Patent claims

1. Switching device (4) for a lift door (2), for providing a door contact signal (S), the switching device (4) comprising a detection space (DR), a plurality of proximity sensors (22a, 22b; 22c, 22d), wherein the proximity sensors (22a, 22c; 22b, 22d) are arranged to adjoin the detection space (DR), and a magnet (20) movable in the detection space (DR), wherein in at least one setting of the magnet (20) in the detection space (DR) a sensor signal (24a, 24b, 24c, 24d) generated by this magnet (20) can be produced by each of the proximity sensors (22a, 22b, 22c, 22d) in order to provide compensation, on the basis of evaluation of the sensor signals (24a, 24b, 24c, 24d), for faulty settings of the magnet (20) in the detection space (DR), wherein the sensor signals (24a, 24b, 24c, 24d) are dependent on the spacing of the magnet (20) from the proximity sensors (22a, 22b, 22c, 22d).

2. Switching device (4) according to claim 1, wherein the proximity sensors (22a, 22b, 22c, 22d) are formed by Hall sensors.

3. Switching device (4) according to one of the preceding claims, wherein the proximity sensors (22a, 22b) are arranged substantially on one side of an axis (B) of movement of the magnet (20).

4. Switching device (4) according to any one of the preceding claims, wherein the proximity sensors (22a, 22c) are arranged substantially on both sides of an axis (B) of movement of the magnet (20).

5. Switching device (4) according to any one of the preceding claims, wherein the switching device (4) comprises two proximity sensors (22a, 22b) or three proximity sensors (22a, 22b, 22c, 22d).

6. Switching device (4) according to any one of the preceding claims, with an evaluating unit (26) which is so constructed that by means of evaluation of all sensor signals (24a, 24b, 24c, 24d) a door contact is switched when a predetermined depth of penetration (ET*) of the magnet (20) into the detection space (DR) takes place.

7. Switching device (4) according to claim 6, wherein the evaluating unit (26) is so constructed that reference signal values (25a, 25b, 25c), which are signal values of the sensor signals (24a, 24b, 24c) produced in a reference setting of the magnet (20), can be stored in the evaluating unit (26) and the reference signal values (25a, 25b, 25c) can be compared with the signal values of the sensor signals (24a, 24b, 24c) produced in an instantaneous setting of the magnet (20).

8. Switching device (4) according to one of claims 6 and 7, wherein a minimum value (M) can be stored in the evaluating unit (26) and the evaluating unit (26) can be so constructed that the door contact is switched only when the signal values (24a, 24b, 24c) exceed the minimum value (M).

9. Switching device (4) according to any one of the preceding claims, comprising a self-testing unit (28.1, 28.2), which produces magnetic pulses and which so acts on at least one of the proximity sensors (22a, 22c; 22b, 22d) that a signal value (24a, 24b, 24c, 24d) is produced by means of such a pulse.

10. Method of providing a door contact signal (S), wherein the method is performed by means of a switching device (4), which comprises a magnet (20), a plurality of proximity sensors (22a, 22c; 22b, 22d) and a detection space (DR), and the proximity sensors (22a, 22c; 22b, 22d) are arranged at the detection space (DR), comprising the following method steps:
producing a first signal (24a), which is dependent on a spacing of the magnet (20) from a first one of the proximity sensors (22a), in a setting of the magnet (20) in the detection space (DR), and
producing a second sensor signal (24c), which is dependent on a spacing of the magnet (20) from a second one of the proximity sensors (22c), in the same setting of the magnet (20) in the detection space (DR),
wherein the method is provided for compensation for faulty settings of the magnet (20) in the detection space (DR).

11. Method according to claim 10 with the following further method steps:
evaluating the first and second sensor signals (24a, 24c) by means of an evaluating unit (26) of the switching device (4) and
switching a door contact in the case of a predetermined depth (ET*) of penetration of the

magnet (20) into the detection space (DR).

12. Method according to claim 11, wherein a depth (ET) of penetration of the magnet (20) into the detection space (DR) is determined on the basis of the evaluation.

13. Method according to one of claims 11 and 12, with the following additional method steps:
determining a first reference signal value (25a) of the first sensor signal (24a) in a reference setting of the magnet (20),
determining a second reference signal value (25b) of the second sensor signal (24b) in the reference setting of the magnet (20),
storing the first and second reference signal values (25a, 25b) in the evaluating unit (26),
comparing the reference signal values (25a, 25b) with the signal values, which can be assigned to an instantaneous setting of the magnet (20), of the sensor signals (24a, 24b) and
issuing an adjustment request signal in the case of an excessive departure, which is recognised on the basis of the comparison of the reference signal values (25a, 25b) with the signal values able to be assigned to the instantaneous setting of the magnet (20), of the reference setting from the instantaneous setting of the magnet (20).

14. Lift door (2) with a switching device (4) according to any one of claims 1 to 9.

15. Lift door (2) according to claim 14, the lift door (2) comprising a locking device (10) which comprises two components (14, 16) to be locked relative to one another, wherein the components (14, 16) to be locked relative to one another are preferably a catch (16) and a stop (14), or the lift door (2) comprising at least two components (6, 6.1, 6.2, 8) movable relative to one another, wherein the at least two components movable relative to one another are at least one door leaf (6, 6.1, 6.2) and a door surround (8), wherein the proximity sensors (22a, 22b, 22c, 22d) are fastened to a first one of the components (14, 16, 6, 6.1, 6.2, 8) and the magnet (20) is fastened to a second one of the components (14, 16, 6, 6.1, 6.2, 8).

Patent claims

1. Switching device (4) for a lift door (2), for providing a door contact signal (S), the switching device (4) comprising a detection space (DR), a plurality of proximity sensors (22a, 22b; 22c, 22d), wherein the proximity sensors (22a, 22c; 22b, 22d) are arranged to adjoin the detection space (DR), and a magnet (20) movable in the detection space (DR), wherein in at least one setting of the magnet (20) in the detection space (DR) a sensor signal (24a, 24b, 24c, 24d) generated by this magnet (20) can be produced by each of the proximity sensors (22a, 22b, 22c, 22d) in order to provide compensation, on the basis of evaluation of the sensor signals (24a, 24b, 24c, 24d), for faulty settings of the magnet (20) in the detection space (DR), wherein the sensor signals (24a, 24b, 24c, 24d) are dependent on the spacing of the magnet (20) from the proximity sensors (22a, 22b, 22c, 22d) and an evaluating unit (26) which is so constructed that by means of evaluation of all sensor signals (24a, 24b, 24c, 24d) a door contact is switched when a predetermined depth of penetration (ET*) of the magnet (20) into the detection space (DR) takes place.

2. Switching device (4) according to claim 1, wherein the proximity sensors (22a, 22b, 22c, 22d) are formed by Hall sensors.

3. Switching device (4) according to one of the preceding claims, wherein the proximity sensors (22a, 22b) are arranged substantially on one side of an axis (B) of movement of the magnet (20).

4. Switching device (4) according to any one of the preceding claims, wherein the proximity sensors (22a, 22c) are arranged substantially on both sides of an axis (B) of movement of the magnet (20).

5. Switching device (4) according to any one of the preceding claims, wherein the switching device (4) comprises two proximity sensors (22a, 22b) or three proximity sensors (22a, 22b, 22c, 22d).

6. Switching device (4) according to claim 1, wherein the evaluating unit (26) is so constructed that reference signal values (25a, 25b, 25c), which are signal values of the sensor signals (24a, 24b, 24c) produced in a reference setting of the magnet (20), can be stored in the evaluating unit (26) and the reference signal values (25a, 25b, 25c) can be

compared with the signal values of the sensor signals (24a, 24b, 24c) produced in an instantaneous setting of the magnet (20).

7. Switching device (4) according to one of claims 1 and 6, wherein a minimum value (M) can be stored in the evaluating unit (26) and the evaluating unit (26) can be so constructed that the door contact is switched only when the signal values (24a, 24b, 24c) exceed the minimum value (M).

8. Switching device (4) according to any one of the preceding claims, comprising a self-testing unit (28.1, 28.2), which produces magnetic pulses and which so acts on at least one of the proximity sensors (22a, 22c; 22b, 22d) that a signal value (24a, 24b, 24c, 24d) is produced by means of such a pulse.

9. Method of providing a door contact signal (S), wherein the method is performed by means of a switching device (4), which comprises a magnet (20), a plurality of proximity sensors (22a, 22c; 22b, 22d) and a detection space (DR), and the proximity sensors (22a, 22c; 22b, 22d) are arranged at the detection space (DR), comprising the following method steps:
producing a first signal (24a), which is dependent on a spacing of the magnet (20) from a first one of the proximity sensors (22a), in a setting of the magnet (20) in the detection space (DR),
producing a second sensor signal (24c), which is dependent on a spacing of the magnet (20) from a second one of the proximity sensors (22c), in the same setting of the magnet (20) in the detection space (DR), and evaluating the first and second sensor signals (24a, 24c) by means of an evaluating unit (26) of the switching device (4) and
switching a door contact in the case of a predetermined depth (ET*) of penetration of the magnet (20) into the detection space (DR),wherein the method is provided for compensation for faulty settings of the magnet (20) in the detection space (DR).

10 . Method according to claim 9 , wherein a depth (ET) of penetration of the magnet (20) into the detection space (DR) is determined on the basis of the evaluation.

11. Method according to one of claims 9 and 10, with the following additional method steps:
determining a first reference signal value (25a) of the first sensor signal (24a) in a

reference setting of the magnet (20),

determining a second reference signal value (25b) of the second sensor signal (24b) in the reference setting of the magnet (20),

storing the first and second reference signal values (25a, 25b) in the evaluating unit (26),

comparing the reference signal values (25a, 25b) with the signal values, which can be assigned to an instantaneous setting of the magnet (20), of the sensor signals (24a, 24b) and

issuing an adjustment request signal in the case of an excessive departure, which is recognised on the basis of the comparison of the reference signal values (25a, 25b) with the signal values able to be assigned to the instantaneous setting of the magnet (20), of the reference setting from the instantaneous setting of the magnet (20).

12 . Lift door (2) with a switching device (4) according to any one of claims 1 to 8 .

13. Lift door (2) according to claim 12 , the lift door (2) comprising a locking device (10) which comprises two components (14, 16) to be locked relative to one another, wherein the components (14, 16) to be locked relative to one another are preferably a catch (16) and a stop (14), or the lift door (2) comprising at least two components (6, 6.1, 6.2, 8) movable relative to one another, wherein the at least two components movable relative to one another are at least one door leaf (6, 6.1, 6.2) and a door surround (8), wherein the proximity sensors (22a, 22b, 22c, 22d) are fastened to a first one of the components (14, 16, 6, 6.1, 6.2, 8) and the magnet (20) is fastened to a second one of the components (14, 16, 6, 6.1, 6.2, 8).