

FRANKLIN AID



Franklin Electric



Franklin Application/Installation Data (AID) ... For The Professional Driller-Installer

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Reduced Voltage Starters (RVS) and Franklin Submersible Motors

REDUCED VOLTAGE STARTERS

This month's technical topic is REDUCED VOLTAGE STARTERS. One of the misconceptions about these devices is that their function is to protect the motor. This is not the case, and as a matter of fact, all Franklin 3-phase submersible motors are suitable for full-voltage starting. Under this condition the motor speed goes from zero to full speed within a half-second or less. Simultaneously, the motor current goes from zero to locked rotor amps, then drops to running amps at full speed. Although it doesn't harm the motor, this may dim lights, cause momentary voltage dips to other electrical equipment, and shock load power distribution transformers.

Reduced voltage starters limit this voltage dip, and power companies often require them. Another reason for a reduced-voltage starter is to reduce motor starting torque. That, in turn, reduces the stress on shafts, couplings, and discharge piping. In addition, reduced-voltage starters slow the rapid acceleration of the water on start-up. This helps to control upthrust and water hammer.

Reduced Voltage Starters Not Usable With Single Phase Motors

Even though larger single-phase motors (10 & 15 HP) require considerable in-rush current when starting, it is not practical to use RVS devices on single-phase motors. The reason is that single-phase motors use a switching relay to remove the start capacitors as the motor comes up to speed. RVS devices naturally inhibit the voltage required for proper relay operation and will cause nuisance tripping of the overload.

METHODS OF REDUCING VOLTAGE AT MOTOR START

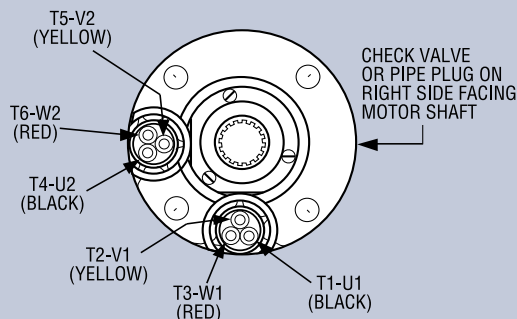
"Soft start" refers to reducing the voltage during the starting phase of a three-phase motor. There are five generally accepted methods of reducing voltage, although only four are practical with a submersible motor.

Part Winding: This method requires two sets of windings for each of the 3 phases, making necessary 9 motor leads and possibly a special control panel. Because this is not a cost-efficient approach to manufacturing or installing a submersible motor

Wye-Delta: A wye-delta motor starter and a special 6-lead

motor are required for this method. The internal wiring configuration of a wye-delta motor is changed by the action of the wye-delta starter that actually switches lead connections.

WYE-DELTA LEAD LOCATION



The motor starts in a wye configuration, where only 58% of full line voltage is applied to each of the three windings, then switches to full voltage in the delta configuration. Both in-rush current and starting torque are limited to 33% of the rated values during the wye starting phase. This method is widely used outside of North America. Most Franklin 3-phase motors are available in wye-delta designs.

Wye-Delta starters of the open-transition type, which momentarily interrupt power during the starting cycle, are not recommended. Closed-transition starters, which have no interruption of power during the start cycle, should be used.

Primary Resistance: A standard 3-lead motor and a special control panel are utilized in this technique. At start-up the control panel energizes the motor through a resistor in each phase. The voltage drop across the resistors lowers the voltage to the motor. After a preset time, usually a few seconds, the resistors are shorted out and full voltage is applied to the motor. The amount of voltage drop is determined by the choice of resistors.

Auto Transformer: With an auto transformer, a standard



2003 Franklin Tech Schedule Announced

The dates for 2003 Franklin Tech are listed below. The October and November sessions will offer instruction on **larger 6" and 8" motors** and will include a tour of Franklin's Wilburton, OK, factory. Other sessions will include a tour of Franklin's 4" motor factory at Siloam Springs, AR. Contact the **Submersible Hotline** at **800.348.2420** to register for a class or to receive more information, or log on to **www.franklin-electric.com**.

January 14 - 15	May 6 - 7	November 11 - 12 (Large Motor)
February 11 - 12	June 3 - 4	December 2 - 3
March 18 - 19	September 16 - 17	
April 8 - 9	October 14 - 15	

3-lead motor is also used, along with a special control panel that contains a transformer with several voltage taps. Typical auto transformer panels can deliver 50%, 65%, or 80% of full line voltage during start-up. After a preset period the transformer is switched out of the circuit and the motor is connected directly to full line voltage.

Two important points should be noted in the use of auto transformers. (1) Franklin submersible motors should be supplied with **at least 55% of rated voltage** to ensure adequate starting torque. (2) Determining whether to use the 65% tap or the 80% tap depends on the percentage of the maximum allowable cable length used in the system. If the cable length is less than 50% of the maximum allowable (consult the Franklin AIM Manual), either the 65% or the 80% taps may be used. When the cable length is more than 50% of allowable, the 80% tap should be used.

Solid State: In recent years, solid state soft start devices have gained favor in the water systems industry by combining a standard 3-lead motor with a solid state starter which utilizes semiconductor technology to reduce voltage and hold starting current below a present maximum value. Variable-Frequency Drives are included in this category (see AIM Manual, page 32).

Such starters often offer a number of programmable options as to how much voltage will be applied to the motor during starting. Typically they are preset for a 30-second "ramp up" time to full voltage. **It is EXTREMELY IMPORTANT to note**

in these cases that the "ramp up" time must be readjusted so that the motor receives full voltage within THREE SECONDS MAXIMUM to prevent excessive radial and thrust bearing wear.

Solid State Devices With Subtrol-Plus

If your system is equipped with Franklin's Subtrol-Plus three-phase motor protector two important considerations must be given: 1) Because solid state soft start devices often manipulate the voltage sine wave during starting, they are not recommended for use with Subtrol-Plus unless a bypass contactor is installed across the starter. If Subtrol-Plus remains in the circuit during reduced voltage starting, nuisance tripping of the overload function may result; 2) Because of the fast reaction time of Subtrol-Plus, **full voltage must be achieved within TWO SECONDS** to prevent unwanted tripping of the protective circuits.

WHICH SOFT START TO USE

When deciding which reduced voltage device best meets your needs for a particular installation, consider cost, availability, access to repair parts, and the particular features each device offers. Other characteristics that might effect your decision are the level to which in-rush current is limited, the amount of starting torque needed, smoothness of acceleration, and whether or not special motors or control panels are required.

Jimmy Vela, Field Service Manager, Texas and Mexico



served as Field Service Manager for Latin America working

Handling field service concerns in Texas and Mexico is Jimmy Vela who is works from Franklin's Dallas sales office. Before starting his career with Franklin in 1994, Jimmy worked as a design engineer for a lighting company where his Bachelor of Arts degree in Industrial Engineering, earned at Washington State University, served him very well. Prior to relocating to Dallas, Jimmy

from Motores Franklin in Monterrey, Mexico.

Jimmy's off duty time is concentrated around his wife Vela, who teaches Spanish at the elementary level, and their three children (a girl and two boys). Whenever he can find a quiet moment, Jimmy enjoys fishing and following basketball, soccer and football. Ask him about the WSU Cougars football team.

Texas distributors and contractors rely heavily on Jimmy's knowledge and experience in the water well field. He is called on regularly to provide training in submersible motor construction and operation and works closely with the TGWA to provide training for its members. Jimmy can be contacted via e-mail at jvela@fele.com, or phone mail at 260.827.5112.

TOLL-FREE HELP FROM A FRIEND

Phone Franklin's toll-free SERVICE HOTLINE for answers to your installation questions on submersible pump motors. When you call, a Franklin expert will offer assistance in troubleshooting submersible systems and provide immediate answers to your motor application questions.

Franklin Electric SERVICE HOTLINE 800-348-2420 FAX 260-827-5102
www.franklin-electric.com

