# Eddy Current Dynamometers

- CE marked
- Non-magnetic steel shaft
- 2 energizing coils
- Electroless Nickel Plated loss plates
- Bi-directional Operation
- Low Moment of Inertia

AN ISO 9001-2008 COMPANY

# SE Series - Eddy Current Dynamometers

## Introduction

The dry gap computer compatible SE series Dynamometers offer a wide range of Eddy current Machines having capacities from 5 kW to 720 kW for engine testing.

The precision strain gauge load cell torque measurement system provides high accuracy torque measurement for exacting test and development applications.

The rugged design of the power absorbing system ensures a long working life, even in the most demanding production and endurance testing environments. This long life is further enhanced by the electroless nickel plating of critical components in contact with the cooling water.

## Standard Features

> Twin silicon rubber encapsulated energising coils, with central ventilation to ensure reliability in extreme conditions.
> Carcase mounted in deep groove ball bearings.
> High accuracy strain gauge load cell for torque measurement.
> Electroless nickel plating of cooling passages to ensure better corrosion protection.
> 'O' Ring pipe connections to minimise torque calibration errors from variations in water supply pressure.
> Differential pressure switch is fitted to check cooling water set pressure drop & give failure warning.
> Dynamically balanced high rigidity shaft assembly on precision bearings to ensure smooth operation. The rotor is designed for low inertia.
> Precise control possible, even at low loads and rapid changes in demands.
> Bi - directional operation.

## Options

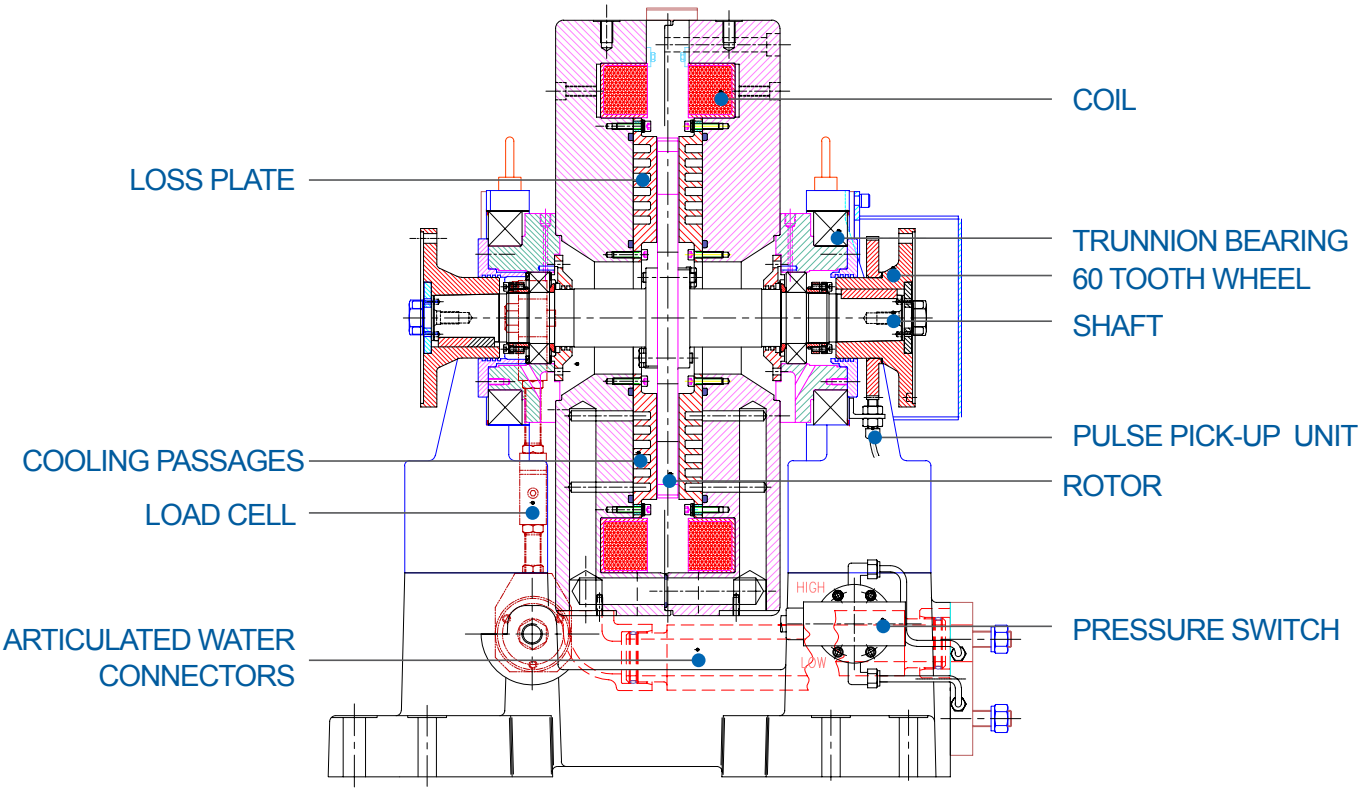
> Calibration equipment (SI / Imperial / Metric)
> Under-frames / Stool for dynamometer
> High speed version

## Technical Data

| | UNIT | SE 5 | SE 10 | SE 20 | SE 30 | SE 80 | SE 150 | SE 200 | SE 250 | SE 350 | SE 400 | SE 500 | SE 720 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Accuracy** | | | | | | | | | | | | | |
| Torque | Nm | +/- 0.25% of dyno. rated torque capacity | | | | | | | | | | | |
| Speed | Rev/Min | +/- 1 (Digital), +/- 1.5% of F.S.D (Analogue) | | | | | | | | | | | |
| **Water Supply** | | | | | | | | | | | | | |
| Maximum Outlet Temperature | Deg.C | 60 | | | | | | | | | | | |
| Acidity | pH | 7.4 TO 8.4 | | | | | | | | | | | |
| Filtration | Micron | 400 Maximum | | | | | | | | | | | |
| Suspended Particles | PPM | 1000 Maximum | | | | | | | | | | | |
| Minimum Flow Required | Ltr/min | 5 | 18 | 23 | 36 | 57 | 107 | 140 | 178 | 250 | 280 | 340 | 470 |
| Minimum Main Supply Pressure | kg/cm2 | 1.6 | 1.6 | 1.6 | 0.8 | 1 | 1 | 1 | 1.6 | 2 | 2.4 | 2.4 | 2.7 |
| **Electronics Connections** | | | | | | | | | | | | | |
| Energising Coil Voltage | V | 60 | 60 | 60 | 75 | 75 | 105 | 165 | 165 | 165 | 165 | 105 | 165 |
| Maximum Current | A | 5 | | | | | | | | | | | |
| Pressure Switch | | SPDT normally to be connected in series with control system | | | | | | | | | | | |
| Maximum Voltage | | 250 V AC | | | | | | | | | | | |
| Pulse Pick-Up | | Inductive non conduct type, output peak to peak (15V) | | | | | | | | | | | |
| Load Cell | | Strain gauge-full bridge | | | | | | | | | | | |
| Input Resistance | OHMS | 375 Nominal (*depend on make of load cell) | | | | | | | | | | | |
| Sensitivity | MV/V | 2.7 Nominal (*depend on make of load cell) | | | | | | | | | | | |
| Excitation | V DC | 10 (-5 to +5 VDC) | | | | | | | | | | | |
| **Environmental Conditions** | | | | | | | | | | | | | |
| Operating Range | Deg.C | -10 to 60 | | | | **Note :** At or below 0 Deg.C. Operating Procedures to prevent water freezing in the machine must be instituted. | | | | | | | |
| Operating Range of load cell | Deg.C | 0 - 60 | | | | | | | | | | | |
| Recommended operating range to acheive optimum accuracy | Deg.C | 20 to 30 | | | | | | | | | | | |
| Maximum humidity | %RH | 90 Non Condensing | | | | | | | | | | | |
| **Machine Weight Approx.(Dry)** | Kg | 80 | 150 | 210 | 350 | 350 | 595 | 645 | 1200 | 1300 | 1620 | 1950 | 4000 |

*Note :*

- *Other versions of dynamometers apart from those listed above will be available on request.*
- *Technical data is subject to change, all rights reserved.*




## Energising Coils

These are fully encapsulated two piece coils, used in place of the more common and cheaper single coil arrangement.

This configuration ensures optimum distribution of flux throughout the working area for maximum low speed torque and at the same time allows the free flow of air from the centre of the machine, through the critical air gap between rotor and stator and out of radial ventilation slots.

These features ensure both rapid response, and reliability under the severest loading conditions, which can be the cause of local overheating in single coil machines.

## Trunnion Bearings

Deep groove ball bearings provide the most precise method of carcase mounting and are virtually free from friction. They are also extremely rigid and free from resonance problems which can occur on the flexible type of mounting systems. The bearing selection ensures extended life.

## Shaft and Rotor

The rotor is manufactured from a high magnetic permeability material for maximum performance and is designed for minimum inertia. Precision grade bearings are used to ensure accurate shaft location and high safe operating speeds.

## Cooling Passages

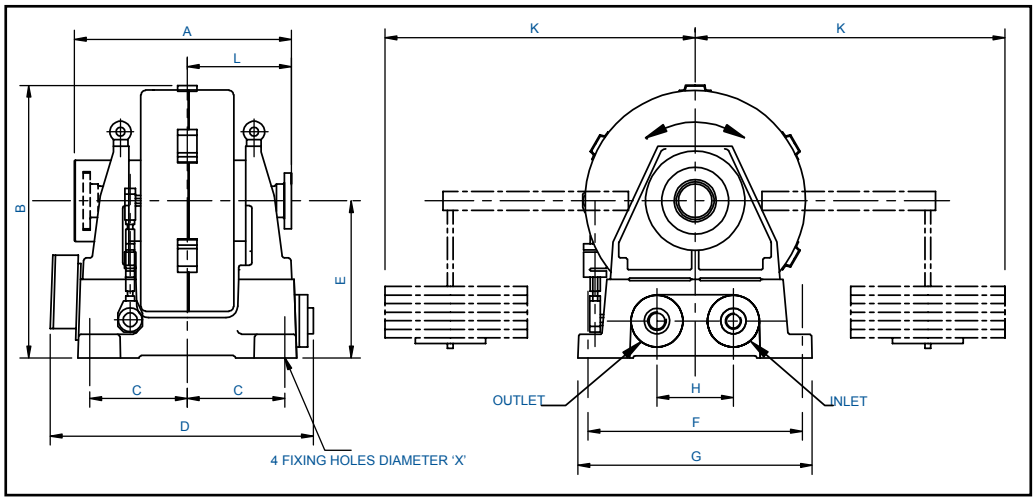
The cooling passages and ‘‘loss plate’’ are critical areas in any Eddy-current dynamometer as thermal loading is high and cyclic loading can cause corresponding temperature changes. Associated loss plate distortion may cause catastrophic contact between plate and rotor or loss of coolant. Extensive design and development has therefore been carried out by us for system of loss plate mounting, which allows controlled radial expansion without water leakage and prevents loss plate distortion. The water passages have been optimized to ensure consistent cooling, and these are electroless nickel plated to ensure that corrosion does not detract from performance.

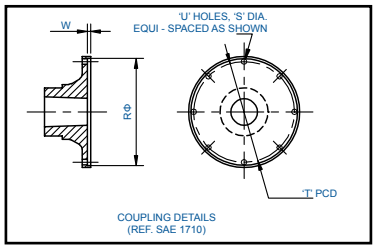
## Water Connections

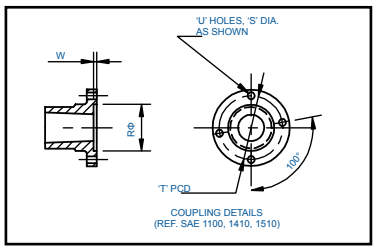
Water connection is by means of ‘O’ ring sealed articulated pipes, leading to flanges suitable for connection to the customers water supply. This ensures that water connection and supply pressure variations have minimum effect on machine accuracy. A Differential pressure switch ensures that a warning signal is given if water pressure drop is beyond SET limit.

## Control

The level of power absorbed is controlled by varying the excitation current at the coil. When used in conjunction with feed back signals for torque from the load cell and speed from the pulse pick-up and toothed wheel, closed loop control is provided.



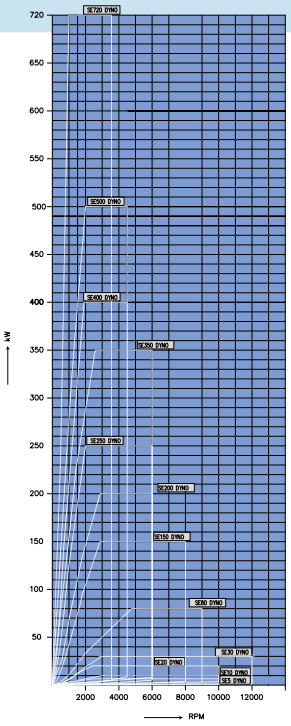




| SE | 'A' max | B | C | 'D' max | E | F | G | H | 'K' max | L (K) | L (O) | X | BSP threading | | R(H7) | S | T | U | W | SAE. STD. Size Code No. | GWB STD. Size Code No. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | IN-LET | OUT-LET | | | | | | | |
| 5 | 305 | 300 | 113 | 313.5 | 180 | 226 | 261 | 107.5 | 305 | 146 | - | 14 | 1/8" | 1/2" | 57.15 | 8.5 | 69.9 | 4 | 2.5 | 1100 | |
| 10 | 411 | 405 | 162.5 | 483 | 240 | 292 | 322 | 145.42 | 518 | 191.5 | - | 14 | 1/2" | 1" | 57.10 | 8.1 | 69.85 | 4 | 2.5 | 1100 | - |
| 20 | 375 | 445 | 162.5 | 483 | 250 | 340 | 370 | 154 | 510 | 180 | - | 14 | 1/2" | 1" | 57.10 | 8.1 | 69.85 | 4 | 2.5 | 1100 | |
| 30/80 | 460 | 575 | 205 | 594 | 330 | 450 | 492 | 160 | 618 | 219 | 212 | 18 | 1" | 1, 1/4" | 69.85 | 11.2 | 95.25 | 4 | 3 | 1410 | |
| 150 | 514 | 689 | 236 | 681 | 400 | 530 | 620 | 192 | 672 | 247 | 235 | 18 | 1, 1/2" | 1, 1/2" | 95.25 | 12.3 | 120.65 | 4 | 3 | 1510 | |
| 200 | 534 | 754 | 236 | 681 | 415 | 530 | 620 | 192 | 978 | 250.5 | 250.5 | 18 | 1, 1/2" | 1, 1/2" | 168.25 | 10.2 | 155.5 | 8 | 2.5 | 1600 | |
| 250 | 613 | 835 | 285 | 781 | 465 | 680 | 740 | 384 | 1022 | 275 | 275 | 22 | 1, 1/2" | 1, 1/2" | 196.86 | 10.2 | 184.15 | 8 | 1.4 | 1710 | |
| 350 | 604.5 | 910 | 285 | 770 | 500 | 680 | 740 | 384 | 1040 | 280 | 280 | 22 | 2" | 2" | 196.86 | 10.2 | 184.15 | 8 | 1.4 | 1710 | |
| 400 | 644 | 970 | 310 | 827 | 540 | 770 | 830 | 470 | 1025 | 300 | 300 | 22 | 2" | 2" | 196.86 | 10.2 | 184.15 | 8 | 1.4 | 1710 | |
| 500 | 621 | 1059 | 310 | 827 | 595 | 770 | 830 | 470 | 1025 | - | 300 | 22 | 2" | 2" | 196.86 | 10.2 | 184.15 | 8 | 1.4 | 1710 | |
| 720 | 1035 | 1335 | 430 | 1150 | 750 | 1050 | 1150 | 544 | 1480 | - | 498 | 32 | 2, 1/2" | 2, 1/2" | 139.98 | 19 | 218 | 8 | 5 | | 587.55.01 |

L (K) : DISTANCE FOR KEYED COUPLING
L (O) : DISTANCE FOR OIL INJECTED COUPLING
SE 500 & SE 720 MODELS ARE SUPPLIED WITH OIL INJECTION COUPLING ONLY

| MODEL | MAX POWER (kW) | MAX TORQUE (Nm) | SPEED (RPM) | | INERTIA (Kg $m^2$) |
|---|---|---|---|---|---|
| | | | STANDARD | HIGH SPEED | |
| SE 5 | 5 | 30 | 10000 | 12000 | 0.002 |
| SE 10 | 10 | 50 | 10000 | 12000 | 0.0056 |
| SE 20 | 20 | 80 | 10000 | 12000 | 0.0125 |
| SE 30 | 30 | 95 | 12000 | 14000 | 0.0168 |
| SE 80 | 80 | 160 | 9000 | 14000 | 0.0275 |
| SE 150 | 150 | 500 | 8000 | 12000 | 0.093 |
| SE 200 | 200 | 800 | 6000 | 8000 | 0.165 |
| SE 250 | 250 | 1200 | 6000 | 8000 | 0.464 |
| SE 350 | 350 | 1600 | 6000 | 8000 | 0.873 |
| SE 400 | 400 | 2000 | 4500 | 8000 | 1.107 |
| SE 500 | 500 | 3000 | 4500 | 7500 | 2.196 |
| SE 720 | 720 | 4500 | 3750 | .... | 5.3 |




**The Dynamometer will be provided with safety against dry running.**

*SAJ policy is one of continuous improvement and the right is reserved to change specifications without notice*

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