

# **A BRIEF OVERVIEW of MEASUREMENT and SCALES USED In the MODEL SHIPBUILDING COMMUNITY**

**PREPARED FOR MSW**

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## INTRODUCTION

Measurement, Ratios and Scales are all intrinsically linked in the world of model ship building just as they are in other disciplines. A clear understanding of what they all are, and what they mean, will aid the process of modelling probably as importantly as the actual modelling itself.

The Oxford definitions of the three are:

<b>Measure</b>	“Ascertain extent or quantity of (thing) by comparison with fixed unit ... especially detailed dimensions”. These dimensions can be feet, inches, millimetres etc. the unit is whatever we choose it to be.
<b>Ratio</b>	“Quantitative relation between two similar magnitudes determined by the number of times one contains the other integrally”. The important point here is similar, so millimetres against millimetres and not inches against feet.
<b>Scale</b>	“Represent in dimensions proportional to the actual ones; increase, reduce, in size” Here the units need not be the same, and we can use inches (or fractions of) to represent feet.

With the internet increasingly drawing peoples of different countries closer together (especially like minded people as ship modellers at MSW), it can, naturally, create confusion when one set of people use a different system of measurement to the others. What happens, on both sides, is that because neither fully understands the measurement units of the other, confusion reigns.

## HISTORY OF MEASUREMENT

The earliest known uniform systems of weights and measures seem to have all been created sometime in the 4th and 3rd millennia BC among the ancient peoples of Mesopotamia, Egypt and the Indus Valley. Many systems were based on the use of parts of the body and the natural surroundings as measuring instruments. Our present knowledge of early weights and measures comes from many sources.

## SYSTEMS OF MEASUREMENT - IMPERIAL

The U.S. system of units is similar to the Imperial system which was used officially in the United Kingdom until 1995. Both systems derive from the evolution of local units over the centuries, as a result of standardization efforts in England; the local units themselves mostly trace back to Roman and Anglo-Saxon units.

## SYSTEMS OF MEASUREMENT - METRIC

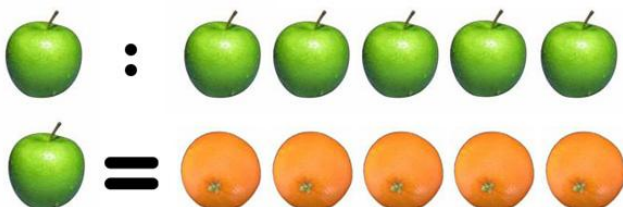
A number of metric systems of units have evolved since the adoption of the original metric system in France in 1791. The current international standard metric system is the International system of units. An important feature of modern systems is standardization. Each unit has a universally recognized size.

## DIFFERENCE BETWEEN RATIOS AND SCALES

The metric system uses ratios to determine relative sizes as the common unit is the millimetre – all sizes are a combination of millimetres, a metre is 1000 millimetres and a kilometre is 1000 metres. The Imperial system uses relationships to determine relative sizes, so we can have  $\frac{1}{4}$ " representing 1'-0". Note that the units, inches and feet, are different. **This is the fundamental difference between the two systems.**

The usual symbols used are

:	(proportional) for metric	1 : 100
=	(represents) for Imperial	$\frac{1}{4}$ " = 1'-0".



It is shown graphically here, in the Metric System 1 apple is proportional to 5 apples, and in the Imperial System 1 apple represents 5 oranges. Neither is right or wrong, they are just different. To make things a bit more complicated, there are some Imperial scales that have crept over to the metric system, especially in modelling. These

'scales', such as 1:48, do not exist in the metric system, they are a representation ( $\frac{1}{4}'' = 1'-0''$ ) expressed as a ratio, the nearest metric ratio being 1:50. It is in this 'carryover' that confusion arises.

## CHOICE OF SCALES

Scale Rationalisation typically falls into 2 categories: Industrial Trade, and Hobbies.

Industrial trade covers areas like building, engineering and naval architecture where universally accepted scales have been established and are conformed to both in the construction of models and drawings, in order to facilitate smoother co-operation between commercial parties.

The rationalisation of hobby scales has been more gradual and organic; largely driven by clubs lobbying industry, as well as tradition, and indirectly, consumer demand. A couple of artificial efforts to standardise have not been successful: i.e. Tamiya in the 1970's with aircraft models in 1/100th scale, and Heller with airline models in 1/125th scale. Even though rationalisation in hobby scales sounds appealing, it has not proved to be historically evident, although there may be some very gradual progress as consumer demand becomes more organised.

### PREFERRED SCALES – IMPERIAL

$1'' = 1'-0''$        $\frac{3}{4}'' = 1'-0''$   
 $\frac{1}{2}'' = 1'-0''$        $\frac{3}{8}'' = 1'-0''$   
 $\frac{1}{4}'' = 1'-0''$        $\frac{3}{16}'' = 1'-0''$   
 $\frac{1}{8}'' = 1'-0''$   
 $\frac{1}{16}'' = 1'-0''$



### PREFERRED SCALES – METRIC

1:1    1:2    1:5  
 1:10   1:20   1:50  
 1:100   1:200   1:500  
  
 Non preferred  
 1:15    1:40    1:125



## MODELLING SCALES AND RATIOS IN USE

The list below shows the more common (and not so common) ratios and scales used in modelling. Those in blue apply to ships models. The List does have some omissions.

Ratio	Scale ft	Comments
1:2500	0.122 mm	A European size for naval wargaming ship models.
1:2400	0.127 mm	A British and American size for naval wargaming ship models.
1:1250	0.244 mm	A European size for ship models.
1:1200	0.254 mm	A British and American size for ship and harbour models.
1:1000	0.305 mm	This is a scale used by Germans for pre-finished airliner models. Herpa produces several models in this scale.
1:720	0.423 mm	This was a standard size for ship models produced by Revell and Italeri.
1:700	0.435 mm	This is the scale that Tamiya, Aoshima, Hasegawa, and Fujimi chose to produce the largest series of waterline plastic model ships and submarines. Later Skywave, Dragon and Trumpeter joined in.
1:600	0.508 mm	Popular for ships, especially liners and capital ships. This is the traditional scale for comparative drawings of ships, used by the Royal Navy because it's about one-tenth of a nautical mile to the foot.
1:570	0.535 mm	This scale was used by Revell for some ship models because it was one-half the size of the standard scale for wargaming models used by the US Army.
1:500	0.610 mm	This is a scale used by Europeans for pre-finished airliner models. Trumpeter and several Japanese Companies produce ships in this scale.
1:432	0.706 mm	The scale used during the Second World War by the US Navy for aircraft recognition.
1:400	0.762 mm	A European size for ship and submarine models and die cast aircraft.
1:350	0.871 mm	A Japanese size for ship models. These are typically full-hull models that are substantially more detailed than 1:700 waterline models.
1:288	1.058 mm	A scale for aircraft and rockets.
1:285	1.070 mm	The US Army scale for sand-table wargames. It is also the standard used for large-scale historical armour battles in hobbyist miniature wargaming.
1:250	1.219 mm	Used by Heller for model ships.
1:220	1.385 mm	Same as Z gauge.
1:182.8	1.667 mm	A newer scale utilized in ancient, fantasy and sci-fi hobbyist miniature wargaming. Known as 10mm scale In wargaming circles.
1:192	1.588mm	A popular scale for ships
1:160	1.906 mm	American and European model trains in N scale.
1:152	1.906 mm	2mm scale/ British N scale railway modelling.
1:150	2.032 mm	Used by Heller for model ships, and proposed by the Japanese to supersede 1:144 scale trains.
1:144	2.117 mm	Popular for aircraft, spacecraft. Also some Japanese N scale trains, as well as Japanese giant robot models and toys.
1:128	2.381 mm	A few rockets and some fit-in-the-box aircraft are made to this size.
1:121.9	2.5 mm	Very popular scale utilized in modern hobbyist miniature wargaming. Also known as 15mm scale in Wargaming circles.
1:108	2.822 mm	An historic size for ships, also used for rockets and spacecraft.
1:100	3.048 mm	A Japanese scale for aircraft, spacecraft, and giant robots.
1:96	3.175 mm	An historic scale for ships, also used for spacecraft.
1:91.4	3.333 mm	A popular scale for WWII hobbyist miniature wargaming. Known as 20mm scale in wargaming circles.
1:90	3.387 mm	A scale proposed by some European manufacturers to supersede HO scale.
1:87	3.503 mm	Civilian and military vehicles. Same as HO scale.
1:82	3.717 mm	An intermediate scale (H0/00) intended to apply to both H0 and 00 scale train sets.
1:76	4.011 mm	Military vehicles. Same as 4 mm scale (00 gauge, etc.).
1:75	4.064 mm	Used by Heller for model ships.
1:73.15	4.167 mm	Common hobbyist miniature wargaming scale for sci-fi games. Also known as 28mm scale in wargaming circles. There are also a large number of miniatures in this scale for fantasy wargaming and Role Playing Games. This scale is popularised by Games Workshop products, but there has been a scale creep over the years. The current miniatures are "Heroic 28mm" scale, which is closer to 1/48 or 1/50 scale. Due to this historical influence, many other hobbyist companies are following this practice.
1:72	4.233 mm	Aircraft, science fiction, space non fiction, figures, vehicles, and watercraft. Now the most prolific small scale (i.e. less than 1:35) for plastic injection armoured fighting vehicle (AFV) models. There is a growing popularity for scratch-built radio control model ships in this scale. More genres are covered in this scale than any other.
1:64	4.763 mm	Ships, die-cast cars. Same as S gauge. Also called 3/16in. scale.
1:60.9	5 mm	Common scale for pre-1970s hobbyist miniature wargaming figures. Some companies such as Privateer Press are producing new figures in this scale. Because 28mm wargaming miniatures have crept in scale over the years, these new 30mm wargaming miniatures are similar in proportion to the current 28mm wargaming miniatures.
1:60	5.08 mm	Used by Dungeons & Dragons Miniatures. A handful of high-detail, Japanese giant robot model kits Primarily produced by Bandai are of this scale. Some Japanese toy manufacturers also produce aircraft toys in this scale.
1:50	6 mm	Many European diecast construction vehicles and trucks. A small quantity of early Japanese aircraft kits are also of this scale.
1:48	6.35 mm	Known as quarter scale. Mainly military aircraft but in 2005 Tamiya launched a new series of armoured Fighting Vehicle (AFV) models in this scale. It is used by Americans with the 0 scale. Also the most popular Lego scale, know as minifig scale.
1:45	6.773 mm	This is the scale which MOROP has declared must go with the 0 scale, because it is half the size of the G-Gauge model railways made by German manufacturers.
1:43	7.088 mm	Still the most popular scale for die-cast cars worldwide, metric or otherwise. It originates from the scale that the British use with the 0 scale.
1:40	7.62 mm	The very early models of the British Coronation Coach and a few other horse-drawn wagons were made in this scale. Cheap soft plastic soldier figures are also made to this scale; there are a few kits to make vehicles for them
1:35	8.709 mm	The most popular scale for military vehicles and figures. It was originally conceived by Tamiya for convenience of fitting motorised parts and batteries.

1:34	8.800mm	A popular scale for collecting vintage and modern American truck models. Established by First Gear, Inc. in the early 90's with growing popularity in Europe and Australia.
1:32	9.525 mm	Military vehicles; 54 mm toy soldiers are supposed to use this scale as well. Same as Gauge 1.
1:29	10.514mm	American model trains running on 45mm Gauge 1 track.
1:28	10.89 mm	Biplane fighters.
1:25	12.2 mm	Cars, figures. AMT (now combined with Ertl), Revell, and Jo-Han made cars in this scale. This is preferred in Europe to 1:24. Holland has whole toy villages in this scale.
1:24	12.7 mm	Cars, figures. Monogram made cars in this scale; Tamiya still does.
1:22.5	13.547mm	G Scale trains made by German manufacturers.
1:20	15.24 mm	Cars.
1:19	16.04 mm	16mm scale live steam model railways. This is also the scale for those "four-inch" adventure movie figurines.
1:18	16.93 mm	Cars made from kits; there are also pre-assembled toy military vehicles, fighter planes, and helicopters.
1:16	19.05 mm	Live steam trains (ridable), Figures
1:12	25.4 mm	Figures, Cars, Live steam trains (ridable)
1:8.3	8.1 mm	Live steam trains (ridable)
1:7	42.857 mm	Common scale utilized by Japanese companies for figures of anime characters, especially when the Portrayed character is supposed to be young in age.
1:6	50.8 mm	Articulated figures (commonly for military/ paramilitary modelling purposes), static display sculpture (commonly of Anime characters), motorcycles, Rail Cannons, Armoured Vehicles, Military Dioramas.

**WITH THANKS TO WIKIPEDIA**