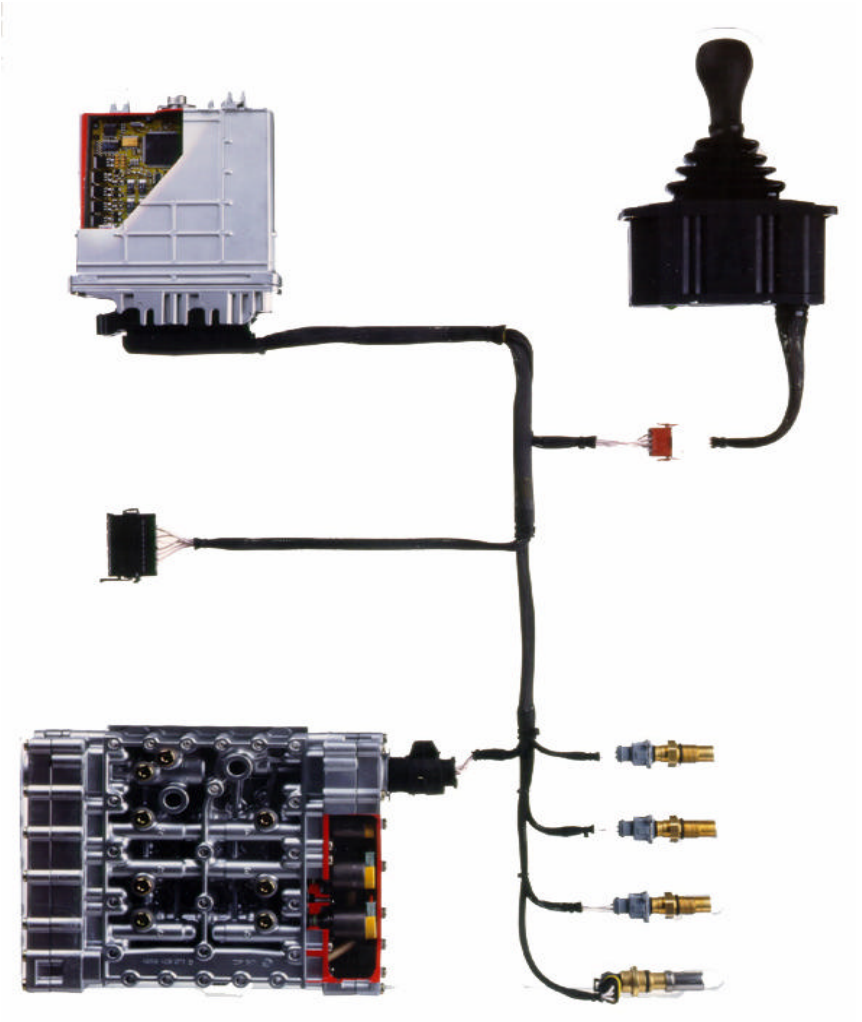
SERVICE

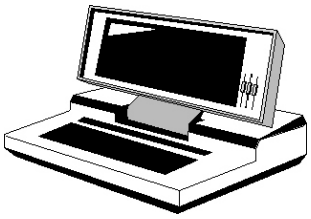
Error code list



Ergopower- EST37/A

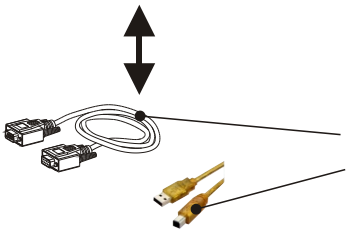
Z F Passau Gmbh
Donaustraße 25 - 71
D - 94034 Passau

DIAGNOSE - UND PROGRAMMIERUNG
EST 37 ERGOPOWER mit LAPTOP und DPA-05



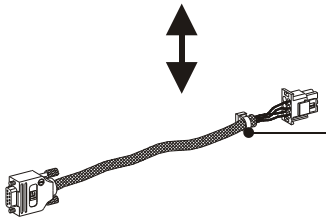
Pentium Laptop min. 1,0 GHz
Zulässiges Betriebssystem
Windows 95 / 98 / Me oder NT
Windows 2000 / Win XP

Software auf CD
Testman Pro und
Getriebe Applikation
ERGOPOWER
5870 220 017



Adapterkabel
6008 308 601 = RS 232
6008 207 026 = USB

Programmieradapter
DPA - 05



Adapterkabel
6008 207 023
6008 207 024
6029 017 005 ZFP

Diagnose - Set
5870 220 703

Diagnose Software auf CD-ROM für ERGOPOWER

EST - 37	EST - 37	EST - 37	EST - 37
WG 110	WG 130/131	WG 190/191	WG 260/261
WG 115	WG 160/161	WG 210/211	WG 310/311

Enthaltene Sprachversionen :
DEUTSCH / ENGLISH / FRANCAI`S / ITALIANO

Gewicht : 2,060 kg

11. Data sheet WG-130/160/190/210

Data of the 3 Inductive transmitters of Engine, Turbine and Central gear train:

⇒ Resistance: 1050 Ohm (±10%) at 20°C
⇒ Temperature range: - 40°C → +150°C
⇒ Torque limit: 30Nm

Data for the Hall-Sensor of the Output:

⇒ Temperature range: - 40°C → +150°C
⇒ Working range: 2 Hz →5 Khz
⇒ Supply voltage: 24 V

Data for the Proportional valves

⇒ Resistance: 19 Ohm (±10%) at 20°C
⇒ Current: 100 → 500 mA
⇒ Pressure range: 0,8 bar → 8,3 bar

12. Data sheet for WG-260/310

Data of the 3 Inductive transmitters of Engine, Turbine and Central gear train:

⇒ Resistance: 1050 Ohm (±10%) at 20°C
⇒ Temperature range: - 40°C → +150°C
⇒ Torque limit: 30Nm
⇒ Gap:
- Engine- and Turbine transmitter: $0{,}5^{+0{,}3}$mm
- Central gear train: $0{,}3^{\pm 0{,}1}$mm

Data or the Hall-Sensor of the Output:

⇒ Temperature range: - 40°C → +150°C
⇒ Working range: 2 Hz →5 Khz
⇒ Supply voltage: 24 V
⇒ Gap: $1{,}0^{+0{,}5}$mm

Data for the Proportional valves

⇒ Resistance: 19 Ohm (±10%) at 20°C
⇒ Current: 100 → 500 mA
⇒ Pressure range: 0,8 bar → 8,3 bar

13. General data sheet for WG 130 → 310

Data for temperature sensors:

⇒ Sump: 1000 Ohm → 1500 Ohm

⇒ Retarder: 800 Ohm → 1500 Ohm

Data for solenoid valve:

⇒ Lock - up clutch:
- Resistance: 60 Ohm → 80 Ohm
- Current: 0,25 A → 0,35 A
- Voltage: 24 V

Data for:

⇒ Control pressure: 16^{+2} bar

⇒ Lubrication pressure: 0,2 → 1,5 bar

⇒ Pressure before the converter:
130/160: max. 11 bar
190/210: max. 11 bar
260/310: max. 8,5 bar

⇒Pressure behind the converter:
130/160: max. 4,3 bar
190/210: max. 4,3 bar
260/310: max. 5 bar

⇒Oil-flow from the pump:
130/160: 80 l/min bei n=2000 min^{-1}
190/210: 105 l/min bei n=2000 min^{-1}
260/310: 115 l/min bei n=2000 min^{-1}

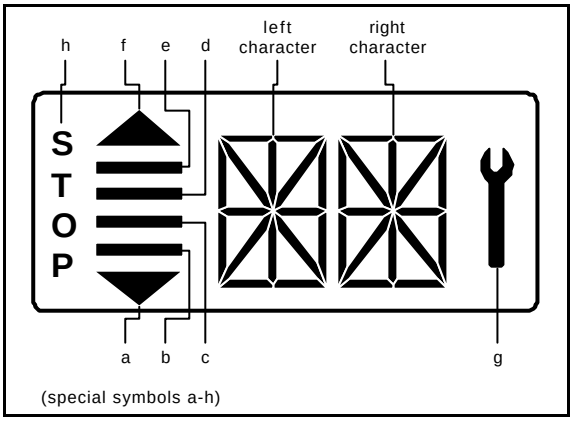
1 Introduction

1.1 Abbreviations

o.c.	open circuit
s.c.	short circuit
OP-Mode	operating mode
TCU	transmission control unit
EEC	electronic engine controller
PTO	power take off

1.2 ZF - Display:

If a fault is detected, the display shows a spanner symbol (g) for a fault. The display shows the fault code, if the gear selector is on neutral position.
If more than one fault is detected, each fault code is shown for about 1 second.



1.3 Display during operation

Symbol	meaning	remarks
1F, 1R 2F, 2R 3F, 3R 4F 5F 6F LF, LR	actual gear and direction left digit shows actual gear right digit shows actual direction limp home gear	
F or R, no gear	Clutch Cutoff	
F or R flashing	direction F or R selected while turbine speed is too high	CAUTION gear will engage if turbine speed drops
NN	not neutral, waiting for neutral after power up or a severe fault	to engage a gear, first move shift selector to neutral position and again to F or R position
**	oil temperature too low, no gear available	warm up engine / transmission
*N	oil temperature low, only one gear available	warm up engine / transmission

1 bar (special symbol)	manual mode 1st gear	
2 bars	manual mode 2nd gear	
3 bars	manual mode 3rd gear	
4 bars	manual mode 4th gear and also 5th and 6th gear in 6WG	
4 bars and 2 arrows	automatic mode	
Bars flashing	6 WG: converter lockup clutch open 4 WG: Downshift mode activ	difference of engine and turbine speed above a certain limit and lockup clutch not activated
Spanner	at least one fault activ	select neutral to get fault code displayed
Fault code	see faultcode list	
WS	warning sump temperature	changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WR	warning retarder temperature	changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WT	warning torque converter temperature	changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
WE	warning high engine speed	changes between actual gear/direction while driving, in neutral only displayed if no fault is detected (spanner)
PN	direction F or R selected while parking brake engaged	transmission in neutral until parking brake is released CAUTION: vehicle starts to move after release of parking brake
EE flashing	no communication with display	checked wiring from TCU to display

AEB Clutch Calibration instructions

Before starting the AEB following instructions must be followed.

Parking Brake must be "on"

Gear selector lever in " Neutral"

Transmission sump temperature between " 70 – 90 ° Celsius"

Engine Idle speed between 650 – 1100 rpm – if to low increase engine speed with gas pedal and keep RPM.

Correct Oil Level – check Dip stick

Vehicle must be on flat surfice level.

Please make shure that safety instructions are followed and no persons next to the vehicle!

When connecting AEB Starter symbol " PL" will show up on display.

To start AEB please push red botton at least 3 seconds till " K1" show up on display after that release the button " AEB" will continiue itself.

Finally if clutches could be calibrated " OK " will show up on display!

Switch off ignition, for at least 5 seconds.

Any Errors appear during AEB procedure please read the Error code book
5872 993 025 German
5872 993 026 englisch

1.4 Display during AEB-Mode

symbol	meaning	remarks
PL	AEB - Starter is plugged at the diagnostic plug	
ST	AEB-Starter-button is pressed	
K1..K4,KV,KR	calibrating clutch K1..K4, KV or KR resp.	
_ and Kx	wait for start, initialization of clutch Kx, x: 1, 2, 3, 4, V, R	
≡ and Kx	fast fill time determination of clutch Kx	
= and Kx	compensating pressure determination of clutch Kx	
OK	calibration for all clutches finished	Transmissions stays in neutral, you have to restart the TCU (ignition off/on) after removing AEB-Starter
STOP	AEB canceled (activation stopped)	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
STOP and Kx	AEB stopped, clutch Kx can't be calibrated	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
Spanner and Kx	Kx couldn't be calibrated, AEB finished	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
Δ E	engine speed too low, ⇨ raise engine speed	
∇ E	engine speed too high, ⇨ lower engine speed	
Δ T	transmission oil temperature too low, ⇨ heat up transmission	
∇ T	transmission oil temperature too high ⇨ cool down transmission	
FT	transmission temperature not in defined range during calibration	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FB	operating mode not NORMAL or transmission temperature sensor defective or storing of Calibrated values to EEPROM-has failed.	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FO	Outputspeed_not_zero	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FN	Shift lever not in Neutral position	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
FP	Parkbrake_not_applied	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)
STOP	AEB - Starter was used incorrect or is defective. Wrong device or wrong cable used	Transmissions stays in neutral, you have to restart the TCU (ignition off/on)

2 definition of operating modes

NORMAL:

There's no failure detected in the transmission-system or the failure has no or slight effects on transmission control. TCU will work without or in special cases with little limitations. (see following table)

SUBSTITUTE CLUTCH CONTROL:

TCU can't change the gears or the direction under the control of the normal clutch modulation. TCU uses the substitute strategy for clutch control. All modulations are only time controlled. (Comparable with EST 25)

LIMP-HOME:

The detected failure in the system has strong limitations to transmission control. TCU can engage only one gear in each direction. In some cases only one direction will be possible.

TCU will shift the transmission into neutral at the first occurrence of the failure. First, the operator must shift the gear selector into neutral position.

If output speed is less than a threshold for neutral to gear and the operator shifts the gear selector into forward or reverse, the TCU will select the limp-home gear .

If output speed is less than a threshold for reversal speed and TCU has changed into the limp-home gear and the operator selects a shuttle shift, TCU will shift immediately into the limp-home gear of the selected direction.

If output speed is greater than the threshold, TCU will shift the transmission into neutral. The operator has to slow down the vehicle and must shift the gear selector into neutral position.

TRANSMISSION-SHUTDOWN:

TCU has detected a severe failure that disables control of the transmission.

TCU will shut off the solenoid valves for the clutches and also the common power supply (VPS1).

Transmission shifts to Neutral. The park brake will operate normally, also the other functions which use ADM 1 to ADM 8.

The operator has to slow down the vehicle. The transmission will stay in neutral.

TCU-SHUTDOWN:

TCU has detected a severe failure that disables control of system.

TCU will shut off all solenoid valves and also both common power supplies (VPS1, VPS2). The park brake will engage, also all functions are disabled which use ADM 1 to ADM 8.

The transmission will stay in neutral.

3 table of fault codes

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
11	5000	12	48	LOGICAL ERROR AT GEAR RANGE SIGNAL TCU detected a wrong signal combination for the gear range • *cable from shift lever to TCU is broken* • *cable is defective and is contacted to battery voltage or vehicle ground* • *shift lever is defective*	TCU shifts transmission to neutral OP-Mode: transmission shutdown	• check the cables from TCU to shift lever • check signal combinations of shift lever positions for gear range	failure cannot be detected in systems with DW2/DW3 shift lever fault is taken back if TCU detects a valid signal for the position	all
12	5010	12	46	LOGICAL ERROR AT DIRECTION SELECT SIGNAL TCU detected a wrong signal combination for the direction • *cable from shift lever to TCU is broken* • *cable is defective and is contacted to battery voltage or vehicle ground* • *shift lever is defective*	TCU shifts transmission to neutral OP-Mode: transmission shutdown	• check the cables from TCU to shift lever • check signal combinations of shift lever positions F-N-R	fault is taken back if TCU detects a valid signal for the direction at the shift lever	all
13	5020	12	95	LOGICAL ERROR AT ENGINE DERATING DEVICE TCU detected no reaction of engine while derating device activ	after selecting neutral, TCU changes to OP-Mode limp home	• check engine derating device	This fault is reset after power up of TCU	all
14	5030	12	169	LOGICAL ERROR AT PARKBRAKE STATUS Parkbrake-status-signal measured by TCU and parkbrake-status-signal send by CAN don't fit • *one of the cables from status-switch to electronic box is broken* • *one of the status-switches is defective*	TCU shifts transmission to DCO-State OP-Mode: normal	• check the cables from electronic boxes to status switches • check signals of the status switches		Case

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
15	5040	12	176	LOGICAL ERROR AT DIRECTION SELECT SIGNAL 2. SHIFT LEVER TCU detected a wrong signal combination for the direction • *cable from shift lever 2 to TCU is broken* • *cable is defective and is contacted to battery voltage or vehicle ground* • *shift lever is defective*	TCU shifts transmission to neutral if selector activ OP-Mode: transmission shutdown if selector activ	• check the cables from TCU to shift lever 2 • check signal combinations of shift lever positions F-N-R	fault is taken back if TCU detects a valid neutral signal for the direction at the shift lever	all case
16	5050	12	178	LOGICAL ERROR AT AXLE CONNECTION feedback axle connection measured by TCU and output signal axle connection don't fit • *axle can't be connected or disconnected due to mechanical problem* • *one of the cables from feedback axle connection -switch to TCU is broken*	OP-Mode: normal	• check the cables from TCU to feedback axle connection switch • check signals of the feedback axle connection switch		all
17	5060	4	148	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 1 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 1 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to customer specific function no. 1 device • check the connectors from customer specific function no. 1 to TCU • check the resistance of customer specific function no. 1 device	[1)] see chapter 4	Z-Funkti on1
18	5060	3	150	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 1 TCU detected a wrong voltage at the	customer specific	• check the cable from TCU to customer specific function no. 1 device • check the connectors from customer	[1)] see chapter 4	Z-Funkti on1

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 1 device has an internal defect* • *connector pin is contacted to battery voltage*		specific function no. 1 to TCU • check the resistance of customer specific function no. 1 device		
19	5060	5	149	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 1 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 1 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 1 device • check the connectors from customer specific function no. 1 device to TCU • check the resistance of customer specific function no. 1 device	[1)] see chapter 4	Z-Funktion1
1A	5070	4	151	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 2 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 2 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to customer specific function no. 2 device • check the connectors from customer specific function no. 2 device to TCU • check the resistance of customer specific function no. 2 device	[1)] see chapter 4	Z-Funktion2
1B	5070	3	153	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 2 TCU detected a wrong voltage at the	customer specific	• check the cable from TCU to customer specific function no. 2 device • check the connectors from customer	[1)] see chapter 4	Z-Funktion2

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 2 device has an internal defect* • *connector pin is contacted to battery voltage*		specific function no. 2 device to TCU • check the resistance of customer specific function no. 2 device		
1C	5070	5	152	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 2 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 2 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 2 device • check the connectors from customer specific function no. 2 device to TCU • check the resistance of customer specific function no. 2 device	[1)] see chapter 4	Z-Funktion2
1D	5080	4	154	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 3 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 3 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to customer specific function no. 3 device • check the connectors from customer specific function no. 3 device to TCU • check the resistance of customer specific function no. 3 device	[1)] see chapter 4	Z-Funktion3
1E	5080	3	156	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 3 TCU detected a wrong voltage at the	customer specific	• check the cable from TCU to customer specific customer specific function no. 3 device	[1)] see chapter 4	Z-Funktion3

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 3 device has an internal defect* • *connector pin is contacted to battery voltage*		• check the connectors from customer specific function no. 3 device to TCU • check the resistance of customer specific function no. 3 device		
1F	5080	5	155	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 3 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 3 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 3 device • check the connectors from customer specific function no. 3 device to TCU • check the resistance of customer specific function no. 3 device	[1)] see chapter 4	Z-Funktion3
21	5090	3	32	S.C. TO BATTERY VOLTAGE AT CLUTCH CUTOFF INPUT the measured voltage is too high: • *cable is defective and is contacted to battery voltage* • *clutch cut off sensor has an internal defect* • *connector pin is contacted to battery voltage*	clutch cutoff function is disabled OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the clutch cutoff sensor		John Deere
22	5090	4	29	S.C. TO GROUND OR O.C. AT CLUTCH CUTOFF INPUT the measured voltage is too low: • *cable is defective and is contacted to*	clutch cutoff function is disabled OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the clutch cutoff sensor		John Deere

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				vehicle ground • *cable has no connection to TCU* • *clutch cut off sensor has an internal defect* • *connector pin is contacted to vehicle ground or is broken*				
23	5100	3	69	S.C. TO BATTERY VOLTAGE AT LOAD SENSOR INPUT the measured voltage is too high: • *cable is defective and is contacted to battery voltage* • *load sensor has an internal defect* • *connector pin is contacted to battery voltage*	retarder function is affected TCU uses default load OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the load sensor sensor • check the assembly tolerances of load sensor	availability of retarder depends on default load	ohne CAN
24	5100	4	70	S.C. TO GROUND OR O.C. AT LOAD SENSOR INPUT the measured voltage is too low: • *cable is defective and is contacted to vehicle ground* • *cable has no connection to TCU* • *load sensor has an internal defect* • *connector pin is contacted to vehicle ground or is broken*	retarder function is affected TCU uses default load OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the load sensor sensor • check the assembly tolerances of load sensor	availability of retarder depends on default load	ohne CAN
25	5110	3	33	S.C. TO BATTERY VOLTAGE OR O.C. AT TRANSMISSION SUMP TEMPERATURE SENSOR INPUT the measured voltage is too high: • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *temperature sensor has an internal defect*	no reaction, TCU uses default temperature OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the temperature sensor		all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *connector pin is contacted to battery voltage or is broken*				
26	5110	4	30	S.C. TO GROUND AT TRANSMISSION SUMP TEMPERATURE SENSOR INPUT the measured voltage is too low: • *cable is defective and is contacted to vehicle ground* • *temperature sensor has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction, TCU uses default temperature OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the temperature sensor		all, Sisu
27	5120	3	76	S.C. TO BATTERY VOLTAGE OR O.C. AT RETARDER TEMPERATURE SENSOR INPUT the measured voltage is too high: • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *temperature sensor has an internal defect* • *connector pin is contacted to battery voltage or is broken*	no reaction, TCU uses default temperature OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the temperature sensor		6WG
28	5120	4	74	S.C. TO GROUND AT RETARDER TEMPERATURE SENSOR INPUT the measured voltage is too low: • *cable is defective and is contacted to vehicle ground* • *temperature sensor has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction, TCU uses default temperature OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the temperature sensor		6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
29	5130	3	31	S.C. TO BATTERY VOLTAGE OR O.C. AT PARKING BRAKE SENSOR INPUT the measured voltage is too high: • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *sensor has an internal defect* • *connector pin is contacted to battery voltage or is broken*	TCU uses default value OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the parking brake sensor		all
2A	5130	4	28	S.C. TO GROUND PARKING BRAKE SENSOR INPUT the measured voltage is too low: • *cable is defective and is contacted to vehicle ground* • *sensor has an internal defect* • *connector pin is contacted to vehicle ground*	TCU uses default value OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check the parking brake sensor		all
2B	5313	12	135	INCHSENSOR-SIGNAL MISMATCH the measured voltage from CCO and CCO2 signal don't match: • *cable is defective* • *sensor has an internal defect*	During inching mode: TCU shifts to neutral While not inching: no change OP-Mode: normal	• check the cable from TCU to the sensor • check the connectors • check sensor		all
31	5140	3	38	S.C. TO BATTERY VOLTAGE OR O.C. AT ENGINE SPEED INPUT TCU measures a voltage higher than 7.00 V at speed input pin • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *speed sensor has an internal defect*	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *connector pin is contacted to battery voltage or has no contact*				
32	5140	4	34	S.C. TO GROUND AT ENGINE SPEED INPUT TCU measures a voltage less than 0.45V at speed input pin • *cable / connector is defective and is contacted to vehicle ground* • *speed sensor has an internal defect*	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
33	5140	12	42	LOGICAL ERROR AT ENGINE SPEED INPUT TCU measures a engine speed over a threshold and the next moment the measured speed is zero • *cable / connector is defective and has bad contact* • *speed sensor has an internal defect* • *sensor gap has the wrong size*	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors • check the speed sensor • check the sensor gap	This fault is reset after power up of TCU	all, Sisu
34	5150	3	39	S.C. TO BATTERY VOLTAGE OR O.C. AT TURBINE SPEED INPUT TCU measures a voltage higher than 7.00 V at speed input pin • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *speed sensor has an internal defect* • *connector pin is contacted to battery voltage or has no contact*	OP-Mode: substitute clutch control if a failure is existing at output speed, TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
35	5150	4	35	S.C. TO GROUND AT TURBINE SPEED INPUT TCU measures a voltage less than 0.45V at speed input pin	OP-Mode: substitute clutch control if a failure is existing at output speed,	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *cable / connector is defective and is contacted to vehicle ground* • *speed sensor has an internal defect*	TCU shifts to neutral OP-Mode: limp home			
36	5150	12	43	LOGICAL ERROR AT TURBINE SPEED INPUT TCU measures a turbine speed over a threshold and at the next moment the measured speed is zero • *cable / connector is defective and has bad contact* • *speed sensor has an internal defect* • *sensor gap has the wrong size*	OP-Mode: substitute clutch control if a failure is existing at output speed, TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the sensor • check the connectors • check the speed sensor • check the sensor gap	This fault is reset after power up of TCU	all, Sisu
37	5160	3	40	S.C. TO BATTERY VOLTAGE OR O.C. AT INTERNAL SPEED INPUT TCU measures a voltage higher than 7.00 V at speed input pin • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *speed sensor has an internal defect* • *connector pin is contacted to battery voltage or has no contact*	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
38	5160	4	36	S.C. TO GROUND AT INTERNAL SPEED INPUT TCU measures a voltage less than 0.45V at speed input pin • *cable / connector is defective and is contacted to vehicle ground* • *speed sensor has an internal defect*	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
39	5160	12	44	LOGICAL ERROR AT INTERNAL SPEED INPUT	OP-Mode: substitute clutch control	• check the cable from TCU to the sensor • check the connectors	This fault is reset after power up of TCU	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				TCU measures a internal speed over a threshold and at the next moment the measured speed is zero • *cable / connector is defective and has bad contact* • *speed sensor has an internal defect* • *sensor gap has the wrong size*		• check the speed sensor • check the sensor gap		
3A	5170	3	41	S.C. TO BATTERY VOLTAGE OR O.C. AT OUTPUT SPEED INPUT TCU measures a voltage higher than 12.5 V at speed input pin • *cable is defective and is contacted to battery voltage* • *cable has no connection to TCU* • *speed sensor has an internal defect* • *connector pin is contacted to battery voltage or has no contact*	special mode for gear selection OP-Mode: substitute clutch control if a failure is existing at turbine speed, TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
3B	5170	4	37	S.C. TO GROUND AT OUTPUT SPEED INPUT TCU measures a voltage less than 1.00V at speed input pin • *cable / connector is defective and is contacted to vehicle ground* • *speed sensor has an internal defect*	special mode for gear selection OP-Mode: substitute clutch control if a failure is existing at turbine speed, TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the sensor • check the connectors • check the speed sensor		all, Sisu
3C	5170	12	45	LOGICAL ERROR AT OUTPUT SPEED INPUT TCU measures a output speed over a threshold and at the next moment the measured speed is zero • *cable / connector is defective and has bad contact* • *speed sensor has an internal defect*	special mode for gear selection OP-Mode: substitute clutch control if a failure is existing at turbine speed, TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the sensor • check the connectors • check the speed sensor • check the sensor gap	This fault is reset after power up of TCU	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *sensor gap has the wrong size*				
3D			71	TURBINE SPEED ZERO DOESN'T FIT TO OTHER SPEED SIGNALS	-	-	not used	
3E	5180	2	72	OUTPUT SPEED ZERO DOESN'T FIT TO OTHER SPEED SIGNALS if transmission is not neutral and the shifting has finished, TCU measures outputspeed zero and turbine speed or internal speed not equal to zero. • *speed sensor has an internal defect* • *sensor gap has the wrong size*	special mode for gear selection OP-Mode: substitute clutch control if a failure is existing at turbine speed, TCU shifts to neutral OP-Mode: limp home	• check the sensor signal of output speed sensor • check the sensor gap of output speed sensor • check the cable from TCU to the sensor	This fault is reset after power up of TCU	all, Sisu
40	5190	2	146	GEAR RANGE RESTRICTION SIGNAL CAN signal for gear range restriction is defective • *cluster controller is defective* • *interference on CAN-Bus*	no gear range restriction	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		Case
40	5200	2	146	FCAN MESSAGE 'GEAR RANGE SELECT (ZF_3_IDENT)' contains invalid data	gear range set from 1st to 5th	• check FWD controller • check wire of CAN-Bus		O&K
41	5210	2	147	DECLUTCH MODULATION SELECTION SIGNAL	-	-	not used	Case
41	5210	2	147	TCU RECEIVES MESSAGES 'GEAR RANGE SELECT (ZF_3_IDENT)' AND 'FRONT WHEEL DRIVE STATUS' (V_IDENT_FWD) ALTHOUGH CONFIGURATION STATES THAT FWD CONTROLLER IS NOT INSTALLED	ignore FWD commands	• reconfigure with TCU Configuration Command (ID PC)		O&K
50	5220	9	99	FMR1 TIMEOUT Timeout of CAN-message FMR1 from	TCU operates like jake brake is off and exhaut brake is off.	• check engine controller • check wire of CAN-Bus		IES

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				engine controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage* • *engine controller is defective*	OP-Mode: normal	• check cable to engine controller		
51	5230	9	100	FMR2 TIMEOUT Timeout of CAN-message FMR2 from engine controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage* • *engine controller is defective*	OP-Mode: substitute clutch control	• check engine controller • check wire of CAN-Bus • check cable to engine controller		IES
52	5240	9	101	EAMODUL1 TIMEOUT Timeout of CAN-message EAM1 from I/O - controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	TCU shifts to neutral and uses substitute gear selector OP-Mode: normal	• check I/O controller • check wire of CAN-Bus • check cable to I/O controller		Liebh err
53	5250	9	102	ABS TIMEOUT Timeout of CAN-message ABS from ABS - controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	no reaction	• check ABS controller • check wire of CAN-Bus • check cable to ABS controller		IES

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
54	5260	9	103	MDU1 TIMEOUT Timeout of CAN-message MDU1 from cluster controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	TCU keeps old auto downshift information and old manual downshift information OP-Mode: normal	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		John Deere
54	5260	9	103	DCT1 TIMEOUT Timeout of CAN-message DCT1 from display computer • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	OP-Mode: normal	• check display computer • check wire of CAN-Bus • check cable to display computer		JCB, Kalmar
54	5260	9	103	GEAR RANGE SELECT TIMEOUT Timeout of CAN-message 'Gear Range Select (ZF_3_IDENT)' • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage* • *FWD Controller is defective*	gear range set from 1st to 5th	• check wire of CAN-Bus • check FWD controller		O&K
55	5270	9	177	DNS1 TIMEOUT Timeout of CAN-message DNS1 from OMRON-master • *interference on CAN-Bus* • *CAN wire/connector is broken*	TCU shifts to neutral OP-Mode: normal	• check OMRON-master • check wire of CAN-Bus • check cable to OMRON-master		Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*				
55	5270	9	177	SCT1 TIMEOUT Timeout of CAN-message SCT 1 from steering computer • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	OP-Mode: normal	• check steering computer • check wire of CAN-Bus • check cable to steering computer		Kalmar
55	5270	9	177	FLC1 TIMEOUT Timeout of CAN-message FCL1 from cluster controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	TCU keeps old auto/man selection, old Clutch cutoff selection and old Clutch Cuttoff Setting OP-Mode: normal	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		John Deere
55	5270	9	177	FRONT WHEEL DRIVE STATUS TIMEOUT Timeout of CAN-message ‘Front Wheel Drive Status (V_IDENT_FWD)’ • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage* • *FWD Controller is defective*	TCU shifts to neutral	• check wire of CAN-Bus • check FWD controller		O&K
56	5280	9	105	ENGINE CONF TIMEOUT Timeout of CAN-message ENGINE CONF	OP-Mode: substitute clutch control	• check engine controller • check wire of CAN-Bus		J1939

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				from engine controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*		• check cable to engine controller		
57	5290	9	106	EEC1 TIMEOUT Timeout of CAN-message EEC1 from EEC controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	OP-Mode: substitute clutch control	• check EEC controller • check wire of CAN-Bus • check cable to EEC controller		J1939
58	5300	9	107	EEC3 TIMEOUT Timeout of CAN-message EEC3 from EEC controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective an has contact to vehicle ground or battery voltage*	OP-Mode: substitute clutch control	• check EEC controller • check wire of CAN-Bus • check cable to EEC controller		J1939
59	5310	2	108	TEST MODE SIGNAL CAN signal for test mode status is defective • *cluster controller is defective* • *interference on CAN-Bus*	Testmode is aborted, if activ	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		Case
5A	5320	2	109	PARKBRAKE STATUS SIGNAL CAN signal for parkbrake status is defective • cluster *controller is defective*	no reaction ????	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		Case, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *interference on CAN-Bus*				
5B	5330	2	110	SHIFT QUALITY SEL SIGNAL CAN signal for shift qualtiy selection is defective • *cluster controller is defective* • *interference on CAN-Bus*		• check cluster controller • check wire of CAN-Bus • check cable to cluster controller	Not used	Case
5C	5340	2	111	AUTO DOWNSHIFT SIGNAL CAN signal for automatic downshift is defective • cluster *controller is defective* • *interference on CAN-Bus*	last selection is kept	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		John Deere
5D	5350	2	112	MANUAL DOWNSHIFT SIGNAL CAN signal for manual downshift is defective • cluster *controller is defective* • *interference on CAN-Bus*	last selection is kept	• check cluster controller • check wire of CAN-Bus • check cable to ???? controller		John Deere
5E	5360	2	113	CCO REQUEST SIGNAL CAN signal for CCO request is defective • cluster *controller is defective* • *interference on CAN-Bus*	last selection is kept	• check cluster controller • check wire of CAN-Bus • check cable to ???? controller		John Deere
5F	5370	2	114	SHIFT LEVER SIGNAL CAN signal for shift lever is defective • *I/O controller is defective* • *interference on CAN-Bus*	TCU shifts to neutral and uses informations from substitute shift lever OP-Mode: normal	• check I/O controller • check wire of CAN-Bus • check cable to I/O controller		Liebherr, Sisu
5F	5370	2	179	TRANSMISSION NEUTRAL REQUEST SIGNAL CAN signal for transmission Neutral Request is defective	OP-Mode: normal	• check steering computer • check wire of CAN-Bus • check cable to steering computer		Kalmar

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• steering computer *is defective* • interference on CAN-Bus				
5F	5370	2	179	CAN MESSAGE ' FRONT WHEEL DRIVE STATUS (V_IDENT_FWD)' CONTAINS INVALID DATA	TCU shifts to neutral	• check FWD controller		O&K
60	5380	2	115	ADDITIONAL BRAKE STATUS SIGNAL CAN signal for additional park brake status is defective • *I/O controller is defective* • *interference on CAN-Bus*	no reaction OP-Mode: normal	• check *I/O* controller • check wire of CAN-Bus • check cable to I/O controller		Liebh err
61	5390	2	116	AEB REQUEST SIGNAL CAN signal for AEB request is defective • *I/O controller is defective* • *interference on CAN-Bus*	no reaction OP-Mode: normal Last selection is kept	• check *I/O* controller • check wire of CAN-Bus • check cable to I/O controller		Liebh err, Sisu, John Deere
62	5400	2	117	PTO TORQUE SIGNAL CAN signal for PTO torque is defective • *I/O controller is defective* • *interference on CAN-Bus*	no reaction, TCU uses default PTO torque signal OP-Mode: normal	• check *I/O* controller • check wire of CAN-Bus • check cable to I/O controller		Liebh err
63	5410	2	118	DRIVING MODE SIGNAL CAN signal for driving mode is defective • *I/O controller is defective* • *interference on CAN-Bus*	no reaction, TCU uses default driving mode signal OP-Mode: normal	• check *I/O* controller • check wire of CAN-Bus • check cable to *I/O* controller		Liebh err
64	5420	2	119	STARTING GEAR SIGNAL CAN signal for starting gear is defective • *I/O controller is defective (illegal starting gear)* • *interference on CAN-Bus*	no reaction, TCU uses default starting gear OP-Mode: normal	• check I/O controller • check wire of CAN-Bus • check cable to *I/O* controller		Liebh err
65	5430	2	120	ENGINGE TORQUE SIGNAL	OP-Mode:substitute clutch	• check engine controller		IES,

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				CAN signal for engine torque is defective • *engine controller is defective* • *interference on CAN-Bus*	control	• check wire of CAN-Bus • check cable to engine controller		J1939
69	5440	2	124	REFERENCE ENGINE TORQUE SIGNAL CAN signal for reference of engine torque is defective • *engine controller is defective* • *interference on CAN-Bus*	OP-Mode:substitute clutch control	• check engine controller • check wire of CAN-Bus • check cable to engine controller		J1939
6A	5450	2	125	ACTUAL ENGINE TORQUE SIGNAL CAN signal for actual engine torque is defective • *engine controller is defective* • *interference on CAN-Bus*	OP-Mode:substitute clutch control	• check engine controller • check wire of CAN-Bus • check cable to engine controller		J1939
6B	5460	2	126	NOM FRICTION TORQUE SIGNAL CAN signal for nominal friction torque is defective • *engine controller is defective* • *interference on CAN-Bus*	OP-Mode:substitute clutch control	• check engine controller • check wire of CAN-Bus • check cable to engine controller		J1939
6E	5470	2	144	EEC2 TIMEOUT Timeout of CAN-message EEC2 from EEC controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	no reaction, TCU uses default signal accelerator pedal in idle position OP-Mode: normal	• check EEC controller • check wire of CAN-Bus • check cable to EEC controller		J1939
71	5480	3	22	S.C. TO BATTERY VOLTAGE AT CLUTCH K1 the measured resistance value of the valve is out of limit, the voltage at K1 valve is	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending	• check the cable from TCU to the gearbox • check the connectors from TCU to the gearbox • check the regulator resistance [1)]	[1)] see chapter 4	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: TCU shutdown	• check internal wire harness of the gearbox		
72	5480	4	10	S.C. TO GROUND AT CLUTCH K1 the measured resistance value of the valve is out of limit, the voltage at K1 valve is too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
73	5480	5	16	O.C. AT CLUTCH K1 the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
74	5490	3	23	S.C. TO BATTERY VOLTAGE AT CLUTCH K2 the measured resistance value of the valve is out of limit, the voltage at K2 valve is too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
75	5490	4	11	S.C. TO GROUND AT CLUTCH K2 the measured resistance value of the valve is out of limit, the voltage at K2 valve is	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU	[1)] see chapter 4	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the regulator resistance [1)] • check internal wire harness of the gearbox		
76	5490	5	17	O.C. AT CLUTCH K2 the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
77	5500	3	24	S.C. TO BATTERY VOLTAGE AT CLUTCH K3 the measured resistance value of the valve is out of limit, the voltage at K3 valve is too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
78	5500	4	12	S.C. TO GROUND AT CLUTCH K3 the measured resistance value of the valve is out of limit, the voltage at K3 valve is too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
79	5500	5	18	O.C. AT CLUTCH K3 the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
7A	5540	3	78	S.C. TO BATTERY VOLTAGE AT CONVERTER CLUTCH	-	-	not used	
7B	5540	4	79	S.C. TO GROUND AT CONVERTER CLUTCH	-	-	not used	
7C	5540	5	80	O.C. AT CONVERTER CLUTCH	-	-	not used	
7D	5550	4	166	S.C. TO GROUND AT ENGINE DERATING DEVICE • *cable is defective and is contacted to vehicle ground* • *engine derating device has an internal defect* • *connector pin is contacted to vehicle ground*	engine derating will be on until TCU power down even if fault vanishes (loose connection) OP-Mode: normal	• check the cable from TCU to the engine derating device • check the connectors from engine derating device to TCU • check the resistance [1)] of engine derating device	[1)] see chapter 4	SHI Proto T10
7E	5550	3	168	S.C. TO BATTERY VOLTAGE AT ENGINE DERATING DEVICE • *cable / connector is defective and is contacted to battery voltage* • *engine derating device has an internal defect*	no reaction OP-Mode: normal	• check the cable from TCU to the engine derating device • check the connectors from backup alarm device to TCU • check the resistance [1)] of backup alarm device		SHI Proto T10
7F	5550	5	167	O.C. AT ENGINE DERATING DEVICE TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin	no reaction OP-Mode: normal	• check the cable from TCU to the engine derating device • check the connectors from engine derating device to TCU	[1)] see chapter 4	SHI Proto T10

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *cable is defective and has no connection to TCU* • *engine derating device has an internal defect* • *connector has no connection to TCU*		• check the resistance [1)] of engine derating device		
81	5510	3	25	S.C. TO BATTERY VOLTAGE AT CLUTCH K4 the measured resistance value of the valve is out of limit, the voltage at K4 valve is too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all
82	5510	4	13	S.C. TO GROUND AT CLUTCH K4 the measured resistance value of the valve is out of limit, the voltage at K4 valve is too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all
83	5510	5	19	O.C. AT CLUTCH K4 the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all
84	5520	3	26	S.C. TO BATTERY VOLTAGE AT CLUTCH KV	TCU shifts to neutral OP-Mode: limp home	• check the cable from TCU to the gearbox • check the connectors from gearbox to	[1)] see chapter 4	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				the measured resistance value of the valve is out of limit, the voltage at KV valve is too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox		
85	5520	4	14	S.C. TO GROUND AT CLUTCH KV the measured resistance value of the valve is out of limit, the voltage at KV valve is too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
86	5520	5	20	O.C. AT CLUTCH KV the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
87	5530	3	27	S.C. TO BATTERY VOLTAGE AT CLUTCH KR the measured resistance value of the valve is out of limit, the voltage at KR valve is too high. • *cable / connector is defective and has contact to battery voltage* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
88	5530	4	15	S.C. TO GROUND AT CLUTCH KR the measured resistance value of the valve is out of limit, the voltage at KR valve is too low. • *cable / connector is defective and has contact to vehicle ground* • *cable / connector is defective and has contact to another regulator output of the TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
89	5530	5	21	O.C. AT CLUTCH KR the measured resistance value of the valve is out of limit. • *cable / connector is defective and has no contact to TCU* • *regulator has an internal defect*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check the cable from TCU to the gearbox • check the connectors from gearbox to TCU • check the regulator resistance [1)] • check internal wire harness of the gearbox	[1)] see chapter 4	all, Sisu
91	5560	4	1	S.C. TO GROUND AT RELAY REVERSE WARNING ALARM TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *backup alarm device has an internal defect* • *connector pin is contacted to vehicle ground*	backup alarm will be on until TCU power down even if fault vanishes (loose connection) OP-Mode: normal	• check the cable from TCU to the backup alarm device • check the connectors from backup alarm device to TCU • check the resistance [1)] of backup alarm device	[1)] see chapter 4	all
92	5560	3	3	S.C. TO BATTERY VOLTAGE AT RELAY REVERSE WARNING ALARM TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery	no reaction OP-Mode: normal	• check the cable from TCU to the backup alarm device • check the connectors from backup alarm device to TCU	[1)] see chapter 4	all

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				voltage • *cable is defective and is contacted to battery voltage* • *backup alarm device has an internal defect* • *connector pin is contacted to battery voltage*		• check the resistance [1] of backup alarm device		
93	5560	5	2	O.C. AT RELAY REVERSE WARNING ALARM TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *backup alarm device has an internal defect* • *connector has no connection to TCU*	no reaction OP-Mode: normal	• check the cable from TCU to the backup alarm device • check the connectors from backup alarm device to TCU • check the resistance [1] of backup alarm device	[1] see chapter 4	all
94	5570	4	4	S.C. TO GROUND AT RELAY STARTER INTERLOCK TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *starter interlock relay has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-Mode: normal	• check the cable from TCU to the starter interlock relay • check the connectors from starter interlock relay to TCU • check the resistance [1] of starter interlock relay	[1] see chapter 4	
95	5570	3	6	S.C. TO BATTERY VOLTAGE AT RELAY STARTER INTERLOCK TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage	no reaction OP-Mode: normal	• check the cable from TCU to the starter interlock relay • check the connectors from starter interlock relay to TCU • check the resistance [1] of starter	[1] see chapter 4	

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *cable is defective and is contacted to battery voltage* • *starter interlock relay has an internal defect* • *connector pin is contacted to battery voltage*		interlock relay		
96	5570	5	5	O.C. AT RELAY STARTER INTERLOCK TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *starter interlock relay has an internal defect* • *connector has no connection to TCU*	no reaction OP-Mode: normal	• check the cable from TCU to the starter interlock relay • check the connectors from starter interlock relay to TCU • check the resistance [1)] of starter interlock relay	[1)] see chapter 4	
97	5580	4	7	S.C. TO GROUND AT PARK BRAKE SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *park brake solenoid has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-Mode: normal	• check the cable from TCU to the park brake solenoid • check the connectors from park brake solenoid to TCU • check the resistance [1)] of park brake solenoid	[1)] see chapter 4	John Deere
98	5580	3	9	S.C. TO BATTERY VOLTAGE AT PARK BRAKE SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to*	no reaction optional: (some customers) TCU shifts to neutral caused by park brake feed back OP-Mode: normal	• check the cable from TCU to the park brake solenoid • check the connectors from park brake solenoid to TCU • check the resistance [1)] of park brake solenoid	[1)] see chapter 4	John Deere

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				battery voltage • *park brake solenoid has an internal defect* • *connector pin is contacted to battery voltage*				
99	5580	5	8	O.C. AT PARK BRAKE SOLENOID TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *park brake solenoid has an internal defect* • *connector has no connection to TCU*	no reaction optional: (some customers) TCU shifts to neutral caused by park brake feed back OP-Mode: normal	• check the cable from TCU to the park brake solenoid • check the connectors from park brake solenoid to TCU • check the resistance [1)] of park brake solenoid	[1)] see chapter 4	John Deere
9A	5590	4	66	S.C. TO GROUND AT CONVERTER LOCK UP CLUTCH SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *converter clutch solenoid has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-mode: normal	• check the cable from TCU to the converter clutch solenoid • check the connectors from converter clutch solenoid to TCU • check the resistance [1)] of converter clutch solenoid	[1)] see chapter 4	6WG
9B	5590	3	67	O.C. AT CONVERTER LOCK UP CLUTCH SOLENOID TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU*	converter clutch always open, retarder not available OP-mode: normal	• check the cable from TCU to the converter clutch solenoid • check the connectors from converter clutch solenoid to TCU • check the resistance [1)] of converter clutch solenoid	[1)] see chapter 4	6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *converter clutch solenoid has an internal defect* • *connector has no connection to TCU*				
9C	5590	5	68	S.C. TO BATTERY VOLTAGE AT CONVERTER LOCK UP CLUTCH SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *converter clutch solenoid has an internal defect* • *connector pin is contacted to battery voltage*	no reaction OP-mode: normal	• check the cable from TCU to the converter clutch solenoid • check the connectors from converter clutch solenoid to TCU • check the resistance [1)] of converter clutch solenoid	[1)] see chapter 4	6WG
9D	5600	4	81	S.C. TO GROUND AT RETARDER SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *retarder solenoid has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-mode: normal	• check the cable from TCU to the retarder solenoid • check the connectors from retarder solenoid to TCU • check the resistance [1)] of retarder solenoid	[1)] see chapter 4	6WG
9E	5600	3	82	O.C. AT RETARDER SOLENOID TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *retarder solenoid has an internal defect*	no reaction OP-mode: normal	• check the cable from TCU to the retarder solenoid • check the connectors from retarder solenoid to TCU • check the resistance [1)] of retarder solenoid	[1)] see chapter 4	6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *connector has no connection to TCU*				
9F	5600	5	83	S.C. TO BATTERY VOLTAGE AT RETARDER SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *retarder solenoid has an internal defect* • *connector pin is contacted to battery voltage*	no reaction OP-mode: normal	• check the cable from TCU to the retarder solenoid • check the connectors from retarder solenoid to TCU • check the resistance [1)] of retarder solenoid	[1)] see chapter 4	6WG
A1	5610	4	84	S.C. TO GROUND AT DIFFLOCK OR AXLE CONNECTION SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *difflock solenoid has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-mode: normal	• check the cable from TCU to the difflock solenoid • check the connectors from difflock solenoid to TCU • check the resistance [1)] of difflock solenoid	[1)] see chapter 4	6WG
A2	5610	3	85	S.C. TO BATTERY VOLTAGE AT DIFFLOCK OR AXLE CONNECTION SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *difflock solenoid has an internal*	no reaction OP-mode: normal	• check the cable from TCU to the difflock solenoid • check the connectors from difflock solenoid to TCU • check the resistance [1)] of difflock solenoid	[1)] see chapter 4	6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				defect • *connector pin is contacted to battery voltage*				
A3	5610	5	86	O.C. AT DIFFLOCK OR AXLE CONNECTION SOLENOID TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *difflock solenoid has an internal defect* • *connector has no connection to TCU*	no reaction OP-mode: normal	• check the cable from TCU to the difflock solenoid • check the connectors from difflock solenoid to TCU • check the resistance [1)] of difflock solenoid	[1)] see chapter 4	6WG
A4	5620	4	96	S.C. TO GROUND AT WARNING SIGNAL OUTPUT TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *warning device has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-mode: normal	• check the cable from TCU to the warning device • check the connectors from warning device to TCU • check the resistance [1)] of warning device	[1)] see chapter 4	6WG
A5	5620	5	97	O.C. AT WARNING SIGNAL OUTPUT TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *warning device has an internal defect* • *connector has no connection to TCU*	no reaction OP-mode: normal	• check the cable from TCU to the warning device • check the connectors from warning device to TCU • check the resistance [1)] of warning device	[1)] see chapter 4	6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
A6	5620	3	98	S.C. TO BATTERY VOLTAGE AT WARNING SIGNAL OUTPUT TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *warning device has an internal defect* • *connector pin is contacted to battery voltage*	no reaction OP-mode: normal	• check the cable from TCU to the warning device • check the connectors from warning device to TCU • check the resistance [1)] of warning device	[1)] see chapter 4	6WG
A7	5630	4	157	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 4 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 4 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to customer specific function no. 4 device • check the connectors from customer specific function no. 4 device to TCU • check the resistance of customer specific function no. 4 device	[1)] see chapter 4	Z-Funktion4
A8	5630	3	159	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 4 TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 4 device has an internal defect* • *connector pin is contacted to battery voltage*	customer specific	• check the cable from TCU to customer specific function no. 4 device • check the connectors from customer specific function no. 4 device to TCU • check the resistance of customer specific function no. 4 device	[1)] see chapter 4	Z-Funktion4

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
A9	5630	5	158	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 4 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 4 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 4 device • check the connectors from customer specific function no. 4 device to TCU • check the resistance of customer specific function no. 4 device	[1)] see chapter 4	Z-Funktion4
AA	5640	4	160	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 5 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 5 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to customer specific function no. 5 device • check the connectors from customer specific function no. 5 device to TCU • check the resistance of customer specific function no. 5 device	[1)] see chapter 4	Z-Funktion5
AB	5640	3	162	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 5 TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 5 device has an internal defect* • *connector pin is contacted to battery voltage*	customer specific	• check the cable from TCU to customer specific function no. 5 device • check the connectors from customer specific function no. 5 device to TCU • check the resistance of customer specific function no. 5 device	[1)] see chapter 4	Z-Funktion5

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
AC	5640	5	161	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 5 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 5 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 5 device • check the connectors from customer specific function no. 5 device to TCU • check the resistance of customer specific function no. 5 device	[1] see chapter 4	Z-Funktion5
AD	5650	4	163	S.C. TO GROUND AT CUSTOMER SPECIFIC FUNCTION NO. 6 TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *customer specific function no. 6 device has an internal defect* • *connector pin is contacted to vehicle ground*	customer specific	• check the cable from TCU to function 6 device • check the connectors from customer specific function no. 6 device to TCU • check the resistance of function 6 device	[1] see chapter 4	Z-Funktion6
AE	5650	3	165	S.C. TO BATTERY VOLTAGE AT CUSTOMER SPECIFIC FUNCTION NO. 6 TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *customer specific function no. 6 device has an internal defect* • *connector pin is contacted to battery voltage*	customer specific	• check the cable from TCU to customer specific function no. 6 device • check the connectors from customer specific function no. 6 device to TCU • check the resistance of customer specific function no. 6 device	[1] see chapter 4	Z-Funktion6

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
AF	5650	5	164	O.C. AT CUSTOMER SPECIFIC FUNCTION NO. 6 TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *customer specific function no. 6 device has an internal defect* • *connector has no connection to TCU*	customer specific	• check the cable from TCU to customer specific function no. 6 device • check the connectors from customer specific function no. 6 device to TCU • check the resistance of customer specific function no. 6 device	[1)] see chapter 4	Z-Funktion6
B1	5660	2	60	SLIPPAGE AT CLUTCH K1 TCU calculates a differential speed at closed clutch K1. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch K1* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at output speed sensor* • *wrong size of the sensor gap* • *clutch is defective*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch K1 • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at output speed sensor • check signal at internal speed sensor • check signal at output speed sensor • replace clutch		all, Sisu
B2	5665	2	61	SLIPPAGE AT CLUTCH K2 TCU calculates a differential speed at closed clutch K2. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch K2* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at output speed sensor* • *wrong size of the sensor gap* • *clutch is defective*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch K2 • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at output speed sensor • check signal at internal speed sensor • check signal at output speed sensor • replace clutch		all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
B3	5670	2	62	SLIPPAGE AT CLUTCH K3 TCU calculates a differential speed at closed clutch K3. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch K3* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at output speed sensor* • *wrong size of the sensor gap* • *clutch is defective*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch K3 • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at output speed sensor • check signal at internal speed sensor • check signal at output speed sensor • replace clutch		all, Sisu
B4	5675	2	63	SLIPPAGE AT CLUTCH K4 TCU calculated a difference speed at TCU calculates a differential speed at closed clutch K4. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch K4* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at turbine speed sensor* • *wrong size of the sensor gap* • *clutch is defective*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch K4 • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at turbine speed sensor • check signal at internal speed sensor • check signal at turbine speed sensor • replace clutch		all
B5	5680	2	64	SLIPPAGE AT CLUTCH KV TCU calculates a differential speed at closed clutch KV. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch KV* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at turbine speed sensor* • *wrong size of the sensor gap*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch KV • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at turbine speed sensor • check signal at internal speed sensor • check signal at turbine speed sensor • replace clutch		all, Sisu

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• *clutch is defective*				
B6	5685	2	65	SLIPPAGE AT CLUTCH KR TCU calculates a differential speed at closed clutch KR. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at clutch KR* • *low main pressure* • *wrong signal at internal speed sensor* • *wrong signal at turbine speed sensor* • *wrong size of the sensor gap* • *clutch is defective*	TCU shifts to neutral OP-Mode: limp home if failure at another clutch is pending TCU shifts to neutral OP-Mode: TCU shutdown	• check pressure at clutch KR • check main pressure in the system • check sensor gap at internal speed sensor • check sensor gap at turbine speed sensor • check signal at internal speed sensor • check signal at turbine speed sensor • replace clutch		all, Sisu
B7	5700	0	87	OVERTEMP SUMP TCU measured a temperature in the oil sump that is over the allowed threshold.	no reaction OP-Mode: normal	• cool down machine • check oil level • check temperature sensor		all, Sisu
B8	5710	0	88	OVERTEMP RETARDER TCU measured a temperature in the retarder oil that is over the allowed threshold.	TCU disables retarder OP-Mode: normal	• cool down machine • check oil level • check temperature sensor		6WG
B9	5720	0	89	OVERSPEED ENGINE	retarder applies if configured OP-Mode: normal	-		6WG, Sisu, Case
BA	5730	0	90	DIFFERENTIAL PRESSURE OIL FILTER TCU measured a voltage at differential pressure switch out of the allowed range • *oil filter is polluted* • *cable/connector is broken or cable/connector is contacted to battery voltage or vehicle ground* • *differential pressure switch is defective*	no reaction OP-Mode: normal	• check oil filter • check wiring from TCU to differential pressure switch • check differential pressure switch (measure resitance)		all

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
BB	5740	2	172	SLIPPAGE AT CONVERTER LOCKUP CLUTCH TCU calculates a differential speed at closed converter lockup clutch. If this calculated value is out of range, TCU interprets this as slipping clutch. • *low pressure at converter lockup clutch* • *low main pressure* • *wrong signal at engine speed sensor* • *wrong signal at turbine speed sensor* • *wrong size of the sensor gap* • *clutch is defective*		• check pressure at converter lockup clutch • check main pressure in the system • check sensor gap at engine speed sensor • check sensor gap at turbine speed sensor • check signal at engine speed sensor • check signal at turbine speed sensor • replace clutch		6WG
BD	5750	4	169	S.C. TO GROUND AT ENGINE BRKAE SOLENOID TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *engine brake solenoid has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-mode: normal	• check the cable from TCU to the engine brake solenoid • check the connectors from engine brake solenoid to TCU • check the resistance [1)] of engine brake solenoid	[1)] see chapter 4	6WG
BE	5750	3	171	S.C. TO BATTERY VOLTAGE AT ENGINE BRAKE TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage*	no reaction OP-mode: normal	• check the cable from TCU to the engine brake solenoid • check the connectors from engine brake solenoid to TCU • check the resistance [1)] of engine brake solenoid	[1)] see chapter 4	6WG

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				• engine brake solenoid *has an internal defect* • *connector pin is contacted to battery voltage*				
BF	5750	5	170	O.C. AT ENGINE BRAKE TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • engine brake solenoid *has an internal defect* • *connector has no connection to TCU*	no reaction OP-mode: normal	• check the cable from TCU to the engine brake solenoid • check the connectors from engine brake solenoid to TCU • check the resistance [1)] of engine brake solenoid	[1)] see chapter 4	6WG
C3	5760	0	91	OVERTEMP CONVERTER OUTPUT TCU measured a oil temperature at the converter ouput that is over the allowed threshold.	no reaction OP-Mode: normal	• cool down machine • check oil level • check temperature sensor		4WG, Sisu 6WG
C4	5770	4	129	S.C. TO GROUND AT JOYSTICK STATUS INDICATOR TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *joystick status indicator has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-Mode: normal	• check the cable from TCU to joystick status indicator • check the connectors from joystick status indicator to TCU • check the resistance [1)] of joystick status indicator		Case
C5	5770	3	131	S.C. TO BATTERY VOLTAGE AT JOYSTICK STATUS INDICATOR TCU detected a wrong voltage at the	no reaction OP-Mode: normal	• check the cable from TCU to joystick status indicator • check the connectors from joystick		Case

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				output pin, that looks like a s.c. to battery voltage • *cable is defective and is contacted to battery voltage* • *joystick status indicator has an internal defect* • *connector pin is contacted to battery voltage*		status indicator to TCU • check the resistance [1)] of joystick status indicator		
C6	5770	5	130	O.C. AT JOYSTICK STATUS INDICATOR TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • *joystick status indicator has an internal defect* • *connector has no connection to TCU*	no reaction OP-Mode: normal	• check the cable from TCU to joystick status indicator • check the connectors from joystick status indicator to TCU • check the resistance [1)] of joystick status indicator		Case
C7	5780	4	132	S.C. TO GROUND AT OVERTEMP NEUTRAL INDICATOR TCU detected a wrong voltage at the output pin, that looks like a s.c. to vehicle ground • *cable is defective and is contacted to vehicle ground* • *overtemp status indicator has an internal defect* • *connector pin is contacted to vehicle ground*	no reaction OP-Mode: normal	• check the cable from TCU to OVERTEMP NEUTRAL INDICATOR • check the connectors from OVERTEMP NEUTRAL INDICATOR to TCU • check the resistance [1)] of OVERTEMP NEUTRAL INDICATOR		Shins ung
C8	5780	3	134	S.C. TO BATTERY VOLTAGE AT OVERTEMP NEUTRAL INDICATOR TCU detected a wrong voltage at the output pin, that looks like a s.c. to battery	no reaction OP-Mode: normal	• check the cable from TCU to OVERTEMP NEUTRAL INDICATOR • check the connectors from OVERTEMP NEUTRAL INDICATOR to TCU		Shins ung

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				voltage • *cable is defective and is contacted to battery voltage* • *overtemp status indicator has an internal defect* • *connector pin is contacted to battery voltage*		• check the resistance [1)] of OVERTEMP NEUTRAL INDICATOR		
C9	5780	5	133	O.C. AT OVERTEMP NEUTRAL INDICATOR TCU detected a wrong voltage at the output pin, that looks like a o.c. for this output pin • *cable is defective and has no connection to TCU* • OVETEMP *status indicator has an internal defect* • *connector has no connection to TCU*	no reaction OP-Mode: normal	• check the cable from TCU to OVERTEMP NEUTRAL INDICATOR • check the connectors from OVERTEMP NEUTRAL INDICATOR to TCU • check the resistance [1)] of OVERTEMP NEUTRAL INDICATOR		Shins ung
CA	5790	9	121	ENGINE_RETARDER CONFIG_TIMEOUT Timeout of CAN-message ENGINE_RETARDER CONFIG from EEC controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective an has contact to vehicle ground or battery voltage*	OP-Mode: substitute clutch control	• check EEC controller • check wire of CAN-Bus • check cable to EEC controller		J1939
CB	5800	9	122	ERC1 TIMEOUT Timeout of CAN-message ERC1 from EEC controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective an*	OP-Mode: substitute clutch control	• check EEC controller • check wire of CAN-Bus • check cable to EEC controller		J1939

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				has contact to vehicle ground or battery voltage				
D1	5810	3	54	S.C. TO BATTERY VOLTAGE AT POWER SUPPLY FOR SENSORS TCU measures more than 6V at the pin AU1 (5V sensor supply)	see fault codes no. 21 to 2C	• check cables and connectors to sensors, which are supplied from AU1 • check the power supply at the pin AU1 (should be appx. 5V)	fault codes no. 21 to no. 2C may be a reaction of this fault	all, Sisu
D2	5810	4	55	S.C. TO GROUND AT POWER SUPPLY FOR SENSORS TCU measures less than 4V at the pin AU1 (5V sensor supply)	see fault codes no. 21 to 2C	• check cables and connectors to sensors, which are supplied from AU1 • check the power supply at the pin AU1 (should be appx. 5V)	fault codes no. 21 to no. 2C may be a reaction of this fault	all, Sisu
D3	5820	4	53	LOW VOLTAGE AT BATTERY measured voltage at power supply is lower than 10 V (12V device) lower than 18 V (24V device)	shift to neutral OP-Mode: TCU shutdown	• check power supply battery • check cables from batteries to TCU • check connectors from batteries to TCU		all, Sisu
D4	5820	3	52	HIGH VOLTAGE AT BATTERY measured voltage at power supply is higher than 18 V (12V device) higher than 32.5 V (24V device)	shift to neutral OP-Mode: TCU shutdown	• check power supply battery • check cables from batteries to TCU • check connectors from batteries to TCU		all, Sisu
D5	5830	2	57	ERROR AT VALVE POWER SUPPLY VPS1 TCU switched on VPS1 and measured VPS1 is off or TCU switched off VPS1 and measured VPS1 is still on • *cable or connectors are defect and are contacted to battery voltage* • *cable or connectors are defect and are contacted to vehicle ground* • *permanent power supply KL30 missing* • *TCU has an internal defect*	shift to neutral OP-Mode: TCU shutdown	• check fuse • check cables from gearbox to TCU • check connectors from gearbox to TCU • replace TCU		all, Sisu
D6	5840	2	58	ERROR VALVE POWER SUPPLY VPS2	shift to neutral	• check fuse		all,

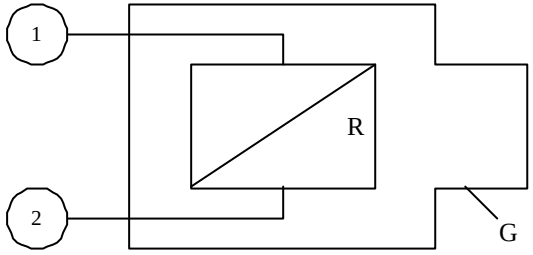
Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				TCU switched on VPS2 and measured VPS2 is off or TCU switched off VPS2 and measured VPS2 is still on • *cable or connectors are defect and are contacted to battery voltage* • *cable or connectors are defect and are contacted to vehicle ground* • *permanent power supply KL30 missing* • *TCU has an internal defect*	OP-Mode: TCU shutdown	• check cables from gearbox to TCU • check connectors from gearbox to TCU • replace TCU		Sisu
E3	5860	3	50	S.C. TO BATTERY VOLTAGE AT DISPLAY OUTPUT TCU sends data to the display and measures allways a high voltage level on the connector • *cable or connectors are defective and are contacted to battery voltage* • *display has an internal defect*	no reaction OP-Mode: normal	• check the cable from TCU to the display • check the connectors at the display • change display		all
E4	5860	4	49	S.C. TO GROUND AT DISPLAY OUTPUT TCU sends data to the display and measures allways a high voltage level on the connector • *cable or connectors are defective and are contacted to vehicle ground* • *display has an internal defect*	no reaction OP-Mode: normal	• check the cable from TCU to the display • check the connectors at the display • change display		all
E5	5270	9	104	DISPID1_TIMEOUT Timeout of CAN-message DISPID1 from display controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and*	TCU select parameter set with ID0 OP-Mode: Limp Home	• check display controller • check wire of CAN-Bus • check cable to display controller		JCB

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
				has contact to vehicle ground or battery voltage				
E5	5270	9	104	CL1 TIMEOUT Timeout of CAN-message CL1 from cluster controller • *interference on CAN-Bus* • *CAN wire/connector is broken* • *CAN wire/connector is defective and has contact to vehicle ground or battery voltage*	TCU keeps old information for: status test mode status plock shift quality selection gear range restriction OP-Mode: normal	• check cluster controller • check wire of CAN-Bus • check cable to cluster controller		Case
E6	5880	2	94	ILLEGAL ID REQUEST VIA CAN	transmission stay neutral OP-Mode: TCU shutdown			Case, JCB, O&K
F1	5890	2	51	GENERAL EEPROM FAULT TCU can't read non volantile memoy • *TCU is defective*	no reaction OP-Mode: normal	• replace TCU	often shown together with fault code F2	all, Sisu
F2	5900	13	56	CONFIGURATION LOST TCU has lost the correct configuration and can't control the transmission. • *interference during saving data on non volatile memory* • *TCU is brand new or from another vehicle*	transmission stay neutral OP-Mode: TCU shutdown	• Reprogramm the correct configuration for the vehicle (e.g. with cluster controller,...)		Case, John Deere, JCB
F2	5900	13	56	FWD CONFIGURATION LOST TCU has lost the FWD configuration. • *interference during saving data on non volatile memory* • *TCU is brand new or from another vehicle*	gear range set from 1st to 4th	• reconfigure with TCU Configuration Command (ID PC)		O&K

Fault Code (hex)	SPN	FMI	Int. Code (dec)	MEANING OF THE FAULT CODE possible reason for fault detection	reaction of the TCU	possible steps to repair	remarks	cost umer
F3	5910	13	59	APPLICATION ERROR something of this application is wrong	transmission stay neutral OP-Mode: TCU shutdown	• replace TCU !!	This fault occurs only if an test engineer did something wrong in the application of the vehicle	all, Sisu
F4	5920	13	73	LIMP HOME REQUEST **no fault!** indicates that another computer requested limp home via CAN	shift to neutral OP-Mode: limp home	• The external controller has to cancel the request		John Deere
F5	5930	7	173	CLUTCH FAILURE AEB was not able to adjust clutch filling parameters • One of the AEB-Values is out of limit	transmission stay neutral OP-Mode: TCU shutdown	• check clutch	TCU shows also the affected clutch on the Display	all, Sisu
F6	5930	13	174	CLUTCH ADJUSTMENT DATA LOST OR INCHPEDAL CALIBRATION DATA LOST TCU was not able to read correct clutch adjustment parameters • *interference during saving data on non volatile memory* • *TCU is brand new*	default values = 0 for AEB offsets used OP-Mode: normal no Inchmode available	• execute AEB		all, Sisu

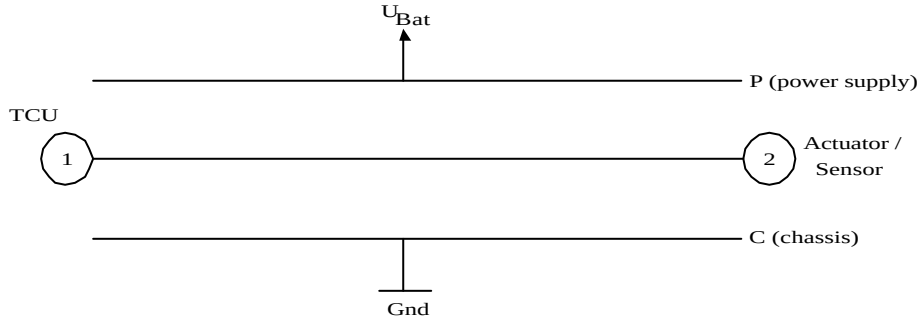
4 measuring of resistance at actuator/sensors and cable

4.1 actuator:



open circuit:	$R_{12} \approx R_{1G} \approx R_{2G} \approx \infty$		
short cut to ground:	$R_{12} \approx R$;	$R_{1G} \approx 0, R_{2G} \approx R$ or $R_{1G} \approx R, R_{2G} \approx 0$	(for s.c. to ground, G is connected to vehicle ground)
short cut to battery:	$R_{12} \approx R$;	$R_{1G} \approx 0, R_{2G} \approx R$ or $R_{1G} \approx R, R_{2G} \approx 0$	(for s.c. to battery, G is connected to battery voltage)

4.2 cable:



open circuit:	$R_{12} \approx R_{1P} \approx R_{1C} \approx R_{2P} \approx R_{2C} \approx \infty$		
short cut to ground:	$R_{12} \approx 0$;	$R_{1C} \approx R_{2C} \approx 0$,	$R_{1P} \approx R_{2P} \approx \infty$
short cut to battery:	$R_{12} \approx 0$,	$R_{1C} \approx R_{2C} \approx \infty$,	$R_{1P} \approx R_{2P} \approx 0$