

Industrial Automation

1-CM Carbon/Manufactured Graphite Section

1. Firms that have primary material manufacturing facilities for at least one of the following products, which fall within the Carbon/Manufactured Graphite Section.
 - 1.1 Electrode Group: Graphite electrodes, cathodes, open arc electrodes, gouging and welding rods, plates and parts, EDM, electrochemical anodes, electrolytic anodes, grounding anodes, heating rods, powdered graphite, and spectroscopic materials.
 - 1.1.1 Excluded are: Metal welding rods, metal (but not metal impregnated) EDM electrodes, metal electrolytic anodes, heating rods or elements and spectroscopic materials that are not carbon, graphite and its compounds.
 - 1.2 Electrical Components Group: Brushes and contacts; plates for electrical use. Rectifier anodes, rheostat discs, telephone parts, lighting arresters, pantograph parts and brush holders.
 - 1.2.1 Excluded are: Any of the above not made of carbon, graphite and its compounds, except for brush holders.
 - 1.3 Mechanical Group: Bearings, seals, rings, valve parts, valve seats, friction parts (brakes), rupture discs, piston rings, turbine packing rings, pistons, check parts, pipe slides, dash pots, compressor vanes and rotors, end plates, graphite lubricants, refractory coated graphite for mechanical uses including mechanical applications made from carbon and graphite fibers and their composite structures.
 - 1.3.1 Excluded are: Metal parts or rings, ceramic or plastic parts or rings.

1-EW Arc Welding Section

The products included within the jurisdiction of this Section have been detailed and are included in the scopes of its constituent Voting Classifications as follows:

1. **Welding Power Sources Voting Classification and Dues Center**
 - 1.1 Electrical equipment, including all associated control devices, applying to the following:
 - a. Engine driven welding power supplies
 - b. Utility-powered welding power supplies
 - c. Plasma cutting and plasma welding power supplies
 - d. Associated electrical attachments such as water coolers, chillers.
 - 1.2 Automatic and manual devices to feed continuous electrode wire including:
 - a. Combination welding products containing a power supply, wire feeder and/or torch
 - b. Stand-alone wire feeding devices.
 - 1.3 Resistance welding equipment including:
 - a. AC transformers
 - b. Other resistance welding power supplies
 - c. Controls
 - 1.4 Mig gun, plasma welding and cutting torches and stick electrode holders.

1-IS Industrial Automation Control Products and Systems Section

The scope of the Industrial Automation Control Products and Systems Section comprises products primarily used in industrial applications to monitor, control, or actuate power utilization apparatus, including motors. Such equipment is rated not more than 750 volts DC nor 15,000 volts AC. This includes, but is not limited to:

1. Motor controls and accessories—used to start, stop, protect, accelerate, decelerate, reverse, and/or control the speed of motors.
2. Machine logic control and systems—hardware and associated software used in the supervision, monitoring, and/or control of industrial processes.

Excerpt from NEMA Product-Related Scopes

3. Man/machine interface—devices that require human intervention and are used to control/communicate the status of machines or manufacturing processes.
4. Position control and monitoring—devices that do not require human intervention and are used to control/communicate the status of machines or manufacturing processes.
5. Systems integration—services to plan, develop, implement, and manage integrated manufacturing and/or process control systems.
6. Communications and software for industrial automation control products and systems.

Excluded from the product scope are:

- Automatic and manual temperature and humidity controls and panels that are in the scope of the Residential Control Section of the types principally used in air conditioning, refrigeration, and comfort heating of non-industrial areas;
- Motors, generators, and motor-generators covered by *Medium Alternating-Current Machine Group*, which function as control when constituting part of adjustable speed drives; and
- Specific components and systems covered by the product scopes of other NEMA Sections.

1-MG Motor and Generator Section

The product scope of the Section comprises the product scopes of its constituent Groups.

Excluded from the scope of this Section are:

- Welding generators.
- Booster, dynamic braking and absorption type machine.
- Isolated electric farm lighting plant.
- Variable speed generator equipment for railway passenger cars.
- Main propulsion motors, generators and motor generator sets mounted on railroad and transit
- Locomotives and cars.
- Automotive accessory and toy motors, generators and motor-generator sets.
- Motors, generators, exciters and motor-generators or exciter sets mounted on airborne craft.
- Alternating-current generators for hydraulic turbine drive above 10,000 kVa.
- Synchronous condensers.
- Frequency changers and phase converters.

1. Medium Alternating-Current Machine Group

All alternating-current motors, generators (specifically including those for geared turbine drive) and motor-generators, exclusive of welding and engine type motors and generators, when built in frames, 1 hp, 1700-1750 rpm continuous open type and larger, up to and including ratings built in frames corresponding to the rating continuous open type given in the table below and excluding such motors, generators, and motor-generators included specifically within the scope of any other Group of the Motor and Generator Section.

- 1.1 All alternating-current motors, generators or motor-generators which constitute part of variable speed drives which fall within the range of the following table:

Speed	Motors, Squirrel-Cage and Wound Rotor	Alternators			Resolving Field Type
		Motors		Synchronous HP	
		Utility pF	.8PF	kW .8PF	
3600	500	200	150	...	
1800	500	200	150	150	
1200	350	200	150	150	
900	250	150	125	100	
720	200	125	100	100	
600	150	100	75	75	
514	125	75	60	60	

Excerpt from NEMA Product-Related Scopes

- 1.2 Note I—In computing the maximum size motor or generator falling within the scope of this Group, synchronous speed shall be used.
- 1.3 Note II—It is understood that the following are included in the scope of this Group:
 - 1.3.1 Machines sold as sets of parts (but not renewal parts) such as hermetic motor parts, universal motor parts, etc.
 - 1.3.2 Alternating-current motors which form part of gear motors, motor-generator sets, adjustable speed drives, etc.

2. Medium Direct-Current Machine Group

- 2.1 All direct-current motors, generators and exciters, except those defined in *Small Machine Group*, with continuous drip-proof ratings, or equivalent capacities, up to and including:
 - ≤ 1.25 HP per rpm
 - Generators ≤ 1.0 KW per rpm
 - Continuous drip-proof equivalent capacities of machines rated for other duties, temperatures, and/or enclosures are the continuous ratings that would be obtained from machines with the same armature core but with drip-proof enclosures and current temperature standards.
- 2.2 All motor-generator or exciter sets whose largest output machine rating is direct-current and within the scope of paragraph 2.1 above.
- 2.3 Specifically excluded from the product scope of this Group are:
 - AISE mill motors.
 - Motors and generators included specifically in the scope of any other Group of the Motor and Generator Section.

3. Large Machine Group

The product scope of the Large Machine Group comprises the product scopes of its constituent Voting Classifications.

4. Large Alternating-Current Machine Voting Classification

All alternating-current motors and generators (specifically including those for geared turbine drive) of ratings larger than those given in *Medium Alternating-Current Machine Group* and all ratings of alternating current motors and generators of the revolving field type of 450 rpm and slower speeds. Specifically excluded from the product scope of this Group are alternating-current generators for hydraulic turbine drives above 10,000 kVa.

5. Large Direct-Current Machine Voting Classification

All direct-current motors and generators (specifically including those for geared turbine drives) and motor-generator sets of ratings larger than those given in *Medium Direct-Current Machine Group*.

6. Small Machine Group

All alternating-current motors built in frames smaller than that frame having a continuous rating of 1 hp, open type, 1700–1750 rpm and all generators in the corresponding frame sizes, excluding

- 6.1 Small synchronous motors of the type generally used in household clocks and timing devices.
- 6.2 Motors and generators included specifically in the scope of any other Group of the Motor and Generator Section

1-PE Power Electronics Section

(See Arc Welding Section, Industrial Automation Control Products and Systems Section)

1. Power Conversion Equipment used in Uninterruptible Power Systems

Power conversion equipment used in uninterruptible power systems, including, but not limited to:

- 1.1 Static electrical power conversion equipment such as, but not limited to, the following:

Excerpt from NEMA Product-Related Scopes

- 1.1.1 AC/DC power converters
- 1.1.2 DC/AC power converters
- 1.1.3 AC/AC power converters
- 1.1.4 DC/DC power converters
- 1.2 Flywheel energy storage systems

2. Power Conversion Equipment used in Energy Producing Systems

Power conversion equipment used in energy producing systems of 1000 V and below, including, but not limited to, the following energy producing systems:

- 2.1 Microturbines
- 2.2 Fuel cells equal to or larger than 1 kVA
- 2.3 Photovoltaics
- 2.4 Utility-connected power sources

3. Voltage Regulators

Equipment of 1000 V and below that provides a regulated or filtered AC output such as, but not limited to:

- 3.1 Active filters
- 3.2 Dynamic voltage restorers
- 3.3 Active power factor correction circuits

4. Battery Charger (Cycle Type) Voting Classification

Battery Chargers (cycle types) used in commercial and industrial battery powered applications such as, but not limited to:

- 4.1 Industrial truck
- 4.2 Electric vehicle (off-road and on-road)
- 4.3 Automatic guided vehicle

5. Excluded are

- Motor Drives
- Arc welding power sources
- Solid state transfer switches
- Electronic tap changers
- Constant voltage (ferro-resonant) transformers

Products covered in other NEMA sections