


<b>ZF FRIEDRICHSHAFEN Aktiengesellschaft</b>					
Description:	Technical customer information Fault Reaction Modes ASTRONIC 2	Nr.:	DIN	Page 1	
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K2 ZFN 904		<b>MODIFICATIONS</b>			
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## Fault Reaction Modes for NAFTA Coach

Software version 31\_13e

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Version	Date	Pages	Remarks
1	2002/02/22	25	First Edition
a	2002/07/08	25	Software update V 31.13c
b	2002/10/11	22	Software update V 31.13e

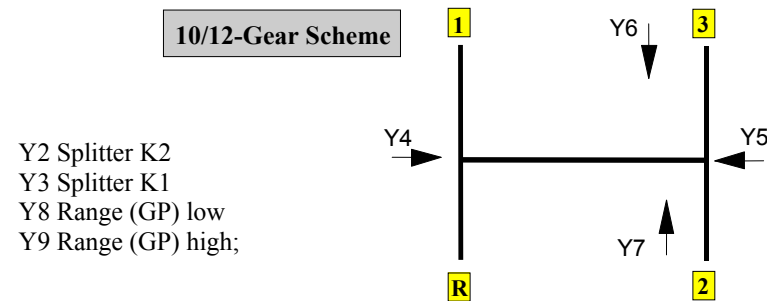
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**Remark to titles in table:**

ZF-fault-number	- defined by ZF.
ISMA available	- (0=NO, 1=YES) Intelligent Shift Management available
ISMA-starting gear	- (0=NO, 1=YES) Intelligent Shift Management (ISMA) suggests starting gear.
Display SM-Symbol	- (0=NO, 1=YES) Display shows „SM“ (severe failure)
Warning-lamp	- (0=NO, 1=YES) Dash board warning lamp „check trans“ (less severe failure)
Display SAE 1587	- The SAE J1587 failure code, according to the ZF-internal fault number, can be called up at the display.

## Shift schemes of transmissions



failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
2	Short circuit to ground at output stage to Y2 (Valve Splitter; DD: high, OD: low)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	25
3	Short circuit to ground at output stage to Y3 (Valve Splitter; DD: low, OD: high)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	26
4	Short circuit to ground at output stage to Y4 (Valve Select)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	27
5	Short circuit to ground at output stage to Y5 (Valve Select)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	32
6	Short circuit to ground at output stage to Y6 (Valve Shift)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	28

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
7	Short circuit to ground at output stage to Y7 (Valve Shift)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	33
8	Short circuit to ground at output stage to Y8 (Valve Range)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	24
9	Short circuit to ground at output stage to Y9 (Valve Range)	by ECU hardware,if output is activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	23
10	Short circuit to ground at output stage to Y10 (Main valve)	by ECU hardware,if output is activated	ECU output switches off. No gearshifting possible! No neutral shifting possible !Selected gear remains engaged; Vehicle start permitted if gear <= lowest gear in high range group is engaged. After ignition on, system not available.	After RESET and no short circuit to ground	0	1	1	1	98
11	Short circuit to ground at output stage to warning buzzer (E-Module)	by ECU hardware,if output is activated	Warning-Buzzer permanently active	After RESET and no short circuit to ground	1	1	0	0	FF
17	Short circuit to ground at output stage to Y1 (inertia brake valve)	by ECU hardware,if output is activated	ECU output switches off. Driving: Upshifts during driving are controlled like downshifts. Input speed will be synchronized by engine speed. Upshifts blocked, when input target speed is below engine idle speed. Increased shifting time. Stationary: Increased self adjustment time. Increased shifting time when shifting out of neutral. Increased PTO engagement time.	After RESET and no short circuit to ground	1	1	0	1	36
18	Short circuit to ground at output stage to Y17 (valve clutch disengage slow)	by ECU hardware,if output is activated	ECU output switches off. Function taken on by valve Y16 (clutch disengage fast). Decreased comfort for clutch functions.	After RESET and no short circuit to ground	1	1	0	1	22
19	Short circuit to ground at output stage to Y15 (valve clutch engage slow)	by ECU hardware,if output is activated	ECU valve output switches off. Function taken on by valve Y14 (clutch engage fast). Decreased comfort for clutch functions.	After RESET and no short circuit to ground	1	1	0	1	22
20	Short circuit to ground at output stage to Y16 (valve clutch disengage fast)	by ECU hardware,if output is activated	ECU valve output switches off. Function taken on by valve Y17 (clutch disengage, slow). Increased shifting time. Decreased comfort for clutch functions.	After RESET and no short circuit to ground	1	1	0	1	22

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
21	Short circuit to ground at output stage to Y14 (valve clutch engage fast)	by ECU hardware,if output is activated	ECU valve output switches off. Function taken on by valve Y15 (clutch engage slow). Increased shifting time. Decreased comfort for clutch functions.	After RESET and no short circuit to ground	1	1	0	1	22
22	Short circuit to ground at output ADVP (wakeup control signal for E-module, voltage supply to display, warning lamp, warning buzzer, output speed sensor 1)	by ECU hardware,if output is activated	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	14
25	Short circuit to ground at output SD to display	Rereading of transmitted signal	display flashing "EE". No system restrictions.	No short circuit to ground or after RESET.	1	1	0	1	F8
26	CAN engine configuration timeout	After timeout of the message, failure is set	Applied substitute parameters (P1 to P7) from data application field will be taken. Reduced functionality for automatic mode and start gear calculation, if deviation of substitute parameters and real values is high. Target speed for downshifting can be reduced. Quality of clutch disengagement for stopping can be reduced.	After receiving a correct message or after RESET.	1	1	0	0	E7
27	Error on "engine configuration message" (engine configuration)	Signal faulty or missing.	Applied substitute parameters (P1 to P7) from data application field will be taken. Reduced functionality for automatic mode and start gear calculation, if deviation of substitute parameters and real values is high. Target speed for downshifting can be reduced. Quality of clutch disengagement for stopping can be reduced.	After receiving a correct message or after RESET.	1	1	0	0	E7
31	Error on "Actual engine retarder - percent torque" signal (ERC1_ER)	Signal faulty or missing.	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions. No information about engine brake torque. If exhaust brake is active, shifting quality at start of shifting may be poor. Engine brake is considered not active.	Signal available or after RESET.	0	0	0	1	E7
32	Error on "Engine retarder configuration message" (Engine retarder configuration)	Signal faulty or missing.	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions	Signal available or after RESET.	0	0	0	1	E7
33	CAN "Engine retarder configuration" timeout	After timeout of the message, failure is set	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions.	After receiving a correct message or after RESET.	0	0	0	1	E7
34	Interruption at output stage to Y2 (Valve Splitter)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	25
35	Interruption at output stage to Y3 (Valve Splitter)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	26

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
36	Interruption at output stage to Y4 (Valve Select)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	27
37	Interruption at output stage to Y5 (Valve Select)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	32
38	Interruption at output stage to Y6 (Valve Shift)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	28
39	Interruption at output stage to Y7 (Valve Shift)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	33
40	Interruption at output stage to Y8(Valve Range)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	24
41	Interruption at output stage to Y9 (Valve Range)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	23

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition	ISMA available				
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
42	Interruption at output stage to Y10 (Main valve)	by ECU hardware,if output not activated	No gearshifting possible! No neutral shifting possible! Selected gear remains engaged; Vehicle start permitted if gear <= lowest gear in high range group is engaged. After ignition on, system not available	No interruption and output not activated or after RESET.	0	1	1	1	98
49	Interruption at output stage to Y1 (inertia brake valve)	by ECU hardware,if output not activated	Driving: Upshifts during driving are controlled like downshifts. Input speed will be synchronized by engine speed. Upshifts blocked, when input target speed is below engine idle speed. Increased shifting time. Stationary: Increased self adjustment time. Increased shifting time when shifting out of neutral.	No interruption and output not activated or after RESET.	1	1	0	1	36
50	Interruption at output stage valve Y17 (clutch disengage slow)	by ECU hardware,if output not activated	Function taken on by valve Y16 (clutch disengage fast) Decreased comfort.	No interruption and output not activated or after RESET.	1	1	0	1	22
51	Interruption at output stage valve Y15 (clutch engage slow)	by ECU hardware,if output not activated	Function taken on by valve Y14 (clutch engagement slow) Decreased comfort.	No interruption and output not activated or after RESET.	1	1	0	1	22
52	Interruption at output stage valve Y16 (clutch disengage fast)	by ECU hardware,if output not activated	Function taken on by valve Y17 (clutch disengage slow). Increased shifting time. Decreased comfort.	No interruption and output not activated or after RESET.	1	1	0	1	22
53	Interruption at output stage to large Y14 (clutch engage fast)	by ECU hardware,if output not activated	Function taken on by valve Y15 (clutch engage slow). Increased shifting time. Decreased comfort.	No interruption and output not activated or after RESET.	1	1	0	1	22
54	Interruption at output ADVP (wakeup control signal for E-module, voltage supply to display, warning lamp, warning buzzer, output speed sensor 1)	by ECU hardware,if output not activated (detection only during initialization)	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	14
56	Short circuit to ground at output SDP	by ECU hardware , if output not activated	Easy Start valve can not disengage.	failure is no longer detected or after RESET	1	1	1	1	FF
58	Short circuit to positive at output SDP	by ECU hardware , if output not activated	Easy Start not available	failure is no longer detected or after RESET	1	1	0	1	FF
66	Short circuit to positive at output stage to Y2 (Valve Splitter)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	25
67	Short circuit to positive at output stage to Y3 (Valve Splitter)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	26



failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
68	Short circuit to positive at output stage to Y4 (Valve Select)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	27
69	Short circuit to positive at output stage to Y5 (Valve Select)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	32
70	Short circuit to positive at output stage to Y6 (Valve Shift)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	28
71	Short circuit to positive at output stage to Y7 (Valve Shift)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	33
72	Short circuit to positive at output stage to Y8 (Valve range low)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	24
73	Short circuit to positive at output stage to Y9 (Valve range high)	by ECU hardware,if output not activated	Driving: Gear remains engaged, gears with present short-circuit at the shift-valve outputs are blocked, engagement of chosen alternative gears is possible. Driving and shifting: If the failure occurs during shifting, gear remains engaged or ECU tries to shift an adequate gear dependent on the current driving conditions. If this is impossible the Main-Transmission is shifted to 'neutral'. Gears with present short-circuit at the shift-valve outputs are blocked, ECU attempts to engage the chosen alternative gears if possible.	failure is no longer detected or after RESET	0	1	0	1	23
74	Short circuit to positive at output	by ECU hardware,if output not activated	Driving: Gearshifting of all gears possible. Stationary: All starting gears can be engaged.	No short circuit to positive and output not	1	1	0	1	98

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
	stage to Y10 (Main valve)		Driving with start off gear possible.	activated or after RESET.					
81	Short circuit to positive at output stage to Y1 (inertia brake valve)	by ECU hardware,if output not activated	Driving: Gearshifting blocked. Stationary: Shift of start off gears possible. Main valve will be only activated during shifting, if clutch is opened. Start off possible.	No short circuit to positive and output not activated or after RESET.	1	1	0	1	36
82	Short circuit to positive at output stage to valve Y17 (clutch disengage slow)	by ECU hardware	Gearshifting generally blocked, system not available. Driving and gear engaged: Attempt to keep clutch engaged (prevention with engagement valves). Stationary: Engagement valves are switched off, automatic neutral shifting when clutch is disengaged.	no short circuit to positive or after RESET.	0	1	1	1	22
83	Short circuit to positive at output stage to valve Y15 (clutch engage slow)	by ECU hardware	Gearshifting generally blocked, system not available. Driving: Required clutch position maintained via disengagement valve. Stationary: Automatic neutral shifting after a certain time.	no short circuit to positive or after RESET.	0	1	1	1	22
84	Short circuit to positive at output stage to valve Y16 (clutch disengage fast)	by ECU hardware	E-Modul switches off. No shift lever information. No display information (display dark), warning buzzer not available; warning lamp not available. Output speed signal 1 will be replaced by redundant information. Output ADVP is switched off, Failure is set back. ISMA is available but no detection of shift lever position over E-modul; failure display is not possible	no short circuit to positive or after RESET.	0	1	1	1	22
85	Short circuit to positive at output stage to valve Y14 (clutch engage fast)	by ECU hardware	Gearshifting generally blocked, system not available. Driving: Required clutch position maintained via disengagement valve. Stationary: Automatic neutral shifting after a certain time.	no short circuit to positive or after RESET.	0	1	1	1	22
86	Short circuit to positive at output ADVP (wakeup control signal for E-module, voltage supply to display, warning lamp, warning buzzer, output speed sensor 1)	by ECU hardware,if output not activated (detection only during initialization)	1. After ignition off/on Failure will be detected during initialization. E-Modul does not switch off. Display can not be switched off. No restrictions on system availability. After ignition off, display is flashing EE. 2. During operation No restrictions on system availability.	After RESET	1	1	0	1	14
89	Short circuit to positive at output SD to display	Rereading of transmitted signal	display flashing "EE". No system restrictions.	no short circuit to positive or after RESET.	1	1	0	1	F8
90	Communication error between controller 1 and controller 2 (ECU failure)	1. Timeout detection, if no datas are coming from other processor. 2. Checksum error of data messages between P1 and P2. 3. If initialization datas from P1 are not complete received in P2, P2 does request datas again with a defined repetition number. If data transfer failed after repetition attempts, failure will be set.	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FE
91	CAN EBC1 timeout	After timeout of the message, failure is set	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions.	After receiving a correct message or after RESET.	0	0	0	1	E7
92	Error on "ABS active" signal (EBC1)	Signal faulty or missing.	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions.	Signal available or after RESET.	1	1	0	0	E7

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
93	Error on "ASR engine control active" signal (EBC1)	Signal faulty or missing.	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions.	Signal available or after RESET.	1	1	0	0	E7
94	Error on "ASR brake control active" signal (EBC1)	Signal faulty or missing.	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill medium start off gear will be shifted. No other functional restrictions.	Signal available or after RESET.	1	1	0	0	E7
95	Error on "Cruise control active" signal (CCVS)	Signal faulty or missing.	No other functional restrictions	Signal available or after RESET.	1	1	0	1	E7
97	Error on "Engine speed" signal (EEC1)	1.Signal faulty or missing 2.Engine speed > drz_n_mot_plaus	Driving: Time based control of clutch during shifting. Decreased clutch comfort after shifting. Clutch does open below fixed value (No clutch opening according coasting condition) Engine speed governor during upshift does not work. Stationary: No special manoeuvring operation possible. Time based control of clutch during starting off. Decreased clutch comfort of manoeuvring and starting.	1.Signal available and engine speed < drz_n_mot_plaus 2.After Reset	1	1	0	1	E7
98	Error on transmission input speed signal	1.Speed gradient > upper limit (FRQ_Konstantenfeld n_Sek_Daten) 2.input_rpm > drz_n_sek_plaus 3. input_rpm = 0 and gear is engaged and outputspeed > n_ab_plaus_ge_mot and outputspeed > drz_n_sek_min/l_gear 4.During selfadjust-ment when clutch is closed and input_speed < rz_n_sek_min and eng_speed > drz_n_sek_min 5.Gear is engaged and clutch is closed and difference speed between input and engine speed > drz_delta_n_tol and outputspeed > n_ab_plaus_ge_mot and outputspeed > drz_n_sek_min/l_gear	Driving: Increased shifting time. During upshifting and downshifting clutch will be partially closed when t/m in neutral to substitute input speed by engine speed. If gear is engaged, input speed is substituted by output speed. Stationary: Increased shifting time. Decreased clutch comfort in manoeuvring and starting.	1.Input_speed > drz_n_sek_min and < drz_n_sek_plaus and clutch is closed and difference between input_speed and eng_speed < drz_delta_n_tol and input_speed > drz_n_mot_min. 2.Input_speed > drz_n_sek_min and < drz_n_sek_plaus and output_speed > drz_n_sek_min/l_gear and gear engaged and difference between input speed and outputspeed*_gear < drz_delta_n_tol 3.After RESET	1	1	0	1	A1
99	Error on output speed signal 1	1.Output speed 1 gradient >upper limit (FRQ_Konstantenfeld n_Ab_1_Daten) 2.Output speed 1 >drz_n_Ab_plaus 3.Output speeds not plausible with each other (n_diff > drz_delta_n_Ab) Erronous output speed defined by plausibility test with input speed	Output speed signal will be calculated depending on system application from redundant output speed information. Redundant speed information will be taken depending on application from vehicle speed signal via CAN OR output speed signal from CAN tachograph. Manual shifting of all gears possible.	1.No gradient failure detection and difference Output speed_1 and output speed_2 < drz_delta_n_Ab and both output speeds > drz_n_Ab_min and both speeds < drz_n_Ab_plaus. 2.After RESET (including gradient failure detection)	1	1	0	1	BF
100	Error on output speed signal 2	Signal faulty or missing.	If outspeed signal 1 is available, no functional restrictions of system.	Signal available or after RESET.	1	1	0	1	3F

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
101	Error on both output speed signals	1.Output speed 1 and 2 = 0, gear engaged and input_speed > n_Ab_Plaus_ge_mot*i_min_getr_gang 2.Output speed 1 and 2 = 0, gear engaged and clutch closed and engine_speed > n_Ab_Plaus_ge_mot*i_min_getr_gang 3.Output speed signal 1 and output speed 2 are faulty	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	9A
102	Plausibility error between transmission input speed and out-put speed	No shifting running and engaged gear > Testgang_plausib and difference between input speed and output_speed_1*i_gear > drz_delta_n_tol (ratio input speed to output speed not according to ratio of engaged gear.	Driving: Gearshifting blocked during driving including neutral shift attempt. Stationary: Start off gears can be engaged. Driving with start off gear possible.	After RESET	0	1	0	1	97
104	High voltage (Vehicle electrical system voltage too high)	Circuit voltage at key 30 > limit threshold	No system restrictions while driving. If fault occurs before 'Ignition ON' (key 15) the transmission does not get out of the check phase.	circuit voltage within valid range or after RESET.	1	1	0	1	FB
105	Low voltage (Vehicle electrical system voltage too low)	Circuit voltage at key 15 < limit threshold	Driving: Gearshifting blocked. Clutch valves will be controlled independent on voltage level. If PTO is engaged and relay cannot be kept active, PTO will be disengaged. Subsequent failure detection of all failures during low voltage will be suppressed. Stationary: Gearshifting blocked. If PTO is engaged and relay cannot be kept active, PTO will be disengaged. If gear is engaged and driver switches off ignition, attempt to shift to neutral is allowed independent on voltage level. Subsequent failure detection of all failures during low voltage will be suppressed. ECU will be switched off independent on successful neutral shifting after time out.	circuit voltage within valid range or after RESET.	0	1	1	1	FB
107	Stabilised voltage supply at output AU (clutch sensor supply) out of valid range	Voltage AU out of range(see ADC_AU_Ausfallschwelle)	Driving: Clutch is disengaged and engaged by time control. Stationary: Manoeuvring not possible. If start does not occur within certain time, transmission is automatically shifted to neutral. New start off gear must be engaged by selector lever. Decreased clutch comfort during start off.	Voltage at AU within valid range and RESET	0	1	0	1	21

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition	ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
108	Error in selector lever or tip lever	By plausibility test of switches in selector lever. D positions will be called in following Da, Db and Dc, Dx means Da or Db or Dc. Failure on rotary switch will be set under following conditions: 1.Dx and R. 2.Dx and N 3.R and N 4. Da and Db 5. Da and Dc 6. Db and Dc 7. No Dx and no N and no R. Failure on tip lever will be detected under following conditions: (G=groundposition. S=Searchfunction) 1.G and "+" 2.G and "-" 3."+" and "-" 4. S and "+" 5. S and "-" 6. No G and no S and no "+" and no "-"	Following item describes failure reaction of ZF selector lever with three D-positions, one N and one R position and tip lever with position G (middle position), S (search function), + and -. General function (also without failure active): After ignition off/on, a gear can be only shifted, if rotary switch once has been in neutral position. Failure reaction is depending on driving situation and on gear engaged. 1.Failure on tip lever:-> No shifting possible. At standstill, start off gear selected by rotary switch will be engaged. Driving with selected start off gear possible (forward and reverse). 2.Failure on rotary switch: If a gear is engaged during driving, no gear shifting is possible. At standstill start off gear according last known (stored) Dx position will be shifted. Driving with selected start off gear possible. If at standstill neutral is engaged, no gearshifting is possible -> system not available.	1. Valid shift lever neutral signal (rotary switch at neutral) 2. After Reset	1	1	0	1	39
110	ZF CAN timeout	ZF-CAN informations can't be transmitted and received; failure after timeout	1. After ignition off/on: Failure will be detected during initialization. No shift lever information. Failure code will be indicated automatically on display alternating with gear information. System not available. 2. During operation: No gearchange possible. When coming to standstill, last selected (via rotary switch) startoff gear will be automatically engaged. Continuous driving only with startoff gear possible. If reverse gear has been engaged, t/m will automatically shifted to neutral. No shift lever information. Failure code will be indicated automatically on display alternating with gear information.	After receiving a correct message or after RESET.	1	1	0	1	39
114	Clutch engaged unintentionally in standstill, gear engaged	Clutch engaged unintentionally in standstill, gear engaged	Standstill: shift to neutral, after neutral system available	After RESET, after neutral, clutch open	0	0	1	1	FF
117	Error in clutch self-adjustment process	No clutch stroke change in spite of piloted valves Condition: · no clutch stroke sensor failure· no engine_rpm error, · no input_rpm error	System not available	After RESET	0	0	1	1	21
118	Clutch does not disengage	No clutch stroke change in spite of piloted disengagement valves condition: no engine_rpm failure, no input_rpm failure, no clutch stroke sensor failure engine_rpm and input_rpm > min. rpm, clutch not disengaged, allowed switch-on-time exceeded	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	1	1	1	37
119	Clutch does not engage / does not transmit engine torque	Driving / Stationary:Clutch sensor does not recognize engagementEng._rpm <> input_rpmCondition: no eng_rpm failure, no input_rpm failure, no clutch stroke sensor failure, engine_rpm and input_rpm > n_min., clutch not engaged, allowed switch-on-time exceeded	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	1	1	1	37

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
120	Mechanical failure of small disengagement clutch valve	Clutch does not disengage in spite of piloted valves (3 times)	Function taken on by redundant valve.Decreased clutch comfort	After RESET	1	1	0	1	22
121	Mechanical failure of large disengagement clutch valve	Clutch does not disengage in spite of piloted valves (3 times)	Function taken on by redundant valve.Decreased clutch comfort	After RESET	1	1	0	1	22
122	Mechanical failure of small engagement clutch valve	Clutch does not engage in spite of piloted valves (3 times)	Function taken on by redundant valve.Decreased clutch comfort	After RESET	1	1	0	1	22
123	Mechanical failure of large engagement clutch valve	Clutch does not engage in spite of piloted valves (3 times)	Function taken on by redundant valve.Decreased clutch comfort	After RESET	1	1	0	1	22
124	Error on clutch travel signal	Clutch stroke sensor signal out of range (see ADC_Kup_Ausfallschwelle) or Increase of input shaft speed while take up if clutch position signal indicates an open clutch or Decrease of difference between engine speed and input shaft speed in standstill if clutch position indicates an open clutch or decrease of engine speed below idle speed while stop if clutch position signal indicates an open clutch or big gradient of the signal and signal remains under the threshold for interruption of the ground signal	Driving: Clutch is disengaged and engaged by time control. Stationary: Manoeuvring not possible. If start does not occur within certain time, transmission is automatically shifted to neutral. New start off gear must be engaged by selector lever. Decreased clutch comfort during start off.	After RESET and plausible voltage signal	0	1	0	1	21
126	Error on pressure sensor signal	Voltage at analog input out of range (see ADC_Drucksensor_Ausfall)	No system restrictions on availability, if external air supply is sufficient. No air pressure indication AL on display in case, air pressure is not sufficient. Self adjustment of transmission and clutch is done time based and not related to the sensor signal. Time for adjustment could be longer.	If voltage level is within plausible range or after RESET.	1	1	0	1	6A
127	Error on ECU temperature sensor signal	Voltage level is out of range (see ADC_ECU_Temp_Ausfall)	No system restrictions on availability.	If voltage level is within plausible range or after RESET.	1	1	0	1	15
128	Error on oil temperature sensor signal	Voltage level is out of range (see ADC_Oel_Temp_Ausfall)	No system restrictions on availability. Shift monitoring time will be depending on ECU temperature signal.	If voltage level is within plausible range or after RESET.	1	1	0	1	B1

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
129	No shift sensor signal (Short circuit to positive)	by ECU hardware	Driving: When failure occurs during shifting, gear engaged signal is transmitted based on time control. Further gearshifting blocked. Only shifting out of neutral possible Stationary: Neutralshifting will be verified by select test procedure. Engagement of starting gears possible. Change of starting gears possible. Main valve and gear valves remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth)	After RESET	0	1	0	1	30
130	No shift sensor signal (Short circuit to ground)	by ECU hardware	Driving: When failure occurs during shifting, gear engaged signal is transmitted based on time control. Further gearshifting blocked. Only shifting out of neutral possible Stationary: Neutralshifting will be verified by select test procedure. Engagement of starting gears possible. Change of starting gears possible. Main valve and gear valves remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth)	After RESET	0	1	0	1	30
131	No shift sensor signal (Interruption)	by ECU hardware	Driving: When failure occurs during shifting, gear engaged signal is transmitted based on time control. Further gearshifting blocked. Only shifting out of neutral possible Stationary: Neutralshifting will be verified by select test procedure. Engagement of starting gears possible. Change of starting gears possible. Main valve and gear valves remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth)	After RESET	0	1	0	1	30
132	Self adjustment error of shift sensor	Sensor value outside of self adjustment range with sufficient air pressure and three attempts to teach in had been not successful. Sensor value outside of self adjustment range with faulty air pressure sensor, and a maximum number of attempts to teach in had been not successful.	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	1	0	1	30
133	No gate select sensor signal (Short circuit to positive)	by ECU hardware	Driving: Only forward gears can be selected, which are allocated in opposite shift-position of the reverse gear. If failure occurs during shifting, the target gate will be engaged by time control. Stationary: All allowed starting gears can be switched, whose positions are allocated in opposite shift-position of the reverse gear. No reverse gear shiftable.	After RESET	0	1	0	1	3C
134	No gate select sensor signal (Short circuit to ground)	by ECU hardware	Driving: Only forward gears can be selected, which are allocated in opposite shift-position of the reverse gear. If failure occurs during shifting, the target gate will be engaged by time control. Stationary: All allowed starting gears can be switched, whose positions are allocated in opposite shift-position of the reverse gear. No reverse gear shiftable.	After RESET	0	1	0	1	3C
135	No gate select sensor signal (Interruption)	by ECU hardware	Driving: Only forward gears can be selected, which are allocated in opposite shift-position of the reverse gear. If failure occurs during shifting, the target gate will be engaged by time control. Stationary: All allowed starting gears can be switched, whose positions are allocated in opposite shift-position of the reverse gear. No reverse gear shiftable.	After RESET	0	1	0	1	3C

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
136	Gate select sensor self adjustment error	Sensor value outside self adjustment range with sufficient air pressure and three attempts to teach in had been not successful Sensor value outside self adjustment range with faulty air pressure after waiting time and a maximum number of attempts to teach in had been not successful.	With ignition off select cylinder will be switched into the gate of high forward-gears. In case of electrical fault at select valve, only possible gate will be adjusted. Engine stopped: If select sensor value is outside of self adjustment range and air pressure is sufficient, then ECU tries once to adjust gate allocated to the high forward-gears. If it's not possible to adjust this gate, the gate allocated to the low forward-gears will be selected. If this adjustment is also not possible, ECU selects again the previous gate. The adjustment procedure will be repeated three times. If no adjustment is possible at all, after third attempt a self adjustment error will be set. If select sensor value is outside of self adjustment range and air pressure is not sufficient, no select position will be adjusted. Engine running: If select sensor value is outside of self adjustment range and air pressure is sufficient, then ECU tries once to adjust gate allocated to the high forward-gears. If it's not possible to adjust th	1. After successful engagement of gate 2. After RESET	0	1	0	1	3C
137	No range change group (GP) sensor signal (Short circuit to positive)	by ECU hardware	Driving: Range group shift during driving blocked. Only gears in engaged range group can be changed. If failure occurs during range shifting, range group will be engaged by time control. Only gears in engaged range group can be shifted. Stationary: All start off gears can be engaged. Low range group will be engaged by time control. Main valve and range valve remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth of range group)	After RESET	1	1	0	1	1F
138	No range change group (GP) sensor signal (Short circuit to ground)	by ECU hardware	Driving: Range group shift during driving blocked. Only gears in engaged range group can be changed. If failure occurs during range shifting, range group will be engaged by time control. Only gears in engaged range group can be shifted. Stationary: All start off gears can be engaged. Low range group will be engaged by time control. Main valve and range valve remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth of range group)	After RESET	1	1	0	1	1F
139	No range change group (GP) sensor signal (Interruption)	by ECU hardware	Driving: Range group shift during driving blocked. Only gears in engaged range group can be changed. If failure occurs during range shifting, range group will be engaged by time control. Only gears in engaged range group can be shifted. Stationary: All start off gears can be engaged. Low range group will be engaged by time control. Main valve and range valve remain active until clutch engagement exceeds defined threshold or driving condition is detected (to overcome tooth-to-tooth of range group)	After RESET	1	1	0	1	1F
140	Self adjustment error of range change group sensor in position fast	Sensor value outside self adjustment range	With ignition off , range group remains in last engaged position. Engine stationary: With ignition on ECU checks the range sensor value. If sensor value is within defined end position range high or low, the appropriate range valve combination will be activated and together with main valve Y10 range end position will be adjusted. If range position is not within defined end position range and air supply is sufficient, ECU tries to shift once into high position. If range position is not within defined end position range and air supply is not sufficient or air pressure sensor is faulty, no range position will be shifted. Engine running: With ignition on ECU checks the range sensor value. If sensor value is within defined end position range high or low, the appropriate range valve combination will be activated and together with main valve Y10 range end position will be adjusted.If range position is not within defined end position range , clutch remains closed and ECU tries to shift into high position. If high pos	1.After successful range group engagement 2.After RESET	1	1	0	1	1F



failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
141	No splitter group (GV) sensor signal (Short circuit to positive)	by ECU hardware	Shifting of splitter group blocked. Further driving only possible with last selected splitter group position. If desired gear is not shiftable, next higher gear will be engaged. If failure occurs during shifting, splitter will be engaged by time control	After RESET	1	1	0	1	20
142	No splitter group (GV) sensor signal (Short circuit to ground)	by ECU hardware	Shifting of splitter group blocked. Further driving only possible with last selected splitter group position. If desired gear is not shiftable, next higher gear will be engaged. If failure occurs during shifting, splitter will be engaged by time control	After RESET	1	1	0	1	20
143	No splitter group (GV) sensor signal (Interruption)	by ECU hardware	Shifting of splitter group blocked. Further driving only possible with last selected splitter group position. If desired gear is not shiftable, next higher gear will be engaged. If failure occurs during shifting, splitter will be engaged by time control	After RESET	1	1	0	1	20
144	Splitter group (GV) sensor self adjustment error	Sensor value outside self adjustment range	With ignition off, splitter remains in last engaged position. Engine stationary: With ignition on ECU checks the splitter sensor value. If sensor value is within defined end position range high or low, the appropriate splitter valve combination will be activated and together with main valve Y10 splitter end position will be adjusted. If splitter position is not within defined end position range and air supply is sufficient, ECU tries to shift once into high position. If splitter position is not within defined end position range and air supply is not sufficient or air pressure sensor is faulty, no splitter position will be shifted. Engine running: With ignition on ECU checks the splittersensor value. If sensor value is within defined end position range high or low, the appropriate splitter valve combination will be activated and together with main valve Y10 splitter end position will be adjusted. If splitter position is not within defined end position range , clutch remains closed and ECU tries to shift into	1.After successful range group engagement 2.After RESET	1	1	0	1	20
145	Range change group (GP) disengagement error	Range change group does not leave the previous position within defined time.	Driving: When shifting from low range group to high group, the highest gear in low range group will be shifted. When shifting from high range group to low group, the lowest gear in high range group will be shifted. Stationary: If it is not possible to select low range group, the lowest gear in high range group is selected as starting gear. New attempt to shift range group is allowed under all driving conditions. No reverse gear in high range group possible.	1.After successful range change group shift 2.After RESET	1	1	0	1	38
146	Changeover error during range change group (GP) shifting	Range change group does not change over to new position within defined time	Driving and stationary: If selected range group could not be engaged, range cylinder tries to repeat engagement three times. If selected range group could not be engaged, following gear will be shifted: When shifting from low range group to high group, the highest gear in low range group will be shifted. When shifting from high range group to low group, the lowest gear in high range group will be shifted. Stationary: If it is not possible to select low range group, the lowest gear in high range group is selected as starting gear. New attempt to shift range group is allowed under all driving conditions.	1.After successful range change group shift 2.After RESET	1	1	0	1	38
147	Range change group (GP) does not engage	Range change group does not reach end stop neither in new nor in old position	Driving and stationary: If selected range group could not be engaged, range cylinder tries to repeat engagement three times. If selected gear could not be engaged, old range position will be selected.If engagement into old range position failed, failure will be set.T/m shifts to neutral. New attempt to shift range group is allowed under all driving conditions.	1.After successful range change group shift 2.After RESET	0	1	1	1	38

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
148	Splitter (GV) does not disengage	Splitter group does not leave the previous position within defined time.	If failure occurs, t/m shifts into next upper gear. Following gear restrictions are valid: Driving: The highest gear which can be selected, is the highest gear in last engaged splitterposition. The lowest gear which can be selected is the lowest gear in last engaged splitterposition. Stationary: The highest gear which can be selected, is the highest start off gear in last engaged splitterposition. The lowest gear which can be selected is the lowest start off gear in last engaged splitterposition.	1.After successful splitter group shift 2.After RESET	1	1	0	1	3D
149	Change over error during splitter shifting	Splitter group does not change over to new position within defined time.	If failure occurs, t/m shifts into next upper gear. Following gear restrictions are valid: Driving: The highest gear which can be selected, is the highest gear in last engaged splitterposition. The lowest gear which can be selected is the lowest gear in last engaged splitterposition. Stationary: The highest gear which can be selected, is the highest start off gear in last engaged splitterposition. The lowest gear which can be selected is the lowest start off gear in last engaged splitterposition.	1.After successful splitter group shift 2.After RESET	1	1	0	1	3D
150	Splitter (GV) does not engage	Splitter group does not reach end stop neither in new nor in old position. detection only in standstill, during driving is GV - shifting active up to stillstand	System not available. New attempt to shift splitter group is allowed under all driving conditions.	1.After successful splitter group shift 2.After RESET	0	0	1	1	3D
151	Selector cylinder does not disengage	Selector cylinder does not leave the previous position	Driving: When failure occurs during shifting, t/m shifts back into the last gear. If last gear is not shiftable because of overspeed condition, the next possible target gear, which is next to last gear will be shifted. When highest shiftable gear could not be shifted because of overspeed condition, then t/m shifts to neutral. Stationary: If target select position could not be engaged, t/m shifts into neutral. New shifting of start off gear must be initiated by selector switch.	1.After successful selection process 2.After RESET	0	1	0	1	3B
152	Change over error during gate selection procedure	Selector cylinder does not change over to new gate	Driving: When failure occurs during shifting, gate cylinder shifts back into last gate position and t/m shifts back into the last gear. If last gear is not shiftable because of overspeed condition, the next possible target gear, which is next to last gear will be shifted. When highest shiftable gear could not be shifted because of overspeed condition, then t/m shifts to neutral. Stationary: If target select position could not be engaged, t/m shifts into neutral. New shifting of start off gear must be initiated by selector switch.	1.After successful selection process 2.After RESET	0	1	0	1	3B
153	Selector cylinder does not engage	Selector cylinder does not engage neither in new gate end position nor in old gate end position. The demanded new endposition AND the starting position cannot be engaged/sensed AND after additional new shifting trials the demanded endposition cannot be engaged/sensed. If after these new shifting trials no endposition is engaged/sensed the failure will be set.	Driving and stationary: T/m shifts into neutral position. New shifting of gear must be initiated by selector switch. If no gate could be engaged, system not available.	1.After successful selection process 2.After RESET	0	1	1	1	3B
154	Main transmission gear does not disengage	Gear engaged signal does not disappear when clutch is dis-en-gaged and Neutral is requested	Driving: Clutch engages in previous gear. Next attempt to shift must be initiated by selector switch. Stationary: Gearshifting only permitted after neutral signal has been reached. Start off and driving can be tried with engaged gear, if gear is equal or lower than lowest gear in range high position.	1.Neutral position could be reached 2.After RESET	0	1	1	1	3A

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
155	Main transmission gear does not engage	Driving: 1.Shift cylinder does not leave neutral position. Stationary: 1.Shift cylinder does not leave neutral position- 2.Clutch exceeds after several gearshifts defined engagement threshold during tooth-to-tooth contact and gear does not engage.	Driving: T/m remains into neutral, if neutral position could not be left. New shifting of gear must be initiated by selector switch. If neutral position has been left, but gear does not engage within defined time, shift cylinder will be shifted back into neutral position and same main gear will be tried to engage again. This procedure will be repeated continuously. Stationary: T/m remains into neutral, if neutral position could not be left. If neutral position has been left, clutch starts to close to overcome tooth-to-tooth contact. If gear does not engage after several gearshifts if clutch has exceeded a maximum engagement stroke, t/m will be shifted back to neutral. New shifting of start off gear must be initiated by selector switch.	1.Any main gear could be engaged 2.After RESET	0	1	1	1	3A
156	Wrong gear shifting	Shift sensor detects shifting into wrong shift direction	Automatic neutral shifting. Clutch remains opened, if neutral could not be shifted. New shifting of gear must be initiated by selector switch	1.Correct gear shifting 2.After RESET	0	1	1	1	3A
158	Shift sensor signal leaves engaged position during driving	Main gear sensor stroke exceeds maximum allowed stroke during vehicle operation without shifting active.	Main valve will be activated automatically together with gear valves to shift into end position. If gear has been disengaged completely, a suitable gear depending on speed condition will be shifted automatically.	1.gear Gear end position has been reached 2.After Reset	1	1	0	1	30
159	Range-change group sensor signal leaves engaged position during driving	Range sensor stroke exceeds maximum allowed stroke during vehicle operation without shifting active.	Main valve will be activated automatically together with gear valves to shift into end position. If gear has been disengaged completely, a suitable gear depending on speed condition will be shifted automatically.	1.Range end position has been reached. 2.After Reset	1	1	0	1	1F
160	Splitter sensor signal leaves engaged position during driving	Splitter sensor stroke exceeds maximum allowed stroke during vehicle operation without shifting active.	Main valve will be activated automatically together with gear valves to shift into end position. If gear has been disengaged completely, a suitable gear depending on speed condition will be shifted automatically.	1.Splitter end position has been reached 2.After Reset	1	1	0	1	20
161	Easy Start feedbacksignal permanently active or brake not completely open	Brakesignal low AND Easy Start feedbacksignal high AND Easy Start signal low AND Brakesignal ok	Easy Start valve can not disengage. No system restrictions	Signal ok or after RESET	1	1	1	1	8
162	Easy Start not available	Brakesignal low AND Easy Start feedbacksignal high AND Easy Start signal low AND Brakesignal keep low while braking OR Brakesignal high AND Easy Start feedbacksignal low AND NOT failure 173 (Error on "Brake switch") OR no Easy Start feedbacksignal AND Easy Start signal high (no electrical or mechanical function from the Easy Start valve)	Easy Start not available	after Reset	1	1	0	1	8
163	Engine does not react on torque intervention	No change of engine speed when intervention via CAN interface	Driving: Gearshifting blocked. Stationary: Starting allowed. Decreased clutch functionality and comfort.	1. Engine speed increase possible(Test will be started automatically each time with t/m in Neutral) 2.After RESET	0	1	0	1	E7

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
164	Error on "Drivers demand engine percent torque" (EEC1)	Signal faulty or missing.	Driving: No calculation of vehicle weight and driving resistance possible. No calculation of startoff gear possible. Drivers demand will be substituted by accelerator pedal position information. After shifting finished, fuel quantity will be released up to accelerator pedal value. Clutch engagement quality could be reduced. During cruise control operation no fuel quantity release is possible, because accelerator pedal value is 0. After clutch is engaged, fuel quantity will be released by EDC. => Bad shift quality after shifting. Stationary: Start off possible. When coming to standstill, medium start off gear will be shifted. No other functional restrictions.	Signal available or after RESET.	1	1	0	1	E7
165	Error on "Accelerator pedal position" (EEC2)	Signal faulty or missing.	Driving: No calculation of vehicle weight and driving resistance possible. No calculation of startoff gear possible. Accelerator pedal position will be substituted by drivers demand information. Shift quality could be reduced. Stationary: Start off possible. When coming to standstill, medium start off gear will be shifted. Manoeuvring and startoff quality could be reduced.	Signal available or after RESET.	1	1	0	1	E7
166	Permanent idle signal	Accelerator pedal position > coast position (defined threshold) and idle signal active	Driving: Shifting during driving allowed. Stationary: No manoeuvring and startoff possible. System not available.	After RESET	1	1	0	1	E6
168	No idle signal or error on "idle signal switch" signal (EEC2) or never active "idle signal"	Idle signal faulty or missing	Driving: No functional restrictions during driving. Stationary: After RESET AP or FP is shown on display as long as accelerator pedal value is in coast condition and idle signal is off. If idle signal does not appear within defined time, failure will be set and display indication AC or FP disappears. ECU checks point P1 from engine configuration (low idle speed). Start off will be allowed, if ECU detects accelerator pedal value > threshold and engine speed exceeds idle speed + defined speed threshold (-> verification of start off intention)	Signal available or after RESET.	1	1	0	1	E6
169	Cut-off relay in ECU does not switch off	During system start test: When cut-off relay is switched off, digital outputs can be switched on.	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FE
170	No voltage supply at pin 30 or cut-off relay in ECU does not switch on	During system start test: When ignition is on, no voltage to power supply pins	Driving and Standstill: block shifting and clutchfunction - System not available. State of clutch and transmission remains unchanged.	Voltage Key 30 over minimum or after RESET	0	0	1	1	FE
171	Error on "Actual engine percent torque" signal (EEC1)	Signal faulty or missing.	Driving: No calculation of vehicle weight and driving resistance possible. No calculation of startoff gear possible. Actual engine percent torque will be substituted by drivers demand information. Shift quality (fuel load reduction and fuel load release) could be reduced. Stationary: Start off possible. When coming to standstill, medium start off gear will be shifted. Warning for clutch overload detection and reaction on overload detection could appear earlier.	Signal available or after RESET.	1	1	0	1	E7
173	Error on "Brake switch" signal (CCVS)	Signal faulty or missing OR Foot brake signal permanent on. Condition: No plausibility error idle signal with accelerator pedal, idle signal not active, accelerator above threshold.	Foot brake is considered active and in consequence, clutch disengages always at foot brake related engine speed (higher engine revolution)	Signal available OR with decreasing signal edge or after RESET.	1	1	0	1	E7

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
175	Error on "Ignition lock" signal (Key 15)	No ignition signal and engine running	Driving: Gearshifting in general blocked, as soon as no ignition on signal is detected (failure detection might be delayed). Standstill: If engine is running , ECU does not switch off. Start off gear shiftable (forward and reverse). Driving with start off gear possible. If engine is not running, t/m will be automatically shifted to neutral and ECU switches off. No initialization of system possible. System not available.	If ignition signal is on (rising signal edge) or after RESET.	1	1	0	1	2B
177	System-CAN Busoff error	System-CAN informations can't be transmitted and received; failure after timeout	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	E7
178	CAN Errorwarning	ERRWARNING Flag from the CAN-Controller	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	E7
179	CAN queue overrun	Not all relevant CAN informations can be transmitted within one cycle of the ECU	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available	failure is no longer detected or after RESET	0	0	1	1	E7
180	CAN EEC1 timeout	After timeout of the message, failure is set	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	E7
181	CAN EEC2 timeout	After timeout of the message, failure is set	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	failure is no longer detected or after RESET	0	0	1	1	E7
182	CAN CCVS timeout	After timeout of the message, failure is set	Wheel based vehicle speed missing (redundant output speed information 2, if output speed will not be taken from 2nd output speed sensor or CAN tachograph). Service brake signal missing. In coast condition service brake signal is considered as active. Cruise control active information missing. No calculation of vehicle weight and driving resistance possible. No calculation of start off gear possible. Subsequent single failure of message variables are suppressed. Clutch disengages always at foot brake related engine speed (higher engine revolution)	After receiving a correct message or after RESET.	1	1	0	1	E7
183	CAN ERC1_ER timeout	After timeout of the message, failure is set	No calculation of vehicle weight and driving resistance possible. No calculation of startoff gear possible. No information about engine brake torque. If exhaust brake is active, shifting quality at start of shifting may be poor. Engine brake is considered as not active. No further functional restrictions.	After receiving a correct message or after RESET.	1	1	0	1	E7
188	ECU fault - wrong interrupt	by software	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FE
189	ECU fault - stack watch	by software	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FE

failure No. (dec)	fault-discription	fault detection	system reaction	fault-recovery condition					
					ISMA available	ISMA Starting gear	display SM-symbol	warning lamp	J1587 Display
190	EOL EEPROM parameter out of valid range	by software EOL values out of range detection with initialization (ignition on).	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FD
191	EOL EEPROM parameter checksum error	by software checksum of EOL parameter not correct detection with initialization (ignition on).	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	0	0	1	1	FD
192	ECU fault - EEPROM access failure	Values from serial EEPROM not readable or Checksum-Error of one or more in EEPROM stored values (Only related to processor 2).	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill, medium start off gear will be shifted. No other functional restrictions.	After RESET and EEPROM is readable	0	0	0	1	FE
193	ECU temperature too high	ECU temperature on circuit board > C_ECU_TEMP_MAX_ZUL and oil temperature > C_OEL_TEMP_MAX_ZUL. (plausibility check) and failures 128 not active. After debouncing time failure will be set.	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. Special display indication for ECU temperature too high alternating with gear information. System not available.	After RESET AND ECU temperature below threshold_1	0	0	1	1	15
194	Both sources for front axle speed not available	Both sources for front axle speed are not available	ISMA is turned off. No other functional restrictions.	One of both sources is available	0	0	0	1	BF
197	Error on "Front axle speed" (WSI)	Signal faulty or missing and WSI is selected as source for front axle speed	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill, medium start off gear will be shifted. No other functional restrictions.	Signal available or after RESET.	1	1	0	0	E7
198	Error on "Relative wheel speeds" (WSI)	Signal faulty or missing and WSI is selected as source for front axle speed	No other functional restrictions	Signal available or after RESET.	1	1	0	0	E7
199	CAN WSI timeout	After timeout of the message, failure is set	No calculation of driving resistance possible. No automatic calculation of start off gear. When coming to standstill, medium start off gear will be shifted. No other functional restrictions.	After receiving a correct message or after RESET.	1	1	0	1	E7
227	Application-Error database for CAN-communication	by software during system start test after ignition on	Driving: Gearshifting blocked. Stationary: Clutch opens, when coming to standstill. Neutral automatically engaged at standstill. Gearshifting blocked, continued driving not possible. System not available.	after RESET, if the failure will not be sensed	1	1	1	1	FF