1.1 INSTALLATION DESCRIPTION

1.1 Installation Description

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1.1 Installation description

1.1.1 Short description of the machine

The bucket wheel excavator consists of the two mechanical machine parts - excavator unit and loading unit. The electrical equipment for the machine is divided into the excavator superstructure, excavator substructure, loading unit superstructure and loading unit substructure. The handled material is transfered from the bucket wheel via the boom conveyor, the receiving conveyor the intermediate conveyor and the discharge conveyor to the input weigher of the conveyor belt system.

1.1.2 Machine data

1.1.2.1 Excavator unit:

Theoretical handling volume (heaped)	6'030 m^3/h
Conveyor belt speed	4 m/s
Travel speed	2-10 m/min
Smallest curve radius	60 m
Removal height above 0:	32 m
Removal depth below 0:	5 m
Working range between bucket wheel centre and excavator centre	42 m

1.1.2.2 Loading unit

Theoretical handling volume		6'030 m^3/h
Belt conveyor speed	approx.	4 m/s
Travelling speed	approx.	10 m/min
Min. curve radius	approx.	20 m

1.1.3 Distribution of E-stations and other rooms

E-station superstructure	"LV equipment"	:+R10
E-station substructure	"HV equipment"	:+R21.1
E-station substructure	"LV equipment"	:+R20.1
E-station substructure	"Transformer room"	:+R22.2,R23.1,R23.2
substructure	"Compressor room"	:+R26
substructure	"Personnel room"	:+R25
substructure	"Workshop"	:+R24.1
substructure	"Lub.pump room"	:+R24.2
substructure	"Lubricant room"	:+R20.3,R24.2,R22.1
E-station substructure	"Clima unit room"	:+R20.2
E-station loading unit	"Lub.pump room"	:+R30

1.1.4 Arrangement of transformers

1.1.4.1 Transformer platform - excavator substructure

- Transformer +T21: 315KVA, 20/0,4 kV, 50 Hz for the aux. busbar A+B
- Transformer +T24: 1250KVA, 20/0,4 kV, 50 Hz for the 660 V main busbar
- Transformer +T25: 1250KVA, 20/0,4 kV, 50 Hz for the 380 V main busbar
- Transformer +T26: 3150KVA, 20/6,3 kV, 50 Hz for the 6 KV main busbar

1.1.5 Power feed

The 20 kV incoming feed is via a 1000 m long cable and a motor driven console cable drum on the loading unit substructure to the 20 kV incomer panel in the excavator substructure, E-station +R21.1

1.1.6 Power distribution

1.1.6.1 20 kV level-excavator substructure E-station +R21.1
Outgoing feeder: Main transformer +T21

1.1.6.2 6 kV main-busbar substructure
Outgoing feeders:
- Bucket wheel motors
- Boom conveyor motors
- Receiving conveyor motors

1.1.6.4 660 V level - excavator substructure, E-station +R20.1
Incoming feed via transformer +T24
Feeders:
- DC panel for slewing drive
- DC panel for travel drive

1.1.6.5 660 V level excavator superstructure E-station +R10
- DC panel for boom hoist

1.1.6.6 380 V level auxiliary busbars A and B.
The auxiliary busbars A and B are fed from auxiliary transformer +T21 and extended into the E-stations +R10, +R20.1. The distribution is made in the excavator substructure, E-station +R20.1
The auxiliary bus A is switched off in the case of an emergency stop and is foreseen for the crane installation, hoist lifts, compressors etc.
The auxiliary bus B is not switched off in case of an emergency and is used for feeders such as control voltages, lighting, power sockets etc.

1.1.6.7 380 V level, main busbars.
The 380 V main busbars are fed as follows:
- 380 V main bus-superstructure, E-station +R10 from transformer +T25
- 380 V main bus - substructure, E-station +R20.1 from transformer +T25
- 380 V main bus - loading unit, E-station +R20.1 from transformer +T25.

1.1.7 Control voltages

The following control voltages are separately formed in the E-stations +R10, +R20.1

1.1.7.1 220 V, 50 Hz, earth fault monitored.
Use:
- Control of HV and LV contactors for the drives
- Control voltage for the equipment
- Control voltage for the DC panels
- Control of the ventilation equipment for the E-station

1.1.7.2 60 V DC, earth fault monitored
Use:
Separate control voltage for the emergency stop circuits.

1.1.7.3 60 V DC, earth fault monitored
Use:
- Control voltage for the Procontic control
- Control voltage for the DC panels

1.1.7.4 24 V DC, earth fault monitored.
- Control voltage for indicating lamps in the drivers cabins.

1.1.8 Protection of electrical machines and transformers

1.1.8.1 20 kV level.

Incomer		: Earth fault monitoring
Transformer	+T21	: Thermal relays
	+T21	Overcurrent relay for short circuit
	+T24	Oil temperature monitoring
	+T25	Buchholz relay
	+T26	Differential relay
		Fuses

1.1.8.2 20 kV level

Main breaker 20 kV : Earth fault monitoring
Overcurrent trip
Undervoltage coil

1.1.8.3 6 kV level

Each motor feeder: Fuses
Thermal relay
Current relay
Winding temperature monitoring
Earth fault monitoring

1.1.8.4 380 V level

Drives smaller than 3,3 kW: motor protection breaker

Drives larger than 3,3 kW : Fuses
Thermal relay

Drives larger than 50 kW : Fuses
Thermal relay
Winding temperature
Monitoring

1.1.8.5 DC drives

Thyristor converter : Fuses
Ventilator monitoring

Motors : Thermal relay
Overcurrent relay
Overvoltage relay
Blocking monitoring
Winding temperature monitoring
Ventilation monitoring

1.1.8.6 Trip and alarm

- HV equipment (20/6 kV)

Advance warning : Individual alarm at the respective HV panel
Collective alarm in drivers cabin

Fault : Trip of 20 kV main breaker
Individual indication at respective HV panel
Collective alarm in drivers cabin

- LV equipment (600/380 V)

Fault : Trip of respective drive.
Individual indication at respective LV panel
Collective alarm in drivers cabin

1.1.9 Safety monitoring circuits

1.1.9.1 Emergency stop circuits.

General:
The complete EMERGENCY STOP control is totally separated from the machine control. It consists of 2 separate circuits:

- holding current circuit
- working current circuit

This means that all EMERGENCY STOP limit swiches and pushbuttons are each foreseen with an opening and closing contact. The control is made in relay technique and is fed from its own 60 V DC power supply. The working current circuit actuates the overcurrent trip of the 20 kV main breaker and the 380 V circuit breaker for the auxiliary busbar A. The holding current circuit actuates the undervoltage coil of the 20 kV main breaker and the 380 V circuit breaker for the auxiliary busbar A.

- EMERGENCY STOP pushbutton.
  The emergency stop pushbutton is operated by pushing the red mushroom button and remains locked in the pressed position:
  Release of the locked button is made by turning the button to the right and lifting it upwards.

1.1.9.2 EMERGENCY STOP limit switch

If an EMERGENCY STOP limit switch has been actuated, a bridging pushbutton (which bridges the limit switch) must be operated in order to be able to switch on the 6 kV and 380 V main breaker again and enable return travel. The bridging pushbutton is always located at a visible distance to the limit switch and is protected against incorrect operation by means of a lockable cover.

1.1.9.3 Safety boxes (SBO)

The following drives are equipped with a safety box:

- bucket wheel
- boom conveyor
- receiving conveyor
- intermediate conveyor
- discharge conveyor
- hoisting drive excavator
- slewing drive of excavator
- travel drive of excavator
- travel drive of loading unit
- middle hopper
- boom hoist discharge conveyor

The 220 V control voltage for the MCC and HV switchgear of the above mentioned drives can be interrupted and the outgoing cable earthed by means of plug devices in the safety boxes.

Each safety box can be secured with 5 locks.

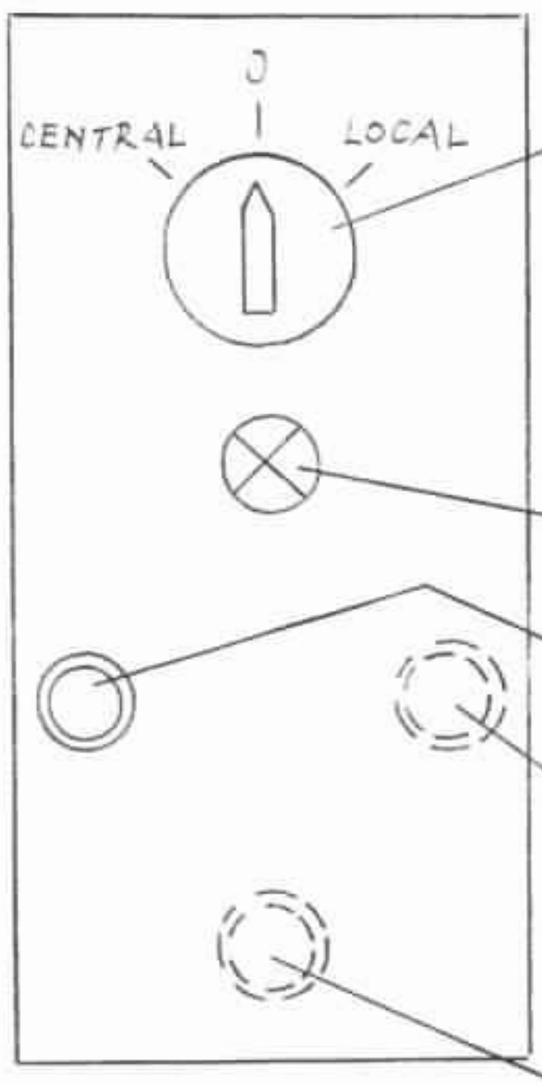
1.1.9.4 Local control box.

The local control boxes have the following functions:

- local stop of respective drive
- local operation of respective drive
- interlocking of respective drive.

Two designs are used:

Type 1



Selector switch
Position "Central" = drive interlocked
Position "0" = local stop
Position "Local" = local operation pre-selected
The selector switch can be locked in the "0" position

Lamp illuminated by selector switch position "0" or "Local"

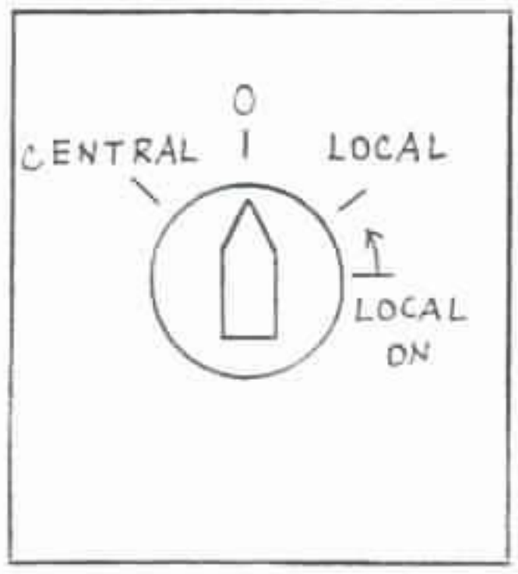
Start pushbutton for local operation

Second start pushputton for reversible drives where rquired

Start pushputton for oil pump(s) of main drives where required

Type 1 is used for following drives:
- Main drive of boom conveyor
- Dirt belt of boom conveyor
- Main drive of receiving conveyor
- Dirt belt, receiving conveyor
- Intermediate conveyor
- Main drive of discharge conveyor
- Buffer drum 1+2
- Roller grate 1+2

Type 2



Selector switch
Position "Central" = drive(s) interlocked
Position "0" = local stop
Position "Local" = local control pre-selected
Position "Local start" = local operation start

The selector switch can be locked in the "0" position.
Type 2 is used for following drives:
- Cable drum
- Oil pumps for bucket wheel
- Oil pumps for ball ring of excavator unit

1.1.9.5 Rope switches.

A continuous pull rope is mounted on each side of the belt along the conveyor belt walkways and connected to a rope switch.
In the case of local danger, pulling of the rope at any position along the walkways operates the rope switch and stops the respective conveyor belt. The rope switch is thereby brought into and locked in the pulled position and a lamp at the switch blinks.
The mechanical blocking can be released by means of a special key.

1.1.9.6 Drift switch

Drift switches are fitted along the conveyor belts. Drifting of the belt results in an indication at the drivers control desk.

1.1.9.7 Limit switch

Limit switches are used for advanced warning and tripping at mechanical end position
Limit switches which stop a drive always work according to the holding current principle

1.1.9.8 Speed monitoring

Following drives are speed monitored:
- bucket wheel
- boom conveyor
- receiving conveyor

A drop below the set minimum speed results in tripping of the respective drive. The speed monitoring is bridged during the starting phase.

1.1.9.9 Slip monitoring

The speed is monitored on either side of a coupling on the slewing mechanism of the excavator unit. The slewing mechanism is switched off if the coupling slip reache the set value.

1.1.10 Measuring devices

1.1.10.1 Function generator

The following machine positions are detected by function generators for indications and/or processing in the control:
- Height position of hoisting gear (excavator unit)
- Angle position between excavator unit superstructure and excavator unit substructure
- Angle position between excavator unit superstructure and loading unit
- Curve radius of travelling mechanism (loading unit)
- Position of roller table (loading unit)

1.1.20.2 Load cells

Load cells are fitted to the fixed points of the hoist rope for indication of rope tension

1.1.20.3 Indication measurement.

The machine indication is detected by an X/Y pendulum inclinometer fitted to the excavator superstructure.

1.1.10.4 Wind measurement.

A wind measurement system is mounted on the excavator unit superstructure for the indication of wind speed and wind direction.

1.1.11 Independant drives

The following drives work only in local operation and without interlocking to other drives.

1.1.11.1 Excavator.

- Compressor
- Installation crane
- E-hoist wheel boom

1.1.11.2 Loading unit

- Compressor

1.1.12 Lubrication system

Twin line and single line lubrication sytems are employed. The control is carried out in a local box for each lubrication system. The operating mode of the lubrication system is pre-selected with the selector switch on the local control box.

Selector switch positions:

- Position "Local" : Lub.sytem runs continuously
- Position "0" : Lub.system is switched off
- Position "Central":

A certain main drive is allocated to each lubrication system. The operating time of the main drive is added up and when the preset operating period has been reached, the lubrication system is started for a set time. By a twin line lubrication system, the lubrication line is changed by means of an electro-hydraulic reverse after each lubrication cycle.

1.1.13 Driver cabins

The functions of the individual operating elements on the control desks are explained in part 3 with the operating instructions of the individual drives.

1.1.13.1 Excavator unit drivers cabin with

- air conditioning unit
- control desk +P10
- control desk +P11
- indicating board +P12
- instrumentation column +P13

for the operation and supervision of following plant sections:

- power distribution
- travel drive of excavator
- crawler steering of excavator
- Slewing drive of excavator unit
- hoist drive of excavator unit
- interlocked operation of conveying drives
- non-interlocked operation of bucket wheel main and auxiliary drives
- automatic operation of slewing and travel drives of excavator unit
- radio telephone
- intercom sytem

1.1.13.2 Loading unit driver cabin with
- air conditioning system
- control desk +P30
- control desk +P31
- indicator board +P32.

For the operation and supervision of following plant sections:
- travel drive of loading unit
- crawler steering of loading unit
- hoist drive of discharge conveyor
- horizontation of hoist for discharge conveyor
- travel drive of feeding device
- roller grate of feeding device

1.1.13.3 Driver cabin of excavator unit installation crane with control desk +P15.
For operation and supervision of excavator installation crane.

1.1.14 Alarm signalling system

The alarm signalling sytem is designed with blink light and continuous light signalling. The procedure by the occurence of a fault is as follows:

Fault, alarm	Corresponding indicator lamp blinks and warning buzzer simultaneously sounds
Reset	Warning buzzer off
Acept/cancel	the lamp changes to continuous illumination. The lamp extinguishes if the fault/alarm no longer exists.
Fault removed	Indicator lamp extinguished.

Exceptions are the so-called status indicators such as "main breaker off " where differentiation is only made between continuously lit lamp and extinguished lamp.

The alarms are differentiated into 3 categories in order to optically divide the alarm signalling system:

- Electrical faults
  These red marked indicators are for faults which can only be dealt with by an electrician i.e. they are for faults arising in the electrical rooms and which have to be dealt with in the electrical rooms.
  Only the indication "fault E-room R XX" is given in the drivers cabin and the detailed indicator in the corresponding E-room.
- Machine faults:
  These indicators are marked yellow and can be dealt with by the machine operating personnel i.e. rope switch, drift switch.
- Limit switch alarms, status alarms.
  These indicators are marked white.

1.1.15 Mimic diagram

A small mimic diagram is built into the indicator board (P12) of the excavator unit drivers cabin. This mimic diagram represents the following material transport paths:

- bucket wheel
- boom conveyor
- receiving conveyor
- intermediate conveyor
- discharge conveyor
- roller grate
- bench conveyor

These indicators are controlled as follows:

- blinking light during the start-up warning phase
- continuous light by 90% of nominal speed

1.1.16 Test-operation switch

A test-operation switch is located in each E-room +R10, +R20.1 and R30 with which the installation can be "dry-run" tested.

Position "Test" : - Main breaker of HV and LV cannot be switched on.
The signal "HV,LV breaker ON" for the control is bridged.

Position "Operation": - Normal operation

1.1.17 Transfer signals

The following transfer signals are transmitted via potential-free contacts:

1.1.17.1 Transfer signals from/to conveyor control room.

Signals to conveyor control room:

- coal
- overburden
- intermediate material
- machine fault
- machine ready for operation
- bucket wheel running
  (in interlocked condition)
- stop first conveyor

Signals from conveyor control room

- excavator stop
- emergency stop
- transport conveyor system running

1.1.17.2 Transfer signals from/to receiving truck

Signals to receiving truck
- travel movement forwards
- travel movement reverse
- roller grate on
- roller grate off

Signals from receiving truck
- fault receiving truck
- fault roller grate
- emergency stop receiving truck

1.1.18 Control

The control of the machine is, with exception of separate relay control for cranes, hoists, lubrication systems and the EMERGENCY STOP control, from two PROCONTIC DP 800 control system (PROCONTIC "A", PROCONTIC "B").

1.1.18.1 PROCONTIC "B".

The control system Procontic "B" for the travel and slewing drive automatic is located in the excavator unit substructure +R20.1

1.1.18.2 PROCONTIC "A".

The control system PROCONTIC "A" is located in the excavator unit substructure +R20.1 and contains the complete drive control of the machine.

Digital inputs and outputs.
The input and output of digital process signals results by means of remote I/O system via modules of the ED 05XX series decentralised in the following rooms:

- Cabin +C10 : For the area of bucket wheel, wheel boom, control desks (+P10, +P11), indicator board (+P13)
- E.station +R10 : For the area of counterweight, hoist drive, boom conveyor
- E-station +R20.1 : For the area of excavator unit travel drive and slewing drive
- Cabin +C30 : For the loading unit and control desk (+P30, +P31), indicator board (+P32).

The connection to Procontic "A" is via serial data lines. In order to limit the number of cables to the input and output modules, local LDB's (type 01) are installed for the compilation of various cables. The standard LDB's (type 02) are used for the control of horns, warning lights, rope switches and drift switches along the conveyors.

Analogue inputs and outputs.
With the exception of PT 100 measured values, all analogue inputs are via UA 9810 and analogue outputs via ED 1401. The inputs of the PT 100 measured values for winding temperature monitoring of HV motors as well as the temperature monitoring of various gearboxes are via the analogue interface XV 9515a-E, the corresponding relay multiplexer LT 9515a-E and the counter ED 1633.

BBC
BROWN BOVERI

1.1.19 DC - D R I V E S

CONTENT

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1.1.19.8 Emergency operation of boom hoist drive

Appendix 1-11

1.1.19.1 Summary

DC-drives are used where a continuous variable speed control is required:
- on the boom hoist drive
- on the slewing drive
- on the crawler drive

Each drive consists of a line-commutated thyristor-controlled one-quadrant converter unit. It is extended to a four-quadrant drive (driving and braking in both directions) by switching over the motor field.

The boom hoist drive has 2 motors. Each of them is driven by a separate converter unit. The special feature of this drive is caused by the heavy weight of the boom, which needs a motor torque in only one direction. Therefore the field switching-over is blocked during normal conditions.

On the slewing drive there are 3 motors in series which are driven by one converter unit. They work via gear boxes directly on the gear ring of the slewing mechanism.

Due to the serially connected fields of the motors, the same torque in every motor is guaranteed.
The main unit of the excavator runs on 3 caterpillar-pairs. Each of the 3 converter units feeds 2 motors in series where-as each motor is located on the next placed caterpillar-pairs to obtain a differtial characteristic during curve-drive.

There is a relay controlled monitoring for each drive separately.
The counter works as a cascade-control (current-controller and superimposed speed-controller).

1.1.19.2 Technical Data

- Boom Hoist Drive : see appendix 1
- Slewing Drive : see appendix 2
- Crawler Drive : see appendix 3

1.1.19.3 One Line Diagram

1.1.19.3.1 Common

The power supply voltage of the main- and auxiliary-drives comes from the MCC's (Motor Control Centre). The overload supervision and the DC-current measuring is located on the AC-side of the converter. The division of the amp.-meter is calibrated in DC-current. (Same principle as the current measuring of the field).
Every current unit (framed part) is cooled by a fan tier. (Appendix 4-6).
From the MCC there are following auxiliry supply voltages:

- 60 V DC for the relay control
- 220 V AC for the fans and other 220 V consumers
- 1 x 380 V for the excitation of the motors

A 220 V AC safety-supply is made for a personal protection during service work. As long as this supply is switched off, there will be no powered outputs on the DC-panels. The automatic cut outs are mounted in a way that switching off is possible from one location. A four-quadrant converter unit produces the DC-current for the field. It ensures a fast and controlled switching over of the field.

The free run of the field and herewith the protection from inductive voltage (in case of power loss) is made by a transformer.
The field supply works for stillstand heating too.
Feeding and control of the motor fan is realized by the MCC.

1.1.19.3.2 Boom Hoist Drive

The power switch is located in the DC-panel. For an independant electronic supply of the converter unit, it is fed from the primary side of the power switch (see appendix 4).

1.1.19.3.3 Slewing Drive

Same as boom hoist drive, without power switch (see appendix 5).

1.1.19.3.4 Crawler Drive

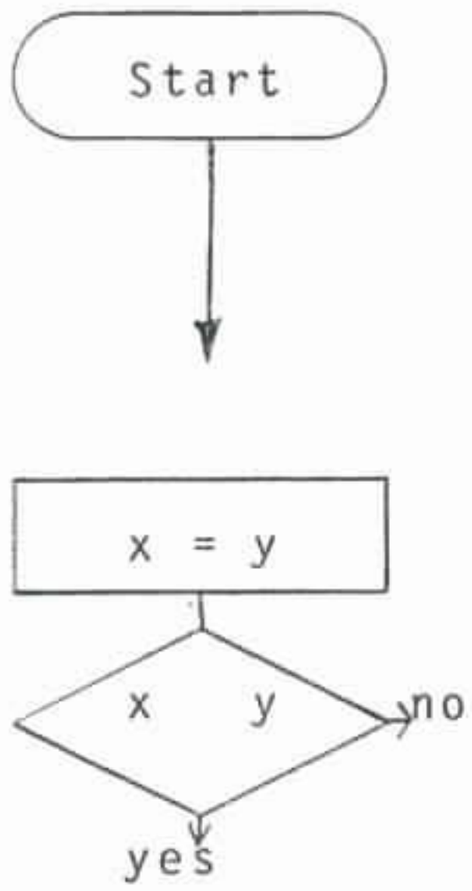
Same as slewing drive.
Ečery converter unit is separately fed by the MCC.
The field is connected series-parallel (see appendix 6).

1.1.19.4 Monitoring

1.1.19.4.1 Common

The superior monitoring is realized by the Procontic DP 800. It ensures an optimal interplay between DC-drives and mechanical auxiliary drives like brakes, oil-pumps (see description of the excavator).
Monitoring of the DC-drive includes on-sequence, fault indication and -storage and the different off-sequences.

Explanation of Flow Diagram:



Meaning

Beginning, all time-memories cleared

signal flow direction

command

interrogation

1.1.19.4.1.1 Boom Hoist Drive

In the monitoring there is a command for a short-time lift of the boom (if the boom touches the ground with its bottom).
Flow diagram see appendix 7.

1.1.10.4.1.2 Slewing and Crawler Drive

Flow diagram see appendix 8.

1.1.19.4.2 Fault supervision

1.1.10.4.2.1 Fast - Stop

If a fault appears at which the drive should be switched off immediately, the drive will be mechanically stopped (by brakes).
Hereunder the following faults:

Faults	indication	drive HD = Boom Hoist Drive SL = Slewing Drive CR = Crawler Drive		
		HD	SL	CR
field converter unit	fault exciter	x	x	x
fault in the main converter unit 1	fault converter 1	x	x	x
fault in the main converter unit 2	fault converter 2	x		x
fault in the main converter unit 3	fautl converter 3			x

fault	indication	drive HD	SL	CR
blown fuse of main converter unit 1	fuse converter 1	x	x	x
blown fuse of main converter unit 2	fuse converter 2	x		x
blown fuse of main converter unit 3	fuse converter 3			x
overcurrent motor 1	overcurrent motor 1	x	x	x
overcurrent motor 2	overcurrent motor 2	x		x
overcurrent motor 3	overcurrent motor 3			x
blocked motor or no current is flowing	blocked motor		x	x
overspeed	overspeed	x	x	
overvoltage on the motors	overvoltage	x	x	x
fault main switch	fault main switch	x	x	x
speed difference (one series-motor blocked, slipping motor, loss of tachodynamo-signal)	speed difference	x	x	x
220V power supply	fault power supply	x	x	x
overtemp. (120°) motor 1	overtemp. motor 1	x	x	x
overtemp. (120°) motor 2	overtemp. motor 2	x	x	x
overtemp. (120°) motor 3	overtemp. motor 3		x	x
overtemp. (120°) motor 4	overtemp. motor 4		x	x
overtemp. (120°) motor 5	overtemp. motor 5			x
overtemp. (120°) motor 6	overtemp. motor 6			x

1.1.19.4.2.2 Stop

On appearing of one of the following faults, a normal stop (electrical braking) of the drive is possible without damaging the drive:

fault	indication	drive HD	SL	CR
pressure switch fan motor 1	motor fan 1	x	x	x
pressure switch fan motor 2	motor fan 2	x	x	x
pressure switch fan motor 3	motor fan 3		x	x
pressure switch fan motor 4	motor fan 4		x	x
pressure switch fan motor 5	motor fan 5			x
pressure switch fan motor 6	motor fan 6			x

fault	indication	HD	SL	CR
current relay fan converter unit 1	fan converter 1	x	x	x
current relay fan converter unit 2	fan converter 2	x		x
current relay fan converter unit 3	fan converter 3			x
overload motor	overload motor	x	x	x
motor blocked	motor blocked		x	

1.1.19.5 Control

The electronics for control are located in the tier of the first converter unit of each drive. Control is explained according to the block-diagram (appendix 7-9). It is based on the same principle on all the 3 drives.
The speed reference value (nw = 0- 10 V equals zero - to nominal speed for- and backward) comes from the master switch. During stopping or during the on sequence the reference value is set on zero, no matter on which value the reference actually is. When the "automatic lift" command is given the ref. value is set internally on a preadjustable value.
The subsequent reference value integrator limits the rising time of the speed ref. value.
The speed actual values (nx) coming from the tachodynamos go to the speed actual value network. There they are added to each other and divided by the number of tachos and formed to a signal which is equivalent to the ref. value (0 - ± 10 V).

In the speed controller nw and nx are compared in order to form the current reference value (Iw).
The speed controller works as a PI-controller (proportional-integral) so that a good dynamic with a minimal static control-difference can be reached.
The current reference value is proprtional to the required motor torque. The sign of Iw gives the switch-over signal for the field (boom hoist drive). Therefore a smitt-trigger is used to set up the reference value for the field.

To link over the undefined state during the field switching-over, the output current of the armature converter unit is suppressed by the WR-END signal at every switching-over. After releasing the WR-END signal a torque reduction prevents a torque-rise by leaps and bounds.

The right control-sense after field switching-over is achieved by rectifying the current reference value.

On the boom hoist drive, under normal condition, the output of the schmitt-trigger is blocked to prevent torque-reversing.

The current controller (a PI-controller too) ensures a controlled characteristic of the motor currents. It compares the current reference value with the current actual value (Ix).

In the additional converter units of the boom hoist and crawler drive, the current controller only works. Since those are fed by the same reference value (Iw), the same torque is guaranteed in all the motors.

There are the following signals originated in the electronics tier:

- speed direction
- standstill
- overspeed (boom hoist only)
- overcurrent (slewing and crawler drive)
- blocked motor supervision
- speed difference (in case of unequal tacho-signals, e.g. in case of slip, defective tachodynamos or blocked series-motor, the drive is switched off).

1.1.19.6 Reference to Descriptions and Data Sheets

For better understanding of drive-details it is necessary to know the following prospectus and descriptions:

- Description of the Excavator
- Description of the Motors
- Test certificates of the motors
- Veritron Converter Units ZSD: DHS 145 280 E
- Veritron Converter Units ZSD: DHS 104 580 E
- Reference Value Integrator ZD0002: GNS 60 054
- Analog Switch UT 9661a: HIBE 421 152
- Change-Over Switch ZD0005. GNS 60 057
- Quadruple Schmitt-Trigger: GNS 60 079
- DC-DC-Converter ZW 2001: DHS 50 549 E
- Sigmatronic e, page 5/4, 5/5, 8/5: DNG 60681E
- Veritron double converter units GAB: DHS 81 077 E
- Veritron static converter units GAB: DHS 106 380 E

1.1.19.7 Maintenance and Trouble Shooting

1.1.19.7.1 Maintenance

The equipment in the DC panel requires no maintenance but a clean and dust-free area is essential for trouble-free operation.
For maintenance of the DC motors see description of the motors.

1.1.19.7.2 Trouble Shooting

All faults occurring in the drives are stored and indicated separately on the front of the DC panel. Fault indication signals together with detailed drawings reduce the possible causes of faults to a minimum.

1.1.19.8 Emergency operation of boom hoist drive

In the event of malfunction of one of the two hoist drives the boom can be brought into horizontal position with one drive only.

In order to operate in this socalled emergency mode the following instructions must be strictly adhered to:

1. Measures to be taken on motor of defective drive
   a) Mechanically decouple the motor
   b) Short-circuit the armature.

Should the motor fan not run, the following additional measures must be taken:

c) The fan monitoring device must be bridged (contacts 2 and P on pressure switch)

d) The field must be short-circuited.

If the fan runs but the field is defective, point c) will no longer apply.

2. <u>In field +G 10</u>

Turn the key-operated switch in the static converter tier to position emergency operation.

<u>CAUTION</u>: As the field also acts as a space heater care must be taken to ensure that the m.c.b. 8 F7 in field G 10 is opened before work commences. On conclusion of the emergency operation and any necessary repairs, all the above-mentioned points are to be cancelled.

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Technical data boom hoist -Appendix 1-

Drawings No.: HIBE 351 018

Motor:

Type	GNR 315 L 32 F
Power	210 - 310
Nominal voltage	350 V=
Nominal current	637 A=
Starting current	833 A=
Duration of starting current	2 s
Emergency condition	948 A
Duration	6 min.
Recovery time	30 min.
Excitation: current/voltage	20 A=/120V=
Rangeof speed	200 - 1000 rpm
Tacho generator	0,06 V=/rpm

Converter

Type		ZSD 2531
Supply voltage	Ur:	3 x 660 V/50 Hz
Rated continuous dc	IdT:	1090 A=
Max. output voltage at	IdT:	750 V=
Converter fan		220 V

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Technical data slewing drive -Appendix 2-

Drawing No.: HIBE 351 043

Motor:

Type		GNQ 250 L 34 F
Power		54 kW
Nominal voltage		225 V=
Nominal current		261 A=
Starting current		387 A=
Duration of starting current		2 s
Excitation: current/voltage		7,8 A=/80 V=
Range of speed		200 - 1000 rpm
Tacho generator		0,06 V=/rpm

Converter:

Type		ZSD 2131
Supply voltage	Ur:	3 x 660 V/50 Hz
Rated continuous dc	IdT:	590 A=
Max. output voltage at	IdT:	750 V=
Converter fan		220 V

Technical data crawler drive -Appendix 3-

Drawing No.: HIBE 351 042

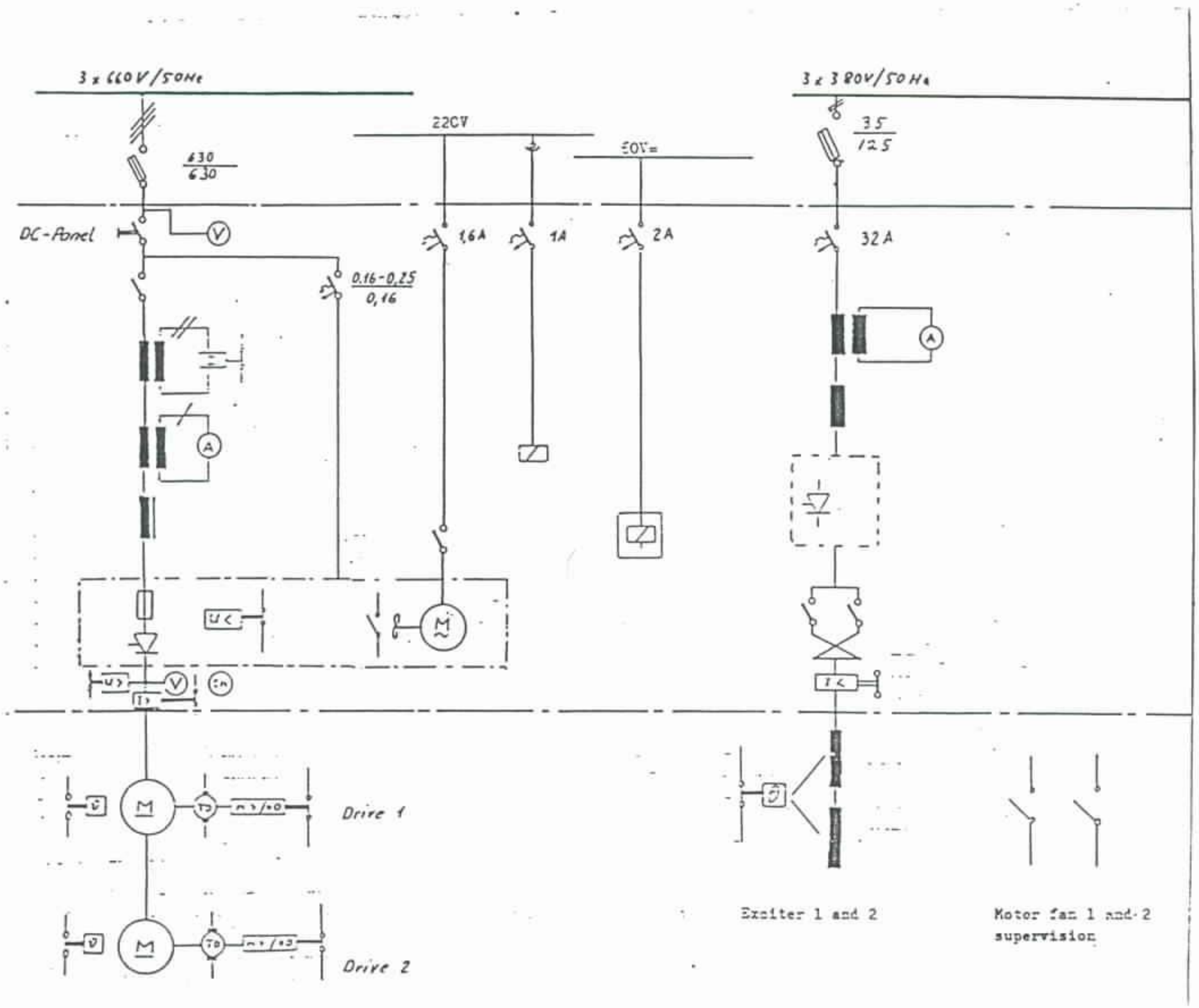
Motor:

Type		GNQ 315 L 34 F
Power		114 kW
Nominal voltage		340 V=
Nominal current		358 A=
Starting current		548 A=
Duration of starting current		2 s
Excitation: current/voltage		10 A=/ 120V
Range of speed		200 - 1000 rpm
Tacho generator		0,06 V=/rpm

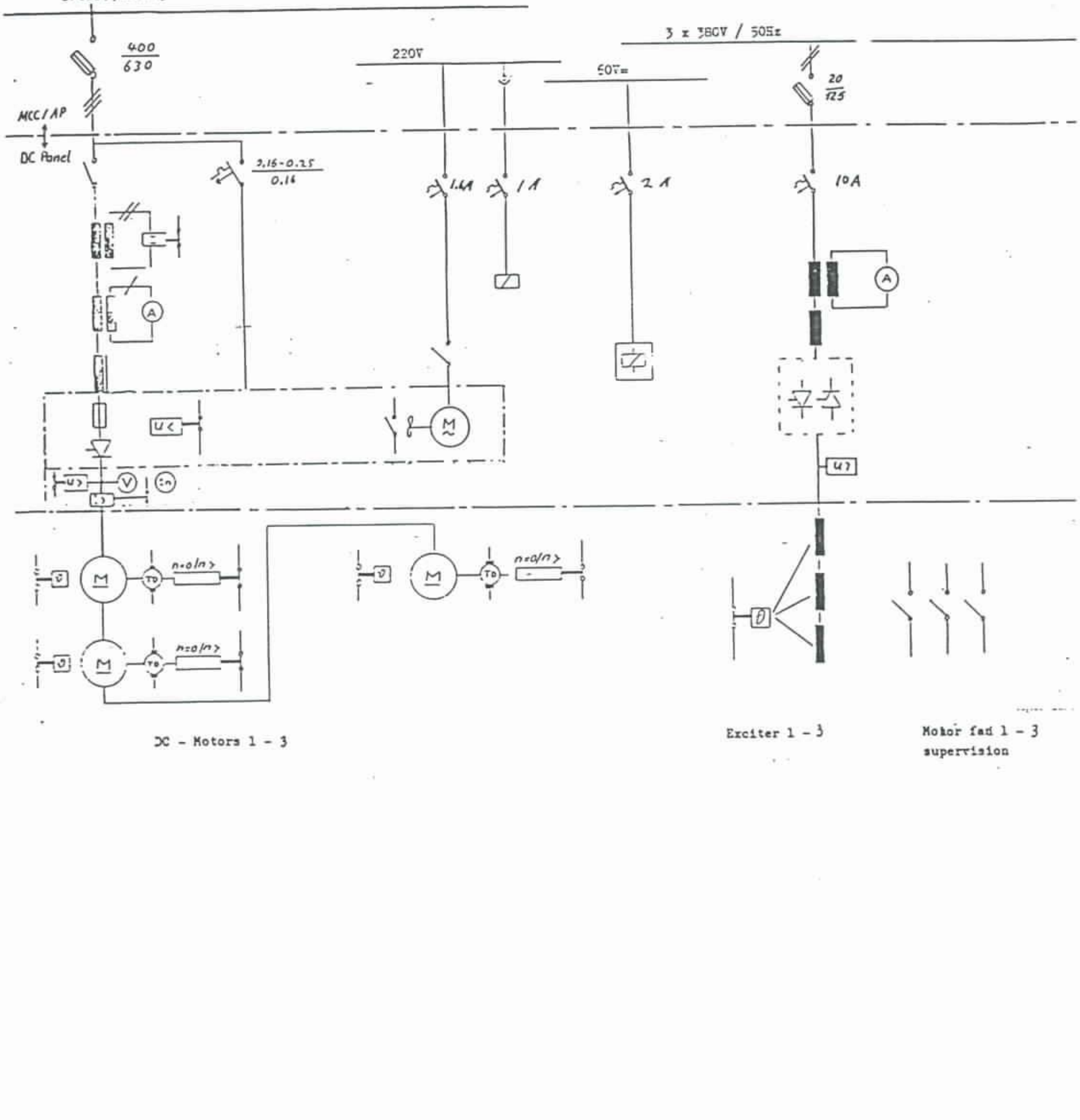
Converter:

Type		ZSD 2131
Supply voltage	Ur:	3 x 660 V/50 Hz
Rated continuous dc	IdT:	590 A=
Max. output voltage at	IdT:	750 V=
Converter fan		220 V

Single line diagram: Boom hoist drive



Single line diagram: Slewing drive

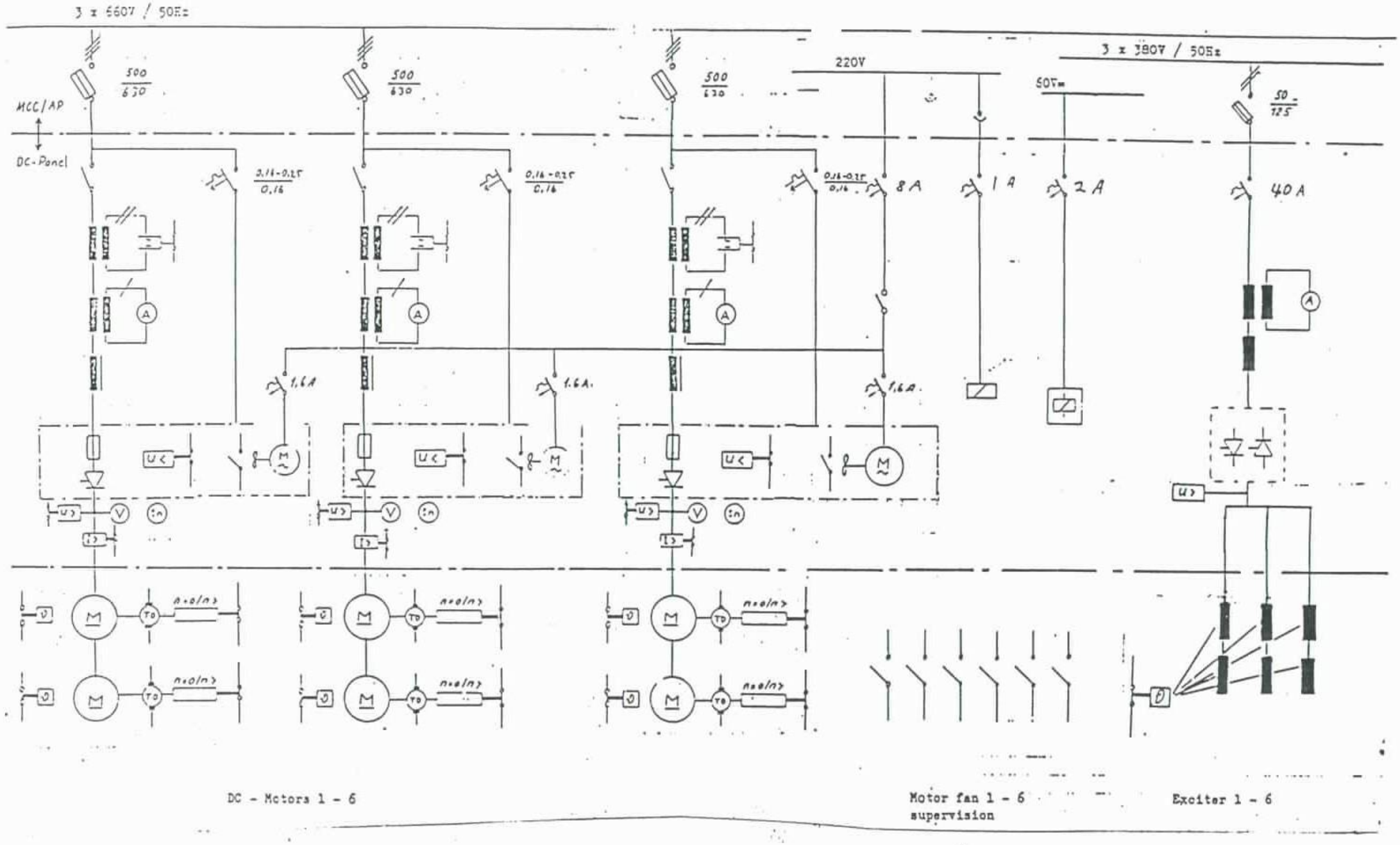


DC - Motors 1 - 3

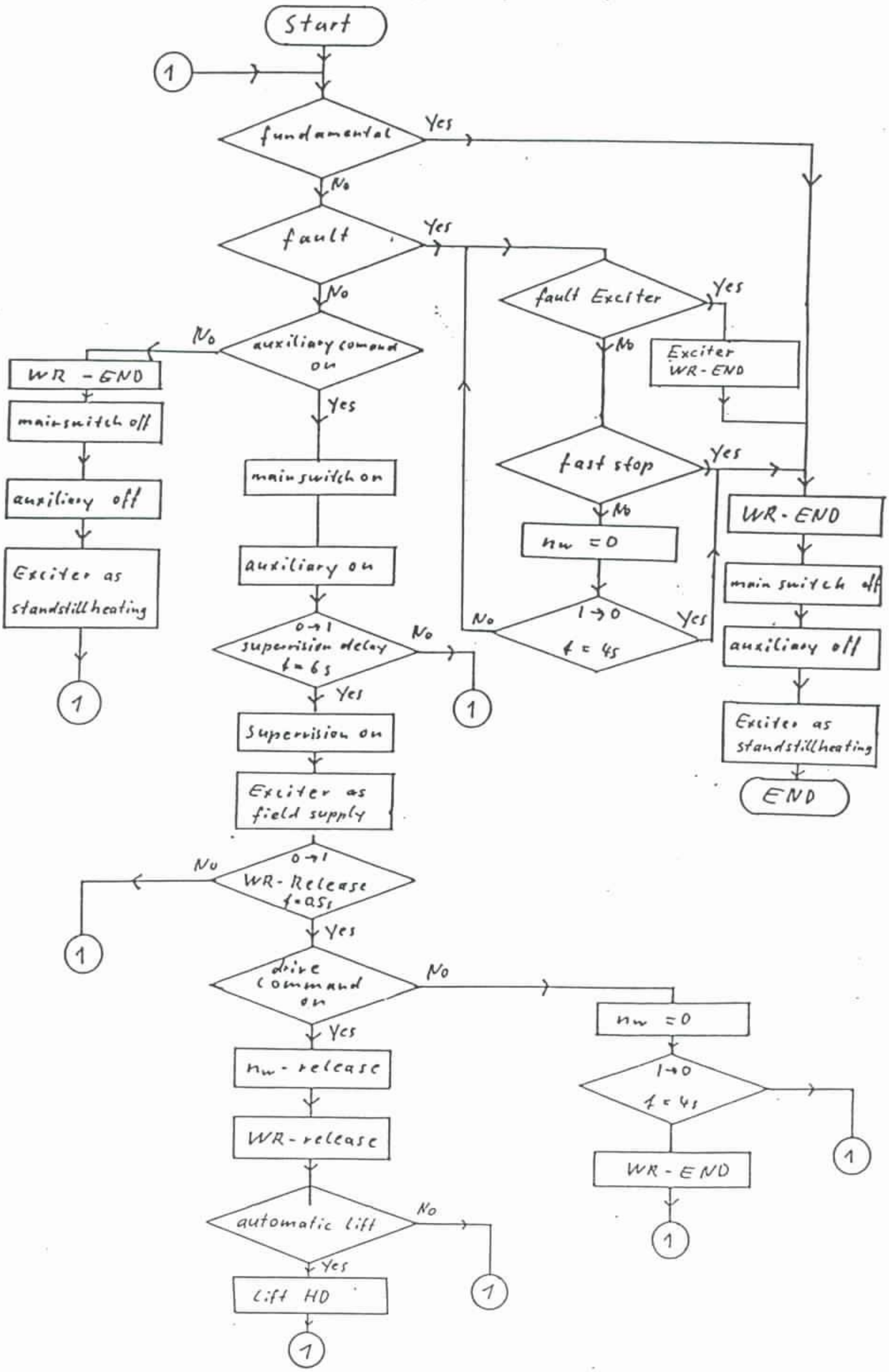
Exciter 1 - 3

Motor fan 1 - 3 supervision

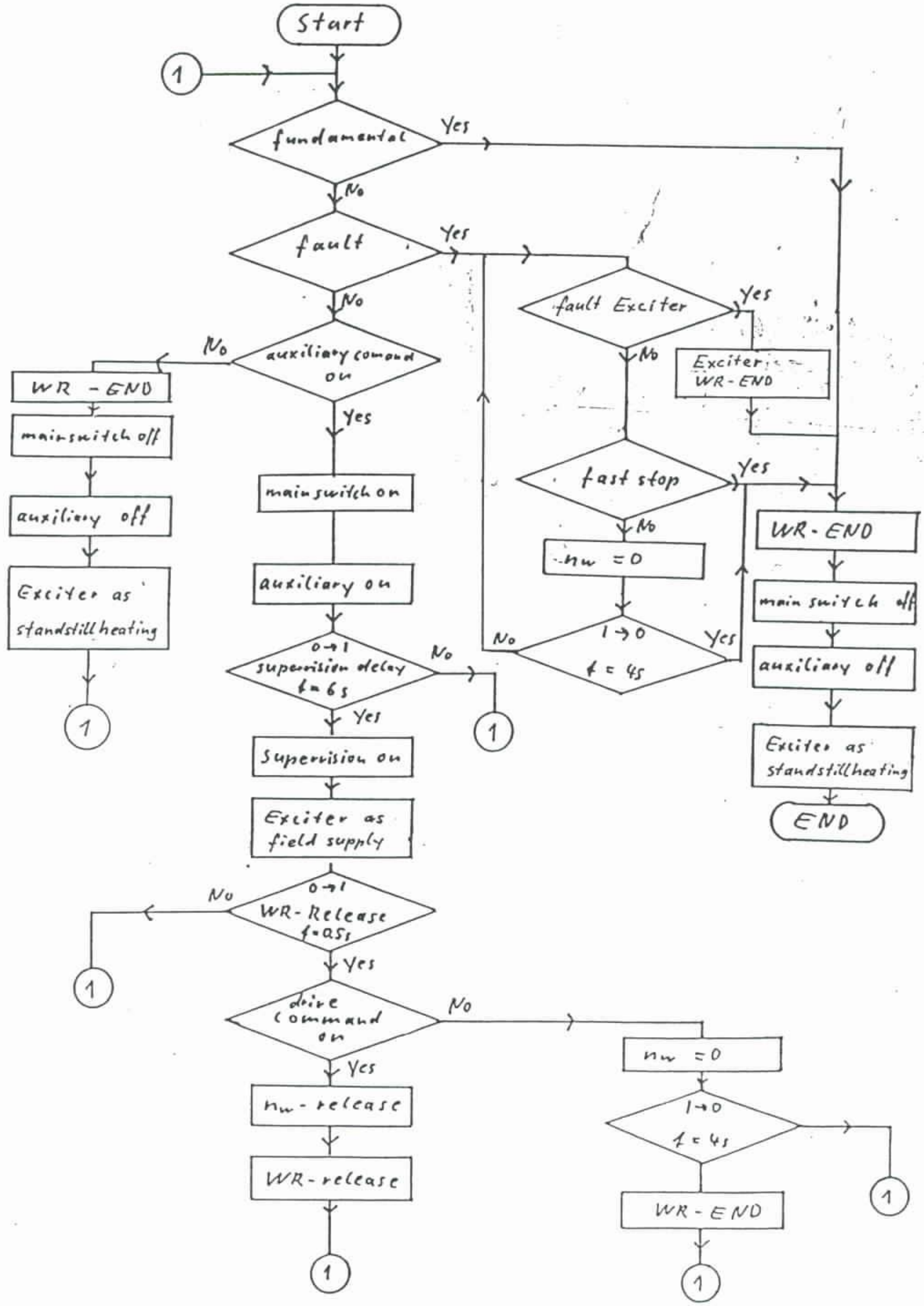
Single line diagram: Travel drive



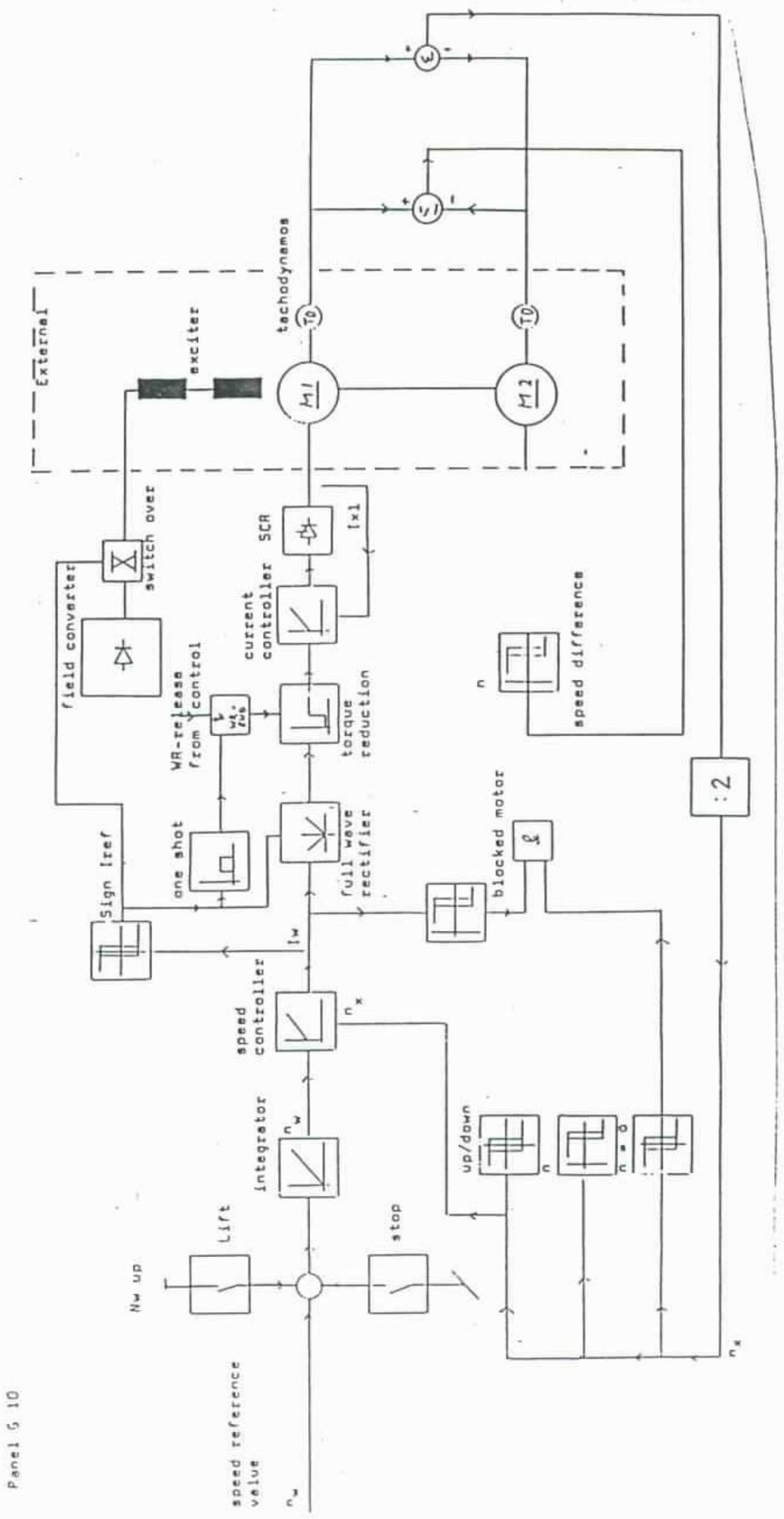
Flow sheet: Boom hoist drive, control



Flow sheet: Slewing drive and Travel drive

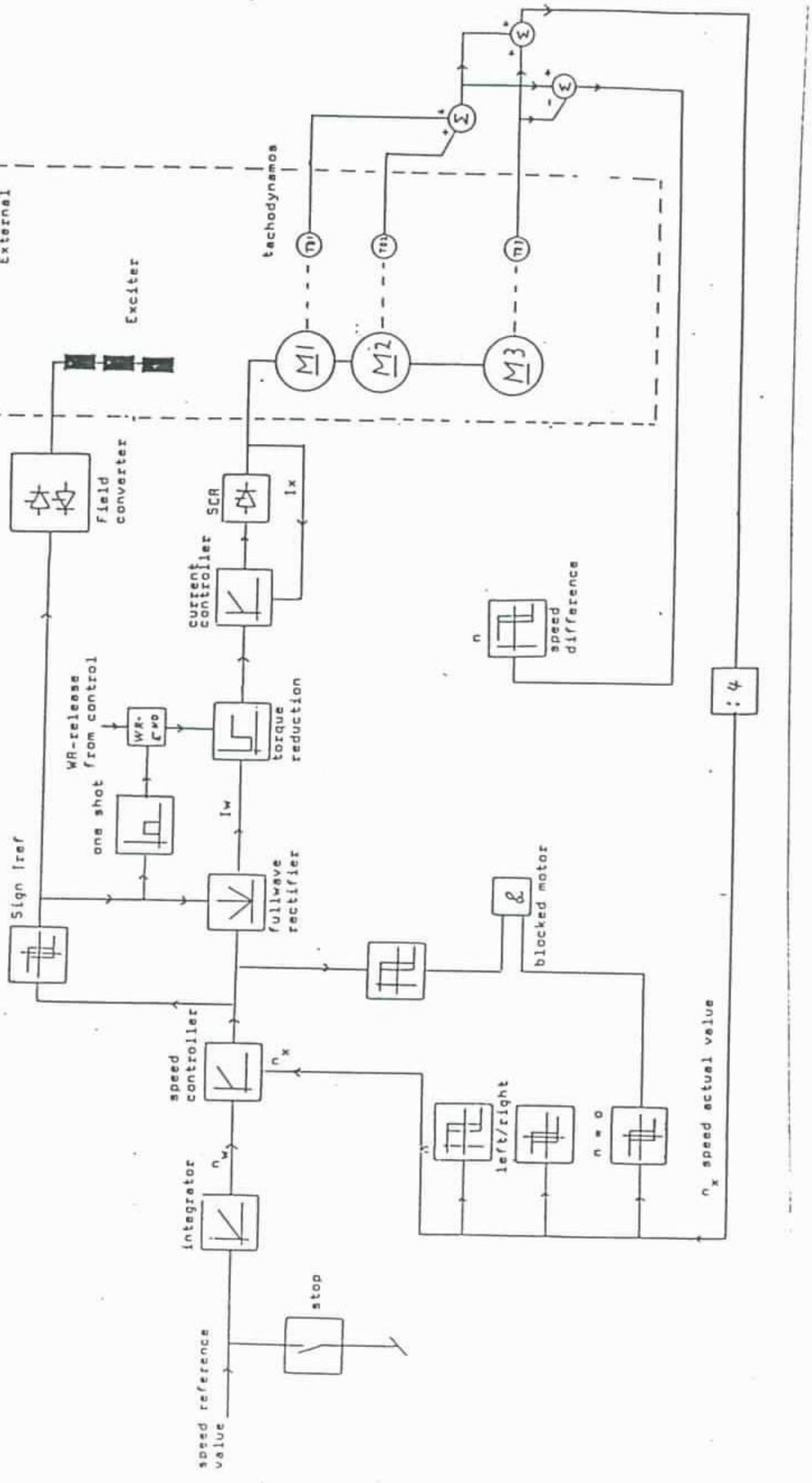


Blockdiagram: Control Boom hoist drive



Panel G 10

Blockdiagram: Control Slewing drive



Blockdiagram: Control Travel drive