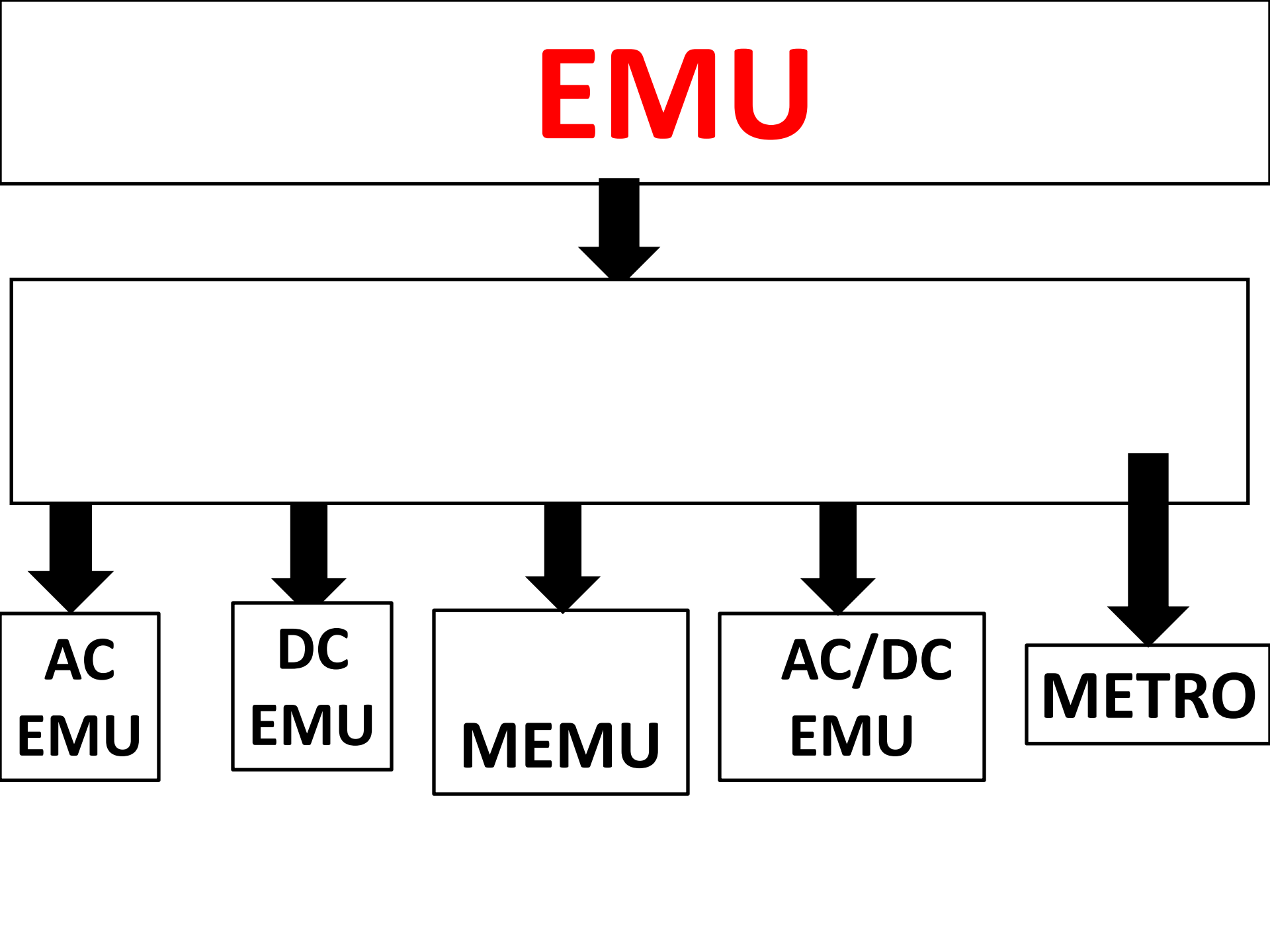
SIEMENS ACDC EMU

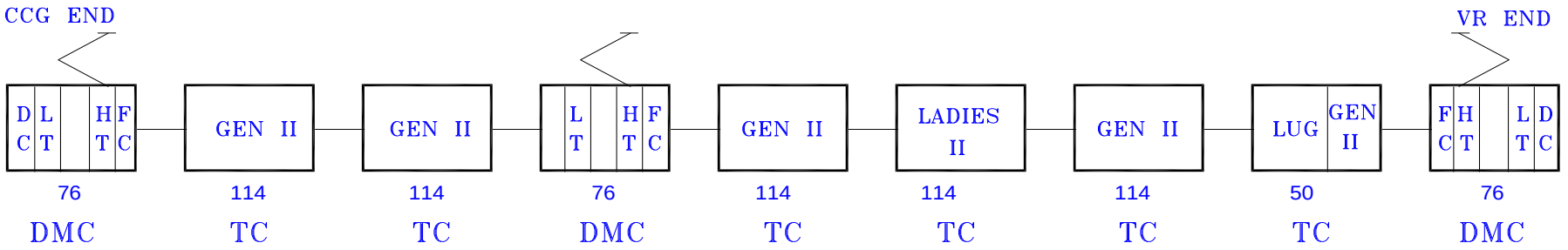
N.D.TURKAR/PL/IRIEEN


EMU
AC EMU
DC EMU
MEMU
AC/DC EMU
METRO

ADVANTAGES OF EMU TRAIN SETS

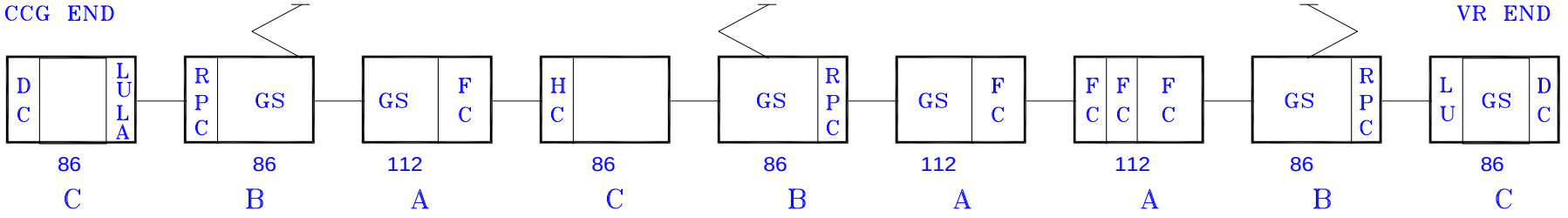
- **Higher reliability – due to distributed power units.**
- **Lower and distributed axle load-reduces track bridge maintenance and increases assets life.**
- **Higher acceleration and deceleration –due to distributed power distribution.**
- **Higher floor area- due to elimination of loco.**
- **Elimination of reversal of train- increases operational efficiency.**
- **Noiseless and environment friendly –due to absence of power cars.**
- **Reduced maintenance ,long life of wheels and brake equipments- due to regenerative braking.**
- **Reduced coupler forces- increases safety.**
- **Due to higher acceleration and deceleration-less time in negotiating speed restrictions and achieving max speed.**
- **(It is possible to reduce the run time by 3 hrs by operating train at 130 kmph without any additional expenditure on track and other infrastructure.)**

9 CAR AC EMU FORMATION



TOTAL SEATING
CAPACITY = 848

9 CAR DC EMU FORMATION



TOTAL SEATING
CAPACITY = 852

SIEMENS EMU

Passenger carrying capacity(12 car)

Type of load	No. of passenger	remarks
Normal load	1255	All in sitting condition
Crush load	2510	1255-in sitting condition 1255- in standing condition
Dense crush	3765	1255-in sitting condition 2510- in standing condition
Super dense Crush	4290	1255-in sitting condition 3035- in standing condition
Practical Dense Crush Load	5000	1255- In sitting condition 3745- In standing condition.

ADVANTAGES OF 3-PHASE DRIVE

- Energy efficient.
- Passenger comfort due to step-less control.
- Better adhesion due to smooth control.
- Flexible operation , wide range of diagnostic features and very compact size of equipment due to adaptability to digital control.
- Robustness and reliability with low maintenance.
- High power/weight ratio.
- Inherent regenerative braking capability.
- Unity power factor in AC traction.

THE ADVANTAGES OF 3 PHASE EMU

1. It enables energy efficiency.

2. It provides step less control thereby increasing passenger comfort.

3. Better adhesion between wheel and rail due to smooth control.

4. Due to digital electronic control, the flexible operation, wide range of diagnostic features and very compact size of equipment.

5. Robustness and reliability with a low maintenance requirement.

6. High power to weight ratio.

7. High voltage, low current operation.

8. Inherent regenerative braking capability.

9. Unity power factor in AC traction.

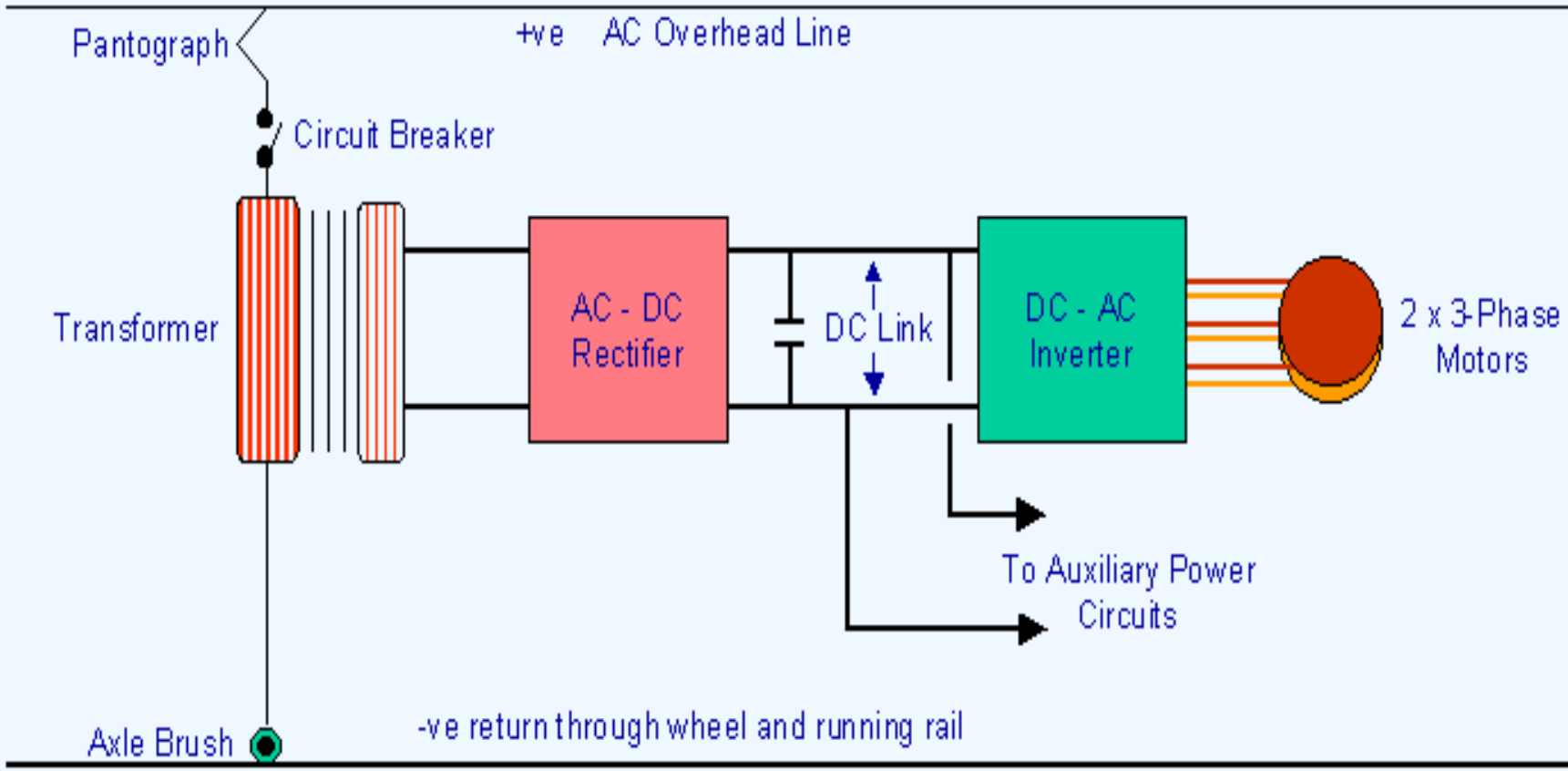
10. Roller bearings axle suspension reduces maintenance.

LIST OF ABBREVIATIONS

- 4QC Four Quadrant Converter
- ACU Auxiliary Converter Unit
- BCU Brake Control Unit
- DTC Driving Trailer Car
- EP Electro-Pneumatic
- HSCB High Speed Circuit Breaker
- HTC High Tension Compartment
- IGBT Insulated Gate Bipolar Transistor

- KLIP Intelligent terminal for peripheral interfacing.
- MVB Multifunction Vehicle Bus.
- NDTC Non Driving Trailer Car
- SIBAS Siemens Bahn Automation System
- TCC Traction Converter Container
- TCU Traction Control Unit
- VCB Vacuum Circuit Breaker

POWER CIRCUIT



Schematic of single phase AC supply powering 3-phase AC motors

TRACTION EQUIPMENTS

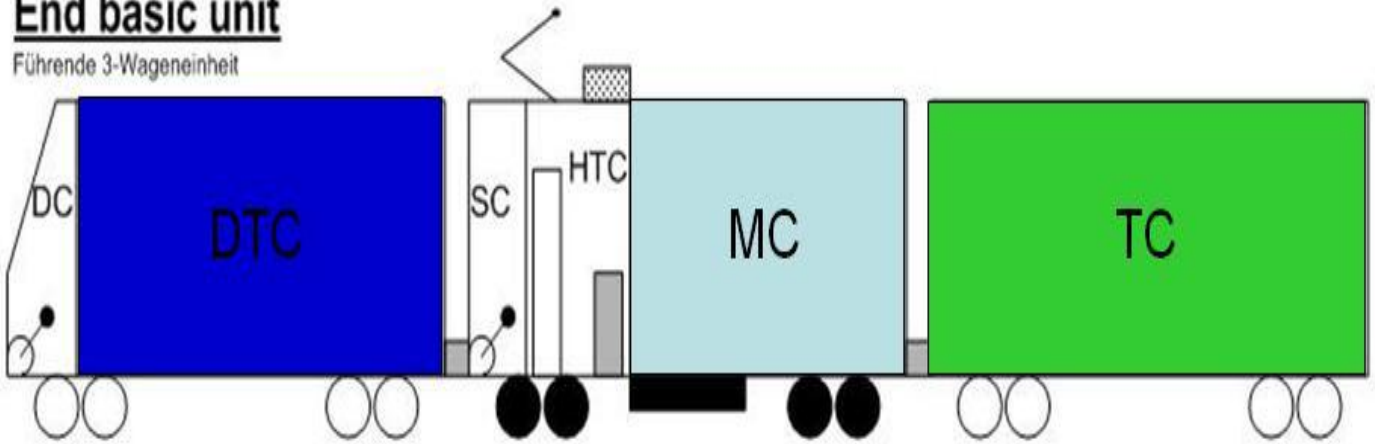
- PANTO GRAPH
- VCB/ABB
- MAIN TRANSFORMER
- 4QC CONVERTER
- DC LINK
- VVVF INVERTER
- TRACTION MOTORS

AUXILARY EQUIPMENTS

- AUXILIARY CONVERTER UNIT
- TRANSFORMER OIL PUMP
- RADIATOR FAN MOTORS
- TCC COOLING FAN MOTOR
- SIMPLIFIED BATTERY CHARGER
- MAIN COMPRESSOR
- AUXILARY COMPRESSOR

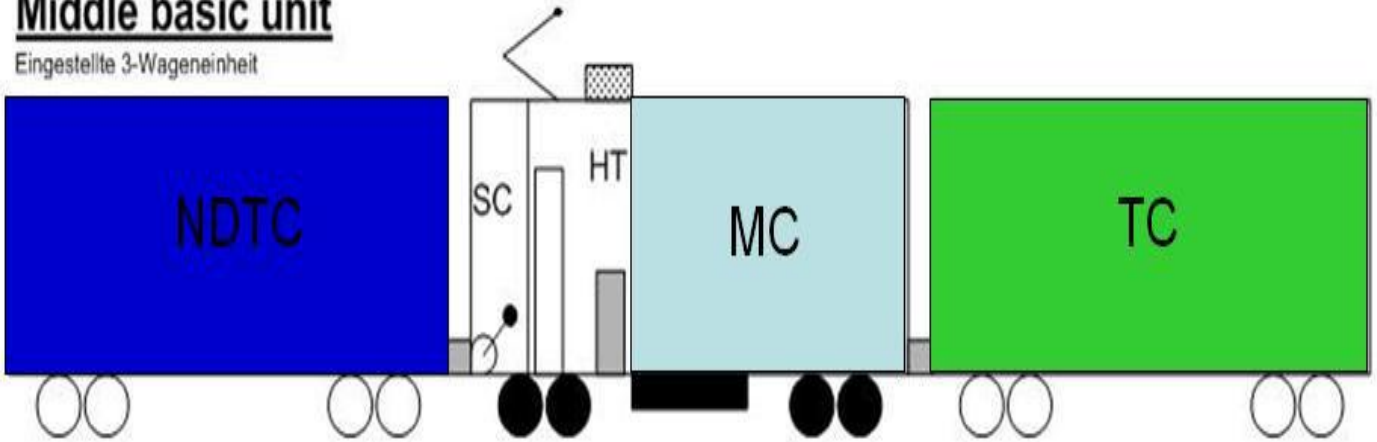
End basic unit

Führende 3-Wageneinheit



Middle basic unit

Eingestellte 3-Wageneinheit

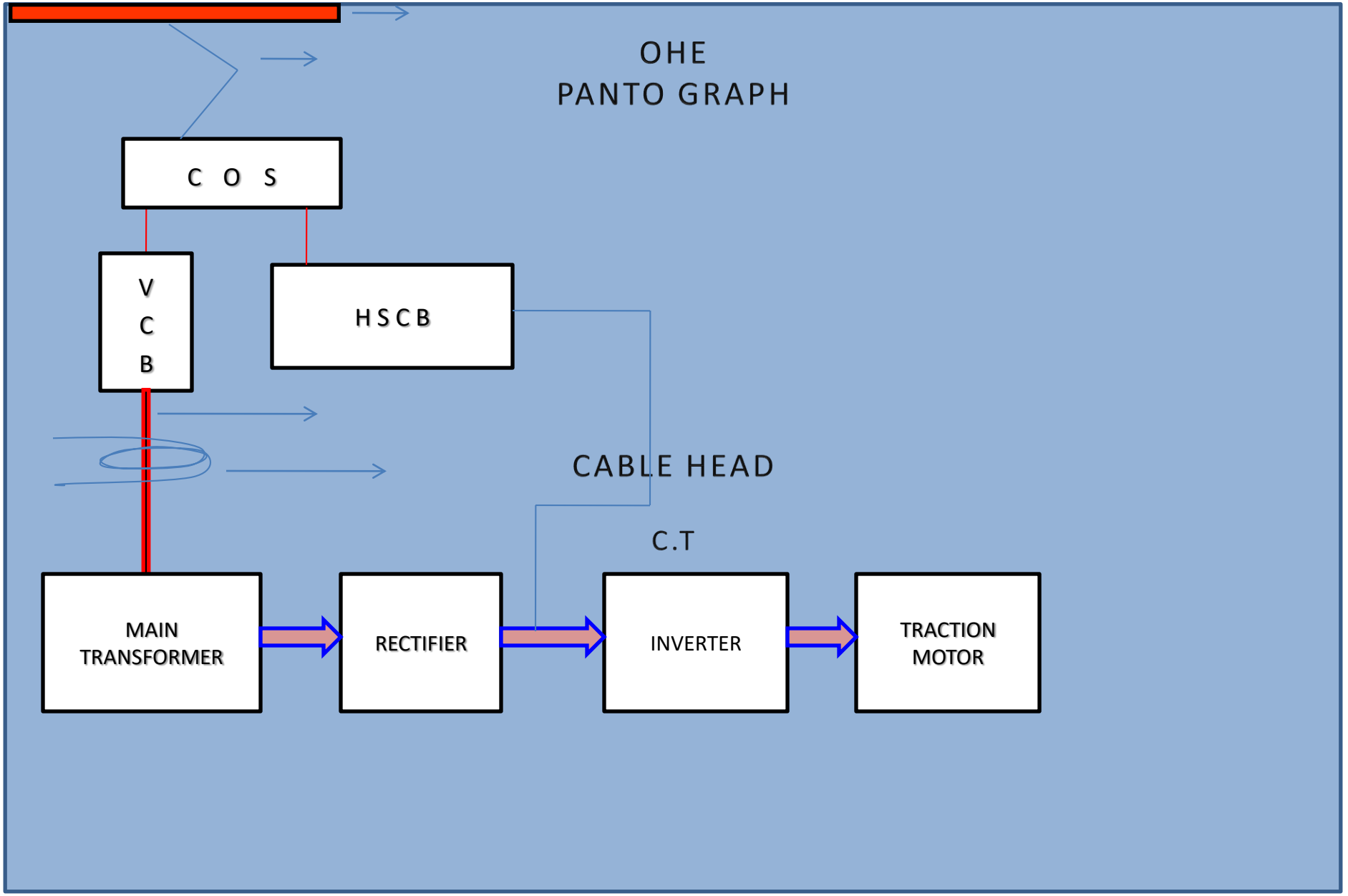


Legend:

DTC	Driving Trailer Car
MC	Motor Car
NDTC	Non Driving Trailer Car
TC	Trailer Car
HTC	High Tension Comp.
DC	Driving Cab
SC	Shunting Cab
	Power axle
	Trailer axle
	Transformer
	Brake resistor
	Traction converter
	Auxillary converter
	Master controller
	Pantograph

AC/DC EMU POWER FLOW DIAGRAM

(Only major equipments are shown)

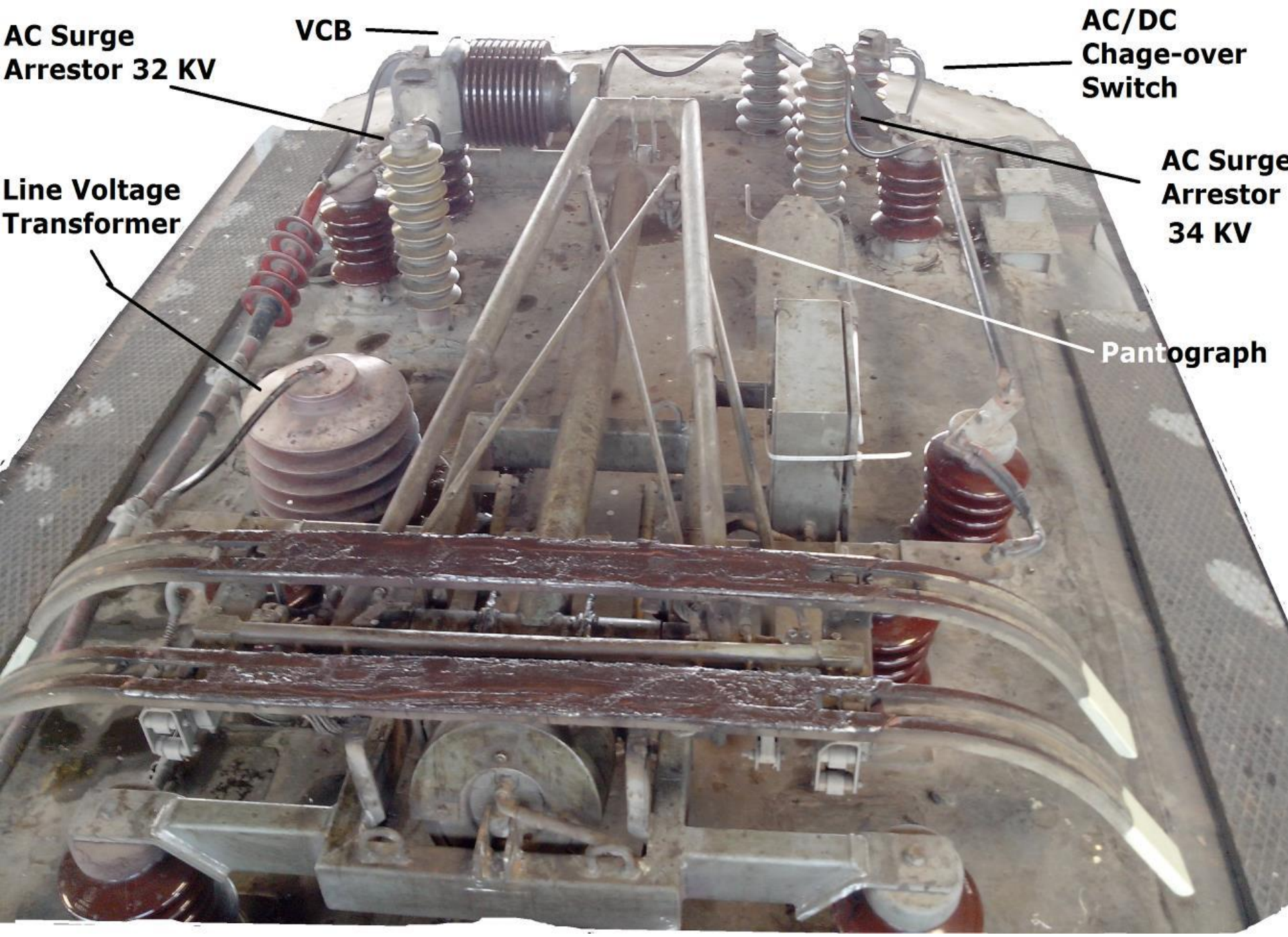


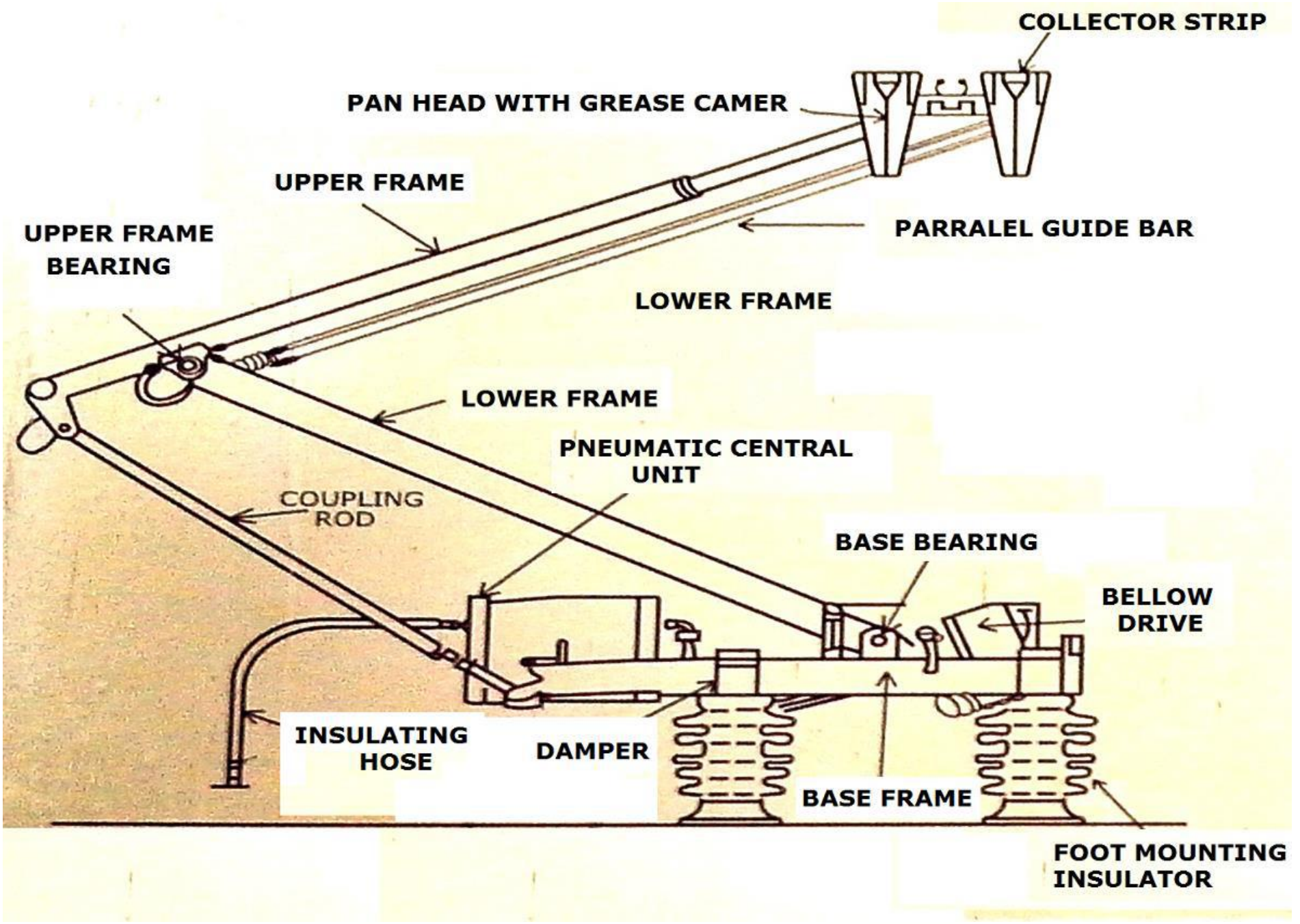
ROOF EQUIPMENTS

- PANTOGRAPH
- AC SURGE ARRESTER
- AC SURGE ARRESTER
- DC SURGE ARRESTER
- CURRENT TRANSFORMER
- LINE VOLTAGE TRANSFORMER PT

ROOF EQUIPMENTS

- AC/DC CHANGEOVER SWITCH (COS)
- VACCUM CIRCUIT BRAKER (VCB)
- AC EARTHING SWITCH
- BRAKING RESISTER


AC Surge
Arrestor 32 KV
VCB
AC/DC
Chage-over
Switch
AC Surge
Arrestor
34 KV
Line Voltage
Transformer
Pantograph


COLLECTOR STRIP
PAN HEAD WITH GREASE CAMER
UPPER FRAME
UPPER FRAME BEARING
PARRALEL GUIDE BAR
LOWER FRAME
LOWER FRAME
PNEUMATIC CENTRAL UNIT
COUPLING ROD
BASE BEARING
BELLOW DRIVE
INSULATING HOSE
DAMPER
BASE FRAME
FOOT MOUNTING INSULATOR

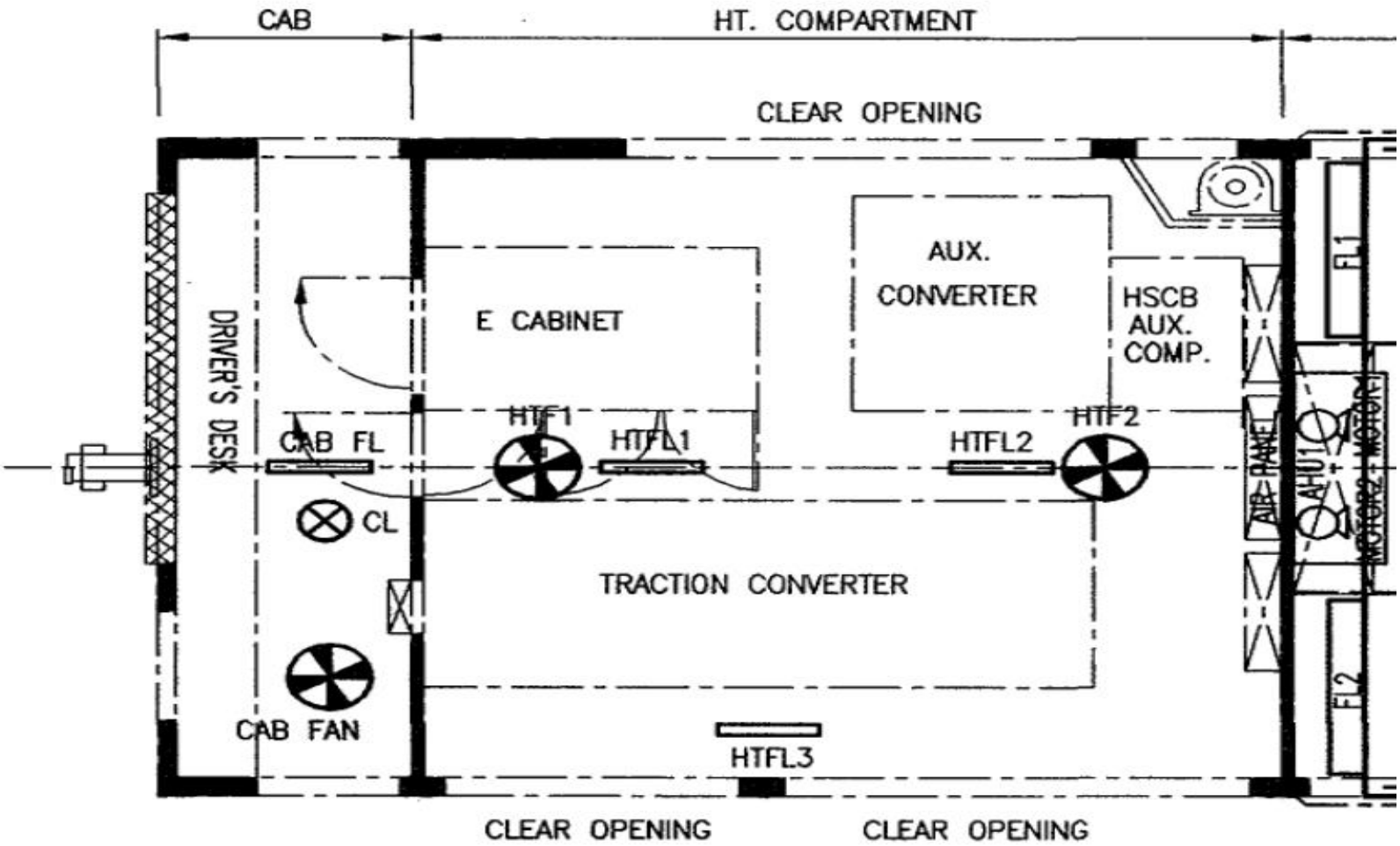
UNDER FRAME EQUIPMENTS

- MAIN TRANSFORMER 25 KVAC/950VAC.
- BATTERY SET.
- MAIN COMPRESSOR.
- BRAKE UNIT.
- BRAKE CYLINDERS.
- TRACTION MOTORS (240 KW).
- AIR SUSPENSION SYSTEM.
- BRAKE CYLINDER PRESSURE SENSOR.

HTC EQUIPMENTS

1. DC main circuit-breaker HSCB (Only In DC-AC EMU)
2. Current converter with integrated TCU
3. Auxiliary converter unit ACU
4. Brake control unit, BCU
5. Pantograph control
6. Measuring equipments
7. Voltage sensing device VSD
8. Auxiliary air compressor
9. Fire detection system
10. E-cabinet Electronic
11. SIBAS Klip station (SKS 22).

Layout of HT Compartment



BRAKE SYSTEM

On EMU rakes following type of brakes are provided.

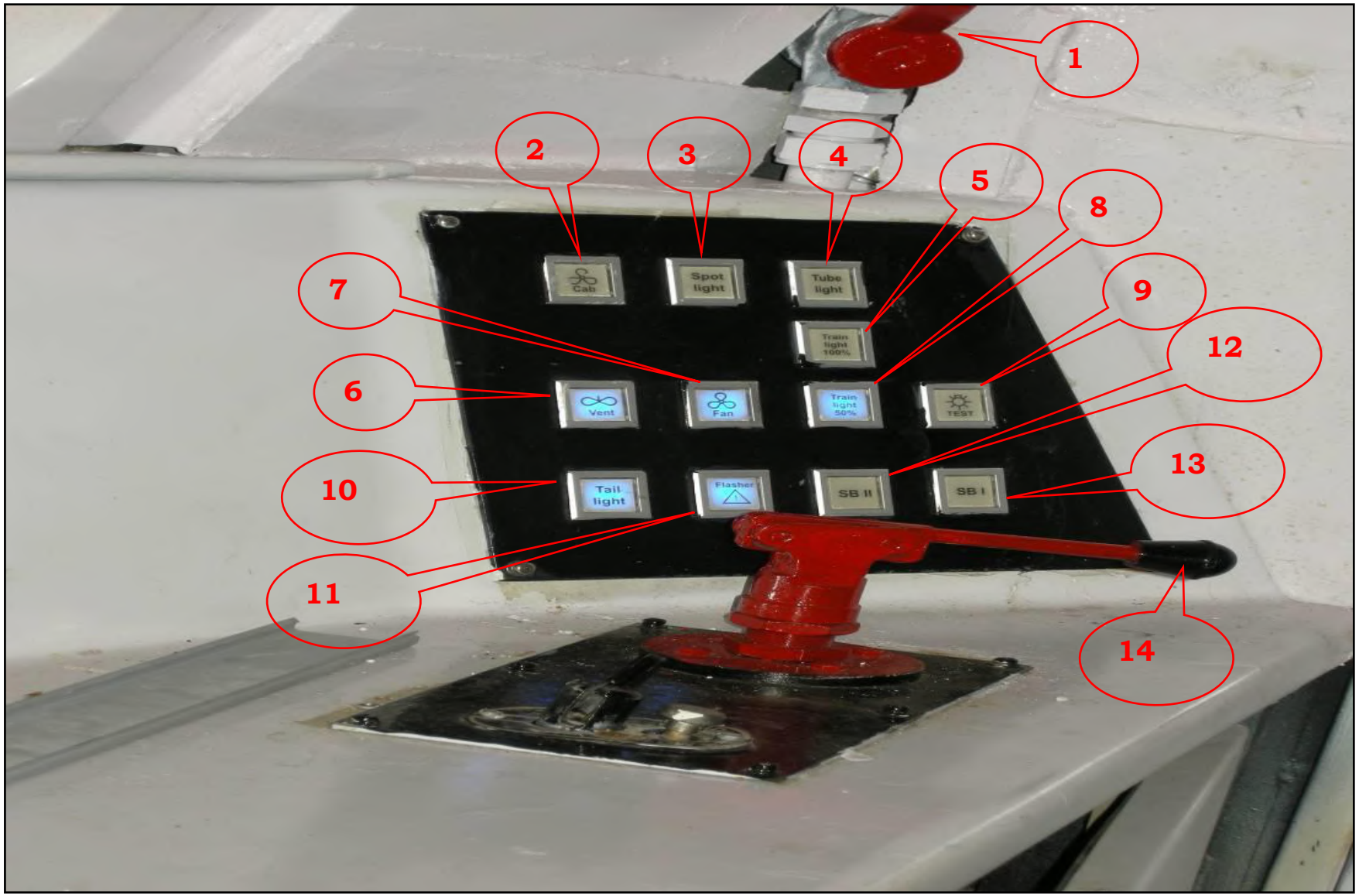
- EP Brake
- Auto Brake
- Emergency Brake
- Guard's emergency brake
- Dead man's handle.,Regenaretive brake,Parking brakes.

DC Earthing switch

Driver’s desk

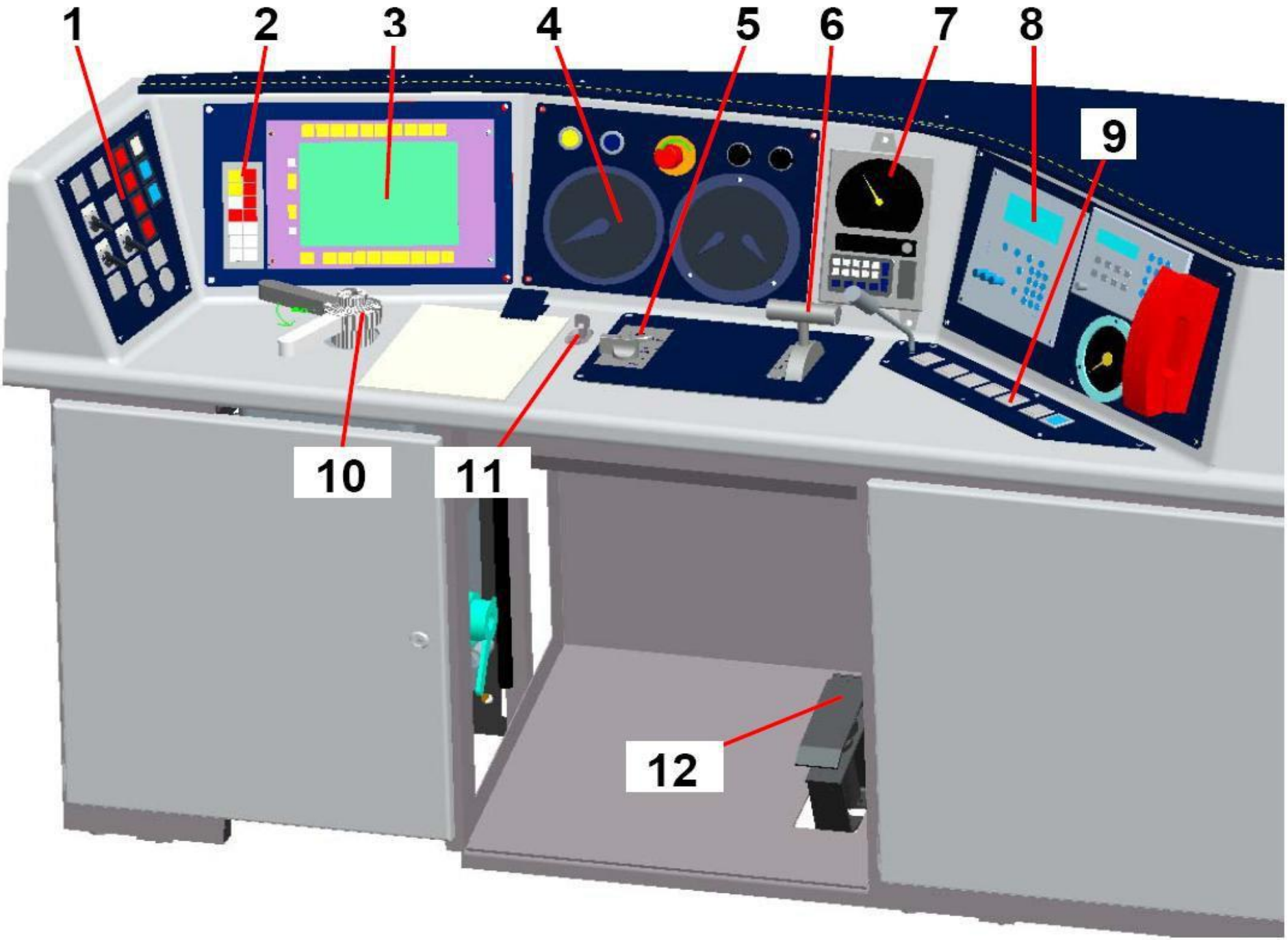

13
RDM
O
ON
2
FWD
O
REV
Driving
Braking
EB

Guard side panel



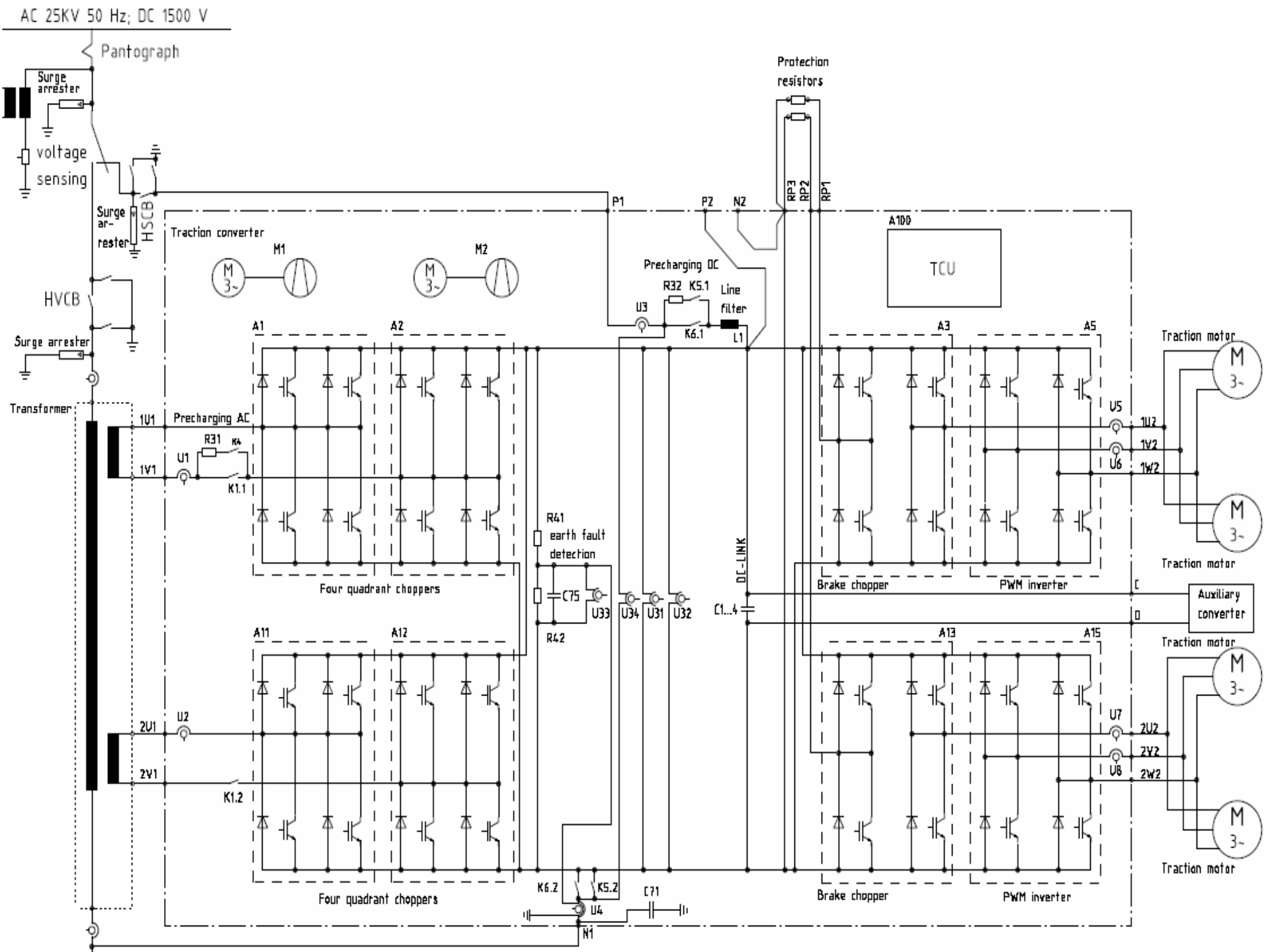
MMI

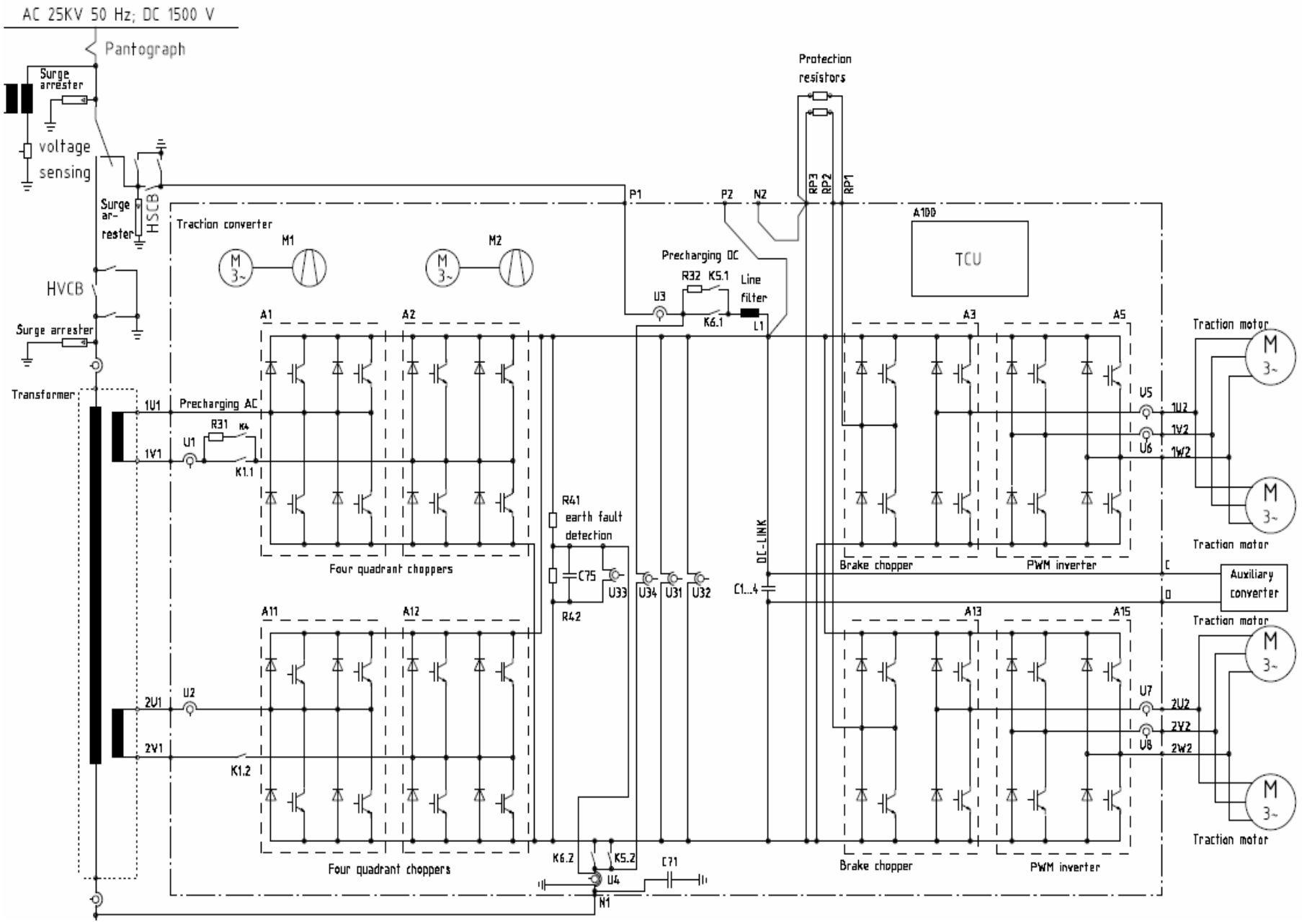

V>0
V=0
Voltage OHE TRAIN
Current OHE TRAIN
Unit 1
Unit 2
Unit 3
Unit 4
AC DC
Cab
Fire
U1 AuxAirCompressor_AAC_not_available
Emergency Brake
Drive/ Brake
Config
Driver
C


1
2
3
4
5
6
7
8
9
10
11
12

Under-frame Equipment DTC

- Main compressor
- Battery box
- Different reservoirs
- Combined brake unit
- Parking brake equipments
- Air suspension equipments
- Mechanical weight transfer equipment


AC 25KV 50 Hz; DC 1500 V
Pantograph
Surge arrester
voltage sensing
Surge arrester
HSCB
HVCB
Surge arrester
Transformer
Traction converter
M1
M2
Protection resistors
RP3
RP2
RP1
P1
P2
N2
A100
TCU
Precharging DC
R32
K5.1
Line filter
U3
K6.1
L1
A1
A2
A3
A5
Traction motor
1U1
Precharging AC
R31
K4
U1
1V1
K1.1
U5
1U2
1V2
1W2
U6
R41
earth fault detection
C75
U33
U34
U31
U32
R42
DC-LINK
C1...4
Brake chopper
PWM inverter
C
D
Auxiliary converter
Four quadrant choppers
A11
A12
A13
A15
2U1
U2
2V1
K1.2
U7
2U2
2V2
2W2
U8
K6.2
K5.2
U4
C71
N1
Four quadrant choppers
Brake chopper
PWM inverter


AC 25KV 50 Hz; DC 1500 V
Pantograph
Surge arrester
voltage sensing
Surge arrester
HSCB
HVCB
Surge arrester
Transformer
Traction converter
M1
M2
P1
P2
N2
Protection resistors
RP3
RP2
RP1
A100
TCU
Precharging DC
R32
K5.1
Line filter
U3
K6.1
L1
A1
A2
A3
A5
Traction motor
1U1
Precharging AC
R31
K4
U1
1V1
K1.1
U5
U6
1U2
1V2
1W2
R41
earth fault detection
C75
U33
U34
U31
U32
R42
DC-LINK
C1...4
Brake chopper
PWM inverter
C
D
Auxiliary converter
A11
A12
A13
A15
2U1
U2
2V1
K1.2
U7
U8
2U2
2V2
2W2
Four quadrant choppers
K6.2
K5.2
U4
C71
N1

Thanking You All