



## Series 249 and 249N Swivels

Versatile, fatigue-rated swivels for demanding closed-loop servohydraulic testing

### Features

- » Fatigue-rated designs ensure strength, durability and quality
- » Easy integration with MTS testing equipment
- » Force ratings up to 1,550 kN (350 kip)
- » Eight sizes of base and rod ends, with or without backlash adjustment

Confidently meet the demands of closed-loop servohydraulic testing with MTS Series 249 and 249N 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.

These swivels 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.

Series 249 and 249N swivels allow linear actuators to pivot freely at the base and rod ends. They offer high axial stiffness for exceptional high frequency testing, and are available in force ratings from 25 kN (5.5 kip) to 1,775 kN (400 kip).

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. Series 249N models do not have backlash adjustment and are ideal for non-reversing applications, such as tension-tension or compression-compression loading cycles.

be certain.

## Engineered for superior performance

With our unique combination of testing knowledge and engineering expertise, MTS develops swivels that are optimized to deliver flawless performance and high reliability over years of heavy use. We scrutinize every detail of the design, materials and manufacturing.

Series 249 swivels can be used for the majority of structural testing applications that require swivel rotation with minimum backlash. Of course, one way to eliminate backlash is to run loading schemes that do not reverse the load. For applications where loading cycles stay in tension or in compression, or loads are applied statically or pseudodynamically, Series 249N swivels are the right choice.

### Critical features for reliable testing

#### SENSOR CAVITY

For force ratings of 160 kN (35 kip) to 1,775 kN (400 kip) the base end swivel includes a cavity to contain a Temposonics® linear-position sensor. This eliminates the need for a spacer plate, increasing overall stiffness. The base end also features a cable notch and integrated Amphenol® connector mounting surface.

#### SWIVEL EYE

The base swivel eye can be mounted to the base of the actuator, while the rod swivel eye is designed for mounting to a load cell or the piston rod of an actuator. The swivel eye contains the spherical bearing.

#### SPHERICAL BEARING

The spherical bearing allows the swivel eye to tilt and rotate through a wide range of motion.

#### SWIVEL JAW

The swivel jaws secure the swivel to the reaction mass. It features two sides joined by a pin that passes through the spherical bearing.

#### PIN

The pin secures the spherical bearing to the swivel jaw.

#### ANTI-ROTATE TABS

These tabs on the swivel eye restrict the twisting motion of the swivel assembly.

#### ACCELEROMETER FLAT

The accelerometer flat provides a consistent landing pad for placement of diagnostic accelerometer for the purpose of measuring force distortions or backlash when traveling through zero load conditions in tension-compression loading cycles.

The rod end of the Series 249 swivel attaches to other components of the force train with a threaded stud for force ratings of 25 kN (5.5 kip) to 340 kN (77 kip). Fatigue-resistant, preloaded connections between the actuator and swivel can be created by using spiral washers in conjunction with the connector stud. For force ratings 500 kN (110 kip) and higher, preload is created using bolted joints. The rod end of the Series 249N swivel offers the same specifications but with no backlash adjustment.

The base end of both Series 249 and 249N swivels couples a linear hydraulic accelerator or other actuating device to a reaction mass. Mounting holes ensure easy attachment to a wide range of actuators and associated fixturing.

Additional Series 249 features (not available on Series 249N)

#### CLAMPING BOLT

Depending on the size of the swivel, clamping force is applied with a single bolt or torque nut.

#### HARDENED WASHER

A washer under the clamping bolt provides a hardened surface to tighten against, preventing deformation of the swivel eye.

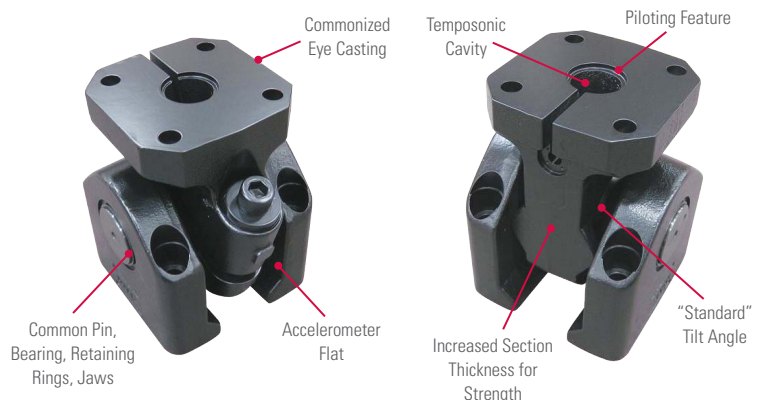
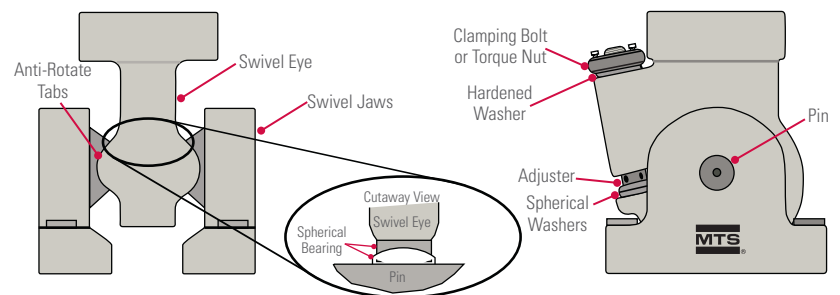
#### ADJUSTER

Available with Series 249 swivels, the adjuster is a threaded sleeve that screws into and out of the swivel eye to act as a variable shim when adjusting swivel backlash. Proper adjustment eliminates

backlash and allows the clamping bolt or torque nut to be tightened adequately without causing excessive friction in the spherical bearing.

#### SPHERICAL WASHERS

On Series 249 swivels, spherical washers compensate for non-parallel surfaces within the load path of the swivel eye. Different backlash adjustment settings may cause the surfaces of the split in the swivel eye to be non-parallel. The washers ensure this does not compromise backlash adjustment or damage the clamping bolt.



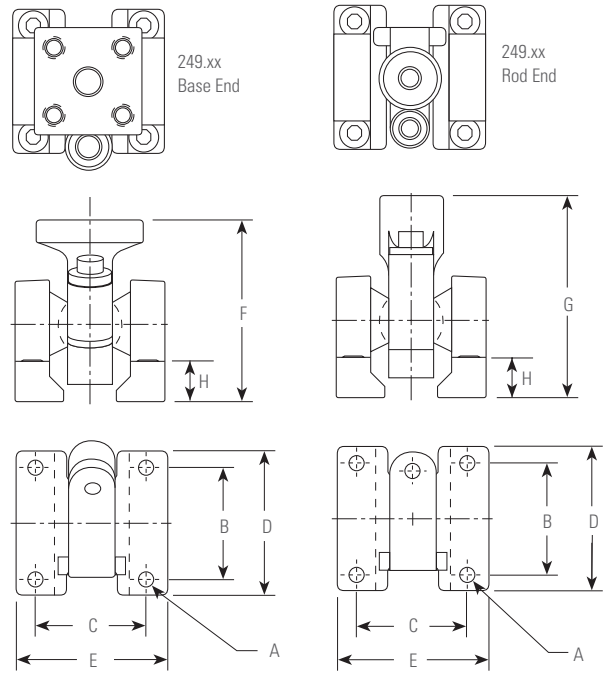
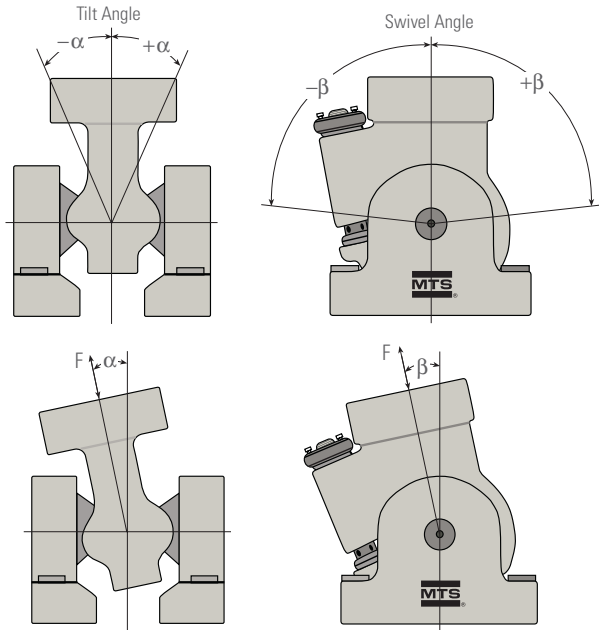
### Operation Specifications (Base & Rod End)

MODEL	TILT ANGLE* ( $\alpha$ )	SWIVEL ANGLE ( $\beta$ )	Clamping Bolt Torque†	
			N·M	LBF·FT
249xx.M25	$\pm 7^{\circ}$ **	$-90^{\circ}, +90^{\circ}$	34	25
249xx.M70	$\pm 17^{\circ}$	$-75^{\circ}, +90^{\circ}$	110	84
249xx.M160	$\pm 17^{\circ}$	$-80^{\circ}, +90^{\circ}$	380	280
249xx.M340	$\pm 14^{\circ}$	$-75^{\circ}, +90^{\circ}$	780	680
249xx.M500	$\pm 6^{\circ}$	$-30^{\circ}, +90^{\circ}$	62	45
249xx.M730	$\pm 7^{\circ}$ *	$-30^{\circ}, +90^{\circ}$	62	45
249xx.M1000	$\pm 8^{\circ}$	$-30^{\circ}, +90^{\circ}$	62	45
249xx.M1775	$\pm 8^{\circ}$	$-30^{\circ}, +90^{\circ}$	285	210

†Models 249xx.M500 through 249xx.M1775 use Superbolt® torque nut. Each jackbolt in the torque nut is torqued to the values shown.

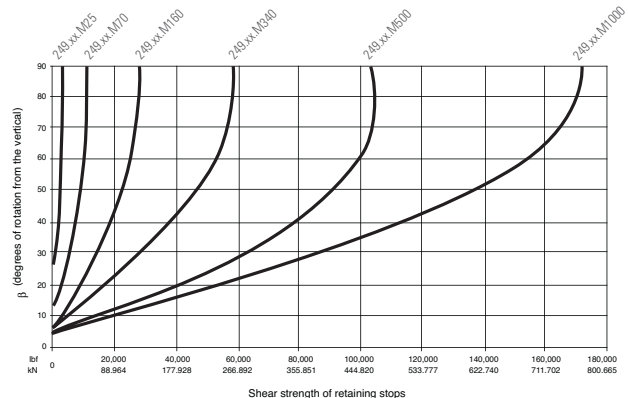
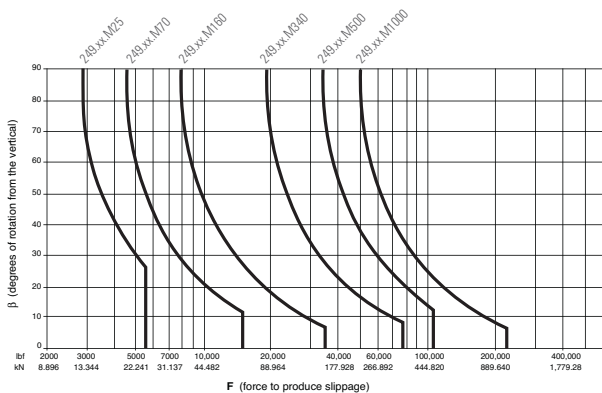
### Mounting Bolt Size, Torque & Grade Requirements

MODEL	RECOMMENDED MOUNTING BOLT SIZE		MOUNTING BOLT TORQUE		RECOMMENDED BOLT GRADE	
	SI Metric	U.S. Customary	N·m	lbf·ft	IS	SAE
249xx.M25	M10 x 1.50	3/8 in-16	53	34	12.9	8
249xx.M70	M16 x 2.00	5/8 in-11	230	160	12.9	8
249xx.M160	M16 x 2.00	5/8 in-11	230	160	12.9	8
249xx.M340	M24 x 3.00	1 in-8	780	680	12.9	8
249xx.M500	M30 x 3.50	1-1/4 in-7	1600	1360	12.9	8
249xx.M730	M30 x 3.50	1-1/4 in-7	1600	1360	12.9	8
249xx.M1000	M42 x 4.00	1-1/2 in-6	3200	2400	12.9	8
249xx.M1775	M48 x 5.00	2 in-4.5	4800	5600	12.9	8



### External Mounting Dimensions

MODEL	A		B		C		D		E		F		G		H	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
249xx.M25	10.7	0.422	63.5	2.5	63.5	2.5	85.9	3.38	83.6	3.29	127	5	120.7	4.75	24.6	.97
249xx.M70	17.5	0.688	114.3	4.5	114.3	4.5	142.7	5.62	142.7	5.62	180.8	7.12	198.2	7.8	38.1	1.50
249xx.M160	17.5	0.688	146.1	5.75	146.1	5.75	187.5	7.38	196.9	7.75	238.3	9.38	263.7	10.38	57.2	2.25
249xx.M340	26.9	1.06	184.2	7.25	184.2	7.25	231.6	9.12	238	9.37	317.5	12.5	355.6	14	127	5.00
249xx.M500	33.5	1.32	241.3	9.5	241.3	9.5	317.5	12.5	314.5	12.38	404.4	16	406.4	16	109.5	4.31
249xx.M730	35.1	1.38	279.4	11	279.4	11	359.7	14.2	355.6	14	457.2	18	457.2	18.0	230.1	9.06
249xx.M1000	43.7	1.72	298.5	11.75	298.5	11.75	406.4	16	406.4	16	546.1	21.5	546.1	21.5	312.4	12.30
249xx.M1775	55.6	2.19	406.4	16	406.4	16	558.8	22	558.8	22	831.9	32.75			406.4	16.00



## Swivel Base Specifications

MODEL	FORCE RATING	WEIGHT	HEIGHT	ACTUATOR END	PART NUMBER
249B.M25	25 kN (5.5 kip)	2.7 kg (6 lb)	127 mm (5 in)	Base	100-221-936
249B.M70	70 kN (15 kip)	12.7 kg (28 lb)	180.0 mm (7.12 in)	Base	100-221-932
249B.M160	160 kN (35 kip)	29 kg (64 lb)	238.3 mm (9.38 in)	Base	100-221-924
249B.M340	340 kN (77 kip)	73.5 kg (162 lb)	317.5 mm (12.5 in)	Base	100-272-540
249B.M500	500 kN (110 kip)	145.6 kg (321 lb)	406.4 mm (16 in)	Base	100-272-542
249B.M730	730 kN (165 kip)	290.3 kg (640 lb)	511.3 mm (20.02 in)	Base	100-232-544
249B.M1000	1000 kN (220 kip)	435.9 kg (961 lb)	546.1 mm (21.5 in)	Base	100-232-546
249B.M1775	1775 kN (400 kip)	1275 kg (2800 lb)	831.9 mm (32.75 in)	Base	100-271-598
249NB.M25	25 kN (5.5 kip)	2.7 kg (6 lb)	127 mm (5 in)	Non-Adj Base	100-221-937
249NB.M70	70 kN (15 kip)	12.7 kg (28 lb)	180.0 mm (7.12 in)	Non-Adj Base	100-221-933
249NB.M160	160 kN (35 kip)	29 kg (64 lb)	238.3 mm (9.38 in)	Non-Adj Base	100-221-925
249NB.M340	340 kN (77 kip)	73.9 kg (163 lb)	317.5 mm (12.5 in)	Non-Adj Base	100-221-929
249NB.M500	500 kN (110 kip)	146.1 kg (322 lb)	406.4 mm (16 in)	Non-Adj Base	100-221-945
249NB.M730	730 kN (165 kip)	294.4 kg (649 lb)	511.3 mm (20.02 in)	Non-Adj Base	100-227-949
249NB.M1000	1000 kN (220 kip)	439.1 kg (968 lb)	546.1 mm (21.5 in)	Non-Adj Base	100-227-953
249NB.M1775	1775 kN (400 kip)	1250 kg (2750 lb)	831.9 mm (32.75 in)	Non-Adj Base	100-271-033

## Swivel Rod End Specifications

MODEL	FORCE RATING	WEIGHT	HEIGHT	ACTUATOR END	PART NUMBER*
249R.M25	25 kN (5.5 kip)	2.3 kg (5 lb)	120.7 mm (4.75 in)	Rod	100-221-938
249R.M70	70 kN (15 kip)	10.9 kg (24 lb)	198.2 mm (7.8 in)	Rod	100-221-934
249R.M160	160 kN (35 kip)	25.9 kg (57 lb)	263.7 mm (10.38 in)	Rod	100-221-926
249R.M340	340 kN (77 kip)	63.5 kg (140 lb)	355.6 mm (14 in)	Rod	100-221-930
249R.M500	500 kN (110 kip)	171.9 kg (379 lb)	406.4 mm (16 in)	Rod	100-227-946
249R.M730	730 kN (165 kip)	329.8 kg (727 lb)	546.1 mm (21.5 in)	Rod	100-227-950
249R.M1000	1000 kN (220 kip)	497.1 kg (1096 lb)	546.1 mm (21.5 in)	Rod	100-227-954
249R.M1775					Contact MTS
249NR.M25	25 kN (5.5 kip)	2.3 kg (5 lb)	120.7 mm (4.75 in)	Non-Adj Rod	100-221-939
249NR.M70	70 kN (15 kip)	10.9 kg (24 lb)	198.2 mm (7.8 in)	Non-Adj Rod	100-221-935
249NR.M160	160 kN (35 kip)	26.8 kg (59 lb)	263.7 mm (10.38 in)	Non-Adj Rod	100-221-927
249NR.M340	340 kN (77 kip)	63 kg (139 lb)	355.6 mm (14 in)	Non-Adj Rod	100-221-931
249NR.M500	500 kN (110 kip)	171.9 kg (379 lb)	406.4 mm (16 in)	Non-Adj Rod	100-227-947
249NR.M730	730 kN (165 kip)	333.4 kg (735 lb)	546.1 mm (21.5 in)	Non-Adj Rod	100-227-951
249NR.M1000	1000 kN (220 kip)	500.3 kg (1103 lb)	546.1 mm (21.5 in)	Non-Adj Rod	100-227-955
249NR.M1775					Contact MTS

\*Part numbers given are for rod end swivels with metric threads. English threads available on request.



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ISO 9001 Certified QMS

### Learn more today

Series 249 and 249N swivels from MTS provide the strength, durability and quality you need for demanding closed-loop servohydraulic testing. Contact your MTS representative today to learn more.

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100-235-018b Swivels249 Printed in U.S.A. 1/14