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ABB MACHsense-R is a remote condition-monitoring service for motors and generators. The service consists of monitoring hardware, referred to as DAU, which is installed at the site. The built-in software in DAU gathers and analyses the input data, which is in form of vibration and/or temperature. DAU then transmits the processed data to the ABB Web server, where engineers prepare and display the report on a web frontend for the customer to view.

2. Data Analysis Unit (DAU) description

2.1 Structure:
The DAU consists of several stacked-printed circuit boards. It is an IP65 certified device; housed in painted stainless steel casing.

The casing dimensions (excluding the inlets, antenna, and mounting brackets) are:

- Width: 300mm
- Depth: 200mm
- Height: 80 mm

2.2 Installation environment:
It is necessary to use a plastic casing for DAU, in case the environment contains detrimental elements. The enclosed equipment can be installed above the water surface.

2.3 Inputs and outputs:
The monitoring device provides various inputs and outputs as follows:

- Four inputs for vibration sensors - these sensor inputs are equipped with a software adjustable gain. This enables the use of extra sensors to strengthen the sensor signal in case it is not strong enough.
- Eight inputs for Pt-100 temperature sensors, maximum cable length for Pt-100 sensors is 20 meters
- Inputs for general purpose sensors, such as:
  - Pulse sensor for RPM measurements
  - Trigger sensors that trigger an action
  - Voltage sensor for three phase voltage measurement
  - Current Sensor for three phase current measurement
- There are four pieces of -10V to+10V inputs and four pieces of 0 to+20mA current channels
  - Two opto-coupled inputs
  - Two opto-coupled outputs
  - One interface for MODBUS devices
  - Two relay controlled outputs for switching ON/OFF the outer circuit

2.4 Applications
The service is typically designed for motors and generators of any size and make. ABB Corporate Research Centers have developed algorithms that focus on picking up typical faults in electrical motors and generators. These algorithms are loaded in the DAU to generate Key Condition Parameter (KCP) individually for each fault. These KCPs give a measure of the equipment condition with respect to each fault parameter of the motor and generator.

3. Pre-Field Activities
It is essential that the following activities are carried out in ABB service shop before dispatching material to the customer site.
3.1 Verify material supply as per the BOM
Check whether all the accessories have been supplied as per the original Bill of Material.

3.2 Test DAU
Power ON the DAU and ensure the Power ON LED glows when power supply is given.

![Fig 2: LED labeling](image)

3.2.1 Locking Mechanism of DAU
The DAU is equipped with a locking mechanism. It can be opened or closed with the key provided.

![Fig 3: Key for opening/closing DAU](image)

3.3 Provide power supply to DAU
The DAU requires an external power supply. The power supply requirements are:
- Supply Voltage: 230 V, Single Phase AC
- Power consumption
  - DAU: up to 38W (depending on the sensor setup)
  - Computer: 4W
- Provide the power connection as per connection diagram table in section 11.2., if the power connection is proper, then Power ON LED will glow.

Note: The power cable supplied will be without any plug at the end. LSCs should procure suitable power plugs according to geography where the system will be used and fix it in the power cable before installation.

3.4 Communication between DAU and Server
For transferring data from DAU to ABB Server, a Subscriber Identity Module (SIM) card is required.
To insert the SIM card in DAU:

1. Open the SIM card holder by pressing PUSH OPEN locking clasp depicted in the figure.
2. Insert the SIM card to the holder as depicted in the figure below.
3. Close the SIM card holder as depicted in the figure below.
4. Close and lock the lid.

Caution: Care has to be taken while opening the SIM card holder clasp. Attempts to open clasp without properly pressing the PUSH button could lead to breakage of the holder.

After installing SIM card power on DAU, verify whether the second green LED is glowing. This indicates that GPRS has been activated.

3.5 Customer interface — creating customer information in Web Portal

Note: Carry out all these activities before going to field for installation.

1. Open the URL: https://machsense.abb.co.in.

2. Log in using your credentials.

ABB MACHsense Home Page is displayed.
Note: For access rights to portal, write to support.machsense@in.abb.com.

ABB field service engineer will have admin rights for creating the following:

Note: Maintain the sequence of steps to be carried out

1. Create customer (if customer is not present in the list)
2. Create user
3. Create motor

3.5.1 Create customer


Fig 8: Add user button

The Add new customer page will open.

Fig 9: Add new customer page

Note: If the Company Name already exists, then go to section 3.5.2 for creating New User.

2. Under Select Company option, select Create New.

The Add New Company page will open.

Fig 10: Add new company page
3. In **Company Name**, mention the name of the customer where the installation is going to be done. (For example Lafarge Cement, Arcelor Mittal, Excon Mobil, etc.)
4. The **LSC** will be default according to the login access given.
5. In the **Address** field, fill in the detailed address of the customer.
6. Click **Save**.

### 3.5.2 Create User

1. On the Home Page of MACHsense Portal, click **Add User**.

   ![Add user button](image1)

   **Fig 11: Add user button**

   The **Add User** page will open.

2. Under **Select Company**, select the company name.

   **Note:** For creating a new customer, refer to section 3.5.1.

3. The **Address** details will be displayed automatically, as filled in while creating the customer.
4. The **Service Centre** details will be displayed automatically as per the login credentials.
5. Enter the details in **Contact Person** field.
6. In the **E-mail** field, enter the e-mail address of customer for granting access to the web portal.

   **Note:** The password for logging into portal will be sent from the server to the e-mail address directly. The customer can change password after logging in.

7. In the **Mobile No.** field, enter the mobile number point of contact for customer.
8. Click **Save**.

   The details are saved and notification is displayed.

![Add New Customer](image2)

**Fig 12: Add new customer page**

**Note:** Access can be given to multiple users by repeating the same process. And entering new e-mail addresses.

### 3.5.3 Create motor

1. On the Home Page of MACHsense Portal, click **Add Motor**.

   ![Add Motor button](image3)

   **Fig 14: Add Motor button**
The Add Motor page will open.

2. Select the Company Name from drop down menu.
3. In the Serial No. of data collector field, enter the serial number of DAU.
4. The MAC address will be automatically updated by server based on serial number.
5. In the Machine Name field, enter name of machine on which the installation will be carried out.
6. In the Plant Name field, enter the name of the plant.
7. Select CMX File (Optional): Select the CMX file generated from MachineMonitor software.

Note: Importing of CMX file is highly recommended.

Note: The Machine Type field will be updated in future.

The serial number can be found on the back side of the DAU.
Plant Name refers to different units within a company. For example:
- Company Name: Lafarge Cements
  - Plant Name: Raw Mill section
    Cement Mill section
    Kiln section

8. After filling up all information, click Accept.
Now the created new motor will appear on the left side. (In this case, we had named it Test Motor)
9. Click on the newly created machine(in this case ABB Test Motor).
Various fields for filling up motor data will be displayed.

Note: If the motor has sleeve bearings then directly go to DAU Config section.

10. For selecting bearing, first select the Driven Side Bearing Manufacturer Name.

11. Select the Driven Side Bearing Number from the drop down menu. The bearing frequencies will be automatically updated by server.

12. Similarly fill in information for Non Drive Side Bearing.

13. Click Save.
14. Go to DAU Config section.
15. Fill in all relevant details
Sensor Resolution (mV/g): 100
On/Off Threshold (g): 0.2
Sampling Frequency (Hz):

Note: After carrying out measurements using ABB MACHsense-P for configuration of portal, the following information will have to be taken from Machine Monitor Report:
- Running Frequency
- Load/Slip Ratio
- Nu of rotor bars

16. Click Save.
17. Open all other section and fill in relevant details:
- General Information
- Machine details
- Name Plate information
- Construction details
- Circuit details

Note: 1. It is suggested that all above activities are carried out before going to field for installation.
2. DAU information has to be fed after making measurements with ABB MACHsense P and generating detailed report from Machine Monitor.

Generate Preliminary Report:
1. Log into the MACHsense portal.
2. Click the Report Tab.

The Download Report page will open.

3. From Select Company drop-down, choose a company name.
4. From Select Plant drop-down, choose a plant name.
5. Select the period for which data report has to be generated by selecting from From Date and To Date.
6. Click **Download**.

A **File Download** dialog box appears, that either opens the file or saves it to hard disk.

7. Click **Save**.
8. Browse to the required location.
9. Click **Save**.
10. Open the file and enter comments.

To upload a report:
1. Open the **Report** tab.
2. Go to **Upload Reports** section.
3. Click **Browse**.
4. Browse to the required location.
5. Select the file.
6. Click **Open**.
7. Click **Upload**.

The file will be uploaded.

**Customer Overview**

To see the overview of any customer:
1. Click the **Home** tab.
2. Under **Customer Search**, enter the keyword in **Search** field.
3. Click **Go**.

The relevant results are displayed.
4. Select the customer whose details you want to view. The details will be displayed.

5. Click on the tab on the left side that displays the plant name. (Here, LAB).
   All the machine under that plant are displayed.

6. Select the machine whose details you want to view.

7. Click on **Operating** tab to see the machine’s operating details.
8. Similarly, click on other tabs to view other details.

4. Installing DAU

4.1 Mounting DAU

Monitoring device can be mounted on the motor or on neighbouring wall or steel structure depending on the feasibility of the condition. Drilling machine can be used for drilling mounting holes and fixing DAU using suitable bolts. The DAU should always be mounted close to the machine to avoid cable lengths to sensors above 20 meters.

Following precautions have to be taken into account while mounting DAU:

1. Select mounting location which is free of shock forces, excessive dust, close proximity to electrical appliances, etc.
2. Selected mounting location and subsequent mounting of DAU should allow trouble free cabling.
3. Sufficient reserve should be provided for connectors.
4. Ensure correct fastening of mounting bolts to prevent any sudden unfastening due to external forces.
5. Ensure proper laying of cables. Use cable ties and fasteners to secure the cables.
4.2 Communications
The DAU communicates with the specific server over a General Packet Radio Services (GPRS) connection or Ethernet. It is also possible to equip this device to use Wireless Local Area Network (WLAN) or 3G communications. A SIM card is required for the GPRS or 3G connection.

4.3 Example of Installation
1. The DAU can be mounted on assembly plate of the motor. Drilling and tapping of holes will be required for this.
2. The DAU can also be mounted on the same side as auxiliary terminal box to reduce the cable length for RTD, BTD.

![Fig 32: Examples of mounting DAU on a motor](image)

5. Installation of accelerometers (Vibration measurement)

5.1 Accelerometer location
Accelerometer mounting locations are as follows:
- Channel 1 - DE Horizontal
- Channel 2 - NDE Horizontal
- Channel 3 - Motor Body (Core) Horizontal
- Channel 4 - DE Vertical

Pay attention to the following while installing the accelerometers:
- The point of measurement is chosen so that point of measurement and sensor are mechanically as close as possible to each other.
- High-frequency oscillation loses some of its energy in the face of the interface. Therefore, the measuring point has to be chosen in such a way that the point of measurement and the sensor has minimal interfaces.
- Vibration of rotating masses transferred to the bearings through the body. So, it is appropriate to the measurement points selected as close as possible and preferably of bearing the load area.
- The sensor mounting point has to be chosen correctly so that the space available allows for the sensor installation and replacement.

![Fig 33: Example of sensor mounting point](image)

- Sensor protection and wiring must be carried out reliably and in accordance with good engineering practice. The sensor must not be allowed subject to a greater acceleration, or temperature. The sensor location should not hinder other operational and maintenance measures.

**Note:** If sensor cannot be mounted at the recommended position then a suitable optimal location can be decided by the Field Engineer and this new position has to be intimated to Global Technical Support Centre (GTSC) for necessary change in analysis configuration.
5.2 Accelerometer mounting (Courtesy: CTC)
The installation of the accelerometer is equally important as that of the location of the sensor. This ensures logging of quality data. Installation comprises of mounting of sensor for collection of data and transmitting data through properly laid cables to DAU.

Accelerometer Installation can be done through any of the following methods:
1. Stud mounting
2. Adapter mounting
3. Adhesive mounting

Note: Generally, customers may not permit to carry out drilling on the motor surface. It has to be discussed with the customer before the installation.

5.3 Stud mounting

1. Use a hand drill with an end mill to create a flat spot on the surface of the machinery.
2. Apply even pressure to ensure flatness.
3. Mill and drill the pilot hole perpendicular to the surface.
4. Use pilot drill of 3.3mm and main drill of 6.9mm. Make sure that the pilot bit in the centre of the end mill is slightly deeper than the exposed length of the stud you will be using.
5. Drill depth can be up to 12mm.
6. Tap pilot hole with M8 tap sets.
7. Start the tap using the starter tap.
8. Use a bottom tap to cut threads all of the way to the bottom of the hole.
9. Clean the surface and tighten sensor into the hole using a torque wrench.

The mounting torque is important for the frequency response of the sensor because:
- If sensor is not tight enough, proper coupling between the base of sensor and the mounting surface will not be achieved.
- If sensor is over-tightened then stud breakage may occur.

Note: Proper installation of mounting hardware or sensors on an application maximizes frequency response and data quality, and ensures long-term adhesion.
To ensure maximum frequency response and data quality, an analyst should:
- Maximize stiffness
- Limit additional mass
- Maximize surface area contact
- Locate sensors close to vibration source

To ensure long-term adhesion ensure that:
- Use proper surface preparation
- Use materials compatible with the environment in which the application is running

For best measurement results, especially at high frequencies, it is important to prepare a smooth and flat machined surface where the accelerometer is to be attached. Inspect the area to ensure that no metal burrs or other foreign particles interfere with the contacting surfaces. The application of a thin layer of silicone grease between the accelerometer base and the mounting surface also assists in achieving a high degree of close surface contact required for best high-frequency transmissibility.

5.4 Mounting adapter
Apart from directly mounting the accelerometers on the motor surface, a more convenient method of using mounting adapter can be adopted.

This low cost option allows you to position the block however you choose and then mount with only one bolt. However this should only be done on the prior consent of the customer.

To mount this hardware:
1. Drill a hole on to the surface of motor as done for the accelerometer.
2. Fix the adapter into that hole using a stud arrangement and mount the accelerometers onto the adapter depending on the configuration requirement of the accelerometer.

5.5 Adhesive mounting
This will be the common type of installation method that will have to be followed for ABB MACHsense-R since drilling on motor for mounting accelerometers may not be permitted by customers. This mounting technique requires a clean surface, free from any residue or paint, to ensure proper bonding of the adhesive. A smooth, flat mounting surface is desirable which can be achieved by milling, grinding or scrubbing with emery sheet.

For adhesive mounting:
1. Place a small portion of adhesive on underside of mounting base.

2. Firmly press down mounting disk to mounting area to force the adhesive out from under the disk.
3. Hold the disk on surface until the adhesive can support the weight of the mounting disk, ensuring that the disk does not move or slide over the adhesive.
4. Allow the full cure of adhesive prior to installing sensor.

**Note:** As part of supply, mounting adaptor MH 130-1A is supplied.

**Suggested adhesives**
Use Loctite 660 or 330 with 7387 Activator as adhesive for mounting accelerometers.

**Note:** Adhesive will have to be procured by LSCs separately as part of installation kit.

**Effects of mounting techniques on frequency response**
The accuracy of high frequency response is directly affected by the mounting technique that is selected for the sensor. In general, the greater the mounted surface area contact between the sensor and the machine surface, the more accurate your high frequency response will be. High frequency response is based on the sensor specified as well as the method of attachment (together as a system). Stud mounted (or epoxy mounted) sensors are often able to utilize the entire high frequency measurement capability of a sensor, because this technique will maximize the surface contact of the sensor on the machine. Conversely, a probe tip mounted sensor has very little surface area contact with the machine surface, and offers
very little high frequency accuracy above 500 Hz (30,000 CPM).

Low frequency response may be accurately obtained by all of the illustrated techniques shown in Fig 31, because low frequency is not based on the mounting system resonance of the sensor and attachment method. The ability to measure low frequency vibrations will be a function of the sensor’s specified capability to measure a given low frequency, and not dependent on the mounting technique chosen.

The following figure offers a general guideline for the range of mounting techniques available, and the corresponding high frequency response expectations:

![General Guideline for Mounting Techniques](image)

**Note:** For pin out/connection details for connecting vibration cables into DAU, refer section 11.2.

### 5.6 Installation in motors with fins

1. Prepare the cooling fins on motor for mounting by scraping or grinding any paint or debris between cooling fins.
2. Apply epoxy to the sides and bottom of the probe portion of the motor fin mount pad.
3. Place the motor fin mount pad between the motor fins at the desired location.
   a. Correct motor fin mount selection is important.
   b. The probe must fit in between the motor fins and the bottom of the probe must contact the motor casing.
4. Firmly press the motor fin mount pad into place, ensuring the bottom of the motor fin mount pad is touching the motor casing (this is the contact area where the vibration is transferred from the motor to the sensor).
   a. The tip of the motor fin mount pad should be as flat against the motor casing as possible.
   b. The motor fin mount pad should not be resting on the top of the fins. If it does, then the bottom of the probe may not be in direct contact with the motor casing.

![Placing of Motor Fin Mount Pad](image)

**Note:** The motor fin mount pads are not provided as part of standard supply. This has to be procured separately. Kindly ensure proper inspection of site conditions to include fin mount pad before submitting offer.

### 5.7 Example

This is the standard followed for ABB motors and generators. For machines of other makes, follow similar procedures.
Mounting block for accelerometers:
1. Accelerometers will be mounted on the end shield as shown.
2. The block will be fixed by welding/4 screws.
3. The cables will be routed along with BTD cables.

6. Temperature sensors
The thermocouples and RTD for measuring winding and bearing temperature can be found in the auxiliary box mounted on the motor.
- Motor has to have RTDs in built for measuring temperature
- Standard measurements for temperature includes
  - 3 winding temperature
  - 2 bearing temperature
- Outputs are taken from auxiliary terminal box of Motor. Maximum cable length for RTD is 20 meters.

Depending on type of output from PT-100, appropriate connections have to be provided to DAU.

Note: For different type of connections from Pt-100 into DAU, refer section 11.2.

7. Cabling (Courtesy: Meggit)

7.1 Connecting accelerometer to DAU
The standard supply comprises of four 10 m cables with integral mill connector at one end and openwired at other end.
1. Insert the mil connector at back of accelerometer according to the key way provided.
2. Press and turn the connector till it is tightly fit.

**Note:** For connection details of vibration cable into DAU please refer to section 11.2.

### 7.2 Cable anchoring

After mounting the sensor, the cable should be anchored to reduce stress at the cable terminations and to prevent false signals due to cable vibration and slapping. Cables that are allowed to have excessive motion will eventually result in cable metal and insulation fatigue. The fatigue causes wire strand breakage, insulation failure, and results in noisy or broken connections.

Use cable ties or clamps to secure cables without being left hanging loose. When securing the cable, leave enough slack cable to allow free movement of the accelerometer on the vibrating machinery. These techniques for cable anchoring are extremely important for machinery with high displacement amplitudes.

Use proper conduit and trays wherever required to help cables withstand the operating environment. The sensor cables should be laid away from high voltage cables by distance of at least 250 mm.

![Recommended cable laying](http://www.mmf.de/accelerometer_cabling.htm)

![Proper cable anchoring](http://www.mmf.de/accelerometer_cabling.htm)
7.3 Cable laying
Use proper conduit and trays wherever required to help cables withstand the operating environment. The sensor cables should be laid away from high voltage cables by distance of at least 250 mm.

Note: It is suggested to carry out a site survey to determine a location to mount DAU and lay the cable.

8. General safety instructions

1. Comply with the facility's safety precautions at all times.
2. Ensure that the physical setup does not interfere with the facility's current or intended operation.
3. Always carry out the installation after the motor stops.
4. Always use proper safety gear such as protective headgear, ear plugs/muffs, safety gloves, safety goggles, safety shoes, protective clothing.
5. Ensure that there is adequate lighting in the test area.

9. Configuration using ABB MACHsense-P

- After carrying out the installation, the motor has to be run at optimal load and measurements using ABB MACHsense-P has to be carried out.
- Do not carry out the measurements immediately after starting motor. The motor has to reach its equilibrium condition before measurements are done.
- The field engineer has to carry out measurements under three configuration:
  - PCA
  - EM
  - MCSA
- The measurements have to be done at optimal load of the motor i.e. at normal operating load.
- Avoid making measurements at no-load and decoupled condition.
- The data after measurements have to be mailed to nearest Regional Technical Center (RTC).
10. Installation hardware requirements

The following will be some of the hardware required for carrying out the installation of ABB MACHsense-R:

- Hand drilling machine
- Extension board with 10mt cable
- Pilot drill-3.3mm
- Main drill 6.9mm
- Flattening tool
- M8 tap set
- Spanner/Wrench
- Air blower
- Cable ties
- Screw driver
- Hammer
- Adhesive
- 8mm mounting bolts and nuts with suitable washers

11. Cable Pinouts and Connections

![Fig 47: DAU seen open from front side](image)

The connectors are in four rows, from top to bottom-Rows 1 to 4:

11.1. Connection of cables to DAU

- All cables supplied with DAU will have lugs crimped at the termination
- Screw out the cable glands
- Remove the red colored cable protector
- Insert cable gland into the cable
- Insert cable into DAU
- The connector row has two sections:

  - Connecting points
  - Pin holders

  Press the pin holder with a small screw driver and insert the lug of cable into corresponding connecting point.
  Refer to below table for details of ‘connection points’

**Note:** The cable terminations with lugs are very fragile. Handle with care to avoid any damage.
### 11.2 Table of connecting points for different cables

**Note:** The below table will be updated with color codes in next edition of manual

<table>
<thead>
<tr>
<th>Connector</th>
<th>Purpose on row 1</th>
<th>Purpose on row 2</th>
<th>Purpose on row 3</th>
<th>Purpose on row 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Usage voltage (~24 VDC)</td>
<td>Voltage input 2 -</td>
<td>IEPE 3 24V</td>
<td>Usage voltage (~24 VDC)</td>
</tr>
<tr>
<td>2</td>
<td>DGND</td>
<td>Voltage input 2 +</td>
<td>IEPE 3 GND</td>
<td>DGND</td>
</tr>
<tr>
<td>3</td>
<td>N/C</td>
<td>Voltage input GND</td>
<td>Voltage input 1 -</td>
<td>Usage voltage (~24 VDC)</td>
</tr>
<tr>
<td>4</td>
<td>IEPE 1 24V</td>
<td>Voltage input 4 -</td>
<td>Voltage input 1 +</td>
<td>DGND</td>
</tr>
<tr>
<td>5</td>
<td>IEPE 1 GND</td>
<td>Voltage input 4 +</td>
<td>Voltage input 1 GND</td>
<td>Usage voltage (~24 VDC)</td>
</tr>
<tr>
<td>6</td>
<td>IEPE 4 24V</td>
<td>Voltage input 4 GND</td>
<td>Voltage input 3 -</td>
<td>DGND</td>
</tr>
<tr>
<td>7</td>
<td>IEPE 4 GND</td>
<td>Pt-100 5 voltage +</td>
<td>Voltage input 3 +</td>
<td>IEPE 2 24 V</td>
</tr>
<tr>
<td>8</td>
<td>Current input 1 -</td>
<td>Pt-100 5 current +</td>
<td>Voltage input 3 GND</td>
<td>IEPE 2 GND</td>
</tr>
<tr>
<td>9</td>
<td>Current input 1 +</td>
<td>Pt-100 5 current -</td>
<td>Pt-100 1 voltage +</td>
<td>Current input 2 -</td>
</tr>
<tr>
<td>10</td>
<td>Current input 1 GND</td>
<td>Pt-100 5 voltage -</td>
<td>Pt-100 1 current +</td>
<td>Current input 2 +</td>
</tr>
<tr>
<td>11</td>
<td>Current input 3 -</td>
<td>Pt-100 7 voltage +</td>
<td>Pt-100 1 current -</td>
<td>Current input GND</td>
</tr>
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<td>12</td>
<td>Current input 3 +</td>
<td>Pt-100 7 current +</td>
<td>Pt-100 1 voltage -</td>
<td>Current input 4 -</td>
</tr>
<tr>
<td>13</td>
<td>Current input 3 GND</td>
<td>Pt-100 7 current -</td>
<td>Pt-100 3 voltage +</td>
<td>Current input 4 +</td>
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<td>14</td>
<td>Pt-100 2 voltage +</td>
<td>Pt-100 7 voltage -</td>
<td>Pt-100 3 current +</td>
<td>Current input GND</td>
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<td>15</td>
<td>Pt-100 2 current +</td>
<td>VGA Blue</td>
<td>Pt-100 3 current -</td>
<td>Pt-100 6 voltage +</td>
</tr>
<tr>
<td>16</td>
<td>Pt-100 2 current -</td>
<td>VGA Green</td>
<td>Pt-100 3 voltage -</td>
<td>Pt-100 6 current +</td>
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<td>17</td>
<td>Pt-100 2 voltage -</td>
<td>VGA Red</td>
<td>Audio out L</td>
<td>Pt-100 6 current -</td>
</tr>
<tr>
<td>18</td>
<td>Pt-100 4 voltage +</td>
<td>VGA LCLK</td>
<td>Audio out R</td>
<td>Pt-100 6 voltage -</td>
</tr>
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<td>Pt-100 4 current +</td>
<td>VGA FCLK</td>
<td>Audio GND</td>
<td>Pt-100 8 voltage +</td>
</tr>
<tr>
<td>20</td>
<td>Pt-100 4 current -</td>
<td>VGA GND</td>
<td>Audio in R</td>
<td>Pt-100 8 current +</td>
</tr>
<tr>
<td>21</td>
<td>Pt-100 4 voltage -</td>
<td>CAN DGND</td>
<td>Audio in L</td>
<td>Pt-100 8 current -</td>
</tr>
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<td>DGND</td>
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<td>RS485 B / RS485 Z</td>
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<td>CAN 2 H</td>
<td>RS485 A / RS485 Y</td>
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