AFFOLTER

SOLUTIONS FOR HIGH PRODUCTIVITY AND PRECISION GEAR HOBBING

- Stiffness
- Precision
- Flexibility
- Productivity

SUMMARY

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-1 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 manufactuer 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.

CNC GEAR HOBBING CENTERS
FULL SAFETY
SETUP MACHINE MODE
CE

GEAR
AFFOLTER

HIGH PRODUCTION AND PRECISION

the most flexible

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

AFFOLTER AF140
GEAR HOBBING MACHINE

CNC axes	8
Max. module	1.0 mm
Max. cutting length	50 mm
Max. parts diameter	40 mm
Automatic inclination	-/+ 30°

The AF140 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 HOBBING MACHINES

the most versatile

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

AFFOLTER AF160

POWERFUL GEAR HOBBING MACHINE

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

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

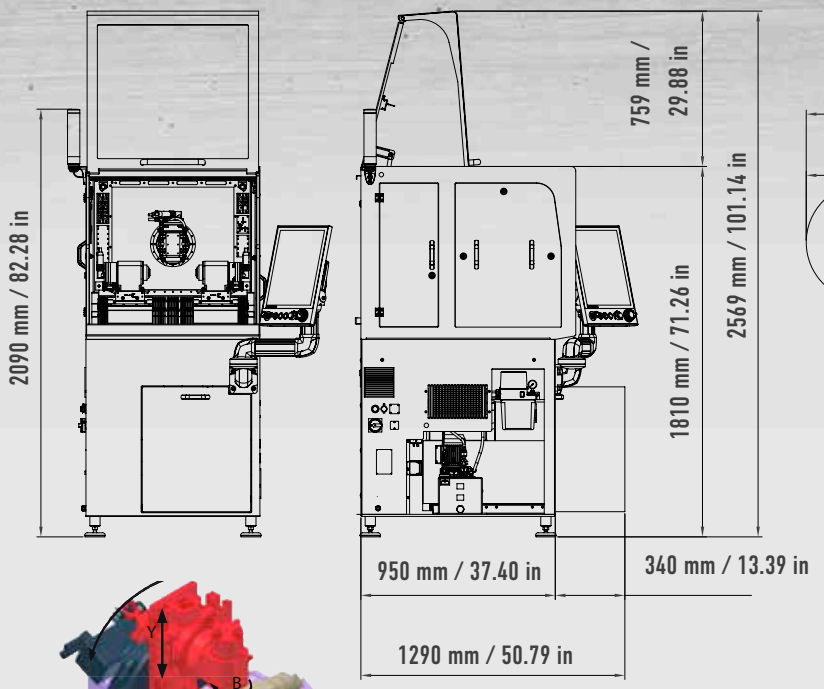
Technical data

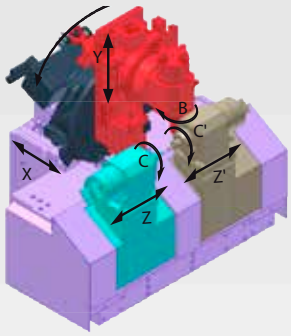
	AF140	AF160
Parts data		
Max. part diameter	40 mm/1.57 in.	60 mm/2.36 in.*
Max. part length	125 mm/4.92 in.	150-260 mm/ 5.9-10.24 in.**
Max. machining length.	50mm / 1.96 in.	110-180 mm / 4.33-7.09 in.
Max. module	1.0 mm/ 25.4 DP	2.0 mm / 12.7 DP
Max. Headstock and tailstock rotation	5,000 rpm	9,000 rpm
Tool data		
Max. hob cutter diameter	24 mm/0.944 in.	100 mm 3.94 in.
Max. hob cutter width	20 mm/0.787 in.	80 mm (2x40)/ 3.14 in.
Cutting spindle inclination angle	+/-30° auto	+/-50° auto / -115°
Max. cutting spindle rotation	16,000 rpm	9,000 rpm
Axes controlled by CNC		
A axis inclination	+/-30° auto	+/-50° auto / -115°
C, C' Headstock/counter-headstock clearance	223 mm/8.78 in.	310mm / 12.20 in.
X in-feed axis stroke (radial feed)	46 mm/1.81 in.	70 mm/2.76 in.
Y axis shifting stroke (tangential feed)	60 mm/2.36 in.	90 mm/3.54 in.
Z / Z' headstock /tailstock (axial feed)	60 mm/2.36 in.	200 mm/7.87 in.
Installation		
Dimensions (WxDxH) in mm/in.	850x1,050x1,810/ 33.4x41.3x71.2	1,500x2,010x2,650/ 60x79.1x104.3
Weight (unladen)	990 kg/ 2,182 lbs	3,900 kg/ 8,598lbs

* Up to diameter 100mm depending the gear material and module, as well as the hob diameter. | ** According to the machine configuration. |
*** Hobbing head tilt angle -115° as an option.

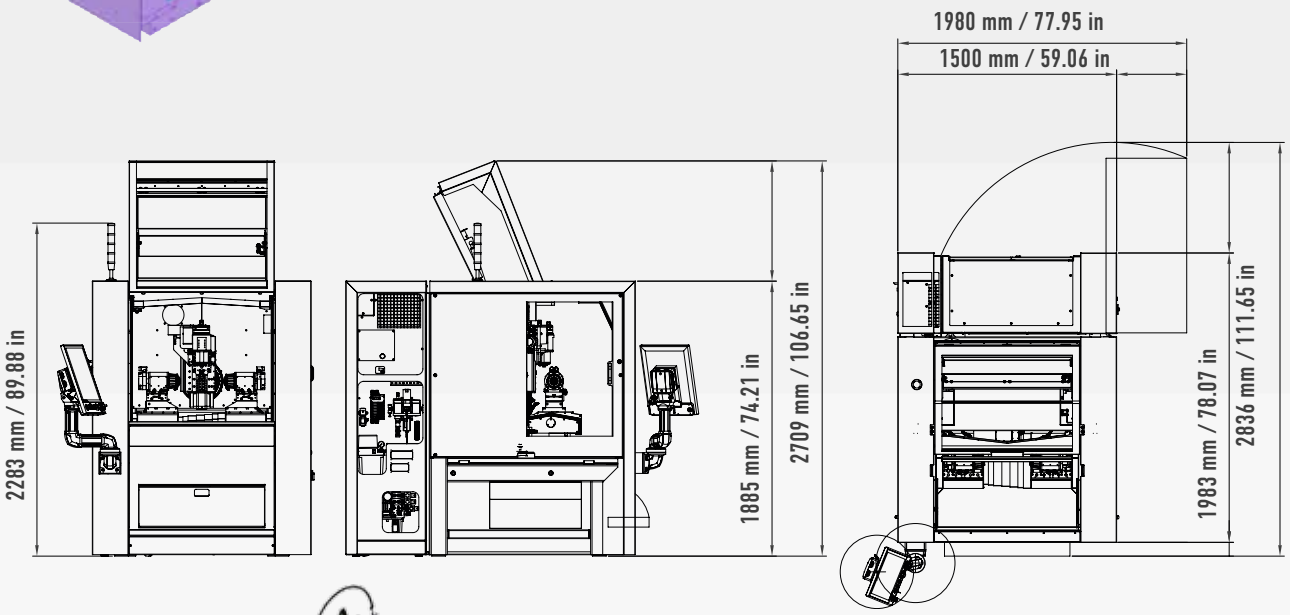


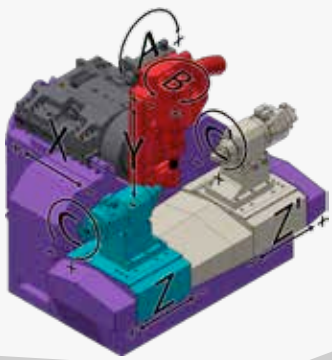

Space Requirement and kinematics (mm/inch)





Kinematic AF14O





Kinematic AF16O

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
Ø 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

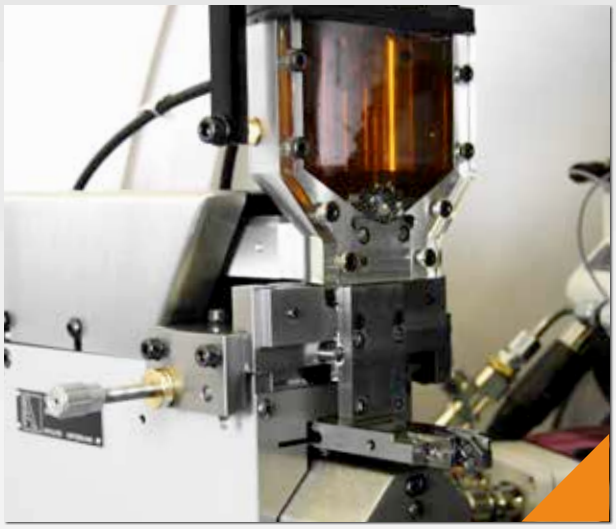
Slide loader for small and medium watchmaking and microtechnical parts.

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	
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

AF73 ROBOTIC ARM LOADING SYSTEM

Versatile feed loading and unloading system with a Robotic Arm

The AF73 loading system features a robotic arm that automates the feeding process between the clamping fixtures. It must be combined with various supply solutions to cutting parts with medium to large autonomy series gear hobbing.

- Stacked feeding system
- Palletizer feeding system
- Vibrating bowl
- Conveyors
- and more.

Technical features:

Capacities	Data
Ø part (mm/inch):	40 / 1.57
Part length (mm/inch):	125 /4.92

AF72 TELESCOPIC LOADER

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

This loader with dual grip, dedicated to the AF160 machine, is a fast, precise solution to cutting larger parts with medium to large autonomy series gear hobbing.

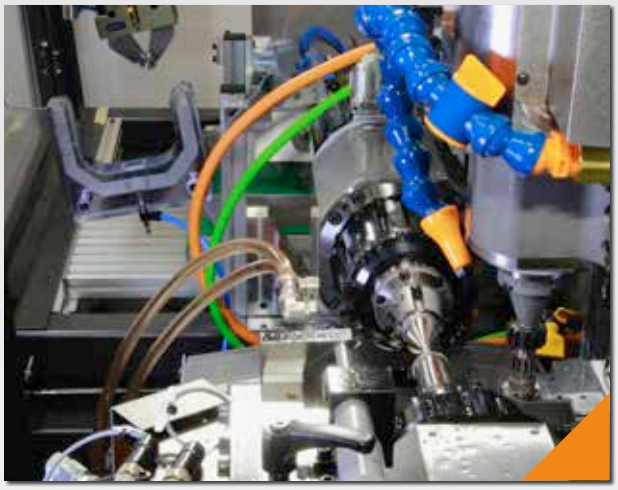
One unit enable parts feeding:

- 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
Ø part (mm/in.):	60 / 2.36	L: 1,017/ 40
Part length (mm/in.):	250 / 9.84	W:1,787/ 70
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
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.

Internal and external Power Skiving Process

Power skiving combines the principles of hobbing and shaping with modern machine technology. By angling the tool precisely to the workpiece, it achieves high cutting speeds and exceptional accuracy.

Advanced spindles and synchronized axes deliver fast, flexible gear production with minimal tool wear.

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.

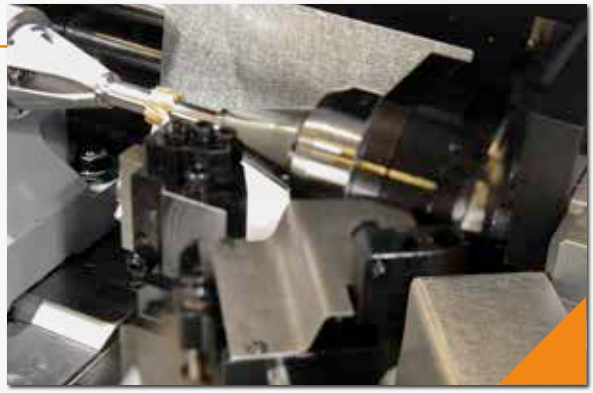
Deburring

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 AF51, AF52 / AF55 (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.

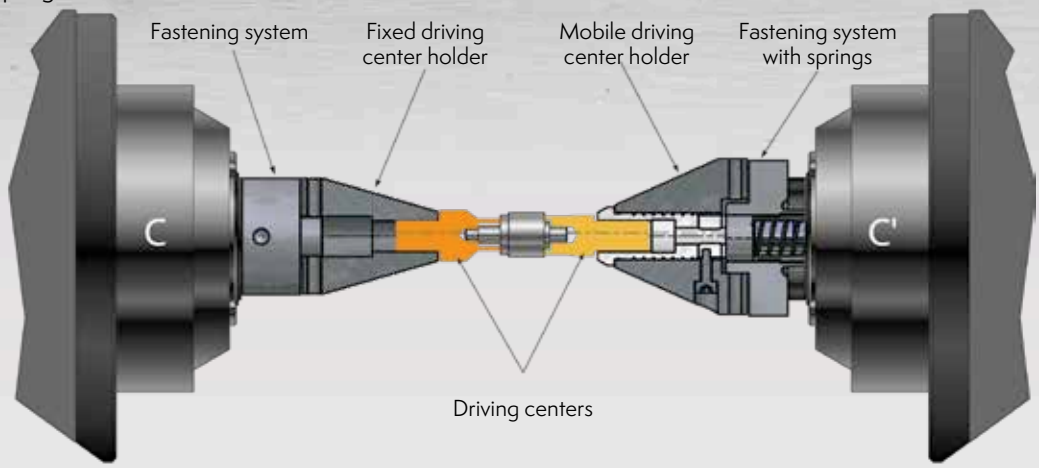
Customer Service

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

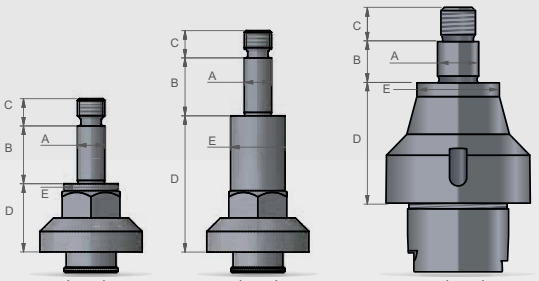
The hob cutter is held on a hob arbor and the part is clamped either between drive centers or in a collet. On the Gear Hobbing Machine AF160, the clamping force is controlled electrically and can be parameterized in the workpiece program.



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



Hob arbor type short

Hob arbor type long

Hob arbor HSK 25 and 40

HSK 25 / 40	øA	B	C	D	øE
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 - Ø22 long (mm)	22	79	41	25	35
25 - Ø13 long (mm)	13	59	38	15	22
25 - Ø22 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:

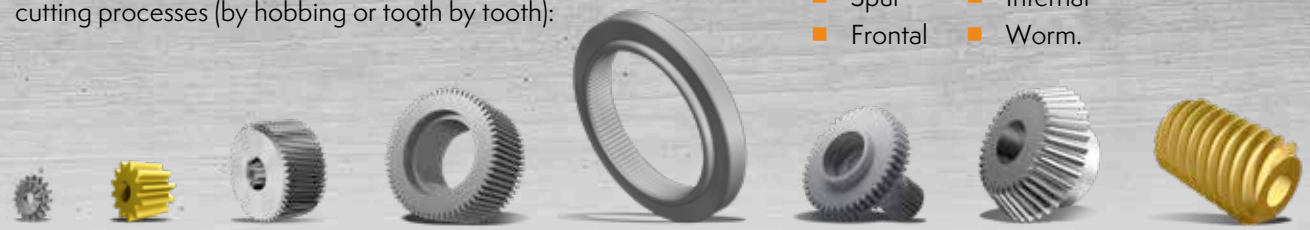
- Ø2 / cylindrical
- Ø5 / cylindrical
- Ø8 / cylindrical
- Ø5 / 1°50' taper
- Ø15 / cylindrical
- Ø3 / cylindrical
- Ø7 / cylindrical
- Ø5 / 2° taper
- Ø8 / 2° taper
- Ø30 / cylindrical

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



Drive center tips

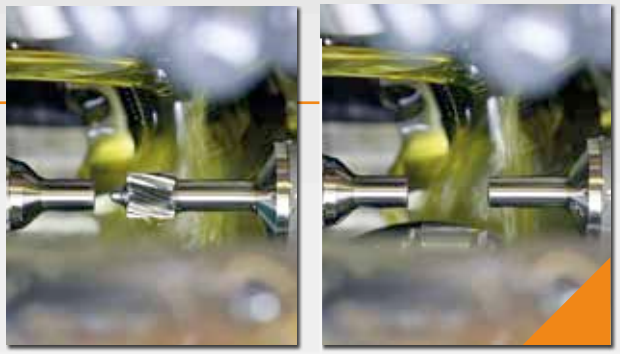
In addition to the fundamental machine design, rigidity, and axes alignments, the drive center tips are the most important tooling components for precise part location and clamping. Their manufactured accuracy is decisive for producing the desired component part quality.

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 *µm* or *µin* 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

USA, Canada & Mexico: Rotec Tools, Mahopac/NY
www.rotectools.com

Eastern Europe: Alfleth Engineering AG, Lenzburg
www.alfleth.com

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