



Overview

The Unico STF® Servo Transfer Feed is a sophisticated multi-axis control system for in-press automation. The standard STF® system provides coordinated motion control for as many as 32 independent axes, while custom systems can control a virtually unlimited number of drives and axes. The servo system provides electronic line shafting that eliminates the large gearboxes and PTOs associated with mechanical feeds, resulting in smoother motion, greater flexibility and safety, and reduced mechanical maintenance.

Features Updated Controller Design

An updated controller design replaces the silicon-controlled rectifiers (SCRs) with insulated-gate bipolar transistors (IGBTs) to achieve faster switching and higher energy efficiency. Not only are the controllers changed internally but also visibly with a redesigned assembly.

Programmable Cam Profiles

The STF® emulates the motion curves provided by the cams of most mechanical feed systems, including modified sine, modified cosine, trapezoidal, parabolic, and asynchronous cycloidal. Custom profiles can also be created upon request.

Multiple Operation Modes

The STF® can be programmed to follow standard profiles, such as triaxis, crossbar, and two-axis, as well as custom profiles for special automation, such as orientation stations.

Programmable Limit Switches

An advanced programmable limit switch (PLS) controller provides contact outputs that turn on and off based upon the angle of the press. PLS outputs can be used for such functions as controlling grippers and vacuum cups, die lifters, oil sprays, and for tracking parts. Each output has independent speed compensation to ensure, for example, that grippers open and close in the same place regardless of press speed.

Press Simulator

A built-in press simulator facilitates die setup and troubleshooting by allowing the automation to simulate automatic operation without moving the press. The simulator can be jogged forward or reverse at one of two preset speeds and can be configured to either stop automatically at the home position or to run continuously.

Features
(continued)

Smooth Start

The STF® eliminates the violence associated with starting a mechanical triaxis press from the on-top position. The machine can be started in automatic mode with the press on top and the automation in a home position. The automation will not move until the press reaches the automation home position angle.

Smooth Stop

The STF® prevents the jarring associated with top-stopping a mechanical triaxis press. When the press stops on top during a cycle stop, the automation continues moving and smoothly returns to its home position.

Smooth Return

The STF® provides a smooth return by dynamically switching between following the press and following the press simulator for a portion of every stroke. By following the simulator, the automation is isolated from the vibration and mechanical backlash of the press. The simulator is synchronized to the press speed and position during the transition, and press position is continually monitored to ensure that the simulator does not fall behind.

Off-Path Jog

Each axis controlled by the STF® may be jogged individually without moving the other axes or the press. Off-path motion can be constrained to either the limits of the programmed motion path or to the mechanical travel limits.

Go-To Positions

Sixteen or more go-to positions can be configured in the STF® system. For each, the user specifies which axis will move, where it will move to, how fast it will move, and how much torque may be used during the move. Go-to positions can be selected via digital I/O to send the automation to the preprogrammed positions. This is particularly useful for sequencing an automatic die-changing routine.

Go-To Angles

Much like go-to positions, go-to angles allow the user to specify preset angles for sequencing the STF® when it is following the press simulator.

Maximum SPM Calculation

The STF® system calculates the maximum speed that the automation can run based upon the part profile entered and motor, drive, and machine data. The system reports which segment of the motion profile sets the limitation and whether it is limited by the maximum motor speed, available peak torque, or required RMS current. By knowing what factor is limiting the maximum speed, the die-setter can make adjustments to optimize production and minimize machine wear.

Redundant Feedback

The STF® system supports redundant feedback for the press resolvers as well as for each motor. If the system detects a problem with its primary feedback device, it can automatically switch to the redundant transducer, flag a fault, and bring the machine to a safe, controlled stop.

Transducerless Takeover

For systems without redundant feedback, the STF® can switch to transducerless operation and bring the machine to a controlled stop should a motor feedback device fail. In transducerless mode, the drive uses the amplitude, frequency, and phase relationship of motor voltage and current, together with the characteristics of the motor, to estimate motor feedback position and control the flux vector.

Features *(continued)*

Multiple Referencing Schemes

The STF® supports snug-up (positive stop) referencing, limit-switch referencing, and learn/teach referencing. If at least one feedback device is an absolute encoder, the drive does not need to be re-referenced every time the machine is powered down. Referencing is only required if the encoder is replaced or its coupling is loosened.

Multiple Motor Types

The STF® will work with any combination of AC induction motors, brushless or permanent magnet AC synchronous motors, permanent-magnet or wound-field DC motors, and linear motors.

Power Ride-Through

An optional power ride-through circuit maintains power to the drives for a brief period during a power outage so that the machine may be brought to a safe, controlled stop.

Common-Bus Architecture

A common-bus system architecture allows multiple drives to be tied together to share a single line-regenerative or non-regenerative front end. This streamlines the design and reduces peak energy demands.

Flywheel Velocity Modulation

The STF® can be configured to control a press flywheel. When connected to the STF® drives in a common-bus arrangement, the flywheel drive can enhance the power ride-through capabilities of the system for increased machine safety on critical applications such as crossbar presses. In this arrangement, flywheel velocity can be modulated to help regulate the bus voltage to the drives. In the event of a power failure, the flywheel is slowed and regenerated energy is used to raise the bus voltage to keep the automation drives running until the machine can be brought to a controlled stop. Conversely, the flywheel may be sped-up to absorb excess energy and lower the bus voltage in the event of a component failure.

Multilevel Protection

The STF® employs multiple levels of protection to ensure operator and machine safety. Drive-level faults detect conditions such as excessive RMS current, excessive peak current, overtemperature, encoder loss, power supply failure, and position error. Numerous application-level faults detect such conditions as feedback mismatch, twist between motors on the same axis, press or simulator following errors, and communication errors. Redundant feedback, transducerless takeover, power ride-through, and flywheel modulation features provide additional protection by gracefully stopping the machine when a fault occurs.

Conditional Fault Handling

The STF® can be programmed to handle faults differently depending upon which fault occurs and the crank angle of the press at the time of the fault. For each fault, the system can be configured independently to either cycle stop with the press, stop immediately with the press, stop immediately independent of the press, or coast while relying on brakes, bumpers, or other mechanical systems to stop the axis.

PLC Interface

The STF® system is designed to interface with a press control PLC via a serial link and/or digital inputs and outputs. The serial link is used for transmitting and receiving diagnostic information and job-specific part data. Digital I/O is used for sending and receiving control and status bits, such as to jog the automation or to indicate that the automation is ready to follow the press. If a high-speed protocol is used for the serial link, it is possible to send the control and status bits serially and eliminate the digital I/O. Protocols supported include:

- ControlNet
- Modbus Plus
- Ethernet IP
- Profibus
- Modbus TCP
- Modbus RTU
- SY/LINK
- EtherCAT
- Profinet
- AnyBus
- ESP
- ANSI

Human Machine Interface

The STF® comes with software for configuring the system as well as for diagnostics and maintenance. A graphical HMI can optionally be provided that offers part recipe storage and management, automated storage and retrieval of the STF® configuration parameters, fault logging, on-line software manuals and hardware drawings, electronic troubleshooting guides, and more.

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