

# MSD Servo Drive

UL-Certification

ML file No. 336734



MSD Servo Drive product range with accessories

UL-Certification

Id No : CC36842-001, Rev. 1.3

Date: 09/2022

We reserve the right to make technical changes.

The content of our documentation was compiled with the greatest care and attention, and based on the latest information available to us.

We should nevertheless point out that this document cannot always be updated in line with ongoing technical developments in our products.

Information and specifications may be subject to change at any time. For information on the latest version please visit [drives-support@moog.com](mailto:drives-support@moog.com).

# Content

1	MSD Servo Drive Product range .....	5
1.1	MSD Servo Drive Compact UL certification .....	6
1.2	MSD Servo Drive Single-Axis System .....	8
1.2.1	AC fed drives sizes 1 - 4 .....	9
1.2.2	AC fed drives size 5 .....	10
1.2.3	AC fed drives size 6 .....	11
1.2.4	AC fed drives size 7 .....	12
1.3	MSD Servo Drive Multi-Axis System .....	13
1.3.1	DC fed drives sizes 1 - 4 .....	14
1.3.2	DC fed drives size 5 .....	15
1.3.3	DC fed drives size 6 .....	16
1.3.4	DC fed drives size 7 .....	17
1.3.5	MSD Power Supply Unit (PSU) size 5 .....	18
1.3.6	MSD Power Supply Unit (PSU) size 6 .....	19
1.3.7	MSD Power Supply Unit (PSU) size 7 .....	20
2	Appendix Accessories .....	21





# 1 MSD Servo Drive Product range

MSD Servo Drive product matrix - what is available and which UL approval

		MSD Compact								MSD Servo Drive																													
	Ordering number	G394-030	G394-020	G394-059	G394-035	G394-065	G394-080	G394-120	G394-160	G392-004A	G392-004	G392-006	G392-008	G392-012	G392-016	G395-016	G392-020	G395-020	G392-024	G395-024	G392-032	G395-032	G392-045	G395-053	G392-060	G392-070	G392-072	G395-084	G392-090	G395-110	G392-110	G395-143	G392-143	G395-170	G392-170	G395-210	G395-250	G395-325	G395-450
Type	Size	C2	C2	C3	C3	C4	C4	C5	C5	Size 1	Size 1	Size 1	Size 2	Size 2	Size 3	Size 3	Size 4	Size 4	Size 5	Size 5	Size 5	Size 5	Size 6	Size 6	Size 6A	Size 6A	Size 6A	Size 6A	Size 7	Size 7	Size 7	Size 7							
AC+W		uR	uR	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL											
AC+W+BR		uR	uR	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL																					
AC+LC															uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	
AC+LC+BR																					uL	uL	uL	uL	uL	uL	uL	uL											
AC+W+FS										uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL	uL																	
AC+W+BR+FS										uL	uL	uL	uL	uL	uL	uL	uL	uL	uL																				
AC+LC+FS															uL	uL	uL	uL	uL	uL	uL	uL																	
AC+LC+BR+FS																					uL	uL	uL																
	Ordering number										G393-004	G393-006	G393-008	G393-012	G393-016	G397-020	G393-020	G397-025	G393-024	G397-026	G393-032	G397-035	G393-045	G397-053	G393-060	G397-070	G393-072	G397-084	G393-090	G397-110	G393-110	G397-143	G393-143	G397-170	G393-170	G397-210	G397-250	G397-325	G397-450
Type	Size										Size 1	Size 1	Size 2	Size 2	Size 3	Size 3	Size 4	Size 4	Size 5	Size 5	Size 5	Size 5	Size 6A	Size 6A	Size 6A	Size 6A	Size 6A	Size 7	Size 7	Size 7	Size 7								
DC+W											cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR
DC+LC															cUR	cUR	cUR	cUR	cUR	cUR	cUR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uR	uL	uL	uL	
DC+W+FS											cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	cUR	uR	uR	uR															
DC+LC+FS															cUR	cUR	cUR	cUR	cUR	cUR	cUR	uR	uR	uR															

Table 1.1 MSD Servo Drive product matrix

## Legend:

Product version not available

uR uL cUR = Product version available uL, uR or cUR certification included!

Product version available uL, uR or cUR certification on request!

W = Wall mounted (air-cooled)  
LC = Liquid-cooled  
BR = Brake resistor  
FS = Functional Safety

MSD Power Supply Unit (PSU)					
G396-026	G396-050	G396-075	G396-110	G396-250	G396-360
Size 5	Size 5	Size 6A	Size 6A	Size 7	Size 7
uR	uR	uR	uR		

## 1.1 MSD Servo Drive Compact UL certification



Common terms to comply with the UL certification (UL508C) for all sizes MSD Servo Drive Compact

Multiple rated equipment. Operation only within the technical ratings of the drive, details see in technical ratings appendix instruction manual.

Ensure that surrounding air temperature does not exceed the maximum appropriate ambient temperature, refer to model tables listed below.

For use only in electric supply mains with maximum overvoltage category III and for circuits not more than maximum short circuit current capability of symmetrical Amperes @ maximum voltage, when protected by fuses as required. Ratings and class refer to model tables listed below.

Integral solid state short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance to the manufacturer instructions, National Electrical Code and any additional local codes.

Use in a pollution degree 2 environment according to IEC 60664-1 only. This means device shall be mounted in a suitable switchgear cabinet.

Use UL-certified device wiring (mains, motor and control cables) only

- use copper conductors rated minimum +60/+75 °C (+140 °F/+167 °F).
- tightening torques for terminals, refer to model tables listed below.

Motor over temperature sensing (such as thermal sensor or switch embedded in the motor) must connected during operation of these drives.

In case the device is used in combination with an externally mounted brake resistor, over-temperature protection shall be provided separately to the brake resistor avoiding excessive temperatures.

Auxiliary supply voltage 24 Vdc.

For control outputs (OSDxx) use an isolated source only, rated 25 Vac or 24-30 Vdc as appropriate for rating of the given output.

A fuse in accordance with UL248 must be connected between the source and the output, rated 4 A/100 V.

Valid

For all models MSD Servo Drive Compact with wall mounting air cooler in combination with or without internal brake resistor.

For 3 x 230/400-480 V three-phase ac fed models only, maximum 277 V RMS to ground.

Including all versions of communication interfaces and/or optional interfaces.

Functional safety models are not included.

Internal overload protection

The internal overload protection operates within maximum 10 seconds when reaching 200 % of the Motor Full Load Current.

G394-120-xxxx-xxxx only:

The internal overload protection operates within maximum 54 seconds when reaching 200 % of the Motor Full Load Current.

G394-160-xxx-xxx only:

The internal overload protection operates within maximum 70 seconds when reaching 200 % of the Motor Full Load Current.

Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

### Special conditions for cold plate version

The G394-030 and G394-020 (size C2) are incomplete in construction and need an external heatsink (cold plate version) at end-users application.

The external cooling must at least be equivalent to a steel plate with dimensions of 140 mm (5.51 in) by 490 mm (19.29 in), 3 mm (0.12 in) nominal thickness.

The temperature conditions shall be conducted in the end-use in situation when the products are going to be installed to a smaller plate/heatsink.

Keep the specific conditions for the different models MSD Servo Drive Compact

Size	Device	Electric supply mains		Tightening torque		Maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Mains terminal	motor terminal, brake resistor L+, L-	Rating	Voltage	Class		
C2	G394-030	1 x 230 V	5 kA RMS	5 - 7 lb-in (0.56 - 0.79 Nm)		1 x 10 A	250 V	RK5 *)	+40 °C (+104 °F)	UL recognized
	G304-020	3 x 400-480 V		5 - 7 lb-in (0.56 - 0.79 Nm)		3 x 6 A	600 V	RK5 *)		
C3	G394-059	1 x 230 V		5 - 7 lb-in (0.56 - 0.79 Nm)		1 x 20 A	250 V	RK5 *)		UL listed
	G394-035	3 x 400-480 V		5 - 7 lb-in (0.56 - 0.79 Nm)		3 x 15 A	600 V	RK5 *)		
C4	G394-080	1 x 230 V		4.4 - 5.3 lb-in 0.50 - 0.60 Nm	7 lb-in (0.79 Nm)	1 x 25 A	250 V	RK5 *)		
	G394-065	3 x 400-480 V		4.4 - 5.3 lb-in (0.50 - 0.60 Nm)	7 lb-in (0.79 Nm)	3 x 20 A	600 V	RK5 *)		
C5	G394-120	3 x 400-480 V		7 lb-in (0.79 Nm)		3 x 30 A	600 V	RK5 *)	+45 °C (+113 °F)	
	G394-160	3 x 400-480 V		7 lb-in (0.79 Nm)		3 x 40 A	600 V	RK5 *)		

\*) Branch circuit protection. User recommended class or faster characteristic.

Table 1.2 Tightening torques, fuses etc. for MSD Servo Drive Compact

## 1.2 MSD Servo Drive Single-Axis System



Common terms to comply with the UL certification (UL508C) for all the sizes MSD Servo Drive AC-AC

Multiple rated equipment. Operation only within the technical ratings of the drive, details see in technical ratings appendix instruction manual.

Ensure that surrounding air temperature does not exceed the maximum appropriate ambient temperature, refer to model tables.

For use only in electric supply mains with maximum overvoltage category III and for circuits delivering not more than maximum short circuit current capability of symmetrical Amperes @ maximum voltage, when protected by fuses as required. Ratings and fuse classes refer to model tables listed below.

Integral solidstate short circuit protection does not provide branch circuit protection. Branch circuit protection must be provided in accordance to the manufacturer instructions, National Electrical Code and any additional local codes.

Use in a pollution degree 2 environment according to IEC/EN 60664-1 only. This means device shall be mounted in a suitable switchgear cabinet.

Use UL-certified device wiring (mains, motor and control cables) only

- use copper conductors rated minimum +75 °C (+167 °F).
- tightening torques for terminals, refer to model tables listed below.

Motor over temperature sensing (such as thermal sensor or switch embedded in the motor) must be connected during operation of these drives.

In case the device is used in combination with an externally mounted brake resistor, over-temperature protection shall be provided separately to the brake resistor avoiding excessive temperatures.

Auxiliary supply voltage 24 Vdc.

For relay outputs (REL, RSH) on control board use an isolated source only, rated 24 Vdc.

A fuse in accordance with UL248 must be connected between the source and the output, rated 4 A.

## 12.1 AC fed drives sizes 1 to 4

### Valid

For all models MSD Servo Drive AC-AC with wall mounting air cooler in combination with or without internal brake resistor, with or without functional safety. For all models size 3 + 4 with liquid cooling, with or without functional safety, without internal brake resistor.

For 3 x 230/400-480 V three-phase ac fed models only, maximum 277 V RMS to ground.

Including all versions of communication interfaces and/or optional interfaces.

### Void

Not valid for cold plate or push through cooler models.

### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 3 liter/min or more.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation.

Maximum temperature +50 °C (+122 °F). Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

### Internal overload protection

The internal overload protection operates within maximum 10 sec seconds when reaching 200 % of the Motor Full Load Current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Size	Device	Electric supply mains		Tightening torque		Maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	mains terminal	motor terminal, brake resistor L+, L-	Rating	voltage	class		
Size 1	G392-004A	1 x 230 V	5 kA RMS		5 - 7 lb-in (0.56 - 0.79 Nm)	1 x 20 A	250 V	K5 *)	+40 °C (+104 °F)	UL listed
	G392-004	3 x 230/ 400-480 V			5 - 7 lb-in (0.56 - 0.79 Nm)	3 x 10 A	600 V	K5 *)		
	G392-006	3 x 230/ 400-480 V			5 - 7 lb-in (0.56 - 0.79 Nm)	3 x 15 A	600 V	K5 *)		
Size 2	G392-008	3 x 230/ 400-480 V			5 - 7 lb-in (0.56 - 0.79 Nm)	3 x 20 A	600 V	RK5 *)		
	G392-012	3 x 230/ 400-480 V			5 - 7 lb-in (0.56 - 0.79 Nm)	3 x 25 A	600 V	RK5 *)		
Size 3	G392-016 G395-016	3 x 230/ 400-480 V			15 lb-in (1.7 Nm) 7 lb-in (0.79 Nm)	3 x 30 A	600 V	RK5 *)		
	G392-020 G395-020	3 x 230/ 400-480 V			15 lb-in (1.7 Nm)	3 x 40 A	600 V	RK5 *)		
	G392-024 G395-024	3 x 230/ 400-480 V			15 lb-in (1.7 Nm)	3 x 50 A	600 V	K *)5		
Size 4	G392-032 G395-032	3 x 230/ 400-480 V			15 lb-in (1.7 Nm)	3 x 50 A	600 V	K5 *)		

Table 1.3 Tightening torques, fuses etc. for MSD Servo Drive AC-AC size 1 to 4

\*) Branch circuit protection. User recommended class or faster characteristic.

## 1.2.2 AC fed drives size 5

### Valid

For all models MSD Servo Drive AC-AC with wall mounting air cooler, push through cooler or liquid cooled models and in combination with or without internal brake resistor, with or without functional safety.

For 3 x 230/400-480 V three-phase ac fed models only, maximum 277 V RMS to ground.

Including all versions of communication interfaces and/or optional interfaces.

### Void

Not valid for cold plate cooler models.

### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 8 or more liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation,

maximum temperature  $+50\text{ °C (+122 °F)}$ .

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

### Internal overload protection

The internal overload protection operates within maximum 3 sec (30 sec for liquid cooled models) when reaching 200 % of the Motor Full Load Current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive AC-AC size 5

Size	Device	Electric supply mains		Tightening torque		Maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Mains terminal	Motor terminal, brake resistor L+, L-	Rating	Voltage	Class		
Size 5	G392-045 G395-053	3 x 230/ 400-480 V	10 kA RMS		22 lb-in (2.5 Nm)	3 x 50 A	600 V	RK1 *)	+40 °C (+104 °F) +45 °C (+113 °F) +55 °C (+131 °F) with derating	UL listed
	G392-060 G395-070	3 x 230/ 400-480 V			22 lb-in (2.5 Nm)	3 x 80 A	600 V	RK1 *)		
	G392-072 G395-084	3 x 230/ 400-480 V			22 lb-in (2.5 Nm)	3 x 80 A	600 V	RK1 *)		

\*) Branch circuit protection. Use recommended class or faster characteristic.

Table 1.4 Tightening torques, fuses etc. for MSD Servo Drive AC-AC size 5

### 1.2.3 AC fed drives size 6 and 6A

#### Valid

For all models MSD Servo Drive AC-AC with wall mounting air cooler, push through cooler. All MSD Servo Drive AC-AC liquid cooled models and in combination with or without internal brake resistor.

For 3 x 230/400-480 V three-phase ac fed models only, maximum 277 V RMS to ground. Including all versions of communication interfaces and/or optional interfaces.

#### Void

Not valid for Functional safety models.

All models MSD Servo Drive AC-AC with wall mounting air cooler, push through cooler and in combination with internal brake resistors.

#### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 11-13 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation.

Use as coolant water with a corrosion preventive additive such as ethylene glycol or equivalent.

#### Internal overload protection

The internal overload protection operates within maximum 30 sec (10 sec for 143-210 A models) when reaching 200 % of the Motor Full Load Current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive AC-AC size 6 and 6A type W, D or L

Size	Device	Electric supply mains		Tightening torque			Maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Mains terminal	Motor terminal	Brake resistor	Rating	Voltage	Class		
Size 6	G392-090 G395-110	3 x 230/ 400-480 V	10 kA RMS	88 - 177lb-in (10 - 20 Nm)	88 - 177lb-in (10 - 20 Nm)	53 - 70 lb-in (6 - 8 Nm)	3 x 100 A	600 V	RK *)1	+40 °C (+104 °F) +45 °C (+113 °F) +55 °C (+131 °F) with derating	UL listed
	G392-110 G395-143	3 x 230/ 400-480 V		88 - 177lb-in (10 - 20 Nm)	88 - 177lb-in (10 - 20 Nm)	53 - 70 lb-in (6 - 8 Nm)	3 x 125 A	600 V	RK1 *)		
Size 6A	G392-143 G395-170	3 x 230/ 400-480 V		88 - 177lb-in (10 - 20 Nm)	132 - 265 lb-in (15 - 30 Nm)	53 - 70 lb-in (6 - 8 Nm)	3 x 175 A	600 V	RK1 *)		
	G392-170 G395-210	3 x 230/ 400-480 V		88 - 177lb-in (10 - 20 Nm)	132 - 265 lb-in (15 - 30 Nm)	53 - 70 lb-in (6 - 8 Nm)	3 x 200 A 3 x 250 A	600 V	RK1 *)	+40 °C (+104 °F)	

\*) Branch circuit protection. User recommended class or faster characteristic.

Table 1.5 Tightening torques, fuses etc. for MSD Servo Drive AC-AC size 6

## 1.2.4 AC fed drives size 7

### Valid

For all MSD Servo Drive AC-AC liquid cooled models.

For 3 x 400-480 V three-phase ac fed models only, maximum 277 V RMS to ground.

Including all versions of communication interfaces and/or optional interfaces.

### Void

Not valid for Functional safety models.

All models MSD Servo Drive AC-AC with wall mounting air cooler, push through cooler. All models in combination with internal brake resistors.

### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 12-14 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation.

Keep the specific conditions for the different models MSD Servo Drive AC-AC size 7 type W, D or L

Use as coolant water with a corrosion preventive additive such as ethylene glycol or equivalent.

### Special conditions for busbar terminals

Use properly sized UL listed ZMVV connector lugs and follow the instruction manual for proper wire sizes and installation or contact manufacturer to purchase proper lugs.

### Internal overload protection

The internal overload protection operates within maximum 30 sec seconds when reaching 150 % of the Motor Full Load Current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Size	Device	Electric supply mains		Tightening torque			Maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Mains terminal	Motor terminal	Brake resistor	Rating	Voltage	Class		
Size7	G395-250	3 x 400-480 V	30 kA RMS	Bus bar terminals M12 221 - 265 lb-in (25- 30 Nm)		Bus bar terminals M10 177 - 221 lb-in (20 - 25 Nm)	3 x 250 A	600 V	RK1 *)	+40 °C (+104 °F)	UL listed
	G395-325	3 x 400-480 V		Bus bar terminals M12 221 - 265 lb-in (25- 30 Nm)		Bus bar terminals M10 177 - 221 lb-in (20 - 25 Nm)	3 x 350 A	600 V	RK1 *)		
	G395-450	3 x 400-480 V		Bus bar terminals M12 221 - 265 lb-in (25- 30 Nm)		Bus bar terminals M10 177 - 221 lb-in (20 - 25 Nm)	3 x 450 A	600 V	RK1 *)		

\*) Branch circuit protection. User recommended class or faster characteristic.

Table 1.6 Tightening torques, fuses etc. for MSD Servo Drive AC-AC size 7



## 1.3 MSD Servo Drive Multi-Axis System



Common terms to comply with the UL certification (UL508C) for all the sizes MSD Servo Drive DC-AC and MSD Power Supply Unit (PSU)

Multiple rated equipment. Operation only within the technical ratings of the drive, details see in technical ratings appendix instruction manual.

Ensure that surrounding air temperature does not exceed the maximum appropriate ambient temperature, refer to model tables.

As the inverter do not incorporate internal MOV's at DC input, they may only be connected to a proper DC-source in which voltage transients are controlled and limited in accordance with UL1449 to the maximum level of 4 kV (DC models) or overvoltage category III (for PSU models). Suitable for use in circuits delivering not more than maximum short circuit current capability of symmetrical Amperes @ maximum voltage. Ratings refer to model tables listed below.

These inverter do not employ dc-capacitor pre-charging circuitry. Consideration shall be given to prevent current inrush when connecting the units to the dc power source. A suitable pre-charging circuitry or component shall be provided externally in the end-use applications.

These inverter are provided with internal semiconductor fuses connected in dc+ and dc- input respectively and suitable for branch circuit protection. These fuses are factory assembled and cannot be replaced by the end-user.

Use in a pollution degree 2 environment according to IEC/EN 60664-1 only. This means device shall be mounted in a suitable switchgear cabinet.

Use UL-certified device wiring (mains, motor and control cables) only

- use copper conductors rated minimum +75 °C (+167 °F).
- tightening torques for terminals, refer to model tables listed below.

Motor over temperature sensing (such as thermal sensor or switch embedded in the motor) must connected during operation of these drives.

In case the device is used in combination with an externally mounted brake resistor, over-temperature protection shall be provided separately to the brake resistor avoiding excessive temperatures.

Auxiliary supply voltage 24 V DC.

For relay outputs (REL, RSH) on control board use an isolated source only, rated 24 Vdc.

A fuse in accordance with UL248 must be connected between the source and the output, rated 4 A.

## 1.3.1 DC fed drives sizes 1 to 4

### Valid

For all models MSD Servo Drive DC-AC sizes 1 to 4 with wall mounting air cooler and for all models size 3 + 4 with liquid cooler. For all with or without functional safety and all without internal brake resistor. For dc fed models only, maximum 770 V dc. Including all versions of communication interfaces and/or optional interfaces.

### Void

Not valid for push through cooler or cold plate cooler models.  
Not valid for any combination with internal braking resistor.

### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 3 liter/min or more.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ }^{\circ}\text{C}$  (+50 °F) to avoid condensation, maximum temperature +50 °C (+122 °F).

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

### Internal overload protection

The internal overload protection operates within maximum 30 sec or 10 sec when reaching 200 % of the motor full load current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive DC-AC size 1 to 4

Size	Device	Electric supply mains		Tightening torque		Maximum ambient temperature	Certification	
		Voltage	Short circuit capability	Mains terminal	Motor terminal , brake resistor L+, L-			
Size 1	G393-004	565 - 770 V DC	5 kA RMS	5 - 7 lb-in (0.56 - 0.79 Nm)		+40 °C (+104 °F)	UL recognized and CSA recognized	
	G393-006							
Size 2	G393-008							
	G393-012							
Size 3	G393-016			15 lb-in (1.7 Nm) 7 lb-in (0.79 Nm)				
	G397-020							
	G393-020			15 lb-in (1.7 Nm)				
Size 4	G397-025							
	G393-024							
	G397-026							
	G393-032							
G397-035								

Table 1.7 Tightening torques, overload protection etc. for MSD Servo Drive DC-AC size 1 to 4

### 1.3.2 DC fed drives size 5

#### Valid

For all models MSD Servo Drive DC-AC with wall mounting air cooler or liquid cooled models. For dc fed models only, maximum 770 V DC.  
Including all versions of communication interfaces and/or optional interfaces.

#### Void

Not valid for push through cooler or cold plate cooler models.  
Not valid for any combination with internal braking resistor.

#### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 8-11 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation,  
maximum temperature  $+50\text{ °C (+122 °F)}$ .

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

#### Internal overload protection

The internal overload protection operates within maximum 3 sec (30 sec for liquid cooled models) when reaching 200 % of the motor full load current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive DC-AC size 5

Size	Cooler type	Device	Electric supply mains		Overload protection	Tightening torque		Maximum ambient temperature	Certification
			Voltage	Short circuit capability		DC input terminal	Motor terminal		
Size 5	W wall mounting air cooler	G393-045	770 V DC	5 kA DC	200 % @ 3 sec	22 - 39,8 lb-in (2.5 - 4.5 Nm)	40 lb-in (4.5 Nm)	+40 °C (+104 °F)	UL recognized
		G393-060	770 V DC						
		G393-072	770 V DC						
	L liquid cooler	G397-053	770 V DC	10 kA DC	200 % @ 30 sec	22 - 39,8 lb-in (2.5 - 4.5 Nm)	40 lb-in (4.5 Nm)		
		G397-070	770 V DC						
		G397-084	770 V DC						

Table 1.8 Tightening torques, overload protection etc. for MSD Servo Drive DC-AC size 5

### 1.3.3 DC fed drives size 6A

#### Valid

For all models MSD Servo Drive DC-AC with wall mounting air cooler or liquid cooled models. For dc fed models only, maximum 770 V dc.

Including all versions of communication interfaces and/or optional interfaces.

#### Void

Not valid for Functional safety models.

Not valid for push through cooler or cold plate cooler models.

Not valid for any combination with internal braking resistor

#### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 11 - 13 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ }^{\circ}\text{C}$  (+50 °F) to avoid condensation.

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

#### Internal overload protection

The internal overload protection operates within maximum 30 sec or 10 sec when reaching 200 % of the motor full load current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive DC-AC size 6A

Size	Cooler type	Device	Electric supply mains		Overload protection	Tightening torque		Maximum ambient temperature	Certification
			Voltage	Short circuit capability		DC input terminal	Motor terminal		
Size 6A	W + L wall mounting air cooler and liquid cooler	G393-090	770 V DC	10 kA DC	200 % @ 30 sec	175 lb-in (20 Nm)	177 lb-in (20 Nm)	+40 °C (+104 °F)	UL recognized
		G397-110							
		G393-110	770 V DC						
		G397-143							
		G393-143	770 V DC						
		G397-170							
G393-170	770 V DC	200 % @ 10 sec	270 lb-in (30 Nm)						
G397-210									

Table 1.9 Tightening torques, overload protection etc. for MSD Servo Drive DC-AC size 6A

### 1.3.4 DC fed drives size 7

#### Valid

For all MSD Servo Drive DC-AC liquid cooled models.

For DC fed models only, maximum 770 V DC. To be supplied by Moog AC Drive Models G395-450 only.

Including all versions of communication interfaces and/or optional interfaces.

#### Void

Not valid for Functional safety models.

All models MSD Servo Drive DC-AC with wall mounting air cooler, push through cooler. All models in combination with internal brake resistors.

#### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 12-14 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation.

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

#### Special conditions for busbar terminals

Use properly sized UL listed ZMVV connector lugs and follow the instruction manual for proper wire sizes and installation or contact manufacturer to purchase proper lugs.

#### Internal overload protection

The internal overload protection operates within maximum 30 sec seconds when reaching 150 % of the Motor Full Load Current. Details see in technical ratings appendix to instruction manual. Adjustment of internal overload protection see document "MSD Servo Drive Device Help".

Keep the specific conditions for the different models MSD Servo Drive DC-AC size 7 type W or L

Size	Cooler type	Device	Electric supply mains		Overload protection	Tightening torque			Maximum mains fuse			Maximum ambient temperature	Certification
			Voltage	Short circuit capability		Main terminal	Motor terminal	Brake resistor	Rating	Voltage	Type (manufacturer Mersen)		
Size 7	L liquid cooler	G397-250	770 V DC	30 kA DC	150 % @ 30 sec	Bus bar terminals M12 221 - 265 lb-in (20 - 25 Nm)	M10 177 - 221 lb-in (20 - 25 Nm)		2 x 400 A	700 V DC	A70QS400-4 or -4k	+45 °C (+113 °F)	UL listed
		G397-325	770 V DC						2 x 400 A		A70QS400-4 or -4k		
		G397-450	770 V DC						3 x 600 A		A70QS600-4 or -4k		

Table 1.10 Tightening torques, overload protection etc. for MSD Servo Drive DC-AC size 7

## 1.3.5 MSD Power Supply Unit (PSU) size 5

### Valid

For all models MSD Power Supply Unit with wall mounting air cooler or liquid cooled models and in combination with internal brake resistors.

For 3 x 400-480 V three phase ac models only, maximum 277 V RMS to ground. Including all versions of communication interfaces and/or optional interfaces. The recommended line connection sets (filter choke, set-up choke and mains filter) shall be used.

### Void

Not valid for Functional safety models, cold plate cooler models.

### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 8-11 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ }^{\circ}\text{C}$  (+50 °F) to avoid condensation.

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

Keep the specific conditions for the different models MSD Power Supply Unit size 5

Size	Device	Mains voltage		Tightening torque		maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Main terminal	DC output terminal	Rating	Voltage	class		
Size 5	G396-026	3 x 400-480 V	5 kA RMS	40 lb-in (4.5 Nm)	22 - 39.8 lb-in (2.5 - 4.5 Nm)	3 x 100 A	600 V	RK1 *)	+40 °C (+104 °F)	UL recognized
	G396-050	3 x 400-480 V	10 kA RMS			3 x 100 A				

\*) Branch circuit protection. Use recommended class or faster characteristic.

Table 1.11 Tightening torques, fuses etc. for MSD Power Supply Unit size 5

### 1.3.6 MSD Power Supply Unit (PSU) size 6A

#### Valid

For all models MSD Power Supply Unit with wall mounting air cooler or liquid cooled models and in combination with internal brake resistors.

For 3 x 400-480 V three phase ac models only, maximum 277 V RMS to ground. Including all versions of communication interfaces and/or optional interfaces. The recommended line connection sets (filter choke, set-up choke and mains filter) shall be used.

#### Void

Not valid for Functional safety models, push through models.

#### Special conditions for liquid cooled models

The coolant pressure may be a maximum of 200 kPa /29 PSI (2 bar).

Coolant flow 11-13 liter/min.

Minimum inlet temperature  $T_{inl} = T_{amb} - +10\text{ °C (+50 °F)}$  to avoid condensation.

Use as coolant water with a corrosion preventing additive such as ethylene glycol or equivalent.

Keep the specific conditions for the different models MSD Power Supply Unit size 6A

Size	Device	Mains voltage		Tightening torque		maximum mains fuse			Maximum ambient temperature	Certification
		Voltage	Short circuit capability	Main terminal	DC output terminal	Rating	Voltage	Class		
Size 6A	G396-075	3 x 400-480 V	10 kA RMS	270 lb-in (30 Nm)	175 lb-in (20 Nm)	3 x 200 A	600 V	RK1 *)	+40 °C (+104 °F)	UL recognized
	G396-110	3 x 400-480 V	10 kA RMS			3 x 200 A				

\*) Branch circuit protection. Use recommended class or faster characteristic.

Table 1.12 Tightening torques, fuses etc. for MSD Power Supply Unit size 6A

## 1.3.7 MSD Power Supply Unit (PSU) size 7

Currently no UL Certification for MSD Power Supply Unit size 7 available!



## 2 MSD Servo Drive Accessories

### 2.1 Motor cables

C08336-xxx-yyy/CB05708-xxx-yyy/CA44958-xxx-yyy/  
CB00076-xxx-yyy/CA98676-xxx-yyy



Approvals:

C08336-xxx-yyy Cables are UL verified (B129699)  
CB05708-xxx-yyy Cables and connectors are UL/CSA approved (E247738)  
CA44958-xxx-yyy Cables and connectors are UL verified (B129699)  
CB00076-xxx-yyy Cables and connectors are UL/CSA approved (E247738)  
CA98676-xxx-yyy Cables and connectors are UL/CSA approved (E247738)

### 2.2 Encoder cables

C08335-013-yyy/CA58876-002-yyy/CA58877-002-yyy



Approvals:

C08335-013-yyy Cables are UL verified (B129699)  
CA58876-002-yyy Cables and connectors are UL/CSA approved (E247738)  
CA58877-002-yyy Cables and connectors are UL/CSA approved (E247738)

## 2.3 Mains chokes

CA68926-001/CA55830-001 to CA55843-001/  
CA96898-001 to CA96900-001/ CB09045-001

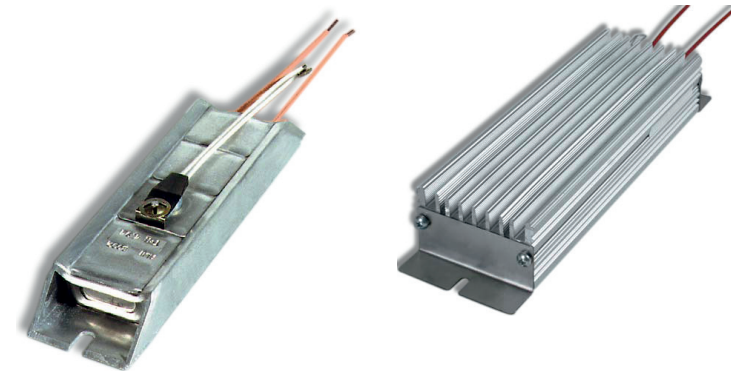


Approvals:

All versions have UL recognition for the USA and Canadian markets  
(File 300981)

## 2.4 Braking resistors

CA59737-001 to CA59744-001/CB09047-001 to CB09050-001/  
CB36901-001 to CB36904-001/CB53860-001



Approvals:

All versions have UL recognition for the USA and Canadian markets  
(File 232497)

## 2.5 Mains Filters - Single-Axis Compact sizes C2 to C5

CB09937-001 to CB09939-001/CB09940-001/  
CB09942-001



Approvals:

All materials and components used, comply with the corresponding UL standard.  
When designing and manufacturing, the rules of UL508C are taken into account. Certified products are listed in File E221999.

## 2.6 Mains Filters - Single-Axis Standard sizes 1 to 7

CA71184-001 to CA71190-001/CB09932-001 to CB09936-001



Approvals:

All materials and components used, comply with the corresponding UL standard.  
When designing and manufacturing, the rules of UL508C are taken into account. Certified products are listed in File E221999.

Approvals:

UL recognition CA71184-001 to CA71189-001

## 2.7 MCS - Mains Connection Set for PSU sizes 5 to 7

CA99591-001 and CA99592-001/CB10356-001 and CB10357-001/  
CC16543-001 and CC16544-001



### Boost inductor

CA99591-002 and CA99592-002/CB10356-002 and CB10357-002/  
CC16543-002 and CC16544-002

Approvals: All versions have UL recognition (File E146022)

### Input reactor

CA99591-003 and CA99592-003/CB10356-003 and CB10357-003/  
CC16543-003 and CC16544-003

Approvals: All versions have UL recognition (File E146022)

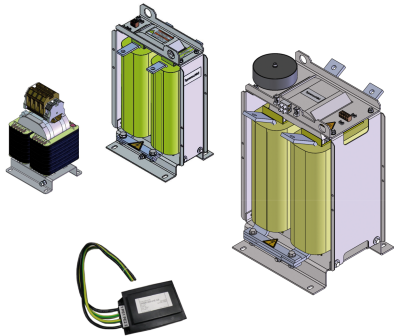
### Mains Filter

CA99591-004 and CA99592-004/CB10356-004 and CB10357-004/  
CC16543-004 and CC16544-004

Approvals: All versions have UL recognition for the USA and Canadian markets  
(File E193139)

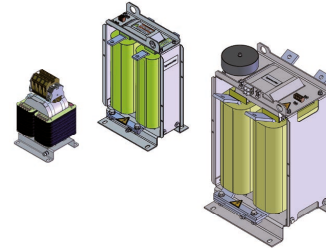
## 2.8 Common Mode Filter

CC86076-001 to CC86078-001



## Common Mode Choke

CC86092-001 to CC86094-001



Approvals:

R-recognized UL 1446\_F2 (File E181051)

## **TAKE A CLOSER LOOK.**

Moog solutions are only a click away. Visit our worldwide Web site for more information and the Moog facility nearest you.

## **MOOG**

Moog GmbH  
Hanns-Klemm-Straße 28  
D-71034 Böblingen  
Phone +49 7031 622 0

[www.moog.com/industrial](http://www.moog.com/industrial)  
[drives-support@moog.com](mailto:drives-support@moog.com)

Moog is a registered trademark of Moog, Inc. and its subsidiaries.  
All quoted trademarks are property of Moog, Inc. and its subsidiaries. All rights reserved.  
© 2022 Moog, Inc.

## **Technical alterations reserved.**

The contents of our documentation have been compiled with greatest care and in compliance with our present status of information.

Nevertheless we would like to point out that this document cannot always be updated parallel to the technical further development of our products.

Information and specifications may be changed at any time. For information on the latest version please refer to [drives-support@moog.com](mailto:drives-support@moog.com).

ID no.: CC36842-001, Rev. 1.3  
Date: 09/2022