ifm electronic

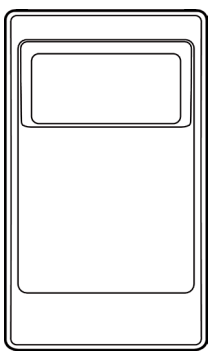
UK

# Programming Manual
# Mobile 3D Smart Sensor

efector250®

## O3M151

## Line Guidance



706405/00 11/2015

# Contents



This document is the original manual.

# 1 About this document

This document explains the 3D O3M151 Smart Sensor's function Line Guidance.

For a detailed description of the device, read the Operating Instructions of the O3M151 sensor and the Programming Manual of the ifm Vision Assistant (→ "1.3 Other applicable documents").

UK

## 1.1 Symbols used

► Instruction
> Reaction, result
→ Cross-reference

Important note
Failure to observe can result in malfunctions or faults.

Information
Additional note

## 1.2 Safety instructions

Read this document and the Operating Instructions before putting the device into operation. Make sure that the device is suitable for the applications concerned without restriction.

Failure to observe the Operating Instructions or the technical information can result in injuries and/or damage.

## 1.3 Other applicable documents

| Document | Description | Item No. |
|---|---|---|
| Operating Instructions | Operating instructions of the O3M15x sensor | 706383 |
| Programming Manual | Programming Manual of the ifm Vision Assistant software for carrying out a program update and changing parameters | 706384 |
| Quick guide | Quick guide on operating the O3M15x sensor | 80222723 |

The software and documents are available on the ifm homepage in the download area (→ www.ifm.com → Service → Download).

# 2 Smart Sensor

## 2.1 Functions

The O3M151 Smart Sensor is an optical system which measures the distance between the sensor and the next surface. An additional illumination unit illuminates the scene and the sensor processes the light reflected by the surface.

The Smart Sensor is optimised and matched to requirements and needs of mobile machines. It is intended for outdoor use and for difficult ambient light situations.

The principle is based on PMD technology for outputting 3D image data. In addition to new options for vehicle automation (AGV, automated guided vehicle), it also provides new assistance functions for automation tasks.

Communication is possible via Ethernet or CAN. System parametrisation and monitoring of the 3D data are carried out via the ifm Vision Assistant (→ ifm Vision Assistant Programming Manual).

The pre-processed functional data are output via the CAN bus, either via CANopen or SAE J 1939 (→ Chapter "7 Interface" on Page 17).

The Basic Function with functions such as measurement of minimum, maximum and average distance is available for simple distance tasks.

The Object Detection function enables automatic object detection of up to 20 objects. This function can, for example, be used as a collision warning tool.

The Line Guidance function enables detection of up to 5 three-dimensional line structures on the ground. This function can, for example, be used for windrow detection.

UK

## 2.2 Measuring principle

The device measures according to the light runtime method based on a phase measurement with modulated light.

Based on this principle, the following points must be taken into account during the measurements:

- Clean sensor window
  - Cleanliness is a basis for the reliable operation of optical sensors. Dirt or liquids reduce the light transmission and cause light scatter. This effect can affect the resolution and the measuring range of the sensor system.
  - Water droplets on the sensor glass can lead to inaccurate detection of the scene. The objects appear larger than in reality.

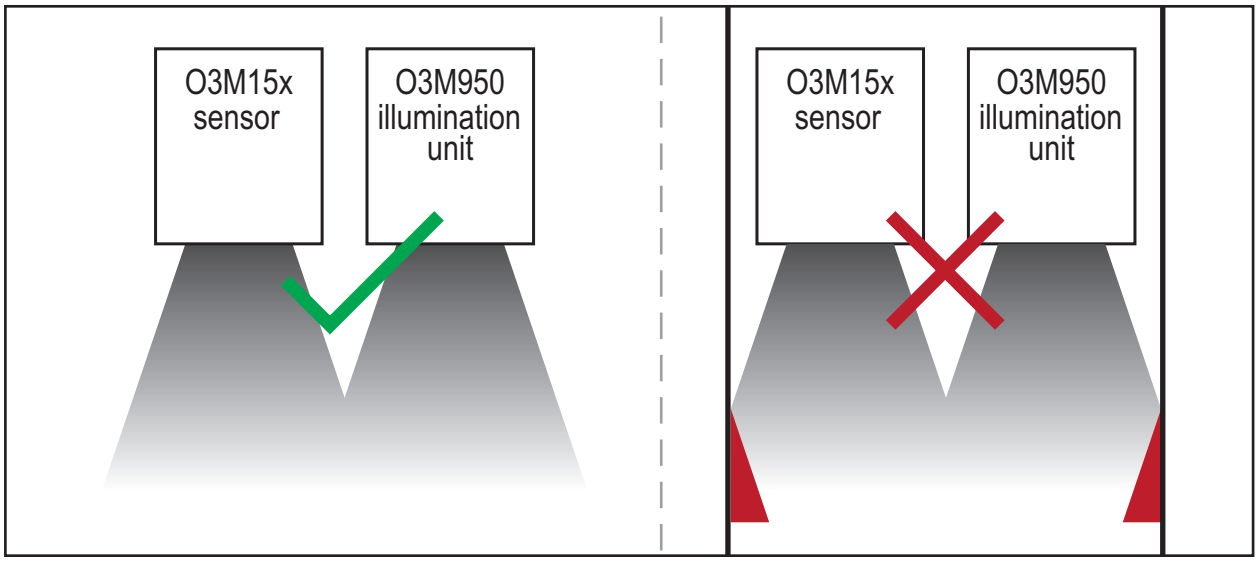
► Avoid installation in system areas which may become heavily soiled.

► Keep sensor window clean.

- Illumination/Range
  - The measurement of objects is carried out based on the active illumination by the additional illumination unit. The emitted infrared light makes the sensor virtually independent of the ambient lighting conditions. In case of bright sunlight, restrictions in the system range can occur due to increased signal noise.
  - The measurement range is dependent on the reflectivity of the object to be detected.
  - Due to the optical measuring principle, the system performance can be considerably increased by reflective materials (factor 3).

- Clear near detection field
  - Objects in the near field (1 m distance) can falsify the measured values of the sensor.
  - The wall on which the sensor is mounted should not be within the sensor area.

► Keep the illuminated area of the illumination unit in the immediate vicinity (up to 50 cm) of attached parts clear.



## 2.3 Operating check

With an optical system, detection faults can occur in case of poor visibility (e.g. in heavy fog, heavy dust, very heavy snowfall). The O3M151 Smart Sensor is equipped with sensory fault detection and generates a message when faults occur.

- The "Blockage Detection" function actively detects relevant soiling, condensation on or icing-up of the sensor.
- The "Diffuse Scene" function actively detects diffuse faults, such as heavy fog or heavy dust in the sensor area.

For the internal fault diagnosis of the hardware, refer to the Operating Instructions.

- Application-specific solutions can simply and especially conveniently be created with a controller (e.g. CR040X) or display (e.g CR108X) based on the functional output.
  There are special CODESYS libraries for receiving and interpreting the CAN signals of the O3M151 Smart Sensor. In addition, various application examples on a CODESYS basis are also available (→ www.ifm.com → Service → Download).

## 2.4 Installation position

Depending on the application, the following aids are available for positioning the O3M151 Smart Sensor:

- Calculation tool for calculating the detection range
- ifm Vision Assistant operating software
- Technical data with performance and values of detection range (→ Data sheet)

# 3 Object Detection

## 3.1 Function

Line Guidance

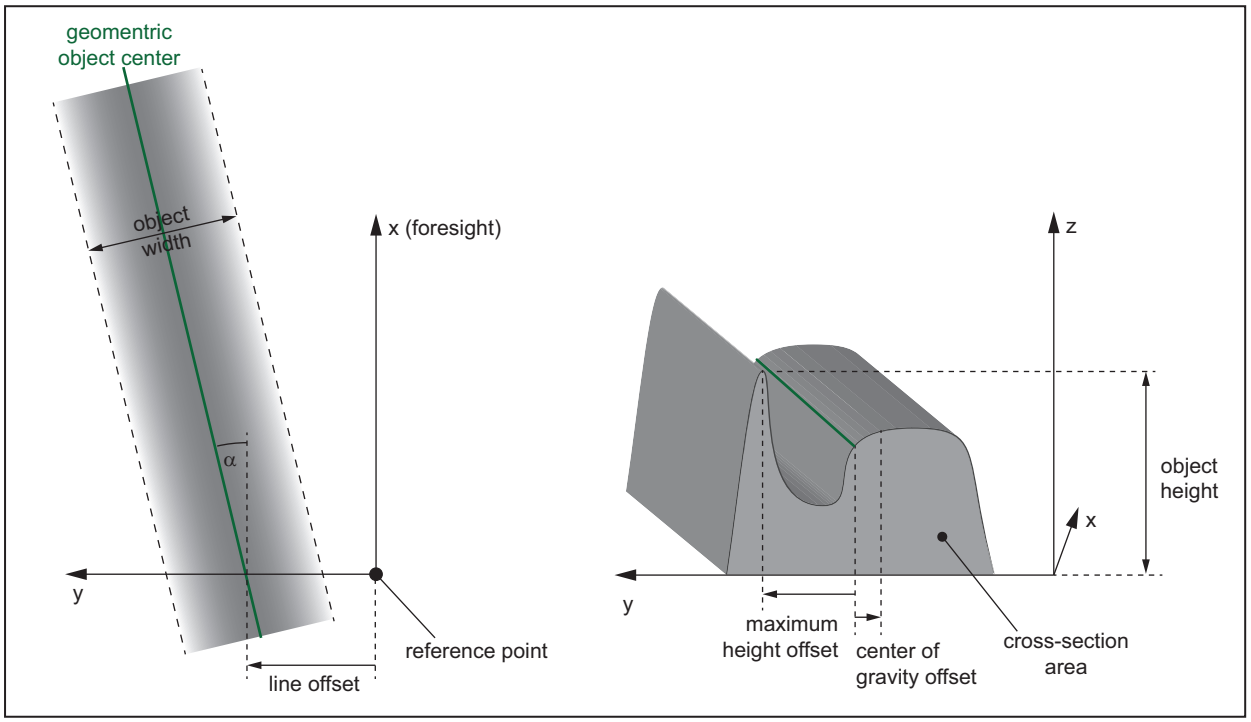
UK

Do not attach the sensor at a height of less than 50 cm.

**Line guidance**

The Line Guidance application detects and tracks up to 5 independent 3D line structures on the ground, e.g. a windrow. A broad range of information is available for each object:

- y-offset and orientation of the line which fits best with the center of the detected line-type object
- Qualitative evaluation of this information
- Maximum visible x-position value on the ground
- Properties of the detected structure, such as cross-section area, width, height, line offset and lateral offsets (maximum height, center of gravity) with respect to the geometric object center:




## 3.2 Possible applications

- Windrow detection (sensor attached to a vehicle)
- Tracking of material to be conveyed (static attachment of the sensor)

# 4 Commissioning

The O3M151 Smart Sensor can be operated with various functions.

For information on flashing the firmware, refer to the ifm Vision Assistant Programming Manual.

► Make sure that the correct firmware is loaded on the sensor.

► Carry out commissioning with the menu-guided ifm Vision Assistant Programming Manual.

For additional instructions on the sensor update with the ifm Vision Assistant, refer to the ifm Vision Assistant Programming Manual.

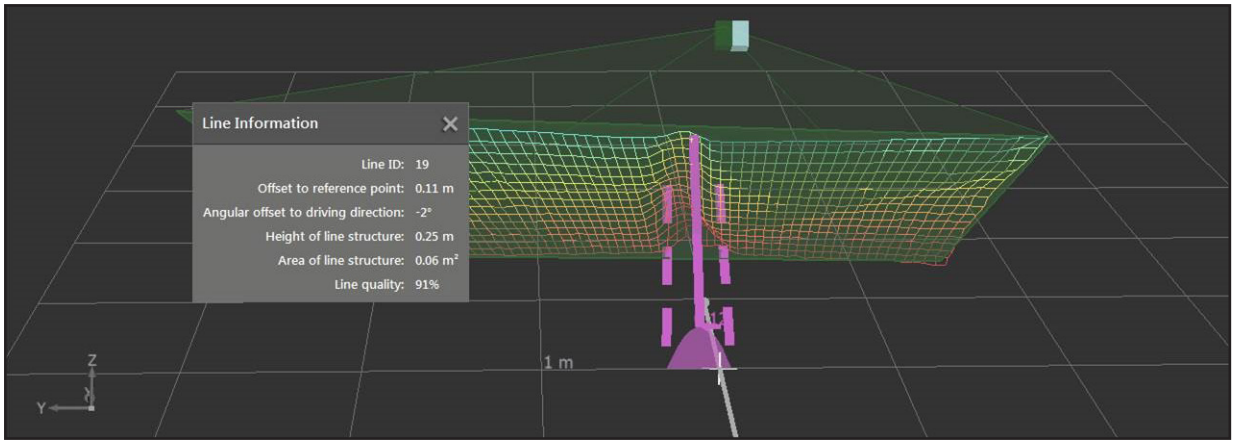
# 5 Windrow detection

Based on the functional output, application-specific solutions can be created simply and especially conveniently with a controller (e.g. CR040X) or display (e.g. CR108X).

There are special CODESYS libraries available for receiving and interpreting the CAN signals of the O3M151 Smart Sensor.

In addition, various application examples on a CODESYS basis are available.

The CODESYS libraries and the application examples can be downloaded from www.ifm.com → Service → Download → Industrial imaging (O3M15X - libraries).

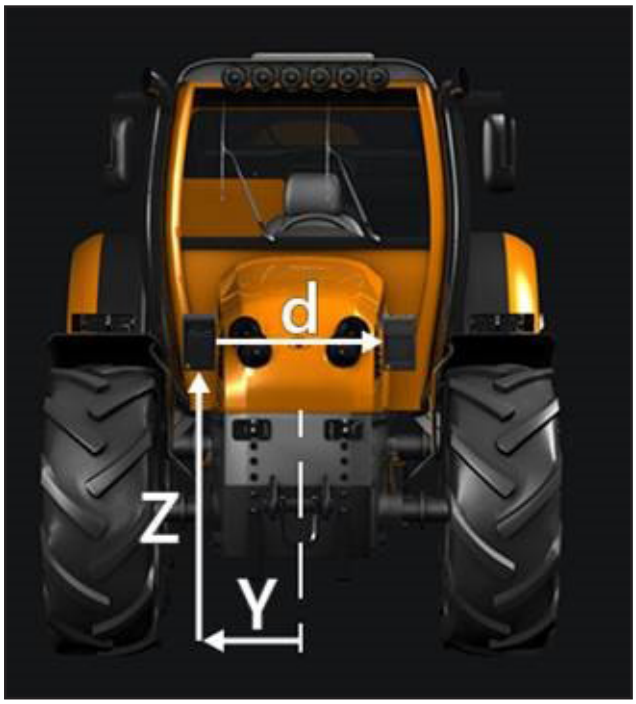



## 5.1 Introduction

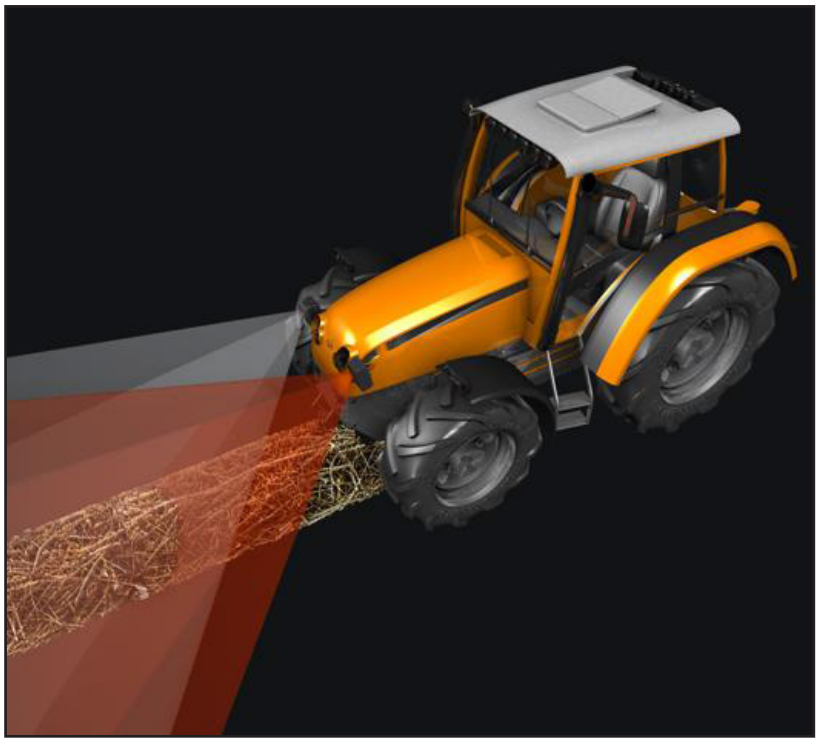
The windrow detection function enables the detection of windrows on the ground of a driving path.

## 5.2 Attachment options

► Mount the O3M151 Smart Sensor horizontally to the vehicle, at a height Z between 1.50 m and 4.50 m.




► Mount the camera and the illumination device spatially separated from each other in order to achieve better robustness with respect to dust.



► Mount the O3M151 Smart Sensor tilted downwards on the vehicle. A pitch angle between 40 and 60 degrees is recommended.

► Set the mounting position values for the camera and for the illumination device in the ifm Vision Assistant.

## 5.3 Parametrisation

If the load on the CAN bus is too high, it can be reduced with the CANoutputcycleModulo setting (→ Operating Instructions).

### 5.3.1 Windrow detection range

The detection range can be limited by setting the following parameters:

**Minimum windrow detection height**

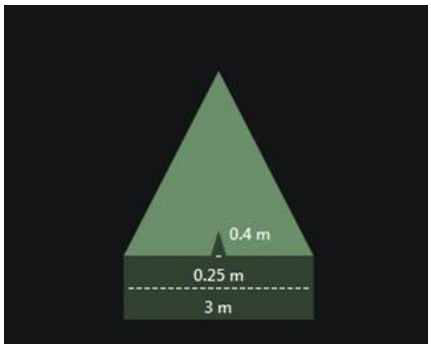
► Set the minimum windrow detection height to enable a clear separation between the ground and the windrows.

> By default, the value is set to 0.3 m. The allowed working range is between 0.2 m and 2.0 m.

**Minimum and maximum windrow width**

► Set the minimum and maximum windrow width in order to limit the detection of the object with respect to its lateral expansion.

> By default, the minimum windrow width (LineGuidanceCust_minWidth) is set to 0.25 m and the maximum windrow width (LineGuidanceCust_maxWidth) is set to 3.00 m.

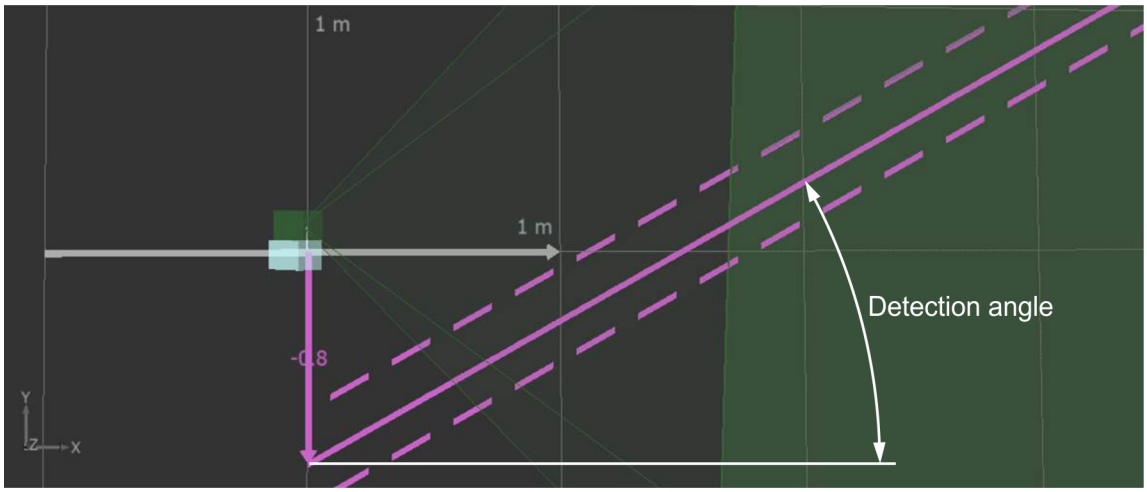



► Make sure that the condition minimum value < maximum value is met.

**Maximum windrow angle**

► Set the maximum angle between the detected windrow and the driving direction.

> By default, the maximum angle is set to 20°.




UK

**Search area limitation**

► Set the search area limits:

- In the x-direction the search area is limited by the xStart minimum value (LineGuidanceCust_xMin) and the xEnd maximum value (LineGuidanceCust_xMax).
- In the y-direction the search area is limited by the yStart minimum value (LineGuidanceCust_yMin) on the right side and the yEnd maximum value (LineGuidanceCust_yMax) on the left side.

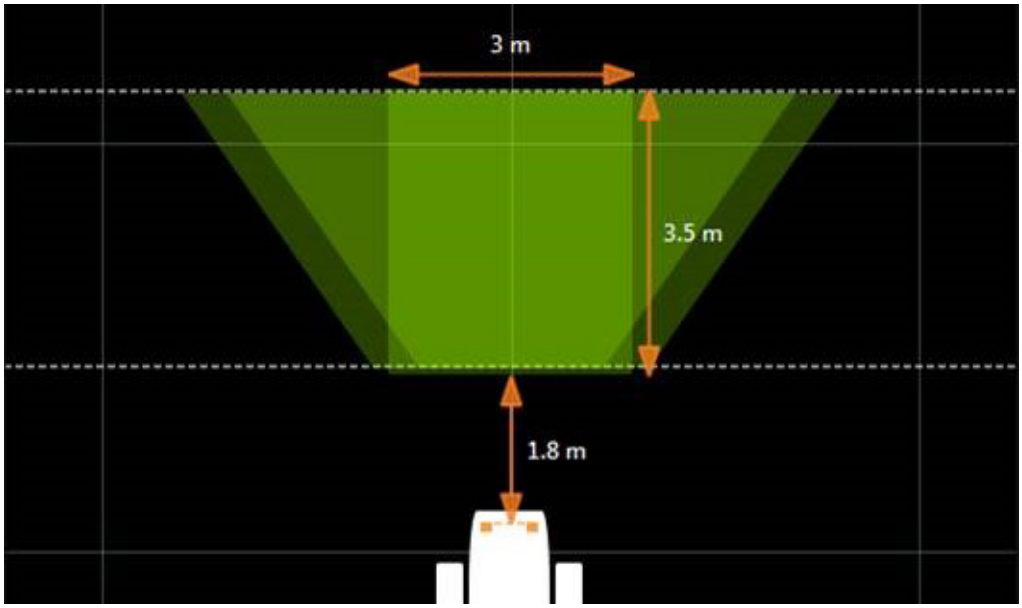
> Only detected windrows which intersect this search area are returned as results.

> Default values and ranges:

| Parameter | Default value | Range |
|---|---|---|
| xStart | +2 m | 0 m to +10 m |
| xEnd | +8 m | 0 m to +20 m |
| yStart | –2 m | –6 m to +2 m |
| yEnd | +2 m | –2 m to +6 m |

To keep data traffic via CAN low, it is recommended to limit the number of transmitted 3D object lines to 3.

► Make sure that the conditions xStart ≤ xEnd and yStart ≤ yEnd are met.




## 5.3.2 Frame rate

► Set the frame rate to 33 Hz.

### 5.3.3 Ground plane detection

► In case of high ego-motion of the vehicle, deactivate the ground plane detection (LineGuidanceCust_skipStreetPlaneEsitmation = 1).

> Possible causes of a high ego-motion of the vehicle:

– Strongly corrugated ground in driving direction, causing a major pitch angle change

– Steep terrain (e.g. vineyard).

In all other cases, it is recommended to activate the ground plane detection (LineGuidanceCust_skipStreetPlaneEsitmation = 0).



## 5.4 Relevant output

The CAN messages with the result values of the detected windrows (e.g. position and orientation) can be received and interpreted on the controller.

The windrows are filtered according to their detection age. The first (oldest) windrow is represented by the 3D line structure which is detected gaplessly for the longest period of time. If the detection of this windrow is halted and resumed later, the windrow will be regarded as the youngest one and it will be enqueued at the end of the object buffer.

With knowledge of the vehicle velocity and the cross-section area of the detected windrow, the volumetric flow can be calculated. In case of windrow collection with a baling press, the knowledge of the volumentric flow can be used to regulate the vehicle velocity to collect a constant volume at a time.

## 5.5 Operating properties and performance

- The following properties influence the detection performance:
  – Distance, height, orientation, lateral width and reflectivity of the windrow
  – Width and orientation of the detected 3D line structure
  – Mounting height of the O3M151 Smart Sensor
  – Vehicle velocity
- The minimum detectable windrow height is dependent on the system parametrisation. Under the worst conditions, it amounts to 20 cm.
- The optimum speed depends on the applied frame rate and the change of object orientation and object offset. The detection performance decreases with increasing vehicle velocity. The optimum performance is obtained with velocities of up to 30 km/h.

# 6 Parameters

The parameters can be changed and adjusted in function of the use of the sensor.

For details on the settings and parameters of the device refer to the ifm Vision Assistant Programming Manual.

| Parameter Name | Parameter Value | Param. Type | Param. Array Length | Min. | Max. | Param. Description | Vision Assistant |
|---|---|---|---|---|---|---|---|
| CycleTime | 40 | uint8 | 1 | 20 | 40 | Cycle time of the camera (20ms/30ms/40ms) | Application → Image Settings → Frame Rate (value as frequency instead of cycle time) |
| BeginHeating Temperature | 5 | sint8 | 1 | -128 | 127 | Temperature at which the heating is turned on (in °C) | Device Settings → Window Heating On Temperature |
| StopHeating Temperature | 8 | sint8 | 1 | -128 | 127 | Temperature at which the Heating is turned off (in °C) | Is set by the system automatically as Begin Heating Temperature + 3 °C |
| CANBaudrate | 250000 | uint32 | 1 | 125000 | 1000000 | CAN Baudrate, one of 125kbs, 250kbs, 500kbs, 1000kbs | CAN → Baudrate |
| MasterSlave Configuration | 0 | uint8 | 1 | 0 | 3 | Master Slave Camera Configuration | Device Settings → Synchronisation of multiple sensors |
| CANProtocol | 0 | uint8 | 1 | 0 | 1 | 0 = J1939, 1 = CANopen | CAN → CAN Protocol |
| CANopenNodeAddress | 10 | uint8 | 1 | 1 | 127 | CANopen Node value | CAN → Node ID |
| CANOutputCycle Modulo | 1 | uint8 | 1 | 1 | 3 | Defines the the cycle-time of can messages: every n-th camera cycle can messages are sent | CAN → Output Cycle Modulo |
| J1939SourceAddress | 239 | uint8 | 1 | 1 | 253 | J1939 source address | CAN → Source Address |
| CANMaxNumber OfLines | 1 | uint8 | 1 | 0 | 5 | Configuration of maximum number of objects in Object List on CAN | CAN → Max Number of Lines |
| Ipv4AddressCamera | 192 168 1 1 | uint8 | 4 | 0 | 255 | Ipv4 address of camera | Ethernet → IP address |
| SubnetMask | 255 255 255 0 | uint8 | 4 | 0 | 255 | Subnet mask of camera | Ethernet → Subnet Mask |
| Ipv4Address Destination | 255 255 255 255 | uint8 | 4 | 0 | 255 | Ipc4AddressDestination of the UDP packets | Ethernet → IP Destination |
| destinationUDPPort | 42000 | uint16 | 1 | 0 | 65535 | Destination UDP port for the UDP packets | Ethernet → UDP Port |
| EthernetOutput Configuration | 0 | uint8 | 1 | 0 | 1 | 0 is standard output, 1 debug output | Only changeable if used for recording of sequences. Monitor → Record Options → Debug Data On/Off |
| EthernetLoad Configuration | 1 | uint8 | 1 | 1 | 4 | EthernetOutput only every nth systemcycle | – |
| DistanceImage OnSwitch | 1 | uint8 | 1 | 0 | 1 | 0 is DistanceImage off, 1 is DistanceImage on | Ethernet Settings → Distance Image On Switch |
| PMDExtrCalib_ camCal_transX | 0 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: X translation [m] | Calibration → follow instructions |
| PMDExtrCalib_ camCal_transY | 0 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: Y translation [m] | Calibration → follow instructions |

| Parameter Name | Parameter Value | Param. Type | Param. Array Length | Min. | Max. | Param. Description | Vision Assistant |
|---|---|---|---|---|---|---|---|
| PMDExtrCalib_ camCal_transZ | 1 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: Z translation [m] | Calibration → follow instructions |
| PMDExtrCalib_ camCal_rotX | -1.571 | float32 | 1 | -3.142 | 3.142 | Extrinsic calibration of camera: Y rotation [rad] | Calibration → follow instructions |
| PMDExtrCalib_ camCal_rotY | 1.571 | float32 | 1 | -3.142 | 3.142 | Extrinsic calibration of camera: Y rotation [rad] | Calibration → follow instructions |
| PMDExtrCalib_ camCal_rotZ | 0 | float32 | 1 | -3.142 | 3.142 | Extrinsic calibration of camera: Z rotation [rad] | Calibration → follow instructions |
| PMDExtrCalib_ IlluCal_transX | 0.047 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: X translation [m] | Calibration → follow instructions |
| PMDExtrCalib_ IlluCal_transY | 0.085 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: Y translation [m] | Calibration → follow instructions |
| PMDExtrCalib_ IlluCal_transZ | 0.948 | float32 | 1 | -10 | 10 | Extrinsic calibration of camera: Z translation [m] | Calibration → follow instructions |
| PMDExtrCalib_ IlluCalibIsRelative | 0 | uint8 | 1 | 0 | 1 | Flag indicating whether illu calibration is given relative to camera or absolute in world coordinates. | Calibration → follow instructions |
| LineGuidanceCust_ sprayRemoval Sensitivity | 0 | uint8 | 1 | 0 | 3 | Spray Removal customization | Application → Image Settings → Spray removal |
| LineGuidanceCust_ pixelPlausibilization Thresholds | 2 | uint8 | 1 | 0 | 2 | Pixel plausibilization customization | Application → Image Settings → Noise reduction filter |
| LineGuidanceCust_ blockageSensitivity | 0 | uint8 | 1 | 0 | 3 | Blockage customization | Application → Image Settings → Blockage detection |
| LineGuidanceCust_ spatialFilterXMin | -100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, minimum X | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ spatialFilterXMax | 100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, maximum X | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ spatialFilterYMin | -100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, minimum Y | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ spatialFilterYMax | 100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, maximum Y | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ spatialFilterZMin | -100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, minimum Z | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ spatialFilterZMax | 100 | float32 | 1 | -100 | 100 | Spatial filter on the Cartesian coordinates, maximum Z | Application → Image Settings → Show advanced parameters |
| LineGuidanceCust_ reflectorThreshold-Value | 0.1 | float32 | 1 | 0 | 1 | Value for setting the reflectivity threshold to detect retroreflectors | Application → Image Settings → Reflector Threshold Value (4 possible values: Max, Med, Low, Min) |
| LineGuidanceCust_ maxLineAngle | 0.349 | float32 | 1 | 0 | 3.142 | Maximum orientation (slope) of line in rad | Application → Line guidance → Max angle to driving direction |
| LineGuidanceCust_ xMin | 0 | float32 | 1 | -100 | 100 | Only lines which intersect with this area remain and are given as output | Application → Line guidance → Show advanced parameters |

| Parameter Name | Parameter Value | Param. Type | Param. Array Length | Min. | Max. | Param. Description | Vision Assistant |
|---|---|---|---|---|---|---|---|
| LineGuidanceCust_ xMax | 10 | float32 | 1 | -100 | 100 | Only lines which intersect with this area remain and are given as output | Application → Line guidance → Show advanced parameters |
| LineGuidanceCust_ yMin | -5 | float32 | 1 | -100 | 100 | only lines which intersect with this area remain and are given as output | Application → Line guidance → Show advanced parameters |
| LineGuidanceCust_ yMax | 5 | float32 | 1 | -100 | 100 | only lines which intersect with this area remain and are given as output | Application → Line guidance → Show advanced parameters |
| LineGuidanceCust_ minHeight | 0.3 | float32 | 1 | 0.2 | 2 | min height of heap/ cut edge/... [m] | Application → Line guidance |
| LineGuidanceCust_ minWidth | 0.25 | float32 | 1 | 0 | 10 | minimum width of heap/ cut edge/... [m] | Application → Line guidance |
| LineGuidanceCust_ maxWidth | 3 | float32 | 1 | -1 | 10 | maximum width of heap/ cut edge/... [m] (negative value <=> unlimited) | Application → Line guidance |
| LineGuidanceCust_ skipStreetPlaneEstima-tion | 0 | uint8 | 1 | 0 | 1 | determines if street plane estimation process is skipped <=> pla-neValid flag is set to 0 | Application → Line guidance → Show advanced parameters → Ground plane detection |
| AutoCalibParam_num-berOfPatterns | 0 | uint8 | 1 | 0 | 8 | Number of patterns to be used for autocalibra-tion (0,1 : autocalibration disabled) | Template in Vision Assistant SW will be available with later update. |
| AutoCalibParam_ xPattern | 0 | float32 | 8 | -30 | 30 | x coordinates [m] of the autocalibration patterns | Template in Vision Assistant SW will be available with later update. |
| AutoCalibParam_ yPattern | 0 | float32 | 8 | -30 | 30 | y coordinates [m] of the autocalibration patterns | Template in Vision Assistant SW will be available with later update. |
| AutoCalibParam_ zPattern | 0 | float32 | 8 | -30 | 30 | z coordinates [m] of the autocalibration patterns | Template in Vision Assistant SW will be available with later update. |
| AutoCalibParam_ patternType | 0 | uint8 | 8 | 0 | 10 | type of the autocalibra-tion patterns | Template in Vision Assistant SW will be available with later update. |
| triggeredStreet Calibration | 0 | uint8 | 1 | 0 | 1 | Flag indicating if the trig-gered calibration based on the street plane estimation is active | Wizard/Template → Windrow Detection → Step 2: "Verification & Adjustment → Find Ground |

# 7 Interface

The preprocessed function data are output via CAN-Bus, either with the CANopen or the SAE J 1939 protocol.

## 7.1 CANopen

### 7.1.1 Objects

UK

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1000 | DeviceType | – | – | 0x7 (Var) | ro | 0 | – | – | Fixed to „0“ (Zero) until there is an adequate CANopen profile available |
| 1001 | Error Register | – | – | 0x7 (Var) | ro | – | – | – | |
| 1018 | Identity Object | – | – | 0x9 (Record) | – | – | – | – | Index 02: Vendor ID is 0x0069666D, this is the ID for ifm electronic GmbH, is fixed<br>Index 03: Product Code:<br>O3M151: 0x0020 0011<br>O3M251: 0x0020 0030<br>Index 04: Revision Number: should be filled at runtime with 0x00 <Major number> <Minor number> <Patch Level> of the SW Version.<br>Index 05: Serial number: should be filled at runtime with the serial number of the camera. |
| | | 00 | Number of entries | 0x7 (Var) | ro | 4 | 1 | 4 | |
| | | 01 | Vendor Id | 0x7 (Var) | ro | 0x0069666D | – | – | |
| | | 02 | Product Code | 0x7 (Var) | ro | 0 | – | – | |
| | | 03 | Revision number | 0x7 (Var) | ro | 0 | – | – | |
| | | 04 | Serial number | 0x7 (Var) | ro | – | – | – | |
| 1003 | Predefined Error Field | – | – | 0x8 (Array) | – | – | – | – | Index 01: Number of Errors is defined according the size of the error memory in the diagnosis. |
| | | 00 | Number of Errors | 0x7 (Var) | rw | 0 | – | – | |
| | | 01 | Standard Error Field | 0x7 (Var) | ro | – | – | – | |
| | | 02 | Standard Error Field_2 | 0x7 (Var) | ro | – | – | – | |
| | | 03 | Standard Error Field_3 | 0x7 (Var) | ro | – | – | – | |
| | | 04 | Standard Error Field_4 | 0x7 (Var) | ro | – | – | – | |
| | | 05 | Standard Error Field_5 | 0x7 (Var) | ro | – | – | – | |
| | | 06 | Standard Error Field_6 | 0x7 (Var) | ro | – | – | – | |
| | | 07 | Standard Error Field_7 | 0x7 (Var) | ro | – | – | – | |
| | | 08 | Standard Error Field_8 | 0x7 (Var) | ro | – | – | – | |
| | | 09 | Standard Error Field_9 | 0x7 (Var) | ro | – | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1003 | Predefined Error Field | A | Standard Error Field_a | 0x7 (Var) | ro | – | – | – | – |
| | | B | Standard Error Field_b | 0x7 (Var) | ro | – | – | – | |
| | | C | Standard Error Field_c | 0x7 (Var) | ro | – | – | – | |
| | | D | Standard Error Field_d | 0x7 (Var) | ro | – | – | – | |
| | | E | Standard Error Field_e | 0x7 (Var) | ro | – | – | – | |
| | | F | Standard Error Field_f | 0x7 (Var) | ro | – | – | – | |
| | | 10 | Standard Error Field_10 | 0x7 (Var) | ro | – | – | – | |
| | | 11 | Standard Error Field_11 | 0x7 (Var) | ro | – | – | – | |
| | | 12 | Standard Error Field_12 | 0x7 (Var) | ro | – | – | – | |
| | | 13 | Standard Error Field_13 | 0x7 (Var) | ro | – | – | – | |
| | | 14 | Standard Error Field_14 | 0x7 (Var) | ro | – | – | – | |
| 1005 | COB ID SYNC | – | – | 0x7 (Var) | rw | 0x00000080 | 0x00000080 | – | – |
| 1006 | Communication Cycle Period | – | – | 0x7 (Var) | rw | 0x00000000 | – | – | – |
| 1008 | Manufacturer Device Name | – | – | 0x7 (Var) | const | O3D151 | – | – | (No Index) should be filled at runtime with the article number („Artikelnummer“) of the camera. Device is Smart Sensor: O3M151 Device is 2D3D two box Sensor: O3M251 Device is 2D3D one box Sensor: O3M211 |
| 1009 | Manufacturer Hardware Version | – | – | 0x7 (Var) | const | – | – | – | (No Index) should be filled at runtime with the HW Version of the camera |
| 100A | Manufacturer Software Version | – | – | 0x7 (Var) | const | – | – | – | (No Index) should be filled at runtime with the Software version number and variant of the camera with <Major>.<Minor>. <Patchlevel> <Variant> |
| 1010 | Store Parameter Field | – | – | 0x8 (Array) | – | – | – | – | Index 02: Save all Parameters: this is the list of parameters to be stored to Flash memory: - not implemented yet |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | – | – | |
| | | 01 | Save all Parameters | 0x7 (Var) | rw | – | – | – | |
| 1011 | Restore Default Parameters | – | – | 0x8 (Array) | – | – | – | – | Index 02: Restore all Default Parameters: this is the list of Parameters to be restored from Flash Memory: - not implemented yet |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | – | – | |
| | | 01 | Restore all Default Parameters | 0x7 (Var) | rw | – | – | – | |
| 1014 | COB ID EMCY | – | – | 0x7 (Var) | ro | $NODEID +0x80 | 0x00000080 | 0x00000100 | – |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1400 | Receive PDO Communication Parameter - SyncMsg | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | 0x02 | 0x02 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0x200 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| 1401 | Receive PDO Communication Parameter - EgoMotion | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | 0x02 | 0x02 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0x300 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| 1600 | Receive PDO Mapping Parameter - SyncMsg | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry - SyncMsg_Rx | 0x7 (Var) | rw | 0x21000220 | – | – | |
| 1601 | Receive PDO Mapping Parameter - EgoMotion | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 3 | 0 | 3 | |
| | | 01 | PDO Mapping Entry - Wheel_ BasedVehicleSpeed | 0x7 (Var) | rw | 0x21300110 | – | – | |
| | | 02 | PDO Mapping Entry - Driving_Direction | 0x7 (Var) | rw | 0x21300208 | – | – | |
| | | 03 | PDO Mapping Entry - Yaw_Rate | 0x7 (Var) | rw | 0x21300310 | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1800 | Transmit PDO Communication Parameter - SyncMsg | – | – | 0x9 (Record) | – | – | – | – | Index02 Transmission Type: 254 (Manufacturer defined):<br>The mobile camera is typically running with internally defined time/ frequency<br>Thus it will send out the data (TPDOs) as available, typically with cycle time of 20ms, 30ms, 40ms or multiple time: double or three times the cycle time.<br>Objects 1800-1819: Index01 COB ID: Invalid Bit:<br>For the first and second (real world) Object in the Object list the Transmission parameters are defined in such a way that the camera will immediately start to send out data when the communication state is set to „Operational“.<br>The camera will send out only 4 objects in default configuration. For the other (real world) Objects the settings are such that they are marked as invalid bit 31(valid bit) is set to „1“. If these Objects are requestet by a Network Master/ Configuration Master the according COB ID has to be set accordingly, especially the valid bit has to be set to „0“. |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0x40000180 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1801 | Transmit PDO Communication Parameter - Global_Information | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0x40000280 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1802 | Transmit PDO Communication Parameter - Reference_ Point | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1809 | Transmit PDO Communication Parameter - Dynamic_2D_ Calib_Data | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 180A | Transmit PDO Communication Parameter - Constant_2D_ Calib_Data | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1810 | Transmit PDO Communication Parameter Line 0 - Part A | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1811 | Transmit PDO Communication Parameter Line 0 - Part B | – | – | 0x9 (Record) | – | – | – | – | Index02 Transmission Type: 254 (Manufacturer defined):<br>The mobile camera is typically running with internally defined time/ frequency<br>Thus it will send out the data (TPDOs) as available, typically with cycle time of 20ms, 30ms, 40ms or multiple time: double or three times the cycle time.<br>Objects 1800-1819: Index01 COB ID: Invalid Bit:<br>For the first and second (real world) Object in the Object list the Transmission parameters are defined in such a way that the camera will immediately start to send out data when the communication state is set to „Operational“.<br>The camera will send out only 4 objects in default configuration. For the other (real world) Objects the settings are such that they are marked as invalid bit 31(valid bit) is set to „1“. If these Objects are requestet by a Network Master/ Configuration Master the according COB ID has to be set accordingly, especially the valid bit has to be set to „0“. |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1812 | Transmit PDO Communication Parameter Line 1 - Part A | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1813 | Transmit PDO Communication Parameter Line 1 - Part B | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1814 | Transmit PDO Communication Parameter Line 2 - Part A | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1815 | Transmit PDO Communication Parameter Line 2 - Part B | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1816 | Transmit PDO Communication Parameter Line 3 - Part A | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1817 | Transmit PDO Communication Parameter Line 3 - Part B | – | – | 0x9 (Record) | – | – | – | – | Index02 Transmission Type: 254 (Manufacturer defined):<br>The mobile camera is typically running with internally defined time/ frequency<br>Thus it will send out the data (TPDOs) as available, typically with cycle time of 20ms, 30ms, 40ms or multiple time: double or three times the cycle time.<br>Objects 1800-1819: Index01 COB ID: Invalid Bit:<br>For the first and second (real world) Object in the Object list the Transmission parameters are defined in such a way that the camera will immediately start to send out data when the communication state is set to „Operational“.<br>The camera will send out only 4 objects in default configuration. For the other (real world) Objects the settings are such that they are marked as invalid bit 31(valid bit) is set to „1“. If these Objects are requestet by a Network Master/ Configuration Master the according COB ID has to be set accordingly, especially the valid bit has to be set to „0“. |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1818 | Transmit PDO Communication Parameter Line 4 - Part A | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1819 | Transmit PDO Communication Parameter Line 4 - Part B | – | – | 0x9 (Record) | – | – | – | – | |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | 0x03 | 0x03 | |
| | | 01 | COB ID | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission Type | 0x7 (Var) | rw | 254 | – | – | |
| | | 03 | Inhibit Time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 181A | Transmit PDO Communication Parameter Curvature A | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Highest sub-index supported | 0x7 (Var) | const | 3 | 3 | 3 | |
| | | 01 | COB-ID used by TPDO | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission type | 0x7 (Var) | rw | 254 | 0x00 | 0xFF | |
| | | 03 | Inhibit time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 181B | Transmit PDO Communication Parameter Curvature B | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Highest sub-index supported | 0x7 (Var) | const | 3 | 3 | 3 | |
| | | 01 | COB-ID used by TPDO | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission type | 0x7 (Var) | rw | 254 | 0x00 | 0xFF | |
| | | 03 | Inhibit time | 0x7 (Var) | rw | 0x0000 | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 181C | Transmit PDO Communication Parameter Curvature C | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Highest sub-index supported | 0x7 (Var) | const | 3 | 3 | 3 | |
| | | 01 | COB-ID used by TPDO | 0x7 (Var) | rw | $NODEID +0xC0000000 | 0x00000080 | 0xFFFFFFFF | |
| | | 02 | Transmission type | 0x7 (Var) | rw | 254 | 0x00 | 0xFF | |
| | | 03 | Inhibit time | 0x7 (Var) | rw | 0x0000 | – | – | |
| 1A00 | Transmit PDO Mapping Parameter - SyncMsg | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry - KP_MasterTime_LastTxTimeStamp | 0x7 (Var) | rw | 0x21000120 | | | |
| 1A01 | Transmit PDO Mapping Parameter - Global_Information | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry - Global_Information | 0x7 (Var) | rw | 0x21010138 | – | – | |
| 1A02 | Transmit PDO Mapping Parameter - Reference_Point | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry - Reference_Point | 0x7 (Var) | rw | 0x21030128 | | | |
| 1A09 | Transmit PDO Mapping Parameter - Dynamic_2D_Calib_Data | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry - Dynamic_2D_Calib_Data | 0x7 (Var) | rw | 0x21090140 | – | – | |
| 1A0A | Transmit PDO Mapping Parameter - Constant_2D_Calib_Data | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 2 | 0 | 2 | |
| | | 01 | PDO Mapping Entry - Constant_2D_Calib_Data_Mux | 0x7 (Var) | rw | 0x210a0108 | – | – | |
| | | 02 | PDO Mapping Entry - ConstCalib_2D_muxed | 0x7 (Var) | rw | 0x210a0220 | – | – | |
| 1A10 | Transmit PDO Mapping Parameter Line 0 - Part A | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21110140 | – | – | |
| 1A11 | Transmit PDO Mapping Parameter Line 0 - Part B | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21110238 | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1A12 | Transmit PDO Mapping Parameter Line 1 - Part A | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21120140 | _ | _ | |
| 1A13 | Transmit PDO Mapping Parameter Line 1 - Part B | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21120238 | _ | _ | |
| 1A14 | Transmit PDO Mapping Parameter Line 2 - Part A | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21130140 | _ | _ | |
| 1A15 | Transmit PDO Mapping Parameter Line 2 - Part B | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21130238 | _ | _ | |
| 1A16 | Transmit PDO Mapping Parameter Line 3 - Part A | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21140140 | | | |
| 1A17 | Transmit PDO Mapping Parameter Line 3 - Part B | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21140238 | _ | _ | |
| 1A18 | Transmit PDO Mapping Parameter Line 4 - Part A | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21150140 | _ | _ | |
| 1A19 | Transmit PDO Mapping Parameter Line 4 - Part B | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21150238 | _ | _ | |
| 1A1A | Transmit PDO Mapping Parameter Curvature A | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21160140 | _ | _ | |
| 1A1B | Transmit PDO Mapping Parameter Curvature B | _ | _ | 0x9 (Record) | _ | _ | _ | _ | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21170140 | _ | _ | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 1A1C | Transmit PDO Mapping Parameter Curvature C | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | rw | 1 | 0 | 1 | |
| | | 01 | PDO Mapping Entry | 0x7 (Var) | rw | 0x21180140 | – | – | |
| 2100 | SyncMsg | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | SyncMsg | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | SyncMsg_Rx | 0x7 (Var) | wo | – | – | – | – |
| 2101 | Global_Information | – | – | 0x9 (Record) | | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | – | – | – |
| | | 01 | Global_Information | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| 2103 | Reference_Point | – | – | 0x9 (Record) | | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | – | – | |
| | | 01 | Reference_Point | 0x7 (Var) | ro | – | – | – | |
| 2109 | Dynamic_2D_Calib_Data | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | – | – | – |
| | | 01 | Dynamic_2D_Calib_Data | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| 210A | Constant_2D_Calib_Data | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | 2 | 2 | – |
| | | 01 | Constant_2D_Calib_Data_Mux | 0x7 (Var) | ro | – | – | – | – |
| | | 02 | ConstCalib_2D_muxed | 0x7 (Var) | ro | – | – | – | – |
| 210F | Standby_Control | – | – | 0x7 (Var) | rw | – | 0 | 1 | – |
| 2111 | Line 0 | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | Part A | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Part B | 0x7 (Var) | ro | – | – | – | |
| 2112 | Line 1 | – | – | 0x9 (Record) | | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | Part A | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Part B | 0x7 (Var) | ro | – | – | – | |

| Object No. | Object Name | Sub Index No. | Parameter Name | Object Type | Access Type | Default Value | Low Limit | High Limit | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 2113 | Line 2 | – | – | 0x9 (Record) | | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | Part A | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Part B | 0x7 (Var) | ro | – | – | – | |
| 2114 | Line 3 | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | Part A | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Part B | 0x7 (Var) | ro | – | – | – | |
| 2115 | Line 4 | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 2 | – | – | – |
| | | 01 | Part A | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Part B | 0x7 (Var) | ro | – | – | – | |
| 2116 | MoCa_ Curvature_A | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | NrOfObjects | 0x7 (Var) | ro | 1 | – | – | – |
| | | 01 | Curvature_A_ Part1 | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| 2117 | MoCa_ Curvature_B | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | NrOfObjects | 0x7 (Var) | ro | 1 | – | – | – |
| | | 01 | Curvature_B_ Part1 | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| 2118 | MoCa_ Curvature_C | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | NrOfObjects | 0x7 (Var) | ro | 1 | – | – | – |
| | | 01 | Curvature_C_ Part1 | 0x7 (Var) | ro | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| 2130 | Ego_Motion | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 3 | – | – | – |
| | | 01 | Wheel_BasedVehicleSpeed | 0x7 (Var) | wo | – | – | – | For subindex bit-codes refer to "7.1.2 Description of the subindex bit-codes" |
| | | 02 | Driving_Direction | 0x7 (Var) | wo | – | – | – | |
| | | 03 | Yaw_Rate | 0x7 (Var) | wo | – | – | – | |
| 21A0 | EDS_File_Version | – | – | 0x9 (Record) | – | – | – | – | – |
| | | 00 | Number of entries | 0x7 (Var) | ro | 1 | 1 | 1 | |

## 7.1.2 Description of the subindex bit-codes

For a description of the value tables refer to "7.3 Value tables".

**Objects 2110 – 2130: Mobile Camera Line, Part A and Part B**

| Message | Name | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|
| MoCa_Line_0_A | Line_0_Id | 0 | 7 | Unsigned | 1 | 0 | 0 | n/a | <none> | ID of line |
| | Line_0_alpha | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | rad | VtSig_Line_0_alpha | Orientation of center line |
| | Line_0_curvature | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 1/m | VtSig_Line_0_curvature | Curvature of center line |
| | Line_0_quality | 24 | 7 | Unsigned | 1 | 0 | 0 | % | VtSig_Line_0_quality | Quality of center line |
| | Line_0_Measured | 31 | 1 | Unsigned | 1 | 0 | 0 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| | Line_0_zStepDetection-Height | 32 | 9 | Unsigned | 0.01 | 0 | 0 | m | <none> | z-step detection height |
| | Line_0_foresight | 41 | 5 | Unsigned | 1 | 0 | 0 | m | VtSig_Line_0_foresight | Foresight range of line detection |
| | Line_0_offset | 46 | 11 | Unsigned | 0.01 | -10 | -10 | m | VtSig_Line_0_offset | y-offset of center line to reference point |
| | Line_0_Type | 57 | 1 | Unsigned | 1 | 0 | 0 | enum | <none> | Type identifier of the line |
| | Line_0_zStepDetection-HeightV | 58 | 1 | Unsigned | 1 | 0 | 0 | nan | <none> | z-step detection height valid flag |
| | Line_0_History | 59 | 1 | Unsigned | 1 | 0 | 0 | n/a | <none> | Toggle bit for newly created line with same id |
| | Line_0_A_cnt | 62 | 2 | Unsigned | 1 | 0 | 0 | n/a | <none> | 2 Bit counter, same for A and B message, next Line message counter shall be one higher |
| MoCa_Line_0_B | Line_0_centerOfGravityOffset | 0 | 8 | Unsigned | 0.05 | -5 | -5 | m | VtSig_Line_0_centerOfGravityOffset | Lateral offset of center of gravity to center line |
| | Line_0_maxHeightOffset | 8 | 8 | Unsigned | 0.05 | -5 | -5 | m | VtSig_Line_0_maxHeightOffset | Lateral offset of max height to center line |
| | Line_0_heapWidth | 16 | 10 | Unsigned | 0.01 | 0 | 0 | m | VtSig_Line_0_heapWidth | Width of heap |
| | Line_0_heapAreaV | 26 | 1 | Unsigned | 1 | 0 | 0 | n/a | <none> | Heap area information valid flag |
| | Line_0_centerOfGravityOffsetV | 27 | 1 | Unsigned | 1 | 0 | 0 | nan | <none> | Valid flag for center of gravity offset |
| | Line_0_maxHeightOffsetV | 28 | 1 | Unsigned | 1 | 0 | 0 | nan | <none> | Valid flag for max height offset |
| | Line_0_heapHeightV | 29 | 1 | Unsigned | 1 | 0 | 0 | nan | <none> | Heap height information valid flag |
| | Line_0_heapWidthV | 30 | 1 | Unsigned | 1 | 0 | 0 | nan | <none> | Heap width information valid flag |
| | Line_0_heapArea | 32 | 10 | Unsigned | 0.01 | 0 | 0 | $m^2$ | VtSig_Line_0_heapArea | Area on yz-plane covered by heap |
| | Line_0_heapHeight | 42 | 9 | Unsigned | 0.01 | 0 | 0 | m | VtSig_Line_0_heapHeight | Height of heap |
| | Line_0_B_cnt | 54 | 2 | Unsigned | 1 | 0 | 0 | n/a | <none> | 2 Bit counter, same for A and B message, next Line message counter shall be one higher |

### Objects 2110 – 2130: Mobile Camera Curvature

| Name | Message | Start bit | Length [bit] | Value type | Initial value | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| MoCa_ Curvature_A | Curvature_ Command_0 | 0 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Line_0_Id | 16 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Line_1_Id | 24 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Curvature_ Command_1 | 32 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Curvature_A_ cnt | 54 | 2 | Unsigned | 0 | 0 | 0 | 3 | n/a | <none> | – |
| MoCa_ Curvature_B | Curvature_ Command_2 | 0 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Line_2_Id | 16 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Line_3_Id | 24 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Curvature_ Command_3 | 32 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Curvature_B_ cnt | 54 | 2 | Unsigned | 0 | 0 | 0 | 3 | n/a | <none> | – |
| MoCa_ Curvature_C | Curvature_ Command_4 | 0 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Line_4_Id | 16 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Line_5_Id | 24 | 7 | Unsigned | 0 | 0 | 0 | 127 | n/a | <none> | – |
| | Curvature_ Command_5 | 32 | 16 | Unsigned | 0 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_Curvature_ Command | – |
| | Curvature_C_ cnt | 54 | 2 | Unsigned | 0 | 0 | 0 | 3 | n/a | <none> | – |

### Objects 2110 – 2130: Ego Motion

| Name | Message | Start bit | Length [bit] | Value type | Initial value | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ego_Motion | DirectionIndi- cator | 30 | 2 | Unsigned | 0 | 0 | 0 | 3 | _ | <none> | Indicates the direction of the vehicle. |
| | YawRate | 24 | 16 | Unsigned | 0 | -3.92 | -3.92 | Mar-92 | rad/s | <none> | Indicates the rotation about the vertical axis. |
| | Wheel_Based- VehicleSpeed | 16 | 16 | Unsigned | 0 | 0 | 0 | 251 | km/ | <none> | Actual speed of the vehicle (positive value for forward and back- ward speed) calcu- lated as the average of the wheel speeds of one axle influenced by slip and filtered by a frequency range of 5 Hz to 20 Hz. |

### Object 2100 SyncMsg

| Name | Message | Start bit | Length [bit] | Value type | Initial value | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mastertime_ LastTxTimeS-tamp | SyncMsg | 0 | 32 | Unsigned | 0 | 0 | 0 | 4.29E+14 | µs | <none> | Measured time value of last sent transmission of this signal on CAN |

### Object 2101 Global_Information

| Name | Message | Start bit | Length [bit] | Value type | Initial value | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| GLOB_master_ time | Global_Infor-mation | 0 | 32 | Unsigned | 0 | 0 | 0 | 4.29E+14 | µs | <none> | – |
| GLOB_sensor_ available | Global_Infor-mation | 32 | 8 | Unsigned | 0 | 0 | 0 | 255 | enum | VtSig_Glob-al_sensor_ available | – |
| Blockage_ Status | Global_Infor-mation | 40 | 8 | Unsigned | 0 | 1 | 0 | 100 | % | <none> | – |
| SwCtrl_ OpMode | Global_Infor-mation | 48 | 6 | Unsigned | 0 | 1 | 0 | 63 | _ | VtSig_SwC-trl_OpMode | – |
| Global_Informa-tion_cnt | Global_Infor-mation | 54 | 2 | Unsigned | 0 | 0 | 0 | 3 | _ | <none> | 2 bit counter, same for all ROI mes-sages, at next ROI message cycle this counter shall incre-ment |

## 7.2 SAE J1939

For a description of the value tables, refer to "7.3 Value tables"

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Actual Retarder PercTorque | EBS21 | 32 | 8 | Unsigned | 1 | -125 | -125 | 125 | % | <none> | Actual torque of the retarder as negative percentage of maximum.Actual torque of the retarder as negative percentage of maximum. |
| AutomTowed VehBreak Active | EBS21 | 6 | 2 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | Signal indicating the automatic towed vehicle braking is active/passive.Signal indicating the automatic towed vehicle braking is active/passive. |
| BlockSize | ISO15765_ Phys | 8 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | – |
| Connection AbortReason | TPCM | 8 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Reason for connection abort message. |
| ControlByte | TPCM | 0 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | VtSig_ControlByte | – |
| Driver1 TimeRelated States | TCO1 | 8 | 4 | Unsigned | 1 | 0 | 0 | 15 | – | <none> | Indicates if the driver approaches or exceeds working time limits (or other limits). |
| Driver1 WorkingState | TCO1 | 0 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | State of work of the driver. |
| Driver2 TimeRelated States | TCO1 | 16 | 4 | Unsigned | 1 | 0 | 0 | 15 | – | <none> | Indicates if the driver approaches or exceeds working time limits (or other limits). |
| Driver2 WorkingState | TCO1 | 3 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | State of work of the driver. |
| Driver CardDriver1 | TCO1 | 12 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| Driver CardDriver2 | TCO1 | 20 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| Drive Recognize | TCO1 | 6 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Indicates whether motion of the vehicle is detected or not. |
| FirstFrame DataLength | ISO15765_ Phys | 8 | 12 | Unsigned | 1 | 0 | 0 | 4095 | Byte | <none> | – |
| FlowStatus | ISO15765_ Phys | 0 | 4 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlowStatus | – |
| Handling Information | TCO1 | 26 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Indicates that handling information is present. |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Lateral Acceleration | VDC2 | 40 | 16 | Unsigned | 0.000488281 | -15.687 | -15.687 | 15.687 | m/s² | <none> | Indicates a lateral acceleration of the vehicle. |
| Longitudinal Acceleration | VDC2 | 56 | 8 | Unsigned | 0.1 | -12.5 | -12.5 | 12-Mai | m/s² | <none> | Indicates the longitudinal acceleration of the vehicle. |
| Maximum Number OfPackets | TPCM | 32 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Maximum number of packets for RTS/CTS message. |
| NextPacket Number ToBeSent | TPCM | 16 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Next Packet Number to be sent (TP.CM_ CTS) |
| NumberOf PacketsThat CanBeSent | TPCM | 8 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Number of Packets that can be sent (TP. CM_CTS) |
| Overspeed | TCO1 | 14 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Indicates whether the vehicle is exceeding the legal speed limit set in the tachograph. |
| PGNumber | TPCM | 40 | 24 | Unsigned | 1 | 0 | 0 | 1.68E+12 | – | VtSig_PG-Number | – |
| Protocol CtrlInformation | ISO15765_ Phys | 4 | 4 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_Pro-tocolCtrlIn-formation | Part of Network Protocol Control Information (N_PCI) of a ISO 15765 message. |
| Separation Time | ISO15765_ Phys | 16 | 8 | Unsigned | 1 | 0 | 0 | 255 | ms | <none> | – |
| Sequence Number | TPDT | 0 | 8 | Unsigned | 1 | 0 | 0 | 252 | – | <none> | – |
| ShrtName OfActual Reporting Device | XFER | 32 | 32 | Unsigned | 1 | 0 | 0 | 0 | (2^32-1) | <none> | Short name of reporting device of the requested PGN via the Transfer PGN. |
| SingleFrame DataLength | ISO15765_ Phys | 0 | 4 | Unsigned | 1 | 0 | 0 | 7 | Byte | <none> | – |
| SN | ISO15765_ Phys | 0 | 4 | Unsigned | 1 | 0 | 0 | 15 | – | <none> | – |
| Standby_ Control | Standby_Con-trol | 0 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |
| SteerWheel Angle | VDC2 | 0 | 16 | Unsigned | 0.000976563 | -31.374 | -31.374 | 31.374 | rad | <none> | The main operator`s steering wheel angle (on the steering column, not the actual wheel angle). |
| SteerWheel-AngleSensor Type | VDC2 | 22 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| SteerWheel TurnCounter | VDC2 | 16 | 6 | Unsigned | 1 | -32 | -32 | 29 | turns | <none> | Indicates number of steering wheel turns, absolute position or relative position at ignition on. |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SupplyLine Braking Request | EBS21 | 10 | 2 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | Signal indicating the trailer is requesting to be braked by the commercial vehicle by means of bleeding the pneumatic supply line. Signal indicating the trailer is requesting to be braked by the commercial vehicle by means of bleeding the pneumatic supply line. |
| SystemEvent | TCO1 | 24 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Indicates that a tachograph event has occurred. |
| Tachograph OutputShaft Speed | TCO1 | 32 | 16 | Unsigned | 0.125 | 0 | 0 | 8031.88 | rpm | <none> | Calculated speed of the transmission output shaft. |
| Tachograph Performance | TCO1 | 28 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| Tachograph VehicleSpeed | TCO1 | 48 | 16 | Unsigned | 0.00390625 | 0 | 0 | 250.996 | km/h | <none> | Speed of the vehicle registered by the tachograph. |
| TotalMessage Size | TPCM | 8 | 16 | Unsigned | 1 | 0 | 0 | 64255 | counts | <none> | Total message size (in bytes) for BAM message.Total message size (in bytes) for RTS/CTS message. Total message size (in bytes) for RTS/CTS message. |
| TotalMessage SizeBAM | TPCM | 8 | 16 | Unsigned | 1 | 0 | 0 | 64255 | counts | <none> | |
| TotalMessage SizeEoMA | TPCM | 8 | 16 | Unsigned | 1 | 0 | 0 | 64255 | counts | <none> | |
| TotalNumber OfPackets | TPCM | 24 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Total number of packets for BAM message. Total number of packets received for RTS/CTS message.Total number of packets for RTS/CTS message. |
| TotalNumber OfPackets BAM | TPCM | 24 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | |
| TotalNumberOfPackets EoMA | TPCM | 24 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | |
| VDCActive | EBS21 | 8 | 2 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | Signal which indicates that Vehicle Dynamic Control (VDC) is active/passive. Signal which indicates that Vehicle Dynamic Control (VDC) is active/passive. |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Vehicle ABSActive | EBS21 | 0 | 2 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | Signal indicating the ABS is active/passive. Signal indicating the ABS is active/passive. |
| Vehicle Retarder CtrlActive | EBS21 | 2 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | This signal indicates the active/passive state in all cases when the installed retarder is applied by the driver's demand or by other systems (brakes).This signal indicates the active/passive state in all cases when the installed retarder is applied by the driver's demand or by other systems (brakes). |
| Vehicle Service BrakeActive | EBS21 | 4 | 2 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | Signal indicating the service brake of the towed vehicle is active/passive, by observing the brake pressure. Signal indicating the service brake of the towed vehicle is active/passive, by observing the brake pressure. |
| WheelSpeed DiffMainAxle | EBS21 | 40 | 16 | Unsigned | 0.00390625 | -125 | -125 | 125 | km/h | <none> | Difference between the wheel speed at the right side and and the left side of the main axle.Difference between the wheel speed at the right side and and the left side of the main axle. |
| Amber Warning LampStatus | DM1 | 2 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_AmberWarningLampStatus | This lamp is used to relay trouble code information that is reporting a problem with the vehicle system but the vehicle need... |
| Blockage_ Status | Global_Information | 40 | 8 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Blockage_ Status | – |
| BlockSize | ISO15765_ Funct | 8 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | – |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant_2D_ Calib_Data_ Mux | Constant_2D_ Calib_Data | 0 | 8 | Unsigned | 1 | 0 | 0 | 12 | – | <none> | – |
| Curvature_A_ cnt | MoCa_ Curvature_A | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | – |
| Curvature_B_ cnt | MoCa_ Curvature_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | – |
| Curvature_C_ cnt | MoCa_ Curvature_C | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | – |
| Curvature_ Command_0 | MoCa_ Curvature_A | 0 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_0 | – |
| Curvature_ Command_1 | MoCa_ Curvature_A | 32 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_1 | – |
| Curvature_ Command_2 | MoCa_ Curvature_B | 0 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_2 | – |
| Curvature_ Command_3 | MoCa_ Curvature_B | 32 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_3 | – |
| Curvature_ Command_4 | MoCa_ Curvature_C | 0 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_4 | – |
| Curvature_ Command_5 | MoCa_ Curvature_C | 32 | 16 | Unsigned | 0.025 | -803.2 | -803.2 | 803.2 | 1/km | VtSig_ Curva- ture_Com- mand_5 | – |
| DirectionIndi- cator | TCO1 | 30 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Indicates the direction of the vehicle. |
| Dynamic_2D_ Calib_Data_ cnt | Dynamic_2D_ Calib_Data | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| ExtrCalib_2D_ delta_tx | Dynamic_2D_ Calib_Data | 12 | 8 | Unsigned | 0.01 | -1.2 | -1.2 | 1-Feb | m | VtSig_ ExtrCalib_ 2D_del- ta_tx | – |
| ExtrCalib_2D_ delta_ty | Dynamic_2D_ Calib_Data | 32 | 8 | Unsigned | 0.01 | -1.2 | -1.2 | 1-Feb | m | VtSig_ ExtrCalib_ 2D_del- ta_ty | – |
| ExtrCalib_2D_ delta_tz | Dynamic_2D_ Calib_Data | 52 | 8 | Unsigned | 0.01 | -1.2 | -1.2 | 1-Feb | m | VtSig_ ExtrCalib_ 2D_del- ta_tz | – |
| ExtrCalib_2D_ rot_x | Dynamic_2D_ Calib_Data | 0 | 12 | Unsigned | 0.00174533 | -345.575 | -345.575 | 345.575 | rad | VtSig_ ExtrCalib_ 2D_rot_x | – |
| ExtrCalib_2D_ rot_y | Dynamic_2D_ Calib_Data | 20 | 12 | Unsigned | 0.00174533 | -345.575 | -345.575 | 345.575 | rad | VtSig_ ExtrCalib_ 2D_rot_y | – |
| ExtrCalib_2D_ rot_z | Dynamic_2D_ Calib_Data | 40 | 12 | Unsigned | 0.00174533 | -345.575 | -345.575 | 345.575 | rad | VtSig_ ExtrCalib_ 2D_rot_z | – |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| FailureMode Identifier1 | DM1 | 32 | 5 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_FailureModeIdentifier1 | The FMI defines the type of failure detected in the subsystem identified by an SPN. |
| FailureMode Identifier2 | DM1 | 64 | 5 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_FailureModeIdentifier2 | The FMI defines the type of failure detected in the subsystem identified by an SPN. |
| FailureMode Identifier3 | DM1 | 96 | 5 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_FailureModeIdentifier3 | The FMI defines the type of failure detected in the subsystem identified by an SPN. |
| FailureMode Identifier4 | DM1 | 128 | 5 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_FailureModeIdentifier4 | The FMI defines the type of failure detected in the subsystem identified by an SPN. |
| FailureMode Identifier5 | DM1 | 160 | 5 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_FailureModeIdentifier5 | The FMI defines the type of failure detected in the subsystem identified by an SPN. |
| FirstFrame DataLength | ISO15765_ Funct | 8 | 12 | Unsigned | 1 | 0 | 0 | 4095 | Byte | <none> | – |
| FlashAmber WarningLamp | DM1 | 10 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlashAmberWarningLamp | This parameter provides the capability to flash the AWL (SPN 3040). |
| FlashMalfunc IndicatorLamp | DM1 | 14 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlashMalfuncIndicatorLamp | This parameter provides the capability to flash the MIL (SPN 3038). |
| FlashProtect Lamp | DM1 | 8 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlashProtectLamp | This parameter provides the capability to flash the engine protect lamp (SPN 3041). |
| FlashRed StopLamp | DM1 | 12 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlashRedStopLamp | This parameter provides the capability to flash the RSL (SPN 3039). |
| FlowStatus | ISO15765_ Funct | 0 | 4 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ FlowStatus | – |
| GLOB_ master_time | Global_Information | 0 | 32 | Unsigned | 1 | 0 | 0 | 4.29E+14 | µs | <none> | – |
| GLOB_ sensor_ available | Global_Information | 32 | 8 | Unsigned | 1 | 0 | 0 | 255 | bit mask | <none> | BIT_INTERFERENCE_DETECTED (1u)... |
| Global_ Information_ cnt | Global_Information | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| LengthOfData ForThe ReportedPGN | XFER | 24 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | Length of data reported with the associated PGN via the Transfer PGN. |
| Line_0_A_cnt | MoCa_ Line_0_A | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_0_alpha | MoCa_ Line_0_A | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | 0.436332 | rad | VtSig_ Line_0_al-pha | Orientation of center line |
| Line_0_B_cnt | MoCa_ Line_0_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_0_ centerOf GravityOffset | MoCa_ Line_0_B | 0 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_0_ centerOf-GravityOff-set | Lateral offset of center of gravity to center line |
| Line_0_ centerOf GravityOffsetV | MoCa_ Line_0_B | 49 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for center of gravity offset |
| Line_0_ curvature | MoCa_ Line_0_A | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 0.05 | 1/m | VtSig_ Line_0_ curvature | Curvature of center line |
| Line_0_ foresight | MoCa_ Line_0_A | 40 | 5 | Unsigned | 1 | 0 | 0 | 20 | m | VtSig_ Line_0_ foresight | Foresight range of line detection |
| Line_0_ heapArea | MoCa_ Line_0_B | 35 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m^2 | VtSig_ Line_0_ heapArea | Area on yz-plane covered by heap |
| Line_0_ heapAreaV | MoCa_ Line_0_B | 48 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap area infor-mation valid flag |
| Line_0_ heapHeight | MoCa_ Line_0_B | 16 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_0_ heapHeight | height of heap |
| Line_0_ heapHeightV | MoCa_ Line_0_B | 46 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap height information valid flag |
| Line_0_ heapWidth | MoCa_ Line_0_B | 25 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m | VtSig_ Line_0_ heapWidth | Width of heap |
| Line_0_ heapWidthV | MoCa_ Line_0_B | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap width information valid flag |
| Line_0_ History | MoCa_ Line_0_A | 59 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Toggle bit for newly created line with same id |
| Line_0_Id | MoCa_ Curvature_A | 16 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | – |
| Line_0_Id | MoCa_ Line_0_A | 0 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | ID of line |
| Line_0_max-HeightOffset | MoCa_ Line_0_B | 8 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_0_ maxHeight-Offset | Lateral offset of max height to center line |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_0_max HeightOffsetV | MoCa_ Line_0_B | 45 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for max height offset |
| Line_0_ Measured | MoCa_ Line_0_A | 57 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| Line_0_offset | MoCa_ Line_0_A | 45 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ Line_0_off-set | y-offset of center line to reference point |
| Line_0_quality | MoCa_ Line_0_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Line_0_ quality | Quality of center line |
| Line_0_Type | MoCa_ Line_0_A | 56 | 1 | Unsigned | 1 | 0 | 0 | 1 | enum | <none> | Type identifier of the line |
| Line_0_zStep Detection Height | MoCa_ Line_0_A | 31 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_0_ zStepDe-tection-Height | z-step detection height |
| Line_0_zStep Detection-HeightV | MoCa_ Line_0_A | 58 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | z-step detection height valid flag |
| Line_1_A_cnt | MoCa_ Line_1_A | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_1_alpha | MoCa_ Line_1_A | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | 0.436332 | rad | VtSig_ Line_1_al-pha | Orientation of center line |
| Line_1_B_cnt | MoCa_ Line_1_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_1_ centerOf GravityOffset | MoCa_ Line_1_B | 0 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_1_ centerOf-GravityOff-set | Lateral offset of center of gravity to center line |
| Line_1_ centerOf GravityOffsetV | MoCa_ Line_1_B | 49 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for center of gravity offset |
| Line_1_ curvature | MoCa_ Line_1_A | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 0.05 | 1/m | VtSig_ Line_1_ curvature | Curvature of center line |
| Line_1_ foresight | MoCa_ Line_1_A | 40 | 5 | Unsigned | 1 | 0 | 0 | 20 | m | VtSig_ Line_1_ foresight | Foresight range of line detection |
| Line_1_ heapArea | MoCa_ Line_1_B | 35 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m^2 | VtSig_ Line_1_ heapArea | Area on yz-plane covered by heap |
| Line_1_ heapAreaV | MoCa_ Line_1_B | 48 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap area infor-mation valid flag |
| Line_1_ heapHeight | MoCa_ Line_1_B | 16 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_1_ heapHeight | height of heap |
| Line_1_ heapHeightV | MoCa_ Line_1_B | 46 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap height information valid flag |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_1_ heapWidth | MoCa_ Line_1_B | 25 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m | VtSig_ Line_1_ heapWidth | Width of heap |
| Line_1_ heapWidthV | MoCa_ Line_1_B | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap width information valid flag |
| Line_1_ History | MoCa_ Line_1_A | 59 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Toggle bit for newly created line with same id |
| Line_1_Id | MoCa_ Curvature_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | _ |
| Line_1_Id | MoCa_ Line_1_A | 0 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | ID of line |
| Line_1_max HeightOffset | MoCa_ Line_1_B | 8 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_1_ maxHeight-Offset | Lateral offset of max height to center line |
| Line_1_max HeightOffsetV | MoCa_ Line_1_B | 45 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for max height offset |
| Line_1_ Measured | MoCa_ Line_1_A | 57 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| Line_1_offset | MoCa_ Line_1_A | 45 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ Line_1_off-set | y-offset of center line to reference point |
| Line_1_quality | MoCa_ Line_1_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Line_1_ quality | Quality of center line |
| Line_1_Type | MoCa_ Line_1_A | 56 | 1 | Unsigned | 1 | 0 | 0 | 1 | enum | <none> | Type identifier of the line |
| Line_1_zStep Detection-Height | MoCa_ Line_1_A | 31 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_1_ zStepDe-tection-Height | z-step detection height |
| Line_1_zStep Detection-HeightV | MoCa_ Line_1_A | 58 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | z-step detection height valid flag |
| Line_2_A_cnt | MoCa_ Line_2_A | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_2_alpha | MoCa_ Line_2_A | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | 0.436332 | rad | VtSig_ Line_2_al-pha | Orientation of center line |
| Line_2_B_cnt | MoCa_ Line_2_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_2_ centerOf GravityOffset | MoCa_ Line_2_B | 0 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_2_ centerOf-GravityOff-set | Lateral offset of center of gravity to center line |
| Line_2_ centerOf GravityOffsetV | MoCa_ Line_2_B | 49 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for center of gravity offset |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_2_ curvature | MoCa_ Line_2_A | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 0.05 | 1/m | VtSig_ Line_2_ curvature | Curvature of center line |
| Line_2_ foresight | MoCa_ Line_2_A | 40 | 5 | Unsigned | 1 | 0 | 0 | 20 | m | VtSig_ Line_2_ foresight | Foresight range of line detection |
| Line_2_ heapArea | MoCa_ Line_2_B | 35 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m^2 | VtSig_ Line_2_ heapArea | Area on yz-plane covered by heap |
| Line_2_ heapAreaV | MoCa_ Line_2_B | 48 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap area information valid flag |
| Line_2_ heapHeight | MoCa_ Line_2_B | 16 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_2_ heapHeight | Height of heap |
| Line_2_ heapHeightV | MoCa_ Line_2_B | 46 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap height information valid flag |
| Line_2_ heapWidth | MoCa_ Line_2_B | 25 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m | VtSig_ Line_2_ heapWidth | Width of heap |
| Line_2_ heapWidthV | MoCa_ Line_2_B | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap width information valid flag |
| Line_2_ History | MoCa_ Line_2_A | 59 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Toggle bit for newly created line with same id |
| Line_2_Id | MoCa_ Line_2_A | 0 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | ID of line |
| Line_2_Id | MoCa_ Curvature_B | 16 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | _ |
| Line_2_max HeightOffset | MoCa_ Line_2_B | 8 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_2_ maxHeight-Offset | Lateral offset of max height to center line |
| Line_2_max HeightOffsetV | MoCa_ Line_2_B | 45 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for max height offset |
| Line_2_ Measured | MoCa_ Line_2_A | 57 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| Line_2_offset | MoCa_ Line_2_A | 45 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ Line_2_off-set | y-offset of center line to reference point |
| Line_2_quality | MoCa_ Line_2_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Line_2_ quality | Quality of center line |
| Line_2_Type | MoCa_ Line_2_A | 56 | 1 | Unsigned | 1 | 0 | 0 | 1 | enum | <none> | Type identifier of the line |
| Line_2_zStep Detection-Height | MoCa_ Line_2_A | 31 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_2_ zStepDe-tection-Height | z-step detection height |
| Line_2_zStep Detection-HeightV | MoCa_ Line_2_A | 58 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | z-step detection height valid flag |
| Line_3_A_cnt | MoCa_ Line_3_A | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_3_alpha | MoCa_ Line_3_A | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | 0.436332 | rad | VtSig_ Line_3_ alpha | Orientation of center line |
| Line_3_B_cnt | MoCa_ Line_3_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_3_ centerOf GravityOffset | MoCa_ Line_3_B | 0 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_3_ centerOf-GravityOff-set | Lateral offset of center of gravity to center line |
| Line_3_ centerOf GravityOffsetV | MoCa_ Line_3_B | 49 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for center of gravity offset |
| Line_3_ curvature | MoCa_ Line_3_A | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 0.05 | 1/m | VtSig_ Line_3_ curvature | Curvature of center line |
| Line_3_ foresight | MoCa_ Line_3_A | 40 | 5 | Unsigned | 1 | 0 | 0 | 20 | m | VtSig_ Line_3_ foresight | Foresight range of line detection |
| Line_3_ heapArea | MoCa_ Line_3_B | 35 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m^2 | VtSig_ Line_3_ heapArea | Area on yz-plane covered by heap |
| Line_3_ heapAreaV | MoCa_ Line_3_B | 48 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap area infor-mation valid flag |
| Line_3_ heapHeight | MoCa_ Line_3_B | 16 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_3_ heapHeight | Height of heap |
| Line_3_ heapHeightV | MoCa_ Line_3_B | 46 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap height information valid flag |
| Line_3_ heapWidth | MoCa_ Line_3_B | 25 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m | VtSig_ Line_3_ heapWidth | Width of heap |
| Line_3_ heapWidthV | MoCa_ Line_3_B | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap width information valid flag |
| Line_3_ History | MoCa_ Line_3_A | 59 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Toggle bit for newly created line with same id |
| Line_3_Id | MoCa_ Line_3_A | 0 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | ID of line |
| Line_3_Id | MoCa_ Curvature_B | 24 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | _ |
| Line_3_max HeightOffset | MoCa_ Line_3_B | 8 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_3_ maxHeight-Offset | Lateral offset of max height to center line |
| Line_3_max HeightOffsetV | MoCa_ Line_3_B | 45 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for max height offset |
| Line_3_ Measured | MoCa_ Line_3_A | 57 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| Line_3_offset | MoCa_ Line_3_A | 45 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ Line_3_ offset | y-offset of center line to reference point |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_3_quality | MoCa_ Line_3_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Line_3_ quality | Quality of center line |
| Line_3_Type | MoCa_ Line_3_A | 56 | 1 | Unsigned | 1 | 0 | 0 | 1 | enum | <none> | Type identifier of the line |
| Line_3_zStep Detection-Height | MoCa_ Line_3_A | 31 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_3_ zStepDe-tection-Height | z-step detection height |
| Line_3_zStep Detection-HeightV | MoCa_ Line_3_A | 58 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | z-step detection height valid flag |
| Line_4_A_cnt | MoCa_ Line_4_A | 62 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_4_alpha | MoCa_ Line_4_A | 7 | 9 | Unsigned | 0.00174533 | -0.436332 | -0.436332 | 0.436332 | rad | VtSig_ Line_4_ alpha | Orientation of center line |
| Line_4_B_cnt | MoCa_ Line_4_B | 54 | 2 | Unsigned | 1 | 0 | 0 | 3 | n/a | <none> | 2 bit counter, same for A and B message, next Line message counter shall be one higher |
| Line_4_ centerOf GravityOffset | MoCa_ Line_4_B | 0 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_4_ centerOf-GravityOff-set | Lateral offset of center of gravity to center line |
| Line_4_ centerOf GravityOffsetV | MoCa_ Line_4_B | 49 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for center of gravity offset |
| Line_4_ curvature | MoCa_ Line_4_A | 16 | 8 | Unsigned | 0.0005 | -0.05 | -0.05 | 0.05 | 1/m | VtSig_ Line_4_ curvature | Curvature of center line |
| Line_4_ foresight | MoCa_ Line_4_A | 40 | 5 | Unsigned | 1 | 0 | 0 | 20 | m | VtSig_ Line_4_ foresight | Foresight range of line detection |
| Line_4_ heapArea | MoCa_ Line_4_B | 35 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m^2 | VtSig_ Line_4_ heapArea | Area on yz-plane covered by heap |
| Line_4_ heapAreaV | MoCa_ Line_4_B | 48 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap area infor-mation valid flag |
| Line_4_ heapHeight | MoCa_ Line_4_B | 16 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_4_ heapHeight | Height of heap |
| Line_4_ heapHeightV | MoCa_ Line_4_B | 46 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap height information valid flag |
| Line_4_ heapWidth | MoCa_ Line_4_B | 25 | 10 | Unsigned | 0.01 | 0 | 0 | 10 | m | VtSig_ Line_4_ heapWidth | Width of heap |
| Line_4_ heapWidthV | MoCa_ Line_4_B | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Heap width information valid flag |
| Line_4_ History | MoCa_ Line_4_A | 59 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Toggle bit for newly created line with same id |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Line_4_Id | MoCa_ Line_4_A | 0 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | ID of line |
| Line_4_Id | MoCa_ Curvature_C | 16 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | – |
| Line_4_max HeightOffset | MoCa_ Line_4_B | 8 | 8 | Unsigned | 0.05 | -5 | -5 | 5 | m | VtSig_ Line_4_ maxHeight-Offset | Lateral offset of max height to center line |
| Line_4_max HeightOffsetV | MoCa_ Line_4_B | 45 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | Valid flag for max height offset |
| Line_4_ Measured | MoCa_ Line_4_A | 57 | 1 | Unsigned | 1 | 0 | 0 | 1 | n/a | <none> | Flag indicating that this line has been measured in actual frame |
| Line_4_offset | MoCa_ Line_4_A | 45 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ Line_4_ offset | y-offset of center line to reference point |
| Line_4_quality | MoCa_ Line_4_A | 24 | 7 | Unsigned | 1 | 0 | 0 | 100 | % | VtSig_ Line_4_ quality | Quality of center line |
| Line_4_Type | MoCa_ Line_4_A | 56 | 1 | Unsigned | 1 | 0 | 0 | 1 | enum | <none> | Type identifier of the line |
| Line_4_zStep Detection-Height | MoCa_ Line_4_A | 31 | 9 | Unsigned | 0.01 | 0 | 0 | 5 | m | VtSig_ Line_4_ zStepDe-tection-Height | z-step detection height |
| Line_4_zStep Detection-HeightV | MoCa_ Line_4_A | 58 | 1 | Unsigned | 1 | 0 | 0 | 1 | nan | <none> | z-step detection height valid flag |
| Line_5_Id | MoCa_ Curvature_C | 24 | 7 | Unsigned | 1 | 0 | 0 | 127 | n/a | <none> | – |
| Major | DBC_File_ Version | 8 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | – |
| Malfunction Indicator LampStatus | DM1 | 6 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_Mal-function-Indicator-LampSta-tus | A lamp used to relay only emissions-relat-ed trouble code information. |
| Mastertime_ LastTxTime Stamp | SyncMsg | 0 | 32 | Unsigned | 1 | 0 | 0 | 4.29E+14 | us | <none> | Measured time value of last sent transmission of this signal on CAN |
| Minor | DBC_File_ Version | 16 | 8 | Unsigned | 1 | 0 | 0 | 255 | – | <none> | – |
| Occurence-Count1 | DM1 | 40 | 7 | Unsigned | 1 | 0 | 0 | 126 | – | <none> | The 7 bit oc-curence count field contains the number of times a fault has gone from active to previously active. |
| Occurence-Count2 | DM1 | 72 | 7 | Unsigned | 1 | 0 | 0 | 126 | – | <none> | |
| Occurence-Count3 | DM1 | 104 | 7 | Unsigned | 1 | 0 | 0 | 126 | – | <none> | |
| Occurence-Count4 | DM1 | 136 | 7 | Unsigned | 1 | 0 | 0 | 126 | – | <none> | |
| Occurence-Count5 | DM1 | 168 | 7 | Unsigned | 1 | 0 | 0 | 126 | – | <none> | |
| Parameter-GroupNumber | RQST | 0 | 24 | Unsigned | 1 | 0 | 0 | 1.68E+12 | – | <none> | PGN which is requested by Request2 mes-sage |
| Parameter-GroupNumber | RQST2 | 0 | 24 | Unsigned | 1 | 0 | 0 | 1.68E+12 | – | <none> | |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| PGNof Requsted Information | XFER | 0 | 24 | Unsigned | 1 | 0 | 0 | 1.68E+12 | – | <none> | PGN associated with this transfer message |
| Protect LampStatus | DM1 | 0 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ProtectLampStatus | This lamp is used to relay trouble code informatio that is reporting a problem with a vehicle system that is most... |
| Protocol CtrlInformation | ISO15765_ Funct | 4 | 4 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_ProtocolCtrlInformation | Part of Network Protocol Control Information (N_PCI) of a ISO 15765 message. |
| RedStop LampState | DM1 | 4 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | VtSig_RedStopLampState | This lamp is uesed to relay trouble code information that is of a severe enought condition that it warrants stopping the vehicle. |
| Reference_ point_ informaion_cnt | Reference_ point_information | 38 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | – |
| RP_x | Reference_ point_information | 0 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ RP_x | x-position of reference point |
| RP_y | Reference_ point_information | 11 | 11 | Unsigned | 0.01 | -10 | -10 | 10 | m | VtSig_ RP_y | y-position of reference point |
| RP_z | Reference_ point_information | 22 | 9 | Unsigned | 0.01 | -2 | -2 | 2 | m | VtSig_ RP_z | z-position of reference point |
| Separation Time | ISO15765_ Funct | 16 | 8 | Unsigned | 1 | 0 | 0 | 255 | ms | <none> | – |
| SingleFrame DataLength | ISO15765_ Funct | 0 | 4 | Unsigned | 1 | 0 | 0 | 7 | Byte | <none> | – |
| SN | ISO15765_ Funct | 0 | 4 | Unsigned | 1 | 0 | 0 | 15 | – | <none> | – |
| SPN1 | DM1 | 16 | 16 | Unsigned | 1 | 0 | 0 | 65536 | – | <none> | SPN #1 (Conversion Version 4) |
| SPN1High | DM1 | 37 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | |
| SPN2 | DM1 | 48 | 16 | Unsigned | 1 | 0 | 0 | 65536 | – | <none> | SPN #2 (Conversion Version 4) |
| SPN2High | DM1 | 69 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | |
| SPN3 | DM1 | 80 | 16 | Unsigned | 1 | 0 | 0 | 65536 | – | <none> | SPN #3 (Conversion Version 4) |
| SPN3High | DM1 | 101 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | |
| SPN4 | DM1 | 112 | 16 | Unsigned | 1 | 0 | 0 | 65536 | – | <none> | SPN #4 (Conversion Version 4) |
| SPN4High | DM1 | 133 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | |
| SPN5 | DM1 | 144 | 16 | Unsigned | 1 | 0 | 0 | 65536 | – | <none> | SPN #5 (Conversion Version 4) |
| SPN5High | DM1 | 165 | 3 | Unsigned | 1 | 0 | 0 | 7 | – | <none> | |
| SPN Conversion Method1 | DM1 | 47 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |

| Name | Message | Start bit | Length [bit] | Value type | Factor | Offset | Minimum | Maximum | Unit | Value table | Comment |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SPN Conversion Method2 | DM1 | 79 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |
| SPN Conversion Method3 | DM1 | 111 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |
| SPN Conversion Method4 | DM1 | 143 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |
| SPN Conversion Method5 | DM1 | 175 | 1 | Unsigned | 1 | 0 | 0 | 1 | – | <none> | – |
| SwCtrl_ OpMode | Global_Information | 48 | 6 | Unsigned | 1 | 0 | 0 | 63 | – | VtSig_SwCtrl_OpMode | – |
| UseTransfer Mode | RQST2 | 24 | 2 | Unsigned | 1 | 0 | 0 | 3 | – | <none> | Requester is to respond via the Transfer PGN |
| Variant | DBC_File_ Version | 0 | 8 | Unsigned | 1 | 0 | 0 | 0 | – | VtSig_Variant | – |
| Wheel_Based VehicleSpeed | EBS21 | 16 | 16 | Unsigned | 0.00390625 | 0 | 0 | 251 | km/h | <none> | Actual speed of the vehicle (positive value for forward and backward speed) calculated as the average of the wheel speeds of one axle influenced by slip and filtered by a frequency range of 5 Hz to 20 Hz.Actual speed of the vehicle (positive value for forward and backward speed) calculated as the average of the wheel speeds of one axle influenced by slip and filtered by a frequency range of 5 Hz to 20 Hz. |
| XCP_CRO | XCP_CRO | 0 | 64 | Unsigned | 1 | 0 | 0 | 0 | | <none> | – |
| XCP_DTO | XCP_DTO | 0 | 64 | Unsigned | 1 | 0 | 0 | 0 | bool | <none> | – |
| YawRate | VDC2 | 24 | 16 | Unsigned | 0.00012207 | -3.92 | -3.92 | Mrz-92 | rad/s | <none> | Indicates the rotation about the vertical axis. |

## 7.3 Value tables

| Value table | Hex-code | Value |
|---|---|---|
| VtSig_SwCtrl_OpMode | 0x11 | INIT |
| | 0x12 | STARTUP |
| | 0x13 | DSP_BOOT |
| | 0x14 | SELFTEST |
| | 0x15 | WAIT_DSP_BOOTED |
| | 0x17 | PARAMETRIZING |
| | 0x20 | RUN_SUPER_STATE |
| | 0x21 | LIMITED_RUN |
| | 0x22 | RUN |
| | 0x23 | STANDBY |
| | 0x31 | EMERGENCY |
| VtSig_Global_sensor_available | 1u | BIT_INTERFERENCE_DETECTED |
| | 2u | BIT_SPRAY_DETECTION |
| | 4u | BIT_TRACKING_ERROR |
| | 8u | BIT_INVALID_CAM_ORIENTATION |
| | 16u | BIT_SIGNAL_PATH_MONITORING |
| | 32u | BIT_INTERNAL_ERROR |
| | 64u | BIT_BLOCKAGE_DETECTED |
| | 128u | BIT_FORCE_CALIBRATION_RESET |
| | (bitwise OR possible) | |
| VtSig_RP_z | 0x1FF | Error |
| | 0x1FE | Out of upper bound |
| | 0x1FD | Out of lower bound |
| VtSig_RP_y | 0x7FF | Error |
| | 0x7FE | Out of upper bound |
| | 0x7FD | Out of lower bound |
| VtSig_RP_x | 0x7FF | Error |
| | 0x7FE | Out of upper bound |
| | 0x7FD | Out of lower bound |
| VtSig_Line_0_alpha | 0x7FF | Error |
| | 0x7FE | Out of upper bound |
| | 0x7FD | Out of lower bound |
| VtSig_Line_0_offset | 0x7FF | Error |
| | 0x7FE | Out of upper bound |
| | 0x7FD | Out of lower bound |
| VtSig_Line_0_curvature | 0xFF | Error |
| | 0xFE | Out of upper bound |
| | 0xFD | Out of lower bound |
| VtSig_Line_0_quality | 0x7F | Error |
| | 0x7E | Out of upper bound |
| | 0x7D | Out of lower bound |
| VtSig_Line_0_foresight | 0x1F | Error |
| | 0x1E | Out of upper bound |
| | 0x1D | Out of lower bound |
| VtSig_Line_0_heapArea | 0x1FF | Error |
| | 0x1FE | Out of upper bound |
| | 0x1FD | Out of lower bound |

| Value table | Hex-code | Value |
|---|---|---|
| VtSig_Line_0_maxHeightOffset | 0xFF | Error |
| | 0xFE | Out of upper bound |
| | 0xFD | Out of lower bound |
| VtSig_Line_0_centerOfGravityOffset | 0xFF | Error |
| | 0xFE | Out of upper bound |
| | 0xFD | Out of lower bound |
| VtSig_Line_0_heapWidth | 0x3F | Error |
| | 0x3E | Out of upper bound |
| | 0x3D | Out of lower bound |
| VtSig_Line_0_heapHeight | 0x1FF | Error |
| | 0x1FE | Out of upper bound |
| | 0x1FD | Out of lower bound |
| VtSig_Standby_Control | 0x0 | standby mode off |
| | 0x1 | standby mode on |
| VtSig_Curvature_Command | 0xFFFF | Error |
| | 0xFFFE | Out of upper bound |
| | 0xFFFD | Out of lower bound |