PRECISION GRANITE PRODUCTS

Granite Surface Plates and Accessories

In 2006, The L.S. Starrett Company acquired Tru-Stone Technologies in Waite Park, MN. With this acquisition, a broad variety of new capabilities are now available to Starrett customers.

OEM Capabilities

Our Starrett Tru-Stone Granite Division continues to provide solutions to customers in precision granite, carbon fiber, ceramic, high precision vacuum chucks and other materials. We offer granite machine bases and surface plates to meet your requirements up to 55 feet long and weighing 72 tons.

Whether your application requires a simple standard surface plate or a large OEM assembly, the Starrett Tru-Stone Division will work with you to fulfill those requirements.

Every linear measurement depends on an accurate reference surface from which final dimensions are taken. Starrett Precision Granite Surface Plates provide this reference plane for work inspection and for work layout. Their high degree of flatness, overall quality and workmanship also make them ideal bases for mounting sophisticated mechanical, electronic and optical gaging systems.

Material

The granite for Starrett surface plates has been selected for the best balance of physical properties, maximum resistance to wear and for deflection under load. Each plate has been lapped to a fine microinch finish to minimize tool wear and drag.

The most important element in the performance and life of granite surface plates is the percentage of quartz that is present in the stone. Quartz is more than twice as resistant to wear as the other minerals in granite. It provides bearing points that are of a hard, highly polished, smooth character which protect the accuracy and finish of both the surface plate and the tools and instruments used on it.

Starrett Crystal Pink® Granite has the highest percentage of quartz of any granite. Higher quartz content means greater wear resistance. The longer a surface plate holds its accuracy, the less often it will require resurfacing, ultimately providing better value.

Selection

Accuracy Under Load

Starrett Crystal Pink® and Superior Black Granite plates have a thickness capable of supporting a total normal load equal to 50lb for each square foot (24kg for each 1,000 sq. cm) of surface area loaded in the center of the plate – without deflecting the plate along a diagonal of more than one-half the flatness tolerance. This is the accepted rating in the U.S. Federal Specification GGG-P-463c and ASME B89.3.7 2013.

In the situations where abnormal loading conditions are anticipated, Starrett can engineer and modify surface plate thickness to meet virtually any requirement.

Ledges and Clamping

Surface plates without work clamping ledges are recommended for sustained accuracy and reliability. Ledges are for work clamping purposes only. If excessive torque is used when applying clamps to ledges, it can adversely affect measurements taken near the plate edges. If clamping is important, T-slots and threaded metal inserts may be installed in the surface.

Accuracy

Specifications

Starrett Granite Surface Plates meet or exceed U.S. Federal Specification GGG-P-463c and ASME B89.3.7 2013.

Starrett Granite Surface Plate Calibration Services

- Calibration of granite surface plates, granite parallels (2 and 4-sided), granite straight edges, granite tri-squares, granite angle plates and granite squares
- Surface plate and granite metrology and accessory resurfacing
- Calibration Lab is accredited by A2LA to ISO/IEC 17025*

* The L.S. Starrett Company's accreditations are site-specific and tool-specific. The scope of accreditation is available upon request to each location.

Technical Information

Accuracy

Granite Surface Plates are manufactured in three grades of accuracy:

- **Grade AA – Laboratory Grade**
  This is typically specified for precision operations in constant temperature gaging rooms and metrology departments.
- **Grade A – Inspection Grade**
  This is typically specified for general work in quality control.
- **Grade B – Toolroom Grade**
  This is typically specified for production checking work throughout the shop.

Unilateral Flatness Tolerance

Overall flatness tolerance is based on unilateral measurement. All points on the work surface shall be contained between two parallel planes separated at a distance no greater than the amount specified for each particular grade and size as shown in our listings.

Repeat Reading Tolerance

Repeat reading tolerance is easily checked with a Repeat Reading Gage. This gage detects local areas, not overall flatness.

In addition to the overall flatness tolerance referred to above, Starrett provides repeat reading tolerances as follows:

Diagonal Inches (mm)	Full Indicator Movement (F.I.M.) in Microinches and (Microns)			Obtained
	Grade AA	Grade A	Grade B	
Through 30" (750)	35 (.9)	60 (1.5)	110 (2.8)	When Not Specified
Over 30-60" (750-1500)	45 (1.1)	70 (1.8)	120 (3)	
Over 60-90" (1500-2250)	60 (1.5)	80 (2)	160 (4)	
Over 90-120" (2250-3000)	75 (1.9)	100 (2.5)	200 (5)	
Over 120-150" (3000-3800)	90 (2.3)	120 (3)	240 (6)	
Over 150" (3800)	100 (2.5)	140 (3.6)	280 (7)	
All Sizes	25 (.6)	50 (1.3)	100 (2.5)	When Specified

A repeat reading gage detects minute variations of the surface within the unilateral flatness tolerance of the whole surface.

Certified Accuracy

Before shipment, each surface plate must pass a critical final inspection to prove that its entire surface is within the specified tolerance. The final inspection is done with an autocollimator in a controlled environment. This instrument is checked and certified against standards traceable to the U.S. National Institute of Standards and Technology (NIST). The instrument's certification is on file at the Starrett Tru-Stone Technologies Division in Waite Park, MN.

All shipments of Starrett precision granite products include a calibration certificate which verifies traceability to NIST as well as certifying that the inspection requirements of U.S. MIL-I-45208A and Federal Spec. GGG-P-463c and ASME B89.3.7 2013 have been met.

Periodic Inspection

Every surface plate in use should be frequently inspected, especially when used in shop conditions where abrasion is common. An effective inspection program should include regular checks with an autocollimator. If tolerance variations are excessive, the plate can be transferred to work involving less accuracy or it can be resurfaced to restore its original level of accuracy.

Resurfacing Services

Resurfacing for Starrett and other brands of granite surface plates are available in our plant or yours.

Design Assistance

Starrett engineers will provide prompt assistance with any problem related to surface plate design, installation or use. Our staff is available to assist in your design of larger OEM projects.

To get the best service and value from any granite plate, contact Starrett Tru-Stone.

Inspecting a granite plate with an autocollimator

Granite Solutions

Custom Engineered Granite Solutions

For Oversize Parts and Assembling

Starrett has unparalleled experience and expertise in building special, extra-large granite surface plates and custom products from granite to meet specific requirements.

All Starrett special surface plates are made from single, solid slabs of granite quarried in one piece, machined in one piece and finished to your specified dimensions and tolerances.

Special Plates are Usually Requested in Two Categories:

Inspecting oversize parts:

The first category is for inspecting oversize parts and assemblies such as diesel engine blocks and crankshafts, vehicle frames, missile components and ground support equipment.

Inquiries for granite surface plates to accommodate oversize parts and assemblies should indicate:

1. Type of part to be staged
2. Distribution of weight
3. Inspection accuracy required
4. Work holding requirements
5. Footing requirements, ceiling height and availability of heavy-duty work-handling equipment

Modifying standard plates:

The second general category relates to modifying standard plates or building special surface plates for work-holding attachments of many different types.

Threaded and solid inserts, adapter holes, T-slots, dovetails – almost anything added to conventional gaging fixtures can also be added to Starrett surface plates, extending their accuracy and versatility for numerous applications. Precision edges, made square with the top surface and adjacent edges, as well as precision graduated rules can also be added.

We can build and assemble this work-holding or special gaging equipment to very close tolerance in either fractional, decimal inch or metric dimensions. All special plates are quoted on an individual basis, based on complexity and tolerance requirements. We will work with you to give you the best, most economical solution for your application.

The uses of Starrett special granite surface plates are limited only by the imagination of the creative tool designer. Inquiries for special surface plates like the type shown will be studied and recommendations given without obligation.

We can build custom fixture plates that provide exceptional positional accuracy for one or several of your applications

Tru-Vac Vacuum and Air-Lift Technology

Starrett provides both standard and custom solutions for vacuum chucking, positioning or air-lift part transfer. Our innovative Tru-Vac technology integrates the stability and precision flatness of granite with a porous medium, usually ceramic.

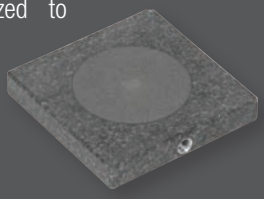
Tru-Vac can eliminate the need for mechanical clamping with its inherent part distortion or damage risk by utilizing vacuum draw at specific locations or distributed over the entire surface of your part.

Conversely, Tru-Vac technology can be utilized to provide positive pressure to allow delicate parts to glide on a cushion of air from which they can be safely lifted or transferred to the next operation.

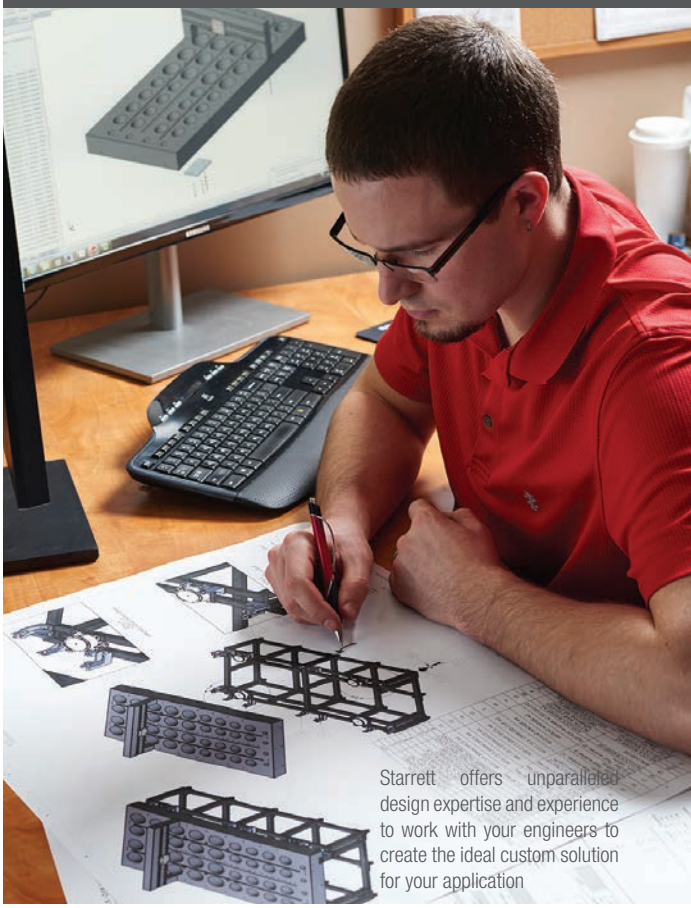
Starrett engineers will work with you to select the best porous medium for your application based on surface area, flatness, wear, and desired airflow characteristics.

Tru-Vac technology can be utilized in air chucks smaller than a hockey puck or larger than a conference room table. Vacuum zones can be of nearly any shape by virtue of our CNC milling capabilities.

Multiple zones can be utilized to accommodate a variety of part sizes or even to provide a combination of negative and positive pressure for controlled part movement.

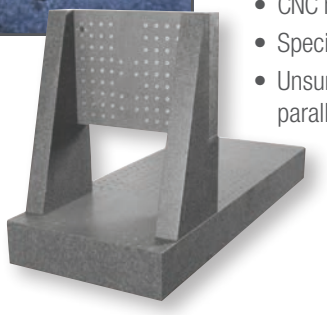


Tru-Vac Vacuum Chuck



Starrett offers unparalleled design expertise and experience to work with your engineers to create the ideal custom solution for your application

Starrett®



Technical Capabilities

Starrett has a variety of technical capabilities that, combined with our expertise, makes us the perfect choice for your custom granite requirements.

These capabilities include:

- Drilled and bored holes with precise size and location (right)
- Inserts turned and inspected in-house for quality control and custom options
- T-slots and inserts bonded using proprietary methods
- CNC milling of patterns of clearance areas
- Specialty slot milling capabilities
- Unsurpassed dimensional control of flat, square, and parallel surfaces

Examples of Custom Applications Capabilities

Above: High-accuracy, CNC-drilled holes and milled contours

Right: Clean room assembly

Left: Extremely large (or small) part capabilities.

Assembly Integration

In addition to collaborating on the design and building of your machine foundation, Starrett technicians are skilled at value-added assembly.

Using precision equipment in our assembly laboratories, we can provide you with the next level assembly, such as adding bearing rails, encoder rails, screw drives, stages, or vibration damping devices.

Having this assembly done at our factory provides accountability for accurate performance.

Granite Surface Plates

Crystal Pink Granite Surface Plate

Crystal Pink®

- Accurate for use in metrology laboratories and wear resistant for use in abrasive shop environments
- The finest, most durable granite surface plate available to industry today
- The name is derived from the fact that it has the highest crystalline quartz content of any granite surface plate

Surface Finish

- Even distribution of large quartz crystals provides a smooth finish, which significantly reduces wear on the surface plate and the instruments used on it
- Fine micro-finish, combined with the natural voids in the surface provides a velvety-smooth tool action

Wear Life

- Non-quartz-bearing granite in average daily use requires resurfacing about once a year, while Crystal Pink plates used in these same plants have required resurfacing only once every three to five years, on average.

Starrett Crystal Pink:

- Meets or exceeds U.S. Federal Specification GGG-P-463c and ASME B89.3.7 2013 for overall flatness, local area flatness and accuracy under load
- Great surface hardness and wear resistance – the highest percentage of quartz crystals of any granite plate
- Smooth, jewel-like quartz bearing points protect accuracy and finish of both the surface and the tools used on it
- Quality and economy combined
- Comparable to black granite plates while outwearing them as much as 5 to 1
- Meets or exceeds 50 lb per square foot (24kg per 1,000 sq. cm) load bearing specifications. Available in 100 lb (45kg) test series.
- Standard-size plates are mounted on resilient support pads, providing isolation from normal vibration and a non-distorting 3-point suspension.
- Packed one per crate with skids for forklift handling.

Grade AA Laboratory						No Ledge			Two Ledge		
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			Weight		
in	mm	in	mm	in	mm	lb	kg	EDP	lb	kg	EDP
12 x 12	300 x 300					55	25	80601	50	23	80602
12 x 18	300 x 450	4	100	.000050	0.0012	85	39	80610	78	35	80611
18 x 18	450 x 450					125	57	80619	120	54	80620
18 x 24	450 x 600	6	150	.000075	0.0019	248	113	80628	224	102	80629
24 x 24	600 x 600					330	150	80646	306	139	80647
24 x 36	600 x 900	6	150	.000100	0.0025	495	225	80655	460	209	80656
30 x 48	750 x 1200	10	250	.000168	0.0043	1585	719	80883	1585	719	80884
36 x 36	900 x 900	6	150	.000150	0.0038	745	338	80701	710	322	80702
36 x 48	900 x 1200	8	200	.000200	0.0050	1320	599	80710	1250	567	80711
36 x 60	900 x 1500	10	250	.000250	0.0063	2065	937	80719	1950	885	80720
36 x 72	900 x 1800	12	300	.000300	0.0076	2970	1347	80728	2810	1275	80729
48 x 48	1200 x 1200	10	250	.000200	0.0051	2535	1150	80889	2535	1150	80890
48 x 72	1200 x 1800	12	300	.000350	0.0088	3960	1796	80755	3795	1721	80756
48 x 96	1200 x 2400	16	400	.000500	0.0127	7040	3193	80773	6750	3062	80774
Grade A Inspection						**No Ledge**			**Two Ledge**		
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			Weight		
in	mm	in	mm	in	mm	lb	kg	EDP	lb	kg	EDP
12 x 12	300 x 300					55	25	80604	50	23	80605
12 x 18	300 x 450	4	100	.000100	0.0025	85	39	80613	78	35	80614
18 x 18	450 x 450					125	57	80622	120	54	80623
18 x 24	450 x 600	6	150	.000150	0.0038	248	113	80631	224	102	80632
24 x 24	600 x 600					330	150	80649	306	139	80650
24 x 36	600 x 900	6	150	.000200	0.0050	495	225	80658	460	209	80659
30 x 48	750 x 1200	8	200	.000400	0.0102	1270	576	80885	1270	576	80886
36 x 36	900 x 900	6	150	.000300	0.0076	745	338	80704	710	322	80705
36 x 48	900 x 1200	8	200	.000400	0.0102	1320	599	80713	1250	567	80714
36 x 60	900 x 1500	10	250	.000500	0.0127	2065	937	80722	1950	885	80723
36 x 72	900 x 1800			.000600	0.0152	2475	1123	80731	2340	1061	80732
48 x 48	1200 x 1200	8	200	.000500	0.0130	2030	921	80891	2030	921	80892
48 x 72	1200 x 1800	10	250	.000700	0.0177	3300	1497	80758	3165	1436	80759
48 x 96	1200 x 2400	12	300	.001000	0.0254	5280	2395	80776	5060	2295	80777
Grade B Toolroom						**No Ledge**			**Two Ledge**		
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			Weight		
in	mm	in	mm	in	mm	lb	kg	EDP	lb	kg	EDP
12 x 12	300 x 300					55	25	80607	50	23	80608
12 x 18	300 x 450	4	100	.000200	0.0050	83	38	80616	76	34	80617
18 x 18	450 x 450					125	57	80625	118	54	80626
18 x 24	450 x 600	4	100	.000300	0.0076	165	75	80634	155	70	80635
24 x 24	600 x 600					220	100	80652	210	95	80653
24 x 36	600 x 900	6	150	.000400	0.0102	495	225	80661	460	209	80662
30 x 48	750 x 1200			.000700	0.0180	950	431	80887	950	431	80888
36 x 36	900 x 900			.000600	0.0152	745	338	80707	710	322	80708
36 x 48	900 x 1200			.000800	0.0203	990	449	80716	955	433	80717
36 x 60	900 x 1500	8	200	.001000	0.0254	1650	749	80725	1560	708	80726
36 x 72	900 x 1800			.001200	0.0304	1980	898	80734	1870	848	80735
48 x 48	1200 x 1200	6	150	.000900	0.0229	1520	689	80893	1520	689	80894
48 x 72	1200 x 1800	8	200	.001400	0.0355	2640	1198	80761	2530	1148	80762
48 x 96	1200 x 2400	10	250	.002000	0.0508	4400	1996	80779	4215	1912	80780

Other sizes available by request. No ledge and two ledge plates listed, four ledge plates available by request.

How to Order

Specify:

1. Surface size of plate
2. Grade AA, A or B tolerance
3. Number of ledges

Special Requirements

Should your application require something other than a standard surface plate, we can provide you with custom options.

Starrett can produce your plate from pink, black or gray granite. Custom sizes and thicknesses are available upon request to meet your needs.

We can also add holes, counterbores, threaded or solid stainless steel inserts and t-slots to your surface plate.

Contact Starrett Tru-Stone for assistance.

Granite Surface Plates

Superior Black

Our superior black granite has low water absorption, thus minimizing the possibility of your precision gages rusting while setting on the plates.

This black granite creates little glare resulting in less eyestrain for individuals using the plates.

We have chosen our superior black granite with the specific intent of keeping thermal expansion to a minimum.

Superior Black Granite Surface Plate

Special Requirements

Should your application require something other than a standard surface plate, we can provide you with custom options.

Starrett can produce your plate from pink, black or gray granite. Custom sizes and thicknesses are available upon request to meet your needs.

We can also add holes, counterbores, threaded or solid stainless steel inserts, and t-slots to your surface plate.

Contact Starrett Tru-Stone for assistance.

How to Order

Specify:

1. Surface size of plate
2. Grade AA, A or B tolerance
3. Number of ledges

Grade AA Laboratory								No Ledge	Two Ledge
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			
in	mm	in	mm	in	mm	lb	kg	EDP	EDP
12 x 12	300 x 300	4	100	.000050	0.0012	61	28	85006	85007
12 x 18	300 x 450					92	42	85010	85011
18 x 24	450 x 600			.000075	0.0019	183	83	85028	85029
24 x 24	600 x 600					244	111	85036	85037
24 x 36	600 x 900	6	150	.000100	0.0025	549	249	85055	85056
30 x 48	750 x 1200	8	200	.000168	0.0043	1220	553	85082	85083
36 x 36	900 x 900	6	150	.000150	0.0038	824	374	85090	85091
36 x 48	900 x 1200	8	200	.000200	0.0050	1464	664	85110	85111
36 x 60	900 x 1500	10	250	.000250	0.0063	2288	1038	85118	85119
36 x 72	900 x 1800	12	300	.000300	0.0076	3294	1494	85128	85129
48 x 48	1200 x 1200	8	200	.000200	0.0051	1952	885	85136	85137
48 x 72	1200 x 1800	10	250	.000350	0.0088	3660	1660	85155	85156
48 x 96	1200 x 2400	12	300	.000500	0.0127	5856	2656	85173	85174
Grade A Inspection								**No Ledge**	**Two Ledge**
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			
in	mm	in	mm	in	mm	lb	kg	EDP	EDP
12 x 12	300 x 300	4	100	.000100	0.0025	61	28	85008	85009
12 x 18	300 x 450					92	42	85013	85014
18 x 24	450 x 600			.000150	0.0038	183	83	85031	85032
24 x 24	600 x 600					844	111	85038	85039
24 x 36	600 x 900	6	150	.000200	0.0050	549	249	85058	85059
30 x 48	750 x 1200			.000400	0.0102	915	415	85085	85086
36 x 36	900 x 900			.000300	0.0076	824	374	85092	85091
36 x 48	900 x 1200			.000400	0.0102	1098	498	85113	85114
36 x 60	900 x 1500	8	200	.000500	0.0127	1830	830	85120	85121
36 x 72	900 x 1800	10	250	.000600	0.0152	2745	1245	85131	85132
48 x 48	1200 x 1200	6	150	.000500	0.0130	1464	664	85138	85139
48 x 72	1200 x 1800	8	200	.000700	0.0177	2928	1328	85158	85159
48 x 96	1200 x 2400	10	250	.001000	0.0254	4880	2214	85176	85177
Grade B Toolroom								**No Ledge**	**Two Ledge**
Surface Size		Thickness		Flatness Unilateral Tolerance		Weight			
in	mm	in	mm	in	mm	lb	kg	EDP	EDP
12 x 12	300 x 300	3	75	.000200	0.0050	46	21	85012	85015
12 x 18	300 x 450					69	31	85016	85017
18 x 24	450 x 600			.000300	0.0076	136	62	85034	85035
24 x 24	600 x 600	4	100	.000300	0.0076	244	111	85040	85041
24 x 36	600 x 900			.000400	0.0102	366	166	85061	85062
30 x 48	750 x 1200	6	150	.000700	0.0180	915	415	85088	85089
36 x 36	900 x 900			.000600	0.0152	824	374	85094	85095
36 x 48	900 x 1200			.000800	0.0203	1098	498	85116	85117
36 x 60	900 x 1500			.001000	0.0254	1373	623	85122	85123
36 x 72	900 x 1800	8	200	.001200	0.0304	2196	996	85134	85135
48 x 48	1200 x 1200	6	150	.000900	0.0229	1464	664	85140	85141
48 x 72	1200 x 1800	8	200	.001400	0.0355	2196	996	85161	85162
48 x 96	1200 x 2400			.002000	0.0508	3904	1771	85179	85180

Other sizes available by request. No ledge and two ledge plates listed, four ledge plates available by request.

Starrett®

Stands

Surface Plate Stands

Our stands are constructed from welded square steel tubing to provide exceptional strength and durability. Steel crossbeams are located at the proper support points to ensure maximum surface plate accuracy.

Stands are supplied with a scratch and abrasion resistant industrial powder coated finish. In addition to our standard beige gray color, other colors are available upon request and at an additional charge.

Stationary stands come with leveling adjustors with the typical adjustment being 2". Rolling stands are fabricated with two stationary and two swivel casters.

Stands require no assembly. Order by surface plate size.

Rolling Stand

Stationary Stand

Surface Plate Stands

Surface Plate Size (Length x Width)	Weight	Stationary with Leveling Screws EDP	Rolling with Casters EDP
12 x 18"	50lb	82220	82221
12 x 18 - 2 Ledge	50lb	82250	82251
18 x 18"	65lb	82222	82223
18 x 18 - 2 Ledge	65lb	82252	82253
18 x 24"	75lb	82224	82225
18 x 24 - 2 Ledge	75lb	82254	82255
24 x 24"	85lb	82226	82227
24 x 24 - 2 Ledge	85lb	82256	82257
24 x 36"	95lb	82228	82229
24 x 36 - 2 Ledge	95lb	82258	82259
24 x 48"	145lb	82230	82231
24 x 48 - 2 Ledge	145lb	82260	82261
30 x 48"	155lb	82266	82268
30 x 48 - 2 Ledge	155lb	82267	82269
36 x 36"	165lb	82232	82233
36 x 36 - 2 Ledge	165lb	82262	82263
36 x 48"	185lb	82234	82235
36 x 48 - 2 Ledge	185lb	82264	82265
36 x 60"	205lb	82236	82237
36 x 72"	235lb	82238	82239
48 x 48"	210lb	82270	82272
48 x 60"	250lb	82240	82241
48 x 72"	265lb	82242	82243
48 x 96"	345lb	82244	82245

Cabinet Type Surface Plate Stand

Cabinet Type Surface Plate Stands

Cabinet stands provide a strong, rigid support for standard plates listed, plus a handy place to store frequently used inspection tools and accessories.

The standard height is 34-36" (900mm) from the floor to top of the surface plate.

All stands are made from heavy-gage welded steel and have locking doors on the front. The 48" (1200mm) wide stands are equipped with doors front and back unless otherwise specified. Stands are supplied with leveling screws or casters as listed. Order by surface plate size. (Works on all thicknesses, and plate with our without ledges.)

Cabinet Type Surface Plate Stands

Surface Plate Size		Stand Weight		Stationary Stand	Rolling Stand
in	mm	lb	kg	EDP	EDP
24 x 36	600 x 900	190	86	81504	81506
36 x 36	900 x 900	245	111	81516	81518
36 x 48	900 x 1200	300	136	81513	81515
36 x 60	900 x 1500	365	166	81519	81521
36 x 72	900 x 1800	440	200	81522	81524
48 x 72	1200 x 1800	660	299	81525	81527

Toolmarkers' Flat

Granite Accessories

Toolmakers' Flats

These handy flats are small precision surface plates that are ideal for many inspection and checking uses throughout the plant.

They are especially well suited for layout work and offer an easy, portable reference for gaging small parts.

Offered in Crystal Pink® or Black Granite, Starrett Toolmakers' Flats are 12" long x 8" wide x 2" thick (300 x 200 x 50mm) and finished to an overall tolerance of .0001" (0.0025mm).

The shipping weight without case is 20 lb (9kg).

Toolmakers' Flats	
EDP	**Description**
81803	Crystal Pink® granite
81802	Black granite
81804	Sturdy felt lined case for toolmakers' flat

Three-Face Granite Tri-Squares

Three-Face Granite Tri-Squares provide an excellent, economical way for accurately checking the X-Y-Z axes on CNC machine tools and coordinate measuring machines.

Laying in the horizontal position, the X and Y axes can be checked for 90º squareness. With the square in the vertical position, tracing along the vertical edge of the square can check the perpendicularity of the Z axis.

Granite tri-squares may also be used in the same manner that steel squares would be used for the direct checking of squareness and straightness.

Tri-Square

Three-Face Granite Tri-Squares					
Accuracy Grade – EDP		**Dimensions (Length x Height x Thickness)**		**Weight**	
AA Laboratory .000025"/6" TIR (0.0006/150mm)	**A Inspection .000050"/6" TIR (0.0012/150mm)**	**in**	**mm**	**lb**	**kg**
81969	81970	6 x 9 x 3	150 x 225 x 75	18	8
81961	81962	9 x 12 x 3	225 x 300 x 75	23	10
81964	81965	12 x 18 x 4	300 x 450 x 100	60	27
81967	81968	18 x 24 x 4	450 x 600 x 100	120	54
81971	81972	24 x 36 x 6	600 x 900 x 150	570	259

Other sizes quoted on application.

Granite Accessories

Five-Face Master Squares

Five-Face Granite Master Squares are popular for accurately checking the X-Y-Z axes on CNC machine tools and coordinate measuring machines.

Laying in the horizontal position, the X and Y axes can be checked for 90º squareness. With the square in the vertical position, tracing along the vertical edge of the square can check the perpendicularity of the Z axis. By tracing along the top edge of the square while in the vertical position, it will check parallelism of the table in the X and Y axes.

Five-face master squares may also be used on any work that requires the checking of squareness or parallelism.

Five-Face Master Square

Five-Face Master Squares

Accuracy Grade – EDP		Dimensions (Length x Height x Thickness)		Weight	
AA Laboratory .000025"/6" TIR (0.0006/150mm)	A Inspection .000050"/6" TIR (0.0012/150mm)	in	mm	lb	kg
81919	81920	12 x 12 x 3	300 x 300 x 75	41	19
81922	81923	14 x 14 x 3	350 x 350 x 75	56	25
81925	81926	16 x 16 x 4	400 x 400 x 100	98	44
81931	81932	24 x 24 x 4	600 x 600 x 100	220	100
81933	81934	36 x 36 x 6	900 x 900 x 150	855	388

24 x 24 and larger have a thru-hole for lifting with a sling.

Granite Parallels

Granite Parallels

Produced in four standard sizes, Granite Parallels are useful in setting up work on surface plates and machine tables. They can also be used to elevate work above the surface of a plate to enable quick and easy inspection of piece parts with shoulders or steps.

Available in matched pairs, finished flat and parallel on two opposite narrow faces or all four faces. Single parallels available by request. Storage cases are available at extra cost.

Granite Parallels

Length x Width x Thickness		Grade AA Laboratory .000025"/6" TIR (0.0006/150mm)		2-Face	4-Face	Grade A Inspection .000050"/6" TIR (0.0012/150mm)		2-Face	4-Face	Weight per Pair		Case Only
in	mm	in	mm	EDP	EDP	in	mm	EDP	EDP	lb	kg	EDP
6 x .75 x 1	150 x 19 x 25	.000025	0.0012	81691	81692	.000050	0.0025	81693	81694	1	.5	81720
12 x 1 x 2	300 x 25 x 50			81695	81696			81697	81698	5	2.3	81721
18 x 1.5 x 3	450 x 37.5 x 75			81699	81700			81701	81702	18	8	81722
24 x 2 x 4	600 x 50 x 100			81703	81704			81705	81706	42	19	81723

Granite Accessories

Straight Edges

Our straight edges are produced from Master Pink granite, as are all of our accessories. Straight edges have a single long, narrow face finished flat. Lifting holes are provided on sizes 48" or larger.

Straight Edge

Straight Edges					
Grade A Inspection .000050"/6" TIR (0.0012/150mm)	Grade AA Laboratory .000025"/6" TIR (0.0006/150mm)	Length x Width x Thickness		Weight	
EDP	EDP	in	mm	lb	kg
81608	81648	2 x 4 x 24	50 x 100 x 600	22	10
81610	81650	2 x 6 x 36	50 x 150 x 900	48	22
81612	81652	3 x 8 x 48	75 x 200 x 1200	85	39
81613	81653	3 x 10 x 60	75 x 250 x 1500	198	90
81614	81654	3 x 12 x 72	75 x 300 x 1800	285	129

Five-Face V-Blocks

V-Blocks are ideal for supporting or holding cylindrical pieces during manufacturing or inspection. They are provided in matched pairs and have 5 finished faces. V-blocks have a nominal 90-degree "V", centered with and parallel to the bottom and two sides and square to the ends.

Five-Face V-Block

Five-Face V-Blocks					
Grade AA Laboratory .000050"/6" TIR (0.0012/150mm)	Grade A Inspection .000100"/6" TIR (0.0024/150mm)	Length x Width x Thickness		Weight	
EDP	EDP	in	mm	lb	kg
81533	81530	3 x 3 x 3	75 x 75 x 75	6	3
81534	81531	4 x 4 x 4	100 x 100 x 100	15	7
81535	81532	6 x 6 x 6	150 x 150 x 150	48	22
81537	81536	9 x 9 x 9	225 x 225 x 225	160	73
81539	81538	12 x 12 x 12	300 x 300 x 300	380	172

Six-Face Cubes

The granite cube has all six faces finished flat, perpendicular and parallel.

Six-Face Cube

Six-Face Cubes					
Grade AA Laboratory .000050"/6" TIR (0.0012/150mm)	Grade A Inspection .000025"/6" TIR (0.0006/150mm)	Length x Width x Thickness		Weight	
EDP	EDP	in	mm	lb	kg
81980	81981	3 x 3 x 3	75 x 75 x 75	3	1
81982	81983	4 x 4 x 4	100 x 100 x 100	8	4
81984	81985	6 x 6 x 6	150 x 150 x 150	24	11

Granite Accessories

Angle Plates

Angle plates provide a convenient and practical means of clamping and holding work in a vertical position. Their excellent finish and flatness make them very compatible for use with granite surface plate accuracies. The angle plates are available with either 2 or 4 finished faces. The 2-face angle plate has the bottom and the adjacent square face finished flat and square to one another. The 4-face is similar to the 2-face, but has the two adjacent sides finished flat and square to the other two faces, as well as being parallel to each other.

Four-Face Inserted Angle Plates

Inserted angle plates are available upon request. This product is the same as our standard angle plate, with the addition of metal discs inserted into one side. The inserted angle plates also have a main gauging face for magnetic chucking purposes and threaded inserts for clamping purposes.

Angle Plate

Angle Plates						Four-Face Inserted Angle Plates			
Size (Length x Width x Thickness)		Grade AA Laboratory .000025"/6" TIR (0.0006/150mm)		Grade A Inspection .000050"/6" TIR (0.0012/150mm)		Grade AA Laboratory .000025"/6" TIR (0.0006/150mm)	Grade A Inspection .000050"/6" TIR (0.0012/150mm)	Weight	
in	mm	2-Face EDP	4-Face EDP	2-Face EDP	4-Face EDP	EDP	EDP	lb	kg
4 x 4 x 4	100 x 100 x 100	81564	81565	81562	81563	81860	81861	8	4
6 x 6 x 6	150 x 150 x 150	81569	81568	81566	81567	81864	81865	24	11
6 x 9 x 12	150 x 225 x 300	81572	81573	81570	81571	81868	81869	72	33
9 x 9 x 9	225 x 225 x 225	81576	81577	81574	81575			80	36
12 x 12 x 12	300 x 300 x 300	81579	81578	81581	81580			190	86

Surface Plate Covers

We highly recommend the use of surface plate covers to protect your precision granite investment. Prevent abrasive build up on your plates with our covers made from heavy gage vinyl with a soft interior lining. Our covers provide a tough, durable, protective outside with a soft cushion inside.

Vinyl Covers		
	For Surface Plate Size	
EDP	in	mm
83020	12 x 12	300 x 300
83021	12 x 18	300 x 450
83022	18 x 18	450 x 450
83023	18 x 24	450 x 600
83024	24 x 24	600 x 600
83025	24 x 36	600 x 900
83026	24 x 48	600 x 1200
83034	30 x 48	750 x 1200
83027	36 x 36	900 x 900
83028	36 x 48	900 x 1200
83029	36 x 60	900 x 1500
83030	36 x 72	900 x 1800
83035	48 x 48	1200 x 1200
83031	48 x 60	1200 x 1500
83032	48 x 72	1200 x 1800
83033	48 x 96	1200 x 2400

Surface Plate Cleaner

To keep surface plates and other precision granite products in top condition, they should be cleaned frequently with Starrett Cleaner. This helps prevent abrasion of tools by dirt and other foreign particles.

The liquid cleaner, which also acts as a degreaser and rust inhibitor, should be used without water to minimize the risk of rusting tools.

Surface Plate Cleaner (left to right) - 1 gal., 1 qrt., 1lb, wipes

Surface Plate Cleaner	
EDP	Description
81820	55 gal. (208 liter) Drum
81822	1 gal. (3.8 liter), Case of four
81824	1 quart (1 liter), Case of 12
81828	Waterless Cleaner, Case of 12 1lb jars
81829	Waterless Cleaner Wipes, Case of 4 1.5lbs canisters

Surface Plate Calibration Products

Planekator Kits

The Planekator measures the overall flatness of your surface plate. It enables you to take direct indicator readings of your surface plate with autocollimator-accuracy, but without the complicated mathematics of the autocollimator. When used in conjunction with a Starrett Repeat Reading Gage, you'll have a very accurate idea of the flatness of your surface plate.

Each kit includes a precision granite straight edge, one adjustable support, one fixed support, a certified 0.00002" dial indicator and an indicator carriage. The entire kit is shipped in a heavy-duty travel case. The straight edge comes equipped with lifting handles, correction tape indicating the accuracy at 1" intervals, and includes a NIST-traceable certificate that meets ISO/IEC 17025 requirements.

The Planekator straight edge should be at least equal to the full width, and at least equal to 50% of the length of the largest surface you will be inspecting. For example, a 36" planekator straight edge can be used to calibrate any surface up to 36" x 72".

Planekator

Part No.	Size (in)	Total Weight of Kit (lbs)	Straight Edge Accuracy (in)
80500	24	50	0.000050
80501	36	80	0.000075
80502	48	115	0.000100

Repeat Reading Gage

High-precision, fast checking of surface plate repeatability with readings taken with a dial indicator. Detects local error, not overall flatness. The base has an adjustment knob for zero-setting the cartridge-type gaging head, and all contact points resting on the granite, including the contact point of the gaging cartridge, are carbide and lapped to a fine finish.

The instrument also accommodates AGD indicators with .375" (9.5mm) diameter stems.

Repeat Reading Gage

Repeat Reading Gage	
EDP	Description
81320	Repeat Reading Gage
81321	Storage Case
81322	Travel Case
81850	0.00002" Dial Indicator

Granite Calibration Services

Starrett calibration and resurfacing services are available for all types and brands of granite surface plates. When certification of surface tolerance is required, recalibration service with an autocollimator will be provided with accuracy traceable to the U.S. National Institute of Standards and Technology.

Calibration and resurfacing of surface plates, tri-squares, master squares, master angles, V-blocks, parallels and straight edges is available at our at Waite Park, MN location.

Resurfacing can also be done in your plant, saving crating and shipping costs as well as equipment down time. The cost is based on a square foot plate area with additional charge for travel. For a quotation, send us a list of plates, their sizes and the flatness tolerance required.

When resurfacing is done in your plant, tolerances for repeat reading of measurement will be per U.S. Federal Specification GGG-P-463c,and ASME B89.3.7-2013. Closer repeat reading tolerances of 25, 50 and 100 millionths can only be assured if the resurfacing is done at our facilities.

Recalibrations are provided by our Calibration Lab which is A2LA accredited.

Tolerances for Repeat Reading of Measurement				
	Full Indicator Movement (F.I.M.) in Microinches and (Microns)			
Diagonal Inches (mm)	Grade AA	Grade A	Grade B	Obtained
Through 30" (750)	35 (.9)	60 (1.5)	110 (2.8)	When not Specified
30-60" (750-1500)	45 (1.1)	70 (1.8)	120 (3)	
60-90" (1500-2250)	60 (1.5)	80 (2)	160 (4)	
90-120" (2250-3000)	75 (1.9)	100 (2.5)	200 (5)	
120-150" (3000-3800)	90 (2.3)	120 (3)	240 (6)	
Over 150" (3800)	100 (2.5)	140 (3.6)	280 (7)	
All Sizes	25 (.6)	50 (1.3)	100 (2.5)	When Specified

A repeat reading gage detects minute variations of the surface within the unilateral flatness tolerance of the whole surface.