

SUBJECT TESTS TO DISTINGUISH CHROMIUM-
BEARING & CHROMIUM-FREE ALLOYS

SUPERSEDED DATE

Formerly 34-9-9

Certain metals used in cathode-ray tubes are selected primarily because of their magnetic behavior. Consequently a magnetic test is particularly useful for identifying a metal and distinguishing it from other alloys. However, due to some metals having a magnetic property in the annealed state different from that in the cold rolled state it is necessary to have those metals in a known state. It is therefore usually required that they be annealed or cold rolled before being used.

1. EXPLANATION FOR TABLE ON PAGE 2

- a. All conditions shown, except where NF or CR appears, are after annealing the specimen for 15 min. at 1050°C in wet hydrogen.
- b. NF (not fired) means that it is not necessary to fire the metals since each has the same magnetic characteristics in the annealed and cold rolled state.
- c. CR (cold rolled) means that the metal should be cold rolled to reduce cross sectional area 50%.
- d. RESISTANCE means that there is no reliable magnetic test but the metals may be distinguished by their resistances which are as follows:

Hastelloy A & B	750 ohms/cir.inil foot
Inconel	600
Molybdenum	35

- e. The conditions in the upper right corner of the table are the simplest or the only conclusive test available and should be used whenever sufficient, while in lower left corner of the table confirming tests are given which may have to be used when three or more metals are involved.
- f. The table is used as follows:
If there is a metal which you know to be Hastelloy A or B, refer to the space to the right of the first of these two metals appearing in the left hand vertical column of metals (in this case Hastelloy A) and underneath the other metal in the top horizontal line of metals (in this case Hastelloy B). There it shows 30° which specifies that, after annealing the metal as specified in W VF 1a, which is implied, otherwise NF or CR will appear, and with the specimen at room temperature (30°C), if the metal is weakly magnetic (W) it is Hastelloy A but if very faintly magnetic (VF) it is Hastelloy B. For methods of obtaining temperatures refer to item 2 and for description of magnetic symbols refer to item 3.
For another test look to the right of Hastelloy B in the left hand vertical column of metals and underneath Hastelloy A in the horizontal line of metals. The -180° found there specifies that when the metal is at a temperature of
NM N
-180°C if it is non-magnetic it is Hastelloy B and if magnetic it is Hastelloy A.
To distinguish Nichrome 3 or 5 from 18-8 stainless steel, the conditions are CR 30° which means that the specimen must be cold rolled (CR) to reduce NM M
cross section area 50% and then when at room temperature (30°C) if it is non-magnetic (NM) it is nichrome 3 or 5 but if magnetic (M) it is 18-8 stainless steel.



SUBJECT:

TABLE SHOWING TESTS FOR DISTINGUISHING BETWEEN METALS BY MAGNETIC PROPERTIES IN COLD ROLLED OR ANNEALED STATE OR BY COLOR AFTER ANNEALING

(For description and use refer to p. 1)

Material	Chrom	Hastel-loy A	Hastel-loy B	Inconel	Molybdenum	Monel	K Monel	S Monel	Ni-chrome III & V	Ni-chrome III & V	Stnls. Steel 18-8	Stnls. Steel 18-12
Chrome Iron 18.5% & 27% Cr.	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Iron 18.5% & 27 Cr.	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Hastel-loy A	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Hastel-loy B	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Inconel	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Molybdenum	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
K Monel	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
S Monel	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Ni-chrome III & V	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Stnls. Steel 18-8	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl
Stnls. Steel 18-12	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl	gn cl

*** CHANGE ADDITION DELETION ***

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51-2 JK



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1. EXPLANATION FOR TABLE ON PAGE 2 (Cont'd)

f.(Cont'd)

In the lower or confirming part of table, xx means that there is no other distinguishing magnetic characteristic or that the magnetic difference is so slight and to be of little value.

If the condition is shown e.g., gn, cl. it means that after annealing the color is green (gn) or there is no change from the original bright metallic clear (cl) color. The other color change symbols are (wh) white and (tnd) tarnished.

2. TEMPERATURES

Metal samples should be cooled or heated to the specified temperatures as follows:

- 180°C. Immerse in liquid air.
- 75°C. Immerse in acetone containing solid carbon dioxide (dry ice).
- 0°C Ice and water.
- 30°C (86 F) Warm room temperature.
- 100°C Air oven.

At -180°, -75° and 0° the tests are made when the specimens are under a liquid which so dampens the movement that the "very faintly" magnetic class cannot be detected. If a sample was very faintly magnetic it was recorded as non-magnetic.

3. MAGNETIC TEST

Test specimens should be 1-1/2 to 2" of wire, strip or tubing. The specimen should be approached by the magnet specified in 44-11-1 and the response noted, being graduated as follows:

- M - Magnetic : Jumps to magnet and adheres strongly.
- W - Weakly Magnetic: Does not jump to magnet but can be lifted.
- S - Slightly magnetic: Adheres readily but cannot be lifted.
- VS - Very slightly magnetic: A slight attraction.
- VF - Very faintly magnetic: Very faint attraction to move the specimen only when balanced on an edge or when tubing placed on a plate glass rolls slowly toward the magnet.
- NM - Not magnetic: No attraction even with special procedure used for VF.

STANDARDIZING SECTION
 RESEARCH & ENGINEERING DEPT.

SU-2