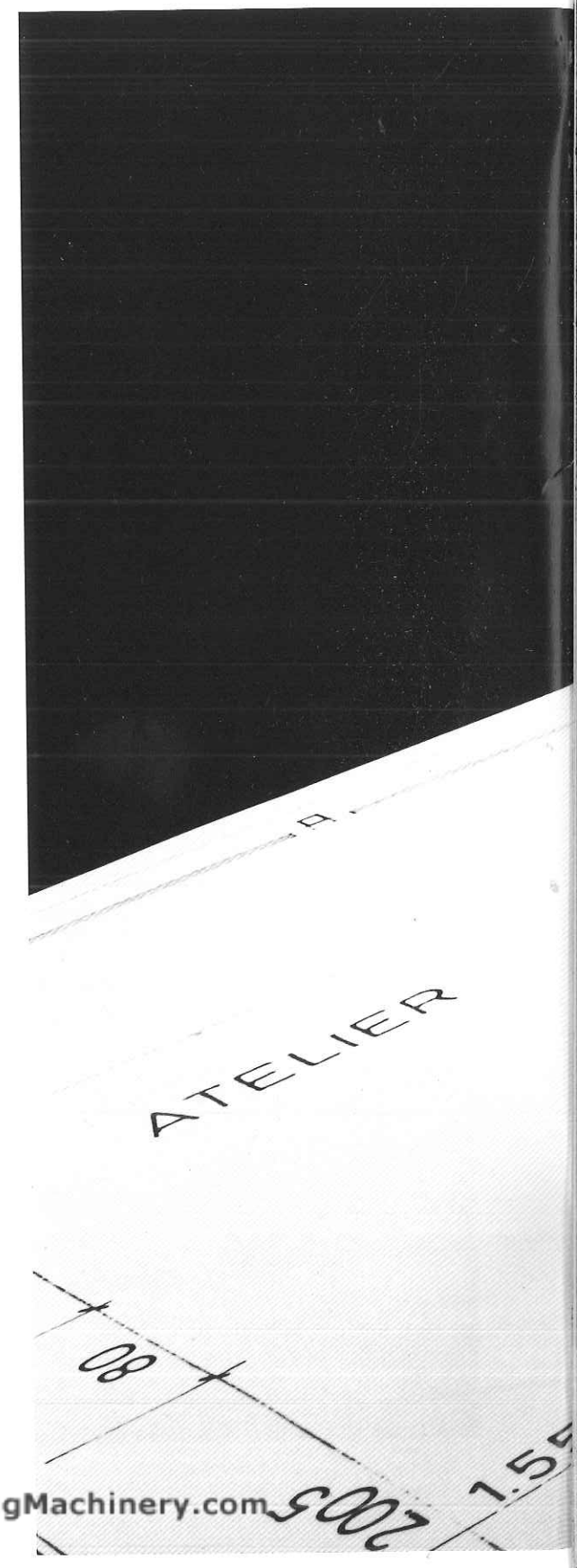
ROBOFIL 300 and 310

CHARMILLES TECHNOLOGIES

Robofil 300 and 310 A thoroughly new concept

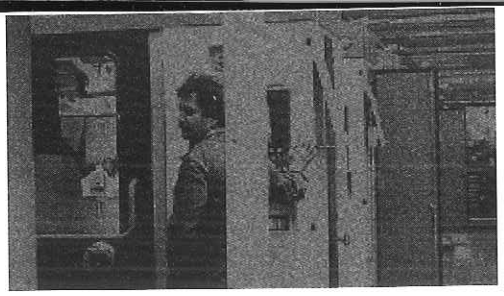
With its new generation of Robofil 300 and 310 EDM centers, Charmilles Technologies meets the market demands for productivity and profitability, while remaining faithful to its worldwide reputation for quality. The sophistication and the technical capabilities of these new wire cutting machines reflect the competence of their designers.

A wide range of applications, high precision in workpiece production, an advanced numerical control and an installation time kept down to the absolute minimum all combine to make the Robofil 300 and 310 machines a profitable investment for the future.



An extremely compact design.
The machine, the dielectric unit and the generator of the new Robofil 300 and 310 centers are mounted on a single base with a surface area of less than 33 square feet*. This extremely rational design also simplifies installation.

* Patent pending.



A bold innovation

A cabin for greater safety.
The first EDM manufacturer to take this big step forward, Charmilles Technologies has equipped the new Robofil 300 and 310 machines with a cabin. This avant-garde concept is perfectly in line with the safety standards soon to come into force within the European Community. The cabin reduces noise and electromagnetic interference during machining. A large sliding door at the front and an opening at the back guarantee free access to the work zones and maintenance points.

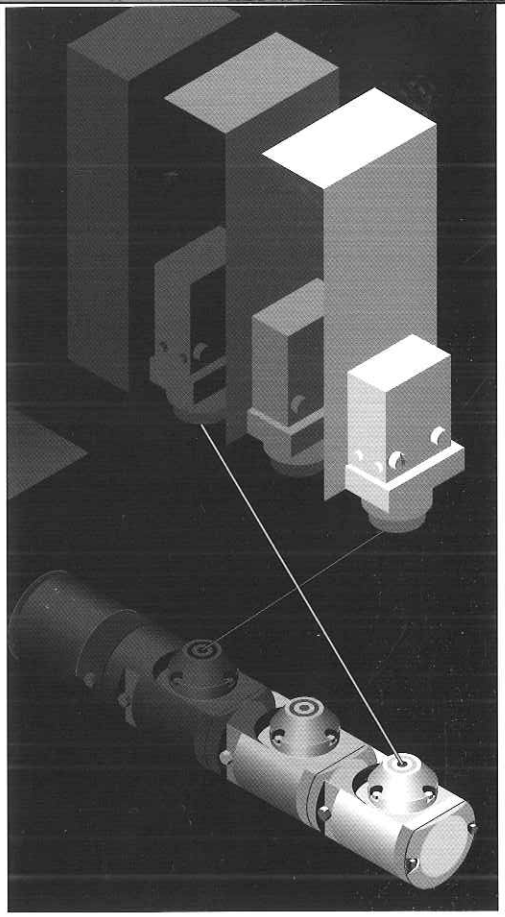
Controlled flushing.
Charmilles Technologies could not allow itself to launch a non-submerged machine using co-axial flushing without convincingly addressing the special difficulties inherent in machining style. To eliminate corrosion problems, the base structure of these machines is made of rhenocast, a cast mineral material completely unaffected by humidity. Its insulating properties, its good coefficient of expansion and its shock resistance make it the ideal material for high precision machines. As for the cabin*, it eliminates splashing and improves thermostabilization in the machining area.

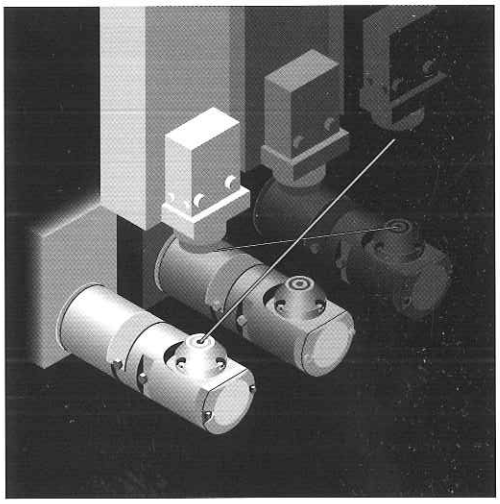
* Patent pending.

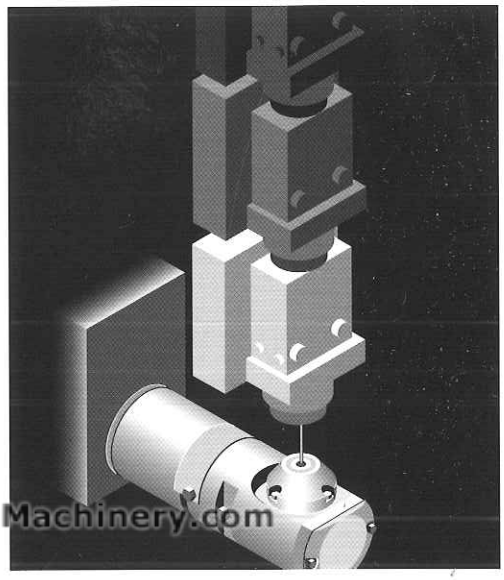
Exceptional features

Large travel for exceptional tapers.
The Robofil 300 and 310 machines are an entirely new mechanical design. This new design provides a U, V travel that is equal to the X and Y travels* making it possible to machine tapers of 30 degrees over heights unequaled up to now. This double table principle, introduced for the first time ever, has been developed exclusively by Charmilles Technologies. The X, Y and U, V axes incorporate very rigid construction and very high precision. Moreover, with upper and lower travel distances of 15.75 × 10 inches, Robofil 300 and 310 centers make it possible to machine a wide range of applications.

* Patent pending.

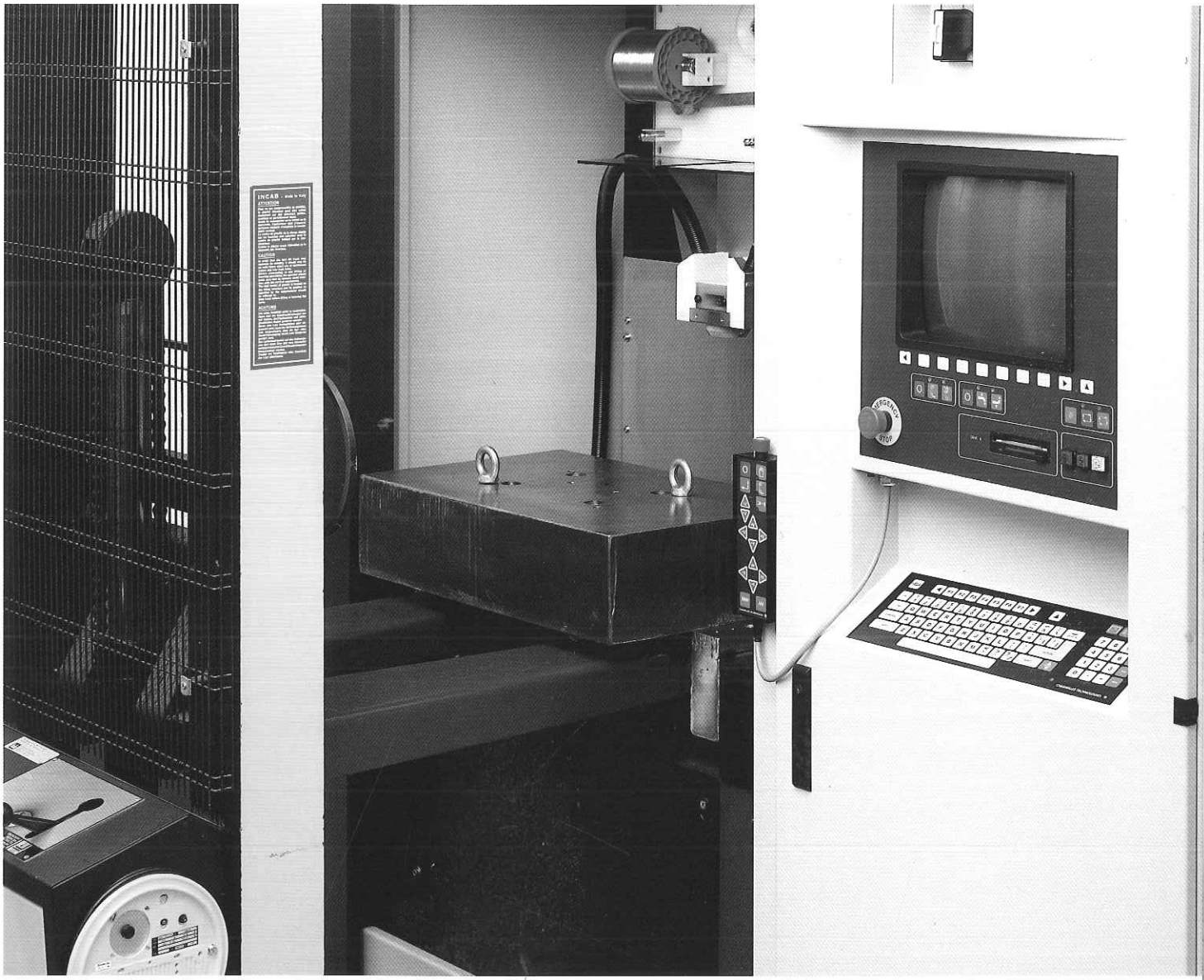






A programmable 15.75" Z axis.
Another decisive advantage of the Robofil 300 and 310 centers is the Z axis, programmable from 0 to 15.75". It allows cutting over great heights and allows machining of parts of different heights in one step, even in cases of taper. The long Z travel also facilitates positioning of workpieces. By raising the upper wire guide to the maximum, the work area becomes completely unobstructed and thus fully accessible.

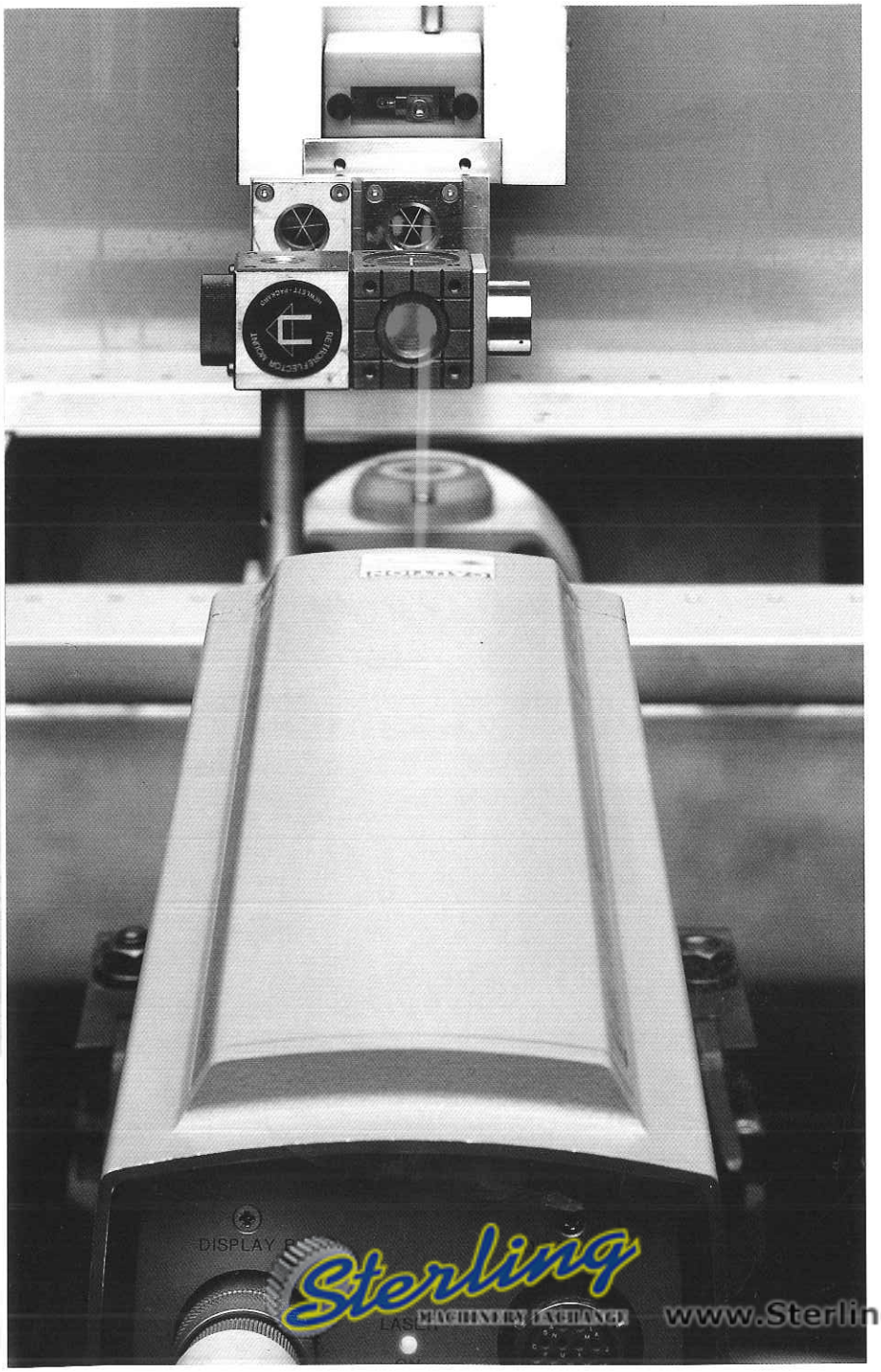
Anti-collision device.
The five axes of the machine are equipped with a system to prevent damage due to programming errors. Any abnormal force is immediately detected and causes the machine to stop.



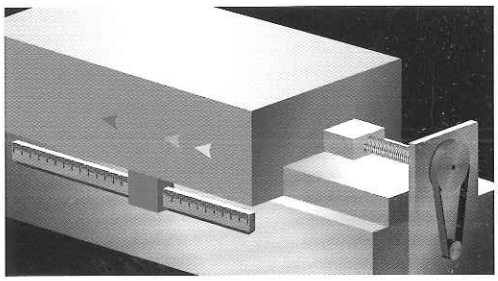
A fixed table for heavy weights.
The fixed table can carry workpieces of 33.5" × 19.75" × 15.75", weighing up to 1100 pounds. Heavy and bulky workpieces can easily be put in place using a pallet truck. The long Z travel combined with the heavy workpiece capabilities permit applications involving machining of very bulky parts.

Accuracy is mastered

Controlled deionization.
To obtain fine and regular surface finishes, the conductivity of the dielectric is a critical factor. A controlled deionization system makes it possible to maintain conductivity at a constant low level.

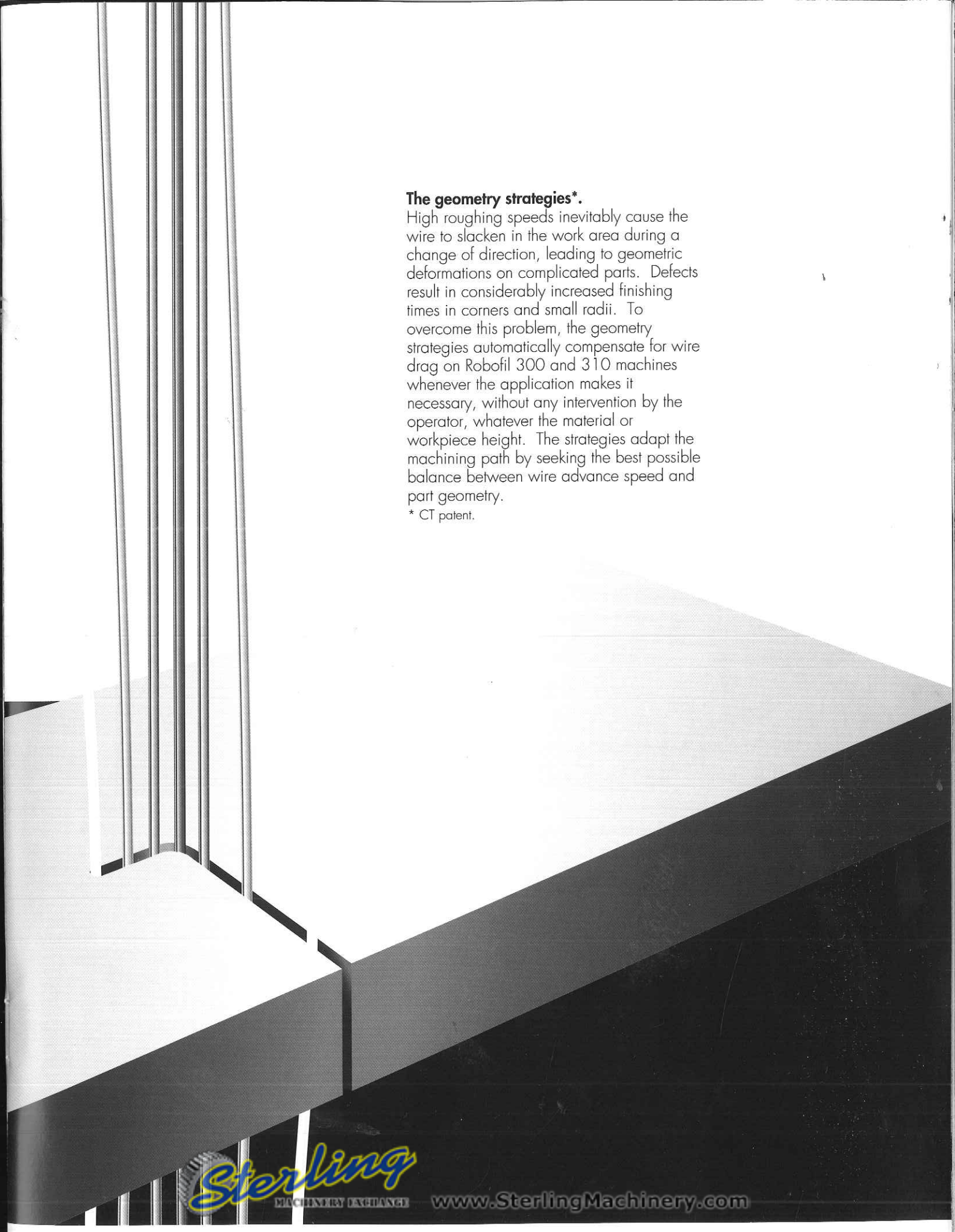


Accuracy in axis positioning.
Positioning measurements are carried out with linear optical scales directly on the five axes of Robofil 300 and 310 machines,



thus eliminating errors caused by screws becoming heated or worn. The mechanical rigidity of the guides along with the accuracy of measurements constitute a guarantee of Charmilles Technologies quality.

The final check.
Every Robofil 300 and 310 center undergoes a tough final check before delivery. Table wobble and pitch errors of the X, Y, U and V axes are corrected by a software process and recorded individually for each machine.



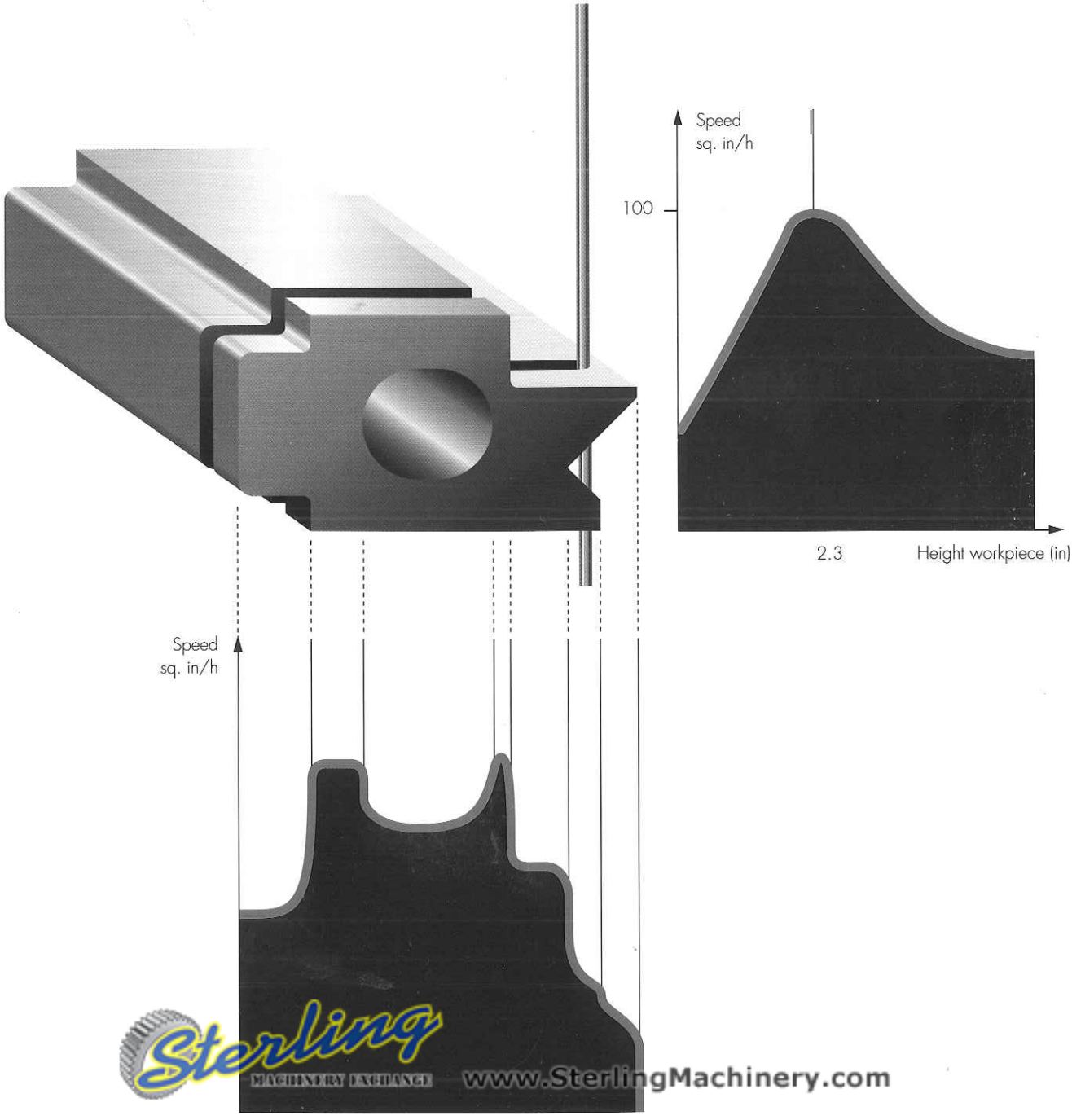
The geometry strategies*.
High roughing speeds inevitably cause the wire to slacken in the work area during a change of direction, leading to geometric deformations on complicated parts. Defects result in considerably increased finishing times in corners and small radii. To overcome this problem, the geometry strategies automatically compensate for wire drag on Robofil 300 and 310 machines whenever the application makes it necessary, without any intervention by the operator, whatever the material or workpiece height. The strategies adapt the machining path by seeking the best possible balance between wire advance speed and part geometry.

* CT patent.

Faultless flushing

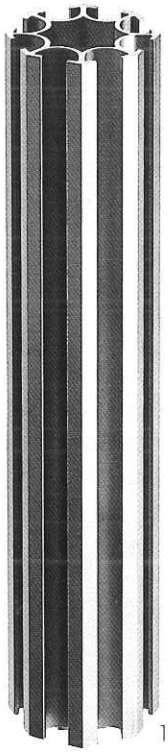
The protection strategies*.
Changes of shape, entering and exiting of workpieces, and machining close to the edges are critical operations. An unsuitable sparking current, excessive speed or inadequate flushing can cause wire breakages. The protection strategies automatically pilot the machining by optimizing speed, flushing and the intensity of the electrical current.
* CT patent.

A high-speed generator.
The Isopulse* generator, developed by Charmilles Technologies, produces repetitive gaps and thus ensures a constant quality of machining. Thanks to the high cutting speed of 23 square inches in. per hour, the Robofil 300 and 310 are highly profitable machines.
* CT patent.



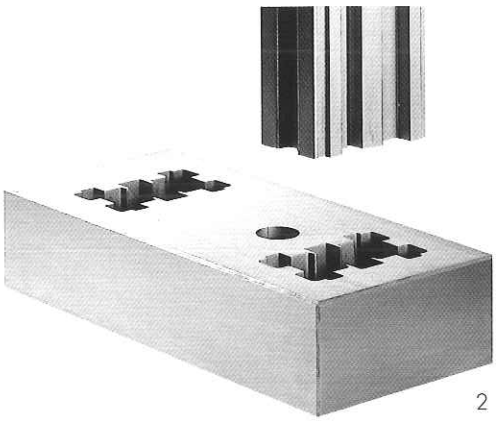
Flushing.
Roughing speed and quality depend on the pressure of the flushing jet in the slot, with best results being obtained when the nozzles are held down onto the workpiece. The nozzles fitted to Robofil 300 and 310 are adaptable to variations of relief or alignment up to 0.03"*. Because of their unique design, and despite the high injection pressures, the pressure on the wire guides remains negligible. During finishing passes pressure is reduced and a second and wider jet completes the flushing of the workpiece. Adjustment of injection pressure is carried out entirely by the numerical control, without the operator having to worry.

* CT patent.



1

1. 400 mm high extrusion prototype in aluminum
2. Progressive tool
3. Extrusion die for flat cable
4. Extrusion die for plastic seal



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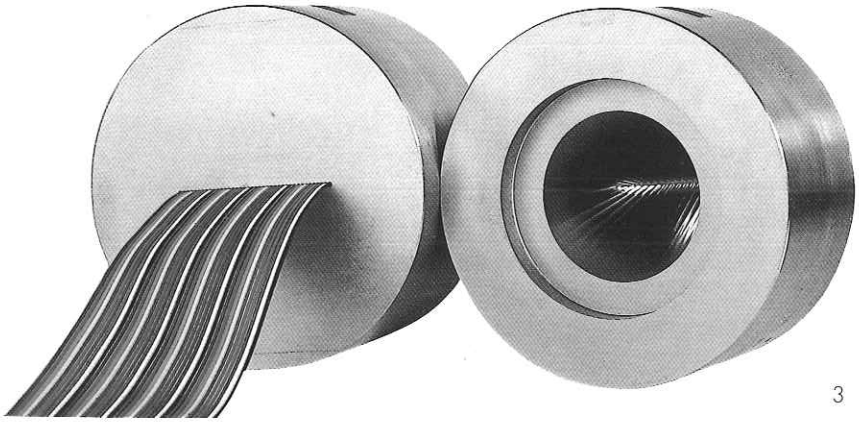
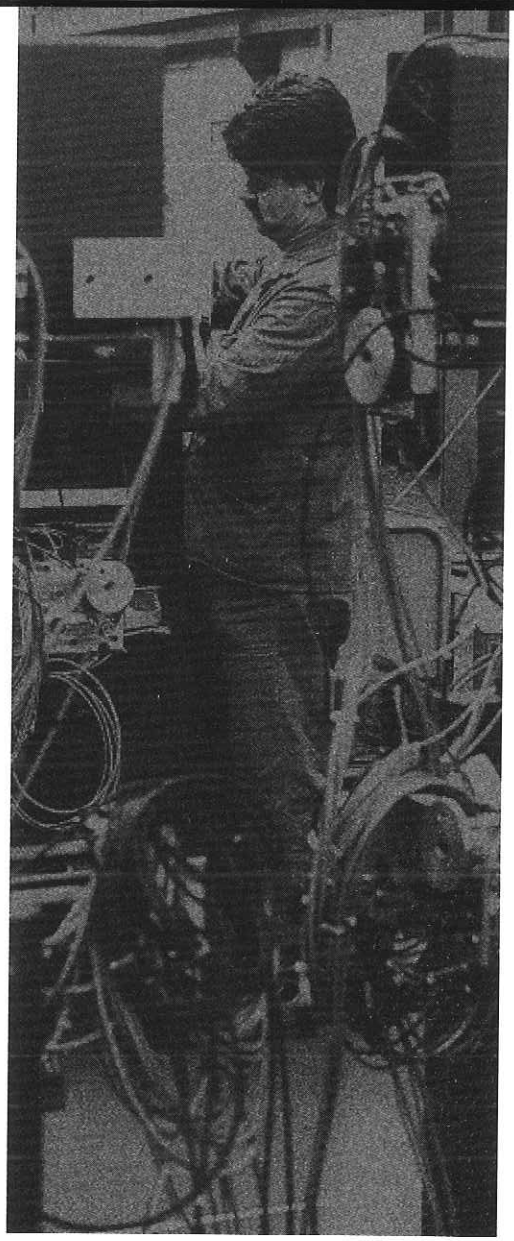


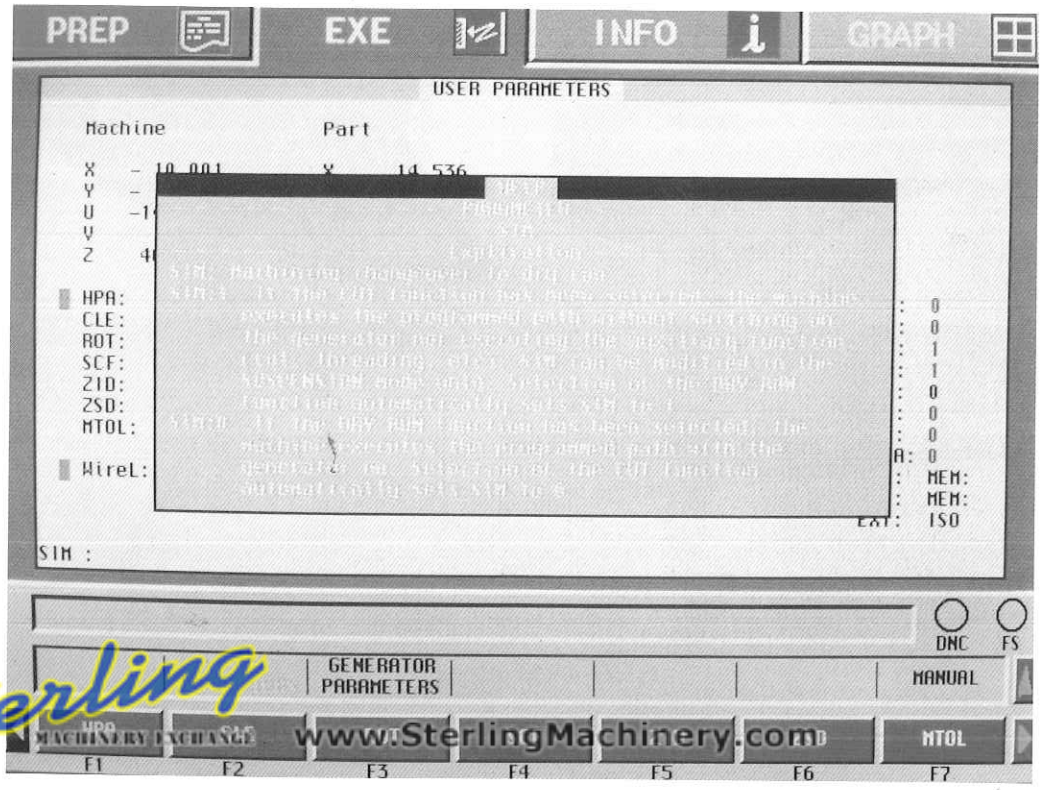
3

4

Numerical control adapted to the needs of EDM

A user-friendly numerical control.
Charmilles Technologies has developed the new numerical control for Robofil 300 and 310 machines with ease of operation as the guiding principle: a simple-to-read screen display, a conversational mode and a contextual "Help" facility contribute to easy dialog with the machine. The multi-task design allows the next job to be prepared while machining is in progress. Transfer of part programs from the programming station is done either by MS-DOS compatible 3.5" diskettes, or by direct transfer with the communication function, which is provided as standard.



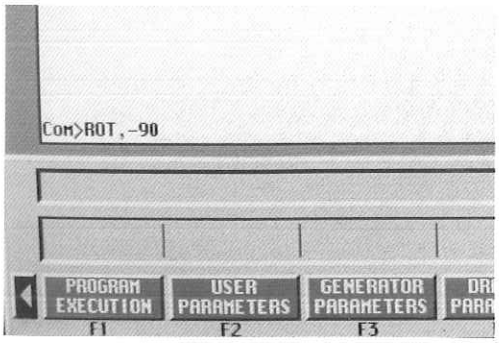


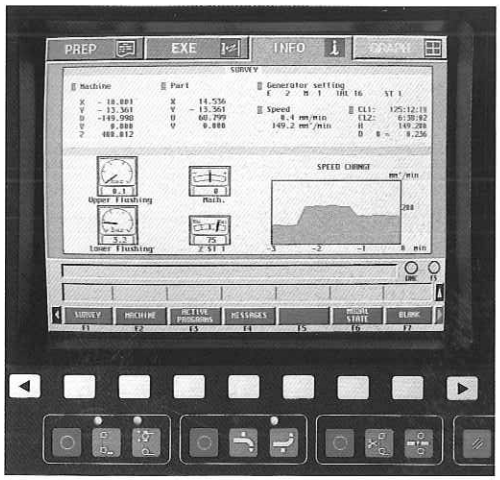
Contextual "Help".
At any time the operator can seek information by means of the "Help" key. Thanks to the multiple windowing technique, the information sought is displayed as an overlay without interrupting the work in progress.

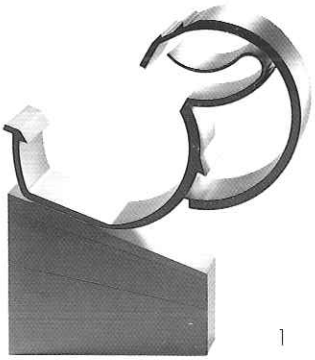
The CT command language.
This high-level language allows direct and complete piloting of the machine from the keyboard. All the operations controlled by the buttons of the front panel can also be executed with the keyboard, by means of simple command words. For example, a wire cut is ordered by WCT, and MOV X 100 causes a movement. These words are added to a large number of other commands, making it possible, for example, to modify parameters such as workpiece rotation (ROT 90), to launch measurement cycles (CEN) or to change the machining setting in the generator (REX.E5). Grouped together in a program, these commands provide enhanced efficiency and allow the machining sequence to be managed automatically. From rough to finish the linking of operations is taken over by the numerical control, eliminating the need for operator intervention.

Monitoring of machining.
The highly integrated numerical control has completely eliminated the need for the electromagnetic measuring and display units. The screen not only displays the status of the machine at a given moment, but also makes it possible to follow the progress of a machining job in progress.

1. Copper electrode
2. Graphite electrodes







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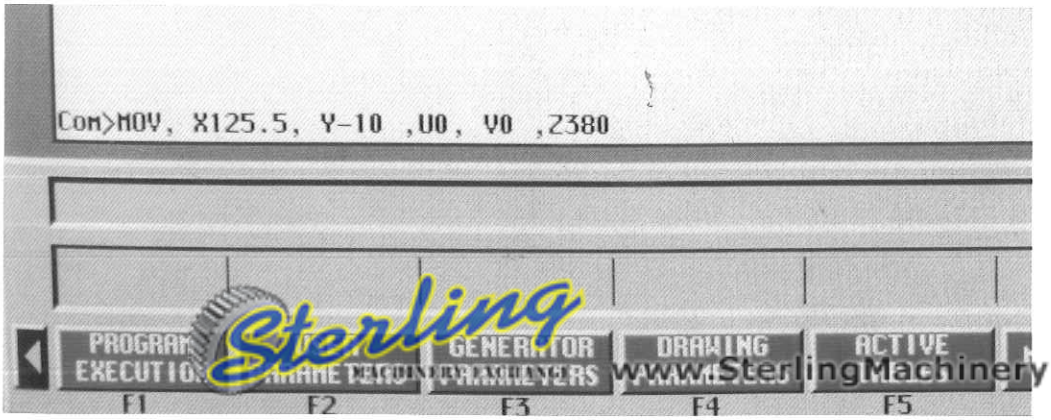
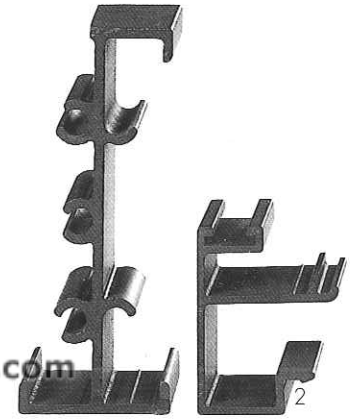


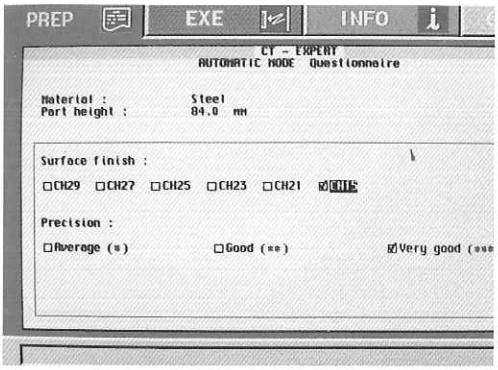


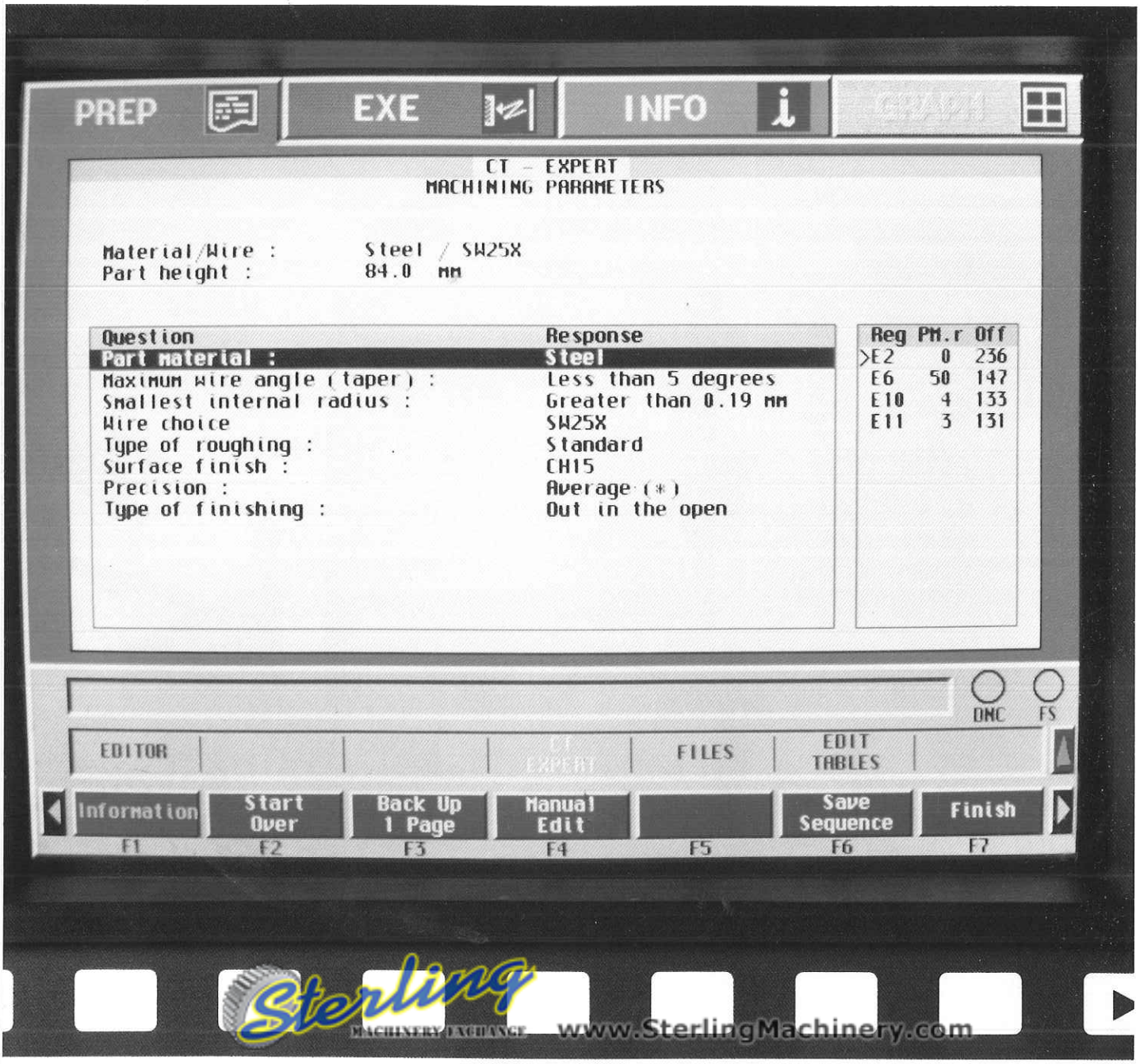
2

The manufacturer's expertise at the service of the operator

CT-Expert...

CT-Expert is a new software function that puts the experience of Charmilles Technologies at the disposal of the user. CT-Expert integrates the wire cutting expertise accumulated by Charmilles over a period of 20 years. This information is stored in the machine's memory. CT-Expert relieves the operator from having to select the sequence of machining settings and the calculation of offsets, so that even a beginner can operate the machine at its full potential.

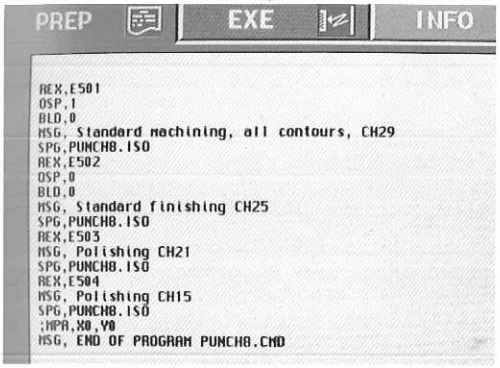




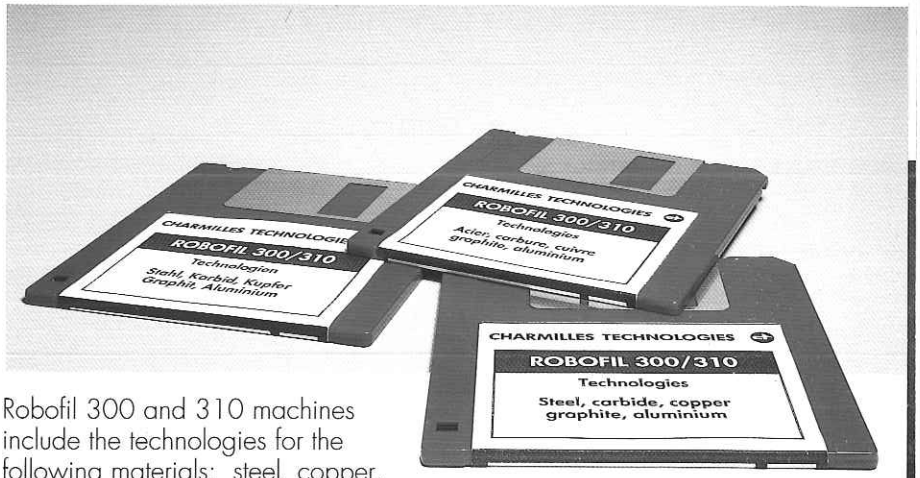
...a straightforward and efficient method.
All the operator has to do is to answer a brief questionnaire describing the work to be done, by indicating the following:

- the height and the type of material to be machined
- the desired accuracy and final surface finish
- the maximum taper angle
- the smallest radius in the path to be cut
- the quality and type of flushing

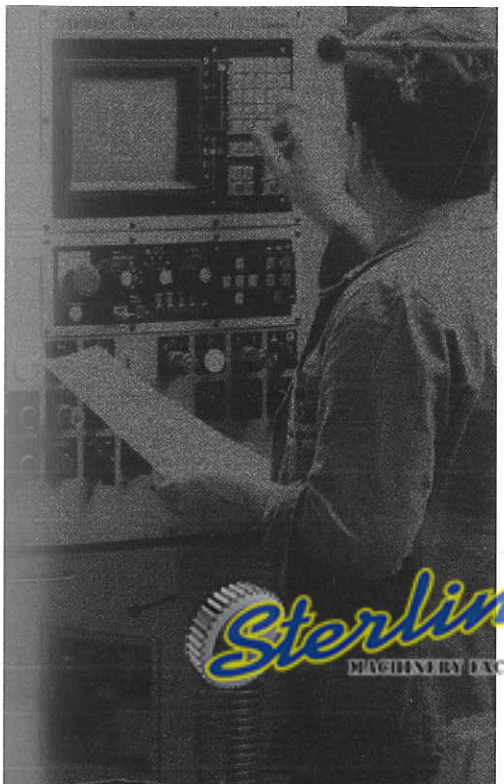
Technologies.
Taking advantage of their experience in EDM, the specialists at Charmilles Technologies have accumulated a wealth of data concerning generator settings adapted to the numerous possible applications. Put together in the technology tables, this information is stored in the numerical control. Following a simple call by the operator, the machine supplies the settings appropriate for the current application.



CT-Expert then selects the most appropriate wire (type and diameter) and the sequence of generator settings from roughing to finishing, and calculates the different offsets. And to recap things, the expert system generates the complete operational chain in the form of a command file.



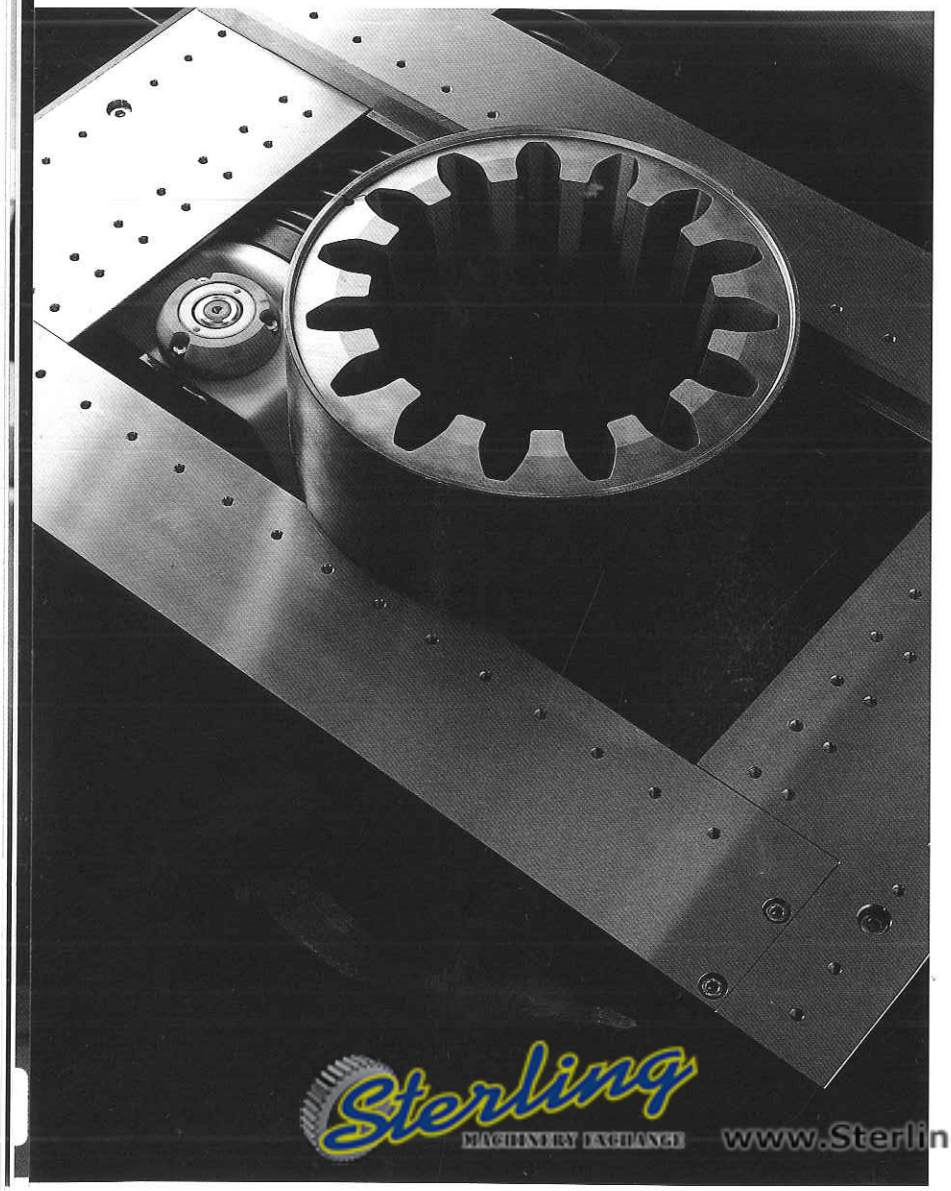
Robofil 300 and 310 machines include the technologies for the following materials: steel, copper, carbide, aluminum and graphite. To guarantee accuracy, the settings are recorded for each millimeter of machining height.

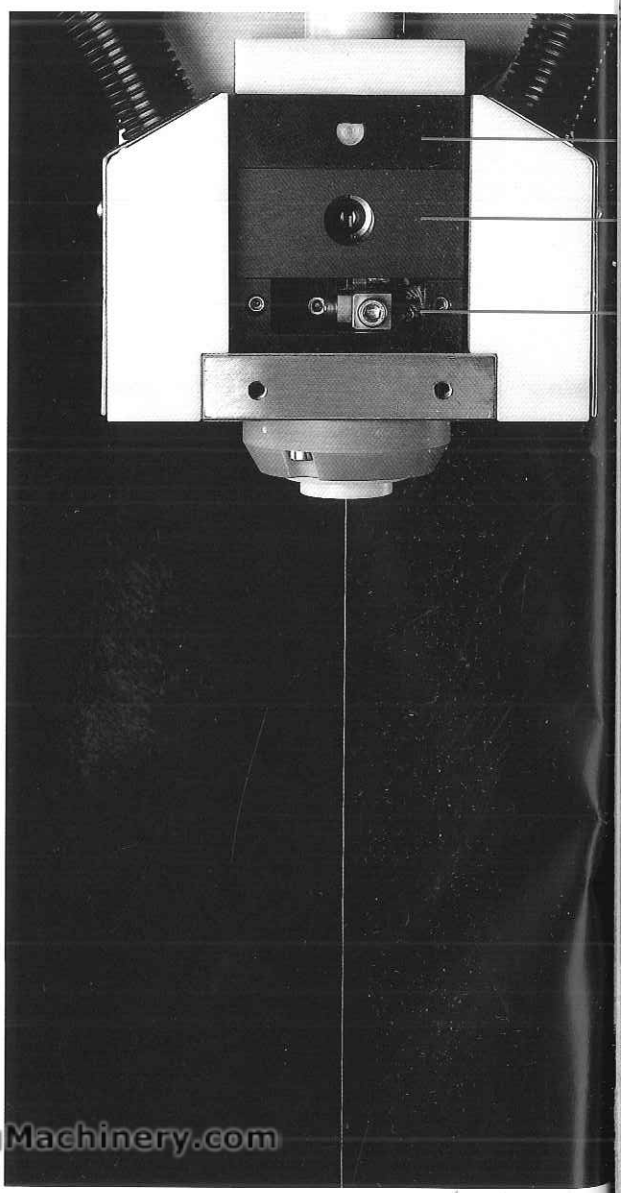


Simplified preparation and minimum maintenance

The CT 300 clamping frame.
The modular concept of the work area allows the user to equip the machine with the clamping system he prefers. The classic and efficient CT 1000 clamping frame can be installed on Robofil 300 and 310 machines. But Charmilles Technologies has also developed a specific system, the CT 300 system. Of simple and rugged design, it can take the heaviest workpieces and, to overcome even the most complicated clamping problems, all the accessories of the CT 1000 system can be adapted to it. For its EDM machines, Charmilles Technologies also offers systems that it has selected from among the best manufacturers of tooling systems.

The machining heads.
The machining heads on the Robofil 300 and 310 machines are the result of extensive research and over 20 years' experience of EDM wire cutting. Completely modular, they are very quickly installed and require a minimum of maintenance.

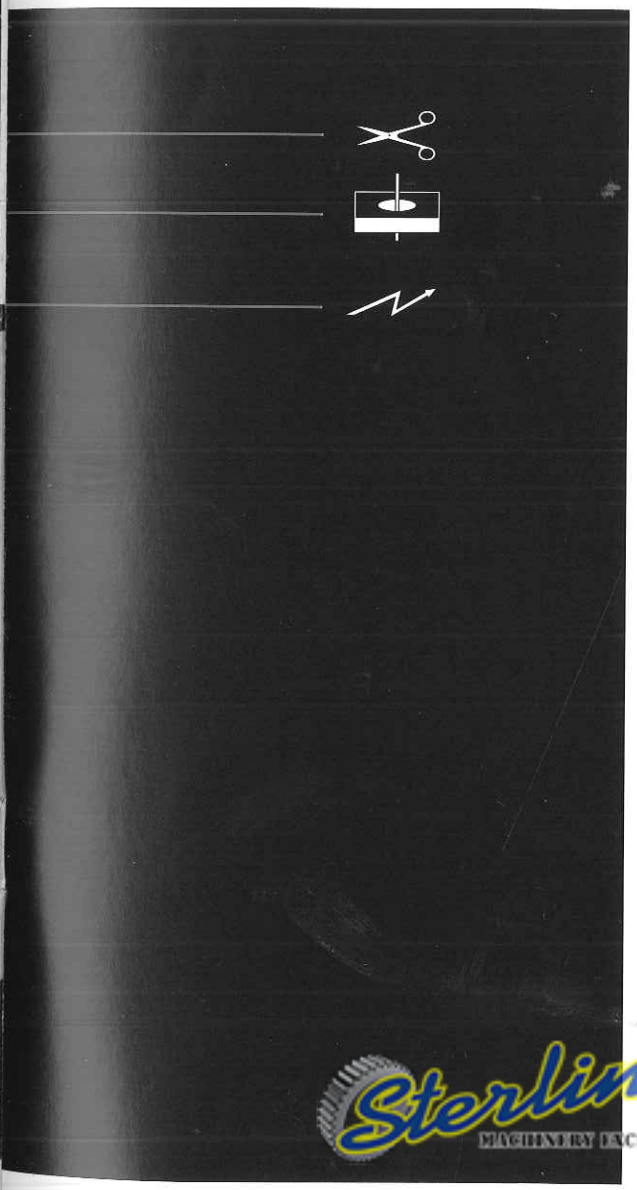


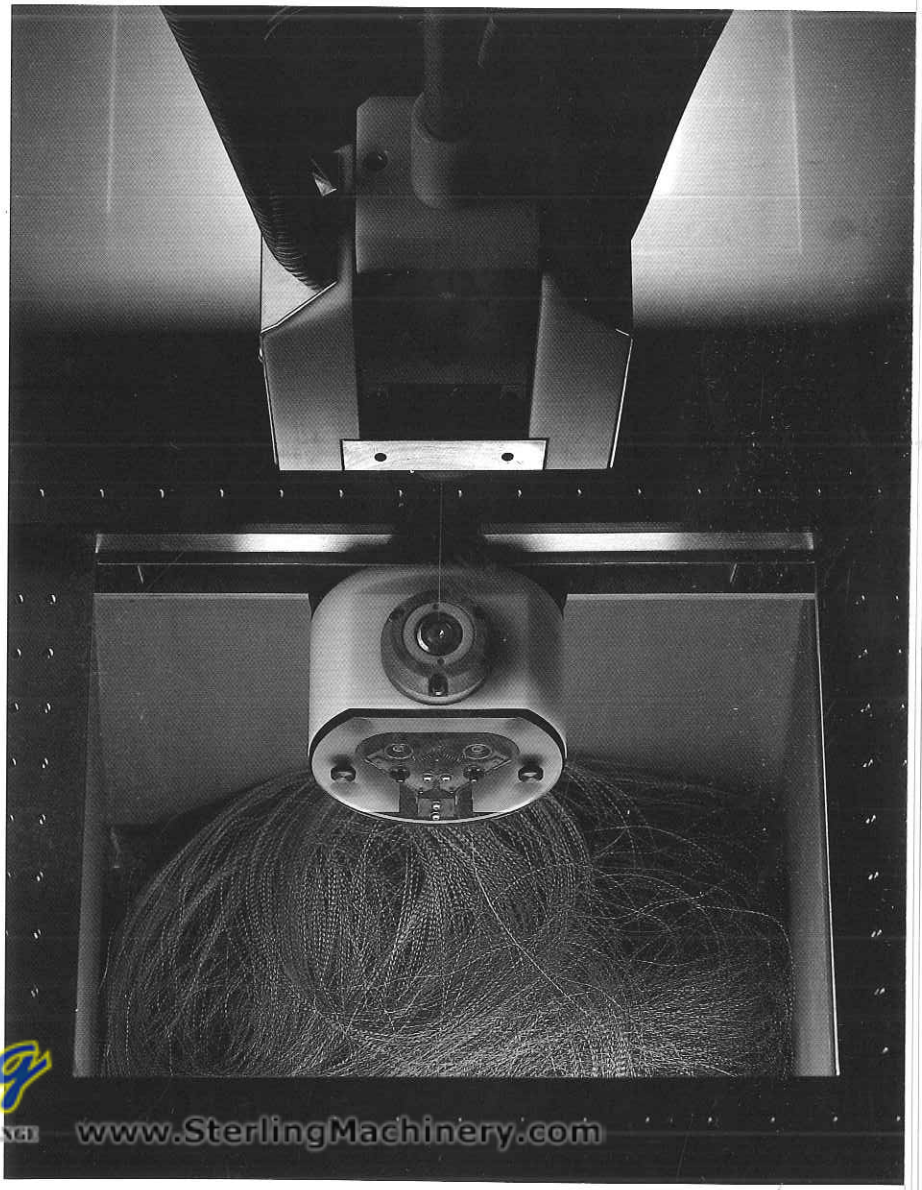


The measurement cycles.
The automatic measurement cycles considerably reduce the time needed to adjust the machine and to position the workpieces. Alignment of the wire, determination of the position of the guides and of the reference plane for taper machining, as well as positioning and referencing of the workpieces, are carried out reliably and completely automatically.

The wire advance mechanism.
For the Robofil 300 and 310 machines, the engineers at Charmilles Technologies have devised a completely new, simple system for wire removal*: the wire is collected directly under the workpiece. This, in turn, simplifies the transport mechanism and reduces maintenance. This practical arrangement, combined with a wire advance in which speed and tension are programmable, highlights the very functional design of these machines.

* Patent pending.





Technical specification – ROBOFIL

		300	310
Machine			
Machine dimensions L x W x H	in	70.9 x 63 x 7.8	70.9 x 63 x 87.8
Total weight (including CNC & tank)	lbs	5500	5500
Max. workpiece weight	lbs	1100	1100
Max. workpiece dimensions	in	33.5 x 19.7 x 15.75	33.5 x 19.7 x 15.75
X Y travel	in	15.75 x 9.85	15.75 x 9.85
U V travel	in	15.75 x 9.85	15.75 x 9.85
Programme Z travel	in	0 to 15.75	0 to 15.75
Collision protection		X Y Z U V	X Y Z U V
Max. taper angle	deg.	±30	±30
Speed of movement	in/min.	0 to 35.4	0 to 35.4
Standard voltages	V	380 or 400	380 or 400
	Hz	50 or 60	50 or 60
Optional voltages	V	204/220/240/420/ 440/480/575	204/220/240/420/ 440/480/575
Fluctuations	%	10 to 15	10 to 15
Power consumption	kVA	10	10
Wire circuit			
Programmable wire feed rate	in/sec	0.13 to 9.8	0.13 to 9.84 4
Programmable wire tension	kg	0.3 to 2	0.3 to 2
Weight of spools	lbs	7.7, 17.6, 35	7.7, 17.6, 35
Wire guides standard (diamond die closed guides)	in	0.010	0.010
Wire guides (option) (diamond die closed guides)	in	0.1, 0.15, 0.185, 0.2, 0.012	0.1, 0.15, 0.185, 0.2, 0.012
Threading		not available	standard
Diameter of wire for threading	in	not available	0.008, 0.010, 0.012
Rethreading		not available	standard
Dielectric system			
Filter	Paper filters	4	8
Dielectric capacity	L	250	250
Ion exchanger capacity	L	21	21
Automatic deionization regulation		standard	standard
Programmable injection	levels	4	4
Auto-restart		not available	standard

Generator

Max. cutting speed	23.25 sq. in/h.
Integrated technology CT-EXPERT	Automatic choice of generator settings (including offsets) from roughing to finishing
Self-adaptive generator output	In accordance with variations of workpiece height or flushing
Recoil to contour	on short circuit
Automatic feed control	To guarantee a constant gap and optimum speed

Numerical control

Automatic wire alignment	standard
Automatic measure of distance between guides	Accurate distance measurement between guides and between lower guide and zero level (for precision taper machining)
External M functions	2 programmable outlets 1 impulse outlet 1 remote warning outlet
Communication interface	1 serial line RS232/RS422 with configuration parameters changeable on screen
Auto-diagnostic	
Screen	14" color graphic
Keyboard	Alphanumeric QUERTY
Program entry methods	MDI on keyboard with recall key for commands
	DNC1 serial interface 3.5" floppy disk MS-DOS compatible Paper tape (option) ISO or EIA
Program execution	From memory or floppy disk
Program names	6 + 3 alphanumerical characters (xxxxxx.xxx) MS-DOS compatible
Subroutines	2 levels in command program
Axis systems	3 systems: absolute – machine – workpiece
Memorizable points	50 points: Defined by program or manually; automatic return on all points
Multitask	Preparation of next job during machining
Multiwindows	2 levels
Contextual help	Direct access to the answer
Taper modes	Conical, iso-radius, sharp corner (mixable in one program) (taper angle change on line or arc) 4 full axes (independent programming on the XY and YV planes) Twist mode

International headquarters
CHARMILLES TECHNOLOGIES S.A.
Case postale 373, 8-10, rue du Pré-de-la-Fontaine,
CH-1217 Meyrin 1 – Genève/Suisse
Tél.: (22) 783 3111
Fax: (22) 782 75 65

Europe
CHARMILLES TECHNOLOGIES FRANCE S.A.
Boîte postale 21
12, avenue du 1er-Mai
F-91122 Palaiseau Cedex
Tél.: (1) 69 3169 00
Fax: (1) 69 20 88 99

CHARMILLES DEUTSCHLAND MASCHINENBAU Gmbh
Postfach 4164
Bruckmannstrasse 11
D-7012 Fellbach 4 Schmiden
Tel.: (711) 9513-5
Fax: (711) 9513-600

CHARMILLES TECHNOLOGIES Ltd.
Arden Street, Stratford-upon-Avon,
Warwicks, CV37 6NW
Tel.: (0789) 2983 00
Fax: (0789) 41 40 10

CHARMILLES TECHNOLOGIES ITALIA Srl
Via Monte Nevoso, 2
I-20095 Cusano Milanino/Milano
Tel.: (2) 66400580,
Fax: (2) 66400798

CHARMILLES TECHNOLOGIES IBERICA S.A.
Polígono Industrial de Tres Cantos
Calle Almazara, 1
SP-28760 Tres Cantos/Madrid
Tel.: (1) 8034500
Fax: (1) 8038899

CEI
CHARMILLES TECHNOLOGIES Ltd. Leningrad
13 Street Krashoarmeskaïa,
St Petersburg
Phone: (812) 113 09 77
Fax: (812) 113 03 95
Telex: 121 018 LMI SU

America
CHARMILLES TECHNOLOGIES CORP.
560 Bond Street,
USA - Lincolnshire, 60069 IL
Tel.: (708) 913-5300
Fax: (708) 913-5340

Asia
CHARMILLES TECHNOLOGIES (JAPAN) Ltd.
1-14-11, Shinyokohama, Kohoku-ku
Yokohama 222/Japan
Tel.: (45) 474 26 41
Fax: (45) 474 32 66

CHARMILLES TECHNOLOGIES South East Asia PTE Ltd.
39 Mac Taggart Road, Shiro House
Singapore 1336
Tél.: 281 03 41
Fax: 284 04 15

CHARMILLES TECHNOLOGIES

Charmilles Technologies S.A.
P.O.Box 373, 8-10, rue du Pré-de-la-Fontaine,
CH-1217 Meyrin 1 – Geneva/Switzerland
Telephone: 022/783 31 11, Fax: 022/782 75 65,
Telex: 418 909 ctv ch

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