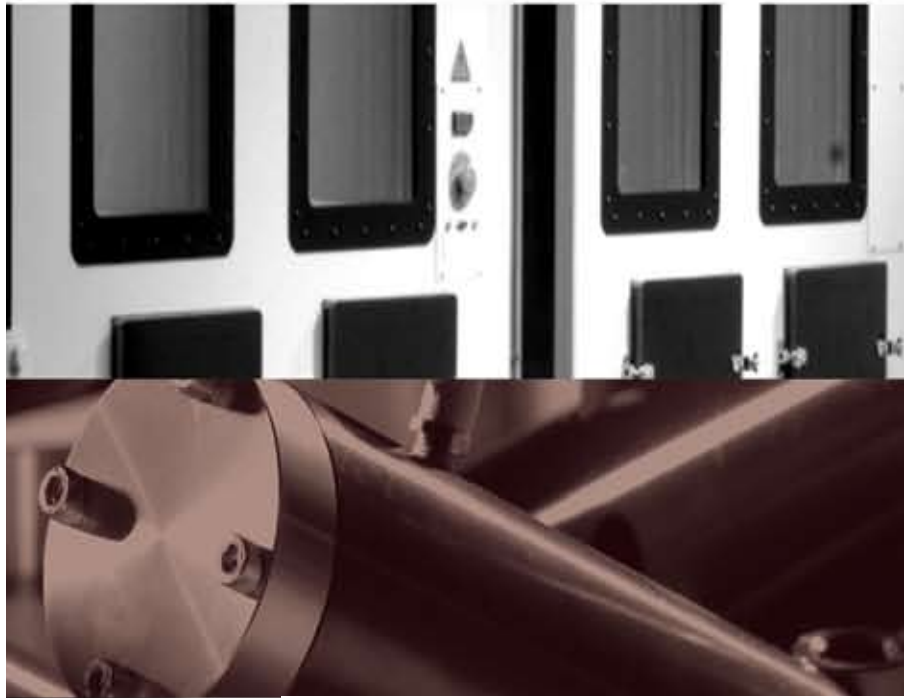


# QUALMARK<sup>®</sup>

HALT/HASS SYSTEMS



## PRODUCTS AND SERVICES CATALOG

## QUALMARK'S TECHNOLOGY

Qualmark's Typhoon™ chamber technology, with its powerful thermal performance and six-degree-of-freedom (6DoF) repetitive-shock vibration, drives out design flaws fast while using far less energy than competitive models. Our patented xLF (Extended Low Frequency) system provides improved low frequency energy for penetrating mechanically complex products, while retaining the high frequency energy that is so effective at exposing weak solder joints and surface mount connections. Only Qualmark's OVS (OmniAxial Vibration System) is so uniquely suited to 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) of vibration. Typhoon air flow technology delivers superior rapid temperature cycling, reaching set points faster, delivering stability during cold/hot dwells and ramps that out-perform other systems. The advanced thermal management introduced in the Typhoon series not only improves ramp rates, but also delivers temperature uniformity throughout the chamber area and an increased efficiency that provides an accelerated return on investment.

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Qualmark's line of Typhoon Chambers incorporate liquid nitrogen cooling into a high ramp rate thermal system, with an integral six degree of freedom repetitive shock vibration system.

### 10 CUSTOM HALT/HASS CHAMBERS

Specific Solutions to Meet Your Specific Needs. Let Qualmark help you design the system that works for your testing needs.

### 11 FEATURES

Features included with the chamber. A description of the vibration table, main supply voltage, computer and software and their options.

### 12 ACCESSORIES

Equipment that will help to contribute to your specific testing needs.

### 16 SUPPORT SERVICES & TRAINING

Qualmark offers a variety of services to support your accelerated reliability testing requirements.

### 17 TRAINING & UPGRADES

Qualmark offers training programs covering all aspects of maintaining your Qualmark equipment and for implementing your accelerated testing programs.

### 18 TESTING & LAB SERVICES

Qualmark has Authorized Test Centers located around the world offering a broad range of testing services.

### 19 WARRANTIES

Qualmark's Warranties, Terms And Conditions.

## CONTACT INFORMATION

#### TYPHOON CHAMBERS & OVTT SYSTEMS

1-888-425-8669  
+1-303-254-8800  
sales@qualmark.com

#### TECHNICAL SUPPORT, SERVICE & TRAINING

1-888-425-8669  
+1-303-254-8800  
support@qualmark.com

#### CHAMBER ACCESSORIES & REPLACEMENT PARTS

1-888-425-8669  
+1-303-254-8800  
support@qualmark.com

#### TESTING SERVICES

1-888-425-8669  
+1-303-254-8800  
artc@qualmark.com

# CHAMBER TYPHOON 8.0V



Typhoon 8.0V shown with optional lower windows in doors and optional windows and lower access ports on front.

The Typhoon 8.0V doubles the width of our popular Typhoon 4.0 chamber. The thermal system in the Typhoon series has been carefully engineered to have superior thermal efficiency. Key design elements such as our patented blower technology, highly efficient air flow characteristics and careful choice of materials have combined to keep liquid nitrogen and electricity costs down without compromising our industry standard thermal performance. The Typhoon 8.0V has the largest vibration table available in a HALT/HASS chamber.

**PART NUMBER:** 971-4004  
971-4005 Stretch (tall)

### STANDARD FEATURES

- High Rate, High Flow Typhoon Thermal System
- xLF Vibration Table
- (2x) Vacuum Jacketed Manifold
- Desktop PC with a 17" Monitor
- Typhoon Manager Software

### WORK SPACE

UPPER TABLE POSITION  
110" w x 53.3" d x 36" h  
(2794 x 1353 x 914mm)

LOWER TABLE POSITION  
110" w x 53.3" d x 55" h  
(2794 x 1353 x 1397mm)

### TABLE SIZE

100" x 48"  
(2540 x 1220mm)

### ACCELERATION

Over 60 GRMS  
*\*Higher GRMS available by special order*

### OUTER DIMENSIONS

121" w x 67.3" d x 108.7" h  
(3073 x 1710 x 2760mm)

### TABLE CAPACITY

Recommended 1000lbs (453.59kg)  
Maximum\* 2000lbs (907.18kg)  
*\*may require custom options*

### TEMP RANGE

+ 200° C to -100° C

### POWER REQUIREMENTS

380V, 400V, 440V 480V  
3Φ  
50/60Hz,  
200A (Service Rating)

### 24 ACTUATORS

Refer To Page 11

## ACCESSORIES

- CE KIT (INTERNATIONAL)
- HALT FIXTURE KIT
- CALIBRATION KIT
- OXYGEN SENSORS
- LAY-DOWN CRATING
- Q-LINK SOFTWARE
- AIR PURGE KIT
- ACCESS PORTS AND OPTIONAL WINDOWS
- QUALMARK SPECTRUM ANALYZER
- REDUNDANT VIBRATION ACCELEROMETER KIT
- AUXILIARY THERMOCOUPLES
- GHI SPECTRUM & FATIGUE ANALYZER
- KEEPFUL VACUUM INSULATED LIQUID LEVEL
- PCBV ADHESIVE-MOUNT ACCELEROMETER KIT
- PCA QUICK RELEASE FIXTURE

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# CHAMBER TYPHOON 4.0V

The Typhoon 4.0V is designed specifically for the task of performing Highly Accelerated Stress Screening (HASS) and for HALT on large products. Its 48" x 48" vibration table is capable of supporting hundreds of pounds of products and fixturing and mounts at two different heights.

**PART NUMBER:** 971-4001  
971-4003 Thermal Only

**STANDARD FEATURES**

- High Rate, High Flow Typhoon Thermal System
- xLF Vibration Table
- (2x) Vacuum Jacketed Manifold
- Desktop PC with a 17" Monitor
- Typhoon Manager Software

**WORK SPACE**

UPPER TABLE POSITION  
53.7" w x 53.3" d x 36" h  
(1364 x 1353 x 914mm)

LOWER TABLE POSITION  
53.7" w x 53.3" d x 55" h  
(1364 x 1353 x 1397mm)

**OUTER DIMENSIONS**

80.1" w x 69.6" d x 109" h  
(2035 x 1768 x 2768mm)

**TEMP RANGE**

+ 200°C to -100°C

**12 ACTUATORS**

**TABLE SIZE**

48" x 48"  
(1220 x 1220mm)

**ACCELERATION**

Over 60 GRMS  
*\*Higher GRMS available by special order*

**TABLE CAPACITY**

Recommended 600 lbs (272.16kg)  
Maximum\* 1200 lbs (544.31kg)  
*\*may require custom options*

**POWER REQUIREMENTS**

380V, 400V, 440V, 480V  
3Φ  
50/60Hz,  
100A (Service Rating)

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## ACCESSORIES

- CE KIT (INTERNATIONAL)
- HALT FIXTURE KIT
- MULTIPLE DEWAR KIT
- CALIBRATION KIT
- OXYGEN SENSORS
- LAY-DOWN CRATING
- Q-LINK SOFTWARE
- AIR PURGE KIT
- QUALMARK SPECTRUM ANALYZER
- REDUNDANT VIBRATION ACCELEROMETER KIT
- SEISMIC HOLD DOWN CHANNEL KIT
- AUXILIARY THERMOCOUPLES
- GHI SPECTRUM & FATIGUE ANALYZER
- ACCESS PORTS AND OPTIONAL WINDOWS
- KEEPFUL VACUUM INSULATED LIQUID LEVEL
- PCBV ADHESIVE-MOUNT ACCELEROMETER
- PCA QUICK RELEASE FIXTURE

Refer to page 12

# CHAMBER TYPHOON 3.0V



The Typhoon 3.0V 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 4.0V, the Typhoon 3.0V vibration table mounts at two different heights, so the interior chamber volume can be adjusted for the needs of the product.

**PART NUMBER:** 971- 4030

## STANDARD FEATURES

High Rate, High Flow Typhoon Thermal System  
xLF Vibration Table  
(2x) Vacuum Jacketed Manifold  
Desktop PC with a 17" Monitor  
Typhoon Manager Software

## WORK SPACE

UPPER TABLE POSITION  
44.1" w x 45" d x 25" h  
(1120 x 1143 x 635mm)

LOWER TABLE POSITION  
44.1" w x 45" d x 35" h  
(1120 x 1140 x 889mm)

## OUTER DIMENSIONS

55.9" w x 69.2" d x 84.0" h  
(1420 x 1760 x 2134mm)

## TEMP RANGE

+ 200° C to -100° C

## 10 ACTUATORS

## TABLE SIZE

36" x 36"  
(914 x 914mm)

## ACCELERATION

Over 60 GRMS  
*\*Higher GRMS available by special order*

## TABLE CAPACITY

Recommended 450lbs (204.12kg)  
Maximum\* 900lbs (408.23kg)  
*\*may require custom options*

## POWER REQUIREMENTS

380V, 400V, 440V, 480V  
3Φ  
50/60Hz,  
80A (Service Rating)

## ACCESSORIES

CE KIT (INTERNATIONAL)  
HALT FIXTURE KIT  
MULTIPLE DEWAR KIT  
CALIBRATION KIT  
OXYGEN SENSORS  
ELEVATION STAND  
CABLE NOTCHES  
Q-LINK SOFTWARE  
AIR PURGE DOOR LOCK KIT  
DUAL WINDOW PORT ADAPTOR  
QUALMARK SPECTRUM ANALYZER  
REDUNDANT VIBRATION ACCELEROMETER KIT  
AUXILIARY THERMOCOUPLES  
GHI SPECTRUM & FATIGUE ANALYZER  
ACCESS PORTS AND OPTIONAL WINDOWS  
KEEPFUL VACUUM INSULATED LIQUID LEVEL  
PCBV ADHESIVE-MOUNT ACCELEROMETER  
PCA QUICK RELEASE FIXTURE

## CHAMBER TYPHOON 2.5V



PART NUMBER: 971- 4026

### STANDARD FEATURES

High Rate, High Flow Typhoon Thermal System  
xLF Vibration Table  
(2x) Vacuum Jacketed Manifold  
Desktop PC with a 17" Monitor  
Typhoon Manager Software

### WORK SPACE

UPPER TABLE POSITION  
44.1" w x 45" d x 25" h  
(1120 x 1143 x 635mm)

LOWER TABLE POSITION  
44.1" w x 45" d x 35" h  
(1120 x 1140 x 889mm)

### OUTER DIMENSIONS

55.9" w x 69.2" d x 84.0" h  
(1420 x 1760 x 2134mm)

### TEMP RANGE

+ 200°C to -100° C

### 10 ACTUATORS

### TABLE SIZE

30" x 30"  
(762 x 762mm)

### ACCELERATION

Over 60 GRMS  
*\*Higher GRMS available by special order*

### TABLE CAPACITY

Recommended 320lbs (145kg)  
Maximum\* 640lbs (290.3kg)  
*\*may require custom options*

### POWER REQUIREMENTS

380V, 400V, 440V, 480V  
3Φ  
50/60Hz,  
80A (Service Rating)

The Typhoon 2.5V 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.

## ACCESSORIES

CE KIT (INTERNATIONAL)  
HALT FIXTURE KIT  
MULTIPLE DEWAR KIT  
CALIBRATION KIT  
OXYGEN SENSORS  
ELEVATION STAND  
CABLE NOTCHES  
Q-LINK SOFTWARE  
AIR PURGE DOOR LOCK KIT  
DUAL WINDOW PORT ADAPTOR  
QUALMARK SPECTRUM ANALYZER  
REDUNDANT VIBRATION ACCELEROMETER KIT  
AUXILIARY THERMOCOUPLES  
GHI SPECTRUM & FATIGUE ANALYZER  
ACCESS PORTS AND OPTIONAL WINDOWS  
KEEPFUL VACUUM INSULATED LIQUID LEVEL  
PCBV ADHESIVE-MOUNT ACCELEROMETER  
PCA QUICK RELEASE FIXTURE

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**PART NUMBER:** 971- 4020  
971- 4022 ( 3 Phase)

**STANDARD FEATURES**

High Rate, High Flow Typhoon Thermal System  
xLF Vibration Table  
(2x) Vacuum Jacketed Manifold  
Desktop PC with a 17" Monitor  
Typhoon Manager Software

**WORK SPACE**

27" w x 27" d x 19.5" h  
(686 x 686 x 496mm)

**TABLE SIZE**

24" x 24"  
(610 x 610mm)

**OUTER DIMENSIONS**

38.7" w x 46" d x 79.9" h  
(983 x 1168 x 2030mm)

**ACCELERATION**

Over 60 GRMS  
*\*Higher GRMS available by special order*

**TABLE CAPACITY**

Recommended 100lbs (45kg)  
Maximum\* 200lbs (90kg)  
*\*may Require Custom Options*

**TEMP RANGE**

+ 200° C to -100° C

**POWER REQUIREMENTS**

208V, 230V(1Φ), 380V  
400V, 440V, 480V  
3Φ  
50/60Hz, 70A(1Φ)  
60A (3Φ) (Service Rating)

**5 ACTUATORS**

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# CHAMBER 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 chamber technology, with its impressive thermal performance, six-degree-of-freedom, repetitive-shock vibration, and up to 60% savings in utility costs. The Typhoon 2.0 is a practical addition to any company's product reliability program.

## ACCESSORIES

- CE KIT (INTERNATIONAL)
- HALT FIXTURE KIT
- MULTIPLE DEWAR KIT
- CALIBRATION KIT
- OXYGEN SENSORS
- CABLE NOTCH
- Q-LINK SOFTWARE
- DOOR LOCK KIT
- QUALMARK SPECTRUM ANALYZER
- REDUNDANT VIBRATION ACCELEROMETER KIT
- AUXILIARY THERMOCOUPLES
- ACCESS PORTS AND OPTIONAL WINDOWS
- KEEPFUL VACUUM INSULATED LIQUID LEVEL
- GHI SPECTRUM & FATIGUE ANALYZER
- PCBV ADHESIVE-MOUNT ACCELEROMETER
- PCA QUICK RELEASE FIXTURE

Refer to page 12





PART NUMBER: 971- 4019  
971- 4021 (3 PHASE)

#### STANDARD FEATURES

High Rate, High Flow Typhoon Thermal System  
xLF Vibration Table  
(2x) Vacuum Jacketed Manifold  
Desktop PC with a 17" Monitor  
Typhoon Manager Software

#### WORK SPACE

27" w x 27" d x 19.5" h  
(686 x 686 x 496mm)

#### OUTER DIMENSIONS

38.7" w x 46" d x 79.9" h  
(983 x 1168 x 2030mm)

#### TEMP RANGE

+ 200° C to -100° C

#### 4 ACTUATORS

#### TABLE SIZE

18" x 18"  
(457 x 457mm)

#### ACCELERATION

Over 60 GRMS  
*\*Higher GRMS available by special order*

#### TABLE CAPACITY

Recommended 80lbs (36kg)  
Maximum\* 160lbs (72.57kg)  
*\*may require custom options*

#### POWER REQUIREMENTS

208V, 230V(1Φ), 380V  
400V, 440V, 480V  
3Φ  
50/60Hz, 70A (3Φ)  
60A (1Φ) (Service Rating)

Refer To Page 11

## CHAMBER 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 chamber technology, with its impressive thermal performance, six-degree-of-freedom, repetitive-shock vibration, and up to 60% savings in utility costs. The Typhoon 1.5 is a practical addition to any company's product reliability program.

## ACCESSORIES

CE KIT (INTERNATIONAL)  
HALT FIXTURE KIT  
MULTIPLE DEWAR KIT  
CALIBRATION KIT  
OXYGEN SENSORS  
CABLE NOTCH  
Q-LINK SOFTWARE  
DOOR LOCK KIT  
QUALMARK SPECTRUM ANALYZER  
REDUNDANT VIBRATION ACCELEROMETER KIT  
AUXILIARY THERMOCOUPLES  
ACCESS PORTS AND OPTIONAL WINDOWS  
KEEFPFUL VACUUM INSULATED LIQUID LEVEL  
GHI SPECTRUM & FATIGUE ANALYZER  
PCBV ADHESIVE-MOUNT ACCELEROMETER  
PCA QUICK RELEASE FIXTURE

Refer to page 12





**PART NUMBER:** 971-5001(ELECTRONIC)

**STANDARD FEATURES**

Electronic Console with PC controller  
Vibration Table  
Ovtt Base Assembly

**WORK SPACE**

20" w x 20" d x 9.5" h  
(508 x 508 x 241mm)

**TABLE SIZE**

18" x 18"  
(457 x 457mm)

**OUTER DIMENSIONS**

27" w x 35" d x 22" h  
(685 x 889 x 559mm)

**ACCELERATION**

Over 60 GRMS  
*\*Higher GRMS available by special order*

**AIR REQUIREMENTS**

30 SCFM AT 90 PSI

**TABLE CAPACITY**

Recommended 50lbs (22.68kg)  
Maximum\* 100lbs (45kg)  
*\*may require custom options*

**4 ACTUATORS**

**POWER REQUIREMENTS**

120VAC/220-240  
3A 50/60Hz

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**OVTT™**

**OMNI-DIRECTIONAL VIBRATION TABLE**

The First Low Cost, Omni-Directional Vibration System  
OVTT™ is the first portable, compact, repetitive-shock, stand-alone, vibration system on the market. The OVTT system is ideal for quick evaluation of field returns, repair verification and random vibration test of small products. The OVTT utilizes Qualmark's patented Six Degree of Freedom vibration technology, and is designed with reduced air requirements and low noise levels, making it efficient and inexpensive to use. The OVTT system can be easily configured for placement inside a thermal chamber for combined stress tests.

**ACCESSORIES**

HALT FIXTURE KIT

CALIBRATION KIT

METAL COVER

QUALMARK SPECTRUM ANALYZER

VIBRATION MONITOR

GHI SPECTRUM & FATIGUE ANALYZER

PCA QUICK RELEASE FIXTURE

PCBV ADHESIVE-MOUNT ACCELEROMETER KIT

CE CERTIFICATION

Refer to page 12



## CUSTOM HALT/HASS Chambers



Typhoon 8.0 shown with optional lower windows in doors and optional windows and lower access ports on front.

### *Specific Solutions to Meet Your Specific Needs*

Qualmark Corporation’s mission is to provide the electronic manufacturing industry with Accelerated Testing Equipment and services that result in bringing product to market faster with reduced design and warranty costs, and improved reliability. Our concentration in this technologically advanced practice has made Qualmark the knowledge leader in engineered HALT and HASS solutions.

Because of our unsurpassed expertise with high value AST engineering and manufacturing services, we are consistently sought out to custom engineer specific purpose chambers. Our team of seasoned professionals has the analytical expertise you want – expertise to develop optimum chamber functional specifications for any product test criteria to ensure the right design solution for your application.



Extended Height Custom Typhoon 8.0 shown with optional windows and lower access ports on front.

## CUSTOM Fixturing Services

*Qualmark offers a complete range of fixturing products and services.*

Fixturing can be one of the most challenging aspects of HALT/HASS testing. The materials chosen must adequately transfer the vibration to the product without significantly altering the vibration characteristics of the table. Improper fixturing can result in poor tests results. Qualmark offers custom HALT/HASS fixturing that will not only save intensive hours on design, but will also ensure the most precise testing on your product. Qualmark’s fixturing team has over 20 years of hands-on experience and can design a cost-effective solution to meet your specifications.

*Contact your nearest Qualmark representative to learn more about our custom design and manufacturing services.*



### *Services include and are not limited to:*

- Turnkey HASS Fixturing
- HASS Screen development and proof of screen
- HALT/HASS fixturing consulting
- HALT/HASS fixturing development
- “Do it yourself” Starter HALT Fixture Kit



Phone: 1-303-254-8800  
Toll Free: 1-888-425-8669  
Sales@qualmark.com

## VIBRATION TABLE

The Omni Axial™ Vibration System (OVS) provides effective excitation of high and low frequency modes while simultaneously delivering rotation (roll, pitch and yaw) around three axis (X, Y, Z) of vibration. This powerful six-degree-of-freedom (6DoF) repetitive shock vibration drives design and manufacturing flaws fast. Our patented xLF (Extended Low Frequency) vibration table provides power and frequency consistency across the spectrum while detecting the defects in the product.



UNC (Unified National Coarse Threads)

CHAMBER: 8.0 TABLE SIZE: 96" x 48" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1655 785-1718
CHAMBER: 4.0 TABLE SIZE: 48" x 48" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1652 785-1653
CHAMBER: 3.0 TABLE SIZE: 36" x 36" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1650 785-1651
CHAMBER: 2.5 TABLE SIZE: 30" x 30" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1646 785-1647
CHAMBER: 2.0 TABLE SIZE: 24" x 24" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1644 785-1645
CHAMBER: 1.5 TABLE SIZE: 18" x 18" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1642 785-1643
CHAMBER: OVTT TABLE SIZE: 18" x 18" xLF VIBRATION TABLE 3/8 – 16 UNC THREAD M-10 METRIC THREAD	785-1640 785-1641

## SOFTWARE

Qualmark's Typhoon Manager is a very easy to use "point and click" Windows® interface. Behind this easy to use interface is a tremendous amount of power and flexibility 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. This software comes with three levels of operation and can be password protected if the customer so chooses. This option allows protection from un-authorized users and limits access to calibration and PID tuning screens. A separate HASS user screen is available for when the chamber operator needs only to run profiles.

INCLUDED - TYPHOON MANAGER SOFTWARE 785-1795

## STANDARD LN<sub>2</sub> SYSTEM VACUUM JACKETED MANIFOLD

The Vacuum Jacketed Liquid Nitrogen Control Valve Assembly controls the flow of liquid nitrogen into the chamber, preventing condensation. The VJ eliminates frost on the cryogenic piping leading into the chamber. It also conserves the usage of LN<sub>2</sub>. Assembly includes vacuum jacketed piping, and two control valves. Required Manifold Adaptor sold separately.



CHAMBERS 3.0 AND 2.5 STANDARD	785-1901
CHAMBER 4.0 STANDARD	785-1872
CHAMBER 8.0 (2 REQUIRED) STANDARD	785-1750
*PLEASE SEE PAGE 12 FOR THE 1.5/2.0 STANDARD LN <sub>2</sub> SYSTEM	
**MUST SELECT ONE MANIFOLD ADAPTOR ON NEXT PAGE	

## TYPHOON 1.5 AND 2.0 STANDARD LN<sub>2</sub> SYSTEM

The cooling system for the Typhoon 1.5 and 2.0 consists of a liquid nitrogen control and distribution system. A liquid nitrogen (LN<sub>2</sub>) attachment point is provided for input of the liquid to the valve controlled by the control system. The solenoid valve controls the flow of LN<sub>2</sub> to the fog nozzles where the LN<sub>2</sub> vaporizes into the air plenum for distribution to the product under test via air flow from the fans. For safety, a redundant solenoid valve inhibits the flow of liquid in case of a shutdown or emergency situation. Two over-pressure safety valves also prevent over-pressurization of the



CHAMBERS: 2.0, 1.5 STANDARD	785-1448
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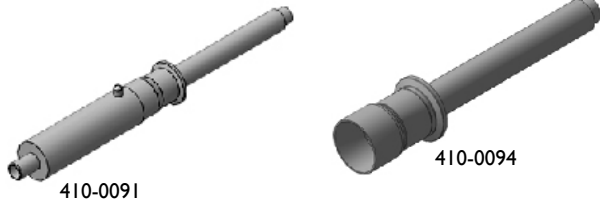
## COMPUTER

The user interface PC includes a desktop computer with 17" LCD monitor, keyboard and mouse, which interface with the Programmable Logic Controller and allows for upgrades. Included with the Typhoon Chamber.



DESKTOP PC	300-0104
MONITOR – 17"	300-0095

## VACUUM JACKETED LN<sub>2</sub> INLET MANIFOLD ADAPTOR



MALE BAYONET ADAPTOR 3/4" NPT 410-0091  
 VJ LINE INTRICATE MALE ADAPTOR 410-0094

\*\* If you currently have VJ piping, please contact Qualmark.

## CALIBRATION KIT

Includes vibration meter, accelerometer and thermocouple calibration equipment required to calibrate the OVS vibration and thermal system.



OVTT CAL KIT

DOMESTIC CALIBRATION KIT (120VAC)	956-0065
INTERNATIONAL CALIBRATION KIT (230VAC)	956-0066
OVTT CALIBRATION KIT (120VAC)	956-0098
OVTT CALIBRATION KIT (230VAC)	956-0109

## Q-LINK SOFTWARE

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 785-1896

## OXYGEN SENSOR

An intrinsically safe 4-20mA oxygen detector. Has a single channel control panel which is an alarm only apparatus providing two independent user configurable alarm relays which can be used to control external visual or audible alarms. The deluxe model includes an LCD display monitor and multiple relay outputs.



NO DISPLAY (NON-CE)	785-1076
DELUXE WALL-MOUNT WITH LCD DISPLAY (CE)	300-0051

## QUALMARK SPECTRUM ANALYZER

This economical, high quality unit can acquire, process and display up to six channels of vibration data in both time and frequency domains. Data can be displayed on a single graph or on up to six separate graphs. Package



includes data acquisition 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. (see item PCBV352A10/AC).

SA KIT: DOMESTIC, 120VAC 60Hz (6 CHANNELS)	785-1048
SA KIT: INTERNATIONAL, 230VAC 50 Hz (6 CHANNELS)	785-1049
SA KIT: INTERNATIONAL, CE, CE230VAC, 50 Hz (4 CHANNELS)	785-1155
SA & PC KIT: SPEC ANALYZER & PC DOMESTIC (120V)	785-1796
SA & PC KIT: SPEC ANALYZER & PC INTERNATIONAL (230V)	785-1770
SA & PC KIT: SPEC ANALYZER & PC INTERNATIONAL/CE	785-1771

## HALT FIXTURE KIT

This starter kit includes everything needed to fixture product for HALT testing. The kit contains a basic set of fixturing pieces; an assortment of aluminum extrusions and fasteners, all-thread rods and quick-threading split nuts.



CHAMBERS 4.0, 3.0, 2.5	
DOMESTIC HALT FIXTURE KIT	750-0116
METRIC HALT FIXTURE KIT	750-0163
CHAMBERS 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 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

## ADHESIVE-MOUNT ACCELEROMETER KIT

Designed to mount directly onto product being tested. The Kit can be used for redundant vibration control or data collection. Kit includes an Accelerometer with BNC Connector, mounting wax and adhesive.



KIT

PCBV352A10/AC

## MULTIPLE DEWER KIT

Consists of necessary fittings and two cryogenic check valves to allow two LN2 Dewars to be used simultaneously on a system. This allows a system using dewars to achieve higher thermal rate changes, as well as allowing easier replacement of spent dewars. Kit includes; two cryogenic check valves, two hose insulations, and two braided hoses with flare fittings.

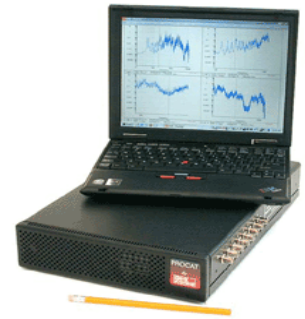


CHAMBER 4.0	
KIT for VJ MANIFOLD	956-0100
CHAMBERS 2.5/3.0	
KIT for VJ MANIFOLD	956-0127
CHAMBERS 1.5/2.0	
STANDARD KIT	956-0124

**\*\*NOTE** - Typhoon Chambers may not achieve specified ramp rates if portable dewars are used.

## GHI SPECTRUM & FATIGUE ANALYZER

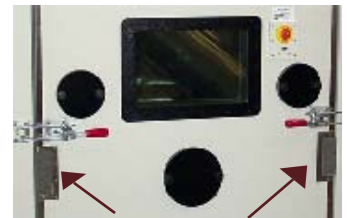
ProCAT 8-parallel-channel Spectrum & Fatigue Analyzer offers advanced capabilities such as overlays, transfer functions, streaming to disk, triax measurements, and fatigue analysis. Tailored for HALT/HASS systems, easy Windows operation requires no training. Time-domain screen displays waveform and measured Grms for all 8 channels. High resolution of 12,500 lines, single and quad spectrum plots, spectrum overlays of new and historical data to document and track machine performance, progressive zoom expansion defines spectral bandwidth and reveals enhanced spectrum details. Full set of analytic functions with selectable averaging include PSD, Transfer Functions with Phase Coherence, FFT, Fatigue Damage Potential Spectrum, Triaxial Resultant Grms over time, Waterfall, stream/recall large blocks of data, export data files or results in ASCII. BNC input box and 2 PCI cards have anti-alias filters and signal conditioning for desktop PCs, may be installed in Qualmark Controller PC or a separate PC.



DESKTOP WITH PC	300-0146
DESKTOP WITHOUT PC	300-0147

## CABLE NOTCHES

Additional notches for increased cable access inside the chamber. Foam plugs are provided.



Lower Position

CHAMBER 2.5 & 3.0	
LOWER POSITION	956-0110
UPPER POSITION	956-0131
CHAMBER 1.5, & 2.0	
4" CABLE NOTCH	956-0119

## DUAL PORT WINDOW ADAPTOR KIT

The optional dual port window adaptor kit converts the standard user side window to two 6" x 10" access ports. Available only on the Typhoon 2.5 and 3.0.



KIT STANDARD FRONT	785-1579
KIT LOWER FRONT	956-0132
KIT UPPER FRONT	956-0133
KIT BACK	956-0134

**REDUNDANT VIBRATION KIT  
ACCELEROMETER H-T**

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, Dytran 10-32 accelerometer, and booted 10-32 to BNC cable.



H-T, 10mV/g KIT  
Chamber 8.0

785-1444  
785-0743

**AUXILIARY THERMOCOUPLE CHANNEL KIT**

Kit consists of a PLC thermocouple module which adds 6 thermocouple channels to the standard 4 included on the chamber (Total of 10 thermocouple channels). Chambers Typhoon 4.0, Typhoon 3.0, and Typhoon 2.5 only.



KIT (Factory Installed) 785-1452  
RETRO KIT (Installed on-site) 785-1451  
72", 24AWG, type TT, THERMOCOUPLE ONLY (not furnished with kit) 785-1537

**KEEPFUL VACUUM INSULATED LIQUID LEVEL**

The Keepful 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 ensure reliable cold steps and ramps.



KIT 410-0077

**ELEVATION STAND**

Raises the Typhoon 2.5 or 3.0 chamber 11-3/4." This also raises the table height.

CHAMBERS 2.5 & 3.0 785-1590

**SEISMIC HOLD DOWN CHANNEL KIT**

The seismic hold down kit contains brackets for securing the chamber to the floor.

CHAMBER 4.0 785-1461

**DOOR LOCK KIT (TYPHOON 1.5/2.0)**

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

Typhoon 1.5/2.0 785-1669

**AIR PURGE DOOR LOCK KIT (TYPHOON 2.5/3.0)**

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 chamber doors to be opened.

Factory Installed Typhoon 2.5/3.0 785-1668  
On-Site Install 785-1772

**AIR PURGE KIT (TYPHOON 4.0)**

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 chamber doors to be opened.

Typhoon 4.0 Only 785-1762

**TYPHOON 8.0 ADDITIONAL WINDOWS**

ADDL.Windows in Front (18" x 12") 956-0146  
ADDL.Windows in Door (12" x 18") 956-0147

## CERTIFICATE(S)

USDA ISPM15 (HEAT TREAT)	920-0105
ORIGIN	920-0063
QUALITY	920-0064
QUANTITY (TEST REPORT OF ORIGIN)	920-0065
NAFTA ORIGIN	920-0104

## CE KIT

The CE (Certified European) 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.

CHAMBER: 8.0	785-1791
CHAMBER: 4.0	785-1462
CHAMBERS: 3.0, 2.5	785-1412
CHAMBERS: 2.0, 1.5	785-1589
CHAMBERS: 2.0, 1.5 (3 PHASE)	785-1931

## LAY DOWN CRATING

Crating to accommodate shipment of the Typhoon 4.0 and the Typhoon 8.0 on its side. Please consult Qualmark when you are considering this option.

LAY DOWN CRATING	980-0503
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## Stationary Air Compressors

Compressed air solutions to help you operate with greater efficiency, economy and productivity. Fans, coolers, oil-separators, controls, air inlet filters, integrated refrigerant dryer, moat, element and drive management are all included in one package with superior performance.



### THE AIR COMPRESSORS OFFER:

- Low installation costs
- Minimal floor space required
- No piping or separate room needed
- Single point connection for power and monitoring
- Low running costs
- Low noise levels
- Absolute reliability and high efficiency
- Low maintenance costs and service friendly
- All worldwide interfaces for remote control & communications available
- Elektronikon® controls

Air compressors available on all OVTT and Typhoon Chamber Models. Please speak to a Qualmark representative to find the right compressor that meets your requirements.

## SPARES KITS

Spares Kits contain commonly used components in a chamber that are replaceable, such as, fuses, filters, light bulbs, heater coils, cables, contactors, etc.

### CHAMBER 4.0

KIT-A (Standard), 400V or 480V (must specify):  
Request document 920-0090 for spares kits inventory.

KIT – B (Deluxe), 400V or 480V (must specify):  
Request document 920-0090 for spares kits inventory.

### CHAMBERS 3.0, 2.5

KIT-A (Standard), 400V or 480V (must specify):  
Request document 920-0088 for spares kits inventory.

KIT –B (Deluxe), 400V or 480V (must specify):  
Request document 920-0088 for spares kits inventory.

### CHAMBERS 2.0, 1.5

KIT-A (Standard), 208V or 230V (must specify):  
Request document 920-0091 for spares kits inventory.

KIT – B (Deluxe), 208V or 230V (must specify):  
Request document 920-0091 for spares kits inventory.

### OVTT

Request document 920-0154 for spares kits inventory.

### CHAMBER 4.0 & 8.0

KIT – A (STANDARD), 400V	956-0117
KIT – A (STANDARD), 480V	956-0115
KIT – B (DELUXE), 400V	956-0118
KIT – B (DELUXE), 480V	956-0116

### CHAMBERS 3.0, 2.5

KIT – A (STANDARD), 400V	956-0113
KIT – A (STANDARD), 480V	956-0111
KIT – B (DELUXE), 400V	956-0114
KIT – B (DELUXE), 480V	956-0112

### CHAMBERS 2.0, 1.5

KIT – A (STANDARD), 208V	956-0120
KIT – A (STANDARD), 230V	956-0122
KIT – B (DELUXE), 208V	956-0121
KIT – B (DELUXE), 230V	956-0123

### CHAMBERS 2.0, 1.5 (3 PHASE)

KIT – A (STANDARD), 208V	956-0150
KIT – A (STANDARD), 230V	956-0148
KIT – B (DELUXE), 208V	956-0151
KIT – B (DELUXE), 230V	956-0149

KIT - OVTT	956-0097
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Qualmark provides expert services and offers professional programs designed to ensure maximum value delivery. Qualmark offers a variety of training, covering all aspects, from maintaining your Qualmark equipment to implementing accelerated stress testing. Our focus is on the way vibration technology can be utilized to support business goals.

## ANNUAL SERVICE LEVEL AGREEMENTS

### PLATINUM

One calibration by a factory trained technician.  
 Certification traceable to NIST provided.  
 Four preventative maintenance visits.  
 A factory-trained technician will perform a 35 point inspection and cleaning of your system. Service reports and a copy of the checklist will be provided.  
 10% discount on any additional labor.  
 5% discount on parts.

### GOLD

One calibration by a factory trained technician.  
 Certification traceable to NIST provided.  
 Three preventative maintenance visits.  
 A factory-trained technician will perform a 35 point inspection and cleaning of your system. Service reports and a copy of the checklist will be provided.  
 10% discount on any additional labor.  
 5% discount on parts.

### SILVER

One calibration by a factory trained technician.  
 Certification traceable to NIST provided.  
 Two preventative maintenance visits.  
 A factory-trained technician will perform a 35 point inspection and cleaning of your system. Service reports and a copy of the checklist will be provided.  
 10% discount on any additional labor.  
 5% discount on parts.

CHAMBER	PLATINUM	GOLD	SILVER
TY 1.5	960-0085	960-0090	960-0095
TY 2.0	960-0086	960-0091	960-0096
TY 2.5	960-0087	960-0092	960-0097
TY 3.0	960-0088	960-0093	960-0098
TY 4.0	960-0089	960-0094	960-0099

## ANNUAL PARTS PLAN

A pre-paid plan for test chamber parts. This is for customers who have completed Qualmark's service training and can maintain chamber performance without the need of a service representative. All chamber parts are covered under this agreement.

OVTT	960-0105
CHAMBER 1.5	960-0100
CHAMBER 2.0	960-0101
CHAMBER 2.5	960-0102
CHAMBER 3.0	960-0103
CHAMBER 4.0	960-0104

## ANNUAL CUSTOMER ASSURANCE PLAN

Qualmark's Customer Assurance Agreement is a prepaid program representing a 10% discount on service work and a 5% discount on parts. The service work can be used for preventative maintenance, calibration, or for any additional services needed. (Discount applies only to the Customer Assurance Plan value).

SERVICE NUMBER 960-0083

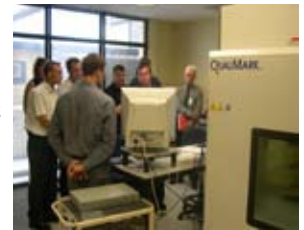
## QUALMARK PROJECT MANAGEMENT

Qualmark's project management services provide a straightforward path for implementing a successful HALT/HASS program at your facility, customized to meet all of your unique needs. Qualmark's project management methods define outcomes, coordinate multiple resources and track processes for achieving agreed goals.

SERVICE NUMBER 985-0039

## AUTHORIZED SERVICE TRAINING ONSITE

This three day service training course is conducted at the customer site. Travel expenses for Qualmark personnel are billed at cost plus 10%. The customer must provide the appropriate facility to conduct the training (training or conference room). This course provides the skills necessary for operation, maintenance, troubleshooting and repair of a Qualmark system. Classroom instruction includes; system components, wiring diagrams/schematics, profile development and PID tuning. Hands-on operation and troubleshooting is conducted on the customer's system.



SERVICE NUMBER 985-0026

## SYSTEM TRAINING

This training is similar to the training performed at the time of system commissioning. This training can be used to expand or repeat the system training performed at commissioning to meet the needs of new on-site system operators.

SERVICE NUMBER 985-0004

*\*\*Travel expenses are billed separately.*

## APPLICATION TRAINING

Highly experienced Qualmark application engineers are available to assist customers in HALT and HASS development specific to the customer product(s).

SERVICE NUMBER 980-0035

*\*\*Charge is per day. Travel expenses are billed separately.*

## WEB BASED EDUCATION (WBE)

WEB BASED EDUCATION (WBE) QUALMARK'S self-paced training curriculums enable our customers to rapidly adopt accelerated testing methodology, become certified in the correct operation of HALT (Highly Accelerated Life Testing) chambers, and enjoy a faster return on investment. These online, self-paced, classes are ideal for training new test personnel and maintaining a proper knowledge base. They are a great cost-effective training solution for training test engineers and technicians deployed in various locations throughout the world.

### BASIC CHAMBER OPERATION:

This course addresses the skills needed for an operator to set up and run a Qualmark chamber according to test parameters established by another job function. Topics range from chamber introduction and safety to sensor placement and working with Typhoon Manager.

### CHAMBER AND TEST CONFIGURATION:

This course is designed to help customers determine the aspects of testing a specific product. It introduces the chamber-specific skills required to set up a proper product test, including chamber tuning and detailed profile creation.

### 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.

### 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.

### PERPETUAL SITE LICENSE:

Available across a company operating under same name, multiple divisions. Ensures unlimited ongoing annual access for up to 25 seats per year. 15% maintenance per year for access beyond the first year.

BASIC CHAMBER OPERATION	985-0030
CHAMBER AND TEST CONFIGURATION	985-0031
HALT BEST PRACTICES	985-0032
SITE LICENSE	985-0033
PERPETUAL SITE LICENSE	985-0037
BUNDLED 3 PACK	985-0038

The bundled package includes: Basic Chamber Operations, Chamber and Test Configuration, and HALT Best Practices.

## UPGRADES



### Benefits of a NEW xLf vibration table: (xLf Upgrade)

- More enhanced energy at the lower frequency
- Can precipitate defects the old tables could not
- Better frequency consistency across the spectrum
- New hammer design with a longer life
- Flatter spectrum

### Benefits of a NEW Typhoon Manager: (PLC Upgrade)

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

**\*\*Note:** A new PLC upgrade might require a table upgrade.

TABLE XLF UPGRADE:		PLC UPGRADE:	
TYPHOON 1.5	785-1562	TYPHOON 1.5	956-0130
TYPHOON 2.0	785-1506	TYPHOON 2.0	956-0128
TYPHOON 2.5	785-1239	TYPHOON 2.5	956-0125
TYPHOON 3.0	785-1486	TYPHOON 3.0	956-0126
TYPHOON 4.0	785-1240	TYPHOON 4.0	956-0129



For years, Qualmark has refined what are now widely considered the most effective product reliability and screening techniques available: Highly Accelerated Life Test (HALT) and Highly Accelerated Stress Screen (HASS). The 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. Qualmark offers partner test centers where you can test a product using the HALT and HASS techniques without having to own a chamber. This gives companies the advantage of bringing their product to market faster, free of design flaws and within budget. Contact us today to find your nearest test center.



### ON-SITE SERVICES

Specialized HALT/HASS testing and/or HALT/HASS training on the customer's equipment, at their site, with their product.

SERVICE NUMBER **980-0036**

### HASS DEVELOPMENT

Our engineers will develop a custom production screen to identify process and vendor defects that can compromise product reliability. The goal in HASS is to verify that the production process does not impact the reliability gained through the proper implementation of the HALT process.

HASS DEVELOPMENT HASS PROOF OF SCREEN **980-0140**

*\*\*Requires a qualified HALT test report & validated HASS fixture*

### CONSULTING SERVICES

Our staff of experienced engineers will work with customers to conduct the type of tests needed. Qualmark can help maximize the efficiency and effectiveness of existing protocols and procedures to meet any customer goal.

SERVICE NUMBER **980-0161**

### TESTING SERVICES

The 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. Let our team of experienced test professionals assist you in conducting optimum reliability testing.

HALT (HIGHLY ACCELERATED LIFE TEST) **980-0138**  
 PRODUCTION HASS (HIGHLY ACCELERATED STRESS SCREEN) **980-0142**

### CUSTOMER DEFINED TEST SERVICES

Customer Defined Testing may not strictly follow the accelerated life testing process as defined by Qualmark; 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.

*Types of customer defined testing available:*

- Customer Directed Testing Service
- Production Screening
- Vibration or Thermal Only Testing
- Thermal Cycling

SERVICE NUMBER **980-0139**

## QUALMARK WARRANTIES

By purchasing products from Qualmark Corporation or any of its subsidiaries (Ling Electronics or ACG Dynamics) ("Qualmark"), buyer ("buyer") agrees to be bound by the following warranties, terms and conditions:

### Limited Warranties

#### New and Rebuilt Systems/Shakers (HALT/HASS and Electrodynamic Systems) ("systems").

Qualmark warrants the workmanship of new and rebuilt systems purchased for one year from date of shipment. If a system fails within 90 days from the date of shipment, the system will be repaired at no charge, including parts, labor or travel. If a system fails more than 90 days from the date of shipment, the system will be repaired at no charge for parts or labor (travel expenses will be billed to the buyer at Qualmark's cost).

#### OVTT (Omni Vibration Table Top) System.

Qualmark warrants the workmanship of a newly-purchased OVTT system for one year from date of shipment. If an OVTT system fails within the one-year from the date of shipment, the OVTT will be repaired at no charge for parts or labor (travel expenses will be billed to the buyer at Qualmark's cost).

### Equipment Upgrades

Qualmark warrants equipment upgrades for 6 months (on the upgraded parts only) from date of shipment. If the upgraded portion of a system fails within 6 months from the date of shipment, the upgraded parts will be repaired or replaced at no charge for parts or labor (travel expenses will be billed to the buyer at Qualmark's cost).

### Replacement Parts

Qualmark warrants replacement parts for 90 days from date of shipment. If a part fails within 90 days from the date of shipment, the part will be repaired or replaced at no charge to the buyer for parts only.

### Buyer Installation

With respect to any warranty set forth above, Qualmark may, at Qualmark's option, ship replacement parts to the buyer for buyer installation with appropriate instruction from Qualmark. If the buyer requests that Qualmark perform the repairs, travel and labor expenses will be billed to the buyer at Qualmark's cost.

### Intended Use Guidelines

Qualmark publishes from time to time guidelines regarding the proper use of its products. Warranty coverage may be invalidated in cases where, in Qualmark's sole opinion, a buyer or operator uses products outside these guidelines. A listing of current guidelines may be found on Qualmark's company website ([www.qualmark.com](http://www.qualmark.com)).

### Transfer of Warranty Coverage between Countries

All of Qualmark's limited warranties are valid only within the country where the systems, upgrades or parts were originally purchased. If a buyer installs a system in a different country, Qualmark's warranty coverage automatically reverts to "parts-only" coverage. If the buyer wishes to obtain continued warranty service coverage for their system, a separate service contract must be established with Qualmark or a Qualmark-authorized service agent within the country where the system is installed.

### Warranty Limitations

The above limited warranties do not apply to any Qualmark product that has been damaged or rendered defective for any of the following reasons:

As a result of accident, misuse, misapplication or abuse;

By use of the product in a manner not in conformance with its published specifications or intended use guidelines; By use of parts not manufactured or sold by Qualmark specifically for use with the applicable product; By use of the product with other products, systems, or software not manufactured, sold or recommended by Qualmark; By modification without prior written permission of Qualmark; or As a result of service by anyone other than a Qualmark service representative or an authorized Qualmark third-party service provider.

*Software is not included in this limited warranty. It is covered by its own warranty as set forth in the Software License included in the Qualmark software.*

### Exclusive Remedy; No Implied Warranties; Disclaimer of Liability.

THE FOREGOING EXPRESS WARRANTIES ARE THE EXCLUSIVE REMEDIES OF THE BUYER, AND ARE IN LIEU OF ALL OTHER WARRANTIES, WHETHER WRITTEN, ORAL OR IMPLIED, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. QUALMARK EXPRESSLY DISCLAIMS ALL WARRANTIES NOT EXPRESSLY STATED HEREIN. TO THE FULL EXTENT PERMITTED BY APPLICABLE LAW, UNDER NO CIRCUMSTANCES SHALL QUALMARK BE LIABLE TO THE BUYER, OR ANY OF ITS CUSTOMERS, FOR DAMAGES ARISING OUT OF THE USE OF, OR INABILITY TO USE, THE QUALMARK PRODUCT, OR FOR ANY DAMAGES OR EXPENSES OF ANY KIND WHATSOEVER ARISING OUT OF THE USE OF PRODUCTS TESTED BY THE QUALMARK PRODUCT. QUALMARK SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING, WITHOUT LIMITATION, DAMAGES FOR LOSS OF GOODWILL, PROFITS, DATA, OR BUSINESS INTERRUPTION ARISING OUT OF QUALMARK'S ACT OR FAILURE TO ACT, AND WHETHER SUCH DAMAGES ARE LABELED IN TORT, CONTRACT, PRODUCT LIABILITY OR OTHERWISE, EVEN IF BUYER HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. IN NO EVENT SHALL QUALMARK BE LIABLE FOR AN AMOUNT GREATER THAN THE AMOUNT PAID HEREUNDER. THE LIMITATIONS SET FORTH IN THIS SECTION SHALL APPLY EVEN IF ANY EXCLUSIVE REMEDY IN THESE TERMS AND CONDITIONS FAILS OF ITS ESSENTIAL PURPOSE.

## ADDITIONAL TERMS AND CONDITIONS

**UTILITIES.** Services required for operating the system (e.g., electrical power, LN2, and compressed air) are the purchasers' responsibility. The purchaser is responsible for connecting the required services to the system, unless this is specifically contracted with Qualmark. Equipment approval drawings, including all required utilities, will be provided to the purchaser in a timely fashion after order placement.

**RIGGING.** Unloading the system from the common carrier and locating the equipment at its site shall be the responsibility of the purchaser.

**BUILDING ALTERATIONS.** Any penetrations or alterations to the facility are the responsibility of the purchaser. These may include, but are not limited to, securing the equipment to the building floor; if required, and providing any building supports or hanging devices for supporting interconnecting material. Any facility modifications such as window, door, or roof removal and replacement are the sole responsibility of the purchaser.

**PRICING.** Quoted prices do not include VAT, National, Federal, State or Local taxes or any import duties or taxes. Taxes, whenever applicable, shall be brought to the attention of the seller prior to the issuance of invoice for inclusion, and as a separate charge, to be paid by the purchaser.

**F.O.B.** All prices are quoted F.O.B. Qualmark shipping point, or as otherwise specified in quotation. F.O.B. Qualmark means that title ownership transfers to the purchaser when the product leaves Qualmark's shipping dock and that shipping and insurance costs from the Qualmark shipping point, are the responsibility of the purchaser.

**SHIPPING.** Unless otherwise specified on the purchase order, all freight will be shipped by Qualmark's chosen carrier(s) on a collect basis (paid by the purchaser). All orders quoted freight not included.

**INVOICE SCHEDULE.** Ling Electronics (Electrodynamic) orders that exceed \$25,000: 1/3 is due at receipt of order, 1/3 is due prior to shipment, 1/3 is due Net 30 from invoice date. Qualmark (HALT/HASS) orders that exceed \$50,000: 1/3 is due at receipt of order, 1/3 is due prior to shipment, 1/3 is due Net 30 from invoice date.

All remaining orders: The total order amount will be invoiced at shipment of the equipment and will be due Net 30 days from invoice date.

**PAYMENT TERMS.** All prices quoted herein are in U.S. funds. All equipment for shipment outside of the USA is subject to payment in full or confirmed irrevocable letter of credit drawn in favor of Qualmark on a US bank before the equipment can be released for shipment.

**DELIVERY.** Delivery dates quoted are reasonable estimates based on situations at the time of the issuance of the quotation.

**CANCELLATION.** Orders canceled by purchaser prior to ship date require a payment of 50% of quoted price for incurred material costs. All orders processed and shipped are final.

**VALIDATION.** Proposal shall remain valid for 30 days unless otherwise specified. Qualmark reserves the right to revise prices and specifications detailed within this proposal after the stated, lapsed date. No verbal orders will be accepted by Qualmark; purchase orders are subject to acceptance and written acknowledgment. Qualmark cannot be held responsible for any misapplied product, nor for consequential damages arising from the use of its product. No claims for damages or missing merchandise will be considered if made more than 15 days after the date of shipment. No returned materials will be honored without prior approval.

**CHOICE OF LAW; FEES.** All disputes arising out of or related to any sale or these Terms and Conditions shall be determined under the law of the State of Colorado without regard to its conflict of laws provisions. Neither the sale of products hereunder, nor these Terms and Conditions, shall be subject to the United Nations Convention on Contracts for the Sale of Goods. No action arising out of or related these Terms and Conditions may be brought more than one (1) year after the claiming party knew or should have known of the cause of action. In the event any proceeding or lawsuit is brought by either party in connection with this Agreement, the prevailing party in such proceeding will be entitled to receive its costs, expert witness fees and reasonable attorneys' fees, including costs and fees on appeal.

**NONDISCLOSURE.** The parties understand and acknowledge that information disclosed by either of them to the other may be confidential in nature and proprietary to the party providing the information (the "Disclosing Party"). Any such information so identified by Disclosing Party shall remain the sole property of Disclosing Party, and the party receiving the information (the "Receiving Party") shall protect its confidentiality by not copying, disseminating, or otherwise disclosing to any third party the substance of any such information for a period of two years following disclosure. On request, copies of any such information shall be returned to the Disclosing Party. The provisions of this paragraph shall not apply to information that is: (i) already rightfully in the Receiving Party's possession without a nondisclosure obligation; (ii) developed independently by the Receiving Party; (iii) publicly available when received, or thereafter becomes publicly available through no fault of the Receiving Party; or (iv) disclosed by the Disclosing Party to a third party without a nondisclosure obligation.

**EXPORT.** Buyer agrees to comply strictly with all applicable U.S. and foreign export, import and re-export laws and regulations.

**MODIFICATION.** Any modification of any term or condition of these Terms and Conditions shall be effective only if in writing and signed by authorized representatives of both parties. No other act, usage, or custom shall be deemed to modify these Terms and Conditions.

**WAIVER.** Any waiver of any default or breach of these Terms and Conditions shall be effective only if in writing and signed by an authorized representative of the party providing the waiver. No such waiver shall be deemed to be a waiver of any other or subsequent breach or default.

**SEVERANCE.** If any provision of these Terms and Conditions is held to be invalid, the remaining portions of these Terms and Conditions shall remain in full force.

**ASSIGNMENT.** Neither party may assign any agreement of sale or these Terms and Conditions, in whole or in part, without the written consent of the other party and any such attempt at assignment shall be void. Notwithstanding the immediately preceding sentence, either party may assign an agreement of sale, subject to these Terms and Conditions, to an entity that is wholly-owned by the party or, in the event of a sale of all or substantially all of its assets or equity, each without the consent of the other party. These Terms and Conditions shall extend to and be binding upon any successors and permitted assigns of the parties.

**NON-EXCLUSIVITY.** These Terms and Conditions shall not be construed to limit either party's right to deal with any other entities.

**FORCE MAJEURE.** Neither party shall be in default under these Terms and Conditions by reason of its delay in the performance of, or failure to perform, any of its obligations under these Terms and Conditions, other than obligations to make any payments due under these Terms and Conditions if, and to the extent, such delay or failure is caused by circumstances beyond the control of the party, including but not limited to strikes, acts of God or the public enemy, delays in transportation or supplies, failure of computer systems, government action, or riots. Upon claiming any excuse or delay under this section, such party shall promptly so notify the other party, use reasonable efforts to remove the cause, and continue its performance under these Terms and Conditions whenever the cause is removed.

**INDEPENDENT CONTRACTORS.** Neither these Terms and Conditions nor the sale of products hereunder shall be construed as constituting a partnership, agency, distributorship, or joint venture between the parties. Neither party shall have any right to obligate or bind the other party in any manner whatsoever, and nothing herein shall give, or be intended to give, any rights of any kind to any third persons.





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