



# LARGE AREA THERMOPLASTIC 3D PRINTERS

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# LARGE AREA COMPOSITE 3D PRINTERS

We manufacture the largest 3D printers  
in the APAC region.

## VSF Large Area Composite Additive Gantries

CNC Design proudly presents our state-of-the-art solution for Additive Manufacturing of large parts, precisely tailored to cater to the unique requirements of industries such as Construction, Aerospace, Mining, Defence, and more. Our VSF Composite gantry-based systems have gained worldwide acclaim as some of the largest 3D printers, integrating unparalleled capabilities in Additive Manufacturing and 5-Axis Machining into a single machine.

## CNC Design Company Profile

Established in 1984, CNC Design is one of ASEAN's leading companies in advanced manufacturing technologies for CNC Machine Tools and Large Area Gantries. The company employs more than 160 people in Australia and SE Asia. In 2020 we created our VSF brand for our Large Area Concrete and Composite printers and large 5 axis gantry milling machines. This is now an established and trusted name in the large scale additive industry. Our comprehensive range of gantry-based robots for 5-Axis machining, 3D printing, and robotic handling and coating applications have become the preferred choice for businesses seeking advanced manufacturing solutions. As a leading supplier of the large 3D printers in the APAC region, CNC Design stands at the forefront of delivering cutting-edge technology and manufacturing excellence. Our Virtual Smart Factory platform seamlessly merges the power of Industry 4.0 with 5-Axis machining for large-sized parts, offering exceptional performance at a cost-effective price point..





The VSF large-scale 3D printing solution offers a fully digital production process designed to enhance productivity and shorten production time.

Ideal for applications such as jigs, plugs & moulds, and structural or decorative end-parts, this solution serves multiple industries.

Utilising a wide range of reinforced thermoplastic materials, it is engineered to meet diverse application requirements.

## VSF 3D Printing Solution

### Hybrid System

The VSF system combines Large Scale 3D printing with 5-axis high speed milling in a single integrated Manufacturing Centre.

### Pellet Extrusion

VSF uses extrusion based Additive Manufacturing with a large print bead width from 5 mm to 50mm. Fiber-reinforced thermoplastic polymer pellets are melted and extruded in precise-layers to form a unified structure.

### 5-Axis Machining

3D printed parts are machined to precision tolerances and high surface finish, the printed near net shape component. VSF is a high performance 5-axis milling system.



Aerospace



Marine



Defence



Construction



Automotive



Design



Renewable Energy

## KEY ADVANTAGES

### VERSATILITY

Tailor the VSF System to match your specific needs. Whether you require a 5x5m printer or a 22m dual bridge hybrid system, we provide configurations to suit your application perfectly.

### FLEXIBILITY

With the ability to print vertically and at 45°, and compatibility with a variety of materials, including PA, PP, PESU, PEI, PET, ABS, and beyond, the VSF system offers unparalleled flexibility in operation.

### QUICK ROI

Thanks to its high print speeds, ultra-energy-efficient material dryer, and low maintenance costs, the VSF System assures a swift return on investment. Its speed, efficiency, and cost-effectiveness make it a valuable asset in your operation.

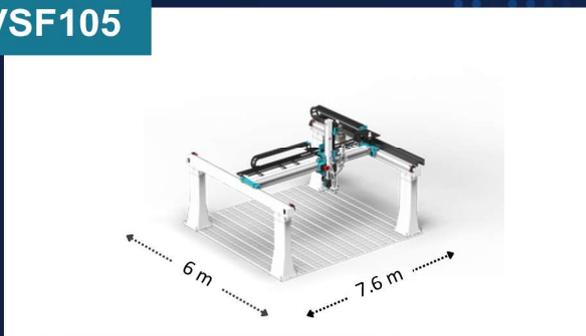


VSF 3D printers are high-performance gantry-based machines, combining high dynamics with high precision. For the drive train ground racks and low backlash planetary gearboxes are used to ensure precision, dynamics and reliability along with minimal maintenance effort. The VSF machine is modular and can be configured to precisely meet your application requirements.

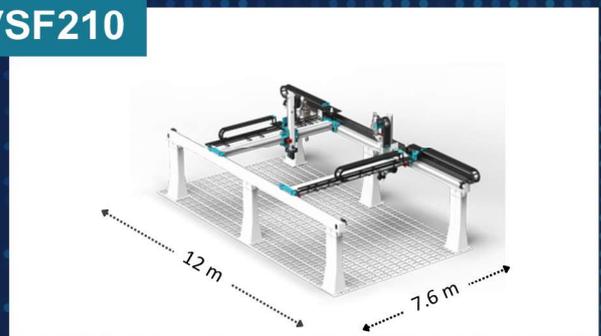
MACHINE	VSF105	VSF210	VSF216	VSF222
Print Area	5m x 5m	10m x 5m	16m x 5m	22m x 5m
Max Print Hight	1.6m Std, 3.2 m Option			
Maximum Speeds	X: 60m/min, Y:60m/min, Z: 40m/min			
Axis Repeatability	X/Y/Z: 0.1 mm			
Configuration	Single Bridge Printing/Milling	2 Bridges for simultaneous Printing & Milling		
Combined Bridge Printing/Milling	Standard	Optional		
Printing Bridge	Optional	Standard		
Milling Bridge	Not available	Standard		

## Single and Dual Bridge Systems

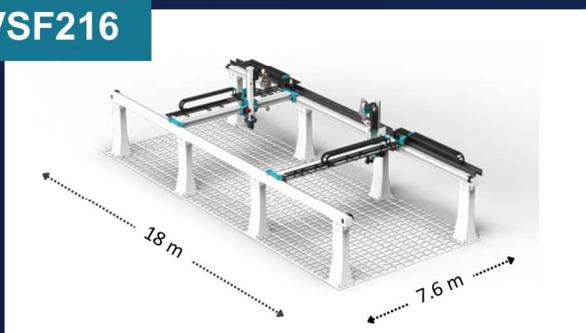
**VSF105**



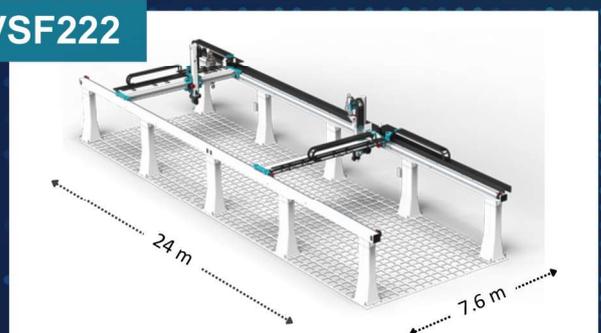
**VSF210**

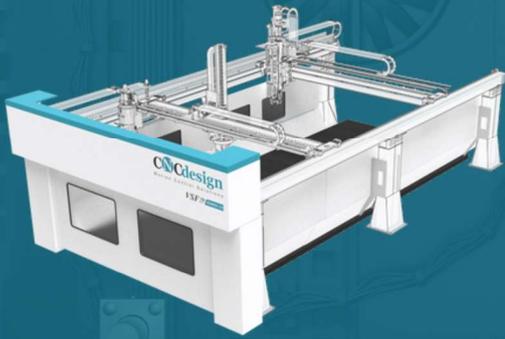


**VSF216**



**VSF222**





The fencing around our VSF large area 3D printers is configurable to align with your overall factory layout and part logistics. We include sliding doors for convenient access and windows in the panels for external monitoring of the printing- or milling process, aiming to create a balanced work environment combining highest safety standards with operational efficiency.

## Front Access Configuration

The **Front Access Configuration** features a vertical sliding panel at the front and/or the back, offering access for setup and moving parts in or out of the machine.

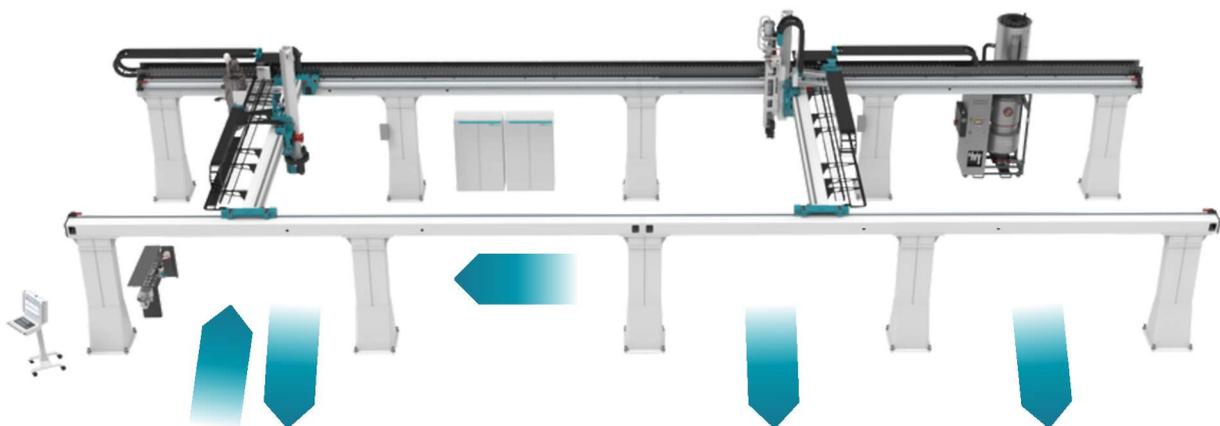


## Side Access Configuration

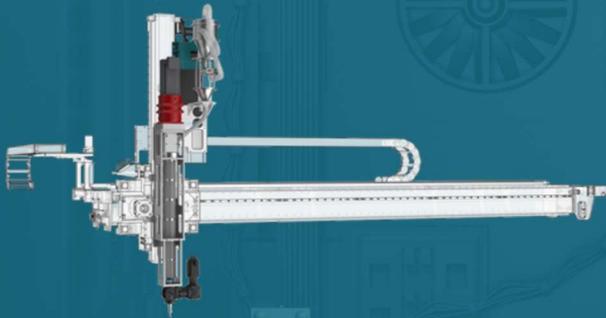
The **Side Access Configuration** allows for the efficient movement of parts through sliding side panels, facilitating seamless transitions in your workflow.

Additionally, the machine is designed to shift parts internally from printing to milling, streamlining multi-stage operations.

To further enhance productivity, we offer the option to establish multiple safety zones. This feature enables parallel operation and setup, allowing you to fully capitalise on the machine's capabilities.



**Customized Fencing and Access to Streamline Material Flow Into, Out of, and Within the Machine**



Our VSF 3D printing technology features a high-performance pellet extruder capable of handling a wide range of different materials.

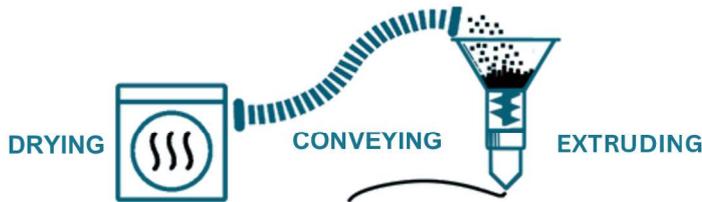
With super fast printing speeds and accurate process control and monitoring, this system is designed to significantly enhance productivity and reduce production time across various applications and industries.

## VSF-Extruder

**High performance pellet extruder for a wide range of different materials**

- Super-fast print speeds for efficient production
- Perfect for mid-sized to large prints
- Multiple, individually accurately controlled heat zones. Parameters set up based on recipes for a given print strategy and material (see VSF Print Assistant)
- Accurate process control and monitoring for high-quality printing (see VSF Print Cockpit)

## Material Conveying System



Extruder	VSF-E30	VSF-E60
Max Throughput	45kg/hr	150kg/hr
Screw Size	30mm	60mm
Heating Zones	3 for Barrel + 1 for 45° Nozzle	6 for Barrel + 1 for 45° Nozzle
Cooling Zones	1 for feed-cooling	
Melt Pump	None	Optional
Temperature Range	up to 420° C	
Nozzles	3-15mm	5-30mm
Rotary Compression Roller	Optional	

## VSF Material Dryer

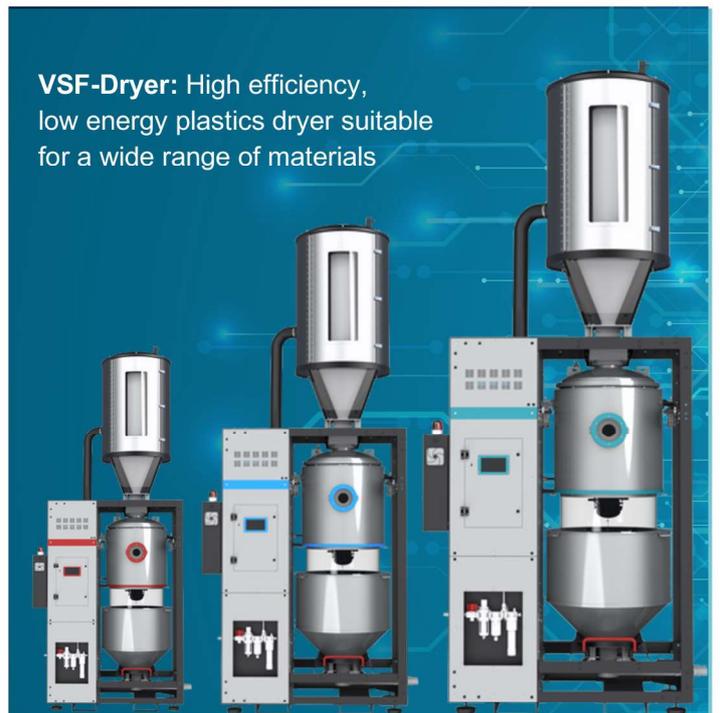
Many materials used for printing are hygroscopic and need drying prior to the print to ensure first class results. VSF machines integrate an energy efficient vacuum drying technology that guarantees excellent results for a big range of materials covering different drying requirements. Depending on the required capacity, different models are available.

Key benefits:

- Unique energy efficient vacuum drying technology
- Fast return on invest due to very low drying costs
- Faster drying, faster start-up, minimal maintenance

DRYER	VSF-D70	VSF-D120	VSF-D340
Sizes	Suitable for E30	Suitable for E30	Suitable for E60
Principle	Quick and Energy Efficient Vacuum Drying		
Capacity	50kg/h	100kg/h	300kg/h
Start-Up Time	4-10 times faster compared to Desiccant Dryer, dep. on Material		
Max Temperature	176°C		
Hopper Volume	70L	120L	340L

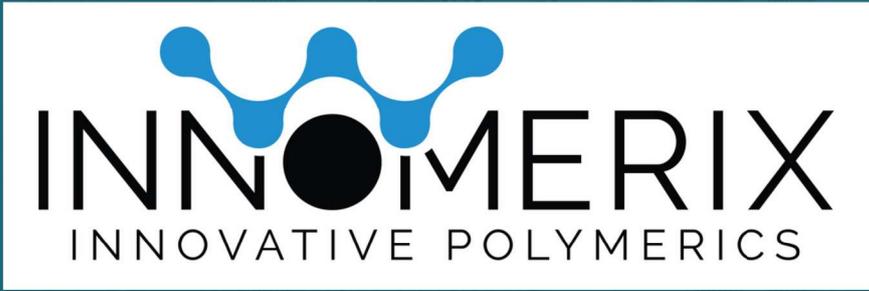
**VSF-Dryer:** High efficiency, low energy plastics dryer suitable for a wide range of materials



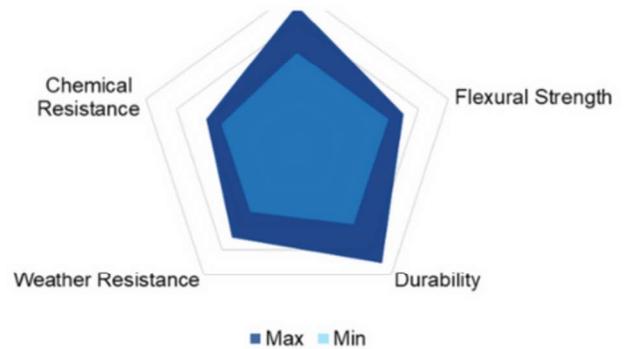
# Thermoplastic Materials

For Sustainable  
Additive Manufacture

[www.innomerix.com](http://www.innomerix.com)



CNC Design subsidiary **Innomerix**, located in Melbourne, Australia, compounds and sells composites for 3D printing, extrusion and injection moulding applications. This enables us to offer our customers the advantage of local supply. Innomerix also develops specific materials for customer applications. Examples of our additive materials in table below. Refer to Innomerix Web Site [www.innomerix.com](http://www.innomerix.com)



Glass Fiber reinforced Materials	
PETG with 30% GF	Great Printability, good machinability, high dimensional stability, High Tensile strength, the gold standard for 3D printing
PP with 30% GF	Moderate Printability, good machinability
PPr with 30% GF	Moderate Printability, good machinability
HDPE with 30% GF	Moderate to good printability, good machinability, high strength
TPU with 30% GF	Good printability, good machinability, high impact resistance
Carbon Fiber reinforced materials.	
PETG with 20% CF	Great Printability, good machinability, high dimensional stability, High Tensile strength, the gold standard for 3D printing
HDPE with 20% CF	Moderate to good printability, good machinability, Electrically Conductive.
ABS with 30% CF	Good Printability, good Machinability, requires fume extraction

## Recycled Additive Materials

Sustainability is at the forefront of our thinking for additive manufacture. We offer additive materials with recycled PP or HDPE.

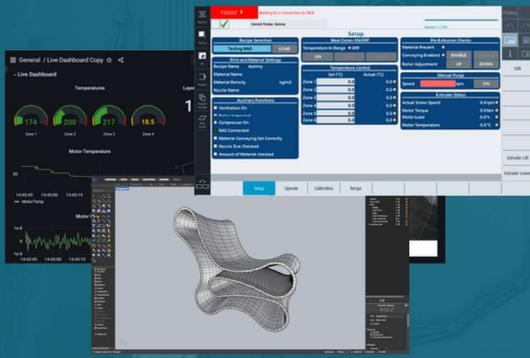
In addition it is possible for our customers to source locally available recycled thermoplastics and we can provide a masterbatch to combine with this for printing.



The design of VSF 3D Software Tools are based on the principles:

- **Ease of Use** - best user experience, eliminate operator errors
- **First Time Right** - Identify and eliminate problems prior to print
- **Minimise Waste** of Time, Energy, and Material

Guaranteed Quality - Predictable and Repeatable Prints  
Process Monitoring and Quality Assurance  
Easy to master Workflow from Design to Production



Large scale 3D printing is a complex technology that requires many process parameters to play together accurately to guarantee high quality prints. Drawing from years of expertise, we've crafted VSF Recipes, which are sets of proven process parameters. VSF Recipes are seamlessly integrated into our user-friendly SW Tools supporting your workflow from Design to Print for ease of use.

**The use of VSF Recipes reduces complexity and leads to high-quality prints at ease.**

VSF Recipes are an open platform and allow modification by the user. This ensures you have a dedicated location to save your constantly growing experience.

## VSF CAM & Print Assessment

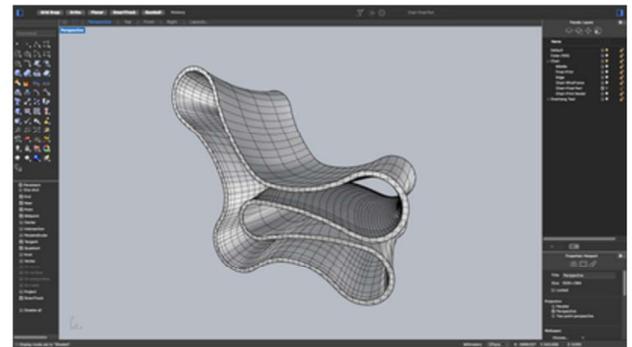
VSF Programming uses Rhino3D CAD as the front end, which enables to read a wide variety of file types. Rhino3D also allows to design or modify parts. The CAD model is the turned into CNC program cycles for 3D printing and 5 axis machining with our VSF CAM system software.

Additional tools are provided to asses the parts and mark areas of critical overhang to judge the printability of the part.

## VSF Print Assistant

Given a CAD model, the VSF Print Assistant performs a quick pre-print assessment of parameters relevant to your print. The assessment includes: Printing Time, Material Usage, Feasibility of the Print and Cost estimate based on print time and material usage

The assessment is performed based on a chosen VSF Recipe. The later use of this recipe for the setup of the VSF printer guarantees that printing is executed according to pre-print optimization and at the best achievable quality.



Print Strategy		Recipe: ABS 45/15.8	
<b>Material</b>		GRF ABS	
Density [kg/m3]	1280		
Cost per kg [AUD]	8		
<b>Part Dimensions</b>			
Min Layer Length [mm]	1650		
Max Layer Length [mm]	1650		
Average Layer Length [mm]	1650		
Height [mm]	1500		
Number of Layers	333		
<b>Print Speed</b>			
Layer Time [s]	60		
Feed-Rate [mm/min]	1650		
Flow-Rate [cm3/min]	117.0		
Output-Rate [kg/h]	9.0		
Print-Time [h]	5.6		
<b>Material Volume</b>			
Material Volume [cm3]	38985		
Part Weight [kg]	49.9		
<b>Material Cost [AUD]</b>			
Machine-Cost [AUD/h]	100		
Labor-Cost [AUD]	0		
Print Cost [AUD]	9		
<b>Total Cost [AUD]</b>	<b>408</b>		
<b>Print Validation</b>		Value	Limit
Max Print Speed	1650.00	6000.00	✓ 0.73
Min Print Speed	1650.00	100.00	✓ 15.50
Max Overhang (straight)	0	30.00	✓ 1.00
Max Overhang at positive R=50	0	50.00	✓ 1.00
Max Overhang at negative R=50	0	10.00	✓ 1.00
Max Overhang at positive R=100	0	40.00	✓ 1.00
Max Overhang at negative R=100	0	20.00	✓ 1.00
Max Overhang at positive R=200	0	35.00	✓ 1.00
Max Overhang at negative R=200	0	25.00	✓ 1.00
<b>Print OK</b>			✓ 0.73
Max Overhang at positive Rmax		Curvature is supporting Overhang -> cone	
Max Overhang at negative Rmax		Curvature is countering Overhang -> Inver	

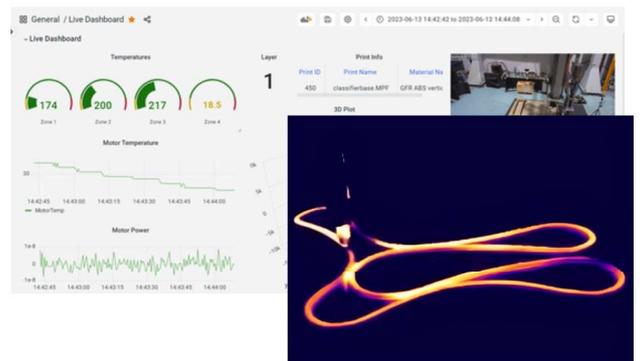
## Process Monitoring & Data Logging

To track print-quality, relevant process data is continuously logged.

**VSF Print Cockpit:** Web-based live dashboard of relevant process parameters including the integration of web-cams

**VSF Print Report:** A summary of process parameters for one print to support quality assurance

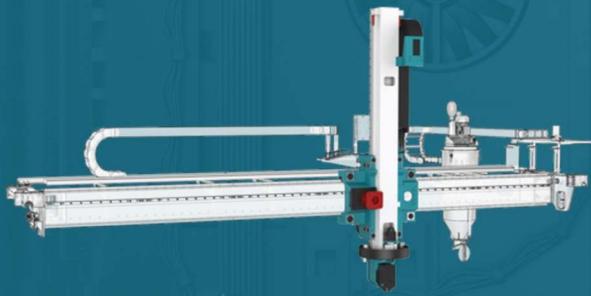
**VSF Thermal Monitoring:** Integration of thermal camera. Real time print speed adjustment based on material surface temperature.



VSF is a high performance 5 axis CNC milling system.

The use of HSD high speed milling spindles and 5 axis milling heads in combination with leading-edge Siemens SINUMERIK ONE CNC controls leads to outstanding machining performance.

Options include tool changers, part and workpiece probing and swarf and dust vacuum systems.



Siemens SINUMERIK ONE's **Digital Twin** technology, offers a cutting-edge solution in CNC systems by harnessing the power of digitalisation and simulation to boost manufacturing productivity and effectiveness. It fully supports part program simulation, evaluation, and refinement, in addition to providing operator training on a virtual platform. The efficiency is backed by precise and rigid 5-Axis head, complemented by a range of tools and options tailored to suit your application requirements.



## Milling Head, Tools and Tool-Rack

5 Axis Milling Head HS673	A-axis		C-axis
Travel	±120°		±360°
Positioning Accuracy	60 arcsec		60 arcsec
Max Speeds	135°/s		135°/s
Max Torque	1030Nm		1030Nm

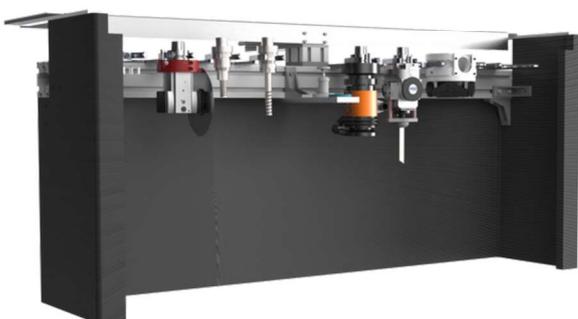
  

Spindle ES779	10 kW	15 kW	22 kW
Spindle Speed	24,000 RPM	24,000 RPM	24,000 RPM
Spindle Power	10kW	15kW	22kW
Toolholder	HSK63F	HSK63F	HSK63F
Swarf Extraction 7kW	Optional	Optional	Optional



Rack for automatic tool-change for 4 to 8 pockets. incl. Touch Probe and Tool Setting Probe

### ATTACHMENTS (OPTIONAL )



ROTARY BLADE  
SAW



RECIPROCATING  
KNIFE



ORBITAL SANDING  
HEAD

# SINUMERIK CNC Systems

Industrial CNC system for  
reliability and performance



VSF systems are driven by Siemens SINUMERIK, the world's leading CNC system for advanced manufacturing. SINUMERIK is used to control all functions on our VSF systems including CNC Program execution, axis machine movements, control logic, extruder control and safety systems.

SINUMERIK has many advantages against PC based controls. It is industrially hardened, with long term parts availability, and meets the safety standards for operation of Industrial equipment. Service and spares are available worldwide.

## SINUMERIK ONE – the digital native CNC

SINUMERIK ONE Features:

- Drive- and panel-based modular CNC
- Multi-technology CNC
- Up to 31 axes/spindles and any number of PLC axes
- Up to 10 simultaneous machining channels
- Up to 24" multi-touch colour display
- SIMATIC S7-1500F PLC



## SINAMICS S120 DRIVES & SIMOTICS AC motors

Siemens SINAMICS AC servo drives and SIMOTICS AC servo motors are supplied for each of the machine axes and extruder. These are high performance industrial systems.

SIMOTICS servo motors for the machine axes have integrated absolute encoders.

SIPLUS 4300 heating control systems are used for smart PID control of all extruder heating zones with real time optimisation.



# SINUMERIK Embedded HMI

Customised operator screens  
for easy operation



## Operator Support Screens for 3D printing

SINUMERIK ONE Operate interface is well proven in industry for milling. We have developed and integrated customised pages to support 3D printing for Set Up, Operation, Calibration and Recipe management. Relevant print data is displayed while you print.

The screenshot displays the SINUMERIK ONE Operate interface with several customised screens for 3D printing. The top bar shows 'Current Recipe: GFR ABS 45deg 22/3.5' and 'Version 1.1.216'.

**Operation Screen:**

- Position:** X: 347.086 mm, Y: 32.851 mm, Z: 9.992 mm, A: -89.999 deg, C: 89.999 deg.
- Temperature Control:** Set (°C) vs Actual (°C) for Zone 1 (170.0/170.3), Zone 2 (182.5/186.3), Zone 3 (185.0/185.6), and Zone 4 (190.0/200.8).
- Cooling:** Feed Chiller (ON/OFF), Roller Chiller (ON).
- Extruder Override:** Override factor: 0.800.
- Feedrate:** 1282.500 mm/min.
- Extruder Status:** Actual Screw Speed: 25.1 rpm, Motor Torque: 5.7 Nm, Motor Load: 9.0%, Motor Temperature, Material Present.
- Print Program Status:** Program Duration: 00:57:05 h.

**Current Recipe Screen:**

- General Recipe Info:** Recipe Name: GFR ABS vertical 14/4.5, Author: Dominique, Notes: vertical print.
- Temperature Control (°C):**

Zone	Default	Min	Max	Warning	Error
Zone 1	180.0	140.0	250.0	+/- 10.0	+/- 20.0
Zone 2	200.0	150.0	250.0	+/- 10.0	+/- 20.0
Zone 3	220.0	150.0	280.0	+/- 10.0	+/- 20.0
- Print Settings:** Nozzle Name: Straight M30, Max Feedrate: 6000 mm/min, Max Layer Time: 90 s.
- Material Properties:** Name: INX10010 GFR ABS 30, Density: 1280.000 kg/m<sup>3</sup>, Supplier: Innomerix, Notes: some Notes.

The interface includes navigation buttons for Setup, Operate, Calibration, and Recipe, and a bottom bar with Accept and Cancel options.

## Recipe Management – rapid set up of print data

All print data is stored as a recipe in an edge device. This includes material type, extruder zone temperatures, extruder calibration curves, maximum feedrate, maximum layer times and more, Recipes can be given simple text based names. Just select the one you want and all printing set up data for the material you have chosen is loaded into the CNC system ready to run your print job.

If you buy materials from our subsidiary Innomerix we supply this recipe ready to run optimised for that specific material.



Digitalisation of the manufacturing process is at the heart of our VSF systems (Virtual Smart Factory) giving you Industry 4.0 performance.

### Digital Twin

Siemens SINUMERIK **Digital Twin** technology, offers a cutting-edge solution by harnessing the power of digitalisation and simulation to boost manufacturing productivity and effectiveness. It fully supports part program simulation, evaluation, and refinement, in addition to providing operator training on a virtual platform.



### Collision Avoidance – Protect MyMachine

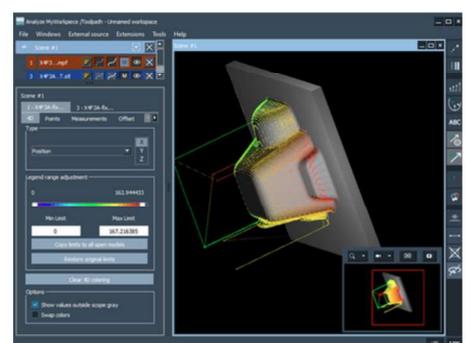
OUR VSF Composite systems are ideal for 5 axis milling of large parts and moulds, such as those used in aerospace or boat building industries.

We offer SINUMERIK ONE Protect MyMachine as an option to help prevent collisions with parts, fixtures and machine elements such as spindles and tooling. Several versions are available depending on your production process. This is real time monitoring on your machine which works in automatic, MDI and jog modes.



### Analyse MyWorkpiece Toolpath

Large 5 axis parts are expensive and SINUMERIK “Analyze MyWorkpiece /Toolpath” PC tool enables a systematic search for the causes of quality defects in freeform surfaces before you machine a part. Visualisation tools enable you to see the actual surface milling speed at every point on the machined surface. This guarantees quality assurance, even before the first machining trial

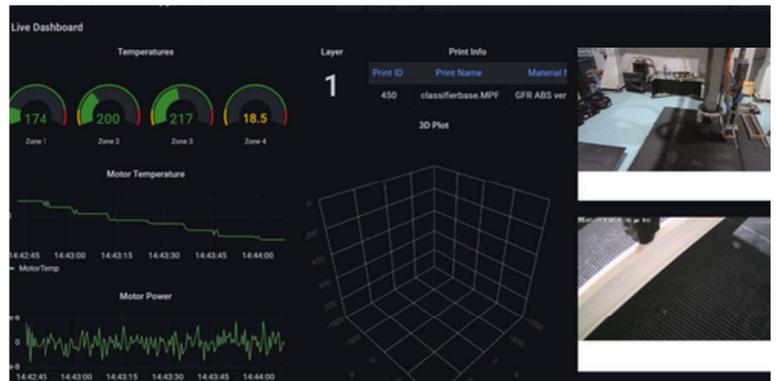




Digitalisation of the manufacturing process is at the heart of our VSF systems (Virtual Smart Factory) giving you Industry 4.0 performance.

### Industry 4.0 – VSF Dashboard

VSF Dashboard can be viewed from anywhere via a web browser and shows a complete real time picture of the print status and printing parameters.. This enables unmanned remote monitoring of the print 'process. Very useful for long print runs.



### Industry 4.0 with Edge Device

Allows users to view the print process via two or more IP cameras and to record print process data. Axis positions, CNC part program block numbers and process variables such as print speed, bead width are stored with time stamp. The data is stored on a **Edge Device** and enables retrieval, analysis, display, and replay. Data can also be extracted for external analysis.



### ROS Interface

For VSF systems with SINUMERIK ONE, we offer an optional ROS interface, for transfer of real time data and motion commands between the SINUMERIK ONE and a **ROS** system.

This enables integration of robots and other devices with VSF. We supply a PCI card (CP1616) to mount in the customer's supplied PC.





## Safety Standards

The safety controls are designed to keep the operator safe, and the machine safe from collisions or damage and use the latest standards for industrial safety with robotics. The machine control is implemented using Siemens Safety Integrated for industrial safe motion control. Our machines are rated to Safety Category 2 or 3 / PL d. We provide a detailed safety risk assessment for the machine and design the safety controls accordingly using SIL2 / PL d or greater safety devices including monitoring switches, safety bumpers and safe limited speed modes when an operator is present.

**Standards used in the assessment process include:**

**Risk and hazard analysis:**

- ISO12100, Safety of Machinery
- ISO14121, Iterative risk reduction
- ISO13849, Performance level risk assessment and validation

**Overarching design principles:**

- IEC61508, Functional safety relating for PLC systems
- IEC60204, Safety of electrical equipment for machines design principles

**Hardware selection:**

- EN 61000-6-4:2007, EMC directive

**Safe Control:**

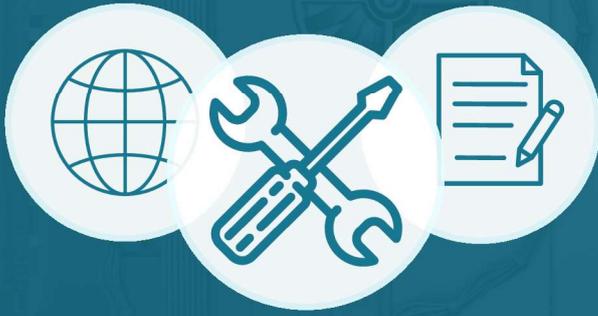
- IEC60204-1, Safe servo control functions including safe stops.
- IEC61800-5-2, Safe position and limited speed control.
- ISO 10218-2, Safety for industrial robots ISO/TS 15066, Safety for collaborative robots

## Safety Enclosures

VSF systems can be provided with Safety Enclosures, depending on the customer site and application.



# Service and Local Presence



We provide timely, local support,  
reinforcing our commitment to  
your success.

## Our technicians are by your side all over the world



Installation



On-site  
assistance



Remote  
Customer  
Care



Spare  
Parts



Preventative  
Maintenance



Training



Engineering



★ Head Office

◆ Partners

● Company Branches



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