ZF-ASTRONIC®

10 AS 2301
12 AS 2301, 16 AS 2601

Repair stages 1 - 2

1327 751 101

Subject to alterations in design

Printed in Germany

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1327 751 101

CAUTION
The ZF order numbers used in this publication apply for the ZF standard.
Deviations may occur depending on the vehicle manufacturer. The binding ZF order numbers are listed in the appropriate parts list - parts list no. can be found on the transmission type plate.

This manual is intended for skilled personnel trained by ZF FRIEDRICHSHAFEN AG to carry out maintenance and repair work on ZF products.

This manual deals with a ZF product in accordance with the state of development of test rigs on the date of issue.

However, due to continuing development of function test rigs, repair work might require work practices and test or adjustment data which are not contained in this manual.
We therefore recommend that work done on your ZF product is carried out only by skilled mechanics and fitters who have had their practical and theoretical knowledge updated on a regular basis at our After-Sales Service training courses.

Service points equipped by ZF FRIEDRICHSHAFEN AG all over the world offer you:

1. Well-trained personnel.
2. Specified equipment, e.g. specialized tools.
3. Genuine ZF spares, to our latest specifications.

All work performed in these service points is carried out conscientiously and with care.

Repair work carried out at ZF service points is guaranteed in accordance with the prevailing contractual conditions.

Damage resulting from work performed by non-ZF personnel in an improper and unprofessional manner, together with follow-on costs caused by such work, is excluded from the contractual warranty agreement. This also applies where genuine parts have not been used.

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SAFETY NOTICE

Companies repairing ZF units are responsible for their own work safety.

To avoid injury to personnel and damage to products, all safety regulations and legal requirements which apply to repair and maintenance work must be adhered to.
Before starting work, mechanics must familiarize themselves with these regulations.

Personnel required to carry out repairs on ZF products must receive appropriate training in advance. It is the responsibility of each company to ensure that their repair staff is properly trained.

The following safety instructions appear in this manual:

NOTE
Refers to special processes, techniques, data, use of auxiliary equipment, 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 or death.

GENERAL INFORMATION

Read this manual carefully before starting any tests or repair work.

CAUTION
Pictures, drawings and components do not always represent the original object, but are used to illustrate working procedures.
Pictures, drawings and components are not to scale. Conclusions about size and weight should not be drawn (even within a complete illustration).
Always follow the working steps as described in the text.

After completion of repair work and testing, skilled staff must satisfy themselves that the product is functioning correctly.

⚠ **THREATS TO THE ENVIRONMENT !**
Lubricants and cleaning agents must not be allowed to enter the soil, ground water or sewage system.

- **Ask your local environment agency for safety information on the relevant products and adhere to their requirements.**
- **Collect used oil in a suitably large container.**
- **Dispose of used oil, dirty filters, lubricants and cleaning agents in accordance with environmental protection guidelines.**
- **When working with lubricants and cleaning agents always refer to the manufacturer's instructions.**

CAUTION
The transmission must NOT be hung by the input shaft NOR by the output flange.

In case of doubt always turn to the relevant department within ZF After-Sales Services for advice.
All work on transmissions is to be performed expertly and under clean conditions.
Use specified tools to dismantle and assemble transmissions.

After removing the transmission from the vehicle, clean thoroughly with a suitable cleaning agent before opening.
Pay particular attention to the projections and recesses of housings and covers when cleaning.
Parts joined with Loctite are easier to separate if warmed with a fan heater.

CLEANING PARTS

Remove remains of old gaskets on all seal-faces. Carefully remove burrs or similar patches of roughness using an oil-stone.

Lube bores and grooves must be free of anti-corrosion agents and foreign matter; check for perfect passage.

Carefully cover opened transmissions to prevent foreign matter from entering.

REUSING PARTS

Parts such as ball or roller bearings, multi-discs, thrust washers etc., must be inspected by a competent person, who should decide whether or not they can be re-used. Replace parts which are damaged or have suffered from excessive wear.

GASKETS, LOCKING PLATES

Parts which cannot be removed without being damaged must always be replaced with new parts (e.g. gaskets and locking plates).

SHAFT SEALS

Always change shaft seals with rough, ripped or hardened packing washers. Seal contact surfaces must be totally clean and in perfect condition.

REWORKING

Rework may be carried out on seal contact surfaces using plunge-cut grinding only, never use an emery cloth. Ensure that there are no traces of grinding or riffling.

If rework is needed on distance washers, shims etc. because of clearance settings, ensure that the reworked areas contain no face runout and have the same surface quality.

TRANSMISSION ASSEMBLY

Find a clean site to assemble the transmission. Gaskets are installed without the use of sealing compound or grease. When measuring silicon-coated gaskets, take care **not to include the silicon layer in the measurement.**
During assembly, comply with all adjustment data, checking data and tightening torques in the Repair Manual.

BEARINGS

If bearings are mounted in heated condition, they are to be heated evenly (e.g. heating cabinet).
Temperature should be at ca. 85 °C and must not exceed 120 °C. Each mounted bearing must be oiled with operating oil.

SEALING

If a specific sealing agent* is to be used for sealing, comply with the manufacturer's directions for use.
Apply a thin layer of sealing agent to the surfaces and spread evenly. Do not allow sealing to enter oil ducts and bores. On oil-carrying ducts and bores, wipe off the sealing agent on the surfaces to be sealed near apertures to ensure that no sealing agent enters the oil feeds when the surfaces are sealed.

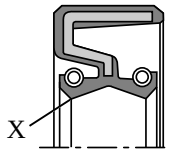
SHAFT SEALS

a) Apply a light coat of sealing agent* on outer edge of shaft seals with "steel surround".

b) **Never apply sealing agent** to shaft seals with "rubber surround", but apply a thin coat of Vaseline 8420 to the outer edge or wet with a lubricant, e.g. a water-soluble, concentrated washing-up liquid (e.g. Pril, Coin, Palmolive).

c) Shaft seals with steel and rubber surrounds should be treated on the outer edge of the rubber surround as described above in section b).

d) Dual shaft seals have two sealing lips. The dust-proof sealing lip (X) must face outwards.



e) Fill the gap between the sealing lips so it is 60% filled with grease (e.g. produced by Aral such as Aralub HL2 or by DEA such as Spectron FO 20).

f) If possible, heat shaft seal bores to between 40 and 50 °C (makes fitting easier). Press the seal shaft with mounting or faceplate onto the relevant installation depth plan.

RETAINING AGENTS

Retaining agents* may only be used in places as specified in the parts list.
Always comply with manufacturer's directions for use when using retaining agents (e.g. Loctite).
During assembly, comply with all adjustment data, checking data and tightening torques.

TRANSMISSION OIL

After completing repairs, fill transmissions with transmission oil. For the procedure and approved oils, refer to the transmission operating manual and List of Lubricants TE-ML (refer to identification plate) which are available from any ZF After-Sales Service Point. After filling the transmission with oil, tighten the screw plugs at the oil filling point and the oil overflow to the specified torques.

** refer to expendable material*

Tightening torques for nuts and bolts, extract from ZFN 148

This standard applies to bolts acc. to DIN 912, DIN 931, DIN 933, DIN 960, DIN 961 and to nuts acc. to DIN 934. This Standard contains data on tightening torques (M_A) for bolts and nuts in strength categories 8.8, 10.9 and 12.9 and nuts in strength categories 8, 10 and 12.

Surface condition of bolts: thermally blackened and oiled or galvanized and oiled or galvanized, chrome-plated and oiled.

Tighten screws with a calibrated torque spanner.

NOTE
Irregular tightening torques are listed separately in the Repair Manual.

Regular screw thread

Size	Tightening torque M_A (Nm) for		
Bolt	8.8	10.9	12.9
Nut	8	10	12
M 4	2.8	4.1	4.8
M 5	5.5	8.1	9.5
M 6	9.5	14	16.5
M 7	15	23	28
M 8	23	34	40
M 10	46	68	79
M 12	79	115	135
M 14	125	185	215
M 16	195	280	330
M 18	280	390	460
M 20	390	560	650
M 22	530	750	880
M 24	670	960	1100
M 27	1000	1400	1650
M 30	1350	1900	2250

Fine screw thread

Size	Tightening torque M_A (Nm) for		
Bolt	8.8	10.9	12.9
Nut	8	10	12
M 8 x 1	24	36	43
M 9 x 1	36	53	62
M 10 x 1	52	76	89
M 10 x 1.25	49	72	84
M 12 x 1.25	87	125	150
M 12 x 1.5	83	122	145
M 14 x 1.5	135	200	235
M 16 x 1.5	205	300	360
M 18 x 1.5	310	440	520
M 18 x 2	290	420	490
M 20 x 1.5	430	620	720
M 22 x 1.5	580	820	960
M 24 x 1.5	760	1100	1250
M 24 x 2	730	1050	1200
M 27 x 1.5	1100	1600	1850
M 27 x 2	1050	1500	1800
M 30 x 1.5	1550	2200	2550
M 30 x 2	1500	2100	2500

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Screw plugs DIN 908, 910 and 7604

The screw plug tightening torques M_A were determined according to DIN 7604 for screwing into steel, grey cast and aluminum alloys.
The values are based on experience and are intended as reference values for the fitter.
The values for the tightening torque M_A apply analogously for screw plugs according to DIN 908 and DIN 910, as the thread geometries are almost identical.
General rule: Screw/bolt class 5, ZFN 148-1
Screw/bolt material: steel acc. to DIN 7604. Surface condition: as manufactured (without surface protection) and lightly oiled or galvanized, chromated and lightly oiled.

Union screws DIN 7643

The tightening torques M_A were determined for screwing into steel, grey cast and aluminum alloys.
The values are based on experience and are intended as reference values for the fitter.

General rule: screw/bolt class 5, ZFN 148-1
Material: 9SMnPb28K acc. to DIN 1651
Surface condition: as manufactured (without surface protection) and lightly oiled or galvanized, chromated and lightly oiled

Screw plugs (DIN 908, 910, 7604)

Dimensions	Tightening torque screwed into	
	steel/gray cast	Al alloy
M 8 x 1	20	10
M 10 x 1	25 / 30*	15 / 20*
M 12 x 1.5	35	25
M 14 x 1.5	35	25
M 16 x 1.5	40	30
M 18 x 1.5	50	35
M 20 x 1.5	55	45
M 22 x 1.5	60 / 80*	50 / 65*
M 24 x 1.5	70	60
M 26 x 1.5	80 / 105*	70 / 90*
M 27 x 2	80	70
M 30 x 1.5	100 / 130*	90 / 130*
M 30 x 2	95	85
M 33 x 2	120	110
M 36 x 1.5	130	115
M 38 x 1.5	140	120
M 42 x 1.5	150	130
M 42 x 2	145	125
M 45 x 1.5	160	140
M 45 x 2	150	130
M 48 x 1.5	170	145
M 48 x 2	160	135
M 52 x 1.5	180	150
M 60 x 2	195	165
M 64 x 2	205	175

Union screws (DIN7643)

Pipe outer diameter	Thread	Tightening torque M_A in Nm
4 - 5	M 8 x 1	20 - 25
6	M 10 x 1	25 - 35
8	M 12 x 1.5	30 - 40
10	M 14 x 1.5	35 - 40
12	M 16 x 1.5	45
15	M 18 x 1.5	50
18	M 22 x 1.5	60
22	M 26 x 1.5	90
28	M 30 x 1.5	130
35	M 38 x 1.5	140

* DIN 7604 Form C

Status: October 1995

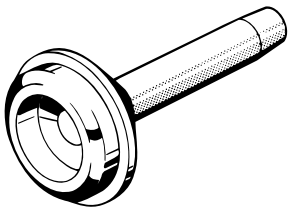
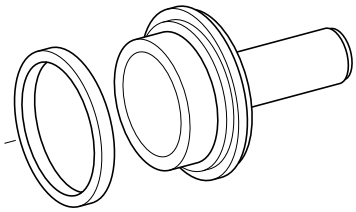
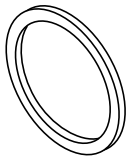
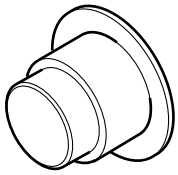
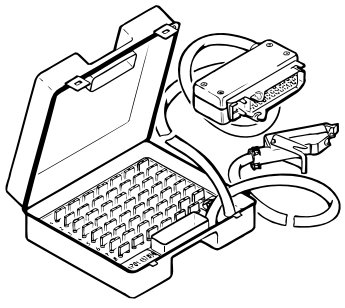
Fig. no.	Special tools	Order no. Application	Qty.	Remarks
1		**1X56 099 063** **Adapter** for shaft seal in release flange	1	
2		**1X56 137 124** **Adapter** for 105 x 125 x 12 shaft seal on output	1	
3		**1X56 138 189** **Spacer ring** (used in conjunction with adapter 1X56 137 124) for Intarder version 105 x 125 x 12 shaft seal on output	1	
4		**1X56 138 215** **Adapter** for shaft seal release fork	2	
5		**6008 006 002** **Terminal tester** 68-pin	1	35-pin terminal testers can also be used.

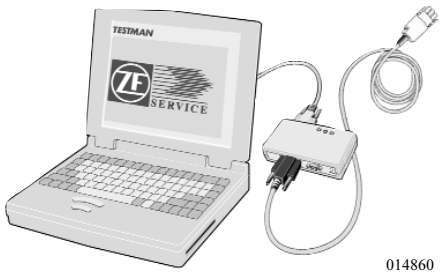
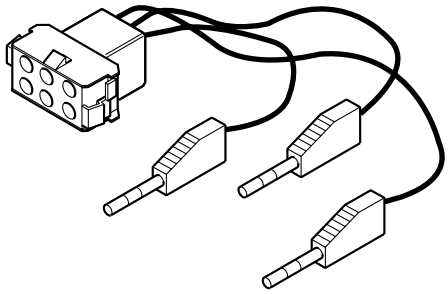
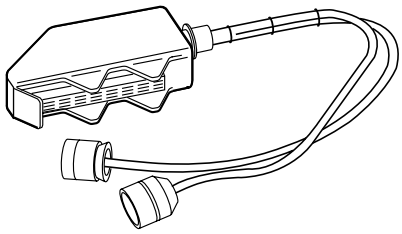
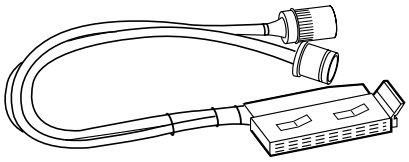
Fig. no.	Special tools	Order no. Application	Qty.	Remarks
6		**6008 208 003** **Testman diagnosis system** Contains: Testman software 6008 308 901 plus DPA 04i adapter 6008 308 600 plus connection cable 6008 308 601 to PC or laptop plus connection cable DPA04i to control unit 0501 211 103	1	
7		**Application** **6008 308 019 D** **6008 308 119 GB** **6008 308 219 F** **6008 308 319 E** **6008 308 419 I**	1	
8		**6008 307 025** **Diagnosis adapter** (universal) used in conjunction with 68-pin terminal tester 6008 006 002	1	
9		**6008 206 013** **Adapter cable, 35/68-pin** used in conjunction with 35-pin or 68-pin terminal tester (the 35-pin terminal tester **1P01 137 365** is no longer produced)	1	
10		**6008 206 006** **Adapter cable** 18/20/68-pin bush for 68-pin terminal tester 6008 006 002	1	

Fig. no.	Special tools	Order no. Application	Qty.	Remarks
11		**6008 206 007** **Adapter cable** 18/20/68-pin connector for 68-pin terminal tester 6008 006 002	1	

Diagnosis in vehicles with ZF standard software

System errors are shown on the display.

If a "Spanner symbol" appears in the display, there is a system error. It is possible that the vehicle may only be driven with limited function.
For example:
Automatic drive mode is deactivated when certain system errors arise and the transmission system remains in manual drive mode.

If "STOP" and the "Spanner symbol" appear in the display, there is a serious system error. The vehicle must not be driven. The vehicle usually has to be towed away.

Calling up of error numbers:*
- Switch on ignition
- Turn rotary switch to "N"
- Hold selector lever in "+" position

The number displayed refers to the error number.

If in a two-digit display, 4 bars are shown in additional to the number displayed, this means: error no. + 100
e.g.: error no. 74
error no. 174

The error number can be decoded using the error list.

The error message and the resultant error response can be deleted via "Ignition off" (wait until the display goes out).
If the display does not go out after "Ignition off", shut down the system via the main battery switch.

Error list
Key to error list
ABS: Antilock Braking System
ASR: Anti-Slip Control
CAN: Electronic data transfer system
ECU: Electronic transmission control
EDC: Electronic engine control
GP: Range change group
GV: Splitter group
MV: Solenoid valve

ISMA: Automatic
Journey may be continued in automatic mode: yes / no

RESET:
Switch off ignition with vehicle at standstill and wait until the display goes out.
Then turn on ignition.
If the error is still present, a diagnosis must be created.

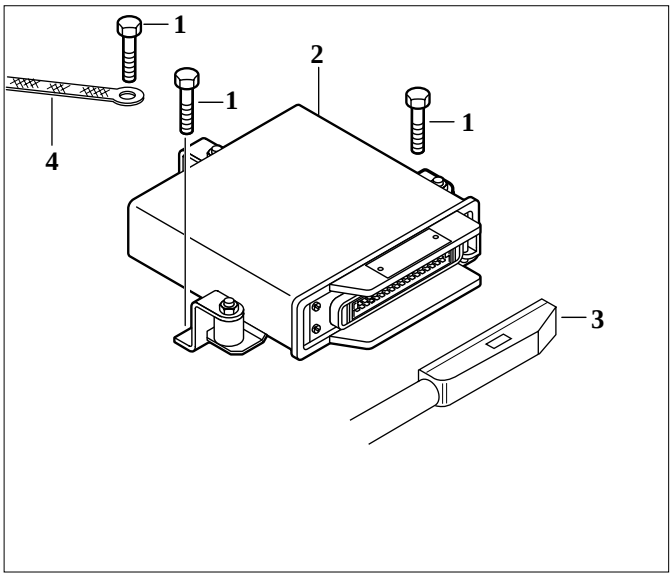
* also refer to operating manual of vehicle manufacturer.

1 E module*

(ZF no. 6041 322 033)

NOTE
The E module is located in the vehicle's E box.

CAUTION
Only work on the E module if the ignition is off.



014 700

1.1 Removal

1 Pull 35-pin connector **(3)** out of E module **(2)**.

2 Remove 3 bolts **(1)** and earth strap **(4)**.

1.2 Fitting

Installation instructions:
The E module housing must be connected with the chassis strap via an earth strap. The E module must be installed in a protected place in accordance with the approved installation points.

1 Screw on E module **(2)** and earth strap **(4)**. Tighten M5 bolts **(1)** to 5.5 Nm.

2 Snap connector **(3)** onto E module **(2)**.

CAUTION
Fit connector without tightening the cable and check detent.

1.3 Changing the connector

If the connector has to be changed, please use the standard AMP tool.

For *wiring diagram,* refer to parts list.

* depending on parts list

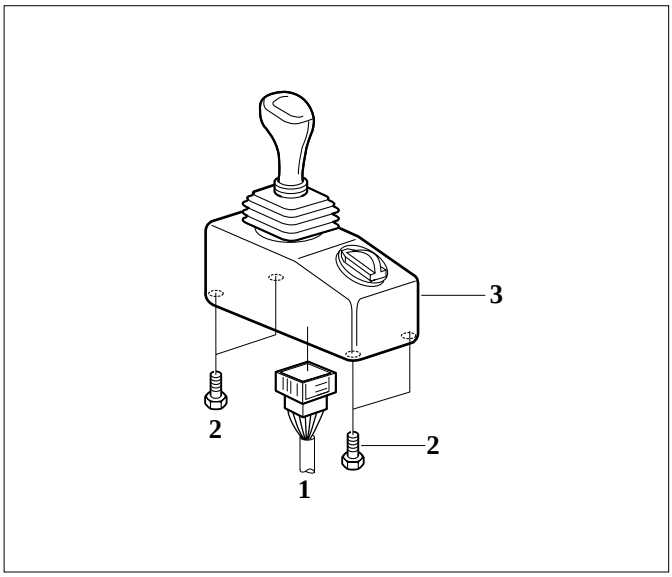
2 Range selector
(ZF no. 6006 029 018)

CAUTION
Only work on the range selector if the ignition is off.

2.1 Console range selector

2.1.1 Removal

1 Pull out connector **(1)** and remove 4 M8 bolts **(2)**.



014 650

2.1.2 Fitting

1 Snap in connector **(1)**.

2 Use 4 M8 bolts **(2)** to secure console range selector **(3)**.
M8 tightening torque = 23 Nm

CAUTION
Fit connector without tightening the cable and check detent.

2.1.3 Changing the connector

If the connector has to be changed, please use the standard AMP tool.

For *wiring diagram* 6006 700 579, refer to Annex.

2.2 Steering column range selector*

2.2.1 Removal

1 Pull connector **(4)** out of wiring harness and remove 2 M5 bolts **(5)**.

2 Remove 4 M4 bolts **(6)** from rotary switch **(8)** and pull connector **(7)** off wiring harness.

2.2.2 Fitting

1 Snap connector **(7)** into wiring harness and use 4 M4 bolts **(6)** to secure rotary switch **(8)**.
M4 tightening torque = 2.8 Nm

2 Snap connector (4) into wiring harness and use 2 M5 bolts **(5)** to secure steering wheel column **(9)**.
M5 tightening torque = 5.5 Nm

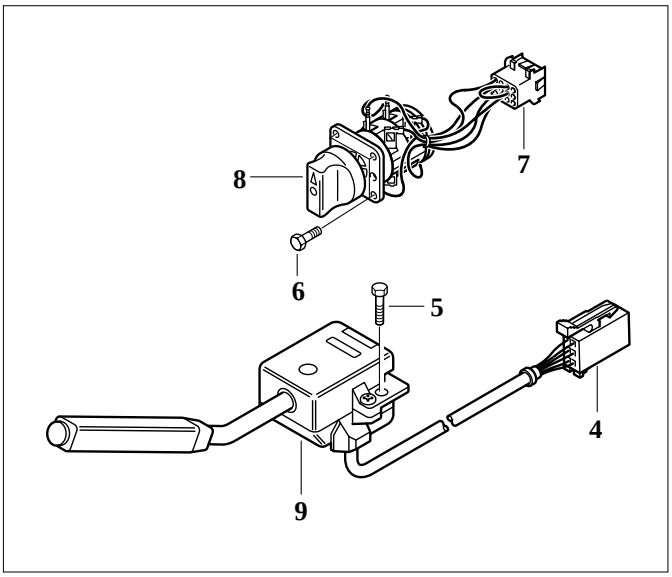
CAUTION
Fit connector without tightening the cable and check detent.

NOTE
Other components (e.g. brake stage switch) must still be accessible.

2.2.3 Changing the connector

If the connector has to be changed, please use the standard AMP tool.

For *wiring diagram*, refer to parts list.



014 652

- *Steering column range selector (9),*
  ZF no. 0501 211 185
  Wiring diagram: 0501 211 185 refer to Annex

- *Rotary switch (8) ZF no. 6006 199 031*
  Wiring diagram: 6006 700 586 refer to Annex

- *Version EVOBUS*
  ZF no. 6006 199 030
  A separate rotary switch and a separate range selector 6006 235 012

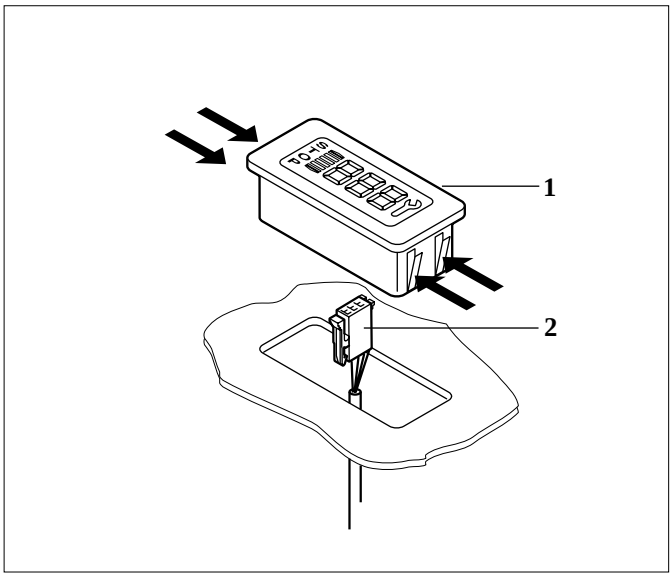
* Special version

3 Display

ZF display 0501 211 422 capable of CAN

CAUTION
Only work on the display if the ignition is off.

NOTE
The display must be accessible from below.



014 651

3.1 Removal

1 Pull connector **(2)** off display.
Press on retaining clamps (see arrow) and move display **(1)** upwards.

3.2 Installation

1 Slide display **(1)** into aperture.

CAUTION
Fit connector (2) without tightening the cable and check detent.

3.3 Wiring diagram

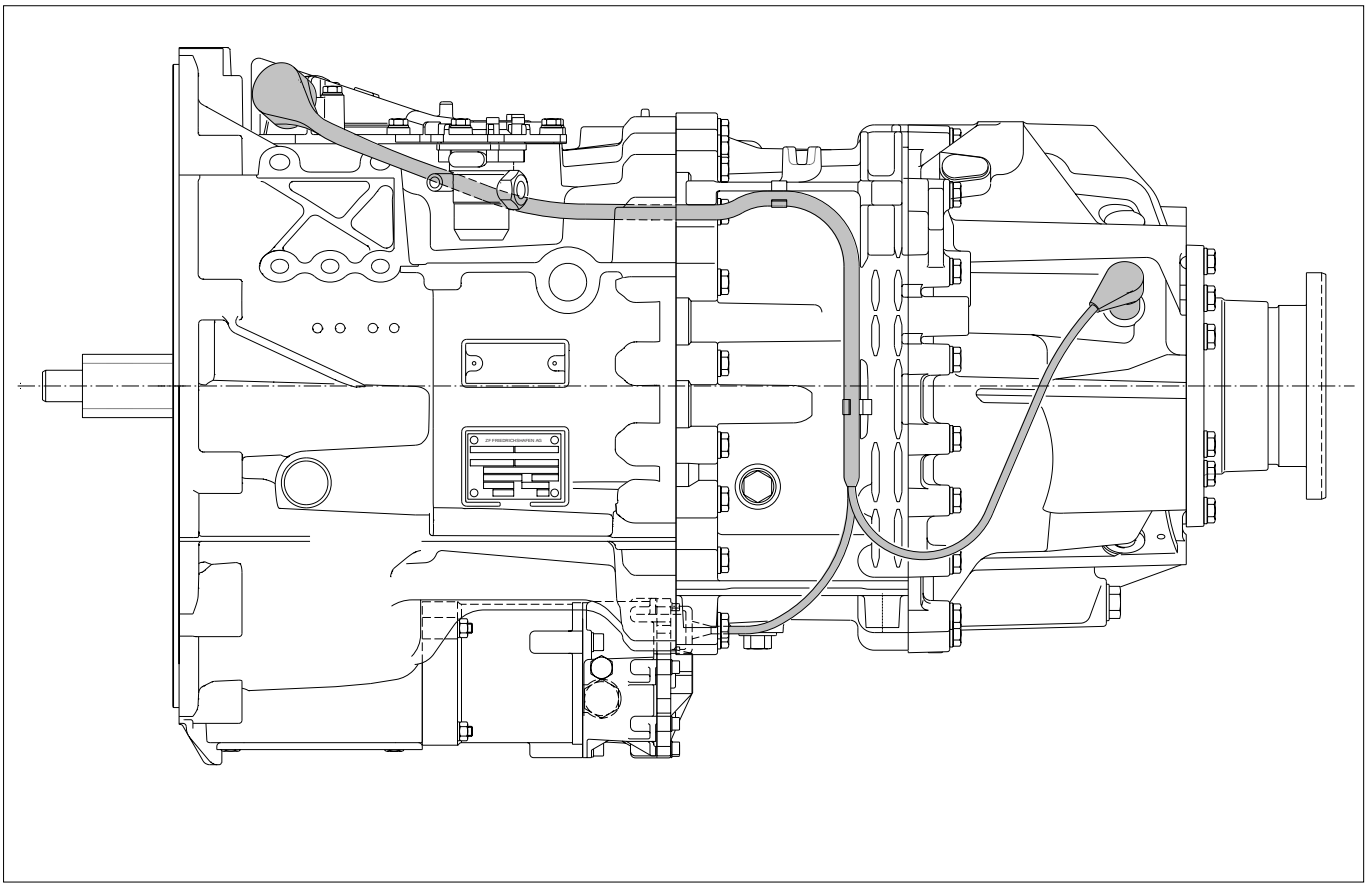
0501 211 422, refer to Annex

Connector arrangement
PIN 1: 58 (light on / off) on = GND
PIN 2: AD (piezo) I_{max} = 200 mA
PIN 3: 58d (light dimmed) on = VP
PIN 4: SD (ZF-BUS)
PIN 5: CAN H
PIN 6: VW (GND)
PIN 7: CAN L
PIN 8: VP (batt): 9 V.....32 V
Max. current capacity 60 mA
Type of protection: IP54 at front, IP30 at rear

3.3.1 Changing the connector

If the connector has to be changed, please use the standard AMP tool.

For vehicle-specific *wiring diagram*, refer to parts list.



014 699

4 Wiring harness (central wiring)

Standard (20-pin) *0501 006 958*
Special version (18-pin) *0501 006 959*

CAUTION
Only work on the wiring harness if the ignition is off.

4.1 Removal

1 Disconnect all plug connections.

2 Remove wiring harness from cable clamps.

4.2 Fitting

CAUTION
- **Do not bend wiring harness and do not tighten the cable.**
- **Avoid chafing points.**
- **Fit connector without tightening the cable and check detent.**

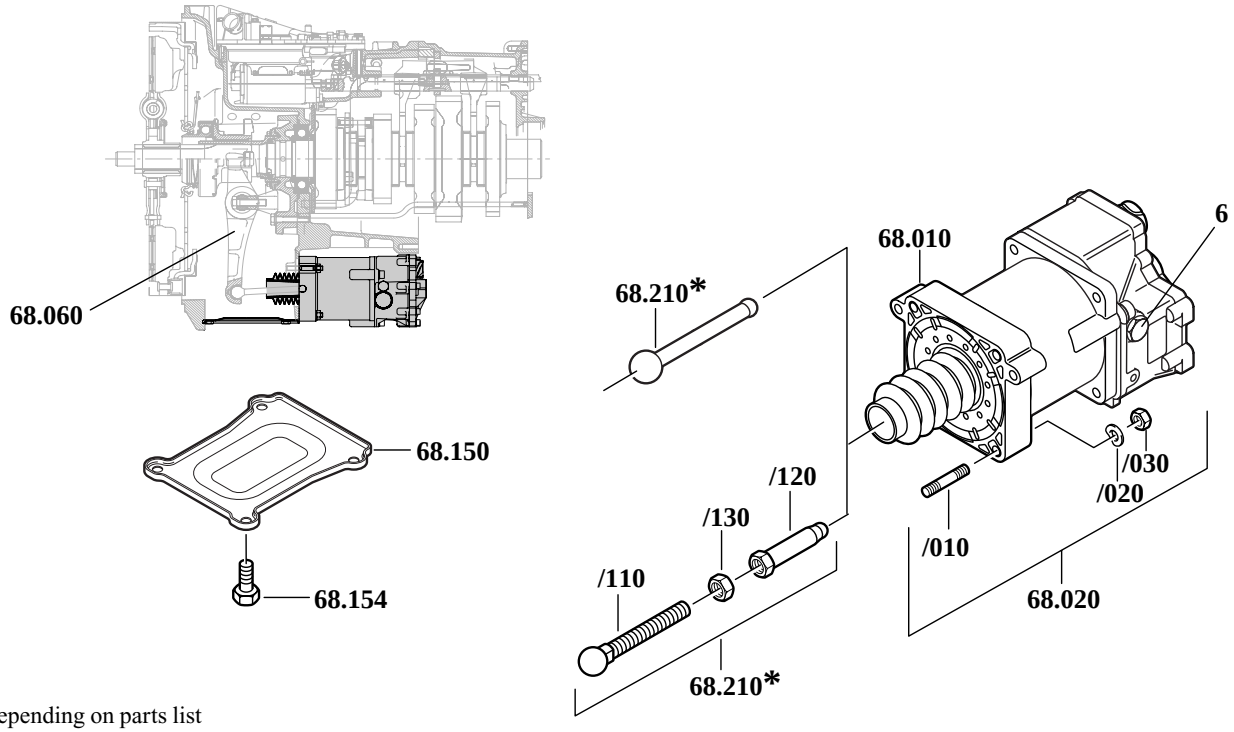
1 Press wiring harness into cable clamps.

2 Reconnect all connectors.

4.3 Vehicle connectors

Standard version
20-pin connector

Special version
Transmission actuator with cable tip.
18-pin connector



* depending on parts list

014703

5 Clutch actuator

ZF no. 0501 211 799

5.1 Removal

1 Remove 4 M8 hex nuts **(/030)** with washers **(/020)** and take off clutch actuator **(68.010)**.

2 Remove 4 M8 hex bolts **(68.154)** and take off cover **(68.150)**.

3 Take thrust rod **(68.210)** totally out of release fork **(68.060)**.

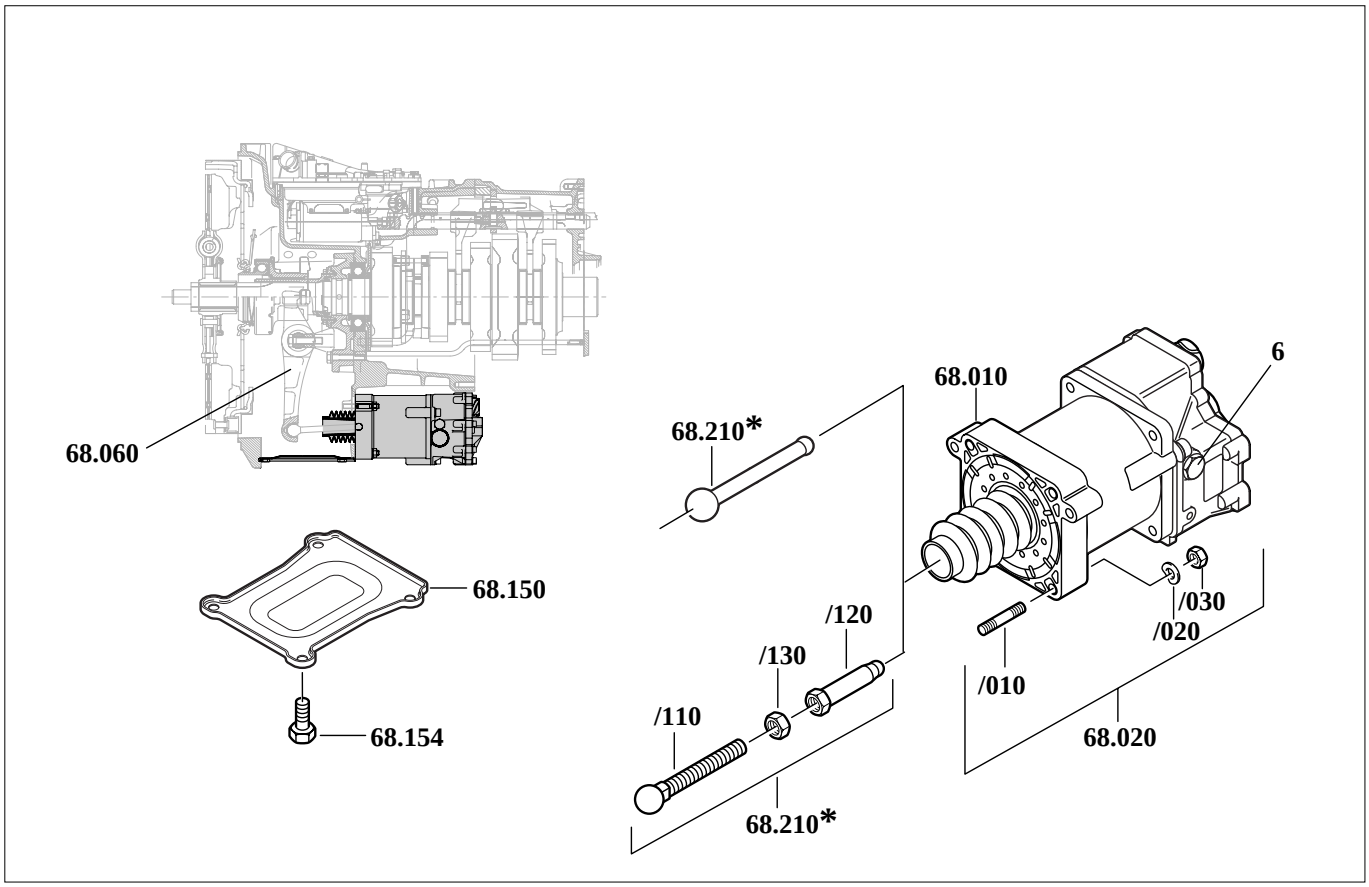
5.2 Thrust rod

Length of thrust rod **(68.210)** depends on parts list version:

ZF no.	*Length in mm*
1328 302 026	*111.6*
1328 302 033	*119.1*
1328 368 003	*127.1*
1328 368 004	*133.6*

Name	*ZF no.*
Cpl. thrust rod ***(68.210)***	*1314 268 002*
(can be set variably)	
Ball pin (/110)	*1314 368 008*
Thrust rod (/120)	*1314 368 004*
Hex nut (/130)	*0637 002 051*

Set thrust rod to dimension (for installation dimensions, refer to parts list) and tighten hex nut **(/130)** to 52 Nm.



014 703

5.3 Fitting

1 Insert thrust rod **(68.210)** in pan of release fork **(68.060)**.
Use 4 M8 hex nuts **(/030)** to secure clutch actuator (**68.010)** and 4 washers **(/020)**.
In so doing, check that the connections are in the correct position and that the thrust rod **(68.210)** is seated correctly in the release fork and clutch actuator.
Tightening torque
Hex nut **(/030)** M8 = 23 Nm
Dowel pin **(/010)** M8 = 10 Nm

2 Use 4 M8 hex bolts **(68.154)** to secure cover **(68.150)**.
M8 tightening torque = 23 Nm

Bleeding clutch actuator
Unfasten M12x1.5 bolt **(6)**.
If the seal on the bolt is torn, replace the seal.
Retighten bolt **(6)** to 22 Nm.

6 Changing the driver disc (not within ZF's scope of supply)

If the driver disc is changed, the following should be noted:

- The input shaft spline should be coated with grease OLISTA LONGTIME 3EP (ZF no. 0671 190 050).

6.1 Fitting engine, clutch and transmission

NOTE
The release bearing is fitted when the transmission is delivered or supplied. The transmission is in neutral or the highest gear.

1 Fit clutch disc and pressure plate (use a mandrel to centre pressure plate).

2 Insert input shaft spline into mating teeth inside clutch disc.

3 Screw transmission to engine.

4 Bleed clutch actuator (refer to chapter 5).

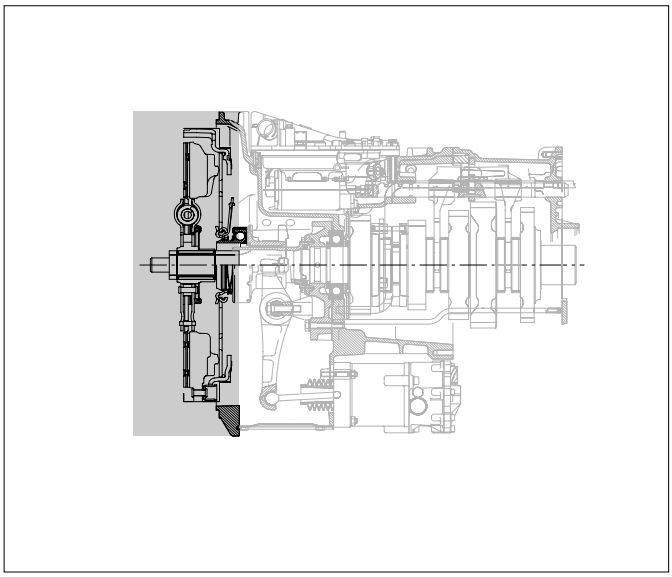
5 Press release bearing forwards (engine side) so that the clutch snaps into the snap-on ring of the release bearing.

NOTE
This is done by using a small lever to press down the lower end of the release fork (transmission side). Pass lever through aperture in transmission bell housing to reach the release fork.

CAUTION
Do not damage the pressure plate.

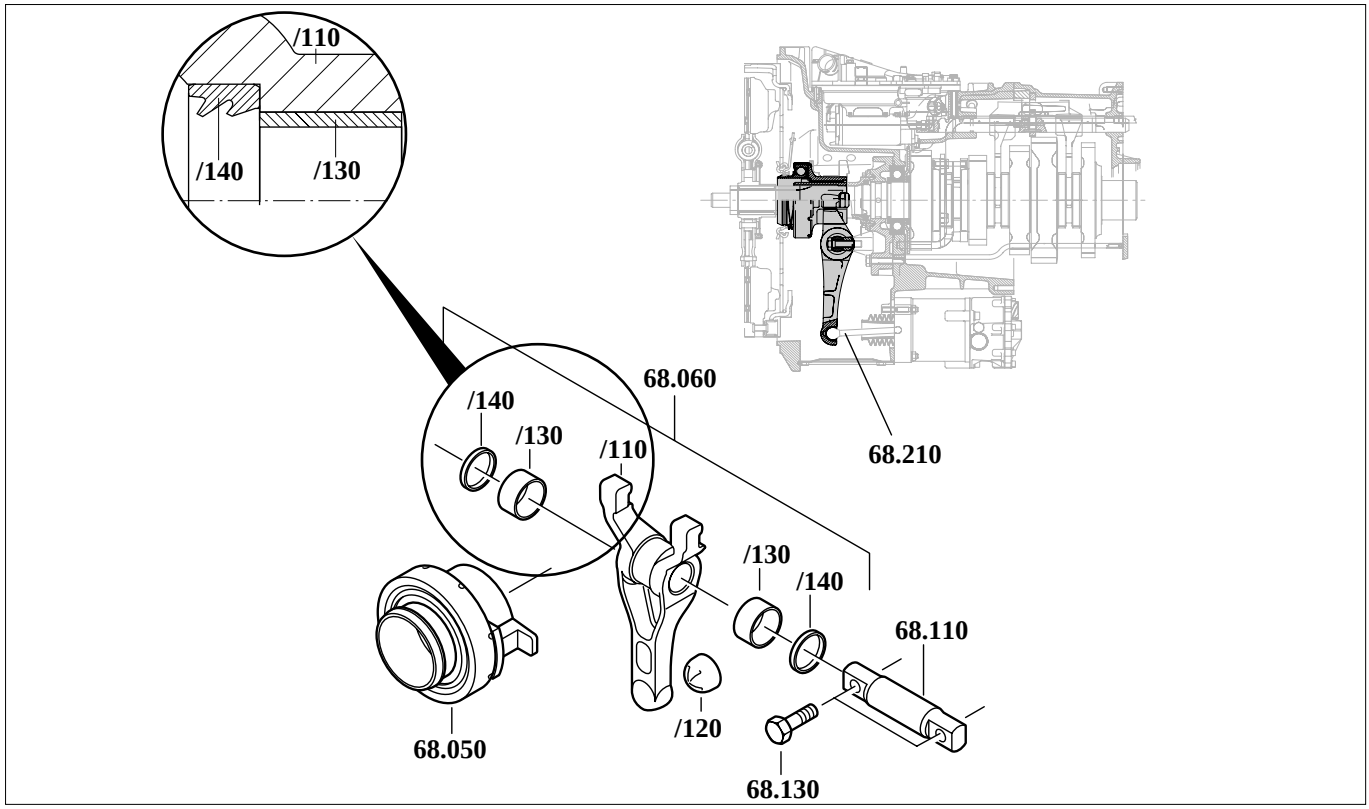
6 Insert thrust rod.

7 Close aperture on transmission bell housing (refer to chapter 5).



014 794

WARNING
The driver disc, pressure plate and friction lining form part of the customer specification (contained within parts list).
The shift program software is co-ordinated to the characteristics of the clutch components.
If components are modified contrary to the customer specification, this will lead to impaired clutch characteristics and/or component damage.



014 702

7 Clutch release device

7.1 Removal of release fork

1 Remove 2 M12 hex bolts **(68.130)** from release shaft **(68.110)**.

2 Take release bearing **(68.050)** and release fork **(68.060)** off input shaft.

3 Slide release shaft **(68.110)** off release fork **(68.060)**.

4 Dismantle release fork **(68.060)**.
Use suitable tool to remove shaft seal **(/140)** and bush **(/130)**. Replace ball cup **(/120)** if damaged or worn.

7.2 Fitting release fork

1 Assemble release fork **(68.060)**.
An adapter **1X56 138 215** is required as support for the release fork. The other two adapters **1X56 138 215** are used to press the two bushes **(/130)** into the release fork **(/110)** until flush.

NOTE
The shaft seals on the outer edge are coated with spirits.

2 Use adapter **1X56 138 215** to drive both shaft seals **(/140)** fully home.
Grease sealing lip of shaft seal **(/140)** with OLISTA LONGTIME 3EP (ZF no. 0671 190 050).

3 Guide release shaft **(68.110)** into release fork **(68.060)** and take care not to damage the shaft seals.

4 Position release bearing **(68.050)** on release flange. **Do not grease sliding seat between release bearing and release flange.**

5 Grease locating faces between release fork **(68.060)** and release bearing **(68.050)** with OLISTA LONGTIME 3EP (ZF no. 0671 190 050). Mesh release fork **(68.060)** with release bearing **(68.050)**.
Check that thrust rod **(68.210)** is seated correctly.

6 Use 2 M12 hex bolts **(68.130)** to secure release shaft **(68.110)** to housing I.
M12 tightening torque = 79 Nm

8 Transmission actuator

20-pin standard version : 6009 074 900
Special 18-pin version : 6009 074 901
The ZF numbers listed above contain :
transmission actuator, gasket and vent.

CAUTION
Only work on the transmission actuator if the ignition is off.

8.1 Removal

CAUTION
If vehicle-specific parts need to be removed (e.g. fuel pump, exhaust pipe or steering pump), please contact the vehicle manufacturer.

1 Disconnect the electrical plug connections on the transmission actuator.
Remove compressed air line from transmission actuator.

2 Remove vent **(74.120)** from transmission actuator **(74.030)**.

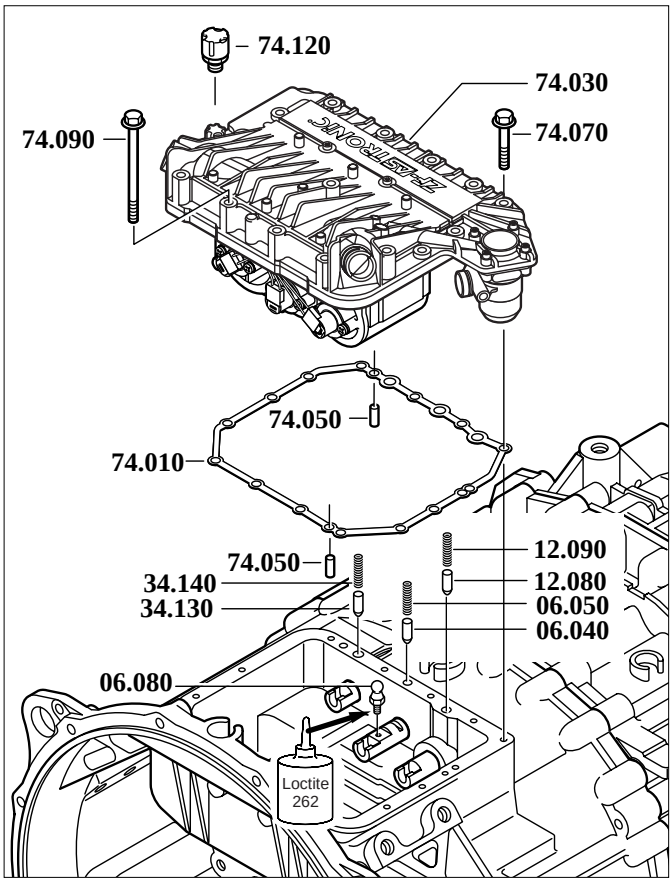
3 Remove 15 M8 hex bolts **(74.090 ; 74.070)** from transmission actuator **(74.030)**.

4 Remove transmission actuator from transmission housing.

5 Remove the compression springs **(06.050 ; 34.140** and **12.090)** and detent pins **(06.040 ; 34.130** and **12.080)**. Replace the 2 cylindrical pins **(74.050)** if damaged.

6 Remove gasket **(74.010)** and clean sealing faces on transmission housing and on transmission actuator.

NOTE
A transmission actuator kit is available. This consists of transmission actuator **(74.030)**, gasket **(74.010)** and vent **(74.120)**.



015 166

8.2 Installation

CAUTION
If the transmission actuator is changed, the following should be noted.

- **Re-program the transmission actuator.**
- **Transfer vehicle parameters from removed transmission actuator or re-enter them.**
- **Transfer the position (installation dimensions) of the piston rods from the removed transmission actuator to the actuator to be installed.**

1 If the ball pin is changed, coat thread of ball pin **(06.080)** with **Loctite no. 262**. Tighten ball pin to 23 Nm.

2 Place new gasket **(74.010)** on transmission housing.

3 Insert the detent pins **(06.040 ; 34.130** and **12.080)** and compression springs **(06.050 ; 34.140** and **12.090)**.

4 Fit transmission actuator **(74.030)**. When fitting, ensure that the piston rods of the transmission actuator mesh in the shift rails of the transmission.

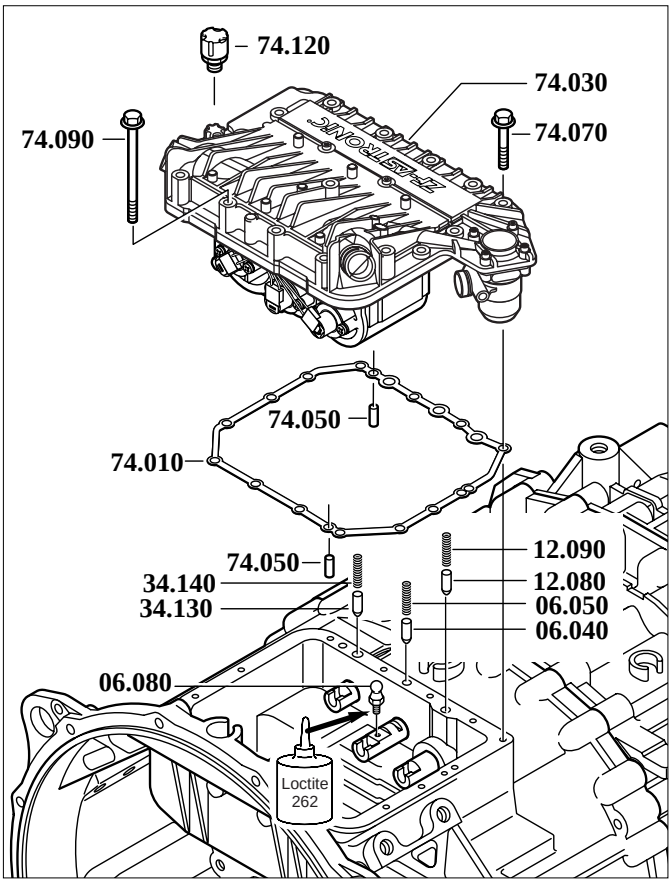
5 Tighten 6 M8x70 hex bolts **(74.090)** and 9 M8x45 hex bolts **(74.070)** to 23 Nm.

6 Tighten vent **(74.120)** to 10 Nm.

7 Connect air line to pressure limiting valve of transmission actuator.

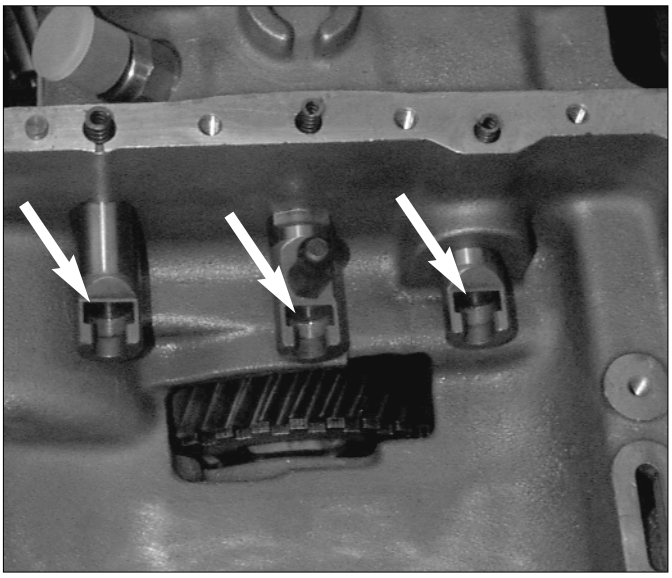
8 Reconnect transmission and vehicle wiring harness. If this is not done, the function test cannot be conducted.

NOTE
Use diagnosis device to check transmission actuator before the vehicle-specific parts are refitted.



015 166

Warning when changing transmission actuator.
Replace old generation with new generation
6009 374 025 with 6009 374 040 (20-pin) or
6009 374 026 with 6009 374 041 (18-pin)
The GP detent compression spring **(34.140)**
0732 042 679 (41 mm) should also be replaced with
0732 042 766 (approx. 10 mm longer).



015 019

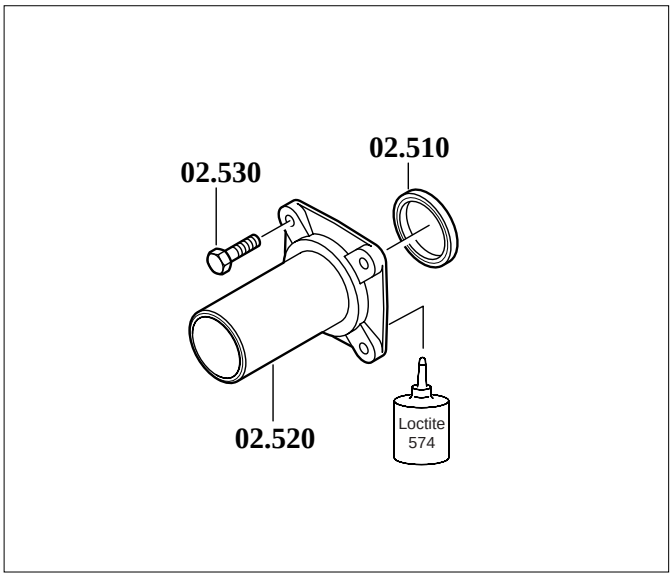
9 Changing input shaft seal

9.1 Removal

1 Remove clutch release device as specified in chapter 7.

2 Remove 4 M8 hex bolts **(02.530)** from release flange **(02.520)**. Lift off release flange.

3 Use suitable tool to remove shaft seal **(02.510)**.



015 856

9.2 Fitting

NOTE
- Coat outer edge of shaft seal with spirits.
- Sealing lip must face inside of transmission.

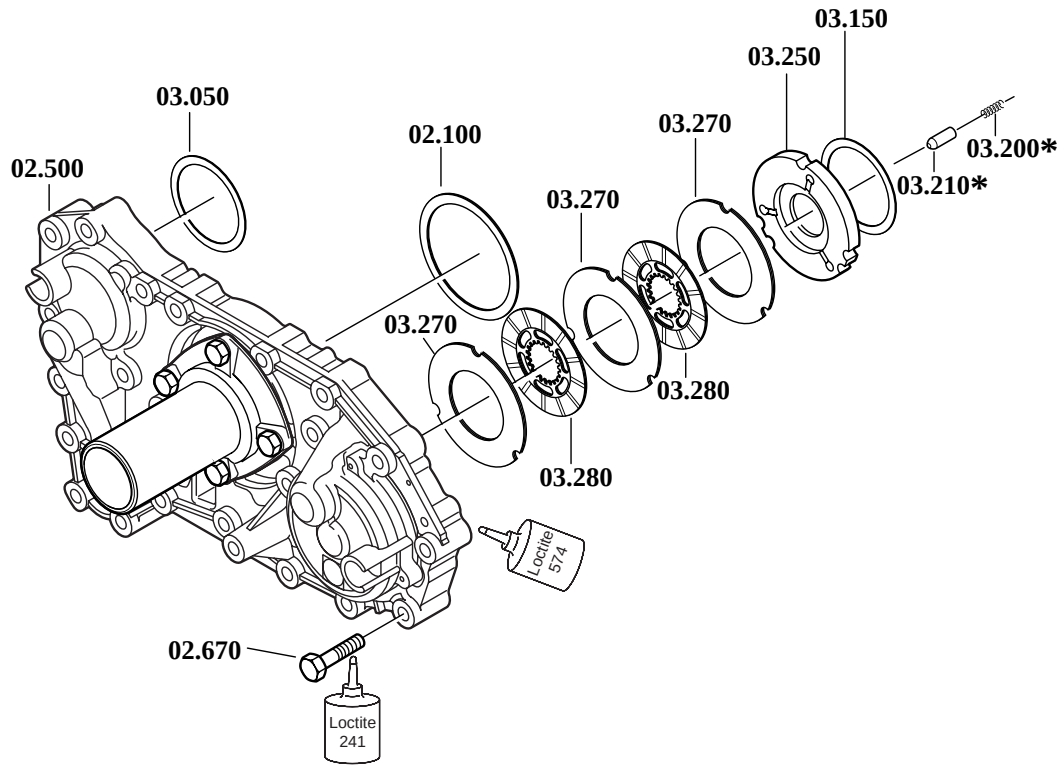
1 Use tool **1X56 099 063** to press shaft seal **(02.510)** firmly home into release flange **(02.520)**. Coat sealing lip of shaft seal with grease.

2 Coat sealing face on release flange **(02.520)** with **Loctite no. 574**.

NOTE
Sealing faces must be clean and free of oil and grease.

3 Use 4 M8 hex bolts **(02.530)** to secure release flange **(02.520)**.
M8 tightening torque = 23 Nm

4 Fit clutch release device, as specified in chapter 7.



* depending on parts list

014 737

10 Changing transmission brake

10.1 Removal

1 Remove clutch release device as specified in chapter 7.

2 Remove 22 M10 hex bolts **(02.670)**.

3 Use suitable tool to lift off connection plate **(02.500)**.

NOTE
It is easier to lift off the connection plate if the release flange **(02.520)** is not removed. If the flange is removed, the connection plate tends to tilt.

4 Leave shims **(03.050 ; 02.100** and **03.150)** on the bearings and do not remove them. Shims **03.050** and **03.150** must not be confused with one another.

5 ***Do not use compressed air*** to remove brake cover **(03.250)** from connection plate (risk of accident) but knock out instead. Remove discs **(03.270** and **03.280)**.

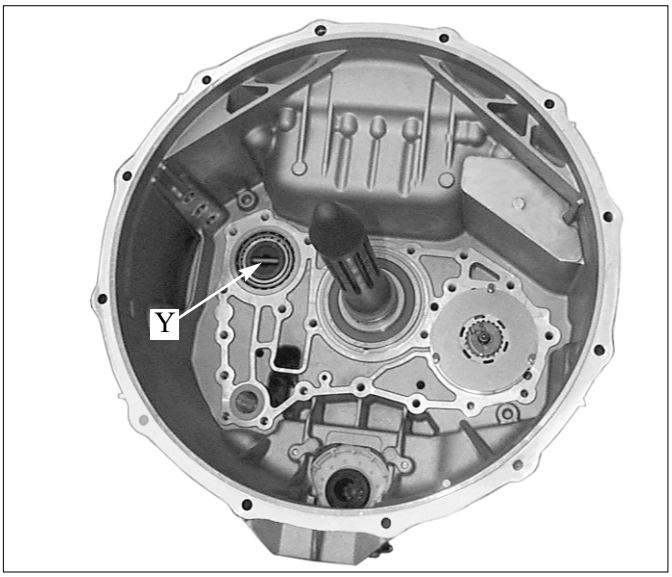
CAUTION
The number of discs (03.270 and 03.280) depends on the parts list.

10.2 Fitting

1 Place brake cover **(03.250)** on the housing sealing face. The 3 ducts of the brake cover **(03.250)** should face the disc pack.

2 Fit outer discs **(03.270)** and inner discs **(03.280)** in accordance with parts list.

NOTE
The sealing faces and the M10 threaded bores in the transmission housing must be clean and free of oil and grease.

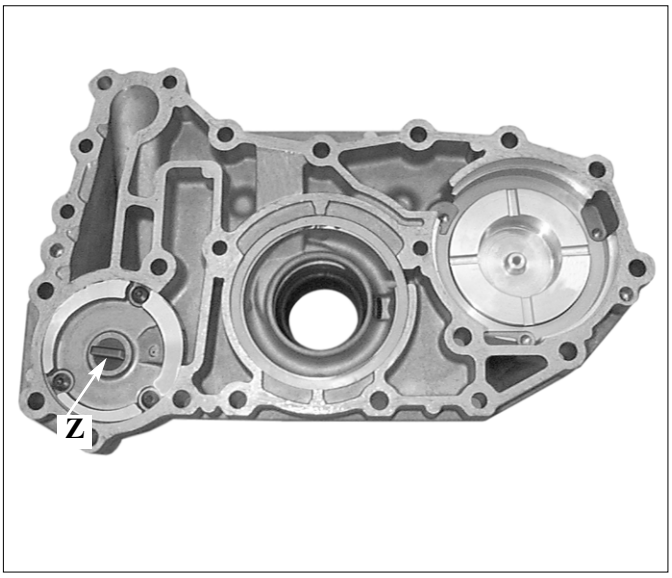


014 819

3 Coat sealing face of connection plate **(02.500)** with **Loctite no. 574**.

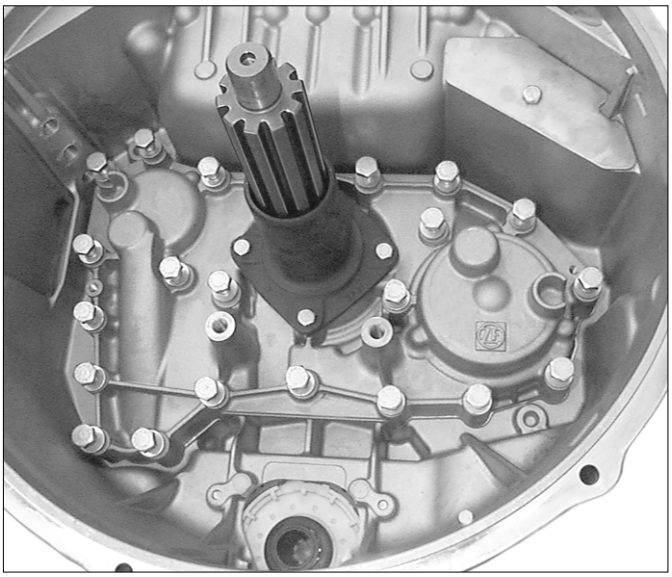
NOTE
The shims **(03.050, 02.100** and **03.150)** must lie correctly on the outer bearing races.

4 Carefully move connection plate **(02.500)** over input shaft onto transmission housing. Align the pump driver **(Z)** ensuring that it meshes in the countershaft groove **(Y)**.



014 820

5 Coat 22 M10x60 hex bolts **(02.670)** with **Loctite no. 241** and tighten to 50 Nm.



014 821

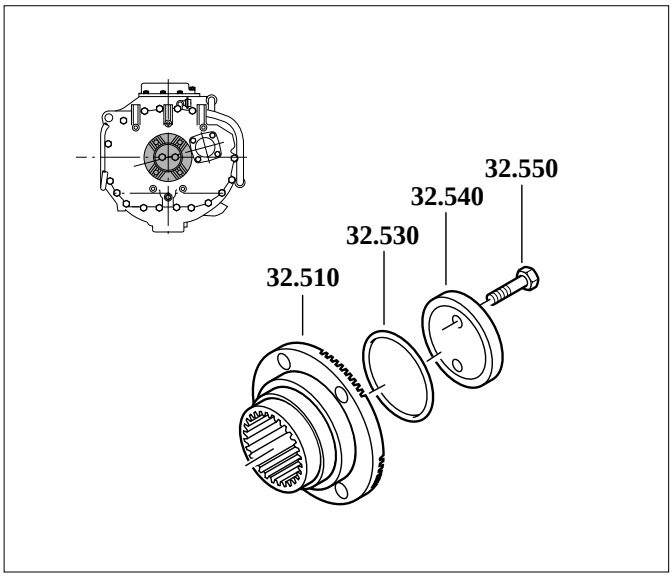
11 Output flange

11.1 Removal

1 Remove 2 hex bolts **(32.550)** and washer **(32.540)**.

2 Use standard two-armed extractor to pull off output flange **(32.510)** and remove O-ring **(32.530)**.

NOTE
During extraction process, use an intermediate piece **1X56 138 191** to protect the shaft.

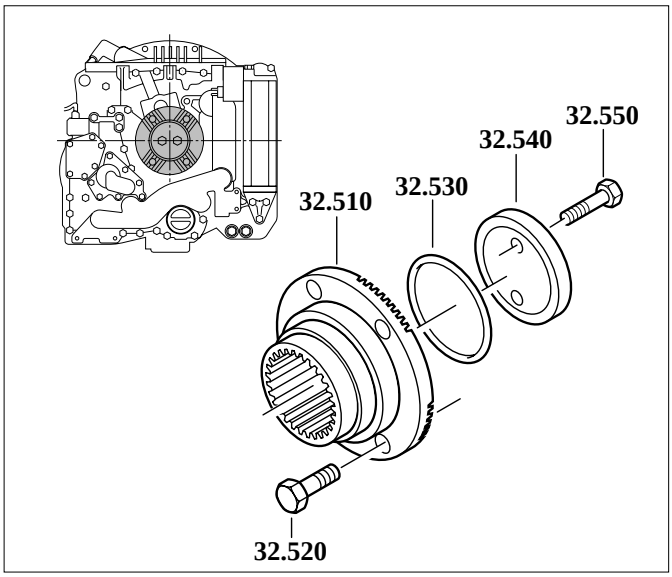


015 171

11.2 Fitting

1 Heat output flange **(32.510)** to max. 70 °C and slide onto spline of planetary carrier until firmly home. When using the Intarder version, ensure that the bolts* **(32.520)** are inserted.

⚠ DANGER
Only ever touch heated output flange when wearing protective gloves.



015 169

2 Once the output flange has cooled, insert O-ring **(32.530)** in groove between shaft and output flange.

3 Use 2 M12 hex bolts **(32.550)** to secure washer **(32.540)**.
M12 tightening torque = 120 Nm

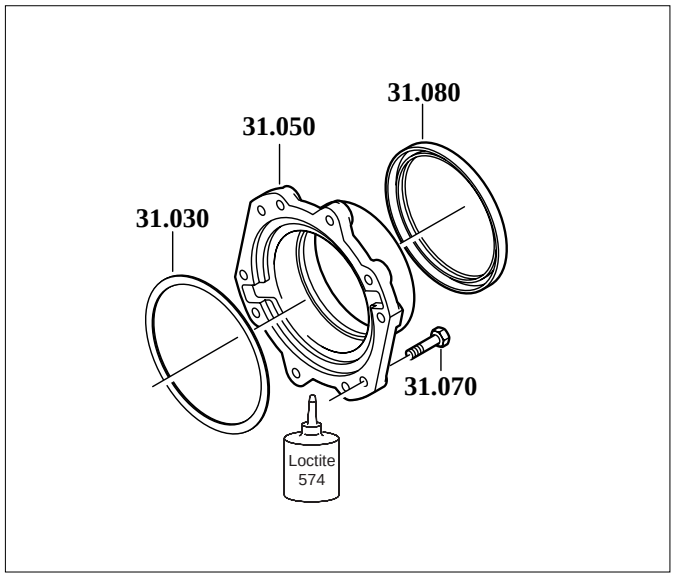
* depending on parts list

11.3 Removing output cover

1 Remove 10 M10 hex bolts **(31.070)** and lift off output cover **(31.050)**.

2 Take off shim **(31.030)**.

3 Use suitable tool to remove shaft seal **(31.080)**. When removing seal ensure that output cover is not damaged.



015 170

11.4 Fitting output cover

1 Coat outer edge of shaft seal **(31.080)** with spirits and use adapter **1X56 137 124** and ring **1X56 138 189** to press into output cover **(31.050)** until firmly home. Lightly grease sealing lip.

2 Coat sealing face of output cover with **Loctite no. 574**.

NOTE
Sealing faces must be clean and free of oil and grease.

3 Fit output cover **(31.050)** with shim **(31.030)**.

4 Tighten 10 M10 hex bolts **(31.070)** to 46 Nm.

12 Output speed sensor (impulse sensor) Depends on vehicle manufacturer

12.1 Removal

1 Pull out connector.

2 Remove impulse sensor **(31.260)**.

12.2 Fitting

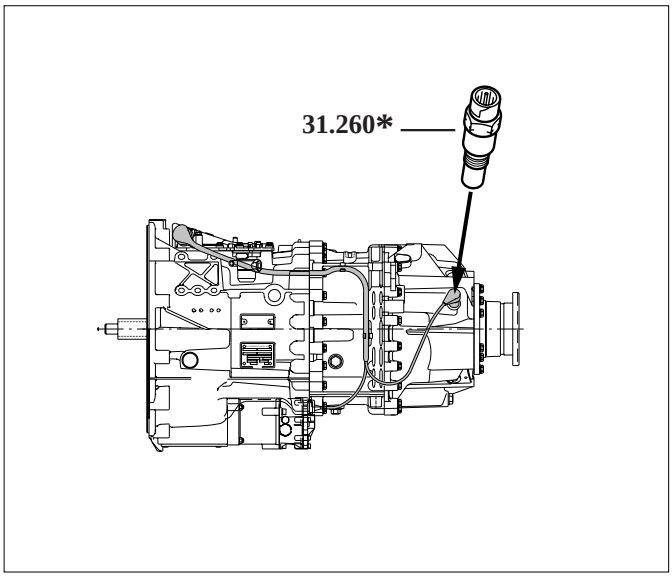
CAUTION
– Fit connector without tightening the cable and check detent.
– The impulse sensor may be confused with another type, therefore check the ZF number.

1 Screw in impulse sensor **(31.260)**.
(No setting is required)
Tightening torque = 45 Nm

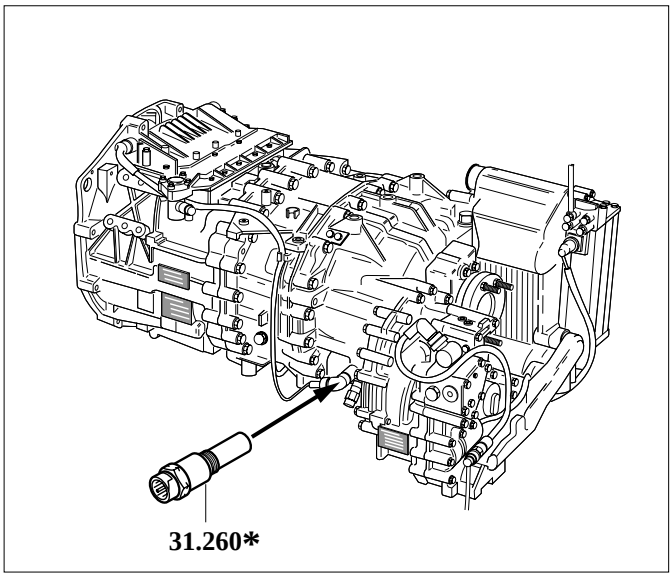
12.3 Changing the connector

If the connector has to be changed, please use the standard AMP tool.

For *wiring diagram*, refer to parts list.



014 813



014 814

Transmission without Intarder
Impulse sensor (DIN bayonet) 90 mm long*

Version		*Voltage supply*	
Hall	*0501 210 859*	*ZF*	*6.5 – 30 V*
Kitas	*0501 211 735*	*Vehicle*	*6.5 – 9 V*

Transmission with Intarder
Impulse sensor (DIN bayonet) 19.8 mm long*

Version		*Voltage supply*	
Hall	*0501 210 855*	*ZF*	*6.5 – 30 V*
Kitas	*0501 211 731*	*Vehicle*	*6.5 – 9 V*

* depending on parts list

13 Changing the neutral switch*

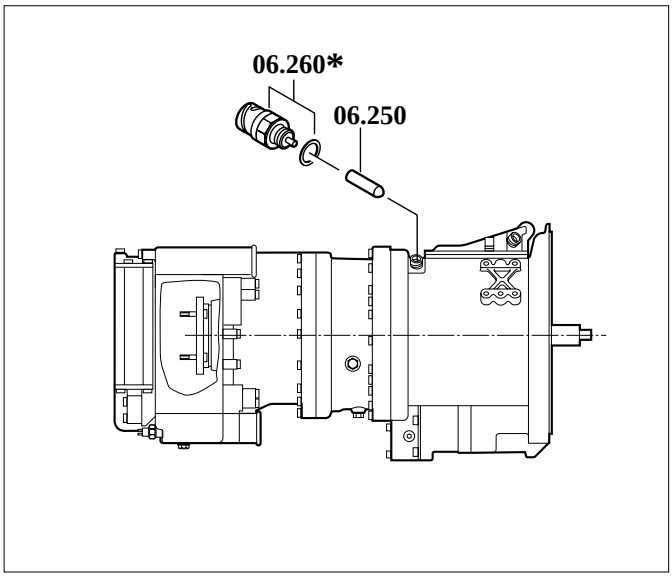
13.1 Removal

1 Remove neutral switch **(06.260)** and seal.

13.2 Fitting

1 Apply a little grease to plunger of neutral switch. Fit seal and screw down neutral switch **(06.260)**. Tightening torque = 50 Nm

NOTE
Pin **(06.250)** must be fitted.



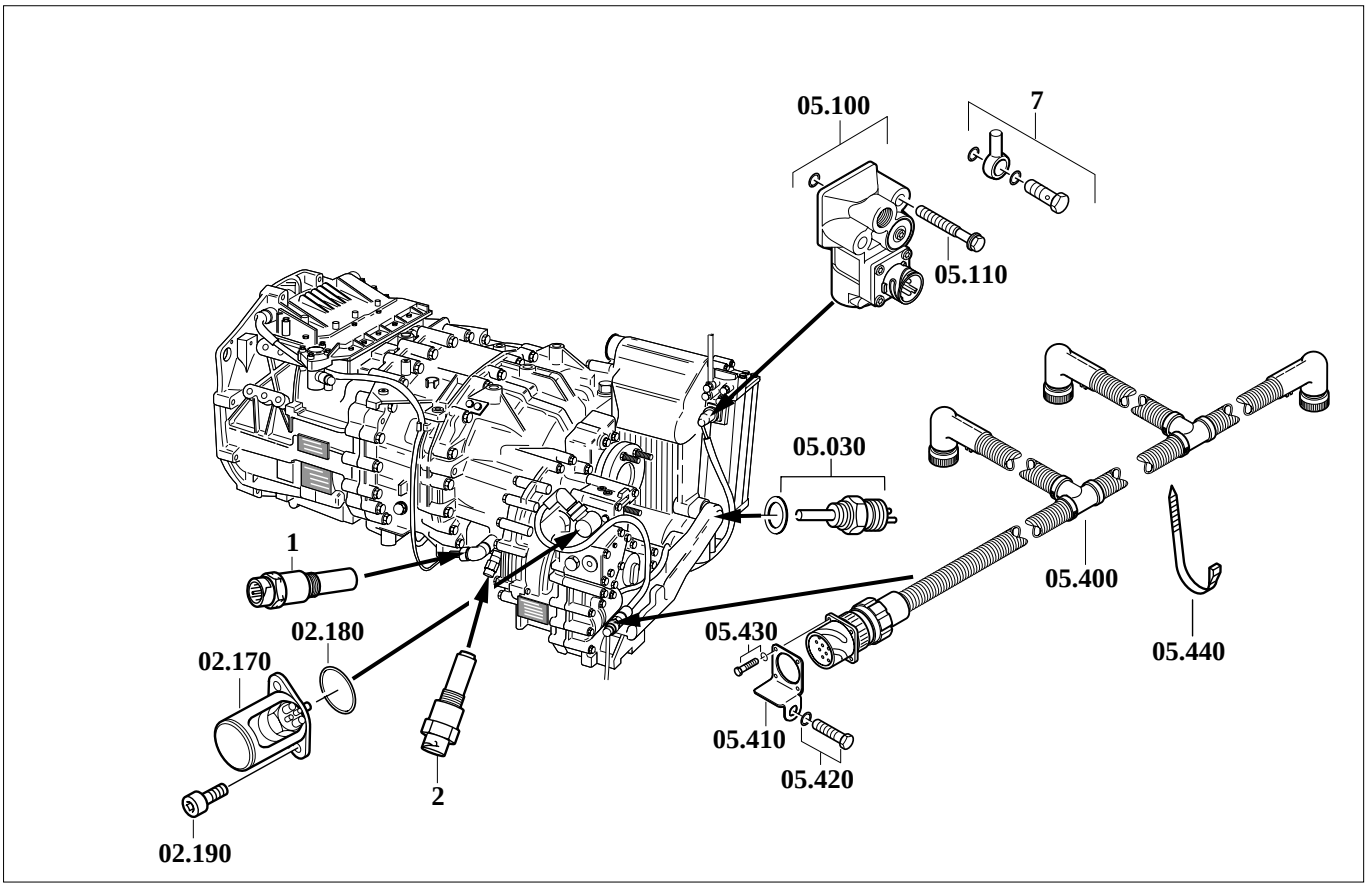
014 815

13.3 Changing the connector

If the connector has to be changed, please use the standard AMP tool.
For *wiring diagram*, refer to parts list.

Name	*ZF no.*
Neutral switch (DIN bayonet)	*0501 210 059*
Seal	*0634 801 062*
Pin	*1328 306 024*

* Option (refer to parts list)



014 738

14 Changing components on the Intarder

CAUTION
Fit all connectors without tightening the cable and check detent.

14.1 Output speed sensor

1 Screw in impulse sensor **(1)**.
Tightening torque = 45 Nm

14.2 Speedometer

1 Screw in impulse sensor **(2)**.
Tightening torque = 45 Nm

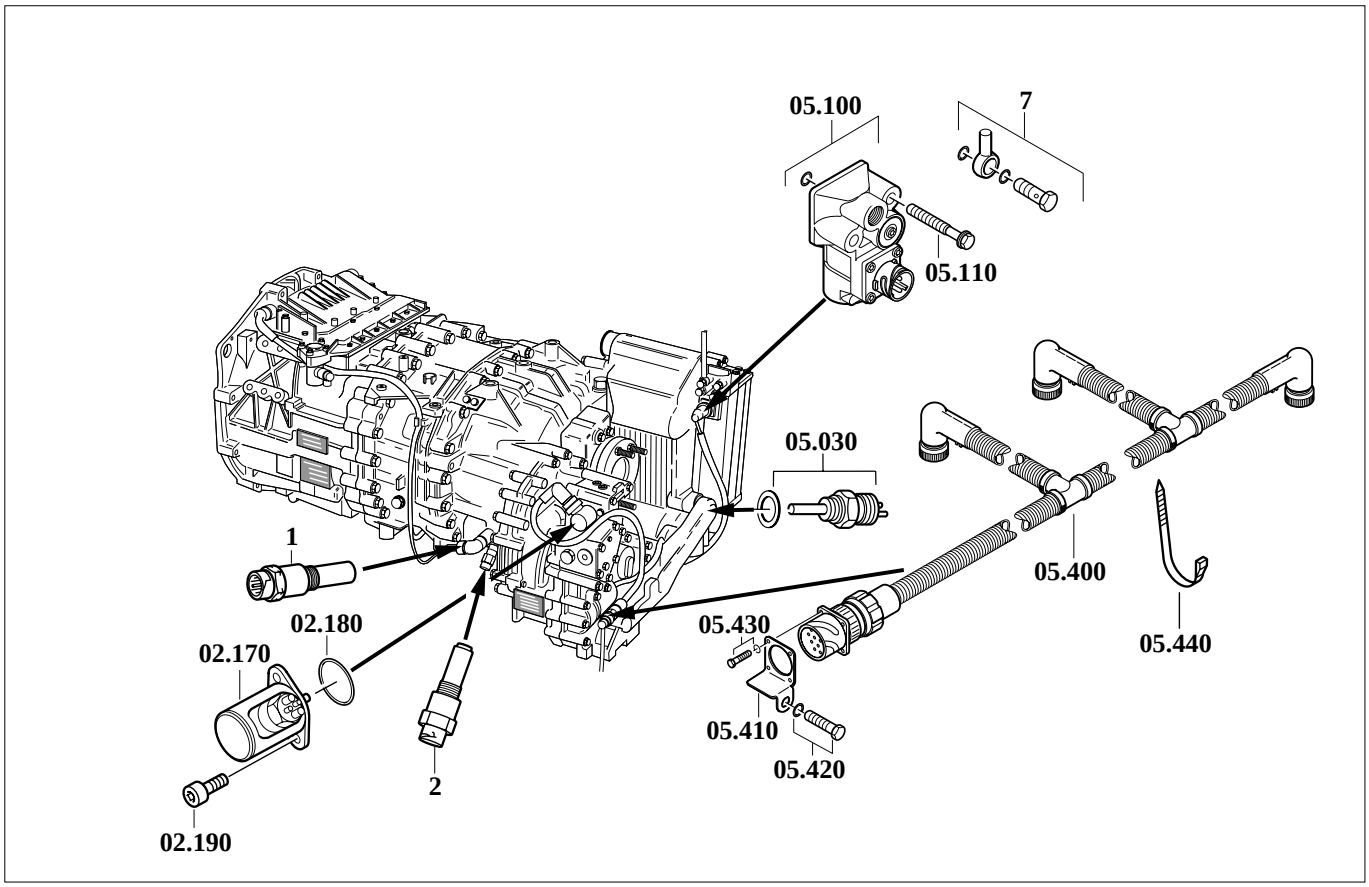
CAUTION
Speedometer must be calibrated and lead sealed.

14.3 Solenoid valve

1 Lightly grease O-ring **(02.180)** and insert in solenoid valve **(02.170)** and use 2 M8x22 cylindrical screws **(02.190)** to secure.
M8 tightening torque = 23 Nm

14.4 Temperature sensor

1 Screw in temperature sensor **(05.030)** and seal.
Tightening torque = 40 Nm



014 738

14.5 Removing 3/2-way valve

1 Pull connector off 3/2-way valve **(05.100)** and remove air connection **(7)**.

2 Remove 2 M8 hex bolts **(05.110)**. Lift off 3/2-way valve **(05.100)** and O-ring (ZF no. 0634 313 028).

Fitting 3/2-way valve

1 Use 2 M8 hex bolts **(05.110)** to secure new O-ring (ZF no. 0634 313 028) and 3/2-way valve **(05.100)**.
M8 tightening torque = 23 Nm

2 Connect air connection **(7)**.
Tightening torque:
M16x1.5 union screw = 45 Nm

14.6 Removing Intarder wiring harness

1 Remove 3 cable clips **(05.440)**.

2 Remove 4 M4 bolts **(05.430)** and disconnect plug connections.

Fitting Intarder wiring harness

1 If the bracket **(05.410)** is damaged, replace it. Tighten M8 hex bolt **(05.420)** to 23 Nm.

2 Wiring harness assembly: with nose in upper position, use 4 M4 bolts **(05.420)** to fasten to bracket.
M4 tightening torque = 2 Nm

3 Use 3 cable clips **(05.440)** to fasten wiring harness to Intarder.

Connector and mating connector designations
ZF standard pneumatic circuit diagram

Steering wheel switch	0501 211 185
Display	0501 211 422
Wiring diagram for range selector	6006 700 579, 6006 700 586
E module (installation drawing)	6041 622 023
Wiring diagram	
Central consumer with ZF E module	6029 713 020
Central consumer with computer	6029 713 025
End consumer with ZF E module	6029 713 041
Connection diagram	
End consumer with ZF E module	6029 713 040

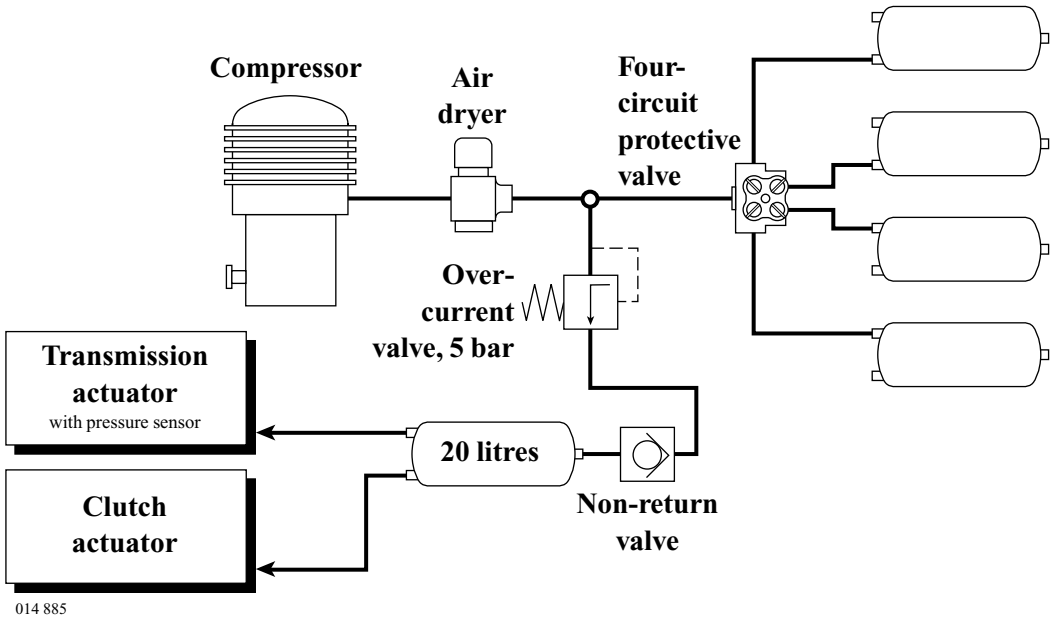
Connector	Usage	Type	Manufacturer	ZF number	Manufacturer no.	CKD no.
X1	Transmission actuator	20-pin Bu	Kostal	6029 201 675	09432001 22124472200 10800444521 10800472632	6029 199 090
	Special version transmission actuator	18-pin Bu	Kostal	0501 317 367		
X36	ZF E module	35-pin	AMP	6029 201 262	925379-1 928544-1 925380-1 ISO-1481-screw ST 2.9X9.5-F ZF gasket 6020 303 013	6029 199 091
X21	Diagnosis	6-pin ST MNL	AMP	6029 201 121	926682-3	6029 199 027
					926887-1	
X21	Mating connector diagnosis	6-pin Bu MNL	AMP	6029 201 120	350715-1 926882-3	6029 199 092
X2	Range selector	14-pin Bu J.P.T	AMP	6029 201 403	927771-3 929504-5	6029 199 042
	Display	8-pin Bu JPT	AMP	6029 201 676	927771-3 929504-3	6029 199 108
	Output sensor	4-pin Bu DIN Bay. angle	AMP	6029 201 618		
X17	Power supply junction	22-pin Bu JPT	AMP	6029 201 336	927771-3 929504-7	6029 199 043
X17 A Mating connector	Power supply junction	22-pin St JPT	AMP	6029 201 354	928930-5 929505-7	6029 199 025
X18	Power supply junction	18-pin Bu JPT	AMP	6029 201 361	927771-3 929504-6	6029 199 084
X18 A Mating connector	Power supply junction	18-pin St JPT	AMP	6029 201 365	928930-5 929505-6	6029 199 026
X18 A Mating connector	CAN power supply junction	6-pin Bu JPT	AMP	6029 201 367		6029 199 109
X18 A Mating connector	CAN power supply junction	6-pin St JPT	AMP	6029 201 366		6029 199 110
X19	Cabin junction	18-pin Bu JPT	AMP	6029 201 361	927771-3 929504-6	6029 199 084
X20 Mating connector to X19	Cabin junction	18-pin St JPT	AMP	6029 201 365	928930-5 929505-6	6029 199 026

Changing the connector

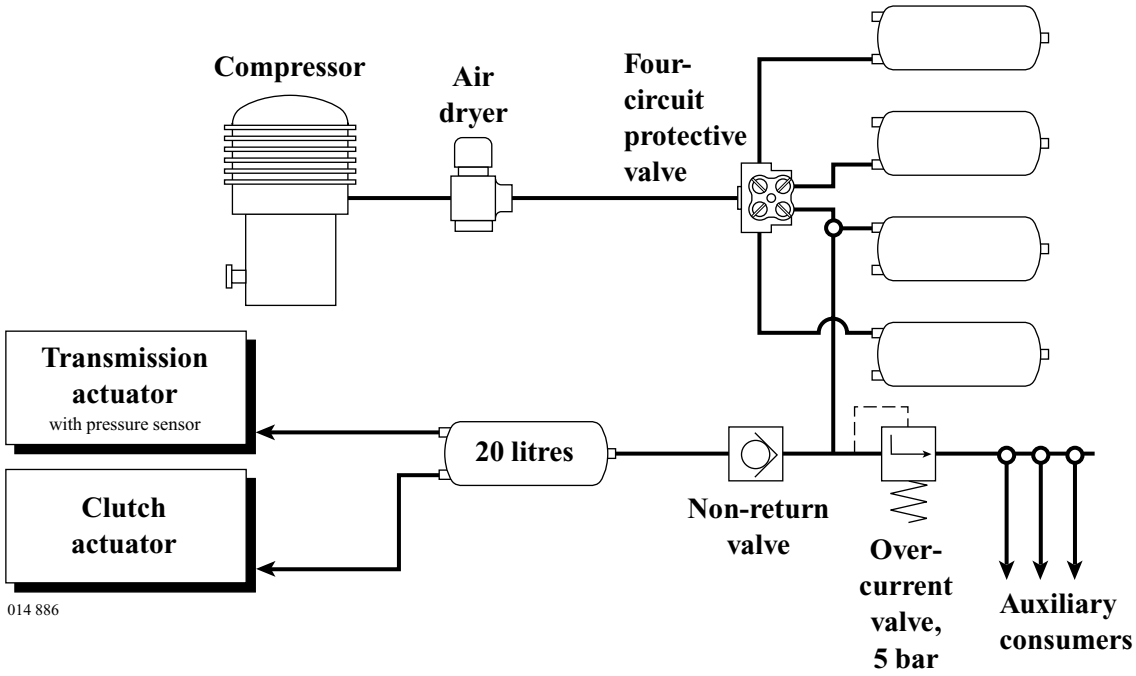
If the connector has to be changed, please use the standard AMP tool.

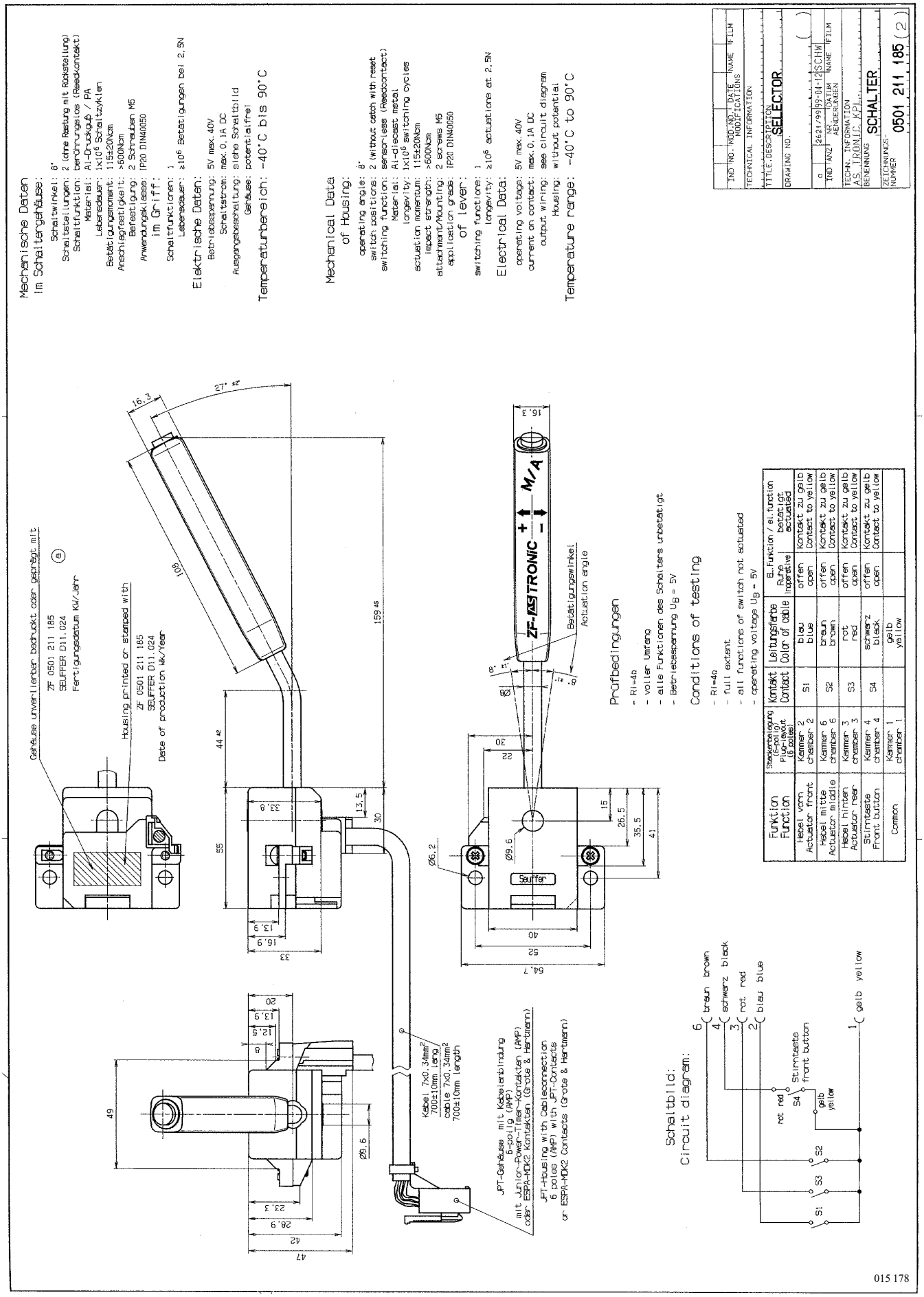
For *wiring diagram*, refer to parts list.

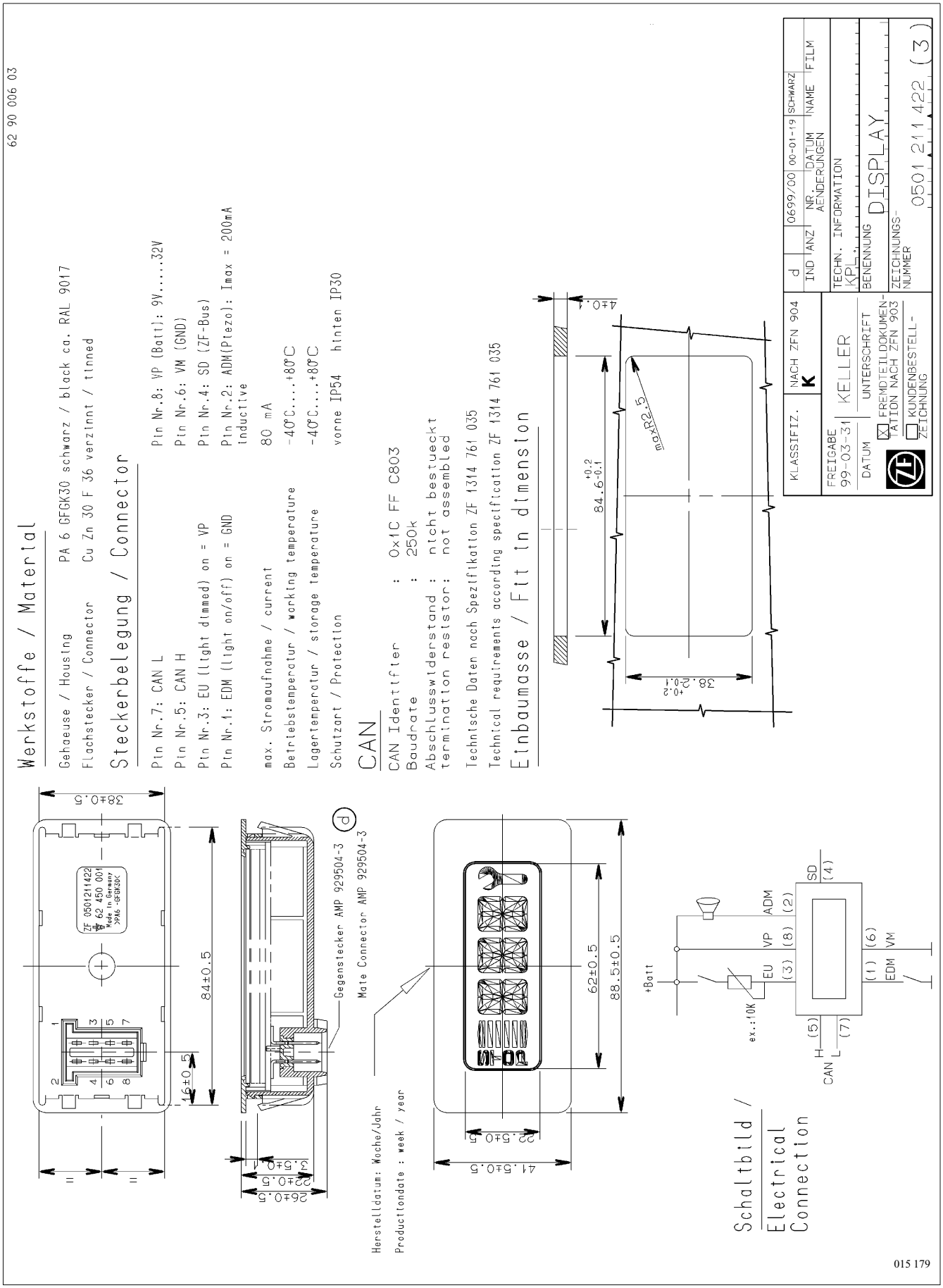
Example 1

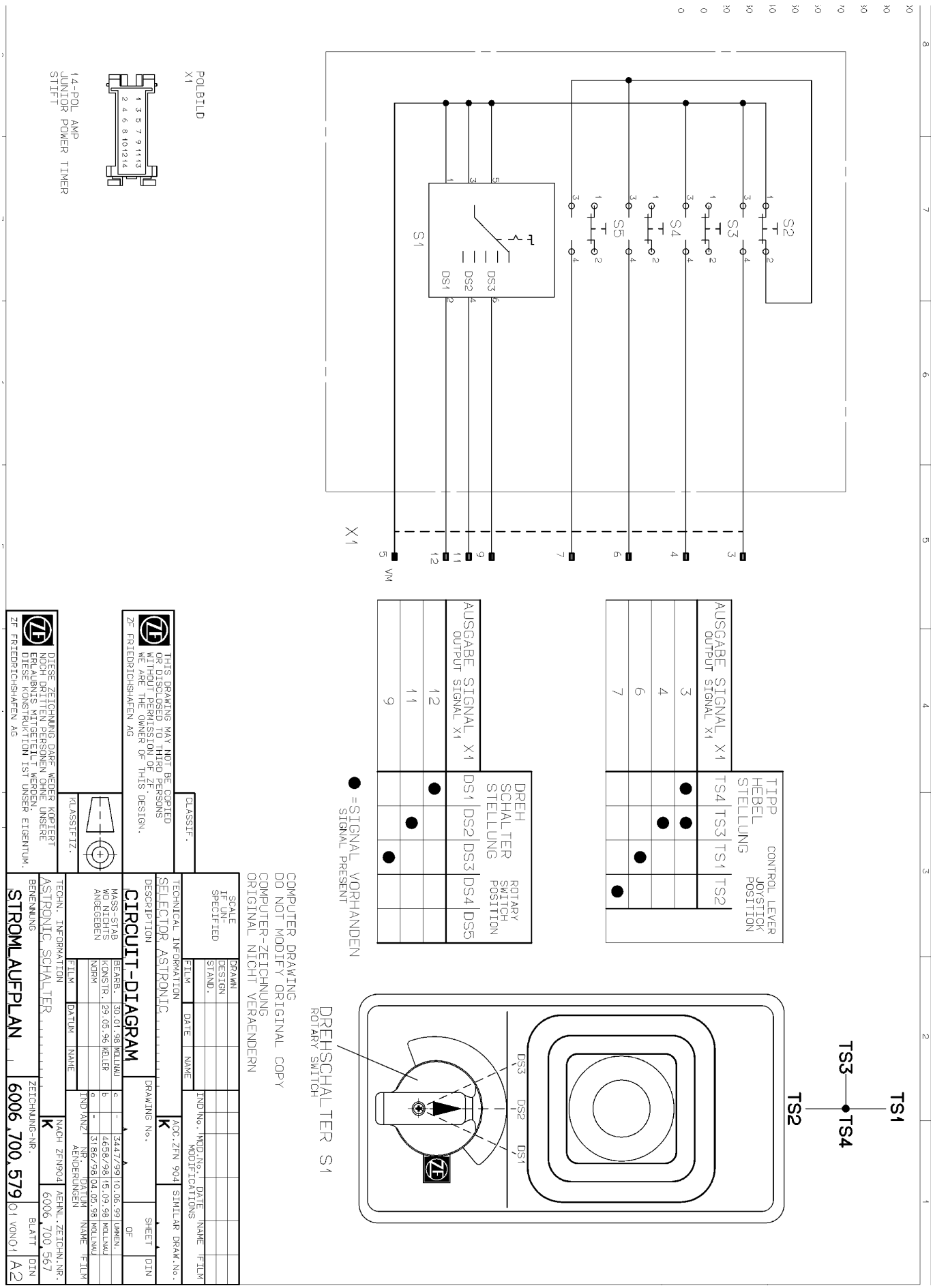


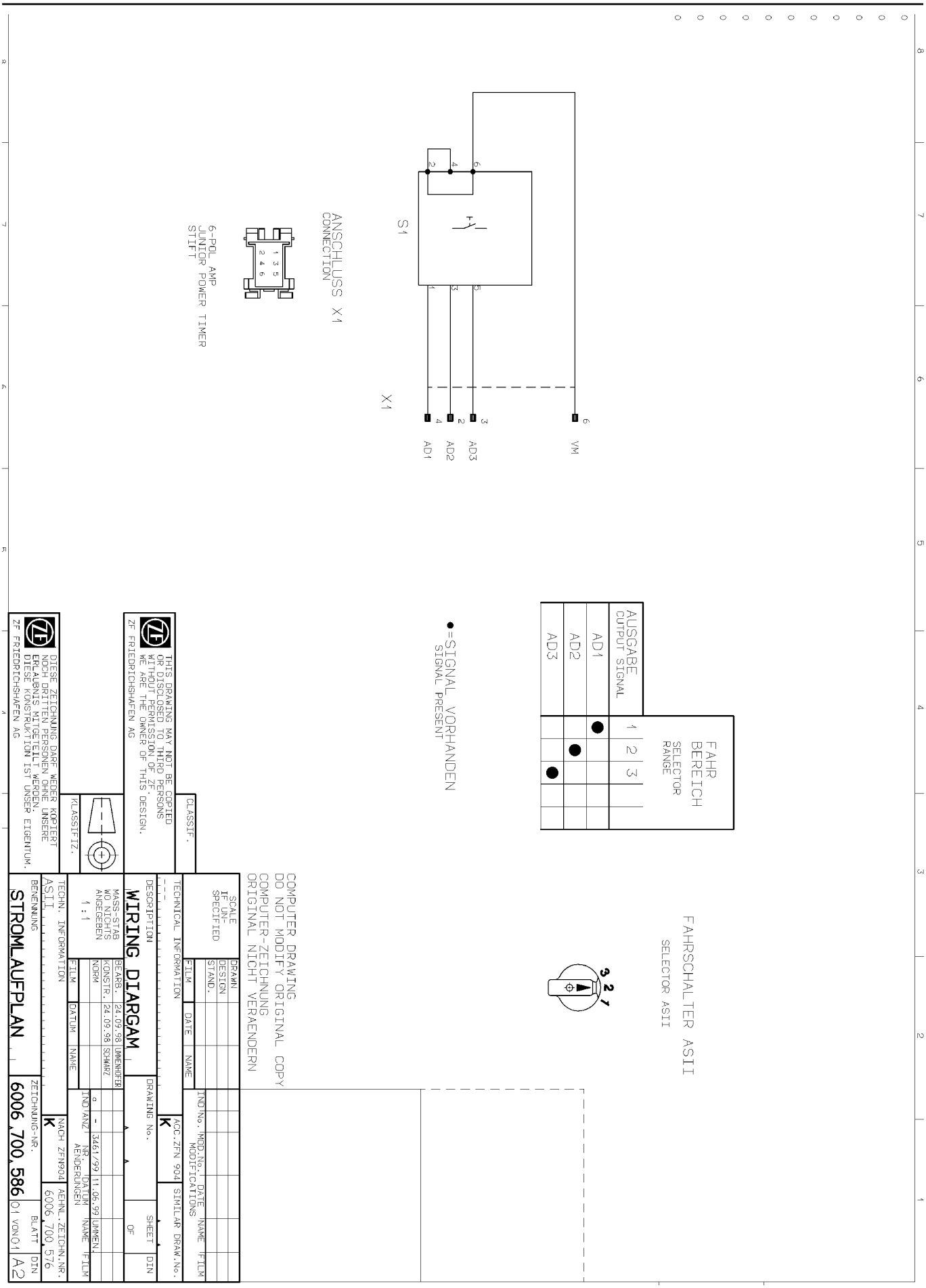
Example 2




Mechanische Daten
Im Schaltergehäuse:
Schaltwinkel: 8°
Schaltstellungen: 2 (ohne Rastung mit Rückstellung)
Schaltfunktion: berührungslos (Reedkontakt)
Material: Al-Druckguß / PA
Lebensdauer: 1x10⁶ Schaltzyklen
Betätigungsmoment: 115±20Ncm
Anschlagfestigkeit: >600Ncm
Befestigung: 2 Schrauben M5
Anwendungsklasse: IP20 DIN40050
im Griff:
Schaltfunktionen: 1
Lebensdauer: ≥10⁶ Betätigungen bei 2,5N
Elektrische Daten:
Betriebsspannung: 5V max.40V
Schaltstrom: max.0,1A DC
Ausgangsbeschaltung: siehe Schaltbild
Gehäuse: potentialfrei
Temperaturbereich: -40°C bis 90°C
Mechanical Data
of Housing:
operating angle: 8°
switch positions: 2 (without catch with reset
switching function: sensorless (Reedcontact)
Material: Al-diecast metal
longevity: 1x10⁶ switching cycles
actuation momentum: 115±20Ncm
impact strength: >600Ncm
attachment/Mounting: 2 screws M5
application grade: IP20 DIN40050
of lever:
switching functions: 1
longevity: ≥10⁶ actuations at 2,5N
Electrical Data:
operating voltage: 5V max.40V
current on contact: max.0,1A DC
output wiring: see circuit diagram
Housing: without potential
Temperature range: -40°C to 90°C
Gehäuse unverlierbar bedruckt oder geprägt mit
ZF 0501 211 185
SEUFFER D11.024
Fertigungsdatum KW/Jahr
Housing printed or stamped with
ZF 0501 211 185
SEUFFER D11.024
Date of production WK/Year
ZF-ASTRONIC M/A
Betätigungswinkel
Actuation angle
Prüfbedingungen
- RI=40
- voller Umfang
- alle Funktionen des Schalters unbetätigt
- Betriebsspannung U_B = 5V
Conditions of testing
- RI=40
- full extent
- all functions of switch not actuated
- operating voltage U_B = 5V
Funktion / Function
Steckerbelegung Pin-layout (6 poles)
Kontakt / Contact
Leitungsfarbe / Color of cable
Bl.Funktion / el.function
Ruhe / inoperative
betätigt / actuated
Hebel vorn / Actuator front
Kammer 2 / chamber 2
S1
blau / blue
offen / open
Kontakt zu gelb / Contact to yellow
Hebel mitte / Actuator middle
Kammer 6 / chamber 6
S2
braun / brown
offen / open
Kontakt zu gelb / Contact to yellow
Hebel hinten / Actuator rear
Kammer 3 / chamber 3
S3
rot / red
offen / open
Kontakt zu gelb / Contact to yellow
Stirntaste / Front button
Kammer 4 / chamber 4
S4
schwarz / black
offen / open
Kontakt zu gelb / Contact to yellow
Common
Kammer 1 / chamber 1
gelb / yellow
IND NO. MOD.NO. DATE NAME FILM
MODIFICATIONS
TECHNICAL INFORMATION
TITLE DESCRIPTION
SELECTOR
DRAWING NO.
a 2621/99 09-04-12 SCHW
IND ANZ NR. DATUM NAME FILM
AENDERUNGEN
TECHN. INFORMATION
AS...TRONIC KPL...
BENENNUNG SCHALTER
ZEICHNUNGS-NUMMER 0501 211 185 (2)
Schaltbild:
Circuit diagram:
braun brown
schwarz black
rot red
blau blue
gelb yellow
Stirntaste
front button
015 178


62 90 006 03
Werkstoffe / Material
Gehaeuse / Housing PA 6 GFGK30 schwarz / black ca. RAL 9017
Flachstecker / Connector Cu Zn 30 F 36 verzinnt / tinned
Steckerbelegung / Connector
Pin Nr.7: CAN L
Pin Nr.5: CAN H
Pin Nr.3: EU (light dimmed) on = VP
Pin Nr.1: EDM (light on/off) on = GND
Pin Nr.8: VP (Batt): 9V.....32V
Pin Nr.6: VM (GND)
Pin Nr.4: SD (ZF-Bus)
Pin Nr.2: ADM(Piezo): Imax = 200mA inductive
max. Stromaufnahme / current 80 mA
Betriebstemperatur / working temperature -40°C....+80°C
Lagertemperatur / storage temperature -40°C....+80°C
Schutzart / Protection vorne IP54 hinten IP30
CAN
CAN Identifier : 0x1C FF C803
Baudrate : 250k
Abschlusswiderstand : nicht bestueckt
termination resistor: not assembled
Technische Daten nach Spezifikation ZF 1314 761 035
Technical requirements according specification ZF 1314 761 035
Einbaumasse / Fit in dimension
Herstelldatum: Woche/Jahr
Productiondate : week / year
Gegenstecker AMP 929504-3
Mate Connector AMP 929504-3
Schaltbild / Electrical Connection
+Batt
ex.:10K
EU (3)
VP (8)
ADM (2)
SD (4)
CAN H (5)
CAN L (7)
(1)
(6)
EDM
VM
KLASSIFIZ. NACH ZFN 904 K
FREIGABE 99-03-31 DATUM
KELLER UNTERSCHRIFT
FREMDTEILDOKUMENTATION NACH ZFN 903
KUNDENBESTELL-ZEICHNUNG
d 0699/00 00-01-19 SCHWARZ
IND ANZ NR. DATUM NAME FILM
AENDERUNGEN
TECHN. INFORMATION
KPL.
BENENNUNG DISPLAY
ZEICHNUNGS-NUMMER 0501 211 422 (3)
015 179


POLBILD
X1
14-POL AMP
JUNIOR POWER TIMER
STIFT
1 3 5 7 9 11 13
2 4 6 8 10 12 14
S1
S2
S3
S4
S5
DS1
DS2
DS3
X1
VM
TIPP HEBEL STELLUNG
CONTROL LEVER JOYSTICK POSITION
AUSGABE SIGNAL X1
OUTPUT SIGNAL X1
TS1 TS2 TS3 TS4
3
4
6
7
DREH SCHALTER STELLUNG
ROTARY SWITCH POSITION
DS1 DS2 DS3 DS4 DS5
12
11
9
● = SIGNAL VORHANDEN
SIGNAL PRESENT
TS1
TS3
TS4
TS2
DREHSCHALTER S1
ROTARY SWITCH
DS3
DS2
DS1
COMPUTER DRAWING
DO NOT MODIFY ORIGINAL COPY
COMPUTER-ZEICHNUNG
ORIGINAL NICHT VERAENDERN
THIS DRAWING MAY NOT BE COPIED OR DISCLOSED TO THIRD PERSONS WITHOUT PERMISSION OF ZF. WE ARE THE OWNER OF THIS DESIGN.
ZF FRIEDRICHSHAFEN AG
DIESE ZEICHNUNG DARF WEDER KOPIERT NOCH DRITTEN PERSONEN OHNE UNSERE ERLAUBNIS MITGETEILT WERDEN. DIESE KONSTRUKTION IST UNSER EIGENTUM.
ZF FRIEDRICHSHAFEN AG
CLASSIF.
KLASSIFIZ.
SCALE IF UN-SPECIFIED
TECHNICAL INFORMATION
FILM
DATE
NAME
DRAWN
DESIGN
STAND.
MASS-STAB
MASS NACH ANGEGEBEN
TECHN. INFORMATION
FILM
DATUM
NAME
BEARB.
KONSTR.
NORM
30.01.98 MOLLNAU
29.05.96 KELLER
CIRCUIT-DIAGRAM
DESCRIPTION
SELECTOR ASTRONIC
DRAWING No.
IND No. MOD.No. DATE NAME
MODIFICATIONS
ACC. ZFN 904
SIMILAR DRAW. No.
SHEET
DIN
OF
NACH ZFN904
AENDERUNGEN
DATUM
NAME
FILM
AENNL. ZEICHN. NR.
6006 700 567
BLATT
DIN
A2
BENENNUNG
ASTRONIC SCHALTER
STROMLAUFPLAN
ZEICHNUNG-NR.
6006 700 579
01 VON 01
K
c - 344799 10.06.99 UMMEN.
b - 46858/98 15.09.98 MOLLNAU
a - 31866/98 04.05.98 MOLLNAU
IND ANZ


FAHRSCHALTER ASII
SELECTOR ASII
FAHR BEREICH
SELECTOR RANGE
AUSGABE
OUTPUT SIGNAL
AD1
AD2
AD3
1 2 3
●=SIGNAL VORHANDEN
SIGNAL PRESENT
ANSCHLUSS X1
CONNECTION
S1
X1
AD1
AD2
AD3
VM
6-POL AMP
JUNIOR POWER TIMER
STIFT
COMPUTER DRAWING
DO NOT MODIFY ORIGINAL COPY
COMPUTER-ZEICHNUNG
ORIGINAL NICHT VERAENDERN
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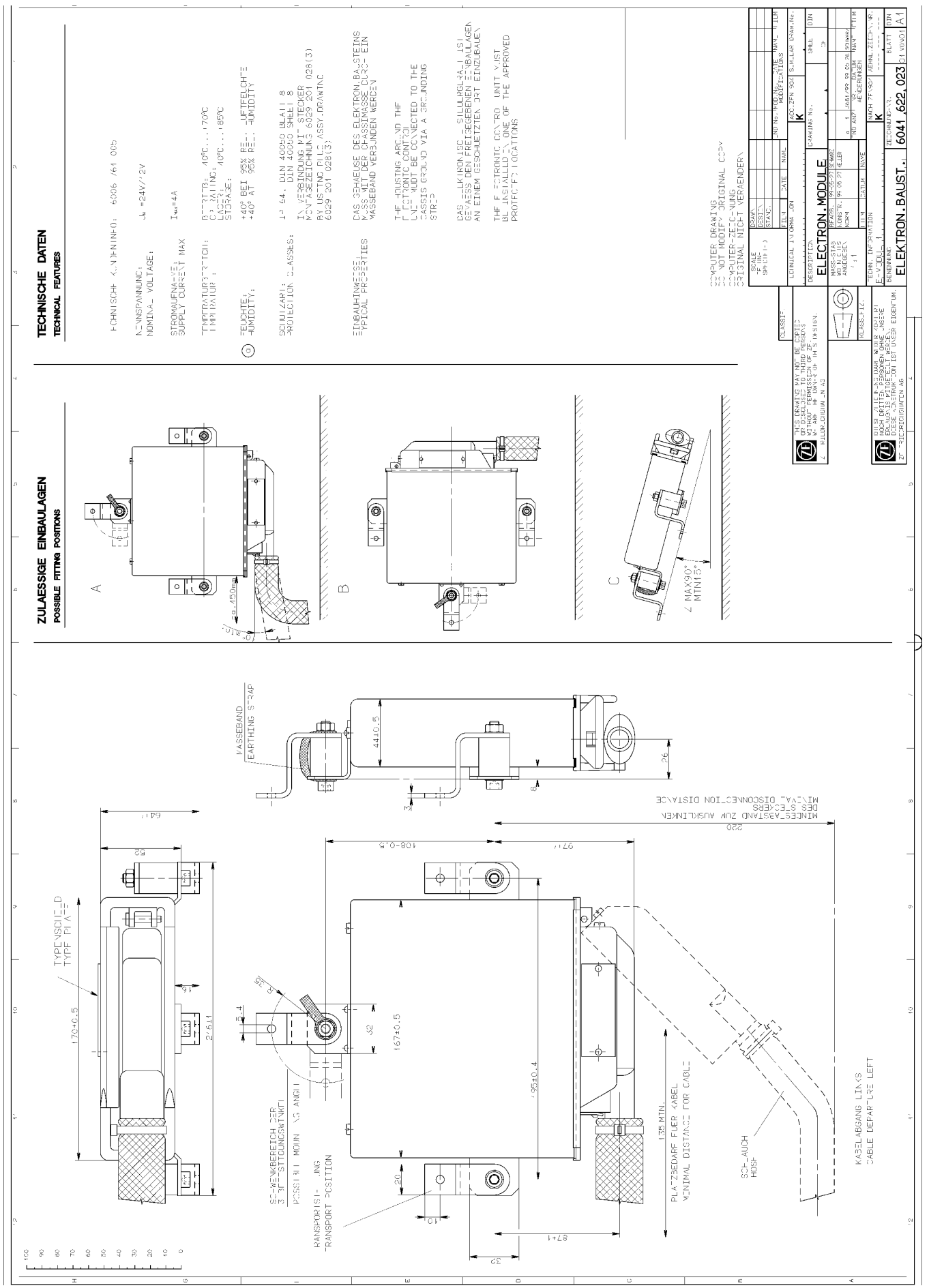
ZF FRIEDRICHSHAFEN AG
DIESE ZEICHNUNG DARF WEDER KOPIERT
NOCH DRITTEN PERSONEN OHNE UNSERE
ERLAUBNIS MITGETEILT WERDEN.
DIESE KONSTRUKTION IST UNSER EIGENTUM.
ZF FRIEDRICHSHAFEN AG
CLASSIF.
KLASSIFIZ.
SCALE IF UN-SPECIFIED
TECHNICAL INFORMATION
DESCRIPTION
WIRING DIARGAM
DRAWING No.
MASS-STAB W.O. NICHTS ANGEGEBEN
1:1
TECHN. INFORMATION
ASII
BENENNUNG
STROMLAUFPLAN
ZEICHNUNG-NR.
6006 700 586
BLATT
01 VON 01
DIN
A2
DRAWN
DESIGN
STAND.
BEARB.
KONSTR.
NORM
FILM
DATUM
NAME
24.09.98 UMMENHOFER
24.09.98 SCHWARZ
IND No. MOD No. DATE NAME FILM
MODIFICATIONS
ACC. ZFN 904
SIMILAR DRAW. No.
SHEET
OF
DIN
IND ANZ
NACH ZFN904
AEHNL. ZEICHN. NR.
6006 700 576
NR. DATUM NAME FILM
AENDERUNGEN
3461/99 11.06.99 UMMEN.


TECHNISCHE DATEN
TECHNICAL FEATURES
ZULAESSIGE EINBAULAGEN
POSSIBLE FITTING POSITIONS
A
B
C
ELEKTRON.MODULE
ELEKTRON.BAUST.
6041.622.023
MASSEBAND
EARTHING STRAP
TYPENSCHILD
TYPE PLATE
KABELABGANG LINKS
CABLE DEPARTURE LEFT
TRANSPORT POSITION
MINDEST-ABSTAND ZUM AUSKLINKEN DES STECKERS
MINIMAL DISCONNECTION DISTANCE

KL.30 F1 KL.30 10A

KL.15 F2 KL.15 10A

Kl.15/1.6

warning-buzzer H9

warning-lamp H8

display A5

Clutch actuator with clutch position sensor

Shift lever

A2

Example:
Shift lever
6006 029 014

ZF-E-Modul A36

VP ED22 ED23 ED21 ED24 ED25 AU ADM23 EDVP ADM21 ADM22

EDM1 EDM2 EDM3 EDM4 EDM5 EDM6 EDM7 EDM8 EDM9 EDM10 EDM11 VMG

CAN-T CANF-H CANF-L VMHF

ZF-CAN High
ZF-CAN Low

Limp home E22

Sensor output speedieb A14

Tachograph A13

(D3orB7)

SDEF

ECU A1

ADVP1 VPI VPE1 VPE2 SD SDP SDEF CANF2-H CANF2-L VMHF1 VMHF2 CANF1-H CANF1-L CANF1-H+ CANF1-L+ CANF1-T SDDK VM1 VM2 VM3

Stecker X1a 20 pin Kostal

Stecker X1b 20 pin Kostal

A23 CAN-vehicle interface in the middle of the CAN-bus

VHF1 VHF2 CANF-H CANF-L CANF-H+ CANF-L+

System-CAN High
System-CAN Low

ADS3 clutch engage quick B Y14
ADS1 clutch engage slow A Y15
ADS4 clutch disengage quick D Y16
ADS2 clutch disengage slow E Y17

A4

AU sensor power supply G 5V
EU1 signal sensor clutch I 0-5V

(-) (-) (-) J C H

VM1 ground
VM2 ground
VMGA1 sensor ground

ADVP 18 → 1 UE
EF 11 → 3 A1
VMGA2 6 → 2 U0

A11 Sensor output speed

EDM21 EDM22 EDM23 EDM24 EDM25 AD21 AD22 AD23 AD24 VM1 VM2

PTO 2-Acknowledge S14
PTO 1-Request S4
Door switch S8
PTO 2-Request S13
PTO 1 E11
PTO 2 E12
Revers.-Light E13
Res. E14
PTO 1-Acknowledge S5

Kl.15 A21 VP VM K

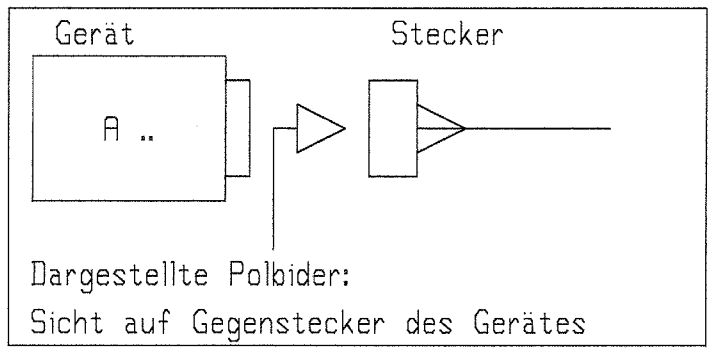
Diagnosis interface

KL.31 Kl.31 KL.31

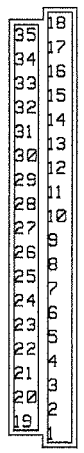
wiring diagram:
6029.713.021

TECHN. INFORMATION: ASTRONIC 2 Allg.MITTELTEILN.	NACH ZFN904: K 2	AEHNL.ZEICHN.NR.
BENENNUNG: STROMLAUFPLAN	ZEICHNUNG-NR.: 6029.713.020	BLATT: 1 VON 2 / DIN: A2

Projekt: 13ALG003

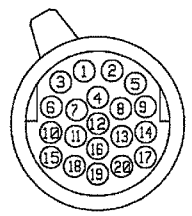


POLBILD
zu A36



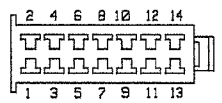
AMP
35-POL.
BUCHSE

Polbild zu A1
X1A/X1B



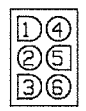
20POL
KOSTAL
BUCHSE
VORN

POLBILD
zu A2



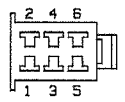
14-POL AMP
JUNIOR POWER TIMER
BUCHSE

POLBILD
zu A21



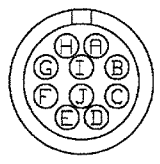
6POL AMP
MATE-N-LOK
STIFT

POLBILD
zu A5



6-POL.AMP
JUNIOR POWER TIMER
BUCHSE

POLBILD
zu A4

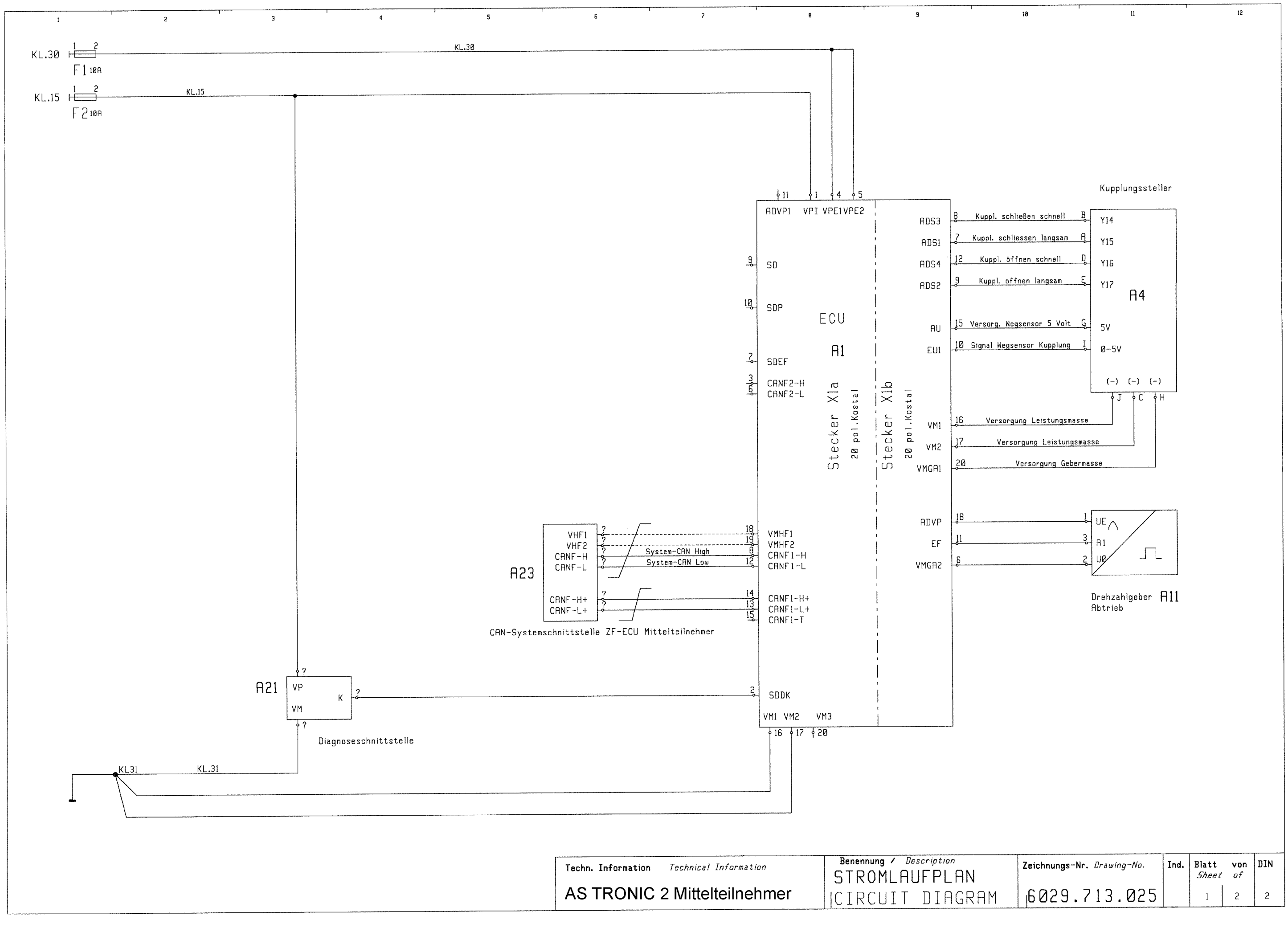


CANNON
10-POL.VG
BUCHSE

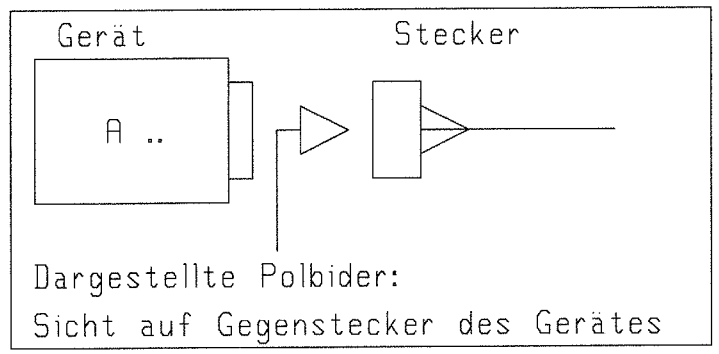
A 1	Elektr. Steuergeraet EST	Electronic Control Unit ECU
A 2	Fahrschalter	Shift lever
A 4	Kupplungssteller mit Sensorik	Clutch actuator with Clutch position sensor
A 5	Display	Display
A11	Drehzahlgeber Abtrieb	Sensor Output Speed
A13	Tachograph	Tachograph
A14	Drehzahlgeber Abtrieb Tacho	Sensor Output Speed Tacho
A21	Diagnoseschnittstelle nach DIN ISO 9141	Diagnostic Interface DIN ISO 9141
A23	Fahrzeug CAN-Schnittstelle	CAN Vehicle Interface
B 4	Sensor "Gang eingelegt"	Switch Gear Engaged
B 5	Wegsensor "Waehlen"	Position Sensor "Select"
B 6	Wegsensor "Gruppe"	Position Sensor "Range Group"
B 7	Wegsensor "Splitter"	Position Sensor "Split"
F 1	Sicherung 10A (Kl.30)	Fuse 10A
F 2	Sicherung 10A (Kl.15)	Fuse 10A
H 8	Lampe Stoerung	Warning Lamp
H 9	Warnsummer	Buzzer
E11	PTO 1	PTO 1
E12	PTO 2	PTO 2
E13	Rückfahrscheinwerfer	Reversing Light
E22	Limp home	Limp home
S 4	Schalter Nebenabtrieb 1	Switch PTO 1
S 5	SchalterNebenabtrieb 1 Rückmeldung	Switch PTO 1 Acknowledge
S 8	Tuerschalter	Door Switch
S13	Schalter Nebenabtrieb 2	Switch PTO 2
S14	SchalterNebenabtrieb 2 Rückmeldung	Switch PTO 2 Acknowledge
Y14	MV Kuppl. schliessen schnell (Entlueften)	Sol. Valve Clutch Engage Fast
Y15	MV Kuppl. schliessen langsam (Entlueften)	Sol. Valve Clutch Engage Slow
Y16	MV Kuppl. oeffnen schnell (Belueften)	Sol. Valve Clutch Disengage Fast
Y17	MV Kuppl. oeffnen langsam (Belueften)	Sol. Valve Clutch Disengage Slow

Projekt: 13ALG003

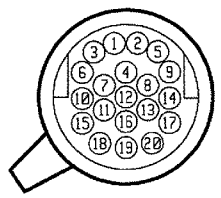
TECHN. INFORMATION: ASTRONIC 2 Allg.	NACH ZFN804: K 2	AEHNL.ZEICHN.NR.	
BENENNUNG: STROMLAUFPLAN	ZEICHNUNG-NR.: 6029.713.020	BLATT: 2 VON 2	DIN: A2



Techn. Information *Technical Information* AS TRONIC 2 Mittelteilnehmer	**Benennung** / *Description* STROMLAUFPLAN CIRCUIT DIAGRAM	**Zeichnungs-Nr.** *Drawing-No.* 6029.713.025	**Ind.**	**Blatt** *Sheet* 1 **von** *of* 2	**DIN** 2

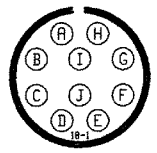


Polbild zu A1
X1A/X1B



Kostal
20-pin

POLBILD
zu A4



Cannon VG95234
10-pin

POLBILD
zu A11/A14

DIN Baj.
4-pin

	Legende Deutsch	Legende Englisch
A 1	Elektr. Steuergeraet EST	Electronic Control Unit ECU
A 4	Kupplungssteller mit Sensorik	Clutch actuator with clutch position sensor
A 5	Display	Display
A11	Drehzahlgeber Abtrieb	Sensor output speed
A21	Diagnoseschnittstelle nach DIN ISO 9141	Diagnostic Interface DIN ISO 9141
A23	CAN Systemschnittstelle	CAN System Interface
A24	ZF CAN Schnittstelle	ZF CAN Interface
F 1	Sicherung 10A (Kl.30)	Fuse 10A
F 2	Sicherung 10A (Kl.15)	Fuse 10A
Y14	MV Kuppl. schliessen schnell (Entlueften)	Sol. valve clutch engage fast
Y15	MV Kuppl. schliessen langsam (Entlueften)	Sol. valve clutch engage slow
Y16	MV Kuppl. oeffnen schnell (Belueften)	Sol. valve clutch disengage fast
Y17	MV Kuppl. oeffnen langsam (Belueften)	Sol. valve clutch disengage slow

Techn. Information *Technical Information*	Benennung / *Description*	Zeichnungs-Nr. *Drawing-No.*	Ind.	Blatt *Sheet*	von *of*	DIN
AS TRONIC 2 Mittelteilnehmer	STROMLAUFPLAN CIRCUIT DIAGRAM	6029.713.025		2	2	2

KL.30 F1 10A

KL.15 F2 10A

KL.15

K1.15

warning-buzzer H9

warning-lamp H8

display A5

(+) Lighting

Shift lever

A2

ZF-E-Modul A36

VP ED22 ED23 ED21 AU EDVP ADM21

ADM22

Limp home E22

output speed sensor tachograph A14

(D3oderB7)

A13

ECU A1

ADVP1 SD VPI VPE1 VPE2

SDP

SDEF

conector X1a 20 pin Kostal

conector X1b 20 pin Kostal

clutch actuator with clutch position sensor A4

ADS3 clutch engage quick Y14

ADS1 clutch engage slow Y15

ADS4 clutch disengage quick Y16

ADS2 clutch disengage slow Y17

AU power supply sensor 5V

EU1 signal clutch sensor 0-5V

(-) (-) (-)

VM1 ground

VM2 ground

VMGA1 sensor ground

CAN-T

CANF-H CANF-L VMHF

CANF2-H CANF2-L

A23

VHF1 VHF2

CANF-H CANF-L

System-CAN High

System-CAN Low

CAN-vehicle interface
ECU at the end of the CAN-bus

VMHF1 VMHF2

CANF1-H CANF1-L CANF1-H+ CANF1-L+ CANF1-T

ADVP EF VMGA2

output speed sensor A11

EDM21 EDM22 EDM23 EDM24 EDM25 AD21 AD22 AD23 AD24 VM1 VM2

switch PTO 2-acknowledge S14

door-switch S8

relay PTO 1 E11

relay reversing light E13

switch PTO 1-acknowledge S5

switch PTO 1-request S4

switch PTO 2 request S13

relay PTO 2 E12

Res. E14

A21 VP K

diagnosis interface

SDDK

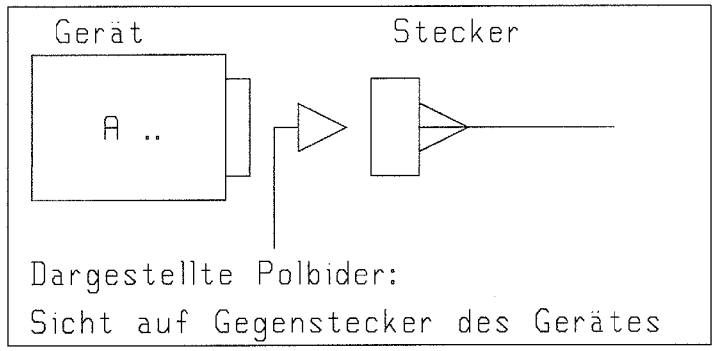
VM1 VM2 VM3

KL.31 K1.31 KL.31

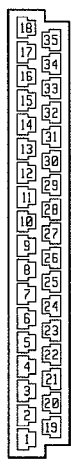
Example:
Shift lever
6006 029 014

wiring diagram:
6029.713.040

Techn. Information *Technical Information*	Benennung / *Description*	Zeichnungs-Nr. *Drawing-No.*	Ind.	Blatt *Sheet*	von *of*	DIN
AS TRONIC 2 Endteilnehmer	Stromlaufplan Circuit Diagram	6029.713.041		1	2	2

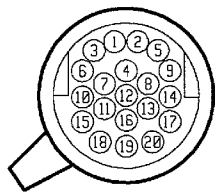


POLBILD zu A36



AMP Timer
35-pin

Polbild zu A1
X1A/X1B

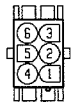


Kostal
20-pin

POLBILD zu A2

AMP JPT
14-pin

POLBILD zu A21

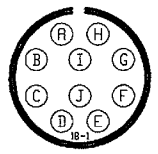


AMP M-N-L
6-pin

POLBILD zu A5

AMP JPT
8-pin

POLBILD zu A4



Cannon VG95234
10-pin

A 1	Elektr. Steuergeraet EST	Electronic Control Unit ECU
A 2	Fahrschalter	Shift lever
A 4	Kupplungssteller mit Sensorik	Clutch actuator with Clutch position sensor
A 5	Display	Display
A11	Drehzahlgeber Abtrieb	Sensor Output Speed
A13	Tachograph	Tachograph
A14	Drehzahlgeber Abtrieb Tacho	Sensor Output Speed Tacho
A21	Diagnoseschnittstelle nach DIN ISO 9141	Diagnostic Interface DIN ISO 9141
A23	Fahrzeug CAN-Schnittstelle	CAN Vehicle Interface
F 1	Sicherung 10A (K1.30)	Fuse 10A
F 2	Sicherung 10A (K1.15)	Fuse 10A
H 8	Lampe Stoerung	Warning Lamp
H 9	Warnsummer	Buzzer
E11	PTO 1	PTO 1
E12	PTO 2	PTO 2
E13	Rückfahrscheinwerfer	Reversing Light
E22	Limp home	Limp home
S 4	Schalter Nebenabtrieb 1	Switch PTO 1
S 5	SchalterNebenabtrieb 1 Rückmeldung	Switch PTO 1 Acknowledge
S 8	Tuerschalter	Door Switch
S13	Schalter Nebenabtrieb 2	Switch PTO 2
S14	SchalterNebenabtrieb 2 Rückmeldung	Switch PTO 2 Acknowledge
Y14	MV Kuppl. schliessen schnell (Entlueften)	Sol. Valve Clutch Engage Fast
Y15	MV Kuppl. schliessen langsam (Entlueften)	Sol. Valve Clutch Engage Slow
Y16	MV Kuppl. oeffnen schnell (Belueften)	Sol. Valve Clutch Disengage Fast
Y17	MV Kuppl. oeffnen langsam (Belueften)	Sol. Valve Clutch Disengage Slow

Techn. Information *Technical Information*	Benennung / *Description*	Zeichnungs-Nr. *Drawing-No.*	Ind.	Blatt *Sheet*	von *of*	DIN
AS TRONIC 2 Endteilnehmer	Stromlaufplan Circuit Diagram	6029.713.041		2	2	2

ZF-E-Modul

A36

X36

VP 1 — 901 WX:+B/1.3
EDVP 2 — 906 WJ:+A/1.3
CANF-L 3 — 403 WD:AbR/1.3
ED21 4
ED23 5
EDM22 6 — 406 X17:20/2.2
EDM1 7 — 407 X2:3/1.7
EDM3 8 — 408 X2:9/1.7
EDM5 9 — 409 X2:10/1.7
EDM7 10 — 410 X2:2/1.7
EDM9 11 — 411 X2:11/1.7
EDM11 12 — 412 X2:8/1.7
EDM25 13 — 413 X17:10/2.2
AD23 14 — 414 X17:18/2.2
AD21 15 — 415 X17:21/2.2
ADM21 16 — 416 X17:14/2.2
VMG 17 — 417 X2:5/1.7
VM1 18 — 902 WY:-/1.3
AU 19
CANF-H 20 — 420 X19:3/1.8
CAN-T 21 — 421 WD:AbR/1.3
ED22 22
EDM21 23 — 423 X17:19/2.2
EDM23 24 — 424 X17:16/2.2
EDM2 25 — 425 X2:4/1.7
EDM4 26 — 426 X2:7/1.7
EDM6 27
EDM8 28 — 428 X2:6/1.7
EDM10 29 — 429 X2:12/1.7
EDM24 30 — 430 X17:17/2.2
AD24 31 — 431 X17:7/2.2
AD22 32 — 432 X17:22/2.2
ADM22 33 — 433 X17:15/2.2
VMHF 34 — 905 WI:-H/1.4
VM2 35 — 902 WE:-/1.3

LX25

X21

WA:+Z/1.3 900
WK:K/1.3 907
WY:-/1.3 902

1 (+)
2 K
3 (-)
4 L
5 Pog
6

X21 A21

Diagnose
Diagnosis

LX 2

X2

X36:10/1.2 410
X36:7/1.2 407
X36:25/1.2 425
X36:17/1.2 417
X36:28/1.2 428
X36:26/1.2 426
X36:12/1.2 412
X36:8/1.2 408
X36:9/1.2 409
X36:11/1.2 411
X36:29/1.2 429

X2 A2

Fahrschalter

LX 5

X5

WZ:+Bel/1.1 948
WT:SD/1.1 917
WY:-/1.3 902
WJ:+A/1.3 906

1
2
3 + Bel.
4 SD
5
6 VM
7
8 VP

A5

Display

LX36

KN1

LX19

X36
403 X36:3/1.2
X36:21/1.2
X19:6/1.8
WD AbR

907 X21:2/1.4
907 X19:1/1.8
907 X17:8/2.2
WK K

900 X17:9/2.2
900 X19:7/1.8
900 X21:1/1.4
WA +Z

901 X17:2/2.2
X19:4/1.8
X36:1/1.2
WX +B

902 X17:11/2.2
X19:16/1.8
X36:35/1.2
WE -

902 X17:12/2.2
X19:12/1.8
X36:18/1.2
X21:3/1.4
X5:5/1.7
WY -

906 X36:2/1.2
X17:13/2.2
X19:15/1.8
X5:8/1.7
WJ +A

905 X36:34/1.2
X19:11/1.8
X18:5/2.3
X18:6/2.3
WI -H

948 X5:3/1.7
948 X17:5/2.2
WZ +Bel

901 X17:1/2.2
901 X19:2/1.8
WC +B

916 X19:8/1.8
916 X18:1/2.3
WR CH

915 X19:13/1.8
915 X18:3/2.3
WS CL

917 X5:4/1.7
917 X19:9/1.8
WT SD

918 X19:5/1.8
918 X17:3/2.2
WU EF

919 X17:4/2.2
919 X19:14/1.8
WV OP

-914 X19:17/1.8
X18:2/2.3
WP H+

-913 X19:18/1.8
X18:4/2.3
WQ L+

LX17

X17/2.1

X18/2.1

X19

WK:K/1.3 907
WC:+B/1.1 901
X36:20/1.2 420
WX:+B/1.3 901
WU:EF/1.1 918
WD:AbR/1.3 403
WA:+Z/1.3 900
WR:CH/1.1 916
WT:SD/1.1 917
WI:-H/1.4 905
WY:-/1.3 902
WS:CL/1.1 915
WV:OP/1.1 919
WJ:+A/1.3 906
WE:-/1.3 902
WP:H+/1.1 -914
WQ:L+/1.1 -913

X19 X20

907 X1:2/1.11
901 X1:4/1.11
420 X1:3/1.11
901 X1:5/1.11
918 X1:7/1.11
403 X1:6/1.11
900 X1:1/1.11
916 X1:8/1.11
917 X1:9/1.11
905 X1:18/1.11
902 X1:16/1.11
915 X1:12/1.11
919 X1:10/1.11
906 X1:11/1.11
902 X1:17/1.11

LX 1

X20 X1

X20:7/1.9 900
X20:1/1.9 907
X20:3/1.9 420
X20:2/1.9 901
X20:4/1.9 901
X20:6/1.9 403
X20:5/1.9 918
X20:8/1.9 916
X20:9/1.9 917
X20:14/1.9 919
X20:15/1.9 906
X20:13/1.9 915
X1:15/1.11
X1:13/1.11
X20:12/1.9 902
X20:16/1.9 902
X20:11/1.9 905

1 VPI
2 SDDK
3 CANF2-H
4 VPE1
5 VPE2
6 CANF2-L
7 SDEF
8 CANF1-H
9 SD
10 SDP
11 ADVP
12 CANF1-L
13 CANF-1L+
14 CANF1-H+
15 CANF1-T
16 VM1
17 VM2
18 VMHF1
19 VMHF2
20 VM3

A1

X1

POLBILD zu X36

AMP Timer 35-pin

POLBILD zu X20

AMP JPT 18-pin

POLBILD zu X19

AMP JPT 18-pin

Polbild zu X1

Kostal 20-pin

POLBILD zu X2

AMP JPT 14-pin

POLBILD zu X21

AMP M-N-L 6-pin

POLBILD zu X5

AMP JPT 8-pin

STROMLAUFPLAN:
6029.713.041

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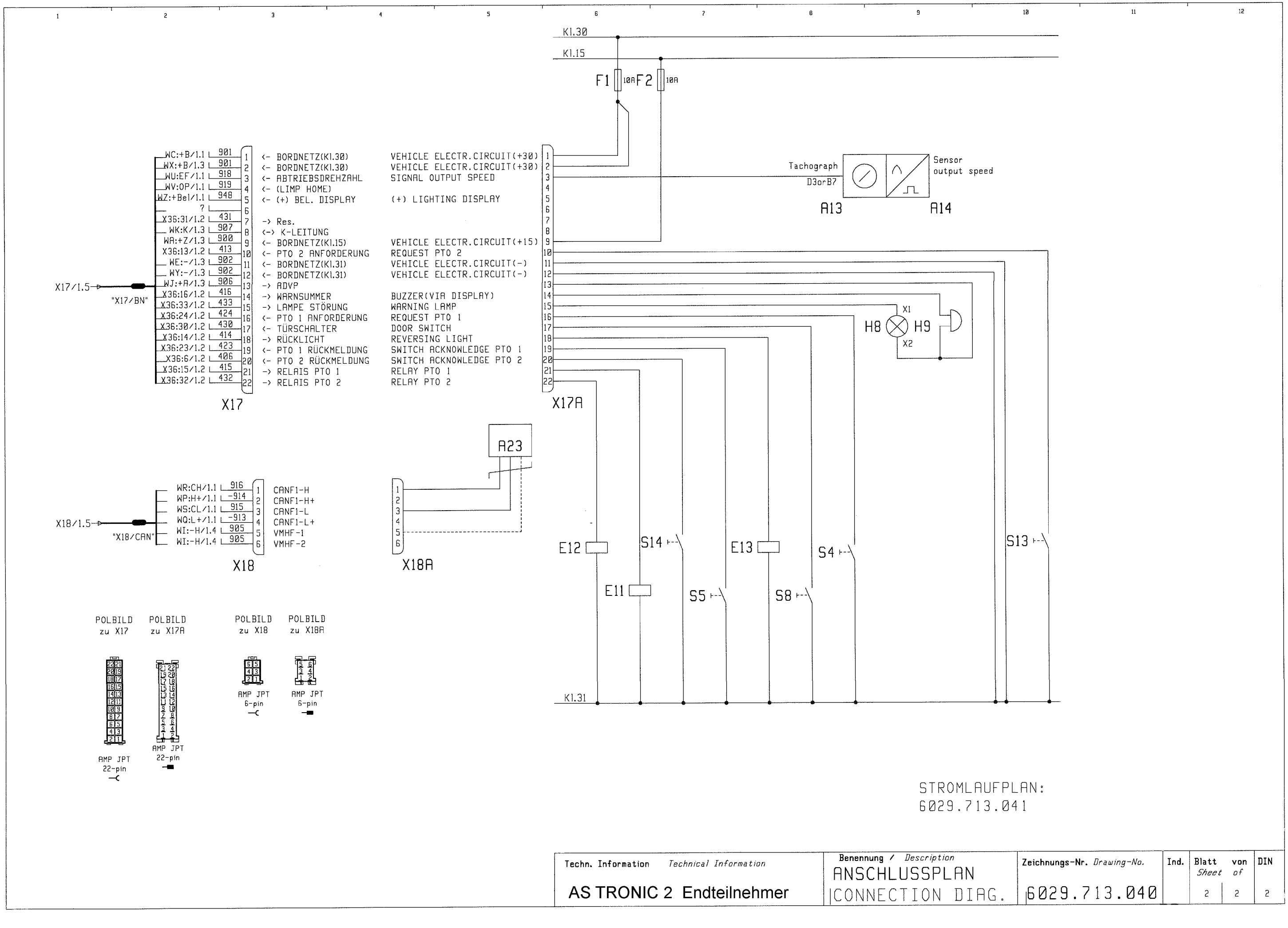
AS TRONIC 2 Endteilnehmer	ANSCHLUSSPLAN CONNECTION DIAG.	6029.713.040		1	2



STROMLAUFPLAN:
6029.713.041

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AS TRONIC 2 Endteilnehmer	ANSCHLUSSPLAN CONNECTION DIAG.	6029.713.040		2	2	2