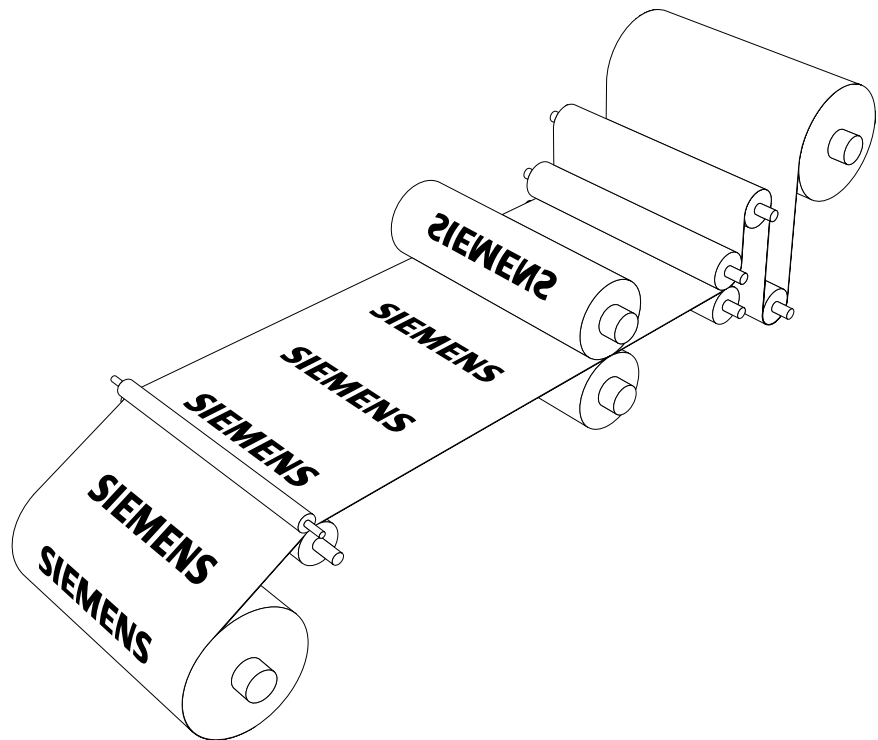


# Applications

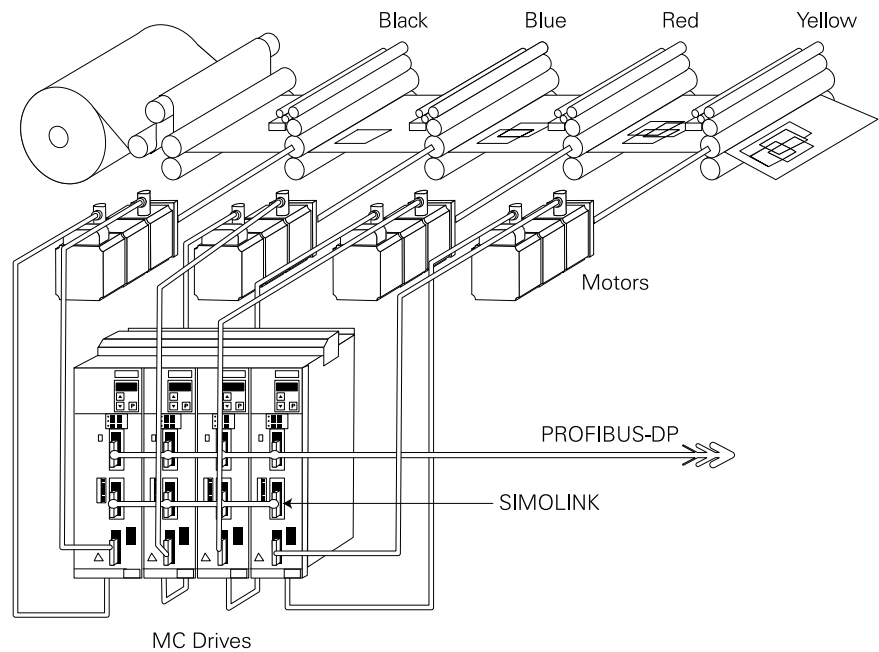
There are any number of applications where motion control can be utilized. The features and functions of the MASTERDRIVE MC product line provides appropriate solutions for these application requirements. Choosing the right components can be confusing and takes careful thought and planning. As you have seen throughout this book there are a number of servomotors, encoders, drives, and technology options to chose from. The following application examples, along with the selection flow chart in the next section, will help you in the planning process. There are, of course, many applications other than the ones illustrated in this section appropriate for the MASTERDRIVE MC.



## Offset Printing

Offset printing traditionally uses a mechanical line shaft to synchronize the different color print stations. The mechanical devices involved require high maintenance, and the system is limited in speed.

The mechanical line shaft system can be replaced with individual servomotors which are precisely synchronized through the MASTERDRIVE MC and SIMOLINK. Communication to higher level controls, such as a SIMATIC S7 PLC, for evaluation of system status and drive setpoint signals, is accomplished with PROFIBUS-DP.

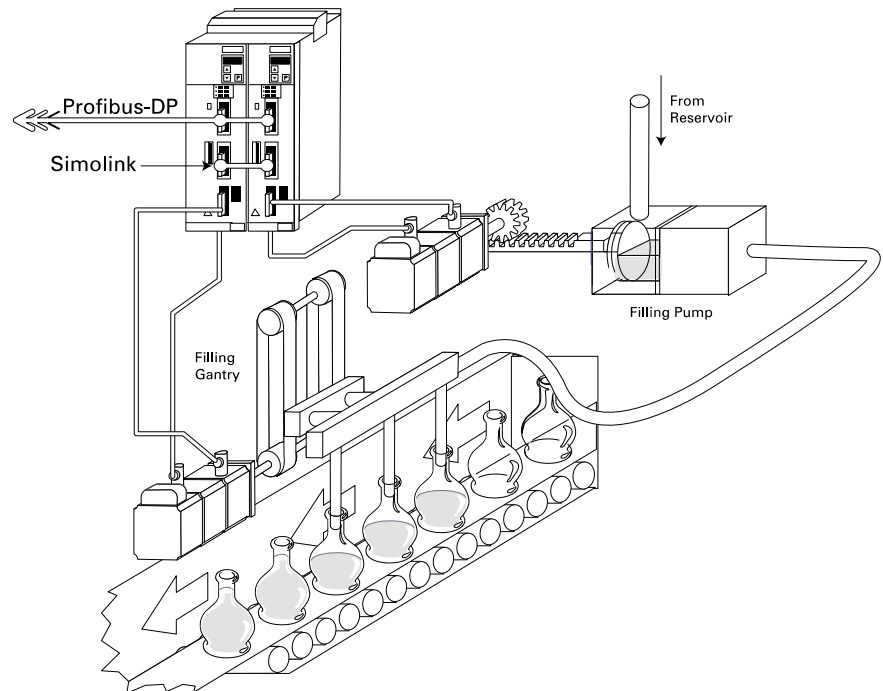


<b>Application Requirement</b>	Web Handling with Synchronization
<b>MASTERDRIVE MC Feature</b>	Synchronization: Virtual Master, Real Master, Gear Box (Electronic Line Shaft)
<b>MASTERDRIVE MC Solution/Benefit</b>	Increased Accuracy and Production Print Speed. Flexibility to Add and Remove Print Stations with Minimum Downtime.

## Bottle Filling

Some bottle filling applications, such as cosmetics, require the distance between the filling pipe and the liquid level in the pipe to be kept constant. In addition, the filling pump must maintain a constant flow. These two axes can be precisely synchronized with the MASTERDRIVE MC.

In this application, the pump drive acts as the master and the filling gantry acts as the slave. As the pump provides a constant flow of product, the filling gantry movement is synchronized, through a cam profile that corresponds to the bottle contour. This maintains a constant filling pipe to liquid distance.

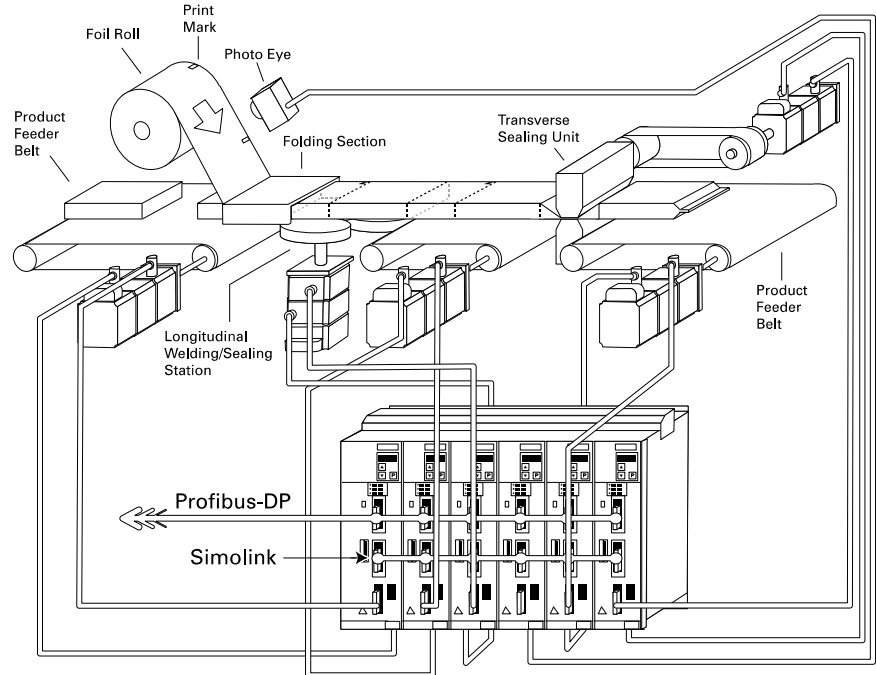


Application Requirement	2-Axis Synchronized Control
MASTERDRIVE MC Feature	Synchronization with Cam Profiling
MASTERDRIVE MC Solution/Benefit	Quick Cam Profile Change to Accommodate Bottle Contour Change. Increased Production for Multi-Product Line Runs.

## Horizontal Bagging

This application involves a continuous roll of foil for horizontal bagging. The sealing station handles the foil transport. Electronic line shaft and print mark registration ensure the foil is synchronized with the products being packaged. Electronic line shafting also ensures the product feeder belt and the foil are in continuous position synchronization. Print mark registration will accelerate or decelerate the foil to make up for possible stretch. This ensures that printed labels on the foil will be correctly positioned on the package.

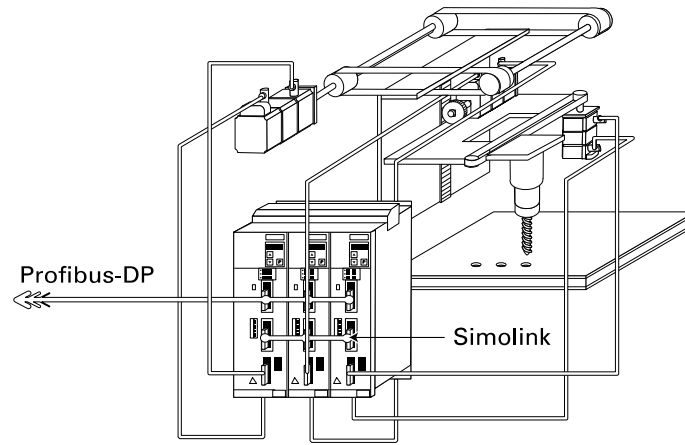
The transverse sealing station must travel with the line in order to achieve continuous packaging. This is accomplished with the MASTERDRIVE MC's electronic line shaft and electronic cam functions. The sealing station is accelerated with the electronic line shaft function to the speed of the product (x-axis). The electronic cam function closes the sealing jaws (y-axis) while the sealer moves across and simultaneously seals the package.



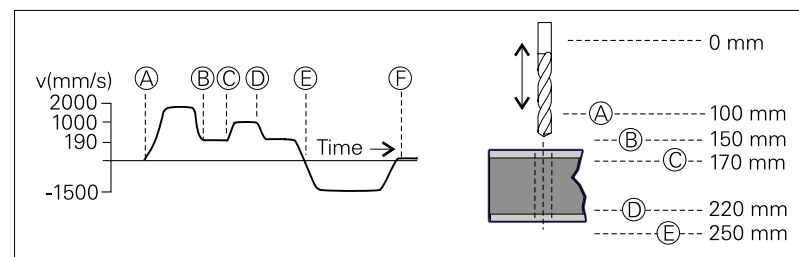
<b>Application Requirement</b>	Continuous Positioning and Synchronization. Continuous Packaging
<b>MASTERDRIVE MC Feature</b>	Print Mark Registration Synchronization: Electronic Line Shaft Control Including Cam Profile
<b>MASTERDRIVE MC Solution/Benefit</b>	Continuous Adjustment to Compensate for Foil Stretch. Multi-Axis Coordination for Sealing and Bagging Sections.

## Composite Drilling

Positioning the x- and y-axis to locate the drilling tool can be accomplished with the manual data input (MDI) mode. Once the drilling tool has reached the desired location, the automatic function takes over and controls the movement of the z-axis. The following instruction set is an example of a drilling profile.



- Moving from A to B the drilling gantry rapidly traverses to just in front of the board and starts to reduce the feed velocity.
- At point B the drill reaches the reduced feed velocity to drill through a plastic laminate.
- Moving from B to C the drill slows to drill through the laminate.
- Moving from C to D the drill increases to normal velocity to drill through core.
- Moving from D to E the drill reduces velocity to drill through bottom laminate.
- Moving from E to F the drill returns with increased velocity.

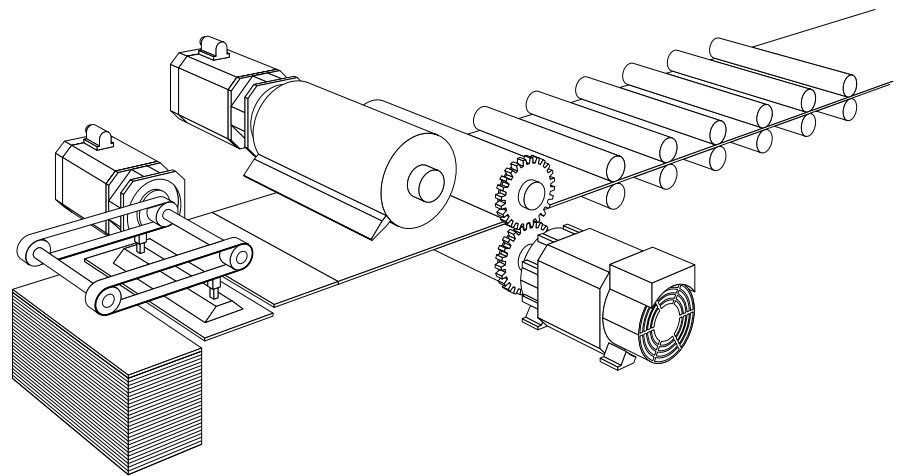


Application Requirement	3-Axis Positioning (Composite Drilling).
MASTERDRIVE MC Feature	MDI Point-to-Point Positioning. Automatic Mode Positioning.
MASTERDRIVE MC Solution/Benefit	High Accuracy Drill Bit Placement and Optimized Drilling Speed to Improve Quality of Cut and Tool Life.

## Cut to Length Rotary Knife/Sheater

In Cut to Length applications, the purpose is to cut material to a precise length. For a fixed cut length, and a knife circumference of the same length, it is simply a matter of maintaining a constant speed between the web and the knife. However, for products that require various cut lengths, the knife's circumference would have to vary to match these new cut lengths. Since this would not be practical, the knife speed is often profiled. By varying the knife speed various cut lengths can be obtained. Furthermore, the rotary knife is accelerated so that as the cutting edge comes into contact with the material it is traveling at the same velocity. This is done to avoid "ripping" the material.

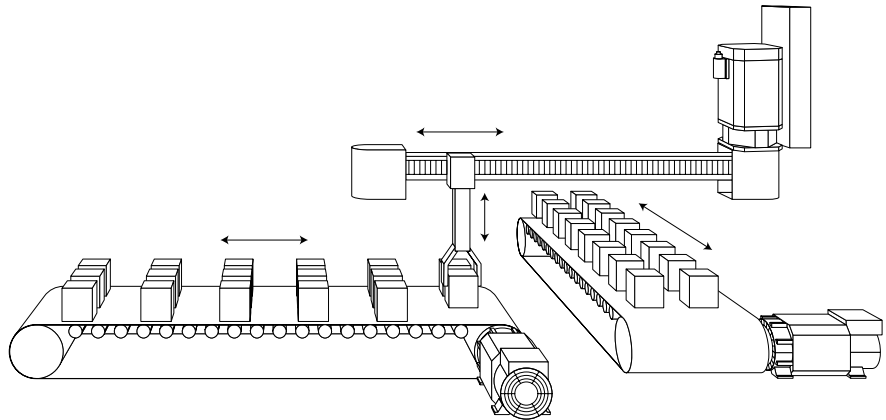
To accomplish this task a Cam profile is often employed. Using the technology features of the MASTERDRIVES MC, a number of cam profiles can be created to perform the needed contoured movement that is synchronized with the material to perform the cut.



<b>Application Requirement</b>	Variable Speed and Product Cut Lengths.
<b>MASTERDRIVE MC Feature</b>	Synchronization with Cam Profiling
<b>MASTERDRIVE MC Solution/Benefit</b>	Short Current Rise Time allows for High Dynamic Response. Multiple Cam Profiles Allow for Quick Changeover to Various Product Lengths.

## Pick and Place

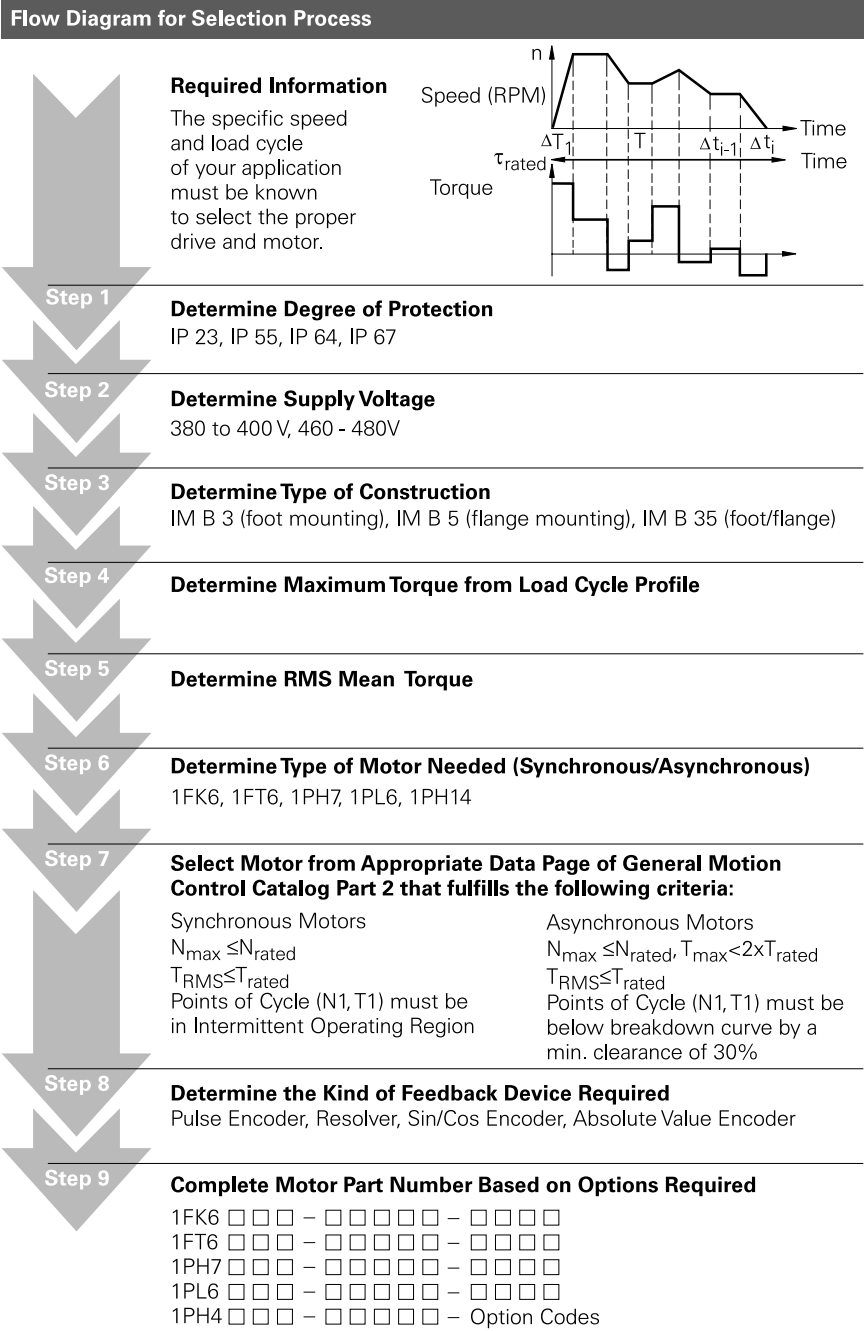
Pick and Place applications involve the precise movement of product from one location to another. Using the Point-to-Point positioning features (MDI mode) of the MASTERDRIVES MC, this precise movement can be realized. Typically the gripper claw is "homed" to the starting location during initialization of the system. From that point, as product is sensed, the gripper closes on it and the Point-to-Point move is made. Once the final destination point is reached the gripper releases the product and the return move to home position is carried out. SIMOLINK is the perfect choice to coordinate these actions. It allows for easily sending all of the appropriate status and control signals from one axis drive to the next.



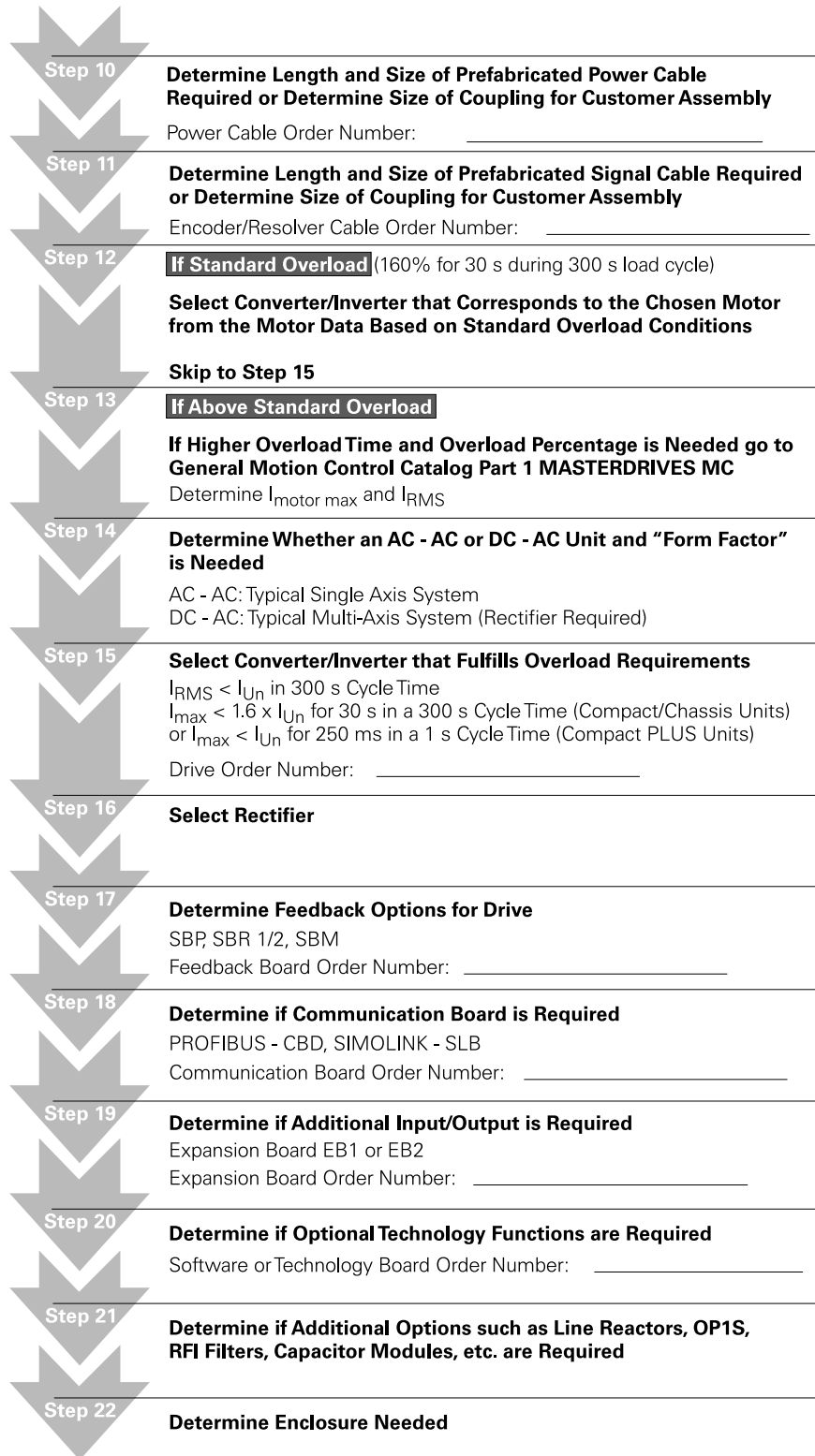
Application Requirement	Pick and Place Positioning
MASTERDRIVE MC Feature	MDI Point-to-Point Positioning
MASTERDRIVE MC Solution/Benefit	High Accuracy Organization and Location of Product Packaging

# Selection

The following flow diagram, along with Part 1 and Part 2 of the General Motion Control Catalog, will help you select the right equipment for your motion control system.





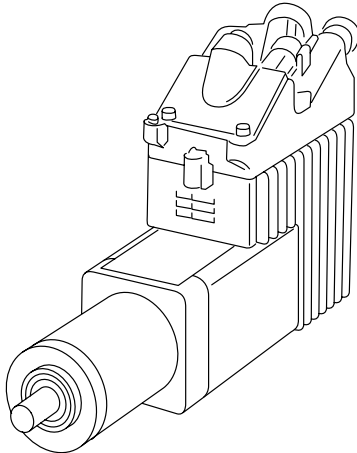


# SIMODRIVE

In addition to the MASTERDRIVE MC, Siemens offers additional general motion control products. Two examples from the SIMODRIVE family of servodrives are described in the following paragraphs.

## POSMO A

The SIMODRIVE POSMO A is an integrated motion control system. POSMO consists of a motion control drive, servomotor, gearbox, and incremental position transducer in one unit. POSMO can be integrated into any PROFIBUS-DP environment. Its only requirement is 24 VDC and PROFIBUS for programming and control. The unit can even act as a stand alone unit by programming it over PROFIBUS and utilizing two digital inputs to perform various position moves.

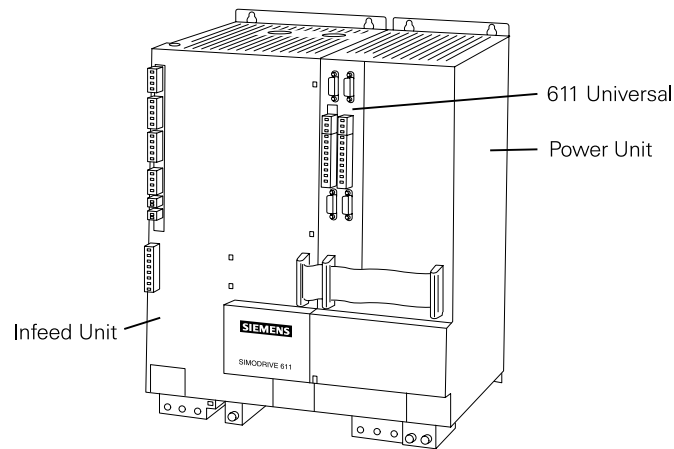


## POSMO Data

Degree of Protection	IP54
Voltage	24 VDC $\pm$ 20%
Power	62 W
Gear Drive	4.5:1 to 162:1

## SIMODRIVE 611 Universal

The SIMODRIVE 611 Universal is a closed-loop control plug-in unit. The 611 Universal is made up of an infeed module and a power module. The infeed module contains a complete electronics power supply and is used to convert the incoming AC line (400 to 480 VAC) to DC. The power module houses the 611 Universal and provides the output to the servomotor. The 611 Universal will support 1 or 2 axis. Like the POSMO, the SIMODRIVE 611 Universal can be integrated into any PROFIBUS -DP environment. This drive is rated from 3 - 250 amps. It is designed for positioning tasks and can operate both sinewave servomotors and linear motors.



## Review 7

1. Which of the following is not part of the basic function software?
  - a. Cam controller
  - b. Brake control
  - c. Electronic Clutch
2. The gear ratio of the electronic gear box function can be set anywhere from  $\pm$  \_\_\_\_\_ .
3. Registration marks are sensed within \_\_\_\_\_  $\mu$ s with the print mark registration function.
4. The maximum screened cable length of a 5.5 kW Compact unit is \_\_\_\_\_ ft.
5. When selecting a motion control system the speed and \_\_\_\_\_ load cycles must be known.

# Review Answers

- Review 1** 1) MASTERDRIVE; 2) linear, rotational; 3) h.
- Review 2** 1) force; 2) 5 N; 3) torque; 4) 6; 5) inertia; 6) 1:1; 7) Work; 8) torque, power; 9) SimoSize.
- Review 3** 1) synchronous, asynchronous; 2) 120; 3) synchronous; 4) slip; 5) b; 6) 105; 7) 64.
- Review 4** 1) S1; 2) 10; 3) continuous, intermittent; 4) 81; 5) asynchronous.
- Review 5** 1) asynchronous; 2) 4096; 3) II, IV; 4) ACTIVE FRONT END
- Review 6** 1) 37; 2) X1; 3) 100; 4) C; 5) CBP; 6) converter; 7) LBA.
- Review 7** 1) C; 2) 32,767:32,767; 3) 1; 4) 164; 5) torque

# Final Exam

The final exam is intended to be a learning tool. The book may be used during the exam. A tear-out answer sheet is provided. After completing the test, mail the answer sheet in for grading. A grade of 70% or better is passing. Upon successful completion of the test a certificate will be issued.

## Questions

- \_\_\_\_\_ is a twisting or turning force that causes an object to rotate.
  - Torque
  - Friction
  - Inertia
  - Acceleration
- Ideally it is desirable to have a \_\_\_\_\_ ratio between the load and the motor.
  - 1:2
  - 1:1
  - 2:1
  - 2:2
- The torque required to accelerate a system with a total inertia of  $0.010 \text{ kgm}^2$  from rest to 2500 RPM in 0.1 seconds is \_\_\_\_\_ Nm.
  - 7.85
  - 13.08
  - 26.17
  - 32.56
- \_\_\_\_\_ is a Siemens PC program designed to accelerate the process of calculating speed, torque, and inertia of a motion control system.
  - SIMOLINK
  - PROFIBUS-DP
  - SimoSize
  - POSMO
- The maximum temperature rise of a motor with Class F insulation, not including the margin for a hot spot, is \_\_\_\_\_ K.
  - 80
  - 125
  - 130
  - 105



13. The Compact PLUS has \_\_\_\_\_ programmable bi-directional inputs and outputs.
- a. two
  - b. three
  - c. four
  - d. six
14. Up to \_\_\_\_\_ option boards can be installed in the Compact PLUS.
- a. two
  - b. three
  - c. four
  - d. six
15. \_\_\_\_\_ is an encoder board used for sine/cosine encoders as well as absolute value encoders.
- a. SPB
  - b. SBR2
  - c. SBR1
  - d. SBM
16. \_\_\_\_\_ refers to a system in which one rectifier supplies DC power to multiple AC inverters.
- a. Multi-Axis
  - b. SIMOLINK
  - c. PROFIBUS-DP
  - d. Common Bus
17. \_\_\_\_\_ is the preferred slot for an encoder board in the Compact PLUS, Compact, and Chassis drives.
- a. A
  - b. B
  - c. C
  - d. D
18. The Cam controller is part of the \_\_\_\_\_ .
- a. basic function software
  - b. rotary axis function
  - c. linear axis function
  - d. Roll feed function
19. The maximum length of a screened cable used on a 0.55 kW converter is \_\_\_\_\_ meters.
- a. 35
  - b. 50
  - c. 65
  - d. 70

20. \_\_\_\_\_ is a type of motion control drive that has an integrated motion control drive, servomotor, gear box, and incremental position transducer in one unit.
- a. SIMODRIVE 611 Universal
  - b. POSMO
  - c. Compact PLUS
  - d. PROFIBUS-DP



# Notes