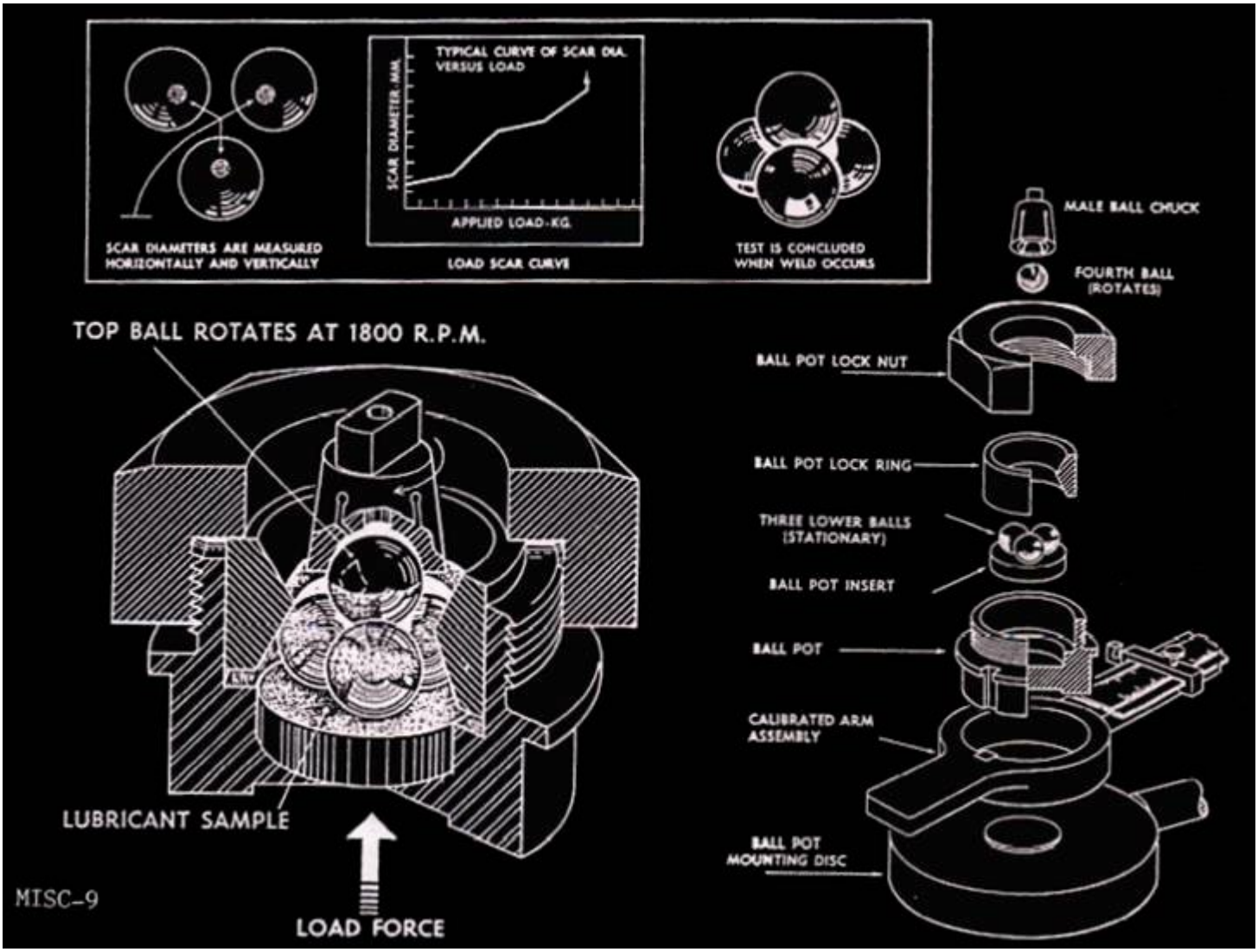
Extreme Pressure

BY PRECISION-SHELL FOUR BALL EP TESTER
TEST PROCEDURE



WHAT IS THE FOUR BALL EP TEST?

The determination of the load carrying capacity of a lubricant in kilograms applied to a system of four steel balls in the form of a tetrahedron.

WHY THE TEST?

To evaluate the EP characteristic of lubricants by a load scar curve and weld point.

A series of 10-second runs are made at pre-selected loads and runs at successively higher loads are made until welding of the four balls occur. Two measurements are made of the wear spots on each of the three lower balls and the average scar diameter readings are plotted to establish the load scar curve and the weld point. The worksheet data collected from the determination of the load scar curve is used in calculations under the mean Hertz load formula for the determination of the EP value.

TEST PROCEDURE:

$$\text{LDH}$$

$$\text{Corrected Load} = X$$

$$L = \text{Load}$$

$$DH = \text{Hertz Diameter}$$

$$X = \text{Average Scar Diameter}$$

$$\text{Extreme Pressure Value} = \frac{\text{Total corrected loads}}{\text{Number (15 min.) of progressive runs}}$$

A series of 10-second runs are made at pre-selected loads shown in the first column of the four ball EP worksheet. The first run is made with a load of 40 kg. (marked base) and subsequent runs at successively higher loads until welding of the four balls occurs. Two check runs at the welding load are made, and if welding does not occur in both of the check runs, the next higher load is applied until welding occurs. The three lower balls are retained in a holder for measurement of the scar diameters.

SCAR DIAMETER MEASUREMENT:

Two measurements are made of the wear spots on each of the three lower balls. One measurement is made horizontally and the second measurement is made vertically. These measurements are recorded in columns one through six on the shell four ball EP worksheet. The arithmetic mean of the six measurements is obtained and placed in column X. The average scar diameter readings are plotted against kg. load as part of the report.

WELD POINT:

Weld point is that point at which there is immediate seizure of the four balls and is the end point of the test. This point is shown on the load scar curve by a vertical arrow at the loading above the last measurable scar recorded.

EP VALUE:

The Hertz line diameter is calculated from the formula determining the diameter of the contact area between two spherical surfaces. This diameter is the static indentation caused by deformation of the balls under load at the start of the test. This dimension is shown on the four ball worksheet as factor DH, where LDH is used to determine the corrected load.

TEST RESULTS:

The objectives of this procedure are completed with the plotting of the load scar curve including weld point and calculations of the EP value.