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High-current contact device and connection device for transmitting electrical energy in a motor vehicle

Abstract

A high-current contact device includes a contact element insertable along a plug-in axis at least partially into a further contact element of a further high-current contact device, a contact housing having a contact receiver receiving the contact element, and a temperature measuring device. The contact housing has a sensor receiver that is inclined with respect to the plug-in axis and leads into the contact receiver. The temperature measuring device is arranged at least partially in the sensor receiver. The temperature measuring device bears against an outer circumferential side of the contact element and measures a temperature of the contact element.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS
(1) This application claims the benefit of the filing date under 35 U.S.C. § 119(a)-(d) of German Patent Application No. 102020116904.3, filed on Jun. 26, 2020.
FIELD OF THE INVENTION
(2) The present invention relates to a contact device and, more particularly, to a high-current contact device.
BACKGROUND
(3) A plug-in device having temperature sensing is known from DE 10 2016 107 401 A1.
SUMMARY
(4) A high-current contact device includes a contact element insertable along a plug-in axis at least partially into a further contact element of a further high-current contact device, a contact housing having a contact receiver receiving the contact element, and a temperature measuring device. The contact housing has a sensor receiver that is inclined with respect to the plug-in axis and leads into the contact receiver. The temperature measuring device is arranged at least partially in the sensor receiver. The temperature measuring device bears against an outer circumferential side of the contact element and measures a temperature of the contact element.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The invention will now be described by way of example with reference to the accompanying Figures, of which:
(2) FIG. **1** is an exploded perspective view of a system having a connection device;
(3) FIG. **2** is a perspective view of a temperature measuring device of a first high-current contact device;
(4) FIG. **3** is a sectional side view of the first high-current contact device, taken along plane A-A in FIG. **1**; and
(5) FIG. **4** is a sectional side view of the system, taken along plane A-A in FIG. **1**.
DETAILED DESCRIPTION OF THE EMBODIMENTS
(6) In the following figures, reference is made to a coordinate system. The coordinate system is exemplarily realized as a right-hand system and has an x-axis (longitudinal direction), a y-axis (transverse direction) and a z-axis (vertical direction).
(7) FIG. **1** shows an exploded representation of a system **10** comprising a connection device **15**. The connection device **15** has at least one high-current cable **20** and a first high-current contact device **25**. The system **10** additionally has a second high-current contact device **30**.

(8) In the embodiment shown in FIG. **1**, the first high-current contact device **25** and the second high-current contact device **30** are realized as multipole contact devices. It would of course also be conceivable, contrary to the multipole design shown in FIG. **1**, in particular to the two-pole design shown in FIG. **1**, for the first high-current contact device **25** and the second high-current contact device **30** to be single-pole. For reasons of simplification, the first high-current contact device **25** and the second high-current contact device **30** are described below in relation to a two-pole design, the detailed description being based on one of the poles of the high-current contact device **25**, **30**.
(9) In an embodiment, the system **10** serves to transmit drive energy in a motor vehicle, for the purpose of driving a drive motor of the motor vehicle. It is also possible for the system **10** to transmit a charging current for charging an electrical energy storage device of the motor vehicle. In the embodiment, the system **10** is designed to transmit an electrical current of between 10 and 1000 amperes, between 200 and 600 amperes, or between 400 and 500 amperes, for at least 20 seconds, one minute, or at least 5 minutes. An upper time limit of the drive current, or charging current, to be transmitted is substantially determined by the capacity of the electrical energy storage device. The electrical power transmitted via the high-current contact device **25**, **30** may be 30 kW to 400 kW. A voltage applied to the high-current contact device **25**, **30** may be between 48 V and 500 V, for example, and thus differs significantly from the usual 12-volt or 24-volt electrical power system of the motor vehicle.
(10) The first high-current contact device **25** has a first contact housing **35**, a second contact housing **40**, at least one first contact element **45** and at least one first temperature measuring device **50**. In addition, as an example in FIG. **1**, the first high-current contact device **25** has a first sealing device **55**, a second sealing device **60**, a second contact element **65** and a second temperature measuring device **70**.
(11) In FIG. **1**, exemplarily, the first contact element **45** and the second contact element **65** are mirror-symmetrical in relation to a plane of symmetry that is arranged centrally between the first contact element **45** and the second contact element **65**. The first and the second contact element **45**, **65** each comprise an electrically and thermally conductive material. The material has a thermal conductivity of greater than and inclusive of 1 W/(m.Math.K) to 2 W/(m.Math.K).
(12) The first temperature measuring device **50** is assigned to the first contact element **45**, and the second temperature measuring device **70** is assigned to the second contact element **65**. The first temperature measuring device **50** in this case is designed to measure a first temperature T.sub.S1(t) of the first contact element **45**. The second temperature measuring device **70**, which in the embodiment is identical to the first temperature measuring device **50**, is designed to measure a second temperature Ts.sub.S2(t) of the second contact element **65**.
(13) The second high-current contact device **30** is designed so as to correspond to the first high-current contact device **25**. In the embodiment shown in FIG. **1**, the second high-current contact device **30** exemplarily has a third contact element **75** and a fourth contact element **80**, the third contact element **75** being designed, when having been fitted together with the first high-current contact device **25**, to realize an electrical contact with the first contact element **45**. Similarly, the fourth contact element **80** is designed, when the first high-current contact device **25** has been fitted on the second high-current contact device **30**, to form an electrical contact with the second contact element **65**.
(14) In the embodiment shown in FIG. **1**, a polarity of the high-current contact device **25**, **30** may be selected such that, for example, the first contact element **45** and the third contact element **75** are electrically connected to a first pole of the electrical energy storage device, for example a positive pole. The second contact element **65** and the fourth contact element **80** may be electrically connected, for example, to a second pole, for example a negative pole, of the electrical energy storage device. It would also be conceivable for the contact elements **45**, **65**, **75**, **80** to be connected in parallel. Thus, for example, the contact elements **45**, **65**, **75**, **80** may be connected only to the positive pole of the electrical energy storage device or only to the negative pole of the electrical

energy storage device, such that the system **10** can transmit a particularly high electrical current. This design is advantageous in particular if the drive motor has a particularly high power consumption. Consequently, the system **10** is particularly suitable for use in commercial vehicles.

(15) The first contact element **45** is realized, exemplarily, as a socket contact in the embodiment shown in FIG. **1**. The first contact element **45** has a plug-in region **100** and a connection region **105** that is mechanically and electrically connected to the plug-in region **100**. The plug-in region **100** extends along a plug-in axis **110**, which extends in the x-direction. In the embodiment, the first contact element **45** is rectilinear, such that the connection region **105** also extends along the plug-in axis **110**. The first contact element **45** could also be realized as an angled contact element, i.e. the connection region **105** is inclined, for example perpendicularly, with respect to the plug-in region **100**. In addition, there may be a contact lock **111** arranged on the first contact element **45**.

(16) As shown in FIG. **1**, the first sealing device **55** is arranged on a side of the first contact housing **35** that faces toward the second high-current contact device **30**. The second sealing device **60** and the second contact housing **40** are arranged on a side of the first contact housing **35** that faces away from the second high-current contact device **30** with respect to the plug-in axis **110**. In the assembled state, the second contact housing **40** is fastened to the first contact housing **35** and closes the first high-current contact device **25** at the rear on a side that faces away from the second high-current contact device **30**. The high-current cable **20** runs on the side that faces away from the second high-current contact device **30** and is led, for example, to the drive motor or to a control unit for controlling the drive motor.

(17) The first contact housing **35** has a first contact receiver **190** for the first contact element **45**, and has a second contact receiver **195** for the second contact element **65**. The first contact element **45** is arranged in the first contact receiver **190**, and the second contact element **65** is arranged in the second contact receiver **195**. The first contact receiver **190** and the second contact receiver **195** are arranged offset from each other in the y-direction. The first and second contact receivers **190**, **195** in this case may be mirror-symmetrical. The first contact receiver **190** extends substantially in its direction of main extent along the x-axis.

(18) FIG. **2** shows a perspective partial representation of the temperature measuring device **50**, **70** of the first high-current contact device **25** shown in FIG. **1**. The temperature measuring devices **50**, **70** each have a temperature sensor **85**, a sensor casing **90** and a connection cable **95**. The temperature sensor **85** is shown schematically in FIG. **2** by a dashed line. The first temperature measuring device **50** is described below. The first temperature measuring device **50** and the second temperature measuring device **70** are, exemplarily, identical to each other. What is explained below for the first temperature measuring device **50** also applies—unless otherwise stated—to the second temperature measuring device **70**.

(19) The temperature sensor **85** may be realized, for example, as a negative temperature coefficient (NTC) element. Another design of the temperature sensor **85** is also conceivable. The temperature sensor **85** is embedded in the sensor casing **90**, as shown in FIG. **2**. Embedding of the temperature sensor **85** in the sensor casing **90** is understood in this case to mean that the temperature sensor **85** is completely enclosed circumferentially by the sensor casing **90** and that none of the side surfaces of the temperature sensor **85** are exposed circumferentially, even only partially. In addition, the sensor casing **90** may be connected to the temperature sensor **85** in a materially bonded manner, such that an unintentional detachment of the sensor casing **90** and/or formation of a gap between the sensor casing **90** and the temperature sensor **85** is avoided. In this way, seepage of moisture between the sensor casing **90** and the temperature sensor **85** can be prevented. In the measuring of the first temperature T.sub.S1(t) by the temperature sensor **85**, therefore, it is thus possible to avoid leakage currents and a resulting falsification of a measurement result of the temperature sensor **85**.

(20) The sensor casing **90** has a first outer circumferential side **115**. FIG. **2** shows, exemplarily, the sensor casing **90** having a bearing contact surface **120** on the underside. Exemplarily, the bearing contact surface **120** is of a flat design. The bearing contact surface **120** extends, exemplarily, in an

xy-plane. The bearing contact surface **120** may also be curved.

(21) On the first outer circumferential side **115**, the sensor casing **90** has, for example, a sealing contour **135**. The sealing contour **135** may have one or more sealing lips **140**. The sealing contour **135** is realized around the circumference, in an embodiment around the entire circumference, on the first outer circumferential side **115**. Instead of the sealing lip **140**, the sealing contour **135** may also be of a different design. In FIG. **2**, for example, the sealing lips **140** are arranged offset from each other in the z-direction.

(22) On the upper side in FIG. **2**, on a side that faces away from the bearing contact surface **120**, the sensor casing **90** has a pressing surface **145**. The pressing surface **145** is parallel to the bearing contact surface **120**. The pressing surface **145** in this case may be flat and extend in an xy-plane. The connection cable **95** is led out of the pressing surface **145**, exemplarily, in a central position with respect to the pressing surface **145**.

(23) Opposite to the bearing contact surface **120** in the z-direction, the connection cable **95** of the temperature measuring device **50**, **70** is led out of the press surface **145** in a straight line along an axis **125** shown in FIG. **2**. When the temperature measuring device **50**, **70** has been assembled, the axis **125** is aligned perpendicularly in relation to the plug-in axis **110**. For example, the axis **125** runs in a plane perpendicular to the plug-in axis **110**. In this case, as shown in FIG. **2**, the axis **125** may run in the z-direction. The connection cable **95** may be bent at a distance from the sensor casing **90** in order to guide the connection cable **95** to an evaluation device of the motor vehicle.

(24) The connection cable **95** has a first cable sheathing **150** shown in FIG. **2**. The first cable sheathing **150** is made of an electrically insulating material. The first cable sheathing **150** may comprise a first matrix material, the first matrix material comprising, for example, silicone, polyurethane, polyethylene. Furthermore, the connection cable **95** comprises at least one sensor line **155**, which is electrically conductive and provides an electrical connection between the temperature sensor **85** and the evaluation device. The sensor line **155** is completely enclosed circumferentially by the first cable sheathing **150** in an embodiment.

(25) The connection cable **95** is led to the temperature sensor **85**. In an embodiment, a first sub-portion **160** of the connection cable **95** is embedded in the sensor casing **90**. The sensor casing **90** is connected in a materially bonded manner to the first cable sheathing **150** in the first sub-portion **160**. The material-bonded connection prevents the formation of a seepage gap. This prevents the ingress of moisture and/or water in the region of the connection cable **95** and the sensor casing **90**.

(26) FIG. **3** shows a detail of a sectional view through the first high-current contact device **25** shown in FIG. **1**, along a sectional plane A-A shown in FIG. **1**. When the first temperature measuring device **50** is in the assembled state, the bearing contact surface **120** bears flatly against a second outer circumferential side **130** of the first contact element **45** in the connection region **105** of the first contact element **45**. In an embodiment, the bearing contact surface **120** is realized so as to correspond to the second outer circumferential side **130** of the first contact element **45**.

(27) The high-current cable **20**, as shown in FIG. **3**, has a second sub-portion **165** and a third sub-portion **170**. The third sub-portion **170** adjoins an end **171** of the high-current cable **20**. The second sub-portion **165** is spaced from the end **171** of the high-current cable **20**. The high-current cable **20** has an electrical conductor **175**, the electrical conductor **175** having a cross-sectional area of at least 15 square millimeters, at least 25 square millimeters, or at least 50 square millimeters in various embodiments. The electrical conductor **175** may be of a fine or very fine stranded construction.

(28) The high-current cable **20** also has a second cable sheathing **180** shown in FIG. **3**, the second cable sheathing **180** enclosing and sheathing the electrical conductor **175** on the circumferential side in the second sub-portion **165**. The second cable sheathing **180** in this case electrically insulates the electrical conductor **175**.

(29) In the third sub-portion **170**, the second cable sheathing **180** is spaced apart from the electrical conductor **175**, and the electrical conductor **175** is arranged in a connection receiver **185** of the

connection region **105**. In an embodiment, the connection region **105** is crimped in the connection receiver **185**. In addition or alternatively, further materially bonded and/or positive and/or non-positive connections are possible for electrically and mechanically connecting the third sub-portion **170** to the connection receiver **185**.

(30) The sensor casing **90** thermally connects the temperature sensor **85** to the second outer circumferential side **130** of the connection region **105**. For this purpose, the sensor casing **90** in an embodiment has at least one of the following second matrix materials: silicone, polyurethane, polyethylene. In an embodiment, the first matrix material is identical to the second matrix material; in the manufacture of the first temperature measuring device **50** by an injection-molding process, the temperature sensor **85**, which is already connected to the connection cable **95**, and the first sub-portion **160** can be encapsulated with the second matrix material, which is still liquid or viscous and is to be cured, and the second matrix material, upon curing, realizes the materially bonded connection to the first matrix material of the first cable sheathing **150**. A particularly good bond is thereby ensured between the first cable sheathing **150** and the sensor casing **90**.

(31) In addition, there may be at least one particulate filler, for example aluminum and/or silver and/or copper, embedded in the second matrix material of the sensor casing **90**. Due to the filler, a thermal conductivity of the sensor casing **90** is particularly high. As a result, the sensor casing **90** has a thermal conductivity of from 100 to 300 W/(m.Math.K).

(32) On the side of the first contact housing **35**, for example on the upper side in FIG. **3**, the first contact housing **35** has at least one collar portion **200**, the collar portion **200** being realized circumferentially around the axis **125**. In an embodiment, there is respectively one collar portion **200** realized for each contact receiver **190**, **195**. The collar portion **200** delimits a sensor receiver **205** with an inner circumferential side **206** of the collar portion **200**. The temperature measuring device **50**, **70** is thereby prevented from tilting in the sensor receiver **205**. The sensor receiver **205** leads, in the axial direction with respect to the axis **125**, to the inside of the associated contact receiver **190**, **195**, in FIG. **3** the first contact receiver **190**.

(33) In addition, the first high-current contact device **25** may have a sensor cover **210** shown in FIG. **3**. In the embodiment, for each collar portion **200**, there is respectively one sensor cover **210** arranged on the collar portion **200**.

(34) A fourth sub-section **215** of the temperature measuring device **50**, **70** engages in the sensor receiver **205**, as shown in FIG. **3**. A fifth sub-section **220** of the temperature measuring device **50**, **70** projects into the respective contact receiver **190**, **195**. The sensor casing **90** bears with the sealing contour **135**, in particular the sealing lip **140**, against the inner circumferential side **206**, such that the sensor receiver **205** is sealed off from an environment of the system **10**, and ingress of liquid via the sensor receiver **205** laterally past the sensor casing **90** is prevented. Corrosion of the contact element **45**, **65**, **75**, **80** is thereby prevented. Instead of the sealing contour **140**, a sealing element may also be arranged between the sensor casing **90** and the inner circumferential side **206**.

(35) On a side facing away from the first contact element **45**, the sensor cover **210** is attached to the collar portion **200**, as shown in FIG. **3**. The sensor cover **210** closes the sensor receiver **205** on a side facing away from the contact receiver **190**, **195** (in the z-direction). The sensor cover **210** bears with an inner side **225** against the pressing surface **145** of the sensor casing **90**. In an embodiment, the sensor cover **210** has at least one web **230** on the inside. In an embodiment, a plurality of webs **230** are arranged, offset from each other in the x-direction, on the sensor cover **210**. Each of the webs **230** is plate-shaped and extends, exemplarily, in a yz-plane. A free end of each of the webs **205** forms the inner side **225** of the cover. The sensor cover **210** also has a circumferential rim **231**. The rim **231** may, for example, be positively connected to the collar portion **200** by a latching device.

(36) In the assembled state, the free end of the web **230** bears with the inner side **225** of the cover against the pressing surface **145**. The sensor cover **210** is also latched to the collar portion **200**. The sensor cover **210** thereby provides a pressing force F.sub.P acting along the axis **125**. With the

pressing force F.sub.P, the sensor cover **210** acts against the pressing surface **145** and presses the sensor casing **90** against the second outer circumferential side **130** of the associated contact element **45**, **65**, **75**, **80**. In FIG. **3**, the sensor casing **90** of the first temperature measuring device **50** is pressed against the second outer circumferential side **130** of the first contact element **45**. The sensor casing **90** is arranged in a tensioned manner in the sensor receiver **205** and a bearing contact surface **120** of the temperature measuring device **50**, **70** presses with a pressing force F.sub.P against the outer circumferential side **115**, **130** of the contact element **45**, **65**.

(37) In FIG. **3**, the first contact element **45** provides a counterforce F.sub.G acting against the pressing force F.sub.P. As a result of the pressing, the bearing contact surface **120** bears flatly against the second outer circumferential side **130**, such that a thermal transfer resistance between the first contact element **45** and the sensor casing **90** is particularly low.

(38) In an embodiment, the pressing force F.sub.P and the corresponding counterforce F.sub.G are selected in such a way that the sensor casing **90** is reversibly elastically deformed between 10 percent and 40 percent, at least in the vertical direction between the temperature sensor **85** and the bearing contact surface **120**. In this way, the thermal transfer resistance between the bearing contact surface **120** and the sensor casing **90** can be further reduced. The pressing force F.sub.P can be introduced particularly effectively into the pressing surface **145** through the multiple webs **230** in the sensor casing **90**.

(39) In addition, the sensor cover **210** may have a lead-through **235** that leads into the sensor receiver **205**, as shown in FIG. **3**. The connection cable **95** is led out of the sensor receiver **205** through the lead-through **235**. In addition, the connection cable **95** is led between two adjacent webs **230**, such that pinching of the connection cable **95** is prevented. Jamming of the connection cable **95** is prevented when it is led out of the contact housing **35**, **40**. Moreover, the sensor cover **210** can reliably introduce the pressing force F.sub.P into the sensor casing **90** without thereby damaging the connection cable **95**.

(40) FIG. **4** shows a sectional view, along a sectional plane A-A shown in FIG. **1**, through the system **10** shown in FIG. **1**, in the assembled state. In this case, for reasons of clarity, in FIG. **4** the second high-current contact device **30** is only indicated schematically by a dashed line.

(41) In the assembled state shown in FIG. **4**, the first contact element **45** contacts the third contact element **75**, and the second contact element **65** contacts the fourth contact element **80**. In the case of the contact between the first contact element **45** and the third contact element **75**, in the plug-in region **100**, the system **10** has a first electrical ohmic contact resistance. Likewise, the connection device **15** has a second electrical ohmic contact resistance at the electrical contact between the electrical conductor **175** of the high-current cable **20** and the connection receiver **185** of the first electrical contact element **45**. During transmission of the electric current, in particular a current greater than 100 amperes, the contact element **45**, **65**, **75**, **80** heats up due to the first and second ohmic contact resistance, as well as an internal ohmic resistance of the contact element **45**, **65**, **75**, **80**.

(42) Due to the short distance between the temperature sensor **85** of the temperature measuring device **50**, **70** and the associated first or second contact element **45**, **65**, and the good thermal connection of the temperature sensor **85**, via the sensor casing **90**, to the connection portion **105**, the temperature sensor **85** of the first temperature measuring device **50** can measure the first temperature T.sub.S1(t) of the connection region **105** of the first contact element **45** in a particularly precise manner. Likewise, the temperature sensor **85** of the second temperature measuring device **70** measures the second temperature T.sub.S2(t) of the connection portion of the second contact element **65**.

(43) If a third temperature T.sub.K3(*t*) of the plug-in region **100** of the first contact element **45** and the first temperature T.sub.S1(t), measured by the temperature sensor **85** at the connection region **105** of the first contact element **45**, are measured over a time t, it can be seen in the embodiment shown in FIGS. **1** to **4** that the first temperature T.sub.S1(t) corresponds to the third temperature

T.sub.K3(*t*) with only a few degrees Kelvin difference (less than 6 Kelvin, in particular less than 4 Kelvin), and has a time curve substantially identical to that of the third temperature T.sub.K3(*t*). Due to the direct thermal coupling, the first measured temperature T.sub.S1(t) substantially corresponds to the third temperature T.sub.K3(*t*) of the plug-in region **100**. The temperature difference between the first temperature T.sub.S1(t) and the third temperature T.sub.K3(*t*) can be taken into account by the evaluation device.
(44) The first and the second temperature T.sub.S1(t), T.sub.S2(*t*) measured by the temperature sensor **85** thus represent a precise indirect temperature measurement of the first contact element **45** and of the second contact element **65**, respectively, in the plug-in region **100**. The respective temperature sensor **85** provides the information of the measured first and second temperature T.sub.S1(t), T.sub.S2(*t*), respectively, to the evaluation device via the connection cable **95**. The evaluation device can take the measured first temperature T.sub.S1(t) and the second temperature T.sub.S2(*t*) into account for controlling, for example, the drive motor of the motor vehicle. Overheating of the contact element **45**, **65** can thus be detected at an early stage, and if necessary current transmitted via the high-current contact device **25**, **30** can be reduced accordingly. To keep the first and second contact resistance low, the first and second sealing device **55**, **60** seal off the contact elements **45**, **65**, **75**, **80** from the environment.
(45) The embodiment of the system **10** shown in FIGS. **1** to **4** is particularly well suited for the particularly precise and accurate measurement of dynamically changing current loads that are to be transmitted, by the system **10**, between the high-current cable **20** and the third and fourth contact elements **75**, **80**, in particular to the electrical energy storage device.
(46) The connection cable **95** allows the temperature sensor **85** to be flexibly connected to the evaluation device. Owing to the temperature measuring device **50**, **70** being inserted on one side, the connection cable **95** can be led independently of the course of the high-current cable **20**.
(47) Due to the temperature sensor **85** being encapsulated by the sensor casing **90**, and to the materially bonded connection of the sensor casing **90** both to the temperature sensor **85** and to the first cable sheathing **150**, the temperature sensor **85** is protected against the ingress of moisture. Leakage current is thereby prevented, such that the temperature sensor **85** measures the first or second temperature T.sub.S1(t), T.sub.S2(*t*) in a particularly precise manner.
(48) Due to the temperature measuring device **50**, **70** being integrated into the contact housing **35**, **40** and the sensor receiver **205** being inclined with respect to the plug-in axis **110**, the temperature measuring device **50**, **70** can be mounted in a particularly simple and cost-effective manner. If necessary, the temperature measuring device **50**, **70** can also be replaced in the event of damage without demounting the high-current contact device **25**, **30**.
(49) The design described in FIGS. **1** to **4** is also suitable in particular for high-current contact device **25**, **30** that are contacted to each other and mechanically locked, for example by a lever device **240**.

Claims

1. A high-current contact device, comprising: a contact element insertable along a plug-in axis at least partially into a further contact element of a further high-current contact device; a contact housing having a contact receiver receiving the contact element and a sensor receiver inclined with respect to the plug-in axis, the sensor receiver delimited by a collar portion and leads into the contact receiver; and a temperature measuring device including: a sensor casing, an integral, protruding circumferential sealing lip of a sensor casing of the temperature measuring device bears against an inner circumferential side of the collar portion and seals the contact receiver; a temperature sensor embedded in the sensor casing; and a connection cable with a first cable sheathing and an electrically insulated and electrically conductive sensor line through the first cable sheathing, the sensor casing is connected to the first cable sheathing in a materially bonded manner,

the temperature measuring device arranged at least partially in the sensor receiver, the temperature measuring device bears against an outer circumferential side of the contact element and measures a first temperature of the contact element.

2. The high-current contact device of claim 1, wherein the sensor casing bears against the contact element and thermally couples the temperature sensor to the contact element, the temperature sensor measures a second temperature of the contact element.

3. The high-current contact device of claim 1, wherein the connection cable is led to the temperature sensor and the sensor line is electrically connected to the temperature sensor, the connection cable embedded in a sub-portion in the sensor casing is led to the temperature sensor.

4. The high-current contact device of claim 1, wherein the sensor casing and the first cable sheathing include a substantially identical matrix material.

5. The high-current contact device of claim 1, wherein the sensor casing and the first cable sheathing include a matrix material selected from at least one of silicone, polyethylene, and polyurethane, and a filler embedded in the matrix material selected from at least one of copper, aluminum, and silver.

6. The high-current contact device of claim 1, wherein the sensor casing has a thermal conductivity greater than or equal to 1 W/(m.Math.K) and less than or equal to 2 W/(m.Math.K).

7. The high-current contact device of claim 1, wherein the contact element has a plug-in region and a connection region connected to the plug-in region, the connection region has a connection receiver on an inside for receiving and electrically contacting an electrical conductor of a high-current cable, the plug-in region forms an electrical contact with the further contact element.

8. The high-current contact device of claim 7, wherein the temperature measuring device bears against an outer circumferential side of the connection region.

9. The high-current contact device of claim 1, further comprising a sensor cover arranged on an outside of the contact housing, the sensor cover at least partially closes an outside of the sensor receiver.

10. The high-current contact device of claim 9, wherein an inner side of the sensor cover bears against the temperature measuring device on a side that faces opposite and away from the contact element and ensures physical contact between the temperature measuring device and the contact element.

11. The high-current contact device of claim 10, wherein the sensor casing is arranged in a tensioned manner in the sensor receiver and a bearing contact surface of the temperature measuring device presses with a pressing force against the outer circumferential side of the contact element.

12. The high-current contact device of claim 9, wherein the sensor cover has a lead-through leading into the sensor receiver, the connection cable is led out of the sensor receiver through the lead-through.

13. The high-current contact device of claim 9, wherein the sensor cover has a circumferential rim arranged on an outside of a collar portion of the contact housing and positively connected to the collar portion.

14. A connection device for transmitting electrical energy, comprising: a high-current contact device including a contact element insertable along a plug-in axis at least partially into a further contact element of a further high-current contact device, a contact housing having a contact receiver receiving the contact element, and a temperature measuring device, the contact housing has a sensor receiver inclined with respect to the plug-in axis, the sensor receiver delimited by a collar portion, an integral circumferential sealing lip of the sensor casing bears against an inner circumferential side of the collar portion and seals the contact receiver, the sensor receiver leads into the contact receiver, the temperature measuring device is received at least partially in the sensor receiver in an insertion direction perpendicular to the plug-in axis, a surface of the temperature measuring device facing in the insertion direction bears against an opposing outer circumferential side of the contact element, the temperature measuring device measures a

temperature of the contact element; and a high-current cable including an electrical conductor and cable sheathing encasing the electrical conductor, the electrical conductor is electrically connected to the contact element.

15. The connection device of claim 14, wherein the contact element has a plug-in region and a connection region connected to the plug-in region, the connection region has a connection receiver on an inside receiving and electrically contacting the electrical conductor of the high-current cable, the temperature measuring device bears against an outer circumferential side of the connection region directly opposite the electrical conductor.

16. A high-current contact device, comprising: a contact element insertable along a plug-in axis at least partially into a further contact element of a further high-current contact device, the contact element defining a plug-in region and a connection region connected to the plug-in region, the connection region having a connection receiver on an inside for receiving and electrically contacting an electrical conductor of a high-current cable; a contact housing having a contact receiver receiving the contact element and a sensor receiver delimited by a collar portion and inclined with respect to the plug-in axis, the sensor receiver leads into the contact receiver; and a temperature measuring device arranged at least partially in the sensor receiver, the temperature measuring device bears against an outer circumferential side of the connection region of the contact element directly opposite the electrical conductor and measures a first temperature of the contact element, an integral circumferential sealing lip of a sensor casing of the temperature measuring device bears against an inner circumferential side of the collar portion and seals the contact receiver.

17. The high-current contact device of claim 16, wherein the temperature measuring device is received at least partially in the sensor receiver in an insertion direction perpendicular to the plug-in axis, a surface of the temperature measuring device facing in the insertion direction bears against an opposing outer circumferential side of the contact element.