Power to Drive

The new operating electronics for BLDC motors

The time has come: ebm-papst's new powerful VARIOTRONIC VTD-K4 operating electronics offer customers the option of operating BLDC motors with their own external controller (image 1). These operating electronics are functionally identical to the integrated electronic module K4 in the portfolio of ebm-papst. This module is already successfully used in many applications with the motors of the series ECI 63.xx-K4 (BLDC internal rotor motor in the power range of 150 - 400 W) and VDC 49.15-K4 (BLDC external rotor motor in the power range of 100 - 150 W).

The significant increase in the possible motor output power of up to 1,000 watts and 4,800 watts peak power makes it possible to operate the new BLDC internal rotor motor ECI 80.xx (up to 754 watts continuous power). In addition, all BLDC motors from ebm-papst (internal and external rotor motors in safety extra-low voltage) can now be operated. (Image 2)

The commissioning and activation during operation (e.g. by means of a PLC) are identical, regardless of whether the controller is integrated in the motor or is designed as an external controller. The 4Q controller allows for position control. Alternatively, a speed or torque control is also possible.

Four digital inputs allow for the actuation of the controller. It is to be noted that two of the digital inputs can be parameterized. A 0-10 volt setpoint signal can be specified via an additional analog input.

Three digital outputs are part of the additional equipment. Actual speed values or error messages can be digitally issued through these outputs, for example, and the status display occurs visually via an LED.

A large number of protective functions is also implemented. Coded plugs allow for a quick and reliable commissioning.

Extensive integrated functions allow for a simple trouble-free operation

The profile generator generates linear travel profiles and ensures that movement profiles are executed as the user requires.

An integrated encoder divider function makes it possible to adapt encoder signals from the motor into a form that can be read by the superordinate control system. An integrated ballast controller protects the drive in regenerative operation from damage and prevents feedback. The ballast circuit is designed in the controller. The necessary ballast resistor is to be connected to the controller externally.

A digital input can be used to specify the speed as a PWM input (pulse width modulation).

The controller offers several types of commutation. Motors can be operated as a block type or sinusoidal. The drive system is maximally energy-efficient with the field-oriented control. The ideal current is impressed into the individual motor phases at all times. This is used entirely for torque generation. An optimal degree of efficiency is ensured in the system and the reactive power is reduced to a minimum.

The rotor position detection may occur in individual cases through three digital HALL sensors integrated in the motor.

Applications with higher requirements for positional accuracy may be used by providing more rotor position information. These more accurate signals can be provided by either motor-integrated analog HALL sensors or by an incremental encoder attached to the motor.

The controllers allow a subsequent firmware update via the service interface in the installed state. In this way, a costly disassembly of the controller is not necessary in the event of an update. The downtimes of the machine are thereby reduced to a minimum. The use of the latest firmware can be ensured if required.

Commissioning is a breeze

Integration into various networks and easy commissioning are supported with the Kickstart PC software. (Image 3)

On the one hand, the software makes it possible to adjust the relevant motor parameters. On the other hand, customer-specific parameterizations (e.g. complete travel profiles) can be made. If desired, these can be firmly programmed before delivery.

Drive controller for a wide range of applications

The new VARIOTRONIC VTD-K4 drive controller is a compact and powerful solution for a wide range of applications, such as automated guided vehicles, wheelchairs or warehouse shuttles.

Battery-powered automated guided vehicles (AGV) and mobile applications require efficient drive systems with high efficiency and maximum power density in a compact space (image 4).
If high load differences with different speeds are moved dynamically, this is a demanding task for a drive system and in particular for the drive controller.

With nominal voltages of 24 and 48 V / DC, up to 1,000 watts of power can be achieved with a continuous current of up to 40 A.

In this case, peak currents of 100 A can be made available for up to 5 seconds to master the high load differences, which are repeatedly required during the acceleration process of an AGV. This drive controller therefore clearly sets itself apart from commercially available controllers. The drive controller can also handle similar stored requirements for shuttle applications.

Another important aspect for battery-operated automated guided vehicles is the low quiescent current consumption of the drive controller. This is the basic requirement for an energy-saving standby operation between the trips and the charging cycles.

Simple Assembly as well as Compact Design

The compact and sturdy design of the control electronics allows for space-saving installation in the immediate vicinity of the drive in the often limited installation space.

The controllers are available in the voltage versions of 24 and 48 V/DC. These operating electronics have been through the paces at ebm-papst for a long time so that customers must parameterize and qualify the product for their application. Afterwards, the product can be safely used in series products. ebm-papst thus allows its customers to minimize their development and testing time.
The product is also available through the ebm-papst online portal.
Link: idt.ebmpapst.com

Images (all ebm-papst images)

Image 1: VARIOTRONIC VTD-K4 product image

Image 2: Drive system ECI 80.60 motor with Optimax gearbox and brake

Image 3: The "Kickstart" PC software allows for easy commissioning and parameterization

Image 4: Application image of AGV

Image 5: Picture of author (Patrick Schumacher)

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