

CD TEKdrive™ Servo Drives TEK10 (LV) & TEK20 (HV) Series

General Description

The TEKdrive range of fast, smooth and accurate servo drives are specifically designed for use with brushed DC motors in small CNC machine applications. Utilisation of Step and Direction input signals enables the TEKdrive to replace direct stepper motors and deliver greater accuracy and increased speed. Easy to mount, compact and versatile, the TEKdrive range deliver proportional spindle velocity control and also provide the ability to control analogue servo motors.

- Drive and fault indicator LEDs
- Analogue voltage input options
- Minimal heat generation
- Mounts vertically or horizontally
- All controls located along one edge

Features

- Power Output over 2000W
- Dual high speed processors
- Full trimpot PID adjustment during operation
- Delivers 1-25A continuous current
- Operates at supply voltages from 15-80V
- Speeds in excess of 2MHZ
- Over current trip adjustments

Applications

- DC brushed motor control
- CNC machine conversion & retrofits
- Analogue Servo retrofit
- Spindle Motor Control
- Industrial Automation
- Process Control

Functional Diagram

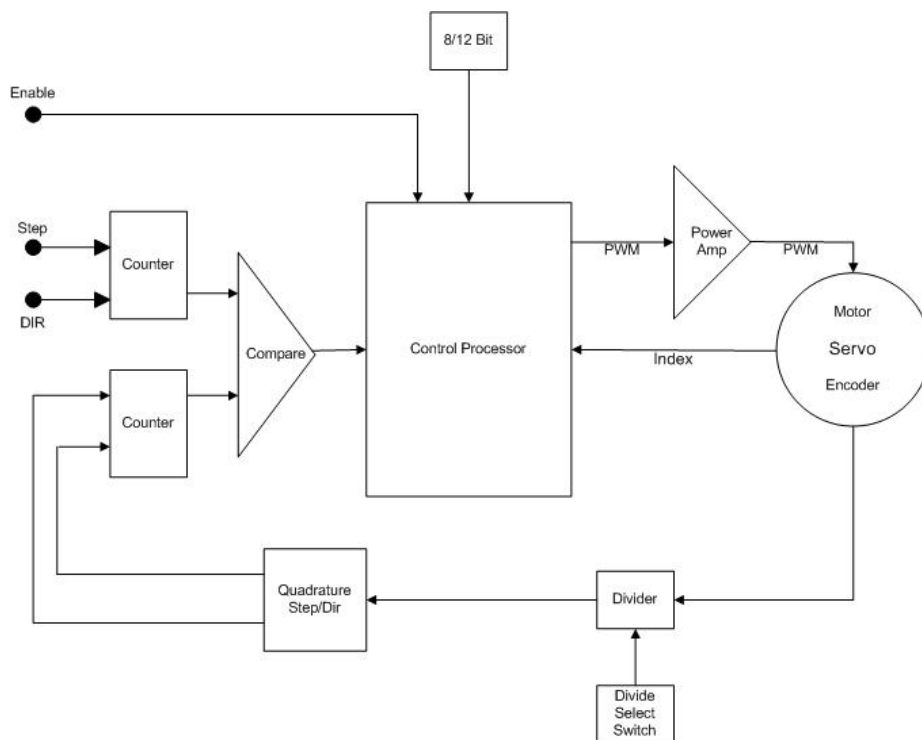


Figure 1 Functional block diagram of TEK10/20

Technical Specifications & Characteristics

Parameter	TEK10	TEK20
Drive Specification		
Drive Voltage (Maximum)	80V,	180V
Drive Voltage (Minimum)	15V,	15V
Drive Voltage Ripple	<2% See Note 2	<2% See Note 2
Drive Current (Peak)	35A,	20A
Drive Current (Continuous)	25A,	15A
Drive Current Trip Value	30A,	15A
Drive Current Trip Time	2mSec,	TEK20 > 1mSec
Servo Motor Resistance (Minimum)	1 ohm	1 ohm
Servo Motor Inductance (Minimum)	1mH	1mH
PWM Switch Frequency	24Khz	24Khz
Logic Specification		
12V Logic Supply	12-15V @ 0.1A	12-15V @ 0.1A
12V Driver Supply	12-15V @ 0.1A	12-15V @ 0.1A
Logic Level	TTL	TTL
Encoder Quadrature TTL Channels	2 or 3	2 or 3
Encoder Index Signal	Index used when transitioning from VMODE	Index used when transitioning from VMODE
Encoder Current (Maximum)	100mA	100mA
Encoder Pulse Frequency (Maximum)	2Mhz	2Mhz
Encoder following error trip	+/- 120 or +/- 2000 selectable	+/- 120 or +/- 2000 selectable
+5V Encoder Voltage	5V +/- 10% 0.25A Maximum current draw	5V +/- 10% 0.25A Maximum current draw
Physical Specification		
Dimensions	88mm (W) 118mm(H) 40mm(D) 3.46in (W) 4.65in(H) 1.58in(D)	88mm (W) 118mm(H) 40mm(D) 3.46in (W) 4.65in(H) 1.58in(D)
Weight	250gms or 8.8oz	250gms or 8.8oz
Mounting	3M tapped holes	3M tapped holes
Motor Terminals	Screw Tab rated 500V 32A	Screw Tab rated 500V 32A
12V Supply Terminals		
Logic Connector	IDC10	IDC10
Encoder Connector	2.54mm (0.1") Header	2.54mm (0.1") Header
Operating Temperature Range	0 ~ 55 DegC RH 90% non condensing	0 ~ 55 DegC RH 90% non condensing
Storage Temperature Range	-30 ~ 85 DegC RH 90% non condensing	-30 ~ 85 DegC RH 90% non condensing
Vibration/Shock Resistance	0.5/2G	0.5/2G
Thermal Resistance	0.165R @ 80degC	0.265R @ 80degC
Thermal Heat Dissipation (Maximum)	90W	65W

Table 1 TEKdrive™ 10 & 20 technical specifications

NOTE:

1. Values are common to both TEK10 and TEK20 unless specified.
2. The addition of a capacitor (C1 in Figure 2 – Connection Diagram) near the power input terminal may be required to reduce supply ripple voltage. This is particularly important when using high input voltages.

Connection Diagram

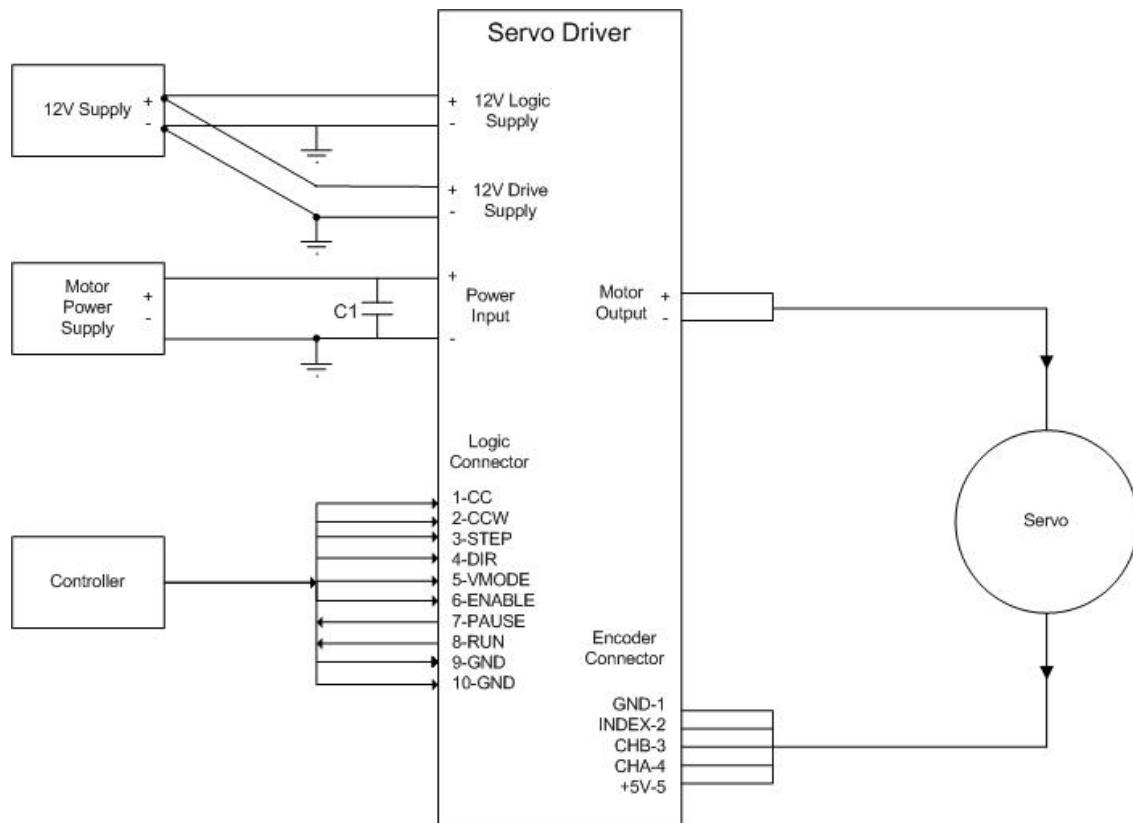


Figure 2 Diagram detailing all available connections

Figure 2, above, details all available connections. The drive connections are all located along one end of the controller to provide easy access when mounted. The two boards in each controller possess separate power supply inputs in order to reduce any noise reaching the top processor board when used with high current motors.

When operating with motors rated less than 10A they can be connected to the same power supply. In this case, wrapping the supply wires to the top motor through a ferrite bead will block any HF noise. Detailed descriptions of each pin and functions are given in table 2

Ordering Information

TEKdrive™ TEK 10 (LV)	<input type="checkbox"/>	<input type="checkbox"/>	
VMODE	V	E	Encoder Feedback
No VMODE	N	T	Tacho Feedback
		N	No Feedback
TEKdrive™ TEK 20 (HV)	<input type="checkbox"/>	<input type="checkbox"/>	
VMODE	V	E	Encoder Feedback
No VMODE	N	T	Tacho Feedback
		N	No Feedback

Insert the corresponding letters in each square to indicate mode and feedback requirements.

I/O Descriptions

Logic Connector - IDC10

Pin	Label	Description
1	CC	Input – In VMODE logic high selects clockwise rotation of the servo motor. Speed is proportional to the VMODE Input voltage.
2	CCW	Input - In VMODE logic high selects counter clockwise rotation of the servo motor. Speed is proportional to the VMODE Input voltage.
3	STEP	Input – When NOT in VMODE the rising edge of the step input commands a single encoder step rotation in the direction selected by DIR.
4	DIR	Input – When NOT in VMODE a logic high selects a clockwise step and logic low a counter clockwise step.
5	VMODE	Input – Logic high commands the controller into VMODE. See VMODE description for further information
6	ENABLE	Input – Logic high enables the driver to control the servo motor. Logic low stops all output to the servo motor.
7	PAUSE	Output – Logic high is output when: The drive is in transition from VMODE to Step/Dir and is rotating the motor to find the Index. The drive is in VMODE and the motor is ramping up to speed.
8	RUN	Output – Logic high output indicating the drive is running correctly. This corresponds with the Green LED on the drive. If the drive is ENABLE and an error occurs the RUN output will indicate logic low.
9	GND	Logic ground connection.
10	GND	Logic ground connection.

Encoder Connector - 2.54mm (0.1") Header

Pin	Label	Description
1	GND	Signal ground to encoder
2	INDEX	Optional index signal input from encoders fitted with index pulse generation. One pulse per encoder revolution. See VMODE description for application.
3	CHB	Input of encoder B channel
4	CHA	Input of encoder A channel
5	+5V	5V supply to encoder

12V Logic Supply - Screw Terminal

Pin	Label	Description
1	+	12V logic supply positive. For operations with motors drawing less than 10A this supply can be connected to the same power source as the 12V Driver Supply. The supply lines should be wrapped through a ferrite bead to block HF noise propagating from the driver supply. For high current motors the supplies should be separated to reduce driver noise entering the logic 12V supply.
2	VMODE Input	In VMODE the controller accepts a 0-5V input signal. The servo motor is driven in the direction set by CW and CCW at a speed proportional to the input voltage level. See VMODE calibration for further information
3	-	12V Logic Supply ground.

12V Drive Supply - Screw Terminal

Pin	Label	Description
1	+	12V driver supply input connection.
2	-	12V driver supply ground connection.

Power Input - Terminal Barriers

Pin	Label	Description
1	+	Power input positive connection. See technical specifications above for

		voltage and current limits.
2	-	Power input ground connection.
Motor Output - Terminal Barriers		
Pin	Label	Description
1	+	Connection to the positive terminal of the servo motor.
2	-	Connection to the negative terminal of the servo motor.

Table 2 Input Output Descriptions for TEK10/TEK20 Servo driver

Switches and Adjustment Descriptions

Table 3 Switches and adjustment descriptions for the TEK10 Servo Driver

Controls –Upper Board		
Label	Signal	Description
SWU1	VCAL	Selecting ON when RUN is logic LOW enables VMODE calibration button to calibrate spindle speed.
SWU2	ERROR	ON selects 12 bit error mode. OFF selects 8 bit error mode. A following error will occur if the encoder count is > +/-120 from the commanded position in 8 bit mode and > +/- 1000 counts in 12 bit mode. SWU2 is read to set the following error following ENABLE. After the drive is enabled SWU2 controls the function of VOUT and VMODE calibration procedure. If the error mode needs to be changed the drive must be re-enabled before the setting will take effect.
SWU3	DIV2	Divides the encoder input pulse count by 4. Can be used in conjunction with SW4.
SWU4	DIV4	Divides the encoder input pulse count by 2. Can be used in conjunction with SW3.
POT1	DER	Derivation: This POT adjusts the rate of change error gain.
POT2	INT	Integration: This POT adjusts the steady state error gain.
POT3	PRO	Proportional: This adjusts the amount of power relative to the error signal that the drive will output.
POT4	SPAN	Adjusts the gain of the VOUT signal.
POT5	ZERO	Adjusts the zero voltage of the VOUT signal.
BUT1	CAL	VMODE calibration button.
JACK	VOUT	VOUT function is selected by SWU2 as follows: SWU2 ON – VOUT voltage is proportional to the following error. SWU2 OFF – VOUT is proportional to the PWM power. With VOUT proportional to PWM power this signal can be used to control analogue servo motor. (2.5mm Socket)
LED	GREEN	ON - indicates drive engaged and OK
LED	RED	ON – Drive disengaged due to following error trip FLASHING - Drive disengaged due to over current trip
Controls - Lower Board		
Pin	Label	Description
POT6	TRIP	Adjusts the drive current trip limit between 0.5A and the maximum current limit selected by SWL1 and SWL2. See current limit logic table for values.
SWL1	CUR1	ON increases the driver peak current error trip limit. See current limit logic table for values.
SWL2	CUR2	ON increases the driver peak current error trip limit. See current limit logic table for values.

Peak Current Limit - Logic			
SW1	SW2	TEK10	TEK20
Off	Off	10A	5A
On	Off	20A	10A
Off	On	20A	10A
On	On	30A	15A

Table 4 Current Limit Logic Table

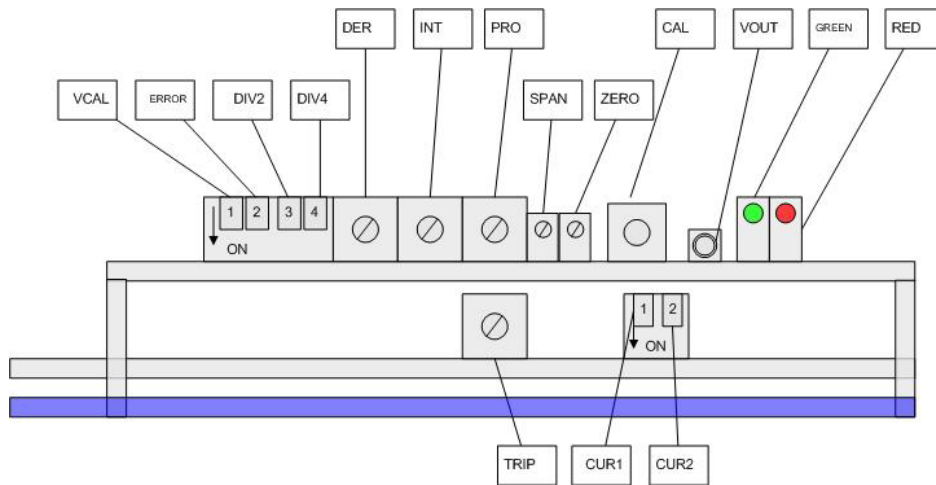


Figure 4 Switches and adjustments

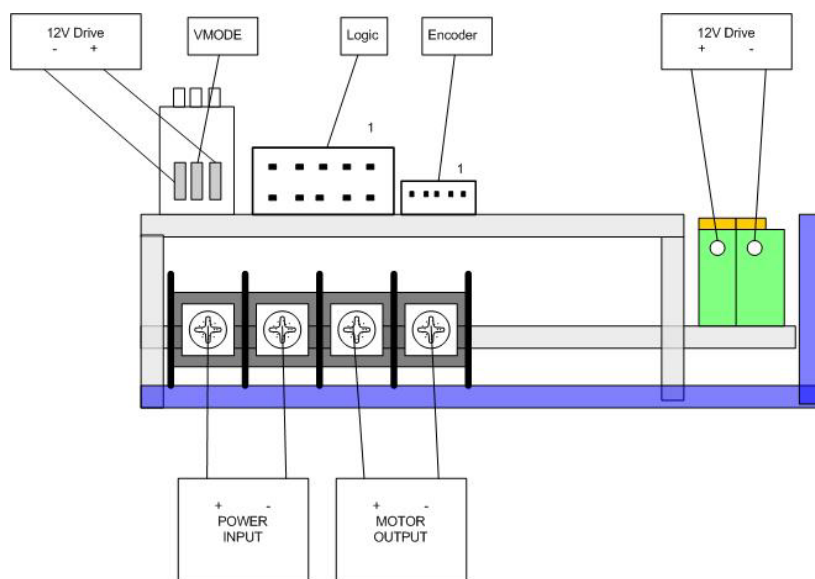


Figure 5 Connector Diagram

VMODE Options

The TEK10 and TEK20 drives are available with the VMODE option. This allows the drive to switch between step/direction servo control and a voltage input control. It is optional and should only be requested if the drive is to be used to control a machine spindle.

In VMODE the servo drive controls the motors velocity proportional to the VMODE input voltage between 0 and 5 volts. The direction of rotation is set by the CW and CCW inputs. The drive can be calibrated to provide proportional RPM control across the full speed range of the motor.

When switching between modes, the driver will output a PAUSE signal to stop axis movement until the drive either reaches speed on entering VMODE or reaches the index position on re-entering Servo mode.

Calibration of the VMODE proportional control is achieved by selecting VMODE high and selecting SWU2 to OFF. Pressing the CAL button then causes the driver to ramp the motor power up to full and remain at full power for 5 seconds before ramping down to zero. During the full power application the drive reads encoder pulses from the motor and saves the full speed count to flash memory. SWU2 should be returned to its original position.

Following calibration motor RPM is controlled in proportion to the VMODE Input signal. For example, an input of 2 volts would drive a motor RPM of 0.2 times the maximum RPM recorded during calibration.

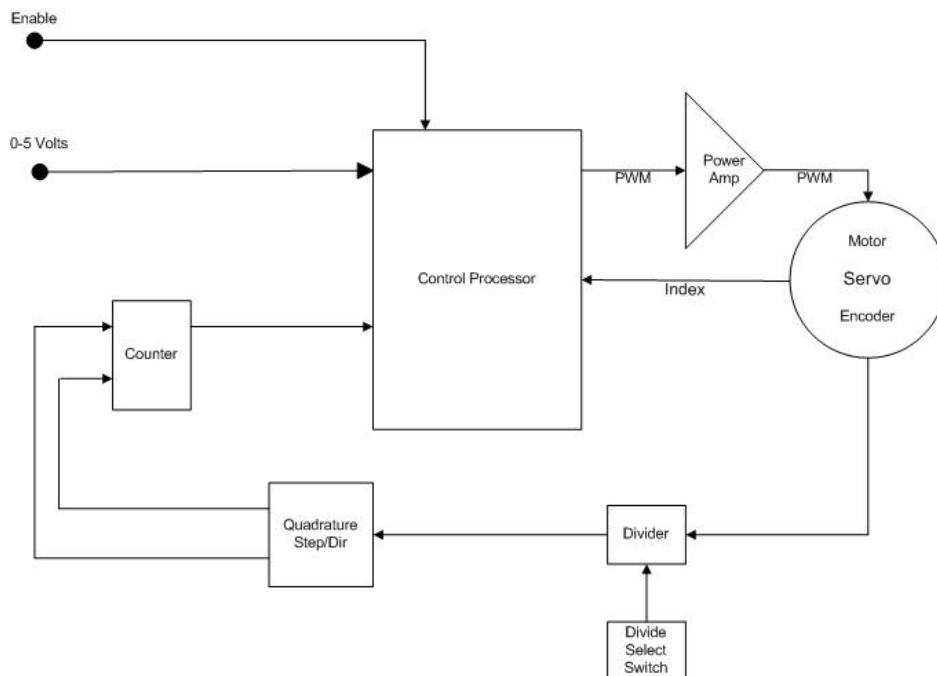


Figure 6 VMODE Functional Block Diagram

Thermal Characteristics

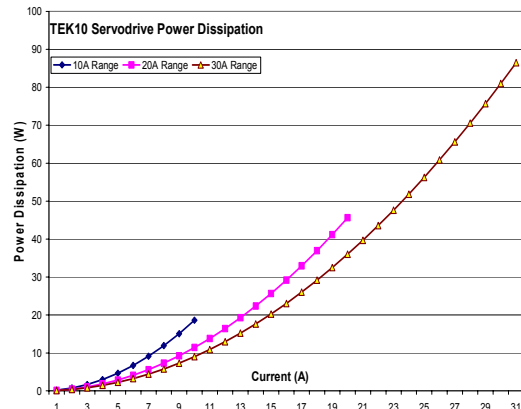
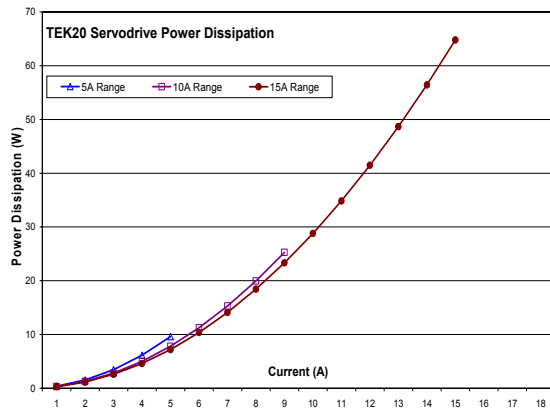


Figure 7 Drive heat generation in various configurations

Figure 7, above, graphs the heat generation of the drive in its various configurations. Each current trip switch lessens the heat generated as it reduces the value of the sense resistors.

Use these graphs as the basis for selecting a suitable heat sink for the drives' intended use.



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