

ECLA EUROPEAN 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 [G01D5/26](#); devices in which mathematical operations are carried out with optical elements [G06E3/00](#), [N: [G06E3/00A](#)]; electrical signal transmission systems using optical means to convert the input signal [G08C19/36](#); information-recording by electric or magnetic means and reproducing by sensing optical properties [G11B11/00](#); static stores using optical elements [G11C13/04](#); transmission systems employing electromagnetic waves other than radio waves, e.g. light, infra-red radiation, [H04B10/00](#); optical multiplex systems [H04J14/00](#); pictorial communication, e.g. television [H04N](#))

[N: **WARNING**

[N1204]The following IPC group is not used in the internal ECLA classification scheme. Subject matter covered by these groups is classified in the following ECLA groups:

- [G02F1/13357](#) covered by [G02F1/1336](#) and subgroups

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G02F1/00

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 [G01K11/12](#); using changes in fluorescence [G01K11/32](#); light guide devices [G02B6/00](#); optical devices or arrangements using movable or deformable elements for controlling light independent of the light source [G02B26/00](#); control of light in general [G05D25/00](#); visible signalling systems [G08B5/00](#); indicating arrangements for variable information by selection or combination of individual elements [G09F9/00](#); control arrangements or circuits for visual indicators other than cathode-ray tubes [G09G3/00](#); control of light sources [H01S3/10](#), [H05B33/08](#), [H05B35/00](#) to [H05B43/00](#); [N: photochromic filters [G02B5/23](#); optical logic elements [G02F3/00](#)]) [C9411]

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.

G02F1/00B

. [N: Materials therefor]

- [N: **Note**
[G02F1/00B](#) and subgroups contain mostly non-patent literature
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- G02F1/00B3 . . [N: Electro-optical materials]
- G02F1/00B3B . . . [N: with ferro-electric properties (domain inversion in ferro-electric materials [G02F1/355R](#); ferro-electric materials in general [H01G7/02](#))] [C9611]
- G02F1/00B9 . . [N: Magneto-optical materials (magnetic materials in general [H01F](#))] [C9411]
- G02F1/00B13 . . [N: Liquid crystals as far as the physical properties are concerned (chemical composition and properties of liquid crystals [C09K19/00](#))]
- G02F1/00B133 . . [N: Structure, phase transitions, NMR, ESR, Moessbauer spectra]
- G02F1/00B134 . . [N: Optical properties e.g. absorption, reflection, non-linear effects, birefringence (non linear optics in general [G02F1/35](#))]
- G02F1/00B135 . . [N: Mechanical, acoustic, electro-elastic, magneto-elastic properties]
- G02F1/00B136 . . [N: Electric or magnetic properties]
- G02F1/00B137 . . [N: Thermal properties (thermometers using change of colour or translucency [G01K11/12](#); radiation pyrometry [G01J5/00](#))]
- G02F1/01 . . for the control of the intensity, phase, polarisation or colour ([G02F1/29](#), [G02F1/35](#) take precedence; polarising elements per se [G02B5/30](#); static storage per se G11C; image tube screens acting as light valves by shutter operation [H01J29/12](#); such screens acting by discoloration [H01J29/14](#); [N: projection arrangements for television image reproduction, e.g. using eidophor [H04N5/74](#); recording by light [G11B7/00](#) to [G11B11/00](#)])
- G02F1/01A . . [N: Constructional details ([G02F1/13B](#), [G02F1/133](#) take precedence)]
- G02F1/01A2 . . . [N: Illumination devices (for liquid crystal cells [G02F1/13357](#); for display devices for electronic time pieces [G04G9/00D1B2](#))]
- G02F1/01A5 . . . [N: Gaskets, spacers, sealing of the cell; Filling and closing of the cell (for liquid crystal cells [G02F1/1339](#), [G02F1/1341](#); for electrochromic or electrolytic cells [G02F1/161](#))]
- G02F1/01C . . [N: in optical waveguides (G02F1/01M2C, G02F1/017C, G02F1/025, G02F1/035, G02F1/05C, G02F1/055C, G02F1/065, G02F1/07C, G02F1/095, G02F1/125, G02F1/13W, G02F1/225 take precedence; optical waveguides in general G02B6/00)] [N1205]
- G02F1/01C5 . . . [N: in optical fibres] [N0101]
- G02F1/01C5C [N: by controlling the evanescent coupling of light from a fibre into an active, e.g. electro-optic, overlay] [N0101]
- G02F1/01D . . [N: Operation of the device; Circuit arrangements not otherwise provided for ([G02F1/03D](#), [G02F1/05D](#), [G02F1/07D](#), [G02F1/09D](#), [G02F1/11D](#), [G02F1/133D](#), [G02F1/163](#) take precedence)] [C0108]
- G02F1/01D2 . . . [N: Circuits for the control or stabilisation of the bias voltage, e.g. automatic bias control (ABC) feedback loops] [N0304]
- G02F1/01L . . [N: by another light beam, i.e. opto-optical modulation ([G02F1/017L](#), [G02F1/03G](#), [G02F1/05G](#), [G02F1/05N](#), [G02F1/055G](#), [G02F1/135](#), [G02F1/29L](#) take precedence)]
- G02F1/01M . . [N: based on electro-mechanical, magneto-mechanical, elasto-optic effects] [C9810]
- G02F1/01M2 . . . [N: based on elasto-optic, i.e. photoelastic effect, e.g. mechanically induced birefringence (acousto-optic devices [G02F1/11](#))] [C9810]
- G02F1/01M2C [N: in optical waveguides]

- G02F1/01P . . . [N: for the control of polarisation, e.g. state of polarisation (SOP) control, polarisation scrambling, TE-TM mode conversion or separation ([G02F1/035C](#) takes precedence)] [N0104]
- G02F1/01T . . . [N: based on thermo-optic effects (G02F1/13H takes precedence; tenebrescent compositions C09K9/00; radiation pyrometry G01J5/00; thermometers using change of colour or translucency G01K11/12)] [N1205]
- G02F1/015 . . . based on semiconductor elements with at least one potential jump barrier, e.g. PN, PIN junction ([G02F1/03](#) takes precedence)
- G02F1/017 . . . Structures with periodic or quasi periodic potential variation, e.g. superlattices, quantum wells [N0002]
- G02F1/017C [N: in an optical waveguide structure] [N0002]
- G02F1/017L [N: Optically controlled superlattice or quantum well devices] [N0002]
- G02F1/017R [N: with a non-rectangular quantum well structure, e.g. coupled, graded, stepped quantum wells] [N0002]
- G02F1/025 . . . in an optical waveguide structure ([G02F1/017](#), [N: [G02F1/225S](#)] take precedence)
- G02F1/03 . . . based on ceramics or electro-optical crystals, e.g. exhibiting Pockels effect or Kerr effect ([G02F1/061](#) takes precedence)
- G02F1/03B [N: Constructional arrangements ([G02F1/03D](#) to [G02F1/05](#) take precedence)] [C9702]
- G02F1/03B2 [N: Structural association of optical elements, e.g. lenses, polarizers, phase plates, with the crystal] [N9611]
- G02F1/03B4 [N: Electrodes] [N9611]
- G02F1/03B6 [N: Arrangements comprising two or more independently controlled crystals] [N9611]
- G02F1/03D [N: Operation of the cell; Circuit arrangements ([G02F1/05](#) takes precedence)] [C9702]
- G02F1/03E [N: addressed by a beam of charged particles e.g. directed to an adjacent layer exhibiting secondary emission or bombardment-induced conductivity effect ([G02F1/05](#) takes precedence; electrography, electrophotography [G03G](#); screens for cathode ray tubes acting as light valves [H01J29/12](#))] [C9702]
- G02F1/03G [N: structurally associated with a photoconductive layer or having photo-refractive properties ([G02F1/05](#) takes precedence)]
- G02F1/03H [N: controlled by a high-frequency electromagnetic wave component in an electric waveguide ([G02F1/035H](#), [G02F1/05](#), [G02F1/225H](#), [G02F1/313C4](#) take precedence)] [C9702]
- G02F1/035 in an optical waveguide structure
- G02F1/035C [N: involving an electro-optic TE-TM mode conversion] [N9705]
- G02F1/035H [N: controlled by a high-frequency electromagnetic wave component in an electric waveguide structure]
- G02F1/05 with ferro-electric properties ([G02F1/035](#), [G02F1/055](#) take precedence; [N: domain inversion in ferro-electric materials [G02F1/355R](#); ferro-electric digital stores [G11C11/22](#)])
- G02F1/05C [N: specially adapted for gating or modulating in optical waveguides]
- G02F1/05D [N: Operation of the cell; Circuit arrangements]
- G02F1/05E [N: 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 [H01J29/12](#))]
- G02F1/05G [N: structurally associated with a photo-conductive layer]

- G02F1/05N [N: using photo-refractive effects (holography [G03H](#); electro-optical digital static stores using an interference pattern [G11C13/04C4](#))]
- G02F1/055 . . . the active material being a ceramic ([G02F1/035](#) takes precedence)
- G02F1/055B [N: Constructional details]
- G02F1/055C [N: specially adapted for gating or modulating in optical waveguides]
- G02F1/055D [N: Operation of the cell; Circuit arrangements]
- G02F1/055F [N: specially adapted for a particular application]
- G02F1/055G [N: structurally associated with a photoconductive layer or exhibiting photo-refractive properties]
- G02F1/061 . . based on electro-optical organic material ([G02F1/07](#), [N: [G02F1/13](#)] take precedence) [N9910]
- G02F1/065 . . . in an optical waveguide structure [N9910]
- G02F1/07 . . based on electro-optical liquids exhibiting Kerr effect
- G02F1/07C . . . [N: specially adapted for gating or modulating in optical waveguides]
- G02F1/07D . . . [N: Operation of the cell; Circuit arrangements]
- G02F1/09 . . based on magneto-optical elements, e.g. exhibiting Faraday effect
- G02F1/09B . . . [N: based on magneto-absorption or magneto-reflection]
- G02F1/09D . . . [N: Operation of the cell; Circuit arrangements]
- G02F1/09F . . . [N: used as non-reciprocal devices, e.g. optical isolators, circulators ([G02F1/095F](#) takes precedence)]
- G02F1/095 . . . in an optical waveguide structure
- G02F1/095F [N: used as non-reciprocal devices, e.g. optical isolators, circulators]
- G02F1/11 . . based on acousto-optical elements, e.g. using variable diffraction by sound or like mechanical waves ([N: elasto-optic effect without wave propagation [G02F1/01M2](#)]; acousto-optical deflection [G02F1/33](#)) [C0108]
- G02F1/11D . . . [N: Circuit or control arrangements] [N9607] [C0108]
- G02F1/11F . . . [N: using an optically anisotropic medium, wherein the incident and the diffracted light waves have different polarizations, e.g. acousto-optic tunable filter (AOTF) ([G02F1/125](#) takes precedence)] [N9705]
- G02F1/125 . . . in an optical waveguide structure [C0108]
- G02F1/13 . . based on liquid crystals, e.g. single liquid crystal display cells (liquid crystal materials [C09K19/00](#))
- G02F1/13A . . . [N: Apparatus specially adapted to the manufacture of LCDs] [N1205]
- G02F1/13B . . . [N: Details (not used, see sub-groups)] [N1205]
- G02F1/13B4 [N: Repairing; Testing (testing of optical apparatus [G01M11/00](#); electronic testing of displays or display drivers, e.g. of LCDs, [G09G3/00E](#))] [C0811]
- G02F1/13F . . . [N: specially adapted for a particular application]
- G02F1/13H . . . [N: Thermal activation of liquid crystals exhibiting a thermo-optic effect (thermometers using change of colour or translucency of liquid crystals [G01K11/16B](#); thermally addressed liquid crystal elements in a matrix [G09G3/36A](#))] [N1205]
- G02F1/13V . . . [N: Arrangements for providing a switchable viewing angle] [N1205]
- G02F1/13W . . . [N: Liquid crystal optical waveguides or liquid crystal cells specially adapted for gating or modulating between optical waveguides] [N1205]
- G02F1/133 . . . Constructional arrangements; Operation of liquid crystal cells; Circuit arrangements (arrangements or circuits for control of liquid crystal elements in a [N: segment display or a] matrix, not structurally associated with these

		elements, [N: respectively G09G3/18 and] G09G3/36] [C0102]
G02F1/133D	. . . . .	[N: Circuit arrangements or driving methods for the control of single liquid crystal cells (G02F1/13H , G02F1/1333V take precedence)] [N1205]
G02F1/133D2	. . . . .	[N: Circuits comprising a photodetector]
G02F1/1333	. . . . .	Constructional arrangements; [N: Manufacturing methods] (G02F1/135 , G02F1/136 take precedence) [C9803]
G02F1/1333B	. . . . .	[N: Flexible substrates, e.g. plastics, organic film] [N9711]
G02F1/1333E	. . . . .	[N: LCD panel immediate support structure, e.g. front and back frame or bezel] [N1205]
G02F1/1333G	. . . . .	[N: Plasma addressed liquid crystal cells [PALC] (plasma panels H01J17/49)] [N1205]
G02F1/1333I	. . . . .	[N: Insulating layers (G02F1/1335 , G02F1/1337 , G02F1/135 , G02F1/136 take precedence)] [C9703]
G02F1/1333J	. . . . .	[N: Charged-particles, e.g. electron-beam, addressed liquid crystals cells (screen for cathode ray tubes acting as light valves H01J29/12 ; electrography, electrophotography G03G)] [N1205]
G02F1/1333K	. . . . .	[N: Manufacturing of individual cells out of a plurality of cells, e.g. by dicing] [N9803]
G02F1/1333N	. . . . .	[N: Combining plural substrates to produce large-area displays, e.g. tiled displays] [N0102]
G02F1/1333O	. . . . .	[N: Optically addressed liquid crystal cells (G02F1/135 takes precedence)] [N1205]
G02F1/1333P	. . . . .	[N: Cells in which the active layer comprises a liquid crystalline polymer (liquid crystalline polymers in general C09K19/38)]
G02F1/1333R	. . . . .	[N: Cells with varying thickness of the liquid crystal layer] [N9906]
G02F1/1333T	. . . . .	[N: Cells with plural compartments or having plurality of liquid crystal micro-cells partitioned by walls, e.g. one micro-cell per pixel] [N9904]
G02F1/1333U	. . . . .	[N: Input devices, e.g. touch-panels (specially adapted as input devices to computers G06F3/033 ; touch-panels per se G06K11/06 , keyboard switches per se H01H13/70)] [N1205]
G02F1/1333V	. . . . .	[N: 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] [N1205]
G02F1/1333V2	. . . . .	[N: with cooling means, e.g. fans] [N1205]
G02F1/1334	. . . . .	based on polymer dispersed liquid crystals, e.g. microencapsulated liquid crystals [N: (compositions C09K19/54A3)] [N9910]
G02F1/1334H	. . . . .	[N: Holographic polymer dispersed liquid crystals] [N0102]
G02F1/1335	. . . . .	Structural association of optical devices, e.g. polarisers, reflectors or illuminating devices, with the cell
G02F1/1335A	. . . . .	[N: Antiglare, refractive index matching layers]
G02F1/1335D	. . . . .	[N: Diffusing, scattering, diffracting elements (associated to illuminating devices G02F1/13357)] [N9612]
G02F1/1335F	. . . . .	[N: Filters, e.g. light shielding masks (optical filters G02B5/20)]
G02F1/1335F1	. . . . .	{7 dots} [N: Light shielding layers, e.g. black matrix (G02F1/1362B takes precedence)] [N9411]
G02F1/1335F2	. . . . .	{7 dots} [N: Colour filters (luminescent elements G02F1/13357L)] [C9411]
G02F1/1335F2B	. . . . .	{8 dots} [N: Methods of making thereof, e.g. printing, electro-deposition, photolithography (photomechanical

			production of textured or patterned surfaces G03F]
G02F1/1335J	. . . . .	[N: Light-guides, e.g. fibre-optic bundles, louvered or jalousie light-guides]	
G02F1/1335L	. . . . .	[N: Lenses, e.g. micro-lenses, Fresnel lenses (lenses in general G02B3/00)]	
G02F1/1335P	. . . . .	[N: Polarisers (polarisers per se G02B5/30)]	
G02F1/1335P4	. . . . .	{7 dots} [N: Colour selective polarisers (G02F1/1347 takes precedence)]	
G02F1/1335P5	. . . . .	{7 dots} [N: Reflective polarizers (G02F1/13357P takes precedence)] [N0001]	
G02F1/1335R	. . . . .	[N: Reflecting elements (associated to illuminating devices G02F1/13357)] [C9612]	
G02F1/1335R2	. . . . .	{7 dots} [N: Transflectors] [N0102]	
G02F1/1336	. . . . .	[N: Illuminating devices (in general F21V; associated with display devices for electronic watches G04G9/00D1B2)] [N1204]	
		[N: WARNING	
		[N1204]Groups G02F1/1336-G02F1/1336Q dos not correspond to former or current IPC groups. Concordance ECLA : IPC for these groups is as follows: - G02F1/1336-G02F1/1336Q : G02F1/13357]	
G02F1/1336B	. . . . .	{7 dots} [N: Direct backlight] [N1204]	
G02F1/1336B1	. . . . .	{8 dots} [N: with LEDs] [N1204]	
G02F1/1336B2	. . . . .	{8 dots} [N: with lamps] [N1204]	
G02F1/1336B3	. . . . .	{8 dots} [N: including specially adapted reflectors] [N1204]	
G02F1/1336B4	. . . . .	{8 dots} [N: including a specially adapted diffusing, scattering or light controlling members] [N1204]	
G02F1/1336B5	. . . . .	{8 dots} [N: including particular frames or supporting means] [N1204]	
G02F1/1336B7	. . . . .	{8 dots} [N: including means for improving the color mixing, e.g. white] [N1204]	
G02F1/1336B8	. . . . .	{8 dots} [N: including means for improving the brightness uniformity] [N1204]	
G02F1/1336E	. . . . .	{7 dots} [N: Edge-illuminating devices, i.e. illuminating from the side (G02B6/00L takes precedence)] [N1204]	
G02F1/1336L	. . . . .	{7 dots} [N: Illumination with ultra-violet light; Luminescent elements or materials associated to the cell] [N1204]	
G02F1/1336P	. . . . .	{7 dots} [N: providing polarised light, e.g. by converting a polarisation component into another one (optical systems for polarising G02B27/28)] [N1204]	
G02F1/1336Q	. . . . .	{7 dots} [N: providing coloured light (G02F1/1336L , G02F1/1335P4 take precedence)] [N1204]	
G02F1/13363	. . . . .	Birefringent elements, e.g. for optical compensation [N0001]	
G02F1/13363G	. . . . .	{7 dots} [N: with refractive index ellipsoid inclined relative to the LC-layer surface] [N0001]	
G02F1/13363N	. . . . .	{7 dots} [N: 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] [N0001]	
G02F1/13363T	. . . . .	{7 dots} [N: with twisted orientation, e.g. comprising helically oriented LC-molecules or a plurality of twisted birefringent	

			sublayers] [N0001]
G02F1/1337	. . . . .		Surface-induced orientation of the liquid crystal molecules, e.g. by alignment layers
G02F1/1337A	. . . . .		[N: by introducing organic surfactant additives into the liquid crystal material (C09K19/56 takes precedence)] [C9711]
G02F1/1337B	. . . . .		[N: Structures for producing distorted electric fields, e.g. bumps, protrusions, recesses, slits in pixel electrodes] [N1205]
G02F1/1337C	. . . . .		[N: by organic films, e.g. polymeric films]
G02F1/1337C2	. . . . .	{7 dots}	[N: with coupling agent molecules, e.g. silane] [C9711]
G02F1/1337C3	. . . . .	{7 dots}	[N: Polyimide, polyamide-imide] [N9703]
G02F1/1337F	. . . . .		[N: by obliquely evaporated films, e.g. Si or SiO ₂ films] [C9711]
G02F1/1337M	. . . . .		[N: with different alignment orientations or pretilt angles on a same surface, e.g. for grey scale or improved viewing angle] [N9411]
G02F1/1337T	. . . . .		[N: by treatment of the surface, e.g. embossing, rubbing, light irradiation (G02F1/1337C , G02F1/1337F , G02F1/1337M take precedence)] [N9711]
G02F1/1337T2	. . . . .	{7 dots}	[N: by rubbing] [N9711]
G02F1/1337T4	. . . . .	{7 dots}	[N: by light irradiation, e.g. linearly polarised light photo-polymerisation] [N9906]
G02F1/1339	. . . . .		Gaskets; Spacers, [N: also spacers with conducting properties (electric line connectors H01R)]; Sealing of the cell
G02F1/1339A	. . . . .		[N: spacers dispersed on the cell substrate, e.g. spherical particles, micro-fibres]
G02F1/1339B	. . . . .		[N: spacers regularly patterned on the cell substrate, e.g. walls, pillars (G02F1/1333T takes precedence)] [C9904]
G02F1/1341	. . . . .		Filling or closing of the cell [N: (G02F1/1333P , G02F1/1334 take precedence)]
G02F1/1343	. . . . .		Electrodes [N: (reflective electrodes G02F1/1335R)] [C9811]
G02F1/1343A	. . . . .		[N: characterised by their geometrical arrangement (G09F9/302 takes precedence)]
G02F1/1343A2	. . . . .	{7 dots}	[N: Segmented, e.g. alpha numeric display]
G02F1/1343A4	. . . . .	{7 dots}	[N: Matrix] [C9610]
G02F1/1343A8	. . . . .	{7 dots}	[N: for applying an electric field parallel to the substrate, i.e. in-plane switching (IPS)] [N9703] [C9904]
G02F1/1343B	. . . . .		[N: characterised by their electrical, optical, physical properties; materials therefor; method of making]
G02F1/1345	. . . . .		Conductors connecting electrodes to cell terminals [N1205]
G02F1/1345D	. . . . .		[N: Conductors connecting driver circuitry and terminals of panels (H01L21/00 takes precedence; electrical details inside the cell G02F1/133;)] [N1205]
G02F1/1345E	. . . . .		[N: Drivers integrated on the active matrix substrate (G02F1/1362S takes precedence)] [N1205]
G02F1/1345T	. . . . .		[N: Terminal pads] [N1205]
G02F1/1347	. . . . .		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 [N: (colour projection displays with liquid crystal valves H04N9/31V)]
G02F1/1347A	. . . . .		[N: in which all the liquid crystal cells or layers remain transparent, e.g.

		FLC, ECB, DAP, HAN, TN, STN, SBE-LC cells (G02F1/1347B takes precedence)]
G02F1/1347A2	. . . . .	{7 dots} [N: for wavelength filtering or for colour display without the use of colour mosaic filters]
G02F1/1347B	. . . . .	[N: in which at least one liquid crystal cell or layer is doped with a pleochroic dye, e.g. GH-LC cell (G02F1/1347C takes precedence)]
G02F1/1347C	. . . . .	[N: in which at least one liquid crystal cell or layer assumes a scattering state]
G02F1/135	. . . . .	Liquid crystal cells structurally associated with a photoconducting or a ferro-electric layer, the properties of which can be optically or electrically varied [N: (G02F1/1333J takes precedence)] [N1205]
G02F1/135C	. . . . .	[N: having a particular photoconducting structure or material]
G02F1/135F	. . . . .	[N: the supplementary layer being a ferro-electric layer]
G02F1/136	. . . . .	Liquid crystal cells structurally associated with a semi-conducting layer or substrate, e.g. cells forming part of an integrated circuit (G02F1/135 takes precedence)
G02F1/1362	. . . . .	Active matrix addressed cells [N: (G02F1/1343A4 , G02F1/1343A8 take precedence)] [N9910]
G02F1/1362A	. . . . .	[N: Arrangements to prevent high voltage or static electricity failures] [N9910]
G02F1/1362B	. . . . .	[N: Light shielding layers, e.g. black matrix, incorporated in the active matrix substrate, e.g. structurally associated with the switching element] [N9910]
G02F1/1362C	. . . . .	[N: Storage capacitors associated with the pixel electrode] [N9910]
G02F1/1362H	. . . . .	[N: Through-hole connection of the pixel electrode to the active element through an insulation layer] [N0005]
G02F1/1362M	. . . . .	[N: having more than one switching element per pixel] [N9910]
G02F1/1362R	. . . . .	[N: Repairing; Defects] [N0303]
G02F1/1362S	. . . . .	[N: formed on a semiconductor substrate, e.g. silicon] [N9910]
G02F1/1362W	. . . . .	[N: Wiring, e.g. gate line, drain line] [N9910]
G02F1/1365	. . . . .	in which the switching element is a two-electrode device [N: (G02F1/1362S takes precedence)] [N9910]
G02F1/1368	. . . . .	in which the switching element is a three-electrode device [N: (G02F1/1362S takes precedence)] [N9910]
G02F1/137	. . . . .	characterised by a particular electro- or magneto-optical effect, e.g. field-induced phase transition, orientation effect, guest-host interaction, dynamic scattering
G02F1/137C	. . . . .	[N: based on a change of the texture state of a cholesteric liquid crystal] [C9511]
G02F1/137D	. . . . .	[N: based on guest-host interaction (G02F1/137L , G02F1/137F2 , take precedence)] [N1205]
G02F1/137F	. . . . .	[N: based on a field-induced phase transition (G02F1/137S takes precedence)]
G02F1/137F2	. . . . .	[N: in liquid crystals doped with a pleochroic dye]
G02F1/137H	. . . . .	[N: based on electrohydrodynamic instabilities or domain formation in liquid crystals]
G02F1/137H2	. . . . .	[N: using dynamic scattering]
G02F1/137L	. . . . .	[N: containing luminescent or electroluminescent additives (luminescent materials in general C09K11/00 ; compositions of liquid crystals comprising

- additives [C09K19/52](#) to [C09K19/60B](#); electroluminescent light sources [H05B33/00](#)] [N1205]
- G02F1/137M [N: based on magneto-optical effects]
- G02F1/137S [N: using smectic liquid crystals ([G02F1/141](#) takes precedence)]
- G02F1/139 based on orientation effects in which the liquid crystal remains transparent [N9411]
- G02F1/139B [N: Bistable or multi-stable liquid crystal cells ([G02F1/141](#) takes precedence)] [N0104]
- G02F1/139C [N: using a field-induced sign-reversal of the dielectric anisotropy] [N9411]
- G02F1/139E [N: the birefringence of the liquid crystal being electrically controlled, e.g. ECB-, DAP-, HAN-, PI-LC cells (G02F1/139T, G02F1/141 take precedence)] [N1205]
- G02F1/139E2 [N: Optically compensated birefringence (OCB)- cells or PI- cells] [N0102]
- G02F1/139T [N: the liquid crystal being selectively controlled between a twisted state and a non-twisted state, e.g. TN-LC cell ([G02F1/141](#) takes precedence)] [N9411]
- G02F1/139T2 [N: the twist being substantially higher than 90°, e.g. STN-, SBE-, OMI-LC cells] [N9411]
- G02F1/141 using ferroelectric liquid crystals [N9411]
- G02F1/141K [N: Details of the smectic layer structure, e.g. bookshelf, chevron, C1 and C2] [N9411]
- G02F1/141R [N: using smectic liquid crystals, e.g. based on the electroclinic effect] [N1205]
- G02F1/15 . . . based on electrochromic elements [N: ([electrochromic materials C09K9/00](#))] [C9411]
- G02F1/15E [N: based on electrolytic deposition of a non-organic material on or in the vicinity of an electrode]
- G02F1/15E2 [N: using a solid electrolyte]
- G02F1/15V [N: based on oxidation reduction in organic liquid solutions, e.g. viologens solutions]
- G02F1/15W [N: based on solid inorganic materials, e.g. transition metal compounds, e.g. in combination with a liquid or solid electrolyte ([G02F1/15E](#) takes precedence)]
- G02F1/15W2 [N: characterised by a particular ion transporting layer, e.g. electrolyte ([H01M6/18](#), [H01M10/08](#) take precedence)]
- G02F1/15W5 [N: based on iridium oxide or hydroxide]
- G02F1/153 Constructional arrangements
- G02F1/153B [N: structural features not otherwise provided for] [N1205]
- G02F1/155 Electrodes
- G02F1/157 Structural association of optical devices, e.g. reflectors or illuminating devices, with the cell
- G02F1/161 Gaskets; Spacers; Sealing of the cell; Filling or closing of the cell
- G02F1/163 Operation of electrochromic cells; Circuit arrangements
- G02F1/167 . . . based on electrophoresis
- G02F1/17 . . . based on variable absorption elements ([G02F1/015](#) to [G02F1/167](#) take precedence; [N: tenebrescent compositions [C09K9/00](#)])
- G02F1/17A [N: based on a suspension of orientable dipolar particles, e.g. suspended

- G02F1/17D . . . particles displays
 . . . [N: based on absorption band-shift, e.g. Stark - or Franz-Keldysh effect
 ([G02F1/015](#), [G02F1/17G](#) take precedence)]
- G02F1/17F . . . [N: using acid- based indicators]
- G02F1/17G . . . [N: based on pressure effects ([G02F1/19B](#) takes precedence)]
- G02F1/19 . . . based on variable reflection or refraction elements ([N: [G02F1/01M3](#)], [G02F1/015](#)
 to [G02F1/167](#) take precedence)
- G02F1/19B . . . [N: by using frustrated reflection (digital reflection using controlled total internal
 reflection [G02F1/315](#))]
- G02F1/21 . . . by interference
- G02F1/21L . . . [N: using liquid crystals, e.g. liquid crystal Fabry-Perot filters]
- G02F1/21S . . . [N: using semi-conducting materials]
- G02F1/225 . . . in an optical waveguide structure
- G02F1/225B [N: in optical fibres]
- G02F1/225H [N: controlled by a high-frequency electromagnetic component in an electric
 waveguide structure]
- G02F1/225S [N: the optical waveguides being made of semiconducting material]
- G02F1/23 . . . for the control of the colour ([G02F1/03](#) to [G02F1/21](#) take precedence)
- G02F1/25 . . . as to hue or predominant wavelength
- G02F1/29 . . . for the control of the position or the direction of light beams, i.e deflection ([N: optical
 coupling means [G02B6/26](#); optical-mechanical scanning in general [G02B26/10](#)]; 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 [H01S3/101](#))
- G02F1/29D . . . [N: by controlled diffraction or phased-array beam steering (controlled diffraction for
 optical switching [G02F1/31](#))] [C9809]
- G02F1/29L . . . [N: by another light beam, i.e. opto-optical deflection]
- G02F1/295 . . . [N: Analog deflection from or] in an optical waveguide structure] [C9809]
- G02F1/295D [N: by controlled diffraction or phased-array beam steering (controlled diffraction
 for optical waveguide switching [G02F1/313](#))] [C9809]
- G02F1/31 . . . Digital deflection, [N: i.e. optical switching] ([G02F1/33](#) takes precedence) [C9809]
- G02F1/313 . . . in an optical waveguide structure
- G02F1/313B [N: in optical fibres]
- G02F1/313C [N: of directional coupler type (all-optical modulation, gating or switching
 using a non-linear directional coupler [G02F1/35C3](#))] [C9810]
- G02F1/313C2 [N: the optical waveguides being made of semiconducting materials]
- G02F1/313C4 [N: controlled by a high-frequency electromagnetic wave component in an
 electric waveguide structure]
- G02F1/313P [N: of interferometric switch type]
- G02F1/313T [N: with intersecting or branching waveguides, e.g. X-switches and
 Y-junctions]
- G02F1/313T2 [N: the optical waveguides being made of semiconducting materials]
- G02F1/315 . . . based on the use of controlled internal reflection
- G02F1/33 . . . Acousto-optical deflection devices [N: (circuit or control arrangements therefor
[G02F1/11D](#))] [C0108]
- G02F1/33M . . . [N: comprising a plurality of transducers on the same crystal surface, e.g.

- multi-channel Bragg cell] [N9810]
- G02F1/335 . . . having an optical waveguide structure
- G02F1/35 . Non-linear optics (optical bistable devices [G02F3/02](#); lasers using stimulated Brillouin or Raman effect [H01S3/30](#))
- G02F1/35A . . [N: Constructional arrangements of non-linear optical devices, e.g. shape of non-linear crystals (constructional arrangements of electro-optic devices [G02F1/03B](#))] [N9809]
- G02F1/35B . . [N: Self-focusing or self-trapping of light; Light-induced birefringence; Induced optical Kerr-effect (photorefractive effects of electro-optic crystals [G02F1/03G](#), [G02F1/05N](#), of ceramics [G02F1/055G](#); opto-optical modulation [G02F1/01L](#); opto-optical deflection [G02F1/29L](#))]
- G02F1/35B2 . . . [N: Soliton propagation] [N9809]
- G02F1/35C . . [N: All-optical modulation, gating, switching, e.g. control of a light beam by another light beam ([G02F1/35W](#), [G02F1/37](#), [G02F1/39](#) take precedence)] [C9809]
- G02F1/35C2 . . . [N: using an interferometer] [C9809]
- G02F1/35C2L [N: of Sagnac type, i.e. nonlinear optical loop mirror (NOLM)] [N9809]
- G02F1/35C3 . . . [N: using a directional coupler] [N9810]
- G02F1/35D . . [N: Non-linear absorption changing by light e.g. bleaching (laser Q-switching using bleachable media [H01S3/113](#))]
- G02F1/35E . . [N: Optical damage]
- G02F1/35K . . [N: using two-photon emission or absorption processes (Raman effect [H01S3/30](#))]
- G02F1/35W . . [N: Frequency conversion, i.e. wherein a light beam with frequency components different from those of the incident light beams is generated (second harmonic generation [G02F1/37](#); optical parametric generation or amplification [G02F1/39](#); transferring the modulation of modulated light [G02F2/00W](#); optical pumping of a laser by another laser [H01S3/094](#); nonlinear optical devices inside a laser cavity [H01S3/108](#))] [N0005]
- G02F1/35W2 . . . [N: Arrangements of plural nonlinear devices for generating multi-colour light beams, e.g. arrangements of SHG, SFG, OPO devices for generating RGB light beams] [N0010]
- G02F1/35W3 . . . [N: Three-wave interaction, e.g. sum-difference frequency generation ([G02F1/35W2](#) takes precedence)] [N0005] [C0010]
- G02F1/35W4 . . . [N: Four-wave interaction] [N0005]
- G02F1/35W4P [N: for optical phase conjugation ([H01S3/10P](#) takes precedence)] [N0005]
- G02F1/35W9 . . . [N: Particular phase matching techniques] [N0005]
- G02F1/355 . . characterised by the materials used [N9909]
- G02F1/355C . . . [N: Crystals] [N9909]
- G02F1/355C4 [N: having the formula $MTiOYO_4$, where M=K, Rb, TI, NH₄ or Cs and Y=P or As, e.g. KTP] [N9909]
- G02F1/355G . . . [N: Glasses] [N9909]
- G02F1/355Q . . . [N: Semiconductor materials, e.g. quantum wells] [N9909]
- G02F1/355R . . . [N: Poled materials, e.g. with periodic poling; Fabrication of domain inverted structures, e.g. for quasi-phase-matching (QPM)]
- G02F1/361 . . . Organic materials [N9909]
- G02F1/361B [N: containing Nitrogen] [N9909]
- G02F1/361B2 [N: Heterocycles having N as heteroatom] [N9909]
- G02F1/361D [N: containing Sulfur] [N9909]

- G02F1/361D2 [N: Heterocycles having S as heteroatom] [N9909]
- G02F1/361F [N: containing polymers] [N9909]
- G02F1/361F2 [N: having the non-linear optical group in the main chain] [N9909]
- G02F1/361F4 [N: having the non-linear optical group in a side chain] [N9909]
- G02F1/361L [N: Langmuir Blodgett Films] [N9909]
- G02F1/361M [N: Organometallic compounds] [N9909]
- G02F1/365 . . . in an optical waveguide structure ([G02F1/377](#), [N: [G02F1/39C](#)] take precedence) [N9809] [C9906]
- G02F1/37 . . . for second-harmonic generation [N: ([G02F1/35W2](#) takes precedence)] [C0010]
- G02F1/377 in an optical waveguide structure [N9906]
- G02F1/377Q [N: with a periodic structure, e.g. domain inversion, for quasi-phase-matching (QPM) ([G02F1/383](#) takes precedence)] [N9906]
- G02F1/383 of the optical fibre type [N9906]
- G02F1/39 . . . for parametric generation or amplification of light, infra-red or ultra-violet waves ([N: [G02F1/35W2](#) takes precedence;] electrical parametric amplifiers [H03F7/00](#)) [C0010]
- G02F1/39C [N: in optical waveguides]
- G02F1/39G [N: Amplification of light by wave mixing involving an interference pattern, e.g. using photorefractive material]

G02F2/00

Demodulating light; Transferring the modulation of modulated light; Frequency-changing of light ([G02F1/35](#) takes precedence; photoelectric detecting or measuring devices [G01J](#), [H01J40/00](#), [H01L31/00](#); demodulating laser arrangements [N: e.g. switching, gating] [H01S3/10](#); demodulation or transference of modulation of modulated electro-magnetic waves in general [H03D9/00](#))

- G02F2/00B . . [N: using optical mixing (**homodyne, heterodyne systems** [H04B10/148](#))]
- G02F2/00W . . [N: 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] [N9810]
- G02F2/02 . . Frequency-changing of light, e.g. by quantum counters (**luminescent materials** [C09K11/00](#))

G02F3/00

Optical logic elements ([N: optical computing [G06E](#)]; electric pulse generators using opto-electronic devices as active elements [H03K3/42](#); logic circuits using opto-electronic devices [H03K19/14](#)); **Optical bistable devices** [C9411]

- G02F3/02 . . Optical bistable devices
- G02F3/02B . . . [N: based on electro-, magneto- or acousto-optical elements ([G02F3/02S](#) takes precedence)]
- G02F3/02D . . . [N: based on non-linear elements, e.g. non-linear Fabry-Perot cavity ([G02F3/02S](#) takes precedence)]
- G02F3/02L . . . [N: based on laser effects]
- G02F3/02S . . . [N: based on self electro-optic effect devices (SEED)]

G02F7/00

Optical analogue/digital converters

Note

This group covers only converters based in substantial manner on elements which are provided for in group [G02F1/00](#).