SECTION H — ELECTRICITY

H02 GENERATION, CONVERSION, OR DISTRIBUTION OF ELECTRIC POWER

H02P CONTROL OR REGULATION OF ELECTRIC MOTORS, ELECTRIC GENERATORS OR DYNAMO-ELECTRIC CONVERTERS; CONTROLLING TRANSFORMERS, REACTORS OR CHOKE COILS [4]

Note(s) [6, 2015.01]

1. This subclass covers arrangements for starting, regulating, electronically commutating, braking, or otherwise controlling motors, generators, dynamo-electric converters, clutches, brakes, gears, transformers, reactors or choke coils, of the types classified in the relevant subclasses, e.g. H01F, H02K.
2. This subclass does not cover similar arrangements for the apparatus of the types classified in subclass H02N, which arrangements are covered by that subclass.
3. In this subclass, the following terms or expressions are used with the meanings indicated:
   - "control" means influencing a variable in any way, e.g. changing its direction or its value (including changing it to or from zero), maintaining it constant or limiting its range of variation;
   - "regulation" means maintaining a variable at a desired value, or within a desired range of values, by comparison of the actual value with the desired value.
4. In this subclass, it is desirable to add the indexing codes of groups H02P 101/00 and H02P 103/00.

Subclass index

1/00 **Arrangements for starting electric motors or dynamo-electric converters** (starting of synchronous motors with electronic commutators H02P 6/20, H02P 6/22; starting dynamo-electric motors rotating step by step H02P 8/04; vector control H02P 21/00) **[1, 4, 2006.01]**

1/02 • Details **[1, 2006.01]**

1/04 • • Means for controlling progress of starting sequence in dependence upon time or upon current, speed, or other motor parameter **[1, 2006.01]**

1/06 • • • Manually-operated multi-position starters **[1, 2006.01]**

1/08 • • • Manually-operated on/off switch controlling power-operated multi-position switch or impedances for starting a motor **[1, 2006.01]**

1/10 • • • Manually-operated on/off switch controlling relays or contactors operating sequentially for starting a motor **[1, 2006.01]**

1/12 • • • Switching devices centrifugally operated by the motor **[1, 2006.01]**

1/14 • • • Pressure-sensitive resistors centrifugally operated by the motor **[1, 2006.01]**

1/16 • for starting dynamo-electric motors or dynamo-electric converters **[1, 2006.01]**

1/18 • • for starting an individual dc motor **[1, 2006.01]**

1/20 • • • by progressive reduction of resistance in series with armature winding **[1, 2006.01]**
1/22 • • • in either direction of rotation **[1, 2006.01]**
1/24 • • for starting an individual ac commutator motor (starting of ac/dc commutator motors H02P 1/18) **[1, 2006.01]**
1/26 • • for starting an individual polyphase induction motor **[1, 2006.01]**
1/28 • • • by progressive increase of voltage applied to primary circuit of motor **[1, 2006.01]**
1/30 • • • by progressive increase of frequency of supply to primary circuit of motor **[1, 2006.01]**
1/32 • • • by star/delta switching **[1, 2006.01]**
1/34 • • • by progressive reduction of impedance in secondary circuit **[1, 2006.01]**
1/36 • • • • the impedance being a liquid resistance **[1, 2006.01]**
1/38 • • • by pole-changing **[1, 2006.01]**
1/40 • • • in either direction of rotation **[1, 2006.01]**
1/42 • • for starting an individual single-phase induction motor **[1, 2006.01]**
1/44 • • • by phase-splitting with a capacitor **[1, 2006.01]**
1/46 • • for starting an individual synchronous motor **[1, 2006.01]**
1/48 • • • by pole-changing **[1, 2006.01]**
1/50 • • • by changing over from asynchronous to synchronous operation (H02P 1/48 takes precedence) **[1, 2006.01]**
1/52 • • • by progressive increase of frequency of supply to motor **[1, 2006.01]**
1/54 • • for starting two or more dynamo-electric motors **[1, 2006.01]**
1/56 • • • simultaneously **[1, 2006.01]**
1/58 • • • sequentially **[1, 2006.01]**

3/00 Arrangements for stopping or slowing electric motors, generators, or dynamo-electric converters (stopping of synchronous motors with electronic commutators H02P 6/24; stopping dynamo-electric motors rotating step by step H02P 8/24; vector control H02P 21/00) **[1, 2, 4, 2006.01]**

3/02 • Details **[1, 2006.01]**
3/04 • • Means for stopping or slowing by a separate brake, e.g. friction brake or eddy-current brake **[1, 2, 2006.01]**
3/06 • for stopping or slowing an individual dynamo-electric motor or dynamo-electric converter **[1, 2, 2006.01]**
3/08 • • for stopping or slowing a dc motor **[1, 2, 2006.01]**
3/10 • • • by reversal of supply connections **[1, 2006.01]**
3/12 • • • by short-circuit or resistive braking **[1, 2006.01]**
3/14 • • • by regenerative braking **[1, 2006.01]**
3/16 • • • by combined electrical and mechanical braking **[1, 2006.01]**
3/18 • • for stopping or slowing an ac motor **[1, 2, 2006.01]**
3/20 • • • by reversal of phase sequence of connections to the motor **[1, 2006.01]**
3/22 • • • by short-circuit or resistive braking **[1, 2006.01]**
3/24 • • • by applying dc to the motor **[1, 2006.01]**
3/26 • • • by combined electrical and mechanical braking **[1, 2006.01]**

4/00 Arrangements specially adapted for regulating or controlling the speed or torque of electric motors that can be connected to two or more different electric power supplies (vector control H02P 21/00) **[2006.01]**

5/00 Arrangements specially adapted for regulating or controlling the speed or torque of two or more electric motors *(H02P 6/04, H02P 8/40 take precedence)* ***[1, 2006.01, 2016.01]***

5/46 • for speed regulation of two or more dynamo-electric motors in relation to one another **[1, 2006.01]**
5/48 • • *by comparing mechanical values representing the speeds* ***[1, 2006.01, 2016.01]***
5/485 • • • *using differential movement of the two motors, e.g. using differential gearboxes* ***[2016.01]***
5/49 • • • *by intermittently closing or opening electrical contacts* ***[2016.01]***
5/50 • • *by comparing electrical values representing the speeds* ***[1, 2006.01, 2016.01]***
5/505 • • • *using equalising lines, e.g. rotor and stator lines of first and second motors* ***[2016.01]***
5/51 • • • *Direct ratio control* ***[2016.01]***
5/52 • • *additionally providing control of relative angular displacement* ***[1, 2006.01, 2016.01]***
5/54 • • • *Speed and position comparison between the motors by mechanical means* ***[2016.01]***
5/56 • • • *Speed and position comparison between the motors by electrical means* ***[2016.01]***
5/60 • controlling combinations of dc and ac dynamo-electric motors (H02P 5/46 takes precedence) **[2006.01]**
5/68 • controlling two or more dc dynamo-electric motors (H02P 5/46, H02P 5/60 take precedence) **[2006.01]**
5/685 • • electrically connected in series, i.e. carrying the same current **[2006.01]**
5/69 • • mechanically coupled by gearing **[2006.01]**
5/695 • • • Differential gearing **[2006.01]**
5/74 • controlling two or more ac dynamo-electric motors (H02P 5/46, H02P 5/60 take precedence) **[2006.01]**
5/747 • • mechanically coupled by gearing **[2006.01]**
5/753 • • • Differential gearing **[2006.01]**

6/00 Arrangements for controlling synchronous motors or other dynamo-electric motors using electronic commutation dependent on the rotor position; Electronic commutators therefor *(vector control H02P 21/00)* ***[3, 4, 6, 2006.01, 2016.01]***

Note(s) [2016.01]

Group H02P 6/26 takes precedence over groups H02P 6/04-H02P 6/24 and H02P 6/28-H02P 6/34.

6/04 • *Arrangements for controlling or regulating the speed or torque of more than one motor (H02P 6/10 takes precedence)* ***[6, 2006.01, 2016.01]***
6/06 • Arrangements for speed regulation of a single motor wherein the motor speed is measured and compared with a given physical value so as to adjust the motor speed **[6, 2006.01]**
6/08 • *Arrangements for controlling the speed or torque of a single motor (H02P 6/10, H02P 6/28 take precedence)* ***[6, 2006.01, 2016.01]***
6/10 • Arrangements for controlling torque ripple, e.g. providing reduced torque ripple **[6, 2006.01]**
6/12 • Monitoring commutation; Providing indication of commutation failure **[6, 2006.01]**
6/14 • *Electronic commutators* ***[6, 2006.01, 2016.01]***
6/15 • • *Controlling commutation time* ***[2016.01]***

6/16 • • *Circuit arrangements for detecting position **[6, 2006.01, 2016.01]***
6/17 • • • *and for generating speed information **[2016.01]***
6/18 • • • *without separate position detecting elements **[6, 2006.01, 2016.01]***
6/182 • • • • *using back-emf in windings **[2016.01]***
6/185 • • • • *using inductance sensing, e.g. pulse excitation **[2016.01]***
6/20 • *Arrangements for starting (H02P 6/08 takes precedence) **[6, 2006.01, 2016.01]***
6/21 • • *Open loop start **[2016.01]***
6/22 • • in a selected direction of rotation **[6, 2006.01]**
6/24 • Arrangements for stopping **[6, 2006.01]**
6/26 • *Arrangements for controlling single phase motors **[2016.01]***
6/28 • *Arrangements for controlling current (H02P 6/10 takes precedence) **[2016.01]***
6/30 • *Arrangements for controlling the direction of rotation (H02P 6/22 takes precedence) **[2016.01]***
6/32 • *Arrangements for controlling wound field motors, e.g. motors with exciter coils **[2016.01]***
6/34 • *Modelling or simulation for control purposes **[2016.01]***

7/00 ***Arrangements for regulating or controlling the speed or torque of electric DC motors [1, 2, 2006.01, 2016.01]***

7/02 • *the DC motors being of the linear type **[2016.01]***
7/025 • • *the DC motors being of the moving coil type, e.g. voice coil motors **[2016.01]***
7/03 • *for controlling the direction of rotation of DC motors **[2016.01]***
7/06 • for regulating or controlling an individual dc dynamo-electric motor by varying field or armature current **[1, 2006.01]**
7/08 • • by manual control without auxiliary power **[1, 2006.01]**
7/10 • • • of motor field only **[1, 2006.01]**
7/12 • • • • Switching field from series to shunt excitation or vice versa **[1, 2006.01]**
7/14 • • • of voltage applied to the armature with or without control of field **[1, 2006.01]**
7/18 • • by master control with auxiliary power **[1, 2006.01]**
7/20 • • • using multi-position switch, e.g. drum, controlling motor circuit by means of relays (H02P 7/24, H02P 7/30 take precedence) **[1, 2006.01]**
7/22 • • • using multi-position switch, e.g. drum, controlling motor circuit by means of pilot-motor-operated multi-position switch or pilot-motor-operated variable resistance (H02P 7/24, H02P 7/30 take precedence) **[1, 2006.01]**
7/24 • • • using discharge tubes or semiconductor devices **[1, 2006.01]**
7/26 • • • • using discharge tubes **[1, 2006.01]**
7/28 • • • • *using semiconductor devices **[1, 2006.01, 2016.01]***
7/281 • • • • • *the DC motor being operated in four quadrants **[2016.01]***

Note(s) [2016.01]

Group H02P 7/281 takes precedence over groups H02P 7/282-H02P 7/298.

7/282 • • • • • *controlling field supply only **[4, 2006.01, 2016.01]***
7/285 • • • • • *controlling armature supply only **[4, 2006.01, 2016.01]***
7/288 • • • • • • *using variable impedance **[4, 2006.01, 2016.01]***
7/29 • • • • • • *using pulse modulation **[4, 2006.01, 2016.01]***
7/291 • • • • • • • *with on-off control between two set points, e.g. controlling by hysteresis **[2016.01]***
7/292 • • • • • • *using static converters, e.g. AC to DC **[4, 2006.01, 2016.01]***
7/293 • • • • • • • *using phase control (H02P 7/295 takes precedence) **[2016.01]***
7/295 • • • • • • • *of the kind having one thyristor or the like in series with the power supply and the motor **[4, 2006.01, 2016.01]***
7/298 • • • • • *controlling armature and field supplies **[4, 2006.01, 2016.01]***
7/30 • • • using magnetic devices with controllable degree of saturation, i.e. transductors **[1, 2006.01]**
7/32 • • • using armature-reaction-excited machines, e.g. metadyne, amplidyne, rototrol **[1, 2006.01]**
7/34 • • • *using Ward-Leonard arrangements **[1, 2006.01, 2016.01]***
7/343 • • • • *in which both generator and motor fields are controlled **[2016.01]***
7/347 • • • • *in which only the generator field is controlled **[2016.01]***

8/00 **Arrangements for controlling dynamo-electric motors rotating step by step [2, 6, 2006.01]**

8/02 • specially adapted for single-phase or bi-pole stepper motors, e.g. watch-motors, clock-motors **[6, 2006.01]**
8/04 • Arrangements for starting **[6, 2006.01]**
8/06 • • in selected direction of rotation **[6, 2006.01]**
8/08 • • Determining position before starting **[6, 2006.01]**
8/10 • • Shaping pulses for starting; Boosting current during starting **[6, 2006.01]**
8/12 • Control or stabilisation of current **[6, 2006.01]**
8/14 • Arrangements for controlling speed or speed and torque (H02P 8/12, H02P 8/22 take precedence) **[6, 2006.01]**
8/16 • • Reducing energy dissipated or supplied **[6, 2006.01]**
8/18 • • Shaping of pulses, e.g. to reduce torque ripple **[6, 2006.01]**
8/20 • • characterised by bidirectional operation **[6, 2006.01]**
8/22 • Control of step size; Intermediate stepping, e.g. micro-stepping **[6, 2006.01]**
8/24 • Arrangements for stopping (H02P 8/32 take precedence) **[6, 2006.01]**
8/26 • • Memorising final pulse when stopping **[6, 2006.01]**
8/28 • • Disconnecting power source when stopping **[6, 2006.01]**
8/30 • • Holding position when stopped **[6, 2006.01]**
8/32 • Reducing overshoot or oscillation, e.g. damping **[6, 2006.01]**
8/34 • Monitoring operation (H02P 8/36 takes precedence) **[6, 2006.01]**
8/36 • Protection against faults, e.g. against overheating or step-out; Indicating faults **[6, 2006.01]**
8/38 • • the fault being step-out **[6, 2006.01]**

8/40 • Special adaptations for controlling two or more stepping motors **[6, 2006.01]**

8/42 • characterised by non-stepper motors being operated step by step **[6, 2006.01]**

9/00 Arrangements for controlling electric generators for the purpose of obtaining a desired output [1, 2006.01]

9/02 • Details **[1, 2006.01]**

9/04 • Control effected upon non-electric prime mover and dependent upon electric output value of the generator (effecting control of the prime mover in general, see the relevant class for such prime mover) **[1, 2, 2006.01]**

9/06 • Control effected upon clutch or other mechanical power transmission means and dependent upon electric output value of the generator (effecting control of the power transmission means, see the relevant class for such means) **[1, 2, 2006.01]**

9/08 • Control of generator circuit during starting or stopping of driving means, e.g. for initiating excitation **[1, 2, 2006.01]**

9/10 • Control effected upon generator excitation circuit to reduce harmful effects of overloads or transients, e.g. sudden application of load, sudden removal of load, sudden change of load **[1, 2, 2006.01]**

9/12 • • for demagnetising; for reducing effects of remanence; for preventing pole reversal **[1, 2, 2006.01]**

9/14 • by variation of field (H02P 9/08, H02P 9/10 take precedence) **[1, 2, 2006.01]**

9/16 • • due to variation of ohmic resistance in field circuit, using resistances switched in or out of circuit step by step **[1, 2006.01]**

9/18 • • • the switching being caused by a servomotor, measuring instrument, or relay **[1, 2006.01]**

9/20 • • due to variation of continuously-variable ohmic resistance **[1, 2006.01]**

9/22 • • • comprising carbon pile resistance **[1, 2006.01]**

9/24 • • due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator **[1, 2006.01]**

9/26 • • using discharge tubes or semiconductor devices (H02P 9/34 takes precedence) **[1, 2, 2006.01]**

9/28 • • • using discharge tubes **[1, 2006.01]**

9/30 • • • using semiconductor devices **[1, 2006.01]**

9/32 • • using magnetic devices with controllable degree of saturation (H02P 9/34 takes precedence) **[1, 2, 2006.01]**

9/34 • • using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device **[1, 2006.01]**

9/36 • • using armature-reaction-excited machines **[1, 2006.01]**

9/38 • • Self-excitation by current derived from rectification of both output voltage and output current of generator **[1, 2006.01]**

9/40 • by variation of reluctance of magnetic circuit of generator **[1, 2006.01]**

9/42 • to obtain desired frequency without varying speed of the generator **[1, 2006.01]**

9/44 • Control of frequency and voltage in predetermined relation, e.g. constant ratio **[1, 2006.01]**

9/46 • Control of asynchronous generator by variation of capacitor **[1, 2006.01]**

9/48 • Arrangements for obtaining a constant output value at varying speed of the generator, e.g. on vehicle (H02P 9/04-H02P 9/46 take precedence) **[3, 2006.01]**

11/00 Arrangements for controlling dynamo-electric converters [1, 4, 2006.01]

11/04 • for controlling dynamo-electric converters having a dc output **[1, 2006.01]**

11/06 • for controlling dynamo-electric converters having an ac output **[1, 2006.01]**

13/00 Arrangements for controlling transformers, reactors or choke coils, for the purpose of obtaining a desired output [1, 4, 2006.01]

13/06 • by tap-changing; by rearranging interconnections of windings **[1, 2006.01]**

13/08 • by sliding current collector along winding **[1, 2006.01]**

13/10 • by moving core, coil winding, or shield, e.g. by induction regulator **[1, 2006.01]**

13/12 • by varying magnetic bias **[1, 2006.01]**

15/00 Arrangements for controlling dynamo-electric brakes or clutches (vector control H02P 21/00) **[1, 2006.01]**

15/02 • Conjoint control of brakes and clutches **[3, 2006.01]**

17/00 Arrangements for controlling dynamo-electric gears (vector control H02P 21/00) **[3, 2006.01]**

21/00 Arrangements or methods for the control of electric machines by vector control, e.g. by control of field orientation [6, 2006.01, 2016.01]

Note(s) [2006.01, 2016.01]

1. When classifying in this group, classification should also be made in group H02P 25/00 when the method of control is characterised by the kind of motor being controlled.

2. When classifying in this group, classification should also be made in group H02P 27/00 when the method of control is characterised by the kind of supply voltage of the motor being controlled.

21/02 • specially adapted for optimising the efficiency at low load **[2006.01]**

21/04 • specially adapted for very low speeds **[2006.01]**

21/05 • specially adapted for damping motor oscillations, e.g. for reducing hunting **[2006.01]**

*21/06 • Rotor flux based control involving the use of rotor position or rotor speed sensors **[2006.01, 2016.01]***

*21/08 • • Indirect field-oriented control; Rotor flux feed-forward control **[2006.01, 2016.01]***

*21/09 • • • Field phase angle calculation based on rotor voltage equation by adding slip frequency and speed proportional frequency **[2016.01]***

*21/10 • • Direct field-oriented control; Rotor flux feed-back control **[2006.01, 2016.01]***

*21/12 • Stator flux based control involving the use of rotor position or rotor speed sensors **[2006.01, 2016.01]***

21/13 • Observer control, e.g. using Luenberger observers or Kalman filters **[2006.01]**

*21/14 • Estimation or adaptation of machine parameters, e.g. flux, current or voltage **[2006.01, 2016.01]***

*21/16 • • Estimation of constants, e.g. the rotor time constant **[2016.01]***

*21/18 • • Estimation of position or speed **[2016.01]***

*21/20 • • Estimation of torque **[2016.01]***

*21/22 • Current control, e.g. using a current control loop **[2016.01]***

21/24 • *Vector control not involving the use of rotor position or rotor speed sensors* ***[2016.01]***
21/26 • • *Rotor flux based control* ***[2016.01]***
21/28 • • *Stator flux based control* ***[2016.01]***
21/30 • • • *Direct torque control [DTC] or field acceleration method [FAM]* ***[2016.01]***
21/32 • • *Determining the initial rotor position (H02P 21/34 takes precedence)* ***[2016.01]***
21/34 • *Arrangements for starting* ***[2016.01]***
21/36 • *Arrangements for braking or slowing; Four quadrant control* ***[2016.01]***

23/00 ***Arrangements or methods for the control of AC motors characterised by a control method other than vector control [2006.01, 2016.01]***

Note(s) [2006.01]

When classifying in this group, subject matter also relating to groups H02P 21/00, H02P 25/00 or H02P 27/00 is further classified in those groups whenever appropriate.

23/02 • specially adapted for optimising the efficiency at low load **[2006.01]**
23/03 • specially adapted for very low speeds **[2006.01]**
23/04 • specially adapted for damping motor oscillations, e.g. for reducing hunting **[2006.01]**
23/06 • *Controlling the motor in four quadrants* ***[2006.01, 2016.01]***
23/07 • • *Polyphase or monophase asynchronous induction motors* ***[2016.01]***
23/08 • Controlling based on slip frequency, e.g. adding slip frequency and speed proportional frequency **[2006.01]**
23/10 • Controlling by adding a dc current **[2006.01]**
23/12 • Observer control, e.g. using Luenberger observers or Kalman filters **[2006.01]**
23/14 • Estimation or adaptation of motor parameters, e.g. rotor time constant, flux, speed, current or voltage **[2006.01]**
23/16 • *Controlling the angular speed of one shaft (H02P 23/18 takes precedence)* ***[2016.01]***
23/18 • *Controlling the angular speed together with angular position or phase* ***[2016.01]***
23/20 • *Controlling the acceleration or deceleration* ***[2016.01]***
23/22 • *Controlling the speed digitally using a reference oscillator, a speed proportional pulse rate feedback and a digital comparator* ***[2016.01]***
23/24 • *Controlling the direction, e.g. clockwise or counterclockwise* ***[2016.01]***
23/26 • *Power factor control [PFC]* ***[2016.01]***
23/28 • *Controlling the motor by varying the switching frequency of switches connected to a DC supply and the motor phases* ***[2016.01]***
23/30 • *Direct torque control [DTC] or field acceleration method [FAM]* ***[2016.01]***

25/00 **Arrangements or methods for the control of AC motors characterised by the kind of AC motor or by structural details [2006.01]**

Note(s) [2006.01]

When classifying in this group, subject matter also relating to groups H02P 21/00, H02P 23/00 or H02P 27/00 is further classified in those groups whenever appropriate.

25/02 • *characterised by the kind of motor* ***[2006.01, 2016.01]***
25/022 • • *Synchronous motors (H02P 25/064 takes precedence)* ***[2016.01]***
25/024 • • • *controlled by supply frequency* ***[2016.01]***
25/026 • • • • *thereby detecting the rotor position* ***[2016.01]***
25/028 • • • *with four quadrant control* ***[2016.01]***
25/03 • • • *with brushless excitation* ***[2016.01]***
25/032 • • *Reciprocating, oscillating or vibrating motors* ***[2016.01]***
25/034 • • • *Voice coil motors (voice coil motors driven by DC H02P 7/025)* ***[2016.01]***
25/04 • • Single phase motors, e.g. capacitor motors **[2006.01]**
25/06 • • *Linear motors* ***[2006.01, 2016.01]***
25/062 • • • *of the induction type* ***[2016.01]***
25/064 • • • *of the synchronous type* ***[2016.01]***
25/066 • • • • *of the stepping type* ***[2016.01]***
25/08 • • *Reluctance motors* ***[2006.01, 2016.01]***
25/083 • • • *Arrangements for increasing the switching speed from one coil to the next one* ***[2016.01]***
25/086 • • • *Commutation* ***[2016.01]***
25/089 • • • • *Sensorless control (direct torque control H02P 23/30)* ***[2016.01]***
25/092 • • • *Converters specially adapted for controlling reluctance motors* ***[2016.01]***
25/098 • • • *Arrangements for reducing torque ripple* ***[2016.01]***
25/10 • • Commutator motors, e.g. repulsion motors **[2006.01]**
25/12 • • • with shiftable brushes **[2006.01]**
25/14 • • • Universal motors (H02P 25/12 takes precedence) **[2006.01]**
25/16 • characterised by the circuit arrangement or by the kind of wiring **[2006.01]**
25/18 • • with arrangements for switching the windings, e.g. with mechanical switches or relays **[2006.01]**
25/20 • • • for pole-changing **[2006.01]**
25/22 • • Multiple windings; Windings for more than three phases **[2006.01]**
25/24 • • Variable impedance in stator or rotor circuit **[2006.01]**
25/26 • • • with arrangements for controlling secondary impedance **[2006.01]**
25/28 • • using magnetic devices with controllable degree of saturation, e.g. transductors **[2006.01]**
25/30 • • the motor being controlled by a control effected upon an ac generator supplying it **[2006.01]**
25/32 • • using discharge tubes **[2006.01]**

27/00 **Arrangements or methods for the control of AC motors characterised by the kind of supply voltage** (of two or more motors H02P 5/00; of synchronous motors with electronic commutators H02P 6/00; of DC motors H02P 7/00; of stepping motors H02P 8/00) **[2006.01]**

Note(s) [2006.01]

When classifying in this group, subject matter also relating to groups H02P 21/00, H02P 23/00 or H02P 25/00 is further classified in those groups whenever appropriate.

27/02 • *using supply voltage with constant frequency and variable amplitude* ***[2006.01, 2016.01]***
27/024 • • *using AC supply for only the rotor circuit or only the stator circuit* ***[2016.01]***
27/04 • *using variable-frequency supply voltage, e.g. inverter or converter supply voltage* ***[2006.01, 2016.01]***

27/048 • • *using AC supply for only the rotor circuit or only the stator circuit **[2016.01]***

27/05 • • using AC supply for both the rotor and the stator circuits, the frequency of supply to at least one circuit being variable **[2006.01]**

27/06 • • using dc to ac converters or inverters (H02P 27/05 takes precedence) **[2006.01]**

27/08 • • • with pulse width modulation **[2006.01]**

27/10 • • • • using bang-bang controllers **[2006.01]**

27/12 • • • • pulsing by guiding the flux vector, current vector or voltage vector on a circle or a closed curve, e.g. for direct torque control **[2006.01]**

27/14 • • • • with three or more levels of voltage **[2006.01]**

27/16 • • using ac to ac converters without intermediate conversion to dc (H02P 27/05 takes precedence) **[2006.01]**

27/18 • • • varying the frequency by omitting half waves **[2006.01]**

29/00 ***Arrangements for regulating or controlling electric motors, appropriate for both AC and DC motors*** *(arrangements for starting electric motors H02P 1/00; arrangements for stopping or slowing electric motors H02P 3/00; control of motors that can be connected to two or more different electric power supplies H02P 4/00; regulating or controlling the speed or torque of two or more electric motors H02P 5/00; vector control H02P 21/00) **[2006.01, 2016.01]***

29/02 • *Providing protection against overload without automatic interruption of supply (protection against faults of stepper motors H02P 8/36) **[2006.01, 2016.01]***

29/024 • • *Detecting a fault condition, e.g. short circuit, locked rotor, open circuit or loss of load **[2016.01]***

29/028 • • • *the motor continuing operation despite the fault condition, e.g. eliminating, compensating for or remedying the fault **[2016.01]***

29/032 • • *Preventing damage to the motor, e.g. setting individual current limits for different drive conditions **[2016.01]***

29/04 • by means of a separate brake **[2006.01]**

29/10 • *for preventing overspeed or under speed **[2016.01]***

29/20 • *for controlling one motor used for different sequential operations **[2016.01]***

29/40 • *Regulating or controlling the amount of current drawn or delivered by the motor for controlling the mechanical load **[2016.01]***

29/50 • *Reduction of harmonics **[2016.01]***

29/60 • *Controlling or determining the temperature of the motor or of the drive (H02P 29/02 takes precedence) **[2016.01]***

29/62 • • *for raising the temperature of the motor **[2016.01]***

29/64 • • *Controlling or determining the temperature of the winding **[2016.01]***

29/66 • • *Controlling or determining the temperature of the rotor **[2016.01]***

29/68 • • *based on the temperature of a drive component or a semiconductor component **[2016.01]***

31/00 **Arrangements for regulating or controlling electric motors not provided for in groups H02P 1/00-H02P 5/00, H02P 7/00 or H02P 21/00-H02P 29/00 [2006.01]**

Indexing scheme associated with groups relating to the arrangements for controlling electric generators [2015.01]

101/00 **Special adaptation of control arrangements for generators [2015.01]**

101/10 • for water-driven turbines **[2015.01]**

101/15 • for wind-driven turbines **[2015.01]**

101/20 • for steam-driven turbines **[2015.01]**

101/25 • for combustion engines **[2015.01]**

101/30 • for aircraft **[2015.01]**

101/35 • for ships **[2015.01]**

101/40 • for railway vehicles **[2015.01]**

101/45 • for motor vehicles, e.g. car alternators **[2015.01]**

103/00 **Controlling arrangements characterised by the type of generator [2015.01]**

103/10 • of the asynchronous type **[2015.01]**

103/20 • of the synchronous type **[2015.01]**