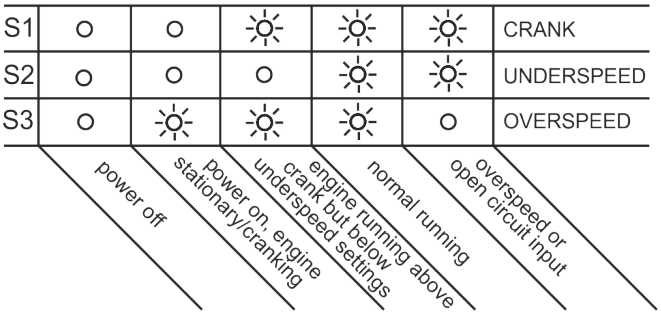
3ST
Three Point Speed Relay

The 3ST provides three independent speed relays in one compact unit. Working with an engine-mounted speed transducer, typically a magnetic pickup, the 3ST measures the transducer signal frequency (which is proportional to engine speed) and compares this with three adjustable trip levels. The three non-latching relays then activate or deactivate as appropriate.

Each relay circuit has a front facia LED that lights when the relay is energised. On standard units, the relay functions are designated S1 (crank), S2 (underspeed) and S3 (overspeed). All three relays are energised, and all LEDs are lit, when the engine is running at normal speed:

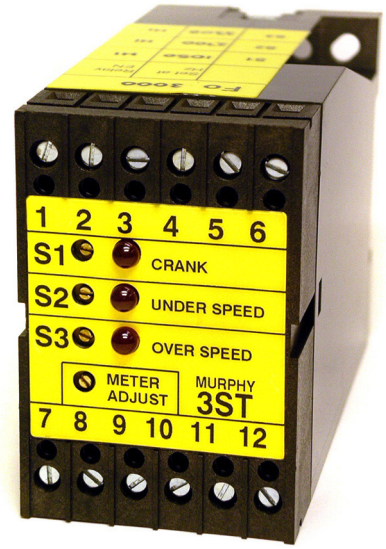


Nominal speed calibration and relay trip levels are set via four multi-turn potentiometers – see Calibration section overleaf. The 3ST also features a meter output, which may be used for calibration and/or engine speed indication.

The 3ST has a robust, polycarbonate case, designed for DIN rail or surface mounting. Electrical connection is by 12 screw terminals, suitable for stripped panel wires or narrow blade crimps.

Application

The 3ST can be used with engines, generators, pumps or any moving machinery that requires speed-related automation. Control functions typically include automatic starter motor release, load control and under/overspeed alarm or fault shutdown protection.



Specifications

Power Supply

Voltage range, 12V units: 8 to 16 V DC
24V units: 16 to 32 V DC
Power consumption: 4 W typ.

Input

Voltage range: 0.5 to 80 V AC rms
Nominal frequency range (f_o): 1 to 8 kHz.

Relay trip settings

S1 (crank) range: 10 to 45% of f_o
S2 (underspeed) range: 50 to 95% of f_o
S3 (overspeed) range: 100 to 130% of f_o

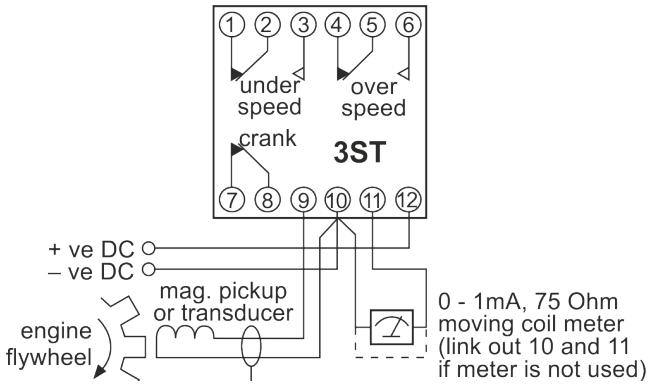
Outputs

Relays: SPNC (S1) and SPDT (S2 & S3) volt-free/dry contacts
5A max. @ 24V DC (resistive load), 2 x 10^5 operations
Tacho/calibration: 0 to 1mA into a 75 Ohm moving coil meter.
Calibrated output at normal engine speed = 0.75mAl

Physical

Operating temperature: –10 to +55°C
Dimensions (W x H x D): 50 x 75 x 110 mm / 1.97 x 2.95 x 4.33 in.
Weight: approx. 190g / 0.42 lb

Electrical Connection



How to Order

Stock Units

These are supplied with blank calibration labels and set to a nominal frequency (f_o) of 3000Hz (equivalent to 120 flywheel teeth at 1500 RPM). Customer calibration will usually be required for stock units:

Stock code	Model / Description
76.70.0039	3ST/1SET4 speed trip, 24V, std. settings
76.70.0068	3ST/2SET4 speed trip, 12V, std. settings

Special Calibrations

We can also supply the 3ST calibrated to your requirements. Please specify:

a) **Model type:** 3ST/1 (24V) or 3ST/2 (12V)

b) **Nominal transducer frequency (f_o)**

c) **Trip levels for S1, S2 and S3**, expressed for each as either an absolute (transducer) trip frequency (in Hz), or as a percentage of f_o

Calibration

For the 3ST to correctly measure engine speed, it must be calibrated for each particular engine and transducer type. Calibration may be carried out during engine commissioning, or 'on the bench' using a signal generator to simulate the engine speed transducer. Calibration is a two-stage process:

1) Nominal calibration (to engine normal running speed)

Use the METER ADJUST potentiometer to calibrate the 3ST to the 'nominal' transducer frequency (or f_o, the transducer output frequency when the engine is running at normal speed). Standard units allow adjustment of f_o between 1 and 8 kHz.

When calibrating with a signal generator, f_o must be known, either:

a) by prior measurement of the pickup when the engine is running, or

b) by calculation, e.g. for a pickup and flywheel:

$$f_o \text{ (Hz)} = \frac{\text{normal engine speed (RPM)}}{60} \times \text{number of flywheel teeth}$$

To set the nominal calibration:

- Connect the pickup, transducer or signal generator input: signal positive to pin 9, signal negative to pin 10
- Connect a 0 – 1mA meter (ideally with a 75 ohm moving coil action): meter positive to pin 11, meter negative to pin 10.
- Connect the DC power supply: positive DC to pin 12, negative DC to pin 10. Switch on the supply.
- Start the engine manually (not under the control of the 3ST relays) and run to normal speed, or adjust the signal generator to simulate the transducer signal.
- Turn the METER ADJUST potentiometer until the meter reads 0.75mA. Turn the pot. clockwise to increase the meter reading (i.e. to lower the nominal calibration frequency). All LEDs should now be lit.

The nominal calibration is now complete. The meter may be left connected to the 3ST or replaced with a wire link.

2) S1, S2 and S3 relay settings

After setting the nominal calibration (f_o), use potentiometers S1, S2 and S3 to set the trip frequency of each relay. The adjustment range of each pot. is fixed in percentage terms to f_o (see specification for ranges): the absolute frequency range and setting of each relay will therefore change if f_o is changed.

For each of the three relay settings:

- Adjust the engine speed to the required trip level, or adjust the signal generator to simulate the transducer frequency at the required engine speed.
- Adjust the potentiometer (S1, S2 or S3) until the relay just changes over (the LED will light then extinguish). Turn each pot clockwise to increase the trip frequency.

The 3ST is now calibrated. For full details of 3ST calibration, please see our separate installation instructions.

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