

**Mechanische Tastarm-Messuhr zur
Innenmessung**

Dial Caliper for Inside Measurement

Palpeurs intérieurs mécaniques

**Calibrados rápidos para mediciones
Interiores**

**Comparatore a bracci tastatori
per interni**

BA9393M

**Bedienungsanleitung
User's Manual
Mode d'emploi
Manual de instrucciones
Manuale d'uso**

Lesen Sie diese Bedienungsanleitung vor der Inbetriebnahme
sorgfältig durch und bewahren Sie sie griffbereit auf.
Read this User's Manual thoroughly before operating the
instrument. Retain it close at hand for future reference.

Mitutoyo

Inhaltsverzeichnis

Einführung	3
Lieferumfang	3
Kurzübersicht	4
Handhabung des Gerätes beim Messen	4
Ermittlung des Minimal – Maßes	5
Ermittlung des Maximal – Maßes	5
Anzeige – Korrektur	5
Toleranzmarken	6
Zubehör	6
Technische Daten (mm + inch Geräte)	23

Einführung

Wir danken Ihnen für das uns mit dem Kauf dieses Produktes entgegengebrachte Vertrauen. Ihr Messgerät ist aus Präzisionsteilen hergestellt und sorgfältig kalibriert.

Versuchen Sie deshalb nie, das Gerät zu zerlegen, oder irgendwelche Verstellungen innerhalb des Gerätes vorzunehmen. Nehmen sie keine Modifizierung der Tastarme vor. Lassen Sie das Gerät nicht fallen und setzen Sie es keinen starken Stößen aus. Schützen Sie das Gerät stets vor hohen Temperaturen, hoher Luftfeuchtigkeit, Staub und Schmutz.

Bringen Sie das Gerät vor der Messung stets auf die vorgeschriebene Betriebstemperatur von $20 \pm 10^{\circ}\text{C}$.

Das Messgerät dient zur Ermittlung von Innenmaßen, speziell Nutdurchmessern. Es darf nur zu diesem Zweck verwendet werden. Für Schäden, die durch artfremde Nutzung entstehen, wird keine Haftung übernommen.

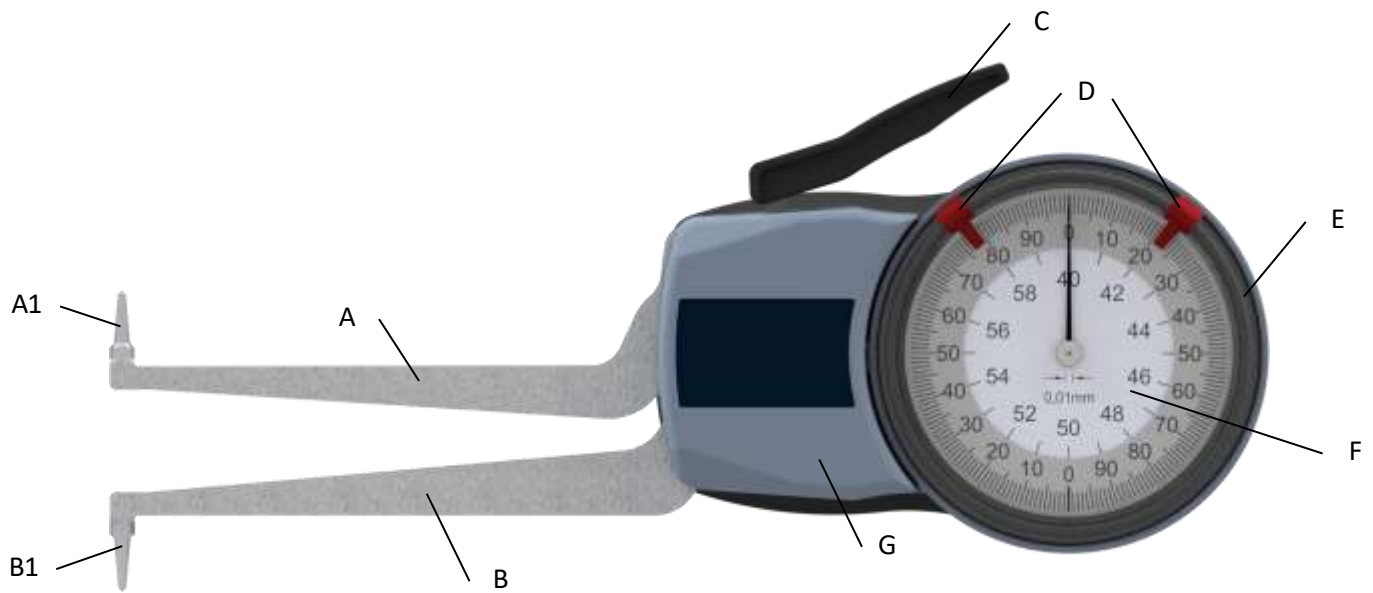


Um den größten Nutzen aus diesem Messgerät zu ziehen, sollten Sie vor der Inbetriebnahme unbedingt zuerst die Bedienungsanleitung lesen und diese griffbereit aufbewahren.

Lieferumfang

- Messgerät
- Bedienungsanleitung
- Prüfzertifikat

Kurzübersicht



- A beweglicher Tastarm
- A1 Messkontakt
- B fester Tastarm
- B1 Messkontakt
- C Tastarmbetätigung
- D Toleranzmarken
- E drehbare Fassung mit Skalenring
- F Skalenscheibe
- G Gehäuse – Deckel

Handhabung des Gerätes beim Messen

Drücken Sie die Tastarmbetätigung (C) vollständig und bringen Sie das Messgerät in Messstellung.



Schonen Sie die Messkontakte (A1+B1) und den beweglich Tastarm (A), indem Sie das Messgerät möglichst ohne Berührung des Prüflings in Messstellung bringen.

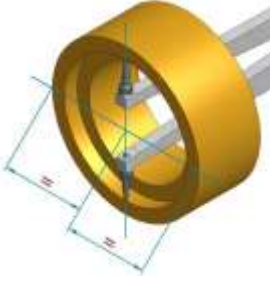
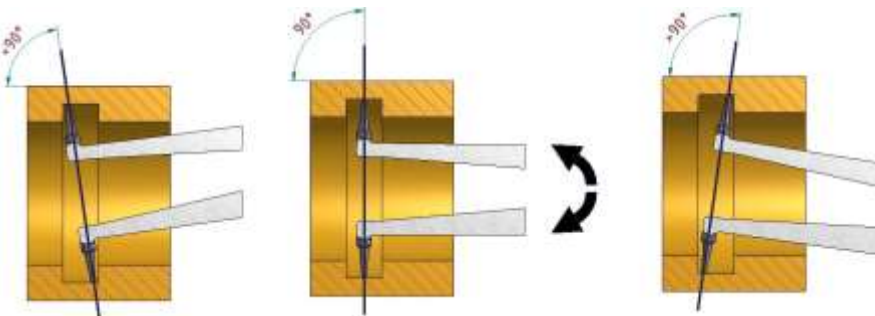
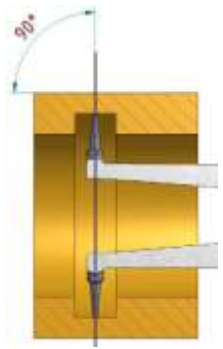
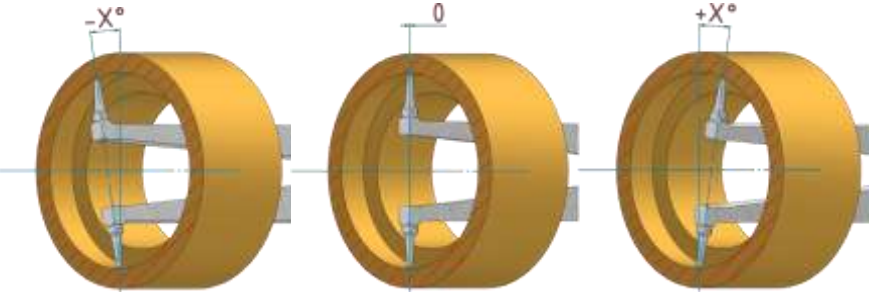
Halten Sie das Messgerät während der Messung locker und lassen Sie die Tastarmbetätigung (C) los.

Durch Schwenken oder Verschieben des Gerätes wird das richtige Prüfmaß ermittelt. Hierbei muss der maximale oder minimale Zeigerausschlag beobachtet werden.



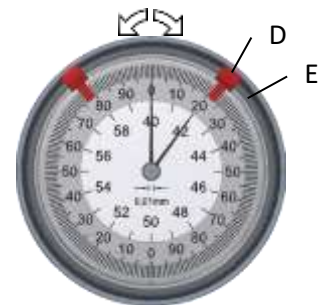
Vor jeder Messreihe ist das Gerät durch eine Vergleichsmessung mit einem entsprechenden Einstellring zu überprüfen (→Anzeige – Korrektur).

Handhabung des Gerätes beim Messen

<p>Voraussetzung: Die Messachse muss zentral zur Bohrung sein!</p> 	<p>Ermittlung des Minimal – Maßes durch vertikales Schwenken des Gerätes (optimale Messung).</p>  <p>Messwert zu groß Messwert richtig Messwert zu groß</p>
<p>Voraussetzung: Die Messachse muss senkrecht zur Bohrung sein!</p> 	<p>Ermittlung des Maximal – Maßes bei schmalen Nuten durch radiales Schwenken des Gerätes, wenn ein vertikales Schwenken nicht möglich ist.</p>  <p>Messwert zu klein Messwert richtig Messwert zu klein</p>

Anzeige – Korrektur

Vor jeder Messreihe ist das Gerät durch eine Vergleichsmessung mit einem entsprechenden Lehrring zu überprüfen.
Bei einer Abweichung vom Sollmaß korrigieren Sie die Anzeige, mit Hilfe der drehbaren Fassung mit Skaleningen (E).
Führen Sie so lange weitere Korrekturen durch, bis das Sollmaß erreicht ist.



Zur Erhöhung der Meßgenauigkeit sollte das Gerät in der Lage korrigiert werden, in der auch anschließend die Messung vorgenommen wird.

Toleranzmarken

Durch Verschieben der beiden Toleranzmarken (D) auf der Fassung (E) kann ein zulässiger Toleranzbereich eingestellt werden. Hierdurch ist ein schnelles Überprüfen eines Teiles auf Maßhaltigkeit gewährleistet.

Zubehör nur für Geräte mit Nr.: 209-3..



011530
Stativ – Halterung

Table of contents

Introduction	7
Scope of supply	7
The gage at a glance	8
Handling during measurement	8
Determining of the minimum value.....	9
Determining of the maximum value	9
Display adjustment	9
Tolerance marks	10
Accessories	10
Technical data (mm + inch gages)	23

Introduction

We thank you very much for your confidence in purchasing this product.

This measuring gage is manufactured with high precision parts and carefully assembled.

Therefore never try to disassemble or change any of the interior parts of this gage.

Do not modify the measuring arms. Do not drop or shock this gage.

Protect gage against high temperature, humidity, dust and dirt.

For a better accuracy and repeatability this gage should be used within an operating temperature of 20 +/-10°C.

This gage is used to measure internal diameters, especially groove diameters. It should only be used for this purpose. Mitutoyo assumes no responsibility for damages caused by mishandling.

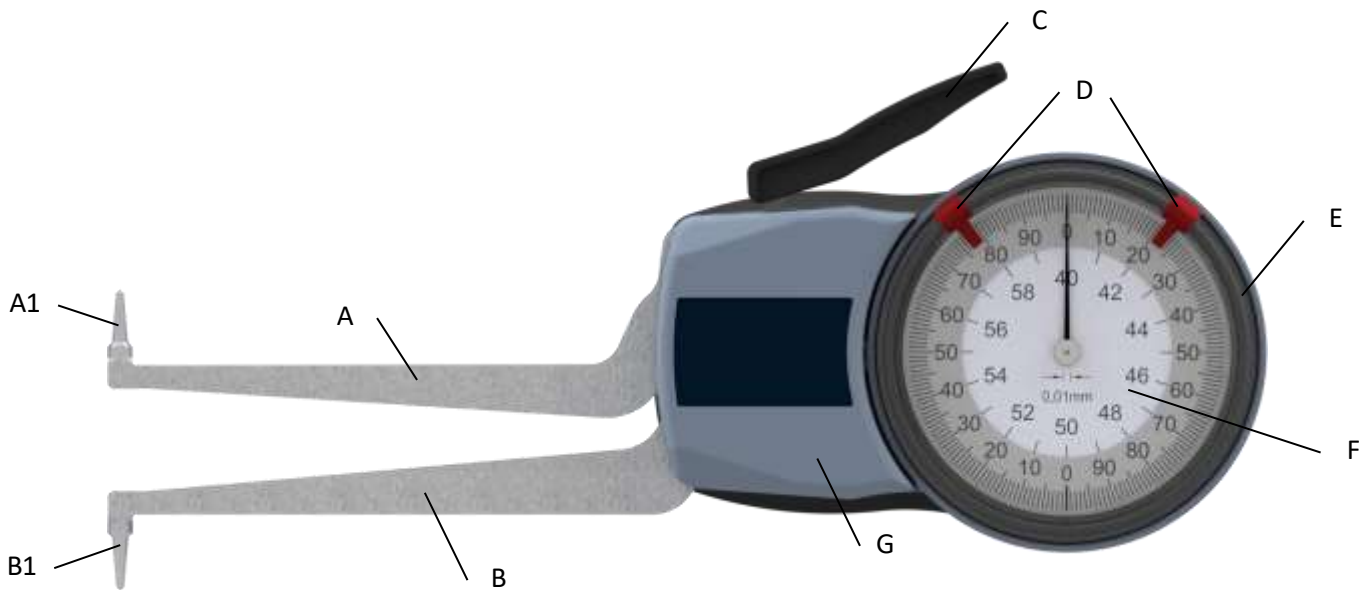


In order to achieve the best use of this measuring instrument it is most important that you first read the operating instructions and have it ready to hand.

Scope of supply

- Measuring gage
- Operating instructions
- Certificate of quality

The gage at a glance



- A Movable measuring arm
- A1 Measuring contact
- B Fixed measuring arm
- B1 Measuring contact
- C Operating lever
- D Tolerance marks
- E Rotating outer dial
- F Inner dial
- G Cover

Handling during measurement

Press the operating lever (C) of the caliper arm completely downwards and bring the gage into the measuring position.



Please be careful with the measuring contacts (A1+B1) and the movable caliper arm (A) and try to locate the gage in the measuring position without touching the workpiece.

Hold the gage loose during measurement and release the operating lever (C). To determine the correct measuring value, please pivot or displace the gage and take the minimum or maximum deflection of the pointer.

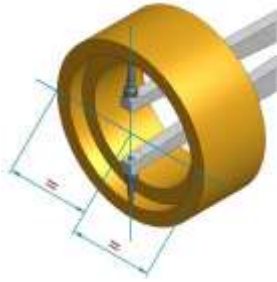


Please check the instrument via comparison measurement with a setting ring each time before starting a new measurement series (→ Display adjustment).

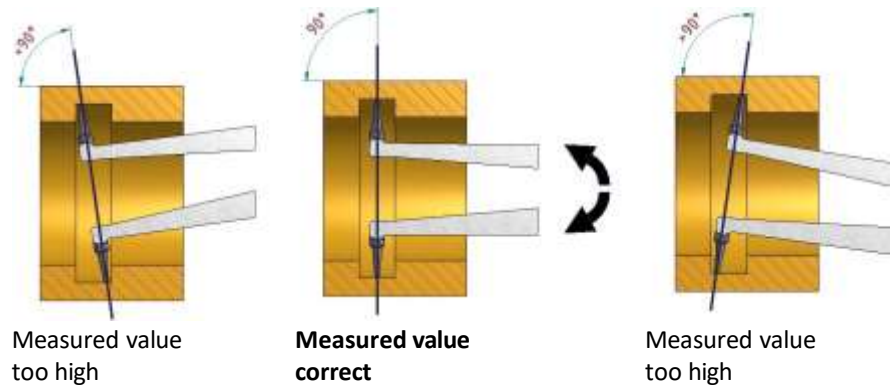
Handling during measurement

Important:

The measuring axis must be in central position to the bore!

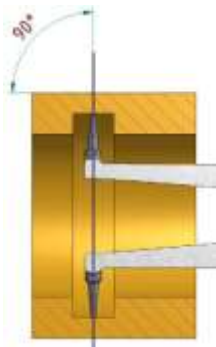


Determination of the **minimum measuring value** via pivoting the gage.

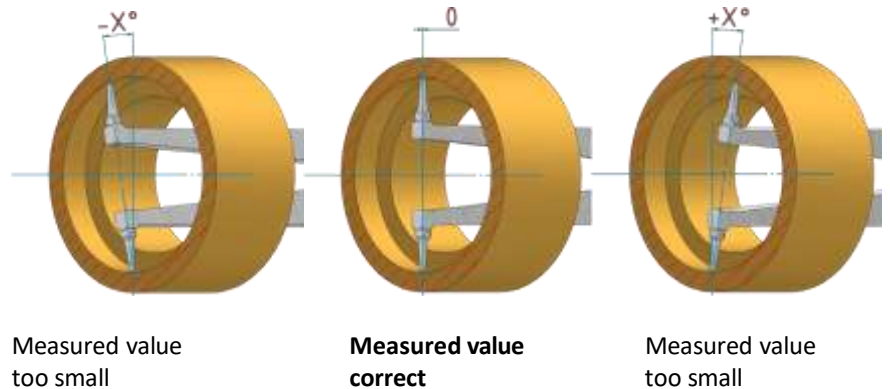


Important:

The measuring axis must be in vertical position to the bore!



Determination of the **maximum measuring value** for measurement of narrow grooves via radial pivoting of the gage, where the gage cannot be pivoted vertically.

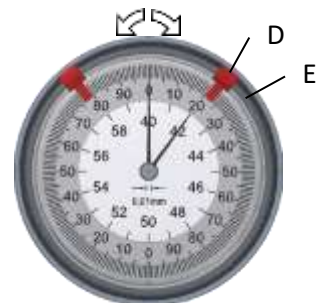


Display adjustment

The gage should be verified before each series of measurements by using a setting ring.

If there is a deviation from the specified measurement the device should be adjusted by using the rotating scale (E).

The measurements have to be repeated until the gage is correctly adjusted.



In order to increase the accuracy of the measurement, the gage should be adjusted in the same position in which later the measurement will be effected.

Tolerance marks

The gage provides tolerance marks (D) that can be set to an acceptable tolerance range which allows a quick measurement reading.

Accessories only for gages with No.: 209-3..



011530
Holding unit

Sommaire

Introduction	11
Livraison	11
Vue d'ensemble	12
Manipulation de l'appareil lors de la mesure	12
Saisie de la valeur minimale.....	13
Saisie de la valeur maximale	13
Affichage – Correction	13
Marques de tolérance	14
Accessoires	14
Données techniques (appareils en mm + pouces)	23

Introduction

Nous vous remercions pour la confiance que vous nous avez accordée en achetant cet appareil. Votre appareil de mesure a été fabriqué avec des pièces de haute précision et a été soigneusement calibré.

N'essayez donc jamais ni de le démonter ni d'effectuer quels réglages que ce soit à l'intérieur de l'appareil. N'effectuez aucune modification des bras de mesure. Ne laissez pas tomber l'appareil et ne le soumettez pas à des chocs violents. Protégez toujours l'appareil contre des températures et une humidité atmosphérique élevés ainsi que contre la poussière et la saleté.

Avant la mesure, portez toujours l'appareil à la température d'exploitation prescrite de $20 \pm 10^{\circ}\text{C}$.

Cet appareil de mesure a été conçu pour la saisie de dimensions intérieures, spécialement de diamètres de rainures. Utilisez-le seulement dans ce but. Toute garantie est exclue en cas d'utilisation inadéquate de l'appareil.

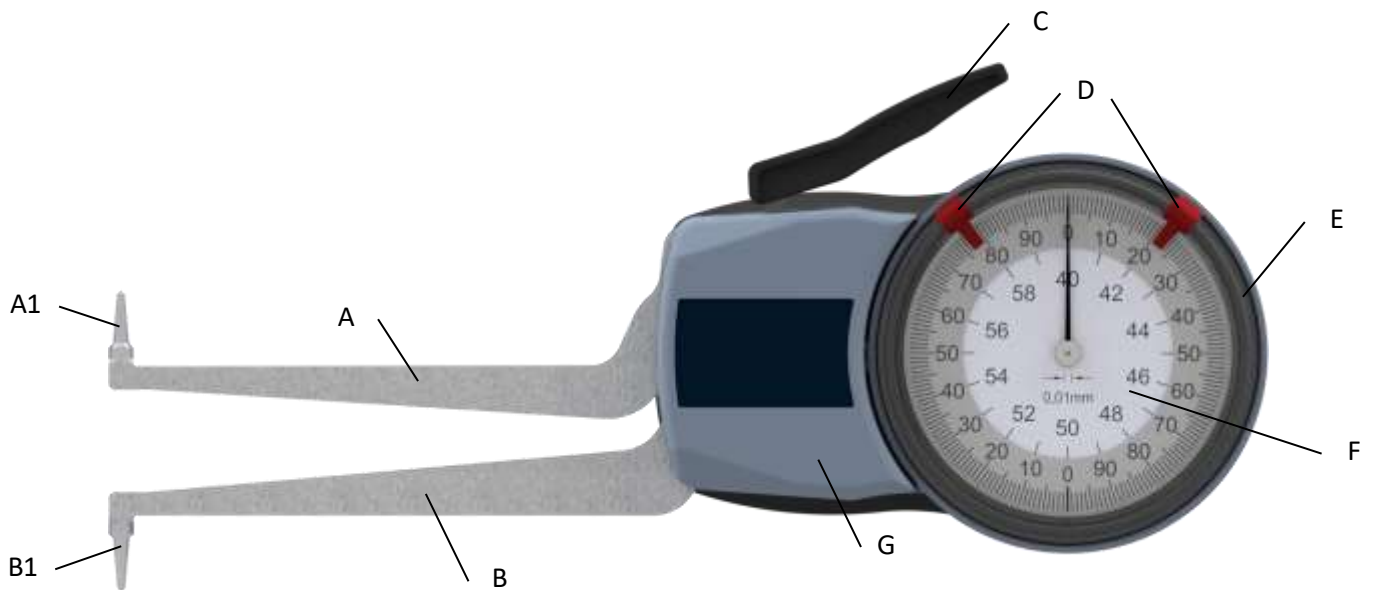


Afin de profiter pleinement de cet appareil, il est impératif d'en lire auparavant le mode d'emploi que vous devez toujours garder à portée de main.

Livraison

- Appareil de mesure
- Mode d'emploi
- Certificat de contrôle

Vue d'ensemble



- A Bras de mesure mobile
- A1 Touche de mesure
- B Bras de mesure fixe
- B1 Touche de mesure
- C Levier de commande du bras
- D Marques de tolérance
- E Cadre rotatif avec anneau gradué
- F Cadran
- G Couvercle – Corps

Manipulation de l'appareil lors de la mesure

Appuyez à fond le levier de commande du bras (C) et placez le palpeur en position de mesure.



Ménagez les touches de mesure (A1+B1) et le bras de mesure mobile (A) en plaçant si possible l'appareil en position de mesure sans le mettre en contact avec la pièce à mesurer.

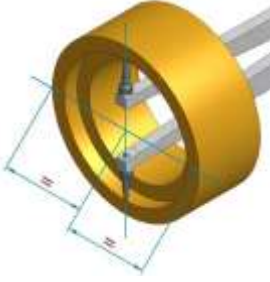
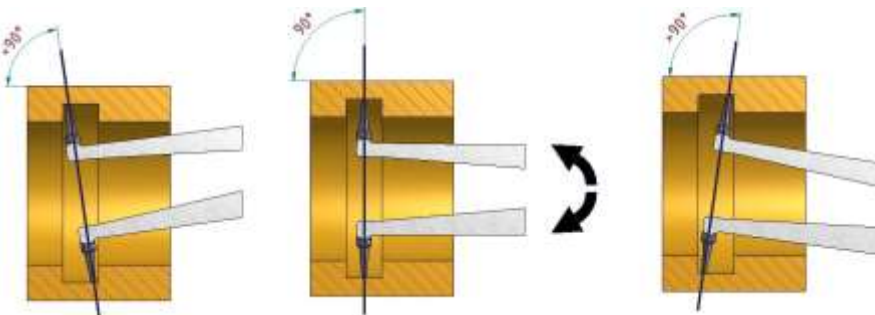
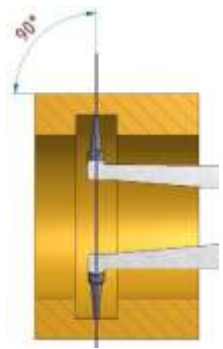
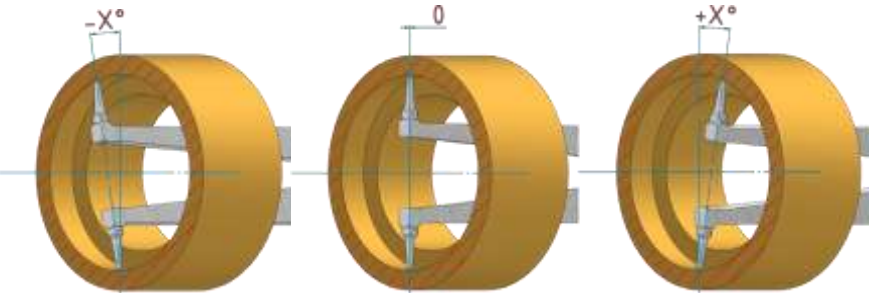
Pendant la mesure, n'exercez pas de pression sur l'appareil et relâchez le levier de commande du bras (C).

La mesure est effectuée en pivotant ou en déplaçant l'appareil. Ce faisant, observez la déviation maximale ou minimale de l'aiguille.



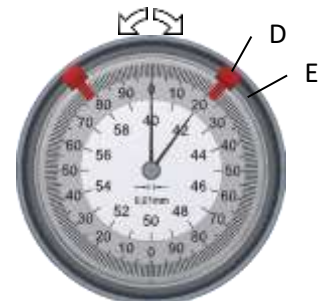
Avant chaque série de mesures, contrôlez l'appareil à l'aide d'une jauge correspondante (→Affichage – Correction).

Manipulation de l'appareil lors de la mesure

<p>Condition: L'axe de mesure doit être centré par rapport à l'alésage!</p> 	<p>Saisie de la valeur minimale par pivotement vertical de l'appareil (mesure optimale).</p>  <p>Mesure trop élevée Mesure correcte Mesure trop élevée</p>
<p>Condition: L'axe de mesure doit être vertical par rapport à l'alésage!</p> 	<p>Saisie de la valeur maximale pour des rainures étroites par pivotement radial l'appareil si un pivotement vertical n'est pas possible.</p>  <p>Mesure trop petite Mesure correcte Mesure trop petite</p>

Affichage – Correction

Avant chaque série de mesures, l'appareil doit être contrôlé à l'aide d'une jauge correspondante.
En cas de divergence par rapport à la valeur de consigne, rectifiez l'affichage à l'aide du cadre rotatif avec anneau gradué (E). Effectuez d'autres rectifications jusqu'à ce que la valeur de consigne soit atteinte.



Pour augmenter la précision de mesure, l'appareil doit être rectifié dans la position dans laquelle la mesure sera ensuite effectuée.

Marques de tolérance

Une plage de tolérance admissible peut être réglée en déplaçant les deux marques de tolérance (D) sur le cadre (E). Un contrôle rapide du respect des dimensions prescrites d'une pièce peut ainsi être effectué.

Accessoires seulement pour appareils avec numéro 209-3..



011530
set de fixation complet

Índice

Introducción	15
Material de entrega	15
Breve descripción	16
Manejo de los aparatos durante la medición	16
Determinar medida mínima.....	17
Determinar medida máxima	17
Corrección de indicación	17
Marcas de tolerancia	18
Accesorios	18
Características técnicas (aparatos mm + inch)	23

Introducción

Su aparato de medición esta fabricado con piezas de precisión y calibrado.

Por lo tanto no traten nunca de desmontar el aparato o de hacer algunos ajustes.

No modifiquen de ninguna manera los brazos del aparato.

No dejen caer el aparato y no lo golpeen.

Protejan el aparato de altas temperaturas, alta humedad atmosférica, polvo y suciedad.

Conecte el aparato antes de la medición siempre en la temperatura requerida de $20 \pm 10^{\circ}\text{C}$.

El aparato sirve para determinar mediciones interiores, especialmente para diámetros de ranuras. Debe de usarse únicamente para este fin.

No se asume ninguna responsabilidad por daños causados de un uso indebido.

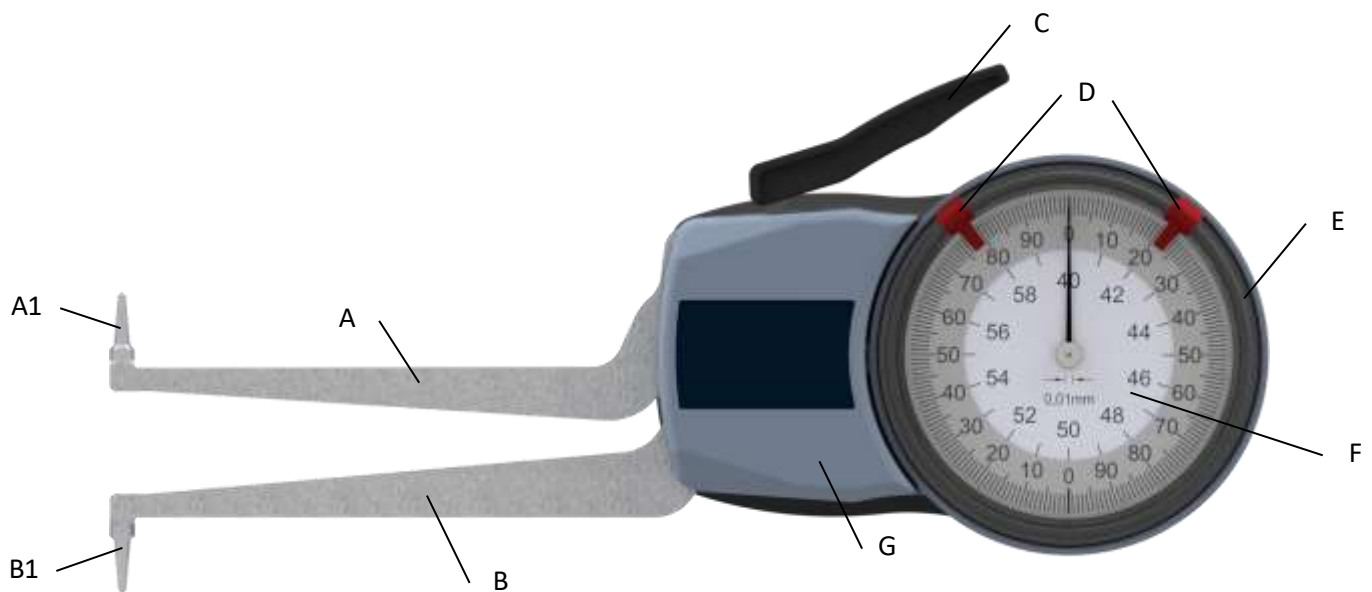


Para aprovechar al máximo las ventajas de este dispositivo de medición, debería de leer antes de la puesta en marcha el manual de instrucciones y tenerlo siempre a mano.

Material de entrega

- Aparato de medición
- Manual de instrucciones
- Certificación de ensayo

Breve descripción



- A brazo palpador móvil
- A1 contacto de medición
- B brazo palpador fijo
- B1 contacto de medición
- C accionamiento de el brazo palpador
- D marcas de tolerancia
- E escala giratoria con anillo graduado
- F cuadrante
- G Carcasa - tapa

Manejo de los aparatos durante la medición

Pulse el accionamiento de el brazo palpador (C) al máximo y pongan el aparato en el punto de medición.



Para no forzar los contactos de medición (A1+B1) y el brazo móvil (A), evitar tocar el objeto con el brazo móvil antes de la medición.

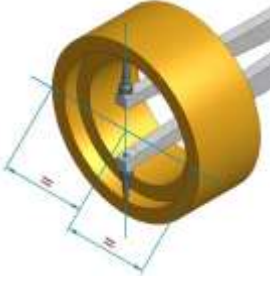
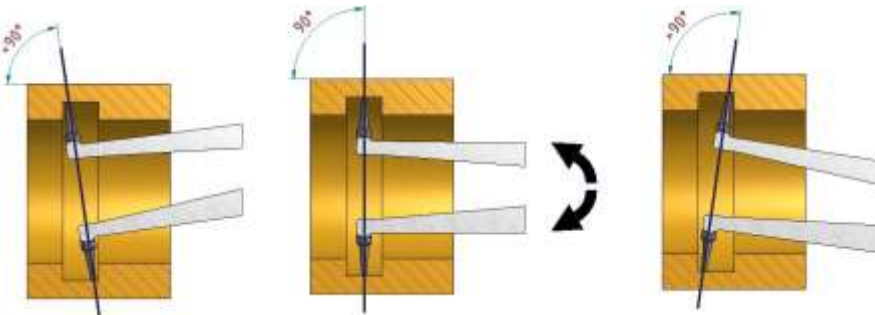
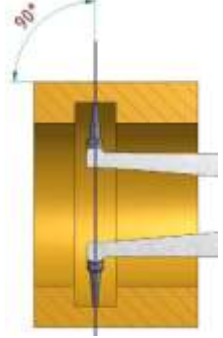
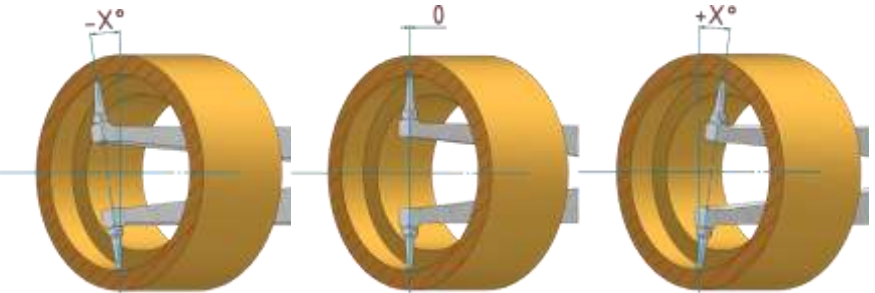
Mantenga suelto el instrumento libre durante la medición, soltar la palanca de accionamiento del brazo móvil (C).

Girando o desplazando el aparato se determina la medida de comprobación. Aquí hay que tener en cuenta el movimiento de la aguja al mínimo y máximo.



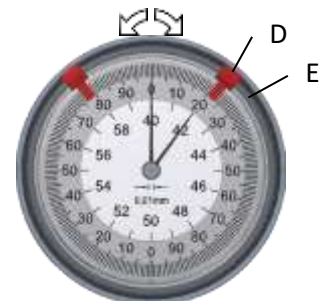
Antes de empezar una nueva serie de mediciones, hay que verificar el instrumento con ayuda de un anillo de calibre (→ Corrección de indicación).

Manejo de los aparatos durante la medición

<p>Condición: El eje de medición tiene que estar central hacia el taladro !</p> 	<p>Determinar medida mínima mediante movimiento vertical del aparato (medición óptima).</p>  <p>Valor de medición es demasiado grande Valor de medición es correcto Valor de medición es demasiado grande</p>
<p>Condición: El eje de medición tiene que estar vertical hacia el taladro !</p> 	<p>Determinar medida máxima en ranuras estrechas mediante el giro radial del aparato si no hay posibilidad de realizar un movimiento vertical.</p>  <p>Valor de medición es demasiado pequeño Valor de medición es correcto Valor de medición es demasiado pequeño</p>

Corrección de indicación

Comprobar el aparato antes de cada medición con un anillo de calibre.
Si tiene una desviación de la dimensión de base se tiene que regular con ayuda del engaste giratorio con anillo escala (E)
Sigán realizando las correcciones oportunas hasta que logren la dimensión de base.



Para aumentar la exactitud de medición se debe realizar las correcciones del aparato en la misma posición que se va a realizar la medición.

Marcas de tolerancia

Desplazando las dos marcas de tolerancia (D) en el engaste (E) se puede ajustar el margen de tolerancia permitido. Esto es una comprobación rápida para garantizar la precisión.

Accesorios sólo para aparatos con número: 209-3..



011530
soporte completo

Indice

Introduzione	19
Materiale fornito	19
Breve descrizione	20
Uso corretto dello strumento durante la misurazione	21
Rilevamento della quota minima	21
Rilevamento della quota massima	21
Correzione dell'indicazione	21
Marcatori di tolleranza	22
Accessori	22
Dati tecnici (strumenti mm + inch)	23

Introduzione

Siamo grati per la fiducia accordataci con l'acquisto di questo prodotto. Lo strumento di misura è realizzato con componenti di precisione e calibrato accuratamente.

Pertanto non tentare in alcun caso di smontare lo strumento o di eseguire alcuna regolazione al suo interno. Non modificare la posizione dei bracci di tastatura. Evitare che lo strumento cada e non esporlo a forti urti.

Tenere sempre lo strumento lontano da temperature molto alte, forte umidità e polvere.

Prima della misurazione portare sempre lo strumento alla temperatura di esercizio prescritta di $20 \pm 10^{\circ}\text{C}$.

Lo strumento serve per rilevare quote interne, specialmente diametri di scanalature. Deve essere usato solo per tale scopo. Non si assumono responsabilità per danni derivanti da un uso improprio.

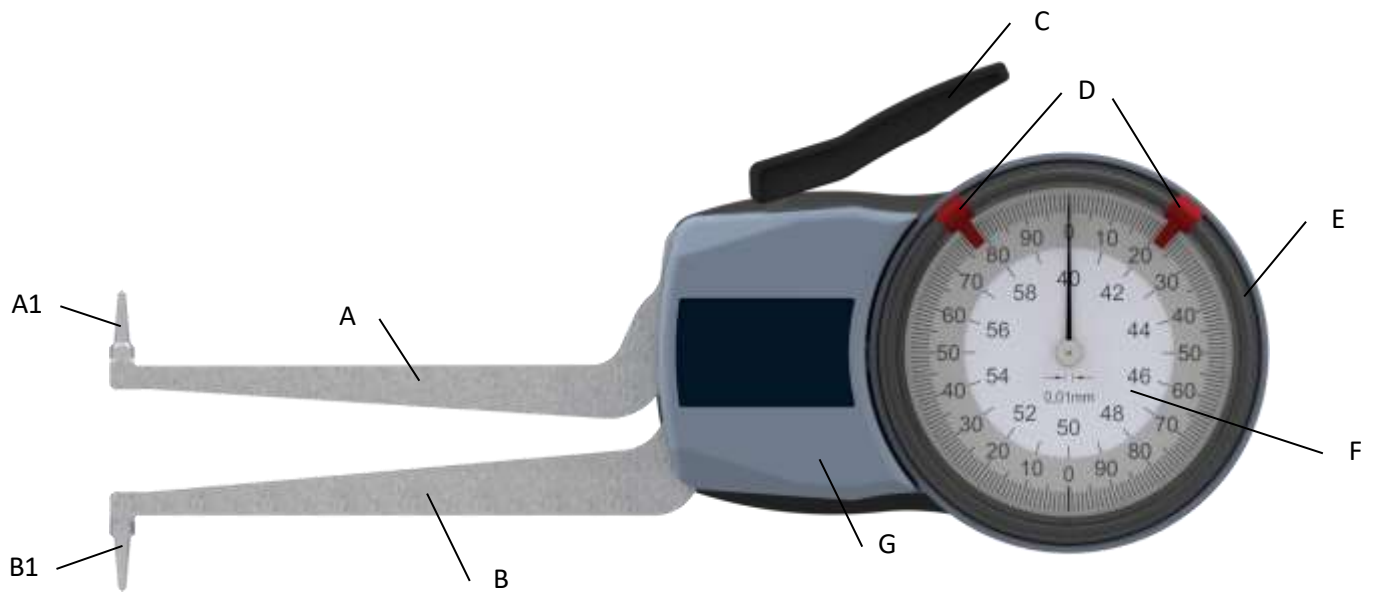


Per sfruttare al massimo le prestazioni dello strumento, il manuale d'uso dovrebbe essere letto prima della messa in funzione e tenuto a portata di mano.

Materiale fornito

- Strumento di misura
- Manuale d'uso
- Certificato di controllo

Breve descrizione



- A Braccio di tastatura mobile
- A1 Contatto di misura
- B Braccio di tastatura fisso
- B1 Contatto di misura
- C Leva di azionamento
- D Marcatori di tolleranza
- E Ghiera mobile con anello scala
- F Indicatore scala
- G Copertura di protezione

Uso corretto dello strumento durante la misurazione

Premere a fondo la leva di azionamento (C) e portare lo strumento in posizione di misurazione.



Per evitare di usurare i contatti di misura (A1+B1) e il braccio di tastatura mobile portare possibilmente lo strumento in posizione di misurazione senza toccare il pezzo in prova.

Durante la misurazione impugnare delicatamente lo strumento e rilasciare la leva di azionamento (C).

La misura corretta viene rilevata orientando o spostando lo strumento. In tale circostanza si deve osservare la deviazione massima o minima dell'indice.

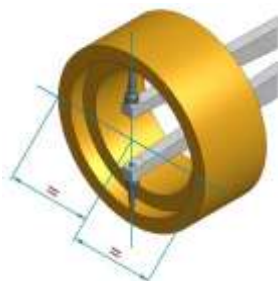


Prima di ogni serie di misure azzerare lo strumento mediante l'uso di un anello di riscontro adatto (--> Correzione dell'indicazione).

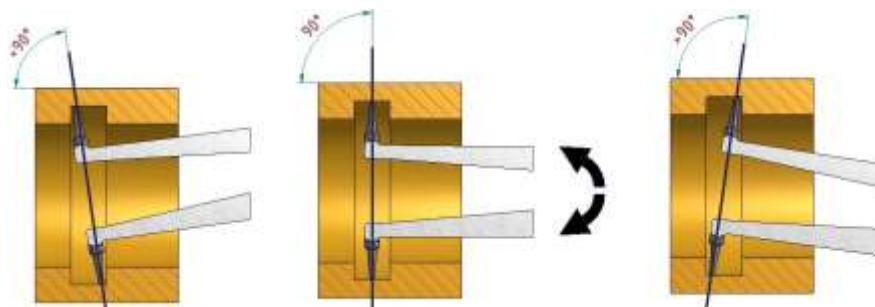
Uso corretto dello strumento durante la misurazione

Presupposto:

L'asse di misurazione deve essere centrale rispetto al foro!



Rilevamento della **Quota minima** orientando verticalmente lo strumento (misurazione ottimale).



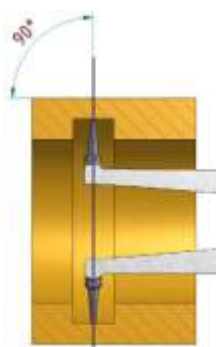
Valor de medición es demasiado grande

Valor de medición es correcto

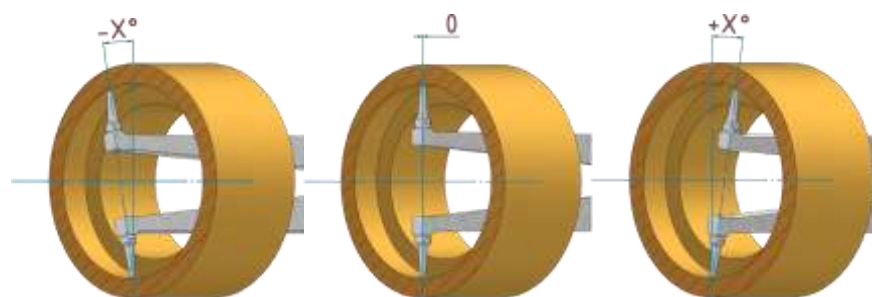
Valor de medición es demasiado grande

Presupposto:

L'asse di misurazione deve essere ortogonale rispetto al foro!



Rilevamento della Quota massima in caso di scanalature strette mediante rotazione radiale lo strumento, se non è possibile la rotazione verticale.



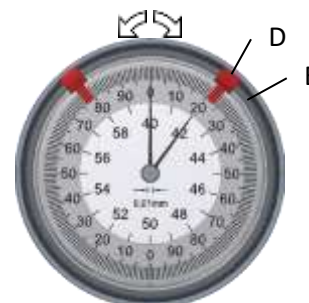
Valore misurato troppo piccolo

Valore misurato corretto

Valore misurato troppo piccolo

Correzione dell'indicazione

Prima di ogni serie di misure si deve controllare lo strumento mediante una misurazione di confronto con un anello di riscontro adatto. In caso di scostamento dalla quota nominale, correggere l'indicazione con l'ausilio della ghiera mobile con anello scala (E). Eseguire ulteriori correzioni fino a quando la quota nominale viene raggiunta.



Per aumentare la precisione della misura, lo strumento dovrebbe essere regolato nella stessa posizione in cui successivamente viene eseguita la misurazione.

Marcatori di tolleranza

Spostando i due marcatori di tolleranza (D) sulla ghiera (E) si può impostare un intervallo di tolleranza ammesso. Ciò garantisce un rapido controllo della corrispondenza dimensionale di un pezzo.

Accessori solo per strumenti con Nr.: 209-3..



011530
supporto

Technical Data

Internal measuring gages	mm	209-300	209-301	209-302	209-303	209-304	209-305	209-306	209-307	209-308	209-309
Measuring range	[mm]	2,5 – 12,5	5 – 15	10 – 30	20 – 40	30 – 50	40 – 60	50 – 70	60 – 80	70 – 90	80 – 100
Scale interval	[mm]	0,005	0,005	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Max. permissible errors „G“	[mm]	0,015	0,015	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
Repeatability limit „r“	[mm]	0,005	0,005	0,01	0,01	0,01	0,01	0,01	0,01	0,01	0,01
Measuring force	[N]	0,8 – 1,2	0,8 – 1,2	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6
Type of measuring contact	[mm]	Chisel-R 0,1	Ball \varnothing 0,6	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1
Internal measuring gages	inch	209-350	209-351	209-352	209-354	209-355	209-356	209-357	209-358	209-359	209-360
Measuring range	[inch]	.10 – .50	.20 – .60	.40–1.20	.80–1.60	1.20–2.00	1,60–2.40	2.00–2.80	2.40–3.20	2.80–3.60	3.20–4.00
Scale interval	[inch]	.0002	.0002	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005
Max. permissible errors „G“	[inch]	.0008	.0008	.0015	.0015	.0015	.0015	.0015	.0015	.0015	.0015
Repeatability limit „r“	[inch]	.0002	.0002	.0005	.0005	.0005	.0005	.0005	.0005	.0005	.0005
Measuring force	[N]	0,8 – 1,2	0,8 – 1,2	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6
Type of measuring contact	[inch]	Chisel-R .004	Ball \varnothing .024	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04
Reference temperature	[°C]	20									
Working temperature	[°C]	+10 to +30									
Storage temperature	[°C]	-10 to +50									
Protection class		IP 65									

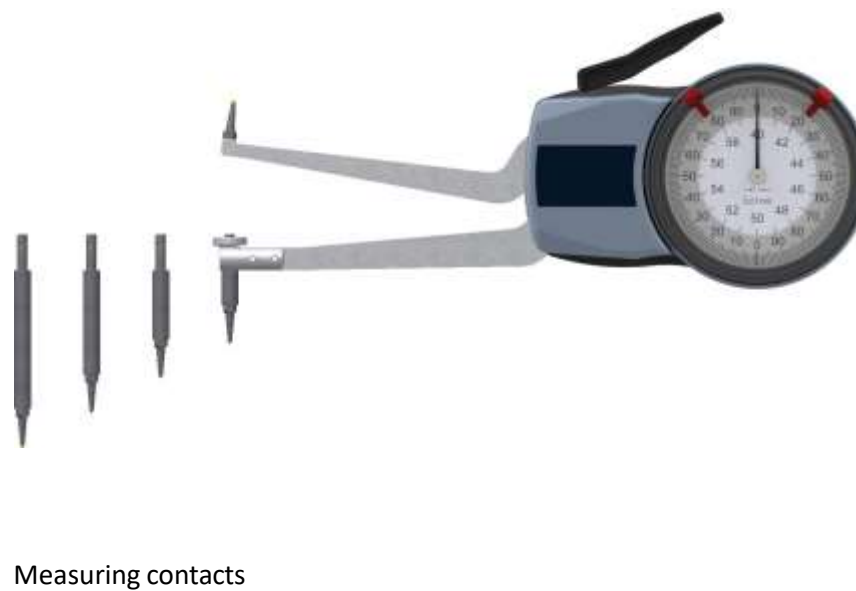
Technical data sheets for each gage are available at www.mitutoyo.eu

All gages are available in digital with interfaces and IP67!

Factory setting is checked subject to VDI/VDE/DGQ 2618 Part 13.1

Technical Data

Internal measuring gages	mm	209-310	209-311	209-312
Measuring range	[mm]	50 - 100	90 - 140	130 - 180
Scale interval	[mm]	0,01	0,01	0,01
Max. permissible errors „G“	[mm]	0,03	0,03	0,03
Repeatability limit „r“	[mm]	0,015	0,015	0,015
Measuring force	[N]	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6
Type of measuring contact	[mm]	Ball \varnothing 1	Ball \varnothing 1	Ball \varnothing 1
Internal measuring gages	inch	209-361	209-362	209-363
Measuring range	[inch]	2.00–4.00	3.60–5.60	5.20–7.20
Scale interval	[inch]	.0005	.0005	.0005
Max. permissible errors „G“	[inch]	.0015	.0015	.0015
Repeatability limit „r“	[inch]	.001	.001	.001
Measuring force	[N]	1,1 – 1,6	1,1 – 1,6	1,1 – 1,6
Type of measuring contact	[inch]	Ball \varnothing .04	Ball \varnothing .04	Ball \varnothing .04
Reference temperature	[°C]	20		
Working temperature	[°C]	+10 to +30		
Storage temperature	[°C]	-10 to +50		
Protection class		IP 65		



Technical data sheets for each gage are available at www.mitutoyo.eu

Factory setting is checked subject to VDI/VDE/DGQ 2618 Part 13.1

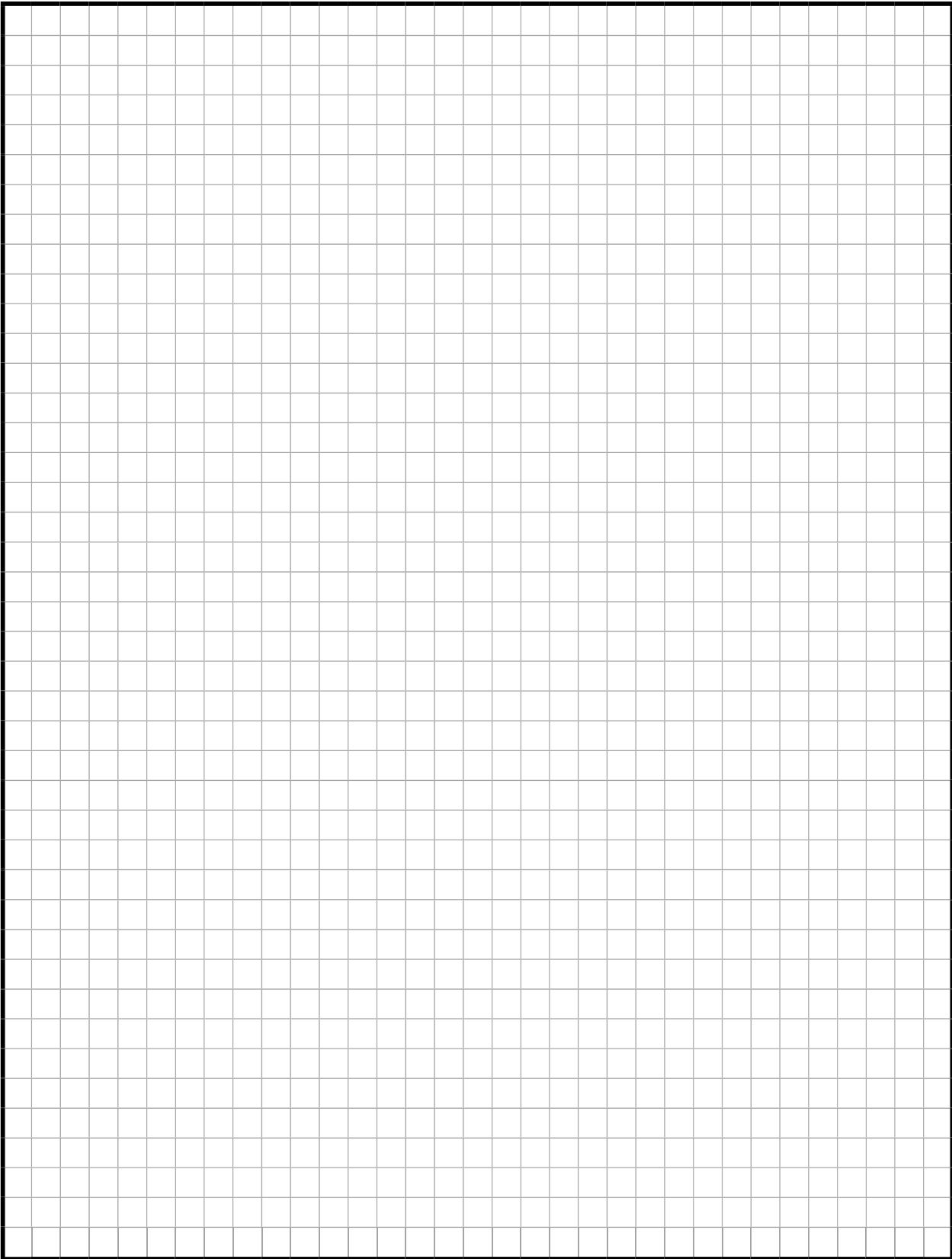
Technical Data

Internal measuring gages	mm	209-901	209-902	209-903
Measuring range	[mm]	15 – 65	40 – 90	70 – 120
Scale interval	[mm]	0,05	0,05	0,05
Max. permissible errors „G“	[mm]	0,05	0,05	0,05
Repeatability limit „r“	[mm]	0,025	0,025	0,025
Measuring force	[N]	0,9 – 1,9	0,9 – 1,9	0,9 – 1,9
Type of measuring contact	[mm]	Ball \varnothing 1,5	Ball \varnothing 2	Ball \varnothing 2
Internal measuring gages	inch			
Measuring range	[inch]			
Scale interval	[inch]			
Max. permissible errors „G“	[inch]			
Repeatability limit „r“	[inch]			
Measuring force	[N]			
Type of measuring contact	[inch]			
Reference temperature	[°C]	20		
Working temperature	[°C]	+10 to +30		
Storage temperature	[°C]	-10 to +50		
Protection class		IP 65		

Technical data sheets for each gage are available at www.kroeplin.com

All gages are available in digital with interfaces and IP67!

Factory setting is checked subject to VDI/VDE/DGQ 2618 Part 13.1



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