

**CPC****COOPERATIVE PATENT CLASSIFICATION****H02J**

**CIRCUIT ARRANGEMENTS OR SYSTEMS FOR SUPPLYING OR DISTRIBUTING ELECTRIC POWER; SYSTEMS FOR STORING ELECTRIC ENERGY** (for digital computers [G06F 1/18](#); circuits or apparatus for the conversion of electric power, arrangements for control or regulation of such circuits or apparatus H02M; interrelated control of several motors, control of a prime-mover/generator combination H02P; control of high-frequency power H03L; additional use of power line or power network for transmission of information H04B)

**NOTE**

This subclass covers:

- ac or dc mains or distribution networks;
- circuit arrangements for battery supplies, including charging or control thereof, or co-ordinated supply from two or more sources of any kind;
- systems for supplying or distributing electric power by electromagnetic waves.

This subclass does not cover:

- control of a single motor, generator or dynamo-electric converter, of the types covered by subclass H01F or H02K, which is covered by subclass H02P;
- control of a single motor or generator, of the types covered by subclass H02N, which is covered by that subclass.

**WARNING**

The following IPC groups are not used in the CPC scheme. Subject matter covered by these groups is classified in the following CPC groups :

[H02J 7/10](#) covered by [H02J 7/0072](#)

**H02J 1/00**

**Circuit arrangements for dc mains or dc distribution networks**

**H02J 1/02**

- . Arrangements for reducing harmonics or ripples (in converters [H02M 1/14](#))

**H02J 1/04**

- . Constant-current supply systems

**H02J 1/06**

- . Two-wire systems

**H02J 1/08**

- . Three-wire systems; Systems having more than three wires

**H02J 1/10**

- . Parallel operation of dc sources (involving batteries [H02J 7/34](#))

**H02J 1/102**

- .. {being switching converters ([H02J 1/108](#), [H02J 1/12](#) take precedence)}

- H02J 1/108 .. {using diodes blocking reverse current flow ([H02J 1/12](#) takes precedence)}
- H02J 1/12 .. Parallel operation of dc generators with converters, e.g. with mercury-arc rectifier
- H02J 1/14 . Balancing the load in a network ([by batteries H02J 7/34](#))
- H02J 1/16 .. using dynamo-electric machines coupled to fly-wheels

### **H02J 3/00 Circuit arrangements for ac mains or ac distribution networks**

- H02J 3/005 . {Arrangements for selectively connecting the load to one among a plurality of power lines or power sources ([for providing uninterruptable power supply H02J 9/00](#))}
- H02J 3/006 .. {for providing alternative feeding paths between load and source when the main path fails, e.g. transformers, busbars}
- H02J 3/008 . {involving trading of energy or energy transmission rights}
- H02J 3/01 . Arrangements for reducing harmonics or ripples ([in converters H02M 1/12](#))
- H02J 3/02 . using a single network for simultaneous distribution of power at different frequencies; using a single network for simultaneous distribution of ac power and of dc power
- H02J 3/04 . for connecting networks of the same frequency but supplied from different sources
- H02J 3/06 .. Controlling transfer of power between connected networks; Controlling sharing of load between connected networks
- H02J 3/08 .. Synchronising of networks
- H02J 3/10 . Constant-current supply systems
- H02J 3/12 . for adjusting voltage in ac networks by changing a characteristic of the network load
- H02J 3/14 .. by switching loads on to, or off from, network, e.g. progressively balanced loading
- H02J 3/16 .. by adjustment of reactive power
- H02J 3/18 . Arrangements for adjusting, eliminating, or compensating reactive power in networks ([for adjustment of voltage H02J 3/12](#); [use of Petersen coils H02H 9/08](#))
- H02J 3/1807 .. {using series compensators}
- H02J 3/1814 ... {wherein at least one reactive element is actively controlled by a bridge converter, e.g. unified power flow controllers (UPFC)}
- H02J 3/1821 .. {using shunt compensators ([H02J 3/1807](#), [H02J 3/1878](#) take precedence)}
- H02J 3/1828 ... {with stepwise control, the possibility of switching in or out the entire compensating arrangement not being considered as stepwise control}
- H02J 3/1835 ... {with stepless control}
- H02J 3/1842 .... {wherein at least one reactive element is actively controlled by a bridge converter, e.g. active filters}
- H02J 3/185 ..... { wherein such reactive element is purely inductive, e.g. superconductive magnetic energy storage systems (SMES)}
- H02J 3/1857 ..... {wherein such bridge converter is a multilevel converter}
- H02J 3/1864 .... {wherein the stepless control of reactive power is obtained by at least one reactive element connected in series with a semiconductor switch}
- H02J 3/1871 ... {Methods for planning installation of shunt reactive power compensators}

- H02J 3/1878 .. {using tap changing or phase shifting transformers}
- H02J 3/1885 .. {using rotating means, e.g. synchronous generators}
- H02J 3/1892 .. {the arrangements being an integral part of the load, e.g. a motor, or of its control circuit}
- H02J 3/20 .. in long overhead lines
- H02J 3/22 .. in cables
- H02J 3/24 . Arrangements for preventing or reducing oscillations of power in networks (by control effected upon a single generator [H02P 9/00](#))
- H02J 3/26 . Arrangements for eliminating or reducing asymmetry in polyphase networks
- H02J 3/28 . Arrangements for balancing of the load in a network by storage of energy
- H02J 3/30 .. using dynamo-electric machines coupled to fly-wheels
- H02J 3/32 .. using batteries with converting means
- H02J 3/34 . Arrangements for transfer of electric power between networks of substantially different frequency (frequency-convertors [H02M](#))
- H02J 3/36 . Arrangements for transfer of electric power between ac networks via a high-tension dc link
- H02J 3/38 . Arrangements for parallelly feeding a single network by two or more generators, converters or transformers
- H02J 3/381 .. { Dispersed generators}
- H02J 3/382 ... { the generators exploiting renewable energy}
- H02J 3/383 .... { Solar energy, e.g. photovoltaic energy (generation of electric power by conversion of light [H02S](#))}
- H02J 3/385 ..... { Maximum power point tracking control for photovoltaic sources (inverter means associated with the PV module [H02S 40/32](#))}
- H02J 3/386 .... { Wind energy (wind motors [F03D](#))}
- H02J 3/387 ... { using fuel cells (fuel cells per se [H01M 8/00](#))}
- H02J 3/40 .. Synchronising a generator for connection to a network or to another generator
- H02J 3/42 ... with automatic parallel connection when synchronisation is achieved
- H02J 3/44 ... with means for ensuring correct phase sequence
- H02J 3/46 .. Controlling of the sharing of output between the generators, converters, or transformers
- H02J 3/48 ... Controlling the sharing of the in-phase component
- H02J 3/50 ... Controlling the sharing of the out-of-phase component
- H02J 4/00** **Circuit arrangements for mains of distribution networks not specified as ac or dc**
- H02J 5/00** **Circuit arrangements for transfer of electric power between ac networks and dc networks ([H02J 3/36](#) takes precedence)**
- H02J 5/005 . {with inductive power transfer (for charging [H02J 7/025](#))}

<b>H02J 7/00</b>	<b>Circuit arrangements for charging or depolarising batteries or for supplying loads from batteries</b>
H02J 7/0003	. {with provision for charging different types of batteries}
H02J 7/0004	.. { with data exchange between battery and charger ( <a href="#">H02J 7/0011</a> takes precedence)}
H02J 7/0006	.. {using passive battery identification means, e.g. resistors, capacitors ( <a href="#">H02J 7/0011</a> takes precedence; identification by mechanical connections <a href="#">H02J 7/0045</a> )}
H02J 7/0008	... {in response to measured battery parameters, e.g. voltage, current, temperature profile}
H02J 7/0009	... {using switches, contacts or markings, e.g. optical, magnetic, barcode}
H02J 7/0011	.. {with charge circuits contained within battery unit}
H02J 7/0013	. {for charging several batteries simultaneously or sequentially ( <a href="#">H02J 7/1423</a> takes precedence)}
H02J 7/0014	.. {Circuits for equalisation of charge between batteries}
H02J 7/0016	... {using shunting, discharge or bypass circuits}
H02J 7/0018	... {using separate charge circuits}
H02J 7/0019	... {using switched or multiplexed charge circuits}
H02J 7/0021	.. {Monitoring or indicating circuits ( <a href="#">H02J 7/0026</a> takes precedence)}
H02J 7/0022	.. {Management of charging with batteries permanently connected to charge circuit ( <a href="#">H02J 7/0014</a> takes precedence)}
H02J 7/0024	.. {Parallel/serial switching of connection of batteries to charge or load circuit}
H02J 7/0026	.. {using safety or protection circuits, e.g. overcharge/discharge disconnection}
H02J 7/0027	.. {Stations for charging mobile units, e.g. of electric vehicles, of mobile telephones ( <a href="#">H02J 7/0021</a> , <a href="#">H02J 7/0026</a> take precedence)}
H02J 7/0029	. {with safety devices ( <a href="#">H02J 7/0026</a> takes precedence)}
H02J 7/0031	.. {using battery or load disconnect circuits ( <a href="#">H02J 9/002</a> takes precedence)}
H02J 7/0032	... {disconnection of loads if battery is not under charge, e.g. in vehicle if engine is not running}
H02J 7/0034	.. {using reverse polarity correcting or protecting circuits (mechanical means of polarity protection <a href="#">H02J 7/0045</a> )}
H02J 7/0036	.. {using connection detecting circuits ( <a href="#">H02J 7/0034</a> takes precedence)}
H02J 7/0042	. {characterised by the mechanical construction ( <a href="#">H02J 7/355</a> takes precedence)}
H02J 7/0044	.. {specially adapted for holding portable devices containing batteries ( <a href="#">H02J 7/0045</a> takes precedence)}
H02J 7/0045	.. {concerning the insertion or the connection of the batteries (charging from ac mains using non-contact coupling <a href="#">H02J 7/025</a> )}
H02J 7/0047	. {with indicating devices ( <a href="#">H02J 7/0021</a> takes precedence)}
H02J 7/0052	. {Charge circuits only ( <a href="#">H02J 7/0003</a> , <a href="#">H02J 7/0013</a> , <a href="#">H02J 7/007</a> take precedence)}
H02J 7/0054	.. {Battery to battery charging (with circuits for polarity protection <a href="#">H02J 7/0034</a> )}
H02J 7/0055	.. {adapted for charging from various sources, e.g. AC, DC, multivoltage}

- H02J 7/0057 .. {adapted for charge maintenance or battery rejuvenation ([H02J 7/0075](#) takes precedence)}
- H02J 7/0063 . {Circuits adapted for supplying loads only}
- H02J 7/0065 .. {using converters specially adapted for use with a battery}
- H02J 7/0068 . {Battery or charger load switching, e.g. concurrent charging and load supply ([H02J 7/0013](#) takes precedence)}
- H02J 7/007 . {Regulation of charging current or voltage}
- H02J 7/0072 .. {using semiconductor devices only}
- H02J 7/0073 ... {with a programmable charge schedule ([H02J 7/0093](#) takes precedence)}
- H02J 7/0075 .... {for charge maintenance, battery initiation or rejuvenation}
- H02J 7/0077 ... {the charge cycle being terminated in response to electric parameters ([H02J 7/0093](#) takes precedence)}
- H02J 7/0078 .... {in response to discharge current, e.g. using a coulometer, pilot cell}
- H02J 7/008 .... {with the battery connected to the charge circuit}
- H02J 7/0081 ..... {and in response to battery voltage gradient}
- H02J 7/0083 ..... {and in response to charge current gradient}
- H02J 7/0085 .... {with the battery disconnected from the charge circuit}
- H02J 7/0086 ..... {and in response to battery voltage}
- H02J 7/0088 ... {the charge cycle being terminated in response to non-electric parameters ([H02J 7/0093](#) takes precedence)}
- H02J 7/009 .... {in response to degree of gas development in the battery}
- H02J 7/0091 .... {in response to temperature of the battery}
- H02J 7/0093 ... {with introduction of pulses during the charging process}
- H02J 7/02 . for charging batteries from ac mains by converters
- H02J 7/022 .. {characterised by the type of converter}
- H02J 7/025 ... {using non-contact coupling, e.g. inductive, capacitive}
- H02J 7/027 .. {with safety or indicating device}
- H02J 7/04 . Regulation of charging current or voltage
- H02J 7/041 ... {with a programmable charge schedule}
- H02J 7/042 ... {the charge cycle being controlled in response to a measured parameter}
- H02J 7/044 .... {in response to integrated charge or discharge current}
- H02J 7/045 .... {in response to voltage or current}
- H02J 7/047 .... {in response to temperature}
- H02J 7/048 .... {in response to degree of gas development in the battery}
- H02J 7/06 ... using discharge tubes or semiconductor devices
- H02J 7/08 .... using discharge tubes only
- H02J 7/082 ..... {with a programmable charge schedule}
- H02J 7/085 ..... {the charge cycle being terminated in response to electric parameters}
- H02J 7/087 ..... {the charge cycle being terminated in response to non-electric parameters}
- H02J 7/12 ... using magnetic devices having controllable degree of saturation, i.e.

- transducers
- H02J 7/125 . . . . {in combination with discharge tubes or semiconductor devices}
  - H02J 7/14 . for charging batteries from dynamo-electric generators driven at varying speed, e.g. on vehicle
  - H02J 7/1407 .. {on vehicles not being driven by a motor, e.g. bicycles}
  - H02J 7/1415 .. {with a generator driven by a prime mover other than the motor of a vehicle}
  - H02J 7/1423 .. {with multiple batteries or generators}
  - H02J 7/1438 .. {in combination with power supplies for loads other than batteries}
  - H02J 7/1446 .. {in response to parameters of a vehicle}
  - H02J 7/1453 .. {with temperature compensation}
  - H02J 7/1461 .. {with safety or indicating devices}
  - H02J 7/1469 .. {Regulation of the charging current or voltage otherwise than by variation of field}
  - H02J 7/1476 . . . . {by mechanical action on the generator}
  - H02J 7/1484 . . . . {by commutation of the output windings of the generator}
  - H02J 7/1492 . . . . {by means of controlling devices between the generator output and the battery}
  - H02J 7/16 .. Regulation of the charging current or voltage by variation of field
  - H02J 7/163 . . . . {with special means for initiating or limiting the excitation current}
  - H02J 7/166 . . . . {with safety or indicating devices}
  - H02J 7/18 . . . . due to variation of ohmic resistance in field circuit, using resistance switching in or out of circuit step by step
  - H02J 7/20 . . . . due to variation of continuously variable ohmic resistor
  - H02J 7/22 . . . . due to variation of make-to-break ratio of intermittently-operating contacts, e.g. using Tirrill regulator
  - H02J 7/225 . . . . {characterised by the mechanical construction}
  - H02J 7/24 . . . . using discharge tubes or semiconductor devices
  - H02J 7/241 . . . . {using discharge tubes only}
  - H02J 7/242 . . . . {using semiconductor devices as final control devices}
  - H02J 7/244 . . . . . {with on/off action}
  - H02J 7/245 . . . . . {with pulse modulation}
  - H02J 7/247 . . . . . {using thyristors or triacs as final control devices}
  - H02J 7/248 . . . . . {characterised by the mechanical construction}
  - H02J 7/26 . . . . using magnetic devices with controllable degree of saturation
  - H02J 7/28 . . . . using magnetic devices with controllable degree of saturation in combination with controlled discharge tube or controlled semiconductor device
  - H02J 7/30 . . . . using armature-reaction-excited machines
  - H02J 7/32 . for charging batteries from a charging set comprising a non-electric prime mover {rotating at constant speed}
  - H02J 7/322 .. {by variation of field, using discharge tubes}
  - H02J 7/324 .. {by variation of field, using semiconductor devices}
  - H02J 7/326 .. {by variation of field, using armature-reaction-excited machines}
  - H02J 7/328 .. {by variation of field, using magnetic devices having controllable degree of saturation}

- H02J 7/34 . Parallel operation in networks using both storage and other dc sources, e.g. providing buffering ([H02J 7/14](#) takes precedence)
- H02J 7/345 .. {using capacitors as storage or buffering devices}
- H02J 7/35 .. with light sensitive cells
- H02J 7/355 ... {characterised by the mechanical construction}
- H02J 7/36 . Arrangements using end-cell switching
  
- H02J 9/00** **Circuit arrangement for emergency or standby power supply, e.g. for emergency lighting** (with provision for charging standby battery [H02J 7/00](#))
  
- H02J 9/002 . {in which a reserve is maintained in an energy source by disconnecting non-critical loads, e.g. maintaining a reserve of charge in a vehicle battery for starting an engine}
- H02J 9/005 . {using a power saving mode (for copiers **G03G 15/00C1**)}
- H02J 9/02 . in which an auxiliary distribution system and its associated lamps are brought into service
- H02J 9/04 . in which the distribution system is disconnected from the normal source and connected to a standby source
- H02J 9/06 .. with automatic change-over
- H02J 9/061 ... {characterised by the use of electronic means ([H02J 9/062](#) and [H02J 9/065](#) take precedence)}
- H02J 9/062 ... {involving non rotating DC/AC converters}
- H02J 9/065 .... {for lighting purposes}
- H02J 9/066 ... {characterised by the use of dynamo-electric machines ([H02J 9/08](#) takes precedence)}
- H02J 9/08 ... requiring starting of a prime-mover
  
- H02J 11/00** **Circuit arrangements for providing service supply to auxiliaries of stations in which electric power is generated, distributed, or converted** (emergency or standby arrangements [H02J 9/00](#))
  
- H02J 13/00** **Circuit arrangements for providing remote indication of network conditions, e.g. an instantaneous record of the open or closed condition of each circuit-breaker in the network; Circuit arrangements for providing remote control of switching means in a power distribution network, e.g. switching in and out of current consumers by using a pulse code signal carried by the network** {(circuits for indication of single switches [H01H 9/167](#); circuits specially adapted for remote switching of lighting via the power line [H05B 37/0263](#))}
  
- H02J 13/0003 . {for DC networks}
- H02J 13/0006 . {for single frequency AC networks}
- H02J 13/001 .. {characterised by the display, e.g. of data or controls}
- H02J 13/0013 .. {characterised by transmission structure between the control or monitoring unit and the controlled or monitored unit}

- H02J 13/0017 . . . {with direct transmission between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/002 . . . . {using the power network as support for the transmission}
- H02J 13/0024 . . . . . {using pulsed signals}
- H02J 13/0027 . . . . . {Details of signals treatment means}
- H02J 13/0031 . . . . . {using static semiconductor means}
- H02J 13/0034 . . . . . {Transmitters}
- H02J 13/0037 . . . . . {Receivers}
- H02J 13/0041 . . . . . {using lamps or electromechanical means}
- H02J 13/0044 . . . . . {using DC signal superposition}
- H02J 13/0048 . . . . . {using modification of a parameter of the network power signal}
- H02J 13/0051 . . . . . {Zero-crossing time}
- H02J 13/0055 . . . . . {using an auxiliary transmission line}
- H02J 13/0058 . . . . . {carrying signals having the network frequency or DC signals}
- H02J 13/0062 . . . . . {using a data transmission bus}
- H02J 13/0065 . . . . . {using optical means}
- H02J 13/0068 . . . . . {using ultrasonic means}
- H02J 13/0072 . . . . . {using phone lines}
- H02J 13/0075 . . . . . { using radio means}
- H02J 13/0079 . . . {with transmission using an intermediate treatment level between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/0082 . . . . . {using the power network as transmission support}
- H02J 13/0086 . . . {with transmission using plurality of intermediate treatment level between the control or monitoring unit and the controlled or monitored unit}
- H02J 13/0089 . . . . . {using the power network as transmission support}
- H02J 13/0093 . . {for AC networks with plurality frequencies}
- H02J 13/0096 . . {for networks combining AC and DC power}
  
- H02J 15/00**      **Systems for storing electric energy** (mechanical systems therefor [F01](#) to [F04](#); in chemical form [H01M](#))
- H02J 15/003 . . {in the form of hydraulic energy}
- H02J 15/006 . . {in the form of pneumatic energy (accumulators for supplying fluid under pressure [F15B 1/04](#))}
  
- H02J 17/00**      **Systems for supplying or distributing electric power by electromagnetic waves**
  
- H02J 2001/00**      **Circuit arrangements for dc mains or dc distribution networks**
- H02J 2001/002 . . Intermediate ac, e.g. dc supply with intermediated ac distribution

- H02J 2001/004 . Distribution of power generated by fuel cells
- H02J 2001/006 . Provisions for temporary connection of dc sources of essentially the same voltage, e.g. jumpstart cables
- H02J 2001/008 . Plural dc voltage, e.g. dc supply voltage with at least two different dc voltage levels
- H02J 2001/10 . Parallel operation of dc sources (involving batteries [H02J 7/34](#))
- H02J 2001/102 . . . {being switching converters ([H02J 1/108](#), [H02J 1/12](#) take precedence)}
- H02J 2001/104 . . . for synchronisation
- H02J 2001/106 . . . for load balancing or load symmetrisation
  
- H02J 2003/00      **Circuit arrangements for ac mains or ac distribution networks****
- H02J 2003/001 . Emergency control, e.g. method to deal with contingencies
- H02J 2003/002 . Flicker reduction, e.g. compensation of flicker introduced by non linear load
- H02J 2003/003 . Load forecast, e.g. method and systems for forecasting future load demand
- H02J 2003/007 . Simulating, e. g. planning, reliability check, modeling
- H02J 2003/12 . for adjusting voltage in ac networks by changing a characteristic of the network load
- H02J 2003/14 . . by switching loads on to, or off from, network, e.g. progressively balanced loading
- H02J 2003/143 . . . Household appliances management
- H02J 2003/146 . . . Tariff based load management
- H02J 2003/36 . Arrangements for transfer of electric power between ac networks via a high-tension dc link
- H02J 2003/365 . . Reducing harmonics or oscillations in HVDC
- H02J 2003/38 . Arrangements for parallely feeding a single network by two or more generators, converters or transformers
- H02J 2003/388 . . Islanding, i.e. disconnection of local power supply from the network
  
- H02J 2007/00      **Circuit arrangements for charging or depolarising batteries or for supplying loads from batteries****
- H02J 2007/0001 . Authentication, i.e. circuits for checking compatibility between one component, e.g. a battery or a battery charger, and another component , e.g. a power source
- H02J 2007/0029 . {with safety devices ([H02J 7/0026](#) takes precedence)}
- H02J 2007/0037 . . Overcharge protection
- H02J 2007/0039 . . Overcurrent protection
- H02J 2007/004 . . Overdischarge protection
- H02J 2007/0047 . {with indicating devices ([H02J 7/0021](#) takes precedence)}

- H02J 2007/0049 .. Detection of fully charged condition
- H02J 2007/005 .. Detection of remaining charge capacity
  
- H02J 2007/0052 . {Charge circuits only ([H02J 7/0003](#), [H02J 7/0013](#), [H02J 7/007](#) take precedence)}
- H02J 2007/0059 .. characterised by the converter
- H02J 2007/006 .. Charge provided using dc bus or data bus of a computer
- H02J 2007/0062 .. Charge provided using USB port connectors
  
- H02J 2007/0063 . {Circuits adapted for supplying loads only}
- H02J 2007/0067 .. Discharge management, i.e. discharge current reduction at low state of charge, sequential battery discharge in systems with a plurality of battery
  
- H02J 2007/0095 . Control circuit supply, e.g. means for supplying power to the control circuit
  
- H02J 2007/0096 . Charger exchanging data with an electronic device, i.e. telephone, whose internal battery is under charge
  
- H02J 2007/0098 . Smart battery, e.g. battery with means for data exchanging with charger
  
- H02J 2007/02 . for charging batteries from ac mains by converters
- H02J 2007/04 .. Regulation of charging current or voltage
- H02J 2007/06 ... using discharge tubes or semiconductor devices
- H02J 2007/10 .... using semiconductor devices only
- H02J 2007/105 ..... with introduction of pulses during the charging process
  
- H02J 2007/14 . for charging batteries from dynamo-electric generators driven at varying speed, e.g. on vehicle
- H02J 2007/1423 .. {with multiple batteries or generators}
- H02J 2007/143 ... Multiple generators
  
- H02J 2009/00** **Circuit arrangement for emergency or standby power supply, e.g. for emergency lighting (with provision for charging standby battery [H02J 7/00](#))**
  
- H02J 2009/005 . {using a power saving mode (for copiers **G03G 15/00C1**)}
- H02J 2009/007 .. Detection of the absence of a load
  
- H02J 2009/04 . in which the distribution system is disconnected from the normal source and connected to a standby source
- H02J 2009/06 .. with automatic change-over
- H02J 2009/062 ... {involving non rotating DC/AC converters}
- H02J 2009/063 .... Common neutral, e.g. ac input neutral line connected to ac output neutral line and dc middle point
- H02J 2009/067 ... using multi-primary transformers, e.g. transformer having one primary for each ac energy source and a secondary for the loads
- H02J 2009/068 ... Electronic means for switching from one power supply to another power supply , e.g. to avoid parallel connection