

# Vapormatt | Leopard

Overview, technical specifications  
and options



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## Overview

The Vapormatt Leopard machine has been designed to clean, polish andpeen hard-to-handle aerospace components. With the machine's unique and patented doughnut sump, the Leopard is much cheaper to install than alternatives where a pit may be required to be dug into workshop floors.

### There are two configurations available:

The fully automated Leopard Vertical is well suited for production and overhaul facilities requiring high levels of throughput when processing taller components.

Our Leopard Horizontal wet blasting system offers a semi-automatic process specifically for heavy/large components, the components are mostly processed automatically, and any touch-ups are to be manually completed by an operator.

Ultimately the Vapormatt Leopard machine is bespoke with a range of options to suit the needs and processing requirements of the end user.

### Key features

The machine's highly advanced and designed technical features results in the following benefits:

- Fully automated, saving on processing time and labour
- A variety of configurations with the ability to suit a diverse range of applications
- Large working envelope to handle large items
- Highly effective filtration system to ensure high levels of purity within the system
- Complete controllability and repeatability
- Customised clamping solutions designed for all component's sizes and shapes
- Full process monitoring and feedback of crucial process data and parameters

## Industries and applications

Thanks to the Leopard's robust and highly efficient build and its incredibly consistent reproducible processing, it is well suited for providing a range of applications to aerospace components.

### Industries

- Aerospace
- Composites



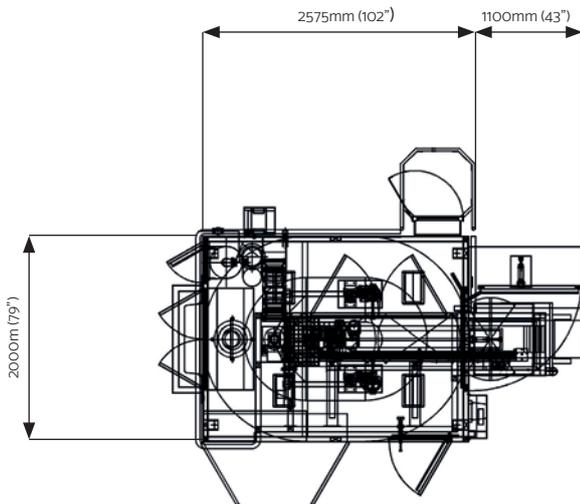
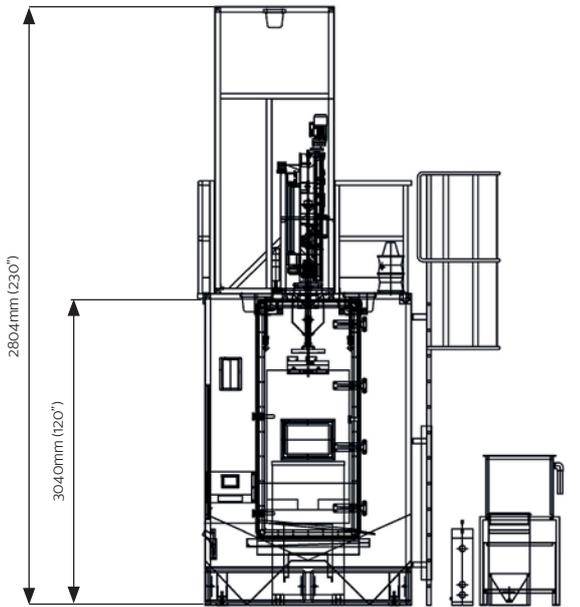
### Applications

- Cleaning and crack detection
- Component cleaning
- Paint removal
- Creation of a reactive surface for coatings or bonding
- Titanium scale removal
- Shot peening

# Configurations

## Leopard Vertical

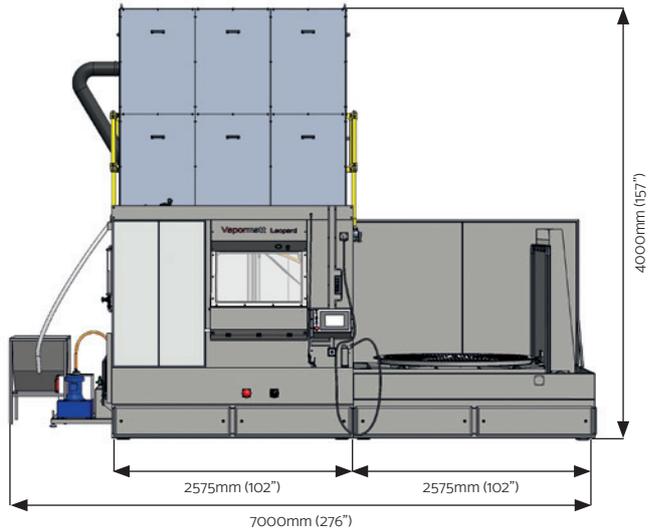
The Leopard Vertical is designed with tall components in mind and with its large access door and patented doughnut sump both configurations have a low-level load height. The machine is fitted with a vertical and horizontal oscillation unit. The machine can be fitted with or without a turntable, or an oscillation system that can be combined with the turntable. The Leopard Vertical is capable of manoeuvring components so that the blast nozzle distance and angle remain approximately constant as it makes use of a Raster scan movement to travel across the component. The movement and manipulation of the axes are programmed via the Human-Machine Interface (HMI) and powered by servo motors to increase the accuracy and speed of blasting. The machine and processing specifications can be fully tailored to the end



user needs. The machine footprint is subject to change.

## Leopard Horizontal

The Leopard Horizontal's robust build is designed to handle heavier/larger aerospace components. A powered trolley is provided so that the turntable can slide out onto the load end, allowing customisable low-level loading options, thanks to the patented doughnut sump. A radial motion is used to process the components, this motion is controlled and programmed via the HMI. In addition to a manual blasting option, the machine is fully bespoke so its many optional



## Leopard Vertical processing description

- Components will be held in specifically designed tooling
- The blast guns will be positioned and set up to ensure maximum coverage of the surfaces to be processed
- The operator loads the component
- A recipe is selected on the HMI which is automatically transferred to the Programmable Logic Controller (PLC)
- Operator presses start and the cycle begins
- The nozzles traverse the components following the pre-programmed locus
- During processing the machine monitors all parameters to ensure consistency: Slurry pressure, blast air pressure, airflow, abrasive concentration / abrasive to water ratio (optional)
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- After processing a complete rinse cycle is carried out, removing most abrasive media from the cabinet and component
- The machine stops and the operator opens the door
- Components are turned to process the other side of the component (dependent on selected options)
- Components can be manually rinsed and dried if required
- Operator unloads the components



## Leopard Horizontal processing description

- Operator opens the main door and moves the turntable to the load station (powered movement)
- Components are loaded into their positions on the turntable
- Operator drives the turntable back into the machine (powered movement) and closes the door
- Operator selects the correct process recipe on the HMI for the loaded components
- The machine automatically wet blasts and cleans all components in the machine following the sequence in the selected recipe
- During the auto cycle the process can be viewed through the window which has a water wash and wiper on demand
- After the blast cycle an automatic rinse of the components is carried out
- Operator opens the main door and moves the turntable to the load station
- A secondary manual rinse and drying operation can be carried out if required
- Components are unloaded from the turntable

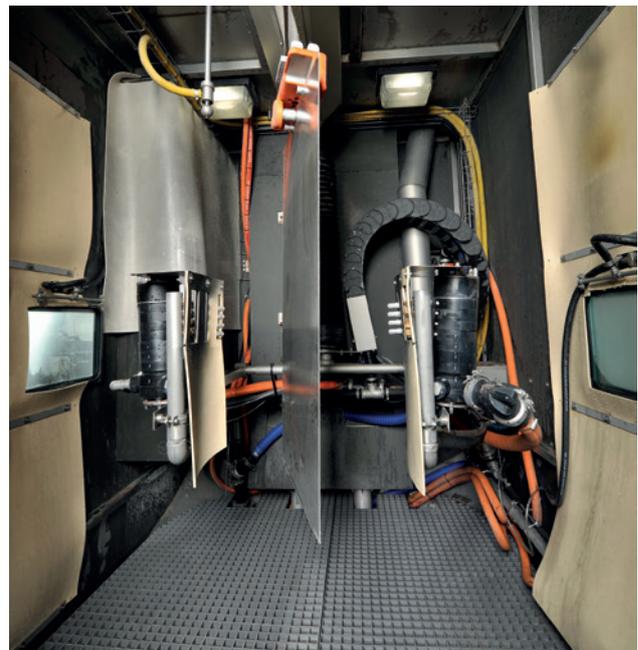


## Technical specification

The following features are included within the machine's basic specification.

Feature	Description
1	<p><b>Blast cabinet</b></p> <p>Constructed from welded stainless steel with abrasion-resistant lining.</p> <p>The main blast enclosure has a viewing window and comes with a wash bar to allow observation of the equipment when in use.</p>
2	<p><b>Cabinet roof access (Process dependent)</b></p> <p>A fixed caged ladder and a handrail around the roof of the machine is provided for maintenance access.</p>
3	<p><b>Sound attenuation</b></p> <p>Maximum noise level of 80dBA.</p>
4	<p><b>Component processing turntable (Process dependent)</b></p> <p>A stainless-steel automatic turntable 1 – 10 RPM is powered by a servo motor. A plastic turntable protection mat is provided. The turntable adjusts the component so that the area being processed is approximately normal to the blast stream.</p>
5	<p><b>Abrasive slurry system</b></p> <p>The slurry system incorporates 2 Vapormatt 50mm (2") 5.5 kW vortex pump fitted with slurry pressure monitoring and control system to facilitate recipe creation.</p> <p>The slurry is pumped through a series of abrasion resistant hoses and solid polyurethane components from the unique Vapormatt slurry pipework system.</p>
6	<p><b>Swing out pumps</b></p> <p>The Leopard pumps are mounted on a removal mechanism which allows the pump to be withdrawn from the machine's sump and worked on 'in situ' without the need to remove the pump from the machine completely.</p>
7	<p><b>Blast gun oscillation (Process dependent)</b></p> <p>Cabinet roof-mounted auto unit in a soundproofed enclosure with inspection doors.</p> <p>A single oscillation shaft enters the roof of the cleaning enclosure and is sealed with vertical and horizontal bellows.</p>
8	<p><b>Blast guns</b></p> <p>Vapormatt MK3 blast guns made from solid abrasive resistant polyurethane and fitted with 10mm (0.4") boron carbide nozzles are mounted on an arm to allow good coverage of the components. Gun angles are manually adjustable.</p> <p>It should be noted that the permissible number of guns will be dictated by the type of component being processed and the twist of that component.</p>

9	<p><b>Process monitoring</b></p> <p>A process monitor screen with moving bar chart graphics to allow all critical process variables to be monitored by the operator/machine setter is provided.</p> <p>The process monitor will also display trend lines for grit water ratio, airflow, actuator movement and media added.</p>
10	<p><b>Vapormatt VSPS Polyurethane Slurry Conduits</b></p> <p>This system is unique to Vapormatt and consists of a range of elbows, tees, Y branches and flow splitters that connect with quick release stainless steel clamps.</p> <p>This eliminates the need for screwed pipe connections and steel pipework elements. Benefits include substantially longer component life, superior flow characteristics ensuring consistency of slurry, and ease of maintenance. It is Vapormatt's design policy to avoid threads within the process enclosure wherever possible due to the problems of thread galling because of contamination with process media.</p>
11	<p><b>Abrasive slurry conditioning</b></p> <p>This continuous abrasive filtration system facilitates accurate and controlled media size which is essential for long-term consistent blasting performance. Particles of broken-down abrasive and debris finer than the selected size are continually removed from the slurry circulation with a Hydrocyclone and collected in settling tanks at the rear of the machine.</p> <p>To compensate for lost abrasive due to breakdown, media level will need to be checked and added. The settling tanks are designed to allow their contents to be easily removed.</p>



Feature	Description
12	<p><b>Sight Glass</b></p> <p>A media concentration sight glass will be provided.</p> <p>Operated by a manually controlled valve, this shows how much abrasive is in the machine.</p>
13	<p><b>Component washing</b></p> <p>Spray jets are positioned above the components and are supplied with water from a recirculated rinse system.</p>
14	<p><b>Doughnut sump</b></p> <p>Allows low-level loading without the requirement of a machine pit or raised walkway.</p>
15	<p><b>Electrical control system (HMI)</b></p> <p>The machine is provided with a sophisticated control system accessed via an HMI unit. All on-screen instructions will be in English. Units will be metrics.</p> <p>Electrical equipment is mounted in an IP65 enclosure.</p>
16	<p><b>Preventative maintenance</b></p> <p>The control system monitors usage of key components such as blast guns, hoses, valves and pumps. Reminders are set to warn when maintenance is due.</p>
17	<p><b>Drain</b></p> <p>Excess water is directed to a reservoir. When either reservoir is full a diaphragm pump pumps the waste to the customer's drain.</p>
18	<p><b>Cabinet exhaust system</b></p> <p>The machine needs to be connected to an in-house forced extraction system to maintain a slight negative pressure within the cabinet when operating.</p>
19	<p><b>Cabinet Gridding</b></p> <p>Gridding is provided above the sump area in the blast cabinet. This prevents large items from accidentally entering the sump.</p>
20	<p><b>LED lighting</b></p> <p>Light units are mounted on the blast cabinet.</p>
21	<p><b>Manual rinse nozzle</b></p> <p>Positioned at the load door to allow additional rinsing of parts and machine interior.</p>
22	<p><b>Manual blow off nozzle.</b></p> <p>Positioned at the load door to allow parts to be dried.</p>

## Optional items

The following features can be added to the machine's basic specification.

Feature	Cabinet enhancement
1A	<b>Labels in non-English</b>
1B	<b>Translation of operation manual and HMI screen</b>
2	<p><b>Programmable ANDON status beacon</b></p> <p>Allows the progress of production/process of the unattended machine to be monitored at a distance from the unit itself.</p>

Feature	Loading and component handling
3	<p><b>Component holding and loading</b></p> <p>This has been identified as a critical aspect of the machine design to ensure optimum operator safety and loading. Vapormatt's innovative approach to machine design has created a very ergonomic loading system.</p> <p>A tailored loading solution will be developed to suit the needs of the component and process.</p>
4	<p><b>Manual workstation</b></p> <p>A manual workstation is provided; the workstation is furnished with twin glove ports and elbow-length rubber gauntlets, a window wash and wiper unit, a manually operated Vapormatt blast gun fitted with a 10mm (0.4") boron carbide nozzle and automatic air and abrasive control valves. A manual trigger-operated wash jet is also provided.</p>
5	<p><b>Component handling crane</b></p> <p>A floor-mounted crane, specification to be confirmed.</p>
6	<p><b>Component fixtures and masking blocks</b></p> <p>Polyurethane fixtures and masking blocks that can be used for components that do not require complete wet blasting.</p>
7	<p><b>Barrel unit</b></p> <p>Loading of the barrel will be via a manually operated hatch that runs the full length of the barrel. There is no need to remove the barrel from the machine for loading/unloading.</p> <p>The barrel will stop in the correct orientation for loading/unloading. Preliminary wash jets remove residual abrasives. (Separating compartments can be created and a spare barrel can be provided).</p>

Feature	Slurry system enhancements
8	<p><b>Slurry concentration sensor</b></p> <p>The SCS offers a continuous monitoring of the liquid abrasive concentration and has a closed loop control of the amount of abrasive media being circulated. The value of concentration will be displayed on the HMI unit. This parameter is changeable but will be set at factory to the user requirements.</p> <p>Watchdog guards are provided to inhibit machine start and prevent blast processing should slurry concentration levels drift outside of predetermined control limits.</p>
9	<p><b>Automatic abrasive dosing system</b></p> <p>The automatic media feed compensates for the broken-down media removed by the separation system. Avoiding the need for the operator to manually add abrasive on demand.</p>
10	<p><b>Sump immersion heater</b></p> <p>Is used to maintain a consistent sump water temperature. Elevated temperatures can allow chemicals to work more effectively and can promote faster drying of components.</p>
11	<p><b>Automatic chemical dosing</b></p> <p>Provided to maintain consistent chemical concentration within the blast process area; the chemical is fed directly from the storage barrel.</p>

Feature	Filtration and Re-circulation
12	<p><b>Elutriation tower</b></p> <p>This patented slurry conditioning system offers a more consistent blast slurry quality which allows for more reliable and repeatable processing. Particles of broken-down abrasive and debris finer than the selected size are continually removed from the slurry circulation.</p>
13	<p><b>Exhaust extractor</b></p> <p>Forced centrifugal extraction unit to maintain a negative pressure within the machine.</p> <p>Exhaust needs ducting to the external atmosphere.</p>
14	<p><b>Exhaust extractor with mist eliminator</b></p> <p>Forced extraction unit to maintain a negative pressure within the machine.</p> <p>The filter unit removes mist and dust and allows exhaust to workshop atmosphere. Will include an additive dosing system.</p>
15	<p><b>Slurry removal system for quick change of abrasive</b></p> <p>This secondary tank is connected to the machine and a "purge" valve can be selected to quickly pump the slurry within the machine through the buckets and tanks to quickly empty the system..</p>

16	<p><b>DI water cleaning station</b></p> <p>This option provides a filter and regeneration unit to purify the water supply to the required standard. The input water can either be from a mains water supply or water recirculated from the final rinse tank (this reduces overall water usage).</p>
17	<p><b>Centrifugal separator</b></p> <p>This system will separate the fines (that are not caught in the settling tanks) from the wastewater before sending it to drain and/or supplying clear rinse water.</p>
18	<p><b>Wet and dry vacuum cleaner</b></p> <p>A small size vacuum cleaner for daily routine cleaning and maintenance.</p>

Feature	Process functionality
19	<p><b>A and C axes</b></p> <p>The blast gun gantry robot will have rotary vertical (wrist, A) and rotary horizontal axes (twist, C) axes, allowing the nozzles to continuously aim directly at the component.</p>
20	<p><b>Mk9 gun</b></p> <p>These latest Vapormatt blast guns are approximately 10% more efficient than the Mk3 blast guns.</p>
21	<p><b>Micro nozzles</b></p> <p>For more efficient blasting of difficult to access areas, this low energy, precision nozzle can be mounted to the robot arm.</p> <p>Micro-nozzle consumption: 0.34Nm<sup>3</sup>/min (12 SCFM) @ 4 bar.</p>
22	<p><b>Manufacturing execution system (MES)</b></p> <p>Allows for data logging of machine status during the wet blasting process.</p>
23	<p><b>Barcode scanner</b></p> <p>This enables the reading of data from any batch card for the automatic loading of recipes.</p>
24	<p><b>Blast airflow monitoring system.</b></p> <p>If flow drifts outside pre-set limits, at any given pressure, due to air jet or hose failure, a signal appears on the HMI unit.</p>

## Services to be provided by the customer

We always ensure our machines operate to the specification.

Service	Requirement
Electricity	400/480V, 3 phase 50/60Hz @ 63-amp supply with isolator.
Process air supply	Pressure: 6 - 7 bar (90 - 100 psi) Consumption: 1.150Nm <sup>3</sup> /min (40 SCFM) per gun with 10mm (0.4") blast nozzle. 1.70Nm <sup>3</sup> /min (60 SCFM) per gun with 12mm (0.47") blast nozzle. Connection DN40 (1½" BSP). Quality DIN ISO 8573-1: class 5.6.4. The pipework is marked light blue as per 92/58 EEC. An isolation valve is provided.
Water supply	Pressure: 2 - 7 bar (30 - 100 psi) Volume 13L/min (2.86 gpm) intermittent. Connection; DN15 (½" BSP). Drinking quality. The pipework marked dark blue as per 92/58 EEC. An isolation valve is provided.
Drain	Floor level with grit trap adjacent to the machine. (Can be pumped to drain up to 5 - 10m (17 - 33') distant and 2 - 3m (7 - 10') high).
Vent or extraction	To be ducted to an in-house ventilation system or to the outside atmosphere. Forced ventilation must be of sufficient capacity to maintain a negative pressure of 62Pa within the machine when all blast systems are operating at full capacity. Optional extraction unit can be supplied.
Foundations	Flat and level waterproof floor. Must be able to carry a point load of 500kg (1102lb).
Networking	Ethernet Internet connection required. If via customer network, then it must be outside any firewall. To be available prior to commissioning.

## Dedicated project management and the Vapormatt Promise

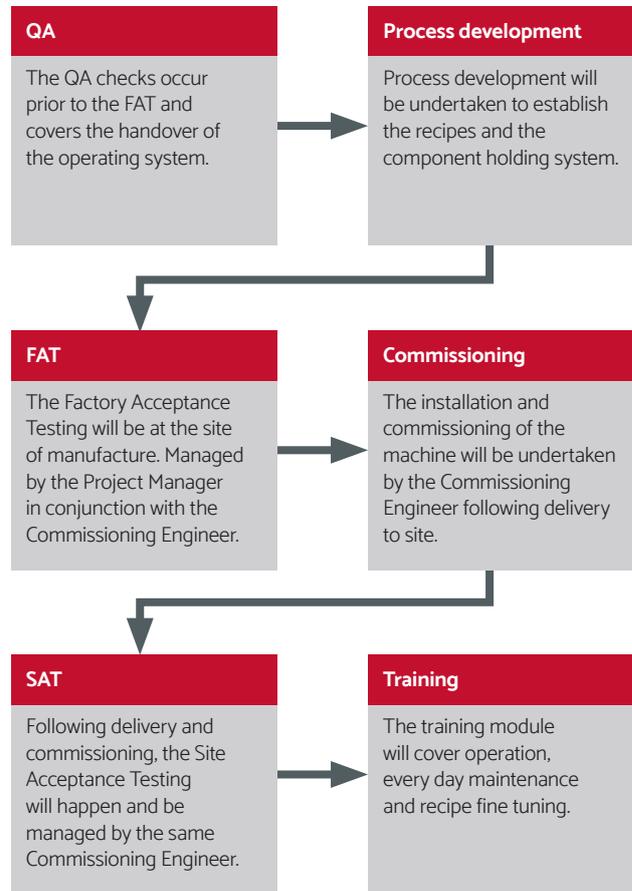
We always ensure our machines operate to the specification agreed upon with the customer, that's the Vapormatt Promise.

To achieve this every customer is assigned a dedicated project leader from order to installation.

Project management includes our detailed technical acceptance process, see below, a key part of which is our factory acceptance testing (FAT). This is where the customer's wet blasting system is extensively tested, often with the actual components the customer will be regularly processing before it leaves us.

Vapormatt support doesn't end there, our aftermarket support includes spares, servicing and Vapormatt 4.0, our Industry 4.0 solution, to ensure maximum production uptime.

### Technical acceptance process



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