BMMS and EMMS Motor Starters

Product Bulletin

Code No. LIT-12013009
Issued June 2018

Introduction

The Johnson Controls® Building Management Motor Starter (BMMS) and Energy Management Motor Starter (EMMS) utilize SMARTSTART™ technology to start, stop, and protect AC induction motors used in HVAC applications.

When driven equipment does not benefit from variable speed operation, for example, a 1 / 2 hp exhaust fan, full voltage non-reversing (FVNR) motor starters like the BMMS and EMMS are routinely specified instead of a variable speed drive.

The BMMS and EMMS are enclosed starter products featuring UL Type 1, and UL Type 3R enclosures. All iterations are available with or without a disconnect switch.

The BMMS series handles motor loads up to 30 hp while the EMMS extends the power range to 300 hp.

Figure 1: BMMS with Disconnect Switch UL Type 1 Enclosure



Versions with a disconnect switch are referred to as combination starters. The disconnect switch provides localized short circuit protection. Combination starters are a popular choice when branch circuit protection is upstream from the driven equipment, or when the electrical code requires them.

Single Phase Solution

The BMMS-1P motor starter is for single phase motors up to 16 A and accepts 120 V or 200 to 230 V input. It can be controlled locally, or integrated into the building management system (BMS). The BMMS-1P features junction box mounting, lockout and tagout capability.

Figure 2: BMMS-1P Single Phase Starter



The front panel slides upward to reveal the class 10 overload dial and the hand, reset and auto switch (not shown). Power, run, and fault LEDs provide starter status locally, while the run and fault relays provide status to the BMS.

Figure 3: Front and Rear of the BMMS-1P



The BMMS-1P is UL508 listed and complies with NEC motor service disconnect guidelines. The enclosure is UL Type 1 rated.

Warranty

All BMMS and EMMS products are backed by a 5 year parts warranty.

Patented Motor Control Technology

SMARTSTART provides 3 different types of overload protection as shown in the following figure.

On start up, SMARTSTART measures the inrush current to establish a safe operating range. This protects the motor from an incorrect dial setting. For example, an incorrect setting would be 40 A on a 5 A motor.

The patented motor control technology also protects against current phase imbalance. When running, the starter trips if phase to phase current imbalance exceeds 25% for more than 3 seconds.

SMARTSTART also helps with diagnosing problem motors.

- Last 10 start conditions, including FLA setting, max inrush, run current, time to start, and safety start mode.
- Last 10 fault conditions, including FLA setting fault type, fault current, and run time.

Figure 4: SMARTSTART Overload Protection

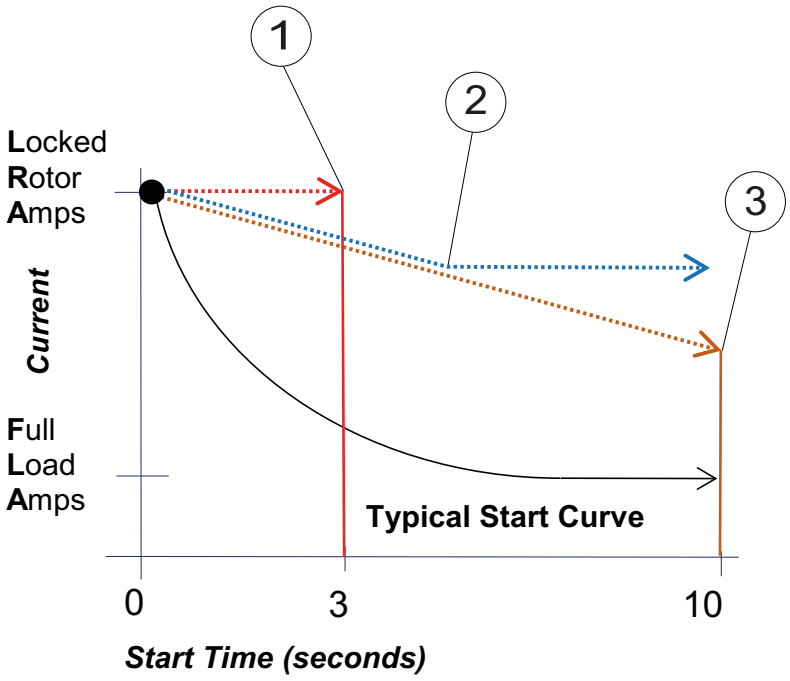


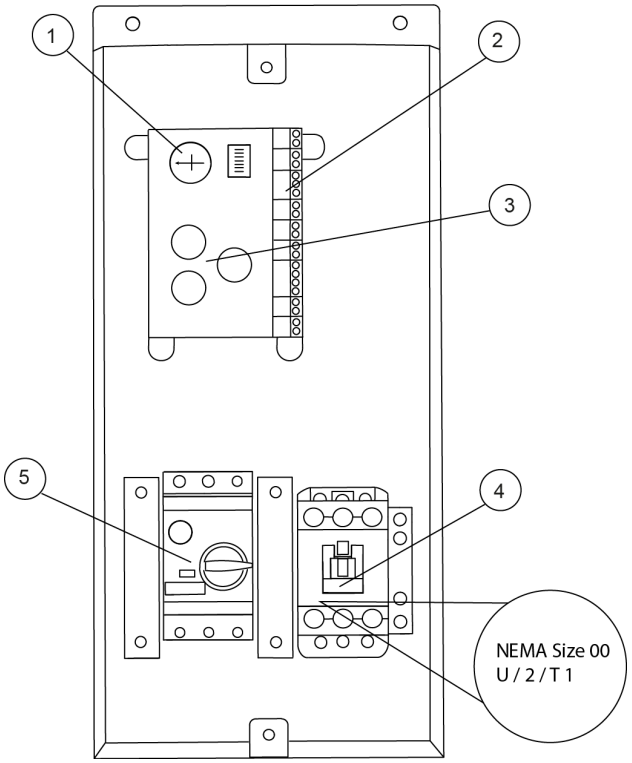
Table 1: Types of Overload Protection

Number	Type of Overload Protection	Description
1	Locked rotor trip	Protects the motor during start up
2	Stall trip	Protection while running
3	Maximum time	Motor never reaches FLA

Table 2: Features and Benefits

Number	Feature	Benefit
1	Wide current overload range: 0 – 40 A	Possible to use one starter on a wide range of formats
2	Built in input/output (I/O)	Eliminate interposing relays for damper end switch
3	Hand / Off / Auto (HOA) membrane style keypad	Always the expected interface with no pilot devices to fail
4	NEMA rating stamped onto contactors	Objection to IEC style controls removed
5	Universal voltage input: 200 – 600 VAC	Inventory reduction and no mis-application of product

Figure 5: Features and Benefits of BMMS-1P



BMMS vs EMMS Product Comparison

Both products are full voltage, non-reversing motor starters, utilizing NEMA rated IEC style components, and patented SMARTSTART overload technology. Both are available with and without a disconnect switch.

Table 3: BMMS and EMMS Product Comparison

	Building Management Motor Starter Building Management Motor Starter with Disconnect (BMMS and BMMSD)	**Energy Management Motor Starter Energy Management Motor Starter with Disconnect (EMMS and EMMSD)**
Voltage	200 – 600 VAC	200 – 600 VAC
Power Range	1 / 2 – 30 hp	1 / 2 – 300 hp
Current Overload Range	1 – 40 A	1 – 135 A
Enclosure Type	UL Type 1 and 3R	UL Type 1 and 3R
Overload Class	10 / 20	5 – 30
Control Power	24 VDC	24 VDC
User Interface	HOA with LED for fault and run	LCD display
Voltage and Dry Contact Digital Input (DI) Start	Voltage and dry contact auto run inputs	Voltage and dry contact auto run inputs
Proof of Flow Output	Based on current	True power
Fault Relay Output	Yes	Yes
Fireman's Override Input	Yes	Yes
Shut Down Input	Yes	Yes
Permissive Auto Input	Yes	Yes
Damper Control	Yes	Yes
BACnet MS/TP	–	Yes
Modbus Remote Terminal Unit (RTU)	–	Yes
Over and Under Voltage	–	Yes
Belt Loss Protection	–	Yes
Ground Fault Protection	–	Yes
Backspin/On Delay Timers	–	Yes
Energy Metering	–	Yes
120 V Damper Control	–	Optional

Product Selection - Building Management Motor Starter (BMMS)

Table 4: Standard Starter

JCI Order Code	NEMA Size	UL hp Ratings					List Price	
		1-Phase	3-Phase				UL Type 1	UL Type 3 R
		230V	208V	230V	460V	575V	x = 1	x = 3
BMMS-9-x	00	1	2		5	7.5	$1,147	$1.508
BMMS-18-x	0	3	5		10	15	$1,199	$1,570
BMMS-32-x	1	5	7.5	10	20	25	$1,253	$1,633
BMMS-40-x	2	7.5	10		30	30	$1,276	$1,661

Table 5: Building Management Motor Starter with Disconnect (Combination Starter)

JCI Order Code	NEMA Size	UL hp Ratings					List Price	
		1-Phase	3-Phase				UL Type 1	UL Type 3 R
		230V	208V	230V	460V	575V	x = 1	x = 3
BMMSD-1D6-x	00	1/10	n/a		3/4	3/4	$1,428	$1,932
BMMSD-2D5-x		1/6	1/2		1	1 1/2	$1,428	$1,932
BMMSD-4-x		1/3	3/4		2	3	$1,428	$1,932
BMMSD-6-x		1/2	1	1 1/2	3	3	$1,428	$1,932
BMMSD-8-x		1	2		5	5	$1,428	$1,932
BMMSD-10-x	0	1.5	2	3	5	7.5	$1,492	$1,966
BMMSD-13-x		2	3		7.5	10	$1,492	$1,966
BMMSD-17-x		3	3	5	10	15	$1,492	$1,966
BMMSD-22-x	1	3	5	7.5	15	20	$1,512	$2,167
BMMSD-26-x		3	7.5		15	20	$1,512	$2,167
BMMSD-32-x		5	7.5	10	20	25	$1,512	$2,167
BMMSD-40-x	1+	7.5	10		30	30	$1,512	$2,310

Refer to LIT-1901076 for Ampacity and Short Circuit Current Ratings.

Table 6: Dedicated Single Phase Starter

JCI Order Code	Single Phase	UL Type 1 List Price
	120 / 230 V	
BMMS-1P	1 hp 16 A MAX	$392
BMMS-1P-AR	+ auto fault reset	$425

Table 7: Dimensions and Weight

	Height	Width	Depth	lb
UL Type 1	15.7 in.	7.4 in.	6.6 in.	<13
UL Type 3R	14.1 in.	7.6 in.	8.1 in.	<15
BMMS-1P	5 in.	3 in.	2.2 in.	1

Sizing Tips

Standard Starters

The SMARTSTART overload range is 1 to 40 A for all order codes on this page. If the motor size is unknown, it is permissible for a standard starter to be oversized. For example, part number BMMS-40-1 is still able to protect a 2 hp motor.

Combination Starters

The disconnect device in a combination starter provides a higher level of short circuit protection (up to 100k AIC, see LIT-1901076 for ratings). If local code requires a disconnect device, oversizing a combination starter may not meet the code.

Figure 6: BMMSD UL Type 1 With Cover Removed



Product Selection - Energy Management Motor Starter (EMMS)

Table 8: Standard Starter

JCI Order Code	NEMA Size	UL hp Ratings				List Price	
		3-Phase				UL Type 1	UL Type 3 R
		208V	230V	460V	575V	x = 1	x = 3
EMMS-9-x	00	2	3	5	7.5	$1,912	$2,682
EMMS-18-x	0	5	7.5	10	15	$1,964	$2,739
EMMS-32-x	1	7.5	10	20	25	$2,014	$2,800
EMMS-50-x	2	20	25	40	50	$2,123	$2,921
EMMS-85-x	3	30	40	60	75	$3,332	$3,384
EMMS-150-x	4	40	50	100	100	$4,597	$5,127
EMMS-300-x	5	100	125	250	250	$10,808	$10,999

Table 9: Factory Installed Option

JCI Order Code	List price
EMMS-120V	TBD

Table 10: Starter with Disconnect (Combination Starter)

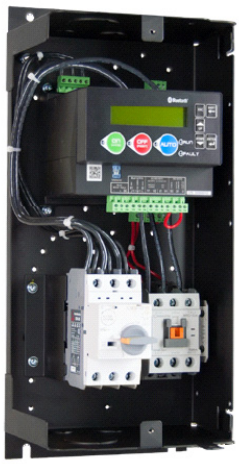
JCI Order Code	NEMA Size	UL hp Ratings				List Price	
		3-Phase				UL Type 1	UL Type 3 R
		208V	230V	460V	575V	x = 1	x = 3
EMMSD-1D6-x	00	n/a		3/4	3/4	$2,304	$3,763
EMMSD-2D5-x		1/2		1	1.5	$2,304	$3,763
EMMSD-4-x		3/4		2	3	$2,304	$3,763
EMMSD-6-x		1	1.5	3	3	$2,304	$3,763
EMMSD-8-x		2		5	5	$2,304	$3,763
EMMSD-10-x	0	2	3	5	7.5	$2,360	$3,777
EMMSD-13-x		3		7.5	10	$2,360	$3,777
EMMSD-17-x		3	5	10	15	$2,360	$3,777
EMMSD-22-x	1	5	7.5	15	20	$2,413	$3,798
EMMSD-26-x		7.5		15	20	$2,413	$3,798
EMMSD-32-x		7.5	10	20	30	$2,413	$3,798
EMMSD-40-x	2	10		30	30	$4,316	$6,794
EMMSD-50-x		15		30	40	$4,316	$6,794
EMMSD-63-x	3	20		40	60	$4,971	$7,824
EMMSD-75-x		20	25	50	60	$4,971	$7,824
EMMSD-150-x	4	40		75	100	$7,322	$8,259
EMMSD-300-x	5	50	60	125	150	$18,280	$21,782

Refer to LIT-1901078 for Ampacity and Short Circuit Current Ratings.

Table 11: Dimensions and Weight

	Height	Width	Depth	lb
UL Type 1	15.7 in.	7.4 in.	6.6 in.	<15
UL Type 3R	14.1 in.	7.6 in.	8.1 in.	<18

Figure 7: EMMSD UL Type 1 With Cover Removed



Technical Specifications

BMMS Series Motor Starter (Part 1 of 2)

200 – 600 VAC, 3-Phase, 50 / 60 Hz input, Across the line, Full-voltage non-reversing			
NEMA Type 1 or 3R enclosed			
User Interface			
Hand / Off / Auto keypad with LED mode indication			
Standard Control Operations			
Inputs	**Voltage Auto-Run**	Accepts 12 – 250 VAC / DC. Applying voltage sends a run command to the starter when in Auto mode.	
	Dry Contact Auto-Run	Normally open dry contact. When closed, the starter commands to run when in Auto mode.	
	Fireman's Override	Accepts 12 / 250 VAC / DC. Applying voltage causes the starter to run in all modes and all LEDs flash.	
	Shutdown	Normally closed dry contact. When closed, the starter does not accept run commands in Auto mode (except Fireman's Override). Hand / Off / Auto LEDs flash.	
	Permissive Auto	Normally closed dry contact. When closed, the starter does not accept run commands in Auto mode (except Fireman's Override).	
	Damper Limit Switch	Normally open dry contact. When used with the damper motor output, the contactor coil is in series with customer provider damper contacts which disable the motor starter until the damper is in position.	
Outputs	**Status Relay**	Normally open relay contacts, Status relay closes when the motor draws 60% of the FLA dial setting.	<u>Contact ratings:</u> 110 VDC, 0.3 A Resistive 125 VDC, 0.5 A GP 30 VDC, 2.0 A Resistive 120 VAC 50 / 60 Hz, 0.5 A Resistive 125 VAC 50 / 60 Hz, 1.0 A GP 240 VAC 50 / 60 Hz, 0.25A Resistive
	Fault Relay	Fault relay closes in the event of a fault trip.	
	Damper/Actuator	24 VDC, 1 A max.	
Operational	**Overload Type**	Electronic I^2t trip curve	
	Fault Reset	Manual (default) or automatic	
	Power Fail Modes	Return to last mode the starter was placed in (Hand / Off / Auto) with no delay (default)	
		Return to last mode the starter was placed in (Hand / Off / Auto) with a 10 second delay	
		Return to Off mode (The LED of the last mode the starter was placed in flashes.)	
Environmental			
Ambient Operating Temp		-5° to 140° F (-20° to 60°C)	
Ambient Storage Temp		-5° to 185° F (-20° to 60° C)	
Relative Humidity		5% to 95% non-condensing	
Motor Protection		**Adjustment/Description**	**Default Setting**
Overload Current Setting Range		1 – 40A	Per FLA
Overload Trip Class		Adjustable: Class 10 or 20, Trip current = 115% of FLA setting	Class 10
Cycle Fault		Trip if cycle rate exceeds 20 starts/minute	Always On
Stall		Trips within 0.5 seconds (disabled during startup)	Always On
Protection		**Adjustment / Description**	**Default Setting**

BMMS Series Motor Starter (Part 2 of 2)

Current Phase Unbalance	On/Off	Trips within 3 sec at 25% current unbalance. *Trip threshold changes to 80% unbalance when switched to Off	On
Locked Rotor		Trips within 0.5 seconds	
Out of Calibration		Trips after 10 seconds if the FLA dial setting is incorrect (set above calculated FLA range). For example, start current is outside of an acceptable range (FLA setting * 5 < inrush < FLA setting * 14).	
Max Time to Start		Regardless of FLA or I^2t curve, always trip at start if starting current is outside of an acceptable range (inrush / 5) and still decreasing after 10 seconds.	
Compliance	**United States**	UL Listed, File E242640, Under UL508	
	Canada	UL Listed, File E242640, Under UL508	

Technical Specifications

EMMS Energy Management Motor Starter (Part 1 of 2)

200 – 600VAC, 3-Phase, 50 / 60Hz input, Across the line, Full-voltage non-reversing			
NEMA Type 1 or 3R enclosed			
User Interface			
Hand-Off-Auto	Door mounted Hand / Off / Auto keypad (NEMA 4X)		
Programming	Door mounted display with programming keys (LCD, back-lit, 16 character), or FE Connect smartphone application		
Mode Indication	Integrated LEDs, Hand, Off, Auto, Run and Fault indication		
Communications	BACnet MS/TP, Modbus RTU, Bluetooth (FE Connect mobile application)		
Standard Control Operations			
Inputs	**Voltage Auto-Run**	Accepts 12 – 250 VAC / DC. Applying voltage sends a run command to the starter when in Auto mode.	
	Dry Contact Auto-Run	Normally open dry contact. When closed, the starter commands to run when in Auto mode.	
	Fireman's Override	Accepts 12 - 250 VAC / DC. Applying voltage commands the motor to run in all modes and supersedes a Shutdwon command. Hand, Off, Auto, Run or Fault LEDs flash.	
	Shutdown	Normally closed dry contact. When open the contactor opens and the starter disengages the contactor and does not accept a run command with the exception of Fireman's Override. Hand, Off, or Auto LEDs flash.	
	Permissive Auto	Normally open dry contact. When closed, the starter does not accept a run command when in Auto mode.	
	Actuator Position Switch	Normally open dry contact. To be used in series with customer provided actuator contacts which disable the motor starter until the actuator is in position. (For example, the contactor does not close unless this contact is closed.)	
Outputs	**Status Relay**	Normally open relay contacts. Status relay closes when the motor draws a user defined percentage of the FLA setting.	Contact Ratings: 0.3 at 125 VAC, 1 A at 24 VAC
	Fault Relay	Fault relay closes in the event of a fault trip.	
	Actuator Power	24 VDC, 1 A max.	
Operational	**Overload Type**	Electronic, I^2t trip curve	
	Power Fail Modes	Restart in last mode (Hand/Off/Auto) with no delay (default)	
		Restart in Off mode	
		Restart in Off mode if power failure lasts longer than 2 seconds. Restart in last mode if power failure is less than 2 seconds.	
	On/Off Time Delay	On / Off, Adjustable: 0.1-99 seconds	
	Fault Reset	Adjustable: Manual or Automatic	
Environmental			
Ambient Operating Temp	-5° to 140° F (-20° to 60° C)		
Ambient Storage Temp	-5° to 185° F (-20° to 85° C)		
Relative Humidity	5% to 95% non-condensing		
Motor Protection	**Adjustment / Description**		**Default Setting**
Overload Current Setting Range	Differs per model		Per FLA

EMMS Energy Management Motor Starter (Part 2 of 2)

Overload Trip Class	Adjustable: 5 – 30		10
Overload Service Factor	Adjustable: 1.00 – 2.00		1.15
Under Power	On / Off, Adjustable: 1-100% of measured kW		Off / 60%
Over Power	On / Off, Adjustable: 101-200% of measured kW		Off / 120%
Over / Under Voltage	On / Off, Adjustable: ± 1-25% over or under the nominal voltage setting		On / 5%
Voltage Phase Unbalance	On / Off, Adjustable: 1-50% voltage phase deviation		On / 3%
Voltage Phase Loss	Always On, Adjustable: 1-50% voltage phase deviation		5%
Voltage Phase Sequence Reversal	On / Off, Trips within 0.1 seconds upon voltage phase reversal detection		On
Ground Fault (Optional)	On / Off, Adjustable: 1.0 – 9.9A		Off / 1 A
Cycle Fault	On / Off, Trips if run command is triggered at a rate exceeding the start limit divided by the limit period.		On, 3 starts, 10 sec
Warm Start Provision	On / Off, Delays motor restart after a fault trip, based on calculated motor temperature		On
Protection	**Adjustment / Description**		**Default Setting**
Current Phase Unbalance	On / Off, Adjustable: 1-50% current phase unbalance		On, 3%
Locked Rotor/Stall	On / Off, Trips within 0.5 seconds		On
Out of Calibration	On / Off, Trips after 10 seconds if the FLA setting is set above the calculated FLA range which is determined by the measured motor inrush current.		On
Max Time to Start	On / Off, Regardless of FLA or I^2t curve, always trip at start if starting current is outside of an acceptable range (inrush / 5) and still decreasing after 10 seconds.		On
Compliance	**United States**	UL Listed, File E242640, Under UL508	
	Canada	UL Listed, File E242640, Under UL508	

Technical Specifications

BMMS-1P - Building Management Motor Starter, 1-Phase

120 – 230 VAC, 1-Phase, 50 / 60Hz input, Across the line, Full-voltage non-reversing (1hp)			
NEMA Type 1			
User Interface			
On / Off Switch, Concealed Hand-Off-Auto Switch			
Standard Control Operations			
Inputs	**Voltage Auto-Run**	Accepts 12 – 250 VAC / DC. Applying voltage sends a run command to the starter when in Auto mode.	
	Dry Contact Auto-Run	Normally open dry contact. When closed, the starter commands to run when in Auto mode.	
Outputs	**Status Relay**	Normally open relay contacts. Status relay closes when the motor draws 60% of the FLA dial setting.	Contact ratings: 0.3 at 125 VAC, 1 A at 24 VAC
	Fault Relay	Fault relay closes in the event of a fault trip.	
Operational	**Overload Type**	Electronic, I^2t trip curve	
	Fault Reset	Manual or Automatic	
	Power Fail Mode	Return to last mode the starter was placed in (Hand/Off/Auto) with no delay (default).	
Environmental			
Ambient Operating Temp	-5° to 104° F (-20° to 40° C)		
Ambient Storage Temp	-5° to 185° F (-20° to 85° C)		
Relative Humidity	5% to 95% non-condensing		
Motor Protection	**Adjustment / Description**		**Default Setting**
Overload Current Setting Range	1 – 16 A		Per FLA
Overload Trip Class	Class 10, Trip current = 115% of FLA setting		Class 10
Locked Rotor/Stall	Trips within 2 seconds at 300% FLA setting		Always On
Compliance	**United States**	UL Listed, File E500445	
	Canada	cUL Listed, File E500445	

Building Technologies & Solutions
507 E. Michigan Street, Milwaukee, WI 53202

Metasys® and Johnson Controls® are registered trademarks of Johnson Controls.
All other marks herein are the marks of their respective owners. © 2018 Johnson Controls.