

Description

Device for coding plug-in assemblies, as well as a
device for connection of external lines to such a
5 coding device

The invention relates to a device for coding
plug-in assemblies as claimed in the precharacterizing
clause of claim 1, and to a device for the connection
10 of external lines to such a coding device, as claimed
in the precharacterizing clause of claim 3.

DE 43 23 440 A1 discloses a device for the
connection of external lines to a programmable logic
controller, which is coupled to this controller for
15 signal transmission and can be set up physically
independently of the programmable logic controller. The
connecting device allows a modular design, in which one
connecting point is provided per actuator/sensor
connection and, depending on the respective type of
20 connection, can be provided with an electronic module
for signal matching and conversion. Input and output
modules can in this case be mixed as required. This has
an advantageous effect on configuration, assembly,
installation, fault rectification and upgrading of the
25 electronic appliance. The connecting device at the same
time acts as a mounting unit for the electronic
modules, which are designed as plug-in assemblies, and
has a large number of identical plug-in slots, arranged
at equal distances from one another, for these
30 assemblies. Supply lines and signal lines are in each
case passed to the electronic modules via a plug
connector at the plug-in slot.

Each electronic module includes a signal matching circuit for signals, which are carried on the external lines, of a signal channel. Connecting elements for the connection of external lines are fitted with the same
5 grid spacing as the plug-in slots and are associated with them.

The invention is based on the object of providing a device for coding plug-in assemblies, by means of which, with regard to plug-in slots that are
10 arranged at equal intervals alongside one another, and when two types of plug-in assemblies are being used, which can in each case be plugged in as required alongside plug-in assemblies of the same type, it is possible to prevent the possibility of a plug-in
15 assembly of the one type being inserted into a plug-in slot, located directly adjacent to it, on the one side of a plug-in assembly of the other type. A second object is to provide a device for the connection of external lines, by means of which a greater packing
20 density is achieved while at the same time complying with the requirements for the minimum creepage distance.

In order to achieve the first object, the new device for coding plug-in assemblies of the type
25 mentioned initially has the features specified in the characterizing part of claim 1. Claim 2 describes an advantageous development of this device. A new device for the connection of external lines is provided with the features quoted in claim 3, in order to achieve the
30 second object.

The invention has the advantage that the packing density can be doubled when using electronic modules with a low operating voltage. At the same time,

electronic modules with a low operating voltage can furthermore be mixed in one mounting unit with electronic modules having a higher operating voltage, with compliance with the required minimum creepage distance being ensured in each case. The new device for coding plug-in assemblies means that a specific fitment sequence is necessarily predetermined, which cannot be contravened by the user. This leads to a considerable improvement in fail-safe design.

10 The invention as well as refinements and advantages will be explained in more detail in the following text with reference to the drawings, in which one exemplary embodiment of the invention is illustrated, and in which:

15 Figure 1 shows a mounting unit of a device for the connection of external lines,

Figure 2 shows a perspective view of an uncoded plug-in assembly,

20 Figure 3 shows a side view of the uncoded plug-in assembly shown in Figure 2,

Figure 4 shows a perspective view of a coded plug-in assembly, and

Figure 5 shows a side view of the coded plug-in assembly shown in Figure 4.

25 The mounting unit shown in Figure 1 is a device for the connection of external lines to an automation appliance. The external lines, which, for example, lead to sensors or actuators on a process that is to be controlled,

are connected in the lower part of the electronic appliance to, for example, connecting elements 1...10, which are designed as terminals with operating openings located above them. Plug-in slots 11...18 for electronic modules are arranged in the upper part of the appliance, include a signal matching circuit, and carry out signal preprocessing, which may differ depending on the type of external line. Finally, data transmission to the automation appliance uses a digital interface 19, in which one digital signal is provided per channel. Two connecting terminals are required for each signal channel, and are arranged one above the other. Two signal channels can be operated by one electronic module with a 24 V DC voltage supply. If, for example, a 24 V module is inserted into the plug-in slot 11, then a slide 20 is moved to the "DC" position, and external lines for 24 V sensors or actuators can be connected to a first signal channel by means of the connecting terminals 1 and 2, and to a second signal channel by means of the connecting terminals 3 and 4. In electronic modules with a 230 V AC voltage supply, only one signal channel is operated, and is in this case connected to the right-hand pair of connecting terminals. For the plug-in slots 11, these are the connecting terminals 1 and 2. When fitted with a 230 V module, the slide 20 must be moved to the "AC" position. The minimum creepage distance must be greater than 5.5 mm for lines which are connected to a 230 V module. In order to comply with this requirement, it is necessary to ensure that those connecting terminals which are adjacent to the connecting terminals of the signal channel of an AC module remain unoccupied. If, for example,

a 230 V module is inserted into the plug-in slot 12, then the connecting terminals 5 and 6 are used for connecting its signal channel. The connecting terminals 7 and 8 automatically remain unoccupied, since they are provided for the module in the plug-in slot 12 which, however, with this fit, has no second signal channel. However, it is necessary to ensure that the connecting terminals 3 and 4 also remain free. Thus, no 24 V module which is designed for two signal channels may be inserted immediately to the right alongside a 230 V module, although a single-channel 230 V module may be inserted there. This is prevented by coding on the housing of the electronic modules, which are also called plug-in assemblies. Since the terminals 7 and 8 are actually unoccupied, the plug-in slot 13 may be fitted with a module as required.

Figures 2 and 3 respectively show a perspective view and a side view of an uncoded plug-in assembly. Identical reference symbols are used for identical parts. Its housing 21 essentially extends over the width of one plug-in slot spacing, which is 10.16 mm. A populated printed circuit board 22 is accommodated in the housing 21, and projects out of the housing 21 on the side, such that it can be inserted into guide slots in the mounting unit. For inserting into the mounting unit shown in Figure 1, the assemblies are hooked-in on the upper edge of the mounting unit by means of hinge pins 23 and 24 and are pivoted downward, so that the contact surfaces located on the top of the side edges of the printed circuit board 22 can produce a plug connection to contact springs in the guide slots. In order that an electronic module for a DC voltage supply can be inserted only in an appropriately connected plug-in slot, the side

edge is provided with a recess 26, which corresponds to the position of a pin 25 (Figure 1) when the coding slide 20 is in the "DC" position. Uncoded assemblies according to Figures 2 and 3 are used for electronic
5 modules with a 24 V DC voltage supply and can be inserted in the plug-in slots 11 ... 18 (Figure 1) alongside one another as required.

The housing 27 of a coded assembly, as is illustrated in Figures 4 and 5 has a projection 28 on
10 the one side for coding and has a recess 29, which corresponds to a corresponding projection of an adjacent coded plug-in assembly, on the other side, so that coded assemblies can likewise be inserted into the plug-in slots 11 ... 18 alongside one another as
15 required. The coding is designed as a change to the width of the hinge pins 30 and 31, so that this on its own prevents an uncoded assembly from being inserted into the hinged joint immediately on the right-hand side of a coded assembly. In consequence, forces that
20 act on the coding pins are kept low, and damage to the mounting unit or to the plug-in assemblies by the coding is virtually precluded. Thus, only a further coded plug-in assembly can be inserted on the right-hand side in the immediate vicinity of a coded assembly
25 while, on the other hand, either an uncoded plug-in assembly or a coded plug-in assembly can be inserted on the left-hand side. Thus, in a device for the connection of external lines, the coding reliably ensures that the required minimum creepage distance for
30 230 V modules is complied with.

Although, in the exemplary embodiment, the invention has been described on the basis of a device for the connection of external lines as a mounting unit, and conversion modules as electronic modules for the plug-in slots in the mounting unit, the invention is also suitable for any other mounting units for the coding of plug-in assemblies. For example, it can be used for coding plug-in assemblies in a mounting rack or for coding front connectors on a programmable logic controller which is fitted with input or output assemblies.



Patent Claims

1. A device for coding plug-in assemblies, which are intended to be fitted in a mounting unit with plug-in slots arranged at equal intervals alongside one another, characterized
- 5 in slots arranged at equal intervals alongside one another, characterized
- in that coded plug-in assemblies have a projection (28) on the one side and a recess (29), which corresponds to a corresponding projection of an adjacent coded plug-in assembly, on the other side, so that they can be plugged into the plug-in slots (11 ... 18) alongside one another as required, and
 - in that uncoded plug-in assemblies have no such recess so that they cannot be plugged into an immediately adjacent plug-in slot on the one side of a coded plug-in assembly.
- 10
2. The device as claimed in claim 1, characterized
- in that the assemblies can be pivoted on the plug-in slots (11 ... 18), about a hinged joint, for insertion, and
 - in that the projection (28) and recess (29) of coded plug-in assemblies are located in the region of the hinged joint, so that a projection, if appropriate, on its own prevents the insertion of a plug-in assembly into the hinged joint.
- 15
3. A device for connection of external lines having plug-in slots (11 ... 18) arranged at equal intervals alongside one another, and having plug-in assemblies which contain a signal matching circuit for signals which are carried on the external lines,
- 20
- 25
- 30



characterized

- 5 - in that two signal channels are provided per
 plug-in slot, the connecting elements (1 ... 10)
 of which signal channels are arranged alongside
10 one another at half the plug-in slot spacing in
 the direction in which the plug-in slots are
 numbered, in which case the distance between the
 connecting elements of adjacent channels is
 greater than the required minimum creepage
15 distance for currents at a low operating voltage
 of a plurality of possible operating voltages, and
 is less than the required minimum creepage
 distance for a higher operating voltage of the
 possible operating voltages, and in which case the
20 distance between the connecting elements of two
 channels, between which connecting elements of
 another channel are located, is greater than the
 required minimum creepage distance for currents at
 the higher operating voltage,
- 25 - in that coded plug-in assemblies with a higher
 operating voltage include a signal matching
 circuit for a channel whose connecting elements
 are located on the one side, and have a projection
 (28) on the one side and a recess (29), which
30 corresponds to a corresponding projection of an
 adjacent coded plug-in assembly, on the other
 side, so that they can be inserted into the plug-
 in slots alongside one another as required, and
- in that uncoded plug-in assemblies with a low
 operating voltage include a signal matching
 circuit for both signal channels and have no such
 recess (29), so that they cannot be inserted into
 an immediately adjacent plug-in slot on the one
 side of a coded plug-in assembly.