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GENERAL ELECTRIC COMPANY
SCHENECTADY, N. Y., U. S. A.

DATA FOLDER No. 71178

Title Sciaky Intermittent Rectifier Tests on FG-271 and FG-235-A

By

Vac. Tube Engg. Dept. Div.

Information prepared for

Tests made by

Information prepared by R. E. Franklin

Countersigned by

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Sciaky Intermittent Rectifier Tests on FG-271 and FG-235-A

Vacuum Tube Engg. Dept. April 26, 1941.

Purpose: Arcback Test

This test was made with the FG-271 and the FG-235-A ignitrons to determine the variation of conduction time before arcback with varied phasing down and overload currents. With this information it may be possible to estimate the probable maximum current that these two particular sizes of ignitrons would carry for approximately two seconds without an excessive number of arcbacks.

Purpose: Duty Cycle

The second portion of the tests on the FG-271 and the FG-235-A was made at a duty cycle to give approximately rated average current in order to demonstrate the maximum current that each size would take for two seconds or more and still fall inside the minimum of one arcback or less in a thousand conduction periods for each tube.

Procedure:

Throughout this test the runs were made either at 30° C or at 50° C water out. During the conduction period no cooling water was put in the reservoir, neither was any other than tube heat added to the reservoir water.

The time-load results are made more consistent if the same temperature gradient between the anodes and cooling water is secured before every run. This best is accomplished by chilling the reservoir slightly below the desired temperature and firing the tubes until the water out reaches 30° C or 50° C, as desired.

All tubes were aged before attempting the test and they also were aged or cleaned after every arcback. Phasing was controlled by a Selsyn in the grid circuit of the FG-105 ignitor tubes.

When the duty cycle run was made it was thought best to use different FG-271 ignitrons so they were changed. Also, an electronic timer or a hand timer was used to secure the proper duty cycle timing.

Discussion:

During these tests, it developed that the FG-271 ignitrons will refuse almost immediately to pass too great a current by arcing back. On the other hand, the FG-235-A seems able to carry unlimited currents for a short time at least as far as the capacity of the equipment used on this test is concerned. The curves show the 235-A to have a flat current-time characteristic at the upper currents. Also, these tubes never did strike back as soon as the circuit was established.

It is evident that even at the higher water temperatures the FG-235-A tubes tend to carry unlimited currents for a second or so. With increased phasing down it appears that the ultimate overcurrent is nearly independent of the water temperature. At least the time before arcback almost is the same at 30° C and 50° C temperatures. This feature, incidentally, is the case for the 271 as well.

Inasmuch as the 271 and 235 carried for over ten seconds an average current of 600 and 1200 amperes, respectively, before arcback, it seemed that a 40 per cent duty cycle, say, could be carried indefinitely at these currents. These were attempted unsuccessfully on both tube types for they repeatedly arced back after a few minutes' run.

In the effort to find how much the tubes would carry at short periods it was necessary to make a 100 per cent duty or continuous run with the FG-235-A and a 50 per cent duty cycle for the 271 tube. The final results indicate about 160 amperes and 80 amperes per tube, respectively, operating three phase, two seconds on and one second off. Both sets of tubes passed the standard factory production tests after these runs were completed so that the tubes must have been in good condition during the test.

Conclusion:

The water temperature has relatively little effect on the time before arcback and especially at the higher currents and greater phasing down of the output voltages.

The duty cycle run shows that at 250 volts it is not possible to increase the average current much over the present rating for short time intervals, like two seconds on. Although the performance

in the arcback test (at high arcback rate) indicated an increase to 150 and 350 average amperes (56 and 140 amperes standard rating) under these conditions for the 271 and 235-A, respectively, it was found that 80 and 160 is all that can be counted on.

If a high rate of arcback can be allowed the tubes will carry several times rated average current, but, if one arcback in 2000 seconds is top, only a little more than rated can be carried.

At lower voltages (155 to 170 required by Sciaky) the ratio of demand current to average current can be expected to be somewhat higher.

It seems that tube rating should be on the basis of full on phasing for the tests show the time to arc back for a constant load impedance was practically independent of the phase angle. That is, the per cent of phasing also is the per cent ratio of maximum current at that setting to the maximum at full phase on.

R. E. Franklin
4-28-41
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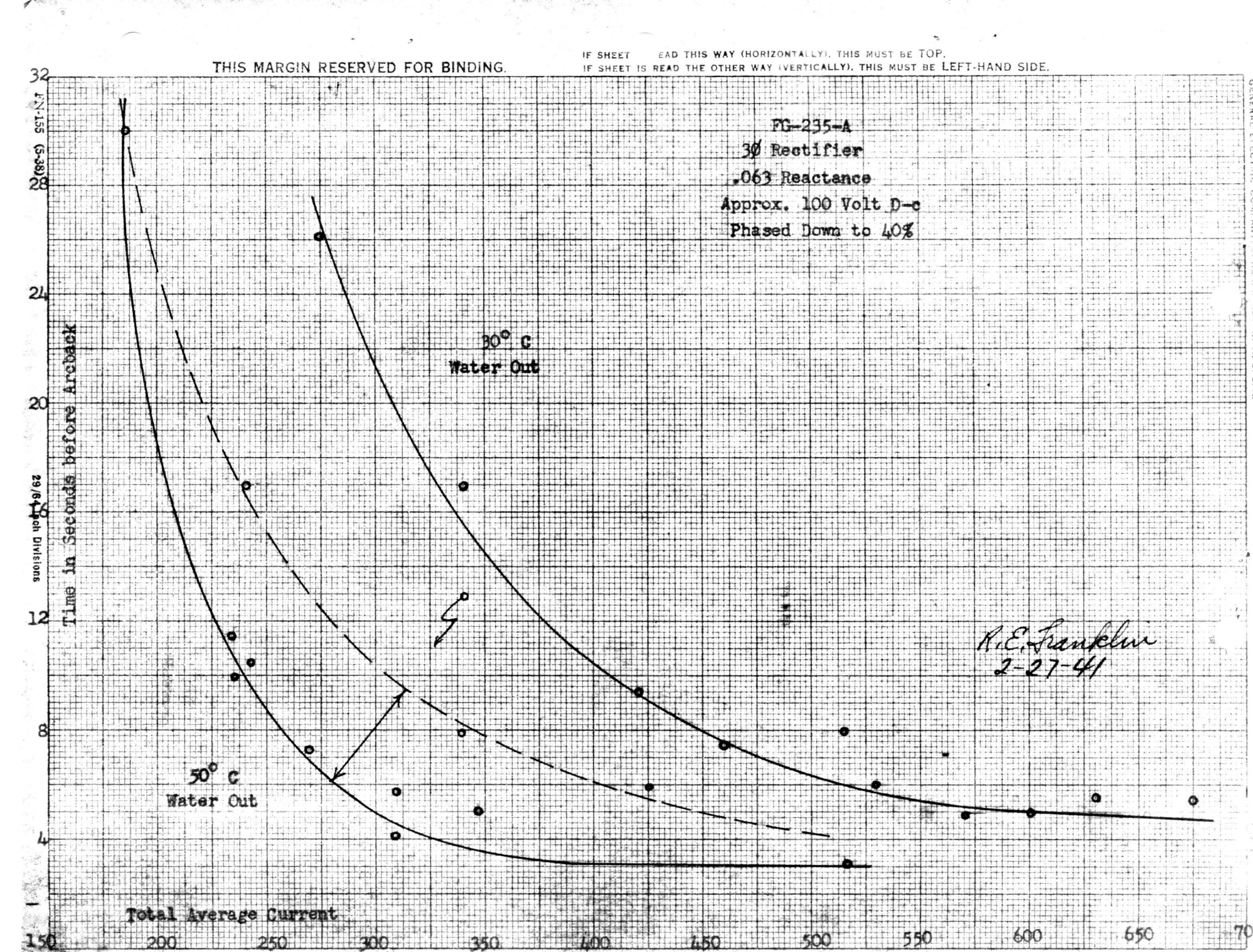
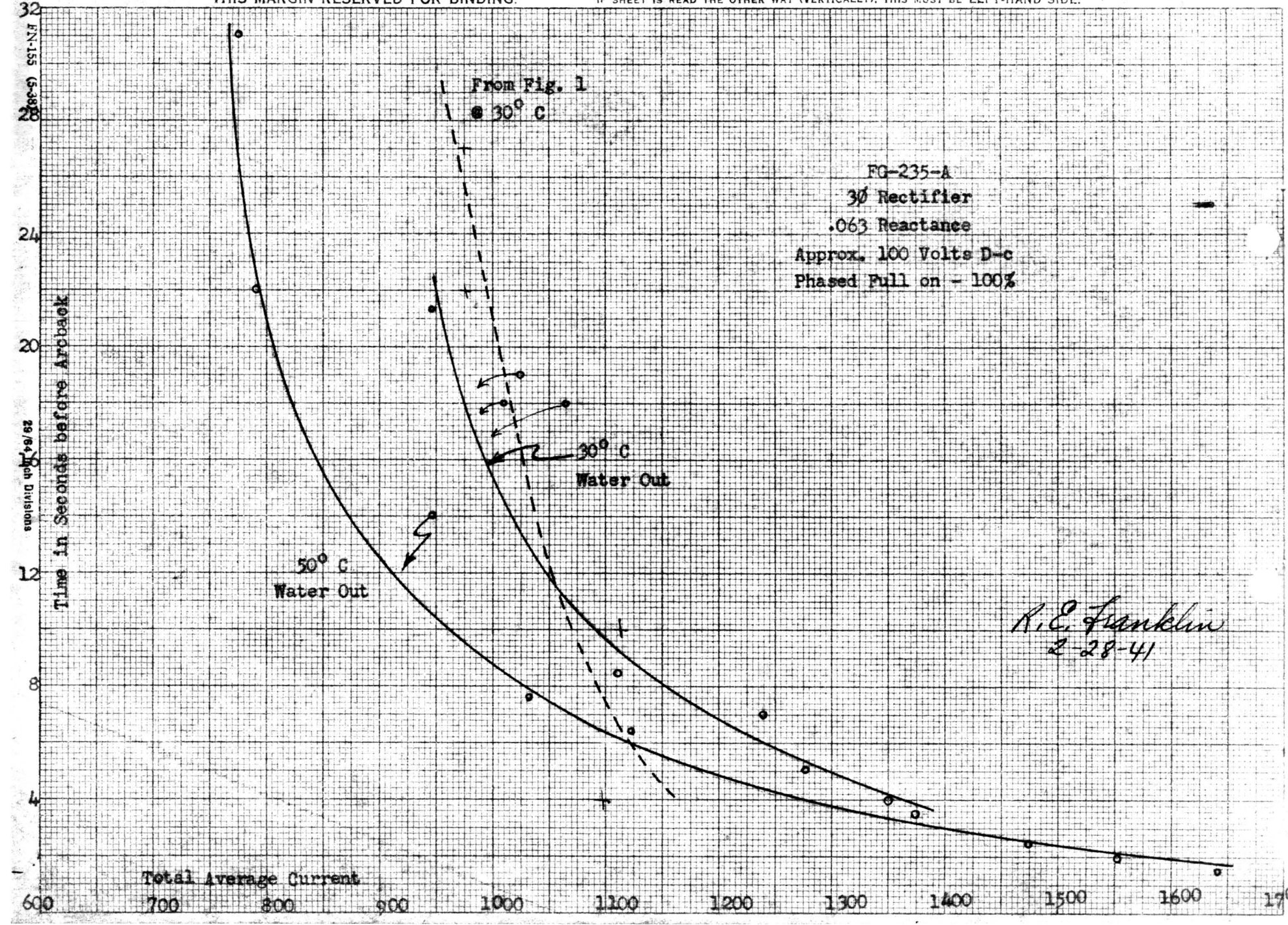
WC White)
OW Pike) 1 copy
RW Larson)

HL Palmer 1 copy
GW Garman 1 copy
AC Gable 1 copy
JH Hutchings - 1 copy
RE Franklin - 1 copy





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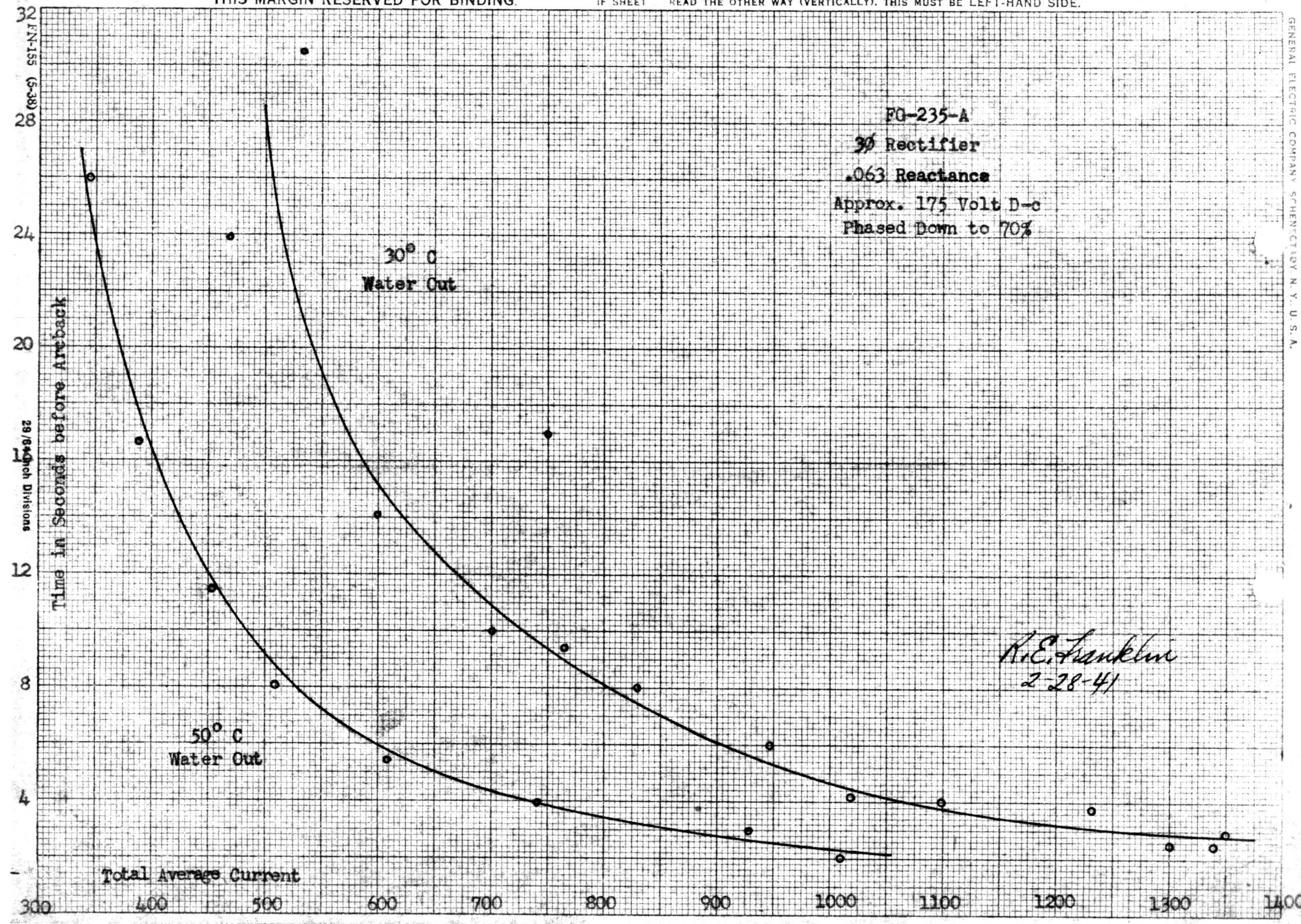
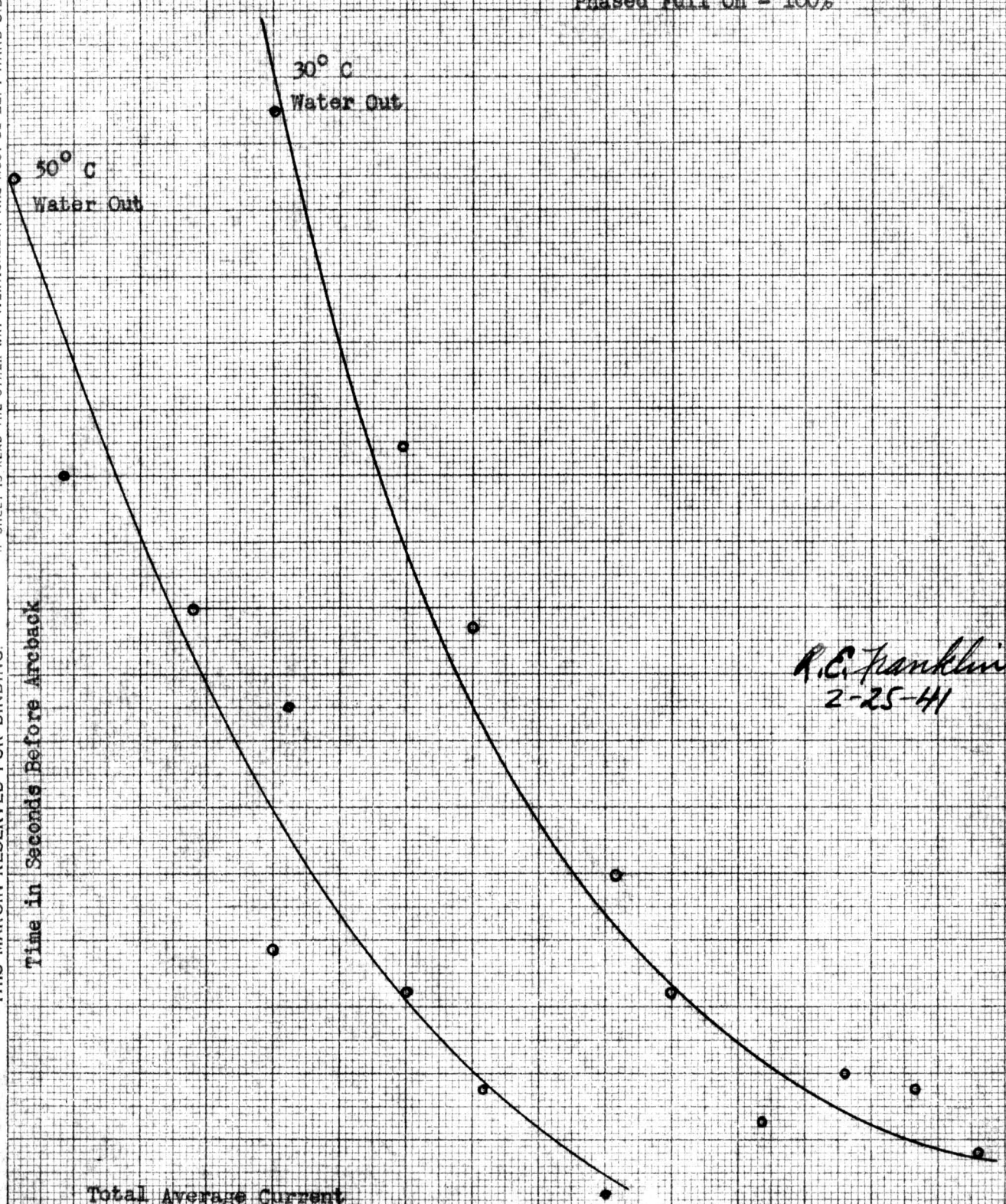


FG-271
3Ø Rectifier
.063 Reactance
Approx. 250 Volt D-c
Phased Full On - 100%



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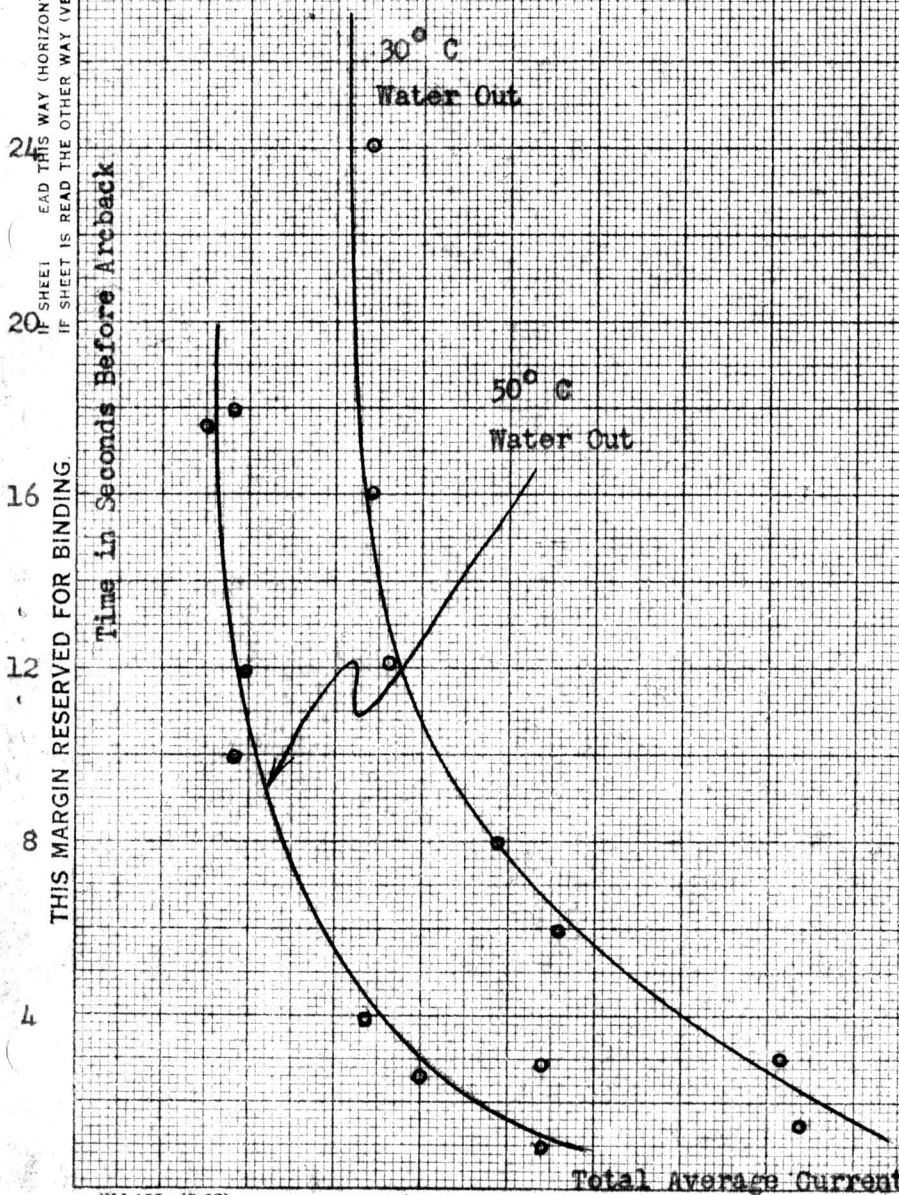
FG-271
3Ø Rectifier
.063 Reactance
Approx. 100 Volt D-c
Phased Down to 40%



R. E. Franklin
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