

Starrett®

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**STARRETT-WEBBER
GAGE BLOCKS**





Precision Gage Blocks, Standard Reference Bars, Angle Gage Blocks, True Squares, Optical Polygons and Targets

The first part of this section is devoted to **GAGE BLOCKS** and **STANDARD REFERENCE BARS**.

Gage Blocks – Major Product Characteristics

Precision gage blocks are the primary standards vital to dimensional quality control in the manufacture of parts. The four major characteristics that are necessary for a precision gage block are accuracy, surface finish, wear resistance and dimensional stability. Other factors are corrosion resistance, hardness, thermal conductivity and coefficient of expansion.

The base material used for gage blocks is crucial in meeting the above criteria. While many materials have been tried, the major types available today are:

- ◆ **Traditional high-grade steel** gage blocks, which are generally used in shop floor environments
- ◆ **Tungsten Carbide** gage blocks, which have the advantage of being harder and longer wearing than steel. (Not available from Webber.)
- ◆ **Ceramic** gage blocks have an advantage over regular steel. They will outwear regular steel and they will not corrode
- ◆ **Chromium Carbide** gage blocks are considered the top of the line – the finest available. They outwear regular steel and ceramic. In addition, they will not corrode and are very stable and accurate, and have exceptional “wringing” qualities

croblox® Chromium Carbide – the superior gage block material. The reason that our Webber Gage Division emphasizes gage blocks made from Chromium Carbide is because they are the most stable measuring devices ever developed.

No one in the world except Starrett/Webber has produced the accuracy and stability of our croblox® Grand Masters. They were produced in 1955 of Chromium Carbide material to an accuracy within one millionth of an inch (.0000254mm) and have been checked periodically by the U.S. National Bureau of Standards and the U.S. National Institute of Standards and Technology (NIST) and have remained stable over this period.

Other Characteristics

Accuracy

All Starrett/Webber gage blocks meet or exceed all known specifications. The flatness, parallelism and surface finish necessary to achieve the required accuracies are the same as or better than government requirements.

Stability

Starrett/Webber gage blocks do not change in size except through normal wear. Gage block stability is a characteristic that our Webber Gage Division has mastered with over seventy years of experience. Our gage blocks have withstood the test of time.

Hardness

Steel blocks have a Rockwell “C” hardness of approximately 64-65. Chromium Carbide blocks have a Rockwell “C” hardness of 71-73, with an unusually fine, hard grain structure which gives them exceptional resistance to wear and abrasion.

Thermal Conductivity and Coefficient of Expansion

These are not important considerations when measurements are taken in temperature-controlled environments. This is primarily done when measuring to microinches or microns.

On the shop floor, where precision measurements are rarely finer than .0002” or 0.005mm, the coefficient of expansion of steel, chromium carbide and ceramics is so close as to be negligible.

Thermal conductivity is important on the shop floor. However, because it takes time for a gage block to move to the same temperature as the work piece, we recommend setting the gage block on a heat sink such as a large mass of metal that is at the shop environment temperature.



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DIMENSIONAL

NVLAP Code: 20/DO3
Gage Blocks

How To Order Starrett Precision Gage Blocks

Gage Block Sets

1. Order by catalog number.
2. Please specify if you require a Commercial Grade Calibration or Master Grade Calibration. See the catalog page regarding our Accredited Gage Block Calibration Service near the end of this section. A certificate of calibration provides individual readings on each block and provides traceability to NIST. Webber gage block calibrations are NVLAP® accredited by NIST. (We need the end user's name and address to place on the certificate.)
3. Specify if you require etched serial numbers. We can provide numbers up to a 6-digit maximum. (Our standard practice is to put the same etch number on each block in a set. Blocks are differentiated by their marked size.)

The buyer of Webber products listed in this catalog agrees to the 100% Relaxed Acceptance Rule contained in ASME B89.7.3.1 (Guidelines for Decision Rules: Considering Measurement Uncertainty in Determining Conformance to Specifications.) Products may not be rejected by the purchaser unless his measurements exceed the published tolerances by more than his uncertainty of measurement.

NVLAP® accreditation does not constitute an endorsement of any product by NVLAP® or any agency of the U.S. government.

Individual Gage Blocks

1. **Specify Shape**, signified on the page by the following symbols:

- ◆ **Rectangular** 
- ◆ **Square** 
- ◆ **Heavy Duty** 

2. **Specify Material** (croblox®, steel, or ceramic)
3. **Specify Unit of Measure** (inch or metric)
4. **Specify the Size**
5. **Specify Special Lengths**, if applicable (Rectangular Only)
 - Thin block sets (28 pc. inch and 17 pc. metric) are all 1.115" (28.3mm) long. Specify "SS" length
 - .050", .100", and .150" blocks in inch 81-92 pc. sets are 1.380 long. Specify the Long length, "L"
 - .100" blocks contained in the 36, 38, and 43 pc. sets are 1.380" long. Specify the Long length, "L"
6. **Specify Accuracy Grade** (see next page)
7. **Please specify if you require a Commercial Grade Calibration or Master Grade Calibration.** See the catalog page regarding our Accredited Gage Block Calibration Service near the end of this section. A certificate of calibration provides individual readings on each block and provides traceability to NIST. Webber gage block calibrations are NVLAP® accredited by NIST. (We need the end user's name and address to place on the certificate.)
8. **Specify if you require etched serial numbers.** We can provide numbers up to a 6-digit maximum.



Gage Block Tolerances: B89.1.9

Inch System: Tolerances expressed in microinches (.000001") 1 millionth of an inch

	Order Webber Grade LM			Order Webber Grade AA B89.1.9 Grade 00			Order Webber Grade A1 B89.1.9 Grade 0		
	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance
Thru .050"	+1.2/-1.2	1.2	1.2	+4/-4	2	2	+6/-6	4	4
Thru .400"	+1.2/-1.2	1.2	1.2	+3/-3	2	2	+5/-5	4	4
Thru 1"	+1.2/-1.2	1.2	1.2	+3/-3	2	2	+6/-6	4	4
Thru 2"	+2.0/-2.0	1.2	1.2	+4/-4	2	2	+8/-8	4	4
Thru 3"	+3.0/-3.0	1.2	1.2	+5/-5	3	Rect.: 2, Sq.: 3	+10/-10	4	4
Thru 4"	+4.0/-4.0	1.2	1.2	+6/-6	3	Rect.: 2, Sq.: 3	+12/-12	5	4
Thru 5"				+8/-8	3	Rect.: 2, Sq.: 3	+16/-16	5	4
Thru 6"				+8/-8	3	Rect.: 2, Sq.: 3	+16/-16	5	4
Thru 7"				+10/-10	4	4	+20/-20	6	6
Thru 8"				+10/-10	4	4	+20/-20	6	6
Thru 10"				+12/-12	4	4	+24/-24	6	6
Thru 12"				+14/-14	4	4	+28/-28	7	6
Thru 16"				+18/-18	5	4	+36/-36	8	6
Thru 20"				+20/-20	6	4	+44/-44	10	6

	Not Available from Webber B89.1.9 Grade AS1			Not Available from Webber B89.1.9 Grade AS2		
	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance
Thru .050"	+12/-12	6	6	+24/-24	12	10
Thru .400"	+8/-8	6	6	+18/-18	12	10
Thru 1"	+12/-12	6	6	+24/-24	12	10
Thru 2"	+16/-16	6	6	+32/-32	12	10
Thru 3"	+20/-20	6	6	+40/-40	14	10
Thru 4"	+24/-24	8	6	+48/-48	14	10
Thru 5"	+32/-32	8	6	+64/-64	16	10
Thru 6"	+32/-32	8	6	+64/-64	16	10
Thru 7"	+40/-40	10	7	+80/-80	16	10
Thru 8"	+40/-40	10	7	+80/-80	16	10
Thru 10"	+48/-48	10	7	+104/-104	18	10
Thru 12"	+56/-56	10	7	+112/-112	20	10
Thru 16"	+72/-72	12	7	+144/-144	20	10
Thru 20"	+88/-88	14	7	+176/-176	24	10

Suggested Replacement Grades for GGG-G-15C

GGG-G-15C Grade	Webber Grade	B89.1.9 Grade
0.5	LM	—
1	AA	00
2	A1	0
3	A	AS1

NOTE: The above replacement grades are suggested in B89.1.9. However, the tolerances specified in GGG-G-15C and B89.1.9 are not exactly the same. Gage blocks meeting B89.1.9 specifications may not meet GGG-G-15C requirements and vice versa.

◆ B89.1.9 Grade 00 exceeds DIN, ISO, BS Grades K

MATERIAL COEFFICIENTS OF THERMAL EXPANSION ARE:

Chromium Carbide 4.7×10^{-6} inch/°F per inch

SAE 52100 Steel 6.4×10^{-6} inch/°F per inch

Ceramic 5.5×10^{-6} inch/°F per inch

Gage Block Tolerances: B89.1.9

Metric System: Tolerances expressed in micrometers (0.001mm)

	Order Webber Grade LM			Order Webber Grade AA B89.1.9 Grade 00			Order Webber Grade A1 B89.1.9 Grade 0		
	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance
Thru 0.5mm	+.03/- .03	.03	.03	+.10/- .10	.05	.05	+.14/- .14	.10	.10
Thru 10mm	+.03/- .03	.03	.03	+.07/- .07	.05	.05	+.12/- .12	.10	.10
Thru 25mm	+.04/- .04	.03	.03	+.07/- .07	.05	.05	+.14/- .14	.10	.10
Thru 50mm	+.05/- .05	.03	.03	+.10/- .10	.06	.05	+.20/- .20	.10	.10
Thru 75mm	+.08/- .08	.03	.03	+.12/- .12	.07	Rect (.05), Sq. (.07)	+.25/- .25	.12	.10
Thru 100mm	+.10/- .10	.03	.03	+.15/- .15	.07	Rect (.05), Sq. (.07)	+.30/- .30	.12	.10
Thru 125mm				+.20/- .20	.08	Rect (.05), Sq. (.07)	+.40/- .40	.14	.10
Thru 150mm				+.20/- .20	.08	Rect (.05), Sq. (.07)	+.40/- .40	.14	.10
Thru 175mm				+.25/- .25	.09	.10	+.50/- .50	.16	.15
Thru 200mm				+.25/- .25	.09	.10	+.50/- .50	.16	.15
Thru 250mm				+.30/- .30	.10	.10	+.60/- .60	.16	.15
Thru 300mm				+.35/- .35	.10	.10	+.70/- .70	.18	.15
Thru 400mm				+.45/- .45	.12	.10	+.90/- .90	.20	.15
Thru 500mm				+.50/- .50	.14	.10	+1.1/- 1.1	.25	.15

	Not Available from Webber B89.1.9 Grade AS1			Not Available from Webber B89.1.9 Grade AS2		
	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance	Size Tolerance	Variation in Length Tolerance	Flatness Tolerance
Thru 0.5mm	+.30/- .30	.16	.15	+.60/- .60	.30	.25
Thru 10mm	+.20/- .20	.16	.15	+.45/- .45	.30	.25
Thru 25mm	+.30/- .30	.16	.15	+.60/- .60	.30	.25
Thru 50mm	+.40/- .40	.18	.15	+.80/- .80	.30	.25
Thru 75mm	+.50/- .50	.18	.15	+1.0/- 1.0	.35	.25
Thru 100mm	+.60/- .60	.20	.15	+1.2/- 1.2	.35	.25
Thru 125mm	+.80/- .80	.20	.15	+1.6/- 1.6	.40	.25
Thru 150mm	+.80/- .80	.20	.15	+1.6/- 1.6	.40	.25
Thru 175mm	+1.0/- 1.0	.25	.18	+2.0/- 2.0	.40	.25
Thru 200mm	+1.0/- 1.0	.25	.18	+2.0/- 2.0	.40	.25
Thru 250mm	+1.2/- 1.2	.25	.18	+2.4/- 2.4	.45	.25
Thru 300mm	+1.4/- 1.4	.25	.18	+2.8/- 2.8	.50	.25
Thru 400mm	+1.8/- 1.8	.30	.18	+3.6/- 3.6	.50	.25
Thru 500mm	+2.2/- 2.2	.35	.18	+4.4/- 4.4	.60	.25

Suggested Replacement Grades for GGG-G-15C

GGG-G-15C Grade	Webber Grade	B89.1.9 Grade
0.5	LM	—
1	AA	00
2	A1	0
3	A	AS1

NOTE: The above replacement grades are suggested in B89.1.9. However, the tolerances specified in GGG-G-15C and B89.1.9 are not exactly the same. Gage blocks meeting B89.1.9 specifications may not meet GGG-G-15C requirements and vice versa.

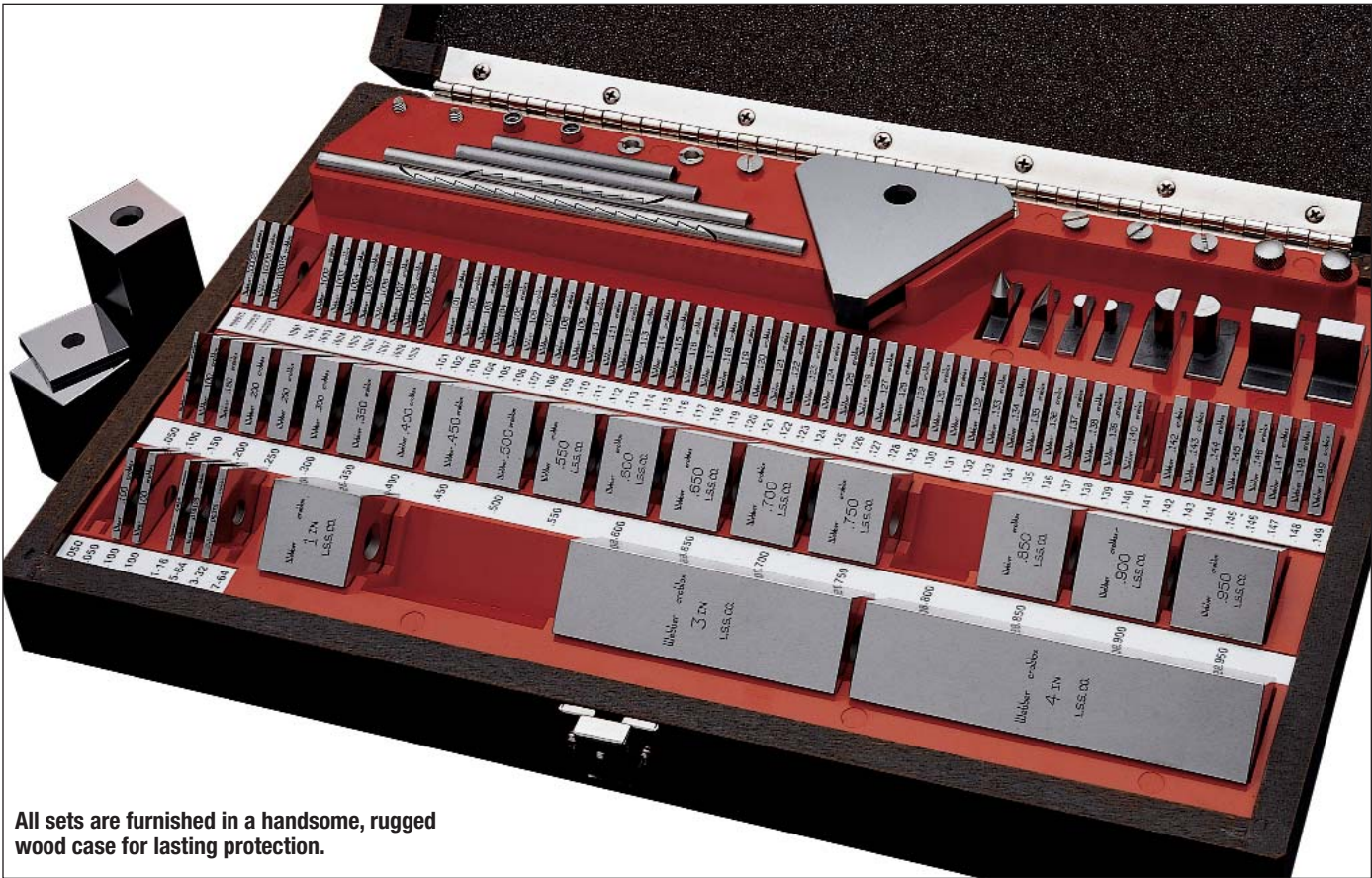
◆ B89.1.9 Grade 00 exceeds DIN, ISO, BS Grades K

MATERIAL COEFFICIENTS OF THERMAL EXPANSION ARE:

Chromium Carbide 8.5×10^{-6} m/°C per m

SAE 52100 Steel 11.5×10^{-6} m/°C per m

Ceramic 9.9×10^{-6} m/°C per m



All sets are furnished in a handsome, rugged wood case for lasting protection.

Inch System Gage Block Sets, Individual Blocks and Accessories

The following pages include these Inch System items in the order shown:

 **Rectangular gage blocks and accessories**

 **Square gage blocks and accessories**

 **Heavy-duty gage blocks and accessories**

Rectangular croblox® – Inch System Gage Block Sets in Case

 Inch 

Accuracy Grade*	Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
B89.1.9 0	.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001	81	9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1")	RC 81.A1
B89.1.9 00				RC 81.AA
Webber LM				RC 81.LM
B89.1.9 0	.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64	88	Same as in RC 81. Set, Plus 3 Blocks .100025, .10005, .100075 4 Blocks 1/16, 5/64, 3/32, 7/64	RC 88.A1
B89.1.9 00				RC 88.AA
Webber LM				RC 88.LM
B89.1.9 0	.200-8.000 in Steps of .001 .300-8.000 in Steps of .0001	34	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 3 Blocks .100 Through .300 (Steps of .100) 1 Block .500 3 Blocks 1.000, 2.000 and 4.000	RC 34.A1
B89.1.9 00				RC 34.AA
Webber LM				RC 34.LM
B89.1.9 0	.020-.240 in Steps of .001 .040-.240 in Steps of .0001 .060-.240 in Steps of .00005	28	1 Block .02005 9 Blocks .0201 Through .0209 (Steps of .0001) 9 Blocks .021 Through .029 (Steps of .001) 9 Blocks .010 Through .090 (Steps of .010)	RC 28.A1
B89.1.9 00				RC 28.AA

NOTES: For gage block accessories, order AC 11.A Accessory Set in Case.

Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

*For complete accuracy specifications, see page at the beginning of this section.



Rectangular Ceramic – Inch System Gage Block Sets in Case

Inch 

Our Ceramic Gage Blocks, offered in rectangular, inch and metric, fill the gap between steel and the universally accepted croblox®. While not as stable as croblox®, ceramic is an excellent alternative to steel because of its superior hardness, thermal expansion and wear characteristics.



Set No. RY 34.A1.

Accuracy Grade*	Measuring Range	Blocks Per Set	Blocks Included in Sets	Catalog No.
B89.1.9 0	.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001	81	9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1")	RY 81.A1
B89.1.9 00				RY 81.AA
B89.1.9 0	.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64	88	Same as in RY 81. Set, Plus 3 Blocks .100025, .10005, .100075 4 Blocks 1/16, 5/64, 3/32, 7/64	RY 88.A1
B89.1.9 00				RY 88.AA
B89.1.9 0	.200-8.000 in Steps of .001 .300-8.000 in Steps of .0001	34	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 3 Blocks .100 Through .300 (Steps of .100) 1 Block .500 3 Blocks 1.000, 2.000 and 4.000	RY 34.A1
B89.1.9 00				RY 34.AA

NOTE: Sets include etched serial number and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

*For complete accuracy specifications, see page at the beginning of this section.

Rectangular Steel – Inch System Gage Block Sets in Case

B89.1.9 Accuracy Grade 0*
Inch

Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001	81	9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1")	RS 81.A1
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64	88	Same as in RS 81.A1 Set, Plus 3 Blocks .100025, .10005, .100075 4 Blocks 1/16, 5/64, 3/32, 7/64	RS 88.A1
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64	92	Same as in RS 88.A1 Set, Plus 2 Blocks .100" (croblox® Wear Blocks) 2 Blocks .050 (croblox® Wear Blocks)	RS 92.A1
.100-4.000 in Steps of .001 .150-4.000 in Steps of .0001 .200-4.000 in Steps of .00005	38	2 Blocks .050 (croblox® Wear Blocks) 1 Block .05005 9 Blocks .0501 Through .0509 (Steps of .0001) 9 Blocks .051 Through .059 (Steps of .001) 11 Blocks .050 Through .150 (Steps of .010) 4 Blocks .200 Through .500 (Steps of .100) 2 Blocks 1.000 and 2.000	RS 38.A1
.200-8.000 in Steps of .001 .300-8.000 in Steps of .0001	34	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 4 Blocks .100, .200, .300, .500 3 Blocks 1.000, 2.000, 4.000	RS 34.A1
.020-.240 in Steps of .001 .040-.240 in Steps of .0001 .060-.240 in Steps of .00005	28	1 Block .02005 9 Blocks .0201 Through .0209 (Steps of .0001) 9 Blocks .021 Through .029 (Steps of .001) 9 Blocks .010 Through .090 (Steps of .010)	RS 28.A1
.0625-4.000 in Steps of .0625 .100-4.000 in Steps of .100	9	1 Block .0625, .100, .125, .200, .250, .300, .500, 1.000, 2.000	RS 9.A1

Micrometer Checking Set

B89.1.9 Accuracy Grade AS1*

	10	10 blocks .105, .210, .315, .420, .500, .605, .710, .815, .920, 1.000	RS 10.A
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NOTES: For gage block accessories, order AC 11.A Accessory Set in Case.

See rectangular block accessories on the next page. Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost. *For complete accuracy specifications, see page at the beginning of this section.



MicroAccurate® – B-Grade Gage Block Sets In Case

Inch & Metric

These B-Grade gage block sets are Starrett Global products. Their very affordable price makes them ideal for general shop floor use.

Now, our initial Inch Sets are joined by four Metric B-Grade Sets.

Etched, unique serial numbers are included on each block. Custom numbers are not available.

Sets are available with a choice of two types of certificates of calibration as described below.

Inch System sets have a tolerance of $\pm 50 \mu\text{in}$.

Metric System sets have a tolerance of $\pm 1.25 \mu\text{m}$.



No. RS 81.B

Gage Block Sets

Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
Inch System Sets .100-12.000 in Steps of .001 .200-12.000 in Steps of .0001	81	9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1")	RS 81.B
			RS 81.W
Metric System Sets 3.0 Through 450 in .0005mm Steps 2.0 Through 450 in .001mm Steps 1.0 Through 450 in .01mm Steps 1.0 Through 450 in .1mm Steps	88	1 block .5mm 1 block 1.0005mm 9 blocks 1.001mm Through 1.009mm (Steps of .001mm) 49 blocks 1.01mm Through 1.49mm (Steps of .01mm) 18 blocks 1mm Through 9.5mm (Steps of .5mm) 10 blocks 10mm Through 100mm (Steps of 10mm)	RS 88.MW
			RS 88.MB
Metric System Sets 3.0 Through 250 in .0005mm Steps 2.0 Through 250 in .001mm Steps 1.0 Through 250 in .01 mm Steps 1.0 Through 250 in .1mm Steps	112	1 block .5mm 1 block 1.0005mm 9 blocks 1.001mm Through 1.009mm (Steps of .001mm) 49 blocks 1.01mm Through 1.49mm (Steps of .01mm) 48 blocks 1mm Through 24.5mm (Steps of .5mm) 4 blocks 25mm Through 100mm (Steps of 25mm)	RS 112.MW
			RS 112.MB

Specifications

Catalog No.	Features
RS 81.B	Calibration performed at Webber Gage in Cleveland, OH. Certificate of Calibration with NVLAP accreditation. Calibration in accordance with ISO 17025 with dated calibration certificate and NIST traceability number. The name and address of the user may be added to the calibration certificate. Inch System (RS 81.B) uncertainty of measurement ($k=2$): $\mu = 6 + L$ where L is in inches, but μ not less than $7 \mu\text{in}$. Metric Systems (RS 88.MB & RS 112.MB) uncertainty of measurement ($k=2$): $\mu = 0.15 + .001L$ where L is in millimeters, but μ not less than $0.18 \mu\text{m}$.
RS 88.MB	
RS 112.MB	
RS 81.W	Calibration performed in China in partnership with Webber Gage. Webber Gage samples the measurements to monitor the calibration results. Calibrations are traceable to NIST, but no NIST traceability number or dates will be given. The name and address of the user will be left blank on the calibration certificate. Inch System (RS 81.W) uncertainty of measurement ($k=2$): $10 \mu\text{in}$. Metric Systems (RS 88.MW & RS 112.MW) uncertainty of measurement ($k=2$): $\mu = 0.25 \mu\text{m}$.
RS 88.MW	
RS 112.MW	

Rectangular Gage Block Accessories

Steel and croblox® – Inch System

Inch


Rectangular Steel and croblox® Accessories Individually or Sets as stated below

Individual Accessories		No. of Steel Accessories Included	
Description	Catalog No.	Set No. AC 11.A	81- 92 Block Sets when ord. w/ Acces.
	Steel croblox®		
Half-Round Jaw** .250 Radius	RA 1.	2	2
Straight Jaw** .250" Thick	RA 4. RA 24.	2*	2*
Clamps 0"-1-1/2" Capacity	RA 5.	1	1
1-1/2"-4" Capacity	RA 6.	1	1
4"-6-1/2" Capacity	RA 7.	1	1
0"-12" Capacity	RA 8.	1	1
Scriber Point	RA 11.	1	1
Center Point, 100 C/L	RA 12.	1	1
Base Block 1" Thick	RA 13.	1	1
Case (CS 9111.)		1	

Rectangular croblox® Wear Blocks

Size	Catalog No.
.020	RC .020 WA1
.050	RC .050 WA1
.100	RC .100 WA1

* croblox® jaws available as an option at extra cost. Please specify.

**Jaws are normally used in pairs, but are ordered individually. Please order accordingly.

Additional Accessories

Clamps 0-18" Capacity	RA 9.		
0-24" Capacity	RA 10.		
0-36" Capacity	RA 14.		
Half-Round Jaws .200 Radius	RA 2.		
.100 Radius	RA 3.		

Square croblox® – Inch System GageBlock Sets in Case

Inch

Accuracy Grade*	Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
B89.1.9 0	.100-12.000 in Steps of .001	81	9 Blocks .1001 Through .1009 (Steps of .0001)	SC 81.A1
B89.1.9 00	.200-12.000 in Steps of .0001		49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1")	SC 81.AA
B89.1.9 0	.100-12.000 in Steps of .001	88	Same as in SC 81. Set, Plus	SC 88.A1
B89.1.9 00	.200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64		3 Blocks .100025, .10005, .100075 4 Blocks 1/16, 5/64, 3/32, 7/64	SC 88.AA
B89.1.9 0	.200-8.000 in Steps of .001	36	1 Block .050	SC 36.A1
B89.1.9 00	.300-8.000 in Steps of .0001		9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 5 Blocks .100 Through .500 (Steps of .100) 3 Blocks 1.000, 2.000, 4.000	SC 36.AA

NOTES: All Square croblox® sets above are available with accessories at extra cost. To order, add "X" to catalog number. Accessories are furnished in steel (see following pages).

Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

*For complete accuracy specifications, see page at the beginning of this section.



Square Steel – Inch System Gage Block Sets in Case

B89.1.9 Accuracy Grade 0*

Inch

Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001	81	9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1") Above Set also Available with ACCESSORIES** (Extra)	SS 81.A1
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .000025 1/16-12.000 in Steps of 1/64	88	Same as in SS 81.A1 Set, Plus 3 Blocks .100025, .10005, .100075 4 Blocks 1/16, 5/64, 3/32, 7/64 Above Set also Available with ACCESSORIES** (Extra)	SS 88.A1
.200-8.000 in Steps of .001 .300-8.000 in Steps of .0001	36	1 Block .050 9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 5 Blocks .100 Through .500 (Steps of .100) 3 Blocks 1.000, 2.000 and 4.000 Above Set Also Available with ACCESSORIES** (Extra)	SS 36.A1
.020-.240 in Steps of .001 .040-.240 in Steps of .0001 .060-.240 in Steps of .00005	28	1 Block .02005 9 Blocks .0201 Through .0209 (Steps of .0001) 9 Blocks .021 Through .029 (Steps of .001) 9 Blocks .010 Through .090 (Steps of .010)	SS 28.A1
5.000-84 in Steps of 1.000	8	8 Blocks 5, 6, 7, 8, 10, 12, 16, 20 Accessories Included: 6 Each SA 8. Studs 2 Each SA 9. Flat Head Screws (long) 2 Each SA 10. Flat Head Screws (short) 1 Each SA 16. 4 1/2 - 6" Tie Rod (adjustable) 1 Each SA 17. 6 - 9" Tie Rod (adjustable) 1 Each SA 18. 11 3/4" Tie Rod 1 Each SA 19. 15 3/4" Tie Rod 2 Each SA 20. 19 3/4" Tie Rods	SS 8.A1X

B89.1.9 Accuracy Grade 00*

5.000-84 in Steps of 1.000	8	Same as above SS 8.A1X	SS 8.AAX
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NOTES: **All square steel sets 34 through 88 are available with accessories at extra cost. To order, add "X" to catalog number. Accessories are steel. See square block accessories on the next page. Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

* For complete accuracy specifications, see page at the beginning of this section.

Internal Measuring Machine Jaws

No. SA 708. croblox®

No. SA 707. Steel

Jaws are doubled-ended, self-proving, assuring parallelism and squareness. Designed for use with square style gage blocks. Jaws are made of long-wearing croblox® or steel material, 2.000" long, 1.000" wide and .500" thick. Both side edges are lapped 90° square to the gaging faces within 30 seconds of arc and extend beyond the gage blocks in the combination, thus forming a square master.

Jaw and gage combination parallelism is quickly checked merely by turning the combination to the opposite side and rechecking the reading. Furnished in pairs.



Square croblox® Wear Blocks

Size	Catalog No.
.100" With 1 Side Countersunk	SC .100 WA1

Additional Accessories

Description	Catalog No.	
	Steel	*croblox®
Tie Rods		
11-3/4" Solid	SA 18.	
15-3/4" Solid	SA 19.	
19-3/4" Solid	SA 20.	

Square Gage Block Accessories Steel and croblox® – Inch System



No. SA 25.A.

Square Steel and croblox® Accessories Individually or sets as stated below

Individual Accessories			No. of Steel Accessories Included	
Description	Catalog No.		Set No. SA 25.A and 81 thru 88 Block Sets when ordered with Accessories	34 and 36 Block Sets when ordered with Accessories
	Steel	croblox®		
Half-Round Jaw**				
.125 Radius	SA 1.		2	
.250 Radius	SA 2.		2	2
Straight Jaw**				
.500" Thick	SA 3.	SA 23.	2*	
Scriber Point	SA 4.		1	1
Center Point, .100 C/L	SA 5.		1	
Base Block .500 Thick	SA 6.		1	
Knurled Screw	SA 7.		2	2
Stud	SA 8.		2	2
Flat Head Screw				
Long	SA 9.		2	2
Short	SA 10.		2	2
Slotted Nut	SA 11.		2	2
Tie Rods				
3/4" Solid	SA 12.		1	1
1-1/2" Solid	SA 13.		1	1
2-1/4" Solid	SA 14.		1	1
3" Solid	SA 15.		1	1
4-1/2-6" Adjust	SA 16.		1	1
6-9" Adjust	SA 17.		1	
Case (CS9168)			(For SA 25.A Only)	

* croblox® jaws available as an option at extra cost. Please specify.

**Jaws are normally used in pairs, but are ordered individually. Please order accordingly.



Individual Rectangular Gage Blocks - Inch System croblox®, ceramic and steel

Inch 

Size/Inches	Grade	croblox®		Ceramic		Steel
		AA	A1	AA	A1	A1
.010		•	•			•
.01005						•
.0101 Through .0109 in Steps of .0001						•
.011 Through .019 in Steps of .001						•
.020 (Wear Blocks)			•			
.020 or .02005		•	•			•
.0201 Through .0209 in Steps of .0001		•	•			•
.021 Through .029 in Steps of .001		•	•			•
.030		•	•			•
.040		•	•			•
.050 long*		•	•	•	•	•
.050 (Wear Blocks)			•			•
.050S or .050SS		•	•			•
.05005						•
.0501 Through .0509 in Steps of .0001						•
.051 Through .059 in Steps of .001						•
.060 or .060SS		•	•			•
.0625 (1/16)		•	•	•	•	•
.070 or .070SS		•	•			•
.078125 (5/64)		•	•	•	•	•
.080 or .080SS		•	•			•
.090 or .090SS		•	•			•
.09375 (3/32)		•	•	•	•	•
.100 long*		•	•	•	•	•
.100 (Wear Blocks)			•			•
.100S		•	•	•	•	•
.100025		•	•	•	•	•

Size/Inches	Grade	croblox®		Ceramic		Steel
		AA	A1	AA	A1	A1
.10005		•	•	•	•	•
.100075		•	•	•	•	•
.1001 Through .1009 in Steps of .0001		•	•	•	•	•
.109375 (7/64)		•	•	•	•	•
.101 Through .109 in Steps of .001		•	•	•	•	•
.110 Through .119 in Steps of .001		•	•	•	•	•
.120 Through .129 in Steps of .001		•	•	•	•	•
.130 Through .139 in Steps of .001		•	•	•	•	•
.140 Through .149 in Steps of .001		•	•	•	•	•
.150 Long*		•	•	•	•	•
.150		•	•	•	•	•
.160 Through .190 in Steps of .010		•	•	•	•	•
.200, .250, .300, .350		•	•	•	•	•
.400, .450, .500, .550, .600		•	•	•	•	•
.650, .700, .750		•	•	•	•	•
.800, .850, .900, .950		•	•	•	•	•
1.000		•	•	•	•	•
2.000		•	•	•	•	•
3.000		•	•	•	•	•
4.000		•	•	•	•	•
5.000						•
6.000						•

How To Order

- ◆ Specify in this sequence: shape, material, size and accuracy grade

◆ **Key:** **Shape** **Material** **Size** **Accuracy**
 R=Rectangular S=Steel (listed in table)
 S=Square C=croblox®
 Y=Ceramic

- ◆ Example: RS .250A1 = Rectangular Steel block, size .250, Grade A1 Accuracy

*Order long length for Webber set replacements.

Rectangular Block Sizes

- ◆ Width: all blocks are .352" wide
- ◆ Length: for blocks under .050", length is 1.115"
- ◆ For blocks with .050 through .190", length is 1.180"
- ◆ For blocks .200" and above, length is 1.380"

Exceptions

- ◆ 28 block sets with blocks to .090" are all 1.115" long. .050, .060, .070, .080, .090 blocks in this set are listed with the suffix "ss".
- ◆ .050, .100, .150" blocks contained in the 81–92-piece sets are 1.380" long. Specify "long length".
- ◆ .100" block contained in the 36, 38, and 43-block sets are 1.380" long. Specify "long length".

Individual Square Gage Blocks – Inch System croblox® and steel

Inch 

Size/Inches	Grade	croblox®		Steel
		AA	A1	A1
		00	0	0
.010				•
.020				•
.02005				•
.0201 Through .0209 in Steps of .0001				•
.021 Through .029 in Steps of .001				•
.030				•
.040				•
.050		•	•	•
.060				•
.0625 (1/16)		•	•	•
.070				•
.078125 (5/64)		•	•	•
.080				•
.090				•
.09375 (3/32)		•	•	•
.100		•	•	•
.100 (Wear with Chamfered Hole)			•	•
.100025		•	•	•
.10005		•	•	•
.100075		•	•	•
.1001 Through .1009 in Steps of .0001		•	•	•
.109375 (7/64)		•	•	•
.101 Through .149 in Steps of .001		•	•	•
.150 Through .190 in Steps of .010		•	•	•
.200		•	•	•
.250		•	•	•
.300		•	•	•
.350		•	•	•
.400, .450, .500, .550		•	•	•
.600, .650, .700, .750		•	•	•
.800, .850, .900, .950		•	•	•
1.000		•	•	•
2.000		•	•	•
3.000		•	•	•
4.000		•	•	•

Square Steel Blocks Only		AA	A1
Size/Inches	Grade	00	0
5.000		•	•
6.000		•	•
7.000		•	•
8.000		•	•
10.000		•	•
12.000		•	•
16.000		•	•
20.000		•	•

Square Block Size

- ◆ All square blocks are .950 x .950"
- ◆ Blocks have a .265" hole in the center
- ◆ On blocks .200" thick and over, the hole is countersunk on both faces (croblox® Wear Blocks are countersunk on one face only)

How To Order

- ◆ Specify in this sequence: shape, material, size and accuracy grade
- ◆ **Key:** **Shape** **Material** **Size** **Accuracy**
 R=Rectangular S=Steel (listed in table)
 S=Square C=croblox®
- ◆ Example: SS .125A1 = Square Steel block, size .125 with a Grade A1 accuracy



Heavy-Duty Steel – Inch System Gage Block Sets and Accessories

Inch



Gaging Area 17/32 x 1-1/2"

These heavy-duty gage block sets are primarily used for assembling together into exclusive Webber fixtures.

Precision “yardsticks” and height gages can be built up to a required dimension by wringing blocks together and then by the use of eccentric clamps, locking them into place. All blocks over 1” long have 1/4” holes that accept eccentric clamps. All blocks 6” or larger have an insulated center grip to eliminate temperature variations caused by handling.

Precision scribes and dividers for tool layout can be created in a few seconds. The center point is on a .500” center line of a 1” block. The scribe point may be sharpened indefinitely without altering the original accuracy.

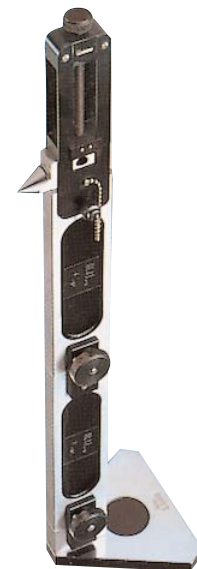
Snap gages with inside or outside calipers can be easily assembled using accessories like the eccentric clamps, a quick-acting clamp, and a pair of half-round or straight jaws.



No. HD 46.A1X.



Snap gage is used to check inside dimensions of ring gage still mounted in internal grinder.



Building up blocks into precision “yardsticks.”



Precision scribes, dividers and snap gages.

Heavy-Duty – Inch System Accessories (continued)

Inch 

Indicator Accessory Set

This heavy-duty accessory mounts on any build-up of heavy-duty blocks and measures the deviation of the work from nominal or desired size. (Indicator is set and checked for zero by placing blocks on any known flat surface.)

HDA 10 and HDA 12 Indicator Accessory Sets consist of a holding block, extension jaw and a precision Starrett indicator. See catalog description below for indicator ranges and graduations.



Above: Eccentric clamps are used for combining long blocks.

Below: Quick-acting clamps are used for combining fractional inch blocks with blocks 1" or longer.

Left: Indicator Accessory Set.

Wear Blocks

creblox® Wear Blocks in .050" and .100" sizes are available for use with heavy-duty blocks.



Size	Catalog No.
.050"	HDC .050 WA1
.100"	HDC .100 WA1

Heavy-Duty Steel Accessories Individually or Sets as stated below

Individual Accessories		No. of Steel Accessories Included
Description	Catalog No.	All 42 thru 46 Piece Sets or 84 Piece Set when ordered with Accessories
Half-Round Jaw* .500 Radius	HDA 1.	2
Scriber Point	HDA 2.	1
Center Point, .500 C/L	HDA 3.	1
Eccentric Clamp	HDA 4.	(See set description next page for qty.)
Quick-Acting Clamp	HDA 5.	1
Base Block 1.500" Thick	HDA 6.	1

Additional Accessories

Straight Jaw* 1.000 Thick	HDA 820.	
Indicator Set Consisting of Indicator Holding Block, Extension Jaw (1.000" Thick), Indicator with $\pm .010$ " Range .0005" Graduations, and Case	HDA 10.	
Indicator Set As Above Except Indicator With $\pm .0015$ " Range .00005" Graduations	HDA 12.	

*Jaws are normally used in pairs, but are ordered individually. Please order accordingly.



Heavy-Duty Steel – Inch System Gage Block Sets and Accessories

Inch



17/32" x 1-1/2" Gaging Area

B89.1.9 Accuracy Grade 0*

Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
.100-12.000 in Steps of .001 .200-12.000 in Steps of .0001 .300-12.000 in Steps of .00005	84	2 Blocks .100 Wear croblox® 1 Block .10005 9 Blocks .1001 Through .1009 (Steps of .0001) 49 Blocks .101 Through .149 (Steps of .001) 19 Blocks .050 Through .950 (Steps of .050) 4 Blocks 1.000 Through 4.000 (Steps of 1") 3 Eccentric Clamps Above Set Also Available With 2 Additional Eccentric Clamps and Accessories** (Extra)	HD 84.A1
.200-48.000 in Steps of .001 .300-48.000 in Steps of .0001	46	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 9 Blocks .100 Through .900 (Steps of .100) 4 Blocks 1.000 Through 4.000 (Steps of 1") 6 Blocks 6.000 10 Eccentric Clamps and Accessories** (Included)	HD 46.A1X
.200-36.000 in Steps of .001 .300-36.000 in Steps of .0001	44	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 9 Blocks .100 Through .900 (Steps of .100) 4 Blocks 1.000 Through 4.000 (Steps of 1") 4 Blocks 6.000 8 Eccentric Clamps and Accessories** (Included)	HD 44.A1X
.200-24.000 in Steps of .001 .300-24.000 in Steps of .0001	42	9 Blocks .1001 Through .1009 (Steps of .0001) 9 Blocks .101 Through .109 (Steps of .001) 9 Blocks .110 Through .190 (Steps of .010) 9 Blocks .100 Through .900 (Steps of .100) 4 Blocks 1.000 Through 4.000 (Steps of 1") 2 Blocks 6.000 6 Eccentric Clamps and Accessories** (Included)	HD 42.A1X

NOTES: Case for HD 84.A1 has space for accessories and six 6.000" heavy-duty blocks. To order with accessories, add "X" to catalog number.

*For complete accuracy specifications, see page at the beginning of this section.

**See previous page for details.

Individual Heavy-Duty Gage Blocks – Steel Only

Block Size	
.050	2.000
.100, .100025, .10005, .100075	3.000
.1001 Through .1009 In Steps of .0001	4.000
.101 Through .149 In Steps of .001	6.000
.150 Through .190 In Steps of .010	6.000 Heavy-Duty Block with Eccentric Clamp and Case
.200 Through .950 In Steps of .050	10.000
1.000	20.000

NOTES: Sets include etched serial numbrs and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

Separate cases for Gage Block Sets are also available.

To order individual blocks, specify HD followed by size and accuracy grade. Example: HD .050 A1

Metric System Gage Block Sets, Individual Blocks and Accessories

The following pages include these metric system items in the order shown:

 **Rectangular gage blocks and accessories**

 **Square gage blocks and accessories**



Metric rectangular 88 piece and square 112 sets are shown.

Mini-Metric Rectangular Steel Gage Block Set No. RS 9.MA1

This mini-metric set of precision gage blocks calibrates micrometers, vernier gages and similar measuring tools. The gage blocks are also useful as setting masters for comparator-type dimensional gages and are useful in teaching the basics of metric measurement.

The set has a capacity of 61mm in 1, 0.5mm or 0.25mm steps. Its nine hardened steel blocks include these sizes: 1, 2, 2.25, 2.5, 3, 5, 10, 15 and 25mm. They are finished to B89.1.9 Accuracy Grade 0 and are furnished in a lined metal case.



Metric re set No. RS 9.MA1



Rectangular croblox® – Metric System Gage Block Sets in Case

Metric



One Millimeter Base

Accuracy Grade*	Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
B89.1.9 0	3.0 Through 450 (Steps of .001mm)	45	9 Blocks 1.001mm Through 1.009mm (Steps of .001mm)	RC 45.MA1
	2.0 Through 450 (Steps of .01mm)		9 Blocks 1.01mm Through 1.09mm (Steps of .01mm)	
	1.0 Through 450 (Steps of .1mm)		9 Blocks 1.1mm Through 1.9mm (Steps of .1mm)	
B89.1.9 00	1.0 Through 450 (Steps of .1mm)		9 Blocks 1mm Through 9mm (Steps of 1mm) 9 Blocks 10mm Through 90mm (Steps of 10mm)	RC 45.MAA
B89.1.9 0	3.0 Through 450 (Steps of .0005mm)	88	1 Block .5mm	RC 88.MA1
	2.0 Through 450 (Steps of .001mm)		1 Block 1.0005mm	
	1.0 Through 450 (Steps of .01mm)		9 Blocks 1.001mm Through 1.009mm (Steps of .001mm)	
B89.1.9 00	1.0 Through 450 (Steps of .1mm)		49 Blocks 1.01mm Through 1.49mm (Steps of .01mm) 18 Blocks 1mm Through 9.5mm (Steps of .5mm) 10 Blocks 10mm Through 100mm (Steps of 10mm)	RC 88.MAA
B89.1.9 0	3.0 Through 250 (Steps of .0005mm)	112	1 Block .5mm	RC 112.MA1
	2.0 Through 250 (Steps of .001mm)		1 Block 1.0005mm	
	1.0 Through 250 (Steps of .01mm)		9 Blocks 1.001mm Through 1.009mm (Steps of .001mm)	
B89.1.9 00	1.0 Through 250 (Steps of .1mm)		49 Blocks 1.01mm Through 1.49mm (Steps of .01mm) 48 Blocks 1mm Through 24.5mm (Steps of .5mm) 4 Blocks 25mm Through 100mm (Steps of 25mm)	RC 112.MAA

NOTE: Sets include etched serial numbers and Commercial Grade Calibration Certificate. Metric croblox® Wear Blocks and/or Master Grade Calibration Certificate are available at extra cost. For gage block accessories, order AC 11.MA Metric Accessory Set in Case.

*For complete accuracy specifications, see page at the beginning of this section.

Rectangular Ceramic – Metric System Gage Block Sets in Case

Metric

Now there's another addition to the famous Starrett-Webber line of precision gage blocks. Ceramic, offered in rectangular, inch and metric, fills the gap between steel and the universally accepted croblox®. While not as stable as croblox®, ceramic is an excellent alternative to steel because of its superior hardness, thermal expansion and wear characteristics.



Set No. RY 88.MA1.

Accuracy Grade*	Measuring Range	Blocks Per Set	Blocks Included In Sets	Catalog No.
B89.1.9 0	3.0 Through 450 in .001mm Steps	45	9 blocks 1.001mm Through 1.009mm (Steps of .001mm)	RY 45.MA1
B89.1.9 00	2.0 Through 450 in .01mm Steps		9 blocks 1.01mm Through 1.09mm (Steps of .01mm)	RY 45.MAA
B89.1.9 00	1.0 Through 450 in .1mm Steps		9 blocks 1.1mm Through 1.9mm (Steps of .1mm)	
B89.1.9 0	3.0 Through 450 in .0005mm Steps	88	9 blocks 1mm Through 9mm (Steps of 1mm)	RY 88.MA1
B89.1.9 00	2.0 Through 450 in .001mm Steps		9 blocks 10mm Through 90mm (Steps of 10mm)	
B89.1.9 00	1.0 Through 450 in .01mm Steps		1 block .5mm	
B89.1.9 00	1.0 Through 450 in .1mm Steps		1 block 1.0005mm	
			9 blocks 1.001mm Through 1.009mm (Steps of .001mm)	RY 88.MAA
			49 blocks 1.01mm Through 1.49mm (Steps of .01mm)	
			18 blocks 1mm Through 9.5mm (Steps of .5mm)	
			10 blocks 10mm Through 100mm (Steps of 10mm)	

NOTE: Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

*For complete accuracy specifications, see page at the beginning of this section.



Rectangular Steel – Metric System Gage Block Sets in Case

Metric

One Millimeter Base

B89.1.9 Accuracy Grade 0*

Measuring Range	Blocks Per Set	Blocks Included in Sets	Catalog No.
1.0 Through 61.0 in 1.0mm Steps 2.0 Through 61.0 in .5mm Steps 4.0 Through 61.0 in .25mm Steps	9	3 blocks 1.0mm, 2.0mm, 2.25mm 4 blocks 2.5mm, 3.0mm, 5.0mm, 10.0mm 2 blocks 15.0mm, 25.0mm	RS 9.MA1 MINI-METRIC
3.0 Through 450 in .001mm Steps 2.0 Through 450 in .01mm Steps 1.0 Through 450 in .1mm Steps	45	9 blocks 1.001mm Through 1.009mm (Steps of .001mm) 9 blocks 1.01mm Through 1.09mm (Steps of .01mm) 9 blocks 1.1mm Through 1.9mm (Steps of .1mm) 9 blocks 1mm Through 9mm (Steps of 1mm) 9 blocks 10mm Through 90mm (Steps of 10mm)	RS 45.MA1
3.0 Through 450 in .0005mm Steps 2.0 Through 450 in .001mm Steps 1.0 Through 450 in .01mm Steps 1.0 Through 450 in .1mm Steps	88	1 block .5mm 1 block 1.0005mm 9 blocks 1.001mm Through 1.009mm (Steps of .001mm) 49 blocks 1.01mm Through 1.49mm (Steps of .01mm) 18 blocks 1mm Through 9.5mm (Steps of .5mm) 10 blocks 10mm Through 100mm (Steps of 10mm)	RS 88.MA1
3.0 Through 250 in .0005mm Steps 2.0 Through 250 in .001mm Steps 1.0 Through 250 in .01mm Steps 1.0 Through 250 in .1mm Steps	112	1 block .5mm 1 block 1.0005mm 9 blocks 1.001mm Through 1.009mm (Steps of .001mm) 49 blocks 1.01mm Through 1.49mm (Steps of .01mm) 48 blocks 1mm Through 24.5mm (Steps of .5mm) 4 blocks 25mm Through 100mm (Steps of 25mm)	RS 112.MA1

Micrometer Checking Set

B89.1.9 Accuracy Grade AS1*

	10	10 blocks 2.5mm, 5.1mm, 7.7mm, 10.3mm, 12.9mm 15.0 mm, 17.6mm, 20.2mm, 22.8mm, 25.0mm	RS 10.MA
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NOTES: No. AC 11.MA Metric Accessory Set in Case, metric croblock® Wear Blocks in sets, etched serial numbers, and Certificate of Calibration are all available at extra cost.
See rectangular metric block accessories on the next page.

* For complete accuracy specifications, see page at the beginning of this section.

Rectangular Gage Block Accessories Steel and croblox® – Metric System

Metric 



No. AC 11.MA.

Rectangular Steel and croblox® Accessories Individually or Sets as stated below

Individual Accessories			No. of Steel Accessories Included
Description	Catalog No.		Set No. AC 11.MA
	Steel	croblox®	
Half-Round Jaw** 5mm Radius	RA 101.		2
Straight Jaw** 5mm Thick	RA 104.	RA 204.	2*
Clamps 0-38mm Capacity	RA 5.		1
38-100mm Capacity	RA 6.		1
100-165mm Capacity	RA 7.		1
0-300mm Capacity	RA 8.		1
Scriber Point	RA 11.		1
Center Point, 2mm C/L	RA 112.		1
Base Block, 25mm Thick	RA 113.		1
Case (CS 9111.)			1

Rectangular croblox® Wear Blocks

Size	Catalog No.
1.0mm	RCM 1.0 WA1
2.0mm	RCM 2.0 WA1

Additional Accessories

Clamps 0-450mm Capacity	RA 9.		
0-600mm Capacity	RA 10.		
0-900mm Capacity	RA 14.		


* croblox® jaws available as an option at extra cost. Please specify.

**Jaws are normally used in pairs, but are ordered individually. Please order accordingly.



Square Combination croblox® and Steel – Metric System Gage Block Sets in Case

An ideal combination of value, price and convenience, these sets include a popular selection of croblox® and steel as listed.

Two Millimeter Base		B89.1.9 Accuracy Grade 0*	Metric 
Measuring Range	Blocks Per Set	Blocks** Included in Sets	Catalog No.
6.0 Through 450 in .001mm Steps 4.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	45	9 Blocks 2.001 Through 2.009 (Steps of .001mm) 9 Blocks 2.01 Through 2.09 (Steps of .01mm) 9 Blocks 2.1 Through 2.9 (Steps of .1mm) 9 Blocks 1.0 Through 9.0 (Steps of 1.0mm) 9 Blocks 10 Through 90 (Steps of 10mm)	S2C 45.MA1
6.0 Through 450 in .001mm Steps 4.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	45	Same as Above Plus the Following Accessories: 1 pair SA 102. 6 mm Radius Jaws 1 each SA 4. Scriber Point 2 each SA 7. Knurled Screws 2 each SA 8. Studs 2 each SA 9. Flat Head Screws (long) 2 each SA 10. Flat Head Screws (short) 2 each SA 11. Slotted Nuts 1 each SA 12. 19mm Tie Rod 1 each SA 13. 38mm Tie Rod 1 each SA 14. 57mm Tie Rod 1 each SA 15. 76mm Tie Rod 1 each SA 16. 114-152mm Tie Rod (adjustable)	S2C 45.MA1X
6.0 Through 450 in .0005mm Steps 4.0 Through 450 in .001mm Steps 2.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	88	1 Block .5mm 1 Block 2.0005mm 9 Blocks 2.001 Through 2.009 (Steps of .001mm) 49 Blocks 2.01 Through 2.49 (Steps of .01mm) 18 Blocks 1.0 Through 9.5 (Steps of .5mm) 10 Blocks 10 Through 100 (Steps of 10mm)	S2C 88.MA1
6.0 Through 250 in .0005mm Steps 4.0 Through 250 in .001mm Steps 2.0 Through 250 in .01mm Steps 2.0 Through 250 in .1mm Steps	112	1 Block .5mm 1 Block 2.0005mm 9 Blocks 2.001 Through 2.009 (Steps of .001mm) 49 Blocks 2.01 Through 2.49 (Steps of .01mm) 48 Blocks 1.0 Through 24.5 (Steps of .5mm) 4 Blocks 25 Through 100 (Steps of 25mm)	S2C 112.MA1

****NOTE:** All blocks are croblox®, except sizes below 1.5mm and above 10mm, which are steel.

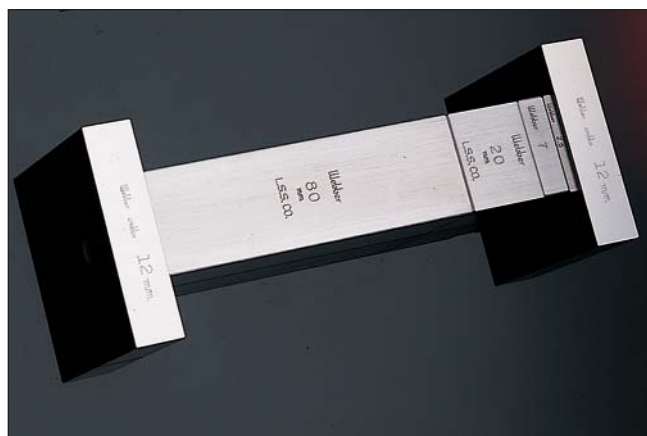
NOTE: Metric croblox® Wear Blocks are available as option. Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

*For complete accuracy specifications, see page at the beginning of this section.

Internal Measuring Machine Jaws croblox® No. SA 712. Steel No. SA 711.

Double ended, self proving- assures parallelism and squareness. Designed for use with square style gage blocks, jaws are made of long-wearing croblox® or steel 50.8mm long, 25.4mm wide and 12mm thick. Both side edges are lapped 90° square to the gaging faces within 30 seconds of arc and extend beyond the gage blocks in the combination, thus forming a square master.

Jaw and gage combination parallelism is checked merely by turning the combination to the opposite side and rechecking the reading. Furnished in pairs.



Square Steel – Metric System Gage Block Sets in Case

Metric 
Two Millimeter Base
B89.1.9 Accuracy Grade 0

Measuring Range	Blocks Per Set	Blocks Included in Sets	Catalog No.
6.0 Through 450 in .001mm Steps 4.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	45	9 Blocks 2.001mm Through 2.009mm (Steps of .00mm) 9 Blocks 2.01mm Through 2.09mm (Steps of .01mm) 9 Blocks 2.1mm Through 2.9mm (Steps of .1mm) 9 Blocks 1.0mm Through 9mm (Steps of 1.0mm) 9 Blocks 10mm Through 90mm (Steps of 10mm)	S2S 45.MA1
6.0 Through 450 in .001mm Steps 4.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	45	Same as Above Plus the Following Accessories: 1 Pair SA 102. 6mm Radius Jaws 1 Each SA 4. Scriber Point 2 Each SA 7. Knurled Screws 2 Each SA 8. Studs 2 Each SA 9. Flat Head Screws (Long) 2 Each SA 10. Flat Head Screws (Short) 2 Each SA 11. Slotted Nuts 1 Each SA 12. 19mm Tie Rod 1 Each SA 13. 38mm Tie Rod 1 Each SA 14. 57mm Tie Rod 1 Each SA 15. 76mm Tie Rod 1 Each SA 16. 114-152mm Tie Rod (adjustable)	S2S 45.MA1X
6.0 Through 450 in .0005mm Steps 4.0 Through 450 in .001mm Steps 2.0 Through 450 in .01mm Steps 2.0 Through 450 in .1mm Steps	88	1 Block .5mm 1 Block 2.0005mm 9 Blocks 2.001mm Through 2.009mm (Steps of .001mm) 49 Blocks 2.01mm Through 2.49mm (Steps of .01mm) 18 Blocks 1.0mm Through 9.5mm (Steps of .5mm) 10 Blocks 10mm Through 100mm (Steps of 10mm)	S2S 88.MA1
6.0 Through 250 in .0005mm Steps 4.0 Through 250 in .001mm Steps 2.0 Through 250 in .01mm Steps 2.0 Through 250 in .1mm Steps	112	1 Block .5mm 1 Block 2.0005mm 9 Blocks 2.001mm Through 2.009mm (Steps of .001mm) 49 Blocks 2.01mm Through 2.49mm (Steps of .01mm) 48 Blocks 1.0mm Through 24.5mm (Steps of .5mm) 4 Blocks 25mm Through 100mm (Steps of 25mm)	S2S 112.MA1
125mm to 2100mm	8	8 Blocks, 125mm, 150mm, 175mm, 200mm, 250mm, 300mm, 400mm, 500mm Accessories Included: 6 Each SA 8. Studs 2 Each SA 9. Flat Head Screws (long) 2 Each SA 10. Flat Head Screws (short) 1 Each SA 16. 114-152mm Tie Rod (adjustable) 1 Each SA 17. 152-228mm Tie Rod (adjustable) 1 Each SA 18. 298mm Tie Rod 1 Each SA 19. 400mm Tie Rod 2 Each SA 20. 502mm Tie Rods	SS 8.MA1X

B89.1.9 Accuracy Grade 00*

125mm to 2100mm	8	Same as Above SS 8.MA1X	SS 8.MAAX
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NOTE: Sets include etched serial numbers and Commercial Grade Calibration Certificate. A Master Grade Calibration Certificate is available at extra cost.

* For complete accuracy specifications, see page at the beginning of this section.



Square Steel or croblox® – Metric System
Gage Block Accessories

Metric 



Square Steel and croblox® Accessories
Individually or Sets as stated below

No. SA 25.MA.

Individual Accessories			No. of Steel Accessories Included	
Description	Catalog No.		Set No. SA 25.MA	45 Block Set when ordered with Accessories
	Steel	croblox®		
Half-Round Jaw** 3mm Radius 6mm Radius	SA 101. SA 102.		2 2	2
Straight Jaw** 12mm Thick	SA 103.	SA 203.	2*	
Scriber Point	SA 4.		1	1
Center Point 2mm C/L	SA 105.		1	
Base Block 12mm Thick	SA 106.		1	
Knurled Screw	SA 7.		2	2
Stud	SA 8.		2	2
Flat Head Screw				
Long	SA 9.		2	2
Short	SA 10.		2	2
Slotted Nut	SA 11.		2	2
Tie Rods				
19mm Solid	SA 12.		1	1
38mm Solid	SA 13.		1	1
57mm Solid	SA 14.		1	1
76mm Solid	SA 15.		1	1
114-152mm Adjustable	SA 16.		1	1
152-228mm Adjustable	SA 17.		1	
Case (CS 9168.)			1	

Square croblox® Wear Blocks

Size	Catalog No.
2.0mm with 1 Side Countersunk	SCM 2.0 WA1

* croblox® jaws available as an option at extra cost. Please specify.

**Jaws are normally used in pairs, but are ordered individually. Please order accordingly.

NOTE: Set No. SS 8.MA1X and SS 8.MAAX furnished with 6 studs, 2 short screws, 2 long screws, one each 114mm, 152mm, 298mm, 400mm tie rods and two 502mm tie rods.

Additional Accessories

Tie Rods				
298mm	SA 18.			
400mm	SA 19.			
502mm	SA 20.			

Individual Rectangular and Square Gage Blocks - Metric System

croblox®, ceramic and steel

Rectangular

Size/Millimeters	Grade	croblox®		Ceramic		Steel
		AA	A1	AA	A1	A1
		00	0	00	0	0
0.3, 0.4*		•	•			•
0.5**		•	•	•	•	•
0.6 Through 0.9 in .1mm Steps*		•	•			•
1.0 or 1.0005		•	•	•	•	•
1.0 Wear Blocks			•			
1.001 Through 1.009 in Steps of .001		•	•	•	•	•
1.01 Through 1.14 in Steps of .01		•	•	•	•	•
1.15 Through 1.49 in Steps of .01		•	•	•	•	•
1.5 Through 1.9 in Steps of .1		•	•	•	•	•
2.0		•	•	•	•	•
2.0 Wear Blocks			•			
2.5		•	•	•	•	•
3.0 Through 4.5 in Steps of .5		•	•	•	•	•
5.0 Through 6.5 in Steps of .5		•	•	•	•	•
7.0 Through 10.0 in Steps of .5		•	•	•	•	•
10.5 Through 14.5 in Steps of .5		•	•			•
15.0		•	•	•	•	•
15.5 Through 19.5 in Steps of .5		•	•			•
20.0		•	•	•	•	•
20.5 Through 24.5 in Steps of .5		•	•			•
25.0 and 30.0		•	•	•	•	•
40.0		•	•	•	•	•
50.0		•	•	•	•	•
60.0		•	•	•	•	•
70.0		•	•	•	•	•
75.0 and 80.0		•	•	•	•	•
90.0		•	•	•	•	•
100.0		•	•	•	•	•

Rectangular Block Sizes

- Width: ♦ All blocks are 9mm wide
- Lengths: ♦ For blocks 10mm thick and under, length is 30mm
- ♦ For blocks 10.5mm thick and above, length is 35mm
- Exceptions: *Blocks are 28.3mm long
- **When ordering the 0.5mm block, specify length (28.3 or 30mm)

Square

Sizes/Millimeters	Grade	croblox®	Steel
		A1	A1
		0	0
0.5 mm Only			•
1.0			•
1.5		•	•
2.0 Wear Blocks with 1 Side Countersunk		•	
2.0 or 2.0005		•	•
2.001 Through 2.009 in .001mm Steps		•	•
2.01 Through 2.49 in .01mm Steps		•	•
2.5 Through 2.9 in .1mm Steps		•	•
3.0 Through 10.0 in .5mm Steps		•	•
10.5 Through 14.5 in .5mm Steps			•
15mm		•	•
15.5 Through 19.5 in .5mm Steps			•
20.0mm Only		•	•
20.5 Through 24.5 in .5mm Steps			•
25.0		•	•
30.0		•	•
40.0			•
50.0		•	•
60.0			•
70.0			•
75.0			•
80.0			•
90.0			•
100.0		•	•

Steel Only

	Grade	00	0
125.0		•	•
150.0		•	•
175.0		•	•
200.0		•	•
250.0		•	•
300.0		•	•
400.0		•	•
500.0		•	•

Square Block Size

- ♦ All blocks are 24.1mm x 24.1mm
- ♦ Blocks have a 6.7mm hole in the center
- ♦ On blocks 5.0mm thick and over, the hole is countersunk on both faces. (croblox® Wear Blocks are countersunk on one face only)

How To Order

- ♦ Specify in this sequence: shape, material, "M" for Metric, size, accuracy grade
- Key:**
- | | | | | |
|-----------------|-----------------|---------------|-------------------|-----------------|
| Shape | Material | Metric | Size | Accuracy |
| R = Rectangular | S = Steel | M | (listed in table) | |
| S = Square | C = croblox® | | | |
| | Y = Ceramic | | | |
- ♦ Example: RSM 2.0. A1 = Rectangular Steel block, Metric size 2.0, Grade A1 Accuracy



Standard Reference Bars

Inch

12", 19", 25", 37", 49"

Millimeter

300, 500, 650, 950, 1250mm

These Standard Reference Bars are invaluable for use in checking table movement of machine tools, accuracy of vernier height gages, surface plate transfer measurement, and for final inspection of precision machine tools and coordinate measuring machines.

The "channel design" places additional measuring pads at appropriate points over the length of the bar as reference points for x, y or z axis measurements. Channel design permits use of the bar on its base (vertical) or on its back or either side (horizontal). The alternating gage block jaws and spacer blocks are permanently wrung and fastened together to form 1" increments for inch bars and 25mm increments for metric bars.

A special bushing arrangement allows the master stack to conform to thermal conditions prevailing during use, thus providing a true master even under less than perfect laboratory conditions. Mating surfaces are treated during assembly to prevent corrosion.

Non-standard lengths and measuring increments are available on special order. A Certificate of Calibration is included. All models are furnished with storage case.

Height Gages

Starrett/Webber-built height gages and accessories are described elsewhere in this catalog, as noted.



**Left: DIGI-CHEK
Height Gage –
see Page 127.**

**Right:
DIGI-CHEK II –
see Page 126.**



Standard Sizes are 12", 19", 25", 37" and 49" in the inch system and 300mm, 500mm, 650mm, 950mm and 1250mm in the millimeter system.

Specifications

Description	Inch System	Millimeter System
Tolerance (Stack) Maximum: Minimum:	expressed in μ in. $2.5L + 10$ L in inches $- 10$	expressed in μ m $.0025L + .25$ L in millimeters $- .25$
Parallelism: Gage surfaces to Base and Each Other	15 μ in.	0.4 μ m
Uncertainty of Calibration	$10 + 2.0L$ L in inches expressed in μ in.	$25 + .002L$ L in millimeters expressed in μ m.

Note: The accuracy of the surface that supports the gage must be taken into account when determining the accuracy of any measurements

With Channel Design

Inch System			Millimeter System		
Size	Catalog No.	EDP No.	Size	Catalog No.	EDP No.
12"	RBC 12.	92626	300mm	RBCM 300.	93642
19"	RBC 19.	92627	500mm	RBCM 500.	92617
25"	RBC 25.	92628	650mm	RBCM 650.	93053
37"	RBC 37.	92629	950mm	RBCM 950.	92619
49"	RBC 49.	92630	1250mm	RBCM 1250.	92620

Free Standing Stack Without Channel Design – Vertical Position Only

Inch System			Millimeter System		
Size	Catalog No.	EDP No.	Size	Catalog No.	EDP No.
8"	RB 8.	92616	200mm	RBM 200.	93261
10"	RB 10.	92623	250mm	RBM 250.	93262
12"	RB 12.	92624	300mm	RBM 300.	93263
18"	RB 18.	92625	450mm	RBM 450.	93264



**Left: DIGI-CHEK
Reverse Reading
Blocks and Right:
DIGI-CHEK Riser
Blocks –
see Page 129.**



Angle Gage Block Sets

Webber Angle Gage Blocks permit fast, simple and accurate measurements of any angle. They are far superior to sine bar measuring methods, that involve trigonometric formulae and complex stacks of gage blocks.

Angle gage blocks come in three accuracies, croblox® Reference Angle Blocks with a 1-second accuracy, steel Calibration Grade Angle Blocks with 2-second accuracy, and steel Working Grade Angle Blocks with 5-second accuracy. Each grade can be purchased in sets that will measure in steps of one-second, one-minute or one-degree to suit any need. (See angle block specification information on next two pages.)

◆ Reference Angle Blocks

croblox®: 1-second accuracy

Designed for optical or as reference standards for autocollimators, spectrometers, etc. They are unsurpassed for use in aerospace, optical and precision instrument fields.

◆ Calibration Angle Blocks

Steel: 2-second accuracy

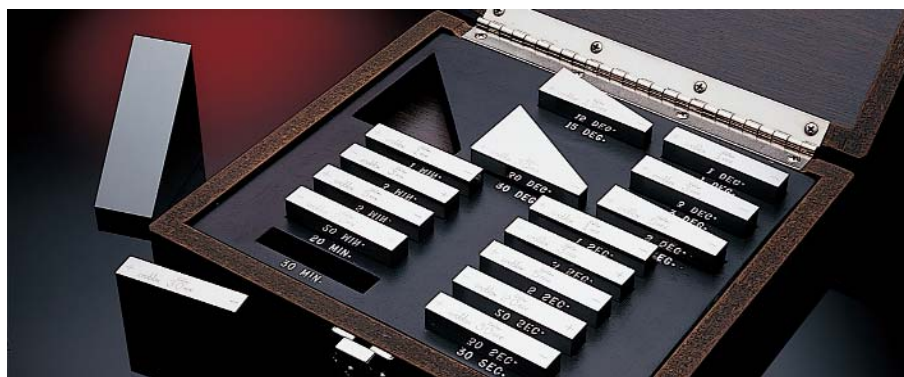
The same high quality as the Reference Grade Angle Blocks

◆ Working Angle Blocks

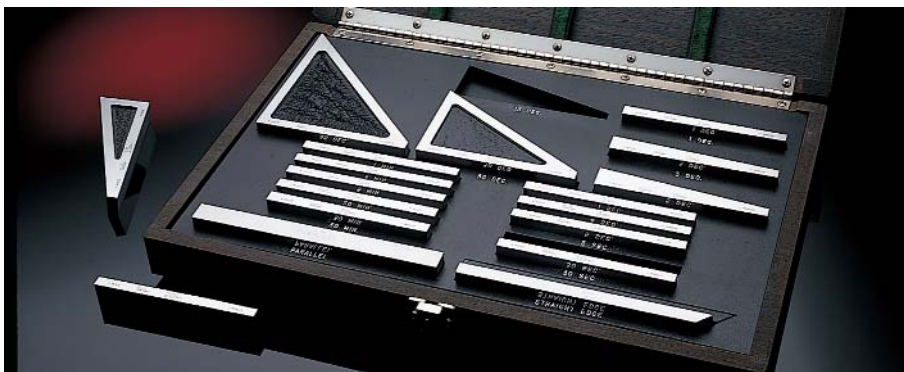
Steel: 5-second accuracy

These angles are designed for shop or tool room. The longer gaging surfaces are made for use with an indicator. These blocks reduce set-up time and minimize error in grinding both simple and compound angles

Note: The catalog numbers and specifications of our angle gage blocks have been changed in response to updated requirements concerning the application of the uncertainty of measurement. See the next two pages for information regarding the specifications of our angle blocks.



Above: No. AG 16.R Below: No. AG 18.W.



Catalog No.	Description/ Accuracy Grade	Blocks Per Set	Measuring Range	Blocks Included In Sets
AG 6.R	Reference Grade ±1.0 Second	6	0-99° in 1° Steps	6 Blocks, 1°, 3°, 5°, 15°, 30°, 45°
AG 6.C	Calibration Grade ±2.0 Seconds			
AG 8.W	Working Grade ±5.0 Seconds			
AG 11.R	Reference Grade ±1.0 Second	11	0-99° in 1' Steps	6 Blocks, 1°, 3°, 5°, 15°, 30°, 45° 5 Blocks, 1', 3', 5', 20', 30'
AG 11.C	Calibration Grade ±2.0 Seconds			
AG 13.W	Working Grade ±5.0 Seconds			
AG 16.R	Reference Grade ±1.0 Second	16	0-99° in 1" Steps	6 Blocks, 1°, 3°, 5°, 15°, 30°, 45° 5 Blocks, 1', 3', 5', 20', 30" 5 Blocks, 1", 3", 5", 20", 30"
AG 16.C	Calibration Grade ±2.0 Seconds			
AG 18.W	Toolroom ±5.0 Seconds			

NOTE: One 6" (150mm) parallel and one 6" (150mm) knife edge are included with Working Grade Sets.

To order individually, specify in the following key sequence:

Key:	AngleGage	Numeric Size	Angle Units	Accuracy Grade
	Prefix	of Angle	(Degree, Min., Sec.)	R, C, or W
	AG	45	D	R

Example: AG 45.DR = a Reference Grade 45° Angle Block

All sets furnished in case. Cases also available separately. Order as follows: The Calibration Set and the Reference Case No. is CS 9135. The Working Case No. is CS 9134.



Angle Gage Block Specifications

Accuracy In Microinches (Microns)

Material	Reference Grade croblox®	Calibration Grade Steel	Working Grade Steel
Tolerances: Deviation From Nominal	±1.0 second	±2.0 second	±5.0 second
Flatness of Gaging Surfaces	6µin. (0.15µm)	8µin. (0.20µm)	14µin. (0.35µm)**
Flatness & Parallelism of Sides	8µin. (0.20µm)	8µin. (0.20µm)	16µin.* (0.40µm)**
Squareness of Sides to Gaging Surfaces	6 seconds	8 seconds	12 seconds
Area of Gaging Surfaces†	1" x 2" (25 x 50mm)	1" x 2" (25 x 50mm)	5/8" x 4" (16 x 100mm)
Surface Finish (Gage Surfaces Only)	0.4µin. AA (.01µm AA)	0.6µin. AA (.015µm AA)	1.0µin. AA (.025µm AA)
Estimated Uncertainty of Measurement (k=2)	0.6 seconds	1.0 seconds	3.5 seconds

Flatness tolerances exclude 1.5mm from the edges on all angle blocks except where marked with **. Then 3mm from the edge is excluded.

† Dimension of gaging surfaces in millimeters is approximate.

Using Angle Gage Blocks Superior to Sine Bar Methods

A precision angle has always been difficult to set because of the involved trigonometric formula that is used with the sine bar.

The main difficulty lies in the dimension X in diagram which often results in a figure with many decimal places. Gage blocks can only approximate this value. For example, to measure 44°30' using a 5" sine bar the following steps are required:

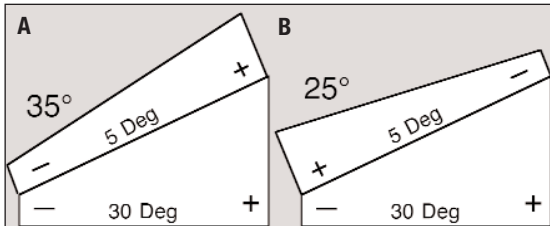
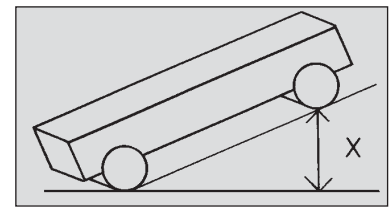
Sine for 44°30' angle	.7009093
For dimension X multiply by 5	3.5045465
Gage Blocks necessary	.1005
to match this dimension	.104
	.300
	3.000
	3.5045

3.5045465 - 3.5045 = Residual error .0000465

With angle gage blocks, you take a 45° block from the set, wring on a 30' block so

This error cannot be eliminated in sine bar procedure.

that the plus end of 45° block contacts the minus end of 30' block, and you have an angle of 44°30'. It is not only easy to accomplish, it is absolutely accurate.

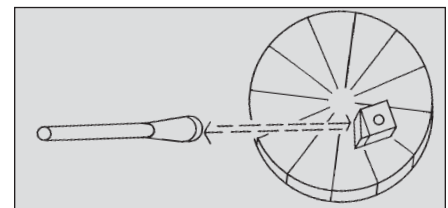


Ease and Versatility

A set consisting of only 16 blocks will measure 356,400 angles in steps of one second, to an accuracy of 1/5,000,000th of a circle! These micro-accurate blocks can be used in either plus or minus positions. In "A", right, example, take the 30° angle and add the 5° angle to obtain a measurement of 35° (making sure that both plus ends are together). In "B" use the same two blocks but wring them together so that the minus end of the 5° block is over the plus end of the 30° block. This will subtract 5° from 30°, thus giving your 25° measurement.

Indexing a Large Rotary Table

A Webber Angle Block or True Square is positioned on the work and a beam of light from an autocollimator is directed against the gaging surface. This becomes 0°, or the reference surface. Other angle blocks are then added in proper combination to measure each succeeding angle. The table is rotated and inspected at each position with reference to the light beam. This method indexes large workplaces quickly, with accuracy measured in fractional seconds.



Inspecting a Simple Angle

The photo below shows a workpiece on which an angle of 30° is required. The workpiece is resting on a parallel* which is wring on angle blocks forming 30°. The entire set-up is lined up vertically with an angle plate and then indicated across the top of the work to determine the correctness of the angle.

*Parallels are not necessary, but they are convenient because of their longer reference surface.



Setting a Revolving Magnetic Chuck

A chuck is set for a 38° angle. Three blocks, +30°, +5° and +3°, are assembled and mounted with the parallel*. The indicator quickly tells if the setting is accurate. Adjustment is a matter of seconds. A revolving chuck teams up perfectly with angle blocks to make possible several applications in tool grinding that are more difficult with other methods.

True Squares

True squares are designed for fast, precision indexing with angle gage blocks.

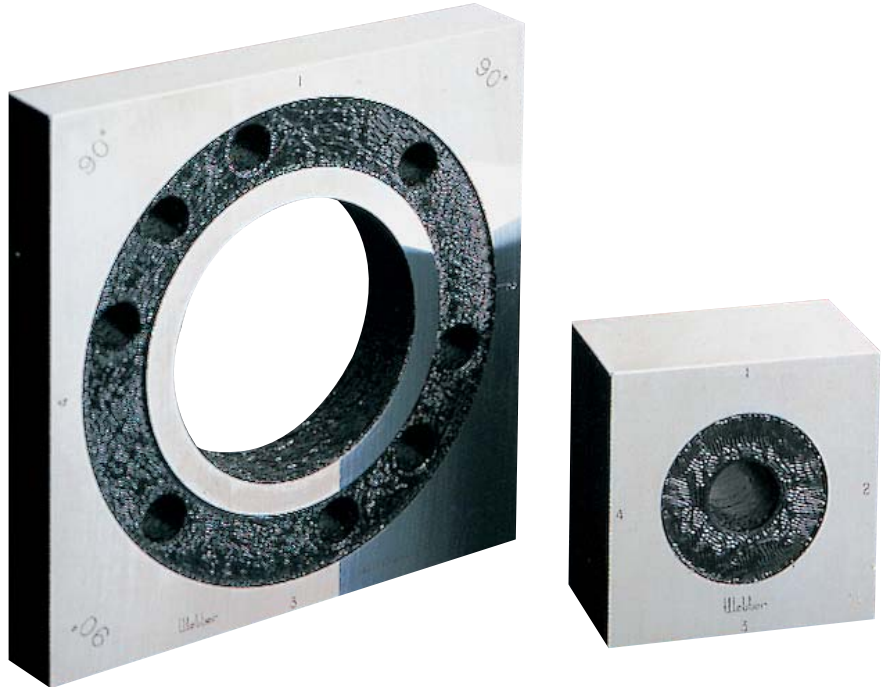
All faces of Webber True Squares are at precisely 90° to adjacent sides, with perfect optical flatness and parallelism to permit use with autocollimators.

Applications for fast precision indexing and setting of angular grinding fixtures are almost unlimited. For example: the work and the true square are mounted together on a revolving fixture. A notch is ground by two successive cuts, one at 90° with the true square, and the other at 2° with the addition of two angle blocks (+3° and -1°) mounted on square. An indicator reading is taken before each grind. This process is then repeated by turning the True Square to successive zero readings.

True Squares are designed for use as an accessory to our angle gage blocks to easily make angles greater than 45° and through 180°.

Webber True Squares also permit a fast, easy check of indexing tables. The gaging faces are at precise 90° angles with optical flatness and finishes that permit the use of autocollimators.

NOTE: The catalog numbers and specifications of our true squares have been changed in response to updated requirements concerning the application of the uncertainty of measurement.



True Square Specifications

Catalog No.	TS 21.R	TS 21.C	TS 44.W	TS 66.W
Grade	Reference	Calibration	Working	Working
Material	croblox®	Steel	Steel	Steel
Tolerances: Deviation From Nominal	±1.0 second	±2.0 second	±5.0 second	±5.0 second
Flatness of Gaging Surfaces	6µin. (0.15µm)	8µin. (0.20µm)	14µin. (0.35µm)**	14µin. (0.35µm)**
Flatness & Parallelism of Sides	8µin. (0.20µm)	8µin. (0.20µm)	16µin. (0.40µm)**	16µin. (0.40µm)* *
Squareness of Sides to Gaging Surfaces	6 seconds	8 seconds	12 seconds	12 seconds
Area of Gaging Surfaces†	1" x 2" (25 x 50mm)	1" x 2" (25 x 50mm)	5/8" x 4" (16 x 100mm)	5/8" x 6" (16 x 150mm)
Surface Finish (Gage Surfaces Only)	0.4µin. AA (0.1µm AA)	0.6µin. AA (.015µm AA)	1.0µin. AA (.025µm AA)	1.0µin. AA (.025µm AA)
Estimated Uncertainty of Measurement (K=2)	0.6 seconds	1.0 seconds	3.5 seconds	4.0 seconds

Flatness tolerances exclude 1.5mm from the edges on all angle blocks except where marked with **. Then, 3mm from the edge is excluded.

† Dimension of gaging surfaces in millimeters is approximate.

True Squares

True squares are designed for fast, precision indexing with angle gage blocks.

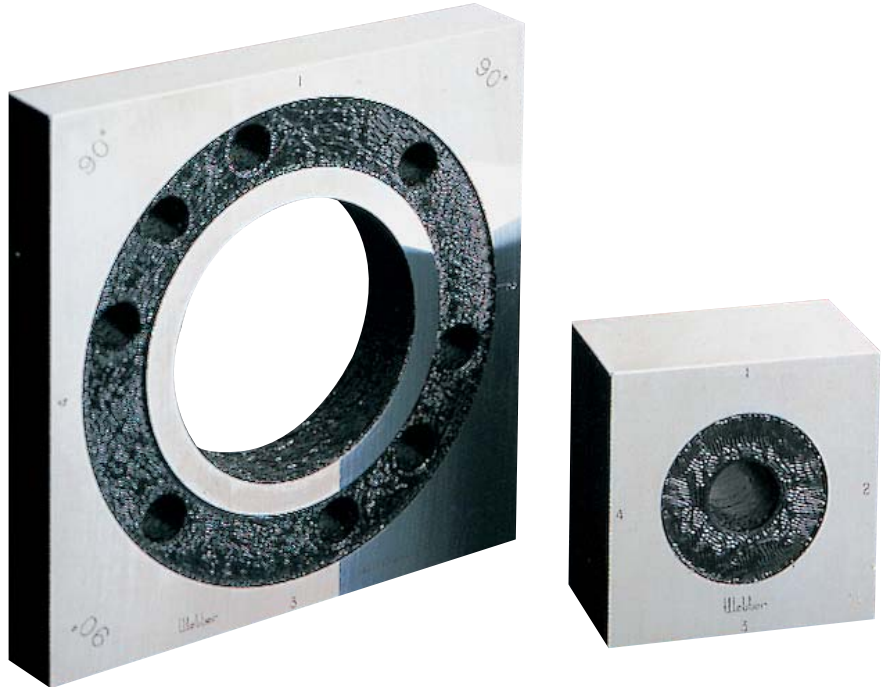
All faces of Webber True Squares are at precisely 90° to adjacent sides, with perfect optical flatness and parallelism to permit use with autocollimators.

Applications for fast precision indexing and setting of angular grinding fixtures are almost unlimited. For example: the work and the true square are mounted together on a revolving fixture. A notch is ground by two successive cuts, one at 90° with the true square, and the other at 2° with the addition of two angle blocks (+3° and -1°) mounted on square. An indicator reading is taken before each grind. This process is then repeated by turning the True Square to successive zero readings.

True Squares are designed for use as an accessory to our angle gage blocks to easily make angles greater than 45° and through 180°.

Webber True Squares also permit a fast, easy check of indexing tables. The gaging faces are at precise 90° angles with optical flatness and finishes that permit the use of autocollimators.

NOTE: The catalog numbers and specifications of our true squares have been changed in response to updated requirements concerning the application of the uncertainty of measurement.



True Square Specifications

Catalog No.	TS 21.R	TS 21.C	TS 44.W	TS 66.W
Grade	Reference	Calibration	Working	Working
Material	croblox®	Steel	Steel	Steel
Tolerances: Deviation From Nominal	±1.0 second	±2.0 second	±5.0 second	±5.0 second
Flatness of Gaging Surfaces	6µin. (0.15µm)	8µin. (0.20µm)	14µin. (0.35µm)**	14µin. (0.35µm)**
Flatness & Parallelism of Sides	8µin. (0.20µm)	8µin. (0.20µm)	16µin. (0.40µm)**	16µin. (0.40µm)* *
Squareness of Sides to Gaging Surfaces	6 seconds	8 seconds	12 seconds	12 seconds
Area of Gaging Surfaces†	1" x 2" (25 x 50mm)	1" x 2" (25 x 50mm)	5/8" x 4" (16 x 100mm)	5/8" x 6" (16 x 150mm)
Surface Finish (Gage Surfaces Only)	0.4µin. AA (0.1µm AA)	0.6µin. AA (.015µm AA)	1.0µin. AA (.025µm AA)	1.0µin. AA (.025µm AA)
Estimated Uncertainty of Measurement (K=2)	0.6 seconds	1.0 seconds	3.5 seconds	4.0 seconds

Flatness tolerances exclude 1.5mm from the edges on all angle blocks except where marked with **. Then, 3mm from the edge is excluded.

† Dimension of gaging surfaces in millimeters is approximate.



Optical Polygons

Webber Optical Polygons provide an easy, accurate method of checking and calibrating angles. They are designed for use with autocollimators in measuring angle spacing.

The exclusive one-piece design provides compact, fixed master for precise angle spacing. Target faces are highly reflective and optically flat.

Chrome carbide polygons provide a hardness of Rockwell 71-73 C and a corrosion resistance 10-20 times that of 18-8 stainless steel, resulting in lifetime accuracy.

Maintenance problems are virtually eliminated due to their ruggedness and extreme stability.

To order polygons, specify number in the following key/sequence:

Optical Polygon OP

No./Faces

Decimal

Accuracy Grade

Example: OP 3.0 = A 3-sided optical polygon with a 0 Reference Accuracy

A 1" mounting hole, flanged bushing, lapped washer and hold-down bolt, furnished with each unit, permit mounting the polygon in any desired attitude. Available in two accuracy grades. Furnished in case. Certificate of Calibration included.



Specifications

No. of Sides	Angle Spacing Degrees	Diameter Across Corners	Height	Target		
				Size	Area	Area
		Inch (mm)	Inch (mm)	Inch (mm)	Sq. In.	Sq. Cm.
3	120	2.90" (73.6mm)	.880" (22.3mm)	75" x .75" (19 x 19mm)	.56	3.60
4	90					
5	72					
6	60					
8	45					
9	40					
10	36					
12	30					

Accuracy Grade	Target Area Flatness*	Accuracy of Calibration (Uncertainty)	Maximum Deviation of Faces from Nominal
			3-12
Reference 0	4 μ in. (.10 μ m)	± 1.0 sec.	± 1.0 sec.
Calibration 1			± 2.0 sec.

*Excludes .020" (0.5mm) from edges.

ALL SIZES: Flatness and parallelism – top and bottom – .00005"; maximum pyramidal error ± 15 seconds.

croblox® Reflecting Cubes

Stable and maintenance free, reflecting cubes are ideal for 90° indexing or alignment in optical tooling or inspection. Reflectivity: 55% in visible spectrum, 87-88% at 10.6 microns.

Starrett-Webber stocks semi-finished solid cube blanks in four standard sizes: 3/4" (19.0mm), 1" (25.4mm), 1 1/2" (38.1mm) and 2" (50.8mm). Also available as standard is a .950" (24mm) square with a 17/64" (6.7mm) countersunk center hole.



To order, specify the following information:

(1) The number and position of all finished sides, including the base:

NOTE: for fixturing purposes during manufacturing, the bottom face must be one of the finished sides. The bottom face is etched with the Webber logo, a serial number, and face identifications as applicable.

Example #1: 4 sides: Top, front, Left, and Base.

Example #2: 3 sides: Front, Right, an Base.

(2) Specify the manufacturing tolerances of the 90° angles, 1 second, 3 seconds, or other angular specification. **NOTE:** Our uncertainty of measurement is estimated to be ± 1.0 seconds. This uncertainty should be added to the manufacturing tolerance to give practical tolerance of the cube.

(3) Specify if a Certificate of calibration is needed, at extra cost.

NOTE: Other sized cubes up to 2-inches are available on special order. Through holes, etched reticules, or threaded holes into stainless steel inserts may also be specified at extra cost.



Gage Block Stones

If a block does not wring together with other blocks, it may be the result of nicks or other damage. Examine blocks carefully with a magnifying glass. If a small burr is found, it may be removed with a gage block stone.

Starrett-Webber stones, when used moderately, may be rubbed directly on the gaging surfaces without danger of decreasing the size of the gage block. Available in 3 styles/materials as listed.

GS 13 is recommended for use with steel gage blocks

SAO 13 is recommended for general use. Steel, ceramic, or carbide blocks

SAO 23 is recommended for use with carbide and ceramic gage blocks



For Block Material	Description	Catalog No.
Steel	Black Granite Stone, 1/4 x 1 x 3" (6.3 x 25 x 75mm)	GS 13.
Steel or Carbide	Sintered Aluminum Oxide, 5/16 x 1 x 3" (8 x 25 x 75mm)	SAO 13.
	Serrated Aluminum Oxide With Case, 1 x 2 x 3" (25 x 50 x 75mm)	SAO 23.

Chamois

These Starrett-Webber synthetic chamois cloths, rather than natural chamois, are recommended for wiping gage surfaces. They can be used with solvents and oils, including Starrett M-1® All-Purpose Lubricant, and are washable in detergents.

Description	Catalog No.
Dry	CH 1.
Lubricated	CH 2.





Accredited Gage Block Calibration Service

In accordance with: ISO 17025

ANSI/NCSL Z540-1

ISO 10012-1

former MIL-STD-45662A

Master Grade Calibration

The calibration procedure is regarded as a process to be controlled and monitored using SPC techniques. Information that would enable the analysis of control data is to be recorded and made available to the user upon request (at extra cost). A second master, sometimes referred to as a control block, is used in the calibration. The purpose of the second master is to generate known difference readings which can be plotted and analyzed. The average of the known differences of several readings of the two masters and the range of their differences can be analyzed using statistical techniques. The calibration process can be demonstrably controlled.

Our Reference Gage Blocks are calibrated directly by the National Institute of Standards and Technology. All other Reference Standards are periodically checked and calibrated either by NIST or NVLAP accredited laboratories. Documented histories are maintained. Statistical methods are used to control the master gages.

All necessary information required to confirm the calibration and calculations is captured. All raw data from the comparator, the temperature of the blocks, the temperature of the comparator, and the relative humidity of the surrounding environment is recorded for each measurement. Applied correction factors are to be broken down and recorded as well as the results of any calculations. The measurement uncertainty is individually computed for each size.

Reported measurement uncertainties based upon a 95% confidence level (two standard deviations) are dynamic, reflecting the current performance of the specific equipment and operator. Other factors included in the stated uncertainty are derived from a detailed error analysis. The error analysis is based upon experimentation whenever possible or industry consensus from estimates derived from NIST publications. Experimental checks of the stated uncertainty levels are made using laboratory comparison techniques involving both internal repeatability studies and external comparisons with other calibration laboratories.

The checks and balances under the Master Grade guidelines require considerably more time and effort than the Commercial Grade Calibrations. The entire process is under constant review and testing.

NOTICE: Webber Gage cannot recommend recalibration due dates on our calibration certificates or calibration stickers. Recalibration due dates must be provided to us at the time of order. If this information is not provided, the recalibration due date will be left blank for the user to add.

Commercial Grade Calibration

Calibrations are performed using the same program as our Master Grade calibrations except that the second master, the control block, is omitted. By omitting this control block some of the statistical tests are also omitted which results in larger uncertainty.

All necessary information to confirm the calibration is recorded. All raw data from the comparator, the temperature of the blocks, the temperature of the comparator, and the relative humidity of the surrounding environment is recorded for each measurement. Applied correction factors are broken down and are recorded, as well as the results of any calibrations.

Our Reference Gage Blocks are calibrated directly by the National Institute of Standards and Technology. All other reference standards are calibrated either by NIST or NVLAP accredited laboratories. Documented histories are maintained of our measuring and test equipment. Statistical methods are used to control our Master Gage Blocks.

Reported uncertainties are based on a 95% confidence level. Experimental checks of the uncertainty are made using laboratory comparison techniques involving repeatability studies and external comparisons with other calibration laboratories.

Approximate Best Uncertainty Values for blocks up through 4" (100mm) in length

Grade	Master Grade		Commercial Grade	
	Uncertainty	Minimum	Uncertainty	Minimum
Webber LM	0.65 + 0.7L .016 + .0007L	1.4 µin. .035 µm	not available	
B89.1.9 00	1.2 + 0.7L .03 + .0007L	1.7 µin. .045 µm	1.6 + 1.0L .04 + .001L	2.4 µin. .060 µm
B89.1.9 0	1.8 + 0.7L .045 + .0007L	2.0 µin. .050 µm	2.0 + 1.0L .05 + .001L	3.0 µin. .075 µm
B89.1.9 AS1	2.0 + 0.7L .05 + .0007L	2.0 µin. .050 µm	2.0 + 1.0L .05 + .001L	3.0 µin. .075 µm

NVLAP® accreditation does not constitute an endorsement of any product by NVLAP or any agency of the U.S. Government.



Gage Block Recalibration Service

Our calibration service catches worn gage blocks before trouble starts ... eliminating costly production inaccuracies. Be sure to have your gage blocks checked regularly.

Starrett-Webber Gage Division offers all gage block users a complete calibration service as insurance against production inaccuracies.

Any brand of used rectangular, square or heavy-duty gage blocks will be calibrated and the deviation from the marked size of each block will be shown on the Certificate of Calibration. All linear measurements are based on the new International Inch or Meter.

For obvious reasons, Starrett-Webber does not calibrate new gage blocks of other brands.

This gage block calibration service is done promptly, and blocks are ready to be returned to you within a few days after their receipt by Starrett-Webber.

1. After your gage block set arrives in the Starrett-Webber receiving room, it is given a receiving number and each block is cleaned to remove oil, grease and film. The case is also thoroughly cleaned.
2. Next, each block is lightly stoned to remove small nicks and burrs. This does not guarantee that the blocks will wring if they are heavily nicked, scratched, or burred.
3. Your gage blocks are then individually compared with master blocks which are accurate to fractions of one millionth of an International Inch. Starrett-Webber Grand Master Blocks are Starrett-Webber croblox® (solid chrome carbide) and therefore

are longer wearing and more stable than steel masters. Starrett-Webber Grand Master Gage Blocks are calibrated directly by the U.S. National Institute of Standards and Technology (NIST).

4. A computer automatically processes the Certificate of Calibration to insure complete accuracy in recording gage block size. This certificate shows the deviation from the marked size of each block and marks those sizes which need replacing.
5. A quotation is then prepared showing the costs of any recommended replacements in the original material and croblox®, if applicable.
6. If no replacements are required, or if you have issued instructions to only calibrate and return the set, the gages are packed and returned to you with a Certificate of Calibration showing the "as found" readings.
7. If you authorize the replacements, your Certificate of Calibration is marked to indicate which blocks were replaced and the date of replacement. However, if you wish, an "as found" and an "as left" certificate can be made at extra cost.

Calibration Service

When sending gage blocks to Starrett-Webber Gage Division for calibration, please specify whether we are to (A) calibrate, issue certificate and return only; (B) Calibrate, advise condition and hold for instructions; or (C) Calibrate, replace worn and missing blocks, and return. If order specifies that worn and missing blocks should be replaced, and the cost of replacement approaches that of a new set, we will inform you, quote prices and wait for instructions.

Shipping Damage is Costly and Inconvenient Please Protect Your Valuable Gage Blocks by Proper Packaging

Remember, gage block cases are made for immobile storage – not as shipping crates.

Follow these steps when preparing your gage blocks for shipment:

1. Gage blocks should be treated with rust preventative such as Starrett M-1® Lubricant.
2. Place waxpaper over the blocks.



Example of a set damaged in transit due to improper packaging.

3. If necessary, place Kimpak or similar cushioning inside lid to prevent jiggling of blocks in the inserts. Do not force lid closed.
4. Seal the closed case with nylon or fiberglass reinforced heavy tape. The clasp will not hold in shipping nor will paper tape.
5. Use a strong outer shipping container large enough to allow sufficient, firm cushioning material to withstand shock in transit.
6. Mark outer carton plainly, "**DELICATE INSTRUMENTS – FRAGILE**".

