MODULAR MULTI-AXIS SERVO DRIVE SYSTEM

MSD

Rev. K, October 2018

DELIVERING ADVANCED MOTION CONTROL AND FLEXIBILITY FOR HIGH PERFORMANCE AXES APPLICATIONS

WHAT MOVES YOUR WORLD

MOOG

Whenever the highest levels of motion control performance and design flexibility are required, you'll find Moog expertise at work. Through collaboration, creativity and world-class technological solutions, we help you overcome your toughest engineering obstacles. Enhance your machine's performance. And help take your thinking further than you ever thought possible.

- Safety Functions STO, SS1, SOS, SS2, SLS, SDI, SLI, SLP, SCA, SSM, SEL, ECS within the Servo Drive family
- Safety Function "Safe Torque Off" within the Servo Drive family

MODULAR MULTI-AXIS SERVO DRIVE SYSTEM - PRODUCT OVERVIEW

A Whole New Level of Machine Performance, Precision and Processing Acceleration.

Higher performance machines can mean a real advantage in productivity and profitability for different markets.

The Moog Modular Multi-Axis Servo Drive System (MSD) answers the call for a new generation of servo drives that provides the highest levels of dynamic response, smooth performance and application versatility.

MSD includes:

- A Motion Controller to coordinate the motion across multiple axes
- Single-Axis Compacts and Standard Versions
- Multi-Axis Servo Drives and Power Supply Units

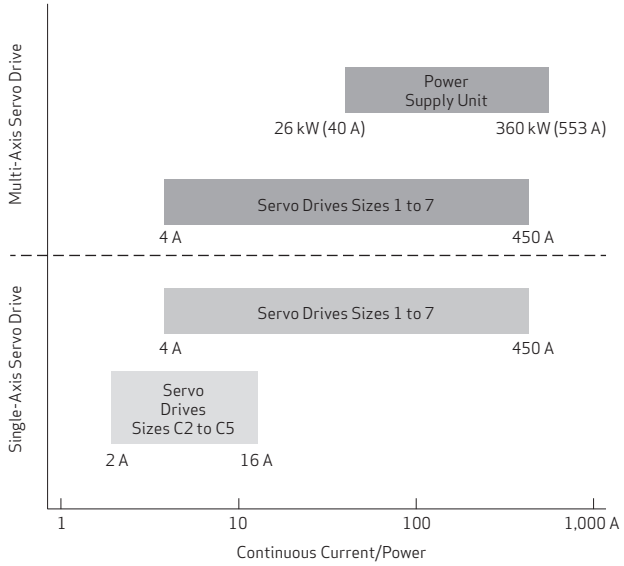
Meeting Your Toughest Machine Challenges

The Modular Multi-Axis Servo Drive System is designed to give machine builders the edge in solving some of the industries' toughest challenges in a wide array of industrial applications. Its user-friendly features, unsurpassed flexibility and high-performance design provide unique advantages including:

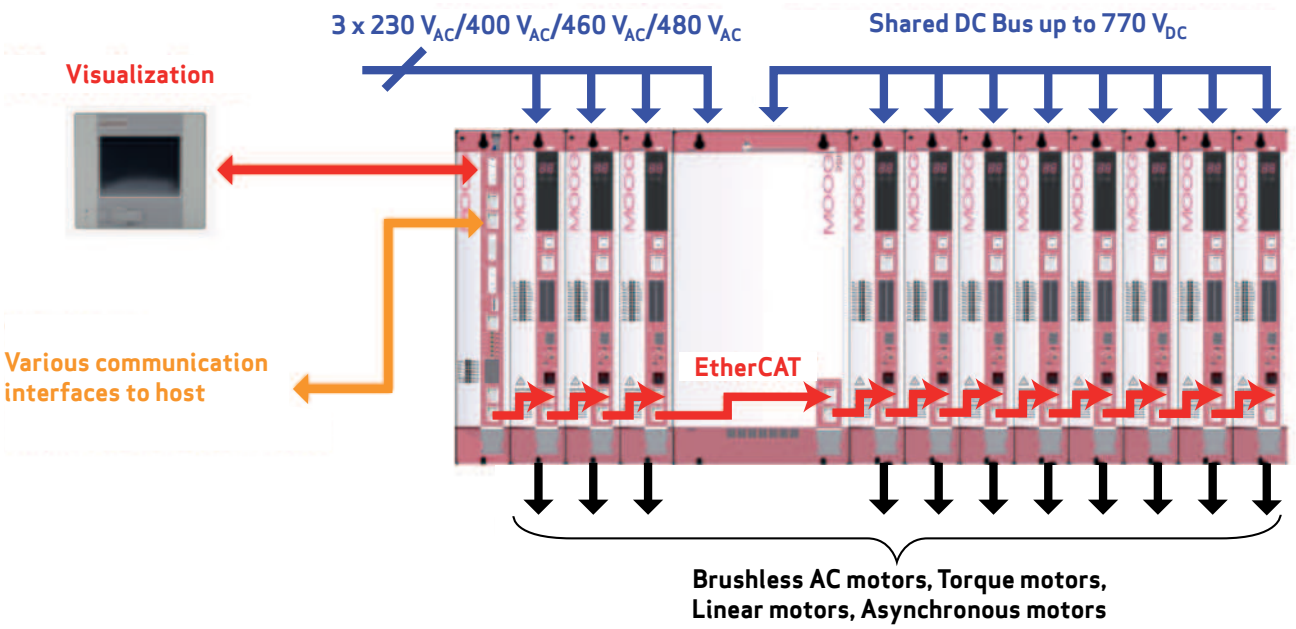
- **Higher machine productivity**
  From lowering cycle times in an injection molding machine, to increasing feed rates in a metal forming press, MSD delivers a significant increase in machine output
- **Improved machine precision**
  More precise motion control results in higher accuracy, virtually no part variations and reduced scrap
- **Higher machine flexibility**
  The modularity of the Programmable Multi-Axis Servo Drive System coupled with the ability to tailor customer-specific solutions provides the perfect flexible platform for different machine types, putting them at the heart of today's leading-edge designs

Features

- Servo drives from 2 to 450 A with the option of either the classic AC_{Mains} connection or a DC feed with a central feeder unit
- Compact size. Suitable for 300 mm switch cabinet depth, extremely small housing width, for the best possible switch cabinet usage
- The Single-Axis Compact Version in sizes C2 to C5 includes modular servo drives in a compact format increasing the offering of lower power requirements for single-axis-systems
- Extendable functionality via flexible MSD design
- Tailored software packages with Motion Control functionality for every application
- Support for simultaneous feedback from 3 feedback devices ensures precise positioning capability extending from resolver to Sin/Cos single-turn and multi-turn encoders
- High-speed communication via fieldbus connection to a wide range of control systems (including EtherCAT, CANopen, PROFIBUS, SERCOS among others)
- Built in PLC according to IEC/EN 61131 provides functions adapted to the application with direct access to the servo drive peripherals, single and multi axis operating units
- Built in functional safety according to IEC/EN 61508, IEC/EN 62061, EN ISO 13849-1, IEC/EN 61800-5-2, personnel safety directly into the servo drive



MODULAR MULTI-AXIS SERVO DRIVE SYSTEM - PRODUCT OVERVIEW



Total Flexibility

The MSD System is designed to work with a wide spectrum of servo motors – brushless permanent magnet, AC motors, Torque motors, Linear motors and Asynchronous motors to ensure optimal control. Likewise, its rapid commissioning and control optimization afford consistently high manufacturing quality.

The MSD System is the ideal complement to Moog's wide array of high-performance servo motors that deliver dynamic performance, power density and reliability in plastics and metalforming machine applications.

Designed for High-performance Applications

Putting the MSD System to work on your motion control tasks is simple when you consider the range of performance features this new servo drive offers:

- Fast update rates for current, velocity and position control loops enable you to meet the toughest demands for machine precision
- High acceleration internal communication via EtherCAT allows for control and coordination across multiple axes
- Comprehensive software package with motion control functionality to suit your needs. The MSD supports IEC/EN 61131 programming as well as programming of customised control loops using MathWorks/C/C++. Thus enabling the creation of application-specific templates for deeper integration with your machines
- Support for multiple communication protocols via fieldbus connection (SERCOS, EtherCAT, CANopen, PROFIBUS and others) plus the ability to develop custom protocols
- Flexible performance secured by up to three feedback devices like Sin/Cos single- and multi-turn encoders with EnDat or Hiperface-interfaces used simultaneously for precise positioning with added ability to support any customized position feedback devices
- Safety is crucial – The MSD is designed to implement safety functions according to IEC/EN 61508
- A size for every application – Servo drives from 2 to 170 A_{rms} air-cooled or even 450 A_{rms} liquid-cooled with AC or DC infeed optional (i.e. with the classic AC_{Mains} connection or a DC infeed with central infeed unit). This allows the MSD to be applied across a wide range of machine sizes
- Ease of use exemplified via user-friendly GUI for PC supported parameterization, data programming and firmware exchange via Multi Media Card (MMC) or USB stick. Your PC may be connected through USB locally, TC P/IP for remote access through factory Ethernet or even via Internet

MOTION CONTROLLER OVERVIEW

Designed for the Present and the Future

The Motion Controller is based on a 32 bit microprocessor to coordinate and synchronize axes, and communicate with host computers and other PLCs via multiple fieldbus protocols. With its PLC functionality, the Motion Controller can control processes of the machine.

It is designed for closed-loop control of velocity and position for up to 30 axes. Additonally, it is able to control input and visualization devices. It supports various communication protocols such as EtherCAT, CANopen and PROFIBUS-DP to any host controller.

The Motion Controller includes 2 x EtherCAT master interfaces for fast real time communication with the servo drives.

Based on the IEC/EN 61131 development standard, Moog Axis Control Software (MACS), with specialized motion libraries is provided to program the Motion Controller.

Features

- Perfect servo drive control – As part of the Modular Multi-Axis Servo Drive System optimized for use with Moog Servo Drives for demanding servo control applications
- Accurate motion control – Fast and precise control of process variables such as position, speed, and power; short cycle times starting from 125 µs and very low jitter (variation of time base) for optimum closed loop accuracy
- Unrestricted flexibility – Freely programmable multimotion controllers with PLC functionality to meet the highest application demands
- Wide range of applications – Applicable with both electric and hydraulic drives for use in various motion control applications
- One-for-all software – One single standardized development environment MACS based on CODESYS for all Moog Motion Controllers
- Powerful software libraries – Special function blocks for applications with very complex motion control challenges
- Extensive error control – Wire fault monitoring for all digital sensor inputs and analog current outputs, LEDs for status and error display and sustained short circuit protection of the outputs for reliable processes

TECHNICAL DATA

Parameters

Ordering number	**G391-001-001**	**G391-001-002**	**G391-001-003**
Integrated interfaces			
Ethernet	1		
USB 1.1 host	1		
EtherCAT master	2		
CAN/CANopen	1		
Optional interfaces			
EtherCAT slave	-		1
PROFIBUS-DP slave	-	1	-
Processor			
Processor type	PowerPC Processor, 32 bit, RISC architecture with floating point unit		
RAM	128 MB		
Flash-EEPROM	32 MB		
Data maintenance	Typically 10 years		
General Technical Data			
Connection technique	Plug-in terminal strips		
Mounting	On a backing plate		
Dimensions W x D x H	58.5 x 355 x 224 mm (2.3 x 13.99 x 8.83 in)		
Operating temperature range	-20 to +55 °C (-4 to +131 °F)		
Storage temperature range	-40 to +80 °C (-40 to +176 °F)		
Maximum mean temperature in operation for 24 hours	+50 °C (+122 °F)		
Relative air humidity	10 to 95 % (non-condensing)		
Maximum operation height	2,000 m (6,562 ft)		
Maximum storage height	3,000 m (9,843 ft)		
Maximum transport height	3,000 m (9,843 ft)		
Protection class	III		
Degree of protection according to IEC/EN 60529	IP20		
Standards			
Operating equipment demands and examinations	IEC/EN 61131-2		
Interference emission	IEC/EN 61000-6-4		
Interference immunity	IEC/EN 61000-6-2, industrial part		
Shock resistance	IEC/EN 60068-2-27		
Vibration resistance	IEC/EN 60068-2-6		
Insulation strength	IEC/EN 61131-2, test voltage 500 V_{DC}		
Power supply			
Voltage supply of module electronics	24 V_{DC} (18 to 36 V) SELV according to IEC/EN 60950-1		
Current consumption of module electronics			
Idling	0.3 A		
Full load	0.8 A		
Potential separation	Separate potentials for: • Module electronics • +24 V supply • Digital inputs/outputs • Ethernet		

TECHNICAL DATA

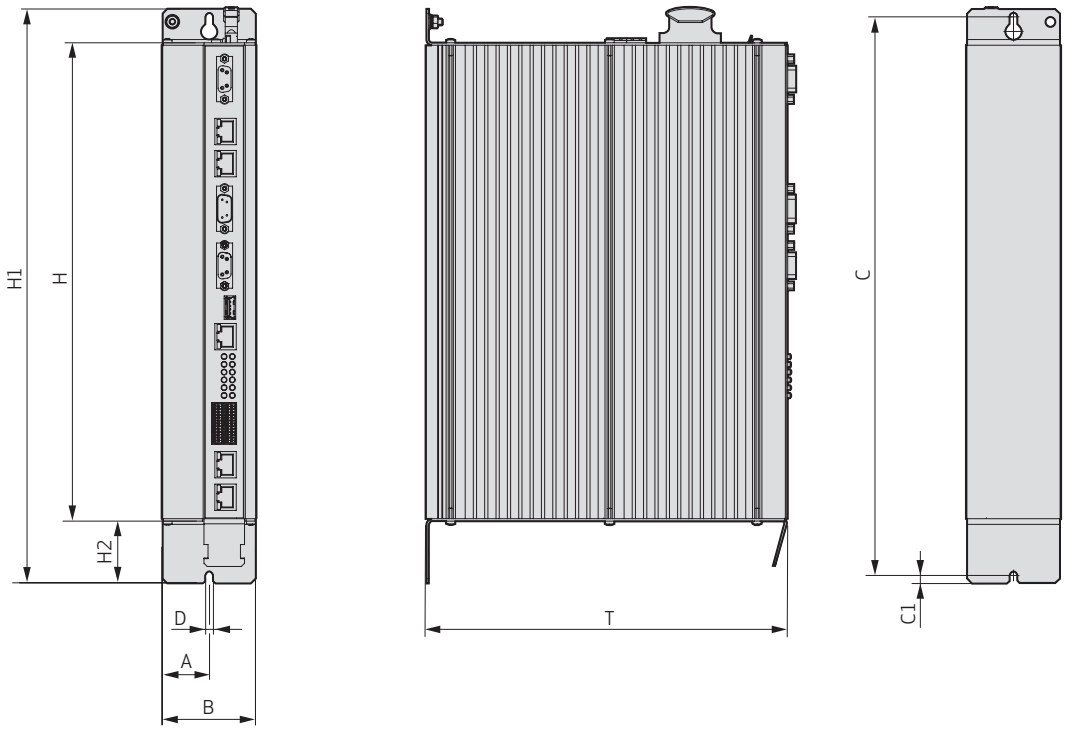
Parameters

Ordering number	**G391-001-001**	**G391-001-002**	**G391-001-003**
Internal voltages	Generated via internal DC/DC converters		
Behavior at voltage features/cut-off of supply voltage	Necessary data are permanently stored. If the supply voltage fails (<18 V), buffer capacitors provide the necessary energy.		
Interfaces			
Ethernet	10/100 Mbit/s with 8-pole RJ45 connector (100 Base-T)		
CAN	Connectors on the front cover, connected internally 1:1. Transmission rate adjustable from 10 kbit/s to 1 Mbit/s.		
EtherCAT master	100 Mbit/s		
EtherCAT slave	-		100 Mbit/s
PROFIBUS-DP slave	-	12 Mbit/s	-
USB	USB 1.1 host, USB-A connectors		
Digital inputs/outputs			
Type of digital inputs	Type 2 (current consuming) according to IEC/EN 61131-2		
Number of digital inputs/outputs	4		
Configuration	Individually configurable as input or output in the MACS software		
Voltage supply	24 V_{DC} (18 to 36 V), SELV according to IEC/EN 60950-1		
Maximum current consumption of single output	0.5 A		
Protection			
Sustained short cicuit	Yes		
Thermal overload	Yes		
Diagnostics			
Watchdog output: Outputs enabled signal	Digital outputs in operation. In the event of a fault, the watchdog output goes to an high impedance state.		

TECHNICAL DATA

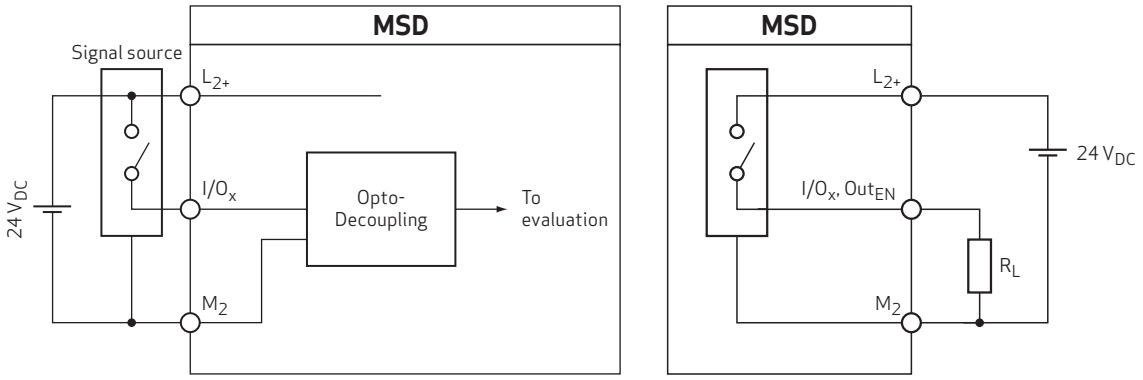
Parameters

Installation drawing



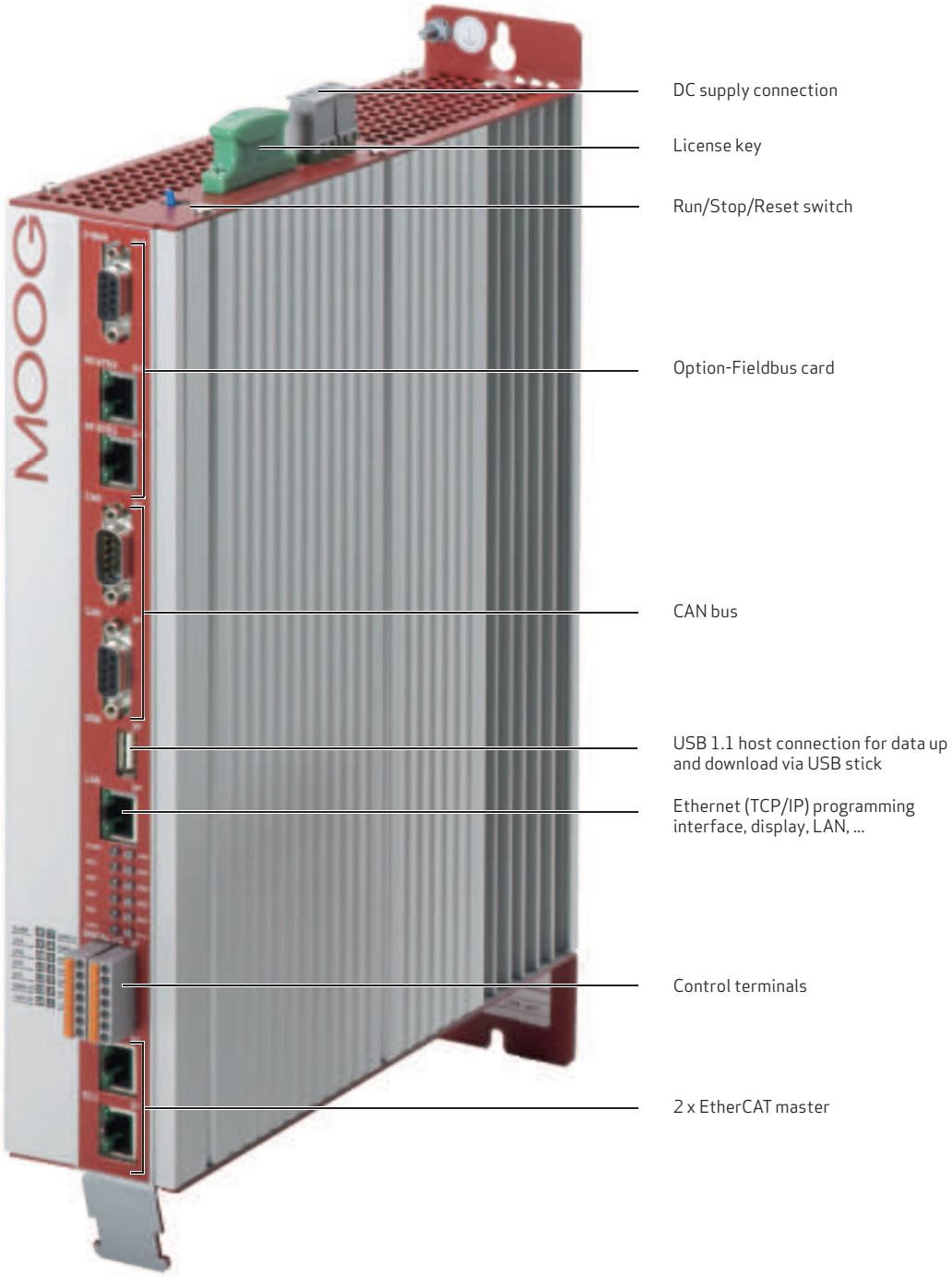
Dimensions	[mm (in)]
A	29.25 (1.15)
B (width)	58.5 (2.3)
C	344.5 (13.56)
C1	13.5 (0.53)
D (ø)	4.8 (0.19)
H (height)	295 (11.61)
H1	355 (13.98)
H2	38.5 (1.52)
T (depth)	224 (8.82)

Circuit diagrams - Inputs/outputs



TECHNICAL DATA

Equipment



ORDERING INFORMATION

Model number (assigned at the factory)		Type designation		
		1	2	3
G391	-		-	

001	MSD Motion Controller

3	Option - Fieldbus
001	EtherCAT master/CAN/CANopen
002	EtherCAT master/CAN/CANopen + PROFIBUS-DP slave
003	EtherCAT master/CAN/CANopen + EtherCAT slave

SINGLE-AXIS SERVO DRIVE COMPACT OVERVIEW

Designed for the Present and the Future

The low power Single-Axis Servo Drive Compact (sizes C2 to C5) are designed for operating asynchronous (ASM) and synchronous motors such as PMSM.

Different switching frequencies (4, 8 and 16 kHz) are available which can be set in the drive by a parameter.

For high-performance control loops, high update rates are supported: The Single-Axis Servo Drive Compact operates at cycle times of 62.5 µs for current and 125 µs for velocity and position control loops.

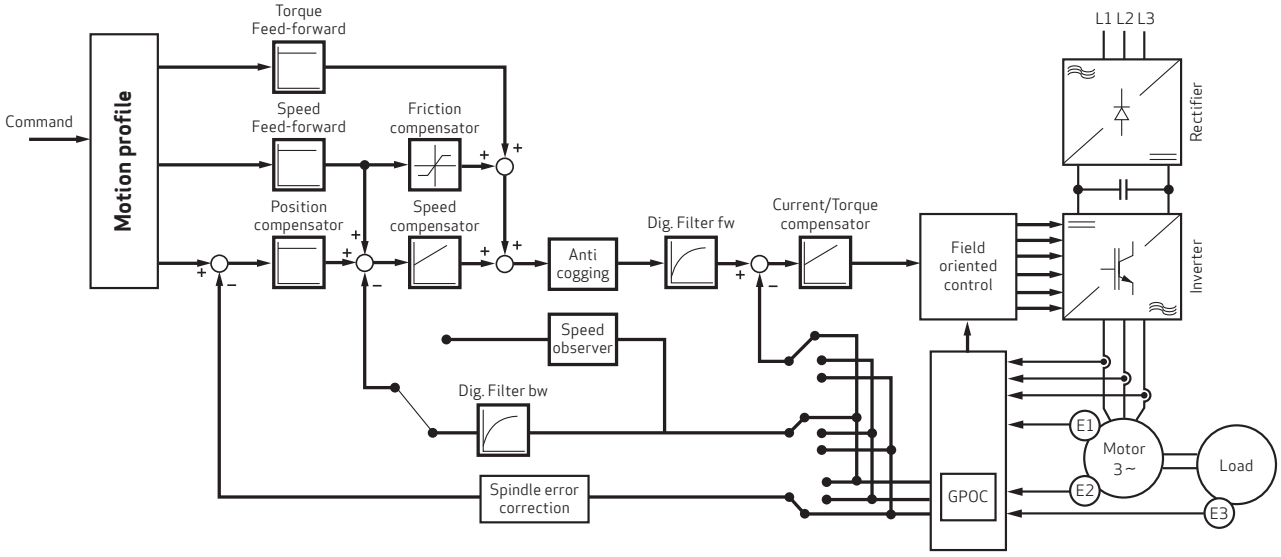
Currently, four mechanical sizes, based on output power, are available, ranging from 2 up to 16 A_{rms}.

Feedback sensors such as Resolver, EnDat encoder or Hiperface encoder are supported as standard. Application specific feedback sensors are possible on request.

The devices are available as air-cooled units.

Features

- Standard cascaded servo loop control structure including current/torque, velocity and position control
- Feed forward structure for higher response time and reduced tracking error
- Compensation of friction and cogging torque
- Compensation of mechanic spindles errors for both directions
- Support for field weakening for asynchronous and synchronous AC motors
- Availability of observer methods (current and velocity observers) which can be switched on, on demand for improving the servo loop performance
- Patented method GPOC (Gain Phase Offset Correction) with correlation technique to compensate encoder and resolver errors
- Servo drives from 2 to 16 A_{rms} supplied with the classic AC_{Mains} connection (1 x 230 V/3 x 230 V or 3 x 400 V/460 V/480 V) and a 2 times overload capacity for 10 seconds
- Evaluation by up to 3 sensors
  For precise positioning even in systems with backlash and other mechanical errors
- Conformance to parts of IEC/EN 61508, IEC/EN 62061, EN ISO 13849-1 and IEC/EN 61800-5-2 Category 4 to ensure personnel safety directly in the control unit of the drive
- Support of different fieldbus interfaces (CANopen, EtherCAT, PROFIBUS, SERCOS II, SERCOS III) via different option cards



TECHNICAL DATA

Sizes C2 to C5

Rated Current

Ordering number	System voltage	Size	Rated current [A]
G394-030	1 x 230 V/3 x 230 V	C2	3
G394-020	3 x 400 V/3 x 460 V/3 x 480 V		2
G394-059	1 x 230 V/3 x 230 V	C3	5.9
G394-035	3 x 400 V/3 x 460 V/3 x 480 V		3.5
G394-080	1 x 230 V/3 x 230 V	C4	8
G394-065	3 x 400 V/3 x 460 V/3 x 480 V		6.5
G394-120		C5	12
G394-160			16

TECHNICAL DATA

Parameters size C2

Type G394-030

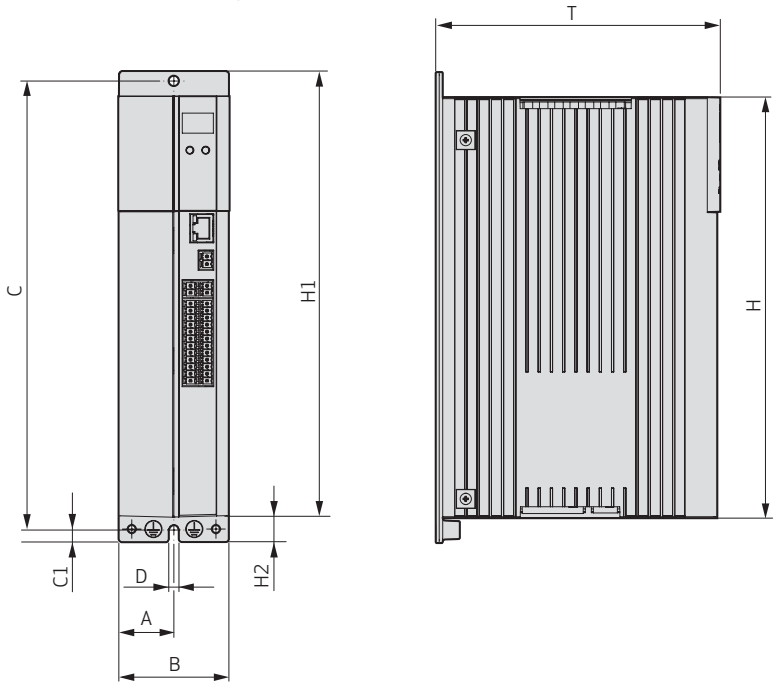
Ordering number	G394-030	G394-020
Output, motor side		
Voltage	3-phase U_{Mains}	
Rated current, effective (I_N)	3 A[1)]	2 A[1) 2)]
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/16 kHz	
Input, mains side		
Mains voltage (U_{Mains})	(1 x 230 V_{AC}/3 x 230 V_{AC}) -20 %/+15 %	(3 x 400 V_{AC}/3 x 460 V_{AC}/3 x 480 V_{AC}) ±10 %
Device connected load (with mains choke)	1.3 kVA	1.5 kVA
Current consumption (with mains choke)	5.4 A (1 x 230 V_{AC})/ 3.3 A (3 x 230 V_{AC})	2.2 A[2)]
Asymetry of mains voltage	±3% maximum (at 3 x 230 V_{AC})	±3% maximum
Frequency	50/60 Hz ±10 %	
Power loss at 8 kHz and I_N	75 W	42 W[2)]
DC link		
DC link capacity	880 µF	220 µF
Brake chopper switch-on threshold	390 V_{DC}	650 V_{DC}[2)]
Minimum ohmic resistance of an externally installed braking resistor	72 Ω	230 Ω
Brake chopper peak with external braking resistor	2.1 kW[3)]	1.8 kW[3)]
Internal braking resistor	550 Ω (PTC)	7,500 Ω (PTC)
Brake chopper continuous power with internal braking resistor	0 W[3)]	
Brake chopper peak with internal braking resistor	400 W[3)]	200 W[2) 3)]
Servo Drive	**G394-030**	**G394-020**
Cooling method	Air-cooled	
Protection	IP10 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	1 kg (2.2 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting	

1) Data referred to 4 kHz and 8 kHz switching frequency
2) Data referred to 400 V_{AC} mains voltage
3) Braking resistor always integrated. Connection of an external resistor is permissible.

TECHNICAL DATA

Parameters size C2

Installation drawing



Dimensions	[mm (in)]
A	27.5 (1.08)
B (width)	55 (2.17)
C	225 (8.86)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height)	210 (8.27)
H1	235 (9.25)
H2	12.5 (0.49)
T (depth) (without terminals)	142 (5.59)

Accessories C2

Part name	Description	Part number
G394-030		
Mains choke	1-phase	CA68926-001
	3-phase	CA55830-001
Braking resistor (external)	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
Mains filter	1-phase	CB09937-001
	3-phase	CB09940-001
G394-020		
Mains choke	3-phase	CA55830-001
Braking resistor (external)	35 W, 260 Ω	CB36903-001
	150 W, 260 Ω	CB36904-001
Mains filter	3-phase	CB09940-001

TECHNICAL DATA

Parameters size C3

Type G394-035

Ordering number	G394-059	G394-035
Output, motor side		
Voltage	3-phase U_{Mains}	
Rated current, effective (I_N)	5.9 A[1)]	3.5 A[1) 2)]
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/16 kHz	
Input, mains side		
Mains voltage (U_{Mains})	(1 x 230 V_{AC}/3 x 230 V_{AC}) -20 %/+15 %	(3 x 400 V_{AC}/3 x 460 V_{AC}/ 3 x 480 V_{AC}) ±10 %
Device connected load (with mains choke)	2.6 kVA	2.7 kVA
Current consumption (with mains choke)	10.6 A (1 x 230 V_{AC})/ 6.5 A (3 x 230 V_{AC})	3.9 A[2)]
Asymetry of mains voltage	±3 % maximum (at 3 x 230 V_{AC})	±3 % maximum
Frequency	50/60 Hz ±10 %	
Power loss at 8 kHz and I_N	150 W	80 W[2)]
DC link		
DC link capacity	1,320 µF	330 µF
Brake chopper switch-on threshold	390 V_{DC}	650 V_{DC}[2)]
Minimum ohmic resistance of an externally installed braking resistor	72 Ω	180 Ω
Brake chopper peak with external braking resistor	2.1 kW	2.3 kW
Optional: Internal braking resistor	100 Ω	420 Ω
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application	
Brake chopper peak with internal braking resistor	1,500 W	1,000 W[2)]
Servo Drive	**G394-059**	**G394-035**
Cooling method	Air-cooled	
Protection	IP10 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	1.5 kg (3.3 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting	

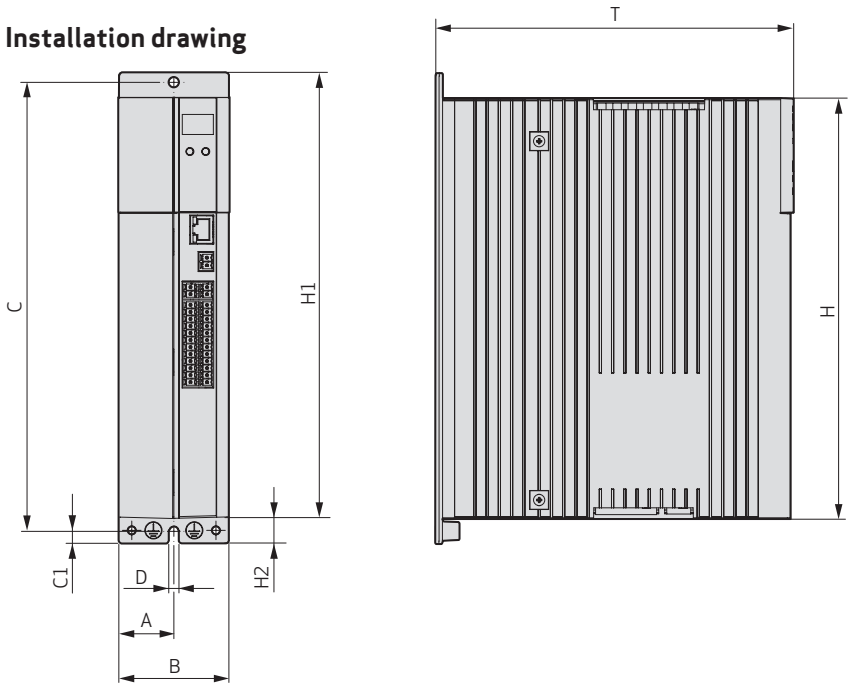
1) Data refered to 4 kHz and 8 kHz switching frequency

2) Data referred to 400 V_{AC} mains voltage

TECHNICAL DATA

Parameters size C3

Installation drawing



Dimensions	[mm (in)]
A	27.5 (1.08)
B (width)	55 (2.17)
C	225 (8.86)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height)	210 (8.27)
H1	235 (9.25)
H2	12.5 (0.49)
T (depth) (without terminals)	189 (7.44)

Accessories C3

Part name	Description	Part number
G394-059		
Mains choke	1-phase	CA68926-001
	3-phase	CA55832-001
Braking resistor (external)	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
	1,000 W, 90 Ω	CA59740-001
Mains filter	1-phase	CB09938-001
	3-phase	CB09942-001
G394-035		
Mains choke	3-phase	CA55831-001
Braking resistor (external)	35 W, 200 Ω	CB09047-001
	150 W, 200 Ω	CB09048-001
	300 W, 200 Ω	CB09049-001
Mains filter	3-phase	CB09940-001

TECHNICAL DATA

Parameters size C4

Type G394-065

Ordering number	G394-080	G394-065
Output, motor side		
Voltage	3-phase U_{Mains}	
Rated current, effective (I_N)	8 A[1)]	6.5 A[1) 2)]
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/16 kHz	
Input, mains side		
Mains voltage (U_{Mains})	(1 x 230 V_{AC}/3 x 230 V_{AC}) -20 %/+15 %	(3 x 400 V_{AC}/3 x 460 V_{AC}/ 3 x 480 V_{AC}) ±10 %
Device connected load (with mains choke)	3.5 kVA	5.0 kVA
Current consumption (with mains choke)	14.4 A (1 x 230 V_{AC})/ 8.8 A (3 x 230 V_{AC})	7.2 A
Asymetry of mains voltage	±3 % maximum (at 3 x 230 V_{AC})	±3 % maximum
Frequency	50/60 Hz ±10 %	
Power loss at 8 kHz and I_N	200 W	150 W
DC link		
DC link capacity	1.760 µF	440 µF
Brake chopper switch-on threshold	390 V_{DC}	650 V_{DC}[2)]
Minimum ohmic resistance of an externally installed braking resistor	72 Ω	
Brake chopper peak with external braking resistor	2.1 kW	5.9 kW
Optional: Internal braking resistor	90 Ω	
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application	
Brake chopper peak with internal braking resistor	1,700 W	4,700 W[2)]
Servo Drive	**G394-080**	**G394-065**
Cooling method	Air-cooled	
Protection	IP20 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	2.8 kg (6.2 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting	

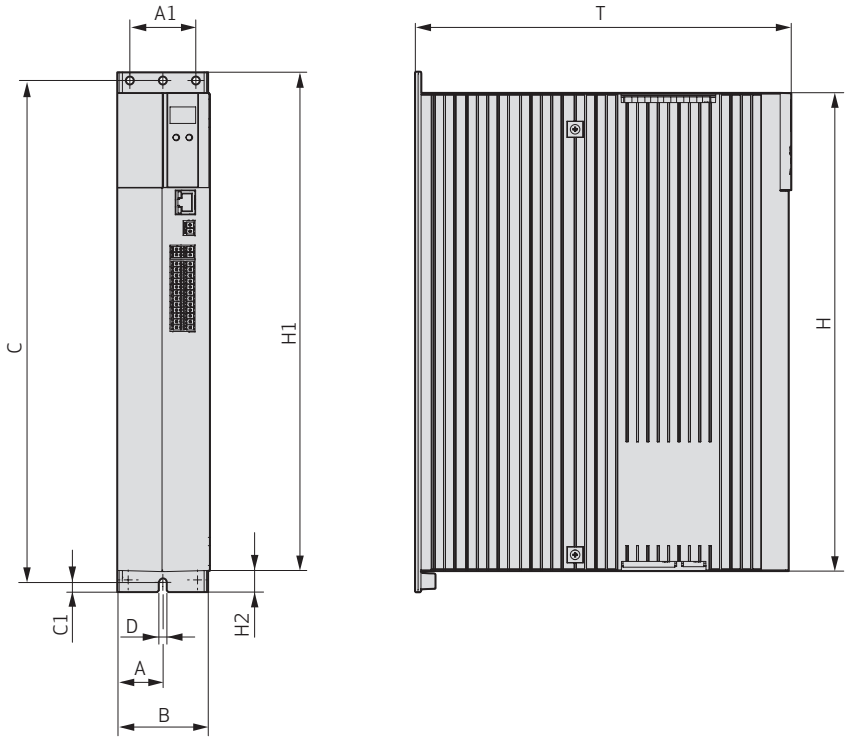
1) Data refered to 4 kHz and 8 kHz switching frequency

2) Data referred to 400 V_{AC} mains voltage

TECHNICAL DATA

Parameters size C4

Installation drawing



Dimensions	[mm (in)]
A	27.5 (1.08)
A1	40 (1.57)
B (width)	55 (2.17)
C	305 (12.01)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height)	290 (11.42)
H1	315 (12.4)
H2	12.5 (0.49)
T (depth) (without terminals)	235.5 (9.27)

Accessories C4

Part name	Description	Part number
G394-080		
Mains choke	1-phase	CA68926-001
Mains filter	1-phase	CB09939-001
G394-065/ G394-080		
Mains choke	3-phase	CA55832-001
Braking resistor (external)	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
	1,000 W, 90 Ω	CA59740-001
Mains filter	3-phase	CB09942-001

TECHNICAL DATA

Parameters size C5

Type G394-160

Ordering number	**G394-120**	**G394-160**
Output, motor side		
Voltage	3-phase U_{Mains}	
Rated current, effective (I_N)	12 A[1)]	16 A[1)]
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/16 kHz	
Input, mains side		
Mains voltage (U_{Mains})	(3 x 400 V_{AC}/3 x 460 V_{AC}/3 x 480 V_{AC}) ±10 %	
Device connected load (with mains choke)	9.1 kVA	12.2 kVA
Current consumption (with mains choke)	13.2 A	17.6 A
Asymetry of mains voltage	±3 % maximum	
Frequency	50/60 Hz ±10 %	
Power loss at 8 kHz and I_N	263 W[1) 2)]	316 W[1) 2)]
DC link		
DC link capacity	680 µF	1,120 µF
Brake chopper switch-on threshold	650 V_{DC}[2)]	
Minimum ohmic resistance of an externally installed braking resistor	35 Ω	25 Ω
Brake chopper peak with external braking resistor	12.1 kW[2)]	16.9 kW[2)]
Internal braking resistor	90 Ω	
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application	
Brake chopper peak with internal braking resistor	4,700 W[2)]	
Servo Drive	**G394-120**	**G394-160**
Cooling method	Air-cooled	
Protection	IP10 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	5.5 kg (12.1 lb)	5.9 kg (13 lb)
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct end-to-end mounting	

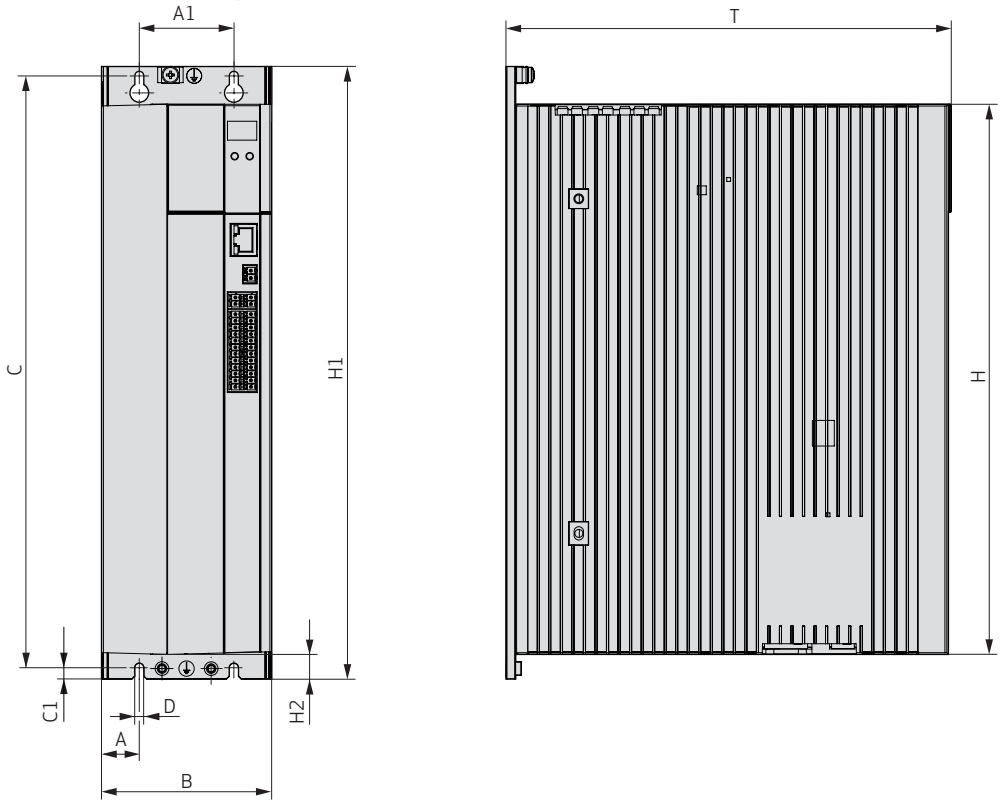
1) Data refered to 8 kHz switching frequency

2) Data refered to 400 V_{AC} mains voltage

TECHNICAL DATA

Parameters size C5

Installation drawing



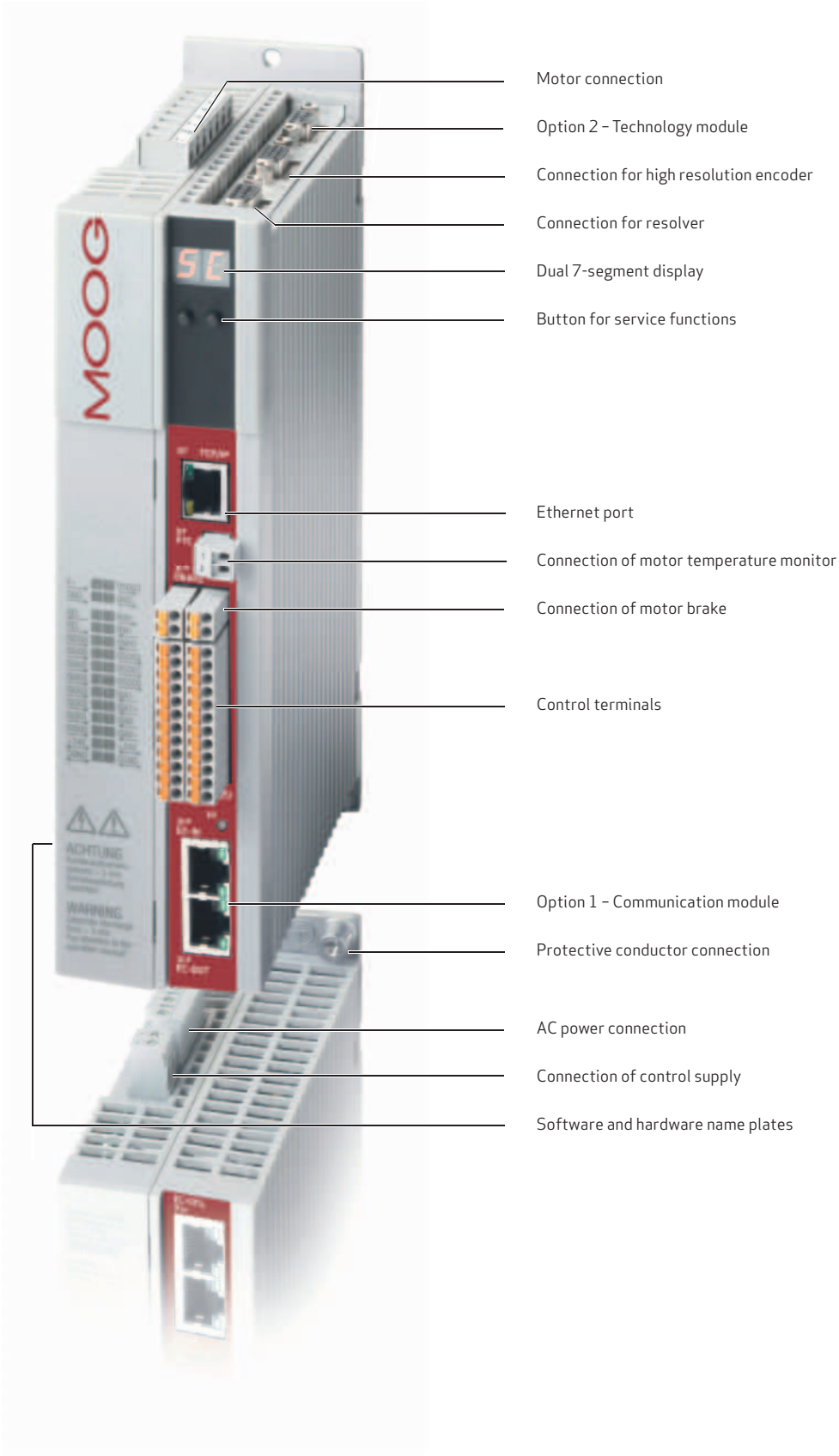
Dimensions	[mm (in)]
A	20 (0.79)
A1	50 (1.97)
B (width)	90 (3.54)
C	313 (12.32)
C1	6 (0.24)
D (ø)	4.8 (0.19)
H (height)	291 (11.46)
H1	324 (12.76)
H2	13 (0.51)
T (depth) (without terminals)	235.5 (9.27)

Accessories C5

Part name	Description	Part number
G394-120		
Mains choke	3-phase	CA55833-001
G394-160		
Mains choke	3-phase	CA55834-001
G394-120/G394-160		
Braking resistor (external)	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
	1,000 W, 90 Ω	CA59740-001
Mains filter	3-phase	CA71186-001

TECHNICAL DATA

Equipment



CURRENT CAPACITY

The rated current of the Single-Axis Compact, overcurrent (200 % rated current) and the maximum peak current (300 % rated current) are dependent on the mains voltage, the motor cable length, the power stage switching frequency and the ambient temperature. If the conditions change, the maximum permissible current capacity of the servo drives also changes.

Sizes C2 to C4 for 1 x 230 V

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current I_N [A_{eff}]	Overload capacity			
				Overcurrent		Peak current	
				[A_{eff}]	For time [s]	[A_{eff}]	For time [s]
G394-030 C2	4	+45 (+113)	3	6	10 [2]	9	0.08 [2]
	8	+40 (+104)				6 (9) [1]	0.08 [2]
	16		2	4		4 (9) [1]	0.08 [2]
G394-059 C3	4	+45 (+113)	5.9	11.8		[3]	
	8	+40 (+104)					
	16						
G394-080 C4	4	+45 (+113)	8	16			
	8	+40 (+104)					
	16		5.4	10.8			

Sizes C2 to C4 for 3 x 230 V

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current I_N [A_{eff}]	Overload capacity			
				Overcurrent		Peak current	
				[A_{eff}]	For time [s]	[A_{eff}]	For time [s]
G394-030 C2	4	+45 (+113)	3	6	10	9	0.08 [2]
	8	+40 (+104)				6 (9) [1]	
	16		2	4		4 (9) [1]	
G394-059 C3	4	+45 (+113)	5.9	11.8		17.7	
	8	+40 (+104)				11.8 (17.7) [1]	
	16						
G394-080 C4	4	+45 (+113)	8	16		24	
	8	+40 (+104)				16 (24) [1]	
	16		5.4	10.8		10.8 (24) [1]	

1) With activation of the function "Automatic power stage switching frequency change to 4 kHz"
2) Shutdown as per I^2t characteristic
3) Operation at this operating point is not possible

Note: Data apply for a motor cable length of ≤10 m (32.80 ft). Maximum permissible motor cable length 30 m (98 ft). All current ratings with recommended mains choke.

CURRENT CAPACITY

Sizes C2 to C5 for 3 x 400 V

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current I_N [A_{eff}]	Overload capacity			
				Overcurrent		Peak current	
				[A_{eff}]	For time [s]	[A_{eff}]	For time [s]
G394-020 C2	4	+45 (+113)	2	4	10[2]	6	0.08[2]
	8	+40 (+104)				4 (6)[1]	
	16		0.7	1.4		1.4 (6)[1]	
G394-035 C3	4	+45 (+113)	5.5	7.1		10.5	
	8	+40 (+104)	3.5	7		7 (10.5)[1]	
	16		2.9	5.8		5.8 (10.5)[1]	
G394-065 C4	4	+45 (+113)	8.5	13		19.5	
	8	+40 (+104)	6.5			13 (19.5)[1]	
	16		4	8		8 (19.5)[1]	
G394-120 C5	4		13	26	10[2]	39	0.1[2]
	8		12	24		28.8 (39)[1]	
	16		10.5	15.8		16.8 (39)[1]	
G394-160 C5	4		20	40		60	
	8		16	32		33.6 (60)[1]	
	16		9	14.4		15.3 (60)[1]	

1) With activation of the function "Automatic power stage switching frequency change to 4 kHz"

2) Shutdown as per I^2t characteristic

Note: Data apply for a motor cable length of ≤10 m (32.80 ft). Maximum permissible motor cable length 30 m (98 ft).
All current ratings with recommended mains choke.

CURRENT CAPACITY

Sizes C2 to C5 for 3 x 460 V

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current I_N [A_{eff}]	Overload capacity			
				Overcurrent		Peak current	
				[A_{eff}]	For time [s]	[A_{eff}]	For time [s]
G394-020 C2	4	+45 (+113)	2	4	10[2]	6	0.08[2]
	8	+40 (+104)				4 (6)[1]	
	16		0.7	1.4		1.4 (6)[1]	
G394-035 C3	4	+45 (+113)	4.8	6.2		9.2	
	8	+40 (+104)	3.5			6.2 (9.2)[1]	
	16		2.2	4.4		4.4 (9.2)[1]	
G394-065 C4	4	+45 (+113)	7.4	11.8		17	
	8	+40 (+104)	6.5			11.8 (17)[1]	
	16		2.4	4.8		4.8 (17)[1]	
G394-120 C5	4		11.5	23		34.5	0.1[2]
	8		10.5	21		25.2 (34.5)[1]	
	16		8	12		12,8 (34.5)[1]	
G394-160 C5	4		20	40		60	
	8		15	30		31.5 (60)[1]	
	16		6.5	10.4		11 (60)[1]	

1) With activation of the function "Automatic power stage switching frequency change to 4 kHz"

2) Shutdown as per I^2t characteristic

Note: Data apply for a motor cable length of ≤10 m (32.80 ft). Maximum permissible motor cable length 30 m (98 ft).
All current ratings with recommended mains choke.

CURRENT CAPACITY

Sizes C2 to C5 for 3 x 480 V

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current I_N [A_{eff}]	Overload capacity			
				Overcurrent		Peak current	
				[A_{eff}]	For time [s]	[A_{eff}]	For time [s]
G394-020 C2	4	+45 (+113)	2	4	10[2]	6	0.08[2]
	8	+40 (+104)	1.7	3.4		3.4 (6)[1]	
	16		[3]			[3]	
G394-035 C3	4	+45 (+113)	4.6	6		8.8	
	8	+40 (+104)	2.6	5.2		5.2 (8.8)[1]	
	16		[3]			[3]	
G394-065 C4	4	+45 (+113)	7	10.7		16	
	8	+40 (+104)	6.5				
	16		1.9	3.8		3.8 (16)[1]	
G394-120 C5	4		11	22		33	0.1[2]
	8		10	20		24 (33)[1]	
	16		7.5	11.3		12 (33)[1]	
G394-160 C5	4		20	40		60	
	8		14	28		29.4 (60)[1]	
	16		6	9.6		10.2 (60)[1]	

1) With activation of the function "Automatic power stage switching frequency change to 4 kHz"

2) Shutdown as per I^2t characteristic

3) Operation at this operating point is not possible

Note: Data apply for a motor cable length of ≤10 m (32.80 ft). Maximum permissible motor cable length 30 m (98 ft).
All current ratings with recommended mains choke.

AMBIENT CONDITIONS

Ambient conditions			
Protection	C4 IP20 except terminals (IP00), C2/C3/C5 IP10 except terminals (IP00)		
Accident prevention regulations	According to local regulations (in Germany e.g. BGV A3)		
Type of installation height	Up to 1,000 m (3,280 ft) above MSL, over 1,000 m (3,280 ft) above MSL with power reduction (1 % per 100 m (328 ft), maximum 2,000 m (6,500 ft) above MSL)		
Pollution severity	2		
Type of installation	Built-in unit, only for vertical installation in a switch cabinet with minimum IP4x protection, when using STO safety function minimum IP54		
Climatic conditions			
In transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2K3[1)]		
Temperature	-25 to +70 °C (-13 to +158 °F)		
Relativ air humidity at maximum + 40 °C (+104 °F)	95 %		
In storage			
According to	IEC/EN 61800-2, IEC/EN 60721-3-1 class 1K3 and 1K4[2)]		
Temperature	-25 to +55 °C (-13 to +131 °F)		
Relative air humidity	5 to 95 %		
In operation			
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3K3[3)]		
Temperature	-10 to +45 °C (+14 to +113 °F) 4 kHz		
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)		
	-10 to +40 °C (+14 to +104 °F) 8/16 kHz		
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)		
Relative air humidity without condensation	5 to 85 %		
Mechanical conditions			
Vibration limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	200 ≤ f < 500 Hz
Amplitude	3.5 mm (0.14 in)	Not applicable	
Acceleration	Not applicable	10 m/s² (394.70 in/s²)	15 m/s² (590.55 in/s²)
Shock limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
	Drop height of packed device maximum 0.25 m (9.84 in)		
Vibration limits of the system[4)]			
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	
Amplitude	0.3 mm (0.01 in)	Not applicable	
Acceleration	Not applicable	1 m/s² (39.37 in/s²)	

1) The absolute humidity is limited to maximum 60 g/m³. This means, at +70 °C (+158 °F) for example, that the relative humidity may only be maximum 40 %
2) The absolute humidity is limited to maximum 29 g/m³. So the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously
3) The absolute humidity is limited to maximum 25 g/m³. That means that the maximum values for temperature and relative air humidity stipulated in the table must not occursimultaneously
4) The devices are only designed for stationary use.

CERTIFICATIONS AND STANDARDS

CE mark

The Single-Axis Servo Drive Compact (sizes C2 to C5) conform to the requirements of the Low Voltage Directive 2014/35/EU and the product standard IEC/EN 61800-5-1.

They thus conform to the requirements for installation in a machine or plant under the terms of the Machinery Directive 2006/42/EC.

The servo drives are accordingly CE marked. The CE mark on the name plate indicates conformity with the above Directives.

EU Dual Use Regulation

To serve the Moog high pole Servo Motors and high performance applications the Moog Servo Drives produce output frequencies above 600 Hz. Therefore the Moog Servo Drives fall under the Council Regulation (EC) No 428/2009 Annex I No 3A225 and need an export license for shipments outside the European Community.

Note: Variants with output frequency limited to maximum 599 Hz are available on request.

UL/UR approval

The devices have the following approval:

MSD Servo Drive Compact	Approval
G394-030-xxx-xx1	UL Recognized
G394-059-xxx-xx1	UL Listed
G394-080-xxx-xx1	UL Listed
G394-020-xxx-xx1	UL Recognized
G394-035-xxx-xx1	UL Listed
G394-065-xxx-xx1	UL Listed
G394-120-xxx-xx1	UL Listed
G394-160-xxx-xx1	UL Listed

For details see document "UL-Certification" CC36842-001.

EMC acceptance tests

Sizes C2 to C5 are by design resistant to interference in accordance with IEC/EN 61800-3, environment classes 1 and 2.

To limit conducted interference emission to the permissible level, external mains filters are available (see section “Accessories”). The use of these mains filters ensures compliance with the EMC Directive 2014/30/EU:

- Public low-voltage network:
  “first environment” (residential C2) up to 10 m (32.8 ft) motor cable length
- Industrial low-voltage network:
  “second environment “(industrial C3) up to 30 m (98.4 ft) motor cable length

STO acceptance

The “STO” (Safe Torque Off) safety function integrated into the Single-Axis Compact is certified according to the following requirements of:

- IEC/EN 61800-5-2
- EN ISO 13849-1 ”PL e”
- IEC/EN 61508/IEC/EN 62061 ”SIL 3“

Acceptance testing is carried out by the accredited certification agency, TÜV Rheinland.

ORDERING INFORMATION

Model number (assigned at the factory) **Type designation**

		1			2	3	4	5	6	7		
G394	-				-							

1	Rated current/maximum current
020	2.0/6.0 A Size C2 - 400 V 3-[2]
030	3.0/9.0 A Size C2 - 230 V 3- 1-[1] [2]
035	3.5/10.5 A Size C3 - 400 V 3-
059	5.9/17.7 A Size C3 - 230 V 3- 1-[1]
065	6.5/19.5 A Size C4 - 400 V 3-
080	8.0/24.0 A Size C4 - 230 V 3- 1-[1]
120	12.0/36.0 A Size C5 - 400 V 3-
160	16.0/48.0 A Size C5 - 400 V 3-

3	Option 1 - Communication module
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS
4	SERCOS II
6	SERCOS III
8	PROFINET

4	Option 2 - Technology module
0	None
1	Second Sin/Cos encoder
2	TTL encoder simulation/TTL master encoder
4	TwinSync communication
5	TTL encoder with commutation signal
8	HIPERFACE DSL consult factory

5	Functional safety
0	Standard
1	Safety (for future use)

6	Option 4 - Function package
-	Standard
P	With PLC

7	Variant sequential numbering
001	Standard (air-cooled)
002	Internal brake resistor (not size C2)
003	Conformal coating
004	Internal brake resistor & conformal coating (not size C2)

1) Single phase with derating
2) A braking resistor is always integrated; connection of an external resistor is permissible

SINGLE-AXIS SERVO DRIVE OVERVIEW

Designed for the Present and the Future

The Single-Axis Servo Drive closes current loops (switching frequencies 4, 8, 12 and 16 kHz). It is also able to close velocity and position control loops.

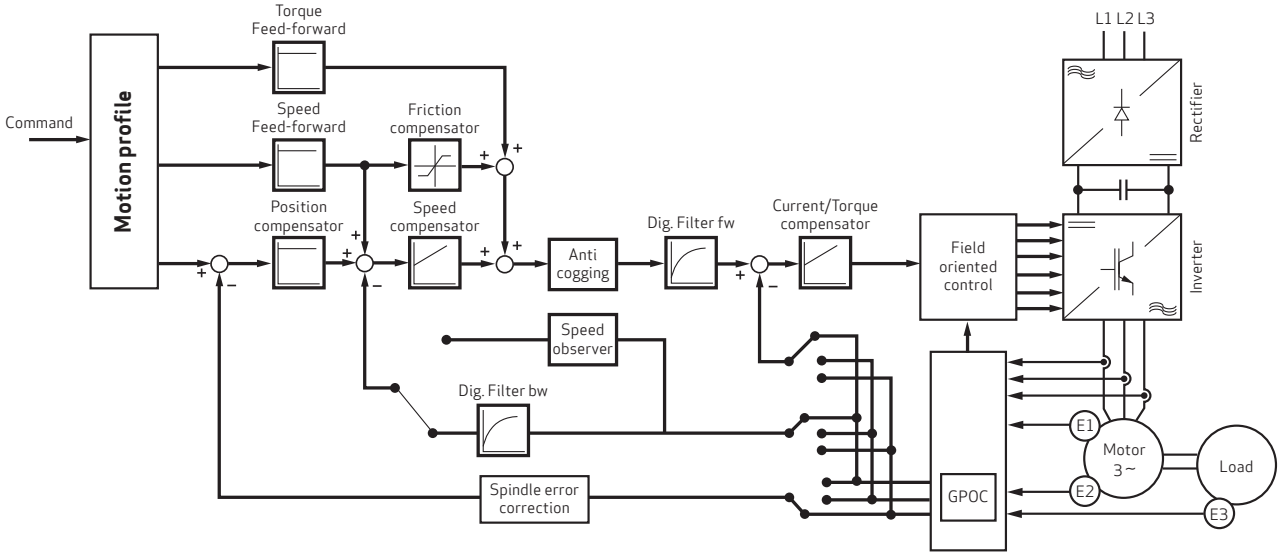
For high-performance control loops, high update rates are supported: The Single-Axis Servo Drive operates at cycle times of 62.5 µs for current and 125 µs for velocity and position control loops.

Currently, 8 mechanical sizes, based on output power, are available, ranging from 4 up to 170 A_{rms} with air cooling. Between 16 and 450 A_{rms} the servo drives are available as liquid-cooled devices.

It supports feedback sensors such as Resolver, EnDat encoder or Hiperface encoder as standard. Application specific feedback sensors are possible on request.

Features

- Standard cascaded servo loop control structure including current/torque, velocity and position control
- Feed forward structure for higher response time and reduced tracking error
- Compensation of friction and cogging torque
- Compensation of mechanic spindle errors for both directions
- Support for field weakening for asynchronous and synchronous AC motors
- Availability of observer methods (current and velocity observers) which can be switched on, on demand for improving the server loop performance
- Patented method GPOC (Gain Phase Offset Correction): Correlation technique to compensate encoder and resolver errors
- Servo drives from 4 to 450 A_{rms}
  Supply with the classic AC Mains connection
- Evaluation by up to 3 position sensors. For precise positioning even in systems with backlash and other mechanical errors
- Built in functional safety according to IEC/EN 61508, IEC/EN 62061, EN ISO 13849-1, IEC/EN 61800-5-2, personnel safety directly into the servo drive



TECHNICAL DATA

Sizes 1 to 7

System voltage 1 x 230 V

Ordering number	Size	Rated current [A]
G392-004A	Size 1	4

System voltage 3 x 400 V

Ordering number		Size	Rated current [A]	
Air-cooled	Liquid-cooled		Air-cooled	Liquid-cooled
G392-004	-	Size 1	4	-
G392-006			6	
G392-008		Size 2	8	
G392-012			12	
G392-016	G395-016	Size 3	16	
G392-020	G395-020		20	
G392-024	G395-024	Size 4	24	
G392-032	G395-032		32	
G392-045	G395-053	Size 5	45	53
G392-060	G395-070		60	70
G392-072	G395-084		72	84
G392-090	G395-110	Size 6	90	110
G392-110	G395-143		110	143
G392-143	G395-170	Size 6A	143	170
G392-170	G395-210		170	210
-	G395-250	Size 7	-	250
	G395-325			325
	G395-450			450

TECHNICAL DATA

Parameters size 1

Type G392-004

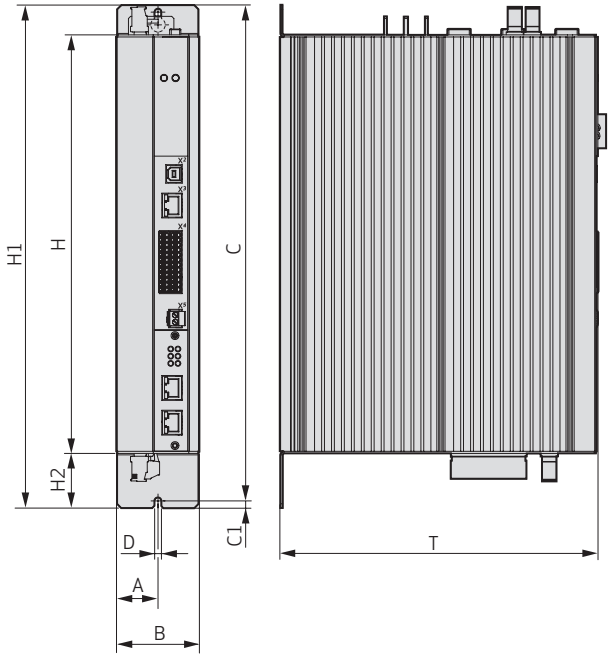
Ordering number	G392-004A	G392-004	G392-006
Output, motor side			
Voltage	1-phase U_{Mains}	3-phase U_{Mains}	
Rated current, effective (I_N)[1]	4 A	4 A[2]	6 A[2]
Rotating field frequency	0 to 400 Hz		
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)		
Input, mains side			
Mains voltage (U_{Mains})	1 x 230 V ±10 %	(3 x 230 V/3 x 400 V/ 3 x 460 V/3 x 480 V) ±10 %	
Device connected load (with mains choke)	2.2 kVA	2.9 kVA[2]	4.4 kVA[2]
Current consumption (with mains choke)	9.5 A[3]	4.2 A[2]	6.4 A[2]
Asymetry of mains voltage	-	±3 % maximum	
Frequency	50/60 Hz ±10 %		
Power loss at I_N[1]	85 W	96 W[2]	122 W[2]
DC link			
DC link capacity	1,740 µF	400 µF	
Brake chopper switch-on threshold	390 V_{DC}	650 V_{DC}[2]	
Minimum ohmic resistance of an externally installed braking resistor	72 Ω[4]		
Brake chopper peak with external braking resistor	2.1 kW	5.9 kW	
Optional: Internal braking resistor	PTC (175 Ω)		
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application		
Brake chopper peak with internal braking resistor	1.7 kW	4.7 kW	
Servo Drive	**G392-004A**	**G392-004**	**G392-006**
Cooling method	Air-cooled	Air-cooled	
Protection	IP20 except terminals (IP00)		
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)		
Weight	3.4 kg (7.5 lb)		
Mounting type	Vertical mounting with unhindered air flow		
Mounting several servo drives	Direct side by side mounting		

1) Data referred to 8 kHz switching frequency
2) Data referred to 3 x 400 V_{AC} mains voltage
3) Without mains choke
4) Connection of an external braking resistor for device variant with internal braking resistor (G392-xxx-xxx-x02/x04) not permitted

TECHNICAL DATA

Parameters size 1

Installation drawing, Air-cooled



Dimensions	[mm (in)]
A	29.25 (1.15)
B (width)	58.5 (2.3)
C	344.5 (13.56)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height) (terminals)	295 (11.61)
H1	355 (13.98)
H2	38.5 (1.52)
T (depth) (terminals)	224 (8.82)

Accessories Size 1

Part name	Description	Part number
G392-004A		
Mains choke	1-phase	CA68926-001
G392-004		
Mains choke	3-phase	CA55830-001
G392-006		
Mains choke	3-phase	CA55831-001
G392-004A/G392-004/G392-006		
Braking resistor	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
	1,000 W, 90 Ω	CA59740-001
G392-004/G392-006		
Mains filter	3-phase	CA71184-001

TECHNICAL DATA

Parameters size 2

Type G392-008

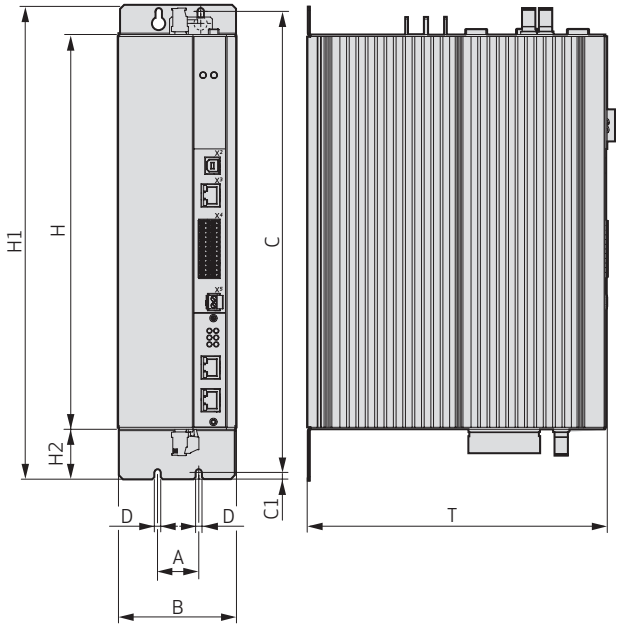
Ordering number	**G392-008**	**G392-012**
Output, motor side		
Voltage	3-phase U_{Mains}	
Rated current, effective (I_N)[1)]	8 A	12 A
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)	
Input, mains side		
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/3 x 480) ±10 %	
Device connected load (with mains choke)[1)]	6 kVA	9.1 kVA
Current consumption (with mains choke)[1)]	8.7 A	13.1 A
Asymetry of mains voltage	±3 % maximum	
Frequency	50/60 Hz ±10 %	
Power loss at I_N[1)]	175 W	240 W
DC link		
DC link capacity	725 µF	
Brake chopper switch-on threshold[1)]	650 V_{DC}	
Minimum ohmic resistance of an externally installed braking resistor[2)]	39 Ω	
Brake chopper peak with external braking resistor	11 kW	
Optional: Internal braking resistor	90 Ω	
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application	
Brake chopper peak with internal braking resistor[1)]	4.7 kW	
Servo Drive	**G392-008**	**G392-012**
Cooling method	Air-cooled	
Protection	IP10 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	4.9 kg (10.8 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting	

1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency
2) Connection of an external braking resistor for device variant with internal braking resistor (G392-xxx -xxx-x02/x04 not permitted

TECHNICAL DATA

Parameters size 2

Installation drawing, Air-cooled



Dimensions	[mm (in)]
A	50 (1.97)
B (width)	90 (3.54)
C	344.5 (13.56)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height) (without terminals)	295 (11.61)
H1	355 (13.98)
H2	38.5 (1.52)
T (depth) (without terminals)	224 (8.82)

Accessories Size 2

Part name	Description	Part number
G392-008		
Mains choke	3-phase	CA55832-001
G392-012		
Mains choke	3-phase	CA55833-001
G392-008/G392-012		
Braking resistor	35 W, 90 Ω	CA59737-001
	150 W, 90 Ω	CA59738-001
	300 W, 90 Ω	CA59739-001
	1,000 W, 90 Ω	CA59740-001
Mains filter	3-phase	CA71185-001

TECHNICAL DATA

Parameters size 3

Type G392-016

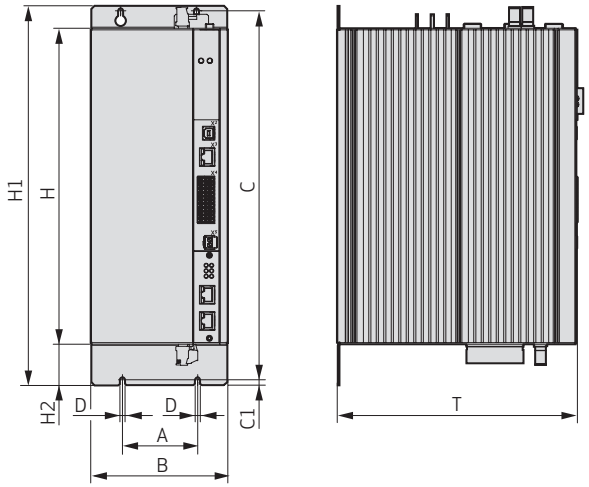
Ordering number	G392-016	G392-020	G395-016	G395-020
Output, motor side				
Voltage	3-phase U_{Mains}			
Rated current, effective (I_N)[1)]	16 A	20 A	16 A	20 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
Input, mains side				
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/3 x 480 V) ±10 %			
Device connected load (with mains choke)[1)]	12 kVA	15 kVA	12 kVA	15 kVA
Current consumption (with mains choke)[1)]	17.3 A	21.6 A	17.3 A	21.6 A
Asymetry of mains voltage	±3 % maximum			
Frequency	50/60 Hz ±10 %			
Power loss at I_N[1) 3)]	330 W	400 W	330 W	400 W
DC link				
DC link capacity	1,230 µF			
Brake chopper switch-on threshold[1)]	650 V_{DC}			
Minimum ohmic resistance of an externally installed braking resistor[2)]	20 Ω			
Brake chopper peak with external braking resistor	21 kW			
Optional: Internal braking resistor	90 Ω		–	
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application			
Brake chopper peak with internal braking resistor[1)]	4.7 kW			
Servo Drive	**G392-016**	**G392-020**	**G395-016**	**G395-020**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP10 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	6.5 kg (14.3 lb)			
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives	Direct side by side mounting			

1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency
2) Connection of an external braking resistor for device variant with internal braking resistor (G392-xxx-xxx-x02/x04 or G395-xxx-xxx-x02/x04) not permitted
3) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

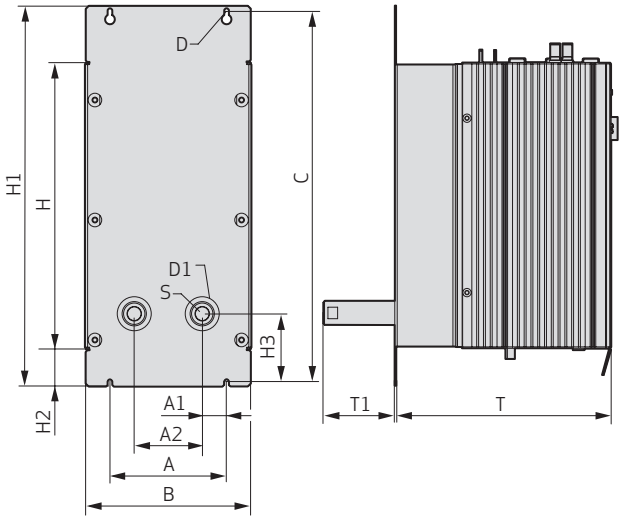
TECHNICAL DATA

Parameters size 3

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	80 (3.15)	
A1		10 (0.39)
A2		60 (2.36)
B (width)	130 (5.12)	
C	344.5 (13.56)	382 (15.04)
C1	5 (0.2)	
D (ø)	4.8 (0.19)	
D1 (ø hole for pipe socket)		48 (1.89)
H (height) (without terminals)	295 (11.61)	
H1	355 (13.98)	392 (15.43)
H2	38.5 (1.52)	
H3		75 (2.95)
S (inside thread)		3/8"
T (depth) (without terminals)	224 (8.82)	
T1		74 (2.91)

Accessories Size 3

Part name	Description	Part number
G392-016/G395-016		
Mains choke	3-phase	CA55834-001
Mains filter		CA71185-001
G392-020/G395-020		
Mains choke	3-phase	CA55835-001
Mains filter		CA71186-001
G392-016/G395-016/G392-020/G395-020		
Braking resistor	35 W, 26 Ω	CA59741-001
	150 W, 26 Ω	CA59742-001
	300 W, 26 Ω	CA59743-001
	1,000 W, 26 Ω	CA59744-001

TECHNICAL DATA

Parameters size 4

Type G392-024

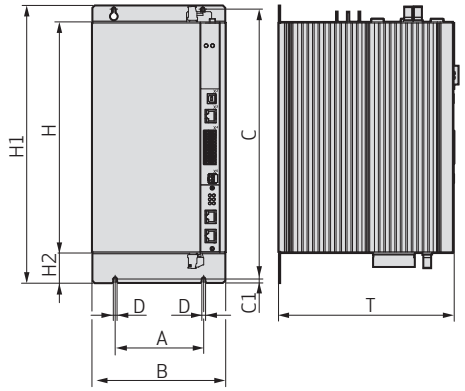
Ordering number	G392-024	G392-032	G395-024	G395-032
Output, motor side				
Voltage	3-phase U_{Mains}			
Rated current, effective (I_N)[1)]	24 A	32 A	24 A	32 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
Input, mains side				
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/3 x 480 V) ±10 %			
Device connected load (with mains choke)[1)]	18.2 kVA	24.2 kVA	18.2 kVA	24.2 kVA
Current consumption (with mains choke)[1)]	26.2 A	34.9 A	26.2 A	34.9 A
Asymetry of mains voltage	±3 % maximum			
Frequency	50/60 Hz ±10 %			
Power loss at I_N[1) 3)]	475 W	515 W	475 W	515 W
DC link				
DC link capacity	2,000 µF			
Brake chopper switch-on threshold[1)]	650 V_{DC}			
Minimum ohmic resistance of an externally installed braking resistor[2)]	12 Ω			
Brake chopper peak with external braking resistor	35 kW			
Optional: Internal braking resistor	90 Ω		–	
Brake chopper continuous power with internal braking resistor	Dependent on the effective loading of the servo drive in the corresponding application			
Brake chopper peak with internal braking resistor[1)]	4.7 kW			
Servo Drive	**G392-024**	**G392-032**	**G395-024**	**G395-032**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP10 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	7.5 kg (16.5 lb)			
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives	Direct side by side mounting			

1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency
2) Connection of an external braking resistor for device variant with internal braking resistor (G392-xxx-xxx-x02/x04 or G395-xxx-xxx-x02/x04) not permitted
3) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

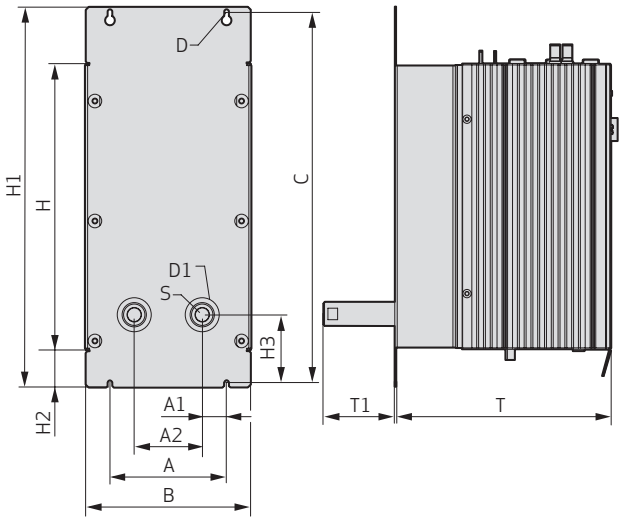
TECHNICAL DATA

Parameters size 4

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	120 (4.72)	
A1		25 (0.98)
A2		70 (2.76)
B (width)	171 (6.73)	
C	344.5 (13.56)	382 (15.04)
C1	5 (0.2)	
D (ø)	4.8 (0.19)	
D1 (ø hole for pipe socket)		48 (1.89)
H (height) (without terminals)	295 (11.61)	
H1	355 (13.98)	392 (15.43)
H2	38.5 (1.52)	
H3		70 (2.76)
S (inside thread)		3/8"
T (depth) (without terminals)	224 (8.82)	
T1		74 (2.91)

Accessories Size 4

Part name	Description	Part number
G392-024/G395-024		
Mains choke	3-phase	CA55835-001
G392-032/G395-032		
Mains choke	3-phase	CA55836-001
G392-024/G395-024/G392-032/G395-032		
Braking resistor	35 W, 26 Ω	CA59741-001
	150 W, 26 Ω	CA59742-001
	300 W, 26 Ω	CA59743-001
	1,000 W, 26 Ω	CA59744-001
Mains filter	3-phase	CA71186-001

TECHNICAL DATA

Parameters size 5

Type G392-045

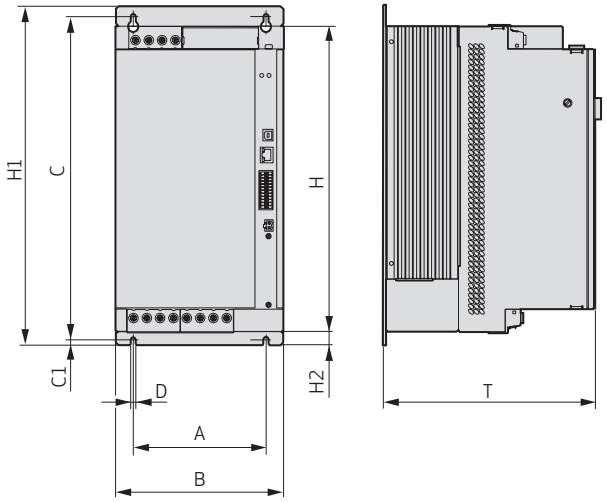
Ordering number	G392-045	G392-060	G392-072	G395-053	G395-070	G395-084
Output, motor side						
Voltage	3-phase U_{Mains}					
Rated current, effective (I_N)[1)]	45 A	60 A	72 A	53 A	70 A	84 A
Rotating field frequency	0 to 400 Hz					
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)					
Input, mains side						
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460/3 x 480 V) ±10 %					
Device connected load (with mains choke)[1)]	31.2 kVA	41.0 kVA	50 kVA	36.7 kVA	48.5 kVA	52.6 kVA[2)]
Current consumption (with mains choke)[1)]	45 A	60 A	72 A	53 A	70 A	76 A[2)]
Asymetry of mains voltage	±3 % maximum					
Frequency	50/60 Hz ±10 %					
Power loss at I_N[1) 3)]	610 W	830 W	1,010 W	690 W	930 W	1,130 W
DC link						
DC link capacity	430 µF	900 µF		430 µF	900 µF	
Brake chopper switch-on threshold	820 V_{DC}					
Minimum ohmic resistance of an externally installed braking resistor	18 Ω		13 Ω	10 Ω		
Brake chopper peak with external braking resistor	37 kW		52 kW	67 kW		
Optional: Internal braking resistor	-			20 Ω	10 Ω	
Brake chopper continuous power with internal braking resistor	-			675 W	1,350 W	
Brake chopper peak with internal braking resistor	-			34 kW	67 kW	
Servo Drive	**G392-045**	**G392-060**	**G392-072**	**G395-053**	**G395-070**	**G395-084**
Cooling method	Air-cooled			Liquid-cooled		
Protection	IP10 except terminals (IP00)					
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)					
Weight	13 kg (28.7 lb)			16.5 kg (36.4 lb)		
Mounting type	Vertical mounting with unhindered air flow					
Mounting several servo drives possible at a distance of	20 mm (0.79 in)			2 mm (0.08 in)		

1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency
2) D_N input current must be limited to maximum 76 A
3) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

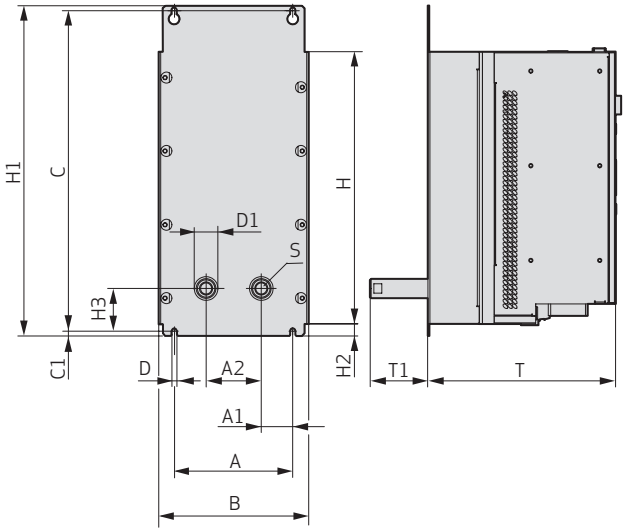
TECHNICAL DATA

Parameters size 5

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	150 (5.91)	148 (5.83)
A1		39 (1.54)
A2		70 (2.76)
B (width)	190 (7.48)	
C	365 (14.37)	378 (14.88)
C1	6 (0.24)	8 (0.31)
D (ø)	5.6 (0.22)	7 (0.28)
D1 (ø hole for pipe socket)		48 (1.89)
H (height) (without terminals)	345 (13.58)	
H1	382.5 (15.06)	394 (15.51)
H2	15 (0.59)	16.5 (0.65)
H3		53.5 (2.11)
S (inside thread)		3/8"
T (depth) (without terminals)	238 (9.37)	198 (7.79)
T1		74 (2.91)

TECHNICAL DATA

Parameters size 5

Accessories Size 5

Part name	Description	Part number
G392-045		
Mains choke	3-phase	CA55837-001
G395-053/G392-060		
Mains choke	3-phase	CA55838-001
G395-070/G392-072		
Mains choke	3-phase	CA55839-001
G395-084		
Mains choke	3-phase	CA55840-001
G392-045/G395-053/G392-060		
Mains filter	3-phase	CA71187-001
G395-070/G392-072/G395-084		
Mains filter	3-phase	CA71188-001
G395-053/G395-070/G392-072/G395-084		
Braking resistor	300 W, 15 Ω	CB36902-001
G392-045/G395-053/G392-060/G395-070/G392-072/G395-084		
Braking resistor	35 W, 26 Ω	CA59741-001
	150 W, 26 Ω	CA59742-001
	300 W, 26 Ω	CA59743-001
	1,000 W, 26 Ω	CA59744-001
	2,000 W, 26 Ω	CB09050-001
	300 W, 20 Ω	CB36901-001

TECHNICAL DATA

Parameters size 6

Type G392-110

Ordering number	G392-090	G392-110	G395-110	G395-143
Output, motor side				
Voltage	3-phase U_{Mains}			
Rated current, effective (I_N)[1)]	90 A	110 A		143 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
Input, mains side				
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/3 x 480 V) -15 %/+10 %			
Device connected load (with mains choke)[1)]	62 kVA	76 kVA		99 kVA
Current consumption (with mains choke)[1)]	90 A	110 A		143 A
Asymetry of mains voltage	±3 % maximum			
Frequency	50/60 Hz ±10 %			
Power loss at I_N[1) 2)]	1,300 W	1,600 W	1,500 W	1,940 W
DC link				
DC link capacity	1,060 µF	2,120 µF		
Brake chopper switch-on threshold	820 V_{DC}			
Minimum ohmic resistance of an externally installed braking resistor	12 Ω	10 Ω	12 Ω	10 Ω
Brake chopper peak with external braking resistor	56 kW	67 kW	56 kW	67 kW
Optional: Internal braking resistor	-		7.5 Ω	
Brake chopper continuous power with internal braking resistor	-		2,650 W	
Brake chopper peak with internal braking resistor	-		90 kW	
Servo Drive	**G392-090**	**G392-110**	**G395-110**	**G395-143**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP20 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	28 kg (61.7 lb)		31.5 kg (69.5 lb)	
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives possible at a distance of	40 mm (1.57 in)		2 mm (0.08 in)	

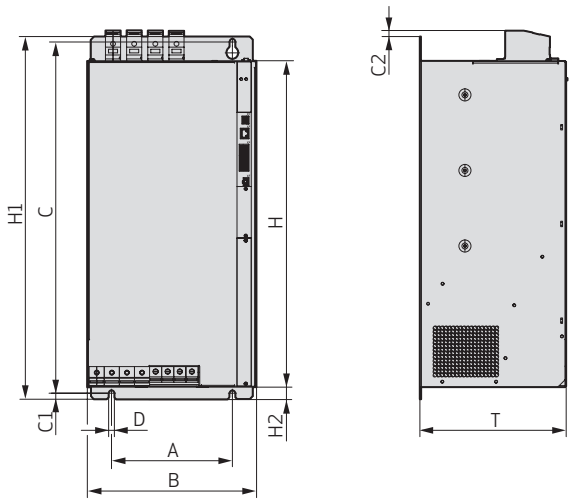
1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency

2) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

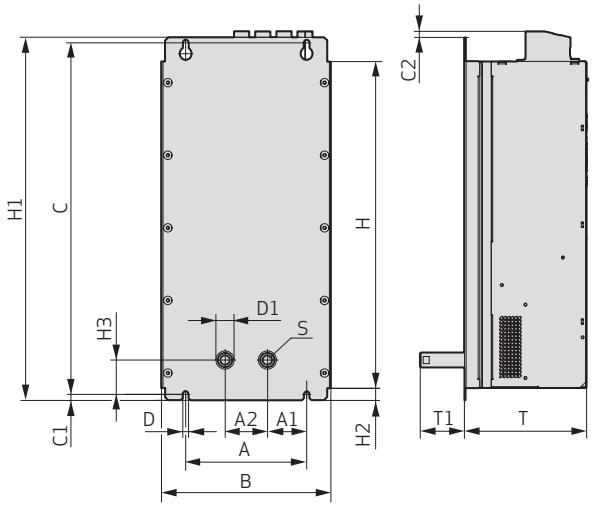
TECHNICAL DATA

Parameters size 6

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	200 (7.87)	
A1		65 (2.56)
A2		70 (2.76)
B (width)	280 (11.02)	
C	581 (22.87)	
C1	10 (0.39)	
C2		
D (ø)	9.5 (0.37)	
D1 (ø hole for pipe socket)		48 (1.89)
H (height) (without terminals)	540 (21.26)	
H1	600 (23.62)	
H2	20 (0.79)	
H3		56.5 (2.22)
S (inside thread)		3/8"
T (depth) (without terminals)	242 (9.53)	202 (7.95)
T1		74 (2.91)

TECHNICAL DATA

Parameters size 6

Accessories Size 6

Part name	Description	Part number
G392-090		
Mains choke	3-phase	CA55840-001
Mains filter		CA71188-001
G395-110/G392-110		
Mains choke	3-phase	CA55841-001
G395-143		
Mains choke	3-phase	CA55842-001
G395-110/G392-110/G395-143		
Mains filter	3-phase	CA71189-001
G392-090/G395-110/G392-110/G395-143		
Braking resistor	35 W, 26 Ω	CA59741-001
	150 W, 26 Ω	CA59742-001
	300 W, 26 Ω	CA59743-001
	1,000 W, 26 Ω	CA59744-001
	2,000 W, 26 Ω	CB09050-001
	300 W, 20 Ω	CB36901-001
	300 W, 15 Ω	CB36902-001

TECHNICAL DATA

Parameters size 6A

Type G392-170

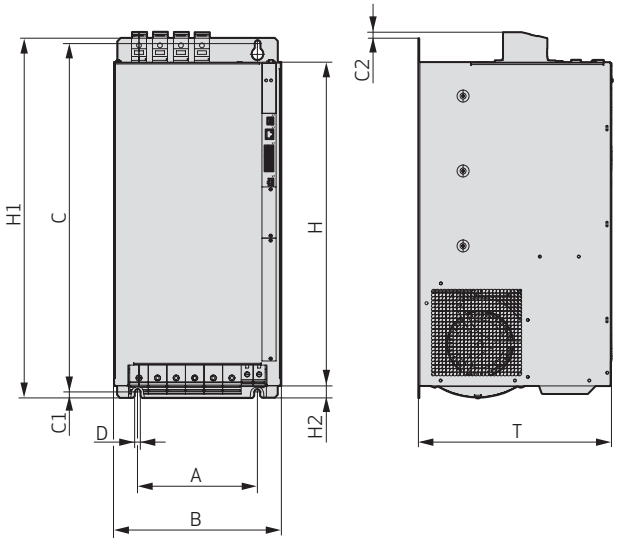
Ordering number	**G392-143**	**G392-170**	**G395-170**	**G395-210**
Output, motor side				
Voltage	3-phase U_{Mains}			
Rated current, effective (I_N)[1)]	143 A	170 A		210 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
Input, mains side				
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/3 x 480 V) -15 %/+10 %			
Device connected load (with mains choke)[1)]	99 kVA	118 kVA		128 kVA[2)]
Current consumption (with mains choke)[1)]	143 A	170 A		185 A
Asymetry of mains voltage	±3 % maximum			
Frequency	50/60 Hz ±10 %			
Power loss at I_N[1) 3)]	2,100 W	2,500 W	2,380 W	2,650 W[2)]
DC link				
DC link capacity	3,180 µF	4,240 µF		
Brake chopper switch-on threshold	820 V_{DC}			
Minimum ohmic resistance of an externally installed braking resistor	8.5 Ω	6.5 Ω	8.5 Ω	6.5 Ω
Brake chopper peak with external braking resistor	79 kW	103 kW	79 kW	103 kW
Optional: Internal braking resistor	-		5 Ω	
Brake chopper continuous power with internal braking resistor	-		4,000 W	
Brake chopper peak with internal braking resistor	-		135 kW	
Servo Drive	**G392-143**	**G392-170**	**G395-170**	**G395-210**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP20 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	32 kg (70.6 lb)		41.1 kg (90.6 lb)	
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives possible at a distance of	40 mm (1.57 in)		2 mm (0.08 in)	

1) Data referred to mains voltage 3 x 400 V_{AC} and 8 kHz switching frequency
2) The input current must be limited to maximum 185 A
3) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

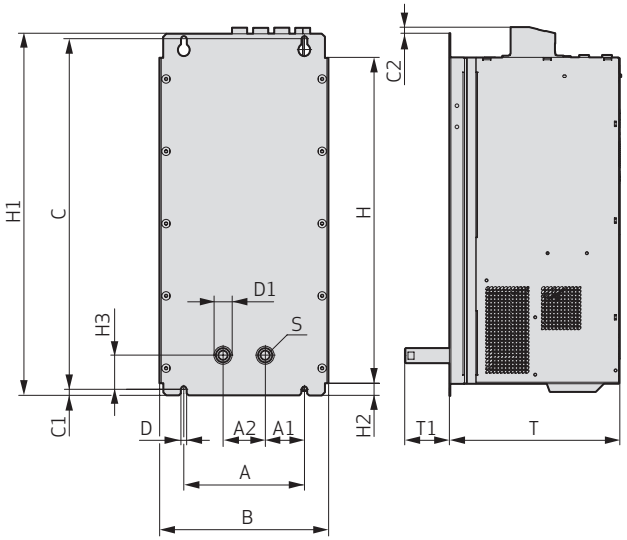
TECHNICAL DATA

Parameters size 6A

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	200 (7.87)	
A1		65 (2.56)
A2		70 (2.76)
B (width)	280 (11.02)	
C	581 (22.87)	
C1	10 (0.39)	
C2		
D (ø)	9.5 (0.37)	
D1 (ø hole for pipe socket)		48 (1.89)
H (height) (without terminals)	540 (21.26)	
H1	600 (23.62)	
H2	20 (0.79)	
H3		56.5 (2.22)
S (inside thread)		3/8"
T (depth) (without terminals)	322 (12.68)	282 (11.1)
T1		74 (2.91)

TECHNICAL DATA

Parameters size 6A

Accessories Size 6A

Part name	Description	Part number
G392-143		
Mains choke	3-phase	CA55842-001
Mains filter		CA71189-001
G395-170/G392-170		
Mains choke	3-phase	CA55843-001
Mains filter		CA71190-001
G395-210		
Mains choke	3-phase	CB09045-001
Mains filter		CB09932-001
G392-143/G395-170/G392-170/G395-210		
Braking resistor	35 W, 26 Ω	CA59741-001
	150 W, 26 Ω	CA59742-001
	300 W, 26 Ω	CA59743-001
	1,000 W, 26 Ω	CA59744-001
	2,000 W, 26 Ω	CB09050-001
	300 W, 20 Ω	CB36901-001
	300 W, 15 Ω	CB36902-001

TECHNICAL DATA

Parameters size 7

Type G395-250

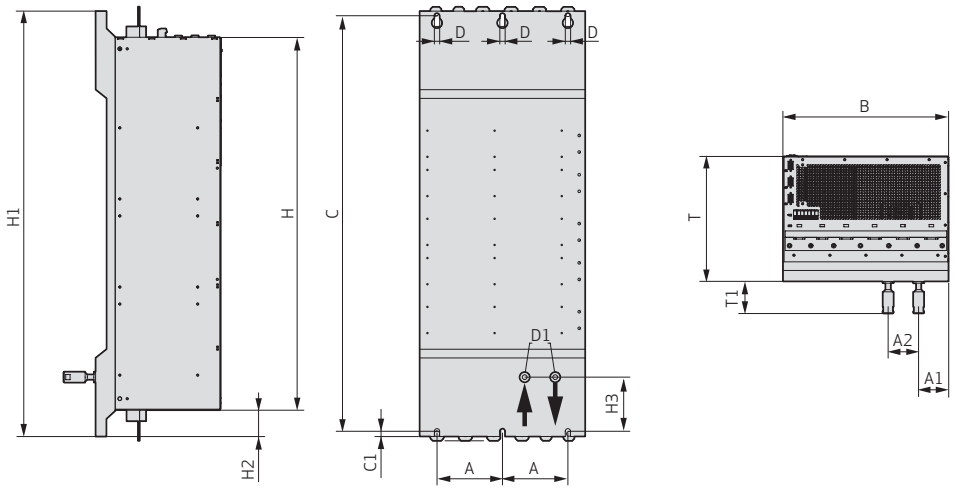
Ordering number	G395-250	G395-325	G395-450
Output, motor side			
Voltage	3-phase U_{Mains}		
Rated current, effective (I_N)[1)]	250 A	325 A	450 A
Rotating field frequency	0 to 400 Hz		
Switching frequency of power stage	2/4 kHz (factory setting 2 kHz at +40 °C (+104 °F))		
Input, mains side			
Mains voltage (U_{Mains})	(3 x 230 V/3 x 400 V/3 x 460 V/ 3 x 480 V) ±10 %		
Device connected load (with mains choke)[1)]	173 kVA	225 kVA	310 kVA
Current consumption (with mains choke)[1)]	250 A	325 A	450 A
Asymetry of mains voltage	±3 % maximum		
Frequency	50/60 Hz ±10 %		
Power loss at I_N[1) 2)]	3,960 W	4,800 W	6,750 W
DC link			
DC link capacity	3,600 µF	5,400 µF	7,200 µF
Brake chopper switch-on threshold	820 V_{DC}		
Minimum ohmic resistance of an externally installed braking resistor	3.2 Ω	2.5 Ω	1.7 Ω
Brake chopper peak with external braking resistor	210 kW	269 kW	395 kW
Optional: Internal braking resistor	3.3 Ω		2.4 Ω
Brake chopper continuous power with internal braking resistor	5,000 W		6,800 W
Brake chopper peak with internal braking resistor	204 kW		280 kW
Servo Drive	**G395-250**	**G395-325**	**G395-450**
Cooling method	Liquid-cooled		
Protection	IP20 except terminals (IP00)		
Cooling air temperature maximum (not more than 10 K below the ambient temperature)	+40 °C (+104 °F)		
Weight	100 kg (220.5 lb)		
Mounting type	Vertical mounting		
Mounting several servo drives	Direct side by side mounting		

1) Data referred to mains voltage 3 x 400 V_{AC} and 2 kHz switching frequency
2) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller

TECHNICAL DATA

Parameters size 7

Installation drawing, Liquid-cooled



Dimensions	[mm (in)]
A	150 (5.91)
A1	29 (1.14)
A2	70 (2.76)
B (width)/(with shield plate)	380 (14.96)/385 (15.16)
C	952 (37.48)
C1	14 (0.55)
D (ø)	12 (0.47)
D1 (ø hole for pipe socket)	48 (1.89)
H (height)/(with terminal cover)/(with shield plates)	952 (37.48)/1,171 (46.1)/1,315 (51.77)
H1	979 (38.54)
H2	62 (2.44)
H3	124 (4.88)
S (inside thread)	3/8"
T (depth) (without terminals)	287 (11.3)
T1	74 (2.91)

TECHNICAL DATA

Parameters size 7

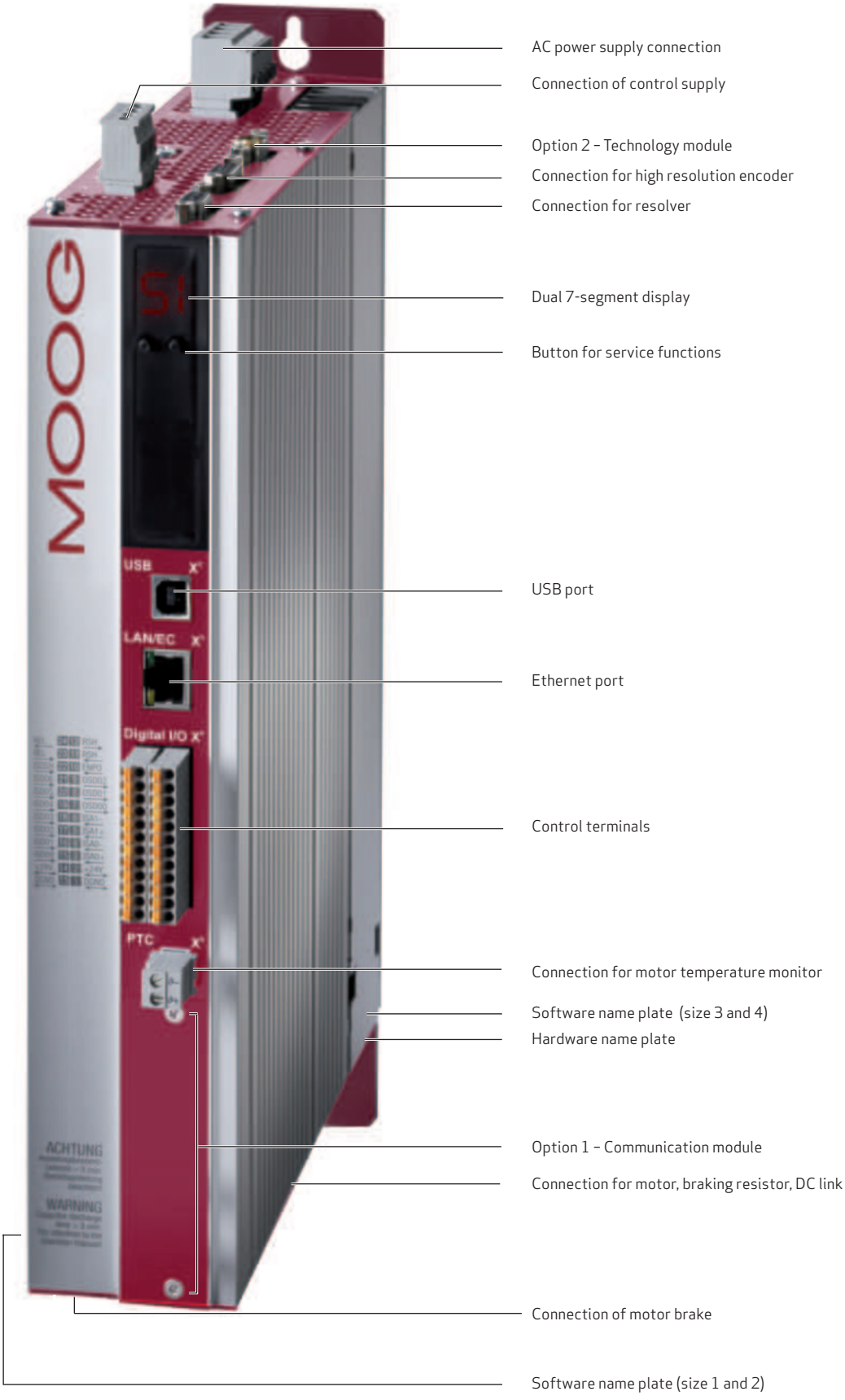
Accessories Size 7

Part name	Description	Part number
G395-250		
Mains choke	3-phase	CA96898-001
Mains filter		CB09933-001
G395-325		
Mains choke	3-phase	CA96899-001
Mains filter		CB09934-001[1)]
		CB09935-001[1)]
G395-450		
Mains choke	3-phase	CA96900-001
Mains filter		CB09935-001[1)]
		CB09936-001[1)]
G395-250/G395-325/G395-450		
Braking resistor	1,000 W, 26 Ω	CA59744-001
	2,000 W, 26 Ω	CB09050-001
	300 W, 20 Ω	CB36901-001
	300 W, 15 Ω	CB36902-001

1) Depends on the effective power

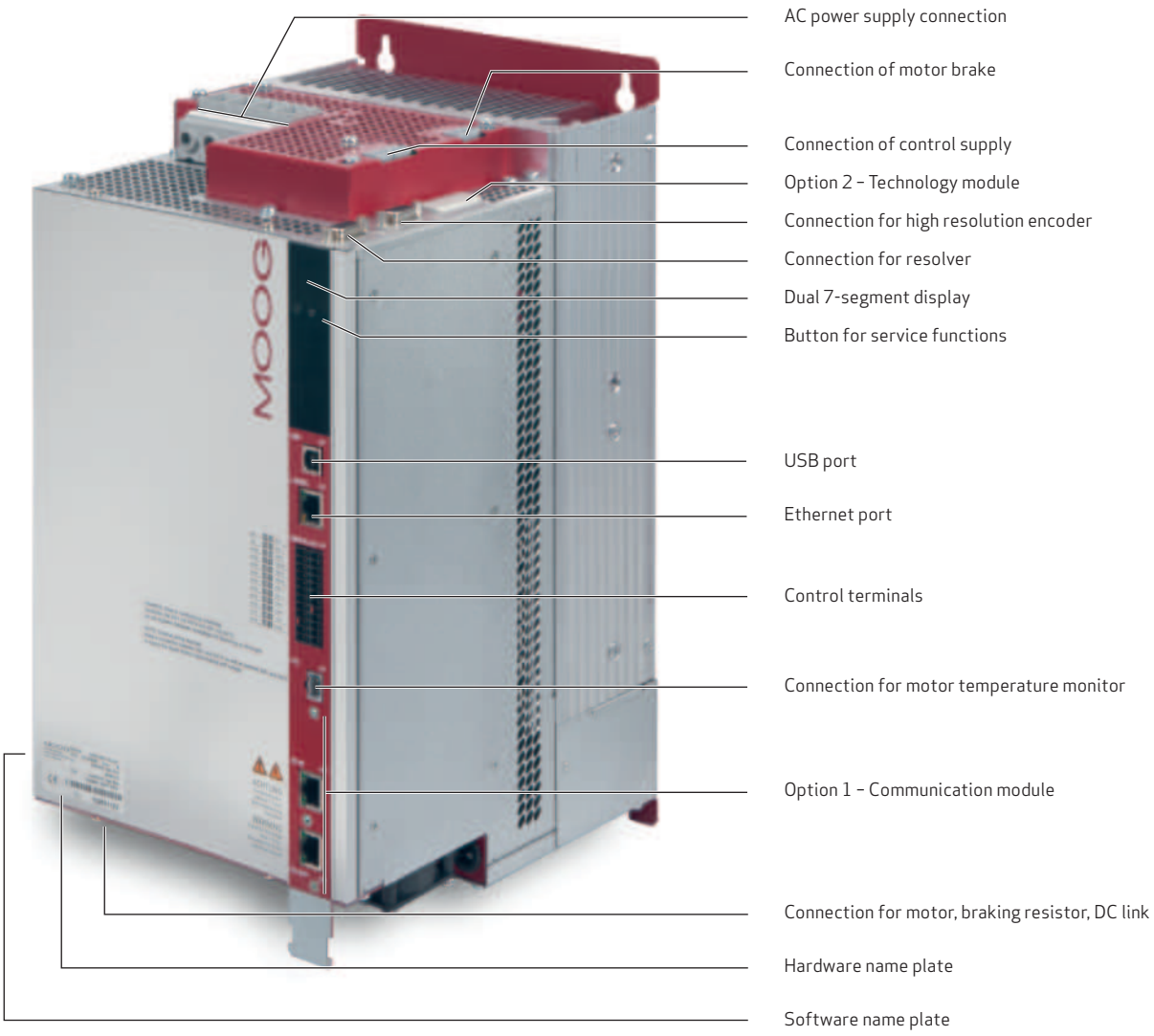
TECHNICAL DATA

Equipment – Sizes 1 to 4 – Interface



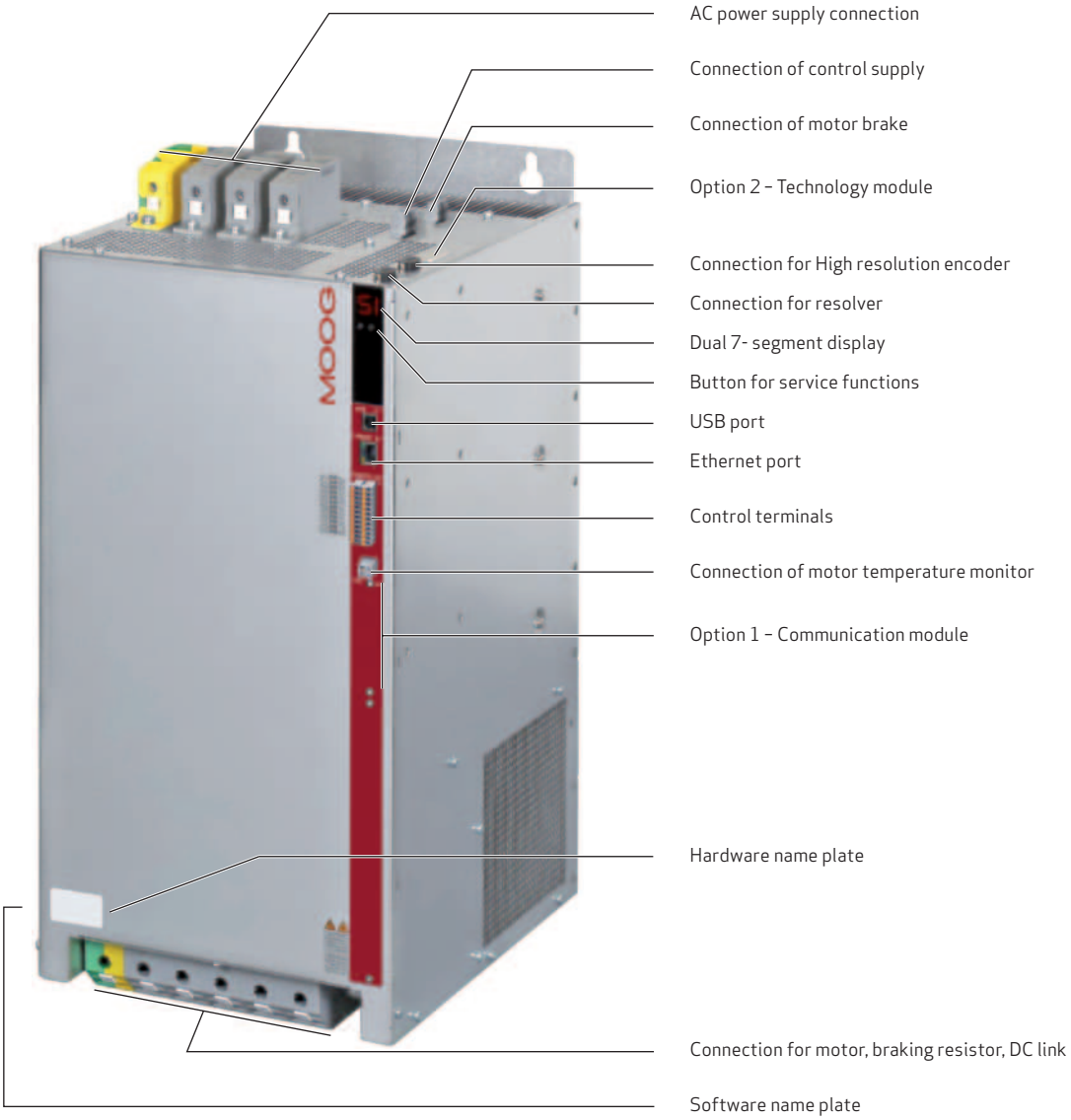
TECHNICAL DATA

Equipment – Size 5 – Interface



TECHNICAL DATA

Equipment – Sizes 6 and 6A – Interface



TECHNICAL DATA

Equipment – Size 7 – Interface

CURRENT CAPACITY

The maximum permissible servo drive rated current and peak current are dependent on the mains voltage, the motor cable length, the power stage switching frequency and the ambient temperature. If the conditions change, the maximum permissible current capacity of the servo drives also changes.

Size 1
Air-cooled, 1 x 230 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}]			
				At rotating field frequency increasing linearly		For intermittent operation	For time
	[kHz]	[°C (°F)]	I_N [A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G392-004A Size 1	4	+45 (+113)	4	8			10
	8	+40 (+104)					
	12		3.7	7.4			
	16		2.7	5.4			

1) Shutdown according to I^2t characteristic

Note: Data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 400 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}] During intermittent operation > 5Hz	For time [s][1]
G392-004 Size 1	4	+45 (+113)[2]	4	8			10
	8	+40 (+104)					
	12		3.7	7.4			
	16		2.7	5.4			
G392-006 Size 1	4	+45 (+113)[2]	6	12			
	8	+40 (+104)					
	12		5.5	11			
	16		4	8			
G392-008 Size 2	4	+45 (+113)	8	16			
	8	+40 (+104)					
	12		6.7	13.4			
	16		5	10			
G392-012 Size 2	4	+45 (+113)	12	24			
	8	+40 (+104)					
	12		10	20			
	16		7.6	15.2			
G392-016 Size 3	4	+45 (+113)	16	32			
	8	+40 (+104)					
	12		11	22			
	16		8	16			
G392-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)					
	12		13.8	27.6			
	16		10	20			
G392-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)					
	12		15.8	31.6			
	16		11.3	22.6			
G392-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)					
	12		21	42			
	16		15	30			

1) Shutdown according to I^2t characteristic

2) For G392 Size 1-Safety only approved up to +40 °C (+104 °F).

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 460 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}] During intermittent operation > 5Hz	For time [s][1]
G392-004 Size 1	4	+45 (+113)[2]	4	8			10
	8	+40 (+104)					
	12		2.9	5.8			
	16		1.6	3.2			
G392-006 Size 1	4	+45 (+113)[2]	6	12			
	8	+40 (+104)					
	12		4.4	8.8			
	16		2.4	4.8			
G392-008 Size 2	4	+45 (+113)	8	16			
	8	+40 (+104)	7.2	14.4			
	12		5.3	10.6			
	16		3.7	7.4			
G392-012 Size 2	4	+45 (+113)	12	24			
	8	+40 (+104)	10.8	21.6			
	12		8	16			
	16		5.6	11.2			
G392-016 Size 3	4	+45 (+113)	16	32			
	8	+40 (+104)	13.9	27.8			
	12		8.8	17.6			
	16		5.9	11.8			
G392-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)	17.4	34.8			
	12		11	22			
	16		7.4	14.8			
G392-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)	21	42			
	12		12.4	24.8			
	16		9.2	18.4			
G392-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)	28	56			
	12		16.5	33			
	16		12.2	24.4			

1) Shutdown according to I^2t characteristic.

2) For G392 Size 1-Safety only approved up to +40 °C (+104 °F).

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 480 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}] During intermittent operation > 5Hz	For time [s][1]
G392-004 Size 1	4	+45 (+113)[2]	4	8			10
	8	+40 (+104)					
	12		2.7	5.4			
	16		1.3	2.6			
G392-006 Size 1	4	+45 (+113)[2]	6	12			
	8	+40 (+104)					
	12		4	8			
	16		1.9	3.8			
G392-008 Size 2	4	+45 (+113)	8	16			
	8	+40 (+104)	6.9	13.8			
	12		4.9	9.8			
	16		3.3	6.6			
G392-012 Size 2	4	+45 (+113)	12	24			
	8	+40 (+104)	10.4	20.8			
	12		7.4	14.8			
	16		5	10			
G392-016 Size 3	4	+45 (+113)	16	32			
	8	+40 (+104)	13.3	26.6			
	12		8	16			
	16		5.2	10.4			
G392-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)	16.6	33.2			
	12		10	20			
	16		6.5	13			
G392-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)	20	40			
	12		11.3	22.6			
	16		8.4	16.8			
G392-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)	26.7	53.4			
	12		15	30			
	16		11.2	22.4			

1) Shutdown according to I^2t characteristic.

2) For G392 Size 1-Safety only approved up to +40 °C (+104 °F).

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Air-cooled, 400 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G392-045 Size 5	4	+45 (+113)	45	90			3/10[3]
	8	+40 (+104)					
	12[4]						
	16[4]		42	84			
G392-060 Size 5	4	+45 (+113)	60	120			
	8	+40 (+104)					
	12[4]		58	116			
	16[4]		42	84			
G392-072 Size 5	4	+45 (+113)	72	144			
	8	+40 (+104)					
	12[4]		58	116			
	16[4]		42	84			
G392-090 Size 6	4	+45 (+113)	90	170	180		30
	8	+40 (+104)		134			
	12			107	144		
	16		72	86	115		
G392-110 Size 6	4	+45 (+113)	110	170	220		
	8	+40 (+104)		134	165		
	12		90	107	144		
	16		72	86	115		
G392-143 Size 6A	4	+45 (+113)	143	191	286		
	8	+40 (+104)		152	215		
	12		115	122	173		
	16		92	98	138		
G392-170 Size 6A	4	+45 (+113)	170	191	323		10
	8	+40 (+104)		152	221		
	12		136	122	163		
	16		109	98	131		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) 10 s at heat sink temperature <+45 °C (+113 °F)
4) For G392 size 5-Safety only allowed up to 8 kHz

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Air-cooled, 460 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G392-045 Size 5	4	+45 (+113)	42	83	84		3/10[3]
	8	+40 (+104)					
	12[4]						
	16[4]		39	78	78		
G392-060 Size 5	4	+45 (+113)	56	111	112		
	8	+40 (+104)					
	12[4]		54	107	108		
	16[4]		39	78	78		
G392-072 Size 5	4	+45 (+113)	67	133	134		
	8	+40 (+104)					
	12[4]		54	107	108		
	16[4]		39	78	78		
G392-090 Size 6	4	+45 (+113)	83	157	166		30
	8	+40 (+104)		124			
	12			99	133		
	16		67	80	107		
G392-110 Size 6	4	+45 (+113)	102	157	204		
	8	+40 (+104)		124	153		
	12		83	99	133		
	16		67	80	107		
G392-143 Size 6A	4	+45 (+113)	132	176	264		
	8	+40 (+104)		140	198		
	12		106	112	159		
	16		85	91	128		
G392-170 Size 6A	4	+45 (+113)	157	176	298		10
	8	+40 (+104)		140	204		
	12		126	112	151		
	16		101	91	121		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) 10 s at heat sink temperature <+45 °C (+113 °F)
4) For G392 size 5-Safety only allowed up to 8 kHz

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Air-cooled, 480 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G392-045 Size 5	4	+45 (+113)	41	81	82		3/10[3]
	8	+40 (+104)					
	12[4]						
	16[4]		38	76	76		
G392-060 Size 5	4	+45 (+113)	54	108	108		
	8	+40 (+104)					
	12[4]		52	104	104		
	16[4]		38	76	76		
G392-072 Size 5	4	+45 (+113)	65	130	130		
	8	+40 (+104)					
	12[4]		52	104	104		
	16[4]		38	76	76		
G392-090 Size 6	4	+45 (+113)	81	153	162		30
	8	+40 (+104)		121			
	12			95	130		
	16		65	77	104		
G392-110 Size 6	4	+45 (+113)	99	153	198		
	8	+40 (+104)		121	149		
	12		81	95	130		
	16		65	77	104		
G392-143 Size 6A	4	+45 (+113)	129	170	258		
	8	+40 (+104)		136	194		
	12		104	109	156		
	16		83	87	125		
G392-170 Size 6A	4	+45 (+113)	153	170	291		10
	8	+40 (+104)		136	199		
	12		122	109	146		
	16		98	87	118		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) 10 s at heat sink temperature <+45 °C (+113 °F)
4) For G392 size 5-Safety only allowed up to 8 kHz

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 3 and 4
Liquid-cooled, 400 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
	[kHz]	[°C (°F)]	[A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G395-016 Size 3	4	+45 (+113)	16	32			10
	8	+40 (+104)					
	12		11	22			
	16		8	16			
G395-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)					
	12		13.8	27.6			
	16		10	20			
G395-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)					
	12		15.8	31.6			
	16		11.3	22.6			
G395-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)					
	12		21	42			
	16		15	30			

1) Shutdown according to I^2t characteristic

2) Permissible peak current at maximum 70 % initial load

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 3 and 4
Liquid-cooled, 460 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
	[kHz]	[°C (°F)]	[A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G395-016 Size 3	4	+45 (+113)	16	32			10
	8	+40 (+104)	13.9	27.8			
	12		8.8	17.6			
	16		5.9	11.8			
G395-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)	17.4	34.8			
	12		11	22			
	16		7.4	14.8			
G395-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)	21	42			
	12		12.4	24.8			
	16		9.2	18.4			
G395-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)	28	56			
	12		16.5	33			
	16		12.2	24.4			

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 3 and 4
Liquid-cooled, 480 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
	[kHz]	[°C (°F)]	[A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G395-016 Size 3	4	+45 (+113)	16	32			10
	8	+40 (+104)	13.3	26.6			
	12		8	16			
	16		5.2	10.4			
G395-020 Size 3	4	+45 (+113)	20	40			
	8	+40 (+104)	16.6	33.2			
	12		10	20			
	16		6.5	13			
G395-024 Size 4	4	+45 (+113)	24	48			
	8	+40 (+104)	20	40			
	12		11.3	22.6			
	16		8.4	16.8			
G395-032 Size 4	4	+45 (+113)	32	64			
	8	+40 (+104)	26.7	53.4			
	12		15	30			
	16		11.2	22.4			

1) Shutdown according to I^2t characteristic

2) Permissible peak current at maximum 70 % initial load

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Liquid-cooled, 400 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G395-053 Size 5	4	+45 (+113)	53	90			30
	8						
	12[3]						
	16[3]		49	83			
G395-070 Size 5	4		70	119			
	8						
	12[3]		68	116			
	16[3]		49	83			
G395-084 Size 5	4		84	143			
	8						
	12[3]		68	116			
	16[3]		49	83			
G395-110 Size 6	4		110	206	220		
	8			166	187		
	12			133	165		
	16		90	106	135		
G395-143 Size 6	4		143	232	286		
	8			192	215		
	12		114	153	171		
	16		91	123	137		
G395-170 Size 6A	4		170	232	340		10
	8			192	255		
	12		136	153	204		
	16		109	123	164		
G395-210 Size 6A	4		210	232	340		
	8			192	255		
	12		168	153	204		
	16		134	123	164		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) With integrated safety control only up to 8 kHz allowed

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Liquid-cooled, 460 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
	[kHz]	[°C (°F)]	[A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G395-053 Size 5	4	+45 (+113)	49	83			30
	8						
	12[3]						
	16[3]		45	77			
G395-070 Size 5	4		65	111			
	8						
	12[3]		63	107			
	16[3]		45	77			
G395-084 Size 5	4		78	133			
	8						
	12[3]		63	107			
	16[3]		45	77			
G395-110 Size 6	4		102	191	204		
	8			154	173		
	12			123	153		
	16		83	99	125		
G395-143 Size 6	4		132	214	264		
	8			177	198		
	12		105	142	158		
	16		84	114	126		
G395-170 Size 6A	4		157	214	314		10
	8			177	236		
	12		126	142	189		
	16		101	114	152		
G395-210 Size 6A	4		194	214	314		
	8			177	236		
	12		155	142	189		
	16		124	114	152		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) With integrated safety control only up to 8 kHz allowed

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 to 6A
Liquid-cooled, 480 V_{AC}

Ordering number Size	Switching frequency of power stage	Ambient temperature	Rated current	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
	[kHz]	[°C (°F)]	[A_{eff}]	0 Hz	5 Hz	> 5Hz	[s][1]
G395-053 Size 5	4	+45 (+113)	48	82			30
	8						
	12[3]						
	16[3]		44	75			
G395-070 Size 5	4		63	107			
	8						
	12[3]		61	104			
	16[3]		44	75			
G395-084 Size 5	4		76	129			
	8						
	12[3]		61	104			
	16[3]		44	75			
G395-110 Size 6	4		99	186	198		
	8			150	168		
	12			120	149		
	16		81	96	122		
G395-143 Size 6	4		129	208	258		
	8			172	194		
	12		103	138	155		
	16		82	111	123		
G395-170 Size 6A	4		153	208	306		10
	8			172	230		
	12		122	138	183		
	16		98	111	147		
G395-210 Size 6A	4		189	208	306		
	8			172	230		
	12		151	138	183		
	16		121	111	147		

1) Shutdown according to I^2t characteristic
2) Permissible peak current at maximum 70 % initial load
3) With integrated safety control only up to 8 kHz allowed

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Size 7 – Liquid-cooled, 400 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G395-250 Size 7	2	+40 (+104)	250	425			30
	4			375			
G395-325 Size 7	2		325	552			
	4			487			
G395-450 Size 7	2		450	765			
	4			675			

Size 7 – Liquid-cooled, 460 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G395-250 Size 7	2	+40 (+104)	231	393			30
	4			346			
G395-325 Size 7	2		300	511			
	4			451			
G395-450 Size 7	2		416	707			
	4			624			

Size 7 – Liquid-cooled, 480 V_{AC}

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][2]			
				At rotating field frequency increasing linearly		During intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][1]
G395-250 Size 7	2	+40 (+104)	225	383			30
	4			338			
G395-325 Size 7	2		293	498			
	4			440			
G395-450 Size 7	2		405	689			
	4			608			

1) Shutdown according to I^2t characteristic

2) Permissible peak current at maximum 70 % initial load

Note: All data apply for motor cable length ≤10 m (32.80 ft).

AMBIENT CONDITIONS

Ambient conditions	
Protection	Size 1/6/6A/7 IP20 except terminals (IP00), size 2/3/4/5 IP10 except terminals (IP00)
Accident prevention regulations	According to local regulations (in Germany e.g. BGV A3)
Type of installation height	Up to 1,000 m (3,280 ft) above MSL, above with power reduction (1 % per 100 m (328 ft), maximum 2,000 m (6,561 ft) above MSL).
Pollution severity	2
Type of installation	Built-in unit, only for vertical installation in a switch cabinet with minimum IP4x protection, when using STO safety function minimum IP54
Climatic conditions	
In transit	
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2K3[1)]
Temperature	-25 to +70 °C (-13 to +158 °F)
Relativ air humidity at maximum + 40 °C (+104 °F)	95 %
In storage	
According to	IEC/EN 61800-2, IEC/EN 60721-3-1 class 1K3 and 1K4[2)]
Temperature	-25 to +55 °C (-13 to +131 °F)
Relative air humidity	5 to 95 %
In operation	
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3K3[3)]
Temperature	**Air-cooled**
	Size 1
	-10 to +45 °C (+14 to +113 °F) 4 kHz
	-10 to +40 °C (+14 to +104 °F) 8/12/16 kHz
	Size 2 to 4
	-10 to +45 °C (+14 to +113 °F) 4 kHz
	Up to +55 °C (+131 °F) with power reduction (5 % per °C)
	-10 to +40 °C (+14 to +104 °F) 8/12/16 kHz
	Up to +55 °C (+131 °F) with power reduction (4 % per °C)
	Size 5 to 6A
	-10 to +45 °C (+14 to +113 °F) 4 kHz
	-10 to +40 °C (+14 to +104 °F) 8/12/16 kHz
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)

1) The absolute humidity is limited to maximum 60 g/m³
This means, at +70 °C (+158 °F) for example, that the relative humidity may only be maximum 40 %

2) The absolute humidity is limited to maximum 29 g/m³
So the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously

3) The absolute humidity is limited to maximum 25 g/m³
That means that the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously

AMBIENT CONDITIONS

Temperature	**Liquid-cooled**		
	Size 3 and 4		
	-10 to +45 °C (+14 to +113 °F) 4kHz		
	Up to +55 °C (+131 °F) with power reduction (5 % per °C)		
	-10 to +40 °C (+14 to +104 °F) 8/12/16kHz		
	Up to +55 °C (+131 °F) with power reduction (4 % per °C)		
	Size 5 to 6A		
	-10 to +45 °C (+14 to +113 °F) 4/8/12/16kHz		
	Up to +55 °C (+131 °F) with power reduction (2 % per °C/°F)		
	Size 7		
	-10 to +40 °C (+14 to +104 °F) 2/4kHz		
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)		
Relative air humidity without condensation	5 to 85 %		
Mechanical conditions			
Vibration limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	200 ≤ f < 500 Hz
Amplitude	3.5 mm (0.14 in)	Not applicable	
Acceleration	Not applicable	10 m/s² (393.70 in/s²)	15 m/s² (590.55 in/s²)
Shock limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
Shock limit in transit	Drop height of packed device maximum 0.25 m (9.84 in)		
Vibration limits of the system[1)]			
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	
Amplitude	0.3 mm (0.01 in)	Not applicable	
Acceleration	Not applicable	1 m/s² (39.37 in/s²)	

1) The devices are only designed for stationary use. The servo drives must not be installed in areas where they would be permanently exposed to vibrations

CERTIFICATIONS AND STANDARDS

CE mark

The Single-Axis Servo Drive conform to the requirements of the Low Voltage Directive 2014/35/EU and the product standard IEC/EN 61800-5-1.

They thus conform to the requirements for installation in a machine or plant under the terms of the Machinery Directive 2006/42/EC.

The servo drives are accordingly CE marked. The CE mark on the name plate indicates conformity with the above Directives.

EU Dual Use Regulation

To serve the Moog high pole Servo Motors and high performance applications the Moog Servo Drives produce output frequencies above 600 Hz. Therefore the Moog Servo Drives fall under the Council Regulation (EC) No 428/2009 Annex I No 3A225 and need an export license for shipments outside the European Community.

Note: Variants with output frequency limited to maximum 599 Hz are available on request.

UL approval

For the Single-Axis Servo Drive UL approval has been obtained.

For details see document "UL-Certification" CC36842-001.

Functional safety acceptances

See "FUNCTION PACKAGES"

EMC acceptance tests

All Single-Axis Servo Drive have an aluminium housing with an anodized finish (sizes 1 to 4) or an aluminium rear panel made of aluminized/galvanized sheet steel (sizes 5 to 7) to enhance interference immunity in accordance with IEC/EN 61800-3, environment classes 1 and 2.

To limit line-borne interference emission to the permissible level, the Single-Axis Servo Drive sizes 1 to 5 are fitted with integral mains filters. For Single-Axis Servo Drive sizes 6 to 7 external mains filters are available (see section “Accessories“). This ensures compliance with the EMC Directive 2014/30/EU:

- Public low voltage network:
  “first environment“ (residential C2) up to 10 m (32.80 ft) motor cable length
- Industrial low-voltage network:
  “second environment” (industrial C3) up to 25 m (82 ft) motor cable length

Additional external mains filters are available for all Single-Axis Servo Drive sizes 1 to 5 (see section “Accessories“).

STO-acceptance

The “STO“ (Safe Torque Off) safety function integrated into the Single-Axis Servo Drive is certified accordingto the requirements of:

- EN ISO 13849-1 “PL e“ and
- IEC/EN 61508/IEC/EN 62061 “SIL3“

Acceptance testing is carried out by the accredited certification agency, TÜV Rheinland.

ORDERING INFORMATION

Air-cooled

Model number (assigned at the factory) **Type designation**

	1		2	3	4	5	6	7	8
G392 -									

1	Rated current/maximum current (at 8kHz switching frequency)
004	4/8 A Size 1
006	6/12 A Size 1
008	8/16 A Size 2
012	12/24 A Size 2
016	16/32 A Size 3
020	20/40 A Size 3
024	24/48 A Size 4
032	32/64 A Size 4
045	45/90 A Size 5[1]
060	60/120 A Size 5[1]
072	72/144 A Size 5[1]
090	90/180 A Size 6[1]
110	110/165 A Size 6[1]
143	143/215 A Size 6A[1]
170	170/220 A Size 6A[1]

2	Supply voltage
–	3 x 230 V to 480 V
A	1 x 230 V

3	Option 1 - Communication module
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II
5	CANopen + 2 AO
6	SERCOS III
8	PROFINET IRT

4	Option 2 - Technology module
0	None
1	Second Sin/Cos encoder
2	TTL encoder simulation/TTL master encoder
4	TwinSync communication
5	TTL encoder with commutation signal
6	SSI encoder simulation
7	Analog I/O option card, 16 bit
A	Second safe Sin/Cos encoder[2]
B	Second safe SSI encoder[2]
C	Second safe axis monitor (Sin/Cos)[2]

5	Option 3 - Functional safety
0	STO
1	Safety[3]

6	Option 4 - Function package
–	Standard
P	With PLC
Q	PQ firmware (see chapter Function package)
R	PQ firmware + PLC (see chapter Function package)

7	Modification
0	Standard
1	Analog input 4 to 20 mA on control card[4]

8	Variant sequential numbering
01	Standard
02	Internal brake resistor
03	Conformal coating[5]
04	Internal brake resistor & conformal coating[5]

1) Not with internal braking resistor available
2) Only for devices with optional Safety system
3) Safety available for sizes 1 to 5
4) Not available with Safety
5) As from size 5 available only with conformal coating

ORDERING INFORMATION

Liquid-cooled

Model number (assigned at the factory) **Type designation**

		1			2	3	4	5	6	7	8	
G395	-				-							

1	Rated current/maximum current (at 8kHz switching frequency)
016	16/32 A Size 3
020	20/40 A Size 3
024	24/48 A Size 4
032	32/64 A Size 4
053	53/90 A Size 5
070	70/120 A Size 5
084	84/144 A Size 5
110	110/187 A Size 6
143	143/215 A Size 6
170	170/255 A Size 6A
210	210/255 A Size 6A
250	250/375 A Size 7[1)]
325	325/485 A Size 7[1)]
450	450/675 A Size 7[1)]

3	Option 1 - Communication module
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II
5	CANopen + 2 AO
6	SERCOS III
8	PROFINET IRT

4	Option 2 - Technology module
0	None
1	Second Sin/Cos encoder
2	TTL encoder simulation/TTL master encoder
4	TwinSync communication
5	TTL encoder with commutation signal
6	SSI encoder simulation
7	Analog I/O option card, 16 bit
A	Second safe Sin/Cos encoder[2)]
B	Second safe SSI encoder[2)]
C	Second safe axis monitor (Sin/Cos)[2)]

5	Option 3 - Functional safety
0	STO[3)]
1	Safety[4)]

6	Option 4 - Function package
–	Standard
P	With PLC
Q	PQ firmware (see chapter Function package)
R	PQ firmware + PLC (see chapter Function package)

7	Modification
0	Standard
1	Analog input 4 to 20 mA on control card[5)]

8	Variant sequential numbering
01	Standard
02	Internal brake resistor
03	Conformal coating (not size 3 and 4)[6)]
04	Internal brake resistor & conformal coating (not size 3 and 4)[6)]

1) 4 kHz switching frequency
2) Only for devices with optional Safety system
3) Safety available for sizes 3 to 5
4) Not available with Safety
5) As from size 5 available only with conformal coating

MULTI-AXIS SERVO DRIVE OVERVIEW

Designed for the Present and the Future

The Multi-Axis Servo Drive closes current loops (switching frequencies 4, 8, 12 and 16 kHz). It is also able to close velocity and position control loops.

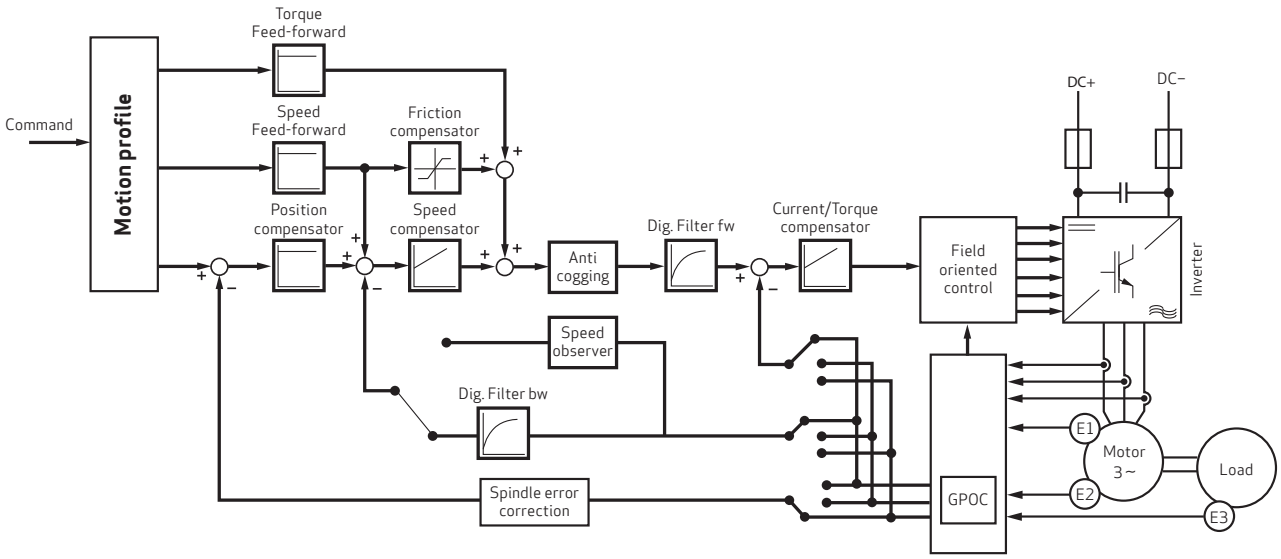
For high-performance control loops, high update rates are supported: The Multi-Axis Servo Drive operates at cycle times of 62.5 µs for current and 125 µs for velocity and position control loops.

Currently, 7 mechanical sizes, based on output power, are available, ranging from 4 up to 170 A_{rms} with classical air cooling. Between 20 and 450 A_{rms} the drives are available as liquid-cooled devices.

It supports feedback devices such as Resolver, EnDat encoder or Hiperface encoder as standard (Customer application specific position feedback is possible upon request).

Features

- Standard cascaded servo loop control structure including current/torque, velocity and position control
- Feed forward structure for higher response time and reduced tracking error
- Compensation of friction and cogging torque
- Compensation of mechanic spindle errors for both directions
- Support for field weakening for asynchronous and synchronous AC motors
- Availability of observer methods (current and velocity observers) which can be switched on, on demand for improving the server loop performance
- Patented method GPOC (Gain Phase Offset Correction): correlation technique to compensate encoder and resolver errors
- Servo drives from 4 to 210 A_{RMS}
  Supply via a DC connection from central MSD Power Supply Unit
- Evaluation by up to 3 position sensors
  For precise positioning even in systems with backlash and other mechanical errors
- Built in functional safety according to IEC/EN 61508, IEC/EN 62061, EN ISO 13849-1, IEC/EN 61800-5-2, personnel safety directly into the servo drive



TECHNICAL DATA

Sizes 1 to 5

Multi-Axis Servo Drives

Ordering number		Size	Rated current [A]	
Air-cooled	**Liquid-cooled**		**Air-cooled**	**Liquid-cooled**
G393-004	-	Size 1	4	-
G393-006			6	
G393-008		Size 2	8	
G393-012			12	
G393-016	G397-020	Size 3	16	20
G393-020	G397-025		20	25
G393-024	G397-026	Size 4	24	26
G393-032	G397-035		32	35
G393-045	G397-053	Size 5	45	53
G393-060	G397-070		60	70
G393-072	G397-084		72	84
G393-090	G397-110	Size 6A	90	110
G393-110	G397-143		110	143
G393-143	G397-170		143	170
G393-170	G397-210		170	210
-	G397-250	Size 7	-	250
	G397-325			325
	G397-450			450

TECHNICAL DATA

Parameters size 1

Type G393-004

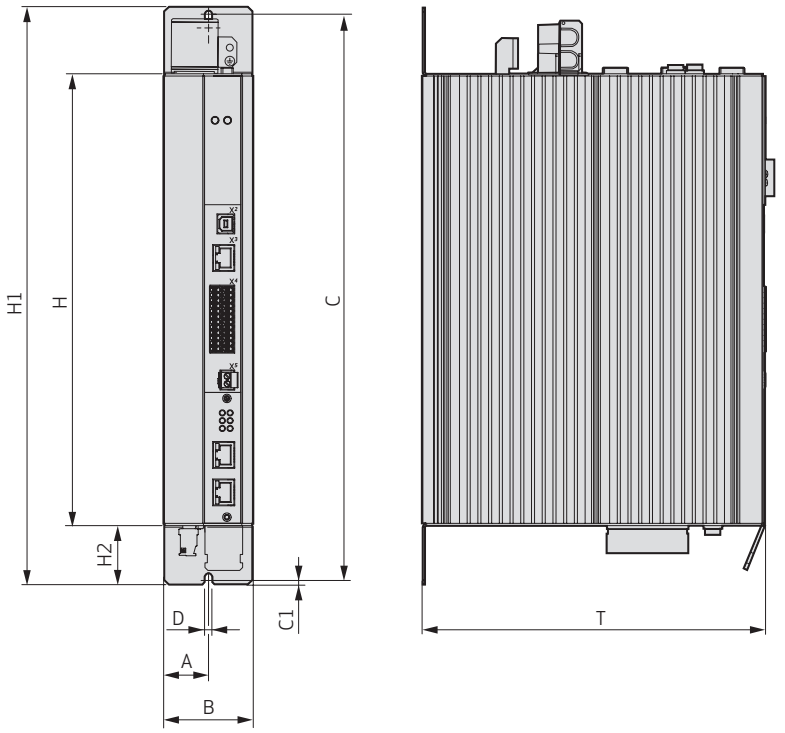
Ordering number	G393-004	G393-006
Output, motor side		
Voltage	3-phase $U_{ZK}/\sqrt{2}$	
Rated current, effective (I_N)[1)]	4 A	6 A
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/12/16 kHz	
DC input		
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}	
Current (RMS-approximation value) [3)]	1.7 x I_{Motor} A	
Device connected load[3)]	U_{ZK} x 1.7 x I_{Motor} kVA	
Power loss at I_N [1)]	110 W	140 W
DC link		
DC link capacity	60 µF	
Servo Drive	**G393-004**	**G393-006**
Cooling method	Air-cooled	
Protection	IP20 except terminals (IP00)	
Cooling air temperature	+40 °C (+104 °F)	
Weight	3.4 kg (7.5 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)	

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz
2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III
3) Approximate value, maximum values depending on DC voltage source and load case

TECHNICAL DATA

Parameters size 1

Installation drawing, Air-cooled



Dimensions	[mm (in)]
A	29.25 (1.15)
B (width)	58.5 (2.3)
C	382 (15.04)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height) (without terminals)	295 (11.61)
H1	392 (15.43)
H2	38.5 (1.52)
T (depth) (without terminals)	224 (8.82)

TECHNICAL DATA

Parameters size 2

Type G393-008

Ordering number	**G393-008**	**G393-012**
Output, motor side		
Voltage	3-phase $U_{ZK}/\sqrt{2}$	
Rated current, effective (I_N)[1)]	9.3 A	14 A
Rotating field frequency	0 to 400 Hz	
Switching frequency of power stage	4/8/12/16 kHz	
DC input		
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}	
Current (RMS-approximation value)[3)]	1.7 x I_{Motor} A	
Device connected load[3)]	U_{ZK} x 1.7 x I_{Motor} kVA	
Power loss at I_N[1)]	185 W	255 W
DC link		
DC link capacity	105 µF	
Servo Drive	**G393-008**	**G393-012**
Cooling method	Air-cooled	
Protection	IP10 except terminals (IP00)	
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)	
Weight	4.9 kg (10.8 lb)	
Mounting type	Vertical mounting with unhindered air flow	
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)	

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz

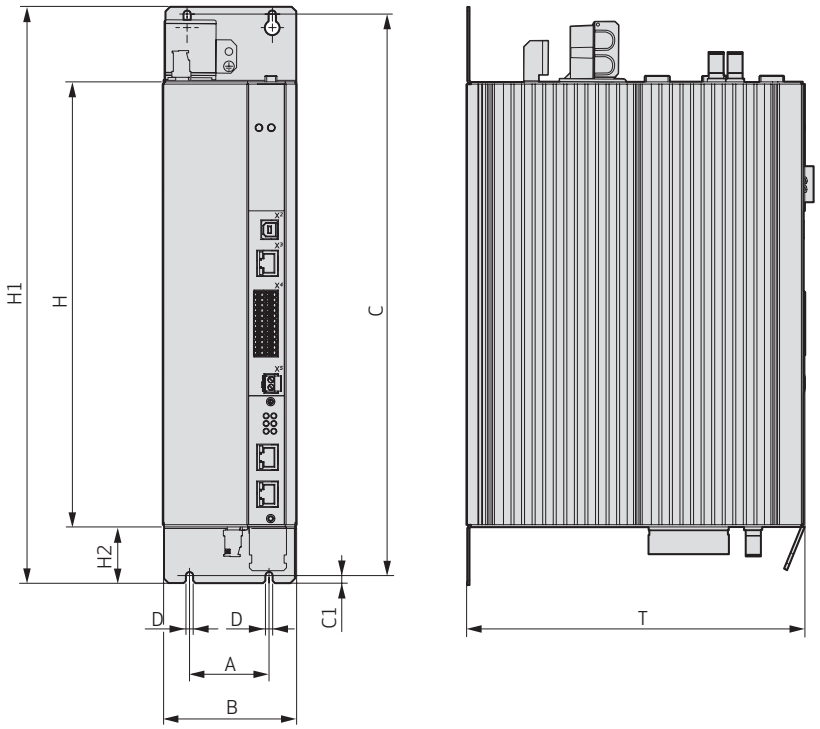
2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III

3) Approximate value, maximum values depending on DC voltage source and load case

TECHNICAL DATA

Parameters size 2

Installation drawing, Air-cooled



Dimensions	[mm (in)]
A	50 (1.97)
B (width)	90 (3.54)
C	382 (15.04)
C1	5 (0.2)
D (ø)	4.8 (0.19)
H (height) (without terminals)	295 (11.61)
H1	392 (15.43)
H2	38.5 (1.52)
T (depth) (without terminals)	224 (8.82)

TECHNICAL DATA

Parameters size 3

Type G397-020

Ordering number	**G393-016**	**G393-020**	**G397-020**	**G397-025**
Output, motor side				
Voltage	3-phase $U_{ZK}/\sqrt{2}$			
Rated current, effective (I_N)[1)]	16 A	20 A		25 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
DC input				
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}			
Current (RMS-approximation value)[3)]	1.7 x I_{Motor} A			
Device connected load[3)]	U_{ZK} x 1.7 x I_{Motor} kVA			
Power loss at I_N[1)] (liquid cooling[4)])	320 W	390 W		480 W
DC link				
DC link capacity	288 µF			
Servo Drive	**G393-016**	**G393-020**	**G397-020**	**G397-025**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP10 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	6.5 kg (14.3 lb)			
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)			

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz

2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III

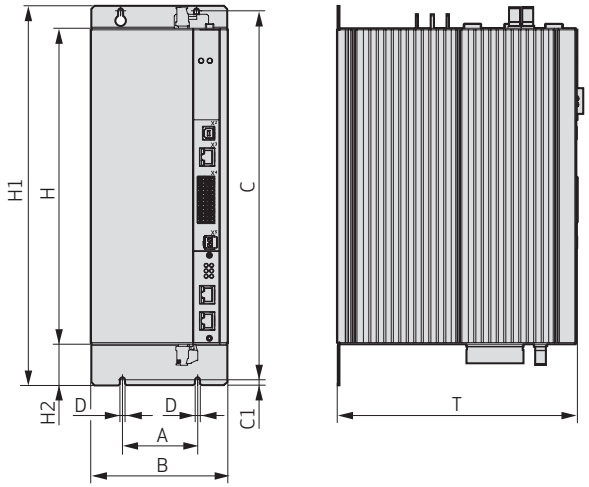
3) Approximate value, maximum values depending on DC voltage source and load case

4) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller

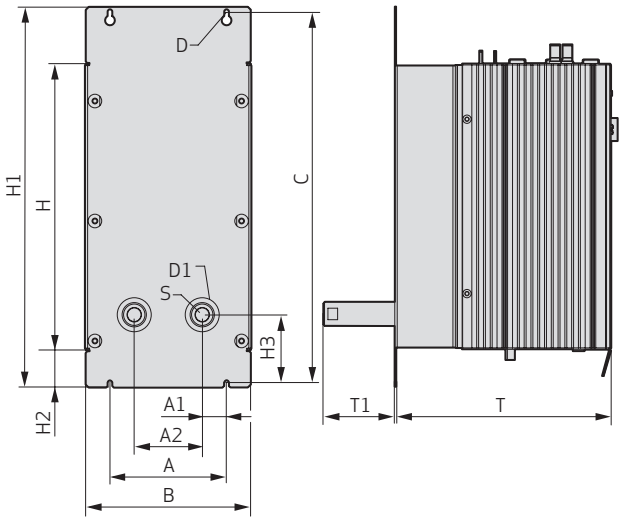
TECHNICAL DATA

Parameters size 3

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	[mm (in)]
A	80 (3.15)
A1	10 (0.39)
A2	60 (2.36)
B (width)	130 (5.12)
C	382 (15.04)
C1	5 (0.2)
D (ø)	4.8 (0.19)
D1 (ø hole for pipe socket)	48 (1.89)
H (height) (without terminals)	295 (11.61)
H1	392 (15.43)
H2	38.5 (1.52)
H3	70 (2.76)
S (inside thread)	3/8"
T (depth) (without terminals)	224 (8.82)
T1	74 (2.91)

TECHNICAL DATA

Parameters size 4

Type G397-026

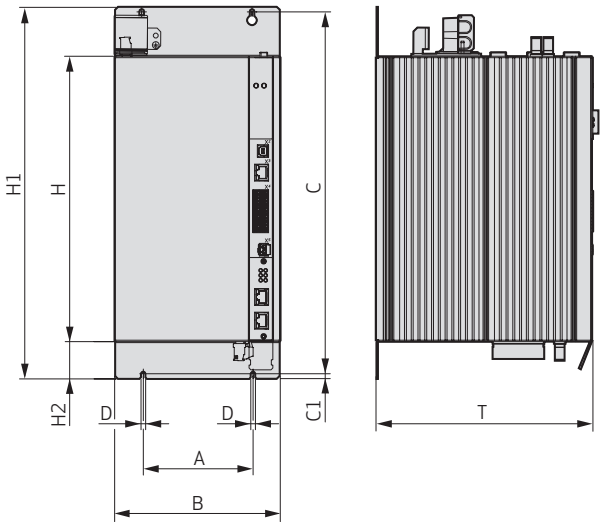
Ordering number	**G393-024**	**G393-032**	**G397-026**	**G397-035**
Output, motor side				
Voltage	3-phase $U_{ZK}/\sqrt{2}$			
Rated current, effective (I_N)[1)]	24 A	32 A	26.3 A	35 A
Rotating field frequency	0 to 400 Hz			
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)			
DC input				
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}			
Current (RMS-approximation value)[3)]	1.7 x I_{Motor} A			
Device connected load[3)]	U_{ZK} x 1.7 x I_{Motor} kVA			
Power loss at I_N[1)] (liquid cooling[4)])	420 W	545 W	455 W	595 W
DC link				
DC link capacity	504 µF			
Servo Drive	**G393-024**	**G393-032**	**G397-026**	**G397-035**
Cooling method	Air-cooled		Liquid-cooled	
Protection	IP10 except terminals (IP00)			
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+45 °C (+113 °F)			
Weight	7.5 kg (16.5 lb)			
Mounting type	Vertical mounting with unhindered air flow			
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)			

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz
2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III
3) Approximate value, maximum values depending on DC voltage source and load case
4) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller

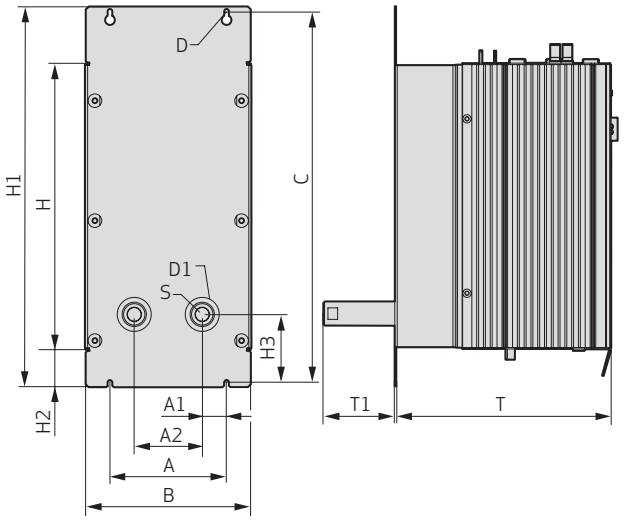
TECHNICAL DATA

Parameters size 4

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	[mm (in)]
A	120 (4.72)
A1	25 (0.98)
A2	70 (2.76)
B (width)	171 (6.73)
C	382 (15.04)
C1	5 (0.2)
D (ø)	4.8 (0.19)
D1 (ø hole for pipe socket)	48 (1.89)
H (height) (without terminals)	295 (11.61)
H1	392 (15.43)
H2	38.5 (1.52)
H3	70 (2.76)
S (inside thread)	3/8"
T (depth) (without terminals)	224 (8.82)
T1	74 (2.91)

TECHNICAL DATA

Parameters size 5

Type G393-045

Ordering number	**G393-045**	**G393-060**	**G393-072**	**G397-053**	**G397-070**	**G397-084**
Output, motor side						
Voltage	3-phase $U_{ZK}/\sqrt{2}$					
Rated current, effective (I_N)[1)]	45 A	60 A	72 A	53 A	70 A	84 A
Rotating field frequency	0 to 400 Hz					
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)					
DC input						
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}					
Current (RMS-approximation value)	1.2 x I_{Motor} A					
Device connected load[3)]	U_{ZK} x 1.2 x I_{Motor} kVA					
Power loss at I_N[1)] (liquid cooling[4)])	610 W	830 W	1,010 W	690 W	930 W	1,130 W
DC link						
DC link capacity	430 µF	900 µF				
Servo Drive	**G393-045**	**G393-060**	**G393-072**	**G397-053**	**G397-070**	**G397-084**
Cooling method	Air-cooled			Liquid-cooled		
Protection	IP10 except terminals (IP00)					
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+40 °C (+104 °F)					
Weight	13 kg (28.7 lb)					
Mounting type	Vertical mounting with unhindered air flow					
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)					

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz

2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III

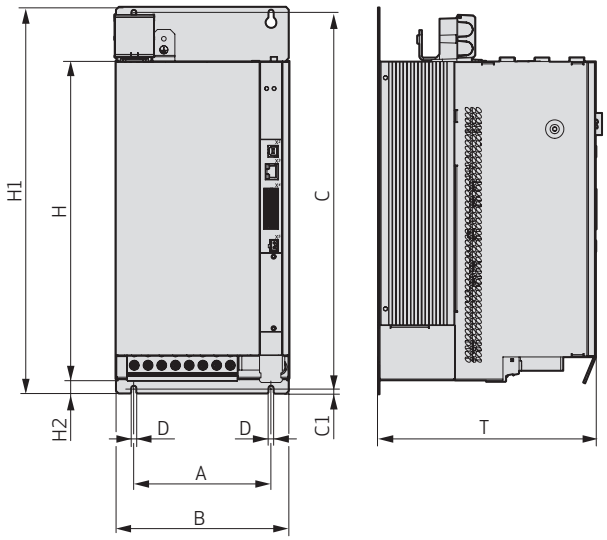
3) RMS value, maximum values depending on DC voltage source and load case

4) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller

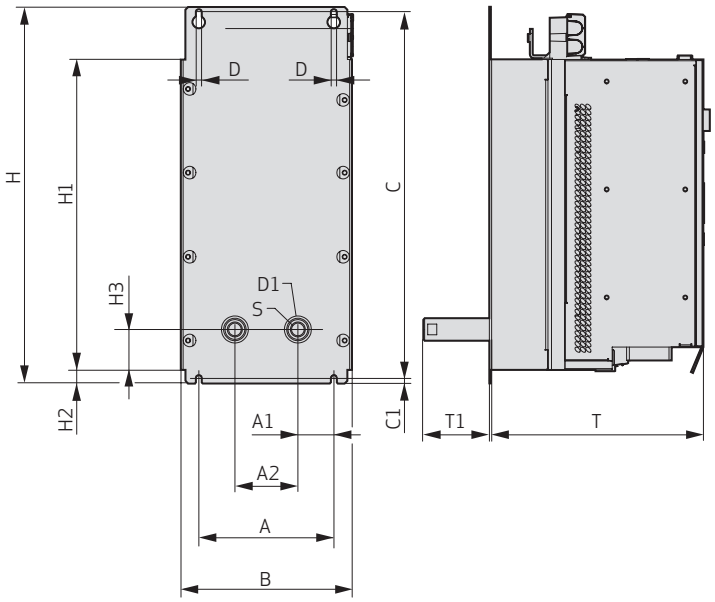
TECHNICAL DATA

Parameters size 5

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	150 (5.91)	
A1	40 (1.57)	
A2	70 (2.76)	
B (width)	190 (7.48)	
C	406.5 (16)	
C1	6 (0.24)	
D (ø)	5.6 (0.22)	6.5 (0.26)
D1 (ø hole for pipe socket)	48 (1.89)	
H (height) (without terminals)	345 (13.58)	
H1	418.5 (16.48)	
H2	15 (0.59)	
H3	54 (2.13)	
S (inside thread)	3/8"	
T (depth) (without terminals)	238 (9.37)	
T1		73.5 (2.89)

TECHNICAL DATA

Parameters size 6A

Type G393-170

Ordering number	G393-090	G393-110	G393-143	G393-170	G397-110	G397-143	G397-170	G397-210
Output, motor side								
Voltage	3-phase $U_{ZK}/\sqrt{2}$							
Rated current, effective (I_N)[1)]	90 A	110 A	143 A	170 A	110 A	143 A	170 A	210 A
Rotating field frequency	0 to 400 Hz							
Switching frequency of power stage	4/8/12/16 kHz (factory setting 8 kHz at +40 °C (+104 °F) cooling air temperature)							
DC input								
DC voltage (U_{ZK}) nominal[2)]	565/650/678/770 V_{DC}							
Current (RMS-approximation value) [3)]	1.2 x I_{Motor} A							
Device connected load[3)]	U_{ZK} x 1.2 x I_{Motor} kVA							
Power loss at I_N and 8 kHz/400 V (liquid cooling[4)])	1,300 W	1,600 W	2,100 W	2,500 W	1,500 W	1,940 W	2,380 W	2,650 W
DC link								
DC link capacity	1,060 µF	2,120 µF	3,180 µF	4,240 µF	2,120 µF	3,180 µF	4,240 µF	
Servo Drive	**G393-090**	**G393-110**	**G393-143**	**G393-170**	**G397-110**	**G397-143**	**G397-170**	**G397-210**
Cooling method	Air-cooled				Liquid-cooled			
Protection	IP20 except terminals (IP00)							
Cooling air temperature maximum (at 4 kHz power stage switching frequency)	+40 °C (+104 °F)							
Weight	32 kg (70.6 lb)							
Mounting type	Vertical mounting with unhindered air flow							
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)							

1) All data referred to output voltage 400 V_{eff} and switching frequency 8 kHz

2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drive devices (Multi-Axis Servo Drive or Power Supply Unit). Insulation voltage according to IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III

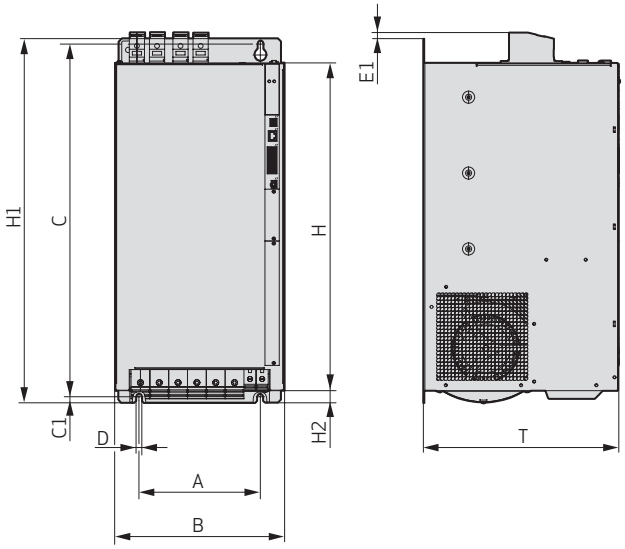
3) Approximate value, maximum values depending on DC voltage source and load case

4) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

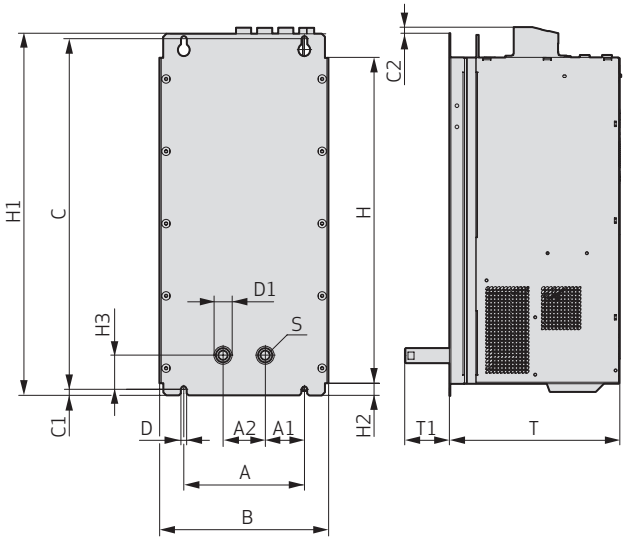
TECHNICAL DATA

Parameters size 6A

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	200 (7.87)	
A1	65 (2.56)	
A2	70 (2.76)	
B (width)	280 (11.02)	
C	581 (22.87)	
C1	10 (0.39)	
C2		
D (ø)	9.5 (0.37)	
D1 (ø hole for pipe socket)	48 (1.89)	
E1	10 (0.39)	
H (height) (without terminals)	540 (21.26)	
H1	600 (23.62)	540 (21.26)
H2	20 (0.79)	
H3	56.5 (2.22)	
S (inside thread)	3/8"	
T (depth) (without terminals)	322 (12.68)	285 (11.22)
T1		73.5 (2.89)

TECHNICAL DATA

Parameters size 7

Type G395-250

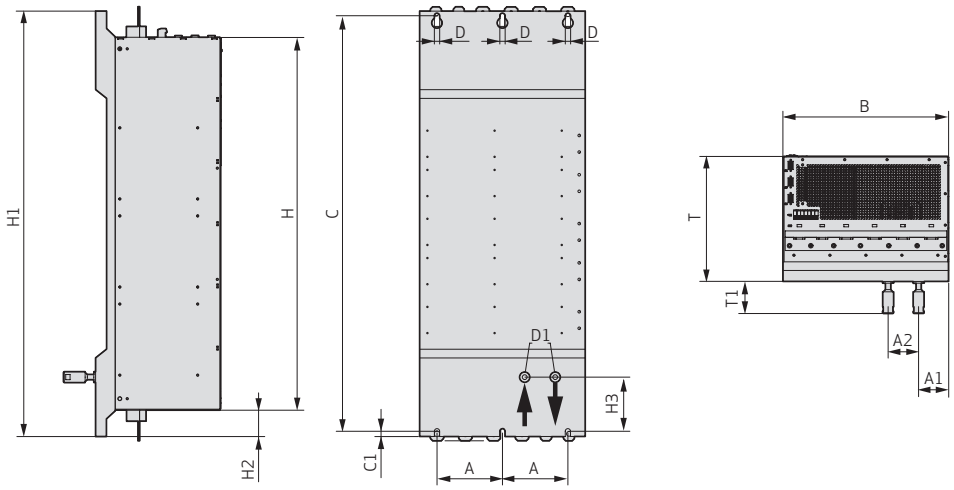
Order code	G397-250	G397-325	G397-450
Output, motor side			
Voltage	3-phase $U_{DC}/\sqrt{2}$		
Rated current, effective (I_N)[1]	250 A	325 A	450 A
Rotating field frequency	0 to 400 Hz		
Switching frequency of power stage	2/4 kHz (factory setting 2 kHz)		
DC input			
DC voltage (U_{DC}) nominal[2]	565/650/678/770 V_{DC}		
Current (RMS-approximation value)[3] [4]	1.2 x I_{Motor} A		
Device connected load[3] [4]	U_{ZK} x 1.2 x I_{Motor} kVA		
Power loss at I_N and 4 kHz/564 V_{DC} [5]	3,200 W	3,800 W	5,400 W
DC link			
DC link capacity	3,600 µF	5,400 µF	7,200 µF
Servo Drive	**G397-250**	**G397-325**	**G397-450**
Cooling method	Liquid-cooled		
Protection	IP20 except terminals (IP00)		
Cooling air temperature maximum (not more than +10 °C (+50 °F) below the ambient temperature)	+40 °C (+104 °F)		
Weight	100 kg (220.5 lb)		
Mounting type	Vertical mounting with unhindered air flow		
Mounting several servo drives	Direct end-to-end mounting		

1) All data referred to output voltage 400 V_{eff} and switching frequency 4 kHz
2) Generated from rectified TN system with grounded neutral point and external conductor voltages 3 x 400 V_{AC}, 3 x 460 V_{AC} or 3 x 480 V_{AC} with the approved Moog Servo Drives (Single-Axis Servo Drive or Power Supply Unit). Insulation voltage as per IEC/EN 61800-5-1, system voltage 277 V, overvoltage category III.
3) All data referred to DC voltage (U_{ZK}) 565 V_{DC}
4) Approximate value, maximum values depending on DC voltage source and load case
5) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

TECHNICAL DATA

Parameters size 7

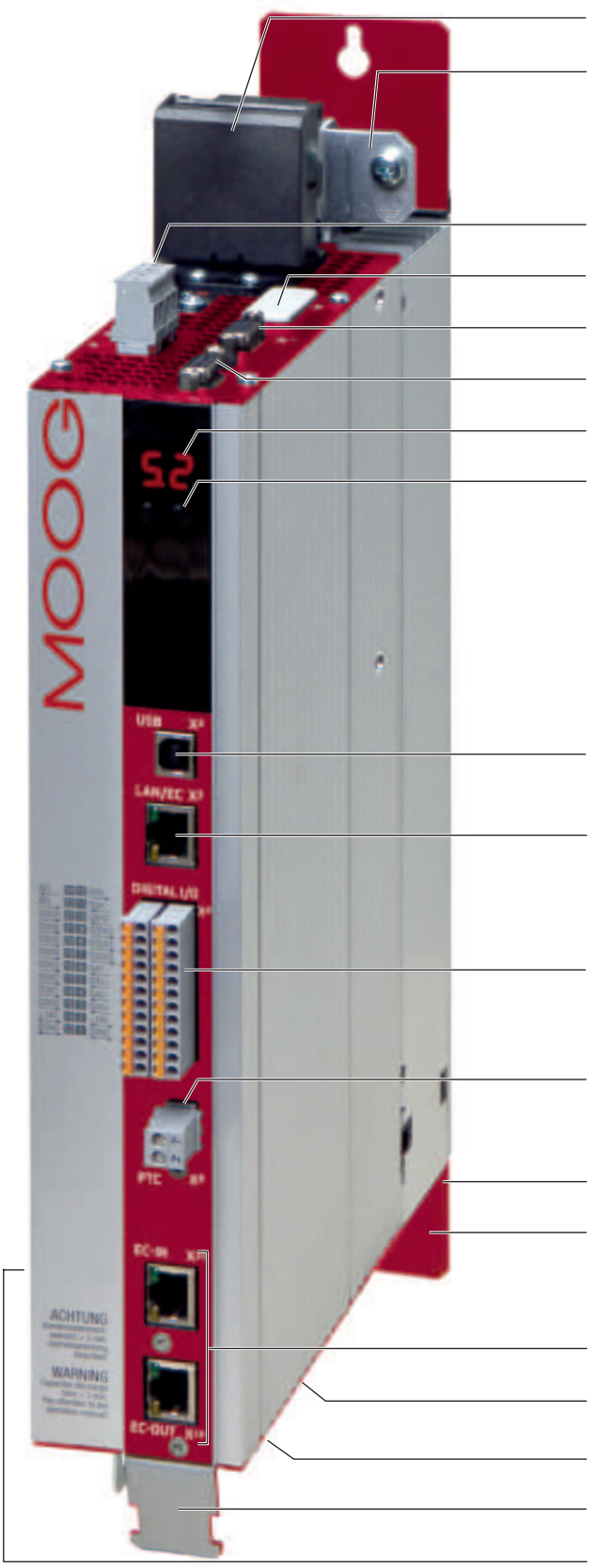
Installation drawing, Liquid-cooled



Dimensions	[mm (in)]
A	150 (5.91)
A1	29 (1.14)
A2	70 (2.76)
B (width)/(with shield plate)	380 (14.96)/385 (15.16)
C	952 (37.48)
C1	14 (0.47)
D (ø)	12 (0.47)
D1 (ø hole for pipe socket)	48 (1.89)
H (height)/(with terminal cover)/(with shield plates)	952 (37.48)/1,171 (46.1)/1,315 (51.77)
H1	979 (38.54)
H2	62 (2.44)
H3	124 (4.88)
S (inside thread)	3/8"
T (depth) (without terminals)	287 (11.30)
T1	73.5 (2.89)

TECHNICAL DATA

Equipment – Sizes 1 to 4



DC supply connection

Protective conductor connection

Connection of control supply

Option 2 – Technology module

Connection for high-resolution encoder

Connection for resolver

Dual 7-segment display

Button for service functions

USB port

Ethernet port

Control terminals

Connection for motor temperature monitor

Software name plate (size 3 and 4)

Hardware name plate

Option 1 – Communication module

Motor connection

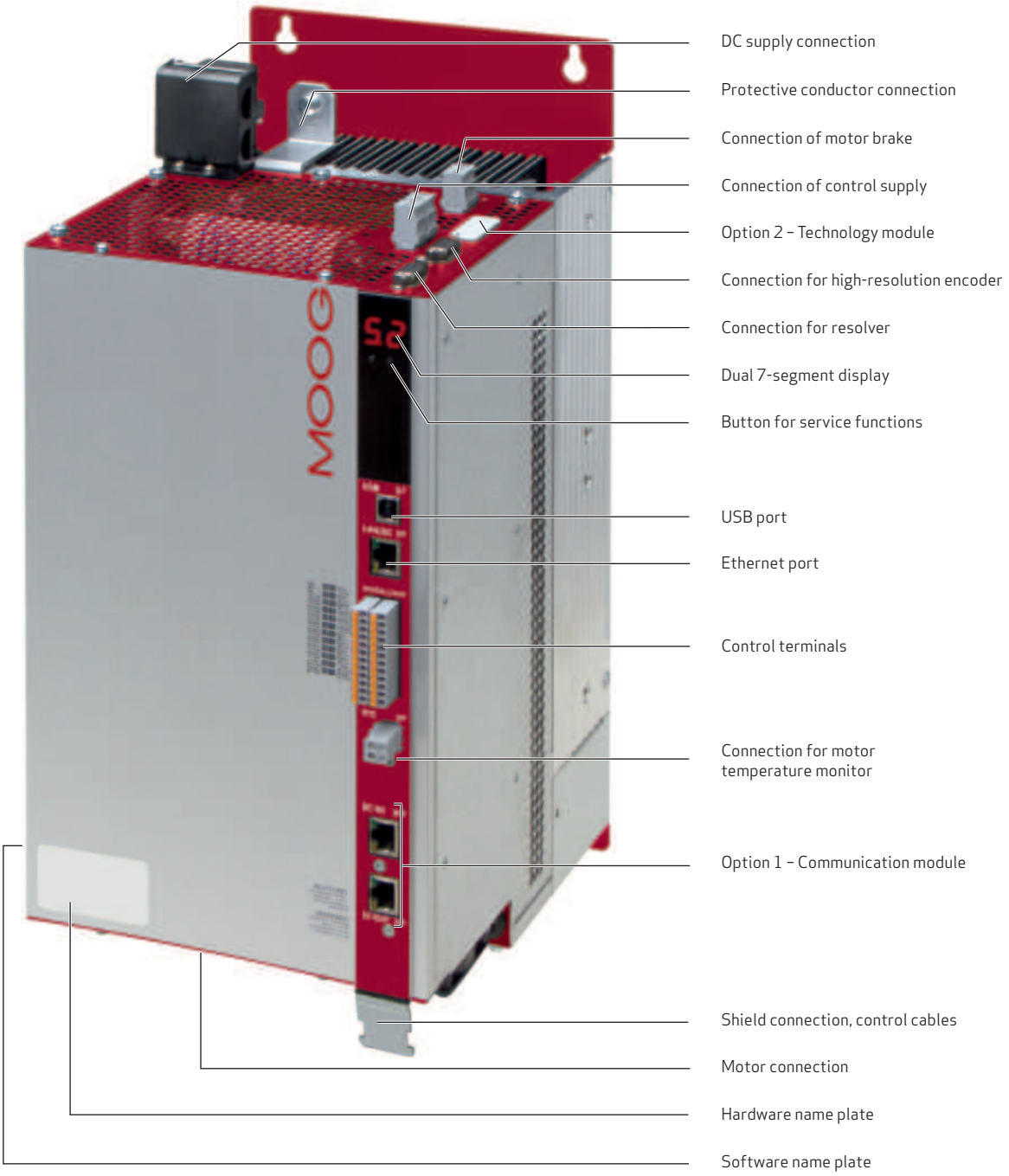
Connection of motor brake

Shield connection, control cables

Software name plate (size 1 and 2)

TECHNICAL DATA

Equipment – Size 5



TECHNICAL DATA

Equipment – Size 6A

CURRENT CAPACITY

The maximum permissible output current of the servo drives and the peak current are dependent on the DC supply voltage, the motor cable length, the power stage switching frequency and the ambient temperature. If the conditions change, the maximum permissible current capacity of the Multi-Axis Servo Drives also changes.

Sizes 1 to 4
Air-cooled, 565 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s] 2)
G393-004 Size 1	4	+40 (+104)	5.3	8.4			10
	8		4				
	12		3.7	6.6			
	16		2.7	5.2			
G393-006 Size 1	4		8	12.7			
	8		6				
	12		5.5	9.9			
	16		4	7.7			
G393-008 Size 2	4		9.3	15.9			
	8						
	12		6.7	9.4			
	16		5.5	7.7			
G393-012 Size 2	4		14	24			
	8						
	12		10	14.1			
	16		8.2	11.5			
G393-016 Size 3	4		20	33.6			
	8		16				
	12		11	23.6			
	16		8.5	19.4			
G393-020 Size 3	4		25	42			
	8		20				
	12		13.8	29.6			
	16		10	22.8			
G393-024 Size 4	4		30	48			
	8		24				
	12		15.8	31.6			
	16		11.3	22.6			
G393-032 Size 4	4		40	64			
	8		32				
	12		21	42			
	16		15	30			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 650 V_{DC} [3) 4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	5 Hz	For intermittent operation > 5Hz	For time [s][2)]
G393-004 Size 1	4	+40 (+104)	5.3	8.4			10
	8		3.4	7.2			
	12		2.8	5			
	16		1.9	3.6			
G393-006 Size 1	4		8	12.7			
	8		5.1	10.8			
	12		4.2	7.5			
	16		2.9	5.6			
G393-008 Size 2	4		8.5	14.6			
	8		6.7	11.5			
	12		5.6	7.9			
	16		4.1	5.8			
G393-012 Size 2	4		11.8	20.2			
	8		10	17.1			
	12		8.4	11.8			
	16		6.2	8.7			
G393-016 Size 3	4		20	33.6			
	8		13.9	29.1			
	12		8.8	18.9			
	16		6.5	14.8			
G393-020 Size 3	4		25	42			
	8		17.4	36.5			
	12		11	23.6			
	16		7.4	16.8			
G393-024 Size 4	4		26	41.6			
	8		21	42			
	12		12.4	24.8			
	16		8.9	17.8			
G393-032 Size 4	4		33.7	53.9			
	8		28	56			
	12		16.5	33			
	16		11.9	23.8			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 678 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1) At rotating field frequency increasing linearly 0 Hz	5 Hz	For intermittent operation > 5Hz	For time [s] 2)
G393-004 Size 1	4	+40 (+104)	5.3	8.4			10
	8		3.3	7			
	12		2.7	4.8			
	16		1.8	3.4			
G393-006 Size 1	4		8	12.7			
	8		5	10.6			
	12		4	7.2			
	16		2.7	5.2			
G393-008 Size 2	4		8.5	14.6			
	8		6.1	10.4			
	12		5.4	7.6			
	16		3.9	5.5			
G393-012 Size 2	4		11.4	19.5			
	8		9.2	15.8			
	12		8.1	11.4			
	16		5.8	8.2			
G393-016 Size 3	4		20	33.6			
	8		13.3	27.9			
	12		8.5	18.3			
	16		6	13.7			
G393-020 Size 3	4		25	42			
	8		16.6	34.8			
	12		10	21.5			
	16		6.5	14.8			
G393-024 Size 4	4		26	41.6			
	8		20	40			
	12		11.3	22.6			
	16		8.4	16.8			
G393-032 Size 4	4		32.5	52			
	8		26.7	53.4			
	12		15	30			
	16		11.2	22.4			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 1 to 4
Air-cooled, 770 V_{DC} [4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)]			
				At rotating field frequency increasing linearly		For intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s][2)]
G393-004 Size 1	4	+40 (+104)	5.1	8.1			10
	8		3.2	6.8			
	12		2.1	3.8			
	16		1.1	2.1			
G393-006 Size 1	4		7.6	12.1			
	8		4.8	10.2			
	12		3.2	5.7			
	16		1.6	3.1			
G393-008 Size 2	4		8	13.7			
	8		5.9	10.1			
	12		5.3	7.4			
	16		3.7	5.2			
G393-012 Size 2	4		11.2	19.2			
	8		8.8	15.1			
	12		7.9	11.1			
	16		5.5	7.7			
G393-016 Size 3	4		20	33.6			
	8		11.2	23.5			
	12		7	15			
	16		4.5	10.2			
G393-020 Size 3	4		25	42			
	8		14	29.4			
	12		7.5	16.1			
	16		5	11.4			
G393-024 Size 4	4		26	41.6			
	8		18.9	37.8			
	12		10.5	21			
	16		7.9	15.8			
G393-032 Size 4	4		32	51.2			
	8		25.2	50.4			
	12		14	28			
	16		10.5	21			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 and 6A
Air-cooled, 565 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1) At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}] 1) At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}] 1) For intermittent operation > 5Hz	For time 2) [s]
G393-045 Size 5	4	+40 (+104)	45	90			10
	8						
	12						
	16		42	84			
G393-060 Size 5	4		60	120			
	8						
	12		58	116			
	16		42	84			
G393-072 Size 5	4		72	144			
	8						
	12		58	116			
	16		42	84			
G393-090 Size 6A	4		90	170	180		30
	8			134			
	12			107	144		
	16		72	86	115		
G393-110 Size 6A	4		110	170	220		
	8			134	165		
	12		90	107	144		
	16		72	86	115		
G393-143 Size 6A	4		143	191	286		
	8			152	215		
	12		115	122	172		
	16		92	98	138		
G393-170 Size 6A	4		170	191	315		10
	8			152	221		
	12		136	122	163		
	16		109	98	131		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
Note: All data apply for motor cable length ≤10 m (32.80 ft)

CURRENT CAPACITY

Sizes 5 and 6A
Air-cooled, 650 V_{DC} [3) 4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}][1)] For intermittent operation > 5Hz	For time[2)] [s]
G393-045 Size 5	4	+40 (+104)	42	84			10
	8						
	12						
	16		39	78			
G393-060 Size 5	4		56	111			
	8						
	12		54	108			
	16		39	78			
G393-072 Size 5	4		67	133			
	8						
	12		54	108			
	16		39	78			
G393-090 Size 6A	4		83	157	166		30
	8			124			
	12			99	133		
	16		67	80	107		
G393-110 Size 6A	4		102	157	204		
	8			125	153		
	12		83	99	133		
	16		67	80	107		
G393-143 Size 6A	4		132	176	264		
	8			140	198		
	12		106	112	159		
	16		85	91	128		
G393-170 Size 6A	4		157	176	291		10
	8			140	204		
	12		126	112	151		
	16		101	91	121		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft)

CURRENT CAPACITY

Sizes 5 and 6A
Air-cooled, 678 V_{DC} [3)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	At rotating field frequency increasing linearly 5 Hz	For intermittent operation > 5Hz	For time[2)] [s]
G393-045 Size 5	4	+40 (+104)	41	82			10
	8						
	12						
	16		38	76			
G393-060 Size 5	4		54	108			
	8						
	12		52	104			
	16		38	76			
G393-072 Size 5	4		65	130			
	8						
	12		52	104			
	16		38	76			
G393-090 Size 6A	4		81	153	162		30
	8			121			
	12			96	130		
	16		65	77	104		
G393-110 Size 6A	4		99	153	198		
	8			121	149		
	12		81	96	130		
	16		65	77	104		
G393-143 Size 6A	4		129	171	258		
	8			137	194		
	12		104	109	156		
	16		83	87	125		
G393-170 Size 6A	4		153	171	283		10
	8			137	199		
	12		122	109	146		
	16		98	87	118		

1) At maximum 70 % initial load

2) Shutdown according to I^2t characteristic

3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft)

CURRENT CAPACITY

Sizes 5 and 6A
Air-cooled, 770 V_{DC} [4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}][1)] For intermittent operation > 5Hz	For time[2)] [s]
G393-045 Size 5	4	+40 (+104)	41	82			10
	8						
	12		37	74			
	16		34	64	68		
G393-060 Size 5	4		54	108			
	8						
	12		48	96			
	16		34	68			
G393-072 Size 5	4		65	130			
	8						
	12		48	96			
	16		34	68			
G393-090 Size 6A	4		73	138	146		30
	8			109			
	12			86	117		
	16		59	70	94		
G393-110 Size 6A	4		90	134	180		
	8			109	135		
	12		73	86	117		
	16		59	70	94		
G393-143 Size 6A	4		116	154	232		
	8			122	174		
	12		94	98	141		
	16		75	78	138		
G393-170 Size 6A	4		138	154	255		10
	8			122	179		
	12		110	98	132		
	16		88	78	106		

1) At maximum 70 % initial load

2) Shutdown according to I^2t characteristic

4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 3 and 4
Liquid-cooled, 565 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s] 2)
G397-020 Size 3	4	+40 (+104)	20	33.6			10
	8						
	12		17.4	26.4			
	16		12	18.2			
G397-025 Size 3	4		25	42			
	8						
	12		21.8	33.1			
	16		15	22.8			
G397-026 Size 4	4		30	48.1			
	8		26.3				
	12		22.5	31.5			
	16		16.1	22.5			
G397-035 Size 4	4		40	64			
	8		35				
	12		30	42			
	16		21.4	29.9	30		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
Note: All data apply for motor cable length ≤10 m (32.80 ft).

Liquid-cooled, 650 V_{DC} 3) 4)

G397-020 Size 3	4	+40 (+104)	20	33.6	10
	8		17.4	29.2	
	12		12.5	19	
	16		9.1	13.8	
G397-025 Size 3	4		25	42	
	8		21.8	36.6	
	12		15.6	23.7	
	16		11.4	17.3	
G397-026 Size 4	4		26	41.6	
	8		23	42	
	12		17.7	24.8	
	16		12.8	17.9	
G397-035 Size 4	4		33.7	53.9	
	8		30.6	55.9	
	12		23.6	33	
	16		17	23.8	

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
4) When supplied with Power Supply Unit
Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 3 and 4
Liquid-cooled, 678 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time
				0 Hz	5 Hz	> 5Hz	[s] 2)
G397-020 Size 3	4	+40 (+104)	20	33.6			10
	8		16.6	27.9			
	12		11.4	17.3			
	16		8.5	12.9			
G397-025 Size 3	4		25	42			
	8		20.8	34.9			
	12		14.3	21.7			
	16		10.6	16.1			
G397-026 Size 4	4		26	41.6			
	8		21.9	40			
	12		16.1	22.5			
	16		12	16.8			
G397-035 Size 4	4		32.5	52			
	8		29.2	53.4			
	12		21.4	30			
	16		16	22.4			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
Note: All data apply for motor cable length ≤10 m (32.80 ft).

Liquid-cooled, 770 V_{DC} 4)

G397-020 Size 3	4	+40 (+104)	20	33.6	10
	8		15.8	26.5	
	12		10.7	16.2	
	16		8.1	12.3	
G397-025 Size 3	4		25	42	
	8		19.8	33.2	
	12		13.4	20.3	
	16		10.1	15.3	
G397-026 Size 4	4		26	41.6	
	8		20.7	37.8	
	12		15.4	21.5	
	16		11.3	15.8	
G397-035 Size 4	4		32	51.2	
	8		27.6	50.5	
	12		20.5	28.7	
	16		15	21	

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
4) When supplied with Power Supply Unit
Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 and 6A
Liquid-cooled, 565 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time 2)
				0 Hz	5 Hz	> 5Hz	[s]
G397-053 Size 5	4	+40 (+104)	53	90			30
	8						
	12						
	16		49	84			
G397-070 Size 5	4		70	120			
	8						
	12		68	116			
	16		49	84			
G397-084 Size 5	4		84	144			
	8						
	12		68	116			
	16		49	84			
G397-110 Size 6A	4		110	205	220		30
	8			166	187		
	12			132	165		
	16		90	106	135		
G397-143 Size 6A	4		143	231	286		
	8			191	215		
	12		114	153	171		
	16		91	122	137		
G397-170 Size 6A	4		170	231	340		10
	8			191	255		
	12		136	153	204		
	16		109	122	164		
G397-210 Size 6A	4		210	231	336		
	8			191	252		
	12		168	153	202		
	16		134	122	161		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 and 6A
Liquid-cooled, 650 V_{DC} [3) 4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 5 Hz	Peak current [A_{eff}][1)] For intermittent operation > 5Hz	For time[2)] [s]
G397-053 Size 5	4	+40 (+104)	49	83			30
	8						
	12						
	16		45	77			
G397-070 Size 5	4		65	111			
	8						
	12		63	107			
	16		45	77			
G397-084 Size 5	4		78	133			
	8						
	12		63	107			
	16		45	77			
G397-110 Size 6A	4		102	190	204		30
	8			153	173		
	12			122	153		
	16		83	98	125		
G397-143 Size 6A	4		132	214	264		
	8			176	198		
	12		105	141	158		
	16		84	113	126		
G397-170 Size 6A	4		157	214	314		10
	8			176	236		
	12		126	141	189		
	16		101	113	152		
G397-210 Size 6A	4		194	214	310		
	8			176	233		
	12		155	141	186		
	16		124	113	149		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 and 6A
Liquid-cooled, 678 V_{DC} [3)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	At rotating field frequency increasing linearly 5 Hz	For intermittent operation > 5Hz	For time[2)] [s]
G397-053 Size 5	4	+40 (+104)	48	82			30
	8						
	12						
	16		44	75			
G397-070 Size 5	4		63	107			
	8						
	12		61	104			
	16		44	75			
G397-084 Size 5	4		76	130			
	8						
	12		61	104			
	16		44	75			
G397-110 Size 6A	4		99	185	198		30
	8			149	168		
	12			119	149		
	16		81	95	122		
G397-143 Size 6A	4		129	207	258		
	8			171	194		
	12		103	137	155		
	16		82	110	123		
G397-170 Size 6A	4		153	207	306		10
	8			171	230		
	12		122	137	183		
	16		98	110	147		
G397-210 Size 6A	4		189	207	302		
	8			171	227		
	12		151	137	181		
	16		121	110	145		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Sizes 5 and 6A
Liquid-cooled, 770 V_{DC} [4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)] At rotating field frequency increasing linearly 0 Hz	At rotating field frequency increasing linearly 5 Hz	For intermittent operation > 5Hz	For time[2)] [s]
G397-053 Size 5	4	+40 (+104)	48	82			30
	8						
	12		42	80	72		
	16		39	64	66		
G397-070 Size 5	4		63	107			
	8						
	12		55	94			
	16		39	66			
G397-084 Size 5	4		76	130			
	8						
	12		55	94			
	16		39	66			
G397-110 Size 6A	4		90	167	180		30
	8			134	153		
	12			107	135		
	16		73	86	110		
G397-143 Size 6A	4		116	186	232		
	8			154	174		
	12		93	123	140		
	16		74	99	111		
G397-170 Size 6A	4		138	186	276		10
	8			154	207		
	12		110	123	165		
	16		88	99	132		
G397-210 Size 6A	4		170	185	272		
	8			154	204		
	12		136	123	163		
	16		109	99	131		

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Size 7
Liquid-cooled, 565 V_{DC} 3)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time 2)
				0 Hz	5 Hz	> 5Hz	[s]
G397-250 Size 7	2	+45 (+113)	250	425			30
	4			375			
G397-325 Size 7	2		325	552			
	4			487			
G397-450 Size 7	2		450	765			
	4			675			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

Size 7
Liquid-cooled, 650 V_{DC} 3) 4)

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}] 1)			
				At rotating field frequency increasing linearly		For intermittent operation	For time 2)
				0 Hz	5 Hz	> 5Hz	[s]
G397-250 Size 7	2	+45 (+113)	231	393			30
	4			347			
G397-325 Size 7	2		301	511			
	4			451			
G397-450 Size 7	2		416	707			
	4			624			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

CURRENT CAPACITY

Size 7
Liquid-cooled, 678 V_{DC} [3)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)]			
				At rotating field frequency increasing linearly		For intermittent operation	For time[2)]
				0 Hz	5 Hz	> 5Hz	[s]
G397-250 Size 7	2	+45 (+113)	225	383			30
	4			337			
G397-325 Size 7	2		293	497			
	4			439			
G397-450 Size 7	2		405	689			
	4			607			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
3) When supplied with Single-Axis Servo Drive

Note: All data apply for motor cable length ≤10 m (32.80 ft).

Size 7
Liquid-cooled, 770 V_{DC} [4)]

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature [°C (°F)]	Rated current [A_{eff}]	Peak current [A_{eff}][1)]			
				At rotating field frequency increasing linearly		For intermittent operation	For time[2)]
				0 Hz	5 Hz	> 5Hz	[s]
G397-250 Size 7	2	+45 (+113)	210	357			30
	4			315			
G397-325 Size 7	2		273	464			
	4			410			
G397-450 Size 7	2		378	643			
	4			567			

1) At maximum 70 % initial load
2) Shutdown according to I^2t characteristic
4) When supplied with Power Supply Unit

Note: All data apply for motor cable length ≤10 m (32.80 ft).

AMBIENT CONDITIONS

Ambient conditions	
Protection	Size 1/6A/7 IP20 except terminals (IP00), size 2/3/4/5 IP10 except terminals (IP00)
Accident prevention regulations	According to local regulations (in Germany e.g. BGV A3)
Type of installation height	Up to 1,000 m (3,280 ft) above MSL, above with power reduction (1 % per 100 m (328 ft), maximum 2,000 m (6,561 ft) above MSL).
Pollution severity	2
Type of installation	Built-in unit, only for vertical installation in a switch cabinet with minimum IP4x protection, when using STO safety function minimum IP54
Climatic conditions	
In transit	
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2K3[1)]
Temperature	-25 to +70 °C (-13 to +158 °F)
Relativ air humidity at maximum + 40 °C (+104 °F)	95 %
In storage	
According to	IEC/EN 61800-2, IEC/EN 60721-3-1 class 1K3 and 1K4[2)]
Temperature	-25 to +55 °C (-13 to +131 °F)
Relative air humidity	5 to 95 %
In operation	
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3K3[3)]
Temperature	**Size 1**
	-10 to +40 °C (+14 to +104 °F) 4/8/12/16 kHz
	Size 2 to 4
	-10 to +40 °C (+14 to +104 °F) 4 kHz
	Up to +55 °C (+131 °F) with power reduction (4 % per °C)
	-10 to +40 °C (+14 to +104 °F) 8/12/16 kHz
	Up to +55 °C (+131 °F) with power reduction (4 % per °C)
	Size 5 and 6A
	-10 to +40 °C (+14 to +104 °F) 4/8/12/16 kHz
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)
	Size 7
	-10 to +40 °C (+14 to +104 °F) 2/4 kHz
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)
Relative air humidity without condensation	5 to 85 %

1) The absolute humidity is limited to maximum 60 g/m³
This means, at +70 °C (+158 °F) for example, that the relative humidity may only be maximum 40 %
2) The absolute humidity is limited to maximum 29 g/m³
So the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously
3) The absolute humidity is limited to maximum 25 g/m³
That means that the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously

AMBIENT CONDITIONS

Mechanical conditions			
Vibration limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	200 ≤ f < 500 Hz
Amplitude	3.5 mm (0.14 in)	Not applicable	
Acceleration	Not applicable	10 m/s² (393.70 in/s²)	15 m/s² (590.55 in/s²)
Shock limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
	Drop height of packed device maximum 0.25 m (9.84 in)		
Vibration limits of the system[1)]			
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	
Amplitude	0.3 mm (0.01 in)	Not applicable	
Acceleration	Not applicable	1 m/s² (39.37 in/s²)	

1) The devices are only designed for stationary use. The servo drives must not be installed in areas where they would be permanently exposed to vibrations

CERTIFICATIONS AND STANDARDS

CE mark

The Multi-Axis Servo Drive conforms to the requirements of the Low Voltage Directive 2014/35/EU and the product standard IEC/EN 61800-5-1.

The Multi-Axis Servo Drives thus conform to the requirements for installation in a machine or plant under the terms of the Machinery Directive 2006/42/EC.

The Multi-Axis Servo Drives are accordingly CE marked. The CE mark on the name plate indicates conformity with the above Directives.

EU Dual Use Regulation

To serve the Moog high pole Servo Motors and high performance applications the Moog Servo Drives produce output frequencies above 600 Hz. Therefore the Moog Servo Drives fall under the Council Regulation (EC) No 428/2009 Annex I No 3A225 and need an export license for shipments outside the European Community.

Note: Variants with output frequency limited to maximum 599 Hz are available on request.

UL/UR approval

UL/UR approval has been obtained for the Multi-Axis Servo Drives.

For details see document "UL-Certification" CC36842-001

Functional safety acceptances

See section "FUNCTION PACKAGES"

EMC acceptance tests

All Multi-Axis Servo Drives have an aluminium housing with an anodized finish (size 1 to 4) or an aluminium rear panel made of aluminized/galvanized sheet steel (size 5 to 7) to enhance interference immunity in accordance with IEC/EN 61800-3, environment classes 1 and 2.

To limit conducted interference emissions to the permissible level and to comply with the EMC Directive 2014/30/EU.

STO acceptance

The “STO” (Safe Torque Off) safety function integrated into the Multi-Axis Servo Drives is certified according to the requirements of:

- EN ISO 13849-1 “PL e“ and
- IEC/EN 61508/IEC/EN 62061 “SIL 3“

Acceptance testing is carried out by the accredited certification agency, TÜV Rheinland.

ORDERING INFORMATION

Air-cooled

Model number (assigned at the factory) **Type designation**

		1			2	3	4	5	6	7	8	
G393	-				-							

1	Rated current/maximum current (at 8kHz switching frequency and 565 V_{DC})
004	4/8 A Size 1
006	6/12 A Size 1
008	8/16 A Size 2
012	12/24 A Size 2
016	16/33 A Size 3
020	20/42 A Size 3
024	24/48 A Size 4
032	32/64 A Size 4
045	45/90 A Size 5
060	60/120 A Size 5
072	72/144 A Size 5
090	90/180 A Size 6A
110	110/165 A Size 6A
143	143/215 A Size 6A
170	170/220 A Size 6A

3	Option 1 - Communication module
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II
5	CANopen + 2 AO
6	SERCOS III
7	PROFINET IRT

4	Option 2 - Technology module
0	None
1	Second Sin/Cos encoder
2	TTL encoder simulation/TTL master encoder
4	TwinSync communication
5	TTL encoder with commutation signal
6	SSI encoder simulation
7	Analog I/O option card, 16 bit
A	Second safe Sin/Cos encoder[1)]
B	Second safe SSI encoder[1)]
C	Second safe axis monitor (Sin/Cos)[1)]

5	Option 3- Functional safety
0	STO
1	Safety[2)]

6	Option 4 - Function package
–	Standard
P	With PLC
Q	PQ firmware (see chapter Function package)
R	PQ firmware + PLC (see chapter Function package)

7	Modification
0	Standard
1	Analog input 4 to 20 mA on control card[3)]

8	Variant sequential numbering
01	Standard
03	Conformal coating[4)]

1) Only for devices with optional Safety system
2) Safety available for sizes 3 to 5
3) Not available with Safety
4) As from size 5 available only with conformal coating

ORDERING INFORMATION

Liquid-cooled

Model number (assigned at the factory) **Type designation**

		1				2	3	4	5	6	7	8	
G397	-					-							

1	Rated current/maximum current (at 8kHz switching frequency and 565 V_{DC})
020	20/33 A Size 3
025	25/42 A Size 3
026	26/48 A Size 4
035	35/64 A Size 4
053	53/90 A Size 5
070	70/120 A Size 5
084	84/144 A Size 5
110	110/187 A Size 6A
143	143/215 A Size 6A
170	170/255 A Size 6A
210	210/255 A Size 6A
250	250/425 A Size 7[1)]
325	325/552 A Size 7[1)]
450	450/765 A Size 7[1)]

3	Option 1 - Communication modules
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II
5	CANopen + 2 AO
6	SERCOS III
7	PROFINET IRT

4	Option 2 - Technology modules
0	None
1	Second Sin/Cos encoder
2	TTL encoder simulation/TTL master encoder
3	CANopen + 2 analog outputs
4	TwinSync communication
5	TTL encoder with commutation signal
6	SSI encoder simulation
7	Analog I/O option card, 16 bit
A	Second safe Sin/Cos encoder[2)]
B	Second safe SSI encoder[2)]
C	Second safe axis monitor (Sin/Cos)[2)]

5	Option 3 - Functional safety
0	STO[3)]
1	Safety[4)]

6	Option 4 - Function package
–	Standard
P	With PLC
Q	PQ firmware (see chapter Function package)
R	PQ firmware + PLC (see chapter Function package)

7	Modification
0	Standard
1	Analog input 4 to 20 mA on control card[5)]

8	Variant sequential numbering
01	Standard
03	Conformal coating[6)]

1) 4 kHz switching frequency
2) Only for devices with optional Safety system
3) Safety available for size 3 to 5
4) Not available with Safety
5) As from size 5 available only with conformal coating

POWER SUPPLY UNIT (PSU) OVERVIEW

Intelligent solutions for modular drives systems

Active front-end power supply with sinusoidal regeneration PSU are complementary parts of the Multi-Axis Servo Drive System.

The PSU is available in three mechanical sizes. Each mechanical size is available in two power sizes (P_{nom}/ P_{max}) with 10 s overlead capacity. The power electronics for the best ratio of size/efficiency is set to 4 kHz and synchronized with servo drive modules.

- Size 5
  - 26/52 KW
  - 50/94 KW
- Size 6A
  - 75/127 kW
  - 110/160 kW
- Size 7
  - 250/375 kW
  - 360/375 kW

400 V is the AC Main nominal input voltage.
The DC bus voltage can be stabilized at minimal 770 V.

Reliability of the PSU is ensured by means of proven power electronics platform combined with advanced control techniques extended by active harmonics shaping of the AC Main. Overall system robustness is further improved by presence of passive braking resistors.

PSU can be set up via an user friendly graphical user interface and status display is located in the front panel of the device.

Features

- Enabling the best electric motor utilization through the DC-bus voltage boost and stabilization (stablilization possible at supply range of 400/460 or 480 V ±10 %, 50 and 60 Hz)
- Running with TN and TT
  IT networks is not permitted
- Single DC supply for multiple axes through a short circuit protected bus streamlines cabling and reduces footprint
- Improving efficiency of process through the power factor control
- Returning energy to the AC Main allows for low energy consumption
- Regulating and controlling AC Main disturbances (blackouts under/over-voltage, spikes. etc.)
- Effective communication with the rest of the motion control system

All above in accordance with regulations of the international standards and the certificates (EMC, CE, UL etc.).

TECHNICAL DATA

Sizes 1 to 6A

Power Supply Unit (PSU)

Order code	Size	Rated current [A]
G396-026	Size 5	40
G396-050		76
G396-075	Size 6A	115
G396-110		170
G396-250	Size 7	385
G396-360		553

TECHNICAL DATA

Parameters size 5

Type G396-026

NOTE:
Project article! The supply units are only allowed to be used after system approval by Moog.
Please contact our application specialists on this issue.

Ordering number	**G396-026**				**G396-050**			
	400 V_{AC}	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**	**400 V_{AC}**	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**
DC link output								
DC voltage	650 V_{DC} /770 V_{DC}							
Rated current, effective (I_N)			40 A	34 A			76 A	64 A
Peak current (for 10 s)			80 A	68 A			144 A	122 A
Continuous power			26 kW				50 kW	
Peak power (for 10 s)			52 kW				94 kW	
DC link capacity[1)]			900 µF				900 µF	
Input, mains side								
Voltage (±10 %)	400 V_{AC} /460 V_{AC}/480 V_{AC}							
Continuous current, effective	40 A	33 A			76 A	63 A		
Peak current (for 10 s)	80 A	67 A			144 A	120 A		
Switching frequency	12 kHz				4 kHz			
Continuous power	27.5 kW				52.5 kW			
Power loss [2)]	1,010 W				1,010 W			
Asymetry of mains voltage	±3 % maximum				±3 % maximum			
Frequency	50/60 Hz				50/60 Hz			
Power Supply Unit	**G396-026**				**G396-050**			
Cooling method	Air-cooled or liquid-cooled							
Protection	IP10 except terminals (IP00)							
Cooling air temperature	+40 °C (+104 °F)							
Weight	13 kg (28.7 lb)							
Mounting type	Vertical mounting with unhindered air flow							
Mounting several servo drives	Direct side by side mounting, maximum 2 mm (0.08 in)							

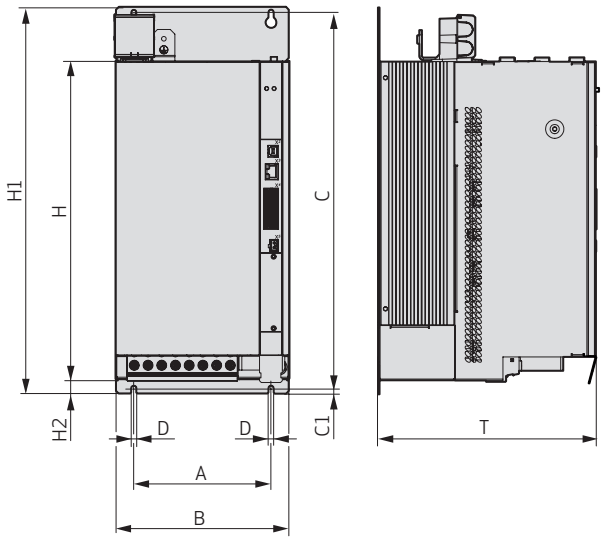
1) The maximum overall capacity of the Multi-Axis System DC link in the case of a Power Supply Unit size 5 (inclusicve) must not exceed 10,000 µF

2) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

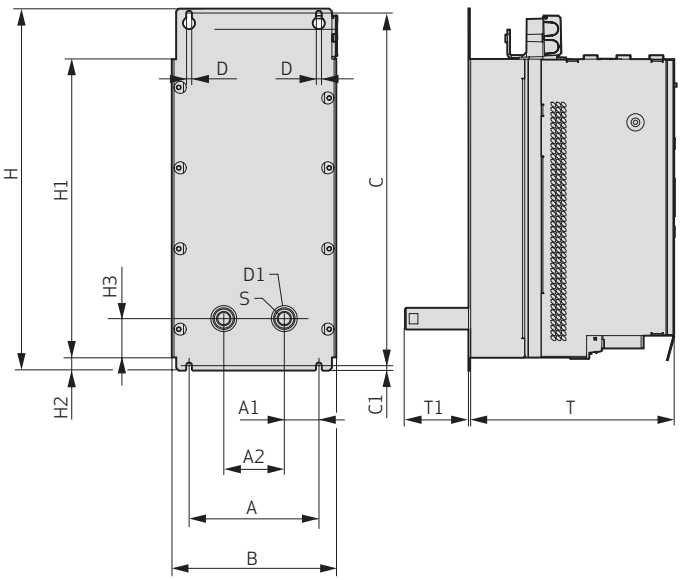
TECHNICAL DATA

Parameters size 5

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	150 (5.91)	
A1	40 (1.57)	
A2	70 (2.76)	
B (width)	190 (7.48)	
C	406.5 (16)	
C1	6 (0.24)	
D (ø)	5.6 (0.22)	6.5 (0.26)
D1 (ø hole for pipe socket)	48 (1.89)	
H (height) (without terminals)	345 (13.58)	346.5 (13.64)
H1	418.5 (16.48)	
H2	15 (0.59)	
H3	54 (2.13)	
S (inside thread)	3/8"	
T (depth) (without terminals)	238 (9.37)	
T1		74 (2.91)

TECHNICAL DATA

Parameters size 5

Accessories Size 5

Part name	Description	Part number
G396-026		
Mains connection	Included components (part number): • Mains filter FFU 3 x 56K (CB10356-004) • Input choke 40 A including capacitor (CB10356-003) • Step-up choke 40 A (CB10356-002) • EMC mounting set (CB10356-005) • Total copper weight 16.6 kg (36.60 lb)	CB10356-001
G396-050		
Mains connection	Included components (part number): • Mains filter FFU 3 x 80K (CA99591-004) • Input choke 76 A including capacitor (CA99591-003) • Step-up choke 76 A (CA99591-002 • EMC mounting set (CA99591-005) • Total copper weight 35 kg (77.16 lb)	CA99591-001

TECHNICAL DATA

Parameters size 6A

Type G396-075

NOTE:
Project article! The supply units are only allowed to be used after system approval by Moog.
Please contact our application specialists on this issue.

Ordering number	**G396-075**				**G396-110**			
	400 V_{AC}	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**	**400 V_{AC}**	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**
DC link output								
DC Voltage	650 V_{DC}/770 V_{DC}							
Rated current, effective (I_N)			115 A	97 A			170 A	144 A
Peak current (for 10 s)			195 A	165 A			246 A	207 A
Continuous power			75 kW				110 kW	
Peak power (for 10 s)			127 kW				160 kW	
DC link capacity[1)]			4,240 µF				4,240 µF	
Input, mains side								
Voltage (±10 %)	400 V_{AC}/460 V_{AC}/480 V_{AC}							
Continuous current, effective	115 A	96 A			170 A	142 A		
Peak current (for 10 s)	195 A	163 A			245 A	204 A		
Switching frequency	8 kHz				4 kHz			
Continuous power	80 kW				118 kW			
Power loss [2)]	2,500 W				2,500 W			
Asymetry of mains voltage	±3 % maximum				±3 % maximum			
Frequency	50/60 Hz				50/60 Hz			
Power Supply Unit	**G396-075**				**G396-110**			
Cooling method	Air-cooled or liquid-cooled							
Protection except terminals (IP00)	IP20							
Cooling air temperature	+40 °C (+104 °F)							
Weight	32 kg (70.6 lb)							
Mounting type	Vertical mounting with unhindered air flow							
Mounting several servo drives	Direct side by side mounting, 40 mm (1.57 in) between two size 6A devices with air cooling							

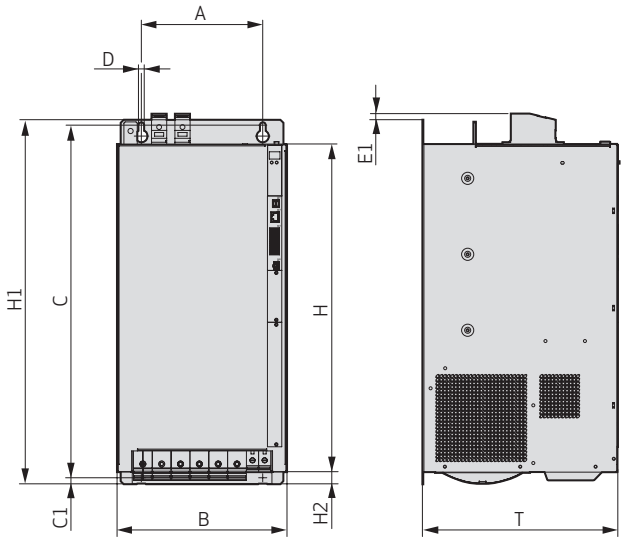
1) The maximum overall capacity of the Multi-Axis System DC link in the case of a Power Supply Unit size 6A (inclusicve) must not exceed 20,000 µF

2) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

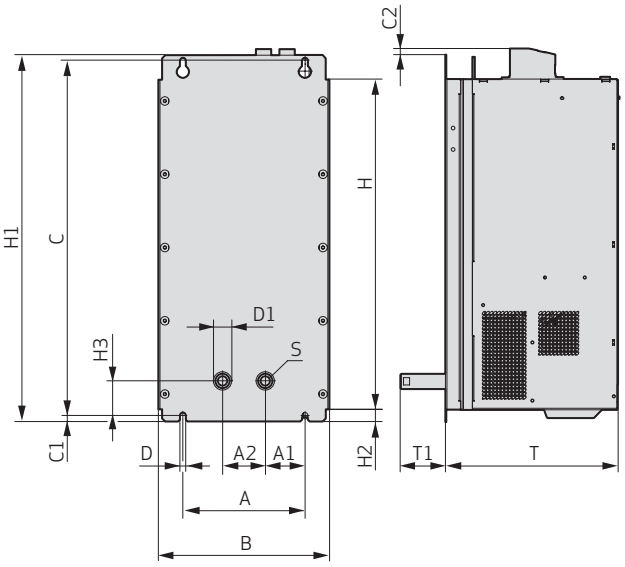
TECHNICAL DATA

Parameters size 6A

Installation drawing, Air-cooled



Installation drawing, Liquid-cooled



Dimensions	Air-cooled [mm (in)]	Liquid-cooled [mm (in)]
A	200 (7.87)	
A1	65 (2.56)	
A2	70 (2.76)	
B (width)	280 (11.02)	
C	581 (22.87)	
C1	10 (0.39)	
C2		
D (ø)	9.5 (0.37)	
D1 (ø hole for pipe socket)	48 (1.89)	
E1	10 (0.39)	
H (height) (without terminals)	540 (21.26)	
H1	600 (23.62)	
H2	20 (0.79)	
H3	56.5 (2.22)	
S (inside thread)	3/8"	
T (depth) (without terminals)	321 (12.64)	281 (11.06)
T1		73.5 (2.89)

TECHNICAL DATA

Parameters size 6A

Accessories Size 6A

Part name	Description	Part number
G396-075		
Mains connection	Included components (part number): • Mains filter FFU 3 x 130K (CB10357-004) • Input choke 115 A including capacitor(CB10357-003) • Step-up choke 115 A (CB10357-002) • EMC mounting set (CB10357-005) • Total copper weight 47.4 kg (104.50 lb)	CB10357-001
G396-110		
Mains connection	Included components (part number): • Mains filter FFU 3 x 180K {CA99592-004) • Input choke 170 A including capacitor (CA99592-003) • Step-up choke 170 A {CA99592-002) • EMC mounting set (CA99592-005) • Total copper weight 74 kg (163.14 lb)	CA99592-001

TECHNICAL DATA

Parameters size 7

Type G396-250

NOTE:
Project article! The supply units are only allowed to be used after system approval by Moog.
Please contact our application specialists on this issue.

Ordering number	**G396-250**				**G396-360**			
	400 V_{AC}	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**	**400 V_{AC}**	**460/ 480 V_{AC}**	**650 V_{DC}**	**770 V_{DC}**
DC link output								
DC voltage	650 V_{DC}/770 V_{DC}							
Rated current, effective (I_N)			385 A	325 A			553 A	468 A
Peak current (for 10 s)			577 A	487 A			577 A	487 A
Continuous power			250 kW				360 kW	
Peak power (for 10 s)			375 kW				375 kW	
DC link capacity[1)]			7,200 µF				7,200 µF	
Input, mains side								
Voltage (±10 %)	400 V_{AC}/460 V_{AC}/480 V_{AC}							
Continuous current, effective	375 A	313 A			540 A	450 A		
Peak current (for 10 s)	565 A	470 A			565 A			
Switching frequency	4 kHz				4 kHz			
Continuous power	260 kW				374 kW			
Power loss [2)]	3,300 W				4,100 W			
Asymetry of mains voltage	±3 % maximum				±3 % maximum			
Frequency	50/60 Hz				50/60 Hz			
Power Supply Unit	**G396-250**				**G396-360**			
Cooling method	Liquid-cooled							
Protection except terminals (IP00)	IP20							
Cooling air temperature (not more than +10 °C (+50 °F) below the ambient temperature)	+5 to +40 °C (+41 to +104 °F)							
Weight	90 kg (198.5 lb)							
Mounting type	Vertical installation in a cabinet							
Mounting several servo drives	Direct side by side mounting, 40 mm (1.57 in) between two size 7 devices							

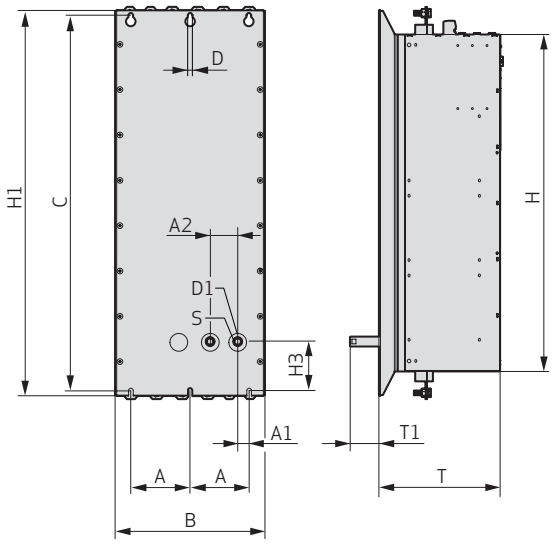
1) The maximum overall capacity of the Multi-Axis System DC link in the case of a Power supply Unit size 7 (inclusive) must not exceed 20,000 µF

2) With liquid cooling typically 80 % of the power loss is lost by the liquid chiller.

TECHNICAL DATA

Parameters size 7

Installation drawing, Liquid-cooled



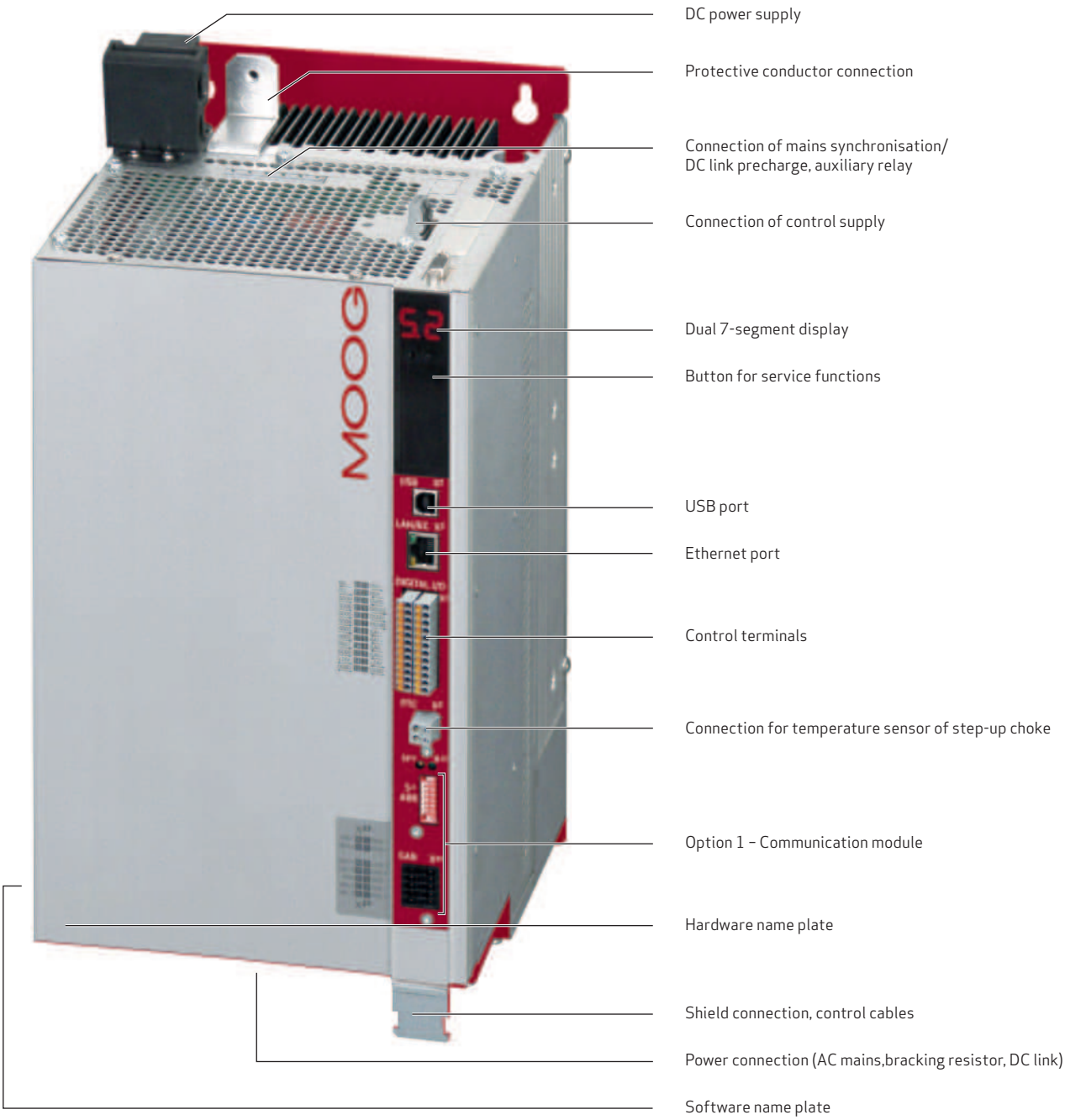
Dimensions	Liquid-cooled [mm (in)]
A	150 (5.91)
A1	29 (1.14)
A2	70 (2.76)
B (width)/(with shield plate)	380 (14.96)/385 (15.16)
C	952 (37.48)
D (ø)	12 (0.47)
D1 (ø hole for pipe socket)	48 (1.89)
H (height)/(with terminal cover)/(with shield plates)	855 (33.66)/1,171 (46.1)/1,315 (51.77)
H1	979 (38.54)
H2	62 (2.44)
H3	124 (4.88)
S (inside thread)	3/8"
T (depth) (without terminals)	287 (11.3)
T1	74 (2.91)

Accessories Size 7

Part name	Description	Part number
G396-250		
Mains connection	Included components (part number): • Mains filter FN 3359-400-99, 400 A (CC16543-004) • Input choke 375 A including capacitor (CC16543-003) • Step-up choke 375 A (CC16543-002) • EMC mounting set	CC16543-001
G396-360		
Mains connection	Included components (part number): • Mains filter FN 3359-600-99, 600 A (CC16544-004) • Input choke 540 A including capacitor (CC16544-003) • Step-up choke 540 A (CC16544-002) • EMC mounting set	CC16544-001

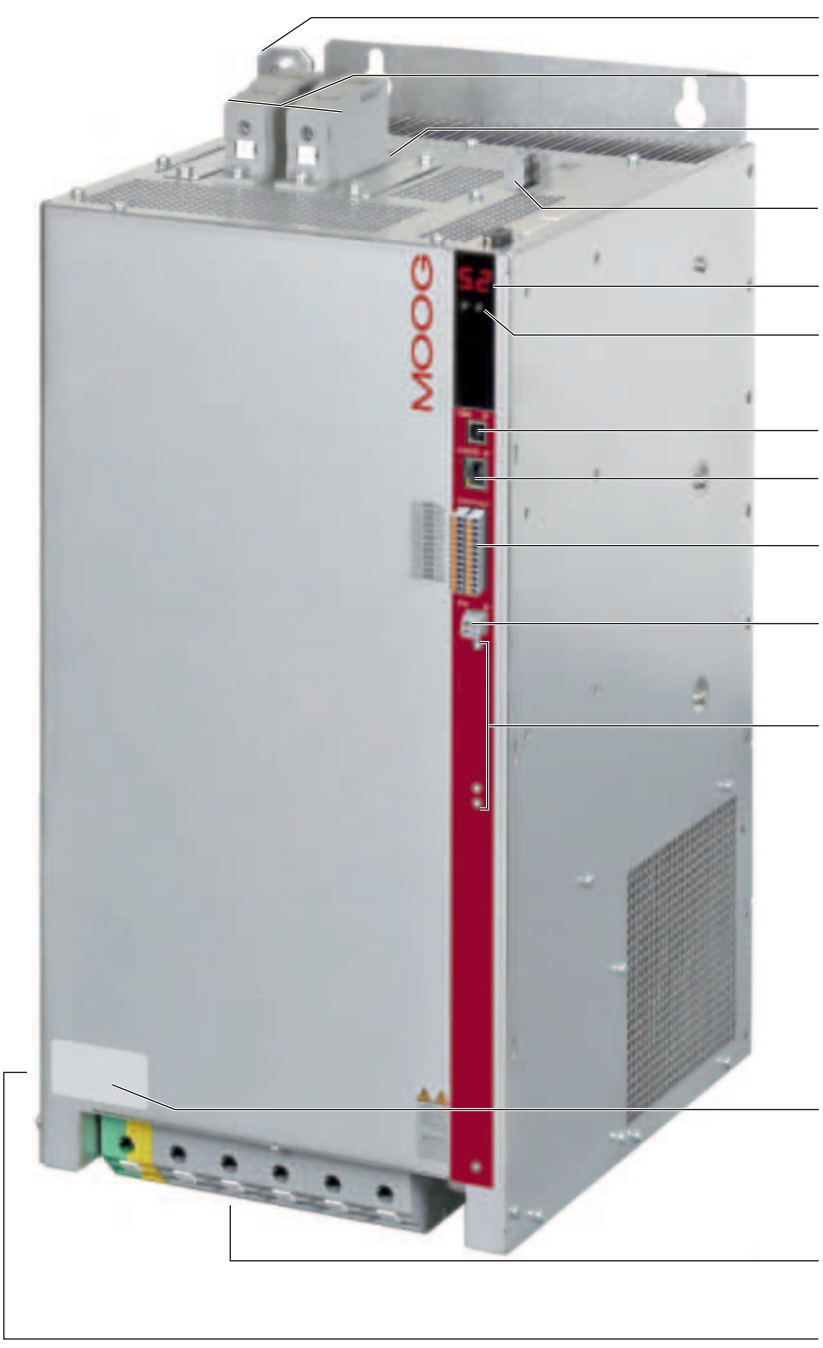
TECHNICAL DATA

Equipment – Size 5 – Power Supply Unit (PSU)



TECHNICAL DATA

Equipment – Size 6A – Power Supply Unit (PSU)



Protective conductor connection

DC power supply

Connection of mains synchronization/DC link precharge, auxiliary relay

Connection of control supply

Dual 7-segment display

Button for service functions

USB port

Ethernet port

Control terminals

Connection for temperature sensor of step-up choke

Option 1 – Communication module

Hardware name plate

Power connection
(AC mains, bracking resistor, DC link)

Software name plate

TECHNICAL DATA

Equipment – Size 7 – Power Supply Unit (PSU)

POWER SUPPLY UNIT - CURRENT CAPACITY

Sizes 5 to 7 – Power Supply Units (PSU)
Air and Liquid-cooled

Ordering number Size	Switching frequency of power stage [kHz]	Ambient temperature maximum [°C (°F)]	Rated current		Peak current		
			At 650 V_{DC} [A_{eff}]	At 770 V_{DC} [A_{eff}]	At 650 V_{DC} 0 Hz [A_{eff}]	At 770 V_{DC} > 5 Hz [A_{eff}]	For time [s]
G396-026 Size 5	12	+40 (+104)	40	34	76	68	10
G396-050 Size 5	4		76	64	144	122	
G396-075 Size 6A	8		115	97	195	165	
G396-110 Size 6A	4		170	144	246	207	
G396-250 Size 7[1)]			375	325	565	487	
G396-360 Size 7[1)]			540	468			

1) Power Supply Units only available with liquid cooling.

AMBIENT CONDITIONS

Ambient conditions	
Protection	Size 6A/7 IP20 except terminals (IP00), size 5 IP10 except terminals (IP00)
Accident prevention regulations	According to local regulations (in Germany e.g. BGV A3)
Type of installation height	Up to 1,000 m (3,280 ft) above MSL, above with power reduction (1 % per 100 m (328 ft), maximum 2,000 m (6,561 ft) above MSL).
Pollution severity	2
Type of installation	Built-in unit, only for vertical installation in a switch cabinet with minimum IP4x protection, when using STO safety function minimum IP54
Climatic conditions	
In transit	
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2K3[1)]
Temperature	-25 to +70 °C (-13 to +158 °F)
Relativ air humidity at maximum + 40 °C (+104 °F)	95 %
In storage	
According to	IEC/EN 61800-2, IEC/EN 60721-3-1 class 1K3 and 1K4[2)]
Temperature	-25 to +55 °C (-13 to +131 °F)
Relative air humidity	5 to 95 %
In operation	
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3K3[3)]
Temperature	**Size 5 and 6A**
	-10 to +40 °C (+14 to +104 °F) 4/8/12 kHz
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)
	Size 7
	-10 to +40 °C (+14 to +104 °F) 4 kHz
	Up to +55 °C (+131 °F) with power reduction (2 % per °C)
Relative air humidity without condensation	5 to 85 %

1) The absolute humidity is limited to maximum 60 g/m³
This means, at +70 °C (+158 °F) for example, that the relative humidity may only be maximum 40 %
2) The absolute humidity is limited to maximum 29 g/m³
So the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously
3) The absolute humidity is limited to maximum 25 g/m³
That means that the maximum values for temperature and relative air humidity stipulated in the table must not occur simultaneously

AMBIENT CONDITIONS

Mechanical conditions			
Vibration limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	200 ≤ f < 500 Hz
Amplitude	3.5 mm (0.14 in)	Not applicable	
Acceleration	Not applicable	10 m/s² (393.70 in/s²)	15 m/s² (590.55 in/s²)
Shock limit in transit			
According to	IEC/EN 61800-2, IEC/EN 60721-3-2 class 2M1		
	Drop height of packed device maximum 0.25 m (9.84 in)		
Vibration limits of the system[1)]			
According to	IEC/EN 61800-2, IEC/EN 60721-3-3 class 3M1		
Frequency	2 ≤ f < 9 Hz	9 ≤ f < 200 Hz	
Amplitude	0.3 mm (0.01 in)	Not applicable	
Acceleration	Not applicable	1 m/s² (39.37 in/s²)	

1) The devices are only designed for stationary use. The servo drives must not be installed in areas where they would be permanently exposed to vibrations

CERTIFICATIONS AND STANDARDS

CE mark

The PSU conforms to the requirements of the Low Voltage Directive 2014/35/EU and the product standard IEC/EN 61800-5-1.

The PSU thus conform to the requirements for installation in a machine or plant under the terms of the Machinery Directive 2006/42/EC.

The PSU are accordingly CE marked. The CE mark on the name plate indicates conformity with the above Directives.

UR approval

For the PSU, UR approval has been obtained for device size 5 and 6A (40 to 170 A rated current).

Currently no UL Certification for size 7 available

For details see document "UL-Certification" CC36842-001.

EMC acceptance tests

All PSU have an aluminium rear panel made of aluminized/galvanized sheet steel (size 5 to 7) to enhance interference immunity in accordance with IEC/EN 61800-3, environment classes 1 and 2.

To limit conducted interference emissions to the permissible level and to comply with the EMC Directive 2014/30/EU, external filter sets are available for the PSU.

ORDERING INFORMATION

Model number (assigned at the factory) **Type designation**

G396	-	1	2	3	4	5	6	7
			-					

1	Rated power/maximum power
026	26/ 52 kW Size 5
050	50/ 94 kW Size 5
075	75/127 kW Size 6A
110	110/160 kW Size 6A
250	250/375 kW Size 7
360	360/375 kW Size 7

3	Option 1 - Communication module
0	None
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II

4	For future use
0	Standard

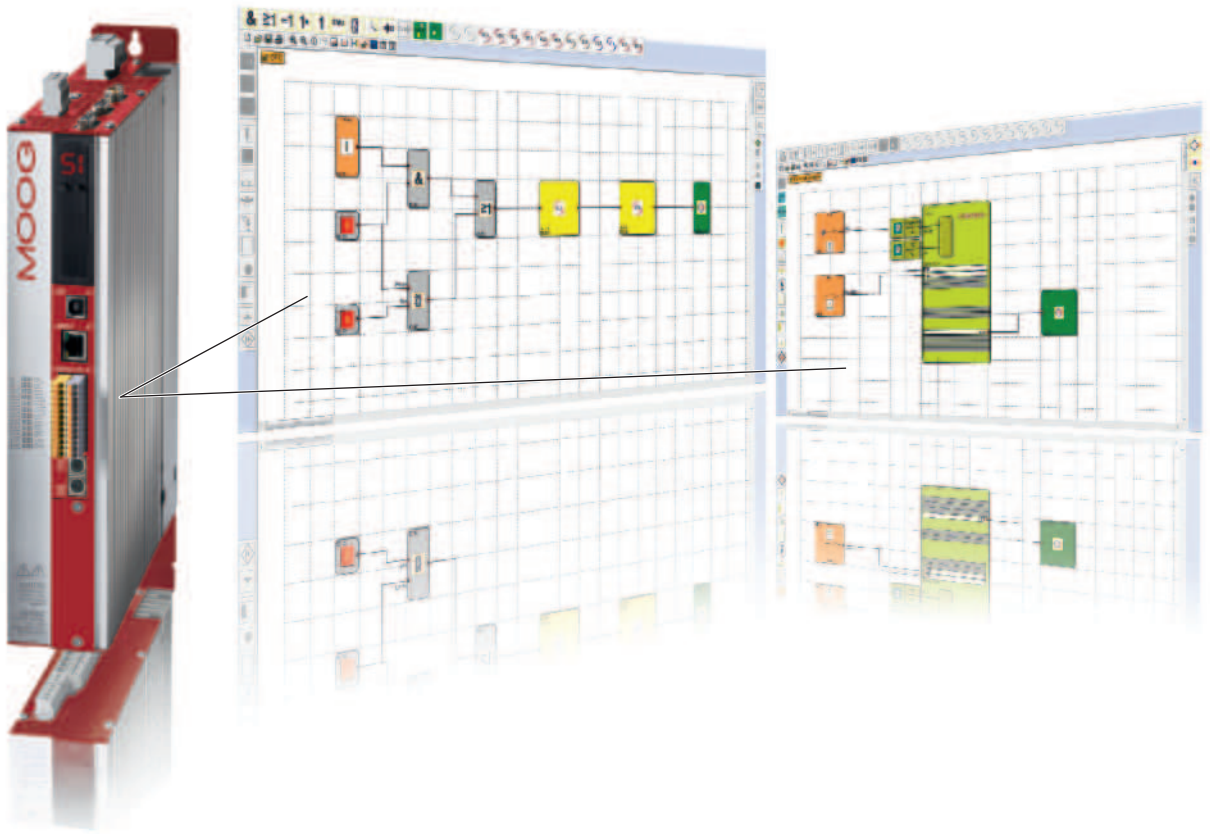
5	Housing/cooling method
1	Air-cooled[1]
2	Liquid-cooled

6	Option 4 - Function package
–	Standard
P	With PLC

7	Variant sequential numbering
001	Standard[2]
002	Internal brake resistor (only with liquid-cooled housing)[2]

1) Not size 7
2) Always with conformal coating

INTEGRATED FUNCTIONAL SAFETY OVERVIEW



Type	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 5	Multi-Axis Servo Drive Sizes 1 to 5	PSU Sizes 5 to 7
Integrated Functional Safety	No		Yes [1]		No
Servo Drive Software with Safety PLC Functions			Yes		
Dongle					
Cable for Safe Cross Communication (SCC)					

1) Only for devices up to and including G392-072/G393-072/G395-084/G397-084

Note: The Integrated Functional Safety can only be ordered with the servo drive. It is always shipped from the factory ready to be installed.

INTEGRATED FUNCTIONAL SAFETY

Short Description

The Integrated Functional Safety option provides a fully featured functional safety offering for machine control including a safety PLC. This package is compliant with the latest standards and the highest safety levels (SIL 3). The Safe-Cross communication feature enables data to be exchanged among up to 6 servo drive units.

Equipment of the Integrated Functional Safety

Safety functions			
Speed dependent	STO	Safe Torque Off	6/1 per axis
	SS1	Safe Stop 1	12 (optionally SS1 or SS2)
	SS2	Safe Stop 2	
	SLS	Safe Limit Speed	48 (optionally SLS or $SLS_{maximum}$)
	$SLS_{maximum}$	Safe Limit Speed maximum	
	SDI	Safe Direction	6/1 per axis
	ECS	Encoder Supervisor	
	ESM	Encoder Standstill Monitoring	
Speed- or position-dependent	SOS	Safe Operating Stop	6/1 per axis
	SCA	Safe Cam	64
	SLI	Safe Limited Increment	6/1 per axis
Position-dependent	SLP	Safe Limited Position	12
	SCA	Safe Cam	64
	Sref	Safe Reference	6
	SEL	Safe Emergency Limit	
Brake	SBC	Safe Brake Control	1 per axis
	SBT [1)]	Safe Brake Test	
	SCC	Safe Cross Communication	
	FSoE [1)]	Functional Safety over EtherCAT	

PC software	
Safe Monitor PLC (Servo Drive Software with Safety PLC Functions)	Configuration
	Programming
	Validation
Moog DriveAdministrator	For details see section “Accessories”
System	
Configuration mode	User-programmable safety control
Safety acceptance tests	SIL 3 according to IEC/EN 61508, IEC/EN 62061, PL e and cat 4 according to EN ISO 13849

1) Project specific

INTEGRATED FUNCTIONAL SAFETY

Control hardware	
Safety digital inputs	4 [1)]
Safety digital outputs	4 [1)]
Safety digital outputs of which usable as safe pulse outputs	4
Safe brake outputs	2 [1)]
Supported safety sensors	Light grids, emergency stops, guard doors, laser scanners, mode selector switches, guard locks, enable buttons, etc.
Analog standard inputs (±10 V, 12 bits)	2
Digital standard inputs	6

Order code	**G392-xxxAxx1-xxx** **G392-xxx-xx1-xxx** **G393-xxx-xx1-xxx** **G395-xxx-xx1-xxx** **G397-xxx-xx1-xxx**

1) SIL 2; SIL 3 with redundant use of the inputs/outputs (2-channel)

Note: Only available built ex factory.
Only for devices up to and including G392-072/G393-072/G395-084/G397-084

The approval of the Moog Servo Drive with Integrated Functional Safety is subject to the Machinery Directive 2006/42/EC. Currently the safety control system is available for countries where the official language is one of the following: German, English, Italian

INTEGRATED FUNCTIONAL SAFETY

Safety inputs and outputs

Safe Cross Communication for safe interlinking of up to 6 axes

Connection for motor temperature monitor

Connection for two motor brakes (SIL 2) or one brake (SIL 3)

Setup

Moog's Modular Servo Drives with integrated safety functions provide a complete freely programmable functional safety system for safe handling of machines. The system provides the various safety functions as defined in IEC/EN 61800-5-2. In addition to these standard functions, the Safe Cross Communication (SCC) feature enables up to six drives to be linked to form a network. This enables a complete machine safety solution independent of the control. The SCC allows centralized evaluation of safety switching elements connected to the drives as well as exchange of status information.

Programming

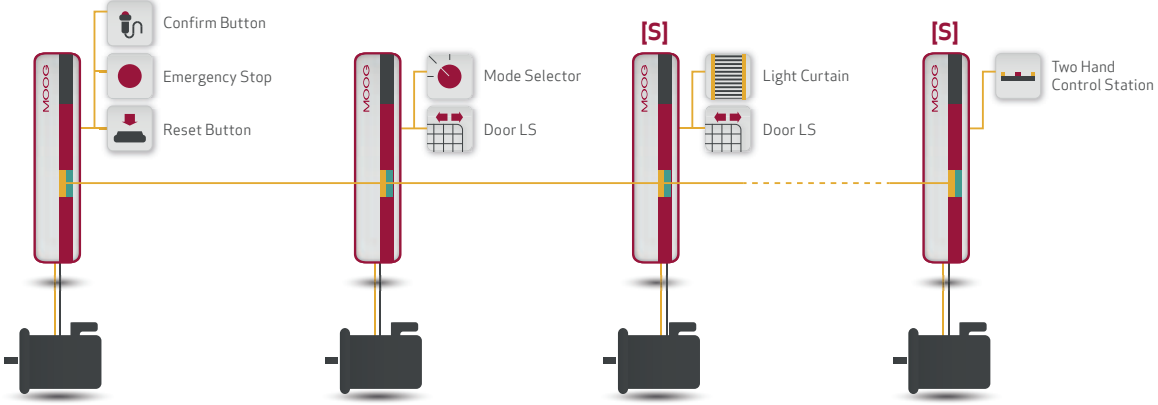
Creation of safety programs is achieved using an intuitive graphical function block diagram language similar to IEC/EN 61131-3. The "Servo Drive Software with Safety PLC Functions" includes pre-programmed modules for all commonly used sensors, each available as a logic element.

Similarly, the safety functions (SLS, SLI, etc.) can be selected and are also represented as logic items with one logic input and output. Programming is then achieved by linking the various input devices and safety functions with standard logic functions (AND, OR, XOR, time etc.).

Once developed, each axis in the network is programmed and parameterized by the master drive, thereby simplifying the overall development and series production process.

Validating

On completing the safety configuration, parameterization and programming, validation needs to occur. Here too, the system assists by providing configuration reports which can be used for validation. Once validated, the parameter data is locked preventing further change and allowing the validated parameter set to be deployed on the production machine.



ACCESSORIES FOR INTEGRATED FUNCTIONAL SAFETY

Servo Drive Software with Safety PLC Functions

Short description

The Servo Drive Software with Safety PLC Functions is required to build the machine safety application. With only one program the entire safety solution of the machine can be programmed.

Functions	Description
Hardware configuration	Selection by drag and drop (controller, encoder, safety switch elements or safety outputs)
Programming	Graphical programming of machine safety solution with function blocks
Parameterization	Setting of threshold values of the safety function blocks
Validation	Validation of the programmed safety functionality
Commissioning	Download of the safety program to the servo drive and debugging respectively PC-based commissioning of the application
System	
Languages	German, English
Operating System	PC with operating system Windows XP (SP2), Windows 7 (32/64 bit), Windows 8 (32/64 bit) or Windows 10 (32/64 bit)

DONGLE

Short description

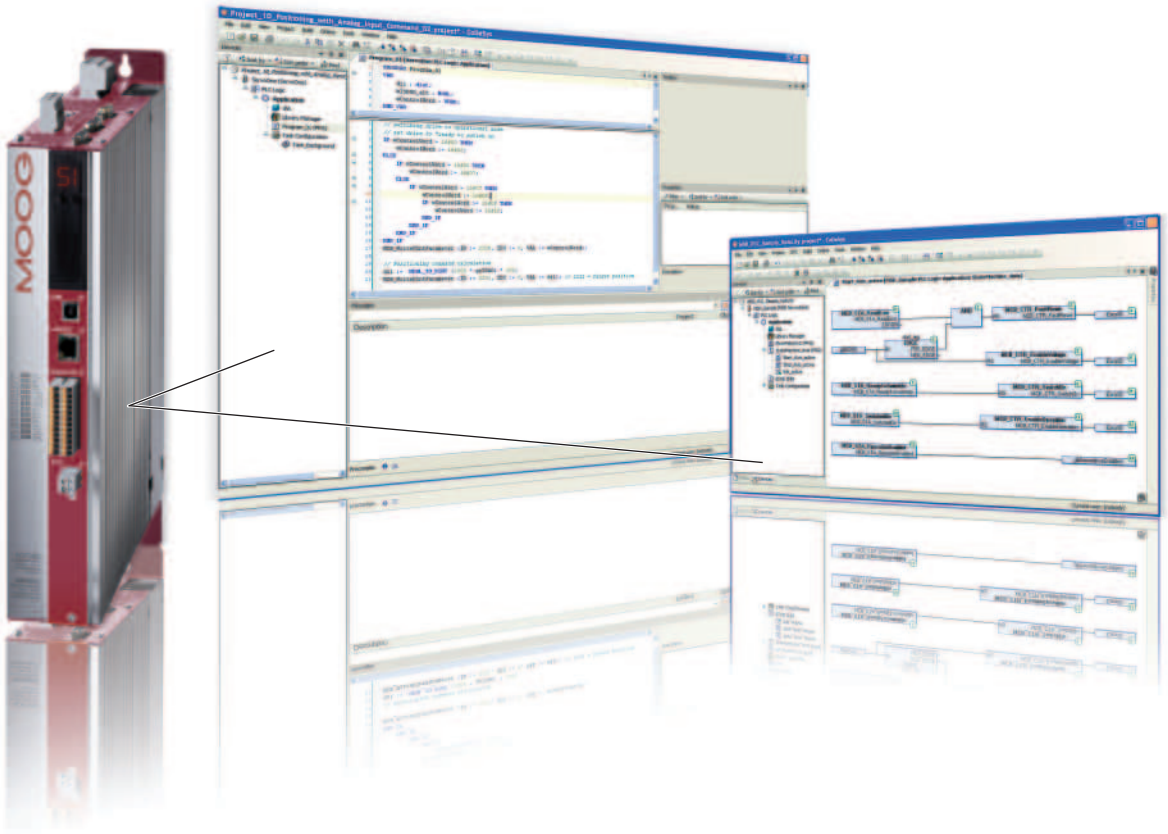
The USB dongle is necessary for authentication of the programmer as well as for creation and modification of safety programs. The required USB driver is supplied with the Servo Drive Software with Safety PLC Functions.

Part number: CB80762-001

CABLE FOR SAFE CROSS COMMUNICATION (SCC) INTERFACE

Technical data	CB72529-001
Cable length	0.4 m (15.74 in)
Connectors	Ready to connect for networking between the servo drives
Cross-section	4 x 2 x 0.25 m (9.84 in) + 2 x 0.50 m (19.68 in)

PLC FUNCTION PACKAGE OVERVIEW



Type	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 7	Multi-Axis Servo Drive Sizes 1 to 7	PSU Sizes 5 to 7
PLC Function Package for Programming in IEC/EN 61131	No	Yes			

PLC FUNCTION PACKAGE FOR PROGRAMMING IN IEC/EN 61131

Short Description

The PLC, programmable in IEC/EN 61131, shares the microcontroller platform of the Moog Servo Drive with the drive control, allowing optimized, fast access to all system and control parameters and interfaces. Extensive motion and interface libraries permit easy, flexible creation of applications and provide a wide range of solution options.

Technical data	**General**
Platform	Microcontroller 32 bit FPU (integrated in standard drive µC)
Flash program memory	512 kB
Data memory SDRAM	512 kB
Data memory remanent NVRAM	512 Byte (retain), 512 Byte (persistant)
Real-time clock	No
Operating system	Single tasking

Technical data	**Open-loop control**
Number of controllable axes	1.5
Processing time	Depends on CPU workload
Real-time tasks	Cyclic (maximum 3 tasks), free-running (maximum 3 tasks)
Minimum sampling time	1 ms (5 ms recommended)
Online program change	Yes
Watchdog timer	Yes
Fieldbus access to variables	Respectively 20 Int16 and Int32, 10 FLOAT32 parameter

Technical data	**Programming and debugging**
Programming environment	CODESYS V3
Programming languages	• Continuous Function Chart editor (CFC editor) • Ladder Diagram (LD) • Function Block Diagram (FBD) • Structured Text (ST) • Instruction List (IL/STL) • Sequential Function Chart (SFC)
Command set	IEC/EN 61131-3
Debug, Single Step, Watch function	Yes
Simulation, Online Trace	Yes
Breakpoints	Yes
Source Code Download	No
Program management	No
Programming interface	Ethernet TCP/IP

Order code	**G39x-xxx-xxxPxxx**

Note: Available built ex factory and separately for existing devices.

SPEED CONTROLLED PUMP (SCP) SOFTWARE

Type	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 7	Multi-Axis Servo Drive Sizes 1 to 7	PSU Sizes 5 to 7
Speed Controlled Pump (SCP) Software	No		Yes [1]	No	

1) Only G392

Short Description

Speed Controlled Pump Software provides intelligent pressure and flow functionality for the Speed Controlled Pump System due to unique control algorithms. Depending on pressure and flow demand values, the MSD controls the speed setting requirements for torque and speed. Pump and servo motor characteristics are stored in the servo drive, creating an intelligent system that can communicate with external systems over a fieldbus.

Control features	
p/Q controller	The main SCP controller structure is based on cascaded PID control principle. There are two coupled controllers, one for flow (Q) and one for pressure (p).
Leakage compensation	The pressure-dependant internal leakage of the pump can be compensated directly in the drive.
Linearization	A linearization table allows compensation of the speed-dependant volumetric losses.
Dual displacement	A pump with dual displacement (control option N1) can be used. Thereby an optimal operating point can be selected (e.g. to be able to use smaller motor).
Feed forward	In the Q-path a feed-forward structure is implemented.
Safety relevant features and limitations	
Protection against cavitation	The controller ensures a) a minimum system pressure to avoid cavitation in the hydraulic system and b) limits the acceleration of the pump to avoid cavitation in the suction line.
Integrator with Anti-wind-up functionality	The integral part of the controller has an anti-wind-up functionality.
Limiters	The controller is able to limit the pump speed and acceleration in different ways. It is also possible to define different limitations for different working points (e.g. depending on the sign of acceleration and velocity).
Setup features	
Parameter sets	The SCP software can handle 15 different predefined parameter sets, e.g. to adapt the control loop to different loads. Via digital inputs the current set can be switched.
Actual value inputs	The actual value inputs have scaling, offset and filter blocks.
Cable break detection	For the input X4 a cable break detection can be activated.

SPEED CONTROLLED PUMP (SCP) SOFTWARE

Model number (assigned at the factory) **Type designation**

		1	2	3	4	5	6	7	8
G392	-								

1	Rated current/maximum current (at 8kHz switching frequency)[1]
024	24/48 A Size 4
032	32/64 A Size 4
045	45/90 A Size 5
060	60/120 A Size 5
072	72/144 A Size 5
090	90/180 A Size 6
110	110/165 A Size 6

2	Supply voltage
–	3 x 230 V to 480 V

3	Option 1 - Communication module
0	None[2]
1	EtherCAT
2	CANopen
3	PROFIBUS-DP
4	SERCOS II
5	CANopen + 2 AO
6	SERCOS III

4	Option 2 - Technology module
0	None[3]
7	Analog I/O option card, 16 bit

5	Option 3 - Functional safety
0	Standard

6	Option 4 - Function package
Q	PQ firmware
R	PQ firmware + PLC

7	Modification
0	Standard
1	Analog input 4 to 20 mA on control card

8	Variant sequential numbering
01	Standard

1) SCP Software is available only for switching frequency of 4 kHz or less
2) Only for Servo Drives with Analog I/O option card, 16 bit required
3) Only for Servo Drives with commutation modules

OVERVIEW

Option 1 - Communication module

Communication module for	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 7	Multi-Axis Servo Drive Sizes 1 to 7	PSU Sizes 5 to 7
EtherCAT	No	Yes			
CANopen					
PROFIBUS					
SERCOS II					
CANopen + 2 AO	No		Yes		No
SERCOS III	No	Yes			
PROFINET IRT	No		Yes		

Note: The communication module can only be ordered with the servo drive It is always shipped from the factory ready to be installed

ETHERCAT

Short Description

EtherCAT is an Ethernet-based, real-time capable, synchronous fieldbus system. It is classed as one of the fastest real-time Ethernet solutions for automation.

Technical data	**EtherCAT**
Standardization	IEC/EN 61158, IEC/EN 61784-2, IEC/EN 61800-7
Transfer rate	Up to 100 Mbit/s
Transfer medium	Standardized Ethernet to IEEE 802.3
Sampling time	≥125 µs
Synchronization jitter	≤1 µs (distributed clocks)
Communication	CoE (CiA 301) (V1.0.2)
Device profile	CiA 402 (Rev. 2.0)
Network topology	Line, tree or star possible
Connection	RJ45 (shielded)
Cable type	CAT5

Order code	**G39x-xxx-1xx-xxx**

Note: Only available built ex factory.

CANOPEN

Short Description

Communication interface for CANopen, isolated from device electronics.

Type	**CANopen**
Standardization	ISO 11898, IEC/EN 61800-7
Communication	CiA 301 (Rev. 4.01)
Device profile	CiA 402 (Rev. 2.0)
Transfer rate/cable length	20 kbit/s up to 1,000 m (3,280 ft) 1 Mbit/s up to 40 m (131 ft)
Connection	2 x Phoenix contact connectors (Type FMC 1.5/ 5-ST-3.5 GY RAL7042) 5-pin (according to CiA 303)
Supply voltage external	24 V ±20 % (according to IEC/EN 61131-2)

Order code	**G39x-xxx-2xx-xxx**

Note: Only available built ex factory.

PROFIBUS

Short Description

Communications interface for PROFIBUS-DP.

Type	PROFIBUS
Standardization	IEC/EN 61158, IEC/EN 61784-2
Communication	Directive 2.082
Device profile	PROFIdrive V3.1
Transfer rate/cable length	9.6 kbit/s up to 1,200 m (3,937 ft) 12 Mbit/s up to 100 m (328 ft)
Connection	PROFIBUS D-SUB connector 9-pin

Order code	G39x-xxx-3xx-xxx

Note: Only available built ex factory.

SERCOS II

Short Description

The interface conforms to IEC/EN 61491 for SERCOS interfaces and ensures optimum integration of digital drives and controllers from different manufacturers.

Type	SERCOS II
Application note	AN17.2 (dated 2003-02-11)
Transfer rate	2/4/8 and 16 Mbit/s
Connection	1 transmitter, 1 receiver, optical waveguides conform to SERCOS Interface Specification (version 2.4, February 2005)

Order code	G39x-xxx-4xx-xxx

Note: Only available built ex factory.
SERCOS III is also available as Option 1 - communication module

CANOPEN + 2 AO

Short Description

Communication interface for CANopen (isolated from device electronics) and two analog outputs (2AO).

Type	CANopen
Standardization	ISO 11898
Communication	CiA 301 (Rev. 4.01)
Device profile	CiA 402 (Rev. 2.0)
Transfer rate/cable length	20 kbit/s up to 1,000 m (3,280 ft) 1 Mbit/s up to 40 m (131 ft)
Connection	2 x Phoenix contact connectors (Type FMC 1.5/ 5-ST-3.5 GY RAL7042) 5-pin (according to CiA303)
Supply voltage external	24 V ±20 % (according to IEC/EN 61131-2)

Technical data	2 AO
Number of channels	2
Voltage range	±10 V differential
Resolution	12 bit
Accuracy	Maximum ±2 % referred to 10 V, offset error < ±0.1 V
Sampling time	125 µs
Connections	2 x Phoenix contact connectors (Type FMC 1.5/ 2-ST- 3.5 GY RAL7042)

Order code	G39x-xxx-5xx-xxx

Note: Only available built ex factory

SERCOS III

Short Description

The interface conforms to IEC/EN 61491 for SERCOS interfaces and ensures optimum integration of digital drives and controllers from different manufacturers. The basis for SERCOS III implementation in the servo drive is the specification V1.1.2 from SERCOS International.

Technical data	SERCOS III
Application note	AN17.2 (dated 2003-02-11)
Communication	SERCOS Communication (V1.1.2.1.7) (SERCOS International)
Device profile	Generic Device profile (V1.1.2.1.1) (SERCOS International)
Sampling time	125 µs to 65 ms (multiples of 125 µs programmable)
Network topology	Line or ring possible
Connection	RJ45 shielded
Cable type	CAT5e

Order code	G39x-xxx-6xx-xxx

Note: Only available built ex factory.
SERCOS II is also available as Option 1 - Communication module

PROFINET IRT

Short Description

The interface conforms to the international standards IEC/EN 61158-5-10 and IEC/EN 61158-6-10.

Technical data	**PROFINET IRT**
Sampling time	500 µs to 65 ms (multiples of 500 µs programmable)
Network topology	Line
Connection	RJ45 shielded
Cable type	CAT5
Communication	PROFINET I/O, V 2.2.4, Conformance Class C (isochronous)
Device profile	PROFIdrive

Order code	**G39x-xxx-8xx-xxx**

Note: Only available built ex factory.

OVERVIEW

Option 2 - Technology module

Interface for	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 7	Multi-Axis Servo Drive Sizes 1 to 7	PSU Sizes 5 to 7
Second Sin/Cos encoder	No	Yes			No
TTL Encoder Simulation/TTL Master Encoder					
Twinsync communication	No		Yes		
TTL encoder with commutation signals	No	Yes			
SSI encoder simulation	No		Yes		
Analog I/O Option Card, 16 Bit					
Second Safe Sin/Cos Encoder					
Second Safe SSI Encoder					
Second Safe Axis Monitor (Sin/Cos)					

Note: The technology module can only be ordered with the servo drive.
It is always shipped from the factory ready to be installed.

SECOND SIN/COS ENCODER

Short Description

This option enables parallel evaluation of two Sin/Cos encoders. Evaluation of only one Sin/Cos encoder is included as standard in the device (connection via X7). With this encoder interface option it is possible to support the following encoder interfaces: SSI encoder, EnDat 2.1 and 2.2 encoder, TTL encoder and Sin/Cos encoder with and without zero pulse.

Technical data	**Sin/Cos encoder**
Signals	A/B, zero pulse
Signal level	Sin/Cos, 1 V_{SS} + analog zero pulse
Signal frequency	500 kHz maximum

Technical data	**Absolute value encoder**
Interface	SSI, EnDat 2.1, EnDat 2.2, TTL, Sin/Cos
Signals	DATA, CLK
Signal level	EIA485-compliant
Switching frequency EnDat	2 MHz maximum
Switching frequency SSI	1 MHz maximum

Technical data	**General**
Supply voltage external encoder	5 V ±5 %/250 mA
Cable length	50 m (164 ft) maximum (Single-Axis Compact 30 m (98 ft) maximum)
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-x1x-xxx**

Note: Only available built ex factory.

TTL ENCODER SIMULATION/TTL MASTER ENCODER

Short Description

This option permits TTL encoder simulation of a connected encoder and/or connection of a TTL master encoder. The following operation modes are possible:

- Evaluation of a TTL encoder
- Simulation of a TTL encoder (signals from other encoders are converted into TTL signals and made available as output signals)
- TTL-Repeater
  Evaluation of encoder connected to X7 or X8 and direct floating transmission via encoder simulation

Technical data	**TTL encoder simulation**
Signals	A/B, zero pulse
Signal level	TTL differential (EIA422), electrically isolated from the servo drive
Signal frequency	1 MHz maximum

Technical data	**TTL master encoder**
Signals	A/B, zero pulse or pulse/direction
Signal level	TTL-differential (EIA422)
Signal frequency	500 kHz maximum

Technical data	**General**
Supply voltage external encoder	5 V ±5 %/250 mA
Cable length	Maximum 10 m (32.80 ft)
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-x2x-xxx**

Note: Only available built ex factory

TWINSYNC COMMUNICATION

Short Description

By way of the TwinSync option, two drives can be synchronized in master/slave mode. The data mapping for bidirectional cyclic communication between the drives can be flexibly parameterized. The master drive can transmit setpoint (reference) values and control information for the slave drive via TwinSync.

Technical data	**TWINSync communication**
Signal level	TTL differential (EIA422), electrically isolated from the servo drive
User data	8 Byte bidirectional, spread across maximum three objects
Transfer mode	Asynchronous, synchronized via Sync pulse
Transfer rate	Maximum 8 kHz
Cable length	Maximum 10 m (32.80 ft)
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-x4x-xxx**

Note: Only available built ex factory.

TWINSYNC CABLE

Technical data	
Connection	2 x SUB-D 9-pin male
Cross-section	4 x 2 x 0.25 mm^2 + 2 x 0.50 mm^2 (4 x 2 x 0.0004 in^2 + 2 x 0.0008 in^2)

Order code	**CB36987 - yyy**[1)]

1) yyy stands for length in meters. Standard length: 0.3 m (0.98 ft), 0.5 mm (1.64 ft), 0.70 mm (2.3 ft), 1 m (3.28 ft), 1.3 m (4.27 ft), 1.5 m (4.92 ft), 1,7 m (5.58 ft), 2 m (6.56 ft)

Note: Further length upon request

TTL ENCODER WITH COMMUTATION SIGNALS

Short Description

This option permits evaluation of a TTL encoder with additional 120° phase-shifted differential commutation signals.

Technical data	**TTL encoder with commutation signals**
Signals	A/B tracks, zero pulse, U, V, W commutation signals
Signal level	TTL-differential (EIA422)
Signal frequency	500 kHz maximum
Supply voltage external encoder	5 V ±5 %/250 mA
Cable length	Maximum 10 m (32.80 ft)
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-x5x-xxx**

Note: Only available built ex factory.

SSI ENCODER SIMULATION

Short Description

This option permits SSI encoder simulation for output of position information. The length and the protocol for SSI data transfer can be flexibly parameterized. Synchronization of the control cycle to the external SSI clock signal is possible as an option.

Technical data	**SSI encoder simulation**
Signal level	TTL differential (EIA422), electrically isolated from the servo drive
Baud rate	250, 500, 750, 1000 kBaud
Coding	Gray, binary
Cable length	Maximum 10 m (32.80 ft)
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-x6x-xxx**

Note: Only available built ex factory.

ANALOG I/O OPTION CARD, 16 BIT

Short Description

The AIO option card is provided with 2 AI and 2 AO. Inputs/Outputs can be used to simply monitor a signal or provide set points for a motion control loop. Signals are processed before becoming actually available for either of the aforementioned uses. In particular signals get filtered, normalized, compensated and scaled. A DC supply output is also included.

Technical data	**Analog option card**
Signals: Input	2 x (0 to 20 mA or -10 to +10 V)
Signals: Output	2 x (0 to 20 mA or -10 to +10 V)
Resolution	16 bit per channel
Cycle update time	125 µs (8 kHz switching frequency)
Interface	15-pole connector, female
DC supply output	60 mA, +10 V ±1 %

Order code	**G39x-xxx-x7x-xxx**

Note: Only available built ex factory.

SECOND SAFE SIN/COS ENCODER

Short Description

This option permits evaluation of a second Sin/Cos encoder. Evaluation of only one safe Sin/Cos encoder is included as standard in the device (connection via X7). This option permits evaluation of the Sin/Cos encoder as a second safe channel for the drive axis.

Technical data	**Safe Sin/Cos Encoder**
Signals	A/B
Signal level	Sin/Cos, 1 V_{SS}
Signal frequency	Maximum 400 kHz

Technical data	**General**
Supply voltage external encoder, Sin/Cos	5 V ±5 %/250 mA
Cable length	Maximum 50 m
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-xAx-xxx**

Note: Only for devices with optional safety system.
Only available built ex factory.

SECOND SAFE SSI ENCODER

Short Description

This option permits evaluation of a second SSI encoder. Evaluation of only one safe SSI encoder is included as standard in the device (connection via X7). This option permits evaluation of the SSI encoder as a second safe channel for the drive axis. Evaluation of a second SSI channel allows use of the SLP (Safe Limited Position) function, subject to certain safety constraints.

Technical data	**Absolut value encoder**
Signals	Data, CLK
Signal level	EIA485-compliant
Switching frequency SSI	Maximum 1 MHz

Technical data	**General**
Supply voltage external encoder	No encoder supply
Cable length	Maximum 50 m
Wave terminating resistance	120 Ω (integrated)

Order code	**G39x-xxx-xBx-xxx**

Note: Only for devices with optional safety system.
Only available built ex factory.

SECOND SAFE AXIS MONITOR (SIN/COS)

Short Description

This option permits safe evaluation of an external drive axis. The encoder must be a safe encoder, as it can only be evaluated over one channel.

Technical data	**Sin/Cos encoder**
Signals	A/B
Signal level	Sin/Cos, 1 V_{SS}
Signal frequency	Maximum 400 kHz

Technical data	**General**
Supply voltage external encoder	No encoder supply
Cable length	Maximum 300 mm (11.82 in) (between the monitored drive axis and the option connection)
Wave terminating resistance	Not integrated

Order code	**G39x-xxx-xCx-xxx**

Note: Only for devices with optional safety system.
Only available built ex factory.

OVERVIEW

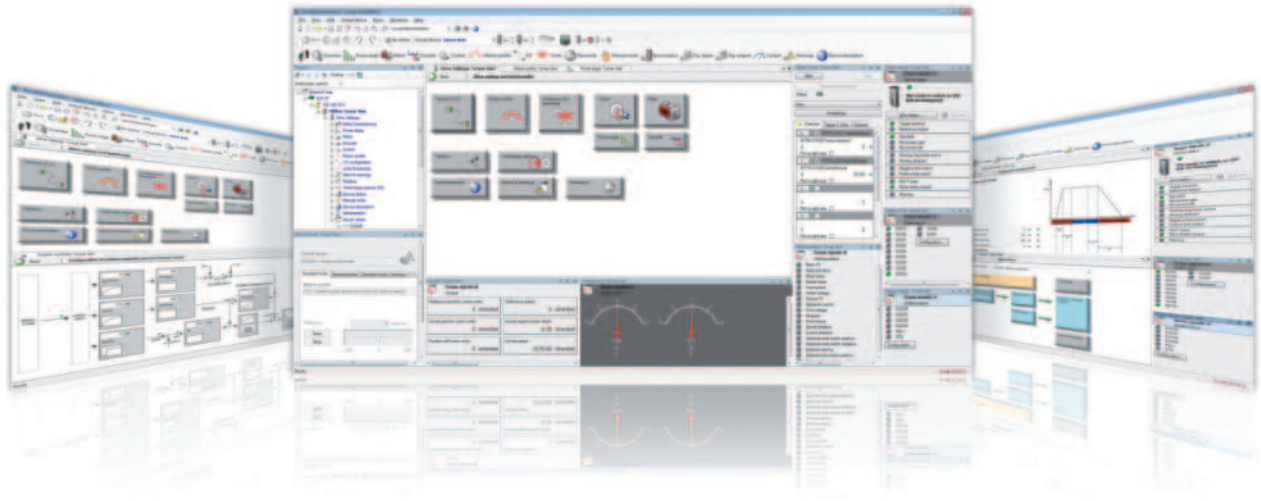
Content	Motion Controller	Single-Axis Compact Sizes C2 to C5	Single-Axis Servo Drive Sizes 1 to 7	Multi-Axis Servo Drive Sizes 1 to 7	PSU Sizes 5 to 7
Moog DriveAdministrator PC User Software	No	Yes			
Dynamic Energy Unit DEU-ST		Yes			
Dynamic Energy Unit DEU-SU					
Dynamic Energy Unit DEU-EM (Expansion Module)					
Selection of Motor Cables		Yes			No
Selection of Encoder Cables					
Mains Chokes		Yes		No	
Braking Resistors					
Mains Filters					
NTC Adapter		Yes	No		
Liquid Cooling Connection Set	No		Yes		
Spare Connector Kits	Yes				

MOOG DriveAdministrator PC USER SOFTWARE

Short Description

The Moog DriveAdministrator parameterization software, featuring extensive integrated online help and autotuning, cuts commissioning times substantially. The Moog DriveAdministrator offers full network capability. This means multiple axis modules can be managed simultaneously in a project.

Parameterization Software



Technical data	Moog DriveAdministrator
Support for the following functions	Initial commissioning of one or more servo drives
	Operator control and diagnosis with cockpit, 6-channel oscilloscope, and others
	Fast serial commissioning with a configurable commissioning file (containing firmware, parameters, PLC program)
	Project management

DYNAMIC ENERGY UNIT DEU-ST

Short Description

The Dynamic Energy Unit (DEU-ST) is used as an accessory to store brake energy from applications. This improves the overall system efficiency and saves energy which is not dissipated in brake resistor. The DEU-ST does not require a seperate power supply and is simply plug-and-play with its connection to the DC link. It is possible to operate multiple DEU-ST in parallel to increase the maximum output power and storage capacity of energy.

Optional Expansion Modules (DEU-EM) can be connected to the DEU-ST to increase the storage capacity of energy.

CB33257-001

Model	**Storage Unit (DEU-ST)**
Storage capacity	1,600 Ws
Maximum continuous DC link voltage	800 V_{DC}
Short-term peak voltage	950 V_{DC} (30 s in 6 minutes)
Working voltage (ex-factory)	-
Maximum output power	18 kW
PTC braking resistor	60 Ω, 30 W
Dimensions W x D x H	100 x 201 x 300 mm (3.94 x 7.92 x 11.82 in)
Weight	6.9 kg (15.2 lb)
Protection class	IP20
Order code	**CB33257-001**

Note: For more information please see Operation Manual Id. No.: CB50580-001.

DYNAMIC ENERGY UNIT DEU-SU

Short Description

The Dynamic Energy Unit (DEU-SU) is used as an accessory for Servo Drives to supply energy to the DC link. The stored energy of the DEU-SU is used where backup or UPS functionality is needed due to the loss of main power supply. This ensures the possibility of a safe shutdown or an emergency operation for the application. The DEU-SU does not require a seperate power supply and is simply plug-and-play. It is possible to operate multiple DEU-SU in parallel to increase the maximum output power and storage capacity of energy.

Optional Expansion Modules (DEU-EM) can be connected to the DEU-SU to increase the storage capacity of energy.

CB33256-001

Model	**Supply Unit (DEU-SU)**
Storage capacity	2,000 Ws
Maximum continuous DC link voltage	800 V_{DC}
Short-term peak voltage	950 V_{DC} (30 s in 6 minutes)
Working voltage (ex-factory)	470 V_{DC}
Maximum output power	18 kW
PTC braking resistor	-
Dimensions W x D x H	100 x 201 x 300 mm (3.94 x 7.92 x 11.82 in)
Weight	6.9 kg (15.2 lb)
Protection class	IP20
Order code	**CB33256-001**

Note: For more information please see Operation Manual Id. No.: CB50579-001.

DYNAMIC ENERGY UNIT DEU-EM (EXPANSION MODULE)

Short Description

The optional available DEU-EM increases the capacity of stored energy for the DEU-SU and DEU-ST.

CB33255-001

Model	**Expansion Module Size 2 (DEU-EM 2.0)**	**Expansion Module Size 4 (DEU-EM 4.0)**
Storage capacity (with -ST)	1,600 Ws	3,200 Ws
Storage capacity (with -SU)	2,000 Ws	4,000 Ws
Dimensions W x D x H	100 x 201 x 300 mm (3.94 x 7.92 x 11.82 in)	
Weight	4.1 kg (9 lb)	6.2 kg (13.7 lb)
Protection class	IP20	
Order code	**CB33255-001**	**CB33255-002**

Note: For more information please see Operation Manual Id. No.: CB50579-001/CB50580-001.

SELECTION OF MOTOR CABLES

Technical data	**CO8336-xxx-yyy[1) 2)]**		**CB05708-xxx-yyy[1) 2)]**		**CA44958-xxx-yyy[1) 2)]**		**CB00076-xxx-yyy[1) 2)]**		**CA98676-xxx-yyy[1) 2)]**	
Continuous rated current	10 A		TBD		44 A		61 A		82 A	
Cable cross-section	4 x 1.5 mm^2 + 2 x 1 mm^2 (4 x 0.0024 in^2 + 2 x 0.0016 in^2)		4 x 4 mm^2 + 2 x 1.5 mm^2 (4 x 0.0062 in^2 + 2 x 0.0023 in^2)		4 x 6 mm^2 + 2 x 1.5 mm^2 (4 x 0.0093 in^2 + 2 x 0.0023 in^2)		4 x 10 mm^2 + 2 x 1.5 mm^2 (4 x 0.0155 in^2 + 2 x 0.0023 in^2)		4 x 16 mm^2 + 2 x 1.5 mm^2 (4 x 0.0248 in^2 + 2 x 0.0023 in^2)	
Temperature range	-40 to +125 °C (-40 to +257 °F)		TBD		-50 to +90 °C (-58 to +194 °F)		TBD			
Wiring	Connector pin	Wiring	Connector pin	Wiring	Connector pin	Wiring	Connector pin	Wiring	Connector pin	Wiring
	2	U	2	U	U	U	U	U	U	U
	4	VV	4	VV	V	VV	V	VV	V	VV
	1	WWW	1	WWW	W	WWW	W	WWW	W	WWW
	PE	yellow/ green	PE	yellow/ green	PE	yellow/ green	PE	yellow/ green	PE	yellow/ green
	5	Brake +/ white	5	Brake +/ white	+	Brake +/ white	+	Brake +/ white	+	Brake +/ white
	6	Brake -/ black	6	Brake -/ black	-	Brake -/ black	-	Brake -/ black	-	Brake -/ black
	Connector housing	Screen	Connector housing	Screen	Connector housing	Screen	Connector housing	Screen	Connector housing	Screen
Connector type	Size 1		Size1		Size 1.5				Size1.5	

Order code	**CO8336 - xxx[1)] - yyy[2)]**

1) xxx = 001 for standard configuration option, others on request

2) yyy stands for length in meters
Standard length: 1 m (3.28 ft), 5 m (16.40 ft), 10 m (32.80 ft), 15 m (49 ft), 20 m (65 ft), 50 m (164 ft)
Further lengths on request

SELECTION OF ENCODER CABLES

Technical data	CO8335-013-yyy [1]	CA58876-002-yyy [1]	CA58877-002-yyy [1]
Motor with encoder system	Resolver	(single-/multi-turn encoder with SSI/EnDat interface)	(single-/multi-turn encoder with Hiperface® interface)
Controller-end assignment (sub-D connector)	1 = S2 2 = S4 3 = S1 4 = n.c. 5 = PTC+ 6 = R1 7 = R2 8 = S3 9 = PTC-	1 = A- 2 = A+ 3 = VCC (+5 V) 4 = Data+ 5 = Data- 6 = B- 8 = GND 11 = B+ 12 = VCC (Sense) 13 = GND (Sense) 14 = CLK+ 15 = CLK- 7, 9, 10 = n.c.	1 = REFCOS 2 = +COS 3 = Us 7 - 12 V 4 = Data+ EIA485 5 = Data- EIA485 6 = REFSIN 7 = Jumper to pin 12 8 = GND 11 = +SIN 12 = Jumper to pin 7 9, 10, 13, 14, 15 = n.c.
Capable for energy chains	Yes		
Minimum bend radius	90 mm (3.54 in)	100 mm (3.93 in)	90 mm (3.54 in)
Temperature range	-40 to +85 °C (-40 to +185 °F)	-35 to +80 °C (-31 to +176 °F)	-40 to +85 °C (-40 to +185 °F)
Cable diameter approximatly	8.8 mm (0.34 in)		
Material of outer sheath	Polyurethane		
Resistance	Resistant to oil, hydrolysis and microbic attack (VDE0472)		
Approvals	UL-Style 20233,+80 °C (+176 °F) -300 V CSA-C22.2N.210-M90, +75 °C (+167 °F) -300 V FT1		

Order code	CO8335-013-yyy[1]

1) yyy stands for length in meters
Standard length: 1 m (3.28 ft),5 m (16.40 ft), 10 m (32.80 ft), 15 m (49 ft), 20 m (65 ft), 50 m (164 ft)
Further lengths on request

MAINS CHOKES

CA55832-001

Ambient conditions	CA68926-001	CA55830-001 to CA55843-001, CA96898-001 to CA96900-001, CB09045-001
Mains voltage [1]	1 x 230 V, -20 % +15 %, 50/60 Hz	3 x 460 V, -25 % +10 %, 50/60 Hz
Overload factor	1.8 x I_N for 40 s	2.0 x I_N for 30 s
Ambient temperature range [2]	-25 to +45 °C (-13 to +113 °F)	
Mounting height	1,000 m (3,280 ft), with power reduction up to 2,000 m (6,500 ft) (6 % per 1,000 m (3,280 ft))	
Relative humidity	15 to 95 %, condensation not permitted	
Storage temperature range	-25 to +70 °C (-13 to +158 °F)	
Protection	IP00	
Short-circuit voltage	U_K 4 % (corresponding to 9.2 V at 230 V)	U_K 4 % (corresponding to 9.24 V at 400 V) applies to mains chokes with I_N = 4.0 A to 32 A[3] U_K 2 % (corresponding to 4.6 V at 400 V) applies to mains chokes with aI_N = 45 A to 450 A[4]
Permissible contamination	P2 according to IEC/EN 61558-1	
Thermal configuration	$I_{eff} \leq I_N$	
UL recognition	All versions have UL recognition for the USA and Canadian markets	

1) At mains frequency 60 Hz the power loss increases by approximately 5 to 10 %
2) With power reduction up to +60 °C (+140 °F) (1.3 % per °C/°F)
3) Only for drives up to 32 A
4) Only for drives from 45 A

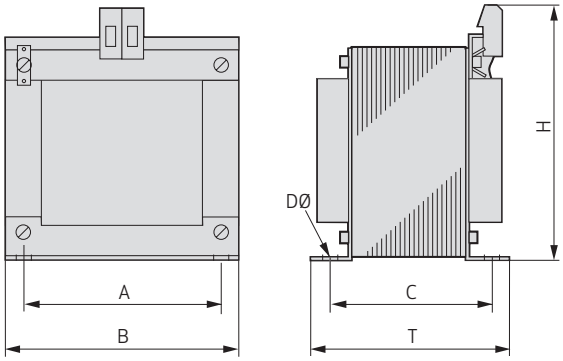
Note: For recommended combinations of servo drives and mains chokes refer to the relevant servo drive catalog page.

MAINS CHOKES

Single-phase mains chokes

Ordering number	Rated current [A]	U_K [%]	Power loss [W]	Inductance [mH]	Weight [kg (lb)]	CU-Weight [kg (lb)]	Connection [mm² (in²)]
CA68926-001	14	4	16	2.1	1.5 (3.3)	0.3 (0.7)	4 (0.006)

Dimensional drawing



Single-phase mains chokes

Dimensions	CA68926-001 [mm (in)]
A	64 (2.52)
B (width)	85 (3.35)
C	50 (1.97)
D (ø)	4.8 (0.19)
H (height)	100 (3.94)
T (depth)	65 (2.56)

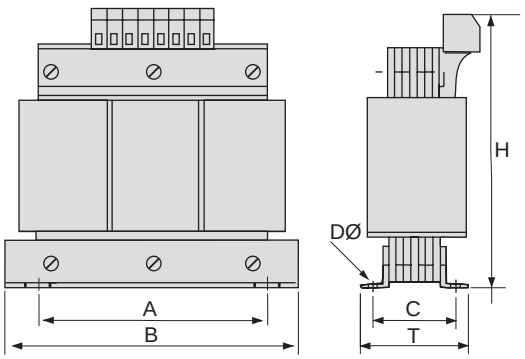
THREE-PHASE MAINS CHOKES

Ordering number	Rated current [A]	U_K [%]	Power loss [W]	Inductance [mH]	Weight [kg (lb)]	CU-Weight [kg (lb)]	Connection [mm² (in²)]
CA55830-001	4.2	4	20	7	2.5 (5.5)	0.4 (0.9)	4 (0.006)
CA55831-001	6		25	4.88	2.5 (5.5)	0.8 (1.8)	4 (0.006)
CA55832-001	8		25	3.66	2.5 (5.5)	1.0 (2.2)	4 (0.006)
CA55833-001	14		45	2.09	4 (8.8)	1.5 (3.3)	4 (0.006)
CA55834-001	17		45	1.72	4 (8.8)	2.0 (4.4)	4 (0.006)
CA55835-001	24		50	1.22	5 (11)	2.0 (4.4)	16 (0.025)
CA55836-001	32		70	0.92	6 (13.2)	2.5 (5.5)	16 (0.025)
CA55837-001	45	2	60	0.33	5 (11)	2.0 (4.4)	16 (0.025)
CA55838-001	60		70	0.25	7 (15.4)	3.5 (7.7)	16 (0.025)
CA55839-001	72		80	0.20	10 (22.1)	4.0 (8.8)	16 (0.025)
CA55840-001	90		120	0.16	13 (28.7)	5.5 (12.1)	35 (0.054)
CA55841-001	110		140	0.13	15 (33.1)	7.0 (15.4)	35 (0.054)
CA55842-001	143		160	0.10	25 (55.1)	8.5 (18.7)	70 (0.108)
CA55843-001	170		170	0.09	25 (55.1)	9.0 (19.8)	70 (0.108)
CB09045-001	210		268	0.07	27 (59.5)	6.1 (13.5)	M12
CA96898-001	250		285	0.059	28 (61.7)	10.8 (23.8)	M12
CA96899-001	325		351	0.045	43 (94.8)	14.3 (31.5)	M12
CA96900-001	450		296	0.033	46 (101.4)	11.9 (26.2)	M12

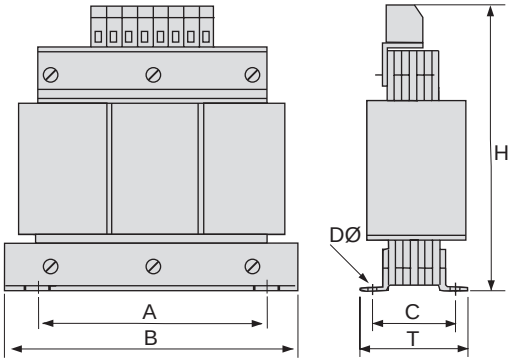
THREE-PHASE MAINS CHOKES

Dimensional drawing

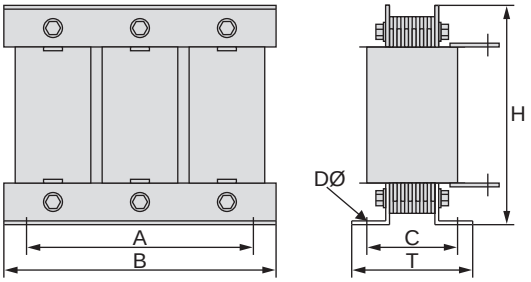
CA55830-001 to CA55838-001



CA55839-001 to CA55843-001



CA96898-001 to CA96900-001, CB09045-001



Dimensions	CA55830-001 [mm (in)]	CA55831-001 [mm (in)]	CA55832-001 [mm (in)]	CA55833-001 [mm (in)]
A	100 (3.94)	100 (3.94)	100 (3.94)	130 (5.12)
B (width)	125 (4.92)	125 (4.92)	125 (4.92)	155 (6.1)
C	55 (2.17)	55 (2.17)	55 (2.17)	59 (2.32)
D (ø)	5 (0.2)	5 (0.2)	5 (0.2)	8 (0.31)
H (height)	130 (5.12)	130 (5.12)	130 (5.12)	160 (6.3)
T (depth)	75 (2.95)	75 (2.95)	75 (2.95)	80 (3.15)

Dimensions	CA55834-001 [mm (in)]	CA55835-001 [mm (in)]	CA55836-001 [mm (in)]	CA55837-001 [mm (in)]
A	130 (5.12)	130 (5.12)	170 (6.69)	130 (5.12)
B (width)	155 (6.1)	155 (6.1)	190 (7.48)	155 (6.1)
C	59 (2.32)	72 (2.83)	58 (2.28)	72 (2.83)
D (ø)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
H (height)	160 (6.3)	170 (6.69)	200 (7.87)	170 (6.69)
T (depth)	80 (3.15)	120 (4.72)	110 (4.33)	120 (4.72)

THREE-PHASE MAINS CHOKES

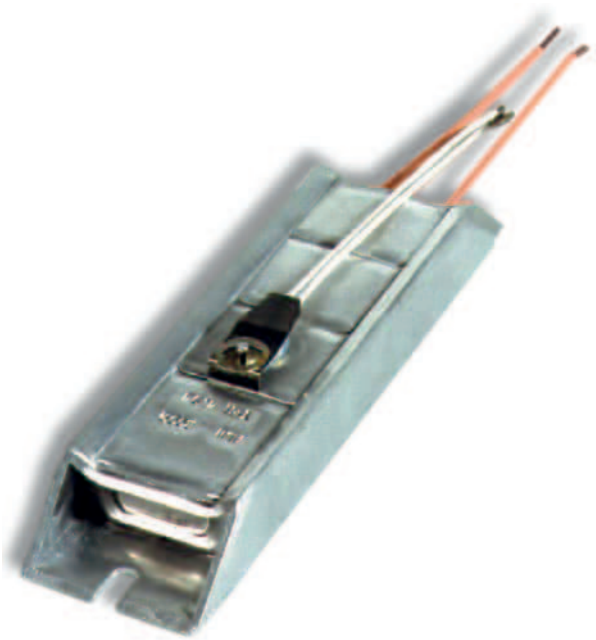
Dimensions	CA55838-001 [mm (in)]	CA55839-001 [mm (in)]	CA55840-001 [mm (in)]	CA55841-001 [mm (in)]
A	170 (6.69)	170 (6.69)	180 (7.09)	180 (7.09)
B (width)	190 (7.48)	190 (7.48)	230 (9.06)	230 (9.06)
C	68 (2.68)	78 (3.07)	98 (3.86)	122 (4.8)
D (ø)	8 (0.31)	8 (0.31)	8 (0.31)	8 (0.31)
H (height)	200 (7.87)	240 (9.45)	300 (11.81)	300 (11.81)
T (depth)	120 (4.72)	110 (4.33)	160 (6.3)	180 (7.09)

Dimensions	CA55842-001 [mm (in)]	CA55843-001 [mm (in)]	CB09045-001 [mm (in)]	CA96898-001 [mm (in)]
A	190 (7.48)	190 (7.48)	215 (8.46)	215 (8.46)
B (width)	240 (9.45)	240 (9.45)	265 (10.43)	300 (11.81)
C	125 (4.92)	125 (4.92)	126 (4.96)	120 (4.72)
D (ø)	11 (0.43)	11 (0.43)	11 (0.43)	11 (0.43)
H (height)	330 (12.99)	330 (12.99)	230 (9.06)	275 (10.83)
T (depth)	200 (7.87)	200 (7.87)	152 (5.98)	152 (5.98)

Dimensions	CA96899-001 [mm (in)]	CA96900-001 [mm (in)]
A	240 (9.45)	240 (9.45)
B (width)	300 (11.81)	300 (11.81)
C	145 (5.71)	160 (6.3)
D (ø)	11 (0.43)	11 (0.43)
H (height)	275 (10.83)	275 (10.83)
T (depth)	177 (6.97)	192 (7.56)

BRAKING RESISTORS

CA59737-001



CA59738-001

Technical data	According to fig. A1	According to fig. A2	According to fig. A3	According to fig. A4	According to fig. A5
Surface temperature	> +250 (+482 °F)				
Touch protection	No				
Voltage maximum	970 V_{DC}				
High-voltage strength	4,000 V_{DC}				
Temperature monitoring	Yes, with bimetallic protector (breaking capacity 0.5 A/230 V)				
Acceptance tests	CE-compliant; UL recognition				
Connection	1 m (39.37 in) long PTFE-insulated flex wire			Terminal box with PG glands (M12 x 1.5 and M25 x 1.5)	

1) At cycle times of maximum 150 s the required rated continuous power can be calculated according to the following formula: Rated continuous power (W) = maximum pulse duration (s) x peak power (W) / cycle time (s)

Note: For recommended combinations of drives and braking resistors refer to the relevant drives catalog page

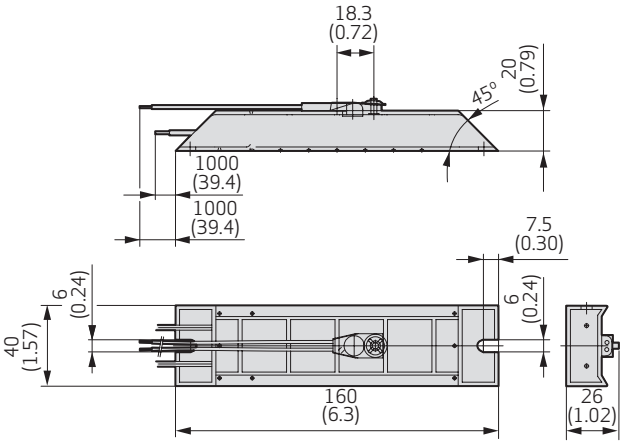
BRAKING RESISTORS

Ordering number	Continuous power[1] [W]	Resistance Ω ±10 %	Peak power [W]			Protection	Connection		Diagram
			390 V_{DC}	650 V_{DC}	750 V_{DC}		Resistance	Bimetallic protector	
CB36903-001	35	260	580	1,620	2,160	IP54	AWG 16	AWG 18	A1
CB36904-001	150	260	580	1,620	2,160	IP54	AWG 14	AWG 18	A2
CB09047-001	35	200	760	2,100	2,800	IP54	AWG 16	AWG 18	A1
CB09048-001	150	200	760	2,100	2,800	IP54	AWG 14	AWG 18	A2
CB09049-001	300	200	760	2,100	2,800	IP54	AWG 14	AWG 18	A3
CA59737-001	35	90	1,690	4,690	6,250	IP54	AWG 16	AWG 18	A1
CA59738-001	150	90	1,690	4,690	6,250	IP54	AWG 14	AWG 18	A2
CA59739-001	300	90	1,690	4,690	6,250	IP54	AWG 14	AWG 18	A3
CA59740-001	1,000	90	1,690	4,690	6,250	IP65	Maximum AWG 6	Maximum AWG 12	A4
CA59741-001	35	26	-	16,250	21,600	IP54	AWG 16	AWG 18	A1
CA59742-001	150	26	-	16,250	21,600	IP54	AWG 14	AWG 18	A2
CA59743-001	300	26	-	16,250	21,600	IP54	AWG 14	AWG 18	A3
CA59744-001	1,000	26	-	16,250	21,600	IP65	Maximum AWG 6	Maximum AWG 12	A4
CB09050-001	2,000	26	-	16,250	21,600	IP65	Maximum AWG 6	Maximum AWG 12	A5
CB36901-001	300	20	7,600	21,100	28,100	IP54	AWG 14	AWG 18	A3
CB36902-001	300	15	10,100	28,100	37,500	IP54	AWG 14	AWG 18	A3
CB53860-001	2,000	90	1,690	4,690	6,250	IP64	Maximum AWG 6	Maximum AWG 12	A5

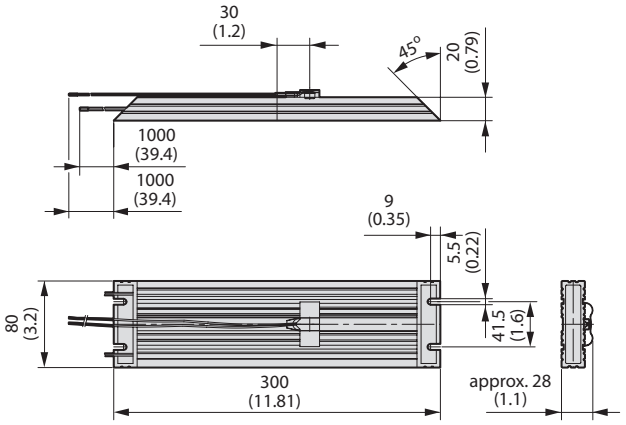
1) At cycle times of maximum 150 s the required rated continuous power can be calculated according to the following formula: Rated continuous power (W) = maximum pulse duration (s) x peak power (W) / cycle time (s)

BRAKING RESISTORS

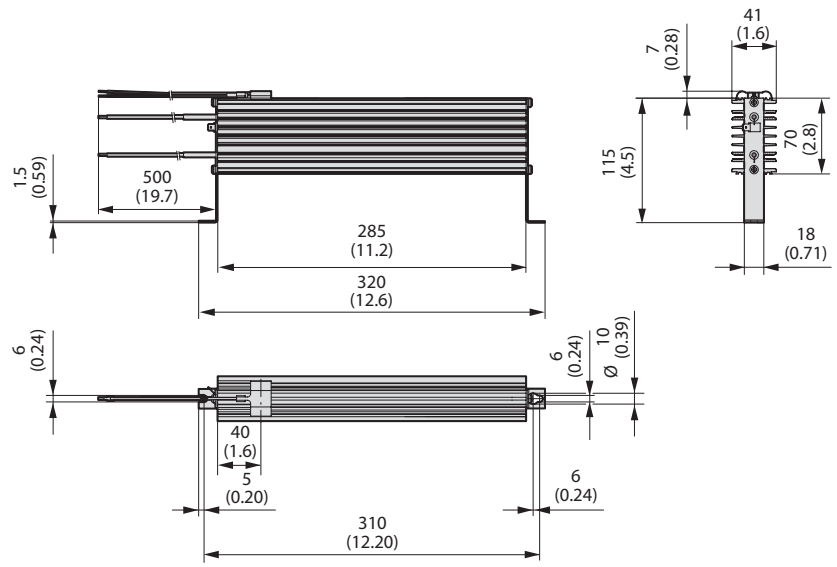
Dimensional drawing, braking resistor, A1



Dimensional drawing, braking resistor, A2

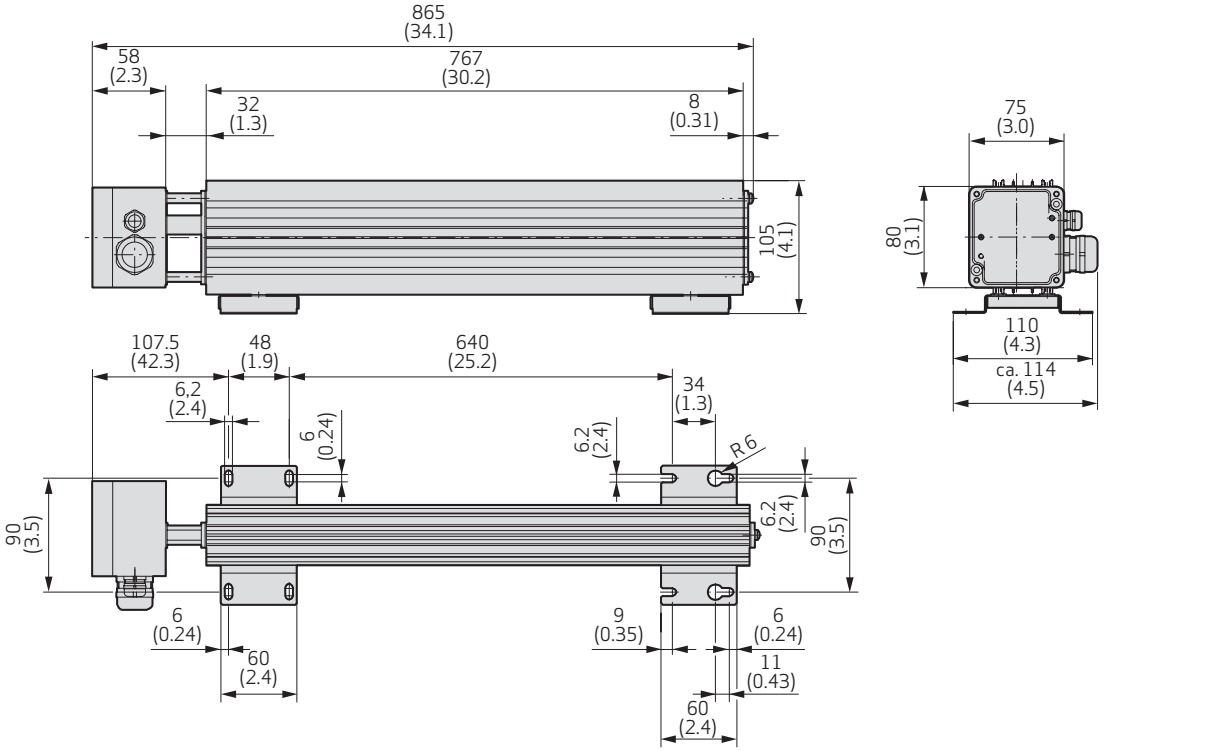


Dimensional drawing, braking resistor, A3

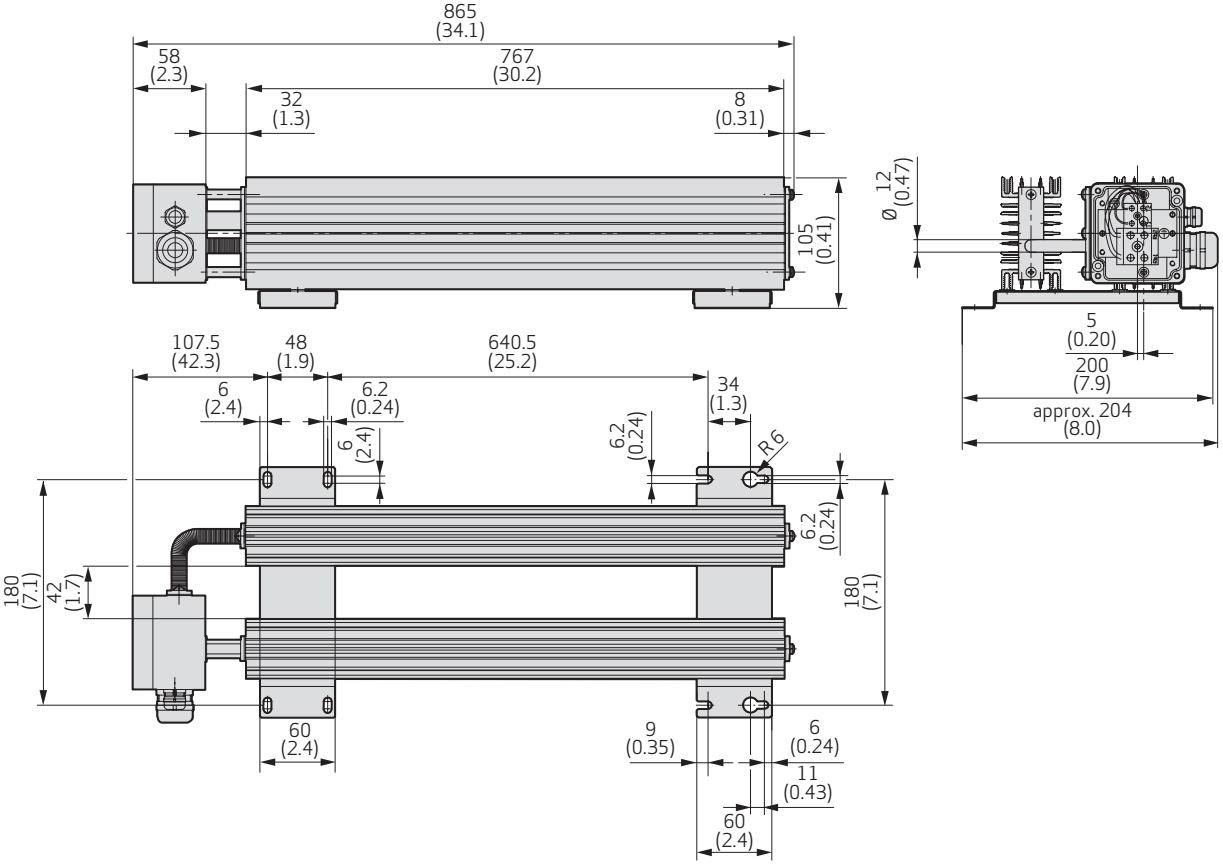


BRAKING RESISTORS

Dimensional drawing, braking resistor, A4



Dimensional drawing, braking resistor, A5



MAINS FILTERS - SINGLE AXIS COMPACT SIZES C2 TO C5

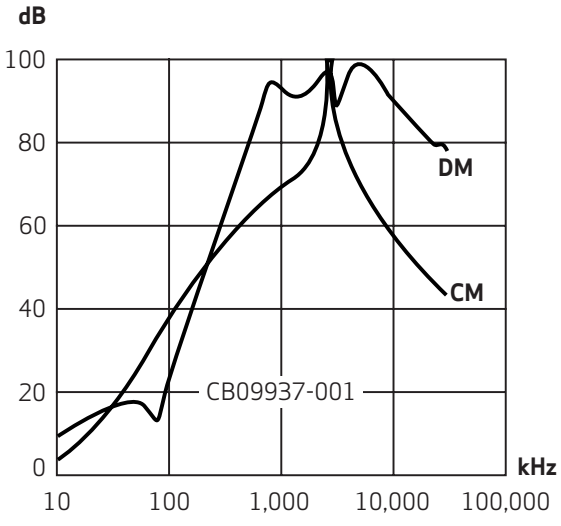
CB09939-001

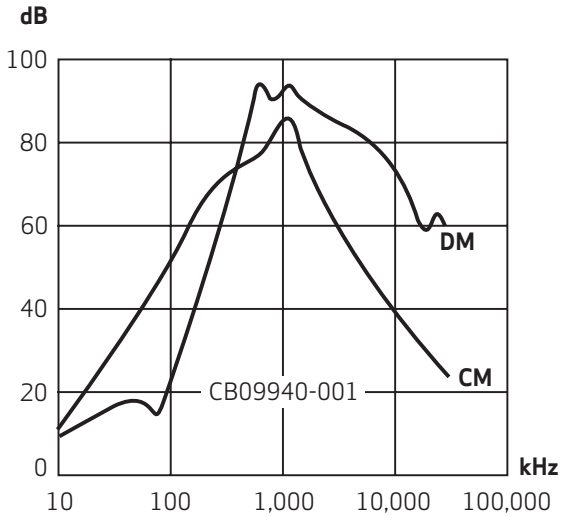
Ambient conditions	CB09937-001 to CB09939-001	CB09940-001 and CB09942-001
Rated voltage	1 x 230 V_{AC} + 10 % at 50/60 Hz	3 x 480 V_{AC} + 10 % at 50/60 Hz
Overload[1)]	2 for 10 s, repeatable after 6 min	
Ambient temperature maximum	+45 °C (113 °F)	
IEC climate category	25/085/21	
Protection	IP00	
Acceptance tests	IEC 60939, UL 508	IEC 60939, UL 1238, UL 508
RFI suppression to IEC/EN 61800-3 -residential-	Motor cable length up to 10 m (32.80 ft) permitted	
RFI suppression to IEC/EN 61800-3 -industrial-	Motor cable length up to 30 m (98 ft) permitted	
Connection	Input: touch-protected terminals (IP 20); output: litz wire	

1) Precondition: Mains filter mounting vertically on metallically bright base plate

Note: For recommended combinations of drives and mains filters refer to the relevant drive catalog page.

Insertion loss curves





MAINS FILTERS - SINGLE AXIS COMPACT SIZES C2 TO C5

Single-phase mains filters

Suitable for servo drives	Ordering number	Rated current [A]	Power loss [W]	Leakage current[1] [mA]	Touch current[2] [mA]		Weight [kg (lb)]
					N	F	
G394-030	CB09937-001	8	2.5	7.9	15	25	0.75 (1.7)
G394-059	CB09938-001	14	5.8	7.9	15	25	0.75 (1.7)
G394-080	CB09939-001	19	6.1	7.9	15	25	0.75 (1.7)

1) Effective value of leakage current to EN 60939 (2009) at 50 Hz and rated voltage. The leakage current may increase further due to the suppressed device

2) Peak value measurement with measurement circuit to IEC/EN 60990 at 50 Hz and rated voltage.
N: Peak value of occurring touch current in normal operation with PE conductor circuit open. At a touch current >3.5 mA the mains filter must be provided with a fixed connection according to EN 50178
F: Peak value of worst-case touch current in case of fault with PE conductor and N conductor circuits open

Three-phase mains filters

Suitable for servo drives	Ordering number	Rated current [A]	Power loss [W]	Leakage current[1] [mA]	Touch current[2] [mA]		Weight [kg (lb)]
					N	F	
G394-030 G394-020 G394-035	CB09940-001	5	2	1.7	2.3	70	0.7 (1.5)
G394-059 G394-080 G394-065	CB09942-001	11	7	1.7	2.3	70	0.7 (1.5)
G394-120	CC16635-001	16	12	6	4.5	70	1.2 (2.6)
G394-160	CC16636-001	25	17	4.8	4.5	70	1.2 (2.6)

1) Effective value of leakage current to EN 60939 (2009) at 50 Hz and rated voltage. The leakage current may increase further due to the suppressed device

2) Peak value measurement with measurement circuit to IEC/EN 60990 at 50 Hz and rated voltage.
N: Peak value of occurring touch current in normal operation with PE conductor circuit open. At a touch current >3.5 mA the mains filter must be provided with a fixed connection according to EN 50178
F: Peak value of worst-case touch current in case of fault with PE conductor and N conductor circuits open

MAINS FILTERS - SINGLE AXIS COMPACT SIZES C2 TO C5

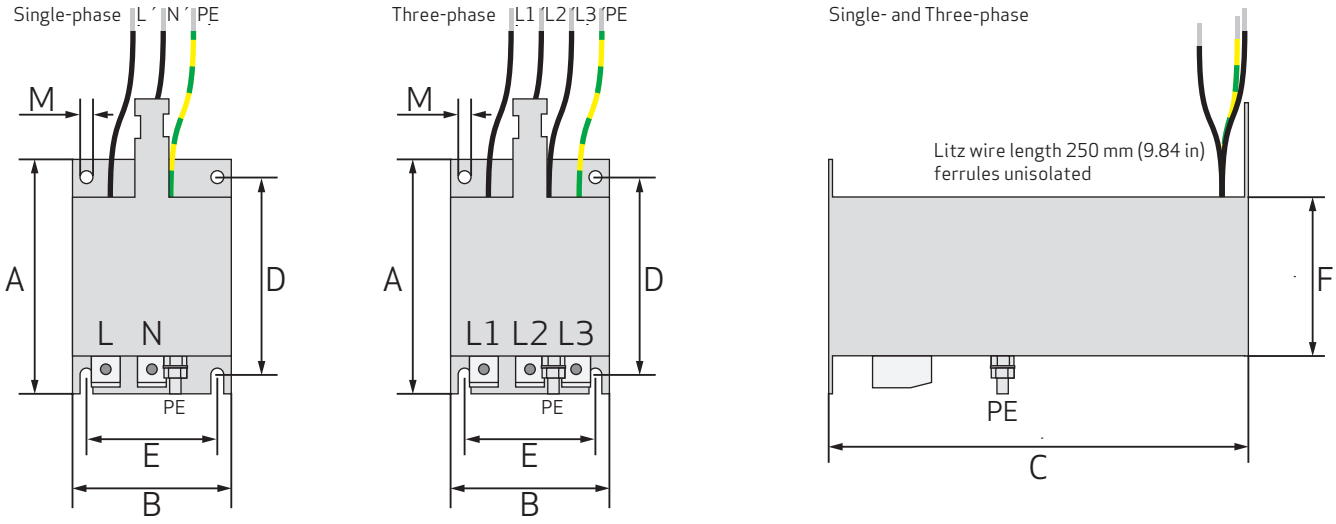
Single-phase mains filters

Ordering number	Dimensions [mm (in)]							PE	Input		Output Wire cross section
	A	B	C	D	E	F	M (ø)		Clamping area	Tightening torque	
CB09937-001	81 (3.19)	55 (2.17)	145 (5.71)	68 (2.68)	45 (1.77)	55 (2.17)	4 (0.16)	M4	0.2 to 4.0 mm² (0.0003 to 0.0062 in²)	0.6 to 0.8 Nm (5.31 to 7.08 lbf in)	AWG 16
CB09938-001											
CB09939-001											AWG 14

Three-phase mains filters

Ordering number	Dimensions [mm (in)]							PE	Input		Output Wire cross section
	A	B	C	D	E	F	M (ø)		Clamping area	Tightening torque	
CB09940-001	81 (3.19)	55 (2.17)	145 (5.71)	68 (2.68)	45 (1.77)	55 (2.17)	4 (0.16)	M4	0.2 to 4.0 mm² (0.0003 to 0.0062 in²)	0.6 to 0.8 Nm (5.31 to 7.08 lbf in)	AWG 16
CB09942-001											
CC16635-001	93 (3.66)	90 (3.54)	200 (7.87)	82 (3.23)	50 (1.97)		5 (0.2)	M5	0.2 to 0.6 mm² (0.0003 to 0.0009 in²)	1.5 to 1.8 Nm (13.28 to 15.93 lbf in)	2.5 mm² (0.1 in²)
CC16636-001											4 mm² (0.16 in²)

Dimensional drawing



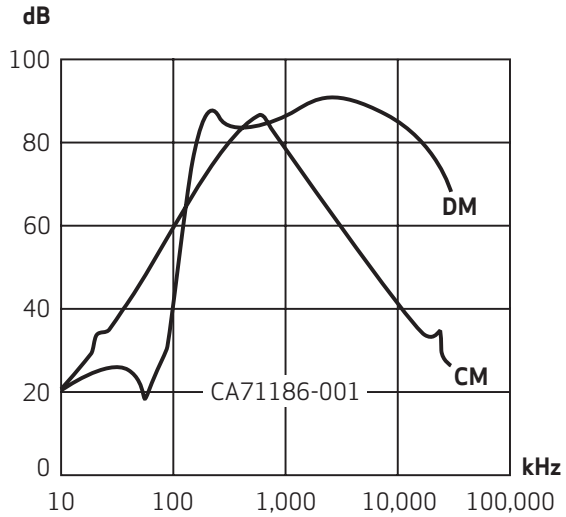
MAINS FILTERS - SINGLE AXIS STANDARD SIZES 1 TO 7

CA71190-001

Ambient conditions	**CB09937-001 to CB09939-001**
Rated voltage	3 x 480 V_{AC} +10 % at 50/60 Hz
Ambient temperature	-25 to +40 °C (-13 to +104 °F)
Mounting height	1,000 m (3,280 ft), with power reduction up to 4,000 m (13,120 ft) 6 % per 1,000 m (3,280 ft)
Relative air humidity	15 to 85 %, condensation not permitted
Storage temperature	-25 to +70 °C (-13 to +158 °F)
Transportation temperature	-40 to +85 °C (-40 to +185 °F)
Protection	IP20 (for all filters rated current ≥ 180 A IP00)
Permissible contamination	P2 according to IEC/EN 61558-1
Acceptance tests	CE-compliant UL recognition (CA71184-001 to CA71189-001)
RFI suppression to IEC/EN 61800-3 (category C2 -residential-)	Motor cable length up to 50 m (164 ft) permitted
RFI suppression to IEC/EN 61800-3 (category C3 -industrial-)	Motor cable length up to 100 m (328 ft) permitted

Note: For recommended combinations of drives and mains filters refer to the relevant drive catalog page.

Insertion loss curves



MAINS FILTERS - SINGLE AXIS STANDARD SIZES 1 TO 7

Three-phase mains filters

Ordering number	Rated current [A]	Overload[1] [A]	Power loss [W]	Leakage current[2] [mA]	Touch current[3] [mA]		Weight [kg (lb)]
					N	F	
CA71184-001	7	14	7.5	11.7	7.6	195	1.4 (3.1)
CA71185-001	16	32	11	11.7	6.8	194	1.35 (3)
CA71186-001	35	64	34	11.7	8.3	225	3.5 (7.7)
CA71187-001	63	125	30	5.5	6.8	195	4.2 (9.3)
CA71188-001	100	150	40	16.9	9.8	252	5.5 (12.1)
CA71189-001	150	225	55	16.9	9.8	253	10.4 (22.9)

1) For 10 s, repeatable after 6 min; precondition: Mains filter Type of installation vertically on metallically bright base plate
2) Effective value of leakage current to EN 60939 (2009) at 50 Hz and rated voltage with 2 % asymmetry. The leakage current may increase further due to the suppress device
3) Peak value measurement with measurement circuit to IEC/EN 60990 at 50 Hz and rated voltage with 2 % asymmetry
N: Peak value of occurring touch current in normal operation with PE conductor circuit open. At a touch current >3.5 mA the mains filter must be provided with a fixed connection according to EN 50178
F: Peak value of worst-case touch current in case of fault with PE conductor circuit open and two of three phase open

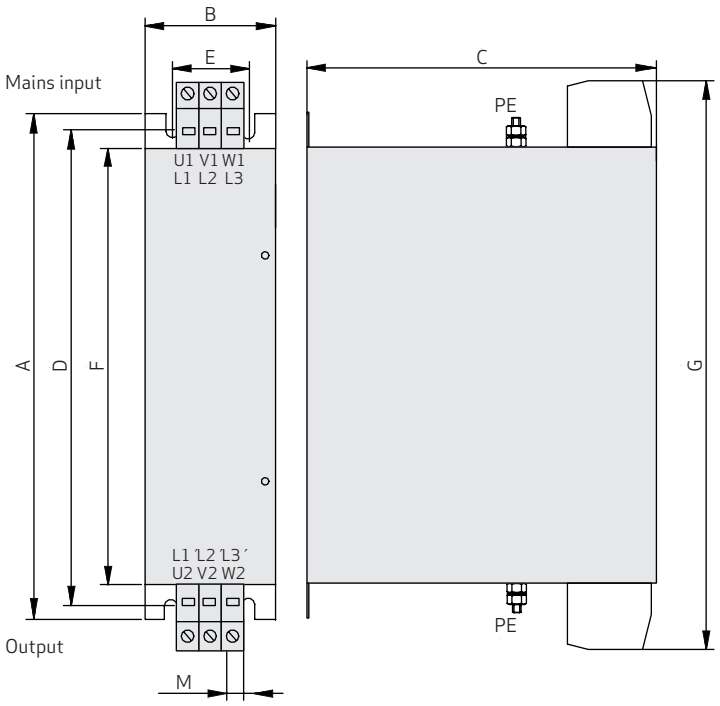
Three-phase mains filters

Ordering number	Rated current [A]	Overload[1] [A]	Power loss [W]	Leakage current[2] [mA]	Touch current[3] [mA]		Weight [kg (lb)]
					N	F	
CA71190-001	180	270	15	-	9.6	-	10.7 (23.6)
CB09932-001	220	330	20	33.8	7.2	225	7.5 (16.5)
CB09933-001	250	375	40	33.8	7.2	225	8.5 (18.7)
CB09934-001	300	450	40	33.8	7.2	225	9.5 (20.9)
CB09935-001	400	600	55	33.8	7.2	225	11.0 (24.3)
CB09936-001	500	750	60	33.8	7.2	225	12.5 (27.6)

1) For 60 s, repeatable after 30 min; precondition: Mains filter Type of installation vertically on metallically bright base plate
2) Effective value of leakage current to EN 60939 (2009) at 50 Hz and rated voltage with 2 % asymmetry. The leakage current may increase further due to the suppress device
3) Peak value measurement with measurement circuit to IEC/EN 60990 at 50 Hz and rated voltage with 2 % asymmetry
N: Peak value of occurring touch current in normal operation with PE conductor circuit open. At a touch current >3.5 mA the mains filter must be provided with a fixed connection according to EN 50178
F: Peak value of worst-case touch current in case of fault with PE conductor circuit open and two of three phase open

MAINS FILTERS - SINGLE AXIS STANDARD SIZES 1 TO 7

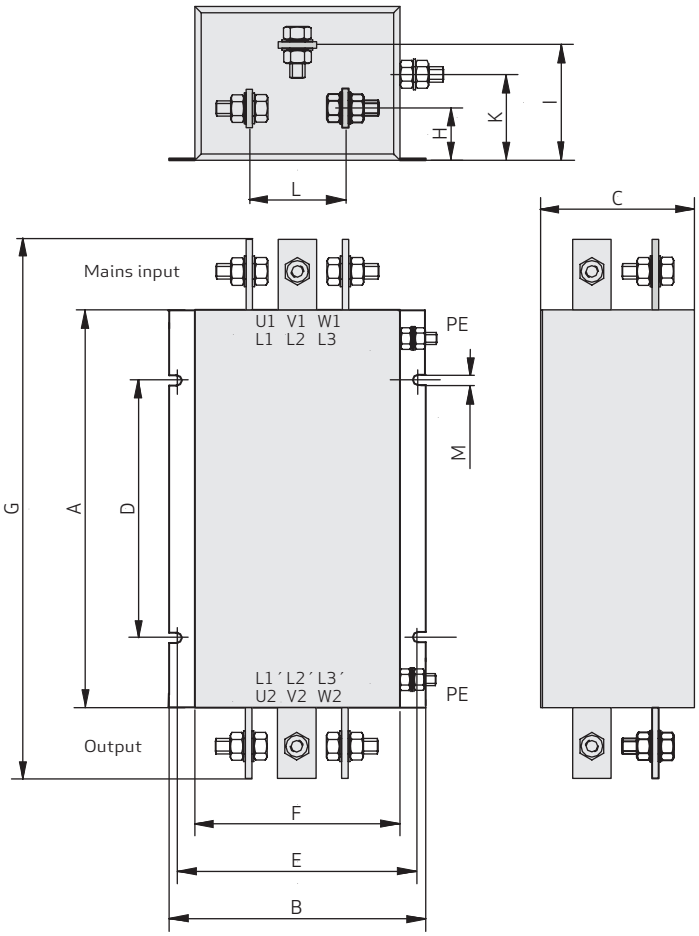
Dimensional drawing



Ordering number	Dimensions [mm (in)]								PE	Input	
	A	B	C	D	E	F	G	M (ø)		Clamping area	Tightening torque
CA71184-001	210 (8.27)	55 (2.17)	90 (3.54)	200 (7.87)	40 (1.57)	180 (7.09)	202 (7.95)	4.0 (0.16)	M5	0.2 to 4.0 mm² (0.0003 to 0.0062 in²)	0.6 to 0.8 Nm (5.31 to 7.08 lbf in)
CA71185-001				205 (8.07)							
CA71186-001	270 (10.63)	62 (2.44)	145 (5.71)	255 (10.04)		240 (9.45)	305 (12.01)	5.5 (0.22)		0.5 to 16 mm² (0.0008 to 0.0246 in²)	2.0 to 2.3 Nm (17.7 to 20.36 lbf in)
CA71187-001	280 (11.02)		180 (7.09)	270 (10.63)				7.0 (0.28)	M6		
CA71188-001	290 (11.42)	75 (2.95)	200 (7.87)		45 (1.77)	250 (9.84)	336 (13.23)		M8	16 to 50 mm² (0.0246 to 0.0769 in²)	6.0 to 8.0 Nm (53.1 to 70.81 lbf in)
CA71189-001	320 (12.6)	90 (3.54)	220 (8.66)	300 (11.81)	60 (2.36)	280 (11.02)	380 (14.96)				15 to 20 Nm (132.76 to 177.01 lbf in)

MAINS FILTERS - SINGLE AXIS STANDARD SIZES 1 TO 7

Dimensional drawing



Three-phase mains filters

Ordering number	Dimensions [mm (in)]												PE	Input/output	
	A	B	C	D	E	F	G	H	I	K	L	M		Busbar [mm (in)]	Hole
CA71190-001	310 (12.20)	200 (7.87)	120 (4.72)	180 (7.09)		160 (6.30)	410 (16.14)	45 (1.77)	86 (3.39)	30 1.18)	91 (3.58)	M8	M10	3 x 25 (0.12 x 0.98)	M10
CB09932-001														4 x 25 (0.16 x 0.98)	
CB09933-001								54 (2.13)						5 x 25 (0.2 x 0.98)	
CB09934-001													M12	6 x 25 (0.24 x 0.98)	
CB09935-001	350 (13.78)	240 (9.45)	150 (5.91)	200 (7.87)	220 (8.66)	200 (7.87)	480 (18.9)	69 (2.72)	110 (4.33)		128 (5.04)			8 x 25 (0.31 x 0.98)	
CB09936-001														8 x 30 (0.31 x 1.18)	M12

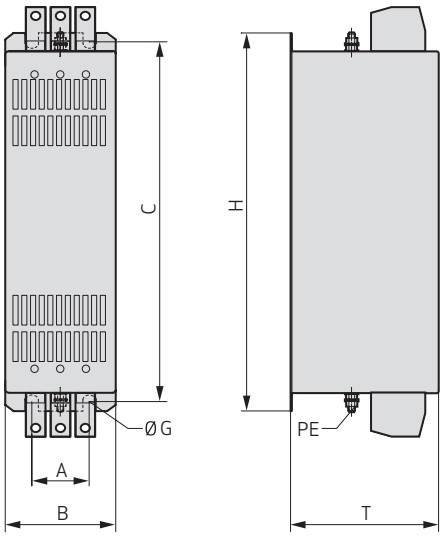
MAINS FILTERS - PSU SIZE 5 TO 7

Dimensions, mains filter

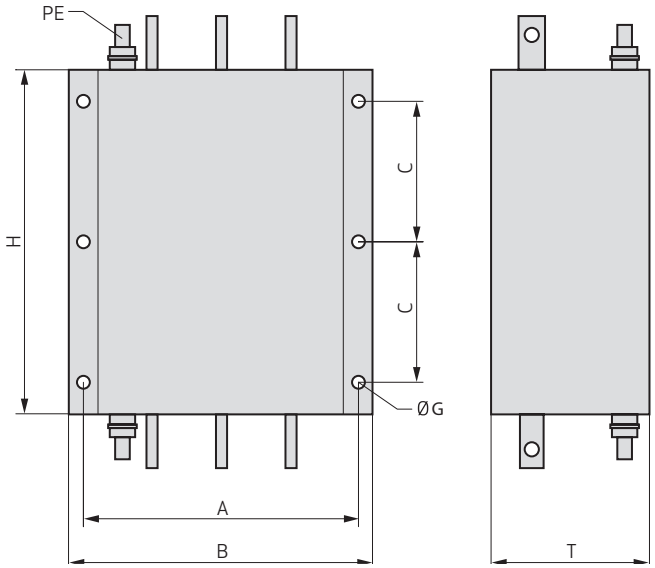
For size	Size 5		Size 6A		Size 7	
For device	**G396-026**	**G396-050**	**G396-075**	**G396-110**	**G396-250**	**G396-360**
Type	FFU 3 x 56 K	FFU 3 x 80 K	FFU 3 x 130 K	FFU 3 x 180 K	FN 3359-400-99	FN 3359-600-99
A	60 (2.36)	60 (2.36)	65 (2.56)	102 (4.02)	235 (9.25)	235 (9.25)
B (width)	85 (3.35)	80 (3.15)	90 (3.54)	130 (5.12)	260 (10.24)	260 (10.24)
C	235 (9.25)	225 (8.86)	255 (10.04)	365 (14.37)	120 (4.72)	120 (4.72)
G (ø)	5.4 (0.21)	6.5 (0.26)	6.5 (0.26)	6.5 (0.26)	12 (0.47)	12 (0.47)
H (height)	250 (9.84)	270 (10.63)	270 (10.63)	380 (14.96)	300 (11.81)	300 (11.81)
T (depth)	90 (3.54)	135 (5.31)	150 (5.91)	180 (7.09)	115 (4.53)	135 (5.31)
Mounting screw	M5	M6	M6	M6	M10	M10
Weight [kg (lb)]	1.9 (4.2)	2.6 (5.7)	4.2 (9.3)	6.0 (13.2)	10.5 (23.2)	11.0 (24.3)

All dimensions in mm (in) and not including terminals/connectors

Dimensional Drawings, mains filter size 5 and size 6A



Dimensional Drawings, mains filter size 7

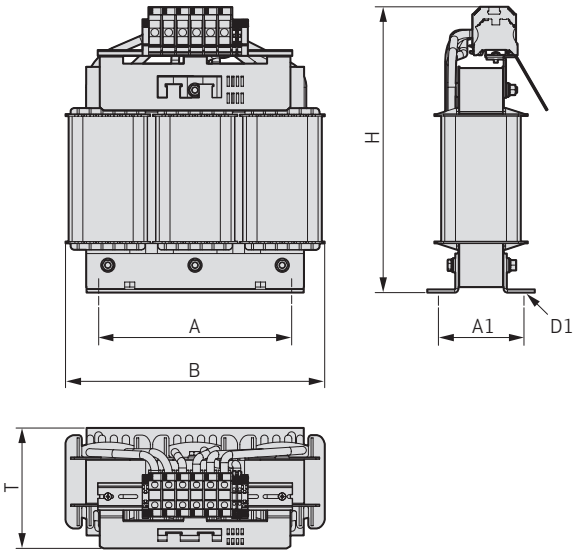


DIMENSIONS, STEP-UP CHOKE – PSU

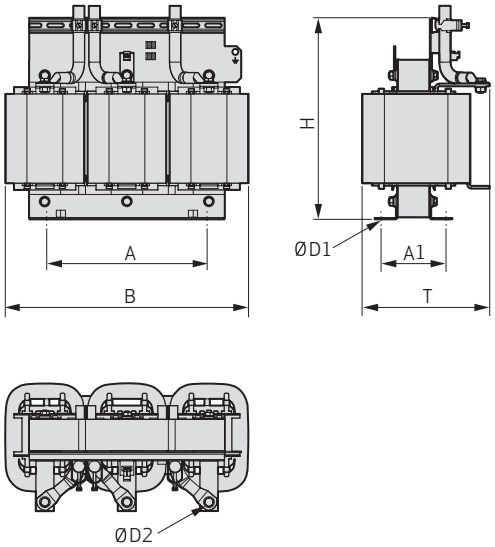
For size	Size 5		Size 6A		Size 7	
For device	**G396-026**	**G396-050**	**G396-075**	**G396-110**	**G396-250**	**G396-360**
A	185 (7.28)	210 (8.27)	248 (9.76)	280 (11.02)	356 (14.02)	300 (11.81)
A1	75 (2.95)	95 (3.74)	122 (4.8)	127 (5)	144 (5.67)	188 (7.4)
B (width)	239 (9.41)	299 (11.77)	335 (13.19)	380 (14.96)	540 (21.26)	454 (17.87)
D1 (ø)	10 x 18 (0.71)	12 x 20 (0.79)	12 x 20 (0.79)	12 x 20 (0.79)	12 x 20 (0.79)	12 x 20 (0.79)
D2 (ø)	-	-	-	-	13 (0.51)	13 (0.51)
H (height)	273 (10.75)	300 (11.81)	344 (13.54)	399 (15.71)	447 (17.6)	671 (26.42)
T (depth)	124 (4.88)	135 (5.31)	158 (6.22)	200 (7.87)	283 (11.14)	268 (10.55)
Mounting screw	4 x M8	4 x M10	4 x M10	4 x M10	4 x M10	4 x M10
Weight [kg (lb)]	16.0 (35.3)	27.0 (59.5)	37.5 (82.7)	56.0 (123.5)	97.0 (213.9)	127 (280)

All dimensions in mm (in) and not including terminals/connectors

Dimensional Drawings, step-up choke size 5 and size 6A



Dimensional Drawings, step-up choke size 7

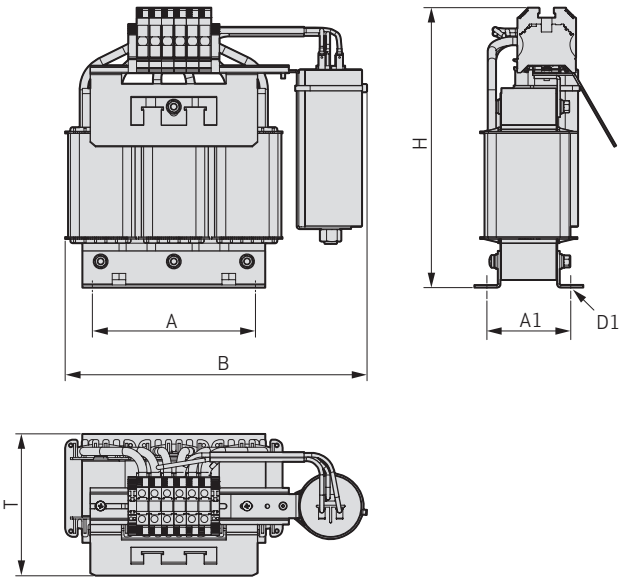


DIMENSIONS, INPUT CHOKE INCLUDING FILM CAPACITOR

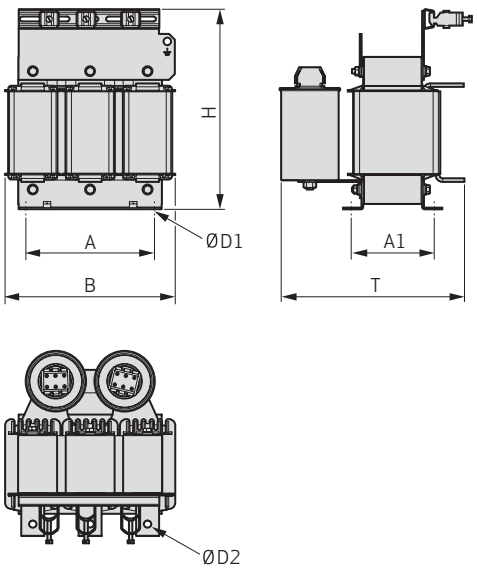
For size	Size 5		Size 6A		Size 7	
For device	**G396-026**	**G396-050**	**G396-075**	**G396-110**	**G396-250**	**G396-360**
A	156 (6.14)	156 (6.14)	176 (6.93)	176 (6.93)	224 (8.82)	310 (12.2)
A1	63 (2.48)	80 (3.15)	95 (3.74)	95 (3.74)	145 (5.71)	146 (5.75)
B (width)	289 (11.38)	289 (11.38)	342 (13.46)	348 (13.7)	297 (11.69)	357 (14.06)
D1 (ø)	7 x 13 (0.51)	7 x 13 (0.51)	9 x 13 (0.51)	9 x 13 (0.51)	10 x 18 (0.71)	12 x 20 (0.79)
D2 (ø)	-	-	-	-	13 (0.51)	13 (0.51)
H (height)	252 (9.92)	268 (10.55)	292 (11.5)	321 (12.64)	347 (13.66)	565 (22.24)
T (depth)	119 (4.69)	136 (5.35)	175 (6.89)	175 (6.89)	319 (12.56)	308 (12.13)
Mounting screw	4 x M6	4 x M6	4 x M8	4 x M8	4 x M8	4 x M8
Weight [kg (lb)]	10.5 (23.2)	14.0 (30.9)	20.0 (44.1)	22.0 (48.5)	45.0 (99.2)	71.0 (156.6)

All dimensions in mm (in) and not including terminals/connectors

Dimensional Drawings, input choke including film capacitor size 5



Dimensional Drawings, input choke including film capacitor size 7

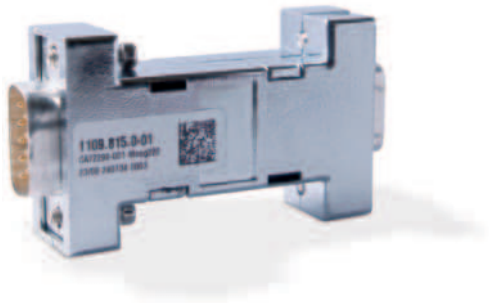


NTC ADAPTER

Short Description

The NTC Adapter is used for motors with a 220 kΩ NTC temperature sensor.
The Adapter converts the NTC signal so that the servo drive is able to measure the temperature of the motor. The NTC adapter is only necessary for Single-Axis Servo Drives Compact and Servo Drives with Integrated Functional Safety.

CA72290-001

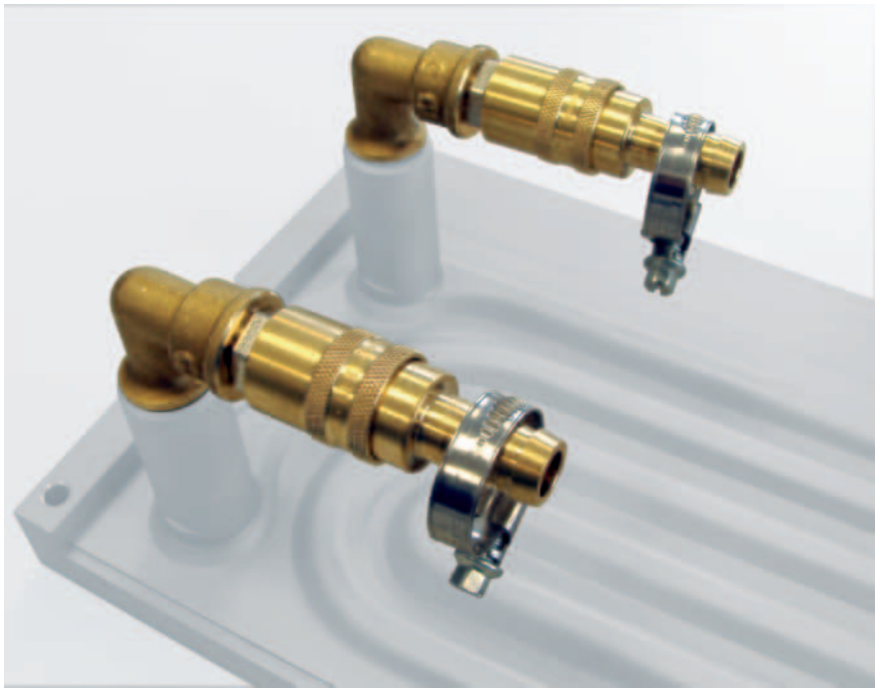


Liquid Cooling Connection Set

Short Description

The connection set includes all the components needed to connect liquid-cooled servo drive devices to the cooling system (intake and return lines). It consists of a roll of Teflon strip, two elbow sections, two quickfasteners, two couplings and two hose clamps.

CB37132-001



Note: Fits all liquid-cooled servo drive devices.

SPARE CONNECTOR KITS

Type	Ordering number	Description
Motion Controller connector kit	CA65115-001	2 x mating connector for x3 - 7-pole 1 x mating connector for x9 - 2-pole 1 x mating connector for x10 - 2-pole
Servo drive control connector kit (G392/G395 size 1 to 4)	CA70545-001	2 x mating connector for x4 - 12-pole 1 x mating connector for x5 - 2-pole 1 x mating connector for x9 - 2-pole 1 x mating connector for x10 - 2-pole 1 x mating connector for x13 - 2-pole
Servo drive power connector kit (G392/G395 size 1 and 2 with 400 V)	CA70546-001	1 x mating connector for x11 - 4-pole 1 x mating connector for x12 - 7-pole
Servo drive power connector kit (G392/G395 size 1 and 2 with 230 V)	CB59705-001	
Servo drive power connector kit (G392/G395 size 3 and 4 with 400 V)	CA70547-001	
Servo drive control connector kit (G392/G395 size 5 to 7 and G393/G397 size 5 to 6A)	CB59706-001	2 x mating connector for x4 - 12-pole 1 x mating connector for x5 - 2-pole 1 x mating connector for x9 - 2-pole 1 x mating connector for x10 - 2-pole 1 x mating connector for x20 - 3-pole
Servo drive control connector kit (G392 size 7)	CB59708-001	2 x mating connector for x4 - 12-pole 1 x mating connector for x5 - 2-pole
Servo drive seals (G395 size 5 to 7, G397 size 5 to 6A and G396)	CB59707-001	
Servo drive shield clamps (G392/G395 and G393/G397 size 1 to 4)	CB59709-001	
Servo drive connector kit CANopen (G392/G395, G393/G397 and G396)	CB59710-001	2 x mating connector for x32 - 5-pole
Servo drive connector kit CANopen + 2 AO (G392/G395, G393/G397 and G396)	CA70548-001	2 x mating connector for x32 - 5-pole 1 x mating connector for x33 - 2-pole 1 x mating connector for x33 - 2-pole
Servo drive control connector kit (G393/G397 size 1 to 4)	CB59711-001	2 x mating connector for x4 - 12-pole 1 x mating connector for x5 - 2-pole 1 x mating connector for x9 - 2-pole 1 x mating connector for x10 - 2-pole 1 x mating connector for x13 - 4-pole

SPARE CONNECTOR KITS

Type	Ordering number	Description
Servo drive power connector kit (G393/G397 size 1)	CB59712-001	1 x mating connector for x^{12} - 7-pole + DC-Link bar
Servo drive power connector kit (G393/G397 size 2)	CB59714-001	
Servo drive power connector kit (G393/G397 size 3)	CB59716-001	
Servo drive power connector kit (G393/G397 size 4)	CB59718-001	
DC-Link bar (G393/G397 size 5 and G396 size 5)	CB59720-001	
DC-Link bar (G393/G397 size 6A and G396 size 6A)	CB59721-001	
Servo drive Compact control connector kit (G394 size C2 to C5)	CB40512-001	2 x mating connector for x^4 - 12-pole 1 x mating connector for x^5 - 2-pole 1 x mating connector for x^{13} - 2-pole 1 x mating connector for x^{13} - 2-pole
Servo drive Compact power connector kit (G394 size C2 and C3)	CB40513-001	1 x mating connector for x^1 - 7-pole 1 x mating connector for x^2 - 2-pole 1 x mating connector for x^3 - 4-pole
Servo drive Compact power connector kit (G394 size C4)	CB40515-001	
Servo drive power connector kit (G394 size C5)	CC05250-001	2 x mating connector for x^1 - 2-pole 1 x mating connector for x^1 - 3-pole 1 x mating connector for x^2 - 2-pole 1 x mating connector for x^3 - 3-pole
Servo drive Compact screaning clamps (G394 sizes C2 to C4)	CB40514-001	
Servo drive screaning clamps (G394 size C5)	CC05249-001	
Power supply unit control connector kit (G396)	CB59722-001	2 x mating connector for x^4 - 12-pole 1 x mating connector for x^5 - 2-pole 1 x mating connector for x^9 - 2-pole 1 x mating connector for x^{10} - 2-pole 1 x mating connector for x^{21} - 6-pole

EMC ACCESSORIES

Cable clamps and clips

Cable clamps

Availability for:
Single-Axis Servo Drive Compact sizes C2 to C5
Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Cable clamps	1101.910.0 SCS01	3 pieces clamps 10 to 16 mm
	1101.920.0 SCS02	3 pieces clamps 12 to 22 mm
	1101.930.0 SCS03	3 pieces clamps 16 to 27 mm
	1101.940.0 SCS04	3 pieces clamps 35 to 45 mm
	1101.950.0 SCS05	3 pieces clamps 40 to 66 mm

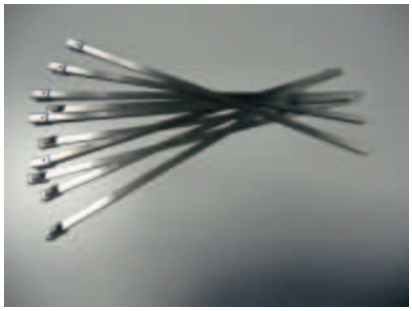
Cable clips

Availability for:

Single-Axis Servo Drive Compact sizes C2 to C5
Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Cable clips	1101.960.0 SCS06	3 pieces clips up to 12 mm

Metal cable ties



Availability for:

Single-Axis Servo Drive Compact sizes C2 to C5
Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

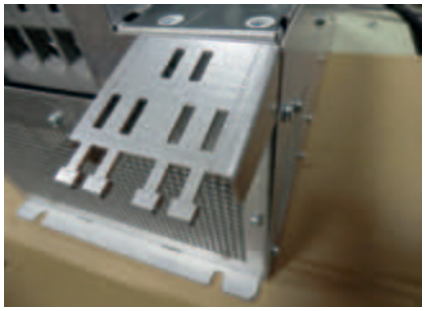
Type	Ordering number	Description
Metal cable ties	1101.970.0 SCS10	10 pieces metal cable ties

Note: Can be used for control and motor cables and for all screen connection plates.

EMC ACCESSORIES

Shield plates for control connections

Shield terminal expansion sizes 1 to 4



Availability for:
Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7
Shield terminal expansion sizes 1 to 4

Type	Ordering number	Description
Shield terminal expansion	1101.810.0 SCE01	Control connections for sizes 1 to 4

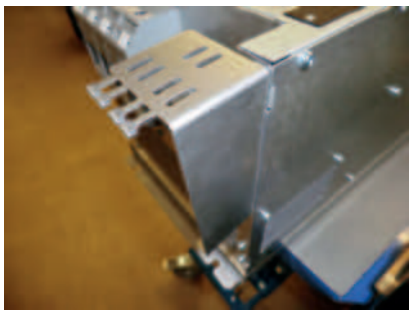
Shield terminal expansion size 5

Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.820.0 SCE05	Control connections for size 5

Shield terminal expansion sizes 6A and 7



Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

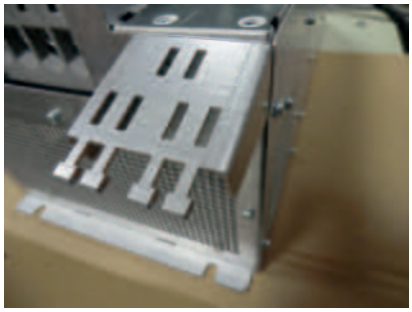
Type	Ordering number	Description
Shield terminal expansion sizes 6A and 7	1101.830.0 SCE06A	Control connections for sizes 6A and 7

Note: Shield plates are suitable for cable clamps, clips or metal cable ties.
Scope of supply in each case only shield plate (cable clamps, clips or metal cable ties not included).

EMC ACCESSORIES

Shield plates for control connections

Shield terminal expansion size 6

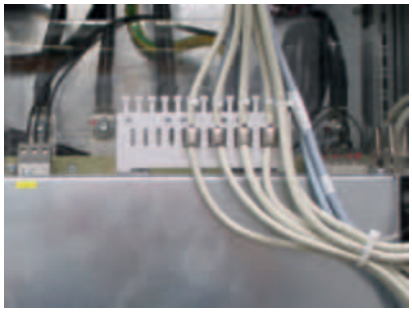


Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.835.0 SCE06	Control connections for size 6

Shield terminal expansion size 7



Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.840.0 SCE07/SPM05	Control connections for size 7

Shield terminal expansion size 5, 145 x 65 mm (5.71 x 2.56 in)

Availability for:

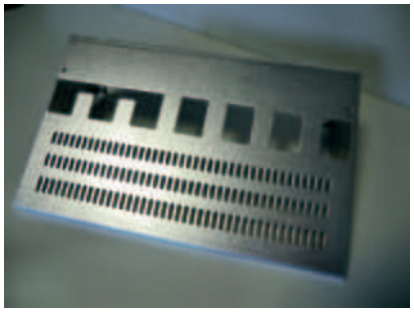
Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.840.0 SCE07/SPM05	Shield plate for size 5

EMC ACCESSORIES

Shield plates for control connections

Shield plate size 6, 280 x 175 mm (11.02 x 6.89 in)



Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.860.0 SPM06	Shield plate for sizes 6 and 6A

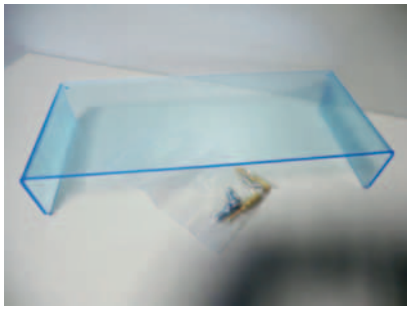
Shield terminal expansion size 7, 385 x 230 mm (15.16 x 9.06 in)

Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1101.870.0 SPM07	Shield plate for size 7 (including mounting accessories)

Terminal cover for size 7, 380 x 157 mm (15.16 x 6.18 in)



Availability for:

Single-Axis Servo Drive sizes 1 to 7
Multi-Axis Servo Drive sizes 1 to 7
PSU sizes 5 to 7

Type	Ordering number	Description
Shield terminal expansion	1190.802.0 SPC07 1101.880.0 SPM/SPC07	Terminal cover for size 7 Terminal cover for size 7 (including SPM07 and mounting accessories)

DOCUMENTS

Modular Multi-Axis Servo Drive System MSD

Document type	Document title	Part number
Documentation		
Operation Manual	MSD Single-Axis Servo Drive Compact	CA97555-001
Operation Manual	MSD Single-Axis Servo Drive	CA65642-001
Operation Manual	MSD Multi-Axis Servo Drive	CA97554-001
Operation Manual	MSD Power Supply Unit	CA97556-001
	MSD Additional information: Fuses size 7 DC-AC	CDS50759-de/en
	MSD Additional information	CDS50758-de/en
Installation Manual	MSD DriveAdministrator 5	CB50726-001
User Manual	MSD Servo Drive UL-Certification	CC36842-001
User Manual	MSD Speed Controlled Pump Software	CB90332-001
Specification	MSD Functional Safety	CB38398-001
Programming Manual	MSD Servo Drive Software with Safety PLC Function	CB78095-001
Help	MSD Device Help	CB40859-001
Help	MSD DriveAdministrator 5	CB19692-001
Description	MSD STO Safety Function	CB19388
Communication		
User Manual	MSD CANopen/EtherCAT	CA65647-001
User Manual	MSD PROFIBUS/PROFINET	CA65645-001
User Manual	MSD SERCOS II	CA65648-001
User Manual	MSD SERCOS III	CA97557-001
Specification	MSD CANopen + 2 analog outputs	CA79904-001
Technology		
Specification	MSD SSI Encoder Simulation	CB08760-001
Specification	MSD TTL Encoder Simulation/TTL Master Encoder	CB32164-001
Specification	MSD TTL encoder/TTL Encoder simulation	CB08758-001
Manual	MSD PLC	CB15237-001
Quick Start Guide	MSD PLC	CC52008-001
Specification	MSD 4...20 mA Inputs on Control Card	CB57187-001
Specification	MSD Sin/Cos Encoder	CB13516-001
Specification	MSD 2nd Sin/Cos Encoder	CA79903-001
Specification	MSD Analog Input/Output Option Card	CB59508-001
Specification	MSD TTL encoder with commutation signals	CB32162-001
Specification	MSD TWINsync Option	CB08759-001
Specification	Safe Tech Options	CC23875-001
Accessories		
Installation Manual	Braking Resistor	CA69043-003
Installation Manual	Mains Chokes	CA69044-003
Installation Manual	Mains Filters	CA69046-003
Short Description	MSD MCS-Mains Connection Set	CC32845-200
Operation Manual	MSD Dynamic Energy Unit DEU-ST	CB50580-001
Operation Manual	MSD Dynamic Energy Unit DEU-SU	CB50579-001
Datasheet	MSD PTC Braking Resistor	CB69044-001

DOCUMENTS

Document type	Document title	Part number
Cable drawing	MSD Power Cable Connector Size 1	C08336
Cable drawing	MSD Power Cable Connector Size 1	CB05708
Cable drawing	MSD Power Cable Connector Size 1.5	CA44958
Cable drawing	MSD Power Cable Connector Size 1.5	CA98676
Cable drawing	MSD Power Cable Connector Size 1.5	CB00076
Cable drawing	MSD Signal Cable for TwinSync	CB36987
Cable drawing	MSD Signal Cable for Heidenhain Encoder EnDat 2.1	CA58876
Cable drawing	MSD Signal Cable for Stegmann Encoder Hiperface	CA58877
Cable drawing	MSD Resolver Cable	C08335
Certificates		
Declaration of Conformity	MSD Modular Multi-Axis Servo Drive System	MRQ37051-001
Declaration of Conformity	MSD Power Supply Unit	MRQ48239-001
Declaration of Conformity	MSD Motion Controller	MRQ38204-001
Declaration of Conformity	MSD Modular Multi-Axis Servo Drive System with integrated Safety Control	MRQ48273-001
RohS Declaration	MSD Modular Multi-Axis Servo Drive System	MRQ48851-001
Declaration of Conformity	MSD Step-up Choke	MRQ48322-001
Declaration of Conformity	MSD Input Choke	MRQ48321-001
Declaration of Conformity	MSD Dynamic Energy Unit	MRQ36999-001
RoHS Declaration	MSD Dynamic Enery Unit	MRQ48723
Declaration	MSD Mains Filter	QAF169
Declaration	MSD Mains Chokes	QAF170
Declaration	MSD Braking Resistor	QAF171
Declaration	MSD Cable	QAF172
TÜV Certificate	MSD Multi-Axis Servo Drive System STO	Reg.-Nr./No.: 01/205/5105.01/15
TÜV Certificate	MSD Servo Drive with integrated Safety Control	Reg.-Nr./No.: 01/205/5349.01/17
Certificate	PROFINET	Certificate No.: Z12284
UL-Multiple Listing Correlation	MSD Servo Drive	E146022

Note: Visit http://www.moogsoftwaredownload.com/msd.html to download a document using the part number in a search.

ABOUT MOOG

Moog Inc. is a worldwide designer, manufacturer and integrator of precision control components and systems. Moog's Industrial Group designs and manufactures high performance motion control solutions combining electric, hydraulic, and hybrid technologies with expert consultative support in a range of applications including energy production and generation machinery, industrial production machinery and simulation and test equipment. We help performance-driven companies design and develop their next-generation machines.

This vast scope ensures that our engineers remain close to the needs of machine builders and provide flexible design solutions and technical expertise tailored to our customers' toughest challenges.

Moog experts work in close collaboration with machine builders and application engineers to design motion control systems for greater productivity, higher reliability, superior connectivity, less costly maintenance and more effective operations. Our regional presence, industry knowledge and design flexibility ensures Moog motion control solutions are tailored to their environment — from meeting operating regulations and performance standards, to taking machine performance to a higher level.

Products

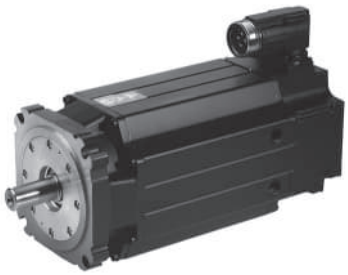
At the heart of every Moog solution is an array of products engineered for precision, high performance and reliability. For more than six decades, Moog products have been specified for critical machine applications.

Some are developed specifically for unique operating environments. Others are standard equipment on machines across many industries. All are continuously improved to take advantage of the latest technology breakthroughs and advancements.

Moog products include:

- Servo Valves and Proportional Valves
- Servo Motors and Servo Drives
- Motion Controllers and Software
- Radial Piston Pumps
- Actuators
- Integrated Hydraulic Manifold Systems and Cartridge Valves
- Slip Rings
- Motion Bases

Servo Drives



Servo Motors

Servo Valves

Radial Piston Pumps

ABOUT MOOG

Hydraulic Solutions

Since Bill Moog invented the first commercially viable servo valve in 1951, Moog has set the standard for world-class hydraulic technology. Today, Moog products are used in a variety of applications - providing high power, enhanced productivity and ever better performance for some of the worlds most demanding applications.

Electric Solutions

Clean operation, low noise generation, less maintenance and reduced power consumption make Moog electric solutions ideal for applications worldwide. Moog is the ideal partner for applications where transitioning technologies requires special expertise.

Hybrid Solutions

By incorporating the advantages of existing hydraulic and electric technologies - including modular flexibility, increased efficiency and cleanliness - into innovative hybrid solutions, Moog offers new performance potential in specialized applications.

Flight Simulation

Formula One Simulation Table

Moog Global Support

Moog Global Support is our promise to offer world-class Repair and Maintenance Services delivered expertly by our trained technicians. With the reliability only available from a leading manufacturer with facilities around the world, Moog offers you service and expertise you can count on to keep your equipment operating as it should.

This promise offers many benefits to our customers including:

- Reduce your downtime by keeping critical machines running in peak performance
- Protect your investment by ensuring reliability, versatility and long-life of products
- Better plan your maintenance activities and make systematic upgrades
- Leverage our flexible programs to meet the unique service requirements of your facility

Look to Moog for global support including:

- Repair services using OEM parts are performed by trained technicians to the latest specifications
- Stock management of spare parts and products to prevent unplanned downtime
- Flexible programs, tailored to your needs such as upgrades, preventative maintenance and annual/multi-year contracts
- On-site services bring the expertise to you, providing quicker commissioning, set-up and diagnostics
- Access to reliable services that are guaranteed to offer consistent quality anywhere in the world

For more information on Moog Global Support visit www.moog.com/industrial/service.

MOOG GLOBAL SUPPORT®

MORE PRODUCTS. MORE SUPPORT.

Moog designs a range of motion control products to complement those featured in this document. Moog also provides service and support for all of our products. For more information, contact the Moog facility closest to you.

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For product information, visit **www.moog.com/industrial**
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Modular Multi-Axis Servo Drive System
STAR PUBLISHING/Rev. K, October 2018, Id. CDL29950-en