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Interface for 3rd party AGV Controller Technical Specification

KOB2.1

Revision 2.4

1 Subject

1.1 Purpose

This technical specification describes CAN Interface between KOB2.1 and AGV controller from functional point of view (process communication).

Since the list of requirements in this document might be not exhaustive, the customer is welcome to make comments or additional requirements.

1.2 Reference

This specification explicitly refers to the following documents:

[1] CAN Specification 2.0;
Robert Bosch GmbH

[2] DIN ISO 11898-1, 2003-12-01;
Road vehicles – Controller Area Network (CAN) – Part 1;
Data link layer and physical signaling

[3] DIN ISO 11898-2, 2003-12-01;
Road vehicles – Controller Area Network (CAN) – Part 2;
High-speed medium access unit

[4] EN50325-4, December 2002
Industrial communications subsystem based on ISO 11898 (CAN)
for controller-device interfaces Part 4:CANopen

1.3 Related contact

This document is intended to the AGV Supplier who integrates KOB2.1 into Linde Warehouse Forklift truck.

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1.4 Definitions, Acronyms and Abbreviations

Definition	Description
ECU	Electronic Control Unit
KOB	KION Option Box
CAN	Controller Area Network
DTC	Diagnostic Trouble Code
OSI	Open System Interconnection
LID	Local Identifier

1.5 Confidentiality of Document

2 Interface

In this chapter requirements to the interface between AGV controller and ECU KOB2.1 are being described.

2.1 Physical Interfaces

Two transceivers according to [3] have to be used as physical CAN-Bus interface. Two terminal resistor (120 Ω) must be designed in CAN system terminations. The wires of CAN-Bus should be realized as an unshielded twisted pair.

2.2 Requirements to Communication

Communication shall be conforming to ISO-11898. This requirement refers to all OSI layers.

Baud rate: 500kbit/s.

Optionally, a 250kbit/s could be implemented.

Extended address is used for communication out of the truck.

The CAN protocol used here is not tolerant to frame losses. 3Rd party AGV suppliers must pay attention to the robustness of their command in order to prevent losing frames. No more than five (5) consecutives frames loss can be acceptable: system will go to safe state in case of missing frames.

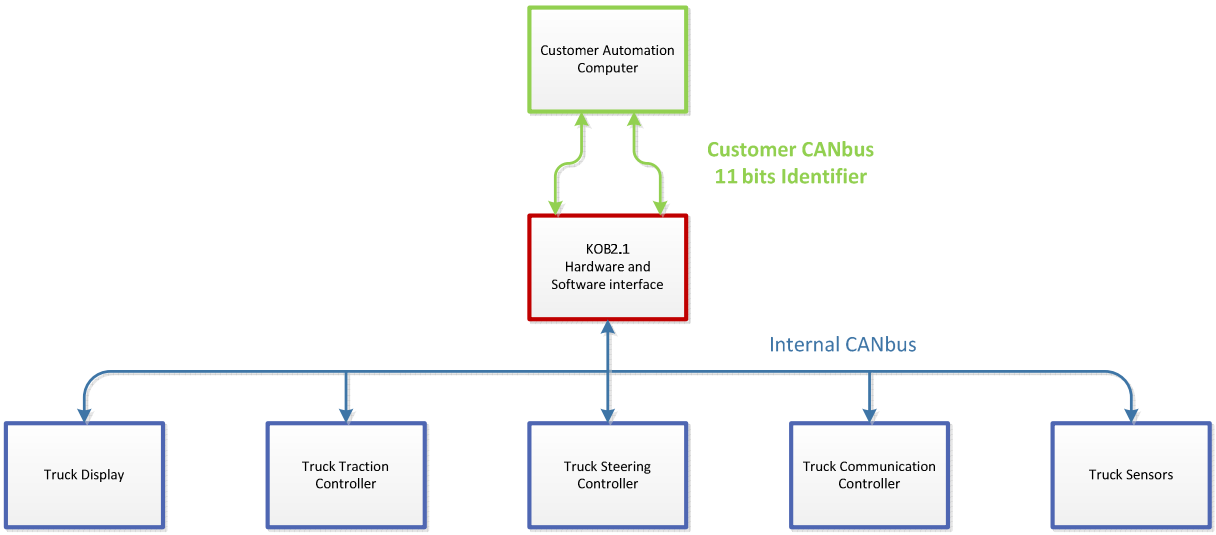
2.3 Functional Requirements Related to Normal Operation

The following sections are used to give an overview about the required functionalities or signals respectively. The format of each signal shall be conform with [1,2].

2.4 Hardware installation in Vehicle

The following sections gives an overview of the installation of the components in truck, from electrical and communication point of view.

Accessing directly to the truck CANbus from the Customer Automation Computer or any customer equipment will cancel the truck certificate. In case of additional need, feel free to contact Linde for customize our equipment to your needs.


Customer Automation Computer
Customer CANbus
11 bits Identifier
KOB2.1
Hardware and
Software interface
Internal CANbus
Truck Display
Truck Traction Controller
Truck Steering Controller
Truck Communication Controller
Truck Sensors

3 List of messages

3.1 Messages received by the KOB2.1, CAN node 1

Name	ID (hex)	DLC (Byte)	Period (ms)	Transmitter	Content
FuncPDO1_Trac1	181	8	20	AGV Controller	Traction command
FuncPDO2_Lift1	281	8	20	AGV Controller	Mast operation Command
FuncPDO3_Steer1	381	8	20	AGV Controller	Steering command

3.2 Messages received by the KOB2.1, CAN node 2

Name	ID (hex)	DLC (Byte)	Period (ms)	Transmitter	Content
FuncPDO1_Trac2	171	8	20	AGV Controller	Traction command
FuncPDO2_Lift2	271	8	20	AGV Controller	Mast operation Command
FuncPDO3_Steer2	371	8	20	AGV Controller	Steering command

Note: Every other message present on the bus must be simply ignored by the KOB2.1

3.3 Messages sent by the KOB2.1, CAN node 1

Name	ID (hex)	DLC (Byte)	Period (ms)	Transmitter	Content
Traction1_RespPDO	182	8	50	KOB2.1-1	Traction information
Lifting1_RespPDO	282	8	50	KOB2.1-1	Lift information
Steer1_RespPDO	382	8	50	KOB2.1-1	Steer information
DTC_LAC	482	8	100	KOB2.1-1	LAC's DTC
DTC_LES	582	8	100	KOB2.1-1	LES's DTC
DTC_KOB1	484	X	100	KOB2.1-1	KOB's DTC

3.4 Messages sent by the KOB2.1, CAN node 2

Name	ID (hex)	DLC	Period (ms)	Transmitter	Content
Traction2_RespPDO	172	8	50	KOB2.1-2	Traction information
Lifting2_RespPDO	272	8	50	KOB2.1-2	Lift information
Steer2_RespPDO	372	8	50	KOB2.1-2	Steer information
DTC_KOB2	486	X	100	KOB2.1-1	KOB's DTC

4 Description of messages

4.1 Messages received by the KOB2.1

4.1.1 FuncPDO1_Trac1

Name	FuncPDO1_Trac1							
Identifier	0x181							
DLC	8 bytes							
Period	20ms							
Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MODE_SELECT						Trac_Ctrl_Cmd	
Byte 1								
Byte 2	Trac_Spd_Set (LSB)							
Byte 3	Trac_Spd_Set(MSB)							
Byte 4								
Byte 5								
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	MODE_SELECT
Description	Required Truck Mode Select from AGV
Length	2 bit
Value table	**0 :** AGV_EXIT 1 : AGV_MODE **2:** AGV_Enter 3 : Manual Mode

Signal name	Trac_Ctrl_Cmd
Description	Required Truck drive status
Length	2 bit
Value table	0 : Stop 1 : Forward 2: Backward

Signal name	Trac_Spd_Set

Description	Required Truck speed set point
Length	16 bit (Unsigned)
Factor	0.001
offset	0
unit	km/h
Min	0
Max	14
default	0

4.1.2 FuncPDO1_Trac2

Name	FuncPDO1_Trac2							
Identifier	0x171							
DLC	8 bytes							
Period	20ms							
Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1			Trac_Ctrl_Cmd				MODE_SELECT	
Byte 2								
Byte 3								
Byte 4	Trac_Spd_Set (MSB)							
Byte 5	Trac_Spd_Set(LSB)							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	MODE_SELECT
Description	Required Truck Mode Select from AGV
Length	2 bit
Value table	**0 : AGV_EXIT** 1 : AGV_MODE **2: AGV_ENTER** 3 : Manual Mode

Signal name	Trac_Ctrl_Cmd
Description	Required Truck drive status
Length	2 bit
Value table	0 : Stop 1 : Forward 2: Backward

Signal name	Trac_Spd_Set
Description	Required Truck speed set point
Length	16 bit (Unsigned)
Factor	0.001
offset	0
unit	km/h
Min	0
Max	14
default	0

4.1.3 FuncPDO2_Lift1

Name	FuncPDO2_Lift1							
Identifier	0x281							
DLC	8 bytes							
Period	20ms							
Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0							Lift_Ctrl_Cmd	
Byte 1								
Byte 2	Lift_Spd_Set(LSB)							
Byte 3	Lift_Spd_Set(MSB)							
Byte 4								
Byte 5								
Byte 6								

Byte 7								

Blank: Reserved for future use

Signal name	Lift_Ctrl_Cmd
Description	Required mast operation status
Length	2 bit
Value table	0 : Stop 1 : Up 2: Lower

Signal name	Lift_Spd_Set
Description	Required Lift speed set point
Length	16 bit (Unsigned)
Factor	0.01
offset	0
unit	%
Min	0
Max	100
default	0

4.1.4 FuncPDO2_Lift2

Name	FuncPDO2_Lift2							
Identifier	0x271							
DLC	8 bytes							
Period	20ms							
Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1					Lift_Ctrl_Cmd			
Byte 2								
Byte 3								

Byte 4	Lift_Spd_Set(MSB)							
Byte 5	Lift_Spd_Set(LSB)							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	Lift_Ctrl_Cmd
Description	Required mast operation status
Length	2 bit
Value table	0 : Stop 1 : Up 2: Lower

Signal name	Lift_Spd_Set
Description	Required Lift speed set point
Length	16 bit (Unsigned)
Factor	0.01
offset	0
unit	%
Min	0
Max	100
default	0

4.1.5 FuncPDO3_Steer1

Name	FuncPDO3_Steer1							
Identifier	0x381							
DLC	8 bytes							
Period	20ms							
Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0							Steer_Ctrl_Cmd	
Byte 1								

Byte 2	Steer_Angle_Set(LSB)							
Byte 3	Steer_Angle_Set(MSB)							
Byte 4								
Byte 5								
Byte 6								
Byte 7								

Signal name	Steer_Ctrl_Cmd
Description	Required Steering operation status
Length	2 bit
Value table	0 : Stop 1 : Left 2: Right

Signal name	Steer_Angle_Set
Description	Required Steer Angle set point
Length	16 bit (Unsigned)
Factor	0.01
offset	0
unit	degree°
Min	0
Max	90
default	0

The Steer_Angle_Set must be managed in accordance to Steering Controller mechanism.
The increase of Steer_Angle_Set must be lower than 3,5°/ 10ms in both positive and negative direction .
Therfore, the Automation Kit must monitor permanently the Real steering angle and manage appropriately the Steer_Angle_Set when changing from manual mode to automatic mode or from automatic mode to manual mode.

4.1.6 FuncPDO3_Steer2

Name	FuncPDO3_Steer2
Identifier	0x371
DLC	8 bytes
Period	20ms

Transmitter	AGV controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1					Steer_Ctrl_Cmd			
Byte 2								
Byte 3								
Byte 4	Steer_Angle_Set(MSB)							
Byte 5	Steer_Angle_Set(LSB)							
Byte 6								
Byte 7								

Signal name	Steer_Ctrl_Cmd
Description	Required Steering operation status
Length	2 bit
Value table	0 : Stop 1 : Left 2: Right

Signal name	Steer_Angle_Set
Description	Required Steer Angle set point
Length	16 bit (Unsigned)
Factor	0.01
offset	0
unit	degree°
Min	0
Max	90
default	0

The Steer_Angle_Set must be managed in accordance to Steering Controller mechanism.
The increase of Steer_Angle_Set must be lower than 3,5°/ 10ms in both positive and negative direction .
Therefore, the Automation Kit must monitor permanently the Real steering angle and manage appropriately the Steer_Angle_Set when changing from manual mode to automatic mode or from automatic mode to manual mode.

4.2 Messages sent by the KOB2.1

4.2.1 Traction1_RespPDO

Name	Traction1_RespPDO							
Identifier	0x182							
DLC	8 bytes							
Period	50ms							
Transmitter	KOB controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Truck_Speed(LSB)							
Byte 1	Truck_Speed(MSB)							
Byte 2								
Byte 3	AGV_STATE				Trac_Cmd_Fedbck			Sw_EStop
Byte 4	TractSpd_Fedck(LSB)							
Byte 5	TractSpd_Fedbck(MSB)							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	Truck_Speed
Description	Real Truck speed
Length	16 bit (Signed)
Factor	0.001
offset	0
unit	km/h
Min	-14.0
Max	+14.0
default	n/a

Signal name	AGV_STATE
Description	Response current AGV state

Length	2 bit
Value table	0 : AGV_EXIT 1 : AGV_MODE 2: AGV_ENTER 3 : Manual Mode

Signal name	Trac_Cmd_Fedbck
Description	Feedback of Truck drive status
Length	2 bit
Value table	0 : Stop 1 : Forward 2: Backward

Signal name	TracSpdSet_Fedbck
Description	Feedback of Truck speed set point
Length	16 bit (Unsigned)
Factor	0.001
offset	0
unit	km/h
Min	0
Max	14
default	0

Signal name	Sw_EStop
Description	Feedback of Emergency Switch of Truck
Length	1 bit
Value table	0 : Emergency stop Inactive 1 : Emergency Stop Active

Nota : Sw_Estop is not implemented on all trucks configurations. This is considered as optional and have to be discussed on a truck by truck basis;

4.2.2 Traction2_RespPDO

Name	Traction2_RespPDO
Identifier	0x172
DLC	8 bytes
Period	50ms
Transmitter	KOB controller

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1								
Byte 2					AGV_STATE			
Byte 3								
Byte 4								
Byte 5	Truck_Speed(MSB)							
Byte 6	Truck_Speed(LSB)							
Byte 7								

Blank: Reserved for future use

Signal name	Truck_Speed
Description	Real Truck speed
Length	16 bit (Signed)
Factor	0.001
offset	0
unit	km/h
Min	-14.0
Max	+14.0
default	n/a

Signal name	AGV_STATE
Description	Response current AGV state
Length	2 bit
Value table	0 : AGV_EXIT 1 : AGV_MODE 2: AGV_ENTER 3 : Manual Mode

4.2.3 Lifting1_RespPDO

Name	Lifting1_RespPDO
Identifier	0x282
DLC	8 bytes

Period	50ms							
Transmitter	KOB controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0							Liftsw_High	Liftsw_Low
Byte 1	Fixed_HighFedbk							
Byte 2	StateOfCharge							
Byte 3					Lift_Cmd_Fedbck			
Byte 4	Lift_*Spd*_Fedbck (LSB)							
Byte 5	Lift_*Spd*_Fedbck (MSB)							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	Liftsw_High
Description	Status of lift high switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Nota : for BR1158 truck only

Signal name	Liftsw_Low
Description	Status of lift low switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Nota : for BR1158 truck only

Signal name	Fixed_HighFedbk
Description	Fixed Lift high switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Nota : for BR1158 truck only

Signal name	StateOfCharge

Description	Battery charge state
Length	8 bits (Unsigned)
Factor	1
offset	0
unit	%
Min	0
Max	100
default	0

Nota : not available for all trucks : only some trucks can offer this feature (BR1158 / BR1189…)

Signal name	Lift_Cmd_Fedbck
Description	Feedback of mast operation status
Length	2 bit
Value table	0 : Stop 1 : Up 2: Lower

Signal name	Lift_*Spd*_Fedbck
Description	Feedback of Lift speed set point
Length	16 bit (Unsigned)
Factor	0.01
offset	0
unit	%
Min	0
Max	100
default	0

4.2.4 Lifting2_RespPDO

Name	Lifting2_RespPDO							
Identifier	0x272							
DLC	8 bytes							
Period	50ms							
Transmitter	KOB controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Byte 0								
Byte 1								
Byte 2		Liftsw_High	Liftsw_Low					
Byte 3				Fixed_HighFedbk				
Byte 4								
Byte 5	StateOfCharge							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	Liftsw_High
Description	Status of lift high switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Signal name	Liftsw_Low
Description	Status of lift low switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Signal name	Fixed_HighFedbk
Description	Fixed Lift high switch
Length	1 bit
Value table	0 : FALSE 1 : TRUE

Signal name	StateOfCharge
Description	Battery charge state
Length	8 bits (Unsigned)
Factor	1
offset	0
unit	%
Min	0

Max	100
default	0

4.2.5 Steer1_RespPDO

Name	Steer1_RespPDO							
Identifier	0x382							
DLC	8 bytes							
Period	50 ms							
Transmitter	KOB controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Steer_Angle(LSB)							
Byte 1	Steer_Angle(MSB)							
Byte 2								
Byte 3					Steer_Cmd_Fedbck			
Byte 4	Steer_Set_Angle(LSB)							
Byte 5	Steer_Set_Angle(MSB)							
Byte 6								
Byte 7								

Blank: Reserved for future use

Signal name	Steer_Angle
Description	Actual steering angle
Length	16 bit (Signed)
Factor	0.1
offset	0
unit	degree
Min	-90
Max	+90
default	n/a

Signal name	Steer_Cmd_Fedbck
Description	Feedback of required steering operation status
Length	2 bit
Value table	0 : Stop 1 : Left 2: Right

Signal name	Steer_Set_Angle
Description	Tiller position transferred to truck range
Length	16 bit (Signed)
Factor	0.01
offset	0
unit	degree
Min	0
Max	+90
default	n/a

4.2.6 Steer2_RespPDO

Name	Steer2_RespPDO							
Identifier	0x372							
DLC	8 bytes							
Period	50 ms							
Transmitter	KOB controller							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1								
Byte 2								
Byte 3		Steer_Cmd_Fedbck						
Byte 4								
Byte 5	Steer_Angle(MSB)							
Byte 6	Steer_Angle(LSB)							
Byte 7								

Blank: Reserved for future use

Signal name	Steer_Angle
Description	Actual steering angle
Length	16 bit (Signed)
Factor	0.1
offset	0
unit	degree
Min	-90
Max	+90
default	n/a

Signal name	Steer_Cmd_Fedbck
Description	Feedback of required steering operation status
Length	2 bit
Value table	0 : Stop 1 : Left 2: Right

4.2.7 DTC_LAC

Name	DTC_LAC							
Identifier	0x482							
DLC	8 bytes							
Period	100ms							
Transmitter	KOB controller, CAN node 1							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	TracErrorCode1(LSB)							
Byte 1	TracErrorCode1(MSB)							
Byte 2	TracErrorCode2(LSB)							
Byte 3	TracErrorCode2(MSB)							
Byte 4	TracErrorCode3(LSB)							
Byte 5	TracErrorCode3(MSB)							
Byte 6	TracErrorCode4(LSB)							
Byte 7	TracErrorCode4(MSB)							

General remark about error codes : It is no intended to provide information about the meaning of error codes. Those are for Linde Field Engineers only.

Providing Error codes by CAN bus is for information only;

Blank: Reserved for future use

Signal name	TracErrorCode1 TracErrorCode2 TracErrorCode3 TracErrorCode4
Description	Error codes (LAC Traction)
Length	16 bit (Unsigned)
Factor	1
offset	0
unit	N/A
default	0: No error code 200 – 999: Active Error code

4.2.8 DTC_LES

Name	DTC_LES							
Identifier	0x582							
DLC	8 bytes							
Period	100ms							
Transmitter	KOB controller, CAN Node 1							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	SteerErrorCode1(LSB)							
Byte 1	SteerErrorCode1(MSB)							
Byte 2	SteerErrorCode2(LSB)							
Byte 3	SteerErrorCode2(MSB)							
Byte 4	SteerErrorCode3(LSB)							
Byte 5	SteerErrorCode3(MSB)							
Byte 6	SteerErrorCode4(LSB)							
Byte 7	SteerErrorCode4(MSB)							

General remark about error codes : It is no intended to provide information about the meaning of error codes. Those are for Linde Field Engineers only.

Providing Error codes by CAN bus is for information only;

Blank: Reserved for future use

Signal name	SteerErrorCode1 SteerErrorCode2 SteerErrorCode3 SteerErrorCode4
Description	Error codes (LES)
Length	16 bit (Unsigned)
Factor	1
offset	0
unit	N/A
default	0: No error code 200 – 999: Active Error code

4.2.9 DTC_KOB2.1-CAN1

Name	DTC_KOB2_1_CAN_1							
Identifier	0x484							
DLC	8 bytes							
Period	100ms							
Transmitter	KOB controller, CAN node 1							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	KOB2_1_1ErrorCode1(LSB)							
Byte 1	KOB2_1_1ErrorCode1(MSB)							
Byte 2	KOB2_1_1ErrorCode2(LSB)							
Byte 3	KOB2_1_1ErrorCode2(MSB)							
Byte 4	KOB2_1_1ErrorCode3(LSB)							
Byte 5	KOB2_1_1ErrorCode3(MSB)							
Byte 6	KOB2_1_1ErrorCode4(LSB)							
Byte 7	KOB2_1_1ErrorCode4(MSB)							

Signal name	KOB2_1_1ErrorCode1 KOB2_1_1ErrorCode2 KOB2_1_1ErrorCode3 KOB2_1_1ErrorCode4
Description	Error codes (KOB2.1 node 1)
Length	16 bit (Unsigned)
Factor	1
offset	0
unit	N/A
default	0: No error code 200 – 999: Active Error code

4.2.10 DTC_KOB2.1-CAN2

Name	DTC_KOB2_1_CAN_2							
Identifier	0x486							
DLC	8 bytes							
Period	100ms							
Transmitter	KOB controller, CAN node 1							
	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	KOB2_1_2ErrorCode1(LSB)							
Byte 1	KOB2_1_2ErrorCode1(MSB)							
Byte 2	KOB2_1_2ErrorCode2(LSB)							
Byte 3	KOB2_1_2ErrorCode2(MSB)							
Byte 4	KOB2_1_2ErrorCode3(LSB)							
Byte 5	KOB2_1_2ErrorCode3(MSB)							
Byte 6	KOB2_1_2ErrorCode4(LSB)							
Byte 7	KOB2_1_2ErrorCode4(MSB)							

Signal name	KOB2_1_2ErrorCode1 KOB2_1_2ErrorCode2 KOB2_1_2ErrorCode3 KOB2_1_2ErrorCode4
Description	Error codes (KOB2.1 node 2)
Length	16 bit (Unsigned)
Factor	1
offset	0
unit	N/A
default	0: No error code 200 – 999: Active Error code

5 Document Log

Version	Date	Name	Notes
1.0	**Sept. 12th 2017**	**Haiyang, Huang**	**Initial Revision**
2.0	**Nov. 20th 2017**	**Gauthier Cokelaer**	**Adding Hardware Installation, redundant CANbus information, KOB2.1 DTC, changing contact person as document to be shared with final customer**
2.1	**Jan. 18th 2018**	**Gauthier Cokelaer**	**Traction1_RespPDO, Lifting1_RespPDO, Steer1_RespPDO, Traction2_RespPDO, Lifting2_RespPDO, Steer2_RespPDO period goes from 100ms to 20ms** **Traction Speed set from 10 to 20km/h** **Possible option for 250kbaud on demand** **Maximum Steering angle from 89 to 90 degrees** **AGV state has only two modes**
2.2	**Mar 26th 2018**	**Gauthier Cokelaer**	**Frame 0x182 : including the TracSpdSet_fedbck on 2 bytes and Trac_Cmd_Fedbck on 2 bits** **Heartbeat1_KOB ID changed from 702 to 782** **DTC_KOB1 ID changed from 712 to 882** **Heartbeat2_KOB IS changed from 703 to 772** **DTC_KOB2 ID changed from 713 to 872**
2.3	**April 12th 2018**	**Gauthier Cokelaer**	**FuncPDO3-Steer1 & FuncPDO3_Steer2 : adding remarks on management of Steering Signal when changing mode for compatibility with Steering Supervision**
2.4	**May 22nd 2018** **May 28th 2018** **June 11th 2018**	**Gauthier Cokelaer**	**Messages received by KOB2.1 : remove HeartBeat_AGV1 signal** **Message received by KOB2.1 : remove Heartbeat_AGV2** **Message sent by KOB2.1 : remove Heartbeat1_KOB** **Message sent by KOB2.1 : remove HeartBeat2_KOB** **FuncPDO1_Trac1 : modification of the MODE_SELECT definition** **FuncPDO1_Trac2 : modification of the MODE_SELECT definition** **FuncPDO1_Trac1 : maximum speed set to 14km/h to comply with latest warehouse truck definition** **FuncPDO2_Trac2 : maximum speed set to 14km/h to comply with latest warehouse truck definition** **Heartbeat_AGV1 : removed** **Heartbeat_AGV2 : removed**

	Traction1_RespPDO : modification of maximum speed to 14kmh/, Modification of AGV_State **Traction2_RespPDO : modification of AGV_Status and maximum speed to 14km/h** **Lifting1_RespPDO : adding remarks about the signals** **Heartbeat1_KOB : removed** **Heartbeat2_KOB : removed** **Overall frames timing adjustment to 50ms except for DTC where they are kept to 100ms** **DTC_KOB1/2 identifiers back to 11 bits definition** **Steer2_RespPDO includes Steer_Cmd_Fedbck** Messages received by KOB have 20ms periodicity Tolerance to 5 frames loss instead of 2