MAUS ITALIA

Accessories

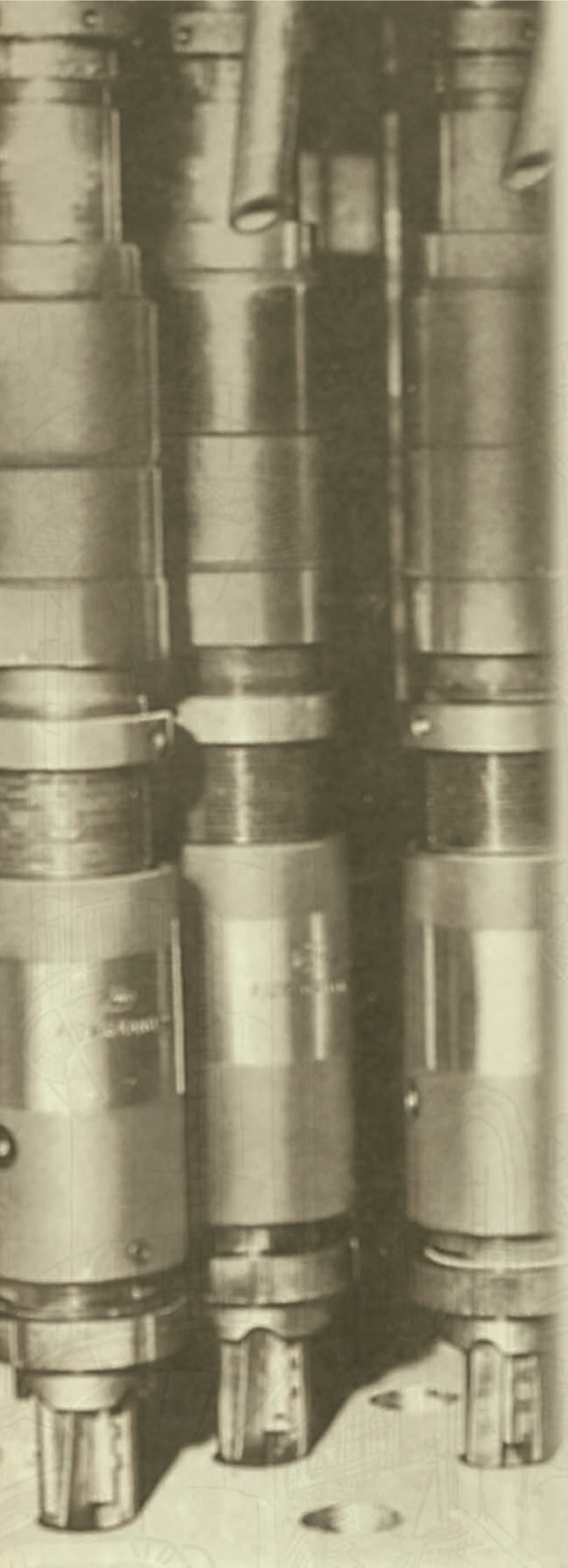
A comprehensive range of gauges, tools and accessories designed for

the manufacture *of* tube sheet heat exchangers

CE

MADE IN ITALY

ENG



Historical overview Maus Italia

Franco and Luisa Agostino
Founders

MAUS ITALIA 1961-2011

since 1961

At the end of the 50s, Franco Agostino seized the opportunity to grasp the art of manufacturing tube expanders which an experienced German manufacturer, Mr. Albert Otto, presented to him. Then, thanks to his indomitable courage, intuition and the help of his wife Luisa, Mr. Agostino set up that small Italian factory that a few years later would become Maus Italia.

Since the beginning, the company began producing the accessories needed by heat exchanger manufacturers, raising the interest of a customer base that has become increasingly demanding in terms of quality and productivity.

Nowadays Maus Italia has reached global leadership levels, thanks to a network of people who have been working very hard and to an Italian customer base with a strong export vocation.

Once again, at Maus Italia, the innovation arises from a long history of passion and enthusiasm, deeply rooted in the factory, which reflects in the proposed products.

The "Accessories" catalogue is but the last item in the comprehensive range of documents available to help the customer in the choice of the product that best fits their needs.

Accessories

A comprehensive range of gauges, tools and accessories designed for

the manufacture *of* tube sheet heat exchangers

With this catalogue, Maus Italia offers a wide range of tools and implements that are essential in a modern workshop, properly equipped for the manufacturing of tube sheet heat exchangers.

The following pages lists tens of products, sorted by topic:

Holetest • internal **measurement**

Holetool • **processing of holes** on the tube sheet
- drilling
- boring
- grooving

TubeIN • tube **insertion**

Tubend • tube **facing** and chamfering

Drivenax • **mechanical transmission** from motor to tube expander

Lubrol • **pastes** and **lubricating fluids** for expanding.

Contents

DNV

DNV BUSINESS ASSURANCE

MANAGEMENT SYSTEM CERTIFICATE

Certificato No. / Certificate No. **CERT-00464-95-AQ-MIL-SINCERT**

Si attesta che / This is to certify that

M.A.U.S. ITALIA Di F. Agostino & C. S.a.s.

S.S. Paullese Km 30 - 26013 Bagnolo Cremasco (CR) - Italy

E' conforme ai requisiti della norma per i sistemi di gestione:
Has been found to conform to the management system standard:

UNI EN ISO 9001:2008 (ISO 9001:2008)

Questa certificazione è valida per il seguente campo applicativo:
This Certificate is valid for the following product or service ranges:

Progettazione e produzione di mandrini allargatubi, macchine per mandrinare e macchine per la manutenzione di scambiatori di calore (Settore EA : 17 - 18)

Design and production of tube expanders, rolling equipments and machines for maintenance of heat exchangers (Sector EA : 17 - 18)

Data Prima Emissione/Initial Certification Date: 1995-04-18
Il Certificato è valido fino al: / This Certificate is valid until: 2015-03-25
L'audit è stato eseguito sotto la supervisione di/ The audit has been performed under the supervision of
Andrea Bariola
Lead Auditor

ACCREDIA

Luogo e data / Place and date: Agrate Brianza, (MB) 2012-03-27
Per l'organismo di Certificazione: / For the Accredited Unit:
Zeno Beltrami
Management Representative

La validità del presente certificato è subordinata al rispetto delle condizioni contenute nel contratto di Certificazione.
Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.

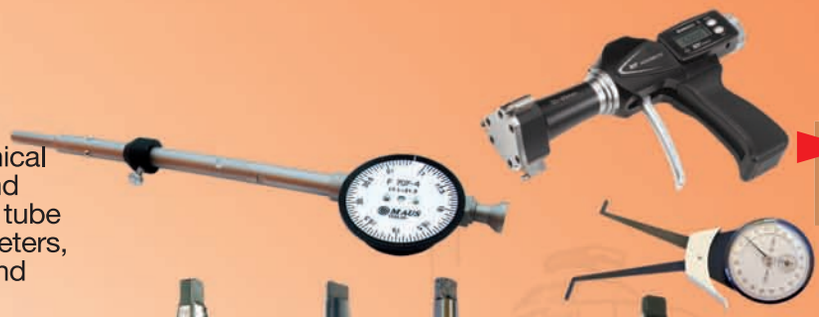
www.dnv.it - www.sincert.it

Symbols

Page AC-nn Go to page AC-nn

Holetest

A comprehensive range of mechanical and digital instruments with two and three contact points for measuring tube sheet holes and tube internal diameters, including calibration instruments and relevant accessories.



AC-4

Holetool

A comprehensive range of tools for tube sheet hole processing, with internal lubricating system for cutting area cooling.

AC-12

TubeIN

Tube guide with aluminium head (steel, Teflon and other materials available upon request) and interchangeable nylon brush to be used in tube sheet assembly to facilitate tube passage through tube sheet and baffle holes.

AC-26

Tubend

Tools for the shaving removal from the ends of the tube sheet heat exchanger tubes.

AC-28

Drivenax

Mechanical transmission equipment: telescopic shafts, fittings, extensions and joints. It includes all tools required to carry out the processing operations anywhere.

AC-34

Lubrol

Special water-soluble lubricating paste and fluids for proper expanding.

AC-42

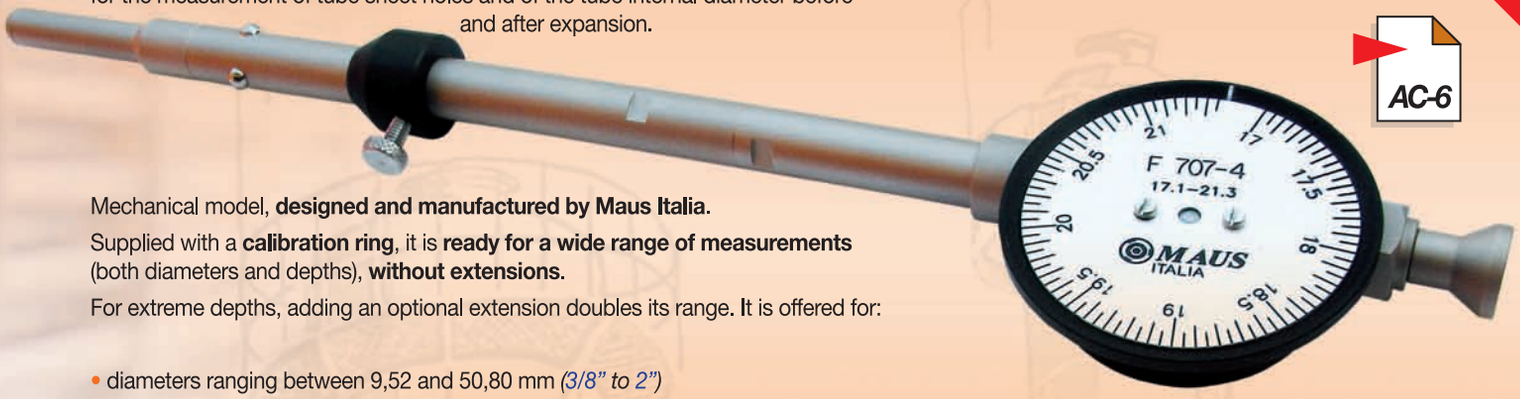
1 Holetest Mechanical and digital instruments for hole measurement

Maus Italia offers a **comprehensive range** of instruments designed to fulfil the critical task of measuring the tube sheet holes and the tube internal diameter before and after expansion.
Maus Italia's **technical staff** are at your disposal to recommend the optimum solution for each situation.

NEW

F/707

Internal **mechanical** gauge *(resolution 0.05 mm)* with **3 contact points**, designed for the measurement of tube sheet holes and of the tube internal diameter before and after expansion.



AC-6

Mechanical model, **designed and manufactured by Maus Italia**.

Supplied with a **calibration ring**, it is **ready for a wide range of measurements** (both diameters and depths), **without extensions**.

For extreme depths, adding an optional extension doubles its range. It is offered for:

- diameters ranging between 9,52 and 50,80 mm *(3/8" to 2")*
- depths up to 203,20 mm *(8")* without extensions

F/703

AC-9

Internal **digital** micrometer with incorporated LCD display and 3 contact points suitable for **series testing. Measured data is recorded and reports can be uploaded as it certifies the work that has been carried out, outputting the measured data report** (Ø of the tube sheet holes and tube inner Ø before and after expansion).

Supplied with calibration rings, it is suitable for a wide range of measurements (both diameters and depths), thanks to its extensions (optional, available upon request).

Offered by Maus Italia in 2 sizes, it is suitable for:

- diameters ranging between 6,0 and 50 mm *(0.236" to 1.968")*
- depths up to 80 mm *(3.15")*, without extensions.

F/700

AC-10

Internal mechanical gauge with 2 contact points, designed for the measurement of tube sheet holes and of the tube internal diameter before and after expansion.

Being particularly lightweight, ***F/700*** is used with a single hand and is dust and splash resistant.

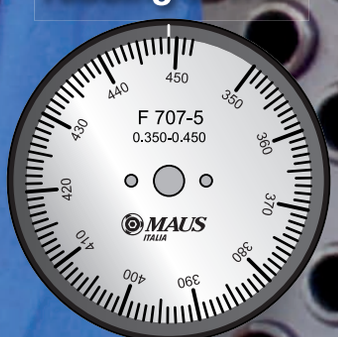
Offered in 5 sizes (complementary measuring fields), it is suitable for diameters ranging between 6,0 and 150,0 mm *(0.236" to 5.905")*.

Holetest

MAUS ITALIA

Particularly suitable for measuring the **tube internal Ø** before and after expansion.

Dial for reading in mm



Dial for reading in inches

MAUS ITALIA

Holetest

Resolution - **0.05** mm

F/707

NEW

Internal mechanical gauges with 3 contact points for tube sheet holes and heat exchanger tubes

Supplied with:

- Elegant wooden box with anti-shock shaped foam padding
- Calibration ring
- Service screwdriver
- Multifunction service wrench
- Reading dial in mm and inches

Optional upon request:

- Body extension
- Cursor extension (optional)

Maus Italia expands its internal gauge range with the new ***F/707*** model.

Its **ease of use assures extremely accurate instant measurements (in mm and inches).**

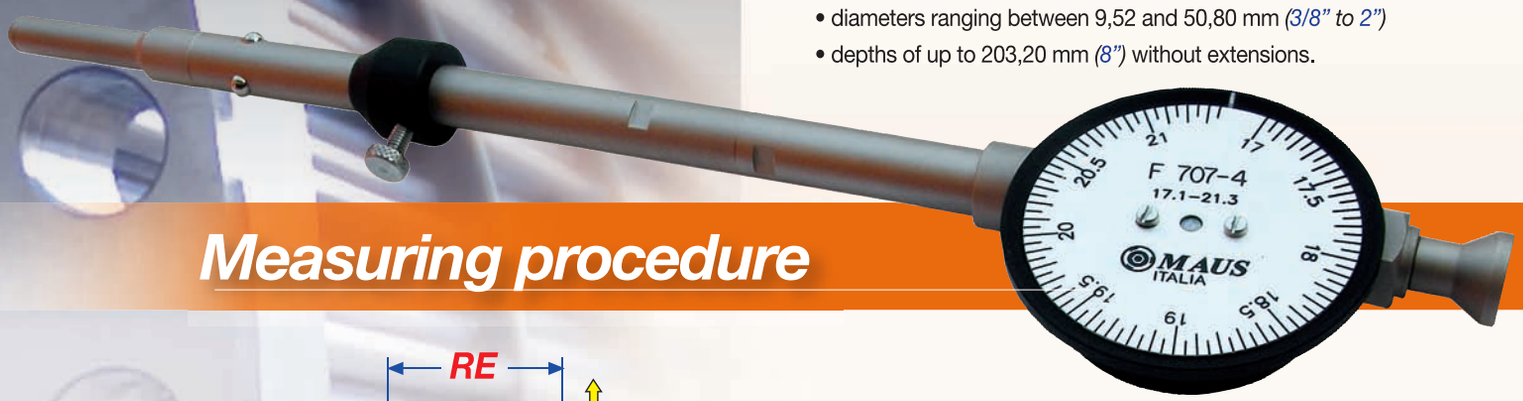
Internal dial **mechanical** gauge with **3 contact points**, designed for the measurement of **tube sheet hole diameter** and of the tube internal diameter before and after expansion.

The ***F/707*** model is particularly **accurate** and dust and splash resistant.

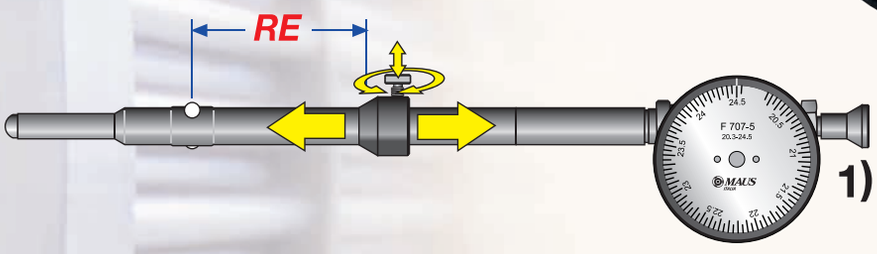
This newly designed mechanical model, supplied with a **calibration ring**, is ready for a **good range of measurements (both diameters and depths),** even without the help of extensions.

For extreme depths, adding a fixed 203,2 mm *(8")* extension doubles its range. It is offered for:

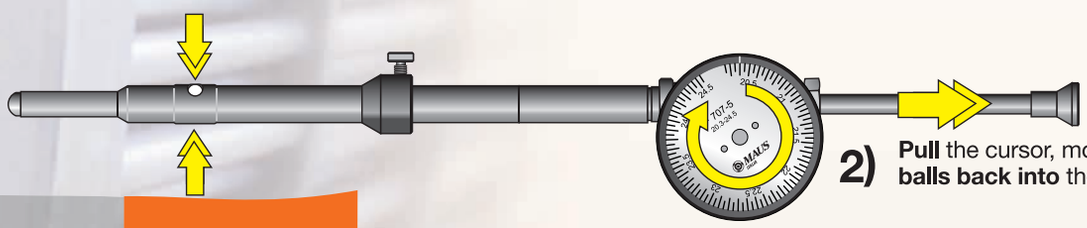
- diameters ranging between 9,52 and 50,80 mm *(3/8" to 2")*
- depths of up to 203,20 mm *(8")* without extensions.



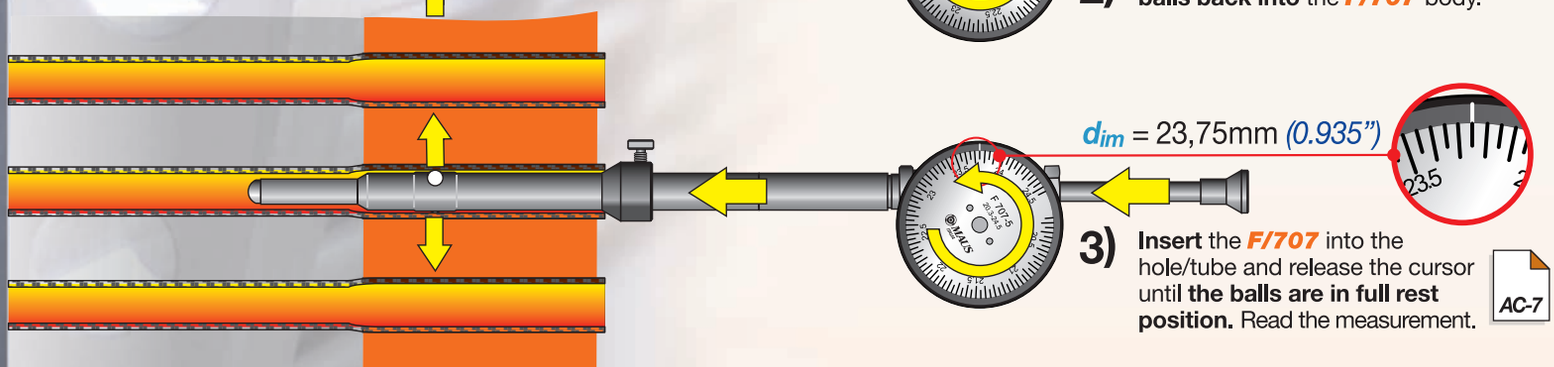
Measuring procedure



1) **Set** the centering taper in the **desired position** and **lock it** by means of the screw.



2) **Pull** the cursor, moving **the three balls back into** the ***F/707*** body.



3) **Insert** the ***F/707*** into the hole/tube and release the cursor until **the balls are in full rest position.** Read the measurement.

AC-7

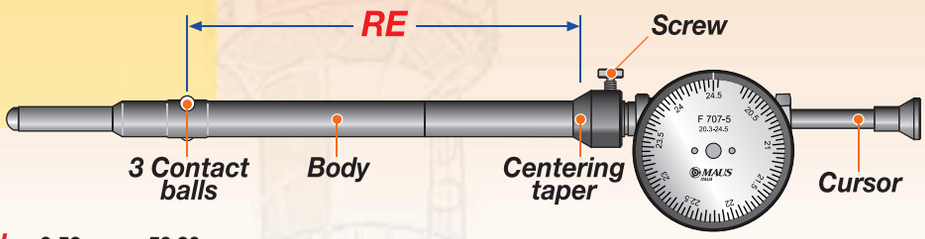
Holetest MAUS ITALIA

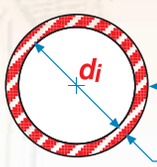
F/707

Sample order codes

If you need to measure **1" (25,4 mm)** tubes, **18 B.W.G**, to a depth of 270 mm *(10.63")*, the full order to be placed shall consist of:

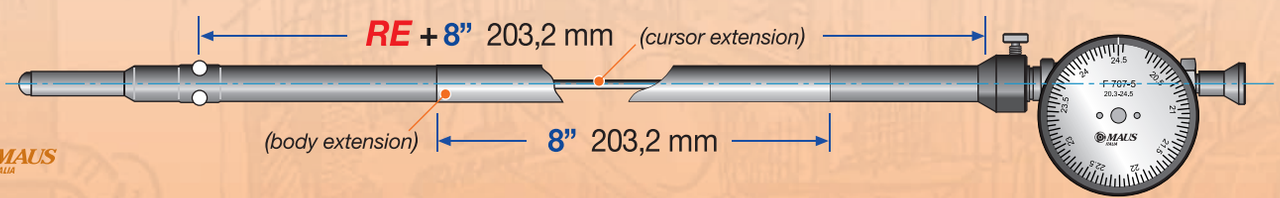
F/707-5 *(1 gauge)*
PC-F707-5 (1 body extension)
PA-F707-4÷5 (1 cursor extension)





F/707

Tube					Measuring field		F/707	STD RE depth		Modular extensions 203.2 mm (8") PC-F/707 Body extension	Modular extensions 203.2 mm (8") PA-F/707 Cursor extension
de		sp	di								
inches	mm	B.W.G.	mm	inches	mm	inches	Code	mm	inches	Code	Code
3/8"	9,52	20÷22	7,7÷8,1	0.305÷0.319	7,4÷8,9	0.290÷0.350	F/707-0	152,4	6"	-	-
1/2"	12,70	14	8,4	0.334	7,4÷8,9	0.290÷0.350	F/707-0	152,4	6"	-	-
		16÷20	9,4÷10,9	0.370÷0.430	8,9÷11,4	0.350÷0.450	F/707-1				
		22÷24	11,3÷11,6	0.444÷0.456	11,0÷14,2	0.440÷0.560	F/707-2				
5/8"	15,87	12	10,3	0.407	8,9÷11,4	0.350÷0.450	F/707-1	152,4	6"	-	-
		14÷18	11,7÷13,4	0.459÷0.527	11,0÷14,2	0.440÷0.560	F/707-2				
		20÷24	14,1÷14,8	0.555÷0.581	14,0÷18,2	0.550÷0.715	F/707-3	203,2	8"		
3/4"	19,05	10÷12	12,2÷13,4	0.482÷0.532	11,0÷14,2	0.440÷0.560	F/707-2	152,4	6"	-	-
		14÷20	14,8÷17,2	0.584÷0.680	14,0÷18,2	0.550÷0.715	F/707-3	203,2	8"		
		22÷24	17,6÷17,9	0.694÷0.706	17,1÷21,3	0.675÷0.840	F/707-4			PC-F707-4	PA-F707-9÷11
7/8"	22,22	10÷12	15,4÷16,6	0.607÷0.657	14,0÷18,2	0.550÷0.715	F/707-3	203,2	8"	-	-
		14÷20	18,0÷20,4	0.709÷0.805	17,1÷21,3	0.675÷0.840	F/707-4			PC-F707-4	PA-F707-4÷5
		22÷24	20,8÷21,1	0.819÷0.831	20,3÷24,5	0.800÷0.965	F/707-5			PC-F707-5	
1"	25,40	10÷12	18,6÷19,8	0.732÷0.782	17,1÷21,3	0.675÷0.840	F/707-4	203,2	8"	PC-F707-4	PA-F707-4÷5
		14÷22	21,2÷24,0	0.834÷0.944	20,3÷24,5	0.800÷0.965	F/707-5			PC-F707-5	
		24	24,4	0.956	24,5÷29,7	0.950÷1.170	F/707-6			PC-F707-6	PA-F707-6÷11
1.1/4"	31,75	10÷16	25,0÷28,5	0.982÷1.120	24,1÷29,7	0.950÷1.170	F/707-6	203,2	8"	PC-F707-6	PA-F707-6÷11
		18÷24	29,3÷30,7	1.152÷1.206	27,5÷32,9	1.085÷1.295	F/707-7			PC-F707-7÷8	
1.3/8"	34,92	10÷16	28,6÷31,6	1.126÷1.245	27,5÷32,9	1.085÷1.295	F/707-7	203,2	8"	PC-F707-7÷8	PA-F707-6÷11
		18÷24	32,4÷33,8	1.277÷1.331	31,5÷36,8	1.240÷1.450	F/707-8				
1.1/2"	38,10	10	31,3	1.232	27,5÷32,9	1.085÷1.295	F/707-7	203,2	8"	PC-F707-7÷8	PA-F707-6÷11
		12÷18	32,5÷35,6	1.282÷1.402	31,5÷36,8	1.240÷1.450	F/707-8				
		22÷24	36,7÷37,0	1.444÷1.457	36,4÷42,4	1.433÷1.673	F/707-9			PC-F707-9÷11	
1.3/4"	44,45	10÷14	37,6÷40,2	1.482÷1.584	36,4÷42,4	1.433÷1.673	F/707-9	203,2	8"	PC-F707-9÷11	PA-F707-6÷11
		16÷24	41,1÷43,3	1.620÷1.706	40,0÷45,0	1.575÷1.772	F/707-10				
2"	50,80	8	42,4	1.670	40,0÷45,0	1.575÷1.772	F/707-10	203,2	8"	PC-F707-9÷11	PA-F707-6÷11
		10÷16	44,0÷47,5	1.732÷1.870	43,2÷49,0	1.700÷1.910	F/707-11				



MAUS ITALIA

Holetest

F/703

Internal quick digital micrometer, 3 contact points, for work requiring certification

Supplied with:

- Case with anti-shock shaped foam padding
- Calibration rings
- Flat service screwdriver
- Multifunction service wrench

Optional upon request:

- Portable printer with RS-232 cables

Internal digital micrometer (resolution 0,001 mm) with large LCD display and 3 contact points, suitable for **series testing**, **as it certifies the work that has been carried out**, outputting the measured data report (tube sheet holes and tube i.d. before and after expansion).

The **quick activation** ***F/703*** model is dust and splash resistant and features a high degree of protection (IP65).

High-end digital model, featuring a practical gun handle for measuring head activation.

A printer (optional) allows storage/printing of the measured values, providing a certified report of the performed work.

Supplied with calibration rings (UKAS certificate), it is suitable for a wide range of measurements (both diameters and depths), thanks to the measuring head extensions **(optional)**. It is offered in 2 sizes:

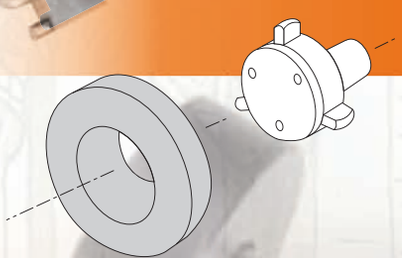
F/703-1

- diameters ranging between 6,0 and 20 mm *(0.236" to 0.787")*
- depths of up to 62 mm *(2.44")*, without extensions.

F/703-2

- diameters ranging between 20,0 and 50 mm *(0.787" to 1.968")*
- depths of up to 80 mm *(3.15")*, without extensions.

Measuring procedure



The measuring head extensions and the calibration rings are supplied complete with UKAS calibration certificate.

Calibrating

Position the display as you prefer and lock it using the special Allen key.

Insert the measuring head (at the height of the anvils) into the stopper ring that is appropriate for the head measuring field, to reset the ***F/703****. Reset the instrument.*

Measurement

Insert the micrometer into the hole to be measured, making sure the anvils properly rest on the hole walls.

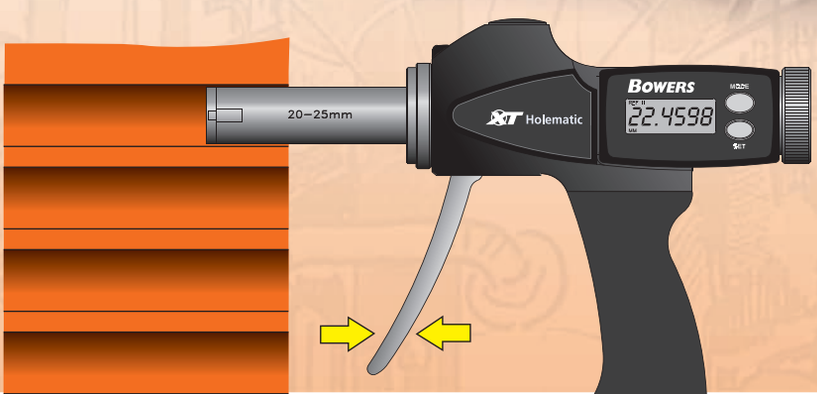
Thoroughly check that contact surfaces are clean.

Press the **operating lever** for a couple of times before reading the measurement, to exert the appropriate pressure.

Read the measurement on the display.

Release the lever, to be able to properly withdraw the ***F/703*** gauge.

E.g.: d_{im} = 22,4598 mm *(0.8842")*

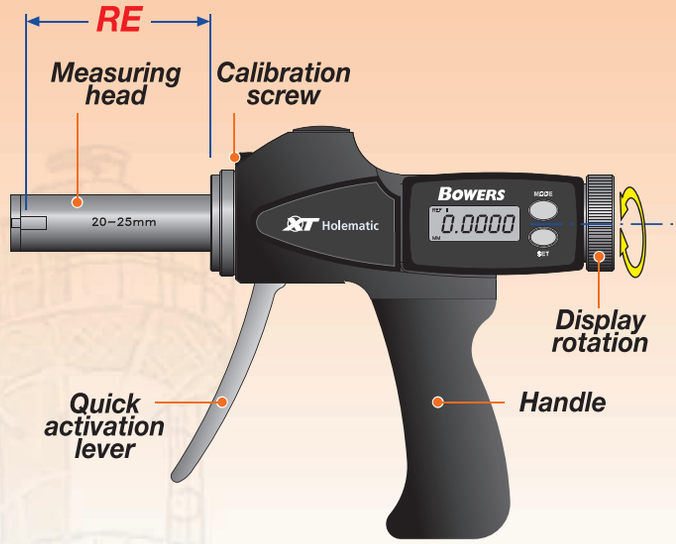


F/703

Sample order codes

If you need to measure any tubes having an inner diameter d_i of 22,00 mm *(0.866")* and a depth of 100 mm *(3.93")*, referring to the table you can see that the full order shall consist of:

F/703-2 *(1 gauge)*
PT-F703-2a (1 head extension)



F/703

Measuring field		F/703	STD RE depth		Extension length		PT-F/703 Head extension
mm	inches	Code	mm	inches	mm	inches	Code
6,0÷8,0	0.236 ÷ 0.315	F/703-1	58,0	2.28	63,0	2.480	PT-F703-1a
8,0÷10,0	0.315 ÷ 0.394		58,0	2.28			
10,0÷12,5	0.394 ÷ 0.492		58,0	2.28	76,0	2.992	PT-F703-1b
12,5÷16,5	0.492 ÷ 0.650		62,0	2.44	100,0	3.937	PT-F703-1c
16,5÷20,0	0.650÷ 0.787		62,0	2.44			
20,0÷25,0	0.787÷0.984	F/703-2	66,0	2.44	150,0	5.906	PT-F703-2a
25,0÷35,0	0.984÷1.378		66,0	2.44			
35,0÷50,0	1.378÷1.968		80,0	3.15			

Resolution - **0,01** mm

MAUS ITALIA Holetest

F/700

Cost-effective internal mechanical gauges, 2 contact points

Supplied with:

- Protection box
- Service wrench
- Test certificate

Cost-effective internal mechanical gauge *(resolution **0,01** mm)* with 2 contact points, for the measurement in mm of tube sheet holes and of the tube interior before and after expansion.

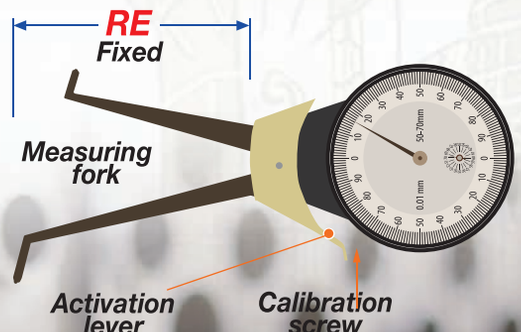
Being particularly lightweight, ***F/700*** is used with a single hand and is dust and splash resistant

F/700

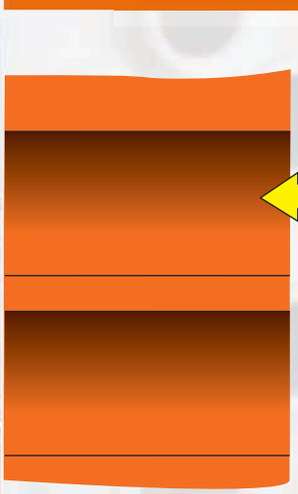
Sample order codes

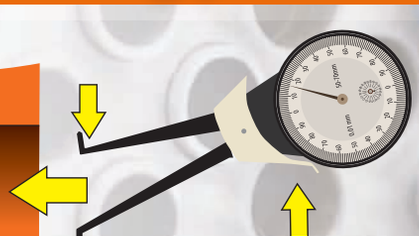
If you need to measure any tubes having an inner Ø d_i of 19 mm the order to be placed shall consist of:

F/700-2 *(1 gauge)*

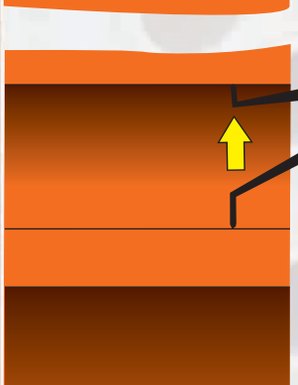


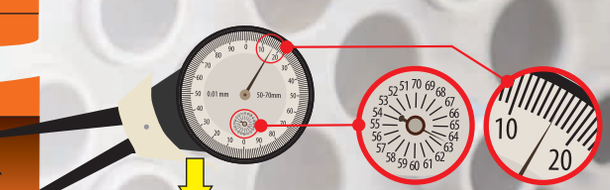
Measuring procedure





1) **Press** the side lever until **the measuring fork arms reach the fully closed position.**
Insert it into the sheet hole**, at the desired depth.**





2) **Release** the lever to let the ***F/700*** come into contact with the hole walls
Read the measurement on the dial.

e.g.: d_{im} = 63,16mm *(2.487")*

F/700

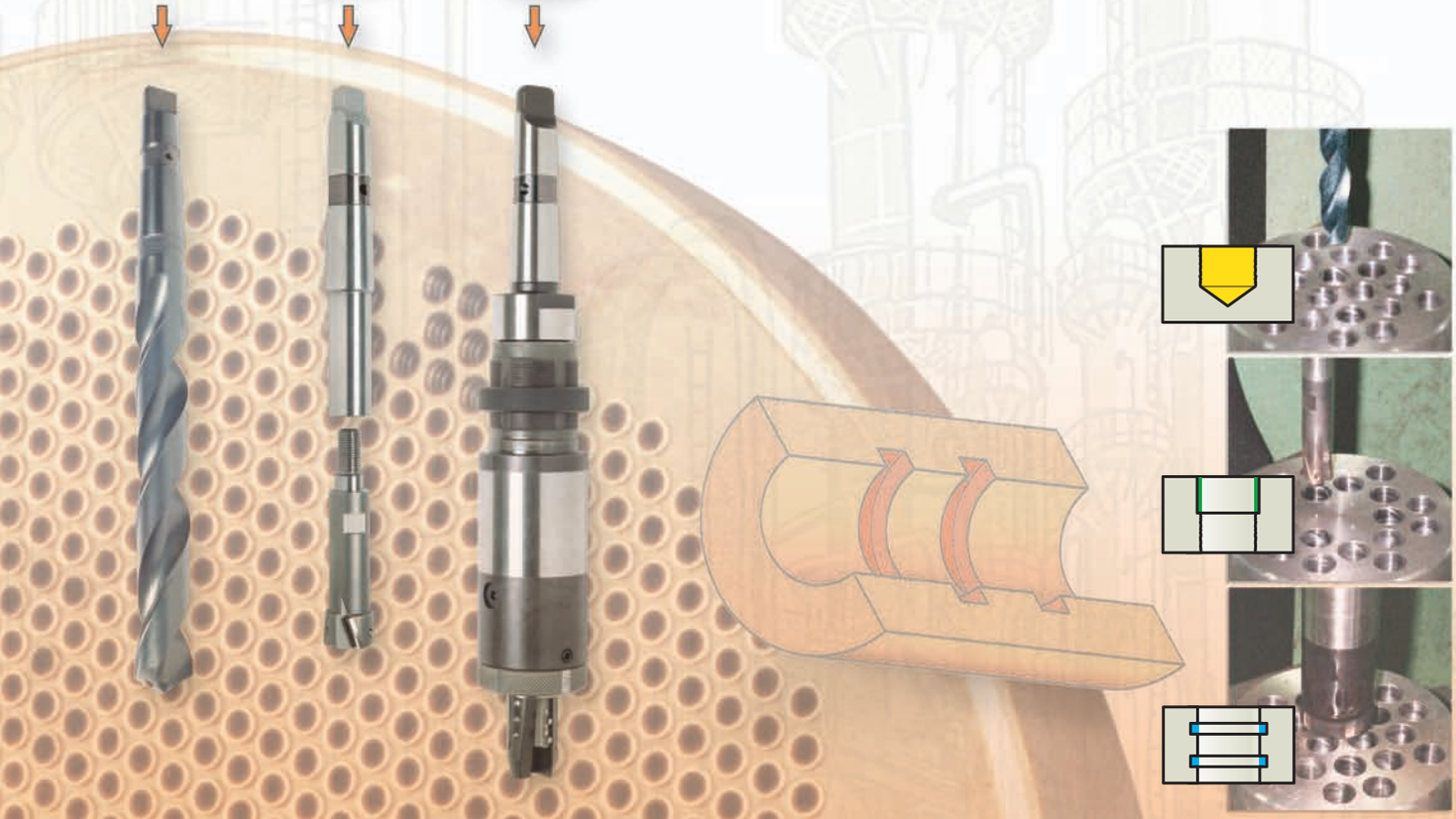
Measuring field	F/700
mm	Code
6,0÷18,0	F/700-1
10,0÷30,0	F/700-2
30,0÷50,0	F/700-3
50,0÷70,0	F/700-4
70,0÷150,0	F/700-5

2 Holetool Tools with coolant channel for hole processing

The initial stage of the heat exchanger manufacturing cycle is among the most critical ones: the processing and preparation of the tube sheet holes before the assembly.

Maus Italia offers a **comprehensive range of tools produced with materials featuring extremely high quality and wear resistance**, capable of withstanding high speeds thanks to coaxial drills with coolant fluid feed channel.

Maus Italia's **technical staff** are at your disposal to recommend the optimum solution for each situation.



Holetool

Coolant distribution

Combined systems consisting of single-size ***F/12*** Maus Italia rotating distributors and ***F/13*** reduction sleeves, available in three sizes, allowing connection to all ***Holetool*** tools.

It allows the coolant fluid to flow in; as it reaches the cutting point directly from the inside, it guarantees the ***Holetool*** tools will be long lasting and will always provide high performances.

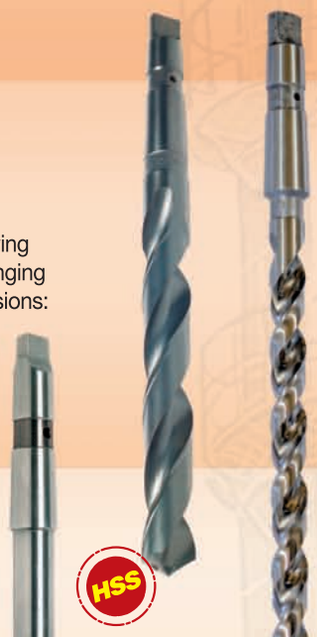
AC-15

Holetool

Drilling

A comprehensive range of **twist drills** with channels allowing coolant fluid to flow through. They are offered for holes ranging between 9,00 and 50,00 mm *(0.354" to 1.969")* in two versions:

- ***F/10*** for depths up to 277 mm *(10.906")* in HSS
- ***F/11*** for depths up to 305 mm *(12.008")* in HSS with 5% of cobalt.



AC-16

Holetool

Boring

A comprehensive set of **reamers for tube sheet holes** with **Tungsten Carbide inserts** and channels allowing coolant to flow through.

- ***F/20*** for holes ranging between 9,75 and 51,50 mm *(0.384" to 2.028")* and depths of up to 195 mm *(7.677")*.

They are manufactured in **two modular pieces**, significantly reducing production cost.

AC-18

Holetool

Grooving

- ***F/26*** **Self-centering grooving tool, with adjustable B depth** for holes ranging between 9,75 and 51,50 mm *(0.384" to 2.028")*

Supplied equipped with tools designed and manufactured by Maus Italia technical staff members according to customer's specifications. They are suitable to create multiple channels/grooves or to perform multiple special processes at the same time.

Like the other ***Holetool*** tools, the ***F/26*** is equipped with channels allowing coolant to flow through and can be used on radial drills or numerical control machines (***MA-2501*** *by Maus Italia).*

AC-20

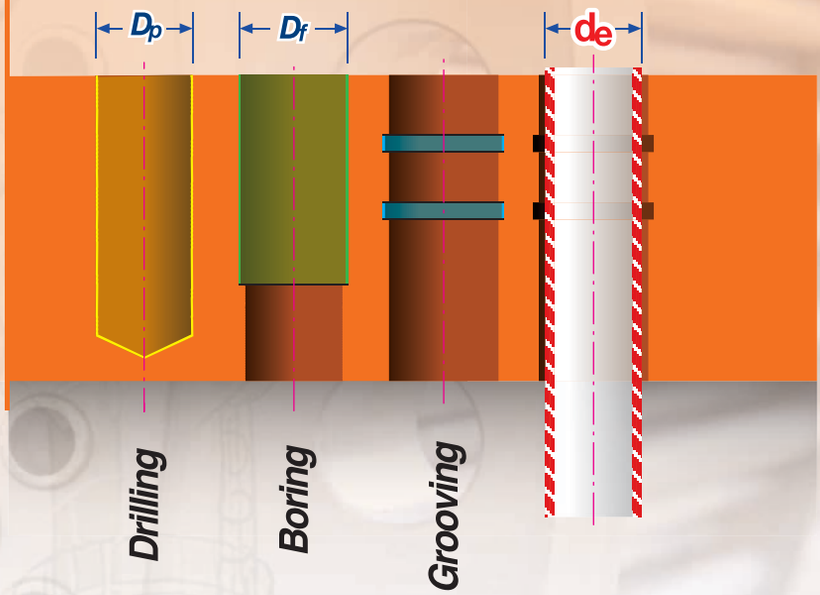
Universal grooving tools

We offer two **universal grooving tools without channels for coolant flow through**:

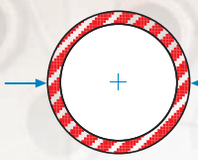
- ***F/112*** **Universal grooving tool, with fixed B depth** for tube sheet holes ranging between 7,00 and 30,00 mm *(0.276" to 1.181")*
- ***F/120***, **universal grooving tool** with **hydraulic power expansion** and **fixed B depth**, specifically designed with the **boiler sector** in mind, for tube sheet holes up to a 120,00 mm *(up to 4.724")*.

AC-24

Preliminary choice of the Holetool series tool according to the diameter of the tube used for the manufacturing of the tube sheet



The table in this page is aimed at helping customers to select the appropriate Holetool series tool before referring to the specific tables, where the larger amount of technical details will allow to fine tune the selection.



d_e = 9,52 mm ÷ 50,80 mm
3/8" ÷ 2"

	F/10-F/11		F/20		F/26
Tube to be assembled	Twist drills		Reamer		Grooving tool
d_e	D_p		D_f		
inches	mm	mm	inches	mm	inches	Code
3/8"	9,52	9,00	0.354	9,75	0.384	F26-00
	10,00	9,50	0.374	10,20 - 10,25	0.402 - 0.404	F26-00a
	12,00	11,50	0.453	12,20 - 12,25	0.480 - 0.482	F26-1a
1/2"	12,70	12,00	0.472	12,90 - 12,95	0.508 - 0.510	F26-1b
	13,00	12,50	0.492	13,20 - 13,25	0.520 - 0.522	F26-1c
	14,00	13,50	0.531	14,20 - 14,25	0.559 - 0.561	F26-1d
	15,00	14,50	0.571	15,20 - 15,25	0.598 - 0.600	F26-1e
5/8"	15,87	15,50	0.610	16,10 - 16,20	0.634 - 0.638	F26-2a
	16,00	15,50	0.610	16,20 - 16,25	0.638 - 0.640	F26-2a
	17,00	16,50	0.650	17,25 - 17,30	0.679 - 0.681	F26-2as
	18,00	17,50	0.689	18,25 - 18,30	0.718 - 0.720	F26-2b
3/4"	19,05	18,50	0.728	19,25 - 19,30	0.758 - 0.760	F26-2c
	20,00	19,50	0.768	20,25	0.797	F26-3a
	22,00	21,50	0.846	22,25 - 22,30	0.876 - 0.878	F26-3b
7/8"	22,22	21,50	0.846	22,50	0.886	F26-3b
	25,00	24,00	0.945	25,25 - 25,30	0.994 - 0.996	F26-3c
1"	25,40	24,50	1.000	25,65 - 25,70	0.010 - 1.012	F26-3d
3/4" GAS	26,90	26,00	1.024	27,20	1.071	F26-4a
	27,00	26,00	1.024	27,30	1.075	F26-4a
1.1/4"	31,75	31,00	1.220	32,10	1.264	F26-4b
	32,00	31,00	1.220	32,25	1.270	F26-4b
1" GAS	33,70	33,00	1.299	34,00	1.339	F26-5a
1.1/2"	38,10	37,00	1.457	38,50	1.516	F26-5b
1.1/4" GAS	42,40	41,00	1.614	42,80	1.685	F26-6a
1.3/4"	44,45	43,00	1.693	44,80	1.764	F26-6b
1.1/2" GAS	48,30	47,00	1.850	48,80	1.921	F26-6c
2"	50,80	50,00	1.969	51,50	2.028	F26-6d

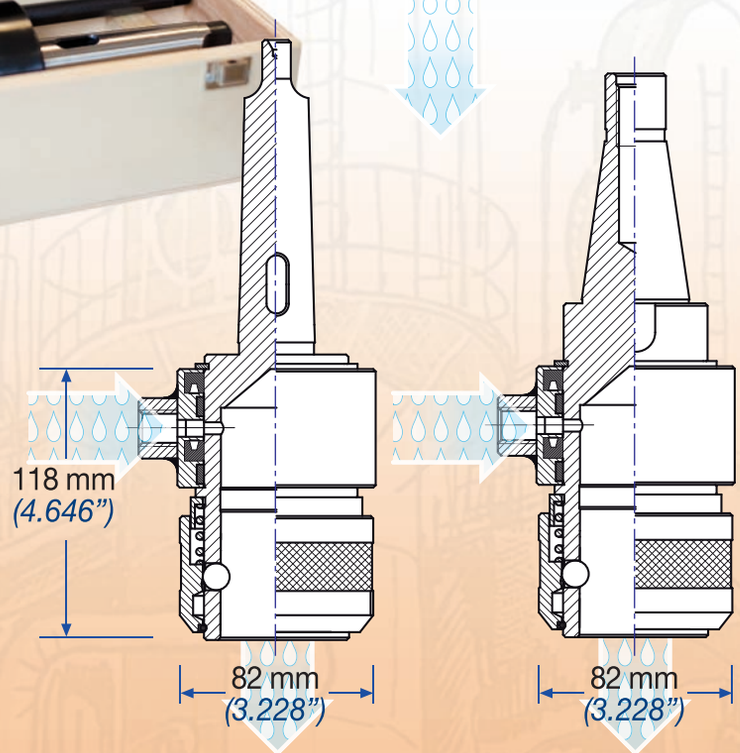
F/12

Rotating coolant distributor to be coupled with the *F/13* sleeves for use with the *Holetool* series tools

Fully designed and manufactured by Maus Italia with high quality materials, it allows the coolant to flow from the inside directly to the cutting point; this guarantees the *Holetool* series tools will be long lasting and will always provide high performances.

F/12 is available in standard version with Morse conical tang and, upon request, with ISO 40 conical tang.

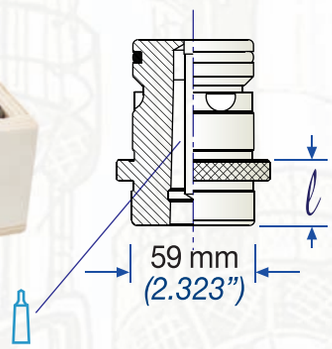
It is offered in a kit with the 3 *F/13* series reduction sleeves.



F/13

Reduction sleeve to be coupled with the *F/12* rotating distributor for use with the *Holetool* series tools

Designed and manufactured by Maus Italia, the *F/13* series reduction sleeve is offered in 3 sizes, allowing it to connect with the Morse taper No.2, No.3 and No.4 of the *Holetool* series tools.

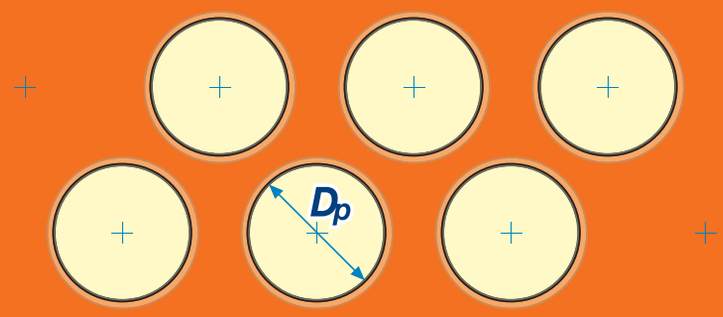


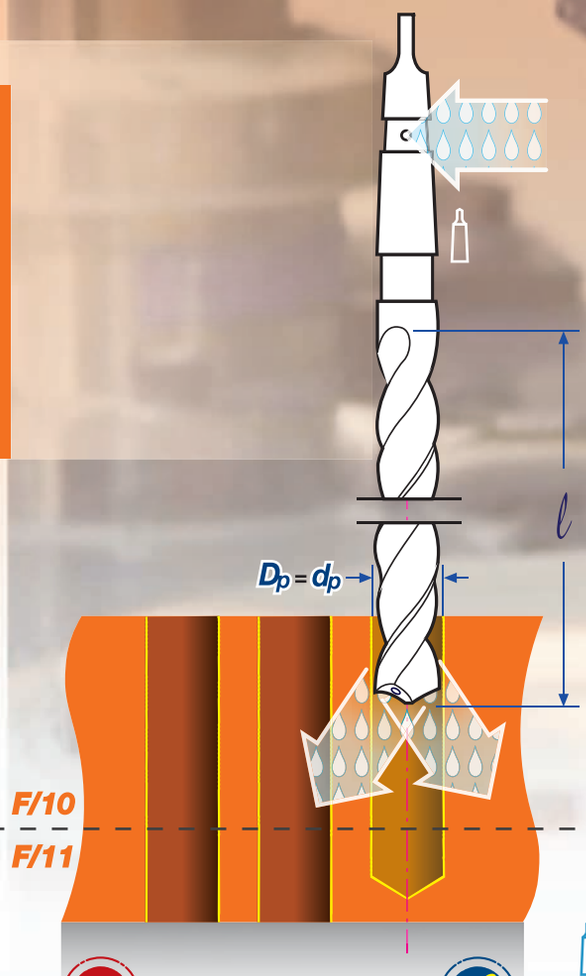
F/13

F/13	Morse taper	l	
Code	N	mm	inches
F/13-2	2	25,00	0.984
F/13-3	3	25,00	0.984
F/13-4	4	48,00	1.890

F/12

F/12	Morse taper	ISO taper
Code	N.	N.
F/12-4	4	/
F/12-5	5	/
F/12-ISO40	/	40





MAX depth = ℓ - 10 mm *(0.394")*

de = 9,52 mm ÷ 50,80 mm
3/8" ÷ 2"

F/10
F/11

F/10 F/11

Tube		Pre-hole		Twist drill HSS			Twist drill HSS Co 5%			Shank
de		Dp = dp		F/10	ℓ		F/11	ℓ		Morse taper
inches	mm	mm	inches	Code	mm	inches	Code	mm	inches	N
3/8"	9,50	9,00	0.354	F10-0900	81,00	3.189	F11-0900	107,00	4.213	
	10,00	9,50	0.374	F10-0950	81,00	3.189	F11-0950	107,00	4.213	
	12,00	11,50	0.453	F10-1150	125,00	4.921	F11-1150	195,00	7.677	
1/2"	12,70	12,00	0.472	F10-1200	134,00	5.276	F11-1200	205,00	8.071	
	13,00	12,50	0.492	F10-1250	134,00	5.276	F11-1250	205,00	8.071	2
	14,00	13,50	0.531	F10-1350	142,00	5.591	F11-1350	220,00	8.661	
	15,00	14,50	0.571	F10-1450	147,00	5.787	F11-1450	220,00	8.661	
5/8"	15,87	15,50	0.610	F10-1550	153,00	6.024	F11-1550	230,00	9.055	
	17,00	16,50	0.650	F10-1650	159,00	6.260	F11-1650	230,00	9.055	
	18,00	17,50	0.689	F10-1750	165,00	6.496	F11-1750	245,00	9.646	
3/4"	19,05	18,50	0.728	F10-1850	171,00	6.732	F11-1850	245,00	9.646	
	20,00	19,50	0.768	F10-1950	177,00	6.968	F11-1950	260,00	10.236	
7/8"	22,22	21,50	0.846	F10-2150	191,00	7.520	F11-2150	270,00	10.630	
	25,00	24,00	0.945	F10-2400	206,00	8.110	F11-2400	290,00	11.417	3
1"	25,40	24,50	1.000	F10-2450	206,00	8.110	F11-2450	290,00	11.417	
3/4" GAS	26,90	26,00	1.024	F10-2600	214,00	8.425	F11 -2600	290,00	11.417	
1.1/4"	31,75	31,00	1.220	F10-3100	239,00	9.409	F11-3100	305,00	12.008	
1" GAS	33,70	33,00	1.299	F10-3300	248,00	9.764	F11-3300	305,00	12.008	
1.1/2"	38,10	37,00	1.457	F10-3700	257,00	10.118	F11-3700	305,00	12.008	
1.1/4" GAS	42,40	41,00	1.614	F10-4100	277,00	10.906	F11-4100	305,00	12.008	4
1.3/4"	44,40	43,00	1.693	F10-4300	277,00	10.906	F11-4300	305,00	12.008	
1.1/2" GAS	48,30	47,00	1.850	F10-4700	277,00	10.906	F11-4700	305,00	12.008	
2"	50,80	50,00	1.968	F10-5000	277,00	10.906	F11-5000	305,00	12.008	

Upon request

MAUS ITALIA Holetool

F/10 F/11

HSS twist drills with channels allowing coolant fluid to flow through Right hand cutting - N execution

A comprehensive range of twist drills with channels allowing coolant fluid to flow through.

Manufactured using high-quality materials and with ISO h8 tolerance, they are designed to drill the pre-hole, with **right hand cutting, N execution and Morse tang.**

They are offered for holes ranging between 9,50 and 50,80 mm *(0.354" to 1.969")* in two versions:

- ***F/10*** for standard drilling depth
- ***F/11*** for extra drilling depth

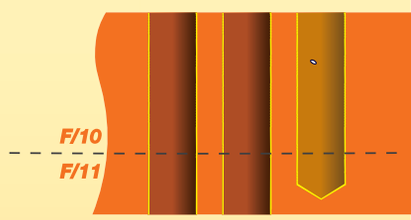
F/10

Sample order codes

The hole of a tube sheet for d_e *3/4"* **(19,05 mm)** tube will have an end diameter of 19,25 ÷ 19,30 mm; as a consequence the hole needs to be drilled by means of a Ø 18.50 mm twist drill; then it shall be widened to 19,25 ÷ 19,30 mm using the ***F/20*** series reamer.

Referring to the twist drill table to the side you can see that the order to be placed for sheet thicknesses up to 171 mm *(6.732")* shall include:

F10-1850



F/11

Sample order codes

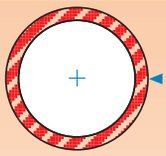
The hole of a tube sheet for d_e *3/4"* **(19,05 mm)** tube will have an end diameter of 19,25 ÷ 19,30 mm; as a consequence the hole needs to be drilled by means of a Ø 18.50 mm twist drill; then it shall be widened to 19.25 ÷ 19.30 mm using the ***F/20*** series reamer.

Referring to the twist drill table to the side you can see that the order to be placed for sheet thicknesses beyond 171 mm *(6.732")* and up to 245 mm (10") shall include:

F11-1850

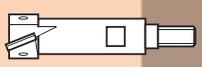
Holetool MAUS ITALIA

F/20



d_e = 9,52 mm ÷ 50,80 mm

3/8” ÷ 2”



Tube		Hole		Reamer body		Reamer shank			
d_e		$D_f = d_f$		F20-BDY	Cutting edges	F20-SHK	ℓ		Morse taper
inches	mm	mm	inches	Code	N	Code	mm	inches	N
3/8”	9,52	9,75	0.384	F20-BDY-0975-#		F20-SHK-1			
	10,00	10,20	0.402	F20-BDY-1020-#					
	10,00	10,25	0.404	F20-BDY-1025-#					
	12,00	12,20	0.480	F20-BDY-1220-#		F20-SHK-2			
	12,00	12,25	0.482	F20-BDY-1225-#					2
1/2”	12,70	12,90	0.508	F20-BDY-1290-#					
		12,95	0.510	F20-BDY-1295-#					
	13,00	13,20	0.520	F20-BDY-1320-#					
	13,00	13,25	0.522	F20-BDY-1325-#					
	14,00	14,20	0.559	F20-BDY-1420-#		F20-SHK-3	60,00	2.362	
	14,00	14,25	0.561	F20-BDY-1425-#					
	15,00	15,20	0.598	F20-BDY-1520-#					
	15,00	15,25	0.600	F20-BDY-1525-#					
5/8”	15,87	16,10	0.634	F20-BDY-1610-#					
		16,20	0.638	F20-BDY-1620-#					
	16,00	16,20	0.638	F20-BDY-1620-#					
	16,00	16,25	0.640	F20-BDY-1625-#					
	17,00	17,25	0.679	F20-BDY-1725-#	3				
	17,00	17,30	0.681	F20-BDY-1730-#					
	18,00	18,25	0.718	F20-BDY-1825-#		F20-SHK-4			
	18,00	18,30	0.720	F20-BDY-1830-#					
3/4”	19,05	19,25	0.758	F20-BDY-1925-#					3
		19,30	0.760	F20-BDY-1930-#					
	20,00	20,25	0.797	F20-BDY-2025-#					
	22,00	22,25	0.876	F20-BDY-2225-#					
	22,00	22,30	0.878	F20-BDY-2230-#					
7/8”	22,22	22,50	0.886	F20-BDY-2250-#					
	25,00	25,25	0.994	F20-BDY-2525-#		F20-SHK-5	120,00	4.724	
	25,00	25,30	0.996	F20-BDY-2530-#					
1”	25,40	25,65	0.010	F20-BDY-2565-#					
		25,70	1.012	F20-BDY-2570-#					
3/4” GAS	26,90	27,20	1.071	F20-BDY-2720-#					
	27,00	27,30	1.075	F20-BDY-2730-#					
1.1/4”	31,75	32,10	1.264	F20-BDY-3210-#		F20-SHK-6			
	32,00	32,25	1.270	F20-BDY-3225-#					
1” GAS	33,70	34,00	1.339	F20-BDY-3400-#		F20-SHK-7			
1.1/2”	38,10	38,50	1.516	F20-BDY-2850-#	5				4
1.1/4” GAS	42,40	42,80	1.685	F20-BDY-4280-#					
1.3/4”	44,45	44,80	1.764	F20-BDY-4480-#		F20-SHK-8			
1.1/2” GAS	48,30	48,80	1.921	F20-BDY-4880-#	6				
2”	50,80	51,50	2.028	F20-BDY-5150-#					

F20-BDY-nnnn-#

for carbon steel sheets: C

for stainless steel sheets: SS

F20-SHK-n-###

ℓ extra

60 = 60 mm (2.362”)

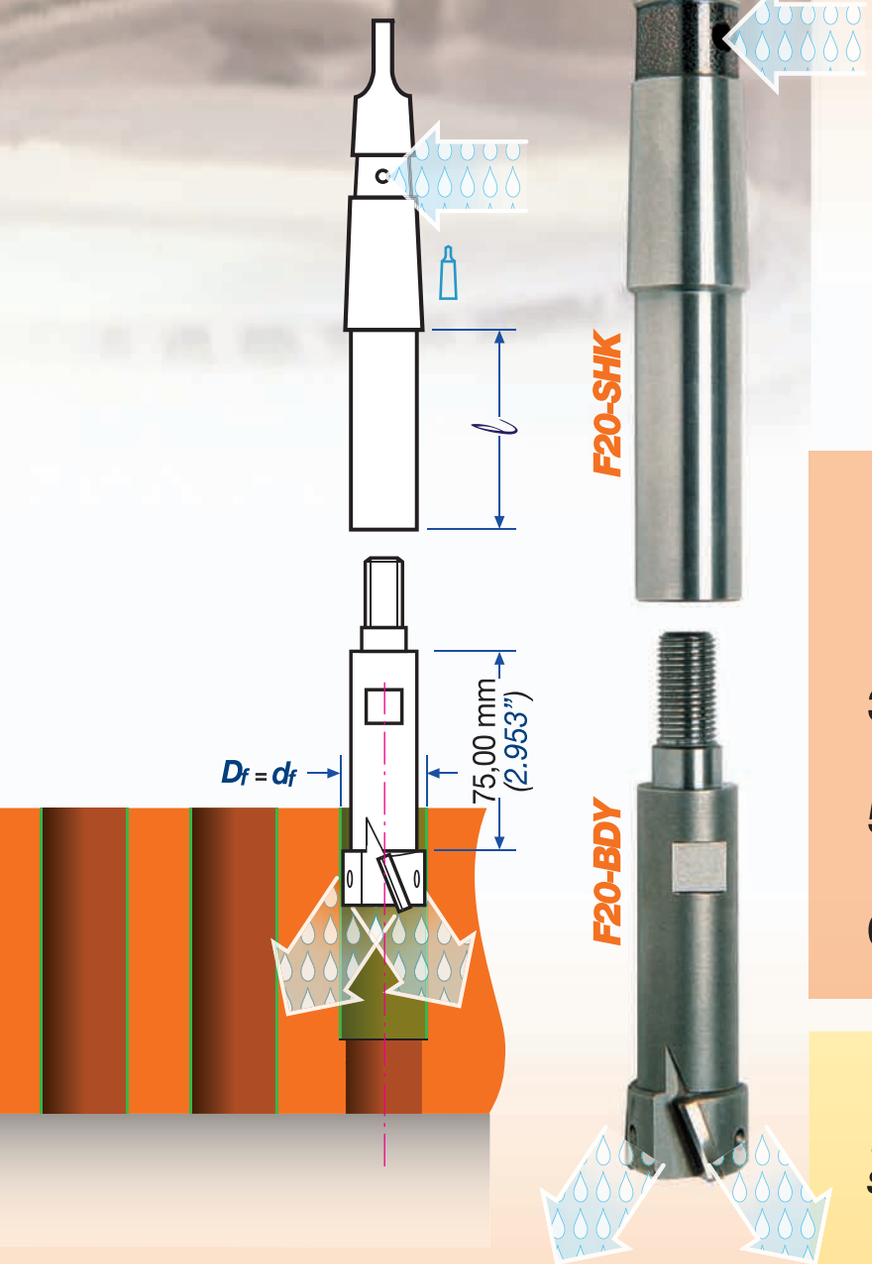
120 = 120 mm (4.724”)

250 = 250 mm (9.843”)

MAUS ITALIA **Holetool**

F/20

Reamers with Tungsten Carbide inserts for tube sheet holes



A comprehensive set of **reamers for tube sheet holes** with Tungsten Carbide inserts and channels allowing coolant to flow through.

Made using high-quality materials and with **ISO h8 tolerance**, they are offered with **Morse taper.**

They are manufactured in **two modular pieces**, to *significantly reduce production cost*.

The Tungsten Carbide **cutting inserts** are arranged geometrically at the end of the ***F20-BDY*** body in order to optimise the cut according to the hole size.

The ***F/20*** reamers are designed for holes ranging between 9,.75 and 51,50 mm *(0.384" to 2.028")* and depths of up to 195 mm *(7.677"*.

F/20 reamers with customised sizes and cutting edge number available upon request.

Cutting edges

The **number** of Tungsten Carbide **cutting inserts** is optimised according to the hole diameter, to assure maximum precision during cutting. As indicated in the table to the side:

3	9,75 to 32,25 mm *(0.384" to 1.270")*	Tungsten Carbide
5	34,00 to 44,80 mm *(1.339" to 1.764")*	
6	48,80 to 51,50 mm *(1.921" to 2.028")*	

F/20

Sample order codes

The hole of a tube sheet for ***d_e 3/4"*** **(19,05 mm)** tube will have an end diameter of 19,25 ÷ 19,30 mm; as a consequence the hole needs to be drilled by means of a Ø 18,50 mm twist drill; then it shall be widened to 19,25 ÷ 19,30 mm using the ***F/20*** series reamer.

Referring to the ***F/20*** reamer table to the side you will be able to select the following codes:

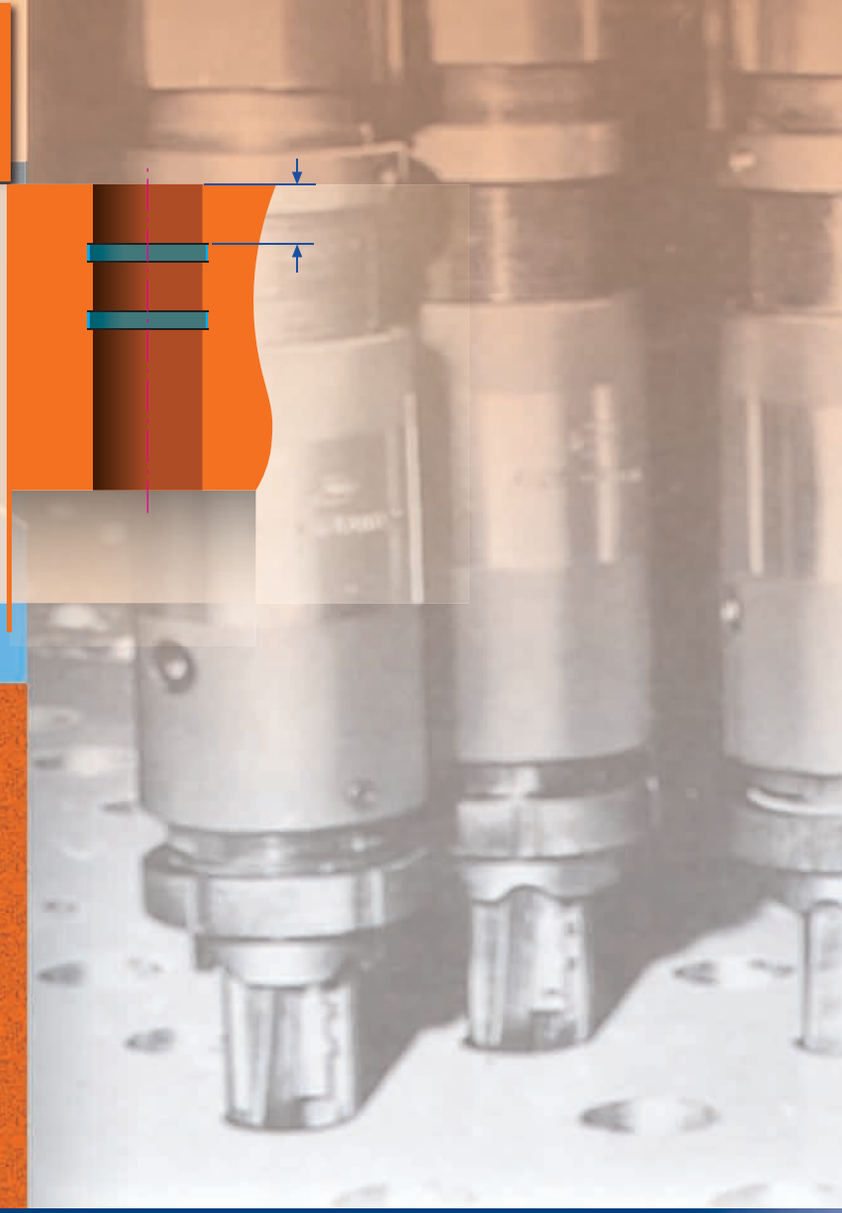
F20-BDY-1925-C	*(1 reamer body)*
F20-SHK-3	*(1 reamer shank)*

Holetool

MAUS ITALIA

F/26

Self-centering grooving tool with **adjustable B depth** and interchangeable **HSS-Co** blades



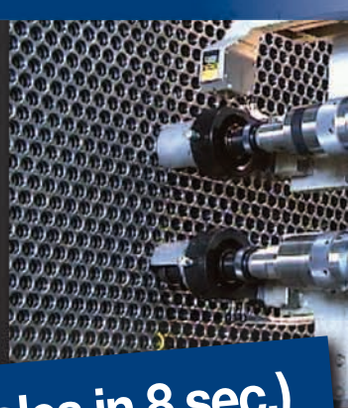
MA-2501

Automatic grooving

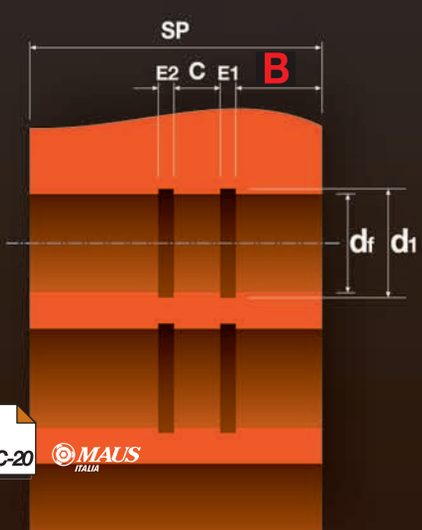
A due reference to the ***MA-2501*** work centre, the flagship of Maus Italia, the leading company for industrial automation in this market sector
*(see catalogue "**Automation**")*

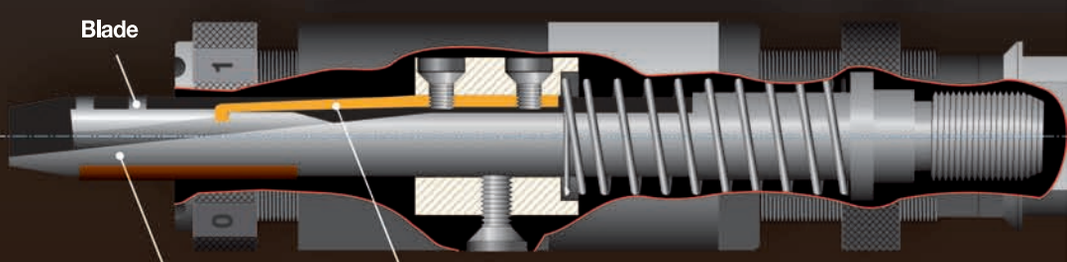
This **fully automatic** system (single or double axis), can be used for tube expansion, facing and welding and for grooving tube sheet holes.

The ***F/26*** series is designed with a special connector and provides excellent results in large productions.



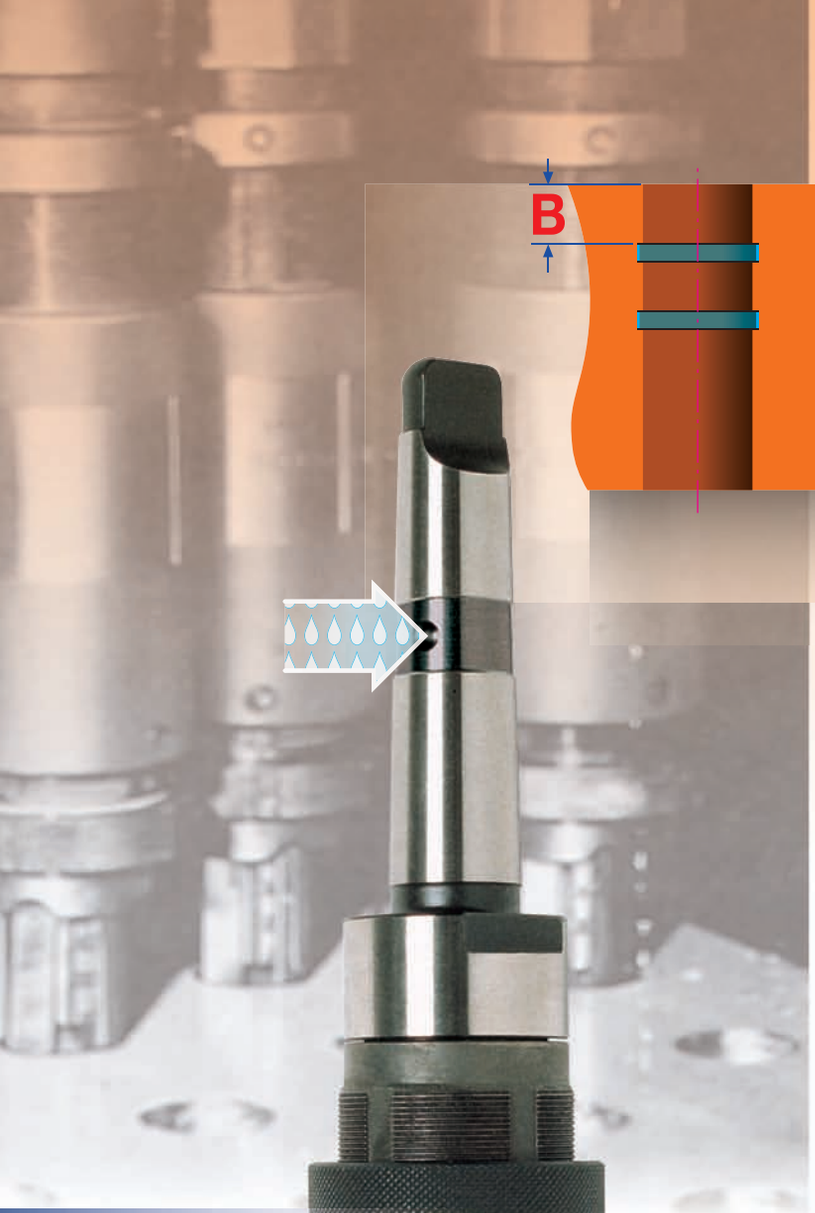
900 holes/hr (2 holes in 8 sec.)





MAUS ITALIA

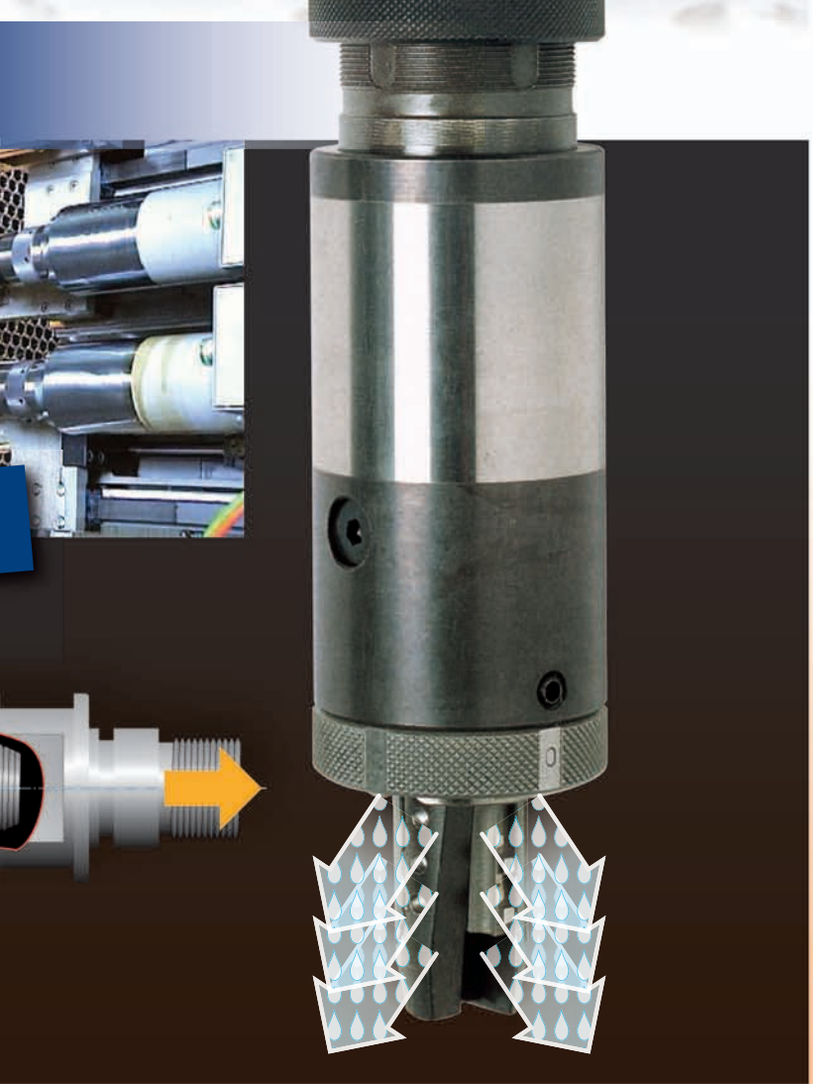
Holetool



F/26

Self-centering grooving tool with **adjustable B depth** and interchangeable **HSS-Co** blades

The ***F/26*** self-centering grooving tool creates grooves in tube sheet holes *(it is also effectively used for trueing existing grooves)* up to a **standard depth B** that can be **adjusted** to a value ranging between 1 and 12 mm *(0.47" to 0.04")*.
Greater depths, up to 300 mm *(11.81")*, can be easily reached using the **modular stem, spring and bush kits**, while retaining the ability to perform the adjustment mentioned above.
Equipped with a channel allowing coolant to flow through, like the other drilling tools of the ***Holetool*** series, the ***F/26*** is used on radial drills and programmed drilling machines *(even with multiple heads)*.
Entirely designed and manufactured by Maus Italia using high quality materials, the ***F/26*** is offered in 7 sizes, to process holes with diameters ranging between 9,75 and 51,50 mm *(0.384" to 2.028")*.
It is equipped with **HSS blades**, to perform multiple channels/grooves or multiple special processes at the same time.



Blades

HSS Co 10%

The ***F/26*** self-centering grooving tool is equipped with interchangeable **HSS-Co 10%** blades, for performing multiple operations.

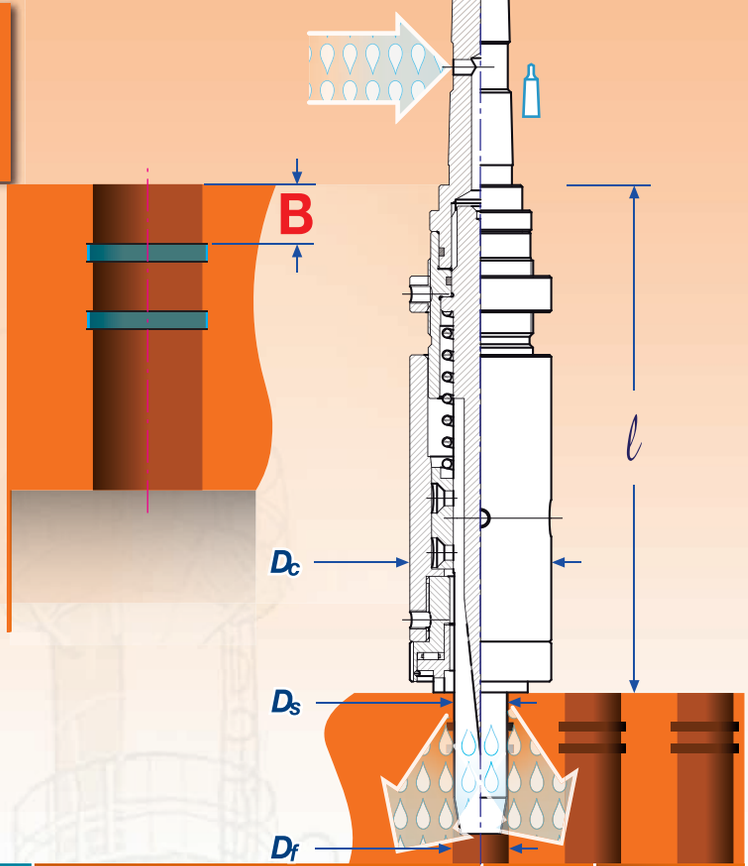
Blades come in **3 different sizes.**

Maus Italia's technical staff are at the Customers' disposal to design and produce customised blades for special processes.

Holetool MAUS ITALIA

F/26

Self-centering grooving tool with **adjustable B depth** and interchangeable **HSS-Co** blades



d_e = 9,52 mm ÷ 50,80 mm
3/8" ÷ 2"

F/26

Tube		Finished tube sheet hole		Grooving tool	Stem Ø		Max. body Ø		Length Body		Shank	Blades
d_e		D_f		F/26	D_s		D_c		l		Morse taper	F/26-BIT
inches	mm	mm	inches	Code	mm	inches	mm	inches	mm	inches	N	Code
3/8"	9,52	9,75	0.384	* F26-00	9,50	0.374						F26-BIT-00
	10,00	10,20 - 10,25	0.402 - 0.404	* F26-00a	10,00	0.394						
	12,00	12,20 - 12,25	0.480 - 0.482	* F26-1a	12,00	0.472						
1/2"	12,70	12,90 - 12,95	0.508 - 0.510	* F26-1b	12,70	0.500	39,00	1.535	180,00	7.087	2	F26-BIT-1
	13,00	13,20 - 13,25	0.520 - 0.522	* F26-1c	13,00	0.512						
	14,00	14,20 - 14,25	0.559 - 0.561	* F26-1d	14,00	0.551						
	15,00	15,20 - 15,25	0.598 - 0.600	* F26-1e	15,00	0.591						
5/8"	15,87	16,10 - 16,20	0.634 - 0.638	F26-2a	16,00	0.630						F26-BIT-2÷6
	16,00	16,20 - 16,25	0.638 - 0.640	F26-2a	16,00	0.630						
	17,00	17,25 - 17,30	0.679 - 0.681	F26-2as	17,00	0.669	47,00	1.850				
	18,00	18,25 - 18,30	0.718 - 0.720	F26-2b	18,00	0.709						
3/4"	19,05	19,25 - 19,30	0.758 - 0.760	F26-2c	19,00	0.748			230,00	9.055	3	
	20,00	20,25	0.797	F26-3a	20,00	0.787						
	22,00	22,25 - 22,30	0.876 - 0.878	F26-3b	22,00	0.866						
7/8"	22,22	22,50	0.886	F26-3b	22,25	0.876	53,00	2.087				
	25,00	25,25 - 25,30	0.994 - 0.996	F26-3c	25,00	0.984						
1"	25,40	25,65 - 25,70	0.010 - 1.012	F26-3d	25,40	1.000						
3/4" GAS	26,90	27,20	1.071	F26-4a	26,90	1.059						
	27,00	27,30	1.075	F26-4a	27,00	1.063	66,00	2.598				
1.1/4"	31,75	32,10	1.264	F26-4b	31,75	1.250						
	32,00	32,25	1.270	F26-4b	32,00	1.260						
1" GAS	33,70	34,00	1.339	F26-5a	33,75	1.329	72,00	2.835	240,00	9.449	4	
1.1/2"	38,10	38,50	1.516	F26-5b	38,10	1.500						
1.1/4" GAS	42,40	42,80	1.685	F26-6a	42,75	1.683						
1.3/4"	44,45	44,80	1.764	F26-6b	44,75	1.762	92,00	3.622				
1.1/2" GAS	48,30	48,80	1.921	F26-6c	48,75	1.919						
2"	50,80	51,50	2.028	F26-6d	51,75	2.037						

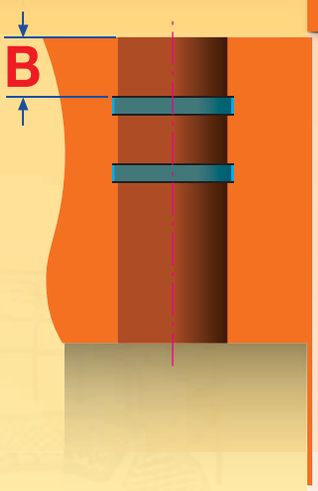
* *F/26 without coolant channels*

F/26

Sample order codes

If you need to create a 3-6-3 (*E-C-E*) set of grooves in *3/4"* (**19,00 mm**) holes at a **B** depth of 10 mm *(0.394")*, referring to the two tables (on these pages) you can see that the full order to be placed shall include the following items:

F26-2c	*(1 grooving tool)*
F26-BIT-2- 363	*(1 blade)*



F/26

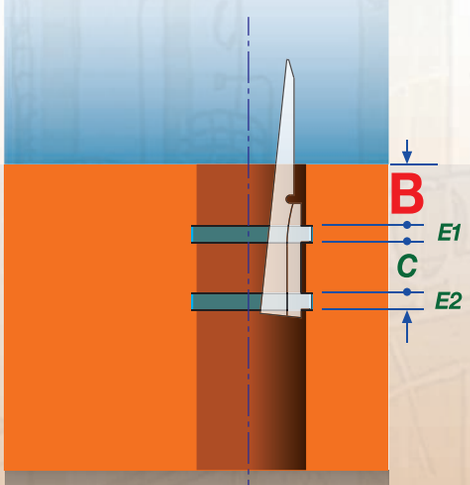
Components for **B depth adjustment** *(distance between the tubesheet surface and the first groove)*

The **depth between the tubesheet surface and the first groove, indicated with B**, can **be set** to a value ranging between 1 and 12 mm *(0.47" to 0.04")* through a ring.

Greater depths, up to 300 mm *(11.81")*, while retaining the ability to perform the ring adjustment, can be easily reached using optional **components: stems, blade coupling springs and thrust bushes.**

The table below provides easy identification of the appropriate **grooving tool** and **accessory** code.

Depth		Grooving tool	
B		***F/26***	
mm	*inches*	*Code*	
1,00 ÷ 12,00	*0.039 ÷ 0.472*	***F26-##***	***F/26*** standard
6,00 ÷ 18,00	*0.236 ÷ 0.709*	***F26-##-CTS06***	*Additional accessory extended blade coupling spring*
20,00 ÷ 32,00	*0.787 ÷ 1.260*	***F26-##-EXT20***	***F/26*** extended by 20 mm *(0.787")*
17,00 ÷ 29,00	*0.669 ÷ 1.142*	***F26-##-THR09***	
11,00 ÷ 23,00	*0.433 ÷ 0.906*	***F26-##-THR15***	*Additional accessory extended thrust bush*
2,00 ÷ 14,00	*0.079 ÷ 0.551*	***F26-##-THR24***	
35,00 ÷ 47,00	*1.378 ÷ 1.850*	***F26-##-EXT35***	***F/26*** extended by 35 mm *(1.378")*
32,00 ÷ 44,00	*1.260 ÷ 1.732*	***F26-##-THR09***	
26,00 ÷ 38,00	*1.023 ÷ 1.496*	***F26-##-THR15***	*Additional accessory extended thrust bush*
17,00 ÷ 29,00	*0.670 ÷ 1.142*	***F26-##-THR24***	

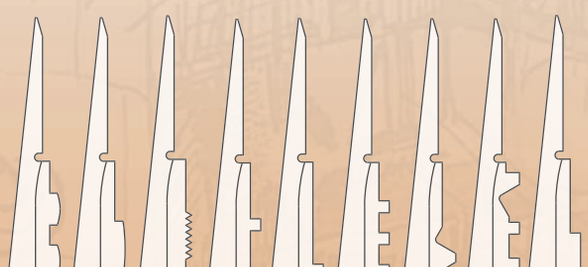


B E1 C E2
F26-BIT-[#]-[###]
00
1
2÷6

Blades

The **fixed groove layout** is given by the **profile of the blades** installed on the ***F/26*** model. Maus Italia offers a comprehensive range for the most common tasks.

Special blades are designed and manufactured according to customer's specifications. In case of **stainless steel tube sheets** we recommend the blades coated with Titanium Aluminium Nitride - TiAlN, whose order code has the **CTD** suffix



B E1 C E2
F26-BIT-[#]-[###]-CTD
00
1
2÷6

Holetool MAUS ITALIA

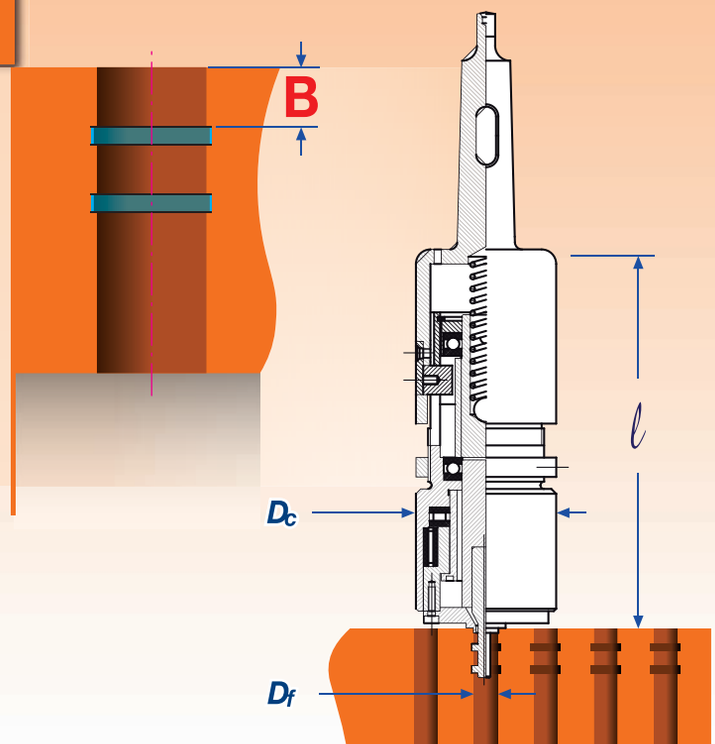
F/112

Universal grooving tool, with **fixed B depth** for tube sheet holes ranging between 7 and 30 mm *(0.276" to 1.181")*

F/112 is a **universal grooving tool**, designed and manufactured by Maus Italia using high quality materials, for executing one or more grooves at the same time in tube sheet holes.

F/112 is used, through a Morse No.3 taper, on radial drills and programmed drilling machines for holes on tube sheets D_f ranging between 7 and 30 mm *(0.276" to 1.181")*

For its operation ***F/112*** uses **centering rings** and **special tools tailor made** by Maus Italia's technical staff.



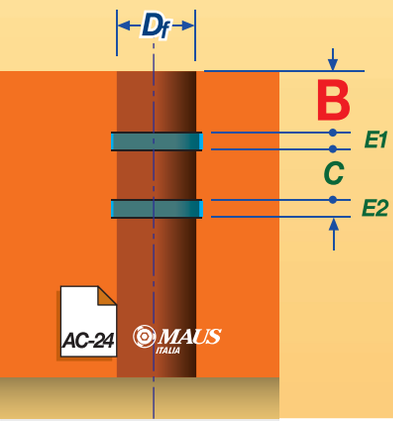
Max. body Ø		Length Body		Shank
D_c		ℓ		Morse taper
mm	*inches*	mm	*inches*	N
58,00	*2.283*	155,00	*6.102*	3

F/112

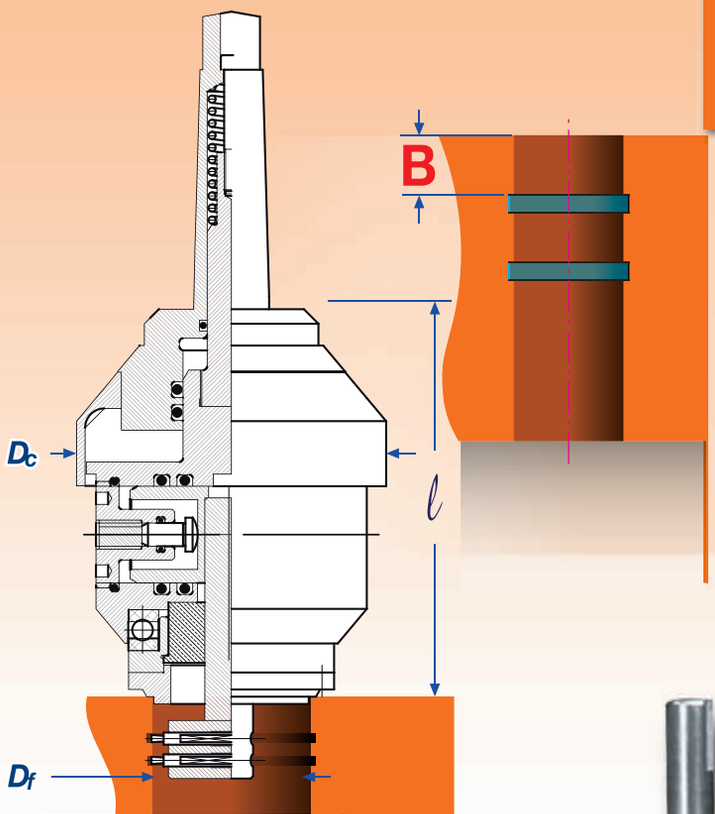
Order code

The full order to be placed shall include the following items:

F112	*Grooving tool*
F112-AC- D_f	*Centering ring*
F112-UT- D_f ***- B-E1-C-E2***	*Tool*



MAUS ITALIA Holetool



Max. body Ø		Length Body		Shank
Dc		l		Morse taper
mm	inches	mm	inches	N
128,00	5.128	155,00	6.102	4

F/120

Universal grooving tool with **fixed B depth** and hydraulic power expansion for holes up to 120 mm *(4.724")*

F/120, universal equipment with **hydraulic power expansion** for **executing at the same time one or more grooves** in tube sheet holes ranging between 15 and 120 mm *(0.591" to 4.724")*, Seeger ring seats, OR rings, drains, etc.

Entirely made of special NiCr steel, cemented, tempered and hardened, it is equipped with a Morse taper no.4. It can be installed on radial drills, parallel lathes (on the mandrel or on the tailstock), boring machines, milling cutters, operating machines in general.

F/120 is **particularly suitable for executing tasks on boiler tubes** for diameters up to 120 mm *(4.724")*

It is supplied with a **self-centering ring, a tool holder and tools tailor made** by the Maus Italia technical staff.

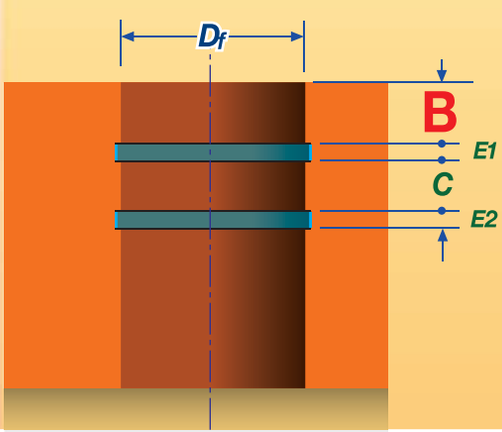
Tungsten Carbide

F/120

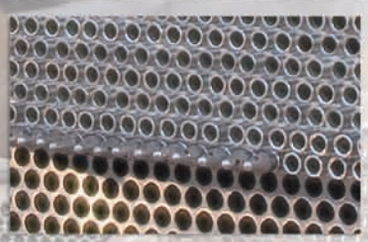
Order code

The full order to be placed shall include the following items:

F120	*Grooving tool*
F120-AC- Df	*Centering ring*
F120-PU- Df - B-E1-C-E2	*Tool holder*
F120-BIT- Df - B-E	*Blade*



3 TubeIN Tube guide for tube sheet assembly



After preparing the exchanger cage using the manufactured tube sheets and baffles, fastened to each other by means of tie-rods, you can proceed with the actual assembly stage.

Maus Italia offers a **comprehensive range of tube guides**, aimed at helping and expediting this operation, significantly increasing productivity.

Maus Italia's **technical staff** are at your disposal to recommend the optimum solution for each situation.

Photograph
By the kind permission of 1926 Villa & Bonaldi s.r.l. Ricengo - Italy

F/780

Tube guide for tube insertion during the assembly of the single and double tube sheet heat exchangers.

F/780, **tube guide** for tube sheet assembly.

It consists of an aluminium **conical head** *(steel, PVC or other materials available upon request)* and an **interchangeable nylon brush.**

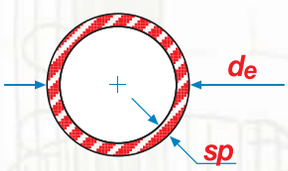
It aids the **quick and smooth insertion of tubes** through the tube sheet and baffle holes.

A transverse hole on the conical head **allows the easy withdrawal the tube guide**, once insertion is completed.

The ***F/780*** model is offered by Maus Italia in **multiple sizes**, to cover the range of the most common tubes, both in **inches** and in **mm**:

- for tubes **classified in inches** - ***3/8*** to ***1.1/2"*** (9.52 to 38.10 mm)
- for tubes **classified in mm** - **10** to **38** mm *(0.394" to 1.496")*

Maus Italia's technical staff are at your disposal for tailor made options *(in terms of size and materials)* **in accordance with customer requests.**

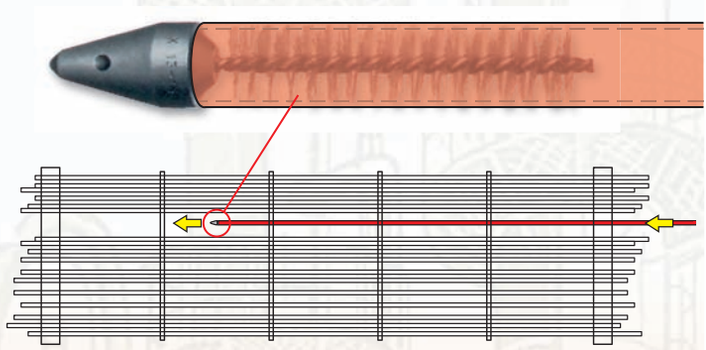


F/780

Tube in inches			
de		sp	F/780
inches	mm	B.W.G.	Code
3/8"	9,52	18÷20	F/780-0
1/2"	12,70	16÷18	F/780-1
		19÷20	F/780-2
5/8"	15,87	12÷13	F/780-3
		14÷16	F/780-4
		17÷20	F/780-5
3/4"	19,05	10÷12	F/780-6
		13÷16	F/780-7
		17÷20	F/780-8
7/8"	22,22	10÷12	F/780-9
		13÷16	F/780-10
		17÷20	F/780-11
1"	25,40	13÷12	F/780-12
		13÷16	F/780-13
		17÷20	F/780-14
1.1/4"	31,75	10÷12	F/780-15
		13÷16	F/780-16
1.1/2"	38,10	10÷12	F/780-17
		13÷16	F/780-18

F/780

Tube in mm			
de		sp	F/780
mm	inches	mm	Code
10	0.394"	0,5÷1,0	F/780-50
12	0.472"	0,5÷1,0	F/780-51
		1,5÷2,0	F/780-52
14	0.551"	0,5÷1,0	F/780-53
		1,5÷2,0	F/780-54
16	0.630"	1,0÷1,5	F/780-55
		2,0	F/780-56
18	0.709"	1,0÷1,5	F/780-57
		2,0	F/780-58
20	0.787"	1,0÷1,5	F/780-59
		2,0÷2,5	F/780-60
22	0.866"	1,0÷1,5	F/780-61
		2,0÷2,5	F/780-62
25	0.984"	1,0÷1,5	F/780-63
		2,0÷2,5	F/780-64
32	1.260"	1,5÷2,0	F/780-65
		2,5÷3,0	F/780-66
38	1.496"	1,5÷2,0	F/780-67
		2,5÷3,0	F/780-68



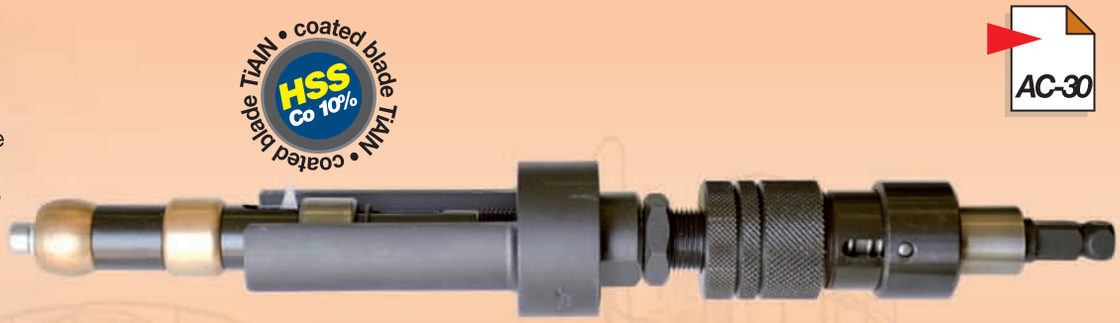
4 Tubend Tools for tube facing

Maus Italia offers a range of tools for machining the ends of heat exchanger tubes.
Maus Italia's technical staff are at your disposal to recommend the optimum solution for each situation.

F/796

Used in the manufacturing of new tube sheets, it solves the problem of the total removal of excess tube protrusion, up to 70 mm *(2.756")*.

This tool is designed to be used before the traditional portable milling cutters, significantly reducing process times and tool consumption.



AC-30

F/751R

F751R, with right hand cutting, faces the tubes to the same protrusion after expansion. It is also suitable for tube finishing. It is equipped with a rotating bell designed to protect the tube sheet surface during processing. The blades are **HSS** for longer life.

The tool is selected according to the tube external diameter and thickness. Tailor-made guide bushes are delivered upon request.

AC-31

F/753

F753, with right hand cutting and by combining two cutting tools, it simultaneously chamfers the tube externally and internally at 90°.

The tool is selected according to the tube external and internal diameter.

AC-32

Portable electrical and pneumatic motorised control gears

For the driving of ***Tubend*** tools Maus Italia offers a comprehensive range of high-quality electrical and pneumatic motorised control gears.

MDse 648 - electrical

MOF - pneumatic

AC-33

Tubend

MAUS ITALIA

F/796

Motorised tube cutter to remove excess sections from tubes with diameters ranging between *1/2”* and *1.1/2”* (12,70 to 38,10 mm)

Used in the manufacturing of new tube sheets, it solves the problem of **the total removal of excess tube protrusions**, up to 70 mm *(2.756”)*. This tool is designed to be used **before the traditional portable milling cutters, significantly reducing process times and tool consumption.**

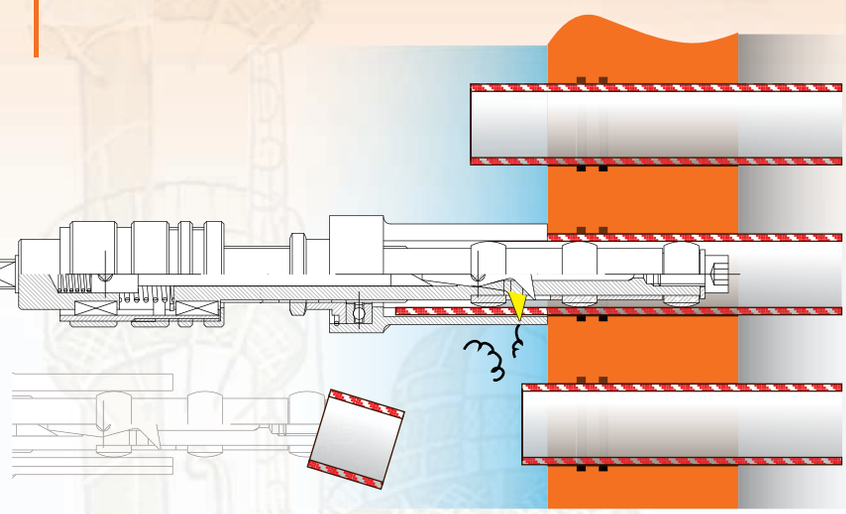
The ***F/796*** model is chosen according to the outer diameter ***de*** and to the thickness ***sp*** of the tube to be

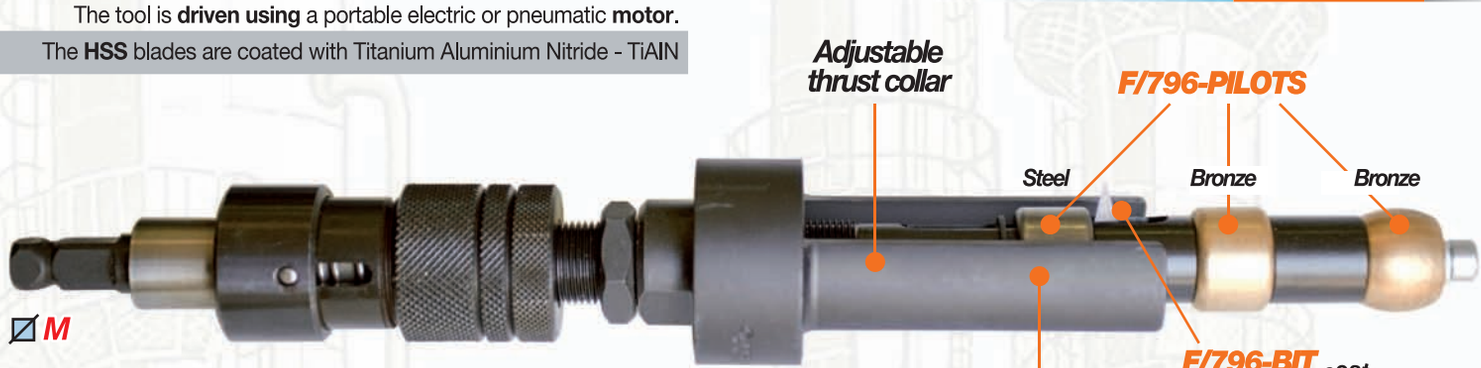
The **SET of 3 bushes**, supplied separately according to the specific requirement, allows the tool to adapt to different wall thicknesses.

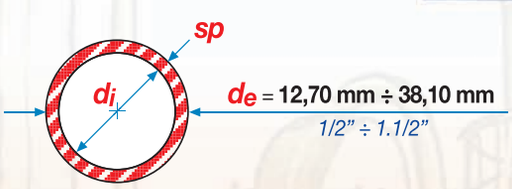
F/796 is inserted into the tube until it stops on the tube sheet; the stopping point is defined by the adjustable thrust collar. **A rotating blade is gradually pushed on the tube internal wall** until cutting is completed.

The tool is **driven using** a portable electric or pneumatic **motor.**

The **HSS** blades are coated with Titanium Aluminium Nitride - TiAlN







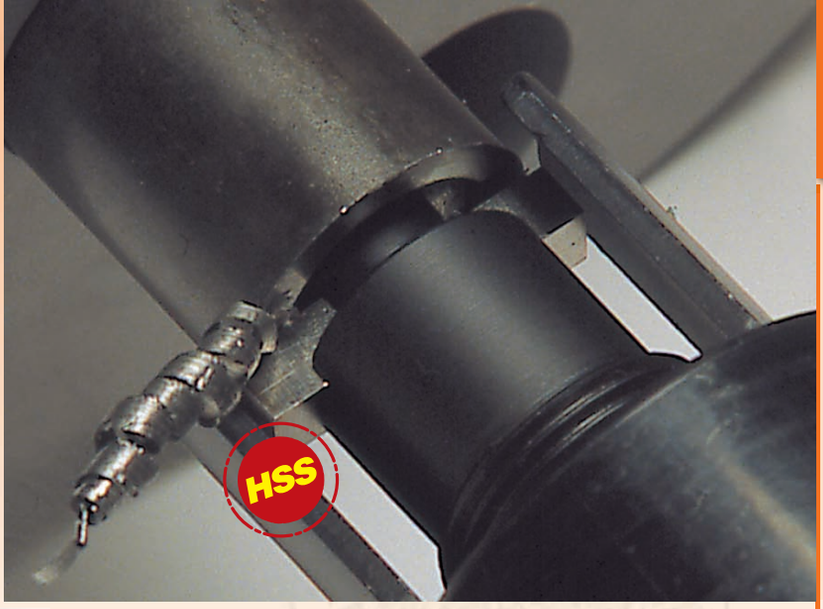
F/796

Tube			Tube cutter	Blade	Shank		SET of 3 bushes
de		sp	F/796	F/796-BIT	M		F/796-PILOTS
inches	mm	B.W.G.	Code	Code	inches	mm	Code
1/2”	12,70	14-16-18-20-22-24	F796-0	F796-BIT-0	3/8”	9,52	F796-PILOTS-0-##
5/8”	15,87		F796-1	F796-BIT-1			F796-PILOTS-1-##
3/4”	19,05		F796-2	F796-BIT-2÷4			F796-PILOTS-2-##
7/8”	22,22		F796-3				F796-PILOTS-3-##
1”	25,40		F796-4				F796-PILOTS-4-##
1.1/4”	31,75	12-14-16-18-20-22	F796-5	F796-BIT-5÷6	1/2”	12,70	F796-PILOTS-5-##
1.1/2”	38,10		F796-6				F796-PILOTS-6-##

F796-PILOTS - nn - ##

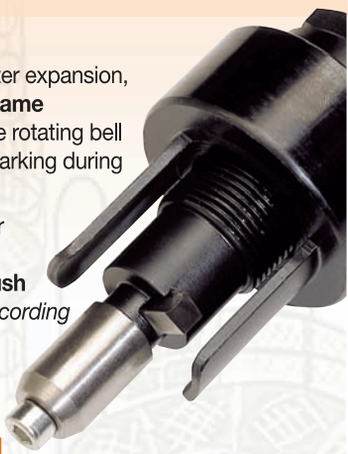
Size

B.W.G.



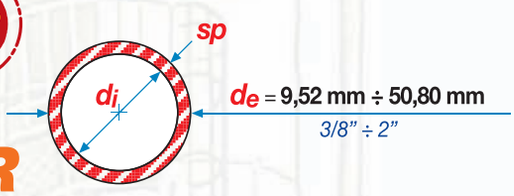
F/751R

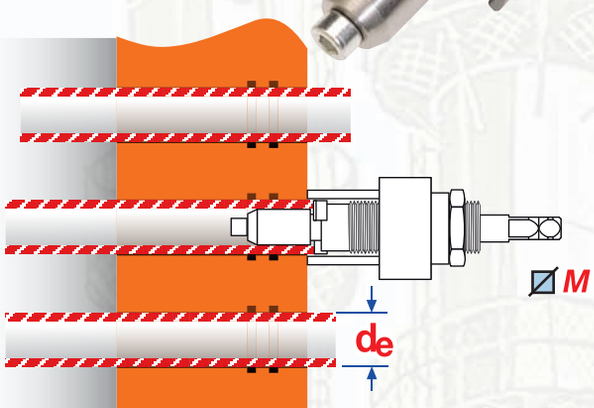
Rotating bell tube end facing milling cutter with **HSS** cutting edges



F/751R, with right hand cutting, is used after expansion, **to face the second sheet tubes to the same protrusion** (also suitable for finishing). The rotating bell protects the tube sheet surface against marking during the process.

The tool is selected according to the outer diameter and thickness of the BWG tube; associated to it is **a steel rotary guide bush** *(not included, to be ordered separately according to the specific requirement)*.





F/751R

Tube			Milling cutter	Blades	Shank		Bushes
de		sp	F/751R	F/751R-BIT	M		F/751R-PILOT
inches	mm	B.W.G.	Code	Code	inches	mm	Code
3/8"	9,52	14-16-18-20	F751R-0	F751R-BIT-0	3/8"	9,52	F751R-PILOT-0-##
1/2"	12,70	14-16-18-20	F751R-1	F751R-BIT-1			F751R-PILOT-1-##
5/8"	15,87	14-16-18-20	F751R-2	F751R-BIT-2			F751R-PILOT-2-##
3/4"	19,05	12-14-16-18-20	F751R-3	F751R-BIT-3			F751R-PILOT-3-##
7/8"	22,22	14-16-18-20	F751R-4	F751R-BIT-4			F751R-PILOT-4-##
1"	25,40	10-12-14-16-18-20	F751R-5	F751R-BIT-5			F751R-PILOT-5-##
1.1/8"	28,57	10-12-14-16-18	F751R-5/A	F751R-BIT-5/A	1/2"	12,70	F751R-PILOT-5/A-##
1.1/4"	31,75	10-12-14-16-18	F751R-6	F751R-BIT-6			F751R-PILOT-6-##
1.3/8"	34,92	10-12-14-16-18	F751R-6/A	F751R-BIT-6/A			F751R-PILOT-6/A-##
1.1/2"	38,10	10-12-14-16-18	F751R-7	F751R-BIT-7			F751R-PILOT-7-##
1.5/8"	41,27	10-12-14-16-18	F751R-7/A	F751R-BIT-7/A			F751R-PILOT-7/A-##
1.3/4"	44,45	10-12-14-16-18	F751R-8	F751R-BIT-8			F751R-PILOT-8-##
1.7/8"	47,62	10-12-14-16-18	F751R-8/A	F751R-BIT-8/A	3/4"	19,05	F751R-PILOT-8/A-##
2"	50,80	10-12-14-16-18	F751R-9	F751R-BIT-9			F751R-PILOT-9-##

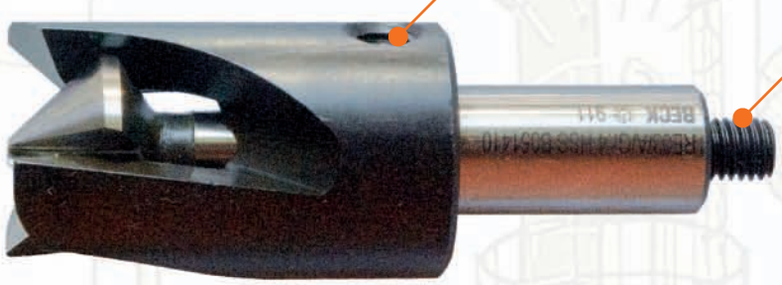
F751R-PILOT -nn-##
Size
B.W.G.

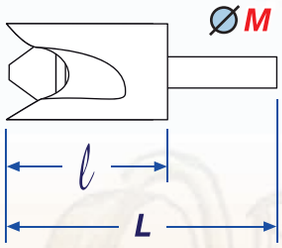
F/753

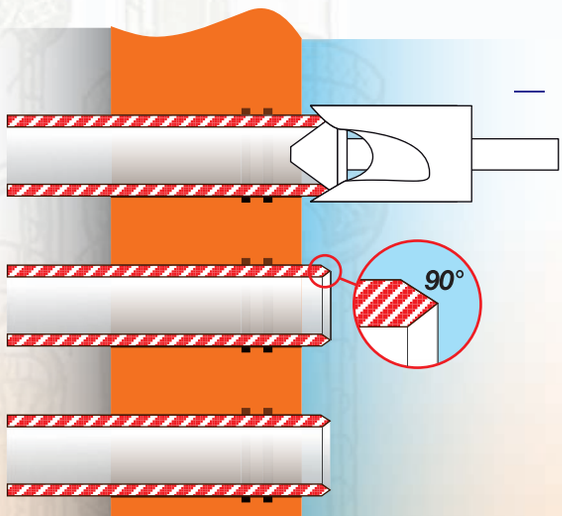
Adjustable combined milling cutter for simultaneous deburring/chamfering of tube outer and inner diameters

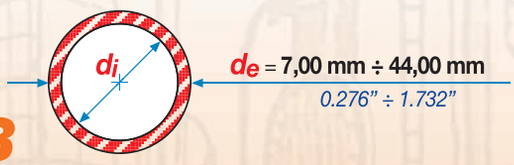
F/753, with right hand cutting and by combining two cutting tools, it simultaneously chamfers the tube externally and internally at 90°.

The tool is selected according to the tube external and internal diameter









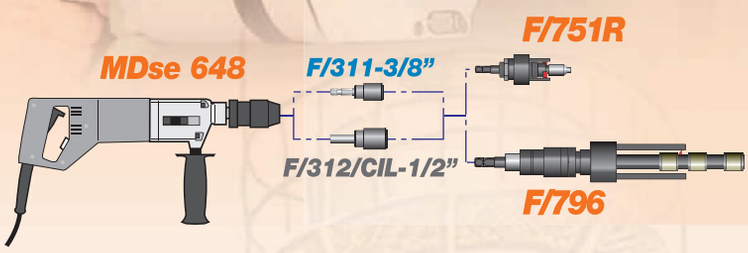
F/753

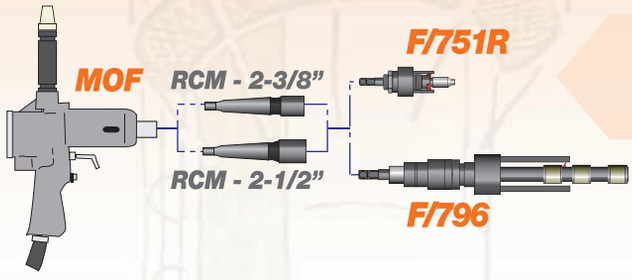
Tube				Milling cutter	Dimensions				Shank		
de		di		F/753	L		l		ØM		Morse taper
mm	inches	mm	inches	Code	mm	inches	mm	inches	mm	inches	N
7,00÷14,00	0.276"÷0.552"	2,60÷7,80	0.102"÷0.307"	F/753-0	65,00	2.559"	37,00	1.457"	12,00	0.472"	/
9,00÷20,00	0.354"÷0.787"	3,60÷12,80	0.146"÷0.504"	F/753-1	75,00	2.953"	43,00	1.693"	16,00	0.630"	/
16,00÷27,00	0.630"÷1.063"	4,60÷24,00	0.181"÷0.945"	F/753-2	85,00	3.346"	53,00	2.087"	16,00	0.630"	/
25,00÷44,00	0.984"÷1.732"	20,00÷39,00	0.787"÷1.535"	F/753-3	155,00	6.102	60,00	2.362	/	/	2

MAUS ITALIA

Tubend

Electrical and pneumatic motorised control gears for Tubend tool driving

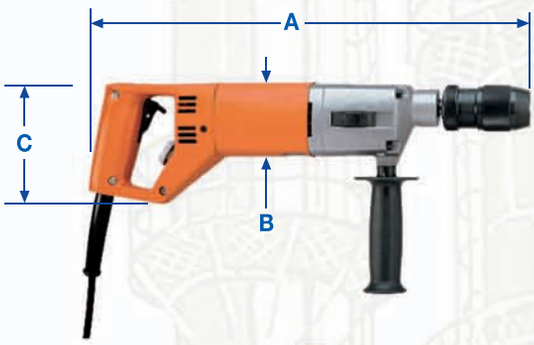


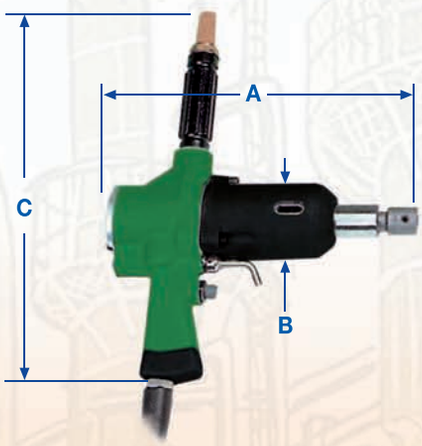


The diagram to the side summarises the full fitting equipment required for Tubend tool driving.

MDse 648 - electrical

Power supply / Capacity			MDse 648
Voltage		Volt - Phase *(Ph)*	220 - 1
Frequency		Hz	50/60
Input power		Kw	0,74
No-load speed		revolution/min *(R.P.M)*	260-600 / 640-1400
Full load speed		revolution/min *(R.P.M)*	0-360 / 0-860
Dimensions			**MDse 648**
Length (depth)	A	mm *(inches)*	487,00 *(19.2)*
Width (Ø)	B	mm *(inches)*	81,00 *(3.2)*
Height (without handle)	C	mm *(inches)*	132,00 *(5.2)*
Weight		Kg *(Lb)*	4,8 *(10.6)*





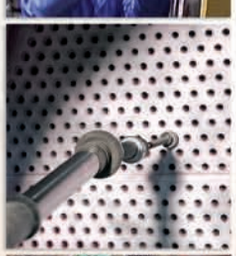
MOF - pneumatic

Power supply / Capacity			MOF 20 R	MOF 3	MOF 3 R
Max insertion		revolution/min *(R.P.M)*	470	170	140
Power		Kw	0,745	0,745	0,745
Air consumption		Litres/sec. *(cfm)*	14 *(30)*	14 *(30)*	14 *(30)*
Dimensions			**MOF 20 R**	**MOF 3**	**MOF 3 R**
Morse taper connector		N	2	2	2
Air connector		” GAS *(mm)*	3/8” GAS *(12.637)*	3/8” GAS *(12.637)*	3/8” GAS *(12.637)*
Length (depth)	A	mm *(inches)*	236,00 *(9.3)*	272,00 *(10.7)*	241,00 *(9.5)*
Width	B	mm *(inches)*	360,00 *(30)*	360,00 *(30)*	360,00 *(30)*
Height (Ø)	C	mm *(inches)*	66,00 *(2.6)*	66,00 *(2.6)*	66,00 *(2.6)*
Weight		Kg *(Lb)*	4,5 *(9.9)*	4,2 *(9.3)*	4,6 *(10.2)*

5 Drivenax Mechanical transmission for tube expansion

Maus Italia offers a comprehensive range of shafts and fittings for the mechanical transmission of rotation from motor to mandrel.

Maus Italia's technical staff are at your disposal to recommend the optimum solution for each situation.



Telescopic shafts

AC-36

A range of articulated telescopic shafts belonging to the ***F/308*** and ***F/308 HS*** series, that effectively **transmit rotational speed from the motor to the tube expander by mechanical means:**

- **The brand-new *F/308 HS*,, the technological evolution** of the ***F/308*** model featuring innovative design solutions, is recommended for high-speed operation, due to its **special dexterity, accuracy and stability.**
- The **traditional *F/308***, which has been in production for many years, is now exclusively offered in the ***F/308-4*** version for heavy transmission.

Quick couplings

AC-38

The **mechanical transmission** between the articulated telescopic shaft and mandrel is **made by** female/female couplings offered by Maus Italia in 3 families:

The brand new joints with double quick coupling ***F/314 HS*** and ***F/317 HS***, like the traditional ***F/313*** and ***F/316***, **facilitate extremely quick tube expander replacement.** The new, **patented design** keeps the input shaft, ***F/308 HS***, **perfectly balanced and aligned with the tube expander, ensuring vibration levels are well below allowable thresholds**

Fixed joints

The range also includes the fixed joints of the ***F/315*** and ***F/318*** series; the latter are used on the ***F/308-4*** telescopic shaft.

Extensions and articulated jointst

AC40

A full range of extensions and articulated joints are available when working in situations with difficult access conditions.

Ratchet wrenches

The offer finally includes a set of extraordinarily strong reversible ratchet wrenches, specially designed for heavy duty, manual tube expansion.


Drivenax
MAUS
ITALIA

Special versions available upon request

F/308 HS
F/308

Universal **telescopic shaft**

Maus Italia offers the universal **telescopic shafts** belonging to the ***F/308 HS*** and ***F/308*** series, facilitating the **effective transmission of rotational speed from the motor to the tube expander**:

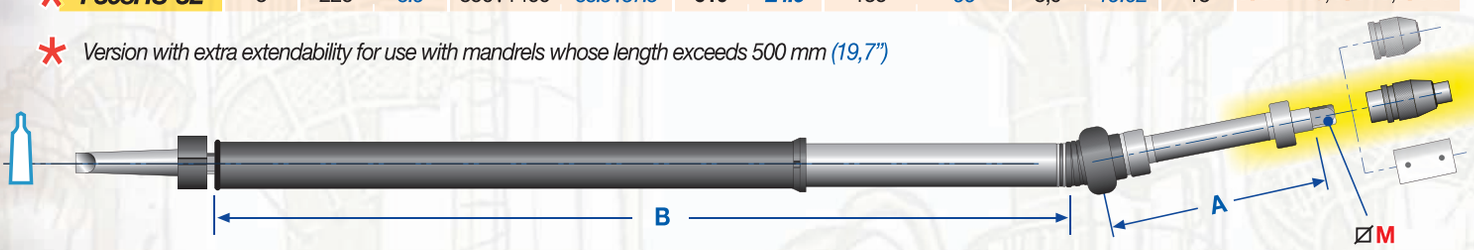
• The **brand-new *F/308 HS***, the **technological evolution** of ***F/308*** featuring new innovative design solutions, is **recommended for use at speeds exceeding 400 revolutions/min (r.p.m.)** due to its special dexterity, accuracy and stability. *The **F/308** model, however, also allows the use of joints belonging to the old **F/316** and **F/315** series.*

• **The traditional *F/308***, which has been in production for many years, is now exclusively offered in the ***F/308*** version for heavy transmission.

F/308 HS

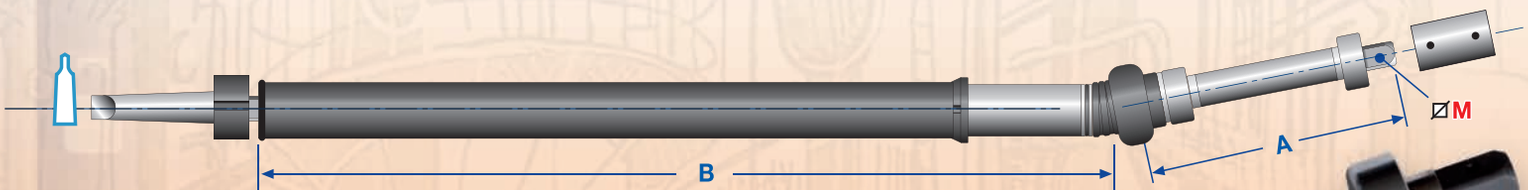
F/308 HS		Handle A		Telescopic range B		Extendability		Max. motor torque		Weight		⌀M	Recommended joints
Code	N	mm	inches	mm	inches	mm	inches	Nm	Lb Ft	Kg	Lb	mm	Code
F308HS-2	3	205	8.1	650÷1060	25.6÷41.7	410	16.1	70	51	5,4	11.90	12	F/314 HS, F/313
F308HS-3	3	225	8.9	650÷1060	25.6÷41.7	410	16.1	135	99	7,9	17.41	18	F/317 HS, F/316, F/315
* F308HS-3L	3	225	8.9	850÷1460	33.5÷57.5	**610**	**24.0**	135	99	8,9	19.62	18	F/317 HS, F/316, F/315

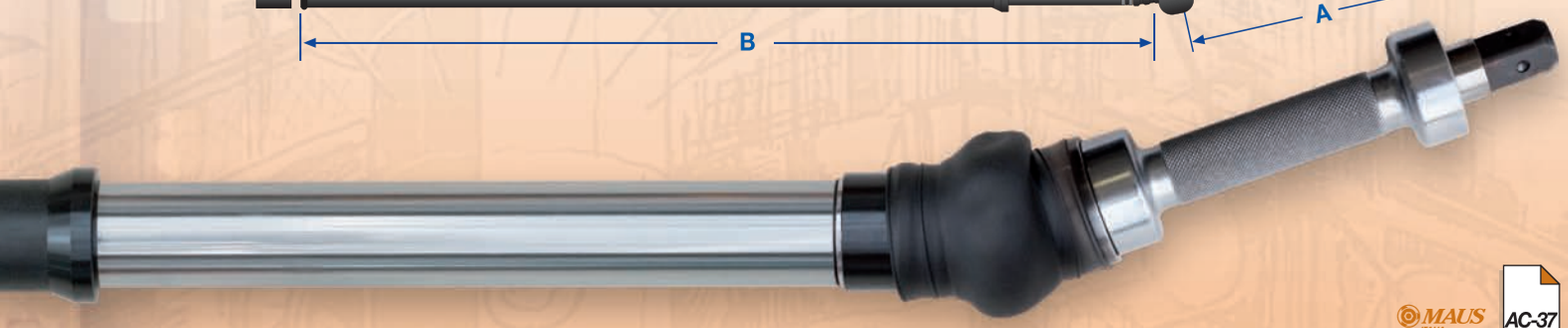
* *Version with extra extendability for use with mandrels whose length exceeds 500 mm (19,7")*



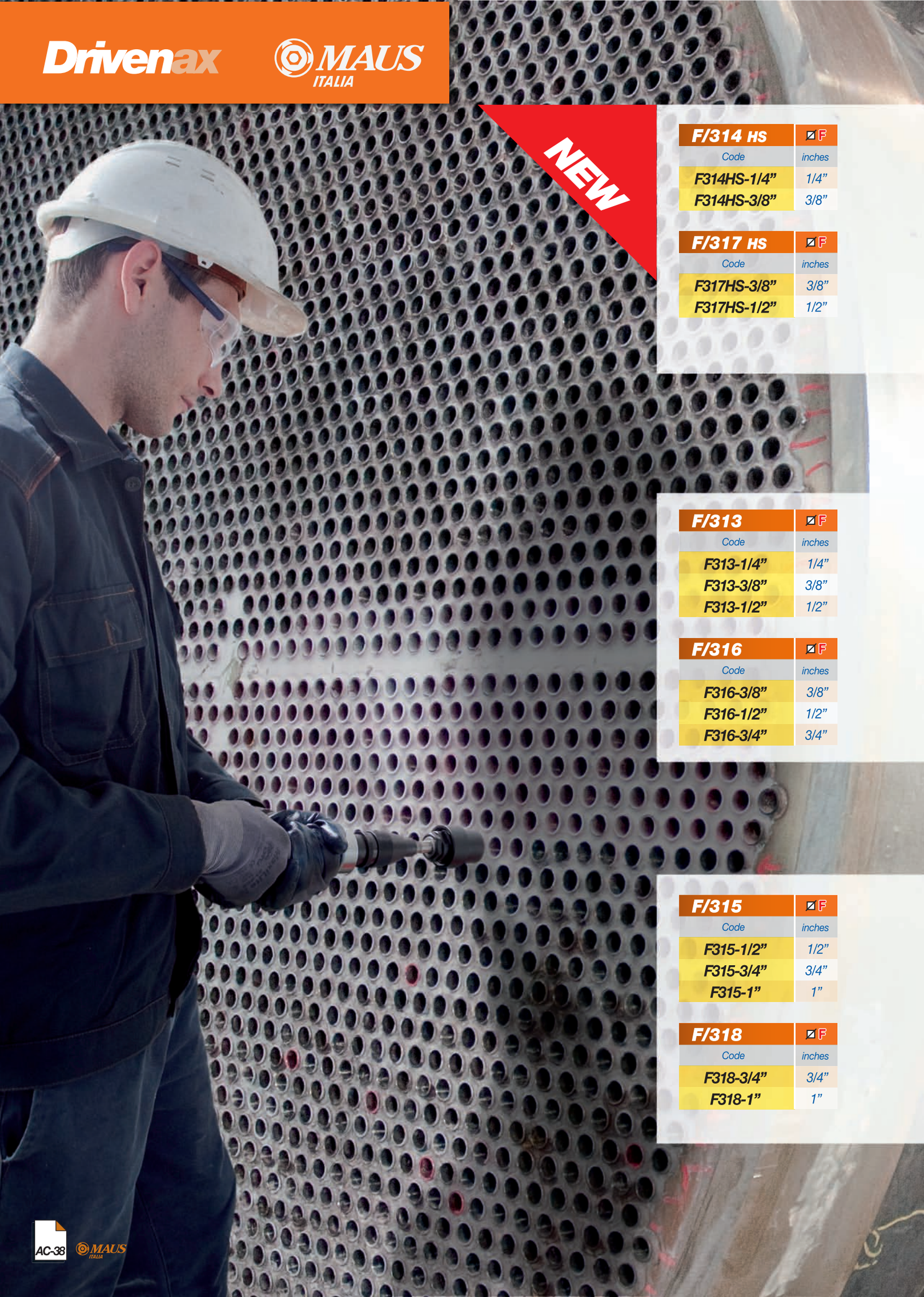
F/308

F/308 HS		Handle A		Telescopic range B		Extendability		Max. motor torque		Weight		⌀M	Recommended joints
Code	N	mm	inches	mm	inches	mm	inches	Nm	Lb Ft	Kg	Lb	mm	Code
F308-4	4	260	10.2	650÷1170	25.6÷461.7	520	205.1	1500	1106	16,5	36.37	24	F/318





Drivenax MAUS ITALIA



NEW

F/314 HS	⧄F
Code	inches
F314HS-1/4”	1/4”
F314HS-3/8”	3/8”

F/317 HS	⧄F
Code	inches
F317HS-3/8”	3/8”
F317HS-1/2”	1/2”

F/313	⧄F
Code	inches
F313-1/4”	1/4”
F313-3/8”	3/8”
F313-1/2”	1/2”

F/316	⧄F
Code	inches
F316-3/8”	3/8”
F316-1/2”	1/2”
F316-3/4”	3/4”

F/315	⧄F
Code	inches
F315-1/2”	1/2”
F315-3/4”	3/4”
F315-1”	1”

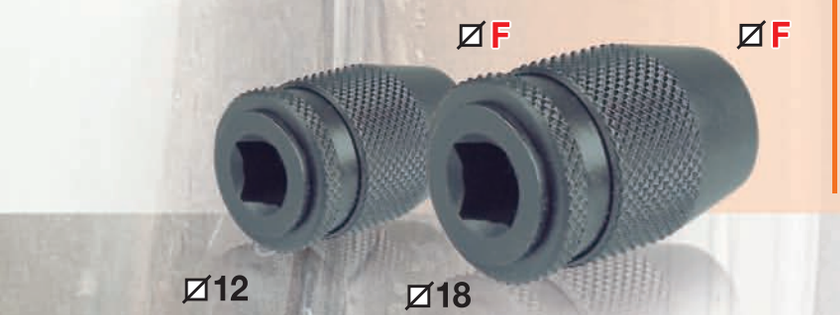
F/318	⧄F
Code	inches
F318-3/4”	3/4”
F318-1”	1”

patented pending

F/314 HS
F/317 HS

Joints with female/female **double quick couplings** specifically for high speed

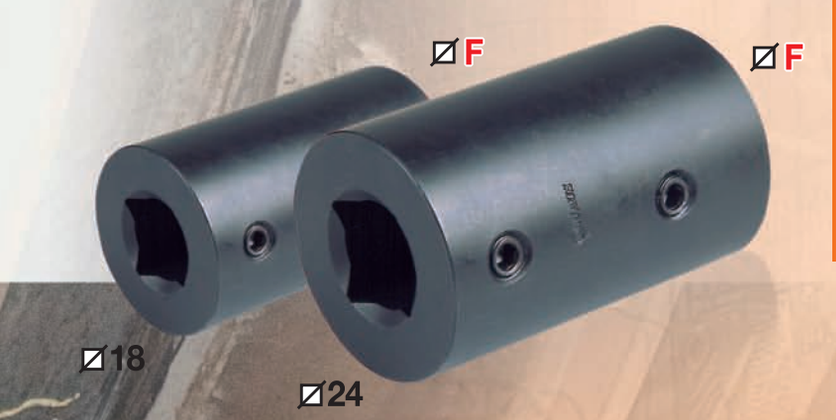
F/314 HS and ***F/317 HS*** double quick coupling joints facilitate extremely **quick tube expander replacement.** The new, **patented design keeps the input shaft**, ***F/308 HS***, **perfectly balanced and aligned** with the tube expander, **ensuring vibration levels are well below allowable thresholds.**



F/313
F/316

Joints with female/female **double quick couplings**

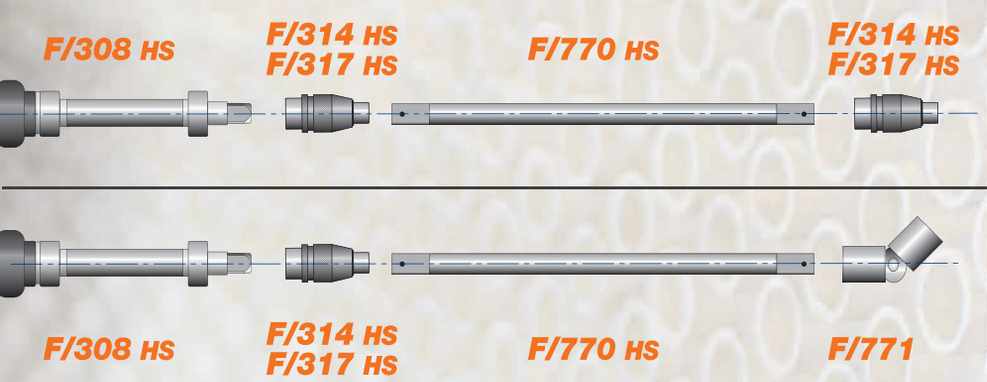
The double quick coupling joints ***F/313*** and ***F/316*** are still in production as spare parts for the many telescopic shafts of the ***F/308*** series existing on the market.



F/315
F/318

Fixed female/female joints

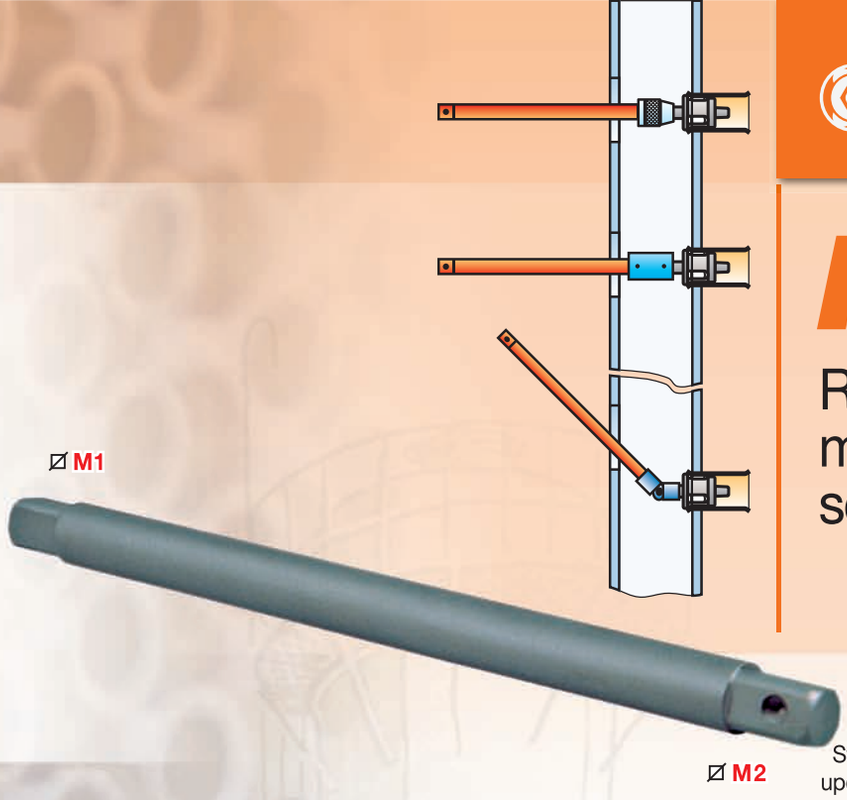
The range also includes the fixed joints of the ***F/315*** and ***F/318*** series; the latter are used on the ***F/308-4*** telescopic shaft.



F/770 HS	⌀ M1	⌀ M2
Code	inches	mm inches
F770HS-3/8”-12	3/8”	12
F770HS-3/8”-18	3/8”	18
F770HS-1/2”-12	1/2”	12
F770HS-1/2”-18	1/2”	18
F770HS-3/4”-18	3/4”	18
F770HS-3/8”-24	3/8”	24
F770HS-1”-24	1”	24
F770HS-3/8”-3/8”	3/8”	3/8”
F770HS-1/2”-1/2”	1/2”	1/2”
F770HS-3/4”-3/4”	3/4”	3/4”

F/771	F1=F2
Code	inches
F771-3/8”	3/8”
F771-1/2”	1/2”
F771-3/4”	3/4”
F771-1”	1”

F/680	⌀ F
Code	inches
F680-2	3/8”- 1/2”
F680-4	1/2” - 3/4” - 1”
F680-6	1.1/4” - 1.1/2”



F/770 HS

Rigid extension with male-male square ends

Rigid extension ideal for mechanical transmission adaptation, solving the problem of **expansion in hard to access areas.** Standard length **L** = 300 mm *(11.811")* . Different lengths available upon request.

F/771

Universal joint

The universal joint for coupling with extension of the series ***F/770***, allows a further adjustability of the mechanical transmission solving the problem of the **tube expansion in areas with difficult access.**

F/680

Square hole reversible ratchet wrench for manual expansion

The offer finally includes a set of extraordinarily strong reversible ratchet wrenches, specially designed for the heavy duty requirements of manual expanding.

6 LubRol Special lubricating paste for expanding

With its ***LubRol*** offer, Maus Italia has selected two lubricating products designed to prolong the life of tube expanders.

The two products, labelled ***GSA-4*** and ***LBR-15***, differ by their consistency.

Maus Italia's **technical staff** are at your disposal to recommend the optimum product and quantity for each situation.

MAUS ITALIA LubRol

GSA-4

Special water-soluble vegetable paste specifically for expanding

The ***GSA-4*** paste significantly increases the life of consumables and improves the expansion result.

It is sold in 4.0 kg *(8.82 Lb)* cans.

LBR-15

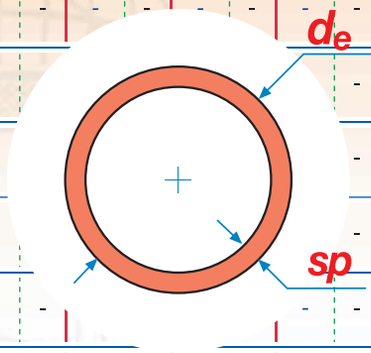
Special water-soluble vegetable lubricant specifically for expanding

The ***LBR-15*** lubricant paste significantly increases the life of consumables and improves the expansion result.

It is sold in 15.0 L *(3.96 Gal US)* cans.

BWG

d_e “ mm	00 BWG		0 BWG		1 BWG		2 BWG		3 BWG		4 BWG		5 BWG		6 BWG		7 BWG		8 BWG		9 BWG		10 BWG		11 BWG	
sp →	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm
	0.380	9,65	0.340	8,64	0.300	7,62	0.284	7,21	0.259	6,58	0.238	6,05	0.220	5,59	0.203	5,16	0.180	4,57	0.165	4,19	0.148	3,76	0.134	3,40	0.120	3,05
1/4” 6,35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3/8” 9,52	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1/2” 12,70	-	-	-							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5/8” 15,87	-	-	-							-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3/4” 19,05	-	-	-							-	-	-	-	-	-	-	-	-	-	-	-	-	0.482	12,2	0.510	12,9
7/8” 22,22	-	-	-	-					-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.607	15,4	0.635	16,1
1” 25,40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.670	17,0	0.704	17,9	0.732	18,6	0.760	19,3
1.1/4” 31,75	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.890	22,6	0.920	23,4	0.954	24,3	0.982	25,0	1.010	25,7
1.1/2” 38,10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.140	28,9	1.170	29,7	1.204	30,6	1.232	31,3	1.260	32,0
1.3/4” 44,45	-	-	-	-	-	-	-	-	-	-	-	-	1.310	33,2	1.344	34,1	1.390	35,2	1.420	36,0	1.454	36,9	1.482	37,6	1.510	38,3
2” 50,80	-	-	-	-	-	-	-	-	-	-	1.524	38,7	1.560	39,6	1.594	40,5	1.640	41,6	1.670	42,4	1.704	43,3	1.732	44,0	1.760	44,7
2.1/4” 57,15	1.490	37,8	1.570	39,8	1.650	41,8	1.682	42,7	1.732	43,9	1.774	45,0	1.810	45,9	1.844	46,8	1.890	47,9	1.920	48,7	1.954	49,6	1.982	50,3	2.010	51,0
2.1/2” 63,50	1.740	44,2	1.820	46,2	1.900	48,2	1.932	49,1	1.982	50,3	2.024	51,4	2.060	52,3	2.094	53,2	2.140	54,3	2.170	55,1	2.204	56,0	2.232	56,7	2.260	57,4
2.3/4” 69,85	1.990	50,5	2.070	52,5	2.150	54,5	2.182	55,3	2.232	56,6	2.274	57,7	2.310	58,6	2.344	59,5	2.390	60,6	2.420	61,4	2.454	62,3	2.482	63,0	2.510	63,7
3” 76,20	2.240	56,9	2.320	58,9	2.400	60,9	2.432	61,8	2.482	63,0	2.524	64,1	2.560	65,0	2.594	65,9	2.640	67,0	2.670	67,8	2.704	68,7	2.732	69,4	2.760	70,1
3.1/4” 82,55	2.490	63,3	2.570	65,3	2.650	67,3	2.682	68,2	2.732	69,4	2.774	70,5	2.810	71,4	2.844	72,3	2.890	73,4	2.920	74,2	2.954	75,1	2.982	75,8	3.010	76,5
3.1/2” 88,90	2.740	69,6	2.820	71,6	2.900	73,6	2.932	74,5	2.982	75,7	3.024	76,8	3.060	77,7	3.094	78,6	3.140	79,7	3.170	80,5	3.204	81,4	3.232	82,1	3.260	82,8
3.3/4” 95,25	2.990	75,9	3.070	77,9	3.150	79,9	3.182	80,8	3.232	82,0	3.274	83,1	3.310	84,0	3.344	84,9	3.390	86,0	3.420	86,8	3.454	87,7	3.482	88,4	3.510	89,1
4” 101,60	3.240	82,3	3.320	84,3	3.400	86,3	3.432	87,2	3.482	88,4	3.524	89,5	3.560	90,4	3.594	91,3	3.640	92,4	3.670	93,2	3.704	94,1	3.732	94,8	3.760	95,5
4.1/4” 107,95	3.490	88,7	3.570	90,7	3.650	92,7	3.682	93,6	3.732	94,8	3.774	95,9	3.810	96,8	3.844	97,7	3.890	98,8	3.920	99,6	3.954	100,5	3.982	101,2	4.010	101,9
4.1/2” 114,30	3.740	95,0	3.820	97,0	3.900	99,0	3.932	99,9	3.982	101,1	4.024	102,2	4.060	103,1	4.094	104,0	4.140	105,1	4.170	105,9	4.204	106,8	4.232	107,5	4.260	108,2



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12 BWG		13 BWG		14 BWG		15 BWG		16 BWG		17 BWG		18 BWG		19 BWG		20 BWG		21 BWG		22 BWG		23 BWG		24 BWG		de	
“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm	“	mm
0.109	2,77	0.095	2,41	0.083	2,11	0.072	1,83	0.065	1,65	0.058	1,47	0.049	1,24	0.042	1,07	0.035	0,89	0.032	0,81	0.028	0,71	0.025	0,64	0.022	0,56	← sp	
-	-	-	-	-	-	-	-	-	-	-	-	0.152	3,8	0.166	4,1	0.180	4,5	0.186	4,7	0.194	4,9	0.200	5,0	0.206	5,2	1/4”	6,35
-	-	-	-	0.209	5,3	0.231	5,8	0.245	6,2	0.259	6,5	0.277	7,0	0.291	7,3	0.305	7,7	0.311	7,9	0.319	8,1	0.325	8,2	0.331	8,4	3/8”	9,52
-	-	0.310	7,9	0.334	8,5	0.356	9,0	0.370	9,4	0.384	9,7	0.402	10,2	0.416	10,5	0.430	10,9	0.436	11,1	0.444	11,3	0.450	11,4	0.456	11,6	1/2”	12,70
0.407	10,3	0.435	11,1	0.459	11,7	0.481	12,2	0.495	12,6	0.509	12,9	0.527	13,4	0.541	13,7	0.555	14,1	0.561	14,3	0.569	14,5	0.575	14,6	0.581	14,8	5/8”	15,87
0.532	13,4	0.560	14,2	0.584	14,8	0.606	15,3	0.620	15,7	0.634	16,0	0.652	16,5	0.666	16,8	0.680	17,2	0.686	17,4	0.694	17,6	0.700	17,7	0.706	17,9	3/4”	19,05
0.657	16,6	0.685	17,4	0.709	18,0	0.731	18,5	0.745	18,9	0.759	19,2	0.777	19,7	0.791	20,0	0.805	20,4	0.811	20,6	0.819	20,8	0.825	20,9	0.831	21,1	7/8”	22,22
0.782	19,8	0.810	20,6	0.834	21,2	0.856	21,7	0.870	22,1	0.884	22,4	0.902	22,9	0.916	23,2	0.930	23,6	0.936	23,8	0.944	24,0	0.950	24,1	0.956	24,3	1”	25,40
1.032	26,2	1.060	27,0	1.084	27,6	1.106	28,1	1.120	28,5	1.134	28,8	1.152	29,3	1.166	29,6	1.180	30,0	1.186	30,2	1.194	30,4	1.200	30,5	1.206	30,7	1.1/4”	31,75
1.282	32,5	1.310	33,3	1.334	33,9	1.356	34,4	1.370	34,8	1.384	35,1	1.402	35,6	1.416	35,9	1.430	36,3	1.436	36,5	1.444	36,7	1.450	36,8	1.456	37,0	1.1/2”	38,10
1.532	38,8	1.560	39,6	1.584	40,2	1.606	40,7	1.620	41,1	1.634	41,4	1.652	41,9	1.666	42,2	1.680	42,6	1.686	42,8	1.694	43,0	1.700	43,1	1.706	43,3	1.3/4”	44,45
1.782	45,2	1.810	46,0	1.834	46,6	1.856	47,1	1.870	47,5	1.884	47,8	1.902	48,3	1.916	48,6	1.930	49,0	1.936	49,2	1.944	49,4	1.950	49,5	1.956	49,7	2”	50,80
2.032	51,5	2.060	52,3	2.084	52,9	2.106	53,4	2.120	53,8	2.134	54,1	2.152	54,6	-	-	-	-	-	-	-	-	-	-	-	-	2.1/4”	57,15
2.282	57,9	2.310	58,7	2.334	59,3	2.356	59,8	2.370	60,2	2.384	60,5	2.402	61,0	-	-	-	-	-	-	-	-	-	-	-	-	2.1/2”	63,50
2.532	64,2	2.560	65,0	2.584	65,6	2.606	66,1	2.620	66,5	2.634	66,8	2.652	67,3	-	-	-	-	-	-	-	-	-	-	-	-	2.3/4”	69,85
2.782	70,6	2.810	71,4	2.834	72,0	2.856	72,5	2.870	72,9	2.884	73,2	2.902	73,7	-	-	-	-	-	-	-	-	-	-	-	-	3”	76,20
3.032	77,0	3.060	77,8	3.084	78,4	3.106	78,9	3.120	79,3	3.134	79,6	3.152	80,1	-	-	-	-	-	-	-	-	-	-	-	-	3.1/4”	82,55
3.282	83,3	3.310	84,1	3.334	84,7	3.356	85,2	3.370	85,6	3.384	85,9	3.402	86,4	-	-	-	-	-	-	-	-	-	-	-	-	3.1/2”	88,90
3.532	89,6	3.560	90,4	3.584	91,0	3.606	91,5	3.620	91,9	3.634	92,2	3.652	92,7	-	-	-	-	-	-	-	-	-	-	-	-	3.3/4”	95,25
3.782	96,0	3.810	96,8	3.834	97,4	3.856	97,9	3.870	98,3	3.884	98,6	3.902	99,1	-	-	-	-	-	-	-	-	-	-	-	-	4”	101,60
4.032	102,4	4.060	103,2	4.084	103,8	4.106	104,3	4.120	104,7	4.134	105,0	4.152	105,5	-	-	-	-	-	-	-	-	-	-	-	-	4.1/4”	107,95
4.282	108,7	4.310	109,5	4.334	110,1	4.356	110,6	4.370	111,0	4.384	111,3	4.402	111,8	-	-	-	-	-	-	-	-	-	-	-	-	4.1/2”	114,30

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