DEPARTMENT OF

TRADE AND COMMERCE
CANADA

S-EA.497

STANDARDS BRANCH

OTTAWA February 17, 1961.

TYPE APPROVAL

SANGAMO TYPE "4L3" COMBINATION POLYPHASE 2-ELEMENT WATTHOUR METER AND THERMAL KVA DEMAND METER

The apparatus specified and illustrated herein has been duly approved by the Standards Branch under the provisions of the Electricity Inspection Act, Chapter 94, R.S. 1952, and may be admitted to verification in Canada.

Apparatus Approved: Type "4L3" Combination Polyphase 2-Element Watthour Meter and Thermal KVA Demand Meter, manufactured by Sangamo Company Limited, Leaside, Toronto 17, Ontario.

Rating of Apparatus:

Current Range	0.12-7.5 amperes
Voltage	115 volts
Frequency	60 cycles
Phase	3
Wire	3
Disc Constant	1/6 each disc
#Register	Differential, clock 4-dial with test dial
Register Ratio	6000 (overall)
*Single Phase Test Constant	3/4
Full Scale (polyphase)	1500 VA

Register approved under Circular S-EA.493, January 23, 1961.

* When testing on single phase, the test load must be reduced by a factor of 3/4 to obtain the same reading; e.g., the test load for a reading of 1.0 KVA will be .75 KVA, that is, .375 KVA single-phase load applied to both elements in series.

NOTE: All single-phase tests must be made with potential applied to both elements.

Description: The watthour section is the same as that now used in the "4L2" meter, namely, two type 'S-3' elements mounted side by side and joined only through a common differential register. The phase-shifting transformers and tap switch found in the "4L2" have been replaced in the type "4L3" by rectifiers through which full wave rectified DC is applied to the demand element heaters so that the demand scale indicates volt-amperes at any power factor, lagging or leading independently of phase rotation. The "4L3" is in the same enclosure, has the same terminal arrangement and can be directly substituted for the "4L2".

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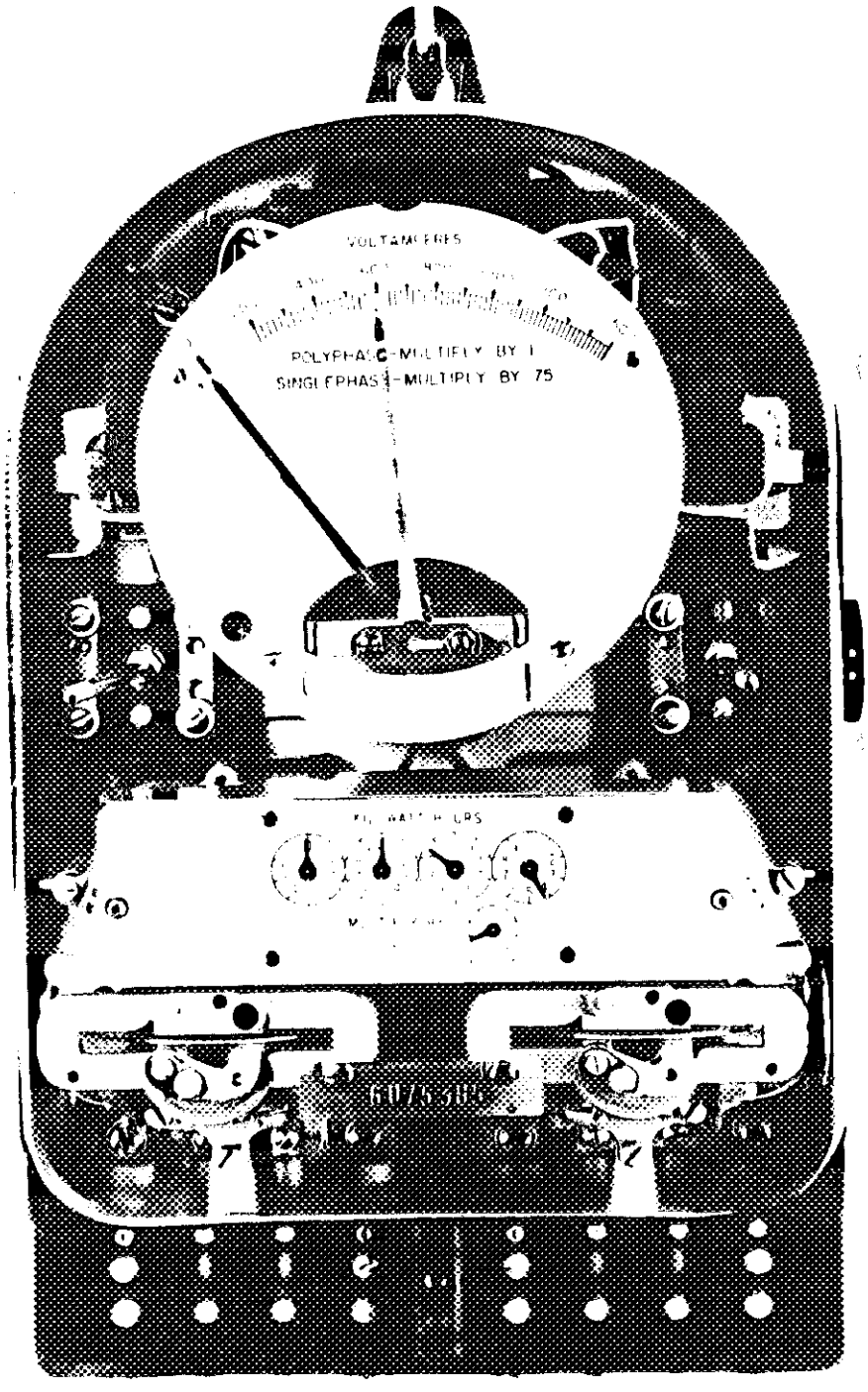

The voltage circuit for the demand element contains two small transformers. On a 3-phase 3-wire service their primaries are connected to two of the 3-phase voltages at 60 degrees. Their secondaries are connected to add at 120 degrees, and the secondary current is rectified by two silicon rectifiers. This means that the voltage component in the heater circuit is proportional to the sum at 120 degrees of the line voltages or $\sqrt{3}$ times one line voltage. On single phase, the transformer primaries are in parallel and the secondaries are in phase, making the secondary current proportional to twice the line voltage, so that for single phase loading an adjustment of $\frac{\sqrt{3}}{2}$ is required.

The current circuit:- For 3-phase measurement, all three currents must be taken into account. Since only two are supplied by the current transformers, the full effect of the three currents must be derived from these two. A network of rectifiers is arranged to supply full wave DC proportional to the three currents on a polyphase load, but if single phase is applied, the transformers will be in phase, so the single-phase current must be reduced by the factor $\frac{\sqrt{3}}{2}$ for a given scale reading. The total adjustment thus required for single-phase testing is $\frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$ or 3/4. This factor is printed on the demand scale. On the odd chance that this meter is used to measure a single-phase load, this factor would apply as a multiplier to the demand register readings, but both elements must be energized.

The above explanation is valid only when potential is applied to both elements; readings obtained otherwise are meaningless.

The use of a metal plate bearing the serial number and mounted between adjacent tapped holes in the magnet housing, and a new differential register are covered by Circular S-EA.493.

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