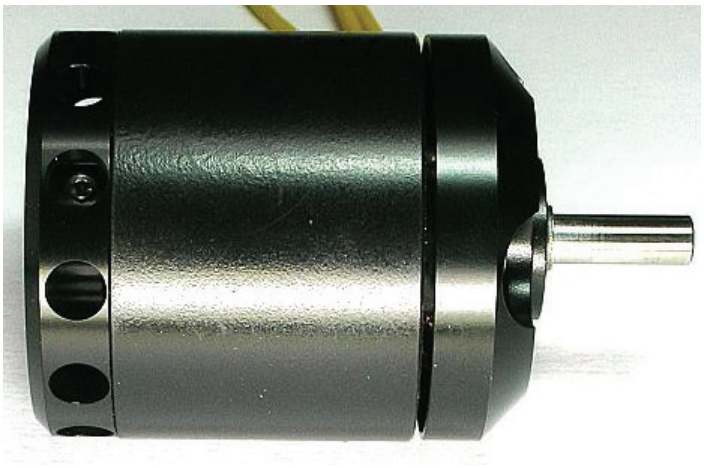
KOFORD
ENGINEERING, LLC



1.57 inch (40mm) Series

• High power density sensorless outer rotor motor with built in internal fan for Industrial, and aerospace applications including blowers, pumps, generators and UAV's.

• Peak output of 1,001 watts and continuous power of 516 watts with no heatsinking and with a weight of only 199g for a power to weight ratio of 5 kilowatts per kilogram.

• Up to 89% efficiency

• Long life premium synthetic bearing lube grease with -73C to 149C temperature range

• Hi temp windings with 200°C insulation, epoxy magnets and silicone lead wires. Motor rated for continuous operation at 150°C.

•Hardened and precison ground stainless shaft.

•Three bearing design for longer bearing life.

• Characterized for operation at 12, 24, 36 and 48 volts

• Custom windings or modified shafts on request

• Matching drives available.

•Available frameless

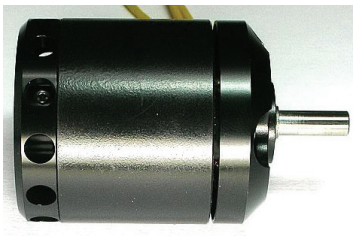
Table of Contents

KOFORD ENGINEERING, LLC

1.57" (40mm) Outer Rotor Slotted Brushless Motor at 12 Volts

1,506 to 6,394 rpm no load • Continuous power up to 254 watts • Peak power up to 426 watts

High power density outer rotor internal fan cooled 12 slot 14 pole slotted motor. The motor uses class 200°C insulation for ruggedness. 150°C Neo magnets are used along with a hardened stainless shaft, and high temp silicone insulated ultraflex lead wires. Custom windings or modified shafts can be provided. Available frameless.

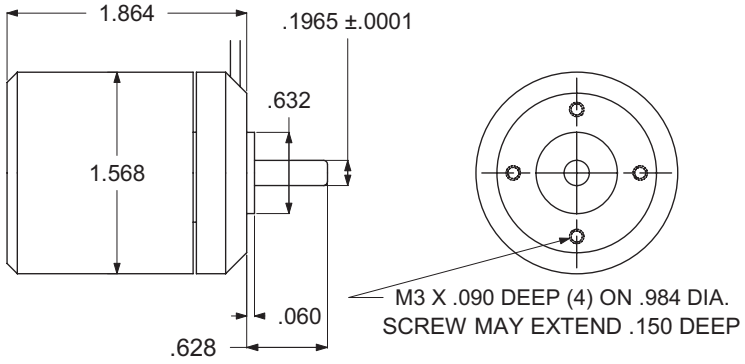


Motor Data

Winding number		126	251	533
Test voltage	volts	12	12	12
No load speed	rpm±12%	1,506	3,008	6,394
Speed/torque slope	rpm/oz-in	11	12	17
Peak efficiency	%	81	85	87
Rated power	watts	38	94	254
Rated speed	rpm	800	2,363	5,298
Rated torque	oz-in	64	54	65
Rated current	amps	6.0	10	26
Peak output	watts	38	94	426
speed at peak output	rpm	744	2,363	3,815
torque at peak output	oz-in	69	54	149
current at peak output	amps	6.5	10.0	60.0
Km	oz-in/√w	12.1	12.8	12.5
Winding resistance#	ohm±15%	.786	.177	.041
No load current	amp±50%	.16	.42	1.34
Velocity constant	rpm/volt±12%	126	251	533
Torque constant Kt	oz-in/amp	10.7	5.4	2.5
Winding inductance	mH	.547	.128	.029

Ambient temperature range -73C to 149C

Weight 7 oz. (199 grams), maximum winding temp. 180C Rated power is for a 40°C ambient max., at elevated ambients the continuous motor power must be reduced. Contact factory for more information. Data is for winding and magnet temperature of 20°C. For 251 winding peak power is limited by drive current limit. Phase leads are 18 AWG



Leads	
Brown	Phase C
Blue	Phase A
White	Phase B
Red	+5 volts
Black	Ground
Yellow	Sensor A
Orange	Sensor B
Green	Sensor C

Ordering Information: To place an order contact us at mail@koford.com

Example: Part Number 40 S 251 A

- 40 — Motor type
- S — Type S=sensorless
- 251 — Winding number
- A — Modifications A=none

Test Data
Total System Performance
40S126A with S12V10A Controller at 12 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
1500	0.00	0.0	0.0	0.19
1465	4.32	4.6	78.1	0.50
1410	9.18	9.5	79.9	1.00
1347	14.38	14.3	79.6	1.50
1284	20.13	19.1	79.7	2.00
1216	26.14	23.5	78.4	2.50
1165	30.96	26.6	74.1	3.00
1102	36.64	29.8	71.2	3.50
1036	42.62	32.6	68.1	4.00
982	47.57	34.5	64.0	4.50
918	53.23	36.1	60.2	5.00
859	58.67	37.3	56.5	5.50
800	64.00	37.8	52.6	6.00
744	69.31	38.1	48.9	6.50
675	74.82	37.3	44.5	7.00
628	79.23	36.8	40.9	7.50
560	84.88	35.2	36.7	8.00
497	90.46	33.3	32.6	8.50
434	95.49	30.6	28.4	9.00
348	100.72	25.9	22.5	9.60

Dyno test results of a motor and drive combination with voltage held to 12v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

Test Data
Total System Performance
40S251A with S12V10A Controller at 12 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
3008	0.00	0.00	0.0	0.45
2952	5.12	11.17	77.6	1.20
2903	9.23	19.84	82.7	2.00
2832	14.82	31.04	86.2	3.00
2772	20.05	41.14	85.7	4.00
2699	25.68	51.30	85.5	5.00
2633	31.18	60.75	84.4	6.00
2565	36.74	69.73	83.0	7.00
2495	42.40	78.29	81.6	8.00
2435	47.97	86.43	80.0	9.00
2363	53.62	93.78	78.1	10.00

Dyno test results of a motor and drive combination with voltage held to 12v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

Test Data
Total System Performance
40S533A with S12V60A Controller at 12 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
6394	0.00	0.00	0.0	1.37
6249	8.56	39.57	73.3	4.50
6190	12.38	56.70	78.8	6.00
6102	17.78	80.32	83.7	8.00
6024	22.75	101.44	84.5	10.00
5911	28.00	122.53	85.1	12.00
5855	33.34	144.50	86.0	14.00
5727	38.67	163.87	85.4	16.00
5655	43.62	182.53	84.5	18.00
5570	49.25	202.96	84.6	20.00
5447	54.51	219.76	83.2	22.00
5373	59.73	237.49	82.5	24.00
5298	64.70	253.71	81.3	26.00
5226	70.00	270.77	80.6	28.00
5076	75.50	283.66	78.8	30.00
5033	80.38	299.36	78.0	32.00
4938	85.50	312.46	76.6	34.00
4842	90.30	323.60	74.9	36.00
4808	95.81	340.88	74.8	38.00
4690	101.06	350.75	73.1	40.00
4621	105.95	362.29	71.9	42.00
4544	111.23	374.11	70.9	44.00
4449	115.76	381.14	69.0	46.00
4364	120.35	388.87	67.5	48.00
4287	125.10	396.91	66.2	50.00
4130	130.59	399.12	64.0	52.00
4042	135.89	406.54	62.7	54.00
3959	140.66	412.11	61.3	56.00
3889	144.73	419.87	60.3	58.00
3815	148.88	425.89	59.2	60.00

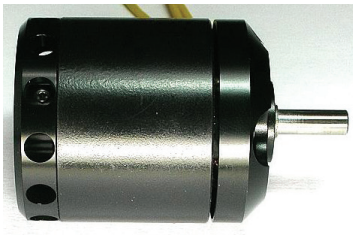
Dyno test results of a motor and drive combination with voltage held to 12v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

KOFORD ENGINEERING, LLC

1.57" (40mm) Outer Rotor Slotted Brushless Motor at 24 Volts

3,031 to 12,837 rpm no load • Continuous power up to 516 watts • Peak power up to 931 watts

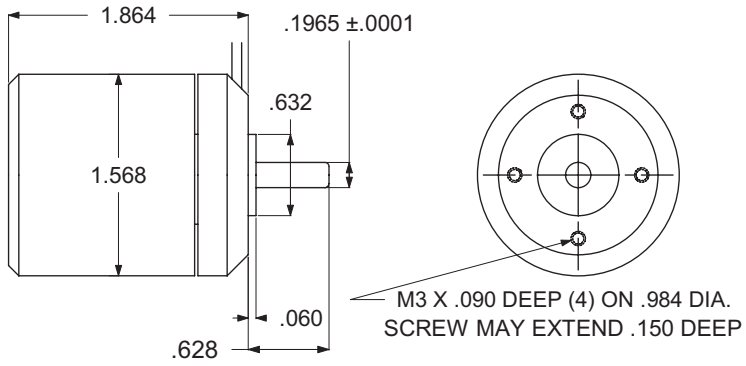
High power density outer rotor internal fan cooled 12 slot 14 pole slotted motor. The motor uses class 200°C insulation for ruggedness. 150°C Neo magnets are used along with a hardened stainless shaft, and high temp silicone insulated ultraflex lead wires. Custom windings or modified shafts can be provided. Available frameless.



Motor Data

Winding number		126	251	533
test voltage	volts	24	24	24
No load speed	rpm±12%	3,031	6,034	12,837
Speed/torque slope	rpm/oz-in	13	15	24
Peak efficiency	%	84	87	88
Rated power	watts	105	238	516
Rated speed	rpm	2,201	5,087	11,357
Rated torque	oz-in	64.5	61.9	61.4
Rated current	amps	6.0	12	26
Peak output	watts	130	384	931
speed at peak output	rpm	1,601	3,817	9,792
torque at peak output	oz-in	108	135	129
current at peak output	amps	10.0	26.0	52.0
Km	oz-in/√w	12.1	12.3	12.5
Winding resistance#	ohm±15%	.786	.177	.041
No load current	amp±50%	.21	.61	2.15
Velocity constant	rpm/volt±12%	126	251	534
Torque constant Kt	oz-in/amp	10.7	5.4	2.5
Winding inductance	mH	.547	.128	.029

Ambient temperature range -73C to 149C. Weight 7 oz. (199 grams), maximum winding temp. 180C Rated power is for a 40°C ambient max., at elevated ambients the continuous motor power must be reduced. Contact factory for more information. Data is for winding and magnet temperature of 20°C. Phase leads are 18 AWG



Leads	
Brown	Phase C
Blue	Phase A
White	Phase B
Red	+5 volts
Black	Ground
Yellow	Sensor A
Orange	Sensor B
Green	Sensor C

Ordering Information: To place an order contact us at mail@koford.com

Example: Part Number 40 S 251 A

- 40 — Motor type
- S — Type S=sensorless
- 251 — Winding number
- A — Modifications A=none

Test Data
Total System Performance
40S126A with S24V30A Controller at 24 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
3031	0.00	0.00	0.0	0.24
2919	8.06	17.41	72.5	1.00
2769	19.84	40.64	84.7	2.00
2625	30.64	59.54	82.7	3.00
2487	42.06	77.44	80.7	4.00
2349	52.90	91.95	76.6	5.00
2201	64.50	105.07	73.0	6.00
2080	74.70	114.98	68.4	7.00
1919	86.62	123.04	64.1	8.00
1781	97.20	128.14	59.3	9.00
1601	108.28	130.33	54.3	10.00
1465	117.90	127.81	48.4	11.00
1289	127.80	122.14	42.4	12.00
1136	137.49	115.54	37.0	13.00
936	148.86	103.69	30.9	14.00

Dyno test results of a motor and drive combination with voltage held to 24v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

Test Data
Total System Performance
40S251A with S24V30A Controller at 24 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
6034	0.00	0.00	0.0	0.64
5913	7.38	32.30	67.3	2.00
5739	18.38	78.11	81.4	4.00
5564	29.49	121.44	84.3	6.00
5402	40.72	162.80	84.8	8.00
5236	52.00	201.49	84.0	10.00
5087	63.26	238.14	82.7	12.00
4919	74.74	272.06	81.0	14.00
4757	85.98	302.70	78.8	16.00
4590	97.36	330.75	76.6	18.00
4429	108.08	354.29	73.8	20.00
4288	119.39	376.83	71.4	22.00
4147	129.57	397.66	69.0	24.00

Dyno test results of a motor and drive combination with voltage held to 24v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

Test Data
Total System Performance
40S534A with S24V60A Controller at 24 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
12837	0.00	0.00	0.0	2.18
12446	14.16	130.40	67.9	8.00
12343	19.23	175.65	73.2	10.00
12218	24.66	222.99	77.4	12.00
12093	29.82	266.96	79.5	14.00
11968	35.14	311.17	81.0	16.00
11855	40.02	351.07	81.3	18.00
11739	45.52	395.42	82.4	20.00
11608	50.45	433.36	82.5	21.90
11496	55.78	474.54	82.4	24.00
11357	61.42	516.32	82.7	26.00
11252	66.62	554.75	82.6	28.00
11117	72.53	596.77	82.9	30.00
10926	78.16	632.00	82.3	32.00
10830	82.19	658.72	80.7	34.00
10744	87.25	693.71	80.3	36.00
10572	92.99	727.58	79.8	38.00
10420	98.60	758.40	79.0	40.00
10331	103.42	790.77	78.4	42.00
10197	109.31	824.96	78.1	44.00
10112	114.27	854.50	77.4	46.00
10015	118.51	878.35	76.2	48.00
9915	123.01	909.33	75.8	50.00
9792	128.56	931.66	74.7	52.00

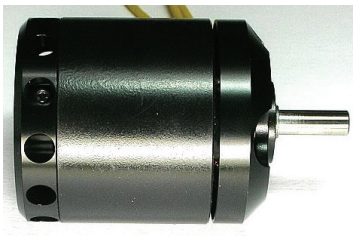
Dyno test results of a motor and drive combination with voltage held to 24v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

KOFORD ENGINEERING, LLC

1.57" (40mm) Outer Rotor Slotted Brushless Motor at 36 Volts

4,557 to 8,352 rpm no load • Continuous power up to 359 watts • Peak power up to 638 watts

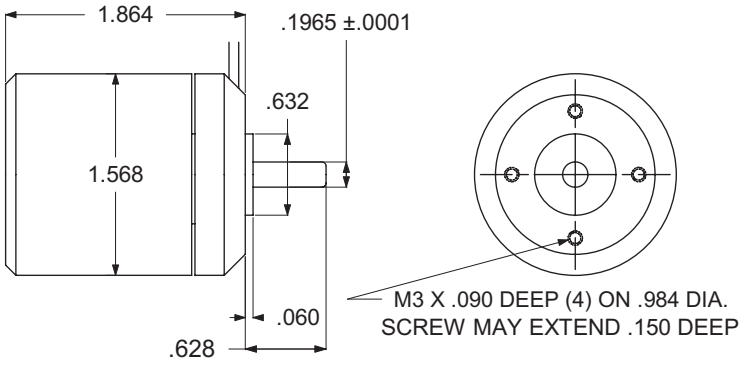
High power density outer rotor internal fan cooled 12 slot 14 pole slotted motor. The motor uses class 200°C insulation for ruggedness. 150°C Neo magnets are used along with a hardened stainless shaft, and high temp silicone insulated ultraflex lead wires. Custom windings or modified shafts can be provided. Available frameless.



Motor Data

Winding number		126	251
Nominal supply voltage	volts	36	36
No load speed	rpm±12%	4,557	9,069
Speed/torque slope	rpm/oz-in	14.9	19
Peak efficiency	%	85	88
Rated power	watts	170	359
Rated speed	rpm	3,638	7,909
Rated torque	oz-in	63.2	61.4
Rated current	amps	6.0	12
Peak output	watts	257	638
speed at peak output	rpm	2,345	6,821
torque at peak output	oz-in	148	128
current at peak output	amps	14.0	24.0
Km	oz-in/√w	12.1	12.8
Winding resistance#	ohm±15%	.786	.177
No load current	amp±50%	.26	.80
Velocity constant	rpm/volt±12%	127	252
Torque constant Kt	oz-in/amp	10.7	5.2
Winding inductance	mH	.547	.128

Ambient temperature range -73C to 149C
Weight 7 oz. (199 grams), maximum winding temp. 180C Rated power is for a 40°C ambient max., at elevated ambients the continuous motor power must be reduced. Contact factory for more information. Data is for winding and magnet temperature of 20°C. Phase leads are 18 AWG



Leads	
Brown	Phase C
Blue	Phase A
White	Phase B
Red	+5 volts
Black	Ground
Yellow	Sensor A
Orange	Sensor B
Green	Sensor C

Ordering Information: To place an order contact us at mail@koford.com

Example: Part Number 40 S 258 A

- 40 — Motor type
- S — Type S=sensorless
- 258 — Winding number
- A — Modifications A=none

Test Data
Total System Performance
40S126A with S36V30A Controller at 36 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
4557.0	0.00	0.00	0.0	0.29
4433.0	7.66	25.14	69.8	1.00
4269.0	18.24	57.60	80.0	2.00
4095.0	30.11	91.25	84.5	3.00
3941.0	41.07	119.82	83.2	4.00
3796.0	51.89	145.76	81.0	5.00
3638.0	63.25	170.27	78.8	6.00
3460.0	74.82	191.57	76.0	7.00
3320.0	86.29	212.00	73.6	8.00
3153.0	96.86	226.06	69.8	9.00
2967.0	107.86	236.86	65.8	10.00
2800.0	117.56	247.50	62.5	11.00
2611.0	128.58	248.50	57.5	12.00
2438.0	138.98	250.80	53.6	13.00

Dyno test results of a motor and drive combination with voltage held to 36v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

Test Data
Total System Performance
40S251A with S36V30A Controller at 36 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
9069	0.00	0.00	0.0	0.83
8846	9.49	62.11	63.9	2.70
8706	16.67	107.42	74.6	4.00
8513	27.54	173.52	80.3	6.00
8298	38.70	237.70	82.5	8.00
8101	49.86	298.93	83.0	10.00
7909	61.41	359.47	83.2	12.00
7714	73.04	416.99	82.7	14.00
7543	83.74	467.50	81.2	16.00
7380	95.26	520.35	80.3	18.00
7135	106.70	563.39	78.2	20.00
7028	117.23	609.81	77.0	22.00
6821	128.54	648.91	75.1	24.00

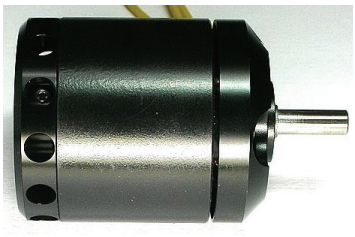
Dyno test results of a motor and drive combination with voltage held to 36v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature.

KOFORD ENGINEERING, LLC

1.57" (40mm) Outer Rotor Slotted Brushless Motor at 48 Volts

•2,076 to 8,352 rpm no load •Continuous power up to 483 watts •Peak power up to 1001 watts

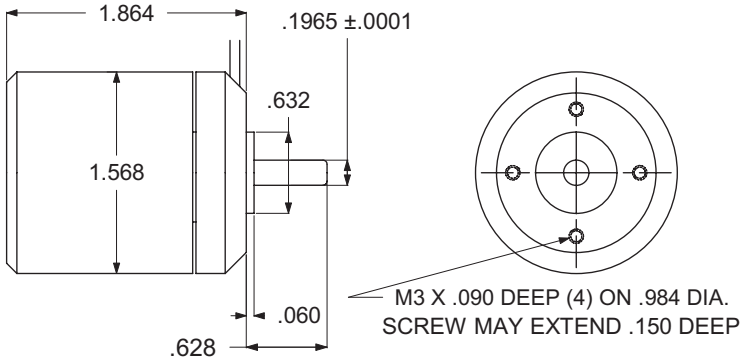
High power density outer rotor internal fan cooled 12 slot 14 pole slotted motor. The motor uses class 200°C insulation for ruggedness. 150°C Neo magnets are used along with a hardened stainless shaft, and high temp silicone insulated ultraflex lead wires. Custom windings or modified shafts can be provided. Available frameless.



Motor Data

Winding number		126	251
Nominal supply voltage	volts	48	48
No load speed	rpm±12%	6,077	12,105
Speed/torque slope	rpm/oz-in	16	22
Peak efficiency	%	86	88
Rated power	watts	235	483
Rated speed	rpm	5,065	10,766
Rated torque	oz-in	62.8	60.6
Rated current	amps	6.0	12
Peak output	watts	397	1001
speed at peak output	rpm	3,887	9,020
torque at peak output	oz-in	138	150
current at peak output	amps	13.0	28.0
Km	oz-in/√w	12.1	12.8
Winding resistance#	ohm±15%	.786	.177
No load current	amp±50%	.31	.97
Velocity constant	rpm/volt±12%	126	252
Torque constant Kt	oz-in/amp	10.7	5.39
Winding inductance	mH	.547	.128

Ambient temperature range -73C to 149C
Weight 7 oz. (199 grams), maximum winding temp. 180C Rated power is for a 40°C ambient max., at elevated ambients the continuous motor power must be reduced. Contact factory for more information. Data is for winding and magnet temperature of 20°C. For 12 amp drive peak power is imited by drive current limit. Phase leads are 18 AWG



Leads	
Brown	Phase C
Blue	Phase A
White	Phase B
Red	+5 volts
Black	Ground
Yellow	Sensor A
Orange	Sensor B
Green	Sensor C

Ordering Information: To place an order contact us at mail@koford.com

Example: Part Number 40 S 258 A

- 40 — Motor type
- S — Type S=sensorless
- 258 — Winding number
- A — Modifications A=none

Test Data
Total System Performance
40S126A with S48V30A Controller at 48 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
6077	0.0	0.0	0.0	0.34
5941	7.2	31.5	65.7	1.00
5764	17.7	75.5	78.7	2.00
5582	28.7	118.7	82.5	3.00
5409	40.1	160.7	83.7	4.00
5239	51.4	199.4	83.1	5.00
5065	62.8	235.4	81.8	6.00
4885	74.9	270.9	80.6	7.00
4732	85.7	300.0	78.1	8.00
4566	96.0	324.4	75.1	9.00
4354	107.4	346.0	72.1	10.00
4185	118.7	367.7	69.6	11.00
4043	129.5	387.6	67.3	12.00
3887	138.3	397.9	63.8	13.00

Dyno test results of a motor and drive combination with voltage held to 48v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature. Motor leads are full untrimmed length.

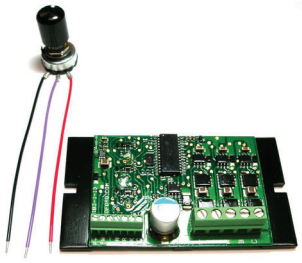
Test Data
Total System Performance
40S251A with S48V30A Controller at 48 volts

Rpm	Torque Oz-in	Watts Out	Efficiency %	Amps
12105	0.00	0.00	0.0	1.00
11721	15.58	135.20	70.4	4.00
11478	26.42	224.42	77.9	6.00
11237	37.47	311.65	81.2	8.00
10987	49.73	404.30	84.2	10.00
10766	60.56	482.54	83.8	12.00
10557	71.63	559.71	83.3	14.00
10334	83.06	635.25	82.7	16.00
10150	93.71	703.94	81.5	18.00
9933	104.30	766.77	79.9	20.00
9745	116.13	837.54	79.3	22.00
9546	127.82	902.99	78.4	24.00
9218	139.98	955.02	76.5	26.00
9020	149.94	1000.85	74.5	28.00

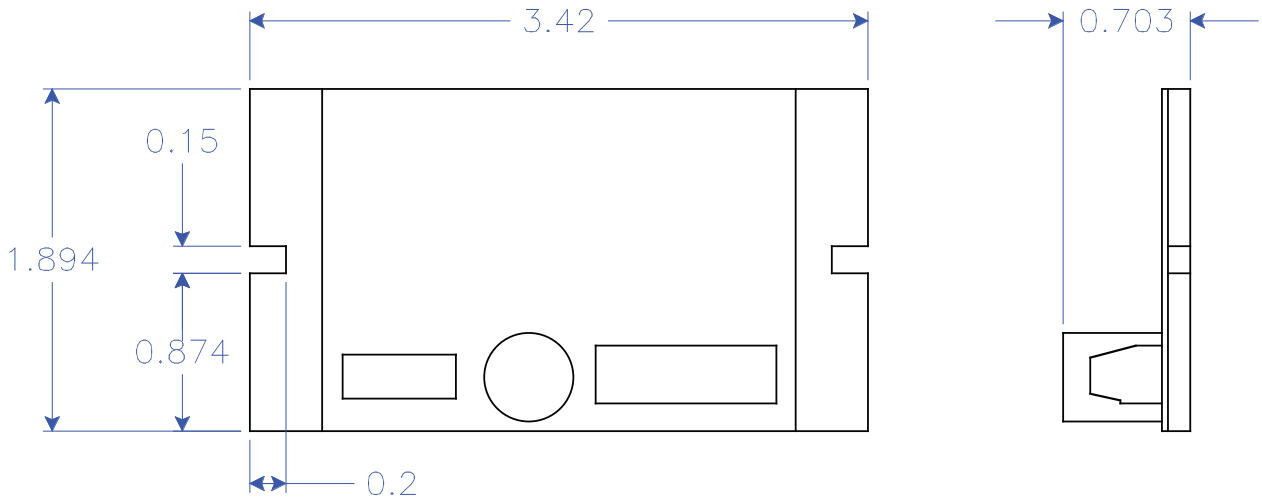
Dyno test results of a motor and drive combination with voltage held to 48v at input of drive using remote voltage sense on the power supply. Winding temperature is held below 40C by running test quickly and/or allowing motor to cool between tests. Test were conducted at room temperature. Motor leads are full untrimmed length.

KOFORD ENGINEERING, LLC

S12V10A digital sensorless motor driver 10A 10-12V



Ultra high efficiency miniature sensorless digital drive with 37kHz pwm frequency, designed for speed input from a pot, or form a 0-5V analog signal or an equivelant 5 volt pwm signal from a microcontroller. In the case of the pwm input the frequency should be above 8kHz to allow the drive to filter out the AC component of the signal. Between 0 and .5 volts the motor is off, the speed ramps to the maximum value as the input is increased from .5v to 4.5 volts. Between 4.5 and 5.0 volts the motor runs at full speed. The speed input should not exceed 5.0 volts. The drive has a sophisticated start up which will start higher inertia loads than is typical for sensorless drives. Once power supply, motor and speed pot are connected, the motor can be operated without the need for any adjustments, set up or programing. If reversible operation is required a SPDT switch can be added between DR and P- or a 0 or 5 volt signal from a microcontroller to DR can be used. If the switch is open the motor will run in the clockwise direction, if the switch is closed the motor will run in the counterclockwise direction. The Tach output is referenced to P-, and is a 5 volt square wave at 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm). The EN input will turn off the motor if pulled to ground. To apply brake connect BRK to P+ with a swich, or use an external 5v signal connected between BRK and BG. The CV-1 braking module should be used when braking if the drive is used with a power supply instead of a battery. The drive can be custom programed for your specific application, for example to run at a fixed speed when power or the enable is applied. The drive weighs 185g with the aluminum mounting plate.



Terminal block positions (motor lead hook up for Koford motors).

P+=connect to one side of pot (5.0v) (red)
PW=connect to pot wiper (center terminal) (purple)
P-=connect to other side of pot (ground) (black)
EN=unconnected or 5v to run, 0v to turn motor off
DR=leave unconnected for forward direction, hook to P- for reverse
BK=unconnected or 0v=off, 5v=on

TC=tach/encoder output 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm)
-=Connect to black (-) lead of power supply
+=Connect to red (+) lead of power supply
A=blue motor wire
B=white motor wire
C=brown motor wire

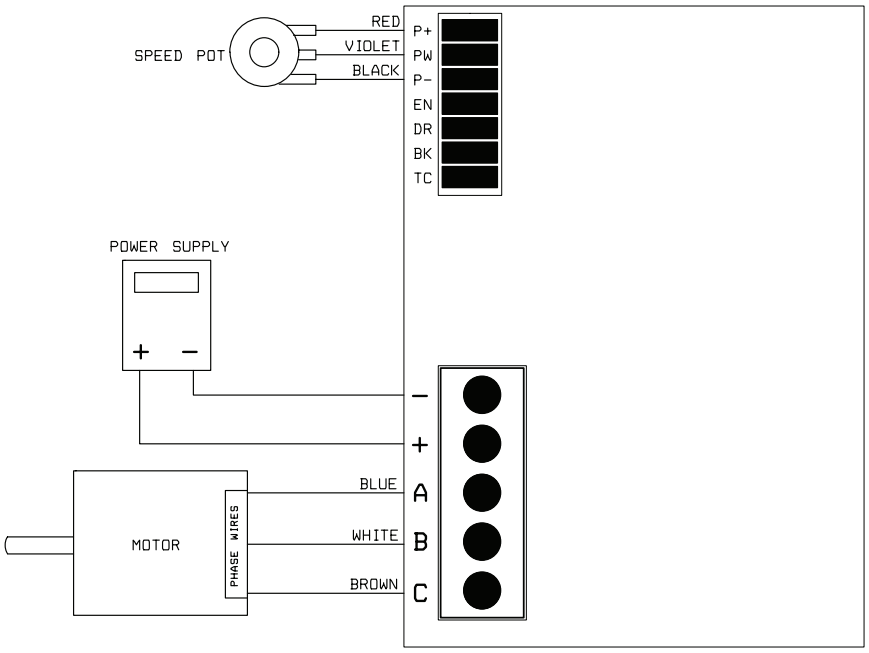
Ordering information:

please send the order to: mail@koford.com

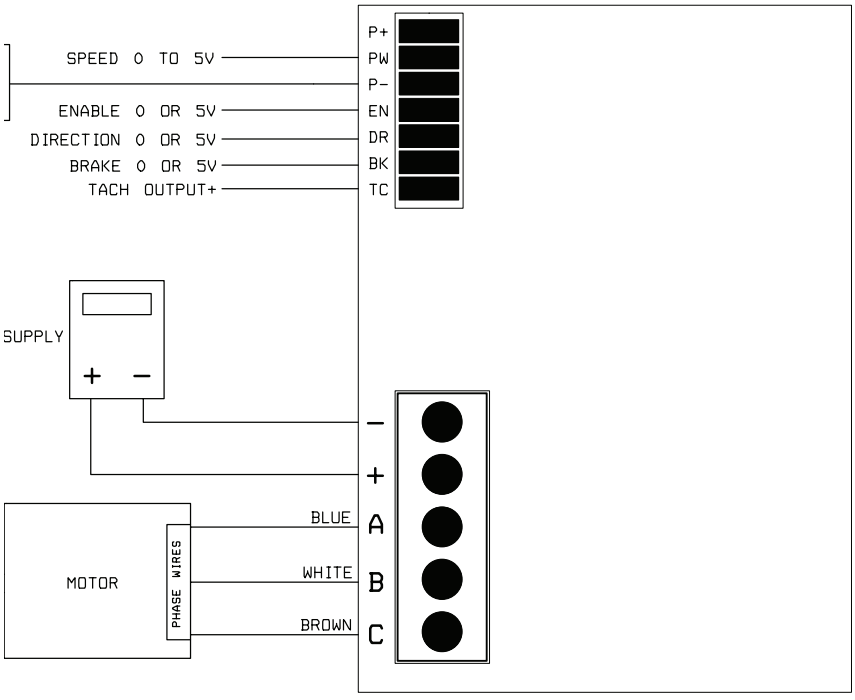
Part number:

S12V10A-40A closed loop speed control drive 1,500 rpm
S12V10A-40B closed loop speed control drive 3,000 rpm
P1 speed pot with knob and leads

Stand alone operation with speed pot, motor direction can be reversed by switching Blue and White leads



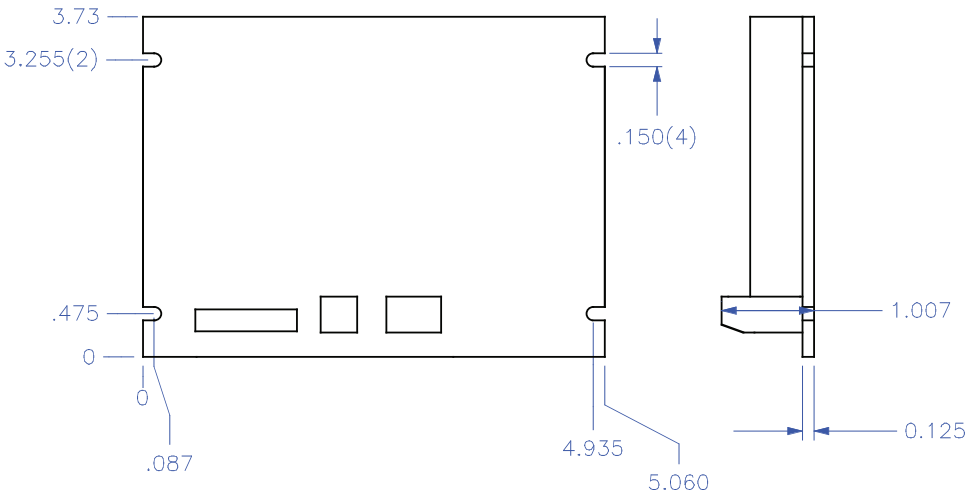
External control



KOFORD ENGINEERING, LLC

S24V30A digital sensorless motor driver 30A 10-32V

Ultra high efficiency miniature sensorless digital drive with 37kHz pwm frequency, designed for speed input from a pot, or form a 0-5V analog signal or an equivelant 5 volt pwm signal from a microcontroller. In the case of the pwm input the frequency should be above 8kHz to allow the drive to filter out the AC component of the signal. Between 0 and .5 volts the motor is off, the speed ramps to the maximum value as the input is increased from .5v to 4.5 volts. Between 4.5 and 5.0 volts the motor runs at full speed. The speed input should not exceed 5.0 volts. The drive has a sophisticated start up which will start higher inertia loads than is typical for sensorless drives. Once power supply, motor and speed pot are connected, the motor can be operated without the need for any adjustments, set up or programing. If reversible operation is required a SPDT switch can be added between DR and P- or a 0 or 5 volt signal from a microcontroller to DR can be used. If the switch is open the motor will run in the clockwise direction, if the switch is closed the motor will run in the counterclockwise direction. The Tach output is referenced to P-, and is a 5 volt square wave at 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm). The EN input will turn off the motor if pulled to ground. To apply brake connect BRK to P+ with a swich, or use an external 5v signal connected between BRK and BG. The CV-3 braking module should be used when braking if the drive is used with a power supply instead of a battery. The drive can be custom programed for your specific application, for example to run at a fixed speed when power or the enable is applied. The drive weighs 185g with the aluminum mounting plate.



Terminal block positions (motor lead hook up for Koford motors).

P+=connect to one side of pot (5.0v) (red)
PW=connect to pot wiper (center terminal) (purple)
P-=connect to other side of pot (ground) (black)
EN=unconnected or 5v to run, 0v to turn motor off
DR=leave unconnected for forward direction, hook to P- for reverse
BK=unconnected or 0v=off, 5v=on

TC=tach/encoder output 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm)
-=Connect to black (-) lead of power supply
+=Connect to red (+) lead of power supply
A=blue motor wire
B=white motor wire
C=brown motor wire

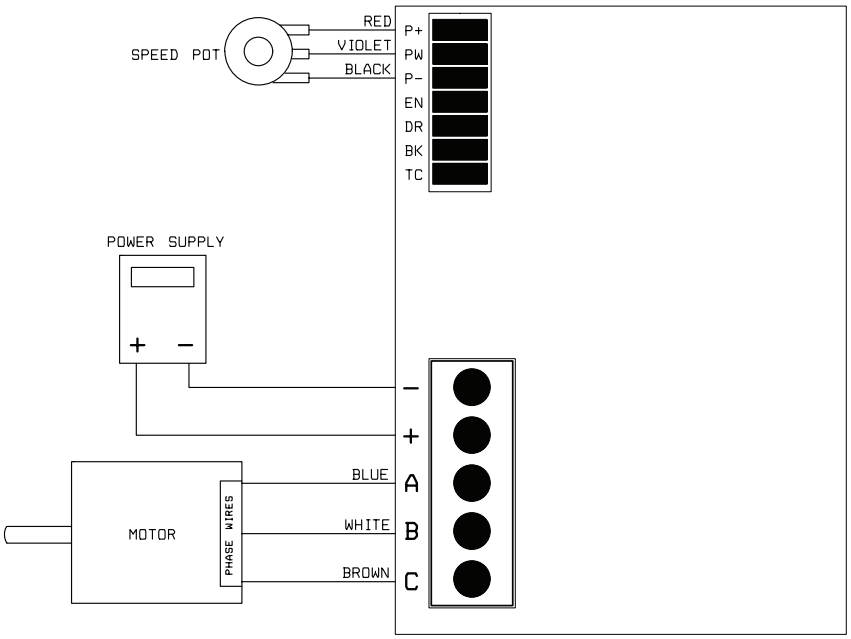
Ordering information:

please send the order to: mail@koford.com

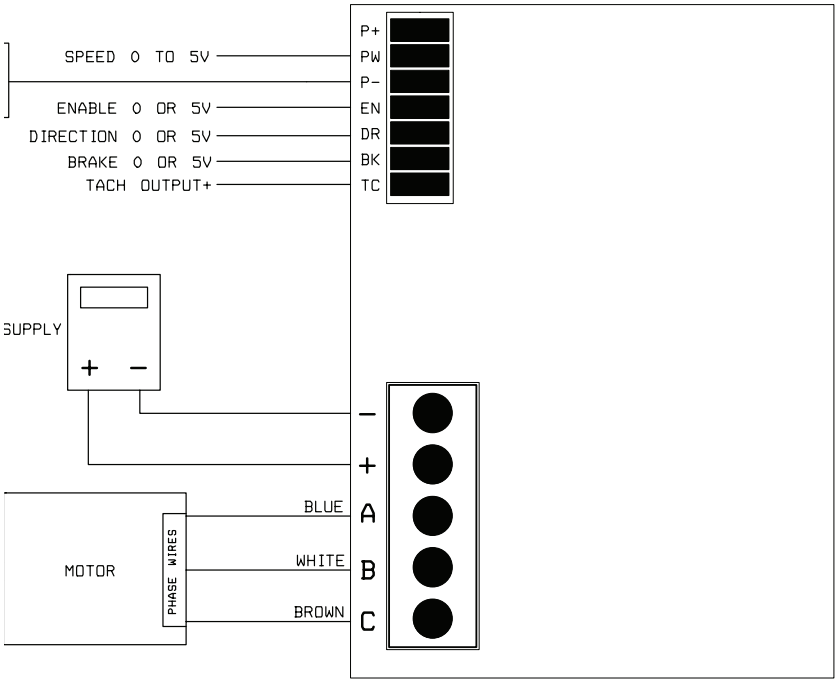
Part number:

S24V30A-40A closed loop speed control drive 3,000 rpm
S24V30A-40B closed loop speed control drive 6,000 rpm
S24V30A-40C closed loop speed control drive 12,000 rpm
P1 speed pot with knob and leads

Stand alone operation with speed pot, motor direction can be reversed by switching Blue and White leads



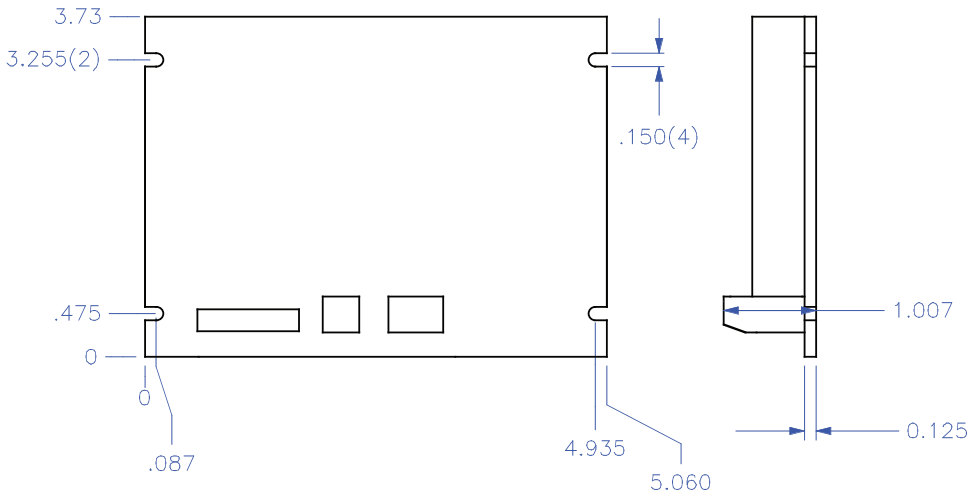
External control



KOFORD ENGINEERING, LLC

S24V60A digital sensorless motor driver 60A 10-32V

Ultra high efficiency miniature sensorless digital drive with 37kHz pwm frequency, designed for speed input from a pot, or form a 0-5V analog signal or an equivelant 5 volt pwm signal from a microcontroller. In the case of the pwm input the frequency should be above 8kHz to allow the drive to filter out the AC component of the signal. Between 0 and .5 volts the motor is off, the speed ramps to the maximum value as the input is increased from .5v to 4.5 volts. Between 4.5 and 5.0 volts the motor runs at full speed. The speed input should not exceed 5.0 volts. The drive has a sophisticated start up which will start higher inertia loads than is typical for sensorless drives. Once power supply, motor and speed pot are connected, the motor can be operated without the need for any adjustments, set up or programing. If reversible operation is required a SPDT switch can be added between DR and P- or a 0 or 5 volt signal from a microcontroller to DR can be used. If the switch is open the motor will run in the clockwise direction, if the switch is closed the motor will run in the counterclockwise direction. The Tach output is referenced to P-, and is a 5 volt square wave at 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm). The EN input will turn off the motor if pulled to ground. To apply brake connect BRK to P+ with a swich, or use an external 5v signal connected between BRK and BG. The CV-3 braking module should be used when braking if the drive is used with a power supply instead of a battery. The drive can be custom programed for your specific application, for example to run at a fixed speed when power or the enable is applied. The drive weighs 185g with the aluminum mounting plate.



Terminal block positions (motor lead hook up for Koford motors).

P+=connect to one side of pot (5.0v) (red)
PW=connect to pot wiper (center terminal) (purple)
P-=connect to other side of pot (ground) (black)
EN=unconnected or 5v to run, 0v to turn motor off
DR=leave unconnected for forward direction, hook to P- for reverse
BK=unconnected or 0v=off, 5v=on

TC=tach/encoder output 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm)
-=Connect to black (-) lead of power supply
+=Connect to red (+) lead of power supply
A=blue motor wire
B=white motor wire
C=brown motor wire

Ordering information:

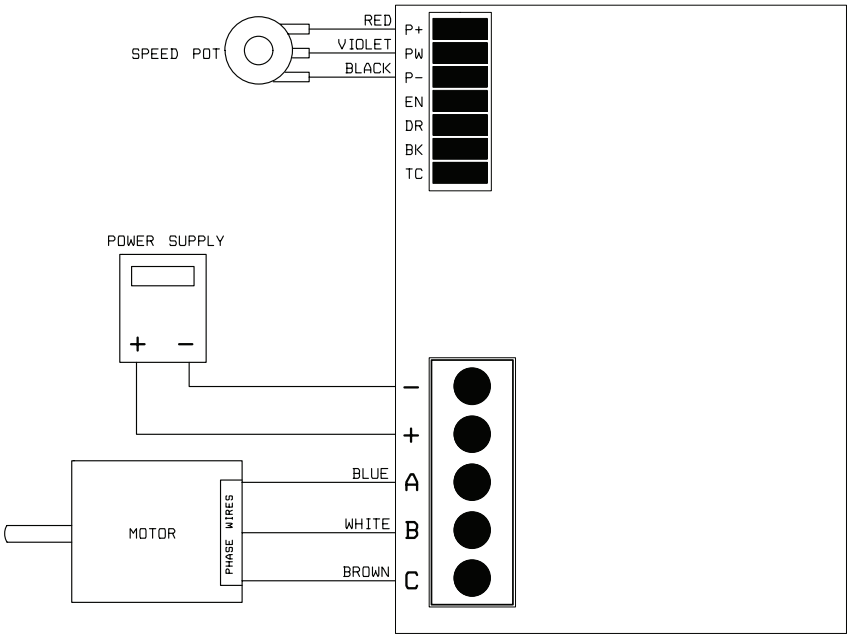
please send the order to: mail@koford.com

Part number:

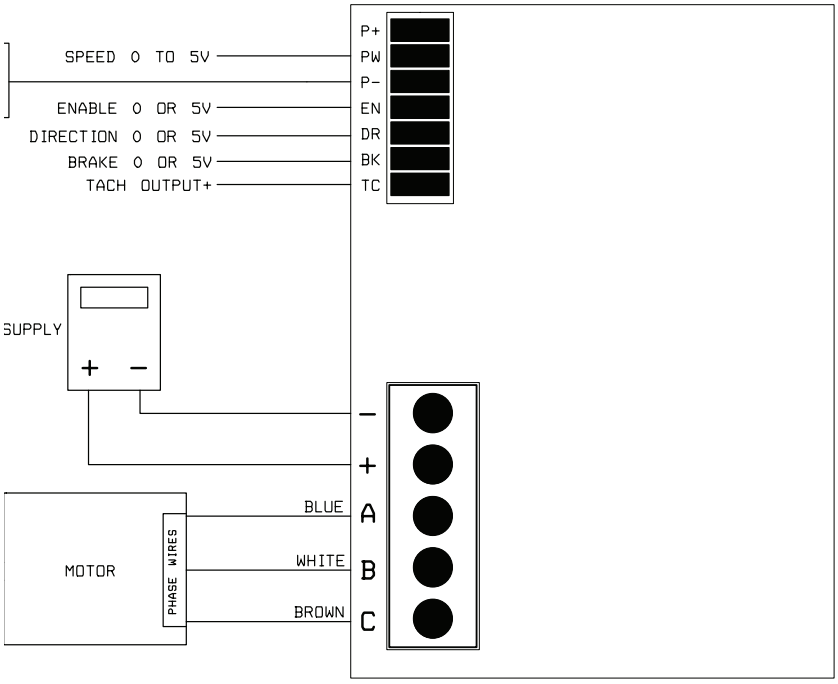
S24V60A-40A closed loop speed control drive 12,800 rpm

P1 speed pot with knob and leads

Stand alone operation with speed pot, motor direction can be reversed by switching Blue and White leads



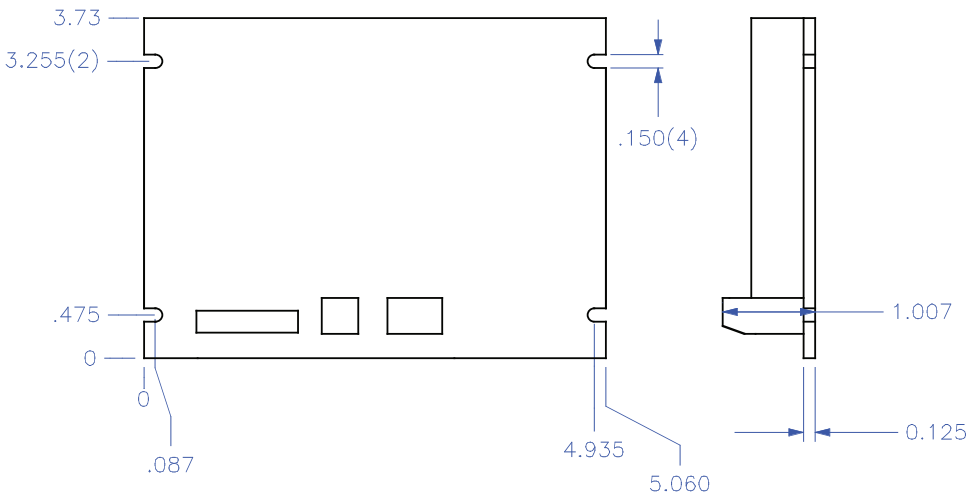
External control



KOFORD ENGINEERING, LLC

S36V30A digital sensorless motor driver 30A 10-43V

Ultra high efficiency miniature sensorless digital drive with 37kHz pwm frequency, designed for speed input from a pot, or form a 0-5V analog signal or an equivalent 5 volt pwm signal from a microcontroller. In the case of the pwm input the frequency should be above 8kHz to allow the drive to filter out the AC component of the signal. Between 0 and .5 volts the motor is off, the speed ramps to the maximum value as the input is increased from .5v to 4.5 volts. Between 4.5 and 5.0 volts the motor runs at full speed. The speed input should not exceed 5.0 volts. The drive has a sophisticated start up which will start higher inertia loads than is typical for sensorless drives. Once power supply, motor and speed pot are connected, the motor can be operated without the need for any adjustments, set up or programing. If reversible operation is required a SPDT switch can be added between DR and P- or a 0 or 5 volt signal from a microcontroller to DR can be used. If the switch is open the motor will run in the clockwise direction, if the switch is closed the motor will run in the counterclockwise direction. The Tach output is referenced to P-, and is a 5 volt square wave at 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm). The EN input will turn off the motor if pulled to ground. To apply brake connect BRK to P+ with a swich, or use an external 5v signal connected between BRK and BG. The CV-5 braking module should be used when braking if the drive is used with a power supply instead of a battery. The drive can be custom programed for your specific application, for example to run at a fixed speed when power or the enable is applied. The drive weighs 185g with the aluminum mounting plate.



Terminal block positions (motor lead hook up for Koford motors).

P+=connect to one side of pot (5.0v) (red)
PW=connect to pot wiper (center terminal) (purple)
P-=connect to other side of pot (ground) (black)
EN=unconnected or 5v to run, 0v to turn motor off
DR=leave unconnected for forward direction, hook to P- for reverse
BK=unconnected or 0v=off, 5v=on

TC=tach/encoder output 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm)
-=Connect to black (-) lead of power supply
+=Connect to red (+) lead of power supply
A=blue motor wire
B=white motor wire
C=brown motor wire

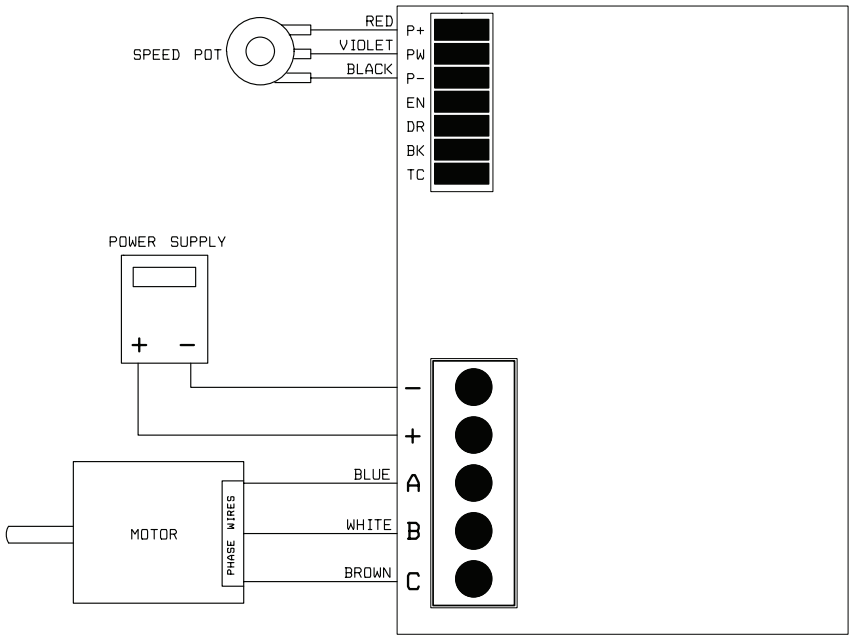
Ordering information:

please send the order to: mail@koford.com

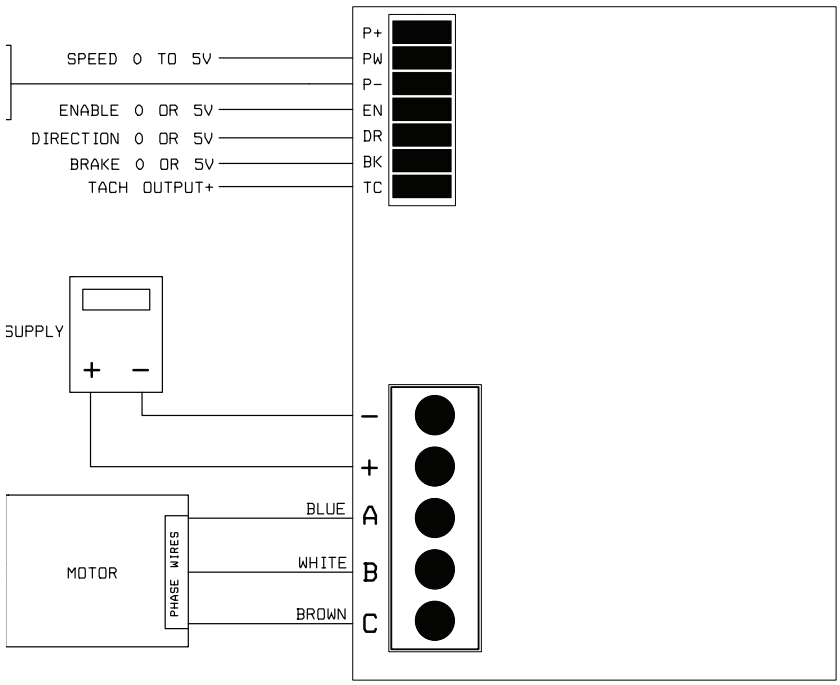
Part number:

S36V30A-40A closed loop speed control drive 4,500 rpm
S36V30A-40B closed loop speed control drive 9,000 rpm
P1 speed pot with knob and leads

Stand alone operation with speed pot, motor direction can be reversed by switching Blue and White leads

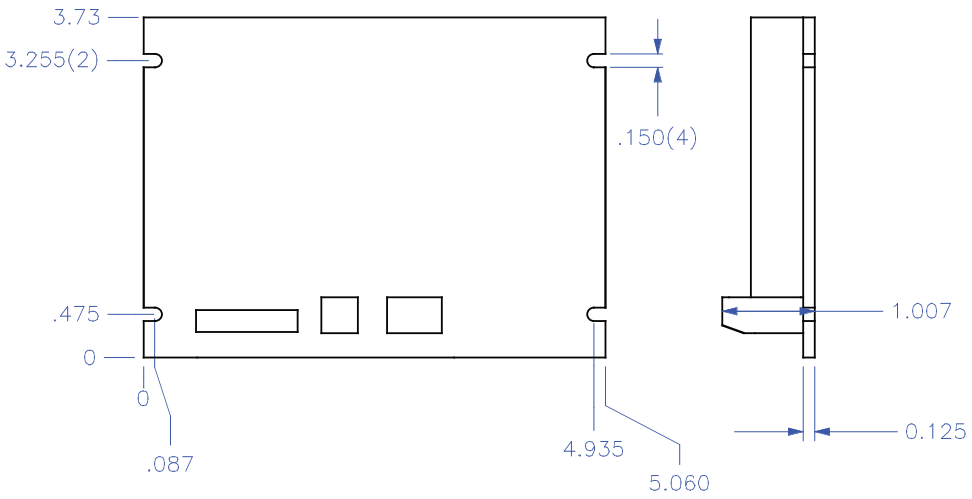


External control



S48V30A digital sensorless motor driver 30A 10-54V

Ultra high efficiency miniature sensorless digital drive with 37kHz pwm frequency, designed for speed input from a pot, or form a 0-5V analog signal or an equivalent 5 volt pwm signal from a microcontroller. In the case of the pwm input the frequency should be above 8kHz to allow the drive to filter out the AC component of the signal. Between 0 and .5 volts the motor is off, the speed ramps to the maximum value as the input is increased from .5v to 4.5 volts. Between 4.5 and 5.0 volts the motor runs at full speed. The speed input should not exceed 5.0 volts. The drive has a sophisticated start up which will start higher inertia loads than is typical for sensorless drives. Once power supply, motor and speed pot are connected, the motor can be operated without the need for any adjustments, set up or programing. If reversible operation is required a SPDT switch can be added between DR and P- or a 0 or 5 volt signal from a microcontroller to DR can be used. If the switch is open the motor will run in the clockwise direction, if the switch is closed the motor will run in the counterclockwise direction. The Tach output is referenced to P-, and is a 5 volt square wave at 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm). The EN input will turn off the motor if pulled to ground. To apply brake connect BRK to P+ with a swich, or use an external 5v signal connected between BRK and BG. The CV-5 braking module should be used when braking if the drive is used with a power supply instead of a battery. The drive can be custom programed for your specific application, for example to run at a fixed speed when power or the enable is applied. The drive weighs 185g with the aluminum mounting plate.



Terminal block positions (motor lead hook up for Koford motors).

P+=connect to one side of pot (5.0v) (red)
PW=connect to pot wiper (center terminal) (purple)
P-=connect to other side of pot (ground) (black)
EN=unconnected or 5v to run, 0v to turn motor off
DR=leave unconnected for forward direction, hook to P- for reverse
BK=unconnected or 0v=off, 5v=on

TC=tach/encoder output 3 pulses per revolution per magnet pole pair (21 kHz=1,000 rpm)
-=Connect to black (-) lead of power supply
+=Connect to red (+) lead of power supply
A=blue motor wire
B=white motor wire
C=brown motor wire

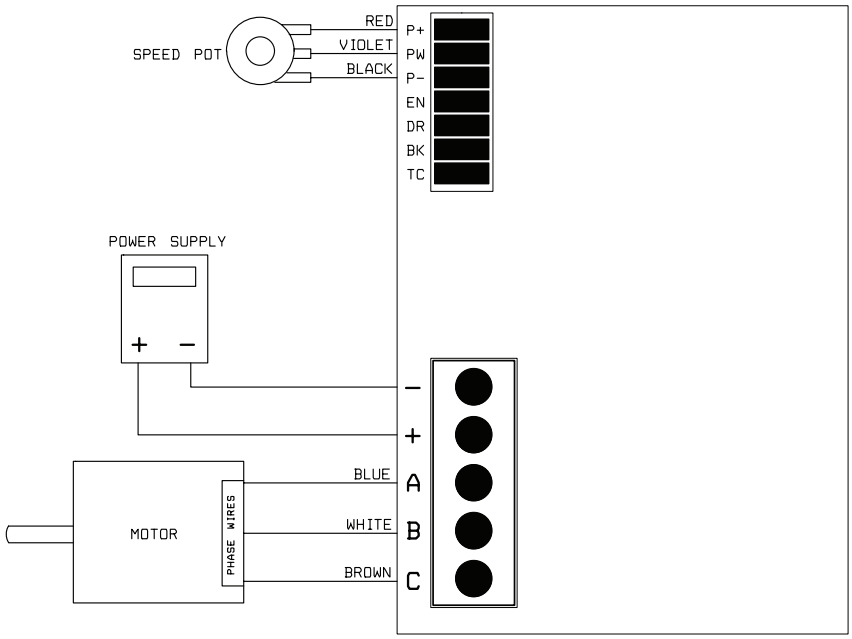
Ordering information:

please send the order to: mail@koford.com

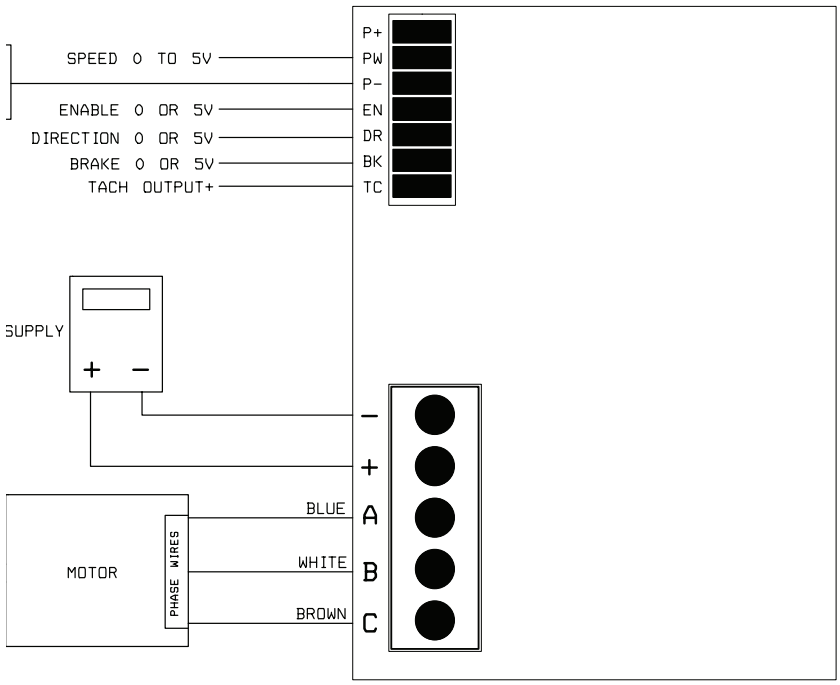
Part number:

S48V30A-40A closed loop speed control drive 6,000 rpm
S48V30A-40B closed loop speed control drive 12,000 rpm
P1 speed pot with knob and leads

Stand alone operation with speed pot, motor direction can be reversed by switching Blue and White leads

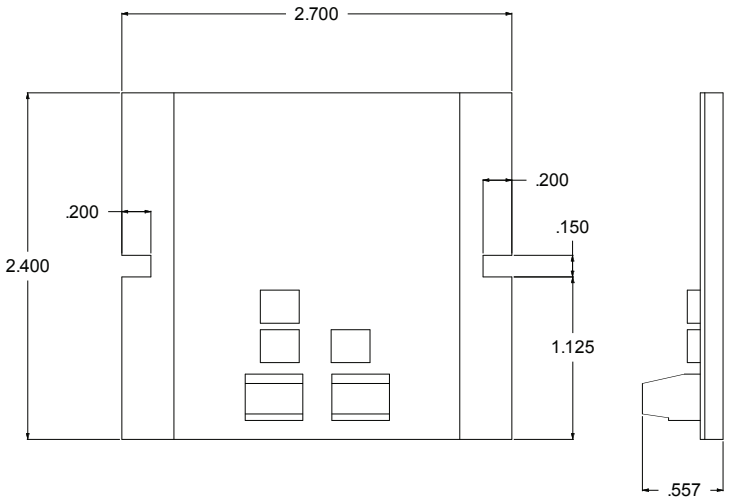


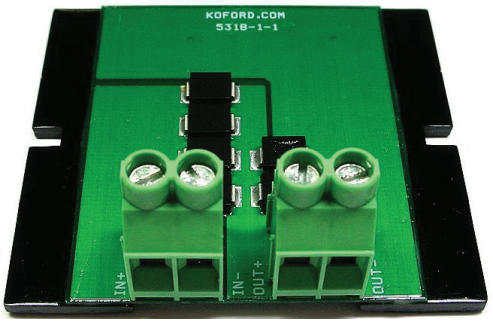
External control

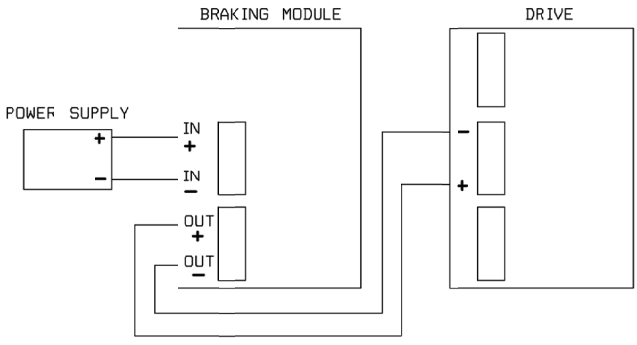


CV-1 10 Amp, 24V braking module

The CV-1 braking module is for use when a drive with braking function is connected to a power supply. If a battery supplies the power, the module is not needed. The module is needed on a system with a power supply because otherwise the regenerated energy would cause an overvoltage condition in the power supply. That would cause power supply shut off and/or power supply damage. The module contains Schottky diodes to prevent current backflow and also a TVS to absorb the transient braking energy. The TVS is needed because otherwise the braking energy would cause an overvoltage in the drive damaging it.

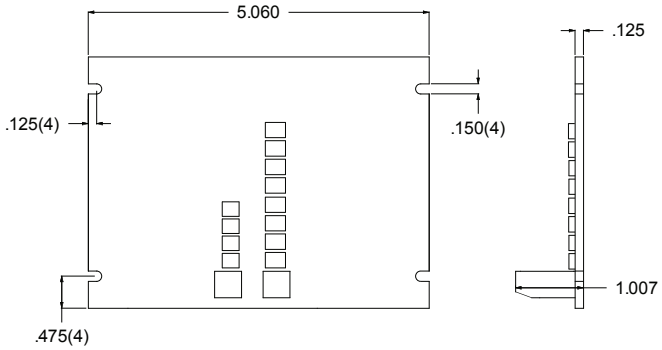


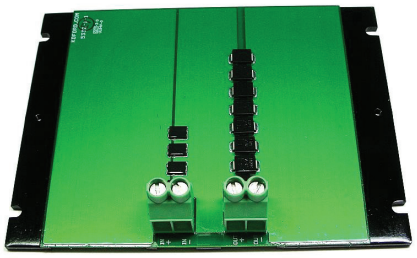


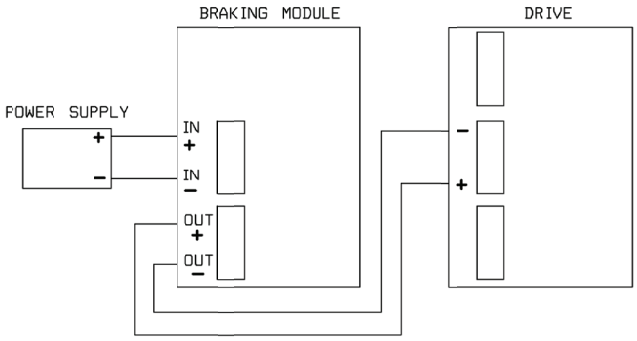


CV-3 40 Amp, 24V braking module

The CV-3 braking module is for use when a drive with braking function is connected to a power supply. If a battery supplies the power, the module is not needed. The module is needed on a system with a power supply because otherwise the regenerated energy would cause an overvoltage condition in the power supply. That would cause power supply shut off and/or power supply damage. The module contains Schottky diodes to prevent current backflow and also a TVS to absorb the transient braking energy. The TVS is needed because otherwise the braking energy would cause an overvoltage in the drive damaging it.

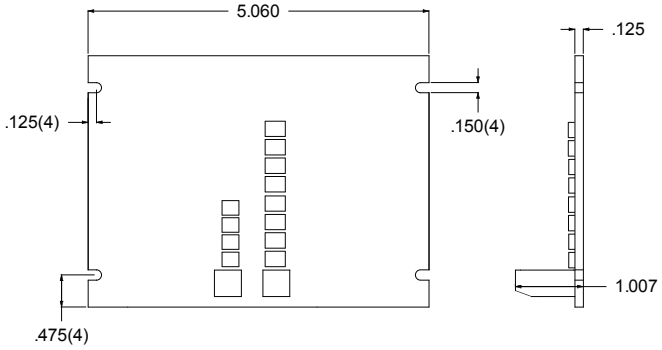


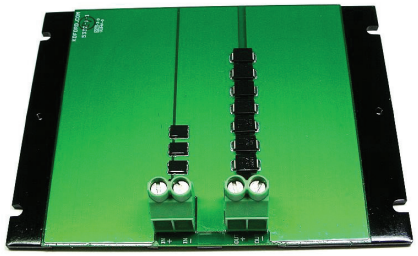


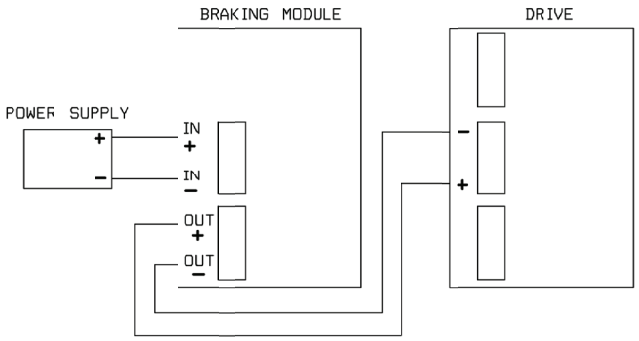


CV-5 40 Amp, 48V braking module

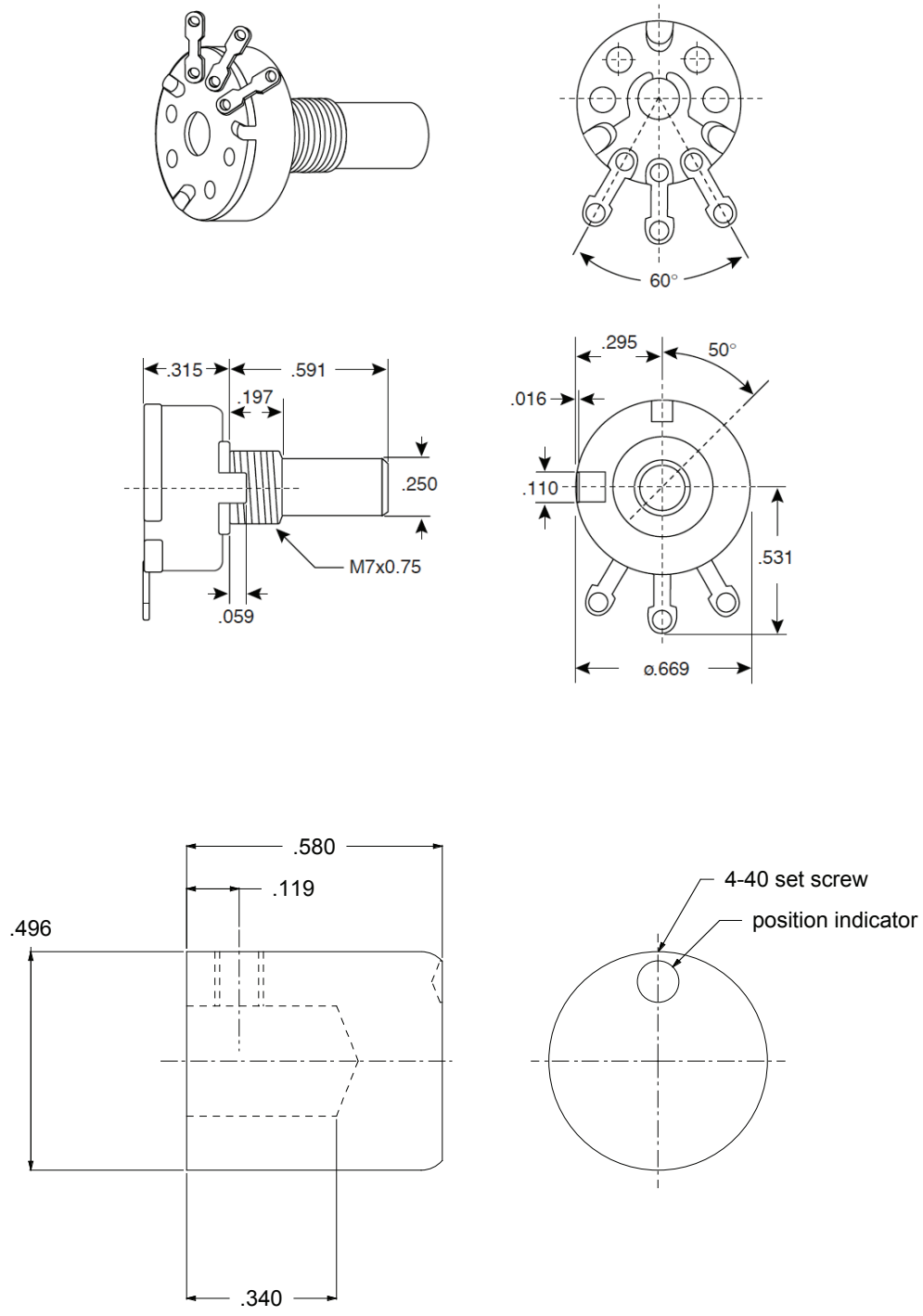
The CV-5 braking module is for use when a drive with braking function is connected to a power supply. If a battery supplies the power, the module is not needed. The module is needed on a system with a power supply because otherwise the regenerated energy would cause an overvoltage condition in the power supply. That would cause power supply shut off and/or power supply damage. The module contains Schottky diodes to prevent current backflow and also a TVS to absorb the transient braking energy. The TVS is needed because otherwise the braking energy would cause an overvoltage in the drive damaging it.







SPEED POT AND KNOB



Leads are 3.440" long stranded 22 gauge with TFE insulation.

Unit conversions

°F -32 ÷1.8=°C example: 212°F=100°C, °C x1.8+32=°F example: 100°C=212°F, in x 25.40=mm, mm x.03937= in., oz x 28.3495=g, oz-in x 7.06=mNm, mNm x .142=oz-in, Nm x 142=oz-in, rpm x .1047=rad s^{-1}, V/R/S x .1047=volts/rpm, 746 watts=1hp, $lb\text{-}in^2$ x .04144=oz-in-sec^2

Motor design

This motor is available in the sensorless configuration only. It is suitable for blowers, pumps, remotely piloted air, ground, sea and underwater devices. It is not suitable for positioning applications or for driving load with a high inertia.

The motor is an open configuration where air is pulled through the motor to cool it. The ball bearings are shielded and grease lubed.

Motor performance is with the listed Koford drive. These drives use block (6 step commutation) for highest performance. The use of other technologies such as sine commutation or field oriented control will result in reduced power and efficiency.

System efficiency

The system efficiency is different then the motor efficiency. The system efficiency takes into account motor losses, drive losses, and wiring losses. The choice of a drive will make a large difference in the total system efficiency. The test data is with the drive set to maximum speed. At less then 100% speed efficiency will be reduced. For example if a motor is operated at 12 volts with the speed control turned all of the way up, the efficiency will be better then if the motor is operated with 24 volts into the drive and the speed set at 50%. Although the motor speed is the same, there are additional losses in the drive and motor to drop the 24 volts down to 12 volts. The amount of these losses is determined by the drive and motor design. Higher frequency drives will slightly increase overall efficiency.

PWM basics

Variable speed drives operate using PWM where the voltage to the motor is rapidly turned on and off. This is the same as a switching power supply where the motor is the filter. A PWM drive operates like a transformer, for example if the motor pulls 20 amps at 12 volts and the input to the drive is 36 volts then the current reading on the power supply will be 12/36 x 20 or 6.66 amps (neglecting losses). A drive rated at 20 amps will only pull 20 amps from the power supply or battery if the speed is turned all of the way up (no PWM) and the motor curent draw is below the drives current limit.