MARPOSS **M1** *Star*

Instruction Manual

CONGRATULATIONS TO HAVE CHOSEN
Marposs M1 Star MBG (Mechanical Bore Gauge)

Reading this manual will enable you to use the product in the best way, and to become acquainted with all the system characteristics that mark it out and make it unique of its kind.

FOREWORD

The M1Star MBG mechanical bore gauge is a new-concept product, designed to measure the inside diameter of blind or through bores in a quick and reliable way.

This product is innovative in its contents: the pioneering technology employed in its construction ensures the utmost reliability and accuracy.
The concepts of extreme modularity on which the MBG system is based makes it possible to meet the manifold application needs present in a normal work-shop environment.

This User Manual is supplied only for information purposes. Marposs SpA reserves the right to change the contents of the manual without being obliged to give advance notice of it and/or not to notify any possible modification of the product.
The descriptions contained in this manual may not be tampered with or altered by unauthorized personnel.

For further information, we invite you to visit our website, www.testar.com, where you can download the updated versions of the individual instruction manuals.

WARNINGS

In order to protract the correct operation and high quality standards of the bore gauge, it is advisable to comply with the warnings below.

WARNING:

Do not manipulate or twist the measuring armset inside the plug gauge (see Fig. 1); any operation that may be carried out inside it is authorized only if the appropriate tools (mentioned in this manual) are used; otherwise the transmission system might get damaged.

WARNING:

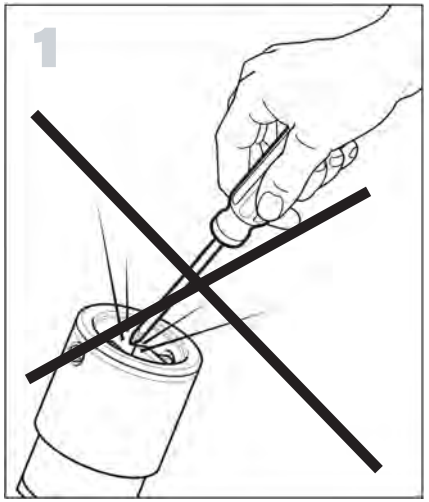
Do not use solvents: the maintenance and/or cleaning of the plug gauge must be carried out following the instructions contained in this manual.

WARNING:

The bore gauge must not be dropped and/or hit: this might damage the measurement detection system, particularly in plug gauges for small diameters.

NOTE:

Any damage on the product and/or relevant components due to an improper use of the product void the Marposs SpA warranty terms.

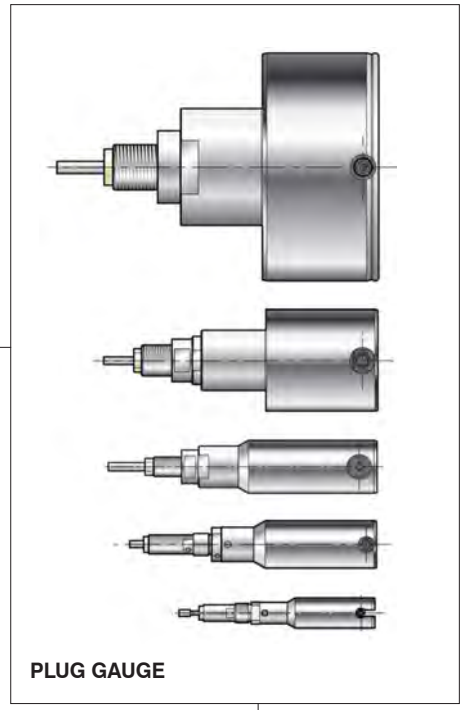


CONTENTS

Chapter 1 - DESCRIPTION OF MAIN PARTS

Thanks to the extreme flexibility of the MBG bore gauge, it is possible to achieve the configuration that is most suitable to any individual requirement.
The graphic representation below identifies the main parts of the bore gauge, which will be analyzed in detail further on.

HANDLES



PLUG GAUGE

HOOKS

THREAD ADAPTORS

ANGLE ADAPTOR

DEPTH STOPS

DEPTH EXTENSIONS

ROTARY SPACER

CONTACTS

CAPS

Chapter 2 - ASSEMBLY AND ZERO-SETTING OF INDICATOR

There are two procedures for the assembly and zero-setting of the indicator:
Procedure for appliances where PENCIL PROBES are present;
Procedure for appliances where MECHANICAL or DIGITAL indicators are present.

PENCIL PROBE
The operations sequence varies according to the model purchased:

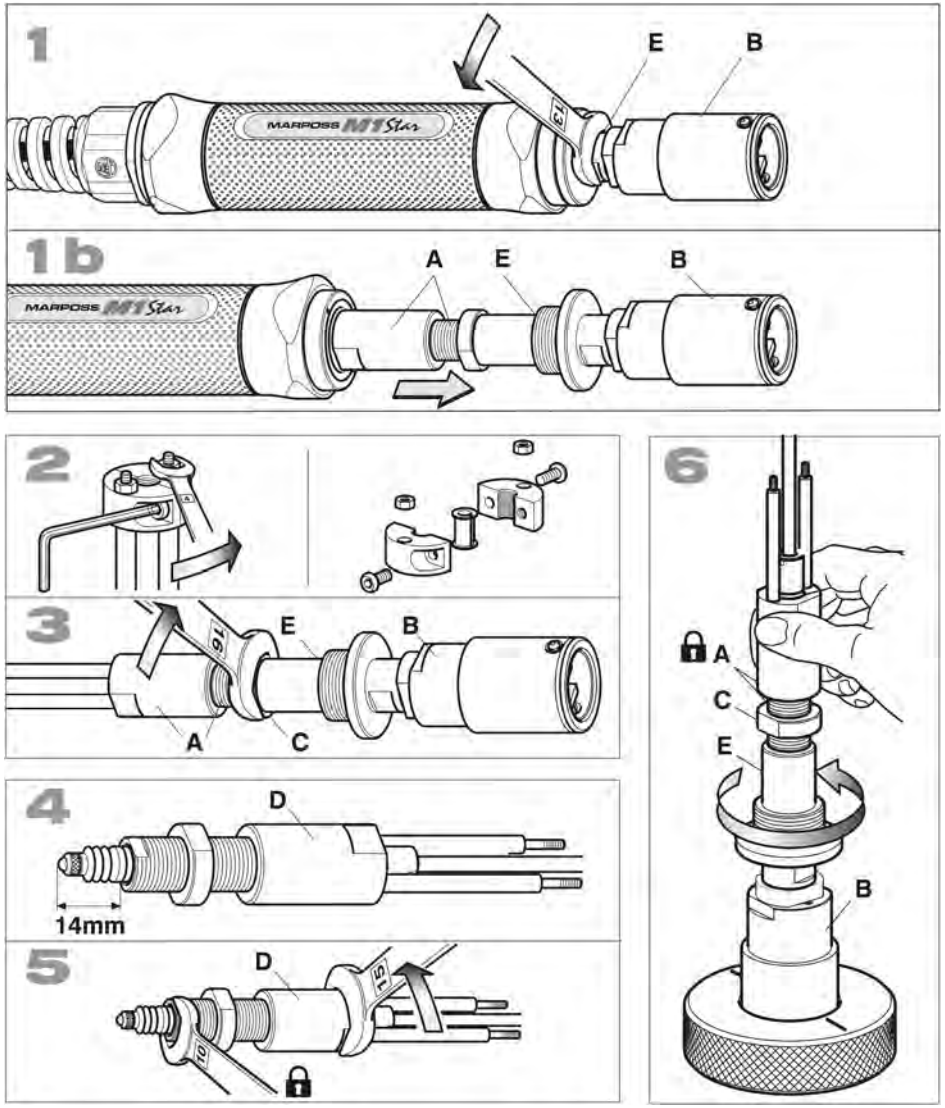
a) Bore gauge WITH Marposs pencil probe (or compatible) mechanically installed and zero set (follow SET-UP A procedure)
b) Bore gauge WITHOUT pencil probe installed (follow SET-UP B procedure)

SET-UP A

1. Connect the bore gauge at the electronic indicator by means of the connector
2. Insert the bore gauge in the master (the displayed measure must be next to zero)
3. Perform the electrical zero setting of the bore gauge, following the procedure of the electronic system in use. Please refer to the mechanical zero setting (SET-UP "B"; from step 7 to step 12) in case the zero setting is not obtained by means of the SET-UP "A" procedure.

SET-UP B

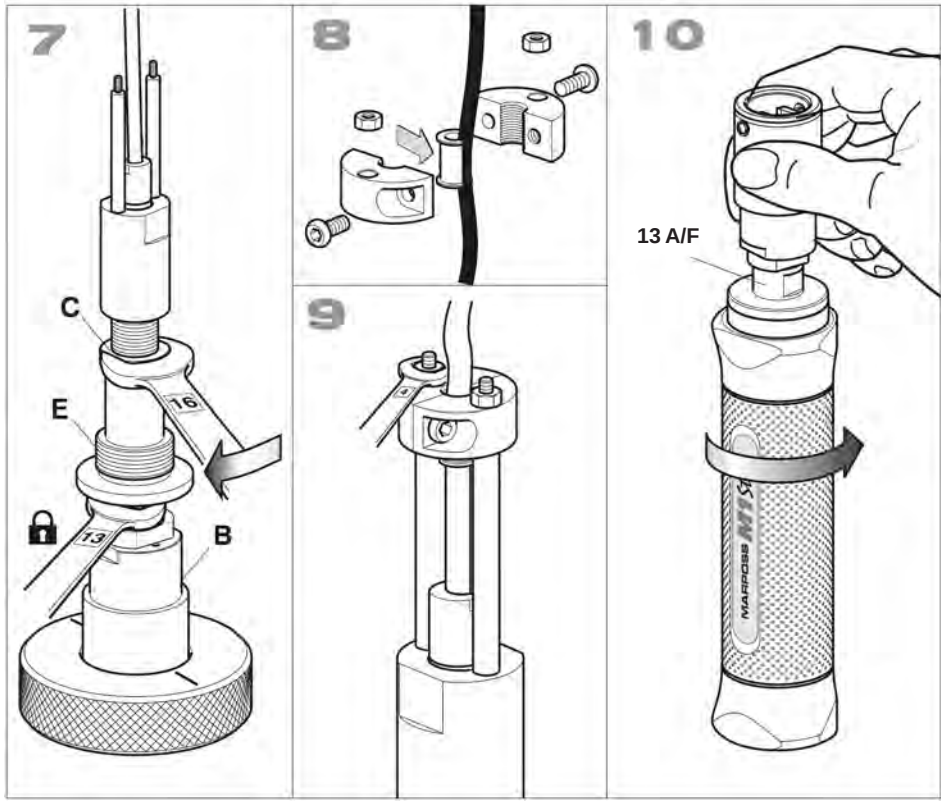
1. Apply the 13 A/F wrench to the threaded connection seat "E" (see fig. 1), unscrew and extract from the handle the measuring unit (probe holder "A" + threaded connection "E" + plug gauge "B", see fig. 1b).
2. Unscrew and remove the nuts from the cable-holder clamp unit using the 4 A/F wrench, and disassemble the two semi-clamps by means of the 1.5 mm hexagonal-end wrench (see fig. 2).
3. Manually loosen the ring nut "C" (if too tight use the 16mm A/F wrench), then unscrew and disassemble the unit "E" + "B" from the probe holder "A" (see fig. 3).
4. Loose the tapered nut "D" and insert the probe in the relevant holder at a 14 mm protrusion (see fig. 4). Manually screw the tapered nut "D" until its stopped.
5. Firmly apply the 10mm A/F wrench to the probe holder, and then permanently lock the tapered nut "D" using the 15mm A/F wrench (see fig. 5).
6. Insert the connector in the handle then plug it in the electronic display.
7. IInsert the plug gauge "B" in the zero-setting master.
8. Insert the probe holder unit "A" in the group "E" +"B". Firmly holding the unit "A", screw "E" + "B" turning them counterclockwise (see fig. 6).



9. Manually screw the ring nut “C” until its stopped, trying to maintain the zero-setting. Firmly apply the 13mm A/F wrench to threaded connection “E”, and then lock the ring nut “C” by means of the 16mm A/F wrench (see fig. 7).
10. Re-assemble the two semi-clamps to the relevant cable holder seats, inserting in-between the cable (*) (see fig. 8).
11. Replace and screw the 2 nuts in the cable clamp, and lock them using the 4mm A/F wrench (see fig. 8).
12. Screw the handle to the measuring unit (see fig. 9), and lock it by means of the 13mm A/F wrench.
13. Perform the electrical zero-setting of the bore gauge through the electronic system in use.

(*) The pencil probes for the M1 Star (see page 53) have been manufactured with a 4,7 mm diameter cable. In case the pencil probes in use have standard diameter cables (3,3 or 3,8 mm), it is required to use the specific tear-resistant gaiter included. Please refer to fig. 8 for assembling.

NOTE:
The removal and/or replacement of the plug gauge may result in the loss of the zero-setting of the bore gauge..



2 ASSEMBLY AND ZERO-SETTING OF INDICATOR

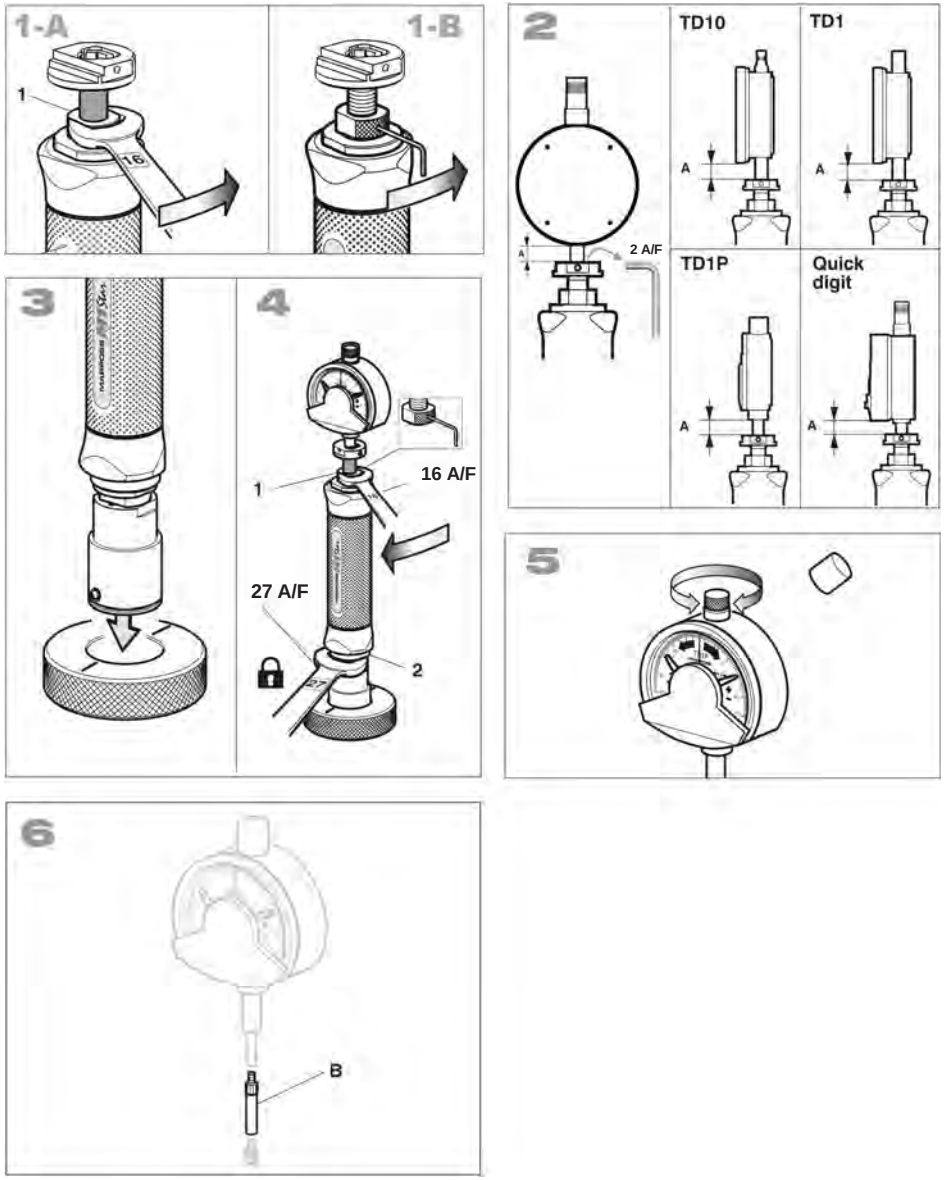
MARPOSS MECHANICAL/ELECTRONIC INDICATORS
In order to complete the bore gauge, it is necessary to assemble the display dial and to follow the quick set-up procedure described below, which is suitable only for indicators with Marposs characteristics.

NOTE:
The indicators, since they are not components of the plug gauge, are not assembled, but placed within the package.

SET-UP WITH TD1, TD10, TD1P AND QUICK DIGIT INDICATORS

1. By means of the A/F 16 mm wrench (fig. 1-A), or a 2 mm hexagonal wrench (fig. 1-B) loose the ring nut "1" and manually unscrew the indicator-holder until extraction from the handle.
2. By means of the hexagonal-end 2 mm wrench, insert and lock the indicator in the relevant indicator-holder (*) at the following distances:
   - 7 mm A-distance (fig. 2) in case of standard indicator holder-handle;
   - until its stopped (A= 0 mm) in case of mini indicator holder-handle;
3. Apply the bore gauge to the zero-setting master (see fig. 3).
4. Re-insert in the handle the indicator-holder unit, manually screw it so as to notice at least a 500 mm shifting of the indicator pointer (for models TD1, TD10 and Quick Digit). For the TD1P model the indicator pointer has to be within the ±30 mm range, in order to be sure to retrieve the ZERO by means of the mechanical potentiometer.
5. Firmly apply the 27mm A/F wrench (**) to the seat of the plug gauge handle "2", and lock the ring nut "1" using the 16mm A/F wrench (see fig. 4) or the 2mm hegagonal wrench.

(*) The 3/8'' indicator-holder require the extension "B" included, to be placed between the indicator rod and the gauge contact (see fig. 6).
(**) If the **mini** handle is employed it is required to use the 15mm A/F wrench.



ZERO-SETTING OF TD1; TD10; TD1P AND QUICK DIGIT INDICATORS

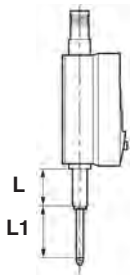
TD1 AND TD10:
Rotate the quadrant ring nut of the indicator, until have the ZERO corresponding to the pointer.

TD1P:
On the upper part of the indicator unscrew the plastic plug, and operate on the mechanical potentiometer in order to have the pointer set to ZERO (see fig. 5). It is possible to operate on the whole display range (± 50 μm). Replace the plastic plug.

QUICK DIGIT:
Push the RESET button to zero the indicator.

NON-MARPOSS INDICATORS

Many indicator models are available on the market, so it is difficult to determine a set-up procedure that can meet all needs. Table 1 shows the maximum indicator specifications with which the procedure described above can be followed.



TAB 1

L max	**L** min	**L1** max	**L1** min
20 mm	16 mm	16 mm	14 mm

CHAPTER 3 - REPLACEMENT OF PARTS AND COMPONENTS

The concept on which the bore gauge is based makes it possible to retool it via a simple and direct replacement of some of its parts and/or components. Below all the procedures for a correct replacement of the components are described.

3.1 PLUG GAUGE

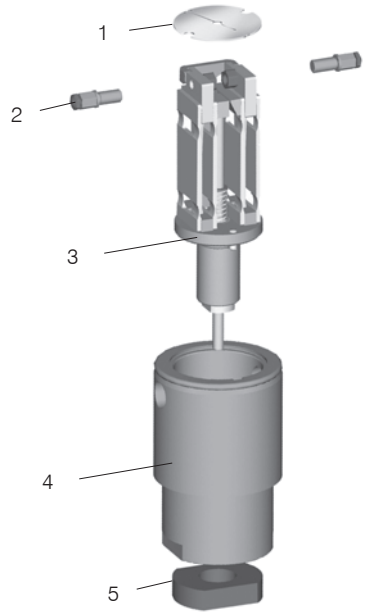
The plug gauge is the basic element of the bore gauge, because it contains all the movement-transduction technology. It is supplied completely assembled (see Fig. 1), calibrated and tested at the Marposs center.
Figure 2 shows all the components that form the plug gauge and that can be replaced in case of wear.

COMPONENTS:
1. CAP
2. CONTACTS
3. MEASURING ARMSET
4. NOSEPIECE
5. LOCKING NUT(*)

(*) A special ring nut is included for the 7,5 – 9,5 range.

1

2



3.1.1 REPLACEMENT OF PLUG GAUGE

The plug gauge can be replaced if its components are worn out, or if a retooling is required in order to measure a different diameter.
For retooling procedures it is important to consider that the size of thread “M” for plug gauge and handle connection, changes in relation to the measuring range of the plug gauge (see Fig. 1 and Table 1).

ATTENTION:

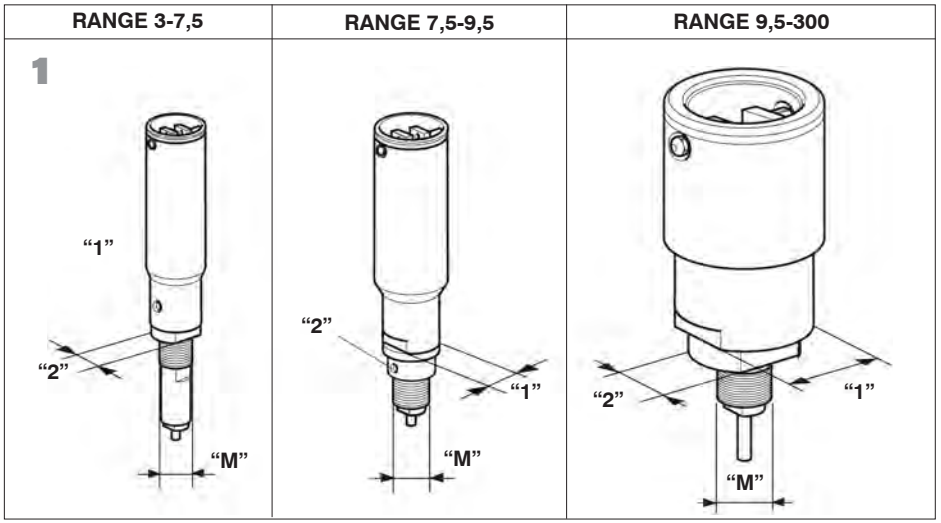
The removal and/or replacement of the plug gauge may result in the loss of the zero-setting of the bore gauge.

DISASSEMBLY OF PLUG GAUGE

To remove the plug gauge use the special wrenches, inserting them in the appropriate seats (see Fig.1 and Table 1).

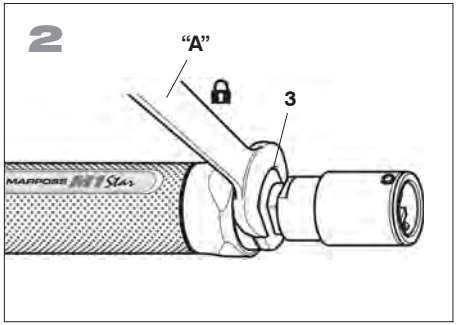
1. Apply wrench “A” (*) to handle seat “3” (see Fig. 2).
2. Firmly holding “A” (*), apply special wrench “B” to seat “1” and loosen the plug gauge by turning it counterclockwise (see Fig. 3); in plug gauges for measuring range 3 to 7.5 mm, the seat to apply the wrench “B” must be “2”.
3. Manually disassemble the plug gauge, taking care not to drop any part of it.

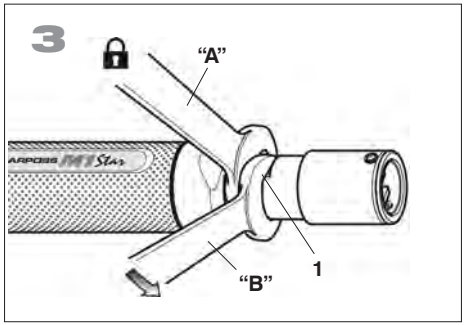
(*) for an INDICATOR HOLDER, use the 27mm A/F wrench;
for a PENCIL PROBE HOLDER, use the 13mm A/F wrench;
for a MINI INDICATOR HOLDER, use the 15mm A/F wrench.



TAB. 1

Ø	3-5,5	5,5-7,5	7,5-9,5	9,5-26	26-300
“M”	M3,5 x 0,35			M6 x 0,75	M10 x 1
“1”	-	-	6 A/F	8,5 A/F	23 A/F
“2”	3 A/F	4 A/F	-	7 A/F	16 A/F





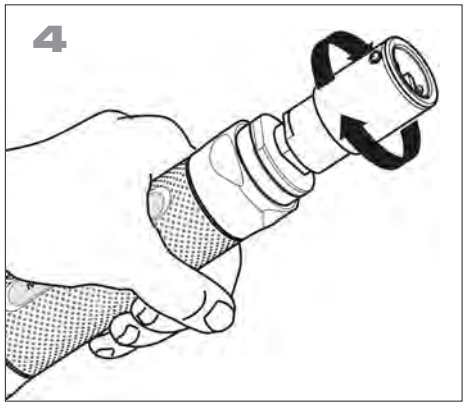
ASSEMBLY OF PLUG GAUGE

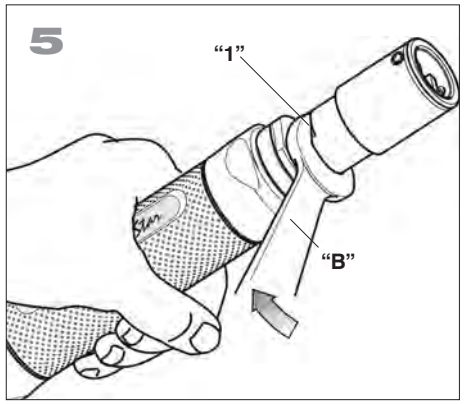
ATTENTION:
In case of substitution of the plug gauge with one of bigger diameter, make sure that the stem does not compress the sensor so as to reach the limit stop. This circumstance may demage both the sensor and the plug gauge. On Fig. 6 are represented the instering distances of the plug gauges in the handle, and the height of the thread adaptor if applied.

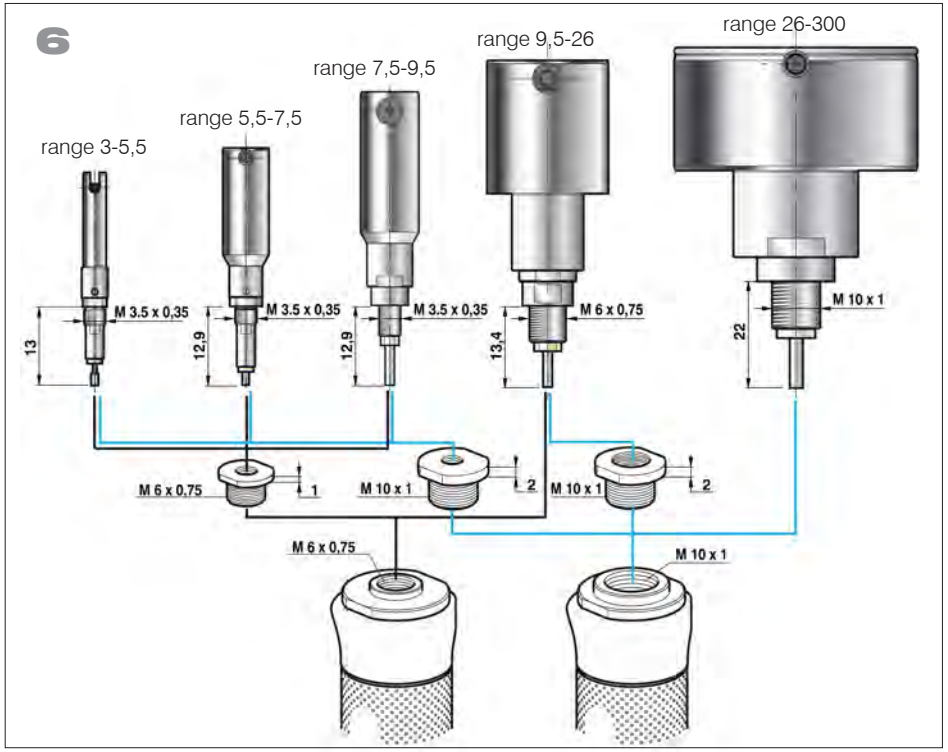
1. Manually screw the plug gauge in the handle seat until stopped (see Fig. 4).
2. Apply special wrench “B” to seat “1” (see Fig. 5), and lock the plug gauge to the handle. The wrench “B” must be applied to seat “2” for plug gauges with range from 3 to 7.5 mm.

IMPORTANT:
The force to be applied to wrench “B” in order to lock the plug gauge depends on the size of the latter. The table below indicates the maximum force to be applied, expressed in newtons/meter.

SUGGESTED TORQUES					
Ø	3-5,5	5,5-7,5	7,5-9,5	9,5-26	26-300
Nw/m	0,8	0,8	0,8	3,5	5







3.1.2 CAP REMOVAL

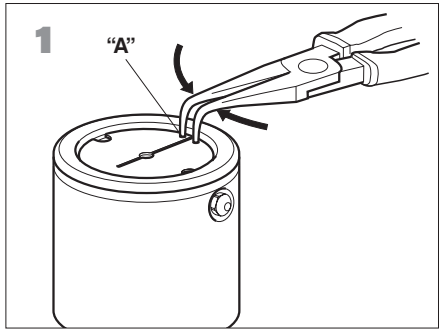
The cap is a component always supplied with the plug gauge and/or complete application. Its function is to preserve the mechanical elements inside the plug gauge from the penetration of coarse solid matter such as chips.
The cap can be removed in order to clean the mechanical transduction assembly and/or to replace some components within the plug gauge.
The assembly/disassembly procedure of the cap differs according to the diameter range of the plug gauge, as indicated below.

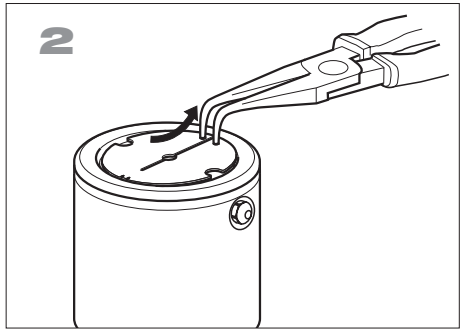
DISASSEMBLY OF CAP IN PLUG GAUGES FOR 12 - ø < 120

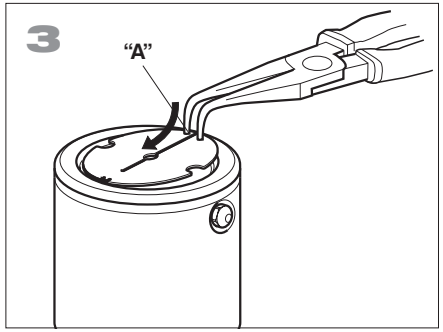
1. Insert the bent circlip pliers in the holes “A” (see Fig. 1).
2. Tighten the pliers and extract the cap (see Fig. 2).

ASSEMBLY OF CAP IN PLUG GAUGES FOR 12 - ø < 120

1. Take the cap and insert the bent circlip pliers in holes “A”.
2. Tighten the pliers and insert the cap in its seat within the nosepiece, as shown in Fig. 3.







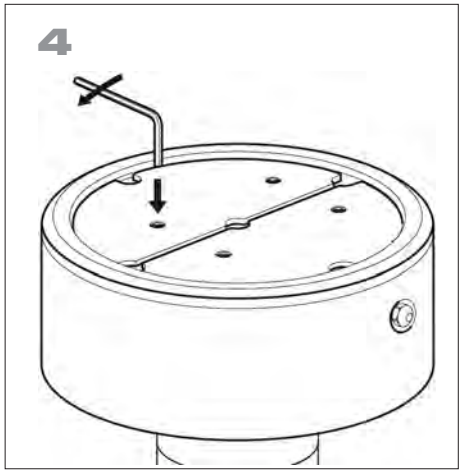
DISASSEMBLY OF CAP IN PLUG GAUGES FOR 120 - ø < 300

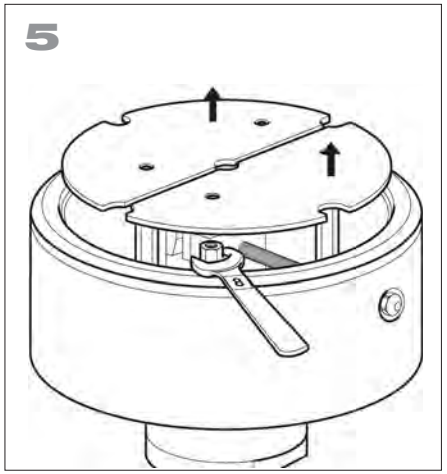
1. As shown in Fig. 4, apply the 2 mm hexagonal-end wrench and unscrew the 4 screws.
2. Extract the 2 half clamps from the plug gauge.
3. Disassemble the 4 spacers by means of the 8mm A/F wrench (see Fig. 5).

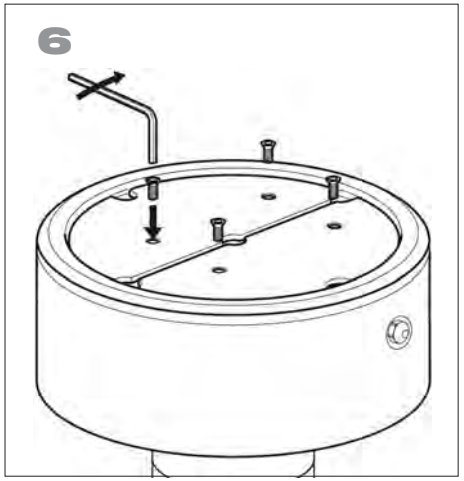
ASSEMBLY OF CAP IN PLUG GAUGES FOR 120 - ø < 300

1. Assemble the 4 spacers by means of the 8mm A/F wrench (see Fig. 5).
2. Insert the two half clamps in the plug gauge, so as to cause the holes on the half clamps to coincide with the spacers (see Fig. 6).
3. Insert the 4 screws and screw them by means of the 2-mm hexagonal-end wrench, so as to lock the two half clamps.

NOTE:
caps are provided for B/BC/T plug gauges with measuring range > 12 mm, and for SB plug gauges with measuring range > 26 mm.







3.1.3 CONTACTS REPLACEMENT

Marposs has developed interchangeable contacts, because these parts are subject to wear. For their replacement, a set of special wrenches (see Table "Wrenches for contacts") is provided: they vary on the basis of the technical specifications of the plug gauge. The table below indicates and represents the specifications of the contacts and the method with which the contacts are fastened to the measuring armsets: the methods vary in relation to the application (for through/blind bores or superblind bores) and/or to the diameter class.

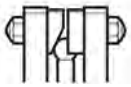
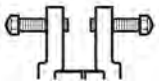
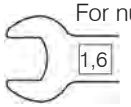
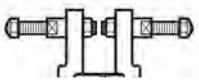
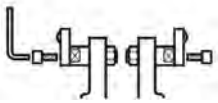
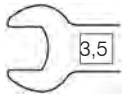
ATTENTION:

(*) The positioning of the contacts and/or extensions on the measuring armset depends on the nominal diameter of the nosepiece, because the contact must NOT protrude more than the maximum value expressed in the table.

(**) The values are only referred to configuration with standard clearance nosepiece/piece, for under/over-sized configurations contact the nearest MARPOSS office, in order to get detailed information on the application.

(***) The pipe wrenches to be applied to assembly/disassembly the contacts are in conjunction with the application itself (through, blind, super-blind or BC), by the contacts building material and by the diameter range of the plug gauge. In the table chart "CONTACT WRENCHES" are expressed the wrenches according to the features mentioned above.

TABLE OF CONTACTS

Application	Diametrical Class (mm)	Fastening method	Reppresentation of Assembly	Representation of Wrenches		Pretravel Values (**)	Max Protrusion of contact out of nosepiece(*)
				open	box		
Through/Blind Bores	3 - ø < 5,5	The contacts are an integral part of the measuring armset, so they cannot be disassembled.		–		See following Technical Table	See following Technical Table
Superblind bores/BC							
Through/Blind Bores	5,5 - ø < 7,5	**Contacts screwed so as to touch the measuring armset.**		–	(***)		
Superblind bores/BC							
Through/Blind Bores	7,5 - ø < 26	**Contacts screwed in and positioned (*) on the measuring armset, and locked by means of a self-locking thread.**		–			
Superblind bores/BC		**Contacts screwed in and positioned (*) on the measuring armset, and locked by means of a lock nut.**		For nut  1,6			
Through/Blind Bores	26 - ø - 300	**Contacts screwed in and positioned (*) on extensions by means of self-locking thread, which in turn are screwed in so as to touch the measuring armset, by means of a lock nut.**		For nut  4			
Superblind bores		**Contacts fitted so as to touch the extensions, which are screwed in and positioned (*) on the measuring armset, and locked by means of a lock nut.**		For extension  3,5			

TECHNICAL TABLE

Description		Unit	Diametrical Range								
			ø 3÷5,5 mm		ø 5,5÷7,5 mm	ø 7,5÷9,5 mm	ø 9,5÷26 mm	ø 25÷300 mm			
			ø 3÷4 mm	ø 4÷5,5 mm				ø 26÷60 mm	ø 60÷150 mm	ø 150÷200 mm	ø 200÷300 mm
Range(1)	MBG-T/B	mm	0,31÷0,4	0,34÷0,45	0,36÷0,7	0,37÷0,7	0,55÷1,05	1÷1,5	1÷1,5	1÷1,5	1÷1,5
	MBG-SB/BC					0,37÷1,2	0,55÷1,2				
Standard Pretravel(2)	MBG-T/B	mm	$0,250^{0}_{+0,05}$	$0,280^{0}_{+0,05}$	$0,300^{0}_{+0,05}$	$0,300^{0}_{+0,05}$	$0,350^{0}_{+0,05}$	$0,500^{0}_{+0,05}$	$0,700^{0}_{+0,05}$	$0,800^{0}_{+0,05}$	$0,900^{0}_{+0,05}$
	MBG-SB/BC		$0,200^{0}_{+0,05}$	$0,200^{0}_{+0,05}$					$0,520^{0}_{+0,05}$	$0,580^{0}_{+0,04}$	$0,580^{0}_{+0,04}$
Min pretravel for each contac	MBG-T/B	mm	0,125	0,140	0,150	0,150	0,175	0,250	0,350	0,400	0,450
	MBG-SB/BC		0,100	0,100					0,260	0,290	0,290
Adjustable Pretravel(3)	MBG-T/B	mm	no	no	no	up to 0,35	up to 0,5	up to 0,8	up to 0,8	up to 0,95	up to 0,95
	MBG-SB/BC							up to 0,65	up to 0,65	up to 0,65	up to 0,65
Application range(4)	MBG-T/B	mm	0,100	0,120	0,120	0,120	0,120	0,150	0,150	0,150	0,150
	MBG-SB/BC		0,007	0,007					0,120	0,08	0,08
Max. Application range(5)		mm	no	no	no	0,170	0,220	0,320	0,320	0,320	0,320
Measuring Force(6)		N	0,1 - 0,5	0,1 - 0,5	0,1 - 0,5	0,1 - 0,5	0,1 - 0,6	0,4 - 1,35	0,4 - 1,35	0,4 - 1,35	0,4 - 1,35
Repeatability (2,77σ)		m	-1 µm								
Accuracy	range (0÷100)µm(7)	%	1% measuring range +1µm								
	range (>100)µm(7)		2% measuring range +1µm								
Thermal driftof zero	3-ø<80	µm/°C	-0,15					-0,2			
	80-ø<150							-0,25			
	150-ø-300							-0,3			
Operating Temperature		°C	-10 ÷ +65								

(1) It consists of the measuring-armset overall travel (from the max opening position to the internal stop)
(2) Difference between the contacts max opening position and the nosepiece minimum diameter.
Note: Each contact can be calibrated with a different pretravel value, provided that the "Minimum Pretravel" reported on the table is applied and the sum of the two pretravels don't exceed the expressed value on Standard Pretravel (considering also the reported tolerances)
(3) Maximum pretravel adjustment margin, as indicated on point (2)
(4) Tolerance range of the piece to be measured by the plug-gauge.
(5) Maximum measurable range of the plug-gauge, considering the contacts coupling and an adjustable pretravel as expressed on point (3)
(6) Plug-gauge measuring force for each contact, measured at bottom end of the working range in compression stage; without pencil probe or dial indicator.
Note: When a pencil probe or dial indicator is associated to the plug-gauge, it is necessary to add to the measuring force F at zero per contact (as indicated in the table), the force of the probe or indicator (Ft) multiplied by a coefficient of **1,34** (from 7,5 to 26 mm), or **1,2** (from 3 to 7,5mm and from 26 mm to end range).
F with probe or indicator = F + (Ft * 1,34) (plug-gauges 7,5-26mm)
F with probe or indicator = F+(Ft* 1,2) (plug-gauges 3-7,5mm and 26-300mm)
To decrease the measuring force it is possible to remove the spring from the plug-gauge, or to apply low-pressure pencil probes or dial indicators.
(7) Meaning with "range" the range of values where the MBG is actually gauging, within the application range. For instance: within a range of 100 µm, the plug-gauge accuracy error will be (1+1) µm= 2 µm.

CONTACT WRENCH TABLE

Description	Contacts Type	Application	Range (mm)	Order Code
4 mm "U" pipe wrench	Tungsten Carbide and DLC	SB	26 ≤ø<300	1346041100
3,8 mm hexagonal pipe wrench	Diamond	B	20 ≤ø<300	1346041101
	Diamond	T	16 ≤ø<300	
3,5 mm hexagonal pipe wrench	Contacts Extensions	SB	26 ≤ø<300	1346041102
	Tungsten Carbide and DLC	B/BC/T	26 ≤ø<300	
3,1 mm hexagonal pipe wrench	Tungsten Carbide and DLC	B/BC/T	9,5 ≤ø<26	1346041103
	Tungsten Carbide and DLC with 2,5 mm radius	T	7,5 ≤ø<26	
	Diamante	B	16 ≤ø<20	
2,5 mm hexagonal pipe wrench	Tungsten Carbide and DLC with 1,5 mm radius	B/BC/T	7,5 ≤ø<9,5	1346041104
	Diamond	B/T	7,5 ≤ø<16	
1,5 mm hexagonal pipe wrench	Tungsten Carbide	B/BC/T	5,5 ≤ø<7,5	1346041106
1,5 mm "U" pipe wrench	Tungsten Carbide	SB	7,5 ≤ø <26	1346041107
1,6mm A/F open wrench	Lock nut contacts of Tungsten Carbide and DLC	SB	7,5 ≤ø<26	1346040025
4mm A/F open wrench	Lock nut contacts of extension	T/B/BC/SB	26 ≤ø<300	1346040021

Pipe Wrench

exagonal "U-shape"

Open wrenches

DISASSEMBLY OF CONTACTS

1. Unscrew the contact and disassemble it, using the appropriate wrench (see Table of Contacts).

ASSEMBLY AND POSITIONING OF CONTACTS

The positioning of the contact depends on the type of measuring armset that is being used (see Table of contacts). There are basically two types of contacts:

- those that are screwed to the fingers so as to touch them;
- those that are screwed to the fingers but require a position adjustment, because there is no mechanical reference.

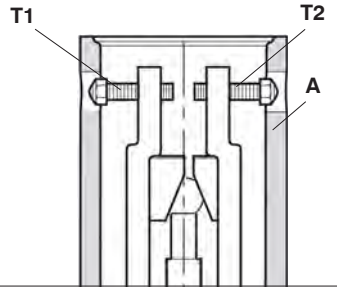
Below there is a description of the procedure, in relation to the indicator that is being used.

DIAMETER ADJUSTMENT OF CONTACTS WITH PENCIL PROBES AND TD1, TD10 AND QUICK DIGIT INDICATORS

1. If not assembled, insert and lock the indicator to the bore gauge, at a depth that ensures a view of the entire bore gauge pretravel (see Table of contacts).
2. Screw in contacts “T1” and “T2” by means of the relevant wrench (see CONTACTS WRENCH TABLE), so as to fit them inside nosepiece “A” (see Fig. 1).
3. With the bore gauge in vertical position, unscrew contact “T1” so as to protrude it out of the nosepiece (see Fig. 2) by an amount that ensures that, when the plug gauge is inserted in the master and pressed against it on the side of contact “T1”, the display shows a shift equal to 50% of the application range as specified on the TECHNICAL TABLE.
4. Unscrew the contact “T2” so as to protrude it out of the nosepiece by approximately 50% of the application range; inserting the plug gauge in the master, the display must shows a value next to the application range (see Fig. 3).
5. With the plug gauge inserted in the master, carry out the fine zero-setting procedure of the display device.

NOTE:
make sure to have an equal protrusion of the two contacts outside of the nosepiece.

1



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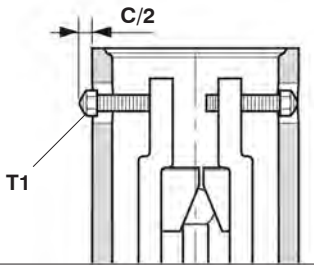

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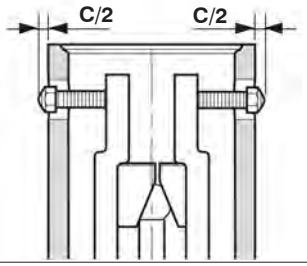
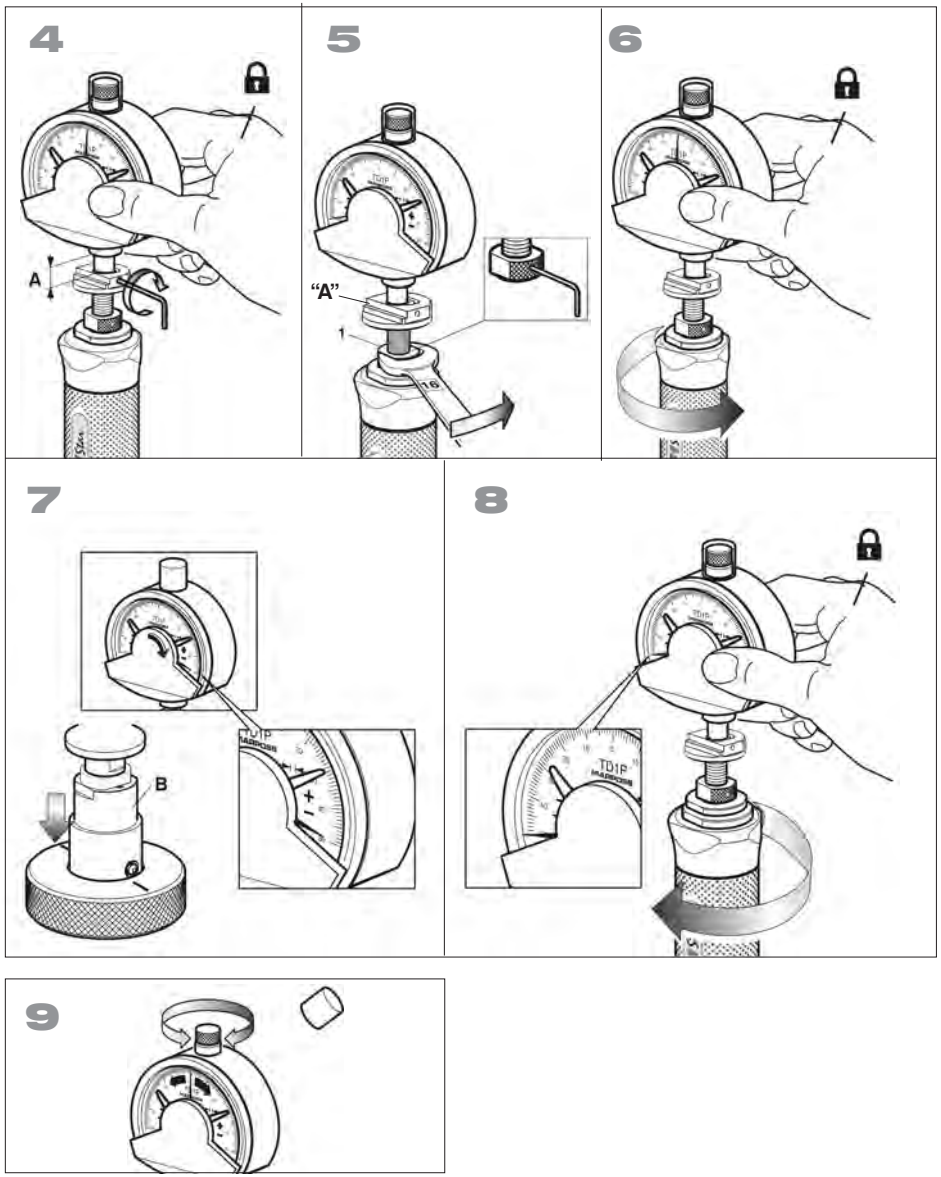


DIAMETER ADJUSTMENT OF TD1P INDICATOR

1. Insert and lock the indicator in the indicator holder by means of the 2 mm hexagonal-end wrench (see Fig. 4) at a 7 mm "A" dimension.
2. Loosen the ring nut "1" by means of a 16mm A/F or with a 2mm hexagonal wrench (see Fig. 5). Turn the handle clockwise so as to visualize zero on the display (see Fig. 6).
3. Manually lock ring nut "1" so as to obtain a friction movement of the indicator holder.
4. Screw the contacts by means of the relevant wrench (see CONTACTS TABLE), in order to bring them inside the nosepiece (see Fig. 1).
5. Unscrew the contact "T1" and, inserting the plug gauge in the master, check for a shift of + 50 μm on the display (see Fig. 7).
6. Firmly holding the indicator turn the handle clockwise until – 50 μm is visualized by the display (see Fig. 8).
7. Repeatedly extract and insert the bore gauge in the master unscrewing contact "T2" each time, until the value ZERO is displayed.
   In this way the excursion for each contact is 50 μm (equal to a 100 μm application range). If the application range defined on the TECHNICAL TABLE has not been reached, repeat steps 5 – 6 – 7 until its achievement.
8. Unscrew the plastic plug from the upper part of the indicator, and set the indicator pointer to ZERO by means of the mechanical potentiometer (see Fig. 9). It is possible to operate on the whole display range (± 50 μm).
   Replace the plastic plug.

NOTE:
make sure to have an equal protrusion of the two contacts outside of the nosepiece.



3.1.4 DISASSEMBLY OF NOSEPIECE/ARMSET

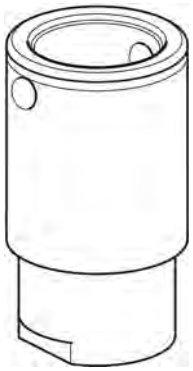
NOSEPIECE:
The nosepiece (see Fig. 1) is the guiding element that makes the measurement independent from the operator's manual skill. Despite its considerable hardness, it is subject to wear, therefore it can be removed and replaced with a new or reconditioned one.

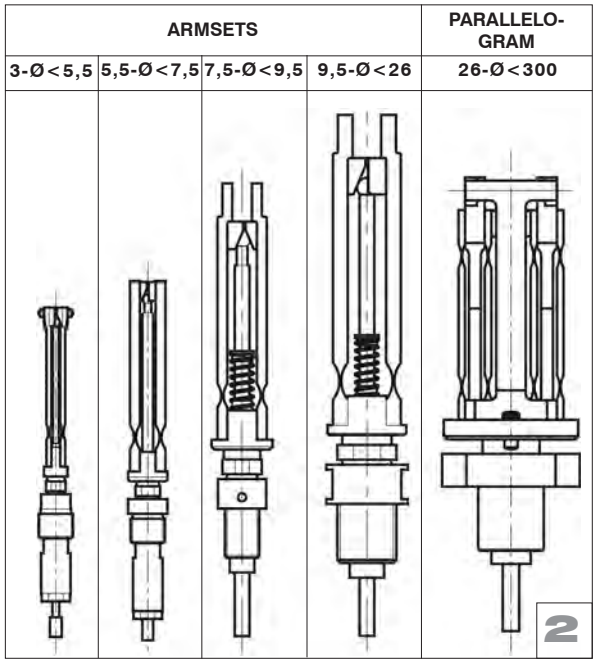
NOTE:
It is possible to perform the retooling of the bore gauge by replacing the nosepiece and contacts (unless the latter cannot be repositioned), provided that the nominal diameter of the nosepiece is compatible with the measuring range of the measuring armset (see Fig. 2).

MEASURING ARMSET
The measuring armset is the bore gauge measuring element, transducing the mechanical movement of the contacts for the display device. The versions developed are basically 2: one with FINGERS (measuring range from ≥3 mm to < 26 mm), and one with PARALLELOGRAM (measuring range, from ≥26 mm to ≤300 mm). Fig. 2 shows the models in relation to their measuring range. Fig. 3 shows, as example, the measuring armset composition for a range between 9,5 and 26.

A. Armset
B. Rod
C. Spring
D. Sliding bushing
E. Nosepiece locking nut

1





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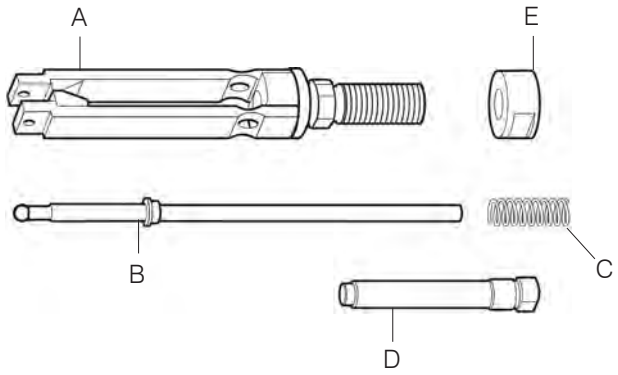


DISASSEMBLY/ASSEMBLY OF NOSEPIECE/MEASURING ARMSET FOR RANGE 3 - 5,5 mm

Due to the reduced dimensions of the components the interchangeability is not possible.

DISASSEMBLY/ASSEMBLY OF NOSEPIECE/MEASURING ARMSET FOR RANGE 5,5 - 26 mm

Special tools are required to disassemble and assemble these components, in order to ensure the proper nosepiece/measuring armset coupling. Due to this reason it is strongly recommended to contact the nearest MARPOSS office.

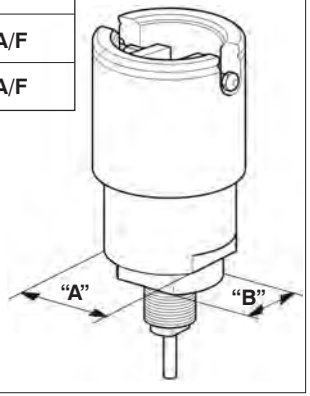
DISASSEMBLY OF NOSEPIECE/MEASURING ARMSET FOR RANGE 26 - 300 mm

ATTENTION:
In order to remove the NOSEPIECE and the MEASURING ARMSET, it is advisable to be equipped with the required wrenches. Fig. 1 represents the seats to apply the wrenches specified in the relevant table.

1. Disassemble the plug gauge from the handle (see page 11).
2. If present disassemble the cap (see page 14).
   Remove the contacts (see page 15), except nosepieces with open contacts seat (see fig. 2).
3. Firmly apply the wrench “A” to the nosepiece seat, then unscrew and remove the nut by means of the wrench “B” (see fig. 3).
4. Extract the measuring armset from the nosepiece (see fig. 4).

1

	26-300
A	23 A/F
B	16 A/F



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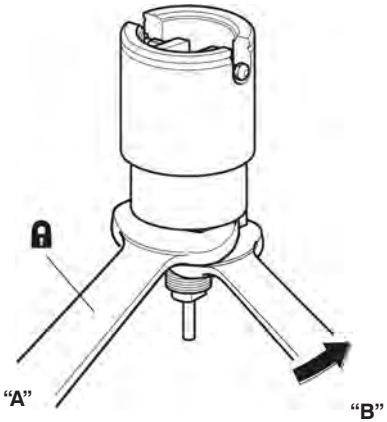
3



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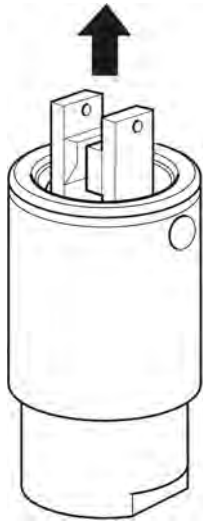


ASSEMBLY OF NOSEPIECE/MEASURING ARMSET FOR RANGE 26 - 300 mm

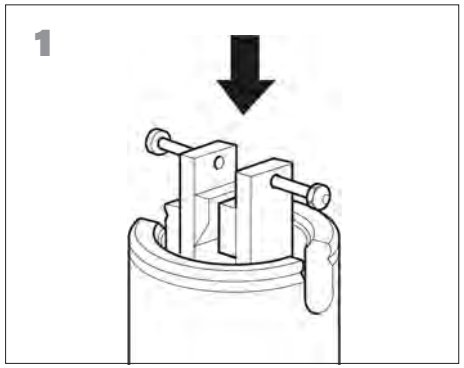
ATTENTION:
in order to ensure the correct mutual position of the measuring armset and the nosepiece, both components are equipped with a centering and mating reference.

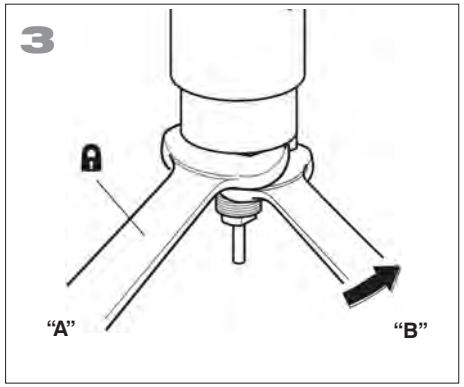
1. Insert and position the measuring armset in the nosepiece (see Fig. 1).
2. Insert and screw the nut “1” until stop it (see Fig. 2).
3. Firmly apply the wrench “A” to the nosepiece seat, then screw and lock (*) the nut by means of the wrench “B” (see fig. 3).
4. Assemble the contacts (see page 17).
5. Assemble the cap if present (see page 13).
6. Assemble the plug gauge on the handle and lock it (see page 11).

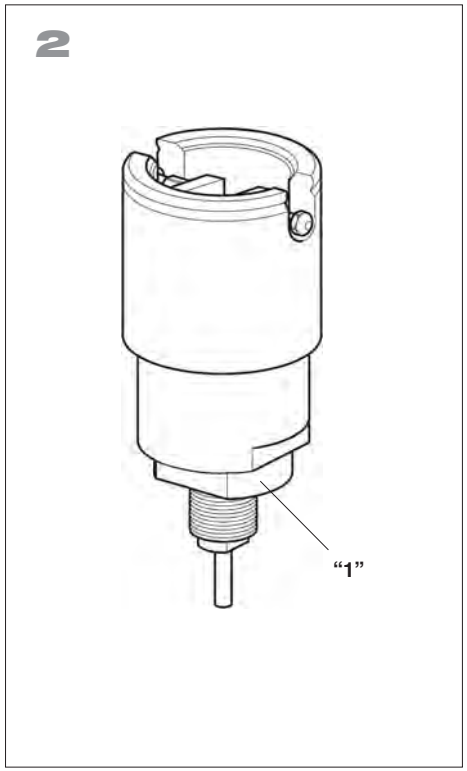
(*) On the table 1 is expressed the suggested torque to lock the nut.

Tab.1

Suggested Torque	
	ø 26 - 300
Nut	5 *Nm*







3.1.5 DISASSEMBLY OF BUSHING, ROD AND SPRING

Together with the indicator, the spring supplies the measuring force of the contacts on the part to be measured. It can be removed in order to decrease the measuring force of the contacts.
The procedure for the disassembly of these components depends on the measuring range of the measuring armset, due to this reason the appropriate procedure has to be chosen.
Fig. 1 shows the seat to apply the wrenches, while the relevant table indicates the type of wrench to be used in relation to the measuring range of the bore gauge.

DISASSEMBLY OF BUSHING FOR RANGE 3 - 7.5 mm

1. Disassemble the plug gauge from the handle (see page 11).
2. Firmly apply wrench "A" to the spacer seat "1" (see Fig. 2), then unscrew bushing "2" by means of the wrench "B".
3. Extract the unit composed by rod "C" + bushing "A" + spring "B" (see Fig. 3).
4. Extract the components, drawing them off the rod.

ASSEMBLY OF BUSHING FOR RANGE 3 - 7.5 mm

1. Assemble the unit composed by rod "C" + bushing "A" + spring "B" (see Fig. 3).
2. Insert and manually screw the rod unit to the measuring armset
3. Firmly apply wrench "A" to the spacer seat "1", then lock (*) the bushing "2" by means of the wrench "B".
4. Assemble the plug gauge to the handle (see page 11).

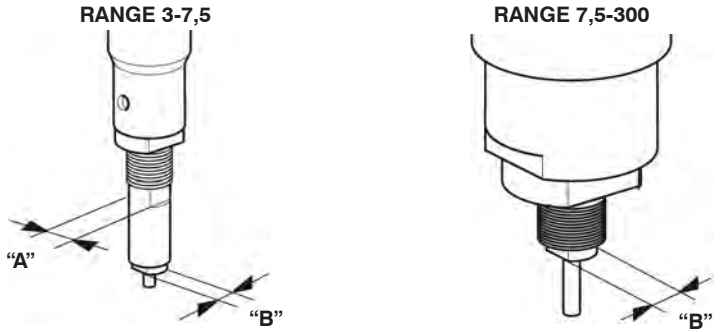
(*) On the table 1 are expressed the suggested torques to lock the rod unit.

Tab. 1

Suggested Torques		
	ø 3 < 5,5	ø 5,5 ≤ 7,5
Rod unit	0,16 Nm	0,16 Nm

1

	3≤ø<5,5	5,5≤ø<7,5	7,5≤ø<9,5	9,5≤ø26	26≤ø
A	2,5 A/F	2,5 A/F	-	-	-
B	2,5 A/F	2,5 A/F	2,5 A/F	3,5 A/F	6 A/F



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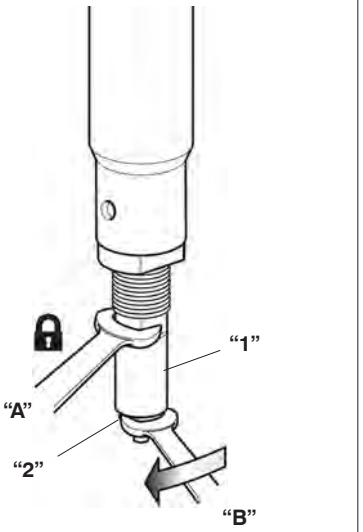


3

DISASSEMBLY OF BUSHING FOR RANGE 7.5 - 300 mm

1. Disassemble the plug gauge from the handle (see page 11).
2. Unscrew bushing “2” by means of wrench “B” (see Fig. 1).
3. Extract bushing “a”, spring “b”and rod “c” from the measuring armset (see Fig. 2).

ASSEMBLY OF BUSHING FOR RANGE 7,5 - 300 mm

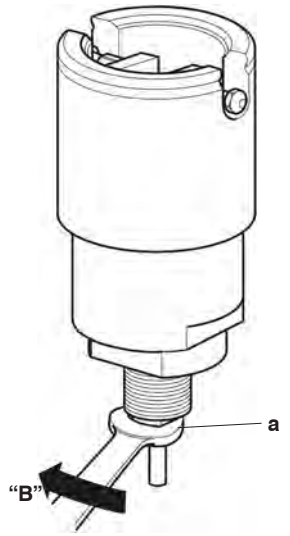
1. Insert the rod “c”, the spring “b” and manually screw the bushing “a” so as to stop it (see Fig. 2).
2. Lock (*) the bushing “2” by means of the wrench “B”.

(*) On the table 1 are expressed the suggested torques to lock the rod unit.

Tab. 1

SUGGESTED TORQUE			
	ø 7,5 ≤ 9,5	**ø 9,5 ≤ 26**	**ø 26 ≤ 300**
ROD UNIT	0,16 *NM*	0,4 *NM*	0,8 *NM*

1



2

3.2 HANDLE

The handle, besides ensuring the handiness of the plug gauge by conforming to the anatomy of the hand, is also the element that connects the indicator to the plug gauge.
It may be a pencil probe holder (in electromechanical applications) (fig. 1) or an indicator holder in the Standard or Mini version (in mechanical applications) (fig. 2).

1 **PENCIL PROBE HOLDER**

2 **INDICATOR HOLDER**

Standard

Mini

3.2.1 PENCIL PROBE HOLDER

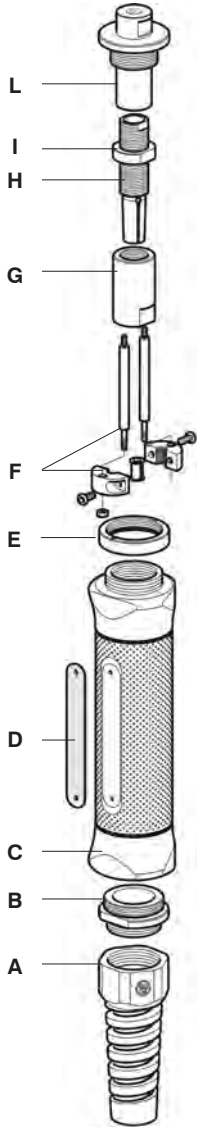
Its ergonomic shape and easy, safe operation ensure functionality. A cable guide and cable clamp protect the pencil probe cable.

COMPONENTS (See Fig. 2):

A. CABLE GUIDE
B. THREADED BUSHING
C. HANDLE
D. REMOVABLE NUMBER PLATE
E. COLLET
F. CABLE CLAMP
G. TAPERED NUT
H. PENCIL PROBE HOLDER
I. ADJUSTING RING NUT
L. THREADED CONNECTION

1

2

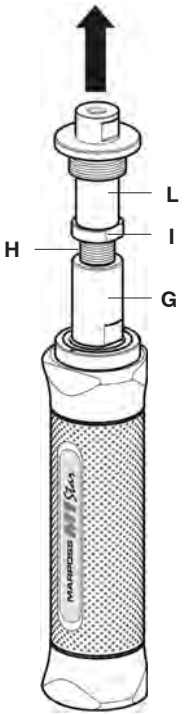


DISASSEMBLY OF COMPONENTS

1. Applying the 13mm A/F wrench to the threaded connection seat “L” (see Fig. 3), unscrew and extract the unit formed by “L” + “I” + “H” + “G” + “F” (see Fig. 4).
2. Unscrew and disassemble the nuts on the clamp unit “F” (Fig. 5) by means of the 4mm A/F wrench, and disassemble the two half clamps by means of the 1.5 mm hexagonal-end wrench.
3. Loosen the adjusting ring nut “I” and unscrew the threaded connection “L” (see Fig. 6).
4. Unscrew the cable guide “A” by means of the 30mm A/F wrench, and the threaded bushing “B” by means of the 28mm A/F wrench (see fig. 2, page 26).

3

4



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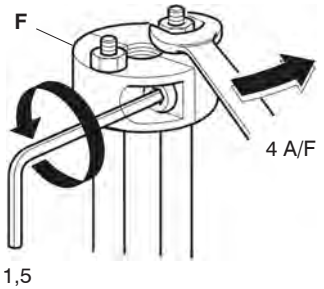

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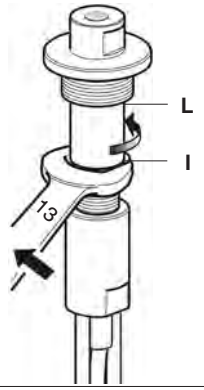


3.2.2 INDICATOR HOLDER HANDLES

Two models of indicator holder handles are available:
1. STANDARD INDICATOR HOLDER HANDLE (see Fig. 1);
2. MINI INDICATOR HOLDER HANDLE (see Fig. 2), for small diameters plug gauges.

3.2.2.1 STANDARD INDICATOR HOLDER HANDLE COMPONENTS (SEE FIG. 3)

A. INDICATOR HOLDER
B. ADJUSTING RING NUT
C. PLASTIC CAP FOR HANDLE
D. HANDLE
E. REMOVABLE NUMBER PLATE
F. COLLET
G. TRANSMISSION UNIT

COMPONENTS DISASSEMBLY OF STANDARD INDICATOR HOLDER HANDLE

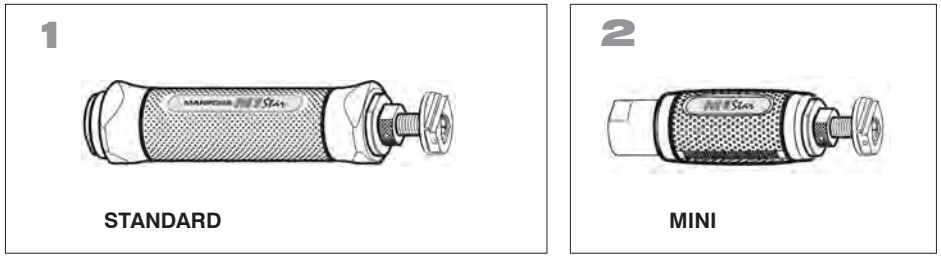
1. Loosen the adjusting ring nut “B” by means of the 16mm A/F or with the 2mm hexagonal-end wrench (see fig. 4); manually unscrew the indicator holder “A” so as to extract it from the handle.
2. Unscrew and extract the transmission unit “G”, by means of the 27mm A/F wrench (see Fig. 5).
3. Unscrew and extract the plastic cap “C” for handle, by means of the 30mm A/F wrench (see Fig. 6).

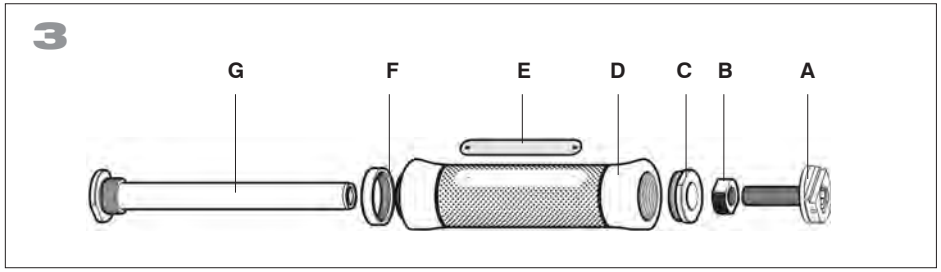
3.2.2.2 MINI INDICATOR HOLDER HANDLE COMPONENTS (SEE FIG. 7)

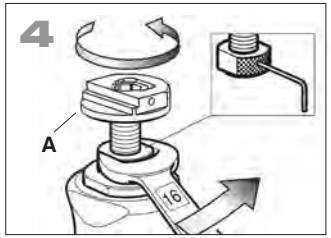
A. INDICATOR HOLDER
B. ADJUSTING RING NUT
H. HANDLE + TRANSMISSION ASSEMBLY

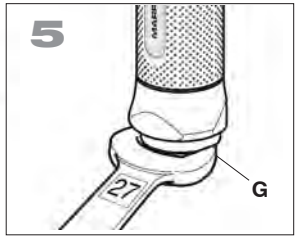
DISASSEMBLY MINI INDICATOR HOLDER COMPONENTS

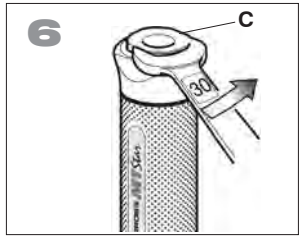
1. Loosen adjusting ring nut “B” by means of the 16mm A/F or with the 2mm hexagonal-end wrench.
2. Manually unscrew indicator holder “A” and extract it from the handle.

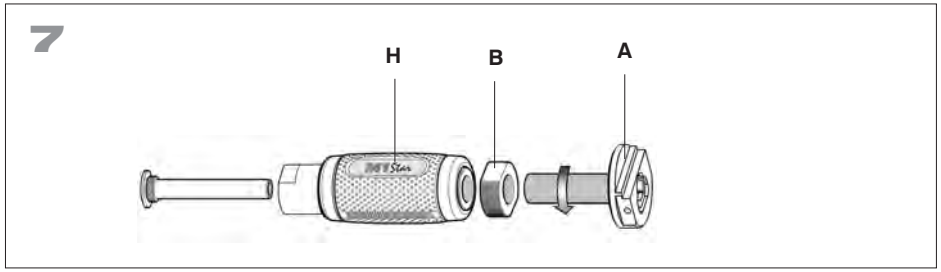












Chapter 4. - OPTIONAL ACCESSORIES

In order to ensure the utmost modularity of the system, a set of optional accessories that can meet all sorts of application needs has been developed.

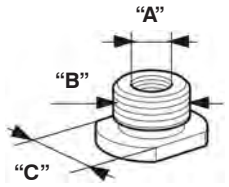
4.1 THREAD ADAPTORS

They ensure the interchangeability and/or interfacing of the plug gauges and/or accessories with the handle. Three are the available manufactured models, which can achieve any type of interfacing.
Figure 1 shows the thread adaptor, and the relevant table indicates the sizes of the threaded connections.

ASSEMBLY

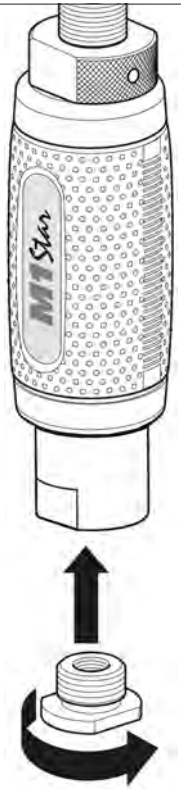
1. Manually screw the thread adaptor to the handle (see Fig. 2).
2. Apply wrench “C” (see table) to the adaptor seat and lock it (see Fig. 2).

1



	1	2	3
A	M3,5 x 0,35	M6 x 0,75	M3,5 x 0,35
B	M10 x 1	M10 x 1	M6 x 0,75
C	13 A/F	13 A/F	7 A/F

2



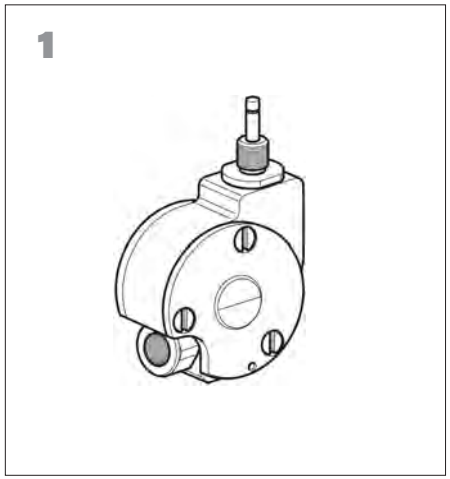
3

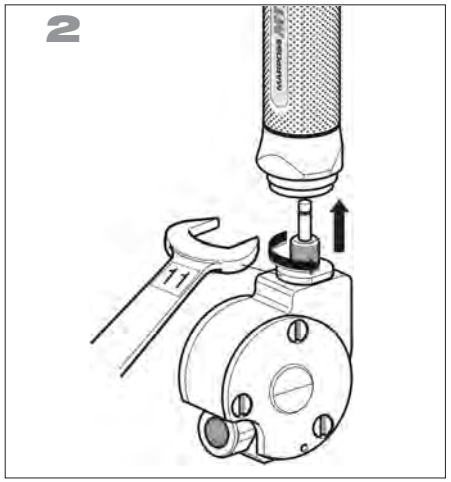
4.2 ANGLE ADAPTOR

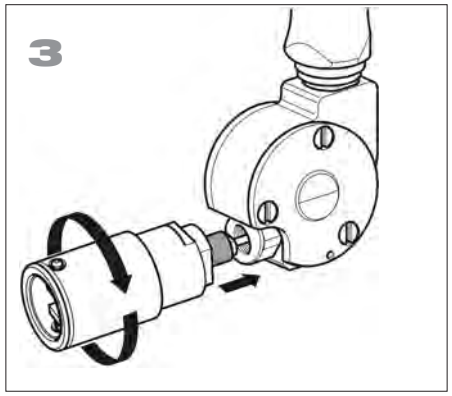
The angle accessory (see Fig. 1) is used in those measurements where limited space is available, such as those in a machine, and where the bore is in a position that requires a 90° tilting of the measuring axis.

ASSEMBLY

1. Disassemble the plug gauge from the handle (see page 11).
2. Screw the angle to the handle (see Fig. 2), and tighten it by means of the 11 mm A/ F wrench.
3. Screw the plug gauge to the angle (see Fig. 3), and lock it by means of the appropriate wrench (see page 11).







4.3 DEPTH STOPS

The depth stops are mechanical stops that are used to fix the measuring section at a predetermined depth. They are divided into two categories:

1. depth stops that can be fastened to the depth extension (see Fig. 1);
2. depth stops that can be fastened directly to the nosepiece (see Fig. 2).

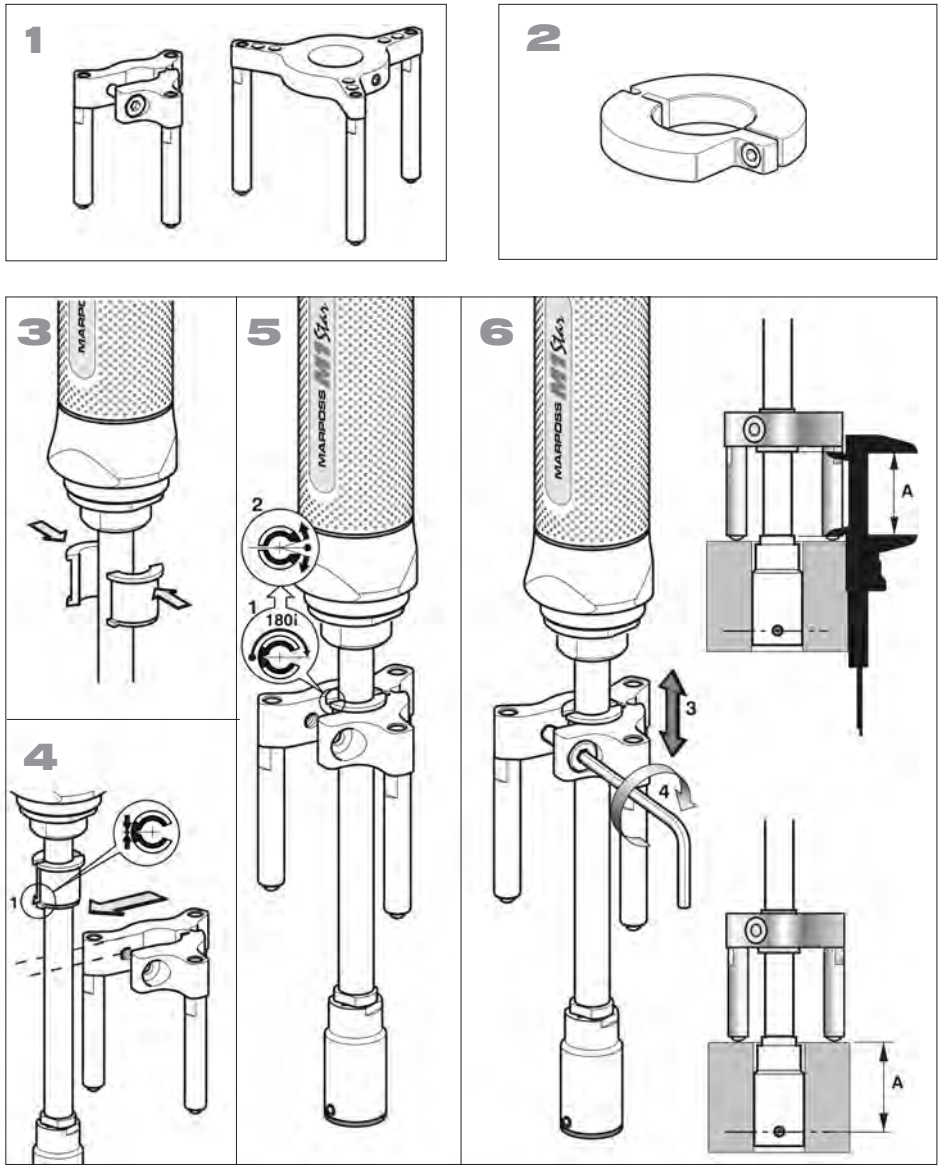
4.3.1 ASSEMBLY OF DEPTH STOPS FOR DEPTH EXTENSIONS

The relevant assembly procedures are described below.

FOR DEPTH EXTENSION, DIAMETER 4 and 7,5 mm

1. Apply the bushing to the two half shells on the depth extension, so as to have the two feet to coincide (see Fig. 3).
2. Laterally insert the depth stop in the depth extension and push the two half shells into it (see Fig. 4)
3. While holding the depth stop firmly, rotate the two half shells by 180°, and move them away from each other so as to obtain the positioning shown in Fig. 5.
4. Apply the hexagonal-end screw to the depth stop seat and slightly tighten the latter by means of the hexagonal-end wrench (2.5 mm for the Ø 4 depth stop and 3 mm for the Ø 7,5 depth stop), so as to allow the positioning A of the depth stop (*).
5. When the desired depth stop position has been achieved, lock the whole unit by means of the hexagonal-end wrench (2.5 mm for the Ø 4 depth stop and 3 mm for the Ø 7,5 depth stop).

(*) The depth stop locking position varies according to the depth in which the measurement needs to be detected. As shown on Fig. 6, if the depth stop rests on the plug gauge, the measuring depth is zero, because the touch takes place on the axis of the contacts (A=0). The measuring depth setting can be done by means of a slider gauge.

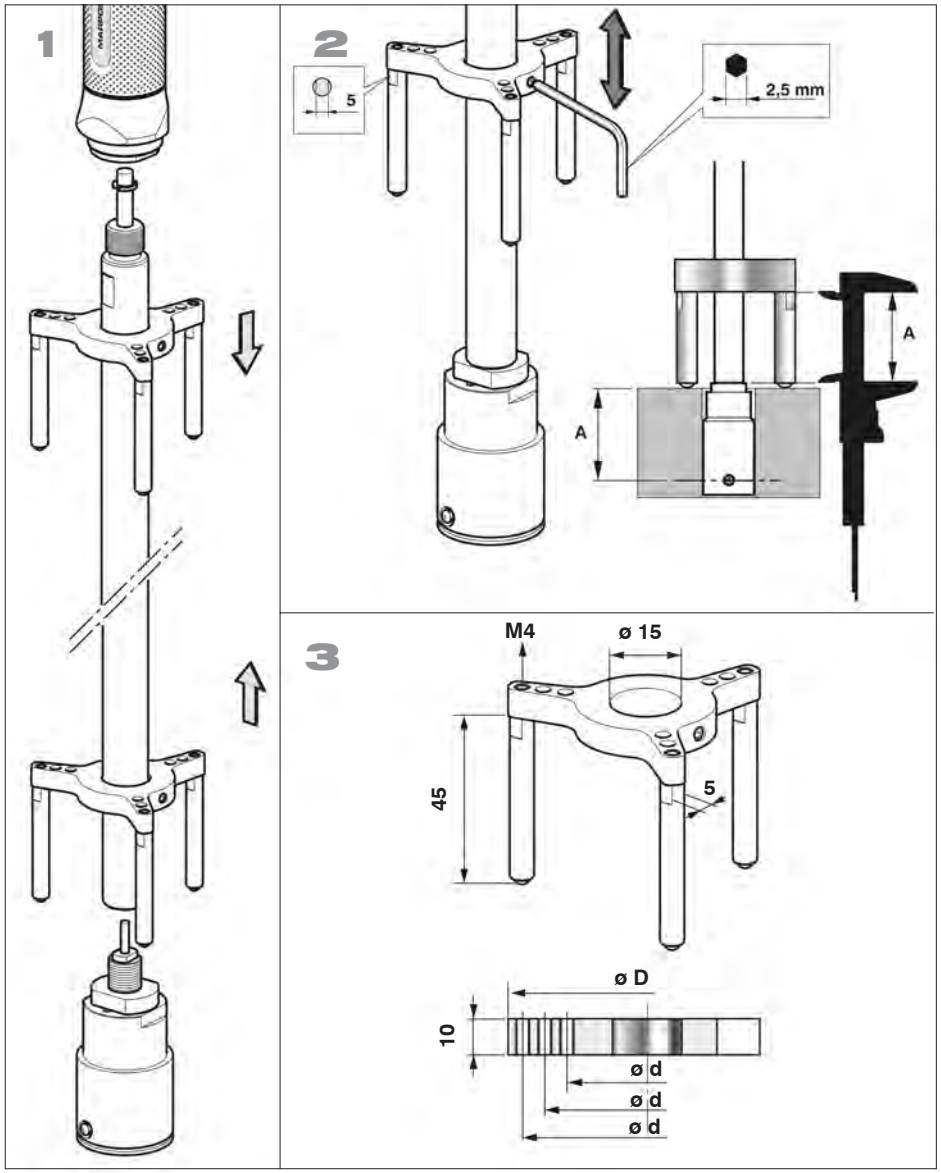


FOR DEPTH EXTENSION, DIAMETER 15 mm

1. Disassemble the depth extension from the handle (or the plug gauge from the depth extension) (see fig. 1).
2. Insert the depth stop in the depth extension and lock it at the desired height A (*), by screwing the M5 dowel by means of the 2.5 mm hexagonal-end wrench (see Fig. 2)
3. By means of the 5 mm A/F wrench, screw and lock the stop spacers in the relevant seats (see Fig. 3). The choice of the seat is determined by the diameter class of the nosepiece (see table below).

(*) The depth stop locking position varies according to the depth in which the measurement needs to be detected. As shown on Fig. 2, if the depth stop rests on the plug gauge, the measuring depth is zero, because the touch takes place on the axis of the contacts (A=0). The measuring depth setting can be done by means of a slider gauge.

Diameter Class (mm)	Overall outside dimension ø D (mm)	Diameter position of spacer ø d			
26 - 29	45	38			
29 - 59	75	44	56	68	
59 - 94	110	79	91	103	
94 - 144	160	117	129	141	153
144 - 204	220	117	189	201	213



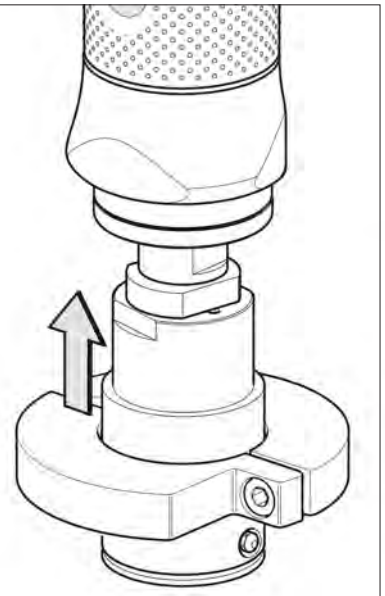
4.3.2 ASSEMBLY OF NOSEPIECES DEPTH STOPS

This model is directly fitted on the outside diameter of the nosepiece and attached to it (see Fig. 1). It is adjusted to the diameter of the nosepiece.

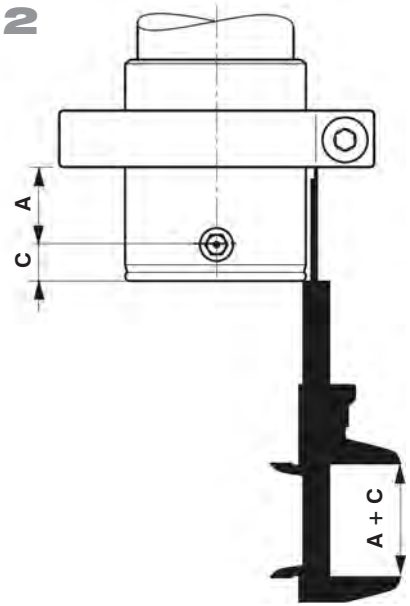
1. Insert the depth stop in the nosepiece and set it at the required height A; this value varies according to the depth in which the measurement needs to be detected (see Fig. 1). To define the correct position it is sufficient to add "A" to "C" (distance between the axis of the contacts and the top of the nosepiece), by means of a slider gauge (see Fig. 2).
2. By means of the 3 mm hexagonal-end wrench (see Fig. 3), lock the depth stop at the required distance.

NOTE:
In order to avoid mechanical stress of the nosepiece do not excessively tight the locking screw of the depth stop, particularly for plug gauges of small diameter.

1



2



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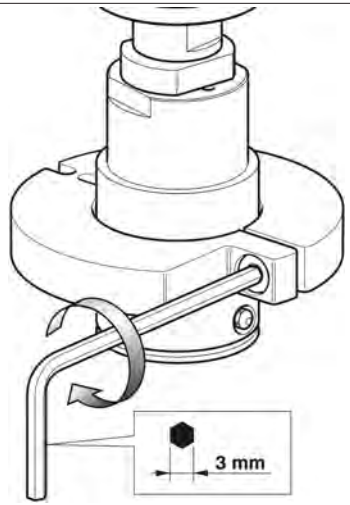
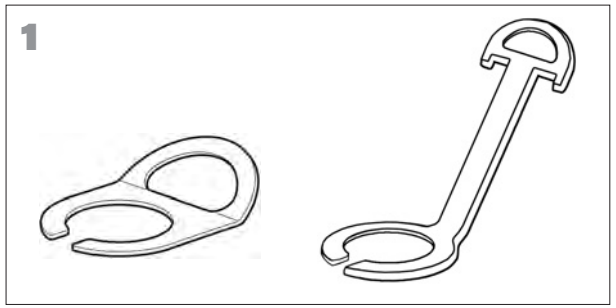


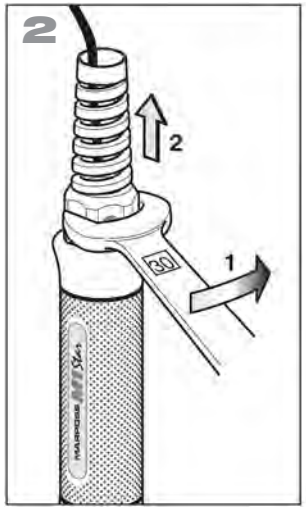
4.4 HOOKS

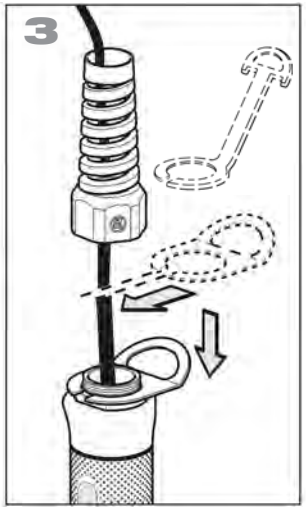
In bore gauges with pencil probe holder it is possible to fit an eye (see Fig. 1), in order to make it possible to hang the appliance to a hook, avoiding the presence of the cable on the worktable.

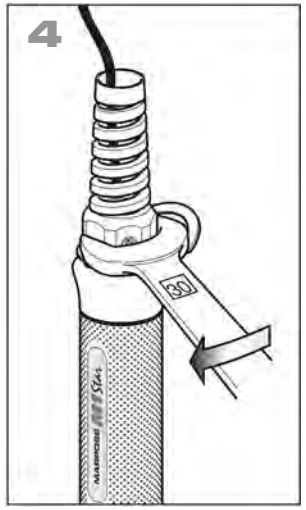
ASSEMBLY

1. Unscrew the cable guide from the threaded bushing, using the 30 mm A/F wrench (see Fig. 2).
2. As shown in Fig. 3, insert the eye in the cable, and position it on the threaded bushing.
3. Screw the cable guide to the threaded bushing, and lock it by means of the 30 mm A/F wrench (see Fig. 4).









4.5 DEPTH EXTENSIONS

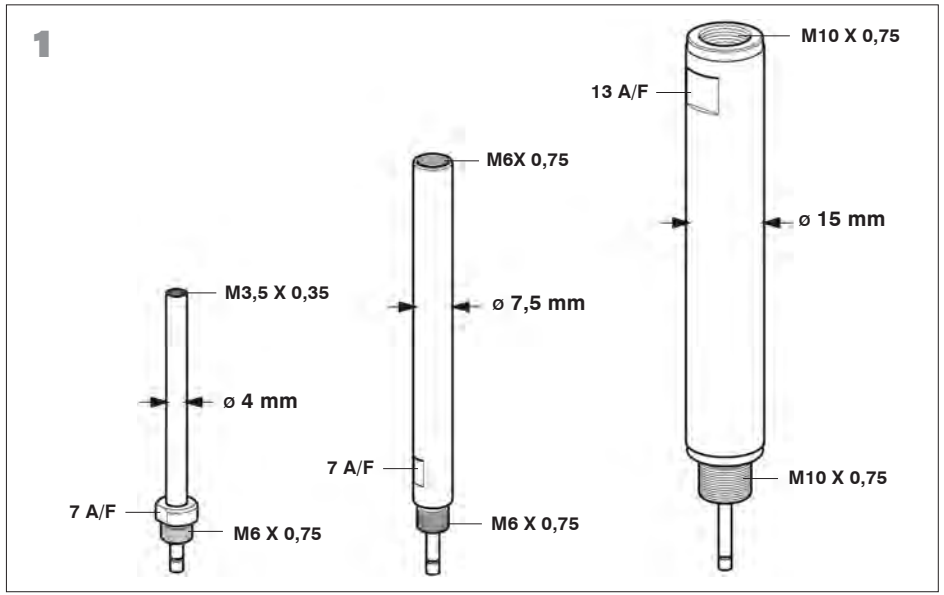
The depth extensions (see Fig. 1) make it possible to reach measuring depths up to 500 mm and even more, if they are connected in cascade.
Fig. 1 shows the three manufactured models, in order to comply with the most operating needs. TABLE 1 represents the available lengths.

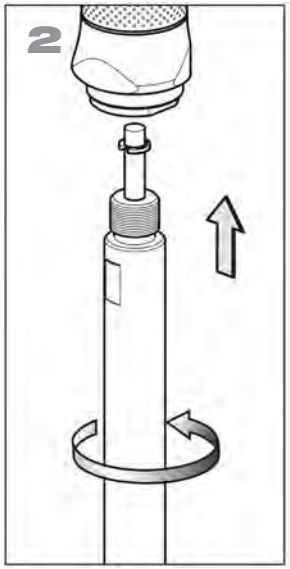
ASSEMBLY

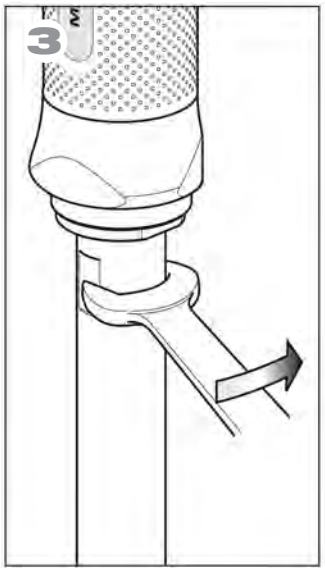
1. Disassemble the plug gauge from the handle (see page 11).
2. Manually screw the depth extension to the handle (see Fig.2),
3. Lock it by means of the appropriate wrench (see Fig. 3 and 1).
4. Manually screw the plug gauge to the other end of the extension (see Fig. 4).
5. Firmly apply the appropriate wrench (see Fig. 1) to the extension seat, then lock the plug gauge by means of the relevant wrench (see page 11).

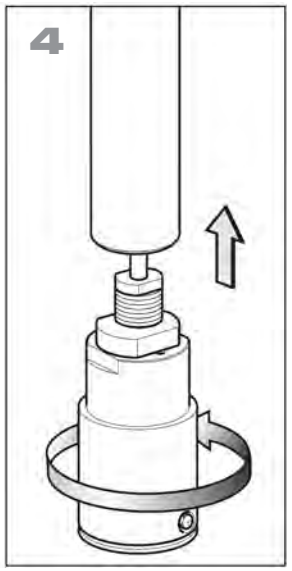
TABLE 1

	ø **4** (mm)	ø **7,5** (mm)	ø **15** (mm)
AVAILABLE LENGHTS	20	20	-
	30	30	-
	40	40	-
	50	50	50
	65	65	65
	80	80	80
	100	100	100
	125	125	125
	-	250	250
	-	-	500









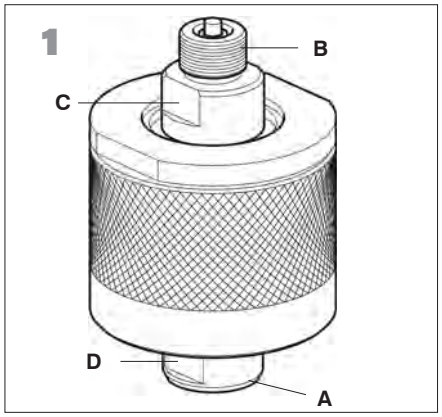
4.6 ROTARY SPACER

The rotary spacer (see Fig. 1) allows to perform dynamic measurements while keeping the indicator constantly facing the operator.

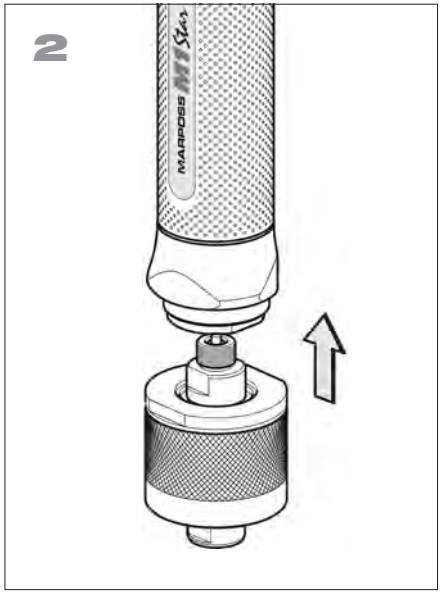
NOTE:
the table in Fig. 1 will help you in the assembly, indicating the size of the wrenches to be used and the connection threads.

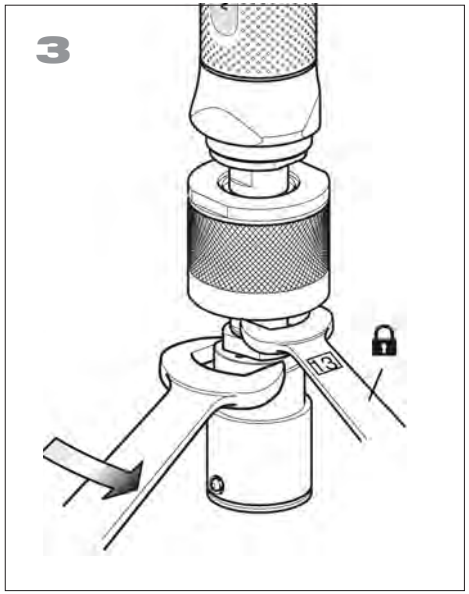
ASSEMBLY OF ROTARY SPACER

1. If installed disassemble the plug gauge (see page 11).
2. Manually screw the rotary spacer to the handle on threaded side “B”, then apply 13 A/F wrench and lock it.
3. Manually screw the plug gauge to the rotary spacer, until stop it.
4. As shown in Fig. 3, firmly apply the 13 A/F wrench to the rotary spacer, and lock the plug gauge by means of the appropriate wrench (see page 11).



A	M6 x 0,75	M10 x 1
B	M10 x 1	
C	13 A/F	
D	13 A/F	





Chapter 5. - TROUBLESHOOTING

MALFUNCTION	CORRECTIVE ACTION
The contacts do not return to the pre-travel position	Verify if any residual dirt entered the movement transducer unit, inside the measuring armset. This instance requires a special maintenance action (see chapter MAINTENANCE).
The contacts remain pressed	The malfunction is generally caused by the following reasons: ① Residual dirt entered the movement transducer unit, inside the measuring armset; this instance requires a special maintenance action (see chapter MAINTENANCE). ② Damaging of an element of the mechanical transducer unit and/or of the transmission unit; this instance requires the substitution of the damaged and/or worn elements.
The bore gauge repeatability is not conform to the technical specification	The malfunction is generally caused by the following reasons: ① Improper use of the product (*) ② Improper bore gauge assembly (see correct procedure reported on this manual) ③ Loosening of one of these components: • Contacts and/or contact extension from the measuring armset • Locking nut for the nosepiece/measuring armset • Plug gauge and/or extension and/or rotary spacer and/or angle from the handle • Measuring system (pencil probe from the pencil probe-holder, or mechanical/electronic indicator from the indicator holder) ④ Wearing of the nosepiece; such situation increases the nosepiece/workpiece clearance, altering the technical-metrological features of the bore gauge. ⑤ Residual dirt entered the movement transducer unit, inside the measuring armset; this instance requires a special maintenance action (see chapter MAINTENANCE).
Zero-setting loss	The malfunction is generally caused by the following reasons: ① Wearing of one of these elements: • Contacts • Mechanical transducer unit and/or transmission unit ② Loosening of one of these components: • Contacts and/or contact extension from the measuring armset • Locking nut for the nosepiece/measuring armset • Plug gauge and/or extension and/or rotary spacer and/or angle from the handle • Measuring system (pencil probe from the pencil probe-holder, or mechanical/electronic indicator from the indicator holder)

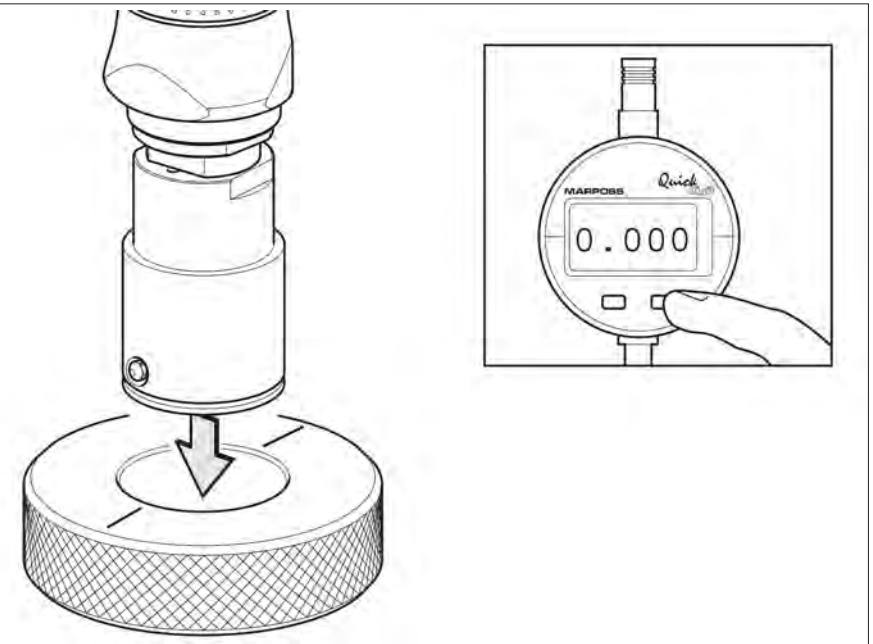
(*) The bore gauge repeatability con be partially influenced by the operator skills; on the next page is described the right procedure to achieve a proper repeatability test of the bore gauge.

5.1 REPEATABILITY TEST

1. Lean on a horizontal surface the measuring master (minimum diameter)
2. Insert the bore gauge in the master and set to zero the indicator (see Fig. 1); leave the bore gauge in this position for 5 minutes, in order to be properly settled.
3. Take out the bore gauge from the master
4. Replace the bore gauge in the master and let it lean on the table; note down the value displayed on the indicator.
5. Take out the bore gauge from the master
6. Repeat step 4 and 5 for 50 times in quick sequence
7. Calculate the standard deviation s of the 50 measurement, and then multiply it for the factor 2,77. The achieved value represents the repeatability of the bore gauge with the applied indicator.
8. Subtract from the calculated value the error of the applied indicator, obtaining the repeatability error of the bore gauge.

ATTENTION:
During the measure sampling, instruments manipulation and accidentally contacts may negatively condition the end result.

1



Chapter 6. - MAINTENANCE

Two are the types of maintenance operation planned:

- ORDINARY MAINTENANCE (on regular basis, in order to ensure the metrological features of the bore gauge)
- SPECIAL MAINTENANCE (to be performed in case the metrological features of the bore gauge are negatively conditioned by residual dirt)

6.1 ORDINARY MAINTENANCE

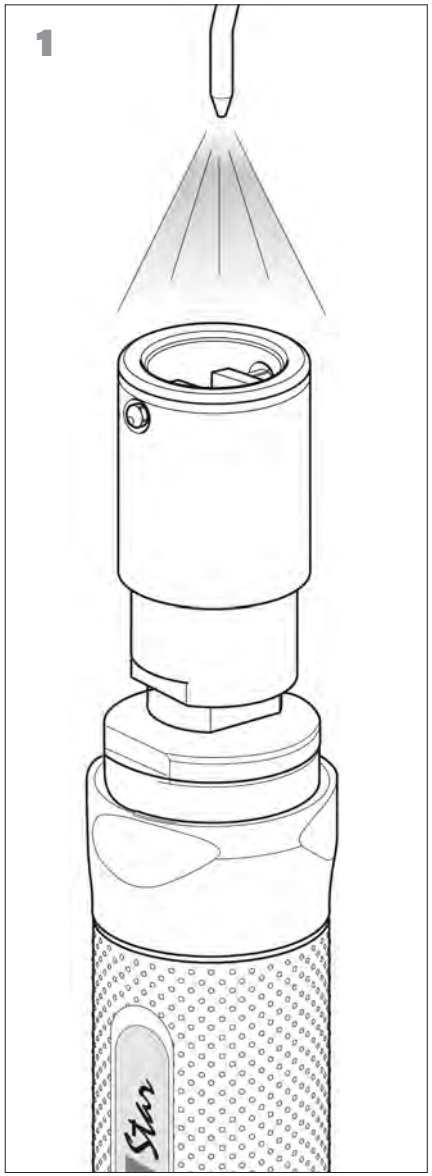
Two are also the types of ordinary maintenance operations planned: the first every three months and the second every six months:

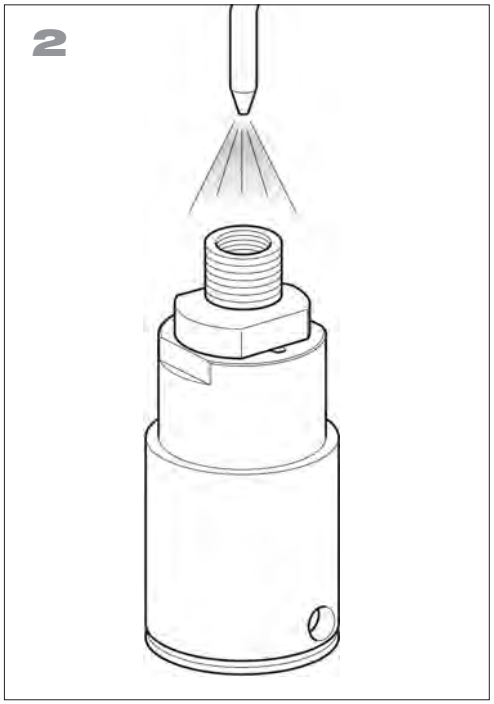
6.1.1 THREE MONTHS MAINTENANCE

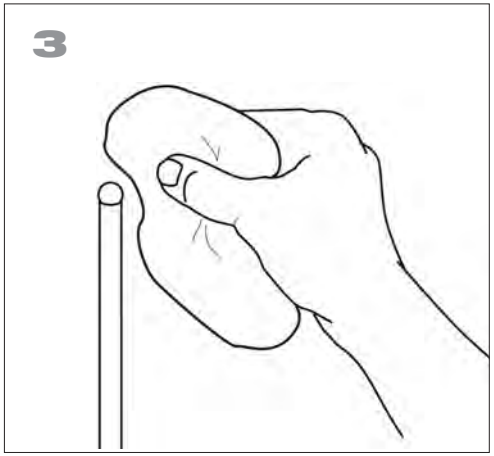
Clean the plug gauge using compressed air (see fig. 1); if it is the case disassemble the cap (see page 14).

6.1.2 SIX MONTHS MAINTENANCE

Disassemble the **plug gauge** from the handle (see page 12).
Disassemble the **rod unit** (see page 24).
By means of compressed air, clean the internal part of the plug gauge starting from the rod unit bore (see fig. 2).
Clean with a cloth the rod unit sphere (see fig. 3), and apply a thin layer of grease (using common workshop lubricant grease).
Re-assemble all the elements as explained on this manual.





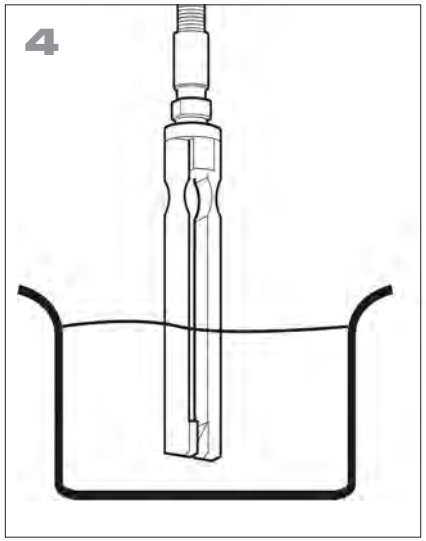


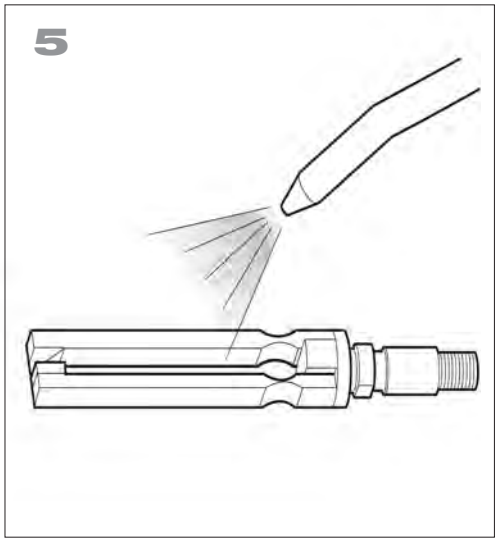
6.2 SPECIAL MAINTENANCE

This operation is required in case of irregular sliding of the elements, and/or bad repeatability of the measure.

NOTE:
The Special Maintenance operation for range between 3÷26 mm must be carried out by a MARPOSS centre. Whereas, for range between 26÷300 mm, plase follow the instuctions here reported.

Remove the **plug gauge** from the handle (see page 12).
Disassemble the **cap** (see page 14)
Remove the **contacts** (see page 16), except for nosepiece with open contacts seat configurations.
Disassemble the **rod unit** (see page 24)
Remove the **measuring armset from the nosepiece** (see page 20)
Cleaning of the measuring armset (special care for the "V" of movement transducing), soaking the elements in a solvent solution (isopropilic alcohol) see fig. 4.
Dry the measuring armset by means of compressed air (see fig. 5) and lubricate it (using a common workshop antioxidant lubricant).
Clean with a cloth the rod unit sphere (see fig. 40), and apply a thin layer of grease (using common workshop lubricant grease).
Re-assemble all the elements as explained on this manual.





Chapter 7. - LIST OF SPARE PARTS

This chapter indicates all the spare assemblies and/or components, with the respective ordering codes.

7.1 STANDARD INDICATOR HOLDER

The table below indicates all the models of STANDARD indicator handles that are marketed.

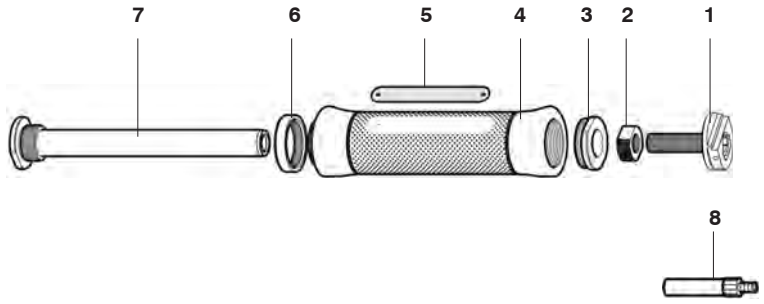
DESCRIPTION	CODE
Indicator handle ø 8 - M10	2TCLAS0000
Indicator handle ø 8 - M6	2TCL6S0000
Indicator handle ø 3/8" - M10	2TCLBS0000
Indicator handle ø 3/8" - M6	2TCL7S0000

7.1.1 COMPONENTS

Besides the complete indicator handle, the individual components are supplied as well (see the table and the relevant graphic representation).

REF.	DESCRIPTION	CODE
1	Indicator holder assembly ø 8	2T0IHAS000
	Indicator holder assembly ø 3/8" (*)	2T0IHAS001
2	Adjusting ring nut	1T0LNS0725
3	Plastic cap for indicator handle	1T0PCS0722
4	Handle + label	1T0HAS0993
5	Removable number plate	1T0NPS0991
6	Collet	1T0CLS0995
7	Transmission assembly	2T0TXAS000
8	Extension for indicator ø 3/8"	1024017116

(*) The extension 1024017116 (see component 8) is also supplied.



7.2 MINI INDICATOR HOLDER

The table below indicates all the models of MINI indicator handle that are marketed.

Description	Code
Indicator handle ø 8 - M10	2TCSAS0000
Indicator handle ø 8 - M6	2TCS6S0000
Indicator handle ø 8 - M3,5	2TCS3S0000
Indicator handle ø 3/8" - M10	2TCSBS0000
Indicator handle ø 3/8" - M6	2TCS7S0000
Indicator handle ø 3/8" - M3,5	2TCS4S0000

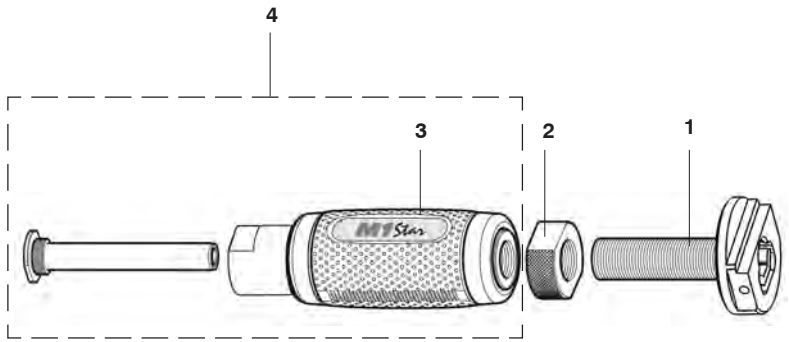
The appropriate extensions to be installed on the indicator are supplied as standard equipment with the indicator handles.

7.2.1 COMPONENTS

Besides the complete indicator handle, the individual components are supplied as well (see table and relevant graphic representation).

REF.	Description	Code
1	Indicator holder unit ø 8	2T0IHAS002
	Indicator holder unit ø 3/8" (*)	2T0IHAS003
2	Adjusting ring nut	1T0LNS0725
3	Handle + labels	1T0HMS0000
4	Handle + labels + transmission assembly	2T0TXAS001

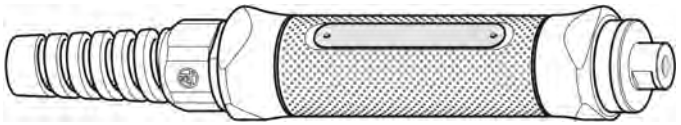
(*) Together with the spare part, the extension to be installed on the indicator is supplied as standard equipment.



7.3 PENCIL PROBE HOLDER

The table below indicates the pencil probe handle model that is marketed.

Description	Code
Pencil probe handle ø 8 M10	2TPLA00000
Pencil probe handle ø 8 M6	2TPL600000
Pencil probe handle ø 3/8" M10	2TPLB00000
Pencil probe handle ø 3/8" M6	2TPL700000

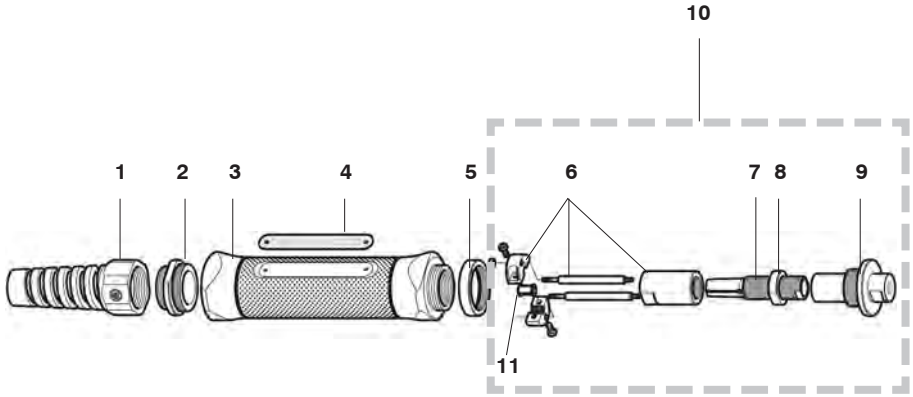


7.3.1 COMPONENTS

Besides the complete pencil probe handle, the individual components are supplied as well (see the table and the relevant graphic representation).

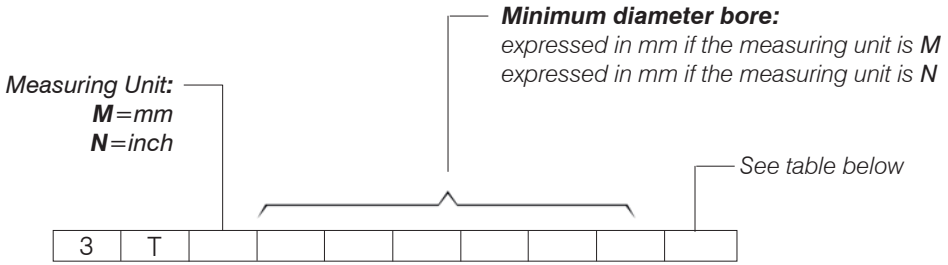
REF.	Description	Code
1	Cable guide	1T0CGS0994
2	Threaded bushing	1T0TBS0996
3	Handle + number plate	1T0HAS0993
4	Removable number plate	1T0NPS0991
5	Collet	1T0CLS0995

REF.	Description	Code
6	Cable clamp assembly ø 8	2T0CCAS000
	Cable clamp assembly ø 3/8"	2T0CCAS001
7	Pencil probe holder ø 8	2T0PPHS702
	Pencil probe holder ø 3/8"	2T0PPHS705
8	Adjusting ring nut	1T0LNS0704
9	Threaded connection M10	1T0TIS0700
	Threaded connection M6	1T0TIS0701
10	Complete penc. pr. holder ass.y ø 8 M10	2T0PHAS002
	Complete penc. pr. holder ass.y ø 8 M6	2T0PHAS000
	Complete penc. pr. holder ass.y ø 3/8" M10	2T0PHAS003
	Complete penc. pr. holder ass.y ø 3/8" M6	2T0PHAS001
11	Cable protector set	1T0CPS0700



7.4 PLUG GAUGE

All the plug gauges are supplied as spare parts. Their coding is based on their technical specifications. Below there is a representation of the pattern of the coding of the plug gauges.



Plug Gauge type	Dimension C	ø MIN Bore		Radius Contact (1)	
		mm	inch	R 1	R 2
MBG-B	2,5 0.0984"	3-4	0.1181"-0.1575"	C	D
		4-5,5	0.1575"-0.2165"		
	3 0.1181"	5,5-7,5	0.2165"-0.2953"	E	F
		7,5-9,5	0.2953"-0.3740"		
		9,5-15	0.3740"-0.5905"		
		15-20	0.5905"-0.7874"		
	3,5 0.1378"	20-26	0.7874"-1.0236"	G	H
		26-300	1.0236"-11.811"		
MBG-BC	1,5 0.0590"	3-4	0.1181"-0.1575"	A	B
		4-5,5	0.1575"-0.2165"		
		5,5-7,5	0.2165"-0.2953"		
		7,5-9,5	0.2953"-0.3740"		
MBG-T	6 0.2362"	5,5-7,5	0.2165"-0.2953"	P	Q
		7,5-9,5	0.2953"-0.3740"		
		9,5-15	0.3740"-0.5905"		
		15-26	0.5905"-1.0236"		
		26-40	1.0236"-1.5748"		
	8 - 0.3150"	40-300	1.5748"-11.811"	R	S
MBG-SB	1 0.0394"	3-4	0.1181"-0.1575"	Y	Z
		4-5,5	0.1575"-0.2165"		
		5,5-7,5	0.2165"-0.2953"		
		7,5-9,5	0.2953"-0.3740"		
		9,5-15	0.3740"-0.5905"		
		15-26	0.5905"-1.0236"		
		26-300	1.0236"-11.811"		

Example of ordering code:

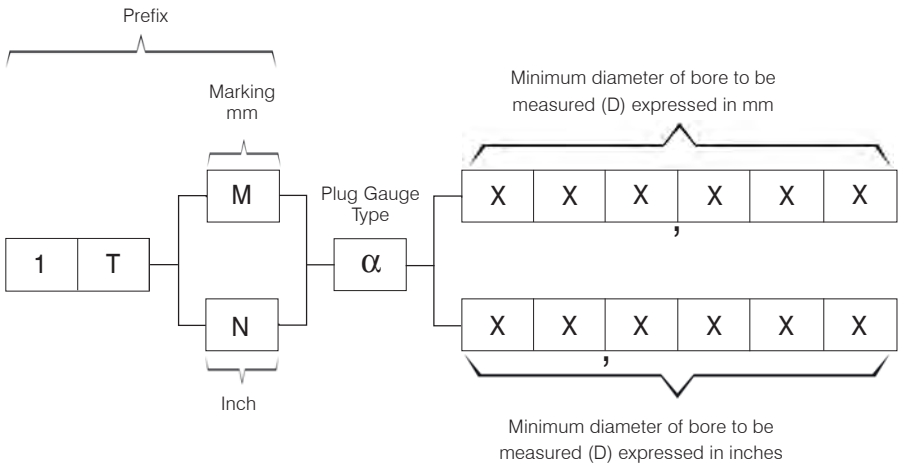
1. A MBG plug gauge has to be ordered, to measure a blind bore of 9,5mm $^{+0.016}_{+0.003}$ of diameter with a roughness Ra ≤2 μm and C=1 mm
   - 3TM009503Y

2. A MBG plug gauge has to be ordered, to measure a blind bore o 11 mm $^{+0.002}_{-0.009}$ of diameter with a roughness Ra ≤2 μm and C=3 mm
   - 3TM010991E

3. A MBG plug gauge has to be ordered, to measure a through bore of 1.757" $^{+0.001}_{-0.001"}$ of diameter with a roughness Ra >2 μm and C=8 mm (0.3150")
   - 3TN017560S

7.4.1 NOSEPIECES

In this case, too, the ordering code is a speaking one: see the diagram below.



Prefix: alphanumerical field that identifies the theme *nosepieces with speaking code*

Measuring Unit:

- **M** indicates that the marked dimension is expressed in **mm** with a ***micron*** resolution;

- **N** indicates that the marked dimension is expressed in **inches** with a **tenthousandth of an inch** resolution.

Plug gauge type: the last alphanumerical character indicates the specification of the distance between the axis of the contacts and the top of the nosepiece (**C**):

α	Measuring range		Plug Gauge type
	mm	*inch*	
A	3-300	*0.1181"-11.811"*	SB
B	3-9,5	*0.1181"-0.3740"*	BC
C	3-5,5	*0.1181"-0.2165"*	B
D	5,5-20	*0.2165"-0.7874"*	B
E	20-300	*0.7874"-11.811"*	B
F	5,5-40	*0.2165"-1.5748"*	T
G	40-300	*1.5748"-11.811"*	T

Example:

1. A complete nosepiece has to be ordered, to measure a bore of $9,5^{+0.016}_{+0.003}$ mm at a distance C=1mm:

1TMA009503

2. A complete nosepiece has to be ordered, to measure a blind bore of $11^{+\,0,002}_{-\,0,009}$ mm of diameter:

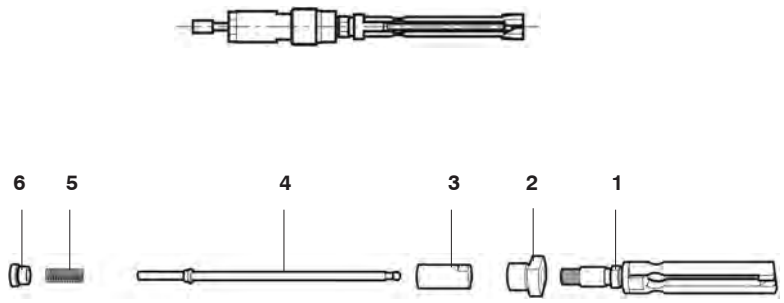
1TMD010991

7.4.2 MEASURING ARMSETS

On the following pages are listed all the spare part components for the measuring armsets.

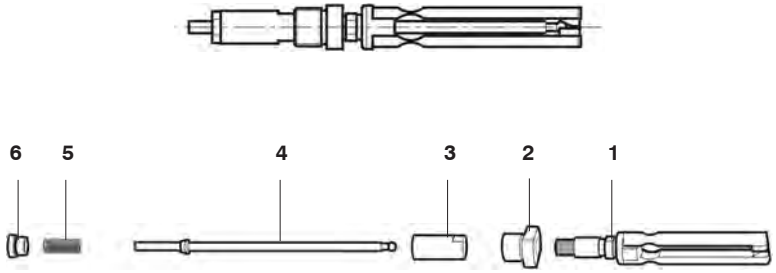
7.4.2.1 MEASURING ARMSET 3 ≤ ø < 5,5

DESCRIPTION		CODE
Complete measuring armset		NOT supplied
COMPONENTS 3 ≤ ø < 5,5		
REF.	**DESCRIPTION**	**CODE**
1	Armset	NOT supplied
2	Locking nut	1TLM000081
3	Spring spacer	1TGL000020
4	Rod	1TGN000000
5	Spring	1TGS000060
6	Bushing	1TGLR00075



7.4.2.2 MEASURING ARMSET 5,5 ≤ ø < 7,5

DESCRIPTION		CODE
Complete measuring armset		NOT supplied
COMPONENTS 5,5 ≤ ø < 7,5		
REF.	**DESCRIPTION**	**Code**
1	Armset	NOT supplied
2	Locking nut	1TLM000082
3	Spring spacer	1TGL000021
4	Rod	1TGN000001
5	Spring	1TGS000061
6	Bushing	1TGLR00076

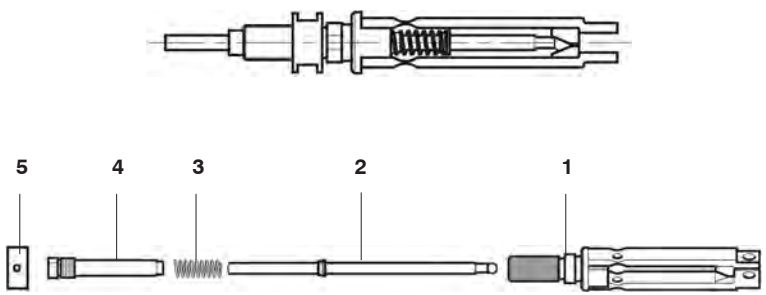


7.4.2.3 MEASURING ARMSET 7,5 ≤ ø < 9,5

DESCRIPTION	CODE
Complete measuring armset for through and blind bores	not supplied
Complete measuring armset for superblind bores	not supplied

COMPONENTS 7,5 ≤ ø < 9,5

REF.	DESCRIPTION	CODE
1	Armset	not supplied
2	Rod	1TGN000002
3	Spring	1TGS000062
4	Bushing	1TGL000068
5	Locking nut	1TLM000022

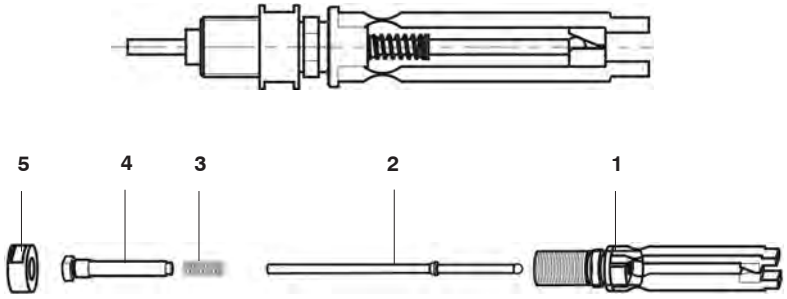


7.4.2.4 MEASURING ARMSET 9,5 ≤ ø < 26

DESCRIPTION	CODE
Complete measuring armset for through and blind bores	not supplied
Complete measuring armset for superblind bores	not supplied

COMPONENTS 9,5 ≤ ø < 26

REF.	DESCRIPTION	CODE
1	Armset	not supplied
2	Rod	1TGN000003
3	Spring	1TGS000062
4	Bushing	1TGL000069
5	Locking nut	1TLM000023

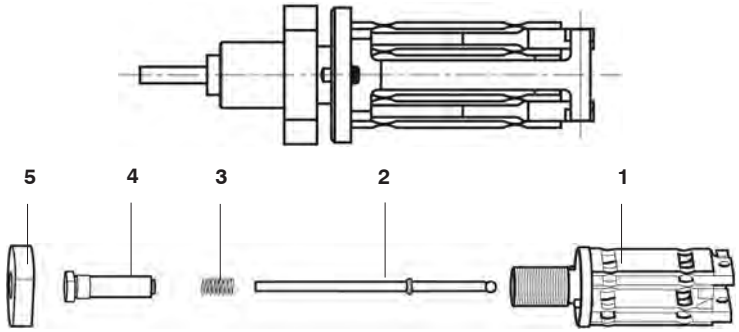


7.4.2.5 MEASURING ARMSET 26 ≤ ø < 300

DESCRIPTION	CODE
Complete measuring armset for Blind and Through bores	2TEM9PE000

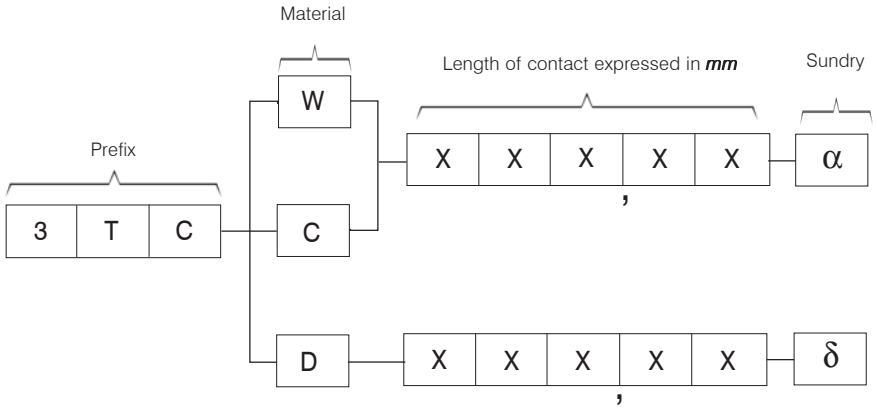
COMPONENTS 26 ≤ ø < 300

REF.	DESCRIPTION	CODE
1	Armset	not supplied
2	Rod	1TGN000004
3	Spring	1TGS000063
4	Bushing	1TGL000070
5	Locking nut	1TLM000024



7.4.3 CONTACTS

All the contacts are supplied as spare parts. Their coding is based on their technical specifications. Below there is a representation of the coding pattern of the contact.



Prefix: alphanumerical range that identifies the theme contacts with *speaking code*

Material: specifies the type of plug gauge and material/coating of its tip:

	MATERIAL OF CONTACT TIP		
	Tungsten carbide	Amorphous Carbon (DLC)	Diamond
W	•		
C		•	
D			•

Length: of contact expressed in **mm** with a **hundredth of a mm** resolution

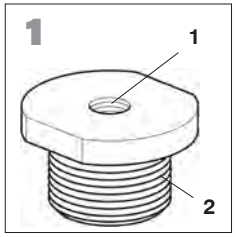
Sundry: these data depend by the diameter class of the plug gauge, and are different in application (B-blind, BC-blind C=1,5mm, T-through or SB-super blind bore) and in contact tip radius(**R1** and **R2**)

Diameter Class mm *(inch)*	Plug gauge type B blind bores				Plug gauge type BC blind bores C=1,5mm	
	Tungsten carbide or DLC		Diamond		Tungsten carbide or DLC	
	R1 (mm)	R2 (mm)	R1 (mm)	R2 (mm)	R1 (mm)	R2 (mm)
3-5,5 (0.1181”-0.2165”)	A	B	-	-	L	M
5,5-7,5 (0.2165”-0.2953”)	C	D	-	-	N	O
7,5-9,5 (0.2953”-0.374”)	E	F	E	-	P	Q
9,5-15 (0.374”-0.5905”)	G	H	G	-	-	-
15-16 (0.5905”-0.6299”)		I		-	-	-
16-20 (0.6299”-0.7874”)			H	-	-	-
20-26 (0.7874”-1.0236”)			K	L	-	-
26-32 (1.0236”-1.2598”)	J	K	M	-	-	-
32-300 (1.2598”-11.811”)			N	O	-	-

Diameter Class mm *(inch)*	Plug gauge type T through bores				Plug gauge type SB super blind bores	
	Tungsten carbide or DLC		Diamond		Widia oe DLC	
	R1 (mm)	R2 (mm)	R1 (mm)	R2 (mm)	R1 (mm)	R2 (mm)
3-5,5 (0.1181”-0.2165”)	-	-			L	M
5,5-7,5 (0.2165”-0.2953”)	C	D	-	-	N	O
7,5-9,5 (0.2953”-0.374”)	E	F	E	-	P	Q
9,5-15 (0.374”-0.5905”)	G	H	G	-	R	S
15-16 (0.5905”-0.6299”)		I		-		T
16-20 (0.6299”-0.7874”)			-	J		
20-26 (0.7874”-1.0236”)			K	L		
26-32 (1.0236”-1.2598”)	J	K	M	-	U	V
32-300 (1.2598”-11.811”)			N	O		

7.5 ACCESSORIES

7.5.1 THREAD ADAPTORS



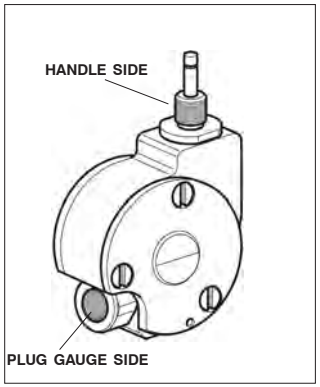
In order to ensure the mating between the handles and all the plug gauges in the program, 3 different thread adaptors are marketed (see Fig. 1). Their specifications and ordering codes are indicated in the table below.

Description	Thread 1	Thread 2	Code
THREAD ADAPTORS	M 3,5 X 0,35	M 6 X 0,75	1TA0350600
	M 3,5 X 0,35	M 6 X 0,75	1TA0351000
	M 6 X 0,75	M 6 X 0,75	1TA0601000

7.5.2 ANGLE ADAPTOR

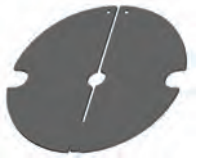
The table below indicates the values of the male thread for the connection of the angle to the handle and of the female thread for the connection of the angle to the plug gauge or, if present, to the extension.

Connection thread on handle side	Connection thread on plug gauge side	Code
M 6 X 0,75	M 3 X 0,35	2TAS630000
	M 6 X 0,75	2TAS660000
	M 10 X 1	2TAS6A0000
M 10 X 1	M 3 X 0,35	2TASA30000
	M 6 X 0,75	2TASA60000
	M 10 X 1	2TASAA0000



7.5.3 CAPS

The table below shows the caps with their ordering codes, on the basis of the diameter class and/or type of plug gauge (for through/blind bores, or for super blind bores).

DIAMETER CLASS (mm)	MBG		CODE
	T/B	SB	
12 ≤ ø < 15			1TCM000750
15 ≤ ø < 17,5			1TCM000751
17,5 ≤ ø < 20			1TC0000752
20 ≤ ø < 23			1TCM000753
23 ≤ ø < 26			
26 ≤ ø < 30			1TCM000754
30 ≤ ø < 35			1TC0000755
35 ≤ ø < 40			1TC0000756
40 ≤ ø < 45			1TC0000757
45 ≤ ø < 50			1TC0000758
50 ≤ ø < 56			1TC0000759
56 ≤ ø < 62			1TC0000760
62 ≤ ø < 68			1TC0000761
68 ≤ ø < 74			1TC0000762
74 ≤ ø < 80			1TC0000763
80 ≤ ø < 88			1TC0000764
88 ≤ ø < 96			1TC0000765
96 ≤ ø < 104			1TC0000766
104 ≤ ø < 112			1TC0000767
112 ≤ ø < 120			1TC0000768

120 ≤ ø < 130		1TC0000769
130 ≤ ø < 140		1TC0000770
140 ≤ ø < 150		1TC0000771
150 ≤ ø < 160		1TC0000772
160 ≤ ø < 170		1TC0000773
170 ≤ ø < 180		1TC0000774
180 ≤ ø < 190		1TC0000775
190 ≤ ø < 200		1TC0000776
200 ≤ ø < 210		1TC0000777
210 ≤ ø < 220		1TC0000778
220 ≤ ø < 230		1TC0000779
230 ≤ ø < 240		1TC0000780
240 ≤ ø < 250		1TC0000781
250 ≤ ø < 260		1TC0000782
260 ≤ ø < 270		1TC0000783
270 ≤ ø < 280		1TC0000784
280 ≤ ø < 290		1TC0000785
290 ≤ ø < 300		1TC0000786

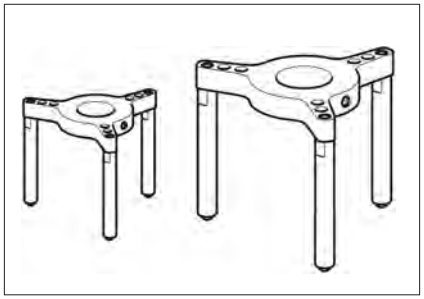
Eight spacers are supplied as standard equipment with the caps (for plug gauges with a range > 120 mm). Four of them are 29 mm long (to be used in plug gauges for through bores), while the other four are 24.5 mm long (to be used in plug gauges for blind and super blind bores).

7.5.4 DEPTH STOPS

Two different models of depth stops are marketed.

7.5.4.1 DEPTH STOPS FOR EXTENSIONS

Two types of this model are marketed: one is for plug gauges with diameter class 3 to 26 mm (see Tab. 1), the other is for diameter class 26 to 204 mm (see Tab 2).



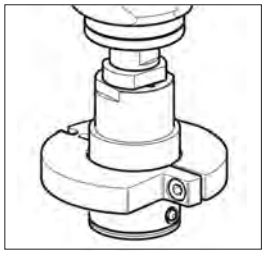
Tab. 1

DIAMETER CLASS (mm)	OUTSIDE OVERALL DIMENSION D (mm)	SPACER LENGTH L (mm)	DIAMETER OF EXTENSION (mm)	CODE
3 ≤ ø < 9,5	32	32,8	4	2TDEM040A0
9,5 ≤ ø < 26	42	34,8	7,5	2TDEM075A0

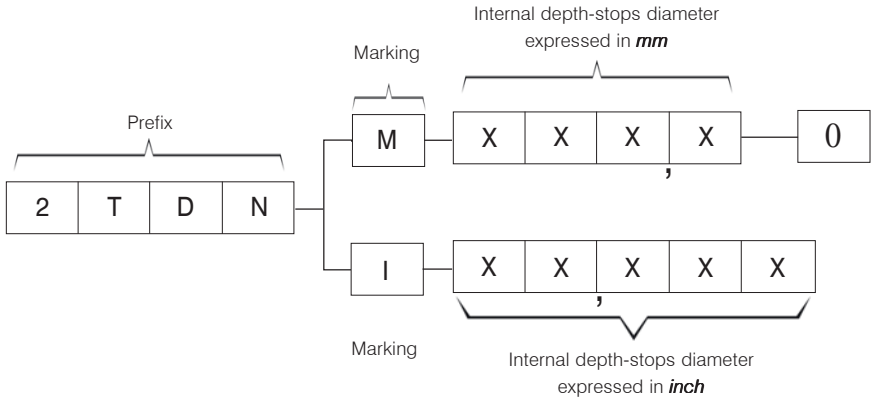
Tab. 2

DIAMETER CLASS (mm)	OUTSIDE OVERALL DIMENSION D (mm)	SPACER LENGTH L (mm)				DIAMETER OF EXTENSION (mm)	CODE
26 ≤ ø < 29	45	38	-	-	-	15	2TDE0M150A0
29 ≤ ø < 59	75	44	56	68	-		2TDE0M150B0
59 ≤ ø < 94	110	79	91	103	-		2TDE0M150C0
94 ≤ ø < 144	160	117	129	141	153		2TDE0M150D0
144 ≤ ø < 204	220	117	189	201	213		2TDE0M150E0

7.5.4.2 DEPTH STOPS FOR NOSEPIECES



This model is applied directly to the nosepiece, so the inside diameter of the depth stop depends on the outside diameter of the nosepiece.
The pattern of the speaking code for depth stops for nosepieces is shown below.



Prefix: alphanumerical field that identifies the theme *depth stops for nosepieces*

Marking: a laser marking on the depth stop indicates the diameter of the bore to be measured:

- M indicates that the marked dimension is expressed in mm with a tenth of a mm range
- I indicates that the marked dimension is expressed in inches with a thousandth of an inch resolution

NOTE:

For the standard versions, the minimum allowed diameter of the nosepiece is ø 8 mm.

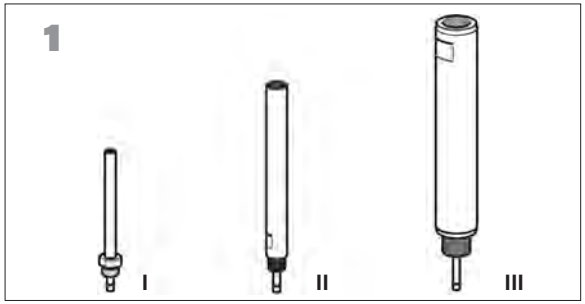
7.5.5 HOOKS

DESCRIPTION	CODE
EYE	1T0JHS0810
T-HOOK	1T0JHS0811

7.5.6 EXTENSIONS

Three different models of extension are marketed. Their technical specifications are shown in Fig. 1. The table below will allow you to identify the commercial codes in relation to the type and/or length of the extensions.

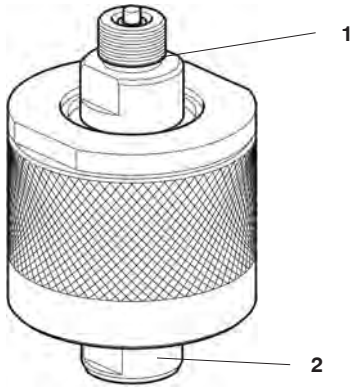
LENGTH (mm)	TYPE OF EXTENSIONS		
	I	II	III
20	2TXMS40020	2TXMS70020	-
30	2TXMS40030	2TXMS70030	-
40	2TXMS40040	2TXMS70040	-
50	2TXMS40050	2TXMS70050	2TXMSF0050
65	2TXMS40065	2TXMS70065	2TXMSF0065
80	2TXMS40080	2TXMS70080	2TXMSF0080
100	2TXMS40100	2TXMS70100	2TXMSF0100
125	2TXMS40125	2TXMS70125	2TXMSF0125
250	-	2TXMS70250	2TXMSF0250
500	-	-	2TXMSF0500



7.5.7 ROTARY SPACER

Two models of rotary spacers are marketed. They are different only in the thread for the connection to the plug gauge, which is indicated in the table below.

Description	Thread 1	Thread 2	Code
ROTARY SPACER	M 6 X 0,75	M 10 X 1	2TR060S000
	M 10 X 1	M 10 X 1	2TR100S000



7.6 INDICATORS

7.6.1 TESTA A MATITA

In the table below are represented the Red Crown pencil probes (± 1 mm) available in the program:

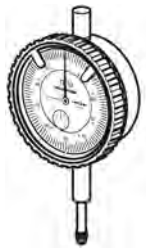
- H10 with HBT MARPOSS (Half Bridge) transducer
- F10 with LVDT MARPOSS (Full Bridge) transducer

Code	Description
3441554037	F10 (LVDT) cable length L=2 m and Lumberg connector SV50/6
3441554041	F10 (LVDT) cable length L=4 m and Lumberg connector SV50/6
3441554038	F10 (LVDT) cable length L=5 m and Lumberg connector SV50/6
3441553010	H10 (HBT) cable length L=2 m and Lumberg connector SV50/6
3441553011	H10 (HBT) cable length L=5 m and Lumberg connector SV50/6
3441562015	Compatible pencil probe with AIR GAGE electronics (L=2 m)
3441565019	Compatible pencil probe with ETAMIC ZDB electronics (L=2 m)
3441567013	Compatible pencil probe with FEINPRÜF/MAHR electronics (L=2 m)
3441563010	Compatible pencil probe with METREL electronics (L=2 m)
3441569013	Compatible pencil probe with METEM electronics (L=2 m)
3441564026	Compatible pencil probe with MERCER electronics (L=2 m)
3441572008	Compatible pencil probe with MITUTOYO electronics (L=2 m)
3441561086	Compatible pencil probe with TESA electronics (L=2 m)
3441566058	Pencil probe F10 (LVDT) – without connector (L=3,5 m)
3441566057	Pencil probe H10 (HBT) – without connector (L=3,5 m)
3441559045	F10 (LVDT) cable length L=2 m and Lumberg connector S3
3441559046	F10 (LVDT) cable length L=5 m and Lumberg connector S3

For compatible models with NON-MARPOSS electronics, please contact the nearest MARPOSS office.

7.6.2 MECHANICAL INDICATORS

Three different models of mechanical indicators are marketed. Their technical specifications are indicated in the table below.



TD10

TD1

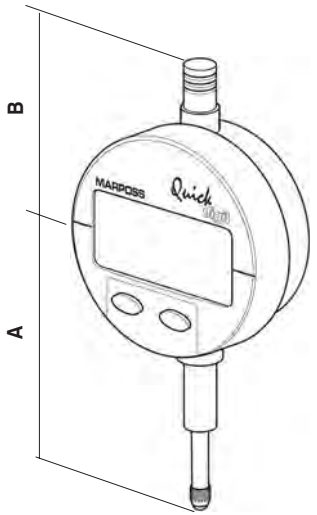
TD1P

Model	Fixing diameter	Resolution	Measuring range	Code
TD10	Ø 8	0.010 mm	10 mm	0E31010100
	3/8"	0.001"	0.250"	0E31111100
TD1	Ø 8	0.001 mm	1 mm	0E31020200
	3/8"	0.0001"	0.025"	0E31121200
TD1P	Ø 8	0.001 mm	0,1 mm	0E31030200
	3/8"	0.0001"	0.004"	0E31131300

7.6.3 ELECTRONIC INDICATOR

The table below indicates the models of QUICK DIGIT Marposs electronic indicators that are marketed, with their technical specifications.

Model	Fixing diameter	Resolution	Measuring range	Code	
				Basic	With memory
Q. Digit 12,5 S	Ø 8	0.001	12,5 mm	0E21201000	0E21201002



Model S	A		B	
	(mm)	(inch)	(mm)	(inch)
12,5 S	65,9	2,59"	53,4	2,10"

Further technical specifications on the Quick Digit indicators can be found in the site www.testar.com

7.7 WRENCHES FOR RETOOLING/RECONFIGURATION/MAINTENANCE

They are supplied only as an optional accessory, and are used for all the retooling and/ or reconfiguration and/ or maintenance operations indicated in this manual.

WRENCHES FOR SPECIAL MAINTENANCE OPERATIONS

SPECIAL AND OPEN WRENCHES	SPECIFICATIONS	SKETCH	CODE
OPEN WRENCHES	1.6 A/F		1346040025
	2.5 A/F		1346040024
	3 A/F		1346040023
	3.5 A/F		1346040022
	4 A/F		1346040021
	6 A/F		1346040018
	7 A/F		1346040017
	8.5 A/F		1346040015
	10* A/F		1346040013
	13* A/F		1346040010
	15* A/F		1346040008
	16* A/F		1346040007
	23* A/F		1346040004
	27* A/F		1346040002
PIN WRENCHES	WRENCH FOR NOSEPIECE (FRON 3 TO 5,5 mm)		1346057001
	WRENCH FOR NOSEPIECE (FROM 5,5 TO 7,5 mm)		1346057002
	WRENCH FOR NOSEPIECE (FROM 7,5 TO 9,5 mm)		1346057003
EXAGONAL-END WRENCH 2 mm	INDICATOR SET-UP		4413675303
EXAGONAL-END WRENCH 1,5 mm	FOR ANTI-ROTATION/TEAR RESISTANT GAITER UNIT		4413675302

* From 10 to 27 A/F standard-commercial wrenches can be applied

7.7.1 WRENCHES FOR CONTACTS

See page 16.

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For a full list of address locations, please consult the Marposs official website www.marposs.com - www.testar.com

D0010010GF - *Edition 07/2005 - Specifications are subject to modifications*

Marposs has an integrated system to manage the Company quality, the environment and safety, attested by ISO 9001, ISO 14001 and OHSAS 18001 certifications. Marposs has further been qualified EAQF 94 and has obtained the Q1-Award