

Air Probes* for Checking Internal Diameters

* Air probes are also referred to as air plug gages or air spindles by some manufacturers.

Air probes with body diameters from .044"(1.1 mm) to 6.26"(160 mm) are supplied from Western's stock of semi-finished gages. Review the selection criteria on this page and see pages 18 & 20 for dimensional data.

Air probe styles



Blind style Air Probes have the sensing nozzles near the front end.



Thru-hole style Air Probes with the sensing nozzle set back from the end which provides maximum wear life.



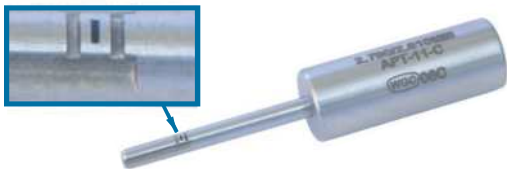
Small Air Probes may require an extension added at the factory to reach into deep holes.



Tubular handles are standard on large series Series 60 to 80 Air Probes (single master types).



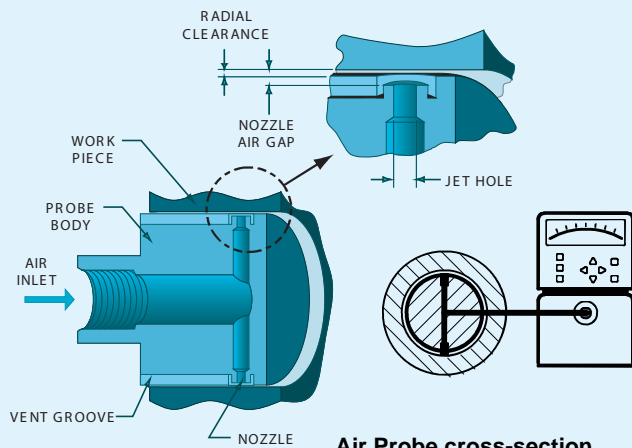
Miniature air probes work well on closely tolerated holes. They are available as dual master types only.



Custom Air Gages with Slot Jets can inspect smaller features than those inspected with round jets. 2.78 mm diameter air probe with .30 mm wide slot is shown above.

Air probe features

The illustration below shows the construction of a typical air probe. The probe comprises a hardened steel body in which air passages are drilled to two or more gaging nozzles. The body is precision ground to slip into the bore at the low limit of the product tolerance; note the nozzle tips are recessed a small amount below the probe body as shown in the magnified view of the air gage nozzle.



Air Probe cross-section

By recessing the air nozzles below the probe body, the measurement is made non-contact so that wear does not directly affect the accuracy of the gage. The air flow purges the gaging surface of contaminants thus making air gage measurements highly repeatable. The probes opposed nozzle design creates a "differential" type of measurement that is independent of how the probe is positioned radially within the test bore -- *i.e.* radial movement causing an increase in air flow in one nozzle is offset by a corresponding decrease in flow in the opposing nozzle. These features are key factors in attaining fast-accurate gaging with unskilled operators.

Application considerations -- When selecting an air probe, the jet locations should be checked, bearing in mind that the measurement occurs where the air exits the gaging nozzle. The air jet must be completely covered by the workpiece plus some additional margin -- consider a land width that's twice the jet hole diameter to be about the minimum required for satisfactory gaging. Also note that the probe will not measure closer to the hole bottom than the leading edge of the jet hole. Specifying a super blind style will allow measurement closer to the bottom; but be aware that the nose end of the probe wears more rapidly than the rest of the body so the best gage life is obtained with thru-hole style probes.

AIR RINGS and C-GAGES for EXTERNAL DIAMETERS

Single master vs Dual master systems

Accurate dimensional measurement requires readouts and gaging members that are calibrated with known standards. Both single and dual master methods of calibration are widely used for air gage systems. The selection of one over the other involves trading off the flexibility and accuracy of the dual master system versus the ease of set up and economy using the single master system. Properly applied, both systems provide acceptable levels of accuracy.

The dual master system user calibrates the readout by observing that the span displayed by the readout corresponds to the span between the minimum and maximum setting masters. This method sets the combined sensitivity of all the components of the gaging system at one time. The sensitivities of components such as flow restrictors, amplifiers, pressure indicators and gaging nozzles, as well as pressure drops in air lines, are included in one overall calibration; thus stringent control of individual components is not necessary to obtain accurate overall results using a dual master system.

The single master system requires controlling the sensitivities of both the gage readout and the air gage member at the factory prior to shipment. The sensitivity of the air gage readout is verified using master orifices that simulate air flow to the gage nozzles; and the gaging member sensitivity is controlled by precise finishing of the gaging nozzles with verification using factory setting masters. Ease of set up is the principal advantage of readouts configured for single master operation, though significant cost savings may be obtained also in large gage sizes by eliminating the cost of a second master.

Single master system accuracy. An allowance must be made for possible scaling errors in both the comparator and the gaging member of the single master system. The effect of scaling error increases in direct proportion to the span between the master and the point of measurement. For instance, if a measurement is made .0002" from the mastered dimension, a scale factor error of 5% would cause an error of 5% of the .0002" span or .000010"; if the span were extended to .001", this error would become .000050". An error allowance of 5% is a reasonable assumption considering that inaccuracies of manufacture and stability with age must be allowed for in both the gaging member and the comparator. For most applications, this is an acceptable level of accuracy. Users should be aware, however, that the use of a master that is well outside of the tolerance zone may lead to unacceptable errors in some applications.

Air Ring Gages

Air Ring styles Center-jet style air rings have gaging nozzles near the center of the body. Shoulder-jet style have jets near the leading edge of the bore. For both air rings and air probes, the best wear life is obtained by using thru-hole or center-jet styles when the application permits.

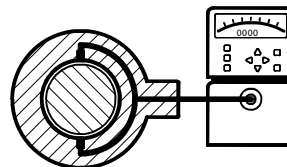


Shoulder type 3-Jet Air Ring

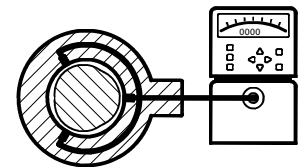


Center Jet type 2-Jet Air Ring

2 & 3 Jet Air Rings Air ring gages are often made with more than two interconnected air nozzles. Three-jet air rings are commonly specified when centerless ground parts are to be inspected. They will detect three lobe out-of-round conditions prevalent in centerless ground parts that are not detectable with two-point gaging methods (see illustration below). Adding additional jets provides direct display of average diameters.

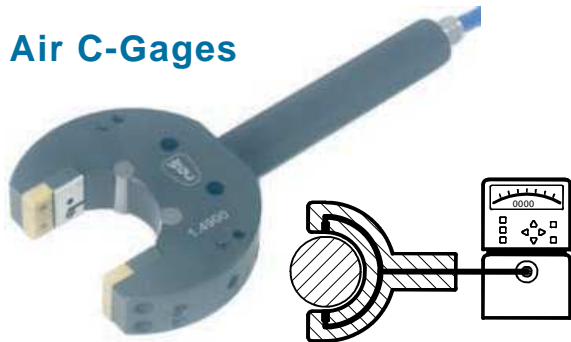


2 Jet Air Ring



3 Jet Air Ring

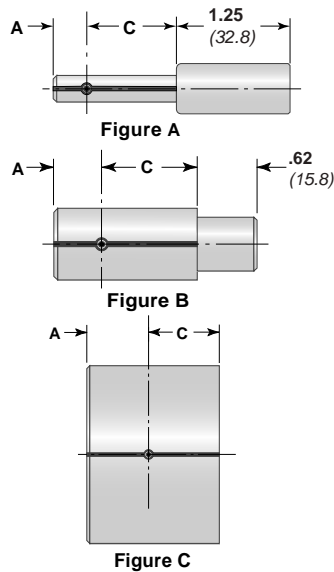
Air C-Gages



Air C-Gages provide side access making them a convenient means to measure shaft O.D.'s while the workpiece is mounted on a grinder. Western's C-Gages feature carbide back stops and Kevlar reinforced nylon bumpers that prevent marking parts.

See pages 22 & 23 for specifications and order codes for Air Ring Gage, C-Gages & Accessories

Air Probe Dimensional Data - Dual Master - Series 10 - 50



Body clearances

Clearances for series 10 thru 50 air gage members are referenced to the maximum material condition of the feature to be inspected. Determine the body size of an air probe by subtracting the clearance value shown in the adjacent table from the minimum part size. For air ring gages, add the value shown to the maximum part size.

Clearance recommendations

Low clearance . . Class 1 -- for the highest accuracy applications such as select fitting of valve spools and sleeves where finishing tolerance is less than .00016" (4.1 μm).

Standard clearance . . Class 2 -- best for most applications. Members are furnished to this specification when no other specification is given.

Extra clearance . . Class 3 -- for applications requiring extra gaging range such as grinding and honing operations where sizing information is required before the final size is obtained.

Sample order code for Dual master air probes

APT-12-C-.5000/.5005

member type
series spec.
clearance spec.

min / max size
material

(Air Probe Thru - Spec 12 - Chrome - Range)

AIR PROBE DIMENSIONAL DATA, Series 10, 40, & 50

Air probe body dimensions (inches / millimeters):

Size above -incl.	Dimension A			Dim. C	Fitting	Figure
	APT	APB	APS			
.059 - .073 1.50 - 1.85	.190 4.83	.080 2.03	.050 1.27	.625 15.88	#10-32 UNF	A
.073 - .120 1.85 - 3.05	.190 4.83	.080 2.03	.050 1.27	.625 15.88	#10-32 UNF	A
.120 - .183 3.05 - 4.65	.250 6.35	.085 2.16	.065 1.65	.750 19.05	.25-28 UNF	A
.183 - .300 4.65 - 7.62	.375 9.53	.095 2.41	.075 1.91	1.000 25.40	.25-28 UNF	A
.300 - .485 7.62 - 12.32	.440 11.18	.095 2.41	.075 1.91	1.000 25.40	#10-32 UNF	B
.485 - .860 12.32 - 21.84	.500 12.70	.095 2.41	.075 1.91	1.000 25.40	.25-28 UNF	B
.860 - 2.510 21.84 - 63.75	.750 19.05	.095 2.41	.075 1.91	1.000 25.40	.50-20 UNF	B
2.510 - 5.865 63.75 - 148.97	.875 22.23	.105 2.67	.085 2.16	1.000 25.40	.50-20 UNF	C
5.865 - 8.260 148.97 - 209.80	1.062 26.97	.125 3.17	.105 2.67	1.000 25.40	.50-20 UNF	C

Air probe body clearances (inches / micrometers):

Size above - incl.	Clearance class		
	1	2	3
.059 - .120 1.50 - 3.05	.00015 3.81	.0003 7.62	.0006 15.24
.120 - .183 3.05 - 4.65	.00015 3.81	.0004 10.16	.0008 20.32
.183 - .540 4.65 - 13.72	.0002 5.08	.0005 12.70	.0010 25.40
.540 - 1.510 13.72 - 38.35	.0003 7.62	.0006 15.24	.0012 30.48
1.510 - 3.010 38.35 - 76.45	.0004 10.16	.0008 20.32	.0014 35.56
3.010 - 4.510 76.45 - 114.55	.0005 12.62	.0009 22.86	.0018 45.72
4.510 - 6.510 114.55 - 165.40	.0007 17.78	.0012 30.48	.0022 55.88

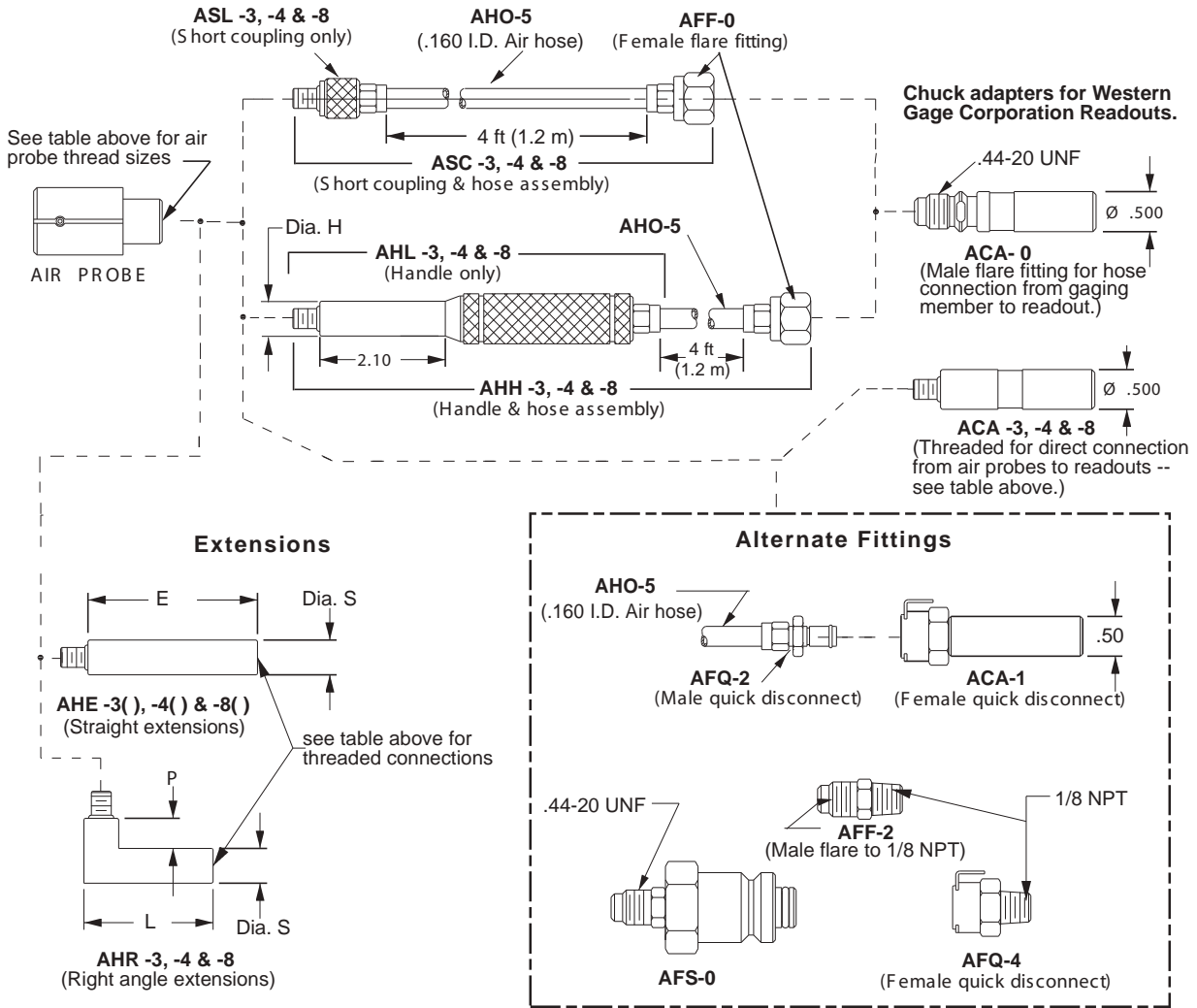
Standard jet diameters (inches / millimeters):

Size above-incl.	Series #	
	10 & 50	40
.059 - .073 1.50 - .185	.018" .046	NA NA
.073 - .120 .185 - 3.05	.023" .058	NA NA
.120 - .183 3.05 - 4.65	.042" 1.07	NA NA
.183 - .323 4.65 - 8.20	.047" 1.19	NA NA
.323 - 9.26 8.20 - 235.4	.050" 1.27	.078" 1.98

See pages 26 & 27 for more detail on specifying air probes

Accessories for Air Probe - Dual Master - Series 10 thru 50

AIR GAGE SIZE ABOVE-INCL	DASH NO.	THREAD SIZE	HANDLE Dia. H	(EXTENSION DIMENSIONS)			(EXTENSION PART NO.S)	
				Dia. S	L	P	DIM E = 4 in.	DIM E = 6 in.
.059-.120	-3	.19-32 UNF	.287"	.312"	1.62"	.38"	AHE-34	AHE-36
.120-.300	-4	.25-28 UNF	.437"	.437"	1.62"	.38"	AHE-44	AHE-46
.300-.485	-3	.19-32 UNF	.287"	.312"	1.62"	.38"	AHE-34	AHE-36
.485-.860	-4	.25-28 UNF	.437"	.437"	1.62"	.38"	AHE-44	AHE-46
.860-UP	-8	.50-20 UNF	.812"	.750"	1.75"	.25"	AHE-84	AHE-86



AIR PROBE ACCESSORIES, SERIES 10 THRU 50

AHH-3 Handle & hose -.19-32 UNF
 AHH-4 Handle & hose -.25-28 UNF
 AHH-8 Handle & hose -.50-20 UNF
 AHL-3 Handle only --- .19-32 UNF
 AHL-4 Handle only --- .25-28 UNF
 AHL-8 Handle only --- .50-20 UNF
 ASC-3 Short coupl'g & hose -.19-32 UNF
 ASC-4 Short coupl'g & hose -.25-28 UNF
 ASC-8 Short coupl'g & hose -.50-20 UNF
 ASL-3 Short coupling only -- .19-32 UNF
 ASL-4 Short coupling only -- .25-28 UNF
 ASL-8 Short coupling only -- .50-20 UNF

AHE-34 Extension, 4 in. - .19-32 UNF
 AHE-36 Extension, 6 in. - .19-32 UNF
 AHE-44 Extension, 4 in. - .25-28 UNF
 AHE-46 Extension, 6 in. - .25-28 UNF
 AHE-84 Extension, 4 in. - .50-20 UNF
 AHE-86 Extension, 6 in. - .50-20 UNF
 AHR-3 Rt. Angle adapter-.19-32 UNF
 AHR-4 Rt. Angle adapter-.25-28 UNF
 AHR-8 Rt. Angle adapter-.50-20 UNF

COMPARATOR FITTINGS

ACA-0 Chuck adapter -- male flare
 ACA-1 Chuck adapter, quick disconnect
 ACA-3 Chuck adapter -- .19-32 UNF

ACA-4 Chuck adapter -- .25-28 UNF
 ACA-8 Chuck adapter -- .50-20 UNF
 ACA-9 Chuck adapter, male flare w/bleed
 AFS-0 Set lock adapter, male flare
 AFF-2 Male flare -- 1/8 NPT

REPAIR PARTS

AHO-4 .125 Air hose only
 AHO-5 .160 Air hose only
 AFF-0 Female flare -- .160 hose barb
 AOR-3 O-rings for -3 accessories, 10 pcs
 AOR-4 O-rings for -4 accessories, 10 pcs
 AOR-8 O-rings for -8 accessories, 10 pcs
 ACF-10 Chuck Nut & Brass Collet

Air Probe Dimensional Data-Single Master - series 60 - 80

AIR PROBE DIMENSIONAL DATA, Series 60, 70, & 80

Air probe body dimensions (inches / millimeters):

Size above -incl.	Dimension A			Dim. C	Figure	Available Series
	APT	APB	APS			
.059 - .073 1.50 - 1.85	.190 4.83	.080 2.03	.050 1.27	.625 15.88	A	70
.073 - .120 1.85 - 3.05	.190 4.83	.080 2.03	.050 1.27	.625 15.88	A	70
.120 - .18 3.05 - 4.65	.250 6.35	.085 2.16	.065 1.65	.750 19.05	A	60 & 70
.183 - .300 4.65 - 7.62	.375 9.53	.095 2.41	.075 1.91	1.000 25.40	A	60 & 70
.300 - .485 7.62 - 12.32	.440 11.18	.095 2.41	.075 1.91	1.000 25.40	A	.60, 70 & 80
.485 - .860 12.32 - 21.84	.500 12.70	.095 2.41	.075 1.91	1.000 25.40	B	.60, 70 & 80
.860 - 2.510 21.84 - 63.75	.750 19.05	.095 2.41	.075 1.91	1.000 25.40	B	60, 70 & 80
2.510 - 5.865 63.75 - 148.97	.875 22.23	.105 2.67	.085 2.16	1.000 25.40	C	60, 70 & 80
5.865 - 8.260 148.97 - 209.80	1.062 26.97	.125 3.17	.105 2.67	1.000 25.40	C	60 & 80

Air probe body clearances (inches / micrometers):

Size above - incl.	Clearance class				
	1	2	3	4	5
.059 - .120 1.50 - 3.05	.00015 3.81	.0003 7.62	.0004 10.16	----	----
.120 - .183 3.05 - 4.65	.00015 3.81	.0003 7.62	.0004 10.16	.0006 15.24	.0010 25.40
.183 - .246 4.65 - 6.25	.00015 3.81	.0003 7.62	.0005 12.70	.0008 20.32	.0018 45.72
.246 - .300 6.25 - 7.62	.0002 5.08	.0004 10.16	.0006 15.24	.0010 25.40	.0022 55.88
.300 - .485 7.62 - 12.32	.0002 5.08	.0004 10.16	.0006 15.24	.0012 30.48	.0026 66.04
.485 - .540 12.32 - 13.72	.0003 7.62	.0004 10.16	.0007 17.78	.0014 35.56	.0030 76.20
.540 - 1.510 13.72 - 38.35	.0003 7.62	.0004 10.16	.0008 20.32	.0016 40.64	.0030 76.20
1.510 - 3.010 38.35 - 76.45	----	.0005 12.70	.0009 22.86	.0018 45.72	.0030 76.20
3.010 - 4.510 76.45 - 114.55	----	.0006 15.24	.0010 25.40	.0020 50.80	.0030 76.20
4.510 - 6.510 114.55 - 165.40	----	----	.0012 30.48	.0022 55.88	.0034 86.36

Jet data & fittings:

Series	Jet dia.	Fitting
60	.048	.375-32 UNEF
70	.023	.281-40 UNS
80	.094	.375-32 UNEF

1 Ser. 60 not available in sizes below .120" (3.05mm).

2 Ser. 80 not available in sizes below .360" (9.14mm).

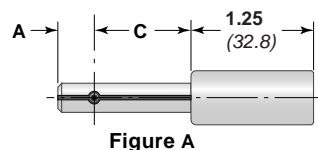


Figure A

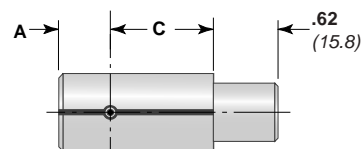


Figure B

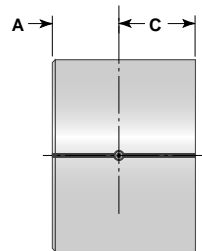


Figure C

Clearance recommendations Series 60 thru 80

Clearance values for single mastered gaging members are referenced to the nominal master sizes. Users should pick clearances that allow the probe to enter the workpieces at their maximum material condition, and at the same time, not have excessive clearance at the minimum material condition. To determine the body size of a single master air probe, subtract the clearance value shown from the nominal master ring. For air ring gages, add the value shown to the nominal setting master.

Guide lines for clearances are as follows:

Product tolerance	WGC specs.
.00001"-.00012" (.2μ - 3μm)	62, 71
.00012"-.0004" (3μ - 10μm)	63, 72
.0004" - .0020" (10μ - 50μm)	64, 73
.0020" - .0040" (50μ - 100μm)	65

Best accuracy will always be obtained with single mastered gages by mastering near the middle of the product tolerance.

Sample order code for Single master air probes

APB-64-S-.2495-XLC-3.00

member type
series spec.
clearance spec.

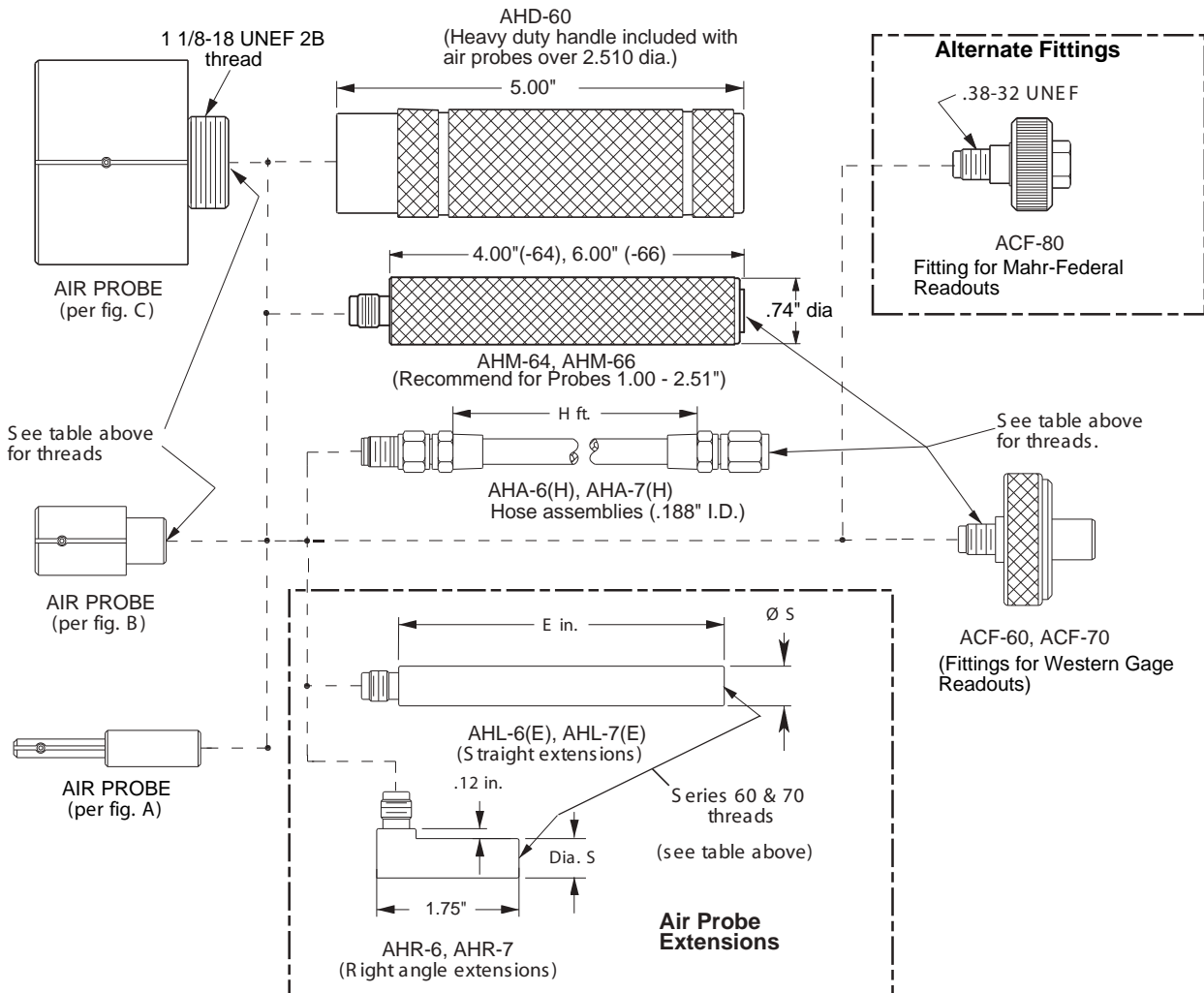
extra length
nominal size
material

(Air Probe Blind - Spec 64 - Steel - Range
- Extra Long dim. C = 3.00")

See pages 26 & 27 for more detail on
specifying air probes

Accessories for Air Probes - single Master - series 60 thru 80

AIR GAGE SERIES	THREAD SIZE	Ø S	(HOSE ASSY PART NO.S)		(PROBE EXTENTION PART NO.S)		
			DIM H = 3 ft.	DIM H = 5 ft.	DIM E = 2 in.	DIM E = 4 in.	DIM E = 6 in.
60	.38-32 UNEF	.485"	AHA-63	AHA-65	AHL-62	AHL-64	AHL-66
70	.28-40 UNS	.360"	AHA-73	----	AHL-72	AHL-74	----
80	.38-32 UNEF	.485"	AHA-63	AHA-65	AHL-62	AHL-64	AHL-66



AIR PROBE ACCESSORIES SERIES 60 THRU 80

AHA-63 Hose ass'y, 3 ft -.38-32 UNEF
 AHA-65 Hose ass'y, 5 ft -.38-32 UNEF
 AHA-66 Hose ass'y, 6 ft -.38-32 UNEF
 AHA-73 Hose ass'y, 3 ft -.28-40 UNS
 AHL-62 Handle/ext., 2 in x .38-32 UNEF
 AHL-64 Handle/ext., 4 in x .38-32 UNEF
 AHL-66 Handle/ext., 6 in x .38-32 UNEF
 AHL-72 Handle/ext., 2 in x .28-40 UNS
 AHL-74 Handle/ext., 4 in x .28-40 UNS
 AHD-60 Heavy duty handle 6" x Ø 1.20"
 AHM-64 Medium duty handle 4" x Ø .74"
 AHM-66 Medium duty handle, 6" x Ø .74"

AHR-6 Rt. Angle adapter, .38-32 UNEF
 AHR-7 Rt. Angle adapter, .28-40 UNS

REPAIR PARTS

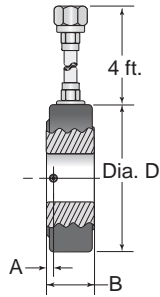
AOR-10 O-ring kit for series 60, 10 pcs
 AOR-07 O-ring kit for series 70, 10 pcs

READOUT FITTINGS

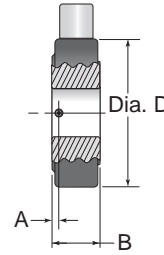
ACF-60 Fitting, use on: Milli Check, Micro Air - Ser.60
 ACF-70 Fitting, use on: Milli Check, Micro Air - Ser.70
 ACF-80 Fitting, use on Mahr-Federal Readouts

Air Ring Gage Dimensional Data - Single & Dual master

See page 27 for Air Ring Gage order codes



Series 10 - 50 (includes hose)



Series 60 - 80 (Order hose separately -- see pg 21)

Dual Master						
Air Ring Dimensional data, Series 10 thru 50						
Air ring gage body dimensions (inches / millimeters):						
Size	Dimension A					
	ARC	ARS	ARX	Dim. B	Dia. D	
above -incl						
.061 - .070*	.250	---	---	.500	1.73	
1.55 - 1.78	6.35	1.91	---	12.70	43.94	
.070 - .183	.281	.075	---	.562	1.73	
1.78 - 4.65	7.14	1.91	---	14.27	43.94	
.183 - .300	.281	.095	.080	.562	1.85	
4.65 - 7.62	7.14	2.41	2.03	14.27	46.99	
.300 - .760	.375	.095	.080	.750	2.31	
7.62 - 19.30	9.53	2.41	2.03	19.05	58.67	
.760 - 1.760	.500	.125	.085	1.000	3.31	
19.30 - 44.70	12.70	3.18	2.16	25.40	84.07	
1.760 - 3.010	.560	.125	.085	1.120	4.62	
44.70 - 76.45	14.22	3.18	2.16	28.45	117.35	
3.010 - 4.000	.625	.135	.090	1.250	5.87	
76.45 - 101.60	15.88	3.43	2.29	31.75	149.10	
4.000 - 4.875	.625	.135	.090	1.250	6.87	
101.60 - 123.83	15.88	3.43	2.29	31.75	174.50	
4.875 - 5.750	.625	.135	.090	1.250	7.87	
123.83 - 146.05	15.88	3.43	2.29	31.75	199.90	
5.750 - 6.625	.625	.135	.090	1.250	8.87	
146.05 - 168.28	15.88	3.43	2.29	31.75	225.50	
6.625 - 7.500	.625	.135	.090	1.250	9.87	
168.28 - 190.50	15.88	3.43	2.29	31.75	250.70	

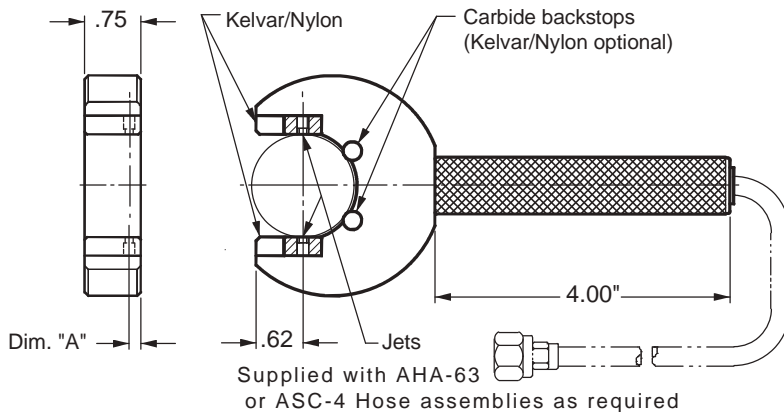
Series 10, 40 & 50 fittings: Air ring gages are furnished with 4 ft (1.22 mm) hoses with .44-20 female flare fittings.

* Air ring sizes .061 to .183 are available in 3 jet, carbide only.

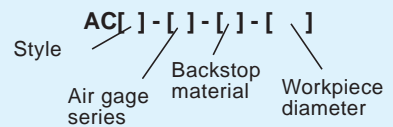
Single Master						
Air Ring Dimensional data, Series 60 thru 70						
Air ring gage body dimensions (inches / millimeters):						
Size	Dimension A					
	ARC	ARS	ARX	Dim. B	Dia. D	
above -incl						
.183 - .300	.281	.095	.080	.562	1.85	
4.65 - 7.62	7.14	2.41	2.03	14.27	46.99	
.300 - .760	.375	.095	.080	.750	2.31	
7.62 - 19.30	9.53	2.41	2.03	19.05	58.67	
.760 - 1.760	.500	.125	.085	1.000	3.31	
19.30 - 44.70	12.70	3.18	2.16	25.40	84.07	
1.760 - 3.010	.560	.125	.085	1.120	4.62	
44.70 - 76.45	14.22	3.18	2.16	28.45	117.35	
3.010 - 4.000	.625	.135	.090	1.250	5.87	
76.45 - 101.60	15.88	3.43	2.29	31.75	149.10	
4.000 - 4.875	.625	.135	.090	1.250	6.87	
101.60 - 123.83	15.88	3.43	2.29	31.75	174.50	
4.875 - 5.750	.625	.135	.090	1.250	7.87	
123.83 - 146.05	15.88	3.43	2.29	31.75	199.90	
5.750 - 6.625	.625	.135	.090	1.250	8.87	
146.05 - 158.75	15.88	3.43	2.29	31.75	225.50	
6.625 - 7.500	.625	.135	.090	1.250	9.87	
168.28 - 190.50	15.88	3.43	2.29	31.75	250.70	

Fittings:
 Series: 60 & 80 .375-32 UNEF fitting (order hose separately).
 Series: 70 .281-40 UNS fitting (order hose separately).

Air C-Gage Dimensional Data - Single & Dual Master



C-Gage Order Code:



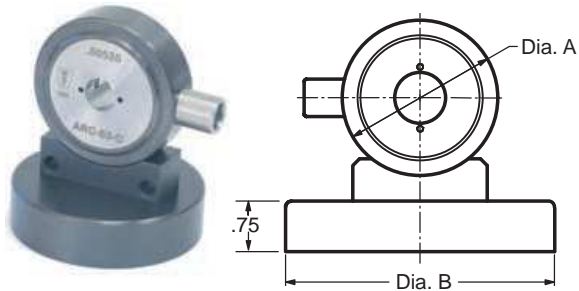
C-Gage type	Code	Dim. A
Shoulder Jet	ACS	.156 (4.0)
Center Jet	ACC	.375 (9.5)

C-Gages are available for O.D. sizes from .60" to 7.81" (15.2 - 198.3 mm).

Multi-channel C-Gages are available as custom designs.

Accessories for Air Ring Gages - Single & Dual Master

Base stands for air ring gages



Order codes for base stands

Code	Range	Dia. A	Dia. B
ABA-0	.120 - .183 (.305 - 4.65 mm)	1.73"	2.94"
ABA-1	.183 - .300 (4.65 - 7.62 mm)	1.85	2.94
ABA-2	.300 - .760 (7.62 - 19.30 mm)	2.31	3.94
ABA-3	.760 - 1.760 (19.30 - 44.70 mm)	???	5.94
ABA-4	1.760 - 3.010 (44.70 - 76.45 mm)	4.63	5.94

Requires factory drilled mounting holes in the air ring housing.

Vee type Guide Chutes for air ring gages

Air Ring Gage Guide Chutes provide convenient means of gaging long parts with interrupted external diameters such as valve spools. Chutes can be ordered as single end or double end.

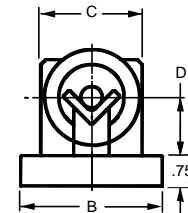
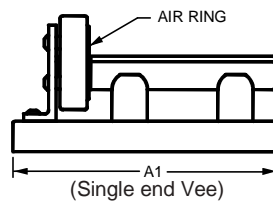
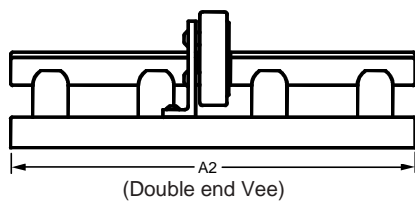


Dash No.	Gaging Range	Dimensions				
		A1	A2	B	C	D
-1	.183-.300	5.66	8.00	3.00	2.00	1.09
-2	.300-.760	6.74	10.00	3.50	3.00	1.60
-3	.760-1.760	7.87	12.00	4.00	3.50	2.46
4	1.760-2.312	9.13	14.00	5.00	4.13	2.65

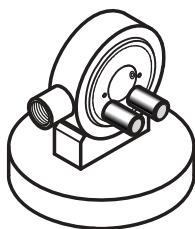
Requires factory modification of air ring housing.

Order code

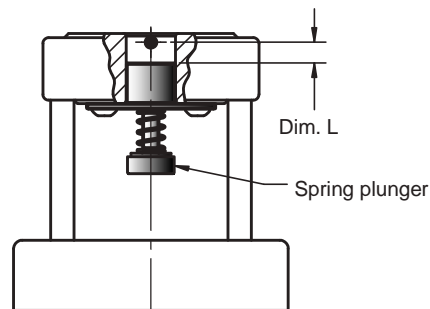
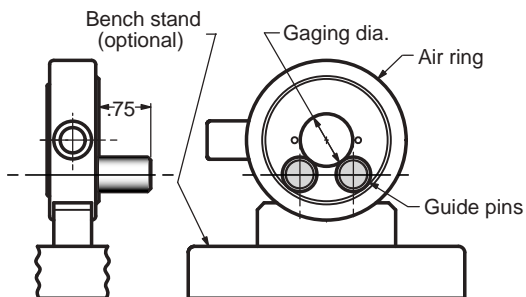
ABV-[]-[] Chute configuration
 1 - Single End
 2 - Double End



Guide pins & backstops



Guide pins can be added to an air ring gage to guide short parts. Consult factory for this modification.



Plunger backstops facilitate inspection of short parts such as bearing races. Factory installation is required, specify Dim. L when ordering the air ring gage. Base stand with standoffs is optional.