

1 Supplemental Information - Applicable Documents

The contents of this supplement apply to the product instructions in [Table 1.1](#).

Table 1.1 Affected Documents

Drive Series	Document
GA500	Finless-Type Installation & Primary Operation (TOEPC7106170Y)
	Technical Reference (SIEPC71061752)

2 Short Circuit Protection for UL Compliance

Install one of the types of short circuit protection devices in order to comply with UL61800-5-1. Yaskawa recommends connecting semiconductor protective type fuses, but alternative short circuit protection devices are also shown. Alternate short circuit protection devices are based on UL61800-5-1.

⚠ WARNING *Electrical Shock Hazard. After the input protective device trips, do not immediately energize the drive or operate peripheral devices. Wait for the time specified on the warning label at a minimum and make sure that all indicators are OFF. Then check the wiring and peripheral device ratings to find the cause of the problem. If you do not know the cause of the problem, contact Yaskawa before you energize the drive or peripheral devices. If you do not fix the problem before you operate the drive or peripheral devices, it can cause serious injury or death.*

Where a minimum enclosure volume is specified, you must mount the drive in a suitable protected enclosure with a minimum specified enclosure volume, as shown in the selection tables.

◆ Short Circuit Current Rating (SCCR)

GA500 Finless-Type is suitable for use on a circuit capable of delivering not more than 100 kA RMS symmetrical amperes, 240 V or 480 V maximum, when protected by devices specified in the selection tables.

- 200 V Class models: Use the protection specified in this document to prepare the drive for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amps and not more than 240 Vac.
- 400 V Class models: Use the protection specified in this document to prepare the drive for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amps and not more than 480 Vac.

◆ Electric Code Compliance

The user must provide short circuit protection to protect input branch circuits as specified by the National Electric Code (NEC), the Canadian Electric Code, Part 1 (CEC), and local codes.

◆ Required Short Circuit Protection for Single-Phase 200 V Class Finless-Type Models

■ Semiconductor Fuse Ratings

Yaskawa recommends connecting semiconductor protective type fuses. Alternative short circuit protection devices are also shown.

Table 2.1 Required Short Circuit Protection for Single-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Semiconductor Fuse for 31 kA or 100 kA SCCR Fuses must be installed in the same enclosure as the VFD			
	Bussmann Fuse Catalog No.	Maximum SCCR	VFD installed in a protected enclosure of minimum volume	
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)
B001	FWH-25A14F	31 kA	100 kA	600
B002	FWH-25A14F	31 kA	100 kA	600
B004	FWH-60B	31 kA	100 kA	600
B006	FWH-80BC	31 kA	100 kA	600
B010	FWH-100BC	31 kA	100 kA	960
B012	FWH-125B	31 kA	100 kA	960

■ Non-Semiconductor Fuse Ratings

- Maximum CC, J, T, RK1 or RK5 fuse rating is 175% of the Normal Duty VFD full load output amp (FLA) rating.
- Class T fuses are fast acting (non-time delay) only.

Table 2.2 Required Short Circuit Protection for Single-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Class CC, J or T Time Delay Fuse for 31 kA or 100 kA SCCR				Class RK1 or RK5 Time Delay Fuse for 31 kA SCCR		
	Maximum Rating (A)	Maximum SCCR	VFD installed in a protected enclosure of minimum volume		VFD installed in a ventilated protected enclosure of minimum volume		
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	Maximum Rating (A)	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
B001	3.5	31 kA	100 kA	600	3.5	31 kA	600
B002	6	31 kA	100 kA	600	6	31 kA	600
B004	12	31 kA	100 kA	600	12	31 kA	600
B006	20	31 kA	100 kA	600	20	31 kA	600
B010	35	31 kA	100 kA	960	35	31 kA	960
B012	40	31 kA	100 kA	960	40	31 kA	960

■ **Molded Case Circuit Breaker (MCCB) Ratings**

- Any UL listed MCCB is approved. Current limiting type MCCBs are an alternate and generally recommended over the non-current limiting type.
- The maximum MCCB rating is 200% of the Normal Duty VFD full load output amp (FLA) rating.
- For the MCCB (current limiting type) an equivalent listed current limiting type MCCB is able to be used where the peak let-through current and I²t of the equivalent MCCB is not greater than the specified MCCB.

Table 2.3 Required Short Circuit Protection for Single-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	MCCB for 31 kA SCCR			
	VFD installed in a ventilated protected enclosure of minimum volume			
	MCCB Maximum Rating (A)	MCCB (Current Limiting Type) Schneider Electric Catalog No.	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
B001	15	HLL36015	31 kA	600
B002	15	HLL36015	31 kA	600
B004	15	HLL36015	31 kA	600
B006	25	HLL36025	31 kA	600
B010	40	HLL36040	31 kA	960
B012	45	HLL36045	31 kA	960

■ **Type E Manual Self Protected Combination Motor Controller (CMC) Ratings**

- CMCs are UL Listed for 208 V or 240 V Wye or Delta and 480Y/277V. CMCs are not UL Listed for 480 V Delta, corner ground or high impedance networks.
- A Schneider Electric GV2GH7 insulating barrier is required for GV2P devices. A GV3G66 insulating barrier and GVAM11 auxiliary contact/indicator are required for GV3P devices.

Table 2.4 Required Short Circuit Protection for Single-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Rockwell Automation				Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Schneider Electric				
	VFD installed in a protected enclosure of minimum volume				VFD installed in a protected enclosure of minimum volume				
	CMC Rating (A)	Rockwell Automation Catalog No.	Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	CMC Rating (A)	Schneider Electric Catalog No.	Maximum SCCR	Required Accessories to maintain UL compliance	Protected Enclosure Minimum Volume (in ³)
B001	2.5	140-MT-D9E-B25	65 kA	600	2.5	GV2P07	65 kA	GV2GH7	600
B002	4	140-MT-D9E-B40	65 kA	600	4	GV2P08	65 kA	GV2GH7	600
B004	10	140-MT-D9E-C10	65 kA	600	10	GV2P14	65 kA	GV2GH7	600
B006	16	140-MT-D9E-C16	65 kA	600	18	GV3P18	65 kA	GV3G66 + GVAM11	600
B010	25	140-MT-F9E-C25	65 kA	960	25	GV3P25	65 kA	GV3G66 + GVAM11	960
B012	25	140-MT-F9E-C25	65 kA	960	32	GV3P32	65 kA	GV3G66 + GVAM11	960

◆ Required Short Circuit Protection for 3-Phase 200 V Class Finless-Type Models

■ Semiconductor Fuse Ratings

Yaskawa recommends connecting semiconductor protective type fuses. Alternative short circuit protection devices are also shown.

Table 2.5 Required Short Circuit Protection for 3-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Semiconductor Fuse for 31 kA or 100 kA SCCR Fuses must be installed in the same enclosure as the VFD			
	Bussmann Fuse Catalog No.	Maximum SCCR	VFD installed in a protected enclosure of minimum volume	
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)
2001	FWH-25A14F	31 kA	100 kA	600
2002	FWH-25A14F	31 kA	100 kA	600
2004	FWH-25A14F	31 kA	100 kA	600
2006	FWH-25A14F	31 kA	100 kA	600
2010	FWH-70BC	31 kA	100 kA	600
2012	FWH-70BC	31 kA	100 kA	600
2021	FWH-90BC	31 kA	100 kA	960
2030	FWH-100BC	31 kA	100 kA	960
2042	FWH-150B	31 kA	100 kA	960
2056	FWH-200B	31 kA	100 kA	2240
2070	FWH-200B	31 kA	100 kA	2240

■ **Non-Semiconductor Fuse Ratings**

- Maximum CC, J, T, RK1 or RK5 fuse rating is 175% of the Normal Duty VFD full load output amp (FLA) rating.
- Class T fuses are fast acting (non-time delay) only.

Table 2.6 Required Short Circuit Protection for 3-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Class CC, J or T Time Delay Fuse for 31 kA or 100 kA SCCR				Class RK1 or RK5 Time Delay Fuse for 31 kA SCCR		
	Maximum Rating (A)	Maximum SCCR	VFD installed in a protected enclosure of minimum volume		VFD installed in a ventilated protected enclosure of minimum volume		
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	Maximum Rating (A)	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
2001	2	31 kA	100 kA	600	2	31 kA	600
2002	3.2	31 kA	100 kA	600	3.2	31 kA	600
2004	6	31 kA	100 kA	600	6	31 kA	600
2006	10	31 kA	100 kA	600	10	31 kA	600
2010	15	31 kA	100 kA	600	15	31 kA	600
2012	20	31 kA	100 kA	600	20	31 kA	600
2021	35	31 kA	100 kA	960	35	31 kA	960
2030	50	31 kA	100 kA	960	50	31 kA	960
2042	70	31 kA	100 kA	960	70	31 kA	960
2056	90	31 kA	100 kA	2240	90	31 kA	2560
2070	110	31 kA	100 kA	2240	110	31 kA	2560

■ Molded Case Circuit Breaker (MCCB) Ratings

- Any UL listed MCCB is approved. Current limiting type MCCBs are an alternate and generally recommended over the non-current limiting type.
- The maximum MCCB rating is 200% of the Normal Duty VFD full load output amp (FLA) rating.
- For the MCCB (current limiting type) an equivalent listed current limiting type MCCB is able to be used where the peak let-through current and I^2t of the equivalent MCCB is not greater than the specified MCCB.

Table 2.7 Required Short Circuit Protection for 3-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	MCCB for 31 kA SCCR			
	VFD installed in a ventilated protected enclosure of minimum volume			
	MCCB Maximum Rating (A)	MCCB (Current Limiting Type) Schneider Electric Catalog No.	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
2001	15	HLL36015	31 kA	600
2002	15	HLL36015	31 kA	600
2004	15	HLL36015	31 kA	600
2006	15	HLL36015	31 kA	600
2010	15	HLL36015	31 kA	600
2012	20	HLL36020	31 kA	600
2021	40	HLL36040	31 kA	960
2030	60	HLL36060	31 kA	960
2042	80	HLL36080	31 kA	960
2056	110	HLL36110	31 kA	2560
2070	125	HLL36125	31 kA	2560

■ **Type E Manual Self Protected Combination Motor Controller (CMC) Ratings**

- CMCs are UL Listed for 208 V or 240 V Wye or Delta and 480Y/277V. CMCs are not UL Listed for 480 V Delta, corner ground or high impedance networks.
- A Schneider Electric GV2GH7 insulating barrier is required for GV2P devices. A GV3G66 insulating barrier and GVAM11 auxiliary contact/indicator are required for GV3P devices.

Table 2.8 Required Short Circuit Protection for 3-Phase 200 V Class Finless-Type Models

VFD Catalog Code GA50U	Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Rockwell Automation				Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Schneider Electric				
	VFD installed in a protected enclosure of minimum volume				VFD installed in a protected enclosure of minimum volume				
	CMC Rating (A)	Rockwell Automation Catalog No.	Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	CMC Rating (A)	Schneider Electric Catalog No.	Maximum SCCR	Required Accessories to maintain UL compliance	Protected Enclosure Minimum Volume (in ³)
2001	1.6	140-MT-D9E-B16	65 kA	600	2.5	GV2P07	65 kA	GV2GH7	600
2002	2.5	140-MT-D9E-B25	65 kA	600	2.5	GV2P07	65 kA	GV2GH7	600
2004	4	140-MT-D9E-B40	65 kA	600	4	GV2P08	65 kA	GV2GH7	600
2006	10	140-MT-D9E-C10	65 kA	600	10	GV2P14	65 kA	GV2GH7	600
2010	16	140-MT-D9E-C16	65 kA	600	13	GV3P13	65 kA	GV3G66 + GVAM11	600
2012	16	140-MT-D9E-C16	65 kA	600	18	GV3P18	65 kA	GV3G66 + GVAM11	600
2021	25	140-MT-D9E-C25	65 kA	960	25	GV3P25	65 kA	GV3G66 + GVAM11	960
2030	45	140-MT-D9E-C45	65 kA	960	40	GV3P40	65 kA	GV3G66 + GVAM11	960
2042	-	-	-	-	65	GV3P65	65 kA	GV3G66 + GVAM11	960
2056	-	-	-	-	-	-	-	-	-
2070	-	-	-	-	-	-	-	-	-

◆ Required Short Circuit Protection for 3-Phase 400 V Class Finless-Type Models

■ Semiconductor Fuse Ratings

Yaskawa recommends connecting semiconductor protective type fuses. Alternative short circuit protection devices are also shown.

Table 2.9 Required Short Circuit Protection for 3-Phase 400 V Class Finless-Type Models

VFD Catalog Code GA50U	Semiconductor Fuse for 31 kA or 100 kA SCCR Fuses must be installed in the same enclosure as the VFD			
	Bussmann Fuse Catalog No.	Maximum SCCR	VFD installed in a protected enclosure of minimum volume	
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)
4001	FWH-40B	31 kA	100 kA	960
4002	FWH-40B	31 kA	100 kA	960
4004	FWH-50B	31 kA	100 kA	960
4005	FWH-70BC	31 kA	100 kA	960
4007	FWH-70BC	31 kA	100 kA	960
4009	FWH-90BC	31 kA	100 kA	960
4012	FWH-90BC	31 kA	100 kA	960
4018	FWH-80BC	31 kA	100 kA	960
4023	FWH-100BC	31 kA	100 kA	960
4031	FWH-125B	31 kA	100 kA	2240
4038	FWH-175B	31 kA	100 kA	2240

■ **Non-Semiconductor Fuse Ratings**

- Maximum CC, J, T, RK1 or RK5 fuse rating is 175% of the Normal Duty VFD full load output amp (FLA) rating.
- Class T fuses are fast acting (non-time delay) only.

Table 2.10 Required Short Circuit Protection for 3-Phase 400 V Class Finless-Type Models

VFD Catalog Code GA50U	Class CC, J or T Time Delay Fuse for 31 kA or 100 kA SCCR				Class RK1 or RK5 Time Delay Fuse for 31 kA SCCR		
	Maximum Rating (A)	Maximum SCCR	VFD installed in a protected enclosure of minimum volume		VFD installed in a ventilated protected enclosure of minimum volume		
			Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	Maximum Rating (A)	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
4001	2	31 kA	100 kA	960	2	31 kA	960
4002	3.5	31 kA	100 kA	960	3.5	31 kA	960
4004	7	31 kA	100 kA	960	7	31 kA	960
4005	9	31 kA	100 kA	960	9	31 kA	960
4007	12	31 kA	100 kA	960	12	31 kA	960
4009	15	31 kA	100 kA	960	15	31 kA	960
4012	20	31 kA	100 kA	960	20	31 kA	960
4018	30	31 kA	100 kA	960	30	31 kA	960
4023	40	31 kA	100 kA	960	40	31 kA	960
4031	50	31 kA	100 kA	2240	50	31 kA	2560
4038	60	31 kA	100 kA	2240	60	31 kA	2560

■ Molded Case Circuit Breaker (MCCB) Ratings

- Any UL listed MCCB is approved. Current limiting type MCCBs are an alternate and generally recommended over the non-current limiting type.
- The maximum MCCB rating is 200% of the Normal Duty VFD full load output amp (FLA) rating.
- For the MCCB (current limiting type) an equivalent listed current limiting type MCCB is able to be used where the peak let-through current and I^2t of the equivalent MCCB is not greater than the specified MCCB.

Table 2.11 Required Short Circuit Protection for 3-Phase 400 V Class Finless-Type Models

VFD Catalog Code GA50U	MCCB for 31 kA SCCR			
	VFD installed in a ventilated protected enclosure of minimum volume			
	MCCB Maximum Rating (A)	MCCB (Current Limiting Type) Schneider Electric Catalog No.	Maximum SCCR	Ventilated Protected Enclosure Minimum Volume (in ³)
4001	15	HLL36015	31 kA	960
4002	15	HLL36015	31 kA	960
4004	15	HLL36015	31 kA	960
4005	15	HLL36015	31 kA	960
4007	15	HLL36015	31 kA	960
4009	15	HLL36015	31 kA	960
4012	20	HLL36020	31 kA	960
4018	35	HLL36035	31 kA	960 [*] / ₁
4023	40	HLL36040	31 kA	960 [*] / ₁
4031	60	HLL36060	31 kA	2560
4038	75	HLL36075	31 kA	2560

*1 Finless models 4018 and 4023 require an enclosure volume of 2560 in³ when utilizing a non-current limiting type MCCB.

■ **Type E Manual Self Protected Combination Motor Controller (CMC) Ratings**

- CMCs are UL Listed for 208 V or 240 V Wye or Delta and 480Y/277V. CMCs are not UL Listed for 480 V Delta, corner ground or high impedance networks.
- A Schneider Electric GV2GH7 insulating barrier is required for GV2P devices. A GV3G66 insulating barrier and GVAM11 auxiliary contact/indicator are required for GV3P devices.

Table 2.12 Required Short Circuit Protection for 3-Phase 400 V Class Finless-Type Models

VFD Catalog Code GA50U	Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Rockwell Automation				Type E Manual Self Protected Combination Motor Controller (CMC) Manufacturer: Schneider Electric				
	VFD installed in a protected enclosure of minimum volume				VFD installed in a protected enclosure of minimum volume				
	CMC Rating (A)	Rockwell Automation Catalog No.	Maximum SCCR	Protected Enclosure Minimum Volume (in ³)	CMC Rating (A)	Schneider Electric Catalog No.	Maximum SCCR	Required Accessories to maintain UL compliance	Protected Enclosure Minimum Volume (in ³)
4001	1.6	140-MT-D9E-B16	65 kA	960	1.6	GV2P06	65 kA	GV2GH7	960
4002	2.5	140-MT-D9E-B25	65 kA	960	2.5	GV2P07	65 kA	GV2GH7	960
4004	6.3	140-MT-D9E-B63	65 kA	960	6.3	GV2P10	65 kA	GV2GH7	960
4005	6.3	140-MT-D9E-B63	65 kA	960	6.3	GV2P10	65 kA	GV2GH7	960
4007	10	140-MT-D9E-C10	65 kA	960	10	GV2P14	65 kA	GV2GH7	960
4009	10	140-MT-D9E-C10	65 kA	960	10	GV2P14	65 kA	GV2GH7	960
4012	16	140-MT-D9E-C16	65 kA	960	18	GV3P18	65 kA	GV3G66 + GVAM11	960
4018	20	140-MT-D9E-C20	65 kA	960	25	GV3P25	65 kA	GV3G66 + GVAM11	960
4023	25	140-MT-F9E-C25	65 kA	960	25	GV3P25	65 kA	GV3G66 + GVAM11	960
4031	45	140-MT-F9E-C45	65 kA	2240	40	GV3P40	65 kA	GV3G66 + GVAM11	2240
4038	45	140-MT-F9E-C45	65 kA	2240	50	GV3P50	65 kA	GV3G66 + GVAM11	2240

Revision History

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YASKAWA

GA500 SHORT CIRCUIT PROTECTION MANUAL SUPPLEMENT

YASKAWA AMERICA, INC.

2121, Norman Drive South, Waukegan, IL
60085, U.S.A.
Phone: +1-800-YASKAWA (927-5292) or +1-
847-887-7000 Fax: +1-847-887-7310
www.yaskawa.com

DRIVE CENTER (INVERTER PLANT)

2-13-1, Nishimiyaichi, Yukuhashi, Fukuoka,
824-8511, Japan
Phone: +81-930-25-2548 Fax: +81-930-25-
3431
www.yaskawa.co.jp

YASKAWA EUROPE GmbH

Philipp-Reis-Str. 6, 65795 Hattersheim am
Main, Germany
Phone: +49-6196-569-300 Fax: +49-6196-
569-398
E-mail: info@yaskawa.eu.com
www.yaskawa.eu.com

YASKAWA ELÉTRICO DO BRASIL LTDA.

777, Avenida Piraporinha, Diadema, São
Paulo, 09950-000, Brasil
Phone: +55-11-3585-1100 Fax: +55-11-3585-
1187
www.yaskawa.com.br

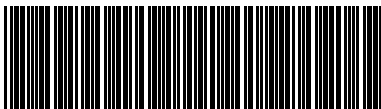
In the event that the end user of this product is to be the military and said product is to be employed in any weapons systems or the manufacture thereof, the export will fall under the relevant regulations as stipulated in the Foreign Exchange and Foreign Trade Regulations. Therefore, be sure to follow all procedures and submit all relevant documentation according to any and all rules, regulations and laws that may apply.

Specifications are subject to change without notice for ongoing product modifications and improvements.

Original Instructions

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