# Specific Gravity Readings for Common World Coíns 

(Displaying a Variety of Base and Precious Metals)

Prefaced with a chart of the standard coin metals and their specific gravities, for reference purposes.
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Mr. Gary S. Dykes
third edition, more U.S. Ag coinage added

## SPECIFIC GRAVITIES of Typical Metals (et al) Seen in Modern Coinage - A Presentation of the Primary Alloys Encountered

| Aluminum 6061 | 2.72 |
| :--- | :--- |
| Aluminum 7050 | 2.8 |
| Aluminum (pure form) | 2.71 |
| Brass (yellow ASTM B36) | 8.47 |
| Brass (Cu .60 and Zn .40 ) | 8.52 |
| Bronze (Cu with $8-14 \% \mathrm{Sn}$ ) | $7.400-8.900$ |
| Aluminum Bronze (ASTM B169) | 7.8 |
| Iron (pure) | $7.85-7.87$ |
| Columbium (also Niobium) | $8.57-8.6$ |
| Copper (pure) | 8.96 |
| Cupronickel (.75 Cu, . 25 Ni) | 8.95 |
| Cupronickel (60/40) | 8.94 |
| Gold (pure) | 19.32 |
| Chromium (pure) | 7.19 |
| Magnesium (pure) | 1.74 |
| Manganese (pure) | 7.44 |
| Nickel (pure) | 8.9 |
| Silver (pure) | $10.49-10.50$ |
| Silver (.90 Ag, .10 Cu) | 10.3 |
| Steel (with 1\% C) | 7.83 |
| Stainless Steel (.864 Fe, . 135 Cr , .001 C ) | 7.75 |
| Zinc (pure) | 7.14 |
| Tin (pure) | 7.28 |
| Lead (pure) | 11.35 |
| Silicon (pure) | 2.33 |
| Titanium (pure) | 4.5 |
| Platinum (pure) | 21.4 |
| omr Gary s. Dykes - 2015 |  |

SG for various silver alloys (where remainder is copper):
$.999=10.49$ (ASEs, silver rounds and bullion should test to this)
$.935=10.41$ (Some Spanish colonials)
$.925=10.39$ (Sterling silver, ie Canada to 1919, Australia to 1945)
$.917=10.38$ (Some Spanish colonials)
$.900=10.31$ (US Coin silver)
$.850=10.23$ (Swiss silver coinage)
$.800=10.17$ (Canada to 1967)
$.750=10.08$
$.600=9.84$
$.500=9.68$ (most Australian pre-decimal silver after 1945)
$.400=9.53$
$.300=9.38$
. $200=9.23$
$.100=9.09$ (Mexico billon Pesos 1957-67)
The above silver ratio chart is from "KurtS" of the forum, www.coincommunity.com. He has not posted since 2010. In his research on that forum, he too found many lower SG readings for US silver coins, quite a few were NOT $90 \%$ Ag.. One is left to wonder!! NOTE: he is now on Coin Talk!

May this present spread sheet assist you in your study of numismatics. Mr. Gary S. Dykes - webmaster of: www.Biblical-data.org
First: love of God and Theology
Second: loving my wife
Third: serving my brethren in the body of Christ
Numismatics is down there somewhere. :-)

|  | Sheet1 |  |  |
| :---: | :---: | :---: | :---: |
| Composition | Coin Type | Specific Gravity | Comments |
| CuNi | 1 Lilangeni Swaziland, 1979 | 8.92 | These coins are minted in Germany. |
| Ni plated SS | 5 Rouble Russia, 2012 | 8.09 | Coin shows surrender of Paris, as with most stainless steel based coins, the relief is low. |
| Ni | 1 Rupee India, 1947 | 8.89 | A 2 year type, with the beautiful tiger! For some unknown reason this nickel metal looks stunning. |
| Sn | 1 Satang <br> Thailand, 1942+ | 7.31 | Also in 1967-1973 about 790,000 were minted, apparently the date BE2485 was frozen. |
| CuNi | 5 cent Nickel <br> Unites States ،, 2002-D | 8.89 | . $750 \mathrm{Cu}, .250 \mathrm{Ni}$, a bit low |
| $\text { CuSn }+\mathrm{Zn}$ <br> see NOTE \#1 | 1 Lincoln cent United States, 1977-D | 8.66 | $.950 \mathrm{Cu}, .050 \mathrm{Sn} \text { and } \mathrm{Zn}$ <br> Usually referred to as "bronze cents" |
| $\mathrm{ZnCu}$ <br> see NOTE \#1 | 1 Lincoln cent United States, 2015-D | 6.94 | $.975 \mathrm{Zn}, .025 \mathrm{Cu}:$ inner core .992 Zn and .008 Cu Inner core was then electroplated with a thin layer of pure Cu . This results in the final .975 \& .025 |
| Alum/Bronze | 50 Centimes <br> Algeria, 1971 | 8.68 | Though not "glowing" this aluminum/bronze alloy still looks good. Ages well. .0712" thick at center. |
| Alum/Bronze | 20 Francs <br> France, 1950 | 7.66 | Counterfeits of this coin exist; this coin is authentic. |

Sheet2

| Composition | Coin Type | Specific Gravity |
| :--- | :--- | :--- |
| Alum/Bronze | 20 Centimes <br> France, 2000 | 7.9 |
| Alum/Bronze | 50 Centimes <br> France, 1923 | 7.69 |
| Alum/Bronze/Tin | 10 Pennia <br> Finland, 1980 | 8.09 |
| Acmonital see note \#2 <br> $\mathrm{Fe}, \mathrm{Cr}, \mathrm{Mn}, \mathrm{Ni}+$ | 100 Lire <br> Italy, 1978 | 7.6 |
| Acmonital see note \#2 <br> $\mathrm{Fe}, \mathrm{Cr}, \mathrm{Mn}, \mathrm{Ni}+$ | 50 Centesimi <br> Italy, 1941 | 7.66 |
| $\mathrm{Acmonital-52} \mathrm{note} \mathrm{\# 2}$ | 50 Kurus <br> $\mathrm{Fe}, \mathrm{Cr}, \mathrm{Mn}, \mathrm{Ni}+$ | Turkey, 1979 |
| Ni | 20 Centesimi | 7.69 |
| Italy, 1909 |  |  |$\quad 8.6$

## Comments

Shows the beautiful golden color, typical of some fresh aluminum/bronze alloys.

One of the few coins with its composition indicated on the coin itself.

Another beautiful aluminum/bronze colored coin, it glows! AI, Cu and Sn.

A later type of Acmonital, a stainless steel similar to AISI 430 (magnetic)

A later type of Acmonital, a stainless steel similar to AISI 430 (magnetic)

A later type of Acmonital, a stainless steel similar to AISI 430 (magnetic)

A coin graded as XF-45, almost no wear A 1922 coin tested to: 8.71.

A counterfeit, same diameter, weight, ( 5.02 grams), surely a counterfeit, via the low 8.54 SG. Missing the " $F$ " below date.

Sheet3

| Composition | Coin Type | Specific Gravity | Comments |
| :---: | :---: | :---: | :---: |
| Bronze | 1 Escudo <br> Portugual, 1979 | 8.97 | A nice reddish/chocolate brown color. Reading is a bit high, not much tin! |
| Cuplated steel | 2 Euro Cents France, 2007 | 7.92 | Edge has a groove, very simiilar to those seen on the cores of various bi-metallics. |
| Bronze | 2 Thebe <br> Botswana, 1981 | 8.82 | Small 12 sided coin. Weighed 1.72 g .. |
| Brass | 25 Sentimo <br> Philippines, 1985 | 8.35 | Typical bright yellow/brassy color. |
| Brass | 20 Euro Cent Finland, 2002 | 7.79 | Reading is on the lower end for brass, suggesting less Cu in the alloy. Bright. |
| AI | 1 Yen (year 47) Japan, 1972 | 2.73 | A good reading for aluminum. |
| $\mathrm{Cu}, \mathrm{Sn}, \mathrm{Zn}$ | 1 Cent <br> Canada, 1972 | 8.89 | Composition: . $980 \mathrm{Cu}, .005 \mathrm{Sn}, .015 \mathrm{Zn}$. SG of Pure Cu is $8.94-8.96$ |
| Fe | 5 Pfennig Germany, 1915 | 8 | Ingot iron is 7.86 , my reading is within limits. |
| Cuplated steel | 1 Cent <br> Canada, 2002 <br> (1952-2002) | 8.13 | The composition of the last of the cents! Some 2003-2006, were Cu plated Zn A magnet differentiates. |


|  | Sheet4 |  |  |
| :---: | :---: | :---: | :---: |
| Composition | Coin Type | Specific Gravity | Comments |
| CuNi | 750,000 Lira Turkey, 2002 | 8.8 | A bright white, suggesting a higher amount of Ni than a US nickel. |
| AgCu | . 25 Cent Quarter <br> United States, 2014 S | 10.16 | Proof, silver, Great Sand Dunes. The SG suggests only about . 800 Ag content! The mint states it is: . $900 \mathrm{Ag}, .10 \mathrm{Cu}$. |
| Mn, Bronze | One dollar Uniited States, 2015-D | 8.63 | Composition: . $770 \mathrm{Cu}, .120 \mathrm{Zn}, .070 \mathrm{Mn}$, .040 Ni . Bright yellow/white color. |
| CuNi | One Peso Mexico, 1974 | 9.16 | Each Mexican Peso showed some minor variations, in strike and weight. |
| CuNi | One Peso <br> Mexico, 1980 | 9.05 | The "open 8" variety. |
| $\mathrm{Cu}, \mathrm{Zn}, \mathrm{Ni}$ | One Pound \#1 Great Britain, 1985 | 8.63 | . $700 \mathrm{Cu}, .245 \mathrm{Zn}$, and .055 Ni |
| Nickel/Brass | 5 Piso <br> Philippines, 2004 | 8.72 | Strong golden/yellow color |
| CuNi | .25 cents <br> British Honduras, 1964 | 8.96 | Right on for a CuNi alloy. |
| $\mathrm{Cu}, \mathrm{Ni}, \mathrm{Nb}(\mathrm{Cb})$ | M.U.L.I.C., medal Franklin Mint, 1967 | 8.98 | Midwestern United Life Insurance medal. 24.42 grams, 38.8 mm . Franklinium II Columbium (Cb) is identical to Niobium |

Sheet5

| Composition | Coin Type | Specific Gravity | Comments |
| :---: | :---: | :---: | :---: |
| Nickel/Brass | 10 Francs <br> France, 1979 | 8.48 | Coin has a somewhat dull or antique finish, apparently applied via the French Mint. |
| Nickel/Brass | 2 Tolarja <br> Slovenia, 1998 | 8.49 | Typical bright yellow/brassy color. |
| Cu Zn | 5 cents <br> Canada, 1943 | 8.52 | . 880 Cu and .120 Zn , known as "Tombac" |
| steel, plated, 2 x | 5 cents <br> Canada, 1944 | 7.76 | low carbon steel, plated with $.0127^{\prime \prime} \mathrm{Ni}$ Then .0003" of Cr.. Bluish tinge. |
| $\mathrm{Ag}, \mathrm{Cu}$ | 2 Piastres <br> Egypt, 1944 | 9.45 | Listed as .500 Ag , but at 9.45 it is closer to being . $350 \mathrm{Ag}!6$ sided coin. |
| $\mathrm{Cu}, \mathrm{Ni}, \mathrm{Nb}(\mathrm{Cb})$ | one dollar token Nevada, 1967 | 8.99 | Franklinium II, not magnetic, exotic! Wagon Wheel Casino. Popular in casinos. |
| $\begin{aligned} & \mathrm{Ni}, \mathrm{Nb}(\mathrm{Cb})(\mathrm{Si} ?) \\ & \text { see note \#3 } \end{aligned}$ | one dollar token Nevada, 1965 | 8.37 | Rare Franklinium I. Is magnetic, Harrah's Casino. SG suggests some lighter metal Al or Mg is alloyed. See Gardiner's Islands issue of 1965 (rare). "Nicon" is $\mathrm{Cu}, \mathrm{Ni}, \mathrm{Cb}$. However it may contain Silicon, see last page. |
| $\mathrm{Al}(+\mathrm{Mg}$ ? $)$ | 10 kurus <br> Turkey, 1975 | 2.57 | Slightly lower SG than pure AI, Mg added? Magnesium is often added to Al to strengthen. |

Sheet6

| Composition | Coin Type | Specific Gravity | Comments |
| :---: | :---: | :---: | :---: |
| $\mathrm{Cu}, \mathrm{Zn}, \mathrm{Ni}$ | 1 pound \#2 <br> Great Britain, 1985 | 8.61 | Basically solid brass: . 700 Cu , .245 Zn and .055 Ni . Hence a nickel-brass. |
| Brass | 1 Piastre <br> Sudan, 1983 | 8.27 | Bright brassy color, weak strike, this one is a rare doubled die on the reverse. |
| Cu plated AI | 10 Prutot Israel, 1957 | 2.73 | Copper is electroplated over the AI. Layer is quite thin, barely affects the SG reading. (The Al may be an alloy with Mg ??) |
| CuNi | 10 Pesos <br> Chile, 1976 | 8.63 | 8.63 is suspiciously low, another element? |
| Al | 1 Centesimo Chile, 1962 | 2.74 | Appears to be pure Aluminum, big coin. |
| $\mathrm{Al}, \mathrm{Mg}, \mathrm{Mn}$ | 5 Lire <br> Italy, 1950 | 2.79 | An example of the Italian "Italma" alloy. $.962 \mathrm{Al}, .035 \mathrm{Mg}$, and .003 Mn |
| Nickel/Brass | 50 Stotinki <br> Bulgaria, 1962 | 8.19 | A bit on the light side for Ni/Brass, color pale, suggesting more Zinc in the alloy. |
| $\mathrm{Cu}, \mathrm{Al}, \mathrm{Zn}$ | 10 Forint 1984, Hungary | 8.05 | . $920 \mathrm{Cu}, .060 \mathrm{Al}$, and .020 Zn |
| Al, Mg | 1 Forint <br> 1984, Hungary | 2.64 | We can see the presence of the Mg lowering the pure Al 2.71 to 2.64 . This coin's alloy is: AI .960 and Mg at .040. Right on!! |

## Sheet7

| Composition | Coin Type | Specific Gravity | Comments |
| :---: | :---: | :---: | :---: |
| Brass | 2 Forint <br> 1984, Hungary | 8.55 | A nice dark yellow. . 720 Cu And .280 Zn . This brass alloy can be used to compare other Cu Zn alloy readings. Note the reading for 60/40 Brass on page 1. |
| Ag (base Cu?) | 1 Peso 1962, Mexico | 8.93 | .100 Ag , remainder may be .90 Cu ? Test coin weighed 15.81 grams. My test is inconclusive as base metal is unknown. |
| Ni plated steel | 10 Leva <br> 1943, Bulgaria | 7.93 | A good reading for this union of metals. |
| Ag | American Silver Eagle (ASE) 2014, USA | 10.54 | my reading is a bit high, but this test suggests a possible . 9999 Ag ! Coin weighed 31.33 grams |
| Ag | American Silver Eagle (ASE) 2015, USA | 10.51 | Another good benchmark, verifies accuracy |
| AgCu | Half dollar Kennedy 1964, USA | 10.19 | Thus this is $.825 \% \mathrm{Ag}$, NOT .900 |
| AgCu | Half dollar Kennedy 2014 D, USA | 10.18 | This is ~ $.820 \%$ Ag, NOT .900 From the Anniversary 4 coin set. |
| AgCu | . 25 Cent Quarter USA, 2014 S | 10.19 | Again not $900!$ ! This is the proof Arches National Park, quarter. |

## NOTE \#1

The U.S. Cent is/was composed thusly over the years:

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1793-1837 Copper
1837-1857 Bronze (95% copper, 5% tin and Zinc)
1857-1864 CuNi; 87.5% copper, 12.5% nickel (also known as NS-12)
1864-1942 Bronze (95% copper, 5% tin and Zinc) Weighs ~3.11 g. [i.e. ~ 48 grains]
1943 Zinc-coated steel (low carbon steel, Zinc coating ~ . 001 ", wt. = 42 grains total.)
1944-1946 Brass (95% copper, 5% Zinc) From spent cartridges.
1946-1962 Bronze (95% copper, 5% tin and Zinc)
1962-1982 Brass (95% copper, 5% Zinc: tin removed in 1962. Weighs ~ 3.11 g.)
1982- present 97.5% Zinc core, 2.5% copper plating. Weighs ~ 2.5 g.
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## NOTE \#2

Several types of Acmonital exist. The 1939 Italian 50 centesimi is not a magnetic Acmonital, that is, it is austenitic, not ferritic. Many of the latter occuring Acmonital's of Turkey are referred to as "Acmonital-52", they are typically magnetic. Basically two types are known: (1) A standard - Fe .8175 and Cr .1825 , which is ferritic. This ratio is similar to the stainless steel known as AISI 430. (2) A more complex alloy is - $\mathrm{Fe} \sim .800$, $\mathrm{Cr} .160-.180$, Si .015, Mg .005, C .014 , S .003, and P .003. This alloy is similar to several alloy compositions of AISI 304, thus it is austenitic (non-magnetic). I have read of other elements seen in some of The early alloys which contained molybdenum, nickel and vanadium. As time has proven, Both alloys have withstood the rigors of circulation for decades quite well! A tribute to the metallurgical talents of the Italians (and others) involved in their manufacture. The only weakness may be the hardness of the SS, requiring coins of a low-relief: however I have a 1977, 100 Lira coin which is quite stunning to behold!

## NOTE \#3

This token is Franklinium I, which is the same metal used in one of the rare Gardiner's Islands issue of 1965. In data attached to the Gardiners set it is stated that Franklinium I is Nickel "impregnated" with Columbium (i.e. Niobium). However the SG reading Of 8.37 suggests another element has been introduced, a light element perhaps magnesium or aluminum. I ran the test 3 times, and in each case cannot possibly read a SG for Nickel or Niobium or any combinations thereof, hence another metal (element) or metals was/were introduced. Another coin in the Gardiner's set was called "Nicon", it consisted of $\mathrm{Ni}, \mathrm{Cu}$ and Cb .

## END NOTE:

All tests were prosecuted via the same method, of using a nylon thread to hold the coin, then dipping the coin in distilled $\mathrm{H}_{2} 0$ with a bit of Joy dish detergent to break the surface tension. In some cases the test was done 4 or 5 times to assure accuracy. The scale used, was one which read to hundredths of a gram. Care was given to remove all air bubbles and other contaminants. All coins were free of any debris. My accuracy would probably be to $\pm .05$ gram. I attempted to illustrate as many alloy combinations as I could. I am sure I missed some alloys, and I realize that many more samples could or should have been displayed. Besides the normal value of such specific gravity readings of common coins, these may assist in detecting counterfeits: it is amazing how that the Chinese and others will duplicate such common coins as U. S. Jefferson nickels of dates which are not even of low mintages!

And finally I am again indebted to the earlier work done by a "KurtS" on the www.coincommunity site. It is odd that his "warnings" went unheeded. Note: http://coincommunity.com/forum/topic.asp?ARCHIVE=true\&TOPIC_ID=40733

## Sheet10

NOTE: Nicon was the tradename for Franklinium II, which was nickel with silicon added. (This is per Krause in: Guidebook of Franklin Mint Issues. 1979 edition. Page 81.) However, he makes no
comment about any Columbium, except that it is in
Franklinium 1. Some confusion seems apparent.

As per my SG tests of these two exotic metal alloys, it is noted that the SG reading of Franklinium 1, was low could it be that it also contained silicon? It would be nice to be able to communicate with any surviving metallurgists from the Franklin Mint!!

I added more silver US coins in this edition. Except for the ASE's all were less than the specified .900 . Specific gravity tests have raised the question, are some silver US minted coins debased? Hopefully future XRF tests will assist!!!

