



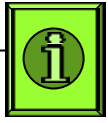
Version. 2.2

Service Training

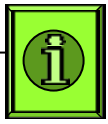


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 Basic
 Electric
 Hydraulic
 Adjustments
 Search for failures

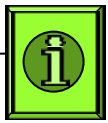
Functions



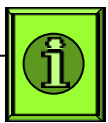
Components



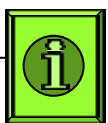
Motor basic



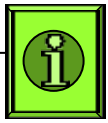
Dashboard



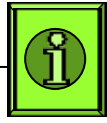
Mechanic



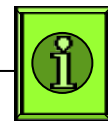
Options



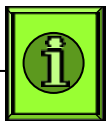
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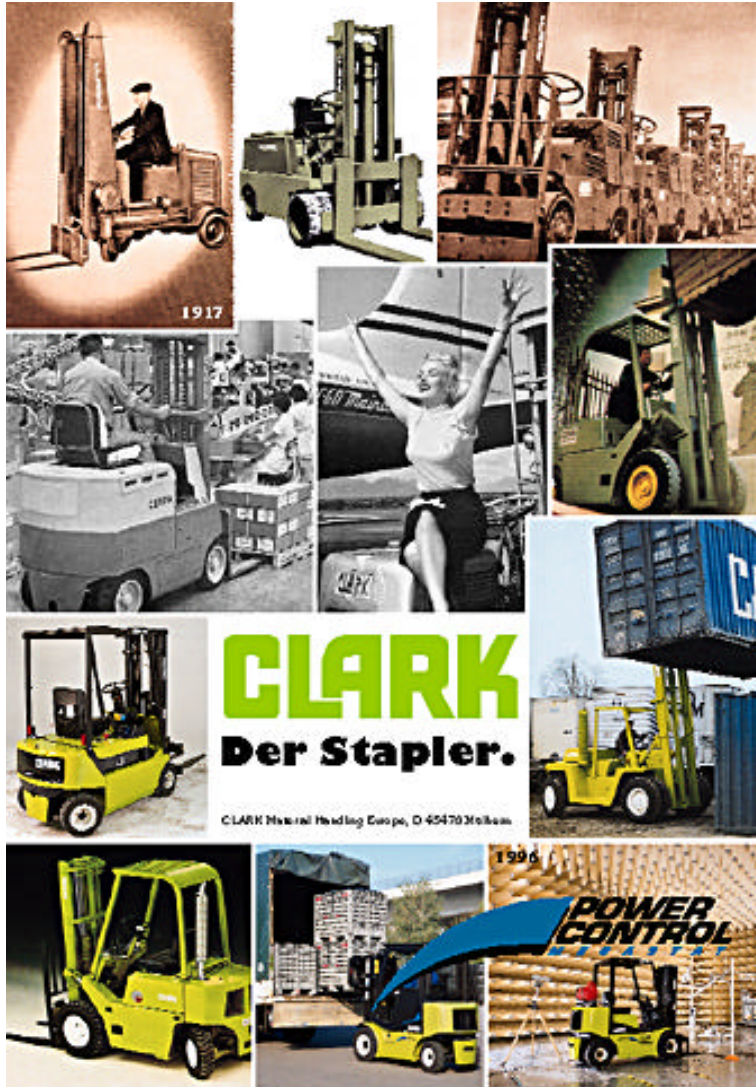
Structure



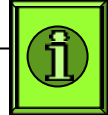
Help



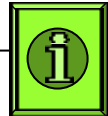
Functions



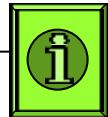
Diagnose controller



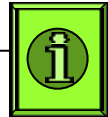
Wiring diagram



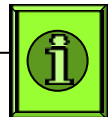
Harness



Single functions



Search for failures



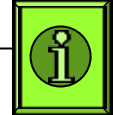
Main menu



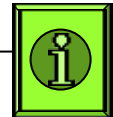
Wiring diagram



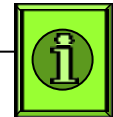
Power supply



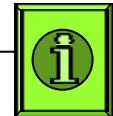
Capacity part



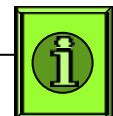
Drive functions



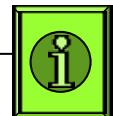
Hydraulic functions



Supervision functions



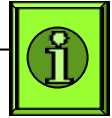
Complete wiring diagram



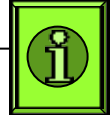
Single functions



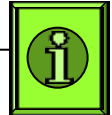
Capacitor charge



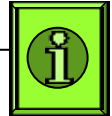
TFR-contactor



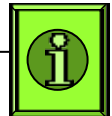
Coil test



Self-test

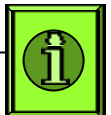
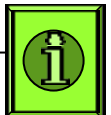
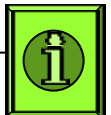
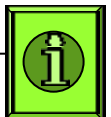
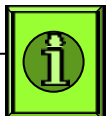
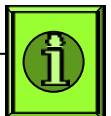
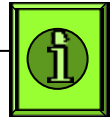


Cornering

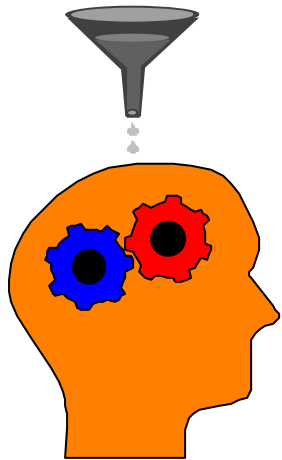
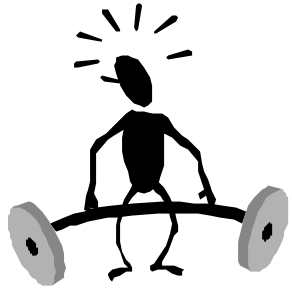


Diagnose Controller



- Test-items 
- Lists of failures 
- Parameter pump 
- Parameter drive 
- Plug pump 
- Plug drive 
- Plug arrangement 

Mechanic



Hydraulic Components



Hydraulic Function



Hydraulic Plan



Steering Components



Steering Function

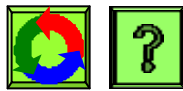


Brake Components



Brake Function





| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
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Tip:

If the accelerator voltage is higher than 1,5V after switching the key-operated switch, the drive functions are blocked.

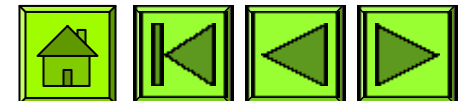
„ACCELERATOR“ appears on the display. **No** error is entered in the fault memory.

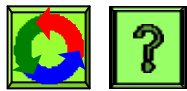
An error is indicated, if the power-circuit of the accelerator-power supply is disturbed.

The +12V supply voltage runs from the drive control, plug TG3, to the drive pedal F1-1 via the wire 78A. The current runs back from the drive pedal F1-3 via wire 13F to the drive control, plug TG1

There is a diode in the drive control, between TG1 and battery minus.

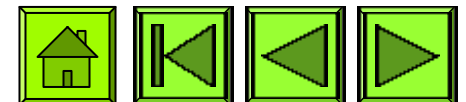
When a current is flowing a voltage arises at this diode (0,6 to 0,7V). This voltage is measured by the control.

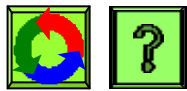




| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
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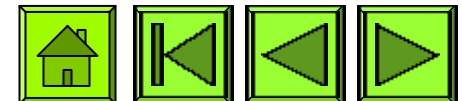
An error is indicated, if the control recognises current while the truck stands still or if no current is measured during operation (faster than 65% speed).

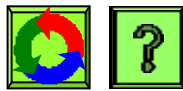




| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10. 1999 |
|---|------|-------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
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The steering potentiometer provides voltage proportional to the actual steering angle. If the voltage is lower then 0,8V or higher then 4,2V, an error is indicated.



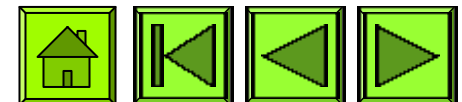


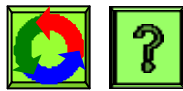
| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
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Software monitoring:

The software (the programme) is processed step by step by the microprocessor.

A counter runs in parallel to this. Each time the programme is run, it reaches a point at which this counter is set to zero. If the programme does not run properly, the counter is not set to zero, leading to the achievement of a defined numerical value at which the programme is interrupted.



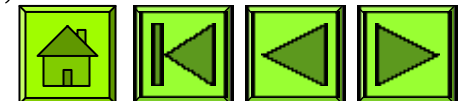


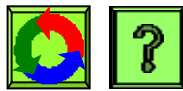
| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksumme | A 54 | |
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If this failure appears, the total parameter list has to be loaded again. If the failure appears repeatedly, the electronic card has to be changed.

The EEPROM is a memory for changeable data, i.e. parameters, failures, etc., which must not get lost after turning of the supply voltage.

If a value of the memory is changed, the software inquires a checksum out of the present index. This checksum is memorised. Every time the machine is turned on, the checksum is inquired again and compared with the memorised checksum. If the checksums are not identical, one or more values must have been changed.

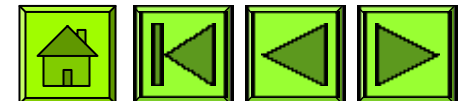


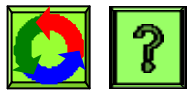


| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A 50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
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The temperature sensor is located directly on the transistors.
 At temperatures above 75°C, the control system regulates the speed.

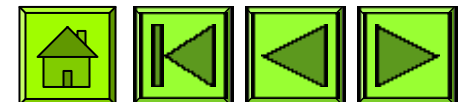
If no cooling is reached with power decrease, the motor is switched off, at a temperature of 80°C.

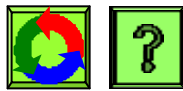




| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
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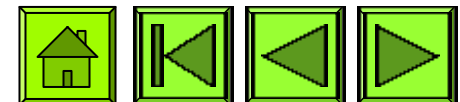
If the transistors are not controlled, the voltage between battery negative and and VMN(R) and (L) is half the battery voltage.

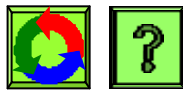




| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A 50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
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The direction-contactors are switched on, before the drive-brake-contactor is activated. After switching on, the software has to change the voltage potential at V MN (R) and (L) to 0V within a given time.

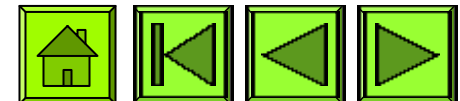


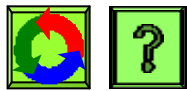


| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A 50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
| No UB+ connection; delay detective (relais not correct) | A 58 | |
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If the direction-coils and the brake-coil is switched on, the potential at VMN(R) and (L) battery has to be +.

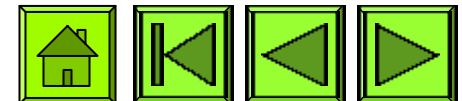
After switching on the coil, the voltage potential has to be reached within a given time, built into the software.

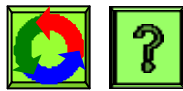




| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|-------------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
| No UB+ connection; delay detective (relais not correct) | A 58 | |
| Problem with contactor coils | A 59 | |

The contactor-coils are checked from the control, that there is no interruption and short circuit in winding (to high current).



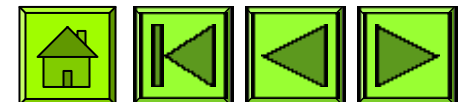


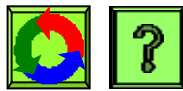
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|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
| No UB+ connection; delay detective (relais not correct) | A 58 | |
| Problem with contactor coils | A 59 | |

| CTM/CEM 10-20 Error Memory Pump Controller | | |
|--|------|--|
| Description | Code | |
| Power circuit open, tested on M- | A 60 | |
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The power circuit is connected with the battery (+) from the exit of the control (M-) via motor coil.

If this connection does not exist, the power circuit must be disturbed.





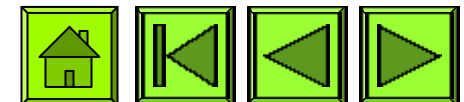
| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|--|-------------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A 50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
| No UB+ connection; delay detective (relais not correct) | A 58 | |
| Problem with contactor coils | A 59 | |

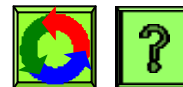
The temperature sensor is located directly on the transistors.

At temperatures above 75°C, the control system regulates the speed.

If no cooling is reached with power decrease, the motor is switched off, at a temperature of 80°C.

| CTM/CEM 10-20 Error Memory Pump Controller | | |
|---|-------------|--|
| Description | Code | |
| Power circuit open, tested on M- | A 60 | |
| Thermal protection close to the transistors (>75°C) | A 61 | |
| | | |
| | | |





Error memory pump control

| CTM/CEM 10-20 Error Memory Drive Controller | | 20.10.1999 |
|---|------|------------|
| Description | Code | |
| Accelerator pedal, Interruption in accelerator circle | A 50 | |
| Shunt value incorrect | A 51 | |
| Steering potentiometer out of range <0,8V or >4,2V | A 52 | |
| Watchdog timer or MOSFET-driver | A 53 | |
| EEPROM-Checksum | A 54 | |
| Thermal protection (>75°C) contin. Speed reduction | A 55 | |
| Voltage at VMN(R)-(L) not between 30% - 70% | A 56 | |
| No UB- connection; delay detective (F or R don't switch on) | A 57 | |
| No UB+ connection; delay detective (relais not correct) | A 58 | |
| Problem with contactor coils | A 59 | |

| CTM/CEM 10-20 Error Memory Pump Controller | | |
|---|------|--|
| Description | Code | |
| Power circuit open, tested on M- | A 60 | |
| Thermal protection close to the transistors (>75°C) | A 61 | |
| Shunt value incorrect | A 62 | |
| | | |
| | | |

A failure is indicated, if the control registers current at the still standing motor or no current at the running motor.

