

Five Cases Where 3-Phase Motors May Run Single Phase

acim.nidec.com/motors/usmotors/techdocs/profacts/5cases-run-1phase

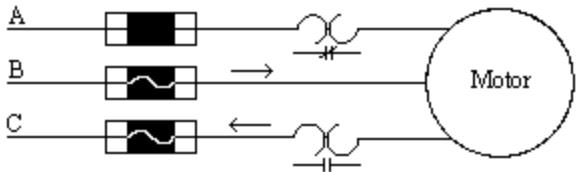
If a one phase conductor supplying a 3-phase running motor is opened the motor usually continues to run as a single-phase machine. But current drawn by the operating phase is greater than design conditions for the winding. You may not discover single-phasing until the winding is damaged. Under some conditions, you may not recognize it at all. Preventing trouble is simple: use overload protectors in all three phases.

Typical Single-Phase Conditions

Motor-circuit fuse blows or circuit opens because of burned connection, worn switch contacts, etc. and motor goes on running. Two overload relays are sufficient to protect the motor. You can use suitable dual-element fuses instead of relays. This trouble often occurs because relay heaters selected are too high, or have been tampered with or neglected. Check relays regularly.

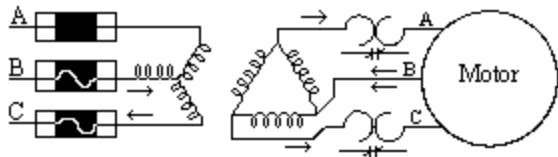
Open Primary Phase

Where transformers are connected wye-delta or delta-wye and have isolated neutral, they can cause severely unbalanced 3-phase current in motor. Current in one phase sometimes runs as much as twice that in others. If high phase lacks relays, like B (below), motor keeps on running until winding is damaged. Or on starting attempts, damage may be done before overload relays trip.



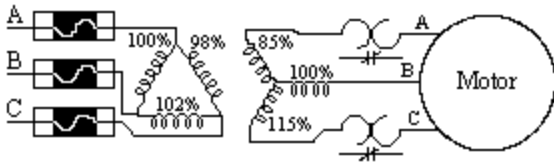
Unbalanced Primary Voltage

With delta-wye, wye-delta transformers can also be a trouble source. A 2% voltage unbalance in one phase of primary can cause 15% over current in one motor phase. If this phase is the unprotected one of a heavily loaded motor, winding can be damaged. Voltage unbalance isn't rare, so three relays are in order where you use this transformer connection.



Shunted Single-Phase Load

The shunted single phase load can produce unbalanced currents in a motor when one line is opened. Depending on magnitude of shunted load and load on motor, one motor may carry current high enough to damage the winding.



This is another case where detection may not be easy, so avoid trouble with a third relay. Most modern starters provide plenty of space for easy installation of third relay.

Parallel 3-Phase Motors

Parallel 3 phase motors that are supplied from the same source can exchange current under some circumstances when one line is open.

Larger motor, No. 1 below, will supply unbalanced 3-phase current to smaller motor, No. 2. Motor No. 2 may even be able to start.

But one phase will carry overload while other two lines carry about normal current or lower, so again damage may result to unprotected phase.

