Claims

1. A device for a secure data connection of at least one manufacturing machine (104), having an information-processing system (114), which is subdivided into individual zones (108, 110, 112) interconnected by data diodes (120) such that data originating from the machine control (118) of the manufacturing machine (104) in a data flow can be transferred to other zones (110, 112) without the possibility of a data return flow, wherein said zones (110, 112), ordered hierarchically, each have a lower level of data security than the upstream zone (108, 110) in relation to the data flow, wherein every zone (108, 110, 112) is formed as an independent computer in the manner of an isolated application and wherein every computer being independently functional with regard to its hardware and software being formed to be separate from the computers of the other zones (108, 110, 112) at the hardware and software level.

2. The device according to claim 1, characterized in that the first zone (108) downstream of the machine control (118), as a production zone, processes at least machine data of the manufacturing machine (104) and forwards them to a monitoring zone (110) and/or a service zone (112) as the respective downstream zone, wherein said machine data can be forwarded to an company-internal (150, 158) or external network (166), such as the Internet.

3. The device according to claim 1 or 2, characterized in that by data transmission (116) the production zone (108) of the one machine control (118) is connected to machine controls of other manufacturing machines within a production plant.

4. The device according to any one of the preceding claims, characterized in that the production zone (108) permits at least one of the data processing operations listed below:

- data processing of data (152) of the manufacturing execution system of a manufacturing management system,
- data processing of data (156) collected over a period of time,
- generation of production logs (174) and/or reports (174).

5. The device according to any one of the preceding claims, characterized in that the monitoring zone (110) permits at least one of the data processing operations listed below:
   - generating a data overview (160) of a manufacturing machine (104),
   - detecting trends (178),
   - recording of the operating state (176) of the machine.

6. The device according to any one of the preceding claims, characterized in that the service zone (112) permits at least one of the data processing operations listed below:
   - data processing of maintenance data,
   - recording the machine operating state (176),
   - performing remote diagnostics (180).

7. The device according to any one of the preceding claims, characterized in that the data transmission between the individual manufacturing machines of a production plant permits at least the transmission of the data listed below:
   - data of the manufacturing execution system (152) of a manufacturing management system,
   - data (156) collected over a period of time.

8. The device according to any one of the preceding claims, characterized in that the company-internal network (158) permits at least the transmission of the data listed below:
   - data to generate a data summary (164) of multiple manufacturing machines (104),

- mobile device data (162).

9. The device according to any one of the preceding claims, characterized in that the external network (166), preferably including the cloud, permits at least the transmission of data for
   - maintenance scheduling and/or
   - a creation of directories (168) and/or documentation documents (168) and/or
   - a link between real machine data and documentation in the cloud.

10. The device according to any one of the preceding claims, characterized in that the respective data diode (120) used between the individual zones (108, 110, 112) having their computer units is formed by a laser diode (134), which is used for light generation, and a photo diode (142), which is used for light detection of the generated light.

11. The device according to any one of the preceding claims, characterized in that the zones (110, 112) at least partially interconnected in parallel, are connected in series with the first zone (108) with respect to the data flow, and/or are at least partially connected in series, starting from the first zone (108).

12. The device according to any one of the preceding claims, characterized in that every zone (108, 110, 112) comprises on the input end at least one protocol converter (126) for protocol conversion and coupling of a data transfer protocol that can be transmitted by means of the data diodes (120) to a data transfer protocol that can be processed by the zones (108, 110, 112) and/or on the output end comprises at least one further protocol converter (126) for protocol conversion and coupling of a data transfer protocol that can be processed by the zones (108, 110, 112) to a

data transfer protocol that can be transmitted by means of the data diodes (120).

13. The device according to any one of the preceding claims, characterized in that the computers are formed identically, in particular with regard to their hardware and/or operating software, and can be configured for the intended use, in particular by means of application software (122, 124), in accordance with the individual zone (108, 110, 112).

14. The device according to any one of the preceding claims, characterized in that a data diode (120) is formed by a transmitting unit (128), which is part of a respective zone (108, 110, 112), and a receiver unit (136), which is part of a zone (110, 112) having a lower level of data security, wherein a data transmission means (138) is used to interconnect the transmitting unit (128) and the receiver unit (136).

15. The device according to any one of the preceding claims, characterized in that the transmitting unit (128) is formed as a transmitting data diode comprising a laser diode (134), and, in particular, a multiplexer (130) and a modulator (132), in that the receiver unit (136) is formed as a receiving data diode comprising a photo diode (142) and in particular a demodulator (144) and a demultiplexer (146), and in that the transmitting unit (128) and the receiver unit (136) are interconnected via the data transmission means (138) in the form of an optical fiber cable (140).

16. A manufacturing machine having a device according to any one of the preceding claims as an integral part thereof.

17. A production plant comprising a plurality of manufacturing machines according to claim 16.