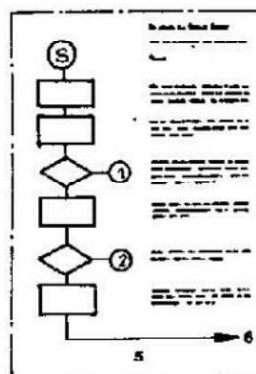


TM 10-16 LOT 7000

EM 10-15S LOT 7005

**TROUBLESHOOTING
ELECTRICAL EQUIPMENT**



Contactor tips

Single contactor, front tip tip : 8 mm min.
10 mm max.
Change-over contactor,
front tip gap : 3 mm min.
5 mm max.
back tip gap : automatic adjustment if the front tip gap
is correct

Thermal protector

The thermal protector TP/RES 13 is a so-called PTC thermistor, i.e. its resistance increases with increasing temperature.

Test:

Test:

An ohmmeter is used for testing. Unplug connector No. 2 at the logic box. Connect one lead at pin 12 of connector 2 and the other lead at the shunt. If the reading is greater than 80 Ω while the power unit is cold, the thermal protector must be replaced.

Zener diode

REC 8 - zener diode

Test:

An ohmmeter is used for testing. Unplug connector No. 2 at the logic box. Connect one ohmmeter lead to pin 2 of connector 2 and connect the other lead to the shunt. Then reverse the test meter lead and repeat the measurement. The reading must be less than 1000 Ω in one direction and greater than 50 000 Ω in the other direction. If the meter shows short or open circuits in at least one direction, the zener diode REC 8 has to be replaced.

Resistors

Resistors REC 1 and 2 are used to supply a reduced voltage to the control card.

Test:

A voltmeter is used for testing. Unplug connector No. 1 at the logic box. Connect one measuring lead to wire 4 at fuse 5 FU and the other lead at pin 18 on connector 1. The voltage drop must be approx. 36 V.

Accelerator unit

For testing of the accelerator unit refer to chapter "Accelerator unit" in this book.

CARD

Use a VOM for testing. Always connect the negative measuring lead to B - (e.g. shunt) and the positive measuring lead to the terminal itself.

Leave both connectors plugged into the card. Voltage range: 60 V - except when stated otherwise under column "Measurement".

Terminal	Operation	Measurement
C 1/1	Not used	
C 1/2	Operate truck during SCR and by-pass range	BV during SCR range 0 V during 1A range
C 1/3	Same as C 1/2	8-12 V during SCR range 0 V during by-pass range
C 1/4	Operate truck in reverse range, then change direction.	0-1 V as soon and as long as forward microswitch is closed. BV, when reverse contactor is closed.
C 1/5	Operate truck in forward range, then change direction.	0-1 V as soon and as long as reverse microswitch is closed. BV, when forward contactor is closed.
C 1/6	Same as C 1/2	0 V during SCR range, 1 V after close of 2 MS; 1.5 V after close of 1 A contactor.
C 1/7	Not used	
C 1/8	Close key switch, select direction, then close MS 1.	0 V as long as PMT has not operated. BV as soon as PMT works.
C 1/9	Not used	
C 1/10	Not used	
C 1/11	Same as C 1/2	0 V during all ranges.
C 1/12	Not used	
C 1/13	Not used	

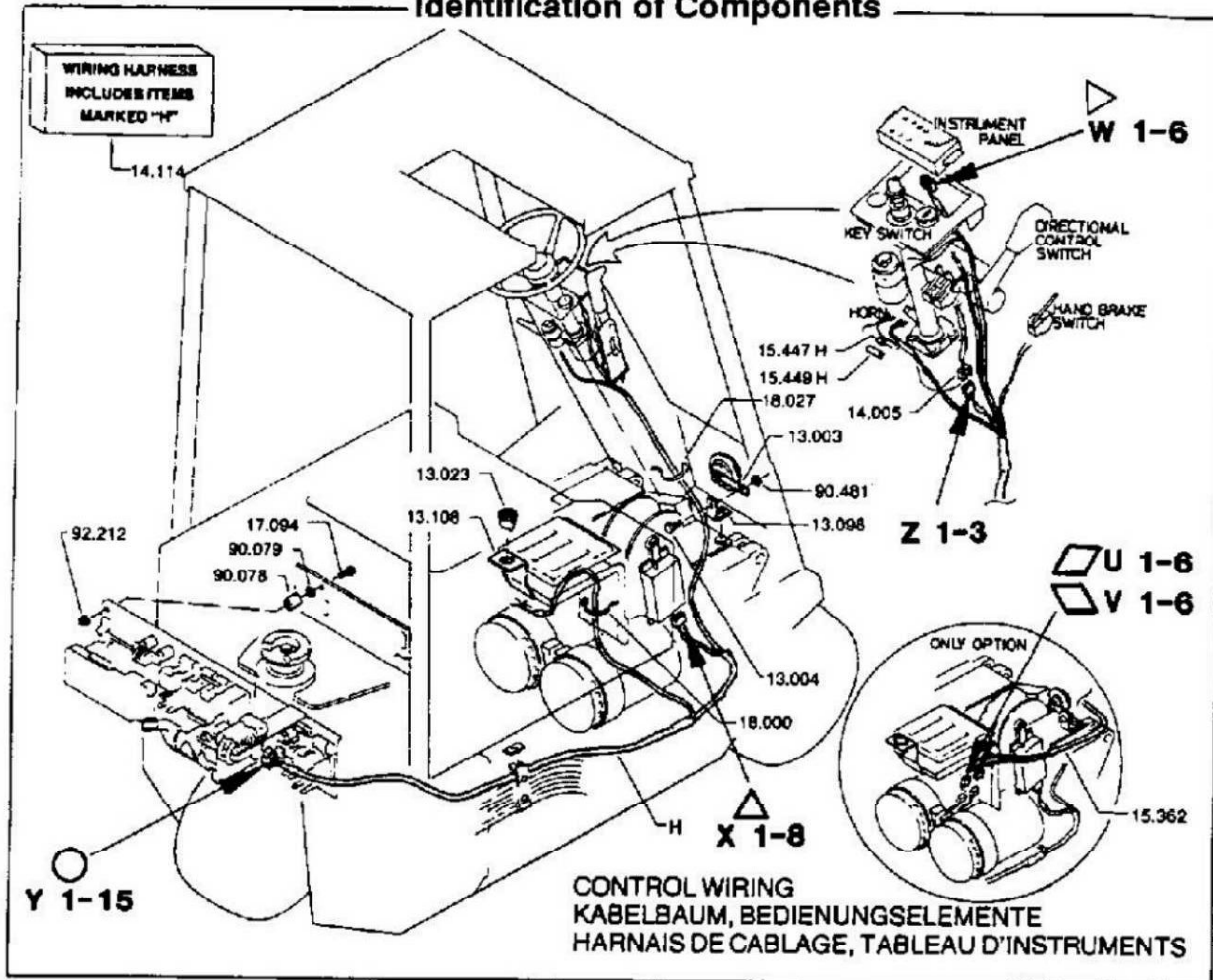
C 1/14	Close key switch, select direction and slowly depress the accelerator.	Variable accelerator input voltage Approx. 0.3 V with closed 1 MS. Voltage rises up to approx. 5 V with accelerator pedal movement.
C 1/15	Operate truck in forward direction, then switch over to reverse direction.	Monitoring wire for plugging operation. Voltage drops under BV during normal operation and shortly rises during plugging.
C 1/16	Operate truck in SCR range.	Voltage supply to accelerator foot pedal - 10-14 V.
C 1/17	Turn the key switch to "ON" position.	BV as soon as key switch is closed.
C 1/18	Same as C 1/17	Stabilised voltage supply 10-14 V as soon as key switch is closed.
C 1/19	Not used.	
C 1/20	Not used.	
C 2/1	Operate truck during SCR and by-pass range	0 V during both ranges.
C 2/2	Operate truck in SCR range.	Zener diode to protect the card against high battery voltages - 10-12 V.
C 2/3	Operate truck in SCR and by-pass range	Gate lead SCR 1, low voltage during creep speed, rising voltage depending on accelerator pedal position. Slight drop with MS 2 closed.
C 2/4	Not used.	
C 2/5	Not used.	
C 2/6	Operate truck in SCR and 1A range.	Capacitor feedline during by-pass operation - low voltage (rising) during SCR range, approx. 0 Volt during by-pass range.

C 2/7	Operate truck during SCR and by-pass range. Note: do not stall motors for longer than 20 seconds.	Voltage drop across shunt during all operations. Low voltage during SCR range, rising voltage with load on the drive motors. Voltage depends directly on the motor current flow. Measure in the 300 mV range.
C 2/8	Operate truck during SCR and by-pass range.	Fuses lines - 0 V during all operations.
C 2/9	Operate the truck in the SCR range, then press the contacts of the 1 A contactor together with a screwdriver.	Monitoring via PMT function - BV during normal operation, 0 V as soon as 1 A contactor tips touch.
C 2/10	Not used.	
C 2/11	Operate truck during SCR and by-pass range.	0 V during both ranges.
C 2/12	Operate truck during SCR and by-pass range.	Output to thermal protector TP/RES 13 - less than 1 V with cold power unit.
C 2/13	Operate truck during SCR and by-pass range.	0 V during both operations (voltage drop across shunt) - measurement as described under C 2/7 possible.
C 2/14	Operate truck during SCR and by-pass range.	0 V during both operations (voltage drop across shunt) - measurement as described under C 2/7 possible.
C 2/15	Operate truck during SCR and by-pass range.	Gate lead SCR 2 - approx. 1 V during creep speed, falling value with accelerator pedal movement, 0 V during 1 A range.

Note :

Using the chart will help you to work out whether the fault is in the wiring harness or inside the logic unit. However, it will not enable you to find or repair any fault inside the electronic card.

Abbildungen der Bauteile Identification of Components



HORN
SIGNALHORN
AVERTISSEUR

FASTENER, HORN
BEF.-MITTEL, SIGNALHORNRELAIS
PIECES DE FIXATION DE L'AVERTISSEUR

METER, ENGINE HOUR
BETRIEBSSTUNDENZAehler
COMPTEUR D'HEURES DE FONCTIONNEMENT

BRACKET, HORN MOUNTING
HALTER, SIGNALHORN
SUPPORT D'AVERTISSEUR

BRACKET, HOUR METER MOUNTING
HALTER, BETRIEBSSTUNDENZAehler
SUPPORT DU COMPTEUR D'HEURES DE FONCT.

HARNESS, DASH END WIRING
KABELBAUM, INSTRUMENTENTAFEL
HARNAIS, TABLEAU D'INSTRUMENTS

HARNESS, MACHINE WIRING
KABELBAUM, MASCHINENVERDRAHTUNG
HARNAIS, CABLAGE DE LA MACHINE

HARNESS, DRIVE MOTOR BRUSH WEAR IND. MOD. WIRING
KABELSTRANG, BUERSTENVERSCHLEISSANZEIG. MODUL
FAISCEAU DE CABLES, INDIC. D'USURE DES BALAIS

13.003

DIODE, HARNESS
DIODE, KABELBAUM
DIODE, HARNAIS CABLAGE

15.447

13.004

BOOT, HARNESS, DIODE
SCHUTZKAPPE, DIODE KABELBAUM
CAPOT PROTECTEUR, DIODE HARNAIS CABLAGE

15.449

13.023

FASTENER, CONTACTOR PANEL MOUNTING
BEF.-MITTEL, SCHUETZTAFEL
PIECE FIX. PANNEAU CONTACTOR

17.094

13.096

CLIP, HARNESS
SCHELLE, KABELBAUM
COLLIER, HARNAIS CABLAGE

18.000

13.106

CLIP, HARNESS
SCHELLE, KABELBAUM
ATTACHE DU HARNAIS

18.027

14.005

WASHER, CONT. PANEL MNTNG FASTENER
SCHEIBE, SCHUETZTAFELBEFESTIGUNG
RONDELLE, FIX. TABLEAU CONTACTEURS

90.078

14.114

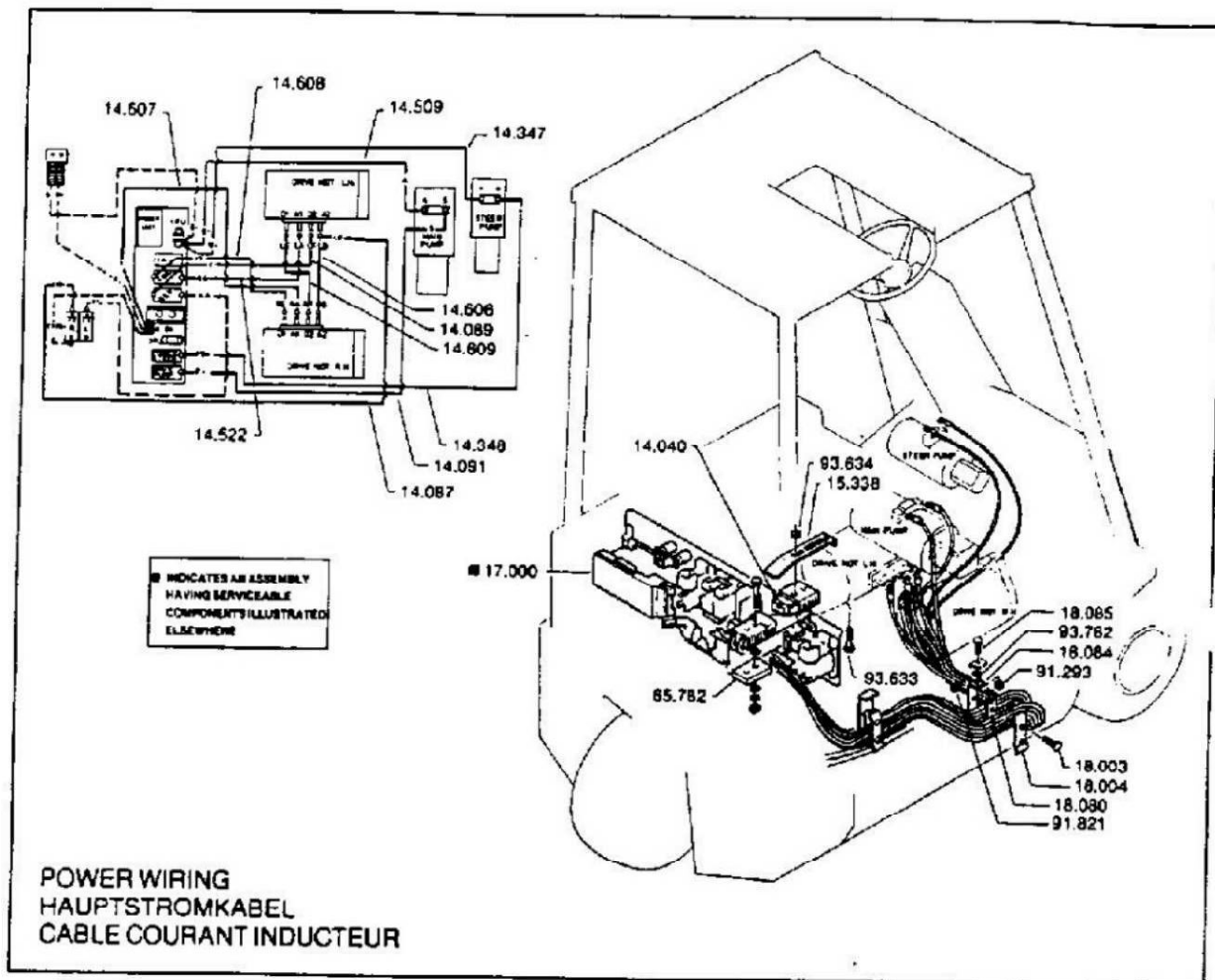
LOCKW. CONTACTOR PANEL FASTENER
FEDERRING BEF. SCHUETZTAFEL
ROND. GROUVER, FIX. PANNEAU CONTACTEUR

90.079

15.362

NUT, HORN MOUNTING BRACKET FAST
MUTTER, MONTAGEHALTERBEFESTIGUNG
ECROU, FIX. SUPPORT DE MONTAGE

90.481



RECEPTACLE, BATTERY CABLE
 BATTERIESTECKER
 PRISE BATTERIE

CABLE, DRIVE MOTOR (A2)
 LEITER, ANTRIEBSMOTOR (A2)
 CABLE, MOTEUR DE COMMANDE (A2)

CONDUCTOR, DRIVE MOTOR (S2)
 LEITER, ANTRIEBSMOTOR (S2)
 CONDUCTEUR, MOTEUR DE COMMANDE (S2)

CABLE, PUMP MOTOR (PA1)
 KABEL, PUMPENMOTOR (PA1)
 CABLE, MOTEUR DE POMPE

WIRE ASSY, STRG PUMP MOTOR
 KABEL, PUMPENMOTOR
 CABLE, MOTEUR DE POMPE

CONDUCTOR, STEER PUMP MOTOR (S2)
 STROMLEITER, LENKPUMPENMOTOR
 CONDUCTEUR, MOTEUR POMPE DE DIRECT.

CABLE, PUMP MOTOR (PS2)
 KABEL, PUMPENMOTOR (PS2)
 CABLE, MOTEUR DE POMPE (PS2)

CABLE, SCR (-)
 KABEL, SCR (-)
 CABLE, SCR (-)

14.040

CABLE, DRIVE MOTOR (A1) LH
 KABEL, FAHRMOTOR (A1)
 CABLE, MOTEUR DE COMMANDE (A1)

14.606

14.087

CABLE, DRIVE MOTOR (A2) LH
 KABEL, FAHRMOTOR (A2)
 CABLE, MOTEUR DE COMMANDE (A2)

14.507

14.089

CABLE, DRIVE MOTOR (S1) LH
 KABEL, FAHRMOTOR (S1)
 CABLE, MOTEUR DE COMMANDE (S1)

14.608

14.091

CABLE, DRIVE MOTOR (S2) LH
 KABEL, FAHRMOTOR (S2)
 CABLE, MOTEUR DE COMMANDE (S2)

14.609

14.347

STRIKER PLATE, BATT PLUG DISCONNECT LEVER
 FANGBLECH, BATTERIESTECKER HEBEL
 SUPPORT, PRISE DE BATTERIE

15.338

14.348

CONTROL PANEL ASSEMBLY
 ZUS.-BAU STEUERTAFEL
 ENSEMBLE PANNEAU CONTROL

17.000

14.509

FASTENER, WIRING HARNESS CLIP
 BEF.-MITTEL, KABELBAUMSCHELLE
 PIECES FIXATION ATTACHE DU HARNAIS

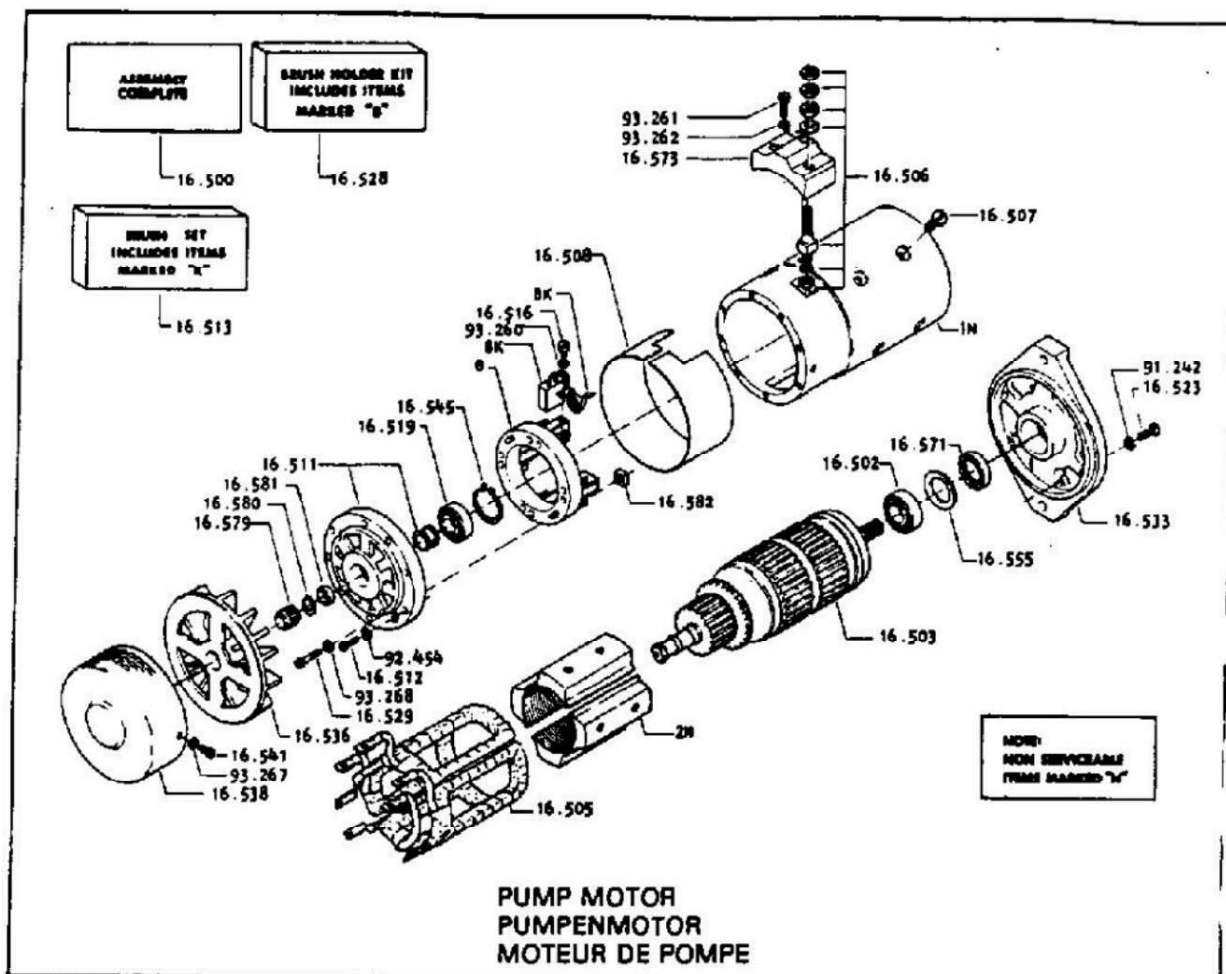
18.003

14.522

CLIP, WIRING HARNESS
 SCHELLE, KABELBAUM
 COLLIER, HARNAIS

18.004

RETAINER, DRIVE END BEARING ARRETIERUNG, MOTORLAGER RETENUE, PALIER DE MOTEUR	16.028	RETAINER, DRIVE MOTOR ARMATURE FAN ARRETIERUNG, MOTORANKER ARRETAGE, VENTILATEUR DU MOTEUR DE TRACTION	16.097
SEAL, ARMATURE SHAFT DRIVE END DICHTUNG, ANTRIEBSWELLE JOINT, ARBRE DE COMMANDE	16.029	SENSOR, DRIVE MOTOR BRUSH WEAR INDICATOR MESSFUEHLER, BUERSTENVERSCHLEISS-ANZEIGER DETECTEUR, INDICATEUR D'USURE BALAIS	16.098
BRUSH HOLDER KIT, DRIVE MOTOR BUERSTENHALTER, FAHRMOTOR SUPPORT DE BALAI, MOTEUR DE COMMANDE	16.030	BRACKET, DRIVE MOTOR INDICATOR SENSOR HALTER, ANTRIEBSMOTOR ANZEIGER-MESSFUEHLER SUPPORT, DETECTEUR-INDICATEUR MOTEUR TRACTION	16.099
TERMINAL KIT, DR MOTOR (FIELD) ANSCHLUSS, FAHRMOTOR (FELD) BORNE, MOTEUR DE COMMANDE (CHAMPS)	16.033	TERMINAL BLOCK DRIVE MOTOR ANSCHLUSS, FAHRMOTOR RACCORD, MOTEUR DE TRACTION	16.106
FAN, DRIVE MOTOR ARMATURE LUEFTER, MOTORANKER VENTILATEUR, ARMATURE DE MOTEUR	16.036	LOCKWASHER, DRIVE MOTOR MOUNTING FASTENER FEDERRING, FAHRMOTORBEFESTIGUNG ANNEAU-RESSORT, FIX, MOTEUR DE COMMANDE	90.983
COLLAR, ARM DRIVE END BUCHSE, MOTORANKER DOUILLE, INDUIT DE MOTEUR	16.061	LOCKWASHER, DRIVE MOTOR END FRAME FAST FEDERRING, LAGERSCHELLENBEFESTIGUNG ANNEAU-RESSORT, FIX, DU CADRE	90.993
FRAME, DRIVE MOTOR DRIVE END ANTRIEBSLAGER, FAHRMOTOR PALIER D'ENTRAINEMENT MOT. DE TRACTION	16.078	LOCKWASHER, DRIVE MOTOR END FRAME FAST FEDERRING, LAGERSCHELLENBEFESTIGUNG ANNEAU-RESSORT, FIX, DU CADRE	90.994
FRAME, DRIVE MOTOR COMMUTATOR END KOLLEKTORLAGER, FAHRMOTOR PALIER DE COLLECTEUR MOTEUR DE TRACTION	16.079	LOCKWASHER, DR. MOT. BRUSH LEAD FAST FEDERRING, FAHRMOTORBURSTENKABELBEF. ANNEAU-RESSORT, FIXATION BALAI	93.003
RETAINER, DRIVE MOTOR COMMUTATOR END FRAME ARRETIERUNG, KOLLEKTOR GEHAUSEDECKEL ARRETAGE, PALIER COLLECTEUR MOTEUR DE TRACTION	16.093	FASTENER, DRIVE MOTOR TERMINAL BLOCK BEF. MITTEL, FAHRMOTORANSCHLUSSBLOCK FIXATION, BLOC DE CONNEXION	93.231
COLLAR, DRIVE MOTOR COMMUTATOR END FRAME BUCHSE, FAHRMOTOR DOUILLE, PALIER COLLECTEUR MOTEUR DE TRACTION	16.094	WASHER, DRIVE MOTOR TERMIN. BLOCK ASSY SCHEIBE, FAHRMOTORANSCHLUSSBLOCK RONDELLE, BLOC DE CONNEXION	93.232
CLAMP DRIVE MOTOR BRUSH HOLDER SCHELLE, BUERSTENHALTER COLLIER, PORTE BALAIS MOTEUR DE TRACTION	16.095	NOT SOLD, USE ITEM NUMBER LISTED NUR LIEFERBAR MIT POSITION SEULEMENT LIVRABLE AVEC POSITION	USE 16.000 1 N
BUSHING, FIELD COIL CONDUCTOR INSULATING BUCHSE, FELDSPULENSATZ ISOLATION DOUILLE, ISOLATION CONDUCTEUR ENROULE D'EXCITA.	16.096	NOT SOLD, USE ITEM NUMBER LISTED NUR LIEFERBAR MIT POSITION SEULEMENT LIVRABLE AVEC POSITION	USE 16.000 2 N



MOTOR ASSEMBLY, PUMP
PUMPENMOTOR, VOLLST.
MOTEUR DE POMPE, COMPLET

16.500

FASTENER, COMMUTATOR END FRAME
BEF.-MITTEL LAGERSCHILD
PIECE FIX. FLASQUE

16.512

BEARING, PUMP MOTOR DRIVE END
LAGER, LAGERSCHILD PUMPENMOTOR
PALIER, FLASQUE MOTEUR DE POMPE

16.502

BRUSH SET, PUMP MOTOR
BURSTENSATZ, PUMPENMOTOR
JEU DE BALAIS, MOTEUR DE POMPE

16.513

ARMATURE, PUMP MOTOR
ANKER, PUMPENMOTOR
ARMATURE, MOTEUR DE POMPE

16.503

FASTENER, PUMP MOTOR BRUSH
BEF.-MITTEL, MOTORBURSTEN
PIECE FIX. BALAIS DE MOTEUR

16.518

COIL SET, PUMP MOTOR FIELD
FELDSPULENSATZ, PUMPENMOTOR
JEU DE BOBINES, MOTEUR DE POMPE

16.505

BEARING, PUMP MOTOR COMMUTATOR END
LAGER, PUMPENMOTOR
PALIER, MOTEUR DE POMPE

16.519

TERMINAL KIT, PUMP MOTOR FIELD
ANSCHLUSSSATZ, PUMPENMOTOR (FELD)
JEU DE BORNES, MOTEUR DE POMPE (CHAMPS)

16.508

FASTENER, PUMP MOTOR DRIVE END FRAME
BEF.-MITTEL LAGERSCHILD
PIECE FIX. PALIER

16.523

FASTENER, PUMP MOTOR POLE SHOE
BEF.-MITTEL, POLSCHUH
PIECE FIX. CORNE POLAIRE

16.507

RING, PUMP MOTOR BRUSH MOUNTING
MONTAGERING, MOTORBURSTEN
ANNEAU DE MONTAGE, BALAIS DU MOTEUR

16.528

BAND, PUMP MOTOR BRUSH HOLE COVER
ABDECKBAND, MOTORBURSTEN
BANDE DE COUVERTURE, BALAIS DE MOTEUR

16.509

FASTENER, BRUSH HOLDER MTG RING
BEF.-MITTEL, MONTAGERING
PIECE FIX. ANNEAU DE MONTAGE

16.529

FRAME, PUMP MOTOR COMMUTATOR END
LAGERSCHILD, PUMPENMOTOR
FLASQUE, MOTEUR DE POMPE

16.511

FRAME, PUMP MOTOR DRIVE END
LAGERSCHILD, PUMPENMOTOR
FLASQUE, MOTEUR DE POMPE

16.533