

**CPC****COOPERATIVE PATENT CLASSIFICATION****G02F**

**DEVICES OR ARRANGEMENTS, THE OPTICAL OPERATION OF WHICH IS MODIFIED BY CHANGING THE OPTICAL PROPERTIES OF THE MEDIUM OF THE DEVICES OR ARRANGEMENTS FOR THE CONTROL OF THE INTENSITY, COLOUR, PHASE, POLARISATION OR DIRECTION OF LIGHT, e.g. SWITCHING, GATING, MODULATING OR DEMODULATING; TECHNIQUES OR PROCEDURES FOR THE OPERATION THEREOF; FREQUENCY-CHANGING; NON-LINEAR OPTICS; OPTICAL LOGIC ELEMENTS; OPTICAL ANALOGUE/DIGITAL CONVERTERS** (optical transfer means between sensing member and indicating or recording part in connection with measuring [G01D 5/26](#); devices in which mathematical operations are carried out with optical elements [G06E 3/00](#), {[G06E 3/001](#)}; electrical signal transmission systems using optical means to convert the input signal [G08C 19/36](#); information-recording by electric or magnetic means and reproducing by sensing optical properties [G11B 11/00](#); static stores using optical elements [G11C 13/04](#); transmission systems employing electromagnetic waves other than radio waves, e.g. light, infra-red radiation, [H04B 10/00](#); optical multiplex systems [H04J 14/00](#); pictorial communication, e.g. television [H04N](#))

**WARNING**

Subject matter covered by these groups is classified in the following CPC groups:  
 - [G02F 1/13357](#) covered by [G02F 1/1336](#) and subgroups

**G02F 1/00**

**Devices or arrangements for the control of the intensity, colour, phase, polarisation or direction of light arriving from an independent light source, e.g. switching, gating, or modulating; Non-linear optics** (thermometers using change of colour or translucency [G01K 11/12](#); using changes in fluorescence [G01K 11/32](#); light guide devices [G02B 6/00](#); optical devices or arrangements using movable or deformable elements for controlling light independent of the light source [G02B 26/00](#); control of light in general [G05D 25/00](#); visible signalling systems [G08B 5/00](#); indicating arrangements for variable information by selection or combination of individual elements [G09F 9/00](#); control arrangements or circuits for visual indicators other than cathode-ray tubes [G09G 3/00](#); control of light sources [H01S 3/10](#), [H05B 33/08](#), [H05B 35/00](#) to [H05B 43/00](#); {photochromic filters [G02B 5/23](#); optical logic elements [G02F 3/00](#)})

**NOTE**

This group covers only :

- devices or arrangements, e.g. cells, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements by the influence or control of physical parameters, e.g. electric fields, electric current, magnetic fields, sound or mechanical vibrations, stress or thermal effects;
- devices or arrangements in which the electric or magnetic field component of the light beams influences the optical properties of the medium, i.e. non-linear optics;

- control of light by electromagnetic waves, e.g. radio waves, or by electrons or other elementary particles.

- G02F 1/0009 . {Materials therefor}
- NOTE**
- [G02F 1/0009](#) and subgroups contain mostly non-patent literature
- G02F 1/0018 .. {Electro-optical materials}
- G02F 1/0027 ... {with ferro-electric properties (domain inversion in ferro-electric materials [G02F 1/3558](#); ferro-electric materials in general [H01G 7/02](#))}
- G02F 1/0036 .. {Magneto-optical materials (magnetic materials in general [H01E](#))}
- G02F 1/0045 .. {Liquid crystals as far as the physical properties are concerned (chemical composition and properties of liquid crystals [C09K 19/00](#))}
- G02F 1/0054 .. {Structure, phase transitions, NMR, ESR, Moessbauer spectra}
- G02F 1/0063 .. {Optical properties e.g. absorption, reflection, non-linear effects, birefringence (non linear optics in general [G02F 1/35](#))}
- G02F 1/0072 .. {Mechanical, acoustic, electro-elastic, magneto-elastic properties}
- G02F 1/0081 .. {Electric or magnetic properties}
- G02F 1/009 .. {Thermal properties (thermometers using change of colour or translucency [G01K 11/12](#); radiation pyrometry [G01J 5/00](#))}
- G02F 1/01 . for the control of the intensity, phase, polarisation or colour ([G02F 1/29](#), [G02F 1/35](#) take precedence; polarising elements per se [G02B 5/30](#); static storage per se [G11C](#); image tube screens acting as light valves by shutter operation [H01J 29/12](#); such screens acting by discoloration [H01J 29/14](#); { projection arrangements for television image reproduction, e.g. using eidophor [H04N 5/74](#); recording by light [G11B 7/00](#) to [G11B 11/00](#)})
- G02F 1/0102 .. {Constructional details ([G02F 1/1306](#), [G02F 1/133](#) take precedence)}
- G02F 1/0105 ... {Illumination devices (for liquid crystal cells [G02F 1/13357](#); for display devices for electronic time pieces [G04G 9/0041](#))}
- G02F 1/0107 ... {Gaskets, spacers, sealing of the cell; Filling and closing of the cell (for liquid crystal cells [G02F 1/1339](#), [G02F 1/1341](#); for electrochromic or electrolytic cells [G02F 1/161](#))}
- G02F 1/011 .. { in optical waveguides ([G02F 1/0134](#), [G02F 1/01708](#), [G02F 1/025](#), [G02F 1/035](#), [G02F 1/0508](#), [G02F 1/0553](#), [G02F 1/065](#), [G02F 1/073](#), [G02F 1/095](#), [G02F 1/125](#), [G02F 1/1326](#), [G02F 1/225](#) take precedence; optical waveguides in general [G02B 6/00](#))}
- G02F 1/0115 ... {in optical fibres}
- G02F 1/0118 .... {by controlling the evanescent coupling of light from a fibre into an active, e.g. electro-optic, overlay}
- G02F 1/0121 .. {Operation of the device; Circuit arrangements not otherwise provided for ([G02F 1/0327](#), [G02F 1/0516](#), [G02F 1/076](#), [G02F 1/092](#), [G02F 1/113](#), [G02F 1/13306](#), [G02F 1/163](#) take precedence)}
- G02F 1/0123 ... {Circuits for the control or stabilisation of the bias voltage, e.g. automatic bias control (ABC) feedback loops}

- G02F 1/0126 .. {by another light beam, i.e. opto-optical modulation ([G02F 1/01716](#), [G02F 1/0338](#), [G02F 1/0533](#), [G02F 1/0541](#), [G02F 1/0558](#), [G02F 1/135](#), [G02F 1/293](#) take precedence)}
- G02F 1/0128 .. {based on electro-mechanical, magneto-mechanical, elasto-optic effects}
- G02F 1/0131 ... {based on elasto-optic, i.e. photoelastic effect, e.g. mechanically induced birefringence (acousto-optic devices [G02F 1/11](#))}
- G02F 1/0134 .... {in optical waveguides}
- G02F 1/0136 .. {for the control of polarisation, e.g. state of polarisation (SOP) control, polarisation scrambling, TE-TM mode conversion or separation ([G02F 1/0353](#) takes precedence)}
- G02F 1/0147 .. { based on thermo-optic effects ([G02F 1/132](#) takes precedence; tenebrescent compositions [C09K 9/00](#); radiation pyrometry [G01J 5/00](#); thermometers using change of colour or translucency [G01K 11/12](#))}
- G02F 1/015 .. based on semiconductor elements with at least one potential jump barrier, e.g. PN, PIN junction ([G02F 1/03](#) takes precedence)
- G02F 1/017 ... Structures with periodic or quasi periodic potential variation, e.g. superlattices, quantum wells
- G02F 1/01708 .... {in an optical waveguide structure}
- G02F 1/01716 .... {Optically controlled superlattice or quantum well devices}
- G02F 1/01725 .... {with a non-rectangular quantum well structure, e.g. coupled, graded, stepped quantum wells}
- G02F 1/025 ... in an optical waveguide structure ([G02F 1/017](#), {[G02F 1/2257](#)} take precedence)
- G02F 1/03 .. based on ceramics or electro-optical crystals, e.g. exhibiting Pockels effect or Kerr effect ([G02F 1/061](#) takes precedence)
- G02F 1/0305 ... {Constructional arrangements ([G02F 1/0327](#) to [G02F 1/05](#) take precedence)}
- G02F 1/0311 .... {Structural association of optical elements, e.g. lenses, polarizers, phase plates, with the crystal}
- G02F 1/0316 .... {Electrodes}
- G02F 1/0322 .... {Arrangements comprising two or more independently controlled crystals}
- G02F 1/0327 ... {Operation of the cell; Circuit arrangements ([G02F 1/05](#) takes precedence)}
- G02F 1/0333 ... {addressed by a beam of charged particles e.g. directed to an adjacent layer exhibiting secondary emission or bombardment-induced conductivity effect ([G02F 1/05](#) takes precedence; electrography, electrophotography [G03G](#); screens for cathode ray tubes acting as light valves [H01J 29/12](#))}
- G02F 1/0338 ... {structurally associated with a photoconductive layer or having photo-refractive properties ([G02F 1/05](#) takes precedence)}
- G02F 1/0344 ... {controlled by a high-frequency electromagnetic wave component in an electric waveguide ([G02F 1/0356](#), [G02F 1/05](#), [G02F 1/2255](#), [G02F 1/3134](#) take precedence)}
- G02F 1/035 ... in an optical waveguide structure
- G02F 1/0353 .... {involving an electro-optic TE-TM mode conversion}
- G02F 1/0356 .... {controlled by a high-frequency electromagnetic wave component in an electric waveguide structure}
- G02F 1/05 ... with ferro-electric properties ([G02F 1/035](#), [G02F 1/055](#) take precedence; { domain inversion in ferro-electric materials [G02F 1/3558](#); ferro-electric digital stores [G11C 11/22](#))}
- G02F 1/0508 .... {specially adapted for gating or modulating in optical waveguides}

- G02F 1/0516 . . . . {Operation of the cell; Circuit arrangements}
- G02F 1/0525 . . . . {addressed by a beam of charged particles, e.g. directed to an adjacent layer exhibiting secondary emission or bombardment-induced conductivity effect (electrography, electrophotography [G03G](#); screens for cathode-ray tubes acting as light valves [H01J 29/12](#))}
- G02F 1/0533 . . . . {structurally associated with a photo-conductive layer}
- G02F 1/0541 . . . . {using photo-refractive effects (holography [G03H](#); electro-optical digital static stores using an interference pattern [G11C 13/044](#))}
- G02F 1/055 . . . the active material being a ceramic ([G02F 1/035](#) takes precedence)
- G02F 1/0551 . . . . {Constructional details}
- G02F 1/0553 . . . . {specially adapted for gating or modulating in optical waveguides}
- G02F 1/0555 . . . . {Operation of the cell; Circuit arrangements}
- G02F 1/0556 . . . . {specially adapted for a particular application}
- G02F 1/0558 . . . . {structurally associated with a photoconductive layer or exhibiting photo-refractive properties}
- G02F 1/061 . . . based on electro-optical organic material ([G02F 1/07](#), {[G02F 1/13](#)} take precedence)
- G02F 1/065 . . . . in an optical waveguide structure
- G02F 1/07 . . . based on electro-optical liquids exhibiting Kerr effect
- G02F 1/073 . . . . {specially adapted for gating or modulating in optical waveguides}
- G02F 1/076 . . . . {Operation of the cell; Circuit arrangements}
- G02F 1/09 . . . based on magneto-optical elements, e.g. exhibiting Faraday effect
- G02F 1/091 . . . . {based on magneto-absorption or magneto-reflection}
- G02F 1/092 . . . . {Operation of the cell; Circuit arrangements}
- G02F 1/093 . . . . {used as non-reciprocal devices, e.g. optical isolators, circulators ([G02F 1/0955](#) takes precedence)}
- G02F 1/095 . . . . in an optical waveguide structure
- G02F 1/0955 . . . . . {used as non-reciprocal devices, e.g. optical isolators, circulators}
- G02F 1/11 . . . based on acousto-optical elements, e.g. using variable diffraction by sound or like mechanical waves ({elasto-optic effect without wave propagation [G02F 1/0131](#);} acousto-optical deflection [G02F 1/33](#))}
- G02F 1/113 . . . . {Circuit or control arrangements}
- G02F 1/116 . . . . {using an optically anisotropic medium, wherein the incident and the diffracted light waves have different polarizations, e.g. acousto-optic tunable filter (AOTF) ([G02F 1/125](#) takes precedence)}
- G02F 1/125 . . . . in an optical waveguide structure
- G02F 1/13 . . . based on liquid crystals, e.g. single liquid crystal display cells (liquid crystal materials [C09K 19/00](#))
- G02F 1/1303 . . . . { Apparatus specially adapted to the manufacture of LCDs }
- G02F 1/1306 . . . . { Details (not used, see sub-groups) }
- G02F 1/1309 . . . . . { Repairing; Testing (testing of optical apparatus [G01M 11/00](#); electronic testing of displays or display drivers, e.g. of LCDs, [G09G 3/006](#)) }
- G02F 1/1313 . . . . {specially adapted for a particular application}
- G02F 1/132 . . . . { Thermal activation of liquid crystals exhibiting a thermo-optic effect (thermometers using change of colour or translucency of liquid crystals [G01K 11/165](#); thermally addressed liquid crystal elements in a matrix [G09G 3/3603](#)) }

G02F 1/1323	...	{ Arrangements for providing a switchable viewing angle }
G02F 1/1326	...	{ Liquid crystal optical waveguides or liquid crystal cells specially adapted for gating or modulating between optical waveguides }
G02F 1/133	...	Constructional arrangements; Operation of liquid crystal cells; Circuit arrangements (arrangements or circuits for control of liquid crystal elements in a {segment display or a} matrix, not structurally associated with these elements, {respectively <a href="#">G09G 3/18</a> and} <a href="#">G09G 3/36</a> )
G02F 1/13306	.....	{ Circuit arrangements or driving methods for the control of single liquid crystal cells ( <a href="#">G02F 1/132</a> , <a href="#">G02F 1/133382</a> take precedence)}
G02F 1/13318	.....	{Circuits comprising a photodetector}
G02F 1/1333	.....	Constructional arrangements; {Manufacturing methods}( <a href="#">G02F 1/135</a> , <a href="#">G02F 1/136</a> take precedence)
G02F 1/133305	.....	{Flexible substrates, e.g. plastics, organic film}
G02F 1/133308	.....	{ LCD panel immediate support structure, e.g. front and back frame or bezel }
G02F 1/13334	.....	{ Plasma addressed liquid crystal cells [PALC]}(plasma panels <a href="#">H01J 17/49</a> )
G02F 1/133345	.....	{Insulating layers ( <a href="#">G02F 1/1335</a> , <a href="#">G02F 1/1337</a> , <a href="#">G02F 1/135</a> , <a href="#">G02F 1/136</a> take precedence)}
G02F 1/133348	.....	{ Charged-particles, e.g. electron-beam, addressed liquid crystals cells (screen for cathode ray tubes acting as light valves <a href="#">H01J 29/12</a> ; electrography, electrophotography <a href="#">G03G</a> )}
G02F 1/133351	.....	{Manufacturing of individual cells out of a plurality of cells, e.g. by dicing}
G02F 1/13336	.....	{Combining plural substrates to produce large-area displays, e.g. tiled displays}
G02F 1/133362	.....	{ Optically addressed liquid crystal cells ( <a href="#">G02F 1/135</a> takes precedence)}
G02F 1/133365	.....	{Cells in which the active layer comprises a liquid crystalline polymer (liquid crystalline polymers in general <a href="#">C09K 19/38</a> )}
G02F 1/133371	.....	{Cells with varying thickness of the liquid crystal layer}
G02F 1/133377	.....	{Cells with plural compartments or having plurality of liquid crystal micro-cells partitioned by walls, e.g. one micro-cell per pixel}
G02F 1/13338	.....	{ Input devices, e.g. touch-panels (specially adapted as input devices to computers <a href="#">G06F 3/033</a> ; touch-panels per se <a href="#">G06K 11/06</a> , keyboard switches per se <a href="#">H01H 13/70</a> )}
G02F 1/133382	.....	{ Heating or cooling of liquid crystal cells other than for activation, e.g. circuits or arrangements for temperature control, stabilisation or uniform distribution over the cell }
G02F 1/133385	.....	{ with cooling means, e.g. fans }
G02F 1/1334	.....	based on polymer dispersed liquid crystals, e.g. microencapsulated liquid crystals {(compositions <a href="#">C09K 19/544</a> )}
G02F 1/13342	.....	{Holographic polymer dispersed liquid crystals}
G02F 1/1335	.....	Structural association of optical devices, e.g. polarisers, reflectors or illuminating devices, with the cell
G02F 1/133502	.....	{Antiglare, refractive index matching layers}
G02F 1/133504	.....	{Diffusing, scattering, diffracting elements (associated to illuminating devices <a href="#">G02F 1/13357</a> )}
G02F 1/133509	.....	{Filters, e.g. light shielding masks (optical filters <a href="#">G02B 5/20</a> )}
G02F 1/133512	.....	{Light shielding layers, e.g. black matrix ( <a href="#">G02F 1/136209</a> takes

		precedence)}
G02F 1/133514	.....	{Colour filters (luminescent elements <b>G02F 1/13357L</b> )}
G02F 1/133516	.....	{Methods of making thereof, e.g. printing, electro-deposition, photolithography (photomechanical production of textured or patterned surfaces <b>G03F</b> )}
G02F 1/133524	.....	{ Light-guides, e.g. fibre-optic bundles, louvered or jalousie light-guides}
G02F 1/133526	.....	{Lenses, e.g. micro-lenses, Fresnel lenses (lenses in general <b>G02B 3/00</b> )}
G02F 1/133528	.....	{Polarisers (polarisers per se <b>G02B 5/30</b> )}
G02F 1/133533	.....	{Colour selective polarisers ( <b>G02F 1/1347</b> takes precedence)}
G02F 1/133536	.....	{Reflective polarizers ( <b>G02F 1/13357P</b> takes precedence)}
G02F 1/133553	.....	{Reflecting elements (associated to illuminating devices <b>G02F 1/13357</b> )}
G02F 1/133555	.....	{Transflectors}
G02F 1/1336	.....	{ Illuminating devices (in general F21V; associated with display devices for electronic watches <b>G04G 9/0041</b> )}

### **WARNING**

**G02F 1/1336-G02F 1/133621** dos not correspond to former or current IPC groups. Concordance CPC : IPC for these groups is as follows:- **G02F 1/1336-G02F 1/133621** : **G02F 1/13357**

G02F 1/133602	.....	{ Direct backlight}
G02F 1/133603	.....	{ with LEDs}
G02F 1/133604	.....	{ with lamps}
G02F 1/133605	.....	{ including specially adapted reflectors}
G02F 1/133606	.....	{ including a specially adapted diffusing, scattering or light controlling members}
G02F 1/133608	.....	{ including particular frames or supporting means}
G02F 1/133609	.....	{ including means for improving the color mixing, e.g. white}
G02F 1/133611	.....	{ including means for improving the brightness uniformity}
G02F 1/133615	.....	{ Edge-illuminating devices, i.e. illuminating from the side ( <b>G02B 6/0001</b> takes precedence)}
G02F 1/133617	.....	{ Illumination with ultra-violet light; Luminescent elements or materials associated to the cell}
G02F 1/13362	.....	{ providing polarised light, e.g. by converting a polarisation component into another one (optical systems for polarising <b>G02B 27/28</b> )}
G02F 1/133621	.....	{ providing coloured light ( <b>G02F 1/133617</b> , <b>G02F 1/133533</b> take precedence)}
G02F 1/13363	.....	Birefringent elements, e.g. for optical compensation
G02F 1/133632	.....	{with refractive index ellipsoid inclined relative to the LC-layer surface}
G02F 1/133634	.....	{the refractive index Nz perpendicular to the element surface being different from in-plane refractive indices Nx and Ny, e.g. biaxial or with normal optical axis}

G02F 1/133636	.....	{with twisted orientation, e.g. comprising helically oriented LC-molecules or a plurality of twisted birefringent sublayers}
G02F 1/1337	.....	Surface-induced orientation of the liquid crystal molecules, e.g. by alignment layers
G02F 1/133703	.....	{by introducing organic surfactant additives into the liquid crystal material ( <a href="#">C09K 19/56</a> takes precedence)}
G02F 1/133707	.....	{ Structures for producing distorted electric fields, e.g. bumps, protrusions, recesses, slits in pixel electrodes}
G02F 1/133711	.....	{by organic films, e.g. polymeric films}
G02F 1/133719	.....	{with coupling agent molecules, e.g. silane}
G02F 1/133723	.....	{Polyimide, polyamide-imide}
G02F 1/133734	.....	{by obliquely evaporated films, e.g. Si or SiO <sub>2</sub> films}
G02F 1/133753	.....	{with different alignment orientations or pretilt angles on a same surface, e.g. for grey scale or improved viewing angle}
G02F 1/13378	.....	{by treatment of the surface, e.g. embossing, rubbing, light irradiation ( <a href="#">G02F 1/133711</a> , <a href="#">G02F 1/133734</a> , <a href="#">G02F 1/133753</a> take precedence)}
G02F 1/133784	.....	{by rubbing}
G02F 1/133788	.....	{by light irradiation, e.g. linearly polarised light photo-polymerisation}
G02F 1/1339	.....	Gaskets; Spacers, { also spacers with conducting properties ( <a href="#">electric line connectors H01R</a> )}; Sealing of the cell
G02F 1/13392	.....	{spacers dispersed on the cell substrate, e.g. spherical particles, micro-fibres}
G02F 1/13394	.....	{spacers regularly patterned on the cell substrate, e.g. walls, pillars ( <a href="#">G02F 1/133377</a> takes precedence)}
G02F 1/1341	.....	Filling or closing of the cell {( <a href="#">G02F 1/133365</a> , <a href="#">G02F 1/1334</a> take precedence)}
G02F 1/1343	.....	Electrodes {( <a href="#">reflective electrodes G02F 1/133553</a> )}
G02F 1/134309	.....	{characterised by their geometrical arrangement ( <a href="#">G09F 9/302</a> takes precedence)}
G02F 1/134327	.....	{Segmented, e.g. alpha numeric display}
G02F 1/134336	.....	{Matrix}
G02F 1/134363	.....	{for applying an electric field parallel to the substrate, i.e. in-plane switching (IPS)}
G02F 1/13439	.....	{characterised by their electrical, optical, physical properties; materials therefor; method of making}
G02F 1/1345	.....	Conductors connecting electrodes to cell terminals
G02F 1/13452	.....	{ Conductors connecting driver circuitry and terminals of panels ( <a href="#">H01L 21/00</a> takes precedence; electrical details inside the cell <a href="#">G02F 1/133</a> ;)}
G02F 1/13454	.....	{ Drivers integrated on the active matrix substrate ( <a href="#">G02F 1/136277</a> takes precedence)}
G02F 1/13458	.....	{ Terminal pads }
G02F 1/1347	.....	Arrangement of liquid crystal layers or cells in which the final condition of one light beam is achieved by the addition of the effects of two or more layers or cells {( <a href="#">colour projection displays with liquid crystal valves H04N 9/3197</a> )}
G02F 1/13471	.....	{in which all the liquid crystal cells or layers remain transparent, e.g.

		FLC, ECB, DAP, HAN, TN, STN, SBE-LC cells ( <a href="#">G02F 1/13475</a> takes precedence)}
<a href="#">G02F 1/13473</a>	.....	{for wavelength filtering or for colour display without the use of colour mosaic filters}
<a href="#">G02F 1/13475</a>	.....	{in which at least one liquid crystal cell or layer is doped with a pleochroic dye, e.g. GH-LC cell ( <a href="#">G02F 1/13476</a> takes precedence)}
<a href="#">G02F 1/13476</a>	.....	{in which at least one liquid crystal cell or layer assumes a scattering state}
<a href="#">G02F 1/135</a>	....	Liquid crystal cells structurally associated with a photoconducting or a ferro-electric layer, the properties of which can be optically or electrically varied {( <a href="#">G02F 1/133348</a> takes precedence)}
<a href="#">G02F 1/1354</a>	.....	{having a particular photoconducting structure or material}
<a href="#">G02F 1/1358</a>	.....	{the supplementary layer being a ferro-electric layer}
<a href="#">G02F 1/136</a>	....	Liquid crystal cells structurally associated with a semi-conducting layer or substrate, e.g. cells forming part of an integrated circuit ( <a href="#">G02F 1/135</a> takes precedence)
<a href="#">G02F 1/1362</a>	.....	Active matrix addressed cells {( <a href="#">G02F 1/134336</a> , <a href="#">G02F 1/134363</a> take precedence)}
<a href="#">G02F 1/136204</a>	.....	{Arrangements to prevent high voltage or static electricity failures}
<a href="#">G02F 1/136209</a>	.....	{Light shielding layers, e.g. black matrix, incorporated in the active matrix substrate, e.g. structurally associated with the switching element}
<a href="#">G02F 1/136213</a>	.....	{Storage capacitors associated with the pixel electrode}
<a href="#">G02F 1/136227</a>	.....	{Through-hole connection of the pixel electrode to the active element through an insulation layer}
<a href="#">G02F 1/13624</a>	.....	{having more than one switching element per pixel}
<a href="#">G02F 1/136259</a>	.....	{Repairing; Defects}
<a href="#">G02F 1/136277</a>	.....	{formed on a semiconductor substrate, e.g. silicon}
<a href="#">G02F 1/136286</a>	.....	{Wiring, e.g. gate line, drain line}
<a href="#">G02F 1/1365</a>	.....	in which the switching element is a two-electrode device {( <a href="#">G02F 1/136277</a> takes precedence)}
<a href="#">G02F 1/1368</a>	.....	in which the switching element is a three-electrode device {( <a href="#">G02F 1/136277</a> takes precedence)}
<a href="#">G02F 1/137</a>	...	characterised by a particular electro- or magneto-optical effect, e.g. field-induced phase transition, orientation effect, guest-host interaction, dynamic scattering
<a href="#">G02F 1/13718</a>	....	{based on a change of the texture state of a cholesteric liquid crystal}
<a href="#">G02F 1/13725</a>	.....	{ based on guest-host interaction ( <a href="#">G02F 1/13762</a> , <a href="#">G02F 1/13737</a> , take precedence)}
<a href="#">G02F 1/13731</a>	.....	{based on a field-induced phase transition ( <a href="#">G02F 1/13781</a> takes precedence)}
<a href="#">G02F 1/13737</a>	.....	{in liquid crystals doped with a pleochroic dye}
<a href="#">G02F 1/13743</a>	.....	{based on electrohydrodynamic instabilities or domain formation in liquid crystals}
<a href="#">G02F 1/1375</a>	.....	{using dynamic scattering}

G02F 1/13762	....	{ containing luminescent or electroluminescent additives (luminescent materials in general <a href="#">C09K 11/00</a> ; compositions of liquid crystals comprising additives <a href="#">C09K 19/52</a> to <a href="#">C09K 19/603</a> ; electroluminescent light sources <a href="#">H05B 33/00</a> )}
G02F 1/13768	....	{ based on magneto-optical effects}
G02F 1/13781	....	{using smectic liquid crystals ( <a href="#">G02F 1/141</a> takes precedence)}
G02F 1/139	....	based on orientation effects in which the liquid crystal remains transparent
G02F 1/1391	.....	{Bistable or multi-stable liquid crystal cells ( <a href="#">G02F 1/141</a> takes precedence)}
G02F 1/1392	.....	{using a field-induced sign-reversal of the dielectric anisotropy}
G02F 1/1393	.....	{ the birefringence of the liquid crystal being electrically controlled, e.g. ECB-, DAP-, HAN-, PI-LC cells ( <a href="#">G02F 1/1396</a> , <a href="#">G02F 1/141</a> take precedence)}
G02F 1/1395	.....	{Optically compensated birefringence (OCB)- cells or PI- cells}
G02F 1/1396	.....	{the liquid crystal being selectively controlled between a twisted state and a non-twisted state, e.g. TN-LC cell ( <a href="#">G02F 1/141</a> takes precedence)}
G02F 1/1397	.....	{the twist being substantially higher than 90°, e.g. STN-, SBE-, OMI-LC cells}
G02F 1/141	.....	using ferroelectric liquid crystals
G02F 1/1416	.....	{Details of the smectic layer structure, e.g. bookshelf, chevron, C1 and C2}
G02F 1/1418	.....	{ using smectic liquid crystals, e.g. based on the electroclinic effect }
G02F 1/15	..	based on electrochromic elements {(electrochromic materials <a href="#">C09K 9/00</a> )}
G02F 1/1506	...	{based on electrolytic deposition of a non-organic material on or in the vicinity of an electrode}
G02F 1/1508	....	{using a solid electrolyte}
G02F 1/1521	...	{based on oxidation reduction in organic liquid solutions, e.g. viologens solutions}
G02F 1/1523	...	{based on solid inorganic materials, e.g. transition metal compounds, e.g. in combination with a liquid or solid electrolyte ( <a href="#">G02F 1/1506</a> takes precedence)}
G02F 1/1525	....	{characterised by a particular ion transporting layer, e.g. electrolyte ( <a href="#">H01M 6/18</a> , <a href="#">H01M 10/08</a> take precedence)}
G02F 1/1527	....	{based on iridium oxide or hydroxide}
G02F 1/153	...	Constructional arrangements
G02F 1/1533	....	{ structural features not otherwise provided for }
G02F 1/155	....	Electrodes
G02F 1/157	....	Structural association of optical devices, e.g. reflectors or illuminating devices, with the cell
G02F 1/161	....	Gaskets; Spacers; Sealing of the cell; Filling or closing of the cell
G02F 1/163	...	Operation of electrochromic cells; Circuit arrangements
G02F 1/167	..	based on electrophoresis
G02F 1/17	..	based on variable absorption elements ( <a href="#">G02F 1/015</a> to <a href="#">G02F 1/167</a> take precedence; {tenebrescent compositions <a href="#">C09K 9/00</a> )}
G02F 1/172	...	{based on a suspension of orientable dipolar particles, e.g. suspended particles displays}
G02F 1/174	...	{based on absorption band-shift, e.g. Stark - or Franz-Keldysh effect ( <a href="#">G02F 1/015</a> , <a href="#">G02F 1/178</a> take precedence)}

- G02F 1/176 ... {using acid- based indicators}
- G02F 1/178 ... {based on pressure effects ([G02F 1/195](#) takes precedence)}
- G02F 1/19 ... based on variable reflection or refraction elements ({[G02F 1/01M3](#)}, [G02F 1/015](#) to [G02F 1/167](#) take precedence)
- G02F 1/195 ... {by using frustrated reflection (digital reflection using controlled total internal reflection [G02F 1/315](#))}
- G02F 1/21 .. by interference
- G02F 1/216 ... {using liquid crystals, e.g. liquid crystal Fabry-Perot filters}
- G02F 1/218 ... {using semi-conducting materials}
- G02F 1/225 ... in an optical waveguide structure
- G02F 1/2252 .... {in optical fibres}
- G02F 1/2255 .... {controlled by a high-frequency electromagnetic component in an electric waveguide structure}
- G02F 1/2257 .... {the optical waveguides being made of semiconducting material}
- G02F 1/23 .. for the control of the colour ([G02F 1/03](#) to [G02F 1/21](#) take precedence)
- G02F 1/25 ... as to hue or predominant wavelength
  
- G02F 1/29 . for the control of the position or the direction of light beams, i.e deflection ({ optical coupling means [G02B 6/26](#); optical-mechanical scanning in general [G02B 26/10](#); static stores with electric or magnetic read-in and optical read-out [G11C](#); lasers provided with means to change the location from which, or the direction in which, laser radiation is emitted [H01S 3/101](#))
- G02F 1/292 .. {by controlled diffraction or phased-array beam steering (controlled diffraction for optical switching [G02F 1/31](#))}
- G02F 1/293 .. {by another light beam, i.e. opto-optical deflection}
- G02F 1/295 .. { Analog deflection from or} in an optical waveguide structure]
- G02F 1/2955 ... {by controlled diffraction or phased-array beam steering (controlled diffraction for optical waveguide switching [G02F 1/313](#))}
- G02F 1/31 .. Digital deflection, {i.e. optical switching}{[G02F 1/33](#) takes precedence)
- G02F 1/313 ... in an optical waveguide structure
- G02F 1/3131 .... {in optical fibres}
- G02F 1/3132 .... {of directional coupler type (all-optical modulation, gating or switching using a non-linear directional coupler [G02F 1/3521](#))}
- G02F 1/3133 ..... {the optical waveguides being made of semiconducting materials}
- G02F 1/3134 ..... {controlled by a high-frequency electromagnetic wave component in an electric waveguide structure}
- G02F 1/3136 .... {of interferometric switch type}
- G02F 1/3137 .... {with intersecting or branching waveguides, e.g. X-switches and Y-junctions}
- G02F 1/3138 ..... {the optical waveguides being made of semiconducting materials}
- G02F 1/315 ... based on the use of controlled internal reflection
- G02F 1/33 .. Acousto-optical deflection devices {(circuit or control arrangements therefor [G02F 1/113](#))}
- G02F 1/332 ... {comprising a plurality of transducers on the same crystal surface, e.g. multi-channel Bragg cell}
- G02F 1/335 ... having an optical waveguide structure

- G02F 1/35 . Non-linear optics (optical bistable devices [G02F 3/02](#); lasers using stimulated Brillouin or Raman effect [H01S 3/30](#))
- G02F 1/3501 .. { Constructional arrangements of non-linear optical devices, e.g. shape of non-linear crystals (constructional arrangements of electro-optic devices [G02F 1/0305](#))}
- G02F 1/3511 .. {Self-focusing or self-trapping of light; Light-induced birefringence; Induced optical Kerr-effect (photorefractive effects of electro-optic crystals [G02F 1/0338](#), [G02F 1/0541](#), of ceramics [G02F 1/0558](#); opto-optical modulation [G02F 1/0126](#); opto-optical deflection [G02F 1/293](#))}
- G02F 1/3513 ... {Soliton propagation}
- G02F 1/3515 .. {All-optical modulation, gating, switching, e.g. control of a light beam by another light beam ([G02F 1/353](#), [G02F 1/37](#), [G02F 1/39](#) take precedence)}
- G02F 1/3517 ... {using an interferometer}
- G02F 1/3519 ..... {of Sagnac type, i.e. nonlinear optical loop mirror (NOLM)}
- G02F 1/3521 ... {using a directional coupler}
- G02F 1/3523 .. {Non-linear absorption changing by light e.g. bleaching (laser Q-switching using bleachable media [H01S 3/113](#))}
- G02F 1/3525 .. { Optical damage}
- G02F 1/3526 .. {using two-photon emission or absorption processes (Raman effect [H01S 3/30](#))}
- G02F 1/353 .. {Frequency conversion, i.e. wherein a light beam with frequency components different from those of the incident light beams is generated (second harmonic generation [G02F 1/37](#); optical parametric generation or amplification [G02F 1/39](#); transferring the modulation of modulated light [G02F 2/004](#); optical pumping of a laser by another laser [H01S 3/094](#); nonlinear optical devices inside a laser cavity [H01S 3/108](#))}
- G02F 1/3532 ... {Arrangements of plural nonlinear devices for generating multi-colour light beams, e.g. arrangements of SHG, SFG, OPO devices for generating RGB light beams}
- G02F 1/3534 ... { Three-wave interaction, e.g. sum-difference frequency generation ([G02F 1/3532](#) takes precedence)}
- G02F 1/3536 ... {Four-wave interaction}
- G02F 1/3538 ..... {for optical phase conjugation ([H01S 3/10076](#) takes precedence)}
- G02F 1/3544 ... {Particular phase matching techniques}
- G02F 1/355 .. characterised by the materials used
- G02F 1/3551 ... {Crystals}
- G02F 1/3553 ..... {having the formula  $MTiOYO_4$ , where M=K, Rb, TI, NH<sub>4</sub> or Cs and Y=P or As, e.g. KTP}
- G02F 1/3555 ... {Glasses}
- G02F 1/3556 ... {Semiconductor materials, e.g. quantum wells}
- G02F 1/3558 ... {Poled materials, e.g. with periodic poling; Fabrication of domain inverted structures, e.g. for quasi-phase-matching (QPM)}
- G02F 1/361 ... Organic materials
- G02F 1/3611 ..... {containing Nitrogen}
- G02F 1/3612 ..... {Heterocycles having N as heteroatom}
- G02F 1/3613 ..... {containing Sulfur}
- G02F 1/3614 ..... {Heterocycles having S as heteroatom}
- G02F 1/3615 ..... {containing polymers}

- G02F 1/3616 . . . . . {having the non-linear optical group in the main chain}
- G02F 1/3617 . . . . . {having the non-linear optical group in a side chain}
- G02F 1/3618 . . . . . {Langmuir Blodgett Films}
- G02F 1/3619 . . . . . {Organometallic compounds}
- G02F 1/365 . . . . . in an optical waveguide structure ([G02F 1/377](#), {[G02F 1/395](#) take precedence})
- G02F 1/37 . . . . . for second-harmonic generation {([G02F 1/3532](#) takes precedence)}
- G02F 1/377 . . . . . in an optical waveguide structure
- G02F 1/3775 . . . . . {with a periodic structure, e.g. domain inversion, for quasi-phase-matching (QPM) ([G02F 1/383](#) takes precedence)}
- G02F 1/383 . . . . . of the optical fibre type
- G02F 1/39 . . . . . for parametric generation or amplification of light, infra-red or ultra-violet waves ({[G02F 1/3532](#) takes precedence;} [electrical parametric amplifiers H03F 7/00](#))
- G02F 1/395 . . . . . {in optical waveguides}
- G02F 1/397 . . . . . {Amplification of light by wave mixing involving an interference pattern, e.g. using photorefractive material}

**G02F 2/00** **Demodulating light; Transferring the modulation of modulated light; Frequency-changing of light** ([G02F 1/35](#) takes precedence; photoelectric detecting or measuring devices [G01J](#), [H01J 40/00](#), [H01L 31/00](#); demodulating laser arrangements {e.g. switching, gating}[H01S 3/10](#); demodulation or transference of modulation of modulated electro-magnetic waves in general [H03D 9/00](#))

- G02F 2/002 . . . . . {using optical mixing ([homodyne, heterodyne systems H04B 10/148](#))}
- G02F 2/004 . . . . . {Transferring the modulation of modulated light, i.e. transferring the information from one optical carrier of a first wavelength to a second optical carrier of a second wavelength, e.g. all-optical wavelength converter}
- G02F 2/02 . . . . . Frequency-changing of light, e.g. by quantum counters ([luminescent materials C09K 11/00](#))

**G02F 3/00** **Optical logic elements** ({[optical computing G06E](#)}; electric pulse generators using opto-electronic devices as active elements [H03K 3/42](#); logic circuits using opto-electronic devices [H03K 19/14](#)); **Optical bistable devices**

- G02F 3/02 . . . . . Optical bistable devices
- G02F 3/022 . . . . . {based on electro-, magneto- or acousto-optical elements ([G02F 3/028](#) takes precedence)}
- G02F 3/024 . . . . . {based on non-linear elements, e.g. non-linear Fabry-Perot cavity ([G02F 3/028](#) takes precedence)}
- G02F 3/026 . . . . . {based on laser effects}
- G02F 3/028 . . . . . { based on self electro-optic effect devices (SEED)}

**G02F 7/00** **Optical analogue/digital converters**

**NOTE**

This group covers only converters based in substantial manner on elements which

are provided in group [G02F 1/00](#).

**G02F 2001/00**      **Devices or arrangements for the control of the intensity, colour, phase, polarisation or direction of light arriving from an independent light source, e.g. switching, gating, or modulating; Non-linear optics** (thermometers using change of colour or translucency [G01K 11/12](#); using changes in fluorescence [G01K 11/32](#); light guide devices [G02B 6/00](#); optical devices or arrangements using movable or deformable elements for controlling light independent of the light source [G02B 26/00](#); control of light in general [G05D 25/00](#); visible signalling systems [G08B 5/00](#); indicating arrangements for variable information by selection or combination of individual elements [G09F 9/00](#); control arrangements or circuits for visual indicators other than cathode-ray tubes [G09G 3/00](#); control of light sources [H01S 3/10](#), [H05B 33/08](#), [H05B 35/00](#) to [H05B 43/00](#); {photochromic filters [G02B 5/23](#); optical logic elements [G02F 3/00](#)})

#### **NOTE**

This group covers only :

- devices or arrangements, e.g. cells, the optical operation of which is modified by changing the optical properties of the medium of the devices or arrangements by the influence or control of physical parameters, e.g. electric fields, electric current, magnetic fields, sound or mechanical vibrations, stress or thermal effects;
- devices or arrangements in which the electric or magnetic field component of the light beams influences the optical properties of the medium, i.e. non-linear optics;
- control of light by electromagnetic waves, e.g. radio waves, or by electrons or other elementary particles.

- G02F 2001/01**      . for the control of the intensity, phase, polarisation or colour ([G02F 1/29](#), [G02F 1/35](#) take precedence; polarising elements per se [G02B 5/30](#); static storage per se [G11C](#); image tube screens acting as light valves by shutter operation [H01J 29/12](#); such screens acting by discoloration [H01J 29/14](#); { projection arrangements for television image reproduction, e.g. using eidophor [H04N 5/74](#); recording by light [G11B 7/00](#) to [G11B 11/00](#)})
- G02F 2001/011**      .. { in optical waveguides ([G02F 1/0134](#), [G02F 1/01708](#), [G02F 1/025](#), [G02F 1/035](#), [G02F 1/0508](#), [G02F 1/0553](#), [G02F 1/065](#), [G02F 1/073](#), [G02F 1/095](#), [G02F 1/125](#), [G02F 1/1326](#), [G02F 1/225](#) take precedence; optical waveguides in general [G02B 6/00](#))}  
**G02F 2001/0113**      ... made of glass, e.g. silica-based optical waveguides  
**G02F 2001/0136**      .. {for the control of polarisation, e.g. state of polarisation (SOP) control, polarisation scrambling, TE-TM mode conversion or separation ([G02F 1/0353](#) takes precedence)}  
**G02F 2001/0139**      ... Polarisation scrambling; Depolarisers  
**G02F 2001/0142**      ... TE-TM mode conversion  
**G02F 2001/0144**      ... TE-TM mode separation  
**G02F 2001/015**      .. based on semiconductor elements with at least one potential jump barrier, e.g. PN,

		PIN junction ( <a href="#">G02F 1/03</a> takes precedence)
<a href="#">G02F 2001/0151</a>	...	modulating the refractive index
<a href="#">G02F 2001/0152</a>	....	by free carrier effects (Plasma)
<a href="#">G02F 2001/0153</a>	....	by electro-refraction ( <a href="#">Kramers-Kronig relation</a> )
<a href="#">G02F 2001/0154</a>	....	by electro-optic effects ( <a href="#">LEO=Pockels</a> , <a href="#">QEO=Kerr</a> )
<a href="#">G02F 2001/0155</a>	...	modulating the optical absorption
<a href="#">G02F 2001/0156</a>	....	by free carrier absorption
<a href="#">G02F 2001/0157</a>	....	by electro-absorption effects ( <a href="#">FK</a> , <a href="#">Stark</a> , <a href="#">QCSE</a> )
<a href="#">G02F 2001/0158</a>	.....	with blue-shift of the absorption band
<a href="#">G02F 2001/0159</a>	.....	with red-shift of the absorption band
<a href="#">G02F 2001/017</a>	...	Structures with periodic or quasi periodic potential variation, e.g. superlattices, quantum wells
<a href="#">G02F 2001/01725</a>	....	{with a non-rectangular quantum well structure, e.g. coupled, graded, stepped quantum wells}
<a href="#">G02F 2001/01733</a>	.....	Coupled or double quantum wells
<a href="#">G02F 2001/01741</a>	.....	Asymmetrically coupled or double quantum wells
<a href="#">G02F 2001/0175</a>	.....	with a spatially varied well profile, e.g. graded, stepped quantum wells
<a href="#">G02F 2001/01758</a>	.....	with an asymmetric well profile, e.g. asymmetrically stepped quantum wells
<a href="#">G02F 2001/01766</a>	....	Strained superlattice or quantum well devices
<a href="#">G02F 2001/01775</a>	....	involving an intersubband transition in one well, e.g. e1->e2
<a href="#">G02F 2001/01783</a>	....	Quantum wire
<a href="#">G02F 2001/01791</a>	....	Quantum box or dot
<a href="#">G02F 2001/09</a>	..	based on magneto-optical elements, e.g. exhibiting Faraday effect
<a href="#">G02F 2001/094</a>	...	Based on magnetophoretic effect
<a href="#">G02F 2001/13</a>	..	based on liquid crystals, e.g. single liquid crystal display cells ( <a href="#">liquid crystal materials C09K 19/00</a> )
<a href="#">G02F 2001/1316</a>	...	Cleaning methods or materials for cleaning part of liquid crystal cell components during the manufacturing process
<a href="#">G02F 2001/133</a>	...	Constructional arrangements; Operation of liquid crystal cells; Circuit arrangements ( <a href="#">arrangements or circuits for control of liquid crystal elements in a {segment display or a} matrix, not structurally associated with these elements, {respectively G09G 3/18 and}G09G 3/36</a> )
<a href="#">G02F 2001/13306</a>	....	{ <a href="#">Circuit arrangements or driving methods for the control of single liquid crystal cells (G02F 1/132, G02F 1/133382 take precedence)</a> }
<a href="#">G02F 2001/13312</a>	.....	Circuits comprising a photodetector not for feedback
<a href="#">G02F 2001/13324</a>	.....	Circuits comprising a solar cell
<a href="#">G02F 2001/1333</a>	....	Constructional arrangements; { <a href="#">Manufacturing methods</a> }( <a href="#">G02F 1/135</a> , <a href="#">G02F 1/136 take precedence</a> )
<a href="#">G02F 2001/133302</a>	.....	rigid substrate, e.g. inorganic
<a href="#">G02F 2001/133308</a>	.....	{ <a href="#">LCD panel immediate support structure, e.g. front and back frame or bezel</a> }
<a href="#">G02F 2001/133311</a>	.....	Environmental protection, e.g. dust, humidity
<a href="#">G02F 2001/133314</a>	.....	Back frame
<a href="#">G02F 2001/133317</a>	.....	Intermediate frame, e.g. between backlight housing and front frame

G02F 2001/13332	.....	Front frame
G02F 2001/133322	.....	Mechanical guiding and alignment of LCD panel support components
G02F 2001/133325	.....	Method of assembling ( <a href="#">G02F 2201/465</a> takes precedence)
G02F 2001/133328	.....	Segmented frame
G02F 2001/133331	.....	Cover glass
G02F 2001/133334	.....	Electromagnetic shield
G02F 2001/133337	.....	Ion-diffusion preventing or absorbing layer
G02F 2001/133342	.....	for double side displays
G02F 2001/133354	.....	Arrangements for aligning or assembling the substrates
G02F 2001/133357	.....	Planarisation layer
G02F 2001/133368	.....	cell having two substrates with different characteristic, e.g. thickness or material
G02F 2001/133374	.....	for displaying permanent signs or marks
G02F 2001/133388	.....	Constructional difference between the display region and the peripheral region
G02F 2001/133391	.....	Constructional arrangement for sub-divided displays
G02F 2001/133394	.....	Piezoelectric element associated with the cell
G02F 2001/133397	.....	for suppressing after-image or image-sticking
G02F 2001/1334	.....	based on polymer dispersed liquid crystals, e.g. microencapsulated liquid crystals <a href="#">{(compositions C09K 19/544)}</a>
G02F 2001/13345	.....	Network or three-dimensional gel
G02F 2001/13347	.....	Reverse mode, i.e. clear in the off-state and scattering in the on-state
G02F 2001/1335	.....	Structural association of optical devices, e.g. polarisers, reflectors or illuminating devices, with the cell
G02F 2001/133504	.....	<a href="#">{Diffusing, scattering, diffracting elements (associated to illuminating devices G02F 1/13357)}</a>
G02F 2001/133507	.....	Luminance enhancement films
G02F 2001/133509	.....	<a href="#">{Filters, e.g. light shielding masks (optical filters G02B 5/20)}</a>
G02F 2001/133514	.....	<a href="#">{Colour filters (luminescent elements G02F 1/13357L)}</a>
G02F 2001/133519	.....	overcoating
G02F 2001/133521	.....	Interference filters
G02F 2001/133528	.....	<a href="#">{Polarisers (polarisers per se G02B 5/30)}</a>
G02F 2001/133531	.....	Special arrangement of polariser or analyser axes
G02F 2001/133538	.....	with a spatial distribution of the polarisation direction
G02F 2001/133541	.....	Circular polarisers
G02F 2001/133543	.....	Cholesteric polarisers
G02F 2001/133545	.....	Dielectric stack polarisers
G02F 2001/133548	.....	Wire-grid polarisers
G02F 2001/13355	.....	Polarising beam splitters [PBS]
G02F 2001/133553	.....	<a href="#">{Reflecting elements (associated to illuminating devices G02F 1/13357)}</a>
G02F 2001/133555	.....	<a href="#">{Transflectors}</a>
G02F 2001/133557	.....	Half-mirror
G02F 2001/13356	.....	Particular location of the optical element

G02F 2001/133562	.....	on the viewer side
G02F 2001/133565	.....	inside the LC element, i.e. between the cell substrates
G02F 2001/133567	.....	on the back side
G02F 2001/1336	.....	{ Illuminating devices (in general F21V; associated with display devices for electronic watches <a href="#">G04G 9/0041</a> )}

### WARNING

[G02F 1/1336-G02F 1/133621](#) dos not correspond to former or current IPC groups. Concordance CPC : IPC for these groups is as follows:- [G02F 1/1336-G02F 1/133621](#) : [G02F 1/13357](#)

G02F 2001/133601	.....	for spatial active dimming
G02F 2001/133602	.....	{ Direct backlight}
G02F 2001/133606	.....	{ including a specially adapted diffusing, scattering or light controlling members}
G02F 2001/133607	.....	the light controlling member including light directing or refracting elements, e.g. prisms or lenses
G02F 2001/133612	.....	Electrical details
G02F 2001/133613	.....	including a particular sequence of light sources
G02F 2001/133614	.....	the light is generated by photoluminescence, e.g. a phosphor is illuminated by UV or blue light
G02F 2001/133616	.....	Front illuminating devices
G02F 2001/133618	.....	for ambient light
G02F 2001/133621	.....	{ providing coloured light ( <a href="#">G02F 1/133617</a> , <a href="#">G02F 1/133533</a> take precedence)}
G02F 2001/133622	.....	colour sequential illumination
G02F 2001/133623	.....	Inclined coloured light beams
G02F 2001/133624	.....	having a particular spectral emission
G02F 2001/133625	.....	Electron stream lamps
G02F 2001/133626	.....	providing two modes of illumination, e.g. day-night
G02F 2001/133627	.....	Projection-direct viewing
G02F 2001/133628	.....	with cooling means
G02F 2001/13363	.....	Birefringent elements, e.g. for optical compensation
G02F 2001/133631	.....	with a spatial distribution of the retardation value
G02F 2001/133633	.....	using mesogenic materials
G02F 2001/133635	.....	Multifunctional compensators
G02F 2001/133637	.....	characterized by the wavelength dispersion
G02F 2001/133638	.....	Waveplates, i.e. plates with a retardation value of $\lambda/n$
G02F 2001/1337	.....	Surface-induced orientation of the liquid crystal molecules, e.g. by alignment layers
G02F 2001/133711	.....	{by organic films, e.g. polymeric films}
G02F 2001/133715	.....	by first depositing a monomer
G02F 2001/133726	.....	made of a mesogenic material
G02F 2001/13373	.....	Disclination line; Reverse tilt
G02F 2001/133738	.....	for homogeneous alignment

G02F 2001/133742	.....	for homeotropic alignment
G02F 2001/133746	.....	for high pretilt angle, i.e. > 15 degrees
G02F 2001/133749	.....	for low pretilt angle, i.e. < 15 degrees
G02F 2001/133753	.....	{with different alignment orientations or pretilt angles on a same surface, e.g. for grey scale or improved viewing angle}
G02F 2001/133757	.....	with different alignment orientations
G02F 2001/133761	.....	with different pretilt angles
G02F 2001/133765	.....	without a surface treatment
G02F 2001/133769	.....	comprising an active, e.g. switchable alignment layer
G02F 2001/133773	.....	The alignment material or treatment is different for the two opposite substrates
G02F 2001/133776	.....	having structures i.e. unevenness locally influencing the alignment
G02F 2001/13378	.....	{by treatment of the surface, e.g. embossing, rubbing, light irradiation (G02F 1/133711, G02F 1/133734, G02F 1/133753 take precedence)}
G02F 2001/133792	.....	by etching
G02F 2001/133796	.....	having conducting property
G02F 2001/1339	.....	Gaskets; Spacers, { also spacers with conducting properties (electric line connectors H01R)}; Sealing of the cell
G02F 2001/13396	.....	Spacers having different sizes
G02F 2001/13398	.....	Materials and properties of the spacer
G02F 2001/1341	.....	Filling or closing of the cell {(G02F 1/133365, G02F 1/1334 take precedence)}
G02F 2001/13415	.....	Drop filling process
G02F 2001/1343	.....	Electrodes {(reflective electrodes G02F 1/133553)}
G02F 2001/134309	.....	{characterised by their geometrical arrangement (G09F 9/302 takes precedence)}
G02F 2001/134318	.....	having a patterned common electrode
G02F 2001/134345	.....	Subdivided pixels, e.g. grey scale, redundancy
G02F 2001/134354	.....	the sub-pixels being capacitively coupled
G02F 2001/134372	.....	for fringe field switching [FFS] where the common electrode is not patterned, e.g. planar
G02F 2001/134381	.....	Hybrid switching mode, i.e. for applying an electric field both parallel and orthogonal to the substrates
G02F 2001/1345	.....	Conductors connecting electrodes to cell terminals
G02F 2001/13456	.....	cell terminals on one side of the display only
G02F 2001/1347	.....	Arrangement of liquid crystal layers or cells in which the final condition of one light beam is achieved by the addition of the effects of two or more layers or cells {(colour projection displays with liquid crystal valves H04N 9/3197)}
G02F 2001/13478	.....	based on selective reflection
G02F 2001/135	.....	Liquid crystal cells structurally associated with a photoconducting or a ferro-electric layer, the properties of which can be optically or electrically varied {(G02F 1/133348 takes precedence)}
G02F 2001/1351	.....	light-absorbing or blocking layer
G02F 2001/1352	.....	light-reflecting layer
G02F 2001/1354	.....	{having a particular photoconducting structure or material}

G02F 2001/1355	.....	material or manufacturing process thereof
G02F 2001/1357	.....	electrode structure
G02F 2001/136	....	Liquid crystal cells structurally associated with a semi-conducting layer or substrate, e.g. cells forming part of an integrated circuit ( <a href="#">G02F 1/135</a> takes precedence)
G02F 2001/13606	.....	having means for reducing parasitic capacitance
G02F 2001/13613	.....	the semiconductor element is formed on a first substrate and thereafter transferred to the final cell substrate
G02F 2001/1362	.....	Active matrix addressed cells {( <a href="#">G02F 1/134336</a> , <a href="#">G02F 1/134363</a> take precedence)}
G02F 2001/136218	.....	Shield electrode
G02F 2001/136222	.....	Color filter incorporated in the active matrix substrate
G02F 2001/136231	.....	for reducing the number of lithographic steps
G02F 2001/136236	.....	using a gray or half tone lithographic process
G02F 2001/13624	.....	{having more than one switching element per pixel}
G02F 2001/136245	.....	having complementary transistors
G02F 2001/13625	.....	Patterning using a multi-mask exposure
G02F 2001/136254	.....	Checking; Testing
G02F 2001/136259	.....	{Repairing; Defects}
G02F 2001/136263	.....	Line defect
G02F 2001/136268	.....	Switch defect
G02F 2001/136272	.....	Auxiliary line
G02F 2001/136277	.....	{formed on a semiconductor substrate, e.g. silicon}
G02F 2001/136281	.....	having a transmissive semiconductor substrate
G02F 2001/136286	.....	{Wiring, e.g. gate line, drain line}
G02F 2001/13629	.....	Multi-layer wirings
G02F 2001/136295	.....	Materials; Compositions; Methods of manufacturing
G02F 2001/1368	.....	in which the switching element is a three-electrode device {( <a href="#">G02F 1/136277</a> takes precedence)}
G02F 2001/13685	.....	Top gate
G02F 2001/137	...	characterised by a particular electro- or magneto-optical effect, e.g. field-induced phase transition, orientation effect, guest-host interaction, dynamic scattering
G02F 2001/13706	....	the LC having positive dielectric anisotropy
G02F 2001/13712	....	the LC having negative dielectric anisotropy
G02F 2001/13756	....	the liquid crystal selectively assuming a light-scattering state ( <a href="#">G02F 1/1334</a> , <a href="#">G02F 1/13718</a> take precedence)
G02F 2001/13775	....	Polymer stabilized liquid crystal layers
G02F 2001/13787	....	Hybrid alignment cells ( <a href="#">G02F 1/1393</a> takes precedence)
G02F 2001/13793	....	Blue phases
G02F 2001/139	....	based on orientation effects in which the liquid crystal remains transparent
G02F 2001/1396	.....	{the liquid crystal being selectively controlled between a twisted state and a non-twisted state, e.g. TN-LC cell ( <a href="#">G02F 1/141</a> takes precedence)}
G02F 2001/1398	.....	the twist being below 90°C

- G02F 2001/141 ..... using ferroelectric liquid crystals
- G02F 2001/1412 ..... Antiferroelectric liquid crystals
- G02F 2001/1414 ..... Deformed helix ferroelectric (DHL)
- G02F 2001/15 .. based on electrochromic elements {(electrochromic materials [C09K 9/00](#))}
- G02F 2001/1502 ... complementary cell
- G02F 2001/1504 ..... having an inorganic electrochromic layer and a second solid organic electrochromic layer
- G02F 2001/151 ... the electrochromic material comprises ferrocene compounds
- G02F 2001/1512 ... the electrochromic layer comprises a mixture of anodic and cathodic compounds
- G02F 2001/1515 ... the electrochromic material is made of polymer
- G02F 2001/1517 ... based on cyano complex compound, e.g. Prussian blue
- G02F 2001/1519 ... the electrolyte is made of polymer
- G02F 2001/153 ... Constructional arrangements
- G02F 2001/1533 ..... { structural features not otherwise provided for }
- G02F 2001/1536 ..... additional, e.g. protective, layer inside the cell
- G02F 2001/155 ..... Electrodes
- G02F 2001/1552 ..... Inner electrode, e.g. the electrochromic layer being sandwiched between the inner electrode and the support substrate---- this group, now to be changed, should already been created by implementation of a previous DOC14 ([prior to the one referred to above](#))----
- G02F 2001/1555 ..... Counter electrode
- G02F 2001/1557 ..... Side by side arrangements of working and counter electrodes
- G02F 2001/163 ... Operation of electrochromic cells; Circuit arrangements
- G02F 2001/1635 ..... the pixel comprises active switching elements, e.g. TFT
- G02F 2001/167 .. based on electrophoresis
- G02F 2001/1672 ... of the microcup type [N0707
- G02F 2001/1674 ... comprising a dry toner particle
- G02F 2001/1676 ... having a particular electrode [N0707
- G02F 2001/1678 ... having a particular composition or particle type [N0707
- G02F 2001/21 .. by interference
- G02F 2001/211 ... Sagnac type
- G02F 2001/212 ... Mach-Zender type
- G02F 2001/213 ... Fabry-Perot type
- G02F 2001/215 ... Michelson type
- G02F 2001/217 ... Multi mode interference type
- G02F 2001/29 . for the control of the position or the direction of light beams, i.e deflection ({ optical coupling means [G02B 6/26](#); optical-mechanical scanning in general [G02B 26/10](#)}; static stores with electric or magnetic read-in and optical read-out [G11C](#); lasers provided with means to change the location from which, or the direction in which, laser radiation is emitted [H01S 3/101](#))
- G02F 2001/291 .. Two-dimensional analog deflection
- G02F 2001/294 .. Variable focal length device
- G02F 2001/31 .. Digital deflection, {i.e. optical switching}{[G02F 1/33](#) takes precedence)

- G02F 2001/311 . . . Cascade arrangement of plural switches
- G02F 2001/313 . . . in an optical waveguide structure
- G02F 2001/3132 . . . . {of directional coupler type (all-optical modulation, gating or switching using a non-linear directional coupler [G02F 1/3521](#))}
- G02F 2001/3135 . . . . . vertical structure
  
- G02F 2001/35 . . Non-linear optics ([optical bistable devices G02F 3/02](#); [lasers using stimulated Brillouin or Raman effect H01S 3/30](#))
- G02F 2001/3501 . . { [Constructional arrangements of non-linear optical devices, e.g. shape of non-linear crystals \(constructional arrangements of electro-optic devices G02F 1/0305\)](#)}
- G02F 2001/3503 . . . Structural association of optical elements, e.g. lenses, with the nonlinear optical device
- G02F 2001/3505 . . . Coatings; Housings; Supports
- G02F 2001/3507 . . . Arrangements comprising two or more nonlinear optical devices
- G02F 2001/3509 . . . Shape, e.g. shape of end face
- G02F 2001/3528 . . for producing a supercontinuum
- G02F 2001/353 . . {[Frequency conversion, i.e. wherein a light beam with frequency components different from those of the incident light beams is generated \(second harmonic generation \[G02F 1/37\]\(#\); optical parametric generation or amplification \[G02F 1/39\]\(#\); transferring the modulation of modulated light \[G02F 2/004\]\(#\); optical pumping of a laser by another laser \[H01S 3/094\]\(#\); nonlinear optical devices inside a laser cavity \[H01S 3/108\]\(#\)\)](#)}
- G02F 2001/354 . . . Third or higher harmonic generation
- G02F 2001/3542 . . . Multi-pass arrangements, i.e. arrangements to pass light a plurality of times through the same element, e.g. by using an enhancement cavity
- G02F 2001/3544 . . . {[Particular phase matching techniques](#)}
- G02F 2001/3546 . . . . Active phase matching, e.g. by electro- or thermo-optic tuning
- G02F 2001/3548 . . . . Quasi-phase-matching (QPM), e.g. using a periodic domain inverted structure
- G02F 2001/37 . . for second-harmonic generation {([G02F 1/3532 takes precedence](#))}
- G02F 2001/372 . . . means for homogenizing the output beam
- G02F 2001/374 . . . Cerenkov radiation
- G02F 2001/39 . . for parametric generation or amplification of light, infra-red or ultra-violet waves ({[G02F 1/3532 takes precedence](#)}; [electrical parametric amplifiers H03F 7/00](#))
- G02F 2001/392 . . . Parametric amplification
  
- G02F 2002/00** **Demodulating light; Transferring the modulation of modulated light; Frequency-changing of light** ([G02F 1/35 takes precedence](#); [photoelectric detecting or measuring devices G01J, H01J 40/00, H01L 31/00](#); [demodulating laser arrangements { e.g. switching, gating}H01S 3/10](#); [demodulation or transference of modulation of modulated electro-magnetic waves in general H03D 9/00](#))
  
- G02F 2002/004 . . {[Transferring the modulation of modulated light, i.e. transferring the information from one optical carrier of a first wavelength to a second optical carrier of a second wavelength, e.g. all-optical wavelength converter](#)}
- G02F 2002/006 . . All-optical wavelength conversion
- G02F 2002/008 . . Opto-electronic wavelength conversion, i.e. involving photo-detection of the first

optical carrier

<b>G02F 2201/00</b>	<b>Constructional arrangements not provided for in groups <a href="#">G02F 1/00</a> to <a href="#">G02F 7/00</a></b>
G02F 2201/02	. fibre
G02F 2201/04	. monomode
G02F 2201/05	. multimode
G02F 2201/06	. integrated waveguide
G02F 2201/063	.. ridge; rib; strip loaded
G02F 2201/066	.. channel; buried
G02F 2201/07	. buffer layer
G02F 2201/08	. light absorbing layer
G02F 2201/083	.. infra-red absorbing
G02F 2201/086	.. UV absorbing
G02F 2201/12	. electrode
G02F 2201/121	.. common or background
G02F 2201/122	.. having a particular pattern
G02F 2201/123	.. pixel
G02F 2201/124	.. interdigital
G02F 2201/125	.. delta-beta
G02F 2201/126	.. push-pull
G02F 2201/127	.. travelling wave
G02F 2201/128	.. field shaping
G02F 2201/14	. asymmetric
G02F 2201/15	. periodic
G02F 2201/16	. series; tandem
G02F 2201/17	. Multi-pass arrangements, i.e. arrangements to pass light a plurality of times through the same element, e.g. by using an enhancement cavity
G02F 2201/18	. parallel
G02F 2201/20	. delay line
G02F 2201/205	.. of fibre type
G02F 2201/30	. grating
G02F 2201/302	.. grating coupler

- G02F 2201/305 . . diffraction grating
- G02F 2201/307 . . Reflective grating, i.e. Bragg grating
  
- G02F 2201/34 . reflector
- G02F 2201/343 . . cholesteric liquid crystal reflector
- G02F 2201/346 . . distributed (Bragg) reflector
  
- G02F 2201/36 . Airflow channels, e.g. constructional arrangements facilitating the flow of air
  
- G02F 2201/38 . Anti-reflection arrangements
  
- G02F 2201/40 . Arrangements for improving the aperture ratio
  
- G02F 2201/42 . Arrangements for providing conduction through an insulating substrate
  
- G02F 2201/44 . Arrangements combining different electro-active layers, e.g. electrochromic, liquid crystal or electroluminescent layers
  
- G02F 2201/46 . Fixing elements
- G02F 2201/465 . . Snap -fit
  
- G02F 2201/48 . Flattening arrangements
  
- G02F 2201/50 . Protective arrangements
- G02F 2201/501 . . Blocking layers, e.g. against migration of ions
- G02F 2201/503 . . Arrangements improving the resistance to shock
- G02F 2201/505 . . Arrangements improving the resistance to acoustic resonance like noise
- G02F 2201/506 . . Repairing, e.g. with redundant arrangement against defective part
- G02F 2201/508 . . . Pseudo repairing, e.g. a defective part is brought into a condition in which it does not disturb the functioning of the device
  
- G02F 2201/52 . RGB geometrical arrangements
  
- G02F 2201/54 . Arrangements for reducing warping-twist
  
- G02F 2201/56 . Substrates having a particular shape, e.g. non-rectangular
  
- G02F 2201/58 . Arrangements comprising a monitoring photodetector

**G02F 2202/00      **Materials and properties****

- G02F 2202/01 . dipole
  
- G02F 2202/02 . organic material
- G02F 2202/021 . . low molecular weight
- G02F 2202/022 . . polymeric

G02F 2202/023	. . .	curable
G02F 2202/025	. . . .	thermocurable
G02F 2202/026	. .	charge transfer complex
G02F 2202/027	. .	Langmuir-Blodgett film
G02F 2202/028	. .	photobleached
G02F 2202/04	.	dye
G02F 2202/043	. .	pleochroic
G02F 2202/046	. .	fluorescent
G02F 2202/06	.	dopant
G02F 2202/07	.	poled
G02F 2202/08	.	glass transition temperature
G02F 2202/09	.	inorganic glass
G02F 2202/10	.	semiconductor
G02F 2202/101	. .	$G_xAs$ and alloy
G02F 2202/102	. .	$In_xP$ and alloy
G02F 2202/103	. .	a-Si
G02F 2202/104	. .	poly-Si
G02F 2202/105	. .	single crystal Si
G02F 2202/106	. .	$Cd_xSe$ or $Cd_xTe$ and alloys
G02F 2202/107	. .	$Zn_xS$ or $Zn_xSe$ and alloys
G02F 2202/108	. .	quantum wells
G02F 2202/12	.	photoconductor
G02F 2202/13	.	photorefractive
G02F 2202/14	.	photochromic
G02F 2202/16	.	conductive
G02F 2202/20	.	$LiNbO_3$ , $LiTaO_3$
G02F 2202/22	.	Antistatic materials or arrangements
G02F 2202/28	.	Adhesive materials or arrangements
G02F 2202/30	.	Metamaterials
G02F 2202/32	.	Photonic crystals
G02F 2202/34	.	Metal hydrides materials

- G02F 2202/36 . Micro or nano materials
- G02F 2202/38 . Sol-gel materials
- G02F 2202/40 . Materials having a particular birefringence, retardation
- G02F 2202/42 . Materials having a particular dielectric constant
- G02F 2202/99 . Test HW
- G02F 2203/00      Function characteristic**
- G02F 2203/01 . transmissive
- G02F 2203/02 . reflective
- G02F 2203/023 .. total internal reflection
- G02F 2203/026 .. attenuated or frustated internal reflection
- G02F 2203/03 . scattering
- G02F 2203/04 . wavelength independent
- G02F 2203/05 . wavelength dependent
- G02F 2203/055 .. wavelength filtering
- G02F 2203/06 . Polarisation independent
- G02F 2203/07 . Polarisation dependent
- G02F 2203/09 . transflective
- G02F 2203/10 . plasmon
- G02F 2203/11 . involving infrared radiation
- G02F 2203/12 . spatial light modulator
- G02F 2203/13 . involving THZ radiation
- G02F 2203/15 . involving resonance effects, e.g. resonantly enhanced interaction
- G02F 2203/16 . involving spin polarization effects
- G02F 2203/17 . involving soliton waves
- G02F 2203/18 . adaptive optics, e.g. wavefront correction
- G02F 2203/19 . linearised modulation; reduction of harmonic distortions

- G02F 2203/20 . Intrinsic phase difference, i.e. optical bias, of an optical modulator; Methods for the pre-set thereof
- G02F 2203/21 . Thermal instability, i.e. DC drift, of an optical modulator; Arrangements or methods for the reduction thereof
- G02F 2203/22 . diffractive
- G02F 2203/24 . beam steering
- G02F 2203/25 . Frequency chirping of an optical modulator; Arrangements or methods for the pre-set or tuning thereof
- G02F 2203/255 . . Negative chirp
- G02F 2203/26 . Pulse shaping; Apparatus or methods therefor
- G02F 2203/28 . focussing or defocussing
- G02F 2203/30 . Gray scale
- G02F 2203/34 . Colour display without the use of colour mosaic filters
- G02F 2203/48 . Variable attenuator
- G02F 2203/50 . Phase-only modulation
- G02F 2203/52 . Optical limiters
- G02F 2203/54 . Optical pulse train (comb) synthesizer
- G02F 2203/56 . Frequency comb synthesizer
- G02F 2203/58 . Multi-wavelength, e.g. operation of the device at a plurality of wavelengths
- G02F 2203/585 . . Add/drop devices
- G02F 2203/60 . Temperature independent
- G02F 2203/62 . Switchable arrangements whereby the element being usually not switchable
- G02F 2203/64 . Normally black display, i.e. the off state being black
- G02F 2203/66 . Normally white display, i.e. the off state being white
- G02F 2203/68 . Green display, e.g. recycling, reduction of harmful substances
- G02F 2203/69 . Arrangements or methods for testing or calibrating a device
- G02F 2203/70 . Semiconductor optical amplifier [SOA] used in a device covered by G02F

- G02F 2413/00** Indexing scheme related to **G02F 1/13363P**, i.e. to birefringent elements, e.g. for optical compensation, characterised by the number, position, orientation or value of the compensation plates
- G02F 2413/01 . Number of plates being 1
  - G02F 2413/02 . Number of plates being 2
  - G02F 2413/03 . Number of plates being 3
  - G02F 2413/04 . Number of plates greater than or equal to 4
  - G02F 2413/05 . Single plate on one side of the LC cell
  - G02F 2413/06 . Two plates on one side of the LC cell
  - G02F 2413/07 . All plates on one side of the LC cell
  - G02F 2413/08 . with a particular optical axis orientation
  - G02F 2413/09 . with a spatial distribution of the retardation value
  - G02F 2413/10 . with refractive index ellipsoid inclined, or tilted, relative to the LC-layer surface O plate
  - G02F 2413/105 . . with varying inclination in thickness direction, e.g. hybrid oriented discotic LC
  - G02F 2413/11 . The refractive index  $N_z$  perpendicular to the element surface being different from in-plane refractive indices  $N_x$  and  $N_y$ , e.g. C plate
  - G02F 2413/12 . Biaxial compensators
  - G02F 2413/13 . Positive birefringence
  - G02F 2413/14 . Negative birefringence
  - G02F 2413/15 . with twisted orientation, e.g. comprising helically oriented LC-molecules or a plurality of twisted birefringent sublayers