BONITRON

Solutions for AC Drives

PRODUCT OVERVIEW

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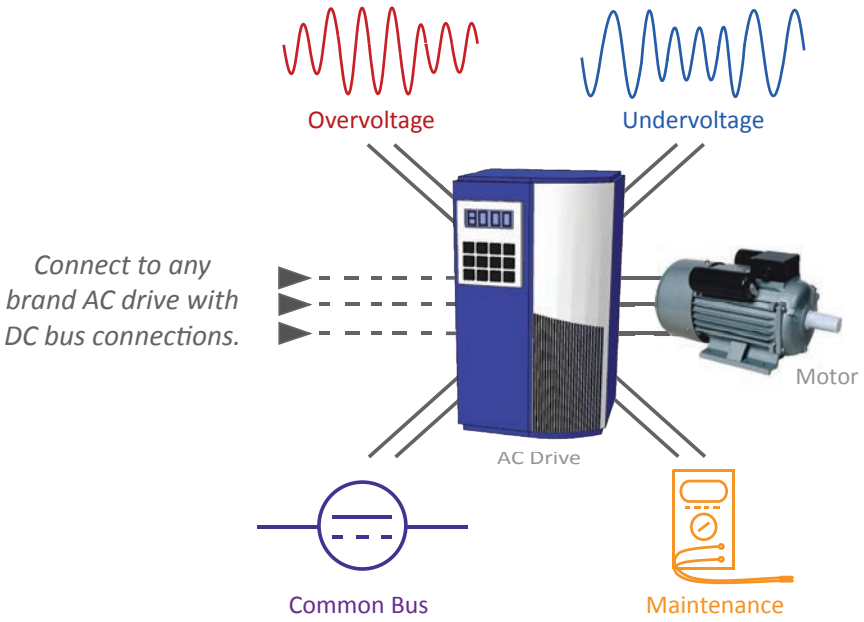
Bonitron Solutions for AC Drives

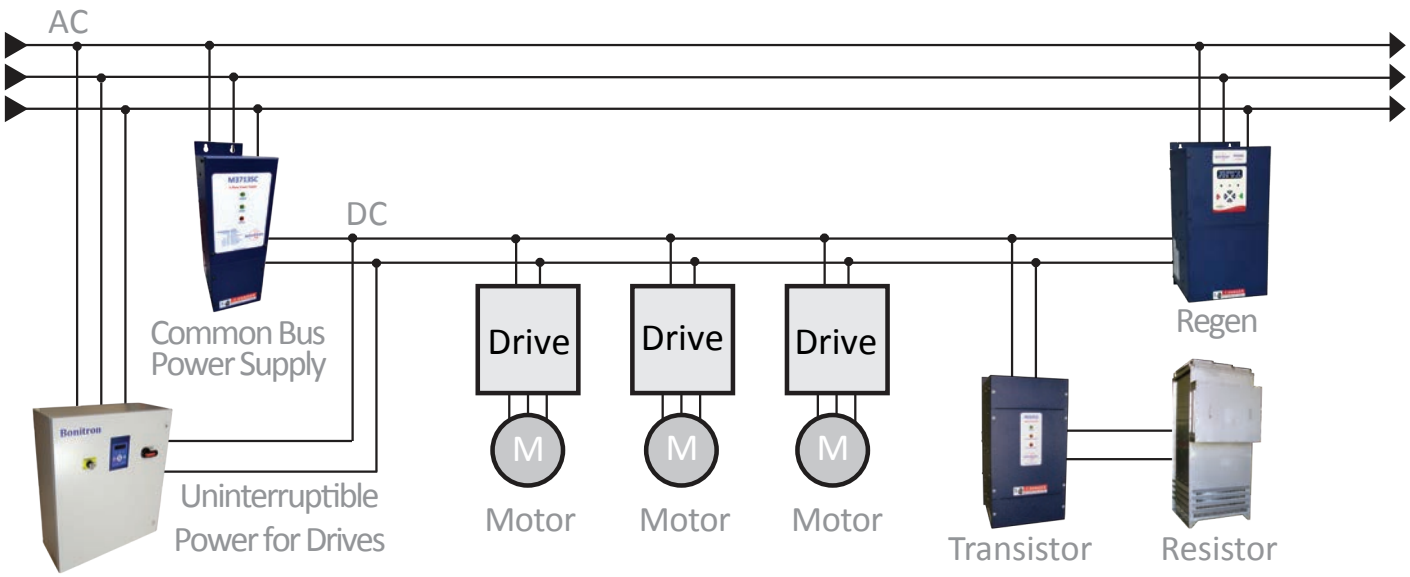
Industrial electronics have evolved greatly over the half-century that Bonitron has been in business, but one thing remains constant; Users want their drive systems and processes to be reliable and maximize productivity.

Bonitron specializes in designing accessories for variable speed drives and offers solutions ranging from Overvoltage braking solutions, such as Braking Transistors, Resistors, and Line Regeneration, to Undervoltage Solutions, such as UPD Uninterruptible Power for Drives. Other solutions include Single and 3-Phase Power Supplies, as well as Portable Capacitor Formers.

With thousands of engineered products and new solutions released regularly, visit Bonitron.com or contact your local drive distributor to learn more.

As always, 'if you have VFDs, you'll need some of these!'





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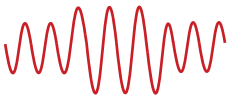
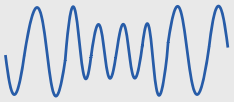
Overvoltage



Undervoltage



Input Power Supply & Common Bus

Maintenance

Custom Solutions

Not only does Bonitron have standard products, but we are able to solve specific solutions for custom applications and projects.

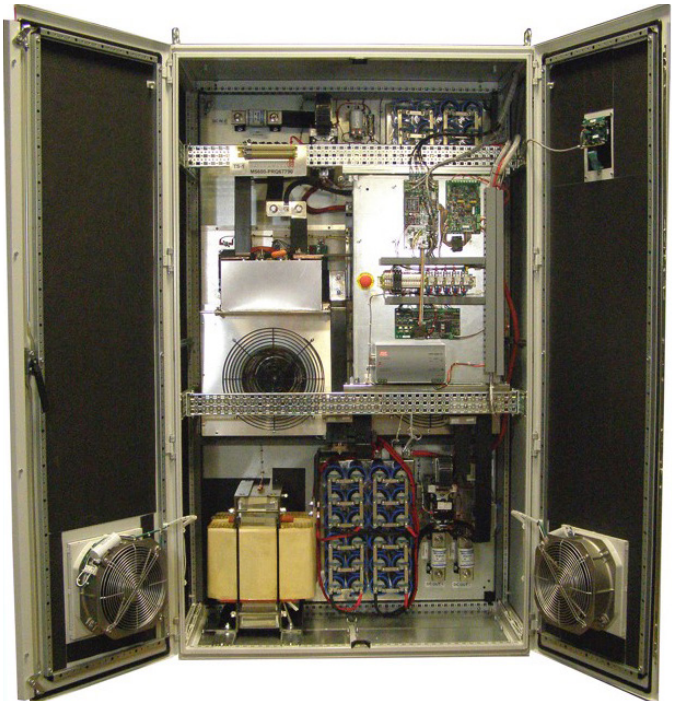
"If you don't see what you need, call us and we'll work together to create a solution to fit your needs!"

- Keith Benson

Power Supply

- Low-Voltage Power Supply used for a streetcar/Trolley project
- Isolated 28V 250-amp battery charger
  - 700-1000VDC input to car from cantenary
- Boost from 24V battery string to operate drives during outage
- Relatively low power of 7kW

Battery Bank Simulator



- 1000 ADC 1000 VDC bidirectional buck-boost
- Battery Simulator
- Great example of Bonitron's capabilities

3-phase Power Supply

- Replacement Power Supply for amusement park
- 230VAC three-phase input
- 100ADC output
- Integrated braking transistor

Overvoltage Solutions

Line Regeneration
- M3545
- M3645

Capacative Regen
- M3800

Braking Transistors
- M3452
- M3675T
- M3575T

Braking Resistors
- Case Resistors
- M3775RPF
- M3575R
- M3775R

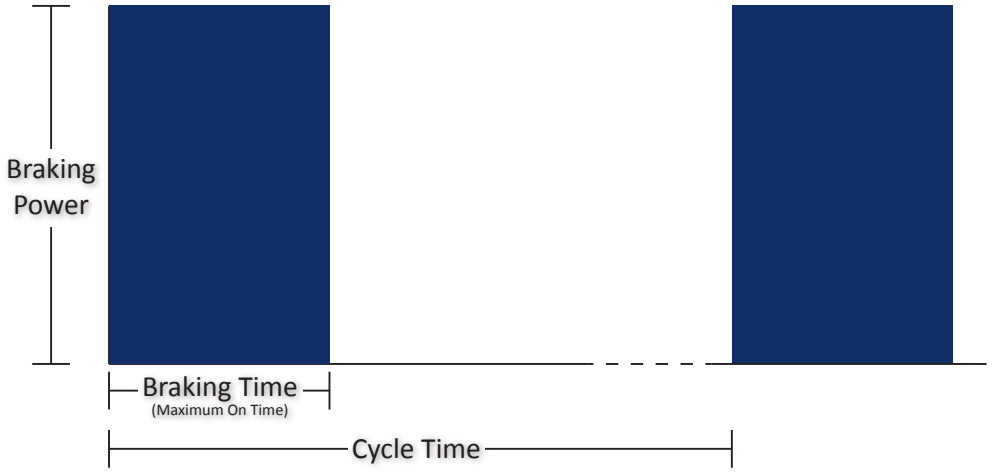
Combo Units
- M3452 Complete

Servo Motor Braking
- M3500DB

Understanding Braking Conditions

Overhauling

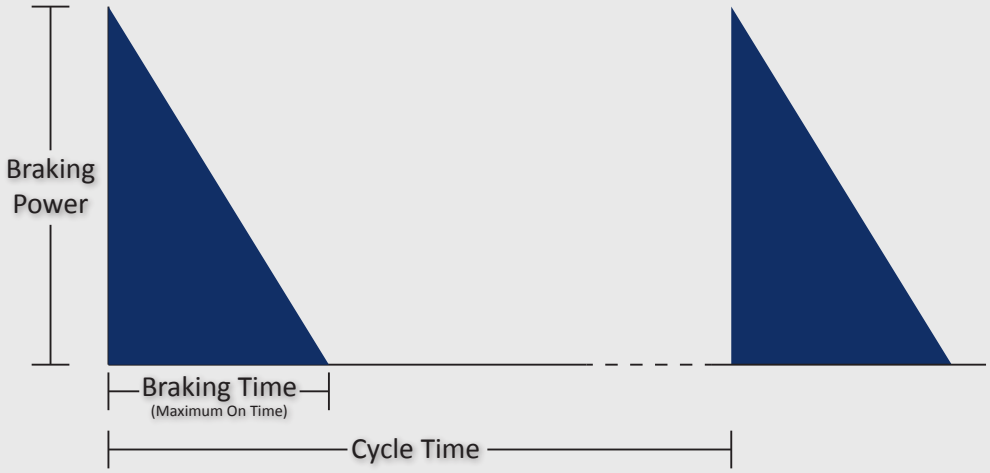
An overhauling load requires braking to keep the motor from increasing speed beyond the speed set by the drive. The required braking torque remains constant and approximately twice the power of deceleration braking is required.



$$\text{Overhauling Duty} = \frac{\text{Braking Time}}{\text{Cycle Time}}$$

Deceleration

During deceleration, braking is required to stop or reduce the speed of the motor. The required braking torque reduces with speed and approximately half the power of braking an overhauling load is required.



$$\text{Deceleration Duty} = \frac{\text{Braking Time}}{\text{Cycle Time}}$$

Line Regeneration

M3545 & M3645

Overvoltage Solutions

M3645 Series

M3545 Series

c UL us LISTED

300A Models are not UL listed

RoHS Compliant

Bonitron Line Regens replace traditional braking transistor and resistor options that waste energy as heat during drive braking. Instead of dissipating braking energy as heat in a resistor, Line Regen solutions return this energy to the power grid. This reduces demand from the utility, which equates to ample energy savings.

The Bonitron Line Regen is efficient and small enough to be integrated into the drive cabinet. This eliminates excess resistor wiring and cooling costs.

Display & Indicators	LED Indicators: Power	LED Indicators: Regen Active	LED Indicators: Not Ready	Interactive Display Screens: Metering	Interactive Display Screens: Energy Records	Interactive Display Screens: Fault Records
M3545 Series	●	●	●			
M3645 Series with -D in Model Number	●	●	●	●	●	●

Metering

- DC ` Voltage
- DC Regen Current
- Regen Power
- Total Unit On-time

Energy Records

- Energy Regenerated in Lifetime
- Energy Regenerated since user reset

Fault Records

- Stores 50 most recent fault states (Last one record is stored with LED Indicators)
- Feedback Undervoltage, Overtemperature, DC Overvoltage, Differential Overvoltage, Sync Loss, IGBT Driver, Phase Overcurrent, Phase Loss, DC Undervoltage, Precharge Failure, Frequency Detect Failure

The M3645-X300R is required with the M3645-X300T-M15-X modules.

Line Regen										Fuse Plate	Reactor
Phase	Power Cont.	Power Peak	Display Type	Model Number	Current Cont.	Current Peak	Watt Loss	Dimensions (H x W x D)	UL and CUL Listing	Model Number	Model Number
208 - 240VAC											
1	0.9 HP	1.4 HP	LEDs	**M3545-L006-M4**	2 A	3 A	34 W	14.80" x 4.00" x 8.30"	UL and CUL	M3545F-H015	N/A
3	2.8 HP	4.2 HP			6 A	9 A	59 W		UL and CUL		
1	2.25 HP	3.5 HP	LEDs	**M3545-L015-M4**	5 A	7.5 A	67W	17.00" x 4.70" x 10.80"	UL and CUL		
3	7 HP	10.5 HP			15 A	22.5 A	117W		UL and CUL		
3	14 HP	21 HP	LEDs+Digital	**M3645-L030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	UL and CUL	M3645F-H030	
3	24 HP	36 HP	LEDs+Digital	**M3645-L050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	UL and CUL	M3645F-H050	
3	48 HP	72 HP	LEDs+Digital	**M3645-L100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	UL and CUL	M3645F-H100	
3	96 HP	120 HP	LEDs+Digital	M3645-L300T-M15-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"		M3645F-H300	M3645-L300R
380 - 415VAC											
3	25 HP	37 HP	LEDs+Digital	**M3645-E030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	UL and CUL	M3645F-H030	
3	41 HP	62 HP	LEDs+Digital	**M3645-E050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	UL and CUL	M3645F-H050	N/A
3	83 HP	125 HP	LEDs+Digital	**M3645-E100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	UL and CUL	M3645F-H100	
3	250 HP	312.5 HP	LEDs+Digital	M3645-E300T-M15-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"		M3645F-H300	M3645-E300R
460 - 480VAC											
1	1.8 HP	2.8 HP	LEDs	**M3545-H006-M4**	2 A	3 A	34 W	14.80" x 4.00" x 8.30"	UL and CUL	M3545F-H015	N/A
3	5.6 HP	8.4 HP			6 A	9 A	59 W		UL and CUL		
1	4.5 HP	7 HP	LEDs	**M3545-H015-M4**	5 A	7.5 A	67W	17.00" x 4.70" x 10.80"	UL and CUL		
3	14 HP	21 HP			15 A	22.5 A	117W		UL and CUL		
3	28 HP	43 HP	LEDs+Digital	**M3645-H030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	UL and CUL	M3645F-H030	
3	48 HP	72 HP	LEDs+Digital	**M3645-H050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	UL and CUL	M3645F-H050	
3	96 HP	144 HP	LEDs+Digital	**M3645-H100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	UL and CUL	M3645F-H100	
3	288 HP	360 HP	LEDs+Digital	M3645-H300T-M15-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"		M3645F-H300	M3645-H300R
575 - 600VAC											
3	36 HP	54 HP	LEDs+Digital	**M3645-C030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	UL and CUL	M3645F-C030	N/A
3	60 HP	90 HP	LEDs+Digital	**M3645-C050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	UL and CUL	M3645F-C050	
3	120 HP	180 HP	LEDs+Digital	**M3645-C100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	UL and CUL	M3645F-C100	

Capacitive Regeneration Controller
M3800 Series

Overvoltage Solutions

M3800 Series

Bonitron's Capacitive Regen Controller is a simple, passive method for storing regenerated energy from a braking motor, well suited for cyclic applications. The M3800 Capacitive Regen Controller, used in conjunction with a capacitor bank and various external components, allows for an increase in energy storage with a smaller rise in DC bus voltage. This stored energy can then be sourced back onto the DC bus during periods of higher demand, lowering the peak power required by the drive system.

System Layout

The M3800 Controller, as part of a Capacitive Regen system, requires several external components. Please see below for a diagram of the expected external system layout.

Storage

The capacitors must be sized according to the voltage and joule requirements of the application. They must be able to absorb the regenerated energy from the drive and keep the voltage below the drive's overvoltage fault level.

Pre-charge

The M3800 must be able to pre-charge the storage bank before it can connect to the drive bus; for this, it needs a rectifier and resistor, with a contactor to control them.

Discharge

The same resistors can be used to discharge the capacitor bank. There also needs to be a contactor in the discharge path, however this one should be a Normally Closed contactor. This way, if power is removed from the system, it automatically discharges the capacitor bank to a safe voltage.

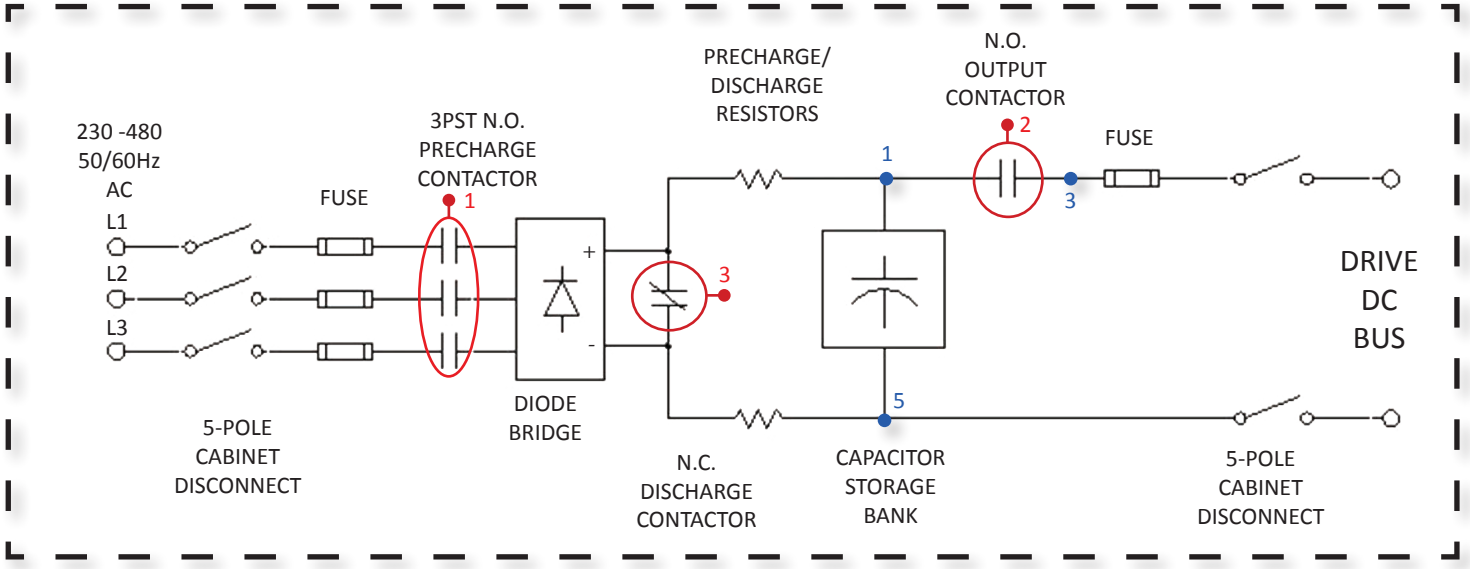
Output to Drive

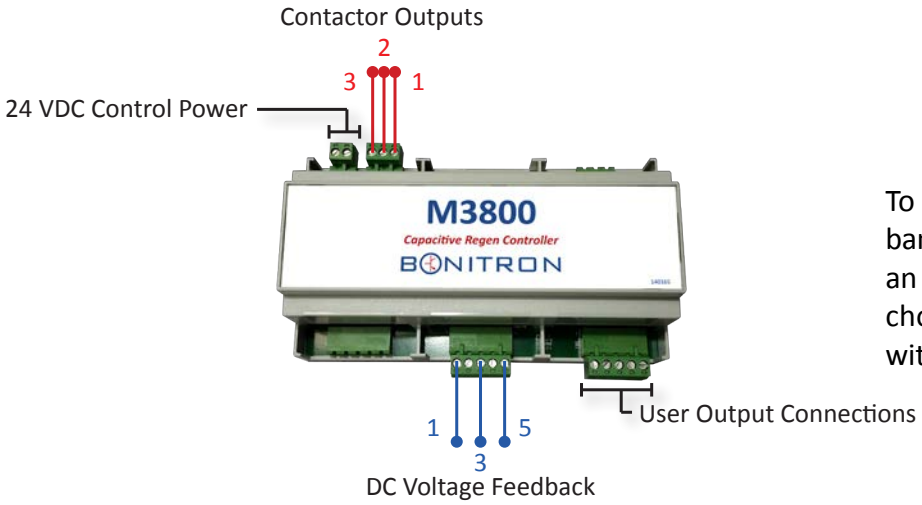
The output contactor must be rated for the max DC bus voltage as well as the max expected regen current.

Model Number	Description 1	Capacitor Storage	Dimensions (H x W x D)	Supply Voltage
208- 480VAC | 750VDC				
M3800-H01	Capacitive Regen Controller	Unlimited	4.20 x 6.22 x 2.28"	24VDC

Model Number	Description 1	Description 2	Capacitor Storage
208- 480VAC | 750VDC			
KIT 3800-H01-02	Capacitive Regen Controller Kit.	480VAC. 1kJ.	1 kJ
KIT 3800-H02-01	Capacitive Regen Controller Kit.	480VAC. 2kJ.	2 kJ
KIT 3800-H05-01	Capacitive Regen Controller Kit.	480VAC. 5kJ.	5 kJ
KIT 3800-H10-01	Capacitive Regen Controller Kit.	480VAC. 10kJ.	10 kJ

External Components for the M3800 Controller





M3800 Controller

To avoid the possibility that the capacitor bank could rise to a DC level that can cause an overvoltage trip on the drive, a braking chopper should be used in conjunction with the Capacitive Regen Controller.

Savings Calculator

Bonitron Line Regen units return regenerative energy back to the AC line where it can used by equipment within the facility. This reduces the amount of power required from the utility; reducing utility costs.

The formula to the right is an example for a 100HP application. Visit **Bonitron.com/RegenCalculator** to see your potential savings.

Bonitron.com/RegenCalculator

Formula:	Example:
(Continuous HP)	(100)
x (Duty Cycle %)	x (0.40)
x (Days of Operation)	x (350)
x (Hours of Operation per Day)	x (12)
x (Cost per kWh)	x (0.10)
x (0.746)	x (0.746)
= Savings	***= $12,527.76***

*Contact Bonitron to discuss your application's possible savings.

Overvoltage Solutions

Bonitron remains a leader in the field of high horsepower braking and proudly maintains its reputation for durability and reliability, with models rated up to 1600A.

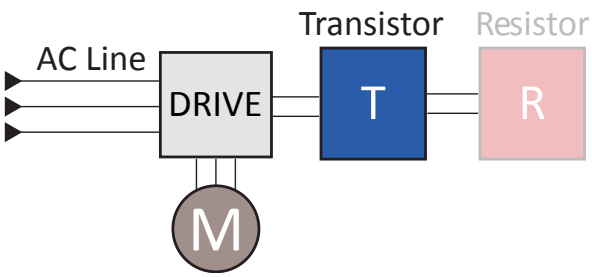
Bonitron Braking Transistors are used with AC drives to allow full power braking and eliminate overvoltage faults. This permits controlled braking and dramatically shortens motor stopping time. The M3452 works with Variable Speed Drives (VSDs) to monitor the DC bus. If overvoltage occurs, the M3452 shunts the excess energy through a braking resistor to prevent overvoltage faults. (Standard and custom braking resistors are also available from Bonitron. For more information see the M3775R series).

Optional advanced diagnostics allow for remote monitoring, while local indicators assist in pinpointing issues. Remote configuration and networking capabilities add to the flexibility and reliability of your overall system and reduce your installation wiring.

Up to 1600A per unit

M3452
Series

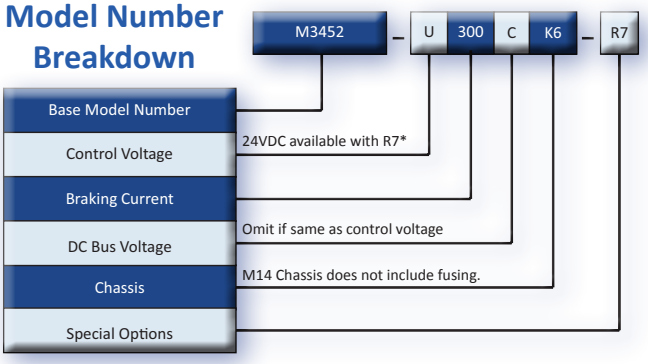
50 - 100% Braking Duty



Product Highlights

- Local and remote status monitoring
- EtherNet/IP™ & PROFIBUS™ DP networking options
- Systems can be reconfigured on-the-fly
- Up to 1600A per unit (Parallel operation for higher ratings)
- Proven record for quality and support

Model Number Breakdown



Specifications

Voltages.....230 - 690VAC
Current Rating.....75 to 1600Amps
Connections.....Drive DC Bus
Input AC Line (Control)
Ground
Max. 'On-Time'.....Peak rating for 60 seconds
Continuous rating - continuous

c UL us LISTED
when used with
A, R5, R7, R7E, R7EIP/PDP
control options

230-240VAC

Power (Peak)	Control Voltage	Base Model Number	Braking Current (Peak)	Braking Current (RMS)	Minimum Resistance	Dimensions (H x W x D)	UL and CUL Listing
230-240 VAC Drives | 375 VDC Setpoint							
37.5 HP	115-120 VAC 230-240 VAC	**M3452-U75LB7** **M3452-L75B7**	75 A	75 A	5.00 Ω	17.75" x 7.00" x 8.10"	UL and CUL
75 HP	115-120 VAC 230-240 VAC	**M3452-U150LB7** **M3452-L150B7**	150 A	150 A	2.50 Ω	17.75" x 7.00" x 8.10"	UL and CUL
100 HP	115-120 VAC 230-240 VAC	**M3452-U200LK6** **M3452-L200K6**	200 A	200 A	1.90 Ω	20.00" x 7.12" x 10.50"	UL and CUL
150 HP	115-120 VAC 230-240 VAC	**M3452-U300LK6** **M3452-L300K6**	300 A	300 A	1.25 Ω	20.00" x 7.12" x 10.50"	UL and CUL
300 HP	115-120 VAC 230-240 VAC	**M3452-U600LK6** **M3452-L600K6**	600 A	300 A	0.63 Ω	20.00" x 7.12" x 10.50"	UL and CUL
400 HP	115-120 VAC 230-240 VAC	M3452-U800LK9 M3452-L800K9	800 A	400 A	0.47 Ω	20.00" x 9.05" x 10.25"	
600 HP	115-120 VAC 230-240 VAC	M3452-U1200LK10 M3452-L1200K10	1200 A	600 A	0.32 Ω	20.00" x 10.00" x 10.50"	

For 24VDC control voltage, replace "U" with "D". Only available with R7, R7E Options. (Not UL Listed)

380-415VAC

Power (Peak)	Control Voltage	Base Model Number	Braking Current (Peak)	Braking Current (RMS)	Minimum Resistance	Dimensions (H x W x D)	UL and CUL Listing
380 - 415 VAC Drives | 620 VDC Setpoint							
62.5 HP	120 VAC 380 VAC	M3452-U75EB7 M3452-E75B7	75 A	75 A	8.27 Ω	17.75" x 7.00" x 8.10"	
125 HP	120 VAC 380 VAC	M3452-U150EB7 M3452-E150B7	150 A	150 A	4.13 Ω	17.75" x 7.00" x 8.10"	
160 HP	120 VAC 380 VAC	M3452-U200EK6 M3452-E200K6	200 A	200 A	3.10 Ω	20.00" x 7.12" x 10.50"	
240 HP	120 VAC 380 VAC	M3452-U300EK6 M3452-E300K6	300 A	300 A	2.07 Ω	20.00" x 7.12" x 10.50"	
490 HP	120 VAC 380 VAC	M3452-U600EK6 M3452-E600K6	600 A	300 A	1.04 Ω	20.00" x 7.12" x 10.50"	
660 HP	120 VAC 380 VAC	M3452-U800EK9 M3452-E800K9	800 A	400 A	0.78 Ω	20.00" x 9.05" x 10.25"	
1000 HP	120 VAC 380 VAC	M3452-U1200EK10 M3452-E1200K10	1200 A	600 A	0.52 Ω	20.00" x 10.00" x 10.50"	
1330 HP	120 VAC 380 VAC	M3452-U1600EM14 M3452-E1600M14	1600 A	1200 A	0.39 Ω	28.00" x 13.90" x 14.60"	
1330 HP	120 VAC 380 VAC	M3452-U1600ET10 M3452-E1600T10	1600 A	1200 A	0.39 Ω	30.59" x 10.12" x 19.18"	

Overvoltage Solutions

c UL us LISTED
when used with
A, R5, R7, R7E, R7EIP/PDP
control options

460-480VAC

Power (Peak)	Control Voltage	Base Model Number	Braking Current (Peak)	Braking Current (RMS)	Minimum Resistance	Dimensions (H x W x D)	UL and CUL Listing
460-480 VAC Drives | 750 VDC Setpoint							
75 HP	120 VAC 460 VAC	**M3452-U75HB7** **M3452-H75B7**	75 A	75 A	10.00 Ω	17.75" x 7.00" x 8.10"	UL and CUL
150 HP	120 VAC	**M3452-U150HB7**	150 A	150 A	5.00 Ω	17.75" x 7.00" x 8.10"	UL and CUL
	460 VAC	**M3452-H150B7**					
200 HP	120 VAC 460 VAC	**M3452-U200HK6** **M3452-H200K6**	200 A	200 A	3.80 Ω	20.00" x 7.12" x 10.50"	UL and CUL
300 HP	120 VAC	**M3452-U300HK6**	300 A	300 A	2.50 Ω	20.00" x 7.12" x 10.50"	UL and CUL
	460 VAC	**M3452-H300K6**					
600 HP	120 VAC 460 VAC	**M3452-U600HK6** **M3452-H600K6**	600 A	300 A	1.25 Ω	20.00" x 7.12" x 10.50"	UL and CUL
800 HP	120 VAC	M3452-U800HK9	800 A	400 A	0.93 Ω	20.00" x 9.05" x 10.25"	
	460 VAC	M3452-H800K9					
1200 HP	120 VAC 460 VAC	M3452-U1200HK10 M3452-H1200K10	1200 A	600 A	0.63 Ω	20.00" x 10.00" x 10.50"	
1600 HP	120 VAC	**M3452-U1600HM14**	1600 A	1200 A	0.47 Ω	28.00" x 13.90" x 14.60"	UL and CUL
	460 VAC	**M3452-H1600M14**					
1600 HP	120 VAC 460 VAC	M3452-U1600HT10 M3452-H1600T10	1600 A	1200 A	0.47 Ω	30.59" x 10.12" x 19.18"	

For 24VDC control voltage, replace "U" with "D". Only available with R7, R7E Options. (Not UL Listed)

575-600VAC

Power (Peak)	Control Voltage	Base Model Number	Braking Current (Peak)	Braking Current (RMS)	Minimum Resistance	Dimensions (H x W x D)	UL and CUL Listing
575-600 VAC Drives | 940 VDC Setpoint							
95 HP	120 VAC 575 VAC	**M3452-U75CB7** **M3452-C75B7**	75 A	75 A	12.50 Ω	17.75" x 7.00" x 8.10"	UL and CUL
190 HP	120 VAC	**M3452-U150CB7**	150 A	150 A	6.30 Ω	17.75" x 7.00" x 8.10"	UL and CUL
	575 VAC	**M3452-C150B7**					
250 HP	120 VAC 575 VAC	**M3452-U200CK6** **M3452-C200K6**	200 A	200 A	4.70 Ω	20.00" x 7.12" x 10.50"	UL and CUL
380 HP	120 VAC	**M3452-U300CK6**	300 A	300 A	3.20 Ω	20.00" x 7.12" x 10.50"	UL and CUL
	575 VAC	**M3452-C300K6**					
760 HP	120 VAC 575 VAC	**M3452-U600CK6** **M3452-C600K6**	600 A	300 A	1.60 Ω	20.00" x 7.12" x 10.50"	UL and CUL
1000 HP	120 VAC	M3452-U800CK9	800 A	400 A	1.20 Ω	20.00" x 9.05" x 10.25"	
	575 VAC	M3452-C800K9					
1500 HP	120 VAC 575 VAC	M3452-U1200CK10 M3452-C1200K10	1200 A	600 A	0.78 Ω	20.00" x 10.00" x 10.50"	
2015 HP	120 VAC	**M3452-U1600CM14**	1600 A	1200 A	0.58 Ω	28.00" x 13.90" x 14.60"	UL and CUL
	575 VAC	**M3452-C1600M14**					
2015 HP	120 VAC 575 VAC	M3452-U1600CT10 M3452-C1600T10	1600 A	1200 A	0.58 Ω	30.59" x 10.12" x 19.18"	

Network and Control Options

		A	R5	R7	R7E	R8EIP	R8PDP
Inputs	Enable			●	●	●	●
	Master/Slave			●	●	●	
	Bus Discharge			●	●	●	●
	Fault Reset			●	●	●	●
	Setpoint Adjust					●	
Outputs	Module Ready	●				●	●
	Logic Power OK		●			●	
	Not IGBT Open		●				
	Not IGBT Shorted		●		●	●	
	Not Overtemp		●		●	●	
	Not Blown Fuse		●		●	●	
	Control Ready			●	●		
	Master/Slave Status			●	●	●	
	Power Stage Ready			●	●		
	Not Overcurrent			●	●	●	
	Bus Voltage					●	
	Active Braking					●	
	Duty Cycle					●	
	Temperature					●	
	Fault History					●	
	Blink Codes			●	●	●	●

M3452
Series

Wire — Discrete Hardwire Connection

Ethernet — Ethernet Network Connection

Profibus — Profibus Network Connection

- 75 - 150A (B7) Options
  Available with "A" Only
- 200 - 600A (K6) Options
  A, R5, R7, R7E, R8EIP, R8PDP
- 800A (K9), 1200A (K10) and
  1600A (M14 & T10) Options
  R7, R7E, R8EIP, R8PDP
- All units above 200A have Master/
  Slave capability

690VAC

	Power (Peak)	Control Voltage	Base Model Number	Braking Current (Peak)	Braking Current (RMS)	Minimum Resistance	Dimensions (H x W x D)	UL and CUL Listing
690 VAC Drives | 1090 VDC Setpoint								
	110 HP	120 VAC	M3452-U75YB7	75 A	75 A	14.50 Ω	17.75" x 7.00" x 8.10"	
	220 HP	120 VAC	M3452-U150YB7	150 A	150 A	7.30 Ω	17.75" x 7.00" x 8.10"	
	300 HP	120 VAC	M3452-U200YK6	200 A	200 A	5.50 Ω	20.00" x 7.12" x 10.50"	
	440 HP	120 VAC	M3452-U300YK6	300 A	300 A	3.60 Ω	20.00" x 7.12" x 10.50"	
	875 HP	120 VAC	M3452-U600YK6	600 A	300 A	1.95 Ω	20.00" x 7.12" x 10.50"	
	1170 HP	120 VAC	M3452-U800YK9	800 A	400 A	1.40 Ω	20.00" x 9.05" x 10.25"	
	1750 HP	120 VAC	M3452-U1200YK10	1200 A	600 A	0.91 Ω	20.00" x 10.00" x 10.50"	
	2300 HP	120 VAC	M3452-U1600YM14	1600 A	1200 A	0.68 Ω	28.00" x 13.90" x 14.60"	

Overvoltage Solutions

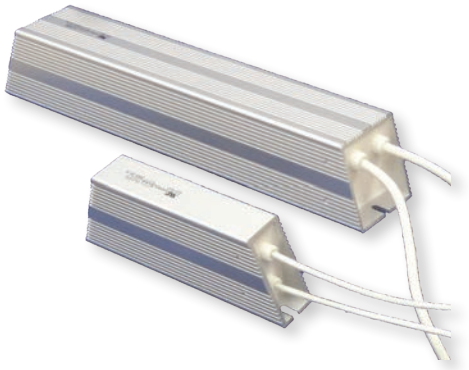
Bonitron Braking Transistors are used with AC drives to allow full power braking and eliminate overvoltage faults. This permits controlled braking and dramatically shortens motor stopping time. **The M3575T and M3675T series are ideal for drives with no internal braking transistor** and work with variable frequency drives to monitor the DC bus. If overvoltage occurs, the braking transistor shunts the excess energy through a braking resistor to **prevent overvoltage faults.**

M3575T Series

M3675T Series

20% Braking Duty

	Peak HP	Model Number	Peak Current	Cont. Current	Min. Resistance	Dimensions (H x W x D)	UL and CUL Listing	
115 - 120VAC | 190 VDC Setpoint								
	2.5HP	M3675T-U10	10A	2A	19Ω	7.00" x 2.06" x 6.75"		
230 - 240VAC | 375VDC Setpoint								
	5HP	M3675T-L10	10A	2A	38Ω	7.00" x 2.06" x 6.75"		
	8HP	**M3575T-L15**	15A	3.8A	25Ω	12.75" x 3.00" x 8.70"	UL and CUL	
	15HP	**M3575T-L30**	30A	7.75A	12.5Ω	12.75" x 3.00" x 8.70"	UL and CUL	
	30HP	**M3575T-L60**	60A	15A	6.25Ω	12.75" x 4.00" x 8.70"	UL and CUL	
	63HP	M3575T-L125	125A	32A	3Ω	17.75" x 6.50" x 8.00"		
	75HP	M3575T-L150	150A	38A	2.5Ω	17.75" x 6.50" x 8.00"		
	100HP	M3575T-L200	200A	51A	1.9Ω	17.75" x 7.00" x 8.00"		
	150HP	M3575T-L300	300A	77A	1.3Ω	17.75" x 7.00" x 8.00"		
	300HP	M3575T-L600	600A	155A	0.7Ω	17.75" x 7.00" x 8.00"		
380 - 415VAC | 620VDC Setpoint								
	7.5HP	M3675T-E10	10A	2A	62Ω	7.00" x 2.06" x 6.75"		
	12.5HP	M3575T-E15	15A	3.8A	41.25Ω	12.75" x 3.00" x 8.70"		
	25HP	M3575T-E30	30A	7.75A	20.5Ω	12.75" x 3.00" x 8.70"		
	63HP	M3575T-E75	75A	19A	8.25Ω	12.75" x 4.00" x 8.70"		
	100HP	M3575T-E125	125A	32A	5Ω	17.75" x 6.50" x 8.00"		
	125HP	M3575T-E150	120A	38A	4.1Ω	17.75" x 6.50" x 8.00"		
	165HP	M3575T-E200	200A	51A	3.1Ω	17.75" x 7.00" x 8.00"		
	240HP	M3575T-E300	300A	77A	2Ω	17.75" x 7.00" x 8.00"		
	530HP	M3575T-E600	600A	155A	1.1Ω	17.75" x 7.00" x 8.00"		
460 - 480VAC | 750VDC Setpoint								
	10HP	M3675T-H10	10A	2A	75Ω	7.00" x 2.06" x 6.75"		
	15HP	**M3575T-H15**	15A	3.8A	50Ω	12.75" x 3.00" x 7.70"	UL and CUL	
	30HP	**M3575T-H30**	30A	7.75A	25Ω	12.75" x 3.00" x 7.70"	UL and CUL	
	75HP	**M3575T-H75**	75A	19A	10Ω	12.75" x 4.00" x 7.70"	UL and CUL	
	125HP	M3575T-H125	125A	32A	6Ω	17.75" x 6.50" x 8.00"		
	150HP	M3575T-H150	150A	38A	5Ω	17.75" x 6.50" x 8.00"		
	200HP	M3575T-H200	200A	51A	3.75Ω	17.75" x 7.00" x 8.00"		
	300HP	M3575T-H300	300A	77A	2.5Ω	17.75" x 7.00" x 8.00"		
	600HP	M3575T-H600	600A	155A	1.25Ω	17.75" x 7.00" x 8.00"		



Case Resistors

Bonitron now offers case resistors for applications up to 10 HP, which are a great add-on solution due to their small size and cost.

Like the rest of Bonitron's resistor offering, Case Resistors protect drives from overvoltage faults by dissipating excess regenerative energy as heat. Case Resistors are used in applications where infrequent, low duty cycle, or low horsepower regeneration occurs.

Case resistors are commonly used with a drive's internal brake or a Bonitron M3675T Braking Transistor.

For resistors rated up to the megawatts, see the Bonitron M3575R or M3775R Series. Custom resistors are also available.

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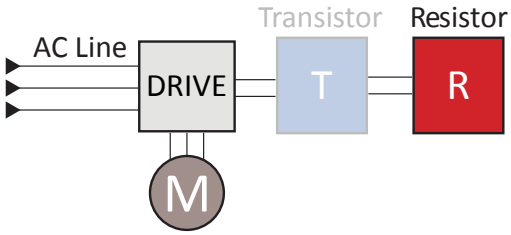
RoHS Compliant



Product Highlights

1 - 10 HP

- UL & CUL Listed
- Aluminium housing
- Two-screw mounting
- Installable with new application or as retrofit
- Rapid installation increases up time

	Power			Resistance (Ohms)	Required Model Number(s)		
	Peak HP	Peak	Cont.		Model Number	Dimensions (HxWxD)	
230 - 240VAC							
	1	1125 W	56 W	125	RS CRL001HP	165 x 30 x 60mm	
	2	2250 W	112 W	62.5	RS CRL002HP	265 x 30 x 60mm	
	3	3375 W	168 W	41.7	Use 1 and 2 HP Solutions in Parallel		
	5	5625 W	281 W	25	RS CRL005HP	335 x 59 x 61mm	
	7.5	7875 W	393 W	17.9	Use 2 and 5 HP Solutions in Parallel		
	10	11250 W	562 W	12.5	Use (two) 5 HP Solutions in Parallel		
460 - 480VAC							
	1	1125 W	56 W	500	RS CRH001HP	165 x 30 x 60mm	
	2	2250 W	112 W	250	RS CRH002HP	265 x 30 x 60mm	
	3	3375 W	168 W	167	Use 1 and 2 HP Solutions in Parallel		
	5	5625 W	281 W	100	RS CRH005HP	335 x 59 x 61mm	
	7.5	7875 W	393 W	71.4	Use 2 and 5 HP Solutions in Parallel		
	10	11250 W	562 W	50	Use (two) 5 HP Solutions in Parallel		

5% Duty rated for 10 seconds on, 100 seconds off

Overvoltage Solutions

M3775R
Series

Convection Cooled

RoHS Compliant

While Bonitron has been the industry leader for Braking Transistors for years, what better way to compliment that than by offering quality resistors too! Bonitron has a vast standard offering of Braking Resistors and welcomes custom requests as well.

M3775R Braking Resistors are used with Bonitron Braking Transistors to allow full power braking and eliminate overvoltage faults. This permits controlled braking and dramatically shortens motor stopping, time. If overvoltage occurs, Bonitron Transistors or the drive's internal brake, shunts excess energy through a Bonitron M3775R Braking Resistor to prevent overvoltage faults.

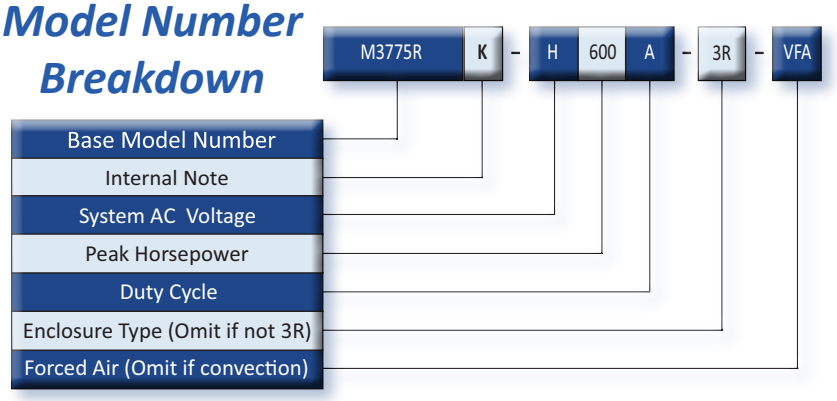
UL listing option can be quoted for M3775R.

A - 10% Duty
B - 50% Duty
C - 100% Duty

L - 230 - 240VAC
E - 380 - 415VAC
H - 460 - 480VAC
C - 575 - 600VAC
Y - 690VAC

VFA - Vertical Fan Exhaust
HFA - Horizontal Fan Exhaust

Model Number Breakdown



Horizontal Forced Air
(HFA)

Vertical Forced Air
(VFA)

Product Highlights

- Standard Mill Galvanized Steel Enclosure
  - 306, 316, etc. Stainless Steel Options
- NEMA-3R Options
- Thermal switch comes standard

Voltages.....230 - 690VAC
Current Rating.....Up to 1600Amps
Duty Cycle.....10 % Overhauling/ 20% Braking
50% Overhauling
100% Overhauling

Braking Resistors

M3775RPF

Overvoltage Solutions

While Bonitron has been the industry leader for Braking Transistors for years, what better way to compliment that than by offering quality resistors too! Bonitron now offers Modular Braking Resistors which can be configured for ratings from 100 to 1200 horsepower. The M3775RPF is a standard stock item, meaning shorter lead times and faster completion of your process installation.

M3775RPF Braking Resistors are used with Bonitron Braking Transistors to allow full power braking and eliminate overvoltage faults. This permits controlled braking and dramatically shortens motor stopping, time. If overvoltage occurs, Bonitron Transistors or the drive's internal brake, shunts excess energy through a Bonitron M3775RPF Braking Resistor to prevent overvoltage faults.

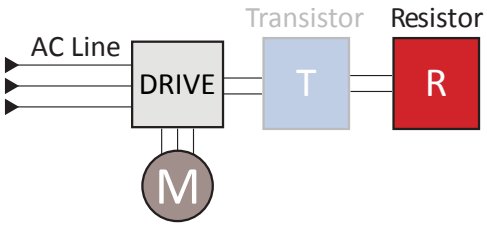
M3775RPF
Series

Standard Stock Item!

Product Highlights

- Standard Powder Coat ANSI Grey Enclosure
  - 304, 316 Stainless Steel Options
- Weather-Proof Blow Open Top
- NEMA-3R Standard
- Thermal switch comes standard

Voltages.....460 - 600VAC
Power Rating.....Up to 1200 HP
Duty Cycle.....100% Overhauling



Several of our Industry Brochures feature our Bonitron Braking Resistors. Learn more at Bonitron.com/industries.html

Marine

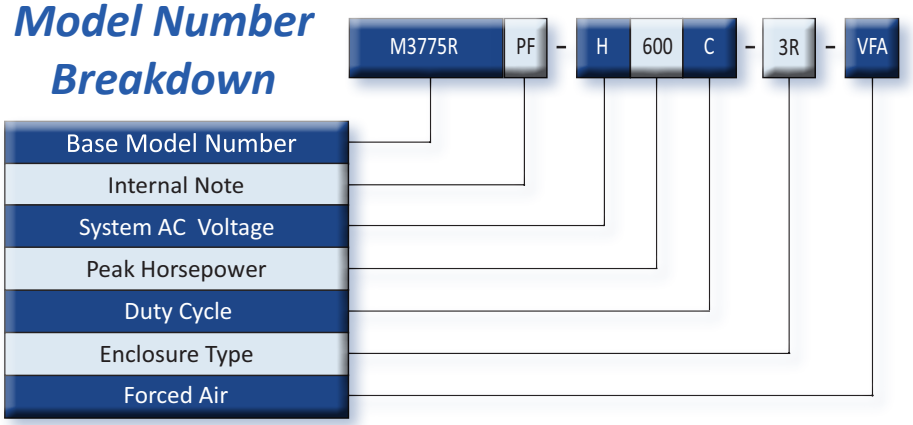
Centrifuge

Logging & Sawmill

Crane & Hoist

Oil & Gas

Model Number Breakdown



System AC Voltage
- *H - 460-480VAC*
- *C - 575-600VAC*

Duty Cycle
- *C - 100% Duty*

Forced Air
- *VFA - Vertical Fan Exhaust*

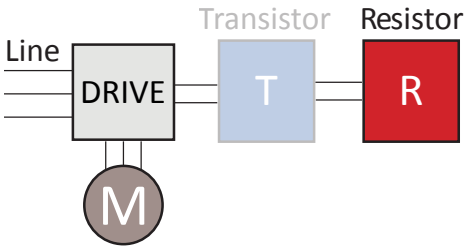
Stainless Steel Options
- *Contact Bonitron*

RoHS Compliant

Model Number Selection

Cont. HP	Peak HP	Peak Amps	Ohms	Model Number	Dimensions (H x W x D)
460 - 480 VAC | 750VDC					
100 HP	100 HP	100 A	7.54 Ω	M3775RPF-H100C-3R-VFA	76.0" x 49.0" x 39.5"
200 HP	200 HP	200 A	3.77 Ω	M3775RPF-H200C-3R-VFA	76.0" x 49.0" x 39.5"
300 HP	300 HP	300 A	2.51 Ω	M3775RPF-H300C-3R-VFA	76.0" x 49.0" x 39.5"
400 HP	400 HP	400 A	1.88 Ω	M3775RPF-H400C-3R-VFA	76.0" x 49.0" x 39.5"
500 HP	500 HP	500 A	1.51 Ω	M3775RPF-H500C-3R-VFA	88.0" x 49.0" x 39.5"
600 HP	600 HP	600 A	1.26 Ω	M3775RPF-H600C-3R-VFA	88.0" x 49.0" x 39.5"
700 HP	700 HP	700 A	1.08 Ω	M3775RPF-H700C-3R-VFA	88.0" x 49.0" x 39.5"
800 HP	800 HP	800 A	0.94 Ω	M3775RPF-H800C-3R-VFA	88.0" x 49.0" x 39.5"
900 HP	900 HP	900 A	0.84 Ω	M3775RPF-H900C-3R-VFA	100.0" x 49.0" x 39.5"
1000 HP	1000 HP	1000 A	0.75 Ω	M3775RPF-H1000C-3R-VFA	100.0" x 49.0" x 39.5"
1200 HP	1200 HP	1200 A	0.63 Ω	M3775RPF-H1200C-3R-VFA	100.0" x 49.0" x 39.5"
575 - 600 VAC | 940VDC					
100 HP	150 HP	125 A	7.54 Ω	M3775RPF-C100C-3R-VFA	76.0" x 49.0" x 39.5"
200 HP	310 HP	250 A	3.77 Ω	M3775RPF-C200C-3R-VFA	76.0" x 49.0" x 39.5"
300 HP	460 HP	375 A	2.51 Ω	M3775RPF-C300C-3R-VFA	76.0" x 49.0" x 39.5"
400 HP	620 HP	500 A	1.88 Ω	M3775RPF-C400C-3R-VFA	76.0" x 49.0" x 39.5"
500 HP	780 HP	625 A	1.51 Ω	M3775RPF-C500C-3R-VFA	88.0" x 49.0" x 39.5"
600 HP	930 HP	750 A	1.26 Ω	M3775RPF-C600C-3R-VFA	88.0" x 49.0" x 39.5"
700 HP	1090 HP	870 A	1.08 Ω	M3775RPF-C700C-3R-VFA	88.0" x 49.0" x 39.5"
800 HP	1250 HP	1000 A	0.94 Ω	M3775RPF-C800C-3R-VFA	88.0" x 49.0" x 39.5"
900 HP	1400 HP	1120 A	0.84 Ω	M3775RPF-C900C-3R-VFA	100.0" x 49.0" x 39.5"
1000 HP	1570 HP	1250 A	0.75 Ω	M3775RPF-C1000C-3R-VFA	100.0" x 49.0" x 39.5"
1200 HP	1870 HP	1500 A	0.63 Ω	M3775RPF-C1200C-3R-VFA	100.0" x 49.0" x 39.5"

M3575R
Series



Product Highlights

- UL & CUL Listed
- Wall or cabinet mountable
- Installable with new application or as retrofit
- Rapid installation increases up time
- Terminal access covers are standard

230 - 240VAC

230 - 240VC | 375VDC Setpoint					
Braking HP	Model Number	Power Peak	Power Cont.	Resistance	Dimensions (H x W x D)
6% Duty					
1 HP	**M3575R-L1M0**	746 W	46 W	190 Ω	12.75" x 4.00" x 9.50"
2 HP	**M3575R-L2M0**	1492 W	91 W	95 Ω	12.75" x 4.00" x 9.50"
3 HP	**M3575R-L3M0**	2238 W	137 W	63 Ω	12.75" x 4.00" x 9.50"
4 HP	**M3575R-L4M0**	2984 W	182 W	48 Ω	12.75" x 7.00" x 9.50"
5 HP	**M3575R-L5B0**	3730 W	243 W	38 Ω	17.75" x 4.00" x 9.50"
6 HP	**M3575R-L6M0**	4476 W	274 W	32 Ω	12.75" x 7.00" x 9.50"
8 HP	**M3575R-L8B0**	5968 W	365 W	25 Ω	17.75" x 4.00" x 9.50"
9 HP	**M3575R-L9M0**	6714 W	410 W	21 Ω	12.75" x 10.00" x 9.50"
11 HP	**M3575R-L11B0**	8206 W	486 W	19 Ω	17.75" x 7.00" x 9.50"
16 HP	**M3575R-L16B0**	11936 W	730 W	13 Ω	17.75" x 7.00" x 9.50"
24 HP	**M3575R-L24B0**	17904 W	1094 W	8 Ω	17.75" x 10.00" x 9.50"
20% Duty					
1 HP	**M3575R-L1MF**	746 W	152 W	190 Ω	12.75" x 4.00" x 9.50"
2 HP	**M3575R-L2MF**	1492 W	304 W	95 Ω	12.75" x 4.00" x 9.50"
3 HP	**M3575R-L3MF**	2238 W	456 W	63 Ω	12.75" x 4.00" x 9.50"
4 HP	**M3575R-L4MF**	2984 W	608 W	48 Ω	12.75" x 7.00" x 9.50"
5 HP	**M3575R-L5BF**	3730 W	811 W	38 Ω	17.75" x 4.00" x 9.50"
6 HP	**M3575R-L6MF**	4476 W	912 W	32 Ω	12.75" x 7.00" x 9.50"
8 HP	**M3575R-L8BF**	5968 W	1216 W	25 Ω	17.75" x 4.00" x 9.50"
9 HP	**M3575R-L9MF**	6714 W	1368 W	21 Ω	12.75" x 10.00" x 9.50"
11 HP	**M3575R-L11BF**	8206 W	1621 W	19 Ω	17.75" x 7.00" x 9.50"
16 HP	**M3575R-L16BF**	11936 W	2432 W	13 Ω	17.75" x 7.00" x 9.50"
24 HP	**M3575R-L24BF**	17904 W	3648 W	8 Ω	17.75" x 10.00" x 9.50"

Overvoltage Solutions

Bonitron M3575R Braking Resistors help protect drives from overvoltage faults by dissipating excess regenerative energy as heat. M3575R Braking Resistors are commonly used in applications where infrequent, low duty cycle, or low horsepower regeneration occurs.

M3575R Braking Resistors are easily applied as resistive loads for use with a drive's internal or external braking transistor. Sizes up to 33 horsepower in a single unit are available and may be paralleled for higher requirements. Units have been designed and tested to ensure that cabinet temperatures are less than 85° Celsius.

For resistors rated up to the megawatts see the Bonitron M3775R Resistive Load Bank Series. Custom resistors are also available.

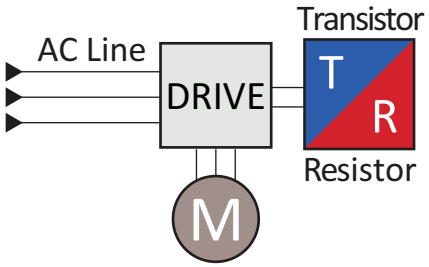
460 - 480VAC

460 - 480VC | 750VDC Setpoint					
Drive HP	Model Number	Power		Resistance	Dimensions (H x W x D)
		Peak	Cont.		
6% Duty					
1 HP	**M3575R-H1M0**	746 W	45 W	780 Ω	12.75" x 4.00" x 9.50"
2 HP	**M3575R-H2M0**	1492 W	90 W	390 Ω	12.75" x 4.00" x 9.50"
3 HP	**M3575R-H3M0**	2238 W	135 W	260 Ω	12.75" x 4.00" x 9.50"
4 HP	**M3575R-H4M0**	2984 W	180 W	195 Ω	12.75" x 7.00" x 9.50"
5 HP	**M3575R-H5B0**	3730 W	225 W	150 Ω	17.75" x 4.00" x 9.50"
6 HP	**M3575R-H6M0**	4476 W	270 W	130 Ω	12.75" x 7.00" x 9.50"
8 HP	**M3575R-H8B0**	5968 W	360 W	90 Ω	17.75" x 4.00" x 9.50"
9 HP	**M3575R-H9M0**	6714 W	405 W	87 Ω	12.75" x 10.00" x 9.50"
11 HP	**M3575R-H11B0**	8206 W	495 W	60 Ω	17.75" x 7.00" x 9.50"
16 HP	**M3575R-H16B0**	11936 W	720 W	45 Ω	17.75" x 7.00" x 9.50"
24 HP	**M3575R-H24B0**	17904 W	1080 W	30 Ω	17.75" x 10.00" x 9.50"
20% Duty					
1 HP	**M3575R-H1MF**	746 W	150 W	780 Ω	12.75" x 4.00" x 9.50"
2 HP	**M3575R-H2MF**	1492 W	300 W	390 Ω	12.75" x 4.00" x 9.50"
3 HP	**M3575R-H3MF**	2238 W	450 W	260 Ω	12.75" x 4.00" x 9.50"
4 HP	**M3575R-H4MF**	2984 W	600 W	195 Ω	12.75" x 7.00" x 9.50"
5 HP	**M3575R-H5BF**	3730 W	750 W	150 Ω	17.75" x 4.00" x 9.50"
6 HP	**M3575R-H6MF**	4476 W	900 W	130 Ω	12.75" x 7.00" x 9.50"
8 HP	**M3575R-H8BF**	5968 W	1200 W	90 Ω	17.75" x 4.00" x 9.50"
9 HP	**M3575R-H9MF**	6714 W	1350 W	87 Ω	12.75" x 10.00" x 9.50"
11 HP	**M3575R-H11BF**	8206 W	1650 W	60 Ω	17.75" x 7.00" x 9.50"
16 HP	**M3575R-H16BF**	11936 W	2400 W	45 Ω	17.75" x 7.00" x 9.50"
24 HP	**M3575R-H24BF**	17904 W	3600 W	30 Ω	17.75" x 10.00" x 9.50"
28 HP	**M3575R-H27BF**	20888 W	1800 W	28.2 Ω	17.75" x 10.00" x 9.50"
33 HP	**M3575R-H33BF**	24618 W	3600 W	22.5 Ω	17.75" x 10.00" x 11.50"

Combination Braking Modules are used with AC drives to allow full power braking and eliminate overvoltage faults. This permits controlled braking and dramatically shortens motor stopping time. Bonitron Combination Braking Modules work with variable frequency drives to monitor the DC bus. If overvoltage occurs, the internal transistor shunts the excess energy through an internal braking resistor to prevent overvoltage faults.

Combination Braking Modules include a braking transistor and resistor in one convenient enclosure. This makes installation much quicker, as it eliminates the need to wire separate components.

M3452 Complete
Series



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Product Highlights

- 230 - 600 VAC | Up to 43HP
- NEMA-1 enclosure
- Transistor and resistor in one package
- Requires less installation wiring
- Reduced footprint
- Simple connection to the DC bus

Peak HP	Model Number	Cont. Watts	Resistance	Duty Cycle		Dimensions (H x W x D)	UL and CUL Listing
				Braking	Overhauling		
230-240 VAC | 375VDC Setpoint							
6.3 HP	**M3452-L2B-R030**	400 W	30 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
6.3 HP	**M3452-L3B-R030**	600 W	30 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
9.4 HP	**M3452-L3B-R020**	600 W	20 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
12.6 HP	**M3452-L9C-R015**	1800 W	15 Ω	40%	20%	18.25" x 11.50" x 10.50"	UL and CUL
18.9 HP	**M3452-L6B-R010**	1200 W	10 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
28.1 HP	**M3452-L9C-R007**	1800 W	6.7 Ω	20%	10%	18.25" x 11.50" x 10.50"	UL and CUL
42.8 HP	M3452-L8C-R004	1600 W	4.4 Ω	10%	5%	18.25" x 11.50" x 10.50"	
460-480 VAC | 750VDC Setpoint							
6.3 HP	**M3452-H2B-R120**	400 W	120 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
7.0 HP	**M3452-H9C-R108**	1800 W	108 Ω	60%	30%	18.25" x 11.50" x 10.50"	UL and CUL
10.1 HP	**M3452-H3B-R075**	600 W	75 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
15.1 HP	**M3452-H9C-R050**	1800 W	50 Ω	30%	15%	18.25" x 11.50" x 10.50"	UL and CUL
20.1 HP	**M3452-H6B-R038**	1200 W	37.5 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
30.2 HP	**M3452-H9C-R025**	1800 W	25 Ω	20%	10%	18.25" x 11.50" x 10.50"	UL and CUL
43.1 HP	M3452-H8C-R018	1600 W	17.5 Ω	10%	5%	18.25" x 11.50" x 10.50"	
575 - 600 VAC | 940VDC Setpoint							
9.9 HP	**M3452-C2B-R120**	400 W	120 Ω	10%	5%	18.25" x 9.50" x 8.50"	UL and CUL
11.0 HP	**M3452-C9C-R108**	1800 W	108 Ω	60%	30%	18.25" x 11.50" x 10.50"	UL and CUL
11.3 HP	**M3452-C3B-R105**	600 W	105 Ω	15%	8%	18.25" x 9.50" x 8.50"	UL and CUL
22.6 HP	**M3452-C6B-R053**	1200 W	52.5 Ω	20%	10%	18.25" x 9.50" x 8.50"	UL and CUL
23.7 HP	**M3452-C9C-R050**	1800 W	50 Ω	20%	10%	18.25" x 11.50" x 10.50"	UL and CUL
33.8 HP	**M3452-C9C-R035**	1800 W	35 Ω	20%	10%	18.25" x 11.50" x 10.50"	UL and CUL

Overvoltage Solutions

The M3500DB Series enhances system performance and safety by providing resistive braking control for emergency stop applications if regenerative braking does not perform.

The M3500DB series provides e-stop braking for servo motion systems and conforms to EN-954 category II or category IV safety requirements. As the secondary brake, the M3500DB stops the motor in case of motion controller or power failure. It also isolates the motor from its power source once it is stopped to increase safety.

M3500DB
Series

Model Number		Contact Type	Resistance	Dimensions (H x W x D)
EN-954 Category II	EN-954 Category IV			
32A Continuous Motor Current				
M3500DB-H01A-32	M3500DB4-H01A-32	Normally Closed	1Ω	15.95" x 2.92" x 10.35"
M3500DB-H01B-32	M3500DB4-H01B-32	Normally Open		
M3500DB-H03A-32	M3500DB4-H03A-32	Normally Closed	3Ω	15.95" x 2.92" x 10.35"
M3500DB-H03B-32	M3500DB4-H03B-32	Normally Open		
M3500DB-H06A-32	M3500DB4-H06A-32	Normally Closed	6Ω	15.95" x 2.92" x 10.35"
M3500DB-H06B-32	M3500DB4-H06B-32	Normally Open		
M3500DB-H16A-32	M3500DB4-H16A-32	Normally Closed	16Ω	15.95" x 2.92" x 10.35"
M3500DB-H16B-32	M3500DB4-H16B-32	Normally Open		
M3500DB-H36A-32	M3500DB4-H36A-32	Normally Closed	36Ω	15.95" x 2.92" x 10.35"
M3500DB-H36B-32	M3500DB4-H36B-32	Normally Open		
M3500DB-H01A-32X	M3500DB4-H01A-32X	Normally Closed	1Ω	15.95" x 2.92" x 10.35"
M3500DB-H01B-32X	M3500DB4-H01B-32X	Normally Open		
M3500DB-H03A-32X	M3500DB4-H03A-32X	Normally Closed	3Ω	15.95" x 2.92" x 10.35"
M3500DB-H03B-32X	M3500DB4-H03B-32X	Normally Open		
M3500DB-H06A-32X	M3500DB4-H06A-32X	Normally Closed	6Ω	15.95" x 2.92" x 10.35"
M3500DB-H06B-32X	M3500DB4-H06B-32X	Normally Open		
M3500DB-H16A-32X	M3500DB4-H16A-32X	Normally Closed	16Ω	15.95" x 2.92" x 10.35"
M3500DB-H16B-32X	M3500DB4-H16B-32X	Normally Open		
M3500DB-H36A-32X	M3500DB4-H36A-32X	Normally Closed	36Ω	15.95" x 2.92" x 10.35"
M3500DB-H36B-32X	M3500DB4-H36B-32X	Normally Open		
43A Continuous Motor Current				
M3500DB-H01A-43	M3500DB4-H01A-43	Normally Closed	1Ω	15.95" x 2.92" x 10.35"
M3500DB-H01B-43	M3500DB4-H01B-43	Normally Open		
M3500DB-H03A-43	M3500DB4-H03A-43	Normally Closed	3Ω	15.95" x 2.92" x 10.35"
M3500DB-H03B-43	M3500DB4-H03B-43	Normally Open		
65A Continuous Motor Current				
M3500DB-H0.5A-65	N/A	Normally Closed	0.5Ω	15.95" x 7.56" x 10.52"
M3500DB-H1.5A-65		Normally Closed	1.5Ω	15.95" x 7.56" x 10.52"
M3500DB-H03A-65		Normally Closed	3Ω	15.95" x 7.56" x 10.52"
150A Continuous Motor Current				
N/A	M3500DB4-H025A-150	Normally Closed	0.25Ω	20.00" x 10.00" x 10.25"
	M3500DB4-H0.75A-150	Normally Closed	0.75Ω	20.00" x 10.00" x 10.25"
	M3500DB4-H1.5A-150	Normally Closed	1.5Ω	20.00" x 10.00" x 10.25"

Undervoltage Solutions

UPD Ride-Thru Systems
- **Sag Systems**
- **Capacitor Systems**
- **Battery Systems**

UPD Ride-Thru Lite

Voltage Regulators
- M3460R
- M3460B
- M3534

Chargers
- M3528

Energy Storage
- M3528B
- M3528UC

Dischargers
- KIT3628T

Understanding Ride-Thru Applications

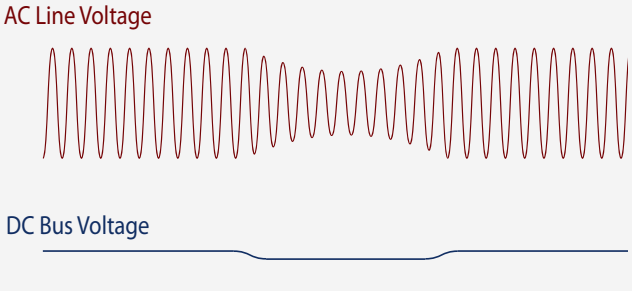
What is Ride-Thru?

The Bonitron Sag UPD Ride-Thru systems provide protection from 50% 3-phase AC line voltage sags or the loss of one phase for up to 2 seconds without loss of motor speed or torque.

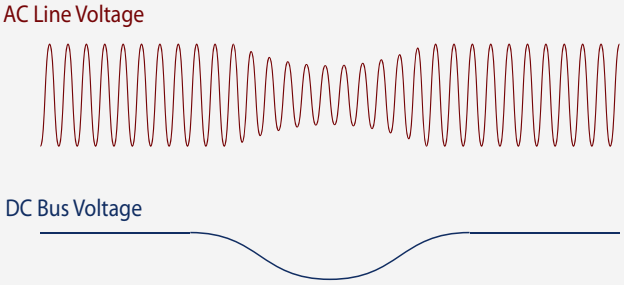
The Bonitron Outage UPD Ride-Thru systems provide protection from AC line voltage sags or the loss of all three phases for up to 15 minutes.

Bonitron UPD Ride-Thru systems are designed for AC drive systems that use a fixed DC bus, such as AC variable speed drives (VSD). Unfortunately, VSDs are quite susceptible to fluctuations in incoming power. Bonitron UPD Ride-Thru systems provide the security of "riding through" these events.

DC Bus with Ride-Thru Protection



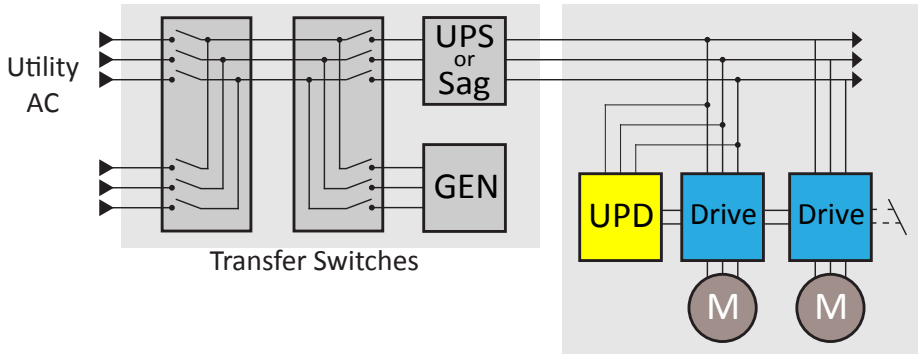
Unprotected DC Bus



Bonitron UPD Ride-Thru System Selection

		Ride-Thru Duration	Voltage Regulator	Charger	Energy Storage	Discharger	Interactive Display
SAG	S3534SR	Sag 2 sec	●	N/A	N/A	N/A	●
	S3460SR	Sag 2 sec	●	N/A	N/A	N/A	●
OUTAGE (CAPACITOR)	S3534EC	Outage 0.5 sec	N/A	N/A	Electrolytic	N/A	
	S3534CR	Outage 1 sec	●	●	Electrolytic	●	Optional
	S3534UR	Outage 2 sec	●	●	Ultracapacitor	●	●
	S3460UR	Outage 2 sec	●	●	Ultracapacitor	●	●
OUTAGE (BATTERY)	S3534BR	Outage Up to 60 sec	●	●	Battery	N/A	●
	S3460BR	Outage Up to 4 min	●	●	Battery	N/A	●

Electricity travels miles to reach the drives and motors that control your process. While outdoor power lines and substations are vulnerable to power outages caused by cars, weather, and even animals, the lines inside your plant are susceptible to power quality events as well.

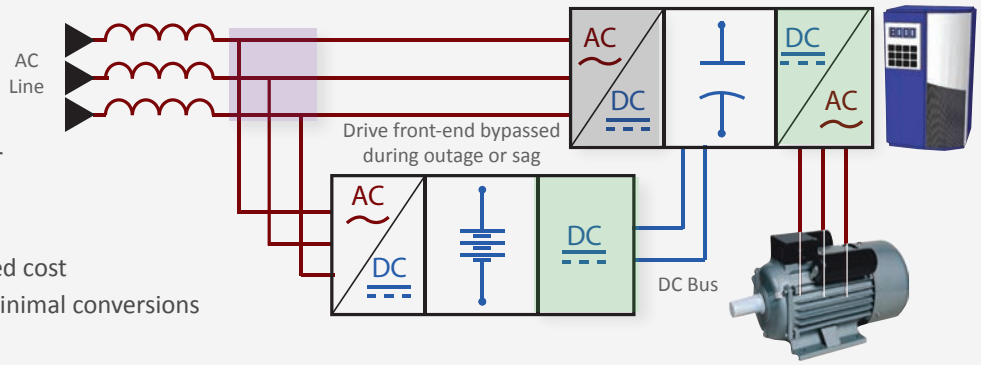


Unlike typical plant wide solutions, Bonitron designed its UPD solutions to connect directly to the DC terminals of one or multiple drives. If drive voltage sags, the Bonitron UPD immediately provides power so motor speed is not affected and the process never sees a disturbance. When properly sized, Bonitron UPD systems provide drives with full-load power until the AC line is restored or generators are online.

Bonitron Battery UPD Systems use battery DC energy to power the DC bus of the drive via DC bus connection terminals on the drive. This eliminates an unnecessary and energy-wasting DC to AC conversion.

Bonitron UPD Advantages

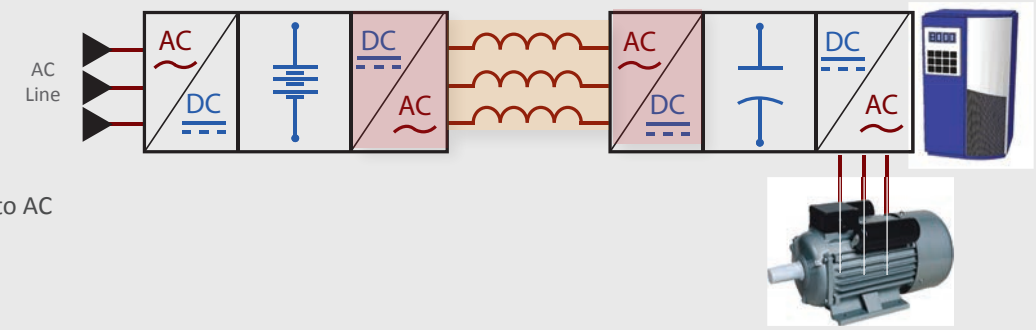
- Parallel Connection
  - High reliability
  - Seamless power source transfer
- Increased efficiency
  - Ultra-low standby power
  - Sized to drive system for reduced cost
  - Power supplied to DC bus for minimal conversions



Competitors' double conversion UPS systems convert DC voltage that is stored in batteries or capacitors back to AC voltage in order to power the drive, which in turn converts it back to DC. Variable frequency drives are not recommended for use with UPS Systems, as the drive input reactance interacts negatively with UPS inverters.

In-line UPS Disadvantages

- Series Connection
  - Decreased reliability
- Decreased efficiency
  - Unnecessary conversions
  - Converts energy storage back to AC



Undervoltage Solutions

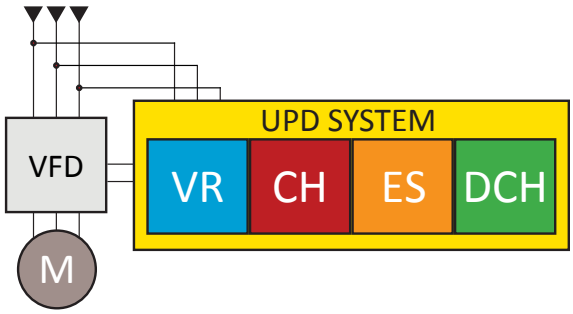
Bonitron UPD Systems (Uninterruptible Power for Drives) are the cost effective way to ensure your critical process never sees power disturbances from voltage sags or **outages lasting up to 4 minutes**. Bonitron UPD Systems include a voltage regulator that monitors the drive's DC bus voltage. If drive voltage sags or disappears, the system becomes active immediately and provides power to the DC bus so that the process is not affected.

Product Highlights

Sag UPD Ride-Thru Systems
- No energy storage required
- Full load power for up to 2 seconds
  - 50% 3-phase sags
  - Single phase sag to 0V

Capacitor UPD Ride-Thru Systems
- Electrolytic or ultracapacitor energy storage
- Full load power for up to 2 seconds
  - 100%, 3-phase outages

Battery UPD Ride-Thru Systems
- Battery energy storage
- Full-load power for up to 4 minutes
  - 100%, 3-phase outages



Uninterruptible Power for Drives (UPD)

Sized to drive system process
- Typically much lower cost than plant-wide UPS
- Support single or multiple drives with one UPD System

Parallel Connection
- High reliability
- Test system with no effect on process
- Very low standby power

Seamless power transfer from utility, to Bonitron, to generator or restored utility
- 208 – 480VAC systems

UPD Ride-Thru Lite

S3460 & S3534

Undervoltage Solutions

Some processes may not require uninterruptible power, but just enough to shut down safely or reset the equipment to a default position. For these applications, a Bonitron UPD can be undersized to 10-20% of the motor HP, greatly reducing the cost.

Bonitron UPD Systems (Uninterruptible Power for Drives) are the cost effective way to ensure your process safely shuts down or resets to the default position. UPD Systems include a voltage regulator that monitors the drive's DC bus voltage. If drive voltage disappears, the system can turn on immediately or can be manually enabled to provide power to the DC bus so that the process is shutdown safely.

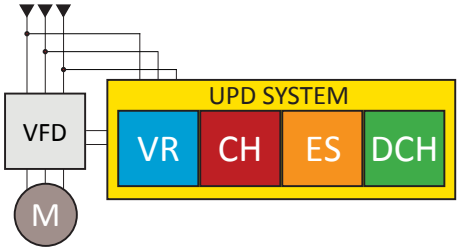
Uninterruptible Power for Drives (UPD)

Parallel Connection
- High Reliability
- Seamless power transfer

Increased Efficiency
- Ultra low standby power
- Sized to 10-20% of drive
- Few AC/DC conversions

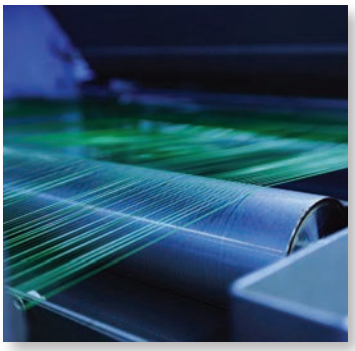
Product Highlights

- Cost effective emergency power system for processes that do not require uninterruptible power
- Sized to 10-20% of the drive HP
- Provides low speed, safe shutdown or reset to default position



Extruders

Purge system before solidification



Cranes & Hoists

Lower load to a safe position

Ovens

Move system before product or conveyor damaged by heat

Elevators

Move to nearest floor

UPD Ride-Thru System Components - Voltage Regulators

M3460R

Undervoltage Solutions

Bonitron Undervoltage Ride-Thru Solutions, also known as Uninterruptible Power for Drives, include a DC Voltage Regulator (M3460B or M3460R) that monitors the drive. If the drive voltage sags or disappears, the Voltage Regulator becomes active and provides power to the DC bus. This allows critical processes to never see the disturbance and can continue operating at full power. Thanks to Bonitron's parallel connection, very low standby power and long product life can be expected.

M3460R
Series

c UL us LISTED

CE

Digital Display

The ASM 3660DD4 is an interactive digital display for the 3460 Series that monitors and stores history of power quality issues, including status, voltage, and current.

	System Power	Peak Current	Max. On-time at Rating	Model Number	Dimensions (H x W x D)	
230 - 240 VAC						
	25 kW	85 A	2 Seconds	**M3460R-L025-R10-F**	28.00" x 16.00" x 14.00"	
	38 kW	127 A	2 Seconds	**M3460R-L038-R10-F**	28.00" x 16.00" x 14.00"	
	50 kW	170 A	2 Seconds	**M3460R-L050-R9-F**	34.00" x 16.00" x 14.00"	
	75 kW	255 A	2 Seconds	**M3460R-L075-R11-F**	44.00" x 16.00" x 14.00"	
	100 kW	340 A	2 Seconds	**M3460R-L100-R11-F**	44.00" x 16.00" x 14.00"	
	125 kW	425 A	2 Seconds	**M3460R-L125-R11-F**	44.00" x 16.00" x 14.00"	
380 - 415 VAC						
	43 kW	85 A	2 Seconds	**M3460R-E043-R10-F**	28.00" x 16.00" x 14.00"	
	65 kW	127 A	2 Seconds	**M3460R-E065-R10-F**	28.00" x 16.00" x 14.00"	
	87 kW	170 A	2 Seconds	**M3460R-E087-R9-F**	34.00" x 16.00" x 14.00"	
	130 kW	255 A	2 Seconds	**M3460R-E130-R11-F**	44.00" x 16.00" x 14.00"	
	175 kW	340 A	2 Seconds	**M3460R-E175-R11-F**	44.00" x 16.00" x 14.00"	
	215 kW	425 A	2 Seconds	**M3460R-E215-R11-F**	44.00" x 16.00" x 14.00"	
433 - 480 VAC						
	50 kW	85 A	2 Seconds	**M3460R-H050-R10-F**	28.00" x 16.00" x 14.00"	
	75 kW	127 A	2 Seconds	**M3460R-H075-R10-F**	28.00" x 16.00" x 14.00"	
	100 kW	170 A	2 Seconds	**M3460R-H100-R9-F**	34.00" x 16.00" x 14.00"	
	150 kW	255 A	2 Seconds	**M3460R-H150-R11-F**	44.00" x 16.00" x 14.00"	
	200 kW	340 A	2 Seconds	**M3460R-H200-R11-F**	44.00" x 16.00" x 14.00"	
	250 kW	425 A	2 Seconds	**M3460R-H250-R11-F**	44.00" x 16.00" x 14.00"	
575 - 600 VAC						
	60 kW	85 A	2 Seconds	M3460R-C060-R10	28.00" x 16.00" x 14.00"	
	90 kW	127 A	2 Seconds	M3460R-C090-R10	28.00" x 16.00" x 14.00"	
	125 kW	170 A	2 Seconds	M3460R-C125-R9	34.00" x 16.00" x 14.00"	
	185 kW	255 A	2 Seconds	M3460R-C185-R11	44.00" x 16.00" x 14.00"	
	245 kW	340 A	2 Seconds	M3460R-C245-R11	44.00" x 16.00" x 14.00"	
	305 kW	425 A	2 Seconds	M3460R-C305-R11	44.00" x 16.00" x 14.00"	

UPD Ride-Thru System Components - Voltage Regulators

M3460B

Undervoltage Solutions

M3460B
Series

c UL us LISTED

CE

M3460R vs. M3460B

M3460R

- Protect drives and processes from 2-second power sags
- Used with energy storage to protect from outages lasting up to 2 seconds
  - electrolytic
  - ultracapacitors

M3460B

- Battery Voltage Regulators are used with energy storage, such as batteries, to protect drives and processes from outages lasting up to 4 minutes to allow time for generator start-up
- With seamless power transfer, the M3534B or M3460B allow seamless power transfer from the grid to generator.

	System Power	Peak Current	Max. On-time at Rating	Model Number	Dimensions (H x W x D)	
230 - 240 VAC						
	25 kW	85 A	4 Minutes	**M3460B-L025-240-R10**	28.00" x 16.00" x 14.00"	
	38 kW	127 A	4 Minutes	**M3460B-L038-240-R9**	34.00" x 16.00" x 14.00"	
	50 kW	170 A	4 Minutes	**M3460B-L050-240-R9**	34.00" x 16.00" x 14.00"	
	75 kW	255 A	4 Minutes	**M3460B-L075-240-R2**	52.00" x 24.00" x 14.00"	
	100 kW	340 A	4 Minutes	**M3460B-L100-240-R2**	52.00" x 24.00" x 14.00"	
380 - 415 VAC						
	43 kW	85 A	4 Minutes	**M3460B-E043-240-R10**	28.00" x 16.00" x 14.00"	
	65 kW	127 A	4 Minutes	**M3460B-E065-240-R9**	34.00" x 16.00" x 14.00"	
	87 kW	170 A	4 Minutes	**M3460B-E087-240-R9**	34.00" x 16.00" x 14.00"	
	130 kW	255 A	4 Minutes	**M3460B-E130-240-R2**	52.00" x 24.00" x 14.00"	
	175 kW	340 A	4 Minutes	**M3460B-E175-240-R2**	52.00" x 24.00" x 14.00"	
433 - 480 VAC						
	50 kW	85 A	4 Minutes	**M3460B-H050-240-R10**	28.00" x 16.00" x 14.00"	
	75 kW	127 A	4 Minutes	**M3460B-H075-240-R9**	34.00" x 16.00" x 14.00"	
	100 kW	170 A	4 Minutes	**M3460B-H100-240-R9**	34.00" x 16.00" x 14.00"	
	150 kW	255 A	4 Minutes	**M3460B-H150-240-R2**	52.00" x 24.00" x 14.00"	
	200 kW	340 A	4 Minutes	**M3460B-H200-240-R2**	52.00" x 24.00" x 14.00"	
575 - 600 VAC						
	60 kW	85 A	4 Minutes	M3460B-C060-240-R10	28.00" x 16.00" x 14.00"	
	90 kW	127 A	4 Minutes	M3460B-C090-240-R9	28.00" x 16.00" x 14.00"	
	125 kW	170 A	4 Minutes	M3460B-C125-240-R9	34.00" x 16.00" x 14.00"	
	185 kW	255 A	4 Minutes	M3460B-C185-240-R2	44.00" x 16.00" x 14.00"	
	245 kW	340 A	4 Minutes	M3460B-C245-240-R2	44.00" x 16.00" x 14.00"	

UPD Ride-Thru System Components - Voltage Regulators

M3534

Undervoltage Solutions

Bonitron Undervoltage Ride-Thru Solutions, also known as Uninterruptible Power for Drives, include a DC Voltage Regulator (M3534) that monitors the drive. If the drive voltage sags or disappears, the Voltage Regulator becomes active and provides power to the DC bus. This allows critical processes to never see the disturbance and can continue operating at full power. Thanks to Bonitron's parallel connection, very low standby power and long product life can be expected.

The **M3534R** is a Voltage Regulator that protects drives and processes from 2-second power sags. It can also be used with energy storage, such as electrolytic or ultracapacitors, to protect from outages lasting up to 2 seconds.

The **M3534B** is a Battery Voltage Regulator that is used with energy storage, such as batteries, to protect drives and processes from outages lasting up to 60 seconds to allow time for generator startup. With seamless power transfer, the M3534B (with appropriate components - M3528 Charger and Batteries) allows seamless power transfer from the grid, to Bonitron, to generator.

M3534
Series

Specifications

Input AC Line.....208 - 480 VAC
Output DC Bus.....265 - 650 VDC
Bus Current Rating.....20 – 85 ADC
Power Rating.....6 - 50 kW
Run Time.....2 seconds – 60 seconds

Uninterruptible Power for Drives (UPD)

Parallel Connection
- High Reliability
- Seamless power transfer

Increased Efficiency
- Ultra low standby power
- Sized to drive systems
- Few AC/DC conversions

Current	Power	Max. On-Time (at rating)	Model Number	Dimensions (H x W x D)
230 - 240 VAC				
20 A	6 kW	2 Seconds	M3534R-L006-A5-I3	18.60" x 5.10" x 9.40"
40 A	12 kW	2 Seconds	M3534R-L012-K7-I3	20.00" x 7.40" x 10.30"
		60 Seconds	M3534B-L012-K9-I3	20.00" x 9.10" x 10.30"
85 A	25 kW	2 Seconds	M3534R-L025-A9-I3	22.10" x 8.70" x 10.30"
380 - 415 VAC				
20 A	10 kW	2 Seconds	M3534R-E010-A5-I3	18.60" x 5.10" x 9.40"
40 A	20 kW	2 Seconds	M3534R-E020-K7-I3	20.00" x 7.40" x 10.30"
		60 Seconds	M3534B-E020-K9-I3	20.00" x 9.10" x 10.30"
85 A	42 kW	2 Seconds	M3534R-E042-A9-I3	22.10" x 8.70" x 10.30"
460 - 480 VAC				
20 A	12 kW	2 Seconds	M3534R-H012-A5-I3	18.60" x 5.10" x 9.40"
40 A	24 kW	2 Seconds	M3534R-H024-K7-I3	20.00" x 7.40" x 10.30"
		60 Seconds	M3534B-H024-K9-I3	20.00" x 9.10" x 10.30"
85 A	50 kW	2 Seconds	M3534R-H050-A9-I3	22.10" x 8.70" x 10.30"

M3528
Series

Bonitron M3528 Chargers maintain energy levels in batteries and ultracapacitors.

Some industrial systems require back-up power to protect critical processes from power outages and voltage sags. Energy storage devices such as batteries and capacitors are required for outage protection. A charger is necessary to keep the energy storage reservoirs at the appropriate levels.

Product Highlights

- Maintain energy levels in batteries and ultracapacitors
- Adjustable current limit
- LED indicators
- Isolated status contacts

UL Listed when used with capacitors

c UL US LISTED

Uninterruptible Power for Drives (UPD)

Parallel Connection
- High Reliability
- Seamless power transfer

Increased Efficiency
- Ultra low standby power
- Sized to drive systems
- Few AC/DC conversions

Isolation Transformer required. Contact Bonitron for sizing.

	Charger					
	Max Charge Current	Input Voltage	Model Number	Charge Voltage	Dimensions (H x W x D)	
208 - 230VAC						
	10A	160-253VAC	**M3528AC-L010-A6**	175-325VDC	18.60" x 6.25" x 11.25"	
	20A	160-253VAC	**M3528AC-L020-K8**	175-325VDC	20.00" x 8.20" x 11.10"	
380 - 415VAC						
	10A	277-506VAC	**M3528AC-E010-A6**	325-600VDC	18.60 x 6.25 x 11.25"	
	20A	277-506VAC	**M3528AC-E020-K8**	325-600VDC	20.00" x 8.20" x 11.10"	
460 - 480VAC						
	10A	277-506VAC	**M3528AC-H010-A6**	325-600VDC	18.60" x 6.25" x 11.25"	
	20A	277-506VAC	**M3528AC-H020-K8**	325-600VDC	20.00" x 8.20" x 11.10"	
575 - 600VAC						
	10A	346-600VAC	M3528AC-C005	406-675VDC	18.60" x 6.25" x 11.25"	

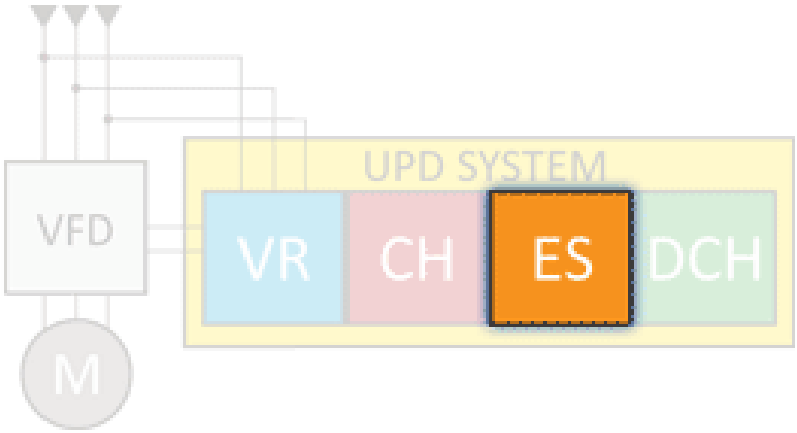
Undervoltage Solutions

M3528B
Series

The M3528B Battery Energy Storage Modules are designed for simple integration and scalability, and are typically used in conjunction with Bonitron Battery Voltage Regulators and Battery Chargers to provide critical processes with 100% power outage protection or offer "dark start" capabilities. M3528B Battery Modules are offered in 108V and 120V and can be connected in series or parallel to be used with 230 or 460VAC systems.

M3528UC
Series

The M3528UC Ultracapacitor Energy Storage Modules are designed for simple integration and scalability, and are typically used in conjunction with Bonitron Voltage Regulators and Battery Chargers to provide critical processes with 100% power outage protection.



	System Voltage	Model Number	Peak Output Current	Quantity	Enclosure	Dimensions (H x W x D)	
	208 VAC	M3528B-108-040-B5	40 A	2	NEMA-1 with Connector	17.60" x 5.10" x 9.40"	
	230 VAC	M3528B-120-040-B5					
	400 VAC	M3528B-108-040-B5	40 A	4	NEMA-1 with Connector	17.60" x 5.10" x 9.40"	
	460 VAC	M3528B-120-040-B5					

KIT3628
Series

Undervoltage Solutions

KIT 3628T is a combination of a relay, 24V power supply, and 24V backup module. In conjunction with an appropriately sized M3628R discharge resistor. The system will discharge an attached capacitor bank to below 50V in 1 minute. Automatic discharge can be set up using an aux contact on the cabinet disconnect switch or breaker, or manual discharge can be triggered locally or remotely via PLC control.

KIT 3628T is available in voltages up to 1000 VDC, and in peak currents up to 600 amps. Complementary M3628R resistors are available up to 4000 kJ, and can be paralleled for faster discharge times or for larger energy banks.

Product Highlights

- Discharge energy in electrolytic and ultracapacitors
- Consists of transistor and resistor
- Ability to abort discharge cycle
- Units may be paralleled for faster discharge

Charge Voltage (VDC)	Capacitance (Farad)	Energy (kJ)	KIT3628T	M3628R Resistor
400 VDC	4.4 F	350 kJ	KIT 3628T-Y200	M3628R-05.0-0350-6T
	9.4 F	750 kJ		M3628R-03.0-0750-6H
400 VDC	19 F	1500 kJ	KIT 3628T-Y600	M3628R-00.8-1500-6H
	25 F	2000 kJ		M3628R-00.8-2000-6H
	38 F	3000 kJ		M3628R-00.7-3000-10H
	50 F	4000 kJ		M3628R-00.7-4000-14H
450 VDC	3.5 F	350 kJ	KIT 3628T-Y200	M3628R-05.0-0350-6T
	7.4 F	750 kJ		M3628R-03.0-0750-6H
450 VDC	15 F	1500 kJ	KIT 3628T-Y600	M3628R-00.8-1500-6H
	20 F	2000 kJ		M3628R-00.8-2000-6H
	30 F	3000 kJ		M3628R-00.8-3000-10H
	40 F	4000 kJ		M3628R-00.8-4000-14H
500 VDC	2.8 F	350 kJ	KIT 3628T-Y200	M3628R-03.5-0350-6T
	6.0 F	750 kJ		M3628R-03.5-0750-6H
500 VDC	12 F	1500 kJ	KIT 3628T-Y600	M3628R-01.0-1500-6H
	16 F	2000 kJ		M3628R-01.0-2000-6H
	24 F	3000 kJ		M3628R-09.0-3000-10H
	32 F	4000 kJ		M3628R-09.0-4000-14H
550 VDC	2.3 F	350 kJ	KIT 3628T-Y200	M3628R-04.0-0350-6T
	4.9 F	750 kJ		M3628R-04.0-0750-6H
550 VDC	10 F	1500 kJ	KIT 3628T-Y600	M3628R-01.0-1500-6H
	13 F	2000 kJ		M3628R-01.0-2000-6H
	20 F	3000 kJ		M3628R-01.0-3000-10H
	26 F	4000 kJ		M3628R-01.0-4000-14H
600 VDC	1.9 F	350 kJ	KIT 3628T-Y200	M3628R-04.0-0350-6T
	4.2 F	750 kJ		M3628R-04.0-0750-6H
600 VDC	8.3 F	1500 kJ	KIT 3628T-Y600	M3628R-01.0-1500-6H
	11 F	2000 kJ		M3628R-01.0-2000-6H
	17 F	3000 kJ		M3628R-01.0-3000-10H
	22 F	4000 kJ		M3628R-01.0-4000-14H

*Contact Bonitron for additional voltages and sizes

ASM 3660DD4

The ASM 3660DD4 is an interactive digital display for the 3460 Series that monitors and stores history of power quality issues, including status, voltage, and current.

Digital Display

	Voltage Regulator			Charger	Model Number	
	M3460R Current	M3460B Current	M3534 Current	Use with M3528		
	85 A	N/A	20 - 85 A	Yes	ASM 3660DD4-11C	
				No	ASM 3660DD4-11X	
	127 A	85 A	N/A	Yes	ASM 3660DD4-31C	
				No	ASM 3660DD4-31X	
	N/A	127 - 170A	N/A	Yes	ASM 3660DD4-33C	
				No	ASM 3660DD4-33X	
	170 - 255 A	255 A	N/A	Yes	ASM 3660DD4-53C	
				No	ASM 3660DD4-53X	
	340 - 425 A	340 A	N/A	Yes	ASM 3660DD4-55C	
				No	ASM 3660DD4-55X	

Input Power Supply & Common Bus Solutions

Common Bus Sharing Diodes
- M3345CBM

Common Bus Isolation Diodes
- M3460D

Bus Filter Capacitance
- M3612

Regenerative DC Bus Power Supplies
- M3645P

3-Phase Power Supplies
- M3713

Single Phase Power Supplies
- M3712

24VDC Power Supplies
- M7001
- M7009
- M3699
- M3728

Common Bus Solutions

Why Common DC Bus?

Applications that require multiple motors and drives can be configured to use a Common DC bus. This is being done more often, and with good reasons, including:

- Reduced component count
- Energy savings
- Cost savings

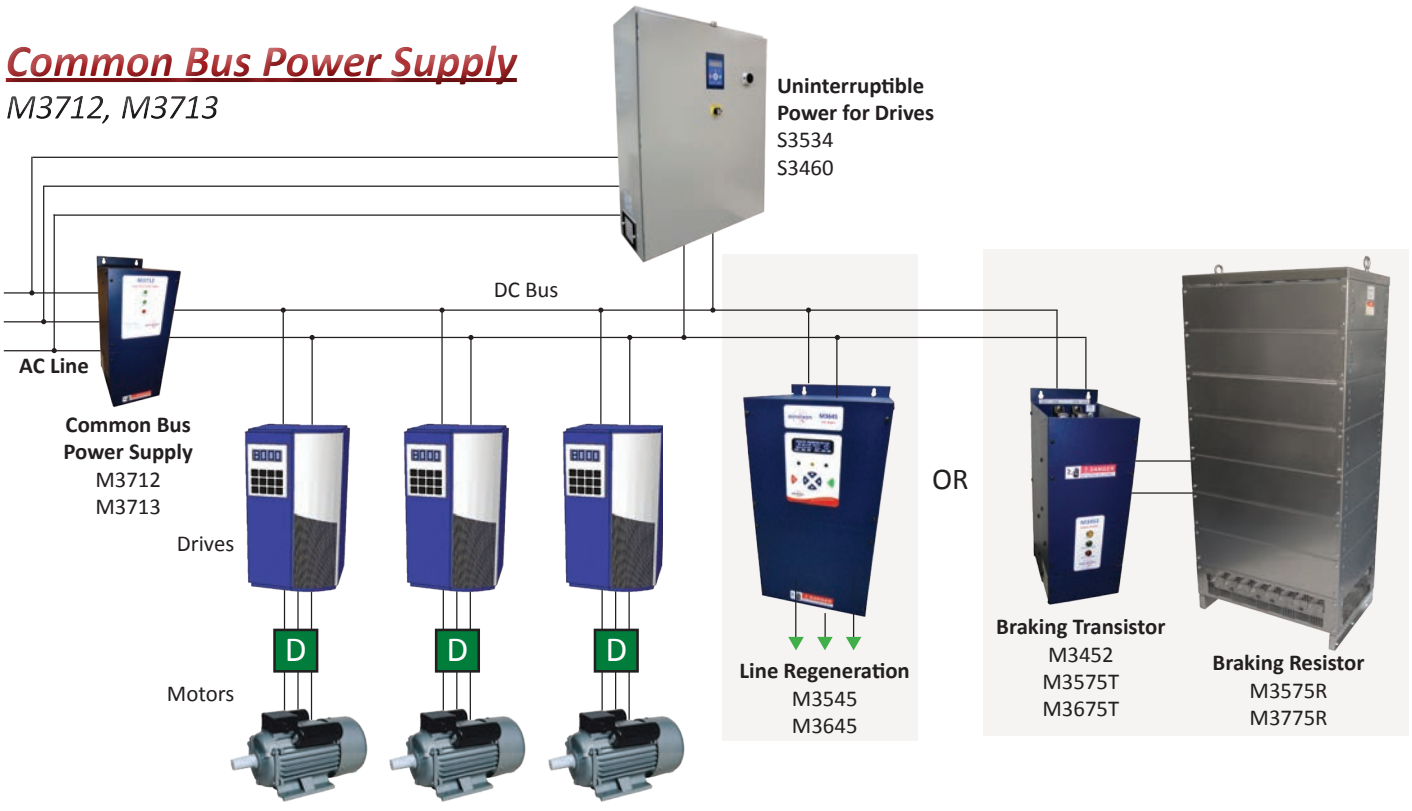
By connecting the DC busses of multiple VFDs, power that is being regenerated by a motor in one part of the system can be consumed by a motor that is powering the system. This is a great advantage for applications with motors that are constantly regenerating while others are motoring. This also allows systems to use one Braking Transistor and Resistor (or Line Regeneration Module) for multiple drives when the line is stopping or decelerating.

Cranes, gantries and other motion systems can also benefit from a common braking solution, as there is typically a single large motor with other smaller motors.
To further reduce component count, a power supply can be used with multiple drives to eliminate multiple power supplies in a drive system.

Any industry application that requires the use of multiple electric motors in a system can benefit from the use of a shared common DC bus. The use of a common bus allows for the reduction of wiring and components, as the linked drives can now share components. It can also allow for the direct sharing of power between drives, reducing amount of power needed from the grid. This can be achieved with either a common bus power supply or with diode sharing.

Common Bus Power Supply

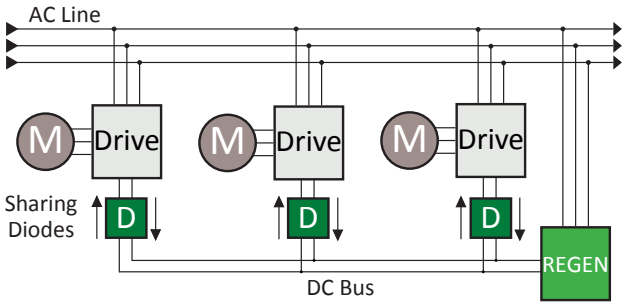
M3712, M3713

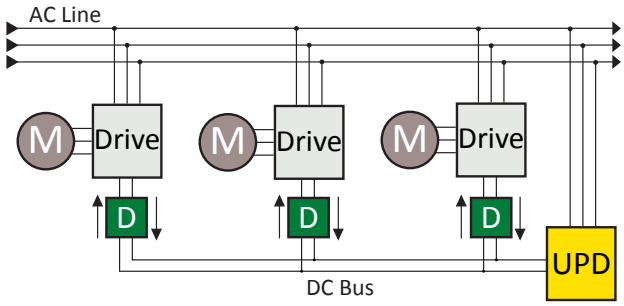


Common Bus Sharing Diodes

M3345CBM

If drives on the AC line are connected by a DC bus, circulating currents can be created that might cause drive faults. Sharing diodes allow a **two way flow of power** to and from drives, enabling them to share power between their DC busses, while preventing circulating currents. The two-way flow allows the drives to share power with each other or use a common braking, regen, or UPD (Uninterruptible Power for Drives) unit. Multiple drives of similar size can be run through a single diode unit while different size drives can be handled with separate diode units.





Common DC Bus Filter Capacitance

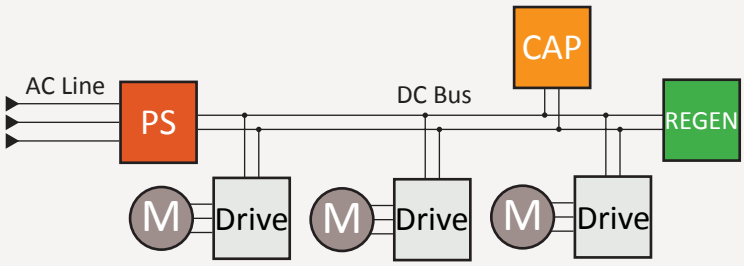
Extra capacitance (CAP) on the DC Bus with power supply or diode units.

3612EC

- Reduce DC bus ripple from AC conversion

3612RC

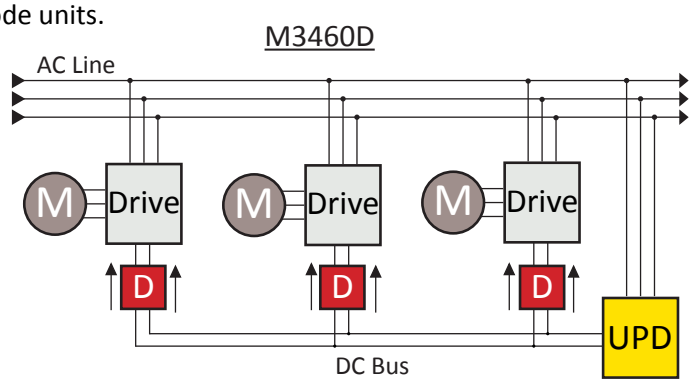
- Limit high frequency spikes from switching



Common Bus Isolation Diodes

M3460D

Unlike sharing diodes, isolation diodes allow only a **one-way flow of power** and do not allow drives to share power with each other, completely isolating the drives. The isolation diodes allow multiple drives to be connected on the DC bus so that they can share one UPD. The M3460D allows inward flow of power so that one UPD can power all of the drives connected to the DC bus. Multiple drives of similar size can be run through a single diode unit while different size drives can be handled with separate diode units.



Common Bus Sharing & Isolation Diodes

M3345CBM & M3460D

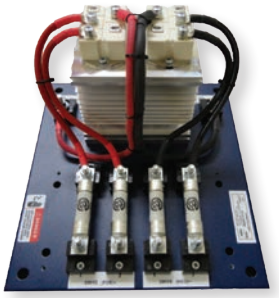
Common Bus Solutions

Drive systems are increasingly being configured with a common DC bus and for good reason. Common DC bus configurations create many advantages including cost savings, greater efficiency, and a more versatile system design.

Multiple drives connected through a common DC bus can share a brake or a UPD resulting in reduced component count and reducing cost. Also, if some drives are overhauling while others are motoring, power from the braking drives can be directly shared with the accelerating drives over the DC bus. Bonitron has diodes that allow your drives to share regenerative energy on a common bus (M3345CBM), or share a common UPD (M3460D) while isolating the drives from each other.

Bonitron common DC bus configuration accessories work with drive systems with DC bus connections.

M3345CBM Series



M3460D Series

M3345CBM

Nominal HP		Max. # of Drives (per unit)	Model Number	Drive Current	Output Current		Dimensions (H x W x D)
230-240 VAC	460-480 VAC				Peak	Cont.	
3 HP	5 HP	3	M3345CBM - 10H3	10A	30A	30A	8.50" x 8.50" x 5.50"
		6	M3345CBM - 10J6		60A		8.50" x 15.00" x 5.50"
10 HP	20 HP	3	M3345CBM - 30H3	30A	90A	30A	8.50" x 8.50" x 5.50"
		6	M3345CBM - 30J6		180A		8.50" x 15.00" x 5.50"
20 HP	40 HP	2	M3345CBM - 60L2	60A	120A	50A	13.00" x 12.00" x 8.00"
		3	M3345CBM - 60L3		180A		
20 HP	40 HP	4	M3345CBM - 60P4	60A	240A	100A	15.00" x 24.00" x 8.00"
		6	M3345CBM - 60P6		360A		
30 HP	60 HP	2	M3345CBM - 90N2	90A	180A	100A	14.00" x 15.00" x 8.00"
		3	M3345CBM - 90N3		270A		
100 HP	200 HP	2	M3345CBM - 200P2	200A	400A	200A	15.00" x 24.00" x 8.00"
75 HP	150 HP	1	M3345CBM – 200X1	200A	400A	200A	13.75" x 6.90" x 9.25"
100 HP	200 HP	1	M3345CBM - 250X1	250A	375A	250A	13.75" x 6.90" x 9.25"
125 HP	250 HP	1	M3345CBM – 300X1	300A	600A	300A	13.75" x 6.90" x 9.25"
125 HP	250 HP	1	M3345CBM - 350X1	350A	450A	300A	13.75" x 6.90" x 9.25"

M3460D

Nominal HP		Max. # of Drives (per unit)	Model Number	Drive Current	Current		Dimensions (H x W x D)
230-240 VAC	460-480 VAC				Peak	Cont.	
1.5 HP	3 HP	6	M3460D-6F6-4	4 A	24 A	20 A	8.00" x 12.50" x 5.50"
3 HP	5 HP	3	M3460D-3H3-10	10 A	30 A	30 A	8.50" x 8.50" x 5.50"
		6	M3460D-6J6-10		60 A		15.00" x 8.50" x 5.50"
10 HP	20 HP	3	M3460D-3H3-30	30 A	90 A	30 A	8.50" x 8.50" x 5.50"
		6	M3460D-6J6-30		180 A		15.00" x 8.50" x 5.50"
20 HP	40 HP	2	M3460D-2L2-60	60 A	120 A	50 A	12.00" x 13.00" x 8.00"
		3	M3460D-3L3-60		180 A		
20 HP	40 HP	4	M3460D-4P4-60	60 A	240 A	100 A	24.00" x 15.00" x 8.00"
		6	M3460D-6P6-60		360 A		
30 HP	60 HP	2	M3460D-2N2-90	90 A	180 A	100 A	15.00" x 15.00" x 8.00"
		3	M3460D-3N3-90		270 A		
100 HP	200 HP	2	M3460D-2P2-200	200 A	400 A	200 A	24.00" x 15.00" x 8.00"

M3612EC
Series

The M3612EC is a filter capacitor bank for a common DC bus drive systems. The drives can be either servo or variable frequency drives intended for use with common bus capacitors.

- 7,000 - 28,000µF

	System Voltage	Model Number	Max. Capacitor Voltage	Capacitance	ESR	End-of-Life		Max Ripple Current		Dimensions (H x W x D)	
						Capacitance Change	ESR Change	@300Hz 45°C	@300Hz 105°C		
	230-240VAC	M3612EC-L280-K7	450VDC	28,000µF	3.8mΩ	-20%	100%	385A	175A	20.00" x 7.12" x 10.30"	
	460-480VAC	M3612EC-H070-K7	900VDC	7,000µF	15.3mΩ	-20%	100%	200A	90A	20.00" x 7.12" x 10.30"	

M3612RC
Series

- Limits voltage spikes on Common Bus Systems -

The M3612RC Common Bus Snubber is a high frequency filter that limits spikes and ringing in DC bus systems caused by inverter switching, supply noise, bus reactance, and other sources. Limiting these spikes protects attached drives and power supplies, preventing premature failure.

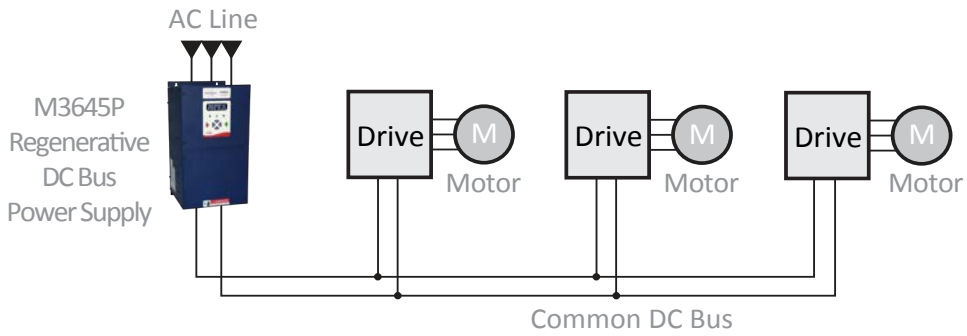
	Model Number	Capacitor	Resistor	Chassis	Dimension (H x W x D)	
460 - 480VAC						
	M3612RC-H12R20C	2000VDC	12 Ohm	M4	12.75" x 4.00" x 9.00"	

Input Power Supply Solutions

M3645P
Series

The M3645P Regnerative DC Bus Power Supply synchronizes to the frequency of the incoming power line, allowing it to automatically adapt to 50Hz or 60Hz input. Under normal conditions, the M3645P rectifies the AC line and supplies power to the load. During a braking event, as the DC bus rises above the AC line peak, the M3645P redirects current from the DC bus into the AC line to limit the rise in bus voltage and prevent overvoltage faults. While regenerating the M3645P will automatically fold back in an overcurrent condition, or shut down in the event that unsafe conditions are detected.

Up to two 100A M3645P units can be run in parallel for high-power applications.



c UL us
LISTED

All 300A modules are not yet UL listed.

RoHS Compliant

Precharge Circuit may be Required. M3728 available from Bonitron. See page 44.

Line Regen									Fuse Plate	Reactor
Phase	Power		Display Type	Model Number	Current		Watt Loss	Dimensions (H x W x D)	Model Number	Model Number
	Cont.	Peak			Cont.	Peak				
208 - 240VAC										
3	14.4 HP	21 .6 HP	LEDs+Digital	**M3645P-L030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	M3645F-H030	
3	24.0 HP	36.0 HP	LEDs+Digital	**M3645P-L050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	M3645F-H050	
3	48.0 HP	72.0 HP	LEDs+Digital	**M3645P-L100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	M3645F-H100	
3	96.0 HP	120 HP	LEDs+Digital	M3645P-L300T-M15-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"	M3645F-H300	M3645-L300R
380 - 415VAC										
3	25.0 HP	37.5 HP	LEDs+Digital	**M3645P-E030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	M3645F-H030	
3	41.7 HP	62.6 HP	LEDs+Digital	**M3645P-E050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	M3645F-H050	
3	83.4 HP	125.2 HP	LEDs+Digital	**M3645P-E100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	M3645F-H100	
3	250 HP	312.5 HP	LEDs+Digital	M3645P-E300T-M12-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"	M3645F-H300	M3645-E300R
460 - 480VAC										
3	28.8 HP	43.2 HP	LEDs+Digital	**M3645P-H030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	M3645F-H030	
3	48.0 HP	72.0 HP	LEDs+Digital	**M3645P-H050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	M3645F-H050	
3	96.0 HP	144.0 HP	LEDs+Digital	**M3645P-H100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	M3645F-H100	
3	288 HP	360 HP	LEDs+Digital	M3645P-H300T-M15-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"	M3645F-H300	M3645-H300R
575 - 600VAC										
3	36.0 HP	54.0 HP	LEDs+Digital	**M3645P-C030-M10-D**	30 A	45 A	180W	20.00" x 10.00" x 10.10"	M3645F-C030	
3	60.0 HP	90.0 HP	LEDs+Digital	**M3645P-C050-M11-D**	50 A	75 A	265W	22.00" x 11.30" x 10.60"	M3645F-C050	
3	120.0 HP	180.0 HP	LEDs+Digital	**M3645P-C100-M12-D**	100 A	150 A	470W	24.00" x 12.00" x 12.10"	M3645F-C100	
3	360 HP	450 HP	LEDs+Digital	M3645P-C300T-M12-D	300 A	375 A	2980W	26.00" x 13.90" x 11.11"	M3645F-C300	M3645-C300R

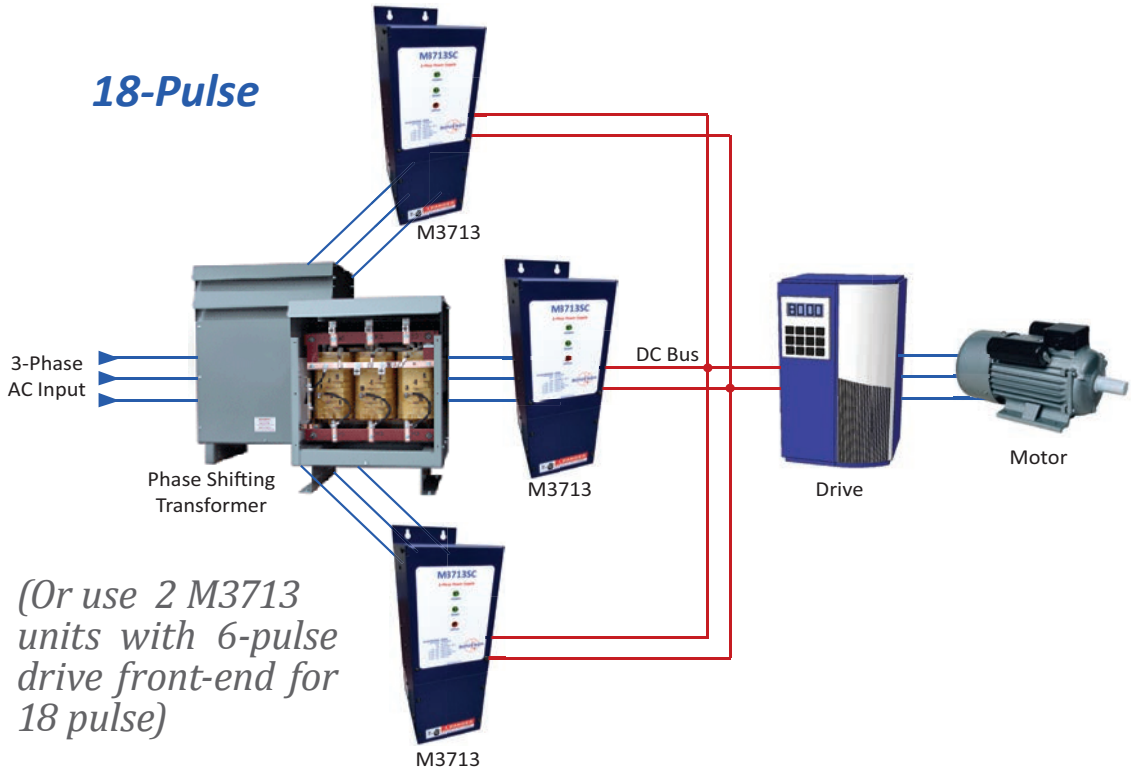
Common Bus Power Supply

M3712, M3713

Input Power Supply Solutions

Using a common bus power supply reduces the amount of wiring and components in a system, resulting in a reduction of maintenance and footprint of the system. In a system with multiple motors, some motors may be regenerating while others are motoring. The common bus allows the regenerating drives to share power with the motoring drives, thus reducing the amount of power needed from the grid. If the drives are creating a net surplus of energy, a single line regen or braking unit can be installed to dissipate the excess energy.

A common bus power supply can also allow the use of single phase AC power with 3-phase motors without having to oversize the drive. The M3712 can create a common DC bus from single phase power while the M3713 uses 3-phase input power.



12 & 18 Pulse Solutions

Model Number	6-PULSE (One Unit)		12-PULSE (Two Units)		18-PULSE (Three Units)	
	Nominal Drive HP	DC Output Current (Amps)	Nominal Drive HP	DC Output Current (Total Amps)	Nominal Drive HP	DC Output Current (Total Amps)
230 - 240VAC						
M3713SC-L30-B5	7.5	30	12.5	55	20	80
M3713SC-L75-B5	20	75	35	135	50	200
M3713SC-L150-K7	50	150	90	270	135	400
M3713SC-L225-K7	75	225	135	405	200	600
M3713SC-L375-K10	125	375	225	675	335	1000
460 - 480VAC						
M3713SC-H30-B5	15	30	25	55	40	80
M3713SC-H75-B5	40	75	70	135	100	200
M3713SC-H150-K7	100	150	180	270	270	400
M3713SC-H225-K7	150	225	270	405	400	600
M3713SC-H375-K10	250	375	450	675	675	1000

Input Power Supply Solutions

The Bonitron M3713 series is a non-regenerative AC to DC rectifier that can serve as the main power supply for your common bus DC system.

Drive systems are more commonly being configured with a common DC bus; for good reason. Common DC bus configurations create advantages including:

- Cost savings
- Greater efficiency
- More versatile system design

One method of creating a common bus systems is the use of a rectifier that supplies DC power to all of the drives instead of individual rectifiers for each drive. The Bonitron M3713 is the ideal solution for this method.

Multiple M3713 Power Supplies can be used in parallel for high power applications, as well as for redundancy and increased process reliability.

The M3713 can also be used as a building block for 12 and 18 pulse systems using standard VFDs. These systems mitigate harmonics and other power quality issues. **Multiple M3713 units used with a phase shifting transformer allows standard drives to meet IEEE 519 compliance.**

M3713
Series

c UL us
LISTED

Specifications

M3713SC (with precharge)		M3713DM (without precharge)
230-240 VAC, 460-480 VAC, 575-600 VAC	**Input Voltage**	230-240 VAC, 460-480 VAC, 575-600 VAC
150% Full Load Rating for 60 seconds	**Intermittent duty Limit**	150% Full Load Rating for 60 seconds
20% Full Load Rating	**Precharge Ramp Current Limit**	N/A
175% Full Load Rating	**Overload Limit**	N/A
24V+ Sinking Precharge Enable Run Enable	**Control Inputs**	N/A
250VAC, 120mA Max Precharge Complete Ready	**Control Outputs**	250VAC @ 120mA 110VAC @500mA Overtemp (NC)
Power, Ready, Status	**Indicators**	Power

Model Number Selection

Up to 3 units can be in parallel for higher current requirements.

	Power (Nominal)	Precharge	Model Number	Output Current	Dimensions (H x W x D)	
208 - 240 VAC						
	7.5 HP	NO	**M3713DM-L030-B5**	30 A	17.75" x 5.50" x 7.80"	
			M3713HF-L030-B5			
		YES	**M3713SC-L030-B5**			
	20 HP	NO	**M3713DM-L075-B5**	75 A	17.75" x 5.50" x 7.80"	
			M3713HF-L075-B5			
		YES	**M3713SC-L075-B5**			
	50 HP	NO	**M3713DM-L150-K7**	150 A	20.00" x 7.12" x 10.35"	
			M3713HF-L150-K7			
		YES	**M3713SC-L150-K7**			
	75 HP	NO	**M3713DM-L225-K7**	225 A	20.00" x 7.12" x 10.35"	
		YES	**M3713SC-L225-K7**			
	125 HP	NO	**M3713DM-L375-K10**	375 A	20.00" x 10.00" x 10.50"	
		YES	**M3713SC-L375-K10**			
380 - 415 VAC						
	12 HP	NO	**M3713DM-E030-B5**	30 A	17.75" x 5.50" x 7.80"	
			M3713HF-E030-B5			
		YES	**M3713SC-E030-B5**			
	32 HP	NO	**M3713DM-E075-B5**	75 A	17.75" x 5.50" x 7.80"	
			M3713HF-E075-B5			
		YES	**M3713SC-E075-B5**			
	80 HP	NO	**M3713DM-E150-K7**	150 A	20.00" x 7.12" x 10.35"	
			M3713HF-E150-K7			
		YES	**M3713SC-E150-K7**			
	120 HP	NO	**M3713DM-E225-K7**	225 A	20.00" x 7.12" x 10.35"	
		YES	**M3713SC-E225-K7**			
	200 HP	NO	**M3713DM-E375-K10**	375 A	20.00" x 10.00" x 10.50"	
		YES	**M3713SC-E375-K10**			
460 - 480 VAC						
	15 HP	NO	**M3713DM-H030-B5**	30 A	17.75" x 5.50" x 7.80"	
			M3713HF-H030-B5			
		YES	**M3713SC-H030-B5**			
	40 HP	NO	**M3713DM-H075-B5**	75 A	17.75" x 5.50" x 7.80"	
			M3713HF-H075-B5			
		YES	**M3713SC-H075-B5**			
	100 HP	NO	**M3713DM-H150-K7**	150 A	20.00" x 7.12" x 10.35"	
			M3713HF-H150-K7			
		YES	**M3713SC-H150-K7**			
	150 HP	NO	**M3713DM-H225-K7**	225 A	20.00" x 7.12" x 10.35"	
		YES	**M3713SC-H225-K7**			
	250 HP	NO	**M3713DM-H375-K10**	375 A	20.00" x 10.00" x 10.50"	
		YES	**M3713SC-H375-K10**			
575 - 600 VAC						
	20 HP	NO	**M3713DM-C030-B5**	30 A	17.75" x 5.50" x 7.80"	
			M3713HF-C030-B5			
		YES	**M3713SC-C030-B5**			
	50 HP	NO	**M3713DM-C075-B5**	75 A	17.75" x 5.50" x 7.80"	
			M3713HF-C075-B5			
		YES	**M3713SC-C075-B5**			
	125 HP	NO	**M3713DM-C150-K7**	150 A	20.00" x 7.12" x 10.35"	
			M3713HF-C150-K7			
		YES	**M3713SC-C150-K7**			
	175 HP	NO	**M3713DM-C225-K7**	225 A	20.00" x 7.12" x 10.35"	
		YES	**M3713SC-C225-K7**			
	300 HP	NO	**M3713DM-C375-K10**	375 A	20.00" x 10.00" x 10.50"	
		YES	**M3713SC-C375-K10**			

Input Power Supply Solutions

The M3712 Single Phase Power Supply is a low-cost solution for powering 3-phase AC drives from a single phase source.

3-phase motors are the economical choice for motor applications above 10 horsepower, however many locations only have single phase power available due to the cost of expanding 3-phase availability. Most VFDs are not designed for single phase operation, and even those that are must be oversized by up to 300% when operated from a single phase source.

Fortunately, there is no longer a need to oversize 3-phase drives when using them in single phase applications thanks to the Bonitron M3712 Single Phase Power Supply. **The M3712 has a single phase AC input and serves as a power supply for one or multiple drives via DC bus terminal connections.** In addition, the M3712 aids in protecting your drive from the high currents caused by single phase operation, which allows your drive to run cooler and longer.

M3712
Series

c UL us LISTED

Specifications

Overload Limit.....150% Full Load Rating for 60 seconds
Precharge Ramp Current Limit.....20% Full Load Rating
Overcurrent Limit.....200% Full Load Rating
Operating Temp.....Derate unit 1% per every 1°C above 40°C
Storage Temp.....-20 to +65 °C
Control I/O.....Inputs: Enable
Outputs: Ready
Indicators.....Power, Ready, Status

Product Highlights

- Power one or multiple 3-phase drives from single phase source
- No need to de-rate drive for single phase operation
- Power drives via DC +/- connection
- Added bus capacitance and filtering
- Soft start-up to drives for increased reliability
- UL Listed
- Integrated pre-charge

Line Reactor Required. Available from Bonitron.

	Power (Nominal)	Model Number	Output Current	Input Current (AC RMS)	Dimensions (H x W x D)	
208 - 240 VAC Drives						
	15 HP	M3712-L015	50 A	87 A	15.00" x 6.20" x 7.30"	
	30 HP	**M3712-L030**	100 A	175 A	20.00" x 7.12" x 10.30"	
	50 HP	**M3712-L050**	160 A	285 A	20.00" x 7.12" x 10.30"	
	75 HP	**M3712-L075**	290 A	550 A	25.00" x 10.00" x 10.20"	
	125 HP	**M3712-L125**	360 A	670 A	32.10" x 14.00" x 12.20"	
460 - 480 VAC Drives						
	15 HP	M3712-H015	28 A	58 A	15.00" x 6.20" x 7.30"	
	30 HP	**M3712-H030**	55 A	115 A	20.00" x 7.12" x 10.30"	
	50 HP	**M3712-H050**	90 A	185 A	20.00" x 7.12" x 10.30"	
	75 HP	**M3712-H075**	135 A	250 A	25.00" x 10.00" x 10.20"	
	125 HP	**M3712-H125**	200 A	365 A	32.10" x 14.00" x 12.20"	

Input Power Supply Solutions

M7001
Series

The M7001 is a 24 volt power supply with a wide range (190 – 1000VDC) input.

For backup systems using capacitors or batteries, such as Bonitron Uninterruptible Power for Drives, the input voltage of the energy storage can vary, yet the local 24VDC controls for the system will need the same RideThru capability as the drive. The M7001 allows the same energy storage system as the RideThru to back up PLCs, sensors or networks, allowing uninterrupted system operation.

The 190 – 1000VDC input range also allows it to be used on drives with active front ends or other systems that could see sustained voltage surges.

Product Highlights

- **24 Watt DC Power Supply**
- **Provide backup power for drive and PLCs with the same energy storage**
- **80% Efficiency Typical**

	Model Number	Input Voltage	Output Voltage	Output Current	Dimensions (H x W x D)	
	M7001	190 - 1000VDC	24VDC	1A	4.13" x 3.52" x 2.36"	

Input Power Supply Solutions

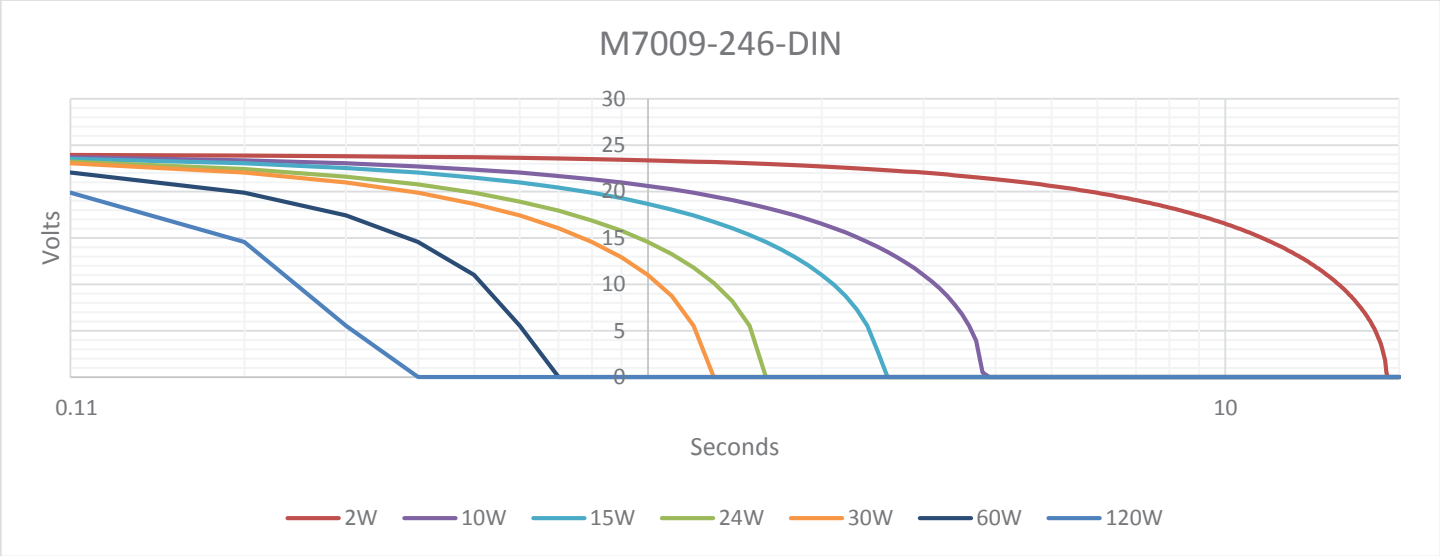
M7009
Series

24VDC Buffer Module

Bonitron M7009 is a cost-effective solution for protecting your 24-volt DC bus from short-duration outages.

During normal operation, the unit charges slowly from the 24V bus, fully charging in under one minute, with a peak charge current of under 400 mA. Once charged, the unit draws no power from the 24V bus.

During an outage, the module supports the 24V bus for a period depending on the power draw and minimum acceptable voltage of your load.



	Model Number	Max Operating Voltage	Capacitance	Dimensions (H x W x D)	Wire Gauge	
	M7009-243-DIN	32VDC	24VDC	8.62” x 4.62” x 2.44”	16-24 AWG	
	M7009-246-DIN	32VDC	24VDC	8.62” x 4.62” x 2.44”	16-24 AWG	
	M7009-249-DIN	32VDC	24VDC	8.62” x 4.62” x 2.44”	16-24 AWG	

M3699
Series

The M3699 Voltage Limiter accepts input voltages of 90 – 1000VDC and outputs 175VDC, acceptable to many common 24VDC power supplies. This allows the use to commonly available, off-the-shelf power supplies with years of field exposure in new applications.

Voltage Limiter

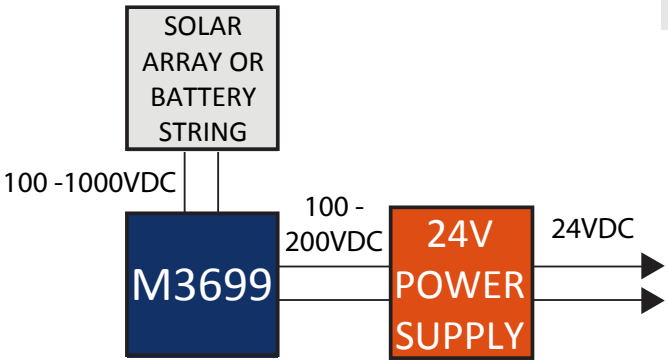
Product Highlights

- Low-cost enhancement for 24-volt power supplies
- DIN rail mounting
- 90 - 1000VDC Input
- 175VDC Output Clamped
- 135W Output

Specifications

Input Voltage.....90 - 1000 VDC
Output Voltage.....175 VDC Clamped
Power.....135 W
Indicators.....Status LED

Solar Array or Battery String



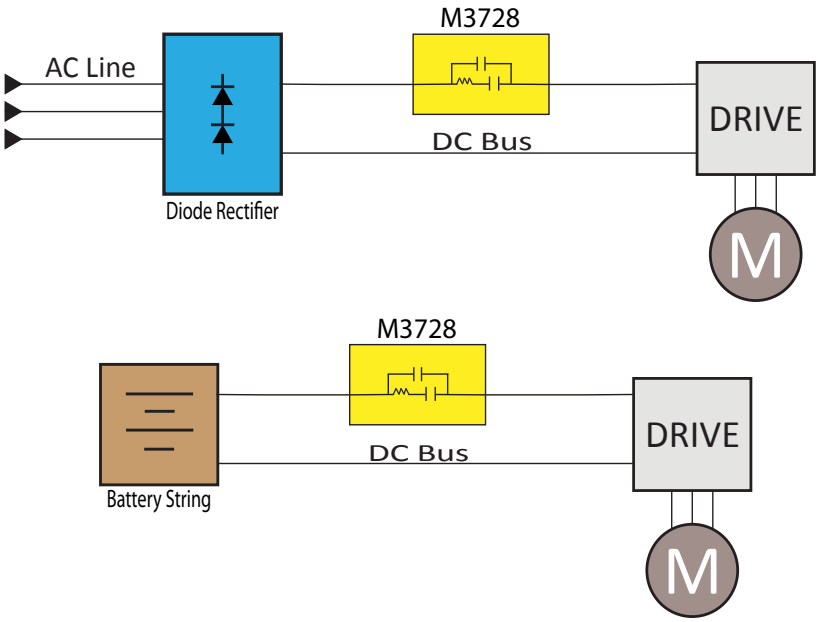
Model Number	Input Voltage	Output Voltage	Output Power	Dimensions (H x W x D)
M3699-135W-DIN	90 - 1000VDC	175VDC	135W	5.90" x 3.80" x 1.90"

Input Power Supply Solutions

The Bonitron M3728 DC Inrush Limiter safely precharges a drive or other capacitive loads from a DC source, such as a diode rectifier or battery bank. When the M3728 is powered off or disabled, there is no path between the source and the capacitive load. When the unit is enabled, a resistor charges the capacitive load slowly. When precharge is complete, the resistor is removed from the circuit, allowing the load to operate normally. The M3728 also has a status contact that indicates when the capacitors are fully charged; this can be wired in series with the drive enable signal for easy integration.

Additionally, care must be taken to protect battery strings, as they can be damaged by discharging them below their safe minimum voltage. Such damage often requires expensive refurbishment or replacement. In situations where M3728 is fed from a battery string, the unit can be set to disconnect the load if the battery voltage falls to a preset level.

M3728
Series



Product Highlights

- Nema 1 Construction
- Optional battery undervoltage protection
- Controlled load disconnect
- Self-protects from overloads
- Allows use of diode rectifiers in case SCR rectifiers will not function
- Allows use of regenerative power supplies without internal pre-charge

Model Number	Maximum Voltage	Peak Current	Max Load Energy	Dimensions (H x W x D)
M3728-H050-010	800VDC	50 A	10kJ	16.0" x 6.0" x 9.4"
M3728-H175-010	800VDC	175 A	10kJ	16.0" x 6.0" x 9.4"
M3728-H500-010	800VDC	500 A	10kJ	16.0" x 6.0" x 9.4"
M3728-C050-010	900VDC	50 A	10kJ	16.0" x 6.0" x 9.4"
M3728-C175-010	900VDC	175 A	10kJ	16.0" x 6.0" x 9.4"
M3728-C350-010	900VDC	350 A	10kJ	16.0" x 6.0" x 9.4"
M3728-Y050-010	1000VDC	50 A	10kJ	16.0" x 6.0" x 9.4"
M3728-Y350-010	1000VDC	350 A	10kJ	16.0" x 6.0" x 9.4"

Maintenance Solutions

Portable Capacitor Former

- M3628PCF

Portable Capacitor Tester

- M3628PCT
- **Portable Ultracapacitor Tester**
- M3628PUT

Maintenance Solutions

Why Bonitron Maintenance Solutions?

Bonitron offers maintenance solutions that allow you to charge, discharge, form, and test energy storage.

Test your capacitors to see when they are approaching their "end of life" and replace them before an unnecessary and expensive failure occurs. If you have capacitors that have been stored for a while, reform them with our M3628PCF Portable Capacitor Former to avoid damage to your drive at start up.

A great benefit of many of Bonitron's Maintenance Solutions is portability - making testing and maintenance more convenient!

Portable Capacitor Former

M3628PCF

When variable frequency drives are stored for long periods (typically over eight months), the internal chemistry of their capacitors may begin to deteriorate and need to be reformed prior to use. If the capacitors are not reformed before the drive is put into use, the capacitors have the potential to fail which can cause extensive damage to the drive.

M3628PCF

Product Highlights

- Charges, discharges, and forms capacitors
- Manually variable output voltage: 0 - 900 VDC
- Digital voltage and current displays
- Overcurrent and over temperature protection
- Tough impact and weather resistant case

M3628PCF Selection

Model Number	Input Voltage	Max Output Voltage	Max Output Current	Max Load Capacitance	Weight
M3628PCF-C01-110	110 - 120 VAC	900 VDC	1 ADC	100000 uF	65 LBS
M3628PCF-C01-220	220 - 240 VAC				

Portable Capacitor Tester & Ultracapacitor Tester

M3628PCT & M3628PUT

Maintenance Solutions

M3628PCT

As electrolytic capacitors' age approach end-of-life, their capacitance drops significantly below their original specification. These capacitors typically need replacement to avoid process failure. Measuring the actual capacitance helps determine when these capacitors reach EOL (end of life), avoiding both process failure and expensive, unnecessary preemptive replacement.

Product Highlights

- Charges, discharges, measures, and forms capacitors
- Variable output voltage: 0 - 800 VDC
- Four line LCD display
- Portable - case on wheels
- Operates from standard 110 VAC supply

M3628PCT Selection

Model Number	Input Voltage	Output Voltage	Output Current	Min. Capacitance	Max. Capacitance
M3628PCT-C01-110	110VAC	800 VDC	0-1.3 ADC	2,200 uF	1,000,000 uF

M3628PUT

As ultracapacitors age, their Equivalent Series Resistance rises and their capacitance drops significantly below their original specification. These ultracapacitors typically need replacement to avoid process failure. Measuring the capacitance and Equivalent Series Resistance helps determine when these capacitors reach their end of life, avoiding both process failure and expensive, unnecessary preemptive replacement.

The Bonitron M3628PUT allows the user to charge a capacitor or bank to a specified voltage, and then discharge the bank. The display will then show the calculated capacitance and Equivalent Series Resistance of the bank.

Product Highlights

- Variable output voltage 0 - 130VDC
- Digital control interface
- Accurate capacitance and equivalent series resistance measurements
- Overcurrent and over-temperature protection

M3628PUT Selection

Model Number	Input Voltage	Output Voltage	Output Current	Min. Load Capacitance	Max. Load Capacitance
M3628PUT-U07-110	110 - 120 VAC	0 - 130 VDC	1 - 7 ADC	1 F	500 F
M3628PUT-U07-220	220 - 240 VAC				

Industry Solutions

Agriculture

Boilers

Centrifuges

Common DC Bus

Cranes & Hoists

HVAC

Logging & Sawmill

Marine

Additional Industries...

No matter what industry your AC drive and motor support, Bonitron has the solution to enhance your process and increase uptime.

While our industry brochures above reflect completed app notes, the items below are a sampling of additional industries Bonitron serves. Feel free to contact us to discuss your application as we continue to build application notes for additional processes and industries.

Material Handling

- Automotive
- Chemical Processing
- Critical Data
- Entertainment/ Stages
- Fiber
- Food Processing
- Metals
- Mining
- Packaging
- Paper
- Petrochemical
- Pharmaceutical
- Recycling
- Semiconductor
- Security
- Textiles
- Transportation
- Water/ Wastewater
- + Many more!

Oil & Gas

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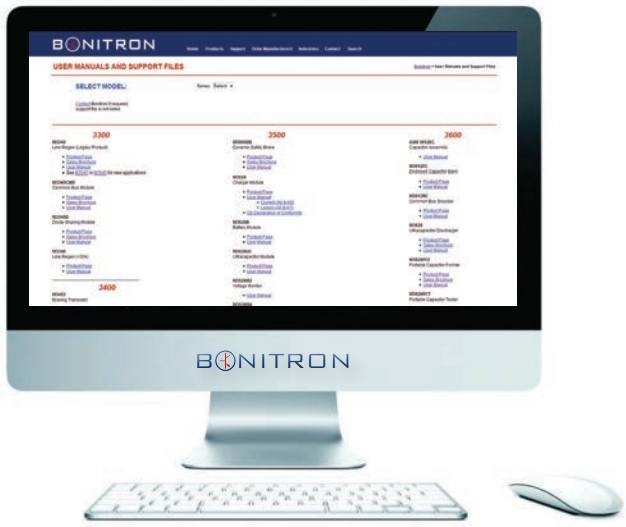

PRODUCT SUPPORT

Please provide the following when contacting Bonitron:

- Full Model Number
- Serial Number
- Drive Power
- Application

Motor Application Formulas

Calculating Horsepower

Once the machine torque requirement is determined, horsepower can be calculated using the formula:

$$HP = \frac{T \times N}{5{,}250}$$

where,

HP = Horsepower
T = Torque (ft-lb)
N = Base speed of motor (rpm)

If the calculated horsepower falls between standard available motor ratings, select the higher available horsepower rating. It is good practice to allow some margin when selecting the motor horsepower.

For many applications, it is possible to calculate the horsepower required without actually measuring the torque required. The following useful formulae will help:

Conveyors

$$HP \text{ (Vertical)} = \frac{\text{Weight (lb)} \times \text{Velocity (FPM)}}{33{,}000}$$

$$HP \text{ (Horizontal)} = \frac{\text{Weight (lb)} \times \text{Velocity (FPM)} \times \text{Coefficient of Friction}}{33{,}000}$$

Web Transport Systems and Surface Winders

$$HP = \frac{\text{Tension (lb)} \times \text{Velocity (FPM)}}{33{,}000}$$

Note: The tension value used in this calculation is the actual web tension for surface winder applications. For sectional drives, it is the tension differential: downstream tension – upstream tension.

Center Winders (Control to Base Speed Only)

$$HP = \frac{\text{Tension (lb)} \times \text{Line Speed (FPM)} \times \text{Buildup}}{33{,}000 \times \text{Taper}}$$

Center Winders (Field Control)

If Taper x Field Range $\geq$ Buildup, then,

$$HP = \frac{\text{Tension (lb)} \times \text{Line Speed (FPM)}}{33{,}000}$$

If Taper x Field Range $\leq$ Buildup, then,

$$HP = \frac{\text{Tension (lb)} \times \text{Line Speed (FPM)} \times \text{Buildup}}{33{,}000 \times \text{Taper} \times \text{Field Range}}$$

NOTE: The preceding formulas for calculating horsepower do not include any allowance for machine function windage or other factors. These factors must be considered when selecting a drive for a machine application.

Fans and Blowers

$$HP = \frac{\text{CFM} \times \text{Pressure (lb/ft}^2\text{)}}{33{,}000 \times \text{Efficiency of Fan}}$$

Effect of Speed on HP:

$HP = K_1 (RPM)^3$ — Horsepower varies as the 3rd power of power of speed.

$T = K_2 (RPM)^2$ — Torque varies as the 2nd power of speed

$Flow = K_3 (RPM)$ — Flow varies directly as the speed

$$HP = \frac{\text{CFM} \times \text{Pressure (lb/in}^2\text{)}}{229 \times \text{Efficiency of Fan}}$$

$$HP = \frac{\text{CFM} \times \text{Inches of Water Gauge}}{6356 \times \text{Efficiency of Fan}}$$

Pumps

$$HP = \frac{\text{GPM} \times \text{Head (ft)} \times \text{Specific Gravity}}{3960 \times \% \text{ Efficiency of Pump}}$$

Specific Gravity of Water = 1.0

1 ft^3 per sec. = 448 GPM

1 PSI = A head of 2.309 ft for water weighing 62.36 lb/ft^3 at 62°F

Constant Displacement Pumps

Effect of Speed on HP:

$HP = K (RPM)$ — Horsepower and capacity vary directly as the speed.

Displacement pumps under constant head require approximately constant torque at all speeds.

Centrifugal Pumps

Effect of Speed on HP:

$HP = K_1 (RPM)^3$ — Horsepower varies as the 3rd power of speed.

$T = K_2 (RPM)^2$ — Torque varies as the 2nd power of speed.

$Flow = K_3 (RPM)$ — Flow varies directly as the speed.

Efficiency:

500 to 1,000 gal/min	= 70% to 75%
1,000 to 1,500 gal/min	= 75% to 80%
Larger than 1,500 gal/min	= 80% to 85%

Displacement pumps may vary between 50% and 80% efficiency, depending on size of pumps.

Electrical Formulas

Ohms Law

$$\text{Amperes} = \frac{\text{Volts}}{\text{Ohms}} \quad \text{or} \quad \text{Ohms} = \frac{\text{Volts}}{\text{Amperes}}$$

or Volts = Amperes x Ohms

Power in DC Circuits

$$\text{Horsepower} = \frac{\text{Volts x Amperes}}{746}$$

Watts = Volts x Amperes

$$\text{Kilowatts} = \frac{\text{Volts x Amperes}}{1{,}000}$$

$$\text{Kilowatt-Hours} = \frac{\text{Volts x Amperes x Hours}}{1{,}000}$$

Power in AC Circuits

Kilovolt-Amperes (KVA):

$$\text{kVA (1Ø)} = \frac{\text{Volts x Amperes}}{1{,}000}$$

$$\text{kVA (3Ø)} = \frac{\text{Volts x Amperes x 1.73}}{1{,}000}$$

Kilowatts (Kw)

kVA (1Ø) =

$$\text{kVA (3Ø)} = \frac{\text{Volts x Amperes x Power Factor x 1.73}}{1{,}000}$$

$$\text{Power Factor} = \frac{\text{Kilowatts}}{\text{Kilovolts x Amperes}}$$

Kilovolt Amperes:

Single Phase

$$\text{KVA} = \frac{\text{E x I}}{1{,}000}$$

Two Phase - *(4 - wire)

$$\text{KVA} = \frac{\text{2 x E x I}}{1{,}000}$$

Three Phase

$$\text{KVA} = \frac{\text{1.73 x E x I}}{1{,}000}$$

Horsepower Output:

Single Phase

$$\text{HP} = \frac{\text{E x I x E}\mathit{ff}\text{ x PF}}{746}$$

Two Phase - *(4 - wire)

$$\text{HP} = \frac{\text{2 x E x I}}{746}$$

Three Phase

$$\text{HP} = \frac{\text{1.73 x E x I x E}\mathit{ff}\text{ x PF}}{746}$$

Contact Us

Bonitron has developed thousands of products since 1962. With an educated and experienced Engineering Team, Bonitron is able to work with customers on both standard and custom applications and projects.

If you don't see what you need, call us and we'll work together to create a solution to fit your needs!

FOUNDED 1962

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- Model Selection Tables
- Sales Brochures
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- Industry Applications
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