV/G accelerometer with BNC connector, and adhesive.

- Kit (order one for each channel) 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). Typhoon 4.0, Typhoon 3.0, and Typhoon 2.5 only.

- Kit (Factory Installed) 785-1452
- Retro Kit (Installed on-site) 785-1451
- 72", 24 AWG, 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 appara-

tus 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. The 300-0171 has a 10 year life Zirconium Oxide Sensor.

- Wall-Mount With LCD Display (Non-CE) 300-0171
- Wall-Mount With LCD Display (CE) 300-0169

Status Screen

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

- Status Screen 956-0218

Redundant Vibration Kit Accelerometer H-T

Don't let your program be delayed due to a broken accelerometer or cable – be sure to have a spare on hand. 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, charge amp, Qualmark's 10 mV/G Table Control Accelerometer and Qualmark's 20' Accelerometer Cable.

- H-T, 10mV/G KIT 785-1444

Type TT 72" Thermocouples

This sections needs some content. Test engineers will appreciate the power and full versatility delivered by Qualmark's QDaq with a full complement of these thermocouples on hand. Order 72.

- Type TT Thermocouples 785-1537

Fixturing

HALT Fixture Kit

This starter 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.



- Typhoons 4.0, 3.0, 2.5
- Domestic Halt Fixture Kit 750-0116
- Metric Halt Fixture Kit 750-0163
- Typhoons 2.0, 1.5, OVTT
- Domestic Halt Fixture Kit 750-0169
- Metric Halt Fixture Kit 750-0170

PCA Fixture Clamps

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



- PCA Quick Release Fixture:
- With Clamp 785-1162
- 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 in a system that are replaceable, such as, fuses, filters, light bulbs, heater coils, cables, contactors, etc.

Typhoon 4.0

- KIT – A (Standard), 400V or 480V (must specify): Request document 920-0281 for spares kits inventory.
- KIT – B (Deluxe), 400V or 480V (must specify): Request document 920-0281 for spares kits inventory.

Typhoons 3.0, 2.5

- KIT – A (Standard), 400V or 480V (must specify): Request document 920-0280 for spares kits inventory.
- KIT – B (Deluxe), 400V or 480V (must specify): Request document 920-0280 for spares kits inventory.

Typhoons 2.0, 1.5

- KIT – A (Standard), 208V or 230V (must specify): Request document 920-0279 for spares kits inventory.
- KIT – B (Deluxe), 208V or 230V (must specify): Request document 920-0279 for spares kits inventory.

OVTT

Request document 920-0154 for spares kits inventory.

Typhoon 4.0 & 8.0

- Kit – A (Standard), 400V 956-0160
- Kit – A (Standard), 480V 956-0158
- Kit – B (Deluxe), 400V 956-0201
- Kit – B (Deluxe), 480V 956-0200

Typhoons 3.0, 2.5

- Kit – A (Standard), 400V 956-0113
- Kit – A (Standard), 480V 956-0111
- Kit – B (Deluxe), 400V 956-0199
- Kit – B (Deluxe), 480V 956-0198

Typhoons 2.0, 1.5

- Kit – A (Standard), 208V 956-0120
- Kit – A (Standard), 230V 956-0122
- Kit – B (Deluxe), 208 V 956-0196
- Kit – B (Deluxe), 230V 956-0197

Typhoons 2.0, 1.5 (3 Phase)

- Kit – A (Standard), 400V 956-0148
- Kit – A (Standard), 480V 956-0150
- Kit – B (Deluxe), 400V 956-0202
- Kit – B (Deluxe), 480V 956-0203

OVTT18

- Kit 956-0097

QVTT24

- Kit 956-0241

Center of Excellence

The value Qualmark technology can bring to an organization derives maximum benefits with effective application. Qualmark's 20+ years of industry leadership in research, development, and delivery of HALT/HASS technology and know-how converges in our Center of Excellence (COE) at Qualmark's Denver headquarters, where we provide the essential collaborative resource for customers who want to fully reap the benefits of HALT and HASS technology in the most timely and effective manner.

The strategic focus of Qualmark's Center of Excellence is to reduce customer warranty costs that are attributable to product failures by deploying and supporting an Accelerated Reliability Testing program.

Our HALT/HASS experts understand that every technology/product creates its own unique attributes that will require specialized approaches for delivering optimal robustness. Only Qualmark offers the collaborative environment, depth of experience, and global infrastructure that enables customers to produce a more reliable product with a faster time to market at less expense.

Qualmark's Center of Excellence oversees all of our professional services which are structured to add to test program equity by tailoring services to deliver customer-specific program optimization. The educational value of Qualmark's Professional Services can dramatically improve reliability program outcomes that will quickly drive increases in product profitability.

Proof of Concept Program

Rapid Visibility Enables Fast Resolution

The Proof of Concept Program offers customers a very quick way to identify product design and manufacturing process issues, then verify corrective action to eliminate their most costly product warranty problems.

Tangible Results that Prove the Solution

COE engagements with automotive, medical device, oil and gas, avionics, and defense industry leaders have resulted in exceptionally fast and accurate product design and manufacturing corrections that saved these customers hundreds of thousands, if not millions, of dollars. The Proof of Concept program can show you where and how you can reduce warranty expense up to 20%, 30%, 50% or more. Program results validate the ROI of Qualmark's approach to accelerated reliability testing.

This priced-right, limited-scope program is designed to solve your most expensive warranty issues fast. Learn more and inquire about Qualmark's Proof of Concept

program on our website: www.qualmark.com



Professional Services

Qualmark offers a wide range of services, from Web Based Education (WBE) to customized on site consulting and training, to maximize your return on investment. Because AST (Accelerated Stress Test) technology is unlike customary burn-in testing, the approach is unique to test engineers trained in traditional methods. Like any new technology, acceptance often entails training and full understanding of AST goals to derive full benefit. The aim of Qualmark Professional Services is to add to the value gained from accelerated testing by customizing services to target customer-specific program optimization. The educational value of Qualmark's Professional Services can dramatically improve reliability program outcomes and deliver faster product profitability.

Fixturing Design & Training

Repetitive shock fixturing design is critical and can determine the success or failure of testing result outcomes. A good fixture can determine 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.

Qualmark delivers experience, knowledge of the process, and knowing how the technology works – not just

the fixture, but the table too. We want to not just design, but also train customers in the design of RS fixturing so they can do it on their own in the future; we provide all CAD models and transfer expert knowledge to the customer's team enabling them to rapidly expand and develop their own fixtures at their own pace.

Qualmark has been at the forefront of delivering Repetitive Shock fixturing design and training worldwide for over 20 years.

Different Vibe Systems, Different Fixturing

Traditional ED (Electrodynamic) Shaker fixture design characteristics:

- Heavy
- Rigid
- Mimic mounting of product in normal use
- Resonant and transmissive characteristics of fixture well understood
- Carefully designed to transmit vibration with minimum alteration

COMPARED TO

RS (Repetitive Shock) Vibration fixture design characteristics:

- Light
- Flexible
- Mounting position irrelevant due to 6 degree of freedom vibration
- Mounted to maximize vibration transmission
- Carefully designed to maximize vibration transmission without radically changing the frequency content

Different Technology, Better HALT and HASS

- Designed specifically to rapidly fatigue products
- Components have varying resonant frequencies
- Excite the resonant frequency of all components
 - Regardless of Frequency
 - Regardless of Orientation

HASS Fixture Development

- Custom Design to Ensure Consistent and Effective Screen
- Fixture Attributes
 - Vibration Transmissibility
 - Temperature Response
 - Consistent Stress Location to Location
 - Fast Product Change Over
- Fixture Qualification
 - Performed Prior to Delivery

Qualmark Fixturing Deliverables

Discussion with Customer about Product and Testing Requirements

- Create initial schedule and cost estimates

Provide Fixture Concept to Customer

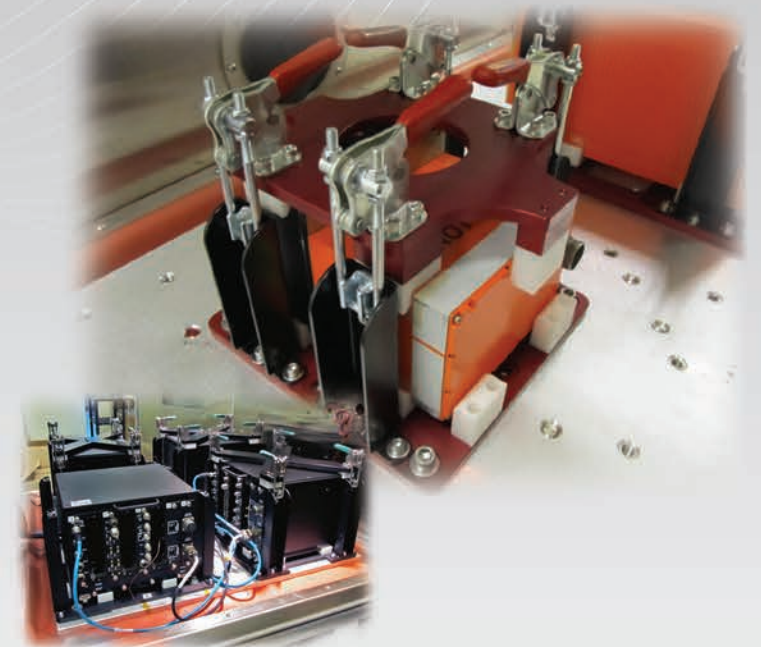
- Introduction pdf document showing fixture and product
- E-Drawing (3D Cad viewable model) of single fixture concept

Fixture Concept Design Review w/ Customer

- Via phone or web, discuss all details about fixture design and implementation
- Schedule Status Update
- Acquire customer signoff on acceptable fixture design

Finalize Fixture

- Qualmark Manufactured and Assembled Fixtures (prototype or production quantities)
- Provide CAD Design Files (output format by request)
- PDF Drawing Files (part and assembly documentation).
- Bill of Materials with any supporting source documents for purchased parts.



Post Warranty and Service Plans*

Realizing the full benefits of an accelerated reliability program requires that systems operate in top condition. To help accomplish this, Qualmark offers four levels of service to keep accelerated testing and production work on track – full maintenance, calibration and preventative maintenance service, extended parts warranty and technical support. For application support, consider Qualmark’s Web Based Education, which is offered at a discount with all post-warranty service plans, or ask about Qualmark’s Professional Services programs. Four levels of post warranty coverage are available:

Annual Maintenance Program

This comprehensive support plan is essential for helping to keep Accelerated Stress Testing programs on track while mitigating the potential for unexpected expenses. Qualmark’s Annual Maintenance program extends the factory warranty, provides preventative maintenance and calibration, and is the only plan that covers the table and actuator performance. It is designed so that customers can focus resources on their product testing program results and leave the chamber maintenance to Qualmark. This program provides the most comprehensive coverage available from Qualmark to help maintain system performance within factory specifications. Most importantly for HASS and HASA, the Annual Maintenance program is crucial in supporting test system compliance (thermal and vibration) with the specifications under which reliability programs have been developed. Annual maintenance includes 12 month’s maintenance, service, and part replacement:

- All provisions in PM and Cal Service Plan
- All provisions in Extended Parts Warranty
- 2 pre-scheduled PM and Cal visits per year
- Vibration table performance evaluation and maintenance. If results from the evaluation indicate more than 25% degradation from initial standard tests the table will be rebuilt or replaced at no additional charge. To measure table degradation, maximum gRMS attainable shall be measured immediately following chamber/table installation or table rebuild.
- Actuator performance evaluation and maintenance. Actuators that are determined to be worn beyond specification will be replaced.

Typhoon 8.0	960-0115
Typhoon 4.0	960-0114
Typhoon 3.0	960-0113
Typhoon 2.5	960-0112
Typhoon 2.0	960-0111

Typhoon 1.5	960-0110
QF300	960-0135
HawQ	960-0142

Preventative Maintenance & Calibration Services Program

Because of the extreme stresses delivered with Qualmark equipment, a twice yearly preventative maintenance and calibration regimen is recommended to help keep accelerated stress test programs delivering consistent results. Heavily used systems should be attended to more frequently. Regularly scheduled visits by a Qualmark certified technician help to keep systems running within factory specifications and can increase life expectancy of parts and components and reduce premature replacements and large-scale repairs. The Preventative Maintenance and Calibration program includes:

- 2 Preventative Maintenance visits with one calibration annually
- 37 point inspection and cleaning
- Calibration traceable to NIST
- Discounts for additional systems at same site
- 5% parts discount on any necessary corrective maintenance
- 10% labor discount on any necessary corrective maintenance

Typhoon 8.0	960-0125
Typhoon 4.0	960-0099
Typhoon 3.0	960-0098
Typhoon 2.5	960-0097
Typhoon 2.0	960-0096
Typhoon 1.5	960-0095
QF300	960-0137
HawQ	960-0143

“It not only paid for the cost of all the equipment, it paid for the whole building!”

– HALT Payback per Reliability Manager, Fortune 100 Company

Tech Enhancement and Maintenance Program

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

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

PLC Upgrade - New 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 newer 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 new 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 Qualmark.

Extended Parts Warranty Program

Protect your Accelerated Test Equipment investment by having a parts warranty in place for when untimely problems might otherwise create an unexpected strain on budgets and production. Qualmark’s Extended Parts Warranty program provides the peace of mind needed to assure minimum down time by covering replacement OEM parts and subsystems for 12 months as follows:

- LN2 System
- VJ Manifold including Primary & Redundant Bonnet, Redundant Bonnet Pressure Regulator and Valve, GN2

Purge Solenoid and Gauge, Primary Bonnet E/P and Purge Valve, Spray Bar Assembly and Fog Nozzles

- Vibration Table
- Actuators
- Motors
- Electrical Components (PLC, Contactors, Overloads, Solid State Relays (SSR’s))

Typhoon 8.0	Contact Qualmark
Typhoon 4.0	960-0120
Typhoon 3.0	960-0119
Typhoon 2.5	960-0118
Typhoon 2.0	960-0117
Typhoon 1.5	960-0116
QF300	960-0136
HawQ	960-0141

Annual Technical Support Plan

Qualmark’s Technical Support plan provides 12 months of support via same or next business day email or call-back phone assistance to help diagnose equipment problems and provide remote troubleshooting. If necessary, on site repairs will be scheduled with a factory-trained technician and replacement parts will be discounted 10%. Non-equipment, application related inquiries will be provided options for assistance from Qualmark’s Professional Services group.

Technical Support (All Systems)985-0041

*Terms and conditions apply to the various Post Warranty and Service Plans. Contact Qualmark for detailed information.



Testing Services – Qualmark ARTC® (Accelerated Reliability Testing Center) Labs

HALT/HASS techniques combine thermal extremes, rapid thermal cycling and multi-axis (Six Degree of Freedom) vibration that rapidly expose process flaws and design defects. This technique saves companies weeks, even months, of testing time and money normally spent testing product by traditional methods. Qualmark's team of experienced test personnel assist customers in conducting the best possible test. Services available:

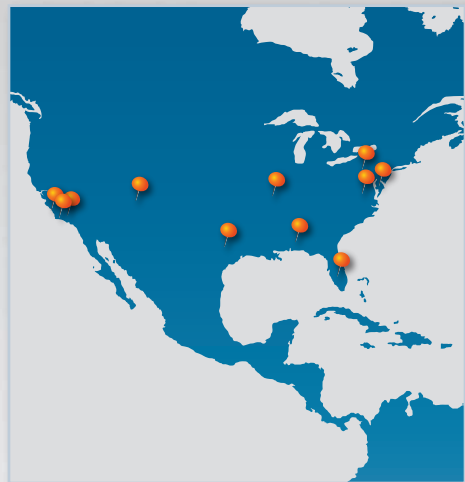
- HALT (Highly Accelerated Life Test)
- Production HASS (Highly Accelerated Stress Screen)
- Production HASA (Highly Accelerated Stress Audit)
- Customer Defined Test Services

This testing may not strictly follow the accelerated life testing process as defined by classical HALT protocol; instead, it takes a more traditional and selective approach to environmental testing. Customers define and direct the testing process, using the temperature and/or vibration stresses available in accelerated life testing independently or in combination.

HALT (Highly Accelerated Life Test) 980-0138
 Production HASS (Highly Accelerated Stress Screen) 980-0142
 Customer Defined Test Services 980-0139

The testing center at Qualmark Headquarters in Denver serves as the Center of Excellence for HALT/HASS methodology, where continuous research supports innovation and extended applications for ever more effective accelerated reliability solutions. The Center of Excellence provides programs and training for Qualmark's global partner lab network of ARTC labs.

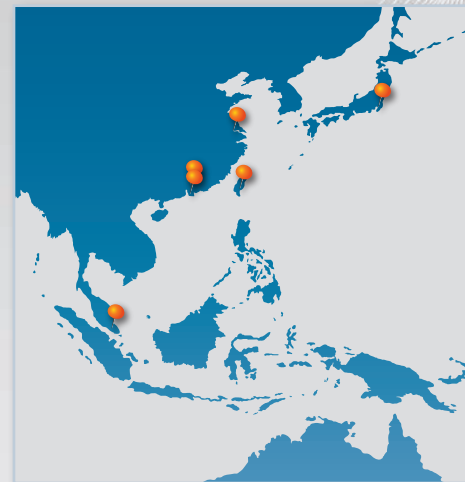
Americas



Europe



Asia/Pacific



Qualmark worldwide testing lab locations.

Visit Qualmark.com to view an interactive lab locator map with all of the latest locations.

Qualmark Authorized Partner Labs provide exclusive testing services on Qualmark systems at locations around the world. These labs are staffed by Qualmark trained, highly skilled HALT and HASS experts focused on providing results, not just reports. Contact Qualmark or visit online at www.Qualmark.com to locate the nearest Authorized Partner Lab.

"HALT Technology has enabled us to accelerate product development and to make a more reliable design, earlier in the process. Qualmark provides excellent products and support services to ensure our testing program is a success."

*– Environmental Test Engineer,
 Manufacturer, Test & Measurement Equipment*



Qualmark – Accelerating Product Reliability

Because we focus on the way Accelerated Stress Test (AST) technology can be utilized to support business goals, Qualmark forms strategic partnerships, provides expert services, and offers professional programs designed for exceptional value delivery.

Starting with customer needs, Qualmark envisions the entire product life cycle and then offers an effective solution that maximizes Return on Investment (ROI). Qualmark's product design and process management solutions help increase productivity, stimulate growth and build competitive advantages – measurable business values for your enterprise.

Qualmark - A Global Business Centered Around Accelerated Stress Test Technology

Qualmark's business is entirely built around accelerated stress test technology and how it can be applied to help our customers develop and manufacture better, less costly product. Since pioneering HALT/HASS/HASA technology in 1991, Qualmark has continually led the industry in research and development, engineering, manufacturing, sales, service, support, training and education. Qualmark's approved Accelerated Reliability Test Center (ARTC®) partners are specially trained to perform effective HALT/HASS/HASA testing that helps customers design and build a more reliable and robust product.

Qualmark systems are available in the Americas through a well established network of approved representatives. Each has been selected by Qualmark for their experience in working with facility managers and reliability engineers in recommending the exact system for effective HALT/HASS testing. Qualmark is represented overseas by a select distribution system of qualified resellers who assist with system import, installation and support.

Qualmark - 20 Year Technology and Application Leadership

Today more than ever, testing programs are driven by market demand to provide reliable products whose timely releases keep pace with technology advancements. Qualmark's continued growth reflects our commitment to offer relevant solutions for customers caught in an increasingly competitive marketplace.

Corporations worldwide, of all sizes, partner with Qualmark to supply the technology and implementation assistance for their accelerated stress testing programs because of our leadership and expertise. From our advanced product development and process verification systems to our Center of Excellence, Qualmark offers solutions that allow our customers to attract new business, sell more product and deliver more value.

Qualmark - Patented Technology and Application Experts Deliver Solid Return on Investment

Industry leaders have discovered that Qualmark's strategic approach to improving product reliability — engineering advanced test systems, providing specialized application expertise and offering an array of global resources — delivers the right test solution to increase reliability, respond to accelerated development and production timelines and reduce warranty expense. Qualmark customers know that products subjected solely to traditional reliability programs — ones that still adhere to legacy test approaches and standards — are competitively vulnerable to egregious product introduction failure rates, product specification limitations, failures in unanticipated use environments and a host of attached costs for managing and containing exposure to recalls, restitution expense, fines, fees and litigation. Qualmark technology and programs provide customer advantages in getting a much more reliable product to market faster, which reduces development and warranty costs and strengthens brand reputation that drives consumer choice.

Qualmark - Advanced Accelerated Stress Test Technology

Qualmark's three founders pioneered the development of new technology back in the early 1990s in response to the need for a faster, more effective way of ruggedizing and increasing reliability of aerospace components which introduced accelerated stress testing.

Based on the reliability principal that asserts, as stress on a product is increased, the number of test cycles required to cause a weak link to fail goes down, Qualmark engineered a new test chamber design that vastly accelerated test results by subjecting product to repetitive shock (RS) vibration and rapid thermal cycling extremes, powered by liquid nitrogen (LN2), in a combined environment.

Adopted by leading manufacturers, the new OmniAxial™ Vibration System (OVS) quickly proved its commercial value by:

- **Reducing Expense**
 - Shorter design cycles
 - Faster design verification
 - Expanded product margins
 - Fewer product failures
- **Increasing Revenues**
 - Faster to market
 - Reduced service and warranty claims

In the ensuing 20+ years, Qualmark's dedication to research and development of accelerated stress test technology and how it can be applied to provide tangible customer value has kept us firmly established in the leadership role for sales and application services.



Smarter Solutions.
Proven Results.

www.W5engineering.com

Technical Sales Offices:

San Diego	(619) 540-2200
Los Angeles	(818) 416-3487
SF Bay Area	(510) 606-9090
Seattle	(425) 321-2757
Canada	(778) 650-5236
NW Main Office	(971) 244-8200

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