ACOMEL

High Frequency Converters
Hoch-Frequenz Umrichter
Convertisseurs Haute Fréquence

DANAHER MOTION

Danaher Motion SA
La Pierreire 2
CH - 1029 Villars-Ste-Croix

INSTRUCTION MANUAL FOR K3000-SERIES CONVERTERS

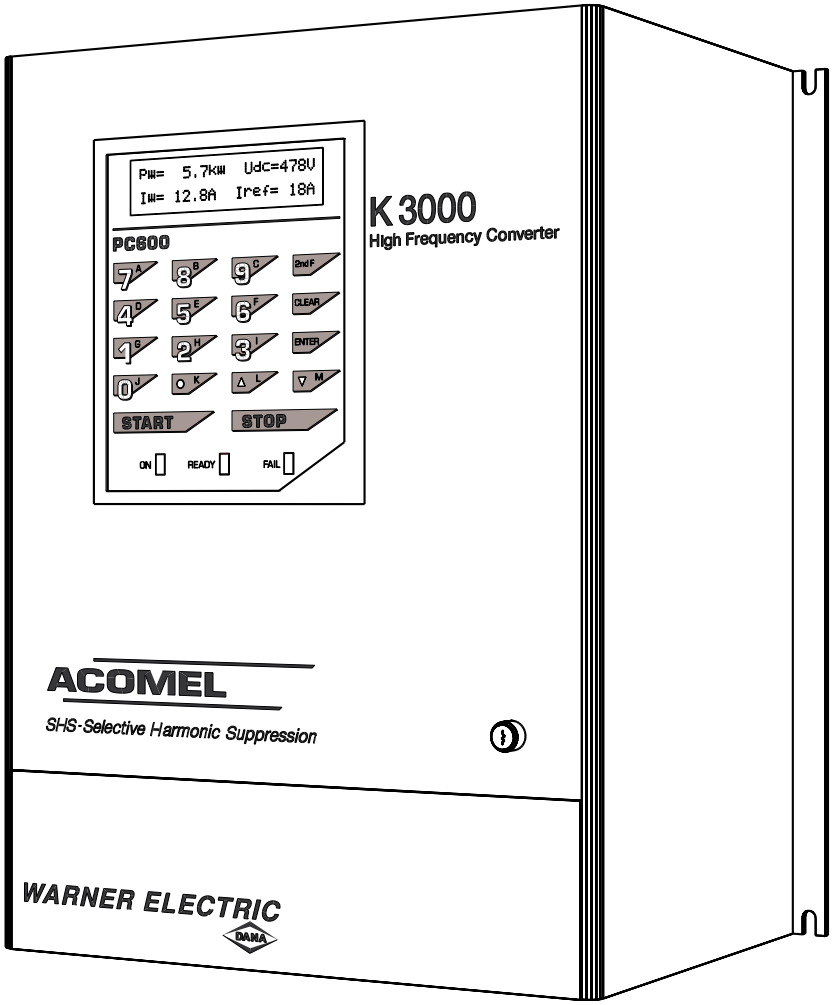
INTRODUCTION

This manual gives instructions for the installation and maintenance of the K3000-.series frequency converters.

Details on the data output protocol are attached. You can check that the converter characteristics match your specifications by examining the printout of the converter memory contents.

ESSENTIAL INFORMATION

Chapter 1 contains essential operating and safety information. This chapter must be studied before beginning to use the converter.



Edition : November 1993

DECLARATION OF CONFORMITY

We: **Warner Electric S.A**
La Pierreire
CH1029 Villars-Ste-Croix

declare under our sole responsibility that the products of the family

K3000

are exclusively designed for incorporation in an other machine. The operation of the product is submitted to the conformity of the complete equipment, following the provisions of the directive **89/392/EEC**

The conformity of the above specified products with the provisions of the Directive **73/23/EEC** is supported by the respect of the standards **CEI/IEC 1010-1**

If the mounting and connecting instructions of the installation's manual have been respected, this product will be conform to the standards **EN50081-1** and **EN50082-1** relating to the EMC directive **89/336/EEC.**

Frequency converters K3000

Mounting instructions related to the EMC - directive 89/336/EEC

1. The frequency converter must be mounted in a closed metal cabinet.

2. The power connection between converter and motor must be MADE using shield cable.

3. The control connection must utilise shielded cables.

4. The shield of the cables must be grounded at both ends.

5. Power connections and control connection must be placed in separated canals.

6. A line filter must be installed. The machine manufacturer has the option to use a single filter for all of his equipment. In this case the correct definition and sizing of the filter is his responsibility. If the option of a separate filter is selected, this filter will have to match the following specification:

Unit	Filter type	I_{Nom} (A)
K3007	FMAC0932-2510	25
K3015	FMAC0932-2510	25
K3022	FMAC0934-5010	50
K3030	FMAC0934-5010	50
K3040	FMAC0937-8010	80
K3055	FMAC0937-H110	110
K3072	FMAC0937-H210	210
K3090	FMAC0937-H210	210
K3120	FMAC0937-H210	210

Supplier: Timonta, Mendrisio (Switzerland)

Villars-Ste-Croix, November 1995
The Engineering Manager: A. Elmaleh

ALPHABETICAL INDEX

K3000 - How to inhibit the analog speed reference input

The analog speed reference input voltage (see page 8) can be affected by inducted disturbances. To reduce or eliminate the impact of those signal noises, the EMC mounting instructions must be respected:

❒ Use only shielded cables to carry the signal, and ground the shield at both ends.

❒ Always separate the cables carrying the signal from the power cables

In order to avoid speed changes during the machining process, this analog speed reference signal is filtered too. Due to the impact of the filter, the speed change step can reach max. 0.8% of the maximum speed (twice the basic analog / digital step), i.e. 240 RPM if the maximum speed is 30’000 RPM.

Such speed variations during the machining process are often not welcome. The K3000 frequency inverter offers a great solution to this problem. A digital signal, coming from the CNC controller, can be used to inhibit the analog speed reference signal during machining.

Closing a contact between terminals 27 and 28 will inhibit the processing of the analog speed reference signal and the speed will be hold constant at the last registered value. To activate again the analog speed reference input, just open the contact.

SAFETY

It is possible for the converter to suffer damage in transit without this being evident from a simple examination of the packaging material.

You are recommended to carefully inspect both the packaging and the equipment itself for any sign of damage in transit. Any complaints should be addressed to the freight and freight insurance companies.

Do not attempt to power up the device if you suspect it is damaged.

Lethal voltages are present at certain points of the converter circuitry. Installation must be performed by qualified personnel only.

The converter contains high-capacitance components at high voltage levels. These capacitors require long discharge periods and the converter should be switched off at least 3 minutes before any work on the inside is undertaken.

The converter remains powered in STOP mode, with the motor terminals at 245 V DC above earth potential. The safety precautions outlined above must be taken for all operations on the motor.

LOAD

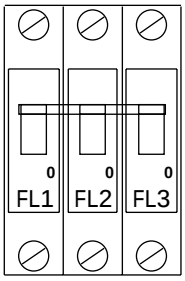
The converter can be operated without load, i.e. with the motor disconnected. In the event some doubts should arise as to the performance of the drive, the motor and the converter can thus be dealt with separately.

HANDLING

Always disconnect the converter from the power line and wait at least 3 min. before doing any work on the terminal blocks or the plug-in boards.

Touch the converter ground before unplugging or inserting a board. The boards should be stored in anti-static envelopes.

CIRCUIT BREAKER



THIS IS NOT A POWER SWITCH !

The converter is protected against overcurrents at the input by an ultra-fast circuit breaker.

Resetting is performed manually by pushing a lever, during this operation tripping is disabled, so that the converter is no longer protected.

It is therefore important to disconnect the converter from the power line prior to resetting the circuit breaker.

25 VDC INTERNAL POWER SUPPLY

This supply has been rated for the power requirement of the converter alone, no allowance has been made for any additional loads.

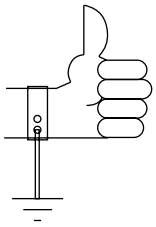
Additional loading by external circuits is likely to result in erratic operation and/or damage to the converter and will void the warranty.

WARRANTY

WARNER ELECTRIC SA disclaims responsability and liabilities for accidents to persons and damage to the equipment arising out of the non-observance of the warnings.

STATIC CHARGE

IMPORTANT !



The converter controller boards use a large number of MOS (Metal Oxyde Semiconductor) integrated circuits, which are highly sensitive to electrostatic charge.

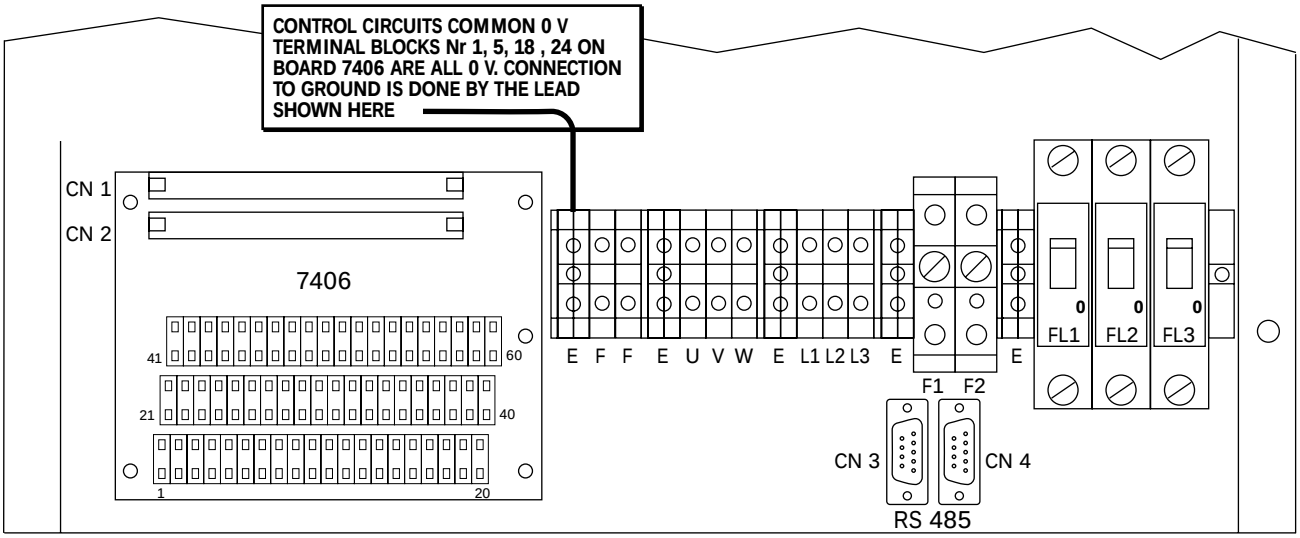
To avoid destruction of these integrated circuits, it is essential to observe the precautions listed below whenever working on the converter boards:

- Wear an earthing strap and always handle the boards by the extractors.
- Make sure you are operating on an earthed anti-static mat.
- Use anti-static packing envelopes.

CONNECTION

The converter connectors are located behind a protective cover at the bottom of the unit.

This cover can be removed by loosening the four fixing screws and sliding the cover.



TERMINALS

E	system ground. The 0 V of the control circuits, terminal blocks 1, 5, 18 and 24, are connected to ground by a single lead on the leftmost terminal block as shown above.
L1, L2, L3	three-phase power line input
U, V, W	three-phase converter output
F, F	braking resistor terminals (not used if resistance braking is absent)
1 - 60	control/signal terminal blocks, also accessible from CN2 ribbon-cable connector, with same pinout.

CONNECTORS

CN 1	female connector to 7406 terminal block board.
CN 2	ribbon cable female connector with same pinout as CN 1 and same numbering as terminal blocks 1 - 60 CN 2 is provided mainly to allow the connection of the converter to machine, using a flat ribbon cable. Characteristics: 2 x 30 pins as per DIN 41651. Harting designation: 0918 516 6904

RS 485	CN 3	connector for one of the following control units: 1 x PC 600, 1 x PC 550. Also used for one interface RS 485.
	CN 4	connector for one display unit DD 550 when used in parallel with the control unit PC 600 or PC 550.
FUSES	F1 F2	auxiliary power supply fuses, 500 mA T250V 6.3 x 32 mm

LINE VOLTAGE

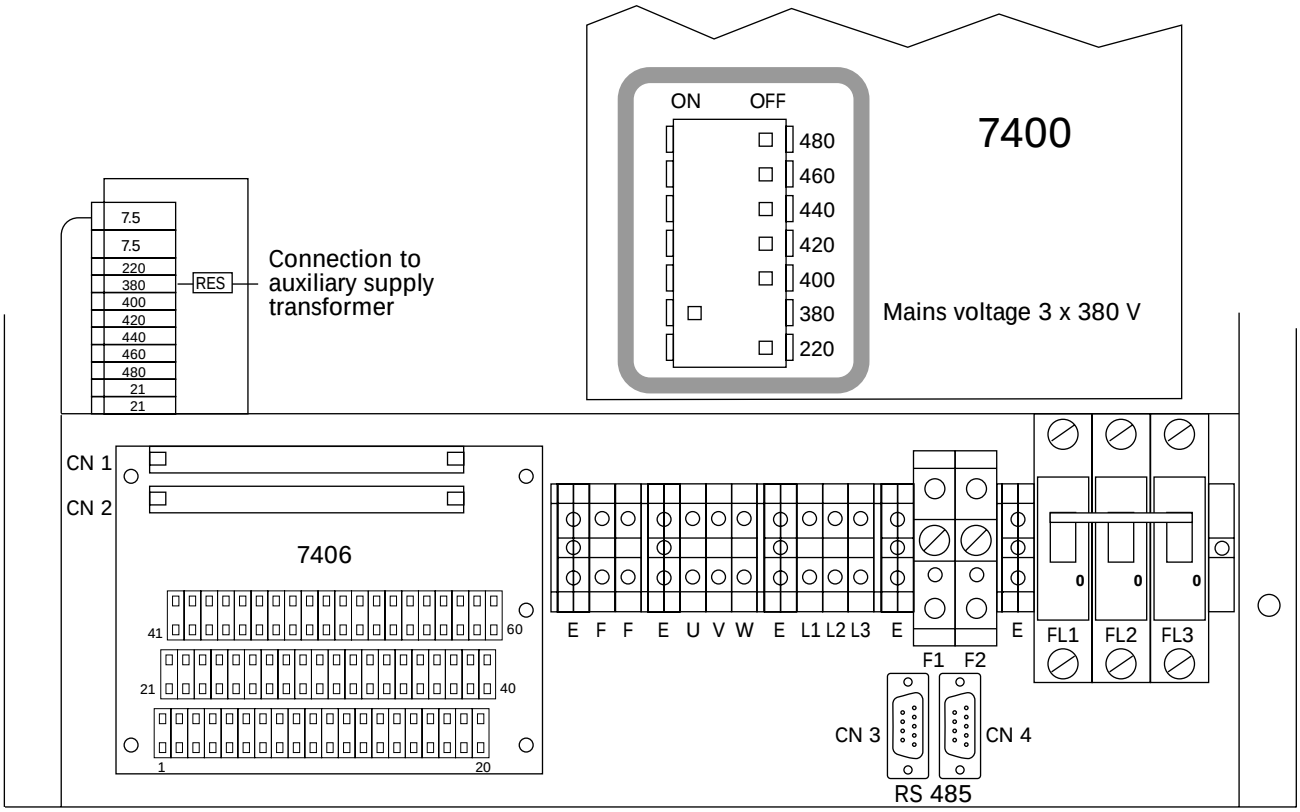
The converter can be used with any of the following line voltages:

3 x 220 - 380 - 400 - 420 - 440 - 460 - 480 V, 50 and 60 Hz.

Three operations, described hereafter, are required for matching the converter to your particular line voltage.

- Connect the wire marked RES to the appropriate terminal on the auxiliary power supply transformer.
- The actual mains voltage is set from a bank of dual in-line switches accessible through an opening in the connector compartment. Set the DIL switch corresponding to the required voltage by pushing the tag to the left.
- **MAINS VOLTAGE** must be entered when the following message appears in the Motor Setup, Menu B

Mains voltage
= V



TERMINAL BLOCK CONNECTIONS

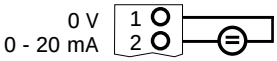
COMPULSORY CONNECTIONS

Some connections are optional, depending on what functions are required and whether these functions are to be accessed in digital mode from the control console (RS 485) or from the terminal block. For further information, refer to the block diagram.

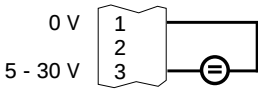
The following connections are compulsory:

- mains input: terminals L1, L2, L3 and E
- converter output: terminals U, V, W and E
- braking resistors: terminals F, F (if FRR braking option is implemented)
- STOP circuit, terminals 8 and 9
- START command (if START command set for terminal block mode)
- external interlocks: terminals 21 and 22 (must be strapped together if external interlocks are not used)
- motor temperature probe, PTC: terminals 23 and 24 (must be strapped together if the motor has no temperature probe)
- motor partition selection: terminals 55 to 60 (if selection set for terminal block mode)
- parametric resistance Rtrip (if set for terminal block mode)
- frequency control signal (if set for terminal block mode)

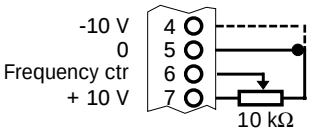
CONNECTIONS



Frequency control by 0-20 mA current-loop, for remote control up to 100 m. Frequency control must be set for terminal block mode.



Frequency control from non-standard 5 - 30 V source. Frequency control must be set for terminal block mode and the maximum control voltage must be specified. See § Non standard frequency control voltages.

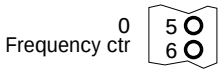


Frequency control by external potentiometer. Frequency control must be set for terminal block mode.

Potentiometer connected to terminal 5: control voltage 0 to +10 V (no reversing).

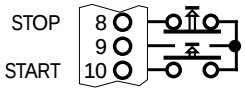
Potentiometer connected to terminal 4: control voltage -10 to +10 V (rotation direction determined by polarity of control signal)

NOTE : see page 4.



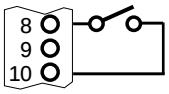
Frequency control by an external source, for instance a CNC.

The motor setup must have the data set correctly for single (+10 V) polarity, or double (-10...+10 v) polarity. If set for 2 polarities, the motor direction of rotation will be determined by the polarity of the control signal.

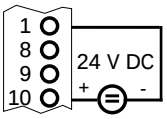


STOP (terminals 8 - 9) and START (terminals 9 - 10) command by pulses.

The START command is operational only when the circuit 9 - 10 is closed.

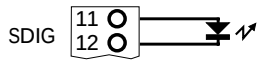


START - STOP control by permanent contact. START is activated by closing the contact.

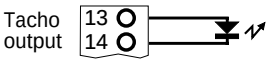


START - STOP control by external 24 V DC signal. START is activated by the signal.
IMPORTANT! Terminal blocks 8 and 9 must be open.

CONNECTIONS (continued)

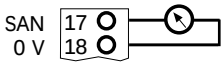


Digital output from converter clock. The number of motor poles (as set in file B) is taken into account so that the SDIG signal can be used to drive a correct indication of speed on a display.



Motor shaft incremental encoder digital output.

Suitable to drive an opto-coupler. Diode current: 4 mA.



SAN analog signal, 0 ÷ 10V or 0 ÷ 20 mA. Can be set to represent one of the following parameters:

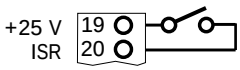
1) output frequency Fs (Hz). SAN = 10 V. for Fs = Fmax. as set up.

2) RMS output voltage Us (V). SAN = 10 V. for Us = 380V.

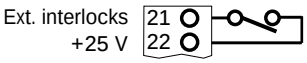
3) RMS output phase current, Im (A RMS). SAN = 10 V. for Im = Imax. converter.

4) RMS active output current, Iw (A RMS). SAN = 10 V. for Iw = Imax. converter.

5) RMS output power Pw (W RMS). SAN = 10 V for Pw = Pmax. converter.

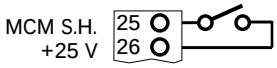


External motor-reversing contact
This function must be set for terminal block mode.

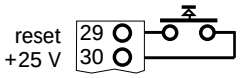


An open circuit here will trigger a converter error condition.

Interlocks for monitoring external functions such as spindle lubrication.



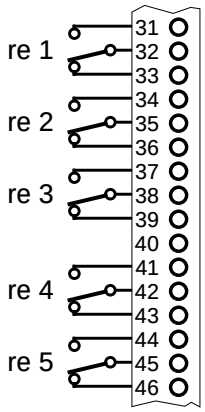
"Sample" command for motor current monitor in Sample & Hold mode (measure and store motor current under no-load conditions). Used mainly for gap elimination.



Resets the system to STANDBY condition after a fault, uses the positive flanc (transition from 0 to +25 V) of the signal.

The RESET instruction is active only:
- after the cause of the fault has been suppressed.
- after the DC bus voltage has dropped below 10 V. This can take several minutes, to allow for the discharge of electrolytic capacitors.

In terminal block mode, RESET reads the motor partition code and activates its selection. An absence of code triggers a fault

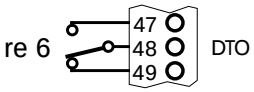


The five relays Re1 to Re 5 can be set to monitor a variety of drive parameters.

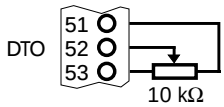
Several parameters can be routed to the same relay, thus forming a logical OR function triggering the same relay.

The INCIDENTS condition constitutes a logical NOR between all possible error conditions, i.e. the relay will be de-energized by the appearance of any incident.

Current capacity of relay contacts: 25 V, 50 mA DC.

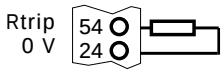


DTO relay contact.
DTO is a high sensitivity gap eliminator available as an option.



Trigger control potentiometer for the high sensitivity gap eliminator DTO.
This is an optional function.

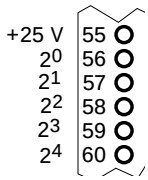
CONNECTIONS (continued)



Parametric resistor–determines motor current limiter level, Iref, (function must be set for terminal block mode). Tolerance of the resulting Iref: -10%; +15 %.

This resistor is often incorporated in the spindle connector to provide automatic current limiting for different spindles.

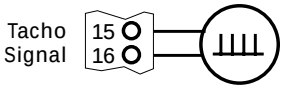
Resistance: 3000 / Iref(A) (ohms)



Coding for motor partitions 1 to 31. Logic level 1 is at +25 V.

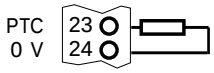
Code: BCD (see appendix)

TIP: The current on terminal 55 (+ 25 V DC) is limited, so that the voltage drops to 0 V if circuits related to this terminal are earthed. When motor partitions are tele-coded (coding inside the spindle connector), a short circuit within the spindle cable (an all too frequent occurrence !) can force a coding bit from 1 to 0 level, thus selecting a wrong partition. This can be prevented by connecting all unused bits, (0), to 0 V. Should a short-circuit happen, all bits at level 1 will be forced to 0. This is interpreted by the converter as an absence of coding and triggers an incident condition.



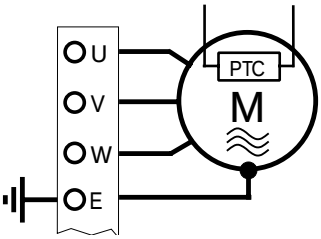
Input for rotor incremental encoder.

If the signal is supplied by a magneto-resistive sensor, use the TACHO BOX option to shape the signal.



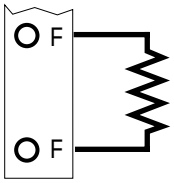
Motor temperature sensor.

Terminals 23 - 24 should be shorted if the motor is not fitted with a temperature sensor.



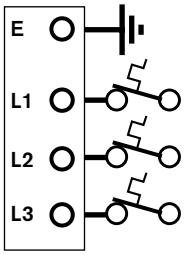
Converter output (three-phase plus earth).

IMPORTANT: These terminals are at 245 V above earth potential with the converter in STOP mode.



Dynamic braking resistor (external).

The F-F terminals take a braking resistor if the regenerative resistance braking option is implemented.



Converter power line input with earth.

Before connecting the line, check that the auxiliary power supply transformer is set for the correct line voltage. See § Line voltage.

PARAMETERS OF THE DRIVE

INTRODUCTION

Before going into the details of setting up the drive, a reminder of the most influencial parameters of each part of the drive, the converter and the motor, is in order. Each part is described separately.

PARAMETERS OF THE CONVERTER

The parameters which differentiate different converter models within the K 3000-series are stored in file A, called by hitting 2ndF and A in sequence.

RMS input voltage

3 x 220 - 380 - 400 - 420 - 440 - 460 - 480 V.; 50 et 60 Hz.

Matching of the converter to your particular line voltage is described in § Line Voltage.

The voltage tolerance is +10%; -15%. Voltages outside this range will trigger an incident condition to protect the converter.

RMS output voltage

Maximum value of the output voltage Us as imposed by the converter. Lower voltages can be entered when defining the output characteristic, see § Us / Fs.

Us max.: 3 x 220 V for mains voltage 3 x 220 V.

Us max.: 3 x 380 V for all standard models.

Us max.: 3 x 460 V for US models.

RMS maximum output current, Imax

Maximum current rating of the converter. Currents larger than Imax trip the converter and trigger an error message.

The converter can operate at Imax without any duration limitation.

PARAMETERS OF THE MOTOR

INTRODUCTION

The description lists the parameters that are handled by the converter and serves as a guide for setting up the converter, see also § Converter Setup.

Number of poles

The motor speed at a given frequency depends on the number of poles. This information is found on the motor name plate.

To give a true indication of motor speed, the converter must be informed of the number of poles. This factor only affects the speed readout; it does not affect the output frequency Fs.

Reference current, Iref

Under overload conditions, the motor current, Im, may become excessively high. To limit such excess currents, the converter is able to monitor Im and compare it with a specified reference current Iref.

Im ≥ Iref (startup process)

During the startup process, frequency backoff is applied to the output frequency (Fs) to cut down slip and reduce excess startup currents.

For short acceleration times, then, this will amount to controlling acceleration from the motor current Im.

PARAMETERS OF THE MOTOR (continued)

Im ≥ Iref (frequency reached)

At the set frequency, the converter can be made to react to overload conditions in one of three possible ways:

- immediate converter shutdown, prompts message "motor overload".
- apply frequency backoff to reduce slip and excess motor current (Im).

  This mode, which reduces the motor power input, is only suitable for coping with short overloads. Frequency backoff is not recommended for machines with a fixed-speed feed.
- no action: in this mode, the motor remains powered as usual, though the motor overload condition (Im ≥ Iref) can be reported by assigning a relay to this function.

RI Compensation

The pure resistance (R) of a motor produces a voltage drop proportional to the motor current, I. While the RI voltage drop will be negligible with respect to the high voltages encountered at higher frequencies, it may have a significant effect at lower voltages.

The RI voltage may be added to the output voltage Us to obtain the nominal motor torque over the entire frequency range. The amount of RI compensation required may be found as follows:

- Under no load conditions, measure the phase current Im at maximum speed.
- Repeat the measurement at minimum speed. Increase RI compensation until both current readings Im are equal.

Default frequency

The default frequency specifies the value to be taken by Fs when the converter is powered up or after the partition has been changed.

This function is active with the communication mode set to RS 485. The command 2ndF J sets the default frequency to the frequency currently in use.

If a frequency control signal (2ndF F) is given before the START command, the default frequency will be ignored.

Low frequency stabilisation

Some motors may develop low-frequency speed fluctuations, particularly around the 30 Hz mark.

This instability can be corrected by entering a low frequency stabilisation factor between 0 and 255.

Slip compensation

The torque of an asynchronous motor is produced by the slip, i.e. the difference in speed between stator and rotor. The motor speed will thus vary with the load - a characteristic which is objectionable in machining operations.
Slip compensation provides a speed which is independent of load conditions by supplying the motor with values of frequency and voltage calculated from the motor current Im.
10 % ≈ 255

Motor Current Monitor (MCM)

The non-reactive motor current, Iw, is indicative of the motor load. It is thus possible to monitor the value of Iw and compare it with pre-determined levels in order to trigger machine action on detection of certain events. Typical applications of this feature are:

- gap eliminators.

- adaptive feed control on machine tools.

PARAMETERS OF THE MOTOR (continued)

The MCM function can operate in one of three possible modes:

ABSOLUTE: Motor current compared against a memorized fixed value.

S.H: Sample & Hold: Motor current sampled under no load condition.This motor current value is stored and used as as a reference for detecting subsequent current variations such as those caused by resumption of loading.

By sampling on each cycle, under control of the machine, it is possible to eliminate drift caused by factors such as temperature variations, wear on bearings, etc.

In all cases, the MCM output will be energised on detection of TRUE status for the set condition. The MCM output can be assigned to trigger a relay if so desired.

DTO The DTO option operates in dynamic mode and greatly increases the sentivity of the standard MCM, for cases in which very small load increments must be detected.

The DTO is assembled on a plug-in board. The sensitivity can be adjusted by a potentiometer or by entering suitable values from the keyboard in RS 485 mode.

Relay RE 6 is assigned to DTO output when sensitivity is setted by potentiometer.

CONVERTER SETUP

INTRODUCTION

The converter possesses its own non-volatile memory for storing data relative to the motor(s) as well as operation directives.

The converter setup consists in writing the appropriate data to memory.

INTERFACES

Setup of the converter can be performed using one of the following interface devices:

- control unit PC 600 or PC 550.
- computer with MS-DOS operating system. A program is available on 3.5" and 5.25" diskettes.

The two above interfaces are linked to the converter by an RS 485 port. In the description to follow, RS 485 will be used as a generic designation.

The display of the PC unit features 2 lines of 20 characters each. The display window can be scrolled up and down over the fields of files. Two keys with UP △ and DOWN ▽ arrows are provided to this effect.

The keyboard has numerical keys which, in addition to numbers, have letters (A, B, C,...etc) to designate data files and operation instructions. Access to the files is obtained by typing 2ndF and the corresponding letter in sequence.

The Menu is called by 2ndF M.

Data files that must be written to files B (motor SETUP) and C (commands and instructions). Please consult the synoptic table showing in detail files and data items.

Data items within the files are accessed sequentially by the UP △ and DOWN ▽ arrows. Modifications to the data or new entries must be validated by pressing ENTER.

The files can be exited at any point by typing another command such as START or 2ndF .... When setting up new files we recommend to scan the entire file to ascertain that no data item is left out.

The output characteristic is defined by pairs of values Us and Fs, hereafter called points. The number of points required to fully define the Us/Fs characteristic depends on its shape (straight line or S).

Upon completion of the output characteristic with point n, the program asks for the next point n + 1. Exit the routine by typing 2ndF ENTER.

```
B  MOTOR
   SETUP
0 = F  1 = En  2 = D
3 = Es  4 = I
Speed display units
0 = Hz  1 = R.P.M.  ?
Motor reversing
0=RS 485 1=T. Block  ?
Freq. ctrl 0 = -10/+10 V
1 = 0 à +10 V  ?
Power line voltage
=      V
Partition selection
0=RS 485 1=T. Block  ?
Partition Nr
=
Number of poles
=
Iref level source
0=RS 485 1=RTrip  ?
Motor current Iref
(A)=
```

PC display

```
B  MOTOR
   SETUP
0 = F  1 = En  2 = D
3 = Es  4 = I
Speed display units
0 = Hz  1 = R.P.M.  ?
Motor reversing
0=RS 485 1=T. Block  ?
Freq. ctrl 0 = -10/+10 V
1 = 0 à +10 V  ?
Power line voltage
=      V
Partition selection
0=RS 485 1=T. Block  ?
Partition Nr
=
Number of poles
=
Iref level source
0=RS 485 1=RTrip  ?
Motor current Iref
(A)=
```

PC 600 display

SELECTION OF THE COMMUNICATION MODE

Some parameters and operation instructions originate either from the RS 485 port (PC 600 or PC 550 unit) or from an external device which feeds its signals to the terminal block of the converter. In such cases the interface program asks the identification of the source, e.g:

Frequency control
0 = RS 485 1 = terminal block

RS 485 means that the frequency control signal will be supplied by the control unit PC 600 or PC 550 (or a computer) through the RS 485 port.

Terminal block means that the signal comes from an external device connected to the terminal blocks.

STRUCTURE OF FILE B

The structure of file B is illustrated on next page.

File B contains data associated with the motors that are to be driven. The first 5 data items are common to all the motors.

Data specifically related to individual motors is stored into partitions of file B.
Each partition contains, among several data items, the voltage to frequency output characeristic Us/Fs. Partitions are often referred to as ranges, this leads to confusion because partitions contain several items in addition to the Us/Fs characteristic.

STRUCTURE OF FILE B (continued)

Partitions are numbered from 1 to 31, each one is identified by a number (BCD code) see Appendix. In RS 485 mode selection of a specified partition can be performed from the keyboard of the PC control unit by entering a decimal number, or, in terminal block mode, by a BCD coded binary word.

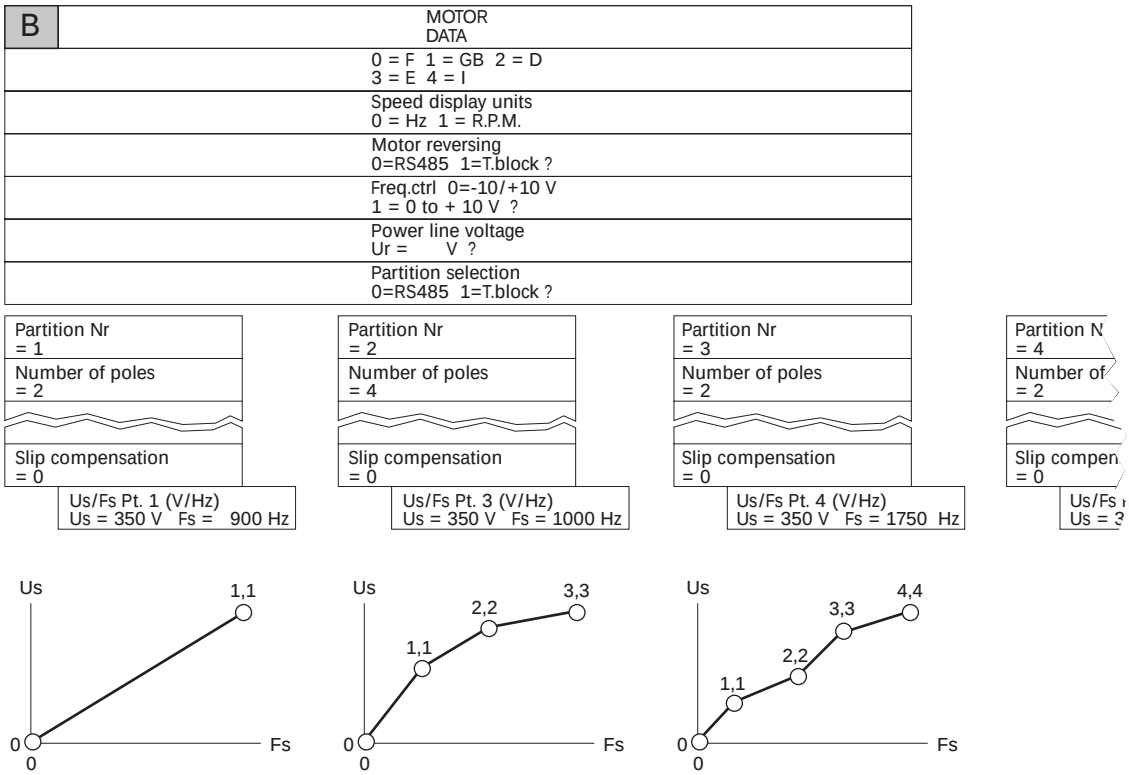
VOLTAGE TO FREQUENCY CHARACTERISTIC Us/Fs

The output frequency being variable, it is necessary to relate the voltage to the frequency. This relation determines the behaviour of the motor (constant torque, constant power etc), as frequency is varied. The output charactistic is defined by pairs of data, namely voltage and frequency, hereafter called points. The number of points available is 31.

The first point, numbered 0, is the origin of the characteristic, it is factory set to 0 V and 0 Hz. This point cannot be accessed.

A linear Us/Fs characteristic needs only points 0 and 1, as a result only point 1 needs be entered.

The illustration below shows (partially) 3 partitions with respectively 2, 4 and 5 points.



2ndF ENTER

Input of data is orchestrated by a routine that calls the data points in sequence, starting from number 1. First voltage must be input, followed by ENTER to confirm and memorise the item just entered. ENTER then calls the next item, in this case frequency. ENTER calls the next point only if the data stored at the factory (0 V and 0 Hz) is altered. When the required number of points has been entered, type 2nF ENTER to exit the Us/Fs routine.

The 2nF ENTER command sets to 0V and 0 HZ the point present on the display as well as points that follow, up to 31.

REVIEWING THE Us/Fs CHARACTERISTIC

It is important to bear in mind that the command 2ndF ENTER erases (sets to 0) data pertaining to the point on the display, as well as the points that follow, up to Nr 31.

Therefore, when scanning the data, a point must be reached where ENTER refuses to call a next point. The data displayed will be 0 V and 0 Hz. Only at this stage issue the command 2ndF ENTER.

Non observation of this rule will result in loss of data points.

EXAMPLES OF Us/FS DATA INPUT

This § applies if the converter has been ordered without specifying data to be memorised at the factory. Motor partitions will then contain the following default values:

• point 1: 1 V and 50 Hz.

• points 2 through 31: 0 V and 0 HZ.

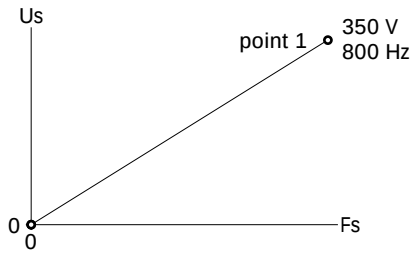
Two examples are given below to illustrate how the frequency ranges shown in the left column must be input.

Keys used are shown in bold.

EXAMPLE 1, characteristic with 2 points

Enter the Us/Fs routine by typint **2ndF B**. The UP arrow (△) brings directly to point 1. Point 0 cannot be accessed, it contains 0 V and 0 Hz.

The display shows the default data



Us/Fs Pt 1 (V/Hz)

Us = 1 Fs = 50

Enter the required data by typing

350 ENTER 800 ENTER

The last ENTER above calls point 2, with the following display:

Us/Fs Pt 2 (V/Hz)

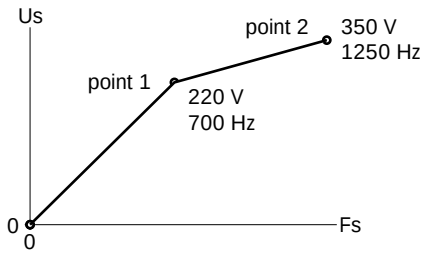
Us = 0 Fs = 0

Point 2 is not required, so type **2nF ENTER** to exit the routine.

EXAMPLE 2, characteristic with 3 points

Enter the Us/Fs routine by typing 2ndF B. The UP arrow (△) brings directly to point 1. Point 0 cannot be accessed, it contains 0 V and 0 Hz.

The display shows the default data



Us/Fs Pt 1 (V/Hz)

Us = 1 Fs = 50

Enter the required data by typing

220 ENTER 700 ENTER

The last ENTER above calls point 2, with the following display:

Us/Fs Pt 2 (V/Hz)

Us = 0 Fs = 0

Enter the required data by typing

350 ENTER 1250 ENTER

Point 3 is not required, so type **2nF ENTER** to exit the routine

CONVERTER SETUP

The converter possesses its own non-volatile memory for storing data entered via the RS 485 Port, which is also used for controlling the drive. The control unit is the standard interface, it is shown on the setup synoptic table and is detailed hereafter.

CONTROL UNIT

The PC 600 and PC550 control unit is made up of the following elements:

- display with two lines of 20 characters each
- ten number keys, 0 to 9
- decimal point key, marked ●
- forward and backward keys, marked ▽ and △ respectively
- CLEAR key: deletes last entry
- ENTER key: validates data entry
- 2ndF key: accesses functions A - M
- START key: starts motor
- STOP key: stops motor
- ON indicator: converter powered
- READY indicator: converter ready
- FAIL indicator: converter incident

2ndF M = MENU

The function menu appears on the display panel when the converter is switched on. Functions are accessed by the key sequence 2ndF plus the letter required.

- The function menu can be recalled at any time by pressing 2ndF M.
- Data is categorised by blocks labelled A, B, C, etc.
- Within each block, the ▽ and △ keys are used to move forward and backward between the different data fields.

ENTER

- Data entry is validated by pressing the ENTER key. Data will be ignored if the user moves on to the next data field by pressing the forward key (▽) without first pressing ENTER.

DATA LOCK

- Access to certain data fields is only possible if enabled from the front panel keyswitch.

2ndF A CONVERTER DATA

Accessible in STOP mode (keyswitch not required).

Converter data is factory set and can be read but not modified.

2ndF - B: MOTOR SETUP

Accessible in STOP mode (keyswitch required).

Language for messages

English, French, German, Italian or Spanish. (type 1 for English).

Unit for speed readout

Hz or R.P.M.

Motor reversing

RS 485 or terminal block

Frequency control signal

From -10 to +10 V voltage source (motor rotation direction determined by signal polarity) or 0 to +10 V voltage source (one-way rotation only).

This only applies to terminal block mode.

CONVERTER SETUP (continued)

Line voltage

Enter the nominal voltage of the line.

Motor partition selection

RS 485 or terminal block

The converter provides 31 motor partitions, which can be switched in directly from the console or via a code sent onto the terminal block.

Partition number

First partition is number 1

The procedure initiated here will be the same for each of the 31 possible motor partitions.

Number of poles

This information is available from the motor name plate.

Iref source

RS 485 or terminal block mode. Iref is the current limit level.

In terminal block mode Iref is set by a parametric resistor Rtrip, see § Connections.

Motor current Iref

Applies to RS 485 mode. Input the current limit level from the console.

In most cases the adequate setting for Iref is 1.2 ÷ 2 times the nominal motor current usually shown on the name-plate.

Im ≥ Iref

Sets the reaction of the converter to the condition Im ≥ Iref, once the set frequency has been reached. During the acceleration phase the output frequency ramping up is controlled so that the motor current Im does not exceed Iref.

Im ≥ Iref, frequency reached

At the set frequency, the converter can be made to react to overload conditions in one of three possible ways:

- immediate converter shutdown, with prompt of message "motor overload".
- Fs frequency backoff to reduce slip and excess motor current (Im).

  This mode, which reduces the motor power input, is only suitable for coping with short overloads. Frequency backoff is not recommended for machines with a fixed-speed feed.
- no action: in this mode, the motor remains powered as usual, though the motor overload condition (Im ≥ Iref) can be reported by assigning a relay to this function.

RI compensation

The pure resistance (R) of a motor produces a voltage drop proportional to the motor current, I. While the RI voltage drop will be negligible with respect to the high voltages encountered at higher frequencies, it may have a significant effect at lower voltages.

The RI voltage may be added to the output voltage Us to obtain the nominal motor torque over the whole frequency range.

The adequate RI value can be found as follows:

- Initially set RI to 0. Run the motor at maximum speed under no-load condition. Read the current Im from the PC 600 display.
- Set the speed to minimum and read again Im. Increase RI until Im reaches the same value as at the high end of the frequency range.

CONVERTER SETUP (continued)

Acceleration time

The time required to accelerate the motor to set speed depends on the moment of inertia and on the motor torque. Motor torque in turn is a function of the motor current Im. The value set to Iref influences the acceleration time when Im > Iref. When this condition holds the ramp is current-controlled to avoid overloads. When Im < Iref the acceleration time corresponds to the entered value.

Start by entering a high value such as 30 s. Gradually decrement the value until the actual acceleration time remains unchanged.

Deceleration time

The STOP command initiates the deceleration phase in which the frequency is decremented at a rate given by the set deceleration time. The motor kinetic energy is fed back to the converter, causing the DC link voltage to increase. The deceleration ramp is voltage-controlled to avoid excessive energy feedback.

A correct value of deceleration time can be found following a similar procedure as for the acceleration time.

The dynamic resistance braking option FRR reduces deceleration time by absorbing part of the kinetic energy into resistors.

Frequency control source

RS 485 or terminal block.

RS 485 mode gives the possibility to set a lower limit, Fmin., to the frequency range.

Default frequency

The default frequency specifies the value to be taken by Fs when the converter is powered up or after the frequency range is switched.

If a frequency control signal (2ndF F) is given before the START command, the default frequency will be ignored.

Minimum frequency Fmin

Lower limit, Fmin., of a frequency range.

Fmin is active in both RS 485 and terminal block modes.

Measure speed

Measures the rotor speed, in RPM, of motors equipped with a tacho signal generator. See the block diagram.

MCM Motor current monitor

The non-reactive motor current, Iw, is indicative of the motor load. It is thus possible to monitor the value of Iw and compare it with pre-determined levels to energize a relay when predetermined conditions are true.

The MCM function can operate in one of three possible modes:

Current I abs: Motor current compared against fixed preset value.

Current Ish: (Sample & Hold) Motor current sampled on detection of a predetermined event (usually zero load). This motor current value is stored and used as a reference for detecting subsequent current variations such as those caused by resumption of loading.

By sampling on each cycle, under control of the machine, it is possible to eliminate drift caused by factors such as temperature variations, wear on bearings, etc. Output from one of the relays Re 1 - Re5, must be setup.

Current IDTO: Used for gap elimination based on the rate of current increment (dI/dt). Requires the optional plug-in board DTO.

CONVERTER SETUP (continued)

FCC duration

DC injection braking duration. This function is initiated automatically, after a STOP instruction, when the frequency has been decremented to a low value.

Duration is in seconds.

IFCC current

Intensity of the DC injection braking current, IFCC. Should be set to a value not greater than the nominal motor current as found on the name-plate.

IFCP current

Intensity of the Permanent DC injection braking current. Should be set to a value not greater than the nominal motor current as found on the name-plate. Intended for applications that require the motor to be braked at standstill. If IFCP is programmed a RESET is required before next START.

Low frequency smoothing

Some motors may suffer from low-frequency instability, particularly around the 30 Hz mark.

This instability can be corrected by setting a smoothing factor between 0 and 255.

Slip compensation

The torque of an asynchronous motor is produced by the slip, i.e. the difference in speed between stator and rotor. The motor speed will thus vary with the load - a characteristic which is to be avoided in machining operations.

Slip compensation gives a speed which is independent of load conditions by supplying the motor with a frequency and voltage calculated from the motor current Im.

Us/Fs

The voltage/frequency characteristic is defined by entering up to 31 pairs of "Us/Fs" values. For a linear Us/Fs curve it is only necessary to enter the point 1.

The procedure for entering Us/Fs points and 2 examples are given in the § VOLTAGE TO FREQUENCY CHARACTERISTIC Us/Fs.

IT IS IMPORTANT TO TYPE **2ndF ENTER** AFTER THE LAST PAIR Us/Fs HAS BEEN ENTERED. THE DISPLAY MUST SHOW 0 V AND 0 Hz. THIS SETS TO ZERO ALL FOLLOWING UNUSED POINTS AND EXITS THE Us/Fs ROUTINE.

CONVERTER SETUP (continued)

2ndF C: TERMINAL BLOCK SETUP

Accessible in STOP mode. Keyswitch required.

Relays Re1 to Re5 can be programmed to energize on detection of true status on a number of pre-determined conditions.

Different conditions may be assigned to the same relay in a logical OR relationship. (i.e. the relay will be triggered if any of the set conditions is satisfied.)

The INCIDENTS condition constitutes a logical NOR between all possible error conditions, the corresponding relay will be de-energized if any one incident condition arises.

IMPORTANT ! THE STATUS OF THE RELAYS IS RANDOM DURING 500 MS FOLLOWING POWER UP OF THE CONVERTER.

SAN

The analog signal SAN can be programmed to report on the following parameters:

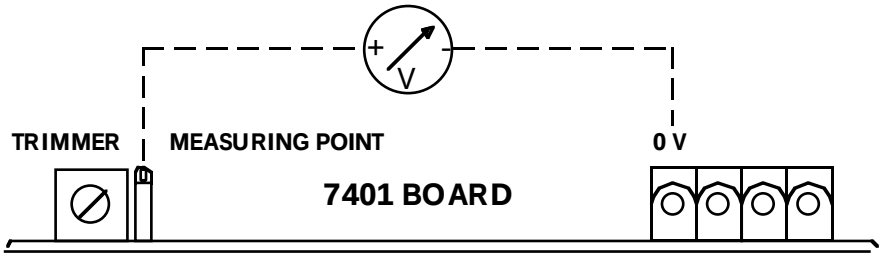
- Fs: stator frequency
- Im: in-phase motor current
- Us: output voltage
- Pw: active electrical power
- Iw: active motor current

NON-STANDARD FREQUENCY CONTROL VOLTAGES

The standarized frequency control voltage is 0...+10 V for single direction of rotation and -10...0...+10 V for reversing direction of rotation.

Some control equipments give frequency control voltages that depart from the above standard. In such cases proceed as follows:

1) Converter in STOP mode.
2) Set the frequency control signal to maximum and connect it to terminal block 3 (signal) and 1 (0 V).
3) Locate the board 7401 and connect a voltmeter as shown on the illustration.
4) Adjust the trimmer so the voltmeter read 2.0 V.



This terminates the converter setup.

Before pressing START we would advise to read § operation of the converter.

OPERATION OF THE CONVERTER

INTRODUCTION

With the converter setup now completed the next step before using it is to verify the data that has been entered.

In the following description it is admitted that all operation directives are set to RS 485 mode to enable the converter to operate on its own.

The synoptic table at the end of this manual shows all the data blocks with items arranged in the same order as they are called by the program. Following the steps described hereafter on the table will familiarize you with the operation of the converter.

If the converter has been unused for longer than 6 months please read the following §.

ELECTROLYTIC CAPACITORS

The dielectric layer of these capacitors tends to weaken if left for a period longer than 6 months with no applied voltage. The voltage rating must be temporarily reduced to enable the dielectric layer to build up again to full strength. The capacitors in the converter are under voltage only after the START button has been pressed.

If the converter has remained idle for more than 6 months proceed as follows:

- Set the output frequency to 20% of the maximum frequency, Fmax, of the partition in use. In terminal block mode this is obtained with a frequency control voltage of 2 V.
- Press START and allow the converter to function for 6 hours.
- Set the frequency to 50% of Fmax. and operate the converter during 1 hour.

POWER ON

Connect the converter to the line. The display shows TEST... As the self check routine is completed, the display changes to block Nr 3.

Try the following instructions:

⇨ 2ndF M MENUS

The display shows menus A B, C D, E F etc. Use keys ▽ and △ respectively to scan data files forward and backward.

⇨ 2ndF A

Accessible in STOP mode. Keyswitch not required.

Machine data as set at the factory. Can be read but not modified.

⇨ 2ndF B MOTOR SETUP

Accessible in STOP mode. Keyswitch required.

This file should be entirely verified and all data items double checked.

Remember to type **2ndF ENTER** to exit the Us/Fs routine.

⇨ 2ndF C TERMINAL BLOCK SETUP

Accessible in STOP mode. Keyswitch required.

Check relay assignements. The relay assigned to INCIDENTS reacts as folows:

INCIDENT TRUE: **relay de-energised**

INCIDENT FALSE (READY): **relay energised**

PRESS THE START BUTTON

START

The motor starts running and reaches the set frequency (speed). One of the display blocks described below should come up.

2ndF F

Frequency control, active only if the source has been set to RS 485 mode. Keyswitch not required.

2ndF D ADJUSTABLE DATA

Accessible in START mode.

This category includes the same data fields as in MOTOR SETUP (2ndF B), with the difference that here the data may be modified with the motor running.

- Acceleration time
- Deceleration time
- Source of frequency control signal
- MCM operation modes and current levels
- DC injection braking duration
- DC injection braking current
- Low frequency smoothing
- Slip compensation

2ndF E MOTOR REVERSING

Accessible in START mode. Keyswitch not required.

2ndF G DISPLAY BLOCS

Accessible in START mode. Keyswitch not required.
Displays operating parameters, in three blocks, toggled by 2ndF G.

BLOCK 1

F: output frequency, Hz
U: output voltage, V
I: motor line current, A
Ur: mains voltage, V

```
F=1667.0Hz     U=350V
I=   5.7A     Ur=380V
```

2ndF G

BLOCK 2

Pw: active motor power, kW
Ud: DC link voltage, V
Iw: active motor current, A
Iref: current limiter level, A

```
Pw=   6.8KW    Ud=478V
Iw= 12.8A   Iref= 18A
```

2ndF G

BLOCK 3

no: motor partition
Fc: frequency set value, Hz
(nc: set speed, RPM)
I: motor current, A.
F: output frequency, Hz
(ns: motor speed, RPM)

```
P=12       Fc=1667.0Hz
I=   5.7A  F=1667.0Hz
```

2ndF H DIAGNOSTIC MESSAGES

Accessible in STOP mode. Keyswitch not required.
Displays operating errors and the last eight incidents encountered, in inverse chronological order (i.e. the most recent error appears first).

2ndF I MOTOR PARTITION + INCIDENTS RESET

This command is enabled only in STOP mode and when the DC bus voltage is < 10 V.
The RESET command reacts to the positive flank of the signal.

Effects:
- clears all fault conditions, after suppression of the cause.
- reads the motor partition number (Terminal block mode) , processes and displays it. An absence of code triggers an fault.

BLOCK 4

P: motor partition in use
Fc: set frequency, Hz
Iref: current limit level, A

```
P=          Fc=
Iref=
```

2nd F J DEFAULT FREQUENCY MEMORISATION

The DEFAULT FREQUENCY is set to the value of the frequency currently in use.

This is the frequency that will be in use when the converter goes again in operation, after power down.

STOP

Initiates the frequency decrement sequence at the rate dictated by the set deceleration time.

As the frequency reaches a low value DC injection braking FCC is activated.

As the FCC sequence is completed the converter returns to READY status..

IMPORTANT

Following a STOP instruction, wait until the converter reverts to READY status before disconnecting it from the mains.

SELECTION OF THE MOTOR PARTITION

RS 485 mode: enter the decimal number of the required motor partition.

Terminal block mode: by a BCD coded binary word on terminals 56 to 60 (see circuit diagram).

The selection code is rendered effective by the following instructions:

- RESET, converter must be in STOP mode. A missing code triggers a fault.
- START. A missing code disables the START instruction and triggers a fault.

When the converter is in START mode, it is possible to preselect the next motor partition which will become effective only when the next START instruction is issued.

WE ARE AT YOUR SERVICE !

Setup of the converter is now complete. If some instructions have been set to RS 485 mode for test purposes, but will ultimately be given by an external controller, do not forget to set them correctly.

When in doubt please do not hesitate to call us, our technical staff will gladly assist you.

APPENDIX

BCD code

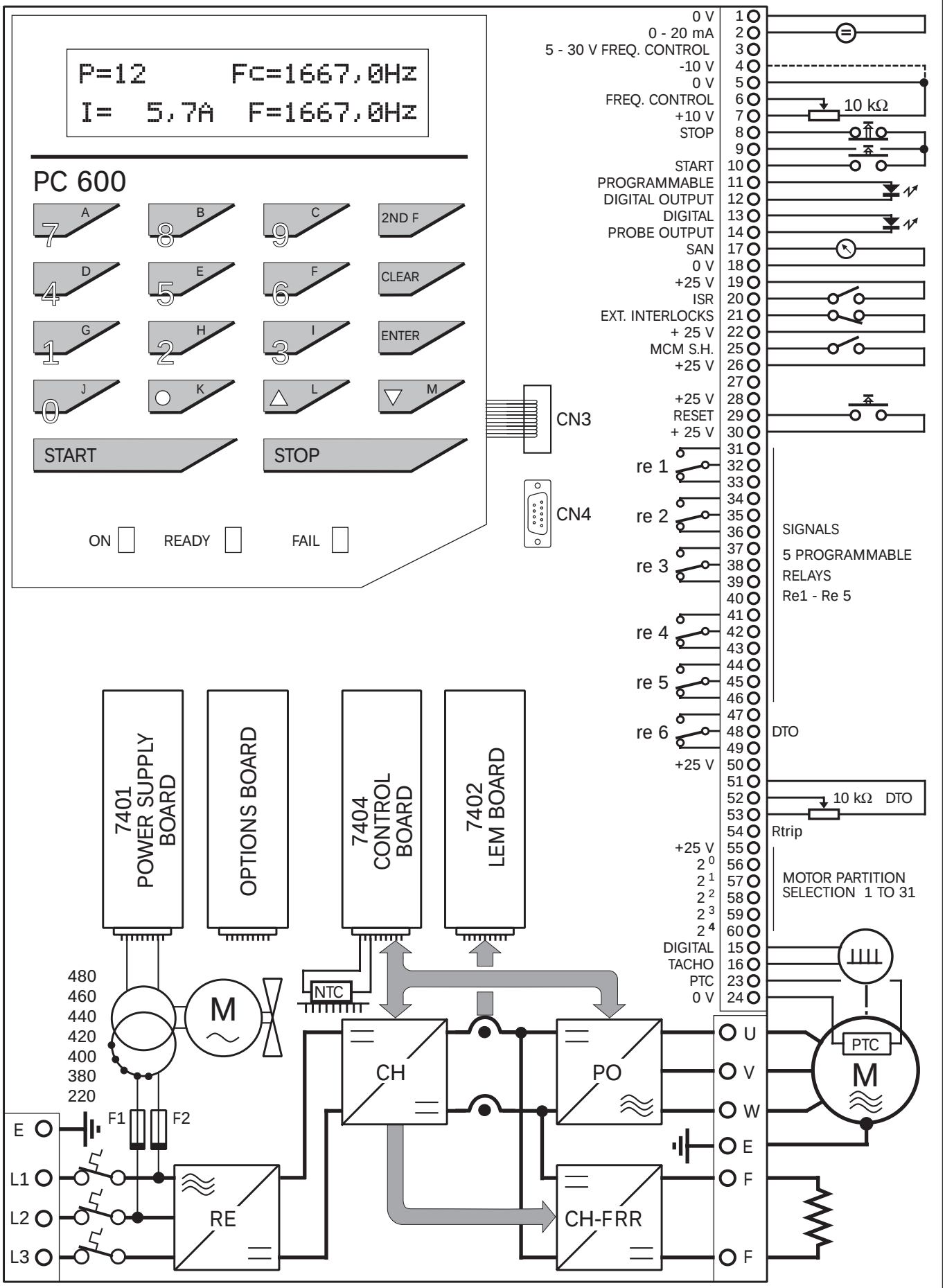
T. blocks	60	59	58	57	56
Decimal	2^4	2^3	2^2	2^1	2^0
0	0	0	0	0	0
1	0	0	0	0	1
2	0	0	0	1	0
3	0	0	0	1	1
4	0	0	1	0	0
5	0	0	1	0	1
6	0	0	1	1	0
7	0	0	1	1	1
8	0	1	0	0	0
9	0	1	0	0	1
10	0	1	0	1	0
11	0	1	0	1	1
12	0	1	1	0	0
13	0	1	1	0	1
14	0	1	1	1	0
15	0	1	1	1	1
16	1	0	0	0	0
17	1	0	0	0	1
18	1	0	0	1	0
19	1	0	0	1	1
20	1	0	1	0	0
21	1	0	1	0	1
22	1	0	1	1	0
23	1	0	1	1	1
24	1	1	0	0	0
25	1	1	0	0	1
26	1	1	0	1	0
27	1	1	0	1	1
28	1	1	1	0	0
29	1	1	1	0	1
30	1	1	1	1	0
31	1	1	1	1	1

NOTICE: Code 00000 (decimal 0) is regarded as an absence of information.

When the motor partition selection mode is set to TERMINAL BLOCK mode, instructions START and RESET read the code, then select and display the partition number.

An absence of partition code triggers a fault condition.

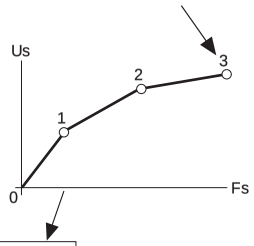
BLOCK DIAGRAM OF K 3000 - SERIES CONVERTERS

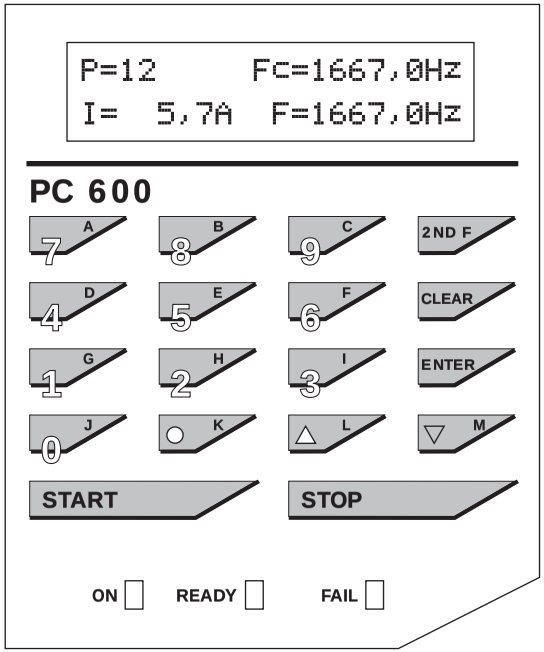


2nd F ▽ M = Menu

A CONVERTER DATA	B MOTOR DATA	N	C T. BLOCK SETUP	D AJUST. PARAMS	N	E MOTOR REVERSING	H MESSAGES
Maximum current Imax = (A)	0 = F 1 = GB 2 = D 3 = E 4 = I		Reached frequency: Relay Nr =	Acceleration time (s) =	2 ≤N ≤ 255	Direction reversed	Freq. ctrl assigned to T. blocks !!!
Software version	Speed display units 0 = Hz 1 = R.P.M.		Reached speed: Relay Nr =	Deceleration time (s) =	2 ≤ N ≤ 255	**F FREQUENCY CONTROL**	Reversing assigned to T. blocks !!!
Date of delivery	Motor reversing 0=RS485 1=T.block ?		Zero frequency: Relay Nr =	Freq. ctrl source 0=RS485 1=T. blocks ?		New frequency	Motor overload Im > Iref !!!
Serial number K	Freq.ctrl 0=-10/+10 V 1 = 0 to + 10 V ?		Zero speed: Relay Nr =	Default frequency (Hz) =		**G DISPLAY BLOCKS**	Please wait before RESETting again !!!
Test No	Mains voltage Ur = ?	220 ≤ Ur ≤ 480	START / STOP: Relay Nr =	MCM 0 = Abs. 1 = SH 2 = DTO 3 = None ?		F=0000.0Hz U=000 V I=000.0 A Ur=000 V	Converter temp. too high !!!
	Partition selection 0=RS485 1=T.block ?		Motor overload: Relay Nr =	Current Iabs (A) =	N ≤ Imax	2ndF G	Motor temp. too high !!!
	Partition Nr =	1 to 32	MCM output: Relay Nr =	Current Ish(A) =	N ≤ Imax	Pw=00.0 kW Ud=000 V Iw=000.0A Iref=00.0A	External interlocks !!!
	Number of poles =	2 ≤ N ≤ 120	Failure: Relay Nr =	Current IDTO (A) =	0 ≤ N ≤ 300	2ndF G	Converter overloaded !!!
	Iref source 0=RS485 1=Rtrip ?		Ext. interlocks: Relay Nr =	FCC duration (s) =	0 ≤ N ≤ 60	P=01 Fc=0000.0Hz I=000.0A F=0000.0Hz	Defect. auxiliary supply !!!
	Motor current Iref (A) =	N ≤ Imax	Converter overload: Relay Nr =	IFCC current (A) =	N < Iref	2ndF G	Mains out of tolerance !!!
	If Im>Iref 0 = trip 1 = dec.Fs 2 = ignore		Def. Aux. supply: Relay Nr =	IFCP current (A) =	N < Iref		Failure on module Nr 1 !!!
	RI compensation (V) =	0 ≤N ≤ 38 V	Motor temp (PTC): Relay Nr =	Low freq. smoothing =	0 ≤ N ≤ 250		Failure on module Nr 2 !!!
	Acceleration time (s) =	2 ≤ N ≤255	Converter temper.: Relay Nr =	Slip compensation =	0 ≤ N ≤ 255		Failure on module Nr 3 !!!
	Deceleration time (s) =	2 ≤N ≤ 255	Mains anomaly: Relay Nr =				Failure on chopper module !!!
	Freq. ctrl source 0=RS485 1=T.block ?		SAN:1=Fs 2=Im 3=Us 4=Pw 5=Iw ?				Failure on brake module !!!
	Default frequency (Hz) =	Fmin≤N<Fmax					STOP circuit open !!!
	Minimum frequency (Hz) =	0 < N					Partition code missing !!!
	Measure speed 0 = no 1 = yes ?						Access is locked !!!
	MCM 0 = Abs. 1 = SH 2 = DTO 3 = none ?						**I RESET**
	Current Iabs(A) =	N < Imax					P= Fc= Iref=
	Current Ish(A) =	N < Imax					**J MEMORIZE FREQ. IN USE**
	Current IDTO(A) =	0 < N < 300					Default frequency = freq. in use
	FCC duration (s) =	0 ≤ N ≤ 60					
	IFCC current (A) =	N < Iref					
	IFCP current (A) =	N < Iref					
	Low freq. smoothing =	0 ≤ N ≤ 250					
	Slip compensation =	0 ≤ N ≤ 255					
	Us/Fs Pt. 1 (V/Hz) Us = 1 Fs = 50	1 ≤ Us ≤ 380(460) V 1 ≤ Fs ≤ 3000 Hz					

Following the entry of the last Us/Fs point, hit the 2 keys 2ndF and ENTER





▽ forward

△ backward

● decimal point

N = possible values

DEFAULT CONVERTER DATA

The drive parameters pertaining to your application have not been specified together with the purchase order. Therefore default values, as listed below, have been written to the converter memory.

It is necessary to write the parameters specific to your application before using the converter. Chapters *Parameters of the drive* and *Converter Setup* provide all necessary information.

To perform converter setup a control unit model PC 600 is required, alternately an MS-DOS computer with RS 485 interface can be used. A communication program is available on 3.5" or 5.25" diskette.

Menu

B MOTOR DATA	DEFAULT DATA	NEW DATA
0 = F 1 = GB 2 = D 3 = E 4 = I	1	
Speed display units 0 = Hz 1 = R.P.M.	0	
Motor reversing 0=RS485 1=T.block ?	1	
Freq.ctrl 0=-10/+10 V 1 = 0 to + 10 V ?	1	
Power line voltage Ur = V ?	380	
Partition selection 0=RS485 1=T.block ?	0	
Partition Nr =	1	
Number of poles =	2	
Iref source 0=RS485 1=Rtrip ?	0	
Motor current Iref (A) =	1	
If Im>Iref 0 = trip 1 = dec.Fs 2 = ignore	0	
RI compensation (V) =	0	
Acceleration time (s) =	255	
Deceleration time (s) =	255	
Freq. ctrl source 0=RS485 1=T.block ?	0	
Default frequency (Hz) =	0	
Minimum frequency (Hz) =	0	
Measure speed 0 = no 1 = yes ?	0	
MCM 0 = Abs. 1 = SH 2 = DTO 3 = none ?	0	
Current Iabs(A) =	0	
Current Ish(A) =	----	
Current IDTO(A) =	----	
FCC duration (s) =	0	
IFCC current (A) =	0	
IFCP current (A) =	0	
Low freq. smoothing =	0	
Slip compensation =	0	
Us/Fs Pt. 1 (V/Hz) Us/Fs Pt. 2 (V/Hz)	1 V 50 Hz 0 V 0 Hz	
Us/Fs Pt. 3 (V/Hz) Us/Fs Pt. 4 (V/Hz)	0 V 0 Hz 0 V 0 Hz	
Us/Fs Pt. 5 (V/Hz) Us/Fs Pt. 6 (V/Hz)	0 V 0 Hz 0 V 0 Hz	

C T. BLOCK SETUP	DEFAULT DATA	NEW DATA
Reached frequency: Relay Nr =	0	
Reached speed: Relay Nr =	0	
Zero frequency: Relay Nr =	0	
Zero speed: Relay Nr =	0	
START / STOP: Relay Nr =	0	
Motor overload: Relay Nr =	0	
MCM output: Relay Nr =	0	
Failure: Relay Nr =	0	
Ext. interlocks: Relay Nr =	0	
Converter overload: Relay Nr =	0	
Def. Aux. supply: Relay Nr =	0	
Motor temp (PTC): Relay Nr =	0	
Converter temper.: Relay Nr =	0	
Mains anomaly: Relay Nr =	0	
SAN:1=Fs 2=Im 3=Us 4=Pw 5=Iw ?	1	

BREAKDOWN Help - Level 1

CONVERTER NOT WORKING WITH MESSAGES ON DISPLAY

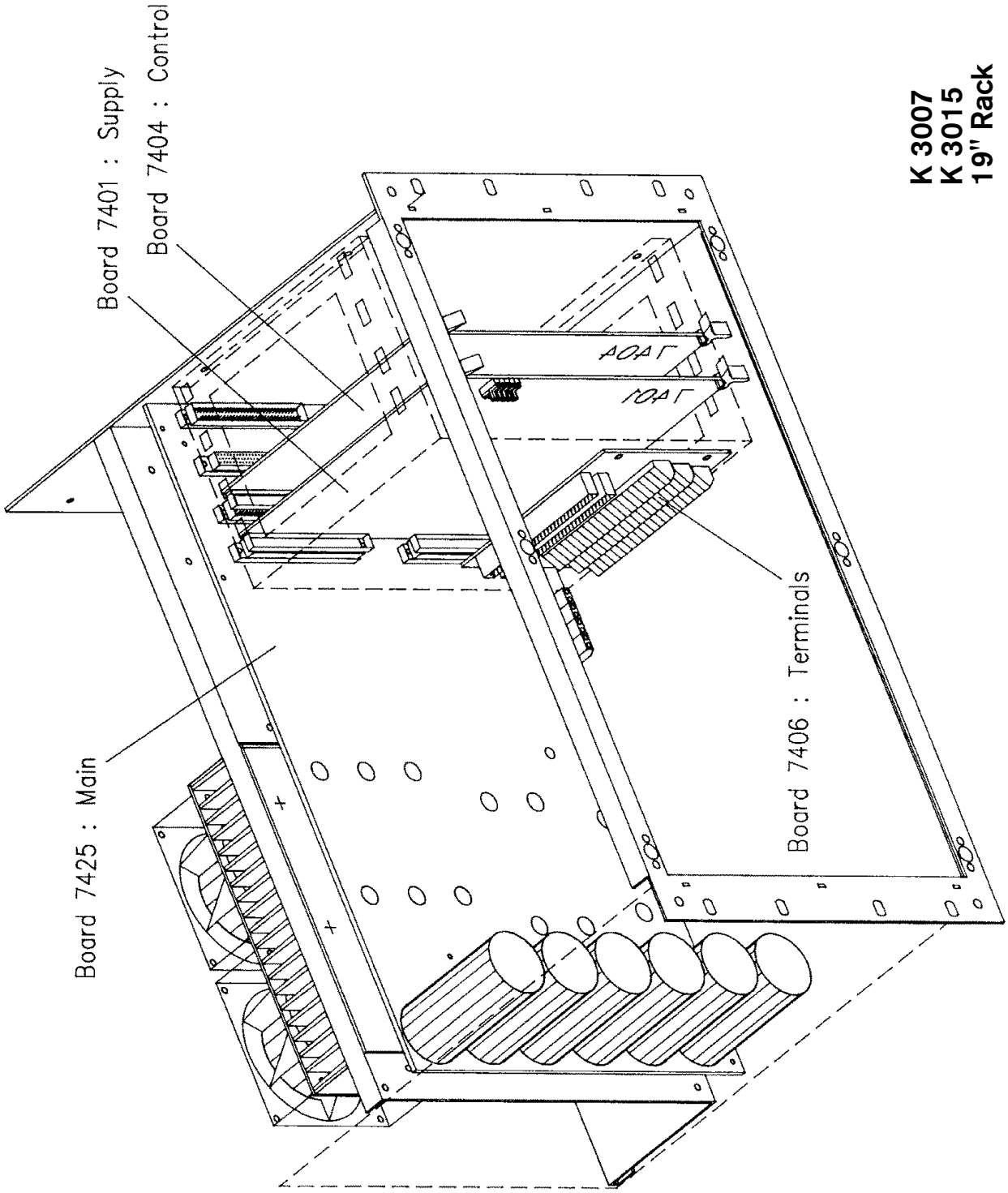
ERROR MESSAGE	WHAT HAPPENS	WHY AND WHAT TO DO
Freq. crtl assigned to T. Block	Input of new speed through control panel not possible	In menu B, the frequency control is assigned to terminal block - modify menu B set-up
Reversing assigned to T. Block	Reversing of direction through control panel not possible	In menu B, function assigned to terminal block - modify menu B set-up
Please wait before resetting again	All functions inactive	The intermediate DC voltage is still over 45 VDC - just wait for a while
Partition code is missing	Converter doesn't START	Wrong partition selected or uncompleted partition - select a new partition - Input missing parameters
Access is locked	Access to specifics menu is not possible	Converter in START mode or key switch locked - see operating manual
Stop circuit open	Converter doesn't start	Circuitry between terminals 8 and 9 open
Motor overload Im > Iref	Motor current Im is higher than the current Iref set- up in menu B or by Rtrip. - Motor load to high - Wrong Us/Fs characteristic - Acceleration too short - Programming mistakes	- Adjust load - Adjust Us/Fs characteristic - Set new acceleration time - Correct menu B set-up - Check Rtrip value
Converter temp. to high	NTC on cooling radiators turned on - Converter overloaded - Ambient temperature too high	- Check working parameters - Check cooling conditions (Fans, heat exchanger, air conditioning....)
Motor temp. to high	PTC in motor winding triggers an alarm	- Check motor - Check motor load - Adjust set-up
External interlocks	Open circuit between terminals 21 and 22	- Check external conditions connected to this circuitry
Converter overload	Short circuit between motor and converter Deceleration time too short	- Check connection lines and motor - Set new deceleration time
Defect auxiliary supply	25 VDC out of tolerance	- Check main voltage - Check 25 VDC (-1V/+3V) - External load on 25 VDC?

Main out of tolerances	Line voltage out of tolerance	- Check voltage (-15/+10%) - Check main voltage set-up according operating manual
Failure on module No 1	Failure on P.O. No 1	- Replace module
Failure on module No 2	Failure on P.O. No 2	- Replace module
Failure on module No 3	Failure on P.O. No 3	- Replace module
Failure on chopper	Failure on chopper module	- Replace module
Failure on brake module	Failure on brake chopper	- Replace module

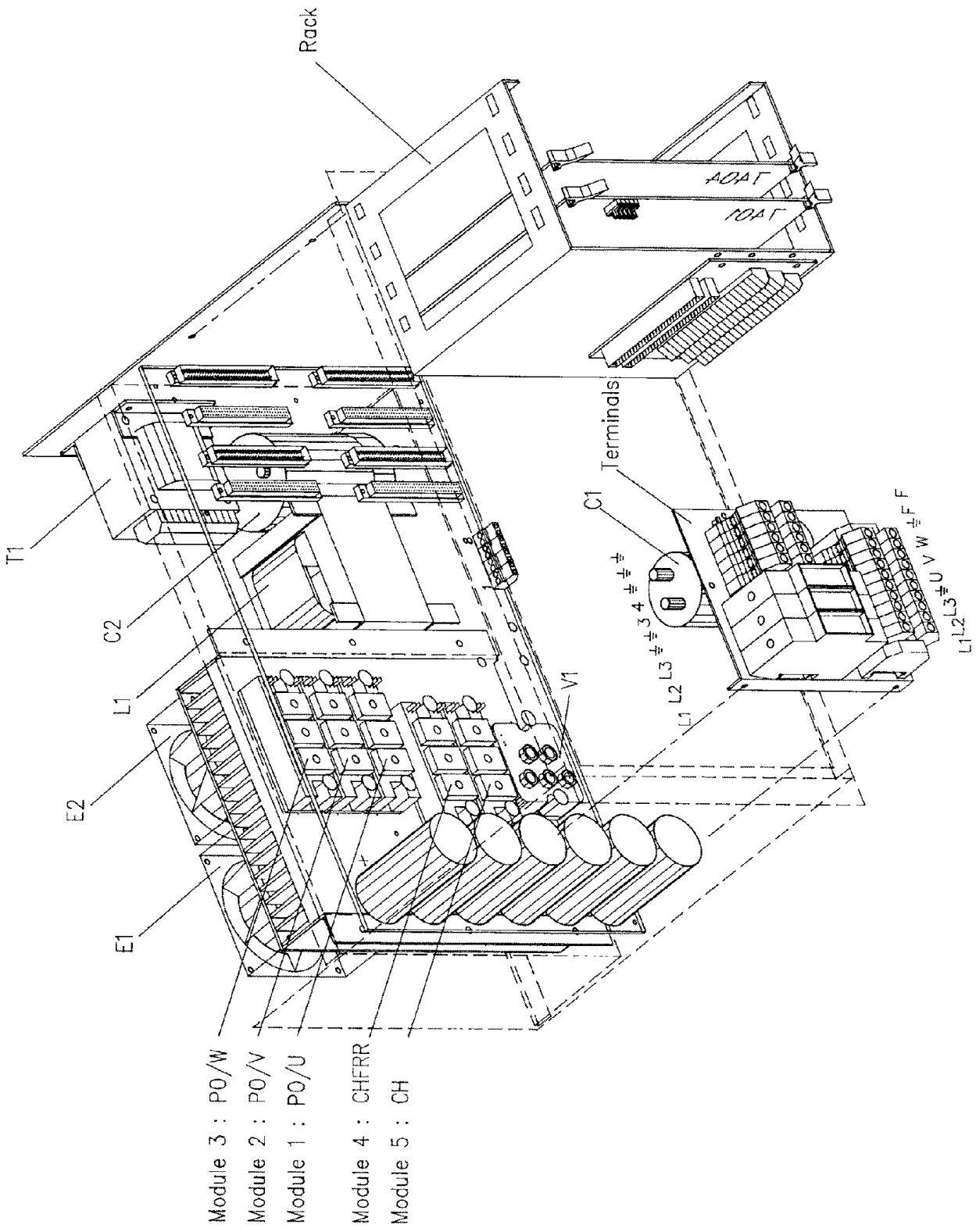
BREAKDOWN WITHOUT MESSAGES

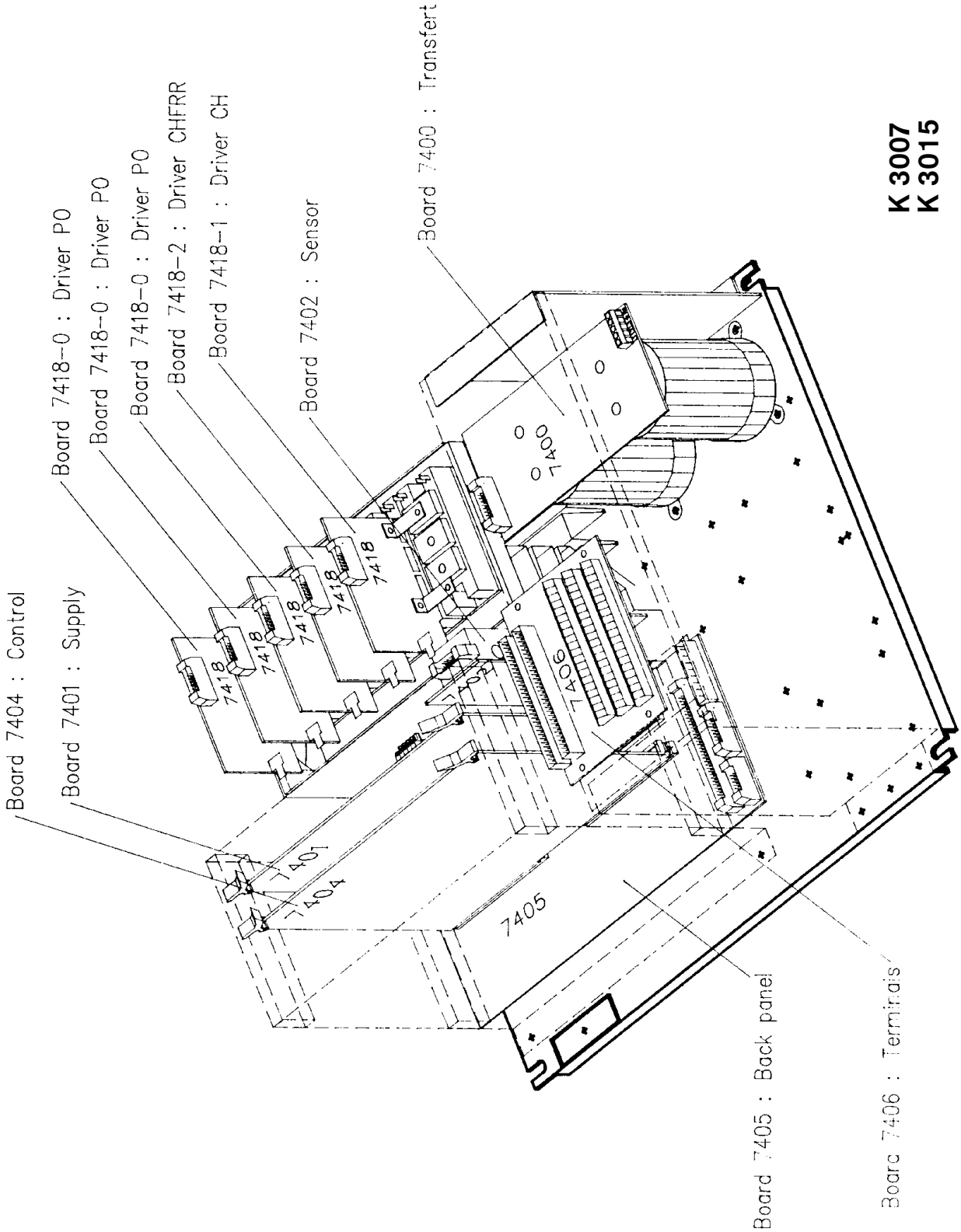
Converter doesn't turn on	Line voltage missing	- Check voltage on terminals L1, L2, L3 - Input circuit-breaker ON?
Circuit breaker switch off	Input rectifier	- Check corresponding components
Fuses blow	Aux. transformer Chopper module Earth leak or short circuit at output	- Converter disconnected from main, check input insulation with an ohmmeter

NOTE: The circuit breaker is not a switch. Turn it on only with disconnected main supply



K 3007
K 3015
19" Rack




Board 7404 : Control
Board 7401 : Supply
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-2 : Driver CHFRR
Board 7418-1 : Driver CH
Board 7402 : Sensor
Board 7400 : Transfert
7418
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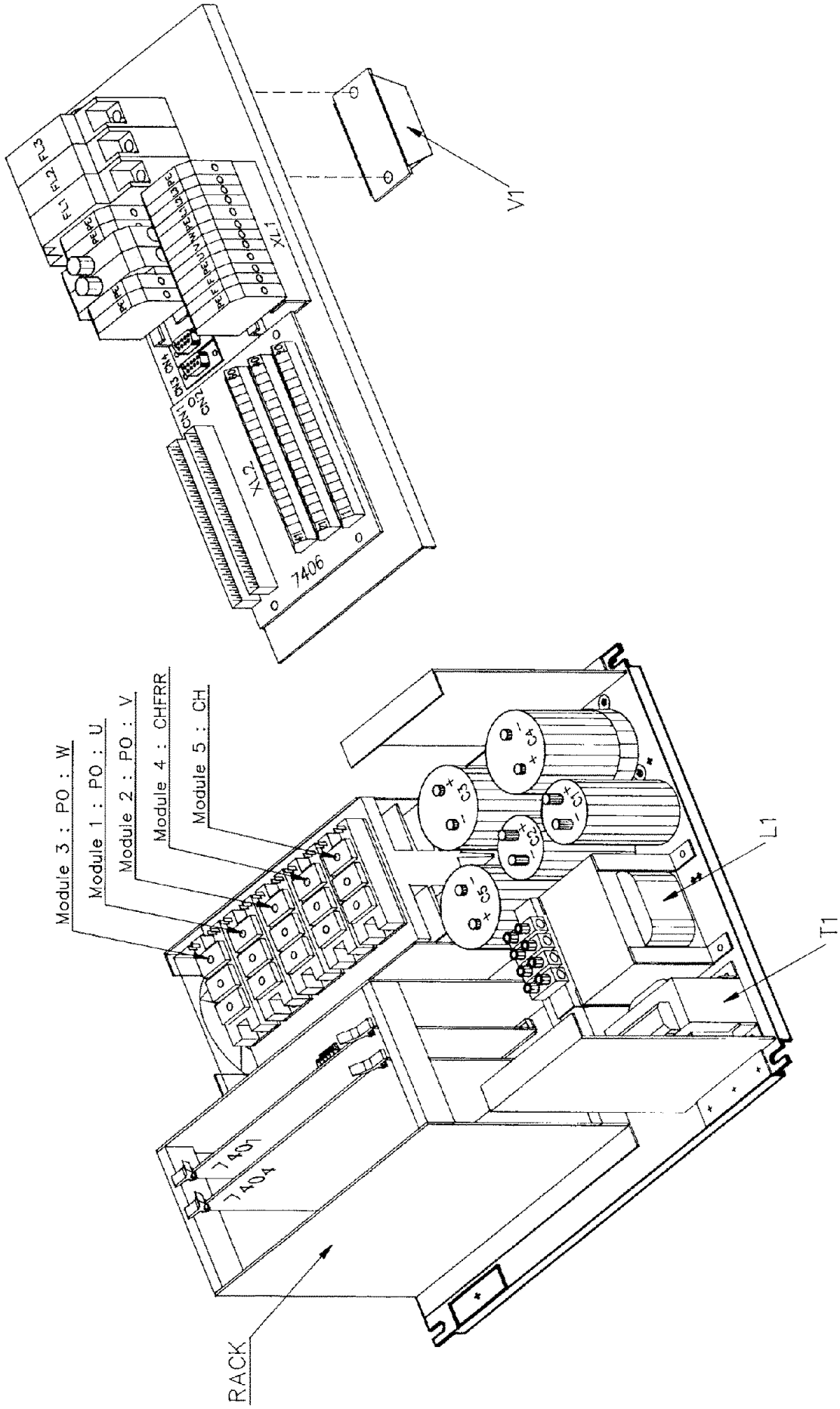
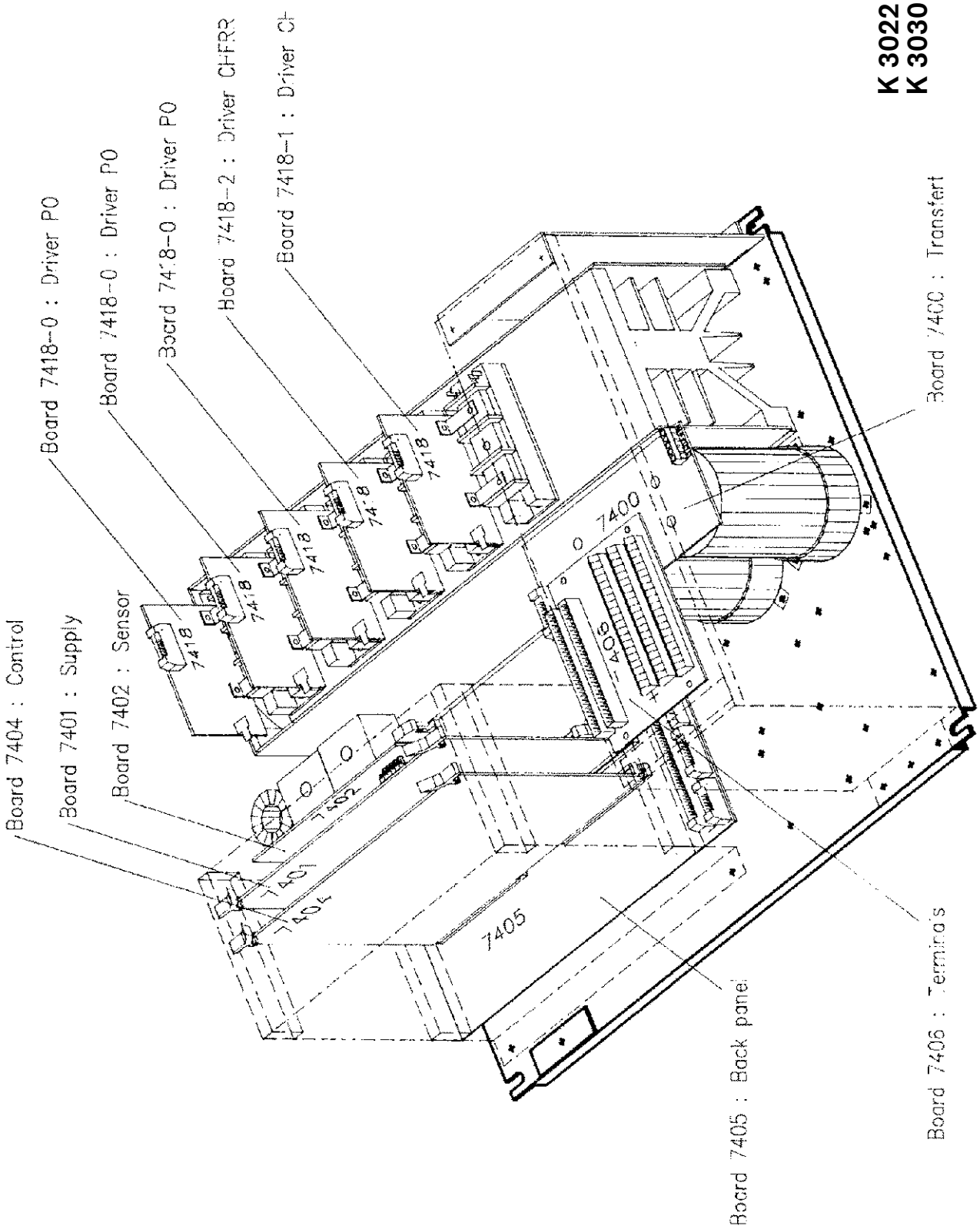
7418
7400
7401
7404
7405
7406
Board 7405 : Back panel
Board 7406 : Terminals

K 3007
K 3015




Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-2 : Driver CHFRR
Board 7418-1 : Driver CH
Board 7404 : Control
Board 7401 : Supply
Board 7402 : Sensor
Board 7400 : Transfert
Board 7405 : Back panel
Board 7406 : Terminals
7418
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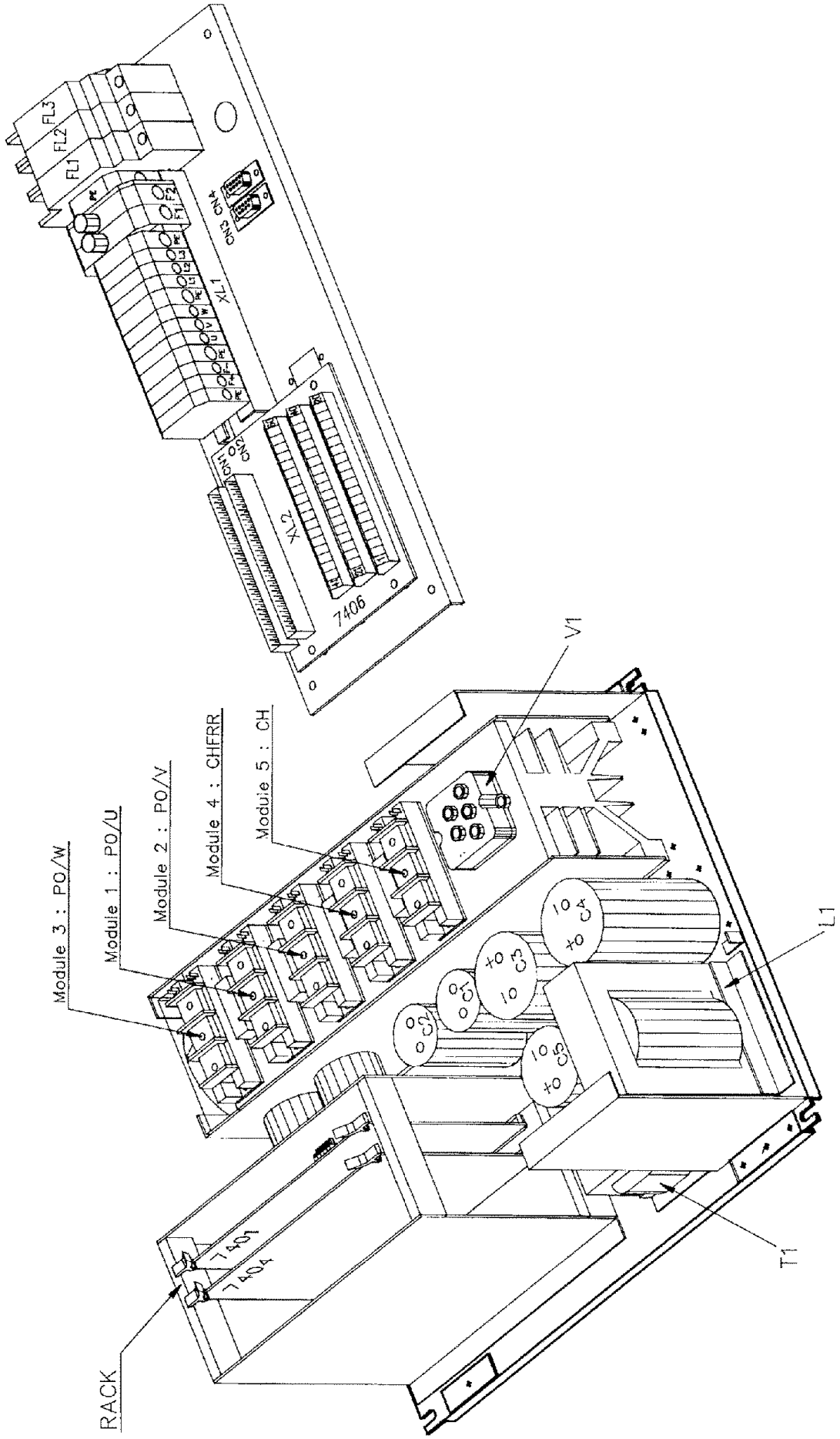
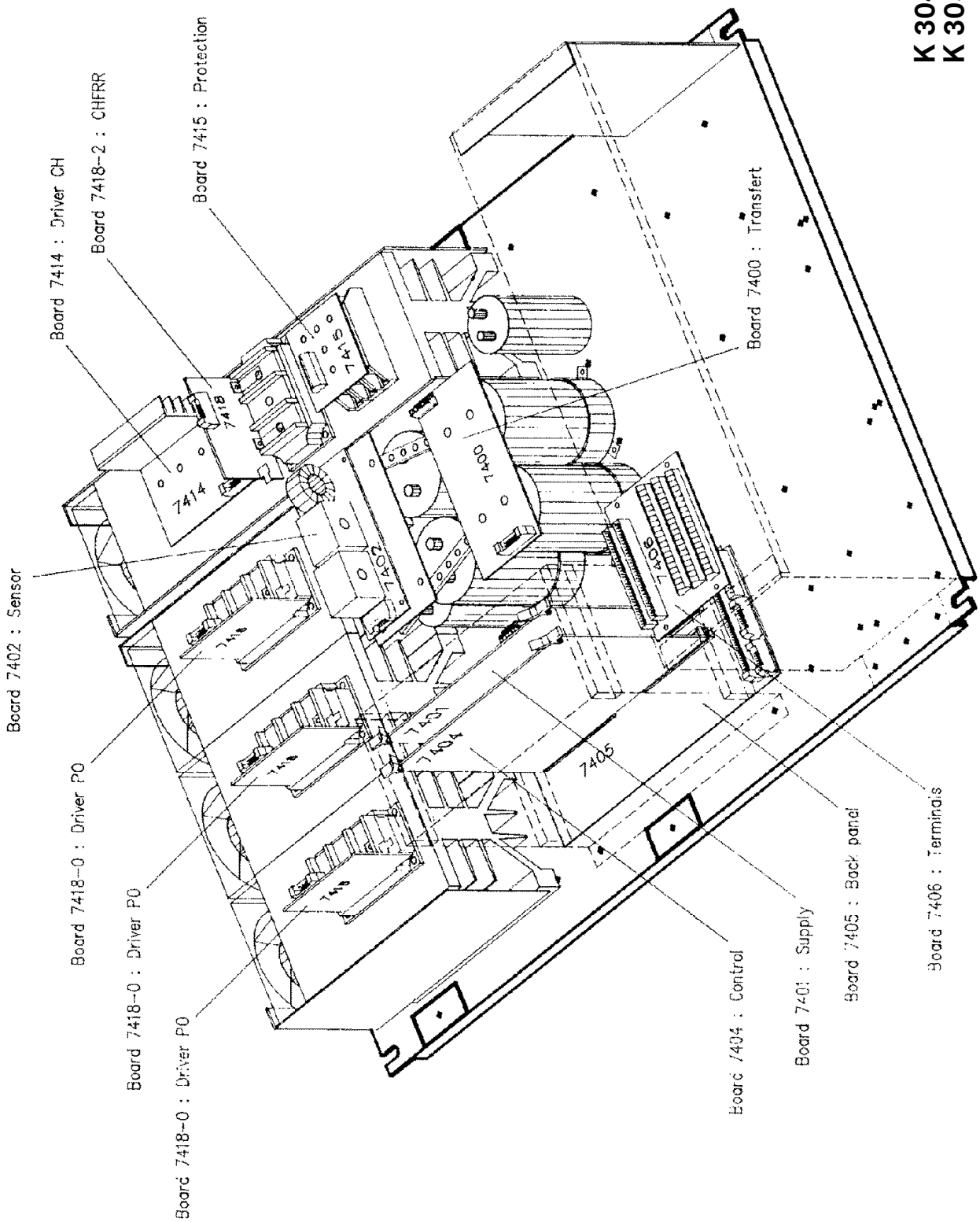
7401
7402
7404

K 3022
K 3030




Board 7414 : Driver CH
Board 7418-2 : CHFRR
Board 7415 : Protection
Board 7400 : Transfert
Board 7402 : Sensor
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7404 : Control
Board 7401 : Supply
Board 7405 : Back panel
Board 7406 : Terminals
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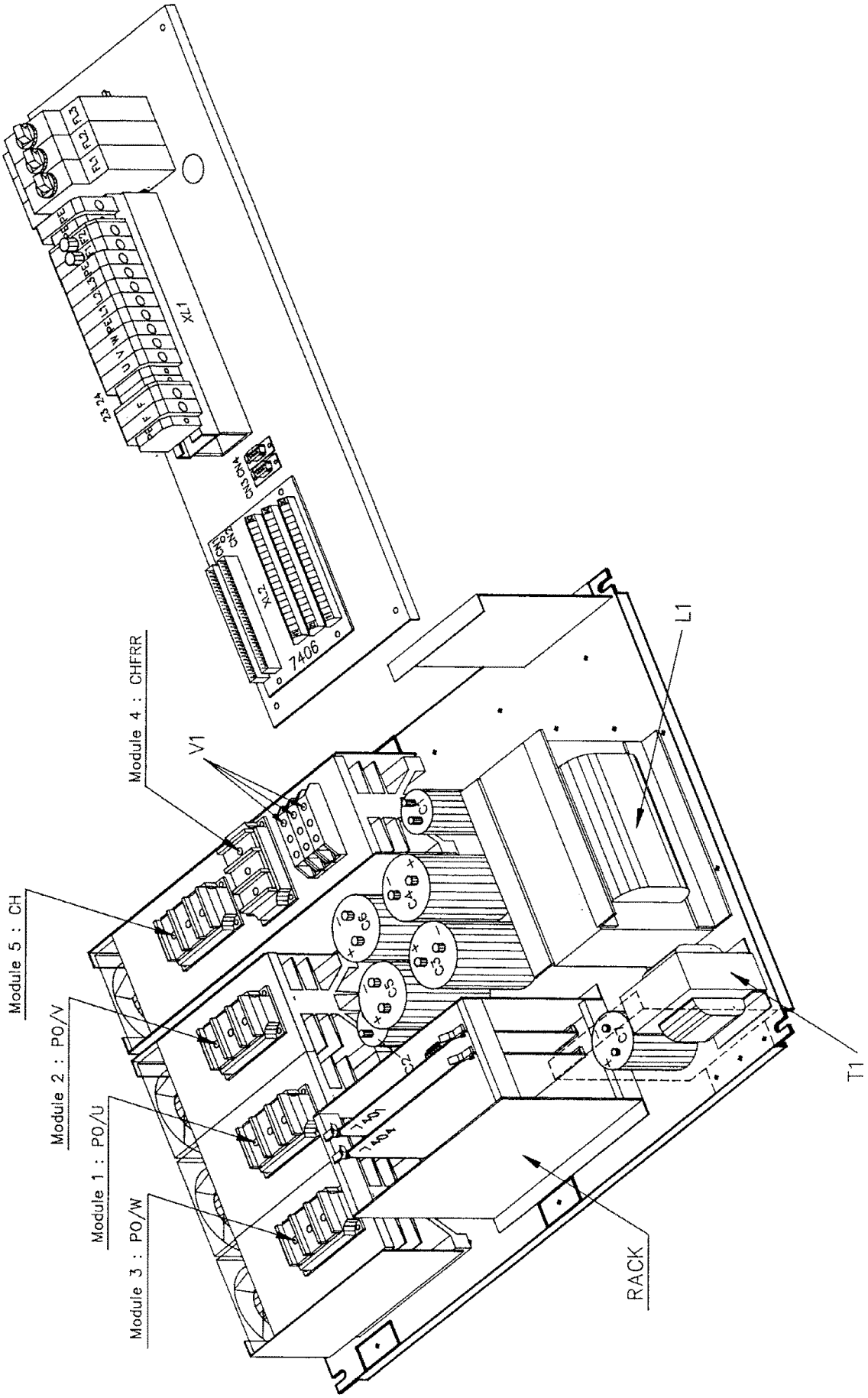
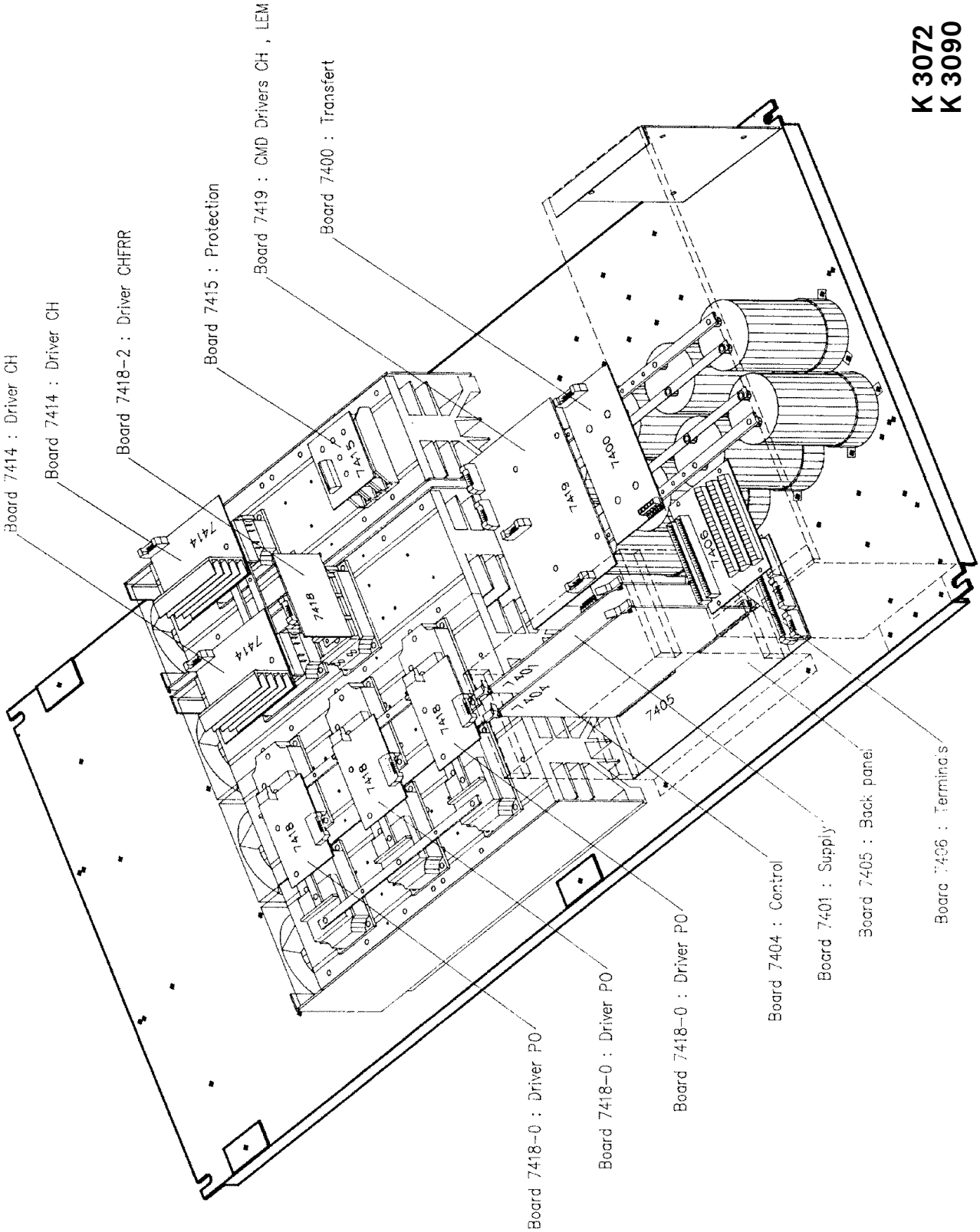
K 3040
K 3055




Board 7414 : Driver CH
Board 7414 : Driver CH
Board 7418-2 : Driver CHFRR
Board 7415 : Protection
Board 7419 : CMD Drivers CH , LEM
Board 7400 : Transfert
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7418-0 : Driver PO
Board 7404 : Control
Board 7401 : Supply
Board 7405 : Back panel
Board 7406 : Terminals
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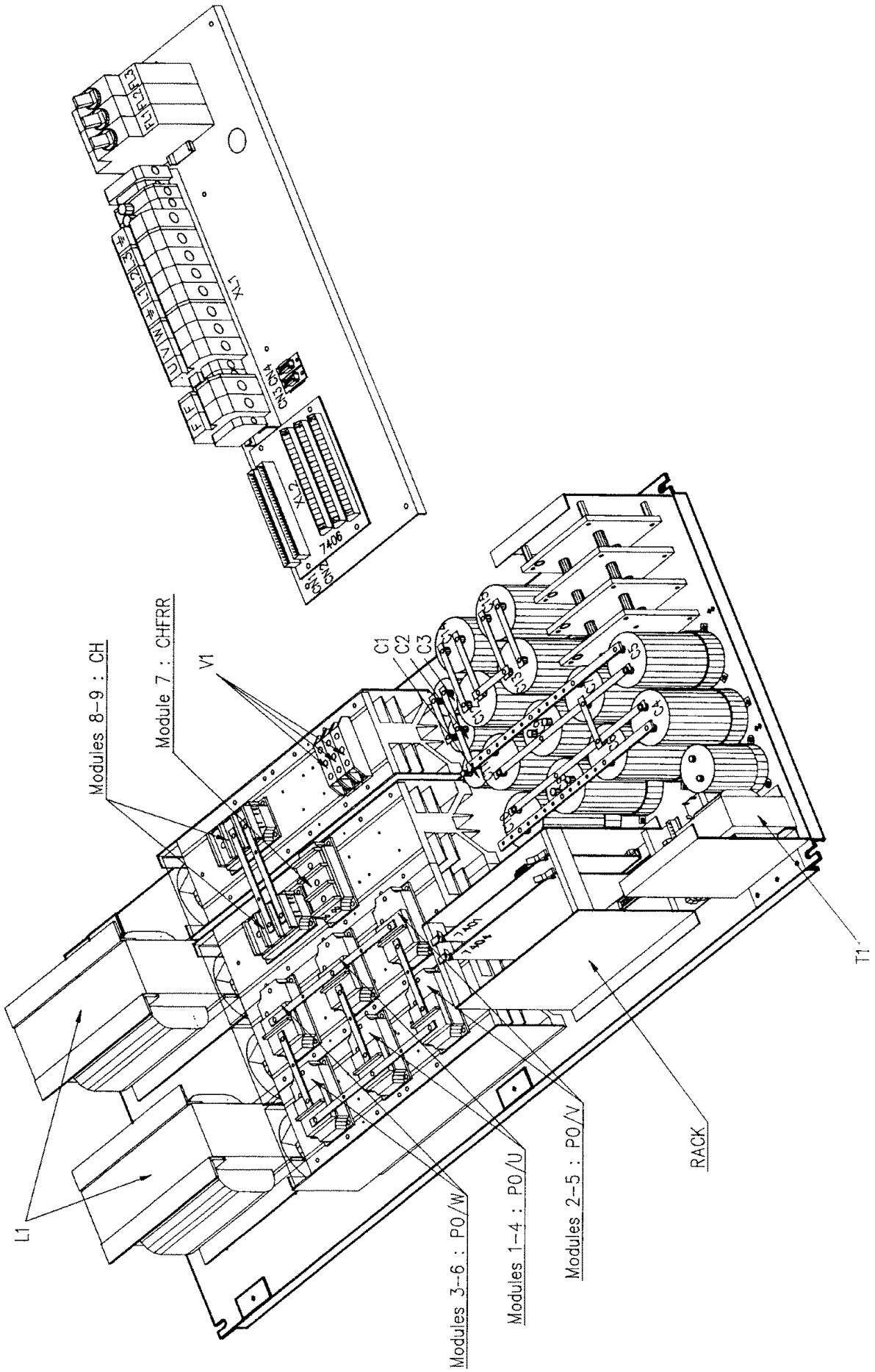
K 3072
K 3090



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