

HEITZ SPRINT 3 PROGRAMMABLE STEERING MACHINE



FEATURES

Powerful, Fast, and Accurate

16 programs of 16,384 steps in each plug-in EPROM

Basic tool for NHTSA rollover & ESC research

In use by research groups in USA, Japan, and Europe

Roll Rate Feedback and Start Program at Preset Speed functions

Thumbwheel switch selection of program, max steer, start speed, direction of initial turn

EPROMs programmable from notebook computer

Optional capability to follow an external analog steer angle input

Machine clamps to vehicle handwheel for 15-minute installation

Alternative installation directly to steering column

Handwheel panel meters show speed and steer angle

Analog outputs for steer angle and torque

Driver's hands remain on Sprint handwheel throughout a maneuver, for safety

Releasing either of two handwheel switches reverts to manual control

Powered by its own batteries with charge maintained from vehicle

Installed weight: Machine 13 kg; Battery/Electronics Box 15 kg.

Two transit cases for storage/transport

3-year full warranty



COMPONENTS

The photo above shows all components for the Sprint application. The B/E (Battery/Electronics) box is a rugged ABS case in which the cover is removed for installation. The B/E Box is connected to the vehicle 12-volt system, the Steering Machine, the Command Module, and the data acquisition system by the four cables shown. The Grounding Plate (a "disk brake rotor") attaches to the vehicle windshield by adjustable struts and suction cups. The Steering Machine clamps to the vehicle handwheel using the 4 mm hex driver tool. The EPROM is inserted in the ZIF (zero insertion force) socket on the leftmost PC board in the B/E Box. A second EPROM is available for optional control of throttle, brakes, recorders, or other devices. The Command Module contains digital thumbwheel switches for selection of program number, direction of first turn, maximum programmed steer angle, and vehicle speed for program start.

OPERATION

With the system unenergized a failsafe brake locks the motor and the Handwheel is ungrounded, so driving is normal. The driver energizes the system by depressing the right-hand thumb switch. After a short self-check cycle the motor fail-safe brake is released. Since there is as yet no Program signal, the servo holds the angle between the vehicle steering wheel and the Sprint Handwheel to zero, and driving remains normal. With energization one of the two green "Klutzlights" will indicate the direction of the initial programmed turn for drivers with poor short-term memories. When the driver depresses the left-hand thumb switch the Program is enabled and the grounding brake is applied, freezing the position of the Sprint Handwheel. If "start at speed" is not selected the program starts immediately; with "Start at Speed" the Program will begin when the vehicle has slowed to the preselected speed.

SAFETY

If the left-hand switch is released, the Program is inhibited and the Grounding Plate is freed. The servo holds the last commanded steer angle between vehicle and Sprint handwheels, with manual control. With release of the right-hand switch, the system is de-energized: the Grounding Plate is freed and the motor fail-safe brake locks the motor position, restoring full manual control. Releasing either or both switches produces the same driving condition.

The Sprint Steering Machine is capable of very large steer angles, at rotational speeds over 1000 degrees/second. For this reason it is important from a human factors standpoint that the driver's hands remain on the handwheel in the same way for both normal driving and programmed conditions. This feature is made possible by use of a "Series Servo", in which the Machine adds to the rotation of the Sprint Handwheel. During programmed steer the vehicle steering wheel rotates while the Sprint handwheel remained "grounded" to the vehicle windshield. During violent maneuvers the driver's hands remain on the stationary Sprint handwheel, for body support and machine control. In our competition's steering robots, the handwheel spins: in violent maneuvers the driver must avoid contact with the spinning handwheel while "hanging on" to a joystick.

SPRINT 3 SPECIFICATIONS

INTERMITTENT DUTY TORQUE, at any speed to 1500 degrees/second:

Peak torque (adjusted by a current limiting resistor) = 60 Nm. (75 Nm on request).

Peak torque for a 2.7 second burst followed by power amplifier foldback to a resistor-adjusted 25 Nm.

Amplifier controls peak duration to maintain long-term average current at continuous rating.

CONTINUOUS DUTY TORQUE, at any speed to 2000 degrees/second:

25 Nm average or RMS. (Peak torque for continuous sinusoidal operation = 30 Nm).

TORQUE MEASUREMENT

To 100 Nm at 1.5 percent linearity, no damage limit.

ANGLE MEASUREMENT

Resolution 0.025 degrees, 16-bit D/A, Full-scale switchable 800/400/200/100 degrees and additional potentiometer-adjustable gain for flexible scaling.

INSTALLATION

Machine clamps to vehicle steering wheel. Left/right are synchronous for automatic centering. Upper/lower are independently adjustable, since steering wheel center is frequently offset vertically from the center of steering column. Adjustable-length struts (11 to 25 inches, 280 to 640 mm) and oval-shape (3 x 6 inches, 75 x 155 mm) suction cups ground Handwheel to windshield. Adapters are supplied for mounting directly on the steering column.

Battery/Electronics Box has cables to vehicle battery, to hand-held Command Module, to Steering Machine, and to data system (Speed & Roll Rate in; Angle & Torque out).

"Hand-held" Command Module sets program, steer angle, direction, and start speed by "pushwheel" digital switches. It connects to Battery/Electronics Box through 15-pin D-Sub cable. It is usually taped down somewhere within the driver's reach.

SIZE & WEIGHT

Machine has 15 inch (380 mm) outside diameter handwheel. Handwheel to vehicle steering wheel is 5.2 inches (134 mm). Installed mass is 29 pounds (13.2 kg).

The Battery/Electronics Box measures 14 x 10.5 x 6 inches (360 x 270 x 160 mm) and weighs 33 pounds (15 kg) installed.

The Command Module measures 4.7 x 2.6 x 2.0 inches (120 x 65 x 50 mm) and weighs 11 oz (0.310 kg).

POWER

Input power is 9 to 18 volts from the vehicle's battery/alternator, which is used to maintain a 13.6 volt charge on system batteries through isolating regulated DC/DC converters. System has five 12-volt, 5 amp-hour lead-acid batteries connected in series for 60 volts at the power amplifier when the servo is energized; and an additional 12 volt, 5 amp-hour battery for miscellaneous system use.

With the system energized, the maximum current draw from the vehicle is 8 amps since additional current is supplied by the batteries.

The DC-DC converters isolate the system from the vehicle battery/alternator system, to prevent accidental ground loops.

The system is protected from reversed connection and alternator load dump transients.

WARRANTY

Heitz Automotive Testing, Inc. warrants the machine and its components to be free from defects in materials and workmanship at the time of manufacture, and to operate normally for a period of three years from the date of delivery. This warranty is subject to the following qualifications:

(1) The machine must be used normally. Heitz Automotive Testing cannot be responsible for machines subjected to severe physical or electrical abuse, or damaged by gross negligence or by vehicular accident, or crash-test collision or rollover.

(2) Certain "programming rules" must be observed, as described in the Technical Manual under "Programming Rules for Motor Heating Considerations" in Section 4 and "Motor Heating Considerations" in Section 6. For example: no program should hold the machine stalled at full current for an extended period.

According to customer's preference, we will immediately and at no charge FedEx any required repair parts, or we will repair and return within 7 days a machine sent to us for repair. Although there will be no charge for repairs, if a machine is returned the customer may be asked to arrange for and pay for shipping charges.

FURTHER INFORMATION

For further information contact:

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