

## Electrical system

### *Trucknology Generation A (TG-A)*

2002

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## Wiring diagrams

### 2nd Edition K 90

MAN Nutzfahrzeuge Aktiengesellschaft  
Dachauer Str. 667 oder Postfach 50 06 20  
80995 MÜNCHEN 80976 MÜNCHEN

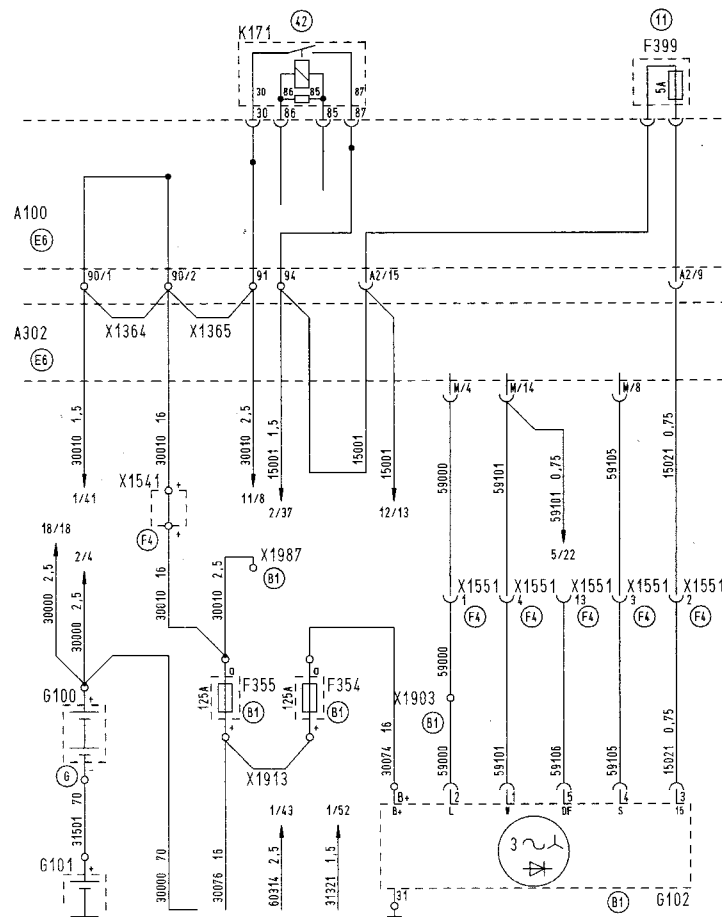
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# Electrical system



## Wiring diagrams K 90 (2nd edition)

### Trucknology Generation A (TG-A)



81.99198-5972

Subject to technical changes in the course of continuing development.

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VSWY / OB/AM 03.2002

Satz: emes GmbH  
Friedrichshafen

## Preface

All series and additional wiring diagrams are documented in the instructions for the "wiring diagrams".

The **series wiring diagrams** (Ch. 3.00) and the **additional wiring diagrams** (Ch. 4.00) are shown in detail to include legends and the names of the circuits.

The present manual is based on wiring diagrams that have been created with the help of a graphics program (CAD).

This allows the instructions to be updated at short notice.

This manual represents the series status of the vehicle on the copy deadline date.

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## Abbreviations

As of: 11.01

<b>a</b>	Acceleration
<b>ABE</b>	General operating permit
<b>ABS</b>	Anti-lock brake system
<b>ABV</b>	Anti-skid system
<b>AC</b>	Air conditioning
<b>ACC</b>	Adaptive cruise control
<b>ACK</b>	Autocheck
<b>ADC</b>	Analog-digital converter
<b>ADR</b>	International agreement for the transport of dangerous goods
<b>AGB</b>	Automatic road speed limiter
<b>AGND</b>	Analog ground
<b>AGR</b>	Exhaust gas recirculation (EGR)
<b>AHK</b>	Trailer coupling
<b>AHV</b>	Trailer brake valve
<b>ALB</b>	Automatic load-dependent brake
<b>AMA</b>	Antenna mast system
<b>ANH</b>	Trailer/semitrailer
<b>AS</b>	Automated gearbox
<b>ASD</b>	Trailer socket
<b>ASM</b>	Trailer control module
<b>ASR</b>	Anti-spin regulator
<b>ASV</b>	Trailer control valve
<b>ATC</b>	Automatic temperature control
<b>ATF</b>	Automatic transmission fluid
<b>AU</b>	Emission test
<b>AV</b>	Exhaust valve
<b>AVS</b>	Automatic gear preselection
<b>BA</b>	Operator's manual
<b>BBA</b>	Service brake system
<b>BBV</b>	Service brake valve
<b>BKR</b>	Brake power regulator
<b>BUGH</b>	Front heater
<b>BV</b>	Back-up valve
<b>BVA</b>	Brake wear indicator
<b>BVS</b>	Brake wear sensor
<b>BVV</b>	Brake wear sensor supply
<b>BW</b>	German Army
<b>BWG</b>	Brake value sensor
<b>BZ</b>	Brake cylinder
<b>CAN</b>	Controller area network
<b>CAN-H</b>	CAN-high data line
<b>CAN-L</b>	CAN-low data line
<b>CATS</b>	Computer-assisted testing and diagnostic system
<b>CCVS</b>	Cruise control vehicle speed
<b>CKD</b>	Completely knocked down
<b>CNG</b>	Compressed natural gas
<b>CPU</b>	Central processing unit
<b>CRT</b>	Continuously regenerating trap
<b>CS</b>	Comfort shift
<b>DAHL</b>	Roof ventilator
<b>DBR</b>	Auxiliary brake relay
<b>DECKE</b>	Cover (for doors)
<b>DF</b>	Speed sensor
<b>DFÜ</b>	Data transmission
<b>DIA</b>	Diagnosis and information display

## ELECTRICAL SYSTEM

### Abbreviations

<b>DIAK</b>	Diagnosis, K-line (data line)
<b>DIAL</b>	Diagnosis, L-line (interrogation line)
<b>DIAR</b>	Diagnosis, further interrogation
<b>DIN</b>	German industrial standard
<b>DKE</b>	Throttle valve increase (ASR control)
<b>DKH</b>	Roof duct heating
<b>DKL</b>	Roof flaps
<b>DKR</b>	Throttle valve reduction (reduction request from ASR to EDC/EMS)
<b>DKV</b>	Throttle valve specification (load sensor signal from EDC/EMS pedal value sensor)
<b>DLB</b>	Compressed air brake system
<b>DM</b>	Diagnostic message
<b>DNR</b>	Drive – Neutral – Reverse (selector switch for automatic gearbox)
<b>DPF</b>	Diesel particulate filter
<b>DRM</b>	Pressure control module
<b>DS</b>	Pressure sensor
<b>DSV</b>	Pressure control valve
<b>DV</b>	Throttle valve
<b>DWA</b>	Anti-theft protection system
<b>DZG</b>	Rpm sensor
<b>DZM</b>	Rev counter
<b>EBS</b>	Electronic brake system
<b>ECAM</b>	Electronically controlled air management
<b>ECAS</b>	Electronically controlled air suspension
<b>ECE</b>	Emergency shut-off to ECE 36
<b>ECU</b>	Electronic control unit
<b>EDC</b>	Electronic diesel control
<b>EDM</b>	Electronic diesel consumption meter
<b>EDR</b>	Maximum speed governor
<b>EEC</b>	Electronic engine controller
<b>EEPROM</b>	Electrically erasable and programmable read-only memory
<b>EFR</b>	Electronic shock absorber control (ESAC)
<b>EFS</b>	Electrical driver's seat
<b>EHAB</b>	Electro-hydraulic shut-off device
<b>ELAB</b>	Electrical shut-off device
<b>ELF</b>	Electronic air suspension
<b>EMS</b>	Electronic throttle control (ETC)
<b>EMV</b>	Electromagnetic compatibility (EMC)
<b>EOL</b>	End-of-line (programming)
<b>EP</b>	Injection pump
<b>ER</b>	Engine retarder (engine brake)
<b>ESAC</b>	Electronic shock absorber control
<b>ESP</b>	Electronic stability program
<b>ESR</b>	Electric sun-blind
<b>EST</b>	Electronic control unit
<b>EV</b>	Intake valve
<b>EVB</b>	Exhaust valve brake
<b>FAP</b>	Driver's area
<b>FAQ</b>	Frequently asked questions
<b>FBA</b>	Parking brake system
<b>FDR</b>	Dynamic handling control
<b>FFR</b>	Vehicle management computer (VMC)
<b>FGB</b>	Road speed limiter (RSL)
<b>FGR</b>	Road speed governor (RSG)
<b>FHS</b>	Cab
<b>FIN</b>	Vehicle identification number (VIN)
<b>FM</b>	Vehicle management
<b>FMI</b>	Failure mode identification

## Abbreviations

<b>FMR</b>	Vehicle/engine management
<b>FOC</b>	Front omnibus chassis (bus/coach chassis with front-mounted engine)
<b>FSCH</b>	Windscreen heater
<b>FSG</b>	Ground reinforcement system
<b>FSH</b>	Window/mirror heating
<b>FTW</b>	Driver's partition
<b>FUNK</b>	Radio communication unit
<b>FZA</b>	Destination system
<b>GDK</b>	Controlled diesel catalytic converter
<b>GEN</b>	Alternator
<b>GET</b>	Gearbox
<b>GGVS</b>	Regulations for the transport of hazardous goods
<b>GND</b>	Ground
<b>GP</b>	Gearbox planetary gear group (range-change box)
<b>GS</b>	Gearbox control
<b>GV</b>	Gearbox splitter gear group (splitter box)
<b>HA</b>	Rear axle
<b>HBA</b>	Auxiliary brake system
<b>HGB</b>	Maximum road speed limiter
<b>HGS</b>	Hydraulic gearshift
<b>HLUE</b>	Hydrostatic fan
<b>HOC</b>	Rear omnibus chassis (bus/coach chassis with rear-mounted engine)
<b>HSS</b>	Highside switch
<b>HST</b>	Main control panel
<b>HU</b>	Main inspection
<b>Hz</b>	Hertz (number of cycles per second)
<b>HZA</b>	Bus stop indicator system
<b>HZG</b>	Auxiliary rpm sensor
<b>IBEL</b>	Interior lighting
<b>IBIS</b>	Integrated on-board information system
<b>IC</b>	Integrated circuit
<b>ID</b>	Identification
<b>IMR</b>	Integrated mechanical relay (starter control)
<b>INA</b>	Information indicator (e.g. check lamp)
<b>IR</b>	Individual control (ABS)
<b>IRM</b>	Modified individual control (ABS)
<b>ISO</b>	International Standards Organisation
<b>IWZ</b>	Incremental angle/time measuring system
<b>KBZ</b>	Combination brake cylinder
<b>KFH</b>	Fuel filter heater
<b>KITAS</b>	Kienzle intelligent tachograph sensor
<b>KLI</b>	Air-conditioning system
<b>KNEEL</b>	Kneeling
<b>KSM</b>	Customer-specified control module
<b>KSW</b>	Customer's special request
<b>KWP</b>	Key word protocol (protocol for MAN-cats diagnosis)
<b>LBH</b>	Air reservoir
<b>LCD</b>	Liquid crystal display
<b>LDA</b>	Manifold-pressure compensator (boost control)
<b>LDF</b>	Boost pressure sensor
<b>LDS</b>	Air spring/damper system
<b>LED</b>	Light emitting diode
<b>LF</b>	Air suspension
<b>LGS</b>	Lane guard system



## ELECTRICAL SYSTEM

### Abbreviations

<b>LL</b>	Idling speed
<b>LLA</b>	Idling speed increase
<b>LLR</b>	Idling speed control
<b>LNG</b>	Liquified natural gas
<b>LOE</b>	Steering oil monitor
<b>LPG</b>	Liquified petroleum gas
<b>LWR</b>	Headlight beam regulator
<b>M-TCO</b>	Modular EU tachograph
<b>MAB</b>	Solenoid valve shut-off (engine shut-off by means of high-pressure solenoid valve in injection pump)
<b>MAN-cats</b>	MAN computer assisted testing and diagnostic system)
<b>MAR</b>	Solenoid valve shut-off relay (redundant engine shut-off relay)
<b>MDB</b>	Engine speed range
<b>MES</b>	Fuel metering control
<b>ML</b>	Midline
<b>MMI</b>	Man-machine interface
<b>MOTB</b>	Engine brake
<b>MP</b>	Engine power box (cable duct on engine block)
<b>MR</b>	Engine governor – ASR
<b>MSG</b>	Engine control unit (EDC)
<b>MV</b>	Solenoid valve
<b>MZ</b>	Diaphragm cylinder
<b>n</b>	rpm
<b>NA</b>	Power take-off (PTO)
<b>NBF</b>	Needle movement sensor
<b>NES</b>	New electronic structure
<b>NFZ</b>	Commercial vehicle
<b>NLA</b>	Trailing axle
<b>NSL</b>	Rear fog lamp
<b>NSW</b>	Front fog lamp
<b>OBDU</b>	On-board diagnostic unit
<b>OC</b>	Occurrence count (errors/faults)
<b>OEAB</b>	Oil separator
<b>OENF</b>	Oil top-up
<b>p</b>	Pressure
<b>PBM</b>	Pulse breadth modulation (→ also see PWM)
<b>PLM</b>	Programmable logic module
<b>PSG</b>	Pump control unit (EDC)
<b>PTO</b>	Power take-off
<b>PWM</b>	Pulse width modulation (→ also see PBM)
<b>RA</b>	Repair manual
<b>RAH</b>	Interior heating
<b>RAM</b>	Random access memory
<b>RAS</b>	Rear axle steering
<b>RAS-EC</b>	Rear axle steering with electronic control
<b>RDRA</b>	Tyre pressure control system
<b>RDS</b>	Radio data system
<b>RET</b>	Retarder
<b>RKL</b>	Priority vehicle light
<b>RLV</b>	Relay valve
<b>RME</b>	Rape seed oil methyl ester (biodiesel)
<b>ROM</b>	Read only memory

## Abbreviations

<b>SA</b>	Special equipment
<b>SAE</b>	Society of Automotive Engineers
<b>SAMT</b>	Semi-automatic mechanical transmission
<b>SB</b>	Service outlet
<b>sec</b>	Second
<b>SER</b>	Series (production)
<b>SG</b>	Control unit
<b>SH</b>	Select-high control (ABS)
<b>SKD</b>	Semi-knocked down
<b>SL</b>	Select-low control (ABS)
<b>SML</b>	Side marker light
<b>SPN</b>	Suspect parameter number
<b>STA</b>	Engine start/stop
<b>SWR</b>	Headlight cleaning system
<b>t</b>	Time
<b>TC</b>	Traction control
<b>TCM</b>	Trailer control module
<b>TCO</b>	Tachograph
<b>TKU</b>	Technical customer document
<b>TMC</b>	Traffic message channel
<b>TRS</b>	Technical road transport directives
<b>TSC</b>	Torque speed control (braking torque)
<b>TUER</b>	Door control
<b>U<sub>Bat</sub></b>	Battery voltage
<b>UDS</b>	Crash recorder
<b>v</b>	Velocity/vehicle speed
<b>VA</b>	Front axle
<b>VG</b>	Transfer case
<b>VLA</b>	Leading axle
<b>WA</b>	Maintenance manual
<b>WAB</b>	Water separator
<b>WLE</b>	Swap-body unit
<b>WR</b>	Warning relay
<b>WS</b>	Position sensor
<b>WSK</b>	Torque converter and clutch unit
<b>z</b>	Braking rate/deceleration
<b>ZBR</b>	Central on-board computer
<b>ZBRO</b>	Central on-board bus computer
<b>ZDR</b>	Intermediate speed governor (ISG)
<b>ZE</b>	Central electrical system (CES)
<b>ZR</b>	Central computer
<b>ZS</b>	Central lubrication
<b>ZUSH</b>	Auxiliary heater
<b>ZWS</b>	Time-based maintenance system
$\lambda$	Slip
$\mu$	Coefficient of friction
$\mu\text{C}$	Microcontroller (microprocessor)

## Notes on safety

The following sections include summaries of important regulations listed according to major topics. The intention is to provide the knowledge needed to avoid accidents which could lead to injury, damage and environmental pollution.

Additional instructions are included in the Operator's Manual that is provided with the vehicle.

### Important:

Accidents may happen in spite of all precautionary measures having been taken. In such an eventuality, **obtain immediate medical assistance from a doctor.** This is particularly important if the accident involves skin contact with corrosive acid, fuel penetration under the skin, scalding by hot oil, antifreeze spraying into eyes etc.

### Regulations for preventing accidents leading to injury to personnel.

#### Only authorised technical personnel are allowed to perform inspection, adjustment and repair work.

- Secure the vehicle to prevent it from rolling away.
- Support the frame when working on the pneumatic or spring suspension system.
- Secure units during their removal.
- Only authorised personnel are allowed to start and operate the engine.
- Do not approach moving parts of a running engine too closely. Do not wear baggy clothing.
- Do not touch the engine with your bare hands when it is at operating temperature: Risk of burns!
- Keep the area around the engine, ladders and steps free from oil and grease. Accidents caused by slipping can have serious consequences.
- Only use tools that are in perfect condition. Damaged or widened spanners can slip: Risk of injury!
- No-one is allowed to stand under an engine suspended from a crane hook. – Keep all lifting tackle in good condition –.
- Collect any brake fluid that emerges. Treat brake fluid as hazardous waste! Comply with the safety regulations for preventing environmental pollution.
- Brake fluid is toxic! Do not allow it to come into contact with food or open wounds.
- Do not open the coolant circuit until the engine has cooled down. If it does need to be opened whilst the engine is at operating temperature, follow the instructions in the "Maintenance and care" section in the Operator's Manual.
- Do not attempt to retighten or open pipe lines and hoses (lubricating oil circuit, coolant circuit and possible subsequent hydraulic oil circuit) whilst they are pressurised: Fluid spraying out represents an injury hazard!
- Do not hold your hands under the jet of fuel when checking the injector nozzles. Do not inhale fuel vapours.



## GENERAL INFORMATION

- Always disconnect the batteries before working on the vehicle electrical system.

**Important!** Oxyhydrogen gas may form in enclosed battery boxes. When the batteries are disconnected, this gas may be ignited by sparks produced by other continuously operating consumers, the tachograph etc. that cannot be shut down. Blow compressed air through the battery box before disconnecting the batteries!

- Only tow-start the vehicle if the batteries are connected (minimum charge 40%)! Do not use a boost-charger to jump-start the vehicle! Always disconnect the positive and negative leads before boost-charging batteries!
- Disconnect the batteries and recharge them every 4 weeks if the vehicle is not in use.

**Caution!** Battery acid is poisonous and corrosive. Battery gases are explosive.

- Follow the manufacturer's instructions for handling batteries.
- **Measure voltage** only using suitable measuring devices!  
The input resistance of a measuring device should be at least 10 MΩ.
- **The ignition must be switched off** before the wiring harness plugs of electronic control units are disconnected or connected up!

**When performing electrical welding work**, connect up the "ANTIZAP SERVICE MONITOR" (MAN item number 80.78010.0001) or the improved SES-1 version (MAN item number 80.78010.0002) in accordance with the instructions supplied with the device.

If this device is not available, disconnect the batteries and join the positive cable to the negative cable in order to make a conductive connection.

Always earth the welding equipment as close as possible to the welding area. Do not lay the cables to the welding equipment in parallel to electrical cables in the vehicle.

For further accident prevention measures, please refer to the "Leaflets for welders".

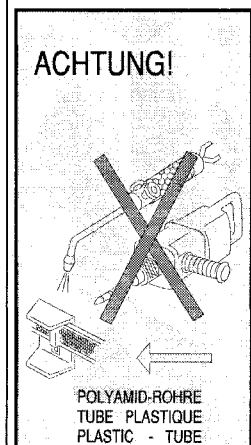
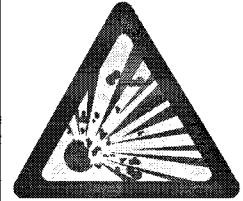
The frame is **not** intended for use as an earth return!

- If attachments are to be retrofitted to the vehicle – e.g. a taillift – **additional earth lines** with adequate cross-section must be fitted as well. Otherwise the earth connection may be created along wire cables, wiring harnesses, gearbox shafts, gears etc. Severe damage could result.
- **If painting work is to be carried out**, do not expose the electronic components to high temperatures (max. 95 °C) for more than brief periods; a time of up to around 2 hours is permissible at a maximum of 85 °C. Disconnect the batteries.

### Plastic tubes (polyamide)

**Important! – Risk of damage and fire!**

- The warning sign opposite can be found on the co-driver's door below the door lock. It warns you against welding or drilling near to plastic tubes.



**Limited liability for accessories and parts**

In your own interests, you are recommended to use only accessories expressly approved by MAN and genuine MAN parts for your MAN vehicle. The reliability, safety and suitability of these parts and accessories have been determined specifically for MAN vehicles. Despite constant market observation, we cannot judge the aspects of other products, nor can we accept responsibility for them – even if they have been officially approved by the German TÜV technical inspection authorities or some other official body.

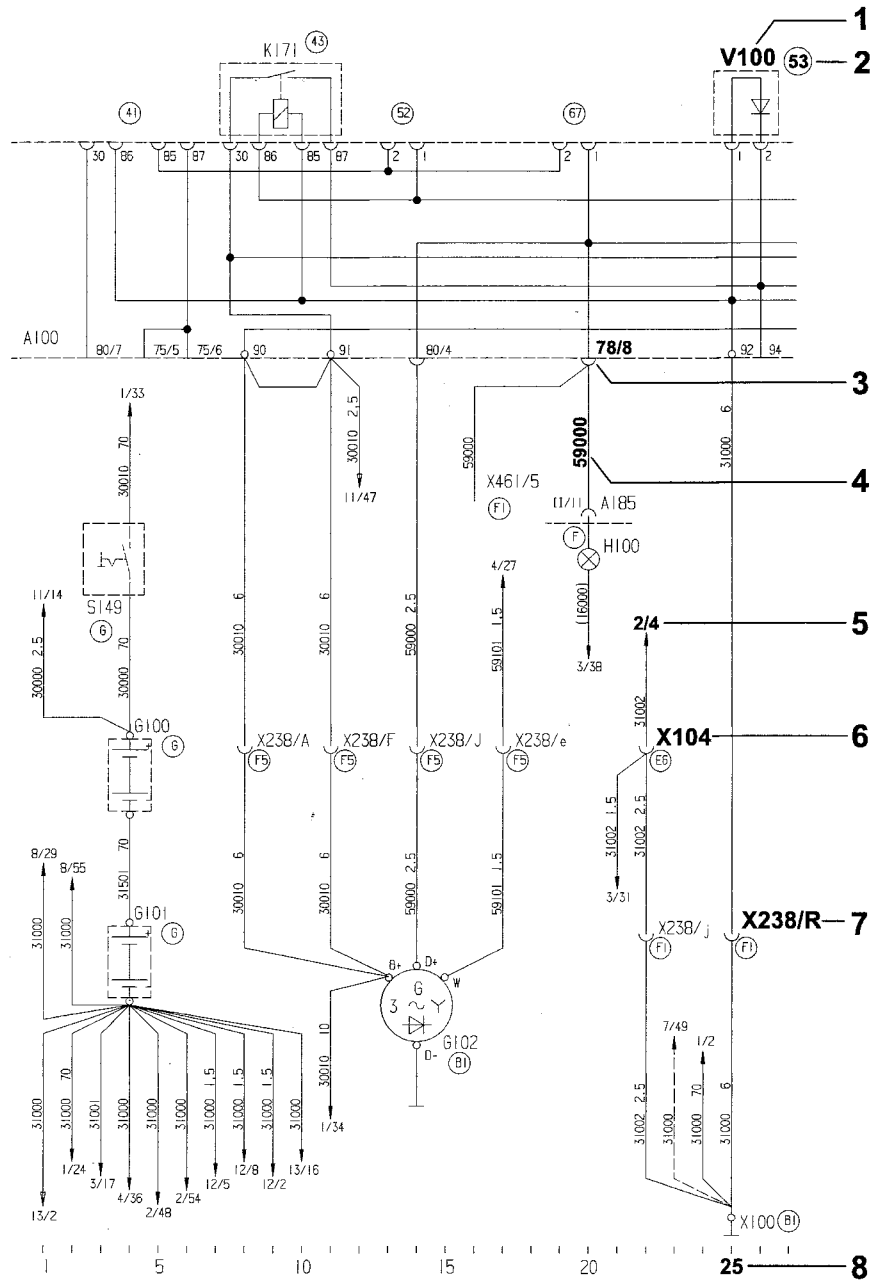
**Bodies and special attachments**

Comply with the safety instructions and regulations issued by the bodymaker in question if bodies or special attachments are fitted.

**Taking out of operation or putting into storage**

The special measures described in MAN Works Standard M 3069 Part 3 apply if buses or trucks are to be withdrawn from service or stored for a period longer than 3 months.

Instructions for using wiring diagrams

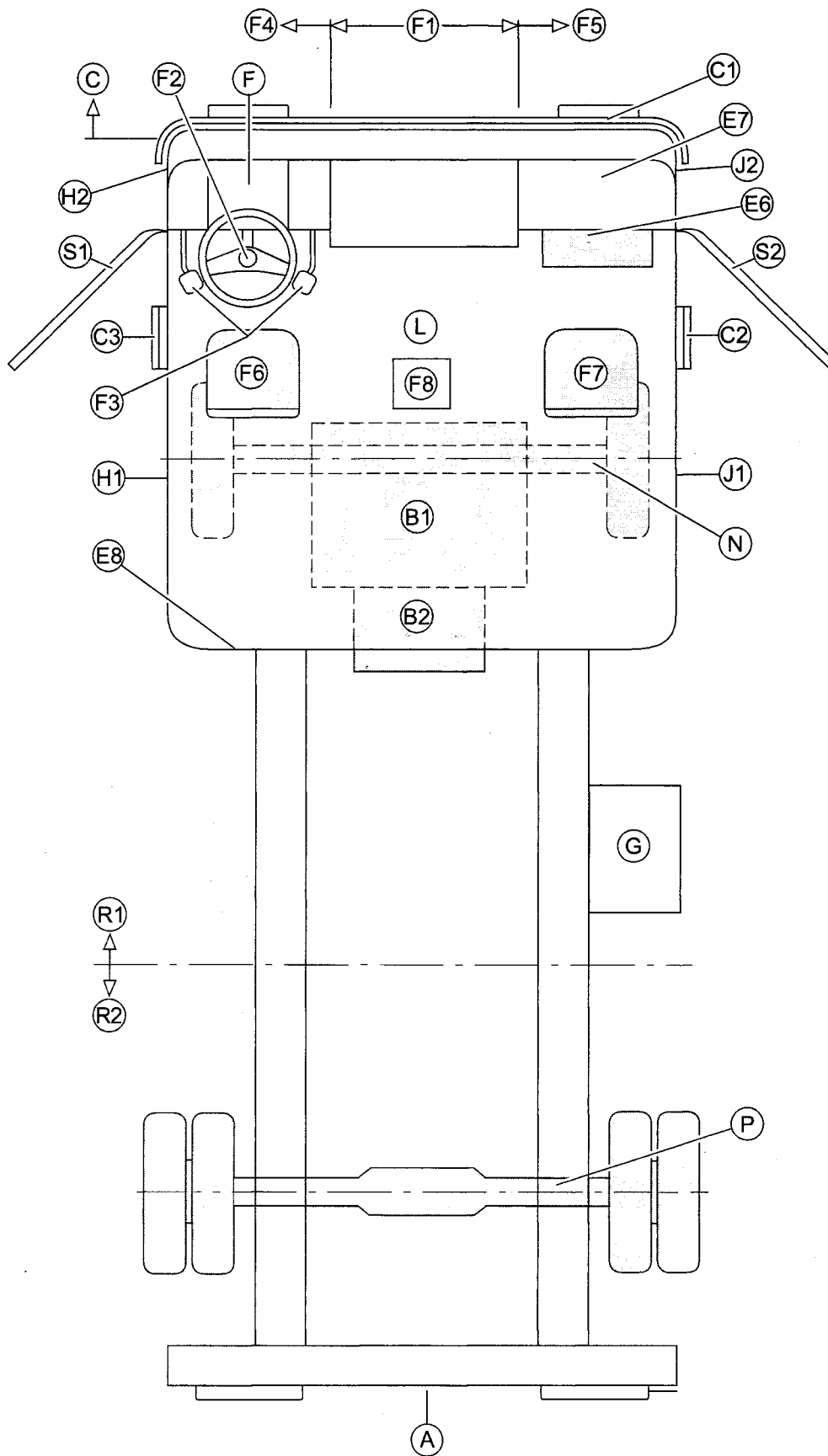


- 1 Name of component (here: diode V100 on the central fuse, relay and terminal box ("ZE"), position 53)
- 2 Mounting position on the front panel of the central fuse, relay and terminal box ("ZE") (here: engraved position number 53)
- 3 Plug connector on the rear of the central fuse, relay and terminal box ("ZE") (here: plug 78, connection 8)
- 4 Cable number; printed on the cable at short intervals (cross-section only if greater than 1<sup>2</sup>)
- 5 Sheet number (**not** page number) and circuit number  
Marking to show on which sheet and circuit the conductor continues  
(here: continuation of conductor 31002 on sheet 2 on circuit 4)
- 6 Plug connector (here: single-pin connector X104 in the ZE area)
- 7 Component mounting position (here: 21-pin connector X238 Pin R  
- wiring harness cab to engine - in central portion)
- 8 Circuit number (**please note**: sheets are numbered consecutively from 1 to 55)

**Important note on the use of the wiring diagram legends:** A three-digit number is shown in brackets after various item numbers. This number is the coded part number for this component! These part numbers can be found in the **T60** device list.

GENERAL REMARKS

Mounting positions for left-hand drive



**Marks**

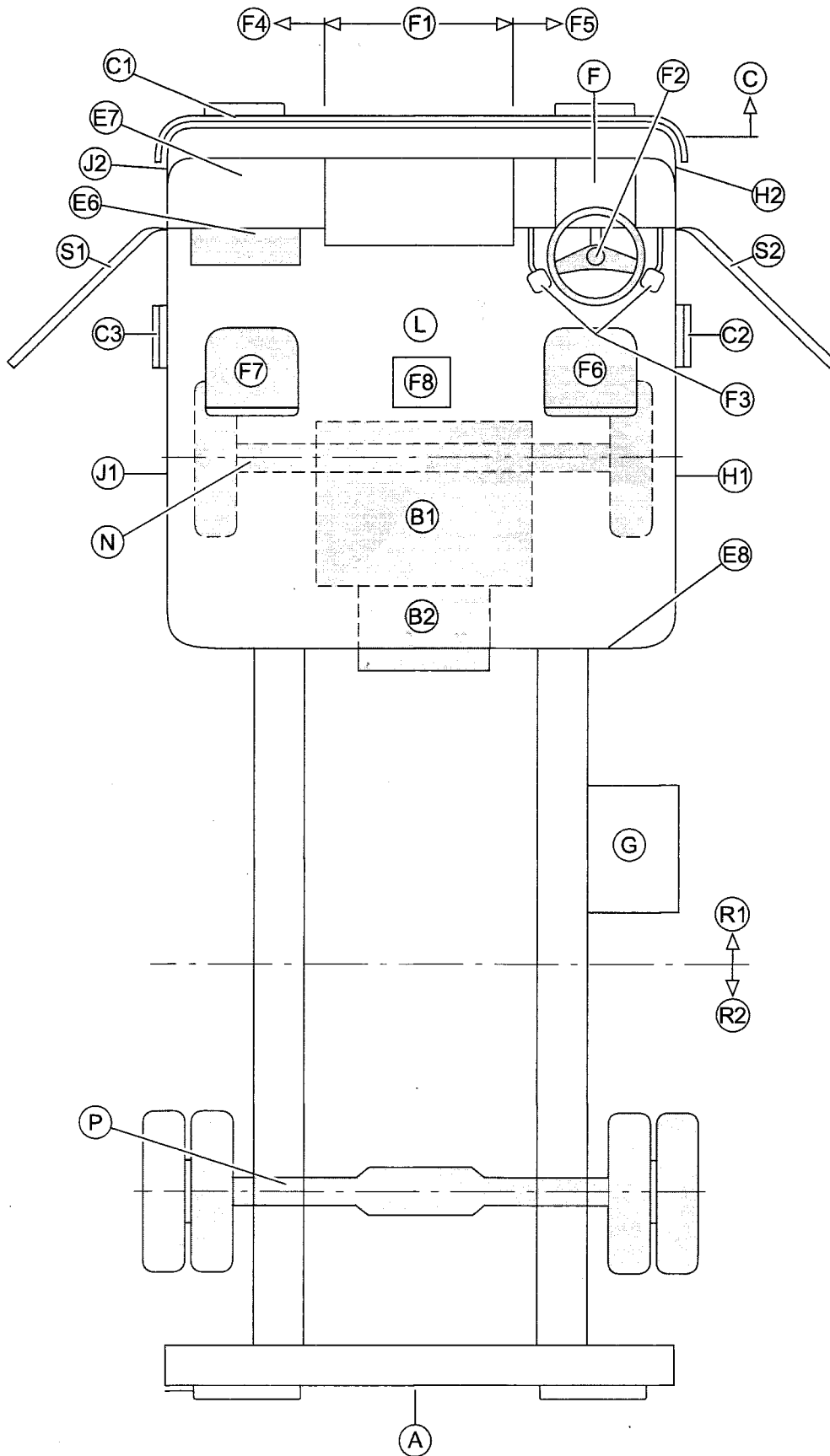
**Mounting position**

<p>(A) .....</p> <p>(B1) .....</p> <p>(B2) .....</p> <p>(C) .....</p> <p>(C1) .....</p> <p>(C2) .....</p> <p>(C3) .....</p> <p>(E6) .....</p> <p>(E7) .....</p> <p>(E8) .....</p> <p>(F) .....</p> <p>(F1) .....</p> <p>(F2) .....</p> <p>(F3) .....</p> <p>(F4) .....</p> <p>(F5) .....</p> <p>(F6) .....</p> <p>(F7) .....</p> <p>(F8) .....</p> <p>(G) .....</p> <p>(H1) .....</p> <p>(H2) .....</p> <p>(J1) .....</p> <p>(J2) .....</p> <p>(L) .....</p> <p>(N) .....</p> <p>(P) .....</p> <p>(R1) .....</p> <p>(R2) .....</p> <p>(S1) .....</p> <p>(S2) .....</p>	<p>Tail</p> <p>Engine</p> <p>Gearbox</p> <p>Front</p> <p>Bumper</p> <p>Entrance right</p> <p>Entrance left</p> <p>Central electrics area</p> <p>Control unit racks</p> <p>Rear wall of cab</p> <p>Instrument panel</p> <p>Central part</p> <p>Steering wheel/column</p> <p>Foot pedals</p> <p>Front wall, inside left</p> <p>Front wall, inside right</p> <p>Driving seat</p> <p>Passenger seat</p> <p>Control panel</p> <p>Battery box</p> <p>B-pillar on driver's side</p> <p>A-pillar on driver's side</p> <p>B-pillar on passenger's side</p> <p>A-pillar on passenger's side</p> <p>Ceiling/roof</p> <p>Front axle</p> <p>Rear axle</p> <p>Front parts of frame</p> <p>Rear part of frame</p> <p>Door left</p> <p>Door right</p>
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



GENERAL REMARKS

Mounting positions for right-hand drive



**Marks**

**Mounting position**

<p>(A) .....</p> <p>(B1) .....</p> <p>(B2) .....</p> <p>(C) .....</p> <p>(C1) .....</p> <p>(C2) .....</p> <p>(C3) .....</p> <p>(E6) .....</p> <p>(E7) .....</p> <p>(E8) .....</p> <p>(F) .....</p> <p>(F1) .....</p> <p>(F2) .....</p> <p>(F3) .....</p> <p>(F4) .....</p> <p>(F5) .....</p> <p>(F6) .....</p> <p>(F7) .....</p> <p>(F8) .....</p> <p>(G) .....</p> <p>(H1) .....</p> <p>(H2) .....</p> <p>(J1) .....</p> <p>(J2) .....</p> <p>(L) .....</p> <p>(N) .....</p> <p>(P) .....</p> <p>(R1) .....</p> <p>(R2) .....</p> <p>(S1) .....</p> <p>(S2) .....</p>	<p>Tail</p> <p>Engine</p> <p>Gearbox</p> <p>Front</p> <p>Bumper</p> <p>Entrance right</p> <p>Entrance left</p> <p>Central electrics area</p> <p>Control unit racks</p> <p>Rear wall of cab</p> <p>Instrument panel</p> <p>Central part</p> <p>Steering wheel/column</p> <p>Foot pedals</p> <p>Front wall, inside left</p> <p>Front wall, inside right</p> <p>Driving seat</p> <p>Passenger seat</p> <p>Control panel</p> <p>Battery box</p> <p>B-pillar on driver's side</p> <p>A-pillar on driver's side</p> <p>B-pillar on passenger's side</p> <p>A-pillar on passenger's side</p> <p>Ceiling/roof</p> <p>Front axle</p> <p>Rear axle</p> <p>Front parts of frame</p> <p>Rear part of frame</p> <p>Door left</p> <p>Door right</p>
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## Search criteria

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