



Calços padrão individuais – em aço - Metalduro integral – Cerâmica - Zircônio –

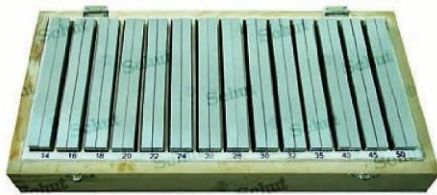
Steel parallel blocks

Parallels to position and layout workpieces in e.g. clamping jaws for drilling, grinding, milling and measuring. The workpieces and assemblies can easily be set up to the desired working height.

- Parallelism of the two measuring faces: ±0.005 mm.
- Size deviation (height): ±0.01 mm.
- Hardness: 55 HRC.
- Ground in matched pairs.
- Produced of a high-grade steel alloy.
- Delivery in a case with a manufacturer's certificate.



(Only available in sets.)



906 996

Item No.	Length mm	Width mm	Height mm
Set of 12 pairs:			
909.800	100	10	14 - 16 - 18 - 20 - 22 - 24 - 26 - 28 - 30 - 32 - 35 - 40
909.804	125		
906.995	150		
Set of 14 pairs:			
909.802	100	10	14 - 16 - 18 - 20 - 22 - 24 - 26 - 28 - 30 - 32 - 35 - 40 - 45 - 50
909.805	125		
906.996	150		
Set of 24 pairs:			
909.803	100	8	11 - 16 - 21 - 26 - 31 - 36
909.806	125		
906.997	150		

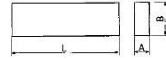


Parallels

Material: Alloyed tool steel
58 +/-2 HRC
Tolerance: A = 0,01 mm
B = 0,005 mm

In wooden case

Size	L mm	A mm	B mm	Quantity	Pairs	Art.-Nr / Order no
100 x 4	100	4	10/14/18/22/26 30/34/38/42	je 2/ 2 each	9	13-MLRD-100/4
120 x 8	120	8	12/17/22/25 28/32/38/38	je 2/ 2 each	8	13-MLRD-120/8
160 x 4	160	4	10/14/18/22/26 30/34/38/42	je 2/ 2 each	9	13-MLRD-160/4
160 x 8	160	8	14/16/18/20/22/24/26 28/30/32/35/40/45/50	je 2/ 2 each	8	13-MLRD-160/8
200 x 8	200	8	17/22/28/28 32/36/38/42	je 2/ 2 each	8	13-MLRD-200/8



In wooden case

Size	L mm	A mm	B mm	Quantity	Pairs	Art.-Nr / Order no
12 x 10	120	10	14/16/18/20/ 22/ 24/ 26/ 28/ 30/ 32/ 35/ 40	je 2/ 2 each	12	13-PUS-120/10
14 x 10	150	10	14/16/18/20/22/24/ 26/28/30/32/ 35/40/45/50	je 2/ 2 each	14	13-PUS-150/10



In wooden tray

Größe/ Size	L mm	B x A mm	Quantity	Pairs	Art.-Nr / Order no
100 x A	100	5x2/10x2/15x2/20x2/26x3/11x3/16x3/21x3/ 7x4/12x4/17x4/22x4/28x5/33x5/38x5/43x5/ 48x5/53x5/58x5/63x5	je 2/ 2 each	20	13-PUS-100HL
125 x A	125	11x8/16x8/21x8/26x8/31x8/36x8/41x8/ 16x10/22x10/28x10/33x10/38x10/43x10/ 20x12/25x12/30x12/35x12/40x12/45x12/ 22x14/27x14/32x14/37x14/42x14	je 2/ 2 each	24	13-PUS-125HL
150 x A	150	11x8/16x8/21x8/26x8/31x8/36x8/41x8/ 13x10/18x10/23x10/28x10/33x10/38x10/ 15x12/20x12/25x12/30x12/35x12/40x12/ 17x14/22x14/27x14/32x14/37x14/42x14	je 2/ 2 each	24	13-PUS-150HL



Steel gauge blocks

Steel gauge blocks delivered with an inspection report.

- Hardness measuring surfaces: 63 - 65 HRC.
- Expansion coefficient: (12±1)·10⁻⁶/°C.
- ISO 3650.



Steel gauge blocks in sets

Item No.	Class	Price	Size mm	Increment mm	Pieces
M32:					
906.622	2		1.005	-	1
906.621	1		1.01 - 1.09	0.01	9
906.620	0		1.1 - 1.9	0.1	9
			1 - 9	1	9
			10 - 30	10	3
			50	-	1
M47:					
906.625	2		1.005	-	1
906.624	1		1.01 - 1.09	0.01	9
906.623	0		1.1 - 1.9	0.1	9
			1 - 24	1	24
			25 - 100	25	4
M87:					
906.613	2		1.001 - 1.009	0.001	9
906.612	1		1.01 - 1.49	0.01	49
906.611	0		0.5 - 9.5	0.5	19
			10 - 100	10	10
M88:					
906.628	2		1.0005	-	1
906.627	1		1.001 - 1.009	0.001	9
906.626	0		1.01 - 1.49	0.01	49
			0.5 - 9.5	0.5	19
			10 - 100	10	10
M112:					
906.631	2		1.0005	-	1
906.630	1		1.001 - 1.009	0.001	9
906.629	0		1.01 - 1.49	0.01	49
			0.5 - 24.5	0.5	49
			25 - 100	25	4

Steel gauge blocks, per piece

Size mm	Increment mm	ISO 3650/1 Price	ISO 3650/0 Price
0.5	-	-	-
1	-	-	-
1.0005	-	-	-
1.001 - 1.009	0.001	-	-
1.01 - 1.5	0.01	-	-
1.001 - 1.009	0.001	-	-
1.01 - 1.50	0.01	-	-
1.6 - 2.0	0.1	-	-
2.5 - 7.5	0.5	-	-
8.0 - 10.0	0.5	-	-
10.5 - 25.0	0.5	-	-
30	-	-	-
40	-	-	-
50	-	-	-
60	-	-	-
70	-	-	-
75	-	-	-
80	-	-	-
90	-	-	-
100	-	-	-

Select steel gauge blocks

The steel gauge blocks are available in all accuracy classes of ISO 3650. Only the most commonly used sizes can be found in this catalog. The gauge blocks are delivered with an inspection report or on request with a DKD-DAKs certificate, UKAS acknowledged. Sets delivered in luxurious case. Special sizes and sets are available on request, as well as special sets for calibration of micrometers and calipers. High quality gauge blocks, can be very well wringed to make a combination size.



Steel gauge blocks, per piece

Size mm	Increment mm	ISO 3650/1 Price	ISO 3650/0 Price
0.5	-	-	-
1	-	-	-
1.0005	-	-	-
1.001 - 1.009	0.001	-	-
1.01 - 1.5	0.01	-	-
1.6 - 1.9	0.1	-	-
2.0 - 5.5	0.5	-	-
6.0 - 10.0	0.5	-	-
10.5 - 15.0	0.5	-	-
15.5 - 20.0	0.5	-	-
20.5 - 25.0	0.5	-	-
30	-	-	-
40	-	-	-
50	-	-	-
60	-	-	-
70	-	-	-
75	-	-	-
80	-	-	-
90	-	-	-
100	-	-	-

Steel gauge blocks in sets

Item No.	Class	Price	Size mm	Increment mm	Pieces
M32:					
831.915	1		1.005	-	1
831.914	0		1.01 - 1.09	0.01	9
			1.1 - 1.9	0.1	9
			1 - 9	1	9
			10 - 30	10	3
			60	-	1
M47:					
831.911	1		1.005	-	1
831.910	0		1.00 - 1.09	0.01	10
			1.1 - 1.9	0.1	9
			2 - 25	1	24
			50 - 100	25	3
M87:					
831.909	1		0.5	-	1
831.908	0		1.001 - 1.009	0.001	9
			1.00 - 1.50	0.01	51
			2.0 - 10.0	0.5	17
			20 - 100	10	9
M103:					
831.907	1		0.5	-	1
831.906	0		1.005	-	1
			1.00 - 1.50	0.01	51
			2.0 - 25.0	0.5	47
			50 - 100	25	3
M112:					
831.905	1		0.5	-	1
831.904	0		1.0005	-	1
			1.001 - 1.009	0.001	9
			1.00 - 1.50	0.01	51
			2.0 - 25.0	0.5	47
			50 - 100	25	3
M122:					
831.903	1		0.5	-	1
831.902	0		1.0005	-	1
			1.001 - 1.009	0.001	9
			1.00 - 1.50	0.01	51
			1.6 - 1.9	0.1	4
			2.0 - 25.0	0.5	47
			30 - 70	10	5
			75	-	1
			80 - 100	10	3

Mitutoyo steel and ceramic gauge blocks

The Mitutoyo gauge blocks are available in all accuracy classes of ISO 3650. Only the most commonly used sizes can be found in this catalog. Other accuracy classes and sizes are available on request. Gauge blocks from 125 mm have two coupling holes on both ends so that they can be coupled by means of a toggle clamp. Individual gauge blocks and sets are delivered with an inspection report.

Steel

These gauge blocks are made of alloy steel, and they are completely stress-relieved and very stable.

- Hardness: 800 HV.
- Available up to 1000 mm.
- Sets M8, M9, M103, M112 and M122 are available on request.

Ceramics

The ceramic gauge blocks are made of zirconia. Because of this, these gauge blocks are highly durable and corrosion proof.

- Hardness: 1350 HV.
- Available up to 500 mm.
- Sets M8 and M103 are available on request.



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Gauge blocks, per piece

Size mm	Incr. mm	Steel		Ceramics	
		Class 1	Class 0	Class 1	Class 0
0.5	-				
1	-				
1.0005	-				
1.001-1.009	0.001				
1.01-1.49	0.01				
1.5-2.0	0.1				
2.5	-				
3.0-4.0	0.5				
4.5-5.0	0.5				
5.5-10.0	0.5				
10.5-11.0	0.5				
11.5-12.5	0.5				
13.0-15.5	0.5				
16	-				
16.5-17.5	0.5				
18.0-20.0	0.5				
20.5-23.0	0.5				
23.5-24.5	0.5				
25	-				
30	-				
40	-				
50	-				
60	-				
70	-				
75	-				
80	-				
90	-				
100	-				

Gauge blocks in sets

Item No.	Class	Price EUR	Size mm	Increment mm	Pieces
M32, steel:					
517.967	1	1.005	1.01-1.09	0.01	9
517.966	0	1.1-1.9	0.1	1	9
M32, ceramics:					
516.367	1	10-30	10	1	3
516.366	0	60	-	1	1
M46, steel:					
516.996	1	1.001-1.009	0.001	1	9
516.995	0	1.1-1.9	0.1	1	9
M46, ceramics:					
516.396	1	1-9	1	1	9
516.395	0	10-100	10	1	10
M47, steel:					
516.963	1	1.005	1.01-1.09	0.01	19
517.962	0	1.2-1.9	0.1	1	8
M47, ceramics:					
516.363	1	1-9	1	1	9
516.362	0	10-100	10	1	10
M87, steel:					
516.947	1	1.001-1.009	0.001	1	9
516.946	0	1.01-1.49	0.01	1	49
516.946	0	0.5-9.5	0.5	1	19
M87, ceramics:					
516.347	1	10-100	10	1	10
516.346	0				

Long gauge blocks from 125 mm

These steel gauge blocks are available in the accuracy classes 0, 1 and 2 of ISO 3650. All gauge blocks have two coupling holes on both ends so that they can be coupled by means of a toggle clamp. Delivered with an inspection report.



907.707

Schut



907.741

Size/mm	Item No.	Price EUR	Item No.	Price EUR	Item No.	Price EUR
ISO 3650/2:						
125	907.728		ISO 3650/1:		ISO 3650/0:	
150	907.729		907.715	54.00	907.702	
175	907.730		907.716	80.00	907.703	
200	907.731		907.717	88.00	907.704	
250	907.732		907.718	101.00	907.705	
300	907.733		907.719	121.00	907.706	
400	907.734		907.720	173.00	907.707	
500	907.735		907.721	226.00	907.708	
600	907.736		907.722	317.00	907.709	
700	907.737		907.723	623.00	907.710	
800	907.738		907.724	662.00	907.711	
900	907.739		907.725	764.00	907.712	
1000	907.740		907.726	940.00	907.713	
			907.727	1,152.00	907.714	

Gauge block set consisting of 125, 150, 175, 200, 250, 300, 400 and 500 mm:
907.743 | 907.742 | 907.741

Gauge block set consisting of 600, 700, 800, 900 and 1000 mm:
907.746 | 907.745 | 907.744

0.5 to 10 = 30x9mm / 10.1 to 1000 = 35x9mm (DIN 861/ISO 3650)

Select long gauge blocks from 125 mm

These steel gauge blocks are available in the accuracy classes 0, 1 and 2 of ISO 3650, equal to DIN 861. The gauge blocks are delivered with an inspection report or on request with a DAKKS certificate, UKAS acknowledged. All gauge blocks have two coupling holes on both ends so that they can be coupled by means of a toggle clamp.



831.937

Schut

SELECT

Size/mm	Item No.	Price EUR	Item No.	Price EUR	Item No.	Price EUR
ISO 3650/2:						
125	831.019		ISO 3650/1:		ISO 3650/0:	
150	831.020		831.008	831.000	831.001	
175	831.021		831.009	831.009	831.002	
200	831.022		831.010	831.010	831.003	
250	831.023		831.011	831.011	831.004	
300	831.024		831.012	831.012	831.005	
400	831.025		831.013	831.013	831.006	
500	831.026		831.014	831.014	831.007	
600	831.027		831.015	831.015	831.008	
700	831.028		831.016	831.016	831.009	
800	831.029		831.017	831.017	831.010	
900	831.030		831.018	831.018	831.011	
1000	831.031				831.012	
Gauge block set consisting of 125, 150, 175, 200, 250, 300, 400 and 500 mm:						
	831.088		831.087		831.086	
Gauge block set consisting of 600, 700, 800, 900 and 1000 mm:						
	831.091		831.090		831.089	

Mitutoyo toggle clamp for long series gauge blocks

Toggle clamp for the coupling of gauge blocks over 100 mm which have coupling holes on both ends. Very quick assembly by means of spring clamping device (with locking screw).

Item No.	Description	Price EUR
619.031	Toggle clamp for long series gauge blocks	



0.5 to 10 = 30x9mm / 10.1 to 1000 = 35x9mm (DIN 861/ISO 3650)

Gauge block accessories

Various accessories to extract the resulting size of one or more gauge blocks outside or to convert it into an inside gauge. This also enables the creation of setting gauges and marking tools. These accessories considerably increase the applicability of standard gauge blocks.



907.204

907.210

907.209

907.202

907.207

907.213

907.211

907.212

Item No.	Description	Price EUR	Set		
			M8	M10	M12
Holder for gauge blocks:					
907.203	Up to 50 mm		•	•	•
907.204	Up to 100 mm		•	•	•
907.205	Up to 200 mm		•	•	•
Pair of measuring jaws, with measuring faces:					
907.206	Cylindrical ϕ 2 mm and flat ($l=40$ mm)		•	•	•
907.207	Cylindrical ϕ 5 mm and flat ($l=45$ mm)		•	•	•
907.208	Cylindrical ϕ 10 mm and flat ($l=70$ mm)		•	•	•
907.209	Flat ($l=100$ mm, $h=19$ mm)		•	•	•
907.213	V-shaped ($l=60$ mm, max. ϕ 60 mm)		•	•	•
907.210	Straight edge ($l=100$ mm)		•	•	•
907.211	Scriber ($l=45$ mm)		•	•	•
907.212	Center point ($l=45$ mm)		•	•	•
907.214	Base for holder ($h=25$ mm)		•	•	•
Accessory sets, delivered in a case:					
907.200	M8				
907.201	M10				
907.202	M12				

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Caliper inspection set

For checking the accuracy of DIN 862 calipers. The set consists of three special steel gauge blocks (30 mm, 41.3 mm and 131.4 mm, ISO 3650 class 1), two steel setting rings (ø4 mm and ø25 mm) and a pair of gloves.



Item No.	Description	Price EUR
909.347	Caliper inspection set	

Micrometer inspection sets

For the inspection of micrometers according to DIN 863. Suitable for micrometers with a measuring range up to 25 mm.

- Nominal sizes (mm): 2.5-5.1-7.7-10.3-12.9-15.0-17.6-20.2-22.8-25.0.
- Including plan parallel optical flat ø30 x 12 mm.



Item No.	Material	Grade	Price EUR
909.346	steel	1	
909.345	steel	0	
909.162	ceramic	1	
909.340	ceramic	0	

Gloves

Comfortable, smooth, lint-free gloves with universal, perfect fit. Ideal for handling gauge blocks and other measuring instruments.

- Perfect thermal isolation.
- Washing machine safe.



Item No.	Description	Price EUR
191.069	Pair of gloves	

Select microfibre cleaning cloth

Microfibre cleaning cloth for gauge blocks. Ideal for measuring rooms.

- Dimensions: 22.5 x 22.5 cm.



Item No.	Description	Price EUR
831.739	Microfibre cleaning cloth	

Angle gauge block set

Set of twelve hardened steel angle gauge blocks, comprising the angles 1/4° (15'), 1/2° (30'), 1°, 2°, 3°, 4°, 5°, 10°, 15°, 20°, 25° and 30°. A combination of angle gauge blocks is possible.

- Accuracy: ±30".
- Thickness gauge blocks: 6 mm.
- Delivery in a case with a manufacturer's certificate.



Item No.	Description
909.799	Angle gauge block set

Steel measuring balls

Set of steel measuring balls for measuring e.g. internal tapers. This set contains of a series of balls of different sizes, with two balls of each size.

- Accuracy: ±3 µm.
- Two balls of each size.
- Delivery in a plastic case with a manufacturer's certificate.



Item No.	Size mm	Incr. mm	Per size	Total number
909.647	1-25	1	2	50

Mitutoyo maintenance kit for steel gauge blocks

Contains all necessary requirements for the use, and maintenance, of steel gauge block.

The maintenance kit consists of:

- whetstone "Cerastone", 100 x 25 x 12 mm,
- pair of tweezers,
- dust remover,
- cleaning cloths,
- washleather,
- pipette bottle for solvent, 100 ml,
- pair of gloves,
- case.



Item No.	Description
516.650	Maintenance kit for steel gauge blocks

Mitutoyo micrometer inspection sets

These sets are composed for the inspection of micrometers according to DIN 863. Micrometers with a measuring range over 25 mm can be inspected if an extra gauge block of 25, 50 or 75 mm is used in addition to the gauge blocks in these sets. Each set consists of ten special gauge blocks and a plan parallel optical flat.

- Nominal sizes (mm): 2.5-5.1-7.7-10.3-12.9-15.0-17.6-20.2-22.8-25.0.
- Including plan parallel optical flat ø30 x 12 mm.

516.156

Item No.	Material	Grade
516.107	steel	1
516.106	steel	0
516.157	ceramic	1
516.156	ceramic	0



Mitutoyo caliper inspection set

For checking the accuracy of DIN 862 calipers.

The set consists of three special steel gauge blocks (30 mm, 41.3 mm and 131.4 mm, ISO 3650 class 1), two steel setting rings (ø4 mm and ø25 mm) and a pair of gloves.

- Delivery in a case with a manufacturer's certificate for the gauge blocks.

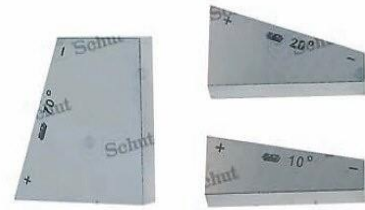


Item No.	Description
516.124	Caliper inspection set

Select steel angle gauge blocks

The gauge blocks are delivered with an inspection report or on request with a DAkkS certificate, UKAS acknowledged. Special sizes and sets are available on request.

- Angle gauge blocks: 10° to 80° available.
- Accuracy: ±2".
- Cross-section: 50 x 9 mm.
- Delivery in a case.
- Also available in sets.



Steel angle gauge blocks, per piece

Category	Angle	Item No.	Description
10° - 5°	10°, 30°, 1', 2', 3', 4', 5', 10', 20', 30', 40', 50', 1°, 2°, 3°, 4°, 5°	831.424	Angle gauge block 10°
10° - 15°	10°, 15°	831.441	Angle gauge block 10°
20° - 30°	20°, 30°	831.442	Angle gauge block 20°
40° - 80°	40°, 45°, 50°, 60°, 70°, 80°	831.443	Angle gauge block 40°

Schwenk carbide precision measuring balls

The carbide measuring balls are excellent wear-proof and corrosion resistant and are supplied in accuracy class 25. Suitable for various precision applications.

- Standard supplied: ø 1-26 mm, ø 1-12 mm, increment 0.5 mm, ø 13-26 mm, increment 1 mm. Other sizes and intermediate dimensions are available on request.
- Hardness: HV 1550 ± 50.
- On request available in ruby or ceramic version.



Optical flats

Optical flats can be used for inspection of the flatness of reflecting surfaces of for example gauge blocks, settings gauges and other lapped surfaces by optical interference.

- Flatness measuring faces: $\leq 0.15 \mu\text{m}$.
- Parallelism measuring faces: $\leq 0.3 \mu\text{m}$ (only 826.630/631/632/633/634).

- On request with a DAkkS certificate, UKAS acknowledged.
- Delivery in a case.



Item No.	Diameter mm	Thickness mm
Single optical flats, single face:		
826.625	30	15
826.626	45	15
826.627	50	20
826.628	60	20
826.629	75	20
Single optical flats, double face:		
826.630	30	12
826.631	45	15
826.632	50	20
826.633	60	20
826.634	75	20



Plan parallel optical flats

Plan parallel optical flats can be used for inspection of the parallelism of measuring surfaces of micrometers and other measuring instruments. Each set consists of 4 sizes plan parallel optical flats for inspection of micrometers on every fourth rotation of the spindle.

- For micrometers with a spindle pitch of 0.5 mm.

- Sets for micrometers with a measuring range of 0-25 mm, 25-50 mm, 50-75 mm and 75-100 mm.
- Flatness measuring faces: $\leq 0.15 \mu\text{m}$.
- Parallelism measuring faces: $\leq 0.3 \mu\text{m}$.
- Diameter: 30 mm.
- On request with a DAkkS certificate, UKAS acknowledged.
- Delivery in a case.



Item No.	Thicknesses/mm
826.635	12.00/12.12/12.25/12.37
826.636	25.00/25.12/25.25/25.37
907.909	50.00/50.12/50.25/50.37
907.910	75.00/75.12/75.25/75.37

TESA optical flats

For examining flatness and wringability of gauge blocks.

- Delivery in a case with a declaration of conformity.

Item No.	Diameter mm	Thickness mm	Flatness deviation/ μm
780.386	50	15	0.125
780.387	75	20	0.125



TESA plan parallel optical flats

For examining deviations in flatness and parallelism of the measuring faces of micrometers and other similar instruments.

- Max. flatness deviation:
12.00-27.335 mm: 0.15 μm .
52.00-77.335 mm: 0.2 μm .
- Max. parallelism deviation:
12.00-27.335 mm: 0.4 μm .
52.00-77.335 mm: 0.5 μm .
- Diameter: 31 mm.
- Delivery of the sets in a case with a declaration of conformity.

Item No.	Thicknesses/mm
Sets:	
780.352	12.00-12.375 (4 pcs.)
780.357	27.00-27.335 (3 pcs.)
780.361	52.00-52.335 (3 pcs.)
780.365	77.00-77.335 (3 pcs.)
780.353	12.00
780.358	27.00



How to use an optical flat

Interference fringes appear in monochromatic light when the optical flat is laid on and wiggled against the surface to be tested. The difference in height between adjacent fringes corresponds to an error in flatness of approx. 0.3 μm .

In the event of a constant distance between the interference fringes, the angle between the measuring face of the optical flat and the surface to be tested is constant (fig. 1).

However, interference fringes do not usually have an even interspacing. When the fringes are close together the angle between the measuring face and the surface to be tested is either convex (fig. 2) or concave (fig. 3). The deviation in flatness can be "measured" by counting the interference fringes.

