Department of consumer and corporate affairs / Ministère de la consommation et des corporations

STANDARDS BRANCH - DIRECTION DES NORMES

NOTICE OF APPROVAL

E - 96

OTTAWA December 10, 1970

SANGAMO TYPES "KYRS", "KYRP" and "KYRF" POLYPHASE
2-ELEMENT and 2½-ELEMENT Y REACTIVE KILOVALTAMPEREHOUR METERS

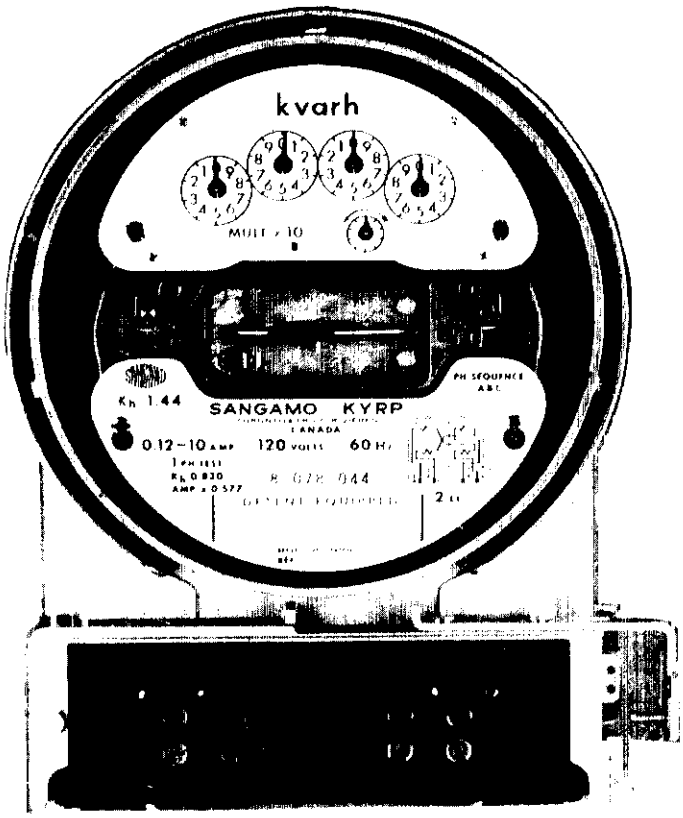
2 Element

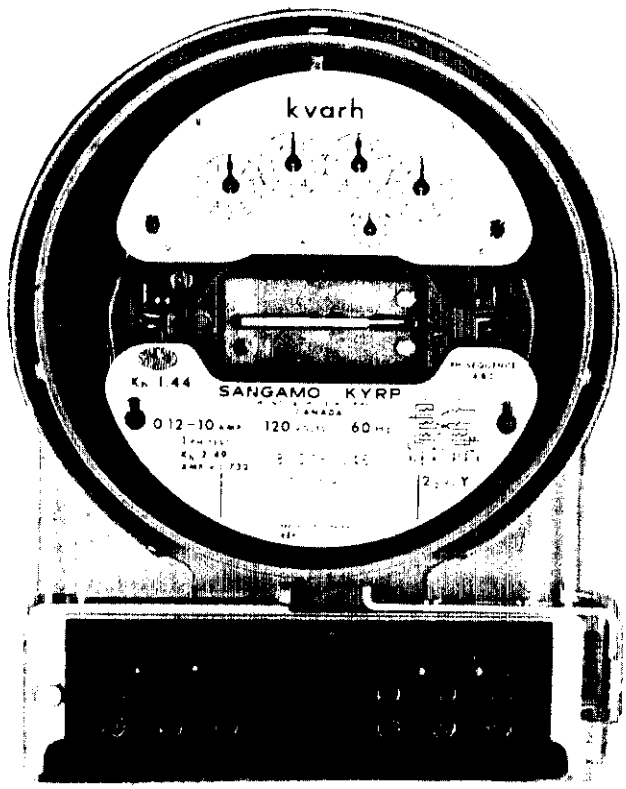
Current Range	0.12-10 amperes				
Voltages	120	240 ①	345	480	600
Varhour Disc Constant (kh)	1.44	2.88	4.32	5.76	7.2
Single Phase Watthour ② Disc Constant	0.830	1.66	2.49	3.32	4.15
Single Phase Test Constant ③	0.577 all ratings				
Register Ratio (Rr)					
4 & 5 dial x 1	83-1/3	41-2/3	27-7/9	20-5/6	16-2/3
4 dial x 10			277-7/9	208-1/3	166-2/3

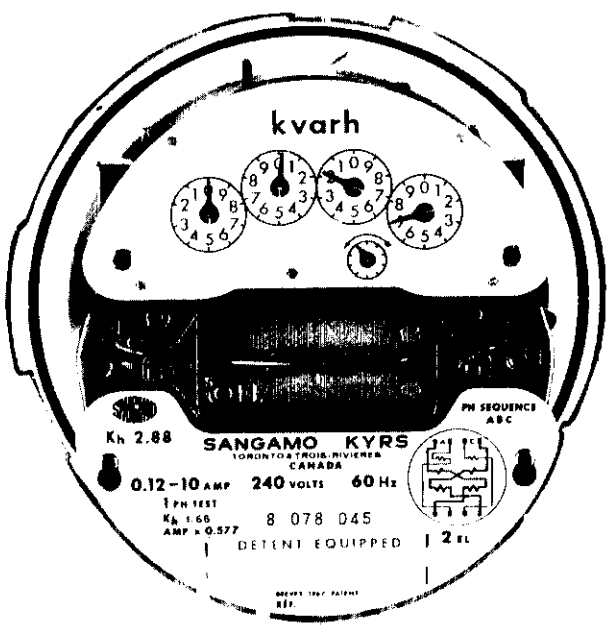
2½ Element Wye

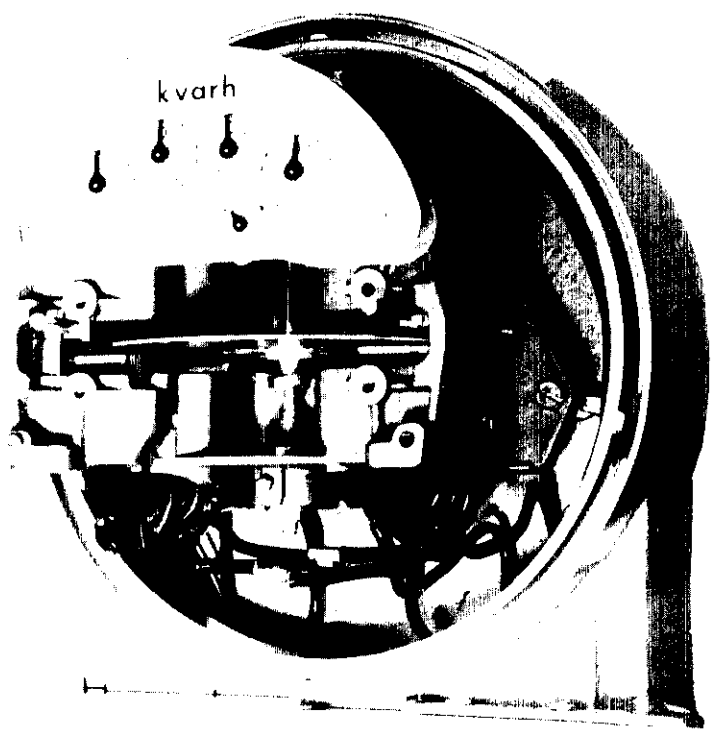
Current Range	0.12-10 amperes		
Voltages	120	240 ①	345
Varhour Disc Constant (kh)	1.44	2.88	4.32
Single Phase Watthour ② Disc Constant	2.49	4.98	7.47
Single Phase Test Constant ③	1.732 all ratings		
Register Ratio (Rr)			
4 & 5 dial x 1	83-1/3	41-2/3	27-7/9
4 dial x 10			277-7/9
Frequency	50hz and 60hz		
Phase Rotation	ABC as shown on nameplate circuit diagram		
Burden Data			
Voltage Coil (at rated voltage)			
60hz	1.0w	7.9va	7.8rva
50hz	1.25w	9.7va	9.6rva

SANGAMO TYPES "KYRS", "KYRP" and "KYRF" POLYPHASE 2- ELEMENT AND 2½ ELEMENT REACTIVE KILOVALTAMPEREHOUR METERS









Current Coil (at 5 amperes polyphase)

2 Element Meter				
60hz single coil		0.70w	3.2va	3.1rva (each coil)
50hz single coil		0.70w	2.7va	2.6rva (each coil)
$2\frac{1}{2}$ Element Wye Meter				
60hz single coils	A and C	0.36w	0.80va	0.72rva (each coil)
	split coil B	0.23w	0.45va	0.39rva
50hz single coils	A and C	0.36w	0.70va	0.60rva (each coil)
	split coil B	0.23w	0.40va	0.32rva

(1) 240 volt 60hz meters may be used on 277 volts without recalibration.

(2) The single phase disc constant marked on the nameplate is in watthours and is the value to be used when verifying these meters on single phase.

(3) The single phase test constant is the multiplier that is to be applied to all the test currents. For example, if the prescribed test current is 2.5 amperes, the single phase test current that should be applied would be 2.5 x .577 or 1.45 amperes for the 2-element and 2.5 x 1.732 or 4.33 amperes for the $2\frac{1}{2}$ element Y. These multipliers must also be applied to the register readings when dial testing on single phase. The register ratio (Rr) matches the disc constant in varhours, and therefore when testing on single phase where the disc constant is in watthours, it will be necessary to apply a multiplier to the register reading.

For example, one revolution of the test dial is equivalent to 1 kilovarhour, so that using the appropriate multipliers, the rotating standard will record 1000 x .577 or 577 watthours for the 2-element meter and 1000 x 1.732 or 1732 watthours for the $2\frac{1}{2}$ element Y meter.

The phase sequence is marked ABC on the nameplate and it is necessary for the correct operation of the meter that this be observed.

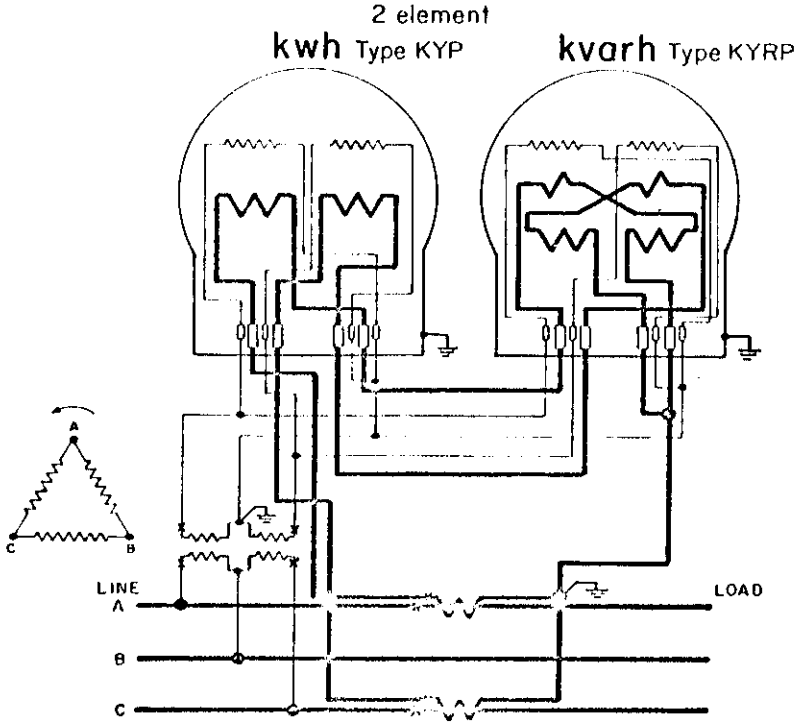
The schematic diagrams on pages 4, 6, 8 and 10 indicate the correct connections for these meters in service and also indicate the various jumpers required to verify these meters on single phase.

All the registers are clock type with test dials.
All meters can be supplied with potential indicating lamps.
All ratings are available in "S" base socket, "P" base bottom connected and "F" base semi-flush panel enclosure.
Meters may be used with and without reverse running detent.

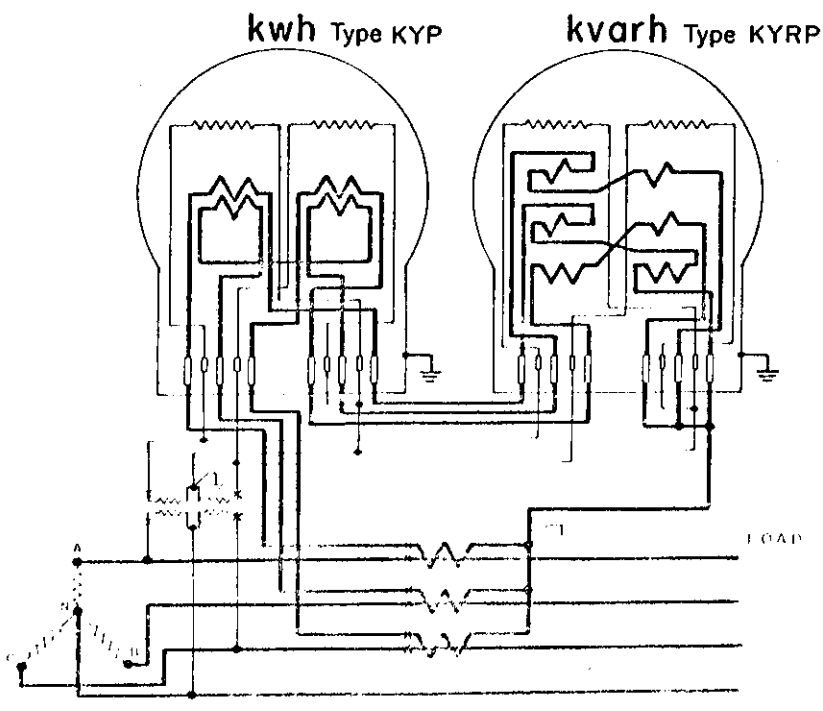
NOTE: The reverse running detent is also approved for use on the following approved meters of the "K" line - KYA, KYS, KYP, KYF, (E-60), KYWA, KYWS, KYWP, KYWF (E-65-1), KYLA. KYLS, KYLP, KYLF, (E-66-1), KYWLP, KYWLS and KYWLF (E-71).

SANGAMO TYPES "KYRS", "KYRP" and "KYRF" POLYPHASE 2-ELEMENT AND $2\frac{1}{2}$ ELEMENT Y REACTIVE KILOVOLTAMPEREHOUR METERS

FRONT VIEW
2 element



FRONT VIEW
2 1/2 element Y



Description

The type "KYR-" Kvarh polyphase meter is basically the type "KY-" Kwh polyphase meter with a change in the internal current circuits like that of the former type P40 reactive energy polyphase meter.

Each current circuit has a number of turns on each of the two current yokes so that each current is associated with two voltages. The meter thus measures reactive kilovoltamperehours on lagging power factor.

The 2-element design has two current coils on each electromagnet, one coil having twice the number of turns of the other, and the $2\frac{1}{2}$-element design has three current coils on each electromagnet, one coil having twice the number of turns of the other two.

When verifying a 2-element meter on single phase, because of the direction in which the current coils are wound, it is necessary to reverse the connections to the voltage coil of the right hand element for forward rotation of the disc. See diagrams on page 10.

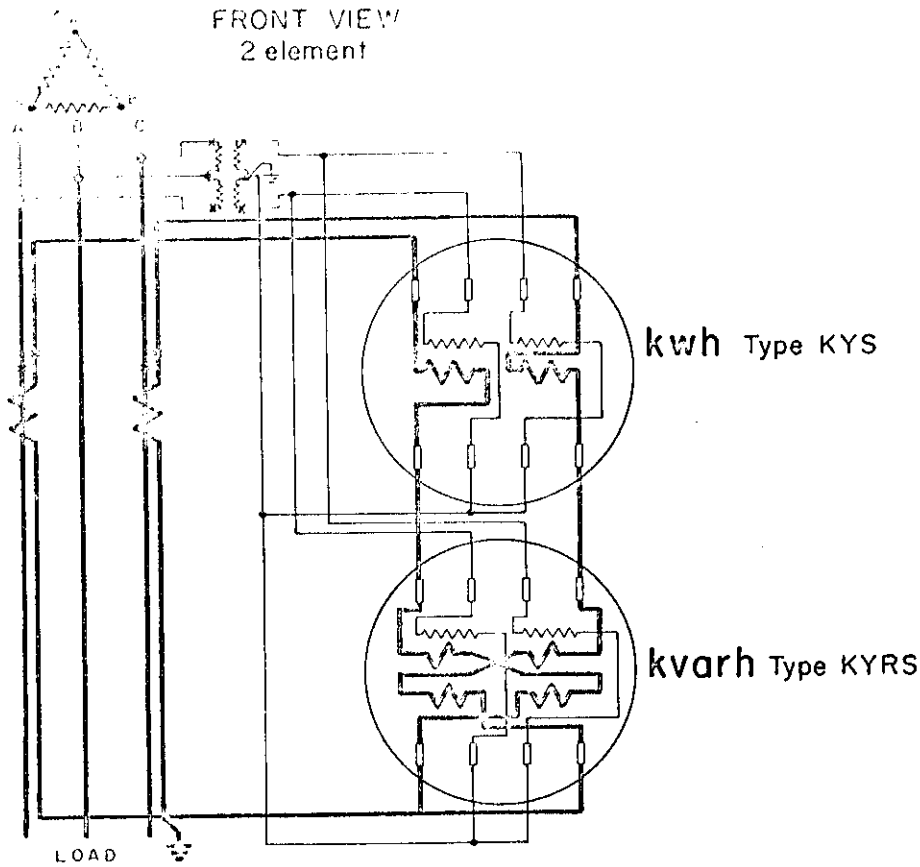
When verifying a $2\frac{1}{2}$ element Y meter on single phase, for the same reason it is necessary to reverse the connections to the voltage coil of the right-hand element and reverse the direction of B current. See diagrams on page 10.

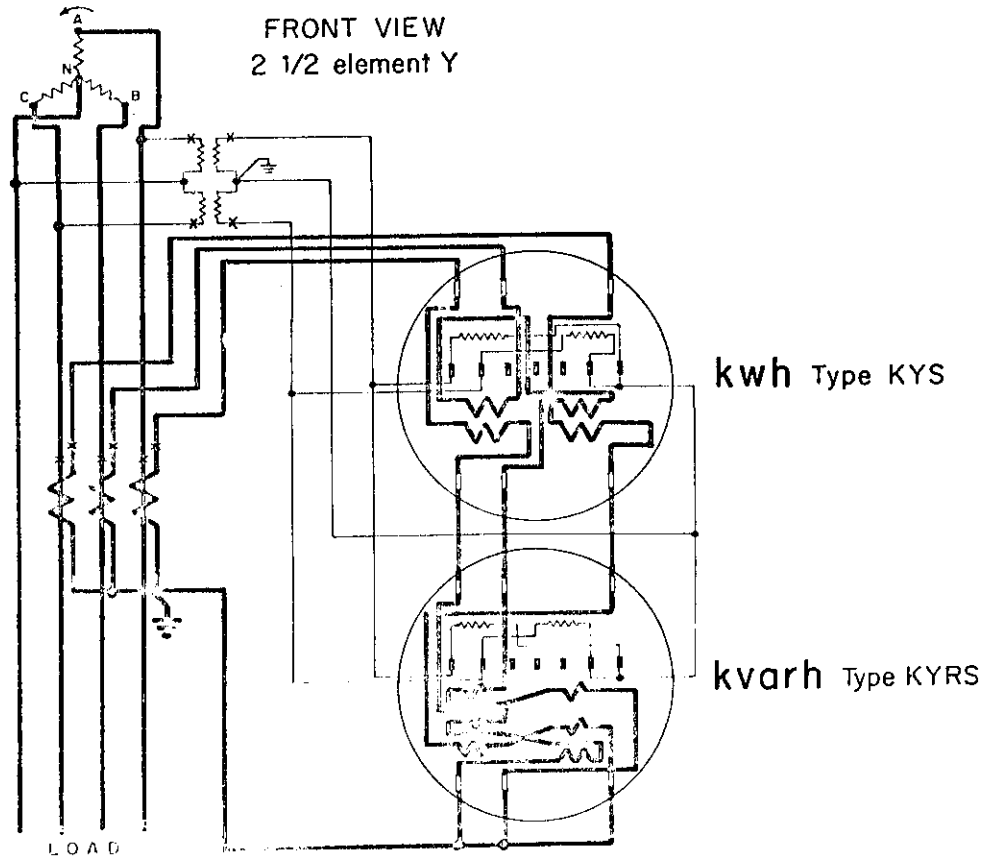
The 2-element meter may be used to measure the reactive energy in a 3-phase 4-wire Y circuit if the current circuit is fed from the secondaries of three current transformers connected in delta similar to the connections of a 2-element watthour meter.

In this application, the connections differ from those of the 2-element watthour meter in that (a) the current to the element "A" and (b) the potential to the element "C" of the varhour meter are connected in reverse polarity. See diagram on page 8.

To prevent reverse rotation of the disc on leading power factor, the meter can be equipped with a reverse running detent that mounts on the disc shaft below the disc. This detent is of a design that does not depend upon gravity for its operation and when a meter is so equipped, the customer badge plate will carry the word "Detent Equipped" in red.

SANGAMO TYPES "KYRS", "KYRP" AND "KYRF" POLYPHASE 2-ELEMENT AND 2½ ELEMENT Y REACTIVE KILOVALTAMPEREHOUR METERS





Because of the interconnection of the current coils, the adjustments of one element affect the calibration of the other element. The initial balancing, therefore, should be done on separate potentials with all current coils in series.

After the meter has been balanced on high load unity and 0.5 power factor and low-load test currents, both potential coils should be energized and the final calibration made on separate current coils or all current coils in series by adjusting both light load vanes or both inductive adjustments by the same amount, thus maintaining the original balance between elements.

The type KYR- reactive kilovoltamperhour meters are of the single disc type with the electromagnet assemblies displayed ten degrees from being diametrically opposite one another across the meter disc.

Each electromagnet assembly consists of separate current and voltage electromagnets, dowelled with spring pins and screwed to machined pads on the meter grid.

A small plate bearing the serial number is held in place by one of the grid mounting screws.

The meter disc is of solid aluminum with a perforated central section.

The rotor bearing system is the magnetic flotation type used in the KY- meter series consisting of 3 toroidal barium ferrite magnets, two mounted on the rotor spindle opposing one mounted in the lower stationary housing with a temperature compensator around its periphery.

The guide pins in the lower and upper housing and the graphite guide bearings are the same as those used in the KY- series.

The disc speed is controlled by a pair of alnico drag magnets. The alnico magnet and its compensator is wrapped in a soft aluminum wrapper and two of these assemblies are pressed into a rigid diecast enclosure.

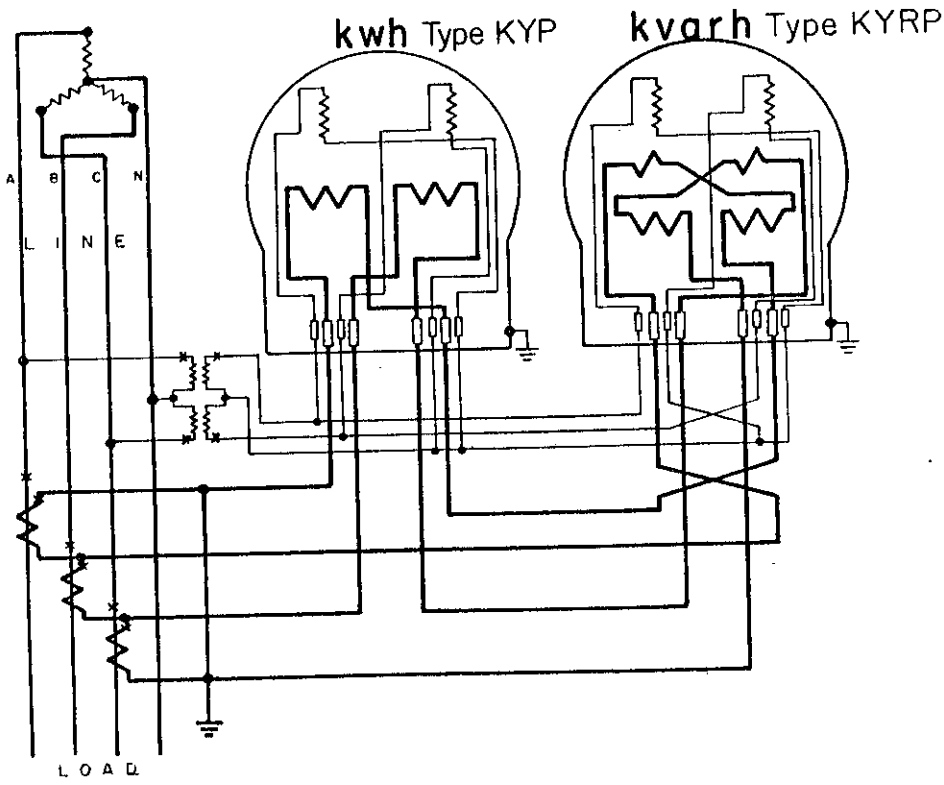
This enclosure carrying the drag magnet is dowelled with spring pins and secured with screws to machined pads on the main meter grid, and can be removed to permit removal of the disc and replaced without disturbing the calibration appreciably.

All adjustments are linear and turn to the right to slow the meter down.

The full load adjustment is a spring loaded plate across the front of the drag magnet and is recessed in the housing. This plate rocks over a ridge in the housing during adjustment.

SANGAMO TYPES "KYRS", "KYRP" AND "KYRF" POLYPHASE 2-ELEMENT AND $2\frac{1}{2}$ ELEMENT Y
REACTIVE KILOVALTAMPEREHOUR METERS

FRONT VIEW
2 Element



Each element has it's individual low load adjustment consisting of a spring-loaded conducting vane, movable across the pole face of the voltage electromagnet by means of a threaded guide rod.

Each element has it's individual inductive adjustment consisting of a lag band around the central pole of the voltage electromagnet whose resistance can be altered in steps by cutting sections out of the band. A "U" shaped vane adjusted by a spring loaded brass screw provides a vernier adjustment.

Each element has an auxiliary calibration adjustment for obtaining balance, consisting of two steel screws that move in or out of the flux gaps of the potential electromagnet. These screws should be moved equal amounts when adjusting.

As these meters are transformer type, there are no test links on either the "P" or "S" bases as the connections to the current and voltage coils are connected to separate terminals or blades. Diagrams on the name-plates show these connections.

Approval granted to

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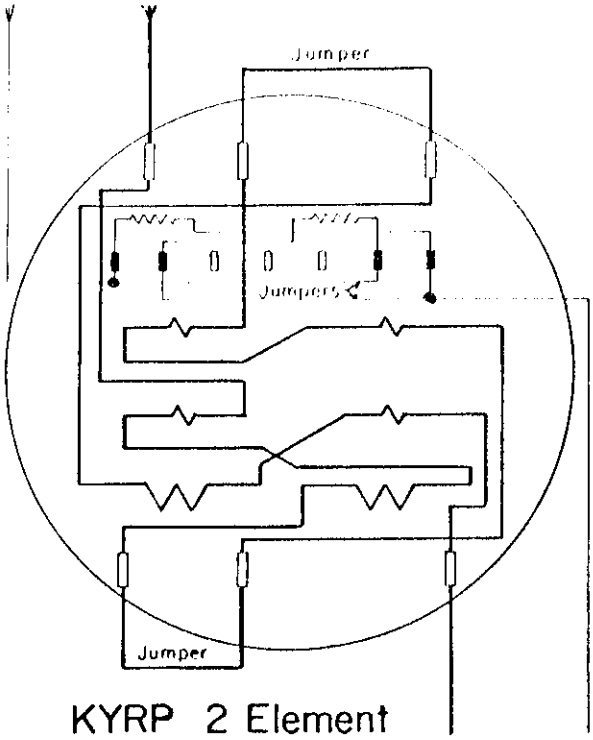
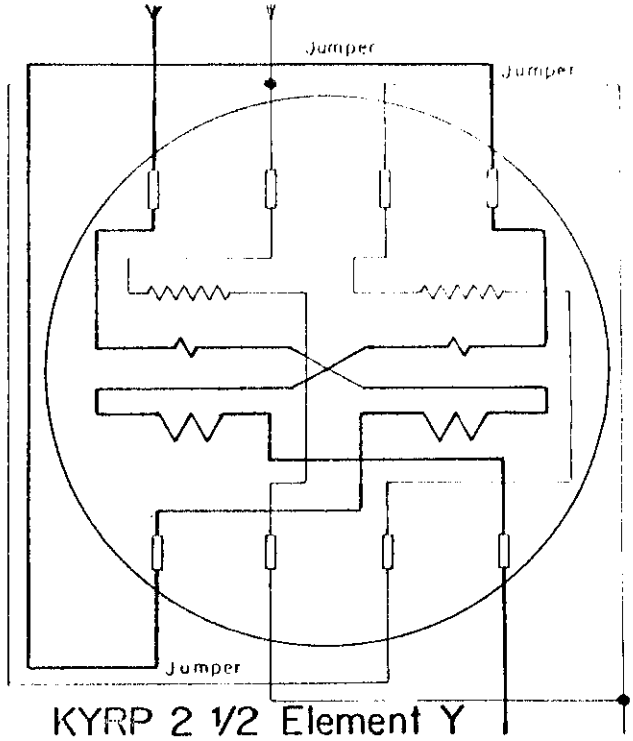
SANGAMO TYPES "KYRS", "KYRP" and KYRF" POLYPHASE 2-ELEMENT AND $2\frac{1}{2}$ ELEMENT Y REACTIVE KILOVALTAMPEREHOUR METERS

KYRS 2 1/2 Element Y



KYRS 2 Element



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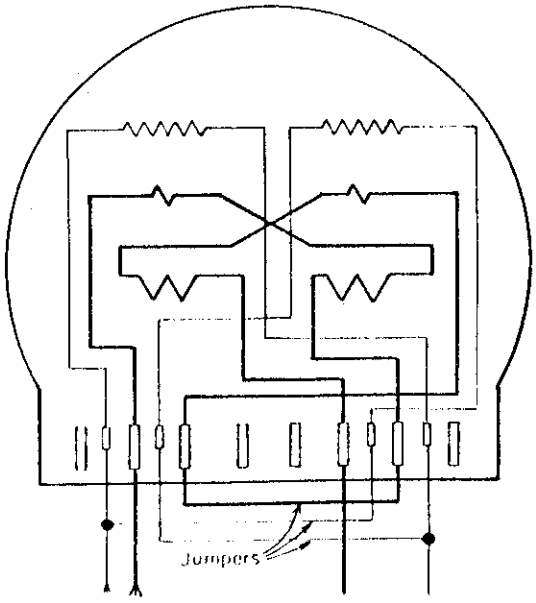
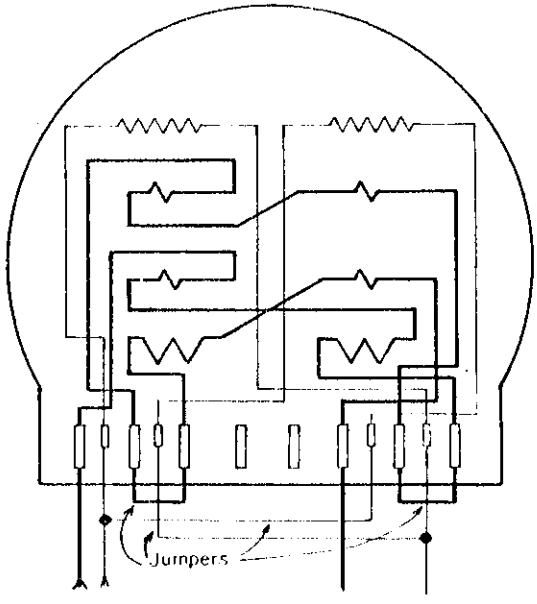


KYRP 2 1/2 Element Y



SINGLE PHASE TEST CONNECTIONS