

# High Frequency Drives



## AV Series

- Frequencies to 6000 Hz
- Currents to 75 A Continuous
- Active output filter for selective harmonic elimination
- Input EMC and output dV/dt filters included

# High Frequency Drives by Design

AV Series is a line of universal high frequency drives, suited for operation of a wide range of 3 phase AC motors, from standard “low speed” motors rated 50 or 60 Hz to high speed motors rated up to 6000 Hz (360,000 RPM for 2 pole design).

AV Series drives are differentiated from “standard” AC drives by the special **attention which is given to specific needs of high frequency (low inductance) motors**. The design was optimized around quality of voltage and current waveforms at any speed, low drive induced motor losses and vibration (bearing temperature and life) and control features which high speed motor applications typically require.

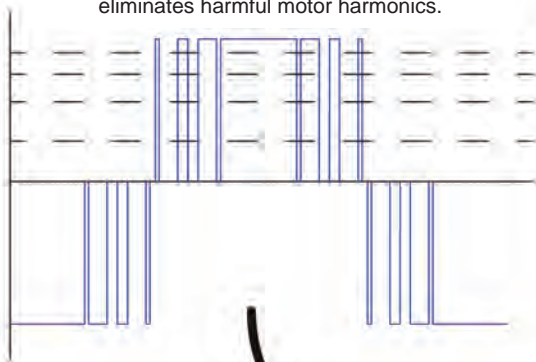
## High Quality Output for High Speed Motors

An **active output filter for selective harmonic elimination** significantly reduces motor losses (heat) and vibration, resulting in longer bearing and stator winding life. This approach results in better performance compared to most PAM and PWM type high frequency drives and is more universal than solutions with L-C filters.

### The Best of Two Modulation Schemes

#### Pulse Width Modulation (PWM):

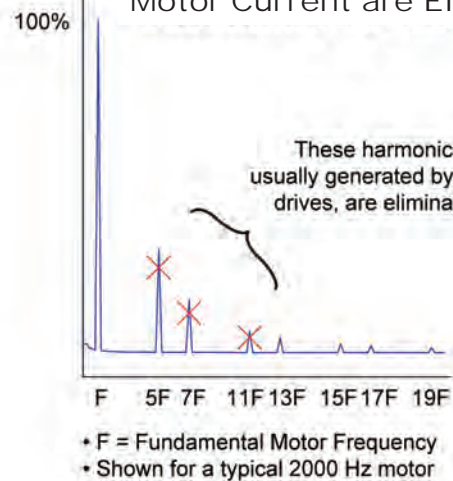
Precise angular placement of pulses eliminates harmful motor harmonics.



#### Pulse Amplitude Modulation (PAM):

Secondary (intermediate) DC voltage is regulated so the amplitude of the voltage pulses are optimized at any speed.

### Harmful Harmonics in the Motor Current are Eliminated



Motor losses are minimized for all high speed motors regardless of motor rated voltage or operating speed.

Low voltage peaks are achieved via intermediate DC bus voltage regulator and built-in output dV/dt filter, resulting in long stator insulation life, even for old motors and relatively long motor cables. With AV Series drives, it is safe to operate spindle motors rated for low voltages.

# Applications

Manufacturing Machinery - High speed electric spindles in:

Internal cylindrical (ID), universal ID/OD grinding

Profile and jig grinding

High speed milling, drilling, routing, engraving

PCB drilling and routing

Semiconductor dicing

Optical lens grinding

Materials: Various metals and alloys, powdered/sintered metal, ceramics, composite materials, stone, marble, granite, glass, wood...

## Rotational (no-load) testing:

Testing of high speed machining spindles after repair

Cycle testing of parts and mechanisms (integrity, life, fatigue)

Functional spin-testing (impellers, seals, etc.)

Rotational testing under load:

Dynamometer testing of high speed motors

Load testing of turbo-generators

Turbo-machinery (turbo-compressors, expanders, blowers)

Process (dryers/atomizers, centrifuges, vacuum pumps)

Instrumentation (precise high speed spinning)

Energy storage (high speed flywheels)

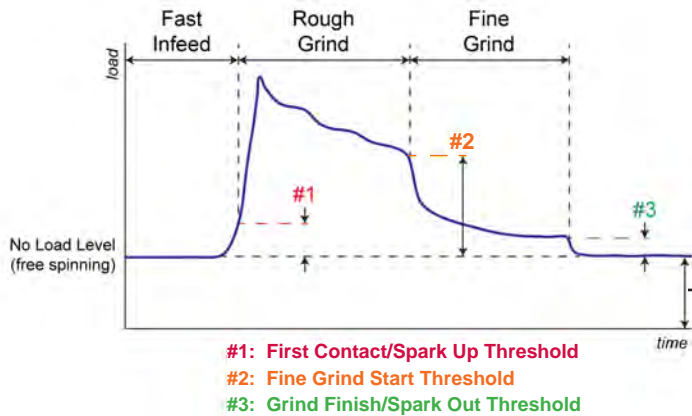


# Features for ID Grinding

Vary fast, repeatable and precise analog load or power signal is well suited for adaptive grinding. When effectively used by grinder CNC control, it can help to shorten grinding cycles. In grinding wheel dressing applications, this signal can help reduce the removal rate of expensive abrasive material.

Integrated fast touch sensing function (first contact, gap eliminator) with very fast solid state output can be used instead of expensive acoustic sensing in many ID grinding applications. Productivity can be improved with no additional cost.

Fast Touch Detect and Load Thresholds  
Improve Cycle Time



Solid State Outputs switch within microseconds of the detected threshold and can also be used for effective crash protection.

*Base Load update/sampling for accurate & repeatable sensing: The no load level (load baseline) is sampled either automatically or by user (CNC) controlled input and is stored before each grinding cycle. This updated load level is then used as the load baseline for programmable thresholds of the Touch Detect function. Accurate and repeatable sensing is maintained even though the no load level varies from motor to motor as well as with bearing condition and temperature.*

Reduced spindle vibration leads to better **surface finish** and longer spindle bearing life.

Better part accuracy due to reduced thermal growth of spindle shaft.

Flexible input/output programming and complete data storage for different configurations of multiple-spindle machines (turret-type grinders).

## Replacement for Older High Frequency Spindle Drives on ID Grinding Machines

AV Series drives were designed to be an easy functional replacement for older PAM and PWM high-frequency spindle drives on internal cylindrical (ID) grinding machines and for other high rotational speed applications. They can mimic control interface and special features of older spindle drives, whether they were made in U.S., Europe or Japan.

## Norminal Mains/Line Voltage: 380 to 480 V<sub>AC</sub>, 50/60 Hz

Rating No.	Continuous Output Current	S6 <sup>(1)</sup> Output Current	kVA <sup>(2)</sup> at 350V	KW[HP] <sup>(3)</sup> at 460V	Input Phases	Dimensions H x W x D mm [inches]
AV-4V006A	6.0	7.2	3.6	3.6 [4.8]	3	331 x 102 x 313 [13 x 4 x 12.3]
AV-4V014A	14	16.8	8.4	8.4 [11.2]	3	453 x 225 x 224 [17.8 x 8.9 x 8.8]
AV-4V021A	21	25	12.7	12.7 [17]	3	453 x 225 x 224 [17.8 x 8.9 x 8.8]
AV-4V036A	36	43	21	21 [28]	3	510 x 232 x 275 [20.1 x 9.1 x 10.8]
AV-4V068A	68	82	41	41 [54]	3	745 x 321 x 276 [29.3 x 12.6 x 10.9]
AV-4V075A	75	90	45	45 [60]	3	745 x 321 x 276 [29.3 x 12.6 x 10.9]

## Norminal Mains/Line Voltage: 100 to 240 V<sub>AC</sub>, 50/60 Hz

Rating No.	Continuous Output Current	S6 <sup>(1)</sup> Output Current	kVA <sup>(2)</sup> at 220V	KW[HP] <sup>(3)</sup> at 230V	Input Phases	Dimensions H x W x D mm [inches]
AV-2V011A	11	13.2	4.1	3.3 [4.4]	3	331 x 102 x 313 [13 x 4 x 12.3]
AV-2V022A	22	26	8.3	6.6 [8.9]	3	453 x 225 x 224 [17.8 x 8.9 x 8.8]
AV-2V038A	38	45.5	14	11 [15]	3	453 x 225 x 224 [17.8 x 8.9 x 8.8]

1. 72 s at S6 value alternating with 48 s at 40% of S6 value (no load). Peak current is 200% of Continuous Output Current.
2. Continuous kVA at voltage indicated.
3. Continuous kW[HP] at voltage indicated for a typical motor.



AV-4V006A  
AV-2V011A



AV-4V014A  
AV-4V021A  
AV-2V022A  
AV-2V038A



AV-4V036A



AV-4V068A  
AV-4V075A

**Norminal Mains/Line Voltage: 100 to 240 V<sub>AC</sub>, 50/60 Hz**

Rating No.	Continuous Output Current	S6 <sup>(1)</sup> Output Current	kVA <sup>(2)</sup> at 220V	KW[HP] <sup>(3)</sup> at 230V	Input Phases	Dimensions H x W x D mm [inches]
AV-2V011A-3	11	13.2	4.1	3.3 [4.4]	1 or 3	133 x 432 x 362 <sup>(4,5)</sup> [5.25 x 17 x 14.25]
AV-2V011A-4	11	13.2	4.1	3.3 [4.4]	1 or 3	165 x 432 x 362 <sup>(4,5)</sup> [6.5 x 17 x 14.25]

1. 72 s at S6 value alternating with 48 s at 40% of S6 value (no load). Peak current is 200% of Continuous Output Current.
2. Continuous kVA at voltage indicated.
3. Continuous kW[HP] at voltage indicated for a typical motor.
4. Width dimension published is for rack inside clearance. Rack mounting brackets are for 19" (3U or 4U) rack systems
5. Height increases 19 mm {0.75 inch} for Tabletop units due to rubber feet mounted on the bottom.



AV-2V011A-3



AV-2V011A-4



Controls and connections on front and back can be customized.

# AV Series High Frequency Drives

## Standard Features:

- Fundamental output frequency up to 6000 Hz (360,000 RPM for a 2 pole motor)
- Active output filter eliminates low order current harmonics
- Simplicity of V/Hz (U/f) programming
- High system efficiency (low drive and spindle motor losses)
- Output dV/dt filter included for low voltage stress at the motor
- No need for motor inductors
- Output fully short circuit protected
- Monitoring of phase currents, motor temperature
- Fast, accurate and repeatable analog load signal (power or torque)
- Fast touch sensing (Gap Eliminator) signal with solid state outputs
- High resolution analog speed reference input
- Two analog inputs, two analog outputs
- Ten digital inputs
- Safe stop/disable (inhibit) input (EN 954-1, Category 3)
- Five solid state outputs, four output relays
- Input EMC filter included (EN 61800-3, PDS Category 3)
- Simple operation of multiple motors, either in parallel connection or one at a time
- Automatic selection of the best control method for a particular spindle motor
- Two MODBUS™ compliant communication ports
- Easy integration with LabView™ test environment
- Dynamic braking with internal resistors
- Control can be powered by an external 24 VDC power supply

## Options:

- Additional dynamic braking resistors (may be needed for very high inertia)
- Remote mounting kit for Control Panel (HMI)
- Fieldbus/Serial Communication Options

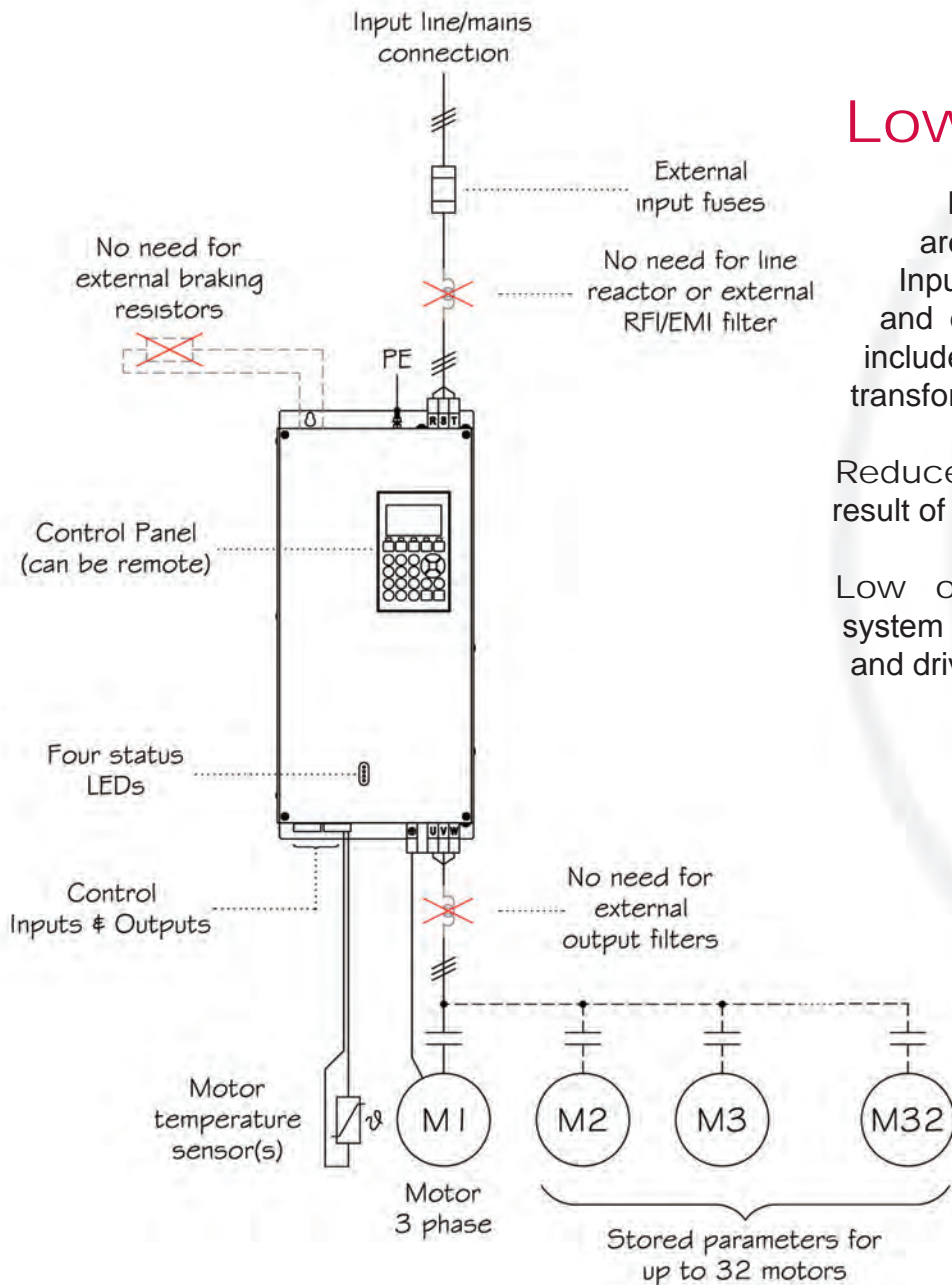


## Low System Costs

No additional components are needed for most applications: Input EMI filters, output dV/dt filters and dynamic braking resistors are all included. Output filter reactors or output transformers are not required.

Reduced spindle repair costs as a result of longer bearing and winding life.

Low operating costs due to high system efficiency (low combined motor and drive losses).



## Advanced Motor Protection

All three phase motor currents are continuously monitored by dedicated fast circuits for safe and expected values, for phase current differences (phase imbalance), for open connection in one phase and for short circuits.

If the insulation in a motor phase fails, AV Series drive will indicate in which phase is the problem without failing, which greatly facilitates machine/system troubleshooting.

Load sensing measures real motor load and is fast and precise. Programmable timed-overload function permits transient overloads while thermally protecting the motor.

Two sensor inputs are available for monitoring of stator winding and bearing temperatures. Each input is programmable for use with PTC style, KTY 84, NC switch or PT 1000 temperature sensors.





SPINDEL Electronics specializes in the design and manufacture of high frequency drives for high speed electric motors. In addition, we repair all major brands of high frequency drives and offer drop-in replacements and engineered retrofit solutions.

With our 30+ years experience in the field of high frequency drives, SPINDEL Electronics is dedicated to helping our customers with quality products and knowledgeable support for all of their high frequency drive needs.

SPINDEL Electronics  
4517 Broadmoor Avenue, SE  
Grand Rapids, MI 49512  
U.S.A.

[www.spindel.com](http://www.spindel.com)

TEL: +1 616 554 2200

FAX: +1 616 554 2033

[sales@spindel.com](mailto:sales@spindel.com)

[service@spindel.com](mailto:service@spindel.com)

[info@spindel.com](mailto:info@spindel.com)

AV Series drives are made in the U.S.A.  
All information is subject to change without notice.

© Copyright 2019 SPINDEL Electronics. All rights reserved.  
"SPINDEL", "SPINDEL Electronics" and "AV Series"  
are trademarks of SPINDEL Electronics.

G0085-4 07/19/2019