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Friday, March 20, 2009

SYSTEM 22 SALES INFORMATION FOR ALLEN ENGINEERING & DESIGN THREAD GAGING PD/Cone &Vee

The following explanation of System 22 is what Allen Engineering advocates for thread gaging.

System 22 is a two-gage system for External or internal thread gaging; each gage gives a separate reading. The difference between the two readings is the quality that is being manufactured. The smaller the difference between the readings, the better the product. The larger the difference between the two readings, the less quality the product has. This is where the term Differential Readings associated with System 22 comes from.

It should be noted that System 22 works for Internal and External Thread Gaging. I will explain the gaging as if we have an External Thread to measure. However the Internal system is a mirror image of the external system.

First I would like to explain, that gage one the Pitch Diameter check, has a Contact Element of Cone and Vee. The Cone and Vee elements can be rolls or segments; the contact surfa ces are the same. The Cone and Vee contact element is manufactured to contact the thread at the pitch line only. The height of contact is usually 10% of the thread height. The Cone and Vee are manufactured so that the length of contact will be ½ the pitch.

The reason for this is to establish the true Pitch Diameter without any influence from other errors such as Lead, Angle, and Root Clearance to name just 3 of the most common problems.

This Pitch Diameter / Cone and Vee reading will be the smaller of the two readings because it will not see any of the other errors in the screw thread.

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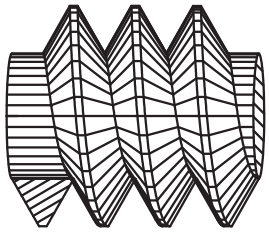

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SYSTEM 22 SALES INFORMATION FOR ALLEN ENGINEERING & DESIGN THREAD GAGING
Full Form Functional

Secondly I would like to explain the second gage used in System 22, " Functional Diameter Reading". This gage may use Multi-Rib Roll or Full Form Functional Segments as the Contact Elements. It should be noted that Allen Engineering offers both and there are good and bad reasons to use either.

The Full Form Functional contact element is designed and manufactured to contact the whole thread from the top of the Crest at Major Diameter to the Root at Minor Diameter. This is usually 9 pitches or one Diameter Long which ever is the longest. Because of the many different thread Diameter / Pitch combinations this length has to be rounded for practical reasons we follow Commercial Standard CS8-61 and B47.1. Looking at this from the purely engineering side the Functional Contact Element should be the same length as the product thread. Once again I plan to cover the design of the Full Form Functional Contact Element in a later paper.

When this contact element is engaged into the thread, the contact element will hang up on any errors that are present. This causes a larger reading. To elaborate a little, let's assume the cutting tool point broke while the thread was being manufactured. Therefore the Full Form Contact Element will hang up on the root giving a larger functional size. Note the first gage with Cone and Vee Contact Elements would not see this. There fore we have differential readings. If both readings are within the allowable tolerance then the thread is OK for use.

Lets take another possibility lets assume the thread has bad angles say the cutting tool was either used for to long a period, ground wrong, or mounted incorrectly, in any case not square, so that the 60 degree is not correct. Once again the Contact Element is engaged into the thread and the contact element will hang up on the bad angles, and you get a larger size.

The last possibility I want to cover in this paper will be bad lead. The lead could be long or short. When the Contact Element is entered into the thread they will hang up on the first and last threads of the Contact Elements. It doesn't matter if the thread has a long or short lead. Any lead error will cause a larger functional size.

It can be said that any incorrect geometry (incorrect thread form) with the thread will cause a larger functional size. Therefore the smaller the difference of the two readings, the better the product thread is. To have a dimensionally correct and accessibility part, the two readings need to be with in the specified tolerance.

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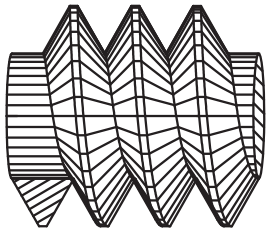

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SYSTEM 22 SALES INFORMATION FOR ALLEN ENGINEERING & DESIGN THREAD GAGING Additional Information

Note: general practice is to have the difference between both readings with in ½ of the pitch diameter tolerance. This is recommended in the Federal Standards. One example is written in H28 Page 6.21 Paragraph 5.4.3.

The Cone & Vee could be the smallest size and the Full Form functional the largest size, this condition is said to be dimensionally correct and therefore a saleable product. At this point a red flag should go up to the machine operator telling him that most likely the next parts will be scrap if he does not change something.

Note System 22 Gaging works for all Thread Forms Acme, Buttress, Whitworth, UN, Trapezoidal, Lowenherz, Pipe, Worms, and Modified Square. The contact elements need to be altered to match the thread max metal profile and their needs to be a master for setting finish size.

External Major Diameter (Outside Diameter) Internal Minor Diameter (Hole)

Another thing that needs to be checked on a screw thread is the Major Dia on an External Thread and the Minor Diameter on the Internal Thread. It would be possible to have the External Major Diameter Size almost down to the Pitch Diameter and The Internal Minor Diameter Size almost up to the Pitch Diameter and System 22 gaging would pass either of these conditions. For the External a simple micrometer or caliper will do the job. For the Internal gage a bore gage, Telescoping Gage, Hole Gage or caliper would do the job.

It should be noted that normally when the part is do to have an External Thread the Outside Diameter size is checked before the thread is cut and like wise the Internal Thread would have the hole checked for size (Tap Drill size) before the Internal Threading was cut or tapped.

I have had customers purchase a tri-roll gage with plain diameter rolls and use a plain diameter plug for setting. The gage will measuring the Major Diameter of the screw thread in about 1 to 2 seconds and is very accurate. The customer claims that it would take 3 to 4 times that amount of time using a micrometer or caliper.

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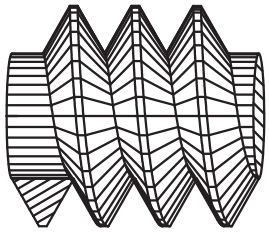

Like wise I have many customers using our 1140 with plain diameter segments and setting with a plain diameter ring for a bore gage. Once again it is possible to tell the bore size in 1 to 2 seconds.

SPECIAL THREADS

As mentioned earlier there are 3 systems for measuring Screw Threads, System 21, 22, and 23. Just a quick review of System 21 this system will tell if the Screw and Nut will assemble. It will not measure Pitch Diameter or and other part of the thread. In fact I have a demo kit where the Pitch Diameter is totally removed from the sample Nut and Screw and the Go and No Go Gages check the parts OK.

Also if the person using these Go and No Go Gages, continue to gages product for a long period of time they usually develop physical problems with there hands and wrists. Allen Engineering does not recommend System 21 for continued use.

System 22 and 23 is what Allen Engineering recommends. It is possibility to gage any type of thread form with any number of starts, and any type of positive angles grater than 0 and less than 90 degrees. There are many special threads out there we almost always can gage them but we need the specifications for the thread. In other words ***we need the Maximum Material and Minimum Material profile for the Screw and Nut .*** This will allow us to design the proper gaging elements (Roll Set or Segments Set).

One Type of Thread Exception For System 22 and 23

There is a new style of Buttress Thread now where the pressure angle is in a minus direction. The standard Rolls and Segments will not contact and gage this thread correctly. We have had success using a ball type contact for the external and internal threads. Even this is just a pitch diameter check and at present there is no known way to get a functional or variable gage reading.

With this one exception all other threads can be measured with System 22 and 23.