

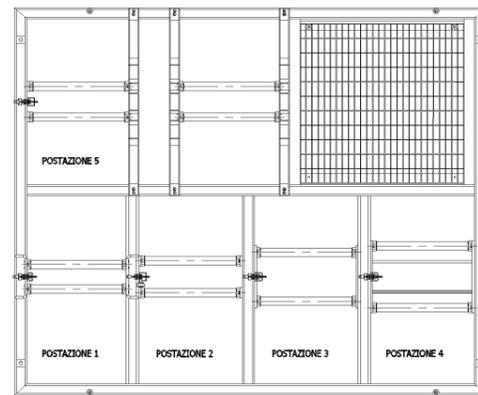


**Idroline waterjet
cutting system for
the production of
mechanical and
technological test
samples**

Case History
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Tenaris e R4T

Idroline™: an innovative system for producing technological test samples in record time

The usage of **Idroline** water jet cutting system, originating from Tecnocut state-of-the-art engineering and fully integrated in the factory manufacturing cycle, has confirmed its enormous potential in diversified industrial sectors, bringing in substantial advantages in terms of machining speed, operating accuracy, versatility and cost optimization. These pluses prove strategic also for workshops manufacturing technological test samples, whether operating directly within large-sized industrial realities or as independent facilities working as specialized servers for quality control businesses. When compared with traditional cutting systems **Idroline's** superiority immediately stands out for the cutting-edge and customized technological solutions that yield incomparable performance results in terms of efficacy and reliability.



Supporting equipment
Idroline is equipped with customizable supporting surfaces for loading several workpieces in one single positioning operation, among which tubes, tube sections and irregular-shaped materials.



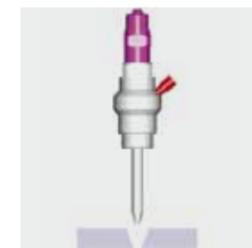
Control panel
The control station enables a fully personalized interface between operator and machining centre, thus ensuring an easy operation of the cutting system.



Machining centre structure
Idroline project developed by Tecnocut has taken great care in designing the machine structure too, in order to combine sturdiness and operating ergonomics in absolute safe conditions. The monolithic frame is equipped with a stainless steel tank and automatic doors to access the work area; it also offers the possibility to load/unload the machinable workpieces from two sides simultaneously. The system handling is operated by a pinion-and-rack transmission guarded by a labyrinth-type casing.



Cutting head
The machining centre is equipped with a five-axis cutting head characterized by IKC technology and a surface contact feeler; it is possible to carry out inclined cutting operations and check groove tapering automatically.



Traditional three-axis machining



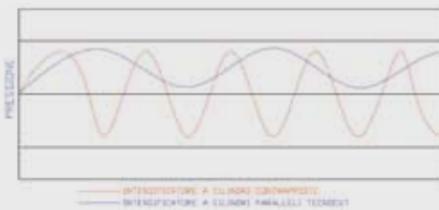
IKC technology

4 Minutes

In just 240 seconds **Idroline** water jet technology enables cutting a sample perfectly, even in the most challenging situations.

The intensifier **Jetpower**™ for the most demanding users.

Jetpower high-pressure intensifier is the **Idroline** system component that makes all the difference in determining the performance superiority of the system when compared to traditional cutting machining centres. The innovative technological contribution provided by **Jetpower** meets the needs of the most demanding users, among whom the workshops attending to the manufacture of test samples. Jetpower is equipped with 3 independent, parallel and electronically-synchronized pressure multipliers. This enables relying on constant pressure without using a high-pressure tank, thus avoiding the typical failures of traditional twin-opposed-cylinder intensifiers.



Pressure multiplier

It is driven by 3 independent, parallel and electronically-synchronized cylinders to gain a constant pressure level and minimize maintenance needs.



Hydraulic unit

A forefront technological system, with variable-flow hydraulic pumps and reduced consumptions. Attention for eco-sustainability is evident from the air/oil exchanger that dispenses with any typical cooling water request of traditional pressure intensifiers.



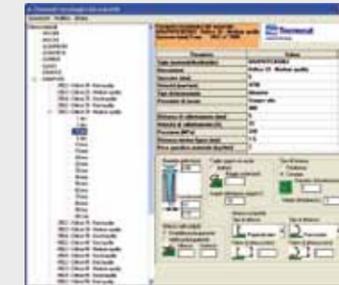
Control panel

PLC controller of all intensifier functions, with the possibility of excluding the pressure multiplier from the operating cycle when in need of servicing.



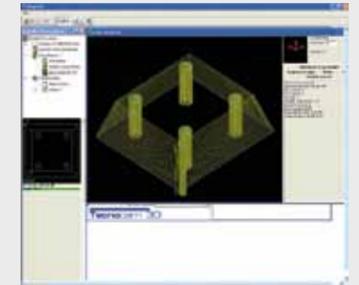
Tecnocam™ software: ideal interface for testing centres.

Idroline system avails itself of an especially user-friendly and highly effective software directly designed by Tecnocut. **Tecnocam** is a dedicated CAM software implemented for managing water jet cutting system technology fully and accurately. It is Windows-environment based, as a result of Tecnocut's long-term experience in the field; it enables interfacing with the most diversified design software packages on the market, among which those used by workshops specializing in manufacturing samples for technological test activities and testing laboratories.



Rational and intuitive interface

The software generates a screen diagram for the operator with all useful parameters for positioning and cutting supervision.



Tecnocam database stores the technological parameters of most commonly used water jet cutting materials, among which tubes and tube sections. The cutting speed can be adjusted according to the single profiles making up the templates in order to reduce machining time. The cutting diagram management is supervised by a user-friendly interface that provides information relating to the positioning data by means of a graphic view of the workpiece, any cutting-specific technological data and the production estimate, subdivided into cutting costs and material costs.

VERSATILE EFFECTIVENESS THAT EASILY FITS ANY WORKSHOP NEEDS

3 excellent reasons for using **Idroline** in a testing department.

WORKING TIMES SLASHED BY 50%

The technical-application features of **Idroline** system and the water jet cutting potential decrease sample timing drastically by up to 50% when compared to traditional methods. **Idroline** is a wearless robot.

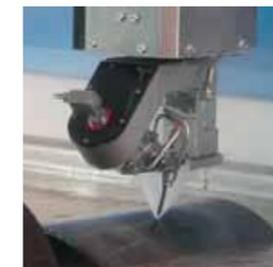
ONE SINGLE POSITIONING

The special supporting equipment offers the advantage of concurrent positioning mixed-diameter tubes, tube sections and irregular-shaped materials to cut. One single positioning enables reducing the machining centre cutting time noticeably: this will take place in the preset sequence and modes.



Total process control

In teamwork with Tecnocam dedicated software, **Idroline** technology enables managing full control of the system more effectively and safely.



NO MECHANICAL AND THERMAL ALTERATION OF THE SAMPLES

The samples that are obtained by water jet cutting appear in excellent conditions for carrying out the next tests: **Idroline** technology does not affect the sample with any mechanical and thermal alteration whatsoever.

Whilst this is a real risk for traditional systems when slowing down the manufacturing process, as any alterations will have to be made up for with suitable workpiece treatments.

1 operator only

Idroline means rationalizing the work process inside the workshop and optimizing working times as well as any control-related resources.



Idroline plays the leading role in Tenaris authoritative testing centre.

THE CUSTOMER'S NEEDS

Tenaris Dalmine is the leading Italian manufacturer of seamless steel pipes for the energy, car-making and mechanic industry, with a yearly productive capacity of 950.000 tons of finished products, over 2500 employees and 5 plants in Italy. Worldwide Tenaris employs almost 25,000 workers in various subsidiaries and production units. Thanks to an integrated global network of production units, research & development laboratories and customer service facilities, it meets the needs of its customers by providing highly effective products for the most diversified operating environments. Tenaris' constant commitment to Research & Development turns into new product design, steadfast improvement of existing products and optimization of production processes, in order to meet the strictest standards and suit the most complex applications. Over 200 scientists



The treated materials

17.2 to 711 mm-diameter seamless pipes, made of carbon steel and alloyed. The production also includes tapered posts, made out of seamless pipes, for power lines and electric-drive contact lines. Hot-finished and cold-finished, medium- and large-sized, high-concentricity seamless pipes. Cold-finished welded seamless pipes, measuring 12 to 273 mm in diameter, made of carbon steel and alloyed up to P91 and X20 degrees.



and engineers work side by side in the 4 research centres of the company. Tenaris also cooperates with first-rate external research & Development centres, product testing laboratories and prestige international universities. The testing department that is based in the historic premises of Dalmine and well integrated with the R&D centre generates an impressive turnout: over 7,000 samples each month, with peaks of 7,800/8,000. For this reason the testing department lays particular stress on those technological developments that afford remarkable abatement in sample manufacturing time and guarantee maximum outcome dependability. Tenaris has found in Tecnocut **Idroline** system a peculiarly effective answer to all of its special needs.

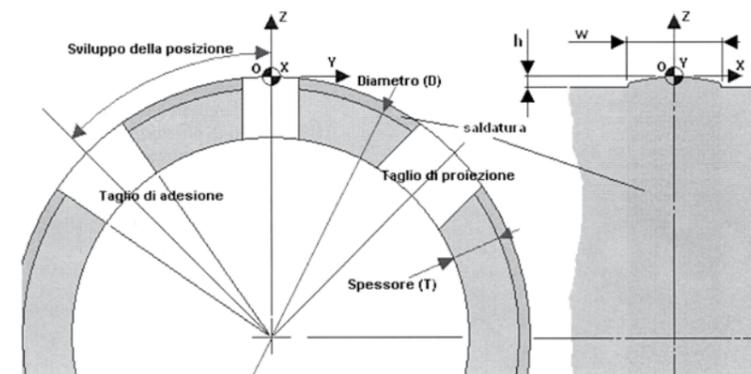


7 thousand samples per month

The testing department provides about 7,000 samples for the internal testing laboratory each month: CMS Idroline machining centre cuts 1/3 of such samples.

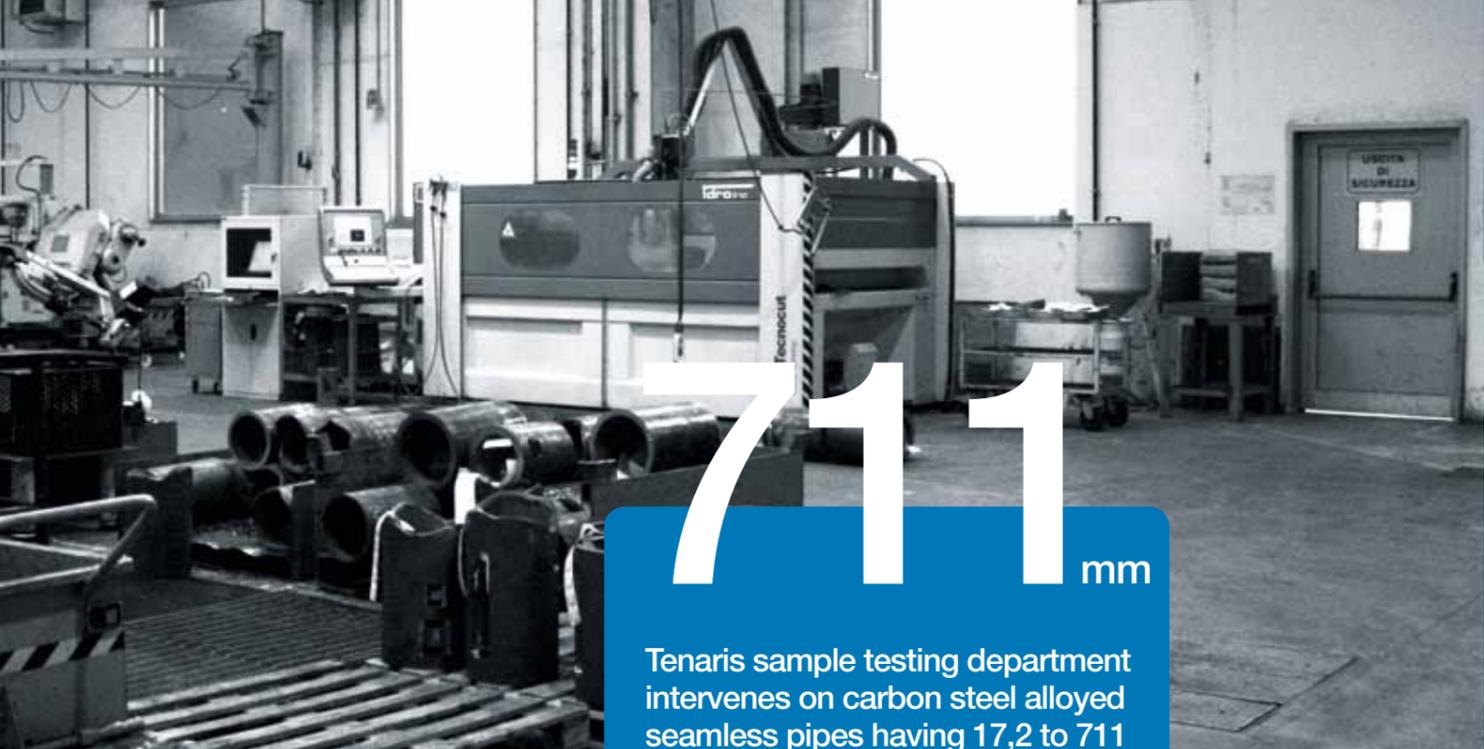
Cutting diagram

The cutting of samples of tubes, bottles, sectors or tube sections is carried out according to the diagram shown in the figure below. The origin of the onboard developing and cutting drawing has the X axis parallel to the tube axis and lies on the tube-tangent horizontal plane, whose Z position represents Z=0 of the movements. X=0 coincides with the left head of the tube. A sample is cut in B-axis constant-inclination mode; identical inclination is maintained for the axis of the template to cut.



The testing centre

The new R&D Tenaris centre, inaugurated in November 2008 in Dalmine over an indoor surface of 2,800 square meters, performs also the functions of the sample testing department and testing laboratory. The Centre specializes in hot-rolling process testing and in mechanic production development. Along with several national and international universities, it works in close touch with the Material Development Centre in Rome. At present the Centre takes in almost 70 technicians and operators, busy with production testing and specific research projects. It also coordinates R&S activities involving production processes, quality and engineering issues, modelling, process and system control. This Centre ranks among the greatest laboratories of the kind in Europe.



711 mm

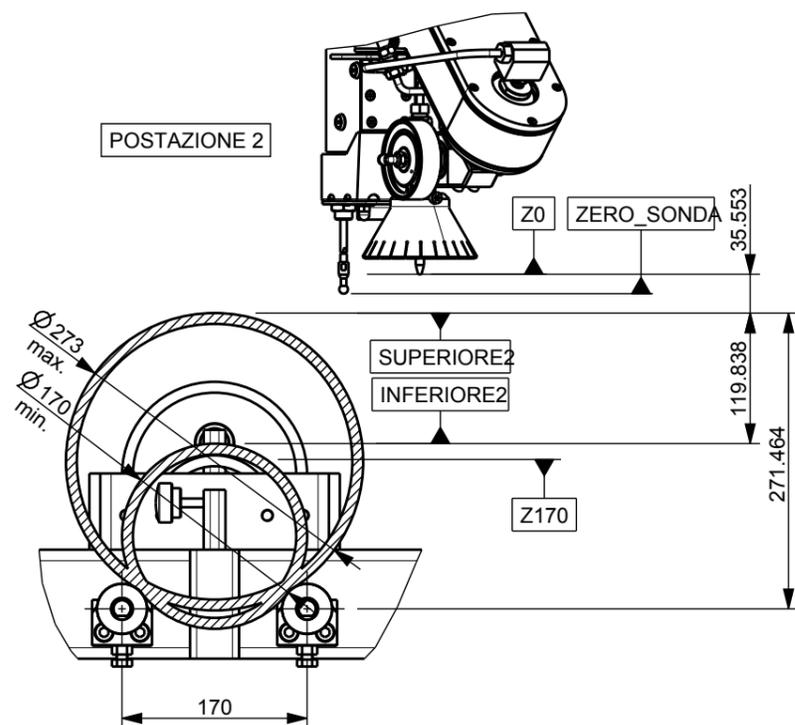
Tenaris sample testing department intervenes on carbon steel alloyed seamless pipes having 17,2 to 711 mm diameter.

IDROLINE INTEGRATION INTO TENARIS PROCESS

A special application software has been developed by Tecnocut for Tenaris testing centre; such software abides by the standards of the corporate ICT system. Actually the machining centre interprets the vectorial file of each sample to cut, applies the cutting technology associated with the database-resident material, generates the ISO file, acquires the tube diameter datum by means of a feeler probe and finally, with the measured dimensions, adjusts the Z movements automatically. Lastly, it waits for cutting completion and erases the corresponding file. Such systemic integration has enabled Tenaris to embed **Idroline** system within its own workflow without changing any parameters or other elements of the ICT complex internal organization. Moreover, the system ensure complete and accurate traceability of each workpiece undergoing sample-purpose cutting.

Positioned tube

This diagram shows how to position a range of tubes loaded onto the supporting surface of an **Idroline** machining centre and the cutting head positioning procedure.



The treated materials

17.2 to 711 mm-diameter seamless pipes, made of carbon steel and alloyed. The production also includes tapered posts, made out of seamless pipes, for power lines and electric-drive contact lines. Hot-finished and cold-finished, medium- and large-sized, high-concentricity seamless pipes. Cold-finished welded seamless pipes, measuring 12 to 273 mm in diameter, made of carbon steel and alloyed up to P91 and X20 degrees.

ACHIEVEMENTS

After few months' work inside Tenaris technological testing department, **Idroline** system has fully confirmed the customers' expectations.

Relevant evidence of this high level of satisfaction is provided by Tenaris thinking about introducing **Idroline** system in other workshops of its plants all over the world.

The system fits in the testing centre working cycle perfectly and also cuts down on related

downtimes and costs for test-ready samples. **Idroline** major achievements stand out when compared to traditional machinery: with **Idroline**, times and costs have been sizeably cut back, thus allowing to meet Tenaris production requirements better, in particular as regards seamless pipe productions (even in case of 600 mm thickness and over).

Idroline's unquestionable superiority over more traditional systems stands out by considering the results of samples cutting in Tenaris workshop.

Technological/mechanical testing typology	Material typology	Material thickness			
		s<10mm	10<s<20	20<s<30	s>30
Analysis	Hard	+++	+++	++	+++
	Medium	+++	+++	++	+++
	Soft	++	-	-	++
Hardness	Hard	++	+++	++	+++
	Medium	+++	+++	+++	+++
	Soft	++	+++	+++	+++
Resilience	Hard	+	+	-	++
	Medium	++	+	+	++
	Soft	++	++	+	++
Traction	Hard	+	+	++	+++
	Medium	++	++	+	+++
	Soft	++	++	+	+++

Legend	
+++	Best value for money in terms of time/costs
++	Excellent value for money in terms of time/costs
+	Good value for money in terms of time/costs
-	Uneconomic

A strategic technology for R4T as a partner of Exova's.

THE CUSTOMER'S NEEDS

R4T is a manufacturing company specializing in the supply of technological test samples realized on the customer's advice and with suitable specifications for testing laboratory needs. Its workshops at Bagnolo Mella (BS) and Villamarzana (RO) are busy helping the customers by entering into a matter-of-fact operational alliance and working in a spirit of a truly positive technical-application partnership. For this reason they are constantly on the move to achieve solutions for the global and targeted optimization of sample cutting processes, in order to reduce machining times and ensuing costs, without jeopardizing the quality of workmanship and results. This is exactly what is required by a customer like Exova, the most important independent material testing laboratory in Italy. Established in 1979 as an L.P.T. (Technological Testing



Alliance for quality

This picture, shot at Tecnocut plants in Levate (Bergamo), shows Rodolfo Giussani and Luca Cantoni from Exova during the final functional test of the Idroline machinery that will be used by R4T to manufacture the samples for Exova's technological tests.

Laboratory) this reality was taken over in 1995 by Bodycote MAterials Testing Group Ltd and is now part of a worldwide famous laboratory group. The Group is currently active in Great Britain, USA, Canada, The Netherlands, Norway, Sweden and the Middle East. It represents an authoritative reference point for testing and trials in the following industrial sectors: aerospace, building, civil-defence engineering, energy, environment, metallurgy, pharmaceutical engineering, plastics, telecommunications, electronics and transport.

Exova offers a complete machinery testing service, as well as chemical-physical and morphological property testing on various types of materials: ferrous and non-ferrous metals, welded component parts, cement and other building materials, plastic materials, polymers and composite materials, electronic component parts.

These tests are carried out in con-



2 synergistic companies

Using **Idroline** system optimizes a cooperative dialogue based on service quality.

formity with rigorous quality procedures and also with national, international and customers' standards; a quick and accurate service is also guaranteed.

The teamwork with R4T ensures top efficiency and precision levels in the production of samples, which are supplied on the basis of strict timing. Exova carries out normalizing heat treatments, quenching, solution heat treatments, hardening and tempering, drawing back and ageing. In the field of mechanical tests, besides performing traditional tensile and bending tests, it carries out fatigue and fracture mechanics tests on samples measuring up to 100 mm thickness.



Approval and satisfaction

During their visit of Tecnocut plants, the two technicians from Exova could realize **Idroline's** performance superiority directly, above all in respect of cutting timing with Tecnocut technology.

R4T's business

R4T - "Ready for Test" carries out accurate mechanical machining of test tubes for technological testing laboratories; it operates in compliance with ISO 9001:2000 quality standards. It offers a complete production range of test tubes for mechanical, chemical-physical, corrosion, fracture mechanics, metallographic and fatigue tests on various types of metals. Integration into the customer's logistics chain through flexible work plans, fixed timing, service of material reclaim and processed test tube delivery are the pluses of R4T's offer that have greatly contributed to its fast-growing presence on the market. R4T's mission is the making of technological test samples in compliance with the International standards or the customers' requirements, while ensuring an accurate service in a very short time.



400 tests per day

R4T'S activity is organized at a whirlwind pace, each day operating on large-sized and markedly-welded tube sections.

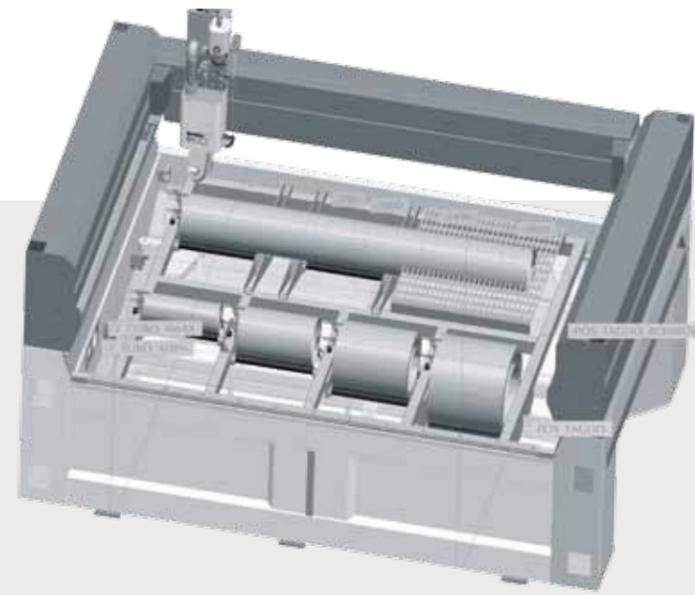
ACHIEVEMENTS

By adopting **Idroline** system in its workshop, R4T could verify the advantages of this innovatory technology immediately. Cutback in timing for the production of one single sample implies a more effective and competitive answer from R4T to customers like Exova, in constant search for quality and efficiency combination. The ability of cutting tube sections characterized by marked and extensive welding at top speed and accuracy turns into the advantage of accepting even the most demanding and exacting job orders without any problems. Much appraised by R4T technicians and staff is also the sample traceability feature, that is made possible by an engraving operated by the water jet system on each cut detail. **Idroline** appears like a compact and safe machining centre, easily controlled by any

operator. Owing to the use of **Idroline** system R4T staff could meet the requests of customers like Exova in the best possible way, their needs being firmly related to sample workmanship accuracy, outcome precision and speed in certification issue.



Technical data



	Model		
	1720	1740	2040
Asse X	2000 mm	4000 mm	4000 mm
Asse Y	1700 mm	1700 mm	2000 mm
Asse Z	250 mm (150 mm with 5-axis head)	250 mm (150 mm with 5-axis head)	250 mm (150 mm with 5-axis head)
Asse A	600°	600°	600°
Asse B	+/- 60°	+/- 60°	+/- 60°
Bearing surface	2700x2050 mm	4600x2050 mm	4600x2050 mm
Overall dimensions	4700x2300x h 3700 mm	6400x2300x h 3700 mm	6400x2600x h 3700 mm

Speed: 0 → 40000 mm/min
 15" TFT colour screen, membrane keyboard with built-in mouse
 External port for USB key interface
 Computer network connection: RJ45 10/100 Mb connector

		Model	
		Jetpower evo 60 hp	Jetpower 120 hp
Power	Kw	45	90
Multipliers	n°	3	6
Max operating pressure	Mpa	413,7	413,7
Max water flow	l/min	5	9
Max outlet diameter	mm	0,40	0,50
Voltage	400V +/- 5% 50-60 Hz (different voltages and frequencies on request)		

CMS Tecnocut, a CMS Industries brand, **is one of the most authoritative** reference realities in the industrial field of water jet cutting technology. Tecnocut guarantees its **presence in 120 countries** and ensures growingly-articulated solutions to the most diversified production needs. Besides, its presence in AIW (Italian Waterjet Association) as a charter member and in **WJTA (American Waterjet Association)** as an ordinary member is for Tecnocut a guarantee of permanent updating. A sound and flexible corporate structure, a team of professionals capable of yielding excellent solutions and introducing exclusive and innovative technological devices. This is the added value that Tecnocut offers its customers every day.



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