

# AFFOLTER

SOLUTIONS  
FOR HIGH PRODUCTIVITY  
AND PRECISION  
GEAR HOBBING

- Stiffness
- Precision
- Flexibility
- Productivity

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# HOBBING MACHINES

## ASSETS AND ADVANTAGES

**Affolter Group SA** develops, constructs and manufactures CNC Gear Hobbing Machines for the watchmaking and micromechanical sectors.

Affolter Gear Machines is a compact, precise and productive machine concept. Power, rigidity and precision combine with universal applicability, providing a means of manufacturing complex parts at the cutting edge of technology.

From standard products to custom-made developments - encompassing the full range of expertise in very stringent fields.

**PRECISE** High-precision machining, with a great quality of finish;

**RIGID** Thermal stability and mechanical rigidity guarantee consistent dimensions throughout the manufacturing process;

**FAST** Direct drive motor spindle, electronic synchronization up to 16'000 min<sup>-1</sup> giving speeds that are always suited to optimal cycle times;

**FLEXIBLE** Many configurations available for different applications;

**COMPACT** Reduced surface area for more productive manufacturing sites;

**ERGONOMIC** Design optimised for production and maintenance;

### **ENVIRONMENTALLY-FRIENDLY**

Integrated protective fairing of the working area, containing oil mist and reducing noise;

**UNIQUE** A sole manufacturer ensuring service and flexibility to suit your needs (machines, mechanical components, digital control and software);

**FULLY SAFETY** Our CNC Gear Hobbing Machines are fully safe in setup machine mode too. Our products meet the highest safety standards and are CE marked.





*the most compact*



*the most flexible*

Fitted with dedicated CNCs, these machines enable **hobbing** or **tooth by tooth** for...

## AFFOLTER AF90

GEAR HOBGING MACHINE

- CNC axes **6**
- Max. module **0.8 mm**
- Max. cutting length **40 mm**
- Max. parts diameter **30 mm**
- Manual inclination **-/+ 10°**

The AF90 is designed to be compact in order to replace conventional machines, while being just as productive and precise as the AF100 *plus*.

## AFFOLTER AF100 *plus*

GEAR HOBGING MACHINE

- CNC axes **8**
- Max. module **0.8 mm**
- Max. cutting length **50 mm**
- Max. parts diameter **36 mm**
- Automatic inclination **-/+ 30°**

The AF100 *plus* is fitted with a variety of loader and options to offer solutions to suit many applications in the microtechnical industrial sectors. It is the most flexible in our line machines.



## MICROTECHNICAL GEAR HOBBIING MACHINES



*the most versatile*

...spur, helical, bevel, conical, crowned and internal on gears, wheels, shafts, pinions and worm screw.

### AFFOLTER AF160 POWERFUL GEAR HOBBIING MACHINE

- CNC axes 8
- Max. module 2.0 mm
- Max. cutting length 110-180 mm
- Max. parts diameter 60 mm
- Automatic inclination  $-/+ 50^\circ (+115^\circ)$

The AF160 is the most versatile Gear Hobbing Machine in the line, with increased performance and extra options dedicated to cutting larger parts.



# COMPARISON

## FULL RANGE

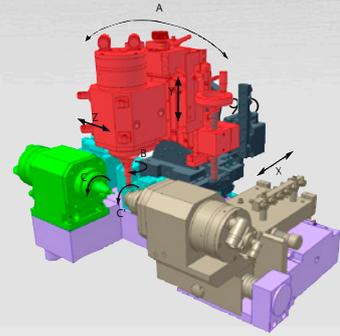
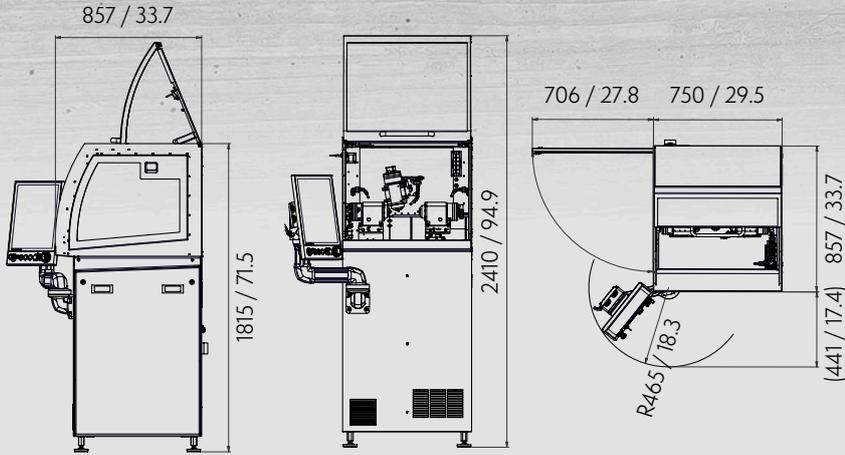
### Technical data

	AF90	AF100 <i>plus</i>	AF160
<b>Parts data</b>			
Max. part diameter	30 mm/1.181 in.	36 mm/1.417 in.	60 mm/2.36 in.*
Max. cutting length	40 mm/1.574 in.	50 mm/1.968 in.	110-180 mm/ 4.33-7.0 in.**
Max. Headstock and tailstock rotation	5,000 rpm	5,000 rpm	9,000 rpm
Minimal module / DP	0.02 mm/1270 DP	0.02 mm/1270 DP	0.02 mm/1270 DP
Maximum module (depending on the material and the number of passes)	0.5 - 0.8 mm/ 50 - 32 DP	0.5 - 0.8 mm/ 50 - 32 DP	2.0 mm / 12.7 DP
<b>Tool data</b>			
Max. hob cutter diameter	24 mm/0.944 in.	24 mm/0.944 in.	100 mm 3.94 in.
Max. hob cutter width	20 mm/0.787 in.	20 mm/0.787 in.	80 mm (2x40)/ 3.14 in.
Cutting spindle inclination angle	-/+10°	-/+30° auto	-/+50° auto / +115°
Max. cutting spindle rotation	16,000 rpm	16,000 rpm	9,000 rpm
<b>Strokes</b>			
Z / Z' axis headstock stroke -	64 mm/2.519 in.	82 mm/3.228 in.	200 mm/7.87 in.
Headstock/counter-headstock clearance	-	82 mm/3.228 in.	345mm / 13.58 in.
X in-feed axis stroke (radial feed)	40 mm/1.574 in.	74 mm/2.913 in.	70 mm/2.76 in.
Y axis shifting stroke (tangential feed)	55 mm/2.165 in.	84 mm/3.307 in.	90 mm/3.54 in.
A axis inclination	-/+10°	-/+30° auto	-/+50° auto / +115°
<b>Installation</b>			
Dimensions (WxDxH) in mm/in.	750x836x1814/ 29.52x32.91x71.41	1180x1660x2589/ 46.46x65.35x102	1,550x2,570x2,650/ 61x101.1x104.3
Weight (unladen)	710 kg/1562 lbs	1'505 kg/ 3318 lbs	2,700 kg/ 5,952 lbs

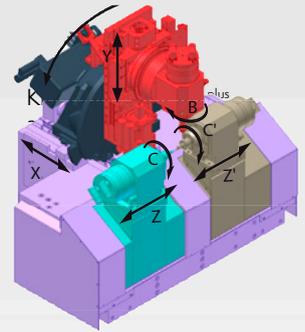
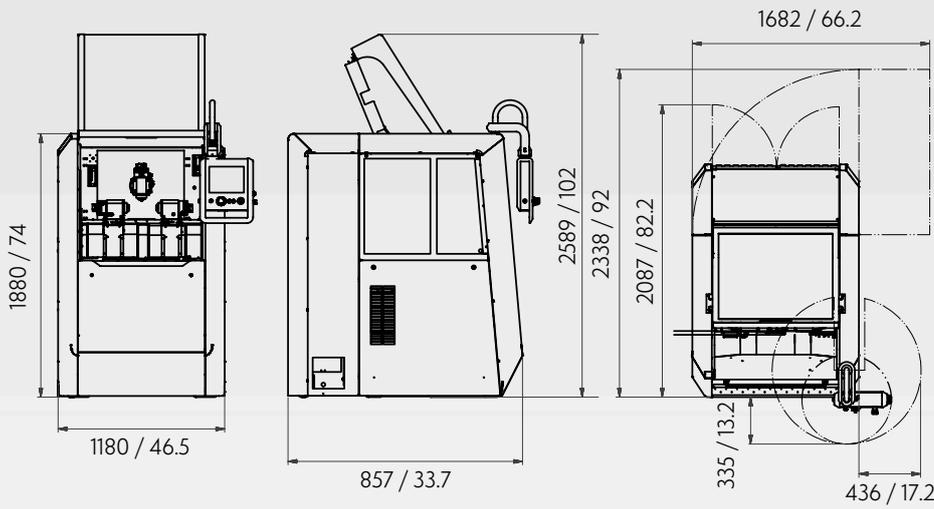
\* According to the setup and the quality required. | \*\* According to clamping of tools.



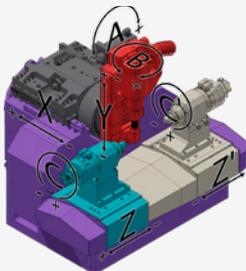
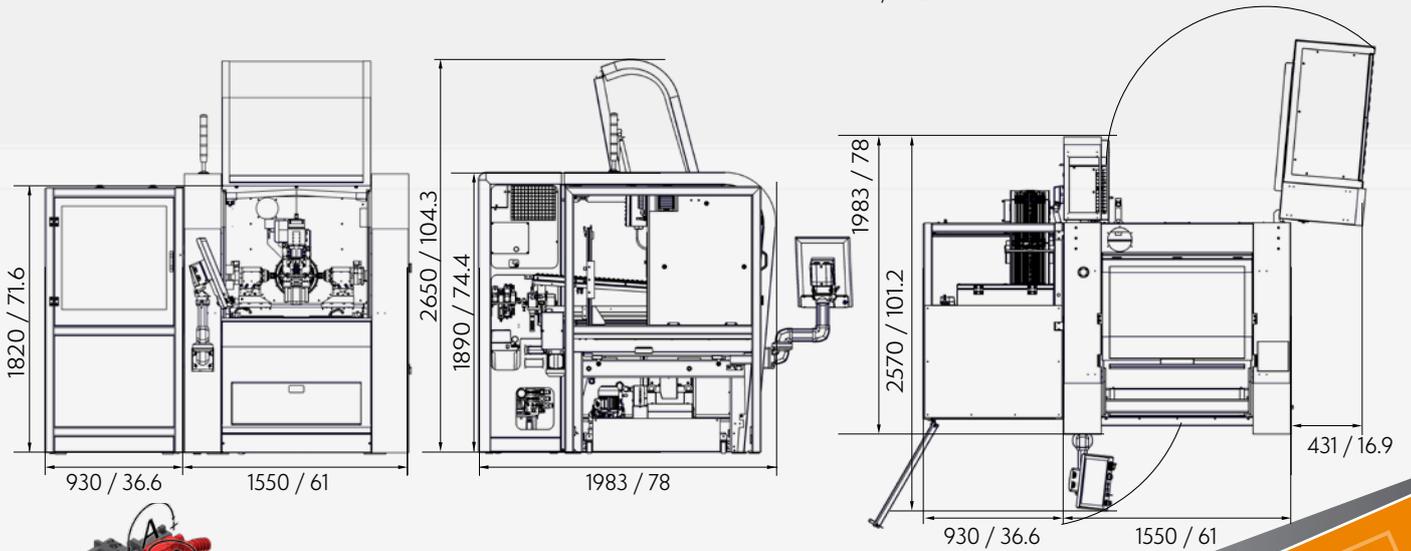
## Space Requirement and kinematics (mm/inch)



Kinematic AF90



Kinematic AF100 plus



Kinematic AF160

# AUTOMATIONS LOADERS

**AFFOLTER Gear Hobbing Machines can be fed manually or automatically. Affolter has a wide range of loaders and automation solutions available to suit the applications and series sizes produced on the machines.**

## AF20

**Drum loader for small watchmaking and microtechnical parts.**

This type of loader is a fast, cost-effective solution for hobbing medium to large series.

The drums and gripper are manufactured based on the part to be loaded.



### Technical features:

Capacities	Data
∅ part (mm/inch):	0.4-6 / 0.015-0.242
Part length (mm/inch):	0.8-12 / 0.031-0.472
Feed time (secs):	0.3-1.2
Range:	up to 100,000 parts
Rotary drum performance:	symmetrical, asymmetrical, shaped

## AF45

**Slide loader for small and medium watchmaking and microtechnical parts.**

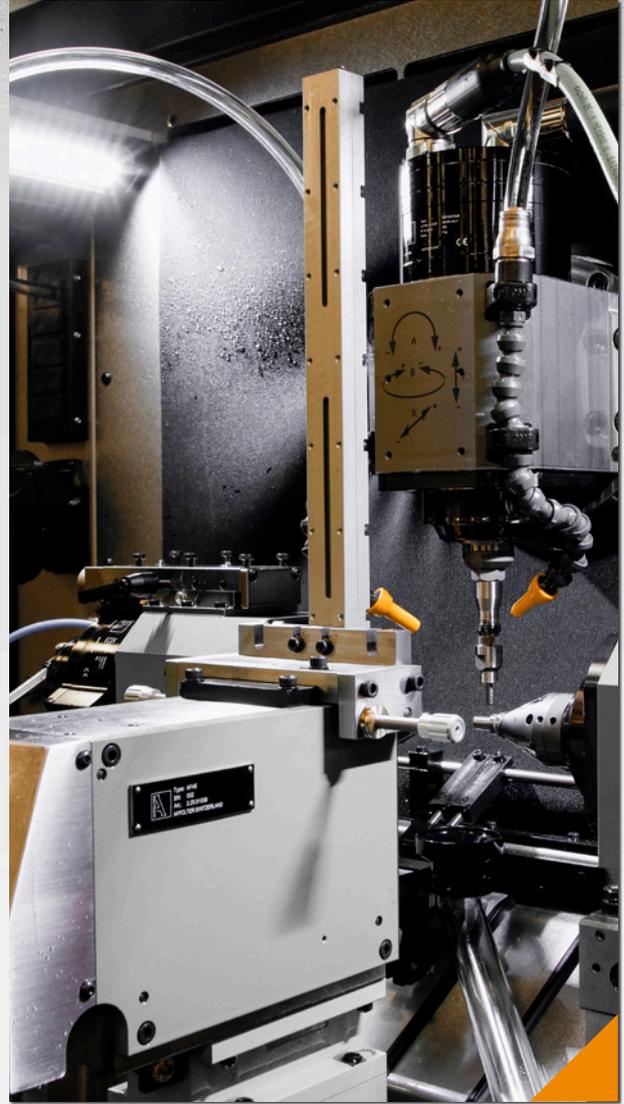
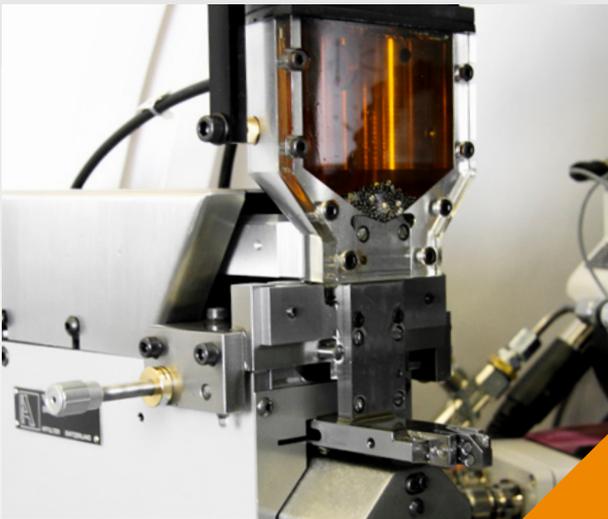
This type of loader is a fast, precise solution for medium to large series gear hobbing.

Three different types of units enable parts feeding:

- Cartridge magazine loader;
- Vibrating bowl feeding system;
- Oil pulse feeding system.

The magazine, gripper and vibrating bowl are adjustable to the part to be fed.





### Technical features:

Feed type	magazine	vibrating bowl		oil pulse	
		thin parts	cubic parts	thin parts	cubic parts
Type of parts		thin parts	cubic parts	thin parts	cubic parts
Ø part (min.-max.) (mm/inch):	2-12 / 0.078-0.472	4-12 / 0.157-0.472	3-12 / 0.118-0.472	1-10 / 0.039-0.393	1-5 / 0.039-0.196
Part length (min.-max.) (mm/inch):	2-30 / 0.078-1.181	2-5 / 0.078-0.196	3-12 / 0.118-0.472	1-5 / 0.039-0.196	1-5 / 0.039-0.196
Max. fill volume (l)		1	1	0.06	0.06
Parts weight (min.-max.) gr.	0.5-5	0.2/8	0.2/8	- /0.2	
Feed time (secs):		0.5 - 1.0			
Repeatability (mm/inch):		0.01 / 0.0004			

# AUTOMATIONS LOADERS

## AF71 GANTRY LOADER

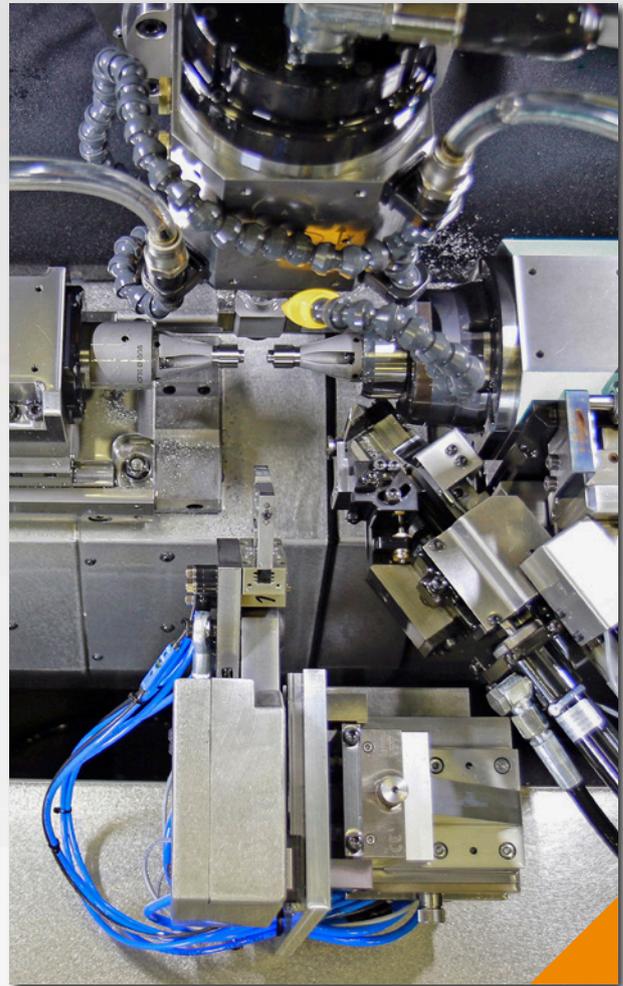
Gantry feed and unloading system for all types of parts.

This loader with dual grip, dedicated to the AF100 *plus* machine, is a fast, precise solution for medium to large series gear hobbing.

One unit enable parts feeding:

- Adjustable feed rail.

This loader does not require specific tooling to the part. The grab clamps are adjusted to a range of diameters.



### Technical features:

Capacities	feed rail
∅ part (mm/in.):	50 / 1.96
Part length (mm/in.):	120 / 4.72
Maximum weight (g / oz):	300 / 11.81
Repeatability (mm/in.):	+/- 0.05 / 0.002
Feed time (secs):	1.5-2
Preparation time for a new part (secs):	5

## AF72 TELESCOPIC LOADER

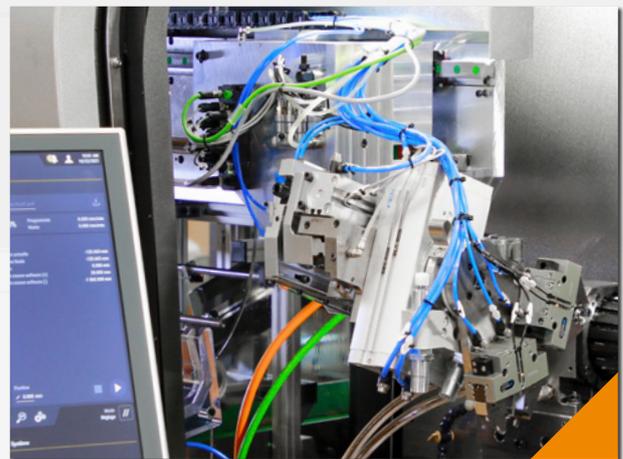
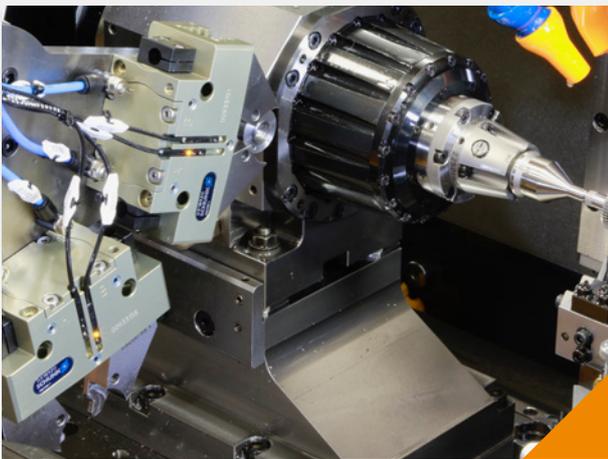
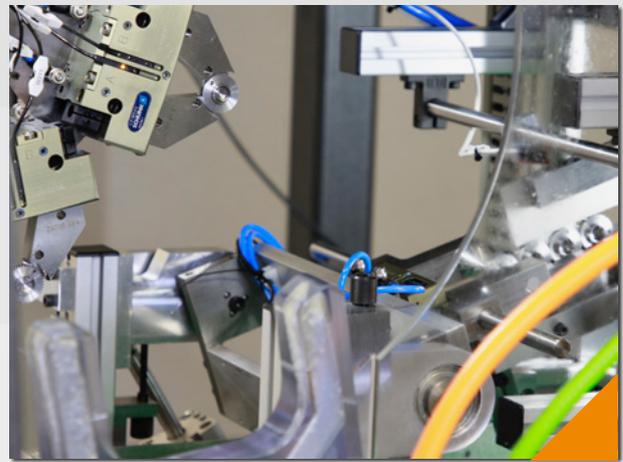
Telescopic feed and unloading system for all types of larger parts.

This loader with dual grip, dedicated to the AF16O machine, is a fast, precise solution to cutting larger parts with medium to large autonomy series gear hobbing.

One unit enable parts feeding:

- Adjustable feed rails up to 5;
- Adjustable chain conveyor belt.

This loader does not require specific tooling to the part. The grab clamps are adjusted to a range of diameters.



### Technical features:

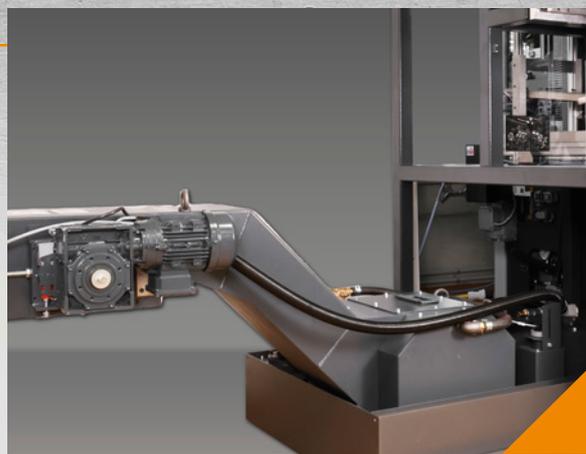
Capacities	feed rail	space requirement
∅ part (mm/in.):	60 / 2.36	L: 1,017 mm / 40 in.
Part length (mm/in.):	250 / 9.84	W: 1,787 mm / 70 in.
Maximum weight (g / oz):	2,500 / 98.42	H: 1,865 mm / 73.5 in.
Repeatability (mm/in.):	+/- 0.1 / 0.004	600 kg / 1,323 lbs
Feed time (secs):	1.5-2	
Preparation time for a new part (secs):	5	

# OPTIONS

The GEAR Hobbing Machines may be equipped with a wide range of options to provide a choice of suitable technical solutions for many gear hobbing and cutting applications.

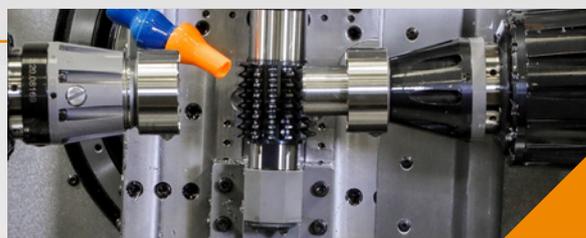
## Customizable coolant system

Various options relating to the management of cutting oil liquid enable the relevant machine to be configured to the customer's specific needs. Indeed, it is possible to improve the quality of filtration and remove shavings independently and economically. The system also allows for improved oil flow and pressure to optimize the quality of the work and removal of chips from the working area. A chip conveyor belt can easily be fitted to the machine using the space designed for this purpose. A significant quantity of chips can therefore be transported out of the machine. Filtration quality of 80 microns for a flow of 40 l/min and 60 l/min for AF16O.



## Counter Bearing HA

The counter Bearing increases the rigidity of the milling cutter with the addition of an end bearing on the milling cutter shaft. It also enables the milling cutter shaft to be held in place firmly top and bottom. It therefore improves the quality of the gear through the increased rigidity of the whole assembly.



## Collet Clamping System

The machine may be equipped with a headstock that utilizes a hydraulic collet clamping system. According to the application type there are three different systems available:

### W15 or W20/W25 and B32 (AF16O)

The W. collet system pulls the collet into the taper. It is highly accurate and offers excellent radial run-out quality as well as adjustable clamping force control. This system is ideally suited for the location and workpiece clamping of gear-shafts and splines, and spline shafts with cylindrical gears.

### L10, F10, F15 or F25 (AF16O)

The L. or F. collet is clamped by the pushing movement against a stop nut. This prevents axial part movement which is especially important when height control is required for processing straight bevel gears, worm-wheels, and crown face gears.



## Deburring

### Deburring with double hob method

Two hobs are mounted on the same hob arbor in opposite direction. Hob #1 cuts in and out only and Hob #2, rotating in the opposite direction makes the synchronized cut and then forms the tooth width or axial length thereby automatically eliminating the burr.

### Deburring unit AF52 / AF54 (AF16O)

The Gear Line machines can be equipped with a mechanical deburring device with cutter or carbide wheel.



# SERVICES

## Technology

### Affolter Pegasus CNC-Control

User friendliness is key: The state-of-the-art digital CNC Control Pegasus ensures extremely fast regulation and integrates IoT. Programming is simple, intuitive, and user-friendly with a 19-inch touch screen. Data can be shared on the cloud, streamlining after-sales service support and preventive maintenance, and therefore minimizing downtimes. Software updates can be done remotely.

### High end components

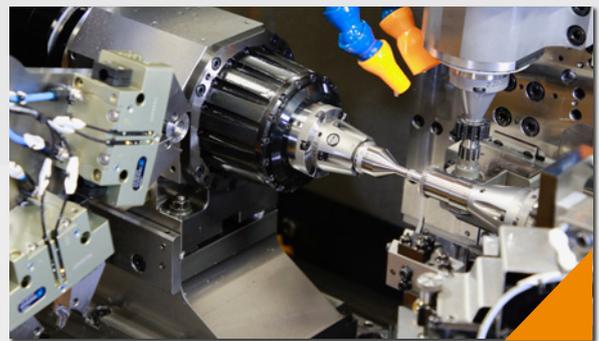
Sourced components in the GEAR Hobbing Machines are of the highest quality and precision: the mineral cast machine bed, linear axes guide-ways and bearings, and the ball screws just to name a few are all the highest quality on the market.

### Synchronisation

The quality and the speed of the spindle synchronization demonstrate excellent tooth to tooth spacing quality.

### Precision

Each machine is measured and kinematically mapped using a laser-interferometer and electronic levels. This guarantees a properly positioning accuracy and axes alignment.



## Services

### Expertises

Affolter has many years of experience in gear hobbing. Our customers are invited to take advantage of our knowledge regarding feasibility studies, tooling and workholding design, cycle time studies, and application specific process training. Turnkey technology!

### Training

The following topics are comprised of the basic customer training course:

- Machine programming ;
- Maintenance.

### Customer Service

Whenever a service action is required, our factory trained technical service and application teams along with our local agents react to quickly competently serve your needs.

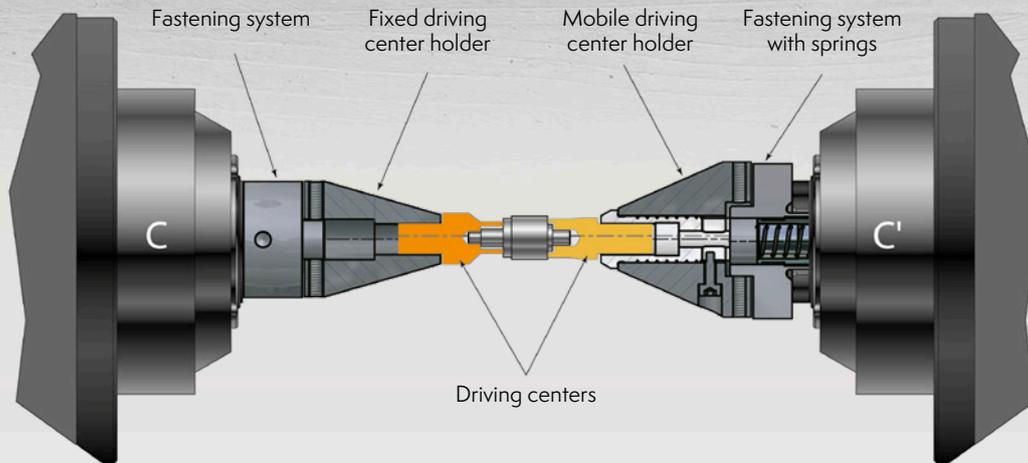


# SETUP

## TOOLING AND ACCESSORIES

### Clamping principle of tool and workpiece

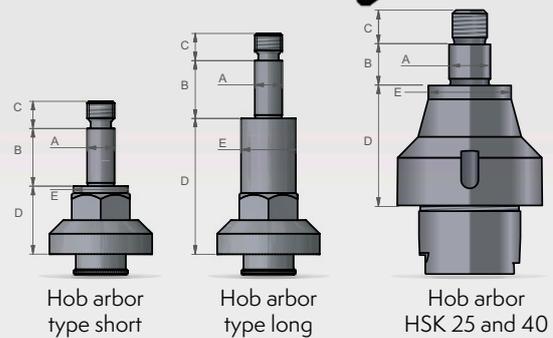
The hob cutter is held on a hob arbor and the part is clamped either between drive centers or in a collet. On the Gear Hobbing Machine AF160, the clamping force is controlled electrically and can be parameterized in the workpiece program.



### Hob arbors

Affolter offers the following standard hob arbors, available from stock:

	A	B	C	D	E
Ø 3.5 type short (mm)	3.5	9	8	20	6
Ø 3.5 type long (mm)	3.5	9	8	40	6
Ø 4.5 type short (mm)	4.5	13	8	20	8
Ø 4.5 type long (mm)	4.5	13	8	40	8
Ø 5 type short (mm)	5	13	8	20	8
Ø 5 type long (mm)	5	13	8	40	8
Ø 6 type short (mm)	6	13	8	20	9
Ø 6 type long (mm)	6	13	8	40	9
Ø 8 type short (mm)	8	17	8	20	16
Ø 8 type long (mm)	8	17	8	40	16
Ø 10 type short (mm)	10	18	10	20	16
Ø 10 type long (mm)	10	18	10	40	16



HSK 25 / 40	φA	B	C	D	φE
40 - Ø 8 short (mm)	8	24	10	25	12
40 - Ø 8 long (mm)	8	50	30	44.5	14
40 - Ø 12 short (mm)	12	22	10	35	24
40 - Ø 13 long (mm)	13	59	38	33	22
40 - Ø 16 long (mm)	16	59	38	33	28
40 - Ø 22 long (mm)	22	79	41	25	35
25 - Ø 13 long (mm)	13	59	38	15	22
25 - Ø 22 short (mm)	22	19	41	55	35

### Driving centers and holders - fixed and actuating types

The drive center holder is the standard interface between the machine and the drive center. The headstock on the left side is equipped with a fixed drive center holder (or with a collet). The tailstock is equipped with an actuating drive center holder which is spring loaded for the clamping force (also called mobile drive center holder).

The diameter and type of the drive center holder is designed and manufactured to interface to the drive center.

AFFOLTER offers the following standard drive center holders, available from stock:

- Ø2 / cylindrical
- Ø3 / cylindrical
- Ø5 / cylindrical
- Ø7 / cylindrical
- Ø8 / cylindrical
- Ø5 / 2° taper
- Ø5 / 1°50' taper
- Ø8 / 2° taper
- Ø15 / cylindrical
- Ø30 / cylindrical

\*Special centers are available upon customer request.

## Hobbing Process

Our CNC Gear Hobbing Machines manufacture gears, pinions, wheels, shafts, cylinders and worms up to a module size of 2.0mm/12.7dp using the following cutting processes (by hobbing or tooth by tooth):

- Breguet
- Helical
- Conical
- Bevel (helical and spur)
- Spur
- Internal
- Frontal
- Worm.



## Drive center tips

In addition to the fundamental machine design, rigidity, and axes alignments, the drive center tips are the most important tooling components for precise part location and clamping. Their manufactured accuracy is decisive for producing the desired component part quality.

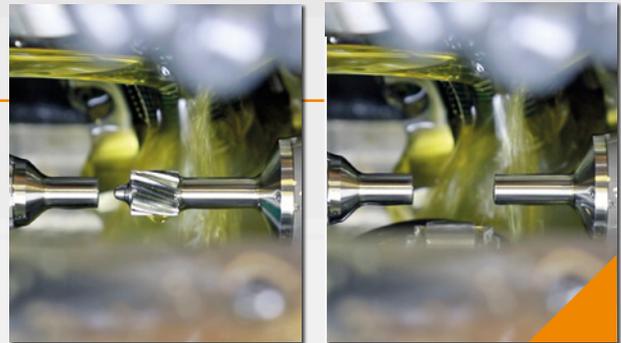
AFFOLTER have many years of experience and know-how in the design and manufacturing of these critical drive centers and we offer the transfer of this know-how to our customers. Our drive centers are designed in accord with the customer part drawing or adapted to existing blank parts and held to precise  $\mu\text{m}$  or  $\mu\text{in}$  manufacturing tolerances!



## Retractable Pin system

The retractable pin system is an efficient and simple system for piece extraction.

It is designed so that the space around the working zone is kept to a minimum. This facilitates integration and adjustment of additional options such as a deburrer, the Counter Bearing HA, a loading system, etc. It is also a time-saver in the working cycle, as there is less movement of axes when extracting the piece.



## Collets

AFFOLTER works together with selected partners in order to offer the collets type in different executions :

- L10 / F10;
- F15 / W15;
- F25 (AF16O);
- B32 (AF16O);
- W20, W25 (AF16O).



## Workpiece presence control

The GEAR Hobbing Machines may be equipped with a workpiece presence or proximity control sensor. This allows the machine, after part loading, to automatically check if the part was correctly loaded or not. If not, the loading cycle is immediately repeated.

This option is also beneficial for checking to avoid axes collisions due to incorrectly loaded and unloaded parts.

# CONTACT US

## Distribution Network

Switzerland/UE/UK: Affolter Group SA  
[www.affoltergroup.ch](http://www.affoltergroup.ch)

USA, Canada & Mexico: Rotec Tools, Mahopac/NY  
[www.rotectools.com](http://www.rotectools.com)

Eastern Europe: Alfleth Engineering AG, Lenzburg  
[www.alfleth.com](http://www.alfleth.com)

Turkey: Selçuklu Horology Mikroteknik Ltd Şti  
[www.selcukluhoroloji.com](http://www.selcukluhoroloji.com)

Korea: LB Tech. Seoul  
[www.lbtech.kr](http://www.lbtech.kr)

China: Corremax International, Chongqing  
[www.corremax-taiwan.com.tw](http://www.corremax-taiwan.com.tw)

Taiwan: Corremax International, Taipei  
[www.corremax-taiwan.com.tw](http://www.corremax-taiwan.com.tw)

Japan: YKT Corporation, Tokyo  
[www.ykt.co.jp](http://www.ykt.co.jp)

South East Asia: Corremax International, Taipei  
[www.corremax-taiwan.com.tw](http://www.corremax-taiwan.com.tw)

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