

UNIDRIVE M400

ADVANCED CAPABILITY LOW VOLTAGE AC DRIVES

Fast set-up, diagnostics with real-text display, integrated PLC and safety inputs 0.25 kW - 132 kW (0.33 hp - 200 hp) 100 V | 200 V | 400 V | 575 V | 690 V



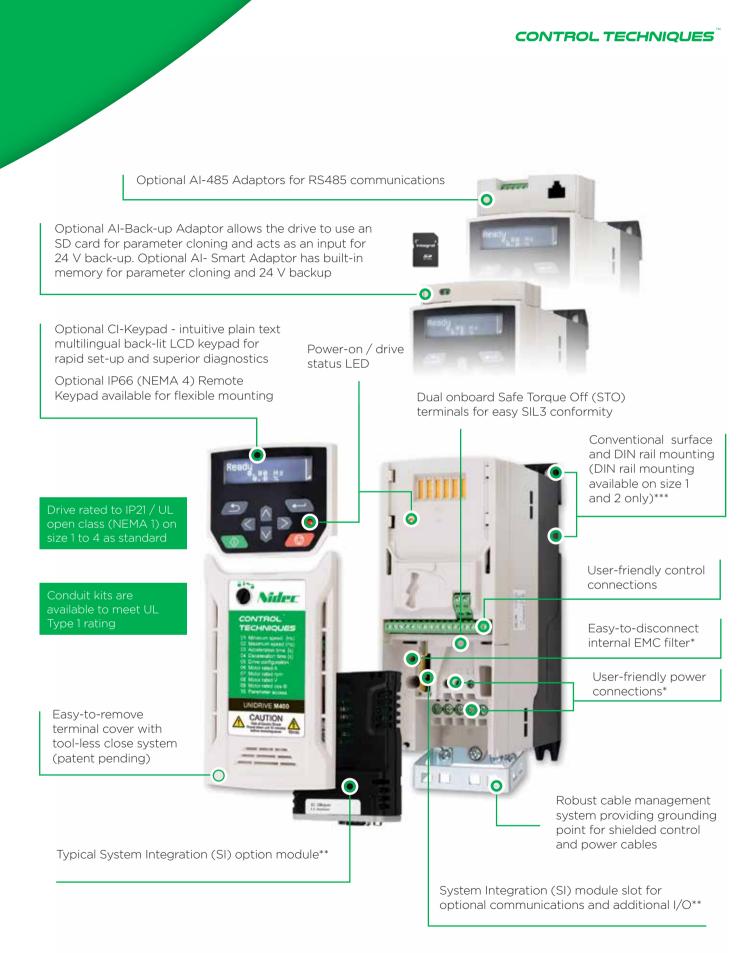
Unidrive M Optimized throughput, open automation systems, maximum ease of use



All-round member of the Unidrive M family

Unidrive M400 is exceptional at combining the ease of use of our general purpose range with the capabilities of our high performance Unidrive M Series. The removable keypad with a real-text display makes it ideal for users who require extra diagnostic help when setting up parameters. Add in an impressive I/O count, dual Safe Torque Off (STO) and integrated PLC, all of which contribute to making Unidrive M400 an extremly capable drive.





*Features and their locations vary on some drive sizes

** Frame 2 upwards

***Additional fixings recommended where heavy vibration is expected

Unidrive M400 Fast set-up and diagnostics with plain text display, integrated PLC and safety inputs

Unidrive M400 minimizes downtime with an intuitive LCD keypad offering a real-text, multi-language display for rapid set-up and clear diagnostic help. The integrated PLC can execute a substantial range of sequencing and logic programs. Coupled with an impressive I/O count complete with two STO inputs and an SI interface for a fieldbus option or extended I/O, this feature set ensures Unidrive M400's flexible integration with any system.

Minimize downtime and system set-up time with advanced keypad options

- Informative, multi-language, 3 line display aids set up and provides diagnostic information
- 4 navigation buttons facilitate intuitive navigation and programming
- Keypad options available:
 - CI-Keypad drive mounted LCD keypad
 - Remote IP66 Keypad rapid panel mount (1 x 32mm Ø hole)
 - No keypad programming and control can be achieved via AI-485, CI-485 or fieldbuses such as SI-Profibus

Reduce system costs by directly integrating with applications

- Unidrive M400 incorporates an onboard PLC which can execute Machine Control Studio (IEC61131-3) programs for logic and sequencing with real-time tasks - removing the need for additional PLCs
- Fit an SI module to add fieldbus communications or additional I/O



Conform to safety standards, maximize uptime and reduce costs by integrating directly with safety systems

• Unidrive M400 has integrated dual STO inputs for SIL3 / PLe conformity, eliminating the need for external components

Energy saving

With energy costs a key factor in many industries, Unidrive M400 is packed with features to enhance energy efficiency:

- Low power standby mode for applications where drives can sit idle for significant periods
- Automatic 3-speed cooling fan keeps energy usage and acoustic noise to a minimum by intelligently responding to load and environmental conditions*

- Square law V/F mode is optimized for quadratic loads like pumps and fans to keep motor losses to a minimum
- Dynamic V to F mode keeps energy usage and motor losses to a minimum in low load conditions
- Unidrive M400 is highly efficient (above 98 %)

*From 0.37 kW

Machine Control Studio software

Unidrive M400's onboard PLC is programmed using Machine Control Studio which provides a flexible and intuitive environment for programming.

IEC 61131-3 automation programming

The programming environment is fully IEC 61131-3 compliant and therefore familiar, fast and easy to use for control engineers around the world.

The following IEC 61131-3 programming languages are supported:

- Structured Text (ST)
- Function Block Diagram (FBD)
- Structured Function Chart (SFC)
- Ladder Diagram (LD)
- Instruction List (IL)

Also supported:

• Continuous Function Chart (CFC)

Intuitive IntelliSense functionality helps to write consistent and robust programs, speeding up software development.

Programmers have access to a vibrant open-source community for function blocks. Machine Control Studio also supports customers' own function block libraries, with on-line monitoring of program variables with user defined watch windows and help for on-line change of programs, in line with latest PLC practices.

Fast and easy access for commissioning, monitoring and diagnostics

Unidrive M Connect commissioning tool

The Connect PC tool is for commissioning, optimizing and monitoring drive/system performance. Its development draws from extensive user research.

using human centered design principles to give the ultimate user experience:

- Task-based drive operations are simplified with intuitive graphical tools in a familiar Windows environment
- Dynamic drive logic diagrams and enhanced searchable listings
- Drive and motor performance can be optimized with minimal specialized drive knowledge



- Supports the import of Commander SK parameter files
- Drive discovery gives the ability to find drives on a network automatically without the user having to specify their addresses

Portable SD memory card

Standard SD cards can be used for quick and easy parameter and program storage using an adaptor. SD cards provide a huge memory capability allowing a system reload if required, and can be easily preprogrammed on a common PC.



Typical Machine Control Studio screen shot. You can download Machine Control Studio from the software section of the Control Techniques website.

Performance motor control

Unidrive M400 combines the latest microprocessor technology with unique motor control algorithms to give maximum stability of induction motors at all powers. Current loop update rates up to 125 μ s and complementary intelligent control features ensure that machine throughput and energy efficiency are maximized in all industrial applications.

Control Mode	Features				
Enhanced open loop Rotor Flux Control for induction motors (RFC-A)	High performance speed and torque control through an advanced vector algorithm, utilizing closed loop current control to greatly enhance performance for all induction motor sizes without the need for a feedback device				
Open loop vector or V/Hz induction motor control	Reliable performance and easy configuration: - 100 % torque available down to 1 Hz - Slip compensation - Multi-motor control - Square law V/F mode - Dynamic V/F mode				

Easy motor pairing

Several intuitive tools are available to guarantee fast and optimized pairing between Unidrive M400 and AC induction motors. These include:

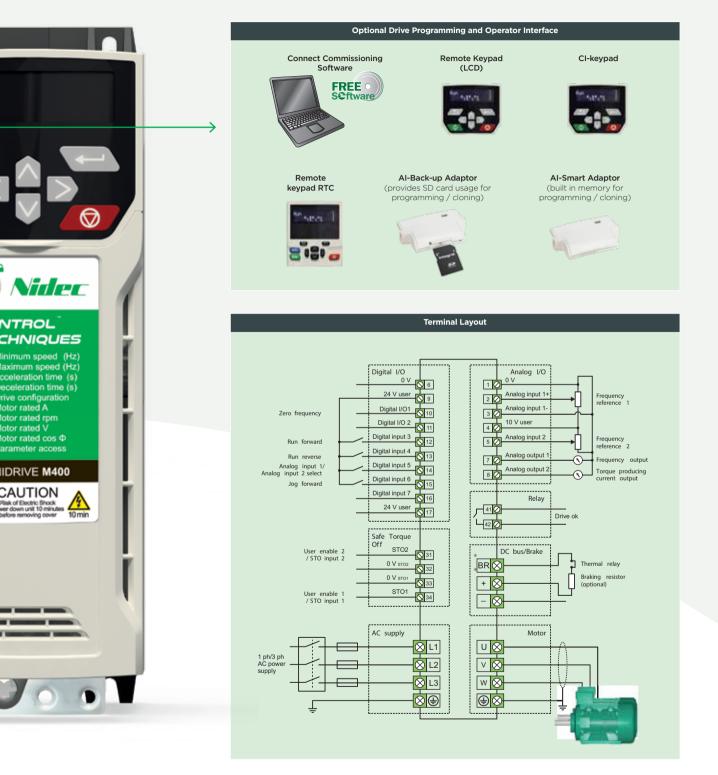
- Easy-to-use keypad with parameter reference guide on front panel
- Multilingual LCD remote keypad with clear parameter and diagnostic descriptions
- Three autotune procedures (stationary, rotating and inertia) to automatically optimize motor and drive configuration

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 Connect commissioning software tool provides a comprehensive motor database and set up wizard

Unidrive M400 option choices and terminal layout





* For frame sizes 5 - 9 STO input, refer to Unidrive M400 documentation

UNIDRIVE M SERIES

Unidrive M400 ratings and specifications

100/120 Vac ±10 %									
			Heavy Duty		Normal Duty				
Order Code	Supply Phases	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (hp)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (hp)		
M400-011 00017A	1	1.7	0.25	0.33					
M400-011 00024A	1	2.4	0.37	0.5	For Normal Duby or	-			
M400-021 00042A	1	4.2	0.75	1	For Normal Duty applications, use Heavy Duty ratings.				
M400-021 00056A	1	5.6	1.1	1.5					

200/240 Vac ±10 %

			Heavy Duty			Normal Duty	
Order Code	Supply Phases	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (hp)	Max Continuous Motor Shaft Power Current (A) (kW)		Motor Shaft Power (hp)
M400-012 00017A	1	1.7	0.25	0.33			
M400-012 00024A	1	2.4	0.37	0.5			
M400-012 00033A	1	3.3	0.55	0.75			
M400-012 00042A	1	4.2	0.75	1			
M400-022 00024A	1/3	2.4	0.37	0.5			
M400-022 00033A	1/3	3.3	0.55	0.75	For Normal Duby or	-	
M400-022 00042A	1/3	4.2	0.75	1	For Normal Duty applications, use Heavy Duty ratings.		
M400-022 00056A	1/3	5.6	1.1	1.5			
M400-022 00075A	1/3	7.5	1.5	2			
M400-032 00100A	1/3	10	2.2	3			
M400-042 00133A	1/3	13.3	3	3			
M400-042 00176A	3	17.6	4	5			
M400-052 00250A	3	25	5.5	7.5	30	7.5	10
M400-062 00330A	3	33	7.5	10	50	11	15
M400-062 00440A	3	44	11	15	58	15	20
M400-072 00610A	3	61	15	20	75	18.5	25
M400-072 00750A	3	75	18.5	25	94	22	30
M400-072 00830A	3	83	22	30	117	30	40
M400-082 01160A	3	116	30	40	149	37	50
M400-082 01320A	3	132	37	50	180	45	60
M400-092 01760A	3	176	45	60	216	55	75
M400-092 02190A	3	219	55	75	266	75	100

380/480 Vac ±10 %

			Heavy Duty Normal Duty				
Order Code	Supply Phases Max Continuous Current (A)		Motor Shaft Power (kW)	Motor Shaft Power (hp)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (hp)
M400-024 00013A	3	1.3	0.37	0.5			
M400-024 00018A	3	1.8	0.55	0.75			
M400-024 00023A	3	2.3	0.75	1			
M400-024 00032A	3	3.2	1.1	1.5			
M400-024 00041A	3	4.1	1.5	2	For Normal Duby or	-	
M400-034 00056A	3	5.6	2.2	3	For Normal Duty ap	oplications, use Heavy [Juty ratings.
M400-034 00073A	3	7.3	3	3			
M400-034 00094A	3	9.4	4	5			
M400-044 00135A	3	13.5	5.5	7.5			
M400-044 00170A	3	17	7.5	10			
M400-054 00270A	3	27	11	20	30	15	20
M400-054 00300A	3	30	15	20	30	15	20
M400-064 00350A	3	35	15	25	38	18.5	25

CONTROL TECHNIQUES

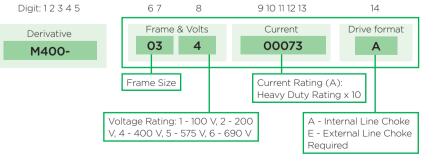
M400-064 00420A	3	42	18.5	30	48	22	30
M400-064 00470A	3	47	22	30	63	30	40
M400-074 00660A	3	66	30	50	79	37	50
M400-074 00770A	3	77	37	60	94	45	60
M400-074 01000A	3	100	45	75	112	55	75
M400-084 01340A	3	134	55	100	155	75	100
M400-084 01570A	3	157	75	125	184	90	125
M400-094 02000A	3	200	90	150	221	110	150
M400-094 02240A	3	224	110	150	266	132	200

500/575 Vac ±10 %

	Cummlu		Heavy Duty			Normal Duty	
Drive	Supply Phases	Max Continuous Current (A)	Typical Output (kW)	Motor Power (hp)	Max Continuous Current (A)	Typical Output (kW)	Motor Power (hp)
M400-055 00030 A	3	3	1.5	2	3.9	2.2	3
M400-055 00040 A	3	4	2.2	3	6.1	4	5
M400-055 00069 A	3	6.9	4	5	10	5.5	7.5
M400-065 00100 A	3	10	5.5	7.5	12	7.5	10
M400-065 00150 A	3	15	7.5	10	17	11	15
M400-065 00190 A	3	19	11	15	22	15	20
M400-065 00230 A	3	23	15	20	27	18.5	25
M400-065 00290 A	3	29	18.5	25	34	22	30
M400-065 00350 A	3	35	22	30	43	30	40
M400-075 00440 A	3	44	30	40	53	37	50
M400-075 00550 A	3	55	37	50	73	45	60
M400-085 00630 A	3	63	45	60	86	55	75
M400-085 00860 A	3	86	55	75	108	75	100
M400-095 01040 A	3	104	75	100	125	90	125
M400-095 01310 A	3	131	90	125	150	110	150

500/690 Vac ±10 %

	Supply	Heavy Duty				Normal Duty		
Drive	Supply Phases	Max Continuous Typical Output Current (A) (kW)		Motor Power (hp)	Max Continuous Current (A)	Typical Output (kW)	Motor Power (hp)	
M400-076 00190 A	3	19	15	20	23	18.5	25	
M400-076 00240 A	3	24	18.5	25	30	22	30	
M400-076 00290 A	3	29	22	30	36	30	40	
M400-076 00380 A	3	38	30	40	46	37	50	
M400-076 00440 A	3	44	37	50	52	45	60	
M400-076 00540 A	3	54	45	60	73	55	75	
M400-086 00630 A	3	63	55	75	86	75	100	
M400-086 00860 A	3	86	75	100	108	90	125	
M400-096 01040 A	3	104	90	125	125	110	150	
M400-096 01310 A	3	131	110	150	150	132	175	



Key:

Unidrive M400 ratings and specifications

Environmental safety and electrical conformance

Size 1 to 4:

- IP21 / UL open class (NEMA 1). IP20 when the AI-Back-up or AI-485 Adaptors are fitted. UL TYPE 1 compliance requires the appropriate conduit kit to be fitted.
- Ambient temperature -20 °C (4 °F) to 40 °C (104 °F) as standard. 60 °C/ 140 °F with derating for frames 1-4.

Size 5 to 9:

- IP20 / UL open class (NEMA 1). UL TYPE 1 compliance requires the appropriate conduit kit to be fitted. IP65 / UL TYPE 12 rating is achieved on the rear of the drive when through panel mounted.
- Ambient temperature -20 °C (4 °F) to 40 °C (104 °F) as standard. 55°C/ 131 °F with derating for frames 5-9.
- Storage temperature -40 °C to 60 °C (-40 °F to 140 °F).
- Humidity 95 % maximum (noncondensing) at 40 °C (104 °F) in accordance with EN/IEC 60068-2-78 and ANSI/EIA-364-31.

Dimensions and Weight

Unidrive M operating modes

- EN/IEC 60068-2-60, Method 4 Corrosive gas.
- Altitude: 0 to 3000 m (0 to 9843 ft), derate 1 % per 100 m (328 ft) between 1000 m and 3000 m (3281 ft and 9843 ft).
- Random Vibration: Tested in accordance with EN/IEC 60068-2-64 with SI and AI option modules fitted.
- Mechanical Shock: Tested in accordance with EN/IEC 60068-2-29.
- Electromagnetic Immunity complies with EN/IEC 61800-3 and EN/IEC 61000-6-2.
- With onboard EMC filter, complies with EN/IEC 61800-3 (2nd environment).
- EN/IEC 61000-6-3 and EN/IEC 61000-6-4 with optional footprint EMC filter.
- EN/IEC 61800-5-1 Electrical Safety.
- EN/IEC 61131-2 I/O.
- Safe Torque Off, independently assessed by TÜV to EN/IEC 61800-5-2 SIL3 and EN ISO 13849-1 PLe.
- UL 508C Electrical Safety.

Unidrive M400 features and specification table

	Current loop update: 125 µs						
	Heavy Duty peak rating: 180 % (3 s), 150 % (60 s)						
Performance	Maximum output frequency: 550 Hz						
	Switching frequency range: 0.67, 1, 2, 3, 4, 6, 8, 12, 16 kHz (3 kHz default)						
Onboard	Programmable Logic Control (PLC) - memory: 16 kB						
intelligence	1 x Real-time task (16ms), 1 x Background task						
Mechanical	DIN rail mountable (size 1 and 2)						
attributes	Commander SK compatible mechanical footprint either as standard or with conversion plates						
Parameter	Serial port cloning (using optional AI-485 Adaptor or CI-485 Adaptor)						
back-up	SD card (using optional Al-Back-up Adaptor)						
Follower	Encoder Input 1						
	2 x Analog inputs, 2 x Analog outputs						
Onboard I/O	5 x Digital inputs, 2 x Bidirectional digital inputs or outputs						
	1 x Relay output						
Machine safety	2 x Safe Torque Off (STO) inputs						
Back-up power	24 V control back-up (using optional Al-Back-up Adaptor) Al-Smart Adaptor (Built-in memory for parameter cloning and 24 V backup)						
	Temperature controlled fan with standby (off)						
	User replaceable fan(s)						
Other	Conformal coating						
	Standby mode (energy saving)						
	User defined security levels (e.g. restricted access or read-only parameters via user defined security code)						

Operating mode RFC from cold RFC from 100 % Open loop from cold Normal duty overload with motor 110 % for 110 % for 110 % for 110 % for

rated current = drive rated current	165 s	9 s	165 s	9 s
Heavy duty overload with motor rated current = drive rated current (size 8 and below)	180 % for 3 s	180 % for 3 s	150 % for 60 s	150 % for 8 s
Heavy duty overload with motor rated current = drive rated current (size 9)	175 % for 42 s	175 % for 5 s	150 % for 60 s	150 % for 7 s



Frame	Size	1	2	3	4	5	6	7	8	9A	9E
Dimensions	mm	160 x 75 x 130	205 x 78 x 150	226 x 90 x 160	277 x 115 x 175	365 x 143 x 202	365 x 210 x 227	508 x 270 x 280	753 x 310 x 290	1049 x310x290	1010 x310x290
(H x W x D)	in	6.3 x 3.0 x 5.1	8.1 x 3.1 x 5.9	8.9 x 3.5 x 6.3	10.9 x 4.5 x 6.9	14.4 x 5.6 x 8	14.4 x 8.3 x 8.9	20 x 10.6 x 11.0	29.6 x 12.2 x 11.4	41.3 x12.2x11.4	39.7 x12.2x11.4
Weight	kg (lb)	0.75 (1.65)	1.0 (2.2)	1.5 (3.3)	3.13 (6.9)	7.4 (16.3)	14 (30.9)	28 (61.7)	50 (110.2)	66.5 (146.6)	46 (101.4)

Open loop from 100 %

110 % for

Notes:

From frame sizes 5 onwards dimensions do not include removable mounting brackets.

Additional distance should be added to the height dimension (H) when the following options are fitted:

- Al-Back-up Adaptor: 15 mm (0.59 in)
- AI-485 Adaptor: 26 mm (1.02 in)
- Al- Smart Adaptor: 15 mm (0.59 in)

CONTROL TECHNIQUES

Optional keypad

Description/Order code	Order code
Remote Keypad	8250000000001
CI-keypad	8250000000000
Remote keypad RTC	8240000019600

Optional accessories

Description/Order code	Order code
Al-Back-up Adaptor	8250000000004
AI-485 Adaptor	8250000000003
AI-Smart Adaptor	8250000018500
CI-485 Adaptor	8250000000002

Through hole kits

 $\rm IP65$ / UL TYPE 12 rating is achieved on the rear of the drive when through panel mounted using the following kits.

Frame size	Order code
5	3470-0067
6	3470-0055
7	3470-0079
8	3470-0083

 $\mathsf{IP55}/\mathsf{UL}$ TYPE 12 rating can be achieved for frame sizes 9A and 9E using the following kits:

Frame size	Order code	
9A	3470-0119	
9E	3470-0105	

UL Type 1 Conduit kit

Frame size	Order code
1	3470-0091
2	3470-0094
3	3470-0098
4	3470-0102
5	3470-0069
6	3470-0059
7	3470-0080
8 / 9A	3470-0088
9E	3470-0115

Retrofit mounting brackets

These mounting brackets ensure the drive can be mounted on existing Commander SK installations.

Frame size	Order code	
3	3470-0097	
4	3470-0101	
5	3470-0066	
6	3470-0074	
7	3470-0078	
8	3470-0087	
9A / 9E	3470-0118	

Line reactor

Frame size	Order code	
9E (200 V/400 V)	4401-0181	
9E (575 V/600 V)	4401-0183	

Finger-guard grommet

Frame size	Order code	
9A / 9E	3470-0107	

Lifting tool

Frame size	Order code	
9A	7778-0045	
9E	7778-0016	

Fan replacement kit

Frame size	Order code	
1	3470-0092	
2	3470-0095	
3	3470-0099	
4	3470-0103	

Optional external EMC filters

Unidrive M built-in EMC filter complies with EN/IEC 61800-3. External EMC filters are required for compliance with EN/IEC 61000-6-4 as per the table below.

Frame size	Voltage	Phases	Туре	Order code
	All	1	Standard	4200-1000
1	All	1	Low leakage	4200-1001
	100 V	1	Standard	4200-2000
		1	Standard	4200-2001
		1	Low leakage	4200-2002
2	200 V	3	Standard	4200-2003
		3	Low leakage	4200-2004
	400 V	3	Standard	4200-2005
	400 V	3	Low leakage	4200-2006
		1	Standard	4200-3000
	200 V	1	Low leakage	4200-3001
3	200 V	3	Standard	4200-3004
5		3	Low leakage	4200-3005
	400 V	3	Standard	4200-3008
	400 1	3	Low leakage	4200-3009
		1	Standard	4200-4000
	200 V	1	Low leakage	4200-4001
4	200 1	3	Standard	4200-4002
		3	Low leakage	4200-4003
	400 V	3	Standard	4200-4004
		3	Low leakage	4200-4005
	200 V	3	Standard	4200-0312
5	400 V	3	Standard	4200-0402
	575 V	3	Standard	4200-0122
	200 V	3	Standard	4200-2300
6	400 V	3	Standard	4200-4800
	575 V	3	Standard	4200-3690
7	200 V & 400 V	3	Standard	4200-1132
	575 V & 690 V	3	Standard	4200-0672
8	200 V & 400 V	3	Standard	4200-1972
	575 V & 690 V	3	Standard	4200-1662
9A	200 V & 400 V	3	Standard	4200-3021
	575 V & 690 V	3	Standard	4200-1660
9E	200 V & 400 V	3	Standard	4200-4460
	575 V & 690 V	3	Standard	4200-2210

For a full list of patents and patent applications, visit www.controltechniques.com/patents.



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Nidec Corporation is a global manufacturer of electric motors and drives. Founded in 1973, Nidec has worldwide operations and a workforce of more than 110.000 who develop, manufacture and install motors, drives and control systems in industrial plants, automobiles, home appliances, office equipment and information technology.



110,000 EMPLOYEES WORLDWIDE



\$11B GROUP TURNOVER



70+ COUNTRIES



CONTROL[™] TECHNIQUES

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5M+ INSTALLED DRIVES



1,000+ EMPLOYEES WORLDWIDE



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Based on open design architecture, our drives integrate with all primary communication protocols.

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Highly experienced, locally based Application Engineers design and support drive technology to provide maximum value, wherever you are in the world.

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