

# TBKZ

系列  
SERIES

## 智能水泵控制器

Smart water pump controller



### > 概述 / Overview

TBKZ智能水泵控制器主要用于调节设备的工作频率，减少能源损耗，能够平稳启动设备，减少设备直接启动时产生的大电流对电机的损害。同时自带模拟量输入（速度控制或反馈信号用），PID控制，泵切换控制（用于恒压），通信功能，宏功能（针对不同的场合有不同的参数设定），多段速等等。可广泛适用于工农业生产及各类建筑的给水、排水、喷淋管网增压以及暖通空调冷热水循环等多种场合的自动控制。控制器是技术人员充分吸收国内外水泵控制的先进经验，经过多年生产和应用，不断完善优化后，精心设计制作而成。

变频控制柜产品具有过载、短路、缺相保护以及泵体漏水，电机超温及漏电等多种保护功能及齐全的状态显示，并具备单泵及多泵控制工作模式，多种主备泵切换方式及各类启动方式。可广泛适用于工农业生产及各类建筑的给水、排水、消防、喷淋管网增压以及暖通空调冷热水循环等多种场合的自动控制。

TBKZ smart water pump controller is mainly used to adjust the working frequency of equipment and reduce energy consumption. It can start equipment steadily and reduce damage to the motor arising from large current generated upon direct start of equipment. Meanwhile, it is equipped with analog input (for speed control or feedback signal), PID control, pump switching control (for constant pressure), communication function, macro function (different parameters settings exist for different occasions), multi-speed, etc. It can be widely applied to auto-control of water supply, drainage, spraying pipeline pressurizing, HVAC cold and hot water circulation and other multiple occasions in industrial and agricultural production and various buildings. The controller is designed and manufactured by technicians after full absorption of domestic and foreign advance experience in water pump control through years of production and application as well as incessant improvement and optimization.

The variable-frequency control cabinet includes multiple protective functions against overload, short circuit, default phase, pump leakage, motor overtemperature, and power leakage, etc. as well as complete status display. Besides, single-pump and multi-pump control modes, multiple main-auxiliary pump switching modes and various starting methods are included. It can be widely applied to the auto-control of water supply, drainage, fire control, spraying pipeline pressurizing, HVAC cold and hot water circulation other multiple occasions in industrial and agricultural production and various buildings.

### > 性能特点 / Performance characteristics

- ◆ 控制线路简明，性能稳定，质量可靠。

The control circuit is simple, the performance is stable and the quality is reliable.

- ◆ 选用知名品牌电器元件为主要零件，使得控制系统误动作为零。

Electrical elements of renowned brands are selected as main parts to achieve 0 malfunction of the control system.

- ◆ 具有过电压、欠电压、缺相、过电流保护等诸多自动保护功能。

It contains multiple self-protection functions including overvoltage, undervoltage, default phase and overcurrent protection, etc.

- ◆ 具有多种启动方式、控制方式，适用范围广。

It has multiple starting methods and control modes and can be applied to a wide range.

- ◆ 可根据用户增加控制功能。

Control functions may be added based on the user.

## 特点分析 / Characteristic Analysis

### ◆ 节约能源 / Energy saving

变频器控制电机与传统控制的电机比较，能源节约是最有实际意义的，根据注水量、输油量需求来供给的电机工况是经济的运行状，即可节电48.8%。

Compared to that of motor of traditional control, the energy conservation of variable-frequency control motor has the most practical meaning. 48.8% power is saved as the motor supplied based on the demand of water injection and oil transportation is running under an economic mode.

### ◆ 运行成本降低 / Running cost reducing

传统电机的运行成本由三项组成：初始采购成本、维护成本和能源成本。其中能源成本大约占电机运行成本的77%。通过能源成本降低44.3%，再加上变频启动后对设备的冲击减少，维护和维修量也跟随降低，所以运行成本将大大降低。

The running cost of traditional motor is comprised of three factors: initial purchasing cost, maintenance cost and energy cost. The energy cost is approximately 77% of the total running cost. The running cost will be largely reduced as the energy cost is reduced by 44.3% and the maintenance quantity is reduced due to lower impact on equipment after variable-frequency starting.

### ◆ 提高压力控制精度 / Pressure control precision improving

变频控制系统具有精确的压力控制能力。使电机的压力输出与系统所需的注水量相匹配。变频控制电机的输出量随着电机转速的改变而改变。由于变频控制电机速度的精度提高，所以它可以使管网的系统压力变化保持在3psig变化范围，也就是0.2bar范围内，有效地提高了工况的质量。

The variable-frequency control system has a precise pressure control capacity that matches the pressure output of motor with the water injection needed by the system. The output of variable-frequency control motor varies with the motor RPM. Due to the improved motor speed precision, it can keep the system pressure change on the pipeline within a range of 3psig, which is 0.2bar to effectively improve the quality of working conditions.

## 控制类型 / Control type

### ◆ 液位控制 / Liquid level control

该控制柜配高性能Key浮球开关，根据液位的高、低变化，自动控制给排水泵的开、停。

The control cabinet is equipped with high-performance Key float switch and able to turn on or off the water supply and drainage pumps through auto-control based on the liquid level changes.

### ◆ 压力控制 / Pressure control

外接电接点压力表或压力控制器，可根据管网压力的变化自动开泵、关泵，本型大量应用于生活给水及消防增压系统。

It is connected to pressure gauge with electric contact or pressure controller and able to automatically turn the pump on or off based on the pipeline pressure changes. The model is massively applied to domestic water supply and firefighting pressurizing system.

### ◆ 延长电机的使用寿命 / Service life extending

变频器从0Hz启动电机，它的启动加速时间可以调整，从而减少启动时对电机的电器部件和机械部件所造成的冲击，增强系统的可靠性，使电机的使用寿命延长。此外，变频控制能够减少机组启动时电流波动，这一波动电流会影响电网和其它设备的用电，变频器能够有效的将启动电流的峰值减少到最低程度。

The frequency converter starts the motor from 0Hz. Its start-up acceleration time is adjustable to reduce the impact on electric and mechanical parts of the motor upon starting, enhance system reliability, and extend service life of motor. Besides, the frequency control may reduce the current fluctuation of units upon starting. As this fluctuation may affect the electricity on the grid and other equipment, the frequency converter can effectively reduce the starting current peak to the minimum degree.

### ◆ 降低了电机的噪音 / Motor noise reducing

根据电机的工况要求，安装变频调速后，电机运转速度明显减慢，因此有效地降了电机运行时的噪音。

Based on the requirement for working conditions of motor, the motor RPM is obviously slowed down after the frequency control is installed. Therefore it effectively reduces the noise of motor running.

### ◆ 温度控制 / Temperature control

外接温度控制器，根据设定的温度范围开泵或关泵，应用于恒温、热交换系统等需温度控制的场合。

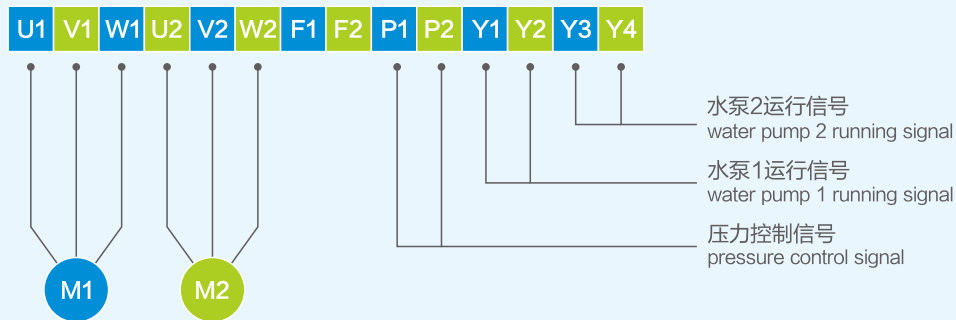
It is connected to temperature controller and able to turn the pump on or off based on the set range of temperature. It is applied to constant temperature and heat exchange systems and other occasions where temperature control is needed.

### ◆ 时间控制 / Time control

机箱面板设有时间设定按钮和显示器，用户可根据定时需要控制水泵的开启和关闭，适用于各种定时或有规律的间歇式工作方式的控制。

The case panel has time setting button and monitor for users to turn on or off the pump based on the timing. It is applied to control of various timed or regular batch-type working modes.

## 安装接线 Installation wiring



### > 工作原理 / Working principle

通常，把电压和频率固定不变的交流电变换为电压或频率可变的交流电的装置称作“变频器”。该设备首先要把三相或单相交流电变换为直流电（DC）。然后再把直流电（DC）变换为三相或单相交流电（AC）。变频器同时改变输出频率与电压，也就是改变了电机运行曲线上的 $n_0$ ，使电机运行曲线平行下移。因此变频器可以使电机以较小的启动电流，获得较大的启动转矩，即变频器可以启动重载负荷。

变频器具有调压、调频、稳压、调速等基本功能，内部结构复杂但使用简单，所以不只是用于启动电动机，而是广泛的应用到各个领域，各种各样的功率、各种各样的外形、各种各样的体积、各种各样的用途等都有。随着技术的发展，成本的降低，变频器一定还会得到更广泛的应用。

In general, the device that turns the AC electricity of constant voltage and frequency to AC electricity of variable voltage or frequency is called “frequency converter”. The equipment first turns three-phase or single-phase AC electricity to DC electricity, and then turns the DC electricity to three-phase or single-phase AC electricity. The frequency converter changes the output frequency and voltage simultaneously, which means it changes the  $n_0$  on the motor running curve and moves the curve down in a parallel manner. Therefore the frequency converter may give large starting torque with relatively small starting current, which means it can enable heavy load.

The frequency converter has the basic functions of pressure regulating, frequency modulation, pressure stabilizing and speed modulation. The internal structure is complicated but the use is simple. Therefore it is not only used on motor starting, but also widely applied extensively to various fields, various powers, various shapes, various volumes and various purposes. As the technology develops and the cost reduces, the frequency converter will certainly be applied more extensively.



## 功能介绍 / Function Introduction

### ◆ 变频控制柜的电源切换与保护功能

#### Power Switching and Protection of variable-frequency control cabinet

变频控制柜通常设计有断路器元件，它连接着进线电源，可以帮助变频控制柜完成电路的通断操作，并能够在电路和变频器出现短路或过载时提供保护。此外变频柜还可以在电机维护时切断电源保证操作人员安全。

The variable-frequency control cabinet is generally design with breaker element connected to the incoming power supply. It can help the variable-frequency control cabinet complete the on-off operation of circuit and provide protection when the circuit and frequency converter are in short circuit or overload. Besides, the cabinet can also cut off the power during motor maintenance to guarantee operator safety.

### ◆ 变频控制柜的变频调速功能

#### Frequency control of variable-frequency control cabinet

变频控制柜的控制面板上设置有变频调速用的电位器，可以根据操作人员的输出频率，向电机输送指令信号，控制电机的转速。变频控制柜中的部分产品设置有工频切换功能，以保证在变频器出现故障时，通过自动控制回路将电动机切换回工频电源。

A potentiometer for frequency control is mounted on the control panel of the variable-frequency control cabinet. It can send command signal to the motor based on the output frequency from the operator and control the motor RPM. Power frequency switching is mounted inside the variable-frequency control cabinet to guarantee to switch the motor back to the frequency power supply via the auto-control circuit when fault occurs to the frequency converter.

### ◆ 变频控制柜的直观控制功能

#### Direct control of variable-frequency control cabinet

变频控制柜的柜体上设计有显示设备与操作面板，它与变频控制柜内部的电器元件相连，可以直观显示变频控制柜的运行状态，同时方便操作人员控制变频装置的运行，及对电机等被控制设备进行现场操作。

变频控制柜的柜体上，还安装有各种仪器仪表及指示灯，例如电压表、电流表，及电源指示灯、报警指示灯、运行指示灯、工频指示灯、故障指示灯等。变频控制柜的运行及操作状态，可以直接反应在各项仪表及指示灯上，实现对变频器工作状态的实时监测。

The cabinet body is designed with display equipment and operation panel connected to the electric elements in the variable-frequency control cabinet. It is able to directly display the running state of the variable-frequency control cabinet and meanwhile facilitate the operators to control the frequency converter running and field operation on motor and other equipment under control.

The cabinet body is also equipped with various instruments, meters and indicators, such as voltmeter, ammeter, power indicator, alarm indicator, running indicator, power frequency indicator, and fault indicator, etc. The running and operation state of the variable-frequency control cabinet may be directly reflect on various meters and indicators to realize real-time monitoring of the working conditions of the frequency converter.

### ◆ 变频控制柜的安全防护功能

#### Safety Protection of variable-frequency control cabinet

变频控制柜将各种包括变频器在内的各种电气元件都集中在柜体内，这样可以减少外部环境对电气元件的影响程度，降低电气元件受环境污染的程度，也降低变频控制柜操作人员的触电危险，因此具有较好的安全防护效果。

The variable-frequency control cabinet keeps various electric elements in the cabinet body, including the frequency converter. In this case, the impact of external environment on electric elements is reduced, the environmental contamination on electric elements is reduced, and the risk of electrocution among the operators of the variable-frequency control cabinet is reduced too. Therefore it has a good effect of safety protection.