

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**