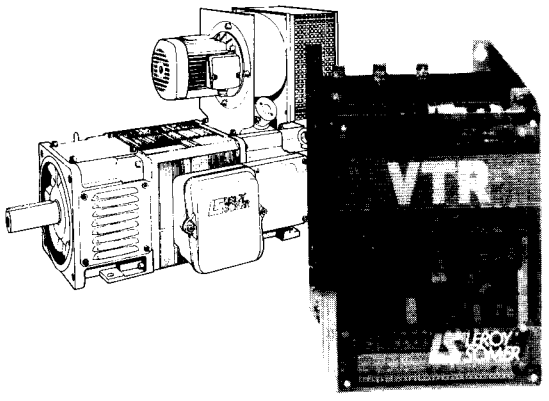
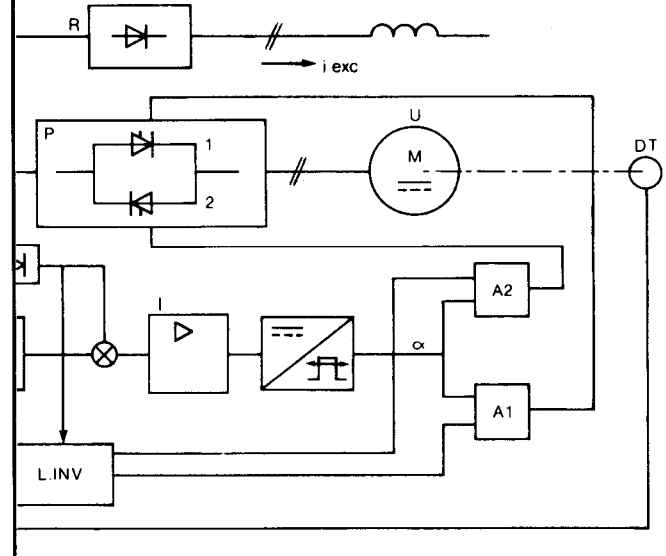
LEROY SOMER





Réf. 46 - 033/a - 3.89

VTR.D

Three phase controller for direct current motor

Installation and maintenance manual

WARNING

Leroy-Somer reserve the right to change the characteristics of their products at any time thought fit to introduce the latest technological advances.

The information contained in this manual is therefore liable to changes without any prior notice.

Leroy-Somer provide no contract guarantee whatever as regards the information published in this document and shall not be held responsible in the event of errors or damage caused by the implementation thereof.

CAUTION

Power supply of the controller should be cut prior to any action affecting either the electrical or the mechanical part of the facility or machine.

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Overview

VTR.D
STATIC REVERSIBLE CONTROLLER
4-QUADRANT

Double-bridge three phase VTR.D controllers -24 to 650A are designed for the speed regulation of 4 to 225 kW dc motors.
Calibres : I (A) 24, 36, 72, 150, 250, 400, 650.
Mains Voltage : (V) up to 440V +/-10%
- 50/60 Hz +/- 2 Hz
Speed range :1 to 300 - tach dynamo control
1 to 20 by U return, with variable accuracy depending on motor.

CHARACTERISTICS
VTR.D speed controllers are designed for the supply of dc motors, alternating mains. The reversible controllers, with complete bridge, allow operation in all four quadrants of the torque-speed plane.
Full power/control isolation.

COMPOSITION
The VTR.D range includes 7 gouges from 24 to 650A in compact design.
A metal enclosure with a protection cover contains :
- a control board supporting a settings board,
- power interface board,
- the power section plus the energization rectifier.

Control board (see page 9 and 26).
This board is common to all the VTR.D range. It features :
- a pressure-type 4-point attachment.
- plug-in terminals for external connections to the inside part of the board.
- settings made by means of jumpers and pots grouped a plug-in type "settings" board, containing only idle components and signalling DELs,
- possibility of adding options (see page 28).

This board is interchangeable, with no tools required; the settings are stored in the memory of the settings board.
It contains the following :
- cascade double current loop regulation,
- speed monitoring with proportional, integral and derivative action, reversing logics,
- armature current limitation function,
- pulse-train ignition circuit,
- safety on power-on and power-off,
- presence of energization current safety,
- ramp,
- control logics,
- 8 DELs, three of which visible on mounted cover.

SPECIAL APPLICATIONS

Refer to following pages : 10, 11, 12, 20 to 22, 32 to 33.
Control Interface board (see page 25).
This board contains :
- regulated power supplies sources,
- thyristor protection and booting circuits,
- a controller customization case (RT) (see page 34 for current module)
- a voltage adapter jumper for the control transformer (CAV4),
- 3 power : control segration links (CAL), allowing for separate supply of power and control systems,
- 2 output relays.

A galvanic insulation board should mandatorily be used in the event of voltage return.

DEL AND RELAY SIGNALLING
8 DELs and 2 relays :
- 4 red LEDs, 3 green LEDs, and 1 yellow LED,
-2 relays assigned as per wiring.
Information supplied by the externally visible LEDs :
- ON : the controller has received validation information = green LED lit up,
- I >= : the controller is current limited = yellow light lit up,
- FAULT : fault = red, LED lit up.
All LEDs are located on the settings board (for other LEDs, see p. 28)
Information supplied by the relays in standard version :
- controller validated : K1 mounted, contact closed,
- controller beyond limits : K2 mounted, contact closed.

CHOOSING THE MOTOR
The motor must be designed for, and dimensioned to, intermittent current power supply with speed and torque variation matching the relevant operation.
Shape factor = 1.05.
Separate energization or permanent magnets. Do not use series and compound energization motors.
In the case of controlled energization or de-energization, use inducer voltage equal to approximately half the value of mains voltage.

For example: 190V for 380Vac mains voltage.
Recommended armature voltage $\leqslant$ mains voltage x 1.05.

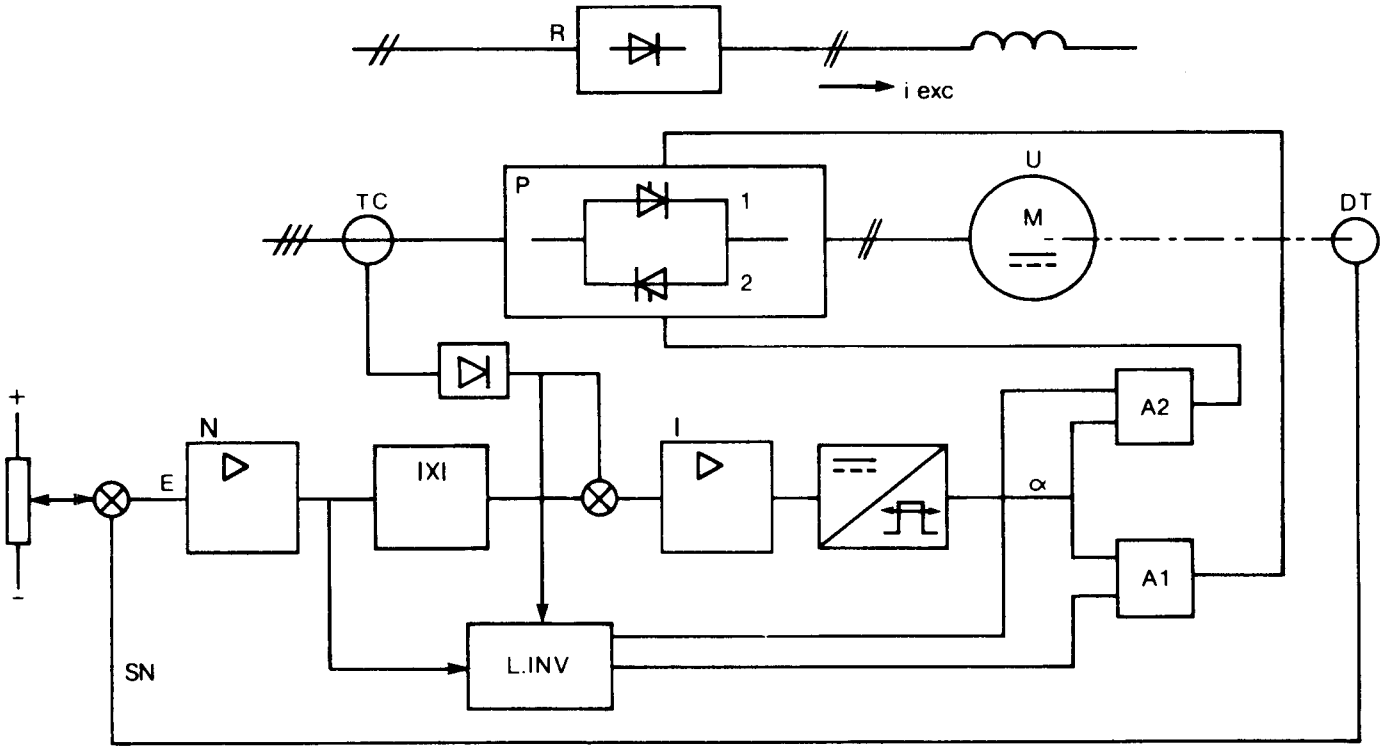
General

PRELIMINARY CHECKS

If the product is still in its package, remove the packaging and check the device has not been damaged during shipment.

Make sure the controller Part Number appearing on the label complies with the delivery slip corresponding to the order.

FUNCTIONAL DIAGRAM



P1 : three phase Graëtz bridge
P2 : three phase Graëtz bridge
TC : Motor current measurement
DT : Motor speed measurement
L.INV : Bridge control logics based on sign of kE
R : Inducer supply

Hints for choosing the VTR.D

CONTROLLER / MOTOR COMBINATION

The controller part number to be found both on the delivery slip and on the identification tag on the left hand side of the device, must be specified for any communication with our services.

Check MAINS - CONTROLLER - MOTOR compatibility using the table below.

The values given here are for an ambient temperature of 40°C. Beyond, and up to 60°C, apply a current derating ratio of 1.2% per additional degree C.

three phase supply				Motor				
Voltage	Line current	Maximum permanent current	Motor maximum power Td/Tn = 1.2	Armature voltage	Excitation current max Iex	Prt.no	Weight
U r m s	I r m s			U A			
	A	A	kW	HP	V	A		kg
220/240 V	18	24	4,2	5,7	230	15	VTR. D 2.24	6,5
± 10%	27	36	6,3	8,5	230	15	VTR. D 2.36	10
50 / 60Hz	54	72	12,5	16,5	230	15	VTR. D 2.72	10
	112	150	25	33,5	230	15	VTR. D 2.150	11
	187	250	41	55	230	15	VTR. D 2.250	13
	300	400	65	88	230	15	VTR. D 2.400	47
340 / 415 V	18	24	7	9,5	400	15	VTR. D 3.24	6,5
± 10%	27	36	10,5	14	400	15	VTR. D 3.36	10
50 /60 Hz	54	72	21	28	400	15	VTR. D 3.72	10
	112	150	45	60	400	15	VTR. D 3.150	11
	187	250	75	100	400	15	VTR. D 3.250	13
	300	400	120	160	400	15	VTR. D 3.400	47
	487	650	195	260	400	15	VTR. D 3.650	47
440 V	18	24	8	10,5	460	15	VTR. D 4.24	6,5
± 10%	27	36	12	16	460	15	VTR. D 4.36	10
50 / 60 Hz	54	72	24	32	460	15	VTR. D 4.72	10
	112	150	52,5	70	460	15	VTR. D 4.150	11
	187	250	86	115	460	15	VTR.D 4.250	13
	300	400	138	183	460	15	VTR. D 4.400	47
	487	650	224	299	460	15	VTR. D 4.650	47

CHOOSING THE CONTROLLER CALIBRE

The table on page 4 can be used to configure the controller for :

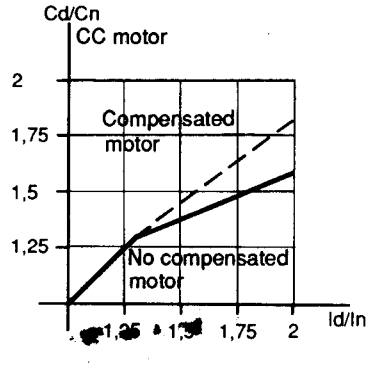
- steady state operation,
- start-up torque 1.2 times the nominal torque of the motor.

For cyclic operation, see below.

If the start-up torque required is greater than 1.2 Cn, consider the maximum current (Id) absorbed by the motor in setting the controller :

- Id must ⩽ maximum permanent current of the controller.

To determine the maximum current (Id) of the motor according to the start-up torque, read the curves on the machine, and otherwise the abacus opposite.

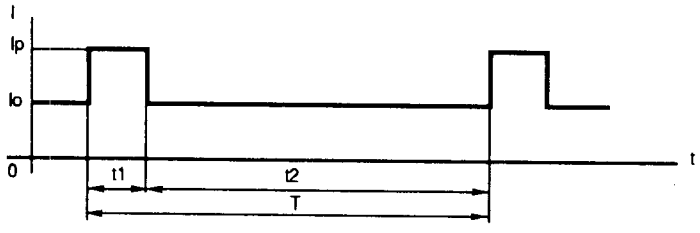


Example : Td/Tn = 1.6 no-compensated motor. Our abacus gives Id/In = 2.
Controller max. I ≥ 2 motor In.

Hints for choosing the VTR. D

STEADY STATE OPERATION
The controller is characterised by a maximum permanent current value (I max) which admits no overload.

CYCLIC STATE OPERATION
This operation may be defined by two current intensities called Io and Ip, where :
- Ip is the peak current,
- Io is the steady state current.



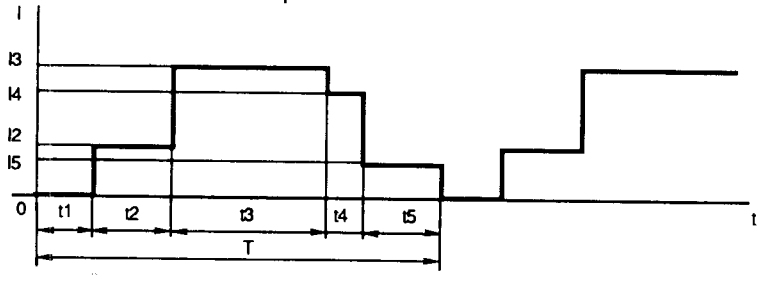
The following time limits must be observed :
- $t2 \geqslant 7\ t1$,
- $t1 \leqslant 30$ s.

For Io and Ip, the maximum values based on the calibres, are the following (in A) :

Maximum permanent current I	24	36	72	150	250	400	650
Io	16	25	50	100	165	265	430
Ip	33	50	100	200	330	530	860

In the case of a specific and well-known operating cycle, one should calculate the thermally equivalent average current intensity, i.e Imte:

$$Imte = \sqrt{\frac{I^2_1 t_1 + I^2_2 t_2 + I^2_3 t_3 + \dots I^2_n t_n}{T}} \quad \text{with } T = t_1 + t_2 + t_3 + \dots + t_n$$



For example : $Imte = \sqrt{\frac{I^2_2 t_2 + I^2_3 t_3 + I^2_4 t_4 + I^2_5 t_5}{T}}$

This Imte current intensity must be equal to ≤ 0.8 I max. One should then check that peak current

Characteristics

Voltage, power supply three phase mains frequency	Maximum : 440V +/- 10% 50/60 Hz +/- 2 Hz
Recommended armature voltage v./mains voltage	Armature U≤Mains U x 1.05
Excitation mains voltage	Max. voltage 440V mains - Excitation U 0.9 U main approx.
Maximum Excitation current	15A
Minimum safety-detectable current	0.5A
Armature current limiting	Adjustable on controller from Ip/3 to Ip (where Ip = peak current of controller, see pages 29 and 31) Other possibilities: see page 21.
Speed range	1 to 300 with tach dynamo 1 to 20 with U return, and accuracy depeding on motor.
Accuracy with variations : -of the resistant torque 0.2 Cn to Cn -of mains voltage +/- 10% -of ambient temperature 20°C +/- 20°C	with tach dynamo - 0.24% of displayed speed - 0.066% of maximum speed - + or - 0.2% of displayed speed - + or - 1% of displayed speed - + or - 0.1% of maximum speed
Speed prescription - by potentiometer - by analogue signal - in current by signal	Two +/- 10V voltage inputs 1 to 10 kOhm connected to internal source 0, +10V or 0, -10V 0 to 10V delivered via an external source (input impedance 32 kOhm) 0/20 mA input impedance 205 Ohm 4/20 mA input impedance 254 Ohm The +/- 10V inputs and the 0/20 mA input are for summation purposes and isolated from the mains.
Speed return by sensors or tach dynamo	6 setting values : 10-22-45-90-180-500 Use with galvanic isolation board for U return - Link on position 10
Acceleration and deceleration ramp	Acceleration and deceleration times adjustable separately in two ranges from 0.5 to 60 sec. Possibility of further increasing time (see page 21).
Reverse operation	Via external orders on logical inputs or by reversing speed prescription Reversing : dead band 10 ms Operation in all four quadrants of the torque/speed plane.
Voltages and currents avalaible on the controller (cumulative current intensity)	+ 15V (P15) or - 15V (N15) 30 mA maximum throughput, for inputs (control, validation, display, regulation), all option boards, all external functions. + 24V (PL) 50 mA or 80 mA maximum throughput if no demand on +15V.
Output relays - maximum electrics characteristics for contacts	220V ~ ; on auxiliary contactor : draw 300 VA, Hold 30 VA - 30V=, 0.5A max. Minimum switching power : 24V/20mA ac/dc. Number of handling operations : 106
Protection class	IP00.
Ambient temperatures : - operating - storage	 - 0°C to 40°C (operation possible up to 60°C by downgrading the current intensity of 1.2% for every additional °C) -25°C to +70°C
Downgrading according to altitude	Downgrade current intensity by 0.7% for every 100 m above 1000 m.
Vibrations and shocks	Tests run as specified in CEI recommendation, publication 68/2/6/FC

VTR.D Definition

CONNECTION TERMINAL BLOCKS

POWER BRIDGE

AL1 AL2 AL3	Main supply to 440V - 50/60 Hz
⏚	Earth
M1+ M2-	Motor armature
0-220	Separate fan power supply (calibres 400 and 650A) - voltage : 220V ac - power : 185W - current intensity: 0,85A

POWER INTERFACE BOARD

DESIGNATION	P.J1-J2	FUNCTION	
CL1 CL2 CL3	1 2 3	Control power supply - used if the power and control supplies are separate (U ≥ 440V) - power consumption: 70mA for 24, 36, 72. 400, 650A and 300 mA for 150 and 250A.	
RU	4	Armature voltage output for U return monitoring	
RNA RNB	5 6	Speed or voltage sensor input	
M1+	7	M1 terminal of motor for U return monitoring	Screw terminal
FL1 FL2	8 9	Monophase supply of excitation bridge	
F1+	10	Positive output of excitation bridge	
F2-	11	Negative output of excitation bridge	
K1A* K1B	12 13	Free contact of K1 relay potential (locking) Closed when controller validated	
K2A* K2B	14 15	Free contact of K2 relay potential (current limitation) Closed when controller is beyond limits	
TTA** TTB	16 17	Potential-free thermal trip contact of the heater temperature probe	
PTE NTE	18 19	Power supply + 24V (10 mA) Power supply - 24V (10 mA)	
NC	20	Not connected	

* Maximum characteristics of contacts :
- voltage : 220V, draw 300 VA max., hold 30 VA max., /30V =, 0.5A maxi
- number of handlings : 10^6
- minimum switching power : 24V20 mA ac/dc.

** Maximum characteristics of probe contacts :
- breaking capacity : - inductive 250V/5A,
  = inductive 30V/3A.

VTR.D Definition

CONNECTION TERMINAL BLOCKS

CONTROL BOARD

DESIGNATION	C.J1	FUNCTION
E1	1	Speed prescription input 0/+ or - 10V (32 kOhm)
OE1	2	0V of E1 input
E2	3	Speed prescription input 0/+ or - 10V (32 kOhm)
OE2	4	OV of E2 input
EC1	5	Speed prescription input 0/20 mA (205 Ohm)
OEC	6	OV of EC1 and EC2 inputs
EC2	7	Speed prescription input 4-20 mA (254 Ohm)
P10	8	+ 10V + or - 0.6V supply of reference potentiometer (10mA)
N10	9	- 10V + or - 0.6V supply of reference potentiometer (10mA)
ECL	10	External current limit input 0/- 10V. R = 32 kOhm (see page 21).
P15	11	+ 15V + or - O.6V supply - maximum throughput 30 mA without options
N15	12	- 15V + or - O.6V supply - maximum throughput 30 mA without options
0V	13	0V
SAO	14	Speed amplifier output - I max. $\leqslant$ 5mA
CAI	15	Current amplifier input (100 kOhm)
PL	16	Power supply of logic inputs (24 V=) (positive logic)
RUN	17	Controller validation (ignitors, amplifiers, ramps) by PL.
SAD	18	Auxiliary speed amplifier input (30 kOhm)
RO	19	ramp output (5mA)
PL	20	Power supply of logic inputs (24 V=) (positive logic)
ISI	21	Inhibition speed integration by 0V.
DCC	22	Current signal (0/10V for peak I VAR. (5mA)) 7.2V for max permanent current I of the controller
SP	23	Speed signal (0/+ or - 8V for max. preset speed (5 mA))
IRT	24	Increase in ramp time via external voltage (see page 21)
RZR	25	Instant resetting of ramp by 0V
FW	26	Forward } validation by PL
RV	27	Reverse } validation by PL
PL	28	+ 24V throughput 20 mA
0V	29	0V
LS	30	Devalidation of internal low speed by PL
AT	31	Assignable terminal connected to AT terminal of terminal J5 - 24
FF	32	Excitation fault
SF	33	Mains failure.

How to use the terminals : see pages 20 to 22.

VTR.D Definition

CONNECTION TERMINAL BLOCKS
SPECIFIC APPLICATIONS

The informations on terminal block J5 is reserved for use with the add on boards located in the "options pack" (see page 28 and 29).

J5 OPTION TERMINAL BLOCK

DESIGNATION	J5	FUNCTION
SMA	01	Input of speed reference presence detector
SM	02	Output of reference summator
SRC	03	Output of "speed reference elaboration" circuit
RIN	04	Input of speed ramp
RO	05	Output of speed ramp
SAI	06	Speed amplifier input
SAO	07	Speed amplifier output
CAI	08	Current amplifier input
CAO	09	Current amplifier output
IGI	10	Input for control of the 0-10V analog signal igniters
FS	11	Output of "Fault" information
CRA	12	Control of relay K1
VA	13	Igniter validation (output)
IHL	14	Logical input for validation of igniter by control logic or brake logic
or		
ODM	15	Control logic output
ODM	16	Control logic output
$\overline{\text{CRB}}$	17	Control of relay K2
$\overline{\text{DLIM}}$	18	Detection of current limitation
SNO	19	Zero speed information (zero speed= 1)
ISI	20	Integration validation (0V by -passing)
SNO	21	Complementary to 19 (zero speed = 0)
VLI	22	Reverse logic validation; reversal impossible if VL1 = 0
PL	23	Positive logic : +24V
AT	24	Assignable terminal connected to AT terminal of customer terminal block (C.J1-31)
AKM10	25	Potential-free interconnected terminals
AKM10	26	Potential-free interconnected terminals
SI	27	Current signal
SAD	28	Additional input of speed amplifier
RZR	29	Resetting of ramp - RZR = 0
RTU	30	Voltage return if galvanic insulation mounted on power board
VNF	31	- 24 V
N15	32	- 15 V
0	33	0 V
P15	34	+ 15 V
DVA1	35	Status of bridge 1
DVA2	36	Status of bridge 2
VSI	37	Validation input of current loop
SP	38	Speed signal : analog information - + or - 8V for Max.
DSE	39	Output of detector for speed error sign
CA1	40	Bridge 1 controlled by logic information - 0V locking
CA2	41	Bridge 2 controlled by logic information - 0V locking
CSI	42	Output of reversal logic for current loop validation
	43	
	44	Used
	45	with controlled
	46	excitation
	47	module.
	48	

Terminals 1 to 24 are also used for product customization (see page 12).

CONNECTION TERMINAL BLOCKS SPECIFIC APPLICATIONS

On the following page, a table lists the various applications of the controller :

1- It shows the wiring of the product ex-factory. The K1 relay is driven when the igniters are validated (motor "On").

The K2 relay is driven when the controller is speed-monitored (current limit not reached).

2- The K1 relay is driven when the product is not in "Faulty" condition.

The K2 relay is driven when the controller is speed-monitored.

3- The K1 relay is driven when the product is not in "Faulty" condition.

The K2 relay is driven when motor speed greater than 1% approx. of maximum speed (detection of non-zero speed).

4- The K1 relay is driven when the igniters are validated.

The K2 relay is driven when motor speed is greater than 1% approx. of maximum speed.

5- The move command is given by the presence of the reference with a relay configuration identical to that of colum 1.

6- Operation takes place only in 2 of the 4 quadrants, bridge reversal occurring on reaching zero speed.

The K1 relay is driven when the igniters are validated (motor " on").
The K2 relay is driven when the controller is speed-monitored (current limit not reached).

7- Integration by-passing at zero-speed.

Is used to avoid speed drifting on nearing to zero.
The K1 relay is driven when the igniters are validated (motor "on").
The K2 relay is driven when the controller is speed-monitored (current limit not reached).

8- Monitoring of a brake control to obtain an exclusively horizontal notion.
The K1 relay is driven when the igniters are validated.

For vertical motion, use the logical brake option.

CONNECTION TERMINAL BLOCKS SPECIFIC APPLICATIONS

APPLICATION EXAMPLES

Designation	J5	1	2	3	4	5	6	7	8	9
AT	24									
PL	23									
VL1	22									
SNO	21									**
ISI	20									
$\overline{SNO}$	19			*	*					
$\overline{DLIM}$	18									
CRB	17									
ODM	16									
ODM	15									
IHL	14									
VA	13									
CRA	12									
FS	11									
IGI	10									
CAO	09									
CAI	08									
SAO	07									
SAI	06									
RO	05									
RIN	04									
SRC	03									
SM	02									
SMA	01									

The controller is delivered with an option terminal block in configuration 1. The other uses are also possible (see page 11).
For these adaptaions to be possible, the product is delivered with 4 6-point connectors and 10 straps.

* ▬ direct link between terminals SNO and CRB.

* * ▬ direct link between terminals SNO and CRB.

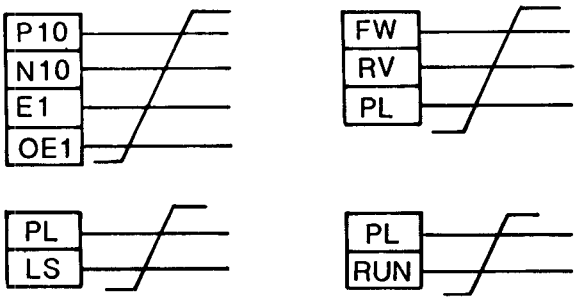
Installation

SET-UP PRECAUTIONS

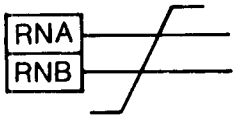
Mount the device vertically so as to allow the air to travel from bottom to top in the heater fins.
Avoid the vicinity of heating elements.
If the device is to be cabinet-mounted, provide openings with shutters for cooling air circulation.
In the case of forced ventilation, an opening should also be provided on the roof, with a protection hood.

ISOLATION
Apart from the terminal marked ⏚ which is reserved for this purpose, connect none of the conductors already wired to the terminal blocks to the earth or to the facility's ground.
The external circuits for speed and return (in the case of the tach dynamo) display will have to be wired with twisted cables (not ⩽ 5 cm).
In as much as possible control wires must be kept separate from the power cables.
On the next terminals, the information should mandatorily be wired as described above.
The maximum length of the link will be 5 m. Beyond this, an interface circuit should be provided for.

Terminal block J1 - Control board



Terminal block J1 - Power interface board



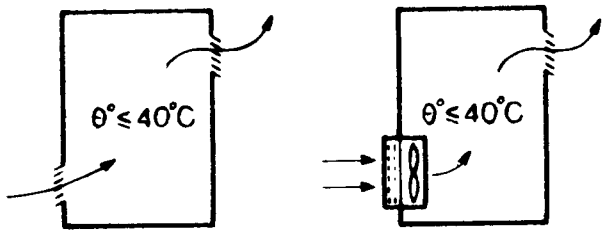
The other information available at the level of the customer terminal block will have to be cabled with twisted (not ⩽ 5 cm) and shielded (shielding connected to product ground) wires.

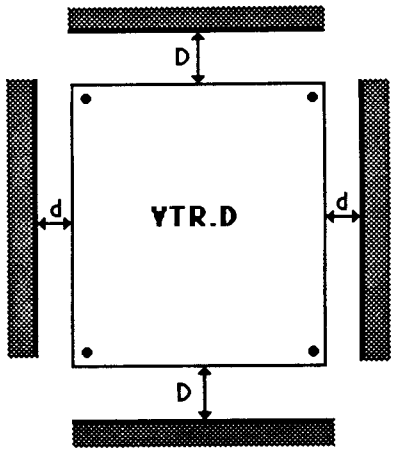
PROTECTED METAL CUBICLE SET-UP

Protection class : IP23

To ensure proper air circulation in the product :

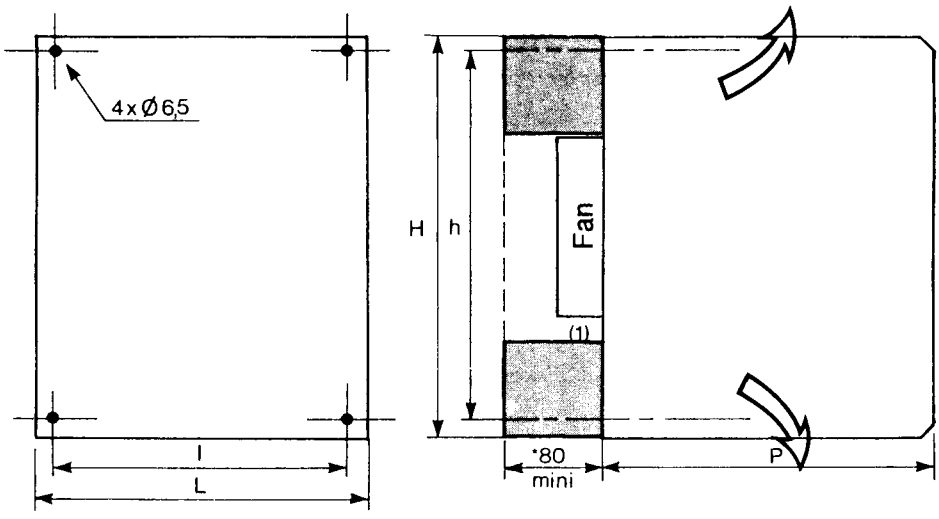
- reserve sufficient free space around the controller :
  . d ⩾ 50 mm,
  . D ⩾ 100 mm.
- provide ventilation holes,
- make sure ventilation is adequate, otherwise provide forced ventilation with filter.



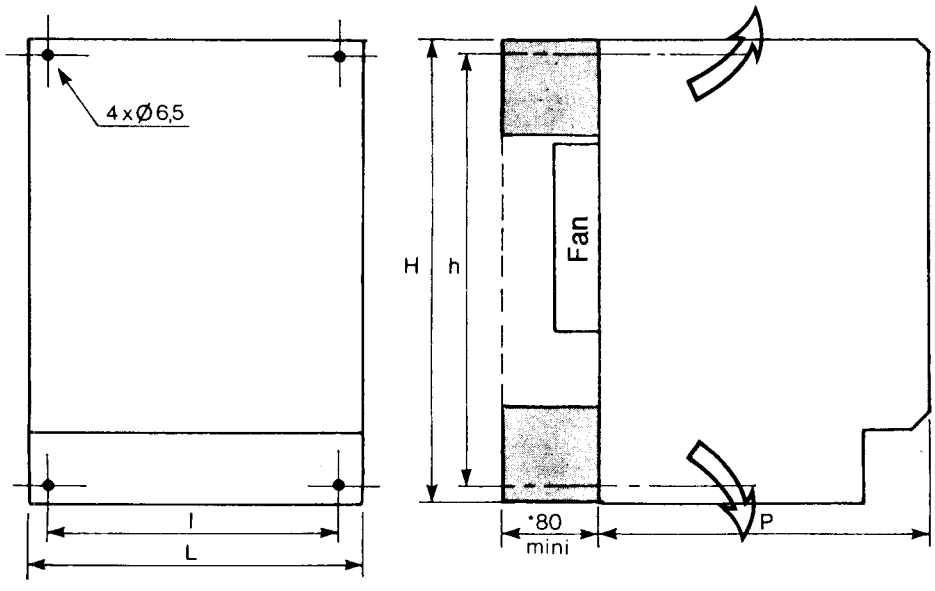


OVERALL DIMENSIONS AND WEIGHTS

VTR.D 24 TO 150 A



VTR.D 250 A

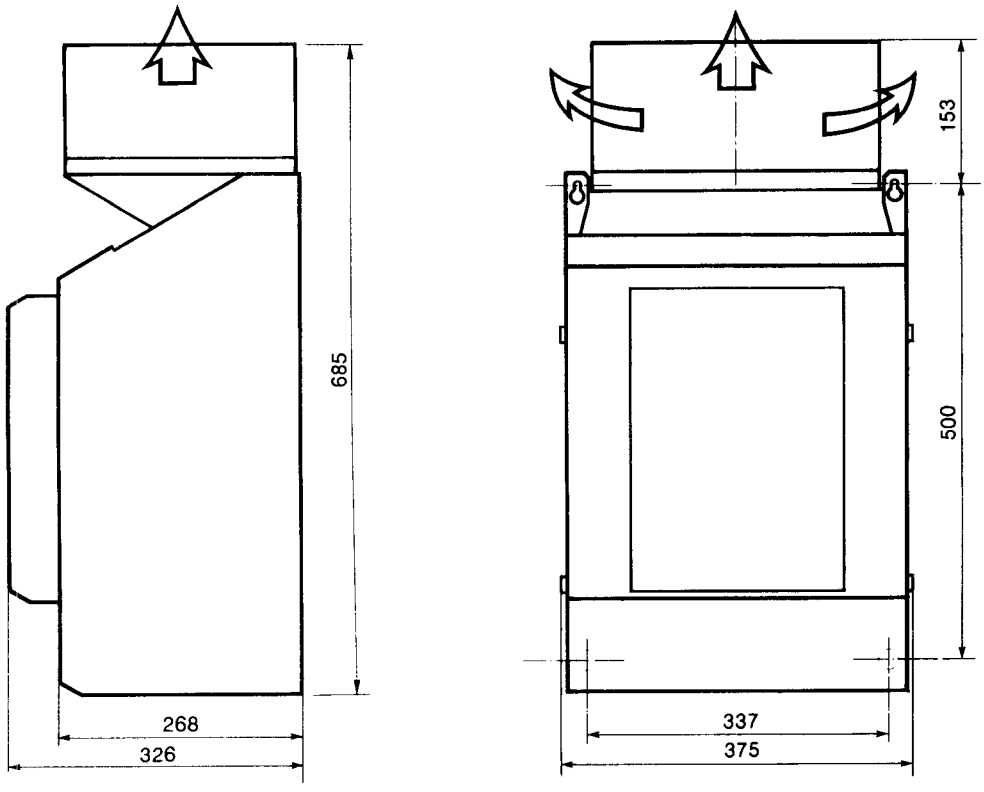


Ventilation spacers in the case of mounting on plane surface.

	Overall dimensions			Fastenings		Weight
controller	H	L	P	h	i	kg
VTR.D 24	323	231	190	290	200	6,5
VTR.D 36	323	231	230	290	200	10
VTR.D 72	323	231	230	290	200	10
VTR.D 150	323	231	230 + (80)*	290	200	11
VTR.D 250	403	231	230 + (80)*	370	200	13

OVERALL DIMENSIONS AND WEIGHTS

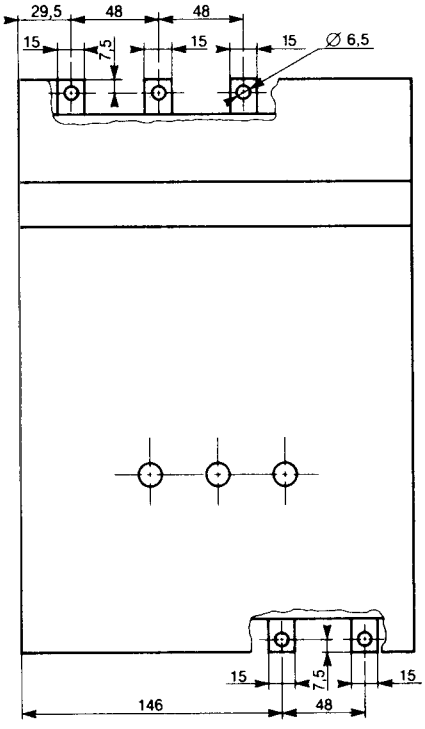
VTR.D 400 TO 650 A



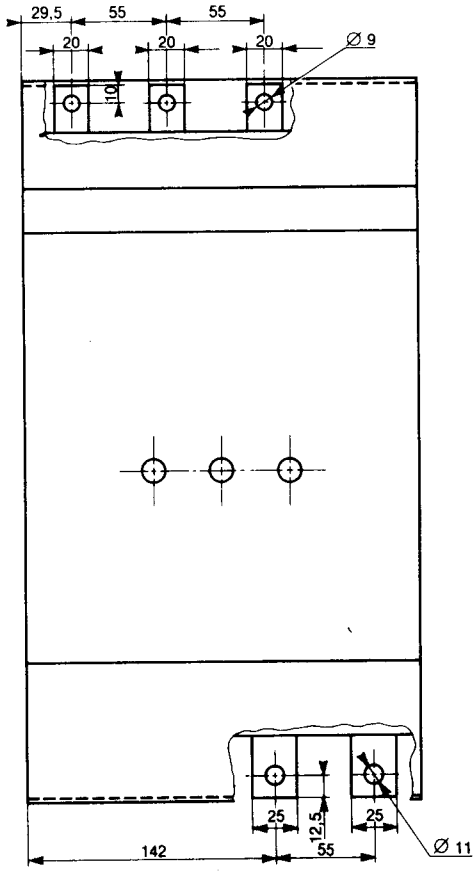
VTR.D	Weight
400A	47 kg
650A	47 kg

POWER CONNECTIONS

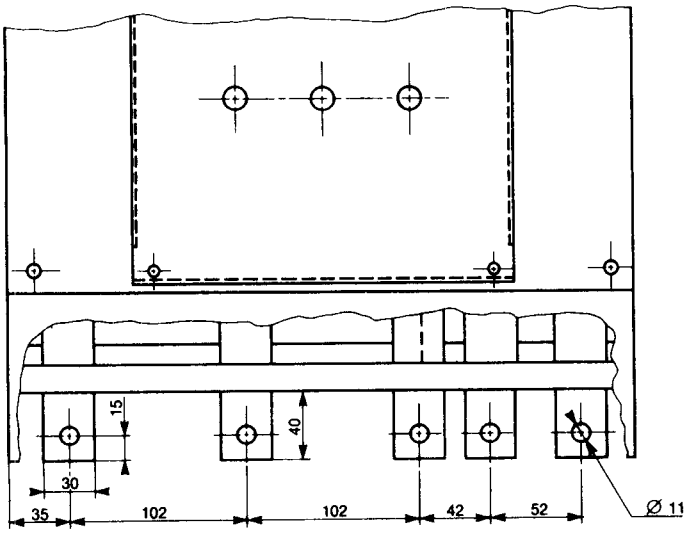
VTR.D 24 TO 150 A



VTR.D 250 A



VTR.D 400 TO 650 A

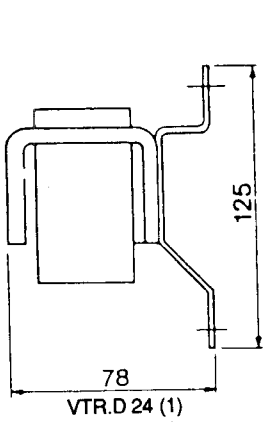


Installation

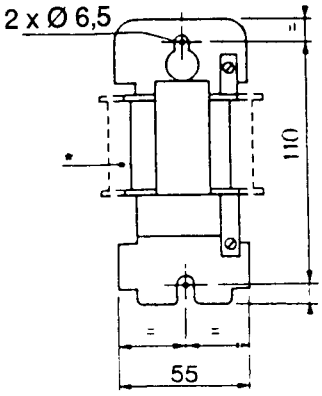
OVERALL DIMENSIONS AND WEIGHTS

LINE INDUCTANCES

Association with product, see page 34.

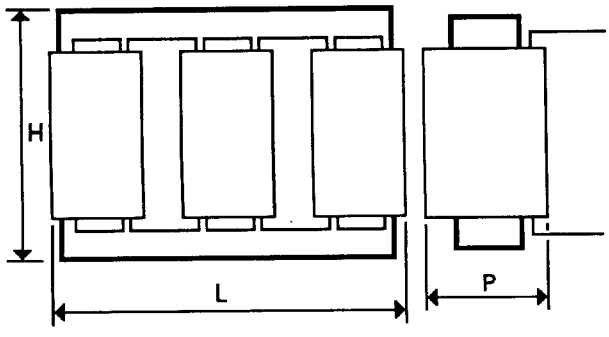


VTR.D 24 (1)
VTR.D 36 (2)
VTR.D 72 (3)



VTR.D 72 (3) : the coil exceeds the plate,the total lenght thus reaching 75.

Weight (1) = 0.610 kg
Weight (2) = 0.660 kg
Weight (3) = 0.770 kg

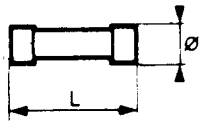


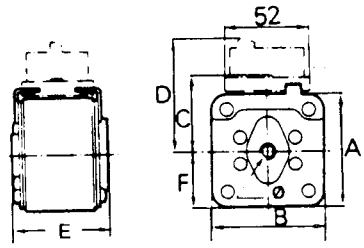
TYPE	L	P	H	WEIGHT
VTR 150	250	200	170	24 kg
VTR 250	300	220	190	27 kg
VTR 400	300	220	220	30 kg
VTR 650	300	220	220	40 kg

POWER FUSES - ULTRA-QUICK ACTING TYPE

Association with product, see page 34.

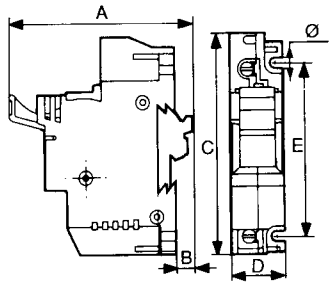
VTR.D	L	Ø
24	51	14
36	58	22
72	58	22





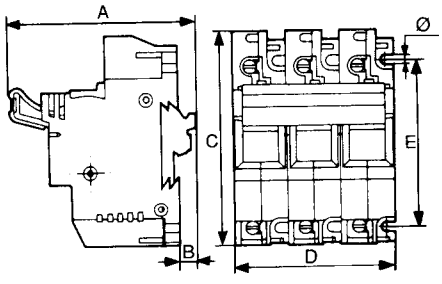
VTR.D	A	B	C	D	E	F	Ø
150	51	51	41	67	51	25,5	8
250	51	51	41	67	51	25,5	8
400	60	60	45	71	51	30	10
650	75	75	53	79	51	37,5	12

FUSE HOLDERS
Single-pole



VTR.D	A	B	C	D	E	Ø
24	90	9	106	26,7	80	4,4
36	90	9	106	26,7	80	4,4
72	96	9	140	36,2	110	4,4

Three-pole



VTR.D	A	B	C	D	E	Ø
24	93	9	106	80	80	4,4
36	93	9	106	80	80	4,4
72	99	9	140	108,5	110	4,4

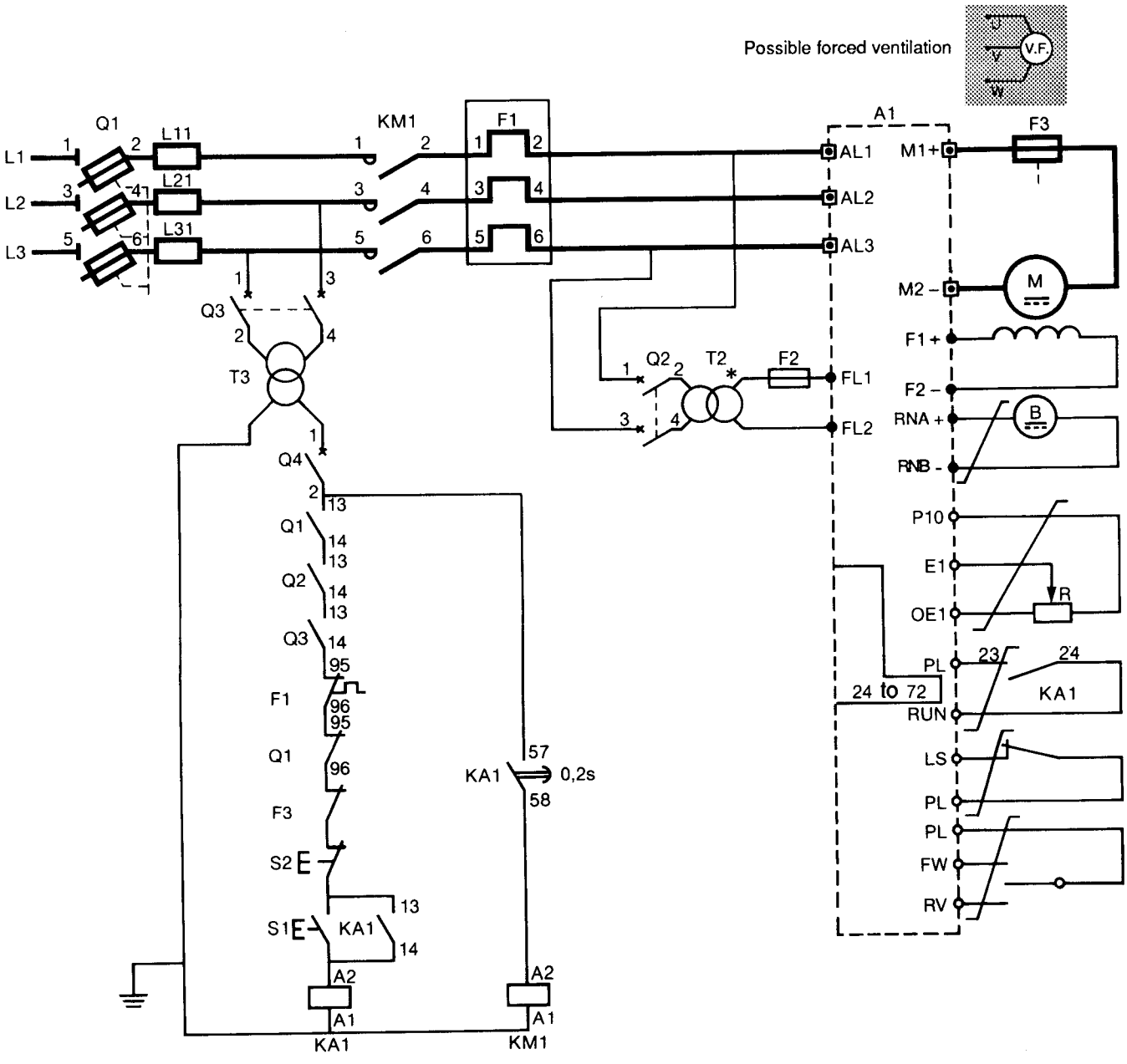
NOTE :

- Fuse sizes : 14 x 51 VTR.D 24 A.
  22 x 58 VTR.D 36 A and 72 A.
- For VTR.D 24 A to 72 A, the following must be provided for the sockets : one micro-contact.
- For the VTR.D 150 A to 650 A, the following must be provided for the fuses : an adapter, one micro-contact.

Connections

Power Supply : 220/240V or 380/415V or 440V
50/60 Hz
Variable 24 to 72 A

RECOMMENDED STANDARD LAYOUT

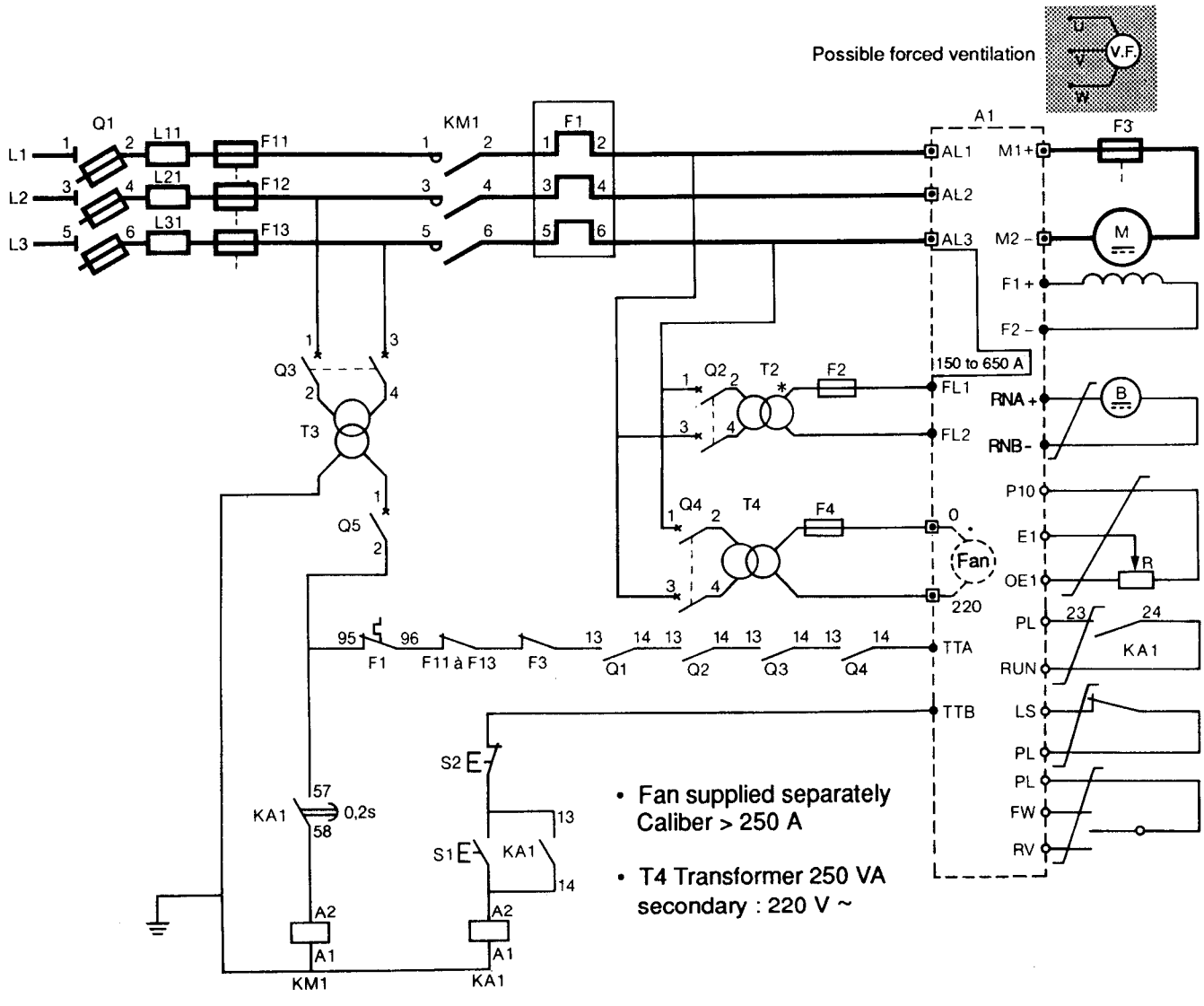


* **NOTE** : Wire the transformer T2 or FL1-FL2 between steps 1 and 3; the possible F2 and T2 depend on mains voltages and excitation.

Connections

Power Supply : 220/240V or 380/415V or 440V
50/60 Hz
Variable 150 to 650 A

RECOMMENDED STANDARD LAYOUT



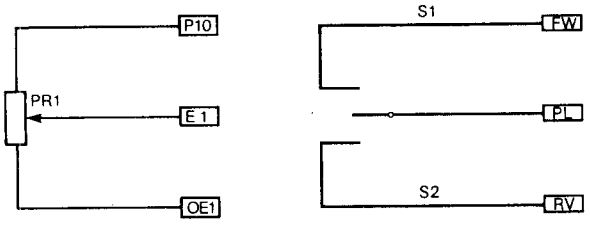
* **NOTE** : Wire the transformer T2 or FL1-FL2 between steps 1 and 3 ; the possible F2 and T2 depend on mains voltages and excitation.

Connections

SPECIAL APPLICATIONS

USE OF CONTROLS

Direction of operation controlled by FW and RV.



SPEED PRESCRIPTION INPUT FUNCTION

With the circuit, it is possible to have 2 voltage references or current references (0/20 mA, 4/20 mA).

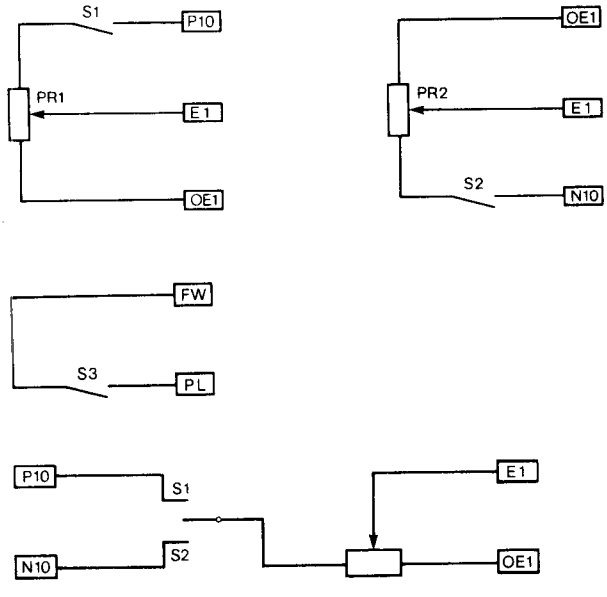
It is also possible to simultaneously enter 2 voltage references plus the 0/20 mA reference. The 4/20 mA current control must be used alone (20 mA in EC1 corresponding to 10 V).

A clipping circuit can be used to limit the sum of these various references to a value of 10 V approximately.

The circuit also provides for the low speed function, which consists of a modification of the clipping voltage. On output (SCR) is obtained the algebraic sum of E1, E2, and EC1 up to a level of 10 V, or less if the low speed function is activated (LS input not connected).

USE OF SPEED PRESCRIPTION INPUTS

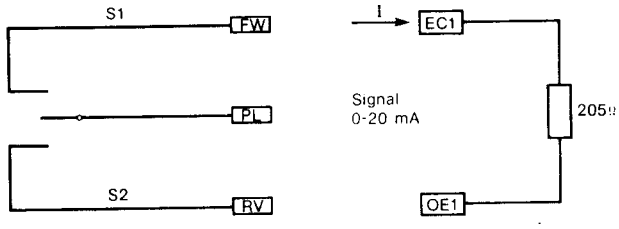
Direction of operation controlled by voltage polarity in E1 and E2.



In both situations, direction of operation is reversed by S1 and S2 when S3 is closed.

* 0/20 mA CURRENT CONTROL

Input impedance is 205 Ohm. 20 mA ≃ 10 V (10.2 V) in J5. 3 (SRC).

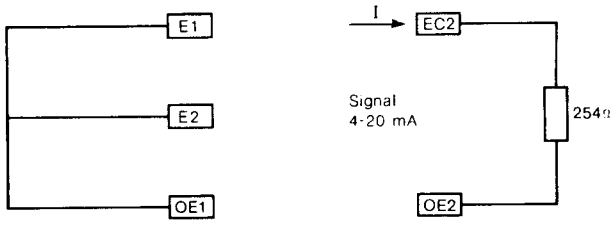


In the same time, voltage can be controlled on inputs E1 and E2 . Rotation direction is indicated by the action of S1 or S2.

* 4/20 mA CURRENT CONTROL

In this case, link up terminals E1, E2, and OE1.

Input impedance is 254 Ohm. The result is 10 V for 20 mA and 0 V for 4 mA in J5. 3 (SRC).

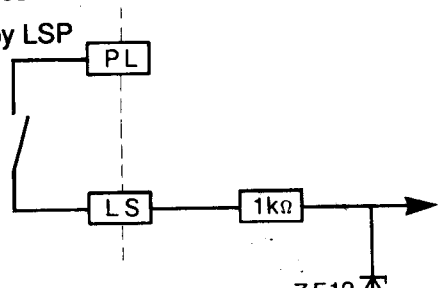


The 4/20 mA control cannot be used in the same time as another type of control.

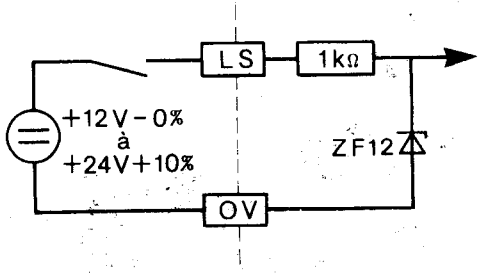
* REFERENCE CLIPPING CIRCUIT

When the PL-LS link has been removed, this makes it possible to clip the references to the value preset by potentiometer LSP and to obtain a low speed. Via this circuit, it will be possible to obtain 2 High-Speed (HSP) and Low-Speed (LSP) operating modes.

Fixed setting by LSP



Remote setting (LSP mini)



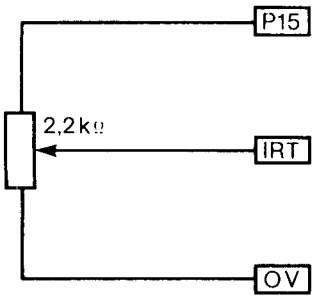
Connections

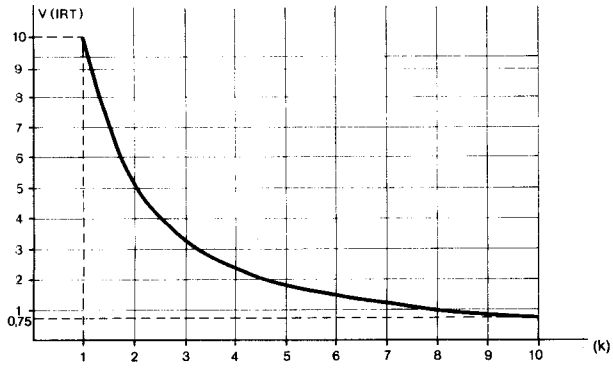
* RAMP

The acceleration time (ACC) and deceleration (DEC) times can be set separately. There are two ways of doing this :

- using a 2-position link setting two ranges : 0.5 sec to 6 sec and 60 sec.
- using a potentiometer to adjust time within each range of values.

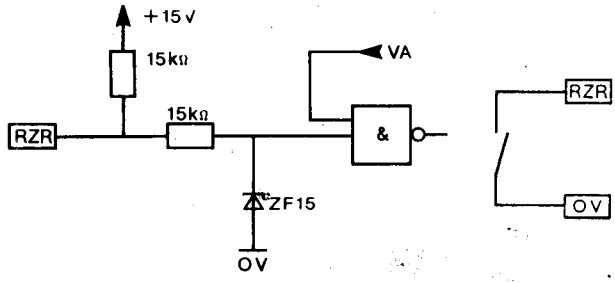
Ramp time can be modified via the IRT (J1. 24 input by connecting a 2.2 KOhm potentiometer based on the diagram below or by using an automoton analog output.



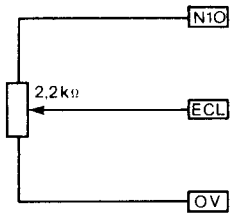


The action range is 1 to 10 V. Reducing such voltage increases all of the times adjusted by the ACC and DEC potentiometers in a ratio of 1 to 10.

With the RZR input non-connected, the speed ramp is validated. To reset the ramp, 0 V must be forced upon this input, otherwise, it must be connected to the 0 V terminal of the control board.



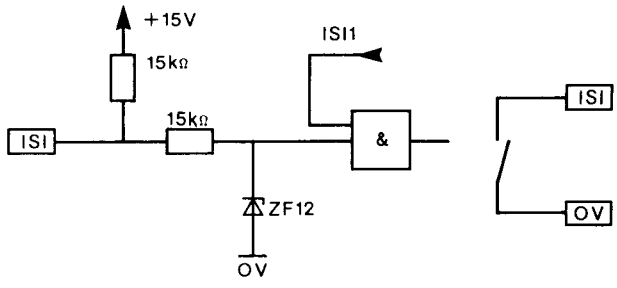
* EXTERNAL CURRENT LIMIT



I = 10 % with ECL = - 10 V
Limit current adjustable from 10 to 100%

* ISI INPUT OF CONTROL BOARD

This input is validated internally by a 15 KOhm resistor linked to + 15 V. Whenever the + 15 V terminal is not connected, integration of the speed amplifier is validated.

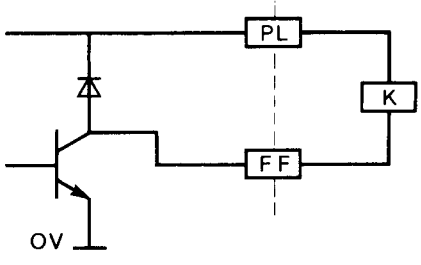


To cancel the action of such intergration, 0 V must be forced upon the input by connecting the ISI terminal to the 0 V terminal of the control board.

* NETWORK AND EXCITATION FAULT OUTPUTS

- Excitation fault (FF)

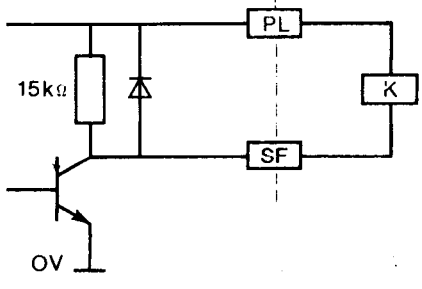
Output on open-collector transistor. In case of failure the transistor is latched and relay K is de-activated.



I max. = 20 mA with 24 V voltage

- Network fault (SF)

Output on transistor. In case of failure, relay K is de-activated.



I max. = 20 mA with 24 V voltage

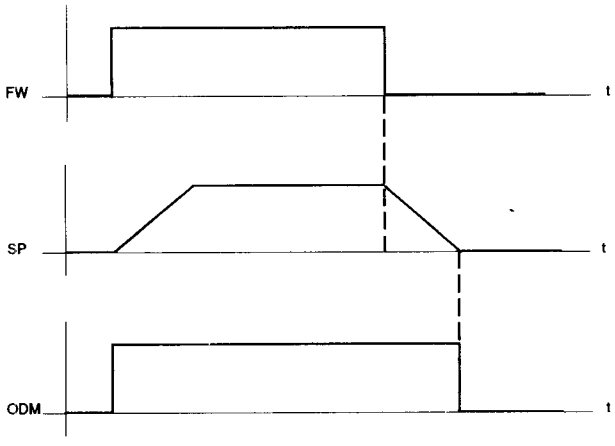
Connections

VALIDATION LOGIC

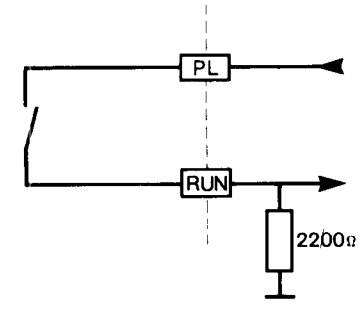
The start-up order is stored :
- either with the FW-RV information,
- or by the reference detector connected to SRC (SRC-SMA link on J5 terminal (see page 10) provides a start-up order via the presence of reference speed.

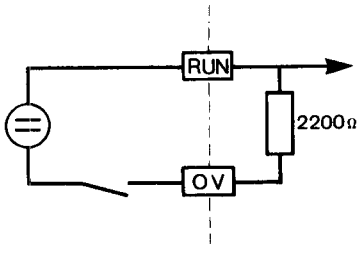
Presence of start-up order is reported by the green DEL (RF).
The memory is reset when the following two conditions have been met :
- start-up order missing due to removal of the FW or RV information or due to zero-reference speed detector.
- zero-speed, i.e less than 1% approx. of maximum speed.

Operation of this sequence is illustrated below.



The logic RUN, FW, and RV inputs are validated by PL or an external voltage source ranging between + 12 V - 0% and + 24 V +10%.



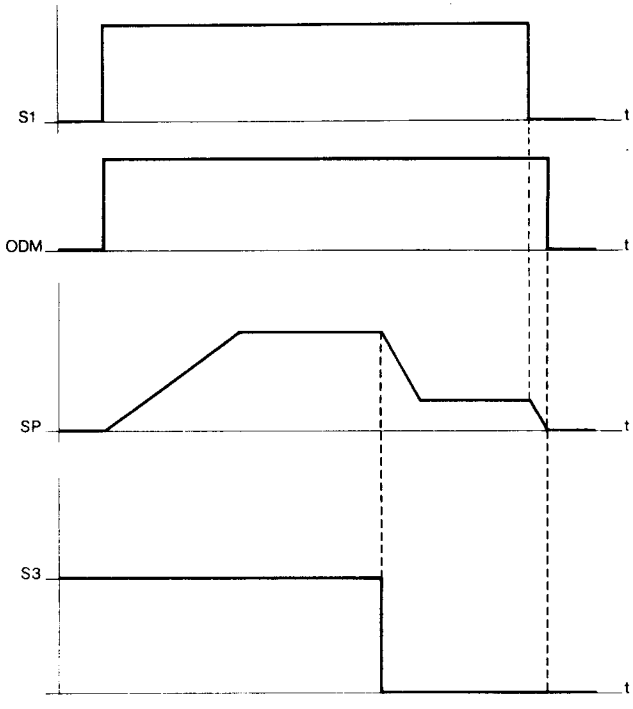


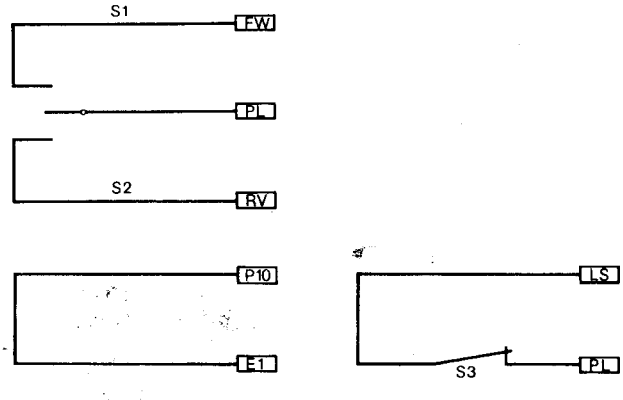
VALIDATION LOGIC

The controller is validated by the simultaneous presence of the RUN and IHL information. Resetting of either of these will latch the controller. When using a standard sequence, the IHL-ODM link is set up in order to.let the control logic drive the various validations.

* EXAMPLE OF USE

If two operating speeds are wanted (HSP:LSP), the FW (or RV) and LS information without external.
Closing S1 or S2 selects the operation direction.
Maximum speed is adjusted by HSP potentiometer.
Low speed, obtained by opening S3, can be set using potentiometer LSP.
A handling cycle can thus be achieved.
The controller is locked when zero speed is reached (near to 1 % of N max, speed).

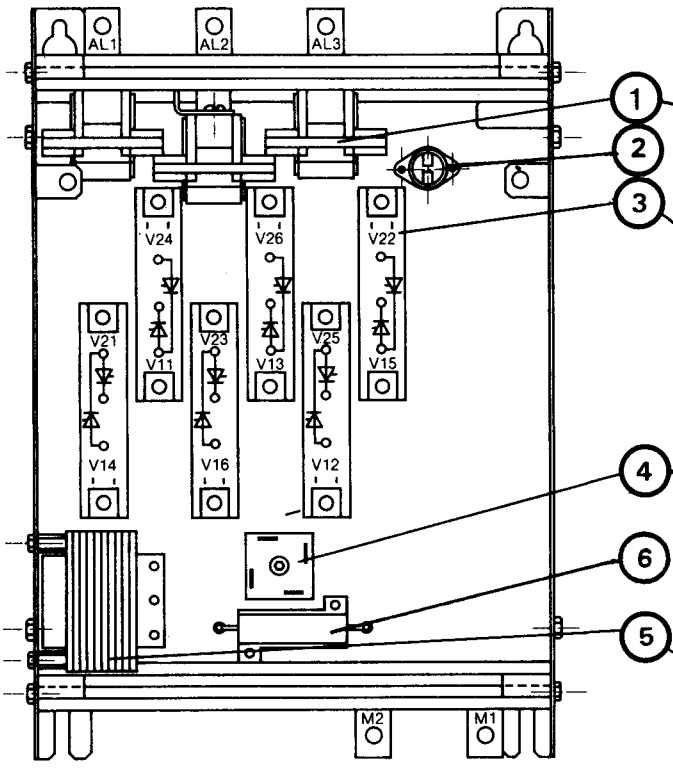




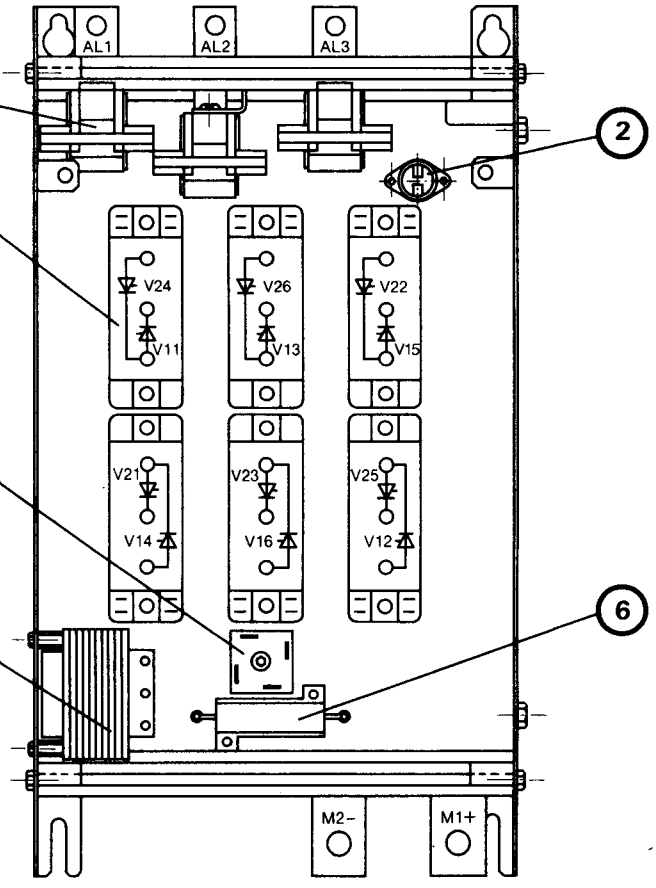
Layout

POWER BRIDGE

24 to 150 A



250 A



1- Current transformer

2- Thermocontact, only for 150 and 250 A.

3- Thyristor-type module (6 per controller)

4- Excitation rectifier

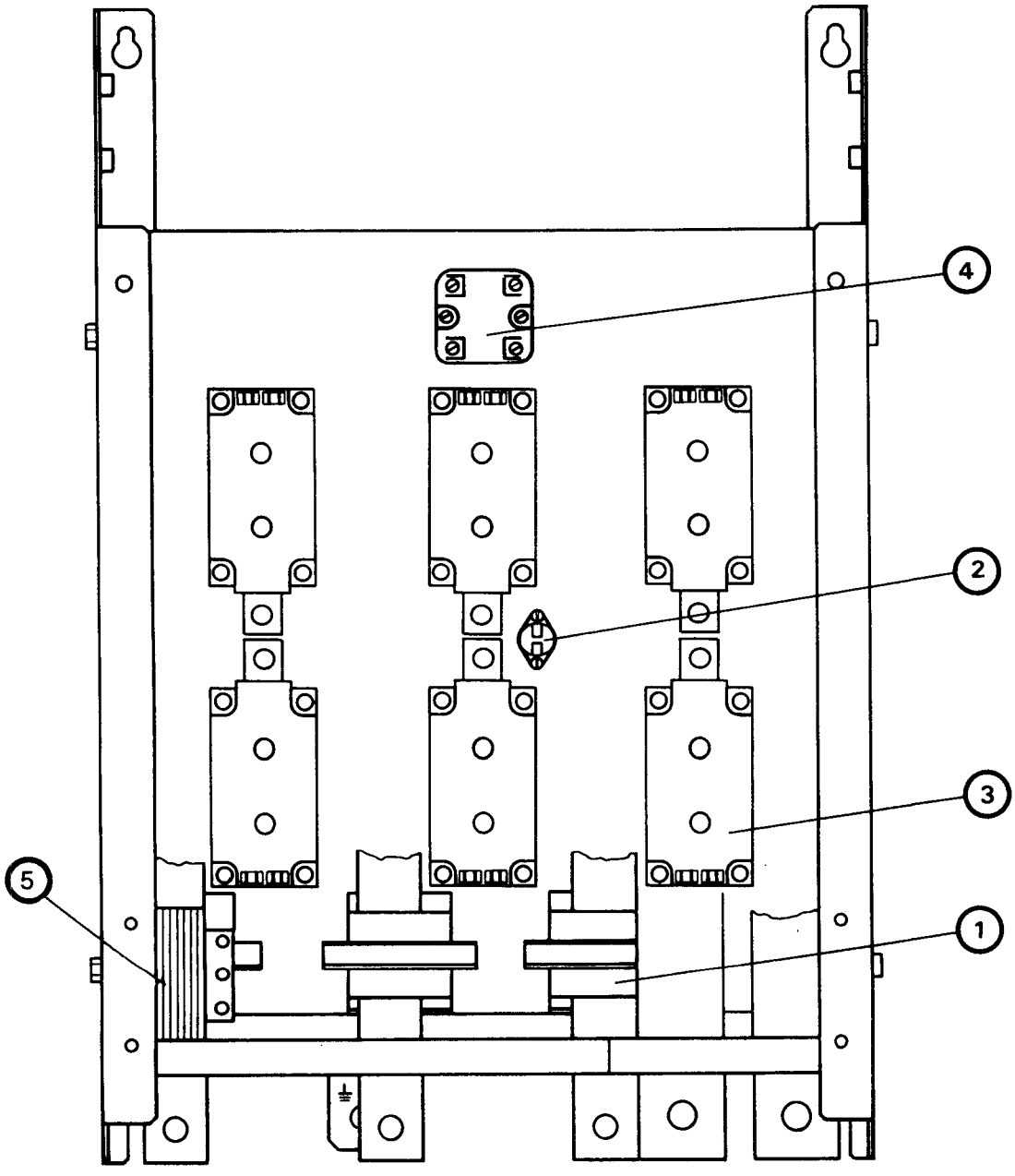
5- Control supply transformer

6- **Resistor** (mounted in series with fan) **only for models 150 to 250 A.**

Layout

POWER BRIDGE

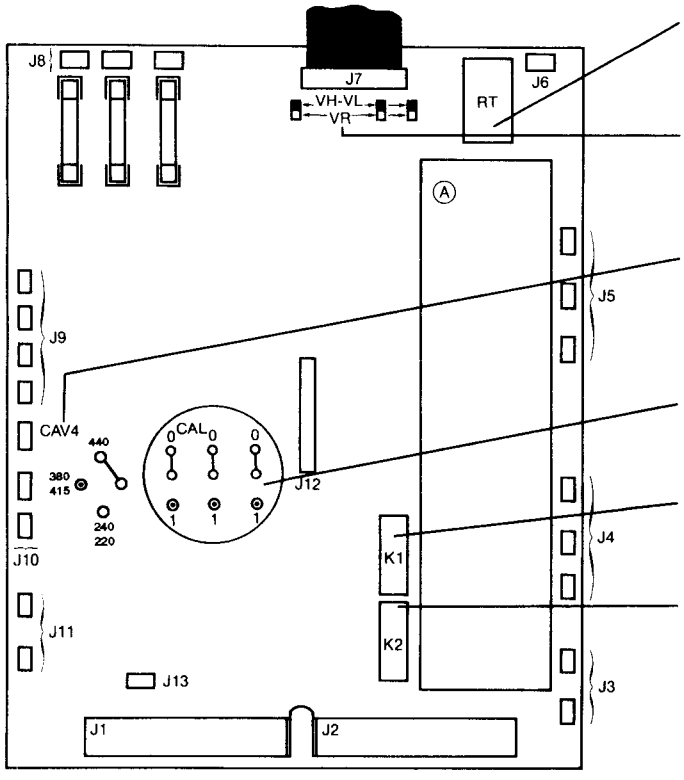
400 to 650 A



1- Current transformer
2- Thermocontact.
3- Thyristor-type module (6 per controller)
4- Energization rectifier
5- Control supply transformer

Layout

POWER INTERFACE BOARD



Current read adaptation as per caliber.
Current module, see page 34

Set in VL; (Low speed).

Control transformer power supply adaptation to match mains.

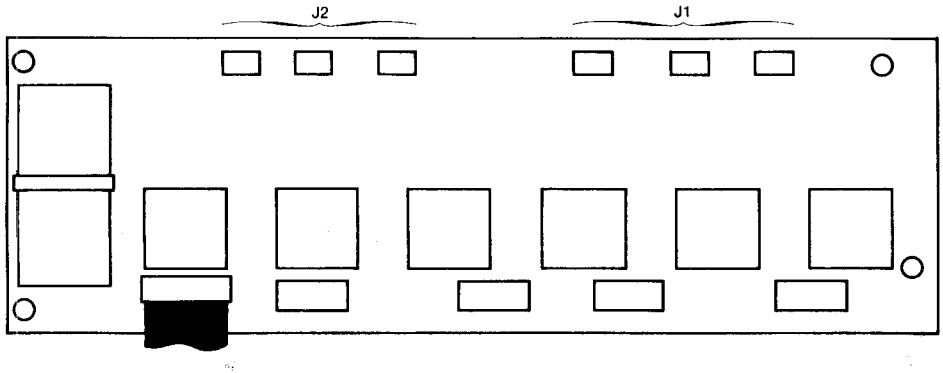
To segregate control supply from power supply.

Relay mounted when variator is validated.

Relay mounted when variator is beyond limit or speed = 0, or brake control.

J3 : Thermocontact
J4-J5 : Thyristor cathode/trigger outgoing
J6 : Current transformer reading link
J8 : Power voltage intake
J9 : RC connection to thyristor terminals
J10 : Control transformer supply and outgoing
J11 : Fan supply
J12 : Speed return - Galvanic insultation board adaptation
A : Reversible igniter board

REVERSIBLE IGNITER BOARD

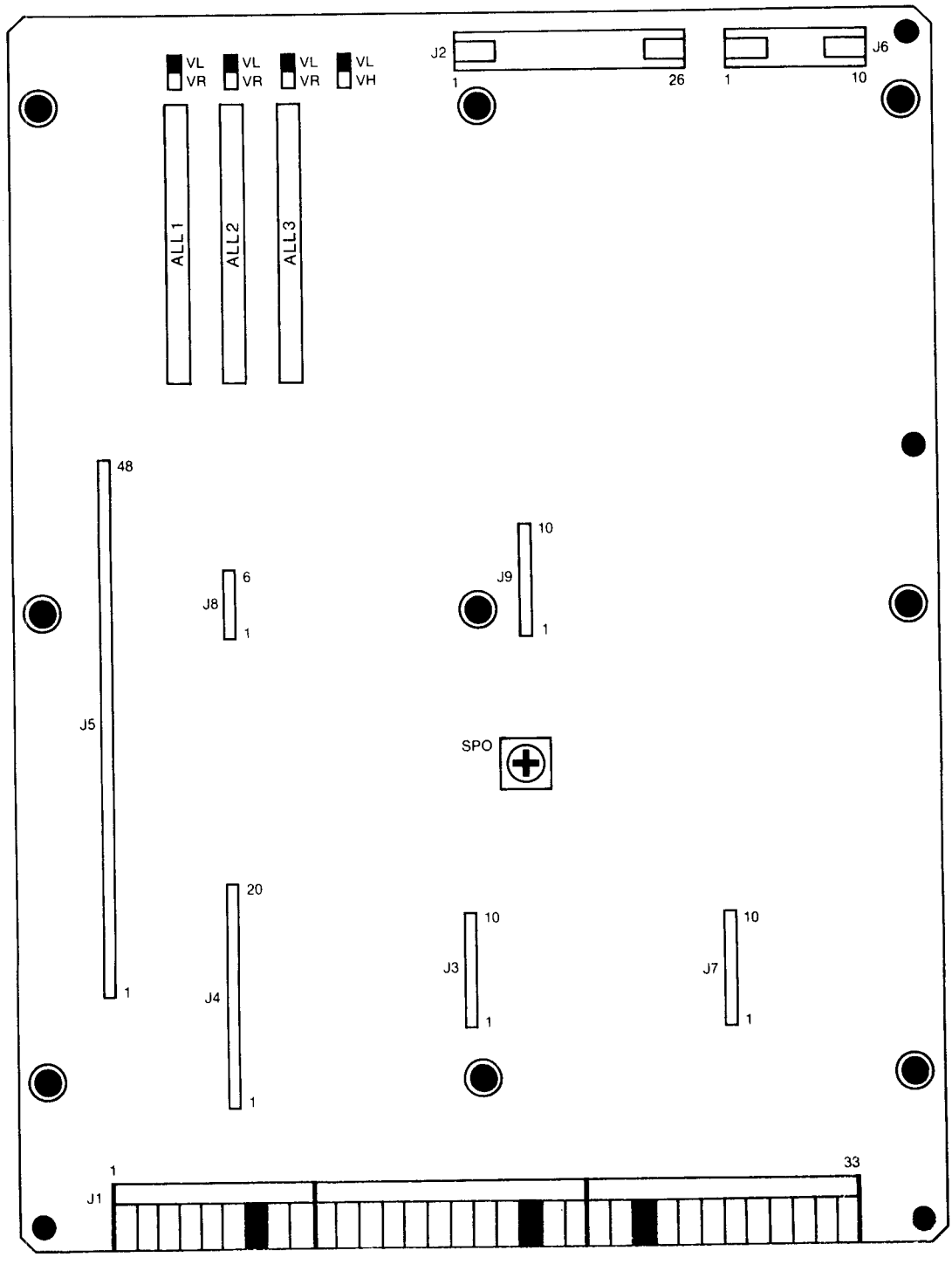


J1 : Thyristor cathode/trigger outgoing V22, V24, and V26.
J2 : Thyristor cathode/trigger outgoing V21, V23, and V25.

Layout

CONTROL BOARD

Product type selection link. Set to low speed (VL).

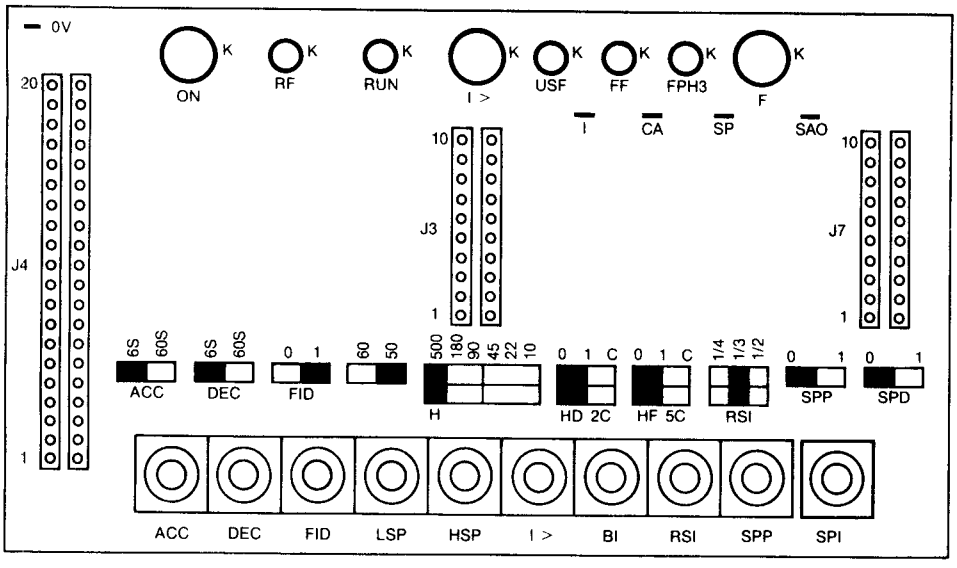


SPO : Setting of amplifier offset (factory set).

Layout

LINKS
POTENTIOMETERS
ELECTROLUMINESCENT DIODES (LEDs)

Settings board



■ Initial position of the links.

LINKS
ACC : Acceleration time setting range
DEC : Deceleration time setting range
FID : Deleting of "excitation" current presence" function (position 0)
50/60 : Mains frequency selection (50 or 60 Hz)
H : Selection according to return voltage level
HD : Speed return derivative (selection of time constant) (page 28)
HF : Filter on speed or voltage return (select breakfrequency) (page 28)
RSI : Current loop adaptation (page 28)
SPP : Range of speed amplifier static gain variation
SPD : Derivative action of speed amplifier.

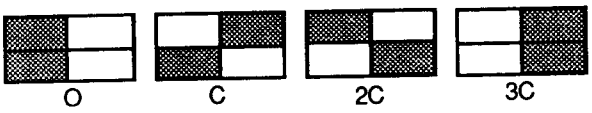
POTENTIOMETERS
ACC : Acceleration time setting range
DEC : Deceleration time setting range
FID : (Field) Setting of "excitation current presence" comparator threshold to (active if link FID set to 1)
LSP : Low speed setting
HSP : High Speed setting
I ≥ : Setting of limit current value
BI : Setting of brake current
RSI : Setting of current loop response time (respons. I)
SPP : Setting of proportional gain of the loop amplifier
SPI : Setting of integral gain of the loop amplifier
NOTE : After factory tests, the RSI, SPP and SPI potentiometers are preset to 1/3 of the stroke. FID and BI are full clockwise. ACC, DEC LSP, HSP and I ≥ are fully anti-clockwise.

TEST POINTS
OV : OV
I : Current Intensity signal (+5 V average for I ≥ set with ECL not activated).
CA : Output of external current loop (0 / + 10 V)
SP : Speed or voltage signal (± 8 V for maximum speed set with HSP).
SAO : Speed amplifier output (± 10 V)
LEDs : see page 28.

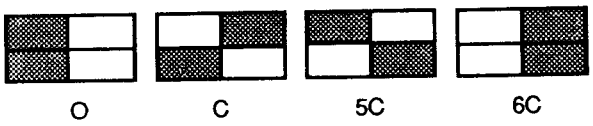
Commissioning

LINKS

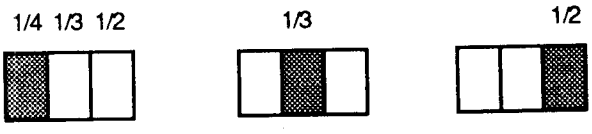
. HD links : speed return derivative



. HF links : speed return filter



. RSI links : current loop adaptation



Very low reactor motor | standard motor | High reactance motor

ELECTROLUMINESCENT DIODES

4 red LEDs

- USF : under mains voltage
- FF : Excitation fault
- FPH3 : Phase 3 fault (no phase)
- F : signals that there is one of the 3 above faults

3 green LEDs

- RUN : lit when terminal is activated
- RF : lit when operation direction has been selected
- ON : lit when the variator has received the RUN and R or F information.

1 yellow LED

- I ≥ : lit when the controller is current limited.

PRELIMINARY CHECKS

The controller is factory preset to the most common operating conditions and with terminal block J5 wired as per configuration 1 (Page 12). Check that they are compatible with the use considered.

WITH POWER OFF
Examining the identification plates and tags of the installed equipement, check the compatibility between controller.

If a voltage reference prescription is to be applied, check the connection of the speed prescription potentiometer and mesure its Ohm value : with a multimeter :
- recommended value : 2200 0hms (terminals 0E1 and P10 or N10 disconnected),
- prescribed value : 1 k0hm ≥ R ≥ 10 k0hm,
- power : P ≥ 3W.

Check proper position of links (as shown on pages 25, 26, 27, and 28. To check the links on the power interface board, it is necessary to remove it from the control box.

• Power Interface Board
If mains is greater than 440 V, set 3 the CAL links to 1 and insert an auto-transformer between the mains and terminals CL1, CL2, and CL3 in order to supply control with 380 V. Place CAV4 on position 380/415 V (page 25).
If there is no galvanic insulation board, check presence of connector J12 on the power interface board.
If the power interface board is replaced, place back the RT box adapted toeach calibre (see pages 25 and 34).

• Potentiometers (page 27).
Caution : To make the settings, make sure that potentiometer LSP is idle. To do so, by-pass terminals PL and LS on terminal block and control board.

SETTING UP OF ADD-ONS
Galvanic insulation board
The base product is delivered without this optional board. If needed, mount onto the power interface board taking care to unplug connector J12 (board delivered in kit form).

Variable current limit board
The base product is delivered without this optional board. Connect it to connectors J8 an J9 of the control board with no other wiring.

Commissioning

Variable gain board
This board includes the variable current limit function.
The base product is delivered without this optional board. Connect it to connectorsJ8 and J9 and the control board with no other wiring.

Vertical motion board
This board includes the variable current limit function.
The base product is delivered without this optional board. Connect it to connectors J8 and J9 of the control board (board delivered as a kit with connectors + board).

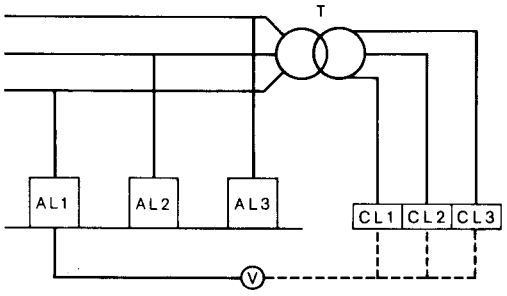
STATIC SETTINGS

EQUIPMENT REQUIRED
- One multimeter, preferably 20 000 0hm/Volt.
- Optionally one 2-way oscilloscope.

Only use an apparatus isolated from the mains. Do not connect the oscilloscope ground to any other ground of the facility.
- optionally one moving coil ammeter, with by-pass if required.

PRECAUTIONS
Check that the LS (C.J1.30) /PL (C J1. 28) link has been established.
Do not request any direction of operation (RV or FW).

TIMING CHECK
- Power on the equipment,
- The FF and F LEDs light up,
- In the case of separate supply for control and power (CAL links of the power interface board set to 1), check phase matching.

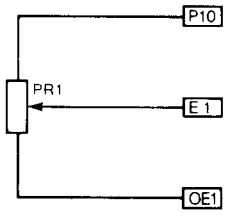


Measure AL1-CL1,CL2,CL3.
For the smallest voltages measured.
connect the relevant wire to CL2.

Measure AL2-CL2,CL3;
For the smallest voltages measured.
Connect the relevant wire to CL2.
Connect the remaining wire to CL3.

REFERENCE POTENTIOMETER

Check its value and connection.
- Recommended value : 2.2 k0hm.



Potentiometer set to 0 : OV between 0E1 and E1.

Potentiometer set to maximum value : + - 10 V between 0E1 and E1.

Bring back the reference potentiometer to zero.

SETTING THE EXCITATION CURRENT THRESHOLD

The FF and F red LEDs are always lit.
Set the Excitation presence safety using the FID potentiometer of the settings board (adjust setting with motor warmed up).

Check the Excitation voltage is correct.

Turn FID anti-clockwise till FF LED goes off.
The F LED should also go off (otherwise, check Excitation, circuit).

Switch power off.

CHECK ON DIRECTION OF ROTATION

Set selection link H to position 500.

Connect a voltmeter between terminals RNA and RNB of the power interface board (zero on RNB).

By-pass integration, with terminal ISI of control board on OV.

Caution : The motor may start racing if the tach dynamo is reversed or not connected. (Plan a stop in the sequence of operation : scheduled stop,emergency stop, etc...)
It can be wiser to use the ECL (C J1. 10) input to limit current and prevent the motor from racing too fast. (see diagram on page 21). For - 10 V on ECL, current is limited to a near to zero value.

Switch power on.

Commissioning

Give the motion order FW. The green FF LED lights up as well as the ON LED, if a RUN order is given.

Display a low speed reference (1/4 approx.). The motor starts rotating.

Check the sign of voltage return on voltmeter.

1/ If the voltage sign is negative, the motor does not race.

Check that the motor is rotating in the desired direction (FW command). If not so, cancel command FW and cutt off main power supply of the facility and swap the connection of the tach dynamo on RNA and RNB, as well as the excitation supply on continuous side (F1 and F2).

Cancel the FW direction order.

Switch power off.

Set link H of the settings board according to the characteristics of the tach dynamo and maximum speed of the motor.

2/ If the sign of the voltage is positive, the motor races.

Stop the sequence. Cancel the FW direction orders. Reverse the sign of the tach dynamo by swapping the wires between RNA and RNB of the power board.
Resume checking on rotation direction.

3/ If the voltage is null, interrupt the sequence and check continuity of the tach dynamo circuit. Cancel the requested FW direction order and resume testing on rotation.

NOTE : The voltage sign on the tach dynamo is valid for this test for a given positive reference and a requested FW rotation direction.

Switch power off.

Remove 0 V and ISI by-pass.

STATIC SETTINGS

SETTING OF SPEED AMPLIFIER GAINS
The controller is delivered with the following response time setting :
The static gain is set in setting ranges by the link :
- position 0 : 4 to 20; position 1: 20 to 100 (link on position 0).
- adjusting within each range by SPP potentiometer (set to 1/3 of its stroke clockwise).

Setting of the integration constant by SPI potentiometer :
- range adjustable from 20 to 900 ms. Set to 1/3 of its stroke clockwise).
RSI potentiometer set to 1/3 of its stroke clockwise.

SETTING OF CURRENT LIMIT
Precautions
- Do not remain too long in current limit mode for there is a risk that the motor and the collector fins will heat up.
- Never exceed the I max. value shown on the controller plate. For cyclic operation, see page 6.
- Remember to downgrade the variator by 1.2% per °C for ambient temperatures ranging between 40 to 60 °C.

For example :
Assume a VTR.D 3.36 operating at 55°C ambient temperature.Downgrading is equal to :
1.2 x (55 - 40) = 18%, namely a caliber downgraded by :

$$36 \times \frac{(100 - 18)}{100} = 29{,}5 \text{ A}$$

For a motor operating with Td/Tn of 1,2 and
n = 0,85 , the maximum power available from the motor becomes :

$$\frac{\text{I max.} \times \text{U arm} \times n}{\text{Td/Tn}} = \frac{29{,}5 \times 400 \times 0{,}85}{1{,}2} = 8358 \text{ W}$$

Switch off mains supply.
Open the excitation circuit by disconnecting FL1 or FL2 (or open the sequence fuse). Cancel the excitation fault control. Set jumper FID (settings board) to 0.
If possible, mechanically latch the motor shaft. Set the multimeter between the 0 V and DCC terminals of the control board.

Commissioning

Switch power on again.
Display maximum speed (on reference potentiometer).
Give a motion order FW. The RF green LED lights on with the ON LED.
The motor is not turning. The I ≥ LED must be lit.
Turn I ≥ clockwise on the settings board to obtain the desired limit current value allowing for Cd/Cn.
Limit setting is : Ip/3 to IP.
The voltmeter connected between 0 V and DCC reads + 7.2 V for the permanent current of the controller (+ 10 V for the peak of the variator).

Example : for the VTR.D 3.150, + 7.2 V corresponds to 150 A.
- Switch power off.
- Reconnect terminals FL1 and FL2 of the power interface board.
- Bring back the reference potentiometer to zero (0).
- Unlatch the motor - set FID link back to position 1.

NOTES:
1/ For the motors that cannot be set mechanically, the limit will be set "on the fly" during the dynamic setting process.
2/ For applications requiring quicker current loop response times, see pages 31 and 32.

BRAKING CURRENT INTENSITY
Setting by BI potentiometer of the settings board. The maximum braking current equal to limit current on BI is turned fully clockwise. It is possible to reduce it by turning BI anti-clockwise according to the desired current setting (BI is a percentage of 10 to 100% of the limit current as set by I ≥).

SETTING OF THERMORELAY
The thermorelay is sized according to motor In.
Calibre : 0.82 motor In.

SETTING OF THE MAXIMUM SPEED
Connect a voltmeter between the power terminals M1 and M2 (motorarmature voltage).
Set HSP fully anti-clockwise.

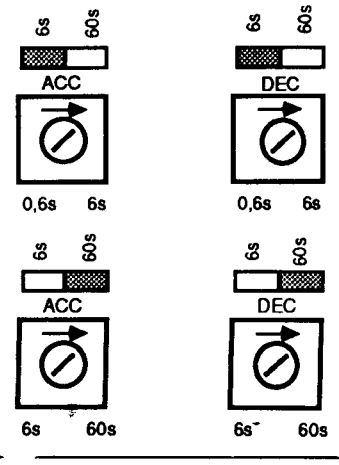
Switch power on.
Select RUN and then FW or RV.
The green ON LED should be lit and all other LED off.
Display a reference value : the motor should start.
Display 10 V as reference.
Adjust maximum speed of the motor using the HSP potentiometer of the setting board, measuring the armature voltage of the machine between M1+ and M2- of the power bridge. Do not exceed the maximum voltage ratings given on identification plate.
Check that this voltage indeed matches the maximum speed of the machine measuring voltage between RNA and RNB terminals of the power interface board.

Example :
For a 3000 rpm motor with 400 V induced and 60 V 1000 rpm tach dynamo, make sure that a value of 180 Vbetween RNA and RNB coincides with the value of 400 V between M1+ and M1-. Otherwise, adjust excitation current.

CHECK ON SETTINGS
With a null reference, check that a near-to-zero voltage is present between terminals RNA and RNB of the power interface board.
Otherwise, adjust SPO potentiometer on the control board.
If required, re-adjust maximum speed setting.

LOW SPEED SETTING
If such speed is required, the LSP potentiometer must be made active by removing the LS/PL link on the control board terminal block.
Adjust LSP to obtain the desired value. Setting range is 10 to 100% of maximum speed.

RAMP TIME
Ramp times are defined in two setting ranges adjustable by ACC and DEC potentiometers of the settings boards.



DYNAMIC SETTINGS
SPECIFIC APPLICATIONS

IMPROVING PERFORMANCE
Improved settings can be obtained by acting on the potentiometers of the settings boards :
- RSI : sets the current loop response time (page 32).
-SPP : sets the proportional gain of the speed amplifier (see pages 32, 33).
- SPI : sets integral gain (see pages 32, 33).
Set Ramp Time fully anti-clockwise.
The product is delivered with a current ramp time corresponding to applications not requiring high performance.
In the case of applications requiring quicker response times, it is necessary to re-adjust the setting of RSI potentiometer on the settings board and to set link RSI as shown page 28.

CAUTION : Make sure that the motor can withstand the di/dt ratio, which is going to be applied. This value generally depends on the following parameters :
- motor maximum speed,
- motor maximum current rating,
- Ko coefficient

whence : $\frac{di}{dt} \leqslant Ko \frac{In}{I\,max} \times \frac{Nm}{N\,max}$

Ko is dependent on the motor :
- Ko ≃ 60 for a solid body motor
- Ko ≃ 200 for an alaminated body motor.

In : nominal current } as indicated in
Nn : nominal speed } manufacturer catalogue

Imax : Maximum start-up or braking current
Nmax. : Maximum speed at which the motor is to run.
di/dt : As expressed in In/sec.

Example :
Imax. = 1.5 In; Nmax. = Nn and laminated body motor

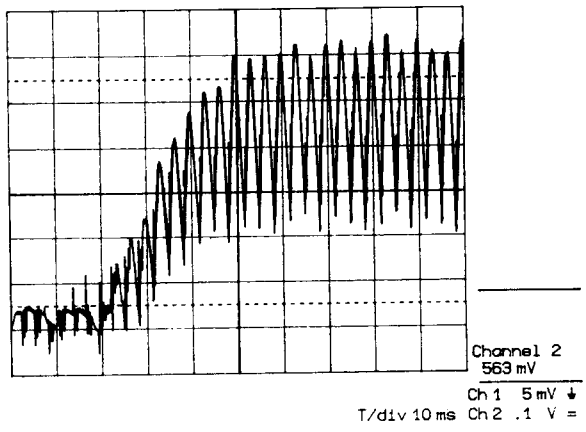
$$\frac{di}{dt} = 200 \times \frac{1}{1,5} = 13 \text{ In/sec.}$$

whence 1.5 In --> 9 ms

Setting : This is done after the limit current has been set.
- Connect an oscilloscope, preferably memory-type, between the 0 V and I test points of the settings boards.
- Open the excitation circuit on Altern. side FID on 0.
- By-pass the speed amplifier integration (ISI and 0 V terminals connected).
- ACC and DEC potentiometers fully anticlockwise
- SPP potentiometer fully clock-wise.
- Display full reference voltage, which equals applying a current reference increment to the current amplifier input.
- Validate the product by FW and RUN.
- Perform test on stalled motor or during speed-up process in limit current mode.
- Adjust RSI potentiometer of the settings boards so as to obtain a current ramp time as quick as possible, e.g, 10 MS = 10% tolerance.
- Switch power off.

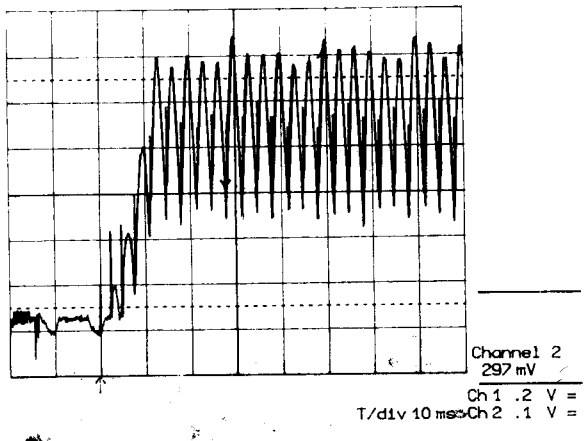
WHEN SETTINGS ARE COMPLETE SET THE POTENTIOMETERS AND LINKS BACK TO INITIAL POSITION
- Reconnect the excitation circuit.

SETTING OF THE RAMP TIME
* STANDARD SETTING



SPI and SPP potentiometers set to maximum value clockwise.
RSI potentiometer set to 1/3 of its stroke.

* RSI POTENTIOMETER SET



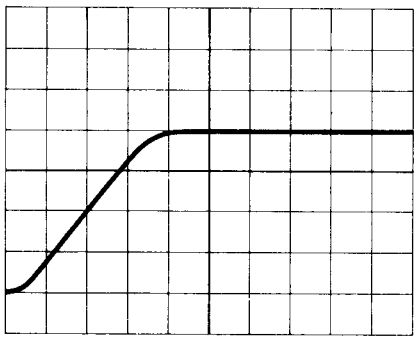
and SPP potentiometers set to maximum rating clockwise.

ACTION OF THE SETTING PARAMETERS
Speed amplifier setting :
- display low speed prescription (e.g. 20 %).
- validate product by FW and RUN.
- start by adjusting SPI up to stability limit, as shown in the figures below, then also set SPP to limit stability.

Current loop set to obtain 1.5 In in 12 ms.

Connect an oscilloscope between test points 0 V and SP of the settings board. The curves below represent the speed signal according to the SPI and SPP settings.

A

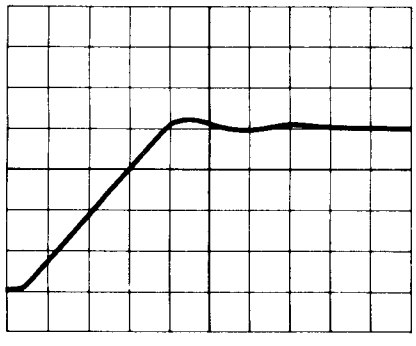


SPI minimum

SPP minimum

SPD position 0

B

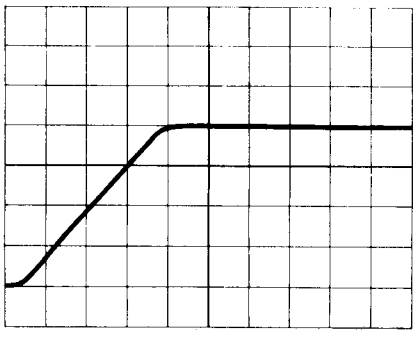


SPI set

SPP minimum

SPD position 0

C



SPI set

SPP set

SPD position 0

If after setting SPP and SPI a curve of type B is still obtained, set SPD link to position 1. If required, readjust SPI and SPP settings as well as the ramp times.

Add - ons and spares

BOARDS

DESIGNATION	VTR.D	TYPE	CODE
Control board	all calibres	VX1-DR303L	to be assigned
Interface board	all calibres	VX1-DM203M	to be assigned
Settings board	all calibres	VX2-DF303L	to be assigned
Igniter board	all calibres	VX2-DB303L	to be assigned

OPTIONS

Galvan. Insul. board	all calibres	VW2-DM207H	to be assigned
Vert. motion board	all calibres	VW2-DC310L	to be assigned
Variable gain board	all calibres	VW2-DF309L	to be assigned
Board I= f (N)	all calibres	VW2-DF308L	to be assigned
Current module board	all calibres	VZ6-DL...(1)	to be assigned

(1) The module reference ends with a reminder of the calibre of the maximum permanent current (I) to which it is associated :

Example : VTR.D 3-72 and module VZ6-DL072.

This must be allowed for when replacing the power interface board.
Remember to put back the current reading module.

FUSES

DESIGNATION	VTR.D	TYPE	CODE	QUANTITY
Interface board fuses	all calibres	6 x 32 - FA A4 very quick	to be assigned	3
Power fuses	24	14 x 51 UR 40	PEL 040 FU 000	4
Ultra-quick type	36	22 x 58 UR 40	PEL 040 FU 001	4
	72	22 x 58 UR 100	PEL 100 FU 000	4
	150(1)	BOD KC3 UR GG 30 Ttc 200	PEL 200 FU 000	4
	250(1)	BOD KC3 UR GG 31 Ttc 315	PEL 315 FU 000	4
	400(1)	BOD KCA URB 31 Ttc 500	PEL 500 FU 000	4
	650(1)	BOD KCA URB 32 Ttc 800	PEL 800 FU 000	4

(1) Along with the fuses adapters and microcontacts should also be provided.

LINE INDUCTANCES

CALIBRE	CHARACTERISTICS	TYPE	CODE	QUANTITY
24	50 mH - 25 A	SM25	SEL025 SM 000	3
36	25 mH - 40 A	SM40	SEL040 SM 000	3
72	10 mH - 63 A	SM63	SEL063 SM 000	3
150	68 mH - 140 A	3ST140	SEL140 NT 000	1
250	38 mH - 250 A	3ST250	SEL250 NT 000	1
400	29 mH - 330 A	3ST330	SEL330 NT 000	1
650	18 mH - 540 A	3ST540	SEL540 NT 000	1

Interchangeable parts

VENTILATION UNIT

	CALIBRE	TYPE	CODE	QUANTITY
Fan	150 to 250	154 DA	VEN 380 VT 000	1
	400 TO 650	RE 2 - 225 AK 01-05	To be assigned	1
Thermocontact	150 TO 650	COMEPA 250 K	To be assigned	1

EXCITATION BRIDGE

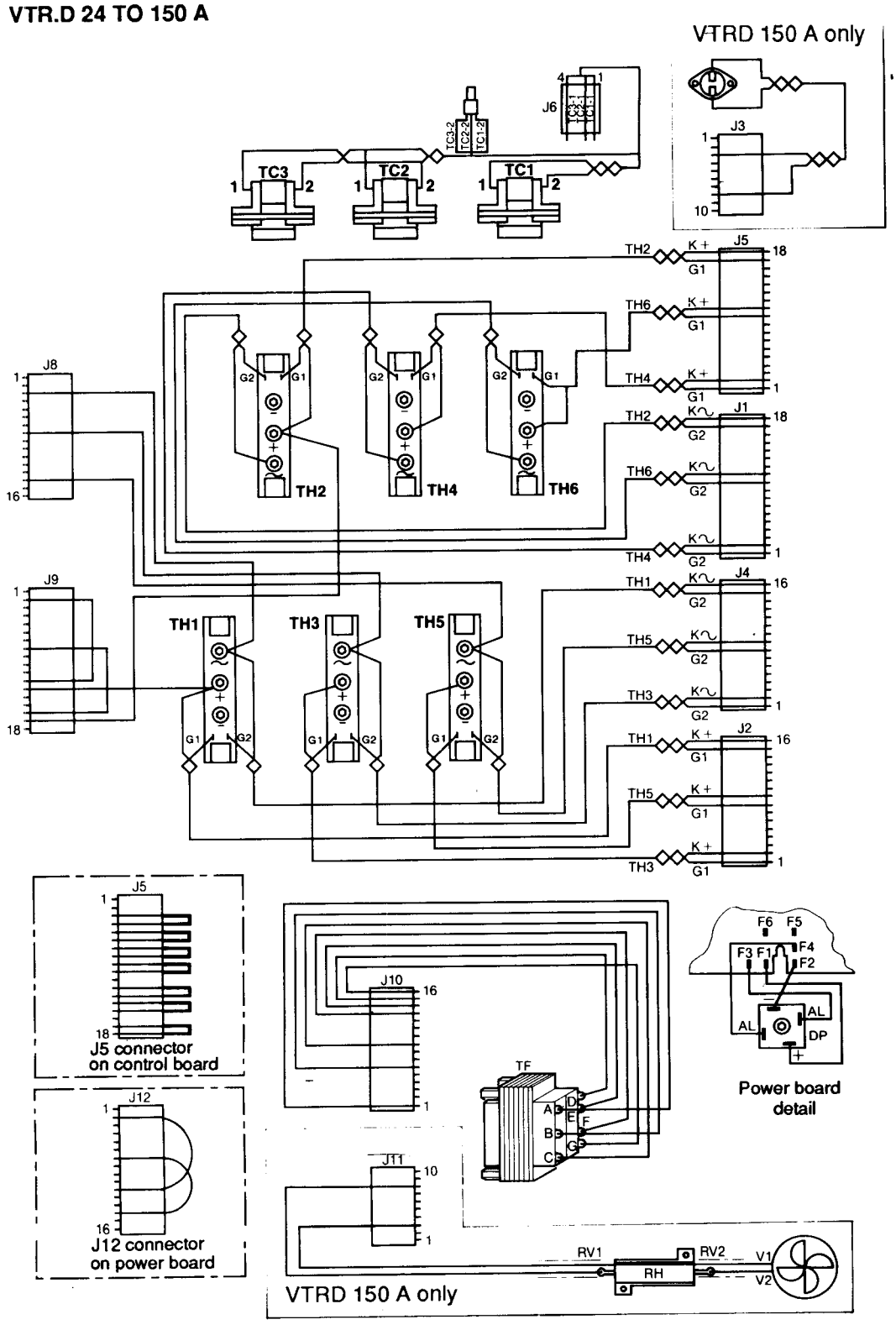
CALIBRE	TYPE	CODE	QUANTITY
for 24 to 250 A	26 MB 100 A	ESC 015 MD 000	1
400 to 650 A	SKB 15/12 A 2	to be assigned	1

POWER BRIDGE

DESIGNATION	FOR	TYPE	CODE	QUANTITY
2-Thyristor module	VTR.D 24	SKKT 26/12	ESC 025 MT 001	6
	VTR.D 36	SKKT 26/12	ESC 025 MT 001	6
	VTR.D 72	SKKT 56/12	ESC 055 MT 001	6
	VTR.D 150	SKKT 91/12	ESC 91 MT 001	6
	VTR.D 250	SKKT 131/12	ESC 131 MT 000	6
	VTR.D 400	SKKT 210/12	ESC 210 MT 000	6
	VTR.D 650	SKKT 250/12	To be assigned	6

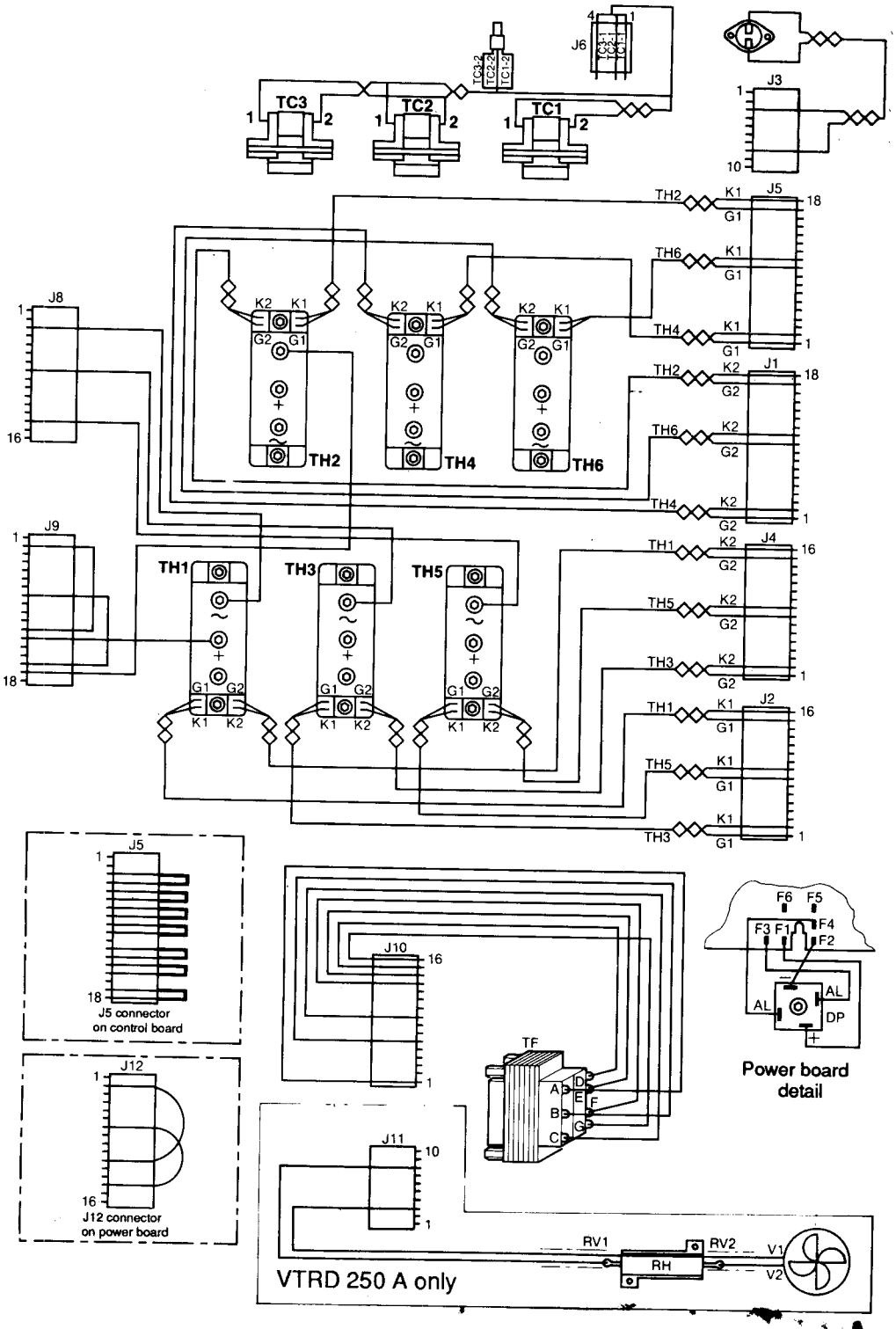
Internal wiring

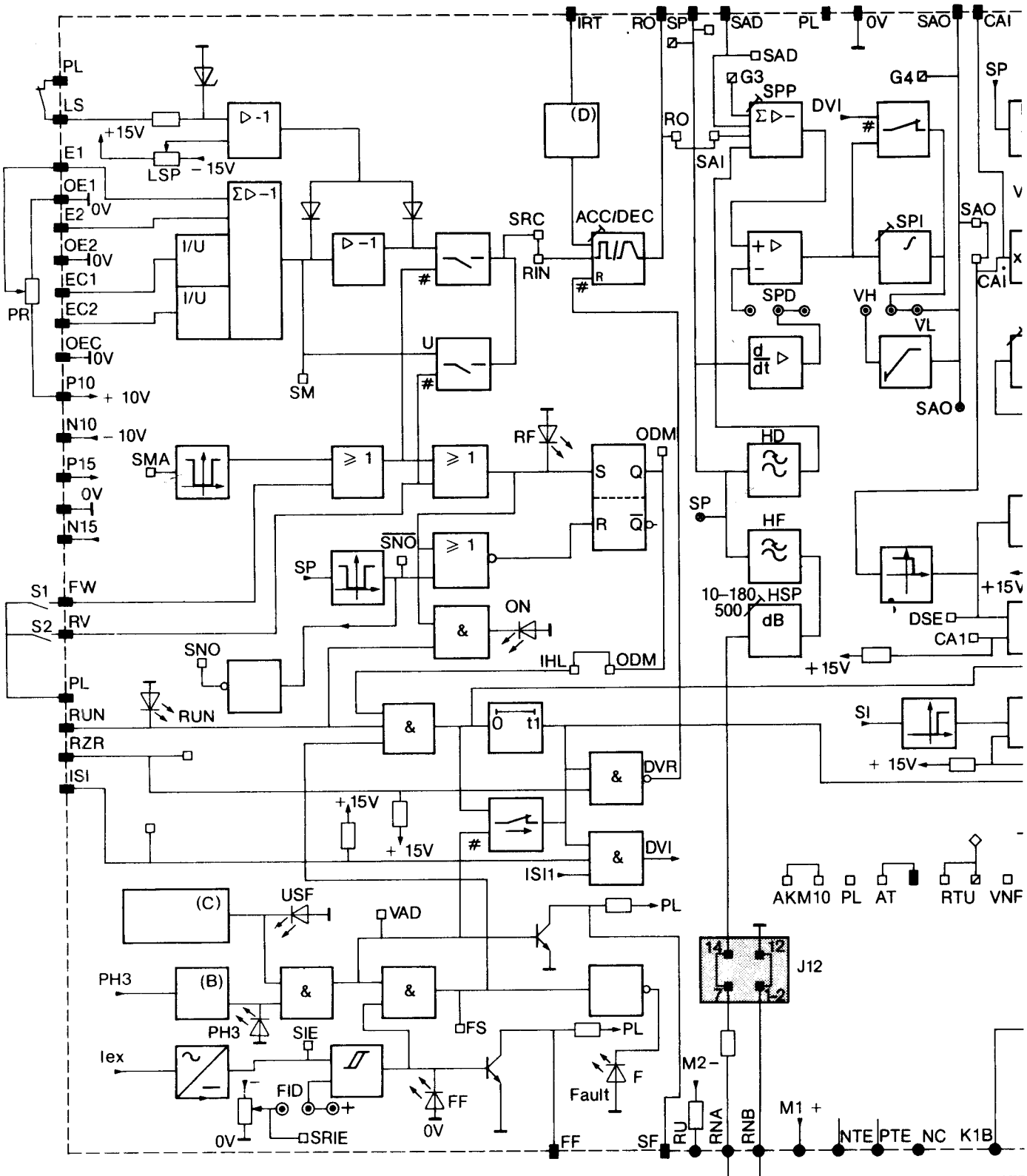
VTR.D 24 TO 150 A



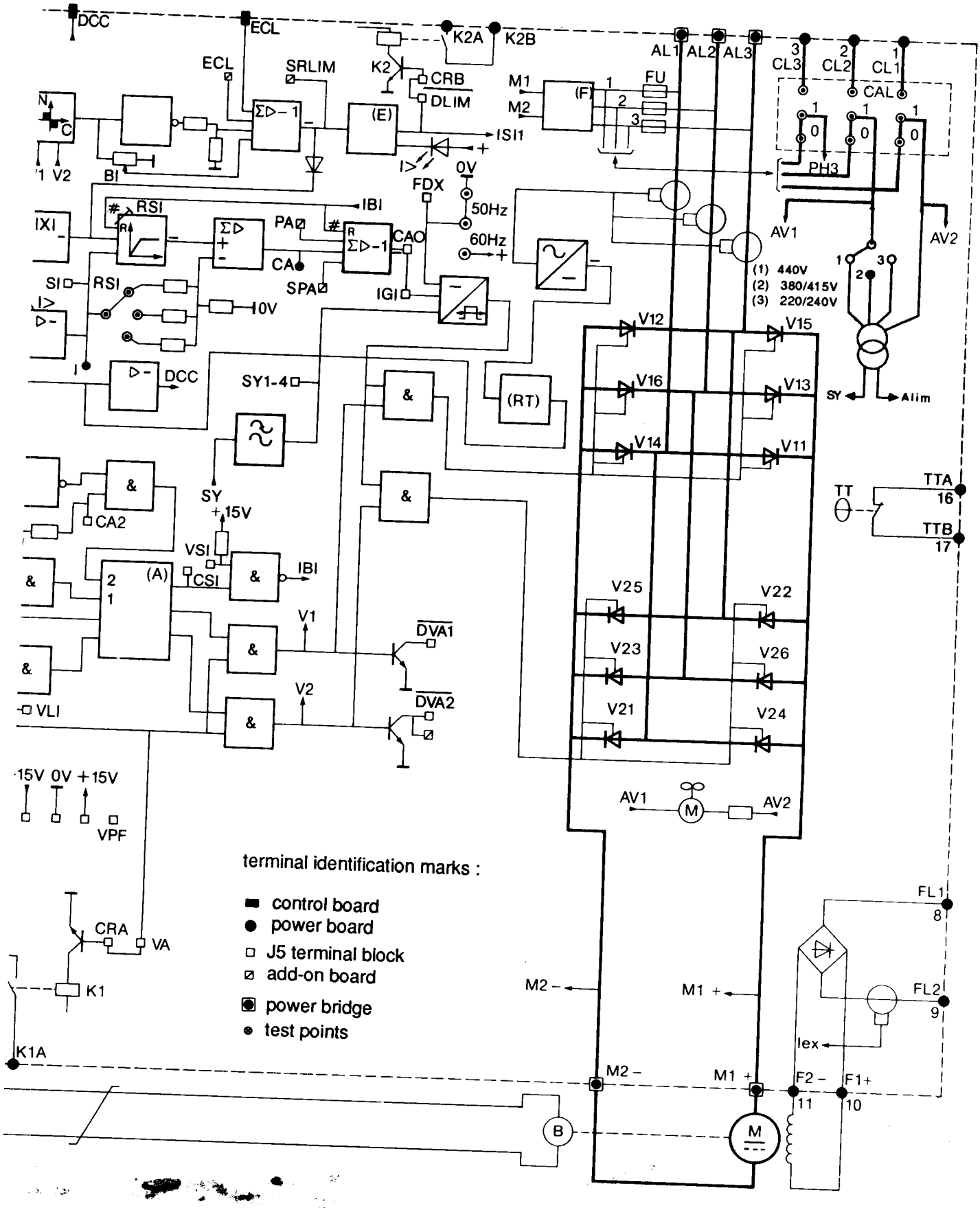
Internal wiring

VTR.D 250 TO 650 A





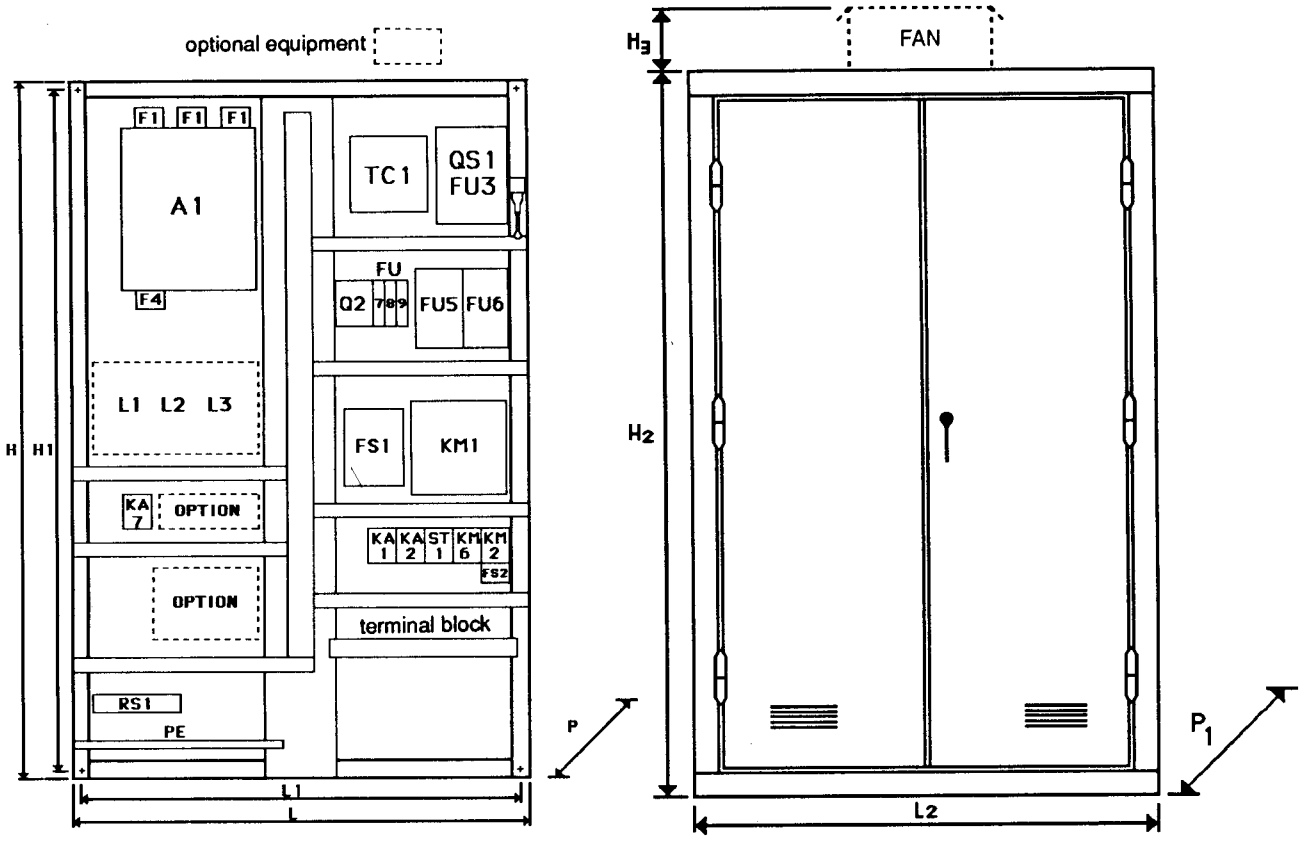
(A) reversibility logic
(B) PH3 validation
(C) PH1 and PH2 validation
(D) ramp time increase - external cntrl
(E) clipping detection - power board
(F) protection
(RT) customized package


DCC
ECL
K2A
K2B
AL1
AL2
AL3
CL3
CL2
CL1
CAL
PH3
K2
CRB
DLIM
SRLIM
M1
M2
(F)
FU
(E)
ISI1
BI
0V
FDX
50Hz
60Hz
IBI
RSI
PA
CAO
CA
SPA
IGI
SI
10V
AV1
AV2
(1) 440V
(2) 380/415V
(3) 220/240V
SY
Alim
V12
V15
V16
V13
V14
V11
SY1-4
(RT)
DCC
TT
TTA
16
TTB
17
CA2
SY
+15V
VSI
CSI
IBI
(A)
V25
V22
V23
V26
V21
V24
V1
V2
DVA1
DVA2
VLI
15V 0V +15V
VPF
AV1
AV2
M
terminal identification marks :
control board
power board
J5 terminal block
add-on board
power bridge
test points
CRA
VA
K1
K1A
FL1
8
FL2
9
M2 -
M1 +
Iex
F2 -
F1+
11
10
B
M

Overall dimensions of equipped variators

OVERALL DIMENSIONS - CABINET OR RACK-MOUNTED

(One rotation direction without option)



rack-mounted VTR.D as equipped

cabinet-mounted VTR.D as equipped

VTR. D	rack-mount						cabinet-mount				
	H	H1	L	L1	P	Masse	H2	H3	L2	P1	Masse
24	920	900	720	700	300	25	1040	0	835	350	55
36	920	900	720	700	300	25	1040	0	835	350	55
72	920	900	720	700	300	45	1040	0	835	350	75
150	1400	1380	770	740	300	95	1500	0	800	450	135
250	1820	1800	770	740	450	135	2000	0	800	600	235
400	1820	1800	1170	1140	450	135	2000	80	1200	600	235
650	1820	1800	1170	1140	450	340	2000	80	1200	600	470

NOTE: The various dimensions and weights appearing here are given for information only. They may be changed, and we may be held liable for such changes only after approval by our R & D department.

NOTES

NOTES

LEROY-SOMER IN FRANCE AND IN THE WORLD

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