MWC25M-L2M-B20 series

Commissioning instructions for the sensors via PACTwareDC

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Inhalt

1 Product Description

1.1 Use and Application

The MWC25M-L2M-B20 series radar sensor with SAE J1939 interface for medium distances up to 25 m range is optimized for use in industrial applications. Its compact cubic L2 series housing is proven in many industrial areas due to its high robustness.

The radar sensor has a J1939 interface. Parameter Group Numbers (PGNs) enable you to directly parameterize the radar sensor optimally for your application. You can parameterize the measurement mode, the foreground and background suppression, and the minimum and maximum velocity suppression. Many other parameters, such as filter mode, filter strength and sampling rate, can also be configured. Alternatively, parameterization with extended functionality can be carried out using the PACTware FTD framework program and a DTM (Device Type Manager). This makes it possible to use various evaluation and filter settings for distance and velocity data.

The radar sensor operates according to the frequency-modulated continuous wave (FMCW) method at 122 GHz, in the ISM band approved for industrial use. It emits a continuous radar signal, which is changed in frequency over the bandwidth. This method enables the sensor to reliably detect the distance and velocity of static and moving objects. When measuring velocity, the radar sensor detects the velocity of an object only in the radial direction, without measuring tangential velocities or velocity components.

You can parameterize the radar sensor in two ways. Either via a J1939 with the specific parameters or via DTM and an FTD frame application.

Typically, radar sensors are used in a wide range of applications, including:

- Distance measurement (between two vehicles, in the crane arm, between two cranes, etc.)
- Velocity measurement (of trains, on AGVs, etc.)
- Area monitoring/anti-collision monitoring (for front and rear of vehicles, etc.)
- Fill level measurement (silos, agricultural tanks, etc.)
- Height control (scissor lift table, working platforms, fork on forklifts, detection of building roofs for trucks, etc.)

Advantages of radar sensors in the MWC25M-L2M-B20 series:

- Measuring distance and velocity, and detecting direction of movement in a device
- Can be used for safety applications up to PL c in combination with a diagnostics-enabled controller (e.g. PLC); see "Safety Application Report"
- Reliable measurements in harsh environments and fast applications
- J1939 interface for service data and process data, and for parameterization
- Extended EMC
- Proven in use cubic VariKont housing design
- Flexible mounting

1.2 Parametrierung über PACTware DC und DTM

Parameterization via PACTware DC and DTM allows convenient and comprehensive parameterization of the sensor due to the graphical interface of the DTM. The DTM (Device Type Manager, a kind of "device driver") displays the parameters clearly and graphically, by subject, in menu items. Furthermore, the measured distances, status changes, and individual radar reflections are visualized. Analysis and observation functions allow you to record and evaluate circumstances.

As an FTD frame application, we recommend using "PACTware 5.0" software or higher as the user interface. The PACTware software package includes the PACTware DC (DC Direct Connect) version for quickly and easily establishing a connection between PACTware and the sensor.

The latest available versions of the individual software components required, such as PACTware 5.0 or higher, J1939-COM-DTM, and device DTM, can be found online at www.pepperl-fuchs.com, on the product page in the "Software" section.

As a convenient solution, we offer the "CAN Parameterization Tool," which contains PACTware, PACTware DC, the device driver for the CAN/USB converter-SUBD9, and the DTM for J1939 and CANopen communication. We recommend using this software package for easy commissioning and parameterization of the sensor. The latest available versions of the individual software components required, such as the "CAN Parameterization Tool" and the device DTM, can be found online at www.pepperl-fuchs.com, on the product page for the MWC25M-L2M-B20 series.

1.3 Anzeigen

The radar sensor has multi-color LEDs, each with three colors, for displaying operating and status information.

Two LEDs with the same meaning are arranged diagonally on the device to ensure better visibility in an application environment.

SENSOR LED (yellow)	Objekt im Auswertebereich
STATUS LED (green/red)	J1939 status indicator: green LED is run LED, red LED is error LED or not connected on the bus

Hinweis!

The STATUS LED (green/red) can also light up green and red successively at the same flashing frequency to indicate the states in the following tables.

SENSOR LED (yellow)

LED status	Description
On	Object detected in the evaluation area
Off	No object detected in the evaluation area

STATUS LED (green)

LED status	Description
On	The device is in the state "Operational"
Off	The device is in the reset state or there is no electric power supply
Flickering	The device is active in the "address claiming" state and is waiting for an address to be assigned (flashing frequency 10 Hz)
Single Flash	The device is in "Power Saving Mode", no PGNs are sent (flashing frequency 1 Hz)

STATUS LED (red)

LED status	Description
On	The device is in the state "CAN Bus Off"
Off	The device is operating without errors
Flickering	The "address claiming" has failed, no address has been assigned to the device and it is not participating in bus communication. (flashing frequency 10 Hz)
Single Flash	The error counter of the CAN controller has reached or exceeded its warning limit (flashing frequency 1 Hz)

1.4 Parameterization Aids

The following parameterization aids are required for parameterization via the DTM:

Designation	Description
CAN Parameterization Tool	Software package for simple commissioning and parameterization of the sensor, consisting of: • PACTware/PACTware DC • DTM for CANopen-Communication • DTM for J1939-Communication • VCI driver for den CAN/USB converter-SUBD9 Visit www.pepperl-fuchs.com and access the product page for the relevant sensor in the MWC25M-L2M-B20 series
DTM for MWC25-L2M-B20-Serie	DTM (Device Type Manager) - device description and graphic user interface for radar sensor parameterization, integration into the system environment Visit www.pepperl-fuchs.com and access the product page for the relevant sensor in the MWC25M-L2M-B20 series
PACTware (5.0 or higher)	FDT frame application for operating IODDs and DTMs. Includes the PACTware and PACTware DC versions. Compared to PACTware, the PACTware DC has a "plug-in" for quickly and easily establishing connections between sensor and PACTware. Visit www.pepperl-fuchs.com and access the product pages for software in the "Products" section.
DTM for J1939-Communication	Device Type Manager - Software for operating the CAN/USB converter-SUBD9 via FDT frame application Not required when installing the "CAN Parameterization Tool." Visit www.pepperl-fuchs.com and access the product pages for software in the "Products" section.
CAN/USB configuration kit	Configuration kit for communications between FDT frame application and radar sensor Includes the following components: • CAN/USB converter-SUBD9 • Power supply for CAN/USB converter-SUBD9 • Connection cable and adapter cable for components The CANopen Parameterization Tool contains both VCI drivers for the CAN/USB converter-SUBD9 and the DTM for CANopen communication for CAN communication with PACTware/PACTwareDC.

2 Installation

2.1 Safety Information

Caution!

Risk of short circuit

Carrying out work while the system is energized may result in damage to the device.

- Always disconnect the supply voltage before carrying out work on the device.
- Only connect the device to the supply voltage once all work has been completed.

2.2 Preparation

Unpacking the Device

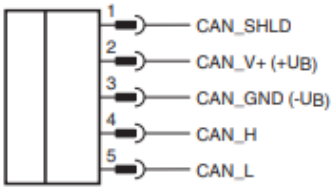
1. Check the packaging and contents for damage.
   ↳ In the event of damage, inform the shipping company and notify the supplier.
2. Check the package contents against your order and the shipping documents to ensure that all items are present and correct.
   ↳ Should you have any questions, direct them to Pepperl+Fuchs.
3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

2.3 Connection

Note!

Use a shielded 5-wire sensor connection cable to connect the sensor to a CANopen bus. Pay attention to the pinouts the standard pinout (A-coded M12 plug) differs from the pinout in the J1939 specification.

Wiring Diagram



Applying Supply Voltage for a Sensor with V15 Connector Plug

To supply voltage to the sensor, proceed as follows:

1. Insert the prepared connection cable into the connector plug provided for this purpose on the sensor.
2. Screw the union nut onto the connector plug as far as it will go. This ensures that the power cable cannot be pulled out inadvertently.
3. Now connect the supply voltage to the cables provided for this purpose and switch it on.
   ↳ The sensor is now ready for operation.

2.4 Mounting and Alignment

Mounting

When mounting, observe the following points:

- Mount the sensor so that no foreign objects are in the sensing range.
- Note the dead band in which objects cannot be detected. If there are objects in the dead band, false reflections may occur. Thin materials with low absorption can be placed in the dead band after extensive testing (e.g., sensor behind a plastic wall, glass).

Alignment

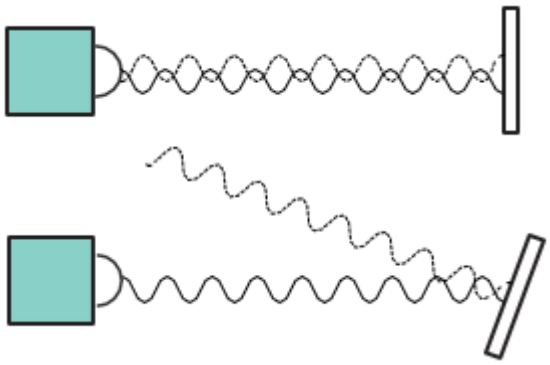
When aligning the radar sensor, the beam direction of the radar wave is often crucial in determining how well the wave is reflected by an object. If object detection parameters are not configured in advance, the radar sensor will detect the object closest to it and reference its measured values to this object. You can use the parameterization options to configure different measurement modes for which object should be referenced.

If the radar sensor does not measure against a reference object, the sensors can be mounted in any alignment, observing the influencing factors of objects in the dead band. The radar wave spreads perpendicular to the radome (radar dome = lens). The opening angle and characteristic response curve of the radar beam can be found in the relevant datasheet for your radar sensor.

Note!

In stationary applications, achieving the full performance of the radar sensor requires good alignment and mounting of the radar sensor and the reflector or reference object. In mobile applications, the following information must be taken into account in the system's design.

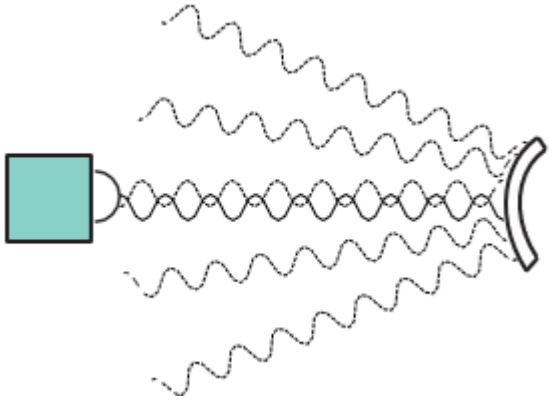
Planar reflecting object



When using a planar surface as the reflecting object, the maximum signal strength is reflected if the radar wave hits the reflecting object at a right angle.

When using an inclined surface and with total reflection of the radar wave, the inclination angle of the reflective object must be smaller than the opening angle of the sensor. If the reflected object is tilted too much, the reflected radar signal will be reflected away from the radar sensor and no object will be detected in the sensing range.

Curved reflecting object



When using a curved surface (e.g., cylindrical objects) as the reflecting object, align the radar sensor with the center of the reflecting object. After hitting the reflecting object, in this scenario the main part of the radar signal is scattered in different directions.

Distances to objects with these geometric properties are identifiable and measurable, but the strength of the detectable signal is lower than that of planar reflecting objects.

3 Commissioning

3.1 Commissioning via PACTwareDC and DTM

Note!

Various software components, adapters and cables are required as parameterization aids for the parameterization of a J1939 radar sensor.

The various software components can be downloaded from www.pepperl-fuchs.com, on the respective MWC25M-L2M-B20 series product page. The software can be downloaded in compressed form as a ZIP file. After unzipping, we recommend installation using the appropriate MSI file.

We recommend installing the "CAN Parameterization Tool" for easy installation and commissioning.

Make sure that you have these available for commissioning the sensor via PACTwareDC and DTM.

Installing Software Components

Certain software components will need to be installed to communicate with the sensor via CANopen using "PACTware" software and the associated DTM (Device Type Manager). Proceed as follows:

1. Preferably install the "CAN Parameterization Tool."

   ↳ PACTware, PACTware DC, the driver, and the DTM for CAN communication are installed automatically. If a PACTware version is installed separately, you must install the driver and DTM for CAN communication separately.

2. Restart your computer to start the newly installed drivers.
3. Install the DTM for the MWC25M-L2M-B20 sensors.

Note!

For the CAN/USB converter-SUBD9 to work, the compatible VCI driver must be installed first. This is done automatically when you install the "CANopen Parameterization Tool." If you want to install software components outside this package individually, ensure that the VCI driver is installed before connecting the CAN/USB converter-SUBD9 and then restart your computer.

Establish connection between sensor, CAN/USB converter, and PC

1. Connect the sensor to input 1 of the T-distributor for the CAN/USB converter-SUBD9 using a 5- pin connection cable.
2. Connect the power supply to input 2 of the T-distributor for the CAN/USB converter-SUBD9 using the adapter cable (2.10 mm DC coupling to 4-pin M12 plug).
3. Make sure that the terminator on the T-distributor is activated.
4. Connect the T-distributor to the SUBD9 plug on the CAN/USB converter-SUBD9.
5. Connect the USB cable of the CAN/USB converter-SUBD9 to a USB port on your work PC or laptop.
6. Connect the power supply of the CAN/USB converter-SUBD9 to the electric power supply

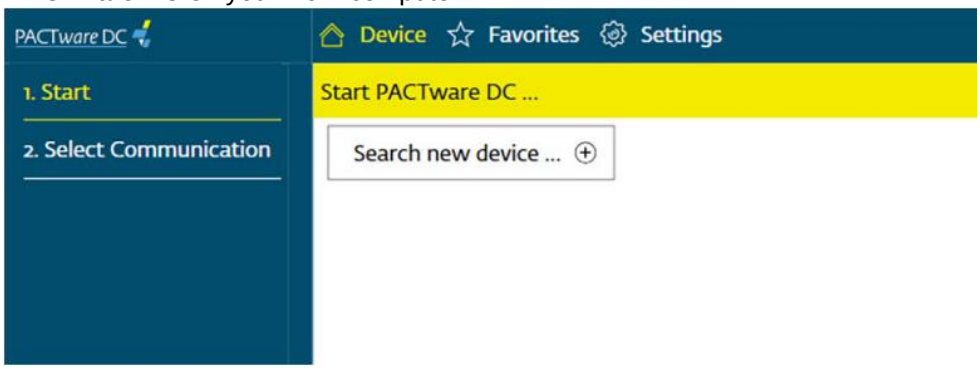
Note!
Before establishing a connection between PACTwareDC and the sensor, check whether the CAN communication between the sensor and the work computer via CAN/USB converter SUBD9 is working. You can check this by seeing if the "USB" LED is lit green on the CAN/USB converter-SUBD9.

If this is not the case, check:

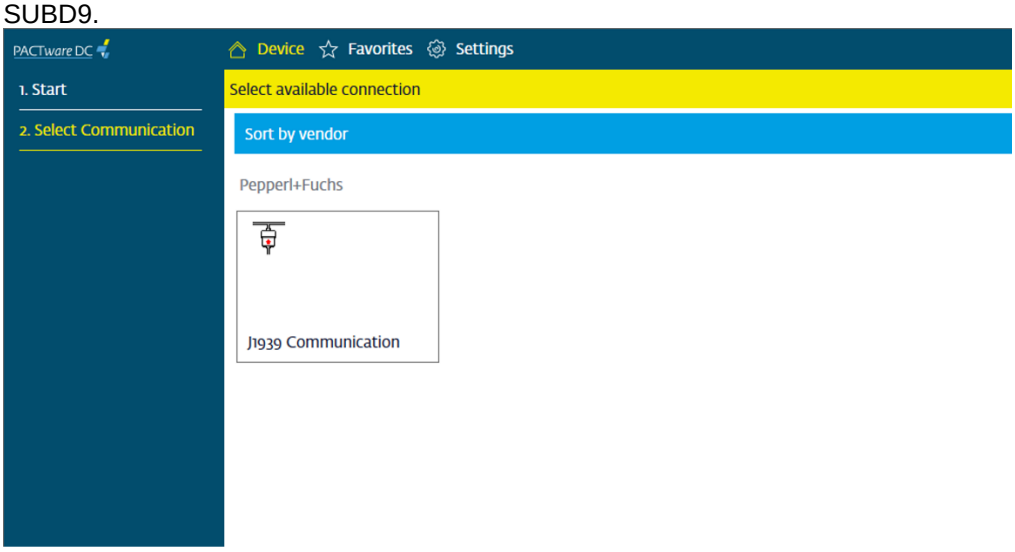
- whether the correct CAN-USB driver (VCI driver) is installed for the CAN/USB converter-SUBD9.
- whether the electric power supply for the CAN/USB converter-SUBD9 is switched on and all cord-sets are connected correctly.
- whether the terminator integrated in the T-distributor is activated

Establishing a Connection between PACTwareDC and the Sensor

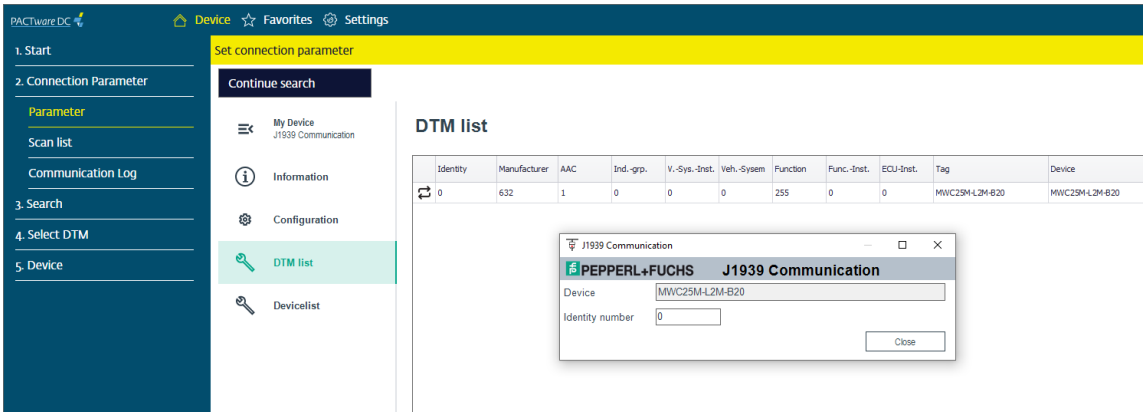
1. Start PACTware DC on your work computer.



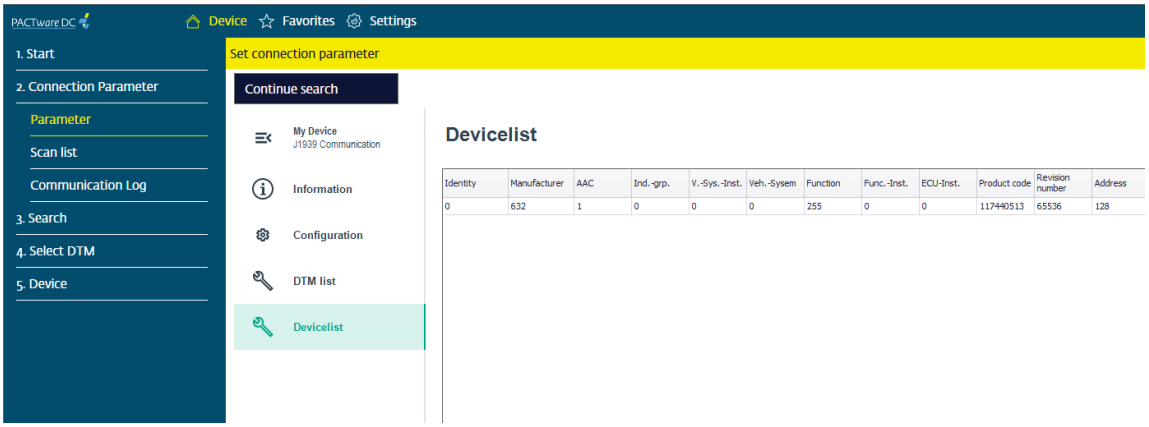
2. First click on "Device," followed by "Find new device..."
   ➔ PACTwareDC first retrieves the DTM for J1939 communication with the CAN/USB converter-SUBD9.



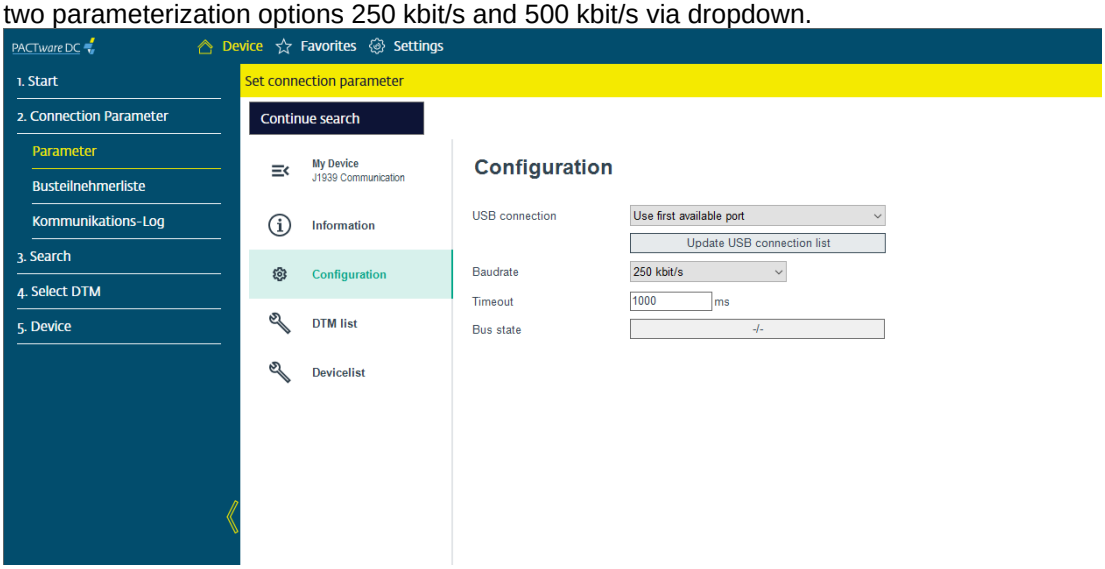
3. Click on "J1939 Communication" to perform a scan of the connected J1939 devices.
   ➔ PACTwareDC finds connected devices.
   ➔ PACTwareDC establishes a connection to the sensor, allowing you to then access the sensor.
   ➔ Control the “Identity” in the first field of the table – this number needs to be the same number in the Field “Identity number” when clicking on the double arrow.
   ➔ If both numbers are the same, a connection to the device DTM is ready



4. Selection of more than one device
   - ➔ If there is only one device on the bus, the connection to the device is established automatically; if there are two or more devices on the bus, select the desired device by clicking on the double arrow. Write the corresponding "Ident number" of the sensor in the field provided, which you can find in the device list.
   - ➔ The devices connected to the bus can be found in the device list. Here you can read the communication parameter "Identity Number" and the assigned (claimed) address of the sensors from the table.



5. Parameterization of baud rate
   - ➔ To do this, select the "Connection Parameter" tab in the PACTwareDC. The baud rate of the sensor can be set in the menu item “Configuration” of the communication DTM. Select from the two parameterization options 250 kbit/s and 500 kbit/s via dropdown.



4 Parameterization and Analysis Using PACTware and DTM via J1939

4.1 Overview

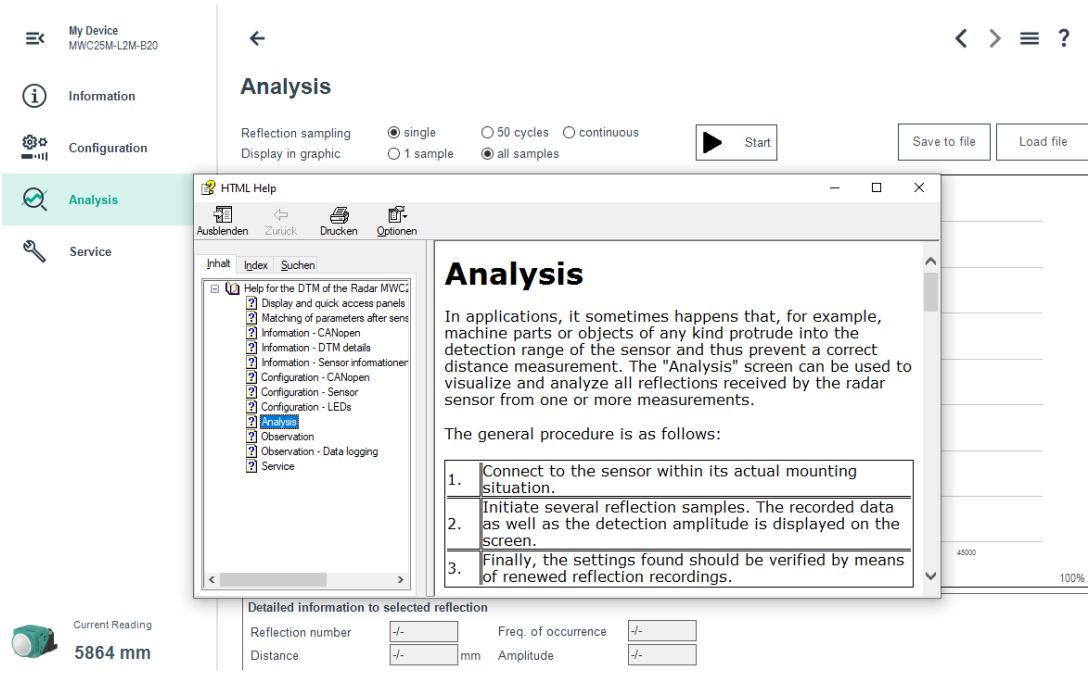
The parameters of the sensors are device-specific. In the DTM (Device Type Manager), these parameters are described in a well-structured way and partly supported with graphics. The DTM can be imported into various engineering tools from different system providers, DTM support provided. The sensor can then be parameterized or diagnosed using the appropriate tool (e.g., PACTware). The DTM menus are outlined below on the basis of the "PACTware" FTD frame application being used.

For simple and comprehensive parameterization of the sensor via J1939 and analysis of the sensor behavior, the DTM (Device Type Manager) described below offers you a wide range of options.

In addition to configuring the sensor, you can use the **Analysis** and **Observation** menus to display and record the sensor behavior during operation to adapt it in the best way possible to your application.

Note!

The following screenshots from the DTM in the PACTware frame application are described for all versions of the MWC25-L2M-B20 series using the example of the MWC25M-L2M-B20-V15 sensor.



Context-Related Help Texts Via F1

In the DTM, you can access context-related help texts by clicking on the "?" icon in the displayed menu or by clicking on the required parameter and then pressing the F1 key. A display will then open showing information about the adjustment options of the relevant menu and its parameters.

You can also call up the DTM help using "Open manual"; see figure below.

Basic DTM Operating Functions

Below are a few basic operating functions for the DTM in the PACTware environment.

1. Basic menu structure of the DTM. When a menu is selected, clickable tile icons for submenus are displayed on the right, or information or control buttons are displayed directly.
2. Navigation: return from the submenu to the menu
3. Navigation to switch between the submenus and parameter handling
4. Manage parameter data, display DTM help via "Open manual"
5. Status indicator: radar sensor connection to DTM.

Note!

To parameterize the radar sensors, use the context-sensitive help texts via F1 by clicking on the "?" symbol in the menu displayed.

5 Cybersecurity Information

The plant operator must implement the countermeasures defined in this section to ensure the cybersecure operation and protection of the device.

Security Context

The device is designed for use in an industrial CAN bus network, such as in applications in the field of Mobile Equipment. The application operator must ensure that the device is physically protected against unauthorized access. It must also be ensured that only well-known and trusted nodes are connected to the CAN bus network.

Decommissioning

Only adjustable parameter data are permanently saved. Parameter data can be deleted by restoring the factory settings. The operating hours are stored retentively. In case of doubt, the device must be physically destroyed to ensure that this data is also destroyed

6 Maintenance and Repair

6.1 Maintenance Work

The sensor itself is maintenance-free. For this reason, it is not necessary to carry out regular adjustments or maintenance work on the sensor itself.

However, check that the sensor and connector are tight within the scope of routine maintenance intervals. You may also want to check that the connection cable is installed and intact

6.2 Cleaning

Cleaning is only necessary in applications where the radome (lens) of the sensors is exposed to heavy dirt or build-up.

In general, the following applies as far as cleaning is concerned:

- Only use water without chemicals
- Only use a soft cloth
- No abrasive cleaning, scratching, or scrubbing

7 Troubleshooting

7.1 What to Do in Case of an Error

In case of a fault, use the following checklist to determine whether a malfunction with the sensor can be remedied. If none of the information provided in the checklist solves the problem, contact Pepperl+Fuchs via your sales office for any queries. If possible, have the model number and firmware version of the sensor to hand.

Checklist

Error	Cause	Remedy
Green LED not lit	The power supply is switched off.	Check whether there is a reason why the power supply is switched off (installation or maintenance work, etc.). Switch on the power supply if necessary.
	The plug is not connected to the connector on the sensor.	Connect the plug to the sensor and tighten the cap nut by hand.
	Wiring error in the splitter or switch cabinet.	Check the wiring carefully and repair any errors with the wiring. Pay attention to the pinoutas the standard pinout (A-coded M12 plug) is different from the pinout of the CAN specification.
	Supply cable to the sensor is damaged.	Replace the damaged cable.
	LEDs have been disabled in the parameter settings	Check the parameter settings.
No CAN connection to the device	The sensor's communication port is not connected to the CAN bus or, in the case of parameterization, to the CAN/USB converter-SUBD9.	Ensure that the communication port of the sensor is connected to the CAN bus/CAN/USB converter-SUBD9 and that a 5-pin cable has been used.
	No power supply	Check whether there is a reason for the absence of the power supply (installation or maintenance work, etc.). Switch on the power supply. Make sure that the correct pins are connected for CAN communication. (Pinout differs from standard pinout)
Target object is not detected even though the sensor is OK	There may be an obstruction in the vicinity of the sensor	Check that the sensor is correctly aligned. Check the sensor parameterization and, if necessary, change the measurement mode. Information about various objects in the sensing range is provided by the object reflection list 0x4100 or in PACTware DTM in the "Reflections in Field of View" evaluation under the "Analysis" main menu

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