

DS2020 DRIVE WITH COMBITRONIC™ CAPABILITY



SYSTEMS GUIDE

PRODUCT OVERVIEW

The name Moog is strongly associated with brushless servo motors and servo drives — offering the highest dynamics, power density and reliability. These products are designed as a system to deliver superior servo performance. Moog offers a broad range of standard, as well as custom, solutions to meet your unique requirements. Moog brushless servo motors and drives are found on a variety of applications; especially where dynamics, compact size and reliability are important.

Compact Dynamic Brushless Servo Motors

Moog's Compact Dynamic Brushless Servo Motors (CD Series) are electronically commutated synchronous AC motors with permanent magnet field excitation. The CD Series Servo Motors are designed for highly dynamic servo applications where positioning times of 30 msec or less are often the norm. The CD Series offers one of the industry's widest power ranges with standard models available at continuous torque ratings from 0.15 to 72 Nm (1.4 to 638 in-lb). The modular design is supported by a variety of options with Moog's application staff capable of supplying fully customized solutions.

The wide range of Moog servo motors, combined with the ability to seamlessly integrate with existing infrastructure, reduces the need for redesign, limits cost and improves space utilization.

The CD Series Servo Motors are available with the following options:

- Cooling options natural and fan cooling
- Integral holding brakes
- Various connector options
- Plain or slot and key type shafts
- Teflon™ shaft seal (IP67 sealing)

Single-axis, Stand-alone Drives

The DS2020 is a single-axis, stand-alone, servo drive, specifically designed with extremely compact dimensions for significant space saving. It features 24 kW of output power in less than 125 mm width [4.92 in] and 16 kHz of internal loop refresh time for an efficient control. Available in various sizes, from 2 to 24 Arms, continuous, and 4 to 48 A, peak, the DS2020 Combitronic™ can be easily tailored to meet any application requirement with different feedback and fieldbus interfaces.

The DS2020 Combitronic™ Servo Drive is designed to control synchronous brushless or asynchronous motors and is compatible with various feedback systems.

Typical advantages of the DS2020 Combitronic™ Drive include:

- High precision and top dynamics
- Significant space saving during installation
- Personalized functionalities and highly flexible configurations
- Quick, precise movements



CD Series Servo Motor



DS2020 Combitronic™ Servo Drive



Combitronic™ Technology

High speed transparent communications over CAN Bus

Combitronic™ is a protocol that operates over a standard “CAN” (Controller Area Network) interface and was developed by Moog Animatics. It may coexist with either CANopen or DeviceNet protocols at the same time. Unlike these common protocols however, Combitronic™ requires no single dedicated master to operate. Each Integrated servo connected to the same network communicates on an equal footing, sharing all information, and therefore, sharing all processing resources. Combitronic communications operate over a standard “CAN” interface, the same basic hardware used in most automobiles as well as in familiar industrial networks such as CANopen and DeviceNet. Unlike these common control networks, however, Combitronic has no master or slave.

Combitronic™ technology allows any SmartMotor™ servo’s program to read from, write to, or control any other SmartMotor or DS2020 Combitronic system simply by tagging a local variable or command with the other motor’s CAN address. All SmartMotor™ units become one multi-tasking, data-sharing system without writing a single line of communications code or requiring detailed knowledge of the CAN protocol. The only prerequisite is to have matched baud rates and unique addresses.

Combitronic protocol features:

- 120 axis node count
- 1 MHz bandwidth

- No master required
- No scan list or node list set up required
- All nodes have full read/write access to all other nodes

Combitronic technology provides the following design and advantages:

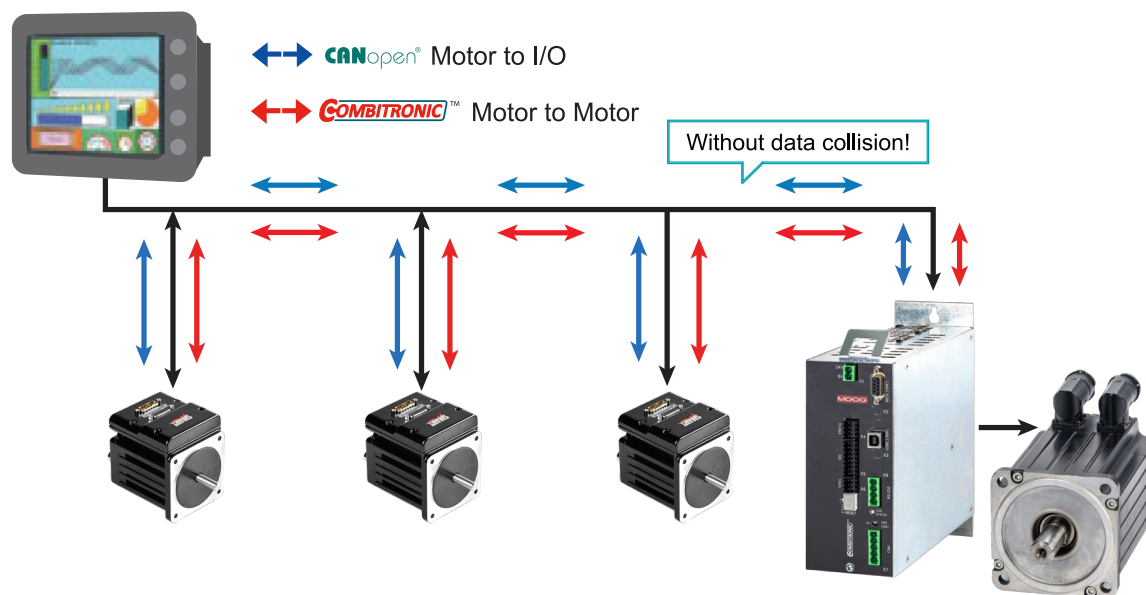
Reduced Size: Compressing the controls into the motors themselves reduces or eliminates the control cabinet, making the machine much smaller.

Reduced Cost: Fewer components and no cabinet cut costs dramatically.

Reduced Development Time: Fewer components to specify, purchase, learn and mount make for dramatically reduced development cycles, getting to market faster, generating revenue sooner and producing a compelling competitive advantage.

Reduced Field Service: Machine repair moves from debugging a cabinet full of wires and controls, to a simple component swap of motors and standard cables.

Reduced Down-Time: Keeping component spares on-hand can virtually eliminate down-time. A traditional control can only be debugged in the cabinet while the machine is down and the factory processes stopped. An Integrated Motor or simple “Y” cable can be swapped out immediately. The faulty component can be debugged, or simply sent back to the manufacturer for analysis and repair — while the machine continues to produce.



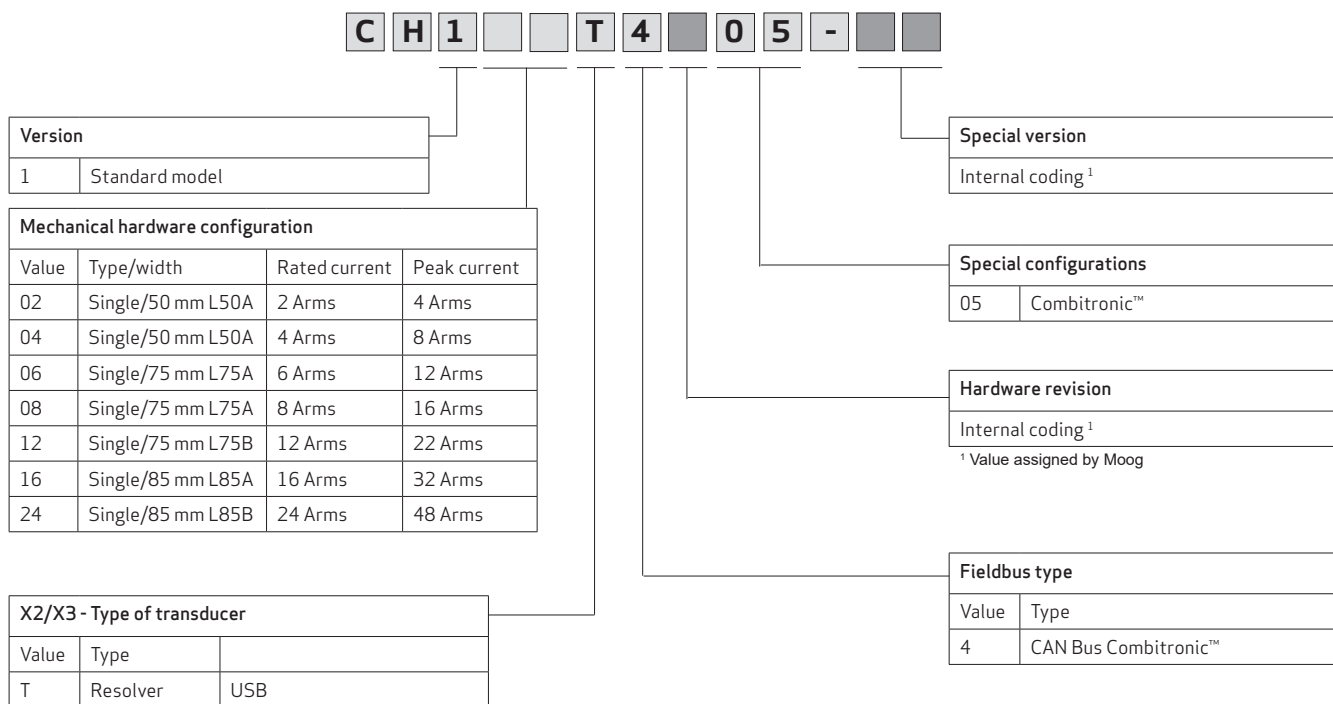
CANopen is a registered trademarks of the CAN in Automation User's Group.
EtherCAT is a registered trademark and patented technology, licensed by Beckhoff Automation GmbH.

Servo Drives

Drives (rated from 220 Vac - 480 Vac mains voltage, standard motor brake interface)				
Drive Model	Nominal Current	Peak Current	Code	Description
DS2020 02/04	2 Arms	4 Arms	CH1 02 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 50 mm
DS2020 04/08	4 Arms	8 Arms	CH1 04 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 50 mm
DS2020 06/12	6 Arms	12 Arms	CH1 06 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 75 mm
DS2020 08/16	8 Arms	16 Arms	CH1 08 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 75 mm
DS2020 12/22	12 Arms	22 Arms	CH1 12 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 75 mm
Connector kit: KITDS2020-R1				
Drive Model	Nominal Current	Peak Current	Code	Description
DS2020 16/32	16 Arms	32 Arms	CH1 16 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 85 mm
DS2020 24/48	24 Arms	48 Arms	CH1 24 T 4 A 05-00	Resolver, USB, CAN Bus Combitronic, 85 mm
Connector kit: KITDS2020-R2				

Notes: DS2020 suggested drive size selected to use the motor at peak torque; further optimization can be obtained according to each application needs. DS2020 can be used at 220 Vac and 400/480 Vac, three phases, without code variation. Other models are available on special request, please contact Moog for details.

Servo Drive Part Numbering System



Servo Motors

CD Motor (FASG) (220 Vac motors)						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-2-M2	0.24 Nm	8.000 rpm	150 W	G-2-M2-080-00-00-01-00	Resolver, no brake	DS2020 02/04
G-2-M4	0.48 Nm	7.400 rpm	260 W	G-2-M4-074-00-00-01-00	Resolver, no brake	DS2020 02/04
G-2-M6	1.00 Nm	6.500 rpm	470 W	G-2-M6-065-00-00-01-00	Resolver, no brake	DS2020 04/08
G-2-M8	2.02 Nm	5.000 rpm	830 W	G-2-M2-050-00-00-01-00	Resolver, no brake	DS2020 06/12
G-2-M2	0.24 Nm	8.000 rpm	150 W	G-2-M2-080-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-2-M4	0.48 Nm	7.400 rpm	260 W	G-2-M4-074-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-2-M6	1.00 Nm	6.500 rpm	470 W	G-2-M6-065-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-2-M8	2.02 Nm	5.000 rpm	830 W	G-2-M8-050-01-00-01-00	Resolver, brake (*)	DS2020 06/12
(*) Small brake option (1 Nm). 55 mm flange						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-3-M2	0.62 Nm	7.200 rpm	430 W	G-3-M2-072-00-00-01-00	Resolver, no brake	DS2020 02/04
G-3-M4	1.64 Nm	6.000 rpm	890 W	G-3-M4-060-00-00-01-00	Resolver, no brake	DS2020 04/08
G-3-M6	2.58 Nm	4.100 rpm	1010 W	G-3-M6-041-00-00-01-00	Resolver, no brake	DS2020 06/12
G-3-M8	3.94 Nm	3.400 rpm	1290 W	G-3-M2-034-00-00-01-00	Resolver, no brake	DS2020 08/16
G-3-M2	0.62 Nm	7.200 rpm	430 W	G-3-M2-072-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-3-M4	1.64 Nm	6.000 rpm	890 W	G-3-M4-060-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-3-M6	2.58 Nm	4.100 rpm	1010 W	G-3-M6-041-01-00-01-00	Resolver, brake (*)	DS2020 06/12
G-3-M8	3.94 Nm	3.400 rpm	1290 W	G-3-M8-034-01-00-01-00	Resolver, brake (*)	DS2020 08/16
(*) Small brake option (2.0 Nm), larger brake option available (4.5 Nm). 70 mm flange						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-4-M2	1.52 Nm	7.000 rpm	880 W	G-4-M2-070-00-00-01-00	Resolver, no brake	DS2020 04/08
G-4-M4	2.66 Nm	5.500 rpm	1150 W	G-4-M4-055-00-00-01-00	Resolver, no brake	DS2020 06/12
G-4-M6	4.74 Nm	4.100 rpm	1550 W	G-4-M6-041-00-00-01-00	Resolver, no brake	DS2020 12/22
G-4-M8	8.31 Nm	3.300 rpm	2080 W	G-4-M8-033-00-00-01-00	Resolver, no brake	DS2020 16/32
G-4-M9	11.33 Nm	2.600 rpm	2380 W	G-4-M9-026-00-00-01-00	Resolver, no brake	DS2020 16/32
G-4-M2	1.52 Nm	7.000 rpm	880 W	G-4-M2-070-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-4-M4	2.66 Nm	5.500 rpm	1150 W	G-4-M4-055-01-00-01-00	Resolver, brake (*)	DS2020 06/12
G-4-M6	4.74 Nm	4.100 rpm	1550 W	G-4-M6-041-01-00-01-00	Resolver, brake (*)	DS2020 12/22
G-4-M8	8.31 Nm	3.300 rpm	2080 W	G-4-M8-033-01-00-01-00	Resolver, brake (*)	DS2020 16/32
G-4-M9	11.33 Nm	2.600 rpm	2380 W	G-4-M9-026-01-00-01-00	Resolver, no brake	DS2020 16/32
(*) Small brake option (9.0 Nm), larger brake option available (14 Nm). 100 mm flange						

Resolver cable: CBLCD-RES-FL-xM (xx= length in meters)

Power cable: CBLCD-PWR1-FL-xM (xx= length in meters)

Note: Other models are available on special request, please contact Moog for details.

Servo Motors

CD Motor (FASG) (400 Vac motors)						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-2-V2	0.26 Nm	9.000 rpm	170 W	G-2-V2-090-00-00-01-00	Resolver, no brake	DS2020 02/04
G-2-V4	0.51 Nm	7.500 rpm	270 W	G-2-V4-075-00-00-01-00	Resolver, no brake	DS2020 02/04
G-2-V6	0.88 Nm	7.500 rpm	410 W	G-2-V6-075-00-00-01-00	Resolver, no brake	DS2020 04/08
G-2-V8	1.79 Nm	6.000 rpm	770 W	G-2-V2-060-00-00-01-00	Resolver, no brake	DS2020 04/08
G-2-V2	0.26 Nm	9.000 rpm	170 W	G-2-V2-090-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-2-V4	0.51 Nm	7.500 rpm	270 W	G-2-V4-075-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-2-V6	0.88 Nm	7.500 rpm	410 W	G-2-V6-075-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-2-V8	1.79 Nm	6.000 rpm	770 W	G-2-V8-060-01-00-01-00	Resolver, brake (*)	DS2020 04/08
(*) Small brake option (1 Nm), 55 mm flange						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-3-V2	0.55 Nm	11.000 rpm	510 W	G-3-V2-110-00-00-01-00	Resolver, no brake	DS2020 02/04
G-3-V4	1.44 Nm	8.000 rpm	910 W	G-3-V4-080-00-00-01-00	Resolver, no brake	DS2020 04/08
G-3-V6	2.26 Nm	4.500 rpm	950 W	G-3-V6-045-00-00-01-00	Resolver, no brake	DS2020 04/08
G-3-V8	3.46 Nm	4.400 rpm	1380 W	G-3-V2-044-00-00-01-00	Resolver, no brake	DS2020 06/12
G-3-V2	0.55 Nm	11.000 rpm	510 W	G-3-V2-110-01-00-01-00	Resolver, brake (*)	DS2020 02/04
G-3-V4	1.44 Nm	8.000 rpm	910 W	G-3-V4-080-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-3-V6	2.26 Nm	4.500 rpm	950 W	G-3-V6-045-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-3-V8	3.46 Nm	4.400 rpm	1380 W	G-3-V8-044-01-00-01-00	Resolver, brake (*)	DS2020 06/12
(*) Small brake option (2.0 Nm), larger brake option available (4.5 Nm), 70 mm flange						
Motor Model	Nominal Torque	Nominal Speed	Nominal Power	Motor Code	Description	Suggested Drive Model
G-4-V2	1.25 Nm	8.000 rpm	760 W	G-4-V2-080-00-00-01-00	Resolver, no brake	DS2020 04/08
G-4-V4	2.31 Nm	5.500 rpm	1000 W	G-4-V4-055-00-00-01-00	Resolver, no brake	DS2020 06/12
G-4-V6	4.01 Nm	4.200 rpm	1300 W	G-4-V6-042-00-00-01-00	Resolver, no brake	DS2020 08/16
G-4-V8	6.85 Nm	3.500 rpm	1690 W	G-4-V8-035-00-00-01-00	Resolver, no brake	DS2020 12/22
G-4-V9	9.31 Nm	2.900 rpm	1940 W	G-4-V9-029-00-00-01-00	Resolver, no brake	DS2020 16/32
G-4-V2	1.25 Nm	8.000 rpm	760 W	G-4-V2-080-01-00-01-00	Resolver, brake (*)	DS2020 04/08
G-4-V4	2.31 Nm	5.500 rpm	1000 W	G-4-V4-055-01-00-01-00	Resolver, brake (*)	DS2020 06/12
G-4-V6	4.01 Nm	4.200 rpm	1300 W	G-4-V6-042-01-00-01-00	Resolver, brake (*)	DS2020 08/16
G-4-V8	6.85 Nm	3.500 rpm	1690 W	G-4-V8-032-01-00-01-00	Resolver, brake (*)	DS2020 12/22
G-4-V9	9.31 Nm	2.900 rpm	1940 W	G-4-V9-029-01-00-01-00	Resolver, no brake	DS2020 16/32
(*) Small brake option (9.0 Nm), larger brake option available (14 Nm), 100 mm flange						

Resolver cable: CBLCD-RES-FL-xM (xx= length in meters)

Power cable: CBLCD-PWR1-FL-xM (xx= length in meters)

Note: Other models are available on special request, please contact Moog for details.

Servo Motor Part Numbering System



Motor size	
1	40 mm (flange)
2	55 mm (flange)
3	70 mm (flange)
4	100 mm (flange)
5	140 mm (flange)
6	190 mm (flange)

Cooling options	
-	Natural cooling
F	Fan cooling for size 4/5/6

DC link voltage	
M	Low voltage: 325 V _{DC} with NTC thermal sensor
V	High voltage: 565 V _{DC} with PTC thermal sensor

Stack length ¹						
Value	Motor size					
Code	1	2	3	4	5	6
0	Special					
2	L20	L05	L05	L10	L10	L15
4	L40	L10	L15	L10	L20	L30
6	L60	L20	L25	L20	L30	L45
8	-	L40	L40	L40	L50	L60
9	-	-	-	L60	L70	L90

¹ Active length in 0.1 inch (for G-1 in mm)

Rated speed ²	
xxx	r/100 min
² Example: r/min = 3500/100 = 035	

Electrical options ³					
	Brake options		Rotatable connector	Straight connector	Fixed angled connector
	1	2			
00					
01					
02					
03					
04					
05					
06					
07					
08					
09	Special				

³ Resolver motors come with fixed angled connectors
Encoder motors come with rotatable angled connectors

Special version	
00	Standard version

Mechanical option		
	Keyway	Shaft exit seal
00		
01		
02		
03		
04	Special	

Brake options							
		Motor size					
		1	2	3	4	5	6
1	Low torque	0.4 Nm	1 Nm	2 Nm	9 Nm	14 Nm	22 Nm
2	High torque	-	-	4.5 Nm	14 Nm ⁴	22 Nm	72 Nm

⁴With encoder holding torque 14.5 Nm (128.5 lb)

Feedback options							
	Motor size						Resolver/ Encoder type
	1	2	3	4	5	6	
00	Not allowed						Steg- mann
01	2 poles resolver						
02	-	-	-	-	-	Incremental	
03	-	SKS36	-	SRS50	-	Absolute single turn	
04	-	SKM36	-	SRM50	-	Absolute multi turn	
05	-	ERN1185	-	ERN1387	-	Incremental	
06	-	ECN1113	-	ECN1313	-	Absolute single turn	
07	-	EQN1125	-	EQN1325	-	Absolute multi turn	
08	Special						Heiden- hain

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