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Information sheet type	Work instruction
Subject	KSM interface (customer-specific control module = control unit for external data exchange)
Validity	• As of the date of publication until withdrawn or replaced • Worldwide
Distribution	This Information sheet will be made available on the Internet (MAN After Sales Portal). This Information sheet will be made available to the MAN service organisation on the MAN Intranet/Extranet.
Link(s)	71302F1

Vehicle(s) affected	TGL, TGM, TGA, TGS, TGX, FOC, HOC
Component(s) affected	Customer-specific control module (KSM) Step 2 (81.25816-7007), Fleet Management System (FMS) 2.0

Changes to process for requesting conversion data file	The conversion data file is no longer requested via an application form for vehicle parameterisation. Instead, requests for a conversion data file in the context of Technical Information sheet 71302 and its supplements must be submitted via form 71302F1 "Application for conversion according to Technical Information sheet 71302 and its supplements". This form can either be sent via fax (as a fax form according to 3237SM) or as an attachment to an online form (according to 3495SM). The form "Application for conversion according to Technical Information sheet 71302 and its supplements" is only available online on the Intranet/Extranet. You must always open a new form from the Intranet/Extranet when requesting a conversion in accordance with Technical Information sheet 71302 and its supplements. This is the only way to ensure that you always use the most recent form.
Corrections to the appendix of supplement 2, 71302	• On page 55 of the appendix, the description of the plug connector X1428 is incorrect. This plug connector is only fitted if the interface for travel and speed signals is installed. Delete: Pl. conn. X1428 is located in the area of the central electrical system (if ~~KSM interface~~ was factory-fitted) Correction: Pl. conn. X1428 is located in the area of the central electrical system (if the **interface for travel and speed signals** was factory-fitted) • On page 41 of the appendix, the behaviour in the event of a failure of the body CAN (A-CAN) is not described correctly. If the A-CAN fails, no **KSM1**_A message is transferred. Delete: ~~KSM2~~_A message Correction: KSM1_A message

Introduction of customer-specific control module (KSM) Step 2	KSM Step 2 can only be operated if the vehicle is equipped with a ZBR Step 7.2 (81.25806-7103) or higher. The introduction of KSM Step 2 brings with it some significant changes: • The KSM is connected to the instrument CAN (I-CAN), but no longer to the driveline CAN (T-CAN) – see page 3. • The terminating resistor for the A-CAN is no longer integrated in the KSM – see page 4. • The monitoring of signals now starts when the ignition is switched on. • Additional messages are provided on the A-CAN – see page 9. • All signals previously available to the KSM via the T-CAN are now also available via the I-CAN. The existing Fleet Management System (1.0) can also be operated with a KSM Step 2. The functions already available in previous versions are described in Technical Information sheet 71302 and its past supplements.
Introduction of Fleet Management System (FMS) 2.0	The previous Fleet Management System (1.0) is being replaced with an updated version (2.0) – see page 14. The FMS 2.0 can only be operated in vehicles that meet specific requirements – see page 14. The FMS 2.0 must be activated via parameterisation – see page 14.
Retrofitting	KSM Step 2 and FMS 2.0 can also be retrofitted on the vehicles TGL, TGM, TGA, TGS, TGX as well as on the FOC and HOC bus/coach chassis (see description from page 15). **Conversion to KSM Step 2 from a previous version is not possible.**

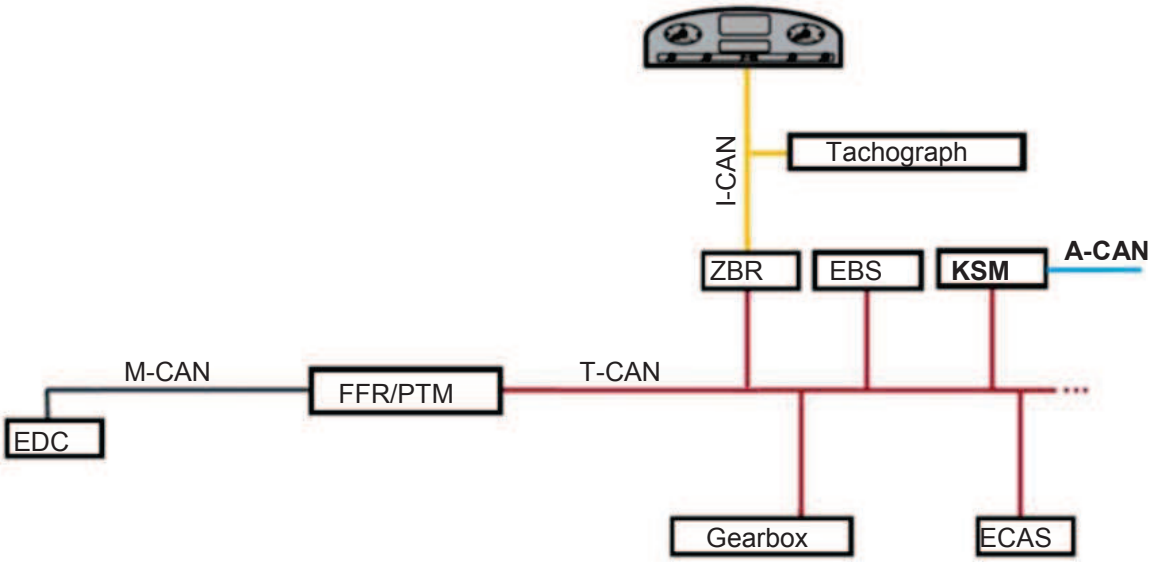
Yours faithfully,
MAN Truck & Bus AG

ppa. R. Lepper

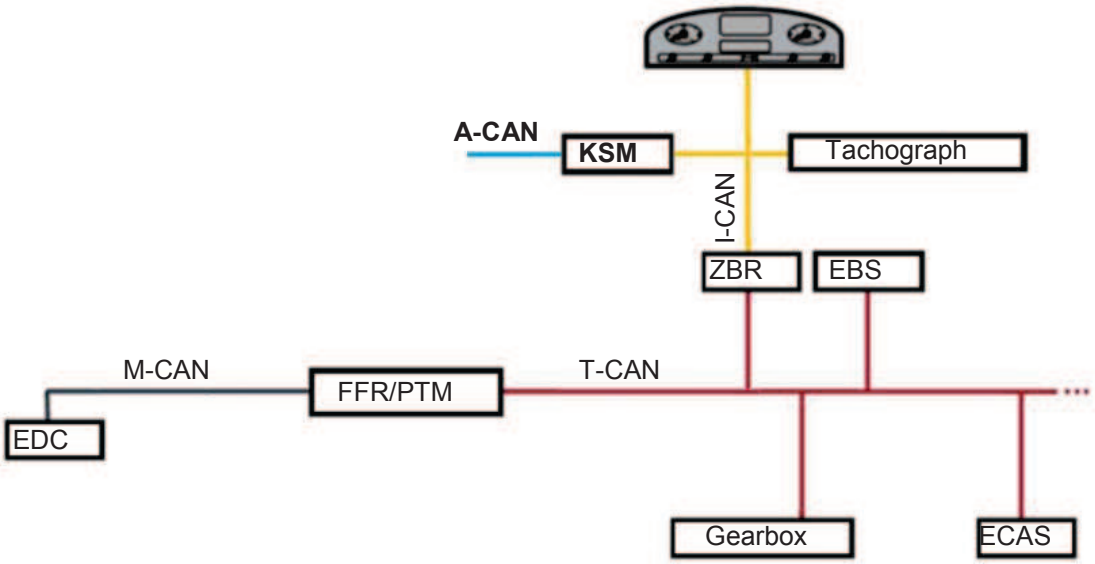
i.V. J. Thomas

Customer-specific control module (KSM) Step 2

- Modified connection in the CAN network
  Before KSM Step 2:



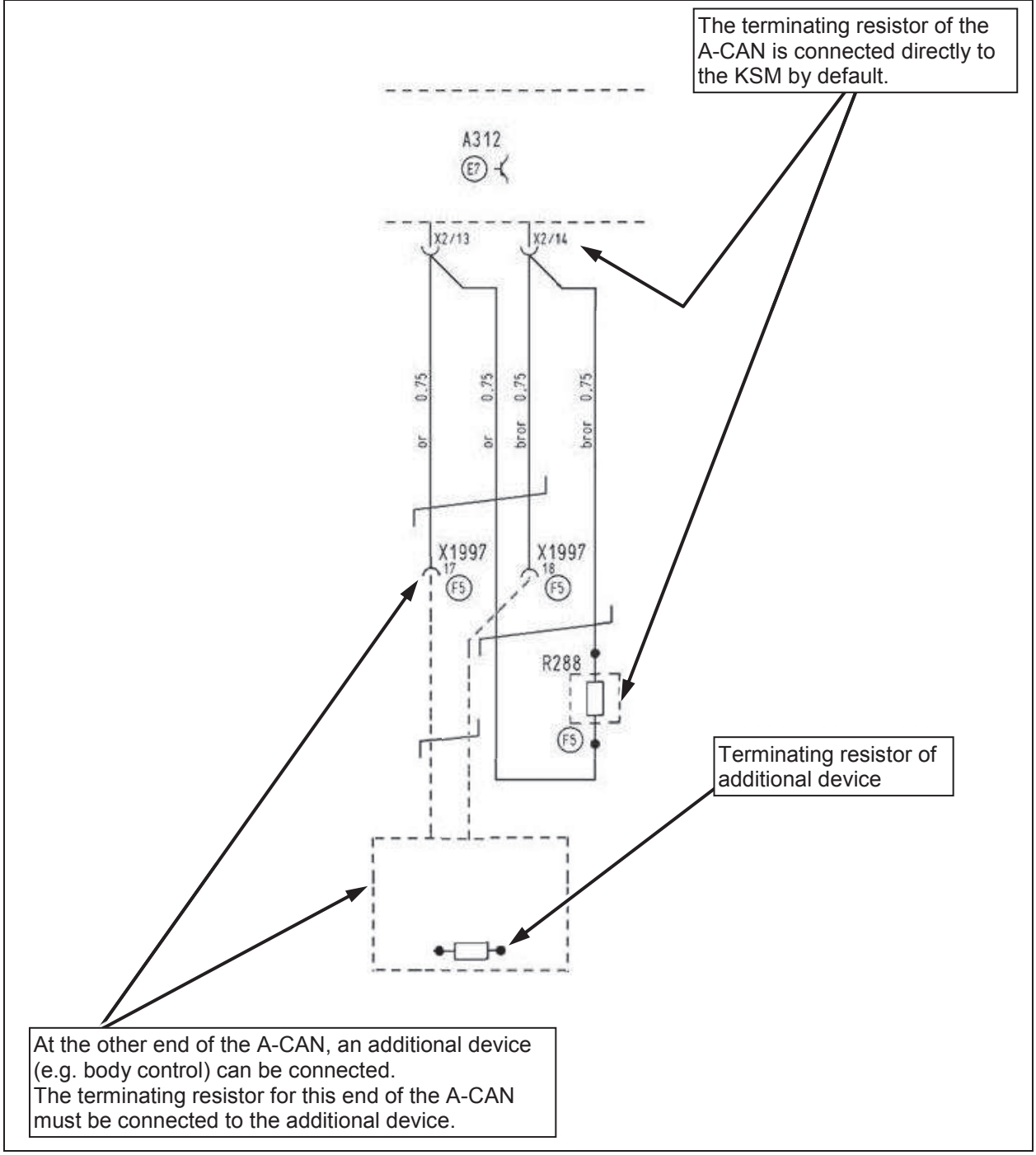
As of KSM Step 2:



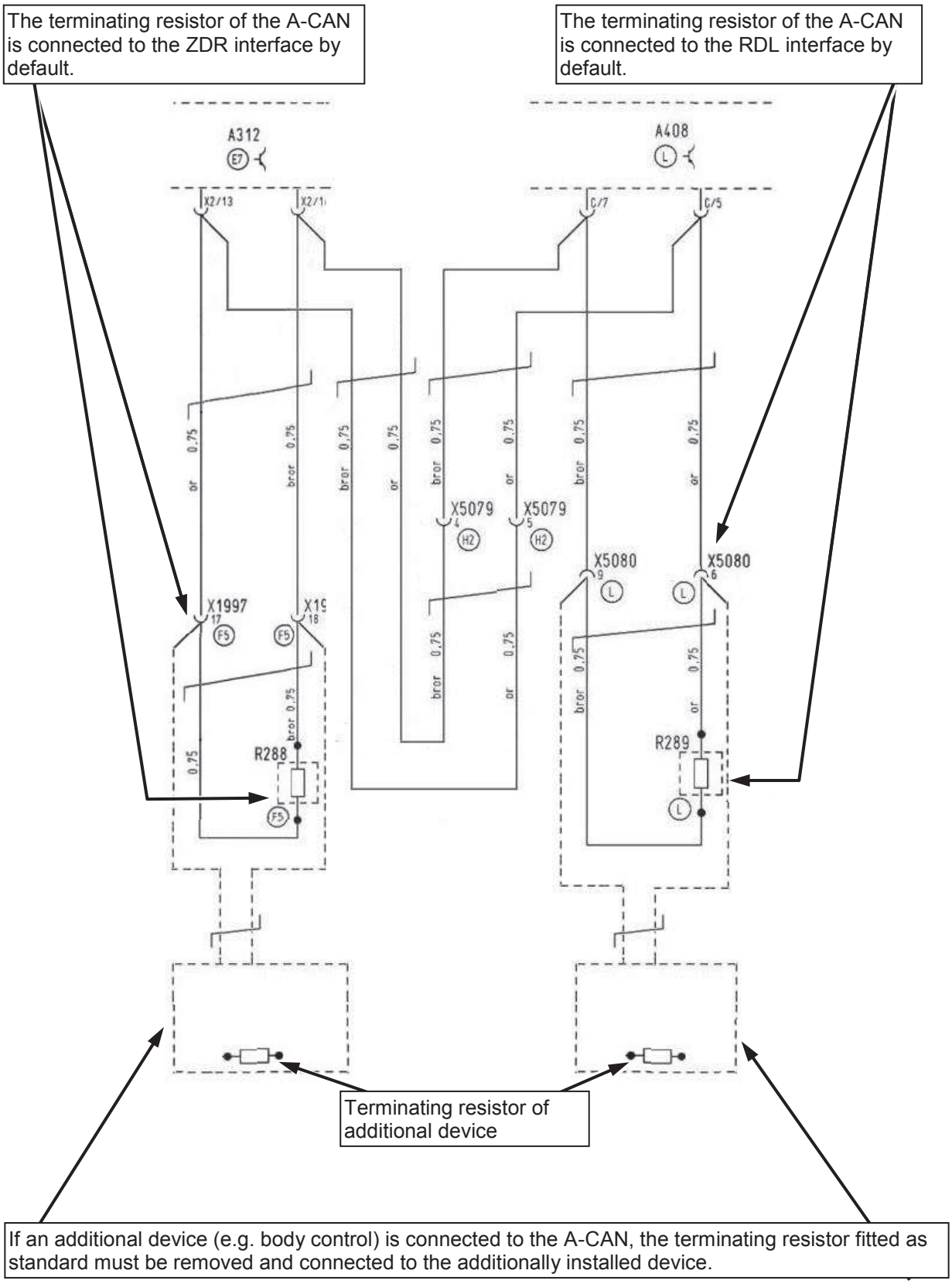
- The terminating resistor for the A-CAN is no longer installed in the housing of the KSM .

  For reasons of electromagnetic compatibility (EMC), it is essential that the terminating resistors are installed in the vehicle. If an additional device is connected to the A-CAN, the terminating resistor must be removed from its standard installation location and connected to this additional device.

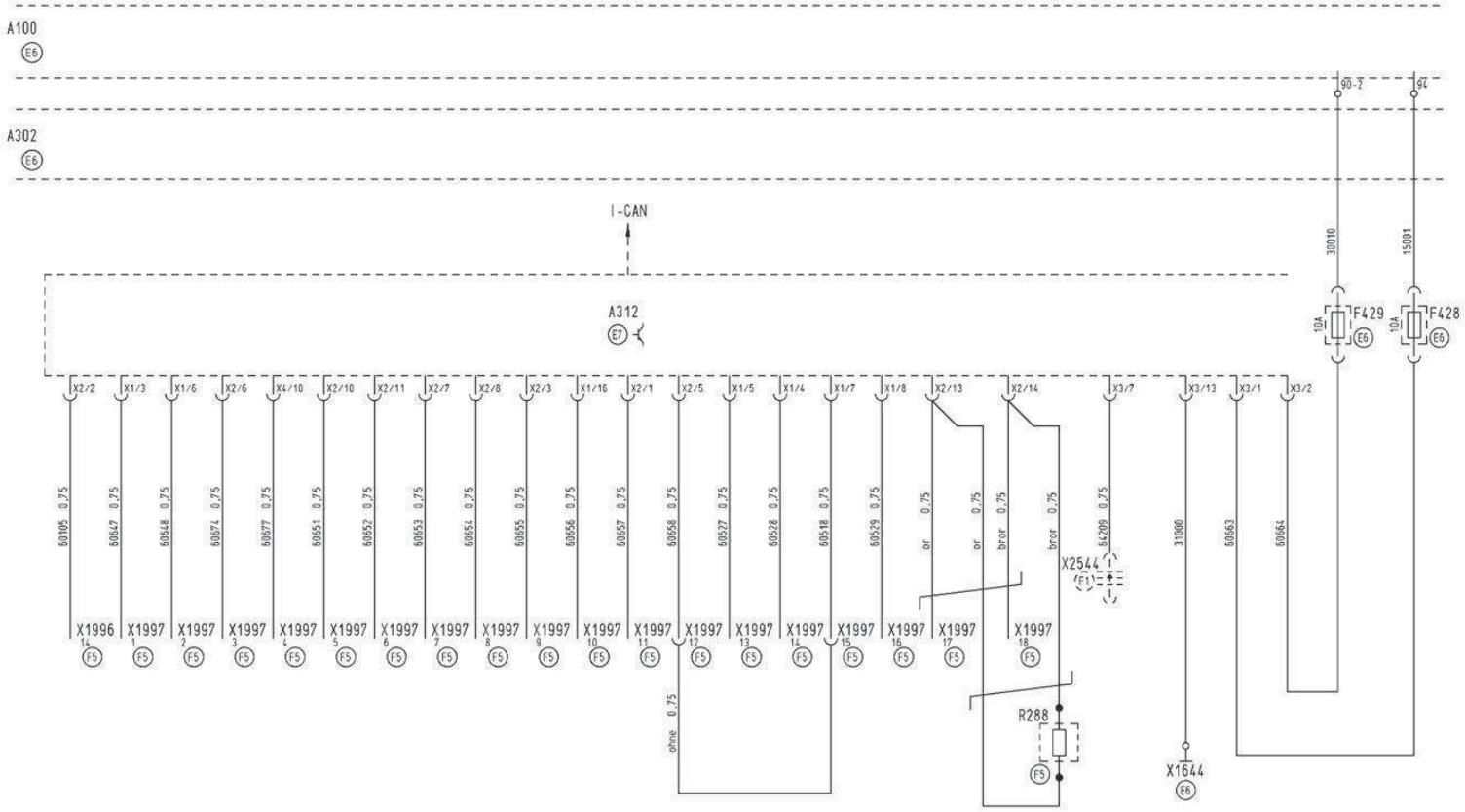
Trucks with KSM Step 2



Trucks with KSM Step 2 and FMS 2.0 and remote download (RDL)

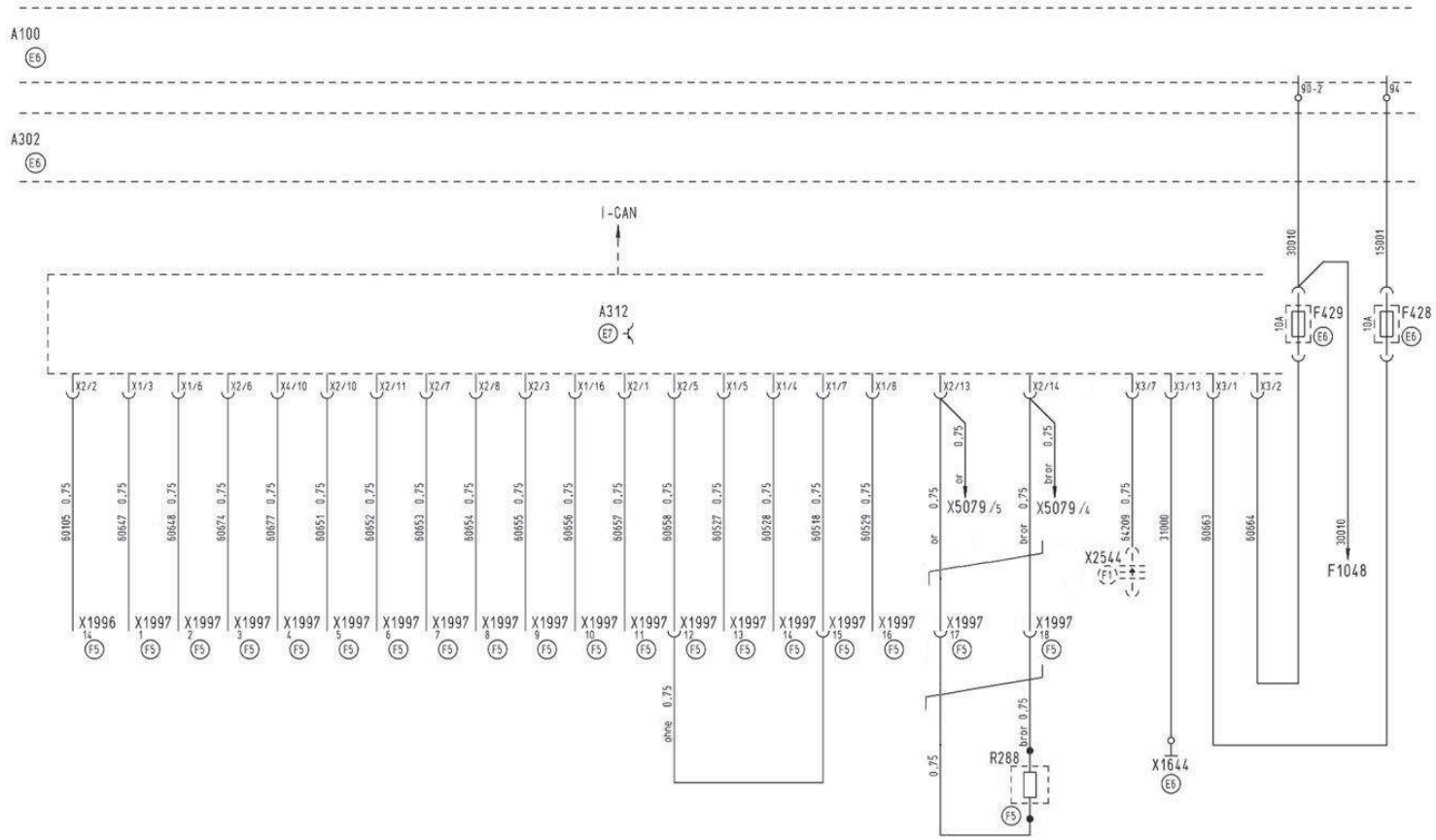


Example circuit diagram for trucks with KSM Step 2



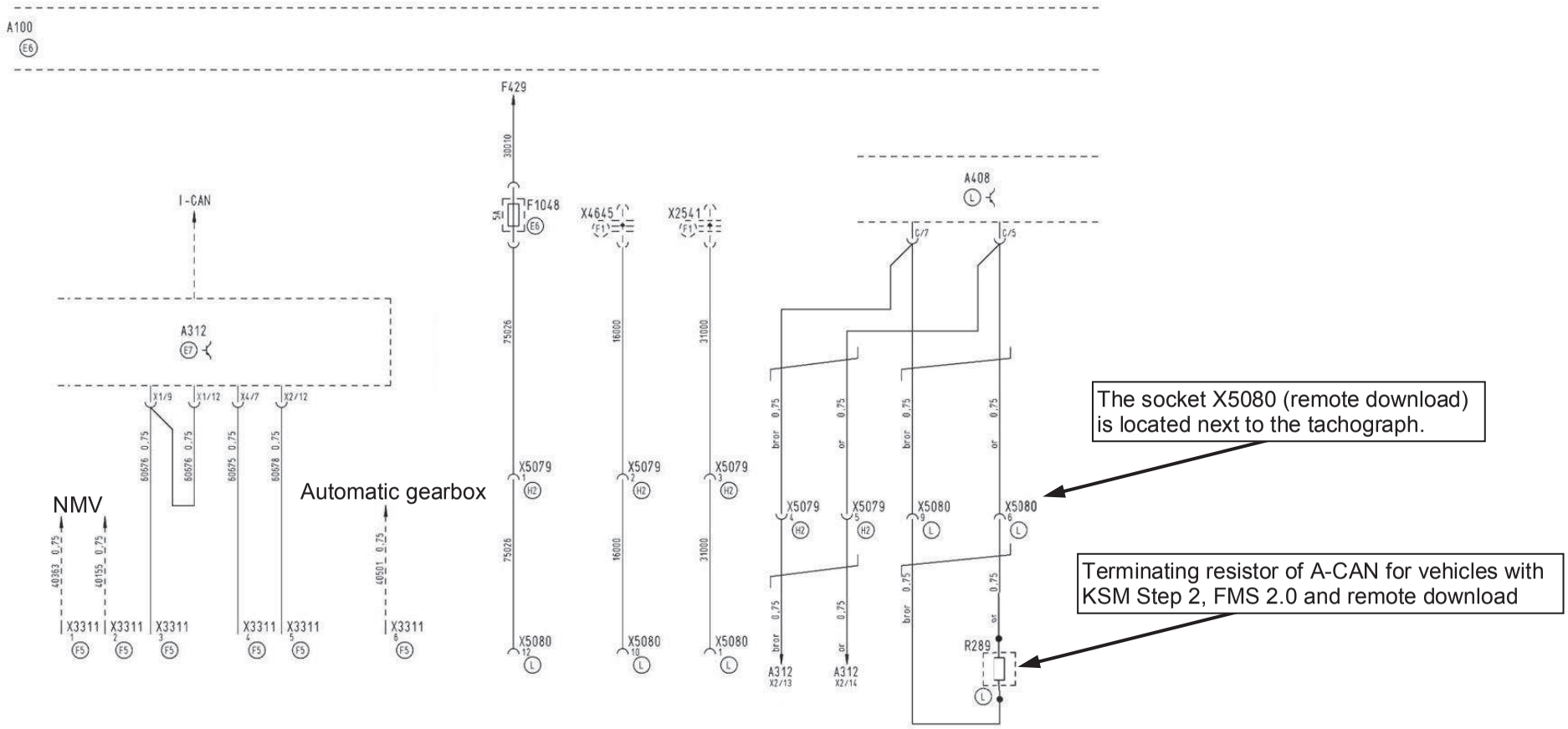
A100	Central electrical system (ZE)
A302	Central on-board computer (ZBR)
A312	Customer-specific control module (KSM)
F428	Fuse, KSM, terminal 15
F429	Fuse, KSM, terminal 30
R288	Terminating resistor, A-CAN
X1644	Ground point next to central electrical system
X1996	ZDR interface (FFR/PTM)
X1997	ZDR interface (KSM)
X2544	Potential distributor, communication line ("K-line") diagnostics

Example circuit diagram for trucks with KSM Step 2 and FMS 2.0 and remote download (page 1 of 2)



A100	Central electrical system (ZE)
A302	Central on-board computer (ZBR)
A312	Customer-specific control module (KSM)
F428	Fuse, KSM, terminal 15
F429	Fuse, KSM, terminal 30
R288	Terminating resistor, A-CAN
X1644	Ground point next to central electrical system
X1996	ZDR interface (FFR/PTM)
X1997	ZDR interface (KSM)
X2544	Potential distributor, communication line ("K-line") diagnostics

Example circuit diagram for vehicles with KSM Step 2 and FMS 2.0 and remote download (page 2 of 2)



A100	Central electrical system (ZE)
A312	Customer-specific control module (KSM)
A408	Tachograph
F1048	Fuse, socket, remote download
R289	Terminating resistor, A-CAN
X2541	Potential distributor, line 31000
X3311	ZDR interface (KSM)
X4845	Potential distributor, line 16000
X5079	Plug connector, remote download
X5080	Socket, remote download
NMV	Engine-side PTO

Information about operating condition of vehicle on A-CAN

- **KSM Step 2 or KSM Step 2 with FMS 1.0**

A-CAN transmitted messages	Truck, FOC, HOC		
	KSM Step 2 **with** body functionality 81.25890-2202	KSM Step 2 **with** FMS 1.0 **and** body functionality 81.25890-2202 81.25890-1111	KSM Step 2 **with** FMS 1.0, **without** body functionality 81.25890-1111
ETC1	x	x	
ETC2	x	x	
ETC3	x	x	
EBC1	x	x	
Amb_Cond	x	x	
Aux_Stat_ZBR1	x	x	
ECAM1	x	x	
Time_date	x	x	
EngFlui_LevPressure	x	x	
ERC1_Rx	x	x	
ERC1_RD/ERC1_RE			
Fuel_ECO	x	x	
Aux_Stat_KSM1	x	x	
Veh_distance	x	x	x

Notes:

x = message is transmitted on A-CAN.
Bold = messages containing the specification "FMS standard interface".
ERC1_RE is only transmitted if a primary retarder (e.g. PriTarder) is installed;
ERC1_RD is only transmitted if a secondary retarder (e.g. Intarder) is installed.
The signals available for the CAN messages are detailed in chapter 7.5 of the appendix to supplement 2 as well as in this supplement.

Caution:

When configuring the KSM with the function parameter set 81.25890-1111, only the FMS interface is provided; the conventional KSM functionality (output of switching signals, engine intervention (MDB mode/requirements etc.)) is not available!

- **KSM Step 2 or KSM Step 2 with FMS 1.0**

A-CAN transmitted messages	Truck, FOC, HOC		
	KSM Step 2 **with** body functionality 81.25890-2202	KSM Step 2 **with** FMS 1.0 **and** body functionality 81.25890-2202 81.25890-1111	KSM Step 2 **with** FMS 1.0, **without** body functionality 81.25890-1111
Veh_weight EBS/ECAS	x	x	x
Eng_hours, Revolutions	x	x	x
TCO1	x	x	x
CCVS	x	x	x
Eng_Temp	x	x	x
EEC1	x	x	x
EEC2	x	x	x
Fuel_consumption		x	x
FMS_SW_Identification		x	x
Dash_display		x	x
Service		x	x
BAM_MTCO_VIN		x	x
P_MTCO_VIN		x	x
HRFC HiResFuelCons.★			
DI Driver Identification★			
BAM Driver ID★			
P Driver ID★			

Notes:

x = message is transmitted on A-CAN.
Bold = messages containing the specification "FMS standard interface".
★ = additional A-CAN messages as of FMS 2.0
The signals available for the CAN messages are detailed in chapter 7.5 of the appendix to supplement 2 as well as in this supplement.

Caution:

When configuring the KSM with the function parameter set 81.25890-1111, only the FMS interface is provided; the conventional KSM functionality (output of switching signals, engine intervention (MDB mode/requirements etc.)) is not available!

- **KSM Step 2 with FMS 2.0**

A-CAN transmitted messages	Truck, FOC, HOC	
	KSM Step 2 **with** FMS 2.0 **without** body functionality 81.25890-3063	KSM Step 2 **with** FMS 2.0 **and** body functionality 81.25890-3063 81.25890-2202
ETC1		x
ETC2		x
ETC3		x
EBC1		x
Amb_Cond	x	x
Aux_Stat_ZBR1		x
ECAM1		x
Time_date		x
EngFlui_LevPressure		x
ERC1_Rx		x
ERC1_RD/ERC1_RE		
Fuel_ECO	x	x
Aux_Stat_KSM1		x
Veh_distance	x	x
Veh_weight EBS/ECAS	x	x

Notes:

x = message is transmitted on A-CAN.
Bold = messages containing the specification "FMS standard interface".
ERC1_RE is only transmitted if a primary retarder (e.g. PriTarder) is installed;
ERC1_RD is only transmitted if a secondary retarder (e.g. Intarder) is installed.
The signals available for the CAN messages are detailed in chapter 7.5 of the appendix to supplement 2 as well as in this supplement.

Caution:

When configuring the KSM with the function parameter set 81.25890-3063, only the FMS interface is provided; the conventional KSM functionality (output of switching signals, engine intervention (MDB mode/requirements etc.)) is not available!

- **KSM Step 2 with FMS 2.0**

A-CAN transmitted messages	Truck, FOC, HOC	
	KSM Step 2 **with** FMS 2.0 **without** body functionality 81.25890-3063	KSM Step 2 **with** FMS 2.0 **and** body functionality 81.25890-3063 81.25890-2202
Eng_hours, Revolutions	x	x
TCO1	x	x
CCVS	x	x
Eng_Temp	x	x
EEC1	x	x
EEC2	x	x
Fuel_consumption	x	x
FMS_SW_Identification	x	x
Dash_display	x	x
Service	x	x
BAM_MTCO_VIN	x	x
P_MTCO_VIN	x	x
HRFC HiResFuelCons.★	From Euro 6	From Euro 6
DI Driver Identification★	x	x
BAM Driver ID★	x	x
P Driver ID★	x	x

Notes:

x = message is transmitted on A-CAN.
Bold = messages containing the specification "FMS standard interface".
★ = additional A-CAN messages as of FMS 2.0
The signals available for the CAN messages are detailed in chapter 7.5 of the appendix to supplement 2 as well as in this supplement.

Caution:

When configuring the KSM with the function parameter set 81.25890-3063, only the FMS interface is provided; the conventional KSM functionality (output of switching signals, engine intervention (MDB mode/requirements etc.)) is not available!

A-CAN transmitted messages

Only the additional signals available as of KSM Step 2 are described here. The signals already available with KSM Step 1 are described in chapter 7.5 of the appendix to supplement 2.

HRFC: High Resolution Fuel Consumption (5.x.x) 18FD0900

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1s	8 bytes	253	9	6	0x00FD09	0x18FD0900

1 to 4	---	High Resolution Engine Trip Fuel		
		0.001 l per bit	Offset = 0	Range = 0… 4211081.215 l
5 to 8	---	High Resolution Engine Total Fuel Used		
		0.001 l per bit	Offset = 0	Range = 0… 4211081.215 l

DI: Driver's Identification (5.x.x) 18FE6BEE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10s	Variable	254	107	6	0x00FE6B	0x18FE6BEE

1	---	Driver 1 Identification
		Driver 1 Identification Delimiter (ASCII "*")
2	---	Driver 2 Identification
		Driver 2 Identification Delimiter (ASCII "*")

Depending on which driver card is inserted in the tachograph, different messages are transmitted:

- If only driver card 1 is present, only the Driver 1 identification and two delimiters "*" are sent.
- If only driver card 2 is present, one delimiter "*" and the Driver 2 identification are sent, followed by the second delimiter "*".
- If no driver card is present, only the two delimiters "*" are sent.

Depending on the length of the data to be transferred, the message is transmitted either as a single message or in the form of one or more packages Broadcast Announce Message, BAM).

A-CAN received messages

Only the changes resulting from the installation of a PTM are described here. The signals already available for the vehicle management computer (FFR) are described in chapter 7.6 of the appendix to supplement 2.

Byte	Bit	Description	
1	4 and 3	Requested speed control conditions ksma_rscc (3.2.3.2)	
		00	Speed Control Standard
		01	Speed Control Conditions 1
		10	Speed Control Conditions 2
		11	Speed Control Conditions 3

- Changes over FMS 1.0:

  Two additional A-CAN messages are transmitted:

  - HRFC: High Resolution Fuel Consumption

    Transmission of the consumed fuel amount in litres
    The amount of fuel consumed during the current journey can be transferred, or the entire volume consumed since commissioning of the vehicle.

  - DI: Driver's Identification

    Transmission of the driver identification of the driver card(s)
    Either the information of driver card 1 or driver card 2 is transferred, or the information that no driver card is inserted in the tachograph.

    If no PTM Step 3 or higher is installed, the A-CAN messages HRFC and DI are transmitted only with the content "FF".

- Prerequisites for FMS 2.0

  - A KSM Step 2 (81.25816-7007) is fitted (prerequisite: ZBR Step 7.2 or higher is fitted).
  - A tachograph that requires two independent speed signals is fitted:

DTCO (Continental)		SE 5000 (Stoneridge)	
For vehicles without ADR equipment	For vehicles with ADR equipment	For vehicles without ADR equipment	For vehicles with ADR equipment
81.27101-6577 (81.25817-7109) or higher	81.27101-6578 (81.25817-7110) or higher	81.27101-6579 (81.25817-7111) or higher	81.27101-6580 (81.25817-7112) or higher

  The numbers in brackets are the control unit numbers of the tachographs.

- Activating the FMS 2.0 by means of parameterisation

  - If a KSM Step 2 is already installed:
    FMS 1.0 and 2.0 can be activated (retrofitted), deactivated (removed) or swapped using MAN-cats (direct order).
  - If no KSM Step 2 is installed:
    Request the FMS together with the KSM using the form 71302F1.

- Prerequisites for retrofitting of KSM Step 2 or FMS 2.0:

Retrofitting	Prerequisite			
KSM Step 2	ZBR Step 7.2 (81.25806-7103) or higher			
FMS 2.0	KSM Step 2 (81.25816-7007)			
	DTCO (Continental)		SE 5000 (Stoneridge)	
	For vehicles without ADR equipment	For vehicles with ADR equipment	For vehicles without ADR equipment	For vehicles with ADR equipment
	81.27101-6577 (81.25817-7109) or higher	81.27101-6578 (81.25817-7110) or higher	81.27101-6579 (81.25817-7111) or higher	81.27101-6580 (81.25817-7112) or higher

The numbers in brackets are the control unit numbers.

In addition to the cable harnesses that must be installed in the cab, retrofitting of the KSM Step 2 or FMS 2.0 also requires a conversion data file with different function parameter sets (FUP). Furthermore, a connection must be established with the instrument CAN (I-CAN).

- Conversion data file

  In addition to the control unit number of the KSM Step 2, different function parameter sets are added in order to activate the KSM Step 2 or the FMS 2.0. Settlement is performed via the listed software packages.

Vehicle configuration	Control unit KSM Step 2	Function parameter sets added	Software package
KSM Step 2 **with** body functionality	81.25816-7007	81.25890-2202 81.25890-3067	81.25890-7226
KSM Step 2 **with** FMS 2.0 **without** body functionality	81.25816-7007	81.25890-3063 81.25890-3067	81.25890-7431
KSM Step 2 **with** FMS 2.0 **and** body functionality	81.25816-7007	81.25890-2202 81.25890-3063 81.25890-3067	81.25890-7431 81.25890-7462

81.25890-7226 = Adapt control units
81.25890-7431 = Control unit for external data exchange with fleet-management standard
81.25890-7462 = Body functionality for control unit for external data exchange

If a KSM control unit is already installed in the vehicle, MAN-cats (direct order) can be used to retrofit, replace or swap Fleet Management Systems 1.0 and 2.0, as well as to retrofit or remove the body functionality.

Vehicle configuration	Retrofit/remove	Select software package
KSM Step 2	FMS 2.0	81.25890-7536 "Fleet Management Standard 2.0"
KSM Step 1 or KSM Step 2	FMS 1.0	81.25890-7154 "Fleet Management Standard 1.0"
KSM Step 1 or KSM Step 2	Body functionality	81.25890-7462 "Body functionality for control unit for external data exchange"

In the case of KSM Step 2 with body functionality, additional function parameter sets may be required depending on vehicle deployment:

Function parameter set	Description	Functional description
81.25890-1300	External vehicle control via A-CAN	The engine speed and torque specification of the body control can be transmitted in the form of a CAN message (KSM1_A message). ocm=0: Neither engine speed/torque specification nor engine speed limit/torque limiting ocm=1: Any engine speed specification/torque limiting ocm=2: Any torque specification/engine speed limit ocm=3: Torque limiting and engine speed limit **Caution: No simultaneous specification of engine speed and torque** Refer to the example on the following page to aid understanding of the function.
81.25890-3057	Deactivation of A-CAN monitoring in KSM Step 2 (service variant)	Deactivation of the timeout monitoring for KSM received messages (KSM1_A and KSM2_A) to prevent a diagnostic memory entry. Used for changing bodies or if it is not assured that the body electronics transmit cyclically with "Term. 15 On".

Function parameter set	Description	Functional description
81.25890-2442	External regulator monitoring via A-CAN	A control parameter set deviating from the standard control parameter set can be requested via the A-CAN. FUP 81.25890-2442 is only effective in conjunction with FUP 81.25890-1300 and, depending on the installed engine, in addition to the FUP 81.25890-1309 (D20, D26, D28) or 81.258590-2453 (D08). The function parameter sets 81.25890-1309 "ZDR control parameters for strong load alterations" and 81.25890-2453 "ZDR control parameters for strong load alterations in TGL, TGM" with steeper control are required to prevent excessive undershooting of the engine speed or stalling of the engine upon load application. Application examples: • Concrete pump • Concrete pump mixers **FUP 81.25890-2453 is only used for the D08 engine and FUP 81.25890-1309 only for the D20, D26 and D28 engines.** FUP 81.25890-1309 is automatically included in the intermediate speed software package for the segments concrete pump (software package 81.25890-7343 "Intermediate speed control for concrete pump vehicle with manually operated gearbox") and concrete pump mixer (software package 81.25890-7345 "Intermediate speed control for pump mixer vehicle with manually operated gearbox"). For the TGL and TGM series, FUP 81.25890-2453 can be applied to any segment set for intermediate speeds. The corresponding software package 81.25890-7220 "Control parameters for intermediate speed operation" must be requested via an application for vehicle parameterisation. FUP 81.25890-2442 can only be used for vehicles with a vehicle management computer (FFR).

The function parameter sets 81.25890-1300, 81.25890-2442 and 81.25890-3057 are also available as software packages and can be ordered using MAN-cats:

Function parameter set	Software package
81.25890-1300	81.25890-7141 "External vehicle control via body interface"
81.25890-3057	81.25890-7458 "Body builder's CAN bus without monitoring by vehicle"
81.25890-1300 81.25890-2442	81.25890-7736 "External regulator control via body interface"

Example:
A speed of 1200 rpm is to be set on the vehicle engine, whereby the engine torque is to be limited to 40% of the nominal torque. The following signals must be sent via the KSM1_A message:

Requirement	KSM1_A messages	Effects
Engine speed: 1200 rpm Torque: 40% of nominal torque	requestedSpeedSpeedLimit: 1200 rpm requestedTorqueTorqueLimit: 40% overrideControlMode: 1	Set engine speed: 1200 rpm Torque limiting to 40% of nominal torque
	requestedSpeedSpeedLimit: 1200 rpm requestedTorqueTorqueLimit: 40% overrideControlMode: 2	Engine speed limit to 1200 rpm Torque: 40% of nominal torque
	requestedSpeedSpeedLimit: 1200 rpm requestedTorqueTorqueLimit: 40% overrideControlMode: 3	Engine speed limit to 1200 rpm Torque limiting to 40% of nominal torque
Deactivation of specification or limitation for speed or torque	requestedSpeedSpeedLimit: 8031.875 rpm requestedTorqueTorqueLimit: 125% overrideControlMode: 0	No engine speed specification or limit No torque specification or limiting

Note that limitations take precedence over specifications. If the vehicle engine cannot adopt the desired speed with the torque limiting in place (for example, if a high load is present), a lower speed is set.

- Required parts:

Parts that are always required when retrofitting the KSM Step 2:		
Quantity	Designation	Item number
2	Fuse, 10 A	07.93810-0003
1	KSM cable harness, jumper	81.25429-6452
1	KSM Step 2	81.25816-7007
Additional parts required for adaptation to I-CAN cable harness:		
Quantity	Designation	Item number
As required	Line, FLRY-2x1-B-28-BLGE-GEBL	07.08132-0537
4	Spring contact, 2.8-1	07.91201-0222
2	Spring contact, 2.8-2.5	07.91201-0224
4	Blade terminal, 2.8-1	07.91202-0848
2	Socket housing, 2-pin	81.25432-0395
2	Plug housing, 2-pin	81.25475-0091

Depending on the vehicle equipment, additional parts must also be installed.

Additional parts required for retrofitting KSM Step 2 to TGS or TGX:		
Quantity	Designation	Item number
1	Cable harness for KSM Step 2 (left-hand drive vehicle)	81.25458-5326
1	Cable harness for KSM Step 2 (right-hand drive vehicle)	81.25458-5327
Additional parts required for retrofitting KSM Step 2 to TGL or TGM:		
Quantity	Designation	Item number
1	Cable harness for KSM Step 2 (left-hand drive vehicle)	85.25412-6405
1	Cable harness for KSM Step 2 (right-hand drive vehicle)	85.25412-6406
Additional parts required for retrofitting KSM Step 2 and FMS 2.0 to TGS or TGX:		
Quantity	Designation	Item number
1	Fuse, 5 A	07.93810-0003
1	Cable harness for KSM Step 2 and FMS 2.0 (left-hand drive vehicle)	81.25458-5323
1	Cable harness for KSM Step 2 and FMS 2.0 (roof)	81.25458-5324
1	Cable harness for KSM Step 2 and FMS 2.0 (right-hand drive vehicle)	81.25458-5325
Additional parts required for retrofitting KSM Step 2 and FMS 2.0 to TGL or TGM:		
Quantity	Designation	Item number
1	Fuse, 5 A	07.93810-0003
1	Cable harness for KSM Step 2 and FMS 2.0 (left-hand drive vehicle)	85.25412-6415
1	Cable harness for KSM Step 2 and FMS 2.0 (right-hand drive vehicle)	85.25412-6416

I-CAN extension

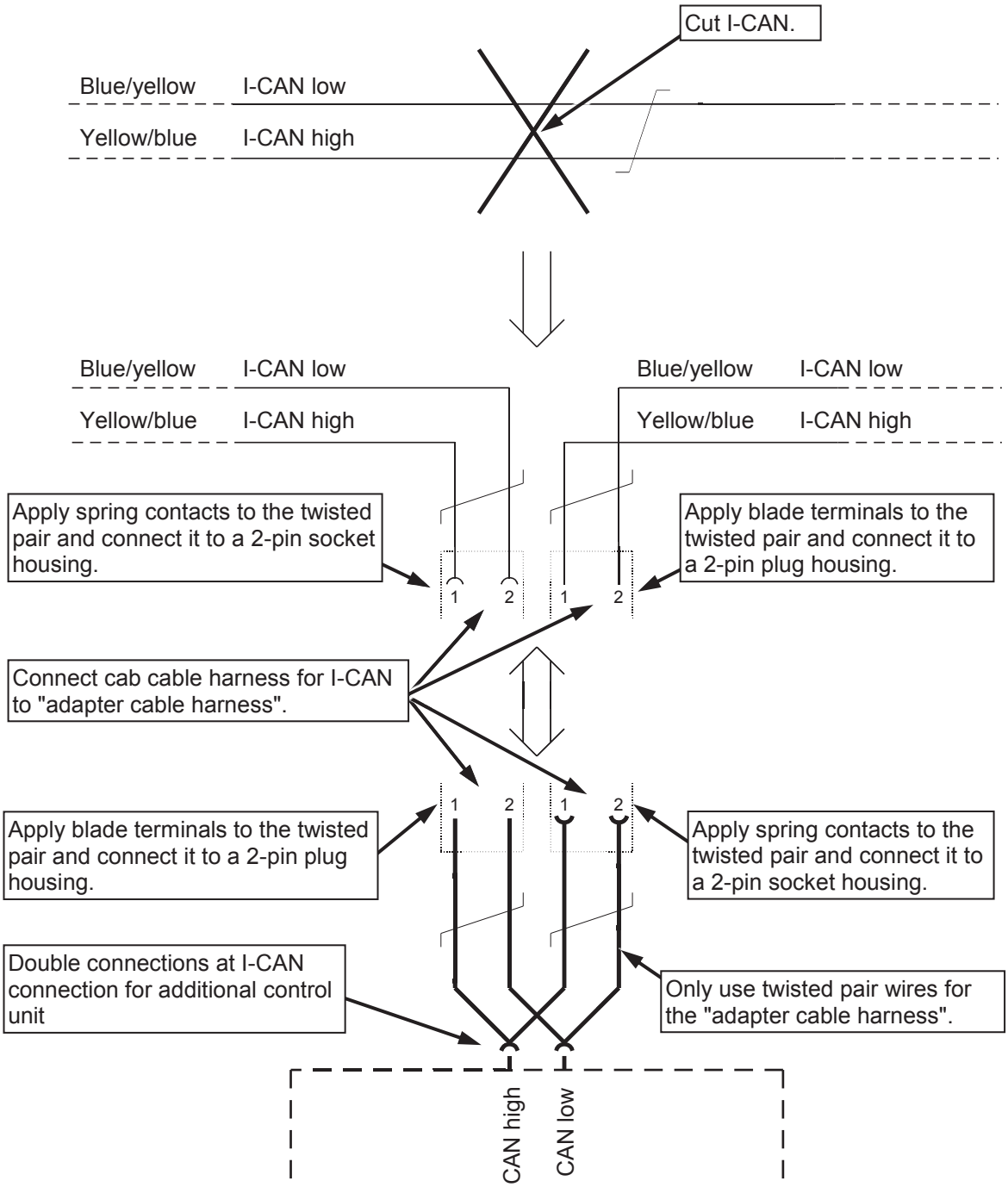
The terminating resistors of the I-CAN are located in the central on-board computer (ZBR) and the combined instrument. All other control units are linked to the I-CAN via double connections.

When extending the I-CAN, the following must be observed:

- The additional control unit must be connected via a 2-pin plug connector (no stub line permitted).
- The connection must only be established using a twisted pair wire consisting of two separate lines (line colours: blue/yellow and yellow blue).
- The I-CAN connection to the additional control unit must take the form of a double connection.
- Note the information in repair manual T51-A1.

Procedure:

1. Cut the twisted pair in the area of the combined instrument.
2. Apply a blade terminal 07.91202-0848 to one end of the CAN high line (blue/yellow) and connect it to slot 1 of a 2-pin plug housing 81.25475-0091.
3. Apply a spring contact 07.91201-0222 to the other end of the line and connect it to slot 1 of a 2-pin socket housing 81.25432-0395.
4. Apply a blade terminal 07.91202-0848 to one end of the CAN low line (yellow/blue) and connect it to slot 2 of the plug housing.
5. Apply a spring contact 07.91201-0222 to the other end of the line and connect it to slot 2 of the socket housing.
6. To create the "adapter cable harness", cut two twisted pairs such that they can be installed between the connector of the additional control unit and the "CAN interface".
7. Apply a blade terminal 07.91202-0848 to the CAN high line (blue/yellow) of one twisted pair and connect it to slot 1 of a 2-pin plug housing 81.25475-0091.
8. Apply a blade terminal 07.91202-0848 to the CAN low line (yellow/blue) of this twisted pair and connect it to slot 2 of the plug housing.
9. Apply a spring contact 07.91201-0222 to the CAN high line (blue/yellow or 173) of the other twisted pair and connect it to slot 1 of a 2-pin socket housing 81.25432-0395.
10. Apply a spring contact 07.91201-0222 to the CAN low line (yellow/blue) of this other twisted pair and connect it to slot 2 of the socket housing.
11. Using a double connection, link the two CAN high lines (blue/yellow) to the CAN high connection of the additional control unit (for KSM Step 2: combine the lines with spring contact 07.91201-0224 and connect them to slot 5 of the connector X3).
12. Using a double connection, link the two CAN low lines (blue/white) to the CAN low connection of the additional control unit (for KSM Step 2: combine the lines with spring contact 07.91201-0224 and connect them to slot 9 of the connector X3).
13. Connect the "adapter cable harness" to the I-CAN cable harness.



Additional control unit
(e.g. KSM Step 2)

MAN Truck & Bus AG

Service Information

Date	Issued by	Number: **Supplement 4, 71302**
2/11/11	SASPC	**Customer-specific control module interface**

Supplement/ Correction

Instead of the wiring diagram on page 61 of the annex to supplement 2 of SI 71302, use the wiring diagram from page 2 of this supplement.

For refuse collectors of the TGM series with TipMatic gearbox, the interface wiring has been modified.

For refuse collectors of the TGS series with TipMatic or Ecomat gearbox, the interface wiring has already been modified for the following model code numbers:

06S, 10S, 18S, 21S, 24S and 74S (for the stated model code numbers, modified interface wiring will also be available soon for the manually operated gearbox).

For this purpose, please observe the wiring diagram on page 1 of this supplement.

For vehicles with modified interface wiring, the button "Lift reverse restriction" is installed.

Yours faithfully,
MAN Truck & Bus AG

ppa G. Ziegler

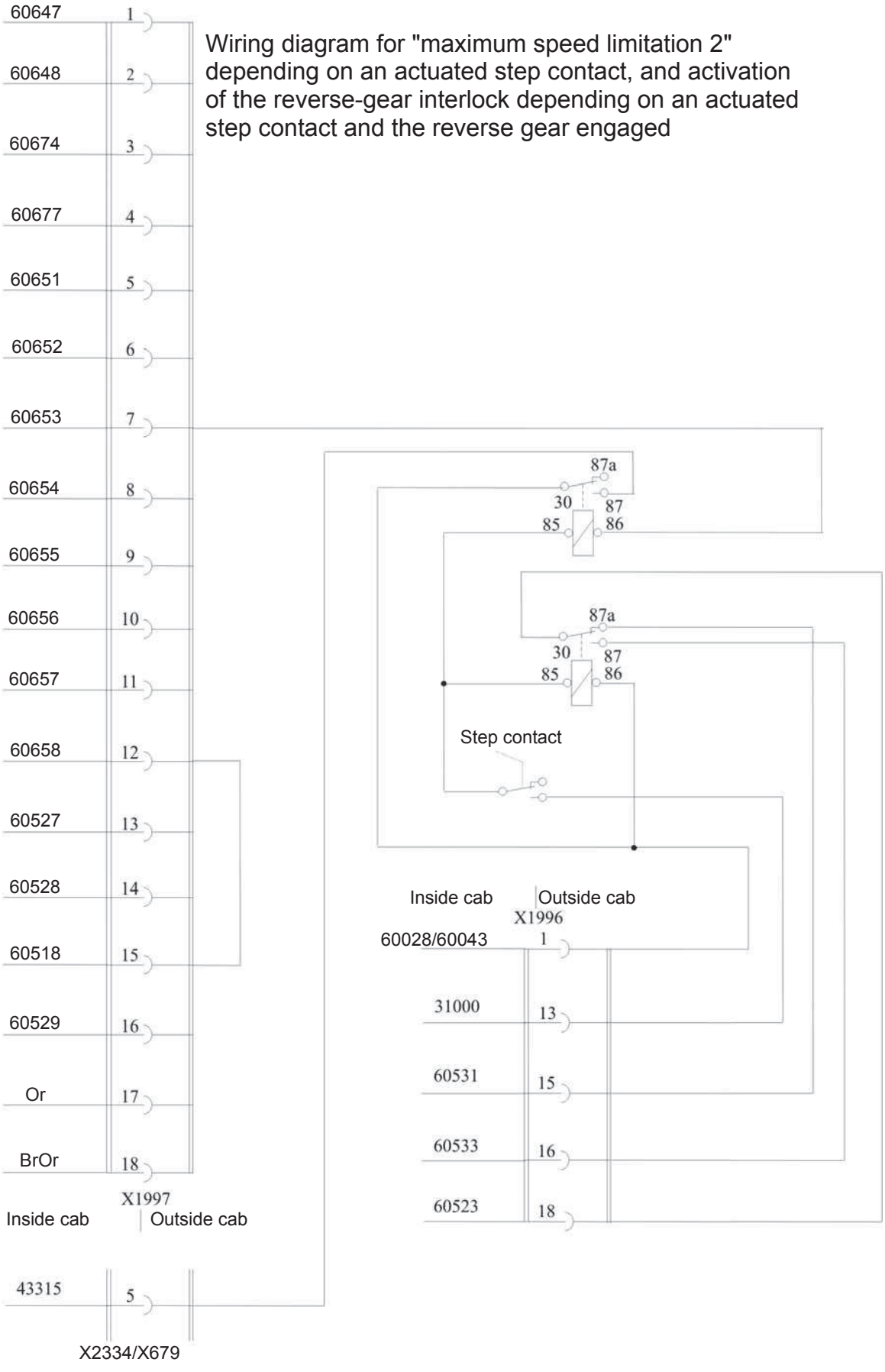
i.V. C. Körner

Cross out the wiring diagram on page 61 of the annex to Supplement 2 and use the wiring diagram from this supplement instead.

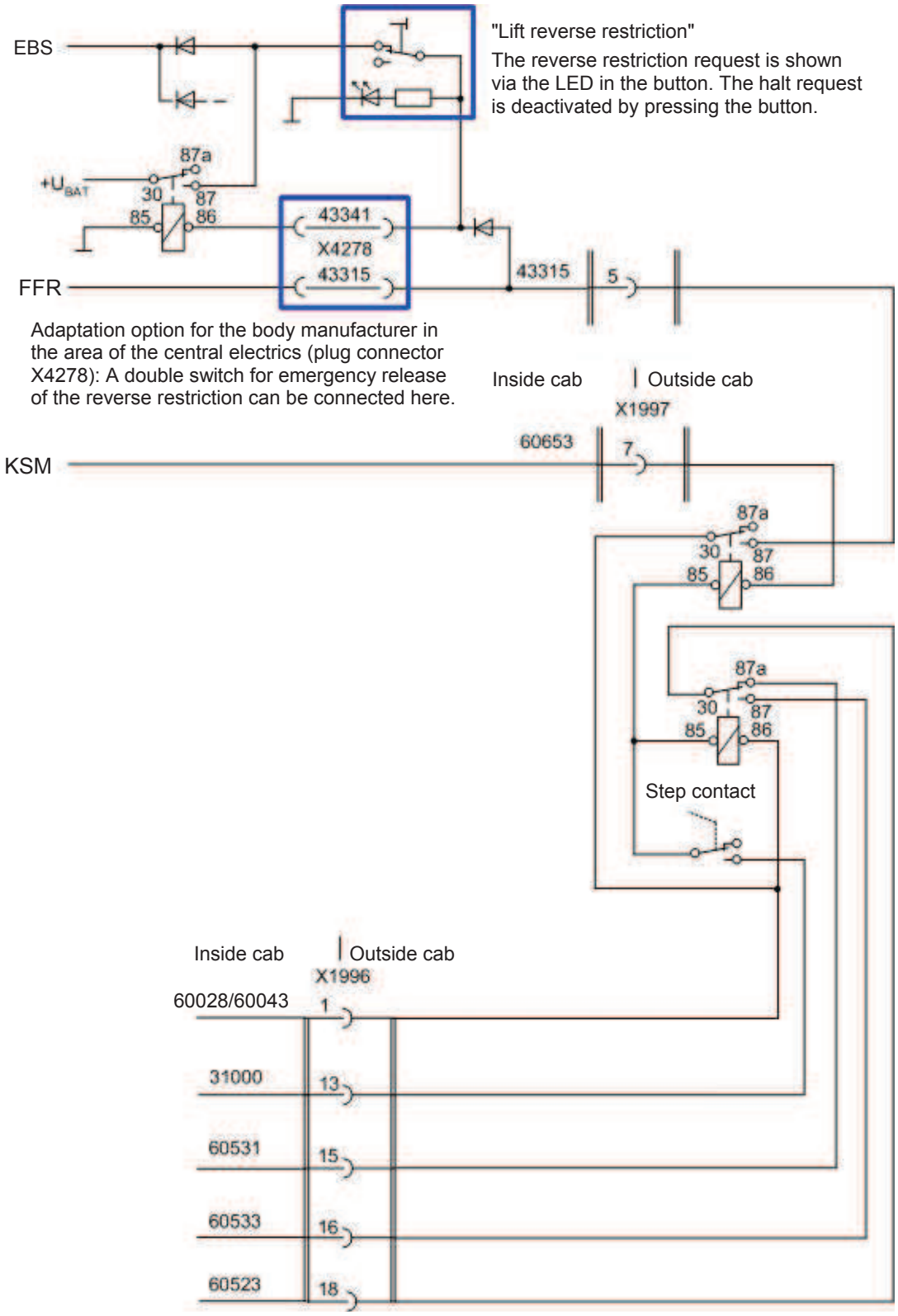
Distribution to the worldwide service organisation

Forwarding within the organisation of the MAN service workshop:			
Workshop management	Yes	Personnel in spare parts store	Yes
Workshop personnel for performance of the work	Yes	Emergency service mechanics	No
Workshop personnel in general	Yes	Customers' workshops authorised for servicing	No

Wiring diagram for "maximum speed limitation 2" depending on an actuated step contact, and activation of the reverse-gear interlock depending on an actuated step contact and the reverse gear engaged



Wiring example for "maximum speed limitation 2" depending on an actuated step contact, and activation of the "modified reverse-gear interlock" depending on an actuated step contact and the reverse gear engaged



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Service Information

Instruction Product Technology	Date 11.04.2008	Issued by VASTI	SI number **Supplement 3 of 71302** **Interface customer-specific control module**

Vehicle(s) affected	TGL, TGM, TGA, TGS, TGX, FOC
Component(s) affected	Interface of the customer-specific control module (KSM) Step 1 (81.25816-7005)

Addition	KSM Step 1 is now also available for the bus chassis. Any description in supplement 2 of 71302 and its appendix that is based on a TGL/TGM can be transferred to FOC. These descriptions also apply for FOCs that are based on a TGA, except for the following: • Circuit diagram (see page 3 to 5) • Installation location and retrofitting the interface (beginning on page 6) **Caution**: The interface in a bus chassis is installed as in TGA (passenger side of front panel) or in the area of the main control panel behind the driver's seat. The "Information concerning the operating condition of the vehicles on the A-CAN" for FOC correspond with that of the TGA series, which were configured with a retrofitting data file, which was produced **from** 12.12.07 (see page 8).

Yours faithfully,
MAN Nutzfahrzeuge Aktiengesellschaft

ppa. i.V.

Please correct supplement 2, 71302 and its appendix according to this supplement.	

Distribution of this SI to the worldwide service organisation

Forwarding within the MAN service workshop organisation:

Workshop management	yes	Personnel in spare parts store	yes
Workshop personnel for performance of the tasks	yes	Emergency service mechanics	no
Workshop personnel in general	yes	Customers' workshops authorised for servicing	no

Correction

1. Delete the following text on page 2 of Supplement 2 of 71302:

   ~~**Caution:**~~
   ~~This plug cannot be retrofitted.~~

2. Modification in programming the KSM

   The number and type of information of the operating condition of the vehicle, which are available on the CAN data bus structure (A-CAN), depends on the KSM model (programmable).

   The KSM is programmed in the delivery condition with the version to support the body function (FUP 81.25890-2202) in vehicles that were configured with a retrofitting data file that was created **before** 12.12.07.
   Two additional versions can be programmed:

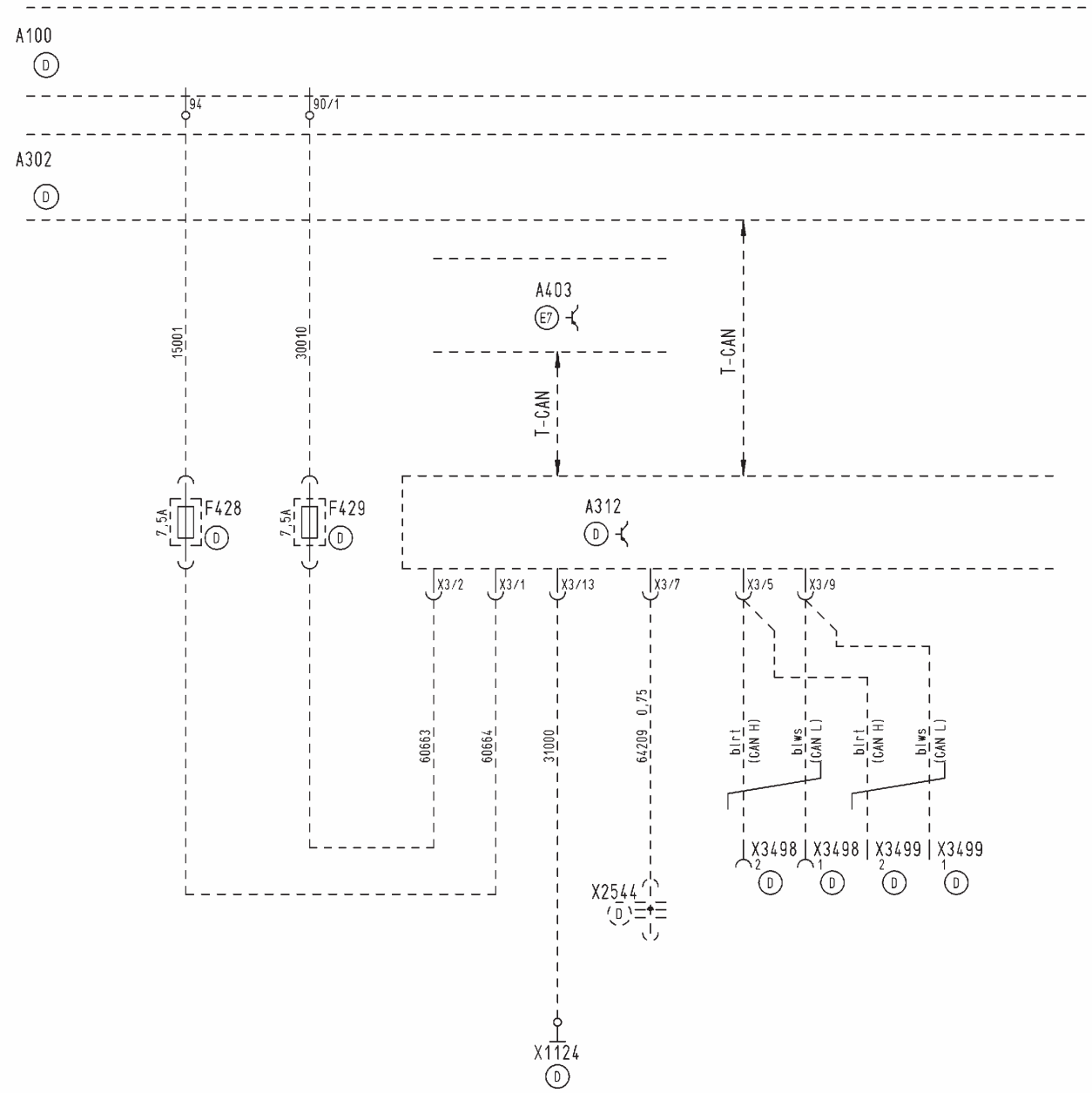
Version	FUP
FMS with body function	81.25890-0444
FMS (without body function)	81.25890-1111

   The KSM is programmed without a version in its delivery condition in vehicles, which are configured with a retrofitting data file that has been created **since** 12.12.07.
   Two following versions can be programmed:

Version	FUP
Body function	81.25890-2202
FMS and body function	81.25890-2202 + 81.25890-1111
FMS (without body function)	81.25890-1111

Please use the information of the operating condition of the vehicle on A-CAN on page 17 of the appendix for supplement 2 of SI 71302 for vehicles, which were parameterised with a retrofitting data file that was created **prior to** 12.12.07.

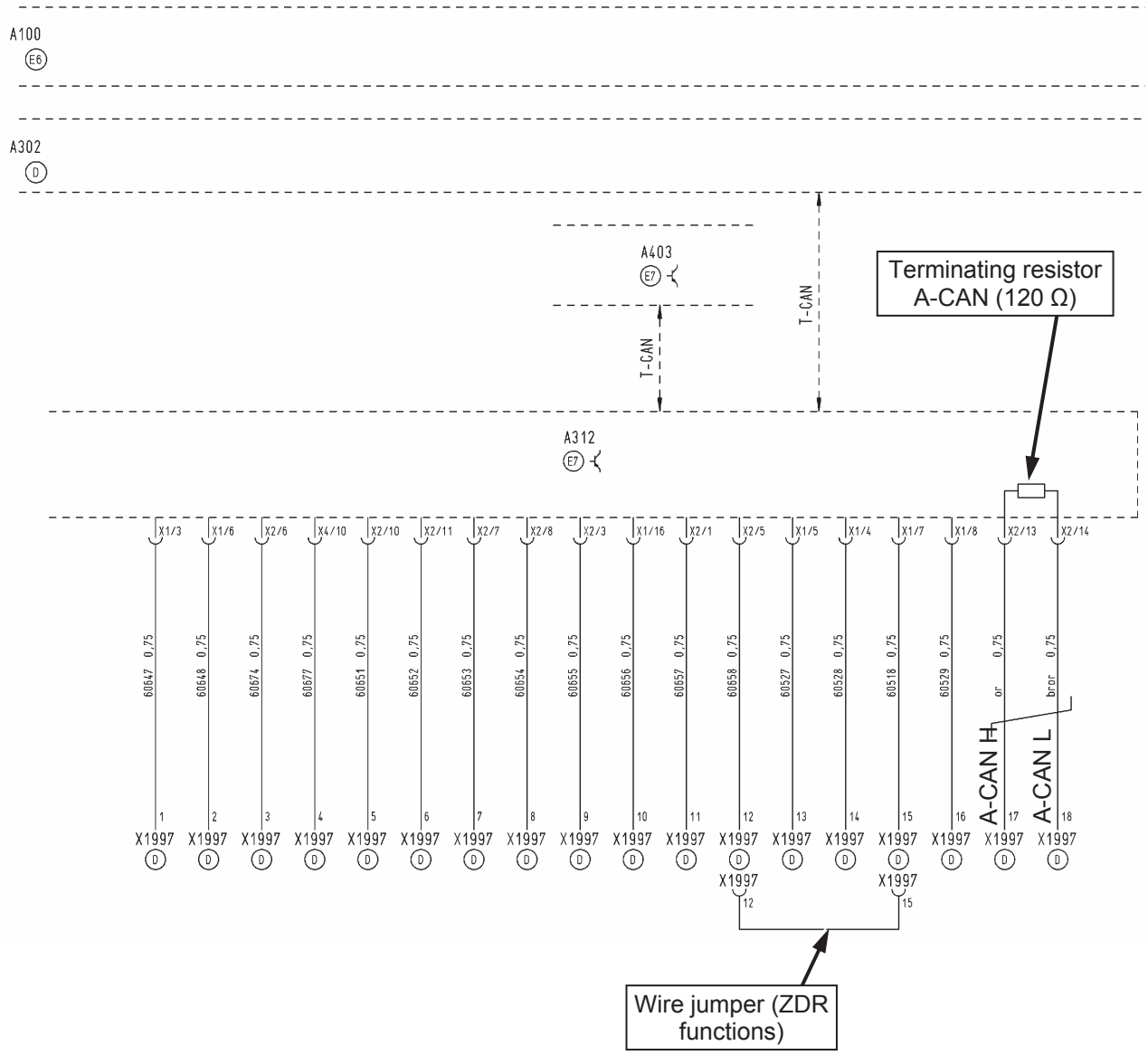
Please use the information of the operating condition of the vehicle on A-CAN on page8 of this supplement for vehicles that were parameterised with a retrofitting data file, which was created **since** 12.12.07.



A100 Central electrical system
A302 ZBR
A312 KSM
A403 FFR

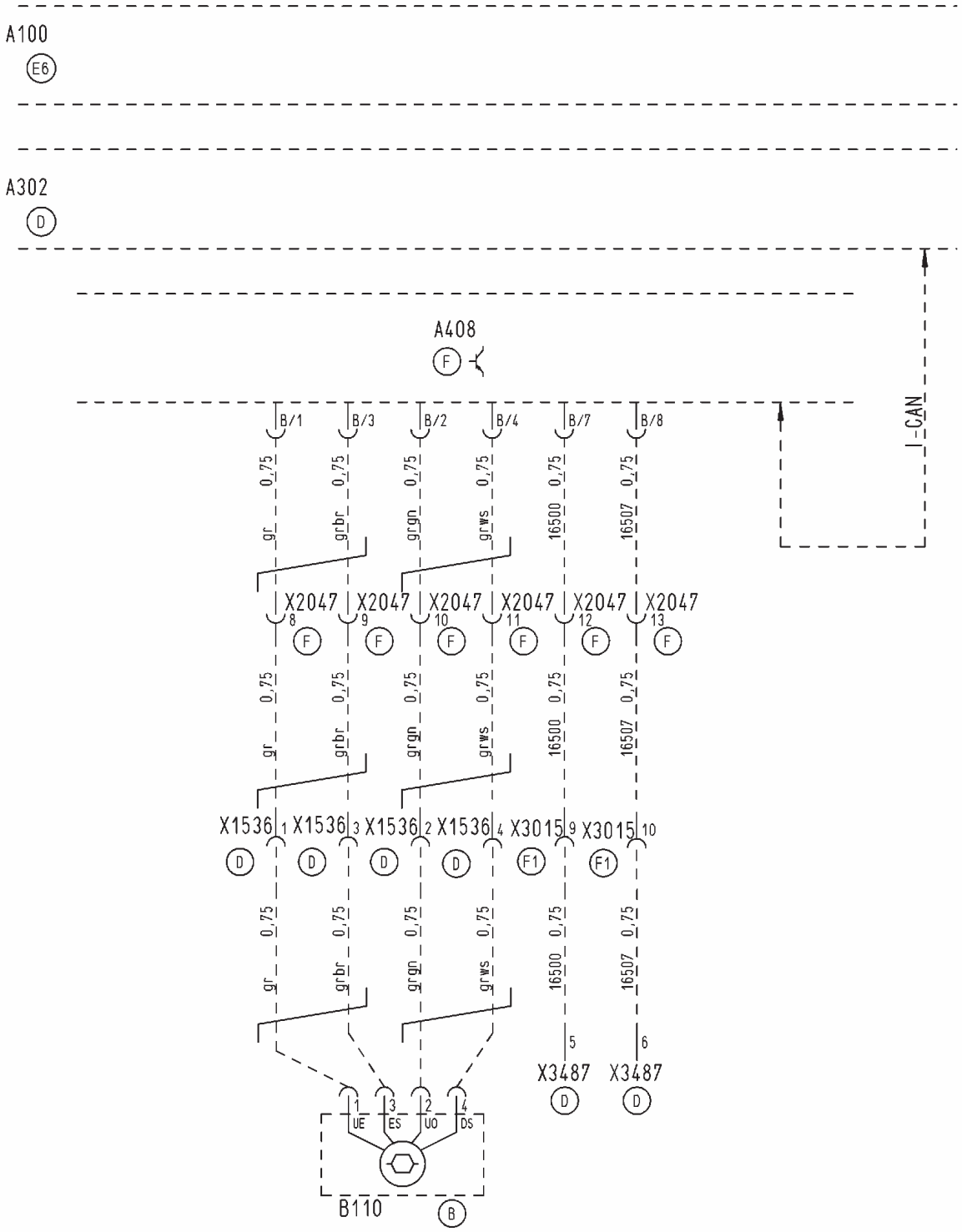
F428 Fuse KSM (terminal 15)
F429 Fuse KSM (terminal 30)

X1124 Earth point on central control panel
X2544 Distributor cable (diagnostics)
X3498 Plug connection for T-CAN
X3499 Plug connection for T-CAN



A100 Central electrical system
A302 ZBR
A312 KSM
A403 FFR

X1997 ZDR interface, KSM



A100 Central electrical system
A302 ZBR
A408 Tachograph

B100 Tachograph pulse generator

X1536 Plug connection of tachograph
X2047 Plug connection of tachograph
X3015 Plug connection 3, instrument panel
X3487 Plug connection 2, interface of main control panel/expansion

Interface on the front panel on the passenger side (those based on TGL/TGM for FOC)

- Place of installation

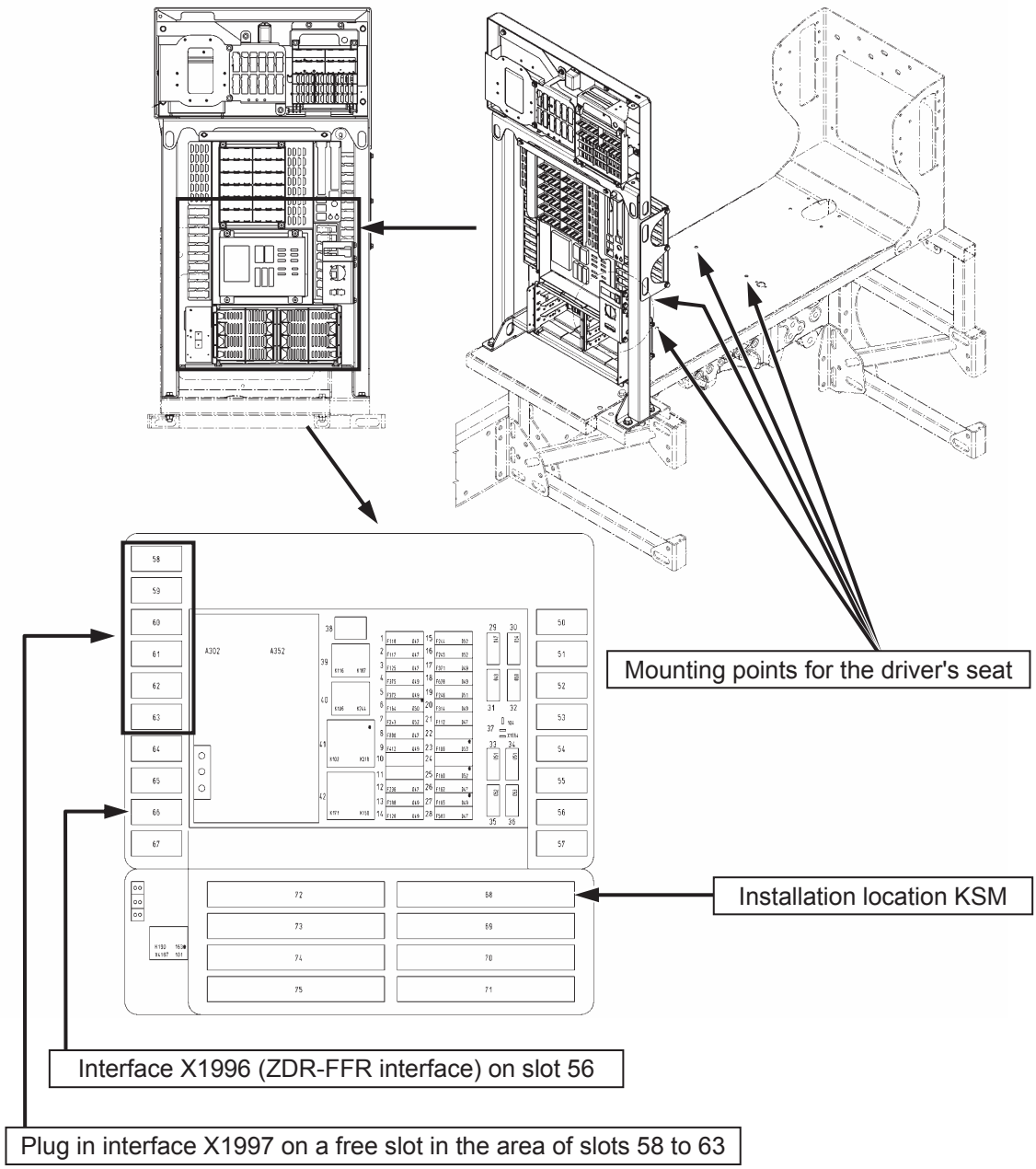
  All descriptions that apply for the installation location of the interface in the appendix for supplement 2 of 71302 also apply for the bus chassis, the interface of which is also installed at this location.

- Retrofit

  The cable harnesses described in supplement 1 of 71302, as well as the descriptions to connect the CAN data bus drive train (T-CAN) in SI 71302 can be used to retrofit the interface installed on the front panel on the passenger side.

Interface behind the driver's seat (based on TGA for FOC)

- Place of installation:



- Retrofit

  Only the KSM with the wiring for its voltage supply will be installed in this model in the factory.
  The connection between the KSM and the interface (X1997) must be produced in-house. The connection on plugs X1 and X2 of the KSM as well as on interface X1997 may be derived from the circuit diagram on page 4.

  Wiring:

Wire	Conductor cross-section	MAN Item number
FLRY0,75-A-RS	$0,75^2$	07.08131-0302
FLRY2x0,75-B-28-OR/BROR		07.08132-4384

  Parts for X1997:

18 pin plug connection:	Colour and coding:	MAN Item number
X1997	natural/6	81.25435-0927
Secondary lock for housing		81.25435-0913

Contacts (individual goods / volume goods)	MAN Item number
Spring contact with stop 2.8×1/0.5-1	07.91201-0222 / 07.91201-0221

  Parts for A312 X1:

18 pin socket housing:	Colour and coding:	MAN Item number
A312 X1	brown/A-C	81.25432-0405
Secondary lock for housing		81.25435-0973

Contacts (individual goods / volume goods)	MAN Item number
Spring contact with stop 2.8×1/0.5-1	07.91201-0222 / 07.91201-0221

  Parts for A312 X2:

18 pin socket housing:	Colour and coding:	MAN Item number
A312 X2	brown/B-C	81.25432-0385
Secondary lock for housing		81.25435-0973

Contacts (individual goods / volume goods)	MAN Item number
Spring contact with stop 2.8×1/0.5-1	07.91201-0222 / 07.91201-0221

  The following parts are required for the body connection of the interface:

18 pin plug connection:	Colour and coding:	MAN Item number
X1997	natural/6	Plug housing
		81.25475-0046
Secondary lock for housing		81.25475-0065

Contacts (individual goods / volume goods)	MAN Item number
Flat-cable plug with stop 2.8×1/0.5-1	07.91202-0848 / 07.91202-0858
Flat-cable plug with stop 2.8×2.5/1.5-2.5	07.91202-0849 / 07.91202-0859

  The interface "ZDR interface with vehicle guidance computer for external speed control for TG" consists of the 18-pin plug connection **X1996** and is included in the standard scope of the vehicle.

Information for the operating condition of the vehicle on A-CAN

The following body electronics information can be provided via the A-CAN - relative to the options degree of the vehicle and the configuration in the KSM:

A-CAN transmitted messages	KSM with body function (FUP 81.25890-2202)	KSM with FMS and body function (FUP 81.25890-2202 + FUP 81.25890-1111)	KSM with FMS without body function (FUP 81.25890-1111)
ETC1	x	x	
ETC2	x	x	
ETC3	x	x	
EBC1	x	x	
Amb_Cond	x	x	
Aux_Stat_ZBR1	x	x	
ECAM1	x	x	
Time_date	x	x	
EngFlui_LevPressure	x	x	
ERC1_Rx	x	x	
ERC1_RD/ERC1_RE			
Fuel_ECO	**X**	x	
Aux_Stat_KSM1	x	x	
Veh_distance	x	x	x
Veh_weight EBS/ECAS	x	x	x
Eng_hours, Revolutions	x	x	x
TCO1	x	x	x
CCVS	x	x	x
Eng_Temp	x	x	x
EEC1	x	x	x
EEC2	x	x	x
Fuel_consumption		x	x
FMS_SW_Identification		x	x
Dash_display		x	x
Service		x	x
BAM_MTCO_VIN		x	x
P_MTCO_VIN		x	x

Note:
x = message is transmitted on A-CAN
X = Modification of the description in the appendix of supplement 2 of 71302
Fett = Messages that contain the specification "FMS-standard interface“
ERC1_RE will only be transmitted, if a primary retarder is installed; ERC1_RD will only be transmitted, if a secondary retarder is installed
Signals available for the CAN-messages may be derived from chapter 7.5 of the appendix of supplement 1 of 71302.

Caution: In the configuration of the KSM with function parameter 81.25816-1111 (FMS without KSM-function), only the FMS-interface will be provided, the usual KSM-function (generating switch-point signals, engine control intervention (speed/torque limitations/requirements, etc.) will not be available!

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Service Information

Instruction - Product Technology	Date 20.11.2003	Issued by: VNSTT	SI number	**Supplement 2 to 71302en Interface for customer-specific**

Vehicles affected	TGA
Parts affected	Interface on customer-specific control module, Step 1 (81.25816-7005)

Supplement

Control module 81.25816-7005 is currently being installed as standard equipment. For this control module, the interface descriptions supplied to you with SI 71302 and supplement 1 for 71302 cannot be used.

Customer-specific control module	Interface description
81.25816-7000	Appendix to SI 71302
81.25816-7004	Appendix to supplement 1 of SI 71302
81.25816-7005	Appendix to supplement 2 of SI 71302

The interface description for the KSM 81.25816-7005 forms the appendix to this supplement.

Note:
The details on the transmitted and received messages of the CAN assembly (pages 19-37 of interface description) are not relevant to MAN workshops. They are solely for the assembly manufacturer's information.

If not provided on the MAN-cats service computer, parameter modifications should be ordered by applying to Dept. TDB for vehicle parameterisation.

Important:
The CAN messages described in this interface description can only be retrieved and evaluated via A-CAN. Access via another CAN bus is an infringement of the MAN assembly instructions and will lead to annulment of all warranty claims and of the vehicle's general operating permit (German ABE). An exception to this will only be made following inspection and written approval by Dept. TDB. Circuit fitting on the body side may only be undertaken at the interface. Tampering with cables on the vehicle side is not permitted, as specified by MAN assembly regulations.

Distribution of this SI to the Germany/export service organisation			
Forwarding within organisation of MAN service workshop			
Workshop management	yes	Personnel in spare parts store	yes
Workshop personnel for performance of work	yes	24-hour service (fitters)	no
Workshop personnel in general (notice boards)	yes	Authorised customers' workshops	no

Technical preconditions for retrofitting	1. ZBR 81.25806-7033 or higher 2. FFR 81.25805-7015 or higher
Retrofitting	➢ Through the TGA, the interface for KSM Step 1 can either be ordered at the same time or retrofitted. ➢ The cable harness already used for KSM Step 0.5 can also be used for KSM Step 1. **Important:** The bridge between "ready for operation" (X1997 Pin 12) and "off" (X1997 Pin 15) must be present in order to use the ZDR functions (ZDR S and ZDR 1 to ZDR 7). Opening this bridge will switch off the ZDR and the cruise control function. ➢ In addition, the connection to the powertrain CAN must be set up in the usual way (see page 6 of SI 71302). If this interface is installed ex works, plug X1428 is also provided. The following signals are available at this plug: • Direction indicator signal (4 pulses per metre) • Speed signal (from B8 EC control device) • Reversing signal • "Engine running" signal **Important:** This plug cannot be retrofitted. **Upgrading the control system** An online upgrade of the 81.25816-7000 (18-pole interface) or 81.25816-7004 (18-pole + 6-pole interface) to 81.25816-7005 (18-pole + 6-pole interface) as specified in SI 101102 is not possible. This is to avoid a situation in which the interface wiring no longer matches the changed pin assignments. With **upgrades applied for by fax form (via Dept. TDB),** from 81.25816-7000 or 81.25816-7004 to 81.25816-7005, the wiring should also be changed because of the changed functions. **Important:** Because the pin assignment has changed, body functions should be rechecked.

KSM control system		Changes necessary to wiring
Part number before upgrade	Part number after upgrade	
81.25816-7000	81.25816-7005	Change wiring harness for KSM (see SI 71302) for cable harness for KSM Step 0.5 (see 1st supplement to 71302)
81.25816-7004	81.25816-7005	Cable harness for KSM Step 0.5 can remain in use. **Check body functions (changed pin assignment)**

Circuit diagrams	With the customer-specific control module Step 1, the circuit diagram has changed. The circuit diagram for KSM Step 1 is shown from page 7 onwards.

Parts for retrofitting			
Quantity	Description	Part number	Available from
1	Cable harness KSM Step 0.5 and Step 1, left-hand drive	81.25452-6767	immediately
1	Cable harness KSM Step 0.5 and Step 1 right-hand drive	81.25452-6768	immediately
1	Cable harness, KSM bridge	81.25429-6452	immediately
1	Control unit KSM Step 1	81.25816-7005	immediately
2	Automatic cut-out, 8 A	81.25437-0118	immediately

For parts needed for connection with the CAN drive harness, please see the listing on page 3 of SI 71302en.

Yours faithfully,
MAN Nutzfahrzeuge Aktiengesellschaft

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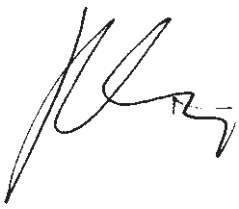
ppa. 

Extra functions of interface

Compared with the preceding version, the following functions are among those added to the KSM Step 1 interface:

⇒ Freely programmable switching signal outputs

The following signals can be freely programmed at three low-side and five high-side switching signal outputs:

- Gearbox in neutral
- Reverse
- Clutch
- ABS active
- Parking brake
- Brake
- Kick-down
- Fuel tank empty
- Oil pressure warning
- Fuel level warning
- Splitter group
- Axle load warning 1
- Axle load warning 2
- Acknowledgement NA 1
- Acknowledgement NA 2
- Acknowledgement NMV
- Engine-speed threshold 1 on
- Engine-speed threshold 1 on/off
- Engine-speed threshold 2 on
- Engine-speed threshold 2 on/off
- Speed threshold 1 on
- Speed threshold 1 on/off
- Speed threshold 2 on
- Speed threshold 2 on/off
- Coolant temperature warning
- Accelerator pedal threshold on/off
- Foot brake threshold on/off
- Driver's cab lock warning

⇒ Automatic selection of ZDR control when power take-off is in operation

⇒ External requirement "gearbox in neutral" possible as a press-button or switch function

⇒ Additional information supplied to body electronics via the CAN interface (A-CAN)[1]:

- Primary- and secondary retarder (if installed)
- Oil pressure warning
- Coolant overheating warning

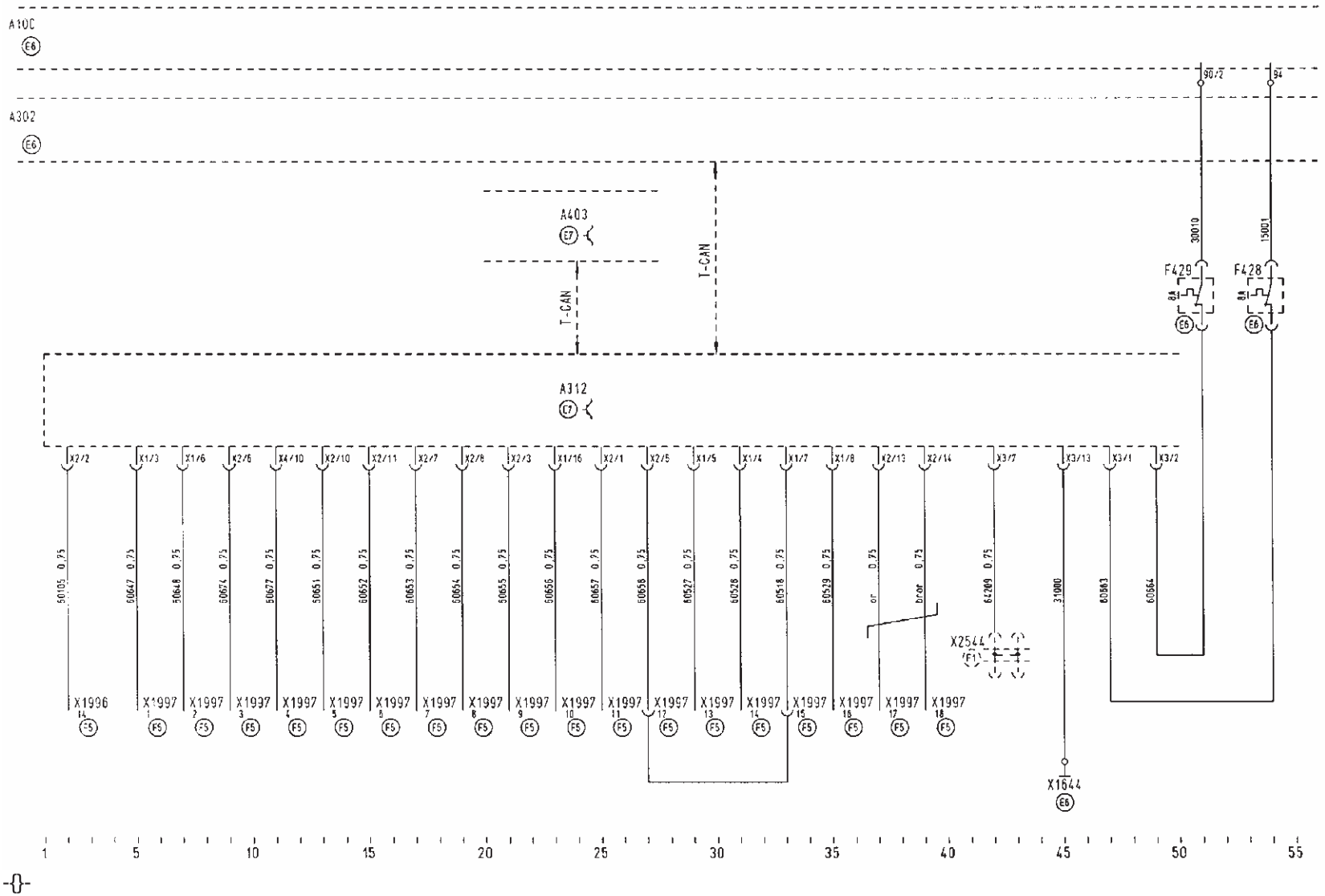
This information does not form a standard part of the instrument display functions

[1] There is a complete list of all available information on the CAN interface in the appendix to this supplement.

Error codes (not displayed on the A-CAN)	Error location	SPN
	Vehicle speed	00084
	Accelerator pedal position	00091
	Fuel level	00096
	Terminal 15 (ignition on)	00158
	Terminal 30 (battery voltage)	00168
	Engine speed	00190
	Retarder torque	00520
	Foot brake position	00521
	Gear currently selected	00523
	Idle switch for accelerator pedal	00558
	Kick-down switch	00559
	Axle load	00582
	Brake switch signal	00597
	Clutch switch signal	00598
	Parking brake output	00617
	T-CAN bus off	00639
	Output parameters can be set	
	Earthing switch 1 (LS1_Konfig)	00702
	Switch 1 Terminal 30 (HS1_Konfig)	00703
	Switch 2 Terminal 30 (HS2_Konfig)	00704
	Switch 3 Terminal 30 (HS3_Konfig)	00705
	Switch 4 Terminal 30 (HS4_Konfig)	00706
	Switch 5 Terminal 30 (HS5_Konfig)	00707
	Earthing switch 2 (LS2_Konfig)	00708
	Earthing switch 3 (LS3_Konfig)	00709
	Reverse gear engaged	00767
	Split H	00770
	Split L	00771
	Gearbox in neutral	00780
	Pedal value indicator	00974
	KSM ready for operation	00975
	Pedal value indicator	00974
	Output ready for operation	00976
	Reservoir pressures	
	Circuit 3	01086
	Circuit 1	01087
	Circuit 2	01088
	Circuit 4	01089
	Circuit 5	01090
	Output for warning light	01213
	A-CAN bus off	01669

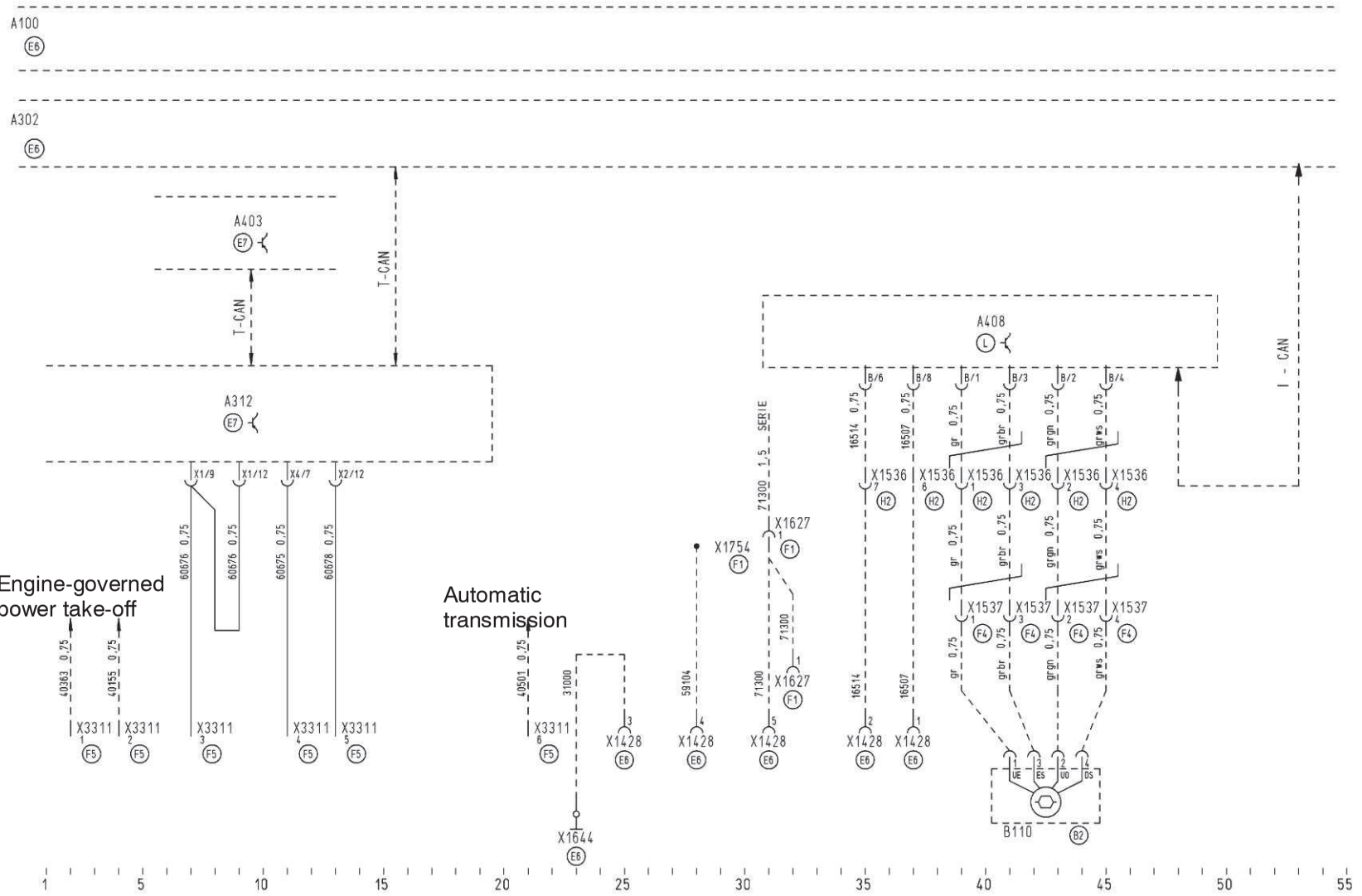
Error codes (not displayed on the A-CAN)	Error location ..... SPN
	CAN data bus: Timeout on reception
	of FFR message ETC1 03000
	of FFR message ETC2 03001
	of FFR message ETC3 03002
	of EBS message EBC1 03003
	of EDC message CcVeh_speed 03004
	of EDC message EEC1 03005
	of EDC message EEC2 03006
	of EDC message Eng_Temp 03007
	of EDC message EngFlui_LevPre 03008
	of EDC message Amb_Cond 03009
	of ECAM message ECAM1 03010
	of ZBR message Aux_Stat_Zbr1 03011
	of ZBR message Time_Date 03012
	of ZBR message Veh_Dist 03013
	of CAN assembly message KSM1_A 03014
	Control unit
	RAM 03015
	ROM 03016
	Watchdog 03017
	EEPROM parameter(s) 03018
	internal relay power supply or short circuit Terminal 30 switched output to UBatt 03019
	EEPROM error memory 03020
	CAN data bus: Timeout on reception
	of FFR message Fuel_Cons. 03021
	of ZBR message Dash_Disp. 03022
	of EBS/ECAS message Veh_Weight 03023
	of FFR message Eng_Hour/Rev 03024
	of tachograph message Veh_Ident. 03025
	of FFR message service 03026
	of tachograph message TCO1 03027
	of FFR message ERC1_RX 03028
	of tachograph message BAM_TCO_VIN. 03029
	of tachograph message P_TCO_VIN. 03030
	Input DKR (throttles - reduction option) 03031
	Signal frequency at DKR input (throttles - reduction option) 03032
	CAN data bus: timeout on reception
	Assembly CAN message KSM2_A. 03033
	Output: auxiliary drive 03034
	CAN data bus: Time overrun upon reception
	of primary retarder message ERC1_RE 03035
	of secondary retarder message ERC1_RD 03036
	of FFR message Fuel_Cons. 03042
	Oil pressure 03211
	Coolant temperature 03311
	First defective EOL-LID 03500
	Driver's cab lock 05600

Circuit diagram for KSM Step 1 Part 1



A100	Central electrical system
A302	ZBR
A312	KSM
A403	FFR
F428	Fuse KSM Terminal 15
F429	Fuse KSM Terminal 30
X1644	Earthing point next to main electrical system
X1996	Plug connection for ZDR interface (FFR)
X1997	Plug panel for K line (diagnostics)
X2544	

Circuit diagram for KSM Step 1 Part 2



A100	Central electrical system
A302	ZBR
A312	KSM
A403	FFR
A408	EG monitor unit
B110	Pulse emitter EG monitor unit
X1428	Plug connection direction indicator pulse (only present if interface is installed ex works)
X1536	Plug connection EG control unit
X1537	Plug connection Pulse emitter EG control system
X1627	Plug connection Reversing light
X1644	Earthing point next to central electrical system
X1754	Soldering tag Line 59104
X3311	Plug connection ZDR interface (KSM)

ZDR INTERFACE WITH CUSTOMER-SPECIFIC CONTROL MODULE (STEP 1) FOR EXTERNAL ENGINE SPEED CONTROL AND FLEET MANAGEMENT INTERFACE ON TG

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1. Areas of Application

This description of an interface will be useful to all vehicle body constructors who need an “external engine speed control system” on a MAN-commercial vehicle. The interface described here supplements and extends the standard “ZDR-Interface with FFR” and provides a much wider range of functions. Via the CAN interface of the KSM (A-CAN) it is possible to set up the Fleet Management System Interface (FMS-Interface). The interface implementation described here refers to the “Trucknology Generation” (TG) range of vehicles.

2. Terms and Abbreviations

The PIN description employs the following technical terms/abbreviations:

/Abbreviation	Explanation
A-CAN	Body CAN (CAN = controller area network)
OFF	Switch-off of the FGR/FGB/ZDR function
DBG	Engine speed limiting
DE	Digital input
EMC	Electromagnetic compatibility
FFR	Vehicle management computer
FGR/FGB/ZDR	Vehicle speed control/ speed limiter/intermediate rev control
FIN	Vehicle identification number acc. to ISO 3779 or MAN standard M1036/7
FMS	Fleet Management System
FUP	Function parameter set
GEAR BOX-N	Neutral selected at gearbox
GMT	Greenwich Mean Time
HGB	Max. speed limiting
High-side switch	Output switching to contact 30 ($+U_{BAT}$)
HP	ZF-Automatic gearbox HP…
KSM	Customer-specific control module
CS	Short circuit
LED	Light-emitting diode
Low-side switch	Output switching to contact 31 ($-U_{BAT}$)
M3135	MAN factory standard (M + 4-digit number)
MAN-cats II	Computer diagnostic system in MAN workshops
MBG	Torque limiting
MEMORY	Recovery of stored function
NA	Power take-off
NMV	Power takeoff at front, engine speed-dependent
PIN	Plug-in connector
PWM	Pulse width modulation
PTO	Power take off
R-Gang	Reverse gear
SAE	Society of Automotive Engineers
SET-	Slow down or reduce engine speed, set value
SET+	Speed up or increase engine speed, set value
SG	Control unit
T-CAN	Powertrain CAN (CAN = Controller Area Network)
$+U_{BAT}$	Battery + (positive)
$-U_{BAT}$	Battery – (negative)
UTC	Universal Time Code
VIN	Vehicle identification number acc. to ISO 3779 or MAN standard M 1036-7
WSK	Converter lock-up clutch
ZBR	Central vehicle computer
ZDR	Intermediate engine speed control/regulator

3. Guidelines and Standards also applicable

- Currently valid body/superstructure guidelines for commercial vehicles and semi-trailer tractors, and in particular the manual “Electrics” and the Trucknology Generation; including all supplements to the information for body constructors (www. manted.de).

- MAN-purchasing documentation - relays for commercial vehicles
- MAN standard M 3285 (EMC) and EC directives 72/245/EEC incl. 95/54/EEC
- MAN standard M 3135 (electric cables)
- MAN standard M 3331/1-2
  (High-speed CAN interface for electronic systems on MAN commercial vehicles)
- MAN standard M 1036-7 (Vehicle Identification Number)
- DIN 40 050
- DIN 40 839 Parts 1, 3 and 4
- DIN 57 879, Part 3
- VDE 0879, Part 3
- VG 95 370 to 95 377
- MIL-STO 461 and 462
- ISO 11898-24V
- SAE J1939/ff
- Bosch Specification 2.0B
- ISO 3779
- FMS Standard (www.fms-standard.com)

4. Addresses and Responsibilities

Supply sources can be found in the MAN Guidelines for Body Constructors. These can be obtained from:

MAN Nutzfahrzeuge AG/ Dept. TBD (Fax + 49 (0)89 1580 4264)
P.O. Box 50 06 20
80976 Munich
Germany

5. General Observations on the ZDR Interface With KSM

- The interface is not included in the standard vehicle delivery specification and must be ordered separately.
- The desired parameters in the KSM control unit such as engine speed limiting, torque limiting etc. must be notified to the MAN sales team when placing the order. This information is passed on for factory programming.
- Preparation for the “Start-stop device” set-up is independent of the external engine speed control system interface and must be ordered separately.

  The attachment necessary for external “Engine start-stop” control is supplied rolled up in the cable harness at the rear end of the frame.
- "Accidental reversing prevention” for garbage collection vehicles is not included in the interface and must be ordered separately.
- **Extreme care is necessary when wiring up the interface. This activity is critical because it involves actions that fundamentally affect the on board network and the wiring for the electronics.**
- Only use suitable electric wiring that conforms to MAN standard M 3135.
- Use only relays that meet the requirements set out in the MAN relay specification for external circuits.
- Make absolutely sure that wires are crimped strictly according to makers’ instructions.
- Any external controls incorporated by the constructor must meet enclosure standards according to IP69K DIN 40 050 and in addition be secure against external tampering.
- The power supply ($+U_{BAT}$) for body equipment and control units incorporated by the constructor must be led from the batteries via a suitable separate circuit protection device or fuse. It is not permissible to take off more than 12 volts from a single battery.
- A separate cable must be used for electrical earthing and connected to the common earth point on the engine mounting (never use the vehicle frame as an earth conductor).
- Do not link together several items of externally switched equipment with different earth potentials.
- **Circuits at the interface must be decoupled from the power supply circuit to the body control systems.**
- External switching systems must meet the demands of MAN standard M 3285 for commercial vehicle systems. For example, radio systems such as radio-operated remote control devices must not have any effect on the functions described in this MAN standard.
- **Diagrams and pictures supplied by MAN to illustrate and provide examples of electrical circuits are not to be regarded as specific assembly instructions. The responsibility for the circuits at the interface rests entirely with the party carrying out the work.**
- Changes to the functionalities of the interface as set in the factory can be made at MAN service centres or by MAN authorized dealers. This requires the use of the MAN-cats II service computer. The MAN-cats experts in the workshops can order additional system solutions from the factory which go beyond those provided on the service computer (e.g. for special cases). For this purpose, department TDB has made available the service “Vehicle Parameter Setting Ex Works” in order to assist the workshops.

6. Notes on setting up the Parameters for the KSM

6.1 Fundamental functions regulating intermediate engine speed settings

- Setting of individual ZDR parameters is carried out in the FFR. Individual modes can be selected externally (outside the driver's cabin) if required via the standard ZDR interface(FFR).
- Possible parameters and also the PIN description of the "ZDR-interface with FFR" are described in the document "ZDR-interface with vehicle management computer for external intermediate engine speed control on the TG (Trucknology Generation) range".
- Using the "ZDR-interface with KSM", the functions "SET+", "SET-", "MEMORY" and "OFF/AUS" (familiar from the cruise control) are available for external use outside the driver's cabin.
- Additionally other intermediate engine speeds can be obtained by activating an engine speed limiter.

6.2 Possibilities for setting parameters on the KSM

Parameters for various functions can be set on the KSM using MAN-cats II:

- Engine speed and torque limiting:
  Activating the DrzMomBgr pins (X1997/Pin 1 and 2) permits selection of the engine speed and torque limit parameters.
  Factory settings:

Signal:	Engine speed	Torque
Engine speed/torque limit 1	1500 rpm	100%
Engine speed/torque limit 2	1800 rpm	100%
Engine speed/torque limit 3	1200 rpm	100%

- Parameter selection matrix for switching outputs.
  A total of 5 high side switching signal outputs (Hs1_ konfig…Hs5_ konfig) and 3 low side switching signal outputs (Ls1_konfig,…Ls3_konfig) are available. The following table shows the signals/functions with which the total of 8 switching signal outputs (5 x high side and 3 x low side) can be set up as required. It is also possible to arrange for several switching signals to initiate the same signal/function.

		Low-side switch			High-side switch				
	Ls_konfig/Hs_konfig	**Ls1**	**Ls2**	**Ls3**	**Hs1**	**Hs2**	**Hs3**	**Hs4**	**Hs5**
	Interface X1997	**Pin3**	**Pin 4**	**Pin 9**	**Pin 5**	**Pin 6**	**Pin 7**	**Pin 8**	**Pin 11**
	max. Load	**300mA**	**300mA**	**300mA**	**500mA**	**500mA**	**500mA**	**500mA**	**600mA**
Nr.	**Signals:**								
0.	**Not used (no function)**								
1.	**Gearbox N**			**X**					
2.	**ABS active**								
3.	**Handbrake**				**X**				
4.	**Brake**					**X**			
5.	**Reverse**						**X**		
6.	**Clutch**							**X**	
7.	**Kick-down**								
8.	**Idle**								
9.	**Speed limit 1 on**								
10.	**Speed limit 1 on/off**								
11.	**Engine speed limit 1 on**								
12.	**Engine speed limit 1 on/off**								
13.	**Fuel level warning**								**X**
14.	**Speed limit 2 on**								
15.	**Speed limit 2 on/off**								
16.	**Engine speed limit 2 on**								
17.	**Engine speed limit 2 on/off**								
18.	**PTO 1 feedback**								
19.	**PTO 2 feedback**								
20.	**NMV feedback [front-end PTO]**								
21.	**Oil pressure warning**		**X**						
22.	**Coolant overheat warning**	**X**							
23.	**Split**								
24.	**Accelerator pedal threshold on/off**								
25.	**Brake pedal threshold on/off**								
26.	**Axle load 1 warning**								
27.	**Axle load 2 warning**								
28.	**Reserved**								
29.	**Reserved**								
30.	**Reserved**								
31.	**Reserved**								
32.	**Reserved**								
33.	**Cabin tilt lock**								

X Factory setting

- Function Parameters and Signal Descriptions
  - Gearbox N.
    The switch output parameter is active when the gearbox is in neutral.
  - ABS active
    The switch output parameter is active when an ABS control operation is active.
  - Handbrake
    The switch output parameter is active when the handbrake is applied.
  - Brake
    The switch output parameter is active when the brake pedal is operated.
  - Reverse
    The switch output parameter is active when the reverse gear is engaged.
  - Clutch
    - Manual shift gearbox:
      The switch output parameter is active when the clutch is released.
    - Automated-shift gearbox:
    - The switch output parameter is active when the driveline is disconnected, i.e. when the clutch is released or the gearbox is in neutral.
    - HP gearbox: (ECOMAT):
      The switch output parameter is active when the gearbox is in neutral.
  - Kick down
    The switch output parameter is active when the accelerator is in the “kick down” position.
  - Idling
    The switch output parameter is active when the accelerator pedal is in the idle position.
  - Speed limit 1 on
    The switch output parameter is active when vehicle speed >= parametered speed limit. The output stays active when the speed drops below the set limit.

Factory setting:

Speed limit 1:	5 km/h

- Speed limit 1 on/off
  The switch output parameter as active when the vehicle speed >= the parametered upper speed limit 1. The output is inactive when the vehicle speed <= the parametered lower speed limit 1.

Factory setting:

Speed limit 1_upper:	5 km/h
Speed limit 1 _lower:	3 km/h

- Engine speed limit 1 on
  The switch output parameter is active when engine speed >= parametered limit. The output remains active when the engine speed drops below the limit.

Factory setting:

Engine speed limit 1:	640 rpm

- Engine speed limit 1 on/off
  The switch output parameter is active when engine speed >= parametered upper limit. Output inactive if engine speed <= parametered lower limit.

Factory setting:

Engine speed limit 1_upper:	640 rpm
Engine speed limit 1_lower:	630 rpm

- Tank warning
  The switch output parameter is active when the remaining fuel is below approx. 20% (set at factory), calculated on the maximum tank content. This information is shown at the same time on the instrument panel with the indication “REFUEL” This value can be set by means of MAN-cats II to a minimum-value parameter of 11.2%. This information is at present valid only for vehicles with a single fuel tank level sensor. with terminal 15 “on”. the output is selected for approximately 3 seconds (bulb test).
- Speed limit 2 on
  The switch output parameter is active when the vehicle speed >= the parametered speed limit. The output stays active when the speed drops below the set limit.

Factory setting:

Speed limit 2:	10 km/h

- Speed limit 2 on/off
  The switch output parameter is active when the vehicle speed >= the parametered upper speed limit 2. The output is inactive when the vehicle speed <= the parametered lower speed limit 2.

Factory setting:

Speed limit 2_upper:	10 km/h
Speed limit 2_lower:	8 km/h

- Engine speed limit 2 on
  The switch output parameter is active when the engine speed >= parametered rev limit. The output also remains active when the engine speed falls back below the limit.

Factory setting:

Engine speed limit 2:	980 rpm

- Engine speed limit 2 on/off
  The switch output parameter is active when engine speed >= parametered upper rev limit. Output inactive if engine speed <= parametered lower rev limit.

Factory setting:

Engine speed limit 2_upper:	980 rpm
Engine speed limit 2_lower:	970 rpm

- NA 1 feedback
  The switch output parameter is active when the indicator signal from NA 1 is present.
- NA 2 feedback
  The switch output parameter is active when the indicator signal from NA 2 is present.
- NMV feedback
  The switch output parameter is active when the indicator signal from the NMV is present.
- Oil pressure warning
  The switch output parameter is active when the engine oil pressure is too low. This information is shown at the same time on the instrument. This function is only active when the engine is running. When terminal 15 is “on” the output is selected for approximately
  3 seconds (bulb test).

- Coolant overheat warning

The switch output parameter is active when cooling water temperature is too high. This information is shown at the same time on the instrument panel. With terminal 15 “on” the output is selected for approximately 3 seconds (bulb test).

- Split
  The switch output parameter is active when the corresponding splitter group is active.

Factory setting:

Slow split range:	X
Fast split range:	

- Accelerator pedal position
  The switch output parameter is active when the accelerator pedal position >= parametered upper accelerator pedal limit. The output is inactive when the accelerator pedal position <= parametered lower accelerator pedal setting.

Factory setting:

Accelerator pedal limit_upper:	10%
Accelerator pedal limit_lower:	5.2%

- Brake pedal position
  The switch output parameter is active when the brake pedal position >= parametered upper brake pedal limit. The output is inactive when brake pedal position <= parametered lower brake pedal limit.

Factory setting:

Brake pedal limit_upper:	10%
Brake pedal limit_lower:	5.2%

- Axle load 1 warning
  The switch output parameter is active when axle load >= parametered upper axle load limit. It is inactive when axle load <= parametered lower axle load threshold

Factory setting:

Axle number:	1
Axle load threshold 1_upper:	0 kg
Axle load threshold 1_lower:	0 kg

Example:
If on a two-axle vehicle the rear axle (driven axle) is evaluated, a parameter must be set for axle number “2”.

- Axle load 2 warning
  The switch output parameter is active when axle load >= parametered upper axle load limit. It is inactive when axle load <= parametered lower axle load threshold

Factory setting:

Axle number:	1
Axle load threshold 2_upper:	0 kg
Axle load threshold 2_lower:	0 kg

Example:
If on a two-axle vehicle the rear axle (driven axle) is evaluated, a parameter must be set for axle number “2”.

- Cabin tilt lock

The switch output parameter is active when the cabin is tilted forward or not correctly locked.

- Fault recognition for switch signal outputs.
  - high-side switch
    - Hs1_konfig (X1997/Pin 5)
    - Hs2_konfig (X1997/Pin 6)
    - Hs3_konfig (X1997/Pin 7)
    - Hs4_konfig (X1997/Pin 8)
    - Telltale light (X1997/Pin 10)
    - Operating readiness (X1997/Pin 12)
    - Hs5_konfig (X1997/Pin 11)
  - low-side switch
    - Ls1_konfig (X1997/Pin 3)
    - Ls2_konfig (X1997/Pin 4)
    - Ls3_konfig (X1997/Pin 9)

For fault recognition, the following variations are possible:

- No fault recognition
  Switch signal output is not monitored

With fault recognition

➢ Monitoring high-side switches:
  Signal high: Short circuit to earth is monitored
  Signal low: Short circuit $+U_{BAT}$ and open circuit are monitored.

➢ Monitoring low-side switch:
  Signal high: Short circuit to earth and open circuit are monitored
  Signal low: Short circuit to $+U_{BAT}$ is monitored

- With fault recognition and test pulses (“extended fault recognition”)

➢ Test pulses during KSM system start (up to approx. 3 sec after “terminal 15 on”)
  During the system start, short circuits to $+U_{BAT}$, short circuits to earth, and open circuits are monitored, and thereafter fault recognition is carried out according to the switch signal output version.

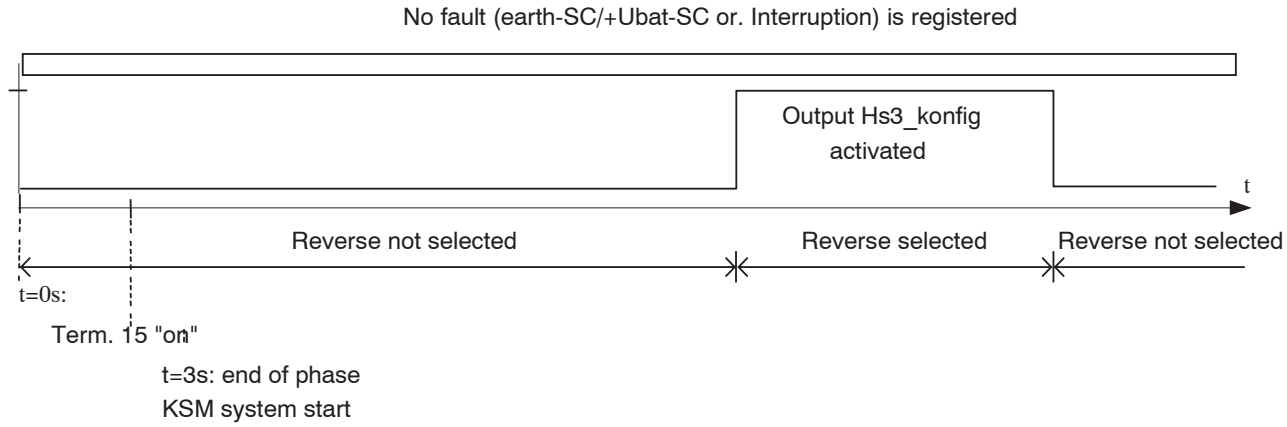
➢ Test pulses
  Irrespective of the switch signal output version, after “terminal 15 on”, short circuits to $+U_{BAT}$, short circuits to earth and open circuits are monitored.

Preconditions for fault recognition:
The load at the output on high-side switches must not be larger than 400Ω, and for low-side switches no larger than 2000Ω.

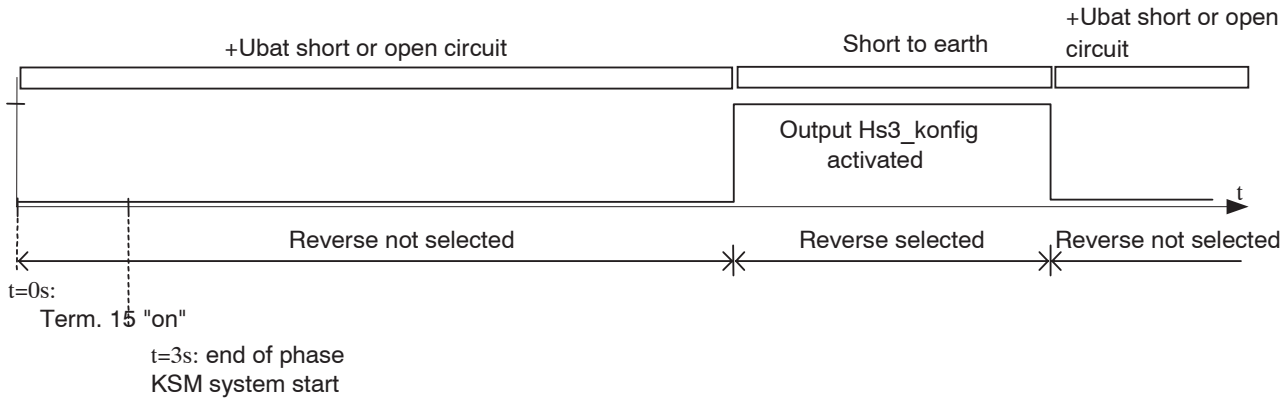
Note: by activating the fault recognition, the depth of diagnosis for the components connected to the “ZDR interface with KSM” is considerably improved, with a consequent increase in functional reliability and vehicle availability.

For example, the recognition of faults on the output Hs3_konfig-delegt with signal R-gear is prevented according to the set parameters:

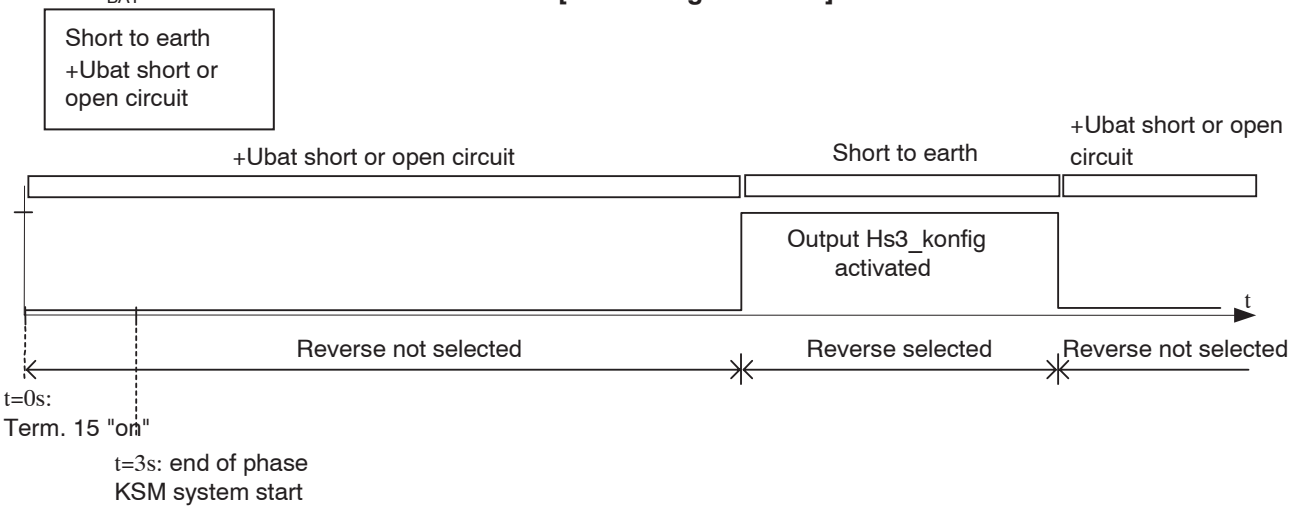
- Output not supported (load is connected):
  Fault recognition not active **[fault recognition “zero”]**



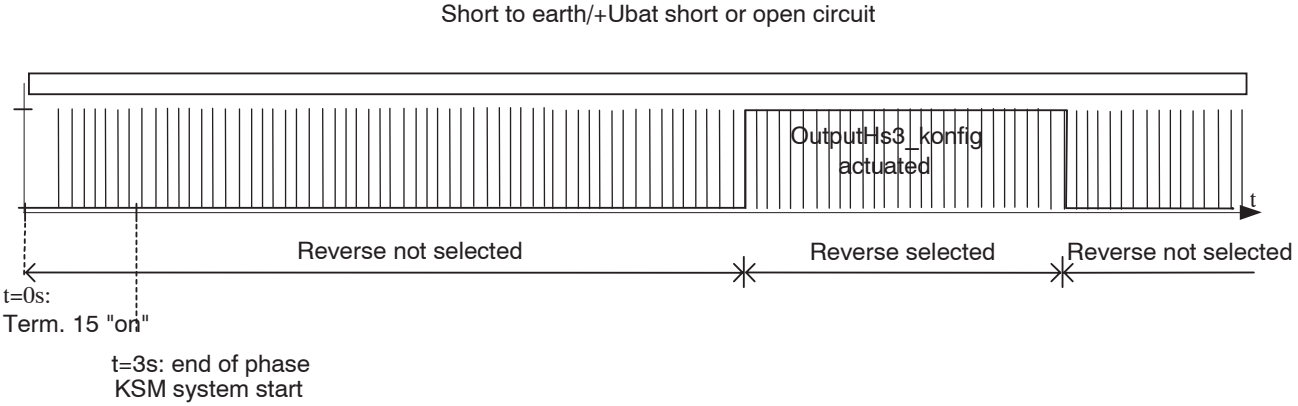
- Output supported (load must be connected!):
  Fault recognition active: present status of output is being monitored **[fault recognition “1”]**



- Output supported (load must be connected!):
  Fault recognition active: present status of output is being monitored and test pulses are only produced during start-up of KSM (checking of short circuits to earth negative for high-side switches and checking of U_{BAT} short circuits for low-side switches **[fault recognition “2”]**



- Output supported (load must be connected!):
  Fault recognition active: present status of output is being monitored and test impulses are cyclical (permanent monitoring of short circuits to earth for high-side switches and permanent monitoring of U_{BAT} short circuits for low-side switches **[fault recognition "3"]**



Note:
Test pulses have a duration of approx. 1ms and a repeat interval of approx. 300ms.

Fault recognition for switch outputs, factory settings:

Switch output:	Fault recog. "0"	Fault recog. "1"	Fault recog. "2"	Fault recog. "3"
Hs1_konfig	X			
Hs2_konfig	X			
Hs3_konfig	X			
Hs4_konfig	X			
Hs5_konfig	X			
Telltale lamp	X			
Operating readiness	X			
Ls1_konfig	X			
Ls2_konfig	X			
Ls3_konfig	X			

- "Fail safe" operation of signal outputs

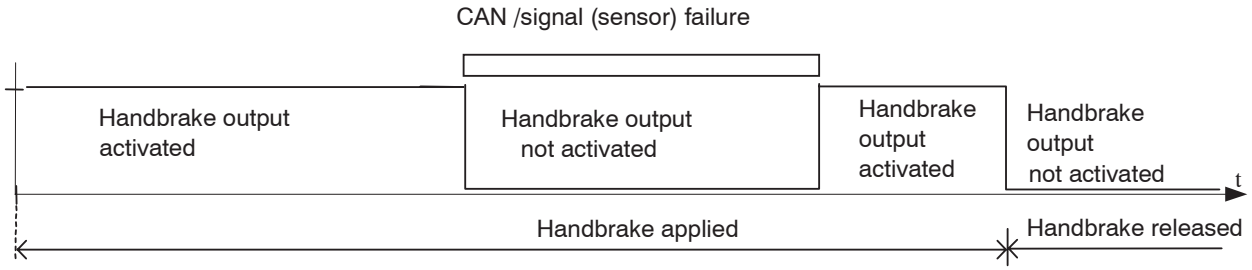
For various signals, parameters can be set in order to control how the corresponding switch signal output operates in the event of a fault. If the driver is energised, the reaction can be parametered to allow for the case of unknown/defective information (CAN failure/signal (sensor) failure):

- "Do not freeze" signal
  The driver which is parametered for this signal (Hs1 konfig…Hs5 konfig…Ls1 konfig…Ls3 konfig) changes from the active energised status to the passive status in the case of CAN failure/signal (sensor) failure.
- "Freeze" signal
  The driver parametered for the signal (Hs1 konfig…Hs5 konfig…Ls1 konfig…Ls3 konfig) is frozen in the active energised status, if there is a CAN failure/signal (sensor) failure, until a valid signal is present again. After a "terminal 15 reset" and a continuing CAN failure/signal (sensor) failure, the driver remains passive.

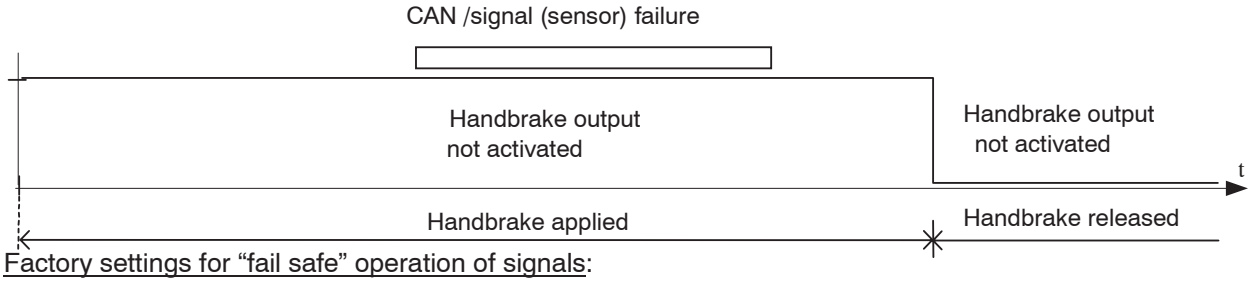
  This parameter facility avoids an undesired reaction (release/blocking/switching off of equipment etc) for components connected to the interface, due to the occurrence of a CAN failure/signal (sensor) failure.

As an example of the parameter setting for " fail-safe" operation on output Hs1_konfig -occupied by the handbrake signal - the following is shown, depending on the parameters:

- Handbrake "do not freeze" signal:
  Output Hs_konfig changes to the passive state in the case of CAN/signal (sensor) failure



- Handbrake "freeze" signal:
  Output stays active in the address status in the case of CAN/signal (sensor) failure



Factory settings for "fail safe" operation of signals:

Signal:	Freeze	Do not freeze
Gearbox N		X
ABS active		X
Handbrake		X
Brake		X
Reverse		X
Clutch		X
Kick-down		X
Idling		X
Speed threshold 1on/off		X
Engine speed threshold 1 on/off		X
Tank warning		X
Speed threshold 2 on/off		X
Engine speed threshold 2 on/off		X
NV1 feedback	X	
NV2 feedback	X	
NMV feedback	X	
Oil pressure warning	X	
Coolant overheat warning	X	
Splitter		X
Accelerator pedal threshold on/off		X
Brake pedal threshold on/off		X
Axle load1 warning	X	
Axle load 2 warning	X	
Cabin tilt lock	X	

- Engine speed

Parameters can be set for the revolution pulse number (number of pulses per revolution of the engine) and the engine speed threshold after which the square wave signal is emitted (sensing ratio 50/50)

Signal:	Engine speed pulse number:	Engine speed threshold:
Engine speed	6	60 rpm

- Evaluation of the request for digital inputs/A-CAN
  - ZDR operation:
    Parameters can be set which determine whether the inputs (set+/-, MEMORY OFF) are supported. If the inputs are supported, a corresponding instruction from the A-CAN will be ignored. If the inputs are not supported, an instruction from the A-CAN will be relayed and possible connections from the digital inputs will be ignored.

Factory settings:

ZDR operation:	Digital inputs:	A-CAN request:
Set +/- MEM, OFF	X	

- Clutch released/ext. gearbox N request:
  - Parameters can be set determining whether this input is supported. If the input is supported, any corresponding instruction from the A-CAN will be ignored. If the input is not supported, an instruction from the A-CAN will be relayed and a possible connection from the digital input will be ignored.

Factory settings:

	Digital input:	A-CAN request:
Clutch off/ext. gearbox N	X	

- Converter lockup clutch (WSK) open/up-shift interlock:
  - Parameters can be set as to whether these inputs are supported. If the inputs are supported, any corresponding instruction from the A-CAN will be ignored. If the inputs are not supported, an instruction from the A-CAN will be relayed and a possible connection from the digital inputs will be ignored.

Factory settings:

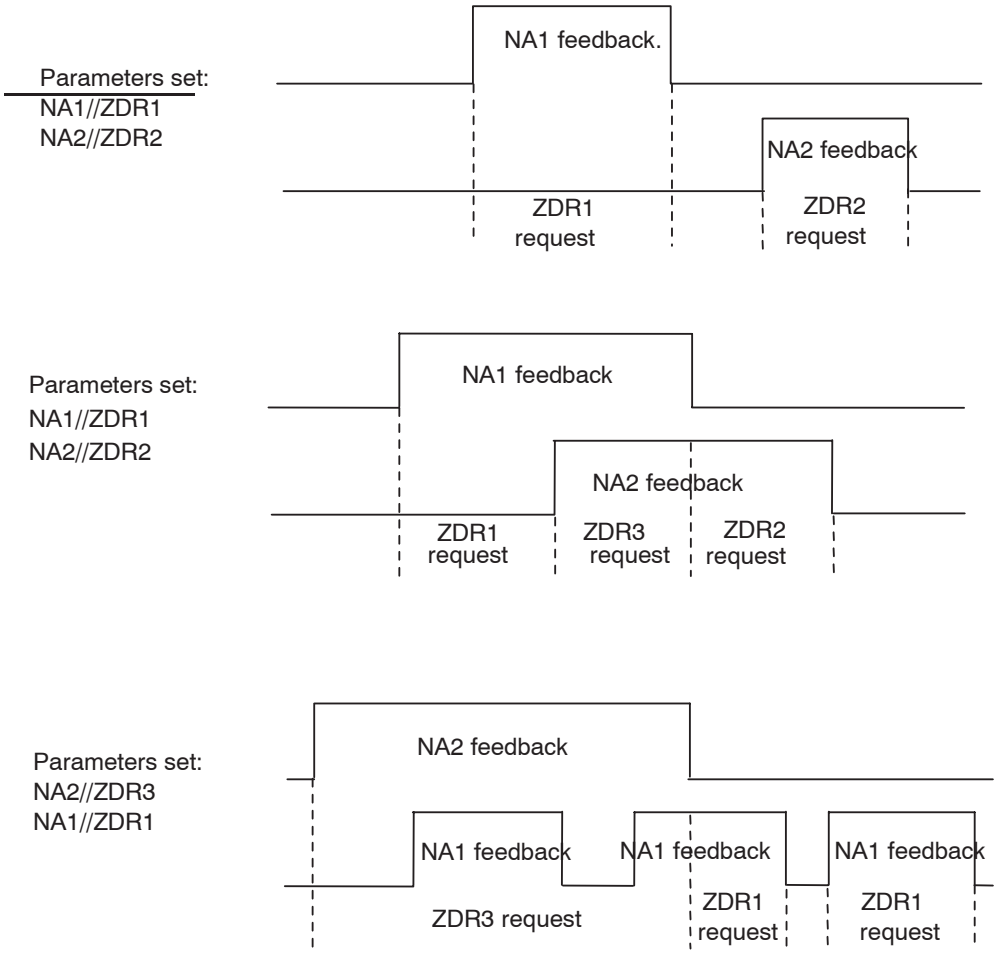
	Digital input:	A-CAN request:
WSK open	X	
Up-shift interlock	X	

- NA-ZDR connection:
  - For each power take-off (NA1, NA2, NMV) any ZDR mode can be ascribed. The ZDR request is created when a feedback signal is present (for NA1 and NA2). For NMV, the ZDR request is created by a feedback signal or an NMV request (parameter). The ZDR mode which is allocated to the power take-offs is only processed when the parameter is set at “evaluate” (see table, page 15). If several power take-offs are activated at the same time, the resulting ZDR mode is created from the association of the values set as parameters, as though the corresponding ZDR pins were activated on the VMC (FFR) interface. The request for a ZDR mode via the KSM has precedence over possible connections from the ZDR pins on VMC module X1996.

.

FFR interface:	X1996/2	X1996/7	X1996/8
ZDR1	x		
ZDR2		x	
ZDR3	x	x	
ZDR4			x
ZDR5	x		x
ZDR6		x	x
ZDR7	x	x	x

Examples:



Important:

The requested ZDR is only activated in the VMC (FFR) when corresponding conditions are set as parameters in the requested ZDR mode (e.g. gearbox N).

Factory setting: Parameter “NA-ZDRx link” in the KSM:

NA-ZDR link	NA1 (FFR)	NA2 (FFR)	NMV (KSM)
ZDR1	x	x	
ZDR2			
ZDR3			x
ZDR4			
ZDR5			
ZDR6			
ZDR7			
ZDR mode not evaluated	x	x	x
ZDR mode - evaluate if there is NA feedback			
ZDR mode - evaluate if there is NA feedback	----[1)]	----[1)]	

[1] Parameters not possible with NA1 and NA2, only with NMV.

- A-CAN interface
  For possible parameters which can be set, see Chapter 7.2

7. A-CAN Interface with FMS Interface

7.1 General points

For communication purposes the A-CAN (body constructors' CAN) offers a High-Speed CAN-interface ISO 11898-24V and specification 2.0B. The data transmission speed is 250kbit/s.
To protect the MAN CAN-integrated net system on the vehicle against external interference/influences, the CAN is fully galvanically separated.
A 120Ω terminal resistor is included in the KSM as A-CAN bus termination; a CAN filter choke is also provided.
The CAN-data communication lead is a 2-wire twisted lead running up to the interface (MAN part number: 07.08132.4384). The lead from the interface to the body-side control unit (e.g. telematics module) should be as short as possible – for electromagnetic reasons – and must be in twisted form (see ISO 11898-24V).
Here too, use leads with MAN article number 07.08132.4384.
For this MAN recommends leads with MAN article number 07.08132.4384
(FLRY-2x0.75-B-28-or-bror).

Important:
Untwisting of the CAN leads must be avoided at all costs, in order to exclude electromagnetic influences which could interfere with the operation of the CAN bus.

If it is not possible to avoid untwisting, for example at a plug connection, the untwisted part of the lead should be kept as short as possible.

MAN's definition of the A-CAN is based on SAE J1939/ff.
The identification numbers in brackets relate to SAE J1939/71 "VEHICLE APPLICATION LAYER".
Implementation of the FMS interface is based on the "FMS-standard interface" jointly specified by several European truck manufacturers (www.fms-standard.com).

7.2 Setting parameters for the A-CAN

- Every message which the KSM receives on the T-CAN can also be sent to the A-CAN.
- By means of MAN-cats II, parameters can be set for every A-CAN message received (KSM1_A, KSM2_A), causing them to be either ignored or further processed by the KSM.

Factory setting:

Message:	"Not received":	"Received":
KSM1_A:	X	
KSM2_A:	X	

- Parameters can also be set for the reception time-out, and if required, for the identifier of the received message as well.
- Using MAN-cats II, parameters can be set for both received messages to provide a "dead time" starting with terminal 15 "on". The actual time-out monitoring of the messages from the body electronics to the KSM will only start upon expiry of this period. By this means it is possible to make an adjustment to the KSM to allow for the possible "run-up time" of the body electronic equipment, without it being necessary to extend the actual time-out monitoring period for the KSM received messages (KSM1_A, KSM2_A).

Factory setting:

Dead time start time-out recognition KSM1_A	5000ms
Dead time start time-out recognition KSM2_A	5000ms

7.3 Information on vehicle operating status on the A-CAN

Depending on the amount of equipment on the vehicle and the parameters set in the KSM, it is possible to make available the following information from the body electronic equipment via the A-CAN:

A-CAN messages sent	KSM with body equipment functions	KSM with FMS and body equipment functions (FUP 81.25890.0444)	KSM with FMS without body equipment functions (FUP 81.25890.1111)
ETC1	x	x	
ETC2	x	x	
ETC3	x	x	
EBC1	x	x	
Amb_Cond	x	x	
Aux_Stat_ZBR1	x	x	
ECAM1	x	x	
Time_date	x	x	
EngFlui_LevPressure	x	x	
ERC1_Rx	x	x	
ERC1_RD/ERC1_RE			
Fuel_ECO		x	
Aux_Stat_KSM1	x	x	
Veh_distance	x	x	x
Veh_weight EBS/ECAS	x	x	x
Eng_hours, revolutions	x	x	x
TCO1	x	x	x
CCVS	x	x	x
Eng_Temp	x	x	x
EEC1	x	x	x
EEC2	x	x	x
Fuel_consumption		x	x
FMS_SW_Identification		x	x
Dash_display		x	x
Service		x	x
BAM_MTCO_VIN		x	x
P_MTCO_VIN		x	x

Note:
x = message to be sent to the A-CAN
Bold = messages included in the “FMS standard interface” specification
ERC1_RE is only sent if a primary retarder is installed; ERC1_RB is only sent if a secondary retarder is installed. The signals which are available for the CAN messages are stated in Chapter 7.5.

Important:
When the KSM is configured with function parameter 81.25816.1111 (FMS without KSM functionality), this only prepares the FMS interface - the usual KSM functions (output of switching signals, carrying out engine intervention functions (limiting engine speed/torque/demands etc.)) are not available.

7.4 Possible requests to the KSM via the A-CAN

The KSM can accept on the A-CAN the following requests from the body electronic equipment for further processing by the KSM/FFR:

- Torque request/torque limiting
- Engine speed request/rev limiting
- Request for intermediate engine speed controller ZDR mode S, 1-7
- Request for ZDR operation (SET+/-, MEM, OFF)
- Maximum speed limiting
- External engine start/stop (on engines with inline injection pumps [EDC MS6.1] only engine stop is possible; on common rail engines [EDC7] engine start and stop are possible.
- NMV demand
- External neutral demand for gearboxes with automated gear shift and automatic transmissions
- Demand: WSK open/blocking of up-shift for HP transmissions (ECOMAT)

7.5 A-CAN output messages

The following output messages can be prepared by the KSM on the A-CAN:

ETC1: Electronic Transmission Controller #1 (3.3.5 = Chapter of SAE J1939/ff) 0CF00203

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	240	2	3	0x00F002	0x0CF00203

Byte	Bit	Description		
1	8 to 3	XX (non-essential information for body constructor)		
	2 and 1	[driveline_engaged] (3.2.2.6)		
		00	Driveline disengaged	
		01	Driveline engaged	
		10	error	
		11	not available	
2 and 3	---	[output_speed_TCU] (3.2.1.14)		
		rpm per bit = 0,125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
4	---	[clutch_slip] (3.2.1.20)		
		% per bit = 0,4	Offset [%] = 0	Range [%] = 0 to 100
5	---	XX		
6 and 7	---	[input_speed] (3.2.5.55)		
		rpm per bit = 0,125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
8	---	XX		

ETC2: Electronic Transmission Controller #2 (3.3.8) 18F00503

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	5	6	0x00F005	0x18F00503

Byte	Bit	Description		
1	---	[selected_gear] (3.2.1.23)		
		Offset = -125[1]	Range = -125 ... 125[1]	
2 and 3	---	[actual_gear_ratio] (3.2.1.25)		
		0,001 per Bit	Offset = 0	Range = 0 ... 64,255
4	---	[current_gear] (3.1.2.22)		
		Offset = -125[1]	Range = -125 ... 125[1]	
5 to 8	---	XX		

[1]Note:

Values with a positive sign represent forward gears, values with a negative sign reverse gears. The value “0” is used for gearbox neutral, the value “126” for the “Park” position (automatic transmissions).

ETC3: Electronic Transmission Controller #3 (3.3.50) 1CFEC703

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Every second, or on status change	8 bytes	254	199	7	0x00FEC7	0x1CFEC703

Byte	Bit	Description	
1 and 2	---	XX	
3	8 to 5	XX	
	4 and 3	Engagement indicator [shift_finger_status_1] (3.2.6.20)	
		00	off
		01	on
		10	error
		11	not available
	2 and 1	Neutral indicator (3.2.6.19)	
		00	off
		01	on
		10	error
		11	not available
4 to 6	---	XX	
7	PTO status (not acc. to J1939/71)		
	8 and 7	[NMV_state]	
		x1	activated
		1x	engaged
	6 to 4	[PTO2_state]	
		0x1	activated
		01x	engaged
		1xx	not defined
	3 to 1	[PTO1_state]	
		0x1	activated
		01x	engaged
		1xx	not defined
8	---	XX	

Note:
The power take off status is not defined according to SAE 1939/71.

Ccveh_speed: Cruise control/vehicle speed (3.3.31)

18FEF100

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	254	241	6	0x00FEF1	0x18FEF100

Byte	Bit	Description		
1	8 to 5	XX		
	4 and 3	[park_brake_switch] (3.2.6.8)		
		00	Parking brake not set	
		01	Parking brake set	
		10	error	
		11	not available	
	2 and 1	XX		
2 and 3	---	[veh_speed_FFR] (3.2.1.12)		
		km/h per Bit = 1/256	Offset [km/h] = 0	Range [km/h] = 0 ... 251
4	8 and 7	[clutch_switch] (3.2.6.12)		
		00	Clutch pedal released	
		01	Clutch pedal depressed	
		10	error	
		11	not available	
	6 and 5	[brake_switch] (3.2.6.11)		
		00	Brake pedal released	
		01	Brake pedal depressed	
		10	error	
		11	not available	
	4 and 3	XX		
	2 and 1	[CC_active] (3.2.6.9)		
		00	Cruise control switched off	
		01	Cruise control switched on	
		10	error	
		11	not available	
5 to 6	---	XX		
7	8 to 6	XX		
	5 to 1	[PTO_state] (3.2.2.19)		
		00000	Off/disabled	
		00101	Set	
		11111	not available	
8	---	XX		

EBC1: Electronic Brake Controller #1 (3.3.4) 18F0010B

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	1	6	0x00F001	0x18F0010B

Byte	Bit	Description			
1	8 and 7	XX			
	6 and 5	[ABS_active] (3.2.2.9)			
		00	ABS passive but installed		
		01	ABS active		
		10	reserved		
		11	don't care		
	4 to 1	XX			
2	---	Brake pedal position [BP_position] (3.2.1.18)			
		0,4% per Bit	Offset = 0 %	Range = 0% ... 100%	
3 to 8	---	XX			

AUX_STAT_ZBR1: Auxiliary state I/O body controller #1 0x18FFA121

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Every second, or on status change	8 bytes	255	$161/A1_{hex}$	6	0x00FFA1	0x18FFA121

Byte	Bit	Description	
1	8 and 7	Reverse gear engaged	
		00	off
		01	on
		10	error
		11	not available
	6 and 5	Info fuel level too low in current tank	
		00	off
		01	on
		10	error
		11	not available
	4 to 1	XX	
2	8 to 3	XX	
	2 and 1	Info EMERGENCY-OFF	
		00	off
		01	on
		10	error
		11	not available
3 to 8	--	XX	

EEC1: Electronic engine controller #1 (3.3.7) 0CF00400

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
20 ms	8 bytes	240	4	3	0x00F004	0x00F00400

Byte	Bit	Description		
1 and 2	---	XX		
3	---	Actual engine torque [act_eng_torque] (3.2.1.5)		
		1% per Bit	Offset = -125 %	Range = -125% ... 125%
4 and 5	---	Engine speed [engine_speed] (3.2.1.9)		
		0,125 rpm per Bit	Offset = 0 rpm	Range = 0 rpm ... 8031,875 rpm
6 to 8	---	XX		

EEC2: Electronic engine controller #2 (3.3.6) 0CF00300

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	240	3	3	0x00F003	0x00F00300

Byte	Bit	Description	
1	8 to 5	not defined	
	4 to 3	Accelerator pedal (AP) kickdown switch [AP_kickdown_sw] (3.2.2.5)	
		00	Kickdown passive
		01	Kickdown active
		10	error
		11	not available
	2 and 1	Accelerator pedal (AP) low idle switch [AP_low_idle_sw] (3.2.2.4)	
		00	AP not in low idle condition
		01	AP in low idle condition
		10	error
		11	not available
2	---	Accelerator pedal (AP) position [AP_position] (3.2.1.8)	
		0,4 % per Bit	Offset = 0 % / Range = 0% ... 100%
3	---	Load at current speed [load_curr_speed] (3.2.1.7)	
		1 % per Bit	Offset = 0 % / Range = 0% ... 100%
4 to 8	---	XX	

EngFlui_LevPre: Engine fluid level/pressure (3.3.29) 18FEEF00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
500 ms	8 bytes	254	239	6	0x00FEEF	0x00FEEF00

Byte	Bit	Description		
1 to 3	---	XX		
4	---	Engine oil pressure [eng_oil_press] (3.2.5.28)		
		40 mbar per Bit	Offset = 0 mbar	Range = 0 bar ... 10 bar
5 to 8	---	XX		

Eng_Temp: Engine temperature (3.3.28) 18FEEE00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	238	6	0x00FEEE	0x00FEEE00

Byte	Bit	Description		
1	---	Engine coolant temperature [eng_cool_temp] (3.2.5.5)		
		1 °C per Bit	Offset = -40 °C	Range = -40 °C ... 210 °C
2	---	Fuel temperature [fuel_temp] (3.2.5.14)		
		1 °C per Bit	Offset = -40 °C	Range = -40 °C ... 210 °C
3 and 4	---	Engine oil temperature [eng_oil_temp] (3.2.5.15)		
		0.03125 °C per Bit	Offset = -273 °C	Range = -273°C ... 1735°C
5 to 8	---	XX		

ECAM1: Air/pneumatic supply pressure 3.3.75 (ECAM1) 18FEAE30

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	174	6	65,198	0x18FEAE30

Byte	Bit	Description
1	---	SAE: Pneumatic supply pressure (not used by MAN) [pneu_supply_press]
2	---	SAE: parking and /or trailer air pressure (MAN: circuit 3 {23}) [park_trailer_press]
3	---	SAE: service brake air pressure, circuit #1 (MAN: circuit 1 {21}) [serv_brake_press1]
4	---	SAE: service brake air pressure, circuit #2 (MAN: circuit 2 {22}) [serv_brake_press2]
5	---	SAE: auxiliary equipment supply pressure (MAN: circuit 4 {24}) [aux_equip_press]
6	---	SAE: air suspension pressure (MAN: pilot circuit) [air_susp_press]
7 to 8	---	XX

Note:

For MAN byte 6 does not reflect the air suspension pressure Resolution for Byte 1 to 6		
80 mbar per bit	Offset = 0 mbar	Range = 0 bar ... 20 bar

Amb_Cond: ambient conditions (3.3.35) 18FEF500

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	245	6	0x00FEF5	0x00FEF500

Byte	Bit	Description		
1	---	Barometric pressure [barometric_press] (3.2.5.43)*		
		5 mbar per Bit	Offset = 0 mbar	Range = 0 ... 1,25 bar
2 and 3	---	XX		
4 and 5	---	Ambient air temperature [amb_air_temp] (3.2.5.12)		
		0.03125 °C per Bit	Offset = -273 °C	Range = -273 ... 1735.0°C
6 to 8	---	XX		

* Important:
These values cannot be calibrated

Time_Date: Time /Date (3.3.20) 18FEE6EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	230	6	FF0A	18FEE6EE

Byte	Bit	Description		
1	---	Seconds [seconds] (3.2.5.93)		
		0,25 s per Bit	Offset = 0 s	Range = 0 ... 59,75 s
2	---	Minutes [minutes] (3.2.5.94)		
		1 min per Bit	Offset = 0 min	Range = 0 ... 59 min
3	---	Hours [hours] (3.2.5.110)		
		1 h per Bit	Offset = 0 h	Range = 0 ... 23 h
4	---	Month [month] (3.2.5.112)[1]		
		1 Month per Bit	Offset = 0 months	Range = 0 ... 12 months
5	---	Day [day] (3.2.5.111)[2]		
		0,25 days per Bit	Offset = 0 days	Range = 0 ... 31,75 days
6	---	Year [year] (3.2.5.113)		
		1 year per Bit	Offset = +1985 years	Range = 1985 ... 2235 years
7	---	Local Minute Offset (3.2.5.296)		
		1 min per Bit	Offset = -125 min	Range = von –59 min to +59 min
8	---	Local Hour Offset (3.2.5.297)		
		1 h per Bit	Offset = -125 h	Range = von –23 h to +23 h

Note:

[1] The value “0” is not used. The value “1” corresponds to the month of January, the value “2” to the month of February etc.

[2] The value “0” is not used. The values 1 to 4 (0,25 days/Bit) correspond to the first day of the month, the values 5 to 8 to the second day of the month etc.

Veh_dist: vehicle distance high resolution (3.3.54)
18FEC1EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	193	6	FEC1	18FEC1EE

Byte	Bit	Description		
1 to 4	---	High resolution total vehicle distance [tot_veh_dist] (3.2.5.106)		
		5 m per Bit	Offset = 0 m	Range = 0 ... 21 055 406 km
5 to 8	---	XX		

Eng_HourRev: Engine Hours, Revolutions (3.3.19) 18FEE527

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	229	6	0x00FEE5	18FEE527

Byte	Bit	Description		
1 to 4	---	Total engine hours [total_eng_hours] (3.2.5.61)		
		0,05 h per Bit	Offset = 0 h	Range = 0 ... 210 554 060.75 h
5 to 8	---	XX		

Veh_Weight_EBS: Vehicle weight EBS 18FEEA0B

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	234	6	65,258	18FEEA0B

Byte	Bit	Description			
1	8 to 5	Axle location [axle_location] (3.2.5.95)			
		0000	Axle 1		
		0001	Axle 2		
		0010	Axle 3		
		0011	Axle 4		
		0100	Axle 5		
		0101	Axle 6		
		0110	Axle 7		
		0111	Axle 8		
		1000	Axle 9		
		1001	Axle 10		
		1010	Axle 11		
		1011	Axle 12		
		1100	Axle 13		
		1101	Axle 14		
		1110	Axle 15		
		1111	Axle 16		
	4 to 1	---	not available		
2 and 3	---	Axle weight [axle_weight] (3.2.5.80			
		0,5 kg per Bit	Offset = 0 kg	Range = 0 kg ... 32127.5 kg	
4 to 8	---	XX			

Important:
The axle loads shown cannot be calibrated; variations of up to some hundred kilograms are normal.
The information shown does not represent a standard part of the instrument display functions. The functions shown here depend on vehicle equipment and are restricted to this interface.

Veh_Weight_ECAS: vehicle weight ECAS 18FEEA2F

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	234	6	00FEEA	18FEEA2F

Byte	Bit	Description			
1	8 to 5	Axle location [axle_location] (3.2.5.95)			
		0000	Axle 1		
		0001	Axle 2		
		0010	Axle 3		
		0011	Axle 4		
		0100	Axle 5		
		0101	Axle 6		
		0110	Axle 7		
		0111	Axle 8		
		1000	Axle 9		
		1001	Axle 10		
		1010	Axle 11		
		1011	Axle 12		
		1100	Axle 13		
		1101	Axle 14		
		1110	Axle 15		
		1111	Axle 16		
	4 to 1	---	not available		
2 and 3	---	Axle weight [axle_weight] (3.2.5.80			
		0,5 kg per Bit	Offset = 0 kg	Range = 0 kg ... 32127.5 kg	
4 to 8	---	XX			

TCO1: Tachograph

0CFE6CEE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	254d	108d	3	FE6C	0CFE6CEE

Byte	Bit	Description	
1	8 and 7	Drive recognition (3.2.6.78)	
		00	off/vehicle motion not detected
		01	on/vehicle motion detected
		10	error
		11	not available
	6 to 4	Driver 2 working status (3.2.6.77)	
		000	rest
		001	available
		010	work
		011	drive
		100	reserved
		101	reserved
		110	reserved
		111	not available
	3 to 1	Driver 1 working status (3.2.6.78)	
		000	rest
		001	available
		010	work
		011	drive
		100	reserved
		101	reserved
		110	reserved
		111	not available

2	---	Not used by MTCO	
	8 and 7	overspeed (3.2.6.81)	
		00	no overspeed
		01	overspeed
		10	error
		11	not available
	6 and 5	driver card 1 (3.2.6.80)	
		00	no card present
		01	card present
		10	driver card malfunction
		11	not available
	4 to 1	driver 1 time related states (3.2.6.79)	
		0000	no warning
		0001	warning #1
		0010	warning #2
		0011	warning #3
		0100	warning #4
		0101	warning #5
		0110	reserved for future use
		0111	reserved for future use
		1000	reserved for future use
		1001	reserved for future use
		1010	reserved for future use
		1011	reserved for future use
		1100	reserved for future use
		1101	reserved for future use
		1110	error
		1111	not available

3	---	Not used by MTCO	
	8 and 7	not defined	
	6 and 5	driver card 2 (3.2.6.80)	
		00	no card present
		01	card present
		10	driver card malfunction
		11	not available
	4 to 1	driver 2 time related states (3.2.6.79)	
		0000	no warning
		0001	warning #1
		0010	warning #2
		0011	warning #3
		0100	warning #4
		0101	warning #5
		0110	reserved for future use
		0111	reserved for future use
		1000	reserved for future use
		1001	reserved for future use
		1010	reserved for future use
		1011	reserved for future use
		1100	reserved for future use
		1101	reserved for future use
		1110	error
		1111	not available

Table to identify the warnings in parameter driver x time related states
Type: European Community regulation

0000	no warning	[0h .. 4 1/4h]
0001	warning #1	[4 1/4h .. 4 1/2h]
0010	warning #2	[4 1/2h .. 8 3/4h]
0011	warning #3	[8 3/4h .. 9h]
0100	warning #4	[9h .. 15 3/4h]
0101	warning #5	[15 3/4h .. 16h]

4	8 to 7	not defined		
	6 to 5	system performance (3.2.6.84)		
		00	system performance o.k.	
		01	faulty system performance	
		10	error	
		11	not available	
	4 to 3	handling information e.g. no record sheet (3.2.6.83)		
		00	no handling info	
		01	handling info	
		10	error	
		11	not available	
	2 to 1	system event (3.2.6.82)		
		00	no system event	
		01	system event	
		10	error	
		11	not available	
5 and 6	---	XX		
7 and 8	---	Tachograph vehicle speed [veh_speed_MTCO] (3.2.1.12)		
		1/256 km/h per Bit	Offset = 0 km/h (upper byte resolution 1.0 km/h/bit)	Range = 0 km/h .. 250,996 km/h

ERC1_RX: Electronic retarder controller retarder exhaust (5.3.3) 18F00029

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	0	6	0x00F000	0x18F00029

1	---	XX		
2	---	Actual retarder torque[1] [act_rx_torque] (3.2.1.17)		
		1% per Bit	Offset = 125%	Range =-125% ... 0%
3 to 8	---	XX		

[1] Only used if engine brake is fitted (parameters set via FFR)

Important:
It is not permissible to deactivate any ERC1 message that may be present.

FMS-standard interface 1CFDD1FD

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 s	8 bytes	253	209	7	FDD1	1CFDD1FD

1	8 to 5	Reserved for FMS-standard	
	4 and 3	requests supported	
		00	request is not supported
		01	request is supported
		10	reserved
		11	don`t care
	2 and 1	diagnostics supported	
		00	diagnostics is not supported
		01	diagnostics is supported
		10	reserved
		11	don`t care
2 to 5	software version supported		
	Byte 2 = a	The Software Version is represented in ASCII-Code in the following Format: ab.cd (SW-Version number in the format ab.cd (ASCII) representing)	
	Byte 3 = b		
	Byte 4 = c		
	Byte 5 = d		
6 to 8	---	Reserved for FMS-standard	

Service_information (3.3.055) 18FEC027

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	192	6	FECO	18FEC027

1	---	XX		
2 and 3	---	Service distance [service_distance] (3.2.5.103)		
		5 km per Bit	Offset = -160635 km	Range =-160635 km ... 160640 km
3 to 8	---	XX		

Fuel_cons: Fuel consumption (3.3.23) 18FEE927

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	233	6	FEE9	18FEE927

1 to 4	---	XX		
5 to 8	---	Total fuel used [total:fuel_used] (3.2.5.66)		
		0,5 l per Bit	Offset = 0 l	Range = 0 l ... 2105540607.5 l

VIN: Vehicle identification number (3.3.26) 18FEECEE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 s	variable	254	236	6	FEEC	18FEECEE

As the VIN for MAN consists of more than 8 Bytes it is transmitted according to SAE1939/21 (Multipacket – Transport mechanism):
18ECFFEE (TP.BAM=Transport protocol_broadcast announce message)
18EBFFEE (TP.DT=Transport protocol_data transfer)

TP.BAM:

Byte 1:	Control Byte	20h
Byte 2 and 3:	Total message size, number of packets	0011h
Byte 4:	Total number of packets	03h
Byte 5:	Reserved	FFh
Byte 6 to 8:	PGN of requested information (VIN)	00FEEC

TP.DT: Packet 1:

Byte 1:	Sequence number	01h
Byte 2 to 8:	Bytes 1-7 of VIN	ASCII

TP.DT: Packet 2:

Byte 1:	Sequence number	02h
Byte 2 to 8:	Bytes 8-14 of VIN	ASCII

TP.DT: Packet 3:

Byte 1:	Sequence number	03h
Byte 2 to 4:	Bytes 15-17 of VIN	ASCII
Byte 5:	* = Delimiter	2Ah
Byte 6 to 8:	Filler bytes	FFFFFFh

Dash Display (3.3.042) 18FEFC21

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	252	6	FEFC	18FEFC21

1	---	XX		
2	---	Fuel level [fuel_level] (3.2.5.71)		
		0,4% per Bit	Offset = 0%	Range = 0% ... 100%
3 to 8	---	XX		

ERC1_RE (Primary retarder): Electronic Retarder Controller (3.3.3) 18F0000F

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	0	6	0x00F000	18F0000F

1	---	XX		
2	---	Actual retarder torque [act_ret_torque] (3.2.5.17)		
		1% per Bit	Offset = -125%	Range =-125% … 0%
3 to 8	---	XX		

ERC1_RD (Secondary retarder): Electronic Retarder Controller (3.3.3) 18F00010

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	0	6	0x00F000	18F00010

1	---	XX		
2	---	Actual retarder torque [act_ret_torque] (3.2.5.17)		
		1% per Bit	Offset = -125%	Range =-125% … 0%
3 to 8	---	XX		

Fuel_Eco: Fuel Economy (3.3.32) 18FEF227

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	254	242	6	0x00FEF2	18FEF227

1 to 2	---	Fuel rate [fuel_rate] (3.2.5.63)		
		0,05 l/h per Bit	Offset = 0 l/h ($13{,}9 \times 10^{-6}$ l/s per bit)	Range = 0 … 210 554 060,75 l/h
3 to 4	---	Instantaneous fuel economy [instant_fuel_eco] (3.2.5.67)		
		1/512 km/l per Bit	Offset = 0 km/l	Range = 0% … 125,5 km/l
5 to 8	---	XX		

Aux_Stat_KSM1 18FED9FD

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	255	253	6	FED9	18FED9FD

1	8 to 5	XX	
	4 and 3	Oil pressure warning (oil pressure too low)	
		00	off
		01	on
		10	error
		11	not available
	2 and 1	Cooling water excess temperature warning (cooling water temperature too high)	
		00	off
		01	on
		10	error
		11	not available

7.6 A-CAN input messages

The following received messages can be processed by the KSM and relayed to the FFR:

KSM1_A: Customer-specific control module #1– body 0CEFFD55

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	239	destination address KSM = FD_{hex}	3	Proprietary A: EF00	0CEFFD55

Byte	Bit	Description		
1	8 and 7	not defined		
	6 and 5	Override control mode priority [ksma_ocmp] (3.2.3.3) not supported		
	4 and 3	Requested speed control conditions [ksma_rscc] (3.2.3.2) not supported		
	2 and 1	Override control mode [ksma_ocm] (3.2.3.1)		
		00	Override disabled	
		01	speed control	
		10	torque control	
		11	speed/torque control	
2 and 3	---	Requested speed/Speed limit [ksma_req_speed] (3.2.1.19)		
		0,125 rpm per Bit	Offset = 0 rpm	Range = 0 ... 8031.875 rpm
4	---	Requested torque/Torque limit [ksma_req_torque] (3.2.1.15)		
		1 % per Bit	Offset = -125 %	Range = 0% ... 125%
5	---	Requested road speed limit [ksma_HGB]		
		1 km/h per Bit	Offset = 0 km/h	Range = 0 km/h ... 250 km/h
6		ZDR-user input [ksma_sw_status]		
	Values described in SAE J1939/ff			
	8 and 7	Cruise control accelerate switch (3.2.6.17)		
	6 and 5	Cruise control resume switch (3.2.6.16)		
	4 and 3	Cruise control coast switch (3.2.6.15)		
	2 and 1	Cruise control set switch (3.2.6.14)		
	Are interpreted by MAN as follows			
	00000000	Neutral		
	00000001	Off		
	00000100	Set -		
	00010000	Resume		
	01000000	Set +		
	10101010	Fault		

Byte	Bit	Description	
7	8 to 5	ZDR Mode request [ZDR_mode_req]	
		0000	Mode S
		0001	Mode 1
		0010	Mode 2
		0011	Mode 3
		0100	Mode 4
		0101	Mode 5
		0110	Mode 6
		0111	Mode 7
		1000	ZDR switch off
		1001	reserved
		1010	reserved
		1011	reserved
		1100	reserved
		1101	reserved
		1110	reserved
		1111	not available
	4 and 3	Motor Stop [ksma_MotorStop]	
		00	no request
		01	Engine stop
		10	reserved
		11	don’t care/take no action
	2 to 1	Motor Start [ksma_MotorStart]	
		00	no request
		01	Engine start
		10	reserved
		11	don’t care/take no action
8	---	XX	

Important:
ZDR mode 7 is reserved for internal MAN purposes; its setting cannot be changed.

KSM2_A: Customer specific control module #2– body 0CFFCA55

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	255	202	3	Proprietary B: FFCA	0CFFCA55

Byte	Bit	Description	
1	8 to 7	---	XX
	6 to 5	disengage driveline request (3.2.3.6) [dis_driveline_req]	
		00	allow driveline engagement
		01	disengage driveline
		10	invalid
		11	take no action
	4 to 3	torque converter lockup disable request (3.2.3.5) [tor_conv_lock_dis]	
		00	allow torque converter lockup
		01	disengage torque converter lockup
		10	invalid
		11	take no action
	2 to 1	gear shift inhibit request (3.2.3.4) [gear_shift_inh_req]	
		00	gear shifts allowed
		01	gear shift inhibited
		10	invalid
		11	take no action
2 to 6	---	XX	
7	8 to 5	not defined	
	4 to 1	Request PTO 3 NMV [ksm_PTO3_req]	
		xxx0	no request
		xxx1	request
8	---	XX	

7.7 Information processing in KSM/VMC as specified by KSM1_A-message

The “override control mode” (OCM) in the KSM1_A message (ASM1_A_OCM) is of great importance for processing engine speed and torque. At the same time the engine speed and torque values in the ASM1_A message are checked for validity. The following description (cases 1-4) describes how the corresponding KSM1_OCM is generated from the KSM1_A_OCM. KSM1 is the T-CAN message from the KSM to the VMC (FFR). In the standard situation the KSM supports the OCM=11 (speed/torque limit control) of the KSM1 message. Processing of the modes OCM=01 (speed control) and OCM=10 (torque control) from the KSM1 message is not activated in the VMC, but if required can be switched on within the VMC.

1. KSM1_A_OCM = 11→ KSM1_A_OCM = 11 (Speed/torque limit control) at n < 8031,875 rpm or m < 100% otherwise KSM1_A_OCM = 00 (disabled)
   - The limits (KSM1_A) are linked with the digital inputs (torque and engine speed) in such a way that the smallest value in each case is used as the KSM1 message.
   - Demand ZDR S, 1-7 is relayed via the KSM1:
     Activation in the VMC (FFR) depends on the switching conditions that have been set as parameters in the VMC.
   - A demand for ZDR operating input (SET +/-, MEM, OFF) via KSM1_A or digital inputs KSM - depending on the KSM parameters - is relayed via KSM1 and implemented within the VMC.

2. KSM1_A_OCM = 01→ KSM1_A_OCM = 01 (speed control) at n < 8031,875 rpm, otherwise KSM1_A_OCM = 00 (disabled) or 11
   - The definition of the engine speed target value is only possible with a valid value in KSM1_A (n<=8031, 875 rpm). Limiting in KSM1 is possible by means of the KSM digital engine speed/torque limit inputs.
   - Torque limiting (KSM1_A) is linked with the digital “engine speed/torque limiting” inputs in such a way that in each case the lowest value is used as the KSM1 message.

3. KSM1_A_OCM = 10→ KSM1_A_OCM = 10 (torque control) at m < =100%, otherwise KSM1_A_OCM = 00 (disabled) or 11
   - Definition of the torque target value is only possible for a valid value in KSM1_A (m < =100%); limiting in KSM1 is possible through digital KSM engine speed/torque limiting inputs.
   - Engine speed limiting (KSM1_A) is linked with the digital “engine speed/torque limiting” inputs in such a way that in each case the lowest value is used as the KSM1 message.

4. KSM1_A_OCM = 00→ KSM1_A_OCM = 11 (speed/torque limit control) on activation of digital inputs, otherwise KSM1_A_OCM = 00 (disabled)
   - No processing/ relaying of KSM1_A/Byte 2,3,4.
   - Engine speed/torque limits via digital “engine speed/torque limiting” inputs possible at KSM.
   - Demand ZDR S, 1-7 is relayed via KSM 1.
     Activation in the VMC (FFR) depends on the switching conditions set as parameters in the VMC.
   - A request for ZDR operating input (SET +/-, MEM, OFF) via KSM1_A or digital KSM inputs - depending on the KSM parameters - is relayed via KSM1: implementation is within the VMC.

The following applies in all cases:

- Choice of ZDR mode via CAN has priority over ZDR pins on the VMC.
- Limits are so linked within the KSM and the VMC that the lowest value is chosen as the KSM1 message.
- Set target values are restricted to limits.

Note:
If an input value from the A-CAN (A-CAN bus off, KSM1_A failure message) is invalid, the limits (engine speed/torque/maximum speed) are frozen until the A-CAN is available again or until valid values are present (for example: the previously requested limits are frozen, or until terminal 15 “Reset”).
If at the time of the failure of the A-CAN (A-CAN Bus off, failure of KSM1_A message) there is a valid demand for an engine speed or torque value (KSM1_A_OCM = 01/10), the engine reverts to idling speed; if in addition there is a valid limit for engine speed or torque, this value is frozen until the A-CAN is available again or until valid values are present (alternatively until terminal 15 “Reset”).

If at the time of the failure of the A-CAN (A-CAN Bus off failure KSM2_A message) there is a request for ZDR mode (KSM1_A_OCM = 00/11), the engine reverts to idling speed until the A-CAN is available again or until valid values are present (alternatively until terminal 15 “Reset”).

If at the time of the failure of the A-CAN (A-CAN Bus off failure KSM2_A message) there is a demand for ZDR operating input (SET +/SET-, MEM, OFF) (KSM1_A_OCM = 00/11), the present engine speed is maintained until the A-CAN is available again or until valid values are present (alternatively until terminal 15 “Reset”).

If at the time of the failure of the A-CAN (A-CAN Bus off failure KSM2_A message) there is an NMV demand (KSM1_A_OCM = 01/10), this is frozen until the A-CAN is available again or until valid values are present (alternatively until terminal 15 “Reset”).

If at the time of the failure of the A-CAN (A-CAN Bus off failure KSM2_A message) there is a NMV demand for Clutch open/ external gearbox N or converter lockup clutch open, these are also frozen until the A-CAN is available again or until valid values are present (alternatively until terminal 15 “Reset”).

8. Pin Description and Circuit Diagrams

DRZMomBgr 1+3 (Plug connection X1997/Pin1)

$+U_{BAT}$ switching signal input for activating engine speed/torque limiting 1 and 3.

Function:
If the input is connected to $+U_{BAT}$ (operating readiness; X1997 Pin12) the engine is limited to “Engine speed/torque limiting 1” for which the parameters can be set via MAN-cats II
If $+U_{BAT}$ is removed, the chosen “Engine speed/torque limiting 1” is cancelled again. If at the same time the DRZMomBgr 2+3 input (X1997/Pin2) is connected along with $+U_{BAT}$ (operating readiness: X1997/PIN12), the engine is limited to “Engine speed/torque limiting 3”, the parameters for which can be set via MAN-cats II.

If $+U_{BAT}$ is removed from both inputs, the selected “Engine speed/torque limiting 3” is cancelled again. This function can also be used as another intermediate engine speed control by setting a higher engine speed limit with it initially.

Functional enablement:
As soon as $+U_{BAT}$ (operating readiness or terminal 15) is present.

Factory settings:
See table for DRZMomBgr 2+3 (plug connector X1997/Pin2).

DRZMomBgr 2+3 (Plug connection X1997 /Pin2)

$+U_{BAT}$ switching signal input for activating engine speed/torque limiting 2 and 3.
Function:
If the input is connected to $+U_{BAT}$ (operating readiness; X1997 Pin12) the engine is limited to “engine speed/torque limiting 2” for which the parameters can be set via MAN-cats II.
If $+U_{BAT}$ is removed, the chosen “engine speed/torque limiting 2” is cancelled again. If at the same time the input DRZMomBgr 1+3 (X1997/Pin1) is connected along with $+U_{BAT}$ (operating readiness: X1997/PIN12) the engine is limited to “Engine speed/torque limiting 3”, the parameters for which can be set via MAN-cats II.

If $+U_{BAT}$ is removed from both inputs, the selected “Engine speed/torque limiting 3” is cancelled again. This function can also be used as another intermediate engine speed control by setting a higher engine speed limit with it initially.

Functional enablement: As soon as $+U_{BAT}$ (operating readiness or terminal 15) is present.

Factory settings:

	DrzMomBgr 1+3 (Plug X1997/Pin 1)	DrzMomBgr 2+3 (Plug X1997/Pin 2)	Engine speed	Torque
Engine speed/torque limit 1	$+U_{Bat}$	-------	1500 rpm	100%
Engine speed/torque limit 2	-------	$+U_{Bat}$	1800 rpm	100%
Engine speed/torque limit 3	$+U_{Bat}$	$+U_{Bat}$	1200 rpm	100%

Each of the possible input combinations is assigned a pair of values consisting of an engine speed limit and a torque limit.

LS1_KONFIG (PLUG CONTACT X1997/PIN3)

-U_{BAT} switching signal output. When the load is connected and in the passive/not activated status, the high level is set (approx. +U_{BAT}).

Load:
Max 300 mA
Function:
Output of signal, depending on what parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).

Factory setting:

Signal:
Coolant overheat warning

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <= 2KΩ. When the error recognition system is activated the load (X1996/PIN1) must be connected after terminal 15, but “Operating readiness” (X1997/PIN12) must not be used. If “Operating readiness” is used instead of terminal 15, once the error recognition system has been activated, entries are made to the error memory during system start-up (monitoring is already active during the phase system start, but operating readiness is only active following the phase system start).

LS2_KONFIG (PLUG CONTACT X1997/Pin4)

-U_{BAT} switching signal output. When the load is connected and in the passive/not activated status, the high level is set (approx. +U_{BAT}).

Load:
Max 300 mA
Function:
Ouput of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).
Factory setting:

Signal:
Low oil pressure warning

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <= 2KΩ. When the error recognition system is activated, the load (X1996/PIN1) must be connected after terminal 15, but “Operating readiness” (X1997/PIN12) must not be used. If “Operating readiness” is used instead of terminal 15, once the error recognition system has been activated, entries are made to the error memory during system start-up (monitoring is already active during the system start phase, but operating readiness is only active following the system start phase).

HS1_KONFIG (PLUG CONTACT X1997/Pin 5)

$+U_{BAT}$ switching signal output. When the load is connected and in the passive/not activated status, the low level is set at. $+U_{low} < 2V$

Load:
Max 500 mA

Function:
Output of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).
Factory setting:

Signal:
Handbrake

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be < 400 Ω.

HS2_KONFIG (PLUG CONTACT X1997/Pin 6)

$+U_{BAT}$ switching signal output. When the load is connected and in the passive/not activated status, the high level is set at $+U_{low} < 2V$

Load:
Max 500 mA

Function:
Output of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).
Factory setting:

Signal:
Brake

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be < 400 Ω.

HS3_KONFIG (PLUG CONTACT X1997/Pin 7)

$+U_{BAT}$ switching signal output. When the load is connected and in the passive/not activated status, the low level is set at $+U_{low} < 2V$

Load:
Max 500 mA
Function:
Output of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).
Factory setting:

Signal:
Reverse gear

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be < 400 Ω.

HS4_KONFIG (PLUG CONTACT X1997/Pin 8)

+U_{BAT} switching signal output. When the load is connected and in the passive/not activated status, the low level is set at +U_{low} < 2V

Load:
Max 500 mA
Function:
Output of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).
Factory setting:

Signal:
Clutch

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be < 400 Ω.

LS3_KONFIG (PLUG CONTACT X1997/Pin 9)

-U_{BAT} switching signal output. When load is connected and in the passive/not activated status the high level is set (approx. +U_{BAT}).

Load:
Max 300 mA
Function:
Output of signal, depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).

Factory setting:

Signal:
Gearbox N

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <2KΩ. When the error recognition system is activated the load (X1996/PIN1) must be connected after terminal 15, but “Operating readiness” (X1997/PIN12) must not be used. If “Operating readiness” is used instead of terminal 15, once the error recognition system has been activated, entries are made into the error memory store during system start-up (monitoring is already active during the system start phase, but operating readiness is only active following the system start phase).

TELLTALE LAMP (plug connector X1997/PIN10)

+U_{BAT} switch signal output. With the load connected and in a fault-free state of the KSM control unit or the connected peripheral equipment, a low level of U_{LOW}<2V is set.

Load:
Max 600mA

Function:
Information that a fault has occurred in the KSM control unit or in peripheral equipment connected to it.
Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <400Ω. After terminal 15 “on” the output is automatically connected for approx. 3 seconds (bulb test).

HS5_KONFIG (plug connector X1997/Pin 11)

+U_{BAT} -switch signal output. With the load connected and in the passive/non activated state, a low level of U_{LOW}<2V is set.

Load:
Max 600mA

Function:
Output of the signal depending on which parameters are set (see Chapter 6.2 “Parameter setting matrix for switch outputs”).

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <400Ω.

OPERATING READINESS (plug connector X1997/Pin 12)

+U_{BAT} -switch signal output. The final stage is switched to “high” approx. 3 sec. after terminal 15 “on”. With a load connected and with the KSM control unit (still) not in state of operating readiness, a low level is set at U_{LOW}<2V.

Load:
Max 2 A

Function:
Information that the KSM control unit is ready to operate. Can be used to enable a function. After terminal 15 “off” the signal is emitted for approx. 2 seconds to allow for body electronic equipment that may be connected to allow the control unit to run on if necessary.

Important:
In order to ensure that short circuits and open circuits are reliably identified when the load is connected and when the error recognition system is activated, the connected load must be <400Ω. The output is activated after system start (approx. 3 sec.).

SET+(plug connector X1997/PIN13)
$+U_{BAT}$ -switch signal input for activation of the function “Increase engine speed”.

Function:
Increases engine speed.
If the input is connected to $+U_{BAT}$ (Operating readiness: X1997/PIN12) the engine speed rises continuously towards the upper rev limit; if activation is interrupted, the engine management regulates engine speed value to the value reached at that moment.

The upper engine speed limit can be:
- The engine’s maximum speed limit
- The upper engine speed limit for ZDR S, ZDR1, …ZDR7 for which the parameters can be set by means of MAN-cats II
- Any engine speed limit which was activated and for which parameters have been set in the VMC or KSM by means of MAN-cats II.

The set engine speed value is cancelled, i.e. the engine reverts to idling speed (ZDR S) or the “lower engine speed limit” (ZDR1, …ZDR7) by means of the “open” command for the standard bridge between “Operating readiness” (X1997/PIN12) and “OFF” (X1997/PIN15).

Function enablement:
As soon as the engine is running, the function can be activated by connecting with $+U_{BAT}$ (Operating readiness or terminal 15).
Important:
The implementation of SET+/SET- via the KSM interface is only possible in the ZDR modes for which the condition “Steering column lever active” is set. Ensure that the steering column lever is secured against undesirable interference within the driver’s cab during operation, for example via an external remote control.

SET- (plug connector X1997/PIN14)
$+U_{BAT}$ -switch signal input for activation of the function “Decrease engine speed”.
Function:
Decreases engine speed.
If the input is connected to $+U_{BAT}$ (Operating readiness: X1997/PIN12) the engine speed setting decreases continuously towards the idle speed setting (ZDR S) or the lower engine speed limit (ZDR1, …ZDR7). If activation is interrupted, the engine management regulates engine speed value to the value reached at that moment.

The set engine speed value is cancelled, i.e. the engine goes to the idling speed (ZDR S) or the “lower engine speed limit” (ZDR1, …ZDR7) by means of the “open” command for the standard bridge between “Operating readiness” (X1997/PIN12) and “OFF” (X1997/PIN15).
Function enablement:
As soon as the engine is running, the function can be activated by connecting to $+U_{BAT}$ (Operating readiness or terminal 15).
Important:
The implementation of SET+/SET- via the KSM interface is only possible in the ZDR modes for which the condition “Steering column lever active” is set. It should be ensured that the steering column lever is secured against undesirable interference within the driver’s cab during operation, for example via an external remote control.

OFF (plug connector X1997/PIN15)
$+U_{BAT}$-switch signal input for enablement/cancelling of the ZDR functions
Function:
If the input is connected to $+U_{BAT}$ (Operating readiness: X1997/PIN12) the ZDR functions are enabled. By setting “OPEN” for the external bridge between “Operating readiness” (X1997/PIN12) and “OFF” (X1997/PIN15) the ZDR and cruise control functions are cancelled
Important:
If the external bridge between X1997/PIN12) and X1997/PIN15) is not present. the “OFF” function is permanently activated/cruise control functions are not possible

MEMORY (plug connector X1997/Pin 16)
$+U_{BAT}$ -switch signal input for retrieval/storage of an engine speed value.

Function:
If the input is connected to $+U_{BAT}$ the engine, on expiry of the checking signal ($t_{max} \leq 1$ sec) goes to the values ZDR S, ZDR1,…ZDR7 for which the parameters can be set by means of MAN-cats II, and regulates them. Following a change, for example by “SET+” or “SET-”, the new engine speed value can be stored by connecting the input with $+U_{BAT}$ ($t \leq 2$ sec) .
The new engine speed value is cancelled, i.e. the engine goes to idle speed (ZDR S) or the lower rev. limit (ZDR1, …ZDR7) by means of the “OPEN” command for the external bridge between X1997/PIN12 and X1997/PIN15, by operating the “OFF control switch” on the control panel in the cabin, or if one of the cancellation conditions is fulfilled.

Function enablement:
As soon as the engine is running, the function can be activated by connecting with $+U_{BAT}$ (Operating readiness or terminal 15) subject to time “t” referred to above.

Important:
The MEM function only takes effect when the control switch is enabled (change of input flank from “high” to “low”). The storage of a target engine speed value that was set using SET+/- is only possible in the corresponding ZDR mode if at the FFR the operator input of the parameter “active with storage in memory” is set and the switch held down for at least 2 seconds.

A-CAN H (Plug connector X1997/Pin 17)
CAN-high cable for FMS/body CAN interface.

A-CAN L (Plug connector X1997/Pin 18)
CAN-low cable for FMS/body CAN interface.

NMV (Plug contact X3311/PIN1)

$+U_{BAT}$ signal input. When the NMV switch is not activated (contact open) the setting is at the "low" level for the KSM PIN (digital input, 4.75kΩ – pull-down, switching level: U_{LOW}<3/U_{HIGH}>16V) "NMV request". With this PIN the NMV can also be requested. This only applies if the NMV switch is fitted.

Load:

Max 500mA

Function:

Information that the NMV was requested or can be used to request NMV. However, the NMV is only activated if the conditions which have been set as parameters in the KSM (by means of the vehicle data file) apply; these are:

- Only engage NMV if Gearbox N: "active"/"not active"
- Only engage NMV if handbrake has been applied: "active"/"not active"
- Only engage NMV if vehicle is stationary: "active"/"not active"

Note:

If the conditions for connecting for Gearbox N, handbrake, clutch or speed signal have been given "active" parameters, they must be fulfilled as soon as the NA request is made, so that the valve can be energised. Once the power take-off has been activated, it remains so even if the conditions for connection are no longer fulfilled later. The connection conditions are considered to be AND-linked.

- NMV with parameter "Engine speed threshold on": "active"/not active"

Note:

Regarding the switching condition "Engine speed threshold on": providing that that the connection conditions (Gearbox N, handbrake, vehicle stationary) are fulfilled (if they have been given "active" parameters) and if the power take-off is requested, the valve is energised as soon as the engine speed exceeds the threshold at which the parameter has been set. The valve remains energised even if the engine speed subsequently drops below this threshold.

- NMV with the parameter "engine speed threshold 'on/off'": "active"/"not active".

Note:

Regarding conditions for switching on and off if "engine speed threshold on/off":
Providing that the connection conditions (Gearbox N, handbrake, vehicle stationary) are fulfilled (if they are given "active" parameters) and if the power take-off is requested, the valve is energised as soon as the engine speed exceeds the threshold to which the parameter has been set. The power is cut off if the engine speed drops below the lower threshold .The conditions for re-energising the valve if the upper engine speed threshold is exceeded are that the request is still active and the connection conditions are still fulfilled.

- NMV request

Parameters can be set to determine whether the switch (digital KSM input) is supported. If the input is supported, then a possible instruction from the A-CAN is ignored. If the input is not supported, then a possible demand from the A-CAN is processed and the switch (digital KSM input) is ignored. Both requests can also be logically linked with "OR" and a demand via A CAN and the digital input is possible.

Function enablement:

As soon as $+U_{BAT}$ is connected following a successful engine start.

Factory settings:

Connection condition, gearbox N	"active"
Connection condition, handbrake	"active"
Connection condition, vehicle stationary	"active"
Engine speed threshold "on"	"not active"
Engine speed threshold "on-off"	"active"
Upper engine speed threshold	800 rpm
Lower engine speed threshold	200 rpm
NMV demand (digital input or A-CAN)	Digital input and A-CAN linked with "OR"

Important

The NMV circuit is not included in the standard equipment supplied with the vehicle and must be ordered separately.

COMPRESSED AIR SWITCH NMV (plug connector X3311/PIN2)

-U_{BAT} switch signal output, same potential as at LED for the NMV switch of the compressed air switch when the NMV is switched on. When the NMV is not operating, the switch signal output of the compressed air switch is at the "high" level (approx. +U_{BAT}) (only if NMV switch is fitted).
Load:
Max 500mA
Function:
Information that the NMV is switched on.
Can be used for enabling the engine speed or power take-off functions in order to prevent undesired external access to operating controls from outside the driver's cabin.
Important:
The NMV switch is not included in the standard equipment of the vehicle and must be ordered separately.

Converter lockup clutch (WSK) OPEN/ UPSHIFT INHIBIT (plug connector X3311/PIN3)
+U_{BAT} switch signal for request "WSK/upshift inhibit" for HP transmission (ECOMAT).
Function:
If the input is connected to +U_{BAT}, no upshifts will be carried out as long as the function is activated. If the function is activated when the vehicle is stationary and with Gearbox N, the appropriate starting gear will be selected, by movement of the DNR switch from "N" to a drive position, or if the DNR switch is at a drive position by deactivating the external Gearbox N request. In both cases the drive-off gear will only be engaged if the brake pedal is operated.
Function enablement:
As soon as +U_{BAT} (Operating readiness or terminal 15) is present.

PWM_KONFIG (PLUG CONTACT X3311/PIN4)
PWM signal output. The signal has the following specification:
- Maximum output current: 10mA
- Output voltage "low" is below 20% +U_{BAT}
- Output voltage (high) is above 80% +U_{BAT}
- The internal pull-up resistance is 15kΩ; the basic status on the PIN is therefore "high"
- The output frequency can be set via a parameter.

Function:
Output of the signal depending on which parameters have been set.
Parameter which can be set:
- Output active with signal "driver's desired torque" (SAE J1939/71: "driver's demand engine torque")
- Output active with signal "actual engine torque" (SAE J1939/71; "actual engine torque")
- Output active with signal "load current speed" (SAE J1939/71; "load at current speed")
- The output frequency can be set by parameters in a range of 100…400Hz.

Note:
The checking ratio of the PWM signal describes the "high time" (e.g. 10% = 10% "high" and 90% "low"). For example:
Torque 0%: checking ratio 10%
Torque 50%: checking ratio 50%
Torque 100%: checking ratio 100%

Factory setting:

Signal:	Frequency:
Degree of engine load	200Hz

EXTERNAL GEARBOX-N DEMAND/CLUTCH RELEASED (plug connector X3311/PIN5)

$+U_{BAT}$ switch signal input for demand “Interrupt drive line”.
Function:

- For automated shift gearboxes and HP transmissions:
  If the input is connected to $+U_{BAT}$, the gearbox is switched to Neutral. When $+U_{BAT}$ is removed, a gear is engaged again. The gearbox is only switched an external N below a speed threshold for which a parameter has been set. The request for this can also be set above the speed threshold for which the parameter has been set.

- Only for HP transmissions:
  When the vehicle is stationary and with Gearbox N, the corresponding drive-off gear is engaged by movement of the DNR switch from “N” to a drive position, or if the DNR switch is already at a drive position by de-activating the external Gearbox N demand. In both cases the drive-off is only selected if the brake pedal has been operated. New parameters can be set which cause the request to be carried out as a “switch function” or a “check function”.
  The “check function” is only effected when the switch is released (change of input flank from “high” to “low”).

Function enablement:
Approximately 3.5 seconds after terminal 15 “on”, the function can be activated by connecting to $+U_{BAT}$ (Operating readiness or terminal 15).

Factory settings:

External gearbox N/clutch released: “switch function”	X
External gearbox N/clutch released: “check function”	

HP TRANSMISSION [ECOMAT] PROGRAMME CHANGE (plug connector X3311/PIN6)

$+U_{BAT}$ switch signal input for activating the function “HP transmission programme change”.

Function:
If the input is connected to $+U_{BAT}$, the corresponding programme for which the parameters have been set will be active; this is a gearbox range and shift programme. Compared with the ECO switching programme, upshifts at higher engine speed occur with the POWER switching programme. Depending on the connections or parameters and on the position of the DNR switch, the transmission control unit will select the drive-off gear.

Factory settings: Refuse collection vehicle (ASF)/Fire engine /(FWF)

	Progr. change (Stv. X3311/Pin 6)	Gear range		Change programme	
		ASF	FWF	ASF	FWF
Progamme change, passive	-------	D: 2-6 D3: 1-3 D2: 1-2 D1: 1	D: 2-6 D3: 1-3 D2: 1-2 D1: 1	ECO	ECO
Progamme change, active	$+U_{Bat}$	D: 3-6 D3: 1-3 D2: 1-2 D1: 1	D: 2-6 D3: 1-3 D2: 1-2 D1: 1	ECO	POWER

Function enablement:
As soon as $+U_{BAT}$ (Operating readiness or terminal 15) is connected.

DISTANCE SIGNAL FROM TACHOGRAPH (plug connector X1428/PIN1)
Output of distance signal from tachograph PINB/8 (according to tachograph specification).

SPEED SIGNAL FROM TACHOGRAPH (plug connector X1428/PIN2)
Output of v-signal from tachograph PINB/6 (according to tachograph specification).

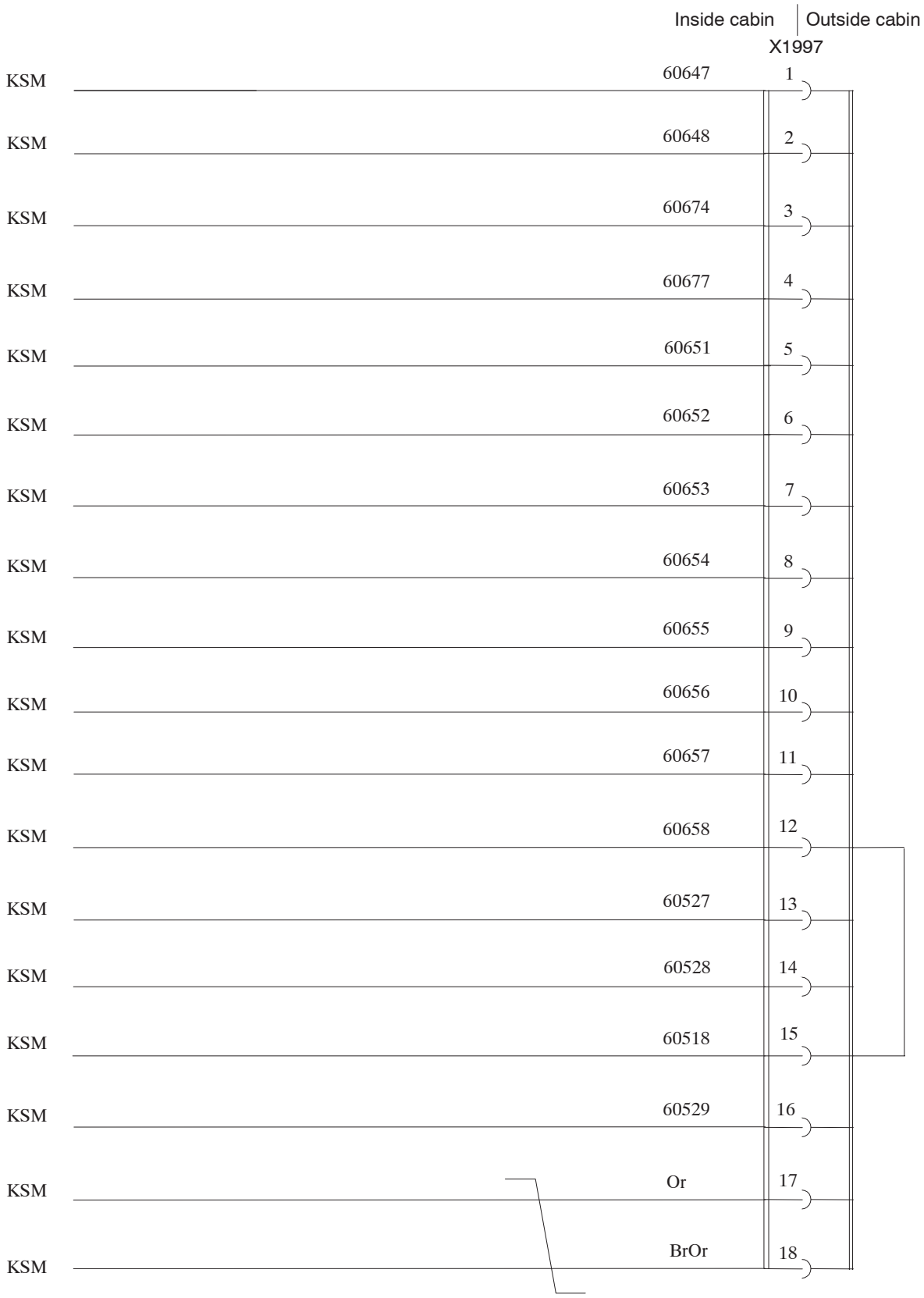
EARTH (GROUND) (plug connector X1428/PIN3)

$-U_{BAT}$ (earth) signal output, vehicle earth, same potential as earth supply point on the central electrical system in the cabin.
Load:
Max. 2A
Function:
Provides an earthing point for external (body) connections.

SIGNAL "ENGINE RUNNING" (X1428/PIN4)
$+U_{BAT}$ -switching signal output.
Load:
Max. 2A
Function:
Information that the engine is running.

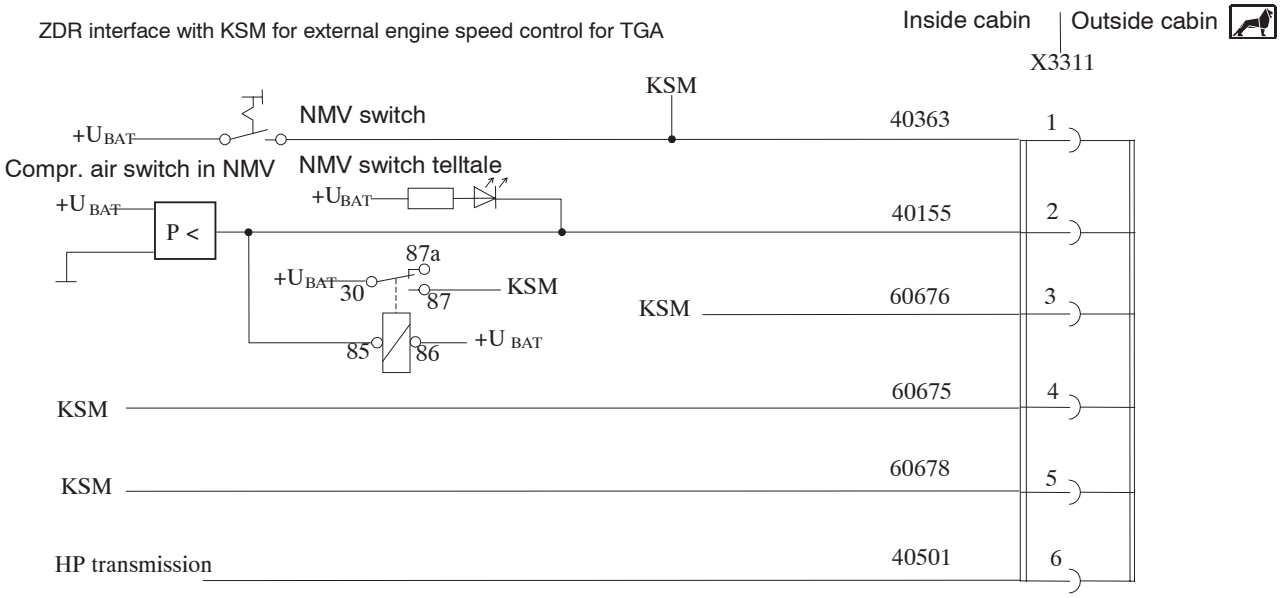
REVERSING LIGHT OPERATION (plug connector X1428/PIN5)
$+U_{BAT}$ - switching signal output.
Load:
Max. 2A
Function:
Information that the reversing lights are switched on.

Important:
This output should not be used for external activation of the reversing lights via $+U_{BAT.}$

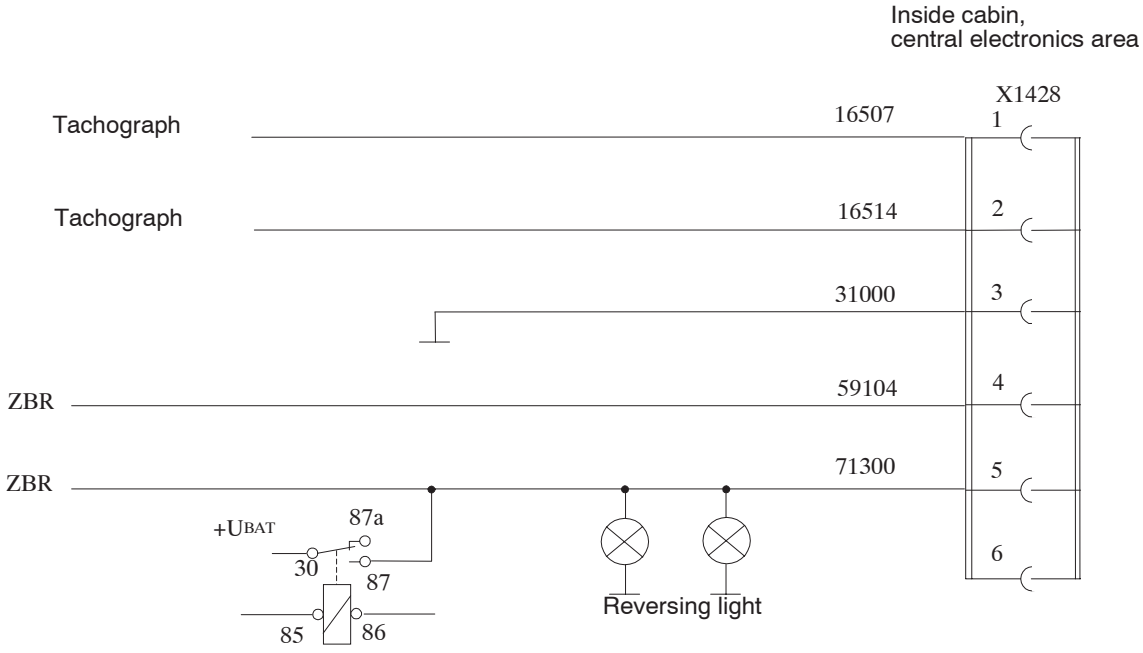


Circuit diagram X1997

ZDR interface with KSM for external engine speed control for TGA

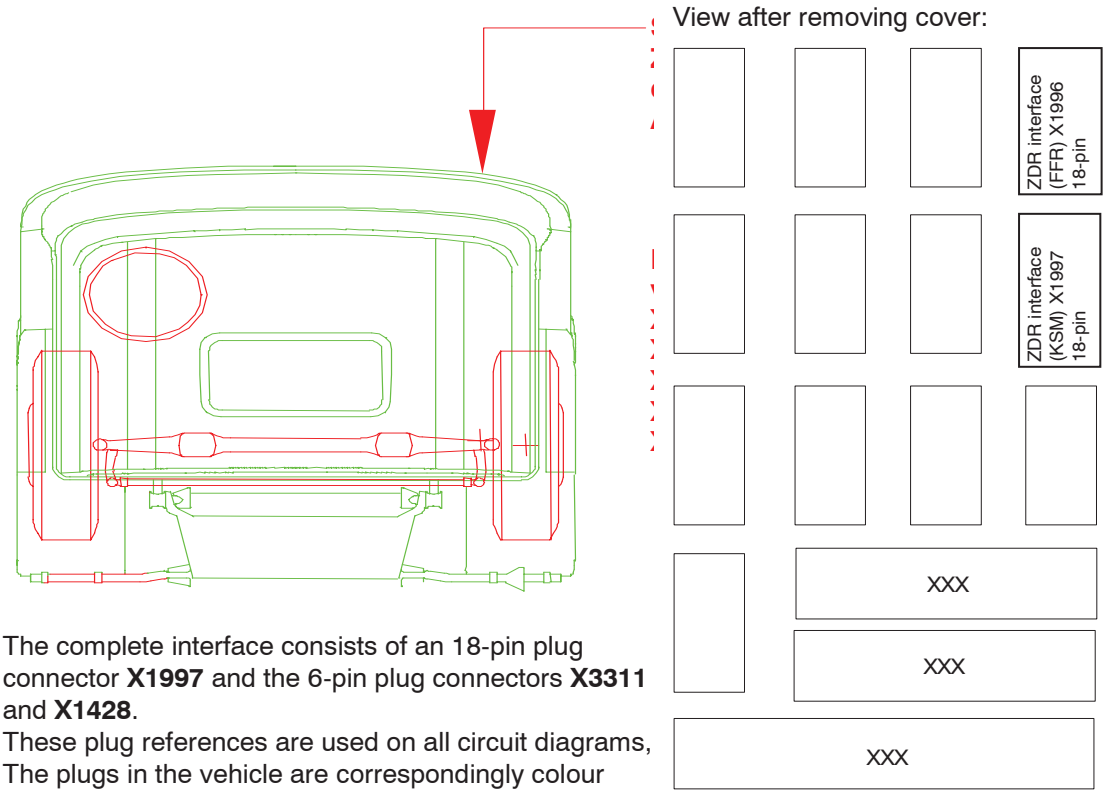


Circuit diagram X3311



Circuit diagram X1428

9. Interface Design and Installation Point



The complete interface consists of an 18-pin plug connector **X1997** and the 6-pin plug connectors **X3311** and **X1428**.
These plug references are used on all circuit diagrams, The plugs in the vehicle are correspondingly colour coded. Access from the outside is by removing the cover.
XXX: Installation area for plug connectors X3311 and X2334/X679.
Plug connector X1428 is in the central electrics area (if the KSM interface is fitted at the factory).

Plug connector, 18-pin:	Colour and coding:	MAN item number	
X1997	natural/6	Plug housing	Socket housing
		81.25475.0046	81.25435.0927
Secondary lock for casing		81.25475.0065	81.25435.0913

Contacts (individual/ strip)	MAN item number
Flat plug with detent 2.8×1/0.5-1	07.91202.0848 / 07.91202.0858
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0849 / 07.91202.0859
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

Plug connector, 6-pin:	Colour and coding:	MAN item number	
X3311	blue/3	Male housing	Female housing
		81.25435.0789	81.25435.0739
Secondary lock for casing		81.25435.0698	81.25435.0698

Contacts (individual/ strip)	MAN item number
Flat plug with detent 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

Plug connector, 6-pin:	MAN item number	
X1428	Plug housing, white	Socket housing, black
	81.25435.0057	07.91601.0601

Contacts (individual/ strip)	MAN item number
Flat plug with detent 6.3×1/0.5-1	07.91202.2618 / 07.91202.2818
Flat plug with detent 6.3×2.5/1.5-2.5	07.91202.2619 / 07.91202.2819
Spring contact with detent 6.3×1/0.5-1	07.91201.2512 / 07.91201.2811
Spring contact with detent 6.3×2.5/1.5-2.5	07.91201.2613 / 07.91201.2813

The interface “ZDR interface with customer-specific control module for external engine speed control for TG-A” consists of the 18-pin plug connector **X1996** and is included in the vehicle’s standard specification.

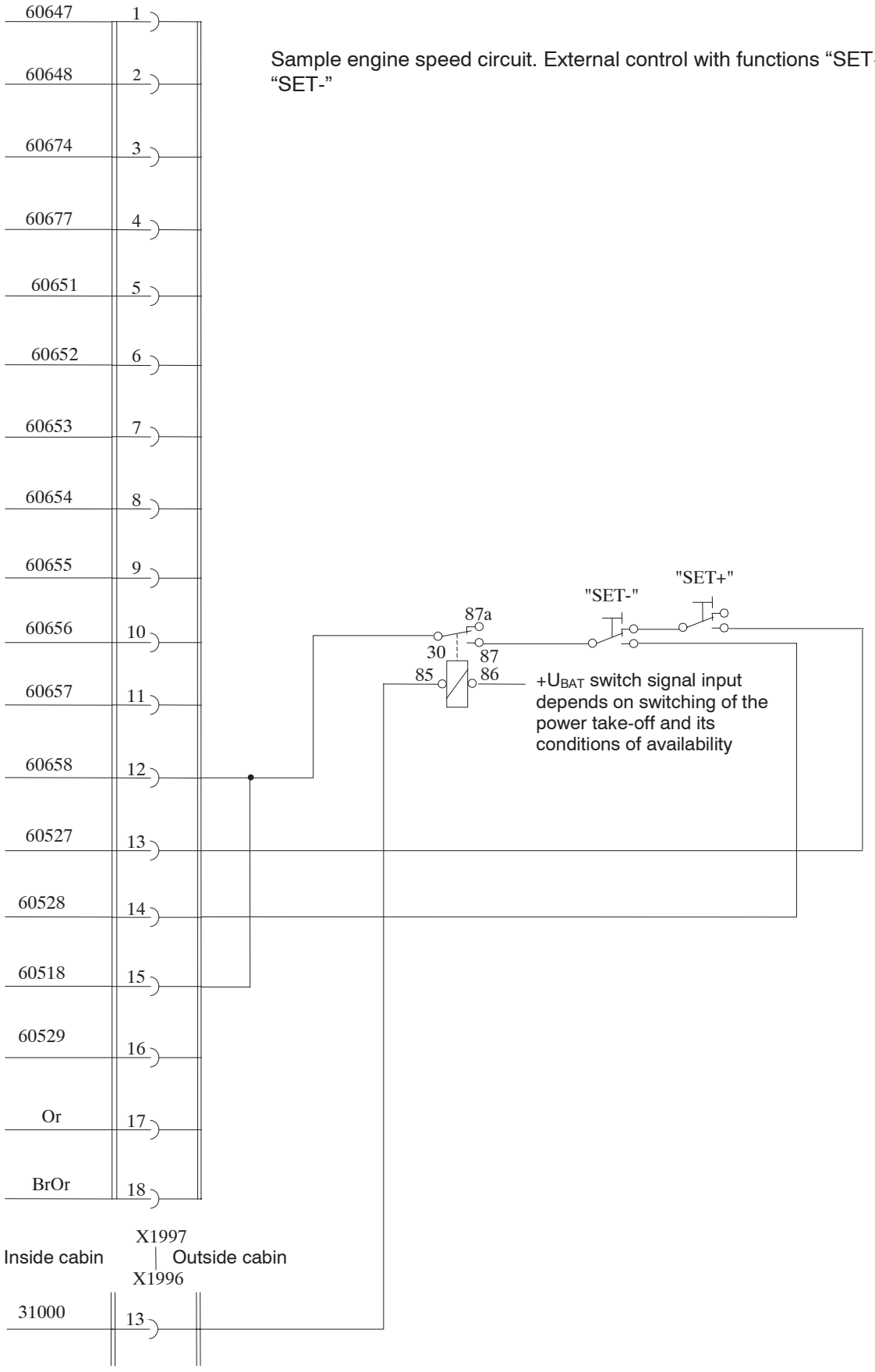
The version „Reverse gear block for refuse collection vehicles“ consists of the 6-pin plug connector **X2334** or **X679**. This connector reference is used on all circuit diagrams, the plug in the vehicle is coloured accordingly.Access from outside is by means of removing the cover.

Plug connector, 6-pin:	Colour and coding:	MAN item number	
X2334 or X679	blue/4	Plug housing	Socket housing
		81.25435.0794	81.25435.0744
Secondary lock for casing		81.25435.0698	81.25435.0698

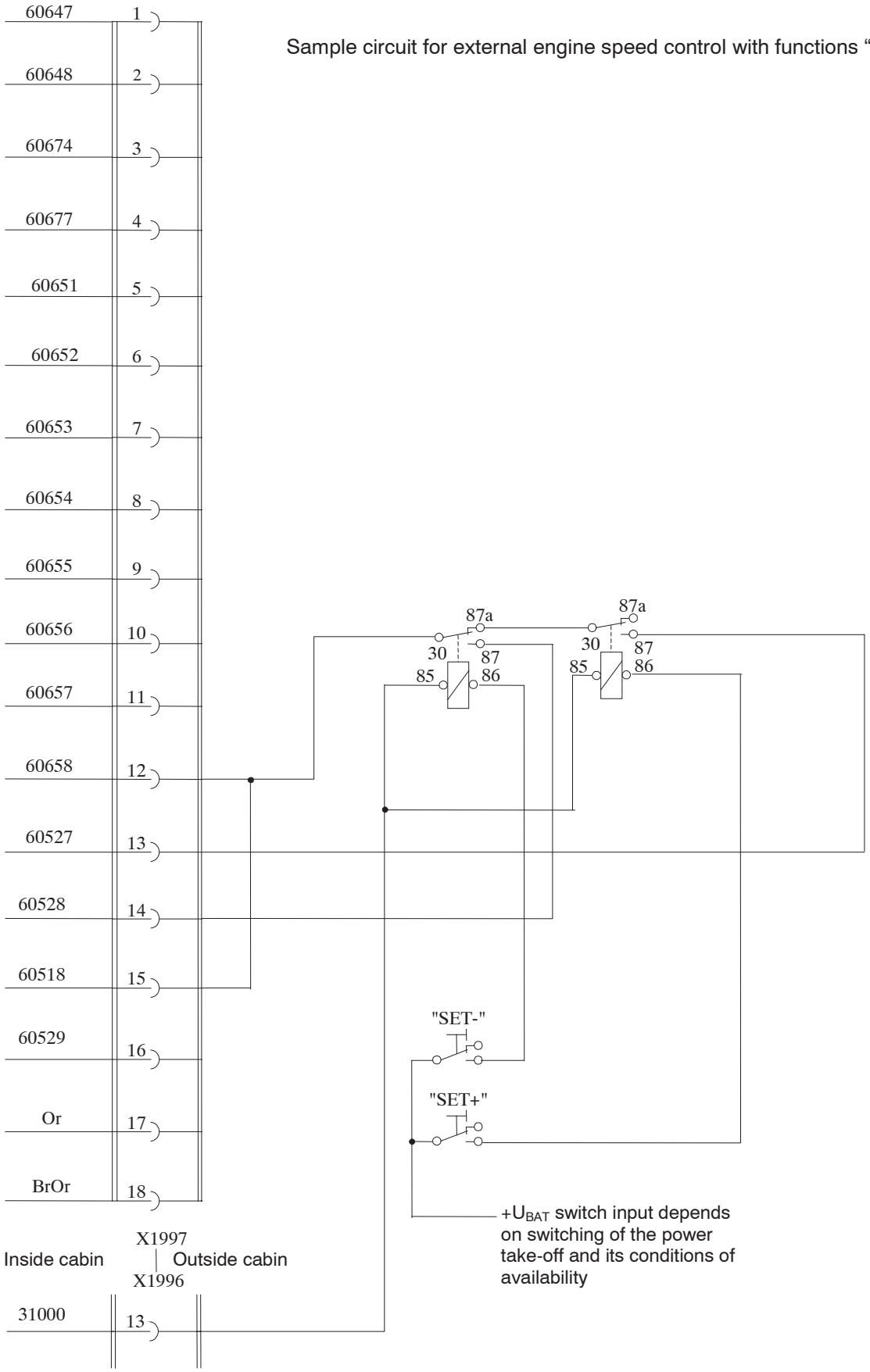
Contacts (individual/ strip)	MAN item number
Flat plug with detent 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

9. Sample Circuits

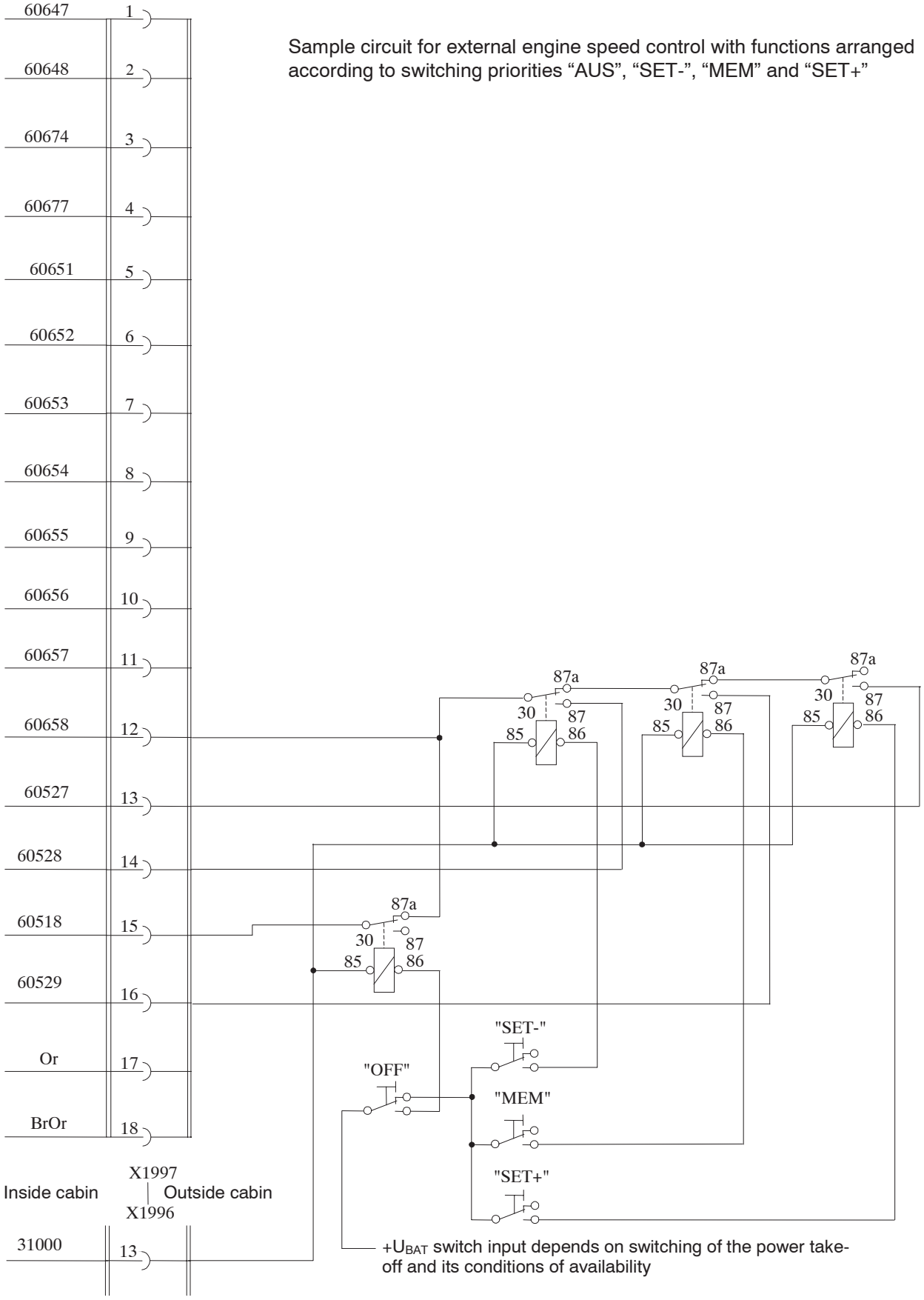
Sample engine speed circuit. External control with functions “SET+” and “SET-”



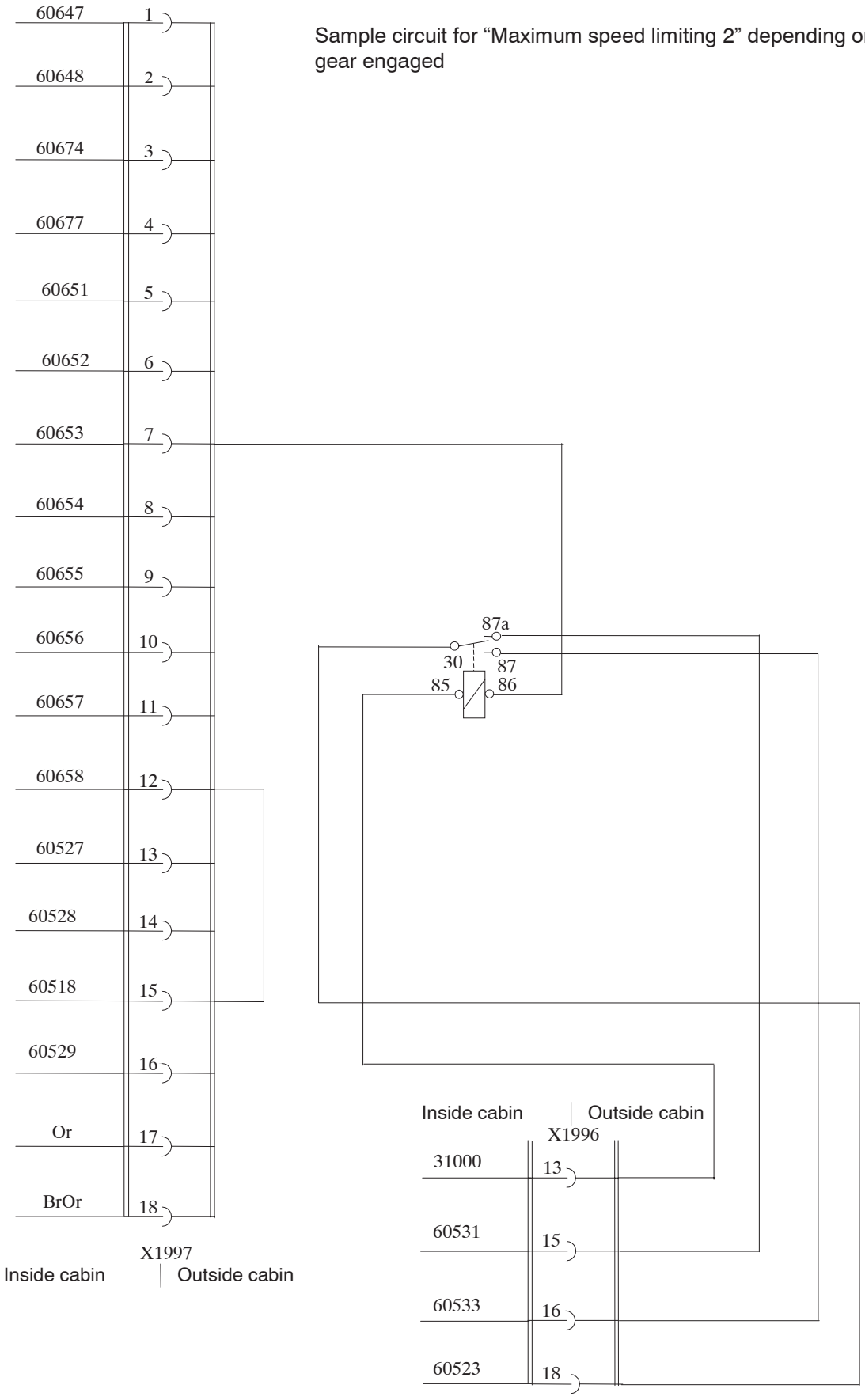
Sample circuit for external engine speed control with functions “SET+” and “SET-”



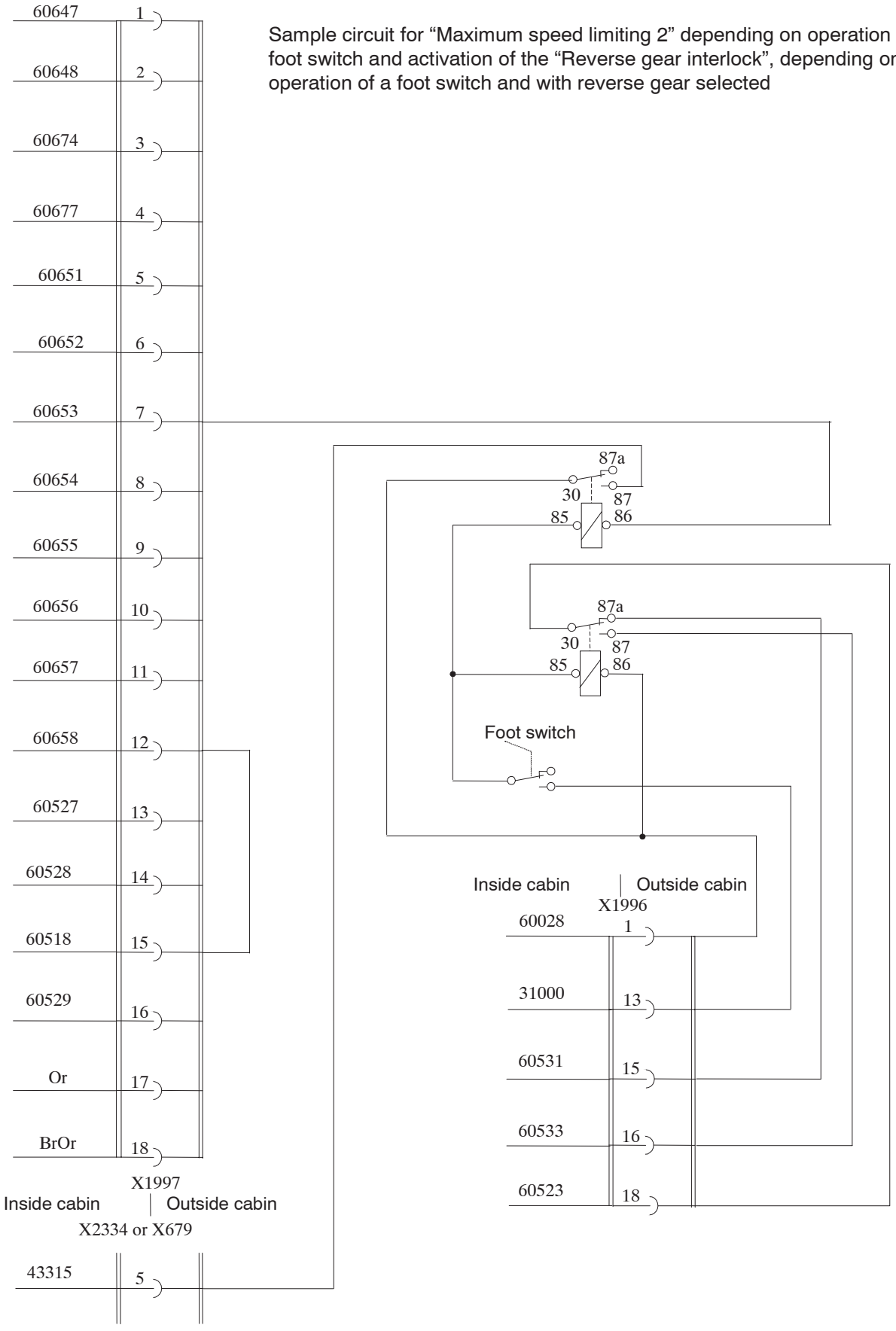
Sample circuit for external engine speed control with functions arranged according to switching priorities “AUS”, “SET-”, “MEM” and “SET+”



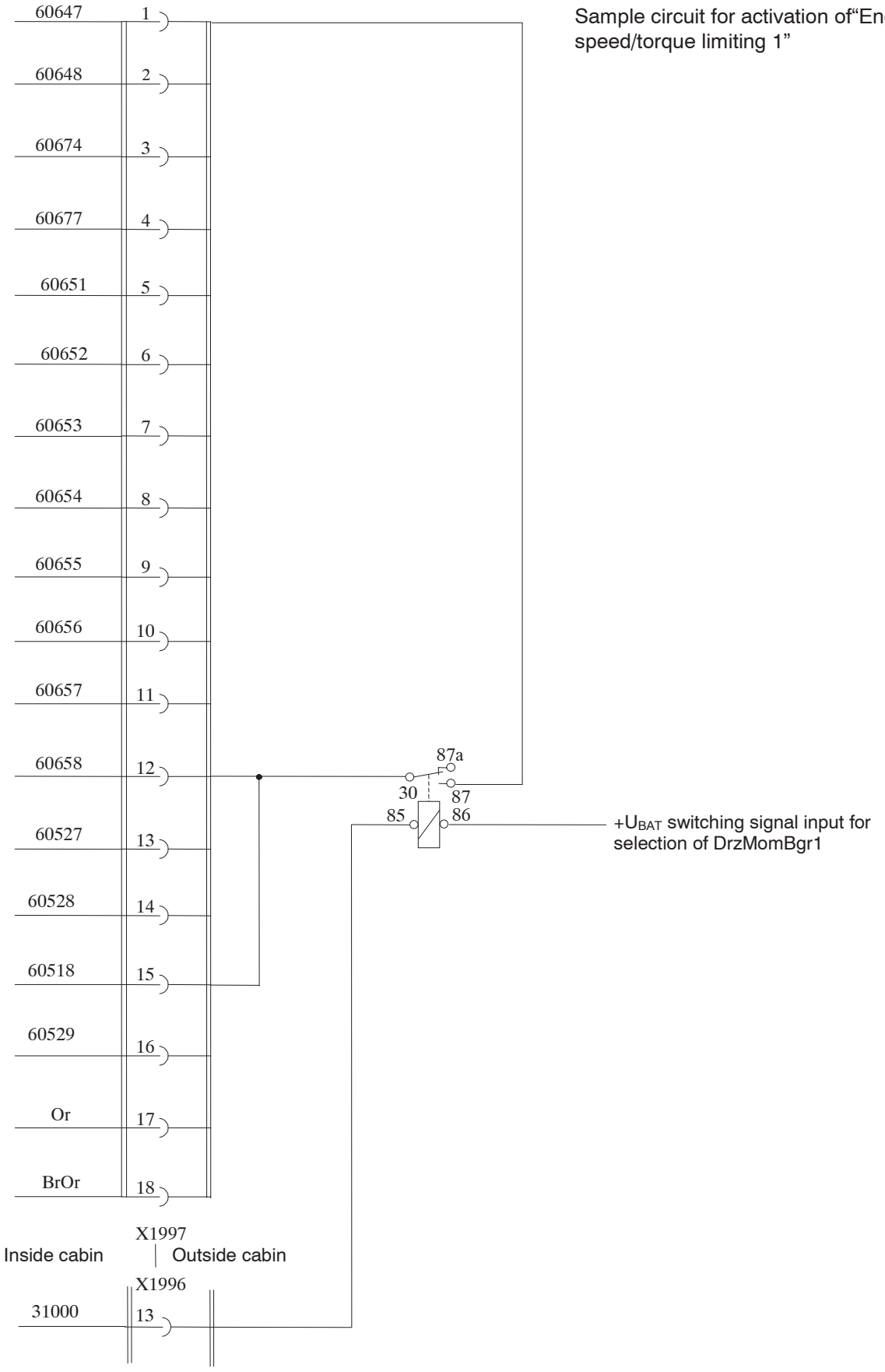
Sample circuit for “Maximum speed limiting 2” depending on the reverse gear engaged



Sample circuit for “Maximum speed limiting 2” depending on operation of a foot switch and activation of the “Reverse gear interlock”, depending on operation of a foot switch and with reverse gear selected

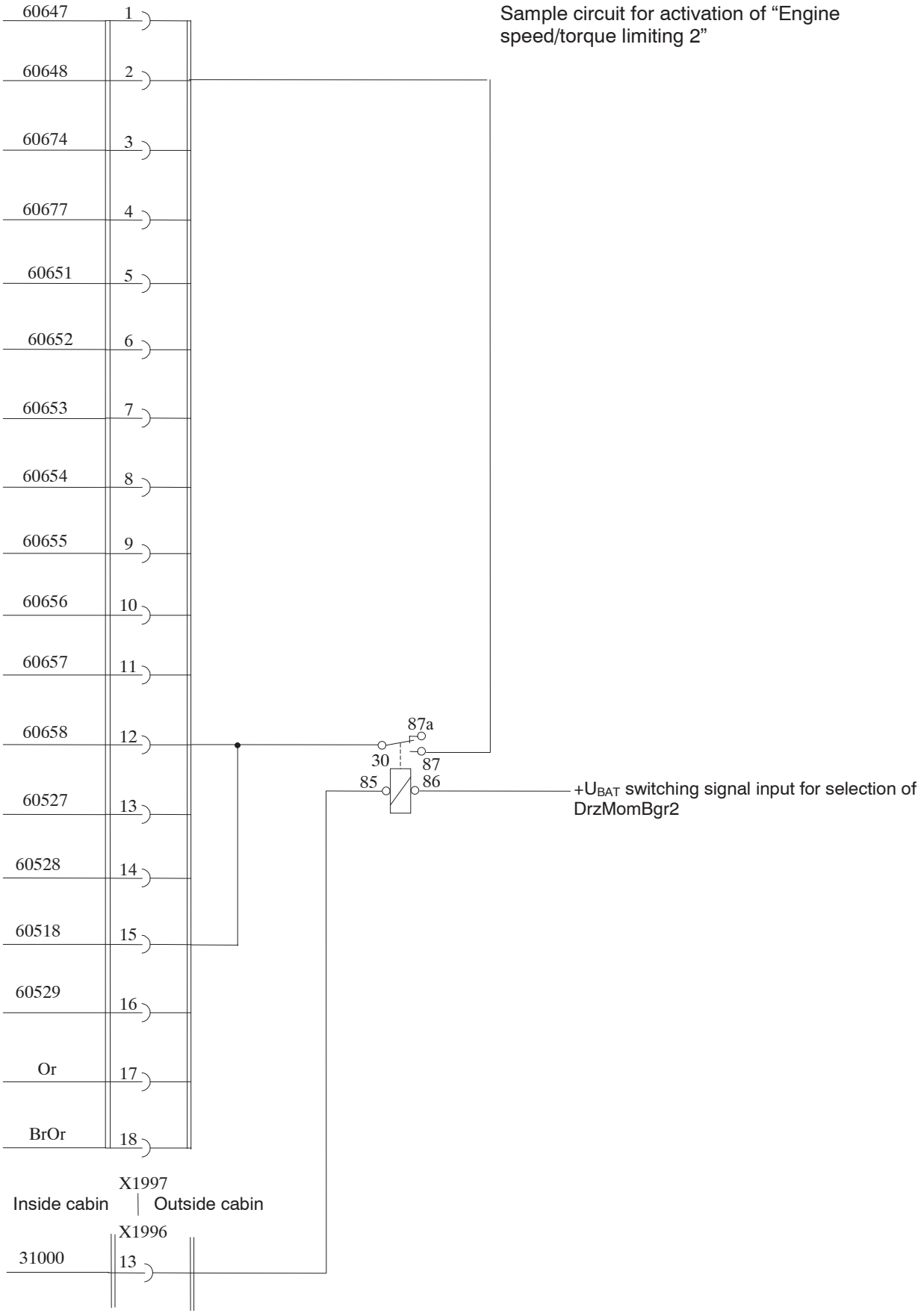


ZDR interface with KSM for external engine speed control for TGA



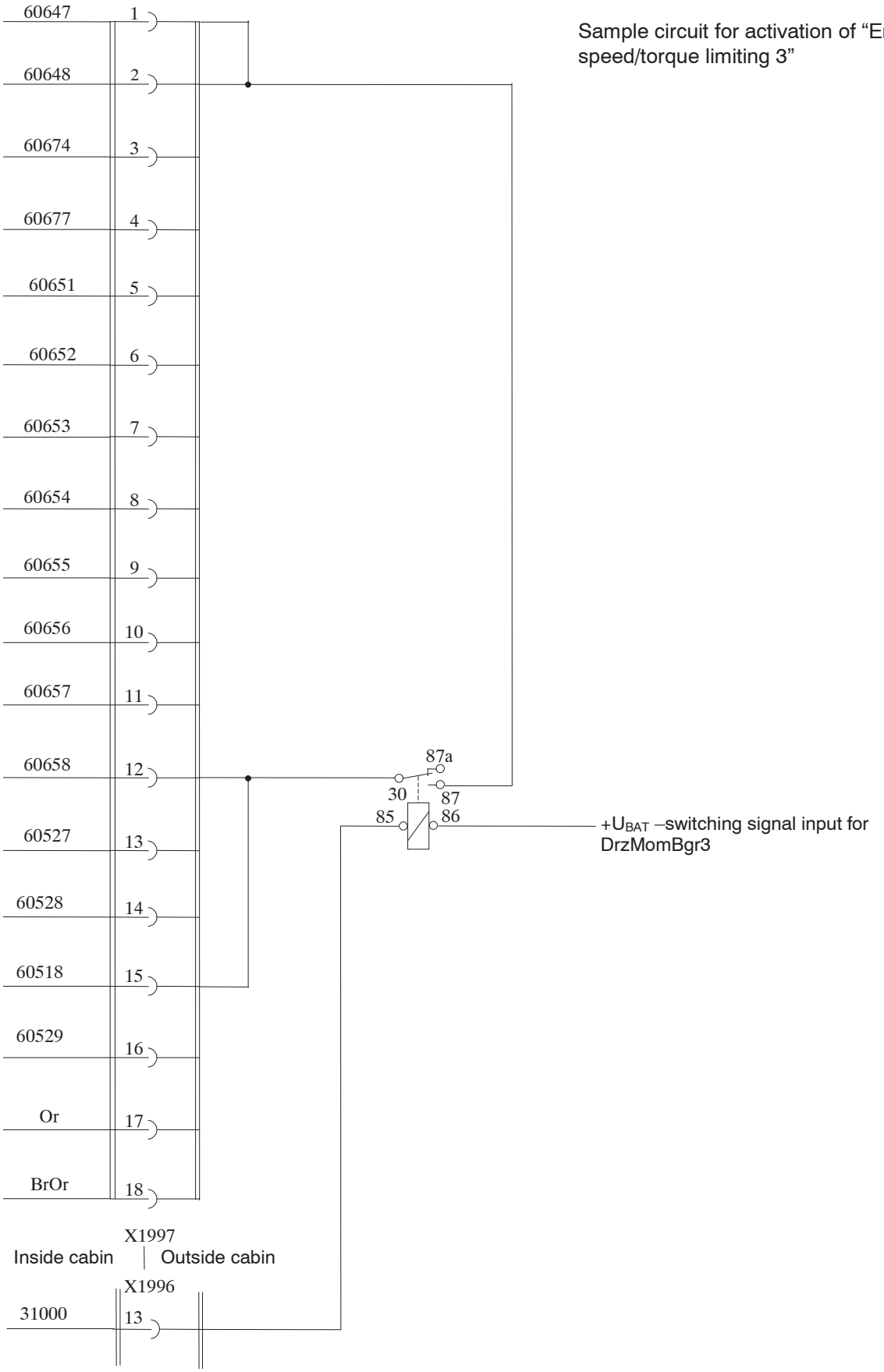
Sample circuit for activation of“Engine speed/torque limiting 1”

ZDR interface with KSM for external engine speed control for TGA



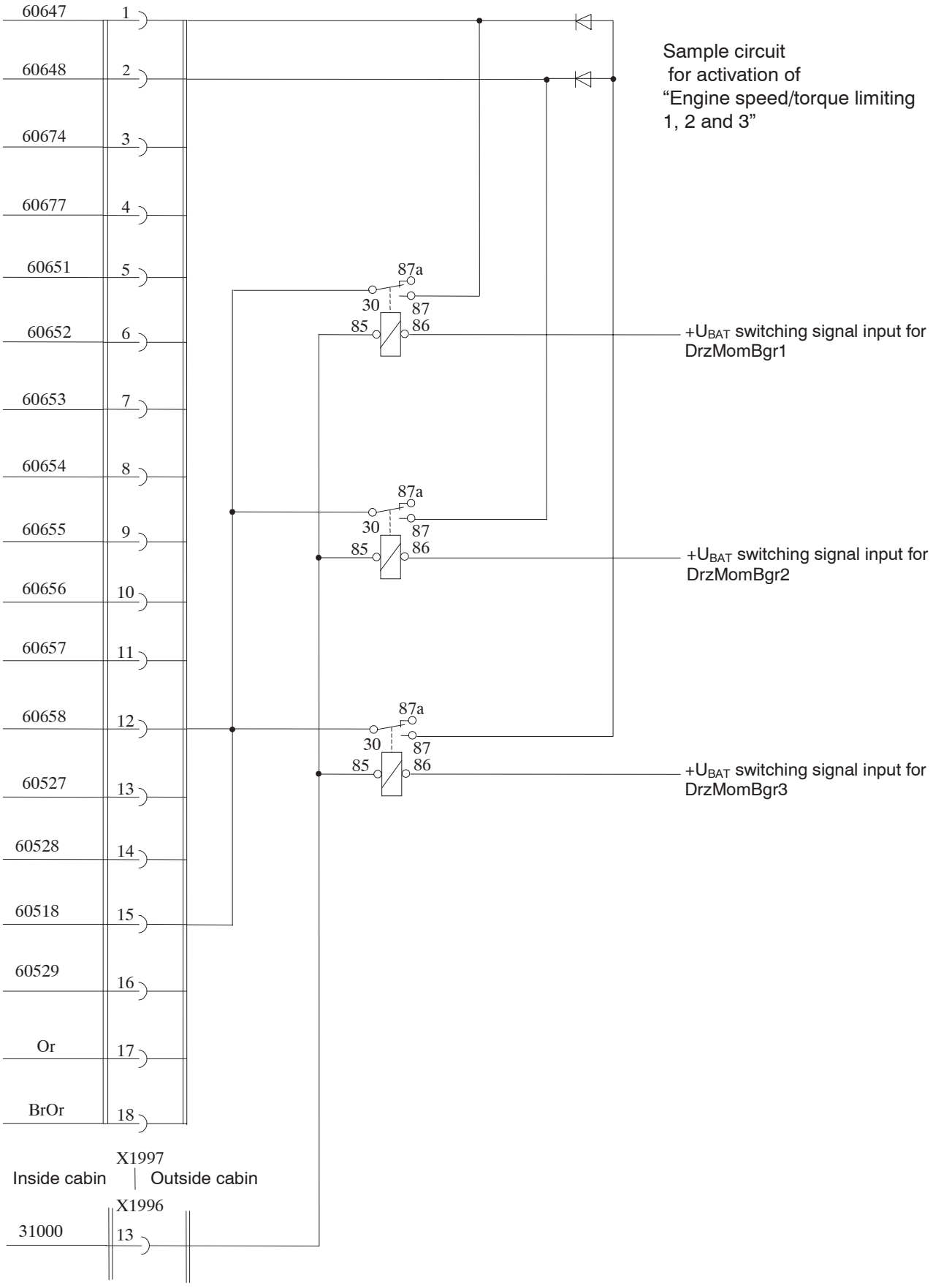
Sample circuit for activation of “Engine speed/torque limiting 2”

ZDR interface with KSM for external engine speed control for TGA

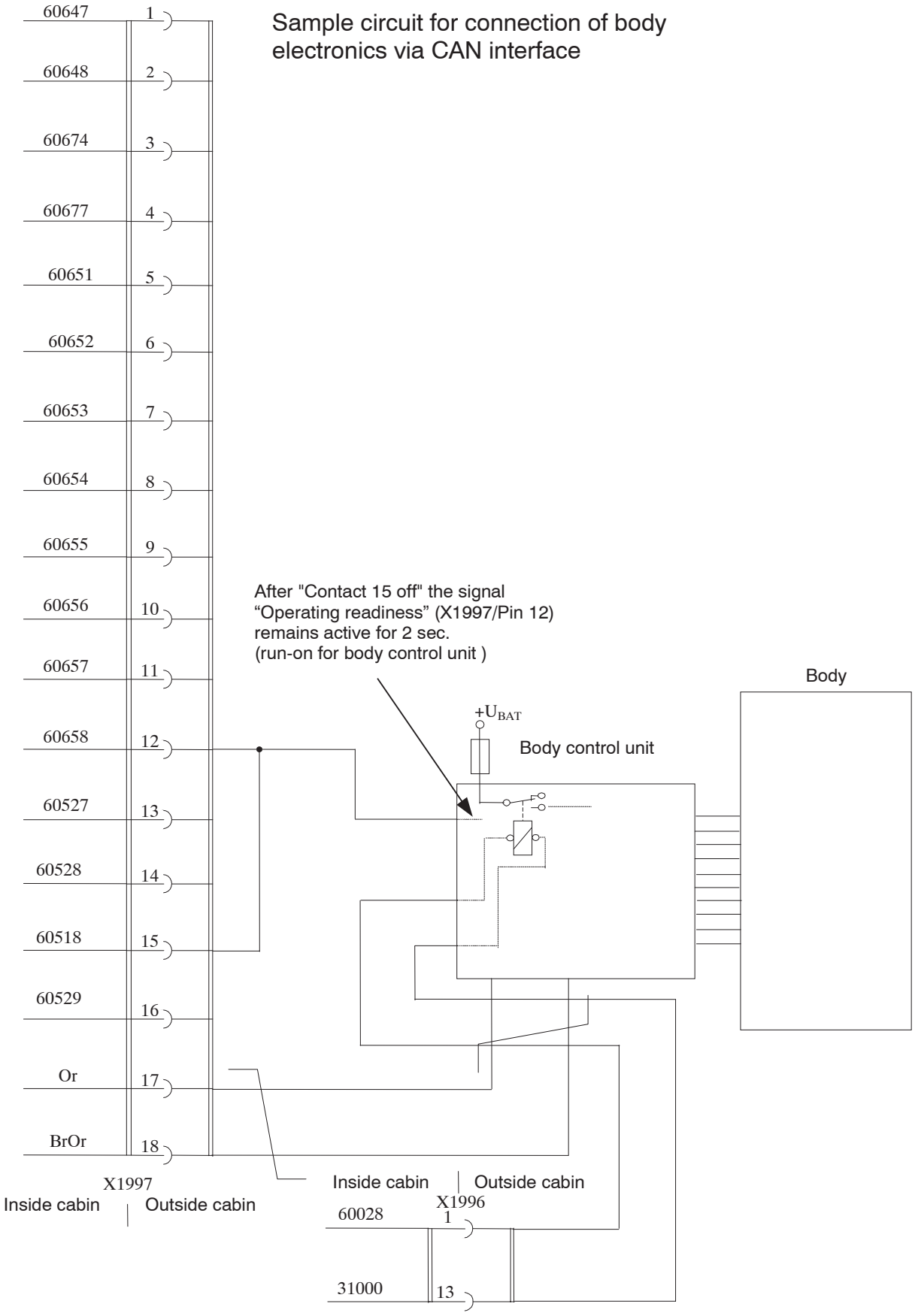


Sample circuit for activation of “Engine speed/torque limiting 3”

ZDR interface with KSM for external engine speed control for TGA



Sample circuit for connection of body electronics via CAN interface



11. Quick Reference for Interface Assignments

ZDR interface (FFR)* / series-production:

18-pin plug connector X1996 (natural/code 4)
Installed position: cabin separating point, right

Connecting plug	Cable number Cable cross-section	Function
X1996/1	60043 0.75	Term.15, central electrics (circuit breaker F582/6 A)
X1996/2	60525 0.75	ZDR 1+3+5+7
X1996/3	40354	NA1 demand
X1996/4	40141	NA1 status[1]
X1996/5	40355	NA2 demand[1]
X1996/6	40142	NA2 status[1]
X1996/7	60526 0.75	ZDR 2+3+6+7
X1996/8	60641 0.75	ZDR 4+5+6+7
X1996/9	60524 0.75	MDB input; external bridge between Pins 9 and 12
X1996/10	60534 0.75	MDB 2 (3,09 kΩ)
X1996/11	60535 0.75	MDB 1 (1,37 kΩ)
X1996/12	60530 0.75	MDB 0 (511 Ω)
X1996/13	31000 1	Earth for external circuits
X1996/14	60105 0.75	Engine speed[2]
X1996/15	60531 0.75	HGB 1 (511 Ω)
X1996/16	60533 0.75	HGB 2 (1,37 kΩ)
X1996/17	60639 0.75	HGB 3 (3,09 kΩ)
X1996/18	60523 0.75	HGB input; external bridge between Pins 15 and 18

***** A description of this interface can be found by

- MAN Service workshops and dealers in SI 68102
- Body constructors as “Intermediate engine speed control via interface to vehicle management computer (ZDR at FFR)” at www.manted.de

[1] only when power take-off is fitted
[2] only when “ZDR interface with KSM” is fitted

ZDR interface (KSM) / special equipment:

18-pin plug connector X1997 (natural/ code 6)
Installed position: cabin separating point, right

Connecting plug	Cable number Cable cross-section	Function
X1997/1	60647/0.75	DrzMomBgr 1+3
X1997/2	60648/0.75	DrzMomBgr 2+3
X1997/3	60674/0.75	LS1_Config (factory setting: coolant overheat warning)
X1997/4	60677/0.75	LS2_Config (factory setting: low oil pressure warning)
X1997/5	60651/0.75	HS1_Config (factory setting: hand brake)
X1997/6	60652/0.75	HS2_Config (factory setting: Brake)
X1997/7	60653/0.75	HS3_Config (factory setting: R_Gear)
X1997/8	60654/0.75	HS4_Config (factory setting: Clutch)
X1997/9	60655/0.75	LS3_Config (factory setting: Gearbox N)
X1997/10	60656/0.75	Telltale lamp
X1997/11	60657/0.75	HS5_Config (factory setting: Tank warning)
X1997/12	60658/1	Operating readiness
X1997/13	60527/0.75	SET+
X1997/14	60528/0.75	SET-
X1997/15	60518/0.75	OFF; external bridge between Pins 12 and 15
X1997/16	60529/0.75	MEM
X1997/17	orange/0.75	A-CAN – H
X1997/18	brown-orange/0.75	A-CAN – L

6-pin plug connector X3311 (blue/ code 3)
Installed position: cabin separating point, right

Connecting plug	Cable number Cable cross-section	Function
X3311/1	40363/0.75	NMV [1]
X3311/2	40155/0.75	Pressure switch, NMV [1]
X3311/3	60676/0.75	WSK open /upshift inhibit
X3311/4	60675/0.75	PWM_configuration
X3311/5	60678/0.75	Clutch released/external Gearbox N request
X3311/6	40501/0.75	Programme change HP transmission

[1] only with NMV fitted

6-pin plug connector X1428 (black)
Installed position: central electrics area

Connecting plug	Cable number Cable cross-section	Function
X1428/1	16507/1	Distance signal, tachograph
X1428/2	16514/1	Speed signal, tachograph
X1428/3	31000/1	Earth for external circuits
X1428/4	59104/1	Signal “Engine running”
X1428/5	71000/1	Signal “Reversing light on”
X1428/6	Not in use	Not in use

MAN Nutzfahrzeuge Aktiengesellschaft

Service Information

Process Instruction Product technology	Date 07.02.2003	Issued by VSTT	SI number **Supplement 1 to 71302en** **Interface for customer-specific control module**

Vehicles affected	TGA
Parts affected	Interface at customer-specific control module Step 0.5 (81.25816-7004)

Supplement	The interface description published with SI 71302 applies only to customer-specific module (KSM) 81.25816-7000. KSM 81.25816-7004 is now being installed, the interface of which differs from the preceding version. For KSM 81.25816-7004 (Step 0.5) you should therefore use the appendix to this supplement as a description of the interface. Note: Details of the transmitted and received messages of the body CAN (pages 11-31 of interface description) are not relevant to MAN workshops. They are solely for the body manufacturer's information. If not provided on the MAN-cats service computer, modifications to parameter settings should be ordered by applying to Section TDB for a vehicle parameter setting. **Important:** The CAN messages described in this interface description must only be retrieved and evaluated via A-CAN. Access via another CAN bus infringes MAN's assembly instructions and will lead to annulment of all warranty claims and of the vehicle's general operating permit (German: ABE). An exception to this will only be made following inspection and written approval by Dept. TDB. Wiring on the body side must only be undertaken at the interface. Tampering with cables on the vehicle side is not permitted, as stated in MAN body instructions.

Yours faithfully,
MAN Nutzfahrzeuge Aktiengesellschaft

ppa. ppa.

Distribution of this SI to the Germany/export service organisation			
Forwarding within organisation of MAN service workshop			
Workshop management	yes	Personnel in spare parts store	yes
Workshop personnel for performance of work	yes	24-hour service (fitters)	no
Workshop personnel in general (notice boards)	yes	Authorised customers' workshops	no

Technical prerequisites for retrofitting	1. ZBR 81.25806-7033 or higher 2. ZBR 81.25805-7015 or higher
Retrofitting	For the TGA, the interface for KSM Step 0.5 can either be ordered at the same time or retrofitted. When retrofitting, please note that not only the cable harness for the KSM in the driver's cab must be retrofitted. In addition, a connection must be made to the CAN drive harness (see page 6 of SI 71302). **Important:** The bridge between "ready for operation" (X1997 Pin 12) and "off" (X1997 Pin 15) must exist in order to use the ZDR functions (ZDR S and ZDR 1 to ZDR 7). Opening this bridge will switch off the ZDR and cruise control functions. An online upgrade of the 81.25816-7000 (18-pole interface) to 81.25816-7004 (18-pole + 6-pole interface) as specified by SI 101102 is not possible. This is to avoid the situation where the interface cabling no longer matches the changed pin assignments. When upgrading from 81.25816-7000 to 81.25816-7004 (via TDB), the wiring harness from the KSM control device to the interface should also be changed. Because the pin assignments have changed, the functions of the body should be rechecked.
Circuit diagrams	The circuit diagram of customer-specific control module Step 0.5 has changed. You will find the circuit diagram for KSM Step 0.5 from page 5 onwards.

Parts for retrofitting

Quantity	Description	Part number	Available from
1	Cable harness KSM Step 0.5, left-hand drive	81.25452-6767	immediately
1	Cable harness KSM Step 0.5, right-hand drive	81.25452-6768	Week 08
1	Cable harness, KSM bridge	81.25429-6452	Week 14
1	Control unit KSM Step 0.5	81.25816-7004	immediately
2	Automatic cutout, 8 A	81.25437-0118	immediately

For the parts needed for connection to the powertrain CAN, please see the listing on page 3 of SI 71302en.

Additional interface functions

Compared with the preceding version, the following functions have been added to the KSM Step 0.5 interface:

⇒ Information on vehicle's operating status
A -U_{batt} switching signal output has been added, the parameters of which can be set; it can be activated if engine or road speed threshholds are reached, or if the accelerator pedal is at a certain position (e.g. engine speed reaches the programmed lower speed threshold, accelerator pedal in kick-down position).

⇒ "Fail-safe" behaviour can be programmed.
Behaviour of switch signal outputs in the event of an error (CAN failure, signal failure) can be programmed.

⇒ Engine speed and torque limits are no longer addressed individually, but form a pair.
Standard limit settings/factory settings:

Signal	Engine speed (rpm)	Moment [%]
Engine speed/torque limit 0	4000	100
Engine speed/torque limit 1	1500	100
Engine speed/torque limit 2	1800	100
Engine speed/torque limit 3	1200	100

⇒ Information provided in addition to the body electronics via the CAN interface (A-CAN)[1]:

- Axle loads (depending on equipment specification)*
- NMV (Power take-off) requirement/status
- Engine running time (display of hours of operation)
- Positions of brake and clutch pedals
- Ratio of gearbox input speed to gearbox output speed
- Time of day/date

This information is not a standard part of the instrument display functions.

[1] You will find a complete list of all available information on the CAN interface in the appendix to this supplement.

* **Important:**
Axle load values cannot be calibrated. Deviations of up to several hundred kilograms are normal.

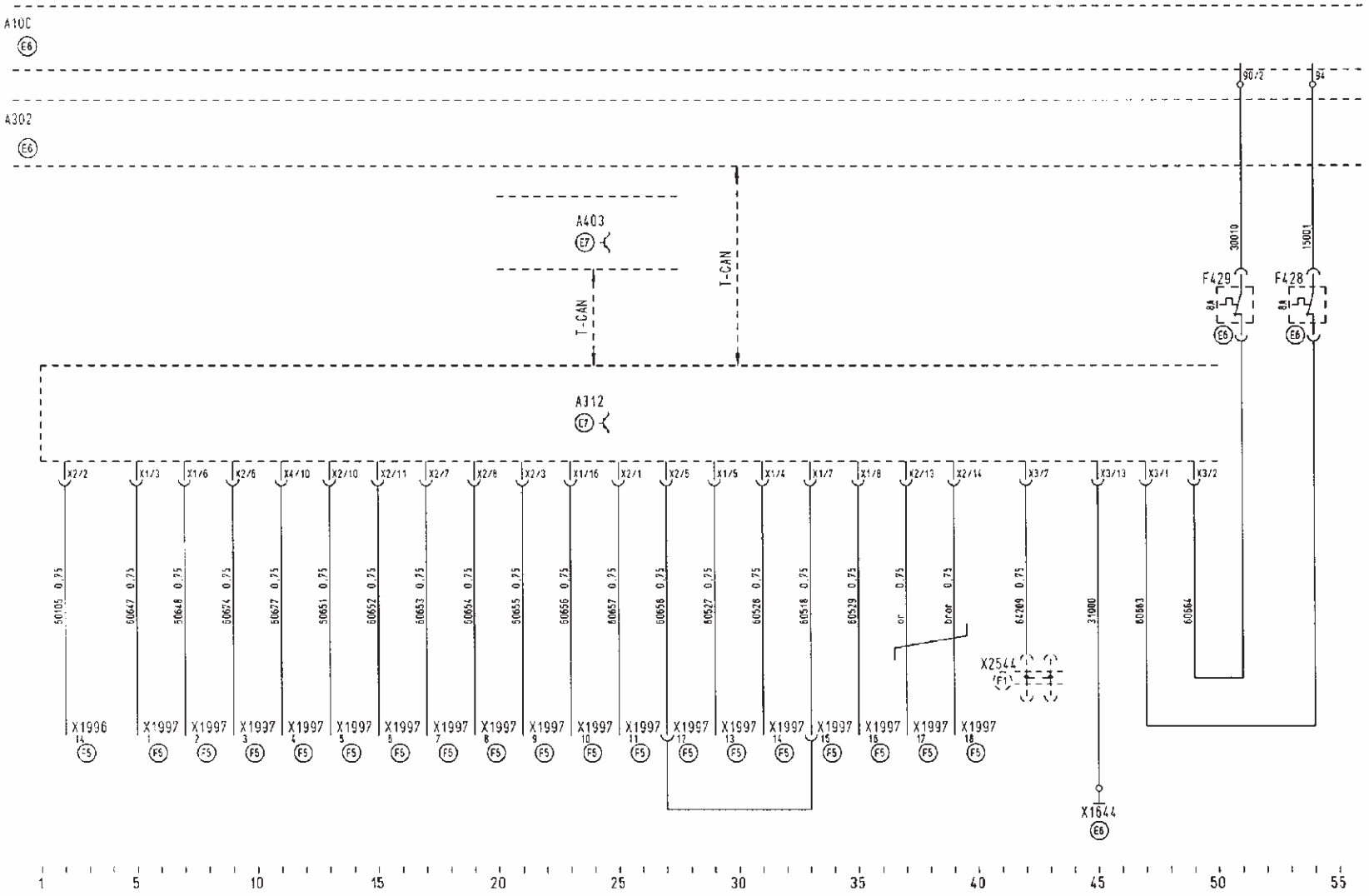
⇒ In addition, with Step 0.5 the requirement of a NMV (engine-governed power take-off) via the body CAN can be applied to the vehicle.

⇒ With the **F**leet **M**anagement **S**ystem (FMS) interface, the "Telematics Assembly" can be fed with the following information:

- Vehicle identification No.
(FIN/VIN as specified by ISO 3779 or MAN standard M1036-7)
- Total fuel consumption
- Fuel level
- Distance remaining before next service
- Information on FMS standard interface

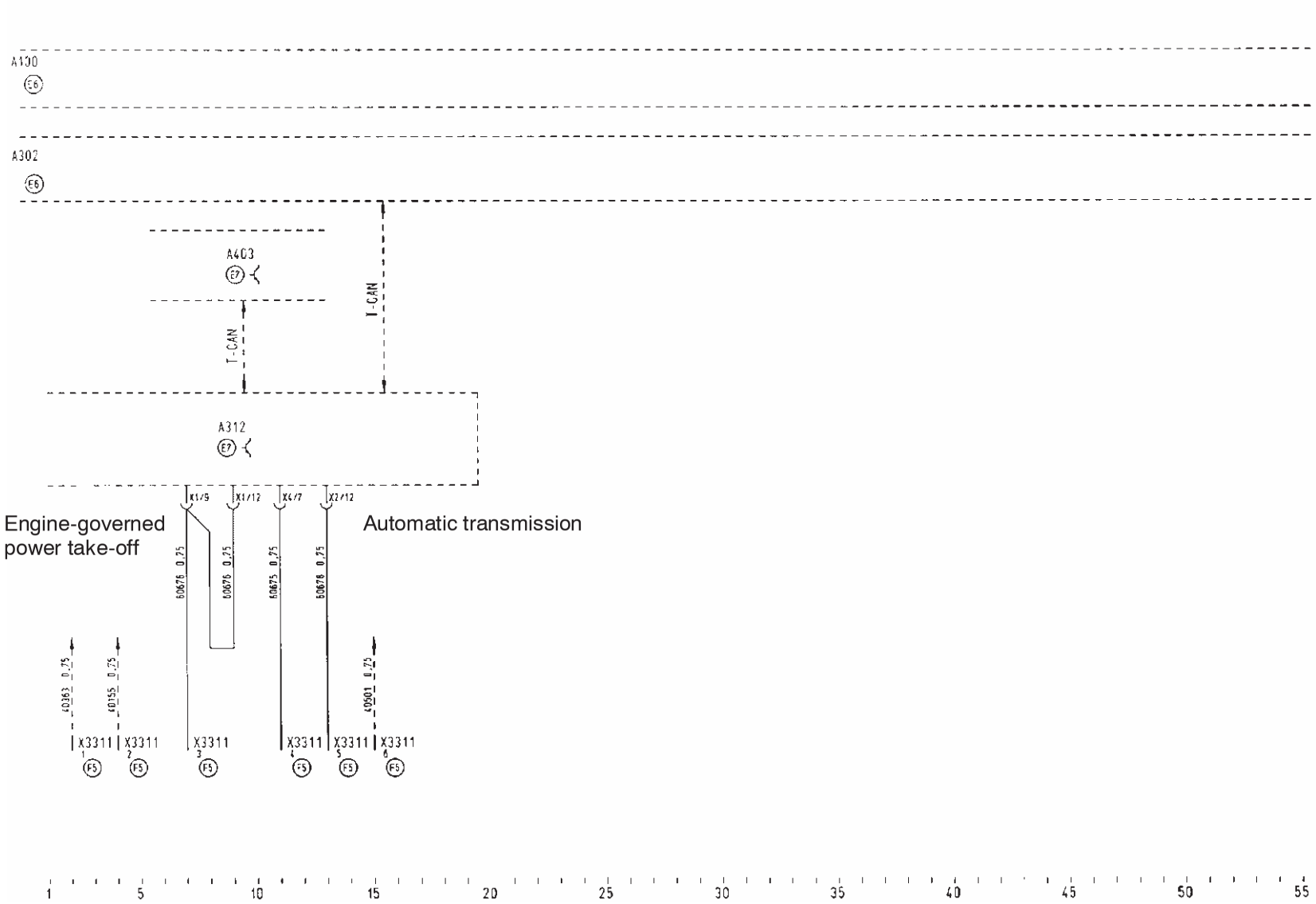
Error codes (not displayed on the A-CAN)	Additional error codes with KSM Step 0.5 Error location ..... SPN CAN Data bus: Time overrun upon reception of FFR message Fuel_Cons. ..... 03021 of ZBR message Dash_Disp. ..... 03022 of EBS/ECAS message Veh_Weight. ..... 03023 of FFR message Eng_Hour/Rev. ..... 03024 of tachograph message Veh_Ident. ..... 03025 of FFR message Service ..... 03026 of tachograph message TCO1 ..... 03027 of FFR message ERC1_RX. ..... 03028 of tachograph message BAM_TCO_VIN. ..... 03029 of tachograph message P_TCO_VIN. ..... 03030 DKR input (throttles - reduction option) ..... 03031 Signal frequency at DKR input (throttles - reduction option) ..... 03032 CAN data bus: timeout upon reception of body CAN message KSM2_A. ..... 03033 Power take-off output ..... 03034 Note: With KSM Step 0.5 the body CAN message (with SPN 03014) is not designated KSMA but KSM1_A.

Circuit diagram for KSM Step 0.5 Part 1



A100	Central electrical system
A302	ZBR
A312	KSM
A403	FFR
F428	Circuit cutout KSM Terminal 15
F429	Circuit cutout KSM Terminal 30
X1644	Earthing point next to central electrical system
X1996	Plug connection for ZDR interface (FFR)
X1997	Plug connection for ZDR interface (KSM)
X2544	Plug distributor for K-line (diagnostics)

Circuit diagram for KSM Step 0.5 Part 2



A100	Central electrical system
A302	ZBR
A312	KSM
A403	FFR
X3311	Plug connection for ZDR interface (KSM)

ZDR (INTERMEDIATE ENGINE SPEED CONTROL) INTERFACE WITH CUSTOMER SPECIFIC CONTROL MODULE (KSM) FOR EXTERNAL ENGINE SPEED CONTROL AND FLEET MANAGEMENT(FMS) INTERFACE ON TGA

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1. Areas of Application

This description of an interface will be useful to all vehicle body constructors who need an “external engine speed control system” on a MAN-commercial vehicle. The interface described here supplements and extends the standard “ZDR-Interface with FFR” and provides a much wider range of functions. Via the CAN interface of the KSM (A-CAN) it is possible to set up the Fleet Management System Interface (FMS-Interface). The interface implementation described here refers to the “Trucknology Generation” (TG) range of vehicles.

2. Terms and Abbreviations

The PIN description employs the following technical terms/abbreviations:

Term/abbreviation	Description (explanation in English)
A-CAN	Body CAN (German “**A**ufbauer” = body/superstructure constructors)
AUS	Switch off of FGR-/FGB-/ZDR function
DBG	Engine speed limiting
DE	Digital input
EMV	Electromagnetic compatibility
FFR	Vehicle management computer
FGR/FGB/ZDR	Vehicle speed control/-speed limiter/Intermediate engine engine speed control
FIN	Vehicle identification number acc. to ISO 3779 or MAN standard 1036-7
FMS	Fleet Management System
GETRIEBE-N	Neutral selected at gearbox
GMT	Greenwich Mean Time
HGB	Max speed limitation
High-side-Switch	Terminal 30 ($+U_{BAT}$) output switching
HP	ZFautomatic transmission HP...
KSM	Customer specific guidance/control module
KS	Short circuit
LED	Light emitting diode
Low-side-Schalter	Terminal 31 ($-U_{BAT}$) output switching
M3135	MAN factory standard (letter M + 4-digit number)
MAN-cats II	Computer diagnostic system MAN-Workshops
MBG	Torque limitation
MEMORY	Memory recovery of stored function
NA	Power take-off
NMV	Power take-off at front, engine-speed-dependent
PIN	Plug pin contact
PWM	Pulse width modulation
PTO	Power take-off
R-Gang	Reverse gear
SET-	Slow down or reduce engine speed, set value
SET+	Speed up or raise engine speed
SG	Control unit
T-CAN	Powertrain CAN (CAN = Controller Area Network)
$+U_{BAT}$	Battery +
$-U_{BAT}$	Battery -
UTC	Universal Time Code
VIN	Vehicle identification number ISO 3779 or MAN standard M 1036-7
ZBR	Central on-board computer
ZDR	Intermediate engine speed control/regulator

3. Guidelines and Standards also Applicable

- Currently valid guidelines covering the construction of trucks and articulated vehicles (semi-trailers), and here especially the manuals “Electrics” and “Trucknology Generation”, including all follwing supplements/ information for vehicle body constructors.
- MAN specification - Relays for commercial vehicles
- MAN standard M 3285 (EMV), also EU directives 72/245/EWG inc. 95/54/EWG
- MAN standard M 3135 (electric wiring)
- MAN standard M 1036-7 (Vehicle identification number)
- DIN 40 050
- DIN 40 839 Parts 1, 3 and 4
- DIN 57 879, Part 3
- VDE 0879, Part 3
- VG 95 370 to 95 377
- MIL-STO 461 and 462
- ISO 11898-24V
- SAE J1939/ff
- Bosch Specification 2.0B
- ISO 3779
- FMS Standard (www.fms-standard.com)

4. Addresses and competencies/responsibilities

Supply sources can be found in the MAN Guidelines for Body Constructors. These con be obtained from:

MAN Nutzfahrzeuge AG / Dept. TDB (Fax: +49 089 1580 4264)
Postfach 50 06 20
80976 Munich, Germany

5. GENERAL ADVICE ON THE ZDR-INTERFACE WITH KSM

- The interface is not included in the standard vehicle delivery specification and must be ordered separately.
- The desired parameters in the KSM control unit such as engine speed limiting, torque limiting etc. must be notified to the MAN sales team when placing the order. This information is passed on for factory programming.
- Preparation for the “Start-stop device” set-up is independent of the external engine speed control system interface and must be ordered separately.

  The attachment necessary for external “Engine start-stop” control is supplied rolled up in the cable harness at the rear end of the frame.
- "Accidental reversing prevention” for garbage collection vehicles is not included in the interface and must be ordered separately.
- **Extreme care is necessary when wiring up the interface. This activity is critical because it involves actions that fundamentally affect the on board network and the wiring for the electronics.**
- Only use suitable electric wiring that conforms to MAN standard M 3135.
- Use only relays that meet the requirements set out in the MAN relay specification for external circuits.
- Make absolutely sure that wires are crimped strictly according to makers’ instructions.
- Any external controls incorporated by the constructor must meet enclosure standards according to IP69K DIN 40 050 and in addition be secure against external tampering.
- The power supply ($+U_{BAT}$) for body equipment and control units incorporated by the constructor must be led from the batteries via a suitable separate circuit protection device or fuse. It is not permissible to take off more than 12 volts from a single battery.
- A separate cable must be used for electrical earthing and connected to the common earth point on the engine mounting (never use the vehicle frame as an earth conductor).
- Do not link together several items of externally switched equipment with different earth potentials.
- **Circuits at the interface must be decoupled from the power supply circuit to the body control systems.**
- External switching systems must meet the demands of MAN standard M 3285 for commercial vehicle systems. For example, radio systems such as radio-operated remote control devices must not have any effect on the functions described in this MAN standard.
- **Diagrams and pictures supplied by MAN to illustrate and provide examples of electrical circuits are not to be regarded as specific assembly instructions. The responsibility for the circuits at the interface rests entirely with the party carrying out the work.**

6. Notes and hints for setting up the parameters for the KSM

6.1. Fandamental functions regulating intermediate engine speed settings

- Setting of individual ZDR parameters is carried out in the FFR. Individual modes can be selected externally (outside the driver's cabin) if required via the standard ZDR interface(FFR).
- Possible parameters and also the PIN description of the "ZDR-interface with FFR" are described in the document "ZDR-interface with vehicle management computer for external intermediate engine speed control on the TG (Trucknology Generation) range".
- Using the "ZDR-interface with KSM", the functions "SET+", "SET-", "MEMORY" and "OFF/AUS" (familiar from the cruise control) are available for external use outside the driver's cabin.
- Additionally other intermediate engine speeds can be obtained by activating an engine speed limiter.

6.2. Various opportunities for setting up parameters with the KSM

Using MAN-cats II different function parameters can set up in the KSM.

- Engine speed and torque limiting:
  Activating the DrzMomBgr-Pins (X1997/Pin 1 and 2) permits selection of the engine speed and torque limit parameters.

  Factory settings:

Signal		Engine speed	Torque
Engine speed/torque limit	0	4000 rev/min	100%
Engine speed/torque limit	1	1500 rev/min	100%
Engine speed/torque limit	2	1800 rev/min	100%
Engine speed/torque limit	3	1200 rev/min	100%

- Engine speeds
  Parameters can be set for both the number of impulses per engine revolution) as well as the engine speed threshold from which the square-wave signal (50/50 sensing ratio) is transmitted.

  Factory setting:

Signal:	No. of impulses	Speed threshold
Engine speed	6	60 rev/min

- ZDR digital entries:
  Parameters can be set to choose whether the SET+/-, MEMORY and AUS (Off) entries are supported. If these entries are supported, any corresponding parameter settings that the A-CAN calls for will be ignored. If the entries are not supported, any parameters set by the A-CAN are passed on and possible signals at the digital entries are ignored.

  Factory setting:

ZDR command:	Digital entries	A-CAN requirement
SET +/-, MEM, AUS	X	

- A-CAN interface:
  For possible parameter settings, see Chapter 7.2.

- Error recognition in the following switching signal outputs:
  - High-side switch
    - Parking brake (X1997/Pin 5)
    - Brake (X1997/Pin 6)
    - Reverse gear (R_Gang) (X1997/Pin 7)
    - Clutch (X1997/Pin 8)
    - Monitor signal lamp (X1997/Pin 10) (installed by body constructor)
    - Tank warning (X1997/Pin 11) (installed by body constructor)
    - Operating readiness of KSM (X1997/Pin 12)
  - Low-side switch
    - Ls1_config (X1997/Pin 3)
    - Ls2_config (X1997/Pin 4)
    - Gearboxs-N (X1997/Pin 9)

  The following error recognition variations are possible:

  - No error recognition
    Switch signal output not monitored
  - With error recognition
    ⇒ Monitoring high-side switch:
    Signal high: short circuit to earth is monitored
    Signal low: short circuit to $+U_{BAT}$ and open circuit are monitored
    ⇒ Monitoring low-side switch:
    Signal high: short circuit to earth monitored and open circuit are monitored
    Signal low: short circuit to $+U_{BAT}$ is monitored
  - With error recognition and test impulses (“extended error monitoring”)
    ⇒ Test impulses during KSM system start (up to approx. 3 seconds after “terminal 15 on”)
    During system start, short circuits to $+U_{BAT}$, short circuits to earth and open circuits are monitored; thereafter error monitoring is dependent on which -switch signal output version is used.
    ⇒ Test impulses
    Independent of the -switch signal output version, short circuits to $+U_{BAT}$, short circuits to earth and open circuits are monitored after “Terminal 15 on”.

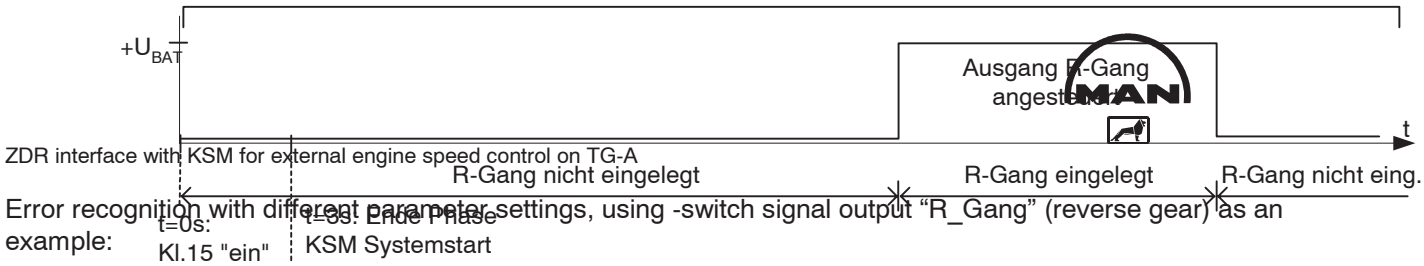
  Preconditions for error recognition:

  Load at output for high-side switches no greater than 400 Ω, for low-side switches no greater than 2000 Ω.

  Note:

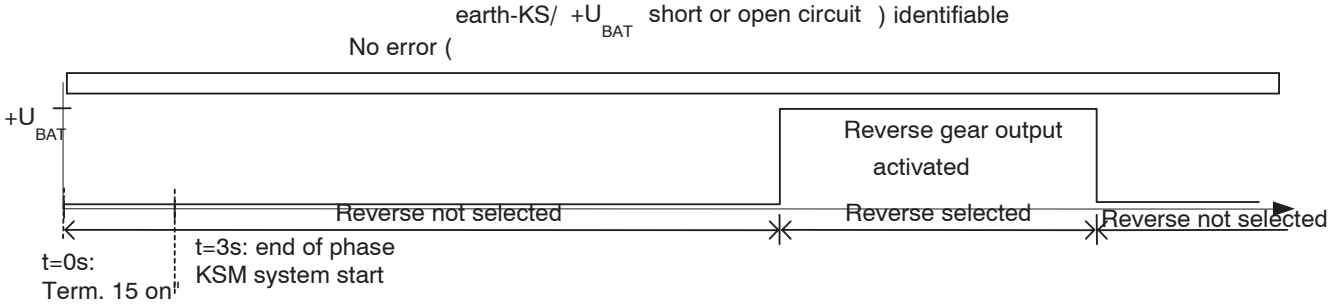
  Activating error recognition greatly improves the diagnostic depth and range of components attached to the “ZDR interface with KSM”, which leads to an increase in functional reliability and the general availability of the vehicle.

kein Fehler (Masse-KS/+U_{BAT}-KS o. Unterbrechung) erkennbar

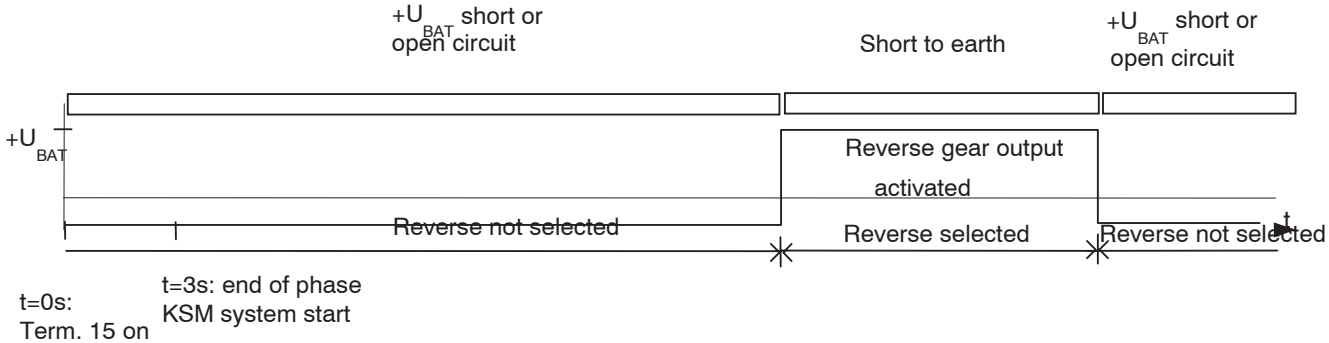


Error recognition with different parameter settings, using -switch signal output “R_Gang” (reverse gear) as an example:

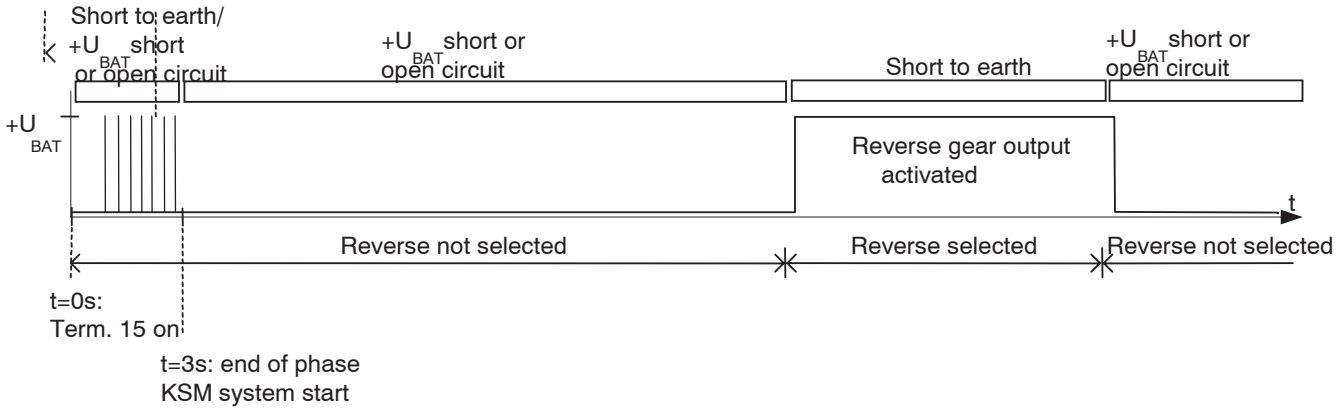
- Output not supported (load is connected):
  Error recognition not active **[error recognition “0”]**



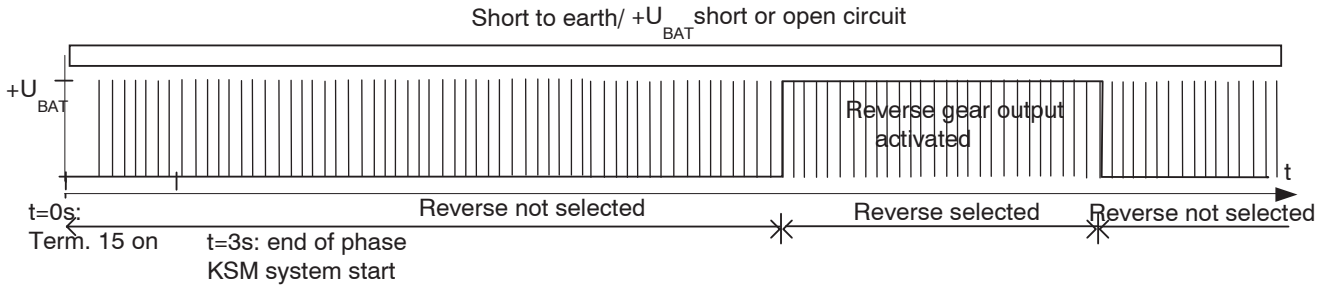
- Output supported (load must be connected!):
  Error recognition active. current condition of the output is monitored **[error recognition “1”]**



- Output supported (load must be connected!):
  Error recognition active: current condition of output is being monitored, test impulse only on the KSM control unit run-up. (Test for short to earth on high-side switches and test for U_{BAT} short on low-side switches) **[error recognition “2”]**



Output supported (load must be connected!):
Error recognition active: current condition of output is being monitored and test impulse cyclically (permanent monitoring for short to earth on high-side switchesand for U_{BAT} short on low-side switches **[Error recognition "3"]**



Note:
The test impulses last for approx. 1 ms and have a repeat time of 300 ms.

Factory setting of error recognition -switch signal outputs:

Signal:	Error recog. "0"	Error recog. "1"	Error recog. "2"	Error recog. "3"
Parking brake	X			
Brake	X			
R-gear	X			
Clutch	X			
Telltale lamp	X			
Tank warning	X			
Oper. readiness	X			
Ls1_konfig	X			
Ls2_konfig	X			
Gearbox N	X			

- "Fail-safe" behaviour at -switch signal outputs:
  Parameters for different reactions in the event of errors can be set independently for all -switch signal outputs. If the driver component is in an activated condition, the reaction required in the case of unknown/erroneous information (CAN failure/signal (sensor) failure) can be set up as a parameter:

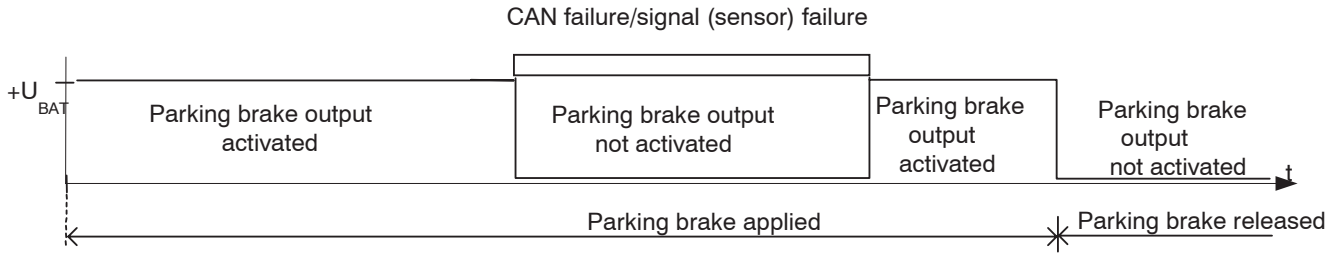
  - Switching signal output "do not freeze"
    Driver component changes from active parametrised condition to passive condition in the event of CAN failure/signal (sensor) failure.

  - Switching signal output "freeze"
    Driver component is frozen in the active parametrised condition on CAN failure/signal (sensor) failure, until a valid signal is received again. The driver component remains passive after a Term. 15 reset if the CAN failure/signal (sensor) failure is still present.

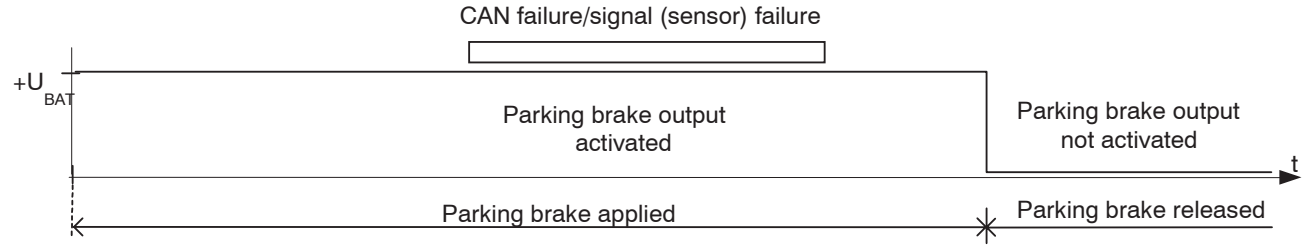
  This opportunity to set parameters makes it possible to avoid a situation in which an unwanted reaction (release/block/switch off assemblies etc.) occurs and would cause external bodycomponents connected to the interface to react because of a CAN failure/signal (sensor) failure.

An example is the parametisation of “fail-safe” behaviour of the parking brake output dependent on parametisation:

- Output “do not freeze”:
  Output changes to passive state in event of a CAN failure/signal (sensor) failure



- Output “freeze”:
  In event of a CAN failure/signal (sensor) failure, output remains active in the activated condition.



“Fail-safe” behaviour of -switch signal outputs with factory settings:

Signal:	“freeze”	“do not freeze”
Parking brake		X
Brake		X
Reverse		X
Clutch		X
Tank warning	X	
Ls1_config		X
Ls2_config		X
Gearbox N		X

7. A-CAN interface with FMS interface

7.1. General points

For communication purposes the A-CAN (body constructors' CAN) offers a High-Speed CAN-interface ISO 11898-24V and specification 2.0B. The data transmission speed is 250kbit/s.
To protect the MAN CAN-integrated net system on the vehicle against external interference/influences, the CAN is fully galvanically separated.
A 120Ω terminal resistor is included in the KSM as A-CAN bus termination; a CAN filter choke is also provided.

The CAN-data communication lead is a 2-wire twisted lead running up to the interface (MAN part number: 07.08132.4384). The lead from the interface to the body-side control unit (e.g. telematics module) should be as short as possible – for electromagnetic reasons – and must be in twisted form (see ISO 11898-24V).
Here too, use leads with MAN article number 07.08132.4384.
For this MAN recommends leads with MAN article number 07.08132.4384 (FLRY-2x0,75-B-28-or-bror).

MAN's Definition of the A-CAN is based on SAE J1939/ff.
The identification numbers in brackets relate to SAE J1939/71 "VEHICLE APPLICATION LAYER".
Implementation of the FMS interface is based on the "FMS-standard interface" commonly specified by several European truck manufacturers (www.fms-standard.com).

7.2. Setting parameters for the A-CAN

- Each message received by the KSM on the T-CAN is also transmitted on the A-CAN; however, the parameter settings can be chosen such that individual or all messages from the KSM and supplied to the A-CAN are stopped (not transmitted).
- Every A-CAN received message (KSM1_A, KSM2_A) can be parametrised regardless of whether it is ignored or further processed by the KSM.
- Reception timeout can also be parametrised, and if necessary the identifier of the reception message as well.
- For both reception messages it is possible to parametrise a "dead time" starting from Term. 15 "on". The actual timeout surveillance of messages from the body-side electronics to the KSM starts only after this preset time delay. This permits tailoring of the KSM to match the run-up time of the body-side electronics if necessary, without having to extend the actual time-out surveillance period for incoming KSM messages (KSM1_A, KSM2_A).

7.3. Vehicle condition Information on the A-CAN

Dependent on the vehicle equipment level and parametisation of the KSM, the following information about the body electronic systems may be made available via the A-CAN:

Standard specification of A-CAN interface:

- ABS active/not active
- Axle load (depending on equipment)
- Current/previous gear
- Brake circuit 1 and 2
- Brake pedal operation
- Brake pedal position
- Cruise control active/not active
- Accelerator pedal position
- Road speed
- Parking brake and/or trailer supply air pressure
- Parking brake operation
- Gear selected
- Total distance reading
- Total engine running time
- Gearbox output speed
- Gearbox input speed
- Gearbox in neutral
- Selected gear
- Kickdown position
- Fuel temperature
- Coolant temperature
- Clutch pedal operated
- Idle position
- Air pressure (ambient)
- Air temperature (ambient)
- Engine speed
- Engine torque/injection volume
- Engine oil pressure
- Engine oil temperature
- NA1 requested/active
- NA2 requested/active
- NMV requested/active
- PTO status (According to FMS values)
- Reverse selected/not selected
- Tachograph information
- Trip distance recorder
- Powertrain open/closed
- Time/date (GMT = Greenwich Mean Time)
- Ratio of gearbox input/output speeds
- Supply pressure for optional extras/special equipment

Special equipment in connection with parametrised and activated FMS interface:

- Vehicle Ident. No.
- Total fuel consumption
- FMS standard interface info
- Fuel level in tank
- Remaining disrtance before next service (according to FMS values)

7.4. Possible demands on the KSM via the A-CAN

KSM can accept the following requests on the A-CAN from the body-side electronics for further processing by the FFR:

- Torque demand/limit request
- Engine speed demand/limit request
- Request from the ZDR control unit Mode S, 1-7
- Request to ZDR- control (SET+/-, MEM, AUS)
- Max speed limiting
- External engine start/stop (engine stop only is possible on engine with inline injection pump [EDC MS6.1]; engine start and stop are possible on common-rail engine [EDC7])
- NMV (power take-off) request

7.5. A-CAN output messages

Following messages can be supplied by KSM to the A-CAN:

ETC1: Electronic Transmission Controller #1 (3.3.5 = Chapter of SAE J1939/ff) 0CF00203

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	240	2	3	0x00F002	0x0CF00203

Byte	Bit	Description		
1	8 to 3	XX (non-essential information for body constructor)		
	2 and 1	[driveline_engaged] (3.2.2.6)		
		00	Driveline disengaged	
		01	Driveline engaged	
		10	Error	
		11	not available	
2 and 3	---	[output_speed_TCU] (3.2.1.14)		
		rpm pro bit = 0,125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
4	---	[clutch_slip] (3.2.1.20)		
		% pro bit = 0,4	Offset [%] = 0	Range [%] = 0 to 100
5	---	XX		
6 and 7	---	[input_speed] (3.2.5.55)		
		rpm pro bit = 0,125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
8	---	XX		

ETC2: Electronic Transmission Control unit #2 (3.3.8) 18F00503

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	5	6	0x00F005	0x18F00503

Byte	Bit	Description		
1	---	[selected_gear] (3.2.1.23)		
2 and 3	---	[actual_gear_ratio] (3.2.1.25)		
		0,001 pro Bit	Offset = 0	Range = 0 ... 64,255
4	---	[current_gear] (3.1.2.22)		
5 to 8	---	XX		

Note:

Offset = -125	Range = -125 ... 125
Positive values represent forward gears, negative values reverse gears. “0” is used for neutral in the gearbox, “126” for “Park” (automatic transmission)	

ETC3: Electronic Transmission Control unit #3 (3.3.50) 1CFEC703

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Every second or in case of status change	8 bytes	254	199	7	0x00FEC7	0x1CFEC703

Byte	Bit	Description	
1 and 2	---	XX	
3	8 to 5	XX	
	4 and 3	Engagement indicator [shift_finger_status_1] (3.2.6.20)	
		00	off
		01	on
		10	error
		11	not available
	2 and 1	Neutral indicator (3.2.6.19)	
		00	off
		01	on
		10	error
		11	not available
4 to 6	---	XX	
7	8 and 7	not defined	
	6 to 4	[PTO2_state]	
		0x1	requested
		01x	Active
		1xx	not defined
	3 to 1	[PTO1_state]	
		0x1	requested
		01x	active
		1xx	not defined
8	---	XX	

Note:
Status of auxiliary power take-off is not defined according to SAE 1939/71.

Ccveh_speed: Cruise control/vehicle speed (3.3.31) 18FEF100

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	254	241	6	0x00FEF1	0x18FEF100

Byte	Bit	Description			
1	8 to 5	XX			
	4 and 3	[park_brake_switch] (3.2.6.8)			
		00	Parking brake not set		
		01	Parking brake set		
		10	error		
		11	not available		
	2 and 1	XX			
2 and 3	---	[veh_speed_FFR] (3.2.1.12)			
		km/h pro Bit = 1/256	Offset [km/h] = 0	Range [km/h] = 0 ... 251	
4	8 and 7	[clutch_switch] (3.2.6.12)			
		00	Clutch pedal released		
		01	Clutch pedal depressed		
		10	error		
		11	not available		
	6 and 5	[brake_switch] (3.2.6.11)			
		00	Brake pedal released		
		01	Brake pedal depressed		
		10	error		
		11	not available		
	4 and 3	XX			
	2 and 1	[CC_active] (3.2.6.9)			
		00	Cruise control switched off		
		01	Cruise control switched on		
		10	error		
		11	not available		
5 to 6	---	XX			
7	8 to 6	XX			
	5 to 1	PTO Status (3.2.2.19)			
		00000	Off/disabled		
		00101	Set		
		11111	not available		
8	---	XX			

EBC1: Electronic Brake Control unit #1 (3.3.4) 18F0010B

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	1	6	0x00F001	0x18F0010B

Byte	Bit	Description		
1	8 and 7	XX		
	6 and 5	[ABS_active] (3.2.2.9)		
		00	ABS passive but installed	
		01	ABS active	
		10	reserved	
		11	don't care	
	4 to 1	XX		
2	---	Brake pedal position [BP_position] (3.2.1.18)		
		0,4% pro Bit	Offset = 0 %	Range = 0% ... 100%
3 to 8	---	XX		

AUX_STAT_ZBR1: Auxiliary state I/O body control unit #1 0x18FFA121

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Every second or with change of status	8 bytes	255	$161/A1_{hex}$	6	0x00FFA1	0x18FFA121

Byte	Bit	Description	
1	8 and 7	Reverse gear not selected (manual gearbox)	
		00	off
		01	on
		10	error
		11	not available
	6 and 5	Info: fuel level in current tank too low	
		00	off
		01	on
		10	error
		11	not available
	4 to 1	XX	
2	8 to 3	XX	
	2 and 1	Info NOT-AUS	
		00	off
		01	on
		10	error
		11	not available
3 to 8	--	XX	

EEC1: Electronic engine control unit #1 (3.3.7) 0CF00400

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
20 ms	8 bytes	240	4	3	0x00F004	0x00F00400

Byte	Bit	Description		
1 and 2	---	XX		
3	---	Actual engine torque [act_eng_torque] (3.2.1.5)		
		1% pro Bit	Offset = -125 %	Range = -125% ... 125%
4 and 5	---	Engine speed [engine_speed] (3.2.1.9)		
		0,125 rpm pro Bit	Offset = 0 rpm	Range = 0 rpm ... 8031.875 rpm
6 to 8	---	XX		

EEC2: Electronic engine control unit #2 (3.3.6) 0CF00300

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	240	3	3	0x00F003	0x00F00300

Byte	Bit	Description	
1	8 to 5	not defined	
	4 to3	Accelerator pedal (AP) kickdown switch [AP_kickdown_sw] (3.2.2.5)	
		00	Kickdown passive
		01	Kickdown active
		10	error
		11	not available
	2 and 1	Accelerator pedal (AP) low idle switch [AP_low_idle_sw] (3.2.2.4)	
		00	AP not in low idle condition
		01	AP in low idle condition
		10	error
		11	not available
2	---	Accelerator pedal (AP) position [AP_position] (3.2.1.8)	
		0,4 % pro Bit	Offset = 0 % Range = 0% ... 100%
3	---	Load at current speed [load_curr_speed] (3.2.1.7)	
		1 % pro Bit	Offset = 0 % Range = 0% ... 100%
4 to 8	---	XX	

EngFlui_LevPre: Engine fluid level/pressure (3.3.29) 18FEEF00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
500 ms	8 bytes	254	239	6	0x00FEEF	0x00FEEF00

Byte	Bit	Description		
1 to 3	---	XX		
4	---	Engine oil pressure [eng_oil_press] (3.2.5.28)		
		40 mbar pro Bit	Offset = 0 mbar	Range = 0 bar ... 10 bar
5 to 8	---	XX		

Eng_Temp: Engine temperature (3.3.28) 18FEEE00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	238	6	0x00FEEE	0x00FEEE00

Byte	Bit	Description		
1	---	Engine coolant temperature [eng_cool_temp] (3.2.5.5)		
		1 °C pro Bit	Offset = -40 °C	Range = -40 °C ... 210 °C
2	---	Fuel temperature [fuel_temp] (3.2.5.14)		
		1 °C pro Bit	Offset = -40 °C	Range = -40 °C ... 210 °C
3 and 4	---	Engine oil temperature [eng_oil_temp] (3.2.5.15)		
		0.03125 °C pro Bit	Offset = -273 °C	Range = -273°C ... 1735°C
5 to 8	---	XX		

ECAM1: Air/pneumatic supply pressure 3.3.75 (ECAM1) 18FEAE30

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	174	6	65,198	0x18FEAE30

Byte	Bit	Description
1	---	SAE: Pneumatic supply pressure (not used by MAN) [pneu_supply_press]
2	---	SAE: Parking and /or trailer air pressure (MAN: circuit 3 {23}) [park_trailer_press]
3	---	SAE: Service brake air pressure, circuit #1 (MAN: circuit 1 {21}) [serv_brake_press1]
4	---	SAE: Service brake air pressure, circuit #2 (MAN: circuit 2 {22}) [serv_brake_press2]
5	---	SAE: Auxiliary equipment supply pressure (MAN: circuit 4 {24}) [aux_equip_press]
6	---	SAE: Air suspension pressure (MAN: Vorkreis) [air_susp_press]
7 to 8	---	XX

Note:

MAN: Byte 6 does not show the air suspension pressure Resolution for Byte 1 to 6		
80 mbar pro bit	Offset = 0 mbar	Range = 0 bar ... 20 bar

Amb_Cond: Ambient conditions (3.3.35) 18FEF500

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	245	6	0x00FEF5	0x00FEF500

Byte	Bit	Description		
1	---	Barometric pressure [barometric_press] (3.2.5.43)*		
		5 mbar pro Bit	Offset = 0 mbar	Range = 0 ... 1,25 bar
2 and 3	---	XX		
4 and 5	---	Ambient air temperature [amb_air_temp] (3.2.5.12)		
		0.03125 °C pro Bit	Offset = -273 °C	Range = -273 ... 1735.0°C
6 to 8	---	XX		

* Warning: these values cannot be calibrated

Time_Date: Time /Date (3.3.20) 18FEE6EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	230	6	FF0A	18FEE6EE

Byte	Bit	Description		
1	---	Seconds [seconds] (3.2.5.93)		
		0,25 s pro Bit	Offset = 0 s	Range = 0 ... 59,75 s
2	---	Minutes [minutes] (3.2.5.94)		
		1 min pro Bit	Offset = 0 min	Range = 0 ... 59 min
3	---	Hours [hours] (3.2.5.110)		
		1 h pro Bit	Offset = 0 h	Range = 0 ... 23 h
4	---	Month [month] (3.2.5.112)[1]		
		1 Month pro Bit	Offset = 0 Month	Range = 0 ... 12 Months
5	---	Day [day] (3.2.5.111)[2]		
		0,25 Days pro Bit	Offset = 0 Days	Range = 0 ... 31,75 Days
6	---	Year [year] (3.2.5.113)		
		1 Year pro Bit	Offset = +1985 Years	Range = 1985 ... 2235 Years
7	---	Local Minute Offset (3.2.5.296)		
		1 min pro Bit	Offset = -125 min	Range = of –59min to +59 min
8	---	Local Hour Offset (3.2.5.297)		
		1 h pro Bit	Offset = -125 h	Range = of –23 h to +23 h

Note:

[1] Value “0” is not used. Value “1” = “January”, value “2” = “February” and so on.

[2] Value “0” is not used. Values 1 to 4 (0,25 days/Bit) correspond to first day of the month, values 5 to 8 correspond to the second day of the month and so on.

Veh_dist: Vehicle Distance high resolution (3.3.54) 18FEC1EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	193	6	FEC1	18FEC1EE

Byte	Bit	Description		
1 to 4	---	High resolution total vehicle distance [tot_veh_dist] (3.2.5.106)		
		5 m pro Bit	Offset = 0 m	Range = 0 ... 21 055 406 km
5 to 8	---	High resolution trip distance [trip_distance] (3.2.5.107)		
		5 m pro Bit	Offset = 0 m	Range = 0 ... 21 055 406 km

Eng_HourRev: Engine Hours, Engine speeds (3.3.19) 18FEE527

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	229	6	0x00FEE5	18FEE527

Byte	Bit	Description		
1 to 4	---	Total engine hours [total_eng_hours] (3.2.5.61)		
		0,05 h pro Bit	Offset = 0 h	Range = 0 ... 210 554 060.75 h
5 to 8	---	XX		

Veh_Weight_EBS: Vehicle weight EBS 18FEEA0B

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	234	6	65,258	18FEEA0B

Byte	Bit	Description	
1	8 to 5	Axle location [axle_location] (3.2.5.95)	
		0000	Axle 1
		0001	Axle 2
		0010	Axle 3
		0011	Axle 4
		0100	Axle 5
		0101	Axle 6
		0110	Axle 7
		0111	Axle 8
		1000	Axle 9
		1001	Axle 10
		1010	Axle 11
		1011	Axle 12
		1100	Axle 13
		1101	Axle 14
		1110	Axle 15
		1111	Axle 16
	4 to 1	---	not available
2 and 3	---	Axle weight [axle_weight] (3.2.5.80	
		0,5 kg pro Bit	Offset = 0 kg	Range = 0 kg ... 32127.5 kg
4 to 8	---	XX	

Warning:
The axle weights shown here cannot be calibrated; a deviation of up to several hundred kilograms is normal. The information shown is not a standard part of the instrument functions. The functions shown here depend on the vehicle equipment and are limited to this interface.

Veh_Weight_ECAS: Vehicle weight ECAS 18FEEA2F

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	234	6	00FEEA	18FEEA2F

Byte	Bit	Description		
1	8 to 5	Axle location [axle_location] (3.2.5.95)		
		0000	Axle 1	
		0001	Axle 2	
		0010	Axle 3	
		0011	Axle 4	
		0100	Axle 5	
		0101	Axle 6	
		0110	Axle 7	
		0111	Axle 8	
		1000	Axle 9	
		1001	Axle 10	
		1010	Axle 11	
		1011	Axle 12	
		1100	Axle 13	
		1101	Axle 14	
		1110	Axle 15	
		1111	Axle 16	
	4 to 1	---	not available	
2 and 3	---	Axle weight [axle_weight] (3.2.5.80		
		0,5 kg pro Bit	Offset = 0 kg	Range = 0 kg ... 32127.5 kg
4 to 8	---	XX		

TCO1: Tachograph 0CFE6CEE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	254d	108d	3	FE6C	0CFE6CEE

Byte	Bit	Description	
1	8 and 7	Drive recognition (3.2.6.78)	
		00	off/vehicle motion not detected
		01	on/vehicle motion detected
		10	error
		11	not available
	6 to 4	Driver 2 working status (3.2.6.77)	
		000	rest
		001	available
		010	work
		011	drive
		100	reserved
		101	reserved
		110	reserved
		111	not available
	3 to 1	Driver 1 working status (3.2.6.78)	
		000	rest
		001	available
		010	work
		011	drive
		100	reserved
		101	reserved
		110	reserved
		111	not available

2	---	Not used for MTCO	
	8 and 7	overspeed (3.2.6.81)	
		00	no overspeed
		01	overspeed
		10	error
		11	not available
	6 and 5	driver card 1 (3.2.6.80)	
		00	no card present
		01	card present
		10	driver card malfunction
		11	not available
	4 to 1	driver 1 time related states (3.2.6.79)	
		0000	no warning
		0001	warning #1
		0010	warning #2
		0011	warning #3
		0100	warning #4
		0101	warning #5
		0110	reserved for future use
		0111	reserved for future use
		1000	reserved for future use
		1001	reserved for future use
		1010	reserved for future use
		1011	reserved for future use
		1100	reserved for future use
		1101	reserved for future use
		1110	error
		1111	not available

3	---	Not used for MTCO	
	8 and 7	not defined	
	6 and 5	driver card 2 (3.2.6.80)	
		00	no card present
		01	card present
		10	driver card malfunction
		11	not available
	4 to 1	driver 2 time related states (3.2.6.79)	
		0000	no warning
		0001	warning #1
		0010	warning #2
		0011	warning #3
		0100	warning #4
		0101	warning #5
		0110	reserved for future use
		0111	reserved for future use
		1000	reserved for future use
		1001	reserved for future use
		1010	reserved for future use
		1011	reserved for future use
		1100	reserved for future use
		1101	reserved for future use
		1110	error
		1111	not available

Table to identify the warnings in parameter driver x time related states
Type: European Community regulation

0000	no warning	[0h .. 4 1/4h]
0001	warning #1	[4 1/4h .. 4 1/2h]
0010	warning #2	[4 1/2h .. 8 3/4h]
0011	warning #3	[8 3/4h .. 9h]
0100	warning #4	[9h .. 15 3/4h]
0101	warning #5	[15 3/4h .. 16h]

4	8 to 7	not defined		
	6 to 5	system performance (3.2.6.84)		
		00	system performance OK	
		01	faulty system performance	
		10	error	
		11	not available	
	4 to 3	handling information e.g. no record sheet (3.2.6.83)		
		00	no handling info	
		01	handling info	
		10	error	
		11	not available	
	2 to 1	system event (3.2.6.82)		
		00	no system event	
		01	system event	
		10	error	
		11	not available	
5 and 6	---	XX		
7 and 8	---	Tachograph vehicle speed [veh_speed_MTCO] (3.2.1.12)		
		1/256 km/h pro Bit	Offset = 0 km/h	Range = 0 km/h ... 250,996 km/h

ERC1_RX: Electronic retarder control unit retarder exhaust (5.3.3)
18F00029

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	0	6	0x00F000	0x18F00029

1	---	XX		
2	---	Actual retarder torque[1] [act_rx_torque] (3.2.1.17)		
		1% pro Bit	Offset = 125%	Range =-125% ... 0%
3 to 8	---	XX		

[1] Only transmitted, if engine brake is installed (parametrised FFR)

Warning:
Deactivation of any ERC1 message that may be present is not allowed.

FMS-standard interface 1CFDD1FD

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 s	8 bytes	253	209	7	FDD1	1CFDD1FD

1	8 to 5	Reserved for FMS-standard	
	4 and 3	requests supported	
		00	request is not supported
		01	request is supported
		10	reserved
		11	don't care
	2 and 1	diagnostics supported	
		00	diagnostics is not supported
		01	diagnostics is supported
		10	reserved
		11	don't care
2 to 5	software version supported		
	Byte 2 = a	The software version is represented in ASCII code in the following format: ab.cd (Software version number represented in the ab.cd format (ASCII))	
	Byte 3 = b		
	Byte 4 = c		
	Byte 5 = d		
5 and 6	---	XX	
6 to 8	---	Reserved for FMS standard	

Service_information (3.3.055) 18FEC027

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	192	6	FECO	18FEC027

1	---	XX		
2 and 3	---	Service distance [service_distance] (3.2.5.103)		
		5 km pro Bit	Offset = -160635 km	Range =-160635 km ... 160640 km
3 to 8	---	XX		

Fuel_cons: Fuel consumption (3.3.23) 18FEE927

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	233	6	FEE9	18FEE927

1 to 4	---	XX		
5 to 8	---	Total fuel used [total:fuel_used] (3.2.5.66)		
		0,5 l pro Bit	Offset = 0 l	Range = 0 l ... 2105540607.5 l

VIN: Vehicle identification number (3.3.26) 18FEECEE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 s	variable	254	236	6	FEEC	18FEECEE

MAN VIN contains more than 8 Bytes, therefore the VIN is translated according to SAE1939/21 (Multipacket – transport mechanism):
18ECFFEE (TP.BAM = transport protocol_broadcast announce message)
18EBFFEE (TP.DT = transport protocol_data transfer)

TP.BAM:

Byte 1:	Control Byte	20h
Byte 2 and 3:	Total message size, number of packets	0011h
Byte 4:	Total number of packets	03h
Byte 5:	Reserved	FFh
Byte 6 to 8:	PGN of requested information (VIN)	00FEEC

TP.DT: Packet 1:

Byte 1:	Sequence number	01h
Byte 2 to 8:	Bytes 1-7 of VIN	ASCII

TP.DT: Packet 2:

Byte 1:	Sequence number	02h
Byte 2 to 8:	Bytes 8-14 of VIN	ASCII

TP.DT: Packet 3:

Byte 1:	Sequence number	03h
Byte 2 to 4:	Bytes 15-17 of VIN	ASCII
Byte 5:	* = Delimiter	2Ah
Byte 6 to 8:	Filler bytes	FFFFFFh

Dash Display (3.3.042) 18FEFC21

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	252	6	FEFC	18FEFC21

1	---	XX		
2	---	Fuel level [fuel_level] (3.2.5.71)		
		0,% pro Bit	Offset = 0%	Range = 0% ... 100%
3 to 8	---	XX		

7.6. A-CAN input messages

The following input messages can be processed by KSM and passed to the FFR:

KSM1_A: Customer specific control module #1– Body 0CEFFD55

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	1	Destination address KSM = FD_{hex}	3	Proprietary A: EF00	0CEFFD55

Byte	Bit	Description		
1	8 and 7	not defined		
	6 and 5	Override control mode priority [ksma_ocmp] (3.2.3.3) not supported		
	4 and 3	Requested speed control conditions [ksma_rscc] (3.2.3.2) not supported		
	2 and 1	Override control mode [ksma_ocm] (3.2.3.1)		
		00	Override disabled	
		01	speed control	
		10	torque control	
		11	speed/torque control	
2 and 3	---	Requested speed/Speed limit [ksma_req_speed] (3.2.1.19)		
		0,125 rpm pro Bit	Offset = 0 rpm	Range = 0 ... 8031.875 rpm
4	---	Requested torque/Torque limit [ksma_req_torque] (3.2.1.15)		
		1 % pro Bit	Offset = -125 %	Range = -125% ... 0%
5	---	Requested road speed limit [ksma_HGB]		
		1 km/h pro Bit	Offset = 0 km/h	Range = 0 km/h ... 250 km/h
6		ZDR-control [ksma_sw_status]		
	in SAE J1939/ff described values			
	8 and 7	Cruise control accelerate switch (3.2.6.17)		
	6 and 5	Cruise control resume switch (3.2.6.16)		
	4 and 3	Cruise control coast switch (3.2.6.15)		
	2 and 1	Cruise control set switch (3.2.6.14)		
	MAN describes as follows			
	00000000	Neutral		
	00000001	Off		
	00000100	Set -		
	00010000	restart		
	01000000	Set +		
	10101010	failed		

Byte	Bit	Description	
7	8 to 5	ZDR Mode request [ZDR_mode_req]	
		0000	Mode S
		0001	Mode 1
		0010	Mode 2
		0011	Mode 3
		0100	Mode 4
		0101	Mode 5
		0110	Mode 6
		0111	Mode 7
		1000	ZDR switch off
		1001	reserved
		1010	reserved
		1011	reserved
		1100	reserved
		1101	reserved
		1110	reserved
		1111	not available
	4 and 3	Motor Stop [ksma_MotorStop]	
		00	no request
		01	Motor Stop
		10	reserved
		11	don’t care/take no action
	2 to 1	Motor Start [ksma_MotorStart]	
		00	no request
		01	Motor Start
		10	reserved
		11	don’t care/take no action
8	---	XX	

Warning:
ZDR mode 7 is reserved for MAN’s internal use; its setting cannot be changed.

KSM2_A: Customer specific control/guidance #2– body 0CFFCA55

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	2	destination address KSM = FD_{hex}	202	Proprietary A: FFCA	0CFFCA55

Byte	Bit	Description	
1 to 6	---	XX	
7	8 to 5	not defined	
	4 to 1	Request PTO 3 NMV [ksm_PTO3_req]	
		xxx0	no request
		xxx1	request
8	---	XX	

7.7. KSM/FFR information processing if defined by KSM1_A message

The “override control mode” (ocm) KSM1_A-message (KSM1_A_ocm) is absolutely critical for the processing of engine speed and torque information. The following description (Case 1-4) explains how the relevant KSM1_ocm is generated from the KSM1_A_ocm. KSM1 is the T-CAN message from the KSM to the FFR. The ocm=11 (speed/torque limit control) of the KSM1 message is supported by the FFR. Processing of the ocm=01 (speed control) and ocm=10 (torque control) modes of the KSM1 message is not active in the FFR, but can be switched on in the FFR if needed after suitable examination and approval by Dept. TDB.

1. KSM1_A_ocm=11 → KSM1_ocm=11 (speed/torque limit control):
   - Limitations in KSM1_A are linked with the digital inputs (torque and engine speed) in such a way that the smallest value in each case is used as a KSM1 message.
   - Requirement ZDR S, 1-7 is transmitted via KSM1:
     Activation in the FFR is dependent on the parametrised switch programming already set in the FFR.
   - Requirement ZDR control (SET+/-, MEM, AUS(Off)) via KSM1_A or the KSM digital inputs – depending on KSM parametrisation – is passed on via KSM1 and executed in the FFR.

2. KSM1_A_ocm=01 → KSM1_ocm=01 (speed control):
   - It is possible to set a “must do” command for engine speeds; limiting in the KSM1 through the digital “Engine speed limits” inputs is possible.
   - Torque limits (KSM1_A) are linked to the digital “Torque limits” inputs in such a way that the smallest value in each case is used as a KSM1 message.
   - Requirement ZDR S, 1-7 is transmitted via KSM1:
     In this case the FFR processes only the switching and rule parameters programmed into the currently selected ZDR mode. The upper and lower engine speed limits parametrised in the currently selected ZDR mode as well as the “must do” value parameter in the FFR are ignored.

3. KSM1_A_ocm=10 → KSM1_ocm=10 (Torque control):
   - It is possible to set a “must do” command for engine torque; limiting in the KSM1 through the digital “Engine torque limits” inputs is possible.
   - Engine speed limits (KSM1_A)) are linked to the digital “Engine speed limits” inputs in such a way that the smallest value in each case is used as a KSM1 message.

4. KSM1_A_ocm=00 → KSM1_ocm=11(Speed/torque limit control):
   - No processing/passing forward from KSM1_A/Byte 2, 3, 4
   - Torque limits via digital “torque limit” inputs possible at the KSM.
   - Engine speed limits via digital “Engine speed limit” inputs possible at the KSM.
   - Request ZDR S, 1-7 passed on via KSM1:
     activation in the FFR dependent on the switching parameters already programmed into the FFR.
   - Request ZDR-control (SET+/-, MEM, AUS(Off)) via KSMA or via digital KSM inputs – according to the parameters set in the KSM – passed on via KSM1: executed in the FFR.

The following apply in all cases:

- ZDR mode selection via CAN takes precedence over ZDR pins of FFR
- ZDR control via CAN takes precedence over cruise control inputs.
- Limits in the KSM and FFR are linked in such a way that the smallest value in each case is used as a KSM1 message.
- Commands can only be set within the permitted limits.
- KSM1_A message is parametrised to “not received” → KSM1_ocm=11

Note:
If an A-CAN input (A-CAN Bus-off, failure KSM1_A message) is invalid, the limits are frozen (engine speed/torque/max. speed limit) until A-CAN comes back into service or valid values are detected. (e.g. previously demanded limits are frozen, depending on circumstances until Term. 15 “Reset”).
If at the moment of A-CAN failure (A-CAN Bus off, failed KSM1_A message) an engine speed or torque demand is present (KSM1_A_ocm=01/10), the T-CAN switches to KSM1_ocm=11; the engine speed or torque demands become limits and the engine drops to idle speed.
If at the moment of A-CAN failure (A-CAN Bus off, failed KSM1_A message) an NMV (power take-off) is present, it is frozen until A-CAN comes back into service or valid values are detected (or depending on circumstances until Term. 15 “Reset”).
Execution of SET+ / SET – via the KSM interface is only possible in ZDR modes under conditions in which “Steering column lever active” is set. A safety system must be installed that guarantees protection of the control lever against undesired activaction in the driver’s cabin during, for example, external remote control operation.

8. Pin Description and Switching Schemes

DrzMomBgr (Engine speed/Torque/Road speed limits) 1+3 (Plug connection X1997/Pin 1)
$+U_{Bat}$ –Switch signal input for engine/road speed limiting command 1and 3

Function:

If the input is switched with $+U_{Bat}$ (Service readiness; X1997/Pin 12), the engine speed is limited to “Engine speed/torque limit 1” programmable via MAN-cats II.
If $+U_{Bat}$ is removed, the chosen “Engine speed/torque limit 1” is cancelled.
If at the same time the “Engine speed/torque limit 2+3” input (X1997/Pin 2) is switched with $+U_{Bat}$ (Service readiness, X1997/Pin 12) the engine is limited to the “Engine speed/torque limit 3” programmable via MAN-cats II.
If $+U_{Bat}$ is removed from both inputs, the selected “Engine speed/torque limit 3” is cancelled.
This function is also useful as an extra intermediate engine-speed setting, to limit an initially higher setting.

Function availability:

As soon as $+U_{Bat}$ (Service readiness or Term. 15 FFR) is set up.

Factory setting:
see Engine speed/torque limit 2+3 (DrzMomBgr 2+3) table (Plug connection X1997/Pin 2)

DrzMomBgr (Engine speed/Torque/Road speed limits) 2+3 (Plug connection X1997/Pin 2)
$+U_{Bat}$ –Switch signal input controlling “Engine speed/torque limit 2 and 3”

Function:

If the input is switched with $+U_{Bat}$ (Service readiness; X1997/Pin 12), engine speed is limited to the “Engine speed/torque limit 2” programmable via MAN-cats II.
If $+U_{Bat}$ is removed, the chosen “Engine speed/torque limit 2” is cancelled..
If at the same time the “Engine speed/torque limit 1+3” input (X1997/Pin 1) is switched with $+U_{Bat}$ (Service readiness, X1997/Pin 12), the engine is limited to the “Engine speed/torque limit 3 programmable via MAN-cats II.
If $+U_{Bat}$ is removed from both inputs, the selected “Engine speed/torque limit 3” is cancelled.
This function is also useful as an extra intermediate engine-speed setting, to limit an initially higher setting.

Function availability:

As soon as $+U_{Bat}$ (Service readiness or Term. 15 FFR) is set up.

Factory settings:

	Engine speed/torque limit 1+3 (Stv. X1997/Pin 1)	**Engine speed/torque limit 2+3 (Stv. X1997/Pin 2)**	**Engine speed**	**Torque**
Engine speed/torque limit 0	-------	-------	4000 rev/min	100%
Engine speed/torque limit 1	$+U_{Bat}$	-------	1500 rev/min	100%
Engine speed/torque limit 2	-------	$+U_{Bat}$	1800 rev/min	100%
Engine speed/torque limit 3	$+U_{Bat}$	$+U_{Bat}$	1200 rev/min	100%

A value pair made up of engine speed/torque limits is allocated to each of the 4 possible input combinations.

LS1_KONFIG (Plug connection X1997/Pin 3)

-U_{Bat} -switch signal output. In the passive/non-programmed condition the “high” level (approx. +U_{Bat}) switches itself on.

Load:

max. 300mA

Function:

Signal output, dependent on the relevant parameters.

Possible parameters:

- Output active, accelerator pedal “idle”
- Output active, accelerator pedal “Kickdown”
- Engine speed threshold “on”: output active, if engine speed >= parametrised upper engine speed threshold.
  The output also remains active if the engine speed falls below the set threshold.
- Engine speed threshold “on-off”: output active if engine speed >= parametrised upper engine speed threshold.
  Output inactive if engine speed <= parametrised lower threshold.
- Speed threshold “on”: output active if vehicle speed >= parametrised upper speed threshold.
  Output remains active if speed falls below the set threshold.
- Speed threshold “on-off”: output active if vehicle speed >= parametrised upper speed threshold.
  Output inactive if vehicle speed <= parametrised lower speed threshold.

Factory setting:

Signal:
Output passive

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <2kΩ. In the case of activitated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12)! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during the system start (surveillance already active during system start phase but Service readiness only active on connection of system start phase).

Warning:

To avoid “dither” in the threshold value area (lower or upper engine speed/road speed thresholds), a margin of at least 10 rpm (engine speed threshold) or 2 km/h (road speed threshold) must be parametrised between the two values.

LS2_KONFIG (Plug connection X1997/Pin 4)
-U_{Bat} -switch signal output. In passive/non-programmed condition the “high” level („ +U_{Bat}) switches itself on.

Load:
max. 300mA

Function:
This function is not implemented in KSM 81.25816.7004.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <2kΩ. In the case of activitated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12)!)! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during the system start (surveillance already active during system start phase but Service readiness only active on connection of system start phase).

PARKING BRAKE (Plug connection X1997/Pin 5)
+U_{Bat} -switch signal output. When the load is connected and the parking brake is not applied the “low” level (U_{low}<2V) switches itself on.

Load:
max. 500mA

Function:
Information that the parking brake is engaged

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω.

BRAKE (Plug connection X1997/Pin 6)
+U_{Bat} -switch signal output. When the load is connected and the brake is not applied the “low” level (U_{low}<2V) switches itself on.

Load:
max. 500mA

Function:
Information that the brake is applied.

Warning:
To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω. This function is controlled only by the action of the brake pedal.

REVERSE (Plug connection X1997/Pin 7)

$+U_{Bat}$ -switch signal output. When the load is connected and reverse gear is not engaged, the “low” level switches itself on (U_{low}<2V).

Load:

max. 500mA

Function:

Information that reverse gear is engaged.

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω.

CLUTCH (Plug connection X1997/Pin 8)

$+U_{Bat}$ -switch signal output. Whenthe load is connected and clutch is not operated, the “low” level switches itself on (U_{low}<2V).

Load:

max. 500mA

Function:

Information that the clutch is engaged.

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω.

GEAR-N (gearbox in neutral) (Plug connection X1997/Pin 9)

$-U_{Bat}$ -switch signal output. When a gear is engaged the “high” level (app. $+U_{Bat}$) switches itself on.

Load:

max. 300mA

Function:

Information that the gearbox is in Neutral.

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <2kΩ. With activated error recognition the load must be connected after Term. 15 FFR (X1996/Pin 1). Do not use “Service readiness” (X1997/Pin 12))! If “Service readiness” is used instead of Term. 15 FFR, this will, if error recognition is active, cause error memory entries during a system start (surveillance already active during system start phase, but Service readiness active only on connection of the system start phase).

TELLTALE LIGHT (Plug connection X1997/Pin 10)

$+U_{Bat}$ -switch signal output. When the load is connected and the KSM-SG or the connected auxiliaries are in error-free condition, the low level switches itself on (U_{low}<2V).

Load:

max. 600mA

Function:

Information that there is a malfunction at the KSM control unit or the auxiliaries connected to it.

Warning:

This telltale light is not included in the vehicle instruments. This information cannot be shown via the A-CAN. To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω. During control unit warm-up, the output is run automatically for approx. 3 seconds (bulb test).

TANK WARNING (Plug connection X1997/Pin 11)

$+U_{Bat}$ -switch signal output. When the load is connected and there is sufficient fuel in the tank, the low level switches itself on (U_{low}<2V).

Load:

max. 600mA

Function:

Information (set by the factory) that the tank is still about 20% full. This information is also flashed up on the instrument panel with the message “REFUEL” (“TANKEN”). Via MAN-cats II this value can be lowered to a minimum of 11,2 %. This information applies at the moment only to vehicles with a single fuel tank level sensor.

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω. During control unit warm-up, the output is run automatically for approx. 3 seconds (bulb test).

SERVICE READINESS (Plug connection X1997/Pin 12)

$+U_{Bat}$ -switch signal output. The output stage switches to “high” approx. 3 seconds after Term. 15 “on”. If the load is connected and the KSM control unit is (still) in a “not ready for service” condition, the low level switches itself on (U_{low}<2V).

Load:

max. 2A

Function:

Information that the KSM control unit is ready for service. This is useful for authorising a function. The signal is issued approx. 2 seconds after Term. 15 “off” (X1996/Pin1, see FFR interface description), to enable additional body electronic equipment control units to run down if necessary.

Warning:

To ensure that short and open circuits are properly identified with a connected load and activated error recognition, the connected load must be <400Ω. After a system start (approx. 3 sec.) the output is energised.

SET+ (Plug connection X1997/Pin 13)

$+U_{Bat}$ –switch signal input to energise the function “Increase engine speed”.

Function:

Increasing engine speed.
If the input is switched with $+U_{Bat}$ (Service readiness; X1997/Pin 12), the engine speed will run up to the upper engine speed limit: if this activation is interrupted/cancelled, engine management sets the engine speed as it is at that moment.

The upper engine speed limit can be:

- The maximum permissible engine speed limit.
- The upper engine speed limit at ZDR S,ZDR 1, ... , ZDR 7 that can be parameterised via MAN-cats II.
- The engine speed limit that can be parameterised and activated via MAN-cats II in the FFR or KSM.

The set engine speed is switched off – that is to say, the engine is returned to idle speed (ZDR S) or the lowest engine speed setting (ZDR1,....,ZDR7) by means of the “Open” command for the bridge between “Service readiness” (X1997/Pin 12) and “Off” (X1997/Pin 15).

Description:
Activating SET + for a period shorter than 200 ms is recognised as “Tippen” (“Quick Enter”) and increases the desired engine speed setting by a parametrised amount. (ex factory, depending on the chosen ZDR mode (see FFR-interface description) this is set at 50 rpm or 10 rpm). If SET + is switched for longer than 200 ms , the current nominal engine speed setting is raised every 100 ms by a parameterised value (this is set ex factory at 15 rpm).
In the case where SET + must be controlled by clocking in order to reach the normal engine working speed, we recommend using a square wave signal with a duty ratio of 50:50, t_{high}= approx. 100 ms and t_{low}= approx. 100 ms.

High level is recognised at the SET+ digital input of the KSM at U > 16 V, low level at U < 3 V (digital input, 4,75 kΩ pull-down).

Function release:

Approx. 3.5 secs. after the availability of Term. 15 “on”, the function can be activated by energising with $+U_{Bat}$ (Service readiness or Term. 15 FFR).

SET- (Plug connection X1997/Pin 14)

$+U_{Bat}$ -switch signal input to energise the function “Reduce engine speed”.

Function:

Reduce engine speed
If the input is switched with $+U_{Bat}$ (Service readiness; X1997/Pin 12), the set engine speed is reduced steplessly to idle speed level (ZDR S) or as appropriate down to the lower set engine speed level (ZDR 1, . . ., ZDR 7). If activation is interrupted, the engine management unit adopts the current engine speed.

The set engine speed is switched off, i.e. the engine returns to Idle speed (ZDR S) or to the “Engine speed lower limit” setting (ZDR 1, ... , ZDR 7)) by means of the “Open”“ command for the standard bridge between “Service readiness” (X1997/Pin 12) and “Off” (X1997/Pin 15).

Description:
Activating SET + for a period shorter than 200 ms is recognised as “Tippen” (“Quick Enter”) and reduces the nominal engine speed setting by a parametrised amount (ex factory; depending on the chosen ZDR mode (see FFR interface description) this is set at 50 rpm or 10 rpm). If SET + is switched for longer than 200 ms , the current nominal engine speed setting is reduced every 100 ms by a parameterised value (this is set ex factory at 15 rpm).
In the case where SET + must be controlled by clocking in order to reach the normal engine working speed, we recommend using a square wave signal with a duty ratio of 50:50, t_{high}= approx. 100 ms and t_{low}= approx. 100 ms.

High level is recognised at the SET+ digital input of the KSM at U > 16 V, low level at U < 3 V (digital input, 4,75 kΩ pull-down).

Function permitted:

Approx. 3.5 secs. after energising of Term. 15 “on”, the function can be activated by energising with $+U_{Bat}$ (Service readiness or Term. 15 FFR).

OFF (Plug connection X1997/Pin 15)

$+U_{Bat}$ -switch signal input to enable/switch off the ZDR functions.

Function:

If the entry is switched with $+U_{Bat}$ (Service readiness; X1997/Pin 12), the ZDR functions are enabled. By means of the “Open” command for the external bridge between “Service readiness” (X1997/Pin 12) and “OFF” (X1997/Pin 15), the ZDR and cruise control functions are switched off.

Warning:

If the external bridge between X1997/Pin 12 and X1997/Pin 15 fails, the “OFF” function is permanently activated and it is then impossible to activate the ZDR functions.

MEMORY (Plug connection X1997/Pin 16)

$+U_{Bat}$ -switch signal input to resume/store an engine speed.

Function:

If the input is switched with $+U_{Bat}$, after the manual switch signal ($t_{max} \leq 1$sec.) the engine runs up to the ZDR S, ZDR 1, ... , ZDR 7 programmable parameters set via MAN-cats II ZDR S, ZDR 1, ... , ZDR 7 and regulates them. The new engine speed can be stored in the memory by energising the input with $+U_{Bat}$ ($t \geq 2$sec.) after changing it through “SET+” or “SET-”.
The set engine speed will be switched off, i.e. the engine reverts to idle speed or the lower engine speed (ZDR 1, ... , ZDR 7), by means of the “Open”“ command for the external bridge between X1997/Pin 12 and X1997/Pin 15; by using the “OFF” on the controls in the driver’s cabin or in the presence of a set condition that demands a shutdown.

Function permitted:

Approx. 3.5 sec. after energising Term. 15 “on”, the function can be activated by switching with $+U_{Bat}$ (Service readiness or Term. 15 FFR), taking into account the above-mentioned time t.

Warning:

The MEM function only becomes effective when the control button is released (change of flank from “high” to “low” at input). Storing a nominal engine speed that has been altered by using SET+/- is only possible in the currently operational ZDR mode, if the user function “active with storage” is parametrised in the FFR and the control button is pressed for at least 2 seconds.

A-CAN-H (Plug connection X1997/Pin 17)

CAN-high wire from the body A-CAN interface.

A-CAN-L (Plug connection X1997/Pin 18)

CAN-low wire from the body A-CAN interface.

NMV (Plug connection X3311/Pin 1)

$+U_{Bat}$ –switch signal input. If the NMV switch (contact opened) has not been operated, the low level setting of the KSM pin (digital input, 4,75kΩ pull-down, switch level: $U_{low}<3$ / $U_{high}>16$V) “NMV demand”“ is active. The NMV can also be requested with this pin.
This of course only applies if an NMV circuit is installed.

Load:

max. 500mA

Function:

Information that the NMV has been requested or can be used to call for the NMV.
NMV switching only takes place if the parametrised conditions have been set in the KSM; these are:

- NMV switched on only with gearbox-N: “active”/“not active”
- NMV switched on only if parking brake is applied: “active”/“not active”
- NMV switched on only if vehicle is standing still: “active”/“not active”

  Note:
  If the switch conditions gearbox-N, parking brake, clutch or speed signal are parametrised to “active”, they must be fulfilled at the moment the power take-off is requested, so that the valve is correctly controlled. If the auxiliary power take-off is then energised, it remains so even if the switch-on conditions are later no longer fulfilled. The switch-on conditions are “AND-linked”.

- NMV parametrised “Engine speed threshold on”: “active”/“not active”

  Note:
  Regarding the switch condition “Engine speed threshold on”: Provided that the switch conditions (gearbox-N, parking brake, vehicle stopped) are fulfilled (if they are parametrised as “active”) and the power take-off is requested, the valve will be energised immediately the speed exceeds the threshold set in the relevant parameter. The valve remains under control even if the speed drops back later to a lower level.

- NMV parametrised “Engine speed threshold off”: “active”/“not active” “

  Note:
  Regarding the on-off-switch condition “Engine speed threshold off”: Provided that the switch conditions (gearbox-N, parking brake, vehicle stopped) are fulfilled (if they are parametrised as “active”) and the powe take-off is requested, the valve will be energised immediately the speed exceeds the threshold set in the relevant parameters. It drops off again if the lower parameter threshold is not reached. The precondition for renewed energising of the valve when the upper threshold is exceeded is as follows: the demand must still be active and the switching conditions must still be fulfilled.

- NMV request:

  Note:
  Parameters can be set to indicate whether or not the switch is supported (KSM digital input). If the input is supported, any equivalent requirement from the A-CAN is ignored. If the input is not supported, any demand from the A-CAN will be processed and the switch (KSM digital input) ignored.

This is useful in permitting engine speed or power take-off functions, in order to prevent undesired influences on the control elements from outside the driver’s cabin.

Function permitted:

Approx. 3sec. After energising Term. 15 “On”, the function can be activated by switching with $+U_{Bat}$ (Service readiness or Term. 15 FFR).

Factory settings:

Switching condition: gearbox N	“active”
Switching condition: parking brake	“active”
Switching condition: vehicle stopped	“active”
Engine speed threshold “On”	“not active”“
Engine speed threshold “On-Off”	“not active”
Upper engine speed threshold	790 rpm
Lower engine speed threshold	400 rpm
NMV demand (digital input or A-CAN)	Digital input

Warning:

NMV switching is not a standard fitting on the vehicle and must be ordered separately.

NMV COMPRESSED AIR SWITCHING (Plug connection X3311/Pin 2)

$-U_{Bat}$ -switch signal output, same potential as at the LED switch from the NMV compressed air switch when the NMV unit is switched on. If the NMV is not switched, the “high” level (approx. $+U_{Bat}$) from the compressed air switch signal output is available.
This applies only when an NMV switching circuit is installed.

Load:

max. 500mA

Function:

Information that the NMV is switched on.
This is useful in permitting engine speed or power take-off functions, in order to prevent/avoid undesired influences on the controls from outside the driver’s cabin.

Warning:

NMV switching is not a standard fitting on the vehicle and must be ordered separately.

PWM_KONFIG (Plug connection X3311/Pin 4)

PWM signal output. The following specification applies to the signal:

- Maximum output current: 10mA
- Output potential “low” less than 20% $+U_{Bat}$
- Output potential “high” greater than 80% $+U_{Bat}$
- The internal pull-up resistance is 15kΩ; the basic condition on the pin is therefore also “high”
- Transmission frequency parameter can be reset

Function:

Signal outputdependent on the parametrised setting.
Possible parameters:
Output active with

- “Driver’s desired torque” signal (SAE J1939/71: “driver’s demand engine torque”)
  or
- “Actual torque” signal (SAE J1939/71: “actual engine torque”)
  or
- “Degree of engine load” (SAE J1939/71: „load at current speed“)

Transmission frequency parameter can be set between 100 ... 400Hz

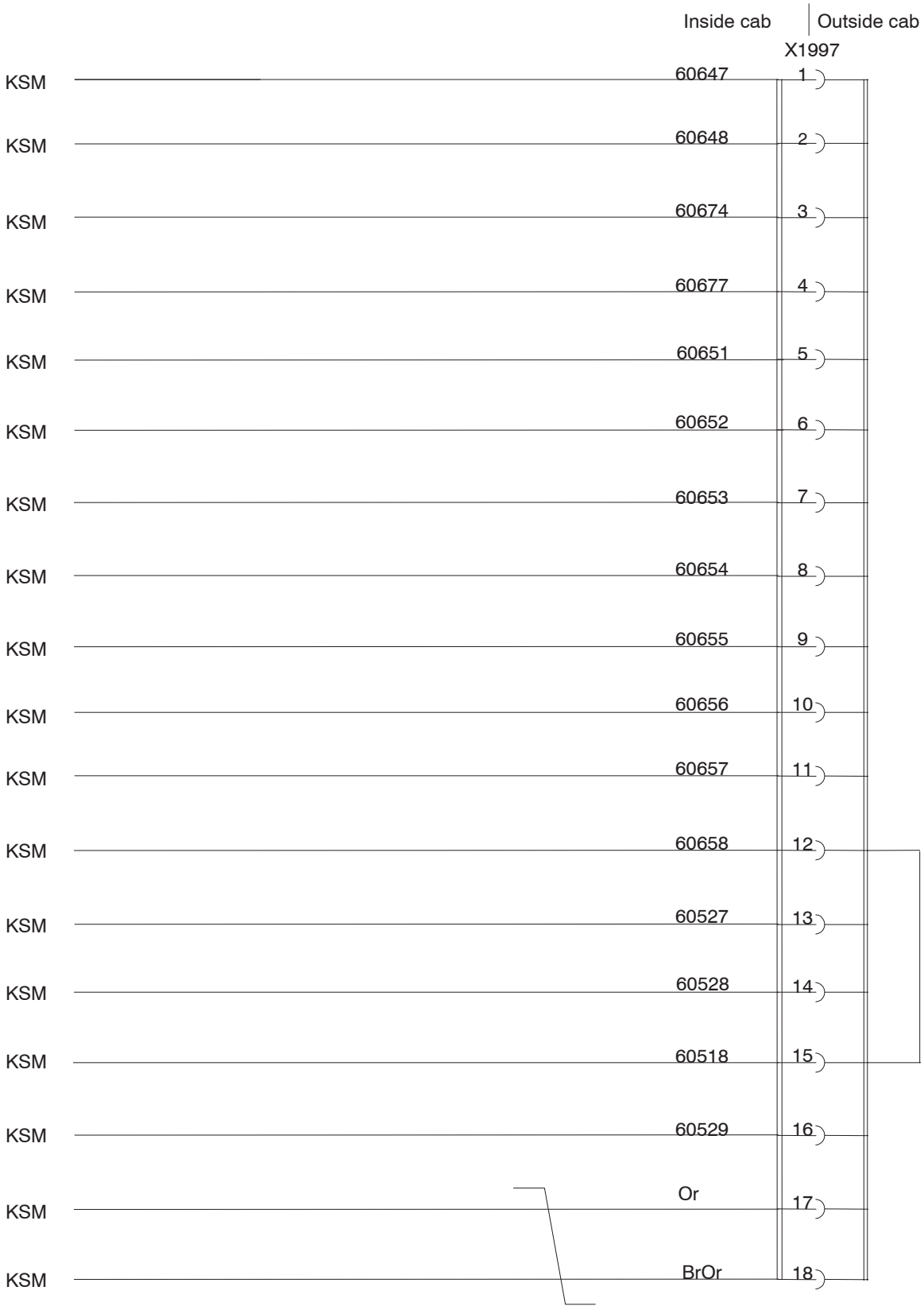
Note:

The duty cycle of the PWM signal refers to the “high” phase, e.g. 10%: 10% “high”, 90% “low” .

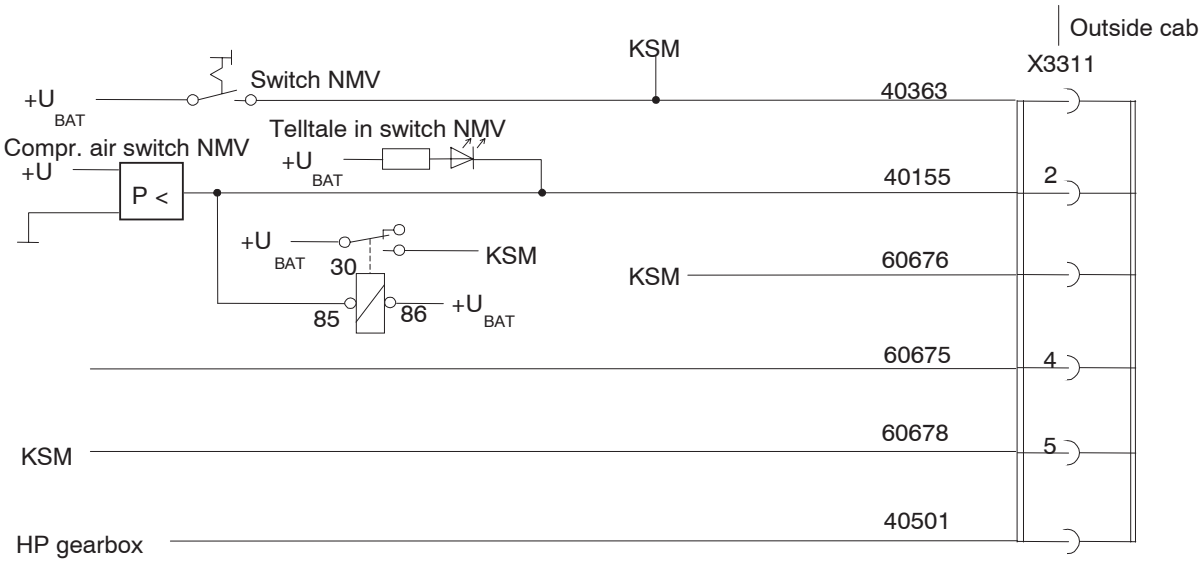
E.g. Torque 0% : duty cycle 10%
Torque 50% : duty cycle 50%
Torque 100% : duty cycle 100%

Factory setting:

Signal:	Frequency:
Degree of engine load	200 Hz

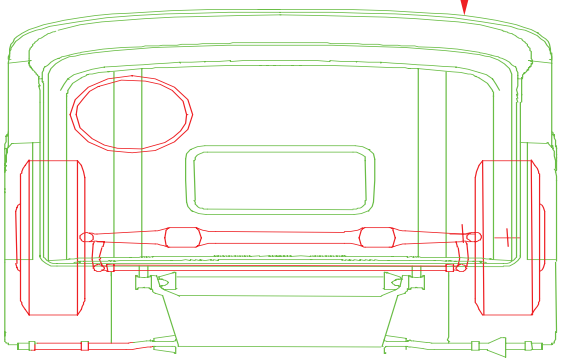


Switching diagram for X1997

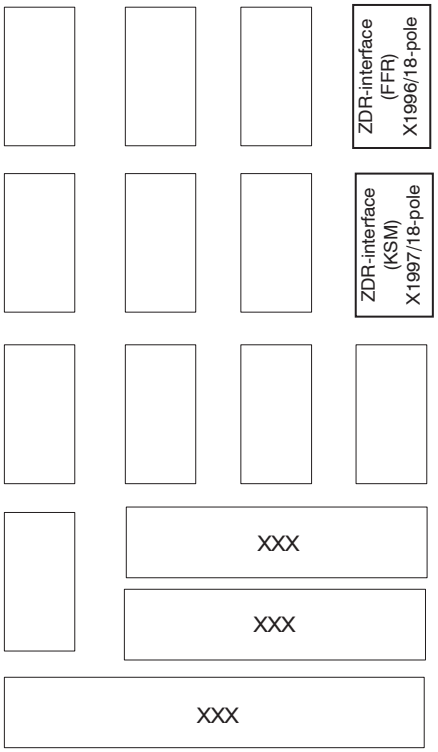


Switching diagram for X3311

9. INTERFACE VERSION AND INSTALLATION POINT



View after removing cover:



The complete interface consists of 18-pole plug connection **X1997** and 6-pole plug connection **X3311**. This plug designation is used on all switch diagrams; the plug on the vehicle is colour-keyed appropriately. Accessible from outside after removal of cover.
XXX: area in which X3311 and X2334/X679 are installed

Plug connection 18-pole: X1997	Colour and coding: natural/6	MAN article number	
		Plug housing	Socket housing
Secondary interlock for housing		81.25475.0046	81.25435.0927
		81.25475.0065	81.25435.0913

Contacts (single units/strip)	MAN article number
Flat plug with detent 2.8×1/0.5-1	07.91202.0848 / 07.91202.0858
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0849 / 07.91202.0859
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

Plug-connection 6-pole: X3311	Colour and coding: blue/3	MAN article number	
		Plug housing	Socket housing
Secondary interlock for housing		81.25475.0789	81.25435.0739
		81.25435.0698	81.25435.0698

Contacts (single units/strip)	MAN article number
Flat plug with detent 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

The “ZDR-Interface with vehicle management computer for external engine speed control on TG” consists of the 18-pole plug connection **X1996** and is included in the vehicle’s standard equipment e.

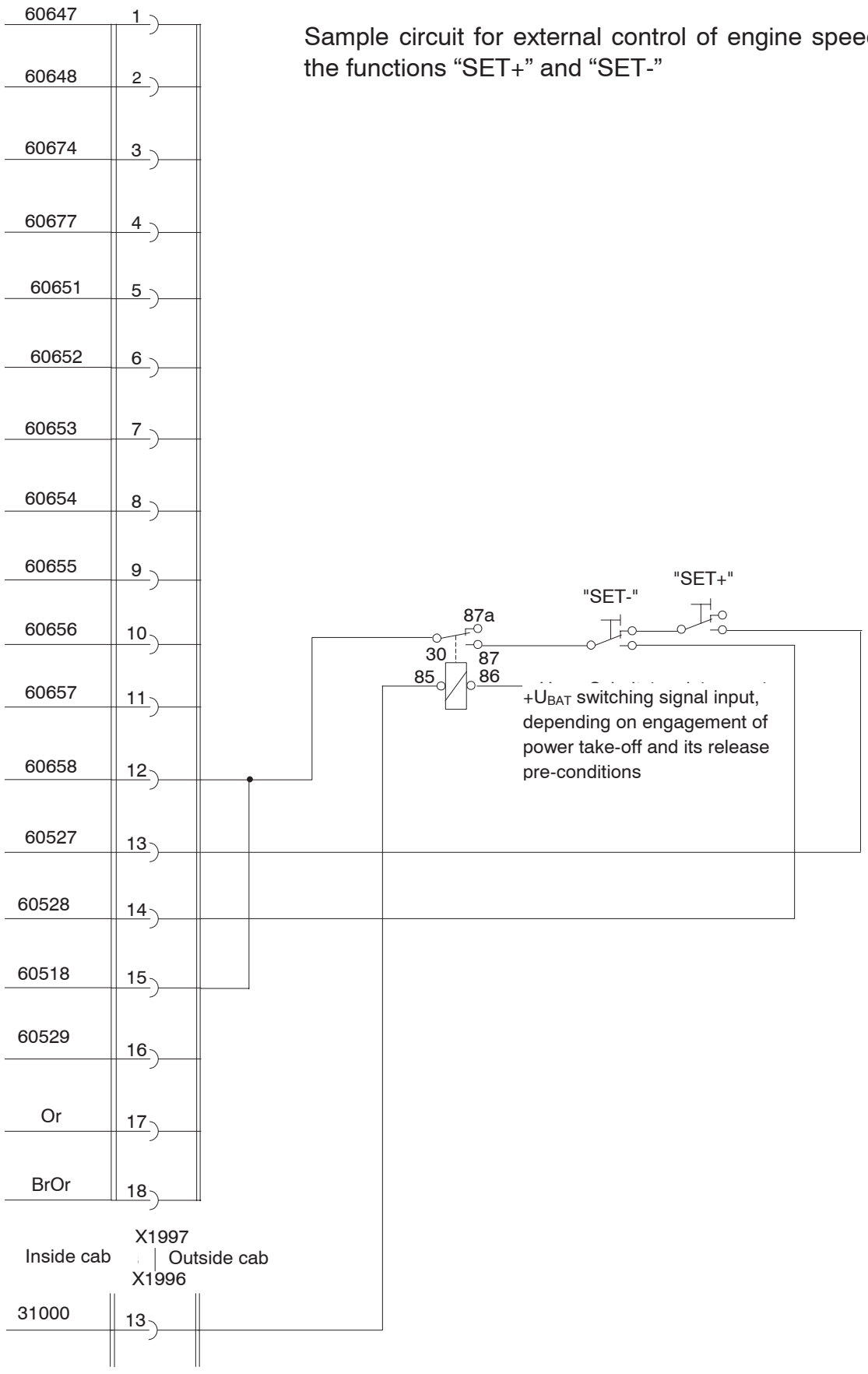
The preparation for „Accidental Reverse Prevention in garbage collection vehicles“ is a 6-pole Plug connection **X2334** or **X679**. This plug designation is used on all switch diagrams, and the plug inside the vehicle is correspondingly colour-keyed. It is accessible from outside by removing the cover.

Plug connection 6-pole: X2334 or X679	Colour and Coding: blue/4	MAN article number	
		Plug housing	Socket housing
Secondary locking for housing		81.25435.0794	81.25435.0744
		81.25435.0698	81.25435.0698

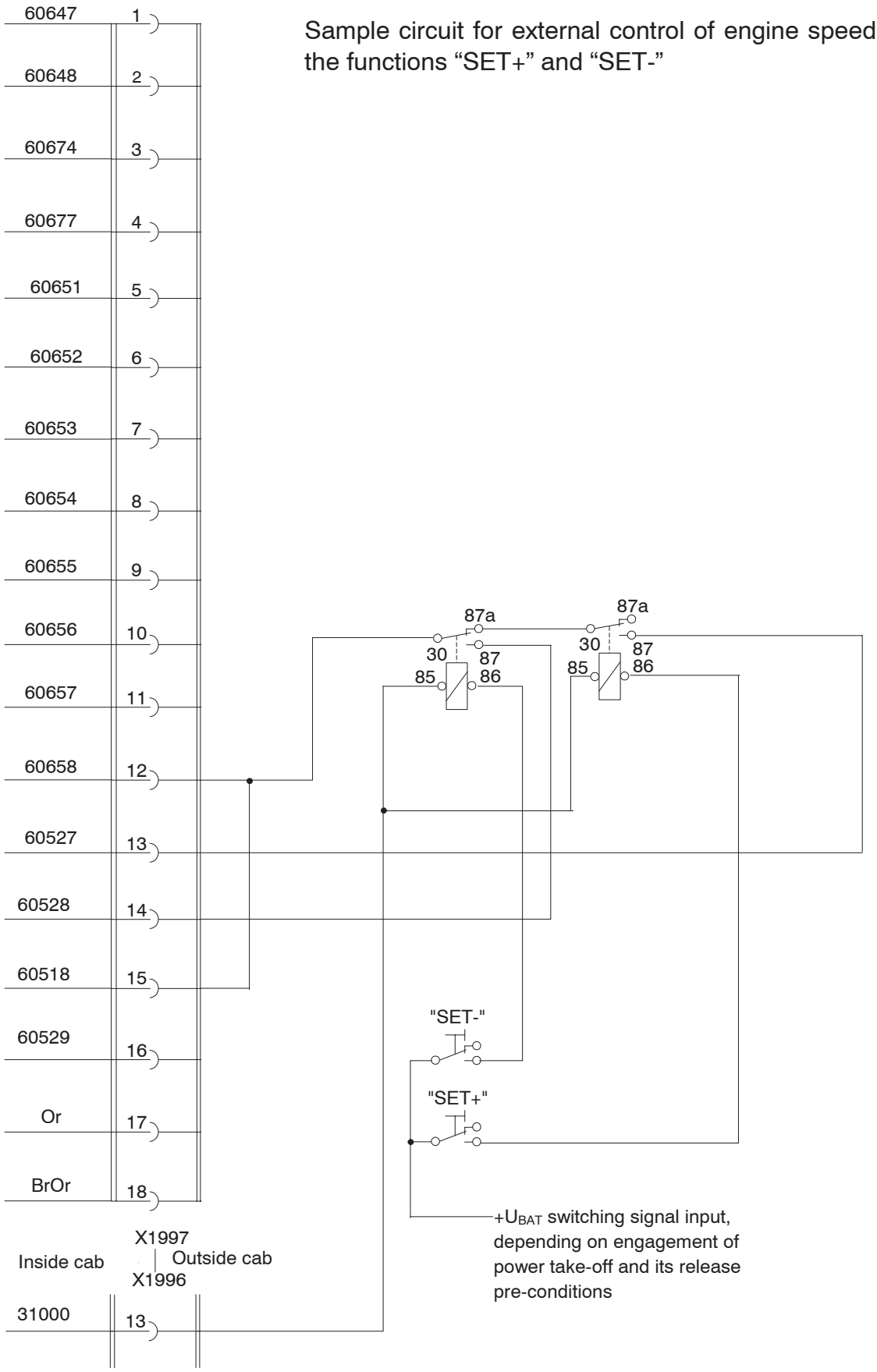
Contacts (single units/tapes)	MAN article number
Flat plug with detent 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Flat plug with detent 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with detent 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with detent 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

10. Sample circuits

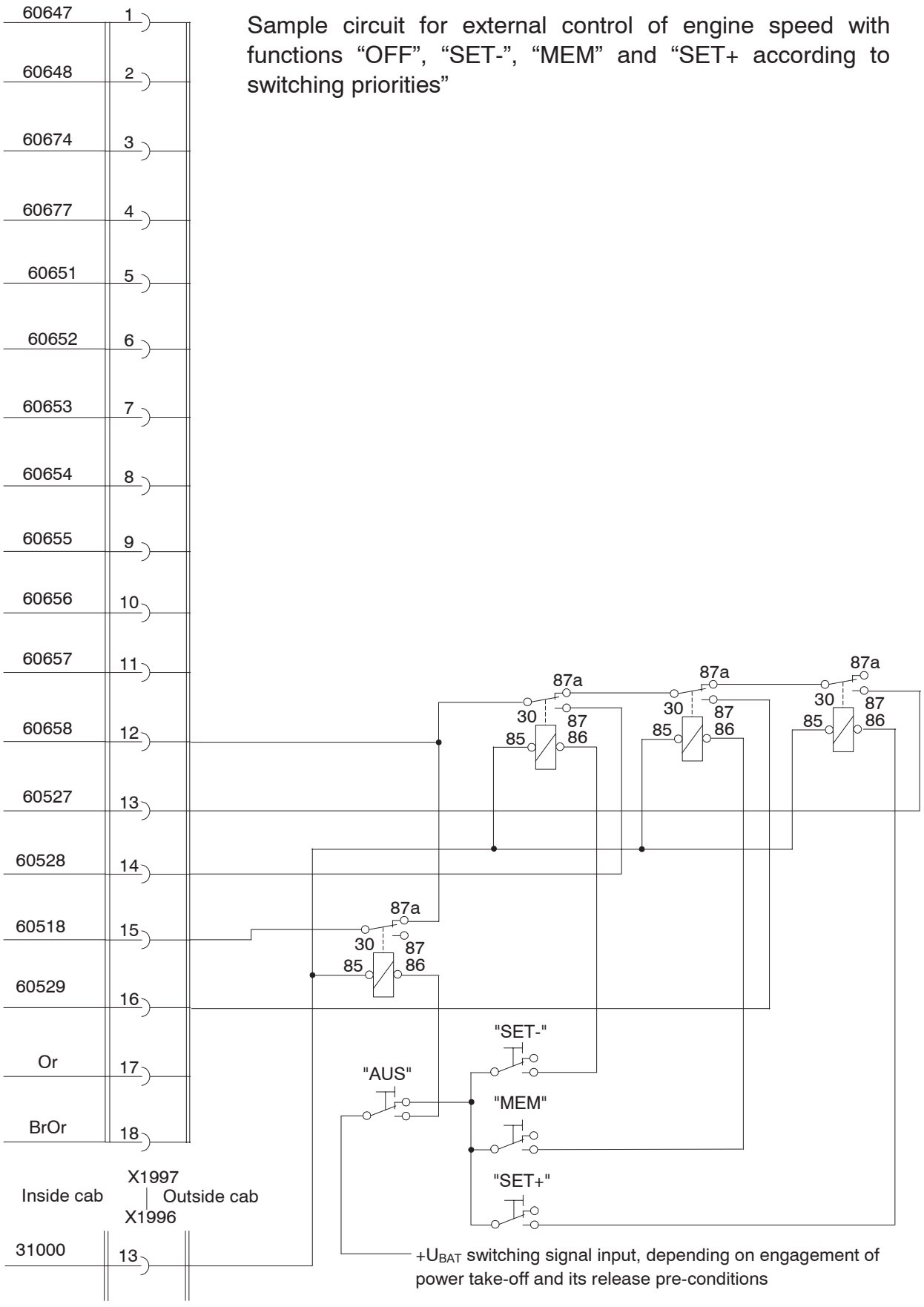
Sample circuit for external control of engine speed with the functions “SET+” and “SET-”



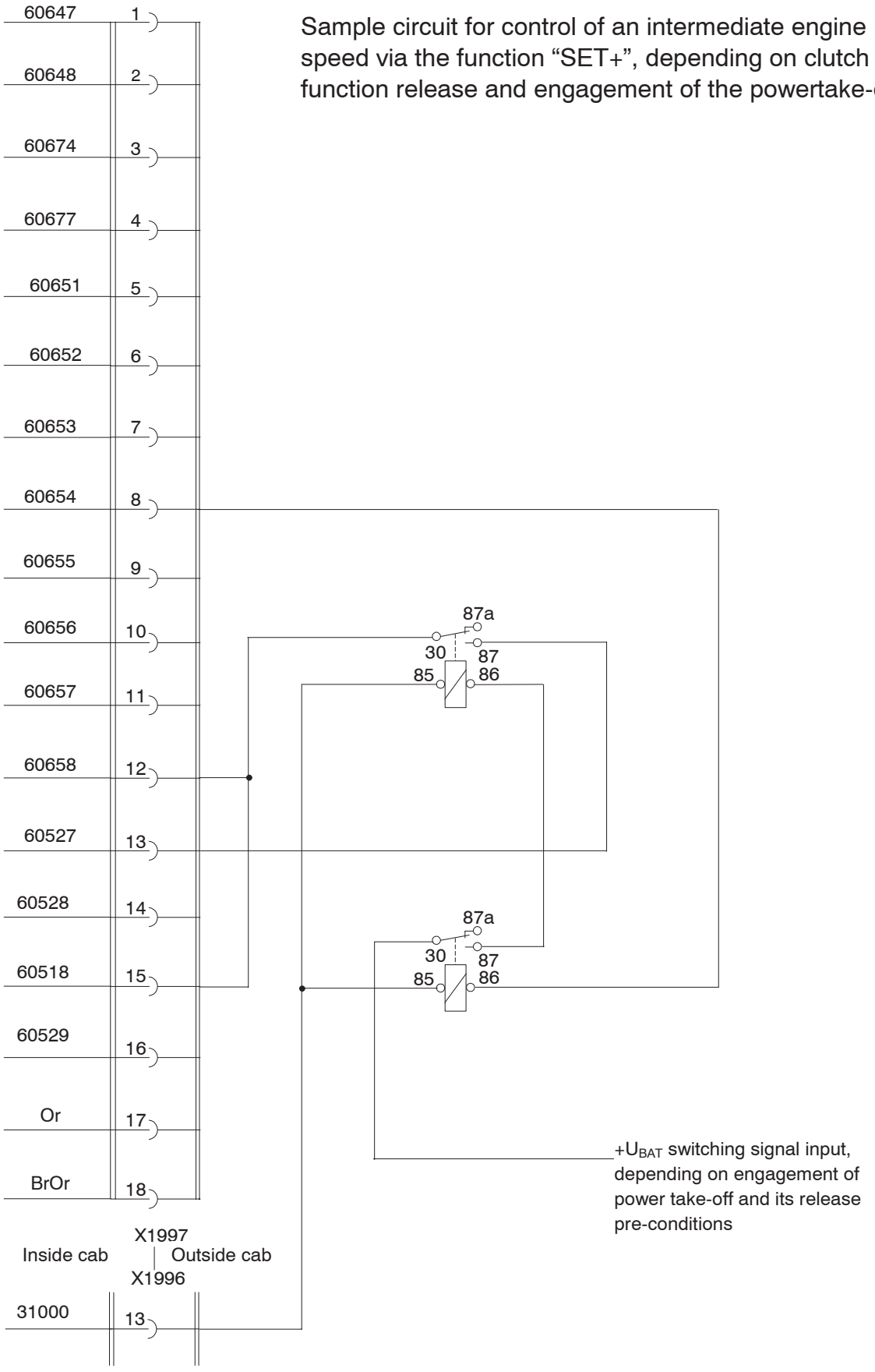
Sample circuit for external control of engine speed with the functions “SET+” and “SET-”



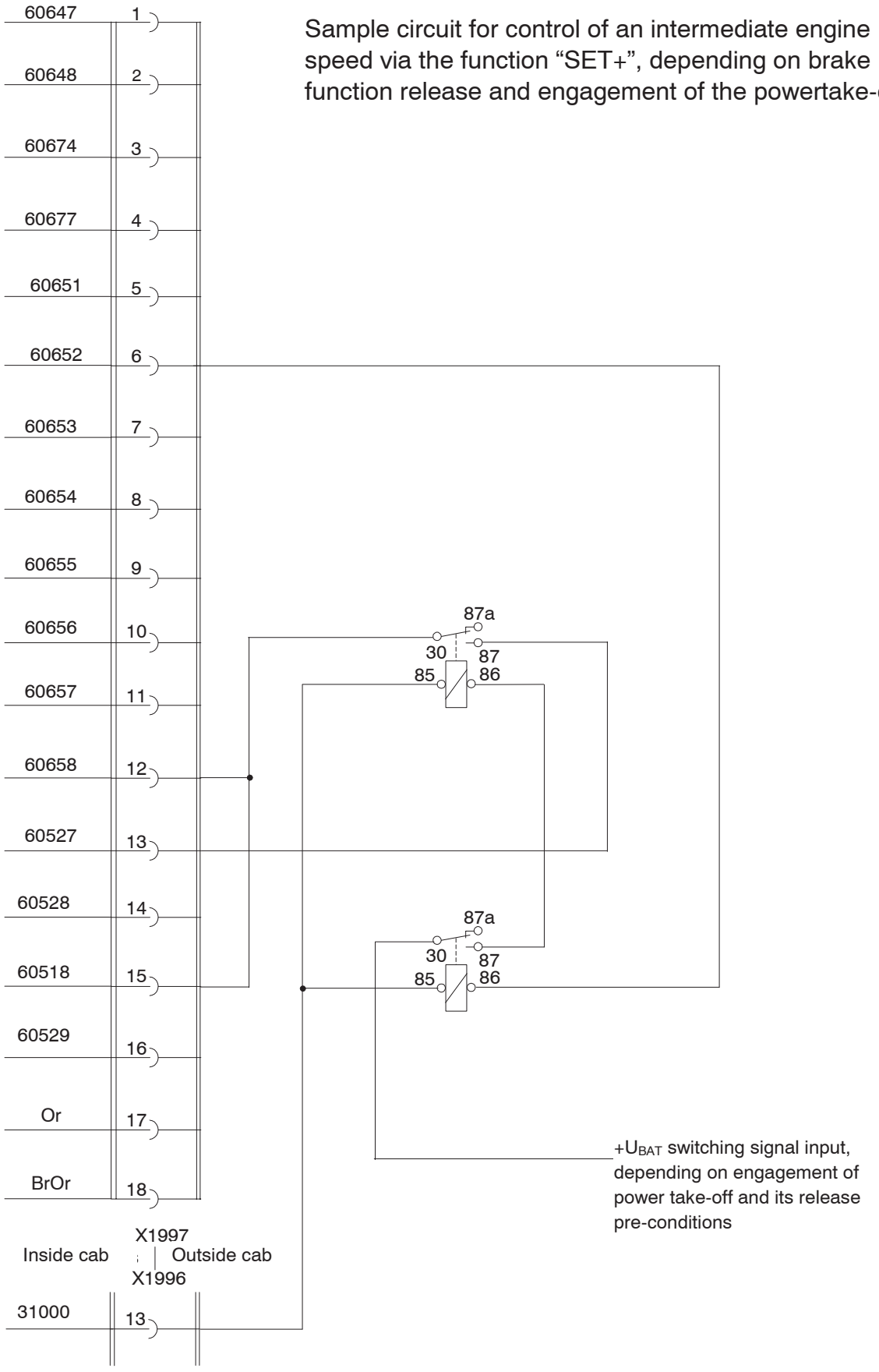
Sample circuit for external control of engine speed with functions “OFF”, “SET-”, “MEM” and “SET+ according to switching priorities”



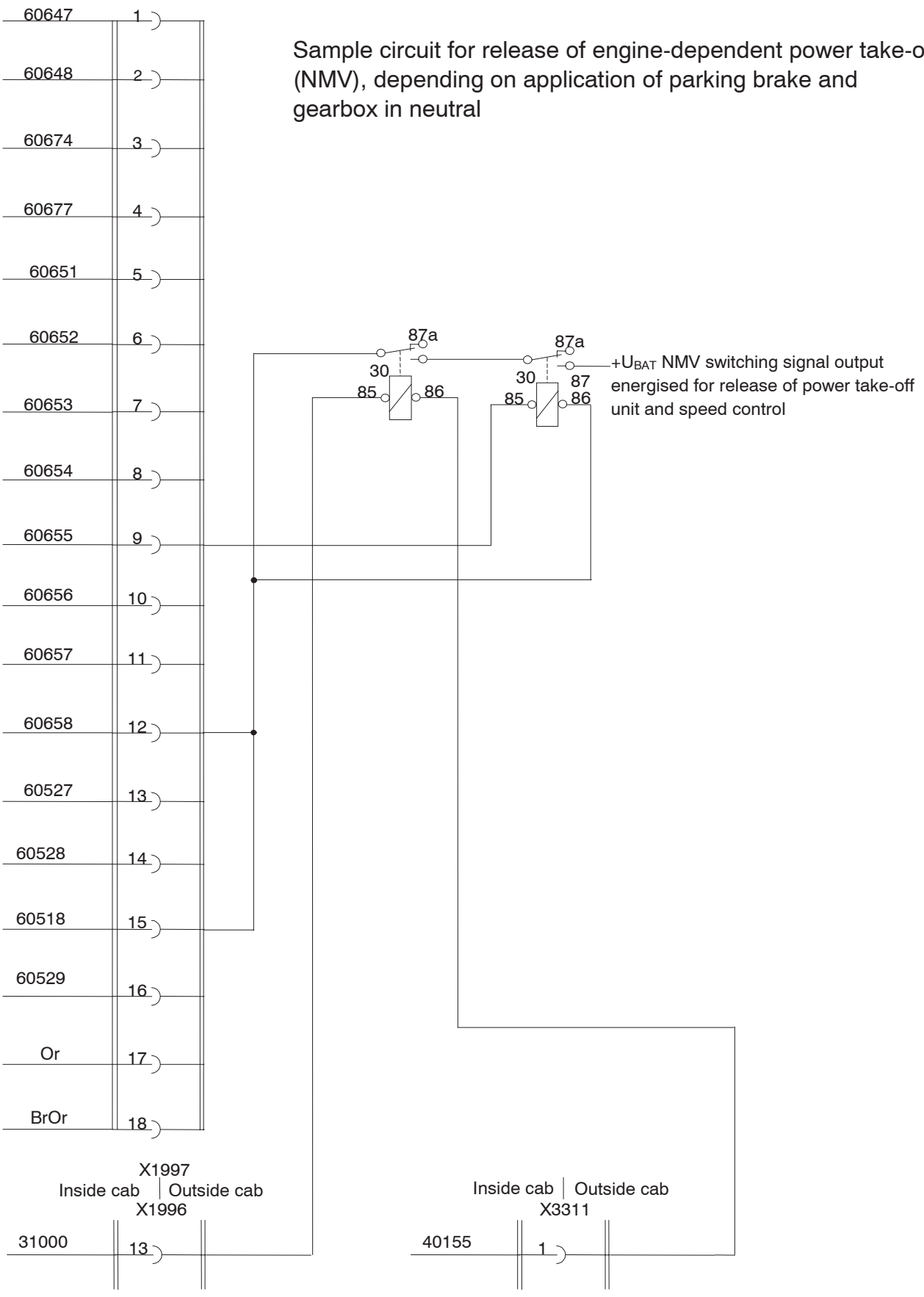
Sample circuit for control of an intermediate engine speed via the function “SET+”, depending on clutch function release and engagement of the powertake-off



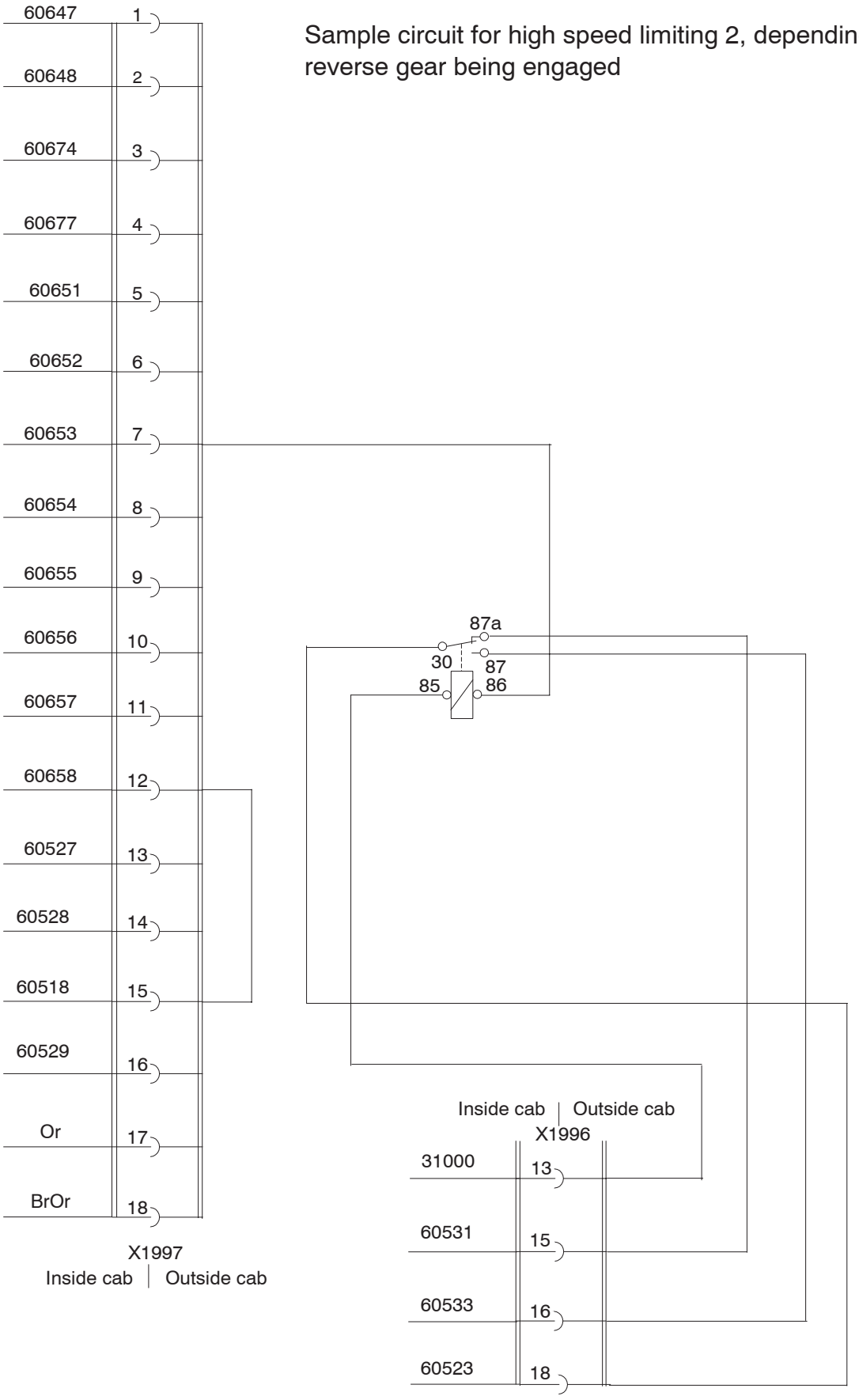
Sample circuit for control of an intermediate engine speed via the function “SET+”, depending on brake function release and engagement of the powertake-off



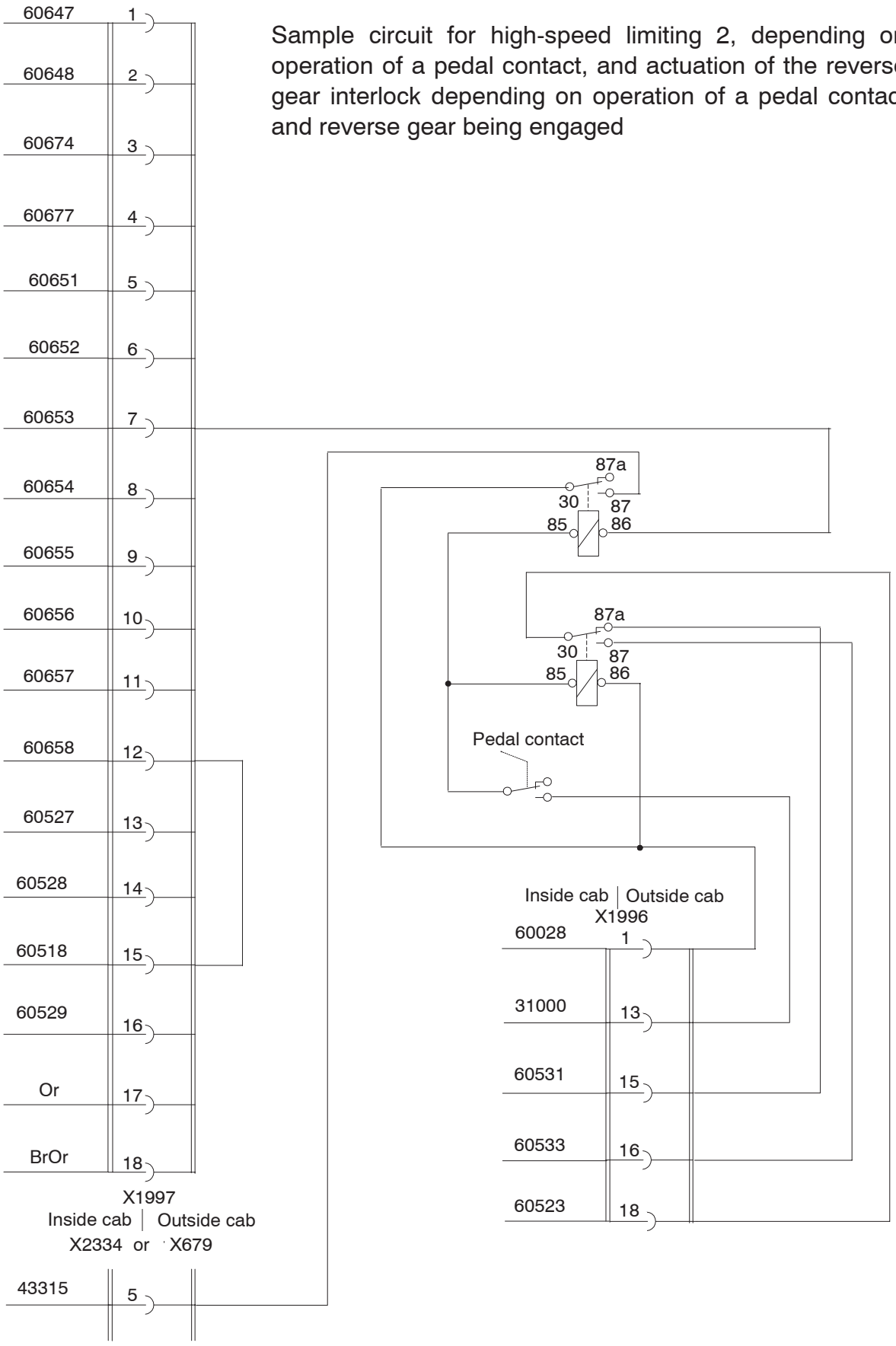
Sample circuit for release of engine-dependent power take-off (NMV), depending on application of parking brake and gearbox in neutral



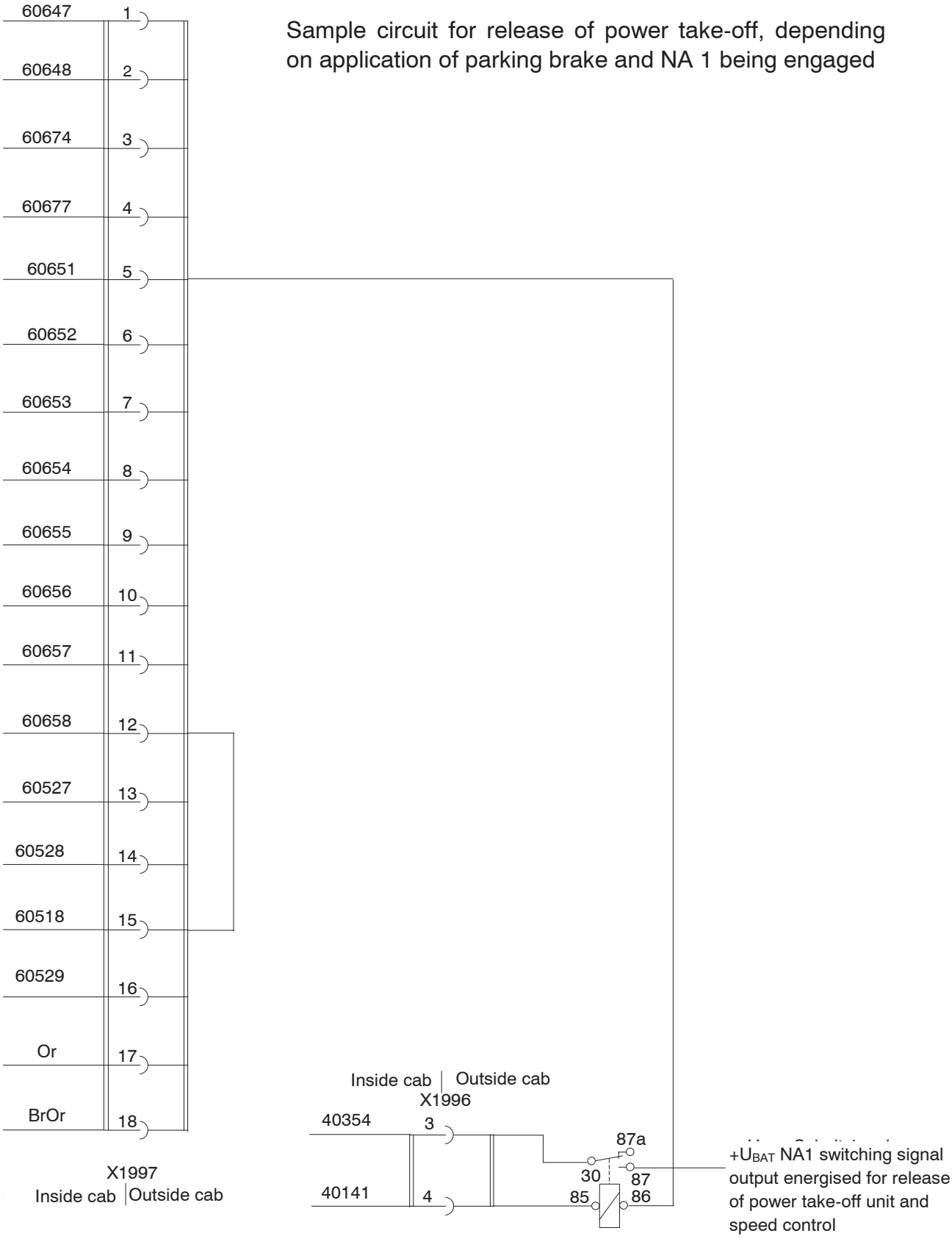
Sample circuit for high speed limiting 2, depending on reverse gear being engaged



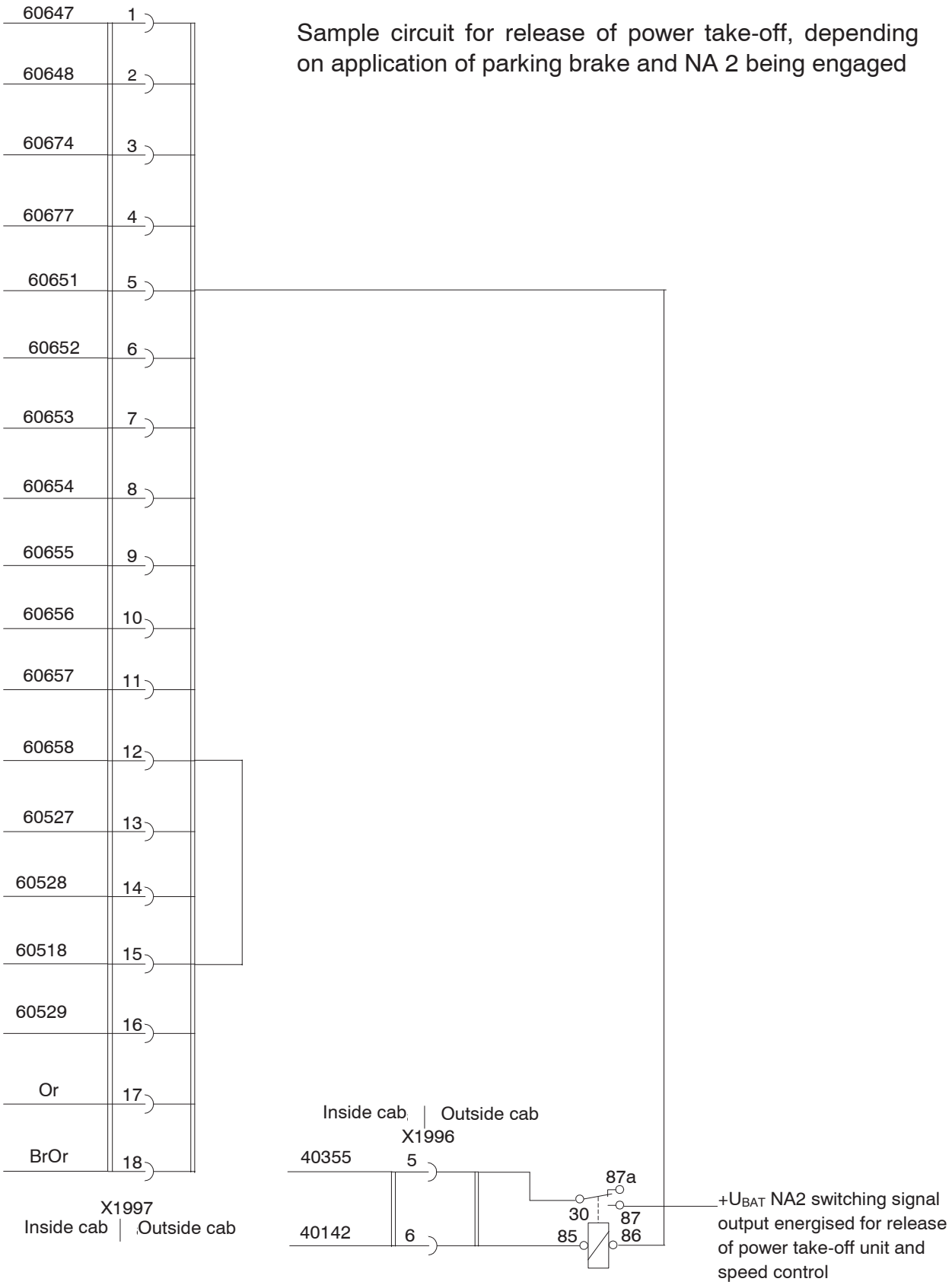
Sample circuit for high-speed limiting 2, depending on operation of a pedal contact, and actuation of the reverse gear interlock depending on operation of a pedal contact and reverse gear being engaged

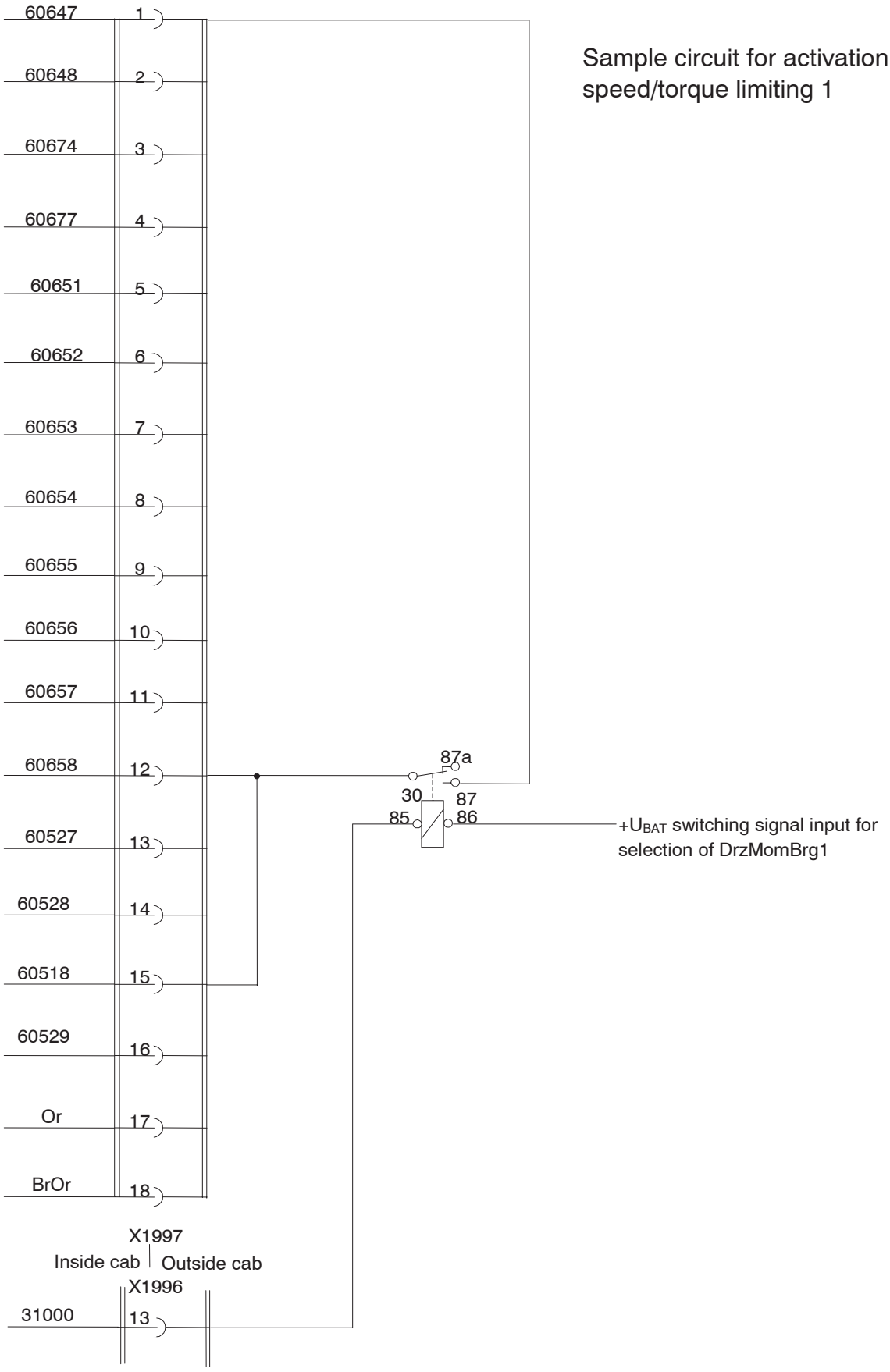


Sample circuit for release of power take-off, depending on application of parking brake and NA 1 being engaged

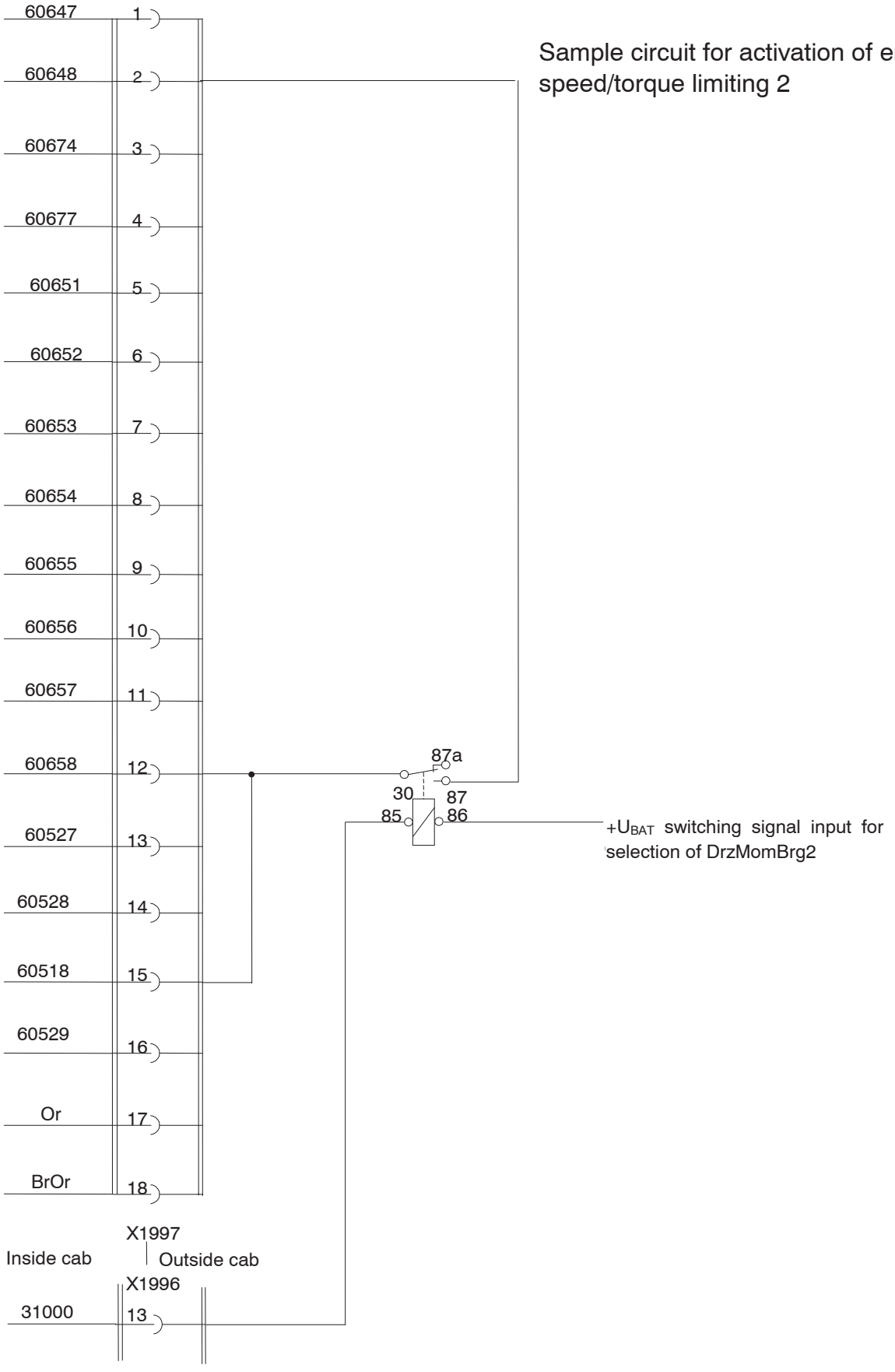


Sample circuit for release of power take-off, depending on application of parking brake and NA 2 being engaged



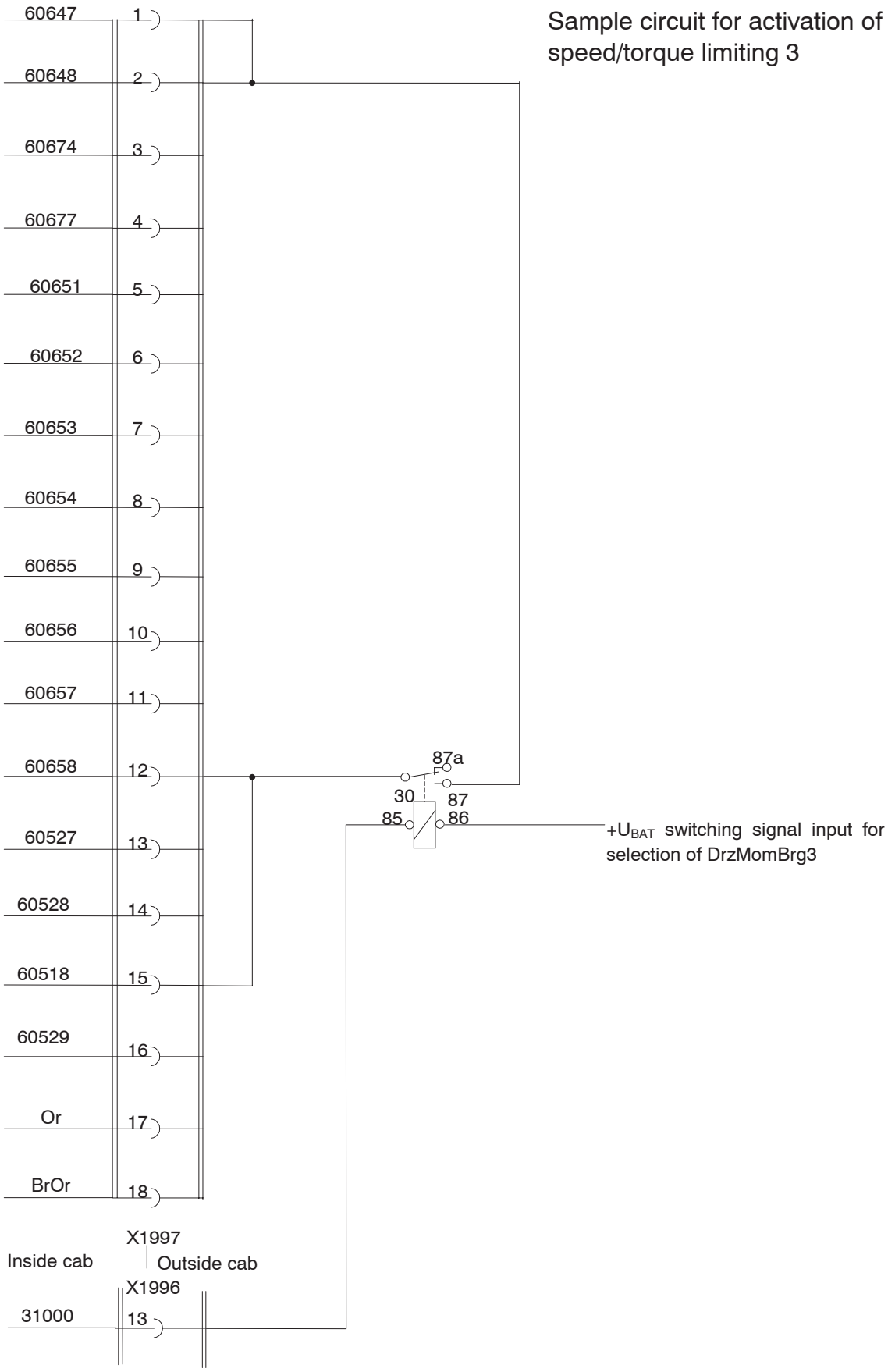


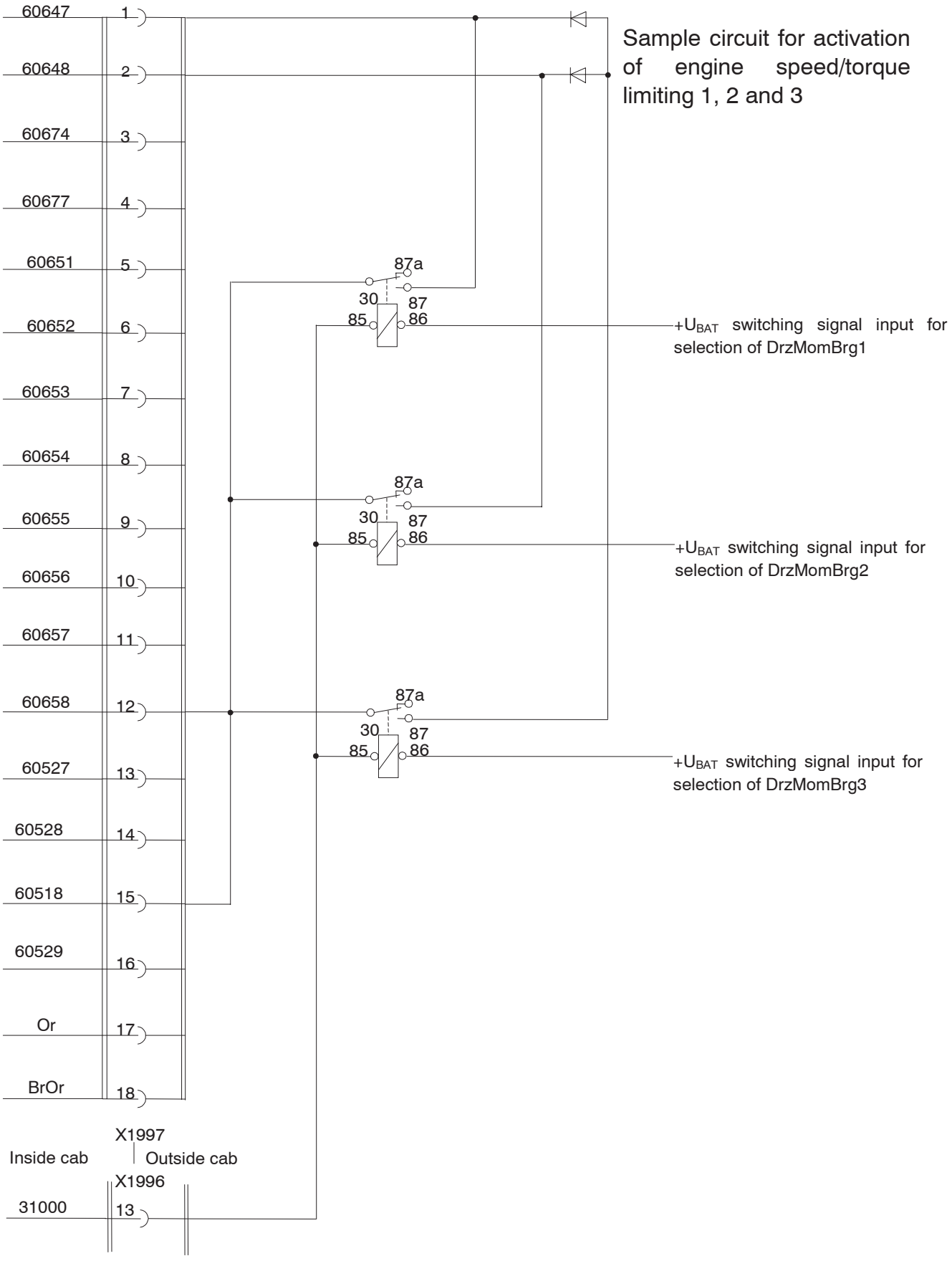
Sample circuit for activation of engine speed/torque limiting 1



Sample circuit for activation of engine speed/torque limiting 2

Sample circuit for activation of engine speed/torque limiting 3




60647
1
60648
2
60674
3
60677
4
60651
5
60652
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60653
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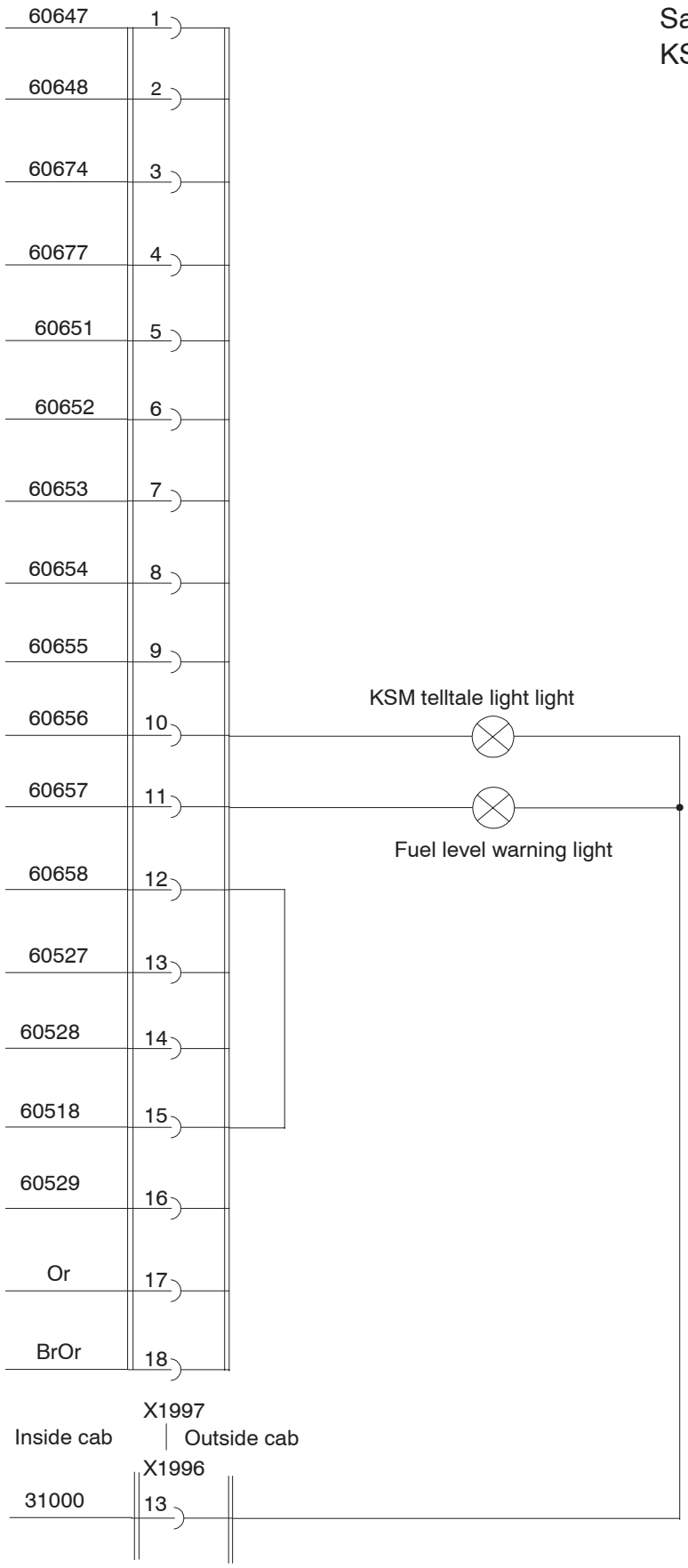
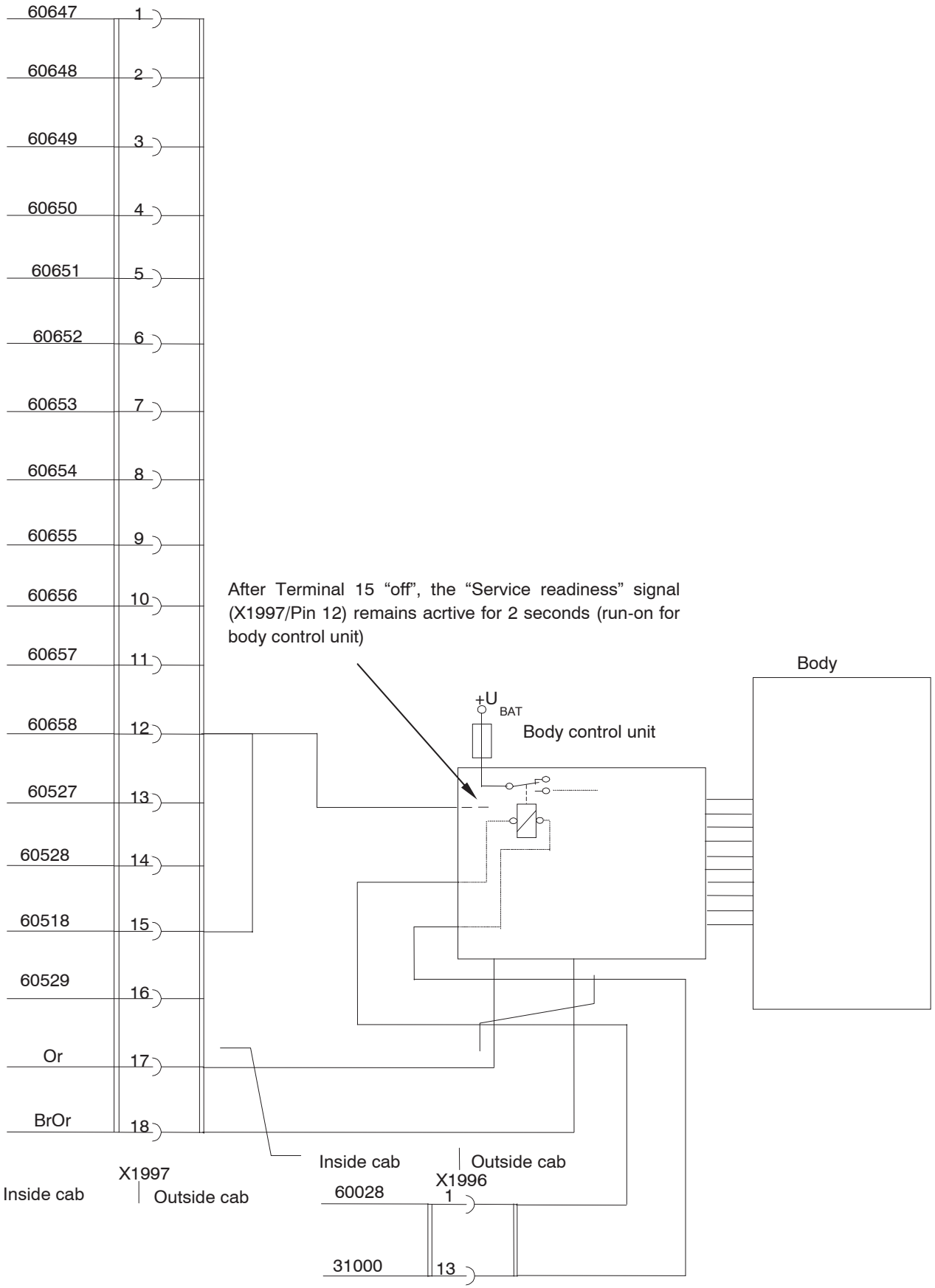
60654
8
60655
9
60656
10
60657
11
60658
12
60527
13
60528
14
60518
15
60529
16
Or
17
BrOr
18
X1997
Inside cab
Outside cab
X1996
31000
13
87a
30
87
85
86
Sample circuit for activation of engine speed/torque limiting 1, 2 and 3
+U_BAT switching signal input for selection of DrzMomBrg1
+U_BAT switching signal input for selection of DrzMomBrg2
+U_BAT switching signal input for selection of DrzMomBrg3

ZDR interface with KSM for external engine speed control on TG-A

Sample circuit for connecting the KSM and fuel level warning lights



Sample circuit for connecting body electronics with CAN interface



MAN Nutzfahrzeuge Aktiengesellschaft

Service Information

Process Instruction Product Technology	Date 21.06.2001	Issued by VSTT	SI number **71302** **Customer-specific module KSM interface**

Vehicles affected	Vehicles in the TG-A range
Parts affected	Interface on the customer-specific module (KSM)

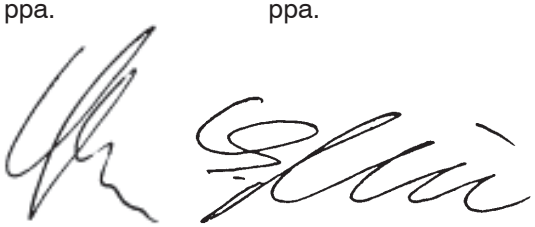
Description of interfaces	The KSM is the interface between the data network of the vehicle and the data network of the body. For the first time in MAN vehicles the KSM makes it possible to pass information about the operational state of the vehicle (in the data bus format) to body controls and requirements of the body controls (in data bus format) to the engine electronics. Information which is available in data bus format in the vehicle can also be converted by the KSM into the normal form of output signals. Input signals can also be recorded and converted into the data bus format for further processing. A description of this interface is attached to this SI. You can find a list of the fault codes on page 3. On page 4 of this SI you can find a comparison of the interfaces for the vehicle management computer (FFR) and for the KSM to help you to understand when a KSM must be installed. Note: The details with regard to the transmitting and receiving messages of the body CAN (page 8 to 17 of the interface description) is not relevant for MAN workshops. These are intended solely as information for the bodymaker.

In this connection please also note SI 68102 (vehicle management computer interfaces)

Distribution of this SI to the German/export service organisation			
Distribution inside the MAN Service workshop:			
Workshop management	yes	Spares department staff	yes
Workshop staff for performance of the work	yes	24-hour service (fitters)	no
Workshop staff in general (notice board)	yes	Authorised customer workshops	no

Retrofitting	This interface can either be ordered with the TG-A or retrofitted. When retrofitting it should be remembered that it is not only the wiring harness for the KSM has to be retrofitted in the cab. A connection must also be made with the driveline CAN (see page 6). **Caution:** The bridge between "readiness for operation" (X1997 Pin 12) and "off“ (X1997 Pin 15) must be available in order to be able to use the intermediate speed functions (ZDR S and ZDR 1 to ZDR 7). The ZDR function is switched off if this bridge is "opened".
Cirucit diagrams	You can find all circuit diagrams with regard to KSM in repair manual K90.

Yours faithfully
MAN Nutzfahrzeuge Aktiengesellschaft
ppa. ppa.



Parts for retrofitting:			
No.	Designation	Parts number	Available from
1	KSM wiring harness, left-hand drive	81.25429-6127	immediately
1	KSM wiring harness, right-hand drive	81.25429-6128	immediately
1	Wiring harness bridge consisting of		
	1 Socket housing, 18-poles	81.25435-0927	immediately
	1 Secondary lock	81.25435-0913	immediately
	1 Double spring contact	07.91201-0222	immediately
	as required line 0.75^2	07.08131-0302	immediately
1	KSM control unit	81.25816-7000	immediately
2	Automatic fuse 8 A	81.25437-0111	immediately
The following parts are required for the adaptation to the T-CAN wiring harness:			
4	Blade terminal	07.91202-0848	immediately
4	Blade receptacle	07.91201-0222	immediately
2	Blade receptacle housing, 2 poles	81.25432-0395	immediately
2	Blade terminal housing, 2-poles	81.25475-0091	immediately
as required	Line, twisted	07.08132-0538	CW 27
2	Double spring contact	07.91201-0647	immediately

Fault codes

Fault location	SPN
T-CAN bus off	00639
Output ground switch, parameterizable	00702
Input, switch terminal 30, parameterizable	00703
Pedal value transmitter	00974
Output, ready for operation	00976
Output, check lamp	01213
A-CAN bus off	01669
CAN data bus: time out for reception	
of FFR message ETC1	03000
of FFR message ETC2	03001
of FFR message ETC3	03002
of EBS message EBC1	03003
of EDC message CcVeh_speed	03004
of EDC message EEC1	03005
of EDC message EEC2	03006
of EDC message Eng_Temp	03007
of EDC message EngFlui_LevPre	03008
of EDC message Amb_Cond	03009
of ECAM message ECAM1	03010
of ZBR message Aux_Stat_Zbr1	03011
of ZBR message Time_Date	03012
of ZBR message Veh_Dist	03013
of the body CAN message KSMA	03014
Control unit	
RAM	03015
ROM	03016
Watchdog	03017
EEPROM parameters	03018
internal relay voltage supply or short circuit Terminal 30 switched output to UBatt	03019
EEPROM fault memory	03020
First faulty EOL-LID	03500

Note:
You can find the FMIs for the fault codes in the valid data collection "TG-A fault codes".

Comparison of the interface for FFR and for KSM

Interface for FFR

The following functions are provided as series at the “ZDR interface with FFR”. They are available to the bodymaker externally (outside the cab) for further wiring or circuits:

⇒ 7 intermediate speed controllers
7 different fixed intermediate speeds can be driven.

The following functions can be parameterised in the vehicle management computer FFR for each of these intermediate speed controllers:

- Target speed
- Upper/lower speed limit; within these limits the target speed can be changed and if applicable stored only in the cab with the control element.
- Control element function (active without/with storage)
- Cut-off conditions (brake, parking brake, speed threshold, gearbox neutral position, clutch)
- Ramp steepness with which the intermediate speed is to be driven
- Control parameter kit (standard/concrete pumps)
- Pedal value transmitter ("violation" of the driven intermediate speed possible or not possible)
- Maximum torque

⇒ 2 different maximum road speeds (can be parameterised in the FFR)

⇒ 2 different engine speed limits (can be parameterised in the FFR)

⇒ Electricity supply with “ignition on”:
- Terminal 15 (max. 1.5A load capacity)
- Ground supply

With KSM the standard ZDR interface with FFR is supplemented/expanded.

KSM is required for the following cases:

- Use of a body electronics system with CAN interface.
- Bodymaker would like to set optional speed externally (outside cab).
- Bodymaker requires information about the operational state (gearbox neutral, parking brake, ...) of the vehicle for his controls.
  Note:
  No information about the operational state of the vehicle is provided via the standard ZDR interface with FFR!

Interface with KSM

The following functions are additionally provided at the "ZDR interface with KSM". They are available to the bodymaker externally (outside the cab) for additional cabling or circuitry.

⇒ Information on the operational state of the vehicle:

provision as high-side switch

- Reverse gear (engaged/disengaged)
- Parking brake (engaged/disengaged)
- Service brake (activated/not activated)
- Clutch (activated/not activated)
- Check lamp (KSM)
- Readiness for service (KSM readiness, can be parameterised)
- Tank warning

Provision as low-side switch

- Gearbox neutral

Provision as frequency signal

- Engine speed (can be parameterised)

The bodymaker can connect check lamps or relays to all high-side and low-side switches if he requires them for the control of his body electrics/electronics. To increase the functional safety or vehicle availability a monitoring system for these switches can be activated and paramaterised to improve the diagnostic depth (test impulses!).

⇒ Variably adjustable intermediate speed control:

The bodymaker can set any speed externally (outside the cab) via the SET+/- and MEMORY function and if required also store it.

⇒ 3 different torque restrictions (can be parameterised in the KSM)

⇒ 3 different speed restrictions (can be parameterised in the KSM)

⇒ Bodymaker CAN interface (A-CAN)

Bodymakers who use CAN-compatible body electronics can use the A-CAN of the KSM for communication with the vehicle.

Provision via CAN interface (A-CAN) [1]

- Power take-offs I + II (request/status) if available
- Reverse gear
- Parking brake
- Service brake
- Clutch
- Tank warning
- Gearbox neutral
- Engine speed
- Gearbox input speed
- Accelerator pedal position
- Injection quantity
- Oil temperature
- Oil pressure
- Coolant temperature
- Fuel temperature
- Supply pressure, brake circuit
- External temperature
- Road speed signal

Influencing the vehicle via bodymaker CAN interface (A-CAN)

- Maximum speed restriction
- Activation of the 7 intermediate speed controllers
- ZDR operation (SET+/-, MEM, AUS)
- Speed definition/restriction
- Torque definition/restriction
- Planned in the medium term: engine-start-stop

[1] This list includes only the most important signals; the full list can be found in the attachment to this SI.

Extension of T-CAN

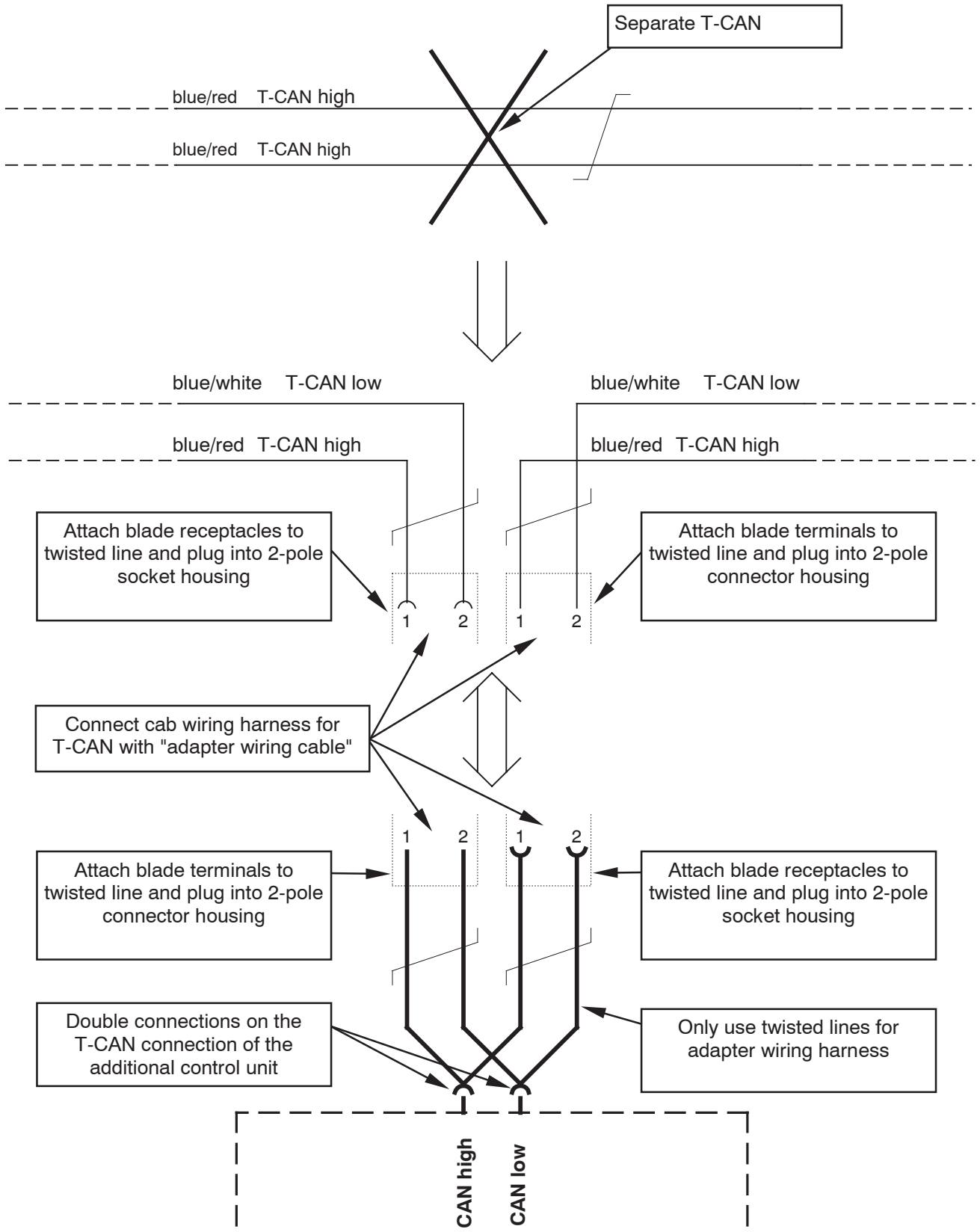
The terminating resistors of the T-CAN are located in the FFR and in the ECAM (in the ECAM replacement solution the resistor is installed in the region of the isolating point behind the left-hand front wall of the cab in the wiring harness). All the other control units are connected to the T-CAN with the aid of a double connection.

The following must be considered for the extension of the T-CAN:

- The additional control unit must be connected via a 2-pole plug connection (no spur line permissible).
- Only one twisted line consisting of two individual lines may be used for the connection (line colours: blue/white and blue/red).
- The T-CAN connection to the additional control unit is to be designed as a double connection.
- Please note descriptions in the repair manual T51-A1.

Procedure:

1. Cut twisted line in the region of the additional control unit.
2. Attach a blade terminal, 07.91202-0848, on the one side of the cut line for CAN high (blue/red) and plug into compartment 1 of a 2-pole connector housing, 81.25475-0091.
3. Attach a blade receptacle, 07.91201-0222, to the other side of the line and plug into chamber 1 of a 2-pole connector housing, 81.25432-0395.
4. Attach a blade terminal, 07.91202-0848, on the one side of the cut line for CAN low (blue/white) and plug into compartment 2 of the connector housing.
5. Attach a blade terminal, 07.91201-0222, to the other side of the line and plug into compartment of the connector housing.
6. To produce the adapter wiring harness cut off two lengths of twisted line which can be laid between the connector plug of the additional control unit and the "CAN isolating point".
7. Attach a blade terminal, 07.91202-0848, to the twisted line for CAN high (blue/red), and plug into compartment 1 of a 2-pole connector housing, 81.25475-0091.
8. Attach a blade terminal, 07.91202-0848, to this twisted line for CAN low (blue/white), and plug into compartment 2 of this connector housing.
9. Attach a blade receptacle, 07.91201-0222, to the other twisted line for CAN high (blue/red) and plug into compartment 1 of a 2-pole connector housing, 81.25432-0395.
10. Attach a blade receptacle, 07.91201-0222, to the other twisted line for CAN low (blue/white) and plug into compartment 2 of this connector housing.
11. Attach both lines for CAN high (blue/red) to the connection for CAN high of the additional control units with the aid of a double connection
    (In the KSM: combine lines with double spring contact, 07.91201-0647, and plug into compartment 5 of the connector X3).
12. Connect both lines for CAN low (blue/white) to the connection for CAN low of the additional control unit with the aid of a double connection
    (In the KSM: combine lines with double spring contact, 07.91201-0647, and plug into compartment 9 of the connector X3).
13. Attach the "adapter wiring cable" to the T-CAN wiring cable.



Additional control unit
(e.g. KSM)

ZDR INTERFACE WITH CUSTOMER-SPECIFIC CONTROL MODULE (KSM) FOR EXTERNAL SPEED CONTROL IN TG-A

1. AREA OF APPLICATION 2

2. TERMS AND ABBREVIATIONS USED 2

3. APPLICABLE DIRECTIVES AND STANDARDS 2

4. ADDRESSES AND RESPONSIBILITIES 3

5. GENERAL NOTES ON THE ZDR INTERFACE WITH KSM 3

6. NOTES FOR THE PARAMETERISATION OF THE KSM 4

6.1. Basic function for intermediate speed control 4

6.2. Parameterisation possibilities in the KSM 4

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7.1. General 7

7.2. Parameterisation of the A-CAN 7

7.3. Information about the operational state of the vehicle on the A-CAN 7

7.4. Possible requirements for KSM via A-CAN 7

7.5. A-CAN transmission messages 9

7.6. A-CAN receipt messages 18

7.7. Processing KSM/FFR information if defined by the KSMA message 20

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9. DESCRIPTION OF INTERFACES AND INSTALLATION LOCATION 28

10. CIRCUIT EXAMPLES 29

1. Area of application

This interface description applies to all bodymakers who require "an external speed control" on MAN's commercial vehicles. The interface described here supplements the standard "ZDR interface with FFR" and thus adds numerous functions to this. Vehicles from the "Trucknology Generation" (TG) are affected by the interfaces as described here.

2. Terms and abbreviations used

The following terms are terms or abbreviations are used in the PIN description:

Term/Abbreviation	Explanation
A-CAN	Bodymaker CAN
OFF	Switching off the FGR/FGB/ZDR function
DBG	Speed limitation
DE	Digital input
EMC	Electromagnetic compatibility
FFR	Vehicle management computer
FGR/FGB/ZDR	Driving speed control/driving speed limitation/intermediate speed control
GETRIEBE-N	Neutral position of the gearbox
HGB	Maximum speed limitation
HP	ZF HP automatic gearbox..
KSM	Customer-specific control module
KS	Short circuit
LED	Light emitting diode
M3135	MAN works standard (letter M + 4-digit number)
MAN-cats II	Computer diagnostic system of MAN workshops
MBG	Torque limitation
MEMORY	Resumption of a stored function
NA	Power take-off
PIN	Plug contact
R-Gang	Reverse gear
SET-	Retardation or lowering and setting speed
SET+	Acceleration or increasing and setting speed
SG	Control unit
T-CAN	Driveline CAN (CAN = Controller Area Network)
$+U_{BAT}$	Plus voltage of the batteries
$-U_{BAT}$	Minus voltage of the batteries
ZDR	Intermediate speed control

3. Applicable directives and standards

- The relevant guides to fitting bodies for trucks and semitrailer tractors, here in particular the "Electrics" and "Trucknology Generation" booklets; incl. all supplements in the bodymaker information sheets
- MAN specification - relays for commercial vehicles
- MAN standard M 3285 (EMC) and EC directive 72/245/EEC incl. 95/54/EEC
- MAN standard M 3135 (electric lines)
- DIN 40 050
- DIN 40 839 part 1, 3 and 4
- DIN 57 879, part 3
- VDE 0879, part 3
- VG 95 370 to 95 377
- MIL-STO 461 and 462
- ISO 11898-24V
- SAE J1939/ff

4. Addresses and responsibilities

The reference sources can be seen in the MAN guides to fitting bodies for trucks. This is available from:

MAN Nutzfahrzeuge AG / TDB Dept (Fax: +49 089 1580 4264)
Postfach 50 06 20
D-80976 München

5. General notes on the ZDR interface with KSM

- The interface is not a standard feature of the vehicle and must be ordered separately.
- MAN Sales must be informed of the desired parameters in the KSM control unit such as speed limitation, torque limitation etc. for the programming in the plant when the order is placed.
- The preparation for "Start-Stop device“ is independent from the interface for external speed control and must be ordered separately.

  The lines for an external control (engine start-stop) are in a coil in the frame end.
- The "backup locking for refuse trucks" is not a part of the interface and must be ordered separately.
- **The interface wiring must be treated with extreme care since it involves major intervention in the on-board network and in the wiring of the electronics.**
- Only electric lines corresponding with MAN's M 3135 standard may be used.
- Only relays corresponding with MAN's relay specifications for external wiring may be used.
- Care must be taken that the contacts are properly crimped in accordance with the instructions of the contact manufacturer.
- External control elements of the bodymaker must comply with the protective system IP69K in accordance with DIN 40 050 and must additionally be secured against unauthorised intervention by third parties.
- The electricity supply ($+U_{BAT}$) for units and controls on the body is to be fed from the battery via a separate and suitable line fuse protection system. The feeding of just +12 volt to just one battery is not permissible.
- For the ground a separate cable is to be laid to the joint ground point on the engine bearing (the vehicle frame must not be misused as a ground lead!).
- Different ground potentials of the external wiring must not be connected to each other.
- **The wiring of the interface must be decoupled from the load current circuit of the body control.**
- The external wiring must comply with the requirements of MAN's M 3285 standard for the commercial vehicle system. For example, radio devices such as radio remote control must not influence any functions described in the specifications.
- **The wiring examples issued by MAN as illustrations are under no circumstances to be used as design instructions. Whoever wires the interface is fully liable in this respect.**

6. Notes for the parameterisation of the KSM

6.1. Basic function for intermediate speed control

- The parameterisation of the individual ZDR modes is carried out in the FFR. The individual modes can be selected externally (outside the cab) via the standard ZDR interface (FFR).
- The parameterisation possibilities of the FFR and the pin description of the "ZDR interface with FFR“ are described in the document "ZDR interface with the vehicle management computer for external speed control in TG".
- With the "ZDR interface with KSM“ the "SET+“, "SET-“, "MEMORY“ and "OFF" functions already known from the cruise control system are made available externally (outside the cab).
- In addition further intermediate speeds can be realised - by means of the activation of the speed limitation.

6.2. Parameterisation possibilities in the KSM

Various functions can be parameterised in the KSM with the aid of MAN-cats II:

- Speed limitation:
  When the corresponding DBG pins (X1997/pin 1 and 2) are activated the parameterised speed limitation is selected.
- Torque limitation:
  When the corresponding MBG pins (X1997/pin 3 and 4) are activated the parameterised torque limitation is selected.
- Engine speed:
  That angular impulse figure (number of impulses per engine revolution) and the speed threshold from which the rectangular signal (duty cycle 50/50) is given can be parameterised.

- ZDR digital inputs:
  Parameterisation is possible if the inputs (SET+/-, MEMORY and OFF) are supported. If the inputs are supported any corresponding specification by A-CAN is ignored. If the inputs are not supported any specification by A-CAN is passed on and a possible wiring of the digital inputs ignored.

- A-CAN interface:
  For parameterisation possibilities see chapter 7.2.

- Fault recognition at the following switch signal outputs:
  - High-side switches
    - Parking brake (X1997/Pin 5)
    - Brake (X1997/Pin 6)
    - R_gear (X1997/Pin 7)
    - Clutch (X1997/Pin 8)
    - Check lamp (X1997/Pin 10)
    - Tank warning (X1997/Pin 11)
    - Readiness for operation (X1997/Pin 12)
  - Low-side switch
    - Gearbox N (X1997/Pin 9)

  The following variants are possible in the fault recognition:

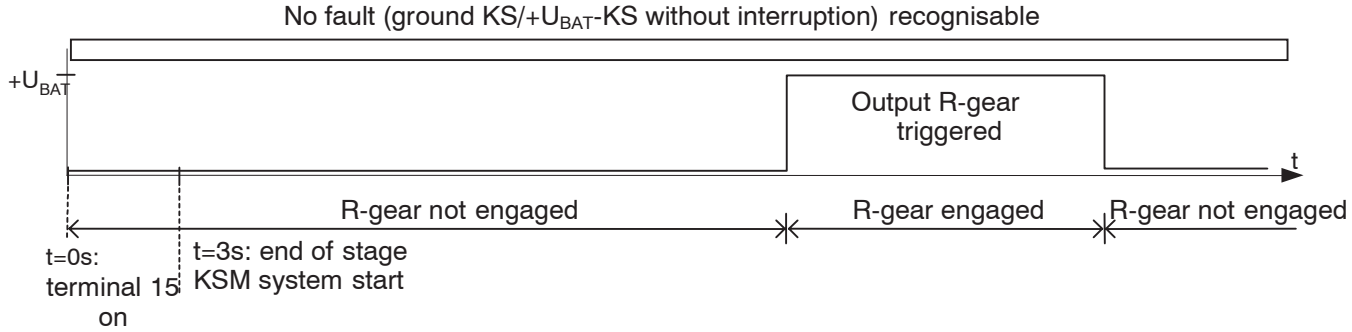
  - Without fault recognition
    Switch signal output is not monitored
  - With fault recognition
    ⇒ Monitoring of high-side switches:
    Signal high: short circuit to ground is monitored
    Signal low: short circuit to $+U_{BAT}$ and line interruption are monitored
    ⇒ Monitoring of low-side switches:
    Signal high: short circuit to ground and line interruption are monitored
    Signal low: short circuit to $+U_{BAT}$ is monitored
  - With fault recognition and test impulses ("extended fault monitoring“)
    ⇒ Test impulses during KSM system start (up to approx. 3 seconds after "terminal 15 on")
    During the system start short circuit to $+U_{BAT}$, short circuit to ground and line interruption are monitored following which faults are monitored depending on the version of the switch signal output
    ⇒ Test impulses
    Independent of the version of the switch signal output, from "terminal 15 on" short circuit to $+U_{BAT}$, short circuit to ground and line interruption are monitored.

  Condition for fault recognition:
  Load at output for high-side switches not higher than 400 Ω and at low-side switches not higher than 2000 Ω.

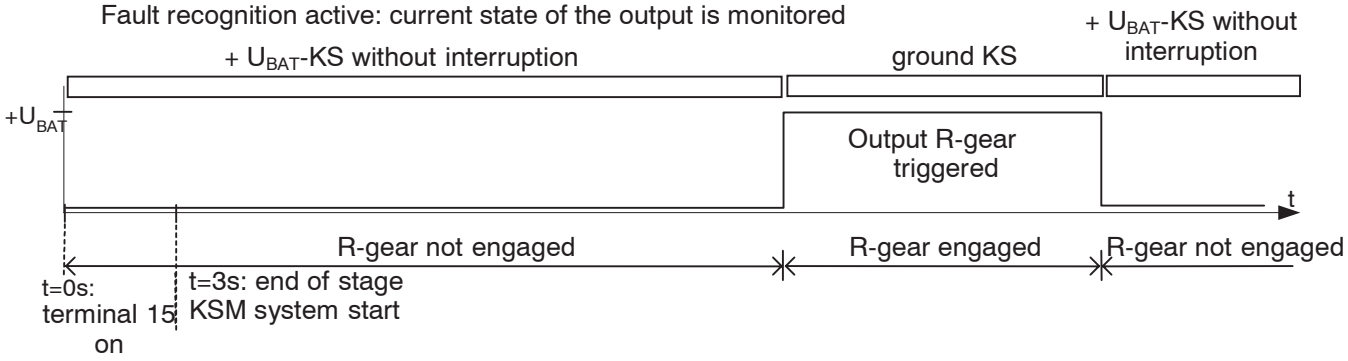
  Note:
  If the fault recognition is activated the diagnostic depth of the components connected to the "ZDR interface with the KSM“ is considerably improved and hence the functional safety and vehicle availability are increased.

Fault recognition with differing parameterisation using the "R-gear" switch signal output as an example:

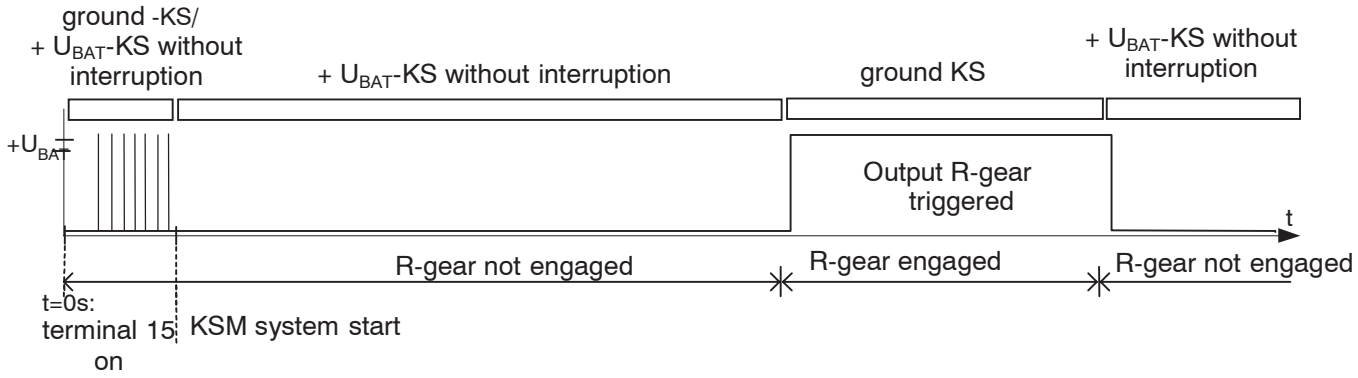
- Output not supported (load is connected):
  Fault recognition not active



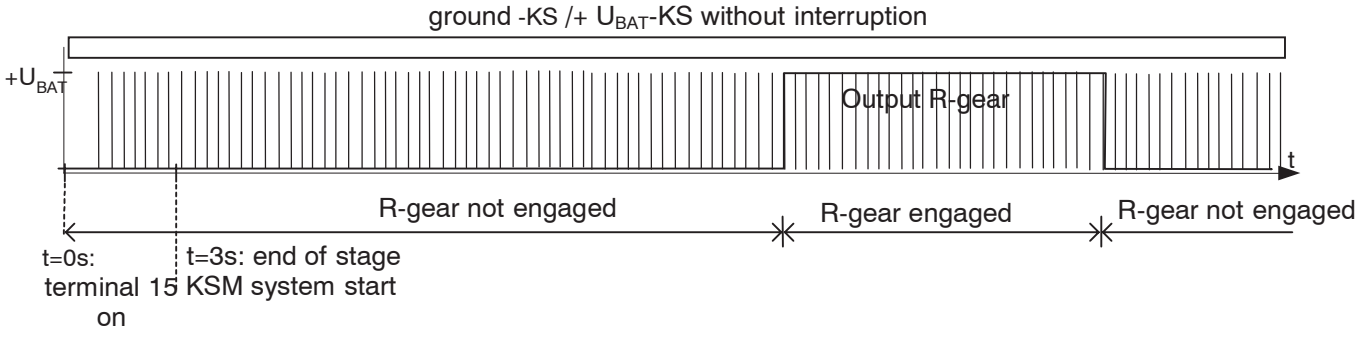
- Output supported (load must be connected!):
  Fault recognition active: current state of the output is monitored



- Output is supported (load must be connected!):
  Fault recognition active: current state of the output is monitored and test impulses only during at KSM control unit run up (test of ground short circuit with high-side switches and test of Ubat short circuit on low-side switches)



- Output supported (load must be connected!):
  Fault recognition active: current state of the output is monitored and test impulses cyclical (permanent monitoring on ground short circuit with high-side switches and permanent monitoring on Ubat short circuit with low-side switches)



Note:
The test impulses have a duration of approx. 1 ms and a repetition time of approx. 300 ms.

Caution:
The switch signal outputs of the KSM are activated by CAN messages which are transmitted on the T-CAN to the KSM. If there is no CAN message the related signal output of the KSM switches into a defined condition:

High-side switch:	low
Low-side switch:	high

7. A-CAN interface

7.1. General

A high-speed CAN interface to ISO 11898-24V and specification 2.0B is available for the communication to the bodymaker CAN. The transmission speed is 250kbit/s.
The A_CAN is completely galvanically separated to protect the MAN CAN network in the vehicle from external influences/interference.

A 120Ω terminating resistor is permanently connected. There is a CAN filter reactor.

The CAN data line is designed as a 2-core twisted line up to the interface (MAN parts number: 07.08132.4384). For EMC reasons the line from the interface to the control unit on the body should be as short as possible and twisted (see ISO 11898-24V). MAN recommends the line with the MAN item number 07.08132.4384 (FLRY-2x0,75-B-28-or-bror) for this.

MAN bases its definition of the A-CAN on the SAE J1939/ff.
The numbers in brackets beside the identification number refer to SAE J1939/71 "VEHICLE APPLICATION LAYER".

7.2. Parameterisation of the A-CAN

Each message which the KSM receives on the T-CAN is also transmitted to the A-CAN. It can be parameterised so that individual or all A-CAN messages are not transmitted.

It can be paramaterised whether a message which is received (KSMA) is ignored by the body electronics in the KSM or processed.

The receiving timeout can also be parameterised; if applicable also the identifier of the message received.

7.3. Information on the operational state of the vehicle on the A-CAN

The following information with regard to the body electronics can be made available via the A-CAN – depending on the fittings of the vehicle and the parameterisation in the KSM:

- Driveline open/closed
- Gearbox output speed
- Gearbox input speed
- Clutch slip
- Gear selected
- Ratio of gearbox input - to gearbox output speed
- Current/last gear
- Gear engaged
- Gearbox neutral position
- NA1 requested/active
- NA2 requested/active
- Parking brake activation
- Vehicle speed
- Clutch pedal activation
- Brake pedal activation
- ABS active/not active
- Brake pedal position
- Reverse gear engaged/ not engaged
- Engine torque/injection quantity
- Engine speed
- Kickdown position
- Idle position
- Degree of engine utilisation
- Accelerator position
- Engine oil pressure
- Coolant temperature
- Fuel temperature
- Engine oil temperature
- Parking brake and/or trailer supply air pressure
- Brake circuit 1 and 2
- Supply pressure for auxiliary (special) equipment
- Air pressure (surroundings)
- Air temperature (surroundings)
- Time/date (GMT = "General Mean Time")
- Total kilometrage
- Daily kilometre recorder

7.4. Possible requirements for KSM via A-CAN

KSM can receive the following requirements from the body electronics on the A-CAN for further processing by the FFR:

- Torque requirement/torque limitation
- Speed requirement/speed limitation
- Request for the intermediate speed control ZDR mode S, 1-7
- Request for ZDR operation (SET +/-, MEM, AUS)
- Maximum speed limitation
- External engine start/stop (currently [2/01] only engine stop possible!)

7.5. A-CAN transmission messages

The following transmission messages can be provided by KSM on the A-CAN:

ETC1: Electronic Transmission Controller #1 (3.3.5 = chapter of SAE J1939/ff) 0CF00203

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	240	2	3	0x00F002	0x0CF00203

Byte	Bit	Description		
1	8 to 3	XX (information insignificant for bodymaker)		
	2 and 1	Driveline status status ETC1 [driveline_engaged] (3.2.2.6)		
		00	Driveline open (driveline disengaged)	
		01	Driveline closed (driveline engaged)	
		10	Error signal	
		11	Signal not available	
2 and 3	---	Gearbox output speed [output_speed_TCU] (3.2.1.14)		
		rpm per bit = 0.125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
4	---	Clutch slip [clutch_slip] (3.2.1.20)		
		% per bit = 0,4	Offset [%] = 0	Range [%] = 0 to 100
5	---	XX		
6 and 7	---	Gearbox input speed [input_speed] (3.2.5.55)		
		rpm per bit = 0,125	Offset [rpm] = 0	Range [rpm] = 0 to 8031,875
8	---	XX		

ETC2: Electronic Transmission Controller #2 (3.3.8) 18F00503

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	5	6	0x00F005	0x18F00503

Byte	Bit	Description		
1	---	Selected gear [selected_gear] (3.2.1.23)		
2 and 3	---	Ratio gearbox input to gearbox output speed [actual_gear_ratio] (3.2.1.25)		
		0.001 per Bit	Offset = 0	Range = 0 ... 64.255
4	---	Current/last gear [current_gear] (3.1.2.22)		
5 to 8	---	XX		

Note:

Offset = -125	Range = -125 ... 125
Values with positive prefixes are forward gears; values with negative prefixes are reverse gears. The value "0“ is used for the neutral position of the gearbox, the value "126" for the parking position (automatic gearbox)	

ETC3: Electronic Transmission Controller #3 (3.3.50) 1CFEC703

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Each second or in the event of changed status	8 bytes	254	199	7	0x00FEC7	0x1CFEC703

Byte	Bit	Description	
1 and 2	---	XX	
3	8 to 5	XX	
	4 and 3	Gear engaged (engagement indicator) [shift_finger_status_1] (3.2.6.20)	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
	2 and 1	Gearbox neutral position (neutral indicator) (3.2.6.19)	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
4 to 6	---	XX	
7	8 and 7	Not defined	
	6 to 4	Power takeoff status NA1 [PTO2_state]	
		0x1	Requested
		01x	Switched on (active)
		1xx	Not defined
	3 to 1	Power takeoff status NA2 [PTO1_state]	
		0x1	Requested
		01x	Switched on (active)
		1xx	Not defined
8	---	XX	

Note:
The power takeoff status is not defined in accordance with SAE 1939/71.

Ccveh_speed: Cruise control/vehicle speed (3.3.31) 18FEF100

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	254	241	6	0x00FEF1	0x18FEF100

Byte	Bit	Description		
1	8 to 5	XX		
	4 and 3	Parking brake activation [park_brake_switch] (3.2.6.8)		
		00	Parking brake not set	
		01	Parking brake set	
		10	CAN message error	
		11	CAN message not available	
	2 and 1	XX		
2 and 3	---	Vehicle speed [veh_speed_FFR] (3.2.1.12)		
		km/h per Bit = 1/256	Offset [km/h] = 0	Range [km/h] = 0 ... 251
4	8 and 7	Clutch switch [clutch_switch] (3.2.6.12)		
		00	Clutch pedal released	
		01	Clutch pedal depressed	
		10	Error signal	
		11	Error signal not available	
	6 and 5	Brake pedal activation [brake_switch] (3.2.6.11)		
		00	Brake pedal released	
		01	Brake pedal depressed	
		10	Error signal	
		11	Signal not available	
	4 to 1	XX		
5 to 8	---	XX		

EBC1: Electronic brake controller #1 (3.3.4) 18F0010B

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
100 ms	8 bytes	240	1	6	0x00F001	0x18F0010B

Byte	Bit	Description		
1	8 and 7	XX		
	6 and 5	ABS active [ABS_active] (3.2.2.9)		
		00	ABS not active (ABS passive but installed)	
		01	ABS active	
		10	Reserved	
		11	Does not have any reaction (don't care)	
	4 to 1	XX		
2	---	Brake pedal position [BP_position] (3.2.1.18)		
		0.4% per bit	Offset = 0 %	Range = 0% ... 100%
3 to 8	---	XX		

AUX_STAT_ZBR1: Auxiliary state I/O body controller #1
0x18FFA121

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
Each second or if status changes	8 bytes	255	$161/A1_{hex}$	6	0x00FFA1	0x18FFA121

Byte	Bit	Description	
1	8 and 7	Reverse gear engaged (in manual gearbox)	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
	6 and 5	Info fuel level in current tank too low	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
	4 to 1	XX	
2	8 to 3	XX	
	2 and 1	Info EMERGENCY OFF	
		00	Off
		01	On
		10	Error signal
		11	Signal not available
3 to 8	--	XX	

EEC1: Electronic engine controller #1 (3.3.7) 0CF00400

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
The FFR sends the EEC1 every 10 ms. SAE 12-50ms	8 bytes	240	4	3	0x00F004	0x00F00400

Byte	Bit	Description		
1 and 2	---	XX		
3	---	Engine torque/injection quantity (actual engine torque) [act_eng_torque] (3.2.1.5)		
		1% per Bit	Offset = -125 %	Range = -125% ... 125%
4 and 5	---	Engine speed [engine_speed] (3.2.1.9)		
		0.125 rpm per Bit	Offset = 0 rpm	Range = 0 rpm ... 8031.875 rpm
6 to 8	---	XX		

EEC2: Electronic engine controller #2 (3.3.6) 0CF00300

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
50 ms	8 bytes	240	3	3	0x00F003	0x00F00300

Byte	Bit	Description	
1	8 to 5	Not defined	
	4 to3	Kickdown position (AP kickdown switch) [AP_kickdown_sw] (3.2.2.5)	
		00	Kickdown not activated (Kickdown passive)
		01	Kickdown activated (Kickdown active)
		10	Error signal
		11	Signal not available
	2 and 1	Idle position (AP low idle switch) [AP_low_idle_sw] (3.2.2.4)	
		00	Pedal not in idle position (AP not in low idle condition)
		01	Pedal in idle position (AP in low idle condition)
		10	Error signal
		11	Signal not available
2	---	Accelerator pedal position (Accelerator pedal (AP) position) [AP_position] (3.2.1.8)	
		0.4 % pro Bit	Offset = 0 % Range = 0% ... 100%
3	---	Degree of engine utilisation (Load at current speed) [load_curr_speed] (3.2.1.7)	
		1 % perBit	Offset = 0 % Range = 0% ... 100%
4 to 8	---	XX	

EngFlui_LevPre: Engine fluid level/pressure (3.3.29) 18FEEF00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
500 ms	8 bytes	254	239	6	0x00FEEF	0x00FEEF00

Byte	Bit	Description		
1 to 3	---	XX		
4	---	Oil pressure (engine oil pressure) [eng_oil_press] (3.2.5.28)		
		40 mbar per bit	Offset = 0 mbar	Range = 0 bar ... 10 bar
5 to 8	---	XX		

Eng_Temp: Engine Temperature (3.3.28) 18FEEE00

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	238	6	0x00FEEE	0x00FEEE00

Byte	Bit	Description		
1	---	Coolant temperature (Engine coolant temperature) [eng_cool_temp] (3.2.5.5)		
		1 °C per bit	Offset = -40 °C	Range = -40 °C ... 210 °C
2	---	Fuel temperature (Fuel temperature) [fuel_temp] (3.2.5.14)		
		1 °C per Bit	Offset = -40 °C	Range = -40 °C ... 210 °C
3 and 4	---	Engine oil temperature (Engine oil temperature) [eng_oil_temp] (3.2.5.15)		
		0.03125 °C per bit	Offset = -273 °C	Range = -273°C ... 1735°C
5 to 8	---	XX		

ECAM1: Supply pressure 3.3.75 (ECAM1) 18FEAE30

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	174	6	65,198	0x18FEAE30

Byte	Bit	Description
1	---	SAE: Pneumatic supply pressure (is not used at MAN) [pneu_supply_press]
2	---	SAE: Parking and /or trailer air pressure (MAN: circuit 3 {23}) [park_trailer_press]
3	---	SAE: Service brake air pressure, circuit #1 (MAN: circuit 1 {21}) [serv_brake_press1]
4	---	SAE: Service brake air pressure, circuit #2 (MAN: circuit 2 {22}) [serv_brake_press2]
5	---	SAE: Auxiliary equipment supply pressure (MAN: circuit 4 {24}) [aux_equip_press]
6	---	SAE: Air suspension pressure (MAN: initial circuit) [air_susp_press]
7 bis 8	---	XX

Note:

At MAN byte 6 does not reflect the pressure of the air suspension Resolution for byte 1 to 6		
80 mbar per bit	Offset = 0 mbar	Range = 0 bar ... 20 bar

Amb_Cond: Ambient conditions (3.3.35) 18FEF500

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	245	6	0x00FEF5	0x00FEF500

Byte	Bit	Description		
1	---	Ambient air pressure (Barometric pressure) [barometric_press] (3.2.5.43)		
		5 mbar per bit	Offset = 0 mbar	Range = 0 ... 1.25 bar
2 and 3	---	XX		
4 and 5	---	Ambient air temperature [amb_air_temp] (3.2.5.12)		
		0.03125 °C per bit	Offset = -273 °C	Range = -273 ... 1735.0°C
6 to 8	---	XX		

Time_Date: Time /Date (3.3.20) 18FEE6EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	230	6	FF0A	18FEE6EE

Byte	Bit	Description		
1	---	Seconds [seconds] (3.2.5.93)		
		0,25 s per bit	Offset = 0 s	Range = 0 ... 59.75 s
2	---	Minutes [minutes] (3.2.5.94)		
		1 min per bit	Offset = 0 min	Range = 0 ... 59 min
3	---	Hours [hours] (3.2.5.110)		
		1 h per bit	Offset = 0 h	Range = 0 ... 23 h
4	---	Month [month] (3.2.5.112)[1]		
		1 Month per bit	Offset = 0 months	Range = 0 ... 12 months
5	---	Day [day] (3.2.5.111)[2]		
		0.25 days per bit	Offset = 0 days	Range = 0 ... 31.75 days
6	---	Year [year] (3.2.5.113)		
		1 year per bit	Offset = +1985 years	Range = 1985 ... 2235 years
7	---	(Local Minute Offset) (3.2.5.296)		
		1 min per bit	Offset = -125 min	Range = from –59min to +59 min
8	---	(Local Hour Offset) (3.2.5.297)		
		1 h per bit	Offset = -125 h	Range = from –23 h to +23 h

Note:

[1] The value "0“ is not used. The value "1“ corresponds with month "January", the value "2" with the month "February" etc.

[2] The value "0“ is not used. The value 1 to 4 (0.25 days/bit) correspond with the first day of the month, the values 5 to 8 with the second day of the month etc.

Veh_dist: Vehicle Distance high resolution (3.3.54) 18FEC1EE

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
1 s	8 bytes	254	193	6	FEC1	18FEC1EE

Byte	Bit	Description		
1 to 4	---	Total kilometrage (high resolution total vehicle distance) [tot_veh_dist] (3.2.5.106)		
		5 m pro Bit	Offset = 0 m	Range = 0 ... 21 055 406 km
5 to 8	---	Daily kilometre counter (high resolution trip distance) [trip_distance] (3.2.5.107)		
		5 m per bit	Offset = 0 m	Range = 0 ... 21 055 406 km

7.6. A-CAN receipt messages

The following receipt message can be processed by KSM and passed on to the FFR:

KSMA: Customer-specific control module – body 0CEFFD55

Transmission repetition rate	Data length	PDU format	PDU specific	Default priority	Parameter group number	Identifier
10 ms	8 bytes	1	destination address KSM = FD_{hex}	3	Proprietary A: EF00	0C EF FD 55

Byte	Bit	Description		
1	8 and 7	Not defined		
	6 and 5	Override control mode priority [ksma_ocmp] (3.2.3.3) not supported		
	4 and 3	Requested speed control conditions [ksma_rscc] (3.2.3.2) not supported		
	2 and 1	Override control mode [ksma_ocm] (3.2.3.1) processing mode for speed/torque		
		00	No processing (override disabled)	
		01	Speed definition/torque limitation (speed control)	
		10	Torque definition/speed limitation (torque control)	
		11	Speed/torque limitation (speed/torque control)	
2 and 3	---	Requested speed/Speed limit [ksma_req_speed] (3.2.1.19)		
		0.125 rpm per bit	Offset = 0 rpm	Range = 0 ... 8031.875 rpm
4	---	Requested torque/Torque limit [ksma_req_torque] (3.2.1.15)		
		1 % per bit	Offset = -125 %	Range = -125% ... 0%
5	---	Requested road speed limit [ksma_HGB]		
		1 km/h per bit	Offset = 0 km/h	Range = 0 km/h ... 250 km/h
6		ZDR operation [ksma_sw_status]		
	in accordance with SAE J1939/ff			
	8 and 7	Cruise control accelerate switch (3.2.6.17)		
	6 and 5	Cruise control resume switch (3.2.6.16)		
	4 and 3	Cruise control coast switch (3.2.6.15)		
	2 and 1	Cruise control set switch (3.2.6.14)		
	At MAN			
	00000000	Neutral		
	00000001	Off		
	00000100	Set -		
	00010000	Resumption		
	01000000	Set +		
	10101010	Defective		

Byte	Bit	Description	
7	8 to 5	ZDR mode request [ZDR_mode_req]	
		0000	Mode S
		0001	Mode 1
		0010	Mode 2
		0011	Mode 3
		0100	Mode 4
		0101	Mode 5
		0110	Mode 6
		0111	Mode 7
		1000	ZDR switch-off
		1001	Reserved
		1010	Reserved
		1011	Reserved
		1100	Reserved
		1101	Reserved
		1110	Reserved)
		1111	Not available
	4 and 3	Engine stop [ksma_MotorStop]	
		00	No request
		01	Engine stop
		10	Reserved
		11	Doesn't cause a reaction (doesn’t care/takes no action)
	2 to 1	Engine start [ksma_MotorStart]	
		00	No request
		01	Engine start
		10	Reserved
		11	Doesn't cause a reaction (doesn’t care/takes no action)
8	---	XX	

7.7. Processing KSM/FFR information if the KSMA message is defined

The override control mode (ocm) of the KSMA message (KSMA_ocm) is crucial for the processing of speed and torque. The following description (case 1-4) explains how the KSMA_ocm is generated from the KSMA_ocm. KSM1 is the T-CAN message from the KSM to the FFR. The ocm=11 (speed/torque limit control) of the KSM1 message is supported by the FFR as standard. The processing of the modes ocm=01 (speed control) and ocm=10 (torque control) of the KSM1 message is not active in the FFR but can if required be released in the FFR.

1. KSMA_ocm=11 → KSM1_ocm=11 (speed/torque limit control):
   - Limitations (KSMA) are linked with the digital inputs (torque and speedl) so that in each case the smallest value can be used as the KSM1 message
   - ZDR S request, 1-7 is passed on via KSM1:
     Activation in the FFR in dependence on the switch-off conditions parameterised in the FFR
   - ZDR operation request (SET+/-, MEM, AUS) via KSMA or via the digital inputs of the KSM – depending on the parameterisation in the KSM – is passed on via KSM1: version in the FFR

2. KSMA_ocm=01 → KSM1_ocm=01 (Speed control):
   - Speed target value definition possible, limitation in KSM1 by digital inputs "speed limitation" KSM possible
   - Torque limitations (KSMA) are linked with the digital inputs "torque limitation" so that in each case the smallest value are used as the KSM1 message
   - ZDR S request, 1-7 is passed on via KSM1:
     Only the switch-off conditions parameterised in the relevant ZDR mode and the parameterised standard parameter kit is then processed by FFR. The upper/lower speed limit parameterised in the relevant ZFR mode and the speed target value parameterised in the FFR are then ignored.

3. KSMA_ocm=10 → KSM1_ocm=10 (torque control):
   - Torque target value definition possible, limitation in KSM1 by digital inputs "torque limitation" KSM possible
   - Speed limitations (KSMA) are linked with the digital inputs "speed limitation so that in each case the smallest value is used as the KSM1 message

4. KSMA_ocm=00 → KSM1_ocm=11(speed/torque limit control):
   - No processing/forwarding of KSMA/Byte 2, 3, 4
   - Torque limitation via the digital inputs "torque limitation" to KSM possible
   - Speed limitations via the digital input "speed limitation" to KSM possible
   - ZDR S request, 1-7 is passed on via KSM1:
     Activation in the FFR in dependence on the switch-off conditions parameterised in the FFR
   - ZDR operation request (SET+/-, MEM, AUS) via KSMA or via the digital inputs of the KSM – depending on the parameterisation in the KSM – is passed on via KSM1: implemented in the FFR

The general rule is:

- ZDR mode selection via CAN has priority over the ZDR pins of the FFR
- ZDR operation via CAN has priority over cruise control controls
- Limitations are linked in the KSM and FFR so that in each case the smallest value is used as the KSM1 message
- Definitions are limited to limitations
- KSMA message parameterised to "not receiving" → KSM1_ocm=11

Caution:
If an input value of the A-CAN is not valid (e.g. in event of bus-off, failure of KSMA message), this has a direct effect, i.e. no "old" A-CAN information is frozen (example: previously requested limitations are no longer active or effective).

8. Pin description and circuit diagrams

DBG 1+3 (plug connection X1997/pin 1)
$+U_{Bat}$ switch signal input for the triggering of speed limitation 1 and 3

Function:

If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the engine speed is limited to "speed limitation 1" which can be parameterised with the aid of MAN cats II.
If $+U_{Bat}$ is taken away the selected "speed limitation 1" is cancelled again.
If at the same time the input DBG 2+3 (X1997/pin 2) is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the engine speed is limited to "speed limit 3" parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away from both inputs the selected "speed limitation 3" is cancelled again.
This function is also useful as a further intermediate speed with which an initially higher set speed is limited.

Function release:

As soon as $+U_{Bat}$ (ready for operation or terminal 15 FFR) is applied.

DBG 2+3 (plug connection X1997/pin 2)
$+U_{Bat}$ switch signal input for the triggering of the speed limitation 2 and 3

Function:

If the input is wired with $+U_{Bat}$ (ready for operation; X1997/Pin 12) the engine speed is limited to "speed limitation 2" which can be parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away the selected "speed limitation 2" is cancelled again.
If at the same time the input DBG 1+3 (X1997/pin 1) is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the engine speed is limited to "speed limitation 3" which can be parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away from both inputs the selected "speed limitation 3“ is cancelled again.
This function is also useful as a further intermediate speed with which an initially higher set speed is limited.

Function release:

As soon as $+U_{Bat}$ (ready for operation or terminal 15 FFR) is applied.

MBG 1+3 (plug connection X1997/pin 3)
$+U_{Bat}$ switch signal input for the triggering of torque limitation 1 and 3

Function:

If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the torque of the engine is limited to "torque 1" which can be parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away the selected "torque limitation 1" is cancelled again.
If at the same time the input MBG 2+3 (X1997/pin 4) is wired with $+U_{Bat}$ (ready for service; X1997/pin 12) the torque of the engine is limited to "torque limitation 3" which can be parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away from both inputs the selected "torque limitation 3" is cancelled again.
This function is useful to protect units connected with the body from too high a torque from the engine.

Function release:

As soon as $+U_{Bat}$ (ready for operation or terminal 15 FFR) is applied.

MBG 2+3 (plug connection X1997/pin 4)
$+U_{Bat}$ -switch signal input for the triggering of the torque limitation 2 and 3

Function:

If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the torque of the engine is limited to "torque limitation 2" which can be parameterised with the aid of MAN-cats II.
If $+U_{Bat}$ is taken away the selected "torque limitation 2" is cancelled again.

If at the same time the input MBG 1+3 (X1997/pin 3) is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the torque of the engine is limited to "torque limitation 3" which can be parameterised with the aid of MAN cats II.
If $+U_{Bat}$ is taken away from both inputs the selected "torque limitation 3"is cancelled again.
This function is useful to protect units connected with the body from too high a torque from the engine..

Function release:

As soon as $+U_{Bat}$ (ready for operation or terminal 15 FFR) is applied.

PARKING BRAKE (plug connection X1997/pin 5)

$+U_{Bat}$ -switch signal output. If a load is connected and the parking brake is not activated a low level of U_{low}<2V sets itself.

Load:

max. 500mA

Function:

Information that the parking brake is engaged. Useful for the release of a function to prevent undesirable outside intervention on controls outside the cab.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

BRAKE (plug connection X1997/pin 6)

$+U_{Bat}$ -switch signal output. If a load is connected and the brake is not activated a low level of U_{low}<2V sets itself.

Load:

max. 500mA

Function:

Information that the brake is activated. Useful for the release of a function to prevent undesirable outside intervention on controls outside the cab.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

R-gear (plug connection X1997/pin 7)
$+U_{Bat}$ switch signal output. If a load is connected and the parking brake is not activated a low level of U_{low}<2V sets itself.

Load:

max. 500mA

Function:

Information, that the reverse gear is engaged. Useful for example for shifting to a lower maximum speed limitation (HGB2) in reverse gear or also for reversing lock for refuse trucks.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

CLUTCH (plug connection X1997/pin 8)
$+U_{Bat}$ switch signal output. If a load is connected and the clutch is not activated a low level of U_{low}<2V sets itself.

Load:

max. 500mA

Function:

Information that the clutch is engaged. Useful for the release of a function to prevent unwelcome outside intervention on controls outside the cab.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω.

GEARBOX N (plug connection X1997/pin 9)
$-U_{Bat}$ switch signal output. If the gear is engaged the high level (approx. $+U_{Bat}$) sets itself.

Load:

max. 300mA

Function:

Information that the gearbox is in neutral position. Useful for the release of a function in dependence of the gearbox neutral position (no gear engaged).

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <2kΩ. If the fault recognition is activated the connected load must be connected after terminal 15 FFR (X1996/pin 1). "Ready for operation" (X1997/pin 12) must not be used if "ready for operation" is used instead of terminal 15 . If "ready for operation" is used instead of terminal 15 FFR and in this way if the fault recognition is activated fault memory entries are already made during the system start (monitoring already active during the system start stage but not ready for operation until active following the system start stage).

CHECK LAMP (plug connection X1997/pin 10)
$+U_{Bat}$ switch signal output. If a load is connected and the KSM-SG or the connected periphery is in a faultfree condition a low level of U_{low}<2V sets itself.

Load:

max. 600mA

Function:

Information that interference has arisen in the KSM-SG or in its connected periphery.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. When the control unit is running up the output will then be automatically triggered for approx. 3 seconds (light bulb test).

TANK WARNING (plug connection X1997/pin 11)
$+U_{Bat}$ switch signal output. If a load is connected and the tank is full enough a low level of U_{low}<2V sets itself.

Load:

max. 600mA

Function:

Information that there is still approx. 20% of the maximum fuel content of the tank. This information is also displayed at the same time on the instruments with the information "FILL UP".

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. When the control unit is running up the output will then be automatically triggered for approx. 3 seconds (light bulb test).

READY FOR OPERATION (plug connection X1997/pPin 12)
$+U_{Bat}$ switch signal output. The final stage switches to high approx. 3 sec after terminal 15 is "on". If a load is connected and KSM-SG is not (yet) in a ready-for-operation state a low level of U_{low}<2V sets itself.

Load:

max. 2A

Function:

Information that the KSM-SG is ready for operation. Useful for the release of a function. The signal is still issued approx. 2 secs after terminal 15 "OFF" to permit any run up of a control unit which may be necessary with a connected body electronics.

Caution:

To ensure that short circuits and line interruption are reliably recognised if loads are connected and fault recognition is activated the connected load must be <400Ω. After the system start (approx. 3sec.) the output is then triggered.

SET+ (plug connection X1997/pin 13)
$+U_{Bat}$ switch signal input for the triggering of the function "increase speed"

Function:

Increase speed.
If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the engine speed runs continuously towards the upper speed limit. If the activation is interrupted the engine control controls the current speed.

The upper speed limit can be:

- the final speed of the engine,
- the upper speed limit in ZDR S, ZDR 1,...., ZDR 7 which can be parameterised with the aid of MAN-cats II.
- the speed limitation which can be parameterised and activated with the aid of MAN-cats II in the FFR or KSM.

The set speed is switched off, i. e. the engine goes to idle speed (ZDR S) or the "lower speed limit“ (ZDR 1, ... , ZDR 7) by "opening" the standard bridge between "ready for operation" (X1997/pin 12) and "OFF“ (X1997/pin 15).

Function release:

Approx. 3.5secs after terminal 15 is "on" the function can be activated by wiring with $+U_{Bat}$ (ready for operation or terminal 15 FFR).

SET- (plug connection X1997/pin 14)
$+U_{Bat}$ switch signal input for the triggering of the function "lower speed".

Function:

Lower speed.
If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the set engine speed runs continuously up to the idle speed (ZDR S) or the lower speed limit (ZDR 1, ... , ZDR 7). If the activation is interrupted the engine control controls the current speed.

The set speed is switched off , i. e. the engine goes to idle speed (ZDR S) or the "lower speed" (ZDR 1, . . . , ZDR 7) by "opening" the external bridge between "ready for operation" (X1997/pin 12) and "OFF“ (X1997/pin 15).

Function release:

Approx. 3.5secs after terminal 15 is "on" the function can be activated by wiring with $+U_{Bat}$ (ready for operation or terminal 15 FFR).

OFF (plug connection X1997/pin 15)
$+U_{Bat}$ switch signal input for the release/switch off of the ZDR functions.

Function:

If the input is wired with $+U_{Bat}$ (ready for operation; X1997/pin 12) the ZDR functions are released. The ZDR functions are switched off by "opening" the external bridge between "ready for operation" (X1997/pin 12) and "OFF" (X1997/pin 15).

Caution:

If there is no external bridge between X1997/pin 12 and X1997/pin 15 the "OFF" function is permanently activated, i.e. activation of the ZDR functions is not possible.

MEMORY (plug connection X1997/pin 16)

$+U_{Bat}$ -switch signal input for the resumption/storing of a speed.

Function:

If the input is wired with $+U_{Bat}$ after the end of the pulse signal the engine runs on the ZDR S, ZDR 1, ..., ZDR 7 which can be programmed with the aid of MAN-cats II and regulates this. After changing this by e. g. "SET+“ or "SET-“ the new speed can be stored by wiring the input with $+U_{Bat}$ (t≥2sec.).
The set speed is switched off, i.e. the engine goes to the idle speed (ZDR S) or the lower speed limit (ZDR 1, ... , ZDR 7) by "opening" the external bridge between X1997/pin 12 and X1997/pin 15; by activating the "OFF button" on the controls in the cab or in the event of switch-off conditions.

Function release:

Approx. 3.5sec. after the terminal 15 is "on" the function can be activated by wiring with $+U_{Bat}$ (ready for operation or terminal 15 FFR) taking the above time t into account.

Caution:

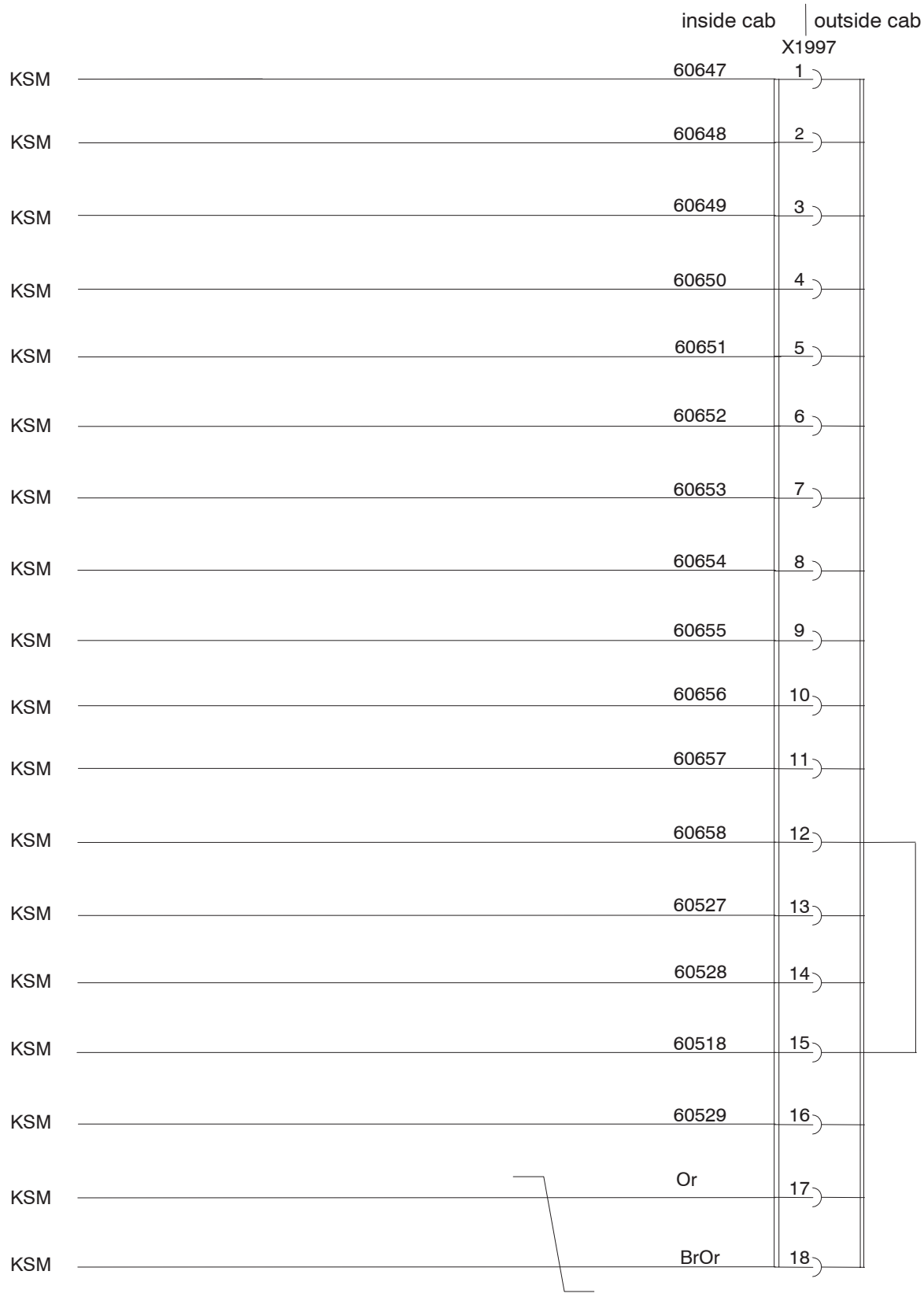
The memory function is not effective until the button is "released" (edge change from "high" to "low"). The storage of a target speed changed with SET+/- is only possible in the relevant ZDR mode if the control function "active with storage" is parameterised and the FFR and the button is activated for at least 2 seconds.

A-CAN-H (plug connection X1997/pin 17)

CAN-high line of the body-CAN interface.

A-CAN-L (plug connection X1997/pin 18)

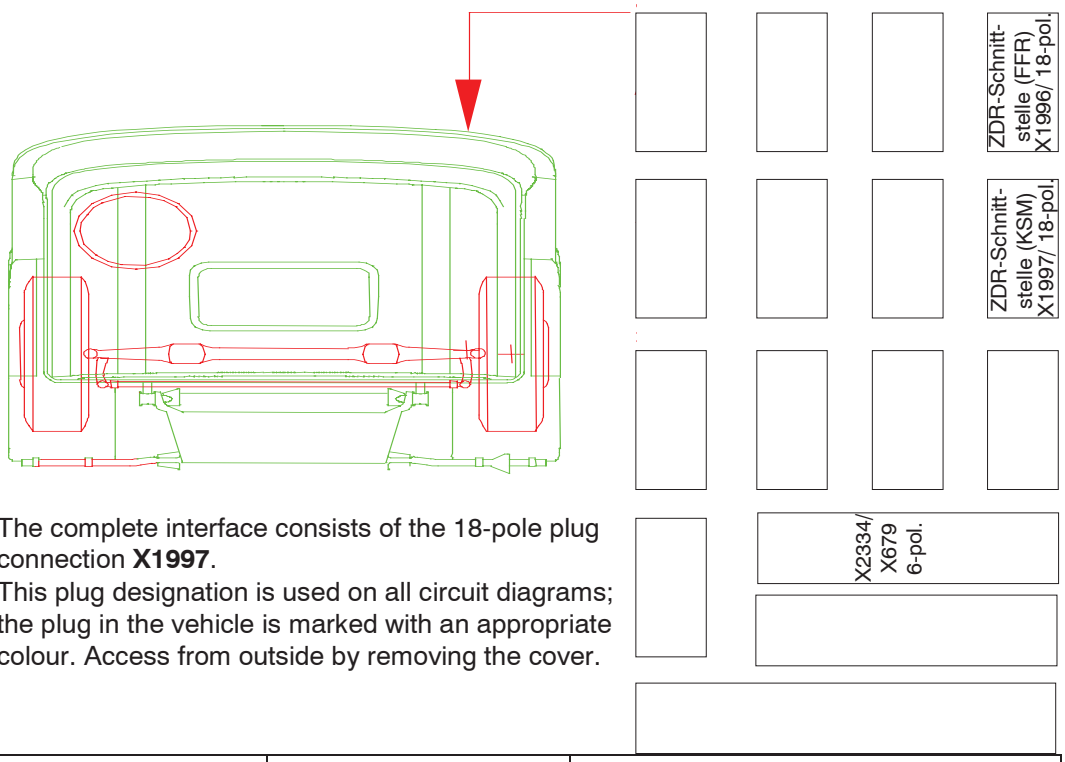
CAN-low line of the body-CAN interface.



Circuit diagram on X1997

9. Interface design and installation location

View after removal of the cover:



The complete interface consists of the 18-pole plug connection **X1997**.
This plug designation is used on all circuit diagrams; the plug in the vehicle is marked with an appropriate colour. Access from outside by removing the cover.

Plug connection 18-pole: X1997	Colour and coding: beige/6	MAN item number	
		Plug housing	Socket housing
Secondary lock for housing		81.25475.0046	81.25435.0927
		81.25475.0065	81.25435.0913

Contacts (individual ware / line ware)	MAN item number
Blade terminal with notch 2.8×1/0.5-1	07.91202.0848 / 07.91202.0858
Blade terminal with notch 2.8×2.5/1.5-2.5	07.91202.0849 / 07.91202.0859
Spring contact with notch 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with notch 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

The interface "ZDR interface with the vehicle management computer for external speed control in TG" consists of the 18-pole plug connection **X1996** and is included in the standard extent of the vehicle.

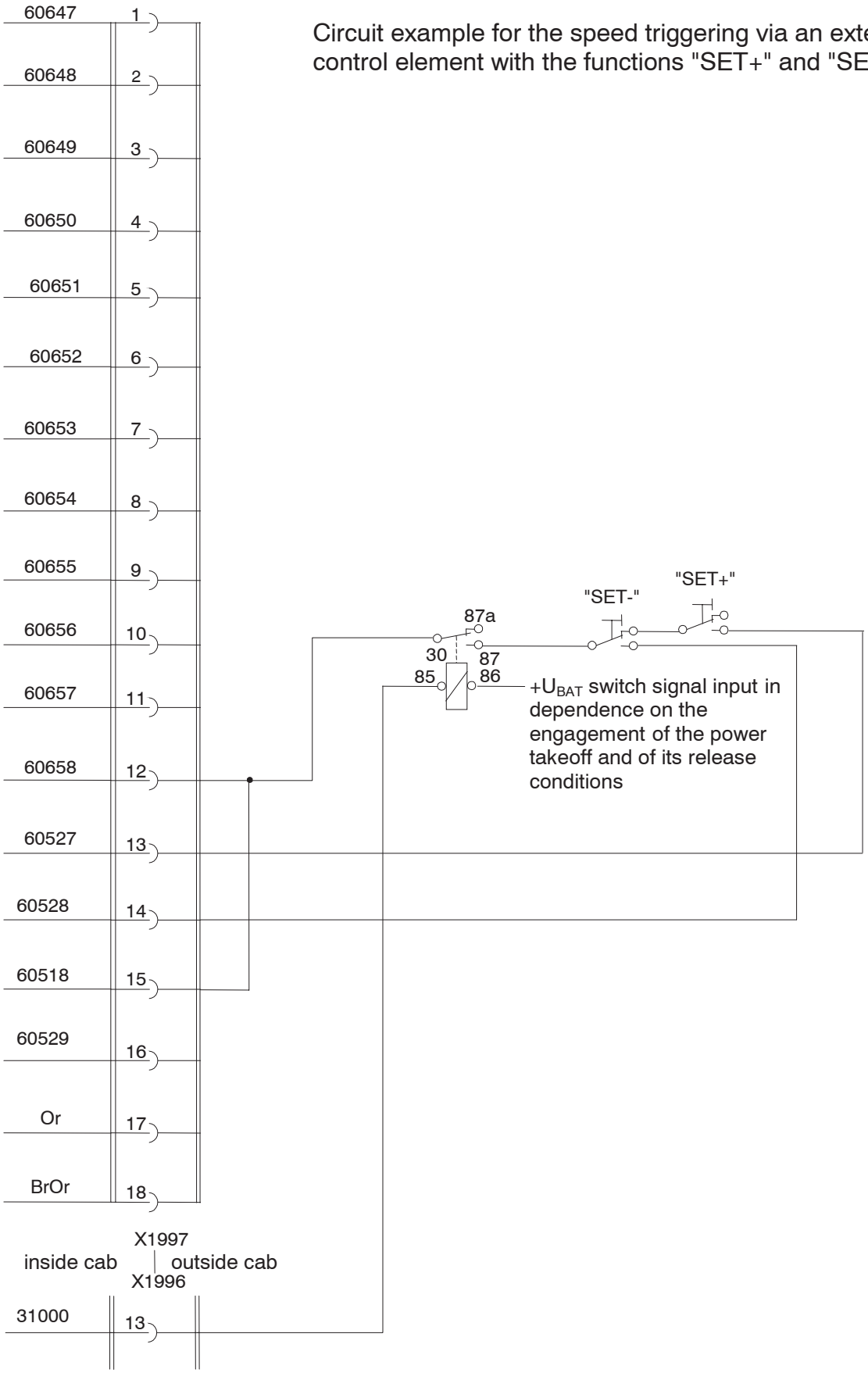
The preparation "reverse locking for refuse trucks“ consists of the 6-pole plug connection **X2334** or **X679**. This plug designation is used on all circuit diagrams the plug in the vehicle is marked in the appropriate colour. Access from outside by removing the cover.

Plug connection 6-pole: X2334 or X679	Colour and coding: blue/4	MAN item number	
		Plug housing	Socket housing
Secondary lock for housing		81.25435.0794	81.25435.0744
		81.25435.0698	81.25435.0698

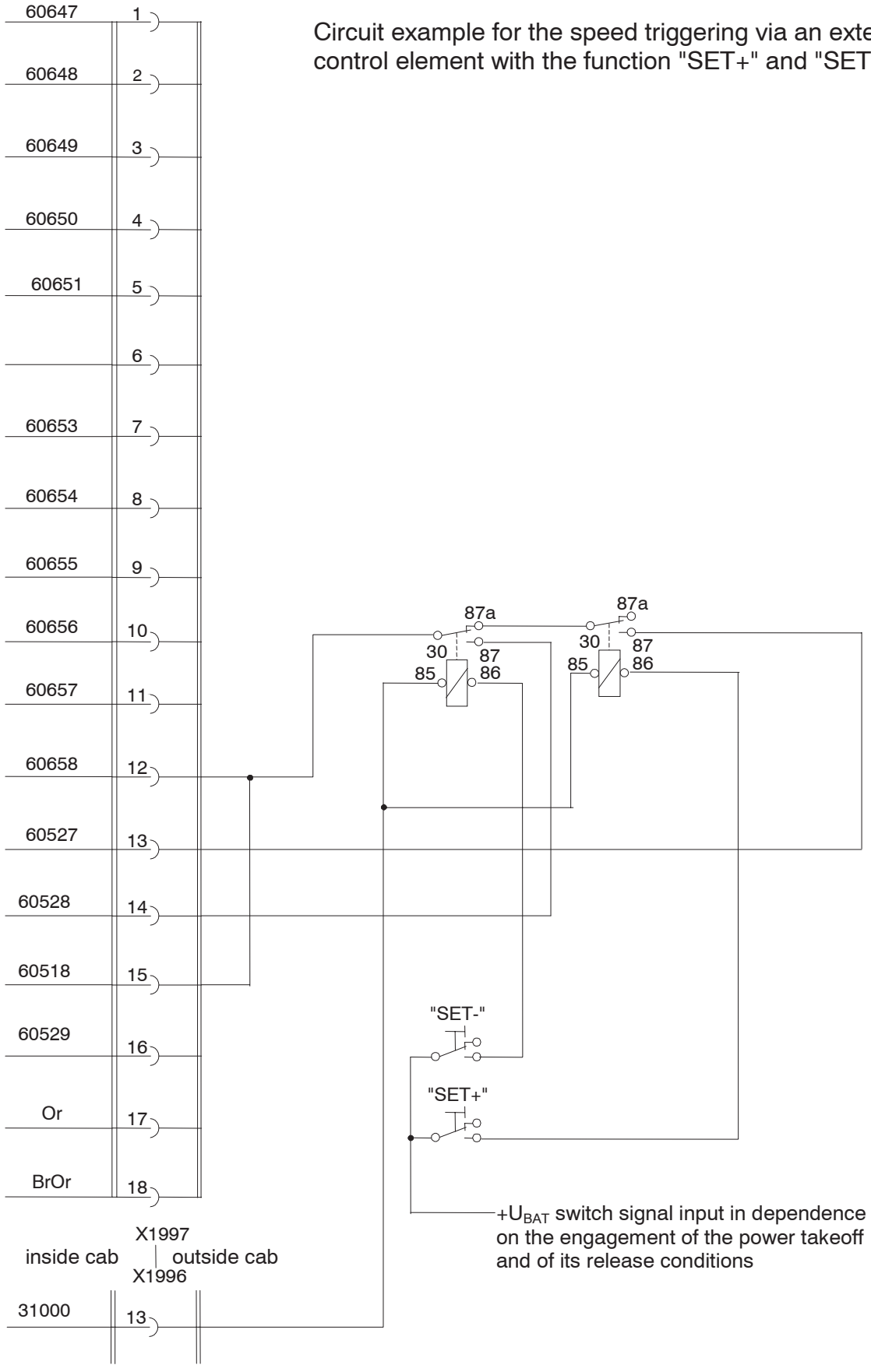
Contacts (individual ware / line ware)	MAN item number
Blade terminal with notch 2.8×1/0.5-1	07.91202.0610 / 07.91202.0830
Blade terminal with notch 2.8×2.5/1.5-2.5	07.91202.0611 / 07.91202.0831
Spring contact with notch 2.8×1/0.5-1	07.91201.0222 / 07.91201.0221
Spring contact with notch 2.8×2.5/1.5-2.5	07.91201.0224 / 07.91201.0223

10. Wiring examples

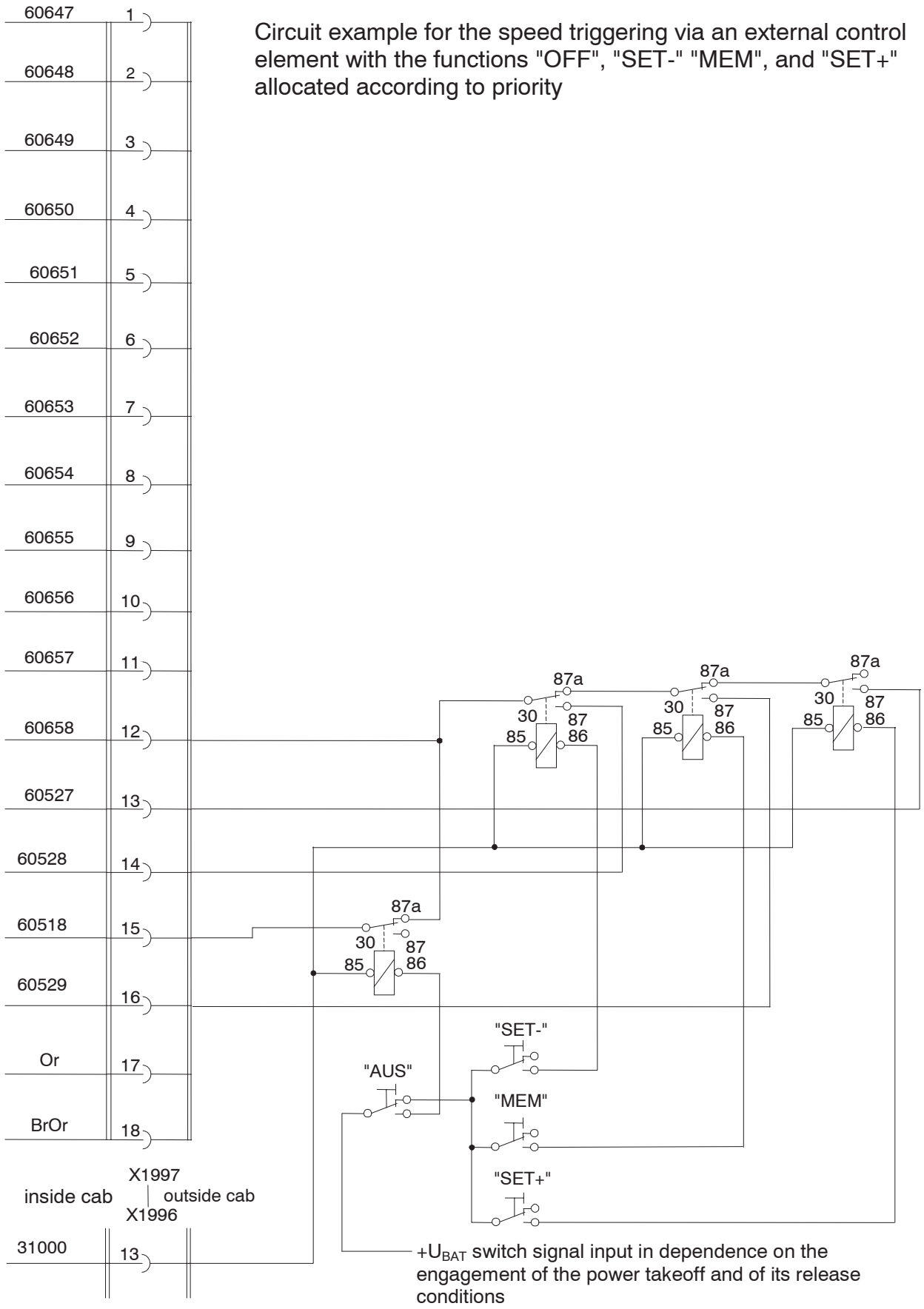
Circuit example for the speed triggering via an external control element with the functions "SET+" and "SET-"



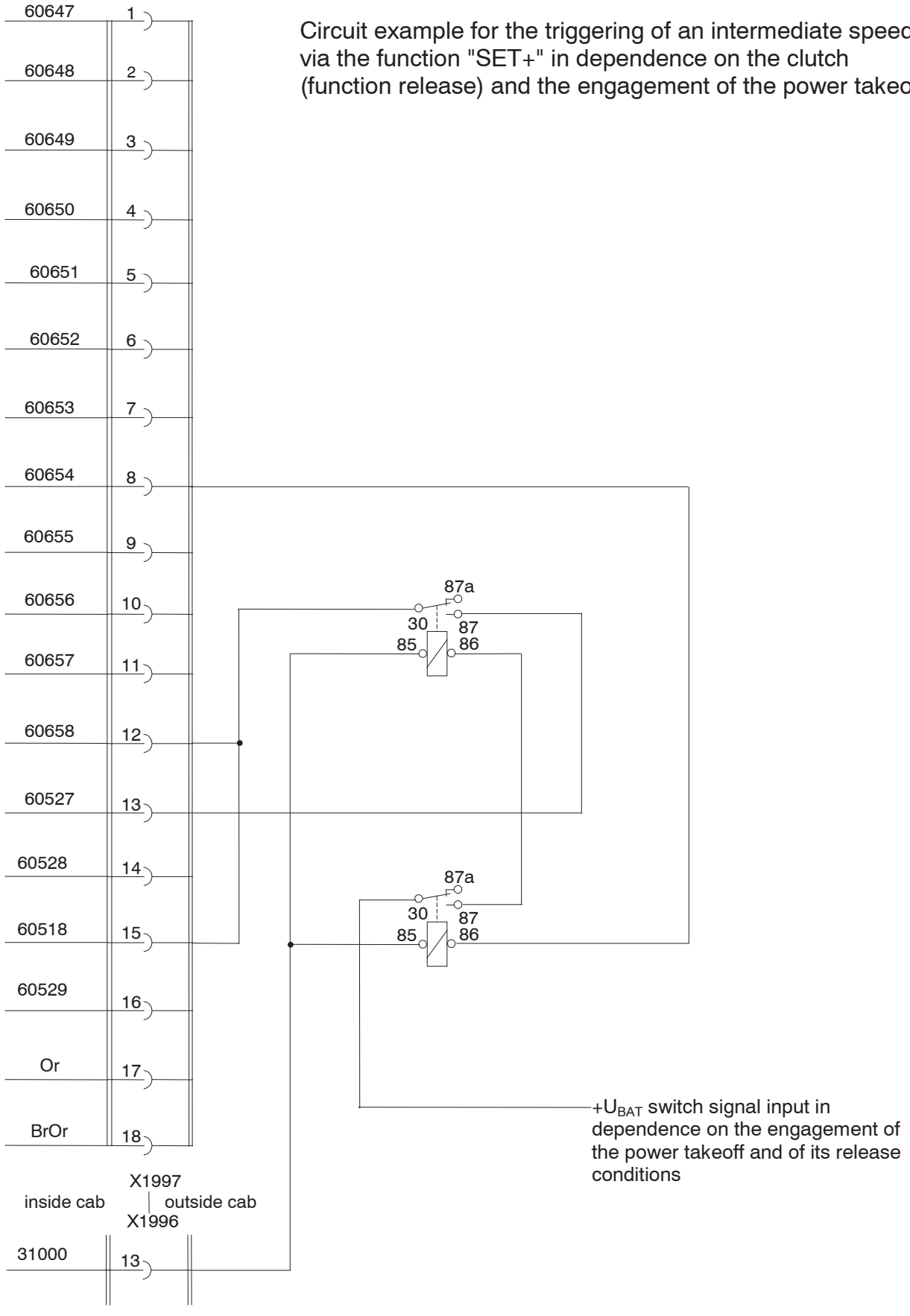
Circuit example for the speed triggering via an external control element with the function "SET+" and "SET-"



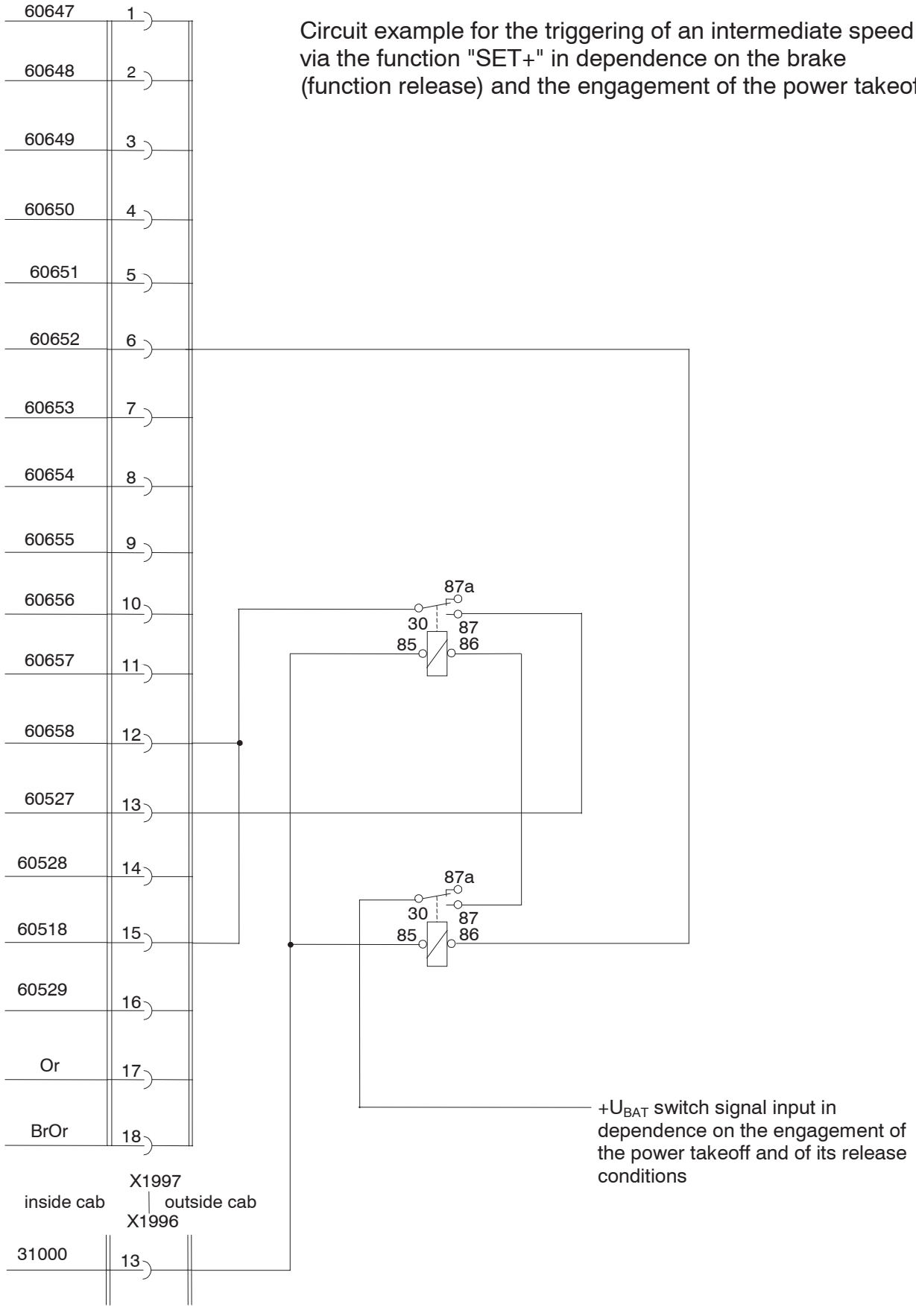
Circuit example for the speed triggering via an external control element with the functions "OFF", "SET-" "MEM", and "SET+" allocated according to priority



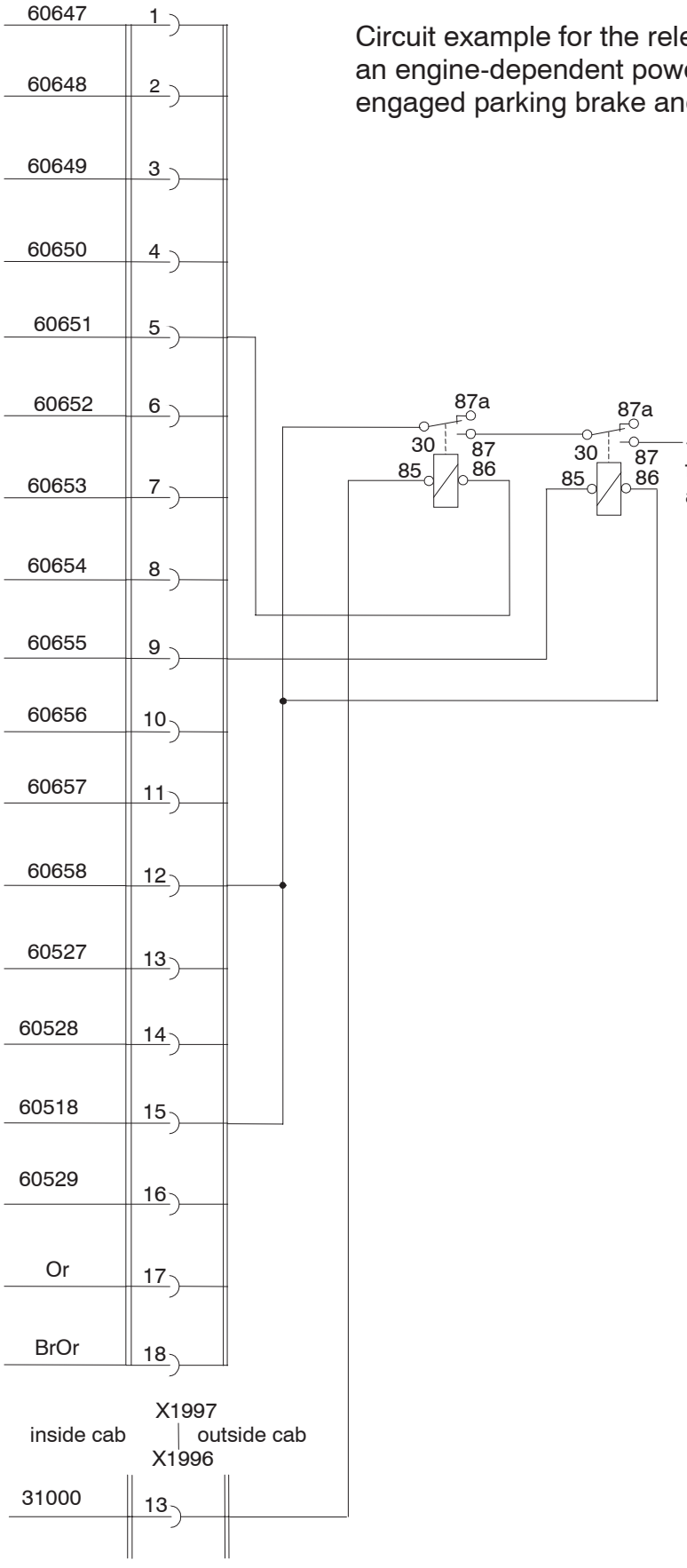
Circuit example for the triggering of an intermediate speed via the function "SET+" in dependence on the clutch (function release) and the engagement of the power takeoff



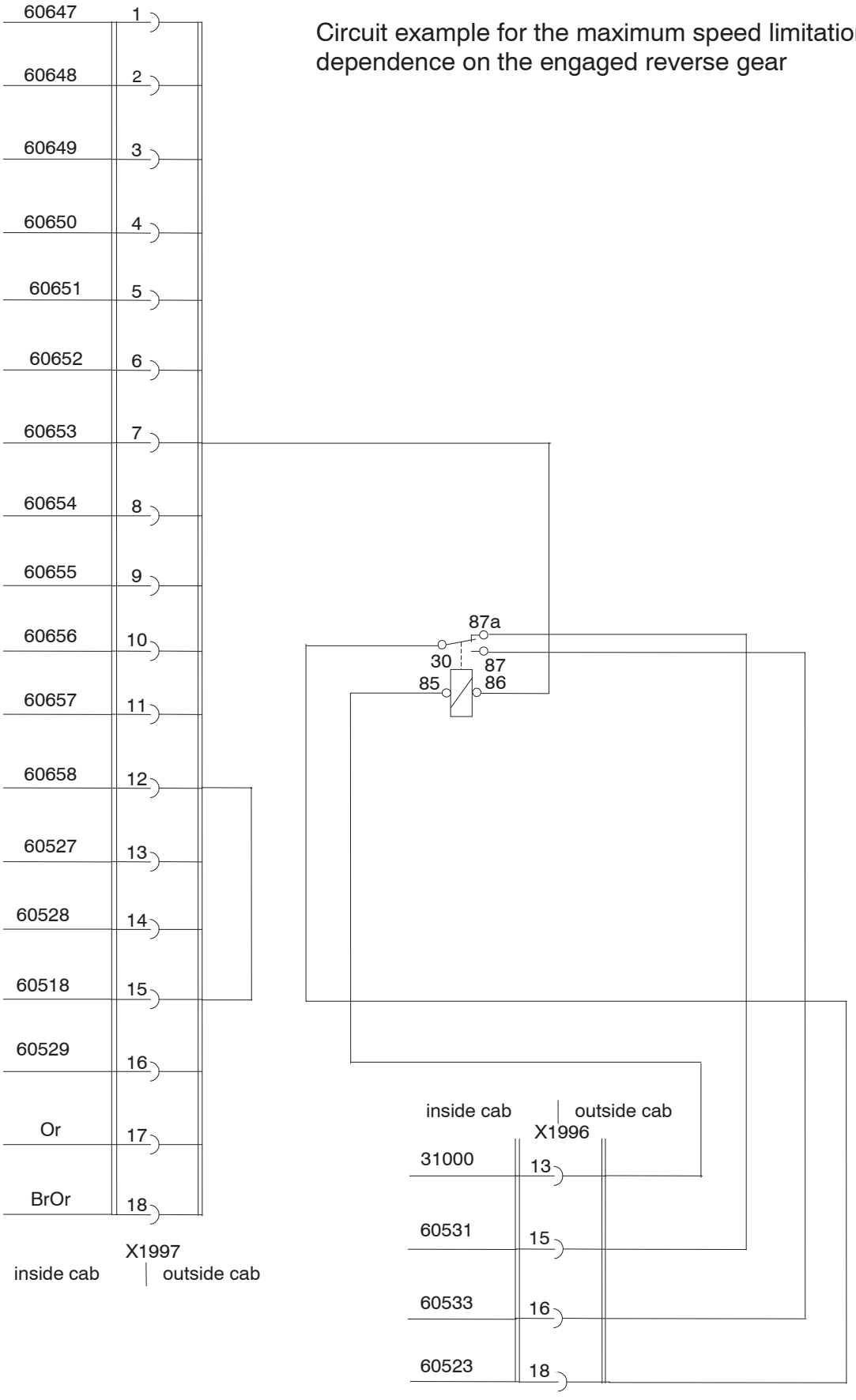
Circuit example for the triggering of an intermediate speed via the function "SET+" in dependence on the brake (function release) and the engagement of the power takeoff



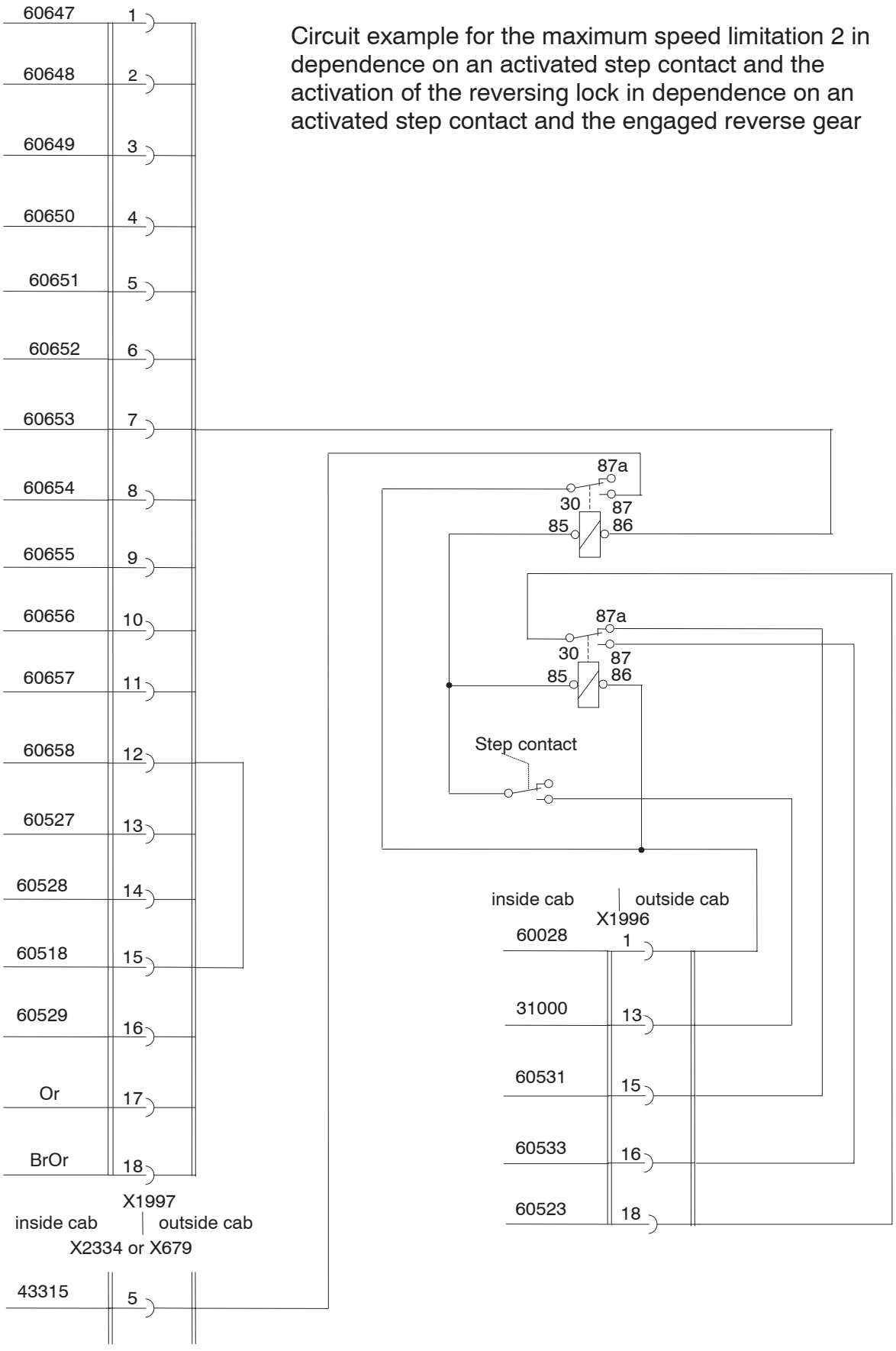
Circuit example for the release of the power take-off unit with an engine-dependent power takeoff in dependence on the engaged parking brake and the gearbox neutral position.



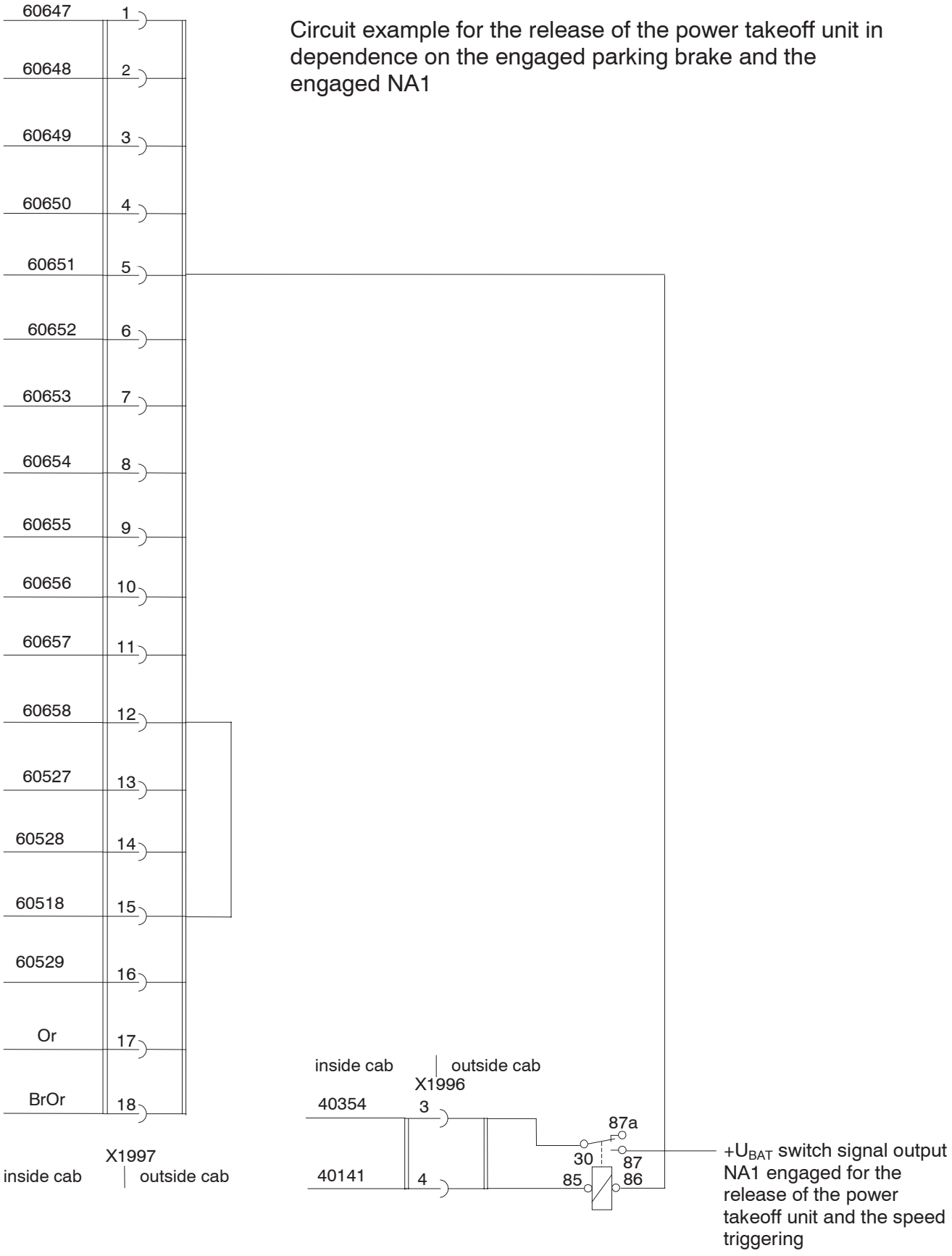
Circuit example for the maximum speed limitation 2 in dependence on the engaged reverse gear



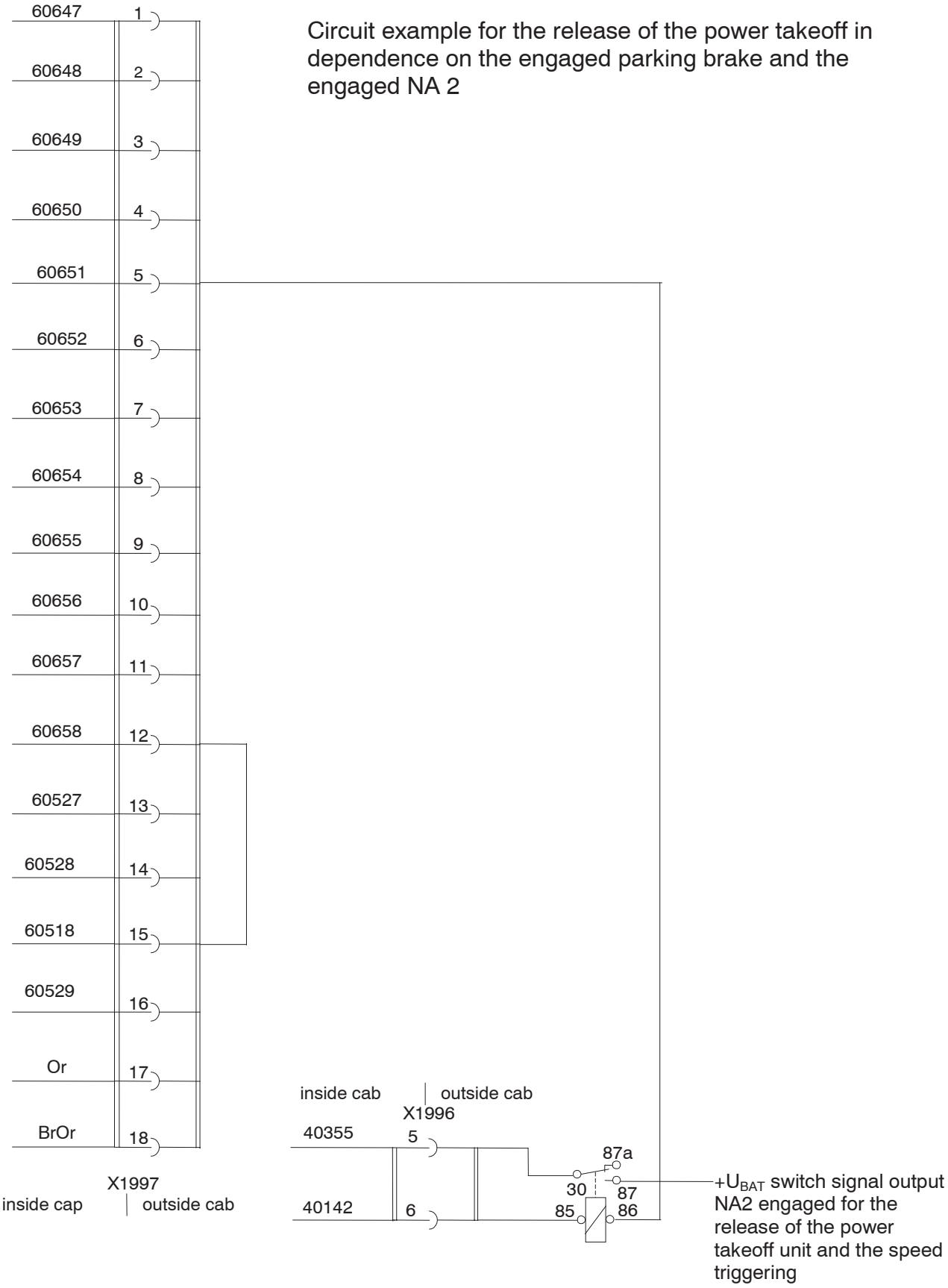
Circuit example for the maximum speed limitation 2 in dependence on an activated step contact and the activation of the reversing lock in dependence on an activated step contact and the engaged reverse gear

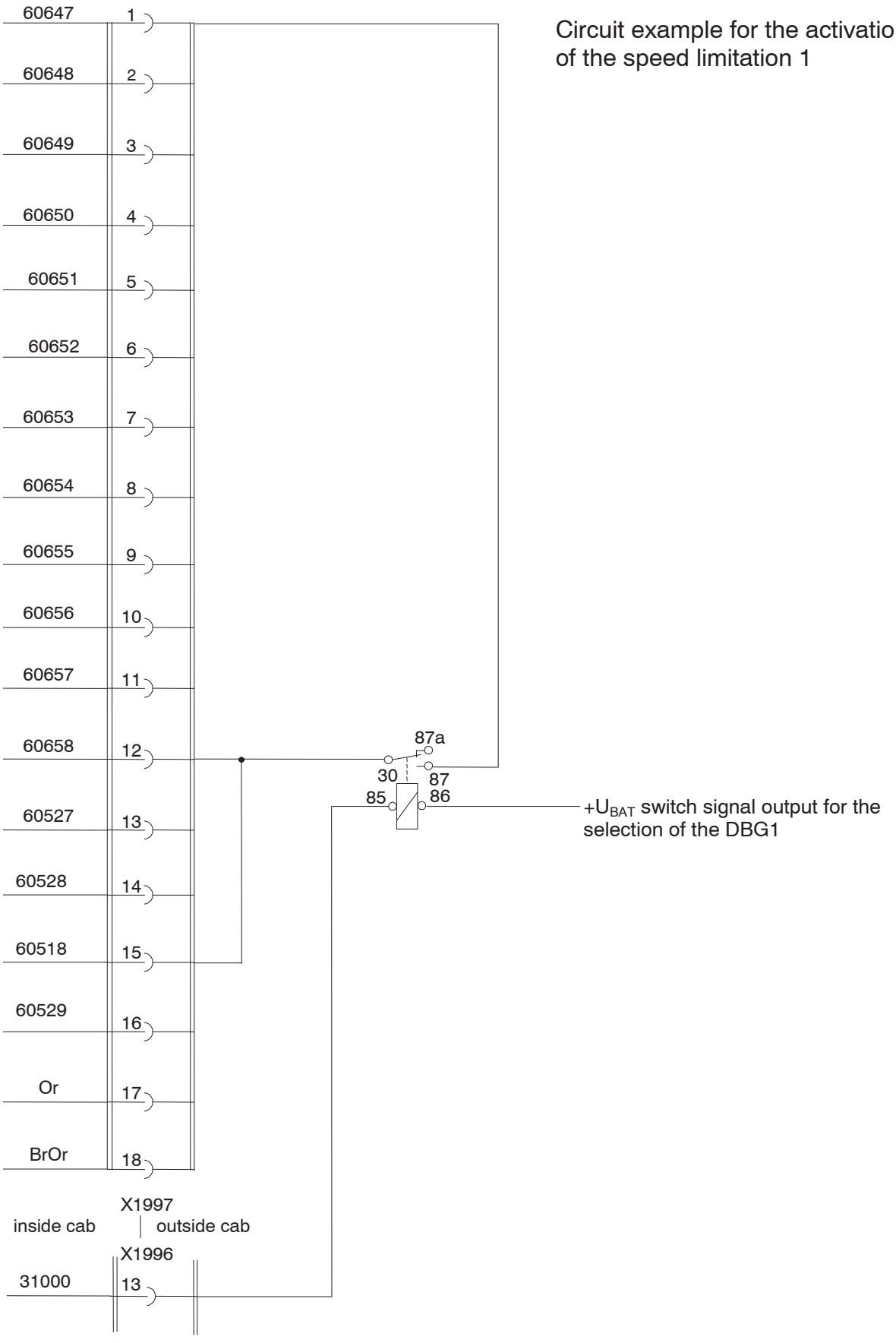


Circuit example for the release of the power takeoff unit in dependence on the engaged parking brake and the engaged NA1



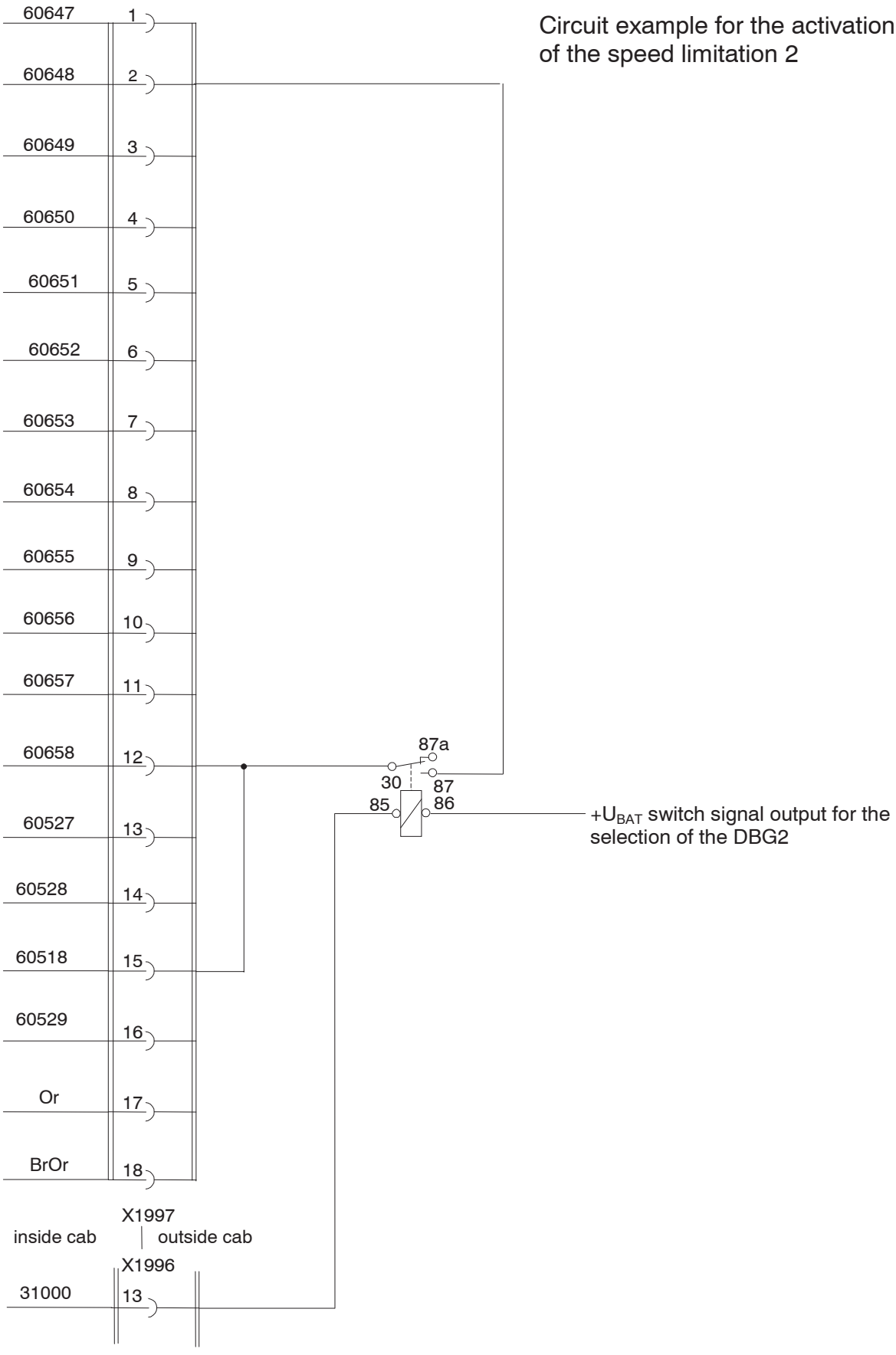
Circuit example for the release of the power takeoff in dependence on the engaged parking brake and the engaged NA 2



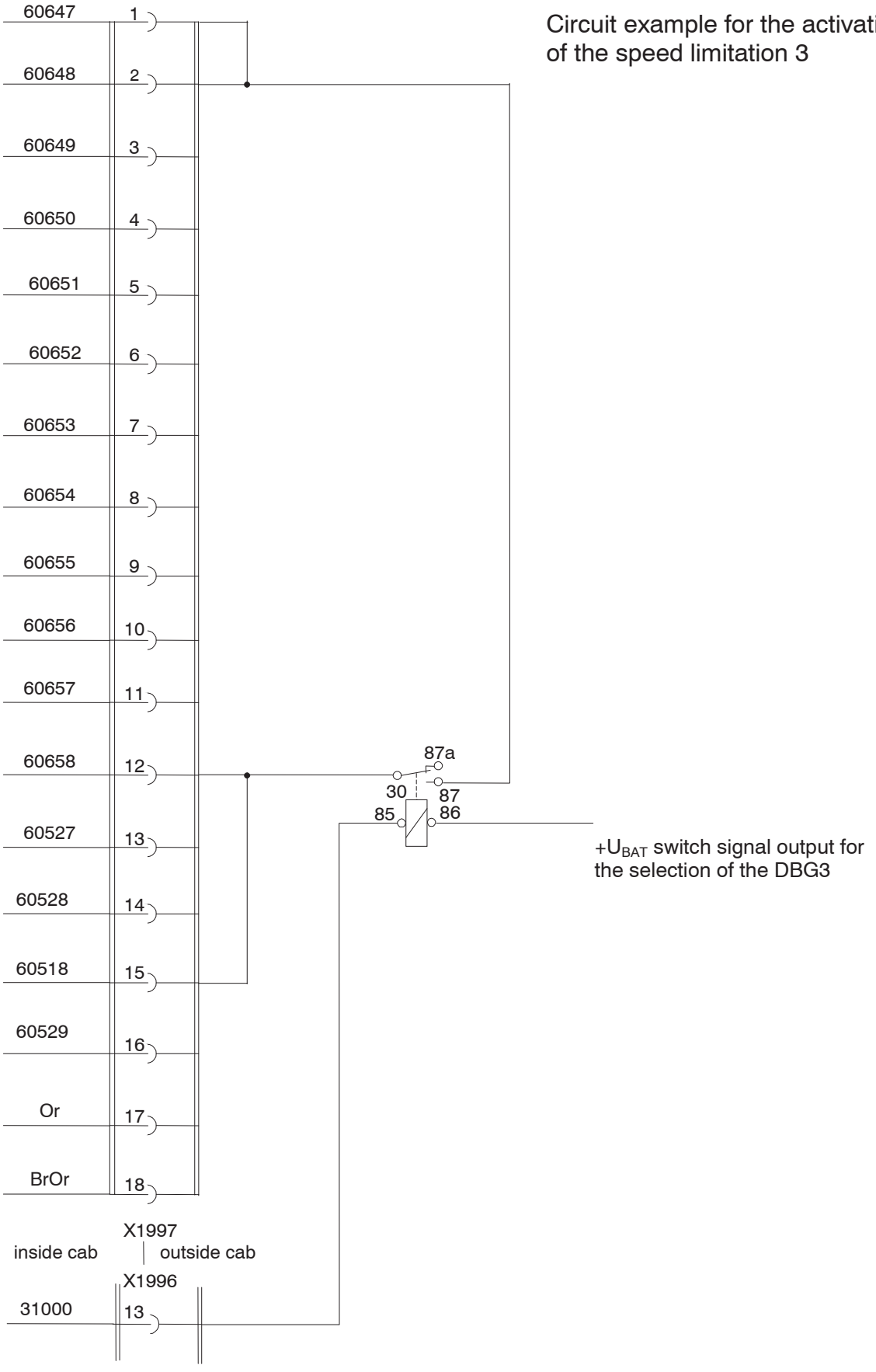


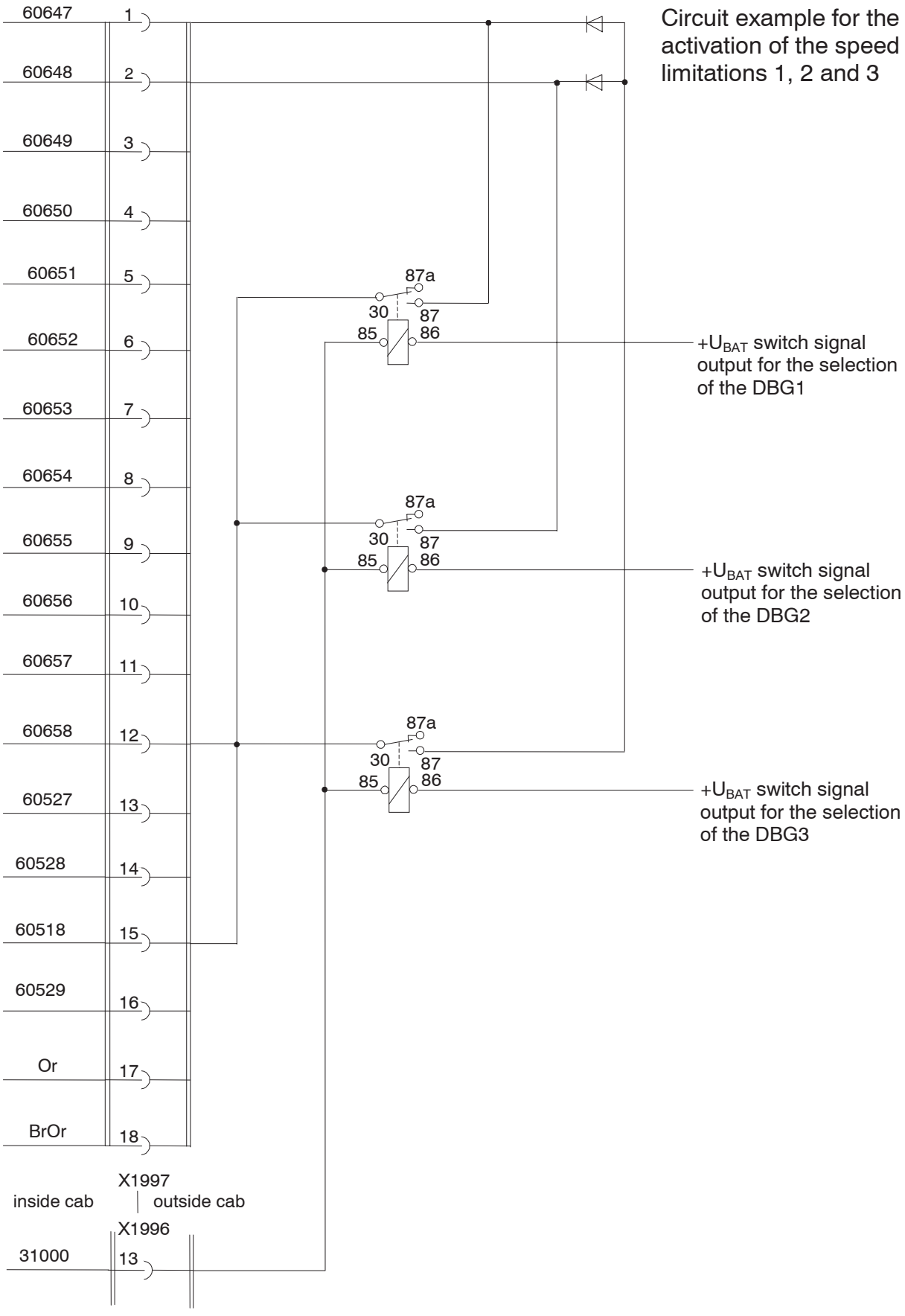
Circuit example for the activation of the speed limitation 1

Circuit example for the activation of the speed limitation 2



Circuit example for the activation of the speed limitation 3

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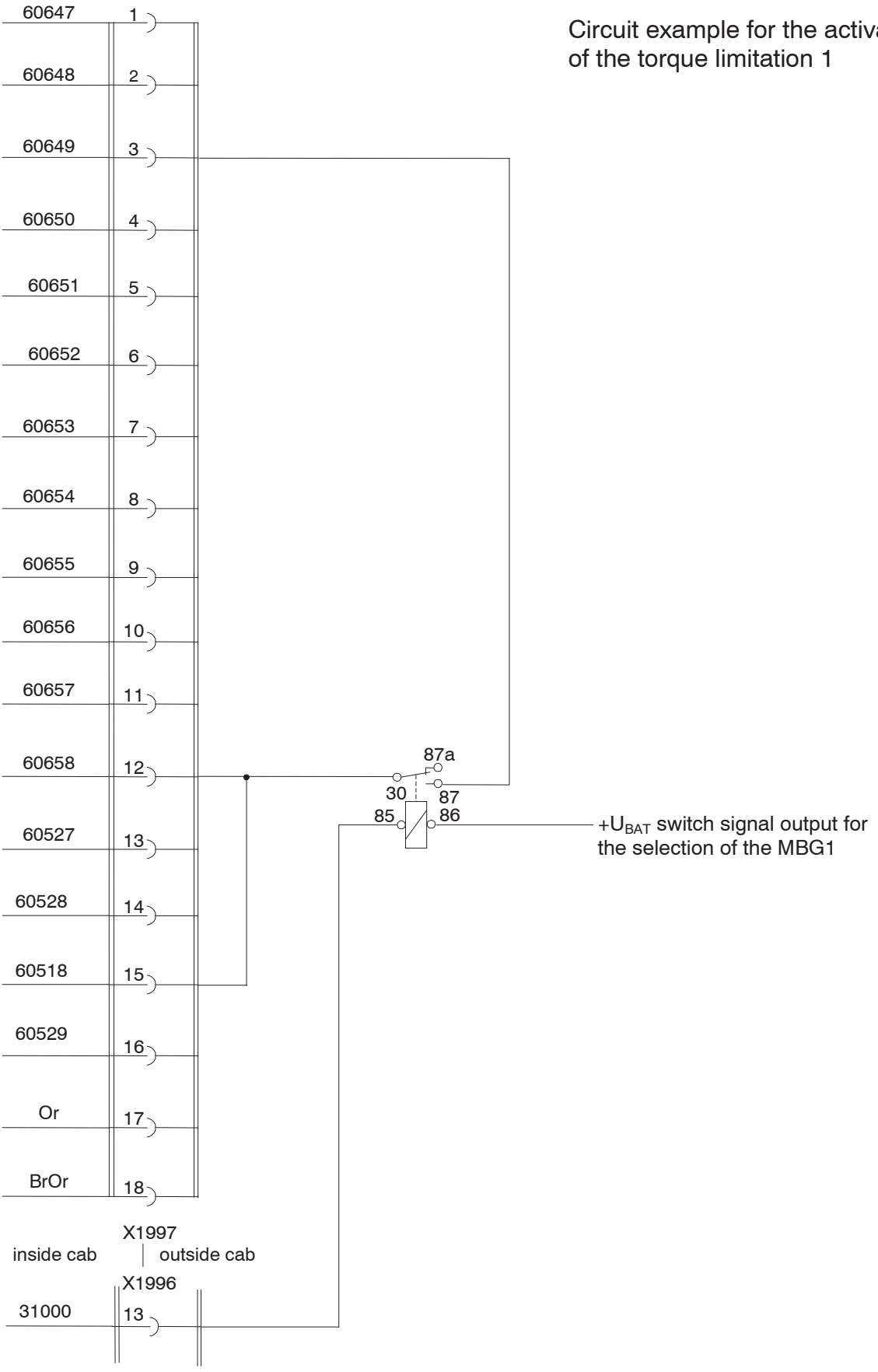
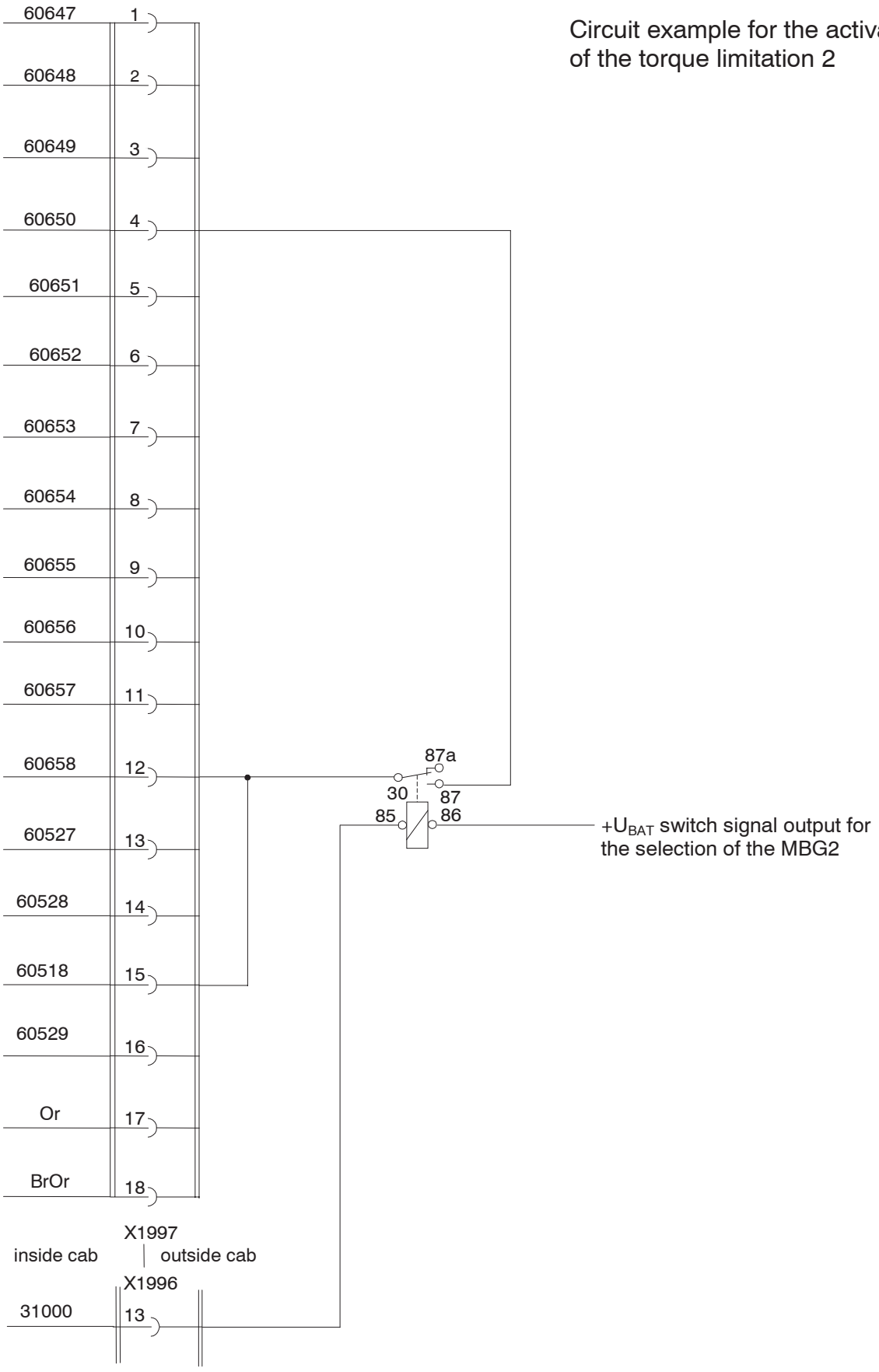
Circuit example for the activation of the speed limitations 1, 2 and 3
+U_BAT switch signal output for the selection of the DBG1
+U_BAT switch signal output for the selection of the DBG2
+U_BAT switch signal output for the selection of the DBG3

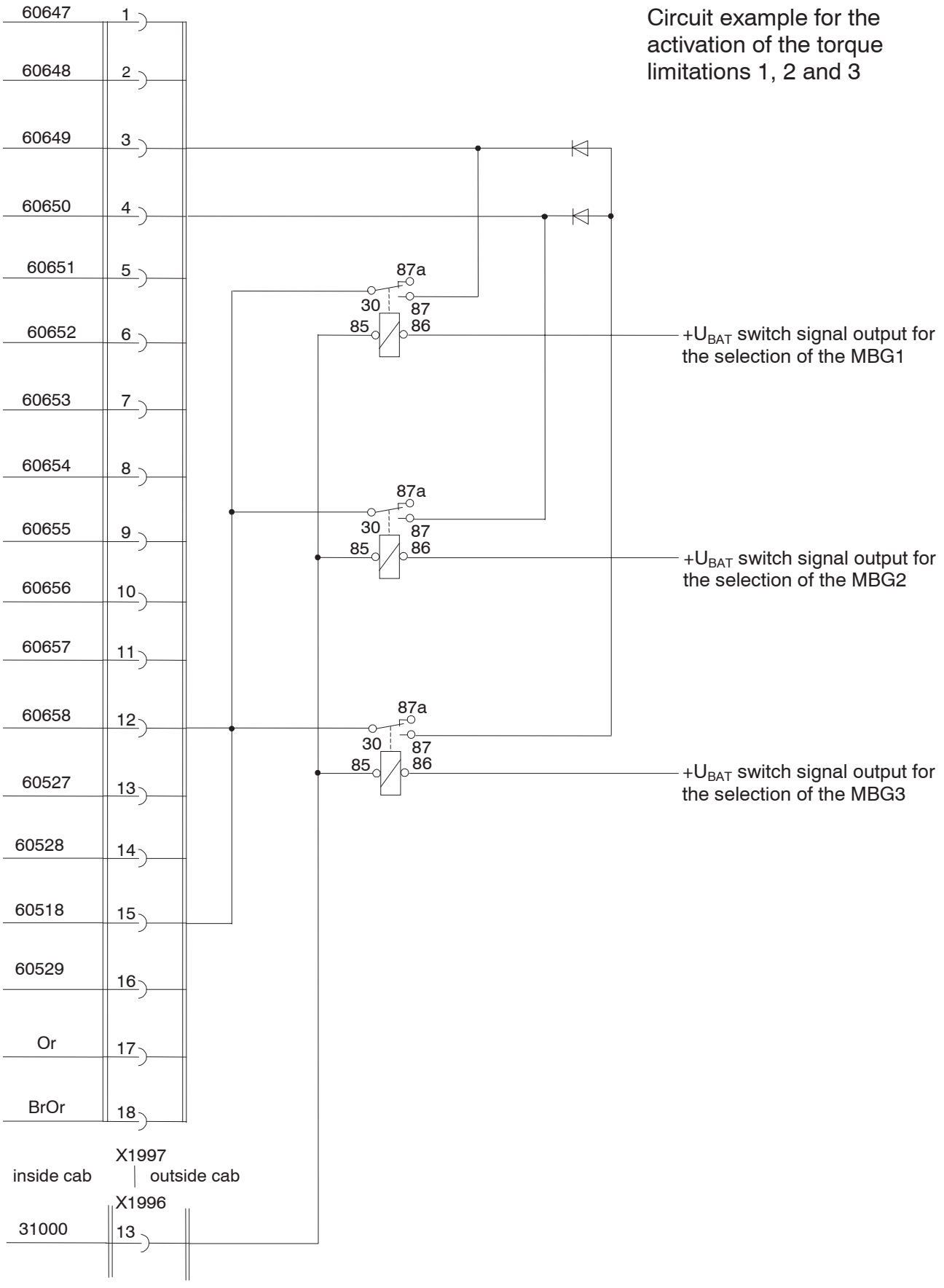
Circuit example for the activation of the torque limitation 1



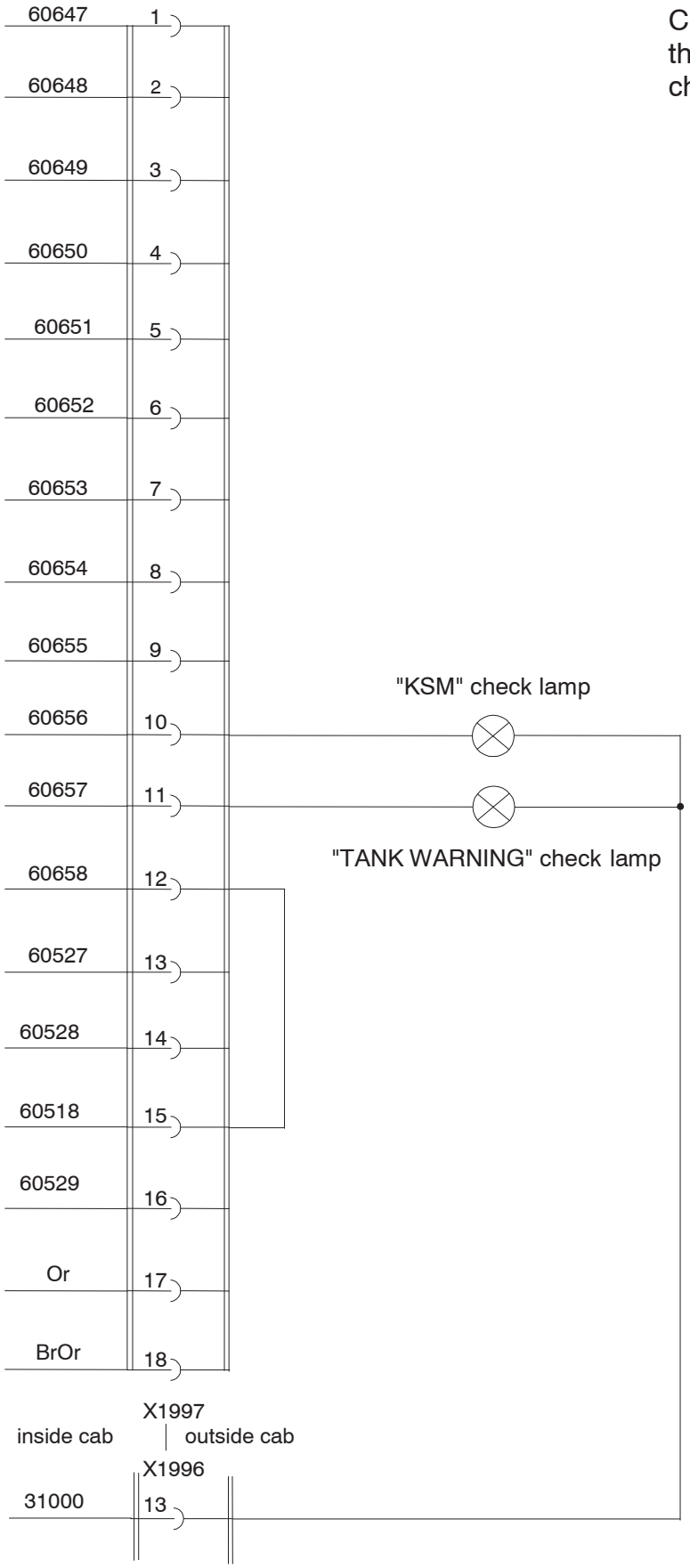
Circuit example for the activation of the torque limitation 2



Circuit example for the activation of the torque limitations 1, 2 and 3



Circuit example for the connection of the "KSM" and "TANK WARNING" check lamps



Circuit example for the connection of a body electronics with CAN interface