

# Powerdrive F300: High Power Modular AC Drives

Fan, pump and compressor drive

Optimum energy efficiency, flexible  
functionality and ease of use

90 kW to 2.8 MW / 125 to 4,200 hp  
200 V | 400 V | 575 V | 690 V



**Control Techniques™**

  
**EMERSON™**  
Industrial Automation

# Control Techniques

– a global leader  
in motor control  
technology

Control Techniques is a leading provider of motor control technology for industrial applications. The company's innovative products are used in the most demanding applications requiring reliability, energy efficiency and performance.

With facilities across Europe, the Middle East, Africa, the Americas and Asia, Control Techniques can offer local technical sales, service and design expertise to customers around the world.



# Powerdrive F300 High Power Modular Drives

## Optimum energy efficiency for fan, pump and compressor applications

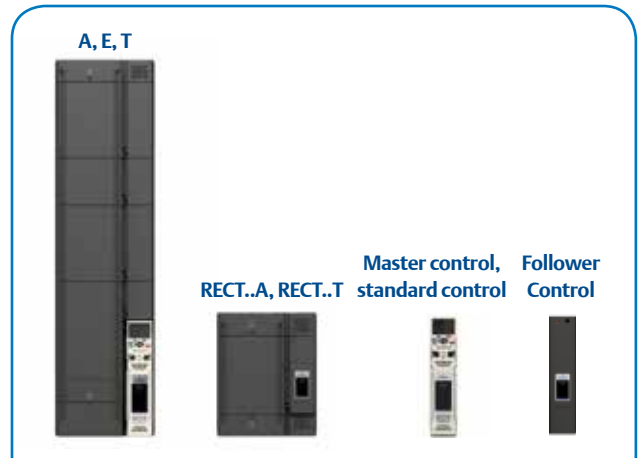
Control Techniques offers a full range of high powered drive products tailor-made for the fan, pump and compressor market from 90 kW to 2.8 MW. The Powerdrive F300 series has a modular design and can control permanent magnet or standard AC induction motors.

The modular approach to building high power systems provides the flow industry with flexibility while keeping complexity low. Modules with integrated rectifiers and/or line chokes can be easily paralleled, keeping installation time and component count to a minimum. Separate inverter and rectifier modules can be paralleled into more flexible common DC bus and regenerative configurations.

Control Techniques offers 40 years of experience and the company's drives and motors engineers have application expertise in a variety of process markets including oil and gas, chemicals, metals, mining, water, waste water, pulp and paper, food and beverage and handling.

Powerdrive F300 offers benefits in four key areas:

- 1) Energy efficiency (see page 4)
- 2) Harmonics and drive solutions (see page 5)
- 3) Reliability (see page 6)
- 4) Modular construction (see page 6)



Format	
A	AC in AC out module with integrated rectifier and line choke. Available in frame size 9 and can be paralleled up to 1.9 MW (Unidrive SPMA replacement)
E	AC in AC out module with integrated rectifier. Available in frame sizes 9, 10 & 11 and can be paralleled up to 2.8 MW
T	AC in AC out module with 12 pulse integrated rectifier. Available in frame sizes 9, 10 & 11 and can be paralleled up to 2.8 MW
RECT..A	AC in DC out rectifier 6 pulse module (Unidrive SPMC replacement)
RECT..T	AC in DC out rectifier 12 pulse module (Unidrive SPMC2 replacement)
Standard Control	Powerdrive F300 controller for single module systems
Master Control	Powerdrive F300 master controller for systems with more than one module
Follower Control	Follower controller for all paralleled modules



# Energy efficiency, low harmonics, reliability and modular construction

## Energy efficiency

### Optimum energy efficiency for fan, pump and compressor applications

Powerdrive F300 works with permanent magnet or induction motors to enable the most efficient performance and highest energy savings for fan, pump and compressor applications.

The drive was designed in conjunction with permanent magnet (PM) motors from partner company Leroy-Somer: the Dyneo® solution provides the highest energy savings available on the market today. Leroy-Somer also offers a range of AC induction motors: IMfinity®. Paired with F300, the induction motor solution offers control, reliability and ease of installation and commissioning.

### Induction motors: meet the new energy efficiency legislation and future proof your investment

- Powerdrive F300 helps IE2 motors comply with the latest European Union Minimum Energy Performance Standard legislation:
  - ⇒ Makes 7.5-375 kW IE2 motors compliant with 1st January 2015 regulations
  - ⇒ Makes 0.75-375 kW IE2 motors compliant with 1st January 2017 regulations

- Powerdrive F300 supports both induction and permanent magnet motors, meaning induction motor users can upgrade to permanent magnet without changing the drive

### Powerdrive F300: efficiency on-board

Powerdrive F300 also increases application efficiency as a result of its own energy saving features.

- Up to 98 % efficient with very low losses
- Low Power Standby and Sleep/Wake Mode using programmable real-time clock (with KI-HOA Keypad RTC) ensures minimal wasted energy
- Advanced Rotor Flux Control (RFC) features a vector algorithm utilizing closed loop current control to greatly enhance performance
- Lower losses at part load for open loop induction motor control are achieved by dynamically changing the switching frequency based on load requirements to save energy



## Harmonics and drive solutions

### Harmonics and drive conformance

Powerdrive F300 is sensitive to its environment. It has been designed for low harmonic emissions and achieves high conformance levels.

- Total Harmonic Distortion can be reduced through:
  - ⇒ Adding an AC line reactor
  - ⇒ Using a 12, 18 or 24 pulse input rectifier solution
  - ⇒ Active Front End configuration

### Environmental safety and electrical conformance

- UL listed
- Electromagnetic immunity complies with EN 61800-3 and EN 61000-6-2
- Electromagnetic emissions comply with EN 61800-3
  - ⇒ On-board EMC filter, category C3
  - ⇒ Optional external EMC filter, category C2 depending on power rating and cable length
- Compliance with EN 61000-3-12 with external line reactor

## Reliability

### Minimize downtime for critical operations

We know how important reliability is to our customers and that every second of system downtime can be costly. Powerdrive F300 high power modules have exceptional build quality based on over 40 years of industry experience. Built using advanced manufacturing processes, the modules are packed with features proven to keep Powerdrive F300 running in the most testing of environments.

### Reliability assured

- Every Powerdrive F300 power module has been subjected to elevated temperature tests that cycle a wide range of load and thermal conditions
- Powerdrive F300 drives have conformal coating to further increase resilience to harsh environmental conditions
- Trip avoidance features take intelligent action instead of interrupting critical processes. For example:
  - ◊ Active thermal monitoring reduces switching frequency as the drive approaches thermal limits
  - ◊ Load shedding reduces speed at current limits
  - ◊ Supply loss ride-through keeps the drive running during supply brown outs
- Protection alarms safeguard the wider system (e.g. over current, over temperature, over voltage and short circuit protection)
- Intelligent variable speed fans are able to ensure operating temperature stays within limits while maximizing fan lifetime by reducing wear and tear. The fans are designed for easy replacement
- Wide supply voltage tolerance keeps operation smooth when supply is variable
- Motor pre-heat function injects low level current when the motor is not running to prevent condensation
- Envelope control for refrigeration compressors

### Comprehensive module stocking system

- Standard replacements: our range is based on mass produced standard product, enabling rapid access to replacements
- Comprehensive stock: regional centers based across the globe carry large stocks, ensuring rapid availability of drives and parts

## Modular construction

### Flexible and easy system design

- Powerdrive F300 high power modules are designed to fit in standard 600 mm x 400 mm (23.6 x 15.7 in) cubicles
- 6, 12, 18 and 24 pulse input and Active Front End configurations are available
- Integrated cooling fan power supply means no additional power supplies are required
- Availability of high power modules means fewer modules per system
- Onboard PLC for custom logic control
- Common control interface ensures a consistent programming method and feature set across the range. Familiarity reduces the need for training:
  - ◊ Identical parameter structure with Smartcard and SD card cloning support
  - ◊ Powerdrive F300 Connect software for monitoring, diagnostics and advanced parameter file management
  - ◊ Machine Control Studio for application programming in the IEC61131-3 environment
  - ◊ SI-option module support for additional I/O and communications (e.g. Ethernet/IP, PROFINET RT, PROFIBUS)
- Current loop mode analog I/O



### Flexible control capability

Powerdrive F300 has been designed with specific fan, pump and compressor control features:

- Two PID controllers with anti-wind-up and user scaling provide flow-specific functionality, enhancing productivity
- Logic functions including 'AND', 'OR', 'invert', 'binary sum' and 'timer' achieved through easy menu set-up
- Realtime Clock available on the KI-HOA Keypad RTC enables the drive to respond to preset instructions or common demand patterns, helping to save energy
- Water hammer control with S-ramp deceleration
- Catch a spinning motor – improved starting sequences for fan and pump control
- On-board Fire Mode allowing 'run to failure' in the event of a fire for smoke extraction
- Low load condition monitoring and hysteresis for broken belt and dry pump detection

### Make compact, easily maintainable systems

The 280 kW (450 hp) AC in AC out module measures 1242 x 310 x 312 mm (48.9 x 12.2 x 12.3 in) - the envelope of our 400 V 280 kW module is 22 % smaller than the equivalent drive from a leading competitor.

- Overall system size and footprint is kept to a minimum
- Manageable small and light modules are maintained and replaced rapidly and easily

### Reduce your spares inventory

Powerdrive F300's modular approach allows customers to reduce their spares holding as different systems can be serviced using one common unit.

### Upgrade Unidrive SP modular systems on fans, pumps and compressors painlessly

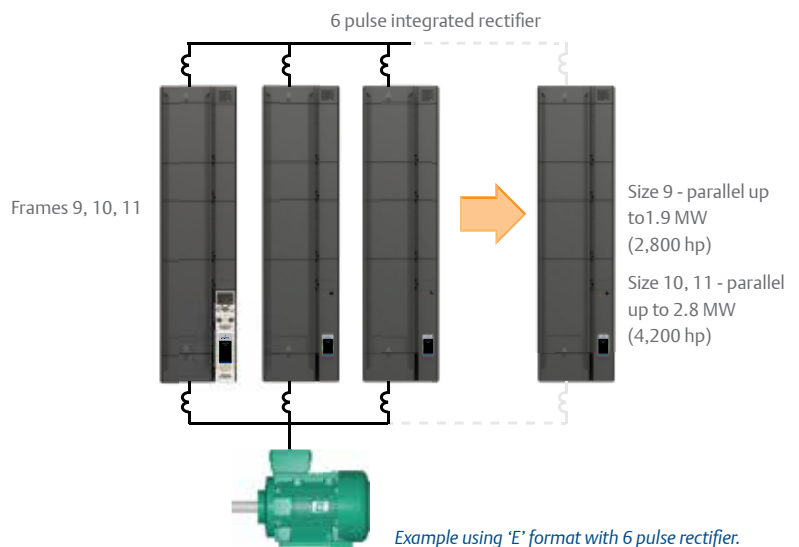
Migration of Unidrive SP modular systems to Powerdrive F300 is fast and easy:

- Compatible physical dimensions, weights and surface mount footprint. When retrofitting surface mount drives, mounting holes are in the same place or retrofit kits are available
- Parameter porting tools

# Module configurations and order information

## 'A', 'E' & 'T' – AC in AC out modules

Powerdrive F300's AC in AC out modules are available in 3 frame sizes (9, 10, & 11) and comprise an integrated 6 or 12 pulse rectifier with an inverter. 'A', 'E' and 'T' formats can be paralleled together to reach powers of 2.8 MW (4,200 hp) and can be supplied with an optional braking transistor. Frame 9A has an internal choke that can be paralleled to 1.9 MW (6 pulse only).



The above system is simply configured by ordering:

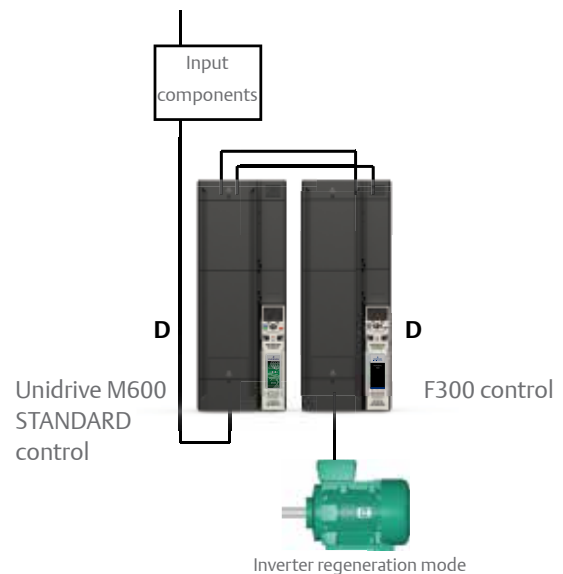
	Component	Quantity
Power module (M000)	'E' format power module (AC in AC out module with integrated rectifier)	Quantity of modules required = total current required / individual module current – 5 % derating (see technical manual)
Control module (single)	Control standard	In systems with only 1 'A' 'E' or 'T' module, use 1 standard control
Control module (multiple)	Control master	In systems with >1 'A' 'E' or 'T' module, use 1 master control
	Control follower	1 for each paralleled module (1 less than the total number of modules)





## Active Front End configuration

F300 control is applied to the motoring stage of the system for use with fans, pumps and compressors, and can achieve very low harmonic distortion performance. Unidrive M drives with regeneration capability, in 'D' format, are available in 3 frame sizes (9, 10 & 11) and can be configured as active input stages of a system. 'D' modules can be paralleled together using a common DC bus to reach powers of 2.8 MW (4,200 hp).



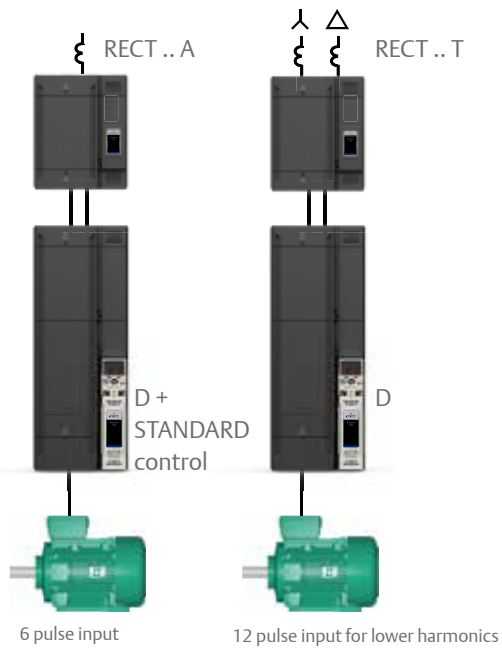
## The above system is simply configured by ordering:

	Component	Quantity
Power module	M000 'D' format inverter module size 9, 10 or 11 depending on power required	1 (add more as system power increases)
Control module (Motoring drive)	Control standard	In systems with only 1 'D' motoring inverter, use 1 standard control
	Control master	In systems with >1 'D' motoring inverter, use 1 master control
	Control follower	1 for each paralleled module (1 less than the total number of modules)
Control module (Regen drive)	M600 Control	In systems with only 1 'D' regen inverter, use 1 standard control. In systems with >1 'D' regen inverter, use 1 master control

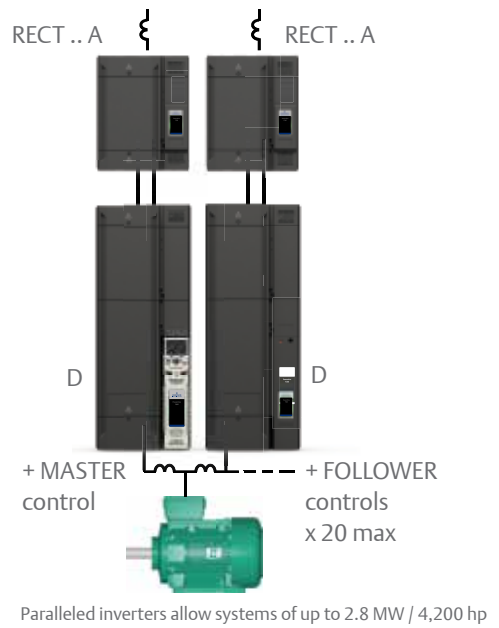


## Other flexible configurations with 'D' modules

Available with six or twelve pulse rectifier



## Easy paralleling for large drives















Frame 9: 110 to 132 kW / 150 to 200 hp

Frame 10: 160 to 200 kW / 250 to 300 hp

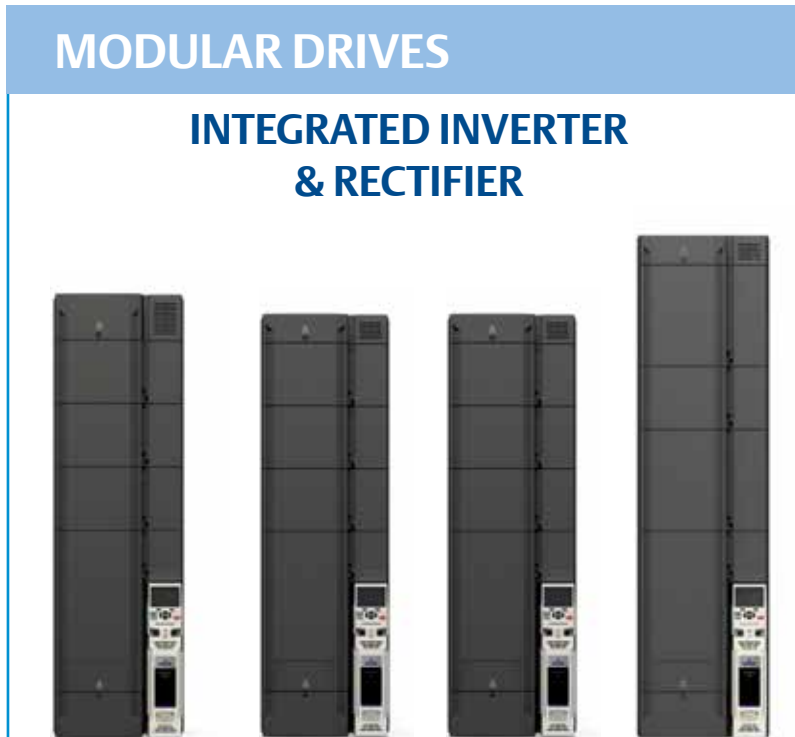
Frame 11: 225 to 280 kW / 350 to 450 hp

# Integrate, automate, communicate with Powerdrive F300 options

Powerdrive F300 drives support a wide range of optional click-in System Integration (SI) modules that allow them to integrate seamlessly with existing fan, pump and compressor systems and other vendor supplied equipment. These include communications, I/O, enhanced safety features and onboard PLCs.

Option		Description
<b>System Integration Modules</b>		
SI-Ethernet		Ethernet module supports EtherNet/IP and Modbus TCP/IP.
SI-PROFINET RT		PROFINET RT interface module.
SI-PROFIBUS		PROFIBUS interface module.
SI-CANopen		CANopen interface module.
SI-DeviceNet		DeviceNet interface module.
SI-I/O		Extended I/O interface module to increase the number of I/O analog and digital points on a drive.
<b>Drive interface units</b>		
Smartcard		Smartcard memory device to back-up and copy parameter sets and basic PLC programs.
SD Card Adaptor		Allows an SD card to be inserted into the Smartcard slot, for parameter back-up cloning and application programs.
CT USB Comms cable		The USB Comms cable allows the drive's RS485 port to connect to a PC for use with Powerdrive F300's PC tools.
<b>Keypads</b>		
Remote LCD keypad		Remote mountable, plain text, multi-language LCD keypad allows flexible mounting on the outside of a panel and meets IP66 (NEMA 4).
KI-HOA keypad		The KI-HOA keypad RTC provides Hand-Off-Auto control. The display presents up to four lines of real text with multi-language translation, enhancing clarity and increasing ease of use. A battery operated real time clock allows accurate time stamping of diagnostics and aids quick fault resolution.
Remote HOA keypad RTC		Same functionality as above but remote mountable, allowing flexible mounting on the outside of a panel (meets IP54/NEMA 12).

# Powerdrive F300 frame sizes and ratings



Frame size		9A	9E   9T	10E   10T	11E   11T
Frame sizes available	F300	•	•	•	•
Dimensions (including mounting brackets) (H x W x D)	mm	1108 x 310 x 290	1069 x 310 x 290	1069 x 310 x 290	1242 x 310 x 312
	in	43.6 x 12.2 x 11.4	42.1 x 12.2 x 11.4	42.1 x 12.2 x 11.4	48.9 x 12.2 x 12.3
Weight	kg (lb)	66.5 (146.6)	46 (101.4)   60 (132.3)	46 (101.4)   60 (132.3)	63 (138.9)   65 (143.3)
AC line choke	Internal	•			
	External		•	•	•
Max continuous heavy duty kW rating / A rating	@ 200 V	55 kW (75 hp)	55 kW (75 hp)	90 kW (125 hp)	N/A
	@ 400 V	110 kW (150 hp)	110 kW (150hp)	160 kW (250 hp)	250 kW (400 hp)
	@ 575 V	90 kW (125 hp)	90 kW (125 hp)	132 kW (200 hp)	225 kW (300 hp)
	@ 690 V	110 kW (150 hp)	110 kW (150 hp)	160 kW (200 hp)	250 kW (300 hp)

Modular ratings up to 2.8 MW (4,200 hp) through parallel connected inverters.



# Hardware selection 90 to 280 kW / 150 to 450 hp

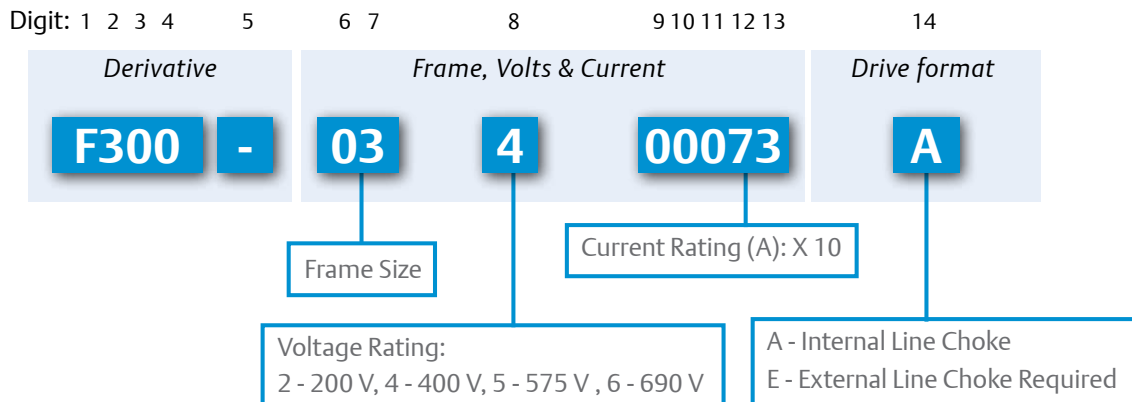
Powerdrive F300 high power AC drives provide market-leading current ratings to maximize system capability

Vac ±10%	Powerdrive F300	Order Code Frame & Format Identifiers	Normal Duty				Rectifier for Modular ‘..D’ Inverters	Input Choke		Output Choke		
			I <sub>CONT</sub> MAX	Motor Shaft Power		I <sub>PEAK</sub>		RECT-..A/T	Single	Dual	Single	Dual
			A	kW	hp	A						
200/240	‘-09202160’	09..A/E	216	55	75	238	‘-10204100A’	INL401	INL411	OTL401	OTL411	
	‘-09202660’	09..A/E	266	75	100	293				OTL402	OTL412	
	‘-10203250’	10..E	325	90	125	358		INL402	INL412	OTL403	OTL413	
	‘-10203600’	10..E	360	110	150	396				OTL404	OTL414	
380/480	‘-09402210’	09..A/E	221	110	150	243	‘-10404520A’	INL401	INL411	OTL401	OTL411	
	‘-09402660’	09..A/E	266*	132	200	293				OTL402	OTL412	
	‘-10403200’	10..E	320	160	250	352		INL402	INL412	OTL403	OTL413	
	‘-10403610’	10..E	361	200	300	397				OTL404	OTL414	
	‘-11404370’	11..E	437*	225	350	480	INL403L		OTL405			
	‘-11404870’	11..E	487*	250	400	535	INL403		OTL407			
	‘-11405070’	11..E	507*	280	450	558			‘-1142X400T’	OTL407		
500/575	‘-09501250’	09..A/E	125	110	125	138	‘-10502430A’	INL601	INL611	OTL601	OTL611	
	‘-09501500’	09..A/E	150	110	150	165				OTL602	OTL612	
	‘-10502000’	10..E	200	130	200	220		INL602	INL612	OTL603	OTL613	
	‘-11502480’	11..E	248*	185	250	273	‘-11503840A’ ‘-1162X380T’	INL603		OTL605		
	‘-11502880’	11..E	288*	225	300	317				OTL607		
	‘-11503150’	11..E	315*	250	350	346				OTL607		
500/690	‘-09601250’	09..A/E	125	110	150	138	‘-10602480A’	INL601	INL611	OTL601	OTL611	
	‘-09601550’	09..A/E	155	132	175	171				OTL602	OTL612	
	‘-10601720’	10..E	172	160	200	189		INL602	INL612	OTL603	OTL613	
	‘-10601970’	10..E	197	185	250	217				OTL604	OTL614	
	‘-11602250’	11..E	225*	200	250	248	‘-11604060A’	INL603		OTL605		
	‘-11602750’	11..E	275*	250	300	303	‘-1162X380T’			OTL607		
	‘-11603050’	11..E	305*	280	400	335				OTL607		

Notes:

\* At 2 kHz switching frequency

For paralleling, a 5 % derating should be applied. For ratings at F ‘switch frequency’ > 3 kHz (or 2 kHz for F11) refer to User Guide





## Powerdrive F300 high power feature and specification table

Feature	Powerdrive F300	Feature	Powerdrive F300
Open loop vector or V/Hz	•	Status LED	•
Sensorless Rotor Flux Control (induction motors)	•	Mechanical retrofit compatibility to previous Control Techniques products	•
Open loop permanent magnet (RFC-S)	•	Common DC bus connections*	•
2 x analog inputs, 2 x analog outputs	•	Stationary autotune for permanent magnet motors	•
3 x configurable digital I/Os	•	Wide operating range back-up DC supply	•
Relay output (2)	•	24 V control back-up	•
1 x Safe Torque Off input	•	Variable speed, user replaceable cooling fan	•
0-20 mA / 4-20 MA analog I/O	•	Conformal coating	•
Onboard RS485 comms with Modbus RTU	•	Standby mode (energy saving)	•
Onboard IEC61131-3	•	Ingress rating	IP20
3 x SI option module slots	•	Dual onboard form C relay outputs	•
Cloning via smartcard	•	Analog input 1 and analog outputs can be configured in current loop mode	•
Cloning via SD card	•	Quick and easy 4 parameter set up for permanent magnet motors	•
Switching frequency range of 2-16 kHz	•		

\*Not available in E format

# Control Techniques™

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