

ECLA**EUROPEAN CLASSIFICATION****H02P**

CONTROL OR REGULATION OF ELECTRIC MOTORS, GENERATORS, OR DYNAMO-ELECTRIC CONVERTERS; CONTROLLING TRANSFORMERS, REACTORS OR CHOKE COILS ([N: specially adapted for electrically propelled vehicles B60L]; structure of the starter, brake, or other control devices, see the relevant subclasses, e.g. mechanical brake F16D, mechanical speed regulator G05D, variable resistor H01C, starter switch H01H; systems for regulating electric or magnetic variables using transformers, reactors or choke coils G05F; arrangements structurally associated with motors, generators, dynamo-electric converters, transformers, reactors or choke coils, see the relevant subclasses, e.g. H01F, H02K; connection or control of one generator, transformer, reactor, choke coil, or dynamo-electric converter with regard to conjoint operation with similar or other source of supply H02J; control or regulation of static converters H02M) [C9907]

Notes

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, 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.

H02P1/00

Arrangements for starting electric motors or dynamo-electric converters (starting of synchronous motors with electronic commutators except reluctance motors, [H02P6/20](#), [H02P6/22](#); starting dynamo-electric motors rotating step by step [H02P8/04](#); vector control [H02P21/00](#)) [C0406]

H02P1/02

. Details

H02P1/02A

. . [N: Protection against "no voltage condition"]

H02P1/02B

. . [N: Security devices, e.g. correct phase sequencing]

H02P1/02B1

. . . [N: Protection against sparking of contacts or sticking together]

H02P1/02B2

. . . [N: Protection against simultaneous starting by two starting devices]

H02P1/02B3

. . . [N: Protection against starting if starting resistor is not at zero position]

H02P1/02B4	. . . [N: Means for delayed starting]
H02P1/02C	. . [N: Special design of starting resistor]
H02P1/02J	. . [N: wherein the motor voltage is increased at low speed, to start or restart high inertia loads] [N1204]
H02P1/02R	. . [N: Restarting, e.g. after power failure] [N0108]
H02P1/04	. . Means for controlling progress of starting sequence in dependence upon time or upon current, speed, or other motor parameter
H02P1/06	. . . Manually-operated multi-position starters
H02P1/08	. . . Manually-operated on/off switch controlling power-operated multi-position switch or impedances for starting a motor
H02P1/10	. . . Manually-operated on/off switch controlling relays or contactors operating sequentially for starting a motor (sequence determined by power-operated multi-position switch H02P1/08)
H02P1/12	. . . Switching devices centrifugally operated by the motor
H02P1/14	. . . Pressure-sensitive resistors centrifugally operated by the motor
H02P1/16	. for starting dynamo-electric motors or dynamo-electric converters
H02P1/16A	. . [N: for starting an individual reluctance motor]
H02P1/16B	. . [N: Driving load with high inertia]
H02P1/18	. . for starting an individual dc motor
H02P1/20	. . . by progressive reduction of resistance in series with armature winding
H02P1/22	. . . in either direction of rotation
H02P1/24	. . for starting an individual ac commutator motor (starting of ac/dc commutator motors H02P1/18)
	[N: Note Group H02P1/02R takes precedence over groups H02P1/26 to H02P1/54]
H02P1/26	. . for starting an individual polyphase induction motor
H02P1/26B	. . . [N: Means for starting or running a triphase motor on a single phase supply] [N0505]
H02P1/28	. . . by progressive increase of voltage applied to primary circuit of motor
H02P1/30	. . . by progressive increase of frequency of supply to primary circuit of motor
H02P1/32	. . . by star-delta switching
H02P1/34	. . . by progressive reduction of impedance in secondary circuit
H02P1/36	. . . . the impedance being a liquid resistance
H02P1/38	. . . by pole-changing
H02P1/40	. . . in either direction of rotation
H02P1/42	. . for starting an individual single-phase induction motor [N: (H02P27/04 takes precedence)] [C0505]
H02P1/42B	. . . [N: by using means to limit the current in the main winding] [N0505] [C1111]
H02P1/42D	. . . [N: by using a specially adapted frequency converter] [N0505]
H02P1/44	. . . by phase-splitting with a capacitor
H02P1/44B	. . . . [N: by using additional capacitors switched at start up] [N0505]
H02P1/46	. . for starting an individual synchronous motor [N: (H02P27/04 takes precedence)] [C0505]

H02P1/46B	. . . [N: for starting an individual single-phase synchronous motor] [N0505]
H02P1/48	. . . by pole-changing
H02P1/50	. . . by changing over from asynchronous to synchronous operation (H02P1/48 takes precedence)
H02P1/52	. . . by progressive increase of frequency of supply to motor
H02P1/54	. . . for starting two or more dynamo-electric motors
H02P1/56	. . . simultaneously
H02P1/58	. . . sequentially
H02P3/00	Arrangements for stopping or slowing electric motors, generators, or dynamo-electric converters (stopping of synchronous motors with electronic commutators except reluctance motors, H02P6/24 ; stopping dynamo-electric motors rotating step by step H02P8/24 ; vector control H02P21/00) [C0406]
H02P3/02	. Details
H02P3/02B	. . [N: holding the rotor in a fixed position after deceleration] [N1204]
H02P3/04	. . Means for stopping or slowing by a separate brake, e.g. friction brake, eddy-current brake (brakes F16D , H02K49/00)
H02P3/06	. for stopping or slowing an individual dynamo-electric motor or dynamo-electric converter
H02P3/06A	. . [N: for stopping or slowing a reluctance motor]
H02P3/08	. . for stopping or slowing a dc motor
H02P3/10	. . . by reversal of supply connections
H02P3/12	. . . by short-circuit or resistive braking
H02P3/14	. . . by regenerative braking
H02P3/16	. . . by combined electrical and mechanical braking
H02P3/18	. . for stopping or slowing an ac motor
H02P3/20	. . . by reversal of phase sequence of connections to the motor
H02P3/22	. . . by short-circuit or resistive braking
H02P3/24	. . . by applying dc to the motor
H02P3/26	. . . by combined electrical and mechanical braking
H02P4/00	Arrangements specially adapted for regulating or controlling the speed or torque of electric motors that can be connected to two or more different voltage or current supplies (starting H02P1/00 ; stopping or slowing H02P3/00 ; vector control H02P21/00) [N0402]
H02P5/00	Arrangements specially adapted for regulating or controlling the speed or torque of two or more electric motors (starting H02P1/00 ; stopping or slowing H02P3/00 ; [N: synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position H02P6/00 ; motors rotating step by step H02P8/00 ;] vector control H02P21/00) [C0402]
H02P5/46	. for speed regulation of two or more dynamo-electric motors in relation to one another
H02P5/48	. . by comparing mechanical values representing the speeds

- H02P5/48B . . . [N: using differential movement]
- H02P5/48C . . . [N: by intermittently closing or opening electrical contacts]
- H02P5/50 . . by comparing electrical values representing the speeds
- H02P5/50B . . . [N: using equalising lines]
- H02P5/50C . . . [N: Direct ratio control]
- H02P5/52 . . additionally providing control of relative angular displacement [N: of relative angular position or phase]
- H02P5/52B . . . [N: Speed and position comparison by mechanical means]
- H02P5/52C . . . [N: Speed and position comparison by electrical means]

- H02P5/60 . controlling combinations of dc and ac dynamo-electric motors ([H02P5/46](#) takes precedence) [N0402]

- H02P5/68 . controlling two or more dc dynamo-electric motors ([H02P5/46](#), [H02P5/60](#) take precedence) [N0402]
- H02P5/685 . . electrically connected in series, i.e. carrying the same current [N0402]
- H02P5/69 . . mechanically coupled by gearing [N0402]
- H02P5/695 . . . Differential gearing [N0402]

- H02P5/74 . controlling two or more ac dynamo-electric motors ([H02P5/46](#), [H02P5/60](#) take precedence) [N0402]
- H02P5/747 . . mechanically coupled by gearing [N0402]
- H02P5/753 . . . Differential gearing [N0402]

- H02P6/00** **Arrangements for controlling synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position; Electronic commutators therefor** (stepping motors [H02P8/00](#); vector control [H02P21/00](#); reluctance motors [H02P25/08](#)) [C0406]
- [N: **Note**
Groups [H02P6/00L](#) and [H02P6/00S](#) take precedence over groups [H02P6/00B](#) to [H02P6/00G](#) and [H02P6/04](#) to [H02P6/24](#)
]

- H02P6/00B . [N: Details, e.g. modelling, simulation, comparisons, control principles in general]
- H02P6/00C . [N: Arrangements for controlling current ([H02P6/10](#) takes precedence)] [N9810]
- H02P6/00D . [N: Controlling the direction of rotation] [C9603]
- H02P6/00G . [N: Arrangements for controlling doubly fed motors] [N9810]
- H02P6/00L . [N: Controlling linear motors] [N0108]
- H02P6/00P . [N: wherein the position is detected using the ripple of the current caused by the commutation] [N1204]
- H02P6/00S . [N: Controlling single phase motors] [N0108]
- H02P6/04 . Arrangements for controlling or regulating speed or torque of more than one motor

- H02P6/06
 - 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
- H02P6/08
 - Arrangements for controlling the speed or torque of a single motor [N: ([H02P6/00C](#) takes precedence)] [C9810]
- H02P6/08B
 - • [N: in a bridge configuration]
- H02P6/10
 - • providing reduced torque ripple; controlling torque ripple
- H02P6/12
 - Monitoring commutation; Providing indication of commutation failure
- H02P6/14
 - Electronic commutators
- H02P6/14B
 - • [N: Changing commutation time] [N9706]
- H02P6/14B2
 - • • [N: wherein the commutation is advanced from position signals phase in function of the speed] [N1204]
- H02P6/14B4
 - • • [N: wherein the commutation is function of electro magnetic force [EMF]] [N1204]
- H02P6/16
 - • Circuit arrangements for detecting position (structural arrangement of position sensors [H02K29/06](#))
- H02P6/16B
 - • • [N: and generating speed information] [N9604]
- H02P6/18
 - • • without separate position detecting elements, e.g. using back-emf in windings [N: ([H02P6/16B](#) takes precedence)] [C9604]
- H02P6/18D
 - • • • [N: using different methods depending on the speed] [N1204]
- H02P6/18E
 - • • • [N: using back-emf in windings] [N9511]
- H02P6/18F
 - • • • [N: using an injected high frequency signal] [N1204]
- H02P6/18H
 - • • • [N: using pulse excitation] [N9702]
- H02P6/18R
 - • • • [N: using difference of inductance or reluctance between the phases] [N1204]
- H02P6/18S
 - • • • [N: using the star point voltage] [N1204]
- H02P6/18V
 - • • • [N: using the voltage difference between the windings (H02P6/18E takes precedence)] [N1204]
- H02P6/20
 - Arrangements for starting ([H02P6/08](#), [H02P6/22](#) take precedence)
- H02P6/20C
 - • [N: Open loop start] [N9911]
- H02P6/22
 - Arrangements for starting in a selected direction of rotation
- H02P6/24
 - Arrangements for stopping
- H02P7/00**

Arrangements for regulating or controlling the speed or torque of electric DC motors (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); [N: synchronous motors or other dynamo-electric motors with electronic commutators in dependence on the rotor position [H02P6/00](#); motors rotating step by step [H02P8/00](#);] vector control [H02P21/00](#)) [C0402]
- H02P7/00E
 - [N: Controlling the direction of rotation of DC motors] [N9603] [C0402]
- H02P7/00E1
 - • [N: by means of a H-bridge circuit] [N0402]
- H02P7/00E3
 - • [N: by means of electronic switching] [N0402]
- H02P7/00P
 - [N: wherein the position is detected using the ripple of the current caused by the

commutator] [N1204]

- H02P7/06 . for regulating or controlling an individual dc dynamo-electric motor by varying field or armature current [C0402]
- H02P7/06A . . [N: using centrifugal devices, e.g. switch, resistor] [N0402]
- H02P7/06B . . [N: using a periodic interrupter, e.g. Tirrill regulator] [N0402]
- H02P7/08 . . by manual control without auxiliary power
- H02P7/10 . . . of motor field only
- H02P7/12 Switching field from series to shunt excitation or vice versa
- H02P7/14 . . . of voltage applied to the armature with or without control of field [N: Ward-Leonard]
- H02P7/18 . . by master control with auxiliary power
- H02P7/20 . . . using multi-position switch, e.g. drum, controlling motor circuit by means of relays (H02P7/24, H02P7/30 take precedence) [C0402]
- H02P7/22 . . . 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 (H02P7/24, H02P7/30 take precedence) [C0402]
- H02P7/24 . . . using discharge tubes or semiconductor devices
- H02P7/24R [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/26 using discharge tubes
- H02P7/26R [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/28 using semiconductor devices
- [N: **Note**
Group H02P7/28B takes precedence over groups H02P7/282 to H02P7/298]
- H02P7/28A [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/28B [N: the DC-motor being operated in the four quadrants]
- H02P7/28B1 [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- [N: **Note**
[N0402]
Groups H02P7/28B1 takes precedence over groups H02P7/28R]
- H02P7/282 controlling field supply only
- H02P7/282R [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/285 controlling armature supply only
- H02P7/285R [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/288 using variable impedance
- H02P7/288R {7 dots} [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P7/29 using pulse modulation

H02P7/29A	. . . . . {7 dots} [N: with on-off control between two set points]
H02P7/29R	. . . . . {7 dots} [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
H02P7/292	. . . . . using static converters, e.g. ac to dc
H02P7/292A	. . . . . {7 dots} [N: using phase control (H02P7/295 takes precedence)]
H02P7/295	. . . . . {7 dots} of the kind having a thyristor or the like in series with the power supply and the motor
H02P7/298	. . . . . controlling armature and field supply
H02P7/298R	. . . . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
H02P7/30	. . . using magnetic devices with controllable degree of saturation, i.e. transductors
H02P7/30R	. . . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
H02P7/32	. . . using armature-reaction-excited machines, e.g. metadyne, amplidyne, rototrol
H02P7/32R	. . . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
H02P7/34	. . . using Ward-Leonard arrangements
H02P7/34G	. . . . [N: in which only the generator field is controlled] [N0402]
H02P7/34M	. . . . [N: in which both generator and motor fields are controlled] [N0402]
H02P7/72	. . . [N: IPC3] for changing between series and parallel connections of motors [C9505]
H02P8/00	Arrangements for controlling dynamo-electric motors of the kind having motors rotating step by step (vector control H02P21/00) [C0402]
H02P8/00B	. [N: of linear motors] [N0108]
H02P8/02	. specially adapted for single-phase or bi-pole stepper motors, e.g. watch-motors, clock-motors [N: Note Groups H02P8/00B and H02P8/02 take precedence over groups H02P8/04 to H02P8/42]
H02P8/04	. Arrangements for starting
H02P8/06	. . in selected direction of rotation
H02P8/08	. . Determining position before starting
H02P8/10	. . Shaping pulses for starting; Boosting current during starting
H02P8/12	. Control or stabilisation of current
H02P8/14	. Arrangements for controlling speed or speed and torque (H02P8/12 , H02P8/22 take precedence)
H02P8/16	. . Reducing energy dissipated or supplied
H02P8/16B	. . . [N: using two level supply voltage]
H02P8/18	. . Shaping of pulses, e.g. to reduce torque ripple
H02P8/20	. . characterised by bidirectional operation

- H02P8/22
 - Control of step size; Intermediate stepping, e.g. micro-stepping
- H02P8/24
 - Arrangements for stopping ([H02P8/32](#) takes precedence)
- H02P8/26
 - • Memorising final pulse when stopping
- H02P8/28
 - • Disconnecting power source when stopping
- H02P8/30
 - • Holding position when stopped
- H02P8/32
 - Reducing overshoot or oscillation, e.g. damping
- H02P8/34
 - Monitoring operation ([H02P8/36](#) takes precedence)
- H02P8/36
 - Protection against faults, e.g. against overheating, step-out; Indicating faults ([emergency protective arrangements with automatic interruption of supply](#) [H02H7/08](#))
- H02P8/38
 - • the fault being step-out
- H02P8/40
 - Special adaptations for controlling two or more stepping motors
- H02P8/42
 - characterised by non-stepper motors being operated step by step
- H02P9/00**

Arrangements for controlling electric generators for the purpose of obtaining a desired output ([Ward-Leonard arrangements](#) [H02P7/34](#); [vector control](#) [H02P21/00](#); [feeding a network by two or more generators](#) [H02J](#); for charging batteries [H02J7/14](#)) [\[C0402\]](#)
- H02P9/00C
 - [\[N: Means for protecting the generator by using control](#) ([H02H7/06](#) takes precedence; [control effected upon generator excitation circuit to reduce harmful effects of overloads or transients](#) [H02P9/10](#)) [\[N0210\]](#)
- H02P9/00D
 - [\[N: Control circuits for doubly fed generators\]](#) [\[N0210\]](#)
- H02P9/00F
 - [\[N: wherein the generator is controlled by the requirements of the prime mover\]](#) [\[N1204\]](#)
- H02P9/00P
 - [\[N: Circuit arrangements for detecting rotor position\]](#) [\[N0210\]](#)
- H02P9/02
 - Details
- H02P9/04
 - 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)
- H02P9/06
 - 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)
- H02P9/08
 - Control of generator circuit during starting or stopping of driving means, e.g. for initiating excitation
- H02P9/10
 - 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

- H02P9/10B . . [N: for limiting effects of transients]
- H02P9/10D . . [N: for increasing the stability]
- H02P9/10F . . [N: for limiting effects of overloads]
- H02P9/12 . . for demagnetising; for reducing effects of remanence; for preventing pole reversal
- H02P9/12B . . . [N: for demagnetising; for reducing effects of remanence]
- H02P9/12D . . . [N: for preventing pole reversal]

- H02P9/14 . by variation of field ([H02P9/08](#), [H02P9/10](#) take precedence)
- H02P9/16 . . due to variation of ohmic resistance in field circuit, using resistances switched in or out of circuit step by step
- H02P9/18 . . . the switching being caused by a servomotor, measuring instrument, or relay
- H02P9/20 . . due to variation of continuously-variable ohmic resistance
- H02P9/22 . . . comprising carbon pile resistance
- H02P9/24 . . due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator
- H02P9/26 . . using discharge tubes or semiconductor devices ([H02P9/34](#) takes precedence)
- H02P9/28 . . . using discharge tubes
- H02P9/30 . . . using semiconductor devices
- H02P9/30B [N: Brushless excitation] [N9602]
- H02P9/30D [N: controlling voltage ([H02P9/30B](#) takes precedence)] [N9602]
- H02P9/30D2 [N: more than one voltage output] [N0009]
- H02P9/32 . . using magnetic devices with controllable degree of saturation ([H02P9/34](#) takes precedence)
- H02P9/34 . . using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device
- H02P9/36 . . using armature-reaction-excited machines
- H02P9/38 . . Self-excitation by current derived from rectification of both output voltage and output current of generator

- H02P9/40 . by variation of reluctance of magnetic circuit of generator
- H02P9/42 . to obtain desired frequency without varying speed of the generator
- H02P9/44 . Control of frequency and voltage in predetermined relation, e.g. constant ratio
- H02P9/46 . Control of asynchronous generator by variation of capacitor
- H02P9/48 . Arrangements for obtaining a constant output value at varying speed of the generator, e.g. on vehicle ([H02P9/04](#) to [H02P9/46](#) take precedence)

- H02P11/00** **Arrangements for controlling dynamo-electric converters** (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); vector control [H02P21/00](#); feeding a network in conjunction with a generator or another converter [H02J](#)) [C0402]
- H02P11/04 . for controlling dynamo-electric converters having a dc output
- H02P11/06 . for controlling dynamo-electric converters having an ac output

- H02P13/00** Arrangements for controlling transformers, reactors or choke coils, for the purpose of obtaining a desired output (regulation systems using transformers, reactors or choke coils [G05F](#); transformers [H01F](#); feeding a network in conjunction with a generator or a converter [H02J](#); control or regulation of converters [H02M](#))
- [H02P13/06](#) . by tap-changing; by rearranging interconnections of windings
- [H02P13/08](#) . by sliding current collector along winding
- [H02P13/10](#) . by moving core, coil winding, or shield, e.g. by induction regulator
- [H02P13/12](#) . by varying magnetic bias
- H02P15/00** Arrangements for controlling dynamo-electric brakes or clutches (controlling speed of dynamo-electric motors by means of a separate brake [H02P29/04](#), vector control [H02P21/00](#)) [N: see provisionally also [H02K49/00](#) and [H02P29/00C2](#)] [C0402]
- [N: **WARNING**
Not complete, see also [H02K49/00](#) and [H02P29/00C2](#) [C0402]
]
- [H02P15/02](#) . Conjoint control of brakes and clutches
- H02P17/00** Arrangements for controlling dynamo-electric gears (vector control [H02P21/00](#)) [C0402]
- H02P21/00** Arrangements or methods for the control of electric machines by vector control, e.g. by control of field orientation [C0402]
- [N: **Notes**[N0911]
1. Groups [H02P21/06](#) to [H02P21/12](#) cover vector control arrangements or methods involving the use of rotor position or speed sensors.
2. Vector control arrangements or methods not involving the use of rotor position or speed sensors are classified in groups [H02P21/00N](#) and subgroups
]
- [N: **Note**
When classifying in this group, it is desirable to also classify in groups 25/00 to 27/00 if the kind of AC motor, structural details, or the kind of supply voltage are of interest.
]
- [H02P21/00B](#) . [N: Control strategies in general, e.g. linear type e.g. P, PI, PID, using robust control] [N0402] [C0911] [C1207]
- [H02P21/00B2](#) . . [N: using sliding mode control] [N1204]
- [H02P21/00B4](#) . . [N: using fuzzy control] [N1204]
- [H02P21/00B6](#) . . [N: using neural networks] [N1204]
- [H02P21/00B8](#) . . [N: Model reference adaptation, e.g. MRAS or MRAC, useful for control or parameter estimation] [N1204]
- [H02P21/00B10](#) . . [N: using different modes of control depending on a parameter, e.g. the speed] [N1204]

- H02P21/00B12 . . [N: implementing a off line learning phase to determine and store useful data for on-line control] [N1204]
- H02P21/00E . [N: Arrangements for starting]
- H02P21/00J . [N: Current control] [N9602]
- H02P21/00N . [N: not involving the use of rotor position or speed sensors] [N0911]
- H02P21/00N2 . . [N: Rotor flux based control] [N0911]
- H02P21/00N4 . . [N: Stator flux based control] [N0911]
- H02P21/00N4A . . . [N: Direct torque control (DTC) or field acceleration method (FAM)] [N0911]
- H02P21/00N6 . . [N: Determining the initial rotor position ([arrangements for starting H02P21/00E](#); [position detection in general H02P6/16-H02P6/18H](#))] [N0911]
- H02P21/00S . [N: specially adapted for high speeds, e.g. above nominal speed] [N1204]
- H02P21/00S1 . . [N: using field weakening] [N1204]
- H02P21/00W . [N: Arrangements for braking or slowing; Four quadrants control] [C0402]
- H02P21/00Z . [N: Vector control arrangements or methods not otherwise provided for in [H02P21/00-H02P21/14T](#)] [N0911]
- H02P21/02 . specially adapted for optimising the efficiency at low load [N0402]
- H02P21/04 . specially adapted for very low speeds [N: ([arrangements for starting H02P21/00E](#); [determining the initial rotor position H02P21/00N6](#))] [N0402] [C0911]
- H02P21/05 . specially adapted for damping motor oscillations, e.g. for reducing hunting [N0402]
- H02P21/06 . Rotor flux based control [N: involving the use of rotor position or speed sensor] [N0402] [C0911]
- H02P21/08 . . Indirect field-oriented control, e.g. field phase angle calculation based on rotor voltage equation by adding slip frequency and speed proportional frequency; [N: Rotor flux feed-forward control] [N0402] [C0911]
- H02P21/08S . . . [N: adding slip frequency and speed proportional frequency] [N0402]
- H02P21/10 . . Direct field-oriented control; [N: Rotor flux feed-back control] [N0402] [C0911]
- H02P21/12 . Stator flux based control, [N: involving the use of rotor position or speed sensor] [N0402] [C0911]
- H02P21/13 . Observer control, e.g. using Luenberger observers or Kalman filters [N0402]
- H02P21/14 . Estimation or adaptation of machine parameters, e.g. rotor time constant, flux, speed, current or voltage [N0402]
- H02P21/14F . . [N: Flux estimation] [N0911]
- H02P21/14J . . [N: Inertia or moment of inertia estimation] [N0911]
- H02P21/14P . . [N: constants estimation, e.g. of the rotor time constant] [N0502]
- H02P21/14S . . [N: Position or speed estimation] [N0402] [C0911]
- H02P21/14T . . [N: Torque estimation] [N0911]

H02P23/00 Arrangements or methods for the control of AC motors characterised by a control

method other than vector control (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); of two or more motors [H02P5/00](#); of synchronous motors with electronic commutators [H02P6/00](#); of DC motors [H02P7/00](#); of stepping motors [H02P8/00](#)) [N0402]

[N: **Note**

When classifying in this group, it is desirable to also classify in groups 25/00 to 27/00 if the kind of AC motor, structural details, or the kind of supply voltage are of interest.
]

- H02P23/00B . [N: Control strategies in general, e.g. linear type e.g. P, PI, PID, using robust control (control strategies related to the motor [H02P23/00C](#))] [N1204] [M1207]
- H02P23/00B2 . . [N: using sliding mode control] [N1204]
- H02P23/00B4 . . [N: using fuzzy control] [N1204]
- H02P23/00B6 . . [N: using neural networks] [N1204]
- H02P23/00B8 . . [N: Model reference adaptation, e.g. MRAS or MRAC, useful for control or parameter estimation] [N1204]
- H02P23/00B10 . . [N: using different modes of control depending on a parameter, e.g. the speed] [N1204]
- H02P23/00B12 . . [N: implementing a off line learning phase to determine and store useful data for on-line control] [N1204]
- H02P23/00C . [N: Control strategies related to the functioning of the motor] [N0402] [C1207]
- H02P23/00C2 . . [N: Direct torque control (DTC); Field acceleration method (FAM)] [N0402]
- H02P23/00D . [N: Control of angular speed of one shaft by controlling the prime mover ([H02P23/00G](#) takes precedence)][N0402]
- H02P23/00G . [N: Control of angular speed together with angular position or phase] [N0402]
- H02P23/00G2 . . [N: of one shaft without controlling the prime mover] [N0402]
- H02P23/00G4 . . [N: of one shaft by controlling the prime mover] [N0402]
- H02P23/00H . [N: Control of acceleration or deceleration] [N0402]
- H02P23/00K . [N: Digital speed control using a reference oscillator, a speed proportional pulse rate feedback and a digital comparator] [N0402]
- H02P23/00L . [N: Controlling the direction, e.g. clockwise - counterclockwise] [N0402]
- H02P23/00M . [N: Characterised by the use of a particular software algorithm] [N0402]
- H02P23/00P . [N: Power Factor Control] [N0402]
- H02P23/00S . [N: specially adapted for high speeds, e.g. above nominal speed] [N1204]
- H02P23/00S1 . . [N: using field weakening] [N1204]
- H02P23/00T . [N: controlled by the switch frequency of the switches connected to a DC supply and the motor phases] [N0402]
- H02P23/02 . specially adapted for optimising the efficiency at low load [N0402]
- H02P23/03 . specially adapted for very low speeds [N0402]

- H02P23/04 . specially adapted for damping motor oscillations, e.g. for reducing hunting [N0402]
- H02P23/06 . Controlling the motor in four quadrants [N0402]
- H02P23/06B . . [N: Polyphase or monophas asynchronous induction motors] [N0402]
- H02P23/08 . Controlling based on slip frequency, e.g. adding slip frequency and speed proportional frequency [N0402]
- H02P23/10 . Controlling by adding a dc current (dc current braking [H02P3/24](#)) [N0402]
- H02P23/12 . Observer control, e.g. using Luenberger observers or Kalman filters [N0402]
- H02P23/14 . Estimation or adaptation of motor parameters, e.g. rotor time constant, flux, speed, current or voltage [N0402]

- H02P25/00** **Arrangements or methods for the control of AC motors characterised by the kind of AC motor or by structural details** (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); of two or more motors [H02P5/00](#); of synchronous motors with electronic commutators [H02P6/00](#); of DC motors [H02P7/00](#); of stepping motors [H02P8/00](#)) [N0402]
- [N: **Note**
When classifying in this group, it is desirable to also classify in groups [H02P21/00](#), [H02P23/00](#) or [H02P27/00](#) if the control method or the kind of supply voltage are of interest.
]
- H02P25/02 . characterised by the kind of motor [N0402]
- H02P25/02C . . [N: Synchronous motors] [N0402]
- H02P25/02C1 . . . [N: controlled by supply frequency] [N0402]
- H02P25/02C1B [N: thereby detecting the rotor position] [N0402]
- H02P25/02C3 . . . [N: Four quadrant control] [N0402]
- H02P25/02C7 . . . [N: with brushless excitation] [N0402]
- H02P25/02G . . [N: Control of reciprocating, oscillating or vibrating motors (Note: see also [H01F](#))] [N0402]
- H02P25/02H . . [N: Control of voice coil motors (Note: see also [H01F](#))] [N0402]
- H02P25/04 . . Single phase motors, e.g. capacitor motors [N0402]
- H02P25/06 . . Linear motors [N0402]
- H02P25/08 . . Reluctance motors [N0402]
- H02P25/08A . . . [N: Modifications for increasing the switching speed from one coil to the next one] [N0402]
- H02P25/08C . . . [N: Commutation] [N0402]
- H02P25/08C2 [N: Sensorless control, see also direct torque control [H02P23/00C2](#)] [N0402]
- H02P25/08E . . . [N: Converters specially adapted for controlling reluctance motors] [N0402]
- H02P25/08E1 [N: wherein the converter comprises only one switch per phase] [N1204]
- H02P25/08R . . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P25/08S . . . [N: Arrangements for reducing torque ripple] [N0402]
- H02P25/10 . . Commutator motors, e.g. repulsion motors [N0402]

- H02P25/10A . . . [N: Repulsion motors] [N0402]
- H02P25/10F . . . [N: Four quadrant control] [N0402]
- H02P25/10P . . . [N: Polyphase or monophase commutator motors] [N0402]
- H02P25/12 . . . with shiftable brushes [N0402]
- H02P25/14 . . . Universal motors ([H02P25/12](#) takes precedence) [N0402]
- H02P25/14R whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value, speed feedback [N0402]

- H02P25/16 . characterised by the circuit arrangement or by the kind of wiring [N0402]
- H02P25/18 . . with arrangements for switching the windings, e.g. with mechanical switches or relays [N0402]
- H02P25/18C . . . [N: whereby the speed is regulated by using centrifugal devices, e.g. switch, resistor] [N0402]
- H02P25/18D . . . [N: wherein the motor speed is changed by switching from a delta to a star, e.g. wye, connection of its windings, or vice versa. [N1204]
- H02P25/18P . . . [N: whereby the speed is regulated by using a periodic interrupter ([H02P5/30](#) takes precedence)] [N0402]
- H02P25/18S . . . [N: wherein the motor windings are switched from series to parallel or vice-versa to control speed or torque] [N1204]
- H02P25/20 . . . for pole-changing [N0402]
- H02P25/22 . . Multiple windings; Windings for more than three phases [N0402]
- H02P25/24 . . Variable impedance in stator or rotor circuit [N0402]
- H02P25/26 . . . with arrangements for controlling secondary impedance [N0402]
- H02P25/28 . . using magnetic devices with controllable degree of saturation, e.g. transducers [N0402]
- H02P25/30 . . the motor being controlled by a control effected upon an ac generator supplying it [N0402]
- H02P25/32 . . using discharge tubes [N0402]
- H02P25/32R . . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]

H02P27/00

Arrangements or methods for the control of AC motors characterised by the kind of supply voltage (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); of two or more motors [H02P5/00](#); of synchronous motors with electronic commutators [H02P6/00](#); of DC motors [H02P7/00](#); of stepping motors [H02P8/00](#)) [N0402]

[N: Note

When classifying in this group, it is desirable to also classify in groups [H02P21/00](#), [H02P23/00](#) or [H02P25/00](#) if the control method, the kind of AC motor or structural details are of interest.

]

- H02P27/02 . using supply voltage with constant frequency and variable amplitude [N0402]
- H02P27/02B . . [N: wherein only rotor or only stator circuit is supplied with ac] [N0402]
- H02P27/02R . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]

- H02P27/04 . using variable-frequency supply voltage, e.g. inverter or converter supply voltage [N0402]

- H02P27/04B . . [N: wherein only rotor or only stator circuit is supplied with ac] [N0402]
- H02P27/04R . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P27/04V . . [N: V/F converter, wherein the voltage is controlled proportionally with the frequency] [N1204]
- H02P27/05 . . using ac supply for both rotor and stator circuits, the frequency of supply to at least one circuit being variable [N: (see also [H02P6/00G](#) or [H02P9/00D](#), doubly fed motors or generators respectively)] [N0402]
- H02P27/06 . . using dc to ac converters or inverters ([H02P27/05](#) takes precedence) [N0402]
- H02P27/08 . . . with pulse width modulation [N0402]
- H02P27/08B [N: wherein the PWM mode is adapted on the running conditions of the motor, e.g. the switching frequency] [N1204]
- H02P27/10 using bang-bang controllers [N0402]
- H02P27/12 pulsing by guiding the flux-, current-, or voltage-vector on a circle or a closed curve, e.g. direct torque control [N: (direct torque control per se, [H02P23/00C2](#))] [N0402]
- H02P27/14 with three or more levels of voltage [N0402]
- H02P27/16 . . using ac to ac converters without intermediate conversion to dc ([H02P27/05](#) takes precedence) [N0402]
- H02P27/18 . . . varying the frequency by omitting half waves [N0402]

- H02P29/00** **Arrangements for regulating or controlling electric motors, appropriate for both ac- and DC motors** (starting [H02P1/00](#); stopping or slowing [H02P3/00](#); control of motors that can be connected to two or more different voltage or current supplies [H02P4/00](#); vector control [H02P21/00](#)) [N0402]

- H02P29/00A . [N: for preventing over- or under speed] [N0402]
- H02P29/00B . [N: for controlling one motor used for different sequential operations] [N0402]
- H02P29/00C . [N: Control of angular speed of one shaft without controlling the prime mover] [N0402]
- H02P29/00C2 . . [N: Controlling a brake between the prime mover and the load] [N0402]
- H02P29/00C4 . . [N: Controlling a clutch between the prime mover and the load] [N0402]
- H02P29/00D . [N: Controlling the mechanical load according to the amount of current drawn or delivered by the motor] [N0402]
- H02P29/00H . [N: Reduction of harmonics] [N0402]
- H02P29/00T . [N: Controlling or determining the motor or drive temperature (AC motor parameter estimation [H02P23/14](#); motor parameter estimation for vector control [H02P21/14](#); protection against overload [H02P29/02](#); protection against faults of stepper motores [H02P8/36](#))] [N0612]
- H02P29/00T2 . . [N: for raising the temperature of the motor] [N0612]
- H02P29/00T4 . . [N: controlling or determining the winding temperature ([H02P29/00T6W](#) takes precedence)] [N0612]
- H02P29/00T6 . . [N: controlling or determining the rotor temperature] [N0612]
- H02P29/00T6M . . . [N: the rotor having permanent magnets ([H02P29/00T8](#) takes precedence)] [N0612]

- H02P29/00T6W . . . [N: the rotor having windings] [N0612]
- H02P29/00T6W2 [N: by rotor current detection] [N0612]
- H02P29/00T8 . . [N: by back-emf evaluation to obtain the motor temperature (back-emf based rotor position determination H02P6/18E)] [N0612]
- H02P29/00T10 . . [N: based on the temperature of a drive component or a semiconductor component] [N0612]
- H02P29/00T10H . . . [N: compensating for Hall sensor temperature non-linearity] [N0612]
- H02P29/02 . Providing protection against overload without automatic interruption of supply, e.g. monitoring [N: (protection during start [H02P1/02B](#); protection for stepper motors [H02P8/36](#); generator overload and transient protection [H02P9/10](#); protection with automatic interruption [H02H7/08H](#))] [N0402] [C0605]
- [N: **Note**
Informative note
References listed below indicate places which could also be of interest when carrying out a search in respect of the subject matter covered by the preceding group:
Emergency protective circuit arrangements with automatic interruption if supply, in general [H02H7/08](#);
Emergency protective circuit arrangements for limiting excess current or voltage without disconnection in general [H02H7/08](#)
]
- H02P29/02D . . [N: Detecting a fault condition, e.g. short circuit, locked rotor, open circuit or loss of load] [N0605]
- H02P29/02D2 . . . [N: the motor continuing operation despite a fault condition, e.g. eliminating, compensating or remediating for the fault] [N0605]
- H02P29/02D4 . . . [N: the fault being a broken phase] [N1204]
- H02P29/02D6 . . . [N: the fault being an overvoltage] [N1204]
- H02P29/02D8 . . . [N: the fault being a power interruption] [N1204]
- H02P29/02D10 . . . [N: the fault being a power fluctuations] [N1204]
- H02P29/02D12 . . . [N: the fault being an over-current] [N1204]
- H02P29/02P . . [N: Preventing damage to the motor, e.g. setting individual current limits for different drive conditions] [N0605]
- H02P29/04 . by means of a separate brake [N0402]
- H02P29/04R . . [N: whereby the speed is regulated by measuring the motor speed and comparing it with a given physical value] [N0402]
- H02P31/00** **Arrangements for regulating or controlling electric motors not provided for in groups [H02P1/00](#) to [H02P5/00](#), [H02P7/00](#) or [H02P21/00](#) to [H02P29/00](#) [N0402]**