INSTALLATION INSTRUCTIONS FOR TOVEY ENGINEERING SW, FR, SWP, AND CS SERIES FORCE TRANSDUCERS

1. Tovey Engineering SW, FR, SWP, and CS Models must be properly installed to achieve the best performance and insure that the transducers are not damaged. Damage can occur if transducers are mounted to non-flat surfaces, or from poor quality fixtures leading to thread damage, or from improper installation torques. Generally, these Models are supplied with a base fixture that provides the necessary mounting surface flatness and stiffness. SWP and CS models are only available with factory-installed bases. All models that have the base installed have a –BXXX option suffix to the model code in which the base is designated by the "B" character. If it is not possible to use the standard base due to space limitations, the customer supplied mounting surface should be flat to within 0.0002 inch and provide similar stiffness to a factory base.

2. If a Tovey Engineering base is not used, then the following instructions apply for attaching the transducer to the mounting surface:
   Use only Grade 8 or Grade 9 mounting screws. Clean the force transducer mounting surface and the mating surface. Lube the screw threads with light oil and install the screws finger tight. Using a calibrated torque wrench, torque the screws to one-half the value shown in the table below in a crosswise pattern to achieve uniform clamping pressure on the part. Torque the screws to the final value shown in the table, again using the crosswise torque pattern.

Base Mounting Screw Torque

Model	Screw Size	Installation Torque, lbf-ft	Installation Torque, N-m
SW10 0.3-2 Klbf	¼ - 28	5	7
SW10 5-10 Klbf	¼ - 28	10	14
SW20	3/8 –24	50	70
SW30	½ - 20	120	160
SW40	¾-16	315	430
SW60	1 – 14	800	1080
FR10 0.15-1 Klbf	¼ - 28	5	7
FR10 2.5 -5 Klbf	¼ - 28	10	14
FR20	3/8 –24	50	70
FR30	½ - 20	120	160
FR40	¾-16	315	430
FR60	1 – 14	800	1080

3. It is recommended that threaded fixtures installed in the hub be used with jam nuts preloaded to the level specified in the table below. . It is good practice to always use preloaded joints to help maintain alignment of load string components. Preloaded fixtures must be used in cyclic load applications to prevent fatigue

damage to the threads. Tovey Engineering force transducers are calibrated with preloaded jam nuts unless otherwise specified by the customer. Threaded fixtures should be heat treated to at least the equivalent of Grade 8 fasteners (150 ksi ultimate tensile strength) and be manufactured with Class 3 thread fits. Install the fixture to bottom the thread and then back out one turn. Torque or preload the jam nut. For lower capacity load cells in which preloading is accomplished by torqueing a jam nut, use caution to avoid damage to the load cell. Do not exceed the recommended torque. It is acceptable to achieve preload on all models by applying 120-150% of rated load and snug up the jam nut. Do not apply more torque than can be applied by hand at the preload force. Note that CS Models have a preloaded fixture installed at the factory. These fixtures use a round nut to discourage removal. The pre-load on these fixtures should not be changed and the fixtures should not be removed.

Threaded Adaptor Installation

Model	**Threaded Fixture Installation Torque lbf-ft**	**Threaded Fixture Installation Torque N-m**
SW10-300, SWP10-300, FR10-150	5	7
SW10-500, SWP10-500, FR10-500	10	14
SW10-1K, SWP10-1K, FR10-500	20	28
SW10-2K, SWP10-2K, FR10-1K	40	55
SW10-5K, SWP10-5K, FR10-2.5K	60	80
SW10-10K, SWP10-105K, FR10-5K	120	160
All models for capacities above 10 klbf	Preload to 120-150% Rated Load and tighten Jam nut.	Preload to 120-150% Rated Load and tighten Jam nut

4. Provision should be made to assure that good alignment is maintained in the application, with the applied force directed down the primary axis of the force transducer. Rod end bearings, eye bolts, shackles, and clevises can be used to facilitate alignment in tension applications. For compression applications, spherical load buttons or balls and sockets may be used for this purpose. It is recommended that hardened bearing plates (>RC 45) be use for compression applications.

5. The force to be measured should be applied to the hub end (live end) of the transducer. Note that the connector or cable exits from the outer ring of the transducer flexure that is attached to the base (dead end) by means of screws in a bolt circle pattern on the outer ring of the transducer. This prevents the cable attached to the cell from providing a parallel load path to the sensitive element of the transducer flexure element and degrading the force measurement. This mounting also provides the best dynamic response from the transducer.