ifm electronic

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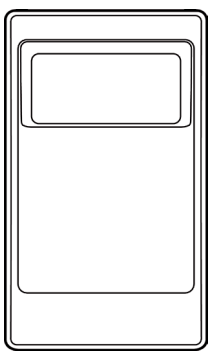
Programming Manual
Mobile 3D Smart Sensor

efector250®

O3M151

Line Guidance



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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").

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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.

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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.

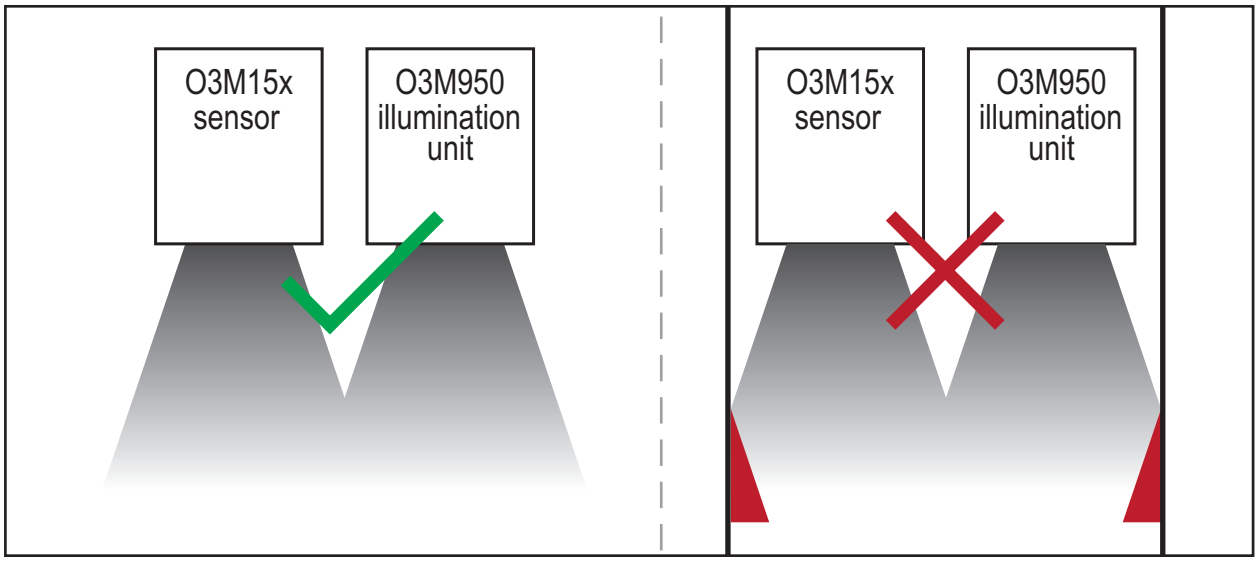
► Avoid installation in system areas which may become heavily soiled.

► 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

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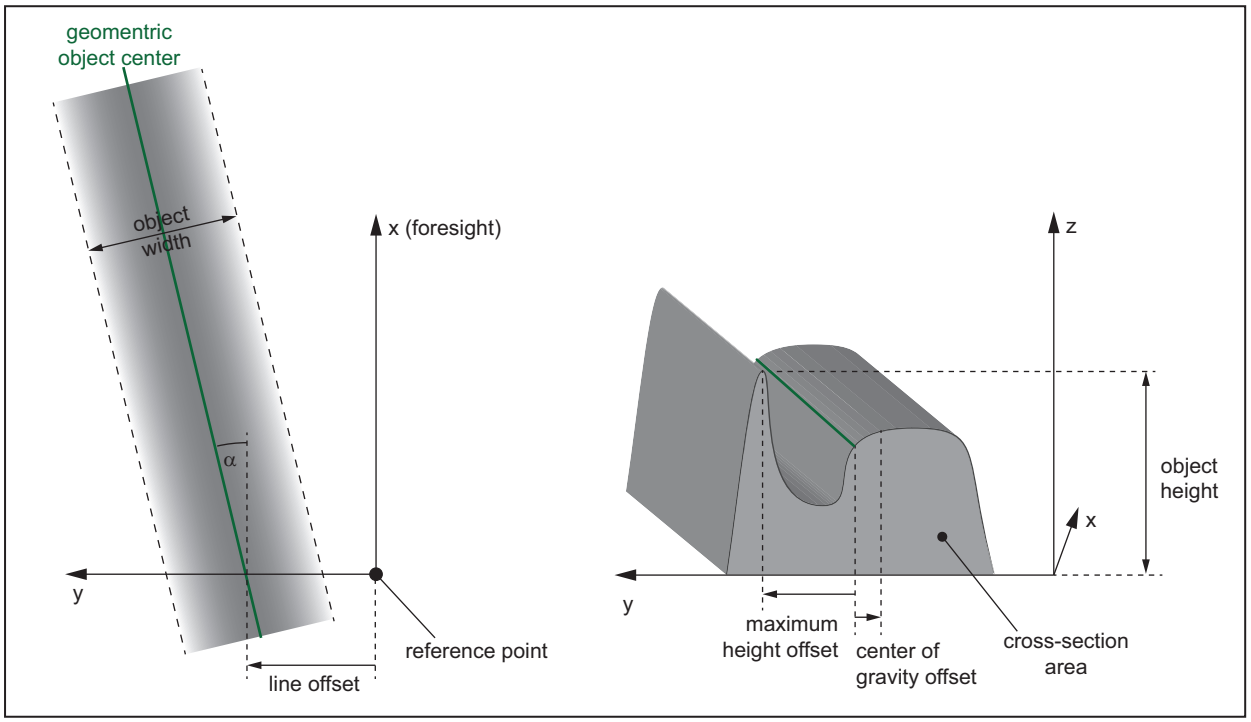
Do not attach the sensor at a height of less than 50 cm.

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.

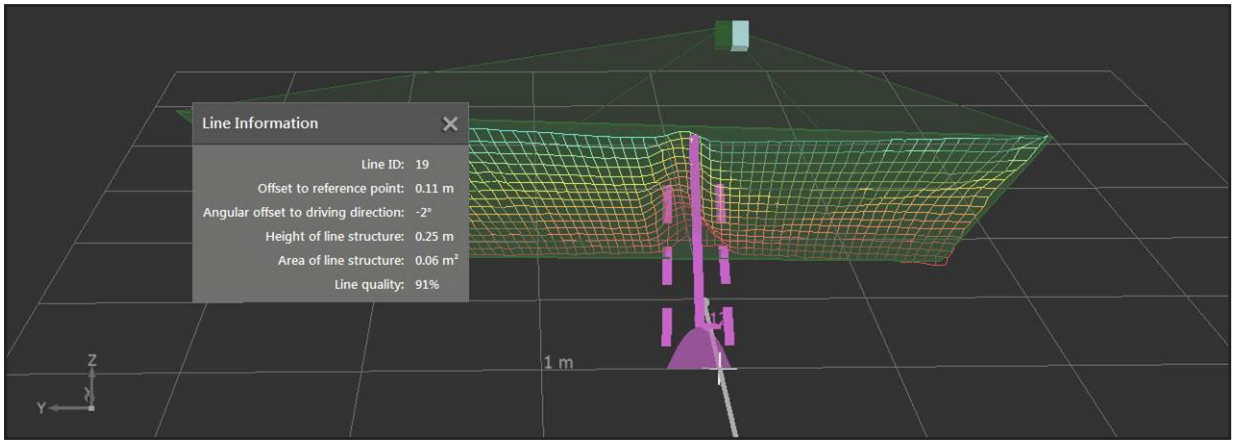
5 Windrow detection

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).

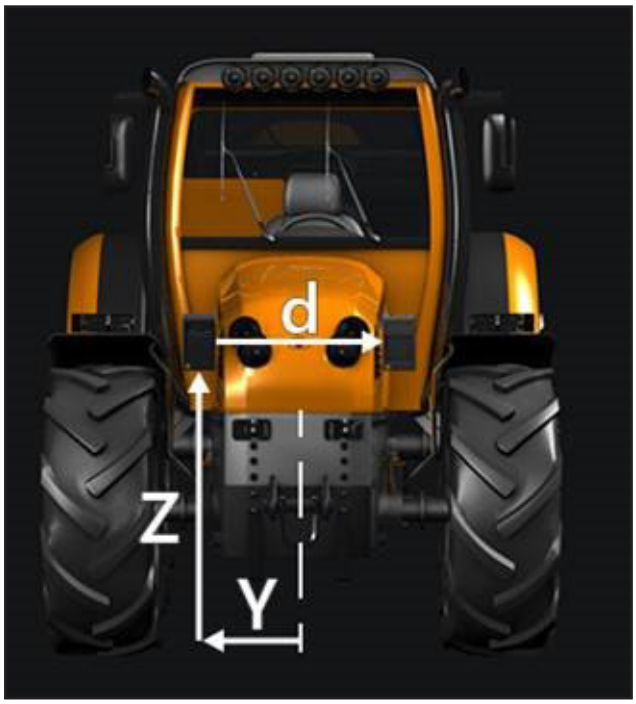


5.1 Introduction

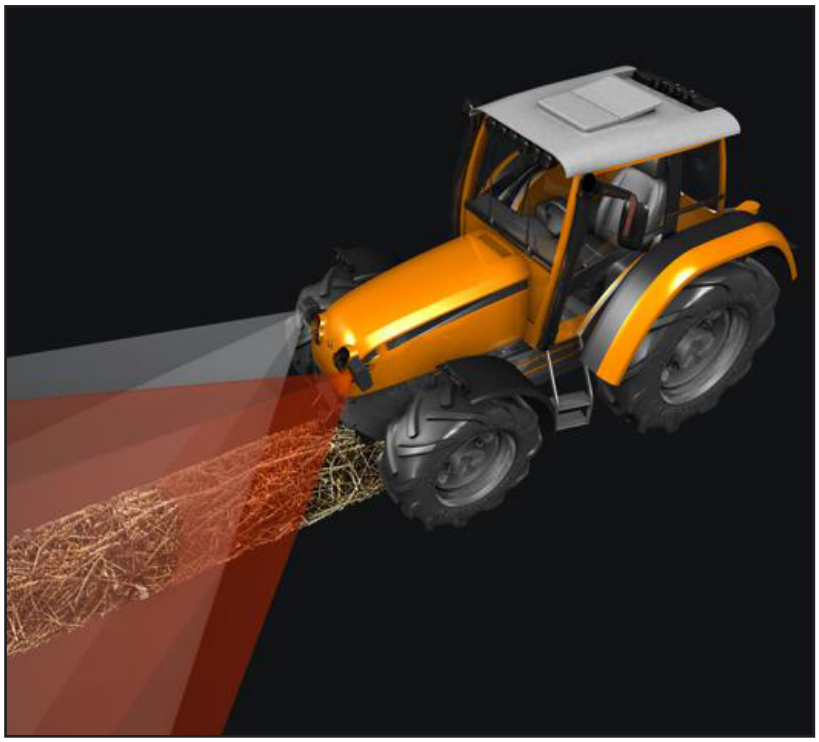
The windrow detection function enables the detection of windrows on the ground of a driving path.

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

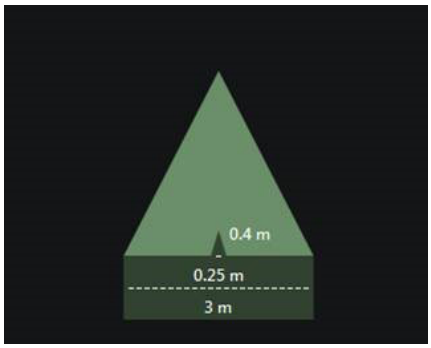
► Set the minimum windrow detection height to enable a clear separation between the ground and the windrows.

> 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.

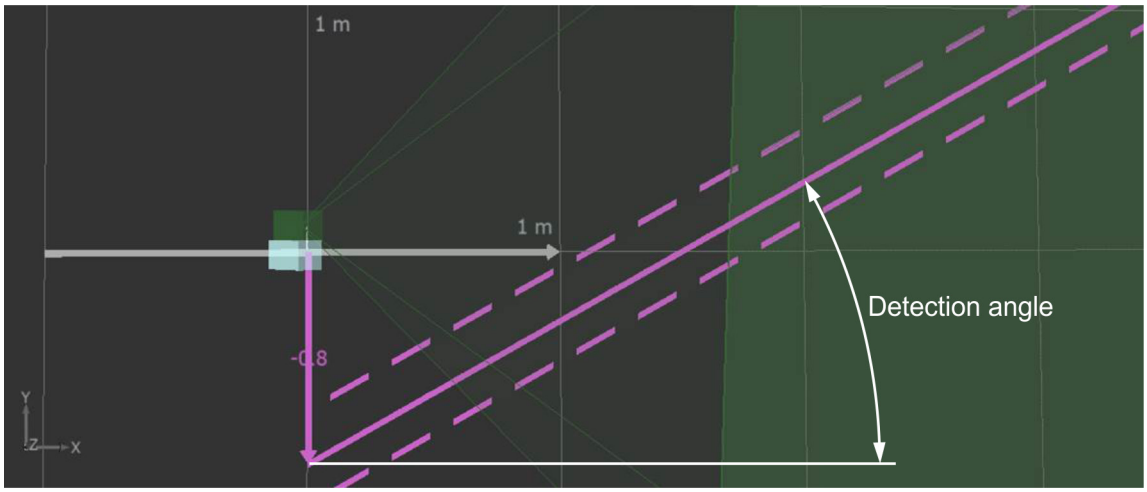


► Make sure that the condition minimum value < maximum value is met.

Maximum windrow angle

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

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



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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.

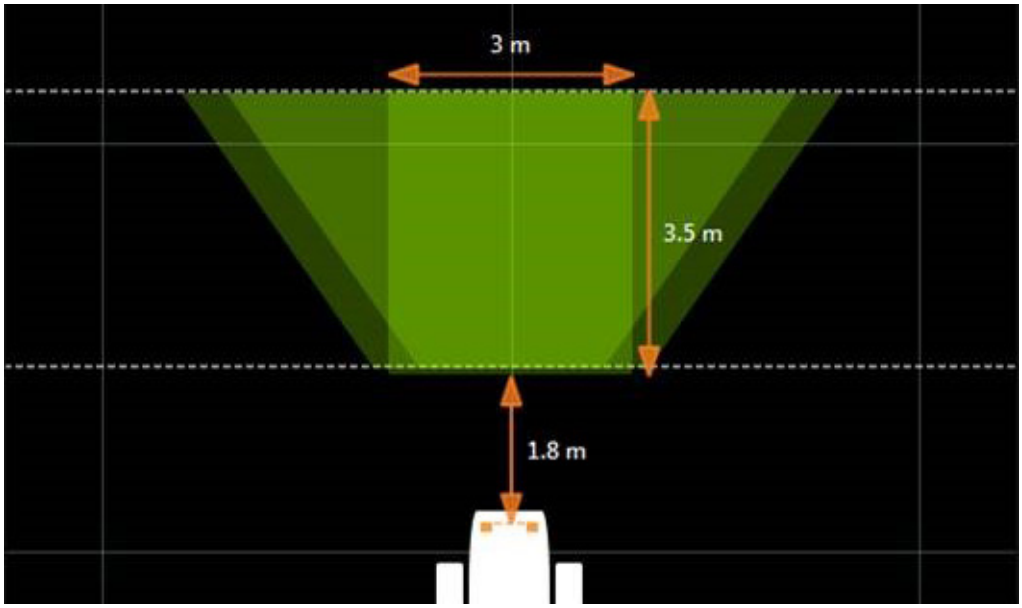
> Only detected windrows which intersect this search area are returned as results.

> 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

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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 Index 03: Product Code: O3M151: 0x0020 0011 O3M251: 0x0020 0030 Index 04: Revision Number: should be filled at runtime with 0x00 <Major number> <Minor number> <Patch Level> of the SW Version. 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): The mobile camera is typically running with internally defined time/ frequency 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. Objects 1800-1819: Index01 COB ID: Invalid Bit: 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“. 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): The mobile camera is typically running with internally defined time/ frequency 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. Objects 1800-1819: Index01 COB ID: Invalid Bit: 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“. 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): The mobile camera is typically running with internally defined time/ frequency 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. Objects 1800-1819: Index01 COB ID: Invalid Bit: 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“. 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

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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