

H02M

APPARATUS FOR CONVERSION BETWEEN AC AND AC, BETWEEN AC AND DC, OR BETWEEN DC AND DC, AND FOR USE WITH MAINS OR SIMILAR POWER SUPPLY SYSTEMS; CONVERSION OF DC OR AC INPUT POWER INTO SURGE OUTPUT POWER; CONTROL OR REGULATION THEREOF (transformers [H01F](#); dynamo-electric converters [H02K 47/00](#); controlling transformers, reactors or choke coils, control or regulation of electric motors, generators or dynamo-electric converters [H02P](#))

Definition statement

This place covers:

Only circuits or apparatus for the conversion of AC or DC input power into AC or DC output power, or the conversion of AC or DC input power into surge output power, or arrangements for control or regulation of such circuits or apparatus.

Relationships with other classification places

The individual electro-technical devices employed when converting electric power are covered by the relevant subclasses, e.g. inductors, transformers [H01F](#), capacitors, electrolytic rectifiers [H01G](#), mercury-vapour rectifying or other discharge tubes [H01J](#), semiconductor devices [H10](#) impedance networks or resonant circuits not primarily concerned with the transfer of electric power [H03H](#).

Voltage and current regulation circuits operating according to the non-switched (linear) principle are classified in subclass [G05F](#)

The subject matter of starting, regulating, electronically commutating, braking, or otherwise controlling electrical machines using power converters covered by this subclass is classified in subclass [H02P](#).

Arrangements of power converters of this subclass in power distribution networks, not being concerned with the particular converter designs, are classified in subclass [H02J](#).

Measuring of circuit parameters such as currents, voltages or magnetic flux in general and not particularly intended for power converters of this subclass, is classified in subclass [G01R](#).

General mechanical arrangements of electronic components other than mechanical arrangements particularly intended for power converters of this subclass, are classified in subclass [H05K](#).

Protection circuits in general, other than those forming an integral part of power converters of this subclass are classified in subclass [H02H](#)

Enabling and disabling of power switches, other than particularly intended for power switches in power converters of this subclass, is classified in subclass [H03K](#).

Use and generation of Pulse Width Modulation schemes, other than particularly intended for power converters of this subclass, are classified in subclass [H03K](#)

General testing and monitoring of power converters of this subclass are classified in subclass [G01R](#)

Power converters particularly adapted for charging batteries are classified in subclass [H02J](#).

Uninterruptible Power Supplies are classified in subclass [H02J](#)

Dynamically controlled power converters, that serve the purpose of signal amplification rather than energy supply as in this subclass, are classified in [H03F](#)

Power supply circuits particularly intended for operating light sources are classified in subclass [H05B](#)

Relationships with other classification places

Power supply circuits and arrangements particularly intended for computer type gear are classified in subclass [G06F](#)

Power supply circuits and arrangements particularly intended for video type gear are classified in subclass [H04N](#)

Switched capacitor power conversion circuits particularly intended for supply of semiconductor memory circuits are classified in subclass [G11C](#)

Generation of pulsed high-voltages used to generate sparks is classified in [H01T/F23Q/F02P](#)

Power converters being used in a particular application and characterised by their operation in that application, without focus on the design of power converter, are classified in the subclass relevant for the application.

References

Limiting references

This place does not cover:

Transformers	H01F
Dynamo-electric converters	H02K 47/00
Controlling transformers, reactors or choke coils, control or regulation of electric motors, generators or dynamo-electric converters	H02P

Application-oriented references

Examples of places where the subject matter of this place is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Conversion of current or voltage specially adapted for use in electronic time-pieces with no moving parts	G04G 19/02
For digital computers	G06F 1/00
Static converters specially adapted for igniting or operating discharge lamps	H05B 41/28

Informative references

Attention is drawn to the following places, which may be of interest for search:

Testing power supplies	G01R 31/40 , G01R 31/42
Systems for regulating electric or magnetic variables in general, e.g. using transformers, reactors or choke coils, combination of such systems with static converters	G05F
Emergency protective circuit arrangements...for static converters or rectifiers	H02H 7/12
Electric power networks; Circuit arrangements or systems for supplying or distributing electric power; Systems for storing electric energy	H02J
Pulse generators	H03K
Electronic switching or gating	H03K 17/00
Generation or supply of power specially adapted for television receivers	H04N 5/63

Special rules of classification

Switch Mode Power Converters are generally made up of generic, functional elements. Such generic elements are rectifiers (AC-DC-conversion), inverters (DC-AC-conversion), transformers (AC-AC-conversion), filters, regulation loops, resonance-circuits, drivers, snubbers etc. Of these generic elements only few may appear at first glance to be novel over the prior art and it serves no purpose repeatedly to classify all elements. Only those elements that appear novel should form basis for the classification.

Glossary of terms

In this place, the following terms or expressions are used with the meaning indicated:

SMPS	Switch Mode Power Supply. A general designation for the type of power converters where power is converted in small quantities at a very rapid pace. The energy entering into the conversion circuit or out of the conversion circuit is controlled by power switches. In an SMPS the power switches are typically operated either to be fully conducting or fully non-conducting, opposite to linear voltage regulators where the power switch is used as partly conductive.
Chopper	Chopper is another name for a switch mode circuit. Chopper refers to that the signal (energy flow) is cut-up into small amounts.
Conversion	In respect of an electric variable, e.g. voltage or current, conversion means the change of one or more of the parameters of the variable, e.g. amplitude, frequency, phase, polarity.
PFC	Power Factor Correction. PFC relates to AC power input. Power Factor Correction is the discipline of rendering the input current sine-wave-shaped, with little harmonics and in phase with the AC input voltage. The aim is to make the AC input power load appear purely resistive for efficient use of the AC distribution network.
Snubber	A circuit aiming at absorbing or redirecting inductive energy generated during switched power conversion when a power switch is turned off (rendered non-conductive).

H02M 1/00

Details of apparatus for conversion

Definition statement

This place covers:

- Details of power converters that are generic for different types of power converters.
- Power switch driving circuits particularly intended for switch mode power converters.
- Adaptation of power converters for operation from different kind of input sources.
- Means for reducing ripple or harmonics on inputs or outputs.
- Contact mechanisms of dynamic converters.
- Means for protecting power converters.
- Means for starting and stopping power converters.
- Means for preventing simultaneous conduction of switches.
- Means for preventing magnetic saturation.
- Circuits or arrangements for Power Factor Correction.
- Circuits or arrangements for compensating for electromagnetic interference.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protection circuits in general	H02H
Protection circuits in general, other than those forming an integral part of power converters	H02H 7/10 , H02H 7/12
Electronic switching or gating	H03K 17/00

H02M 1/08

Circuits specially adapted for the generation of control voltages for semiconductor devices incorporated in static converters

Definition statement

This place covers:

Details of circuits used in static power converters for generating driving voltages or currents necessary for controlling, e.g. via a gate or base terminal, the switching state of power semiconductor devices (e.g., gate drivers).

The scope of this subgroup is not intended to cover logical control circuits in a static converter without additional, specialized driver circuitry for controlling the gate or base of a power semiconductor switching device.

References

Informative references

Attention is drawn to the following places, which may be of interest for search:

Electronic switching or gating	H03K 17/00
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H02M 1/096

the power supply of the control circuit being connected in parallel to the main switching element ([H02M 1/092](#) takes precedence)

References

Limiting references

This place does not cover:

Control signals being transmitted optically	H02M 1/092
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H02M 1/32**Means for protecting converters other than automatic disconnection****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Emergency protective circuit arrangements specially adapted for converters with automatic disconnection	H02H 7/10
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H02M 3/00**Conversion of DC power input into DC power output****Definition statement**

This place covers:

- Conversion of DC power input into DC power output without conversion into AC.
- Conversion of DC power input into DC power output with conversion into AC.
- Conversion of DC power input into DC power output using dynamic converters.

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Protection circuits in general	H02H
Electric motor control with feedback of internal parameters of the motor	H02P
Electronic switching or gating	H03K 17/00
Generation or supply of power specially adapted for television receivers	H04N 5/63

H02M 3/07**using capacitors charged and discharged alternately by semiconductor devices with control electrode {, e.g. charge pumps}****References****Informative references**

Attention is drawn to the following places, which may be of interest for search:

Charge pumps for substrate bias voltage generators	G05F 3/205
Charge pumps for static stores	G11C 5/145 , G11C 16/06
Charge pumping structures for internal polarisation	H10D 89/215

H02M 3/10

using discharge tubes with control electrode or semiconductor devices with control electrode ([H02M 3/07](#) takes precedence)

References**Limiting references**

This place does not cover:

Capacitors charged and discharged alternately by semiconductor devices with control electrode	H02M 3/07
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H02M 3/337

in push-pull configuration {([H02M 3/33576](#) takes precedence; with self-oscillating arrangements [H02M 3/3382](#), [H02M 3/3385](#))}

References**Limiting references**

This place does not cover:

Semiconductor devices having at least one active switching element at the secondary side of an isolation transformer	H02M 3/33576
With self-oscillating arrangements	H02M 3/3382 , H02M 3/3385

H02M 3/338

in a self-oscillating arrangement ([H02M 3/337](#) takes precedence)

References**Limiting references**

This place does not cover:

Semiconductor devices in push-pull configuration	H02M 3/337
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H02M 3/42

with electromagnetically-operated vibrating contacts, e.g. chopper

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Self-interrupters in general	H01H 51/34
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H02M 5/00

Conversion of AC power input into AC power output, e.g. for change of voltage, for change of frequency, for change of number of phases

Definition statement

This place covers:

- Direct conversion of AC input power into different AC output power, e.g. by change of voltage, frequency or number of phases, without intermediate conversion into DC.
- Conversion of AC input power into AC output power with intermediate conversion onto DC (DC-link).
- Conversion of AC input power into AC output power using dynamic conversion means.

References**Limiting references**

This place does not cover:

Uninterruptible power supplies	H02J 9/00
Electric motor control with feedback of internal parameters of the motor	H02P

Informative references

Attention is drawn to the following places, which may be of interest for search:

Protection circuits in general	H02H
Electronic switching or gating	H03K 17/00

H02M 5/25

using devices of a thyatron or thyristor type requiring extinguishing means

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Two stages of AC-AC conversion, e.g. having a high frequency intermediate link	H02M 5/225
Conversion of frequency	H02M 5/27

H02M 5/275

using devices of a triode or transistor type requiring continuous application of a control signal

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Two stages of AC-AC conversion, e.g. having a high frequency intermediate link	H02M 5/225
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Conversion of frequency	H02M 5/297
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H02M 7/00

Conversion of AC power input into DC power output; Conversion of DC power input into AC power output

Definition statement

This place covers:

- Constructional details of power converters.
- Conversion of AC power input into DC power output without reversal.
- Conversion of DC power input into AC power output without reversal.
- Conversion of AC power input into DC power output or DC power input into AC power output with possibility of reversal.
- Conversion of AC power input into DC power output or DC power input into AC power output using dynamic converter means.

References

Limiting references

This place does not cover:

Electric motor control with feedback of internal parameters of the motor	H02P
Switched power amplifiers (class D)	H03F

Informative references

Attention is drawn to the following places, which may be of interest for search:

Semiconductor device modules	H10
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H02M 7/23

arranged for operation in parallel {([H02M 7/2176](#) takes precedence)}

References

Limiting references

This place does not cover:

Semiconductor devices comprising a passive stage to generate a rectified sinusoidal voltage and a controlled switching element in series between such stage and the output	H02M 7/2176
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H02M 7/36

with electromagnetically-operated vibrating contacts, e.g. chopper

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Self-interrupters in general	H01H 51/34
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H02M 7/505

using devices of a thyatron or thyristor type requiring extinguishing means
{([H02M 7/4807](#), [H02M 7/483](#), [H02M 7/493](#) and [H02M 7/4826](#) take precedence)}

References**Limiting references**

This place does not cover:

High frequency intermediate AC stage	H02M 7/4807
Discharge tubes with control electrode or semiconductor devices with control electrode operating from a resonant DC source, i.e. the DC input voltage varies periodically, e.g. resonant DC-link inverters	H02M 7/4826

H02M 7/519

in a push-pull configuration ([H02M 7/517](#) takes precedence)

References**Limiting references**

This place does not cover:

Special starting equipment	H02M 7/517
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H02M 7/53

using devices of a triode or transistor type requiring continuous application of a control signal {([H02M 7/4807](#), [H02M 7/493](#) and [H02M 7/4826](#) take precedence)}

References**Limiting references**

This place does not cover:

High frequency intermediate AC stage	H02M 7/4807
Discharge tubes with control electrode or semiconductor devices with control electrode operating from a resonant DC source, i.e. the DC input voltage varies periodically, e.g. resonant DC-link inverters	H02M 7/4826

H02M 7/5383

in a self-oscillating arrangement ([H02M 7/538](#) takes precedence)

References**Limiting references**

This place does not cover:

In a push-pull configuration	H02M 7/538
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H02M 7/539

with automatic control of output wave form or frequency
([H02M 7/5375](#) - [H02M 7/5387](#) take precedence)

References**Limiting references**

This place does not cover:

Special starting equipment	H02M 7/5375
Push-pull configuration	H02M 7/538
Self-oscillating arrangement	H02M 7/5383
Bridge configuration	H02M 7/5387

H02M 7/62

with electromagnetically-operated vibrating contacts, e.g. chopper

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Self-interrupters in general	H01H 51/34
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H02M 7/75

using devices of a thyatron or thyristor type requiring extinguishing means

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Devices of a thyatron or thyristor type arranged for operation in parallel	H02M 7/77
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H02M 7/79

using devices of a triode or transistor type requiring continuous application of a control signal

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Devices of a triode or transistor type arranged for operation in parallel	H02M 7/81
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H02M 7/95

with electromagnetically-operated vibrating contacts, e.g. chopper

References**Informative references**

Attention is drawn to the following places, which may be of interest for search:

Self-interrupters in general	H01H 51/34
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H02M 11/00

Power conversion systems not covered by the preceding groups

Definition statement

This place covers:

- Switch mode power converters not falling under any of the groups described previously.
- Power converters with pulsed power output.
- Power converters including piezoelectric elements performing power conversion.

References**Limiting references**

This place does not cover:

Generation of pulsed high-voltages used to generate sparks	H01T 15/00 , F23Q , F02P/00
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Informative references

Attention is drawn to the following places, which may be of interest for search:

Piezoelectric devices	H10N 30/00
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