PowerFlex Medium Voltage AC Drives

Bulletin Numbers 6000G, 6000T, 7000A, 7000, and 7000L

Allen-Bradley
by ROCKWELL AUTOMATION

Selection Guide

What's Inside

Topic	Page
What's New	2
Benefits of PowerFlex Medium Voltage Drives	3
Select the Right PowerFlex Drive for Your Application	4
Medium Voltage Drive Selection Flowchart	6
PowerFlex Medium Voltage Drive Comparison	7
Typical Application Load Torque Profiles	9
PowerFlex 6000T Medium Voltage AC Drives	11
PowerFlex 7000 Medium Voltage AC Drives	15
Drive Options	20
Additional Resources	23

What's New

Enhancements to the PowerFlex® 6000T include the following:

High-Speed Applications

PowerFlex 6000T can inherently control high speed applications up to 120 Hz output frequency with all control modes.

CIP Security-enabled

PowerFlex 6000T is CIP Security™-enabled to support your in-depth defense strategy and secure itself against all cybersecurity incidents.

Extended Input Voltage Capabilities

PowerFlex 6000T A-Frame IEC drives rated for 3.3 and 4.16 kV output voltage are now available with up to 13.8 kV primary input capability.

Optional RealSine Solution

Available from 2.4...4.16 kV up to 215 A, without changing the number of drive transformer secondary windings, each winding is specially phase-shifted to achieve 54 pulse or 72 pulse respectively, compared to traditional 18 pulse or 24 pulse designs for this voltage range. The optional RealSine™ solution offers up to 30% improvement in input Total Harmonic Current Distortion (THDi). This new design does not require additional hardware or affect the drive footprint.

Reduced Footprint A-Frame

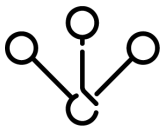
PowerFlex 6000T IEC drives rated for 6 and 6.6 kV are now available in an all-in-one design rated up to 215 A. These compact drives are available with up to 13.8 kV primary voltage without any change to the drive dimensions.

Benefits of PowerFlex Medium Voltage Drives

Rockwell Automation, the world's largest company that is dedicated to industrial automation and information, has been developing leading medium voltage motor control technology for over 80 years. Our drives offer these features:

Application Expertise
With over 30 years of experience and thousands of applications in a wide variety of industries, our medium voltage drives deliver proven results that you can rely on. Our application and test engineers, project management teams, and field service engineers develop and deliver solutions that meet your needs.

Intelligent Motor Control – Connected Enterprise®
Our medium voltage drives provide valuable information about drive health and process parameters back to the control system. Full support of Studio 5000® and Connected Components Workbench™ software tools minimize the time and effort required to integrate these smart assets into your control system.

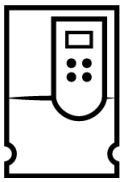


Connectivity
Our medium voltage drives offer built in EtherNet/IP™ communication and support other typically used communication protocols. Flexible connectivity and control system compatibility helps deliver seamless control system integration.

Proven Reliability
Robust design guidelines, reliable components, low parts count, control power ride-through, and automatic restart capabilities inherently provide maximized up-time. Redundant critical components and bypass options, which are coupled with factory testing on a dynamometer before shipment, all contribute to improved asset utilization.

Safety / Quality Standards
Our quality systems and processes help ensure that the highest-quality products are delivered to our customers. Arc-resistant enclosure options and functional safety options help optimize safety for your personnel and processes.

Energy Efficiency
ECO design cooling fans and high efficiency isolation transformers maximize system efficiency and lower operating costs. Transformerless configurations help deliver the highest system efficiency.



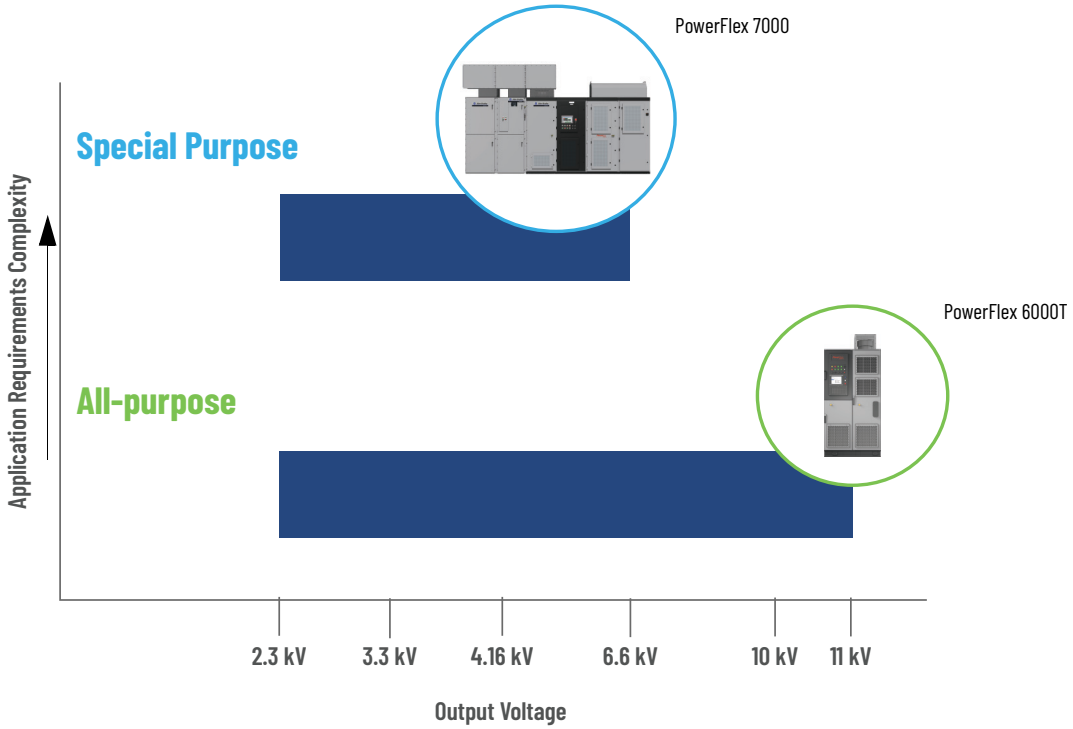
Targeted Product Portfolio
Our portfolio offering is tailored to meet the needs of general-purpose fan, pump, and compressor applications or special purpose mixer, conveyor, crane, and hoist applications.

Global Support
Our extensive installed base is supported by a worldwide service and support network to help you with what you need, wherever and whenever you need it.

Comprehensive Testing
When you select a PowerFlex medium voltage drive, you get a solution that is thoroughly tested before it arrives at your facility. Full load testing with medium voltage induction motors. Load profile testing for constant torque and variable torque applications. Test facilities are in Canada, China, Brazil, and Poland.

Select the Right PowerFlex Drive for Your Application

The PowerFlex medium voltage drive family delivers the performance your application demands with a broad selection of drives and options. All-purpose PowerFlex 6000T drives provide high-performance characteristics to operate applications such as fans, pumps, compressors, conveyors, and mills. Special purpose PowerFlex 7000 drives feature enhanced characteristics to operate specialty applications such as ball and sag mills, conveyors, extruders, and mixers.



PowerFlex Medium Voltage Drive Best Fit

Requirement	PowerFlex 6000T	PowerFlex 7000
Typical applications	• Variable torque (fans, pumps, and compressors) • Constant torque (non-regen applications, flat-land conveyors) • High-speed applications up to 120 Hz	• Variable torque (all) • Constant torque (all)
Drive system configurations	Stand-alone, synchronous transfer for multiple motors, load-sharing	Stand-alone, synchronous transfer for multiple motors, load-sharing
Drive cooling requirements	Air-cooled	Air-cooled, liquid-cooled
Motor voltage rating	Up to 11 kV	Up to 6.6 kV
Motor current rating	Up to 680 A	Up to 720 A
Motor types	Induction	Induction, synchronous
Regenerative braking	No (two quadrant operation)	Yes (four quadrant operation)
Motor cable lengths	Up to 10 km (6.2 mi)	Up to 30 km (18.7 mi)
Holding Torque at zero speed	Yes, flux vector, closed-loop control mode only	Yes
Arc-resistant enclosure requirement	No	Yes - certified to 50 kA arc flash rating

PowerFlex 6000T Drives

PowerFlex 6000T medium voltage drives are well-suited for all-purpose applications such as fans, pumps, compressors, conveyors, and mills. They are an ideal solution for motor control applications from 100…11,000 kW (190…14,600 Hp) and for motors that are rated from 2.3…11 kV, up to 120 Hz output frequency.

Air-cooled PowerFlex 6000T drives are designed to maximize energy efficiency by enabling soft-starting and variable-speed control in normal duty and heavy-duty applications.

To achieve low input harmonics and near-unity power factor, the drives use a Cascaded 'H' Bridge (CHB) topology. This topology combines an integrally mounted phase-shifting isolation transformer with series-connected power cells for each phase.

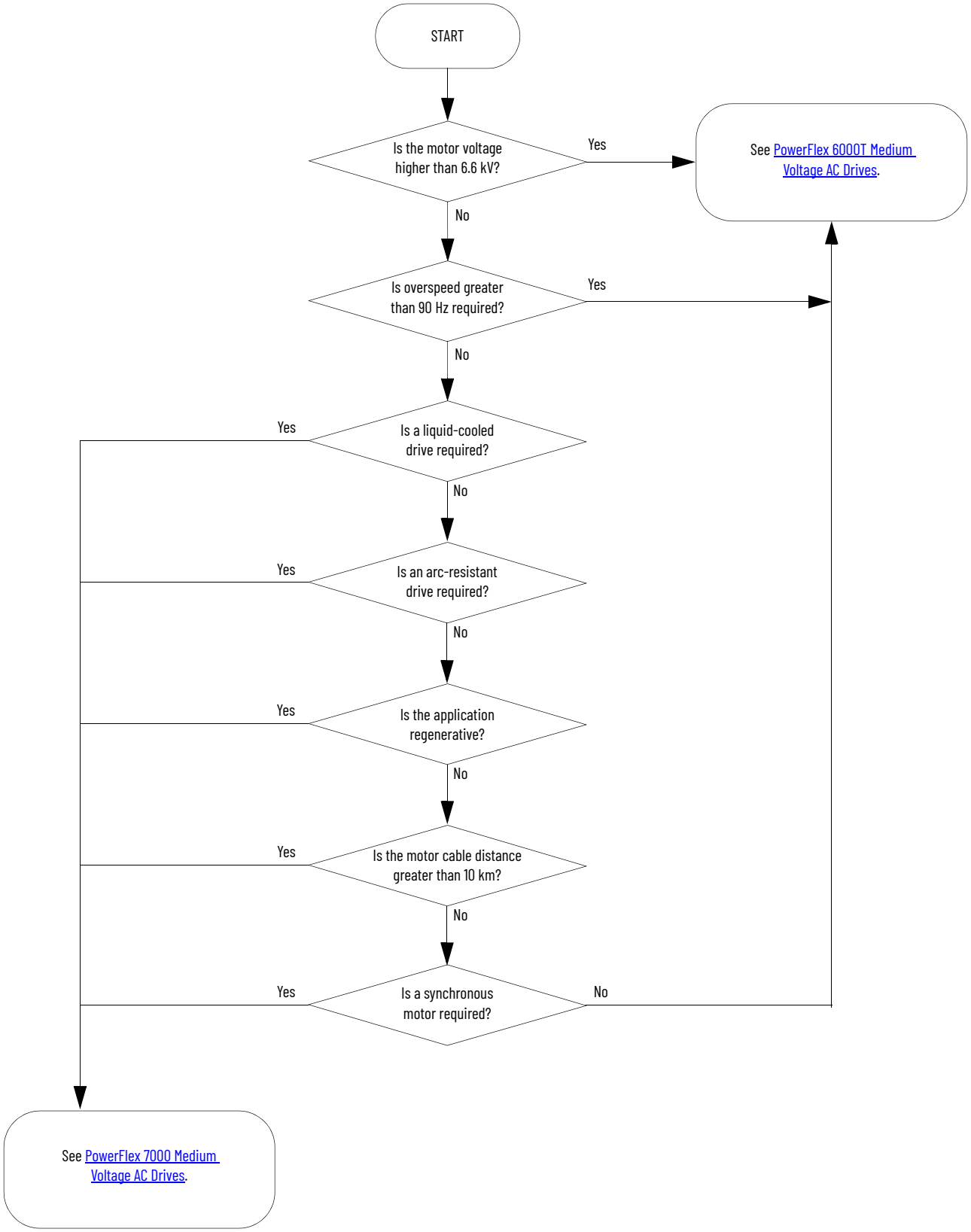
PowerFlex 6000T Drives feature Premier Integration with Studio 5000 add-on profiles to reduce integration time. TotalFORCE drives have built-in adaptive control to keep your operation up and running, together with maintenance analytics to simplify maintenance scheduling.

PowerFlex 7000 Drives

The PowerFlex 7000 medium voltage product line is designed to meet a broad variety of heavy industry needs and configurations. High performance, safety, and robust communication features help improve asset utilization and lower safety risk for your critical applications from offshore oil platforms, natural gas or oil pipelines, mining sites, water/wastewater facilities, to marine applications and beyond.

PowerFlex 7000 medium voltage AC drives offer drive configurations and control options such as active front end (AFE) with Direct-to-Drive™ technology and high-performance torque control to help meet application demands. Add to this, the Safe Torque Off control option, and the ArcShield™ arc-resistant enclosure option, and the PowerFlex 7000 drive can provide a complete solution that delivers higher performance and enhanced safety for your critical assets.

Medium Voltage Drive Selection Flowchart



PowerFlex Medium Voltage Drive Comparison

PowerFlex Drive Comparison

Features	PowerFlex 6000T All-purpose Drives	PowerFlex 7000 Special Purpose Drives	
	Air-cooled	Air-cooled	Liquid-cooled
Power Rating Range @ 2.3/2.4 kV	Up to 2390 kW (3205 Hp)	150...1500 kW (2000 Hp)	–
Power Rating Range @ 3 kV	Up to 2990 kW (4010 Hp)	–	
Power Rating Range @ 3.3 kV	Up to 3280 kW (4398 Hp)	187...3600 kW (4750 Hp)	–
Power Rating Range @ 4/4.16 kV	Up to 4140 kW (5525 Hp)	261...4400 kW (5750 Hp)	2240...3900 kW (5000 Hp)
Power Rating Range @ 6 kV	Up to 5970 kW (8006 Hp)	–	
Power Rating Range @ 6.3 kV	Up to 6300 kW (8450 Hp)		
Power Rating Range @ 6.6 kV	Up to 6570 kW (8810 Hp)	400...6000 kW (8000 Hp)	3000...5595 kW (7500 Hp)
Power Rating Range @ 6.9 kV	Up to 6870 kW (9210 Hp)	–	
Power Rating Range @ 10 kV	Up to 9950 kW (13,343 Hp)		
Power Rating Range @ 11 kV	Up to 10,950 kW (14,686 Hp)		
Topology	Cascaded H-Bridge	CSI PWM	
Motor Type	Induction	Induction and Synchronous	
Control Power	120V 60 Hz, 240V 60 Hz, 110V 50 Hz, or 220/230V 50 Hz	220/240V or 110/120V, Single phase - 50/60 Hz (20 A)	
Input Voltage Rating	2.4 kV, 3 kV, 3.3 kV, 4.16 kV, 6 kV, 6.6 kV, 6.9 kV, 7.2 kV, 10 kV, 11 kV, 13.8 kV	2.4 kV, 3.3 kV, 4.16 kV, 6.6 kV	4.16 kV, 6.6 kV
Input Voltage Tolerance	±10% of nominal	±10% of nominal	
Input Voltage Sag	-30% of nominal	-30% of nominal, continuous with derating	
Input Frequency	50/60 Hz, ±5%	50/60 Hz, ±5%	
Input Power Factor	>.95	>.95 (AFE Rectifier)	
Input Impedance Device	Multiphase isolation transformer	• Line reactor (Direct-to-Drive AFE) • Isolation transformer (AFE) • Multiphase isolation transformer (18 Pulse)	
Typical VFD System Efficiency[1]	• Drives up to 500 kVA = 96% • Drives greater than 500 kVA = 96.5%	> 97.5% (Direct-to-Drive AFE), > 98% (18 Pulse)	
VFD Noise Level[2]	• A-Frame Drives: 80 dB(A) • B and H-Frame Drives: <85 dB(A)	< 85 dB(A)	
Output Voltage	0...2300/2400V, 0...3000V, 0...3300V, 0...4000/4160V, 0...6000V, 0...6300V, 0...6600V, 0...6900V, 0...10,000V, 0...11,000V	0...2300V, 0...3300V, 0...4000V, 0...6600V[3]	0...4000V, 0...6600V[3]
Overload Capacity	• 110% overload for 1 min every 10 min (normal duty) • 150% overload for 1 min every 10 min (heavy duty)	• 110% overload for 1 min every 10 min (normal duty/variable torque load) • 150% overload for 1 min every 10 min (heavy duty/constant torque load)	
Rectifier Configurations	18-Pulse to 54-Pulse	• Direct-to-Drive (transformerless AFE rectifier) • AFE with separate isolation transformer • AFE with integrated transformer • 18-Pulse with separate isolation transformer	• Direct-to-Drive (transformerless AFE rectifier) • AFE with separate isolation transformer • 18-Pulse with separate isolation transformer
Rectifier Switch	Diodes	SGCTs (AFE Rectifier), SCRs (18 Pulse)	
Inverter Configuration	Pulse Width Modulated (PWM) power cells	Pulse Width Modulated (PWM)	
Inverter Switch	IGBTs	SGCTs	
Output Current THD	< 3%	< 5%	
Output Waveforms to Motor	Near sinusoidal current and voltage	Near sinusoidal current and voltage	
Medium Voltage Isolation	Fiber-optic	Fiber-optic	
Control Method	• Volts per Hertz • Sensorless Vector Control (SVC) • Flux vector control (encoderless) • Flux vector control with encoder feedback (optional)	• Digital sensorless direct vector • Full vector control with encoder feedback (Optional)	

PowerFlex Drive Comparison (Continued)

Features	PowerFlex 6000T All-purpose Drives	PowerFlex 7000 Special Purpose Drives	
	Air-cooled	Air-cooled	Liquid-cooled
Speed Regulation	• ±0.5% with V/Hz and SVC control • ≤ ±0.1% with open-loop vector control • ≤ ±0.01% with closed-loop vector control	• 0.1% without encoder feedback • 0.01...0.02% with encoder feedback	
Output Frequency	0.3...120 Hz, with up to 200:1 speed range (FVC CL)	• 0.2...75 Hz (Standard) • 0.2...90 Hz (Optional)	
Acceleration/Deceleration time	0...3276 s	0...4800 s	
Flying Start Capability	Yes	Yes	
Power Loss Auto Restart	Yes	Yes	
Regen Motor Braking	No	Yes	
Operator Interface	10 in. Enhanced Color Touch Screen	10 in. Enhanced Color Touch Screen	
Languages	English, Chinese, Spanish, Portuguese, Russian, German, French, Italian, Polish, Korean, Japanese, Turkish, Czech	English, Chinese, Spanish, Portuguese, Russian, German, French, Italian, Polish, Korean, Japanese, Turkish, Czech	
External Digital Input Ratings	24V DC (standard), 120/240V available	• 50...60 Hz AC or DC • 120...240 V – 1 mA	
External Digital Output Ratings	Dry contacts rated at 24V DC, 2 A max	• 50...60 Hz AC or DC • 30...260 V – 1 A	
Analog Inputs	(2) isolated, 0...10V DC	(3) Isolated, 4...20 mA or 0...10V	
Analog Outputs	(2) non-isolated: 0...10V DC or 4...20 mA	(1) Isolated: 4...20 mA, (8) Non-isolated: 0...10V (600 Ω)	
Communications Protocols (Optional)	EtherNet/IP, Modbus RTU Follower RS-485, Modbus-TCP, Modbus-PLUS Follower RS-485, PROFIBUS RS-485	EtherNet/IP, RI/O, DeviceNet®, Lon Works, Can Open, PROFIBUS DP, RS-485 HVAC, Modbus, RS-485 DF1, Interbus, RS-232 DF1, ControlNet®, USB	
Motor Cable Length	• Up to 800 m (0.5 mi) • Up to 2 km (1.2 mi) with output dv/dt filter • Up to 10 km (6.2 mi) with custom filter	30 km (18.6 mi)	
Safety	• UL Version: Electromechanical and Trapped Key Mechanical Interlocks (standard) • IEC Version: Electromechanical Interlocks (standard) and Trapped Key Mechanical Interlocks (optional)	• Trapped Key Mechanical Interlock • Safe Torque Off	
Digital Security	• CIP Security™ Compliant Design	No	No
Enclosure	• IP31 (standard) • IP42 (optional)	• IP21/NEMA Type 1 (standard) • IP42 (optional)	
Arc-resistant Enclosure	No	Yes, ArcShield option available	
Structure Finish	• Epoxy Powder - Paint • Exterior Sandtex Light Gray (similar to RAL 7035) Textured with Black (similar to RAL 8022) Textured LV Door • Internal - Control Sub Plates - High Gloss White (similar to RAL 9003)	• Epoxy Powder - Paint • Exterior Sandtex Light Gray (similar to RAL 7035) Textured with Black (similar to RAL 8022) Textured LV Door • Internal - Control Sub Plates - High Gloss White (similar to RAL 9003)	
Conformal Coating	Yes	Yes	
Ambient Temperature (Operating)	• 0...40 °C (32...104 °F) (standard) • 0...50 °C (32...122 °F) (optional)	• 0...40 °C (32...104 °F) (standard) • 0...50 °C (32...122 °F) (optional)	
Ambient Temperature (Storage)	-25...+55 °C (-13...+133 °F)	-40...+70 °C (-40...+158 °F)	
Relative Humidity	Max 95% noncondensing	Max 95% noncondensing	
Altitude	• 0...1000 m (0...3280 ft) (standard) • 1001...5000 m (3284...13,123 ft) (optional)(1)	• 0...1000 m (0...3280 ft) (standard) • 1001...5000 m (3284...16,404 ft) (optional)(1)	
Design Standards	NEMA, ANSI, IEEE, UL, CSA, IEC, CE, EEMAC	NEMA, ANSI, IEEE, UL, CSA, IEC, CE, EEMAC	
Direction - Torque	Forward and Reverse, Motoring	Forward and Reverse, Motoring and Regeneration	–

(1) Based on a typical 4-pole induction motor.
(2) Without redundant fan option. With redundant fan option: <215 A is 83 dB(A), 216...680 A remains as 85 dB(A).
(3) For Direct-to-Drive AFE configurations, maximum output voltage is approximately 3...4% less than input voltage.

Typical Application Load Torque Profiles

Typical Application Load Torque Profiles

Application		Load Torque Profile[1]	Typical Load Torque (% of Full-load Torque)[2]			Encoder Required for Additional Starting Torque?	Typical Overload Rating (%)	Required Drive Service Duty Rating	Regen Braking or Decel Required?	Recommended Drive(s)
			Break-away	Accelerating	Peak Running					
Fans (centrifugal, ambient)	Damper closed	VT	25	60	50	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Damper open	VT	25	110	100	No	110	Normal	Check[3]	PowerFlex 6000T PowerFlex 7000
Fans (centrifugal, hot gases)	Damper closed	VT	25	60	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Damper open	VT	25	200	175	No	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Fans (propeller, axial flow)	VT	40	110	100	No	150	Heavy	Check[3]	PowerFlex 6000T
	Kilns (rotary, loaded)	CT	250	125	125	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
Blowers (centrifugal)	Damper Closed	VT	30	50	40	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Damper Open	VT	40	110	100	No	150	Heavy	Check[3]	PowerFlex 6000T
	Chipper (wood), starting empty	CT	50	40	200	No	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
Pumps	Centrifugal, discharge open	VT	40	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Centrifugal, discharge closed	VT	40	75	75	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Oil field flywheel	CT	150	200	200	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Propeller	VT	40	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Fan pump	VT	40	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Reciprocating/ Positive displacement	CT	175	30	175	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Screw type, started dry	VT	75	30	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Screw type, primed, discharge open	CT	150	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Slurry handling, discharge open	CT	150	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Turbine, centrifugal, deep-well	VT	50	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Vane-type, positive displacement	CT	150	150	175	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Separators, air (fan type)	VT	40	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Electro-submersible [ESP]	VT	20...100	Assess	Assess	No	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
Compressors	Axial-vane, loaded	VT	40	100	100	No	110	Normal	Check[3]	PowerFlex 6000G/T
	Reciprocating, start unloaded	CT	100	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000G/T
Conveyors	Belt type, loaded	CT	150	130	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Drag type	CT	175	150	100	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Screw type, loaded	CT	200	100	100	Yes	Custom[4]	Custom[4]	Yes	PowerFlex 7000
	Extruders (rubber or plastic)	CT	150	150	100	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000

Typical Application Load Torque Profiles (Continued)

Application		Load Torque Profile[1]	Typical Load Torque (% of Full-load Torque)[2]			Encoder Required for Additional Starting Torque?	Typical Overload Rating (%)	Required Drive Service Duty Rating	Regen Braking or Decel Required?	Recommended Drive(s)
			Break-away	Accelerating	Peak Running					
Mixers	Chemical	CT	175	75	100	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Liquid	CT	100	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Slurry	CT	150	125	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Solids	CT	175	125	175	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Pulper	VT	40	100	150	No	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Banbury	CT	200...250	Assess	Assess	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
Agitators	Liquid	CT	100	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Slurry	CT	150	100	100	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
Mills	Sugar	CT	150	Assess	Assess	Yes	130	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Vertical roller (raw mill)	CT	Unloaded - 30 Loaded - Assess	Assess	Assess	Yes	150	Heavy	Check[3]	PowerFlex 6000T PowerFlex 7000
	Rolling	CT	Assess	Assess	Assess	Yes	Custom[4]	Custom[4]	Check[3]	PowerFlex 6000T PowerFlex 7000
	Ball and sag	CT	>150...225	Assess	Assess	Yes	Custom[4]	Custom[4]	Yes	PowerFlex 7000
Draglines	Bucket wheel excavator and reclaimer	CT	>150	Assess	Assess	Check[4]	175...225	Heavy	Yes	PowerFlex 7000
	Draglines	CT	>150	Assess	Assess	Check[4]	175...225	Heavy	Yes	PowerFlex 7000
	Cranes and hoists	CT	Assess	Assess	Assess	Check[4]	150	Heavy	Yes	PowerFlex 7000
Chillers	Chiller	CT	Assess	Assess	Assess	Check[4]	110	Normal	Check[3]	PowerFlex 6000
Propulsion	Ship propeller	CT	>120	Assess	Assess	Yes	Custom[4]	Custom[4]	Yes	PowerFlex 7000

(1) CT: constant torque, VT: variable torque.
(2) Shaded load torque attributes may impact PowerFlex 6000T drive rating. Contact Rockwell Automation Medium Voltage Commercial Engineering or your local Allen-Bradley distributor.
(3) If regeneration and/or fast deceleration is required, select the PowerFlex 7000 drive.
(4) Contact Rockwell Automation Medium Voltage Commercial Engineering or your local distributor for drive rating.

PowerFlex 6000T Medium Voltage AC Drives

PowerFlex 6000T drives provide proven technology with a robust power structure and built-in safety and smart features in a compact design. User-friendly controls and premier integration provided by TotalFORCE® technology helps reduce commissioning time and increase drive and process uptime throughout the life cycle of the drive.

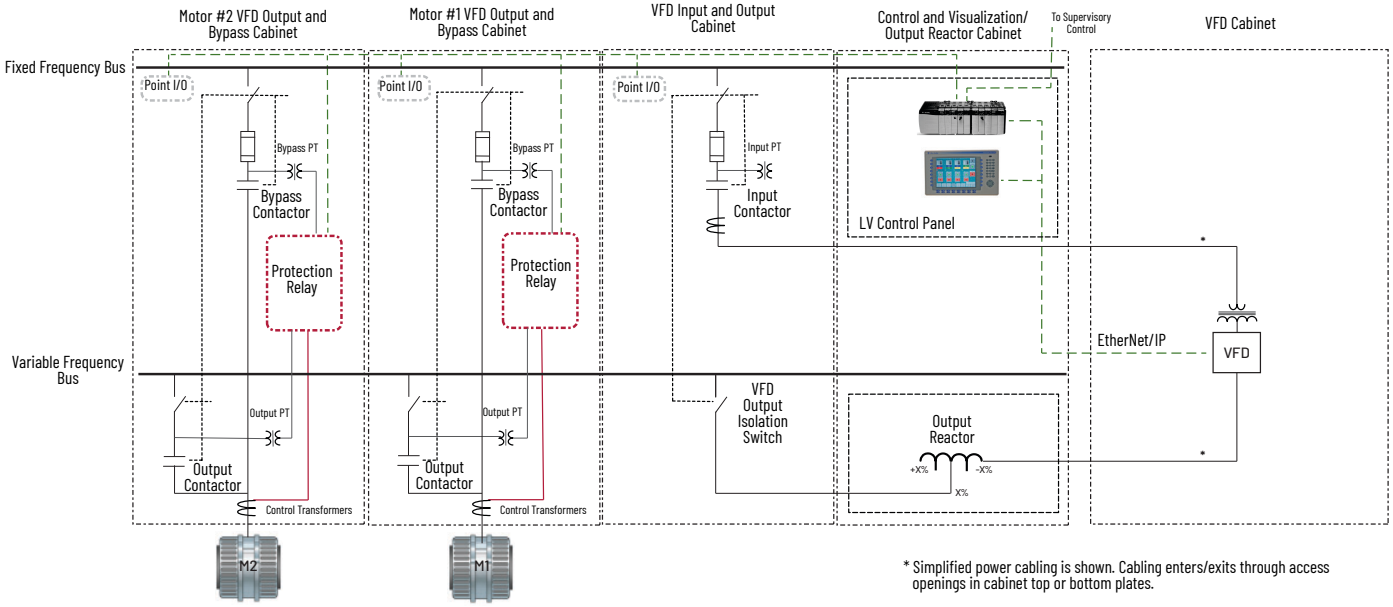
Features

- Volts per hertz, sensorless vector control suitable for all-purpose applications (6000G/6000T)
- Flux vector control for applications that require high starting torque and low speed operation (6000T only)
- Supports motor cable distances of up to 800 m (2625 ft) without an output filter, and up to 10 km (6.2 mi) with filter
- Automatic cell bypass allows for continuous operation at reduced capacity to minimize downtime, and does not increase drive size
- Supports EtherNet/IP and a wide variety of other communication modules
- Compact design provides best-in-class footprint, available for 2.3...6.6 kV in three frame sizes - up to 70 A, 71...140 A and 141...215 A
- Reinforced NEMA Type 1/IP31 or IP42 (optional) enclosure has front-access design for easy maintenance and built-in safety features like electromechanical interlocking (standard) and trapped key mechanical interlocking (optional)
- Synchronous transfer and bypass (available from 2.4...11 kV) can start up to 10 motors with one drive, up to a maximum of 680 A (totaling up to 3000 A)
- Optional surge arrestors without any size increase to the drive
- Multi-level cascaded H-Bridge design provides 96.5% efficiency including VFD and transformer
- Easy configuration, integration, and visualization in the Studio 5000 environment via Premier Integration - the common experience of integrating drive assets into a Logix control project. The PowerFlex 6000T Add-on Profile is the pre-configured data translator, visual user interface, and data configurator all rolled into one, and is the primary tool that sends drive data upstream into the higher-level control system.
- Connected Components Workbench software full device profile support - easy to configure, program, and visualize in one software package (connected to the device or offline)
- A simplified and more intuitive on-machine control, monitoring, and diagnostics user experience via a larger 10 in. color touch screen enhanced HIM (eHIM)
- Extensive input power monitoring functionality - kW, kVA, kVAR, elapsed kWh and MWh, and Power Factor
- Quick and secure flash-over-fiber firmware updates for all main control boards and power cells from one file
- More comprehensive and faster troubleshooting with the Forensic Data Recorder functionality
- Real-time Predictive and Preventative Maintenance diagnostic to predict fan life, monitor requirements for drive and critical components' life, and prevent unplanned downtime.
- Can inherently control high-speed applications up to 120 Hz output frequency with all control modes
- CIP Security-enabled to support your in-depth defense strategy and secure against all cybersecurity incidents

Synchronous Transfer Bypass

Synchronous transfer is used for controlled starting and speed control of multiple motors, with one drive. The drive can be used for soft-starting large motors to limit inrush current or for speed control of multiple motors, one at a time, as required by your process. Synchronous transfer helps to limit the mechanical wear and tear on the motor to prolong its life. It also reduces the investment and operating costs for the user.

- Available from 2.4...11 kV
- Can start up to 10 motors with one drive, up to a maximum of 680 A (totaling up to 3000 A)
- Bumpless transfer
- Ideal for natural gas or oil pipeline applications
- EtherNet/IP and a wide variety of other communication modules



NEMA 3R Enclosure

PowerFlex 6000T is available in a NEMA 3R enclosure suitable for outdoor applications. The enclosure is available for both A and B-Frame drives. The drive can be mounted virtually anywhere, which saves space on the plant floor.

- Available in both walk-in and non walk-in enclosures
- Available in both forced-cooled and air-to-air heat exchanger designs
- Also available in IP54
- No concrete pad required
- Operating temperature range: -40...+50 °C (-40...+122 °F)
- PLC-controlled enclosure heat management system for optimum energy efficiency
- Optional closed-loop internal cooling system with air-to-air heat exchanger design
- Easy installation: three cables in, three cables out
- Minimum filter maintenance
- Reduced total cost of ownership

TotalFORCE Technology

TotalFORCE Technology helps your application achieve increased throughput, improved quality, and reduced downtime.

Increase the Throughput of Your Application

With excellent tracking, the drives follow speed or torque commands closely. They also effectively reject disturbances, when loads change suddenly, to help keep the application running smoothly and help increase output.

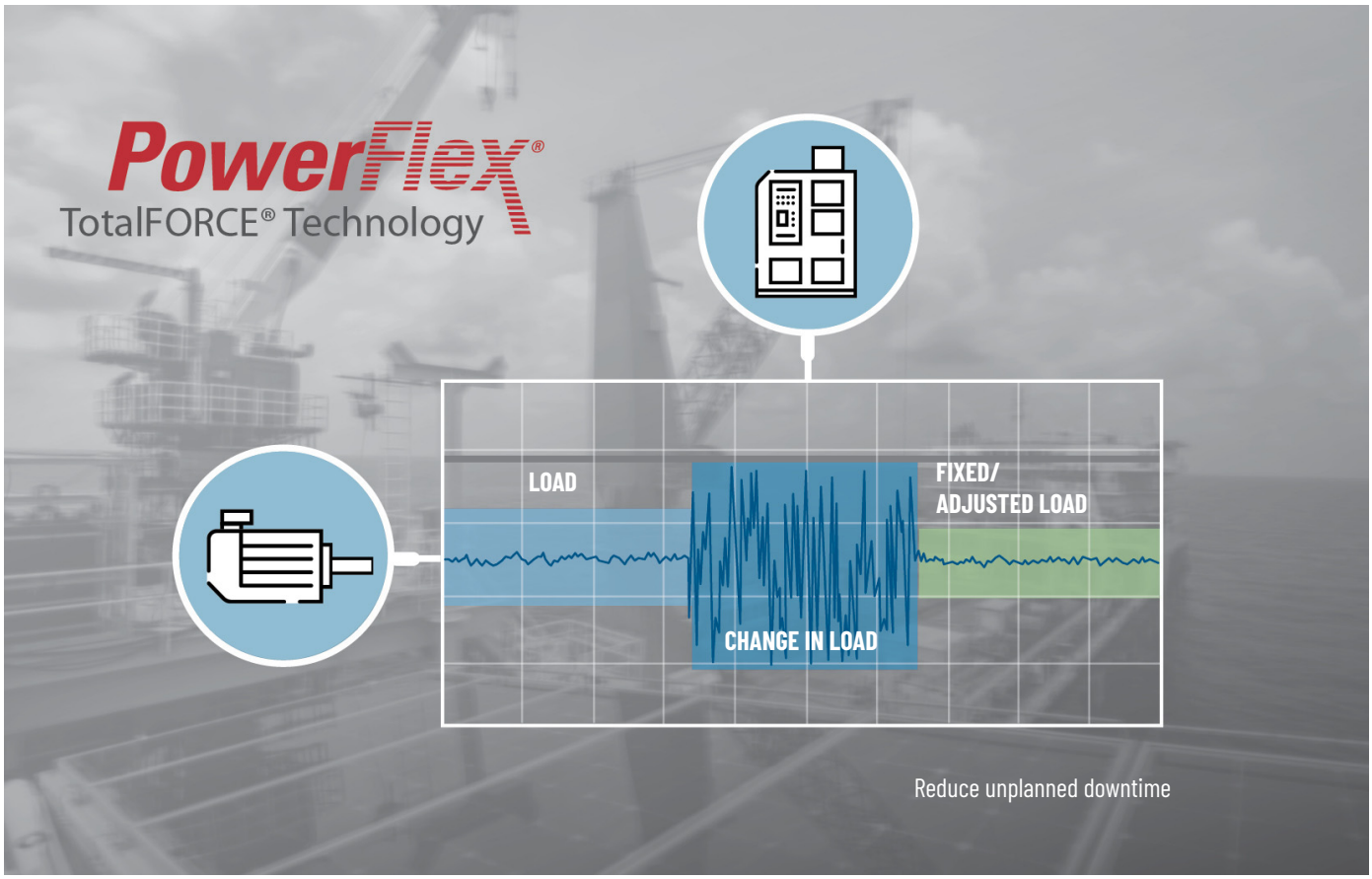
Improve the Quality of End Products

As a result of rapid processing speed, the drives provide precise velocity and torque control to help improve the uniformity of end products. In addition, high torque accuracy helps maintain speed regulation in highly demanding applications.

Reduce Equipment Downtime

PowerFlex 6000T drives continuously monitor operation, tracking the health of electrical components in the drive and motor to provide real-time diagnostic information to your control system. With this information, it is possible to predict equipment failures and take action to prevent unplanned downtime.

In addition, adaptive control features within the drives help isolate potentially harmful vibration and automatically compensate for variances to help keep your application up and running.



Catalog Number Explanation

Use the catalog numbering table chart below to understand the configuration of your medium voltage drive. Examples that are given in this section are not intended to be used for product selection. Not all combinations produce a valid catalog number. For questions regarding product availability, contact your Allen-Bradley distributor.

6000T	-	A	A	140	M	J	6	AJ	-	J	HE	E	-	...etc.
a		b	c	d	e	f	g	h		i	j	k		l

a	
Bulletin Number	
Code	**Description**
6000G	PowerFlex 6000G
6000T	PowerFlex 6000T

b	
Drive Frame Size	
Code	**Description**
A	'A' Frame (Air-cooled)
B	'B' Frame (Air-cooled)
H	'H' Frame (Air-cooled)

c	
Service Duty	
Code	**Description**
A	Normal Duty, 0...1000 m Altitude. Maximum 40 °C (104 °F) Ambient Temp, 110% or 120% overload for 1 minute, every 10 minutes
C	Heavy Duty, 0...1000 m Altitude. Maximum 40 °C (104 °F) Ambient Temp, 150% overload for 1 minute, every 10 minutes
Z	Custom configuration (contact your local Rockwell Automation sales office or Allen-Bradley distributor)

d	
Drive Current Rating Range	
Code	**Description**
15	15 A
680	680 A

e	
Enclosure Type	
Code	**Description**
D	Type 1/IP21 (with door gaskets)
M	IP31 (with door gaskets)
K	IP42 (with door gaskets)

f			
Nominal System Voltage			
Code	**Description**	**Code**	**Description**
A	2400V	L	7200V
B	3000V	P	8320V
C	3300V	R	10,000V
E	4160V	S	11,000V
G	4800V	T	11,500V
D	5500V	M	12,000V
F	6000V	U	12,470V
H	6300V	V	13,200V
J	6600V	W	13,800V
K	6900V		

g	
Line Frequency	
Code	**Description**
5	50 Hz
6	60 Hz

h	
Control Voltage	
Code	**Description**
AG	110V
AJ	120V
AL	220V
AN	230V
AP	240V

i	
Normal Load (Motor) Voltage	
Code	**Description**
A	2300V/2400V
B	3000V
C	3300V
E	4000V/4160V
D	5500V
F	6000F
H	6300V
J	6600V
K	6900V
R	10,000V
S	11,000V

j	
Transformer Efficiency	
Code	**Description**
HE	High Efficiency - Copper
SE	Standard Efficiency - Copper
SA	Standard Efficiency - Aluminum

k	
Drive Certificate	
Code	**Description**
E	IEC
U	UL

l	
Options	
Code	**Description**
See PowerFlex 6000T Medium Voltage Drive Options List.	

See publication 6000-TD100, PowerFlex 6000 Medium Voltage AC Drives Technical Data, for detailed selection, drive options, specifications, dimensions, and weights.

PowerFlex 7000 Medium Voltage AC Drives

Our PowerFlex 7000 medium voltage drives portfolio air- and liquid-cooled drives, drives with extended power configurations, and drives specially suited for marine applications.

PowerFlex 7000 Air-cooled Drives

For motors from 150…6000 kW (200…8000 Hp) at 2.4…6.6 kV, this drive offers different frame sizes and heatsink or heat pipe configurations to accommodate various power ranges.

PowerFlex 7000 Extended Power Configurations

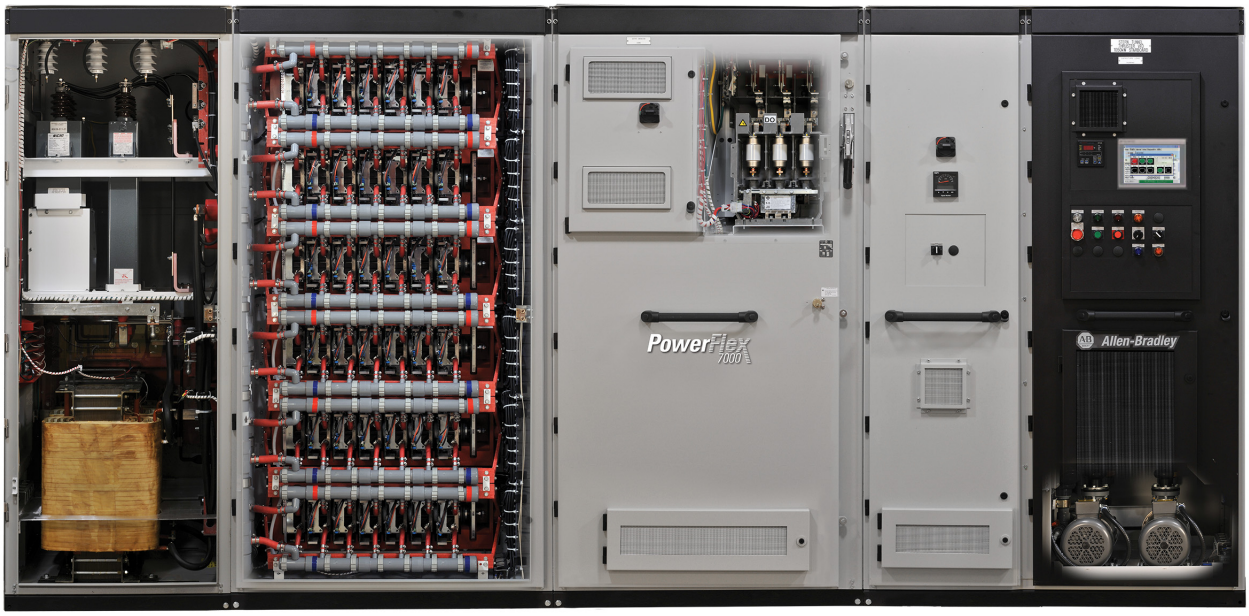
Available up to 25,400 kW (34,000 Hp), these high power air-cooled and liquid-cooled drive modules are effective solutions for hot back-up and redundancy, Load Commutated Inverter (LCI) retrofits, and power upgrades.

PowerFlex 7000 Liquid-Cooled Drives

For motors from 2240…6340 kW (3000…8500 Hp) at 4.16…6.6 kV, this option uses a closed-loop liquid-cooling system with liquid-to-air or liquid-to-liquid heat exchanger options and provides redundant pumps as standard, for optimal reliability.

PowerFlex 7000 Marine Drives

With power ratings from 600 kW to 24 MW (800…32,000 Hp), this liquid-cooled marine drive uses Direct-to-Drive technology to conserve space and weight and is built to withstand the rigors at sea.



Features

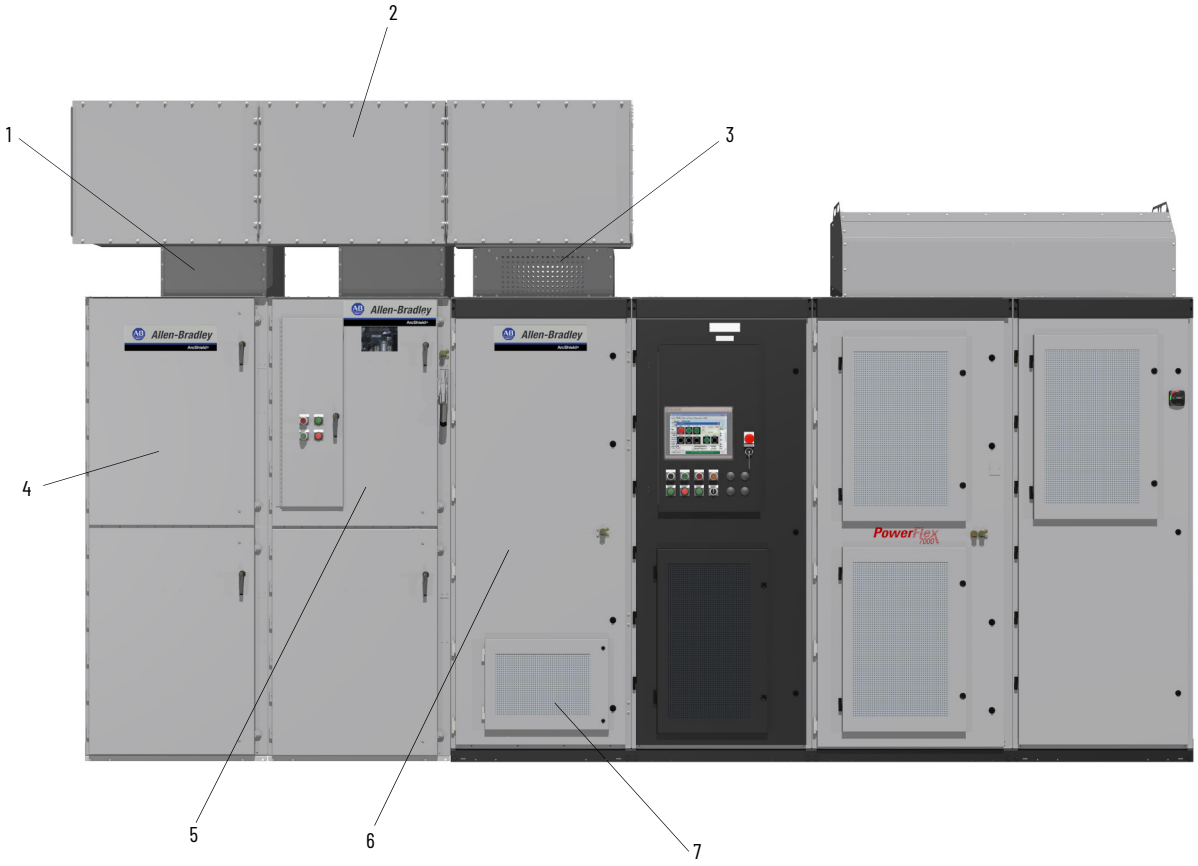
PowerFlex 7000 AC drives provide greater flexibility with high performance control options and the option for an arc-resistant enclosure.

- Controls speed, torque, and direction of induction or synchronous AC motors, normal duty or heavy duty
- Broad power range: 150…25,400 kW (200…34,000 Hp)
- Near sinusoidal current and voltage waveforms allow use of standard motors
- EtherNet/IP communication interface. Optional interfaces for various network protocols
- Help reduce downtime with built-in diagnostic and detection features that monitor the health of drive components
- Synchronous bypass and transfer to control multiple motor systems
- Direct-to-Drive Technology eliminates bulky isolation transformers, reducing the size and weight of the system while increasing efficiency
- Flexible input configurations include: Direct-to-Drive (transformerless), Active Front End with separate or integral isolation transformers, and 18-pulse rectifier with separate transformer
- Inherent four-quadrant drive operation provides regeneration capability without additional hardware for efficient motor braking
- Safe Torque Off option helps protect personnel and property with support for applications up to and including SIL 3, PLe according to IEC 61508 and ISO 13849-1
- TorqProve™ verifies that the mechanical brake has control of the load when stopping and provides 100% holding torque at zero speed
- Active Front End configurations support both Safe Torque Off and TorqProve features
- Up to 30 km (18.6 mi) motor cable distance makes the PowerFlex 7000 drive ideal for land-based or offshore platform-based applications
- Premier Integration into the Logix control platform with Studio 5000 Logix Designer application reduces development and integration time
- Remote monitoring available

PowerFlex 7000 with ArcShield Technology

The PowerFlex 7000 drive with ArcShield technology significantly reduces arc flash hazards and minimizes the risks that are associated with the operation and maintenance of electrical equipment. ArcShield technology is available for AFE Direct-to-Drive configurations and is designed to help protect employees and minimize unplanned outages and downtime.

- The first 50 kA rated arc-resistant medium voltage drive with full regeneration capabilities
- Redirects arc flash energy away from personnel via patented plenum design
- Fully integrated solution including input starter and VFD combination
- Compatible with existing Allen-Bradley arc-resistant MCCs
- Available for either 40 kA or 50 kA arc fault ratings
- Type 2B protection with low voltage door open



Item	Description
1	Pressure relief vents direct arc gases and material away from the front, rear, and sides of the enclosure during an arc flash.
2	Gases and materials are vented up and out of the top of the enclosure through the plenum exhaust system.
3	Patented self-closing vent plates prevent arc flash gases from escaping through the fan exhaust vents.
4	Cabinet doors are reinforced with welded channels that are designed to maintain structural integrity during an arc flash.
5	Robust cabinet construction, including reinforced side sheets, doors, roof, and back plates are designed to increase rigidity to contain the arc fault energy.
6	High strength hinges, latches, and bolts securely attach doors to cabinets for added protection.
7	Patented self-closing vent plates prevent arc flash gases from escaping out through front air-intake vents.

Catalog Number Explanation

Use the catalog numbering table chart below to understand the configuration of your medium voltage drive. Examples that are given in this section are not intended to be used for product selection. Not all combinations produce a valid catalog number. For questions regarding product availability, contact your Allen-Bradley distributor.

7000	-	A	40	D	A	RPDTD	1...etc.
a		b	c	d	e	f	g

a	
Bulletin Number	
Code	**Description**
7000A	A Frame (Air-cooled)
7000	B Frame (Air-cooled)
7000L	C Frame (Liquid-cooled)

c	
Drive Current Rating	
Code	**Description**
40	40 A
46	46 A
53	53 A
61	61 A
70	70 A
81	81 A
93	93 A
105	105 A
120	120 A
140	140 A
160	160 A
185	185 A
215	215 A
250	250 A
285	285 A
325	325 A
375	375 A
430	430 A
495	495 A
575	575 A
625	625 A
657	657 A
720	720 A

b	
Service Duty/Altitude Code	
Code	**Description**
A	Normal Duty, 0...1000 m Altitude Maximum 40 °C (104 °F) Ambient
B	Normal Duty, 1001...5000 m Altitude Reduced Ambient Temperature (from 40 °C [104 °F] offering) 1001...2000 m = 37.5 °C (99.5 °F) 2001...3000 m = 35 °C (95 °F) 3001...4000 m = 32.5 °C (90.5 °F) 4001...5000 m = 30 °C (86 °F)
C	Heavy Duty, 0...1000 m Altitude Maximum 40 °C (104 °F) Ambient Temperature
D	Heavy Duty, 1001...5000 m Altitude. Reduced Ambient Temperature (from 40 °C [104°F] offering) – same as "B" code above
E	Normal Duty, 0...1000 m Altitude. Maximum 35 °C (95 °F) Ambient
F	Normal Duty, 1001...5000 m Altitude Reduced Ambient Temperature (from 35° C [95 °F] offering) 1001...2000 m = 32.5° C (90.5 °F) 2001...3000 m = 30° C (86 °F) 3001...4000 m = 27.5° C (81.5 °F) 4001...5000 m = 25° C (77 °F)
G	Heavy Duty, 0...1000 m Altitude. Maximum 35° C (95 °F) Ambient Temperature
J	Normal Duty, 0...1000 m Altitude. Maximum 50° C (122 °F) Ambient Temperature
L	Heavy Duty, 0...1000 m Altitude. Maximum 50° C (122 °F) Ambient Temperature
N	Normal Duty, 0...1000 m Altitude. Maximum 20° C (68 °F) Ambient Temperature
Z	Custom Configuration (contact your local Rockwell Automation sales office or Allen-Bradley distributor)

d	
Enclosure Type	
Code	**Description**
D	Type 1 / IP21 (with door gaskets)
K	IP42 (with door gaskets)

7000	-	A	40	D	A	RPDTD	1...etc.
a		b	c	d	e	f	g

e					
Supply Voltage/Control Voltage/Control Power Transformer (C.P.T.) Selection					
Frame Size	Voltage		Frequency (Hz)	Code	
	Nominal Line	Control		With a C.P.T.(1)	Without a C.P.T.(2)
'A' Frame	2400	120	60	A	AD
		120...240		AA	—
	3300	110	50	CY	CDY
		220		CP	CDP
	4160	110	50	EY	EDY
		220		EP	EDP
		120	60	E	ED
		120...240		EA	—
	6600	110	50	JY	JDY
		220		JP	JDP
		110...220		JAY	—
		120	60	J	JD
		240		JA	—
'B' and 'C' Frames	2400	208	60	AHD	
		480		ABD	
		600		ACD	
	3300	230	50	CPD	
		380		CND	
		400		CKD	
	4160	230	50	EPD	
		380		END	
		400		EKD	
		208	60	EHD	
		480		EBD	
		600		ECD	
	6600	230	50	JPD	
		380		JND	
		400		JKD	
		208	60	JHD	
		480		JBD	
		600		JCD	

(1) You must select a control power transformer modification (6, 6B...etc.) to size the transformer.
(2) Control circuit power is supplied from separate/external source.
(3) RPTXI configuration is only available for 'A' frame configurations.
(4) R18TX configuration is only available for 'B' and 'C' frame configurations.

f	
Rectifier Configuration/Line Impedance Type	
Code	Description
RPDTD	AFE Rectifier with Integral Line Reactor and Direct-to-Drive DC Link
RPTX	AFE Rectifier with provision for connection to separate Isolation Transformer (standard DC Link)
RPTXI	AFE Rectifier with integral Isolation Transformer (standard DC Link)(3)
R18TX	18 Pulse Rectifier with provision for connection to separate Isolation Transformer (standard DC Link)(4)

g	
Options	
Code	Description
See PowerFlex 7000 Medium Voltage Drive Options List.	

See publication 7000-TD010, PowerFlex 7000 Medium Voltage AC Drives Technical Data, for detailed selection, drive options, specifications, dimensions, and weights.

Drive Options

PowerFlex medium voltage drives offer an array of options to help meet your application needs. These and many more options can be selected for operator interface, communication, drive system configuration, functional safety, and motor control. Tools for handling equipment can also be ordered.

For a full list of available options, see the following for your respective drive:

- Publication 6000-TD100, PowerFlex 6000 Medium Voltage AC Drives Technical Data
- Publication 7000-TD010, PowerFlex 7000 Medium Voltage AC Drives Technical Data

Door Mounted Operator Interface

Both drive families offer door-mounted interface options, from various pilot lights and start or stop push buttons to human interface modules (HIMs). HIMs provide convenient configuration, monitoring, and local control of the drive.

The PowerFlex 6000T drive offers the Enhanced HIM with its intuitive color touch screen. The PowerFlex 7000 offers local and remote-mounted HIM options.

Isolated Analog Signal Interface

Choose from Input Speed Reference or Output Speed, Voltage, or Current reference options. Up to four output options can be selected.

Communication Modules

These communication options for these industrial networks and more are available:

- EtherNet/IP
- Dual EtherNet/IP
- Modbus
- PROFIBUS
- PROFINET

Redundancy Options

Redundant fan and power supply options help to keep your system up and running.

I/O Module Option and Option Cards

The PowerFlex 6000T control pod lets you add a digital/analog I/O card and multiple choices of option cards, as required.

Enclosure Type

Type 1 / IP21 (General-purpose)

Type 1 / IP21 enclosures are intended for indoor use primarily to provide a degree of protection against contact with the enclosed equipment in locations where unusual service conditions do not exist. Enclosure is sheet steel, treated to resist corrosion.

Type 1 / IP21 (with Door Gaskets)

Type 1 / IP21 (with Door Gaskets) enclosures are identical to Type 1 / IP21 enclosures with the addition of gaskets around the doors. This is intended to provide additional protection against ingress of contaminants. Enclosure is sheet steel, treated to resist corrosion.

Type 1 / IP42 (with Door Gaskets)

Type 1 / IP42 enclosures are intended for indoor use to provide a degree of protection against contact with the enclosed equipment and to provide protection against entry of most wires, screws, etc. (of diameters greater than 1 mm) and to protect against vertical falling drops of water at angles of up to 15°. Enclosure is sheet steel, treated to resist corrosion.

Type 12 / IP52 (Dust Tight)

Type 12 / IP52 enclosures are intended for indoor use to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide protection from dust, falling contaminants and vertical falling drops of water at angles of up to 15°. Enclosure is sheet steel, treated to resist corrosion.

Type 3R (Outdoor Non-Walk-In)

Type 3R non-walk-in enclosures utilize a door-within-door construction. This enclosure is intended for indoor or outdoor use primarily to provide a degree of protection to personnel against incidental contact with the enclosed equipment and to provide protection against falling dirt, rain, sleet, and snow. The equipment is undamaged by the external formation of ice on the enclosure. Enclosure is sheet steel, treated to resist corrosion.

Structure Modification

Arc-resistant

Arc-resistant enclosures direct the energy that is released during an internal arc fault away from personnel and adjacent equipment into a plenum or chimney, where it is contained and vented safely. In an arc-resistant enclosure, an arc event does not compromise the integrity of the freely accessible front, sides, and rear of the enclosure or the walls isolating the low-voltage control or instrument compartments.

Seismic Rated

Seismic enclosures typically include larger sill channels and strengthened structural attachments to stiffen the cabinets. Includes additional mechanical drawings indicating dimensions, weights, and centers of gravity.

Notes:

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

Resource	Description
PowerFlex 6000 Medium Voltage Variable Frequency Drive Firmware, Parameters, and Troubleshooting Manual, publication 6000-TD004	Provides detailed information on drive features, parameters, and troubleshooting faults.
PowerFlex 6000 Medium Voltage Variable Frequency Drive User Manual, publication 6000-UM002	Provides instructions for daily recurring drive usage, HMI, and maintenance tasks.
PowerFlex 6000 Medium Voltage AC Drives Technical Data, publication 6000-TD100	Provides information on technical specifications, certifications, dimensions, cable considerations, drive torque capabilities, and product selection tables
PowerFlex 6000 Medium Voltage Variable Frequency Drive Shipping and Handling Manual, publication 6000-IN008	Provides instructions for shipping and handling a medium voltage variable frequency drive and related equipment.
PowerFlex 6000 Installation Instructions, publication 6000-IN006	Provides instructions for installing the drive, dimensions, requirements, and wiring information.
PowerFlex 6000T Drives Programming Manual, 6000-PM100	Provides detailed information on drive features, programming parameters, and troubleshooting faults and alarms
PowerFlex 6000T Drives Hardware Service Manual, 6000-TG100	Provides instructions for daily recurring drive usage, HMI, and maintenance tasks.
PowerFlex 6000T Drives Shipping and Handling Product Information, publication 6000-PC100	Provides instructions for shipping and handling PowerFlex6000T drives and related equipment.
PowerFlex 6000T Drives Installation Instructions, publication 6000-IN100	Provides instructions for installing PowerFlex 6000T drives and related equipment.
PowerFlex 7000 AC Drive A Frame User Manual, publication 7000A-UM200	Provides detailed information on hardware replacement, overview, control and power component definition, maintenance and specifications for air-cooled A frame medium voltage variable frequency drives.
PowerFlex 7000 AC Drive B Frame User Manual, publication 7000-UM202	Provides detailed information on hardware replacement, overview, control and power component definition, maintenance and specifications for air-cooled B frame medium voltage variable frequency drives.
PowerFlex 7000 AC Drive C Frame User Manual, publication 7000L-UM303	Provides detailed information on hardware replacement, overview, control and power component definition, maintenance and specifications for liquid-cooled C frame medium voltage variable frequency drives.
PowerFlex 7000 Series Safe Torque Off User Manual, publication 7000-UM203	Provides information on safety requirements, installing, configuring, and preventative maintenance of the PowerFlex 7000 Safe Torque Off option.
PowerFlex 7000 HMI Offering User Manual, publication 7000-UM201	Provides detailed information to configure, set up, operate, update and troubleshoot the PowerFlex 7000 HMI Interface Board.
PowerFlex 7000 Medium Voltage AC Drives Technical Data, publication 7000-TD010	Provides information on technical specifications, certifications, dimensions, cable considerations, drive torque capabilities, and product selection tables
PowerFlex 7000 Medium Voltage AC Drives Troubleshooting Guide, publication 7000-TG002	Provides fault and warning messages, spare parts, and fault and warning codes for all PowerFlex 7000 medium voltage drives.
PowerFlex 7000 AC Drive Transportation and Handling Procedures, publication 7000-IN008	Provides receiving and handling instructions for medium voltage variable frequency drive and related equipment
PowerFlex 7000 AC Drive Medium Voltage AC Drive Parameter Manual, publication 7000-TD002	Provides complete parameter listing for all PowerFlex 7000 medium voltage drives.
PowerFlex 7000 AC Drive B Frame Installation Instruction, publication 7000-IN007	Provides detailed installation and pre-commissioning procedures and information for PowerFlex 7000 B frame drives.
System Security Design Guidelines Reference Manual, SECURE-RM001	Provides guidance on how to conduct security assessments, implement Rockwell Automation products in a secure system, harden the control system, manage user access, and dispose of equipment.
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, rok.auto/certifications.	Provides declarations of conformity, certificates, and other certification details.

Rockwell Automation Support

Use these resources to access support information.

Technical Support Center	Find help with how-to videos, FAQs, chat, user forums, Knowledgebase, and product notification updates.	rok.auto/support
Local Technical Support Phone Numbers	Locate the telephone number for your country.	rok.auto/phonesupport
Technical Documentation Center	Quickly access and download technical specifications, installation instructions, and user manuals.	rok.auto/techdocs
Literature Library	Find installation instructions, manuals, brochures, and technical data publications.	rok.auto/literature
Product Compatibility and Download Center (PCDC)	Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes.	rok.auto/pcdc

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Rockwell Automation maintains current product environmental compliance information on its website at rok.auto/pec.

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