

MODULE HAVING TERMINALS FOR ACTUATORS AND/OR SENSORS

[0001] The invention relates to a module having terminals for actuators and/or sensors, in accordance with the preamble of Claim 1.

[0002] DE 196 30 352 C2 has already disclosed a module of this kind. The known module is made up of a lower part and an upper housing part having a circuit board arranged in the interior. The upper housing part is embodied in substantially cuboidal fashion and comprises an upper side, lower side, and peripherally two longitudinal sides as well as two end faces. Terminals for actuators and/or sensors are arranged on the upper side. They are embodied as plug terminals and/or screw terminals, and are connected to the circuit board located in the upper housing part. Contacting pins of a contacting device are soldered onto the circuit board. They project with their tips out of the lower side.

[0003] The lower part comprises an upper side, adapted in its dimensions to the lower side, having recesses for the reception of two shape-coded ribbon cables that can be embodied, for example, as bus conductors or control conductors.

[0004] For accurate guidance of the upper housing part into an initial fastening position in which the contact pins face exactly, with their tips, toward the conductor strands of ribbon cables placed into the lower part, on the one hand pivoting means, as well as positioning lugs having corresponding receptacles in the region of the receptacles for the ribbon cables, are provided on the end face of the upper housing part and of the lower part. From the initial fastening position, the upper housing part can be connected centrally in the contact region, via a **[word missing]**, to the lower part, and through-contacting of shape-coded ribbon cables placed into the lower part with the contact pins can be ensured.

[0005] Proceeding from this existing art, the object of the invention is to describe a module, having terminals for actuators and/or sensors, with an alternative and simple capability for guiding the upper housing part into its initial fastening position.

[0006] The invention achieves the object by way of a module having terminals for actuators and/or sensors, having the features of Claim 1. This module comprises guidance means coacting with the longitudinal sides of the upper housing part. The

advantage achieved thereby is that the upper housing part can be guided particularly easily onto the lower part and into the initial fastening position for fastening of the two module parts. In addition, the advantage is achieved that with this type of guidance, the upper housing part is aligned onto the lower part in the transverse direction of the module. Further advantageous embodiments of the invention are indicated in the dependent claims.

[0007] In order to minimize tolerances of the upper housing part with respect to the lower part in the transverse direction in the initial fastening position, an advantageous refinement of the invention provides that the guidance means are configured in such a way that they are suitable for peripheral clamping of the upper housing part. This is very easy if the side walls of the lower part function as guidance means for the upper housing part. Exact alignment of the upper housing part in the longitudinal direction can be achieved by way of grooves and/or stop elements mounted on the longitudinal sides or side walls.

[0008] The upper housing part comprises, in addition to its longitudinal sides and end faces, an upper side, adjacent thereto, having the terminals for the actuators and/or sensors, and a lower side. In the case of actuators and/or sensor already connected to the terminals, additionally changing of the ribbon cables is often necessary. Provision is therefore made that the upper housing part can be moved into an installation position in which access is provided to inserted ribbon cables. According to the known existing art, the module can be guided into the installation position by pivoting up the upper housing part. Pivoting up the lower part is, however, often unfavorable for space reasons. If the module is installed on a wall, for example, the pivoting-up angle is limited by the actuators and/or sensors, with their cables, connected on the upper side. When swung up, they strike against the wall and in that context may be damaged.

[0009] An advantageous refinement therefore provides that the guidance means are embodied, on the upper housing part and/or the lower part, in such a way that the upper housing part is guidable out of the initial fastening position into the installation position, and guidable back, by way of a transversal motion. When, according to this embodiment, the upper housing part is guided from the initial fastening position via a transversal motion into the installation position, the connected sensors do not impede

this operation. In the simplest case, the transversal motion can be implemented by displacing the upper housing part with respect to the lower part.

[0010] For controlled guidance of the upper housing part into the initial fastening position from which the upper housing part can be fastened onto the lower part, provision is made in a refinement according to the present invention that at least one guidance groove is provided on each of the two longitudinal sides of the upper housing part, and at least one guidance peg facing toward to the opposite side wall is provided on each of the two side walls of the lower part, as guidance means. With this refinement, the upper housing part coacts with the lower part in such a way that the guidance pegs engage into the guidance grooves. The upper housing part is thereby secured transversely to the course of the guidance grooves. This advantage also exists when the upper housing part is guided from the initial fastening position into the installation position, in which shape-coded ribbon cables can be placed into the recesses provided in the base of the lower part, or those already in place can be replaced with others.

[0011] In order also to secure the upper housing part against any displacement in the direction in which the groove extends, a refining configuration of the invention provides that the guidance grooves each comprise at least one detent position for detent engagement of the guidance pegs guided therein. The detent position can be embodied, for example, by way of a depression, positively fitting with respect to the guidance pegs, within the guidance grooves. The detent engagement allows the upper housing part to be held in the installation position independently of the spatial alignment of the module, so that an installer can, with both hands, replace shape-coded ribbon cables already placed into the lower part.

[0012] A further refinement according to the present invention provides that the guidance groove has two detent positions. The result of this is that the upper housing part and the lower part are joined in lossproof fashion to one another as soon as the guidance pegs engage into the guidance grooves. It is advantageous in this context to arrange the detent positions in such a way that they immobilize the upper housing part with respect to the lower part in the initial fastening position and in the installation position.

[0013] Usefully, a respective insertion groove leading to the guidance groove and proceeding from the edge of the respective side wall is provided on the two side walls of the upper housing part.

[0014] To ensure that stable and tiltproof guidance of the upper housing part is achieved, at least two guidance grooves, arranged parallel to one another, are provided on each of the two longitudinal sides of the upper housing part, two guidance pegs associated with the guidance grooves being embodied on each of the two side walls of the lower part. As an alternative thereto, however, it is also conceivable to provide a single guidance groove as guidance means, and instead of a guidance peg of round configuration to provide a guidance element that is elongated in cross section.

[0015] An advantageous refinement provides that the two guidance grooves arranged parallel to one another are connected to one another by a connecting groove. Guidance pegs can be guided from one guidance groove into the other by way of the connecting groove, so that the location of the upper housing part with respect to the lower part can be modified.

[0016] In order to enable rapid fastening of the module to a support rail arranged, for example, in an electrical cabinet, a particular embodiment of the invention provides that a cut-out area is provided in the base of the lower part, a support rail being receivable, with its retaining segments, via a segment of the edge region adjacent to said area.

[0017] LIST OF REFERENCE CHARACTERS

Upper housing part	1
Lower part	2
Module	3
Upper side	4
Longitudinal sides	5
End faces	6
Terminals	7
Shape-coded ribbon cables	8
Conductors	8.1

Side walls	9
Base	10
Guidance means	11, 12
Guidance pegs	11
Front guidance peg	11.1
Rear guidance peg	11.2
Guidance grooves	12
Upper guidance groove	12.1
Lower guidance groove	12.2
Fastening means	13, 14
Locking lever	13
Locking peg	14
Handle	15
Guidance segment	16
Contact region	17
Upper housing part end	18
Insertion groove	19
Front guidance peg [sic]	19.1
Rear insertion groove	19.2
Connecting groove	21
Detent position	23
Cut-out area	27
Adjacent edge region	29
Support rail	31
Retaining segments	33
Spring	35
Overlay spring	36
Receiving insert	37
Recess	38
Aperture	39
First narrow side	40
Retaining lug	41

Second narrow side	42
Spring element	43
Receiving region	45
Installation orifice	47
Grounding contact	49

[0018] The module according to the present invention is described below in an exemplifying embodiment and depicted graphically. In the drawings:

[0019] FIG. 1 shows, in perspective, a module according to the present invention having an upper housing part and a lower part, in the closed state;

[0020] FIG. 2 shows the module of FIG. 1 in the initial fastening position;

[0021] FIG. 3 shows the module of FIG. 1 in the installation position;

[0022] FIG. 4 shows the upper housing part of the module of FIG. 1, with guidance grooves embodied on its longitudinal sides;

[0023] FIG. 5 shows the lower part of the module of FIG. 1, with a receiving insert, installed on its base, having recesses into which shape-coded conductors are placed;

[0024] FIG. 6 shows the lower part of FIG. 5 in a depiction rotated with respect thereto, with a view of the base without a receiving insert;

[0025] FIG. 7 is a perspective depiction of a receiving insert having recesses for the reception of shape-coded ribbon cables;

[0026] FIGS. 8a and 8b are front views of the receiving insert of FIG. 7; and

[0027] FIG. 9 shows the lower part of the module of FIG. 1, with a support rail received.

[0028] FIG. 1 shows a module 3, assembled from an upper housing part 1 and a lower part 2, in the installed and closed state. Upper housing part 1 is preferably embodied cuboidally, and comprises an upper side 4, a lower side arranged parallel thereto and not depicted, and peripherally two longitudinal sides 5 and two end faces 6. Terminals 7 for plug connectors of actuators and/or sensors are arranged on upper side 4. These terminals 7 are connected in known fashion, via a circuit board (not depicted)

received in upper housing part 1, to contact pins of a contact device that project out of the lower side. When module 3 is in the closed state as shown in FIG. 1, the contact tips penetrate through at least partially into shape-coded ribbon cables 8 placed into lower part 2, and thereby ensure an electrical contact between terminals 7 and conductors 8.1 of shape-coded ribbon cables 8.

[0029] Longitudinal sides 5 of upper housing part 1 are embodied as guidance means 11, 12 by way of which upper housing part 1 is guidable from an installation position according to FIG. 3 for changing ribbon cables 8, into an initial fastening position shown in FIG. 2. From the initial fastening position according to FIG. 2, upper housing part 1 is fastenable onto lower part 2, with its fastening means 13, 14 arranged thereon, directly, i.e. without an intermediate installation step. This is achieved by mutually aligning upper housing part 1 with respect to lower part 2 and fastening means 13, 14. For alignment of upper housing part 1 with respect to lower part 2 in the transverse direction, lower part 2 as shown in FIG. 5 comprises two side walls 9. The vertical spacing of side walls 9 with respect to one another is preferably selected to be somewhat smaller than the width of upper housing part 1, so that the latter is received in clamping fashion and no clearance exists in the transverse direction.

[0030] As is evident from FIGS. 5 and 6, lower part 2 is constituted in the manner of a receiving chamber open at the end faces and having a base 10, a respective front guidance peg 11.1 and rear guidance peg 11.2 being provided on side walls 9 of said chamber. Guidance pegs 11.1, 11.2 each face toward the opposite side wall 9, and are arranged at different heights with reference to base 10. Guidance pegs 11.1, 11.2 constitute a first part of guidance means 11, 12 for controlled guidance of upper housing part 1 into the initial fastening position according to FIG. 2.

[0031] As a second part of guidance means 11, 12, guidance grooves 12 are provided on longitudinal sides 5 of upper housing part 1. The width of guidance grooves 12 is adapted to the diameter of guidance pegs 11. With module 3 in the assembled state as shown in FIGS. 1 to 3, guidance pegs 11 engage into guidance grooves 12. As a result of the coaction of guidance grooves 12 and guidance pegs 11, upper housing part 1 can be displaced relative to lower part 2, by way of a transversal

motion, between the initial fastening position shown in FIG. 2 and the installation position according to FIG. 3.

[0032] Guidance grooves 12 extend obliquely with respect to upper side 4 and the lower side of upper housing part 1. In the initial fastening position according to FIG. 2, upper housing part 1 is correspondingly arranged tiltedly with respect to base 10 of lower part 2, the spacing between base 10 and upper housing part 1 being maximal at upper housing part end 18 that is arranged in the contact region.

[0033] A locking lever 13 supported on longitudinal sides 5, and locking pegs 14 mounted on side walls 9, are arranged in contact region 17 of module 3 as fastening means 13, 14. Locking lever 13 comprises a handle 15 and a guidance segment 16 embodied in a curved shape.

[0034] For the transfer of module 3 from its initial fastening position as shown in FIG. 2 into its closed state according to FIG. 1, locking lever 13 is moved with its handle 15 toward terminals 7. At the beginning of this motion, the curve-shaped guidance segment 16 firstly surrounds locking pegs 14. As handle 15 is guided farther in the direction of terminals 7, the curve-shaped guidance segment 16 presses with its lower edge onto locking pegs 14, with the result that upper housing part 1 is pulled toward base 10 of lower part 2. In the context of this downward motion toward base 10, upper housing part 1 is pivoted about at least two guidance pegs 11 located opposite one another on the two side walls 9.

[0035] Alternatively to the embodiment described above, the locking lever can also be installed with a 180-degree rotation. Handle 15 must then be guided toward upper housing part end 18 in order to transfer the module from the initial fastening position according to FIG. 2 into the closed state according to FIG. 1.

[0036] As is evident from FIG. 4, an upper guidance groove 12.1 and a lower guidance groove 12.2 are arranged on each longitudinal side 5 of upper housing part 1. Lower guidance groove 12.2 is connected at its two end regions respectively to a rear insertion groove 19.2 proceeding from the lower edge of longitudinal side 5, and to a front insertion groove 19.1, while a connecting groove 21 opens from lower guidance groove 12.2 into upper guidance groove 12.1

[0037] The two insertion grooves 19.1, 19.2 and the two guidance pegs 11.1, 11.2 embodied on side walls 9 of lower part 2 respectively have the same spacing from one another in the longitudinal direction of module 3. The vertical spacing between front guidance peg 11.1 and rear guidance peg 11.2 with reference to base 10 corresponds to the vertical spacing between the two guidance grooves 12.1, 12.2 with reference to upper side 4 of upper housing part 1.

[0038] The result of the above-described coordination of the spatial arrangement of guidance pegs 11.1, 11.2 and grooves 12.1, 12.2, 19.2, 21 is that upper housing part 1 can be shifted by way of its insertion grooves 19.1, 19.2 onto guidance pegs 11.1, 11.2, such that front guidance pegs 11.1 can be guided via lower insertion grooves 12.2 and connecting grooves 21 into upper guidance grooves 12.1. Rear guidance pegs 11.2 can be guided only into lower guidance grooves 12.2.

[0039] The groove depth of connecting groove 21 and of insertion groove 19 is less than that of guidance grooves 12 so that the guidance walls of guidance grooves 12 are not broken through; this ensures secure guidance of upper housing part 1 via guidance pegs 11. In order to ensure immobilization of upper housing part 1 in the initial fastening position and in the installation position, guidance grooves 12 have in their course detent positions 23 corresponding to the aforesaid positions. Detent positions 23 are provided as indentations into guidance grooves 12, the diameter of which preferably corresponds to that of guidance pegs 11.

[0040] FIG. 6 shows lower part 2 separately, without upper housing part 1 in place and without a receiving insert 25, embodied as a loose part, for the reception of shape-coded ribbon cables 8. Lower part 2 is made at least for the most part from conductive metal. Base 10 encompasses a cut-out area 27 whose adjacent edge region 29 is dimensioned and shaped such that a support rail 31 can be received with its retaining segments 33 (see FIG. 9). For clamping of support rail 31, lower part 2 comprises a spring 35 onto which an overlay spring 36 is preferably mounted in order to intensify its holding force. It is attached to base 10, and configured, in such a way that it extends in a longitudinal direction over most of the cut-out area 27, and clamps, at its retaining segments 33, a support rail 31 received by lower part 2. Spring 35 preferably overlaps a received support rail 31 in the latter's transverse direction in such a way that the force of

spring 35 acts on retaining segment 33 of support rail 31, and longitudinally with respect to lower part 2 in the direction of guidance pegs 11.

[0041] Lower part 2 comprises apertures 39 for immobilization of a receiving insert 37 (depicted in FIG. 7) having recesses 38 for the reception of shape-coded ribbon cables 8. Said apertures are arranged asymmetrically with respect to a notional plane of symmetry between the two side walls 9. Corresponding to apertures 39, receiving insert 37 encompasses retaining lugs 41 only on a first narrow side 40 at its four corners, and a spring element 43 arranged on the second narrow side 42 located opposite thereto. Retaining lugs 41 and spring element 43 are arranged in such a way that receiving insert 37 can be inserted in two positions, rotated 180° from one another about its longitudinal axis, into lower part 2. Because of the above-described asymmetric arrangement of retaining lugs 41, spring element 43, and the corresponding apertures 39, receiving insert 37 cannot be inserted into lower part 2 in two positions rotated 180° from one another about its transverse axis. The result of the above-described arrangements of retaining lugs 41 and of spring element 43 is that only two positions exist for the insertion of receiving insert 37, and a coding exists.

[0042] FIG. 8a depicts receiving insert 37 with shape-coded ribbon cables 8 placed into recesses 38, and FIG. 8b shows the same receiving insert 37 in the same view, rotated 180°. Receiving insert 37 with its recesses 38 is configured in such a way that in the two positions according to FIGS. 8a and 8b, shape-coded ribbon cables 8 can be respectively placed into the upward-facing recesses 38 only in one position.

[0043] Receiving insert 37 can be used both in module 3 according to the present invention with its specifically configured guidance means 11, 12, and in modules known from the existing art.

[0044] According to the present embodiment, lower part 2 is embodied integrally with spring 35. Said part is made of sheet metal, and was manufactured using a stamping and bending method. As shown in FIG. 6, it comprises a grounding contact 49 in addition to apertures 39 and installation orifices 47. Said contact is preferably tulip-shaped, and bent outward from base 10.

CLAIMS

1. A module (3) having terminals (7) for actuators and/or sensors,

which comprises a lower part (2) having at least one recess (38) for the reception of a shape-coded ribbon cable (8) and

an upper housing part (1), installable onto the lower part (2) via fastening means (13, 14), for reception of a circuit board,

which part comprises peripherally at least two longitudinal sides (5) and two end faces (6) and

is guidable, via guidance means (11, 12) arranged on the upper housing part (1) and/or on the lower part (2), into an initial fastening position for fastening thereof onto the lower part (2), the upper housing part (1) and/or lower part (2) encompassing a contact device having contact pins that, upon fastening of the upper housing part (1) onto the lower part, penetrate at least partially through a shape-coded ribbon cable (8) received in the recess (38) and contact its conductors (8.1),

wherein by way of its longitudinal sides (5), the upper housing part (1) coacts with the guidance means (11, 12) and is guidable into the initial fastening position.
2. The module (3) having terminals (7) for actuators and/or sensors according to Claim 1, wherein the lower part (2) encompasses a base (10) and two side walls (9) arranged opposite one another and embodied at least in subregions as guidance means (11, 12).
3. The module having terminals (7) for actuators and/or sensors according to Claim 2, wherein the lower part (2) forms, with its base (10) and the two side walls (9), a receiving chamber open at the end face.
4. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein the guidance means (11, 12) are configured in such a way that they are suitable for peripheral clamping of the upper housing part (1).

5. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein the guidance means (11, 12) are embodied on the upper housing part (1) and/or on the lower part (2) in such a way that the upper housing part (1) is guidable via a transversal motion.
6. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding Claims 2 to 5, wherein at least one guidance peg (11) is provided as guidance means (11, 12) on each of the two longitudinal sides (5) of the upper housing part (1), at least one guidance groove (12) being arranged on each of the two side walls (9) of the lower part for guidance of the upper housing part (1) via the guidance pegs (11).
7. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims 2 to 5, wherein at least one guidance peg (11) facing toward the oppositely located side wall (9) is arranged as guidance means (11, 12) on each of the two side walls (9) of the lower part (2), at least one guidance groove (12) being provided, for guidance of the upper housing part (1) via the guidance peg (11), on each of its two longitudinal sides (5).
8. The module (3) having terminals (7) for actuators and/or sensors according to Claim 7, wherein an insertion groove (19) leading to the guidance groove (12) and proceeding from the edge of the respective longitudinal side (5) is provided on each of the two longitudinal sides (5) of the upper housing part (1).
9. The module (3) having terminals (7) for actuators and/or sensors according to Claim 8, wherein the groove depth of the insertion groove (19) is less than that of the guidance groove (12).
10. The module (3) having terminals (7) for actuators and/or sensors according to Claim 9, wherein the upper housing part comprises a lower side and an upper side (4), located oppositely thereto, having the terminals (7) for the actuators and/or sensors, wherein the guidance groove (12) extends obliquely with respect to the lower side and/or upper side (4).
11. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims 2 to 10, wherein at least two guidance grooves

(12.1, 12.2) arranged parallel to one another are provided on each of the two longitudinal sides (5) of the upper housing part (1), at least two guidance pegs (11.1, 11.2) associated with the guidance grooves (12.1, 12.2) being embodied on each of the two side walls (9) of the lower part (2).

12. The module (3) having terminals (7) for actuators and/or sensors according to Claim 11, wherein the two guidance grooves (12.1, 12.2) arranged parallel to one another are connected to one another via a connecting groove (21).
13. The module (3) having terminals (7) for actuators and/or sensors according to Claim 12, wherein the connecting groove (21) extends substantially perpendicular to the lower side and/or upper side (4) of the upper housing part (1).
14. The module (3) having terminals (7) for actuators and/or sensors according to Claim 12 or 13, wherein the groove depth of the connecting groove (21) is less than that of the guidance grooves (12.1, 12.2).
15. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims 6 to 14, wherein the guidance groove (12) comprises at least one detent position (23) for detent engagement of the guidance peg (11) guided therein.
16. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims 6 to 15, wherein the guidance pegs (11) are embodied as indentations into the side walls (9).
17. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims,

in which a first portion of the fastening means (13, 14) is provided on the upper housing part (1), and a second portion of the fastening means (13, 14) on the lower part,

wherein the first portion of the fastening means (13, 14) are arranged on the longitudinal sides (5) and/or end faces (6) of the upper housing part (1).

18. The module (3) having terminals (7) for actuators and/or sensors according to Claim 17, wherein the second portion of the fastening means (13, 14) is arranged on the side walls (9) of the lower part (2).
19. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein a pivotably or rotatably supported locking lever (13), as well as one or more locking pegs (14) coacting therewith, are provided as fastening means (13, 14).
20. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein the lower part (2) is made for the most part of metal.
21. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein the lower part (2) is embodied as a stamped and bent part.
22. The module (3) having terminals (7) for actuators and/or sensors according to at least one of the preceding claims, wherein a cut-out area (27) is provided in the base (10) of the lower part (2), a support rail (31) being receivable with its retaining segments (33) via a segment of the edge region (29) adjoining said area.
23. The module (3) having terminals (7) for actuators and/or sensors according to Claim 22, wherein the lower part (2) encompasses a spring (35) for clamping the received support rail (31).
24. The module (3) having terminals (7) for actuators and/or sensors according to Claim 23, wherein the spring (35) clamps the support rail (31) received by the lower part (2) at the retaining segments (33) of said rail.
25. The module (3) having terminals (7) for actuators and/or sensors according to Claim 24, wherein the spring (35) overlaps the received support rail (31) in its transverse direction.