CNC - 5 AXIS MACHINE

Many industries today, especially in the high-tech world of aerospace and automotive design, are turning to 5-axis machining as a means to speed manufacturing ability and increase repeatable accuracy. The ability to machine complex shapes, undercuts and difficult angles in a single setup reduces tooling cost and labor time, resulting in a better cost per part, in addition to maintaining parts conformity throughout the part run.

VF-6SS PRODUCT OVERVIEW

Super-Speed Vertical Machining Center; 64” x 32” x 30” (1626 x 813 x 762 mm), 40 taper, 30 hp (22.4 kW) vector drive, 12,000 rpm, inline direct-drive, high-speed 24+1 side-mount tool changer, 900 ipm (22.9 m/min) X rapids, 1200 ipm (30.5 m/min) Y & Z rapids, automatic chip auger, programmable coolant nozzle, colorremote jog handle, 1 MB program memory, 15” color LCD monitor, USB port, memory lock keyswitch, rigid tapping and 95-gallon (360 liter) flood coolant system.

VF-6SS		
TRAVELS	**S.A.E.**	**METRIC**
X Axis	64 "	1626 mm
Y Axis	32 "	813 mm
Z Axis	30 "	762 mm
Spindle Nose to Table (~ min)	4 "	102 mm
Spindle Nose to Table (~ max)	34 "	864 mm
TABLE	**S.A.E.**	**METRIC**
Length	64 "	1626 mm
Width	28 "	711 mm
T-Slot Width	5/8 "	16 mm
T-Slot Center Distance	4.92 "	125.0 mm
Number of Std T-Slots	5	5
Max Weight on Table (evenly distributed)	2000 lb	907.2 kg
SPINDLE	**S.A.E.**	**METRIC**
Max Rating	30 hp	22.4 kW
Max Speed	12,000 rpm	12,000 rpm
Max Torque	90 ft-lb @ 2000 rpm	122 Nm @ 2000 rpm
Drive System	Inline Direct-Drive	Inline Direct-Drive
Taper	CT or BT 40	CT or BT 40
Bearing Lubrication	Air/Oil Injection	Air/Oil Injection
Cooling	Liquid Cooled	Liquid Cooled
FEEDRATES	**S.A.E.**	**METRIC**
Rapids on X	900 in/min	22.9 m/min
Rapids on Y	1200 in/min	30.5 m/min
Rapids on Z	1200 in/min	30.5 m/min
Max Cutting	833 in/min	21.2 m/min
AXIS MOTORS	**S.A.E.**	**METRIC**
Max Thrust X	3400 lb	15124 N
Max Thrust Y	3400 lb	15124 N
Max Thrust Z	3400 lb	15124 N

VF-6SS		
TOOL CHANGER	**S.A.E.**	**METRIC**
Type	SMTC	SMTC
Capacity	24+1	24+1
Max Tool Diameter (adjacent empty)	5 "	127 mm
Max Tool Diameter (full)	3 "	76 mm
Max Tool Length (from gage line)	11 "	279 mm
Max Tool Weight	12 lb	5.4 kg
Tool-to-Tool (avg)	2.3 sec	2.3 sec
Chip-to-Chip (avg)	3.2 sec	3.2 sec
GENERAL	**S.A.E.**	**METRIC**
Air Required	4 scfm, 100 psi	113 L/min, 6.9 bar
Coolant Capacity	95 gal	360 L
Machine Weight	21000 lb	9526 kg

Computer Numerical Control (CNC) machines are automated milling devices that make industrial components without direct human assistance. They use coded instructions that are sent to an internal computer, which allows factories to fabricate parts accurately and quickly. There are many different types of CNC machines, ranging from drills to plasma cutters, so they can be used to make a wide variety of parts. Though most are used industrially in manufacturing, there are also hobby versions of most of the machines that can be used in private homes.

TYPES OF MACHINES

The most common CNC machines are milling machines, lathes, and grinders. Milling machines automatically cut materials, including metal, using a cutting spindle, which can move to different positions and depths as directed by the computer instructions. Lathes use automated tools that spin to shape material. They're commonly used to make very detailed cuts in symmetrical pieces, like cones and cylinders.

Grinders use a spinning wheel to grind down materials, and mold metal or plastic into the desired shape. They're easy to program, so they're usually used for projects that do not require the same precision as mills or lathes. Besides these, there are also CNC routers, which are used to make cuts in a variety of materials; as well as computer programmable 3D printers; and turret punches, which are used to make holes in metal or plastic. This technology can also be used with different types of cutters, including those that work with water, lasers, and plasma.

PROGRAMMING AND OPERATION

The code used to program CNC units is generically called G-Code. It contains information about where parts of the machine should be positioned, and tells the machine exactly where to place a tool. Other instructions tell the machine additional details, like the speed a part should run at; how deep it should cut, burn, or punch; and the angle of an automated tool. Most modern industrial CNC machines are tied into a network of computers, and receive operating and tooling instructions via a software file.

ADVANTAGES AND DISADVANTAGES

In an industrial setting, CNC machines can be combined into entire cells of tooling machines that can operate independently of each other. They are often driven by completely digital designs, which eliminates the need for design blueprints to be physically drawn up. Many are capable of running for several days without human intervention. In fact, some are so sophisticated that they can contact the operator's cell phone and send an alert if a malfunction occurs. These automated features make it possible to produce thousands of parts with minimal supervision, and free the operator to perform other tasks.

Besides this, a CNC machine can form parts with a level of precision that is nearly impossible using older tools. In a conventional factory, workers must control different tools by hand, and errors are common, but a machine can perform the same task without becoming tired, and can work non-stop. This saves a lot of time, and the improved accuracy can help eliminate waste, since there are less faulty parts that have to be thrown away.

Despite their advantages, CNC machines are more expensive than older types of machines, which can make them unaffordable for smaller operations. They're also expensive to repair and maintain. Also, though they do limit the potential for errors, they don't eliminate it entirely, since operations can still program or operate the machine incorrectly. Additionally, these machines need to be operated by a skilled workforce with a specific type of training, which may not be available in all areas.

DEVELOPMENT

CNC machines have evolved considerably since their initial introduction into the manufacturing industry. The earliest ones received code instructions through hard-wired controllers, which meant that the programming format could not be altered. Later models were programmed via mainframe cables and floppy disks, which permitted variations in programming. Modern ones can be operated by software files found on CDs, USB drives, or sent over a network.