



MTS SafeGuard™ Technology

Solutions to protect test operators, equipment and specimen

MTS PROVIDES **INDUSTRY-LEADING SAFETY TECHNOLOGY** FOR
HYDRAULIC SYSTEM CONTROL. THESE SAFETY SOLUTIONS CREATE A
TESTING ENVIRONMENT THAT IS SAFER FOR THE HUMAN OPERATOR AND
THAT CAN BE CERTIFIED TO PERFORMANCE LEVEL-C (PLc), PLd, AND PL_e
STANDARDS. THIS MANAGED CONTROL OF HYDRAULIC PRESSURE IS
ESSENTIAL TO MAINTAINING A SAFE OPERATING ENVIRONMENT.



Safer Operating Environment

Successful testing requires protection of the test equipment and specimen, and most importantly, the test operator. Unfortunately, many systems that are designed to ensure human safety, negatively impact testing fidelity. So, although these solutions provide a safer environment, they also impede testing productivity and compromise testing accuracy. With MTS SafeGuard™ Technology, you can create a safer environment for test operators while protecting the test equipment and specimen, and maximizing test fidelity.

Importance of Functional Safety

With the power to apply significant force at startling velocities, a test system needs to function in an accurate and safe manner to maintain a safe operating environment. Unplanned actuator movement or unexpected hydraulic pressure states must be detected and controlled quickly to provide the best possible environment for human safety.

Functional safety is a term that typically applies to electrical, electronic and programmable electronic systems, and it is defined as a system or equipment that is operating correctly in response to its inputs. Meeting functional safety requirements requires active systems to detect potentially dangerous conditions. It also requires the activation of a protective or corrective device or mechanism to prevent hazardous events or reduce escalating consequences.

Determining the Right Level of Safety

Although organizations strive to provide a safe working environment, there is still a great deal of confusion about best practices and compliance requirements for safe operation of machinery. ISO 13849 offers clear guidelines to define the potential safety risk to humans and to determine the required Safety Performance Level for each situation. This international standard is a common end-user requirement in the EU and is referenced in many other regional safety standards.

Three factors influence the required Performance Level:

1. Potential severity of injury
2. Frequency of exposure
3. Possibility of limiting the hazard

Please consult the chart at the back of this brochure for more details on the safety performance levels.

2006/42/EC MACHINERY DIRECTIVE

EN ISO 13849 Safety of machinery – Safety related parts of control systems – General principles for design

- » EN ISO 13849 is an international standard common in the EU
- » Defines required Performance Level (PLr) for safety function
- » Categorizes five Performance Levels; a through e, with e being the highest level
- » Test equipment used in the EU will typically comply with the standard
- » Applies to EU countries and countries with trade ties to the EU

GLOBAL SAFETY STANDARDS

- » Many regional safety standards, such as ANSI B11 and CSA Z432, reference ISO 13849



Without MTS SafeGuard Technology



With MTS SafeGuard Technology

Providing a safe environment for the test operator without consideration of other factors, often compromises specimen protection or testing accuracy.

MTS SafeGuard Technology provides the right level of human safety without impeding testing fidelity or productivity.

Components of the MTS SafeGuard Solution

MTS SafeGuard Technology provides PLd and PLe Compliant Solutions

MTS SafeGuard Technology can be used on any mechanical test system to provide safe power isolation and safe actuator speed control.



MTS SafeGuard 273 Processor

- » Manages safety and specimen protection
- » Scalable up to 4 stations
- » Configures to each safety system
- » 4 mounting configuration options
- » Can integrate with facility safety systems



MTS SafeGuard 274 User Interface

- » Displays system configuration, system status & fault diagnostics
- » Includes system reset function
- » Includes system e-stop function
- » 3 mounting configuration options

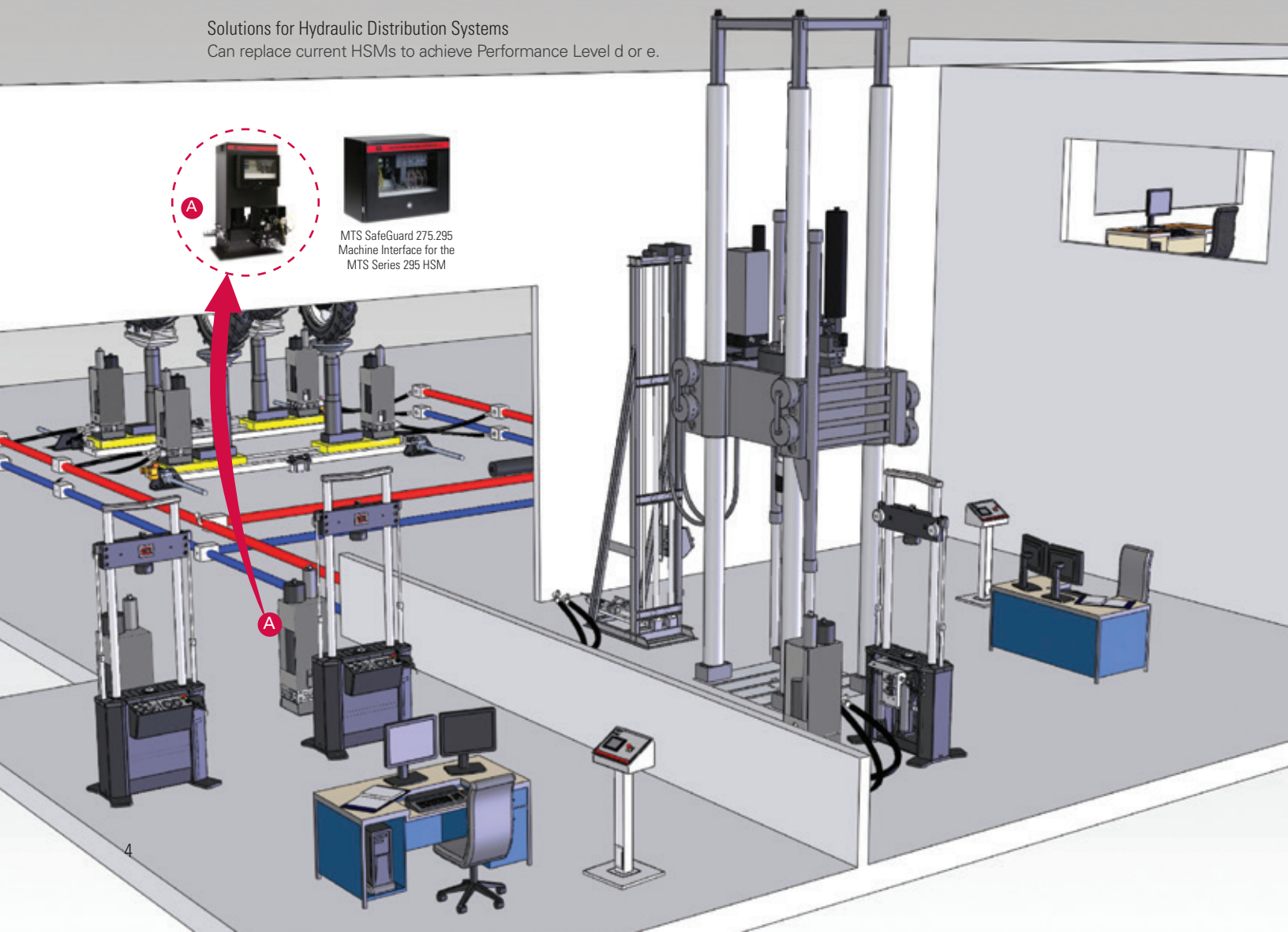


MTS SafeGuard 275 Machine Interface

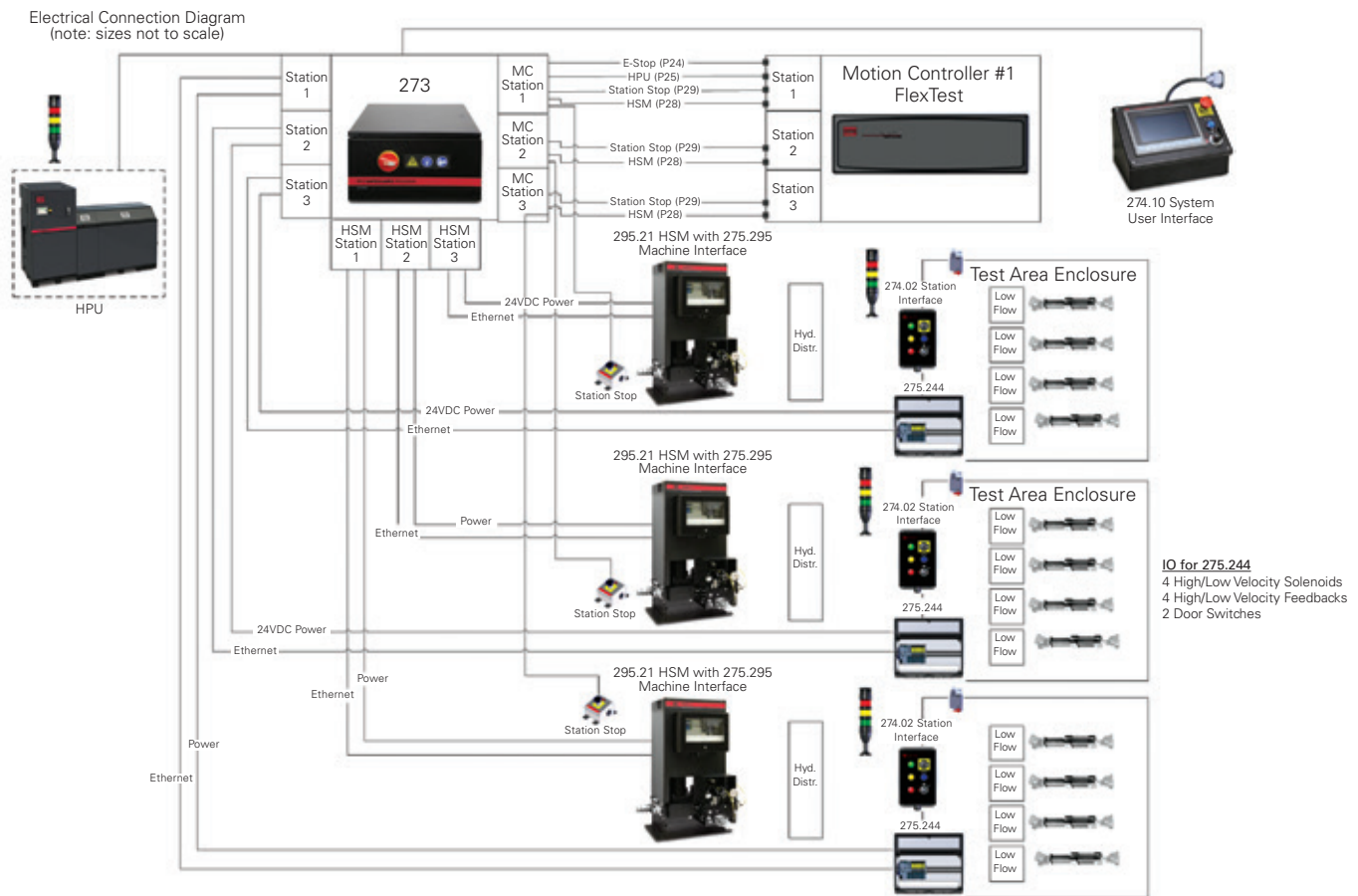
- » Connects I/O for safety functions at system (safe speed, station stop, test area enclosure)
- » Configurable per system

Solutions for Hydraulic Distribution Systems

Can replace current HSMs to achieve Performance Level d or e.

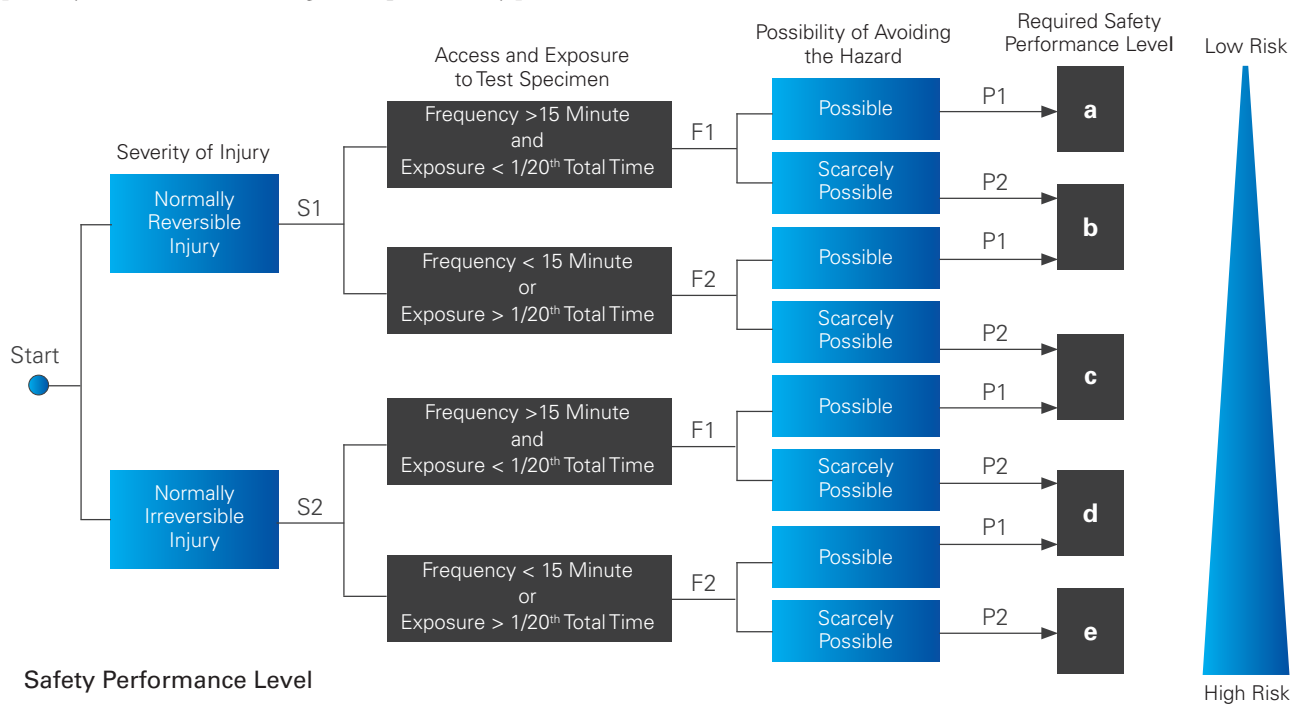


Example System Layout of an MTS SafeGuard Solution



FREQUENCY OF TEST SPECIMEN AREA ACCESS IS A CRITICAL FACTOR

A Performance Level rating of c, d or e is required to meet certain safety standards for most test equipment. Frequency of access and exposure to the test specimen area are the primary factors in determining the required safety performance level.



Determining Appropriate Safety Performance Level

Three factors influence the required Performance Level:

1. Potential severity of injury
2. Frequency of exposure
3. Possibility of avoiding the hazard

SEVERITY OF INJURY — *Slight or Serious*

The two options for classifying equipment in the severity of injury category are: slight, indicating a normally reversible injury; and serious, indicating a normally irreversible injury or death. Due to the potential for

irreversible injury or death when operating test equipment, mechanical test systems are considered to be in the serious classification, which requires a minimum of Performance Level c (PLc) for compliance.

Slight	Serious
» Normally reversible injury	» Normally irreversible injury or death
» May require up to PLc	» Most mechanical test systems would be classified in this category
	» Requires minimum of PLc

FREQUENCY AND/OR DURATION OF EXPOSURE — *Seldom or Frequent*

For test equipment, the frequency of exposure is defined as access to the specimen area. Access typically occurs in specimen loading/unloading, alignment etc. The two options for classifying equipment in the frequency of exposure category are seldom and frequent. With respect to exposure time, “seldom” is defined as accessing the specimen area

no more than once in 15 minute intervals and the accumulated exposure time does not exceed 1/20 of the overall operating time. Per this definition, the rating would be “F1” for exposure. If the test operator is accessing the specimen more than once every 15 minutes or this exposure exceeds 1/20 of the overall operating time, it is considered frequent exposure. This would

be an “F2” rating for exposure. Frequent exposure of an “F2” rating requires a minimum Performance Level d (PLd) for compliance. Seldom exposure could require a Performance Level of c or d, depending on the possibility of avoiding or limiting the hazard.

Seldom	Frequent
» Access to the test specimen area once in fifteen minute or greater intervals AND exposure less than 1/20 total time	» Access to the test specimen area more than once every fifteen minutes OR exposure more than 1/20 total time
» Requires minimum of PLc if severity = S2	» Requires a minimum of PLd if severity = S2

POSSIBILITY OF AVOIDING THE HAZARD — *Possible or Scarcely Possible*

There are two categories for possibility of avoiding the hazard or limiting the harm: possible under specific conditions or scarcely possible. A risk assessment can help determine the appropriate category. If there is a use case in which the possibility of avoiding the hazard is considered

scarcely possible and severity = S2, then this case would require a minimum of Performance Level d. If in this same case, the frequency of exposure = F2, then it would require a Performance Level e solution.

Possible	Scarcely Possible
» Possible to avoid the hazard	» Severe obstacles to avoiding the hazard
» Most mechanical test systems would be classified in this category	» Requires a minimum of PLd if severity = S2
» Requires minimum of PLc if severity = S2	

PERFORMANCE LEVEL C (PLC)

Applicable for test systems in which the test specimen area is not accessed more frequently than once every 15 minutes.

Performance Level c (PLc) is the standard option on most MTS Landmark® Test Systems. This solution requires a load frame with test area enclosure* and a FlexTest® controller. It includes a low flow power supply for safe speed control (<10 mm/s).

PERFORMANCE LEVEL D (PLd)

Applicable for test systems in which the test specimen area is accessed more than once every 15 minutes.

Performance Level d (PLd) is the standard option on MTS Landmark Test Systems that are using hydraulic pressure of 57-114 lpm (15-30 gpm). This solution requires a load frame with test area enclosure*, a FlexTest controller and a MTS SafeGuard 272 Supervisor, formerly Load Frame Station Supervisor. It includes cables and hose kit. The PLd version adds redundancy and monitoring to the already high reliability of the PLc safety circuits. In addition, a safety-rated Programmable Logic Controller arbitrates the safety functions.

PERFORMANCE LEVEL E (PLe)

Applicable for use cases where the possibility of limiting hazards is considered scarcely possible, or the risk tolerance is low.

Meeting Performance Level e (PLe) requires a custom solution. MTS has the experience necessary to create a system that meets PLe standards.

**Must be supplied by MTS to be classified as PLc or PLd compliant.*



MTS SafeGuard 272 Supervisor for use with MTS Landmark Test Systems

REQUIRED FOR PERFORMANCE LEVEL D (PLd) COMPLIANCE WHEN SEVERITY = S2 MTS SAFEGUARD 272 SUPERVISOR

- » Safety Programmable Logic Controller with single location for system AC power input/output
- » Safe Power Off / Safe Isolation: floor-standing manifold with positive isolation and dump functions
- » Safe Speed: adds monitoring to existing low flow valve and replaces the low flow power supply with LSS
- » Handset with E-stop
- » Load frame wiring harness with redundant chains to E-Stop and mode switching functions
- » Test Area Enclosure (TAE) interlock switches and tamper-resistant fasteners
- » Three-position keyed Mode Selection Switch (per EN 60204)
- » Remote E-Stop/Status box with illuminated status indicators
- » For EU deliveries, a System Level CE certification/ marking along with the applicable component certifications (Declaration of Incorporation/ Declaration of Conformity) will be provided

Benefits of MTS SafeGuard Technology

A safety system should not interfere with test system performance. MTS offers an ideal solution to maximize testing productivity and minimize risk. To be confident that your test system meets the specified safety performance level, MTS can supply System Level CE declaration along with the applicable component certifications: Declaration of Incorporation (DOI) or Declaration of Conformity (DOC) as required.

Protecting test operators, equipment and specimen are all critical to testing success. MTS provides the tools to help meet the functional safety requirements, and the test systems that perform reliably test after test. Contact MTS today to learn more about test system safety requirements.

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100-418-386c SafeGuardTechnology • Printed in U.S.A. • 08/23