Home page

ZF-ASTRONIC®

12AS 2301

ZF Standard

1328 758 104

Subject to alterations in design

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Please read this operating manual carefully before driving your vehicle.
When operating the shift system, please note the special instructions provided in the vehicle manufacturer's operating manual.
Your vehicle is fitted with a ZF-*AS* TRONIC automatic shift system. The more you familiarize yourself with this system, the more economically you can drive your vehicle. This operating manual will provide you with all the information you require to be able to make full use of the advanced technical features of the ZF-*AS* TRONIC. To ensure operating safety, please note the maintenance specifications. Specialists employed by ZF After-Sales Service are always available to help with maintenance work on the transmission and are there to assist you should any other problems occur. The relevant addresses can be obtained from ZF in Friedrichshafen.

We would like to wish you pleasant driving with your ZF-*AS* TRONIC

ZF Friedrichshafen AG
Truck Transmissions Division
D-88038 Friedrichshafen
Telefon: (0 75 41) 77-0
Telefax: (0 75 41) 77-90 80 00

Important work safety notice

The following safety instructions appear in this manual:

NOTE
Refers to special processes, techniques, data, etc.

CAUTION
This is used when incorrect, unprofessional working practices could damage the product.

⚠ **DANGER! !**
This is used when lack of care could lead to personal injury and damage to property.

⚠ **ENVIRONMENTAL HAZARD !**
Lubricants and cleaning agents must not be allowed to enter the ground, the water table or the sewage system.

- **Request safety information for the products concerned from your local environmental protection authority and follow any instructions herein at all times.**
- **Always collect used oil in a suitably large container.**
- **Always dispose of used oil, clogged filters, lubricants and cleaning agents in accordance with environmental protection laws.**
- **Always observe manufacturer instructions when dealing with lubricants and cleaning agents.**

View of unit installed by Deutsche Grove without intarder

013165

1 Description of system

1.1 General description

The ZF-*AS* TRONIC automatic transmission is adapted to the engine by means of a standard dry clutch. Since the clutch is also controlled by the ZF-*AS* TRONIC transmission system, the clutch pedal can be dispensed with.

The ZF-*AS* TRONIC consists of a basic transmission and an integrated splitter and planetary group.

The basic transmission is shifted using constant mesh gears. The splitter and planetary group are synchronized.

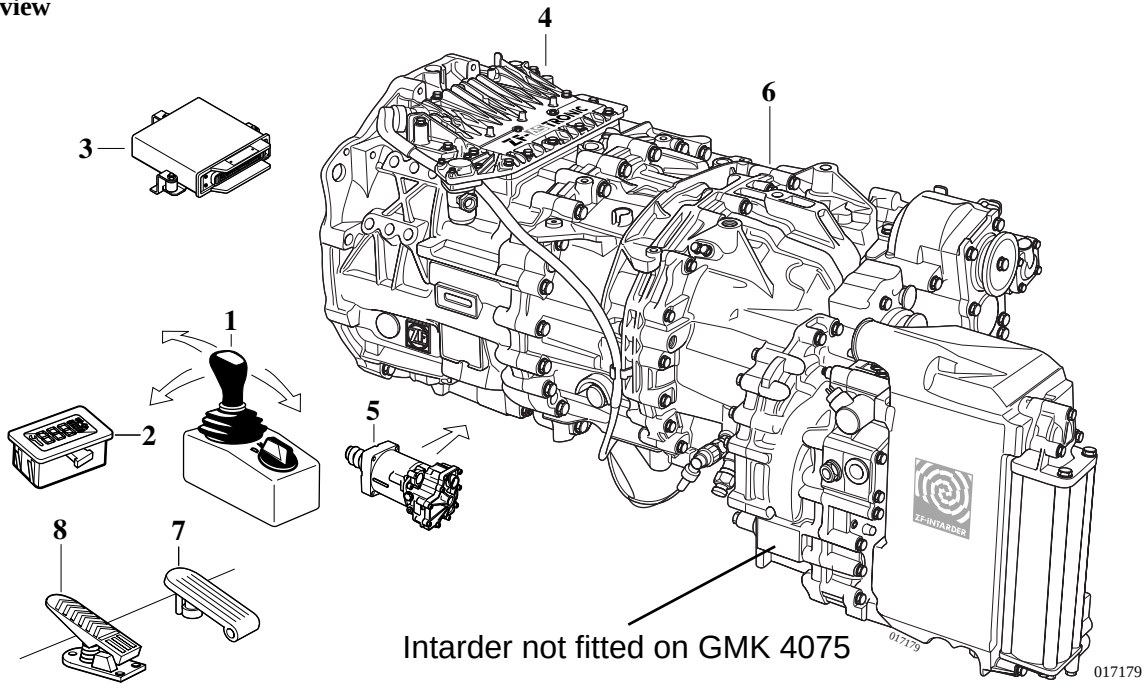
A **display** in the dashboard shows the driver all the system information required (e.g. gear stage, fault, etc.)

The **transmission actuator** and the **clutch actuator** are the components most crucial to complete transmission automation.

The transmission actuator consists of the transmission electronics, shift valves, shift cylinders and sensors.

The clutch actuator is electro-pneumatically controlled and is responsible for the entire clutch actuation process.

1.2 Overview



Key

1 *Console range selector*

2 *Display*

3 *E module*

4 *Transmission actuator with integrated electronic transmission control unit*

5 *Clutch actuator*

6 *Transmission*

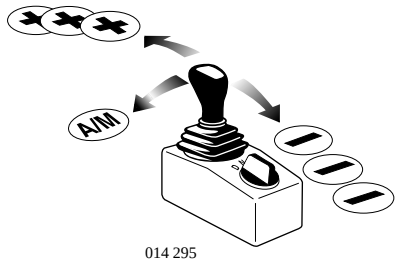
7 *Accelerator*

8 *Brake pedal*

1.3 Range selector

The **range selector** consists of a **rotary switch** and a **tip lever** (shift lever).

Console range selector



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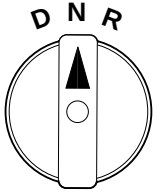
The **rotary switch** has 3 settings:



013 176

« **D** » forwards travel
« **N** » neutral (no gears selected in transmission)
« **R** » reverse travel

When the rotary switch is in the « **N** » position, the tip lever does not function.

The **tip lever** is used to select gears and change operating mode.

Whenever actuated, the tip lever always springs back into its original position.

Upshifts and downshifts covering several stages can be performed by toggling the tip lever several times.

\+ Upshift through **one** stage

\+ + Upshift through **two** stages

– Downshift through **one** stage

– – Downshift through **two** stages

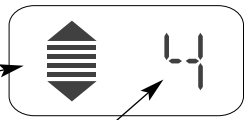
A/M

Mode changes:
Press tip lever to the left to switch between manual mode and automatic mode and vice versa.

1.4 Display

Automatic mode

Transmission in automatic mode (4 bars and 2 arrows)



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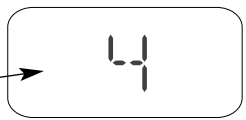
4th gear selected in transmission

Manual mode

4th gear selected in transmission



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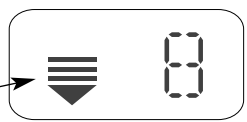
Downshift option from 8th gear into 5th gear (one gear per bar)



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1.5 Accelerator

When a gear is engaged, to move the vehicle, you simply have to depress the accelerator. Do not alter the accelerator pedal setting during the shift operation.
The ZF-*AS* TRONIC takes full charge of clutch operation.
During the gear change, the engine is controlled by the ZF-*AS* TRONIC.

1.6 Automatic mode

Rotary switch in « **D** » position. The shift system automatically selects the most appropriate gear for starting off.
The ZF-*AS* TRONIC shift system automatically performs upshifts and downshifts during travel.
Change from automatic to manual mode is always possible.

1.7 Manual mode

Rotary switch in « **D** » position. If the tip lever is actuated, the ZF-*AS* TRONIC transmission switches into manual mode.
Using the tip lever, the driver can also select a gear for setting off other than that suggested.
The driver must avoid over-revving the engine.
The engine stall if the accelerator is depressed in too high gear.

2 Operation

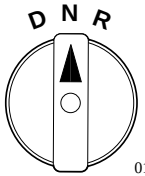
Some deviations from the operating processes are permitted depending on the manufacturer and vehicle type.
Therefore, also consult the vehicle manufacturer's operating manual.

⚠ **DANGER !**
The driver must not leave the vehicle when the engine is running and a gear is selected.

2.1 Starting the engine

⇨ Engage parking brake.

⇨ Rotary switch is pointing to « **N** » (transmission in neutral setting).



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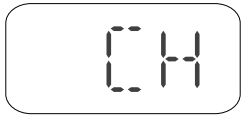
⇨ Switch on "ignition".

⇩ Self-check of shift system (« CH »display).



008 010

⇨ Start the engine.

⇩ Self-check is complete. « **N** » appears on the display, transmission is in neutral setting.

008 011

NOTE
Gear shifts are not possible when the engine is at a standstill.

2.2 Setting off, forwards travel

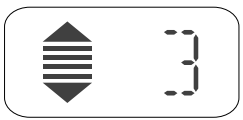
⇨ Start the engine (see 2.1).

⇨ Turn rotary switch from « **N** » to « **D** ».

013 178

↳ Automatic mode is activated.

↳ The display shows the starting gear selected. (The system selects the starting gear itself, the clutch remains separated (disengaged)


014 788

⇨ Depress accelerator and at the same time release the parking brake.

⚠ **DANGER!**
The vehicle may roll away even if the accelerator is not depressed.

↳ Vehicle sets off (clutch closes automatically).

2.2.1 Correcting the starting gear

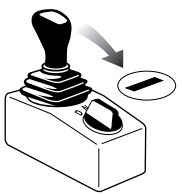
The driver may correct the starting gear selected by the system.

How to make a correction:

⇨ Press tip lever in the « – » or « + » direction.

↳ The display shows the starting gear selected.

Console range selector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2.3 Maneuvering

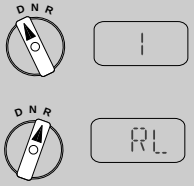
For extremely slow-speed travel (e.g. connecting or disconnecting a trailer or semi-trailer), a maneuvering option is provided.

For maneuvering purposes, the system can call on the first 2 forward gears and both reverse gears.
In other gears, the maneuvering option is not available.

The system recognizes maneuvering status from the position of the accelerator pedal and the low roadspeed.

In maneuvering mode, the vehicle (accelerator) is more responsive and clutch actuation is different from normal status.

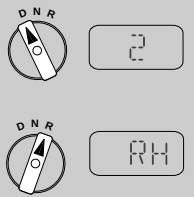
⚠ **DANGER !**
Depending on the accelerator position and vehicle roadspeed the system switches from maneuvering to startup mode.
The vehicle can accelerate.
RISK OF ACCIDENT!



Unlimited maneuvering time

In the event of clutch overload, the display shows « **CL** ».

Whenever clutch overload occurs, the display unit shows « **CL** ».



⚠ **DANGER !**
If the driver fails to respond to the display « **CL** », the system switches from maneuvering.
The vehicle can accelerate at this point.
RISK OF ACCIDENT!

2.4 Starting to roll on slopes

Precondition: the engine must be running.

⚠ **DANGER!**
If the vehicle starts to roll and no gears are selected - rotary switch pointing to « N » - the engine brake is ineffective!
Do not allow the vehicle to roll in the opposite direction of travel to that of the gear selected.

If the vehicle rolls forwards - with transmission in neutral - once the brake is released and the driver shifts from « **N** » to « **D** », then the system selects a gear suitable for the roadspeed. The driveline is then fully engaged.

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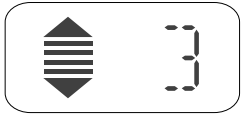
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2.5 Changing between manual and automatic mode

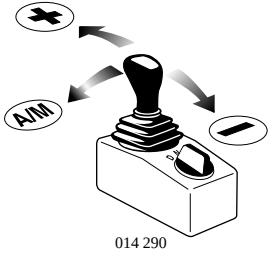
Always possible, even while the vehicle is in motion.

Changing from manual to automatic mode:

(A/M) ⇨ tip lever to the left.

Changing from automatic to manual mode:

⇨ tip lever to the left or push tip lever in the « + » or « – » direction.



014 290

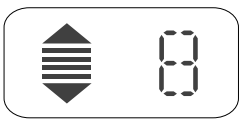
2.6 Changing gear

2.6.1 Changing gear in automatic mode

↳ All upshifts and downshifts are performed automatically.

These depend on:

- ➢ driving resistance
- ➢ loading
- ➢ accelerator-position
- ➢ speed
- ➢ engine speed



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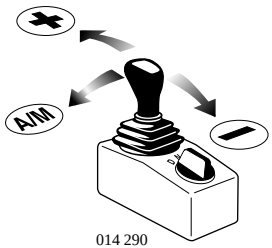
The gear indication appears as a digit in the display during travel.

2.6.2 Changing gear in manual mode

⇨ Push tip lever in « + » or « – » direction.



014 290

When a shift is performed manually, the shift system automatically exits automatic mode.
If the driver moves the tip lever to the left, automatic mode is reactivated.

Jumping gears

Jumping one gear:

⇨ Twice in rapid succession, push tip lever in the direction required.

Jumping two gears:

⇨ Three times in rapid succession, push tip lever in the direction required.

NOTES

➢ You can use the rotary switch to shift any gear to neutral at any time. This shift process always takes priority.

➢ The position of the accelerator must not be changed during the shift process because the engine is automatically controlled.

➢ A shift command is not carried out if this shift would lead to the maximum engine speed being exceeded.

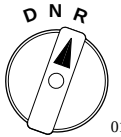
⚠ **DANGER !**
The driver may shift to "Neutral" during travel. If the driver does shift to "Neutral", the driveline is interrupted.
The engine brake is then no longer effective.

2.7 Reversing

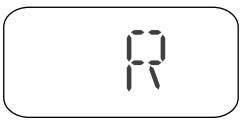
⚠ **DANGER !**
If the vehicle is rolling, shifts cannot be made into reverse! Stop the vehicle immediately.

Selecting reversing gear:

- ⇨ The vehicle must be at a standstill.
- ⇨ Turn rotary switch to « **R** ».
- ↳ « **R** » appears in the display (clutch remains separated/ disengaged).
- ⇨ Depress accelerator and at the same time, release brake (clutch closes automatically).
- ↳ Vehicle moves backwards.



013 177



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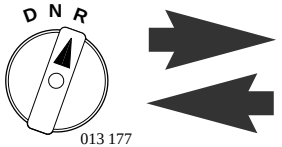
2.7.1 Changing direction of travel

Changing from reverse « **R** » to forwards travel « **D** » and vice versa.

⇨ Turn rotary switch from « **R** » to « **D** ».



013 177
013 178

⚠ **DANGER !**
A change in the direction of travel, performed by moving the rotary switch from « R » to « D » and vice versa « D » to « R », may only be undertaken when the vehicle is at a standstill otherwise the transmission will shift into neutral.

2.8 Engine brake

⚠ **DANGER !**
The engine braking action is interrupted during the gear change process. The vehicle may accelerate when travelling downhill.

Manual driving mode
The engine brake is deactivated by the system during gear changes. After successful shifts, the engine brake is automatically re-engaged.

Automatic driving mode
When the engine brake is employed, the system changes down to deliver maximum braking torque.

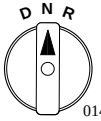
2.9 Stopping

- ➢ After releasing the accelerator pedal, retard the vehicle using the service brake, until it comes to a complete stop.
- ➢ The clutch opens automatically before the vehicle comes to a complete stop, preventing the engine from stalling.
- ➢ If ever the vehicle is stationary for extended periods, ZF advises you to select transmission neutral.

⚠ **DANGER !**
- ➢ **If ever the vehicle is stationary with the engine run ning and the gear engaged, you only have to press the accelerator pedal for the vehicle to set off unless the parking brake is applied!**
- ➢ **Before leaving the vehicle with the engine running, the transmission must be in neutral and the parking brake engaged.**
- ➢ **The engine may stall if the parking brake is actuated while the vehicle is in motion on slippery road surfaces. If this happens, power steering assistance is NO LONGER available!**

2.10 Switching off engine/parking vehicle

- ⇨ Bring vehicle to a standstill.
- ⇨ Engage parking brake.
- ⇨ Move rotary switch to « **N** ».
- ⇨ Switch off engine via ignition key.
- ⇨ Place chocks under vehicle wheels (e.g. on gradients).



014 176

⚠ **DANGER !**
The ZF *AS* TRONIC automatically selects Neutral whenever the engine is switched off. The vehicle may roll away if brakes are not actuated.

2.11 Towing

Vehicle manufacturer instructions must be observed when towing!

CAUTION
For towing purposes, always disconnect the propeller shaft flange from the rear axle before setting off. If it cannot be disconnected, remove both stub shafts.
Avoid polluting the environment in the event of oil loss.

2.12 Tow-starting

The engine **cannot** be tow-started.

2.13 Clutch protection

« **CL** » appears in display if there is a risk of clutch overload resulting from several starting process occurring in rapid succession or of crawling in too a high starting gear.

NOTE
Select an operating mode in which the clutch will not be overloaded, for example:
➢ accelerate vehicle (to close the clutch).
➢ stop the vehicle.
➢ set off in a lower gear.

⚠ **DANGER !**
If the driver ignores the warning signal, the clutch will close when the accelerator is depressed.
The clutch thereby avoids further loading.
This may cause the engine to "stall" and, if on an incline, it is possible that the vehicle will roll backwards.
The clutch opens again when speed is reduced.

➢ To conserve the mechanical components of the clutch release device, the transmission should be shifted to neutral if the vehicle stops for long periods of time (for more than approx. 1 to 2 min., for example, in traffic jams, at railway crossings etc.).This closes the clutch and relieves the clutch release device.

Even though the clutch is automated, the driver still has considerable influence on clutch service life.
To keep levels of wear on the clutch low, we would recommend that when setting off, **you always select the lowest gear possible**.

2.14 Overspeed protection

To protect the entire driveline from excessive speeds, the ZF-*AS* TRONIC only permits gear shifts which fall within the vehicle manufacturer's specified range of engine speeds.

2.14.1 Manual mode

➢ Ensure that the engine does not exceed the permitted speed range.

➢ If the vehicle accelerates on downhill slopes, **there is no automatic upshift** into a higher gear.

CAUTION
The engine may be damaged if the vehicle is accelerated on downhill gradients and the engine thereby enters the overspeed range.

2.14.2 Automatic mode

⚠ **DANGER !**
The vehicle may accelerate on downhill slopes. The system will undertake upshifts to protect the engine from damage in the overspeed range (red range).

2.16 Roller test rig

Having driven onto the roller test rig (brake test rig), shift transmission into "neutral".

- ➢ When the roller is activated, the system recognizes the "driving vehicle" function. If the driver selects a gear, the clutch closes.
- ➢ Reverse gear cannot be selected when the roller is activated.

⚠ **DANGER !**
The vehicle may drive off the roller even if the accelerator is not depressed.

2.17 Display for ZF-*AS* TRONIC

The display provides information on the status of the transmission. It usually shows the gear selected (e.g.: 1 - 16 or « **N** », « **R** »).

Additional display information:

008 010

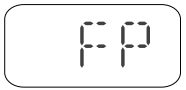
- « **CH** » = system self-check.
- Display appears when «ignition is ON ».

008 128

- « **AL** » = Airless (Luftmangel).
- Alternates with the normal display. The transmission compressed air system hasinsufficient pressure.

NOTE
Only set off once there is sufficient air pressure in the system. If air pressure is too low when the vehicle stops, do not open the clutch otherwise the engine will "stall".

⚠ **DANGER !**
If shifts are undertaken when pneumatic pressure is too low, the transmission may remain in neutral to ensure that there is no direct drive and that the engine brake is ineffective.

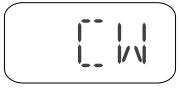


008 012

- « **FP** » = drive pedal (accelerator)
- Bring accelerator to idling position.
- If the display does not go out, there is a system error. The vehicle cannot be driven!

008 021

- « **CL** » = clutch (clutch)
- Alternates with the normal display. Clutch is overloaded.
- Remedy: chapter 2.11 Clutch protection.



008 029

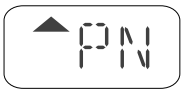
- **« CW »** = clutch wear (clutch wear)
- Proceed to approved workshop to have clutch exchanged at next opportunity.

013 586

- **Automatic mode** is shown in the display by means of 4 bars and 2 arrows. (8th gear is selected in transmission)

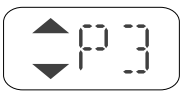
008 122

- **«EE» = Electronic Error**
- Appears if display communicationis impaired by the transmission electronics.



008 024

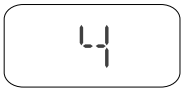
- «▲ PN» = PTO* 1, transmission in «Neutrtal»
- PTO is activated. The transmission may for example be in neutral position.
  ▲ Arrow facing upwards = PTO 1 is activated.



008 102

- «▲▼ P3» = PTO* 1 + 2, transmission in 3rd gear
- PTOs 1 and 2 are activated. The transmission is in its 3rd setting off gear.
  ▲ Arrow facing upwards = PTO 1 is activated.
  ▼ Arrow pointing downwards = PTO 2 is activated.

**PTO = Power Take Off*



008 014

- **Manual mode**
- 4th gear selected in transmission.

014 789

- **Manual mode**
- Downshift option from 8th gear into 5th gear (one gear per bar).


008 026

- « Spanner » = system error
- Appears if the operating mode is only available with restrictions.
- Visit a specialist workshop as soon as possible.

NOTE
When certain system error occurs, automatic mode is deactivated and the transmission system remains in manual mode.

008 027

- «**STOP**» + «spanner» = serious system error
- **Stop** the vehicle. Vehicle may no longer be driven and must be taken to workshop.

⚠ **DANGER !**
If possible, do not stop the vehicle when it is in a danger zone.

➢ Also refer to chapter 2.18.

2.18 System error (error messages)

If a « spanner symbol » appears in the display, a system error has occurred. Operation may only be possible with restrictions. If « STOP » and the « spanner symbol » appear in display, a serious system error has occurred. Stop the vehicle. Vehicle may no longer be driven (refer to chapter 2.17 and 4).

Error messages and the reactions resulting from these errors can be deleted with the vehicle at a standstill and the «ignition OFF», wait until the display goes out. If the display does not go out once the ignition has been turned Off, use the battery isolator to switch off the system. Switch the ignition back on. If the error message is still in place, the vehicle will have to be taken to a service point. Please specify the error number(s) when the service point is contacted.

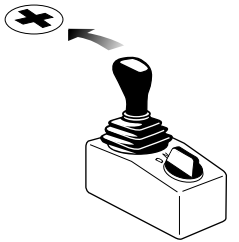
Calling up error numbers:

Switch on ignition

Turn rotary switch to « **N** »

Hold tip lever in « + » position

Console range selector



014 289

Depending on the version, a 2 or 3-digit error number appears on the display. This corresponds to the error currently in place.

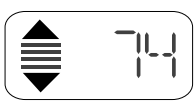
If **4 bars** are displayed in addition to the number, this means: **error no.** + **100** (only applies to two-digit displays).
If **4 bars and arrows** are displayed in addition to the number, this means: **error no. + 200** (only applies to two-digit displays).

013 588

e.g.: error no. 74

013 587

error no. 174



error no. 274

Calling up inactive error numbers from the error memory:

⇨ switch on ignition.

⇨ turn rotary switch to « **N** » and at the same time depress foot brake.

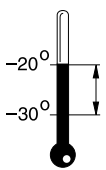
⇨ hold tip lever in « + » position.

The errors stored are shown on the display one after another.

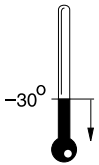
2.19 Starting the vehicle at very low temperatures

The transmission is filled in accordance with ZF List of Lubricants TE-ML 02. It can therefore be used in outside temperatures of down to -30 °C.
The following should be noted:

The vehicle manufacturer's specifications should always be observed.



◆ **At outside temperatures of below -20 °C,** the transmission will require a warming up phase once the engine is started. The engine must be operated for at least 10 minutes with the vehicle at a standstill until the transmission oil has warmed up.



◆ **At outside temperatures of below -30 °C,** warm air must be used to heat transmission up to a temperature above -30 °C before the engine is started.

2.19.1 Using the vehicle when the outside temperature is between 0 °C and -40 °C

If the outside temperature is **continually** very low, specifications for starting the vehicle must be requested from the engineering department at ZF.

2.19.2 Parking the vehicle at very low temperatures

The vehicle may be parked for a long time or the transmission may be stored at outside temperatures of down to -40 °C.

3 Maintenance

Regular maintenance work increases the operational safety of the transmission.
Visual check for oil leaks conducted during the scheduled vehicle service check.
When driving with transmissions fitted with ZF Intarder, the ZF Intarder operating manual 6085 758 002 should be observed.

3.1 Transmission oil

3.1.1 Oil grade

According to ZF List of Lubricants TE-ML 02. The ZF List of Lubricants is available from all ZF subsidiaries or via Internet http://www.zf.com/zf-n

3.1.2 Oil quantities

To ensure correct oil quantities when changing oil, always conduct the oil filling process as specified (refer to chapter 3.2.2).

Transmission	Oil changes	Initial fill at OEM or after repair work
12 AS 2301	**11** / 12* litres	**11** / 21* litres

** with intarder*

3.2 Oil changes

NOTE
Vehicle should be on horizontal ground when oil is changed.

3.2.1 Oil change intervals

To safeguard reliable operation of the transmission, compliance with the oil change intervals specified in ZF List of Lubricants TE-ML 02 is mandatory!

3.2.2 Draining oil

Always change oil after long journeys provided that the transmission oil is still at operating temperature and is still thin.

⚠ **DANGER !**
Risk of burning upon contact with parts and with the transmission oil.

⇨ Remove oil drain plugs from transmission (Figs. 1.1 and 1.2, items 1 and 2) and collect transmission oil in a suitable container. Dispose of in an environmentally-friendly manner.

⇨ Clean oil drain plug with magnetic plug and replace seal.

⇨ Tighten oil drain plugs to the specified torque.

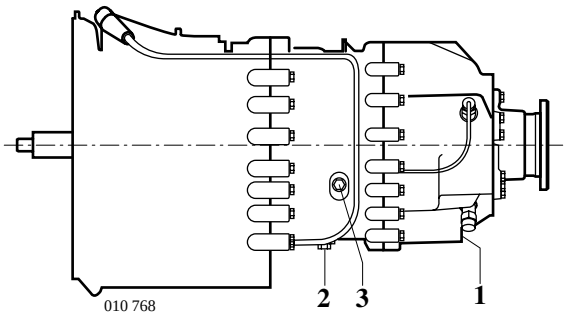


Fig. 1.1 Version: solo transmission

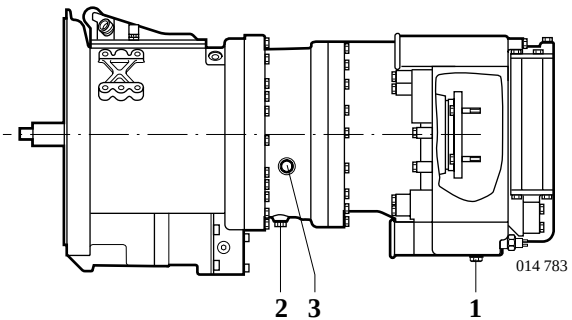


Fig. 1.2 Version: transmission with Intarder

Key to Figs. 1.1 and 1.2

1 *Oil drain plug*
tightening torque T_A = 60 Nm

2 *Oil drain plug*
tightening torque T_A = 60 Nm

3 *Oil fill and overflow measurement point*
There is a notice on this screw indicating the oil grades and oil change intervals.
tightening torque T_A = 60 Nm

3.2.3 Oil filling

⇨ Top up with oil through the oil filling point. (Figs. 1.1 and 1.2, item 3).

⇩ The oil level is correct once the top of the oil has reached the bottom of the filling point or once oil has already started to escape from the filling point.

3.3 Checking oil level

⚠ **DANGER !**
The transmission will be damaged if it does not contain enough oil.
RISK OF ACCIDENT!

Regularly check the oil level in the transmission:

- Check the oil level when the vehicle is on horizontal ground.
- Do not check oil level straight after a journey (incorrect measurement). Only check once the transmission oil has cooled down (<40 °C).
- ⇨ Remove oil fill screw (item 3).
- ⇨ If the oil level has fallen below the oil filling point, it will have to be topped up (section 3.2.2).

NOTE
Each time you check the oil, also watch out for any leakages on the transmission.

3.4 Transmission ventilation

The transmission oil heats up during travel. This causes excess pressure which is continually reduced by a breather valve.
Ensure that the breather valve is always functioning correctly. The breather (item 5) must be clean and must not have a plastic cover.

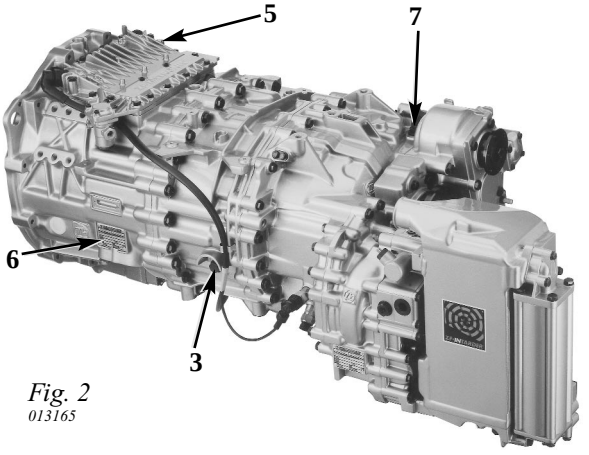


Fig. 2
013165

3 *Oil fill screw*
5 *Transm. breather*
6 *Type plate*
7 *Initial fill or oil top ups after repairs, only in Intarder version*

3.5 Type plate

The type plate contains the most important data. It can be found on the left-hand side of the transmission when viewed from the output.

The following should always be specified when making inquiries or repairs:

- parts list no. of transmission
- transmission type
- serial no. of transmission

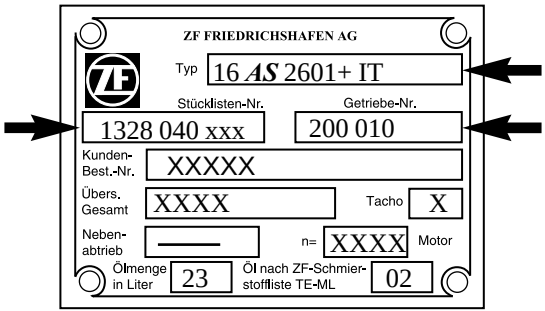


Fig. 3 Type plate (example)

3.6 Visual inspection of wiring

⇨ Check wiring for damage.

⇨ Ensure that connectors are seated correctly, connectors must be fitted with tension relief.

3.7 Pneumatic system maintenance

⇨ The maintenance instructions of the vehicle manufacturer must be observed.

⇨ The compressed air reservoir must be drained every week (every day in winter).

NOTE
When the compressed air reservoir is drained, the compressed air cleaner and water separator must also be drained unless these operate automatically.

4 List of errors

See following pages

RESET: Switch off ignition while vehicle is stationary and wait until display goes out. Then switch on the ignition. If there is an error in the system, visit a workshop without delay.

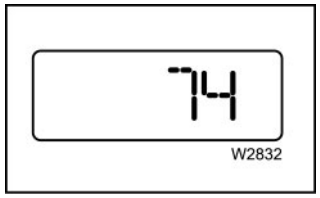
ZF AS Tronic Error codes

Calling up Current (active) error codes

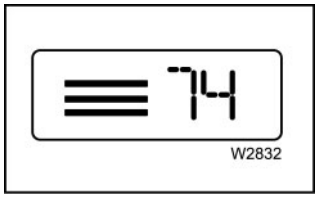
- Engage parking brake
- Switch transmission (gearbox) to neutral position **N**
- Do **Not** operate the brake pedal
- Push the Transmission (gearbox) touch lever forwards

The display indicates the current error code. If there are several errors, all the errors are displayed repeatedly in sequence as long as you hold the touch lever forwards

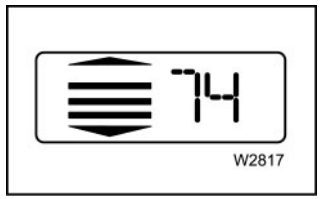
The errors are displayed in various ways:



Error codes up to 99 are simply displayed as a number e.g. 74



If bars appear in front of the displayed number, you need to add 100 to the number e.g. 174

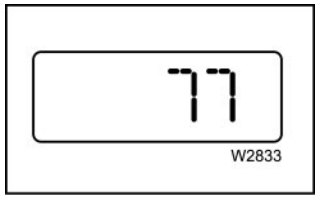


If bars & arrows appear in front of the displayed number, you need to add 200 to the number e.g. 274

Calling up Stored error codes

- Engage parking brake
- Switch transmission (gearbox) to neutral position **N**
- Operate the brake pedal & push the transmission (gearbox) touch lever forwards

The display indicates the stored error code. If there are several errors, all the errors are displayed repeatedly in sequence as long as you hold the touch lever forwards



The errors are displayed in the same way as current error codes e.g. 77:

See following pages for explanation of error codes
See operators manual: pages 7 - 40/41 for additional error symbols / messages

Int. ZF-Error no. dec/hex	Description of error	Shift automat.	Warning lamp	Spanner display	Stop display	System reaction	Error Reset Condition
02	Short-circuit earth at output to valve Y2 (GV valve; DD: high, OD: low)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
03	Short-circuit earth at output to valve Y3 (GV valve; DD: low, OD: high)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
04	Short-circuit to earth at output to valve Y4 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
05	Short-circuit to earth at output to valve Y5 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
06	Short-circuit to earth at output to valve Y6 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
07	Short-circuit to earth at output to valve Y7 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
08	Short-circuit earth at output to valve Y8 (GP low valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
09	Short-circuit earth at output to valve Y9 (GP high valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected

10	Short-circuit to earth at output to valve Y10 (main valve)	-	X	X	X	Travel: no gear shift possible! No neutral shift possible! Selected gear remains engaged; Possible to start if gear <= lowest GP "high" gear is engaged. Once ignition is on, further travel is not possible.	ECU without power and no short-circuit to earth.
11	Short-circuit to earth at output to warning buzzer and warning lamp	X	-	X	-	Warning buzzer and warning lamp permanently active.	ECU without power and no short-circuit to earth.
12	Short-circuit to earth at output to reversing lamp relay (electronic module)	X	-	X	-	Reversing lamp cannot be activated. No further system restrictions.	ECU without power and no short-circuit to earth.
15	Short-circuit to earth at output to AD 24	X	-	X	-	Output cannot be activated.	ECU without power or no short-circuit to earth.
17	Short-circuit to earth at output to valve Y1 (transmission brake valve)	-	X	X	-	Travel: longer shift times for upshifts. Upshifts are blocked if target speed is lower than engine idling speed.	ECU without power and no short-circuit to earth.
18	Short-circuit to earth at output to valve Y17 (clutch slowly disengages valve)	-	X	X	-	Reduced comfort during manoeuvring and starting.	ECU without power and no short-circuit to earth.
19	Short-circuit to earth at output to valve Y15 (clutch slowly engages valve)	-	X	X	-	Reduced comfort during manoeuvring and starting.	ECU without power and no short-circuit to earth.
20	Short-circuit to earth at output to valve Y16 (clutch quickly disengages valve)	-	X	X	-	Increased shift time. Reduced comfort when starting.	ECU without power and no short-circuit to earth.
21	Short-circuit to earth at output to valve Y14 (clutch quickly engages valve)	-	X	X	-	Increased shift time. Reduced comfort when starting.	ECU without power and no short-circuit to earth.
22	Short-circuit to earth at output ADVP	-	(X)	(X)	(X)	No display indication, warning buzzer and warning lamp not available. Sequence errors will be suppressed by the electronic module.	Following RESET when the error is no longer detected
25	Short-circuit to earth at output SD to the display	X	X	EE	EE	“EE” flashes on the display. No system reactions.	No short-circuit to earth or ECU without power.

27	"Engine configuration message" signal error	X	-	X	-	Possibly reduced functionality for automatic operation and calculation of starting gear. Target speed for downshifts can be reduced. Reduced comfort during stopping.	Signal available or ECU without power.
31	"Current engine retarder – percent torque" signal error	-	X	X	-	No automatic starting gear. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions. No information regarding engine braking torque. If the engine brake is active, the shift quality at the start of the shift might be reduced. It is assumed that the engine brake is not active.	Signal available or ECU without power.
34	Cable break at output to valve Y2 (GV valve DD: high; OD: low)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
35	Cable break at output to valve Y3 (GV valve DD: low; OD: high)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
36	Cable break at output to valve Y4 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
37	Cable break at output to valve Y5 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
38	Cable break at output to valve Y6 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
39	Cable break at output to valve Y7 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
40	Cable break at output to valve Y8 (GP low valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
41	Cable break at output to valve Y9 (GP high valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following reset when the error is no longer detected

42	Cable break at output to valve Y10 (main valve)	-	X	X	X	No gear shift possible! No neutral shift possible! Selected gear remains engaged; Possible to start if gear <= lowest GP "high" gear is engaged. Following ignition on further travel is not possible.	No Cable break and output not activated or ECU without power
43	Cable break at output to warning buzzer and warning lamp	X	(X)	X	-	Warning buzzer and warning lamp cannot be controlled.	No Cable break and output not activated or ECU without power
44	Cable break at output to reversing lamp relay (electronic module)	X	-	X	-	Reversing lamp cannot be activated. No further system restrictions.	No Cable break and output not activated or ECU without power
47	Cable break at output to AD 24	X	-	X	-	Output cannot be activated.	No Cable break and output not activated or ECU without power
49	Cable break at output to valve Y1 (transmission brake)	-	X	X	-	Travel: increased shift time during upshifts. Upshifts are blocked if target speed is lower than engine idling speed. Standstill: increased training time. Increased shift time when shifting from neutral.	No Cable break and output not activated or ECU without power
50	Cable break at output to valve Y17 (clutch slowly disengages valve)	-	X	X	-	Reduced comfort during manoeuvring and starting.	No Cable break and output not activated or ECU without power
51	Cable break at output to valve Y15 (clutch slowly engages valve)	-	X	X	-	Reduced comfort during manoeuvring and starting.	No Cable break and output not activated or ECU without power
52	Cable break at output to valve Y16 (clutch quickly disengages valve)	-	X	X	-	Increased shift time. Reduced comfort when starting.	No Cable break and output not activated or ECU without power
53	Cable break at output to valve Y14 (clutch quickly engages valve)	-	X	X	-	Increased shift time. Reduced comfort when starting.	No Cable break and output not activated or ECU without power
54	Cable break at output ADVP	-	(X)	(X)	(X)	1. Following ignition on: No display indication, warning buzzer and/or warning lamp not available. Further travel not possible. 2. In operation: error is not detected. No display indication, warning buzzer and/or warning lamp not available. ZF CAN timeout error is detected. No gear shifting possible during travel. When stopped the transmission automatically shifts to neutral. Further travel not possible.	Following RESET when the error is no longer detected

66	Short-circuit positive at output to valve Y2 (GV valve DD: high, OD: low)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
67	Short-circuit positive at output to valve Y3 (GV valve DD: low, OD: high)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
68	Short-circuit positive at output to valve Y4 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
69	Short-circuit positive at output to valve Y5 (select valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
70	Short-circuit to positive at output to valve Y6 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
71	Short-circuit to positive at output to valve Y7 (shift valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
72	Short-circuit positive at output to valve Y8 (GP low valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
73	Short-circuit positive at output to valve Y9 (GP high valve)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
74	Short-circuit positive at output to valve Y10 (main valve)	-	X	X	-	Travel: gear shift blocked, standstill: starting gear shift in GP slow and neutral shift permitted	No short-circuit to positive and output not activated or ECU without power
75	Short-circuit positive at output to warning buzzer and warning lamp	X	(X)	X	-	Warning buzzer and warning lamp cannot be controlled.	No short-circuit to positive and output not activated and ECU without power.
76	Short-circuit positive at output to reversing lamp relay (electronic module)	X	X	X	-	Reversing lamp is permanently switched on. No further function restrictions.	No short-circuit to positive and output not activated and ECU without power.

79	Short-circuit positive at output to AD 24	X	-	X	-	Output permanently active	No short-circuit to positive or ECU without power
81	Short-circuit positive at output to valve Y1 (transmission brake)	-	X	X	-	Travel: gear shifting blocked. Standstill: starting gears can be engaged. Main valve is only activated during shifting if clutch is disengaged. Starting possible.	No short-circuit to positive and output not activated or ECU without power
82	Short-circuit positive at output to valve Y17 (clutch slowly disengages valve)	-	X	X	X	Gear shifting generally blocked, system not available. Travel and gear engaged: attempt made to prevent the clutch disengaging (start-up valves are switched to act against it). Standstill: transmission automatically shifts to neutral when clutch disengages. Further travel not possible.	No short-circuit to positive or ECU without power
83	Short-circuit positive at output to valve Y15 (clutch slowly engages valve)	-	X	X	X	Gear shifting generally blocked, system not available. Travel: gear shifting blocked. Standstill: transmission automatically shifts to neutral after a certain period of time. Further travel not possible.	No short-circuit to positive or ECU without power
84	Short-circuit positive at output to valve Y16 (clutch quickly disengages valve)	-	X	X	X	Gear shifting generally blocked, system not available. Travel and gear engaged: attempt made to prevent the clutch disengaging (start-up valves are switched to act against it). Standstill: transmission automatically shifts to neutral when clutch disengages. Further travel not possible.	No short-circuit to positive or ECU without power
85	Short-circuit positive at output to valve Y14 (clutch quickly engages valve)	-	X	X	X	Gear shifting generally blocked, system not available. Travel: required clutch position is obtained by switch-off valve. Standstill: transmission automatically shifts to neutral after a certain period of time. Further travel not possible.	No short-circuit to positive or ECU without power
86	Short-circuit positive at output ADVP	-	X	X	-	1. Following ignition off/on: no restrictions on system availability. Following ignition off "EE" flashes on the display. 2. During travel operation: no restrictions on system availability.	ECU without power.
89	Short-circuit positive at output SD to display	X	X	EE	EE	“EE” flashes on the display. No system reactions.	No short-circuit to positive or ECU without power
90	Communications error between processor 1 and processor 2 (ECU error)	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	ECU without power and correct communications
92	“ABS active" signal error	-	X	X	-	Starting gear not automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	Signal available or ECU without power.
93	“ASR engine control active” signal error	-	X	X	-	Starting gear not automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	Signal available or ECU without power.

94	“ASR brake control active” signal error	-	X	X	-	Starting gear not automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	Signal available or ECU without power.
95	“Cruise control active” signal error	-	X	X	-	No further function restrictions.	Signal available or ECU without power.
96	“Set cruise control speed” signal error	X	-	-	-	No further function restrictions, pendulum shifts in cruise control operation possible.	Signal available or ECU without power.
97	“Engine speed” signal error	-	X	X	-	Travel: during shifting, the clutch is controlled time-dependently. Reduced engaging comfort following the shift. Clutch disengages below a preset value. Standstill: no special manoeuvring operation possible. During starting the clutch is controlled time-dependently. Reduced engaging comfort during manoeuvring and starting.	Signal available and engine speed < acceptable value or ECU without power
98	“Gear input speed” signal error	-	X	X	-	Travel: increased shift time. Standstill: increased shift time. Reduced comfort during manoeuvring and starting.	Transmission input speed in acceptable range or ECU without power
99	“PTO speed signal 1" signal error	-	X	X	-	Depending on the application, speed information is accepted by the vehicle speed signal via CAN, or by the CAN PTO speed signal tachograph. Manual shifting of all gears possible. Reduced shift quality because dynamics of the CAN message are too low.	Transmission input speed in acceptable range or ECU without power
101	Both "PTO speed" signals defective	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a standstill. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
102	Plausibility error between “gear input speed” and “PTO speed 1"	-	X	X	-	Travel: gear shifting blocked during travel including shift attempts to neutral. Standstill: starting gears can be engaged. Travel possible with starting gear.	ECU without power.
104	Excessive voltage (vehicle voltage too high)	X	-	X	-	No system restrictions.	Voltage within the valid range or ECU without power
105	Undervoltage (vehicle voltage too low)	-	X	X	X	Travel: gear shifting blocked. Standstill: gear shifting blocked. If gear is engaged and the driver switches off the ignition, an attempt will be made to shift to neutral.	Voltage within the valid range or ECU without power
107	Stabilised voltage supply at output AU (clutch sensor supply) outside range	-	X	X	-	Travel: engaging and disengaging of clutch is time controlled. Standstill: manoeuvring not possible. If starting does not occur within a certain period of time, the transmission automatically shifts to neutral. The new starting gear must be engaged by the travel switch. Reduced engaging comfort during starting.	Voltage at AU within the valid range and ECU without power

108	Error in operation or jogging switch (travel switch)	-	X	X	-	General function (also without active errors): following ignition off/on a gear can only be shifted, if the rotary switch was previously in the neutral position. Error reaction depends on the travel status and whether a gear is engaged. 1. Error at "jogging" lever: no shift possible during travel. When stopped, the starting gear, which was selected by the rotary switch, is engaged. Travel possible with starting gear thus selected (forwards and reverse). 2. Error at rotary switch: if gear is engaged during travel, no gear shift is possible. When stopped the transmission shifts to the last known (stored) gear. Travel possible with selected starting gear. If the transmission was shifted to “N” prior to the error occurring, no gear shift is possible. Further travel not possible. Following ignition off a shift to "N" always occurs	Valid travel switch neutral signal (rotary switch at neutral) or ECU without power.
109	Plausibility error between superstructure and carrier operation	X	X	X	-	Only carrier operation possible.	Following RESET and acceptable signals
110	ZF CAN timeout	-	(X)	X	-	1. Following ignition off/on: error code, alternating with gear display, is automatically indicated on the display. System not available. 2 . Travel operation: No gear change possible. If vehicle comes to a standstill, the starting gear last selected (by rotary switch) will be engaged. Further travel only possible with starting gear. If reverse gear was engaged, the transmission automatically shifts to neutral. Error code, alternating with gear display, is automatically indicated on the display.	After receiving a correct message or ECU without power.
117	Error in clutch training process	-	X	X	X	Further travel not possible.	ECU without power.
118	Clutch does not disengage	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	ECU without power.
119	Clutch does not engage/ transfers no engine torque	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	ECU without power.
120	Mechanical error valve Y17 (clutch slowly disengages valve)	-	X	X	-	Function is taken over by redundant valve. Reduced engaging comfort.	ECU without power.
121	Mechanical error valve Y16 (clutch quickly disengages valve)	-	X	X	-	Function is taken over by redundant valve. Reduced engaging comfort.	ECU without power.
122	Mechanical error valve Y15 (clutch slowly engages valve)	-	X	X	-	Function is taken over by redundant valve. Reduced engaging comfort.	ECU without power.

123	Mechanical error valve Y14 (clutch quickly engages valve)	-	X	X	-	Function is taken over by redundant valve. Reduced engaging comfort.	ECU without power.
124	Clutch path signal error	-	X	X	-	Travel: disengaging and engaging of clutch is time controlled. Standstill: manoeuvring not possible. If starting does not occur within a certain period of time, the transmission automatically shifts to neutral. The new starting gear must be engaged by the travel switch. Reduced comfort during starting.	ECU without power and acceptable voltage signal
125	Pressure limiting valve error	-	X	X	-	No system restrictions.	If pressure level is lower than the threshold value or ECU without power.
126	Pressure sensor signal error	-	X	X	-	System function not adversely affected, if air supply is sufficient. No “AL” air pressure indication on the display in the event that the air pressure is not sufficient. Training process of transmission and clutch could take longer.	If voltage level is within the acceptable range or ECU is without power.
127	ECU temperature signal error	-	X	X	-	System function not adversely affected.	If voltage level is within the acceptable range or ECU is without power.
128	Oil temperature sensor signal error	X	-	X	-	System function not adversely affected.	If voltage level is within the acceptable range or ECU is without power.
129	No shift sensor signal available (short-circuit to positive)	-	X	X	-	Travel: gear shift blocked. Only shifting from neutral possible. Standstill: starting gears can be engaged. Change of starting gear possible.	ECU without power.
130	No shift sensor signal available (short-circuit to earth)	-	X	X	-	Travel: gear shift blocked. Only shifting from neutral possible. Standstill: starting gears can be engaged. Change of starting gear possible.	ECU without power.
131	No shift sensor signal available (Cable break)	-	X	X	-	Travel: further gear shifting blocked. Only shifting from neutral possible. Standstill: starting gears can be engaged. Change of starting gear possible.	ECU without power.
132	Training error of shift sensor	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected

133	No gutter selector sensor signal (short-circuit to positive)	-	X	X	-	Travel: only forward gears can be selected, which are opposite the shift direction for the reverse gear. Standstill: all those permitted starting gears with a shift direction opposite that of the reverse gear can be selected. Reverse gear cannot be shifted.	ECU without power.
134	No gutter selector sensor signal (short-circuit to earth)	-	X	X	-	Travel: only forward gears can be selected, which are opposite the shift direction for the reverse gear. Standstill: all those permitted starting gears with a shift direction opposite that of the reverse gear can be selected. Reverse gear cannot be shifted.	ECU without power.
135	No gutter selector sensor signal (Interruption)	-	X	X	-	Travel: only forward gears can be selected, which are opposite the shift direction for the reverse gear. Standstill: all those permitted starting gears with a shift direction opposite that of the reverse gear can be selected. Reverse gear cannot be shifted.	ECU without power.
136	Training error of gutter selector sensor	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a standstill. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
137	No GP sensor signal (short-circuit to positive)	-	X	X	-	Travel: GP shift blocked during travel. Only those gears in the shifted GP range can be shifted. Standstill: all starting gears can be engaged.	ECU without power.
138	No GP sensor signal (short-circuit to earth)	-	X	X	-	Travel: GP shift blocked during travel. Only those gears in the shifted GP range can be shifted. Standstill: all starting gears can be engaged.	ECU without power.
139	No GP sensor signal (interruption)	-	X	X	-	Travel: GP shift blocked during travel. Only those gears in the shifted GP range can be shifted. Standstill: all starting gears can be engaged.	ECU without power.
140	Training error of GP sensor	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages, when vehicle comes to a standstill. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
141	No GV sensor signal (short-circuit to positive)	-	X	X	-	GV shift blocked. Further travel only possible with last selected GV position. If transmission cannot shift the desired gear, the next highest gear is engaged.	ECU without power.
142	No GV sensor signal (short-circuit to earth)	-	X	X	-	GV shift blocked. Further travel only possible with last selected GV position. If transmission cannot shift the desired gear, the next highest gear is engaged.	ECU without power.
143	No GV sensor signal (interruption)	-	X	X	-	GV shift blocked. Further travel only possible with last selected GV position. If transmission cannot shift the desired gear, the next highest gear is engaged.	ECU without power.

144	Training error of GV sensor	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
145	GP switch-off error	-	X	X	-	Travel: during a shift from GP "low" to GP "high" the highest gear in GP "low" is engaged. During a shift from GP "high" to GP "low" the lowest gear in GP "high" is engaged. Standstill: if it is not possible to shift GP "low", the lowest gear in GP "high" is selected as the starting gear. No reverse gear is possible in GP "high".	Following successful gear change of the GP or ECU without power
146	Gear shift error during GP shift	-	X	X	-	Travel and standstill: if the selected GP position cannot be engaged, the transmission shifts the following gear: During a shift from GP "low" to GP "high" the highest gear in GP "low" is engaged. During a shift from GP "high" to GP "low" the lowest gear in GP "high" is engaged. Standstill: if it is not possible to shift GP "low", the lowest gear in GP "high" is selected as the starting gear.	Following successful gear change of the GP or ECU without power
147	GP does not switch on	-	X	X	X	Travel and standstill: if the selected gear cannot be engaged, the temporary GP position is shifted. If engaging in the previous GP position fails, an error is set. Transmission shifts to neutral.	Following successful gear change of the GP or ECU without power
148	GV does not switch off	-	X	X	-	If an error occurs, the transmission shifts into the next highest gear. The following gear restrictions are valid: Travel: the highest gear, which can be selected, is the highest gear in the GV position last engaged. The lowest gear, which can be selected, is the lowest starting gear in the GV position last engaged.	Following successful gear change of the GV or ECU without power
149	Error during GV shift	-	X	X	-	If an error occurs, the transmission shifts into the next highest gear. The following gear restrictions are valid: Travel: the highest gear, which can be selected, is the highest gear in the GV position last engaged. The lowest gear, which can be selected, is the lowest starting gear in the GV position last engaged.	Following successful gear change of the GV or ECU without power
150	GP does not switch on	-	X	X	X	Further travel not possible.	Following successful shifting of the GV or ECU without power
151	Selector cylinder does not deactivate	-	X	X	-	Travel: if an error occurs during the shift, the transmission shifts back into the previous gear. If the transmission cannot shift into the previous gear because of an overspeed condition, the transmission shifts into the next possible target gear, which is nearest to the previous gear. If the transmission cannot shift into the highest possible gear because of an overspeed condition, the transmission shifts to neutral. Standstill: if the desired target position cannot be engaged, the transmission shifts to neutral. Renewed shifting of the starting gear must be activated via the travel switch.	Following successful selection process or ECU without power.

152	Gear change error during gutter selection process	-	X	X	-	Travel: if an error occurs during the shift, the gutter cylinder shifts back to the last gutter position and the transmission shifts back into the previous gear. If the transmission cannot shift back into the previous gear because of a overspeed condition, the transmission shifts to the next possible target gear, which is closest to the previous gear. If the transmission cannot shift to the highest possible gear because of an overspeed condition, the transmission shifts to neutral. Standstill: if the desired target position cannot be engaged, the transmission shifts to neutral. Renewed shifting of the starting gear must be activated via the travel switch.	Following successful selection process or ECU without power.
153	Selector cylinder does not activate	-	X	X	X	Travel and standstill: transmission shifts to neutral. Renewed gear shifting must be activated via the travel switch. If no gutter can be selected, further travel is not possible.	Following successful selection process or ECU without power.
154	Main transmission does not throw into gear	-	X	X	X	Travel: clutch engages in previous gear. The next shift attempt must be activated via the travel switch. Standstill: gear shifting is not allowed until the neutral signal has been achieved. Starting and travel can be attempted with the gear engaged, if the gear is equal to or lower than the lowest gear in GP "high".	Neutral position could be achieved or ECU without power.
155	Main transmission does not throw out of gear	-	X	X	X	Travel: repeat attempt to shift gear. Standstill: if the gear does not shift after various shift attempts, the gear will shift back to neutral. Repeat shift attempt.	Each HG gear could be reached or ECU without power.
156	Wrong gear shift	-	X	X	X	Automatic neutral shifting. Clutch remains disengaged if neutral cannot be shifted. Repeat shift attempt.	Correct gear shifting or ECU without power.
158	Shift sensor signal leaves engaged position during travel	X	X	X	-	Shift valves are re-activated in order to shift to the end position. If transmission was completely thrown out of gear, a suitable gear depending on the speed is automatically shifted.	Gear end position could be achieved or ECU without power
159	GP sensor signal leaves engaged position during travel	X	X	X	-	Shift valves are re-activated in order to shift to the end position. If transmission was completely thrown out of gear, a suitable gear depending on the speed is automatically shifted.	GP end position could be achieved or ECU without power
160	GV sensor signal leaves engaged position during travel	X	X	X	-	Shift valves are re-activated in order to shift to the end position. If transmission was completely thrown out of gear, a suitable gear depending on the speed is automatically shifted.	GV end position could be achieved or ECU without power
163	Engine does not react to engagement of torque (engine speed increase)	-	X	X	-	Travel: gear shifting blocked. Standstill: starting permissible. Clutch functionality and comfort are reduced.	Engine speed increase possible (check is automatically started each time, if transmission is in neutral) or ECU without power

164	“Engine torque (as a % of) drivers demand” signal error	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible. Errors 164 and 165 always occur together.	Following RESET when the error is no longer detected
165	“Accelerator pedal position “ signal error	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible. Errors 164 and 165 always occur together.	Following RESET when the error is no longer detected
166	Permanent idling signal	-	X	X	-	Travel: shifting permitted during travel. Standstill: no manoeuvring and starting possible. Further travel not possible.	ECU without power.
167	“Percent load at current speed” signal error	-	X	X	-	No further function restrictions.	Signal available or ECU without power.
169	Cut-off relay in ECU does not switch off	-	X	X	X	Further travel not possible.	ECU without power.
170	No voltage supply from terminal 30 or cut-off relay in ECU does not switch on	-	X	X	X	Further travel not possible.	ECU without power.
171	“Current percent engine torque” signal error	-	X	X	-	Travel: starting gear cannot be calculated. Current engine percent torque is replaced by driver’s demand message. Shift quality could be reduced. Standstill: starting possible. If vehicle comes to a standstill, middle starting gear is shifted. Clutch overload detection (“CL“) warning could appear earlier.	Signal available or ECU without power.
173	“Brake switch” signal error	-	X	X	-	It is assumed that foot brake is not active and consequently the clutch always disengages at foot brake-related engine speed (higher engine speed).	Signal available OR with falling signal edge or ECU without power.
174	“Kickdown switch” signal error	X	X	X	-	"Kickdown" type of operation not possible. No further function restrictions.	Signal available or ECU without power.
175	"Ignition lock" error (terminal 15)	-	X	X	-	Travel: gear shifting generally blocked, as soon as no "ignition on" signal is detected (error detection could be delayed). Standstill: if engine is running, ECU does not switch off. Starting gears can be shifted (forwards and reverse). Travel possible with selected starting gear. If engine is not running, the transmission automatically shifts to neutral and ECU does not switch off. System cannot be initialised. Further travel not possible.	If ignition signal is on (increasing signal edge) or ECU without power.

177	System CAN bus off error	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
179	CAN queue overrun	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
188	ECU fault – defective interrupt	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
189	ECU fault - stack watch	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
190	EOL EEPROM parameters outside the valid range	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
191	EOL EEPROM parameters checksum error	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
192	ECU fault – EEPROM access fault	-	X	X	-	Travelling resistance cannot be calculated. Starting gear cannot be automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	ECU without power and EEPROM can be read.
193	ECU temperature too high	-	X	X	X	Travel: gear shifting is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further gear shifting possible, further travel not possible. Display shows a special symbol for excessive ECU temperature, which alternates with the gear display. Further travel not possible.	ECU without power and ECU temperature below threshold value 1
197	“Front axle speed” signal error	-	X	X	-	Travelling resistance cannot be calculated. Starting gear cannot be automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	Signal available or ECU without power.
198	“Relative wheel speed” signal error	-	X	X	-	No further function restrictions.	Signal available or ECU without power.

216	IES: CAN _message ID512 (ABS/ASR control unit) timeout	-	X	X	-	Travelling resistance cannot be calculated. Starting gear cannot be automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	After receiving a correct message or ECU without power.
217	IES: CAN_message ID513 (ABS/ASR control unit) timeout	-	X	X	-	Travelling resistance cannot be calculated. Starting gear cannot be automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	After receiving a correct message or ECU without power.
218	IES: CAN_message ID592 (engine control unit) timeout	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
219	IES: CAN_message timeout	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
222	IES: CAN_message ID1104 (engine braking requirement of travel switch) timeout	-	X	X	-	Travelling resistance cannot be calculated. Starting gear cannot be automatically calculated. If vehicle comes to a standstill, middle starting gear is engaged. No further function restrictions.	After receiving a correct message or ECU without power.
223	IES: CAN_message ID1360 (engine control unit) timeout	-	X	X	X	Travel: gear shift is blocked. Standstill: clutch disengages when vehicle comes to a stop. When stopped, transmission automatically shifts to neutral. No further shifts possible. Further travel not possible.	Following RESET when the error is no longer detected
228	IES: plausibility error superstructure/carrier change-over	-	X	X	-	Carrier operation is accepted.	ECU without power.

Note:

- ISMA: Intelligent shift management (travel program)
- Error 166: in superstructure operation the error can also be caused by a short-circuit or interruption at EDM22 (superstructure idling signal).