

CPC COOPERATIVE PATENT CLASSIFICATION

H ELECTRICITY

(NOTE omitted)

H01 BASIC ELECTRIC ELEMENTS

(NOTES omitted)

H01G CAPACITORS; CAPACITORS, RECTIFIERS, DETECTORS, SWITCHING DEVICES OR LIGHT-SENSITIVE DEVICES, OF THE ELECTROLYTIC TYPE (selection of specified materials as dielectric [H01B 3/00](#); capacitors with potential-jump or surface barrier [H01L 29/00](#))

WARNING

In this subclass non-limiting references (in the sense of paragraph 39 of the Guide to the IPC) may still be displayed in the scheme.

2/00	Details of capacitors not covered by a single one of groups H01G 4/00-H01G 11/00	4/12	. . . . . Ceramic dielectrics {(H01G 4/085 takes precedence)}
2/02	. Mountings	4/1209	. . . . . {characterised by the ceramic dielectric material (H01G 4/1272 , H01G 4/1281 take precedence)}
2/04	. . specially adapted for mounting on a chassis	4/1218	. . . . . {based on titanium oxides or titanates (H01G 4/1245 takes precedence)}
2/06	. . specially adapted for mounting on a printed-circuit support	4/1227	. . . . . {based on alkaline earth titanates}
2/065	. . . {for surface mounting, e.g. chip capacitors}	4/1236	. . . . . {based on zirconium oxides or zirconates (H01G 4/1263 takes precedence)}
2/08	. Cooling arrangements; Heating arrangements; Ventilating arrangements	4/1245	. . . . . {containing also titanates}
2/10	. Housing; Encapsulation	4/1254	. . . . . {based on niobium or tungsten, tantalum oxides or niobates, tantalates}
2/103	. . {Sealings, e.g. for lead-in wires; Covers}	4/1263	. . . . . {containing also zirconium oxides or zirconates}
2/106	. . {Fixing the capacitor in a housing}	4/1272	. . . . . {Semiconductive ceramic capacitors}
2/12	. Protection against corrosion (H01G 2/10 takes precedence)	4/1281	. . . . . {with grain boundary layer}
2/14	. Protection against electric or thermal overload (by cooling H01G 2/08)	4/129	. . . . . {containing a glassy phase, e.g. glass ceramic}
2/16	. . with fusing elements	4/14	. . . . . Organic dielectrics
2/18	. . with breakable contacts	4/145	. . . . . {vapour deposited}
2/20	. Arrangements for preventing discharge from edges of electrodes	4/16	. . . . . of fibrous material, e.g. paper
2/22	. Electrostatic or magnetic shielding	4/18	. . . . . of synthetic material, e.g. derivatives of cellulose (H01G 4/16 takes precedence)
2/24	. Distinguishing marks, e.g. colour coding	4/183	. . . . . {Derivatives of cellulose (H01G 4/145 takes precedence)}
4/00	Fixed capacitors; Processes of their manufacture (electrolytic capacitors H01G 9/00)	4/186	. . . . . {halogenated (H01G 4/145 takes precedence)}
4/002	. Details	4/20	. . . . . using combinations of dielectrics from more than one of groups H01G 4/02 - H01G 4/06 (H01G 4/12 takes precedence)
4/005	. . Electrodes	4/203	. . . . . {Fibrous material or synthetic material}
4/008	. . . Selection of materials	4/206	. . . . . {inorganic and synthetic material}
4/0085	. . . . {Fried electrodes}	4/22	. . . . . impregnated
4/01	. . . Form of self-supporting electrodes	4/221	. . . . . {characterised by the composition of the impregnant}
4/012	. . . Form of non-self-supporting electrodes	4/222	. . . . . {halogenated}
4/015	. . . Special provisions for self-healing	4/224	. . Housing; Encapsulation
4/018	. . Dielectrics	4/228	. . Terminals
4/02	. . . Gas or vapour dielectrics		
4/04	. . . Liquid dielectrics		
4/06	. . . Solid dielectrics		
4/08	. . . . Inorganic dielectrics		
4/085	. . . . . {Vapour deposited}		
4/10	. . . . . Metal-oxide dielectrics {(H01G 4/085 takes precedence)}		
4/105	. . . . . {Glass dielectric}		

4/232	. . . electrically connecting two or more layers of a stacked or rolled capacitor	5/145	. . . {with profiled electrodes}
4/2325	. . . . {characterised by the material of the terminals}	5/16	. using variation of distance between electrodes
4/236	. . . leading through the housing, i.e. lead-through	5/18	. . due to change in inclination, e.g. by flexing, by spiral wrapping
4/242	. . . the capacitive element surrounding the terminal	5/38	. Multiple capacitors, e.g. ganged
4/245	. . . . Tabs between the layers of a rolled electrode	5/40	. Structural combinations of variable capacitors with other electric elements not covered by this subclass, the structure mainly consisting of a capacitor, e.g. RC combinations
4/248	. . . the terminals embracing or surrounding the capacitive element, e.g. caps (H01G 4/252 takes precedence)		
4/252	. . . the terminals being coated on the capacitive element (H01G 4/232 takes precedence)	7/00	Capacitors in which the capacitance is varied by non-mechanical means; Processes of their manufacture
4/255	. . Means for correcting the capacitance value	7/02	. Electrets, i.e. having a permanently-polarised dielectric
4/258	. . Temperature compensation means	7/021	. . {having an organic dielectric}
4/26	. Folded capacitors	7/023	. . . {of macromolecular compounds}
4/28	. Tubular capacitors	7/025	. . {having an inorganic dielectric}
4/30	. Stacked capacitors (H01G 4/33 takes precedence)	7/026	. . . {with ceramic dielectric}
4/302	. . {obtained by injection of metal in cavities formed in a ceramic body}	7/028	. . {having a heterogeneous dielectric}
4/304	. . {obtained from a another capacitor}	7/04	. having a dielectric selected for the variation of its permittivity with applied temperature
4/306	. . {made by thin film techniques}	7/06	. having a dielectric selected for the variation of its permittivity with applied voltage, i.e. ferroelectric capacitors (electrets H01G 7/02)
4/308	. . {made by transfer techniques}		
4/32	. Wound capacitors	9/00	Electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices; Processes of their manufacture
4/33	. Thin- or thick-film capacitors (thin- or thick-film circuits H01L 27/00 {capacitors without a potential-jump or surface barrier specially adapted for integrated circuits, details thereof, multistep manufacturing processes therefor H01L 28/40})	9/0003	. {Protection against electric or thermal overload; cooling arrangements; means for avoiding the formation of cathode films (H01G 9/12 takes precedence)}
4/35	. Feed-through capacitors or anti-noise capacitors	9/0029	. {Processes of manufacture}
4/38	. Multiple capacitors, i.e. structural combinations of fixed capacitors	9/0032	. . {formation of the dielectric layer}
4/385	. . {Single unit multiple capacitors, e.g. dual capacitor in one coil}	9/0036	. . {Formation of the solid electrolyte layer}
4/40	. Structural combinations of fixed capacitors with other electric elements, the structure mainly consisting of a capacitor, e.g. RC combinations	9/004	. Details
5/00	Capacitors in which the capacitance is varied by mechanical means, e.g. by turning a shaft; Processes of their manufacture	9/008	. . Terminals
5/01	. Details	9/012	. . . specially adapted for solid capacitors
5/011	. . Electrodes	9/02	. . Diaphragms; Separators
5/012	. . . at least one of the electrodes being a displaceable liquid or powder	9/022	. . Electrolytes; Absorbents
5/013	. . Dielectrics	9/025	. . . Solid electrolytes (H01G 11/54 takes precedence)
5/0132	. . . . {Liquid dielectrics}	9/028	. . . . Organic semiconducting electrolytes, e.g. TCNQ
5/0134	. . . . {Solid dielectrics}	9/032	. . . . Inorganic semiconducting electrolytes, e.g. MnO ₂
5/0136	. . . . . {with movable electrodes}	9/035	. . . . Liquid electrolytes, e.g. impregnating materials (H01G 11/54 takes precedence)
5/0138	. . . . . {with movable dielectrics}	9/038	. . . . {Electrolytes specially adapted for double-layer capacitors}
5/014	. . Housing; Encapsulation	(Frozen)	
5/015	. . Current collectors		
5/017	. . Temperature compensation		
5/019	. . Means for correcting the capacitance characteristics		
2005/02	. {having air, gas, or vacuum as the dielectric}		
5/04	. using variation of effective area of electrode		
5/06	. . due to rotation of flat or substantially flat electrodes		
5/08	. . . becoming active in succession		
5/10	. . due to rotation of helical electrodes		
5/12	. . due to rotation of part-cylindrical, conical, or spherical electrodes		
5/14	. . due to longitudinal movement of electrodes	9/04	. . Electrodes {or formation of dielectric layers thereon}

WARNING

Group H01G 9/038 is no longer used for the classification of documents as of January 1, 2021.

The content of this group is being reclassified into groups H01G 11/54 - H01G 11/64. Groups H01G 9/038 and H01G 11/54 - H01G 11/64 should be considered in order to perform a complete search.

- 9/042 . . . characterised by the material ([H01G 11/22 takes precedence](#))
- 9/0425 {specially adapted for cathode}
- 9/045 based on aluminium
- 9/048 . . . characterised by their structure ([H01G 11/22 takes precedence](#))
- 2009/05 {consisting of tantalum, niobium, or sintered material; Combinations of such electrodes with solid semiconductive electrolytes, e.g. manganese dioxide}
- 9/052 Sintered electrodes
- 9/0525 {Powder therefor}
- 9/055 Etched foil electrodes
- 9/06 . . . Mounting in containers
- 9/07 . . Dielectric layers
- 9/08 . . Housing; Encapsulation
- 9/10 . . . Sealing, e.g. of lead-in wires
- 9/12 . . . Vents or other means allowing expansion
- 9/14 . . Structural combinations {or circuits} for modifying, or compensating for, electric characteristics of electrolytic capacitors
- 9/145 . Liquid electrolytic capacitors ([H01G 11/00 takes precedence](#))
- 9/15 . Solid electrolytic capacitors ([H01G 11/00 takes precedence](#))
- 9/151 . . {with wound foil electrodes}
- 9/153 . . {Skin fibre}
- 9/155 . {Double-layer capacitors}
- (Frozen) **WARNING**
Group [H01G 9/155](#) is no longer used for the classification of documents as of January 1, 2021. The content of this group is being reclassified into groups [H01G 11/00](#) - [H01G 11/86](#). All groups listed in this Warning should be considered in order to perform a complete search.
- 9/16 . specially for use as rectifiers or detectors ([H01G 9/22 takes precedence](#))
- 9/18 . Self-interrupters
- 9/20 . Light-sensitive devices
- 9/2004 . . {characterised by the electrolyte, e.g. comprising an organic electrolyte}
- 9/2009 . . . {Solid electrolytes}
- 9/2013 . . . {the electrolyte comprising ionic liquids, e.g. alkyl imidazolium iodide}
- 9/2018 . . . {characterised by the ionic charge transport species, e.g. redox shuttles}
- 9/2022 . . {characterized by the counter electrode}
- 9/2027 . . {comprising an oxide semiconductor electrode}
- 9/2031 . . . {comprising titanium oxide, e.g. TiO₂} ([H01G 9/2036 takes precedence](#))
- 9/2036 . . . {comprising mixed oxides, e.g. ZnO covered TiO₂ particles}
- 9/204 . . . {comprising zinc oxides, e.g. ZnO} ([H01G 9/2036 takes precedence](#))
- 9/2045 . . {comprising a semiconductor electrode comprising elements of the fourth group of the Periodic System (C, Si, Ge, Sn, Pb) with or without impurities, e.g. doping materials}
- 9/205 . . {comprising a semiconductor electrode comprising AIII-BV compounds with or without impurities, e.g. doping materials}
- 9/2054 . . {comprising a semiconductor electrode comprising AII-BVI compounds, e.g. CdTe, CdSe, ZnTe, ZnSe, with or without impurities, e.g. doping materials ([H01G 9/2027 takes precedence](#))}
- 9/2059 . . {comprising an organic dye as the active light absorbing material, e.g. adsorbed on an electrode or dissolved in solution}
- 9/2063 . . . {comprising a mixture of two or more dyes}
- 9/2068 . . {Panels or arrays of photoelectrochemical cells, e.g. photovoltaic modules based on photoelectrochemical cells}
- 9/2072 . . . {comprising two or more photoelectrodes sensible to different parts of the solar spectrum, e.g. tandem cells}
- 9/2077 . . . {Sealing arrangements, e.g. to prevent the leakage of the electrolyte}
- 9/2081 . . . {Serial interconnection of cells}
- 9/2086 . . . {Photoelectrochemical cells in the form of a fiber}
- 9/209 . . {Light trapping arrangements}
- 9/2095 . . {comprising a flexible substrate}
- 9/21 . Temperature-sensitive devices
- 9/22 . Devices using combined reduction and oxidation, e.g. redox arrangement or solion
- 9/26 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices, light-sensitive or temperature-sensitive devices with each other
- 9/28 . Structural combinations of electrolytic capacitors, rectifiers, detectors, switching devices with other electric components not covered by this subclass
- 11/00 Hybrid capacitors, i.e. capacitors having different positive and negative electrodes; Electric double-layer [EDL] capacitors [EDLCs]; Processes specially adapted for the manufacture thereof or of parts thereof**
NOTE
Group [H01G 11/02](#) takes precedence over groups [H01G 11/04](#) - [H01G 11/14](#)
WARNING
Group [H01G 11/00](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
Groups [H01G 9/155](#) and [H01G 11/00](#) should be considered in order to perform a complete search.
- 11/02 . using combined reduction-oxidation reactions, e.g. redox arrangement or solion
WARNING
Group [H01G 11/02](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
Groups [H01G 9/155](#) and [H01G 11/02](#) should be considered in order to perform a complete search.

- 11/04 . Hybrid capacitors
- WARNING**
- Group [H01G 11/04](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/04](#) should be considered in order to perform a complete search.
- 11/06 . . with one of the electrodes allowing ions or anions to be reversibly doped thereinto, e.g. lithium-ion capacitors [LICs]
- WARNING**
- Group [H01G 11/06](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/06](#) should be considered in order to perform a complete search.
- 11/08 . Structural combinations, e.g. assembly or connection, of hybrid or EDL capacitors with other electric components, at least one hybrid or EDL capacitor being the main component
- WARNING**
- Group [H01G 11/08](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/08](#) should be considered in order to perform a complete search.
- 11/10 . Multiple hybrid or EDL capacitors, e.g. arrays or modules ([housings, cases or mountings thereof](#) [H01G 11/78](#))
- WARNING**
- Group [H01G 11/10](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/10](#) should be considered in order to perform a complete search.
- 11/12 . . Stacked hybrid or EDL capacitors
- WARNING**
- Group [H01G 11/12](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/12](#) should be considered in order to perform a complete search.
- 11/14 . Arrangements or processes for adjusting or protecting hybrid or EDL capacitors ([emergency protective circuit arrangements specially adapted for capacitors, and effecting automatic switching in the event of an undesired change from normal working conditions](#) [H02H 7/16](#); [emergency protective circuit arrangements for limiting excess current or voltages without disconnection](#) [H02H 9/00](#))
- WARNING**
- Group [H01G 11/14](#) – [H01G 11/20](#) are incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/14](#) – [H01G 11/20](#) should be considered in order to perform a complete search.
- 11/16 . . against electric overloads, e.g. including fuses
- 11/18 . . against thermal overloads, e.g. heating, cooling or ventilating
- 11/20 . . Reformation or processes for removal of impurities, e.g. scavenging
- 11/22 . Electrodes
- WARNING**
- Group [H01G 11/22](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/22](#) should be considered in order to perform a complete search.
- 11/24 . . characterised by structural features, e.g. forms, shapes, surface areas, porosities or dimensions, of the materials making up or comprised in the electrodes; characterised by the structural features of powders or particles used therefor
- WARNING**
- Group [H01G 11/24](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/24](#) should be considered in order to perform a complete search.
- 11/26 . . characterised by the structures of the electrodes, e.g. multi-layered, shapes, dimensions, porosities or surface features
- WARNING**
- Groups [H01G 11/26](#) – [H01G 11/28](#) are incomplete pending reclassification of documents from group [H01G 9/155](#).
- Groups [H01G 9/155](#) and [H01G 11/26](#) – [H01G 11/28](#) should be considered in order to perform a complete search.
- 11/28 . . . arranged or disposed on a current collector; Layers or phases between electrodes and current collectors, e.g. adhesives

- 11/30 . . characterised by their materials

WARNING

Group [H01G 11/30](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/30](#) should be considered in order to perform a complete search.

- 11/32 . . . Carbon-based, e.g. activated carbon materials

WARNING

Groups [H01G 11/32](#) – [H01G 11/44](#) are incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/32](#) – [H01G 11/44](#) should be considered in order to perform a complete search.

- 11/34 characterised by carbonisation or activation of carbon
- 11/36 Nanostructures, e.g. nanofibres, nanotubes or fullerenes
- 11/38 Carbon pastes or blends; Binders or additives therein
- 11/40 Fibres
- 11/42 Powders or particles, e.g. composition thereof
- 11/44 Raw materials therefor, e.g. resins or coal
- 11/46 . . . Metal oxides, e.g. ruthenium oxide

WARNING

Group [H01G 11/46](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/46](#) should be considered in order to perform a complete search.

- 11/48 . . . Conductive polymers

WARNING

Group [H01G 11/48](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/48](#) should be considered in order to perform a complete search.

- 11/50 . . . specially adapted for lithium-ion capacitors, e.g. for lithium-doping or for intercalation

WARNING

Group [H01G 11/50](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/50](#) should be considered in order to perform a complete search.

- 11/52 . Separators

WARNING

Group [H01G 11/52](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/52](#) should be considered in order to perform a complete search.

- 11/54 . Electrolytes

WARNING

Group [H01G 11/54](#) is incomplete pending reclassification of documents from groups [H01G 9/038](#) and [H01G 9/155](#).

Groups [H01G 9/038](#), [H01G 9/155](#), and [H01G 11/54](#) should be considered in order to perform a complete search.

- 11/56 . . Solid electrolytes, e.g. gels; Additives therein

WARNING

Group [H01G 11/56](#) is incomplete pending reclassification of documents from groups [H01G 9/038](#) and [H01G 9/155](#).

Groups [H01G 9/038](#), [H01G 9/155](#), and [H01G 11/56](#) should be considered in order to perform a complete search.

- 11/58 . . Liquid electrolytes

WARNING

Groups [H01G 11/58](#) – [H01G 11/64](#) are incomplete pending reclassification of documents from groups [H01G 9/038](#) and [H01G 9/155](#).

Groups [H01G 9/038](#), [H01G 9/155](#), and [H01G 11/58](#) – [H01G 11/64](#) should be considered in order to perform a complete search.

- 11/60 . . . characterised by the solvent
- 11/62 . . . characterised by the solute, e.g. salts, anions or cations therein
- 11/64 . . . characterised by additives
- 11/66 . Current collectors

WARNING

Group [H01G 11/66](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/66](#) should be considered in order to perform a complete search.

- 11/68 . . characterised by their materials

WARNING

Group [H01G 11/68](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).

Groups [H01G 9/155](#) and [H01G 11/68](#) should be considered in order to perform a complete search.

- 11/70 . . characterised by their structures
WARNING
 Group [H01G 11/70](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/70](#) should be considered in order to perform a complete search.
- 11/72 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
WARNING
 Group [H01G 11/72](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/72](#) should be considered in order to perform a complete search.
- 11/74 . . Terminals, e.g. extensions of current collectors
WARNING
 Group [H01G 11/74](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/74](#) should be considered in order to perform a complete search.
- 11/76 . . specially adapted for integration in multiple or stacked hybrid or EDL capacitors
WARNING
 Group [H01G 11/76](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/76](#) should be considered in order to perform a complete search.
- 11/78 . . Cases; Housings; Encapsulations; Mountings
WARNING
 Group [H01G 11/78](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/78](#) should be considered in order to perform a complete search.
- 11/80 . . Gaskets; Sealings
WARNING
 Group [H01G 11/80](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/80](#) should be considered in order to perform a complete search.
- 11/82 . . Fixing or assembling a capacitive element in a housing, e.g. mounting electrodes, current collectors or terminals in containers or encapsulations
WARNING
 Group [H01G 11/82](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/82](#) should be considered in order to perform a complete search.
- 11/84 . . Processes for the manufacture of hybrid or EDL capacitors, or components thereof
WARNING
 Group [H01G 11/84](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/84](#) should be considered in order to perform a complete search.
- 11/86 . . specially adapted for electrodes (carbonisation or activation of carbon for the manufacture of electrodes [H01G 11/34](#))
WARNING
 Group [H01G 11/86](#) is incomplete pending reclassification of documents from group [H01G 9/155](#).
 Groups [H01G 9/155](#) and [H01G 11/86](#) should be considered in order to perform a complete search.
- 13/00 Apparatus specially adapted for manufacturing capacitors; Processes specially adapted for manufacturing capacitors not provided for in groups [H01G 4/00](#) - [H01G 11/00](#)**
- 13/003 . {Apparatus or processes for encapsulating capacitors}
- 13/006 . {Apparatus or processes for applying terminals}
- 13/02 . Machines for winding capacitors
- 13/04 . Drying; Impregnating
- 13/06 . with provision for removing metal surfaces
- 15/00 Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with each other (involving at least one hybrid or electric double-layer [EDL] capacitor as main component [H01G 11/08](#))**
- 17/00 Structural combinations of capacitors or other devices covered by at least two different main groups of this subclass with other electric elements, not covered by this subclass, e.g. RC combinations**