Subminiature & Type N Precision Gaging Instruments

Lab Series

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Instructions

Velocity Microwave

www.velocitymicrowave.com

Type N ~ Lab Series

VM's N type gages come in two configurations, one analog and one digital as pictured in figures 1 and 1a. The digital gage has a resolution of 0.00005 and an accuracy, verified by accredited calibration, of +/- 0.00012 or better. To use the digital gage simply read the numerical mesurement, keeping in mind that the male is in recession and the female in in procession relative to the reference plane. The analog gage, as indicated earlier, has embedded tolerance zones for all of the major Standards and has a resolution of +/- 0.0005 per accredited cal in the male zone and +/- 0.001 for the female due to the rack extension on the instrument having to move about 500 mils between the states of recession and procession for the two genders.

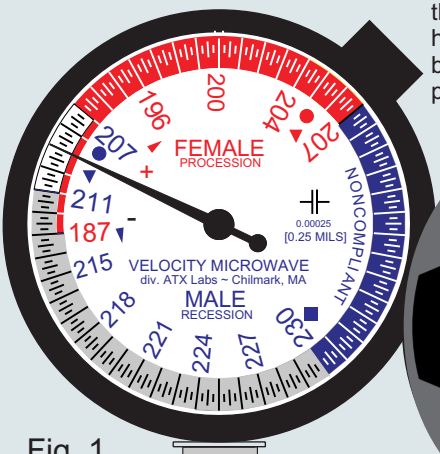


Fig. 1

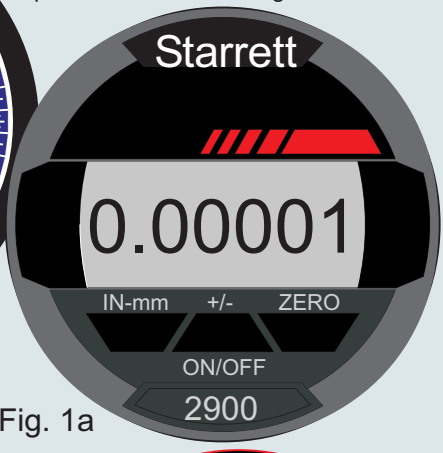


Fig. 1a

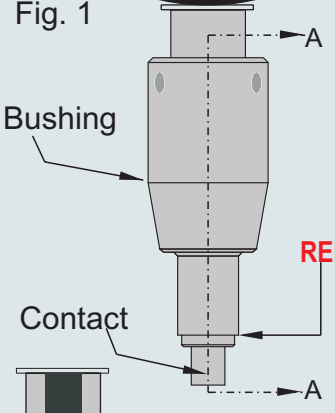


Fig. 4

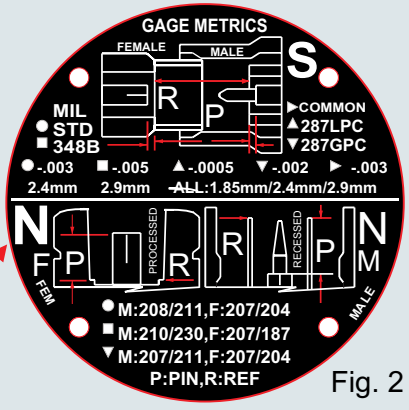
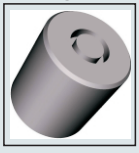


Fig. 2



Note: rear of gage is fixed with a metal plate that defines the N interface requirements per Standards: MIL-STD-348B, IEEE287 LPC, IEEE287 GPC, and "common" practice. Subminiature is also represented.

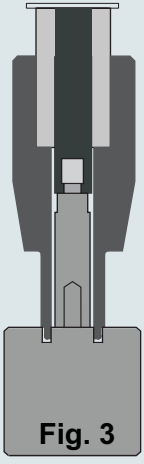


Fig. 3

Zeroing: To zero any gage, flushly and firmly seat the bushing and contact into the annular ring and rotate the bezel to align the "200" with the tip of the hand. This normalizes the measurement to the step feature **(REF)** on the bushing as this is the common feature that sits on both the male and female reference planes. It is this feature that makes it possible to gage all N Standards without the cost of additional master gages. Fig. 3 shows the A-A sectional view of the bushing and contact sitting on a sectional view of the master gage of fig. 4.

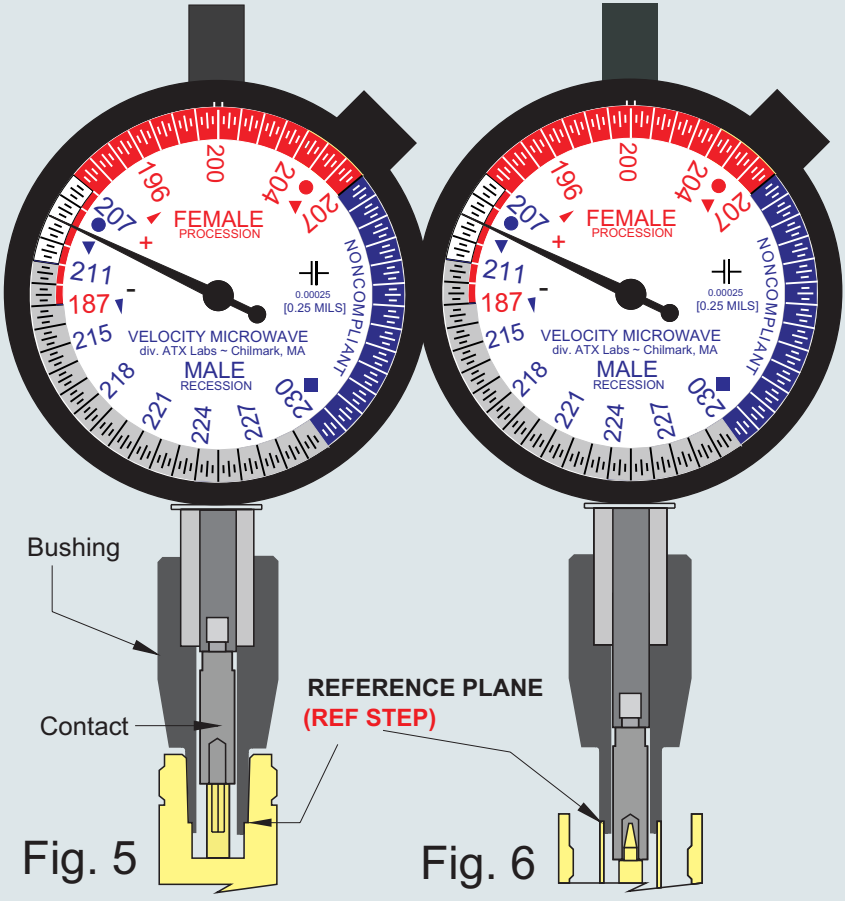
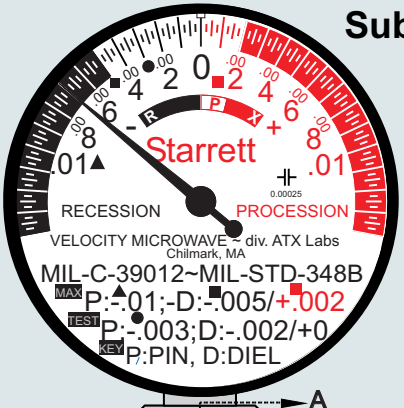


Fig. 5 Fig. 6

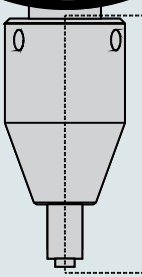
To gage the female or male N: (1) place the contact (which is spring loaded and automatically falls into place) on the pin (front plane for female and pin shoulder for male) and the reference step (**REF STEP**) on the outer body reference plane. In the female this is lower than the front plane of the pin and hence the pin by definition is in procession relative to the reference plane - which by convention is always the outer coaxial body's coplanar mating surface (the male on the other hand is in recession); (2) rock the gage slightly until you feel a firm coplanar and stable seating; (3) read the number on the gage.

VM gages use a dial fascia that embeds all of the major standards, so the reading on the dial will tell you the exact nature of Standards compliance. For example, under the MIL-STD-348 Test interface, the front plane of the female pin is processed relative to the surrounding coaxial body by no greater than 207mils and no less than 204 mils, and that tolerance zone is clearly articulated on the dial. Under the MIL-STD-348 General interface the female pin is processed no more than 207 mils and no less than 187 mils, and that too is clearly articulated. The tolerance boundaries for all of the major Standards are articulated, male and female, and on the back of the dial there is a rich graphic on a machined aluminum plate that defines all of the major interface requirements under MIL-C-348A/B, MIL-C-39012, and IEEE287LPC/GPC, as well as interface specifications found in common use. For the Type N, the interface requirements of 348 and 39012 are identical, and if the user is observing the former as a criterion of measurement the latter is by definition also being observed. Subminiature interface specifications are also indicated on the back for the user's reference.

Subminiature ~ Lab Series



FRONT
Fig. 1



VM subminiature gages for 1.85mm, 2.4mm, 2.92mm, 3.5mm and SMA come in an analog version with an ergonomically enhanced human interface that contains embedded Standards tolerance zones (fig. 1), conventional analog versions based on the ASME B89.1.10M-2001 Standard (fig. 1a), and digital versions as pictured in the Type N instructions.The use of the analog versions is self explanatory since the Standards are illustrated on the front and back. The digital versions are equally straightforward and the backs also contain Standards data as pictured in fig. 2. In the case of the analog versions (fig. 1a is typical) the numbers represent thousandths and the user would compare the reading on the front to the requirement on the back. Resolutions vary from .0005 through .00025 to .0001, with accuracies that are +/- the resolution per A2LA accredited cal.

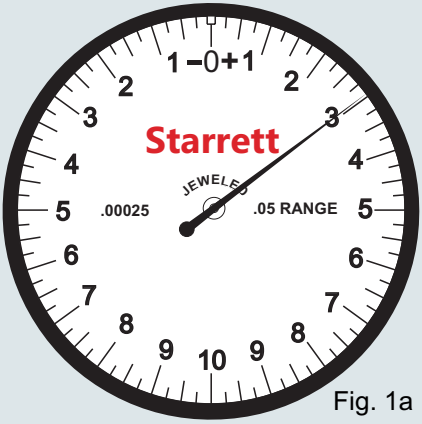
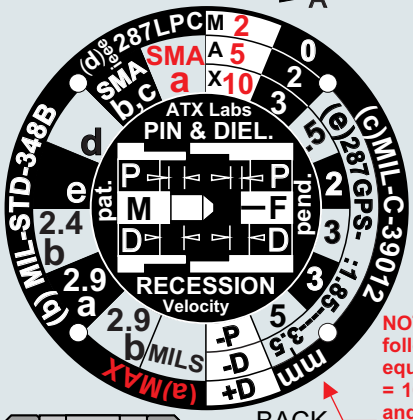


Fig. 1a



BACK
Fig. 2

NOTE: The SMA back in Fig. 2 is to be read as follows: the one o'clock position on the right equals the 11 o'clock position on the left (SMA a = 10,5,2), and so on. Letters key to Standards and the numbers in mils - 1 to 5 o'clock - match pin and dielectric recession and procession(-P, -D, +D). Hence 10 = .01 inches.

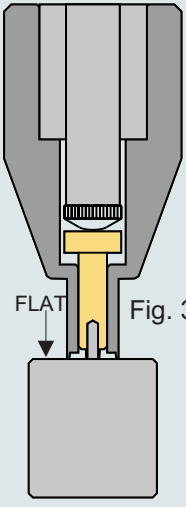
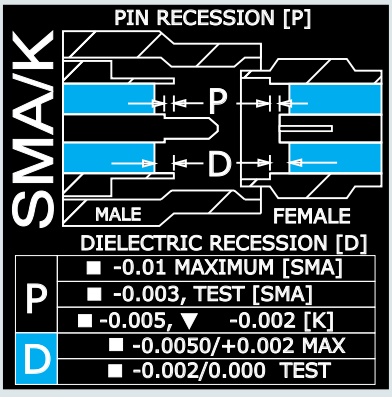
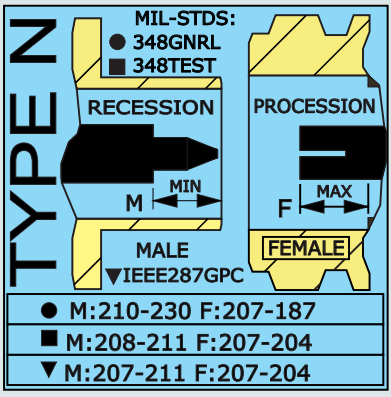


Fig. 3

Mastering (zeroing): the gage is zeroed by placing it on the flat master provided in the kit. As with a measurement the technique is the same: rock the gage back and forth slightly until you are making solid coplanar contact and thereby seating in a flush manner on the surface. Note that it is difficult with analog gages to hold the master and the gage at the same time. Hence the best way to master or set the zero state is to incrementally approach the 0. In other words: (1) place the bushing on the flat surface provided; (2) note the distance from 0; (3) move the dial bezel by that amount. You will need to do this a few times but it's a better technique than trying to hold the instrument flush and simultaneously move the bezel. Figure 3 illustrates the gage bushing and rack extension, in sectional view, sitting flush atop the master gage.





SUBMINIATURE & N INTERFACE SPECIFICATIONS PER COMMON STANDARD

SMA Gaging in general is not unlike checking tire tread depth, the technique is the same though it requires greater accuracy and precision: a fixed bushing rests on one plane or grade and a movable contact rests on a second plane. The dial records the differential grade. Velocity Microwave's gages are designed to be both user friendly and accurate, and the stainless parts are warranted against defect for a period of 10 years.

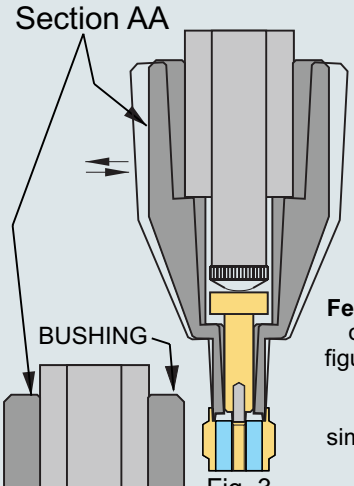


Fig. 3

Female gaging: If we look at the sectional view of the bushing and contact point delineated in figure 1 and pictured in figure 3, and also take a sectional view of the female SMA connector during gaging, note the gaging of the female simply involves placing the fixed bushing on the front plane of the outer coaxial body, and allowing the contact point to fall into place on the top plane of the female pin (fig. 3). Setting the gage implies rocking it slightly until you can feel the flush coplanar condition. Note that the smallest measurement is by definition the correct measurement due to the nature of a true coplanar condition.

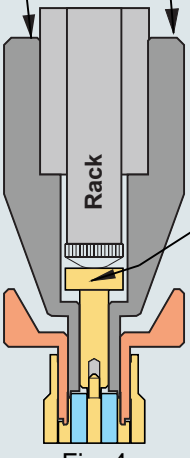


Fig. 4

Male gaging: to gage the male screw the guide (fig. 5) into the male (fig. 4) and then back it off one turn. Next insert the bushing and contact point into the bore in the guide. There is no torque requirement and it should be a bit loose. As with the female, rock it slightly until you feel the coplanar flush condition. Again, that will be the smallest reading. If you are careful you can do the measurement without the guide in place.

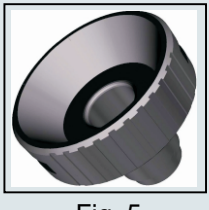


Fig. 5

Dielectric gaging: this in done the exact same way as the above for both male and female; the only difference is that in the case of the dielectric you are measuring the difference in grade between the Teflon or PEI core and the outer mating plane of the coaxial body. But the mechanics of the measurement are the same.

Velocity Microwave (VM) has introduced three gage families based on the principle that the human interface associated with microwave gaging, and that the hardware that implements the measurement, can be simplified in the interest of greater accuracy, greater ease of use, lower cost relative to performance and greater clarity with regard to judging compliance to virtually any Standard, though most commonly with reference to MIL-STD-348B, MIL-C-39012, and IEEE287-2001.

The Lab Series gages you purchased utilize either an analog interface that has been enhanced with embedded Standards data to improve ergonomics, or is a digital gage. In both case the insturment backs contain additional Standards data In general, VM has made several improvements to legacy art.

The Type N Gage. The conventional solution for gaging N connectors has been to either use two gages, one for each gender, or one gage that requires a change in bushings and a remastering in order to gage both genders. Additionally, the legacy solution is Standard specific - meaning that the mastering component in the gage is machined to one Standard only. For example, the male N connector has a recession specification of 207 mils, 208 mils and 210 mils for each of Standards IEEE287GPC/LPC, MIL-STD-348 TEST, and MIL-STD-348 GENERAL SPEC, respectively. Thus the master gage in legacy kits is machined with a proud feature matching *only one* of these standards. To gage relative to all Standards requires two more master gages. The downside of this approach is cost and accuracy, the latter being the case since the machining of a proud feature always carries a tolerance penalty. VM's gages reverse this logic. VM uses only one gage with one fixed bushing, and there is no requirement of changing components between the gaging of a male and the gaging of a female, thereby increasing both ease of use and potential accuracy. Moreover, VM's gages do the mastering relative to a common reference feature, and this means that VM gages are ***universal gaging solutions*** with no dependence on a specific Standard. Thus VM gages show the true state of recession and procession between the pin and the mating plane of the outer coaxial body. Finally, VM's N gages do the mastering relative to a flat surface whose machining for all intents and purposes is error free and hence no tolerance penalty is carried forward as an uncertainty to be accounted for.

The Subminiature Gage. Like the N gage, VM's subminiature gages for connectors like the SMA, 1.85mm, 2.4mm, 2.92mm and 3.5mm break with legacy art by using *only one instrument* for both male and female measurement. Typically, the legacy solution has been to use either two gages, one for each gender, or a single gage with an adapter that requires threaded engagement to the measuring instrument prior to use. With a VM gage, there is only one instrument, and a guiding means is used to thread loosely to the male connector (only) under test. Moreover, this guiding means carries no torque requirement. All of this makes the act of gaging easier, less error prone, and reduces both carrying and acquisition cost. With all subminiature gages there is an analog option based on ASME B89.1.10M, and analog option with an ergonomically advantaged interface, and a digital option.

Common Features. VM's Lab Series utilize some form of embedded Standard's data on the dial face and rear of the dial to graphically clarify the tolerance zones for each of the Standards associated with the connector under gage. Another benefit is that the cost of acquisition is reduced by using a novel means of mechanically simplifying the gaging process. Additionally, maintenance costs are reduced to a fraction of what they would otherwise be by using precision platforms that are easily and inexpensively calibrated by A2LA and ACLASS Corp accredited labs.