



THINK PARTS THINK TORNOS



SAS 16.6

Cam operated multitasking lathe with programmable control.

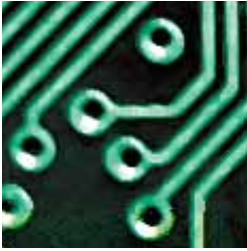
TORNOS PROVIDES SOLUTIONS
TO HIGH-TECHNOLOGY INDUSTRIES,
IN THE FOLLOWING SECTORS IN PARTICULAR :



Automotive



Medical



Electronics



Watchmaking & Micromechanics

SAS 16.6

World leader in small capacity multi-spindle turning machines

To our Current and Future Customers...

Perhaps you are unfamiliar with the family of Tornos Machine Tools.

It was in 1880 that the predecessors to Tornos developed the first Swiss type sliding headstock lathe in Moutier, Switzerland, and since then, men and women have built their businesses with confidence, that Tornos will provide them

The quality of our work is your guarantee that these machines will cycle 24 hours a day, day after day, year after year; and if there is a service problem our after sales service organization will minimize your down time with a quick and courteous response.

Our research and development engineers are constantly developing new innovations to keep



with the service and quality they expect.

We strive to provide the best product to the market, to produce both simple and complex parts with the latest developing technology. Tornos stands ready to resolve your machining problems on single and multispindle automatic lathes; for short and long production runs.

The 100'000 lathes delivered worldwide by the main plant in Moutier, Switzerland and by our subsidiaries and agencies worldwide are proof of our quality and reliability.

Tornos and you in front of the others.

We all benefit from our experience working with automotive, aerospace, electronic, medical industries, etc.

With our experience and ambition, we can find a solution to your needs. It is our pleasure to introduce to you the Tornos multispindles.

We are the world's leader of multispindles for small parts production with more than 3'500 machines in service worldwide.

Our new machine the SAS 16.6 is derived from its well known multispindles of the past – the AS 14, SAS 16 and SAS 16 DC!

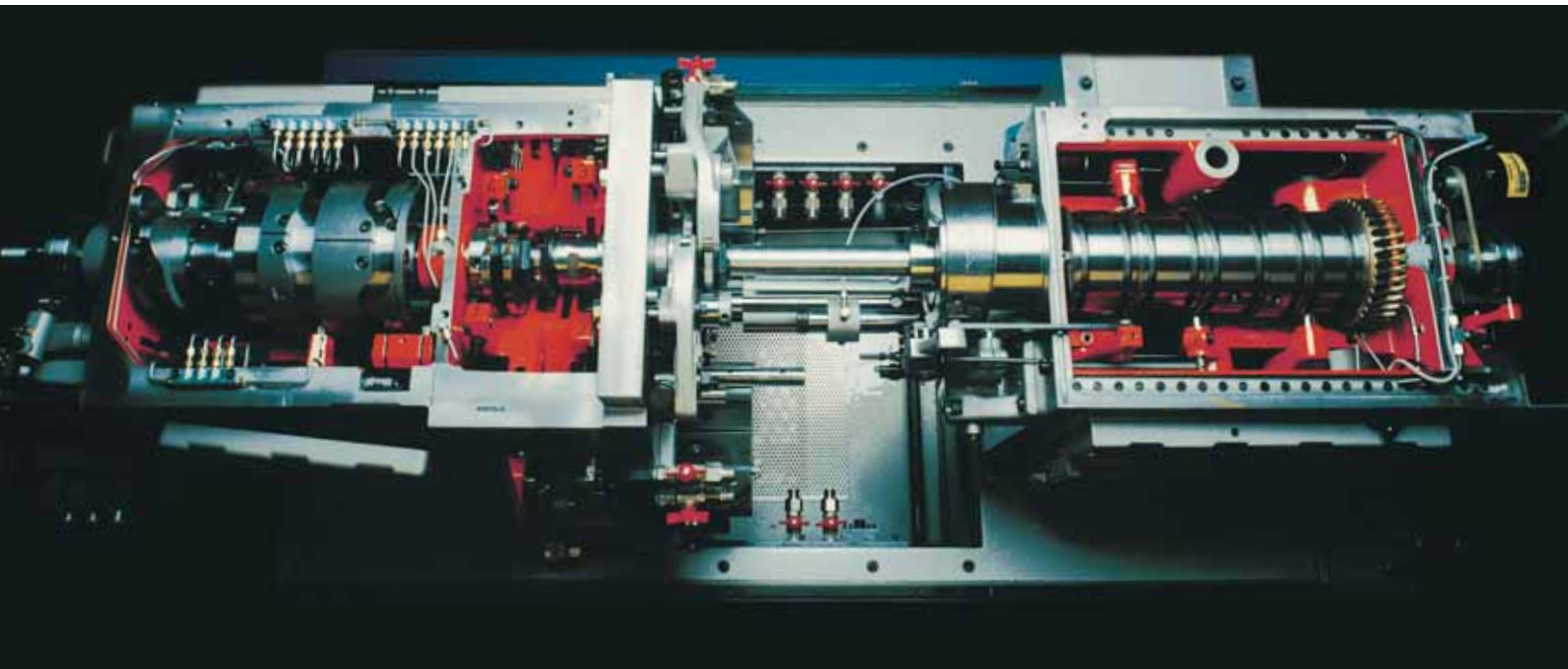
PRESENTATION

Cam-operated multi-spindle turning machine and programmable controller



PERFORMANCE

Force no 1

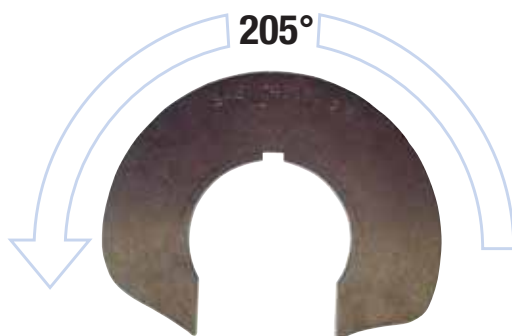


Production

With its speed of indexing and its amount of degrees of production (205°) the multispindle SAS 16.6 can offer:

- A better distribution of cutting operations.
- A more accurate spindle speed.
- An increase of production.

These advantages make the SAS 16.6 lathe the leader of the 6-spindle multispindles for small parts.



205° of work zone to obtain a production of up to 80 parts per minute.

PERFORMANCE

Force no 1

Rigidity

The replacement of the traditional mechanical finger locking of the carrier with a combination of Hirth toothed coupling gears, the development of a 3-bearing front support of the spindle and the addition of a pressure lubricated spindle, gives you the following advantages :

- Increased axial and radial rigidity.
- Increased precision on length and diameter.
- Increased tool life.
- Increased surface finish.
- Increased reliability of the machine.

Guarantee tolerances on certain operations by eliminating the shaving operation.



Precision

Precision is defined as the capability of a machine to produce parts consistently with the least amount of deviation. Those items that affect precision on our SAS 16.6 are as follows :

- Rigidity of the spindle carrier.
- Thermal stability.
- Evacuation of the chips from the work area.
- Large 300 liter (80 gallons) coolant tank.

These are the elements that guarantee the quality of the surface finish and the precision necessary to achieve your production run and to meet stringent SPC control.

A reduction of size deviation and an increase of machine process capability.



PERFORMANCE

Force no 1

Optionally

Spindle stop

- Cross drilling and milling.
- Eccentric end drilling for complex parts.

Counter turret

Up to 3 counter-operations can be performed on free time. This will allow you to complete :

- Very difficult parts.
- Eliminate secondary operations.

Electronic handwheels

Which users of automatic multispindle lathes have never complained about fine adjustment or dimension corrections requiring the machine to be stopped and time spent on adjustment. These can now be a thing of the past, as the new TORNOS electronic handwheels, are naturally available "ex-factory", enable dimension corrections to be made without stopping the machine. Quick fine adjustment, tool wear correction and preliminary adjustment eliminated are the other strong points of this new feature for your production. Adapted for positions 1, 2, 3 and 4 adjusting them on (within a 2 mm range) enables you to face up to all situations. Besides the huge time savings, variations between your parts are reduced and so repetition and accuracy of the machine are still further improved. So this constant quality and guarantee gives you the assurance that your production meets the needs of modern competitive conditions.



Pick-off spindle

Possibility to have 2 pick-off spindles in pos. 3 and 6 that give you the opportunity to work in counter-operation and to realize 2 simple parts per cycle. Strong mechanical clamping of the parts in the pick-off spindles allow heavy cuts.

In this case :

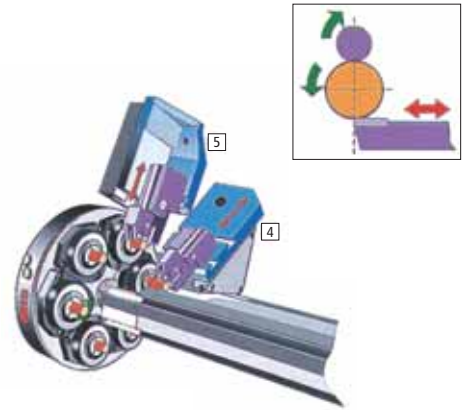
more than 120 parts per minute.

CONVENIENCE

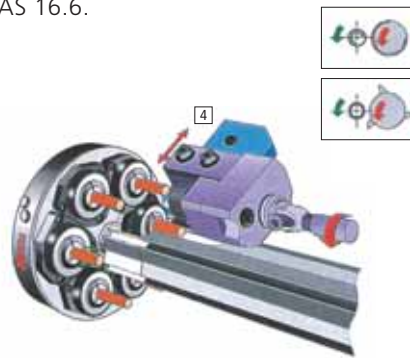
Force no 2

Equipment interchangeability

Today more than 300 attachments are available in our catalogue going from drilling and forming, to more complex operations like polygoning and thread milling. These attachments are interchangeable between the AS 14, SAS 16, SAS 16 DC and now the new SAS 16.6.



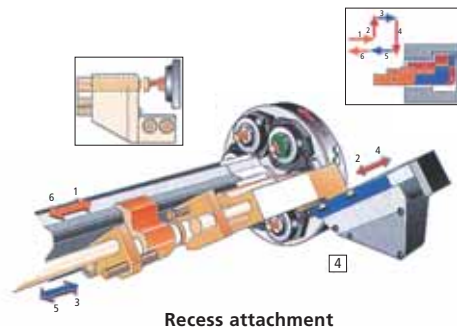
Toolholder for shaving



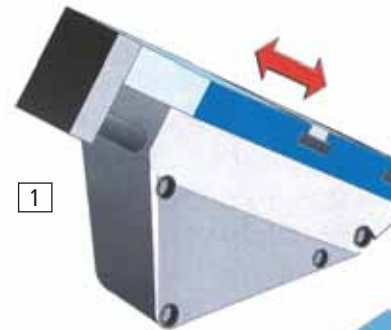
Polygon and thread milling attachment



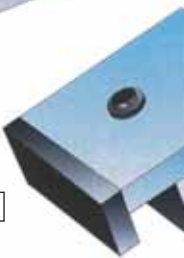
Independent stationary spindle



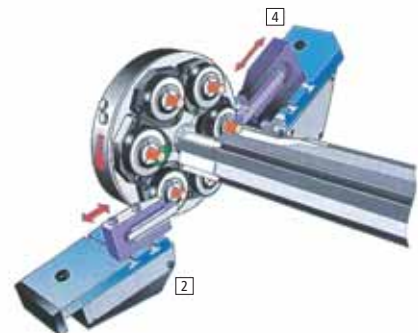
Recess attachment



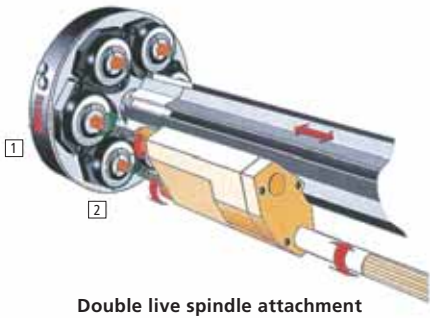
1



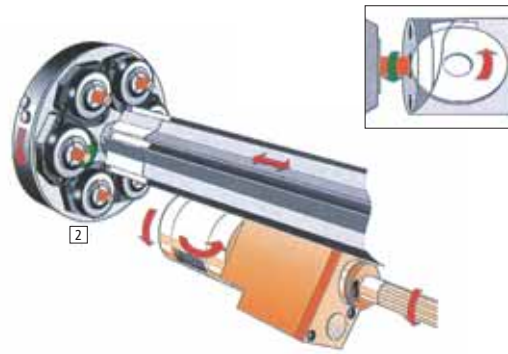
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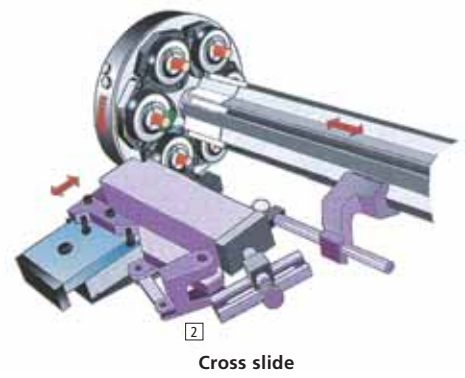
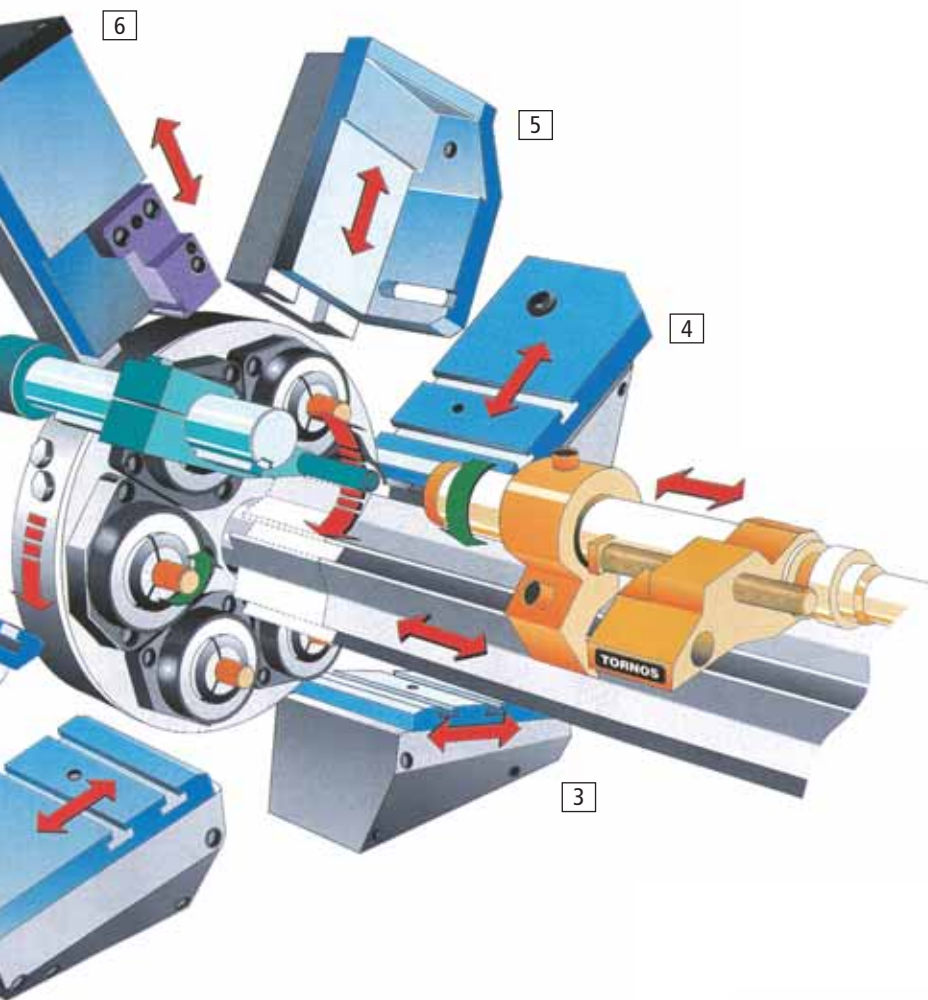
Forming toolholder



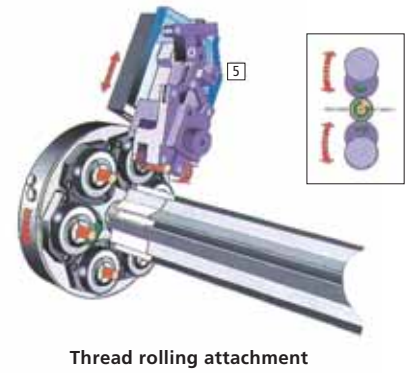
Double live spindle attachment



End milling attachment



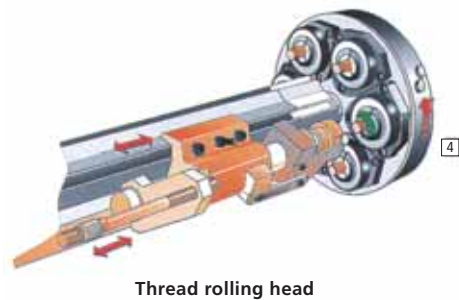
Cross slide



Thread rolling attachment



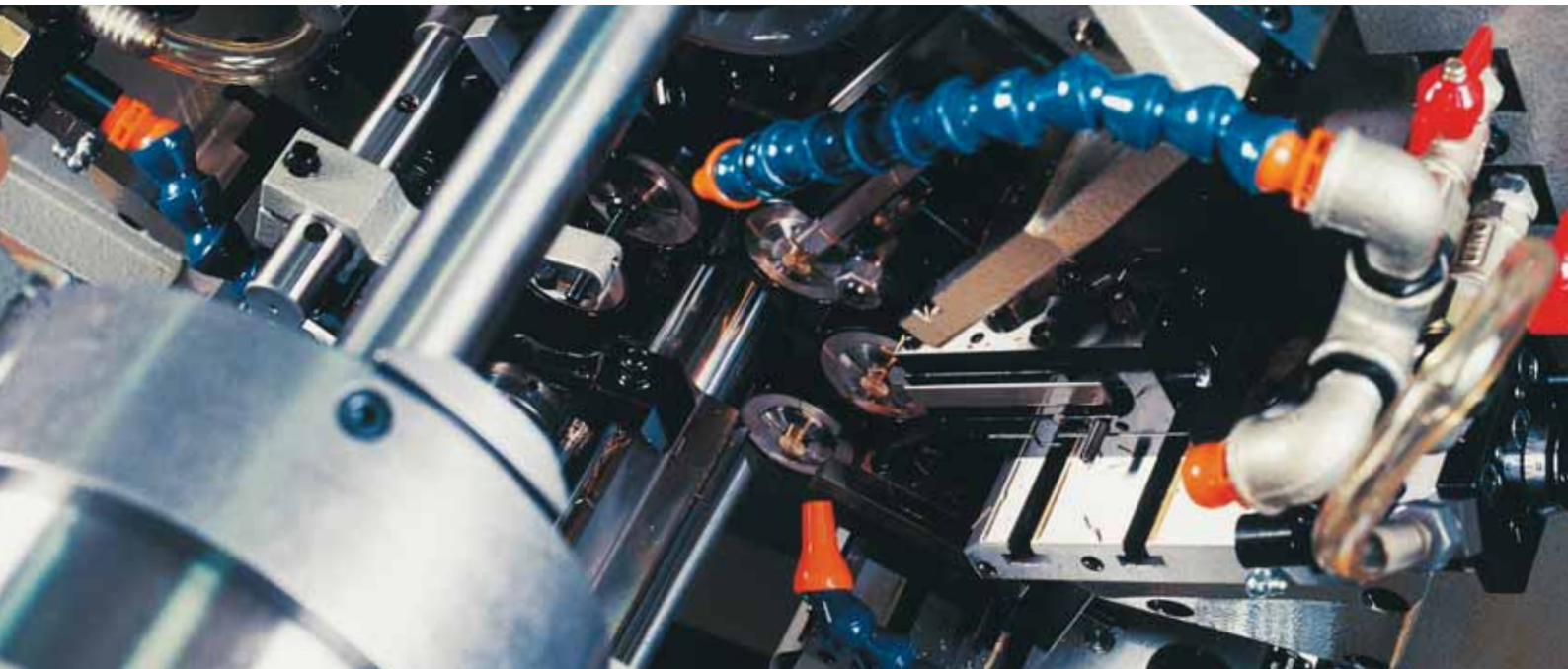
Stationary drilling attachment



Thread rolling head

RELIABILITY

Force no 3



Know-how

With the evolution of the indexing system of the spindle carrier in relation to the old "Malte cross", we can offer you the following :

- Smooth indexing.
- Elimination of vibrations.
- An increase of the product life.

The low mass of the spindle carrier gives us the smoothness of indexing. Tornos is the worldwide leader of the multispindles for small parts with 40 years of experience and 3'500 machines in service.

User friendly

The operation of the machine is monitored by a Fanuc (Power Mate) with a detailed diagnostic system.

Programmable features:

- Spindle speed.
- Acceleration speed.
- Camshaft speed.
- Auxiliary function (like drill safeties, chip conveyor, broken tool detection, bar loaders, etc.).
- Management of tool life.
- Alarm display.

All these options give us:

- Greater flexibility.
- Greater optimisation for the user.
- Greater production, due to tool management.
- Limited down time.

AUTOMATIC BAR LOADER

Robobar MSL 320 optionally

Installed behind the regular stock reel, it automatically feeds the machine with bar stock to maximize time savings.



Technical features

Bars running in an oil bath.

Fanuc control.

Bar storage: 110 bars of 7 mm.

Possible productivity up to 50 p/min.

Minimum inertia.

The "oil bath" design guarantees a production follow-up up to 50 p/min. without vibration and without the bars being "clawed" by the turret. As a result the new MSF 316 integrated loader increases further the quality of parts made on an SAS 16.6.

Summing up, the Robobar MSF 316 provides you with less space requirement, improvement in parts production, greater independence "without human participation" and simplified operation.

Robobar MSF 316 integrated loader

A loading system which eliminates the old stock reel saves you floor space !

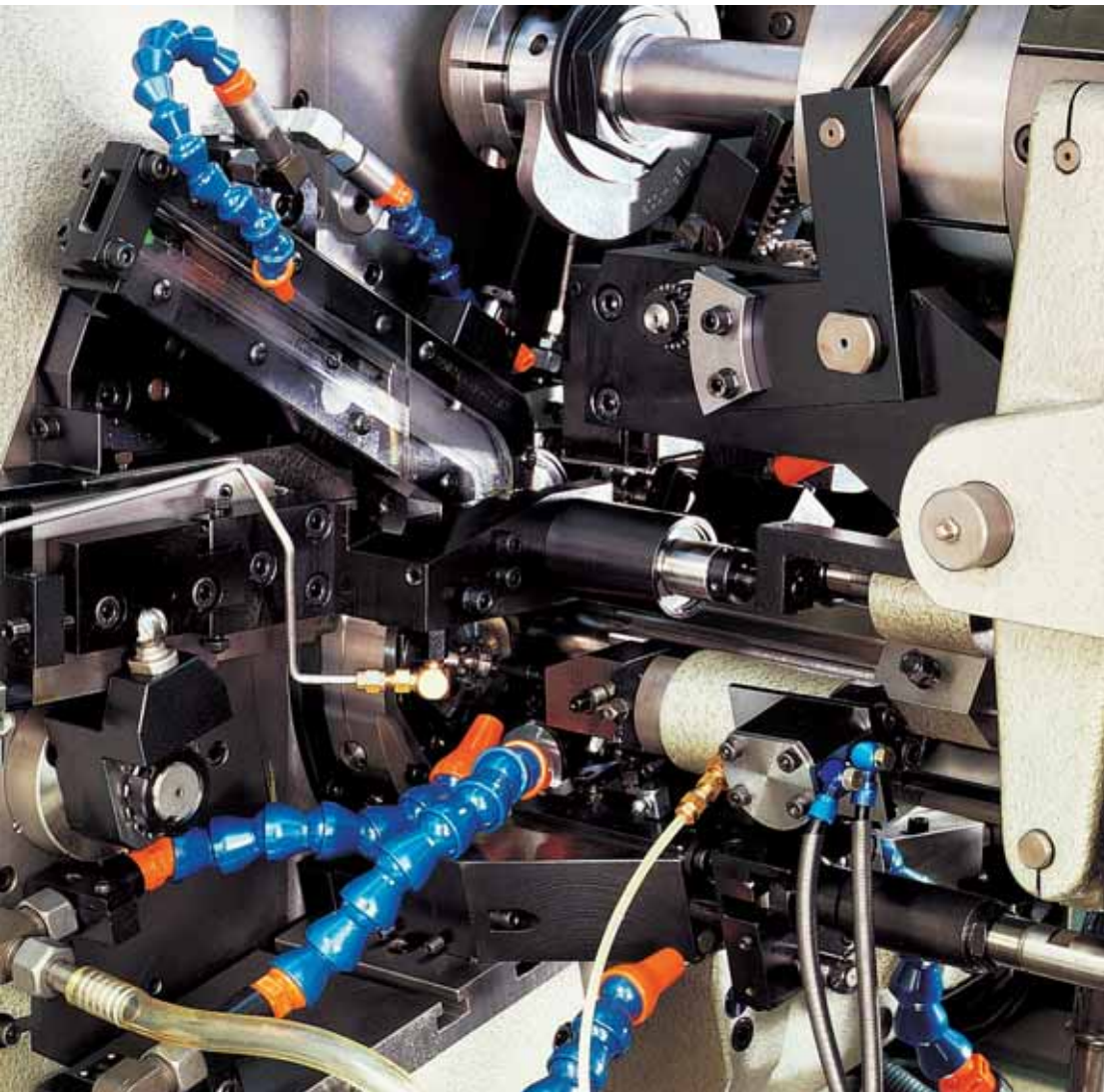
Apart from the advantages of space (over 32 % space gained in comparison with an additional bar loader), the new MSF 316 integrated loader brings significant advantages of loading simplification and reduced staff.

The faster more flexible plant works hand in hand to reduce completion times and increase flexibility requirements.



AUTOMATIC BAR LOADER

Secondary machine-collet "Chucker"



Secondary machine-collet "Chucker"

In today's market, especially in the automotive and bearing industries, the use of pre-formed and blanked parts are increasing. Tornos has now developed the multispindle SAS 16.6 collet "Chucker". The installation of the tooling and

attachments is similar to the bar machine. The loading and part clamping system is specific to each application.

TECHNICAL CHARACTERISTICS

TECHNICAL CHARACTERISTICS

Number of spindles			6
Max. capacity :	Round (diameter)	mm	16 (17) .630" (.670")
	Hex (on flat)	mm	13 .512"
	Square	mm	11 .433"
Spindle speed (3 ranges)		rpm	800 to 8'000
	Range 1 - Ratio 1	rpm	800 to 2'000
	Range 2 - Ratio 2	rpm	800 to 4'000
	Range 3 - Ratio 3	rpm	800 to 8'000
Production Speed		p/min.	3 to 80
Max. length of feed stroke with standard cam		mm	63 2.480"
Max. part length with standard cam		mm	52 2.047"
Max. length of feed stroke with cam for long part		mm*	85 3.346"
Max. part length with long part cam		mm*	75 2.953"
Number of cross-slides			6
Travel of the cross-slides		mm	20 .787"
Number of independent advances			4
Travel of the independent slide		mm	45 1.772"
Travel of the central slide		mm	50 1.968"
Amount of working degree		°	205
Spindle motor			
Max. torque		Nm	70 52 ft. lbs.
Constant torque up to 1'500 rpm		Nm	47,7 35 ft. lbs.
Constant power from 1'500 rpm (50 % ED)		kW	7,5 10 HP
Camshaft motor			
Nominal torque		Nm	5,9 4.35 ft. lbs.
Max. speed		rpm	3'000
Coolant pump motor (50 Hz)			
Speed		rpm	1'500
Power		kW	2,2 3 HP
Pump capacity (at 60 Hz)		l/min.	95 (30 gallons/min.)
Manufacturing standards			In accordance with current EEC Specifications
Indexing of spindle carrier			Manifold
Locking of spindle carrier			Hirth Toothed Coupling
Monitoring system			Fanuc

* The use of long part cam limits the production to 60 p/min. and the spindle speed to 6'000 rpm

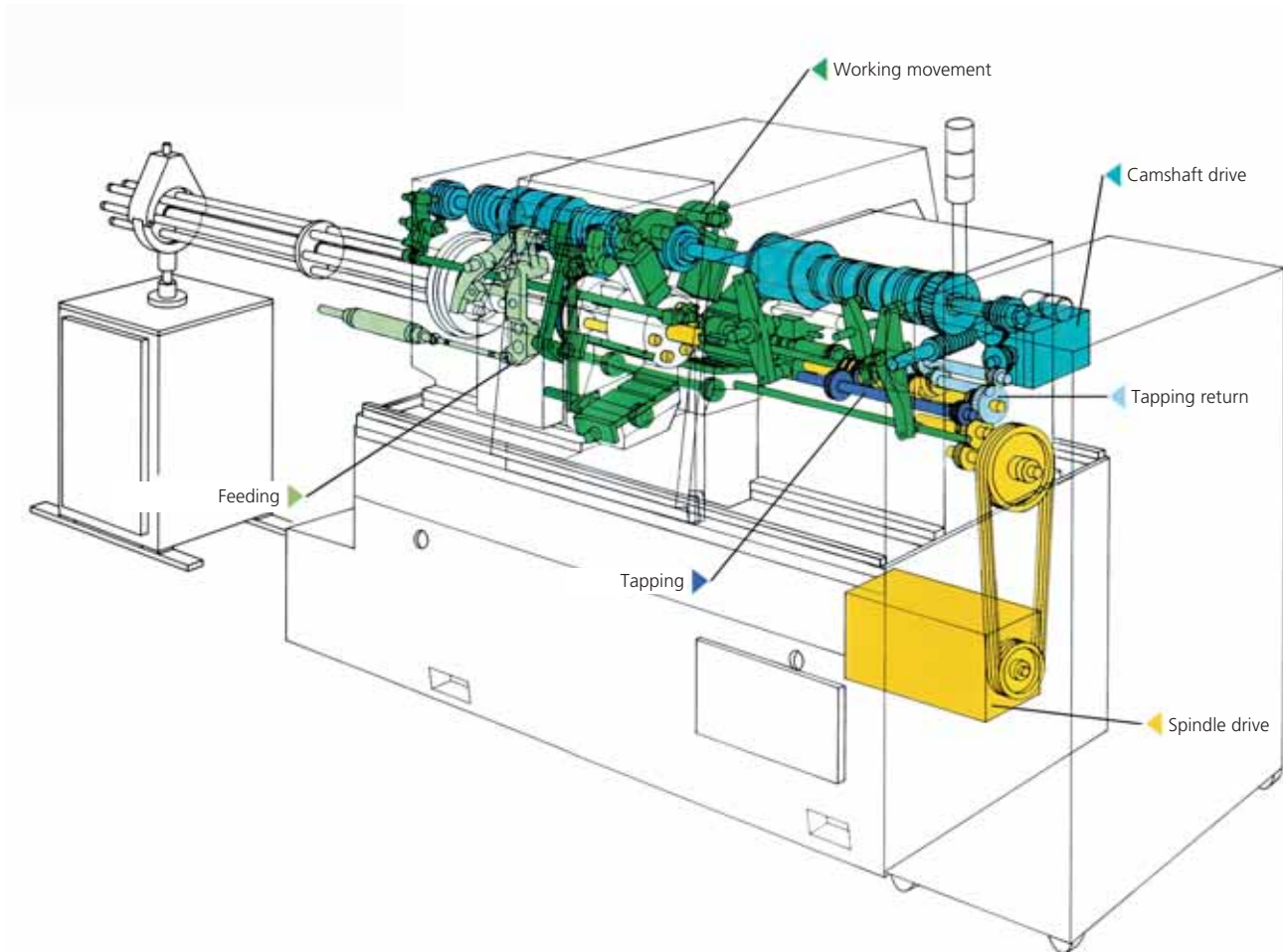
SAS 16.6 with spindle stop

Position for spindle stop 2-3-4-5

1 stop per cycle at indexing speed 50 p/min.	Spindle speed	Max. production
	5'000 rpm	20 p/min.
	4'000 rpm	25 p/min.
2 stops per cycle at indexing speed 50 p/min.	3'000 rpm	32 p/min.
	Spindle speed	Max. production
	4'000 rpm	15 p/min.
	3'000 rpm	20 p/min.

KINEMATICS OF THE MACHINE

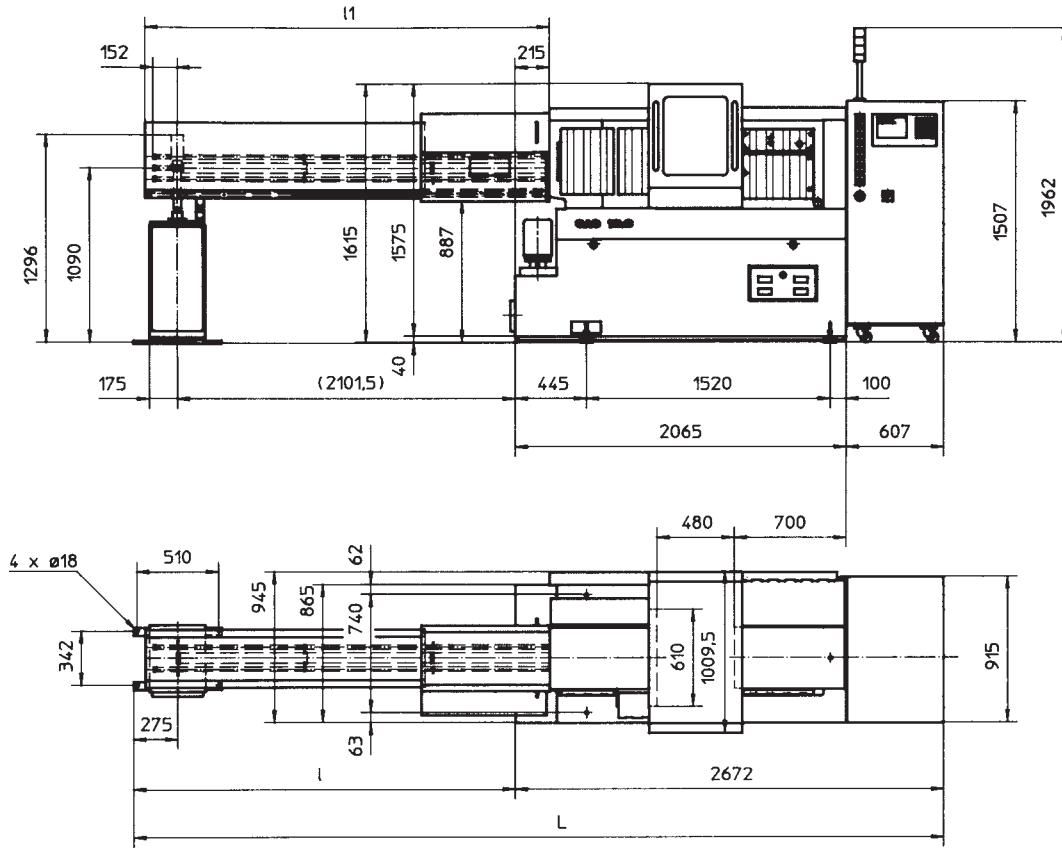
Principals options



PRINCIPALS OPTIONS

Independent Advances				4
Travel	Pos. 1 & 2	mm	1 x 60	1 x 2.362"
	Pos. 3, 4 & 5	mm	2 x 45	2 x 1.772"
	Pos. 6 (pick-up spindle)	mm	1 x 100	1 x 3.937"
Counter-spindle	Pos. 6 and 3			
Clamping capacity:	Up to 5'000 rpm	mm	Ø 12,5	.472"
	Special for short parts	mm	Ø 16	.630"
	Up to 8'000 rpm	mm	Ø 10	
Differential threading	Pos. 2-6			
	Capacity: mild steel		M 8 (M 10 x 1)	
	: brass, aluminium		M10 (M 12 x 1)	
Drilling quills	Pos. 2-6			
	Drilling, threading, low or high speed			
	Other synchronized attachments			
	Threading: differential, 2 speed			
Slotting attachment: transportation of the part	Production max.	p/min.		40
Counter turret operation: transportation of the part	Number of working positions			3
	Max. production		p/min.	40

MACHINE SPECIFICATIONS



3m	L = 5049	l = 2377	h = 2517
4m	L = 6049	l = 3377	h = 3517

GENERAL CHARACTERISTICS

Machine length with electrical cabinet	mm	2'962	116.6"
Machine length with 3 m (10 feet) stock reel	mm	5'049	198.8"
Width, including the guard	mm	1'100	43.3"
Height over the guard	mm	1'615	63.6"
Height over the tower light	mm	1'962	77.2"
Weight of the machine only	kg	2'700	5.954 lbs.
Weight of the electrical cabinet	kg	270	595 lbs.
Coolant pump pressure	bars	10	145 PSI
Coolant tank capacity	l.	300	80 ga.
Power rating	KVA	15	
Pneumatic operating pressure	bars	6	87 PSI
Standard color 2 shades		Gray RAL 7023 M	
		Blue RAL 5013 M	

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