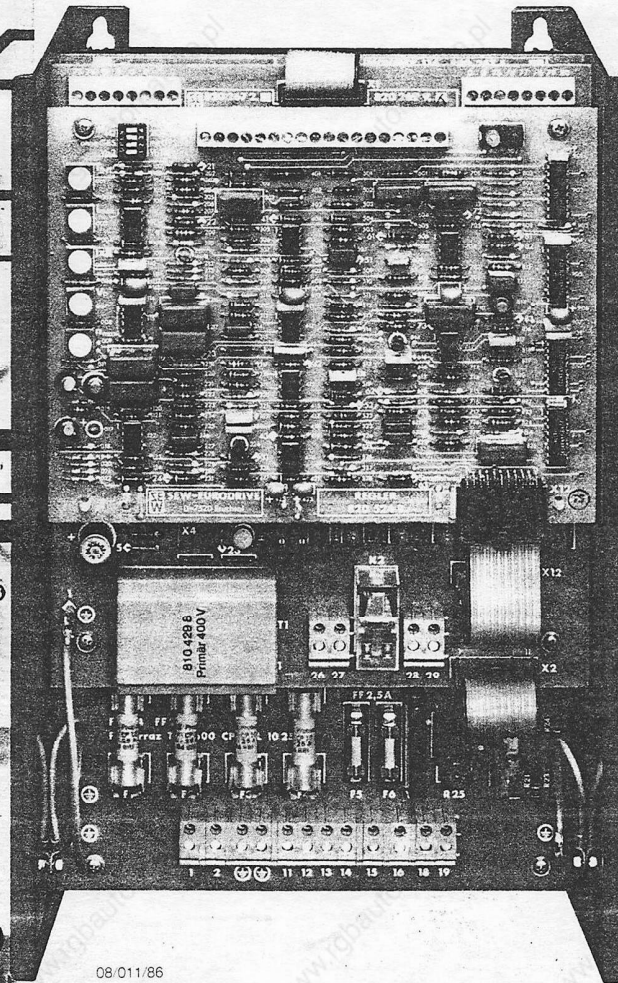
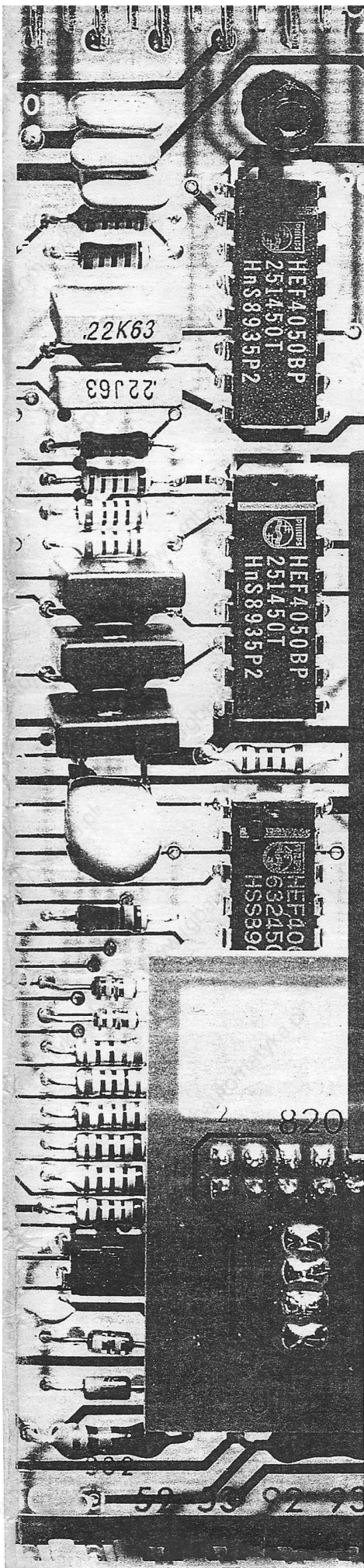


DC Converter MOVIRET® 108/114/214/122/222/235

Installation and Operating Instructions

Version 4/93



08/011/86

SEW EURODRIVE

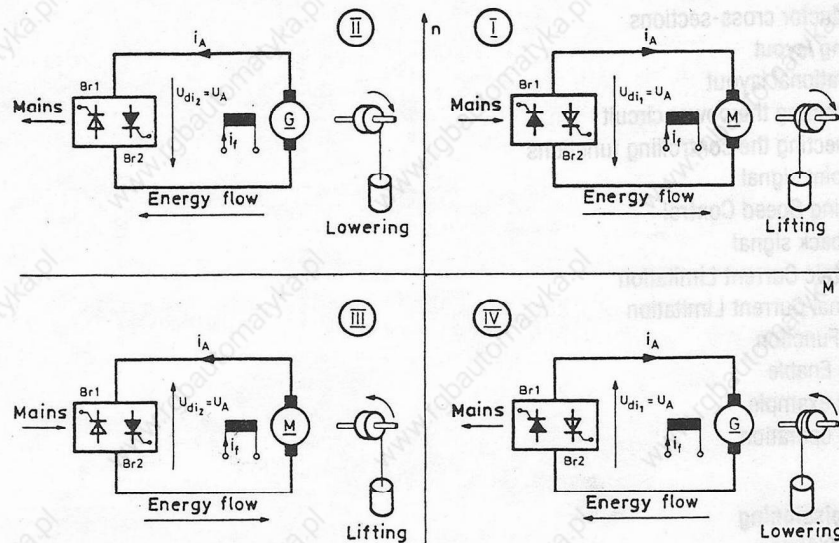
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1.1 In general

The DC power converters of the series MOVIRET® are suitable for alternating current supply of 220-240 Volt AC (MOVIRET® 108/114/122) and for 380-415 Volt AC (MOVIRET® 214/222/235). The converters operate on 50 Hz, but can be changed for 60 Hz supply (Check point 3.3).

These units supply the connected DC shunt wound motors with a constant DC voltage for the field winding, as well as variable DC voltage for the armature winding, which enables speed variation.

By virtue of the anti-parallel bridge circuit, positive as well as negative voltages and currents are possible, thus the drive can operate in all four quadrants.



The units are factory tested and leave our company in working order, properly packed for transport. After receipt, please check the merchandise for transport damage. Should damage have occurred, file a claim with the forwarding agency.

1.2 Constructional design

The power circuit employs two fully controlled anti-parallel single-phase bridges. The thyristor moduls are mounted on a common heatsink, which, together with side panels, form the supporting chassis of the unit. The rectifier for the field, with fuses, the current transducer, as well as super fast fuses for the thyristors, are all part of the power circuit.

The seven units are functionally identical, only the power circuits have different components. The mains supply chokes are already incorporated within the MOVIRET® 108/114/214 units. On the larger units, MOVIRET® 122/222/235, the chokes although included in our supply are due to structural considerations mounted externally to the units.

The MOVIRET® contains standard features for the ease of adaption of the unit to the motor or specific applications. This scope of functions can be further widened through extension modules. These modules are hooked up to terminal connections in order not to interfere with the inter-changeability of the standard components.

Non-standard units are clearly marked with a suffix "X" on its type designation (for example "MOVIRET® 235X") and modified non-standard subprints are marked with a red dot close to the part number imprint. These units contain certain features which are beyond the scope of the standard converters.

1.3 Basic functions

The setpoint signal is either provided as an external voltage or via a potentiometer. The reference potential is connected to earth/ground and is free of any potential. The polarity of the setpoint signal determines the direction of rotation of the motor. The actual speed can either be picked up by via a tachogenerator or by armature voltage feedback via the incorporated differential amplifier.

The electronic current limitation provides reliable overload protection for the converter and the driven motor, as it limits and controls the torque to the manually adjustable limit. To protect the motor against thermal overload the design details of the motor are to be taken into consideration. The setting can be selected such that either the speed regulation is contained within the set current limit, or the current regulation is contained within the set speed limit.

The units are provided with a self-monitoring circuit, which prevents critical operating conditions, and establishes automatically proper switching sequences for specific operations and functions.

There is no need for any time sequence when operating the controls of the MOVIRET® except when shutting it down. We recommend to de-energize the circuit by applying pulse blocking. Under no circumstances should the D.C. circuit be opened while there is current flow.

Any de-energizing of the D.C. circuitry should be done only after applying pulse blocking.

-
- **When operating in the generative mode, it is imperative to apply the pulse blocking before disconnecting the unit from the mains. The minimum time gap allowable is 50 ms. On no account may the DC circuit be opened.**
-



1.4 Extension of functions

The scope of functions can be further widened by employing several extension modules.

In this respect, we may mention the importance of the "E" System, which uses plug-in P.C.B.s for specific standard functions.

The MOVIRET® units have several strategic connections brought out to a terminal board in order to allow for a meaningful scope of operations. A single "E" System P.C.B. can be powered directly by the MOVIRET® unit. In case of need for several P.C.B.s, a rack for their mounting, requiring a separate power pack will be provided.

2.1 Mechanical installation

The converter has to be mounted with its P.C.B.s in a vertical position with sufficient space above and below to ensure unobstructed air flow. We recommend at least 100 mm free space to ensure proper cooling conditions.

Deviation from the suggested mounting position, stacking of several units vertically, or insufficient heat dissipation by the cabinet enclosure may lead to overheating. The air temperature immediately below each unit should not exceed 45 °C.

The nominal current rating of the converter is based on 45 °C air temperature. The units have to be derated (according to technical data 4.1) for cooling air temperatures in excess of 45 °C. Derating is also applicable for installation sites in altitudes of more than 1 000 meters above sea level.

Derating might not be needed if sufficient forced air ventilation is installed. Please approach our technical staff for assistance if needed.

The converters have to be protected against dust, especially in environments of high humidity or occasional condensation. Cabinet enclosures should have sealed doors with filtered openings for cooling air. Occasional condensation is not harmful, in the absence of dust or other aggressive agents. Otherwise cabinet heaters should be installed.

To avoid magnetic stray field interference with the control electronics it is necessary to provide a minimum clearance distance of 20 cm between the DC converter and any contactors, chokes, transformers and their connecting leads.

2.2 Electrical installation



- **Electrical equipment may only be connected by qualified electrical personnel, who are conversant with relevant accident prevention regulations.**

The wiring of the converters should be in accordance with the VDE regulations or the local equivalents. Specifically, regulation VDE 0100 "Power circuit installations up to 1 000 Volt nominal voltages" and regulation VDE 0160 "Power circuits with electronic controllers" apply.

2.3 Conductor cross-sections

Cross-sections of power cables have to comply with the VDE regulations or the local equivalents. Check the converter's nameplate data for nominal currents and voltages and size the cables accordingly. The armature circuit conductors should be according to the rating of the armature circuit fuses. External fuses should be at least of equivalent rating and of slow response. Signal lines should have reduced cross-sections. We recommend a minimum of 0.5 mm² sections, with tabs installed on both ends.

2.4 Wiring layout

- **Signal lines of one circuit should be intertwined, or shielded if longer than 2 meters.**
- **To avoid any feedback from power cables (inductance, capacitance) on to the highly sensitive signal lines, power lines and signal lines have to be installed apart from each other. Only one end of the cable shield must be earthed/grounded to the converter (terminal "0").**

2.5 Operational layout

Separation of the converters from the rest of the circuitry should be provided for, by means of circuit breakers, electromagnetic contactors or similar.

If individual separation is not feasible, at least isolation of sub-groups of the circuitry should be insured.

- **Certain regulations, such as VDE 0160, do not consider controlled semiconductors as a safe means for isolation.**

If contacts are incorporated into the D.C. circuit (in order to switch power between several motors, for example) the pulse blocking has to be applied at least 50 ms before and after switching these contacts (terminal 62 open to earth/ground terminal 0). If national regulations stipulate that in the immediate vicinity of the motor, isolating switches have to be installed between the DC converter and armature as well as the field, then it is important that the DC converter is switched off from the mains at least 1 sec. before operating the isolating switches.



The converter itself is reliably protected against short circuits and overload through built-in ultra rapid fuses and by the current limiting circuitry. It does not need any further protection.

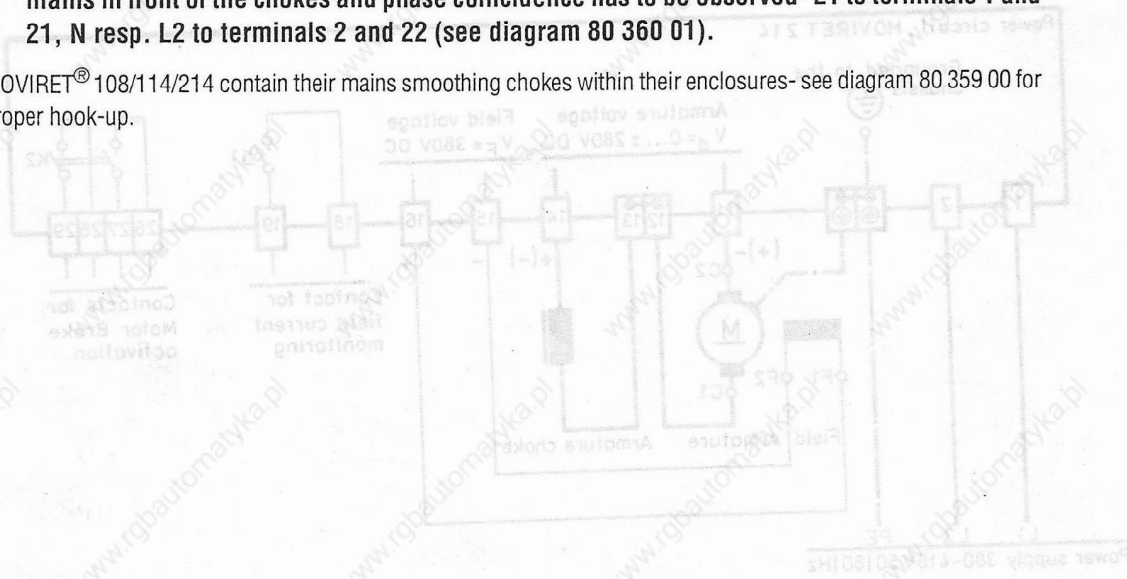
- **As switching elements for the control circuitry, only low voltage contacts are to be used. Such as reed relays, or gold plated contacts.**

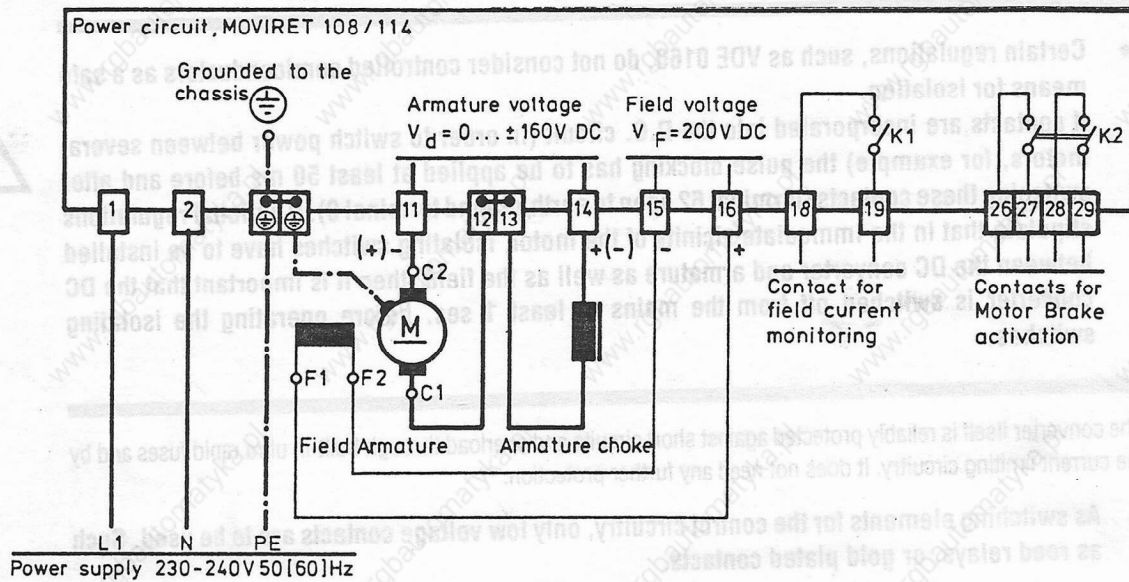
2.6 Connecting the power circuit

Connect the power supply to the MOVIRET[®]S power circuit according to diagrams 80 359 00 respectively 80 360 01. For MOVIRET[®] 122 one and for MOVIRET[®] 222/235 two line chokes are to be provided into the on line side.

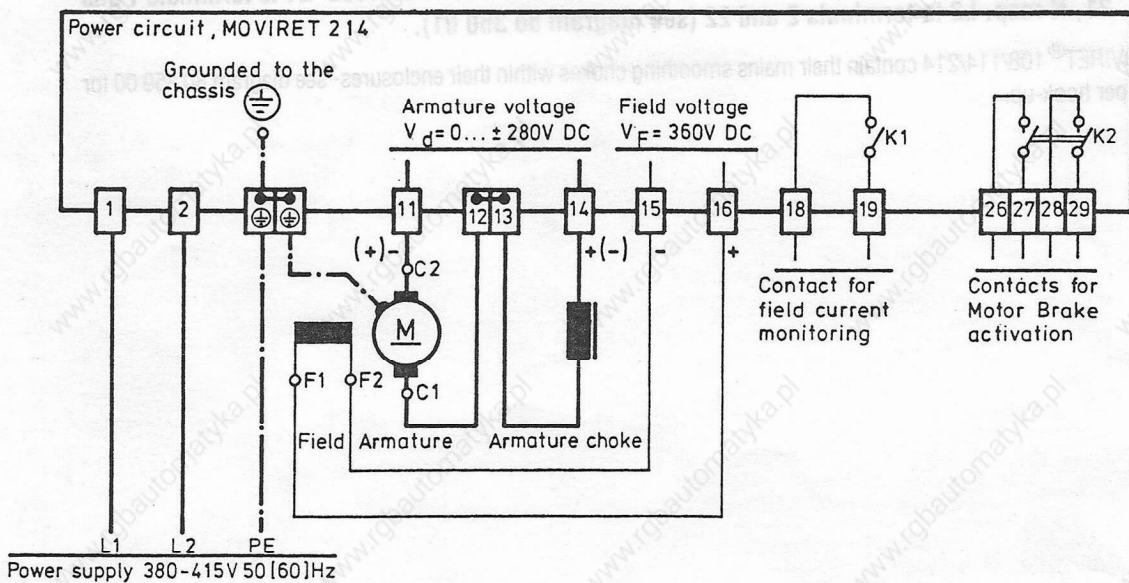
- **The power supply lines for the control circuitry- terminals 21, 22- must be connected to the mains in front of the chokes and phase coincidence has to be observed- L1 to terminals 1 and 21, N resp. L2 to terminals 2 and 22 (see diagram 80 360 01).**

MOVIRET[®] 108/114/214 contain their mains smoothing chokes within their enclosures- see diagram 80 359 00 for proper hook-up.



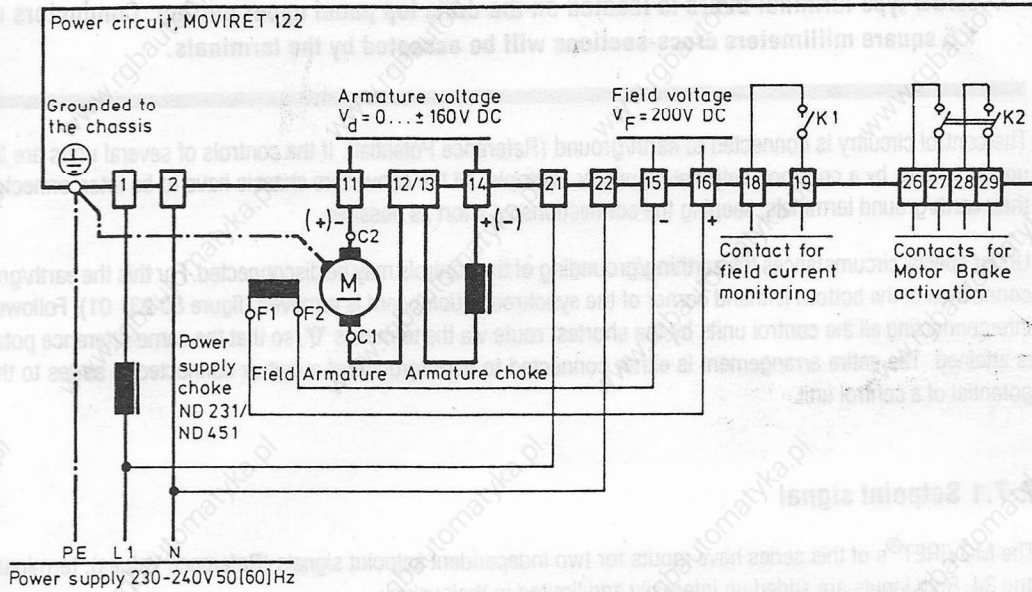


Wiring diagram 80 359 00 Fig. a

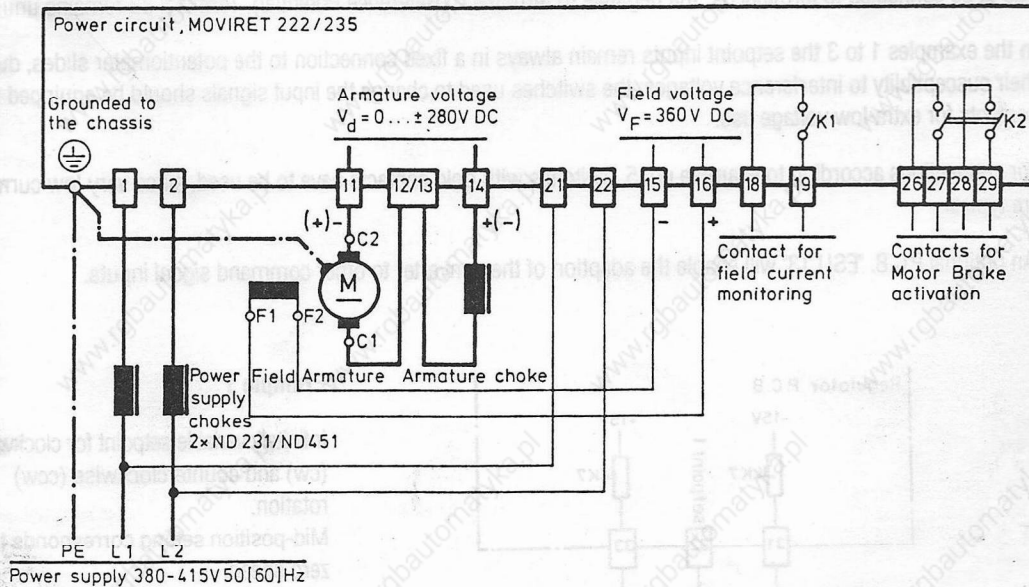


The polarities shown for the motor armature indicate clockwise rotation. Those in brackets indicate counterclockwise rotation.

Wiring diagram 80 359 00 Fig. b



Wiring diagram 80 360 01 Fig. a



The power supply for the electronic control unit must be tapped prior to the line chokes and phase coincidence must be ensured.

The polarities shown for the motor armature indicate clockwise rotation. Those in brackets indicate counterclockwise rotation.

Wiring diagram 80 360 01 Fig. b

2.7 Connecting the controlling functions



- The wiring of the units control circuitry has to be done according to diagram 80 362 01. A screw type terminal board is located on the units top panel upper portion. Conductors up to 1.5 square millimeters cross-sections will be accepted by the terminals.

The control circuitry is connected to earth/ground (Reference Potential). If the controls of several units are linked up electrically, by a common setpoint signal for example, all the converters chassis have to be interconnected on their earth/ground terminals, keeping the connections as short as possible.

Under special circumstances the earthing/grounding of the controls may be disconnected. For this the earth/ground connection at the bottom lefthand corner of the synchronisation board is removed (figure 80 231 01). Followed by interconnecting all the control units by the shortest route via the terminals "0", so that the same reference potential is attained. The entire arrangement is either connected to earth/ground of a unit or connected in series to the "0" potential of a control unit.

2.7.1 Setpoint signal

The MOVIRET®s of this series have inputs for two independent setpoint signals (Reference Values), terminals 32 and 34. Both inputs are added up internally and limited in their value.

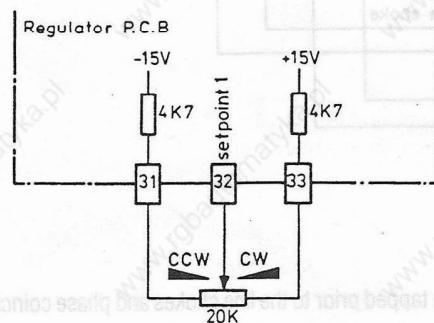
For potentiometer control, positive and negative reference voltages are provided by the unit (see wiring diagram 80 347 00 below).

If the speed is to be controlled via an external voltage signal, the positive polarity (for clockwise (cw) rotation sense) has to be connected to terminal 32, the negative to terminal 0 (Reference Potential). Terminal 33 remains unused.

In the examples 1 to 3 the setpoint inputs remain always in a fixed connection to the potentiometer slides, due to their susceptibility to interference voltages; the switches used to change the input signals should be equipped with contacts for extra-low voltage use.

For connections according to example no. 5, switches with gold contacts have to be used, since very low currents are typical.

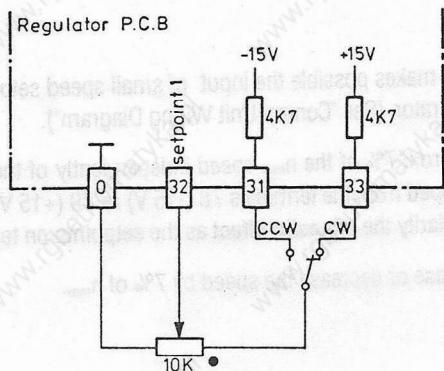
An optional P.C.B. "ESU 13" will enable the adaption of the converter to other command signal inputs.



Example 1

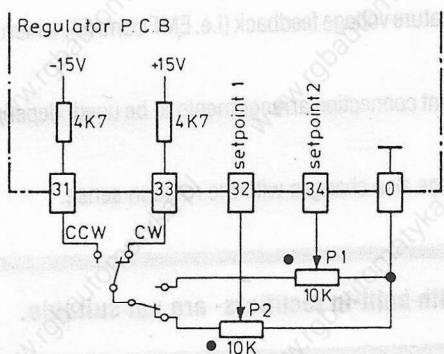
Infinitely variable setpoint for clockwise (cw) and counterclockwise (ccw) rotation.

Mid-position setting corresponds to zero speed.



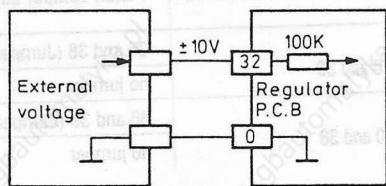
Example 2

Setpoint switchable to cw and ccw rotation.
Switch position shown for cw rotation.



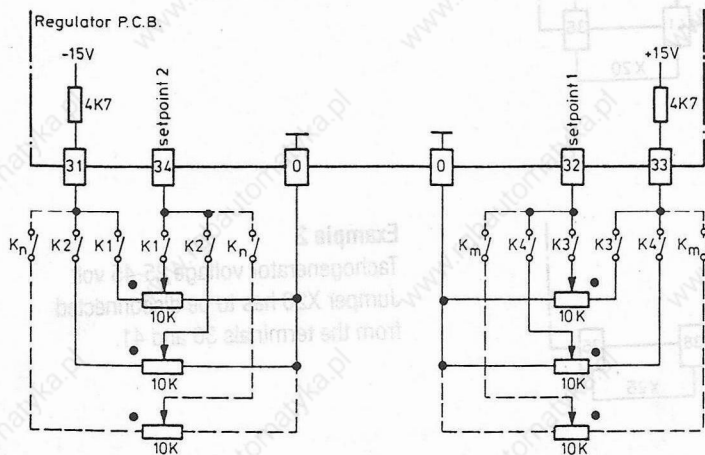
Example 3

Setpoint selection with two setpoints providing cw and ccw speed.
Shown: Clockwise rotation with setpoint 1.



Example 4

Speed setpoint provided by an external voltage source.



Example 5

Setpoint reversal positive and negative for more than two setpoint signals.

2.7.2 Jogging Speed Control

Applying the "Jogging Control" input, terminal 35, makes possible the input of small speed setpoints directly into the speed controller i.e. by-passing the ramp generator. (See "Control Unit Wiring Diagram").

The setpoint increment is limited internally at approx. 7% of the n_{max} speed independently of the input voltage at terminal 35. The voltage for terminal 35 can be tapped from the terminals 78 (-15 V) or 79 (+15 V). As the setpoint **is not fed via** the ramp generator it has with its polarity the **opposite effect** as the setpoints on terminals 32/34.

The input at terminal 35 may also be used to increase or decrease the speed by 7% of n_{max} .

2.7.3 Feedback signal

Feedback signal connections should be provided in accordance with diagram 80 361 01.

The following diagram shows the connection for armature voltage feedback (i.e. EMF control), which does not require a tachogenerator.

For the use of tachogenerators, there are four different connection arrangements to be used, depending on the EMF voltage of the tachogenerator.

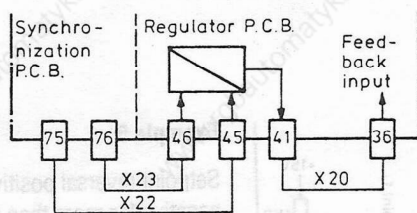
On DC tachogenerators the polarity of the EMF voltage also changes with the rotation sense.



- **AC or 3-phase tachogenerators- even with built-in rectifiers- are not suitable.**

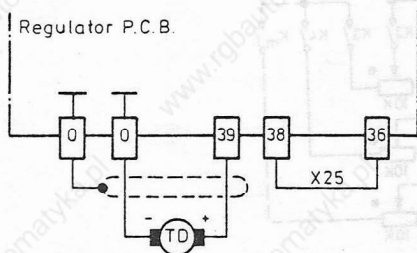
Tachogenerator EMF voltage at maximum speed	Tachogenerator connected to terminals	Install Jumper between terminals
25 – 45 Volt	0 and 39	36 and 38 (Jumper X25)
35 – 75 Volt		no jumper
60 – 130 Volt	0 and 38	36 and 39 (Jumper X24)
90 – 200 Volt		no jumper

The tachogenerator's negative terminal is connected to terminal 0 and the positive terminal is connected to terminal 38 resp. 39. The tachogenerator polarity shown is for positive setpoint.



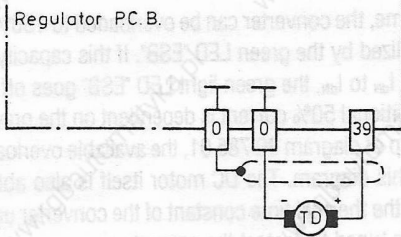
Example 1

EMF control
No tacho connected



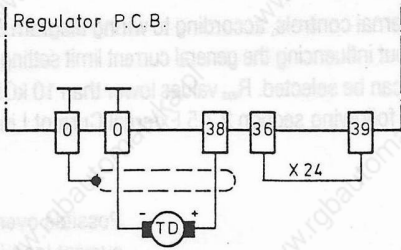
Example 2

Tachogenerator voltage 25-45 volt
Jumper X20 has to be disconnected from the terminals 36 and 41.



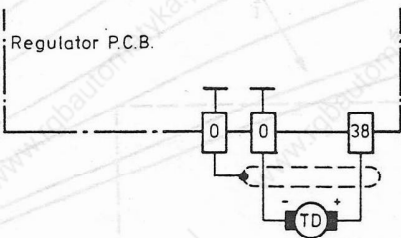
Example 3

Tachogenerator voltage 35-75 volt
Jumper X20 has to be disconnected from the terminals 36 and 41.



Example 4

Tachogenerator voltage 60-130 volt
Jumper X20 has to be disconnected from the terminals 36 and 41.



Example 5

Tachogenerator voltage 90-200 volt
Jumper X20 has to be disconnected from the terminals 36 and 41.

The tachogenerator polarity shown is for positive setpoint.

Wiring diagram 80 361 21



2.7.4 Dynamic Current Limitation

For a limited amount of time, the converter can be overloaded to 150% of its nominal current. The availability of this additional power is signaled by the green LED "ESB". If this capacity is exhausted, the unit automatically reduces the current limit from $1.5 I_{dN}$ to I_{dN} , the green light LED "ESB" goes off.

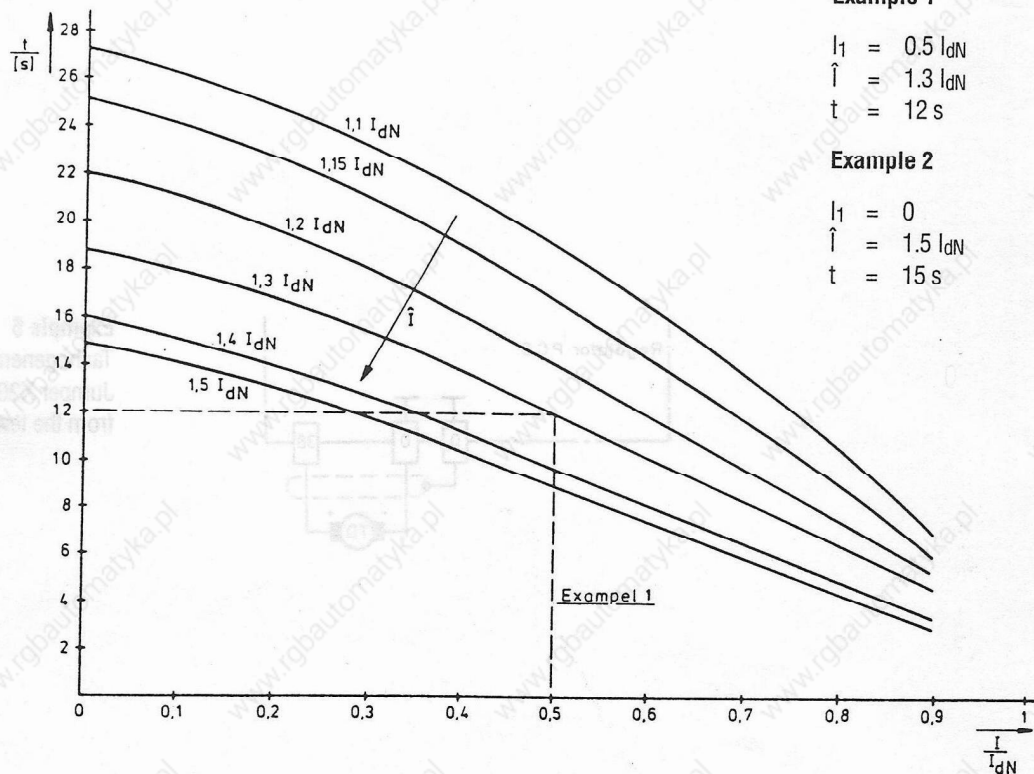
The availability of this additional 50% current is dependent on the previous running condition and the magnitude of the overload. With the help of diagram 80 785 01, the available overload capacity can be determined. Two examples demonstrate the use of this diagram. The DC motor itself is also able to handle overload up to its mean thermal capacity. Since, however, the thermal time constant of the converter unit is essentially smaller, the Dynamic Current Limitation characteristic is tuned to protect the converter.

In cases in which the internal current limitation has been set for a reduced value (in order to adapt the unit for a DC motor of smaller rating, for example) the Dynamic Current Limitation then is 150% of the reduced setting. This measure is not needed then for the protection of the converter, but it will avoid motor overloading through external loads.

The Dynamic Current Limitation makes available power for heavy starts or accelerations, up to 150% of the rated motor current. Through its automatic monitoring function, it prevents at the same time, overheating of the converter and the motor by means of automatic reduction of the current limit (satisfactory cooling conditions being a prerequisite).

By means of additional external controls, according to wiring diagram 80 348 00, the dynamic current limitation can be reduced externally, without influencing the general current limit setting of the converter. With diagram 80 774 00, the right value for resistor R_{ext} can be selected. R_{ext} values lower than 10 kOhms will also reduce the general current limit setting as described in the following section 2.7.5 External Current Limitation.

Possible overload time dependent on the preceding current load I_1 and the magnitude of the overload \hat{I}



Example 1

$$\begin{aligned} I_1 &= 0.5 I_{dN} \\ \hat{I} &= 1.3 I_{dN} \\ t &= 12 \text{ s} \end{aligned}$$

Example 2

$$\begin{aligned} I_1 &= 0 \\ \hat{I} &= 1.5 I_{dN} \\ t &= 15 \text{ s} \end{aligned}$$

2.7.5 External Current Limitation

With External Current Limitation the motor current, as opposed to the internal setting, may be limited down to zero, without influencing the dynamics of the control circuit. For the external current limitation a 10 kOhm potentiometer has to be connected (refer to the recommended wiring diagram 80 348 00); by this means also the Dynamic Current Limitation is suppressed.

If the Dynamic Limitation is only to be reduced, then in addition to the jumper X21 between terminals 42 and 43, a fixed resistor R_{ext} needs to be connected between terminals 42 and 0, with a value of 10 kOhms which fixes the current limitation at 100% of the rated motor current set with the potentiometer " I_{max} ". The higher the degree of limitation required, the greater is the value for R_{ext} , which can be determined from the diagram 80 774 00. With resistance values lower than 10 kOhms a fixed External Current Limitation below 100% of the I_{max} setting can be attained. This is recommended when the current limitation has to be reduced to values lower than 80% of the converter's rated current, due to converter specific reasons.

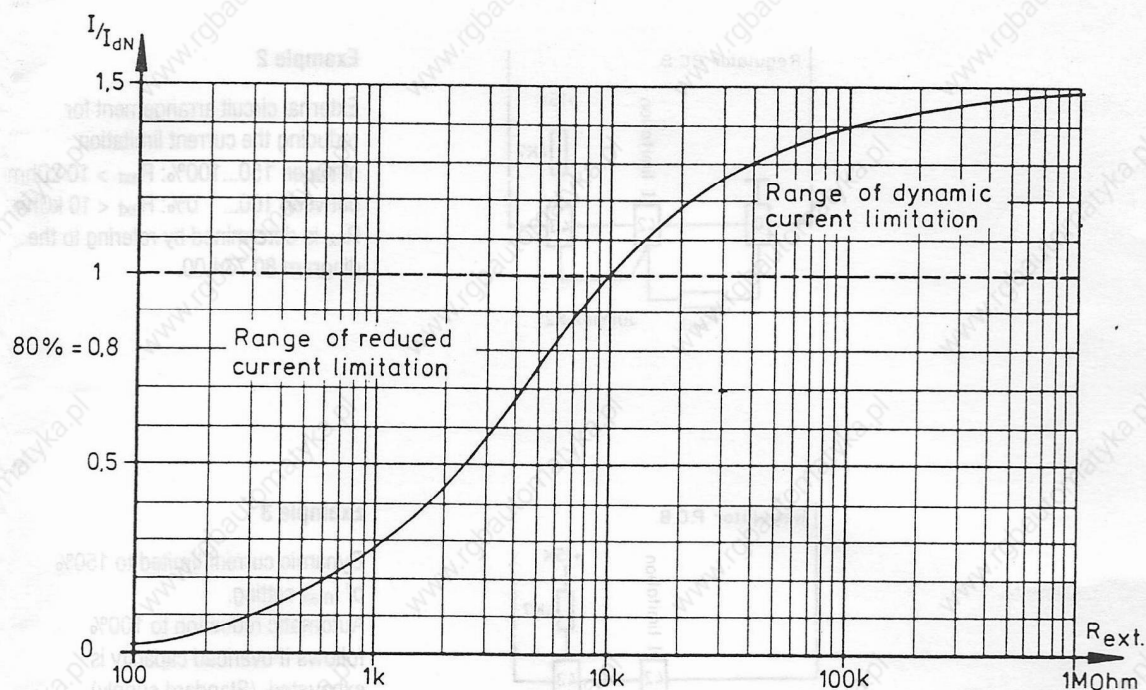
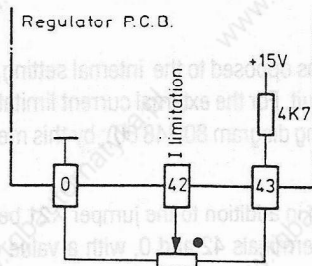
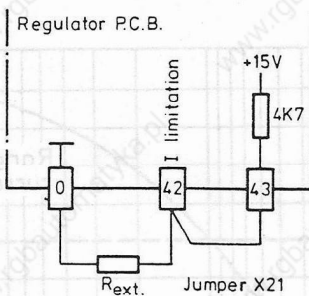


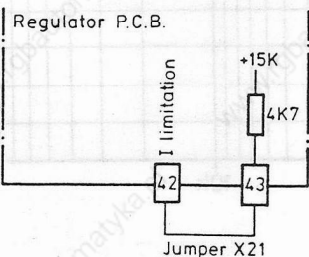
Diagram 80 774 00

**Example 1**

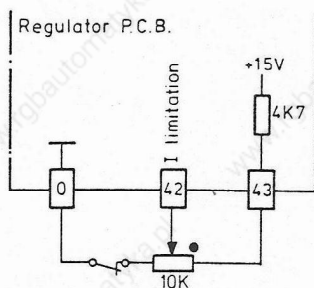
Current limitation externally variable from 0-100% of I_{max} setting. Dynamic current (> 100-150%) is not available with this circuitry. Alternatively the current limitation can be provided by a reference voltage of 0-10 V to the terminals 0 and 42.

**Example 2**

External circuit arrangement for reducing the current limitation between 150...100%: $R_{ext} > 10\text{ k}\Omega$
between 100... 0%: $R_{ext} < 10\text{ k}\Omega$
 R_{ext} is determined by referring to the diagram 80 774 00.

**Example 3**

Dynamic current limited to 150% of I_{max} setting. Automatic reduction to 100% follows if overload capacity is exhausted. (Standard supply).

**Example 4**

Current externally variable from 0-100% of I_{max} setting. Opening the switch 150% current elevation becomes available (indicated by glowing LED "ESB").

2.7.6 Stop Function

With the Stop Function applied, the system goes into generative braking mode, feeding energy back into the mains.

The Stop Function is triggered BY OPENING the contact between terminals 63 and 0 (See "Control Unit Wiring Diagram" 80 362 01). Thereby the reference value ramp generator is set to zero and the stop logic activated. The braking takes place with the maximum set current. As soon as the motor speed drops approx. 3% below the rated speed, the signal for triggering the mechanical brake is given and approx. 150 ms later the firing pulses to the thyristors are blocked, ensuring a safe overlap of motor torque and brake torque, with the brake working only as a holding brake.

- **For positioning operations the "Stop Function" is recommended, due to the advance activation of the brake. The pulse enable must be given here (i.e. terminal 62 must be connected to 0).**

An additional setpoint input via the jogging input (terminal 35) would hinder the drive to reach zero speed and should therefore be avoided with this operating mode, since it will not allow the triggering of the brake relay K2.

When closing the contact between terminal 63 and 0, the drive will accelerate according to the ramp generator setting to its previously set speed. Reducing the command signal (setpoint) to zero, will cause the drive to decelerate according to ramp generator setting, but the stop logic and the brake relay will not be activated. The drive might drift. This makes possible extremely low creep speeds, which are below the response threshold of the stop logic.

2.7.7 Pulse Enable

By closing the contact to terminal 62, the firing pulses to the gates of the thyristors are enabled, and the reference value ramp generator will bring the motor up to the set speed within the ramp generator time (refer to the control unit wiring diagram 80 362 01).

-
- **Caution:**
The terminal 63 must be connected to the terminal 0 via a closed contact (Stop Function).
-

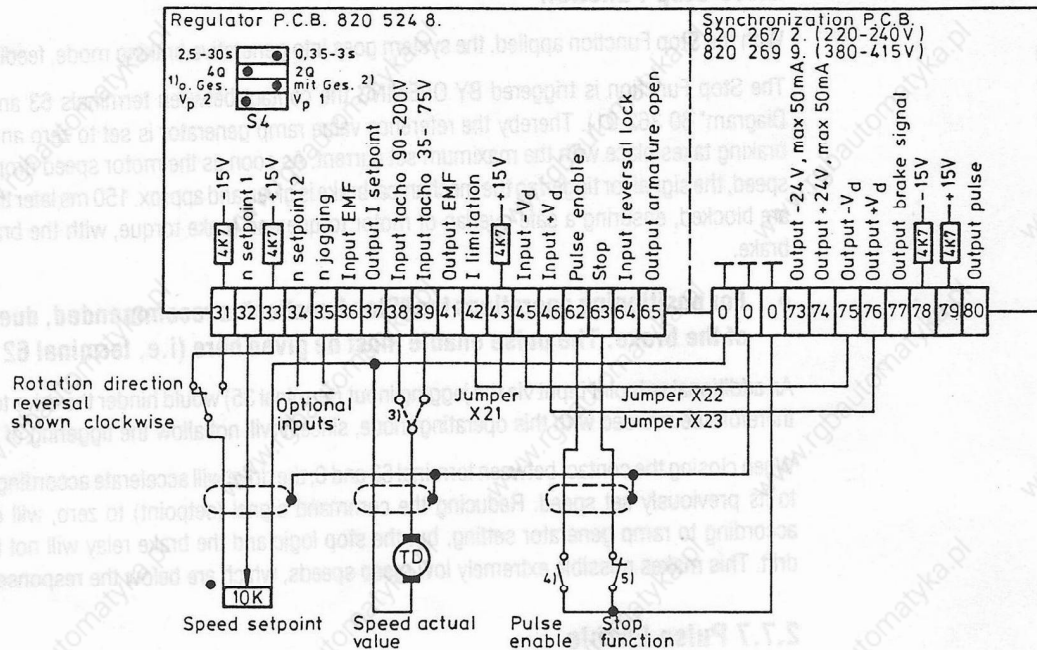


Closing the "Pulse Enable" also activates the control circuitry for the mechanical brake and the brake is released.

With the opening of the contact to terminal 62, the ramp generator is set to zero, the brake activated and the converter will electronically be made currentless (inverter limit position). As a result the thyristor firing pulses are blocked automatically as soon as the current drops to zero. A special shutdown sequence of inverter limit signal and pulse signal is not needed even with high load currents and motor inductances.

After the thyristor blocking has become active it can only be cancelled by the switch command "Pulse Enable".

2.7.8 Wiring example



1. Gear protection mode "off"
2. Gear protection mode "on"
3. Choose correct terminal according to maximum tachogenerator voltage.
4. Contact open = pulse blocking
5. Contact closed = unit enable

Caution:

Jumper X20 (connecting terminals 36 and 41) has to be removed for tachogenerator operation.

As switching elements for the control circuitry, only low voltage contacts are to be used (i.e. reed relays, or gold plated contacts).

Control unit wiring diagram 80 362 01

2.8 Brake operation

The operation of the motor's electro-mechanical disc brake is controlled by a brake relay K2 built into the DC converter. When the brake relay is not energized, the relay contacts are open, the brake is in action (i.e. closed), and the LED "ISP" is on.

The following conditions will trigger the brake:

- **Pulse blocking**
(i.e. the thyristors are blocked)
The connection between terminal 62 and 0 is opened.
- **Stop function**
After operating the stop function and the speed has dropped below the rated speed by approx. 3% the relay contacts of K2 open and the brake comes into action.
- **Undervoltage**
A voltage drop in the mains or a blown fuse will immediately trigger the "ISP" (i.e. pulse blocking) and the contacts of the brake relay K2 will open up. In addition the LED "BSP", respectively all LEDs will go off.

• **Armature circuit interruption**

If an interruption of the armature circuit is monitored and the LED "AKO" signals a fault by going on.

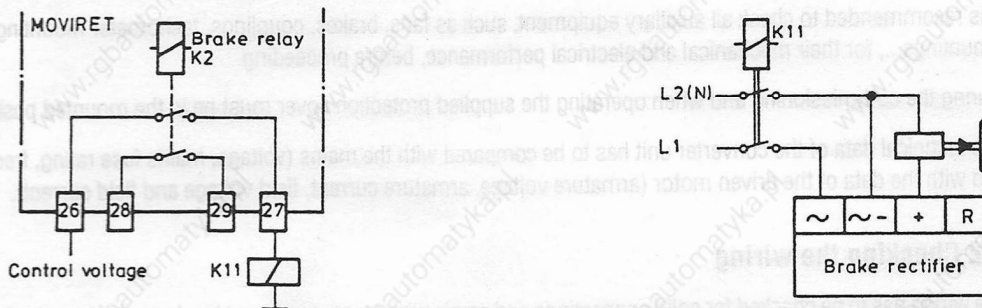
The brake is connected according to the wiring diagram 80 380 02.

If rapid brake response is required for accurate stopping, then simultaneous switch action in the AC and DC circuits must be applied. For the brake response times, please refer to the DC geared motor catalogue.

With the use of the "Quick Brake Exciter BSE 22" fast brake opening as well as fast brake closing can be achieved. Please refer to the operating instructions "Quick Brake Exciter BSE 22".

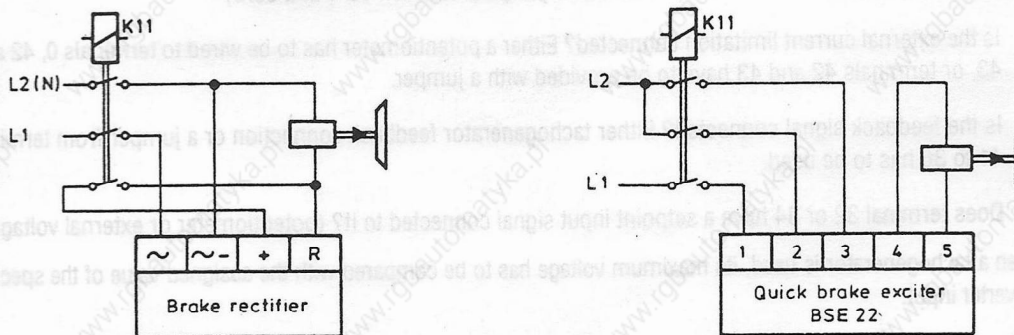
Activation of the brake via a circuit breaker

Switch action in the AC circuit with brake rectifier



Simultaneous action in the AC and DC circuit
with brake rectifier

with the Quick Brake Exciter BSE 22



Contacts of K11 must be rated for heavy duty inductive loads (AC-3 rating).

3.1 General Notes



- **The connection and commissioning of electrical equipment may only be carried out by qualified electrical personnel !**
Before connecting the converter on to power, make sure that the wiring has been done according to the regulations of the local authorities and the instructions contained in this booklet.
Caution:
Avoid any physical contact to the power circuit which is connected to the mains voltage. Spent fuses must be replaced with the specified ones.

It is recommended to check all auxiliary equipment, such as fans, brakes, couplings, tachometer mountings, drive mountings..., for their mechanical and electrical performance, before proceeding.

During the commissioning and when operating the supplied protection cover must be in the mounted position !

The technical data of the converter unit has to be compared with the mains (voltage, mains fuse rating, frequency) and with the data of the driven motor (armature voltage, armature current, field voltage and field current).

3.2 Checking the wiring

The wiring has to be checked for solid connections and ample wire cross- sections. Very important are the following points:

- Are the power supply connections to the electronic control and to the power circuit in phase coincidence (not applicable to MOVIRET[®] 108/114/214).
- Are armature and field connected to the proper terminals and with the proper polarity?
- Are terminals 62 and 63 used? (If not: Install jumpers between 62/0 and 63/0)
- Is the external current limitation connected? Either a potentiometer has to be wired to terminals 0, 42 and 43, or terminals 42 and 43 have to be provided with a jumper.
- Is the feedback signal connected? Either tachogenerator feedback connection or a jumper from terminal 41 to 36 has to be used.
- Does terminal 32 or 34 have a setpoint input signal connected to it? (potentiometer or external voltage)

When a tachogenerator is used, its maximum voltage has to be compared with the assigned value of the specific converter input.

3.3 Setting procedures

Units for 50 Hz can be converted for 60 Hz line frequency (60 Hz = remove jumper X4 on the synchronization P.C.B.) Refer to fig. 80 231 01.

- **The program switch S4 on the top left corner of the regulator P.C.B., must be set for 4 quadrant operation (position 4Q). Otherwise one of the two antiparallel rectifier bridges would not be operational.**

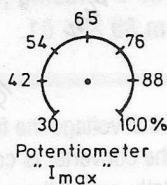
The selection of the ramp generator range will be dealt with when tuning the potentiometer T_{INT}.

The switch position "mit GES" (gear protection mode) should be used when a relatively big backlash in drive train is given. It limits the DC current at the lower values for a fraction of a second, to allow for soft engaging of gears, when starting or reversing.

Potentiometer "V_p" optimizes and stabilizes the dynamics of the closed loop speed regulation circuit. Its setting is very much dependent on the external load condition.

Dynamic ranges "V_{p1}" or "V_{p2}" of this potentiometer can be selected via the program switch. The range "V_{p2}" provides the higher dynamics. If unstable conditions develop, change position to "V_{p1}".

For the time being, set potentiometer "I_{xR}" and "n_{max}" to the ccw stop, and potentiometer "V_p" to the mid-position. The setting of potentiometer "T_{INT}" is arbitrary. The current limitation, via potentiometer "I_{max}", should be preset at this point as follows.



MOVIRET®	100%	88%	76%	65%	54%	42%	30%
108	I _{dN} = 8A	7 A	6 A	5 A	4.5A	3.5A	2.5A
114/214	I _{dN} =14A	12.5A	10.5A	9 A	7.5A	6 A	4 A
122/222	I _{dN} =22A	19.5A	16.5A	14.5A	12 A	9 A	6.5A
235	I _{dN} =35A	31 A	26.5A	23 A	19 A	14.5A	10.5A

Remark:

MOVIRET® units which show an "R" behind the type designation, have a reduced current rating indicated on the nameplate. For these units the current limitation is to be preset proportionally lower.

Following steps have to be taken to adapt the converter to the motor, and tune the complete drive to the application's requirements:

- Switch-off pulse enable (i.e. open switch to terminal 62, refer to control unit wiring diagram)
- Switch on power supply.
- The six LEDs "BSP"/ "ESB"/ "POM"/ "NEM"/ "ISP" and "AKO" should now signal following conditions:

LED	Function	Normal condition	Indicating
BSP	Operating voltage	ON	All circuits correctly under power
ESB	Dynamic current limit	ON	150% current capacity available
POM	Positive Torque	ON	One of the two should be on
NEM	Negative Torque	ON	
ISP	Pulse blocking	ON	Thyristor pulses are blocked
AKO	Armature circuit monitor (open loop)	OFF	Armature circuit closed

- **Note:**
In case of armature voltage feedback speed regulation (i.e. EMF control), the AKO-monitor checks the circuit only within the converter, that is back to the terminal board, including the fuses.

With tachogenerator feedback, the complete circuit, including the motor, is monitored by the LED "AKO".

If the signal display of the LED is different from the above, the circuit's connections have to be checked over again.

Further steps:

- Provide a small reference signal either via the main speed setpoint through terminal 32 or 34 or via the jogging speed control input, taking a -15 V signal from terminal 31 or 78 and applying it to terminal 35. By this method approx. 7% of the rated setpoint is preset.
- Eliminate the external current limitation, either by turning up the potentiometer for external current limitation, or by installing jumper X21 between terminals 42 and 43.

- Release the thyristor pulses (both terminals 62 and 63 have to be on 0 potential).



- At this point the motor should turn at a slow speed. If the motor starts to accelerate into a high speed, apply the pulse blocking immediately, as either the tachogenerator voltage is missing or of wrong polarity, or with armature voltage feedback, the connections to terminals 45 and 46 are either missing or transposed. Another possibility would be a missing jumper X20, between terminals 36 and 41. Please check against wiring diagram 80 361 01.

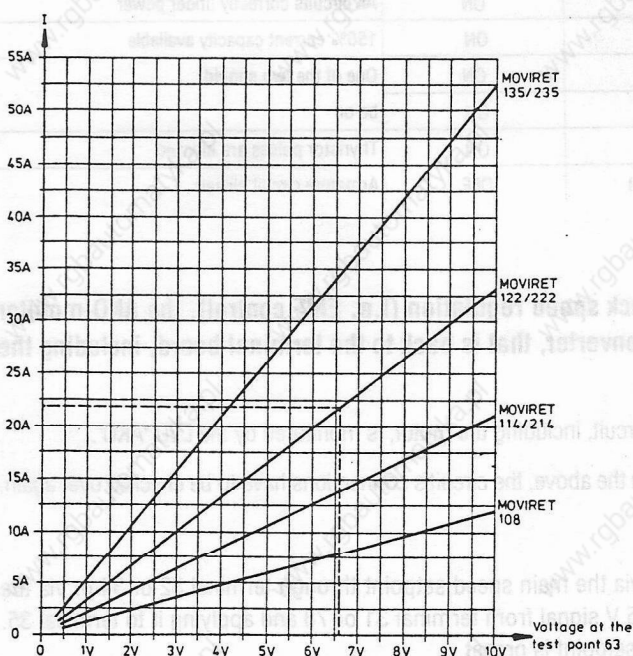
If over and above the drive rotates in the wrong direction, then in the case of tacho feedback voltage the field OR the armature connection must be interchanged. With armature voltage feedback, and if the converter is correctly wired according to the circuit diagram, then the speed control will continue to operate correctly, even if the armature or the field connection is transposed. If the motor rotates slowly, however, in the wrong direction, then the field or the armature connection, and if existing also the tachogenerator connection require to be interchanged.

If other irregularities occur, please investigate the "check list for trouble shooting malfunctions" in chapter 5 of this manual.

3.3.1 Internal Current Limitation

The purpose of the internal current limitation is to adapt the converter to the motor, it is set to the motor's rated current, or slightly less e.g. approx. 80%. The dynamics of the controller will be influenced by this current reduction. A bigger reduction of the motor's rated torque has to be done via the external current limitation (see point 2.7.5). In order to monitor the current limitation setting a moving coil amperemeter has to be connected into the armature circuit.

Instead of measuring the current directly, the voltage on test point 63 (on the upper P.C.B.) against terminal 0 can be monitored, and the equivalent armature current can be determined with the help of the following diagram:



Example:

6.6 V at the test point 63 corresponds for MOVIRET[®] 122/222 to an armature current of 22 A. 10 V corresponds to 33 A i.e. 150% of the unit's rated current.

- For the setting of the current limitation, and for the following IxR adjustment, the current can be driven up by the simulation of a load, by removing the field coil wires from terminals 15 and 16. The blank field wires must be joined together in order to avoid inducing high voltages on the field coil. The terminals 15 and 16 remain vacant.
- Before any adjustment is made, the power supply to the converter has to be switched off.

The potentiometer "I_{max}" should be set to the ccw stop. In order to allow maximum current, the external current limitation has to be opened up (install jumper X21 between terminals 42 and 43 or disconnect external potentiometer from "0").

After switching on the power supply to the converter, the Dynamic Current Limitation will allow increased current draw (150% I_{dN}) for a short time (approx. 15 s), until I_{dN} is reached (LED "ESB" goes off). Now, by means of turning the potentiometer "I_{max}", and monitoring the current either on the moving coil amperemeter, or checking the voltage on point 63, the converter can be set to the motor's rated current.

- If an IxR Compensation setting has to be done, the field should be kept disconnected and the amperemeter should be kept in the armature circuit, for the next step of adjustment.

3.3.2 Armature voltage control with IxR Compensation (EMF Control)

The IxR Compensation counters the load dependent speed drop of the motor with armature voltage control, and is to be tuned to the motor used.

The IxR trimming is carried out as follows:

- "I_{max}" trimming must already have been carried out (refer to point 3.1)
- Set the potentiometer "IxR" to its MIN position = ccw stop.
- Adjust the speed setpoint to approx. 50%: Thus the armature current rises to the set current limit. After the LED "ESB" has extinguished, measure the armature voltage (terminals 11/12), this is the value of IxR in volts. Calculate the armature voltage drop (IxR) IxR percentage relationship = armature voltage (V_A) and set the potentiometer "IxR" accordingly:

3.3.3 Maximum speed setting

The setting of the MAX speed is determined for the MOVIRET® units by the recommended armature voltage (as standardised). These are dependent on the appropriate voltage inputs:

Max. permissible

$$V_{VT} = 230 V_{AC} / 50-60 \text{ Hz} : V_d = 160 V_{DC}$$

$$V_{VT} = 240 V_{AC} / 50-60 \text{ Hz} : V_d = 165 V_{DC}$$

$$V_{VT} = 400 V_{AC} / 50-60 \text{ Hz} : V_d = 270 V_{DC}$$

$$V_{VT} = 415 V_{AC} / 50-60 \text{ Hz} : V_d = 280 V_{DC}$$

Speed settings which attain higher armature voltages than shown above, are not permissible, because during the changeover from MAX speed to braking operation, can result in excess current and the blowing of fuses.

For setting the MAX speed the internal potentiometer "n_{max}" is initially set to MIN i.e. against the ccw stop. Then via the external setpoint potentiometer the MAX setpoint is preset (+ or -) followed by setting the internal potentiometer "n_{max}" to the desired MAX speed (i.e. possibly up to, however, not exceeding the maximum voltage of V_d).

For the operation mode "Armature Voltage Control" the maximum value of V_d is to be measured with the motor under load, because with the IxR compensation the armature voltage is increased by the previously set amount of the IxR. If the setting can only be carried out with the motor not under load, then the armature voltage must be set lower by this amount.

3.3.4 Optimizing the Speed Control Loop

The dynamic behaviour of the system is influenced to a great extent by the driven application (its inertias and friction loads). The converter can to a certain degree be adapted to a given application characteristic. The aim is to follow speed changes quickly, without creating unstable conditions (hunting). Two sensitivity ranges V_{p1} - V_{p2} of the potentiometer V_p can be selected with the program switch S4/1, in order to be able to optimize for a wide range of conditions.

Following characteristics should be aimed for:

- In cases of larger setpoint step changes the drive should approach the final speed without overrunning it. The tendency to overrun increases when turning the potentiometer V_p ccw but the circuitry will always be stable (no hunting will occur).
- Turning V_p cw will decrease the systems tendency to overrun.
- If turned too far cw, the V_p will produce unstable (hunting) conditions with the drive producing oscillating audible speed changes, visible with LEDs "POM" and "NEM" blinking alternately. In this case, turn potentiometer V_p ccw again until condition stabilizes.
- Drives with large inertias have a tendency to overrun, but remain stable. V_{p2} range should be chosen for optimizing in this case.
- For drives with small inertias and/or armature voltage feedback, V_{p1} range should be chosen.
- Friction torques or other mechanical loads reduce overrun tendencies.
- The highest dynamics is attained in the switch position V_{p2} and the potentiometer V_p set cw. The limit is attained when instability sets in.

The overrun after large setpoint step changes is greatly reduced by using the setpoint ramp generator and increases, when accelerating with current limitation.

3.3.5 Setpoint ramp generator

The setpoint ramp generator determines the acceleration behaviour of the drive in respect to rapid setpoint changes, as long as these remain below the current value of the current limitation. The speed acceleration, can be set with the potentiometer T_{INT} in two ranges. The ranges are chosen via the program switch S4/4. With 4-quadrant operation the same also applies for the deceleration behaviour. The degree of setpoint change has no influence on the ramp generator speed.

If the current limit is attained, then the ramp generator no longer determines the acceleration but the torque, which is then heavily load dependent. Particularly on positioning operations when changing from the fast speed to the creep speed this must definitely be avoided, as this leads to positioning errors.

With the pulse blocking (62 open) or the stop function (63 open) the ramp generator is brought to zero instantaneously. A renewed start is in any case thus guided by the ramp generator.

4.1 Technical Data

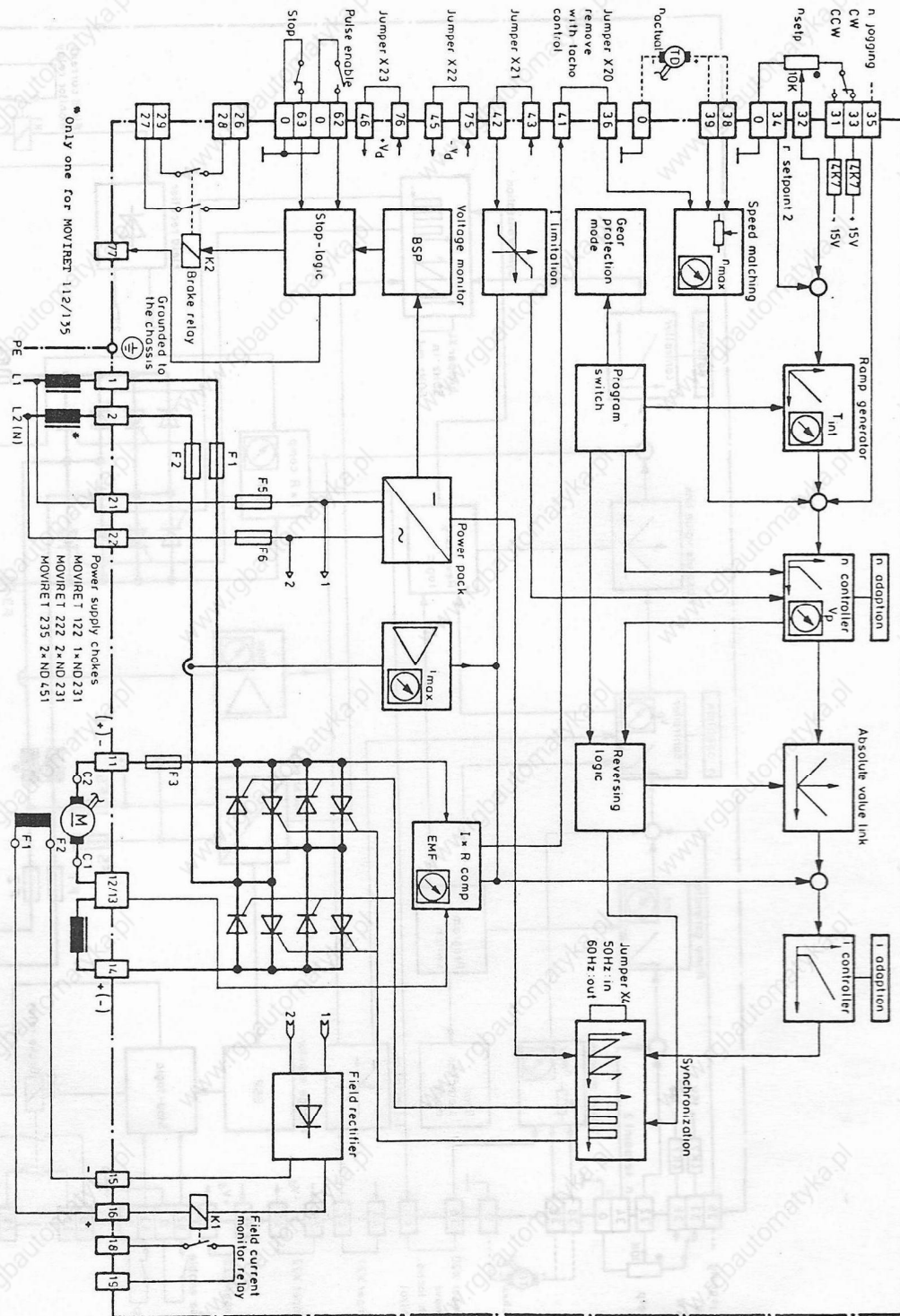
Type MOVIRET® Part number	108 825 211 4.	114 825 077 4.	122 825 080 4.
Controller function	4 quadrant duty DC converter with two anti-parallel fully controlled single phase bridges (circular current free)		
Rated voltage supply V_{Vr}	230/240 V AC \pm 10 %		
Line frequency	50 Hz, convertible to 60 Hz		
Armature voltage V_d (according to DIN 40 030)	160 V DC (at $V_{Vr} \geq 230$ V AC -5%)		
Unit's rated current I_{dN}	8 A DC	14 A DC	22 A DC
Permissible form factor at unit's rated current	≤ 1.25		
Dynamic Current Limitation	1.5 I_{dN}		
Fuses: Mains + armature circuit	4 x FF 16 A	4 x FF 25 A	3 x FF 40 A
Field circuit	2 x FF 2.5 A		2 x FF 4 A
Field voltage/max. field current (at 230 V)	200 V DC/0.7 A DC	200 V DC/1.2 A DC	200 V DC/2 A DC
Field current monitor relay K1: Pull-on threshold current	≥ 0.18 A DC		
Contact rating	250 VAC 4A AC AC1		
Brake monitor relay K2: Drop out n_{min}	$\leq 3\%$ of n_{max}		
Contact rating	250 VAC 4A AC AC1		
External line chokes	(incorporated)		1 x ND 231
Speed setpoint	0 ... \pm 10 V		
Input impedance (Setpoint)	100 kOhm		
Speed feedback inputs (at n_{max})	25-45 V/35-75 V/60-130 V/90-200 V		
Current actual value pick-up	internal measuring transformer		
Current limitation: internally externally	30 ... 100% for motor nominal load adjustment 0 ... 100% for torque adjustment		
I x R compensation	0 ... 20 % V_d adjustable		
Speed regulating range	400:1 DC tachogenerator feedback 40:1 EMF control with I x R compensation		
Time ranges of the set-point ramp generator	0.35 ... 3.5 s or 3 ... 30 s selectable with S4/4		
Power loss	55 W	80 W	115 W
Ambient temperature range	70 °C		
Current reduction at $T_u > 45$ °C	2 % per K		
Type of cooling / enclosure	natural cooling KS/IP00		
Type of duty / loading	Continuous operation (S1) / Motor operation (M)		
Weight (without external chokes)	2.5 kg	4.4 kg	6.5 kg

Technical Data 80 225 01, page 1

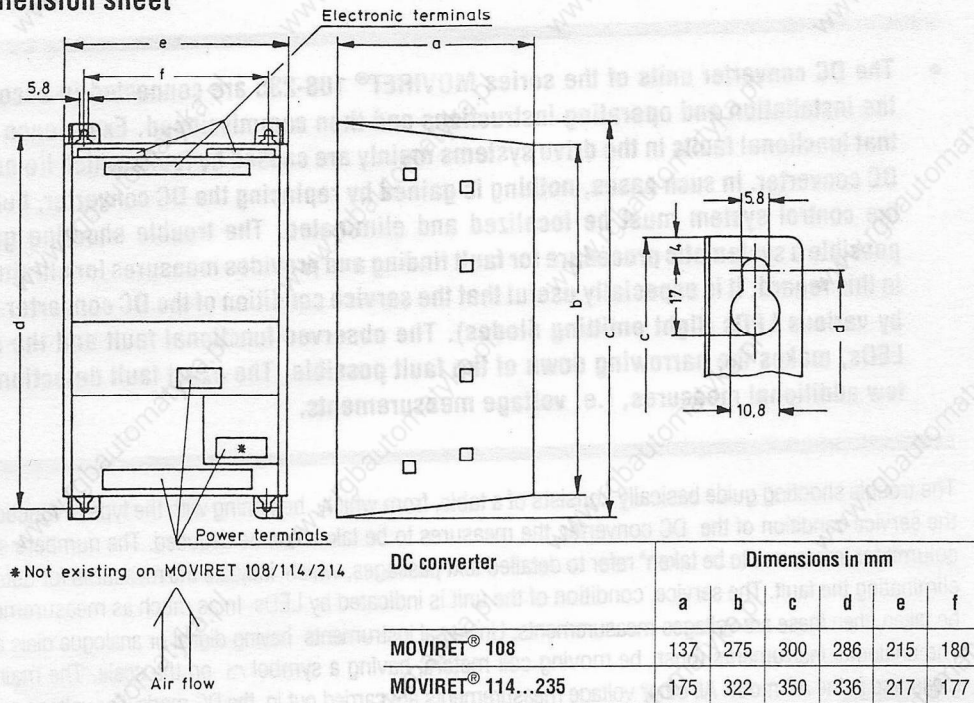
Type MOVIRET® Part number	214 825 079 0.	222 825 081 2.	235 825 190 8.
Controller function	4 quadrant duty DC converter with two anti-parallel fully controlled single phase bridges (circular current free)		
Rated voltage supply V_{VT}	400/415 V AC \pm 10%		
Line frequency	50 Hz, convertible to 60 Hz		
Armature voltage V_d (according to DIN 40 030)	280 V DC (at $V_{VT} \geq 400$ V AC -5%)		
Unit's rated current I_{dN}	14 A DC	22 A DC	35 A DC
Permissible form factor at unit's rated current	≤ 1.25		
Dynamic Current Limitation	1.5 I_{dN}		
Fuses: Mains + armature circuit	4 x FF 25 A	3 x FF 40 A	3 x FF 63 A
Field circuit	2 x FF 2.5 A		2 x FF 4 A
Field voltage/max. field current (at 400 V)	360 V DC/1.2 A DC	360 V DC/2 A DC	
Field current monitor relay K1: Pull-on threshold current	≥ 0.18 A DC		
Contact rating	250 VAC 4A AC AC1		
Brake monitor relay K2: Drop out n_{min}	$\leq 3\%$ of n_{max}		
Contact rating	250 VAC 4A AC AC1		
External line chokes	(incorporated)	2 x ND 231	2 x ND 451
Speed setpoint	0 ... \pm 10 V		
Input impedance (Setpoint)	100 kOhm		
Speed feedback inputs (at n_{max})	25-45 V/35-75 V/60-130 V/90-200 V		
Current actual value pick-up	internal measuring transformer		
Current limitation: internally externally	30 ... 100% for motor nominal load adjustment 0 ... 100% for torque adjustment		
I x R compensation	0 ... 20 % V_d adjustable		
Speed regulating range	400:1 DC tachogenerator feedback 40:1 EMF control with I x R compensation		
Time ranges of the set-point ramp generator	0.35 ... 3.5 s or 3 ... 30 s selectable with S4/4		
Power loss	90 W	130 W	180 W
Ambient temperature range	70 °C		
Current reduction at $T_u > 45$ °C	2 % per K		
Type of cooling / enclosure	natural cooling KS/IP00		
Type of duty / loading	Continuous operation (S1) / Motor operation (M)		
Weight (without external chokes)	4.8 kg	6.5 kg	6.5 kg

Technical Data 80 225 01, page 2

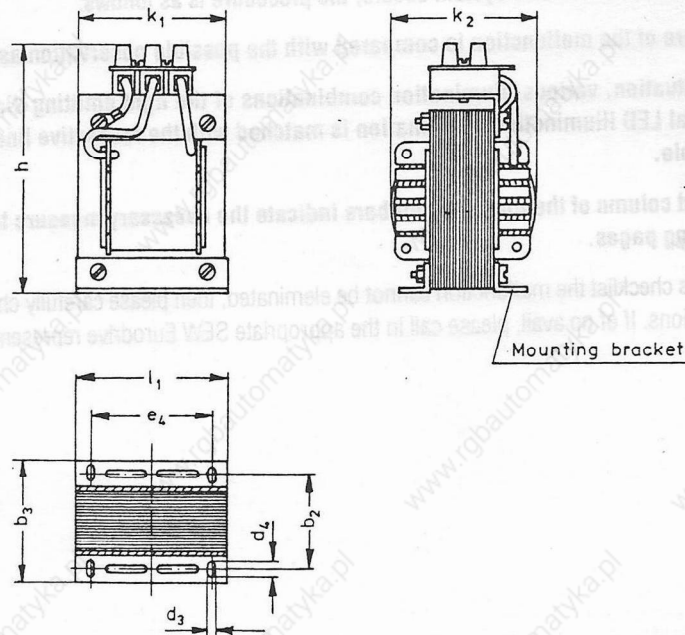
MOVIRET® 122/222/235



4.3. Dimension sheet



For adequate cooling at least 100 mm clearance above and below the unit must be provided.



Choke size	Induc. [mH]	Dimensions in mm									wt. kg
		e ₄	b ₂	l ₁	b ₃	d ₃	d ₄	h	k ₁	k ₂	
ND231	0.9	56	48	73	61	4.8	9	120	72	70	1.7
ND451	0.5	63	60	80	76	5.8	11	134	82	75	2.5

5.1 In general



- The DC converter units of the series MOVIRET® 108-235 are connected in accordance with the installation and operating instructions and then commissioned. Experience has shown, that functional faults in the drive systems mainly are caused by faults which lie outside of the DC converter. In such cases, nothing is gained by replacing the DC converter, but the fault of the control system must be localized and eliminated. The trouble shooting guide makes possible a systematic procedure for fault finding and provides measures for eliminating them. In this regard, it is especially useful that the service condition of the DC converter is indicated by various LEDs (light emitting diodes). The observed functional fault and the state of the LEDs, makes the narrowing down of the fault possible. The exact fault detection requires a few additional measures, i.e. voltage measurements.

The trouble shooting guide basically consists of a table, from which, beginning with the type of functional fault and the service condition of the DC converter, the measures to be taken can be deduced. The numbers shown in the column for "measures to be taken" refer to detailed text passages, which indicate the measures for determining and eliminating the fault. The service condition of the unit is indicated by LEDs. In as much as measurements need to be taken, then these are voltages measurements. Universal instruments having digital or analogue dials are adequate. The analogue instruments must be moving coil meters, having a symbol \sphericalcap on the scale. The mains voltage is measured in the AC mode. All other voltage measurements are carried out in the DC mode. For voltage measurements in the electronic control unit the zero terminal serves as the reference potential. On drives having an electro-mechanical brake, it is assumed, that the brake is fed from the MOVIRET® unit.

When a malfunction in the drive system occurs, the procedure is as follows:

1. The nature of the malfunction is compared with the possible observation as listed.
2. In this situation, various illumination combinations of the light emitting diodes (LED) are possible. The actual LED illumination combination is matched with the respective line on the trouble shooting guide table.
3. In the last column of the line, the numbers indicate the necessary measure to be taken, shown in the succeeding pages.

If, in spite of this checklist the malfunction cannot be eliminated, then please carefully check for correct wiring and perfect connections. If of no avail, please call in the appropriate SEW Eurodrive representative.

LED	Service condition										Measure	
	1	2	3	4	5	6	7	8	9	10		
1	0	0	0	0	0	0	0	0	0	0	0	1
2	0	0	0	0	0	0	0	0	0	0	0	2

Arrangement of the component parts on the unit.

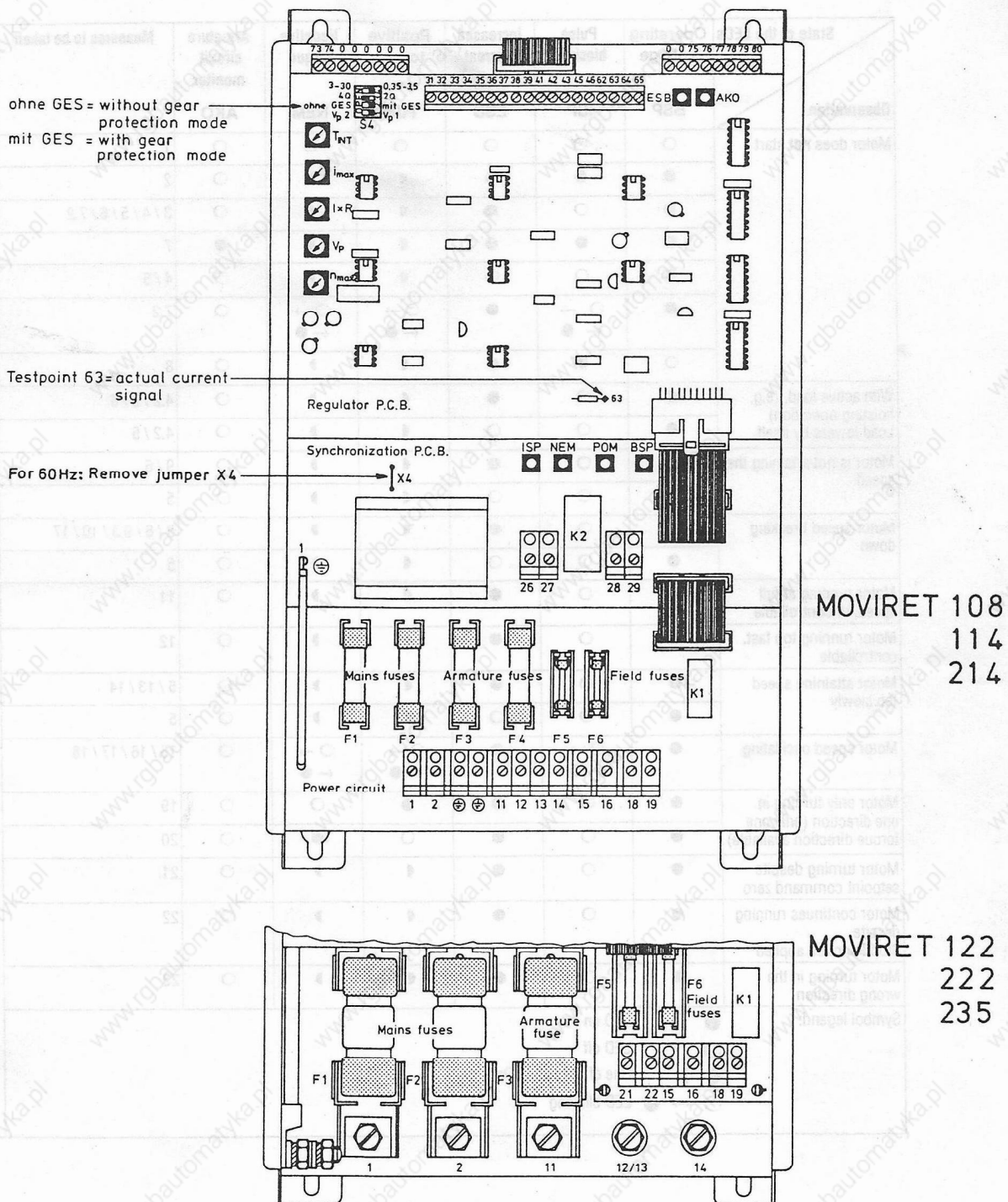


Fig. 80 231 01

5.2. Trouble shooting guide table

State of the LEDs Observation	Operating voltage	Pulse blocking	Increased current limit	Positive torque	Negative torque	Armature circuit monitor	Measures to be taken
	BSP	ISP	ESB	POM	NEM	AKO	
Motor does not start	○	○	○	○	○	○	1
	●	●	●	◄	►	○	2
	●	○	●	◄	►	○	3 / 4 / 5 / 6 / 7.2
	●	●	●	◄	►	●	7
	●	○	○	◄	►	○	4 / 5
	●	○ → ← ●	●	○ → ← ●	○ → ← ●	○	7.2
	○	●	●	◄	►	○	8
With active load, (e.g. hoisting operation) Load lowers by itself	●	○	●	◄	►	○	4.2 / 5 / 6
	●	○	○	◄	►	○	4.2 / 5
Motor is not attaining the speed	●	○	●	◄	►	○	9 / 6
	●	○	○	◄	►	○	5
Motor speed breaking down	●	○	●	◄	►	○	5 / 6 / 9.3 / 10 / 17
	●	○	○	◄	►	○	5
Motor running at full speed, uncontrollable	●	○	●	◄	►	○	11
Motor running too fast, controllable	●	○	●	◄	►	○	12
Motor attaining speed too slowly	●	○	●	◄	►	○	5 / 13 / 14
	●	○	○	◄	►	○	5
Motor speed oscillating	●	○ → ← ●	●	○ → ← ●	○ → ← ●	○	15 / 16 / 17 / 18
Motor only turning in one direction (only one torque direction available)	●	○	●	●	○	○	19
	●	○	●	○	●	○	20
Motor turning despite setpoint command zero	●	○	●	◄	►	○	21
Motor continues running despite Stop Function applied	●	○	●	◄	►	○	22
Motor turning in the wrong direction	●	○	●	◄	►	○	23
Symbol legend:	● LED on ○ LED off ◄ ► One of the two LEDs is on ○ ↔ ● LED blinking						

5.3. Diagnosis and Corrective Steps

1. The power supply is missing

- 1.1 Check whether between terminals 1 and 2 the mains voltage is available. Additionally, on MOVIRET® 122/222/235 check for the mains voltage between terminals 21 and 22. If the mains voltage is absent, then refer to chapter 2.6 "Connecting the power circuit".
- 1.2 Isolate the unit. Remove the fuses F1 to F6 and test for continuity. If the fuses are defective, refer to points 24 to 27.

2. The unit is internally interlocked

- 2.1 Measure the voltage between terminals 62 and 0 (15 V DC measuring range). If more than 1 V is present between terminals 62 and 0, then the pulse enable has not set in. Please refer to chapter 2.7.7.
- 2.2 Measure the voltage between terminals 63 and 0 (15 V DC measuring range). If more than 1 V is present between terminals 63 and 0 then the stop function is still activated. Please refer to chapter 2.7.6.
- 2.3 Measure the mains voltage. If undervoltage is present, then the unit is blocking the firing pulses. Please refer to the Technical Data Sheet 80 225 01.
- 2.4 Check whether the terminal 64 has been connected. The terminal on this unit must not be used.

3. No speed reference value (setpoint signal) available or negative torque direction blocked

- 3.1 Measure the voltage between terminals 32 and 0 resp. 34 and 0 (15 V DC measuring range). If no voltage is present, provide a speed setpoint signal. If two reference values are connected, then their sum should not add up to zero. Refer to chapter 2.7.1 Setpoint Signal.
- 3.2 The setting of the switch S1/3 on the control circuit board must be checked. The switch must be set to position 4Q, or otherwise the negative torque direction will not operate.

4. The motor is overloaded (the light emitting diode ESB extinguishes approximately 15 sec. after switching on)

- 4.1 Check whether the drive is mechanically blocked. This could possibly be due to the motor having an electromechanical brake, which has not been released.
- 4.2 The motor hardly produces any torque if there is no field current. The check is carried out via the field monitor relay K1. Continuity must be measurable in terminals 18 and 19.

5. The unit is at the internally set current limitation (LED "ESB" extinguishes approximately 15 seconds after switching on)

If the internal current limitation has not been set to the armature rated current, then trim as per chapter 3.3.1.

6. The unit is at the externally set current limitation

Measure the voltage between the terminal 42 and 0 (15 V DC measuring range). If less than 10 V, then the external current limitation is dominating and is reducing the internal set current limitation. Refer to chapter 2.7.5.

7. The main circuit is open

- 7.1 Refer to points 1.2 (fuses).
- 7.2 Isolate the unit; remove the conductors from terminals 11 and 14 and check for continuity. If no continuity is measured, then the armature circuit is interrupted within the motor or in the connecting leads.

7.3 On the MOVIRET®s 122/222/235 measure the voltage between terminals 1 and 21 and between terminals 2 and 22 (i.e. measuring range: 500 V AC). If voltage is measured between these terminals then there is no phase coincidence between the power circuit and the electronics. Check the external wiring according to the chapter 2.6.

8. The control electronics has identified an undervoltage of the mains

8.1 With nonpermissible undervoltage of the mains, the supply to the control electronics is no longer assured. This may be the case with an undervoltage of greater than 10%.

8.2 The operating voltage for the control electronics has possibly been reduced due to external load conditions. This effect is also especially pronounced with undervoltage of the mains. The voltage from terminals 73 and 74 to earth/ground must be at least 18 V. If external accessories are fed from these terminals, disconnect and measure the voltage again.

9. The converter has been trimmed incorrectly

9.1 Measure the voltage between the terminals 32 (setpoint 1) and 0 resp. between 34 (setpoint 2) and 0 (15 V DC measuring range). If the setpoint voltage is less than 10 V, increase the setpoint voltage. Only at 10 V does the drive attain its maximum cw resp. ccw speed (please refer to chapter 2.7.1). When two setpoints are connected please take into account the prefix signs for proper addition of the setpoint voltages.

9.2 Turn the potentiometer "n_{max}" cw. If the speed increases with this measure, then set the maximum speed according to the chapter 3.3.3.

9.3 With tachogenerator feedback control: Ensure, that the jumper X20 between terminals 36 and 41 has been removed.

9.4 Measure the voltage between the terminals 36 and 0 (10 V DC measuring range). If between the mentioned terminals a voltage of approx. 4.4 V is present, then with tacho feedback control the speed actual value has not been trimmed. Reset the speed limitation per chapter 3.3.3, taking into account the wiring of the tachogenerator in accordance with the wiring diagram 80 361 01 and the tachogenerator voltage.

9.5 The field voltage of the motor is too low or the armature voltage of the motor is too high. Check the nameplate of the DC motor, whether the field voltage and the armature voltage match with that of the MOVIRET® unit.

9.6 LED "AKO" is on despite intact armature circuit fuses F3/F4. Reason: Armature voltage set too high (refer to the chapter 3.3.3).

10. On EMF control: IxR Compensation not or insufficiently compensated

Set the IxR Compensation in accordance with chapter 3.3.2.

11. The actual speed value feedback is missing or has wrong polarity

11.1 With tachogenerator feedback control: The tachogenerator has been connected with the wrong polarities or a discontinuity of the tachogenerator leads or an AC tacho with incorporated diodes has been used. Refer to chapter 2.7.3.

11.2 With EMF control: check whether the jumpers X20, X22, X23 as per wiring diagram 80 361 01 have been connected.

11.3 Check whether, according to the wiring diagrams 80 359 00 and 80 360 01 the armature has been connected between terminals 11 and 12 and the armature choke has been connected between terminals 13 and 14.

12. The converter has been trimmed incorrectly

- 12.1 Turn the potentiometer "n_{max}" ccw and set the maximum speed according to chapter 3.3.3.
- 12.2 Ensure that with tachogenerator feedback control the jumper X20 has been removed from terminal 36 to 41. (Refer to wiring diagram 80 361 01).
- 12.3 Check whether with tachogenerator feedback control, the tachogenerator has been correctly connected, with respect to the tacho voltage in accordance with the wiring diagram 80 361 01.
- 12.4 The specification of the motor diverges from the specification of the DC converter. Refer to point 9.5.

13. The reference value (setpoint) rises too slowly

- 13.1 The setpoint ramp generator limits the acceleration.

Turn the potentiometer "T_{INT}" ccw respectively if in the ccw stop position, switch the program selection switch S4/4 to the ramp generator time range of 0.35- 3.5 s. If the motor speed thereupon accelerates faster, set the required acceleration time with the potentiometer "T_{INT}".

- 13.2 Too slow rising of the external given setpoint.

Check by measurement the setpoint rise at terminals 32 respectively 34 with a small time setting of the acceleration ramp generator, against the reference point terminal 0 and compare with the acceleration time of the motor. If differences show up between the acceleration time of the motor and the setpoint rise, then the drive is running up as per the current limitation. Please refer to the checklist point 14. If no difference exists, then the external setpoint is rising too slowly.

14. The motor is running up as per the current limitation (with high load resp. with high inertia values).

- 14.1 The external current limitation reduces the torque. (Please refer to the checklist point 6).
- 14.2 Measure the voltage between terminals 42 and 0 (15 V DC measuring range). If lower than 10 V is measured, then release the Dynamic Current Limitation per wiring diagram 80 348 00.

15. With EMF control: The load dependent drop of the motor speed is over compensated

The potentiometer "IxR" is turned back ccw and is to be set according to the chapter 3.3.2. Over compensation has to be avoided.

16. The speed control- speed oscillates

Optimise the speed control according to chapter 3.3.4.

17. The reference value (setpoint) not stable

Turn the potentiometer "T_{INT}" cw and set the program selection switch S4/4 to the ramp generator time range of 3 to 30 s. If the oscillation, resp. the break down of the motor speed, is reduced, then the speed reference value itself is oscillating. (Check the setpoint voltage source).

18. Periodic load changes

With rapid periodic load changes the speed control has not sufficient time to completely compensate the breakdowns in speed. With load variation frequencies up to 2 Hz the optimizing of the speed control provides improvement as per chapter 3.3.4.

With periodic load oscillations in the range between 2 Hz and 5 Hz it is more advantageous to set the speed control slow on purpose, so that the oscillations do not build up. The speed controller then hardly reacts to load oscillations, which now are only compensated by the gyrating masses. The selector switch S4/1 is set to Vp1 and the potentiometer Vp is set back almost against the ccw stop.

19. The negative reference value (setpoint) is absent or the torque reversal within the unit is interlocked.

19.1 Measure the voltage between terminals 32 and 0 resp. between 34 and 0 (15 V DC voltage measuring range). If the negative reference value is absent, then the motor speed cannot change into the opposite direction (please refer to the chapter 2.7.1). If two reference values are connected then the sum of the two reference values must be negative.

19.2 If the reference value is negative, then check the program selection switch S4/3. It must be set to position 4Q.

20. The positive reference value (setpoint) is absent

Measure the voltage between terminals 32 and 0 resp. between 34 and 0 (15 V DC voltage measuring range). If a positive reference value is absent, provide the appropriate reference value. (Please refer to the chapter 2.7.1).

21. The DC converter is not set to the correct mains frequency or is incorrectly trimmed

21.1 Check whether for 50 Hz mains the jumper X4 is soldered in on the synchronization P.C.B. For 60 Hz this jumper has to be removed.

21.2 The jogging input for approx 7% setpoint is connected. Check whether between the terminals 35 and 0 a voltage is measured. If this is the case, isolate terminal 35.

21.3 With EMF Control: If the motor despite the setpoint voltage equalling to zero rotates with creep speed, please refer to point 15 of this checklist (IxR Compensation).

21.4 With setpoint voltage equalling zero it is possible, due to drift, that the motor rotates slowly. This speed amounts to approx. 1/1000 of the maximum speed. If the motor may not rotate, then either the firing pulses are to be blocked (disconnect the connection from terminal 62 to 0) or operate the stop function (disconnect the connection 63 to 0).

If the motor without a preset setpoint rotates at more than $1/1000 n_{max}$, then measure whether between terminals 32, 34 and 35 against 0 there really exist a setpoint voltage condition of equal to zero. Possible faults can arise due to a potential fault on the earth/ground conductor lead.

22. The jogging input for approx. 7% setpoint is activated

The Stop Function brakes only down to zero speed, if the jogging input is not connected. Check whether between terminals 35 and 0 a voltage is measured. If so, then isolate terminal 35.

23. The motor turning in the wrong direction

23.1 With EMF control interchange the field connections to terminals 15 and 16.

23.2 With tachogenerator feedback control interchange the field connections to terminals 15 and 16, as well as, the tachogenerator connections to terminals 0 and 38/39.

24. Field fuses F5 resp. F6 blow when switching on the mains

24.1 Check whether the field has been correctly connected to terminals 15 and 16 in accordance with the wiring diagrams 80 359 00 resp. 80 360 01 and the correct fuses according to the technical data are being used.

24.2 In accordance with the technical data on the motor and on the converter, check whether the maximum permissible field current of the MOVIRET® is being exceeded.

24.3 Remove the connection leads to terminals 15 and 16, check these leads for short circuit and short circuit to earth/ground.

25. The mains fuses F1, F2 resp. armature fuses F3, F4 blow during switching on (Pulse Enable)

- 25.1 If connected to a 60 Hz mains check whether the MOVIRET also has been converted to 60 Hz. For 60 Hz operation the jumper X4 on the synchronization P.C.B. must be removed.
- 25.2 Isolate the unit, remove the connection leads from terminals 11 and 14 and check these leads with the motor and choke connected for short circuit and short circuit to earth/ground.
- 25.3 Check whether a magnetic contactor (m.c.) has been incorporated between the converter and the motor. In this case it must be assured that the m.c. is closed with a safety margin, before the pulse enable occurs (i.e. terminal 62 connected to terminal 0). It is only permissible to open the m.c. if, 50 ms previously the converter unit has been interlocked (i.e. terminal 62 to terminal 0 has been disconnected).

26. Mains fuses F1, F2 resp. armature fuses F3, F4 blow at high speed

- 26.1 Please refer to point 25.1.
- 26.2 Check whether the armature voltage of the motor at high speeds exceeds the load voltage specified in the data sheet 80 225 01. (Also refer to the chapter 3.3.3).
- 26.3 Check the motor (carbon brushes and the commutator).
- 26.4 Please refer to point 25.2.

27. Fuses blow at nondefinable times

- 27.1 Check whether adjacent to the control conductor leads also heavy current conductor leads have been strung. (Please refer to the chapter 2.4). If relay control conductor leads are involved, then generally it is sufficient to damp the relay coil with an R-C suppressor. Other equipment having magnetic straying field in the immediate vicinity are to be moved away or respectively are to be suitably screened.
- 27.2 Please refer to point 2.5.3. (Magnetic contactor between motor and converter).



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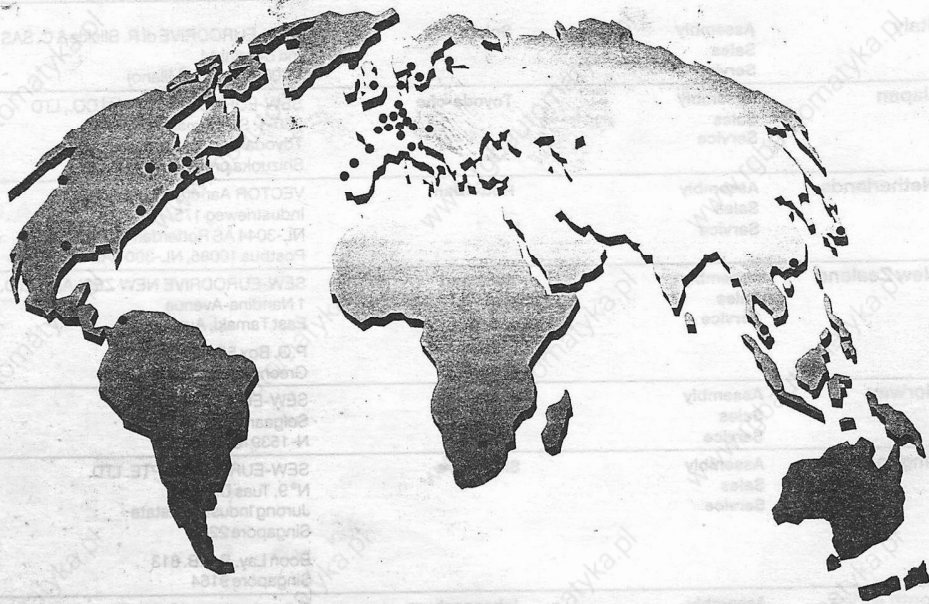


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