진동대용 스위블 조인트 및 관련부품 규격서

COMMODITY DESCRIPTION

HS NO	ITEM NO	DESCRIPTION	UNIT	Q'TY
		Swivels Joint and Standard Accessories for Seismic Table System	System	1

A. GENERAL DESCRIPTION

1. The system should consist of Seismic Table Swivels and Standard Accessories for Seismic Table System. This system should be installed in and fully integrated to 6 DOF Seismic Simulator System that is installed at KIMM.
2. The system shall confidently meet the demands of closed-loop servohydraulic testing with MTS Series 249 Swivels. Available with or without backlash adjustment, these fatigue-rated swivels are precision-engineered to deliver the strength, durability and versatility required for optimal performance in a variety of structural testing applications.
3. These swivels shall provide unmatched quality and easy integration with MTS actuator assemblies, seismic systems and simulation tables. To minimize weight and maximize strength, the swivels are cast with fatigue-resistant ductile iron. Maintenance-free, non-metallic bearings reduce friction, eliminate the need for lubrication and increase swivel life span.
4. Series 249 swivels allow linear actuators to pivot freely at the base and rod ends. They offer high axial stiffness for exceptional high frequency testing,.
5. Series 249 models feature backlash adjustment, which removes as much relative movement as possible between system and jaws, while allowing the needed rotation for tension-compression loading cycles.

B. SYSTEM CONFIGURATION

1. Seismic Table Swivels

1.1 Swivel Base ASSY-7DEG (MTS Model 249.42) : 12ea

1.2 Swivel Base ASSY-16DEG (MTS Model 249.42) : 4ea

1.3 Installation and Check-out : 1 set

2. Standard Accessories for MTS Model 249.42 Swivel

2.1 Standard Accessories : 1set

C. TECHNICAL SPECIFICATION

1. Seismic Table Swivels

1.1 Swivel Base ASSY-7DEG (MTS Model 249.42) ————12ea

Part Name : SWIVEL BASE ASSY-249.42,7 DEG, BROKEN

Part Number : 044-157-505

Mount : Horizontal Actuator Base/Table, Vertical Base

Width 14.34inch, Length 14.00inch, Hight 8.125+9.875inch

Act Bolt MTG DIA 0.96/0.99inch

Act Bolt Head MTG DIA 1.50inch

Force Rating : 165kip

DOF Angle : 7degree bearing broken IN

1.2 Swivel Base ASSY-16DEG (MTS Model 249.42) ————4ea

Part Name : SWIVEL BASE ASSY-249.42,16 DEG, BROKEN

Part Number : 044-157-506

Mount : Vertical Table

Width 15.57inch, Length 14.00inch, Hight 8.125+9.875inch

Act Bolt MTG DIA 0.96/0.99inch

Act Bolt Head MTG DIA 1.50inch

Force Rating : 165kip

DOF Angle : 16degree bearing broken IN

1.3 Installation and Check-out ————1 set

Dis-assemble

- Seismic Table / Actuator / Swivel / Hydraulic Hose Disassemble Re-assemble
- Seismic Table / Actuator / Swivel / Hydraulic Hose Disassemble Performance Check-out
- System Operating
- System SWIVEL Adjustment
- ACCEL Mode and DOF Mode Operating

Tuning
- System Tuning on free Loading
- ACCEL Servo Valve Adjustment

Training
- MTS Hardware Concepts and Series 793 Software Course in MPLS HQ
- 5days for 2man Research Engineer

2. Standard Accessories for MTS Model 249.42 Swivel

1.1 Standard Accessories ———————— 1set

COLLAR-PRELOAD, 165KIP, W/BUMPER MOUNTAIN 8ea
- P/N 044-799-901
- Size : OD 12.50+/-0.06 IN
  ID 5.135+/-0.01 IN
- Force Rating : 165kip

MODULE-CLOSED FACE 10.00 DIA × 2.00 THK 8ea
- P/N 044-799-701

SCR-CAP, BTNHD, SKT, ZNCPL 5/16-18UNC × 3/4 32ea
- P/N 010-017-904

SCR-SKTHD, 7/8-9 UNC, 3" LG, A574, BLK OXD 64ea
- P/N 010-015-102

WASR-FLT, STL, HDN, M30, 31MMID×56MMOD×6MM 64ea
- P/N 011-873-608

NUT-TORQUE, 80K LBS PRELD 30MM × 3.5P × 5 64ea
- P/N 011-873-607

ROD-THREADED M30 × 3.5P × 15.50 LG 32ea

- P/N 043-658-604

ROD-THREADED M30 × 3.5P × 13.25 LG 32ea

- P/N 043-658-601

SHIM-ACTUATOR, . 003 THK. LAMINATES 8ea

- P/N 043-657-901

SHIM-ACTUATOR, . 003 THK. LAMINATES 20ea

- P/N 043-659-801

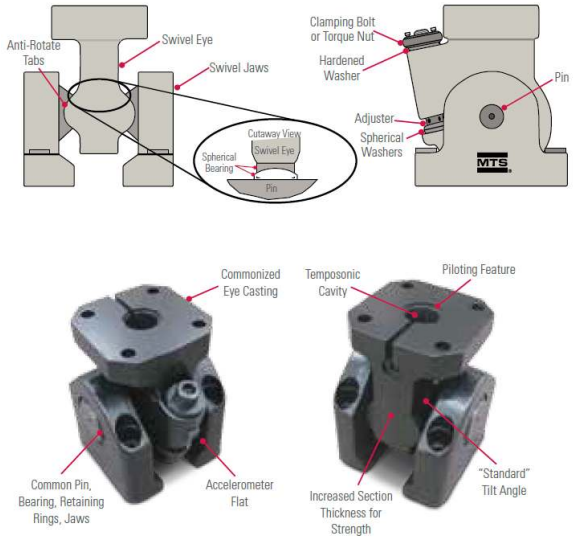
SHIM-ACTUATOR, . 003 THK. LAMINATES 12ea

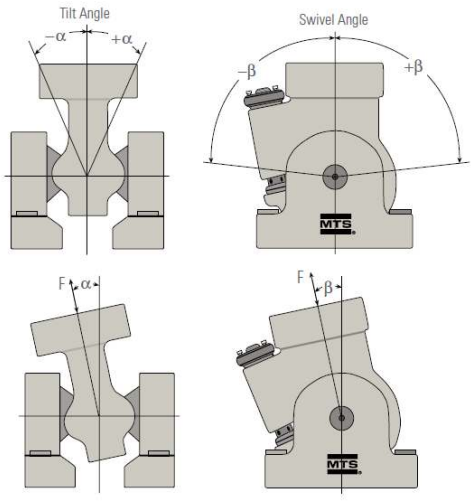
- P/N 043-257-302

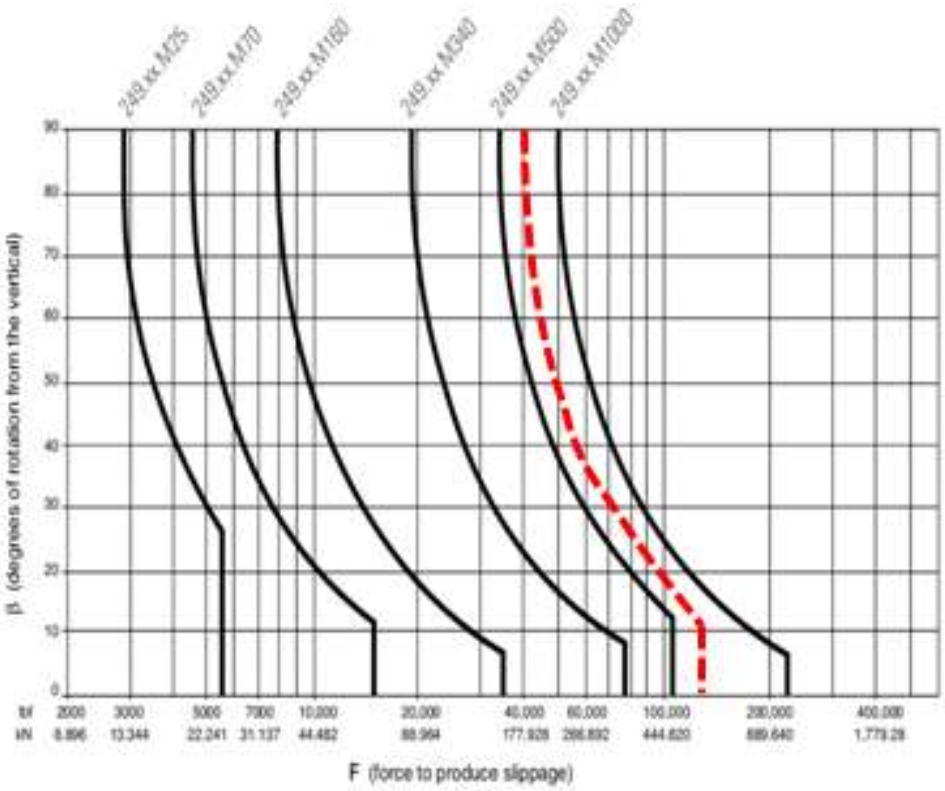
D. TECHNICAL REQUIREMENTS

1. Operating Requirements of Swivels

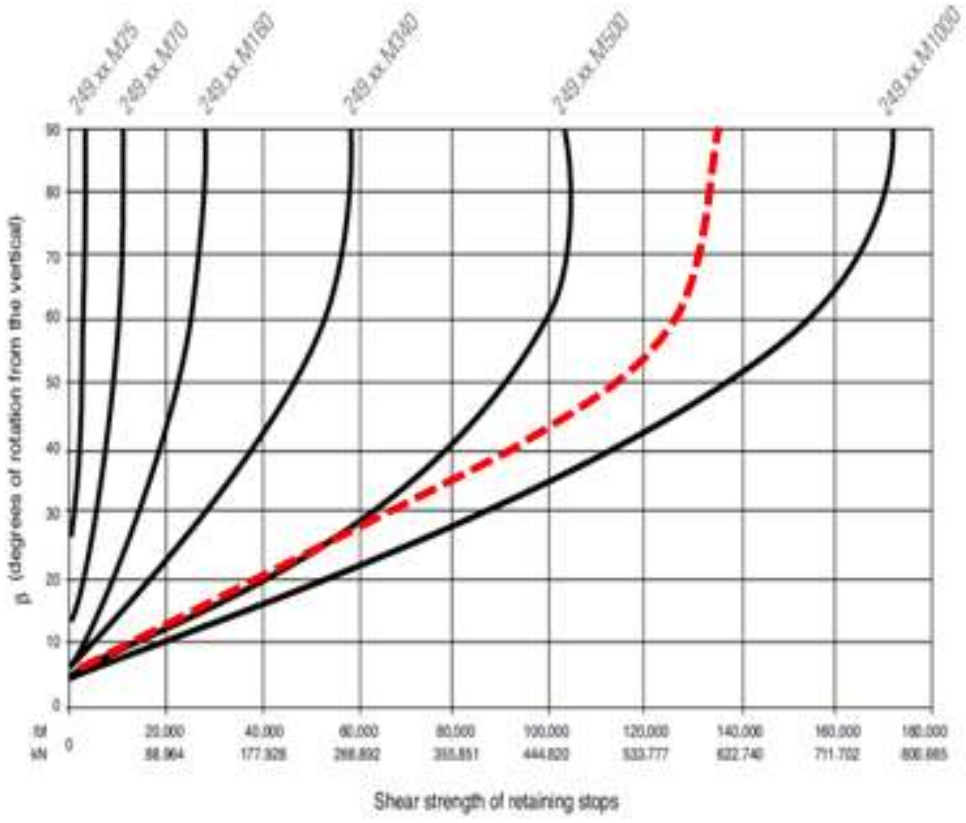
Location	TILT ANGLE (α)	SWIVEL ANGLE (β)	Clamping Bolt Torque (Nm)	FORCE RATING (kN)
Horizontal Base/Table Vertical Base	± 7 degree	- 30 ~ + 90 degree	62	730 (165kip)
Vertical Table	± 16 degree	- 30 ~ + 90 degree	62	730 (165kip)







[β(degrees of rotation from the vertical) – F(force to produce slippage) 선도]



[β(degrees of rotation from the vertical) – Shear strength of retaining stops 선도]

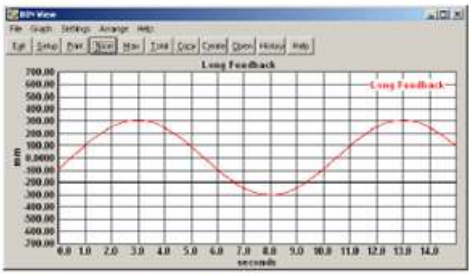
2. Performance Check Guidelines

- Displacement test (refer to examples)
- Velocity Test. (refer to examples)
- Acceleration Test (refer to examples)
- Total Harmonic Distortion Test (refer to examples)
- Frequency Response Function Test. (refer to examples)
- Earthquake Response profile Test. (refer to examples)

1. **Displacement tests**
Independently move each major axis to confirm that the maximum displacement values for degree of freedom. Capture or record the displacement event using the data recorder.

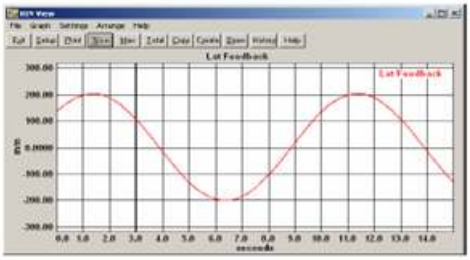
Longitudinal Displacement: +/- 300 mm

Results: Plot shows the displacement range for the longitudinal (X axis) for the system. The system was capable of achieving +/- 300 mm displacement for this test.



Lateral Displacement: +/- 200 mm

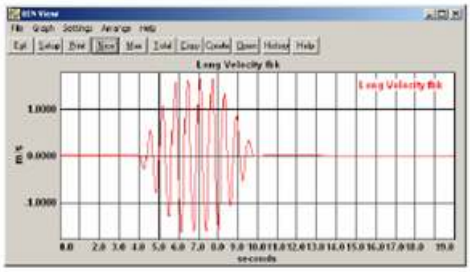
Results: Plot shows the displacement range for the lateral (Y axis) for the system. The system was capable of achieving +/- 200 mm displacement.



2. **Velocity tests**
Select and set up one degree of freedom for a sinusoidal (cyclic) motion profile to demonstrate the maximum velocity values for the bare table operation. Initiate the motion profile and capture or record the axis velocity signal using the data recorder.

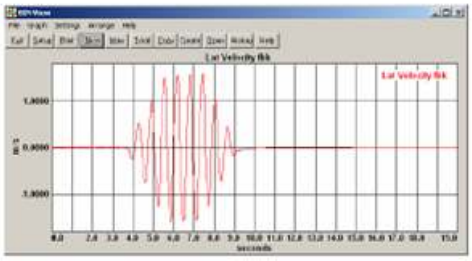
Longitudinal Velocity: +/- 1.5 m/s

Results: Plot shows that the longitudinal (X) axis was able to achieve the maximum velocity specification.



Lateral Velocity: +/- 1.5 m/s

Results: Plot shows that the lateral (Y) axis was able to achieve the maximum velocity specification.

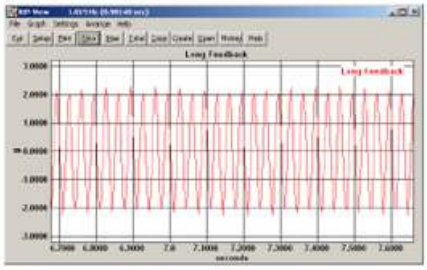


3. **Acceleration tests**

Independently set up each degree of freedom to perform sinusoidal (cyclic) motion profiles to demonstrate the maximum acceleration levels. The maximum acceleration values for the bare table condition will be higher than those shown in the specification for the "loaded" table conditions. Initiate the motion profile and capture or record the axis acceleration signal using the data recorder.

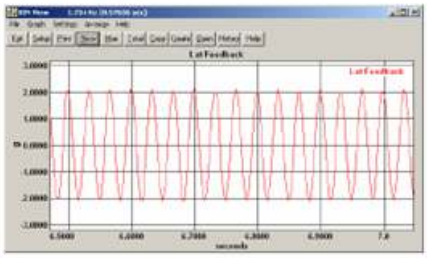
Longitudinal Acceleration: +/- 2 g

Results: Plot shows that the longitudinal (X) axis was able to achieve the acceleration specification.



Lateral Acceleration: +/- 2 g

Results: Plot shows that the lateral (Y) axis was able to achieve the acceleration specification.



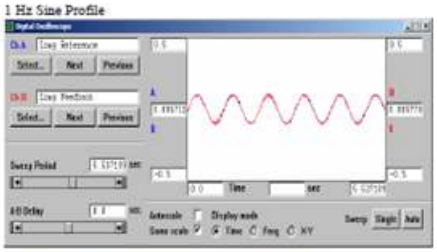
4. **Total Harmonic Distortion (THD) Test Results**

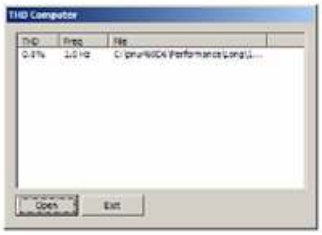
Demonstrate using sinusoidal motion profiles that the total harmonic distortion ,THD, for each axis is less than 5% without iteration techniques applied. For this test MTS will operate each axis at 5 frequencies between 0.1 and 50 hertz, (1, 5, 10, 20 & 50) and for accelerations from 0.1 g's. The THD value will be computed using a MATLAB algorithm in the controller software.

Longitudinal Axis (1, 5, 10, 20 & 50 Hz)

Results: The following plots and screen captures of the THD calculation algorithm show that the total harmonic distortion of the sinusoidal response wave profiles was 5% or less.

1 Hz Sine Profile



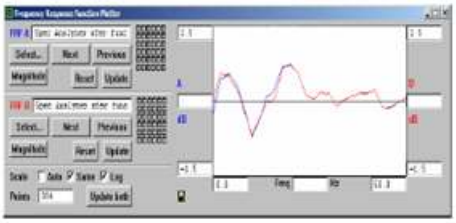


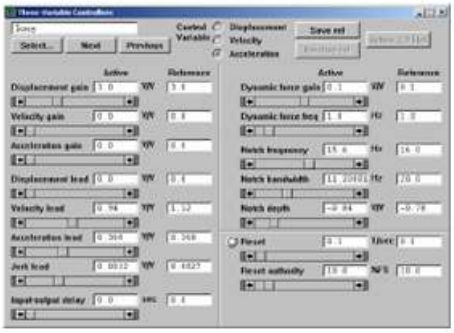
5. **Frequency Response Function Test Results**

For each axis of the table system, using random inputs, demonstrate that the frequency response function of the system, from 1 to 50Hz without iteration, must be less than +/-1.5 dB. The maximum acceleration level for each test condition will be 0.3 g's.

Longitudinal Axis (1 to 50 Hz)

Results: The following plot shows the log scale transfer function for the axis. The trace shows that the frequency response function is within specifications. A screen capture of the three variable control tuning parameters is enclosed indicating the levels used for tuning the system response.





6. **Earthquake Response Profiles**

For each table system, run or execute an earthquake record (El Centro profile). Capture and record the acceleration command and feedback signals for each axis under test. Compare the command vs feedback signals to ensure favorable system response.

Note: The earthquake profile was executed in all axes simultaneously. The plots shown below have been separated to show the response of each axis during the test.

Longitudinal Axis *

Results: The following plots show the acceleration command (reference) and feedback signals for the earthquake record profile. The first plot shows the command and feedback data for the first several seconds of the earthquake record. The second plot shows data for approximately 60 seconds of the profile. Both traces show that feedback follows the command signal acceptably.