INCREMENTAL CHANGE Release Notification Date: 12/27/2022

SPM 70-31-01 USE LIMITS FOR STANDARD MEASURING INSTRUMENTS

DISCLAIMER

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HIGHLIGHTS

HIGHLIGHT REFERENCE	DESCRIPTION OF CHANGE
sk70-31-01-220-023	Technical Change: Changed Limits of Measuring Devices.

TASK 70-31-01-220-002

1. General.

The internal accuracy of measuring instruments decreases with increasing size; therefore, the tolerance of a part dimension may be less than the internal tolerance of the instrument used to measure that dimension. The tolerance limitations tabulated in this section are to be observed when special inspection tooling is not specified or is not available. Whenever the total part tolerance for a specific size is closer than the tolerance limit shown for a specific size and type of measuring instrument, a more precise checking device must be used.

2. Error in Measurement.

Subtask 70-31-01-220-021

A. The design, manufacture and operation of all inspection devices must be controlled so that, with 95 percent assurance, the total error of measurement in the measuring device resulting from any combination of lack of repeatability and accuracy shall not exceed 25 percent of the total part tolerance. (Ninety-five percent assurance means that 95 out of 100 readings will be within the allowable error in measurement.)

EXAMPLE: If the dimensional limits of a given part are 1.200-1.202 inches (30.48-30.53 mm), the estimated total error in measurement of the inspection device, as determined by tests, shall not exceed 0.0005 inch (0.013 mm) [with 95 percent assurance] that is, 1.200 - 1.202 inch (30.48-30.53 mm) x 0.25 = 0.0005 inch (0.013 mm).

B. Temperature effects should be considered when performing critical, small tolerance inspections. Parts should be as close as possible to the same temperature, ± 5°F (± 2.7°C), as the inspection tooling. This will minimize the effects that variation in temperature may have on measurement accuracy. If there is a significant variation in temperature, allow time for the component and the tooling to reach the same temperature.

NOTE: The concern is for the variation in temperature between the inspection tooling and component, not the temperature changes of the component itself that may occur because of normal shop environmental changes. Consideration should also be given to sources of localized heating or

cooling, radiant heaters, skylights, air conditioner outlets, etc. that may cause a component or a portion of a component to be heated or cooled resulting in a temperature variation between the component and the inspection tooling. Hand held inspection tooling used for critical, small tolerance inspections, should be fitted with thermal pads to prevent heating of the tooling that could effect measurement accuracy.

3. Effect of Measurement Error on Dimensional Limit.

Subtask 70-31-01-220-022

A. The allowable error of measurement does not in any way affect the measured value obtained by the inspector, which he must compare directly with the dimensional limits stated in the repair manual.

EXAMPLE: If the dimensional limit is 1.202 inches (30.53 mm) as above, and the inspection reading (using the applicable measuring device) is 1.2021 inches (30.533 mm), the dimension is out-of-limits.

4. Limits of Measuring Devices.

Subtask 70-31-01-220-023

A. The types and sizes of measuring devices listed below may be used to measure dimensions whose tolerance range is no closer than those shown, unless it can be shown statistically that the device being used can meet 25 percent of part tolerance accuracy described above in Subtask 70-31-01-220-021, Error in Measurement.

B. When it is necessary to measure a defect with a replicast compound, appropriate compound for horizontal, vertical, or slopping surfaces must be selected based on resolution and working time by manufacturer's recommendation that follows.

Size of Standard Outside Micrometer, (inches)	**Minimum Total Part Tolerance (inch)**
0-1 (0.0001 graduations)	0.0008
0-1 (0.001 graduations)	0.002
1-2 through 5-6	
(0.0001 graduations)	0.0012
(0.001 graduations)	0.002
6-7 through 8-9	0.002
9-10 through 11-12	0.002
12-13 through 14-15	0.003
15-16 through 17-18	0.0035
18-19 through 23-24	0.004
24-25 through 32-33	0.0045
33-34 through 35-36	0.004
36-37 through 41-42	0.005
42-43 through 45-46	0.006
46-47 through 47-48	0.010

For dimensions greater than 48 inches (1219 mm), having a total tolerance range of 0.010 inch (0.25 mm) or less, an indicator gage and master must be used unless otherwise specified by the repair manual.

Size of Standard Inside Micrometer, (inches)	**Minimum Total Part Tolerance (inch)**
3-4 through 11-12	0.002
12-13 through 23-24	0.003
24-25 through 35-36	0.004
36-37 through 42-43	0.005
43-44 through 47-48	0.006
48-49 through 52-53	0.007
53-54 through 57-58	0.008
58-59 through 62-63	0.009
63-64 through 67-68	0.010

Vernier Calipers (Size being measured - inches)	**Minimum Total Part Tolerance (inch)**
0-6	0.004
6-12	0.005
12-24	0.007
24-36	0.010
36-48	0.013
48-60	0.017
60-72	0.020

Size of Standard Vernier Height Gage (inches)	**Minimum Total Part Tolerance (inch)**

12	0.003
24	0.004
36	0.005
48	0.006

Miscellaneous Measuring Instruments	**Minimum Total Part Tolerance (inch)**
Depth micrometers	0.002
Decimal scale	0.030
Radius gage	0.010
Dial bore gage	0.001
Dial caliper (0.001 inch graduations)	0.005
Dial indicators (electronic) under	0.001
(0.0001 inch graduations)	0.001
(0.0005 inch graduations)	0.005
(0.001 inch graduations)	0.010
Periphery tape	0.010
Telescopic hole gage	0.004
Small hole gage	0.004
Bevel protractor	15 minutes

When it is necessary to measure to the fourth decimal place, optical collimators, optical or mechanical electro-limit gages or equivalent must be used.