

SHAFT MONITORING SYSTEM FOR LIFT

The invention relates to monitoring of the shaft doors of a lift system.

5 Lift systems of conventional kind generally comprise shaft doors by which the lift shaft can be separated from the adjoining areas in each storey. Many lift systems additionally have cage doors by which the lift cage is self-closing and which move together with the cage from storey to storey. For reasons of safety all shaft doors must always be closed in operation with the exception of the shaft door of that storey in which the lift cage has just
10 stopped. Equally, the cage doors have to be closed when the lift has not just stopped at a storey in order to allow loading or unloading or entering or leaving. For maintenance purposes the shaft and/or cage doors can obviously also be opened when the lift cage is disposed elsewhere than in the above-described positions. The state, i.e. the setting of the shaft doors or the setting of locks by which the shaft door leaf or leaves is or are
15 lockable in the closed setting thereof, are monitored with the help of monitoring systems. For this purpose sensor means, for example in the form of positively guided devices with safety contact positions, are provided. The safety contact positions are integrated in series connection in a safety circuit. The arrangement is realised in such a manner that the lift cage can be moved only when the safety circuit and thus also all safety contacts
20 integrated therein are closed.

Monitoring systems with safety circuits of this kind are subject to numerous disadvantages which are briefly listed in the following:

25 Each safety circuit has inherent problems; belonging thereto are the length of the connections, the voltage drop in the safety circuit and the comparatively high assembly cost.

Individual safety contacts are relatively susceptible to fault; unnecessary emergency stops of the lift system therefore frequently occur.

30 Notwithstanding a monitoring system with a safety circuit, unsafe and risky situations cannot be entirely avoided; on the one hand the safety contacts can individually or in common be bridged over relatively easily, which is virtually equivalent to placing the safety precautions out of action, and on the other hand an open shaft door does indeed prevent movement of the cage, but if the cage is not located at the shaft door just open the risk
35 nevertheless exists of a fall through the open shaft door.

Intelligent or situationally appropriate reactions, for example in the case of interruption of the safety circuit, are not possible; in particular, it is not possible to avoid unintentional trapping of persons in the lift cage.

- 5 The monitoring system does not allow a specific diagnosis, i.e. if the safety circuit is opened it can only be established that at least one safety contact and thus at least one lock or at least one shaft door is open. However, it cannot be established which safety contact has opened. The monitoring system does not, before a fault in the safety circuit occurs, deliver any information allowing recognition of the state (wear, corrosion) of
- 10 individual safety contacts or enable identification thereof. A state-dependent maintenance at an instant in time in which the lift cage can be shut down without problems is thus not assisted.

Serviceability of the lift is limited, since an open safety contact always has the

15 consequence of placing the lift system out of operation even when another solution, for example blocking of the access region to a non-closable shaft door, would be possible.

A further disadvantage of known systems is that each shaft door leaf is provided with at least one electrical contact which has to be incorporated into the safety circuit. This

20 approach is laborious and costly.

An improved system in which the state of the shaft doors is detected by way of a bus at the storey side and by way of a cage bus is described in the parallel patent application with the title "Lift system". This parallel application was filed on 18 September 2001 and carries

25 the application number 01810903.3. In the case of the monitoring system for a lift described in this patent application the shaft doors and/or the cage doors have sensor means by which the state thereof, i.e. the position of its door leaves, is detected. The monitoring system additionally comprises an evaluating system which is connected with the sensor means and which evaluates the signals delivered by the sensor means. This

30 evaluation is carried out at short intervals in time and makes it possible to detect the state of the monitored shaft or cage door leaf; equally, changes in the signal characteristic over time can be detected. According to this improved system, detection of the state of the shaft or cage door leaf by the sensor means can be analysed and is capable of diagnosis. Moreover, a gradual deterioration of individual subsystems is recognisable so that

35 preventative maintenance can be initiated in good time.

The object of the invention is thus to be seen in indicating an improved monitoring for lift shaft doors by which the disadvantages of the state of the art can be avoided or at least significantly reduced.

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Fulfilment of the object is effected by the features of claim 1, the features of claim 6 and the features of claim 9.

Advantageous developments of the lift system according to the invention are defined by
10 the dependent patent claims 2 to 5, 7, 8 and 10.

The invention is described in more detail in the following on the basis of examples of embodiment and with reference to the drawing, in which:

15 Fig. 1 shows a lift system with a first monitoring system according to the invention, in strongly simplified schematic illustration;

Fig. 2 shows a detail view of a shaft door lock with sensor means, according to the invention;

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Fig. 3 shows a detail view of a shaft door lock with reversing means, according to the invention;

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Fig. 4 shows a detail view of a shaft door lock with sensor means, according to the invention;

Fig. 5 shows a detail view of a mechanical system for securing and releasing a shaft door lock securing means, according to the invention; and

30 Fig. 6 shows a detail view of a further shaft door lock with deflecting means, according to the invention.

Fig. 1 shows a first form of embodiment of the invention. There is shown a lift system comprising a lift cage 12 which is guided to be vertically movable in a lift shaft 10. The lift
35 cage 12 can serve three storeys A, B and C. The lift cage 12 is closed by a cage door 13.

Each of the three storeys has a shaft door 11. As soon as the lift cage 12 travels behind a storey door in order to stop at the corresponding storey the shaft door 11 of this storey is opened by the cage door 13. In the illustrated case the cage 12 is disposed at the level of the storey B. The corresponding shaft door 11 and the cage door are opened, which
5 cannot be seen in Fig. 1. The shaft door 11 is provided with a self-closing device so that the leaves of the shaft door 11 automatically shut if they are not actively held open.

Shaft and cage doors can comprise one or more door leaves. In the following the invention is respectively described only with respect to doors with one door leaf. It is
10 emphasised at this point that the features, functions and characteristics according to the invention also apply to multi-leaf doors.

An automatically locking shaft door lock 18 is provided which locks the leaf of the shaft door 11 as soon as this has reached its closed setting, wherein the shaft door lock 18 can
15 be unlocked by the lift cage 12.

As schematically illustrated in Fig. 1 there is provided a control 16 which is connected with a drive 14 and moves the lift cage 12 by way of a cable 22. The lift cage 12 is disposed in communicating connection with the lift control 16 by way of a cage bus 17. The cage bus
20 17 is preferably a safety bus. According to the invention the lift installation is equipped with contactless sensor means 15, 19. These sensor means 15, 19 serve the purpose of monitoring, from the lift cage 12, whether locking of the shaft door lock 18 has taken place. Beyond that, depending on the respective form of embodiment the sensor means 15, 19 can also serve for repeated monitoring of the locked state of the shaft door lock 18,
25 wherein this monitoring is undertaken while the lift cage 12 moves past the shaft doors. In order to enable monitoring from the lift cage the sensor means 15, 19 are connectible with the lift control 16 by way of the cage bus 17. Alternatively, the sensor means 15 can be connected with the lift control 16 by a safety monitoring system. Such a safety monitoring system can serve the purpose of detecting at least a part of the safety-relevant states of a
30 lift installation separately from the actual lift control and, in the case of occurrence of problems, triggering reactions intervening directly in the lift control.

The mode of operation of the above-described form of embodiment is as follows:

35 Before the lift cage 12 leaves a storey (for example, storey B), the cage 13 and therewith

also the leaf of the shaft door 11 of this storey are closed. As soon as the leaf of the shaft door 11 has reached its closed setting, the shaft door lock 18 drops into locked state, whereby the shaft door is secure against unauthorised or inadvertent opening. The contactless sensor means 15, 19 notify the lift control by way of the bus 17 that the shaft door lock 18 was closed and is now closed. Only after the shaft door lock 18 has been reported as closed does the lift control 16 set the lift cage 12 in motion by way of the drive 14. As long as this report is absent, the lift cage 12 remains at standstill.

While the lift cage 12 moves in the shaft 10, the sensor means 15, 19 can, with each movement past a shaft, detect the locked state of the shaft door lock 18 thereat. This state information can be transmitted to the control 16. Should one of the shaft door locks 18 not be locked, then a corresponding reaction (for example, shutting-down the lift or an emergency call) can be triggered.

A further form of embodiment of the invention is distinguished by the fact that the contactless sensor means comprise an active sensor part 15 and a passive sensor part 19, as shown on the basis of an example in Fig. 2. The active sensor part 15 is arranged at the lift cage 12, for example at the cage door, and the passive sensor part 19 is arranged in the region of the shaft door lock 18 to be monitored. As shown in Fig. 2, the passive sensor part can be seated directly on the shaft door lock 18 to be monitored.

The arrangement of the active and the passive sensor part is preferably undertaken in such a manner that the active sensor part 15 can come into interaction with the passive sensor part 19 as soon as the lift cage 12 stops behind the shaft door 11 to be monitored and the shaft door 11 together with the shaft door lock 18 to be monitored are closed. In Fig. 2 there is shown a state in which the shaft door lock 18 is closed and the lift cage 12 inclusive of the active sensor part 15 approaches the stopping position.

As indicated in Figure 1, the cage 12 can be equipped with a bus node 20. All elements of the cage 12 which act on the bus 17 or have to be reachable by the bus can be connected with the bus 17 by way of the bus node 20. In the illustrated form of embodiment the active sensor part 15 is, for example, connectible with the bus node 20 by way of a cable 21 or another form of connection.

In another form of embodiment the sensor means is connected by way of direct (parallel)

wiring with the lift control. In this case a cage bus is not needed in order to produce a connection between the sensor means and the lift control.

In a further preferred form of embodiment the two sensor parts 15 and 19 are so designed
5 and mounted that they can transiently interact each time the lift cage 12 moves past a shaft door 11 to be monitored and the shaft door 11 together with the shaft door lock 18 to be monitored are closed. It can thereby be checked every time the cage 12 travels past whether the cage door lock 18 is closed.

10 The shaft door lock 18 can, for example, be so mounted at the leaf of the shaft door 11 that it is lockable by a part which is fixedly connected with a door frame fastened to the lift shaft 10. For this purpose the shaft door lock 18 has a rotational axle and an arm which is constructed to be hook-shaped and which engages in a recess of the part connected with the shaft door frame. Moreover, the shaft door lock 18 is provided with a weight or a
15 spring so that the lock 18 automatically locks the leaf of the shaft door 11 as soon as this has reached its closed setting.

A locking mechanism 30 according to the invention is illustrated in Fig. 3. The form of illustration is so selected that the locking mechanism 30 is seen from the lift cage through
20 the cage door 35 (illustrated in dashed lines). In the upper region of Fig. 3 a shaft door lock 28 can be seen in closed state (i.e. in locked state). The shaft door lock 28 engages by an arm 33 of hook-shaped construction in a recess of the shaft door frame 31 and locks the shaft door 41 against unintended or unauthorised opening. The lock 28 is so arranged that it can rotate about an axle 32 as indicated by the arrow. The shaft door lock 28 is
25 provided with a weight 34 so that the lock 28 hooks in by itself as soon as the leaf of the shaft door 41 has reached its closed setting.

If the lift cage now approaches, by its cage door 35, a storey then two entraining blades 36 of a door entraining mechanism mounted at the leaf of the cage door 35 engage in a
30 deflecting mechanism 37 which is mounted at the leaf of the shaft door 41 and which is mechanically connected with the shaft door lock 28 by way of a rod 38. In the case of the illustrated form of embodiment of the locking mechanism 30 the entraining blades 36 are spread apart before the beginning of the door opening movement. A force is exerted on the rollers 40 of the deflecting mechanism 37 by this movement apart of the entraining
35 blades 36, whereby the deflecting mechanism 37 executes a slight rotational movement

counter to clockwise sense about the rotational axle 39 as indicated by the arrow. The rod 38 thereby urges the weight 34 of the lock 28 upwardly and locking of the leaf of the shaft door 41 relative to the shaft door frame 31 is released. The shaft door 41 can now be opened by the cage door 35.

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In the case of conjunctive closing of cage and shaft door the entraining blades 36 move towards one another again at the end of the closing process so that the afore-described unlocking action is cancelled and the arm 33 of hook-shaped construction of the lock 28 detents in the recess connected with the shaft door frame 31, whereby the leaf of the shaft
10 door 41 is locked.

The deflecting mechanism 37 is preferably provided with rollers 40 so as to enable movement of the entraining blades 36 with reduced friction. Whilst the lift cage moves in the lift shaft, the entraining blades 36 are held (for example by a spring) at a minimum
15 mutual spacing so that the lift cage can move from storey to storey without the entraining struts 36 colliding with the rollers 40 of the deflecting mechanism 37 mounted at the shaft doors 41. The entraining blades 36 are spread apart only when the lift cage approaches a storey and the door opening process begins. The door opening process can be already commenced while the lift cage slowly approaches the stopping position, since the
20 entraining blades 36 have an appropriate length. As soon as the leading ends of the two entraining blades 36 are disposed between the rollers 40 the spreading movement can begin.

Several possibilities for realisation of the contactless sensor means are described in the
25 following by way of example. An appropriate sensor means is schematically illustrated in Fig. 4. A sensor means which operates optically is shown in Fig. 4. Seated at the upper end of the leaf of a shaft door 51 is a shaft door lock 52 which engages in a recess of the shaft door frame 57 and locks the leaf of the shaft door 51. A lift cage (not shown) is disposed at the same height as the shaft door 51. The lift cage carries a cage door 53
30 with a door leaf, at the upper end of which an active sensor means 54, 55 is provided. It comprises a transmitter 54 which transmits a light beam in the direction of the shaft door lock 52. A passive sensor part 59, which reflects the light beam and guides it back in the direction of the active sensor means, is disposed at the shaft door lock 52. There the light beam is received by a receiver 55 and converted into an electrical signal which can be
35 transmitted for evaluation either to a local evaluating device or by way of a bus or parallel

wiring to a remote evaluating device. If the shaft door lock 52 is disposed in the desired position then the light beam is reflected for the greatest part and detected on the receiving side. If the shaft door lock 52 is opened (not locked) the passive sensor part 59 is not disposed in the region of the transmitted light beam and no light, or only a small proportion
5 of the light, is reflected to the receiver. It is thus recognisable whether the shaft door lock 52 is closed. If the sensor means based on an optical principle operates sufficiently rapidly it can also be ascertained from the lift cage when travelling past whether the shaft door lock 52 is locked. A mirror, a reflective surface or a reflector can be used as passive sensor means 59.

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A further sensor means operating contactlessly and based on the radio frequency identification principle (RFID) can be realised as follows. An RFID tag (for example, in the form of a thin adhesive label) can be fixed to the shaft door lock. An active sensor part, which essentially comprises a transmitter and receiver, is disposed at the lift cage. The
15 transmitter emits an electromagnetic field. If the active part and the passive part are disposed in a specific predefined setting relative to one another then the electromagnetic field interacts with the RFID tag. In that case the RFID tag receives electromagnetic energy and transmits back an identification signal. A unique identification can be assigned to each of the shaft doors. The contactlessly operating sensor means can thus recognise
20 whether an identification signal is received, from which it can be concluded that the shaft door lock is closed, since only in this case does the interaction between transmitter, RFID tag and receiver come into being. Moreover, the respective shaft door can be uniquely recognised by way of the identification. If, for example, problems with the shaft door lock should result in the case of one of the shaft doors, then the shaft door concerned can be
25 identified and thereby ensure that a service engineer can more quickly localise the location subject to a problem. This is of significance particularly in the case of large buildings with numerous storeys.

A further form of embodiment is distinguished by the fact that a magnetic element as
30 passive sensor part is provided in the region of the shaft door lock to be monitored. A magnetic sensor, which serves as active sensor part, is disposed at the lift cage or preferably at the cage door. The arrangement and sensitivity have to be so selected that the magnetic field emanating from the magnetic element is detectable by the magnetic sensor when the lift cage is disposed in the region behind the shaft door and the shaft door
35 lock is locked.

As alternatives, sensor means based on ultrasound or radio frequency can also be used. It is also possible to use inductively or capacitively operating sensor means. In the case of a capacitively operating sensor means the arrangement can be so selected that in the
5 presence of the locked shaft door lock a disturbance of an electromagnetic field results in the vicinity of the active sensor part. Such a disturbance can be made detectable by, for example, tuning of an oscillator circuit.

In order to achieve additional safety, there can be used, instead of only one contactlessly
10 operating sensor means per shaft door lock, also a second contactlessly operating sensor means.

A further form of embodiment of the invention is distinguished by the fact that there is provided a shaft door lock securing means which serves the purpose of mechanically
15 locking the shaft door lock in order to prevent unintended opening of the shaft door lock and thus of the shaft door. The shaft door lock securing means is constructed so that it can be activated from the lift cage. The lock setting of the shaft door lock can be secured by, for example, a suitable pin in such a manner that the shaft door lock cannot be unlocked as long as this pin is in a securing position. A permanent monitoring of the shaft
20 doors is thus no longer necessary if it is possible to rely on the fact that the shaft door has been securely closed, locked and secured by the shaft door lock securing means.

In a first form of embodiment the shaft door lock securing means is mechanically unlocked from the lift cage when the lift cage approaches a storey at which the lift cage stops. An
25 example for mechanical unlocking of the shaft door lock securing means is shown in Fig. 5. The lift cage 62 carries a cage door 65 to which an unlocking cam 63 is fastened. This unlocking cam is seated on a fastening means 61 which is so constructed that the unlocking cam 63 during normal travel of the lift cage 62 can be retracted. This is necessary so as to prevent the unlocking cam from colliding with the shaft door lock
30 securing means 64 during travel past a shaft door. When the lift cage 62 approaches a destination storey then the unlocking cam 63 is moved out by enlarging the spacing from the cage door 65. As shown in Fig. 5, the shaft door lock securing means 64 has a recess 66. The profile of the unlocking cam 63 is so selected that the upper free end of the unlocking cam 63 engages in the recess 66 of the shaft door lock securing means 64 (this
35 initial state is shown in Fig. 5) while the cage 62 executes a small upward movement (if the

cage 62 approaches the storey from below) in order to then come to rest at the level of the storey. While the lift cage 62 covers the last few centimetres of travel the shaft door lock securing means 64 slides along the unlocking cam 63 and follows the profile thereof. A movement of the shaft door lock securing means 64 away from the shaft door towards the
5 cage door 65 thereby results. This movement is sufficient to unlock the shaft door lock, which is not shown in Fig. 5. As soon as the shaft door lock securing means 64 is unlocked, the shaft door lock can be unlocked by spreading of the entraining blades and the shaft door opened. If the lift cage 62 leaves the storey after the leaf of the shaft door has reached its closed setting and the shaft door lock is in locking setting, then the shaft
10 door lock securing means 64 is pushed by the unlocking cam 63 back in direction of the shaft door in order to there secure shaft door lock.

Numerous other forms of embodiment are conceivable which are suitable for the purpose of activating and deactivating the shaft door lock securing means 64.

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In a further form of embodiment the shaft door lock securing means is unlocked in contactless manner. In this case the shaft door lock securing means can, for example, be unlocked by way of a magnetic field able to be switched on and off. Generation of the magnetic field, for example by a coil on a soft-iron core, takes place from the lift cage.

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A further shaft door locking mechanism 70 according to the invention is shown in Fig. 6. A shaft door lock 78 in closed state (i.e. in locked state) can be seen. The shaft door lock 78 engages by an arm 73 of hook-shaped construction in a lock member 71 and locks the leaf of the shaft door against unintended or unauthorised opening. The lock 78 is so arranged
25 that it can rotate about an axle 72. The shaft door lock 78 is provided with a weight 74 so that the lock 78 automatically detents in the lock member as soon as the leaf of the shaft door has reached its closed setting. If the lift cage now approaches, by the cage door, a storey, then two entraining blades (not shown) mounted at the leaf of the cage door engage between two rollers 80 of a deflecting mechanism. The deflecting mechanism is
30 so designed in the illustrated form of embodiment that one of the rollers 80 is fastened to the leaf of the shaft door and the second roller 80 is fastened directly to the shaft door lock 78. For unlocking the shaft door locking mechanism 70 the two entraining blades are spread apart, whereby these exert a force on the rollers 80 of the deflecting mechanism. Through this force the shaft door lock 78 executes a limited rotational movement about its
35 rotational axle 72 counter to the clockwise sense. The weight 74 of the lock 78 is thereby

raised and the locking relative to the lock member 71 is released. The shaft door can now be opened by the cage door.

The shaft door lock and the shaft door lock securing means are preferably so constructed
5 that in the case of emergency the shaft door can be unlocked from the storey side by a service engineer or by another operative. A special tool can, for example, be provided for this purpose.

According to the invention there is provided a solution which is based on the fact that a
10 method of closing the shaft doors by the cage door or doors is combined with monitoring from the cage which allows recognition whether locking of the shaft door lock has taken place. The invention is based on the fact that the shaft doors are securely closed and locked after each actuation. Thus it is possible to dispense with the usual shaft door contacts and consequently also a large part of the safety circuit.

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In the case of a lift system according to the invention the shaft doors can be opened only by the cage when this is disposed at a corresponding storey behind the shaft doors. However, a shaft door can preferably also be opened by a service engineer when the engineer uses a special tool. The starting point can thus be that a shaft door is only open
20 or can be opened when either a lift cage is located behind the corresponding shaft door or when an appropriately trained service engineer is present.

With the device according to the invention it cannot be monitored whether a service engineer or another person has opened the shaft door by a special tool. In the case of
25 previous systems a contact was opened by opening of the shaft door lock and the safety circuit interrupted. According to the invention such a contact is no longer provided.

In a further form of embodiment of the invention a sensor can be used which makes it possible to monitor whether a shaft door was opened by a special tool. A sensor of that
30 kind is of lesser need, since opening by a special tool takes place only rarely. Moreover, such a sensor can be so constructed that it is less susceptible to distortion, displacement, wear, etc.

Patent claims

1. Lift installation comprising a lift cage (12; 62) which has a cage door (13; 53) and is arranged in a lift shaft (10) to be vertically movable, at least one shaft door (11; 41; 51) by which access to the lift shaft (10) is closable and which has at least one door leaf, an automatically locking shaft door lock (18; 28; 78) for locking the door leaf of the shaft door (11; 41; 51) when the door leaf is in its closed setting, wherein the shaft door leaf (18; 28; 78) can be unlocked by the lift cage (12; 62), and a lift control (16), characterised in that the lift installation comprises contactless sensor means (15, 19; 54, 55, 59) enabling recognition from the lift cage (12; 62) whether the shaft door lock (18; 28; 78) and the door leaf of the shaft door (11; 41; 51) are disposed in the correct locked setting thereof, wherein this sensor means (15, 19; 54, 55, 59) is connectible with the lift control (16) and/or with a separate safety monitoring system.
2. Lift installation according to claim 1, characterised in that a shaft door lock securing means (64) is provided, which serves the purpose of mechanically securing the shaft door lock (18; 28; 78) in order to prevent opening of the shaft door (11; 41; 51), wherein the shaft door lock securing means (64) is mechanically or electromagnetically activatable from the lift cage (12; 62).
3. Lift installation according to claim 1 or 2, characterised in that the contactless sensor means comprises an active sensor part (15) and a passive sensor part (19), wherein the active sensor part (15) is arranged at the lift cage (12; 62), preferably at the cage door (13; 53), and the passive sensor part (19) is arranged in the region of the shaft door lock (18; 28; 78) to be monitored.
4. Lift installation according to claim 3, characterised in that the active sensor part (15) can interact with the passive sensor part (19) as soon as the lift cage (12; 62) stops behind the shaft door (11; 41; 51) to be monitored and the door leaf of the shaft door (11; 41; 51) together with the shaft door lock (18; 28; 78) to be monitored are disposed in the correct locked setting thereof.
5. Lift installation according to claim 3 or 4, characterised in that the active sensor part (15) can transiently interact with the passive sensor part (19) when the lift cage (12; 62) moves past a shaft door (11; 41; 51) to be monitored and the door leaf of the shaft

door (11; 41; 51) together with the shaft door lock (18; 28; 78) to be monitored are disposed in the correct locked setting thereof.

6. Monitoring system for a lift installation, wherein the lift installation comprises a lift
5 cage (12; 62), which is arranged in the lift shaft (10) and is vertically movable, with a cage
door (13; 53), the lift installation comprises at least one shaft door (11; 41; 51) with at least
one door leaf, by which access to the lift shaft (10) is closable, the shaft door (11; 41; 51)
comprises an automatically locking shaft door lock (18; 28; 78) for locking the door leaf in
a closed setting, the shaft door lock can be unlocked by the lift cage (12; 62) and the lift
10 installation includes a lift control (16), characterised in that the monitoring system
comprises a contactless sensor means (15, 19; 54, 55, 59) enabling recognition from the
lift cage (12; 62) whether the shaft door lock (18; 28; 78) and the door leaf of the shaft door
(11; 41; 51) are disposed in the correct locked setting thereof, wherein this sensor means
(15, 19; 54, 55, 59) is connectible with the lift control (16) and/or with a separate safety
15 monitoring system.

7. Monitoring system according to claim 6, characterised in that the contactless
sensor means comprises an active sensor part (15) and a passive sensor part (19),
wherein the active sensor part (15) is fastenable to the lift cage (12; 62), preferably to the
20 cage door (13; 53), and the passive sensor part (19) is fastenable in the region of the shaft
door lock (18; 28; 78) to be monitored.

8. Monitoring system according to claim 6, characterised in that the active sensor part
(15) and the passive sensor part (19) are so designed that the active sensor part (15) can
25 interact with the passive sensor part (19) as soon as the lift cage (12; 62) stops behind the
shaft door (11; 41; 51) to be monitored, the door leaf of the shaft door (11; 41; 51) is
disposed in its closed setting and the shaft door lock 18; 28; 78) to be monitored is in
locked setting.

30 9. Shaft door lock (18; 28; 78) for use in a lift installation, wherein the lift installation
comprises a lift cage (12; 62), which is arranged in the lift shaft (10) and is vertically
movable, with a cage door (13; 53), the lift installation comprises at least one shaft door
(11; 41; 51) with at least one door leaf, by which access to the lift shaft (10) is closable, the
shaft door lock (18; 28; 78) is an automatically locking shaft door lock (18; 28; 78) for
35 locking the door leaf of the shaft door (11; 41; 51) and is so designed that it can be

mechanically unlocked by the lift cage (12; 62) and the lift installation includes a lift control (16), characterised in that the shaft door lock (18; 28; 78) is provided with a passive sensor means (19) which is designed for the purpose of contactlessly interacting with an active sensor part (15) when the lift cage (12; 62) is disposed in the region of the shaft door (11; 41; 51).

10. Shaft door lock (18; 28; 78) according to claim 9, characterised in that a shaft door lock securing means (64) is provided at the shaft door lock (18; 28; 78) and serves the purpose of mechanically securing the shaft door lock (18; 28; 78) in order to prevent opening of the shaft door (11; 41; 51), wherein the shaft door lock securing means (64) is mechanically or electromagnetically activatable from the lift cage (12; 62).