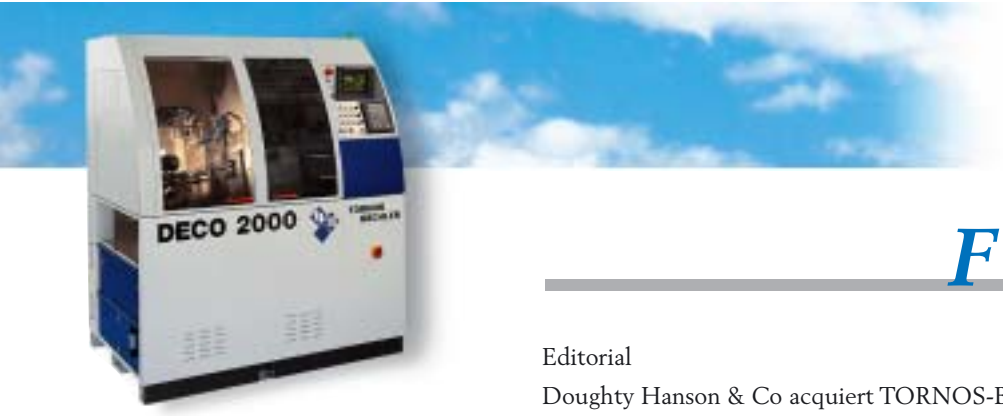
DECO MAGAZINE

8
1/99
FEBRUARY

«WELCOME TO THE SHOW»



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IMPRESSUM
DECO-MAGAZINE 1/99

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Doughty Hanson & Co acquires TORNOS-BECHLER SA

Doughty Hanson & Co ("Doughty Hanson"), Europe's leading independent private equity company, announces today that it has signed an agreement to acquire TORNOS-BECHLER SA of Switzerland.

TORNOS-BECHLER SA, headquartered in Moutier, is a worldwide leading manufacturer of high performance automatic lathes for the production of precision turned parts.

The company had turnover of SFr280m in 1998, representing an approximately 35 % gain over 1997 figures.

As with other Doughty Hanson companies, it is intended that existing management will stay in place and participate in the acquisition and that the new company will go public through an initial public offering in three to five years.

Dr. Anton Menth, President and CEO of TORNOS Holding SA, said:

"Doughty, Hanson has a reputation for investing in market leading companies and helping those companies fulfil their total potential. Doughty Hanson's backing will give us the opportunity to continue our rapid and sustained growth. Furthermore, the company will be in a strong position to continue with the development of new, technologically innovative products."

ABOUT DOUGHTY HANSON & CO

Doughty Hanson & Co is an independent fund management company with offices in London, Chicago, New York, Frankfurt, Milan, Stockholm and Warsaw. Doughty Hanson & Co's partners have many years' experience in the successful management of international private equity funds and have led and arranged a number of the largest European acquisitions.

Doughty Hanson's latest fund was successfully launched in September 1997, raising US$2.5 billion. Investors in the fund include major pension funds, insurance companies, banks and state funds worldwide.

Doughty Hanson differentiates itself both by the size and complexity of its transactions as well as its consistent record of innovation. Recent examples include:

- Dunlop Standard Aerospace Group, acquired from BTR plc, is a market leading business within various niches within the aerospace industry;

- Geberit, one of the largest such transactions in Europe and the first to use a non US dollar denominated high yield financing;

- Impress Metal Packaging, in which Doughty Hanson simultaneously acquired and merged two European metal packaging businesses to form a new company which is now one of the largest metal packaging producers in Europe;

- Elexis, a German holding company for nine engineering businesses, formed from the rump businesses of Daimler Benz/AEG AG. The business was heavily loss-making when acquired in December 1995 but has since become profitable. The company is now planned for a Frankfurt Stock Exchange Listing during 1999.

Investment Strategy

The objective of Doughty Hanson & Co is to grow each investment in partnership with management, through investment where appropriate. Typically, Doughty Hanson & Co looks to arrange an initial public offering for the companies it acquires within 3-5 years of acquisition.

Doughty Hanson & Co is always represented on the supervisory board of the company and actively assists the management of the company in the preparation and execution of strategic and financial objectives.,

Examples of Doughty Hanson's European IPO portfolio include:

- Tarkett AG, Europe's largest manufacturer of resilient and hardwood flooring, listed on the Frankfurt Stock Exchange in 1995;

- Tag Heuer International SA, one of the world's premier producers of prestige ,sports watches, listed on the Zurich and New York Stock Exchanges in 1996;

- PowderJect Pharmaceuticals plc, the innovative manufacturer of needleless injection systems, listed on the London Stock Exchange in 1997;

- Winkler & Diinnebeir AG, the world market leader in production of machines for printing and folding paper envelopes, listed on the Frankfurt Stock Exchange in May 1998.

Reputation as a good owner

Doughty Hanson is committed to developing the companies it acquires in preparation for a stock market listing. It has pioneered the use of bond finance in structuring a number of its larger European acquisitions, thereby establishing rated paper and research on investee companies from the outset of its involvement. It has found these techniques to be an excellent preparation for achieving a full listing of the investee company's shares on the public market.

Doughty Hanson seeks to work with experienced professional management teams in the businesses it acquires and to develop shared strategic goals. In this way Doughty Hanson has established a reputation as an entrepreneurial shareholder that works with management.

www.doughtyhanson.com

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«Welcome to the show»

In our field of activities, the « trade fair » is vital for meeting new people.

Trade fairs in 1999

What the market has to offer takes place in a restricted geographical area, with all visitors, company clients, competitors and other exhibitors being available and interested in obtaining useful and pertinent information.

As the meeting point between companies and clients, this communication vehicle is a vital element to both parties.

Being an EMO year, the countries of Cecimo (Europe) will be somewhat neglected by this event – owing to restrictive regulations.

We are anxious to present several new high-quality products, so it has been decided that 'Open Houses' will be organised for our subsidiaries.

The following table is a provisional schedule:

EXHIBITION	COUNTRY	OPENING DATE	CLOSING DATE
Mach-Tech	Hungary	2.3.1999	5.3.1999
Amtex	Australia	22.3.1999	26.3.1999
Tornos-Bechler	Switzerland	12.4.1999	17.4.1999
Maribor	Slovenia	21.4.1999	23.4.1999
Feimafe 99	Brazil	May	
Linkage	Hong kong	May	
Emo	France	5.5.1999	12.5.1999
Balttechnika	Lithuania	18.5.1999	21.5.1999
Nitra	Slovakia	25.5.1999	28.5.1999
Open House TTUK	United Kingdom	25.5.1999	27.5.1999
Open House TB	Switzerland	To be agreed	
Open House Tecnocontrol	Italy	10.6.1999	13.6.1999
Poznan	Poland	14.6.1999	18.6.1999
Open House Martini	Italy	18.6.1999	20.6.1999
Tel Aviv	Israel	21.6.1999	24.6.1999
Open House TTD	Germany	To be agreed	
Tatev 99	Turkey	September	
Cimt 99	P. R. of China	September	
Brno	Czech Republic	13.9.1999	15.9.1999
Open House	Denmark	20.9.1999	25.9.1999
Open House	Czech Republic	October	
Open House	Netherlands	October	
TIB	Rumania	11.10.1999	14.10.1999
Open House	Japan	To be agreed	
INDEX	Greece	November	

USA	LOCATION	OPENING DATE	CLOSING DATE
Orlando	Orlando, FL	19.1.1999	21.1.1999
South-Tec	Greenville/Spartanburg	26.1.1999	28.1.1999
WESTEC	Los Angeles, CA	22.3.1999	25.3.1999
Fort Wayne Show	Ft. Wayne, IN	14.4.1999	14.4.1999
Zimco Open House	St. Louis, MO	20.4.1999	22.4.1999
Pennco Open House	Philadelphia, PA	22.4.1999	29.4.1999
Denver Tool Show	Denver, CO	27.4.1999	29.4.1999
Minneapolis	Minneapolis, MN	4.5.1999	6.5.1999
Cleveland	Cleveland Fairgrounds	11.5.1999	13.5.1999
Indiana Ind. Prod. Show	Indianapolis, IN	25.5.1999	26.5.1999
EASTEC	Springfield, MA	25.5.1999	27.5.1999
Detroit	Detroit, MI	14.9.1999	16.9.1999
Rochester Tool Show	Rochester, NY	21.9.1999	23.9.1999
MidAtlantic	Fort Washington, PA	28.9.1999	30.9.1999
Cleveland	Cleveland (IX Center)	19.10.1999	21.10.1999
Southeast Florida	Ft. Lauderdale, FL	20.10.1999	21.10.1999
Dallas	Dallas, TX	2.11.1999	4.11.1999
Chicago Ind. Prod. Show	Villa Park, IL	9.11.1999	10.11.1999
Pacific Coast Ind. Show	Santa Clara, CA	16.11.1999	18.11.1999
Houstex	Houston, TX	25.1.2000	27.1.2000
South-Tec	Charlotte, NC	29.2.2000	2.3.2000
IMTS 2000	Chicago, IL	6.9.2000	13.9.2000

EMO Paris 99

Hall 5
Stand B16

The above information was correct at the time of publication. However, changes are possible and only the invitations to these events will feature the exact dates.

All customers will be invited to these events. If you are not among the group of people regularly invited to attend, but would like some information and be sent invitations, then we would be pleased to put your name on our privileged notification list.

REPLY COUPON

to be returned by fax to DECO magazine on number ++41 32 494 49 07

☐ I do not know TORNOS-BECHLER and would like to be added to the «privileged» list

☐ Moutier ☐ F ☐ UK ☐ I ☐ E ☐ USA ☐ D

Surname & first name _____ Company _____

Address _____

Comments: I may, at any time, request that the above information be deleted by calling (++41 32 494 44 34).

Fundamental change

If you had visited the company more than 6 months ago, the changes made since then mean that you would no longer recognise it!

The renewal of TORNOS-BECHLER S.A. is well underway and this project has enabled the company to meet stringent market requirements.
Whilst undergoing continuous improvement, the process entails widescale change on a daily basis throughout the company. Both the processes and places of work are changing.
In order to provide a full explanation on the full details of the restructuring of the company, we arranged to interview Mr. Roland Breitschmid, production manager and initiator of these changes.

DM: ***Hello Mr. Breitschmid! We are talking a lot about major changes in TORNOS-BECHLER but what exactly are they?***

RB: We have completely rebuilt the company over the last 15 months, especially the machine shop.

All production means and processes, the flow of goods and information, are new or in the process of being so!

DM: Why exactly did you proceed with these changes?

RB: The success of the DECO 2000 and the quantities produced were considerable. As this was in line with our aim of continuous improvement, it was essential to act quickly to relieve the pressure on production.

DM: If I understand things correctly, the company was restructured to face rapid growth. Would such reactions not entail any risk, especially in a highly volatile market such as machine tools?

RB: Of course! We accounted for this in our strategy with production being re-structured to work in 2 shifts. The flexi-hour system helps when faced with peaks or troughs and we have the facility to go from 1 to 3 shifts to meet short or medium term cyclic fluctuations.

DM: In concrete terms, what exactly are the changes in production?

RB: The whole of production has been broken down into « islands ». An island is the concept of a mini-shop being constructed around a family of parts.

These islands resemble autonomous divisions operating within the company along « client-supplier » lines.

Each islands is responsible for its own quality and meeting deadlines and costs.

DM: Did this change take place without problem?

RB: Yes. We were impressed with the calibre of all the professionals within the company. There was, a willingness to improve, whilst the success of the DECO and need to react quickly has enabled us to implement this new system and transformation.

DM: How did your colleagues regard these changes?

RB: As far as our colleagues were concerned, the major change was the re-appraisal of jobs – from being an operative to someone with responsibility. The degree of responsibility obviously depends on the job, but everyone is responsible for the quality of their work.

DM: And was this change in attitude straightforward?

RB: think that change is never simple, but it has been a positive move. This can be discussed with Mr. Heizmann, who is head of the board of the company (see frame below).

In the press, the editorial is often a separate section where the editor adopts a position or addresses subjects which are not necessarily in keeping with the magazine. To date, DECO Magazine has managed to avoid this phenomenon – we have always remained very "technical" even within these columns.

After eight editions, including many technical articles I need to take stock and see how we can improve. Any suggestions?

At a time when all the talk is about globalisation, high-speed communication networks, the Internet, information technology and how we launched a computer-controlled automatic lathe, the launch of a magazine in hard copy, dedicated to the DECO 2000, could appear presumptuous.

After 7 editions and distribution of more than 78,000 magazines, with an ever-growing number of interested parties and faithful advertisers, we can state that this system is a success!

With the aim of providing even better information to our clients and interested parties, this form of back up has hit the target. We may decide to merge the DECO Magazine and the Multispindle Magazine (currently on stand-by), and supplement these with CD, Web site and video information.

Like all other means of communication, our magazine has withstood many problems associated with translation, formatting, deadlines and so on, but generally speaking, we are very satisfied.

However, it is not our satisfaction which is of importance – what really counts is our readers' satisfaction!

This is why we are inviting you to send us your comments on the DECO magazine, its articles, our activities in the market, our products or even on the global competitive environment.

DECO magazine wants to create an objective tool for information and exchange and not merely be yet another run-of-the mill advertising vehicle.

This year, the last year of the millennium, will see the last EMO of the millennium. We shall issue 4 editions of DECO magazine with a vast series of innovations, special editions, and errata (hopefully few if any) etc.

I would like to thank all our readers for their interest and would really like to invite you to express your comments as to how we can improve. We look forward to meeting you in ten or so magazines' time with a view to re-appraising the situation.

Pierre-Yves Kohler
Chief editor

DM: What were the aims of such re-organisation?

RB: The main aim was to meet market demands and become more competitive – in other words:

- reduce the number of parts in the process of manufacture.
- reduce machine change-over times.
- allow the run to take place with flow drawn downstream.

The ideal ratio between flow time and actual machining is 3:1 and we are actively working to achieve this aim.

According to the old methods of organisation, this factor could be within the region of 50:1 to 100:1, if not more!

DM: Does flow drawn from downstream mean reduced stock?

RB: Ideally it goes without saying that the stocks should be as small as possible commensurate with customer requirments so as to reduce capital tie-up to a minimum.

At the moment, the stocks at TORNOS-BECHLER are down to

Views of Mr. Daniel Heizmann, employees representative, on this major change.

DM: Hello Mr. Heizmann! Did the change go well as far as the employees were concerned?

DH: The change went well, but it is quite clear that this particular process requires a complete change in the attitude of our colleagues, those who have been involved in the change-over, changing from operatives to managers.

In all, we can say that two categories of people emerged:

the young employees who clearly understood the benefits of the system right from the outset.

the older employees who had to make a lot of effort to adapt, following several decades of conditioning.

DM: And what about the hierarchy?

DH: All levels of the company were affected, both management and staff had to undergo change.

All staff were involved from the outset with the emphasis placed on versatility and increased ability, also leading to the overall use of ability scales which aims at improving knowledge and skills.

DM: So all employees are involved in the process?

DH: Absolutely. Several motivation levels came to the fore, but in all events the decisive factors were the communication and attitude of the leaders and the interface between top management and staff.

DM: In concrete terms then, what was your own investment in time for this project?

DH: Despite a general positive attitude, much time was still needed explaining the targets and means of achieving then.

Personally, I spent more than 60 % of my working hours – which started on the lathe – in meetings, seminars and organisation, as well as still working on my lathe.

DM: As a conclusion and purely at staff level, do you really believe that there has been an improvement in working conditions?

DH: Absolutely. We are now looking to introduce the concept of versatility for all members of staff, by on-going training. Improvement and learning are encouraged and jobs have been re-evaluated. This provides an excellent opportunity for everyone.

Re-evaluation and responsibility have been beneficial to the company climate (hence its production!).

DM: Mr. Heizmann, thank you very much.

a minimised and controlled level. As the drawing on production flow tightens, the stock will decrease until it reaches its optimum level, thus providing the best service for product assembly.

DM: In concrete terms, is this creation of islands associated with other actions?

RB: Of course. This restructuring also involved the renovation of buildings and means of production, amounting to several tens of millions of francs, resulting in:

- a new environment
- a new organisation
- a new attitude amongst our colleagues

All workstations are more ergonomic in design and a «management of order» concept has emerged!

DM: What do you understand by «management of order»?

RB: The basic idea is that in a workstation everything must be in its proper place. Each colleague is responsible for the order, care and cleanliness of his work place.

This would lead to improved working conditions and pleasure in executing the work, since it is now possible to concentrate on what is essential.

DM: Which brings us back to the workforce. They really seem to be the key element of this reorganisation – what do you think?

RB: Absolutely. Whatever it takes, we are striving to uphold the high degree of know-how throughout the company, and are looking at ways of increasing the added value provided by our colleagues to our products.

Based on this context, we are also increasing the «man-machine» ratio by continuing to improve our know-how and added value.

DM: So if I understood correctly, production at Moutier, the historic centre for producing automatic lathes in the world, is ongoing?

RB: More than ever before. The know-how of our colleagues is one of our reasons for being successful in the market.

DM: In terms of staff, could they cope with this rapid growth?

RB: We have taken on more than 150 people over the year. In this context, I would like to say that we have set up a permanent training system which will allow outside professionals to work at TORNOS-BECHLER and complete their training, whilst at the same time allowing our employees to acquire new knowledge.

DM: What reasons led you to adopt this measure?

RB: There are several reasons but as a company priority it is to increase its own added value and develop the strategic know-how of its employees!

Obviously, the saturation of the labour market in precision engineering has also had an effect.

This personalised form of training at the professional Tornos centre is extremely successful and has allowed us to plug a few gaps in our means of production.

At present, 5 people are trained each month!

DM: What are the benefits to a client purchasing a DECO 2000 machine (or other)?

RB: I am well aware that talk of long lead times is very unpopular. The periods encountered over these past months have not been good publicity for TORNOS-BECHLER, but without this complete re-organisation, the company's position would have been absolutely catastrophic. We would never have been able to supply more than 1000 DECO machines within 18 months!

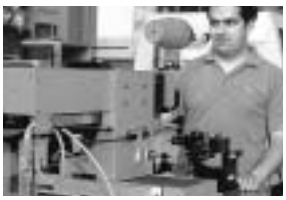
The fact that we have colleagues responsible for costs, delivery dates and quality at all levels of the production process, guarantees the reliability of our machines. Each part is certified as being correct by the skilled worker who has produced it.

DM: I would like to thank you, Mr. Breitschmid, for this interview. To conclude, what do you have to say to such a change?

RB: The reorganisation of the company actually makes the region stand out. At TORNOS-BECHLER, the entire production was revolutionised by the DECO 2000 and customer requirements.

I would like to take this opportunity to thank all our workforce, senior management, employee committees and trade unions for their involvement in this project which will allow us to face up to the future with confidence.

DM: Production at TORNOS-BECHLER has shown the way to renewal, let us ensure that the entire company will adopt this process which is destined to lead to the on-going improvement of its products...



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DECO MAGAZINE
TRICKS OF THE TRADE

Now for the second use of the polar co-ordinate interpolation function (TRANSMIT function):

Following presentation of milling a square with T31 and end-milling, we shall now discuss milling a square with a circular Ø 80 miller mounted on the polygon unit in position T24 (example taken from the DECO-2000 26 mm)

Please refer to the previous DECO MAGAZINE edition for information on the principles of programming polar co-ordinates.

Reminder:

The operation line containing the code M198 D-1 to execute machining in polar co-ordinates, must have axis X as master 1, axis C as master 2 and the third axis (e.g. Z) as slave.

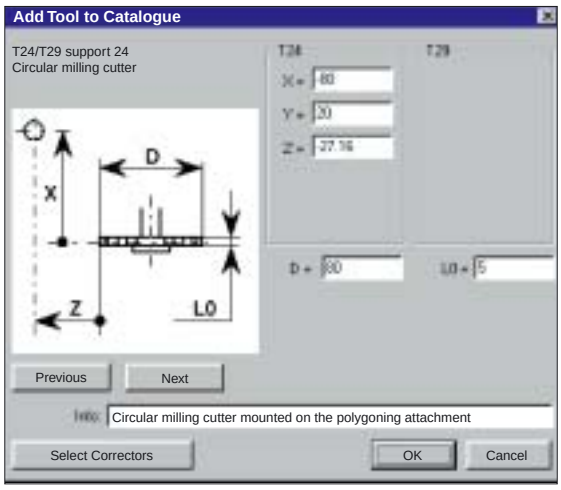
The first master axis must, as a matter of course, be a diametral axis (X2, X3 or X4).

Programming with milling radius correction

For easier programming, it would be useful to use the milling radius correction using functions G41 or G42.

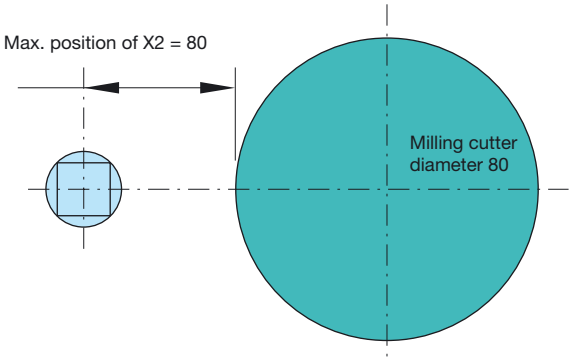
The square shape will be machined with a polygoning unit fitted with a circular miller of Ø 80 mm mounted in position T24. The programmed shape will be obtained by combining the movements X2 and C1.

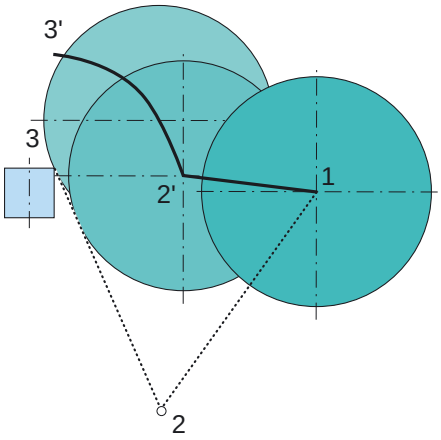
From the tool catalogue, introduce the geometry of the miller in X at the centre of the miller. For example, miller with a Ø 80 (size recommended for the DECO 2000, 20 and 26 mm capacity): D = 80, geometry in X = -80



Graphic representation of the approach:

Where the miller has a diameter which is far greater than that of the bar being machined, and where the path of axis X2 is limited (see figure below), programming the approach (engaging G41 or G42) is extremely important. It is not easy to explain programming of functions G42 and G40 in detail, because these functions require special programming. Nonetheless, the example we are going to describe, (which is frequently used at TORNOS-BECHLER) is a good starting basis if one wants to mill any shape in polar co-ordinates using a polygoning unit and the functions G42/G40.





ISO code for the milling operation:

```
1.   G1 X2=160 Z1=-4 G100 T24 G94
2.   M198 D-1
3.   (APPROACH AND PREPARATION OF CONTOURING G42)
4.   G1 X2=70 C1=-55 G100 T24 G42
5.   G1 X2=14 C1=7 F500
6.   G1 X2=-14 C1=7
7.   G1 X2=-14 C1=-7
8.   G1 X2=14 C1=-7
9.   G1 X2=14 C1=7
10.  (OUTPUT PREPARATION)
11.  G1 X2=0 C1=10
12.  G3 X2=0 C1=-10 G100 R10
13.  G3 X2=20 C1=0 G100 R10
14.  (CONTOUR OUTLET)
15.  G1 X2=160 C1=0 G100 G40
16.  M199
```

Comments:

Path 1 - 2 - 3 = programming the approach

Path 1 - 2' - 3' = path resulting from the approach (G42 engaged)

To be found in our next issue:

- Constant cutting speed when cutting parts with a G904
- Saving time with the long part device!

The fictitious point 2 which is programmed on line No. 4 of the ISO code above, must be determined as a graph. This is only of use for executing the approach, irrespective of material. Its precision is therefore, not critical.

Engaging milling correction must also be carried out with the same degree of care given to programming the approach. The axes must be at the same points (machine position) when engaging M 199 polar co-ordinate interpolation as when engaging M198 D-1. Consequently, it is necessary to turn around the part before proceeding with the function G40 (lines 11 to 13).

To conclude, why should you use this method rather than the one demonstrated in our previous edition (milling a square with T31 and end milling, Ø 10 mm) or the other way round?

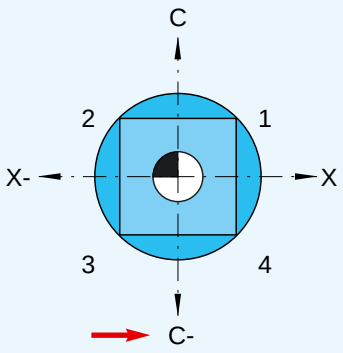
The choice for the customer is based on the machine that they have. In terms of quality, the result obtained is a better solution with the «circular miller with polygoning unit»!

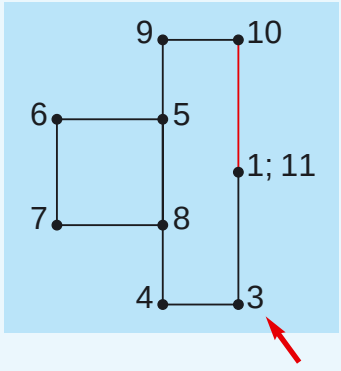
Erratum

The last issue in 1998 was the first to contain errors in its tricks of the trade articles.

Logically, this means that this is the first edition to contain an erratum…

These minor errors were due to unfortunate technical problems. Please accept our apologies. We shall publish the corrections here.





New table summarising the various hints and equipment

No.	DECO Mag	Hints	Option required	
			DECO 20/26	DECO 10
	3/97	Incorporated assistance	Standard	Standard
	3/97	Much quicker programming	Standard	Standard
	1/98	Compensation for wear	Standard	Standard
	2/98	Cross-tapping with threading miller on the T24 tool	Standard	No.1500
6	3/98	Deburring a cross drilled hole using axis C	 No. 0916	No. 1500 No. 0916
7	4/98	Macro G903 (indexing)	Standard	Standard
7	4/98	Milling a square in T31 with an end miller. Transmitted function	No. 0916 No. 0917	No. 0916 No. 0917
8	1/99	Milling a square with a circular miller on the polygoning unit Transmitted function	No.0916 No.0917 No.1700	No.0916 No.0917 No.1700

TECHNICAL

MULTIDECO 26/6

Let us examine the characteristics in detail.

Applying the DECO 2000 concept to multi-spindles is likely to create a new standard in terms of high, flexible productivity.

The purpose of this section is to discover some new elements of the MULTIDECO which have not yet come to light.

Based on the comments or questions already received we shall look at the information in greater detail.

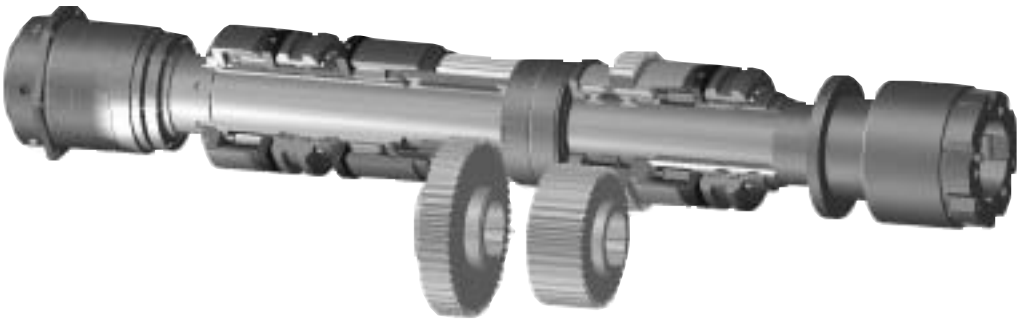
In this edition, we shall be presenting the spindles and their various facilities.

The design of the MULTIDECO 26/6 spindles (irrespective of type) hinges on the ISO dimensional quality roller bearings.

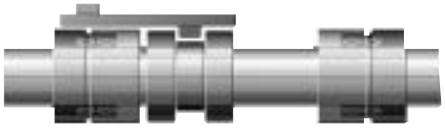
The spindle nose is supported in a 3 bearing assembly using pre loaded bearings, thus guaranteeing that the machining stability required for high precision, large production runs is maintained.

The different versions

Apart from the single speed spindle, several types of spindle considerably increases the range of operations available on the MULTIDECO 26/6.



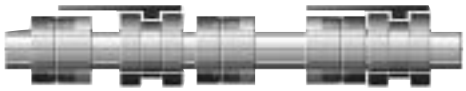
Single speed spindle with single stop



This is designed for cross-machining operations such as drilling, boring and tapping, with the maximum speed of this version being 4000 rpm. This option is available for one or more spindles running at the same time.

Two-speed spindle with stop

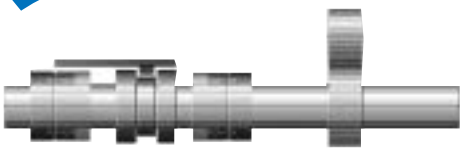
This is ideal for obtaining the best suited cutting speed, especially during hobbing and sliding operations at different stations. Its ratio of 1:2 is a good compromise which dispenses with spindle waiting times during different operations at 2 working positions.



The cutting is always executed at high speed. The choice of high or low speeds is completely optional on all the other workstations.

This option is also well suited for polygon and threading operations!

The spindle with positioned stop



Is only available for position 4. The cross-machining functions such as drilling, boring and tapping are ensured within specific, angular tolerances.

This spindle therefore enables the MULTIDECO 26/6 to execute very precise parts with positioned holes.

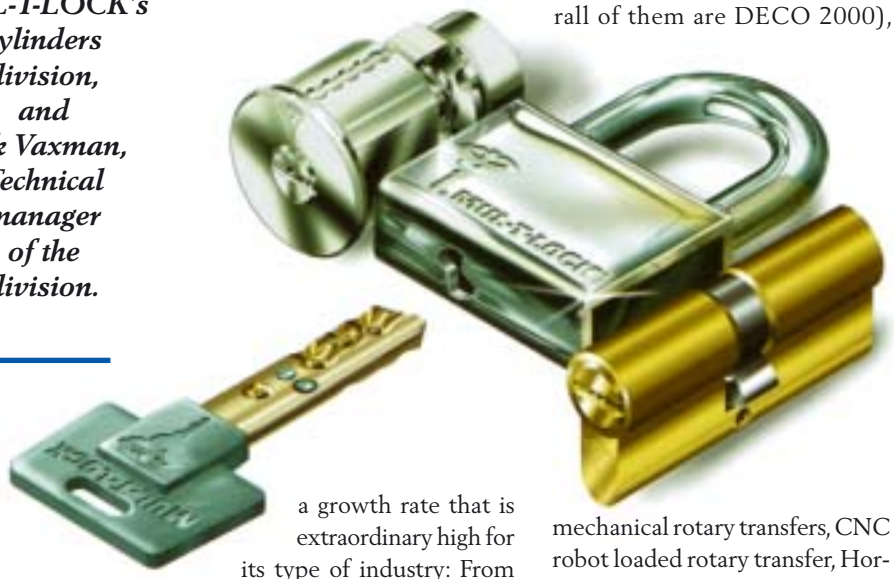
In a future edition we shall discuss the concept of combining cam shafts and PNCs.

The story of MUL-T-LOCK:

In 1973, two young men set out to realize a dream. Avraham Bahry and Moshe Dolev established in Israel, were to become one of the world's foremost manufacturers of High Security products, MUL-T-LOCK.
Today, Millions of people worldwide are MUL-T-LOCK users.

Interview with David Ellenbogen, Project manager in MUL-T-LOCK's cylinders division, and Izik Vaxman, Technical manager of the division.

MUL-T-LOCK was born of an ingenious 4 way locking system, developed and expanded into worldwide activity, providing a wide range of High Security products for the protection of property. MUL-T-LOCK is a proud owner of hundreds of registered patents and patent pending applications. MUL-T-LOCK enjoyed



a growth rate that is extraordinary high for its type of industry: From sales of $1,000,000 in 1973, to nearly $100,000,000 today.

MUL-T-LOCK nurtures its employees and encourages them to realize their own individual potential in conjunction with the attainment of MUL-T-LOCK's goals.

MUL-T-LOCK products are sold in over 100 countries, by 4 subsidiaries and more than 150 distributors and some 15,000 sales and service dealers.

MUL-T-LOCK's subsidiaries market and distribute their products in the US , Canada, France and the U.K, with production lines are spread over some 35,000 square meters.

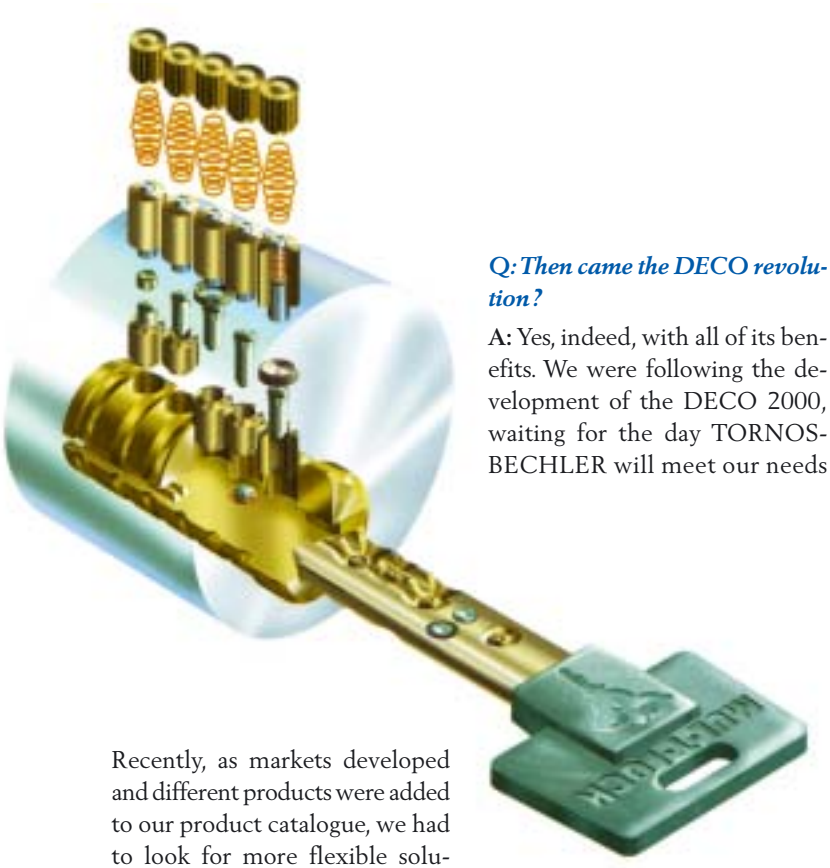
The Cylinders Division is one of five major divisions. The division employs 270 staff, and it produces cylinder locks, padlocks and many other types. The machining plant, spreads over 4500 sq. meters and occupies 90 employees using a wide range of machining technologies: «Esco» screw machines, mechanical cam lathes, 2-axes CNC lathes, turning centers (several of them are DECO 2000), mechanical rotary transfers, CNC robot loaded rotary transfer, Horizontal machining centers, vertical machining centers, plastic injection molding machines, broaches, a heat treatment line, a production line for keys, and many other machines. Most of the machines in the factory are working round the clock, with the operators being highly skilled. The plant produces in total about 30,000 different parts, in a concept of just in time and short delivery times, which causes very complicated logistics and very dynamic atmosphere.

Q: What are the typical products produced in the factory?

A: The products machined in the factory are cylinder lock bodies (stators), plugs (rotors), keys, pins, sub assemblies and other cylinders and locks components. The most challenging are plugs and bodies, since they are of various shapes and designs and high precision components. Any market has its own types of bodies and plugs, fitted to local standards. As we serve around 100 different markets, and constantly expand the applications, new designs are frequent, which demands fast responses to the setting of machines.

Q: How did the factory grow?

A: In the beginning, with a very small range of products, we started with special purpose single operation machines. The products had to go through a long route, causing long production cycles and operator dependent quality. Later, when quantities increased, came the rotary transfers. At this point we had developed a solid infrastructure for future growth. This was good preparation for the 90's.



Recently, as markets developed and different products were added to our product catalogue, we had to look for more flexible solutions.

Q: What flexible solutions did you find?

A: First step were horizontal machining centers. The flexibility of those machines is almost unlimited, but a long set up must be done before first component is produced on the machine. The blank must be cut off a profile or turned from round bar, then a jig and a program must be produced. In optimal conditions this process may last 2 weeks.

Next came the CNC rotary transfer. This machine has enormous output, but involves huge investment and a long preparation time for a new product.

The next generation was that of the turning centers, producing finished parts directly from raw material and eliminating the need for second operations. In 1994 we purchased 2 CNC machines. Those machines reduced the time between the finishing of design, and the production of the first part, and were an excellent starter for new technology.

Q: Then came the DECO revolution?

A: Yes, indeed, with all of its benefits. We were following the development of the DECO 2000, waiting for the day TORNOS-BECHLER will meet our needs for bar capacity and number of power driven tools. We came to Moutier on the very first day of showing the 20 mm DECO 2000, with a purchase order for one machine and option for another. We have used the option to order a 25 mm 6 months after the first. Today, we have 2 DECO 2000 machines running and we know that they will not be the last DECO machines we will buy.

Q: What, by your opinion, are the major advantages of DECO 2000 machines?

A: In one word, efficiency!

1. Low cycle time due to 4 tools machining simultaneously, short chip to chip time because no time pneumatics or hydraulics is involved in tool change, and smooth and continuous movements, saving dwell caused on traditional CNC controls.

2. Saving precious machine time due to the simple off-line programming and simulation on the TB DECO program. This feature allows loading of a proven and optimized program before the first product is cut, instead of optimizing after the first part has been produced, as on other machines.

3. Excellent investment compared to productivity.

4. Excellent floor space to production ratio.

5. Very simple maintenance and good access to machine's systems.

6. Finally, top Swiss precision due to rigid construction and Swiss-type turning.

Q: What about the future?

A: As far as we can see, the trend is for increased flexibility. No longer can we rely on old designs and conquer markets with them. Markets are thirsty for innovations, fast response and top quality. Therefore we worked very hard to develop flexible production capabilities as part of our plant. Our R&D is working continuously to bring innovations according to the markets demands. All activities of the company are controlled by a leading ERP software, «SAP», and the division is ISO 9001 qualified since 1998 (ISO 9002 since 1995).

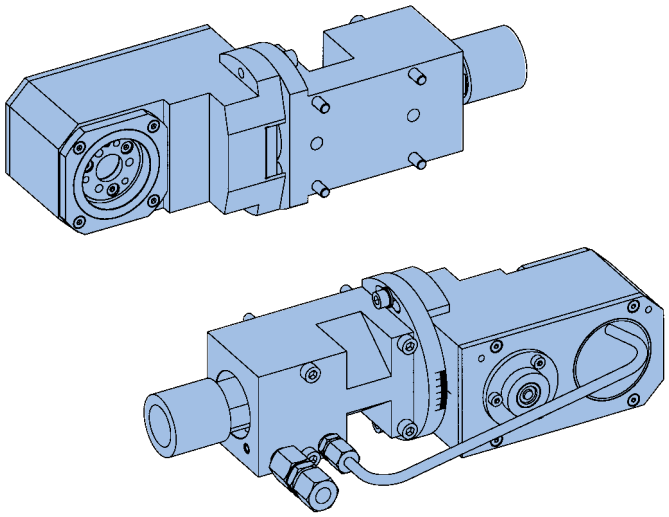
We feel that today, based on the latest technologies, innovations and quality, we are a leading company in the field of High Security products.

All this together gives us the power to grow and expand in the saturated and competitive market of locking products.

MUL-T-LOCK

Discovering options

After presenting the principle of thread whirling in the edition (1/98), we now look at the tooling used.



First of all, the external whirl cutter fitted to the DECO 2000, 20 mm capacity:

Option 1900 – ***High-speed external thread milling device (high capacity whirl cutting)***

(Uses 2 positions - T24 and T25 on X2-Y2)
(Requires options 1910 and 5250)
(Incompatible with emulsion based coolant)

Characteristics:

Max. part rpm: 8,000 rpm.
Max. drive power: 1.5 kW
Max. machining diameter: 11 mm
Max. whirl cutting length: 200 mm

Option 1910 – ***Milling head and tool centring system (without cutters)***

Number of cutters required: 3
Regrinding ~40 times

Option 5250 – ***Coolant pump, 20 bar (ex-works)***

Left or right hand treads are controlled by the setting of the angle of the unit.

The inclination of the unit is calculated as follows:

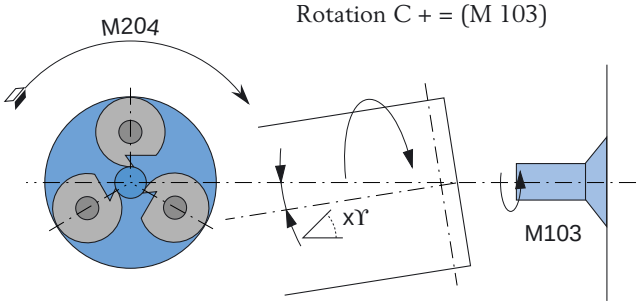
(mean diameter)

$$\frac{5{,}35 \times \neq}{(\text{pitch})\ 2.8} = 6.0027°$$

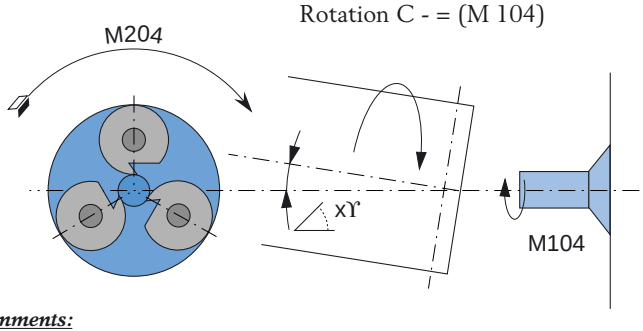
➜ 6° incline

Comments on the direction of threads:

A) Unit inclined upwards: Programming in X -
Geometry in X = - 6
Rotation C + = (M 103)



B) Unit inclined downwards: Programming in X -
Geometry in X = - 6
Rotation C - = (M 104)



Comments:

The geometry is calculated in relation to the machine kinematics and the part to be produced. If necessary, please do not hesitate to contact our specialists for further information...

Second option put forward:

Internal whirl cutting on the DECO 2000, 10 mm capacity

Option 3800 – Option 4400

High speed internal thread milling device

(whirl cutting with air spindle)

(including lubrication system)
Ex-works

Characteristics:

Can be mounted in the following positions:

T31, T32 or T33 (option 3800)

T41, T42, T43 or T44 (option 4400)

Max. tool rpm: 30,000 rpm

Max. torque: 0.01 Nm

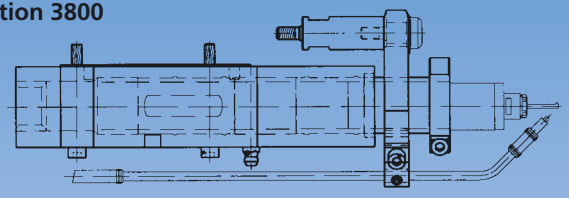
Max. machinable diameter: M4

Min. diameter possible: 1.4 mm

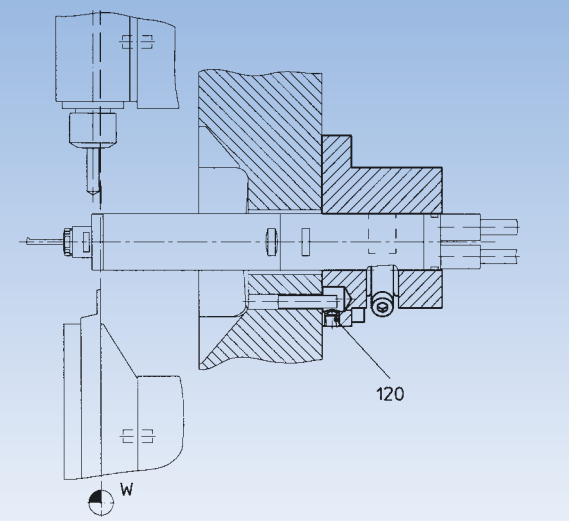
Depth:
More than 2 x the diameter

Main material worked:
Titanium or stainless steel

Option 3800



Option 4400



Fixing the spindle requires the following option:

3810 (for 3800) – System for fixing the internal whirl cutter spindle

4410 (for 4400) – for counter-operation

It is possible to mount two internal thread millers per machine (if required), for example, one for main spindle and one for counter-operation!

Table summarising the novel features			DECO	
Option	Designation	DECO Mag. no	10	20/26
5430	Oil mist and emulsion suction device	7 (4/98)	x	
4900	Long parts extractor	7 (4/98)	x	
0940	Spindle lock			
3800	Internal thread miller, for counter-operation	8 (1/99)	x	
3810	Fixing system for the whirl cutter spindle	8 (1/99)	x	
4400	Internal thread miller, for operation	8 (1/99)	x	
4410	Fixing system for the whirl cutter spindle	8 (1/99)	x	
1650	Revolving spindle unit for ESX 25 chuck	4 (1/98)		x
2100	HF drilling spindle 15,000 rpm	4 (1/98)		x
3240	Triple end tool holder	4 (1/98)		x
5010	High pressure drilling device	5 (2/98)		x
1800	Generation cutting device	5 (2/98)		x
3300	Long revolving drilling/milling spindle for ESX 25 chuck	6 (3/98)		x
4550	S5 longitudinal motorisation to drive the revolving units to positions T41-T44	6 (3/98)		x
3350	Differential spindle	6 (3/98)		x
0940	Spindle lock	7 (4/98)		x
1900	High speed external thread miller	8 (1/99)		x
1910	Milling head with tool centring system	8 (1/99)		x
5250	Coolant pump, 20 bar	8 (1/99)		x