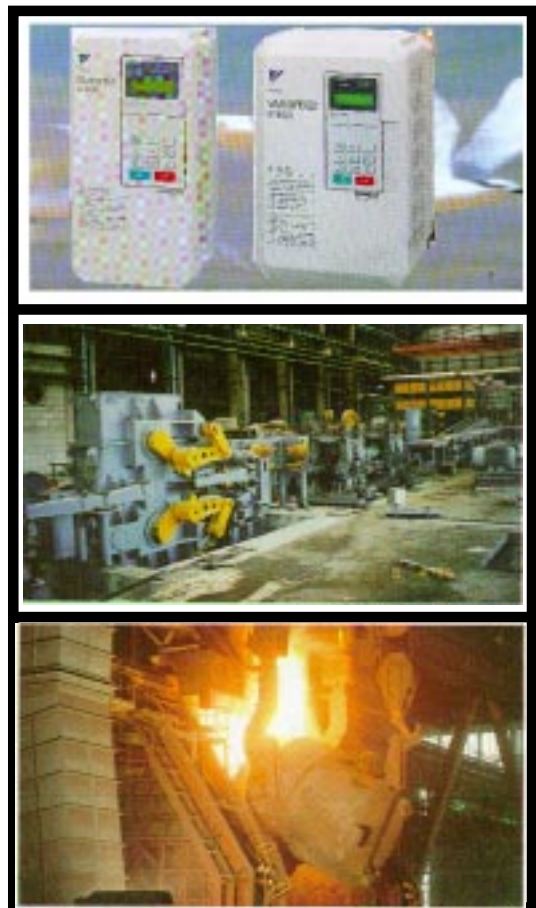
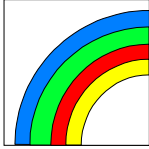

VS-616G5

AC drive for optimal efficiency and productivity





Control & Automation from L & T

L&T offers system solutions for control, regulation and monitoring. It plans and implements drive controls and automation projects from concept to commissioning.

The spectrum includes system analysis, project planning, hardware selection, application engineering, application software, manufacture, procurement, testing, integration, commissioning, training, spares and after-sales service.

Applications



Iron and Steel *

- .. Sponge iron plants
- .. Blast furnaces/arc furnaces
- .. Continuous casting plants
- .. Wire rod mills
- .. Annealing furnaces
- .. Cold rolling mills
- .. Process and finishing lines



Cement *

Plant-wide drives, control and instrumentation from crusher to packing.

SPRS for ID, FD fans, classifier fans



Paper *

- .. Sectional paper machines
- .. Super calenders
- .. Slitters
- .. Rewinders



Material Handling *

- .. Port-based long conveyor
- .. Stacker reclaimers
- .. Bagging plants

* Exhaustive reference lists are available.





Chemical *

- .. LPG/gas sweetening
- .. Distillation column control
- .. Naphtha cracker and aromatic plants
- .. Lactum and anone plants



Power *

- .. Boiler interlocks, burner management
- .. Water treatment
- .. Coal & ash handling

Range of Equipment

Drive Systems

based on



- .. Fully digital DC drives - ACEDRIVE
- .. High performance, *vector control* AC drives with powerpack from YASKAWA ELECTRIC, Japan
- .. Slip **P**ower **R**ecovery **S**ystems (SPRS)
- .. Transformers, motors, control desks, sensors and other electrics

Automation Systems

based on



- .. High-end 'Quantum' process controllers and accessories from SCHNEIDER AUTOMATION, U.S.A.
- .. Mid-size 'GL' process controllers and accessories from YASKAWA ELECTRIC, Japan

Both with a full range of 1000/1600 I/O modules and panels.

- .. Windows® 95/NT based 'Panorama' supervisory colour graphic operator stations. Network hardware and integration
- .. Programming packages, sensors, instruments, consoles and other accessories

* Exhaustive reference lists are available.

Overview

The VS-616G5 is a full-scale flux vector control (or Adaptive Vector Control, AVC™) AC drive.

The VS-616G5 **directly controls** the direct current that results in the **motor torque**.

The VS-616G5 integrates **four** control functions in one drive.

User-friendly **built-in programmable parameters** (more than 200) make most of the control system tasks as easy as 1-2-3.

The VS-616G5 is the ultimate drive for a wide range of applications. With its extensive features it is ideal for use as a stand-alone drive or as part of a system and offers smooth start up from low speeds.



Interactive digital operator

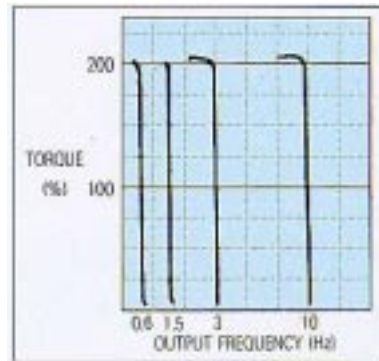
The user-friendly interactive digital operator allows :

- **Customized programming** of AC drive based on applications
- Extensive monitoring of AC drive **operating conditions**



Torque at zero speed

VS-616G5 allows smooth operation from 1/100th of rated speed to high starting torque. Overcomes tough starts even without a PG*. When an additional PG is installed, it enables full torque operation even at zero speed.

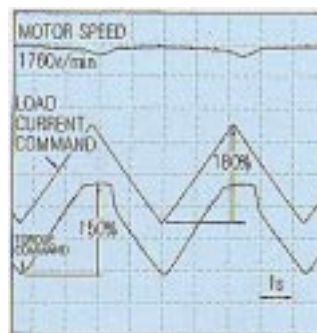


High starting torque at low speeds without PG
[Speed control range 100:1 (1000:1 with PG)]

Accurate Torque Control

The VS-616G5 offers excellent output torque response of 150Hz with a torque accuracy of $\pm 5\%$.

Online switching from torque to speed control is possible!



* PG = Pulse Generator (speed sensor)

Integrated Control

The VS-616G5 comes with **four** integrated control functions.

- **Speed-sensorless V/f control**
- **V/f control with speed sensor**
- **Speed-sensorless vector control**
- **Vector control with speed sensor**

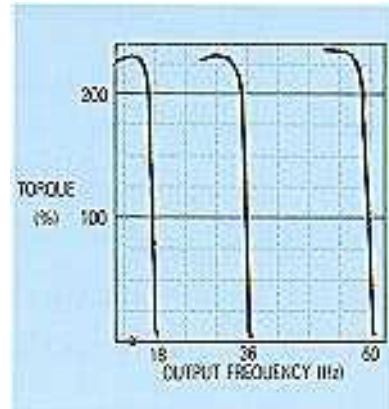
The control functions can be applied to a wide range of applications starting from stand-alone drive to multi-drive systems by a simple switching of parameters through a digital operator.

Overview

Control method	Speed-sensorless V/f control	V/f control with speed sensor	Speed-sensorless vector control	Vector control with speed sensor
Basic control	Voltage/frequency control (open loop)	Voltage/frequency control with speed compensation	Current vector control without PG	Current vector control with PG
Speed sensor		Necessary		Necessary
Speed control range	1:40	1:40	1:100	1:1000
Starting torque	150% at 3Hz	150% at 3Hz	150% at 1Hz	150% at 0 rpm
Speed control accuracy	± 2 to ± 3%	± 0.03%	±0.2%	±0.01%
Torque limit	Disabled	Disabled	Enabled	Enabled
Torque control	Disabled	Disabled	Disabled	Enabled
Applications	<ul style="list-style-type: none"> • Simple replacement of conventional product • Simple speed variation • Multiple motor drive 	<ul style="list-style-type: none"> • Applications in which accuracy of the speed in the steady state has to be improved • Cases where the resolution of the speed sensor is low • Cases where there is backlash between the motor shaft and the speed sensor 	<ul style="list-style-type: none"> • Variable speed control in general 	<ul style="list-style-type: none"> • Simplified servo drive • High accuracy speed control • Torque control

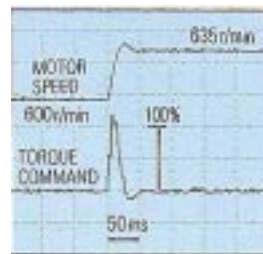
Response to 100% load change

The VS-616G5 offers an excellent **speed holding accuracy** of $\pm 0.01\%$ even under fluctuating load conditions.

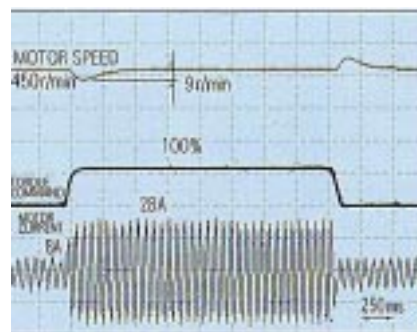


Outstanding Servo Response

The unique high-speed flux vector control allows fast response (better than 30Hz) to changes in the speed reference.



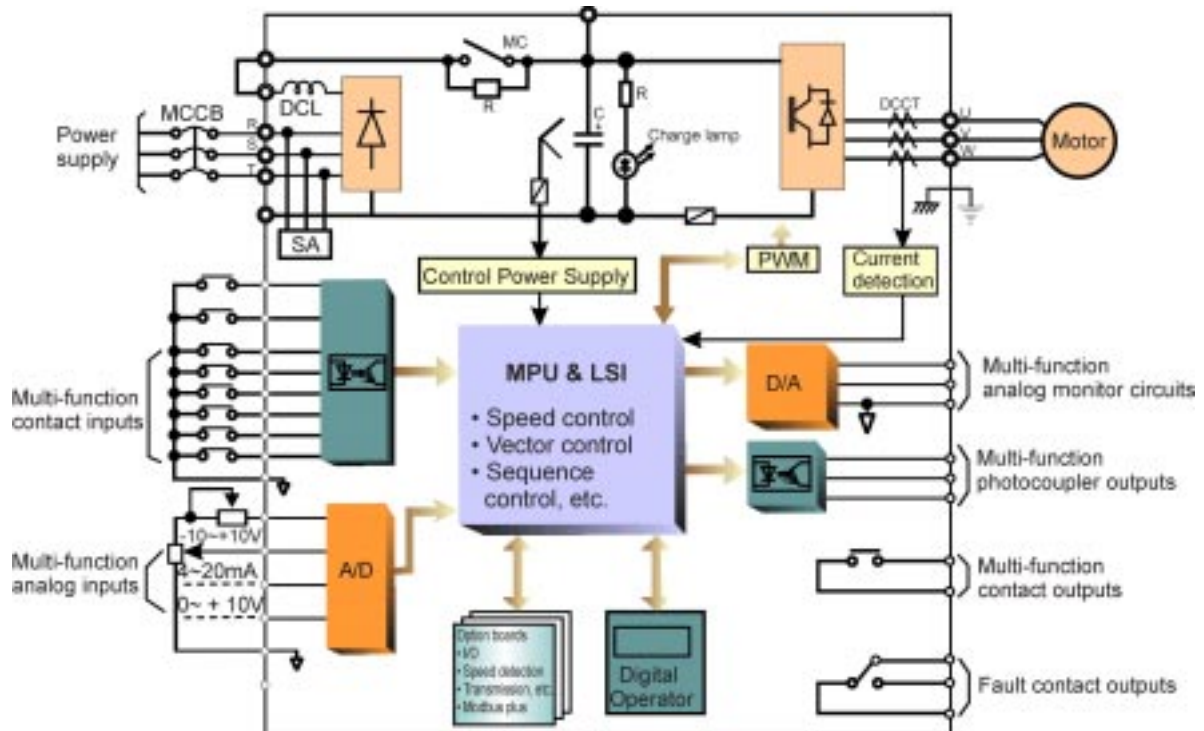
Quick response to any reference changes
(Speed reference step response)



Quick response to rapid changes in load
(Speed recovery characteristics upon impact load)

Ultra Modern Hardware

- The 32-bit RISC (**R**educed **I**nstruction **S**et **C**omputer) type MPU and advanced LSI based control elements enable **real time** processing of information and complex calculations [**40000 calculations per second**] accurately to get DC drive like performance.
- **Flash memory** enables editing of the application programmes with personal computer.
- Low noise, low loss and compact IGBT (**I**nsulated **G**ate **B**i-polar **T**ransistor) for **reliable power processing**.
- **Network compatible*** through Modbus Plus™ protocol (Modbus Plus™ - High speed, peer-to-peer *de-facto* industry standard plantwide network protocol)



* Onboard option

Specification

Power conditions/capacity

Capacity	1.4 to 460 kVA
Rated current	1.8 to 600A
Input supply voltage	380/400/415/440/460V, +10%, -15%
Input supply frequency	50/60Hz \pm 5%
Deration of current rating	1.25% /°C above 45°C

Control characteristics

Control method	High carrier frequency (low noise) sine wave PWM technique
Speed control range	1:1000 with PG (1:100 without PG)
Speed control accuracy	\pm 0.01% with PG (\pm 0.2% without PG)
Speed response	30Hz with PG (5Hz without PG)
Starting torque	150% at zero mechanical speed with PG (150% at 1Hz without PG)
Torque accuracy	\pm 5%
Torque response	150Hz or better with PG (20Hz or better without PG)
Frequency control range	0.1 to 400Hz (standard) 1000Hz available as option
Frequency control accuracy	
Digital command	\pm 0.01% [-10°C to 40°C]
Analog command	\pm 0.1% [25°C \pm 10°C]
Frequency setting signal	-10 to +10V, 0 to +10V, 4 to 20mA
Frequency setting resolution	
Digital command	0.01Hz/100Hz
Analog command	0.03Hz/60Hz

Braking torque	Approximately 20% (<i>upto 150% with braking resistor</i>)
Accel./Decel. time	0.01 to 6000 seconds (<i>available in 4 independent steps</i>)

Protections

Motor overload, instantaneous overcurrent, power-loss ride through, ground fault, FIN overheat, O/P short-circuit protection, stall prevention, I/P & O/P overvoltage and undervoltage, I/P & O/P open-circuit protection, etc.



Application Software Functions

The VS-616G5 has more than 200 powerful system application software functions inbuilt. Given beneath an overview of selected functions:

Highlights

- For constant flow control : PID control
- For maximum efficiency in fans & pumps : Patented energy-saving feature based on optimum system efficiency calculation in real time
- For versatile operation : Four independent settings for acceleration/ deceleration
- For master-slave operation : Droop control

Overview

Function	Application		Description of Function
Energy saving operation	Pumps, fans, blowers.	<ul style="list-style-type: none"> • Energy saving 	Full power is out during accel/decel. When it reaches a constant speed, the output voltage is automatically reduced to the preset value.
Droop control	Calender drives, press section drives, bridle roll drives, stacker reclaimer drives.	<ul style="list-style-type: none"> • Multi-motor drives • Feeders • Conveyors 	Best suited for master-slave configurations.
2-motor changeover	Spindle drives, main/aux. hoist drives.	2 motors with difference in capacity and characteristics are driven alternatively by single AC drive	The AC drive stores the V/f patterns and motor constants as separate data sets, and the appropriate one is automatically selected based on digital input.
Torque limit	Agitator drives, pay-off reel drives.	<ul style="list-style-type: none"> • Protection of machine • Improvement of continuous operation reliability • Torque limit 	The AC drive can be switched to coasting or speed reducing mode as soon as it reaches a certain preset torque level. This prevents overload tripping.
Torque control	Coiler/uncoiler drives, unwinder drives.	<ul style="list-style-type: none"> • Constant tension control 	Adjusts motor torque externally. Appropriate for controlling winder tension.

Application Software Functions

Function	Application	Description of Function	
Excess torque signal	Machine tool applications.	<ul style="list-style-type: none"> • Protection • Improves reliability 	Works when 'over torque setting operation' is accomplished. Can be used as a torque limiter.
Quick stop without braking resistor (DC injection braking stop)	High-speed routers, fans, blowers.	<ul style="list-style-type: none"> • DC injection braking stop • DC injection braking during starting 	Prevents overrun at stop. Used for starting the coasting motor without tripping. Generates better than 70% of the braking torque.
Frequency hold operation	Conveyors, elevators, cranes.	Easy operation	Temporarily holds frequencies during accel/decel.
Multi-step speed operation	Yarn twisting, draw twisting, carding drives.	Schedule operation under fixed speed command and positioning stop	Setting the contact combinations can set multi-stop operation, so the connection with process controller becomes very easy. When combined with jog speed, it allows simple positioning.
Accel/decel. time changeover operation	General	Accel/decel. time changeover with an external signal	The accel/decel. times are set by an external contact signal. Necessary for switching operation of 2 machines with different functions by a single drive.
Operating site selection	General	Easy operation	Operation and settings can be selected while the AC drive is online (gain, frequency set point, etc.)
Speed search operation	Centrifugal load drives, ID, FD drives.	Synchronize with the coasting motor	Starts the AC drive at the specified frequency, automatically detects the synchronization point, and performs at the operation frequency. No speed detector is required.

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