Selecting a Motion Control Package

Where to start!

Today's industry is continually pushing towards more efficient, cost effective and faster productivity rates.

This means that many more machines and processes are being carefully analysed and upgraded to accomplish these goals.

This process of 'automation' brings new people into contact with the world of motion control, and presents those already involved with new and challenging tasks.

Technology in this field is literally in 'hyperdrive mode' with new equipment being designed and introduced almost weekly and this means there are many devices from motors to controls to positioning systems that need to be understood.

In selecting a motion control package, the load is being positioned rapidly and accurately. The first and most important area requiring identification is the 'Mechanics of the Load' which is to be moved.

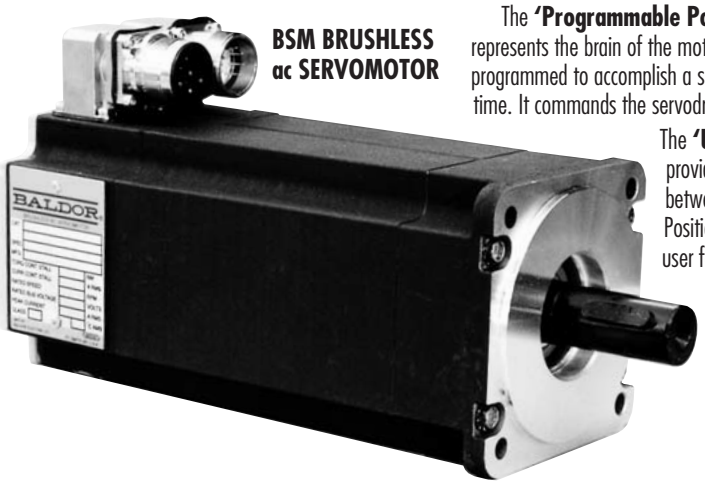
Once the load and its dynamics are known, the torque is known, and the selection of a 'Motor' which will deliver that torque can begin.

This is followed by the selection of the 'Servodriver/Amplifier' which will supply the power to move the motor and the machine's load.

The next step may be to select the desired 'Programmable Positioning Controller' to suit the application and servo equipment.

Finally, the most suitable 'User Interface' can be selected to provide the necessary input and output link to the operator.

If the mechanics of the load (friction and inertia) have been properly determined, the torque to accomplish the task has been accurately established. Therefore the motor should be correctly sized to deliver that torque, and the control should be adequately sized to power and move the motor. If not, the motion control package will either take too long to position the load, or it may be damaged by overheating.



BSM BRUSHLESS ac SERVOMOTOR

Components and Information Linkages of a Basic Motion Control Package

Components of a Motion Control Package

The basic motion control components and information linkages are illustrated in the adjacent block diagram. Slight variations of this diagram are possible in actual usage.

The **'Transformer',** when required, takes incoming ac power and steps it down to an appropriate level that the power supply can use.

The **'Power Supply'** converts ac power to the proper dc power level that the amplifier and logic circuitry can use. This is generally integrated in current technology drives.

The **'Servodriver/Amplifier'** takes low level incoming command signals (these may be a simple ±10V signal from a potentiometer to computer controlled signals from a positioning system) and applies them to the dc power from the power supply, thereby amplifying the signal. This amplified signal is then applied directly to the 'motor', thereby telling the motor what to do: start, how fast to go, and when to stop.

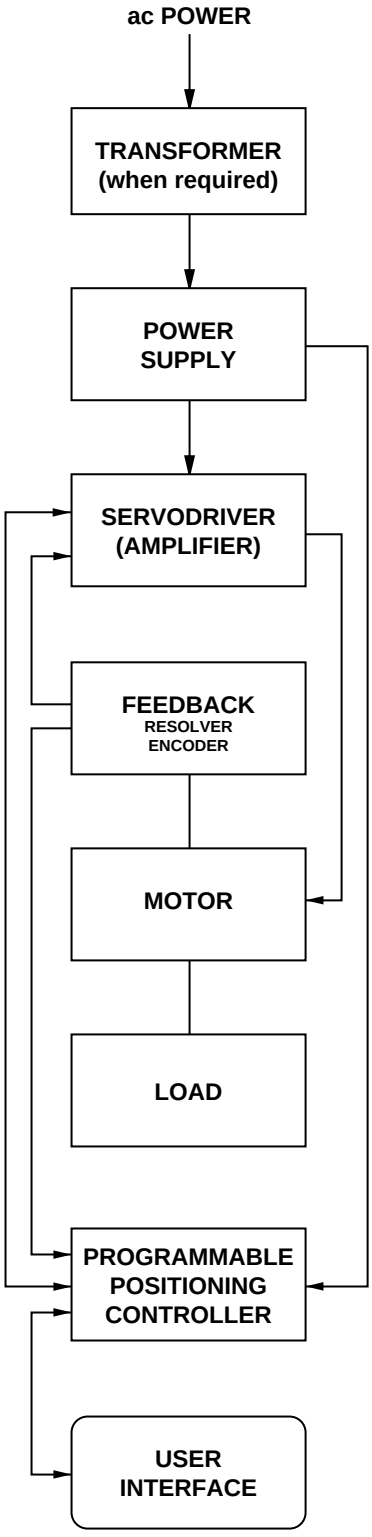
The **'Motor'** supplies the movement, or the muscle of the system. It may be a rotary or a linear design, a permanent magnet dc servo motor, a 'vector' motor, or a brushless ac servo motor. The motor takes the high power from the servodriver/amplifier and uses it to move the mechanical system and load.

The **'Feedback/Resolver/Encoder/Other'** provides a signal which is read by the 'Programmable Positioning Controller', enabling it to keep track of the load's position. Through a comparison of the 'desired' position (the position programmed in) and the 'feedback' position (actual load position), the positioning controller will command the entire package to move the load to the desired position.

The **'Load'** represents the mechanics being positioned. The load is coupled/connected through mechanical linkages such as direct gearing, belt-pulley, or lead-screw.

The **'Programmable Positioning Controller'** represents the brain of the motion control package. It is programmed to accomplish a specific task in a specific time. It commands the servodriver/amplifier.

The **'User Interface'** provides communications between the 'Programmable Positioning Controller' and the user for the input of programming data and the output of operational information.



BALDOR MOTORS AND DRIVES

An Introduction to Brushless ac Servo Systems

Servo Systems (using brushless ac motors) are very high performance variable speed drives which give full torque at zero speed, and are also capable of high speeds without the limitations of the brush type drives.

'BSM' Brushless ac Servo Motors

BALDOR ac Servo Systems utilise BSM Type A motors (with premium performance rare earth Samarium Cobalt magnets), BSM Type N motors (which incorporate high performance Neodymium magnets), BSM Type B motors (which incorporate Ferrite magnets for normal applications), or BSM Type C motors (which incorporate high performance Neodymium magnets and Ring Magnet technology). These designs incorporate magnets on the rotating part of the motor while a three phase ac winding is incorporated on the stationary portion of the motor. Each individual coil in the motor's winding is switched on and off in rotation, thereby inducing the rotor to turn in a synchronised step. This requires electronic commutation (which is performed by the Baldor Servodriver) and in order to be able to turn on and off the coil, the exact position of the rotor poles must be known. To do this a resolver is used and is factory set in the motor. This gives precise rotor position along with speed reference and also can eliminate the need for additional feedback components in a closed loop positioning system application. Optionally, encoder feedback is available in absolute or incremental configurations.

Baldor Brushless Transistor Servodrivers

The BALDOR Brushless Transistor Servodrivers (SD23H, *MicroFlex™*/*Flex™*/Flex+/*Mint™*) take an appropriate dc Bus voltage from an internal power supply, which is then switched at high frequency to a sinusoidal three phase ac output waveform.

The Servodriver is supplied with dc voltage by an uncontrolled rectifier. An ac inverter, equipped with transistors, allows control of the motor's stator rotating field according to size and angle position, through change of frequency and voltage. A digital current regulator equalises the sinusoidal desired current value information obtained from the read-only memory with digitalised actual current value. Torque control is produced together with information from the resolver or encoder for the positioning of the rotor magnets. This control is superimposed by an analogue or digital speed control system.

Baldor SD23H, MicroFlex, FlexDrive II, Flex+Drive II, and MintDrive II Servo Controllers are digital based drives, ensuring the most accurate control and eliminating potential drift due to temperature variation. Digital drives also provide less current overshoot than do analogue type drives.

Which Servo System will suit your needs?

Baldor SD23H single axis digital servodriver is the simplest of all the Baldor servo systems to set-up and operate. An inbuilt keypad and routines (common to Baldor Inverter/Vector drives) allows direct user access to all of the set-up parameters without the need for a computer or extensive programming knowledge. The SD23H provides most of the commonly used features and functions for simple servodrive applications. Can provide up to 15 programmable moves/positions with optional firmware.

MicroFlex, FlexDrive II, Flex+Drive II, and MintDrive Servo Controllers are digital based drives, performing all of their servo tasks and internal monitoring etc via digital interface. Drive set up is via PC Software and RS232 or RS485 communications.

MicroFlex is an extremely cost effective solution for single and multi-axis motion control applications which require up to 9amps continuous output. It is ideally suited for use with Baldor's range of rotary servo and linear motors, motion controllers, as well as ac stepper motors. MicroFlex provides an encoder output for connection to external motion controllers such as NextMove. This approach provides a cost effective complete package solution for your motion control application.

FlexDrive II is a state-of-the-art digital servodriver for use with brushless ac rotary motors, linear motors and motion controllers. Models up to 27.5 amps continuous output cater for larger servo tasks. Feedback options include, Resolver, Commutating Encoder and EnDat – single and multi-turn absolute. FlexDrive II can perform simple PLC tasks eliminating the need for external PLCs. Comprehensive fieldbus options.

Flex+Drive II is a FlexDrive II servodriver with built-in incremental/absolute positioning capabilities for applications requiring fast, accurate and repeatable moves. Flex+Drive II can be programmed with repeatable trapezoidal moves/positions (7 as standard or up to 256 with option) or controlled with ±10Vdc, pulse and direction or electronic handwheel input signals. Flex+Drive II is ideal for applications such as indexing, cut-to-length, rotary index tables, labelling, etc.

MintDrive II is a fully programmable, single axis, stand-alone, motion control package which provides, motion control, I/O handling, serial communications, machine level networking and optional operator interface panel all working together under the control of the powerful MintMT program. MintDrive II is suitable for complex and exacting applications. For a comprehensive explanation of MintMT programming capabilities refer to page 28.