

Speed control

Principles

HSV

Overview

The HSV relay controls the speed (or, more strictly speaking, the operating rate, or frequency) of a process (moving walkway, conveyor, etc.) using discrete sensors:

- 3-wire PNP or NPN output proximity sensor
- voltage input 0 - 30 V
- NAMUR proximity sensor
- volt-free contact

It can be used to monitor under OR overspeed

Operating principle

Measurement

The monitored process cycle is the succession of pulses characterised by a signal with two states: high and low. The speed measurement is obtained by measuring the duration of this signal, from the first detected change of state (either a rising or falling edge).

Digital signal processing avoids the problem of disparity of signals.

From energisation, or after the appearance (or reappearance) of the sensor signal, detection (characterisation) of the signal requires processing of one or more periods (two maximum).

During this time, control is inoperative.

Operating mode

Using the selector switch, select one of four modes:

- Underspeed without latching
- Underspeed with latching
- Overspeed without latching
- Overspeed with latching

If, on energisation, the switch is placed in one of the three intermediate positions (between "underspeed with latching" and "overspeed with latching"), the relay stays in the rest state ("alarm") and the error is signalled by all three LEDs flashing simultaneously.

The mode selector switch position is taken into account on energisation.

Modifications made during operation will have no effect: the active configuration may therefore be different from that indicated by the switch, the relay operates normally but the change in configuration is signalled by all three LEDs flashing simultaneously.

Latching

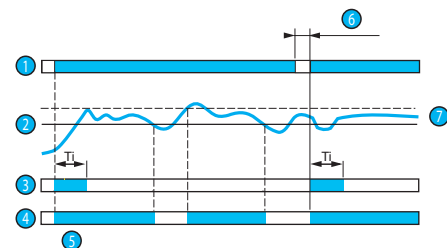
In "memory" mode, when a fault has been recorded, the HSV relay latches in the rest position ("alarm" operational state). Once the speed is correct again, the relay can be unlatched (reset) by closing contact S2 (for 50 ms minimum).

Irrespective of the speed of the controlled process, when S2 is closed the HSV relay is inhibited, the output is at the operating point ("normal" operational state); if the speed is still not correct when contact S2 is reopened, the relay latches again in the rest position ("alarm" operational state).

The HSV can also be reset, by switching off and on again several times in succession (the power break must last at least 1500 ms).

If the process speed is incorrect, this method is limited by the same restriction as resetting using S2.

HSV - Control of underspeed without latching



- 1 Voltage (S1)
- 2 Threshold
- 3 Inhibit LED
- 4 Relay
- 5 Inhibit delay on starting (T_i)
- 6 1500 ms min.
- 7 Speed

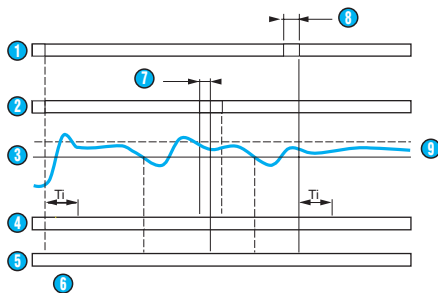
After the end of the inhibit delay on starting, " T_i ", as soon as the measured speed drops below the threshold value, the output relay changes state, from operating point to rest position ("alarm" operational state, 11-14 open and 11-12 closed).

It returns to the initial state when the speed rises above the threshold plus the hysteresis (fixed at 5% of the displayed threshold).

After the power supply returns, following a break that has lasted at least 1500 ms, the relay is in the ("normal") operating state during the time delay and stays there until the speed is above the threshold.

Principles

HSV - Control of underspeed with latching

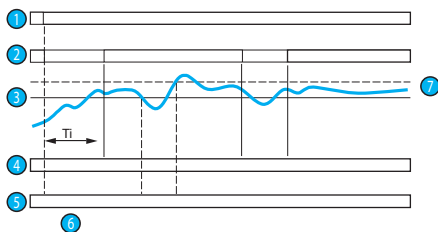


- 1 Voltage (S1)
- 2 Contact S2
- 3 Threshold
- 4 Inhibit LED
- 5 Relay
- 6 Inhibit delay on starting (T_i)
- 7 50 ms min.
- 8 1500 ms min.
- 9 Speed

When the HSV has been configured in "memory" mode, if underspeed is detected, the output relay stays in the rest state ("alarm") irrespective of any subsequent change in the speed of the process.

It will not be able to revert to ("normal") operating state until contact S2 closes (50 ms minimum). If, when S2 reopens, the speed is inadequate, the relay reverts to the rest latched state ("alarm"). The HSV can also be reset by a power break (1500 ms minimum); the relay then returns to the ("normal") operating state for at least the duration of the time delay, irrespective of the speed of the process.

HSV - Underspeed with inhibition by S2



- 1 Voltage (S1)
- 2 Contact S2
- 3 Threshold
- 4 Inhibit LED
- 5 Relay
- 6 Inhibit delay on starting (T_i)
- 7 Speed

On energisation, to allow the controlled process to reach its nominal operating speed, the HSV relay is inhibited for a period that is adjustable from 0.6 to 60 seconds.

This time delay can be modified during inhibition to be shorter or longer.

The HSV relay can also be inhibited by the closing of contact S2: on starting, for example, if the process acceleration time is more than 60 s, or at any time during operation.

Irrespective of the origin (delay on starting or S2 closing), inhibition maintains the output relay in the "closed" position ("normal" operational state, contacts 11-14 closed and 11-12 open) and is signalled by the Inhibit LED lighting up.

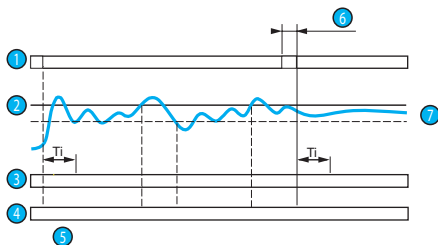
If, after removal of the inhibition (end of delay on starting or opening of contact S2), the signal detection phase has not ended, the relay drops out after the expected time between two pulses (measured from the end of inhibition).

Inhibition must last for as long as required for the product to detect at least 2 periods.

If the signal type has not been determined at the end of the inhibit period, the "inhibit" LED flashes for as long as it is impossible to measure the speed.

Similarly, during operation, it is possible to inhibit the HSV relay at any time by closing S2.

HSV - Control of overspeed without latching



- 1 Voltage (S1)
- 2 Threshold
- 3 Inhibit LED
- 4 Relay
- 5 Inhibit delay on starting (T_i)
- 6 1500 ms min.
- 7 Speed

After the end of the inhibit delay on starting, " T_i ", as soon as the measured speed rises above the threshold value, the output relay changes state, from operating point to rest position ("alarm" operational state, 11-14 open and 11-12 closed).

It returns to the initial state when the speed falls back below the threshold minus the hysteresis (fixed at 5% of the displayed threshold).

After a power break that has lasted at least 1500 ms, the relay is in the ("normal") operating state during the time delay and stays there until the speed is below the threshold.