UNIDRIVE M600

NEW

Manufacturing Automation drive

High performance drive for induction and sensorless permanent magnet motors

FROST & SULLIVAN
2013 BEST PRACTICES AWARD
EUROPEAN ELECTRIC DRIVES FOR MANUFACTURING AUTOMATION PRODUCT LINE STRATEGY AWARD

- Unidrive M100
- Unidrive M200
- Unidrive M300
- Unidrive M400
- **Unidrive M600**
- Unidrive M700
- Unidrive M800

0.75 kW – 1.2 MW Heavy Duty
(1.0 hp – 1600 hp)
200 V | 400 V | 575 V | 690 V

CONTROL TECHNIQUES

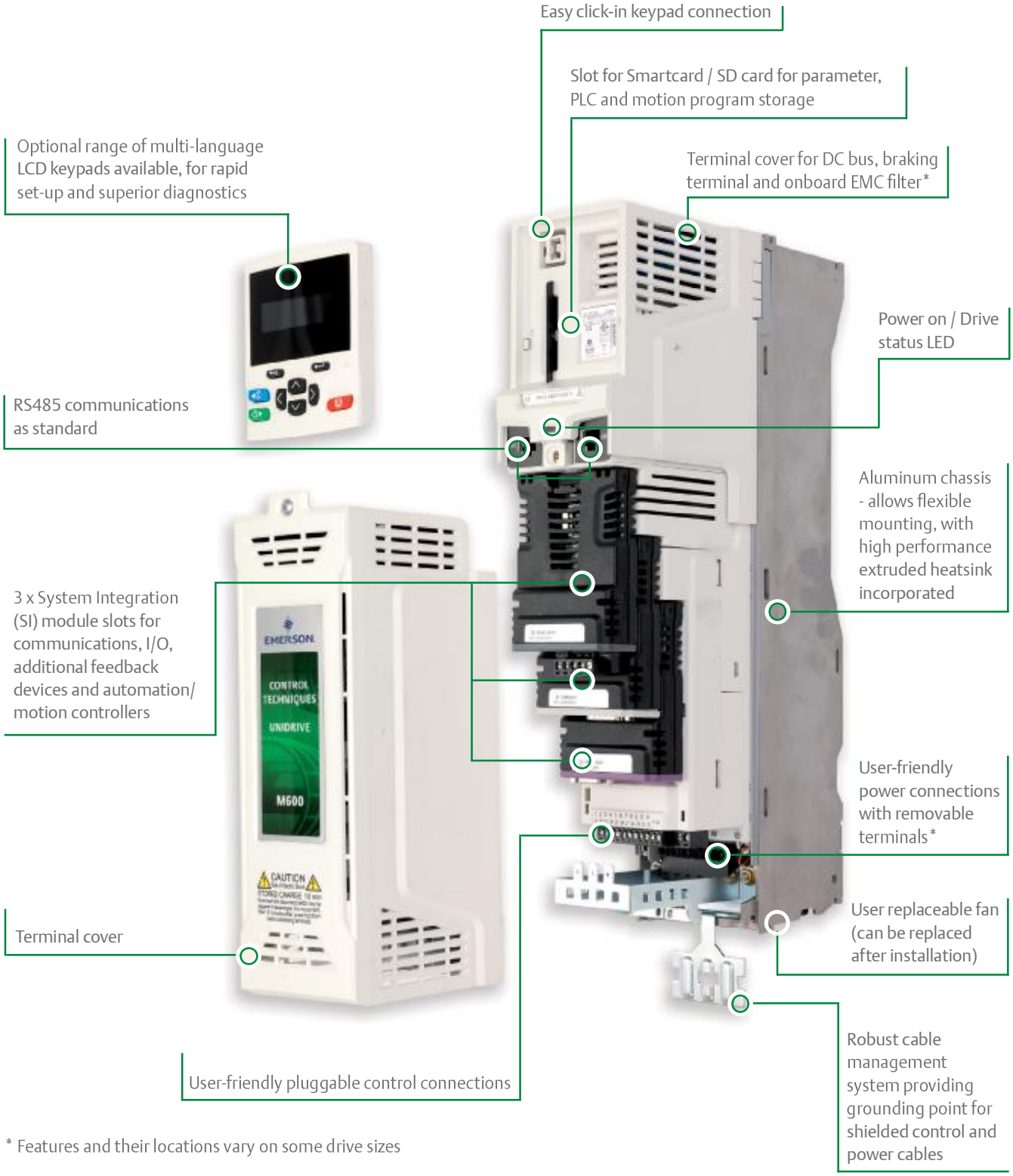
EMERSON
Industrial Automation

Unidrive M – The Manufacturing Automation drive family tailored to customer needs

Led by the results of extensive customer-driven market research, we have tailored seven Unidrive M feature-sets to specific application needs identified within Manufacturing Automation. The Unidrive M600 adds enhanced motor control, a higher performance onboard PLC with CODESYS programming and greater system expansion capability to the range.

For more information on the full Unidrive M family, please download the Unidrive M Overview brochure or the 'Discover Unidrive M' App (available on the App Store, Android and online) via www.UnidriveM.com.

Unidrive M600 features



* Features and their locations vary on some drive sizes

Unidrive M600 AC drive

High performance drive for induction and sensorless permanent magnet motors

M600 delivers increased machine performance with sensorless induction and sensorless permanent magnet motor control, for dynamic and efficient machine operation. An optional encoder port can be used for precise closed loop velocity applications and digital lock/frequency following. Additional I/O, global fieldbus communications and encoder feedback options maximize system connectivity and flexibility.

Unidrive M600 Highlights

Maximize productivity with high performance control with all AC motors

Unidrive M600's advanced RFC control algorithm gives maximum stability and control, especially with high power motors. It provides a high bandwidth motor control algorithm with 62.5 µs current loop update rates and 200% motor overload for heavy industrial machinery applications.

Highly efficient permanent magnet motors from Leroy Somer

Flexible integration with automation systems

Unidrive M600 allows up to three optional System Integration modules to be fitted within the drive footprint. This additional speed feedback, I/O and fieldbus communications maximizes flexibility whilst minimizing cabinet space. The SI-Encoder option provides Closed loop Rotor Flux Control for induction motors (RFC-A) on the M600.

Enhanced open onboard PLC

Unidrive M600 provides an onboard PLC with a real-time task that can be used for basic logic control, speed following and digital lock to enhance drive application capability. Using open CODESYS leading technology for Machine Control programming, Unidrive M600 is easily accessible to machine builders worldwide.

CODESYS

Reduce machine size and cost

Unidrive M600's compact drive dimensions are among the smallest in class at every power rating. Packed full of onboard features, such as programmable automation for simple applications, RS485 communications and 1 x Safe Torque Off terminal for compliance with SIL3, Unidrive M600 provides a powerful economical solution, eliminating the need for many external components.

Easy to access machine control features

Software tools, keypads and memory storage devices provide easy and fast access to Unidrive M's machine control features for configuration, monitoring and diagnostics.

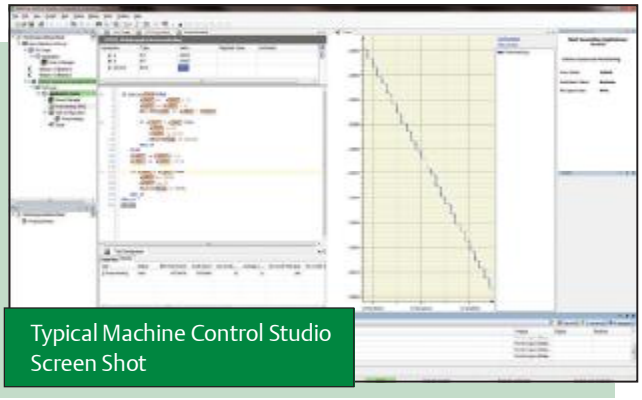
Typical applications:

Speed control with high starting torque for extruders, slitters, material transport, compressors, manufacturing cranes, hydraulic replacement, ratio control, gearing, winding (coilers), web handling, metal cutting.

Machine Control Studio Software - Powered by CODESYS

Control Techniques Machine Control Studio provides a flexible and intuitive environment for programming Unidrive M's new automation and motion control features. This new software offers programming for the Unidrive M600's onboard PLC.

Machine Control Studio is powered by CODESYS, the leading open software for programmable machine control. The programming environment is fully IEC 61131-3 compliant, meaning that it is familiar and therefore fast and easy to use for control engineers around the world.



Typical Machine Control Studio Screen Shot

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 programming, speeding up software development. Programmers have access to a vibrant open-source community for function blocks. Control Techniques also provides support for customers' own function block libraries, with on-line monitoring of program variables with user defined watch windows and help for on-line change of program, in line with current PLC practice.

Power System Flexibility

Unidrive M's power stage enhances flexibility and energy efficiency

- Easy common DC bus configuration enables braking energy to be recycled within the drive system, reducing energy usage and eliminating external supply components. This economic method also provides a minimum footprint for a multiple drives solution.
- Unidrive M can run with a wide operating DC voltage input, from 24 V up to maximum volts, providing optimum choice of auxiliary power supply for back-up purposes.
- Low losses, up to 98% efficient.
- Low power standby mode. In some applications, drives can sit idle for significant periods; M600's reduced standby power saves energy.
- M600 supports sensorless (open loop) control of compact high efficiency permanent magnet motors.
- Active Front End to return braking energy to the power supply and minimize harmonic distortion.

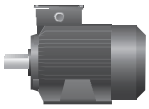
Common DC bus configuration enables braking energy to be recycled within the drive system

Motor control options available include:

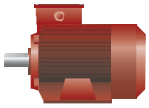
Control Mode	Control Strategy	Features
Open loop vector or V/Hz induction motor control	Frequency Speed	Open loop motor control for induction motors, providing the easiest configuration. V/Hz can be used in multi-motor systems.
Enhanced open loop Rotor Flux Control for induction motors (RFC-A)	Speed Torque	Vector algorithm utilizing closed loop current control to greatly enhance performance for all induction motor sizes.
New open loop permanent magnet motor control (RFC-S)	Speed Torque Position	Open loop motor control for permanent magnet motors utilizing closed loop current control. This mode offers good dynamic performance and enables more compact and higher efficiency motor technologies to be used. This mode also supports simple positioning without the need for encoder position feedback .
Optional enhanced closed loop Rotor Flux Control for induction motors (RFC-A) when SI-Encoder fitted	Speed Torque Position	Dynamic speed or position control of induction motors, supporting a wide range of feedback devices.
Enhanced Active Front End (AFE) Power Quality Convertor	Regenerative	Active Front End (AFE) to return excess braking energy back onto the power line, reducing energy costs instead of dissipating this energy as heat. The AFE provides power factor control for power quality management and greatly reduces unwanted power harmonics.

Control Mode

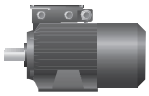
1. Open loop vector or V/Hz induction motor control
2. Open loop Rotor Flux Control for induction motors (RFC-A)



Open loop permanent magnet motor control (RFC-S)



Closed loop Rotor Flux Control for induction motors (RFC-A) when SI-Encoder fitted



Active Front End (AFE) power quality converter

Optional Drive Programming and Operator Interface

Unidrive M Connect

KI-Keypad

KI-Keypad RTC

Remote Keypad

Operator Interface

Smartcard

SD Card using SD-Smartcard Adaptor

Input/Output

SI-I/O

4 x Digital I/O
3 x Analog input (default) / Digital input
1 x Analog output (default) / Digital input
2 x Relay

Standard

5 x Analog I/O8 x Digital I/O (including 2 x high speed I/O [250 µs])
1 x Relay output
1 x STO

Applications with PLC Functionality

Standard

Easy to use onboard PLC using industry standard CODESYS programming environment

CODESYS

Communications

Standard

RS485

SI-EtherCAT*

SI-PROFIBUS

SI-Ethernet

SI-DeviceNet

SI-CANopen

SI-PROFINET

Feedback

SI-Encoder

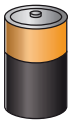
Safety

SI-Safety*

DC back up power supply

24 - 1067 Vdc power

24 Vdc control



*Future availability.

Typical roller table application

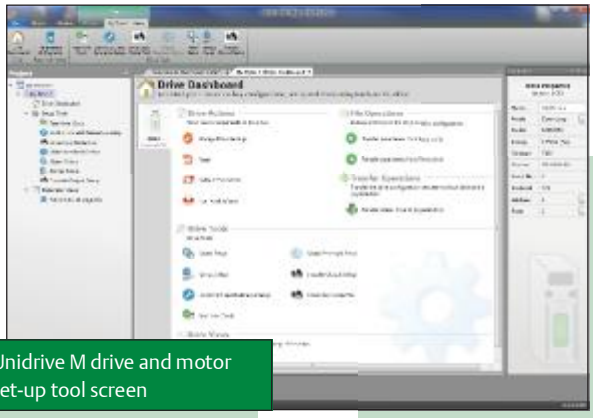
Fast and Easy access for Commissioning, Monitoring and Diagnostics

Unidrive M keypads, memory devices and software tools make it easy to access Unidrive M600's full feature set, allowing users to optimize drive tuning, back-up the configuration set and troubleshoot more quickly.

User interface options

Unidrive M benefits from a number of optional keypad choices to meet your application needs.

Type		Benefit
KI-Keypad: Removable plain text LCD keypad		Plain text, multi-language LCD keypad for in depth parameter and data descriptions for an enhanced user experience. Can also be used for mounting on the side of the drive, using the appropriate tile mounting kit.
KI-Keypad RTC: Removable plain text LCD with real-time clock		All the features of the KI-Keypad, but with battery operated real-time clock, allowing accurate time stamping of diagnostics and aiding quick resolution.
Remote Keypad		Remote mountable, plain text, multi-language LCD keypad allows flexible mounting on the outside of a panel and meets IP66 (NEMA 4).



Unidrive M drive and motor set-up tool screen

Unidrive M Connect commissioning tool

Based on Control Techniques' 25 years experience, Unidrive M Connect is our latest drive configuration tool 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:

- Fast task based commissioning and easy maintenance of the Unidrive M family is simplified via familiar Windows interface
- Intuitive graphical tools enhance and simplify user experience
- For experienced users, dynamic drive logic diagrams and enhanced searchable listings are present
- Drive and motor performance can be optimized with minimal specialized drive knowledge
- Tool is scalable to match application requirements
- Supports the import of Unidrive SP parameter files and allows full drive cloning (i.e. parameter sets and application program)
- Multiple simultaneous communications channels for a more complete overview of the system
- Drive discovery gives the ability to find drives on a network automatically without the user having to specify their addresses
- Automatic RTU baud rate scanning on the M600 485 connection

Unidrive M's portable memory devices

Smartcard

The optional Smartcard memory device can be used to back-up parameter sets and basic PLC programs, as well as copying them from one drive to another. It also allows:

- Simplified drive maintenance and commissioning
- Quick set-up for sequential build of machines
- Machine upgrades to be stored on a Smartcard and sent to the customer for installation

SD card

Unidrive M600 uses popular SD cards for quick and easy parameter and program storage using an adaptor, allowing them to fit in the drive Smartcard slot. SD cards provide a huge memory capability allowing a complete system reload if required, and can be easily pre-programmed on a common PC.

Performance motor control

Control Techniques' unique motor control algorithms combined with the latest microprocessor technology ensure that Unidrive M600 offers the high stability and bandwidth for many industrial motor types. This enables you to maximize machine throughput and efficiency in every application using open loop permanent magnet and AC induction motors.

Unidrive M600 feature and specification table

Performance	Current loop update: 62 µs
	Heavy Duty peak rating: 200 % (3s)
	Maximum output frequency: 550 Hz
	Switching frequency range: 2, 3, 4, 6, 8, 12, 16 kHz (3 kHz default)
Onboard intelligence	Programmable Logic Control (PLC)
	Real-time tasks
	Digital lock control
Onboard comms	RS485
Mechanical attributes	Tile mounting on sizes 3, 4, 5
	Common DC bus connections on sizes 3, 4, 5, 6
Parameter back-up	Serial port cloning
	SD card (using SD-Smartcard adaptor)
	Smartcard reader support
Feedback	Optional SI-Encoder
Onboard I/O	3 x Analog input, 2 x Analog output
	4 x Digital input, 1 x Digital output, 3 x Bidirectional digital input or output
	1 x Relay output
Machine safety	1 x Safe Torque Off (STO) terminal
Power and motor control	Stationary autotune for permanent magnet motors
	Wide operating range back-up DC supply
	24 V control back-up
Other	Temperature controlled fan operation with user adjustable speed limit
	User replaceable fan(s)
	Conformal coating
	Standby mode (energy saving)

Unidrive M600 ratings and specifications

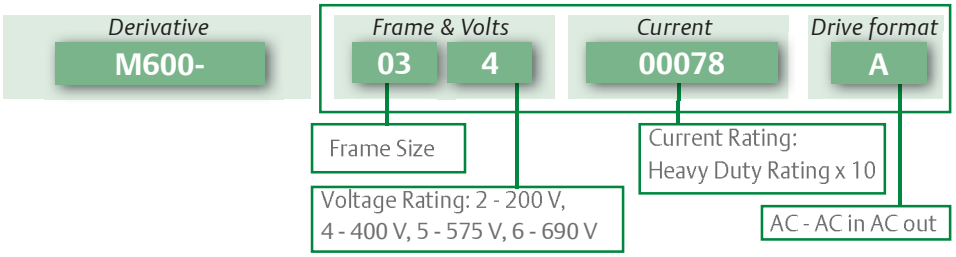
200/240 Vac ±10%						
Drive	Heavy Duty			Normal Duty		
	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)
M600-032 00050 A	5	0.75	1	6.6	1.1	1.5
M600-032 00066 A	6.6	1.1	1.5	8	1.5	2
M600-032 00080 A	8	1.5	2	11	2.2	3
M600-032 00106 A	10.6	2.2	3	12.7	3	3
M600-042 00137 A	13.7	3	3	18	4	5
M600-042 00185 A	18.5	4	5	24	5.5	7.5
M600-052 00250 A	25	5.5	7.5	30	7.5	10
M600-062 00330 A	33	7.5	10	50	11	15
M600-062 00440 A	44	11	15	58	15	20
M600-072 00610 A	61	15	20	75	18.5	25
M600-072 00750 A	75	18.5	25	94	22	30
M600-072 00830 A	83	22	30	117	30	40
M600-082 01160 A	116	30	40	149	37	50
M600-082 01320 A	132	37	50	180	45	60
M600-092 01760 A	176	45	60	216	55	75
M600-092 02190 A	219	55	75	266	75	100
M600-102 01760 A	176	45	60	216	55	75
M600-102 02190 A	219	55	75	266	75	100
M600-102 02830 A	283	75	100	325	90	125
M600-102 03000 A	300	90	125	360	110	150

380/480 Vac ±10%						
Drive	Heavy Duty			Normal Duty		
	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)
M600-034 00025 A	2.5	0.75	1	3.4	1.1	1.5
M600-034 00031 A	3.1	1.1	1.5	4.5	1.5	2
M600-034 00045 A	4.5	1.5	2	6.2	2.2	3
M600-034 00062 A	6.2	2.2	3	7.7	3	5
M600-034 00078 A	7.8	3	5	10.4	4	5
M600-034 00100 A	10	4	5	12.3	5.5	7.5
M600-044 00150 A	15	5.5	10	18.5	7.5	10
M600-044 00172 A	17.2	7.5	10	24	11	15
M600-054 00270 A	27	11	20	30	15	20
M600-054 00300 A	30	15	20	30	15	20
M600-064 00350 A	35	15	25	38	18.5	25
M600-064 00420 A	42	18.5	30	48	22	30
M600-064 00470 A	47	22	30	63	30	40
M600-074 00660 A	66	30	50	79	37	50
M600-074 00770 A	77	37	60	94	45	60
M600-074 01000 A	100	45	75	112	55	75
M600-084 01340 A	134	55	100	155	75	100
M600-084 01570 A	157	75	125	184	90	125
M600-094 02000 A	200	90	150	221	110	150
M600-094 02240 A	224	110	150	266	132	200
M600-104 02000 A	200	90	150	221	110	150
M600-104 02240 A	224	110	150	266	132	200
M600-104 02700 A	270	132	200	320	160	250
M600-104 03200 A	320	160	250	361	200	300
M600-114 03770 A	377	185	300	437	225	300
M600-114 04170 A	417	200	300	487	250	400
M600-114 04800 A	480	250	400	585	315	450

500/575 Vac ±10%						
Drive	Heavy Duty			Normal Duty		
	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)
M600-055 00030 A	3	1.5	2	3.9	2.2	3
M600-055 00040 A	4	2.2	3	6.1	4	5
M600-055 00069 A	6.9	4	5	10	5.5	7.5
M600-065 00100 A	10	5.5	7.5	12	7.5	10
M600-065 00150 A	15	7.5	10	17	11	15
M600-065 00190 A	19	11	15	22	15	20
M600-065 00230 A	23	15	20	27	18.5	25
M600-065 00290 A	29	18.5	25	34	22	30
M600-065 00350 A	35	22	30	43	30	40
M600-075 00440 A	44	30	40	53	45	50
M600-075 00550 A	55	37	50	73	55	60
M600-085 00630 A	63	45	60	86	75	75
M600-085 00860 A	86	55	75	108	90	100
M600-095 01040 A	104	75	100	125	110	125
M600-095 01310 A	131	90	125	150	110	150
M600-105 01040 A	104	75	100	125	110	125
M600-105 01310 A	131	90	125	150	110	150
M600-105 01520 A	152	110	150	200	130	200
M600-105 01900 A	190	132	200	200	150	200
M600-115 02000 A	200	150	200	248	175	250
M600-115 02540 A	254	185	250	288	225	300
M600-115 03020 A	302	225	300	339	250	350

500/690 Vac ±10%						
Drive	Heavy Duty			Normal Duty		
	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)	Max Continuous Current (A)	Motor Shaft Power (kW)	Motor Shaft Power (HP)
M600-076 00190 A	19	15	20	23	18.5	25
M600-076 00240 A	24	18.5	25	30	22	30
M600-076 00290 A	29	22	30	36	30	40
M600-076 00380 A	38	30	40	46	37	50
M600-076 00440 A	44	37	50	52	45	60
M600-076 00540 A	54	45	60	73	55	75
M600-086 00630 A	63	55	75	86	75	100
M600-086 00860 A	86	75	100	108	90	125
M600-096 01040 A	104	90	125	125	110	150
M600-096 01310 A	131	110	150	150	132	175
M600-106 01040 A	104	90	125	125	110	150
M600-106 01310 A	131	110	150	155	132	175
M600-106 01500 A	150	132	175	172	160	200
M600-106 01780 A	178	160	200	197	185	250
M600-116 02100 A	210	185	250	225	200	250
M600-116 02380 A	238	200	250	275	250	300
M600-116 02770 A	277	250	300	325	315	400

Key:



Information on higher powers will appear in subsequent issues of this brochure.
See overleaf for Normal Duty and Heavy Duty definitions.

Unidrive M600 ratings and specifications

Heavy Duty

Suitable for demanding applications, current overload of 200% is available for dynamic loads.

Normal Duty

Suitable for most applications, with a current overload capacity of 110%.

Environmental safety and electrical conformance

- IP20 / NEMA1 / UL TYPE 1*
  *UL open class as standard, additional UL Type 1 conduit kit needed to achieve Type 1
- IP65 / NEMA4 / UL TYPE 12 rating is achieved on the rear of the drive whenthe Through hole IP65 kit is used
- Ambient temperature -20 °C to 40 °C as standard. Up to 55 °C with derating
- Humidity 95 % maximum (non-condensing) at 40 °C
- Altitude: 0 to 3000m, derate 1 % per 100 m between 1000 m and 3000 m
- Random Vibration: Tested in accordance with IEC 60068-2-64
- Mechanical Shock Tested in accordance with IEC 60068-2-29
- Storage temperature -40 °C to 70 °C
- Electromagnetic Immunity complies with EN 61800-3 and EN 61000-6-2
- With onboard EMC filter, complies with EN 61800-3 (2nd environment)
- EN 61000-6-3 and EN 61000-6-4 with optional footprint EMC filter
- IEC 60146-1-1 Supply conditions
- IEC 61800-5-1 (Electrical Safety)
- IEC 61131-2 I/O
- Safe Torque Off, independently assessed by TÜV to IEC 61800-5-2 SIL 3 and EN ISO 13849-1 PL
- UL 508C (Electrical Safety)

Optional media and accessories

Description	Order code
SD-Smartcard Adaptor	
Smartcard (64 kB)	2214-0010

Internal brake resistor

Frame size	Order code
3	1220-2752
4 & 5	1299-0003

DC bus paralleling kit

Frame size	Order code
3	3470-0048
4	3470-0061
5	3470-0068
6	3470-0063

Through hole IP65 kit

Frame size	Order code
3	3470-0053
4	3470-0056
5	3470-0067
6	3470-0055
7	3470-0079
8	3470-0083

Dimensions and Weight

Frame Size		3	4	5	6	7	
Dimensions (H x W x D)	mm	379 x 83 x 200	379 x 123.5 x 200	379x 141x 200	379 x 210 x 227	548 x 270 x 280	
	in	14.9 x 3.3 x 7.9	14.9 x 4.9 x 7.9	14.9 x 5.6 x 7.9	14.9 x 8.3 x 8.9	21.6 x 10.6 x 11.0	
Weight	kg (lb)	4.5 (9.9)	6.5 (14.3)	7.4 (16.3)	14 (30.9)	45 (99.2)	

Tile mount kit

Frame size	Order code
3	3470-0049
4	3470-0060
5	3470-0073

UL Type 1 Conduit kit

Frame size	Order code
3 & 4	6521-0071
5	3470-0069
6	3470-0059
7	3470-0080
8	3470-0088

Retrofit brackets

To allow Unidrive M drives to be fitted in existing Unidrive SP surface mount installations.

Frame size	Order code
4	3470-0062
5	3470-0066
6	3470-0074
7	3470-0078
8	3470-0087

Cable grommet kit

Frame size	Order code
7	3470-0086
8 - Single cable	3470-0089
8 - Dual cable	3470-0090

General kit items

Item	Order code
Keypad blanking cover (10 pieces in pack)	3470-0058
Frame size 3 & 4 power connector split kit	3470-0064
Frame 3 through hole multi-axis kit **	3470-0065

** To allow multiple drives to be through hole mounted with no space between them.

Optional external EMC filters

Unidrive M built-in EMC filter complies with EN 61800-3. External EMC filters are required for compliance with EN 61000-6-4.

Frame size	Voltage	Order code
3	200 V	4200-3230
	400 V	4200-3480
4	200 V	4200-0272
	400 V	4200-0252
5	200 V	4200-0312
	400 V	4200-0402
	575 V	4200-0122
6	200 V	4200-2300
	400 V	4200-4800
	575 V	4200-3690
7	200 V & 400 V	4200-6406
	575 V	4200-6408

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





	8	9*	10	10	11*	11*
	785 x 310 x 290	940 x 310 x 290	1054 x 310 x 290	Rectifier 400 x 310 x 290	1410 x 310 x 310	Rectifier 570 x 310 x 310
				Inverter 730 x 310 x 290		Inverter 880 x 310 x 310
	30.9 x 12.2 x 11.4	37.0 x 12.2 x 11.4	41.5 x 12.2 x 11.4	Rectifier 15.8 x 12.2 x 11.4	55.5 x 12.2 x 12.2	Rectifier 22.4 x 12.2 x 12.2
				Inverter 28.7 x 12.2 x 11.4		Inverter 34.7 x 12.2 x 12.2
	50 (110.2)					

*Future availability.

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