

CPC**COOPERATIVE PATENT CLASSIFICATION****B61L****GUIDING RAILWAY TRAFFIC; ENSURING THE SAFETY OF RAILWAY TRAFFIC**

(power supply lines for electrically-propelled vehicles [B60M](#) ; vehicle signalling in general [B60Q](#) ; brakes or auxiliary equipment [B61H](#) , [B61K](#) ; point or crossing construction [E01B](#) ; insulated rail joints [E01B 11/54](#); optical devices in general [G02](#) ; controlling in general [G05](#) ; electric communication technique [H04](#))

Guidance heading:**B61L 1/00**

Devices along the route controlled by interaction with the vehicle or vehicle train, { e.g. pedals } (detonators [B61L 5/20](#); operation of points or signals by passage of the vehicle [B61L 11/00](#), [B61L 13/00](#); central traffic control systems controlled by train [B61L 27/04](#); operation of gates, or gates and signals, by approaching vehicle [B61L 29/18](#))

B61L 1/02

. Electric devices associated with track {e.g. rail contacts }

B61L 1/025

.. {actuated by variation of resistance or by piezo-electricity }

B61L 1/04

.. mechanically actuated by a part of the vehicle

B61L 1/045

... {actuated by fluid-pressure }

B61L 1/06

.. actuated by deformation of rail; actuated by vibration in rail

B61L 1/08

.. magnetically actuated; electrostatically actuated

B61L 1/10

.. actuated by electromagnetic radiation; actuated by particle radiation

B61L 1/12

. Electric devices associated with overhead trolley wires

B61L 1/14

. Devices for indicating the passing of the end of the vehicle or vehicle train

B61L 1/16

. Devices for counting axles; Devices for counting vehicles (counting moving objects in general [G06M](#))

B61L 1/161

.. { characterised by the counting methods }

B61L 1/162

.. { characterised by the error correction }

B61L 1/163

.. { Detection devices }

B61L 1/164

... { Mechanical }

B61L 1/165

... { Electrical }

B61L 1/166

... { Optical }

B61L 1/167

.. { Circuit details }

B61L 1/168

.. { Specific transmission details }

B61L 1/169

.. { Diagnosis }

B61L 1/18

. Railway track circuits (automatically-operated track circuits specially adapted for section blocking for controlling traffic [B61L 23/00](#); rail joints [E01B 11/00](#))

B61L 1/181

.. {Details }

B61L 1/182

... {Use of current of indifferent sort or a combination of different current types }

B61L 1/183

.... {Use of means on the vehicle for improving short circuit e.g. in vehicles with

	rubber bandages }
B61L 1/184	.... {Use of additional conductors for examining leakages between rails }
B61L 1/185	... {Use of direct current }
B61L 1/186	... {Use of rectified alternating current }
B61L 1/187	... {Use of alternating current }
B61L 1/188	... {Use of coded current }
B61L 1/20	. Safety arrangements for preventing or indicating malfunction of the device, e.g. by leakage current, by lightning {remote indicating means for abnormal operations conditions G08B 21/00 , G08B 23/00 ; detectors for indicating the overheating of axle bearings B61K 9/00 }
B61L 3/00	Devices along the route for controlling devices on the vehicle or vehicle train, e.g. to release brake, to operate a warning signal
B61L 3/002	. {Recorders on the vehicle }
B61L 3/004	. { Memory means reproducing during the running of the vehicle or vehicle train, e.g. smart cards }
B61L 3/006	. { On-board optimisation of vehicle or vehicle train operation (track-side optimisation of operation B61L 27/0027) }
B61L 3/008	. { On-board target speed calculation or supervision (track-side control of safe travel B61L 27/0038 ; speed control circuitry B60L 3/08 ; speed control of electric drives B60L 15/20) }
B61L 3/02	. at selected places along the route, e.g. intermittent control {simultaneous mechanical and electrical control }
B61L 3/04	.. controlling mechanically {arrangements of making elements acting directly on tread B60T 1/04 }
B61L 3/06	.. controlling by electromagnetic or particle radiation, e.g. by light beam (using radio waves B61L 3/12)
B61L 3/065	... {controlling optically }
B61L 3/08	.. controlling electrically
B61L 3/10	... using current passing between devices along the route and devices on the vehicle train
B61L 3/103	.... {Details of current transmitting conductors or contact brushes }
B61L 3/106	.... { with mechanically controlled electrical switch on the vehicle }
B61L 3/12	... using magnetic or electrostatic induction; using radio waves
B61L 3/121	.... {using magnetic induction }
B61L 3/125	.... { using short-range radio transmission (long-range radio transmission B61L 15/0027 , B61L 27/0005) }
B61L 3/126	.... { Constructional details }
B61L 3/127	.... { for remote control of locomotives (remote control of locomotives within a train consist B61C 17/12) }
B61L 3/128	.... { for control of tilting trains by external control devices, e.g. by Eurobalise (tilting details B61F 5/22) }
B61L 3/14	.. to cut-off the power supply to traction motors of electrically-propelled vehicles

- B61L 3/16 . Continuous control along the route
- B61L 3/18 .. using electric current passing between devices along the route and devices on the vehicle or vehicle train
- B61L 3/185 ... {using separate conductors }
- B61L 3/20 ... employing different frequencies or coded pulse groups {e.g. using currents carried by traction current (operating and signalling systems using network power supply [H02J 13/00](#)) }
- B61L 3/22 .. using magnetic or electrostatic induction; using electromagnetic radiation
- B61L 3/221 ... {using track circuits }
- B61L 3/222 {Arrangements on the track only }
- B61L 3/225 ... {using separate conductors along the route }
- B61L 3/227 ... {using electromagnetic radiation }
- B61L 3/24 ... employing different frequencies or coded pulse groups {e.g. in combination with track circuits }
- B61L 3/243 {using alternating current }
- B61L 3/246 {using coded current }

- B61L 5/00** **Local operating mechanisms for points or track-mounted scotch-blocks** (track-mounted scotch-blocks per se [B61K](#)) ; **Visible or audible signals; Local operating mechanisms for visible or audible signals** ([B61L 11/00](#) takes precedence)

- B61L 5/02 . Mechanical devices for operating points or scotch-blocks {e.g. local manual control }
- B61L 5/023 .. {using funicular driving means }
- B61L 5/026 .. {fixing switch-rails to the driving means }

- B61L 5/04 . Fluid-pressure devices for operating points or scotch-blocks
- B61L 5/045 .. {using electrically controlled fluid-pressure operated driving means }

- B61L 5/06 . Electric devices for operating points or scotch-blocks {e.g. using electromotive driving means }
- B61L 5/062 .. {Wiring diagrams }
- B61L 5/065 .. {Construction of driving mechanism }
- B61L 5/067 .. {using electromagnetic driving means }

- B61L 5/08 . Underground actuating arrangements, e.g. for tramways

- B61L 5/10 . Locking mechanisms for points; Means for indicating the setting of points
- B61L 5/102 .. {Controlling electrically }
- B61L 5/105 .. {Controlling funicularly }
- B61L 5/107 .. {electrical control of points position }

- B61L 5/12 . Visible signals { (signalling means on the vehicle [B61L 15/00](#); signalling means for classification yards, or the like, with multiple indicating means [B61L 17/023](#); signalling means for road crossings [B61L 29/24](#); lighting in general [F21](#) ; visible signalling arrangements in general [G08B 5/00](#)) }
- B61L 5/125 .. {Fixed signals, beacons, or the like }
- B61L 5/14 .. Form signals, e.g. semaphore arms { (illumination for points, form signals

9/00) }

- B61L 5/16 . . . Local operating mechanisms for form signals
- B61L 5/161 {using electromotive driving means }
- B61L 5/162 {Wiring diagrams }
- B61L 5/163 {Driving mechanisms }
- B61L 5/165 {using electromagnetic driving means }
- B61L 5/166 {using electrically controlled gravity operated driving means }
- B61L 5/167 {using electrically controlled fluid-pressure operated driving means }
- B61L 5/168 {using funicular driving means }
- B61L 5/18 . . Light signals; Mechanisms associated therewith, e.g. blinders
- B61L 5/1809 . . . {Daylight signals }
- B61L 5/1818 {using mobile coloured screen }
- B61L 5/1827 {using light sources of different colours and a common optical system }
- B61L 5/1836 {using light sources of different colours and separate optical systems }
- B61L 5/1845 {Optical systems, lenses }
- B61L 5/1854 {Mounting and focussing of the light source in a lamp, fixing means
(focussing of the light source in reflecting mirrors [F21M 3/02](#)) }
- B61L 5/1863 {Lamp mountings on a mast }
- B61L 5/1872 {Mobile mounting arrangements on a mast; Arrangements for hoisting of the
lamp along the mast }
- B61L 5/1881 {Wiring diagrams for power supply, control or testing }
- B61L 5/189 . . . {using flashing light sources (visible signalling in general using flashing light
sources [G08B 5/38](#); thermal switches operating intermittently [H01H 61/06](#),
[H01H 61/08](#)) }
- B61L 5/20 . Audible signals, e.g. detonator {audible signalling }
- B61L 5/203 . . {Detonators; Track mounting means; Composition of the detonative product }
- B61L 5/206 . . {Signalling means for special purposes }
- B61L 5/22 . . Devices for initiating the release of detonators in a certain position of a signal
- B61L 5/24 . . Replacement of detonators

**B61L 7/00 Remote control of local operating means for points, signals, or trackmounted
scotch-blocks ([B61L 11/00](#) takes precedence; interlocking arrangements [B61L 19/00](#);
transmission per se, see the relevant classes)**

- B61L 7/02 . using mechanical transmission; e.g. wire, lever
- B61L 7/021 . . {Driving wheels or supports for traction wires }
- B61L 7/022 . . {Guiding means or supporting foundations in beton }
- B61L 7/024 . . {Coupling for wires or traction bars }
- B61L 7/025 . . {Bracing or compensating arrangements }
- B61L 7/027 . . {Control levers }
- B61L 7/028 . . { Indicating or fixing arrangements in the event of breaking or tension difference of
transmission wires for points, signals or similar }
- B61L 7/04 . using fluid-pressure transmitting

B61L 7/06	. using electrical transmission
B61L 7/061	.. {using electromotive driving means }
B61L 7/062	... {Wiring diagrams }
B61L 7/063	... {Construction of driving mechanism }
B61L 7/065	.. {using electromagnetic driving means }
B61L 7/066	.. {using electrically controlled fluid-pressure operated driving means }
B61L 7/067	.. {Supply for electric safety arrangements }
B61L 7/068	.. {Protection against eddy-currents, short-circuits, or the like, for electric safety arrangements }
B61L 7/08	.. Circuitry
B61L 7/081	... {Direct line wire control }
B61L 7/083	... {Common line wire control using currents of different amplitudes, polarities, frequencies, or the like }
B61L 7/085	... {Common line wire control using synchronous distributors }
B61L 7/086	... {Common line wire control using relay distributors }
B61L 7/088	... {Common line wire control using series of coded pulses }
B61L 7/10	... for light signals, e.g. for supervision, back-signalling
B61L 7/103	.... {Electric control of the setting of signals }
B61L 7/106	..... {for form signals }
B61L 9/00	Illumination specially adapted for points, form signals, or gates (lighting in general F21)
B61L 9/02	. non-electric
B61L 9/04	. electric
B61L 11/00	Operation of points from the vehicle or by the passage of the vehicle
B61L 11/02	. Using mechanical interaction between vehicle and track
B61L 11/04	.. Trailable point locks
B61L 11/06	.. with fluid-pressure transmission
B61L 11/08	. using electrical or magnetic interaction between vehicle and track
B61L 11/083	.. {Magnetic control }
B61L 13/00	Operation of signals from the vehicle or by the passage of the vehicle
B61L 13/002	. {actuated by the passage of the vehicle }
B61L 13/005	. {optically actuated }
B61L 13/007	. {acoustically actuated }
B61L 13/02	. using mechanical interaction between vehicle and track { (pedals B61L 1/00) }

- B61L 13/04
 - . using electrical or magnetic interaction between vehicle and track {e.g. by conductor circuits using special means or special conductors }
- B61L 13/042
 - .. {using isolated rail sections }
- B61L 13/045
 - .. {using separated rail contacts, pedals or similar } ([B61L 1/02](#) takes precedence)]
- B61L 13/047
 - .. {controlling inductively or magnetically }

- B61L 15/00** **Indicators provided on the vehicle or vehicle train for signalling purposes; {**
 On-board control or communication systems }

- B61L 15/0009
 - . {wiring diagrams for start- or stop-signals on vehicles having one or more carriages and having electrical communication lines between the carriages }
- B61L 15/0018
 - . { Communication with or on the vehicle or vehicle train (line transmission systems [H04B 3/00](#)) }
- B61L 15/0027
 - .. { Radio-based, e.g. using GSM-R }
- B61L 15/0036
 - .. { Conductor-based, e.g. using CAN-Bus, train-line or optical fibres }
- B61L 15/0045
 - . { Destination indicators, identification panels or distinguishing signs on the vehicles (displaying in general [G09F](#)) }
- B61L 15/0054
 - . { Train integrity supervision, e.g. end-of-train (EOT) devices }
- B61L 15/0063
 - . { Multiple on-board control systems, e.g. "2 out of 3"-systems (trackside multiple control systems [B61L 27/0061](#)) }
- B61L 15/0072
 - . { On-board train data handling (trackside train data handling [B61L 27/0077](#)) }
- B61L 15/0081
 - . { On-board diagnosis or maintenance (trackside diagnosis or maintenance [B61L 27/0083](#)) }
- B61L 15/009
 - . { On-board display devices }
- B61L 15/02
 - . Head or tail indicators, e.g. light

- B61L 17/00** **Switching systems for classification yards (rail brakes [B61K](#))**

- B61L 17/02
 - . Details, e.g. indicating degree of track filling
- B61L 17/023
 - .. {Signalling; Signals with multiple indicating means }
- B61L 17/026
 - .. {Brake devices }

- B61L 19/00** **Arrangements for interlocking between points and signals by means of a single interlocking device, { e.g. central control (remote control [B61L 7/00](#); station block arrangements [B61L 21/00](#)) }**

- B61L 19/02
 - . Interlocking devices having mechanical or fluid-pressure operation
- B61L 19/023
 - .. {purely mechanical (control levers [B61L 7/027](#)) }
- B61L 19/026
 - .. {using fluid-pressure operated points or signals }
- B61L 19/04
 - .. Detail- e.g. hand lever, back-signalling device

B61L 19/06	· Interlocking devices having electrical operation
B61L 19/08	.. Special arrangements for power supply for interlocking devices
B61L 19/10	.. with mechanical locks
B61L 19/12	... Details
B61L 19/14	.. with electrical locks
B61L 19/16	... Details
B61L 21/00	Station blocking between signal boxes in one yard (interlocking between points and signals by means of a single interlocking device B61L 19/00)
B61L 21/02	· Mechanical locking and release of the route; Repeat locks; Coupling of semaphores
B61L 21/04	· Electrical locking and release of the route; Electrical repeat locks { (central interlocking B61L 19/00) }
B61L 21/06	· Vehicle-on-line indication; Monitoring locking and release of the route
B61L 21/065	.. {for signals, including signals actuated by the vehicle }
B61L 21/08	· Order transmission and reception arrangements for giving or withholding permission
B61L 21/10	· Arrangements for trains which are closely following one another (automatic central traffic control systems B61L 27/04)
B61L 23/00	Control, warning, or like safety means along the route or between vehicles or vehicle trains
B61L 23/002	· {Control or safety means for heart-points and crossings of aerial railways, funicular rack-railway (points or safety systems for model railways A63H ; points, crossings or hearts for aerial railway, funicular rack railway E01B 25/12) }
B61L 23/005	.. {Automatic control or safety means for points for operator-less railway, e.g. transportation systems }
B61L 23/007	· {Safety arrangements on railway crossings }
B61L 23/02	· for indicating along the route the failure of brakes
B61L 23/04	· for monitoring the mechanical state of the route
B61L 23/041	.. { Obstacle detection }
B61L 23/042	.. { Track changes detection }
B61L 23/044	... { Broken rails }
B61L 23/045	... { Rail wear }
B61L 23/047	... { Track or rail movements }
B61L 23/048	... { Road bed changes, e.g. road bed erosion }
B61L 23/06	· for warning men working on the route
B61L 23/08	· for controlling traffic in one direction only (station blocking between signal boxes in one yard B61L 21/00)

- B61L 23/10 . . manually operated {e.g. block arrangements }
- B61L 23/12 . . partly operated by train
- B61L 23/14 . . automatically operated
- B61L 23/16 . . . Track circuits specially adapted for section blocking
- B61L 23/161 {using current of indifferent sorte or a combination of different current types }
- B61L 23/163 {using direct current }
- B61L 23/165 {using rectified alternating current }
- B61L 23/166 {using alternating current }
- B61L 23/168 {using coded current }
- B61L 23/18 . . specially adapted for changing lengths of track sections in dependence upon speed and traffic density
- B61L 23/20 . . with transmission of instructions to stations along the route

- B61L 23/22 . for controlling traffic in two directions over the same pair of rails (station blocking between signal boxes in one yard [B61L 21/00](#))
- B61L 23/24 . . using token systems, e.g. train staffs, tablets
- B61L 23/26 . . with means for actuating signals from the vehicle or by passage of the vehicle
- B61L 23/28 . . using non-automatic blocking from a place along the route
- B61L 23/30 . . using automatic section blocking
- B61L 23/32 . . . with provision for the blocking or passing sidings

- B61L 23/34 . Control, warnings or like safety means indicating the distance between vehicles or vehicle trains by the transmission of signals therebetween

B61L 25/00 Recording or indicating positions or identities of vehicles or vehicle trains or setting of track apparatus

- B61L 25/02 . Indicating or recording positions or identities of vehicles or vehicle trains
- B61L 25/021 . . {Measuring and recording of train speed }
- B61L 25/023 . . { Determination of driving direction of vehicle or vehicle train }
- B61L 25/025 . . { Absolute localisation, e.g. providing geodetic coordinates }
- B61L 25/026 . . { Relative localisation, e.g. using odometer }
- B61L 25/028 . . { Determination of vehicle position and orientation within a train consist, e.g. serialisation }
- B61L 25/04 . . Indicating or recording train identities
- B61L 25/041 . . . {using reflecting tags }
- B61L 25/043 . . . {using inductive tags }
- B61L 25/045 . . . {using reradiating tags }
- B61L 25/046 . . . {using magnetic tags }
- B61L 25/048 . . . {using programmable tags }

- B61L 25/06 . Indicating or recording the setting of track apparatus, e.g. of points, of signals
- B61L 25/065 . . {for signalling systems on the vehicle using current conduction }
- B61L 25/08 . . Diagrammatic displays

B61L 27/00 Central traffic control systems; { Track-side control or specific communication systems

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- B61L 27/0005 . { Details of track-side communication }
- B61L 27/0011 . { Regulation, e.g. scheduling, time tables }
- B61L 27/0016 .. { Preparing schedules }
- B61L 27/0022 .. { Following schedules }
- B61L 27/0027 .. { Track-side optimisation of vehicle or vehicle train operation (on-board optimisation [B61L 3/006](#)) }
- B61L 27/0033 .. { Crew rosters and itineraries }
- B61L 27/0038 . { Track-side control of safe travel of vehicle or vehicle train, e.g. braking curve calculation (on-board target speed calculation and supervision [B61L 3/008](#)) }
- B61L 27/0055 . { Testing or simulation }
- B61L 27/0061 . { Track-side multiple control systems, e.g. switch-over between different systems, "2 out of 3"-systems (on-board multiple control systems [B61L 15/0063](#)) }
- B61L 27/0066 .. { Backup systems, e.g. switching when failures occur }
- B61L 27/0072 .. { Migration, e.g. parallel installations running simultaneously }
- B61L 27/0077 . { Track-side train data handling, e.g. vehicle or vehicle train data, position reports (on-board train data handling [B61L 15/0072](#)) }
- B61L 27/0083 . { Track-side diagnosis or maintenance, e.g. software upgrades (on-board diagnosis or maintenance [B61L 15/0081](#)) }
- B61L 27/0088 .. { for track-side elements or systems, e.g. trackside supervision of trackside control system conditions }
- B61L 27/0094 .. { for vehicles or vehicle trains, e.g. trackside supervision of train conditions }
- B61L 27/02 . Manual systems
- B61L 27/04 . Automatic systems, e.g. controlled by train; Change-over to manual control

B61L 29/00 Safety means for rail/road crossing traffic

- B61L 29/02 . Guards or obstacles for preventing access to the route (cattle guards connected to the permanent way [E01B 17/00](#))
- B61L 29/023 .. { Special gates }
- B61L 29/026 ... { Preventing access by means of obstacles raising across the route }
- B61L 29/04 . Gates for level crossings
- B61L 29/06 .. yielding to vehicles in one direction but operated in a different direction
- B61L 29/08 . Operation of gates; Combined operation of gates and signals
- B61L 29/10 .. Means for securing gates in their desired position
- B61L 29/12 .. Manual operation

B61L 29/14	... mechanically
B61L 29/16	... electrically
B61L 29/18	.. Operation by approaching rail vehicle or rail vehicle train
B61L 29/20	... mechanically
B61L 29/22	... electrically
B61L 29/222	.... {using conductor circuits with separate contacts or conductors }
B61L 29/224	..... {using rail contacts }
B61L 29/226	.... {using track-circuits, closed or short-circuited by train or using isolated rail-sections }
B61L 29/228	.... {using optical means }
B61L 29/24	. Means for warning road traffic that a gate is closed or closing, or that rail traffic is approaching, e.g. for visible or audible warning
B61L 29/243	.. {Transmission mechanism or acoustical signals for gates }
B61L 29/246	.. {Signals or brake- or lighting devices mounted on the road vehicle and controlled from the vehicle train }
B61L 29/26	.. mechanically operated
B61L 29/28	.. electrically operated
B61L 29/282	... {magnetic or inductive control by the vehicle }
B61L 29/284	... {using rail-contacts, rail microphones, or the like, controlled by the vehicle }
B61L 29/286	... {using conductor circuits controlled by the vehicle }
B61L 29/288	... {Wiring diagram of the signal control circuits }
B61L 29/30	... Supervision, e.g. monitoring arrangements
B61L 29/32	... Timing, e.g. advance warning of approaching train
B61L 99/00	Subject matter not provided for in other groups of this subclass

Guidance heading:

B61L 2003/00	Devices along the route for controlling devices on the vehicle or vehicle train, e.g. to release brake, to operate a warning signal
B61L 2003/02	. at selected places along the route, e.g. intermittent control {simultaneous mechanical and electrical control }
B61L 2003/08	.. controlling electrically
B61L 2003/12	... using magnetic or electrostatic induction; using radio waves
B61L 2003/121	.... {using magnetic induction }
B61L 2003/122	..... German standard for inductive train protection, called "Induktive Zugsicherung"[INDUSI]
B61L 2003/123	..... French standard for inductive train protection, called "Contrôle de vitesse par balises" [KVB]
B61L 2003/16	. Continuous control along the route
B61L 2003/22	.. using magnetic or electrostatic induction; using electromagnetic radiation
B61L 2003/221	... {using track circuits }

- B61L 2003/223 French cab signaling system, called "Transmission Voie-Machine" [TVM]
- B61L 2003/225 . . . {using separate conductors along the route }
- B61L 2003/226 German inductive continuous train control, called 'Linienzugbeeinflussung' [LZB]
- B61L 2003/228 . . . Constructional details

B61L 2011/00 Operation of points from the vehicle or by the passage of the vehicle

- B61L 2011/08 . using electrical or magnetic interaction between vehicle and track
- B61L 2011/086 . . German radio based operations, called "Funkfahrbetrieb" [FFB]

B61L 2019/00 Arrangements for interlocking between points and signals by means of a single interlocking device, { e.g. central control (remote control [B61L 7/00](#); station block arrangements [B61L 21/00](#)) }

- B61L 2019/06 . Interlocking devices having electrical operation
- B61L 2019/065 . . with electronic means

B61L 2027/00 Central traffic control systems; { Track-side control or specific communication systems }

- B61L 2027/0038 . { Track-side control of safe travel of vehicle or vehicle train, e.g. braking curve calculation (on-board target speed calculation and supervision [B61L 3/008](#)) }
- B61L 2027/0044 . . using European Train Control System (ETCS)
- B61L 2027/005 . . using Communication-based Train Control (CBTC)

Guidance heading:

B61L 2201/00 Control methods

- B61L 2201/02 . Fuzzy control

Guidance heading:

B61L 2205/00 Communication or navigation systems for railway traffic

- B61L 2205/02 . Global system for mobile communication - railways (GSM-R)
- B61L 2205/04 . Satellite based navigation systems, e.g. GPS

B61L 2207/00 Features of light signals

- B61L 2207/02 . using light-emitting diodes (LEDs)

B61L 2210/00 Vehicle systems

[B61L 2210/02](#) . Single autonomous vehicles

[B61L 2210/04](#) . Magnetic elevation vehicles (maglev)