



PRIFYSGOL CYMRU

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Vehicle Engineering

Engine Dyno Testing

- Introduction
- Types of engine dynamometers
 - Friction brake
 - Water brake
 - Eddy current
 - Other types
- Safety / Operation
- Correction of results

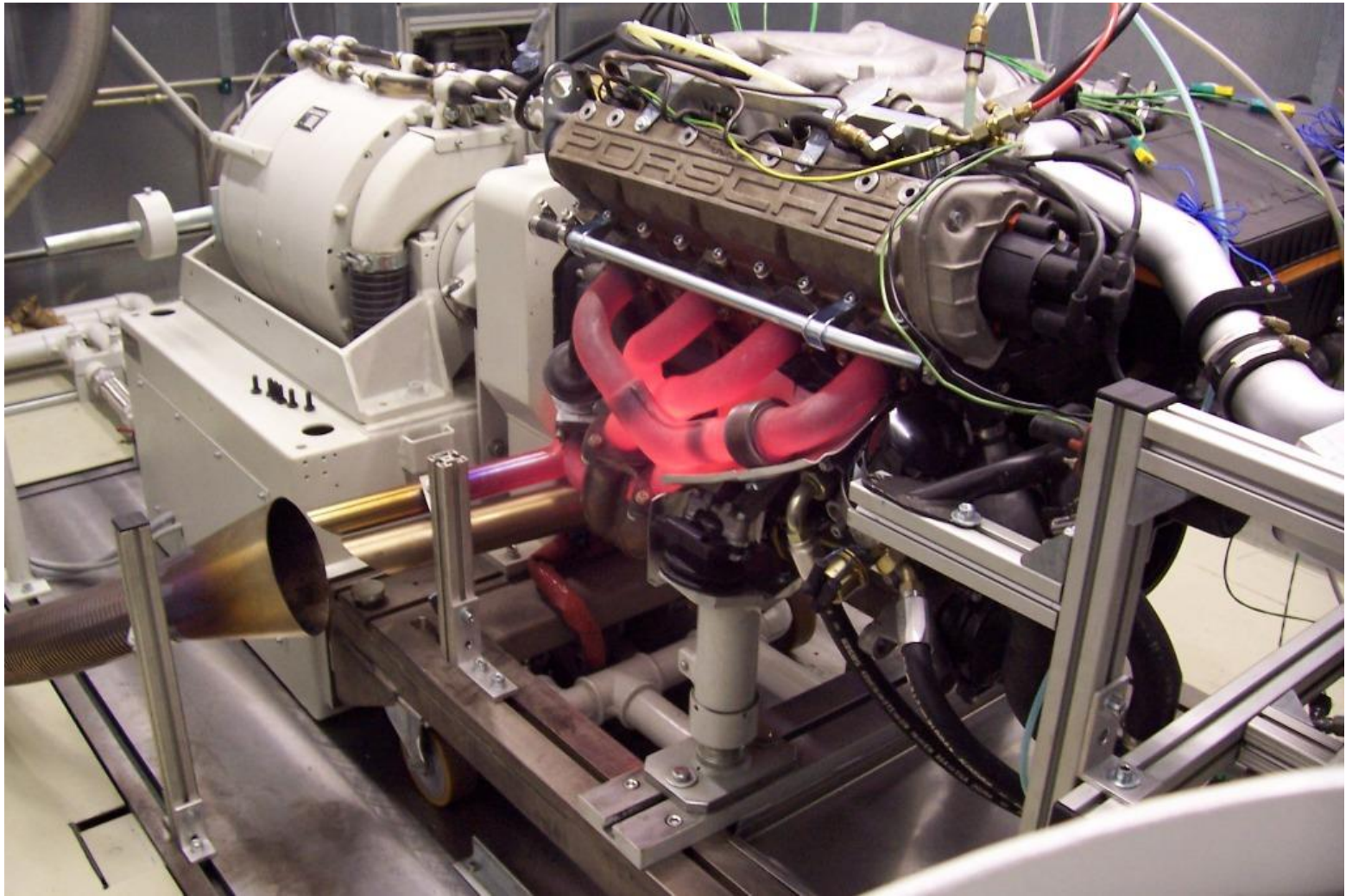
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Introduction

- A dyno is a means of measuring engine torque output
- It is used for engine development and research
- The torque produced by the engine is resisted and measured by the dyno
- Used for
 - engine power measurements
 - Mapping
 - Development work (testing new components)
 - cycle tests etc
- Instrumentation etc

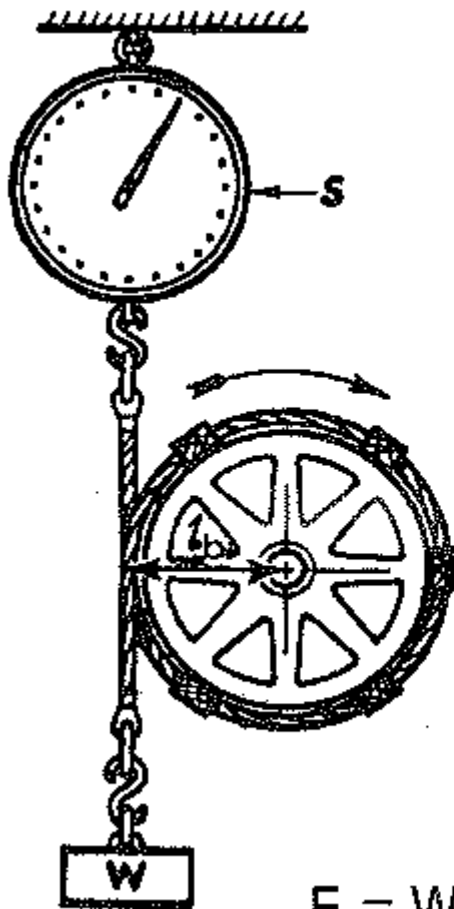


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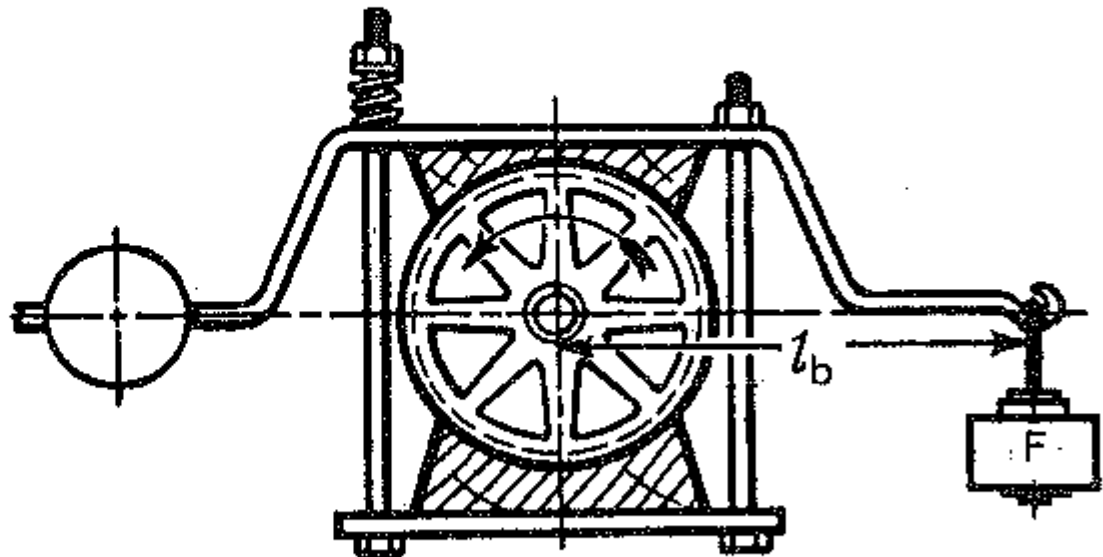
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Types of Dynamometer

- Friction brake

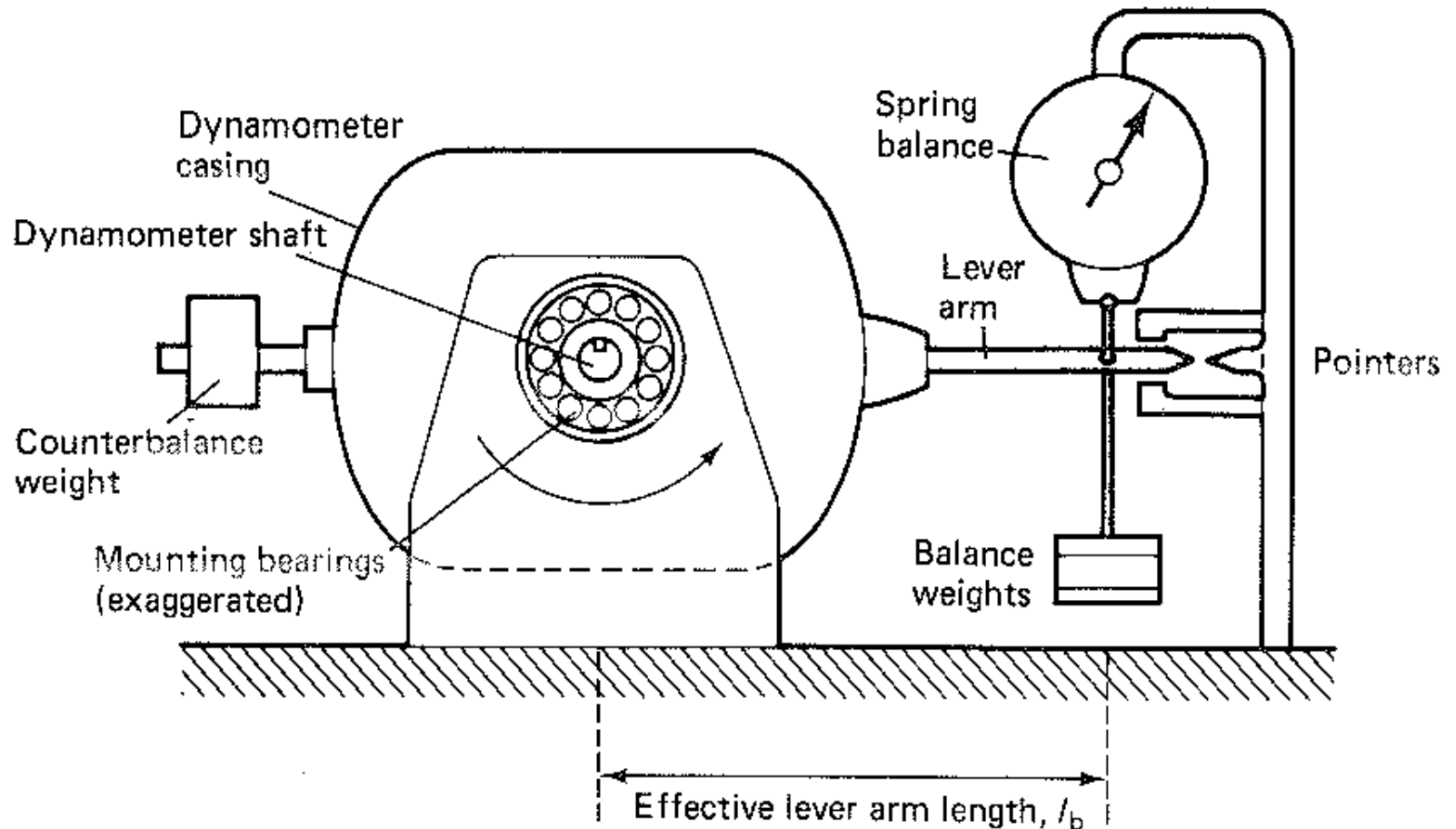


$$F = W - S$$



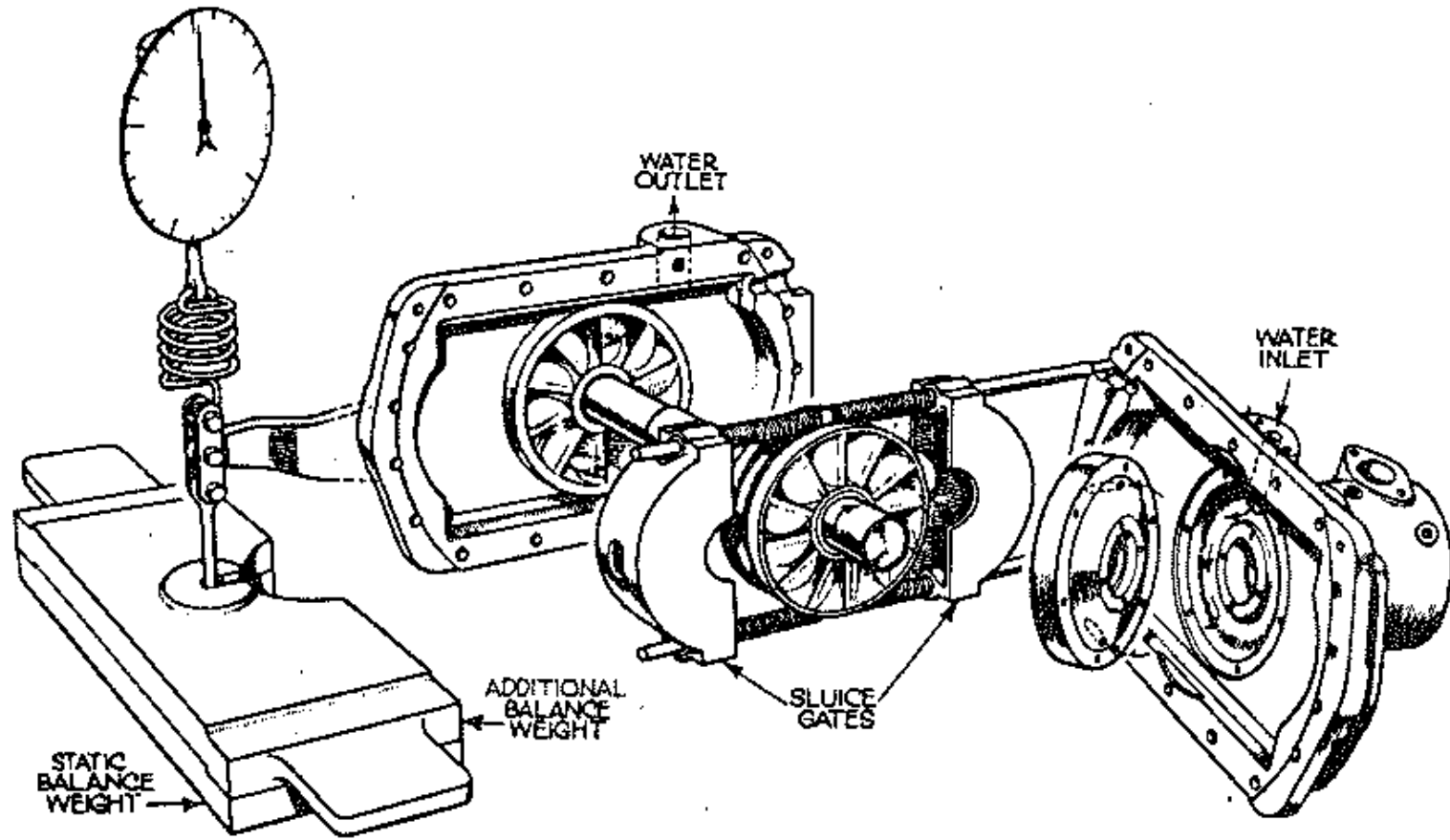
Types of Dynamometer

- Water Brake



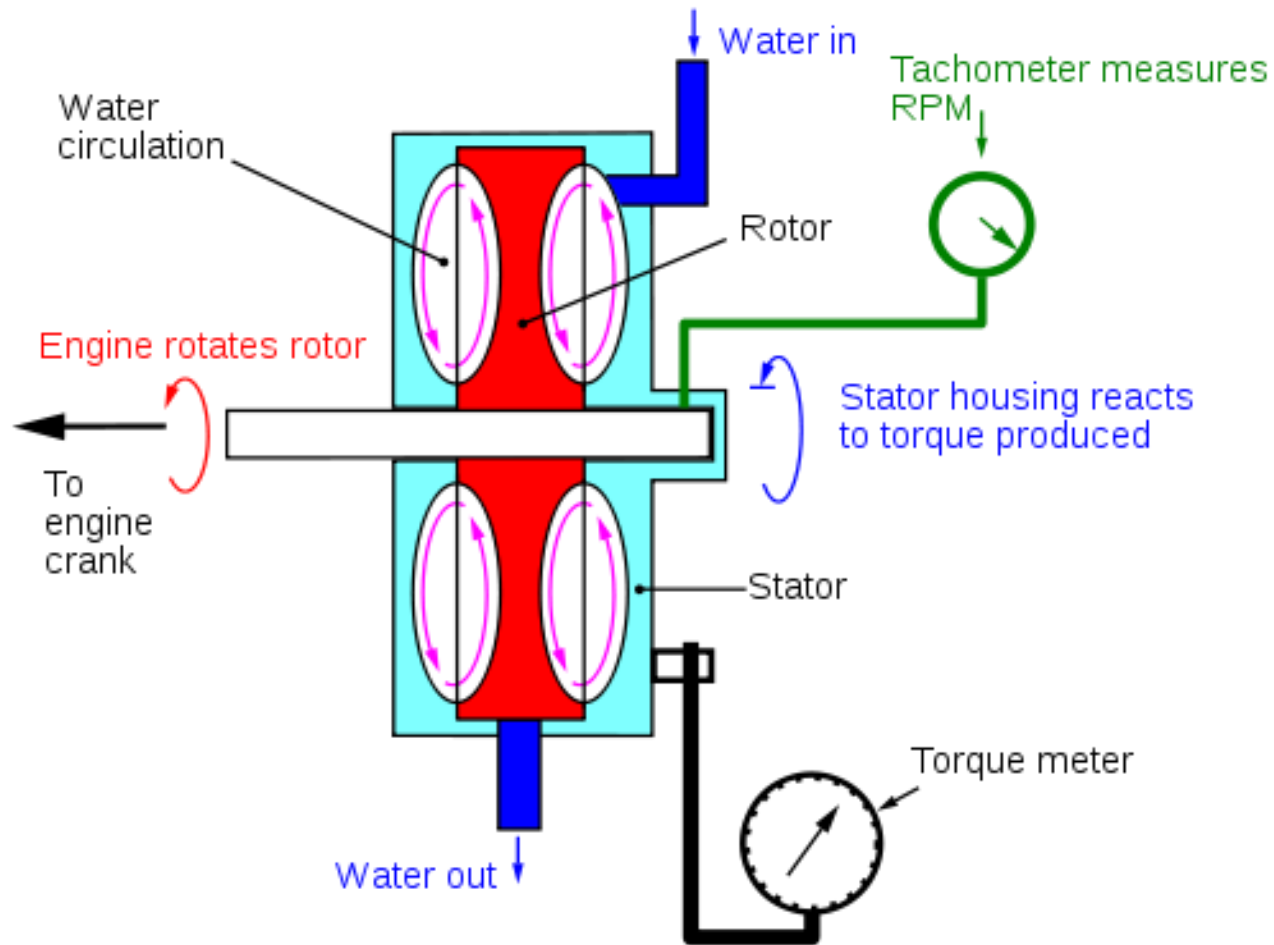
Types of Dynamometer

- Water Brake



Types of Dynamometer

- Water Brake



Types of Dynamometer

■ Eddy Current

- Rotor runs between water cooled plates
- Coils create magnetic field along m/c axis
- Rotor disturbs magnetic flux in plates
- This gives eddy currents
- These dissipate heat via resistive losses
- Power controlled by varying coil current
- Capable of transient measurements

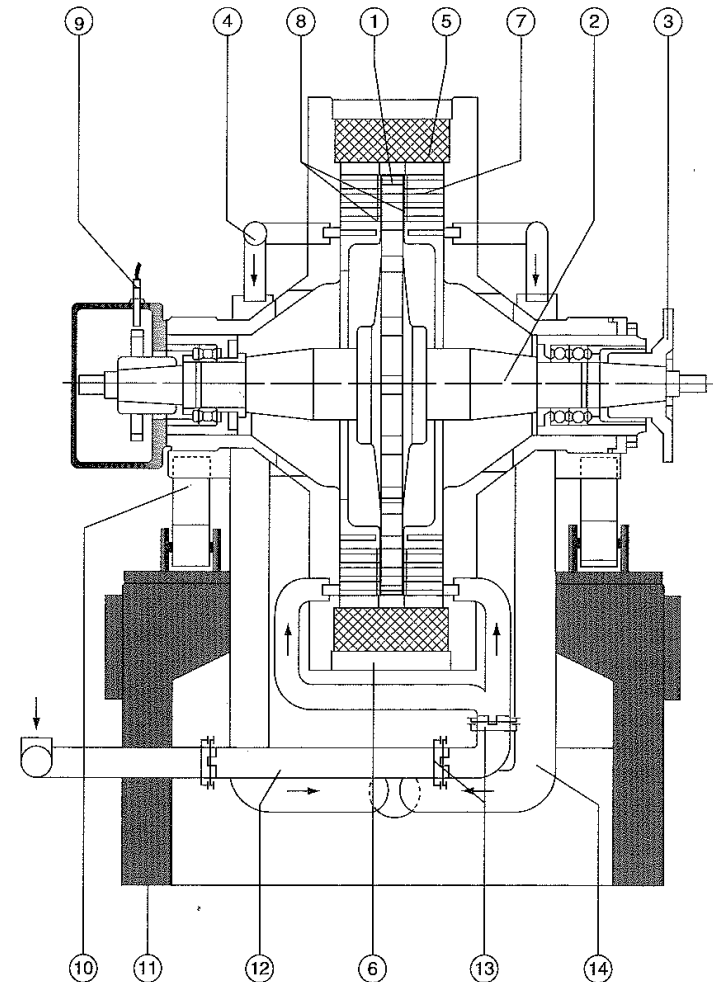


Figure 8.3 Schenck, dry gap, disc type eddy-current dynamometer 1, rotor; 2, rotor shaft; 3, coupling flange; 4, water outlet with thermostat; 5, excitation coil; 6, dynamometer housing; 7, cooling chamber; 8, air gap; 9, speed pick-up; 10, flexure support; 11, base; 12, water inlet; 13, joint; 14, water outlet pipe

- Other types

- Brake disks
- Air brake
- DC electrical
- AC electrical
- Other hydraulic types

Types of Dynamometer

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Safety / Operation

- Engine testing can be dangerous unless basic checks are ol
- **Before** running engine, check
 - oil level in engine, cooling water
 - Fire extinguisher and exit point locations
- **During** running
 - wear goggles and ear defenders at all times
 - ensure engine is at running temperature before applying load
 - continuously monitor water temperature and flow
 - continuously monitor oil temperature and flow
 - avoid hot exhaust
 - **DO NOT STAND IN FRONT OF THE ENGINE**



■ Test Record

- Engine ID
- Date
- Ambient Pressure
- Throttle Position
- At each engine speed, measure:
 - Load
 - Time for a known volume of fuel to be burnt
 - Inlet air temperature
- Note down anything else that is relevant so you can remember it!!!

Safety Operation

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Correction

- To enable tests carried out under different atmospheric conditions to be compared, a correction factor is applied to the measured power
- DIN standard 70020 (Others are available, eg SAE standard)
- Two factors are important
 - Temperature
 - Pressure
- These affect the air charge density and flow into the engine
- So we use an overall correction factor which includes ambient temperature and pressure

Correction

- The power correction formula is:

$$P_s = \left(\frac{1.01325}{p_a} \sqrt{\frac{T_a}{293}} \right) \times P$$

- P_s Corrected power
- P Measured power
- p_a Ambient pressure (bar)
- T_a Ambient temperature (Kelvin)
- Standard atmospheric pressure = 1.01325 bar
- Standard temperature = 293 K (20 degrees C)