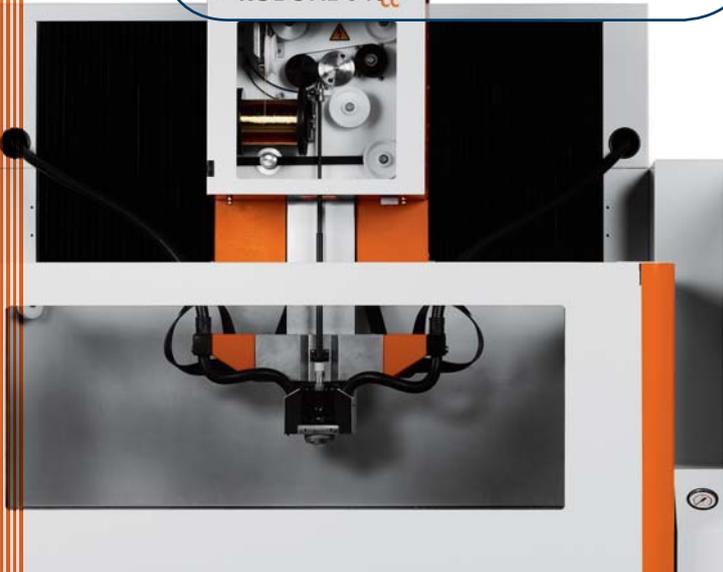
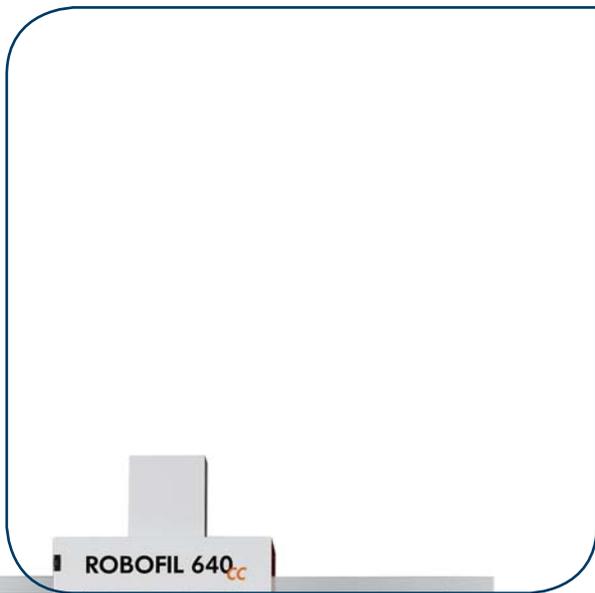




**ROBOFIL**  
**240 CC**  
**440 CC**  
**640 CC**



**CHARMILLES** 



# The benchmark

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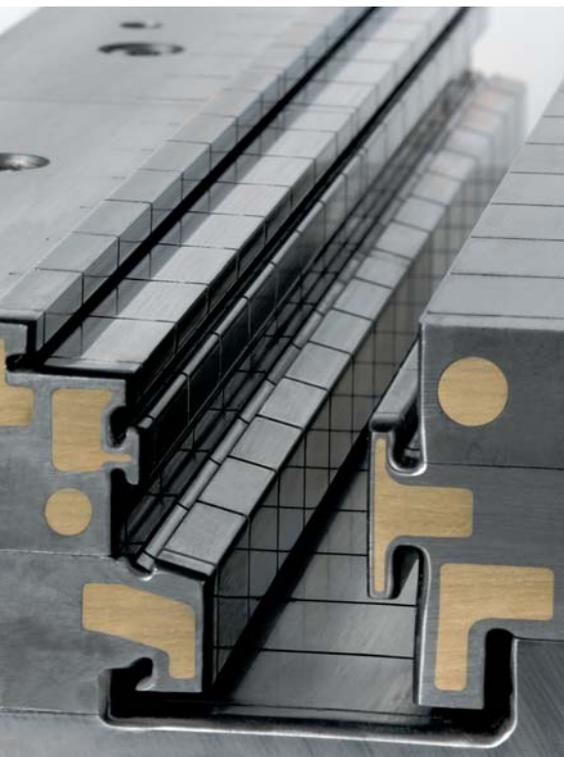
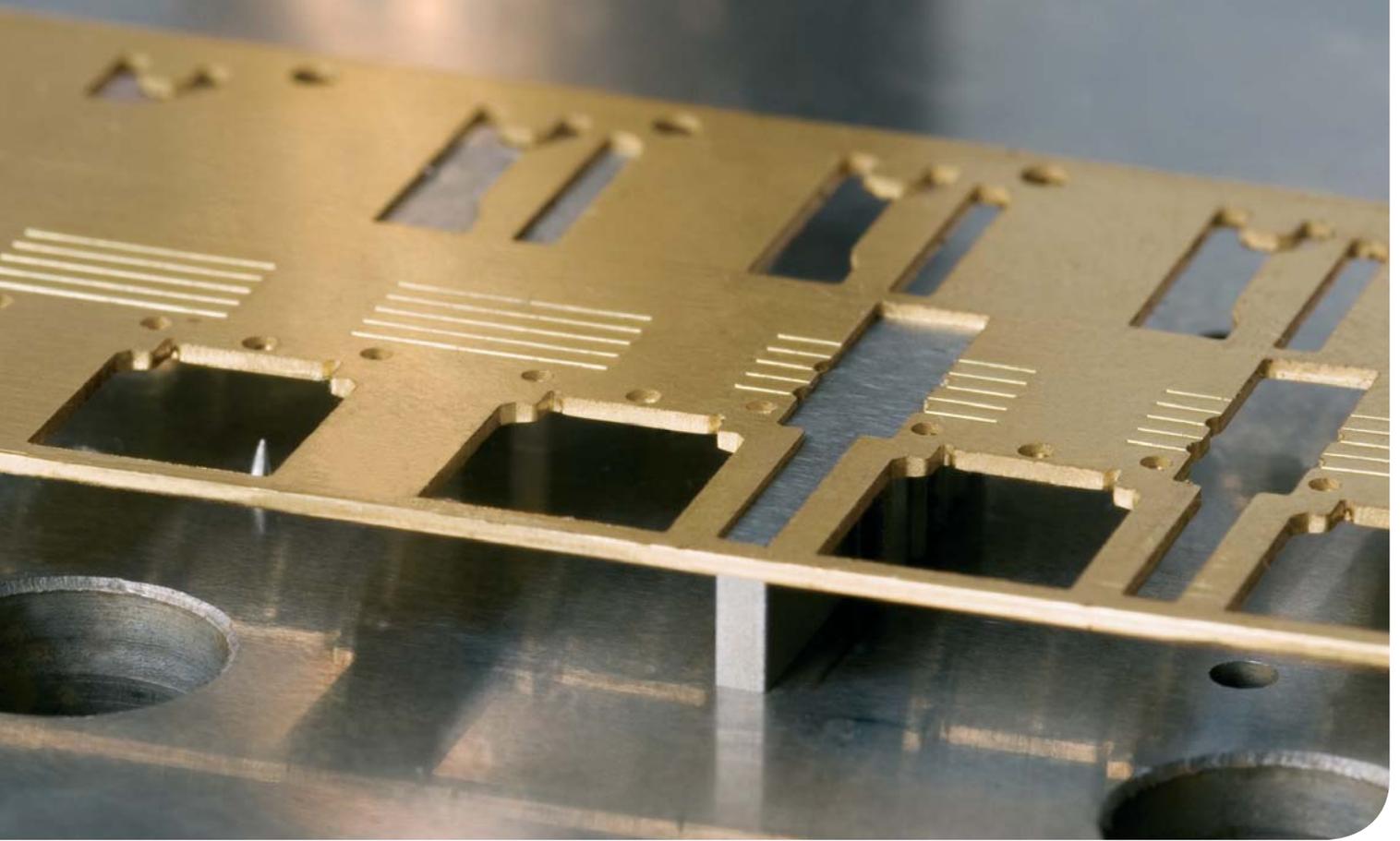
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The ROBOFIL 240 CC, 440 CC and 640 CC (ROBOFIL CC) fulfill the wishes of any wire EDM machine user – to cut faster and obtain excellent accuracy while maintaining the mechanical and metallurgical properties of the cut surfaces. The CC spark generator achieves this performance, which ensures a considerable gain in productivity.

This increase in productivity is evidently noticeable when high cutting speed is the most important criterion... but also when very precise tools can be made in less machining passes than before. This results in real benefits that can be seen in the most diverse applications.

# Applications

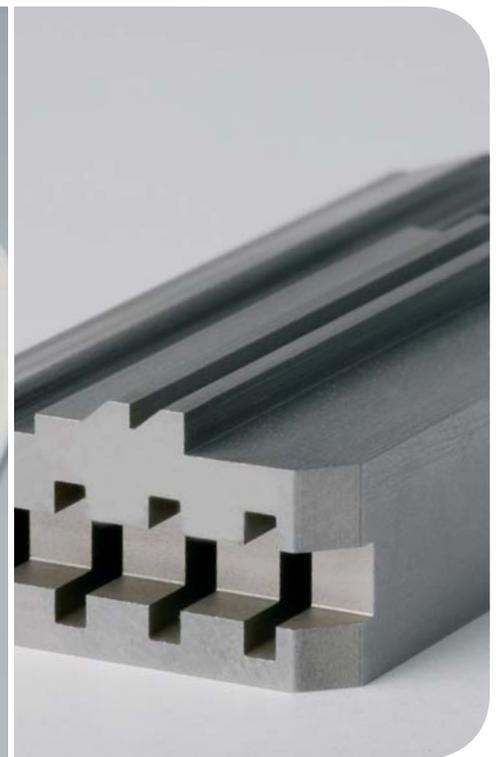
General mechanics, molds, cutting tools, extrusion tools, sets tooling, etc.



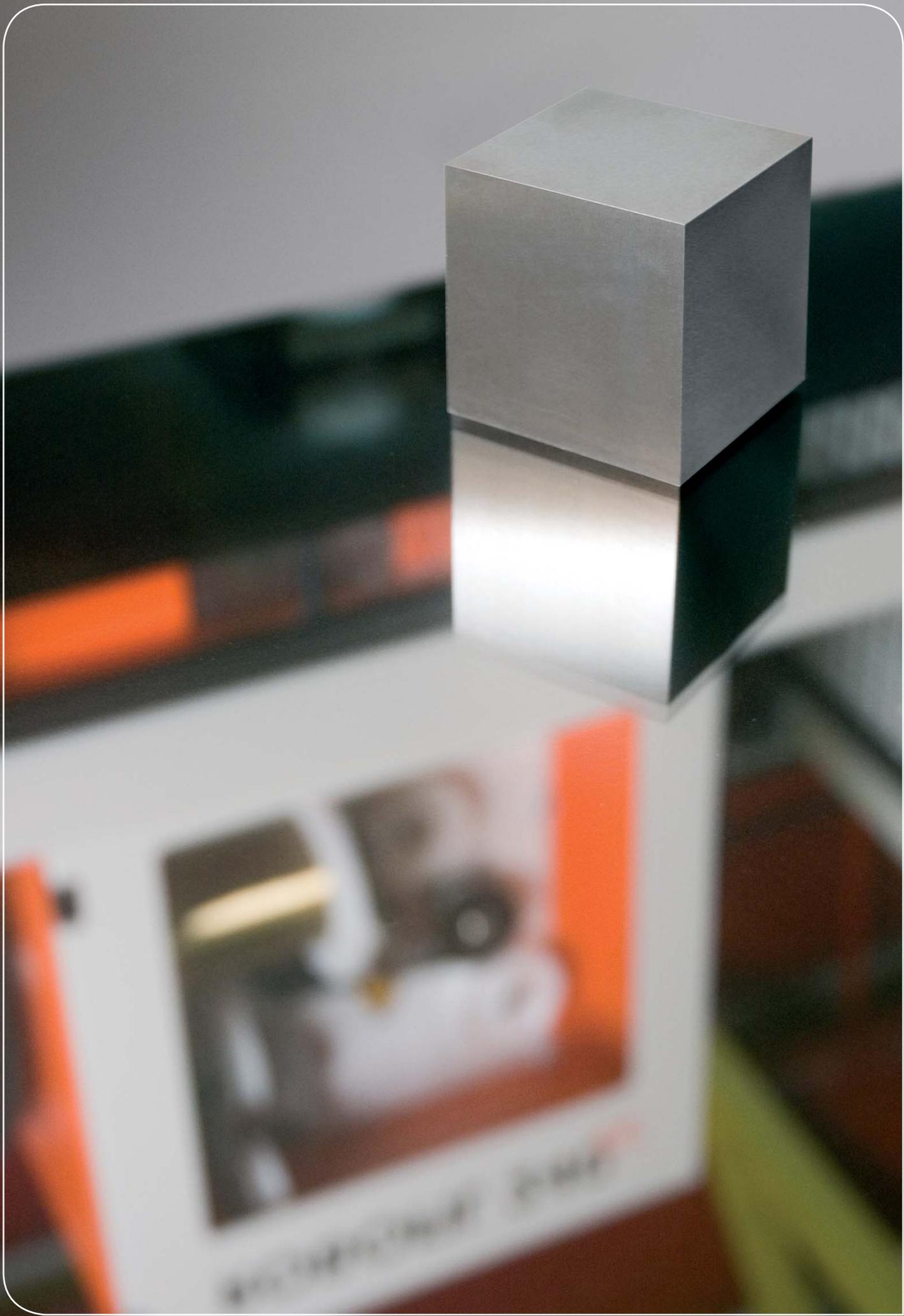
Extruder conformer for a plastic section for a PVC window frame



Component of a guidance system



Imprint of a mold with pin holder

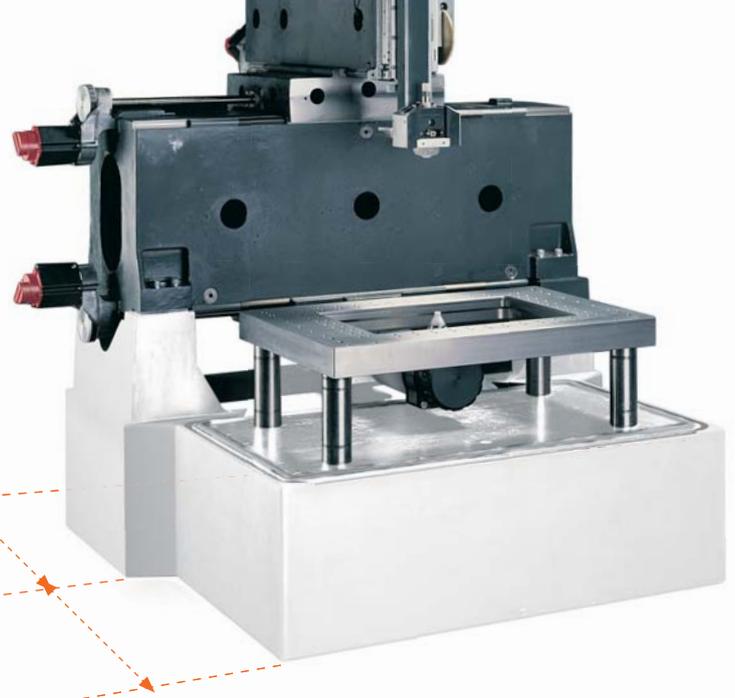


# Performance

The **6** facets of performance

# The mechanical basis

# 1



### The mechanical design is that of the fixed bench, combining robustness and accuracy

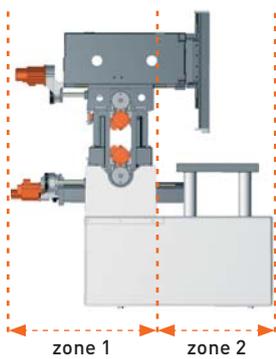
The part to be machined rests directly on the interdependent fixed table of the polymer concrete main frame. This design, where the part is static, enables very heavy parts to be loaded without affecting accuracy. The precision components of the machine are used solely to move the wire guides. Protected from dirt, shocks and stresses, they permanently work in an ideal situation to ensure durable accuracy.

### Accuracy guaranteed for life

To obtain durable accuracy, only direct measurement of positions by linear scales is truly effective. This system enables the actual movement of the slide to be checked directly. It eliminates all the classic errors that arise from the ball screw, such as backlash on reversal, expansion or wear. Accuracy does not vary over time and no subsequent calibrating is required.

### Greater thermal stability

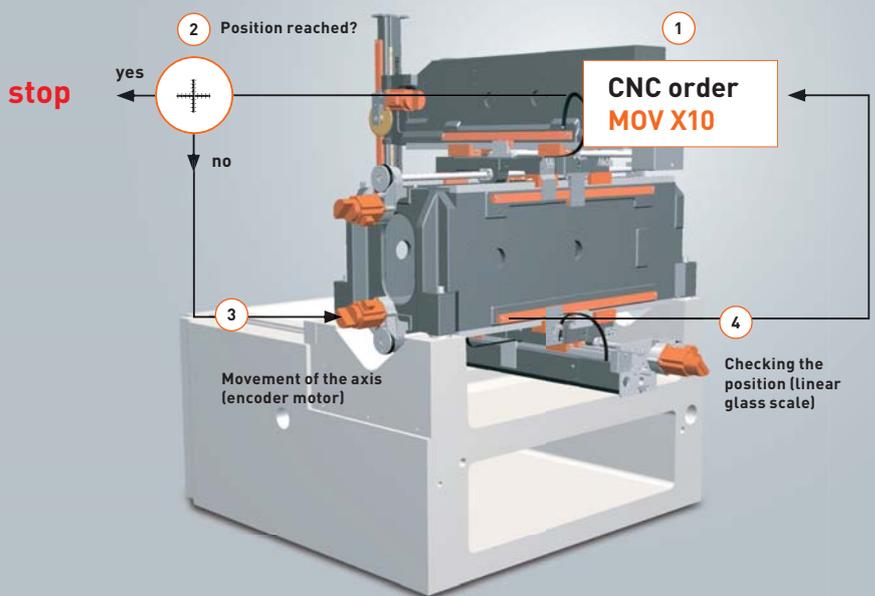
The main frame of the machine is made of polymer concrete. Its thermal expansion is 25 times less than that of cast iron. This material is also a good electrical insulator, which protects the whole of the machine from potential current leakages. These are often the cause of corrosion, which is particularly destructive for the machine tool.



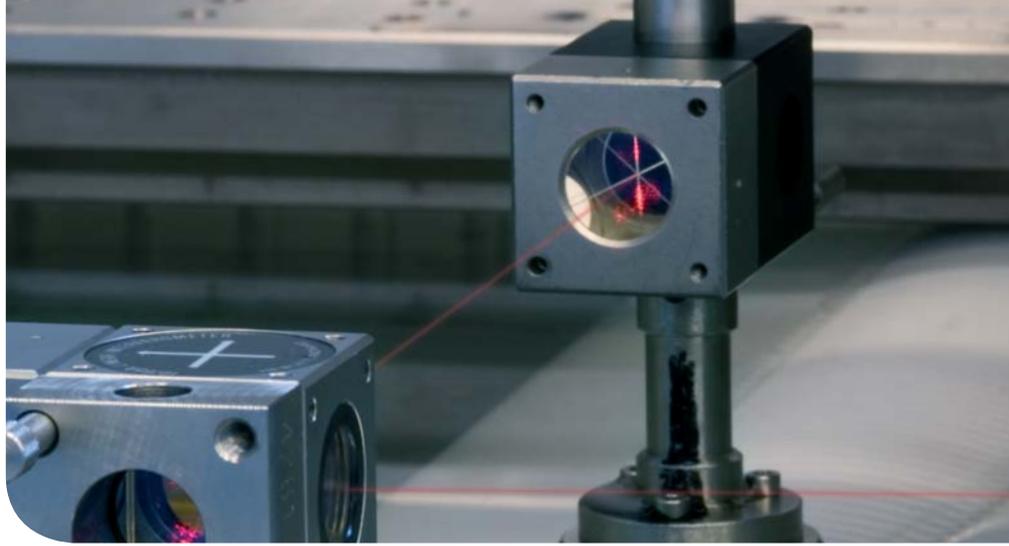
Accuracy guaranteed from 1 to 6600 lbs. workpiece weight

zone 1	zone 2
Linear glass scales	Machining
Guide ways	Dirt
Ball screw	Risks of collision

The linear glass scales measure the position with extreme accuracy



## Certified accuracy



Systematic laser check

### Traditional Swiss design and manufacture

Performances of the ROBOFIL CC machines do not change even after years of use. This longevity is due, to a great extent, to the quality of the manufacture. The very high accuracy surface grinding of the guide and assembly surfaces contributes to this durable accuracy.

### Guaranteed accuracy of movements

Each machine is subjected to a laser test, which checks the machine accuracy to be in accordance with the VDI 3441 standard. This standard requires that all axes position within the specified tolerances.

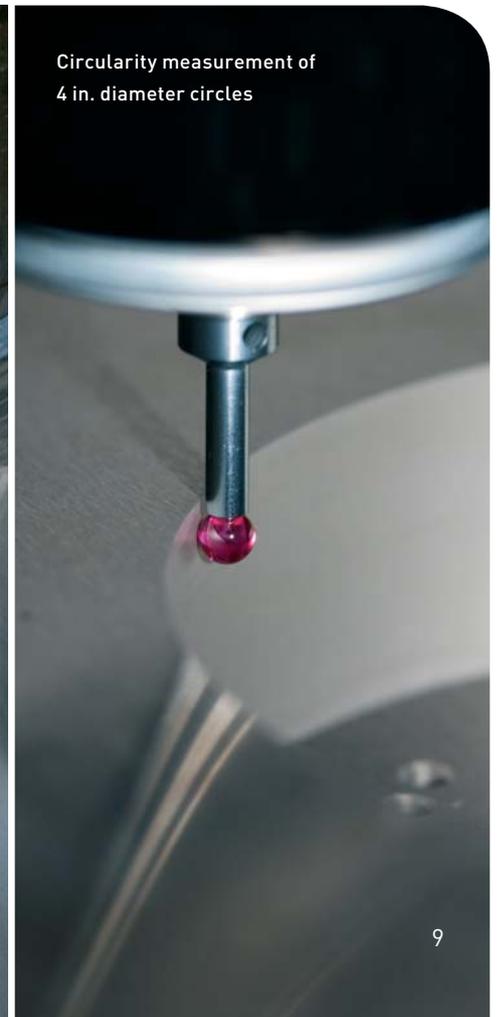
### Checking circularity and pitch to confirm accuracy

The mechanical design of the ROBOFIL CC machines ensures very high pitch and circularity accuracy. This is measured and checked in accordance with the ISO 230-4 standard.

Surface grinding of the guides

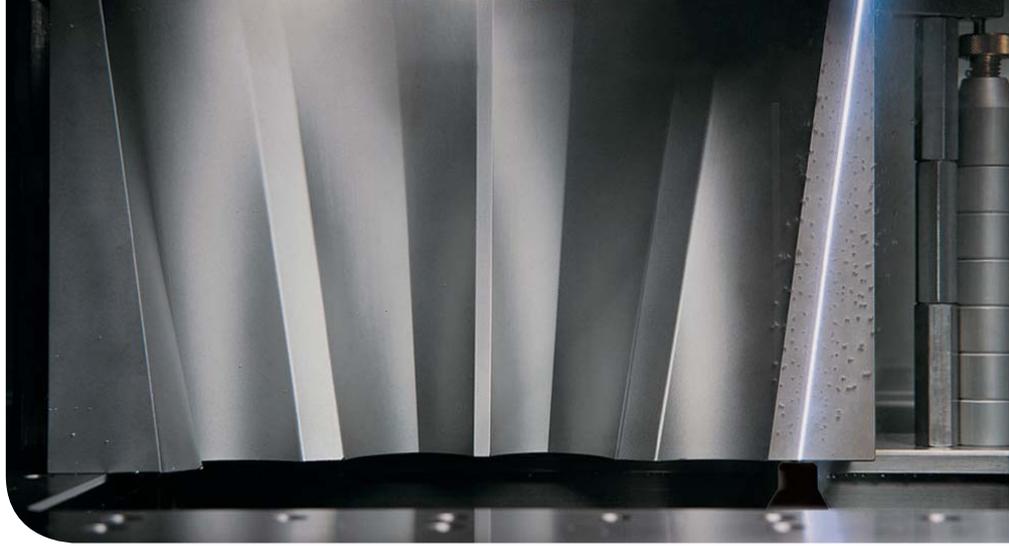


Circularity measurement of 4 in. diameter circles



## Unique characteristics

# 2



Cutting tapers up to 45° whatever the height of the part (up to 20 in.)

### Totally submerged wire cutting of parts up to 20 in. tall

The powerful CC generator, which is very effective with tall parts, as well as rapid filling and emptying of the dielectric tank, make the ROBOFIL CC machines very productive and well adapted to EDM tall parts, which are really common in the mold, plastic extrusion or general mechanics industries.

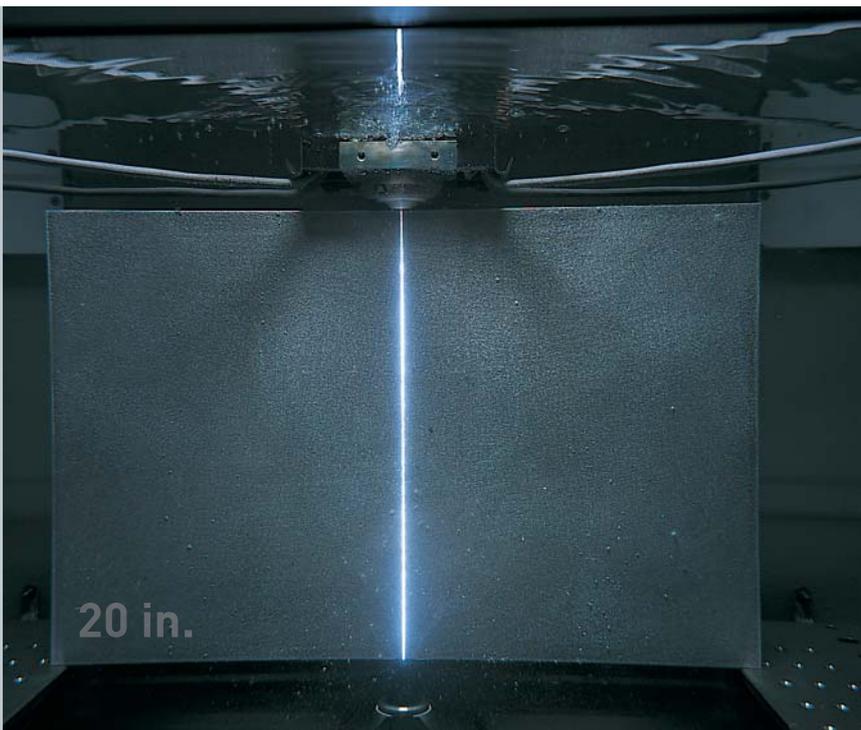
### QUADRAX® 45° up to 20 in., a unique capacity for tapered machining

The ROBOFIL CC machines are the most flexible on the market, capable of cutting tapers of 45° whatever the height of the part (up to 20 in.). The principle of crossed double guidance of X, Y and U, V axes, which are independent and have the same dimensions, enables large taper machining and therefore enables the potential range of applications with wire EDM machining to be expanded.

Despite the considerable size of the tank, it takes **less than 30 seconds** to completely submerge an 8 in. tall part.



Ergonomic remote control

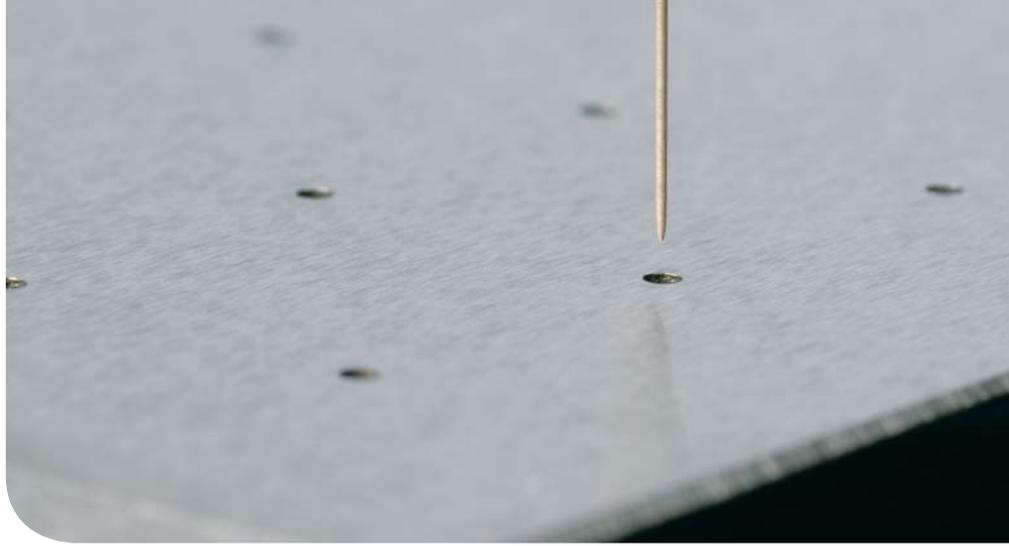


Machining in taper mode of -45° to +45° of the whole height of the part (as an option)



# Threading functionalities

## 3



Threading performance improved by new functionalities

The performance of the machine is closely linked to the large number of machining technologies available. In fact, this series has around fifty machining technologies enabling the machine always to be used to optimum effect with various materials and various types of specialized or inexpensive wire. Performance can thus be perfectly adapted to the needs of the user, who will benefit either from the speed, the quality of machining or the reduction in operating costs.

### 1. Hole search during threading

Furthermore, it is possible to program the hole search. Activation of this function can be programmed by a specific code. The machine attempts, if necessary, up to eight successive threadings over a circular trajectory around the initially defined point.

### 2. Automatic detection of a missing threading hole

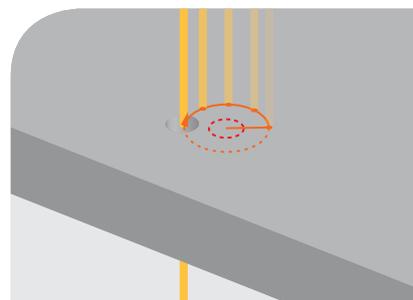
If the start-hole has been forgotten or if it is not located in the programmed position, the machine moves automatically towards the next start-hole. This ensures unattended machining overnight or during the weekend.

### 3. Non-contact search before machining launch

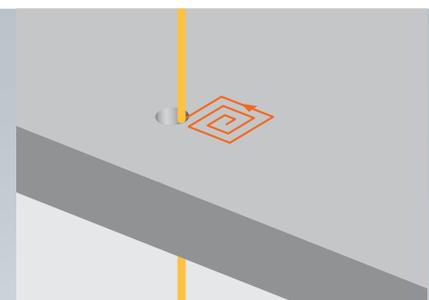
For the start-up of machining, the wire cannot touch the part. If this happens, there will be a short circuit and the spark machining cannot begin. Now it is possible to move the wire away from the part in a helical trajectory until there is no contact. Machining can then begin.

### 4. Threading and rethreading under all circumstances with 0.012 in. to 0.004 in. diameter wires

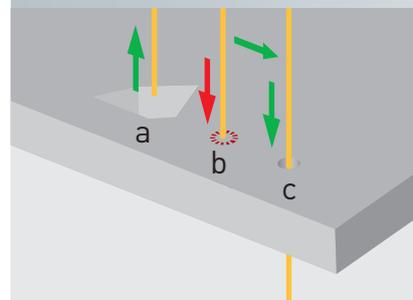
Suction in the lower head safeguards threading. Furthermore, it is possible to program the filling height of the tank to the threading, which enables difficult threadings to be performed successfully.



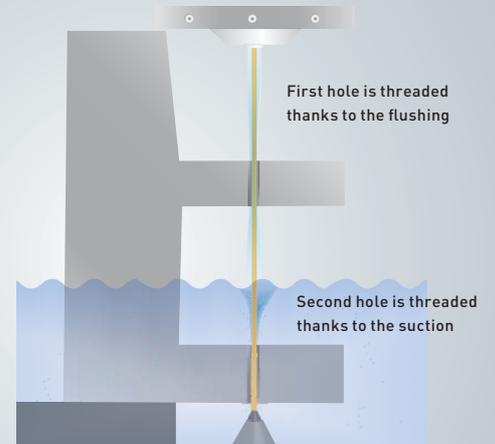
1. Example of successful threading after the sixth attempt



3. Removal of the wire in a helical trajectory



2. a) The start-hole is offset  
b) Automatic detection of the missing threading hole. Movement towards the next start-hole  
c) Threading and rethreading



4. Threading with the tank full or partially filled saves time emptying and filling the tank between several cavities to be threaded

## Customized automation

# 4



Integrated automation for pallet changes

### Progressive investment

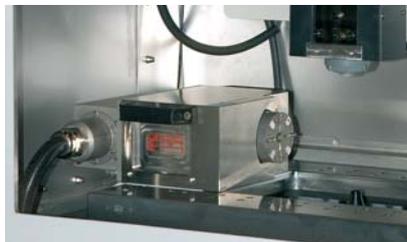
The ROBOFIL 240 CC and 440 CC machines are built to be automated. The ROBOFIL 240 CC and 440 CC machines leaving the production site are built to be equipped with several automation solutions existing on the market. They can be adapted at the production plant or later at the customer's location; the process is simple, fast and economical, enabling the user progressively to invest into automation.

### Integrated automation

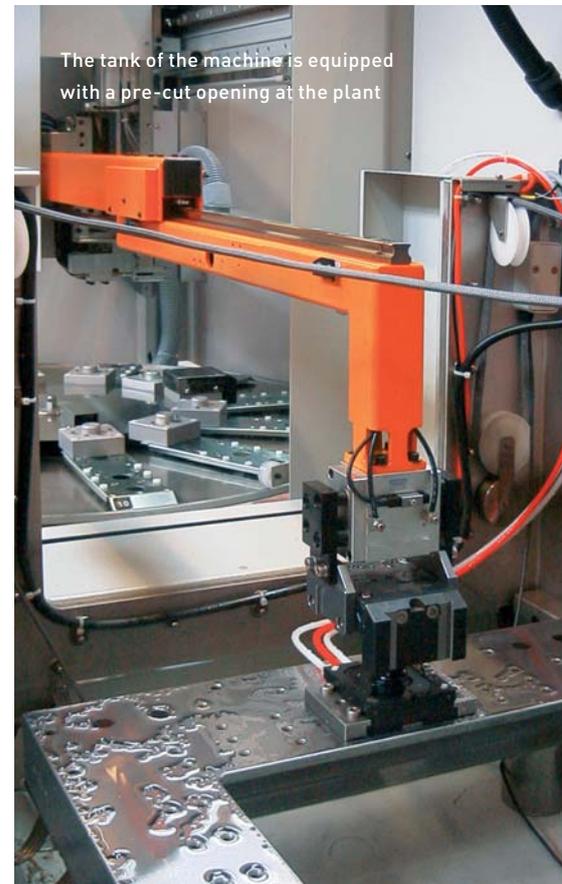
Charmilles has a range of standard workpiece changers allowing maximum use of the machine without human intervention. The automation solution offers maximum flexibility. This intensive use of the machine reduces production timelines, what leads to higher production output per hour while reducing operating costs.

### Rotary axes

Charmilles offers various types of rotary axes totally integrated into the numerical control. Their installation is very simple. Rotation controlled simultaneously with the movement of the X, Y, U and V axes during machining is also possible. This function enables complex shapes to be produced, which would be otherwise unfeasible.

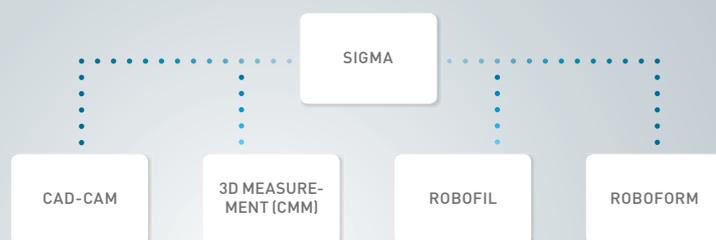


The tank of the machine is equipped with a pre-cut opening at the plant



### Workshop manager

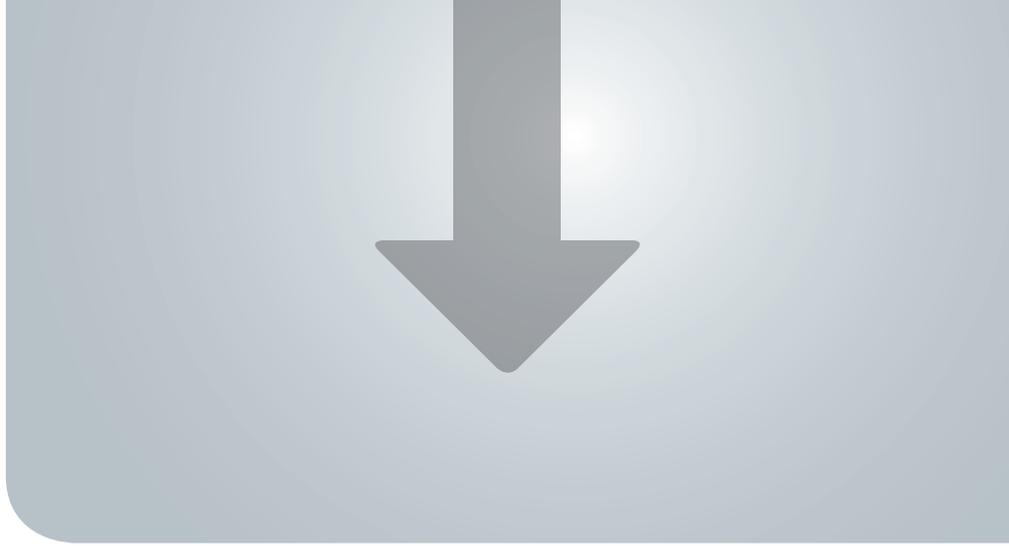
The SIGMA workshop planning and management software ensures, with great simplicity, optimum use of the various production equipment into which, potentially, ROBOFIL, ROBOFORM, molding machines and three-dimensional measuring machines can be integrated. Furthermore, SIGMA enables continuous checking of the state of progress and the accounting aspect of the work.



Graphic of a cell assembly:  
The whole workshop is optimally managed

## A more economical machine

# 5



Falling costs

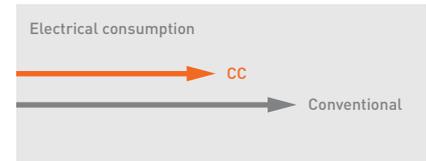
The ROBOFIL CC machines is designed to control operating costs, using inexpensive wires and a reduced filtration cost. Along with low electrical consumption, this makes the ROBOFIL CC machines particularly economical to use.

### Optimum filtration

This series offers a filtration system equipped with four filters. The larger filter surface increases the capacity of the filter life, what leads into lower hourly cost of filtration. The minimum flow of dielectric required, provided in the past by two filters, is now provided by four. Therefore, it is possible to lower the cost of filtration by 25%.

### Controlled electrical consumption

Electrical consumption of the CC series is less than that of the other EDM machines. In fact, the CC generator enables the discharge of each spark to be managed in order to get the maximum power possible. The machining speed is therefore maximized and electrical consumption minimized.



If CC speed = Conventional speed



With 4 filters (standard), it is possible to lower the cost of filtration by 25%

# The CC generator

# 6



The generator for all situations

The ROBOFIL CC machines are equipped with a latest generation spark generator. Its unique design uses modern and powerful electronic components, which enable new forms of spark to be generated. Five years on, this digital generator is still unique and unequalled.

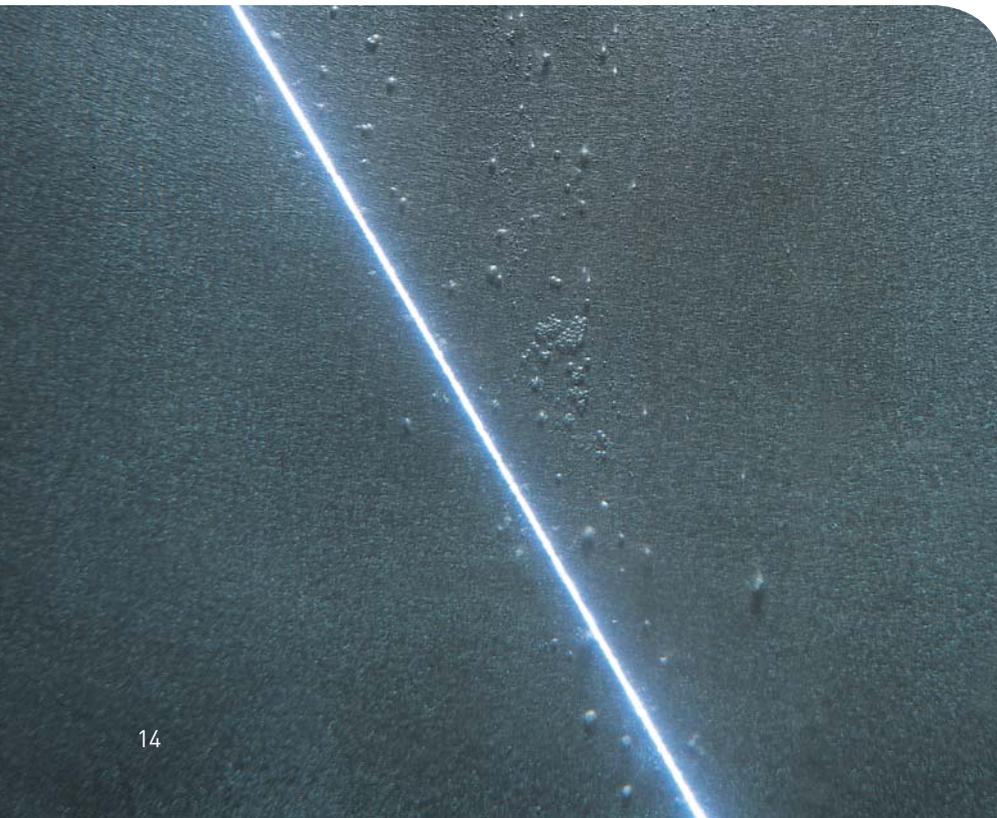
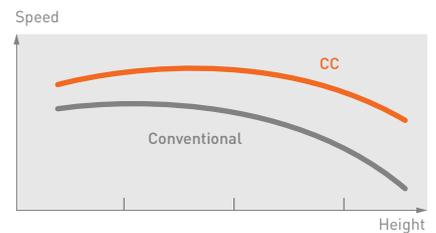
Besides the fact that this generator has anti-electrolysis technology, it eliminates thermal effects, such as redeposition (also called “white layer”) as well as surface microcrackings, what helps to increase tool life.

### Over 47 in<sup>2</sup>/hour at top speed

The CC generator, can reach, cutting speeds greater than 38 in<sup>2</sup>/hour under industrial cutting conditions. The ROBOFIL CC machines can thread and rethread stratified wires essential for fast machining speeds and high productivity.

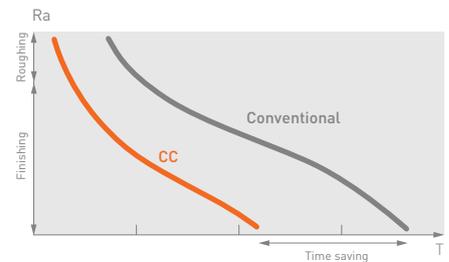
### Time saved on roughing cuts

The ROBOFIL CC machines are equipped with the most powerful generator ever manufactured by Charmilles. The high intensity sparks of the CC generator allow high speed cutting of tall parts.



### Time also saved on finishing cuts

Whatever the quality of finish required, the CC generator is faster. The high frequency finishing settings reduce the number of skim cuts to achieve fine finishes.



# The spark adapted to materials



Carbide or PCD (polycrystalline diamond) form tools

## Steel

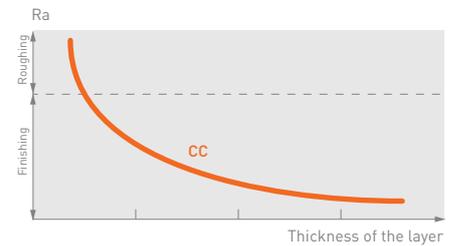
- Elimination of the heat affected layer

- Increased longevity of tools

Due to the exclusive patented Charmilles CC generator and its perfectly calibrated sparks, the recast layer is very thin after

roughing and practically disappears after two finishing passes.

The hardness of the surface is not changed. When cutting tools are machined with the CC generator, they have a significantly extended tool life.



Thickness of the recast layer of K107 steel with respect to the Ra obtained

## Carbide (1)

- The integrity of the surface is totally preserved
- Surface quality Ra 0.2  $\mu\text{m}$

The CC generator enables a surface quality less than Ra 0.2  $\mu\text{m}$  to be attained with an outstanding bearing capacity rate.

The sparks are without electrolysis effect. They prevent loss of the binder (cobalt), which is very sensitive to electrochemical reactions. This maximizes the service life of the tools machined.

## Titanium

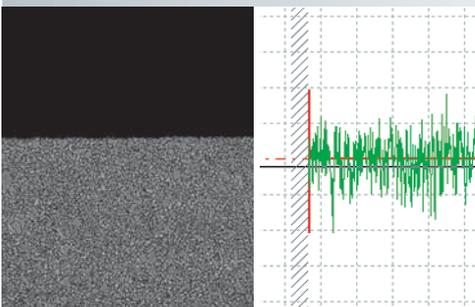
- Prevents oxidation (blueing)
- Elimination of surface pollution

Titanium, which is light, stable and in particular biocompatible, is frequently used in the medical field (manufacture of artificial implants), spectacle manufacture and watchmaking. The CC generator minimizes pollution of the surface of the titanium by particles of copper or zinc from the EDM process. Furthermore, it does not oxidize the surface and therefore does not change its color.

## PCD (polycrystalline diamond) and tungsten carbide tools (2, 3)

- Cutting edges preserved
- Increased tool life

The ROBOFIL CC machines are ideal for machining PCD or carbide form tools. The generator settings of the CC generator and the perfectly calibrated power of the microsparks provide sharp, solid and durable cutting edges.



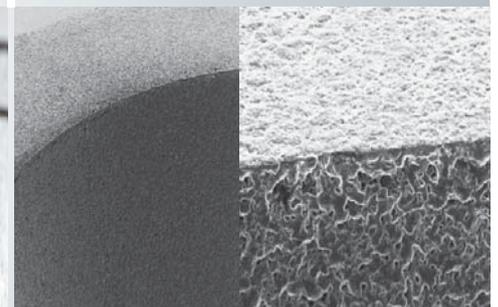
1 Carbide die (no microcracking)

Surface finish  
Ra 0.2  $\mu\text{m}$   
Rtmax. 1.7  $\mu\text{m}$



Surface machined with a conventional generator: deposits, pollution

Surface machined with CC: minimum deposits, homogeneous surface



2 PCD mold (10 mm = 1 mm)

3 PCD form tool (10 mm = 100  $\mu\text{m}$ )



ROBOFIL 640<sup>CC</sup>

CHARMILLES 



**Safety  
and comfort**

Confidence and ease

## Usage safety



Facility of access to the working area

### Collision Protection

Due to the ICP system, collisions are of no consequence. The five axes of the ROBOFIL CC are protected by ICP against the effects of programming errors or wrong axis movements. This protection system, which is completely integrated into the mechanics of the movements, detects the slightest abnormal force and stops the machine before the workpiece or wire guide system is damaged.

**ICP (Integrated Collision Protection):** mechanical shock absorption and machine protection system.

### User-friendly

With its one-piece worktable, mounted directly onto the main frame, the immobile working area is fully accessible to the operator. With a mobile table, the working area is at a distance from the operator, which can limit viewing of the machining area or manually moving a heavy part. The wide special EMC glass windows provide excellent visibility of the machining in progress while eliminating the electromagnetic radiation specific to the EDM process.



Large UV travel to facilitate loading by hoist

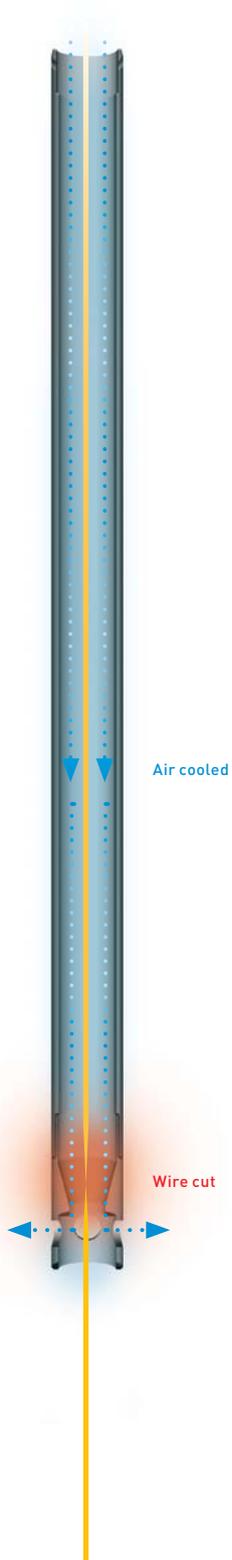


Wide special EMC glass windows provide excellent visibility

# ThermoCut System



Preparation of the wire is the key to reliable threading

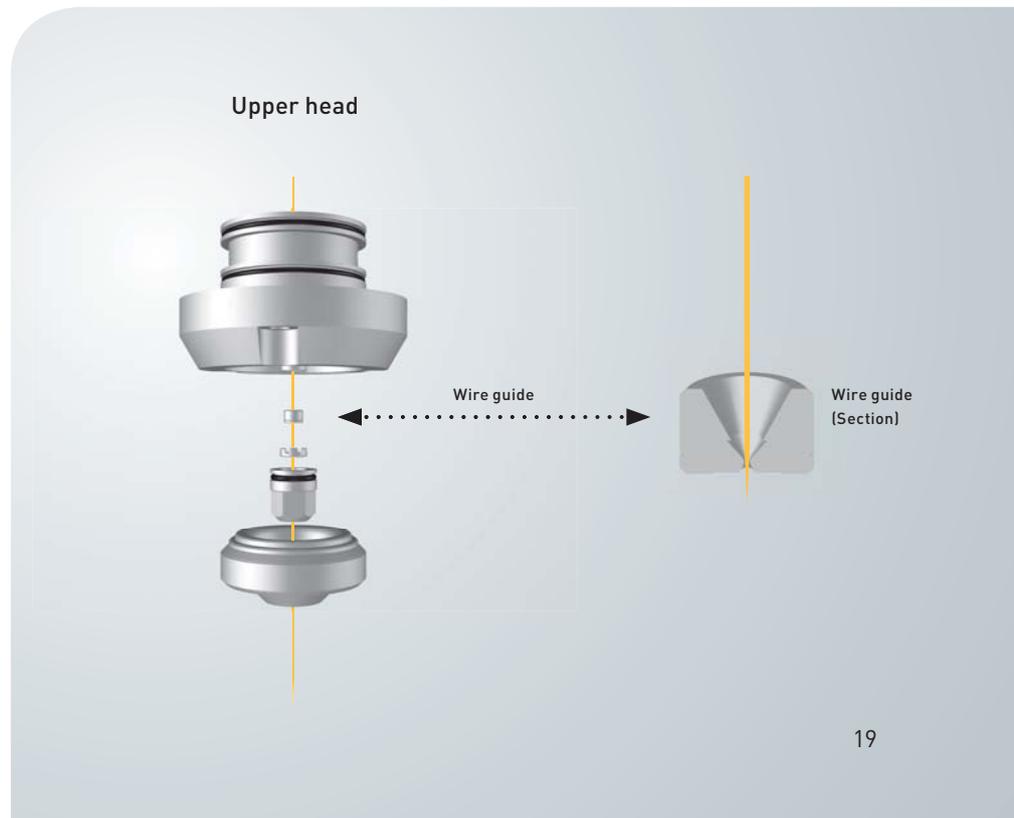


## The exclusive threading system for all types of wire

Automatic threading is rapid and reliable whatever the type of wire used: hard or soft brass, coated or not. The key to success lies in preparing the wire properly before threading. The wire is annealed and stretched over long distance. The thermal break leaves no burr and the tapered tip of the wire ensures reliable threading through the closed wire guides.

## Wire guide closed without clearance

The wire is exposed to considerable forces exerted by the injection, the sparks or inclination during machining in taper mode. To ensure a very precise trajectory of the wire in all conditions, Charmilles has developed diamond closed guides of the same diameter as the wire used.



# The CNC CT-Millennium



Liquid crystal touch screen

## The touch screen is efficient and user-friendly

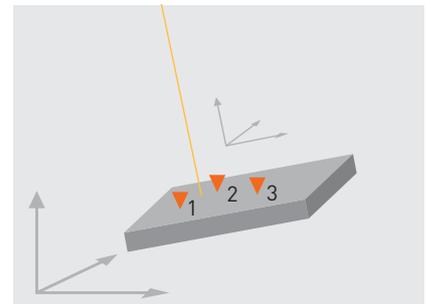
A powerful PC contains the most advanced technologies. Based on the Windows operating system, the machines are equipped with a 10 GB hard disk as standard, a PCMCIA port for a flash memory card as well as a CD-ROM drive. The touch screen allows for fast data entry and menu navigation of the CNC functions.

## Easy Windows based file management

The Windows operating system makes managing programs and technologies extremely simple. Like an office PC, files are organized by directory grouping together all the programs required to carry out a job.

## Measurement cycle, "3 Point Set Up"

The "3 Point Set Up" cycle of the CNC sets up the perpendicular wire alignment with the upper face on the workpiece. The "3 Point Set Up" cycle can be prepared on a Coordinate Measuring Machine (CMM) in order to gain time by preparing next machining in hidden time.



"3 Point Set Up"

## DSF (Dynamic Screen Function): assistance in images

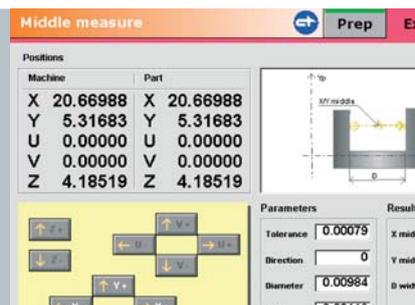
The new dynamic screen function (DSF) assists and helps the operator with set-up and references for the work to be performed. Drawings are animated in accordance with the parameters entered by the operator. For example, the injection nozzles can be adjusted without the risk of errors or damage to the workpiece.

## e-Doc: machine documentation always at your fingertips

The CNC contains intelligent and interactive documentation in HTML with the appearance of a website. The maintenance procedures help to prevent breakdowns and loss in machining performance. When an alarm is triggered, a detailed explanation and a clear procedure for resolving the problem are given instantly. The parts which have to be replaced are identified with pictures and part numbers.



File manager



DSF



e-Doc

## Communication possibilities



Connectivity to enhance productivity

The ROBOFIL CC machines allow the connection of a very wide choice of peripheral devices, for example by serial line or by integration of the machine into a LAN (Local Area Network). The functions for transferring files such as programs or machining technologies enable communication between the machines and the programming stations.

### e-Connect: remote notification

In order to ensure a maximum number of machining hours and increased flexibility, the ROBOFIL CC machines enable, due to their advanced numerical command, remote notification of messages or alarms. This notification is made by e-mail and can then be transferred by SMS (Short Message System).

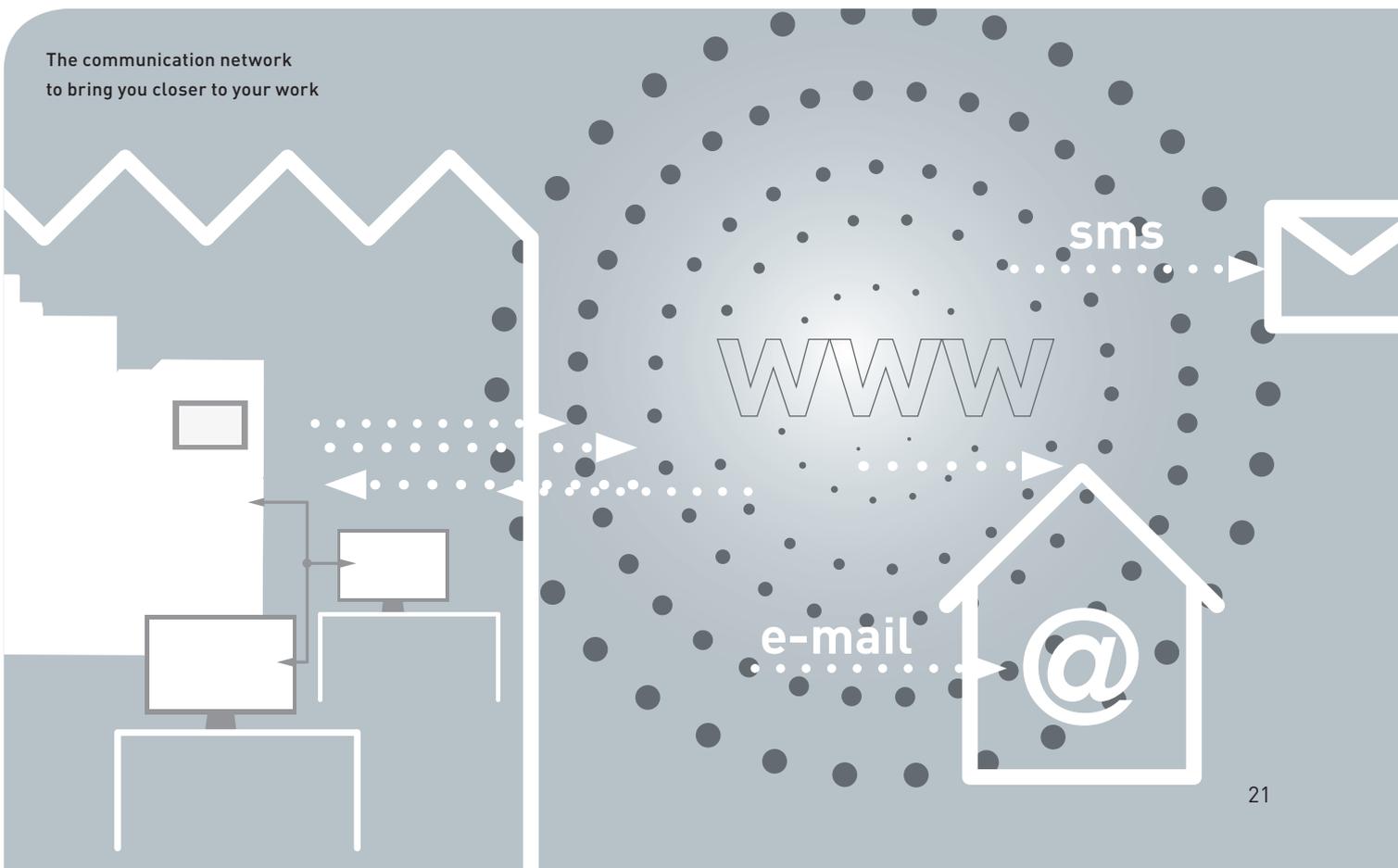
### e-Supervision: telemonitoring

In addition to remote notification, e-Supervision provides the possibility to see remotely the status of the ROBOFIL CC machines at any time.

### e-Control: remote management

This option combines all the functionalities of e-Connect and e-Supervision and also enables the machine to be controlled remotely.

The communication network to bring you closer to your work



# **EXPERT systems**

Charmilles expertise at the service of the operator

**CT-EXPERT, Charmilles expertise within your reach**

Designed to enable beginners to get the maximum benefit from their machine, CT-EXPERT selects the best machining settings, suggests the best wire, automatically calculates all the offsets and creates a command program linking the various machining sequences.



**PROFILE-EXPERT, mastery of fine details**

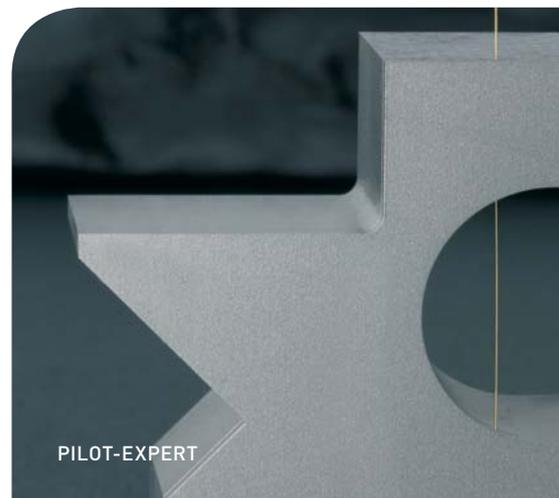
To ensure accuracy of sharp angles and small radii when roughing, PROFILE-EXPERT automatically adjusts the machining parameters and the wire tension during changes of direction. When finishing, it accurately adjusts the advance speed to ensure perfect geometry of the fine details. PROFILE-EXPERT needs no adjusting, does not modify the programmed path and is adapted to all part materials and heights provided in the Cutting Technology.

**PILOT-EXPERT, effective protection against wire breaks**

The PILOT-EXPERT software automatically optimizes machining speed depending on the shape of the part and the machining difficulty. The operator does not have to define any parameters. When the height of the part changes, the spark power is adjusted to maintain optimum cutting speed without breaking the wire. The machine can cut complex parts unattended.

**TAPER-EXPERT, mastery of large tapers**

The TAPER-EXPERT software enables high accuracy machining of tapers with an angle varying between 0 and 30°. It corrects the position of the wire in accordance with the angle in real time and during machining. Fine surface quality can be achieved similar to vertical machining.



PILOT-EXPERT



TAPER-EXPERT



## The range

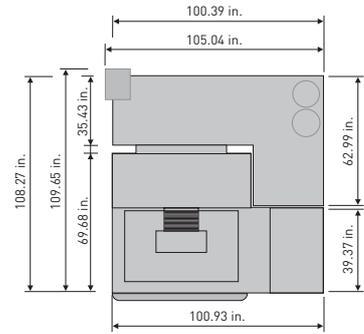
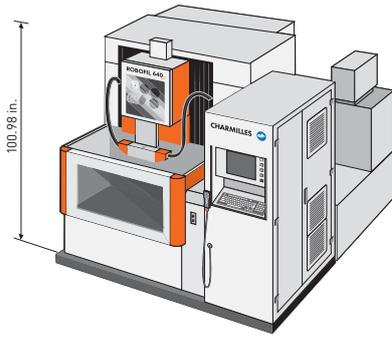




Three models, so you have the choice...



# Technical specifications



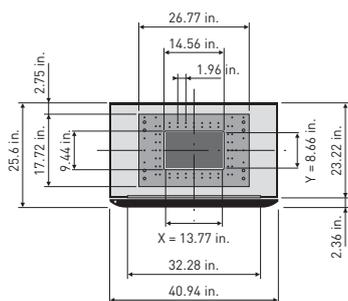
ROBOFIL 640 CC

		ROBOFIL 240 CC	ROBOFIL 440 CC	ROBOFIL 640 CC
<b>Machine</b>				
Type of machining		Submerged wire cutting	Submerged wire cutting	Submerged wire cutting
Dimensions of complete equipment (*)	in.	79.53 x 80.71 x 78.74	102.36 x 110.63 x 88.19	100.39 x 108.27 x 101
Total weight of equipment (without dielectric)	lbs.	5401	7275	13860
<b>Machining area</b>				
Max. workpiece dimensions (*)	in.	39.37 x 21.65 x 8.66	47.24 x 27.56 x 15.75	51.2 x 39.4 x 20.1
Front door dimensions	in.	32.28	40.16	53.1
Max. workpiece weight	lbs.	1653	3307	6600
Dimensions of table (**)	in.	26.77 x 17.72	35.43 x 23.62	48.8 x 31.5
Floor-to-table distance	in.	39.37	35.43	43.3
Total volume of dielectric	gal.	201	317	450
<b>X, Y, Z and U, V axes</b>				
X, Y, Z travel (*)	in.	13.77 x 8.66 x 8.66	21.65 x 13.77 x 15.75	31.5 x 21.65 x 20.07
U, V travel (**)	in.	13.77 x 8.66	21.65 x 13.77	31.5 x 21.65
Anti-collision protection (ICP)		Standard on 5 axes	Standard on 5 axes	Standard on 5 axes
<b>Taper machining</b>				
Max. taper (***)	°/in.	± 45/8.66 (± 30/8.66 standard)	± 45/15.75 (± 30/15.75 standard)	± 45/20.07 (± 30/20.07 standard)

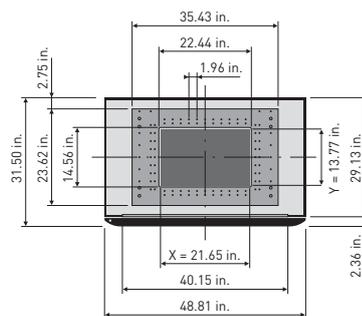
\* Width x depth x height

\*\* Width x depth

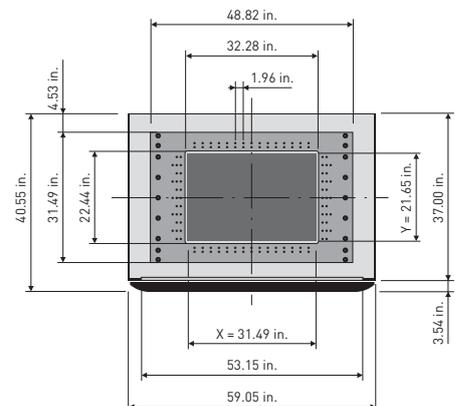
\*\*\* Option



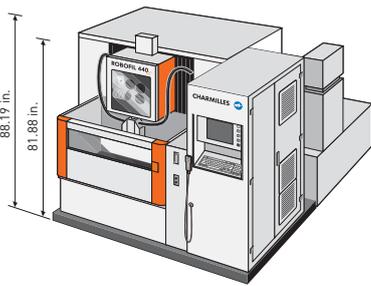
ROBOFIL 240 CC



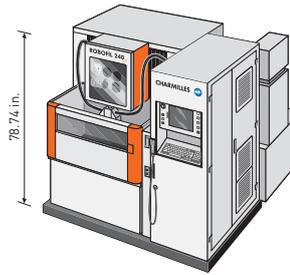
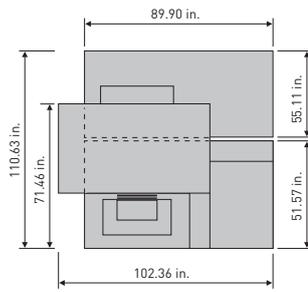
ROBOFIL 440 CC



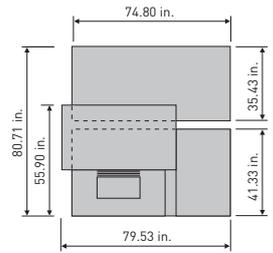
ROBOFIL 640 CC



ROBOFIL 440 CC



ROBOFIL 240 CC



ROBOFIL 240 CC / 440 CC / 640 CC

**Electricity supply**

Three-phase input voltage	V	380/400
Total electricity consumption	kVA	11

**Wire circuit**

Wire diameters available	in.	0.012 to 0.004
Type of wire guides		Closed diamond type without clearance
Permissible weights and types of reel (ISO standards)	lbs.	3.52 (K100) to 17.6 (K160), 55 standard on the ROBOFIL 640 CC
Permissible weights and types of reel (JIS standards)	lbs.	6.6 (P3) to 10 (P5)
Programmable wire tension	daN	0.3 to 3
Used wire processing		Built-in wire chopper
Automatic threading for wire	in.	0.012 to 0.004
Automatic rethreading for wire	in.	0.012 to 0.004

**Dielectric**

Paper filters		4 cartridges
Dielectric temperature variation	°F	± 2
Total volume of deionization resin	gal.	5.3
Max. injection pressure	bar	20

**CC high speed generator**

Protection against electrolytic effects		From roughing through to finishing
Cutting speed	in. <sup>2</sup> /hour	38 (SW33Xcc wire)
Min. finishing	µm Ra	0.2

**Numerical control**

Position measurement system	Linear glass scales
Measurement resolution	0.00002 in.
Servomotors	AC type
Architecture	PC multiprocessors
Operating system	Windows
Processors	Celeron
Screen	LCD 12" TFT
Data input	Touch screen
Keyboard	Standard alphanumeric, PC style
Remote control	Standard
Hard disk capacity	10 GB
Floppy disk	1.44 MB
CD-ROM	Standard
Ethernet, PCMCIA ports	Standard
Parallel, Serial ports	Optional

**NC functions**

File management
Extended ISO
Text editor
Graphic check
Measuring cycle
Manual mode
CT-EXPERT
Integrated documentation
Program execution
Information screens

**Options**

Large spools (240 CC or 440 CC)	lbs.	35.2 (K200), 55 (K250)
TAPER-EXPERT		
e-Connect, e-Supervision, e-Control		
Taper cutting	°	from 30 to 45

## Contact

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Agie Charmilles Group  
**+GF+**