

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](#))

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 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 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 2003/223
 - {French cab signaling system, called "Transmission Voie-Machine" [TVM]}
- B61L 3/225
 - . . . {using separate conductors along the route}
- B61L 2003/226
 - {German inductive continuous train control, called 'Linienzugbeeinflussung' [LZB]}
- B61L 3/227
 - . . . {using electromagnetic radiation}
- B61L 2003/228
 - . . . {Constructional details}
- 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 [{\(illumination for points, form signals B61L 9/00\)}](#)
- 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 \(focussing of the light source in reflecting mirrors F21S 48/00\)}](#)
- 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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Coupling for wires or traction bars}
B61L 7/025	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Bracing or compensating arrangements}
B61L 7/027	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Control levers}
B61L 7/028	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Indicating or fixing arrangements in the event of breaking or tension difference of transmission wires for points, signals or similar}
B61L 7/04	<ul style="list-style-type: none"> using fluid-pressure transmitting
B61L 7/06	<ul style="list-style-type: none"> using electrical transmission
B61L 7/061	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {using electromotive driving means}
B61L 7/062	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Wiring diagrams}
B61L 7/063	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Construction of driving mechanism}
B61L 7/065	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {using electromagnetic driving means}
B61L 7/066	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {using electrically controlled fluid-pressure operated driving means}
B61L 7/067	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Supply for electric safety arrangements}
B61L 7/068	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Protection against eddy-currents, short-circuits, or the like, for electric safety arrangements}
B61L 7/08	<ul style="list-style-type: none"> <ul style="list-style-type: none"> Circuitry
B61L 7/081	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Direct line wire control}
B61L 7/083	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Common line wire control using currents of different amplitudes, polarities, frequencies, or the like}
B61L 7/085	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Common line wire control using synchronous distributors}
B61L 7/086	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Common line wire control using relay distributors}
B61L 7/088	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Common line wire control using series of coded pulses}
B61L 7/10	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> for light signals, e.g. for supervision, back-signalling
B61L 7/103	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Electric control of the setting of signals}
B61L 7/106	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {for form signals}
B61L 9/00	Illumination specially adapted for points, form signals, or gates (lighting in general F21)
B61L 9/02	<ul style="list-style-type: none"> non-electric
B61L 9/04	<ul style="list-style-type: none"> electric
B61L 11/00	Operation of points from the vehicle or by the passage of the vehicle
B61L 11/02	<ul style="list-style-type: none"> Using mechanical interaction between vehicle and track
B61L 11/04	<ul style="list-style-type: none"> <ul style="list-style-type: none"> Trailable point locks
B61L 11/06	<ul style="list-style-type: none"> <ul style="list-style-type: none"> with fluid-pressure transmission
B61L 11/08	<ul style="list-style-type: none"> using electrical or magnetic interaction between vehicle and track
B61L 11/083	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Magnetic control}
B61L 2011/086	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {German radio based operations, called "Funkfahrbetrieb" [FFB]}
B61L 13/00	Operation of signals from the vehicle or by the passage of the vehicle
B61L 13/002	<ul style="list-style-type: none"> {actuated by the passage of the vehicle}
B61L 13/005	<ul style="list-style-type: none"> {optically actuated}

B61L 13/007	<ul style="list-style-type: none"> • {acoustically actuated}
B61L 13/02	<ul style="list-style-type: none"> • using mechanical interaction between vehicle and track {(pedals B61L 1/00)}
B61L 13/04	<ul style="list-style-type: none"> • using electrical or magnetic interaction between vehicle and track {e.g. by conductor circuits using special means or special conductors}
B61L 13/042	<ul style="list-style-type: none"> • . {using isolated rail sections}
B61L 13/045	<ul style="list-style-type: none"> • . {using separated rail contacts, pedals or similar (B61L 1/02 takes precedence)}
B61L 13/047	<ul style="list-style-type: none"> • . {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	<ul style="list-style-type: none"> • {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	<ul style="list-style-type: none"> • {Communication with or on the vehicle or vehicle train (line transmission systems H04B 3/00)}
B61L 15/0027	<ul style="list-style-type: none"> • . {Radio-based, e.g. using GSM-R}
B61L 15/0036	<ul style="list-style-type: none"> • . {Conductor-based, e.g. using CAN-Bus, train-line or optical fibres}
B61L 15/0045	<ul style="list-style-type: none"> • {Destination indicators, identification panels or distinguishing signs on the vehicles (displaying in general G09F)}
B61L 15/0054	<ul style="list-style-type: none"> • {Train integrity supervision, e.g. end-of-train [EOT] devices}
B61L 15/0063	<ul style="list-style-type: none"> • {Multiple on-board control systems, e.g. "2 out of 3"-systems (trackside multiple control systems B61L 27/0061)}
B61L 15/0072	<ul style="list-style-type: none"> • {On-board train data handling (trackside train data handling B61L 27/0077)}
B61L 15/0081	<ul style="list-style-type: none"> • {On-board diagnosis or maintenance (trackside diagnosis or maintenance B61L 27/0083)}
B61L 15/009	<ul style="list-style-type: none"> • {On-board display devices}
B61L 15/02	<ul style="list-style-type: none"> • Head or tail indicators, e.g. light
B61L 17/00	Switching systems for classification yards (rail brakes B61K)
B61L 17/02	<ul style="list-style-type: none"> • Details, e.g. indicating degree of track filling
B61L 17/023	<ul style="list-style-type: none"> • . {Signalling; Signals with multiple indicating means}
B61L 17/026	<ul style="list-style-type: none"> • . {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	<ul style="list-style-type: none"> • Interlocking devices having mechanical or fluid-pressure operation
B61L 19/023	<ul style="list-style-type: none"> • . {purely mechanical (control levers B61L 7/027)}
B61L 19/026	<ul style="list-style-type: none"> • . {using fluid-pressure operated points or signals}
B61L 19/04	<ul style="list-style-type: none"> • . Detail- e.g. hand lever, back-signalling device
B61L 19/06	<ul style="list-style-type: none"> • Interlocking devices having electrical operation
B61L 2019/065	<ul style="list-style-type: none"> • . {with electronic means}
B61L 19/08	<ul style="list-style-type: none"> • . Special arrangements for power supply for interlocking devices
B61L 19/10	<ul style="list-style-type: none"> • . with mechanical locks

B61L 19/12	<ul style="list-style-type: none"> <ul style="list-style-type: none"> Details
B61L 19/14	<ul style="list-style-type: none"> <ul style="list-style-type: none"> with electrical locks
B61L 19/16	<ul style="list-style-type: none"> <ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> Mechanical locking and release of the route; Repeat locks; Coupling of semaphores
B61L 21/04	<ul style="list-style-type: none"> Electrical locking and release of the route; Electrical repeat locks {(central interlocking B61L 19/00)}
B61L 21/06	<ul style="list-style-type: none"> Vehicle-on-line indication; Monitoring locking and release of the route
B61L 21/065	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {for signals, including signals actuated by the vehicle}
B61L 21/08	<ul style="list-style-type: none"> Order transmission and reception arrangements for giving or withholding permission
B61L 21/10	<ul style="list-style-type: none"> 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	<ul style="list-style-type: none"> {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	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Automatic control or safety means for points for operator-less railway, e.g. transportation systems}
B61L 23/007	<ul style="list-style-type: none"> {Safety arrangements on railway crossings}
B61L 23/02	<ul style="list-style-type: none"> for indicating along the route the failure of brakes
B61L 23/04	<ul style="list-style-type: none"> for monitoring the mechanical state of the route
B61L 23/041	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Obstacle detection}
B61L 23/042	<ul style="list-style-type: none"> <ul style="list-style-type: none"> {Track changes detection}
B61L 23/044	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Broken rails}
B61L 23/045	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Rail wear}
B61L 23/047	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Track or rail movements}
B61L 23/048	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {Road bed changes, e.g. road bed erosion}
B61L 23/06	<ul style="list-style-type: none"> for warning men working on the route
B61L 23/08	<ul style="list-style-type: none"> for controlling traffic in one direction only (station blocking between signal boxes in one yard B61L 21/00)
B61L 23/10	<ul style="list-style-type: none"> <ul style="list-style-type: none"> manually operated {e.g. block arrangements}
B61L 23/12	<ul style="list-style-type: none"> <ul style="list-style-type: none"> partly operated by train
B61L 23/14	<ul style="list-style-type: none"> <ul style="list-style-type: none"> automatically operated
B61L 23/16	<ul style="list-style-type: none"> <ul style="list-style-type: none"> Track circuits specially adapted for section blocking
B61L 23/161	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {using current of indifferent sorte or a combination of different current types}
B61L 23/163	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {using direct current}
B61L 23/165	<ul style="list-style-type: none"> <ul style="list-style-type: none"> <ul style="list-style-type: none"> {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}**

- 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 2027/0044 . . {using European Train Control System [ETCS]}
- B61L 2027/005 . . {using Communication-based Train Control [CBTC]}
- 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	<ul style="list-style-type: none"> • • {Transmission mechanism or acoustical signals for gates}
B61L 29/246	<ul style="list-style-type: none"> • • {Signals or brake- or lighting devices mounted on the road vehicle and controlled from the vehicle train}
B61L 29/26	<ul style="list-style-type: none"> • • mechanically operated
B61L 29/28	<ul style="list-style-type: none"> • • electrically operated
B61L 29/282	<ul style="list-style-type: none"> • • • {magnetic or inductive control by the vehicle}
B61L 29/284	<ul style="list-style-type: none"> • • • {using rail-contacts, rail microphones, or the like, controlled by the vehicle}
B61L 29/286	<ul style="list-style-type: none"> • • • {using conductor circuits controlled by the vehicle}
B61L 29/288	<ul style="list-style-type: none"> • • • {Wiring diagram of the signal control circuits}
B61L 29/30	<ul style="list-style-type: none"> • • • Supervision, e.g. monitoring arrangements
B61L 29/32	<ul style="list-style-type: none"> • • • Timing, e.g. advance warning of approaching train
B61L 99/00	Subject matter not provided for in other groups of this subclass
B61L 2201/00	Control methods
B61L 2201/02	<ul style="list-style-type: none"> • Fuzzy control
B61L 2205/00	Communication or navigation systems for railway traffic
B61L 2205/02	<ul style="list-style-type: none"> • Global system for mobile communication - railways (GSM-R)
B61L 2205/04	<ul style="list-style-type: none"> • Satellite based navigation systems, e.g. GPS
B61L 2207/00	Features of light signals
B61L 2207/02	<ul style="list-style-type: none"> • using light-emitting diodes (LEDs)
B61L 2210/00	Vehicle systems
B61L 2210/02	<ul style="list-style-type: none"> • Single autonomous vehicles
B61L 2210/04	<ul style="list-style-type: none"> • Magnetic elevation vehicles (maglev)