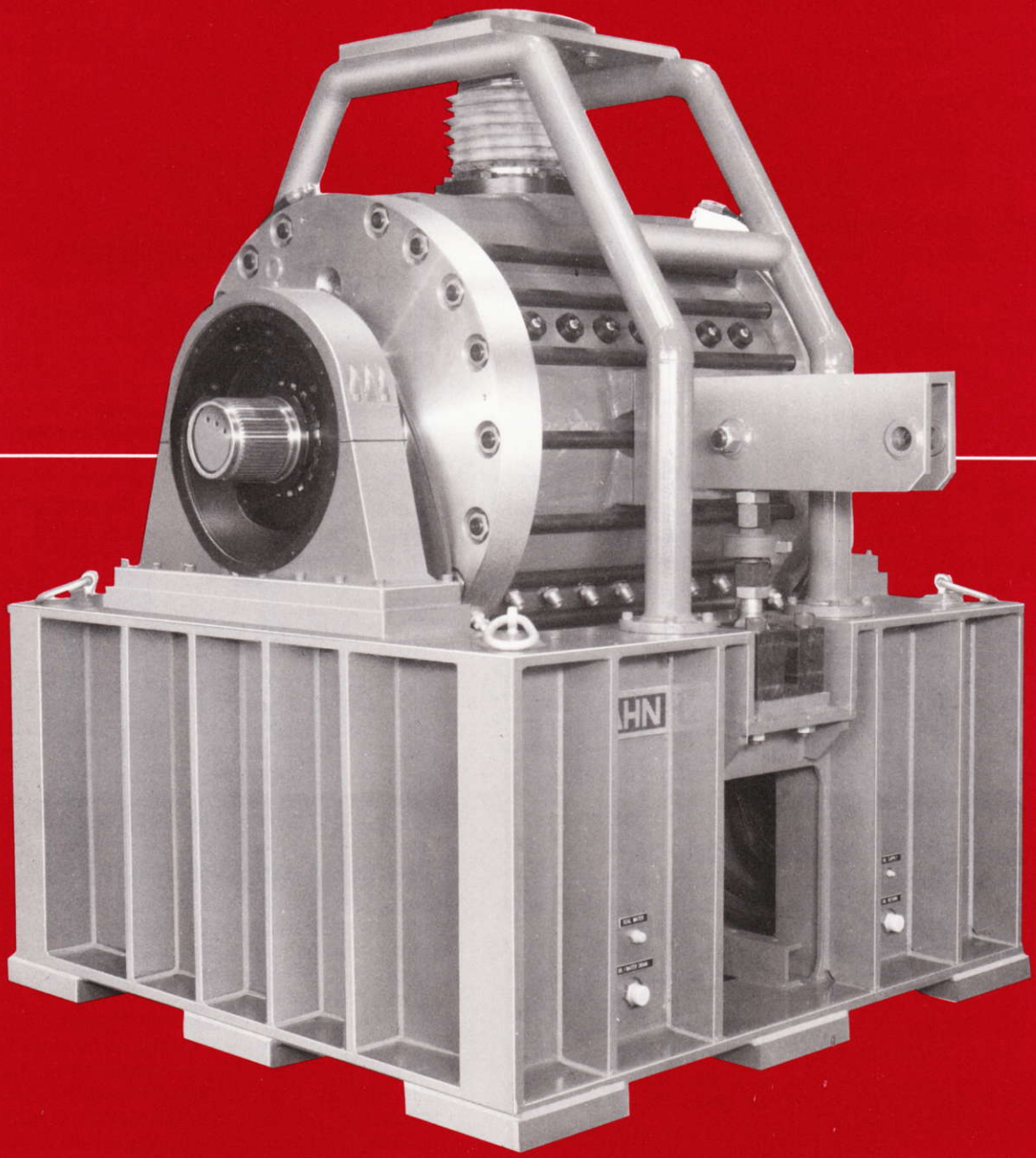
HYDRAULIC DYNAMOMETERS FOR TESTING GAS TURBINES

KAHN SERIES
100



KAHN

KAHN INDUSTRIES INC.

KAHN SERIES 100 HYDRAULIC DYNAMOMETERS FOR TESTING GAS AND STEAM TURBINES

FEATURES

- Compact, base mounted units with high power to weight ratio
- Self centering polygon connection between shaft and rotors permitting quick overhaul
- Hardened stainless steel power elements providing superior resistance to cavitation and corrosion
- Individual water supply to each rotor providing excellent operating stability
- Double ended, hardened stainless steel shaft
- Spring loaded, oil jet lubricated high speed ball bearings
- Water cooled carbon face seals
- Built-in flexible o-ring joints in water inlet and outlet lines
- All service lines terminated in bulkhead fittings on base
- Full power absorption in both directions of rotation

OPERATING PRINCIPLE

Several perforated discs rotate in a housing between perforated stators. Cold water enters each rotor chamber through annular orifices around the shaft. The water is accelerated by the rotating discs and thrown outwards. From the outer diameter of the rotor chamber inwards, the water forms an annulus which rotates at approximately half of the angular disc speed. The centrifugal pressure resulting from this process, forces the hot water out of the rotor chambers into the outlet manifold.

Power is absorbed—and converted into heat—by water vortices generated in rotor and stator holes. The resulting drag applies a resistance to rotation and tends, with an equal effort, to turn the dynamometer housing in the trunnion bearings. The housing is restrained from turning by a load cell, which is mounted to the torque arm at a fixed distance from the centerline of the dynamometer.

The amount of power absorbed by the dynamometer is a function of water level (size of rotating water annulus) and speed. The water level is modulated with the inlet and outlet control valves. At a given speed, maximum power is absorbed when the rotor chambers are completely filled with water.

WATER SUPPLY REQUIREMENTS

Hydraulic dynamometers convert mechanical energy into heat. The heat is dissipated by a continuous flow of water through the dynamometer. The flow rate is proportional to the amount of power absorbed.

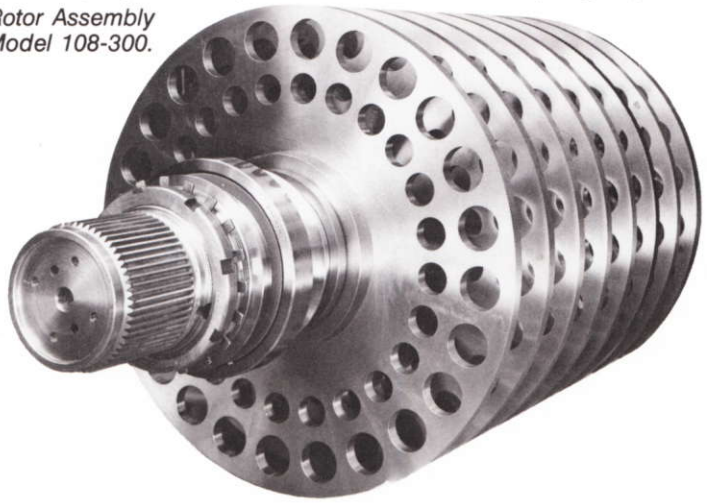
Water Flow*	4 gal/hr hp (20 l/hr kW)
Supply Pressure	50 psig (3.5 bar)
Max. Inlet Temperature	90°F (32°C)
Max. Outlet Temperature	180°F (82°C)
Filtration	20 mesh screen
Seal Water Flow	0.4 gal/min (1.5 l/min)

*at delta t=76°F (42°C)

ROTOR ASSEMBLY

Eight perforated discs mounted on the shaft by means of a self-centering polygon connection. Reduced bore stresses due to polygon shape—no shrink fits required. Shaft and discs made from hardened stainless steel. All rotating parts subjected to magnetic particle inspection. Splined shaftends. Entire rotor assembly dynamically balanced to 0.1 oz. in. (7.2gcm).

Rotor Assembly Model 108-300.



BEARINGS, LUBRICATION AND SEALS

Two angular contact high speed ball bearings. Spring preloaded to increase bearing rigidity and to reduce vibration. Oil-jet lubricated—one removable oil injector is located adjacent to each bearing. Rotating flingers on both sides of each bearing to carry away the oil. One thermocouple port per bearing.

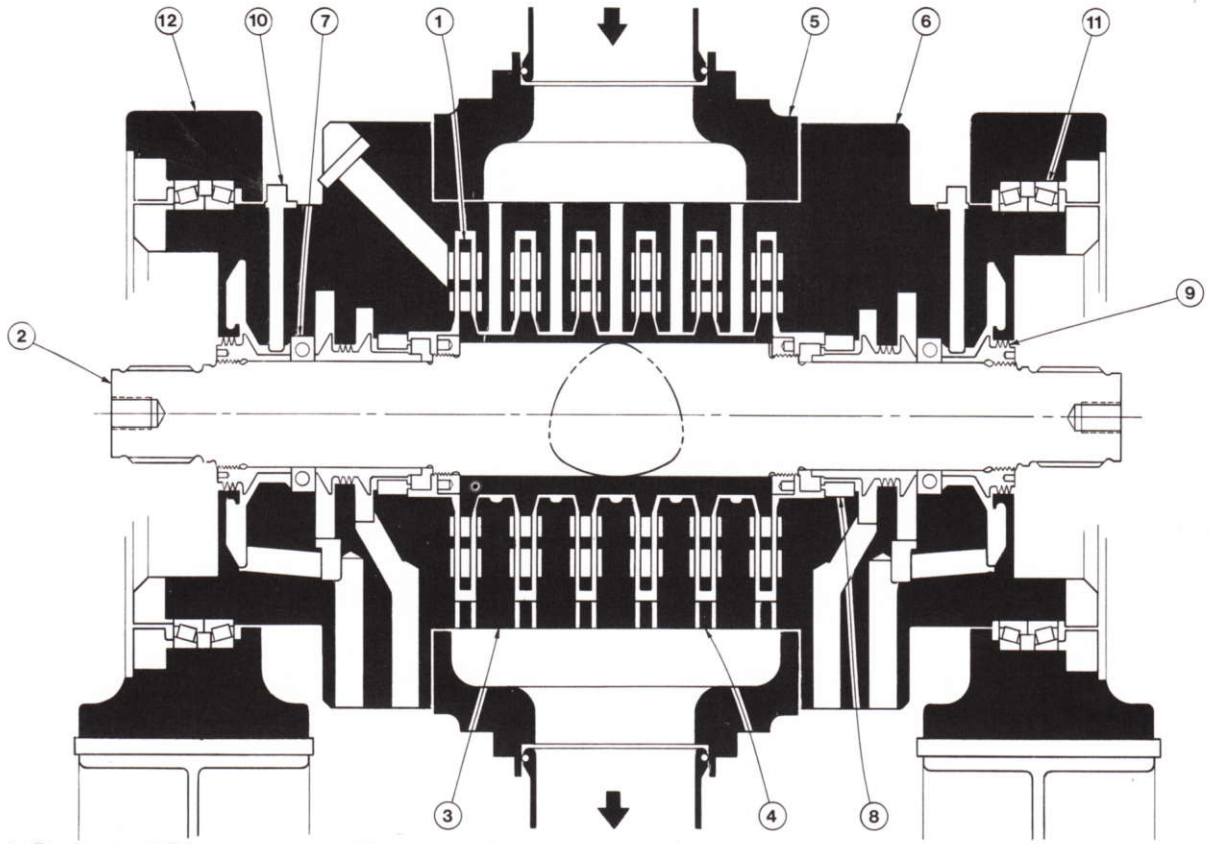
Oil Type	Light Turbine Oil*
Total Oil Flow, Max.	3.0 gal/min (11.4 l/min)
Supply Pressure	40 psig (2.8 bar)
Supply Temperature	120°F (49°C)
Return Temperature	150°F (66°C)
Filtration	5 micron

*Synthetic aircraft engine oils with a viscosity of 3.0-5.0 cSt at 210°F (99°C).

Stationary carbon face seals with chrome plated mating ring, located on each side of rotor chamber. Continuously cooled with water to prevent distortion or cracking of carbon rings. Any water leakage across the carbon seals is discharged by a flinger into a drain cavity. Labyrinth seals on each side of bearings to prevent oil leakage to drain cavities and around the shaftends.

HOUSING ASSEMBLY AND BASE

Cast stainless steel housing clamped between endcaps with prestressed tiebolts. Perforated stator plates made from hardened stainless steel. Stators and discharge rings made from cavitation resistant nickel aluminum bronze. Removable plugs in both endcaps to permit inspection of rotor chambers. Grease lubricated trunnion bearings. Flexible o-ring joints in water inlet and outlet lines to permit free movement of housing in trunnion bearings. Torque arm with calibration extension, safety arm with restraining bracket on opposite side of housing. Rigid, lightweight base made from structural steel. All service lines (oil supply, oil return, seal cooling water, water/oil drain) terminated in bulkhead fittings on the base.

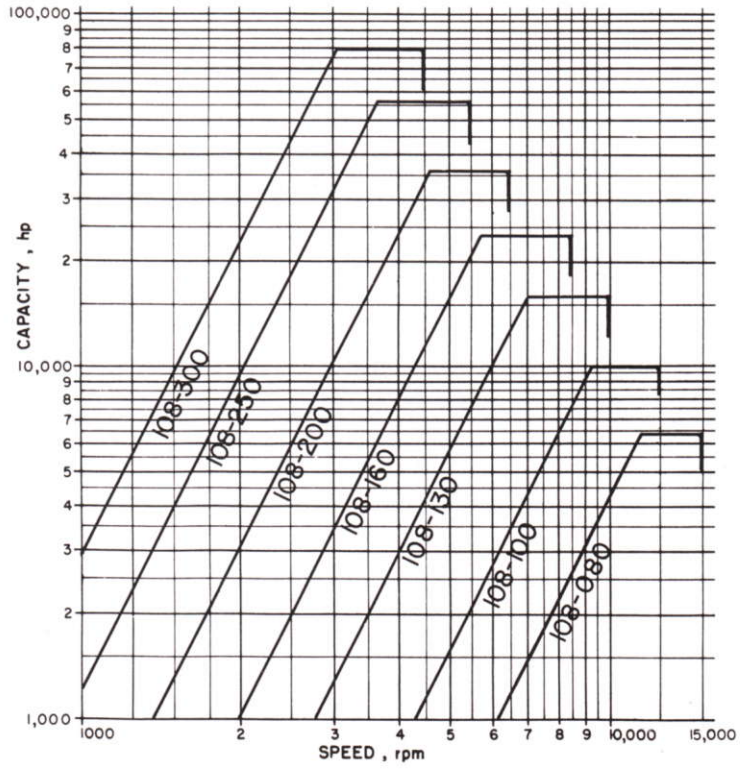


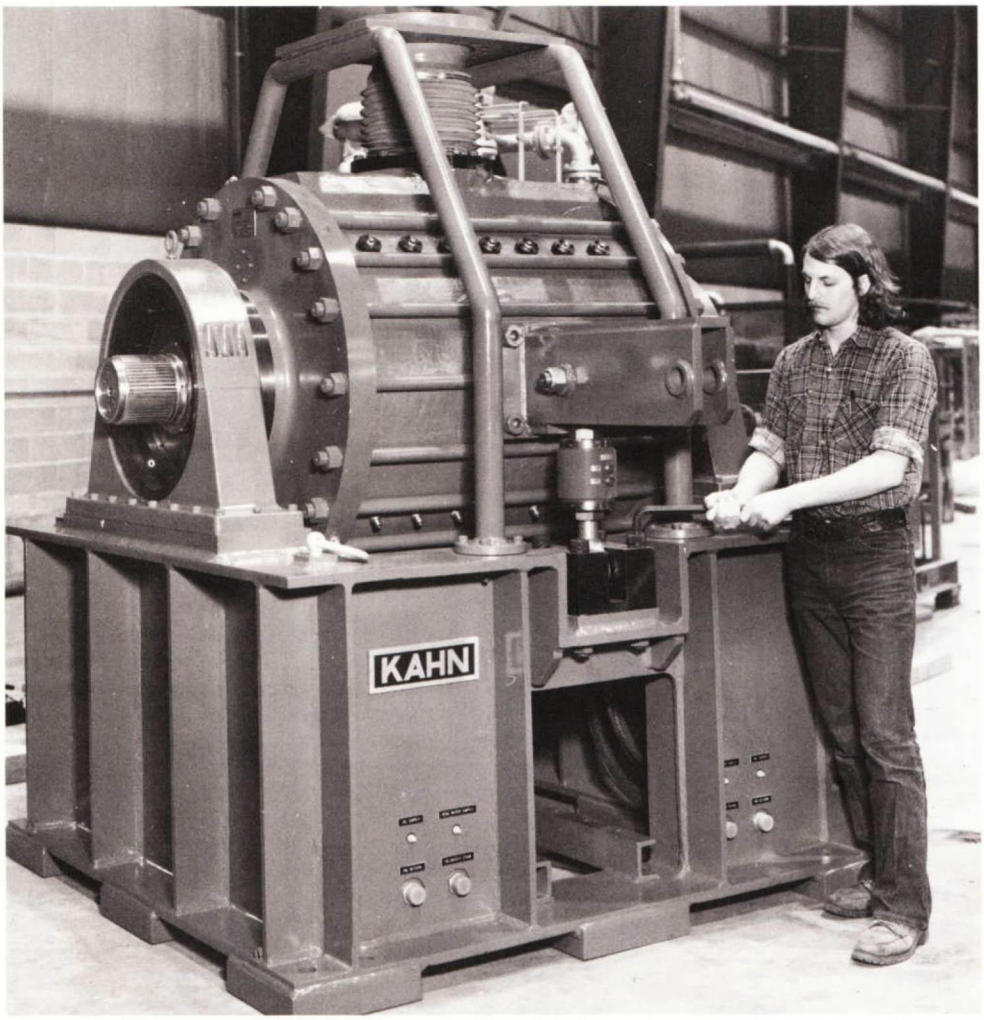
1 Perforated Disc
2 Shaft
3 Perforated Stator
4 Discharge Ring
5 Housing
6 Endcap
7 Shaft Bearing
8 Carbon Face Seal
9 Labyrinth Seal
10 Oil Injector
11 Trunnion Bearings
12 Trunnion Mount

SPECIFICATIONS

Model	Max. Power hp	Max. Speed rpm	Max. Torque ft. lb.	Approx. Dry Weight lbs.
108-080	6,400	15,000	6,000	2,000
108-100	10,000	12,500	10,800	2,800
108-130	16,000	10,000	22,500	4,000
108-160	24,000	8,500	40,000	5,500
108-200	36,000	6,500	80,000	8,000
108-250	56,000	5,500	80,000	12,500
108-300	80,000	4,500	180,000	23,000

OPERATING RANGE





Model 108-300 dynamometer being prepared for shipment to a leading U.S. gas turbine manufacturer. This unit has a dry weight of 23,000 lbs. and absorbs 80,000 hp at speeds up to 4,500 r.p.m.

AUTOMATIC CONTROL SYSTEM SERIES 525

Designed for closed-loop dynamometer speed and torque control. System includes control console for table-top installation, high-response electro-pneumatic control valves, universal strain-gage load cell, magnetic speed pickup and connecting cable. Control console features a micro processor-based PID controller and a modular instrument system with digital indicators and signal conditioners. System suitable for direct control from remote computer.

OIL SYSTEM SERIES 506

Self contained, skid mounted oil system including 10 gallon oil tank, supply pump, scavenge pump, oil cooler and filter. Built-in alarm switches, pressure and temperature gages. NEMA 12 electrical enclosure with pump motor starters. Completely wired and tested. Dimensions 32x60x31 high. Approx. dry weight 350 lbs. Power Supply 220V/440V, 50/60 Hz, 3 phase, 0.5 hp.

NOTE: The information included herein was correct at the time of publication and supersedes all previous data. It is our policy to continually improve our products to insure even better performance. Consequently, current Kahn products may incorporate modifications not shown on these pages.

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KAHN

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