

M-Flex™ – Enclosed drives

The M-Flex™ enclosed drive controller features the Advantage 61 adjustable frequency power converters to provide a robust, packaged adjustable-speed solution for commercial, industrial and municipal process applications where high functionality of features are required. M-Flex™ enclosed drive controllers offer a platform of standard, engineered and special features to meet the most demanding application and specification requirements.



Features & Benefits

Designed for maximum flexibility to meet the most demanding applications

Variable torque

(Light-duty ratings, 110% current limit)

- Advantage 61 power converter
- 1 hp to 500 hp, 460 V
- 1 hp to 50 hp, 208 V/230 V

M-Flex™ enclosed drive controllers are available in Type 1 general purpose or Type 12/12K drip-/dust-proof enclosures in integrated or barriered designs.

Integrated enclosures can be wall or floor mounted, depending on size. They provide a circuit breaker disconnect and enough room for power peripherals, including isolation and bypass contactors, all within the same enclosure.

Barriered enclosures separate power and control circuits, such as bypass, from drive control. The separate compartments allow for maximum flexibility if servicing a drive in bypass operation.



Integrated enclosure



Barriered construction



Advantage 61 power converter

Featuring the Advantage 61 power converter platform

High and optimized power converter performance

Provides evolutionary performance to meet even the most demanding applications. The M-Flex™ power converters are optimized for motor control applications. They are reliable, expandable and easy to control.



Expandable network cards

Intuitive graphic display terminal

Offers end use simplicity in plain text with diagnostics capability and ease of programming that is illustrated, precise and clear even from 16 feet away.



Intuitive graphic display terminal

Expandable connectivity to network protocols

Features connectivity capabilities to:

- Building automation – BACnet, LonWorks®, MetaSYS N2, APOGEE® P1
- Industrial – DeviceNet, Ethernet TCP/IP, FIPIO, Interbus S, Modbus® Plus, Modbus/Uni-Telway™, Profibus® DP

Key benefits

- Custom performance – customized to provide optimal performance to meet specific industrial, municipal and high-end commercial application requirements.
- Ease of use – features easy-to-use graphic terminal display and operators mounted on enclosure doors, which are pre-programmed by the factory to save set-up time and money when commissioning.
- Simple installation – available with either pre-punched conduit knock-outs or top and bottom removable conduit plates to save time and prevent metal filings inside enclosure during installation.
- Structural integrity – UL 508C listed to exceed minimum UL short circuit requirements and enhance personnel safety under short circuit conditions for both drive and bypass mode.
- Increased functionality – offered with both integral and barriered enclosures for flexibility in meeting specific application needs. A circuit breaker disconnect provides coordinated short circuit rating at 100,000 A.
- Reliable operation – fully-rated (AC3 duty) motor isolation and bypass contactors with electrical and mechanical and electrical interlocks prevent accidental voltage feedback. An integrated AC line reactor provides transient protection from surge and over voltage conditions while minimizing line harmonics.

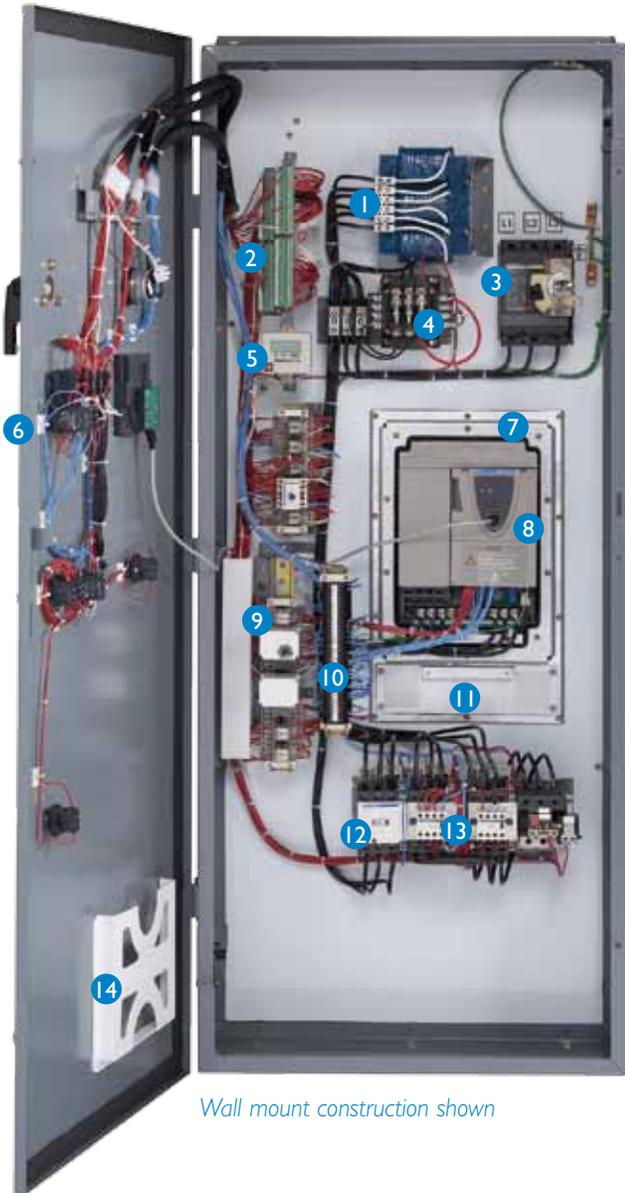
Seismic qualification for new generation of building codes

First Drive manufacturer to meet this criteria!

All M-Flex™ enclosed drive controllers meet IBC and ASCE 7 seismic qualification requirements in accordance with the ICC ES ACI 56 shaker table testing protocol. Many states and jurisdictions are beginning enforcement of the seismic guidelines for installed equipment contained in the IBC. The M-Flex™ enclosed drive controllers were subjected to actual shaker table tests, not just theoretical calculations for seismic ratings or obsolete requirements of the UBC. The M-Flex™ enclosed drive controller meets the structural integrity when installed to our published guidelines, and can be specified for use in applications that require an $I_p = 1.5$, which means operational status can be restored subsequent to a seismic event.

Specifications

A platform designed to meet your specifications



Wall mount construction shown

- 1 3% AC line reactor
- 2 Customer interface terminal blocks (TB1)
- 3 Circuit breaker disconnect
- 4 120 VAC control transformer
- 5 3-15 PSI input (if used)
- 6 22 mm dedicated door mounted operators
- 7 Heatsink/flange assembly
- 8 Advantage 61 power converter
- 9 Control relay/logic rail
- 10 Customer interface terminal blocks (TB2)
- 11 Fan assembly with front access (for maintenance and replacement)
- 12 Line contactor (if used)
- 13 Isolation and bypass contactors (if used)
- 14 Document pocket

Construction methodology

- Assembled in the U.S.
- 100,000 A symmetrical SCCR
- ANSI #49 powder-coat steel enclosures
- Dedicated plenum for air flow
- White back panels for improved visibility
- Seismic qualification

Components used

- Advantage 61 drives
- Powerpact® H and J-Frame circuit breakers
- AC line reactor – 3% standard (5% optional)
- XB5 22 mm push buttons and operators
- TeSys™ D-Line contactors
- Type R industrial control relays
- PowerLogic® power circuit monitors

Specifications

Input voltage	460 V \pm 10%, 230 V \pm 10%, 208 V \pm 10%
Displacement power factor	98% through speed range
Input frequency	60 Hz \pm 5%
Output voltage	Three-phase output Maximum voltage equal to input voltage
Galvanic isolation	Galvanic isolation between power and control (input, output, and power supplies)
Frequency range of power converter	0.1 Hz to 500 Hz (factory setting of 60 Hz)
Torque/overtorque	VT: 110% of nominal motor torque for 60 s CT: 150% of nominal motor torque for 60 s
Current (transient)	VT: 110% of controller rated current for 60 s CT: 150% of controller rated current for 60 s
Switching frequency	Selectable from 0.5 kHz to 16 kHz [1] Factory setting: VT: 8 kHz for 208 V, 203 V, and 1 hp to 100 hp @ 460 V 2 kHz for 125 hp to 500 hp @ 460 V CT: 4 kHz (2 kHz for 100 hp to 450 hp @ 460 V) The drive reduces the switching frequency automatically in the event of excessive heatsink temperature
Speed reference	AI1: 0 V to +10 V, Impedance = 30 k Ω . Can be used for speed potentiometer, 1 k Ω to 10 k Ω AI2: Factory setting: 4 mA to 20 mA. Impedance = 242 Ω (reassignable, x-y range with graphic display terminal). Factory modification J10 allows 0 Vdc to 10 Vdc reference signal to AI2, Z = 30 k Ω
Frequency resolution in analog reference	0.1 for 100 Hz (11 bits)
Speed regulation	V/f control: equal to the motor's rated slip SFVC: 10% of the motor's rate slip from 20% to 100% of nominal motor torque
Efficiency	97% at full load typical
Reference sample time	2 ms \pm 0.5 ms
Acceleration and deceleration ramps	0.1 s to 999.9 s (definition in 0.1 s increments)
Drive controller protection	<ul style="list-style-type: none"> • Thermal protection of power converter • Phase loss of AC mains • Circuit breaker rated at 100 kAIC • Conforming to ANSI/IEEE C62.41 Category A and B
Motor protection	Class 10 electronic overload protection Class 20 electromechanical overload protection with bypass [2]
Graphic display terminal	8 lines, 240 pixels by 160 pixels. Supports display of bar charts. Save and download up to 4 configuration files. Display is rated up to 140° F (60°C) maximum operating temperature with IP54 protection.
Temperature	Storage for all enclosures: -13° F to +149° F (-25° C to +65° C). Operation: +14° F to +104° F (-10° C to 40° C). For 1 hp to 100 hp drives (208 V, 230 V & 460 V) operating between 40° C and 50° C, derate the current 2% per °C above 40° C. For 125 hp to 500 hp (460 V) operating between 40° C and 50° C, derate the current 3.3% per °C above 40° C.
Humidity	95% with no condensation or dripping water, conforming to IEC60068-2-78
Altitude	3,300 ft (1000 m) maximum without derating Derating of the current by 1% for each additional 330 ft (100 m)
Enclosure	Type 1: all controllers Type 1G: 125 hp to 500 hp VT or 100 hp to 450 hp CT @ 460 V only Type 12/12K: all except 125 hp to 500 hp VT and 100 hp to 450 hp CT @ 460 V
Pollution degree	Type 1, 1G: Pollution degree 2 per NEMA ICS-1 Annex A and IEC 60664-1 Type 12/12K: Pollution degree 3 per NEMA ICS-1 and IEC 60664-1
Operational test vibration	Conforming to IEC 60721-3-3-3M3 amplitude 1.5 mm peak to peak from 3 Hz to 13 Hz 1 g from 13 Hz to 200 Hz
Transit test to shock	Conforming to National Safe Transit Association and International Safe Transit Association test for packages
Operational shock	15 g, 11 ms
Seismic qualification	IBC, ASCE 7 ICC ES AC 156 shaker table acceptance protocol, ground and roof top applications with an importance factor of 1.5
Codes and standards	UL listed per UL 508C under category NMMS (Power Conversion Equipment) Conforms to applicable NEMA ICS, NFPA, and IEC standards Manufactured under ISO 9001 standards Factory modification G10 provides Canadian cUL certification

[1] On 1 hp to 75 hp CT and 1 hp to 100 hp VT controllers, above 4 kHz CT/8 kHz VT, select the next largest size drive controller. If the duty cycle does not exceed 60% (36 s maximum for a 60 s cycle), this is not necessary.

[2] Class 10 electromechanical for 1 hp @ 460 V.

Selection Guide

The controller catalog number, located on the inside of the door, is coded to describe the configuration and options present. Use the following illustration to translate the catalog number into a description of the controller.



Class

- 1 Combination device**
8839 = Circuit breaker disconnect

Type

- 2 Design**
MFD M-Flex™ controller

- 3 Horsepower rating**
- | | | |
|---------|---------|---------|
| C = 1 | L = 25 | U = 150 |
| D = 2 | M = 30 | W = 200 |
| E = 3 | N = 40 | X = 250 |
| F = 5 | P = 50 | Y = 300 |
| G = 7.5 | Q = 60 | Z = 350 |
| H = 10 | R = 75 | 4 = 400 |
| J = 15 | S = 100 | 5 = 450 |
| K = 20 | T = 125 | 6 = 500 |

- 4 Enclosure environmental rating**
- G = Type 1 general purpose
 - A = Type 12/12K dust/drip proof
 - B = Type 1 with gasket/fan filter

- 5 Voltage code**
- 2 = 208 V, 60 Hz
 - 3 = 230 V/240 V, 60 Hz
 - 4 = 460 V/480 V, 60 Hz

- 6 Application type**
- V = Variable torque (110% current limit)

- 7 Power circuit type**
- R = Barrired bypass – RVAT
 - S = Barrired bypass – soft start
 - T = Isolation & transfer
 - W = Combination device (drive only)
 - Y = Integrated bypass (IEC)
 - Z = Barrired bypass – full voltage

Mods

- 8 Modifications**
(120+ options are available)
- A07 = Hand-Off-Auto selector switch with manual speed potentionmeter
 - H10 = Seismic qualified
 - E301 = ANSI #61 enclosure paint
 - SPL = Special features (specified)

Series

- 9 Series designation**
- A = Advantage 61 power converter platform

Dimensions & Weights

M-Flex™ Enclosed AC Drives Class 8839 Type MFD with or without options			Dimensions			Weights	Construction Data			
HP/Voltage (VT)	Power Circuit Configuration	Enclosure Size	Height (in)	Width (in)	Depth (in)	Lbs.	Wall or Floor Mount	Environment	Operating Handle	
1 hp to 25 hp @ 460 V 1 hp to 5 hp @ 208 V/230 V	Power circuit W combination device or power circuit Y integrated bypass	C	49.00	20	14.81	175	Wall	Type 1 or Type 12/12K	3" metal rotary	
7.5 hp to 10 hp @ 208 V/230 V		D	63.00	25	14.81	243	Wall			
30 hp to 50 hp @ 460 V 15 hp to 25 hp @ 208 V/230 V		E	93.87	20	20.38	170.5	Floor		Type 1 or Type 1A filtered	6" metal rotary
60 hp to 100 hp @ 460 V 30 hp to 50 hp @ 208 V/230 V		F	93.87	25	20.38	249.1				3" metal rotary
1 hp to 25 hp @ 460 V 1 hp to 10 hp @ 208 V/230 V	Barriered C/D	93.87	20	20.38	379	6" metal rotary				
30 hp to 50 hp @ 460 V 15 hp to 25 hp @ 208 V/230 V	Power circuits Z, S, T or R barriered designs with 2 disconnects	Barriered E	93.87	25	20.38	512	Floor	Type 1 or Type 1A filtered	6" metal rotary	
60 hp to 100 hp @ 460 V 30 hp to 50 hp @ 208 V/230 V		Barriered F	93.87	30	20.38	684			Flange	
125 hp @ 460 V		Power circuit W ¹	H	94.58	25	20			489	Type 1 or Type 1A filtered
150 hp to 250 hp @ 460 V	Power circuit W ^{2,3}	I	94.58	30	20	657				
300 hp to 500 hp @ 460 V	Power circuit W ^{4,5}	J	94.58	35	20	969				

Notes:

- ¹ Integrated bypass for 125 hp offered in 20 in. wide section adder (45 in. total width). Barriered bypass offered in 25 in. wide section adder (50 in. total width) — standard product configuration
- ² Integrated bypass for 150 hp to 200 hp offered in 20 in. wide section adder (50 in. total width). Barriered bypass offered in 25 in. wide section adder (55 in. total width) — standard product configuration
- ³ Integrated bypass for 250 hp offered in 20 in. wide section adder (50 in. total width). Barriered bypass offered in 30 in. wide section adder (60 in. total width) — factory engineered configuration
- ⁴ Integrated bypass for 300 hp to 400 hp not available. Barriered bypass offered in 30 in. wide section adder (65 in. total width) – factory engineered configuration
- ⁵ Integrated bypass for 450 hp to 500 hp not available. Barriered bypass offered in 35 in. wide section adder (70 in. total width) – factory engineered configuration

Power Circuit – Description

- R – Barriered bypass with autotransformer reduced voltage starter
- S – Barriered bypass with soft start
- T – Isolation and transfer (separate starter)
- W – Combination drive with disconnect means only
- Y – Integrated-bypass drive with full-voltage starter in same enclosure compartment
- Z – Barriered-bypass drive with full-voltage starter in separate enclosure compartment



In order to provide the most efficient pump solution to our customers, Taco is now working with Schneider Electric.

This collaboration brings together Taco's pump technology with Schneider Electric Variable Frequency Drives and the drive packaging of Square D enclosures to offer the best overall pumping solution for our customers.



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