

Dynamatic® Adjustable Frequency Dynamometers

DSI/Dynamatic® has been in the dynamometer business since the 1930's, when the principle of an Eddy-Current drive was first developed. While there are still many applications for the Eddy-Current dynamometer there are many applications which require the flexibility and high performance of the adjustable frequency dynamometer system. The advances in the design of the line regeneration, vector inverters now can provide a high performance dynamometer system that may be utilized in both production and R & D environments.

DSI/Dynamatic® offers a full range of adjustable frequency dynamometer systems to meet the requirements of the relatively straightforward "cold engine" test stand to the more elaborate transmission test stands. Please contact **DSI/DYNAMATIC®** to review your specific test stand requirements.

Fully Regenerative Performance

The regenerative adjustable frequency drive system (comprised of the inverter and motor) provides full four-quadrant performance using an induction motor configured as a dynamometer. The regenerative adjustable frequency inverter is inherently capable of controlling a standard AC motor in all four quadrants of driving/braking operation. This capability is fully utilized by furnishing the inverter with a regenerative input power converter so that braking energy can be returned to the utility power line. The active "front end" input devices of today's vector drive would return this power to the AC line with minimal voltage and current harmonic distortion.



Operational Concepts

The Dynamatic® adjustable frequency regenerative dynamometer consists of a trunnion mounted, AC induction motor powered from a solid state regenerative IGBT inverter. Attached to the induction motor is a torque arm and load cell for torque measurement. The inverter converts 3-phase power of a fixed voltage and frequency into an output of adjustable voltage and frequency. This adjustable voltage and frequency ensure a uniform torque/slip ratio over the entire speed range, in either direction of rotation.

Enclosed Design

The regenerative dynamometer is essentially a universal dynamometer because it is capable of absorbing power as well as motoring or driving the same load. The dynamometer possesses inherent cranking ability for engine starting purposes. Typically 85 to 90% of the power absorbed from the load is converted to useable electrical power. The dynamometer can either be operated manually or it can be programmed by the customer's computer to automatically follow program changes between motoring and absorbing modes of operation.

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The dynamometer will operate in either speed control or torque control. When in speed control, the inverter compares either a frequency or digital encoder/resolver feedback to a speed reference. When in torque control the inverter compares a digital encoder/resolver speed and shaft position feedback to a torque reference to maintain a fixed load on the prime mover as set by the torque reference.

The dynamometer is available in either the open carcass version or the enclosed version. The enclosed version consists of two rectangular sections split horizontally so the top half can be removed to expose the carcass. Both versions contain trunnion bearings and shift rings to support the carcass. The carcass is free to turn in the trunnion bearings, restricted by the torque arm and load cell. The load cell functions in compression or tension as required for clockwise and counter-clockwise rotation. Shift rings permit repositioning the trunnion bearing outer races to extend their life. Safety stops above and below the torque arm limit stator movement.



AF Dynamometers are blower-cooled by two blowers mounted on top of the enclosed version or on the side of the open version. The blowers rotate in opposite directions to cancel out their reaction torque. To minimize windage losses, a smooth rotor design is used. Internal ducting guides the cooling air through the induction motor and vents motor heat losses out through the end and sides.

USER BENEFITS

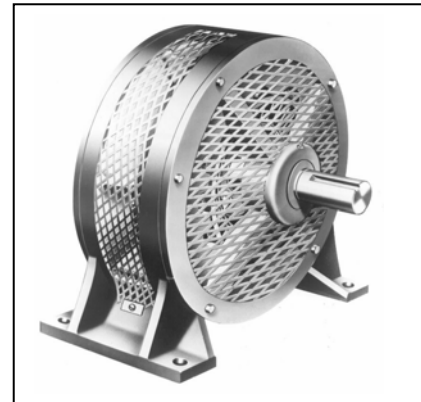
- **Wide Horsepower Range**
Regenerative Dynamometers available from 75 to 500 HP.
- **Wide Speed Range Available**
Operating speeds 0 to 10,000 RPM.
- **Fast Payback**
Engine power is regenerated directly to plant A C distribution system to reduce your power cost.
- **High Performance**
Fast response from digitally controlled technology.
- **Ease of Start-Up**
State-of-the-art flux vector.
Auto self-tuning feature calibrates drive in minutes.
- **Inherent Motoring/Absorbing Capability**
Motoring for overhauling loads, cranking, friction, pumping and component testing.

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- **Dynamic Drive/Absorb Operation**
Follows program commands between motoring and absorbing modes to simulate vehicle driving cycles.
- **Computer Compatible**
Computer interface accepts remote analog speed and torque commands from your computer or programmable controller.
- **Maintenance Problem Eliminated**
No brushes or commutators to service.



**Water-Cooled
Eddy-Current
Brake**



**Air-Cooled
Eddy-Current
Brake**