

TECH SHEET

PEM® - REF/ THREAD INSPECTION

SUBJECT: Clarification of ANSI / ASME specifications as they relate to the inspection and gaging of PEM® fasteners.



Many years of experience with customer concerns related to threads indicates there is value in clarifying three main areas of thread inspection criteria. These three areas are:

1. The proper use of NO GO gages and acceptance of product.
2. Dimensional accommodation of coating or plating - limits of external threads to allow for coatings.
3. Acceptability of product and limitations of gaging.

The following information covers the 3 main points as called out directly from ANSI / ASME specifications.

1. The use of NO GO gages and the limits of acceptance.

- **Unified = Ref: ANSI/ASME B1.2 Para. 4.2.1 – internal and 5.2.1 external**

4.2.1 NOT GO (HI) Thread Plug Gages – Purpose and Use

“NOT GO (HI) functional diameter is acceptable when the NOT GO (HI) thread plug gage applied to the product internal thread does not enter more than three complete turns. The gage should not be forced”.

5.2.1 NOT GO (LO) Thread Ring Gages – Purpose and Use

“NOT GO (LO) functional diameter is acceptable when the NOT GO (LO) thread ring gage applied to the products external thread does not pass over the thread more than three complete turns. The gage should not be forced”.

- **Metric = Ref: ANSI/ASME B1.16M Para. 4.2.1 – internal and 5.2.1 external**

4.2.1 HI Thread Plug Gages – Purpose and Use

“HI functional diameter is acceptable when the HI thread plug gage is applied to the products internal thread it does not enter, or if all complete product threads can be entered, provided that a definite drag from contact with the product material results on or before the second turn of entry. The gage should not be forced after the drag is definite”.

5.2.1 LO Thread Ring Gages – Purpose and Use

“LO functional diameter limit is acceptable when the LO thread ring gage is applied to the product external thread if:

- a) It is not entered; or
- b) All complete product threads enter, provided that a definite drag from contact with the product material results on or before the second turn of entry. The gage should not be forced after the drag is definite”.

Summary – There is a slight difference between acceptance of unified and metric threads. Acceptance based on maximum of three turns of engagement for unified threads and based on definite drag developing by maximum of two turns for metric threads.

2. **Dimensional accommodation of coating or plating.**

Limits of external threads to allow for coatings – per the note in our catalog / bulletins:
“For plated studs, Class 2A/6g, the maximum major and pitch diameter, after plating, may equal basic sizes and be gauged to Class 3A/4h. Per ASME B1.1, Section 7, Paragraph 7.2 and ASME B1.13M, Section 8, paragraph 8.2”.

- **Unified = Ref: ASME B1.1 Para 7.2**

7.2 Material Limits for Coated Threads

“Unless otherwise specified, size limits for standard external thread Class 2A apply prior to coating. The external thread allowance may thus be used to accommodate the coating thickness on coated parts, provided that the maximum coating thickness is no more than one-fourth of the allowance. Thus, the thread after coating is subject to acceptance using a basic Class 3A GO thread gage and a Class 2A thread gage for either minimum material or NOT GO”.

- **Metric = Ref: ASME B1.13M Para 8.2**

8.2 Material Limits for Coated Threads

“Unless otherwise specified, size limits for standard external thread tolerance classes 6g and 4g6g apply prior to coating. The external thread allowance may thus be used to accommodate the coating thickness on coated parts, provided that the maximum coating thickness is no more than one-fourth of the allowance. Thus, a 6g thread after coating is subject to acceptance using a basic size 6h GO thread gage and a 4g6g thread, a 4h6h or 6h GO thread gage”.

Summary - For both unified and metric threads a coated external thread of class 2A or 6g is allowed to go up to basic dimensions after the coating has been applied. In practice this will not cause any interference, as all internal threads are toleranced above basic.

3. **Limitations of gaging and acceptability of one gage compared to another for product acceptance.**

- **Unified = Ref: ANSI/ASME B1.2 Para 2.2.1**

2.2.1 Limitations of Gaging

“Product threads accepted by a gage of one type may be verified by other types. It is possible, however, that parts which are near a limit may be accepted by one type and rejected by another. Also it is possible for two individual limit gages of the same type to be at opposite extremes of the gage tolerances permitted, and borderline product threads accepted by one gage could be rejected by another. For these reasons, a product screw thread is considered acceptable when it passes a test by any of the permissible gages in ASME B1.3 for the gaging system specified, provided the gages being used are within the tolerances specified in this Standard”.

- **Metric = Ref: ANSI/ASME B1.16M Para 2.2.1**

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- **Acceptability per ASME B1.3, Para: 6 b.**

6 ACCEPTABILITY

“b) Within each gaging system, a choice of gages is specified for each characteristic. Acceptance by any one gage in current calibration specified for a characteristic shall be the criterion for acceptance of the characteristic”.

Summary - Standards allow that because gages have a size tolerance, it is possible for product near the edge of the limits of size to be accepted by one gage and rejected by another. When this happens, the standards state that the product is acceptable as long as it is accepted by a gage which is within specified gage tolerance, regardless of the fact that a second gage, also within specified gage tolerance, does not accept the product.