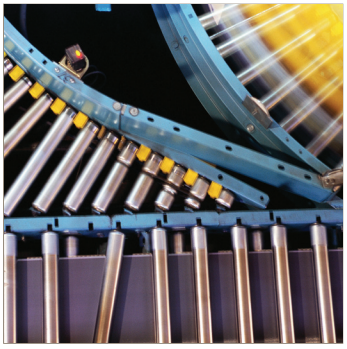

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding

AC650G Series

General Purpose AC Drive
0.3 HP - 10 HP (0.25 kW - 7.5 kW)

Parker

ENGINEERING YOUR SUCCESS.

WARNING — USER RESPONSIBILITY

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

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- The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.
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AC650G - General Purpose AC Drive

Parker Hannifin

The global leader in motion and control technologies and systems

Global Partnerships
Global Support

Parker is committed to helping make our customers more productive and more profitable through our global offering of motion and control products and systems. In an increasingly competitive global economy, we seek to develop customer relationships as technology partnerships. Working closely with our customers, we can ensure the best selection of technologies to suit the needs of our customers' applications.

Electromechanical Technologies for High Dynamic Performance and Precision Motion

Parker electromechanical technologies form an important part of Parker's global motion and control offering. Electromechanical systems combine high performance speed and position control with the flexibility to adapt the systems to the rapidly changing needs of the industries we serve.

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SSD Drives Division Manufacturing

Parker SSD drive products are manufactured globally to provide our customers with quality products at a competitive price point. In addition to factory-direct support, Parker provides sales assistance and local technical support through a group of dedicated sales teams and a network of authorized systems integrators, field service engineers, and technical distributors across the globe. For contact information, please refer to the Sales Offices listed on the back cover of this document or visit **www.parker.com/ssd**

Charlotte, NC

Littlehampton, UK

Wuxi, China

Chennai, India

AC650G - General Purpose AC Drive

Overview

Description

The AC650G is ideally suited to applications requiring accurate control at lower speeds, higher starting torques or where improved speed regulation of variable loads is important. Whether you are controlling a conveyor belt, pump, mixer, machine spindle, or other high performance application, the sensorless flux vector technology of the AC650G delivers improved control for an economical price.

Designed with simplicity in mind, the AC650G comes in a compact format with DIN rail mounting as standard, allowing easy integration into any electrical control panel.

The AC650G is an easy to use, out of the box solution that will have your system up and running quickly. It provides reliable, robust motor control from 0.3 HP through 10 HP. (0.25 kW to 7.5 kW)

Features

- **High torque sensorless vector control mode for advanced motor control**
- **Power range 0.3 through 10 HP**
- **Integrated operator keypad**
- **Profibus, RS232, RS485 communication option for PLC integration**

Technical Characteristics - Overview

The AC650G is available in three input voltage supply variants to suit your application needs.

Version	230 VAC 1 phase input	230 VAC 3 phase input	460 VAC 3 phase input
Power Supply	220...240 VAC (+10%) 50/60 Hz (+10%) Single phase input Three phase output Ratings: 0.3 - 3 HP (0.25 - 2.2 kW) 1.50 - 9.6 A	220...240 VAC (+10%) 50/60 Hz (+10%) Three phase input Three phase output Ratings: 3 - 5 HP (2.2 - 4.0 kW) 9.6 - 16.4 A	380...460 VAC (+10%) 50/60 Hz (+10%) Three phase input Three phase output Ratings: 0.5 - 10 HP (0.37 - 7.5 kW) 1.50 - 16.0 A

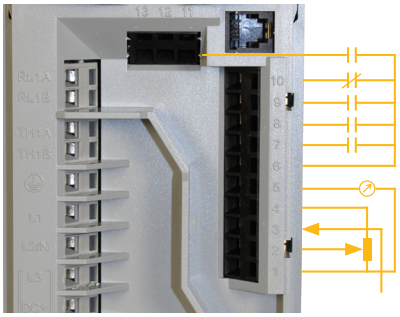
Product Description

The Parker AC650G is an entry level adjustable speed drive designed to provide cost-effective control of AC induction motors used in many everyday industrial applications. Its simplicity makes the AC650G ideally suited for use in standalone motor applications where previously a drive would have been considered too complex.

The AC650G is ideally suited to energy saving in pump and fan applications and delivers reliable, cost-effective voltage/frequency or sensorless vector speed control of your motor.

To prevent unauthorized changes to drive configuration after setup, the operator/programming keypad can be removed or password protected.

The AC650G is an easy to use, out of the box solution that will have your system up and running in record time. It provides reliable, robust motor control from 0.3 HP through 10 HP.



Flexible I/O including analog and relay output and motor thermister input allowing greater control options

- High torque sensorless vector control mode for advanced motor control
- Fully configurable drive with graphical software tools such as DSE Lite provided at no additional charge
- Standard Ethernet communications with additional optional protocols for integration into PLC systems
- DIN Rail mounting as standard
- Integrated applications macro to simplify programming
- Remote mountable keypad option
- Integrated EMC filter fitted as standard

Integrated operator keypad with option for remote mounting

Pre-programmed Macros allowing quick and simple drive setup

DIN rail mounting for easy integration into any electrical cabinet

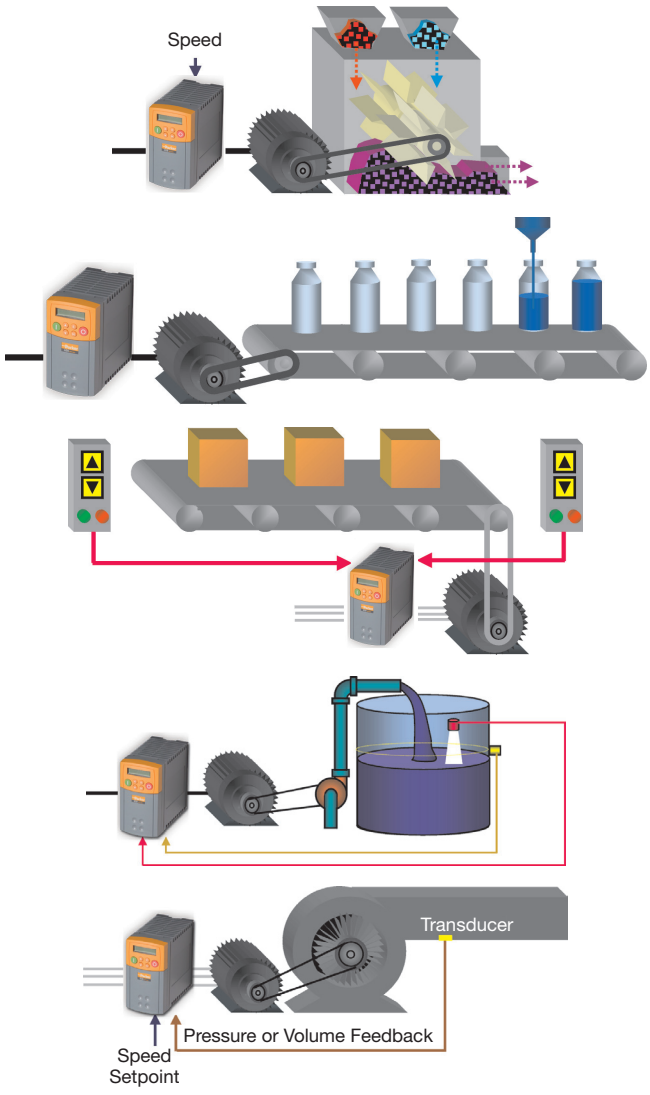
Optional integrated EMC filter ensures compliance while maintaining a compact footprint

6514 cloning module (option) allows easy back-up and transfer of parameters between different AC650G drives

Diagnostic and control through the operator keypad

Easy-to-use Operator/Programming Controls

Simplified operation throught the use of pre-programmed macros



Simple speed control

set speed and voltage or current with start / stop direction control

Manual / Automatic control

set to run with local speed setting or external reference

Preset speed control

select up to 8 pre-programmed speeds using digital inputs

Increase / Decrease

Increase or reduce speed using digital inputs

PID Control

Control the pressure, flow, temperature or any process variable

Technical Characteristics

Power Ratings

Order Code/Part Number	Nominal power [HP/kW]	Output current [A]	Frame
Nominal 220-240 VAC single phase			
650G-21115010-...	0.3/0.25	1.5	1
650G-21122010-...	0.50/0.37	2.2	1
650G-21130010-...	0.75/0.55	3.0	1
650G-21140010-...	1.0/0.75	4.0	1
650G-21155020-...	1.5/1.1	5.5	2
650G-21170020-...	2.0/1.5	7.0	2
Nominal 220-240 VAC single or three phase			
650G-22196030-..	3.0/2.2	9.6	3
Nominal 220-240 VAC three phase			
650G-23212330-...	4.0/3.0	12.3	3
650G-23216430-...	5.0/4.0	16.4	3
Nominal 380-460 VAC three phase			
650G-43115020-...	0.5/0.37	1.5	2
650G-43120020-...	0.75/0.55	2	2
650G-43125020-...	1.0/0.75	2.5	2
650G-43135020-...	1.5/1.1	3.5	2
650G-43145020-...	2.0/1.5	4.5	2
650G-43155020-...	3.0/2.2	5.5	2
650G-43168030-...	4.0/3.0	6.8	3
650G-43190030-...	5.0/4.0	9	3
650G-43212030-...	7.5/5.5	12	3
650G-43216030-...	10.0/7.5	16	3

See Ordering Information for full order codes and description

Electrical Characteristics

Power Supply Requirements

Power Supply	230 VAC 1 Ph - Nominal	230 V 3 Ph - Nominal	460 V Nominal
Rated Input Voltage	1 Ø 220...240 VAC ±10 %	3 Ø 220...240 VAC ±10 %	3 Ø 380...460 VAC ±10 %
Input Frequency	45...65 Hz		
Supply Type	Ground referenced (TN) or non-ground referenced (IT)		
Overload	150 % for 30 seconds		
Output Frequency	0...240 Hz		
Input Power Factor (lag)	0.9 @ 50/60 Hz		
Supply Short Circuit Rating	220-240 V 1 Ø - 5000 A, 220-240 V 3 Ø - 7500 A, 380-460 V 3 Ø - 10000 A		

Auxiliary Characteristics

User Relay (RL1A, RL1B)	Maximum voltage: 250 VAC Maximum current: 4 A Sample interval: 10 ms
Analog Inputs/Outputs (AIN1 and AIN2)	Range: 0-10 V and 0-5 V (no sign) set via IP13 (AIN1) 0-10 V, 0-5 V, 0-20 mA or 4-20 mA (no sign) set via IP23 (AIN2) Absolute maximum input current 25 mA in current mode Absolute maximum input voltage 24 VDC in voltage mode
Analog Outputs (AOUT1 and AOUT2)	Range: 0-10 V (no sign) Maximum rated output current 10 mA, short circuit protection Resolution: 10 bits, (1 in 1024) Dynamic response: sampled every 5 ms
Digital Inputs	Operating Range (DIN1, 2, 3, 4, 5): 0-5 VDC = OFF, 15 - 24 VDC = ON Operating Range (DIN6, 7): 0-1.5 VDC = OFF, 4-24 VDC = ON Absolute maximum input voltage = ± 30 VDC IEC1131 Input current: 7.5 mA @ 24 VDC Sample interval: 10 ms
Digital Output (DOUT1 and DOUT2)	Nominal open circuit output voltage: 23 V (Minimum 19 V) Nominal output impedance: 47 Ω Rated output current: 50 mA total

Environmental Characteristics

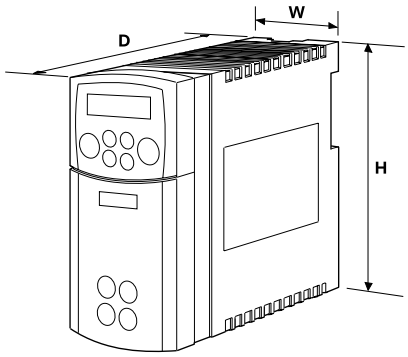
Operating Temperature	0 to +40 °C
Storage Temperature	-25 to +55 °C
Shipping Temperature	-25 to +70 °C
Product Enclosure Rating	IP20 (UL open type) suitable for cubicle mount only
Altitude	1000 m ASL. Derate output current by 1 % per 100 m to a maximum of 2000 m
Operating Humidity	Maximum 85 % relative humidity at 40 °C non-condensing
Climatic Conditions	Class 3k3, as defined by EN60721
Operating Vibration	Test Fc of EN60068-2-6 10 Hz <=f<= 57 Hz sinusoidal 0.075 mm amplitude 57 Hz<=F<=150 Hz sinusoidal 1g 10 sweep cycles per axis on each of three mutually perpendicular axis

Standards and Conformance

Pollution Degree	Pollution degree II (non-conductive pollution, except for temporary condensation)
North America	UL listed to US standard UL508C cUL listed to Canadian standard C22.2#14
Rest of world	CE marked to EN50178 (safety, low voltage directive 2006/95/EC) CE marked to EN61800-3 (EMC directive)

Dimensions

Frame Size	H [in/mm]	W [mm]	D [mm]
1	5.4/137	2.9/73	5.6/142
2	7.6/192	2.9/73	6.8/173
3	10.0/257	3.8/96	7.9/200



Connections

Typical connection details

Term.	Label	Description	Range
RL1A	User Relay	Volt-free contact	0-250 VAC / 24 VDC 4 A
RL1B	User Relay	Volt-free contact	0-250 VAC / 24 VDC 4 A
13	DIN7	Configurable digital input	0-24 VDC
12	DIN6	Configurable digital input	0 -24 VDC
11	DIN5	Configurable digital input	0-24 VDC*
10	DIN/DOUT2	Configurable digital input/output	0-24 VDC source open collector*
9	DIN3	Configurable digital input	0-24 VDC
8	DIN2	Configurable digital input	0-24 VDC
7	DIN1	Configurable digital input	0-24 VDC
6	+24V	24 VDC supply for digital I/O	*
5	AOUT1	Configurable analog output 10 mA)	0-10 V
4	10VREF/ AOUT2	10 V reference / analog output (10 mA)	10 V
3	AIN2	Analog input 2	0-10 V, 4-20 mA
2	AIN1	Analog Input 1	0-10 V
1	0V	0 V reference for analog/digital I/O	0 V

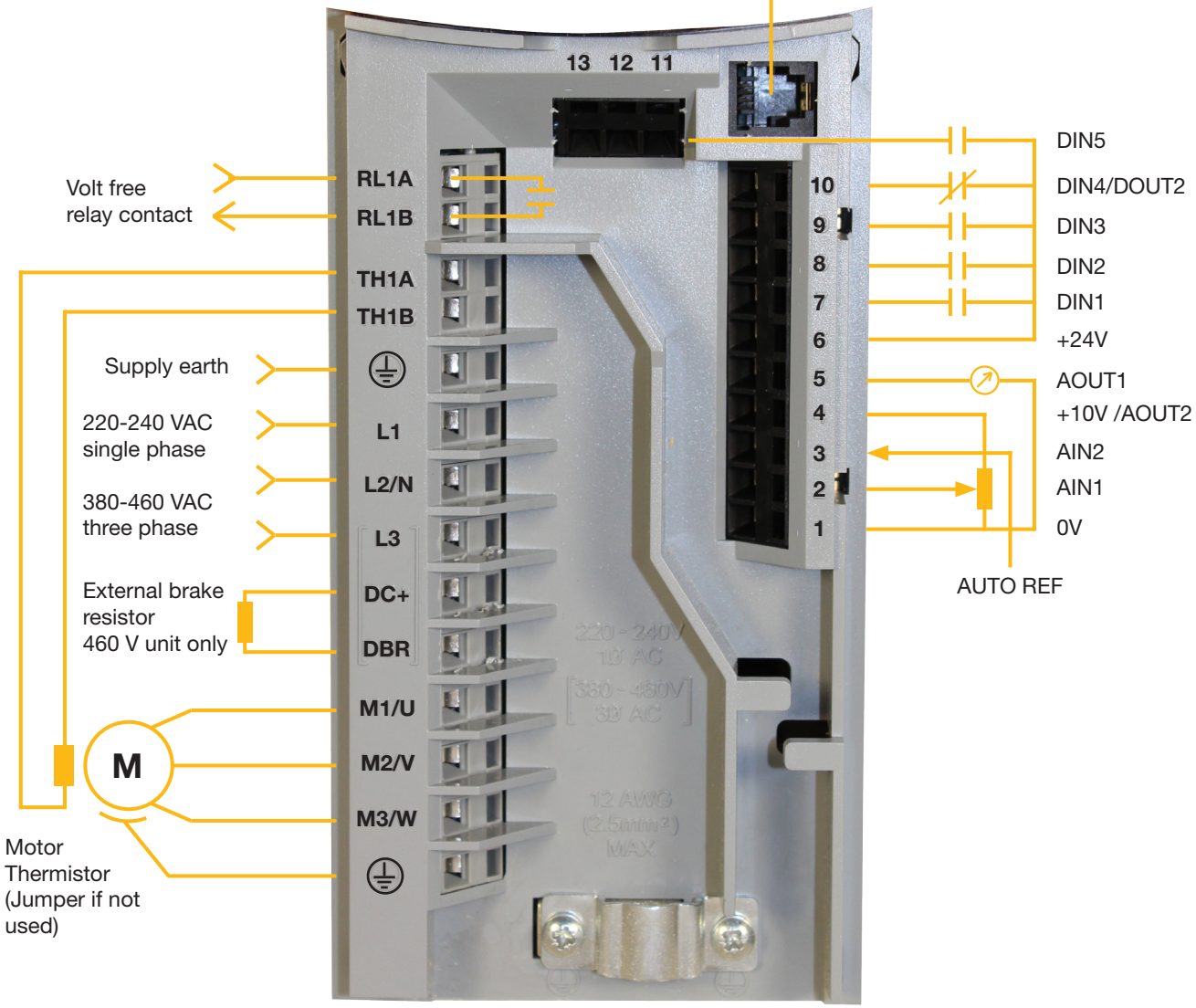
TH1A	Thermistor	Connection to motor thermistor	PTC
TH1B	Thermistor	Connection to motor thermistor	PTC
L1	Power Input	1 and 3 phase live connection	220/240 1 or 3 phase or 380/460 V 3 phase
L2/N	Power Input	1 phase neutral (or L2 3 phase live connection)	220/240 1 or 3 phase or 380/460 V 3 phase
L3	Power Input	3 phase live connection	220/240 3 phase or 380/460 V 3 phase
DC+	Dynamic Brake	Connection to external brake resistor	See manual
DBR	Dynamic Brake	Connection to external brake resistor	See manual
M1/U	Motor Outputs	Connection for motor Phase 1	1 ph 220/240 VAC: motor rated at 0 - 220/240 VAC 3 ph 220 V/240 VAC: motor rated at 0 - 220/240 VAC 3 ph 400 VAC: motor rated at 0 - 380/460 VAC Output frequency 0 - 240 Hz
M2/V	Motor Outputs	Connection for motor Phase 2	
M3/W	Motor Outputs	Connection for motor phase 3	

* The total current available is 50mA, either individually or as the sum of outputs from terminals 6, 10 and 11

6521-00-G

6511-xxxx-00

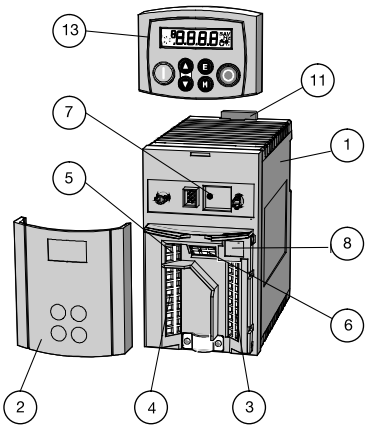
P3 Port - RS232 communications to remote mounted keypad or connection to laptop



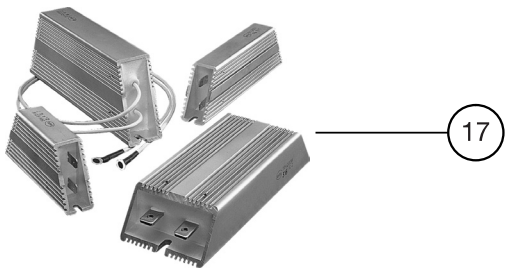
Accessories and Options

All AC650 Series AC Drive Frames 1 - 3

Options		Frame	AC650G/V only	Fitting	Part Number/ Order Code
AC Inverters					
1	Inverter housing	1–3		Standard	See order code
2	Terminal Cover (simplified wiring diagram)				
3	Control wiring terminals				
4	Power wiring terminals				
5	Volt-free relay contact				
6	Encoder / Digital Inputs		√		
7	Power On LED				
8	RS232 P3 port for remote mounting of operator keypad		√		
11	DIN Rail mounting clip	1-3			
Operator keypad					
13	TTL keypad (local mounting only)	1-3		Standard	6511-TTL-00
	RS232 keypad (remote mountable)	1-3	√	Option	6511-RS232-00
	RS232 keypad (remote mountable)	1-3		Option	6521-00-G
	RS232 keypad (remote mountable)	1-3		Option	6901-00-G
Communication					
14	Profibus communications card	1-3	√	Factory Option	6513-PROF-00
15	RS232/RS485 communication card (Modbus RTU, EI Bisync F1/3)	1-3	√	Factory Option	6513-EI00-00
Other options					
16	Cloning module for the storage and transfer of up to 10 drive configurations	1-3		Option	6514-00
Accessories					
17	Brake resistor	See corresponding section			



Frames 1 - 3, up to 10 HP
(7.5 kW)



Options

Operator Keypads


6511-xxxx-00


6521-00-G


6901-00-G

Order Code	Description	Suitable for	Notes
6511-TTL-00	Spare TTL keypad (local mounting)	All AC650 Series AC Drives Frames 1-3	Provided with drive if last character in drive order code is "1"
6511-RS232-00	Spare RS232 keypad (remote mountable)	All AC650 Series AC Drives Frames 1-3	Provided with drive if last character in drive order code is "2"
6521-00-G	RS232 keypad (remote mountable)	All AC650 Series AC Drives Frames 1-3	For remote mounting only
6901-00-G	RS232 keypad (remote mountable)	All AC650 Series AC Drives Frames 1-3	For remote mounting only

Communication Interfaces

RS485 Modbus Interface

Description

The RS485/RS232 communications interface provides serial data communication, allowing an AC650G/AC650V/AC650S drive to connect to a Modbus RTU network as a slave station.

6513-E100-00	RS485/Modbus communication interface
Supported Protocols	Modbus RTU or EI-6ASCII
Communication Speed	1200 to 115200 bits/s
Station Address	Selectable via software
Suitable for firmware	All AC650 Series AC Drives V4.x+

PROFIBUS-DP Interface

Description

The PROFIBUS option supports the PROFIBUS-DP PROFIBUS protocol, designed specifically for communication between a PLC system and remote I/O. The PROFIBUS interface enables the drive to connect to a PROFIBUS-DP as a slave station.

6513-PROF-00	PROFIBUS-DP I/O communication interface
Supported Protocols	PROFIBUS-DP; Demand data and data exchange
Communication Speed	Up to 12 Mbits/s; selected by the master
Station Address	Software setting of station address via DSE
Suitable for firmware	All AC650 Series AC Drives V4.9+

Options

Cloning Module

Description

The cloning module can be used with the complete range of AC650 series AC drives.

It allows the user to store up to 10 separate drive configurations which can then be transferred between different drives. The configurations can be mapped between different drive sizes. This is an invaluable tool for commissioning or plant maintenance personnel allowing drives to be backed up and reconfigured simply and easily without the need of a computer.

Product Codes

Order Code	Description	Suitable for
6514-00	Cloning Module	All AC650 Series Drives

Braking Resistors
for AC Drives

Description

Brake resistors are used with AC650 Series or AC690 drives equipped with a braking option modules. They are designed to allow the drive to stop a motor at full load during deceleration or an overhauling load.

Brake resistor selection

Brake resistor assemblies must be rated to absorb both peak braking power during deceleration and the average power over the complete cycle.

Resistors above 500 W

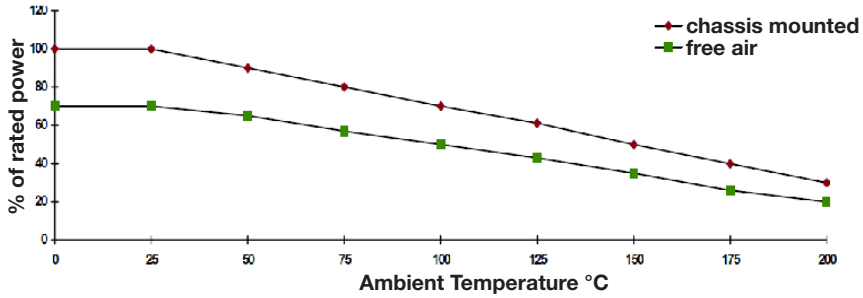
Resistors above 500 W are available upon request:

- IP20 protection up to 3 kW
- IP13 protection between 4.2 and 9.8 kW

$$\text{Peak braking power} = \frac{0.0055J \times (n_1^2 - n_2^2)\ (W)}{tb}$$

$$\text{Average braking power } P_{av} = \frac{P_{pk} \times t_b}{t_c}$$

J - total inertia in kgm^2
n_1 - initial speed in min^{-1}
n_2 - final speed min^{-1}
t_b - braking time in s
t_c - cycle time in s

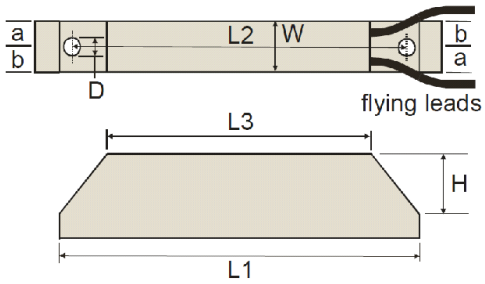


Dimensions

Nominal Power [kW]	Dimensions		
	L [mm]	H [mm]	P [mm]
1.0	137	450	140
1.6	182	450	140
2.0	182	450	140
2.5	227	450	140
3.0	227	450	140
4.2	450	440	540
5.6	530	440	540
7.0	530	440	540
8.4	610	440	540
9.8	610	440	540

Model	Impedance [Ω]	Nom. Power [W]	Dimensions							
			L1	L2	L3	W	H	D	a	b
CZ467715	500	60	100	87	60	22	41	4.3	10	12
CZ467714	200	100	165	152	125	22	41	4.3	10	12
CZ389853	100	100	165	152	125	22	41	4.3	10	12
CZ467717	100	200	165	146	125	30	60	4.3	13	17
CZ463068	56	200	165	146	125	30	60	4.3	13	17
CZ388397	56	200	165	146	125	30	60	4.3	13	17
CZ388396	36	500	335	316	295	30	60	4.3	13	17
CZ467716	28x2	500	335	316	295	30	60	4.3	13	17

Overload 5 s : 500 %
Overload 3 s : 833 %
Overload 1 s : 2500 %



EMC Filters

for AC Drives

Description

A range of custom designed optional EMC (Electromagnetic Compatibility) filters are available for use with Parker SSD Drives product range.

They are used to help achieve conformance with the EMC directive BS EN 61800-3:2004 - "Adjustable speed electrical power drive systems - Part 3".

Installation of the drive must be in accordance with the installation guidelines in the product manual. The filters comply with the relevant standards as outlined in the following table.

1st Environment: Drives directly connected without intermediate transformers to a low voltage (<100 Vrms) supply network that is part of a network that also supplies buildings used for domestic purposes.
2nd Environment : Establishments where there is no direct connection to a low voltage supply network that also supplies buildings used for domestic purpose.
TN Earthing = Grounded neutral AC supply <460 VAC
IT Earthing = Ungrounded neutral AC supply <500 VAC
Ext. Filter = External filter
Ext. Filter FP = Footprint external filter

EMC Filters

AC Drives	2nd Environment (Industrial)	1st Environment (Domestic)
All AC650 Series AC Drives		
Frame 1-3	Indicated by an F in the product code	Indicated by an F in the product code

Order Code

AC650G Series

	1		2	3	4	5		6	7	8	9	10		11	12
Order example	**650G**	-	**21**	**1150**	**1**	**0**	-	**0**	**0**	**1**	**P**	**00**	-	**B**	**2**

1	**Product family**	
	650G	AC650G general purpose AC drive
2	**Supply voltage**	
	21	230 VAC 1 phase
	23	230 VAC 3 phase
	43	400/460 VAC 3 phase
3	**Output Current**	
	230 VAC 1 phase supply voltage	
	1150	0.3 HP/0.25 kW / 1.5 A (Frame 1)
	1220	0.5 HP/0.37 kW / 2.2 A (Frame 1)
	1300	0.75 HP/0.55 kW / 3 A (Frame 1)
	1400	1 HP/0.75 kW / 4 A (Frame 1)
	1550	1.5 HP/1.1 kW / 5.5 A (Frame 2)
	1700	2 HP/1.5 kW / 7 A (Frame 2)
	230 VAC 1/3 phase supply voltage	
	1960	3 HP/2.2 kW / 9.6 A (Frame 3)
	230 VAC 3 phase supply voltage	
	2123	4 HP/3.0 kW / 12.3 A (Frame 3)
	2164	5 HP/4.0 kW / 16.4 A (Frame 3)
	400/460 VAC 3 phase supply voltage	
	1150	0.5 HP/0.37 kW / 1.5 A (Frame 2)
	1200	0.75 HP/0.55 kW / 2 A (Frame 2)
	1250	1 HP/0.75 kW / 2.5 A (Frame 2)
	1350	1.5 HP/1.1 kW / 3.5 A (Frame 2)
	1450	2 HP/1.5 kW / 4.5 A (Frame 2)
	1550	3 HP/2.2 kW / 5.5 A (Frame 2)
	1680	4 HP/3.0 kW / 6.8 A (Frame 3)
	1900	5 HP/4.0 kW / 9 A (Frame 3)
	2120	7.5 HP/5.5 kW / 12 A (Frame 3)
	2160	10 HP/7.5 kW / 16 A (Frame 3)
4	**Frame**	
	1	
	2	
	3	
5	**Auxiliary supply**	
	0	Not required
6	**Brake switch**	
	0	Not fitted (not available on frame 1 and 2 230 V products)
	B	Brake switch fitted (must be fitted on frame 2 400/460 V products and all frame 3 products)

7	**Filter**	
	0	Not fitted
	F	Filter fitted
8	**Communications**	
	0	None
	1	RS232 port fitted
9	**Mechanical style**	
	P	Panel mount
10	**Special option**	
	00	None
11	**Destination**	
	A	Multi-lingual (50 Hz)
	B	Multi-lingual (60 Hz)
12	**Keypad**	
	0	None
	1	6511 TTL fitted (local mounting only)[1]
	2	6511 RS232 fitted (local or remote mount)[2]

[1] Requires communications (8) selection to be 'None'
[2] Requires communications (8) selection to be 'RS232 port fitted'

Industrial AC/DC and Servo Drives

Parker SSD Drives Division offers a comprehensive line of motion control products for industrial automation. Parker drive products are sold, supported, and serviced worldwide, with solutions from simple speed control to complex coordinated process control. Parker drive products are easy to configure and commission, with simple but flexible function block-based configuration tools and connectivity with all major industrial fieldbus networks. **www.parker.com/ssdusa**

Hybrid/Electric Mobile Systems

In addition to industrial grade AC and DC drives, Parker also has diverse offerings to the mobile market. These include inverter drives, motors, and electro-hydraulic pumps for traction and ancillary applications in vehicular, marine, and utility truck markets. Electro-hydrostatic solutions for aerial lift trucks and construction equipment provide fuel savings and reduced emissions by eliminating unnecessary idling. Parker Hybrid/ Electric technologies allow trucks and buses to run more efficiently, and with lower emissions. Consider upgrading your fleet to hybrid/electric technology. **hev.parker.com**

Grid Tie/Renewable Energy

Parker offers grid tie inverters and related equipment in numerous configurations and sizes for a variety of renewable energy applications, including PV solar, wind, wave, and energy storage. Outdoor duty megawatt class central inverters provide efficient power conversion for utility scale solar farms. Direct drive permanent magnet generators and inverters provide power conversion for wind and wave power. In the field of utility scale battery energy storage, Parker is the industry leader in lithium ion battery-based systems. Energy storage can facilitate the integration of renewable energy with the grid by virtue of its capacity firming and ramp rate control functions. Parker's Energy Grid Tie division is committed to providing reliable and efficient solutions to the renewable energy market. **www.parker.com/gridtie**

At Parker, we're guided by a relentless drive to help our customers become more productive and achieve higher levels of profitability by engineering the best systems for their requirements. It means looking at customer applications from many angles to find new ways to create value. Whatever the motion and control technology need, Parker has the experience, breadth of product and global reach to consistently deliver. No company knows more about motion and control technology than Parker. For further info call (800) C-PARKER

AEROSPACE

Key Markets
- Aircraft engines
- Business & general aviation
- Commercial transports
- Land-based weapons systems
- Military aircraft
- Missiles & launch vehicles
- Regional transports
- Unmanned aerial vehicles

Key Products
- Flight control systems & components
- Fluid conveyance systems
- Fluid metering delivery & atomization devices
- Fuel systems & components
- Hydraulic systems & components
- Inert nitrogen generating systems
- Pneumatic systems & components
- Wheels & brakes

CLIMATE CONTROL

Key Markets
- Agriculture
- Air conditioning
- Food, beverage & dairy
- Life sciences & medical
- Precision cooling
- Processing
- Transportation

Key Products
- CO^2 controls
- Electronic controllers
- Filter driers
- Hand shut-off valves
- Hose & fittings
- Pressure regulating valves
- Refrigerant distributors
- Safety relief valves
- Solenoid valves
- Thermostatic expansion valves

ELECTROMECHANICAL

Key Markets
- Aerospace
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Paper machinery
- Plastics machinery & converting
- Primary metals
- Semiconductor & electronics
- Textile
- Wire & cable

Key Products
- AC/DC drives & systems
- Electric actuators
- Controllers
- Gantry robots
- Gearheads
- Human machine interfaces
- Industrial PCs
- Inverters
- Linear motors, slides and stages
- Precision stages
- Stepper motors
- Servo motors, drives & controls
- Structural extrusions

FILTRATION

Key Markets
- Food & beverage
- Industrial machinery
- Life sciences
- Marine
- Mobile equipment
- Oil & gas
- Power generation
- Process
- Transportation

Key Products
- Analytical gas generators
- Compressed air & gas filters
- Condition monitoring
- Engine air, fuel & oil filtration & systems
- Hydraulic, lubrication & coolant filters
- Process, chemical, water & microfiltration filters
- Nitrogen, hydrogen & zero air generators

FLUID & GAS HANDLING

Key Markets
- Aerospace
- Agriculture
- Bulk chemical handling
- Construction machinery
- Food & beverage
- Fuel & gas delivery
- Industrial machinery
- Mobile
- Oil & gas
- Transportation
- Welding

Key Products
- Brass fittings & valves
- Diagnostic equipment
- Fluid conveyance systems
- Industrial hose
- PTFE & PFA hose, tubing & plastic fittings
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects

HYDRAULICS

Key Markets
- Aerospace
- Aerial lift
- Agriculture
- Construction machinery
- Forestry
- Industrial machinery
- Mining
- Oil & gas
- Power generation & energy
- Truck hydraulics

Key Products
- Diagnostic equipment
- Hydraulic cylinders & accumulators
- Hydraulic motors & pumps
- Hydraulic systems
- Hydraulic valves & controls
- Power take-offs
- Rubber & thermoplastic hose & couplings
- Tube fittings & adapters
- Quick disconnects

PNEUMATICS

Key Markets
- Aerospace
- Conveyor & material handling
- Factory automation
- Food & beverage
- Life science & medical
- Machine tools
- Packaging machinery
- Transportation & automotive

Key Products
- Air preparation
- Compact cylinders
- Field bus valve systems
- Grippers
- Guided cylinders
- Manifolds
- Miniature fluidics
- Pneumatic accessories
- Pneumatic actuators & grippers
- Pneumatic valves and controls
- Rodless cylinders
- Rotary actuators
- Tie rod cylinders
- Vacuum generators, cups & sensors

PROCESS CONTROL

Key Markets
- Chemical & refining
- Food, beverage & dairy
- Medical & dental
- Microelectronics
- Oil & gas
- Power generation

Key Products
- Analytical sample conditioning products & systems
- Fluoropolymer chemical delivery fittings, valves & pumps
- High purity gas delivery fittings, valves & regulators
- Instrumentation fittings, valves & regulators
- Medium pressure fittings & valves
- Process control manifolds

SEALING & SHIELDING

Key Markets
- Aerospace
- Chemical processing
- Consumer
- Energy, oil & gas
- Fluid power
- General industrial
- Information technology
- Life sciences
- Military
- Semiconductor
- Telecommunications
- Transportation

Key Products
- Dynamic seals
- Elastomeric o-rings
- EMI shielding
- Extruded & precision-cut, fabricated elastomeric seals
- Homogeneous & inserted elastomeric shapes
- High temperature metal seals
- Metal & plastic retained composite seals
- Thermal management

ENGINEERING YOUR SUCCESS.

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