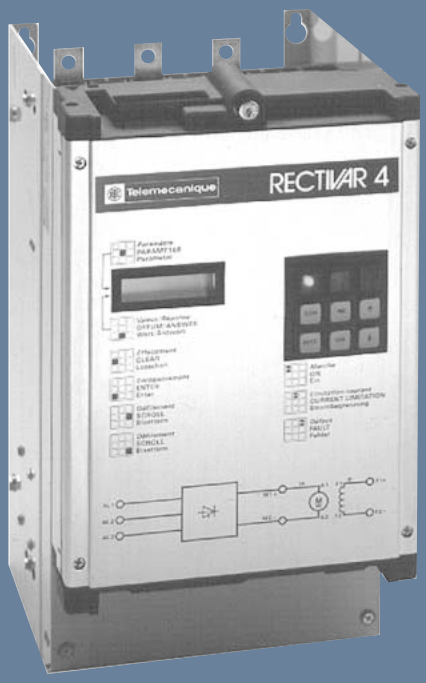

RECTIVAR® 4 series 74-84
Three phase digital speed controllers for d.c. motors

user's manual

Telemecanique
GROUPE SCHNEIDER

CAUTION

NOTE

The speed controller includes safety devices which, in the event of defects, may cause the speed controller to stop and thereby stop the motor. This motor can itself sustain stoppage by a mechanical lock. Finally, voltage variations, in particular power cuts, may also cause stoppages to occur.

The disappearance of causes of stoppage could cause restarting, dangerous to some machines or installations, in particular those which must be in conformity with the decrees relative to safety.

Therefore, in such cases, the user must take stepsagainst such possibilities of restarting, more particulary by the use of a low speed detector which, in the event of an unprogrammed stoppage of the motor, will cut off the speed controller supply.

The equipement design must be in conformity with the prescriptions of standard NFC 15-100.

More generally, any action, whether on the electrical part or the mechanical part of the installation or machine,must follow the cutoff of the speed controller power supply.

SOFTWARE COMPATIBILITY

This type of RECTIVAR is equipped with V3● - version software.
It can replace V1● - or V2● - version RECTIVARs with the following conditions :

1- RECTIVAR requiring the "vertical motion" cartridge :
use cartridge VW2-RLD221 which is the only one that is compatible with V3● -.

2- For installations controlled or monitored via a serial link other RECTIVARs using V1● - or V2● - : version software : use software which corresponds to the RECTIVARs **already installed**.

References :

V1● - : VW2-RZD101

V2● - : VW2-RZD102

Contents

Part 1

Common applications

For all special applications, see summary in part 2, on page 2/1.


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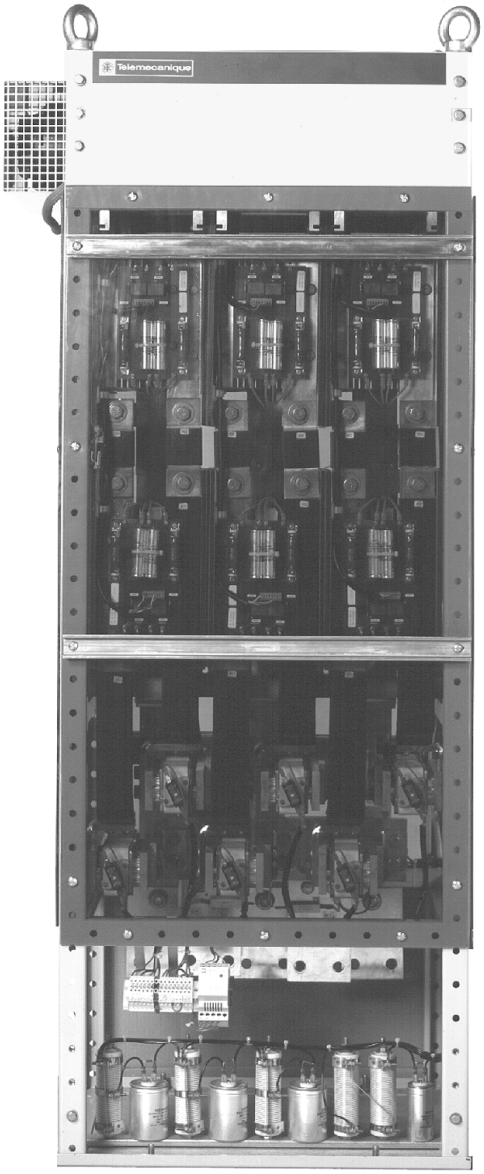
RECTIVAR 4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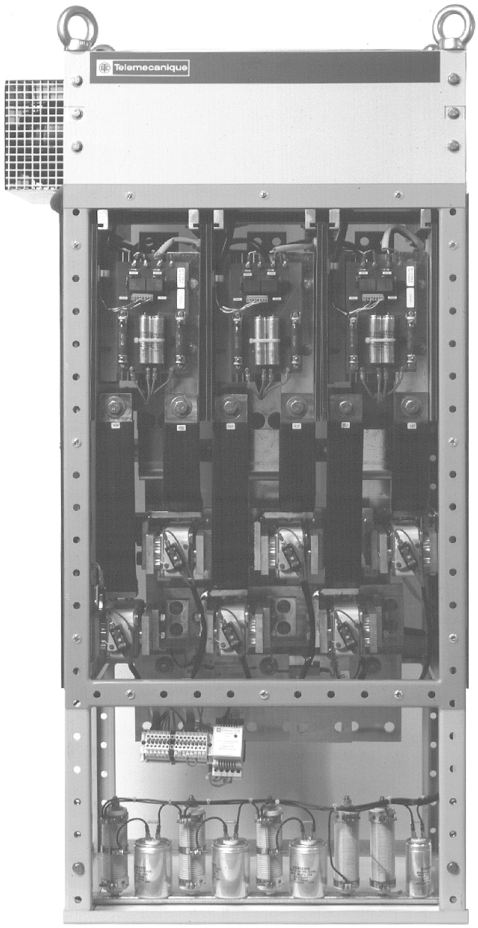
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Presentation - General

RTV-74 non-reversing, 2 quadrants

RTV-84 solid state reversing 4 quadrants

The RECTIVAR RTV-74 32 to 3000 A single bridge three phase variable speed controllers are designed for speed regulation of 6 to 1700 kW DC motors, with separate excitation.
The RECTIVAR RTV-84 16 to 3000 A double bridge three phase variable speed controllers are designed for the speed regulation of 2,7 to 1300 kW DC motors with separate excitation.
Both series are supplied from an AC three phase mains.

Ratings : I (A)	16, 32, 48, 72, 180, 270, 400, 650, 800, 1250, 1750, 3000
Mains voltage (V)	up to 660 ± 10 % - 50/60 Hz ± 5 Hz
Speed range	1 to 300 - tachogenerator control 1 to 3000 with pulse generator and interface option 1 to 20 by U feedback, but the accuracy depends on the motor.

Characteristics

The RTV-74 speed controllers enable operation in quadrants 1 and 4 or 2 and 3 of the torque/speed range.
The RTV-84 speed controllers enable operation in all 4 quadrants of the torque/speed range.
From the 800 A rating upwards, both series are fitted with a field current regulator.

Constitution

The RECTIVAR 74/84 includes for each one of the series :
- 7 compact technology ratings from 32 to 650A, rating 16A is only available in RTV-84
- 4 modular technology ratings from 800 to 3000A.

• Compact technology combines in the same metal enclosure :

- the power part, with a 6 or 12 thyristor bridge and the thyristor protections, the control transformer, a power interface board and its daughter board in the case of the 12 thyristor bridge, a galvanic isolation board, the current transformers and the fans, if necessary

- the control rack, located at the front of the speed controller on the 8 ratings, includes the microprocessor board, the display board and a dialogue keypad on the protective cover.

• The modular technology includes a power chassis and a control module connected by a set of 2 metre long, sleeved screened cables.

- The power chassis includes :
  a 6 or 12 thyristor bridge with the thyristor protections, the firing circuits, the control transformer, the thyristor protection fuses and the fan with its safety devices.

- The module known as the control module :
  identical for all 4 ratings, includes :

  - the thyristor excitation bridge
  - the excitation current sensor
  - the excitation control board
  - the control transformers
  - the power interface board
  - the galvanic isolation board
  - the control rack, identical to the one described above, located on the front.

For both technologies, the control rack, mounted on hinges, can pivot, enabling access to the part at the back.

The control is completely isolated from the power part, the maximum voltage being 24 volts DC.

Presentation - General

Power interface boards

Control rack

Power interface boards

• 16A rating
This carries : (see details page 1/33)
- the regulated power supplies
- the firing circuits and thyristor protections
- a double complete 12 thyristors bridge
- the control transformer's voltage adaptation link (CAV4)
- the two assignable function output relays : K1 and K2
- the current transformers
- the galvanic isolation board

• Ratings 32 to 650A.
This carries : (see details page 1/33)
-the regulated power supplies
- the firing circuits and thyristor protections
- the (RT) customization module for the speed controller rating
- the control transformer's voltage adaptation link (CAV4)
- the three power/control separation links (CAL) which enable a separate supply for the power and the control, in position 1
- the two assignable function output relays : K1 and K2
- the galvanic isolation board
- the "6 firing gate" daughter board, for 12 thyristor power bridges.

• Ratings 800 to 3000A
This carries : (see details, page 1/34)
- the regulated power supplies
- the power bridge pulse transformer control circuits
- the customization connector (J4) for the speed controller rating
- the excitation bridge's firing circuit and thyristor protections
- the control transformer supply adaptation link
- the excitation transformer supply adaptation link
- the two excitation power/control separation links
- the two assignable function output relays : K1 and K2
- the galvanic isolation board.

Excitation control board

(Ratings 800 to 3000A)

This carries the following functions : (see page 1/34)
- the field current regulator
- the pulse train firing circuit
- the switch on/off safety devices
- the excitation presence safety devices
- the flux reduction function
- other adjustment and safety circuits not used with digital control.

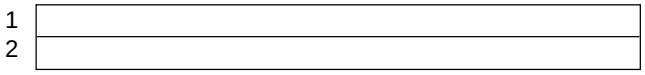
Digital control rack

This includes two or three boards
See hardware architecture, page 1/40.
• A microprocessor control board, carrying essentially :
- two 80C32 microprocessors and their associated EPROM programme memory banks
- the common external oscillator
- the communication transfer for communication between the two microprocessors
- the converters and safety devices necessary.
• A display and interface board to which are connected, by flat, disconnectable cable, the keypad located on the front cover. It also includes :
- the RAM working memory
- the EEPROM backup memory cartridge
- the EPROM memory cartridge for optional additional programmes.
• An optional board with the pulse generator speed feedback functions, the frequency speed refer ence and other optional utilisation interfaces (see part 2).
• The cover allows the display and the local dialogue keypad to be seen, with a concise serigra phed label explaining their functions.

The dialogue

Local dialogue via display and keypad

• 16 digit, 2 line, liquid crystal display

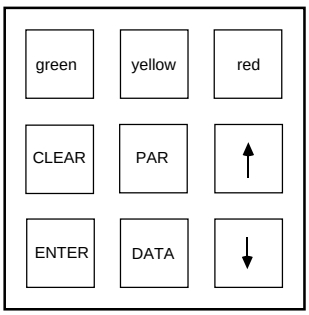


- In normal operating mode : line 1 : speed in rpm
  line 2 : armature current in amps.

- In configuration, adjustment, calibration and keypad reference mode : line 1 : question or parameters
  line 2 : response or value (DATA).

Where adjustments are concerned, the flashing of one of the lines indicates that the parameter or value is accessible.

- For automatic signalling or fault analysis : line 1 : number of faults present
  line 2 : type of fault .



• Six key, three indicator light keypad.

- Indicator lights
  red on : controller on stop fault (page 1/46)
  yellow on : current in limitation
  green on : controller operating (RUN and operating direction).

- Keys

ENTER : input of choice validation or change to next configuration step } memorisation in both cases of the position displayed

CLEAR : input of revert on incorrect choice or fault acknowledgement when latching function of faults has been configured

PAR : connection to the 1st line: Parameters.
This key is only used in Adjustment mode (see page 1/59)

DATA : connection to the 2nd line : Value or response, or type of fault

↑ } Increase of value or response address (up in menu tables).
↓ } Decrease of value or response address (down in menu tables).

The two last functions are used in three ways :
- by pulse, for step by step scrolling
- by maintained actuation for continuous scrolling
- by maintained actuation with simultaneous maintained actuation of the CLEAR key for fast scrolling.

LED

Case of controlled excitation for 800 to 3000A modular products :
- a green LED externally visible in the lower part of the control module, on to indicate when the field regulator is on.

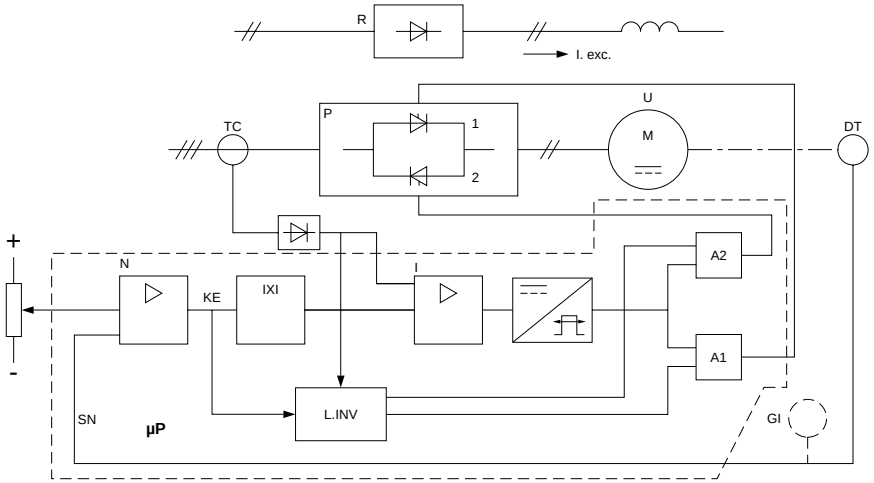
Motor selection

The motor must be designed and of the right size for a pulse current supply with variable speed and torque corresponding to the operation to be assured.
Form factor = 1,05.
It must have separate excitation or permanent magnets. Do not use a series or compound excited motor.
In the case of controlled excitation, the maximum field voltage will be 0,8 times the mains voltage.
In the case of field weakening, the maximum field voltage will be 0,5 times the mains voltage
example : 190V for a 380V AC mains voltage. However, for machiner with long acceleration and deceleration times (ramps > 5s), this ratio can be increased up to 0,8.

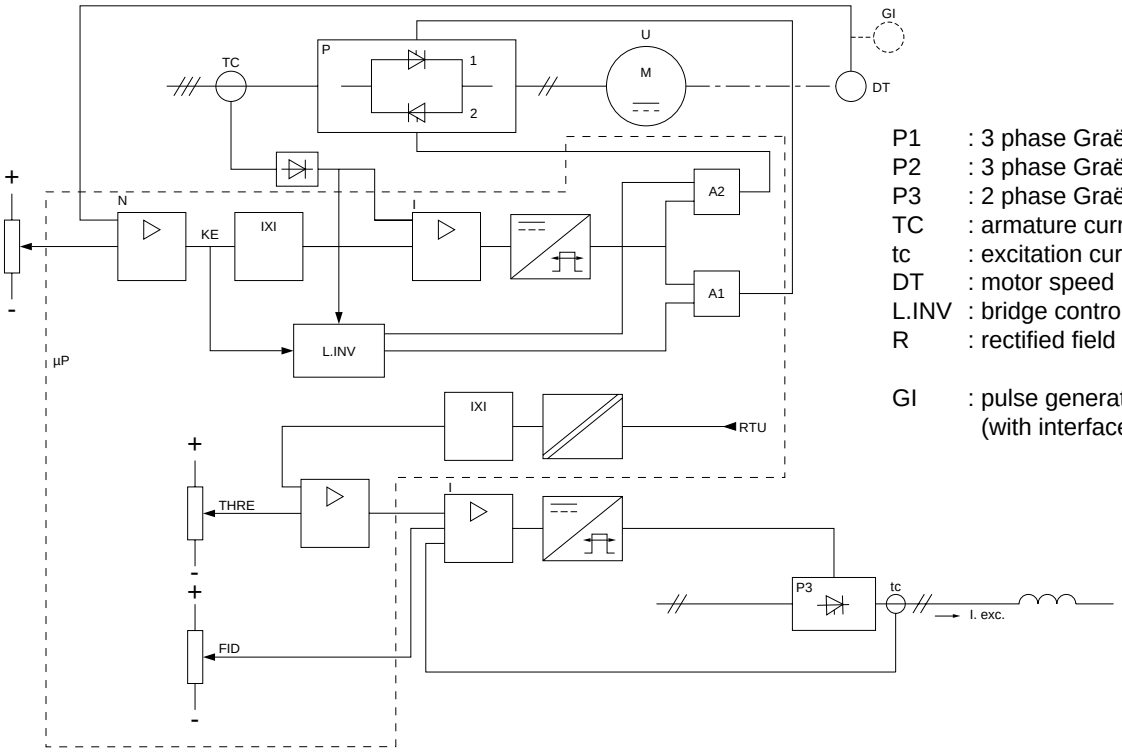
Recommended armature voltage ≤ mains voltage x 1,05 for RTV-84.
and ≤ mains voltage x 1,16 for RTV-74

Functional diagrams

• Compact technology



• Modular technology



P1 : 3 phase Graëtz bridge
P2 : 3 phase Graëtz bridge (with RTV-84)
P3 : 2 phase Graëtz bridge
TC : armature current measurement
tc : excitation current measurement
DT : motor speed measurement
L.INV : bridge control logic, depending on KE
R : rectified field supply

GI : pulse generator
(with interface option)

Selection guide

Motor /speed controller combination

The speed controller reference which is stated on the delivery note and on the label located on the left hand side of the device, must be referred to in all communications with our services.

Check the MAINS-CONTROLLER-MOTOR compatibility against the table below.
The values given correspond to an ambient temperature of 40°C. Above this, and up to 60°C, apply a current derating factor of 1,2 % for each additional °C.

Three phase voltage Un ± 10 %
Mains : 50/60 Hz ± 5 Hz

RTV-74 controller		Motor								RECTIVAR	
Max. DC	Line current I rms	Maximum motor power with Starting torque/Rated torque = 1,2							Excitation current Iex max.	Reference (1)	Weight
		220V	380V	415V	440V	480V	500V	660V			
A	A	kW	kW	kW	kW	kW	kW	kW	A		kg
32	24	6	10	10,5	12	11,5	13	-	15	RTV-74D32•	6,500
48	36	9	15	16	18	17	19,5	-	15	RTV-74D48•	10,000
72	54	13,5	23	24	27	26	30	-	15	RTV-74D72•	10,000
180	135	33,5	57,5	60	67,5	65	75	-	15	RTV-74C18•	11,000
270	203	51	86	90	101	97	112	-	15	RTV-74C27•	13,000
400	300	78	132	138	166	150	171	-	15	RTV-74C40•	47,000
650	488	127	214	224	253	243	278	-	15	RTV-74C65•	47,000
800	600	156	264	275	312	300	342	450	30 (2)	RTV-74C80•	54,000
1250	938	244	413	432	487	469	535	704	30 (2)	RTV-74M12•	54,000
1750	1313	342	578	604	683	657	749	985	30 (2)	RTV-74M17•	60,000
3000	2250	585	990	1035	1170	1125	1285	1690	30 (2)	RTV-74M30•	220,000
Armature voltage		260V	440V	460V	520V	500V	570V	750V			
Mains voltage		220V	380V	415V	440V	480V	500V	660V			
Voltage code letter		Q	Q	Q	Q	S	S	Y			

(1) Basic reference to be completed by the voltage code letter. For C80• to M30• ratings, the Rectivar includes two sub-assemblies (see page 1/10).
(2) Field regulation incorporated in control module. 3 ratings with 10A - 20A - 30A current selection by link.

Selection guide

Three phase supply Un ± 10 %
Mains : 50/60 Hz ± 5 Hz

RTV-84 controller		Motor								RECTIVAR	
Max. DC	Line current I rms	Maximum motor power with Starting torque/Rated torque = 1,2							Excitation current Iex max.	Reference (1)	Weight
		220V	380V	415V	440V	480V	500V	660V			
A	A	kW	kW	kW	kW	kW	kW	kW	A		kg
16	12	2,7	4,7	5	5,3	-	-	-	2	RTV-84D16Q	6,000
32	24	5,5	9,5	10	10,5	11,5	12	-	15	RTV-84D32•	6,500
48	36	8	14	15,5	16	17,5	18	-	15	RTV-84D48•	10,000
72	54	12	21	23	24	26	27	-	15	RTV-84D72•	10,000
180	135	30,5	54	59,5	63	67	70	-	15	RTV-84C18•	11,000
270	203	46	81	89	93	101	105	-	15	RTV-84C27•	13,000
400	300	69	120	132	138	150	156	-	15	RTV-84C40•	47,000
650	488	112	195	214	224	243	253	-	15	RTV-84C65•	47,000
800	600	138	240	264	275	300	312	408	30 (2)	RTV-84C80•	108,000
1250	938	215	375	413	432	469	487	637	30 (2)	RTV-84M12•	108,000
1750	1313	302	525	578	604	657	683	813	30 (2)	RTV-84M17•	120,000
3000	2250	518	900	990	1035	1125	1170	1530	30 (2)	RTV-84M30•	298,000
Armature voltage		230V	400V	440V	460V	500V	520V	680V			
Mains Voltage code letter		220V Q	380V Q	415V Q	440V Q	480V S	500V S	660V Y			

(1) Basic reference to be completed by the voltage code letter.
For C80• to M30• ratings, the Rectivar includes two sub-assemblies (see page 1/10)

(2) Field regulation incorporated in control module. 3 ratings with 10A - 20A - 30A current selection by link.

Selection guide

Constitution of the modular controllers

The following types of Rectivar are modular : RTV-74 and RTV-84 from C80• to M30• with separate power and control. Each of the 2 parts has its own reference:

Rectivar 74	Power part		+Control module	
Reference	Reference	Weight (kg)	Reference	Weight (kg)
RTV-74C80Q	VZ8-DH1C80Q	54	VW3-RZD1122	12
RTV-74C80S	VZ8-DH1C80S	54	VW3-RZD1122	12
RTV-74C80Y	VZ8-DH1C80Y	54	VW3-RZD1122	12
RTV-74M12Q	VZ8-DH1M12Q	54	VW3-RZD1122	12
RTV-74M12S	VZ8-DH1M12S	54	VW3-RZD1122	12
RTV-74M12Y	VZ8-DH1M12Y	54	VW3-RZD1122	12
RTV-74M17Q	VZ8-DH1M17Q	60	VW3-RZD1122	12
RTV-74M17S	VZ8-DH1M17S	60	VW3-RZD1122	12
RTV-74M17Y	VZ8-DH1M17Y	60	VW3-RZD1122	12
RTV-74M30Q	VZ8-DH1M30Q	220	VW3-RZD1122	12
RTV-74M30S	VZ8-DH1M30S	220	VW3-RZD1122	12
RTV-74M30Y	VZ8-DH1M30Y	220	VW3-RZD1122	12

Rectivar 84	Power part		+Control module	
Reference	Reference	Weight (kg)	Reference	Weight (kg)
RTV-84C80Q	VZ8-DL1C80Q	108	VW3-RZD1122	12
RTV-84C80S	VZ8-DL1C80S	108	VW3-RZD1122	12
RTV-84C80Y	VZ8-DL1C80Y	108	VW3-RZD1122	12
RTV-84M12Q	VZ8-DL1M12Q	108	VW3-RZD1122	12
RTV-84M12S	VZ8-DL1M12S	108	VW3-RZD1122	12
RTV-84M12Y	VZ8-DL1M12Y	108	VW3-RZD1122	12
RTV-84M17Q	VZ8-DL1M17Q	120	VW3-RZD1122	12
RTV-84M17S	VZ8-DL1M17S	120	VW3-RZD1122	12
RTV-84M17Y	VZ8-DL1M17Y	120	VW3-RZD1122	12
RTV-84M30Q	VZ8-DL1M30Q	298	VW3-RZD1122	12
RTV-84M30S	VZ8-DL1M30S	298	VW3-RZD1122	12
RTV-84M30Y	VZ8-DL1M30Y	298	VW3-RZD1122	12

Supply voltages

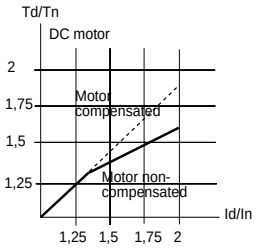
• Power according to the tables
• Excitation: mains voltage 440V max. Excitation selection: 0,9 U mains with fixed excitation
0,8 U mains with field regulation
0,8 to 0,5 U mains with field weakening

For the S and Y references (480 or 500V or 660V mains) supply the excitation and its control using a single phase transformer with a 380V or 440V secondary.
Transformer power : P = i exc x 1,10 U secondary (if fixed excitation, use i exc in cold state).

• Control : mains voltage 440V max
the control can be supplied separately from the power (CAL links). It must when using reference S or Y. Use an auto-transformer, secondary 220/240V or 380/ 415V or 440V. Control circuit consumption : 120VA for all ratings except ratings C18 and C27 with fan supply : 300 VA.

• Fans (see connections page 1/13)
- ratings D16 to D72 : no fan
- ratings C18 to C27 : fans supplied by the control : 220V/240V bypass the fan resistance on the J11 connector on the power board (terminals 5 and 10)
- ratings C40 and C65 : One 220V-50/60Hz fan : 185W-0,85A
- ratings C80 to M17 : Two 220V-50/60Hz fans : 370W-1,7A in total, apart from one fan for the RTV74
- rating M30 : Two 380V-50/60Hz fans : 1100W-2,4A in 50 Hz in total
1580W-2,9A in 60 Hz in total.

Selecting the speed controller rating



The tables on pages 1/8 and 1/9 enable the speed controller rating to be determined for :
- continuous duty operation,
- starting torque 1,2 times the rated motor torque.

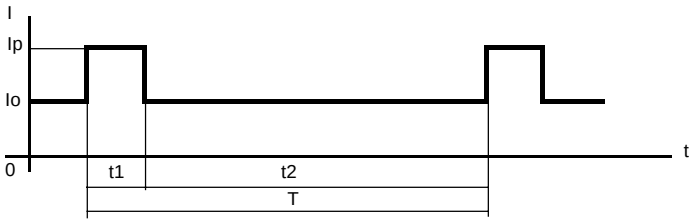
For cyclic operation, see below.
If the required starting torque is greater than 1,2 Tn, use the maximum current taken by the motor Id (the starting current) to determine the speed controller rating :
- Id must be ≤ maximum DC of the speed controller.

To determine the maximum motor current Id depending on starting torque, consult the machine curves or, if these are not available, the curves on the left.
Example : Td/tn = 1,6 non-compensated motor. Our curve gives Id/In (starting/rated current) = 2.
I max. speed controller ≥ 2 In motor.

Operating modes

Continuous duty
The speed controller has a maximum continuous DC rating (I max.) which cannot be exceeded.

Standard cyclic operation
Operation can be defined by two current values Io and Ip.
Ip = peak current,
Io = DC = Ip/2



The following time limits must be complied with :
- t2 ≥ 7 t1,
- t1 ≤ 15s for 16 to 650A ratings,
- t1 ≤ 10s for 800 to 3000A ratings.

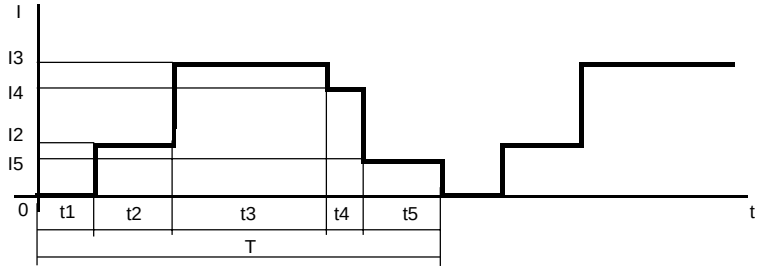
For Io and Ip, the maximum values for the different ratings are as follows (in A) :

I max cont. (A)	16	32	48	72	180	270	400	650	800	1250	1750	3000
Io	11	22	34	50	125	175	260	425	520	750	1050	1800
Ip	22	44	68	100	250	350	520	850	1040	1500	2100	3600

Particular cyclic operation
For a given known operating cycle, Imte, the equivalent mean thermal current must be calculated.

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

Example :



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

Current Imte must be ≤ 0,8 I maximum (DC).
Check that the peak current is ≤ Ip.

Characteristics

Three phase mains supply voltage and frequency	Maximum, 440V ± 10% for D16, 500V ± 10 % for D32 to C65 660V ± 10% for C80 to M30 50/60 Hz ± 5 Hz (45-55 / 55-65 Hz)
Recommended armature voltage depending on the mains voltage	U armature ≤ U mains x 1,05 with the RTV84 U armature ≤ U mains x 1,16 with the RTV74
Excitation supply voltage	Maximum mains voltage 440 V - U excitation (see page 1/10).
Maximum excitation current	2A to 30A depending on the speed controller rating (see page 1/8 - 1/9 - 1/10).
Minimum excitation current detectable by safety devices	D16 : 0,1A D32 to C65 : 0,5A C80 to M30 : 1A
Armature current limit	Adjustable on the controller from Ip/3 to Ip (Ip = peak current of controller, see characteristics, page 1/11)
Speed range	1 to 300 with tachogenerator 1 to 3000 with incremental encoder option board 1 to 20 with voltage feedback but the accuracy depends on the motor

Static accuracy with variations :	*with tachogenerator*	*with incremental encoder and digital reference*
- of resistive torque 0,2 Tn to Tn	- 0,24 % of the set speed - 0,066 % of the maximum speed	- 0,1 % of the maximum speed
- of mains voltage ± 10 %	± 0,2 % of the set speed	
- of ambient temperature 20°C ± 20°C	± 1 % of the set speed ± 0,1 % of the maximum speed	

Speed reference • Two input voltages : - by potentiometer - by analogue signal • One current input • By serial link	The 3 inputs are summing and galvanically isolated from the power circuits. 0 to ± 10V, converted into 2000 points resolution + sign 1 to 10 kΩ connected to internal supplies : 0, + 10V ou 0, - 10V 0 to ± 10V, supplied externally. Input impedance 35 kΩ. 0 - 20 mA or 4 - 20 mA by configuration, impedance 100 Ω, resolution : 2000 points Resolution 1 rpm
Configurable inputs – outputs (see part 2 pages 2/10 to 2/15)	- 1 analogue input : 0 to ± 10V, impedance 35 kΩ, resolution 2000 points + sign, - 2 analogue outputs : 0 to ± 10V, maximum load 5 mA, resolution 128 points + sign - 4 logic inputs (+ RUN) : level 0 ≤ 1,5V/3,5V ≤ level 1 < 26,4V - impedance 2,2 kΩ - 2 logic outputs : open collector, maximum load : 20 mA with 24 Vac (ex.: CA2 - EN 411) - 2 relays with voltage free contacts : max 250 V a.c. On control relay : inrush 300 VA max, sealed 30 VA max - 30 Vdc - 0,5A max, number of operations : 10^6 Minimum switching power : 24V/20mA a.c. or d.c.
Speed feedback	- by armature voltage : max 750 - by tachogenerator : max 320V - by incremental encoder with VW1-RZD101 interface option : max 100kHZ
Reversing (RTV 84)	By external signals on logic inputs or by inversing the reference signal. Current reversal : dead band 15 ms. Operation in all four torque/speed quadrants.
Acceleration and deceleration ramps (Page 1/54).	Acceleration and deceleration times separately adjustable from 0 s to 999,9 s. "Overspill" function for automatic recopying of the speed feedback value, if the RECTIVAR is not validated.
Voltages and currents available on the controller (cumulative currents)	+ 15V or -15V maximum load 30 mA, for all inputs (control, validation,display, adjustment), the option boards and all the external functions. + 24V maximum load 50 mA or 80 mA if no load on the + 15 V.
Degree of protection	IP00
Ambient temperature : - for operation - for storage	 - 0°C to + 40°C (operation possible up to 60°C by derating the current by 1,2 % for each additional °C) - 25°C to + 70°C
Derating according to the altitude	Current derating by 0,7 % for each 100 m above 1000 m.
Qualification standards	See catalogue for RECTIVAR 4 three phase models.

Connection terminals

Power bridge Ratings 32 to 3000A

AL1 AL2 AL3	mains supply
⏚	earth (ground)
M1 + M2 -	motor armature

The layout of the power terminals differs according to the rating (see pages 1/23 - 1/24).
In particular, the fans are supplied from the terminals given below.
Reminder : for ratings C18 and C27 the fans are supplied by the control part of the RECTIVAR.

• Ratings 400 and 650A (C40 and C65)

0 - 220	separate fan supply 220 V single phase voltage - 50/60 Hz 185W power - current : 0,85A.

• Ratings 800 to 1750A (C80 to M17)

0 - 220 (RTV74)	fan supply
0A - 220A 0B - 220B (RTV84)	separate supply for the two fans voltage 220V single phase - 50/60Hz unit power 185W - current : 0,85A
9-91 10-101 207-208	fuse breaking thermo-contact 1 contact ... line peak limiter fault } contacts NC

• Rating 3000A (M30)

0 - 380	ventilation presence module supply
U1, V1, W1 U2, V2, W2	separate supply for the 2 fans - 380V AC unit power : 550W in 50Hz, 790W in 60Hz unit current : 1,2A in 50Hz, 1,45A in 60Hz i.e. for the 2 fans power : 1100W in 50 Hz - 1580W in 60Hz current : 2,4A in 50Hz - 2,9A in 60Hz
9 and 91 10 and 101 203-204	fuse breaking ventilation present cover in position } contacts NC

Separate module power terminals (Ratings 800 to 3000A)

FL1 FL2	single phase supply to excitation bridge
⏚	earth (ground)
F1 + F2 -	excitation bridge positive output excitation bridge negative output

Terminal referencing

Power interface boards

There are three types of board for the whole range, each fitted systematically with the galvanic isolation board
- 16A rating
- 32 to 650A range
- 800 to 3000A range

• 16A rating

Marking	P.J1	Function
CL1	1	control supply (**) - used if the power and control supplies are
CL2	2	separate (U > 440V) - power : 120VA
CL3	3	
RNA	4	tachogenerator input
RNB	5	
K1A*	6	K1 relay voltage free contact
K1B	7	with configurable function
K2A*	8	K2 relay voltage free contact
K2B	9	with configurable function
FL1		excitation bridge single phase supply
FL2		
F1 +		positive excitation bridge output
F2 -		negative excitation bridge output
AL1		power bridge supply, 50/60 Hz three phase mains
AL2		
AL3		
M1 +		motor armature
M1 -		

• 800 to 3000A ratings

Marking	P.J1	Function
CL1	1	Control supply - power : 120VA.
CL2	3	
CL3	5	
RNA	7	Tachogenerator input
RNB	8	
FTA	9	+ 24V
FTB	10	sensor presence fault
PTE	11	+ 24V supply (10mA max)
NTE	12	- 24V supply (10mA max)
K2A*	13	K2 relay voltage free contact
K2B	14	with configurable function
K1A*	15	K1 relay voltage free contact
K1B	16	with configurable function
FC1	18	excitation control supply if power/control supplies
FC2	20	disassociated - power : 70VA.

* Maximum contact characteristics : see page 1/12.

** Special precautions must be taken when using a separate control supply (see page 1/56).

Terminal referencing

Power interface board

• 32 to 650A ratings

Marking	P.J1	Function	
CL1	1	control supply (***) - used if the power and control supplies are	screw terminals
CL2	2	separate (U > 440V) - power : 120VA for 32, 48, 72, 400,	
CL3	3	650A and 300VA for 180 and 270A (with fan)	
RU	4	armature voltage output	
RNA	5	tachogenerator input	
RNB	6		
M1 +	7	M1 motor terminal	
FL1	8	excitation bridge single phase supply	
FL2	9		
F1 +	10	positive excitation bridge output	
F2 -	11	negative excitation bridge output	
K1A*	12	K1 relay voltage free contact	
K1B	13	with configurable function	
K2A*	14	K2 relay voltage free contact	
K2B	15	with configurable function	
TTA**	16	(thermal trip contact), radiator temperature probe	
TTB	17	normally open contact, voltage free (not connected on ratings 32 to 72A)	
PTE	18	+ 24V supply	
NTE	19	- 24V supply	
NC	20	not connected	

* Maximum contact characteristics : see page 1/12.

** Maximum probe contact characteristics (from the 180A rating).

- Utilisation : a.c. inductive 250V, inrush 300VA max, sealed 30VA max,
  d.c. inductive 30V/0,5A max.

*** Special precautions must be taken when using a separate control supply (see page 1/56).

Terminal referencing

Control board

C.J1	Marking	Function
1	E1	Speed reference input n°1 : 0 ± 10V
2	0E1	0V of input E1
3	E2	Speed reference input n°2 : 0 ± 10V
4	0E2	0V of input E2
5	EC	Current speed reference input (configuration 0-20mA or 4-20mA)
6	0EC	0V of input EC
7	AI	Configurable analogue input
8	P10	+ 10V reference potentiometer supply
9	N10	– 10V reference potentiometer supply
10	0AI	0V of input AI
11	P15	+ 15V supply
12	N15	– 15V supply
13	0V	0V
14	AO1	Configurable analogue output n°1
15	LO1	Configurable logic output n°1
16	0V	0V
17	RUN	Validation of the controller (gate circuits, loops, ramp)
18	AO2	Configurable analogue output n°2
19	LO2	Configurable logic output n°2
20	PL	Logic inputs supply (+ 24V =)
21	LI1	Configurable logic input n°1
22	PL	Logic inputs supply (+ 24V =)
23	LI2	Configurable logic input n°2
24	PL	Logic inputs supply (+ 24V =)
25	PL	Logic inputs supply (+ 24V =)
26	LI3	Configurable logic input n°3
27	LI4	Configurable logic input n°4
28	+ EM	Point to point serial link - see part 2, pages 2/34 to 2/37
29	- EM	
30	+ RE	
31	- RE	

See input and output characteristics page 1/12.

The configurable input/output assignments are described on pages 2/10 to 2/15.

Installation of the RECTIVAR

Safety precautions

Reception of the controller

When unpacking the controller, check that it has not been damaged during transport.
Make sure that the speed controller reference on the label fixed on the left hand side conforms to the delivery note corresponding to the purchase order, and to the correspondance table (page1/10) for ratings C80 • to M30•
It is recommended to transport the controller in a horizontal position, or by using the lifting rings (ratings 400 to 3000A). However the controllers can be placed on the ground in an upright position, except for ratings 800 to 1750A.

⚠ If the controller has been stored or switched off for several months, turn the fan rotor by hand, where applicable.

Climatic environment

For ambient temperature and humidity, altitude, vibrations and shocks, and degree of protection, see characteristics in the three phase RECTIVAR catalogue.
Protect the speed controller against dust, particularly conductive dust, corrosive gases and splashing liquids.

⚠ In the event of danger of condensation :
If the controller is switched off for periods longer than one hour, a heating system must be fitted (0,2 to 0,5W per square decimeter of the enclosure) automatically active the moment the controller is switched off. This device maintains the inside of the controller at a temperature slightly higher than the external temperature, thus avoiding any risk of condensation and dripping water. When switched on, the heating caused by the internal components is sufficient to produce this same effect.

Mounting precautions

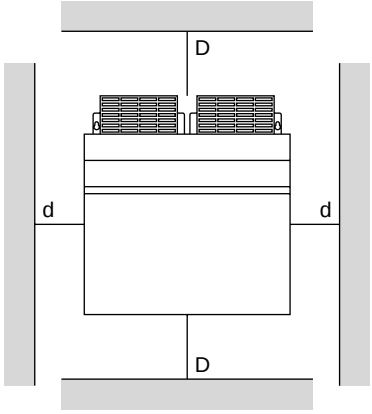
Mount the speed controller in the vertical position so that the air circulates from the bottom to the top of the cooling radiator fins.
Do not install near heat radiating elements.
If the controller must be installed in an enclosure, provide louvres for cooling air flow and, where a cooling fan is fitted, provide an opening in the top of the enclosure with a protective cover and filters if necessary.

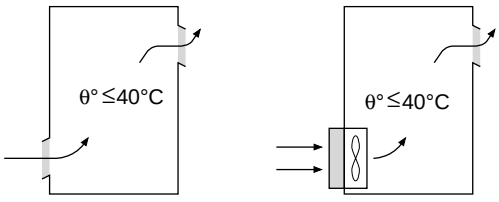
Mounting in a metal enclosure

Degree of protection IP23.

In order to ensure adequate air flow inside the controller :

- leave sufficient space around the unit :
  • d ≥ 50 mm,
  • D ≥ 100 mm.
- provide ventilation louvres,
- make sure that the ventilation is adequate, if not fit a cooling fan with filter.





- air flows :
  • 180 and 270A bridges : 360m³/h
  • 400 and 650A bridges : 1300m³/h
  • 800 to 1750A bridges : 2600 m³/h for RTV-84
    1300 m³/h for RTV-74
  • 3000A bridges : 3600m³/h

Precautions

Mounting in a general purpose metal enclosure

- power to be dissipated :

Type of bridge A	Power W	Type of bridge A	Power W
16	110	400	1200
32	150	650	2000
48	200	800	2400
72	270	1250	3710
180	600	1750	5250
270	850	3000	9000

Mounting in dust and damp protected metal enclosure

Degree of protection IP54

Fit a heat exchange device to dissipate the heat generated inside the enclosure.

See power dissipated by speed controller table.

Wiring

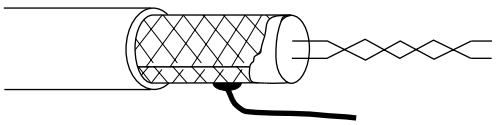
- Insulation
  Apart from the special earth terminal marked ⏚ no other conductors connected to terminal blocks should be connected to earth or the protective earth of the installation.

⚠

- Analogue and logic external circuits of CJ1 terminal must be wired using screened and twisted pairs (pitch ≤ 5 cm) as well as RNA-RNB terminals of PJ1 terminal block.
  Keep the control and power cables as separated as possible.

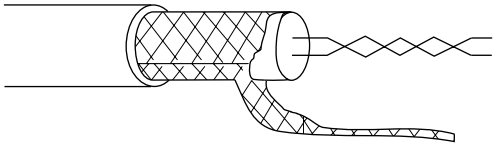
  The screenings of cables connected to CJ1 should be wired directly to the 3 earth terminals specifically provided for that purpose on the speed controller control rack. The tachogenerator screening should be connected to the earth terminal provided for that purpose near the power interface board. The maximum length of connections other than the speed reference and feedback will be 5 m.
  Above this, fit an interface circuit.

Wrong



wire soldered to the braid

Right



braid wired directly to the terminal earth of the speed controller

Filter module

Delivered with the speed controller, connect it directly to the terminals ahead of the line inductances.

Its use is obligatory.

⚠

If power and control are supplied separately, connect the module directly to control terminals CL1,CL2 and CL3.

For 16 A and 800 à 3000 A ratings, connect it directly to control terminals CL1,CL2 and CL3.

Speed controller cover

This serves as an electromagnetic screen for the control board, and as a support plate for the dialogue keypad.

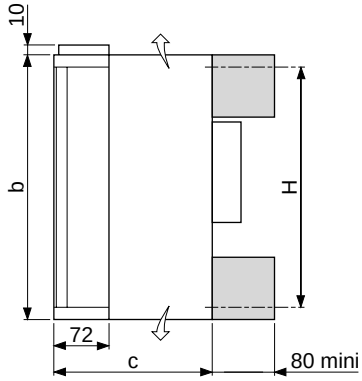
Avoid operating the controller when the cover is off or open.

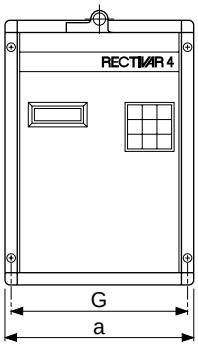
Installation of the RECTIVAR

Dimensions and weights

RECTIVAR 16 to 180A

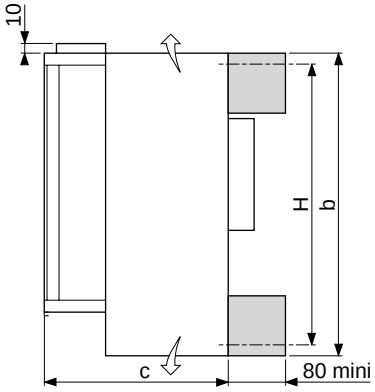
Fixings : 4 x ∅6,5

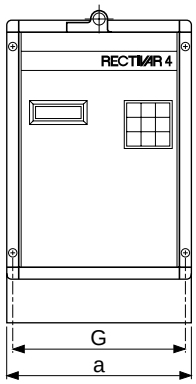




RECTIVAR 270A

Fixings : 4 x ∅6,5

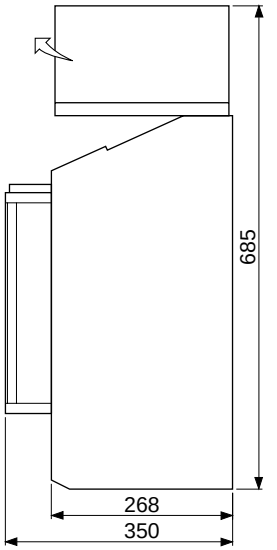


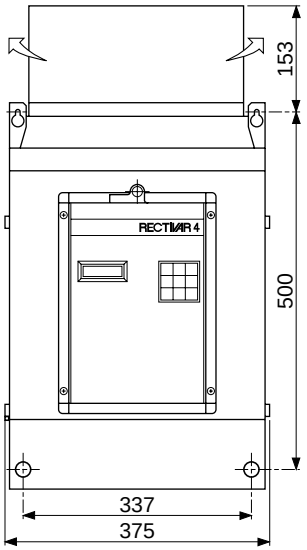


Cooling spacers for 180A and 270A rated controllers mounted on flat surfaces.
Reference VY1-RZD102, to be ordered separately.

	Dimensions			Fixings			Weight
RECTIVAR	a	b	c	H	G	∅	kg
RTV-84D16Q	231	323	176	290	200	6,5	6
RTV-74/84D32	231	323	220	290	200	6,5	6,5
RTV-74/84D48	231	323	260	290	200	6,5	10
RTV-74/84D72	231	323	260	290	200	6,5	10
RTV-74/84C18	231	323	260 + (80)*	290	200	6,5	11
RTV-74/84C27	231	403	260 + (80)*	370	200	6,5	13

RECTIVAR 400 and 650A
RTV - 74/84 C40• and C65•

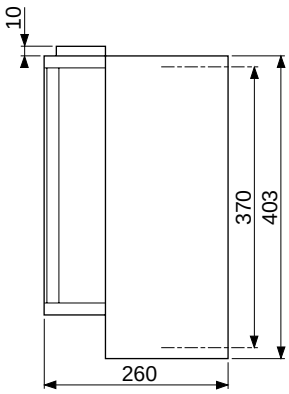


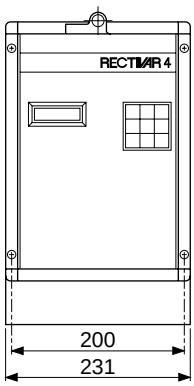


Weight : 47 kg

Fixings : 4 x ∅8,5

Control module VW3-RZD1122
RTV - 74/84 C80• to M30





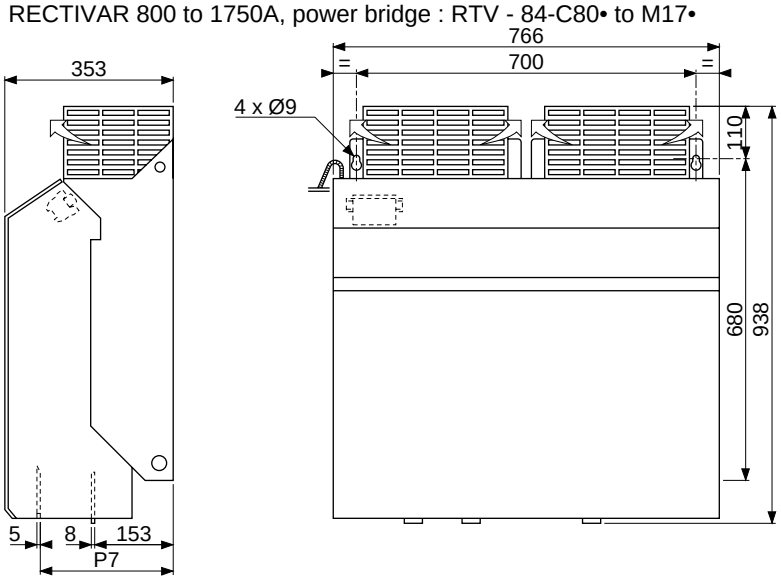
Weight : 12 kg

Fixings : 4 x ∅8,5

Installation of the RECTIVAR

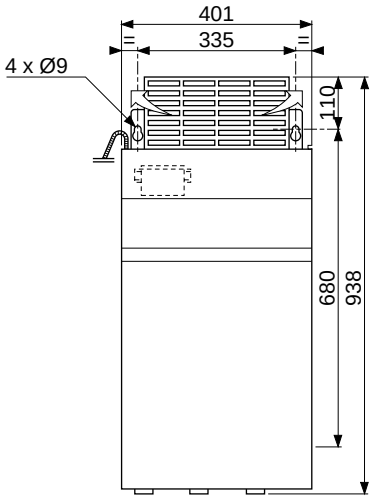
Dimensions and weights

RECTIVAR 800 to 1750A, power bridge : RTV - 84-C80• to M17•



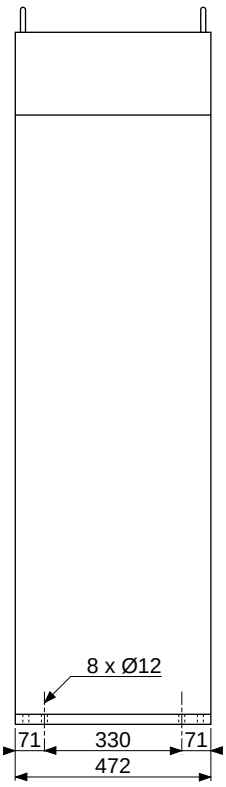
RECTIVAR	P7	Weight (kg)
RTV-84C80• to M12•	270	108
RTV-84M17•	278	120

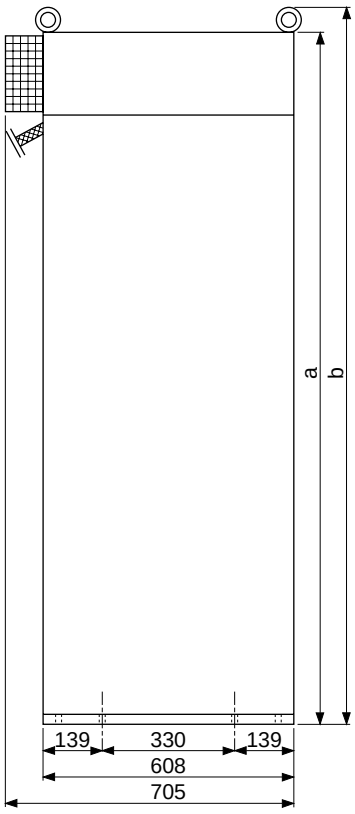
power bridge : RTV - 74-C80• to M17•



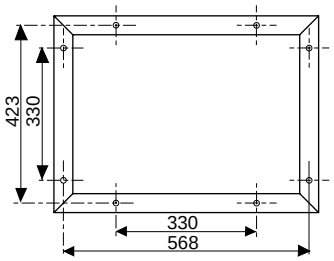
RECTIVAR	P7	Weight (kg)
RTV-74C80• to M12•	270	54
RTV-74M17•	278	60

RECTIVAR 3000A, power bridges : RTV - 74-M30•
RTV - 84-M30•





floor fixings
viewed from A

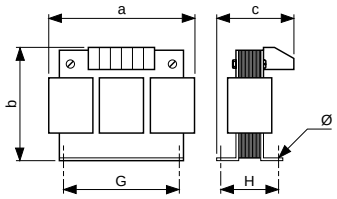


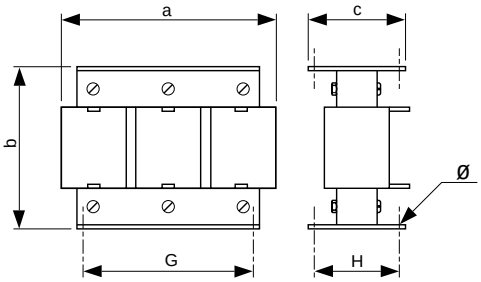
	a	b	Weight (kg)
RTV - 74	1330	1400	220
RTV - 84	1670	1740	298

A

Dimensions and weights

Three phase line inductance



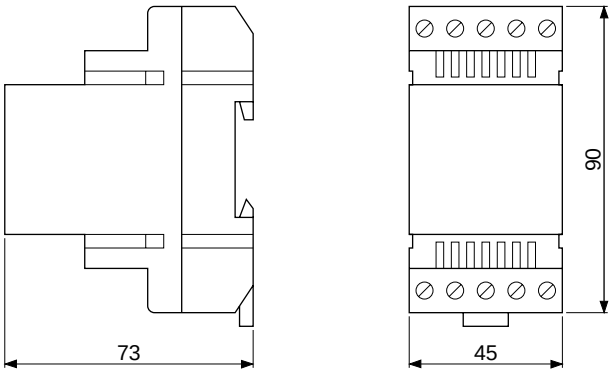


Reference	a	b	c	g	h	ø	Weight (kg)
VZ1-L015UM17T	120	150	80	60	52	6	2,100
VZ1-L030U800T	150	180	120	75	76	7	4,100
VZ1-L040U600T	180	215	130	85	76	7	5,100
VZ1-L070U350T	180	215	150	85	97	7	8,000
VZ1-L150U170T	270	240	170	105	96	11,5	14,900
VZ1-L250U100T	270	240	220	105	125	11,5	24,300
VZ1-L325U075T	270	240	240	105	138	11,5	28,900
VZ1-L530U045T	380	410	225	310	95	9	37,000
VZ1-L650U038T	390	410	275	310	100	9	46,000
VZ1-LM10U024T	400	410	310	310	125	9	66,000
VZ1-LM14U016T	420	490	340	310	125	9	80,000
VZ1-LM24U010T	420	550	385	310	155	9	120,000

For association with speed controller, see page 1/67.

Filter module VY1 RZD106

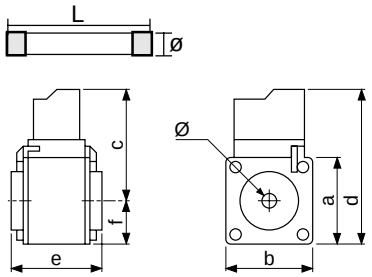
Mounting on AM1-ED rail



Dimensions and weights

Fuses

Association with controller (see page 63)



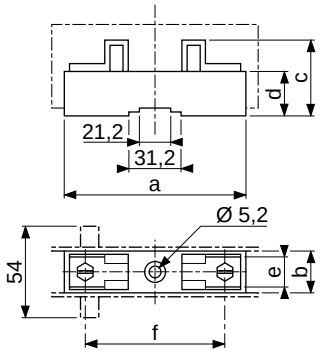
Reference	L	ø	Reference	L	ø
DF3-EF04001	51	14	DF3-FF10001	58	22
DF3-FF05002	58	22			

Reference	A	B	C	D	E	F	ø
DF3-NF25002	51	51	32	66	51	25,5	8
DF3-NF40002	51	51	32	66	51	25,5	8
DF3-NF50002	51	51	32	66	51	25,5	8
DF3-QF80002	75	75	43	77	51	37,5	12

For DF3-NF25002 to DF3-QF80002 fuses, use :
- a micro-contact, reference VZ1-P001

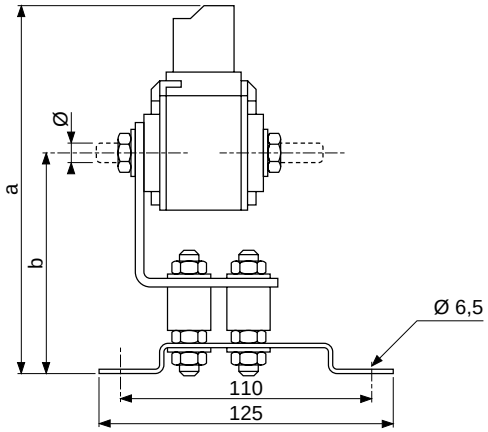
Fuse carriers

(1) Carriers for fuse sizes 14-51, 22-58 :
DF5-EA and FA.



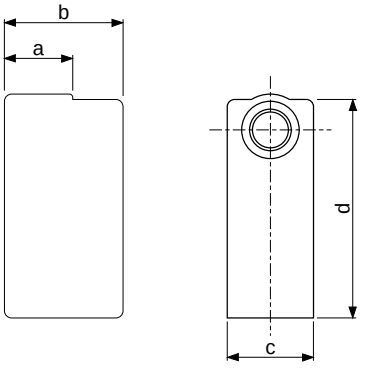
Reference	Size	A	B	C	D	E	F
DF5-EA61	14-51	105	22	48	24	17	85
DF5-FA61	22-58	115	30	55	24	23	90

• Carriers for DF3-NF. to QF fuses
- for separate mounting of the fuses.
WARNING : respect the creepage distances between fuses
E.g. NFC 20.040

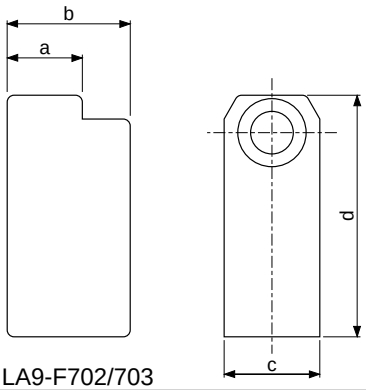


Reference	Fuse	a	b	c	ø
DF5-NZ01	DF3-NF25002	157	90	51	8
DF5-NZ01	DF3-NF40002	157	90	51	8
DF5-NZ01	DF3-NF50002	157	90	51	8
DF5-QZ01	DF3-QF80002	181	102	75	12

Power terminals protective cover



LA9-F701



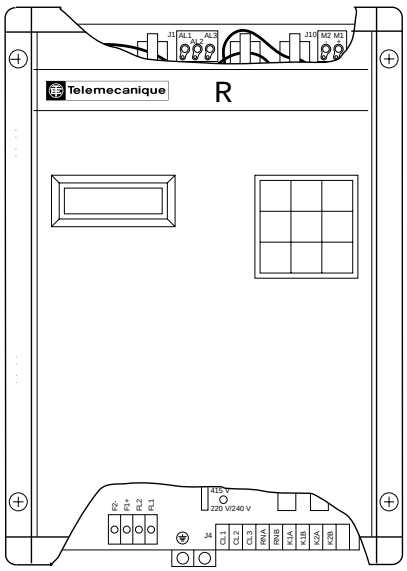
LA9-F702/703

Reference	a	b	c	d	Controller
LA9-F701	26	43	26	72	RTV-74/84 D32 to C18
LA9-F702	27	48	34	90	RTV-74/84 C27 (a.c.) and VW3-RZD1122 module
LA9-F703	35	58	45	112	RTV-74/84 C27 (d.c.) and C40 and C65

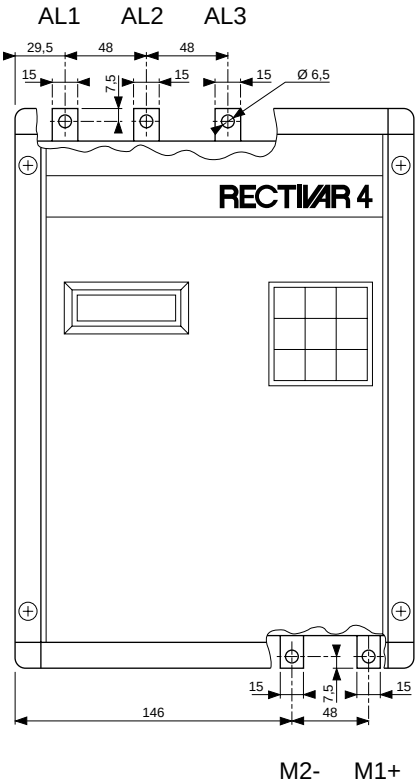
Installation of the RECTIVAR

Power connections

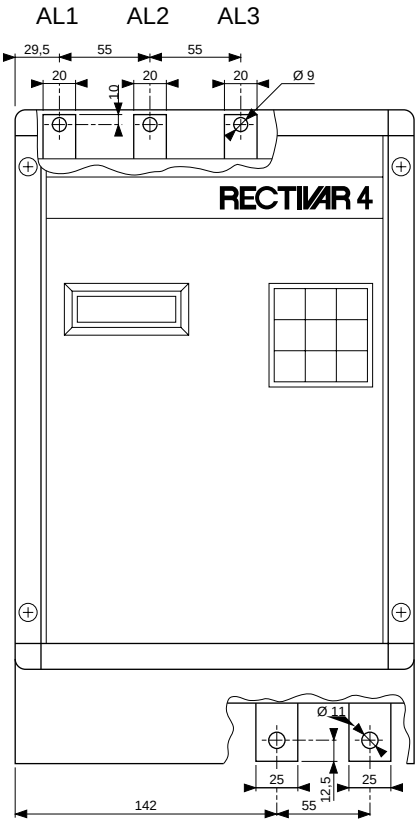
RECTIVAR 16A



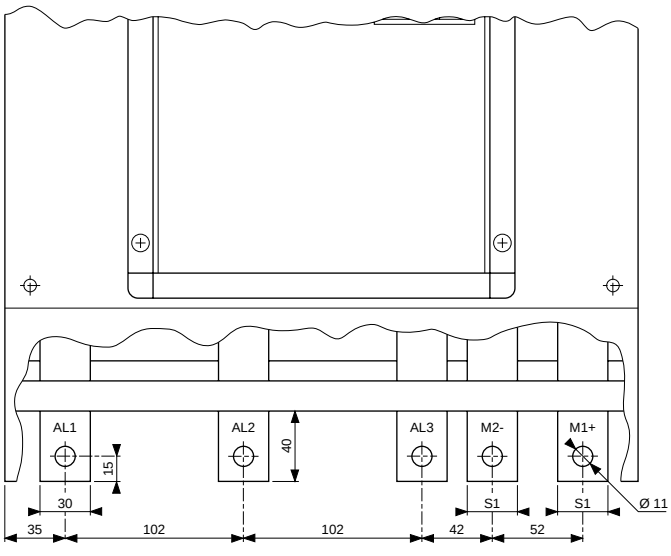
RECTIVAR 32 to 180A



RECTIVAR 270A



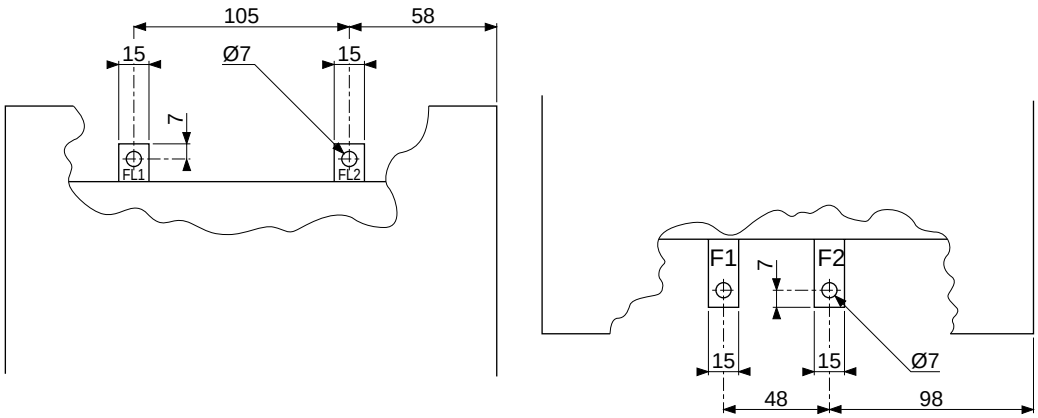
RECTIVAR 400 to 650A



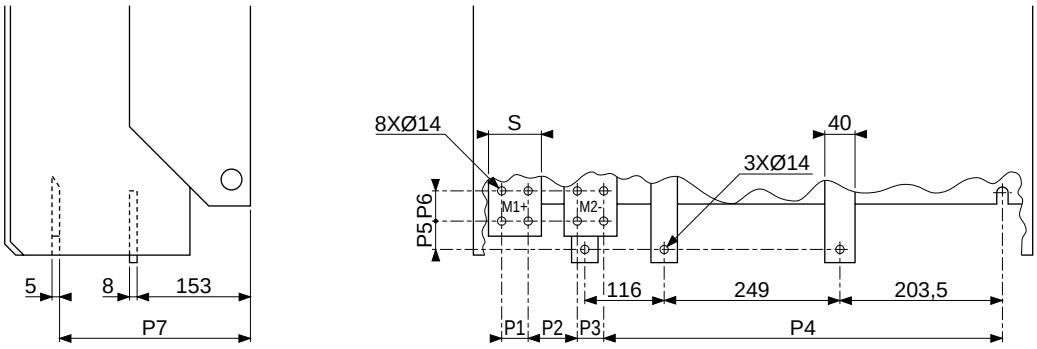
	RTV-74/84C40	RTV-74/84C65
S1	30	40

Power connections

Control module VW3-RZD1122

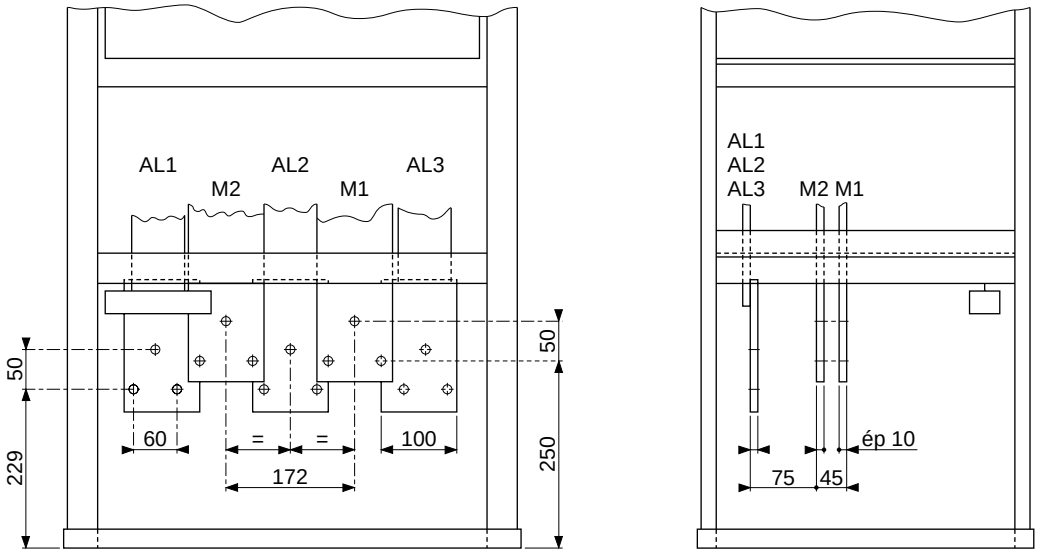


RECTIVAR 800 to 1750A



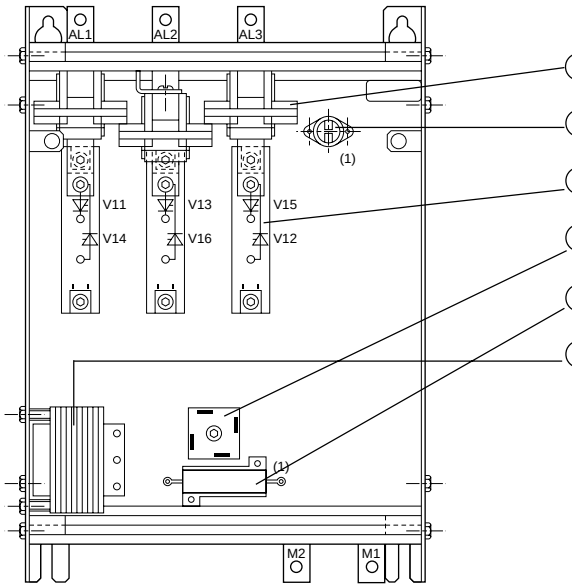
RECTIVAR	P1	P2	P3	P4 RTV 84	P4 RTV 74	P5	P6	P7	S
RTV-74/84C80• to M12•	26	94	26	516	151	38,5	26	270	63
RTV-74/84M17•	40	80	40	529	164	41,5	40	278	80

RECTIVAR 3000A



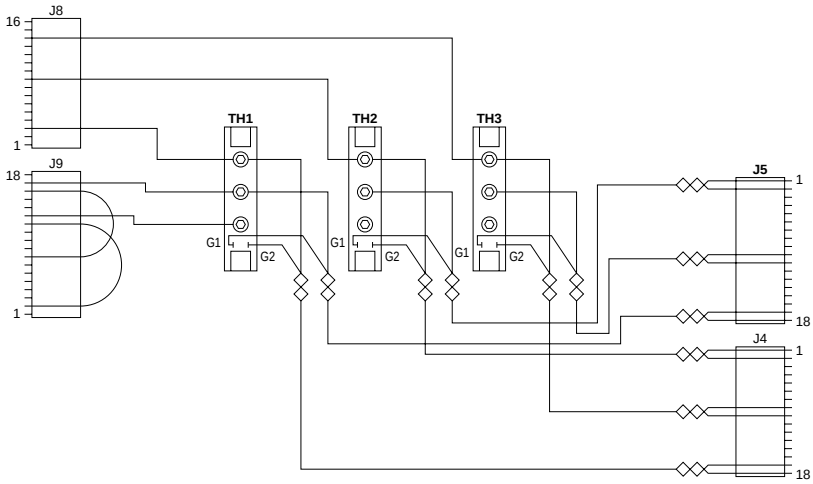
Component layout
RECTIVAR RTV-74

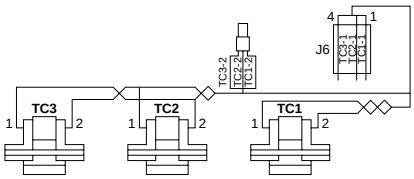
Power bridge
32 to 180A

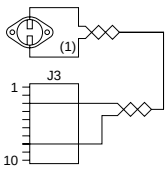


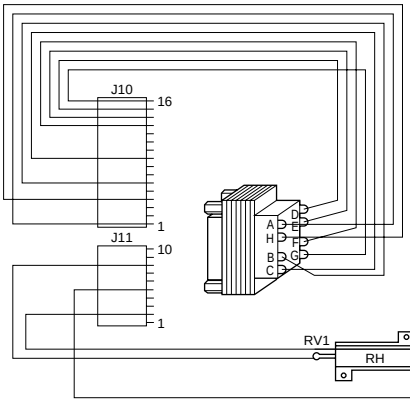
① Current transformer
② Thermocontact for 180A rating only
③ Thyristor module (3 per controller)
④ Excitation rectifier
⑤ Résistance for 180A rating only
⑥ Control supply transformer

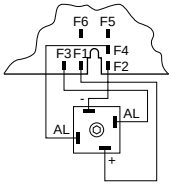
Internal wiring











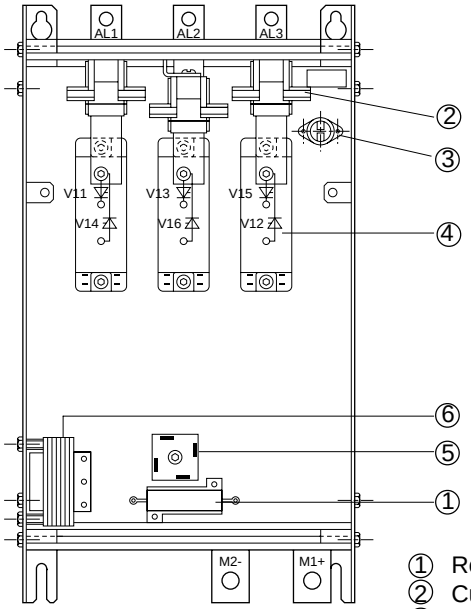
Cutting up of
power board

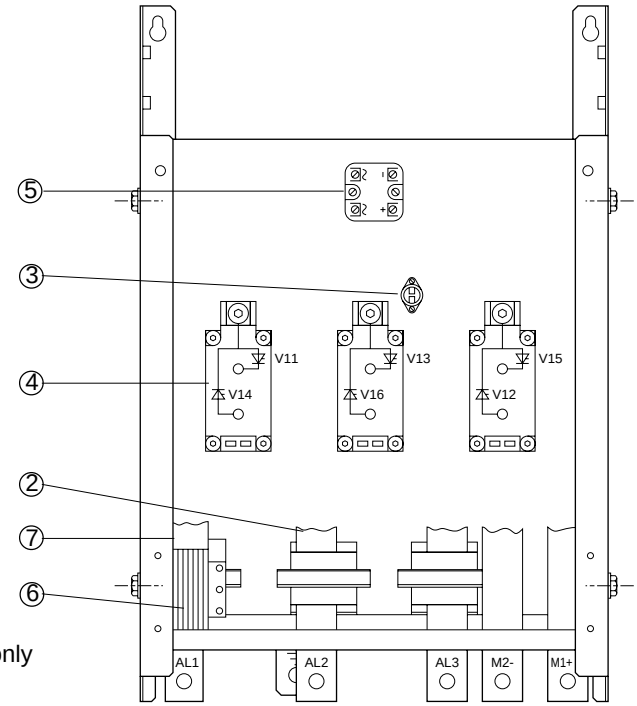
(1) for 220V, on C18 models only, short out the RH resistance using terminals 6 and 10 of the J11 connector on the power board.

Installation of the RECTIVAR

Component layout
RECTIVAR RTV-74

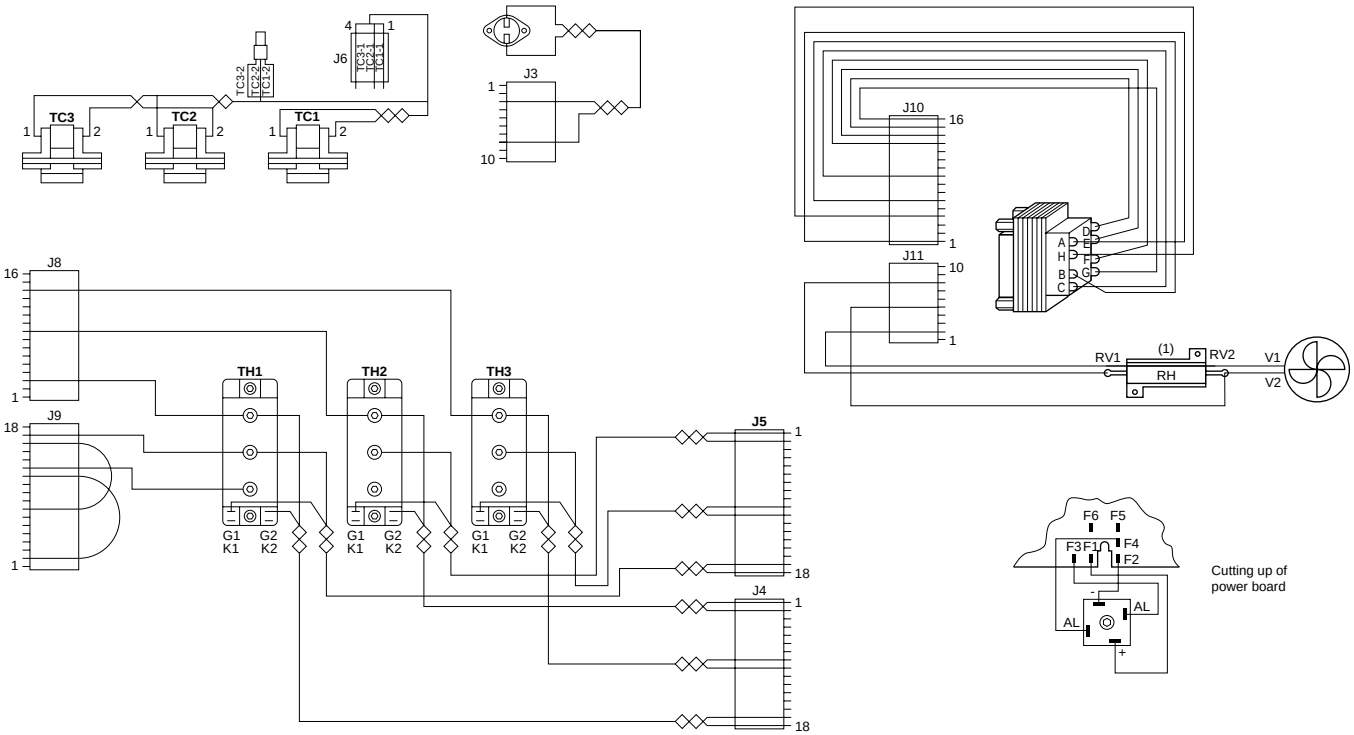
Power bridge
270 to 650A





① Resistance for 270A rating only
② Current transformer
③ Thermocontact
④ Thyristor module (3 per controller)
⑤ Excitation rectifier
⑥ Control supply transformer
⑦ Fan connection terminals, ratings 400 and 650A (0 - 220)

Internal wiring



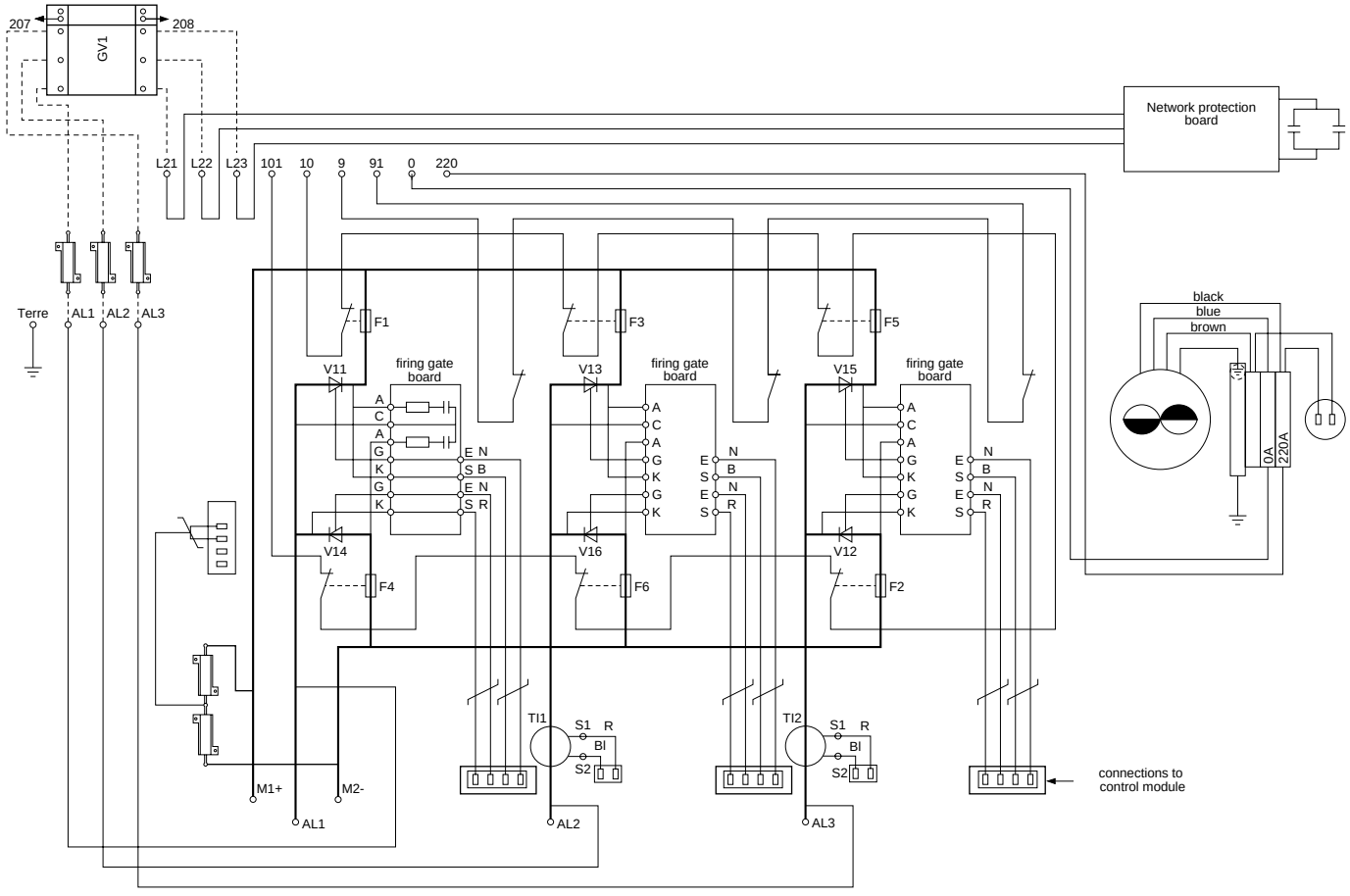
Ratings 400 and 650A : fans connected to terminals 0 - 220
270A rating : for 220V short out the RH resistance using terminals 6 and 10 of the J11 connector of the power board.

Installation of the RECTIVAR

Component layout
RECTIVAR RTV-74

Power bridge
800 to 1750A

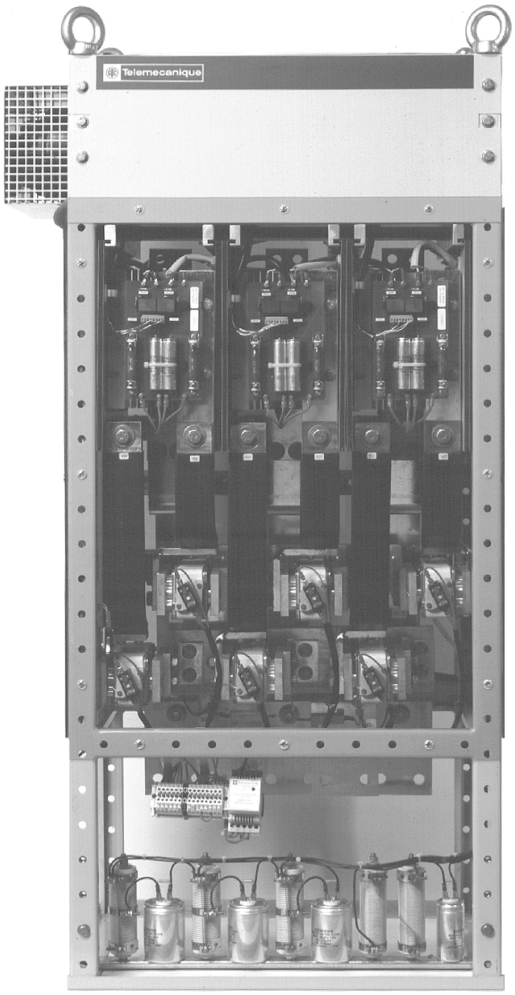
Internal wiring
800 to 1750A



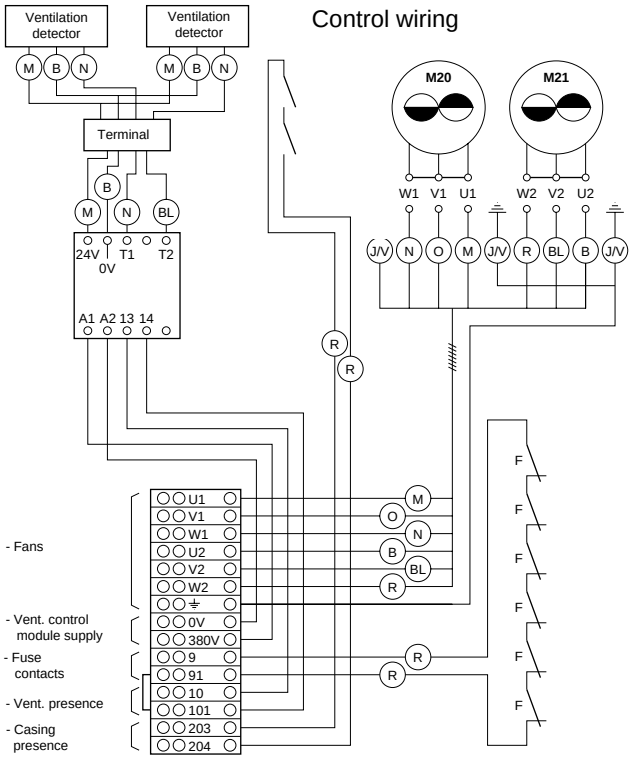
Installation of the RECTIVAR

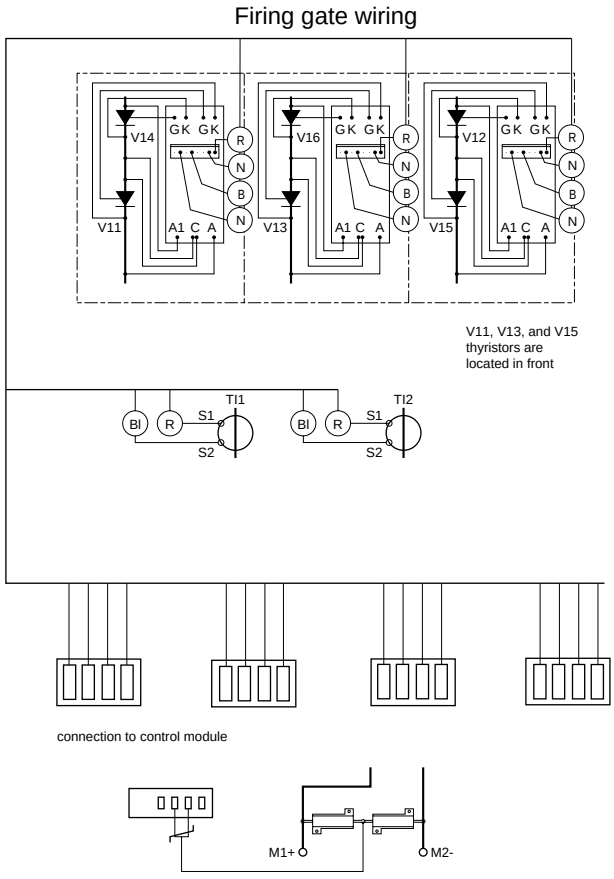
Component layout
RECTIVAR RTV-74

Power bridge 3000A



Internal wiring

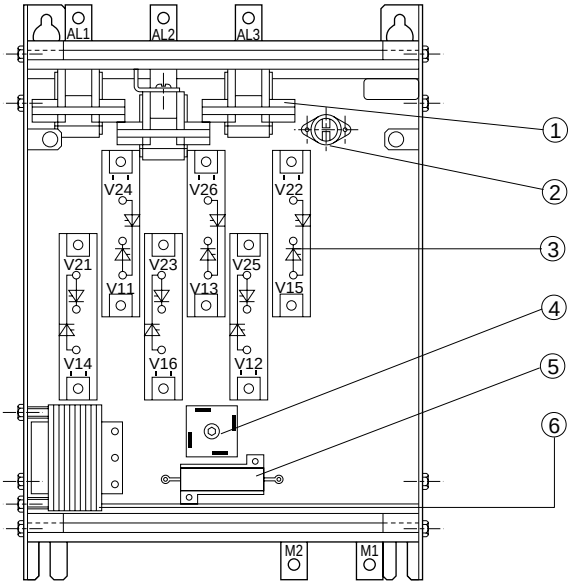




Installation of the RECTIVAR

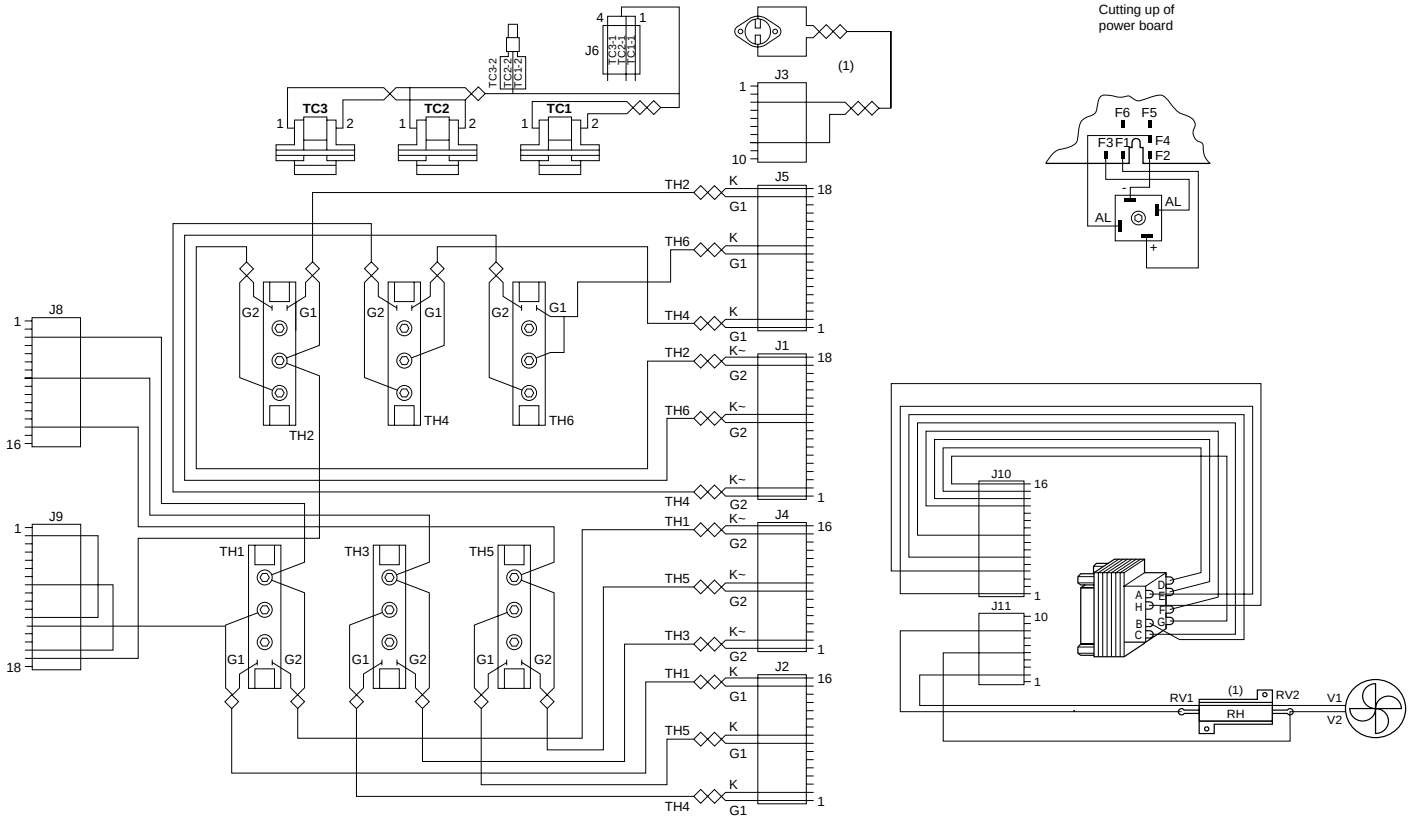
Component layout
RECTIVAR RTV-84

Power bridge
32 to 180A



1. Current transformer
2. Thermocontact, for 180A rating only
3. Thyristor module (6 per controller)
4. Excitation rectifier
5. Resistance, for 180A rating only
6. Control supply transformer

Internal wiring

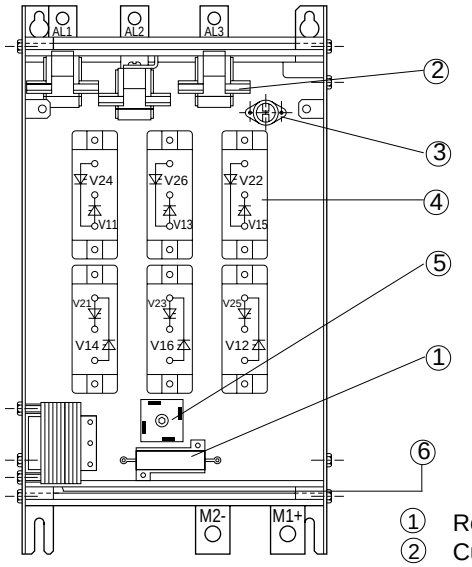


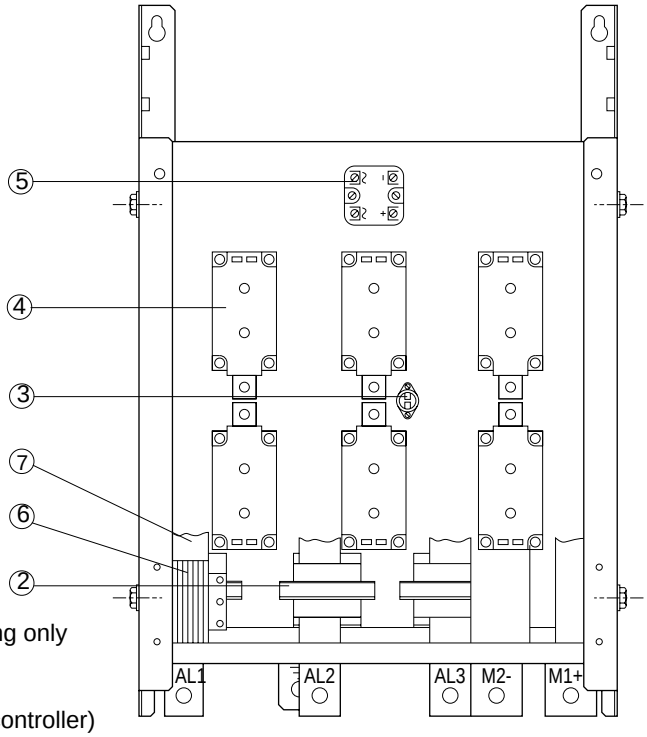
(1) for 220V, on C18 models only, short out the RH resistance using terminals 6 and 10 of the J11 connector on the power board.

Installation

Components layout
RECTIVAR RTV-84

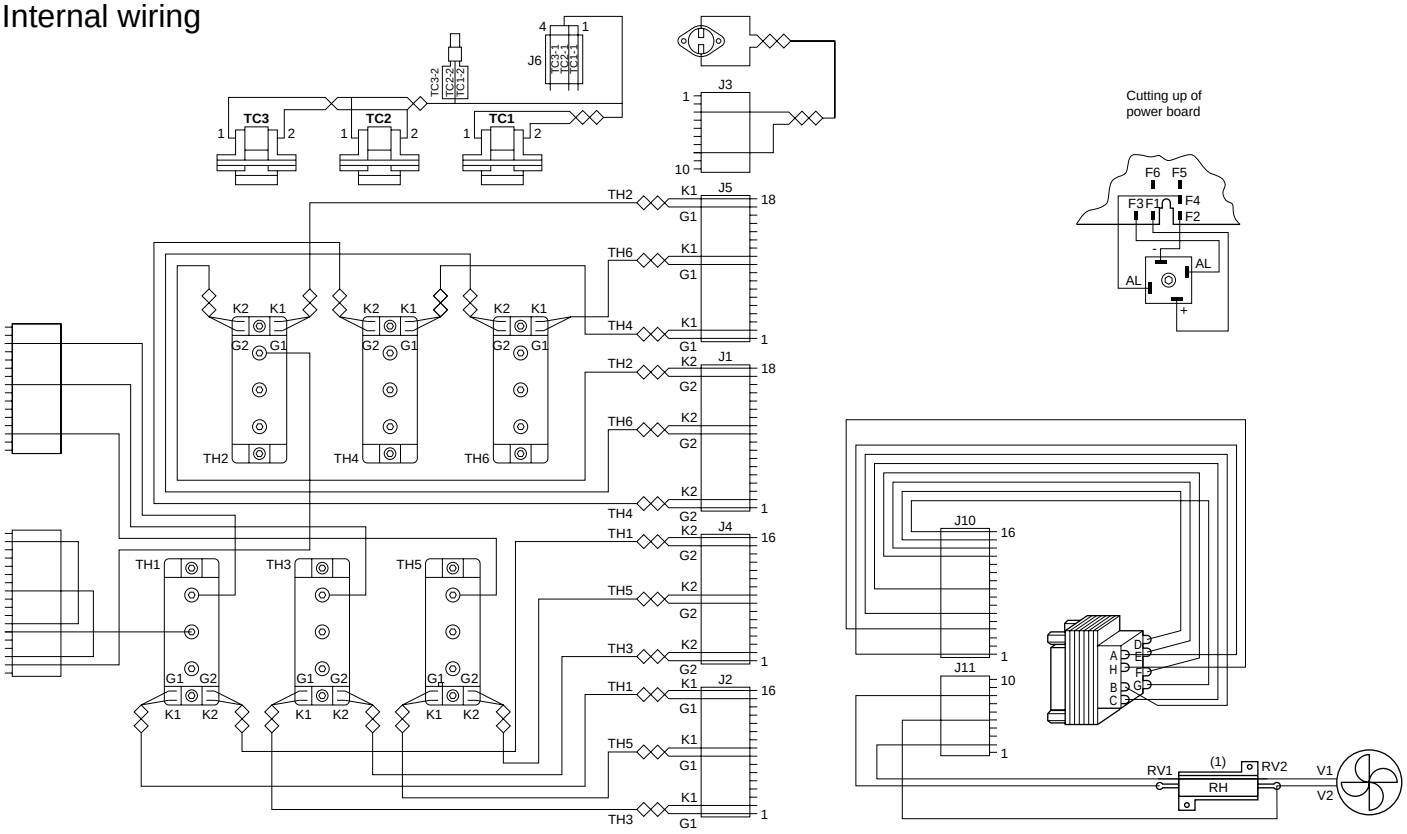
Power bridge
270 to 650A





① Resistance for 270A rating only
② Current transformer
③ Thermocontact
④ Thyristor module (6 per controller)
⑤ Excitation rectifier
⑥ Control supply transformer
⑦ Fan connection terminals, ratings 400 and 650 A

Internal wiring

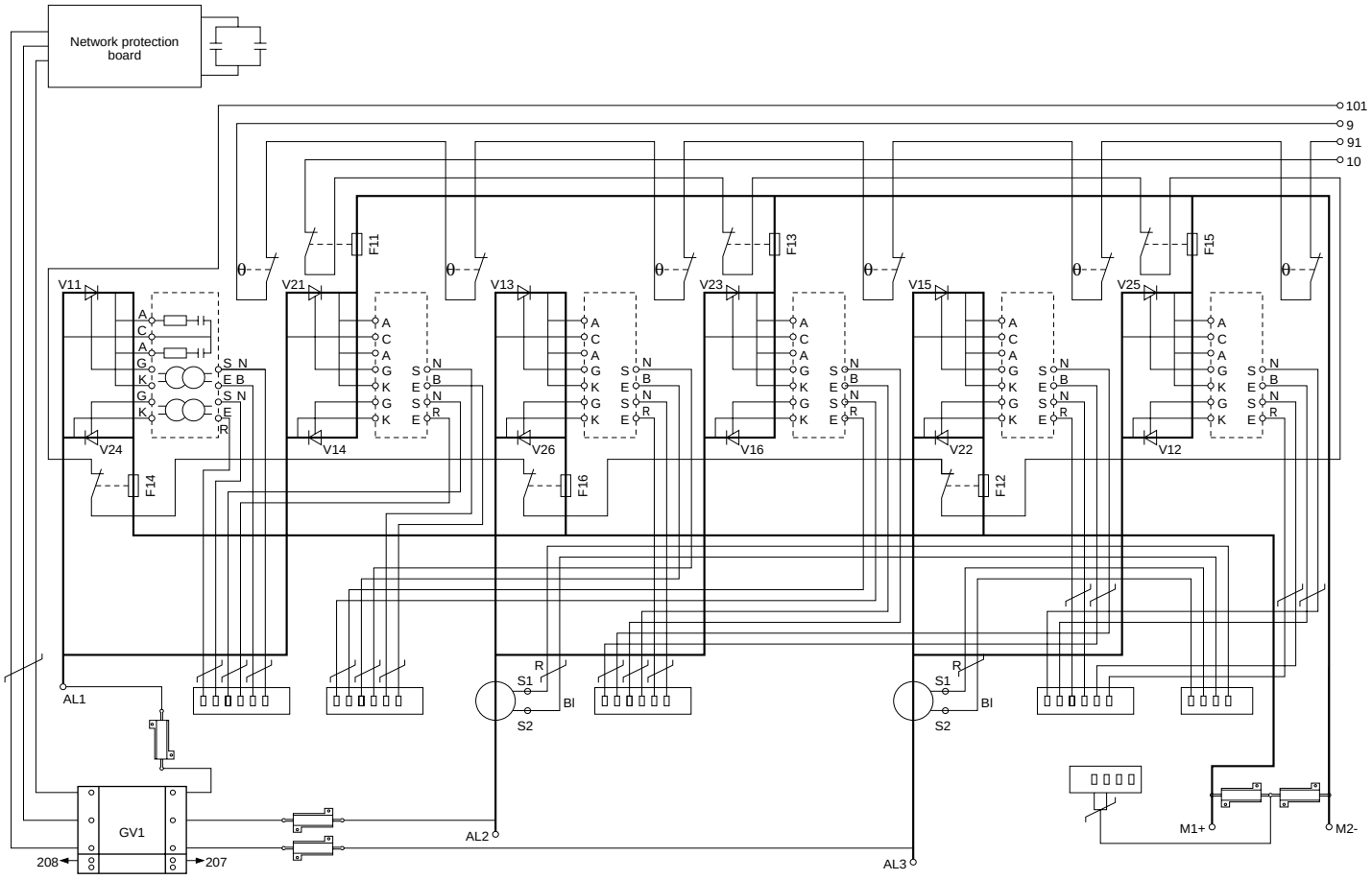


Ratings 400 and 650A : fans connected to terminals 0-220
270A rating : for 220V, short out the RH resistance using terminals 6 and 10 of the J11 connector on the power board.

Component layout
RECTIVAR RTV-84

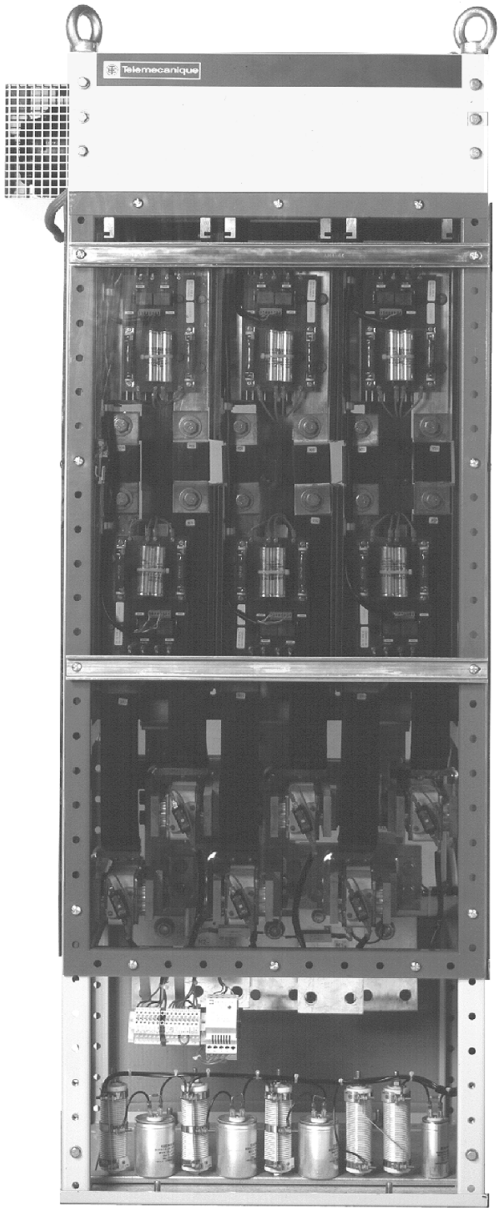
Power bridge
800 to 1750A

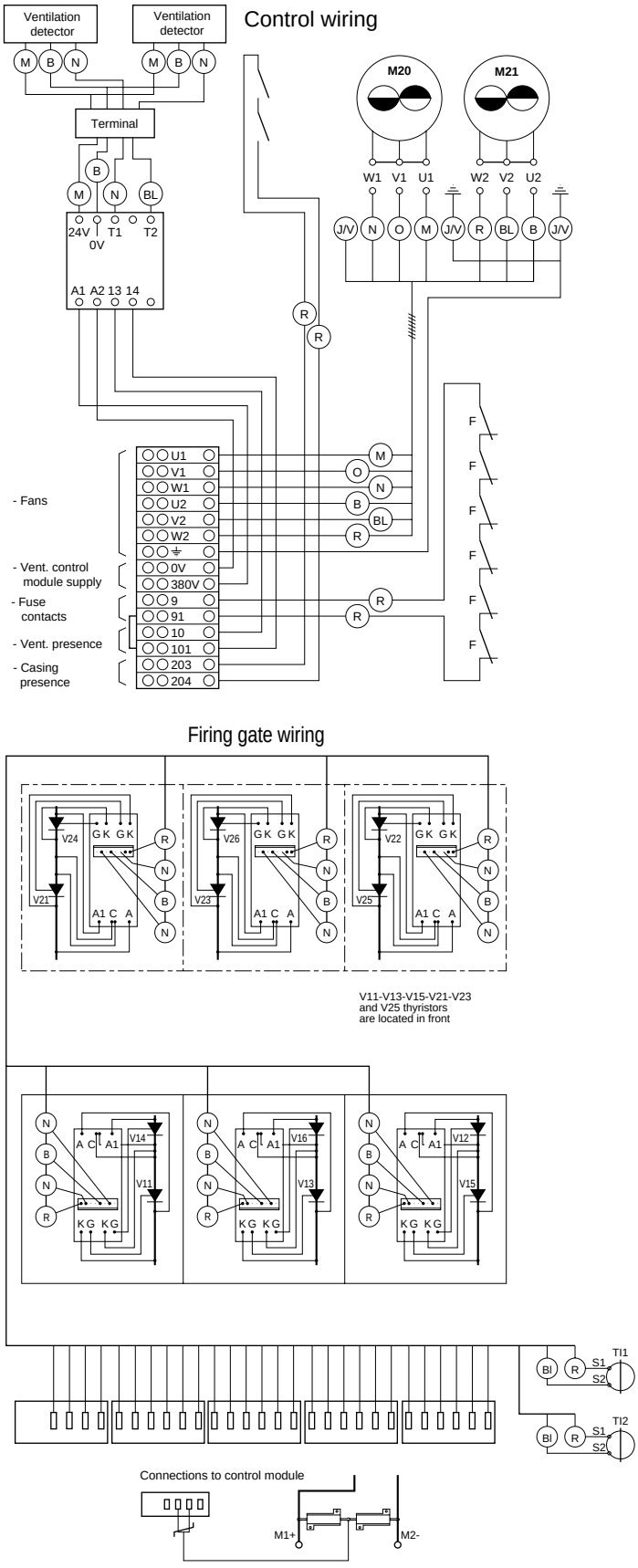
Internal wiring
800 to 1750A



Component layout
RECTIVAR RTV-84

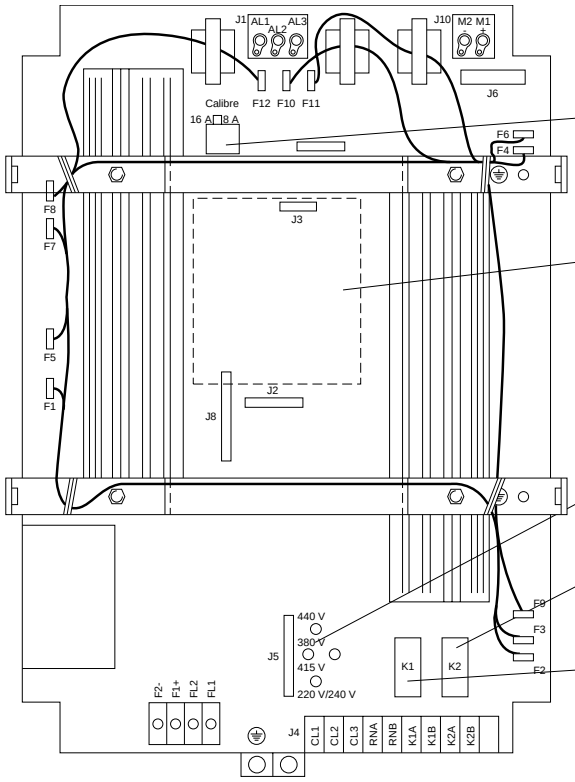
Power bridge 3000A





Components layout

16A power board VX5-RLD101



Choice of rating
8 or 16A according
to power motor

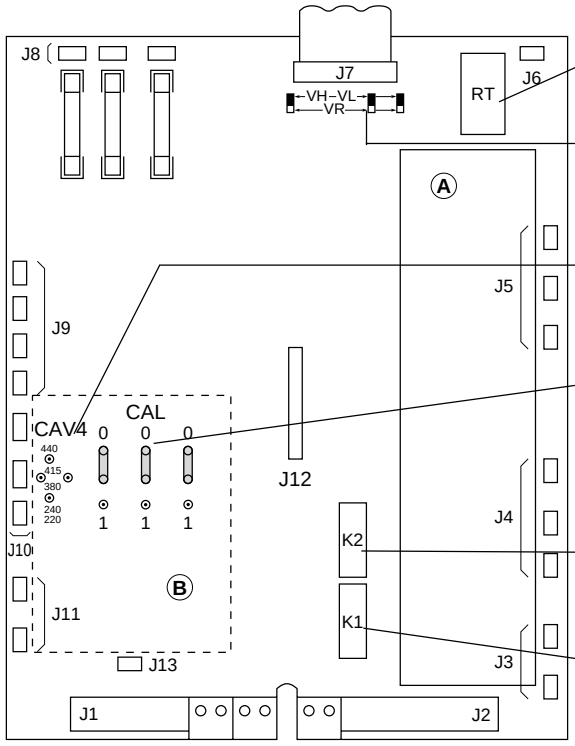
Galvanic isolation
board

Adaptation of control
transformer supply
according to network

Assignable K2 relay

Assignable K1 relay

Carte interface puissance 32à 650A VX5-RZD109



Adaptation of current reading
according to rating.
Current module, see page 1/66

Choice of type of controller.
Set to VL for RTV-84
or VH for RTV-74

Adaptation of the control supply
transformer to suit the mains
supply

Enables seperation of the control
supply from the power supply
in position 1

Assignable relay K2

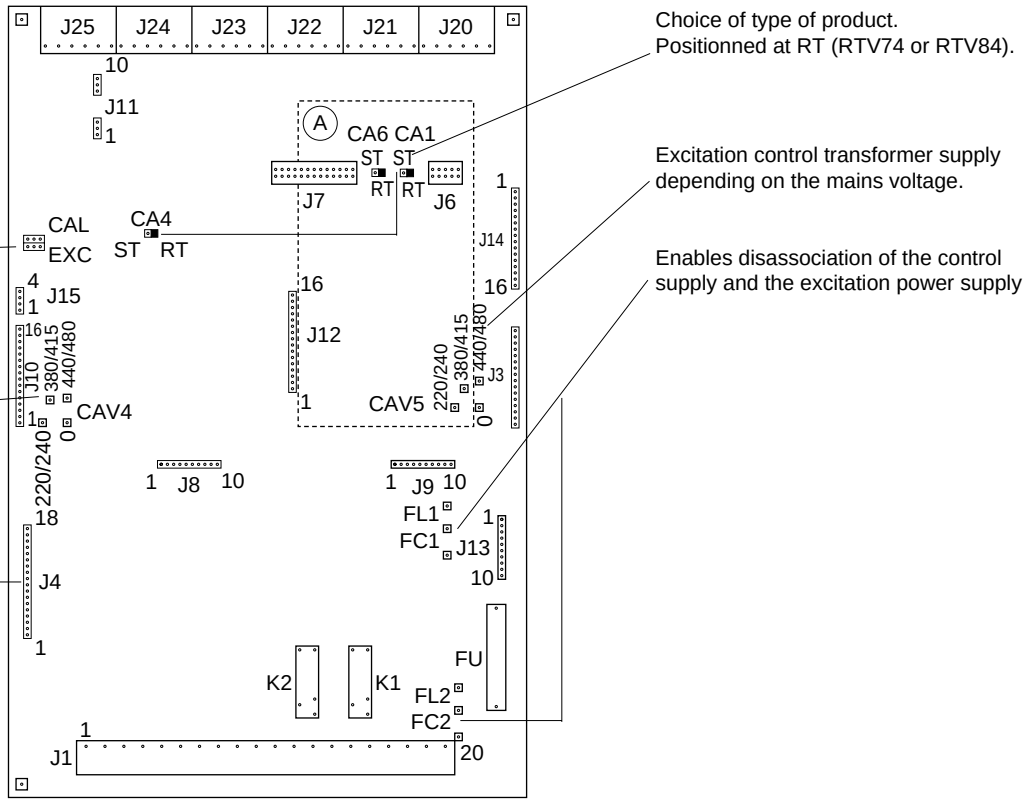
Assignable relay K1

For 220/240V mains on ratings C18 and C27, add a link on connector J11.
(see pages 1/25-1/26, 1/29-1/30)

J3 : Thermocontact
J4-J5 : Output to thyristor gate/cathode
J6 : Current transformer reading link
J8 : Power voltage take off
J9 : RC connection to thyristor terminals
J10 : Supply and output of the control transformer
J11 : Fan supply
J12 : Speed feedback - Adaptation galvanic isolation board
A : Reversible firing gate board (for RTV 84 only)
B : Galvanic isolation board

Components layout

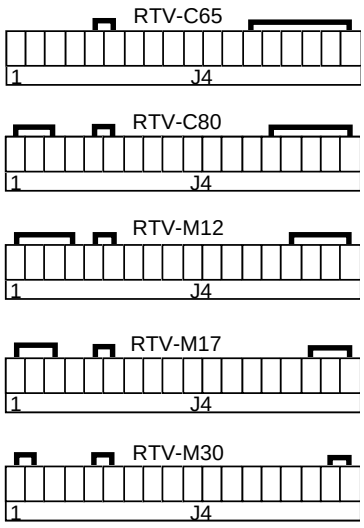
Power interface board 800 to 3000A VX5-RZD202



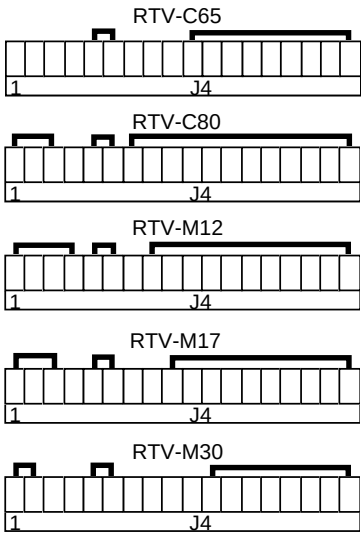
A : galvanic isolation board
J3 : excitation control transformer supply and output
J5 : excitation current transformer reading connections
J8, J9 : excitation control board connections
J10 : control transformer supply and output
J11, J12 : speed feedback and galvanic isolation board adaptation
J13 : excitation power voltage output
J14 : excitations thyristors gate/cathode output
J20 to J23 : to power bridge impulse transformers
J24 : power bridge current transformer reading connections
J25 : armature voltage reading connection.

Customization connector J4

RTV-74

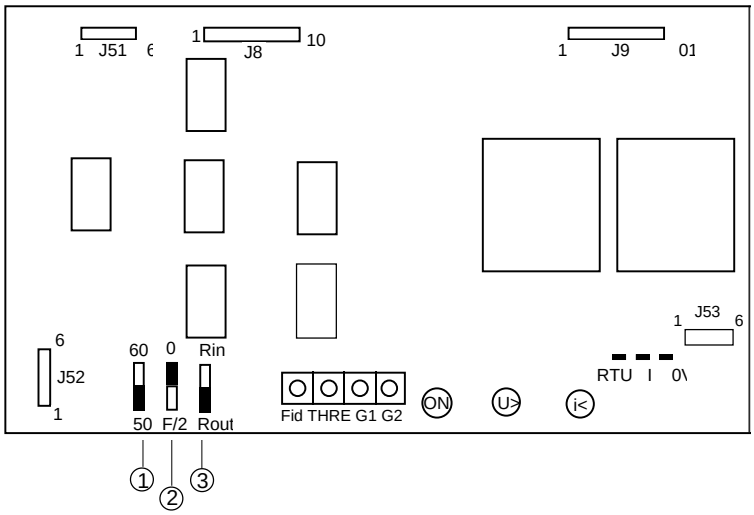


RTV-84



Components layout

Excitation control board 800 to 3000A VX4-RZD104



LEDs :

ON : excitation on
U > : armature overvoltage
I < : excitation fault
} non-active

Links :

① Mains frequency selection 50 or 60 Hz

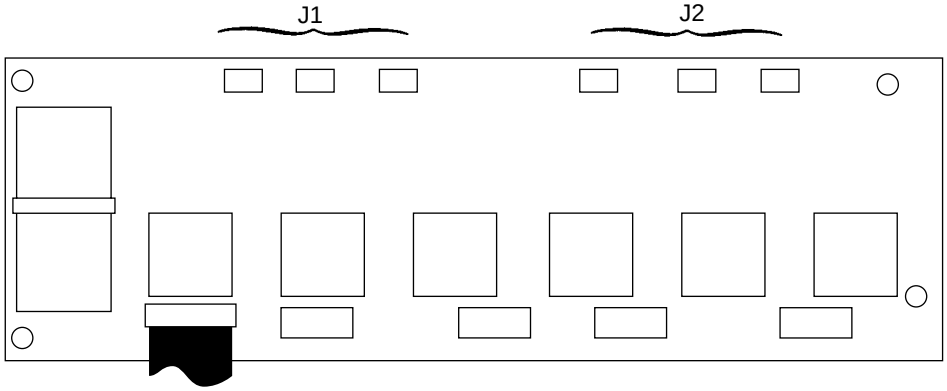
② Operation at reduced flux, positionned at 0

③ To be switched to R.OUT.

Potentiometers : Non-active armature voltage loop via microprocessor

Fid : any position
THRE : in the fully clockwise position
G1 and G2 : any position.

Reversible firing gate board VX2-DB303L for RTV-84

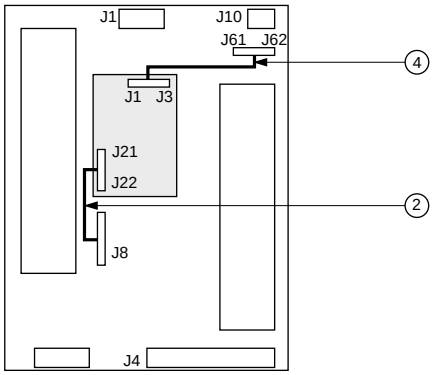


J1 : Output to thyristor gate/cathode V22, V24 and V26
J2 : Output to thyristor gate/cathode V21, V23 and V25

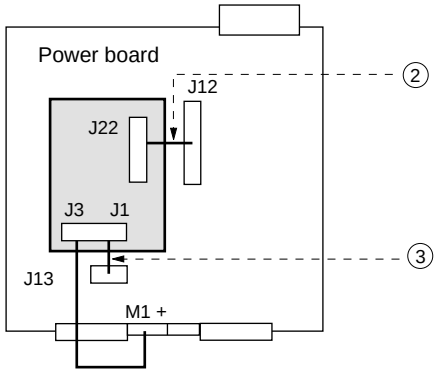
Component layout
Galvanic isolation board VW2-RZD2071

Type of speed controller

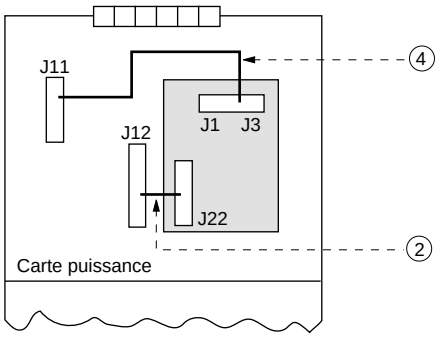
RTV-84D16Q



32 to 650 A speed controllers

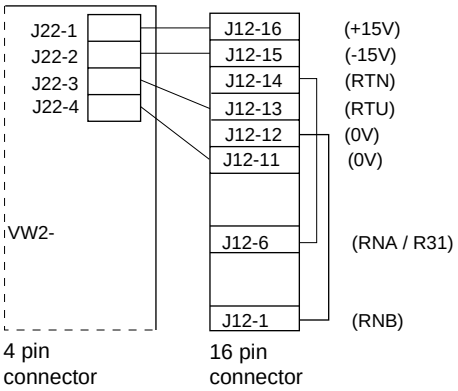


800 to 3000 A speed controllers

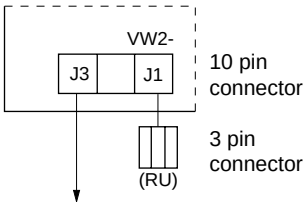


Type of strips

Strip n°2

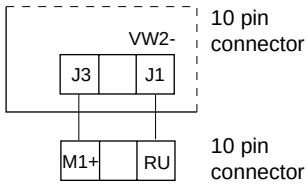


Strip n°3



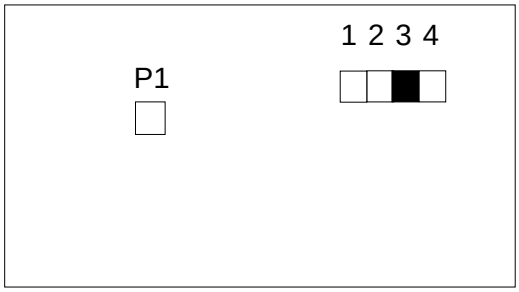
To be connected to screw terminal M1 + on the power board

Strip n°4



◯ Connector strip number

Switch and offset potentiometer layout



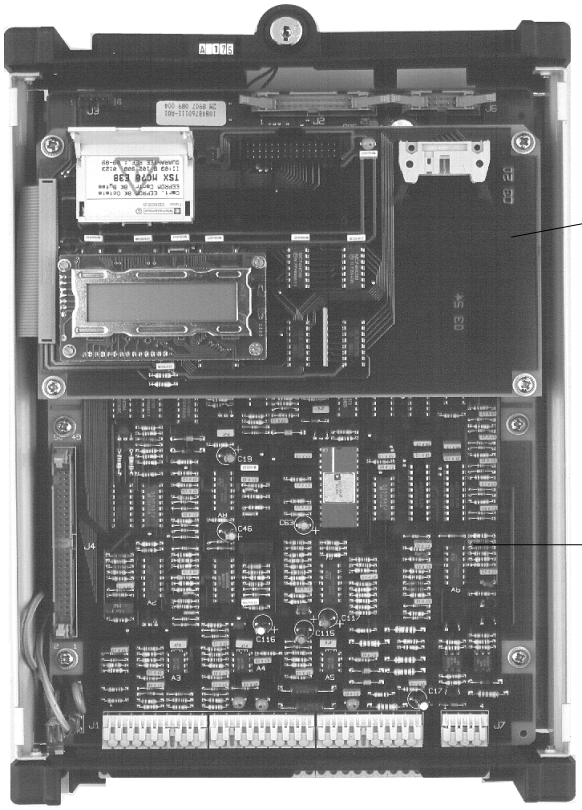
- Link to be positioned according to maximum armature voltage

1 - from 0 to 260V
2 - from 261 to 460V
3 - from 461 to 570V
4 - from 571 to 750 V

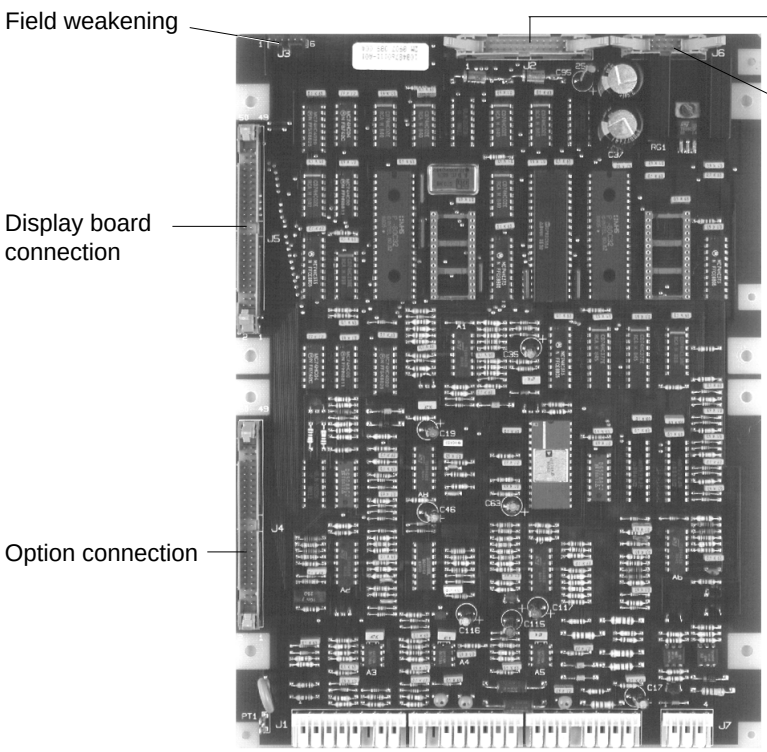
Errors may cause faults to appear on the display

Components layout

Control rack

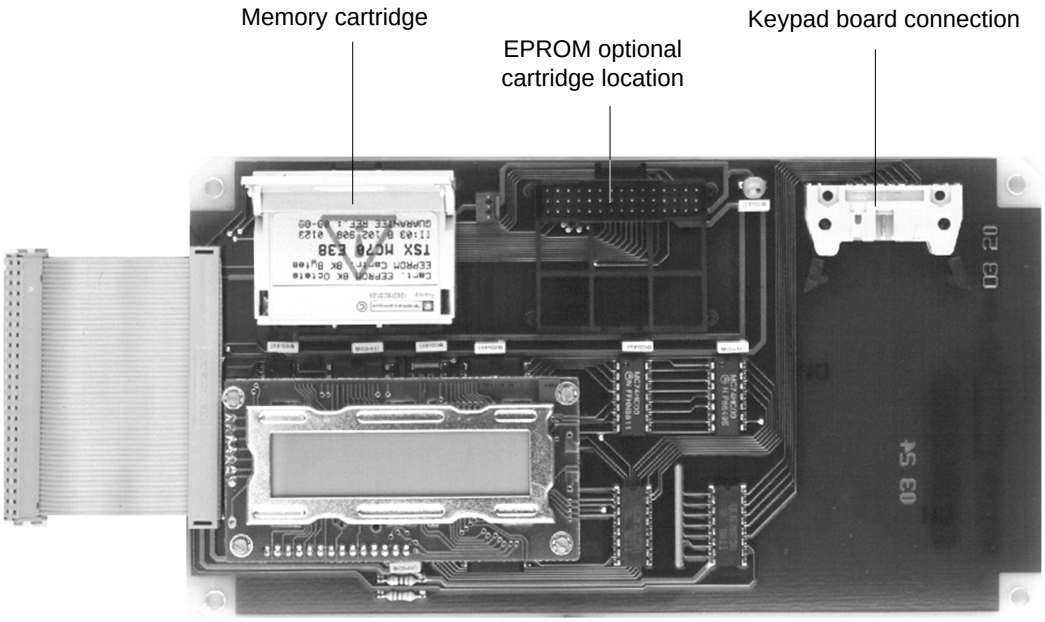


Control board

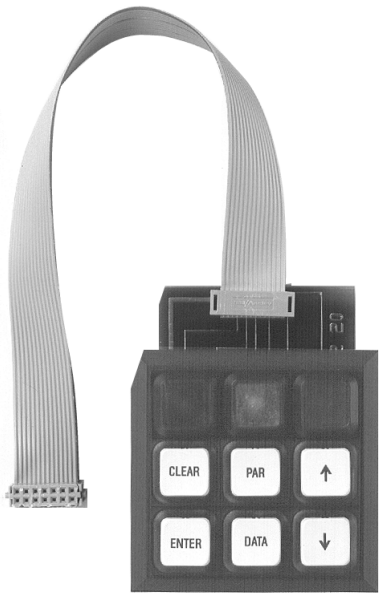


Components layout

Display board



Keypad board



As a spare part, this board is supplied mounted on the front cover

Presentation of the digital control

The RECTIVAR RTV74-84 controllers are fully digitalized for :

- the current and speed loops
- the processing of internal and external faults
- local and remote dialogue.

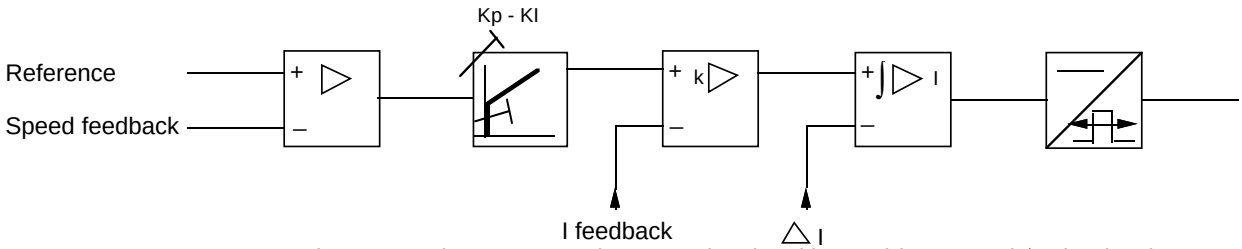
The task division between the two microprocessors is as follows :

- microprocessor n°1 controls :
  - logic inputs and outputs
  - the display/keypad and faults
  - point to point serial link
  - the calculation of speed references
  - the acceleration and deceleration ramps
  - speed regulation loop.

- microprocessor n°2 includes control of :
  - the current regulation loop
  - thyristors, via transfer modules
  - the analogue inputs and outputs
  - the mains safety processes.

For dialogue exchanges, microprocessor n°2 is considered to be the master.
These exchanges are inhibited during the configuration process. In this mode, only micro-processor n°1 is operating which stops, for example, the fault processing during this operation.

The algorhithms used for the calculations transcribe the following adjustment loop diagrams :

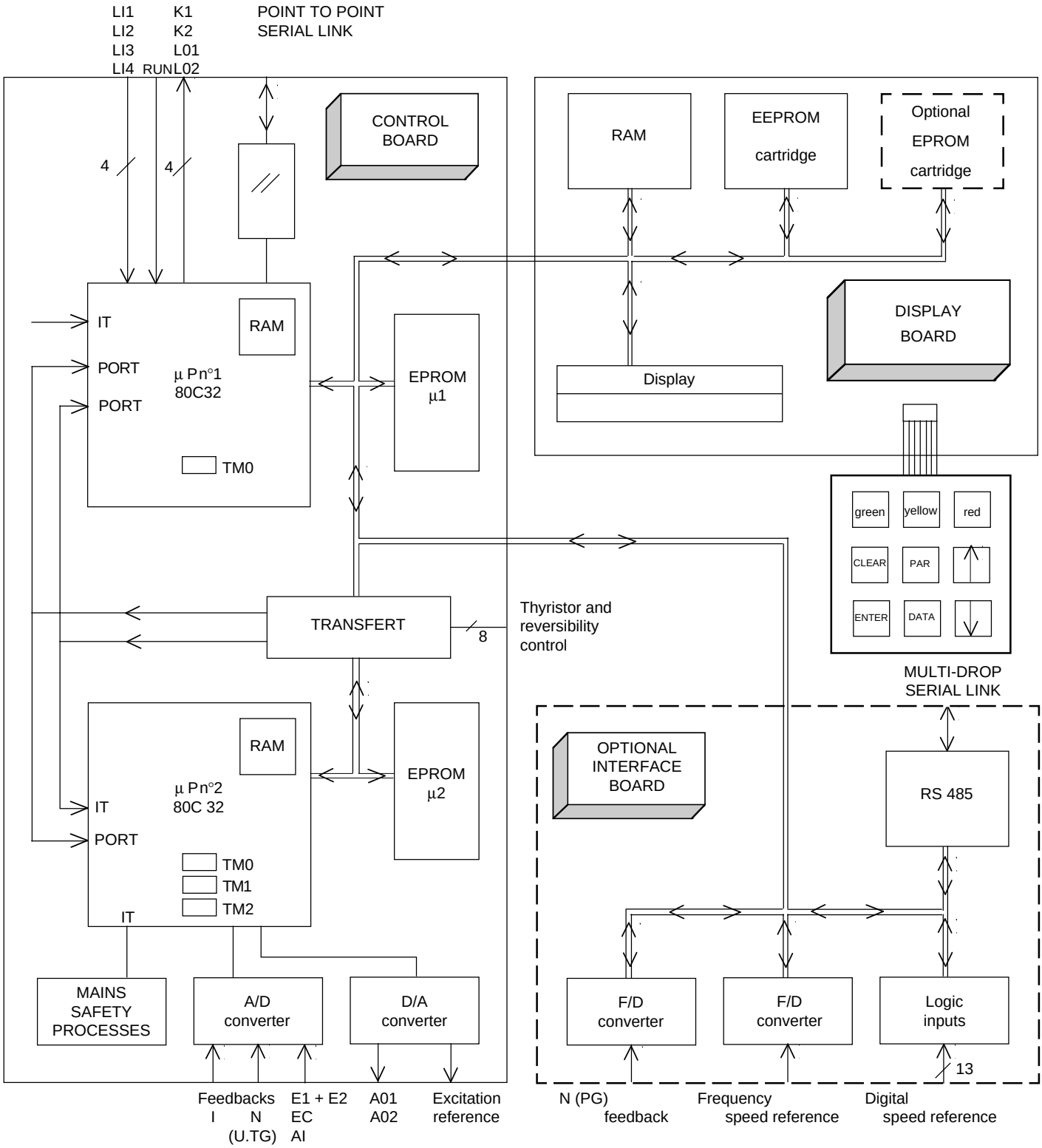


where Kp and KI represent the proportional and integral factors and Δ I the development of the current between arch n and arch n-1.

The basic time between index n-1 and n is 3.3 ms at 50 Hz and 2.8 ms at 60 Hz.

Presentation of the digital control

Hardware structure



Operation modes

The digital control RECTIVAR RTV74-84 includes, when switched on, several operating modes, shown in the diagram on the following page.

This diagram is considered to be in local dialogue mode (keypad and display), that is, when any serial link interventions which may occur, are not accepted.
If the serial link is used, see part 2 : Special applications, pages 2/25 to 2/37.

Supply failure

Any power switch off, voluntary or involuntary, of the electronic control is supervised by a no-volt safety device.
A momentary power failure lasting less than 3,3 ms at 50Hz (2,8 ms at 60Hz) has no effect, longer supply losses are detected and the "Short power fail" alarm fault control locks the firing gates.
Above 10 ms at 50Hz (8,4 ms at 60Hz), the "Mains volt drop" fault appears and can necessitate resetting (selectable).

In the event of power failure, the digital control board supply has a 50 ms back up, which enables the assuring of any memorizations necessary (maximum memorization time limited to 20 ms). For example, short power failures lasting from 3,3 ms to 10 ms (at 50 Hz), which, during operation, do not create any major problems despite the short interlock, are memorized in the fault processing (see "Short power failure" page 1/47).

Voltage recovery causes reversion to the stage reached in the diagram, after reinitialisation and automatic memory test.

Note :
Bearing in mind the fault control, it is recommended to leave the control supply circuits independent from any opening of the line contactor which may occur. Special attention must always be paid to the RUN signal control (see page1/54).

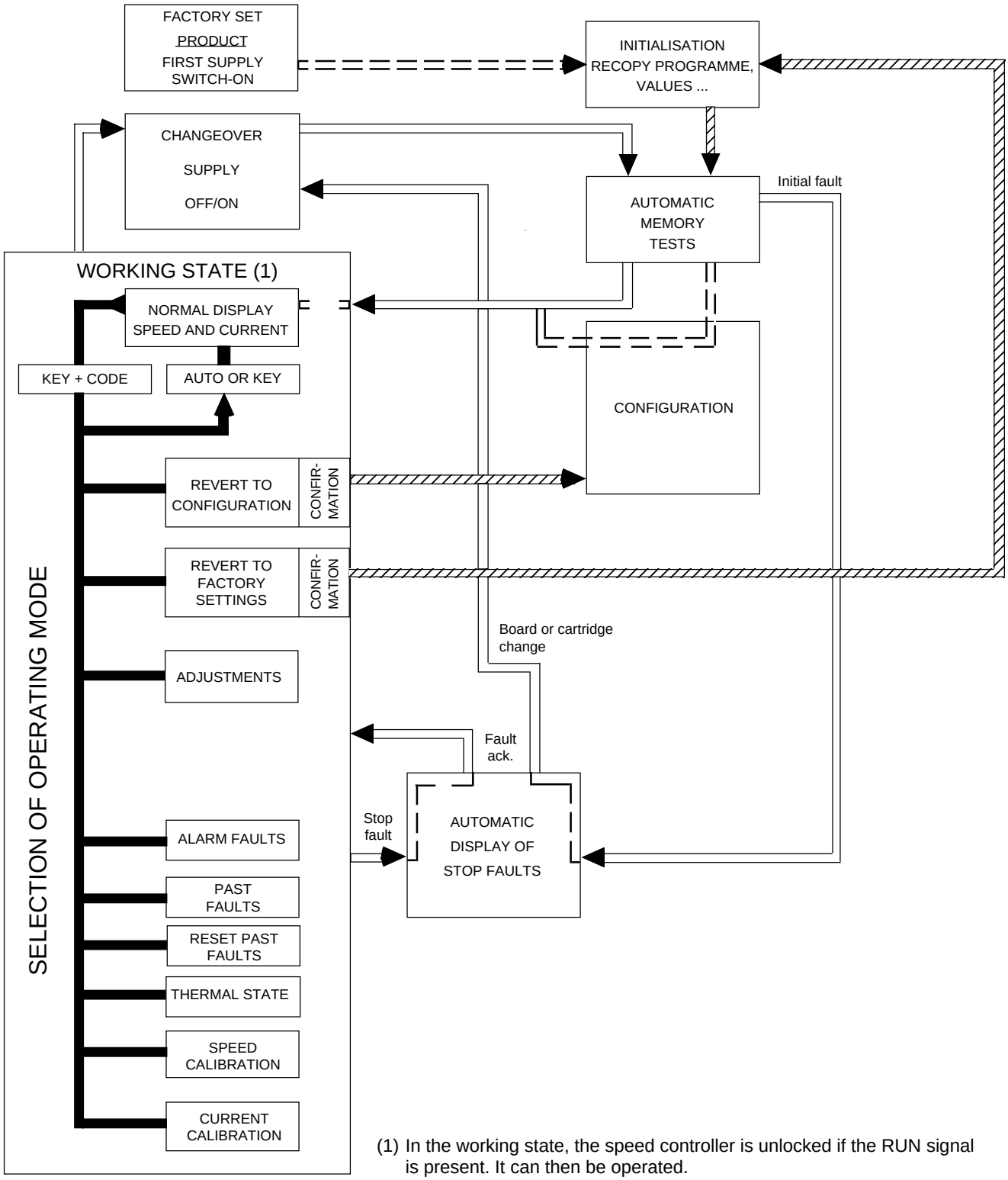
Procedure

- Access to the question "Operation mode ?" is carried out according to the following procedure :
  - turn the key, located in the upper part of the speed controller, to the "Unlock" position, it is then captive
  - then press ↓ and ↑ simultaneously
- The operating mode menu then appears on the second line of the display. It can be scrolled by using the keys ↑ or ↓ and choice of input is validated using ENTER which causes the corresponding parameters to appear. PAR and DATA do not have any effect. As a general rule, the operating mode output is achieved by pressing ENTER (see detailed procedure for each mode).

- Quitting the operating mode procedure can be performed :
  - definitively :
  by returning the key to the "Lock" position, the key being taken out or not, whether at the operation mode selection level, or already in an operation mode.

  - temporarily :
  by the appearance of stop faults in the RECTIVAR until these faults are acknowledged.
  by a 15 second break in all keypad activity but only if the display is showing the question "Operation mode ?". The mode quit can only either be voluntary, or due to a stop fault. Reversion to the question "Operation mode ?" can then be achieved by pressing any key on the keypad.

Operating modes



(1) In the working state, the speed controller is unlocked if the RUN signal is present. It can then be operated.

Configuration mode

Procedure

This operation mode is accessible locally via the keypad and the display.
During this mode the motor cannot be supplied.
It appears :

a) automatically when the installation is switched on for the first time.

b) from software version V2.1, if installation of the 2 base PROM memories causes modification of the internal data structure.
This is not systematic and depends on software evolution.
If this does arise, entry into configuration mode is preceded by an obligatory passage through the factory settings procedure, validated by the only possible answer : ENTER

Factory settings
< ENTER >

c) by deliberate choice of an operating mode having gone through the operating mode selection access procedure.

In this case, input in the mode

Operation mode ?
Configuration

is achieved by pressing ENTER

Without quitting Operation mode, the display shows the confirming question.

Configuration
< CLEAR > < ENTER >

Pressing CLEAR causes reversion to the question "Operation mode ?".
Pressing ENTER causes Working state to be quit and configuration mode to be entered.

Content

This mode is conversational with the display and the keypad. It causes the essential data of the application to be recorded in the EEPROM memory, whether it concerns :

- the mains, motor, feedback speed reading (sensor or tachogenerator) characteristics, with the limits due to the speed controller.
- the operation of certain "simple function" options
- the reassigning of configurable input/output roles conforming to the diagram required for the application.
- the special assignments for processing the faults.

The last three series of assignments can easily be ignored, which simplifies the procedure for most of the usual applications.
If necessary, see contents of part 2, page 2/1.

Recording

The start of configuration mode is indicated by the display of dialogue language selection :

Dialogue ?
Francais

or English or Deutsch or Espanõl or Italiano or Portugues

When configuring, only line 2 of the display can be modified, using the scroll-up/down keys ↓ or ↑.

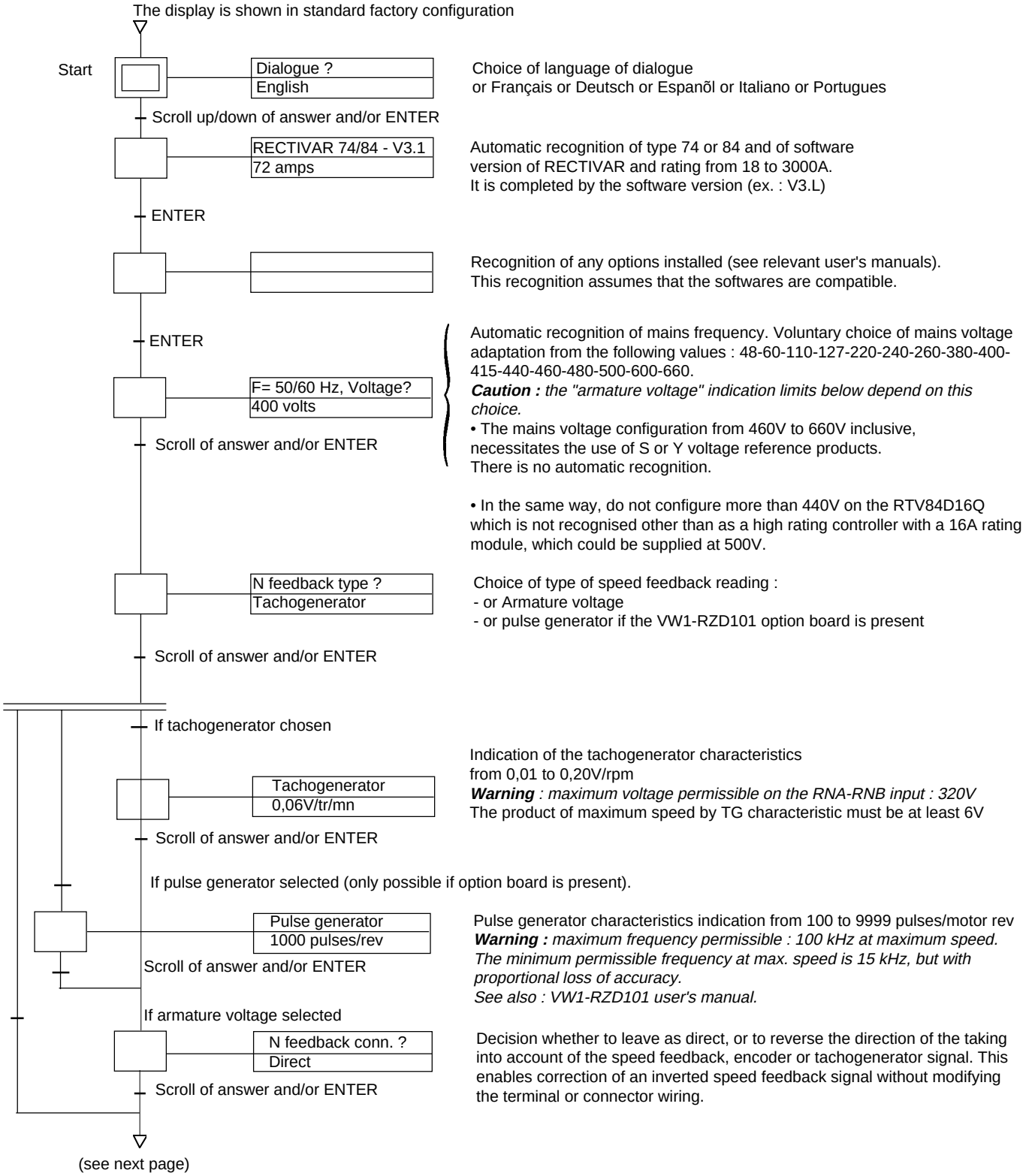
The listing of the parameters is sequential and is carried out by pressing ENTER which memorises the answer in the EEPROM memory.

Pressing CLEAR has no effect during configuration except for the final validation (see end of page 1/45) or for rapid scrolling, in association with keys ↓ or ↑.

PAR and DATA have no effect.

Configuration mode

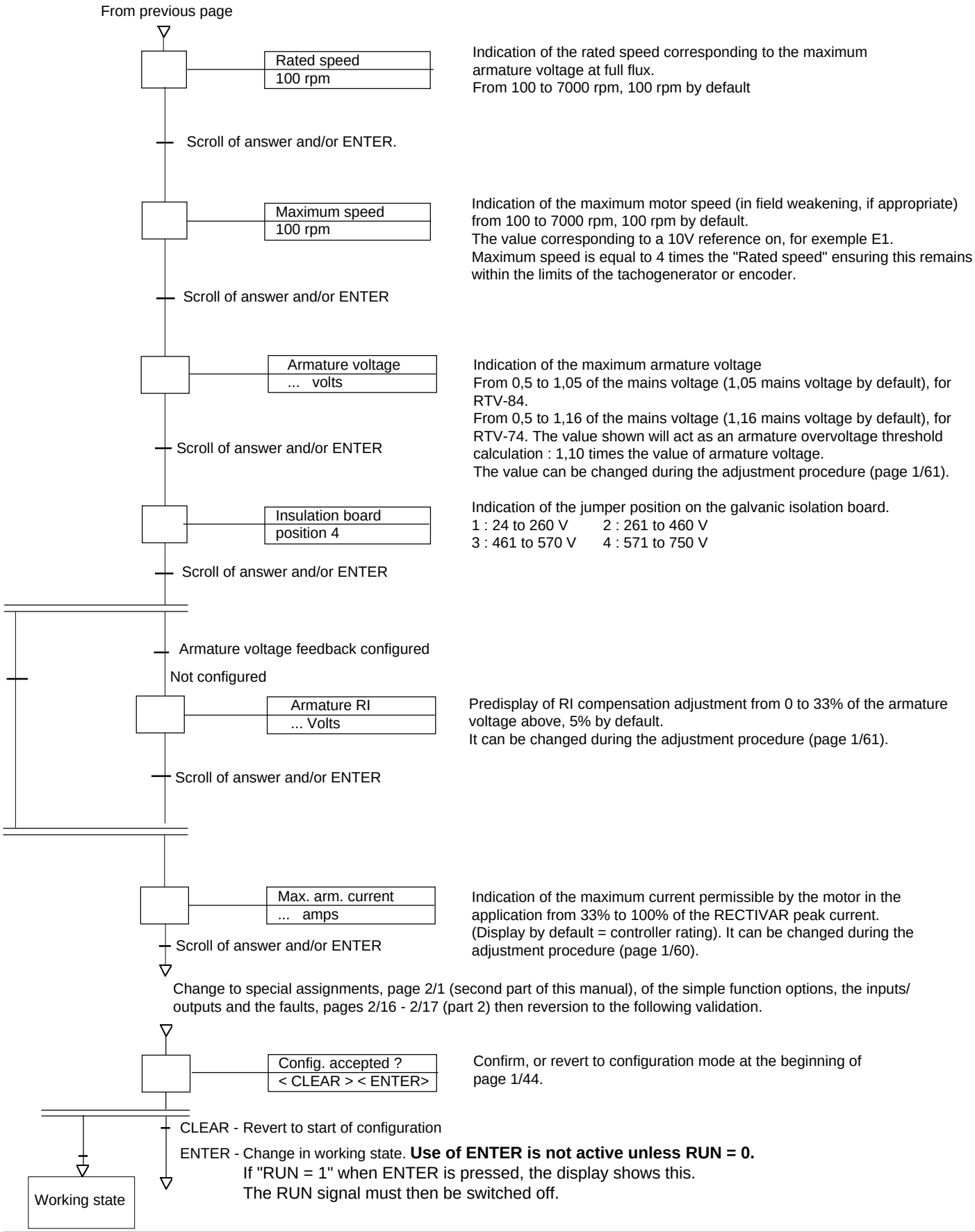
GRAFCET scroll down diagram



(see next page)

Configuration mode

Grafcet scrolldown diagram



Indication of the rated speed corresponding to the maximum armature voltage at full flux.
From 100 to 7000 rpm, 100 rpm by default

Indication of the maximum motor speed (in field weakening, if appropriate) from 100 to 7000 rpm, 100 rpm by default.
The value corresponding to a 10V reference on, for exemple E1.
Maximum speed is equal to 4 times the "Rated speed" ensuring this remains within the limits of the tachogenerator or encoder.

Indication of the maximum armature voltage
From 0,5 to 1,05 of the mains voltage (1,05 mains voltage by default), for RTV-84.
From 0,5 to 1,16 of the mains voltage (1,16 mains voltage by default), for RTV-74. The value shown will act as an armature overvoltage threshold calculation : 1,10 times the value of armature voltage.
The value can be changed during the adjustment procedure (page 1/61).

Indication of the jumper position on the galvanic isolation board.
1 : 24 to 260 V 2 : 261 to 460 V
3 : 461 to 570 V 4 : 571 to 750 V

Predisplay of RI compensation adjustment from 0 to 33% of the armature voltage above, 5% by default.
It can be changed during the adjustment procedure (page 1/61).

Indication of the maximum current permissible by the motor in the application from 33% to 100% of the RECTIVAR peak current.
(Display by default = controller rating). It can be changed during the adjustment procedure (page 1/60).

Confirm, or revert to configuration mode at the beginning of page 1/44.

Assistance with maintenance

Maintenance

The RECTIVAR series 74 and 84 do not require preventive maintenance.
It is, however, recommended to take the following measures at regular intervals :
- check the state and tightness of the connections,
- ensure that the fan is still effective, that the temperature around the controller remains at an acceptable level and that there is no accidental condensation.
- remove any dust from the speed controller, if necessary.

In the event of any abnormality during operation, check, in addition to what is indicated on the screen, that the recommendation relating to the environment and to mounting as regards connections, have been respected.

Fault processing

- The series 74 and 84 RECTIVAR controllers carry out monitoring and provide visual display (and transfer by serial link) of a certain number of internally accessible faults, as well as two external faults (one stop fault, and one alarm, or 2nd priority fault). Three initial faults ("RAM", "EEPROM", "Module RT") are not memorised, but inhibit entry of configuration data.

Nota :
- From software version V2.1, the installation of two uncompatible basic PROM cartridges causes the appearance of a fourth initial fault, which inhibits the entry of configuration data.
  This is displayed as

Prom 1 / Prom 2

- After switching off, the compatibility must be corrected according to the memory versions.

- A fifth initial fault may also occur during installation of an optional EPROM cartridge if not compatible with the basic software.
  This is displayed as

Prom 1 / Prom 2

Also refer to the corresponding EPROM manuals.

- A sixth initial fault "5 V option" appears if the 5 V supply wire bundle from the control transformer is not connected on the VW1-RZD101 board, par ailleurs déjà raccordée à la carte contrôle.
  This is displayed as

+5V option

This fault is tested only at initialisation. In working state the fault "Nfeedback absent " is priority in cas of pulse generator.

- The "EEPROM" fault is permanently retested, and all the other faults are classified in 4 families and 2 levels of priority.

• The 4 families are defined by combining in pairs the concepts stated below :
- Internal faults : concern the adjustment of the RECTIVAR, and its hardware
- External faults : concern the environment and the machine
- Static faults : can be detected with the machine switched off, without command on the RECTIVAR.
- Dynamic faults : appear when the machine is operating.

These families do not appear on the display; they provide an internal means of classifying the faults with differentiated access for the latching function and, when necessary, an appearance hierarchy when commissioning.

• The two priorities are :
- stop faults : these cause the RECTIVAR to lock and the fault to be displayed automatically.
- alarm faults : these have no effect on the RECTIVAR, but they are memorised and can be retrieved for external processing by a programmable controller, for example.

Some faults are assignable, as stop or alarm, by configuration.
If required, certain stop faults can be configured without the latching function (see next page).

⚠ **In the event of displays of inexistant faults or in event of incoherent displays** :

- switch off and check that the sceening connections is correctly realised on all circuits.Check also that the filter module is mounted and the earth connections.
  If after switch on the situation is abnormal again, this means that the EEPROM memory has been corrupted by interferences:
  proceded as below
- switch off
- maintened action with simultaneous maintened action on the CLEAR and ENTER key and switch on again without release the keys,
- release the key.

You are sure to be in " factory settings " (see page 2/18).
Take care this procedure is exceptional.

Utilisations of the RECTIVAR

Assistance with maintenance

List of faults

ST : systematic stop, AL : systematic alarm, CF : configurable stop/alarm — Y/N

TEXT ON THE DISPLAY		DETECTION CONDITIONS	Permanently On initialisation	Priority			Latching			
LINE 1	LINE 2			ST	AL	CF	Y	N	O/N (3)	
		**** INITIAL FAULTS ****								
PROM1/PROM2	-	Incompatible basic memory								
RAM	-	Memory test, incorrect reading								
EEPROM	-	Memory test, incorrect write - read								
RT module	-	Power rating module faulty or absent								
		**** STATIC INTERNAL FAULTS ****								
Number of faults present	Display	Exceeding of answer time in test loop (> 1,8 ms) The text is not used except for recorded "previous" faults								0
As above	Micropr. transfer	On initialisation, no exchanges for the first second or time between exchanges > 20 µ s								1
As above	EEPROM	Response time > 18 ms after writing								2
As above	A/D converter	Conversion time > 50 µ s								3
As above	24V voltage low	24V voltage level internally filtered to 16V lower than 12V Displayed if voltage level is sufficient to operate the display								4
As above	Synchro signal	Level of 24V established but synchronous clock signal not appeared within 25 ms								5
		**** STATIC EXTERNAL FAULTS ****								
Number of faults present	Mains volt. drop	Level of 24V voltage, reduced to below 18V for 10 ms at 50 Hz, 9 ms at 60 Hz								0
As above	Third phase	Third phase (not used for control supply) not present at initialisation During operation monitored by excitation connected to third phase								1
As above	Freq over limits	The mains frequency adaptation has exceeded automatic operating limits : 45/55 Hz or 55/65 Hz								2
As above	Short power fail	24V voltage failure for more than 3 ms or 3,3 ms and less than 9 ms or 10 ms								3
As above	Serial link (1)	Time longer than 1 second between reception of 2 requests								4
As above	Excitation	In fixed excitation, excitation current lower than excitation current ref. In controlled excitation, fault in feedback from excitation control board Fault not tested in half-flux or during current increase								5
		****INTERNAL DYNAMIC FAULTS ****								
Number of faults present	Overcurrent	Current reading higher than 125% of the preset limitation value : Incorrect adjustment of the armature current loop								0
As above	I = 0 not reached	Internal current reading data, not zero for more than 30 ms against "inversion limit"								1
		****EXTERNAL DYNAMIC FAULTS ****								
Number of faults present	Thermal protect. (1)	100% threshold of the motor thermal exceeding : reached								0
As above	N = 0 not reached (1)	Speed feedback not at zero although speed reference at zero for a time adjustable from 1 to 360 seconds in configuration								1
As above	Motor stalling (2)	Current in limitation at zero speed feedback for more than 10 seconds								2
As above	Ramp unfollowed (2)	Current in limitation at any speed for a time adjustable from 0 to 360 seconds in configuration								3
As above	Arm circuit open (1)(4)	Zero current at zero speed with armature voltage not zero (immediate)								4
As above	Overspeed	Speed feedback > 110% of maximum speed adjustment (immediate)								5
As above	N Fback reversed (1) (4)	Tacho or encoder wiring reversed (immediate at low armature voltage)								6
As above	N Fback absent (1) (4)	Speed feedback zero with armature current and voltage not zero (imm.)								7
As above	Ext. stop fault	Assignable by configuration on a logic input LI1 to LI4								8
As above	Ext. alarm fault	As above								9
As above	Arm overvoltage (2)(5)	U armature ≥ 1,10 configured indication								A

Number of bit in fault register (see page 2/28)

N.B : The special application optional memory cartridges provide additional fault processing.
See the relevant user's manual.

(1) No systematic latching in alarm, configurable in stop fault.

(2) No systematic latching in alarm, systematic latching on stop fault.

(3) The (Y/N) reconfiguration of the latching function is not possible except for all the faults concerned at the same time.
By default, latching is configured. Acknowledgement of latched faults must be carried out by the CLEAR function, active if RUN = 0
If RUN = 1 during CLEAR pressing, the display shows this.

(4) Faults not monitored in speed feedback by the armature voltage.

(5) With fixed excitation, this fault can appear in the cold state, with some motors.

Assistance with maintenance

Fault memorization

Faults are recorded in :
- 3 zones of the RAM operating memory
- 1 zone of the EEPROM back up memory

The RAM zones are accessible by analysis in local mode, or by serial link (see part 2, pages 2/25 to 2/37).
The stop fault zone is automatically accessible on the display when a fault of this kind is shown.

■ RAM memory

Stop faults

- All faults appearing within 13,2 ms before a stop are recorded in this zone.
  They are memorised if they are latching.
  If these faults appear, they cause an automatic visual display.
  See next page.

Actual faults

- All faults are recorded in this zone, whether stop or alarm faults.
  They are not memorised and are therefore visible during their real development via serial link.
  Because of the automatic priority display of stop faults (see above), the voluntary analysis of this zone only gives access to alarm faults, hence the name for this operating mode.

Past faults

- All faults recorded in the "actual faults" zone are memorised in the "past faults" zone which keeps a record of all faults which have occured.
  The second occurence of a fault only confirms the memorisation; there is no counting.

■ EEPROM memory

Past faults

- A back-up of all development in the above zone is automatically made in a corresponding zone in the EEPROM memory as a no-volt safeguard. The instant a mains failure is detected, a sequence of 20 ms enables a back-up to be made of the development of the faults as they occur. A faults analysis process enables the reset of the two previous faults zones.

Assistance with maintenance

Automatic local display

On the occurence, during operation, of one or more stop faults (systematic or configured), the RECTIVAR locks just as if the RUN signal had disappeared. The red keypad indicator light goes on and the display instantly shows :

nn stop faults ↑	number of stop faults recorded and possible scrolling direction
Overspeed	name of first fault in order given on page 1/47.

The keys [↑] and [↓] enable the scrolling of the names of the non-acknowledged faults present. The scrolling limit is shown by arrows on the first line.

↑ : first fault ↓ : last fault

↕ : intermediate fault No arrow : one fault only

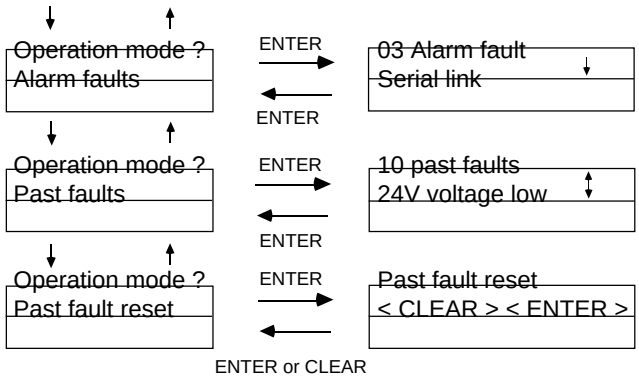
The other keys have no effect except [CLEAR] which acknowledges all stop faults present at this moment if RUN = 0. If RUN = 1 during CLEAR, the display shows it on the first line
You must correct the RUN signal.

The acknowledgement of faults causes reversion to the "working state", with the speed and current being displayed, provided that all the faults have actually cleared. If this is not the case, the remaining faults are displayed again.

Voluntary local display of faults

The access to operating modes process enables three replies to be accessed, relative to fault analysis.

Input to the replies is achieved by pressing ENTER, just as is reversion to the question "Operation mode ?".



As a reminder, only the alarm faults present in the actual fault zone are concerned.

- In the first two analysis modes, the number of corresponding faults appears on the first line and their names, in order given on page 1/47, can be scrolled using ↑ or ↓ within the limit of their number, as shown above.
  The keys PAR, DATA and CLEAR have no effect.

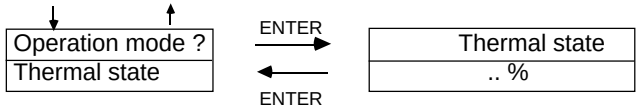
- Resetting past faults concerns both memory zones for that type of fault (RAM and EEPROM).

- Reset to zero, followed by returning to Operation mode ? is again achieved by pressing ENTER,

- Returning to Operation mode ? without action is obtained by pressing CLEAR.

Local display of thermal exceeding

The current thermal exceeding value is visible in this operation mode and can be accessed as above by pressing the ENTER key (see page 2/17).



Value also available via serial link.

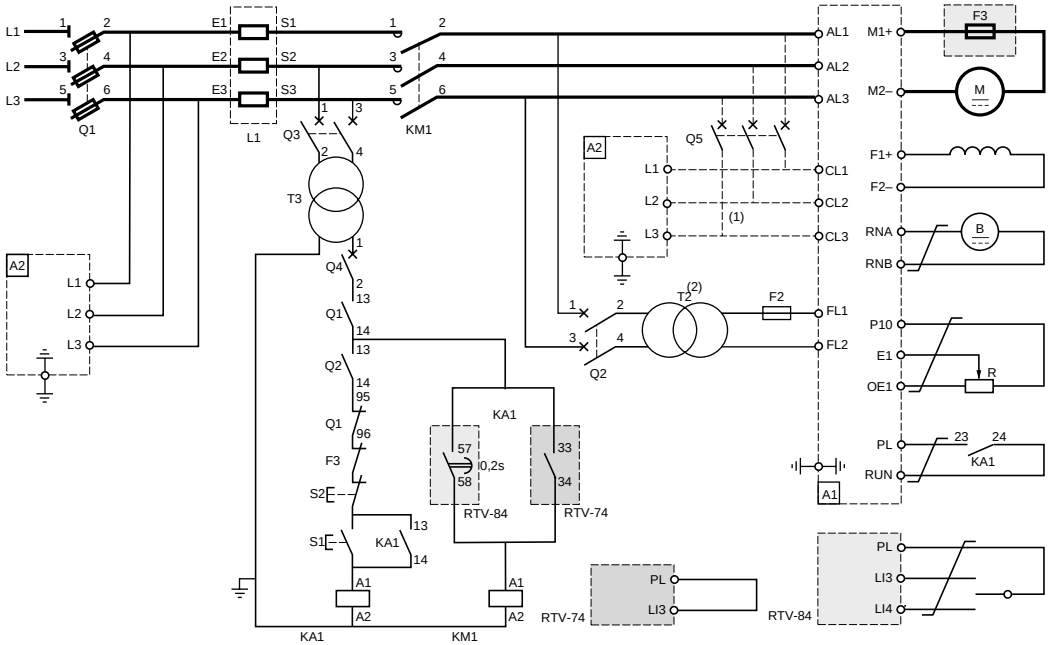
Utilisations of the RECTIVAR

Simplified sequence diagrams

Supply : 380/415V or 440V, 50/60Hz

16 to 72A speed controller with factory configuration d'usine

Recommended circuit diagram



For more complex sequences, see :

Assignable inputs/outputs

(Part 2 of the manual)

(1) Connections only possible for 16A rating.
(2) Connect transformer T2 or FL1-FL2 between phases 1 and 3. F2, T2, where required depending on AC supply and excitation voltages.
If power and control are supplied separately, connect VY1-RZD106 (A2) module directly to terminals CL1-CL2-CL3 (automatic for RTV-84D16Q).

Nomenclature of the required hardware

Reference code	Description	Reference	Reference	Reference	Reference
		Maximum power with Td/Tn = 1,2 and armature voltage 440V			
M	Motor	4,3 kW	10kW/9,1kW	15,5kW/14kW	23kW/21kW
A1	Speed controller	**RTV-84D16Q**	**RTV-74/84D32Q**	**RTV-74/84D48Q**	**RTV-74/84D72Q**
A2	Suppressor module (5)	VY1-RZD106	VY1-RZD106	VY1-RZD106	VY1-RZD106
F2	Fuse + carrier	Rated at value of excitation current in cold state +DF6-AB10			
F3	Fuse (3)	DF3-EF04001 (2)	DF3-FF05002 (2)	DF3-FF05002 (2)	DF3-FF10001 (2)
KA1	Control relay	CA2-DN140MA65	CA2-DN140MA65	CA2-DN140MA65	CA2-DN140MA65
	time delay block (3)	LA3-D20A65	LA3-D20A65	LA3-D20A65	LA3-D20A65
KM1	Line contactor	LC1-D163MA65	LC1-D253MA65	LC1-D403M	LC1-D503M
L11-L21-L31	Line inductances	VZ1 L015 UM17T	VZ1 L030 U800T	VZ1 L040 U600T	VZ1 L070 U350T
Q1	Isolator (1)	GK1-EV	DK1-FB28	DK1-FB28	DK1-GB28
	+ 3 fuses	DF3-EF04001	DF3-FF05002	DF3-FF05002	DF3-FF10001
Q2	Circuit breaker	GV1-M..rated at 2 times the value of the primary T2 current in cold state + GV1-A01			
Q3	Circuit breaker	GV1-M04	GV1-M04	GV1-M04	GV1-M04
Q4	Circuit breaker	GB2-CB06	GB2-CB06	GB2-CB06	GB2-CB06
R	Potentiometer	SZ1-RV1202	SZ1-RV1202	SZ1-RV1202	SZ1-RV1202
S1-S2	Control	XB2-M or XB2-B units, as required			
T2	Transformer	Mains ≥ 440V, secondary 220V P (VA) = 1,5 P excitation (W) hot state motor.			
T3	Transformer	Primary : 380V, 415V, 440V or 500V - secondary : 220V - Power 100VA			

(1) Quick blow fuses incorporated in the isolator.
(2) Fuses mounted on Ferraz carrier, (see page 1/22). For RTV-84D32S products, fit 2 fuses in the armature loop.
(3) For RTV84 only, unnecessary with RTV74.
(4) Connect directly to terminals CL1-CL2-CL3 for RTV-84D16Q
(5) The filter module is supplied with the speed controller
Note : if mains supply is other than 380/415V or 440V a.c., supply the control (CL1/2/3) via an auto-transformer, power ≥ 40 VA, secondary voltage 3 x 380V 50/60Hz.

Utilisations of the RECTIVAR

Simplified sequence diagrams

Supply : 380/415V or 440V, 50/60Hz

180 to 650A speed controller with factory configuration

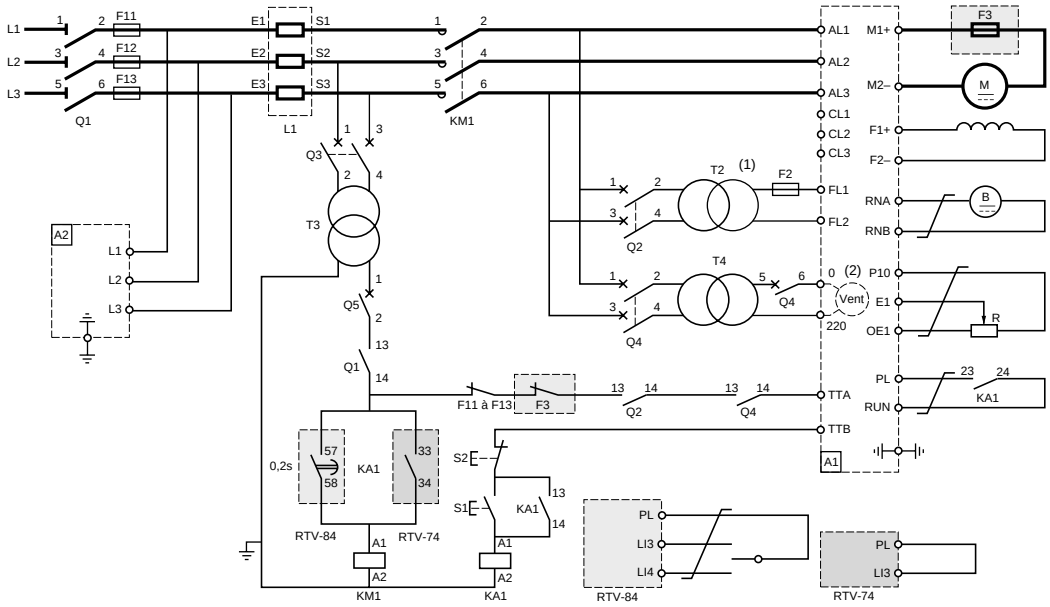
Recommended circuit diagram

For more complex sequences, see :

Assignable inputs/outputs

(Part 2 of the manual)

If power and control are separately supplied, connect VY1-RZD106 (A2) module directly to terminals CL1-CL2-CL3.



Note

* connect the T2 or FL1-FL2 transformer between phases 1 and 3
F2, T2 where appropriate, depending on the mains and excitation voltages

** Fan supplied separately for ratings > 270A.

Nomenclature of the required hardware

Reference code	Description	Reference	Reference	Reference	Reference
		Maximum power with Td/Tn = 1,2 and armature voltage 440V / 400 V			
M	Motor	57kW	86kW	132kW / 120kW	214kW / 195kW
A1	Speed controller	**RTV-74/84C18Q**	**RTV-74/84C27Q**	**RTV-74/84C40Q**	**RTV-74/84C65Q**
A2	Filter module (3)	VY1-RZD106	VY1-RZD106	VY1-RZD106	VY1-RZD106
F2	Fuse	Rated at value of excitation current on cold			
	+ carrier	DF6-AB10	DF6-AB10	DF6-AB10	DF6-AB10
F3 (1)	Fuse (2)	DF3-NF25002	DF3-NF40002	DF3-NF50002	DF3-QF80002
KA1	Control relay	CA2-DN140MA65	CA2-DN140MA65	CA2-DN140MA65	CA2-DN140MA65
	+ time delay block (2)	LA3-D20A65	LA3-D20A65	LA3-D20A65	LA3-D20A65
KM1	Line contactor	LC1-FF43	LC1-FG43	LC1-FJ43	LC1-FK43
	+ coil	LX1-FF220	LX1-FG220	LX1-FJ220	LX1-FK220
L11-21-31	Line inductances	VZ1 L150 U170T	VZ1 L250 U100T	VZ1 L325 U075T	VZ1 L530 U045T
F11-12-13	+ fuses (1)	DF3-NF25002	DF3-NF40002	DF3-NF50002	DF3-QF80002
Q1	Isolator	DK1-HC2312	DK1-HC2312	DK1-KC2312	DK1-KC2312
Q2	Circuit breaker	GV1-M.. rated at twice the value of the primary T2 current on cold + GV1-A01			
Q3	Circuit breaker	GV1-M06	GV1-M07	GV1-M08	GV1-M08
Q4	Circuit breaker	-	-	GV1-M06 + GV1-A01	GV1-M06 + GV1-A01
Q5	Circuit breaker	GB2-CB06	GB2-CB10	GB2-CB10	GB2-CB10
R	Potentiometer	SZ1-RV1202	SZ1-RV1202	SZ1-RV1202	SZ1-RV1202
S1-S2	Contol	XB2-M or XB2-B units, as required			
T2	Transformer	≥ 440V mains, secondary 220V P (VA) = 1,5 P excitation (W) hot state motor.			
T3	Transformer	250VA	400VA	630VA	630VA
T4	Transformer	-	-	Secondary 220V P = 250VA	

(1) Quick blow fuses to be mounted on DF5 carriers (see page 1/21) or on busbars.
(2) For RTV84 only, unnecessary for the RTV74.
(3) The filter module is supplied with the speed controller.

Nota : if mains supply is other than 380/415V or 440V a.c., fit a three phase auto-transformer, 380V 50/60Hz secondary, power ≥ 40VA for ratings 400 and 650A and 250VA for ratings 180 and 270A, to supply the control (CL1-CL2-CL3).
****** RTV-84C40. and C65. : fan supplied separately at 220V single phase, 250VA power.

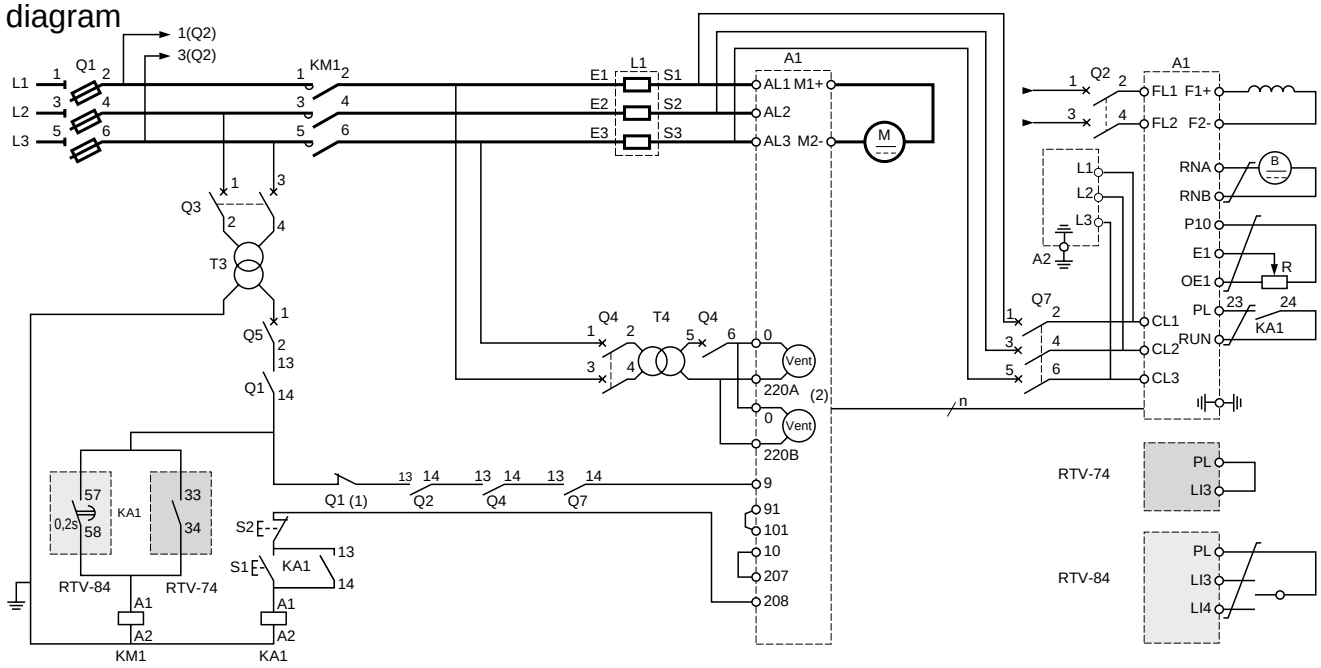
Utilisations of the RECTIVAR

Simplified sequence diagrams

Supply : 380/415V or 440V - 50/60Hz

800 to 1750A speed controller with factory configuration

Recommended circuit diagram



For more complex sequences, see assignable inputs/outputs, in part 2 of this manual.
Connections : respect the phase order given on the diagram.
(1) Circuit breaker contact, if necessary, depending on type of protection.
(2) Single cooling fan for RTV-74 speed controllers

Nomenclature of the required hardware

Reference code	Description	Reference
A2	Filter module (3)	VY1-RZD106
F4	Fuse	DF2-CA02 + carrier DF6-AB10
KA1	Control relay	CA2-DN140MA65
	Time delay block (2)	LA3-D20A65
KM1	Line contactor	To be rated according to motor power - see paragraph (1)
L11-L21-L31	Line inductances	VZ1-L650 U038T (RTV..C80•)
		VZ1-LM10 U024T (RTV..M12•)
		VZ1-LM14 U016T (RTV..M17•)
Q4	Circuit breaker	GV1-M07 + GV1 - A01
Q6	Circuit breaker	GV1-M08 + GV1 - A01
Q7	Circuit breaker	GV1-M05 + GV1 - A01
S	Control	XB2-M or XB2-B as required
T4	Transformer	Secondary 220V P = 450VA

The Q1 - Q2 - Q3 - Q5 - T3 components will be selected according to the operating sequence of the speed controller and the power of the motor with which they are associated.

Note : If the mains is other than 220V - 380/415V or 440V a.c. fit :
- a three phase auto-transformer, power ≥ 40 VA secondary 380V 50/60Hz to supply the control (CL1-CL2-CL3),
- a single phase transformer power (VA) = I excitation (hot state motor) x U transformer secondary, secondary 380V 50Hz, to supply the excitation (FL1-FL2).

(1) The line contactor normally operates at zero current and only opens when the machine is switched off. These stipulations usually result in a thermal rating. The AC1 operating category according to standard IEC 158-1 for the rms line current, calculated according to the type of continuous or cyclical duty. Take into account the ambient air temperature and the possibility of wiring according to the choice of connections (cables or bars), and the capacity of the device's terminations.

(2) For RTV84 only, unnecessary with RTV74.
(3) Always connect the filter module (VY1-RZD106) to terminals CL1-CL2-CL3.
The filter module is supplied with the speed controller.

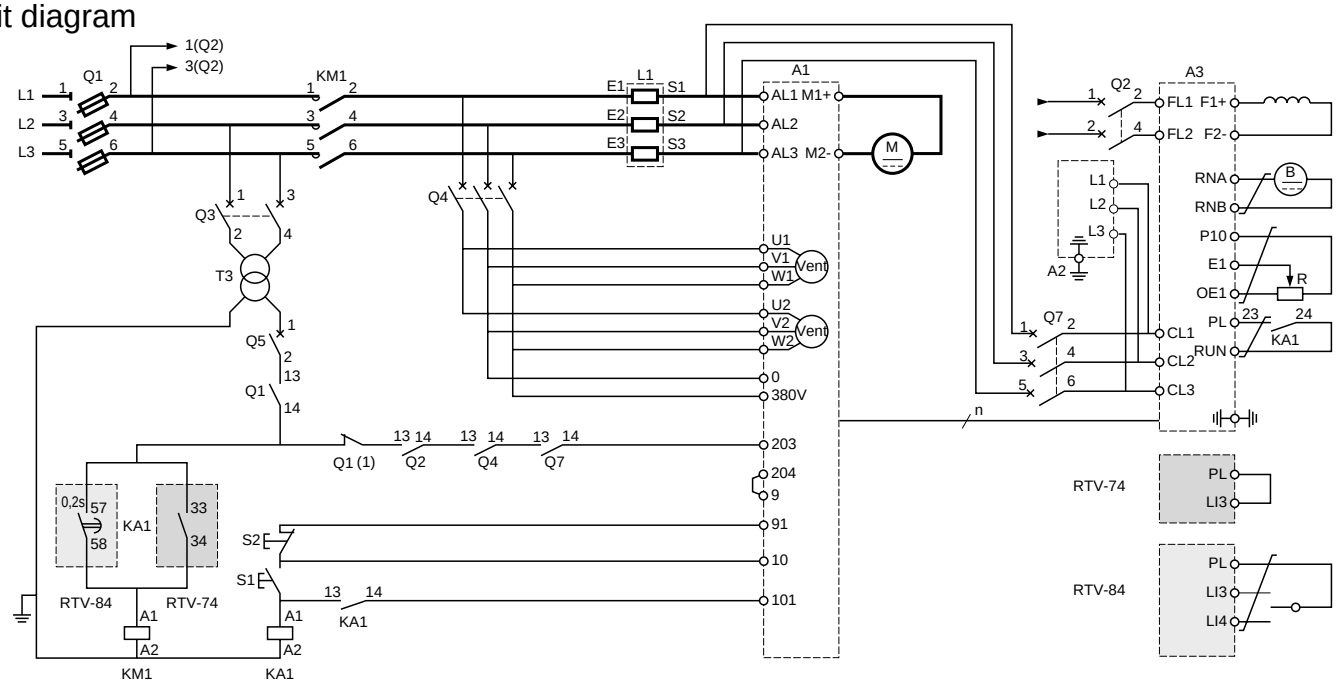
Utilisations of the RECTIVAR

Simplified sequence diagrams

Supply : 380/415V or 440V - 50/60 Hz

3000A speed controller with factory configuration

Recommended circuit diagram



For more complex sequences, see assignable inputs/outputs, in part 2 of this manual
Connections : respect the phase order given on the diagram.
(1) Circuit breaker contact, if necessary, depending on type of protection.

Nomenclature of the required hardware

Reference code	Description	Reference
A2	Filter module (3)	VY1-RZD106
KA1	Control relay	CA2-DN140MA65
	Time delay block (2)	LA3-D20A65
KM1	Line contactor	To be rated according to the motor power - See paragraph (1)
L11-L21-L31	Line inductances	VZ1 LM 24U010T
Q4	Circuit breaker	GV1-M08 + GV1 - A01
Q7	Circuit breaker	GV1 - M05 + GV1 - A01
S	Control	XB2-M or XB2-B as required

The Q1 - Q2 - Q3 - Q5 - T3 components will be selected according to the operating sequence of the speed controller and the power of the motor with which they are associated.

Note : If the mains is other than 220V - 380/415V or 440V a.c. fit :
- a three phase auto-transformer, power ≥ 40 VA secondary 380V 50/60Hz to supply the control (CL1-CL2-CL3),
- a single phase transformer, power (VA) = I excitation (hot state motor) x U transformer secondary, secondary 380V 50Hz, to supply the excitation (FL1-FL2).

Fan supply : fit a three phase transformer P ≥ 1100VA if the mains is other than 380V.

(1) The line contactor normally operates at zero current and only opens when the machine is switched off. These stipulations usually result in a thermal rating. The AC1 operating category according to standard IEC 158-1 for the rms line current, calculated according to the type of continuous or cyclical duty. Take into account the ambient air temperature and the possibility of wiring according to the choice of connections (cables or bars), and the capacity of the device's terminations.

(2) For RTV84 only, unnecessary with RTV74.
(3) Always connect the filter module (VY1-RZD106) to terminals CL1-CL2-CL3.
The filter module is supplied with the speed controller.

RUN, FORWARD, REVERSE signals

Utilisation of the RUN terminal

Connection of the RUN terminal to PL (+ 24V) assures the RECTIVAR unlocking by validating all the control logic and the thyristor firing gates.
Absence of the RUN signal locks the RECTIVAR, slowing down is thus carried out in freewheel, without dynamic braking torque.

The RUN command can be carried out by serial link. See part 2 of the manual page 2/26.

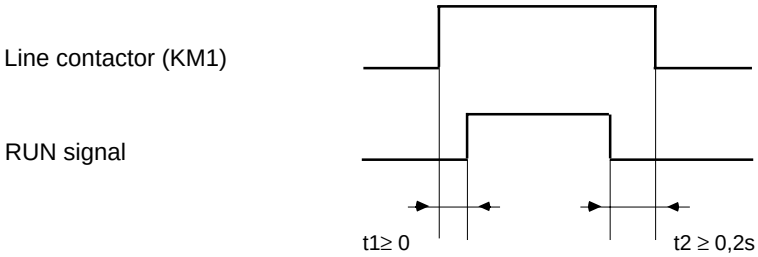
Precautions to take to avoid unwanted firings

• 1st case : control and power linked, links CAL at 0.

The RUN command can precede or follow switching on but **MUST** be cancelled before switching off (≥ 0,2s).

• 2nd case : control and power separated, links CAL at 1 (or ratings ≥ 800A).

The control must be supplied upstream of the line contactor.
Respect the timing diagram below :



The RUN command must not precede the power supply, but its cancellation must be carried out at least 0,2 seconds before switching off the power.

"Overspill" function

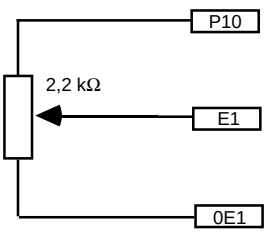
When not carrying out a command (RUN and FORWARD or REVERSE or internal operation command), or during the occurrence of a stop fault, the speed controller carries out an "Overspill" function, that is, the speed feedback signal is copied in the speed ramp the moment the operation command reappears. This function enables restarting while running under optimum conditions.

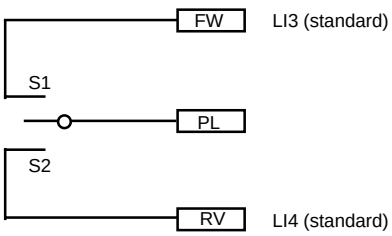
Utilisation of the FORWARD, REVERSE commands

By convention, the FORWARD operation direction corresponds to positive signals.
FORWARD and REVERSE are factory assigned to logic inputs LI3 and LI4.

See special assignments part 2 of the manual, pages 2/9 and 2/14.

Example of connection to input 0/+10V on logic input E1.





For the RTV 74, FORWARD control is sufficient.
However, the REVERSE can be used with a negative reference connected to the N10 terminal.

Speed reference inputs

Input functions

The speed controller has :

- two voltage inputs with ± 10V : E1 and E2,
- one current input with 0/20mA : Ec.

It is possible to reconfigure input Ec to 4/20 mA and to use a third on the AI analogue input (see special assignements part 2, page 2/11).

The three (or four) reference inputs are algebraically summing.
For the Ec input, 20 mA corresponds to a + 10 V voltage on the other inputs.

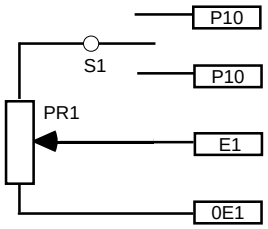
The algebraic sum of the inputs is peak limited at ± 10V, or maximum limited or minimum limited, or overridden at a lower configurable value with the low speed function (see special assignments, page 2/15).

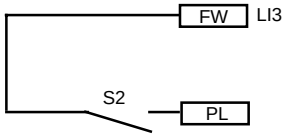
The input characteristics are given on page 1/12.

Utilisation of the inputs

Operating direction control by voltage polarity at E1, for RTV 84.

For example, with the FORWARD direction permanently activated (reversal by S1 when S2 is closed).

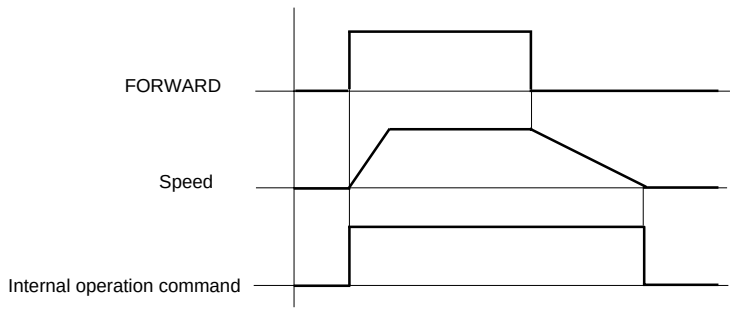




The same operation is possible with several simultaneous and algebraically additive speed reference inputs.
With the RTV 74, a negative reference with the FORWARD command or a positive with the REVERSE command are not taken into account and correspond to 0.

Validation logic

After unlocking, the speed contoller is validated by the presence of either the FORWARD or the REVERSE command. This operation command is memorised once the logic commands have disappeared, and until the speed feedback signal is cancelled (non-adjustable threshold < 2 % of the maximum speed).
This arrangement enables electrical braking and the cancellation of the command if the RUN signal is present.



Two variations on the logic above :

- operation command by reference detector
- brake logic for vertical movement

See special applications 2nd part, page 2/1.

Initial setting-up

Preliminary checks

The digital control RECTIVAR series 74 or 84 is used, given the external connections, like a series 541 or 641 analogique control speed controller.
It adapts more flexibly to special applications (part 2) and enables clearer dialogue with the operator and the surrounding system, but this does not detract from its being simple to use.
The RECTIVAR is factory configured and adjusted for the most common operating conditions. Nevertheless, with the help of this manual, it must be checked that this configuration is suitable for the utilisation defined by the design office, and if this is not the case, the product must be reconfigured.

Verification of the kinematic chains

DC drive applications usually call for extremely precise speed regulation. This cannot be obtained without high quality mechanical drives, which must be checked before connecting to the speed controller : fixing, coupling, alignment, friction of reduction gears, motors and tachogenerators or incremental encoders.

With the supply disconnected

Check the rating plates and the labels on the equipment to ensure that the speed controller, the motor and the mains supply are compatible.
Make sure that the wiring corresponds to the circuit diagram.
Check that all terminals are tight and that the speed controller connectors are fully plugged in and latched.
Where a voltage speed reference is being used, check the connections of the speed reference potentiometer and measure its resistance using a multimeter :
- suggested value : 2200 Ω (terminals 0E1 and P10 or N10 disconnected),
- recommended value : 1 kΩ ≤ R ≤ 10 kΩ,
- power : P ≥ 3W.

The cover of the RECTIVAR serves as an electromagnetic screen for the control board and as a support for the dialogue keypad. Avoid operation when the cover is off or open. Control rack opening does not present any danger as the maximum voltage is 24V for electronic boards.
However, retraction of the control rack does give access to dangerous voltage levels, notably the mains and armature. Do not retract when ON.

Checking the power links

Access to the power control board can be gained by retracting the control rack.
Ratings 16 to 650A
Check that the control voltage is compatible with the supply voltage (link CAV4). If the supply voltage is other than 220/240V, 380/415V or 440V, set the CAL links in position 1 and fit an auto-transformer between the mains and CL1-CL2-CL3 terminals to supply the control (secondary voltage compatible with a CAV4 position).
For rating 16A, no CAL link, alimentation systématique en CL1-CL2-CL3, check that the switch 8A/16A is in position corresponding to the motor.

Check that the VH-VL/VR link is in position VH-VL, (upper position 32A to 650A).

Ratings 800 to 3000A
Check that the control and excitation voltages are compatible with the supply voltage (links CAV4 and CAV5). If the supply voltage is other than 220/240V, 380/415Vor 440V fit :
- an auto-transformer between the mains and CL1, CL2, CL3 terminals to supply the control (secondary voltage compatible with one of the CAV4 link positions)
- a transformer between the mains and the FC1-FC2 terminals to supply the excitation control ((secondary voltage compatible with one of the CAV5 link positions). Set the links to positions FC1 and FC2.
  Check also that the position of the excitation link (10 - 20 - 30) corresponds to a value slightly higher than the motor's rated excitation current. **For these ratings, fit the power connector (VZ6-DL.or DH..), supplied with the power bridge** (attaché au câble de liaison).
  Check that the ST.RT link is in position RT. All ratings : galvanic isolation board, check that the position of the link corresponds to a value slightly higher than the armature voltage motor.

Notes:
- if it becomes necessary to replace the power interface board, ensure that the adaptations above are repeated.
- the galvanic isolation board is systematically mounted on the power interface board in the standard factory assembled controller. In the event of the power interface board being replaced, reinstall the original galvanic isolation board, respecting the wiring.
  Position the link of the galvanic isolation board according to the armature voltage motor.
  1 : 24 to 260 V 2 : 261 to 460 V3 : 461 to 570 V4 : 571 to 750 V
- for the 800 to 3000A models, or the associated VW3-RZD1042 regulator module : position the links and potentiometers on the VX4-RZD104 excitation board as follows :

Links :		*Potentiometers :*	
- 50/60 :	according to the mains frequency	- Fid, G1 and G2 :	any position
- 0 - F/2 :	in position 0	- THRE :	in the fully clockwise position
- R IN-R OUT :	in position R OUT.		

For the optional VW3-RZD1042 module, fit the connecting cables and connectors as shown in the accompanying user's manual, supplied with the product.
Also check the position of the control supply link and of the current selection link (set to the value immediately above the value of rated motor excitation current).

Static adjustments

Equipment required

- One or two multimeters, preferably 20000 ohms/volt. Reminder : the assignment of the 2 analogue outputs enables access to a certain number of read points ; See configuration in part 2, page 2/13.

- A two channel oscilloscope, if required.

- The electricans standard tools.

- A moving scale ammeter, if required, with shunt if necessary.

As a reminder, the armature current and the motor speed appear on the display as soon as the speed controller is switched on.

Switching on for the first time

Having carried out the preliminary checks described in the preceding pages, switch on the device, without requesting a Forward or Reverse movement via the logic inputs. For ratings 800 to 3000A, the green ON excitation LED goes on. Conforming to the general operation mode diagram (p.1/42), the speed controller, on the first occasion it is switched on, carries out an initialisation sequence and an automatic memory test.

- On testing, any one of the initial faults, described on page 1/46 may appear.
  These faults must be corrected, with the controller switched off, by checking the connection or exchange. Faults "RAM", "Module RT", "PROM1/PROM2"," PROMS/Options" and "5V-Option" are not rechecked until the next initialisation. They are not monitored in the same way as the standard faults.

- Establishing the inductor flux - Excitation current fault.
  If the product is in controlled excitation, the current reference takes effect as soon as the initialisation sequence starts.
  Every time the controller is switched on, after initialisation, the excitation current is checked every 50 ms. As soon as this is established, and at maximum, after 2 seconds, the product is ready for operation.
  On the other hand, the fault will not be controlled unless the RUN signal is present and after configuration, during which the speed controller is locked and no fault test is carried out.
  If the speed controller control circuit is energised, when the excitation supply and the RUN signal appear simultaneously :
  - if the flux does not establish, the transfer to working state, speed controller locked, will occur after 4 seconds and the fault will be processed at the end of 6 seconds.
  - if the excitation is broken less than 2 seconds after the appearance of the RUN signal, the speed controller locks instantly, but the fault is only signalled 2 seconds after the appearance of the RUN condition.

Configuration

After initialisation, which takes approximately 100 ms, if neither of the faults described above appear, the two following messages appear on the display :

Dialogue ?
Français

which indicate the start of the configuration process. This process is carried out as described on pages 1/41 and 1/42 with, if necessary, the special configurations described in part 2, page 2/1.

Pay special attention to the current, voltage and speed indications and the speed feedback characteristics.

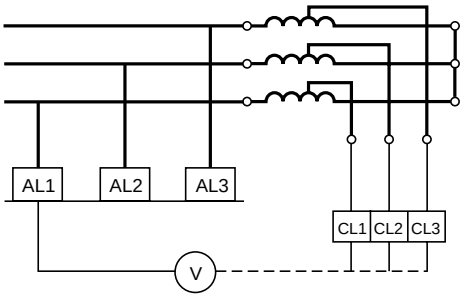
Possible static faults

As soon as configuration is complete, the fault processing becomes active in the form of an automatic visual display of stop faults (and storage), which provides assistance with the preliminary checks before going on to the adjustment procedure as such.
The faults which can appear on the display and cause the red LED on the keypad to go on are, outside product control, the following types :
- internal or external static, stop faults, in the order given on page 1/45.
When the cause of the fault is displayed, it is essential that it is cancelled, so that the RECTIVAR can be unlocked. The same applies to any faults which follow, appearing after acknowledgement of the previous fault causes.
In particular, the excitation current fault becomes active if the RUN signal is present. If the wiring is correct, it appears, in fixed excitation because of an incorrect adjustment which will be examined further on pages 1/60 and 1/61.
If the "reduced flux" function is configured, the controlled excitation fault is only active if a RUN command is present and after the fixed time of 2 seconds required for the current to be established.

For internal static faults, the cancellation of the faults is carried out by replacing the control parts.
If there are no faults present, the display immediately shows the values of the armature current and motor speed.

Checking the synchronisation

Reminder : the internal static fault "Synchro signal" internally checks the creation of the signals necessary for synchronisation, but not the coincidence of the phases between the power and control, when these are supplied separately (CAL switches on the power interface board at 1).
If this is the case in the installation, check phase coincidence as follows :



Measure AL1-CL1, CL2, CL3.
For the lowest voltage measured, connect the corresponding wire to CL1.

Measure AL2-CL2, CL3.
For the lowest voltage measured, connect the corresponding wire to CL2.

Connect the remaining wire to CL3.

In the case of the electronic control being internally supplied (CAL at 0), a synchronisation check is unnecessary.

Synchronisation of the excitation control

For 800 to 3000A ratings (or with the VW3-RZD1042 module for lower ratings) the same procedure as above, if separate supply between the FL1-FL2 a.c. terminals and the FC1-FC2 d.c. terminals.
Measure FL1-FC1 and FL1-FC2 : for the lower of the voltages measured, connect the corresponding wire to FC1, connect the second wire to FC2.

First product command

- Command the signals RUN then FORWARD or REVERSE.

- Set a low speed reference (20 % for example), with low Motor/Brake max. I decrease (current peak limiting) adjustment values. Never slope under 0,5 I rated motor

By default, these adjustments are the copy of the configuration or adjustment of I armature max. It is possible to adjust them to a low value for safety reasons on initial starting up in order to prevent brutal drive rotation.

The faults which can appear on the display, causing the red LED to go on, are more particularly internal dynamic or external stop faults. They are in the order given on page 1/47.

These safety devices protect the motor against running away, or stalling during initial setting up.

The following faults could, for example, be found :

N Fback absent →	Check the tachogenerator or encoder wiring
N Fback reversed →	Reverse the tachogenerator or encoder wiring or, without altering the wiring, use the configurable "Sp. feedback conn." function, see page 1/44, configuration on Inverse.

and if they were configured as stop faults :

Arm. circuit open →	Check the motor armature wiring
Motor stalling →	Check the operation of the mechanical brake and the kinematic chain.

The other dynamic faults which can appear are mainly the result of the standard factory settings not being suitable for the application. In this case, reset the configuration, reassign the faults causing problems to alarm faults, and reset the adjustments as described below.

Adjustment procedure

Conforming to the operation modes general diagram on pages 1/44 and 1/45, access to adjustment mode is carried out with the question

Operation mode ?
Adjustments

and pressing ENTER.

The two display lines are accessible using keys PAR and DATA. Scrolling (slowly or quickly, see page 1/5) of parameters or answers is carried out with ↑ or ↓ (pressing CLEAR simultaneously).

The recording of the display signal in the EEPROM memory is carried out by pressing ENTER : this action, then, must not be omitted if storage of the adjustments is required in case of accidental loss of control voltage.

Each adjustment value must be validated by pressing ENTER.

Furthermore, every time ENTER is pressed, the display offers the possibility of quitting Adjustment mode, with the question

End of setting ?
<CLEAR> <ENTER>

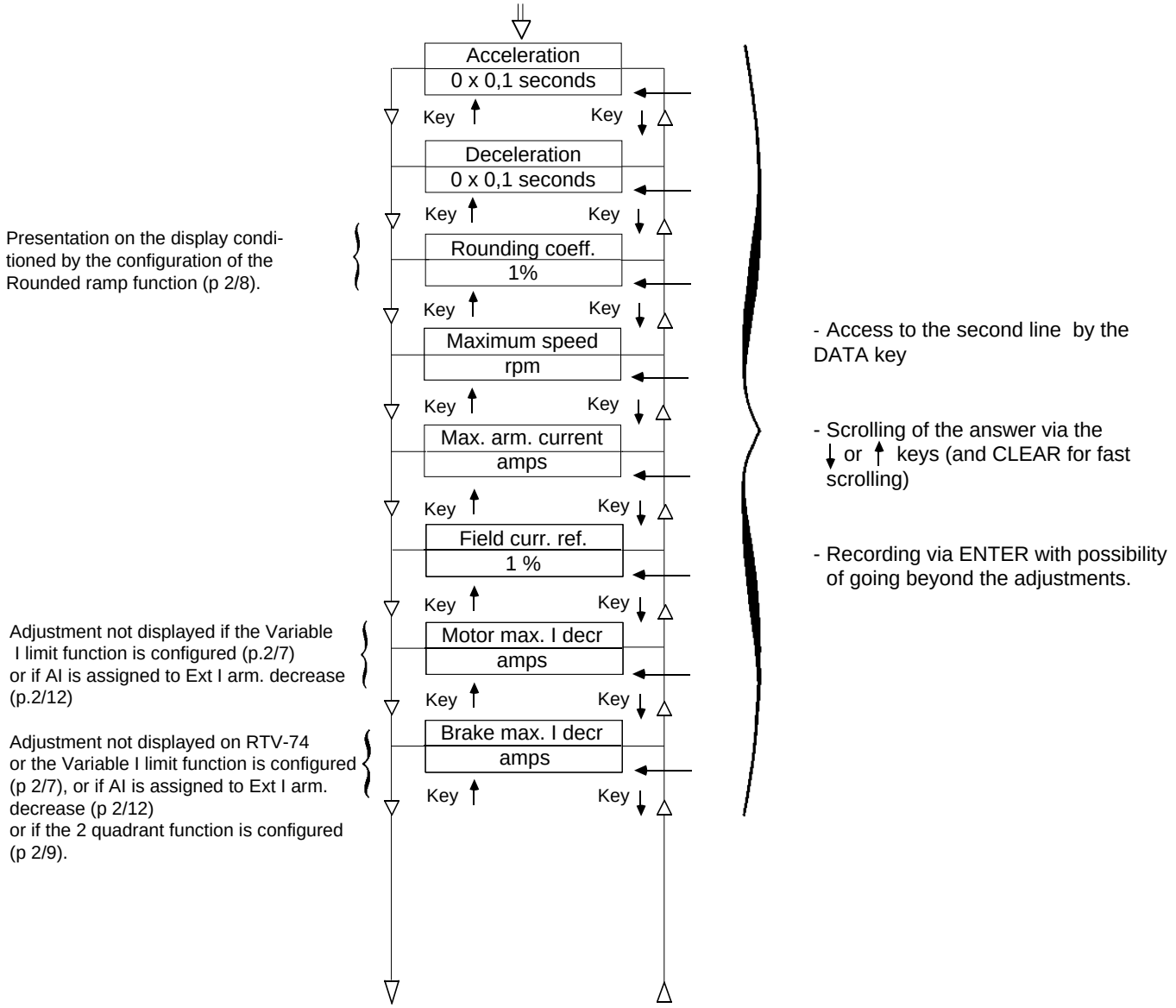
Pressing CLEAR makes it possible to remain in adjustment mode, and reconnects to the previous parameter recorded. Pressing ENTER a second time causes reversion to the question Operation mode ?

NOTE : The adjustments are also accessible by serial link (see part 2, page 2/25).

Parameters

ENTER key : input in adjustment mode

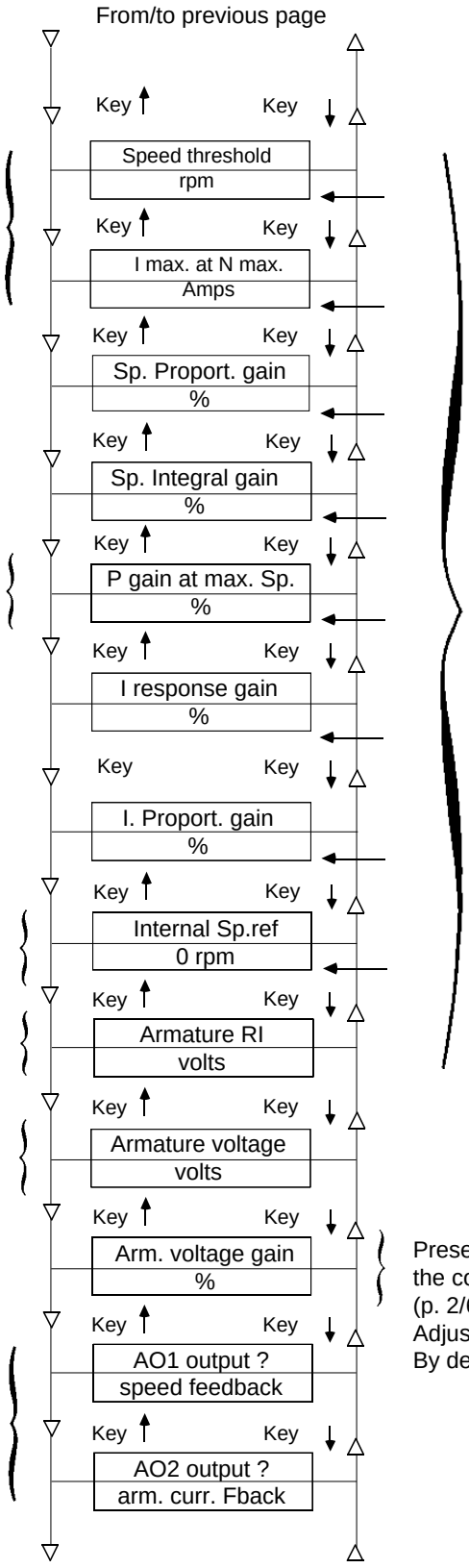
PAR key : enables the Ist line parameters to be changed by using ↓ or ↑



From/to next page

Dynamic adjustments

Parameters



Adjustments displayed if the Variable I limit function is configured (p 2/7)

Adjustment displayed if the Speed gain fading is configured (p 2/7)

Adjustment from 1 to 100%
By default 10%

Adjustment from 1 to 100%
By default 3%

Presentation on the display conditioned by the configuration of the "Internal Sp. ref." function (p. 2/8).

Presentation on the display conditioned by configuration of armature voltage as speed feedback (p. 1/45).

Presentation on the display conditioned by configuration of armature voltage as speed feedback (p.1/45) on of field weakening function (p. 2/6 and 2/21). By default, the configuration value is used as the armature voltage.

Presentation on the display conditioned by configuration of AO adjustment function (p. 2/13)

- Access to the second line by the DATA key
- Scrolling of the answer via the ↓ or ↑ keys (and CLEAR for fast scrolling)
- Recording via ENTER with possibility of escape from adjustment mode.

Presentation on the display conditionned by the configuration of field weakening fonction (p. 2/6 and 2/21).
Adjustment from 0 to 225%.
By default 10%.

To special application adjustments, where necessary.
The presence of the special application cartridges can increase the number of adjustments : see corresponding manuals.

Ramp adjustment

Acceleration and Deceleration

Adjustment by default is 0,0 seconds for each of the two times. Acceleration and deceleration can be adjusted independently from 0,0 seconds to 999,9 seconds.

Precautions : If, after adjustment, the speed controller goes systematically into current limitation during these phases (yellow indicator lights up on keypad) go to the maximum armature current adjustment or increase the ramp time so that the current required by the motor to start or brake the inertias under normal operating conditions, stays within an acceptable limit. for rounded ramp, or cancellation of the ramp function, see part 2 page 2/8 or 2/14 .

Maximum speed adjustment

Maximum speed

The adjustment by default of "Maximum speed" corresponds to the configured indicated maximum speed which must be identical to the motor nameplate (in field weakening if appropriate). It is possible, using this adjustment, to precisely readjust the correspondance between maximum motor speed and a maximum speed reference of 10 volts (or 20 mA on the Ec input)

Precautions : the mechanical accuracy of the machine depends on this adjustment (speed, flux...).
- In fixed excitation, (or controlled excitation) measure the armature voltage of the machine between M1 + and M2 - of the power bridge. Do not exceed the maximum voltage marked on the nameplate, the overcurrent fault will appear for an excess of 10 %.
  Check that the voltage corresponds correctly to the machine's maximum speed by measuring the voltage between terminals RNA and RNB of the power interface board.

Example
For a 3000 rpm motor, 400V armature and a 0,06V rpm tachogenerator, make sure that 180V between RNA and RNB corresponds to about 400V between M1+ and M2 -. If this is not the case, adjust the excitation current.

- In field weakening, see part 2 of the manual, page 2/21.
- In speed feedback by armature voltage, ensure a perfect offset on the galvanic isolation board

Note
The adjusted value is the same as the corresponding value in configuration mode. Ajustment is therefore optional.
However, the adjustment above is more easily accessed for any alteration during operation, in particular, by means of serial link.
It should also be noted that this adjustment scales up the speed feedback analogue signal, hence the accuracy of the measurement : max speed adjusted above = 1843 points of definition.

Internal speed reference adjustment

Internal sp. ref.

This adjustment alters the configured value and operates by replacing the sum of the speed references if the Internal N ref. is configured; page 2/8.
The commands FORWARD and REVERSE remain necessary. The reference detector function cannot be fitted. The adjustments in progress are taken into account. The adjustment by default is 0 rpm. The arrows ↓ or ↑ cause the value to change, which is taken into account immediately, from 0 to the maximum speed indicated above.
The sign depends on the FORWARD - REVERSE signal.
Use of the ENTER key records the value displayed as long as the Internal Sp ref. function remains configured (p 2/8).

Adjustment of current limitation

Max. arm. current

Adjustment by default of maximum armature current corresponds to the configured value of Max. arm. current signal which must be identical to the motor nameplate.
It is possible to limit the maximum current delivered by the speed controller using this adjustment, whatever the operating quadrant, motor or brake.
The adjustment is limited by two stops : 33% and 100 % of the speed controller current peak (see page 1/8).

Precautions : The mechanical behaviour of the machine depends on this adjustment (permissible torques)
- do not remain long in current limitation adjusted to a high value, as this may cause overheating of the motor and commutator segments.
- never exceed the max current indicated on the speed controller label. In the event of cyclical operation, see p. 1/11
- do not forget to derate the controller by 1,2 % for every °C for ambient air temperatures between 40 and 60°C.

Example :
Take an RTV-84C80Q operating in an ambient temperature of 55°C.
Derating is equal to 1,2 x (55 - 40) = 18 % that is, a derated value of maximum current of :

$$800 \times \frac{(100 - 18)}{100} = 656A$$

For a motor used with a Td/Tn of 1,2 and $\eta = 0,90$ the maximum power available on the motor shaft becomes :

$$\frac{I\ max \times U\ armature \times n}{Td/Tn} = \frac{656 \times 400 \times 0,90}{1,2} = 283kW$$

Note : Conversion of the current signal and calculation of the current loop are carried out at 2048 points.
But the peak current of the controller is always defined in 1600 points, including a margin for calculation of the overcurrent foult.

Excitation fault or reference

Field curr. ref.

This adjustment has two functions
- in fixed excitation : excitation threshold, below which there is a fault. Adjustment by default is 1 %, 100 % corresponding to 15 amps for D32 to C65 ratings. For D16 rating the threshold is fixed (0,1 A), the adjustment is non active set it to a medium value .
- in controlled excitation or field weakening : excitation current regulation reference with fixed flux, if these functions are configured (see part two page 2/6).

- Excitation fault. This is always treated as a stop fault, but is only tested if the RUN signal is present. Adjustment is at 1 % which activates the protection only for genuine supply circuit or excitation measurement failures. If more accurate monitoring of the excitation current is required, increase the adjustment value until the fault is activated, then reduce by a margin to cover later fluctuations due to heating of the motor and of the ambient air around the speed controller. It may be necessary to reset this adjustment in the hot state, if this margin is inadequate.

- Adjustment of the current reference in controlled excitation or field weakening. When these functions are configured, p 2/6, a request is made to display the reference value (1 % by default). The adjustment consists of resetting this indication. The value 100 % represents the maximum current for the rating, considered to be :
- for ratings ≤ 650A with module VW3-RZD10425167 : 0,3A, 1A or 3A by link,
- for ratings ≤ 650A with module VW3-RZD1042 : 3A, 10A or 30A by link
- for ratings ≥ 800A with control moduleVW3-RZD1122 : 10A, 20A or 30A by link.

The adjustment of the rated excitation current is carried out, therefore, in proportion to the value selected by the link and by checking this value, using a measuring device.
- For motors with permanent magnets : set the value to 0 %

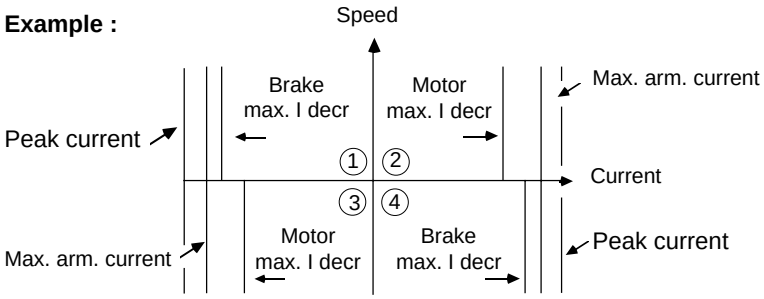
Adjustment of the max I decrease current peak limitations

Motor max. I decr and Brake max. I decr

These two adjustments enable differentiation of the current according to the motor or brake (generator) operating quadrant.
It concerns the peak limiting of Maximum armature current, therefore with the latter value as maximum limit. The adjustment is Maximum armature current by default.

Precautions : The same as for maximum armature current. However, these three adjustments do not modify the scaling of the current feedback reading at 1600 definition points. Therefore, the three adjustments must not be too far from the peak armature current of RECTIVAR to avoid losing definition of the armature current feedback reading.

Example :



Observations : These two adjustments are without effect when the analogue input AI stays in the factory pre-set configuration, i.e. ext. arm. current decr (see part 2 page 2/12).
- The adjustment to 0 of Brake max. I decr for the RTV84 gives "2 quadrant" operation without electrical braking, but this function is easily configured, see page 2/12. It makes this adjustment invisible.

Adjustment of the RI term

Armature RI

Alteration of the configured preindication.
Where speed feedback is configured in armature voltage reading, the speed controller automatically carries out a U ± RI calculation depending on the operating quadrant. The RI adjustment is carried out in volts. Adjustment by default at 5 %; Adjustment limits, 0 to 33 % of the configured armature voltage value.

Adjustment of the amplifier gains

Sp. proport. gain | Sp. integral gain | I response gain | I proport. gain

The proportional and integral gains of the speed adjustment loop, and the I response and proportionnal gains of the current loop are factory preset to satisfy the majority of applications not requiring high performance levels.
For some special applications (unusual divisions of inertia, precise positioning...), it will be necessary either to weaken, or to reinforce the adjustment loop reactions, by balancing the various gains. Given the multiplicity of the applications, it is impossible to specify adequate adjustments for each individual case. These adjustments should be optimised on initial setting up, using the directions on the following page.

Note : Regarding the speed amplifier's proportional gain, the configurable function G = GO - KN (p.2/7), can extend these adjustments when very good proportional gain at low speed is required. Obtaining high regulation performance is only possible with fast current loop responses, which must always be adjusted first, by the I gains. Always check that the dI/dt obtained can be taken by the motor. As an example, the dI/dt expressed in IN/sec will be limited by :

$$\frac{dI}{dt} \leq KO \quad \frac{In}{I\,max} \quad \frac{Nn}{N\,max}$$ with

KO ~ 60 for motors with solid frames
KO ~ 200 for motors with laminated frames.

Field weakening adjustment

See page 2/21.

Instructions for gain adjustments

• Current loop gains

From armature circuit characteristics (resistance in Ωand inductance in H), we can calculate the gains which give the greatest speed without instability of the current sloop :

I response gain in % : $\frac{\text{R armature x I max}}{\text{U mains}}$ x 300

Proportional gain in % : 20 x f x $\frac{L}{R}$ with f = mains frequency

Example : 400 V 50 Hz mains, I max 100 A
R = 0,1Ω L = 0,0005 H
I response gain = 8 %
I proportional gain = 5 %.

• Speed loop gains:

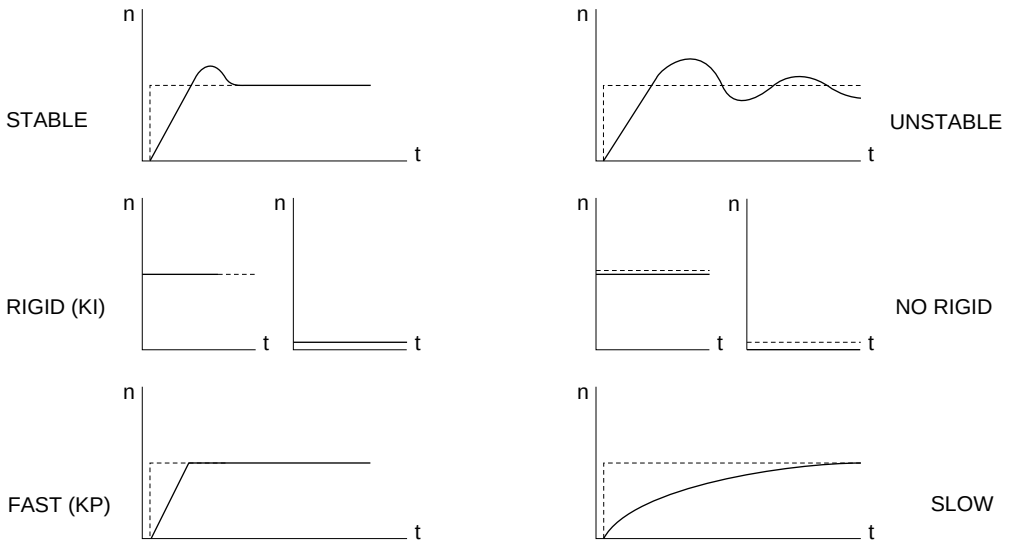
The integral gain is adjustable from 1 to 100% with a standard factory setting of 10% which corresponds to the most common applications. It improves dynamic performance during fast changes of speed reference.
The proportional gain is adjustable from 1 to 100% with a standard factory setting of 20 %which corresponds to the most common applications. It improves static accuracy during slow changes of speed reference.

Additions for speed loop :
Various adjustment criterea exist, depending on the application. For example: speed response at constant rate of change, without exceeding its limits, with a medium value of proportionnal gain.
It is not always desirable to supply maximum performance; when this is not necessary mechanical wear and the appearance of play could adversely affect operation. In many cases, the standard settings can be suitable.

In the event of instability, ripple frequency provides a great deal of information :
- low frequency (2 Hz for example) can mean that levels of inertia and integral gain are high. Response can, therefore, be improved by reducing (or by short-circuiting) the integral gain, or by increasing proportional gain.

- higher frequency (20 Hz, for example), can mean that the level of proportional gain is too high

EXAMPLES OF SPEED RESPONSE



Accessories and spare parts

Spare parts

Boards

Description	For RECTIVAR		Unit reference
Control board (1) with microprocessors	All ratings	Software version V3.1	VX4-RZD201
		Software version V1.•• and V2••	VX4-RZD101
Power interface board	D16 (RTV 84 only)		VX5-RLD101
	D32 to C65		VX5-RZD109
	C80 to M30		VX5-RZD202
Display board	All ratings (without EEPROM cartridge)		VX4-RZD103
Complete keypad	All ratings, delivered with front cover		VY1-RZD103
Firing gate board	D32 to C65 - RTV-84 only		VX2-DB303L
Galvanic isolation board	All ratings		VW2-RZD2071
Firing gate protection	C80 to M17 Q or S		SF1-LG220
	C80 to M17 Y		VX5-RZD107
Mains protection	C80 to M17Q or S		VX5-RZD108
	C80 to M17 Y		VX5-RZD106
Protection	M30 Q or S		VX5-RZD101
+ firing gates	M30Y		VX5-RZD103
Excitation control	C80 to M30		VX4-RZD104
Current module	D32 to C65		VW2-R•••••(2)
Current connector	C80 to M30		VZ6-D•••(2)
EEPROM cartridge	All ratings		TSXMC70E38 (3)

(1) Never change software version without consulting us.
(2) For the RTV - 74, the reference is VW2 - RHD... or VZ6 - DH..., for the RTV - 84, VW2 - RLD or VZ6 - DL..
The reference is completed with a reminder of the speed controller's max permanent I.
examples : RTV-84D72. and module VW2-RLDD72, RTV-74C65 and module VW2-RHDC65
RTV-84M17. and VZ6-DL1750 connector (current in amps), RTV-74C80 and VZ6-DH800
This should be taken into account when replacing the power interface board.
Do not forget to put the current module back in position.
Note : a VZ6-DH/DL651 connector is available which can be adapted to an 800A bridge for I = 650A and a VW2-RLD• or RHDD161 module which can be adapted to ratings 32A to 650A for I=16A.
(3) Always leave the switch on WORK and never on MASTER (Read only).

Power components

Description	For RECTIVAR	Characteristics	Reference
2 thyristors	RTV-84D16Q (4)		
MODULE	RTV-74/84D32/D48Q	26A - 1200V-1000V/µs	VZ3-TM2026M12
RTV 74 AND 84	RTV-74/84D72Q	55A - 1200V-1000V/µs	VZ3-TM2055M12
	RTV-74/84C18Q	90A - 1200V-1000V/µs	VZ3-TM2090M12
	RTV-74/84C27Q	130A - 1200V-1000V/µs	VZ3-TM2130M12
	RTV-74/84C40Q	160A - 1200V-1000V/µs	VZ3-TM2160M12
	RTV-74/84C65Q	250A - 1200V-1000V/µs	VZ3-TM2250M12
	RTV-74/84C80Q	540A - 1200V-1000V/µs	VZ3-TP2540M12
	RTV-74/84M12Q	900A - 1200V-1000V/µs	VZ3-TP2900M12
	RTV-74/84M17Q	1200A - 1200V-1000V/µs	VZ3-TP2M12M12
	RTV-74/84M30Q	1800A - 1200V-1000V/µs	VZ3-TP2M18M12
	RTV-74/84D32/D48S	26A - 1600V-1000V/µs	VZ3-TM2026M16
	RTV-74/84D72S	55A - 1600V-1000V/µs	VZ3-TM2055M16
	RTV-74/84C18S	90A - 1600V-1000V/µs	VZ3-TM2090M16
	RTV-74/84C27S	130A - 1600V-1000V/µs	VZ3-TM2130M16
	RTV-74/84C40S	160A - 1600V-1000V/µs	VZ3-TM2160M16
	RTV-74/84C65S	250A - 1600V-1000V/µs	VZ3-TM2250M16
	RTV-74/84C80S	540A - 1600V-1000V/µs	VZ3-TP2540M16
	RTV-74/84M12S	900A - 1600V-1000V/µs	VZ3-TP2900M16
	RTV-74/84M17S	1200A - 1600V-1000V/µs	VZ3-TP2M12M16
	RTV-74/84M30S	1800A - 1600V-1000V/µs	VZ3-TP2M18M16
	RTV-74/84C80Y	785A - 1800V-1000V/µs	VZ3-TP2785M18
	RTV-74/84M12Y	900A - 1800V-1000V/µs	VZ3-TP2900M18
	RTV-74/84M17Y	1200A - 1800V-1000V/µs	VZ3-TP2M12M18
	RTV-74/84M30Y	1800A - 1800V-1000V/µs	VZ3-TP2M18M18

The characteristics are only given as a guide, and are not the only factors to be considered when selecting thyristors.

Note : The power components for the RTV-84D16Q are not sold separately.
Use a complete power board, reference VX5-RLD101.

Three phase line inductances

One three phase choke per speed controller is required
Dimensions : see page 1/21

Description	For RECTIVAR	Characteristics (1)	Reference
	RTV..D16•	15A,1700 µH	VZ1 L015 UM17T
	RTV..D32•	30A, 800 µH	VZ1 L030 U800T
	RTV..D48•	40A, 600 µH	VZ1 L040 U600T
	RTV..C72•	70A, 350 µH	VZ1 L070 U350T
	RTV..C18•	150A, 170 µH	VZ1 L150 U170T
	RTV..C27•	250A, 100 µH	VZ1 L250 U100T
	RTV..C40•	325A, 75 µH	VZ1 L325 U075T
	RTV..C65	530A, 45 µH	VZ1 L530 U045T
	RTV..C80•	650A, 38 µH	VZ1 L650 U038T
	RTV..M12•	1025A, 24 µH	VZ1 LM10 U024T
	RTV..M17•	1435A, 16 µH	VZ1 LM14 U016T
	RTV..M30•	2460A, 10 µH	VZ1 LM24 U010T

Filter module

	All ratings	500 V max.	VY1-RZD106

Fuses as spare parts

Description			
Power fuses Ultra quick acting	RTV-84D16Q	6,621CPURGB145140	DF3-EF04001 (2)
	RTV-74/84D32Q/S	BUSSMAN 170L2114	DF3-FF05002 (2)
	RTV-74/84D48Q/S	BUSSMAN 170L2114	DF3-FF05002 (2)
	RTV-74/84D72Q/S	6.621CPURD2258100	DF3-FF10001 (2)
	RTV-74/84C18Q/S	6,6URD31TTF250	DF3-NF25002
	RTV-74/84C27Q/S	6,6URD31TTF400	DF3-NF40002
	RTV-74/84C40Q/S	6,6URD31TTF500	DF3-NF50002
	RTV-74/84C65Q/S	6,6URD33TTF800	DF3-QF80002
Single pole carriers	RTV-84D16Q	SI14 + MC 1,5	DF5-EA61
	RTV-84D32Q/S & D72Q/S	SI22 + MC 1,5	DF5-FA61
	RTV84D48Q/S	SI2760PRE+MCPS	DF5-SA61
	RTV-74/84C18Q/S		DF5-NZ01
	RTV-74/84C25Q/S		DF5-NZ01
	RTV-74/84C40Q/S		DF5-NZ01
	RTV-74/84C65Q/S		DF5-QZ01
Micro-contact	RTV-74/84C18 to C65Q/S		VZ1-P001

(1) The type of fuse given is one of several equivalent models which can be supplied under the same reference.
(2) Sold in lots of 10.

Fuses as spare parts

Description	For RECTIVAR	Characteristics (1)	Reference
interface board		All ratings	DF2-DF00401 (2)
Power Ultra fast acting type	RTV-74/84C80Q/S	6,6URD33TTF630	DF3-QF63002
	RTV-74/84M12Q/S	6,6URD33TTF900	DF3-QF90002
	RTV-74/84M17Q/S	6,6URD33TTF1250	DF3-QFM1202
	RTV-74/84M30Q/S	6,6URD2X33TTF2200	DF3-QQFM2202
	RTV-74/84C80Y	12,5BODKC3URE73TTC550	DF3-RF55001
	RTV-74/84M12Y	10BODKC4URB73TTC900	DF3-RF90001
	RTV-74/84M17Y	10BODKC6URG73TTC1100	DF3-RFM1101
	RTV-74/84M30Y	10BODKC6URK2x73PLA1800M	DF3-RRFM1801
Micro contact :	RTV74/84C80 à M30Q/S		VZ1-P001
	RTV-74/84C80 à M30Y		VZ1-P002

(1) The type of fuse given is one of several equivalent models which can be supplied under the same reference.
(2) Sold in lots of 10.

Ventilation

Fan	RTV-74/84C18. and C27.		SZ1-XH07
	RTV-74/84C40. to M17		VZ3-V001
	RTV-74/84M30		SZ1-XH09
Ventilation detector	RTV-74/84M30		LH9-ZD001
Control module detector	RTV-74/84M30		VW3-RZD101

Plate mounting

Set of spacers	RTV-74/84C18 and C27.		VY1-RZD102

Excitation

Field excitation bridge	RTV-74/84D32 to C27		VZ3-DM4025M1201
	RTV-74/84C40. and C65		SZ1-DP170
2 thyristor module	RTV-74/84C80. to M30.	26A 1200V	VZ3-TM2026M12

Options

Encoder interface board	All ratings	with Uni-telway and MODBUS ®	VW1-RZD101
EPROM cartridge	All ratings RTV-84	vertical movement	VW2-RLD221
	RTV-84	unwinder-rewinder	VW2-RLD124
Current regulator module	RTV-74/84D48 to C65		VW3-RZD1042

Initial setting up debugging unit

All ratings			SD2-MB2101

CONTENTS - PART 2

Special applications

Part 2 – Special applications

Types of speed controller adaptations

Part 1 looked at the common types of RECTIVAR 74-84 applications.
In addition, the speed controller can satisfy the needs of a wide range of applications which are examined in the second part of the manual, and in the detailed manuals for the optional EPROM memory cartridges and for the VW1-RZD101 board.

- Without any additional hardware, entry into the special assignments during the configuration procedure (page 1/41) enables :

  - utilisation of the simple optional functions
    by recording the response

Options assign ?
Yes

    + ENTER

    • special case : the controlled excitation or field weakening simple functions for ratings ≤650A, presuppose that the VW3-RZD1041 optional module is connected.

  - the reassignment of configurable logic and analogue inputs/outputs
    by recording the response

I/O reassign ?
Yes

    + ENTER

    This question can be bypassed by some configurations.
  - the adaptation of fault processing
    by recording the response

Fault reassign ?
Yes

    + ENTER

- With the addition of the VW1-RZD101 "Interface option " board, which enables :
  - speed feedback via incremental encoder
  - the speed reference via frequency signal
  - a summing speed reference in pure binary
  - connection in RS485 multidrop serial link in UNI-TELWAY or MOBBUS ® protocol.

- With the addition of a single EPROM special application memory cartridge, for applications :
  - vertical movements
  - rewinder

- By simple connection of the 0-20 mA serial link to a controller, communication is established in Telemecanique ASCII point to point protocol.

- By connecting the 0-20 mA serial link via the VW3-A45103 communication coupler, communication is established in UNI-TELWAY or MODBUS ® protocol (variant to the VW1-RZD101 board for a multipoint serial link).

Simple optional function assignment (Configuration extension)

Note : The other options require additional hardware, automatically involving the appropriate adaptations during mounting and connection of the EPROM cartridge and/or the VW1-RZD 101 interface option board.

Configuration mode, after display of Max. arm. current, page 1/45.

Options assign ?
No

Yes or No decision to access the reassignment of simple options

Reply NO + ENTER

Change to reassignment of Inputs/Outputs, page 2/10

Reply YES + ENTER

Faster/slower ?
Non

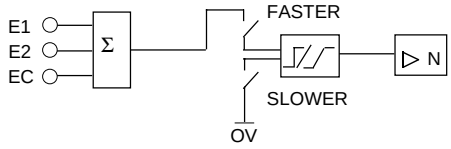
Yes or No decision to use this function

Reply YES + ENTER

"Motorised potentiometer" type operation (incompatible with the low speed function).
When configured, this function automatically assigns inputs LI1 to Slower and LI2 to Faster. The two inputs can no longer be assigned in any other way.These two logic signals are sandwiched between the summing of references E1, E2, EC (and, possibly AI = E3), and the acceleration/deceleration ramp, for which the the adjustments are taken into account..
The signal *Faster* "connects" the positive or negative sum of the ramp references while the input is activated.
The signal *Slower* "connects" 0 reference volts to the ramp input while the input is activated.
Where the two inputs are present simultaneously, only the first to appear is taken into account.
Changes in the FORWARD / REVERSE logic inputs and the decrease of the references take priority over the Faster/Slower function (this reference can only be positive for the RTV-74).
If the Faster/Slower signal is not present :

- absence of Forward and Reverse gives priority to slow-down with cancellation of the sum of the references
- fast reversal of FW/RV or of the reference gives priority to slow-down, but does not enable acceleration in the opposite direction for which the Faster signal is required.

Equivalent diagram



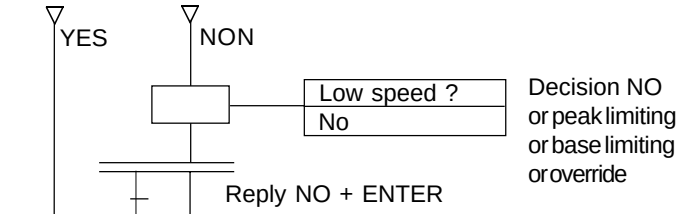
When changing from YES response to NO response, the change to reassignment of the inputs/outputs becomes systematicallly in the current configuration.

Answer NO + ENTER

When changing from YES response to NO response, the LI1 and LI2 inputs are in the "NOT assigned" condition. Change to inputs/outputs reassignments mode becomes systematic in the configuration in progress.

Next page

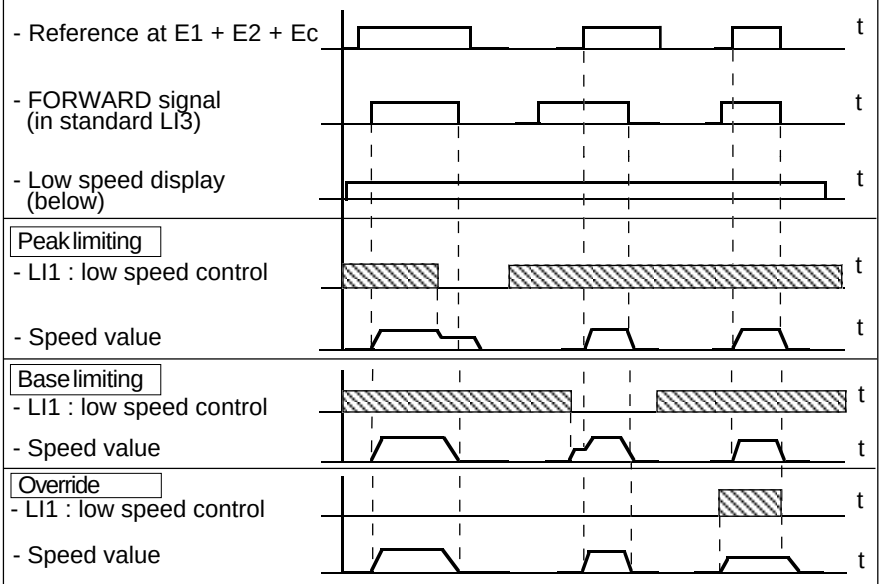
Simple optional function assignment
(Configuration extension)



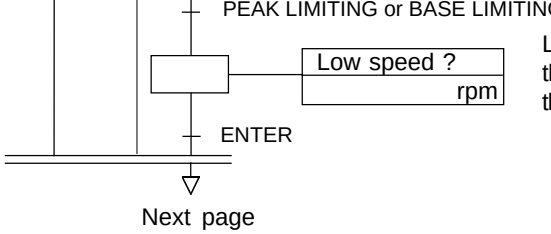
Low speed control (incompatible with the faster/slower function)
When configured, this function assigns the logic control to LI1 which is then no longer assignable.

- The peak limiting function consists of setting a top limit to the E1+E2+EC references while LI1 remains idle, with a run signal present.
  In this case, the sign and the sum of the references, confirmed by FORWARD or changed by REVERSE, or automatically defined by the Reference Detection function provides the speed sign.
- The base limiting function consists of setting a low limit to the absolute value of E1+E2+EC references while LI1 remains idle. If LI1 is idle, it is the absolute value of E1+E2+EC together with the FORWARD or REVERSE sign which is taken into account. With the Reference Detection function, commands FW and RV, derived automatically from the sign of E1+E2+EC, provide the speed sign.
- The override function consists of replacing the E1+E2+EC references by an internal reference while LI1 remains active; the FORWARD or REVERSE operation command provides the reference sign.

Operation timing diagrams



All alteration of the No response to peak limiting, base limiting, or override, causes the systematic change to the inputs/outputs assignments during the configuration in progress.

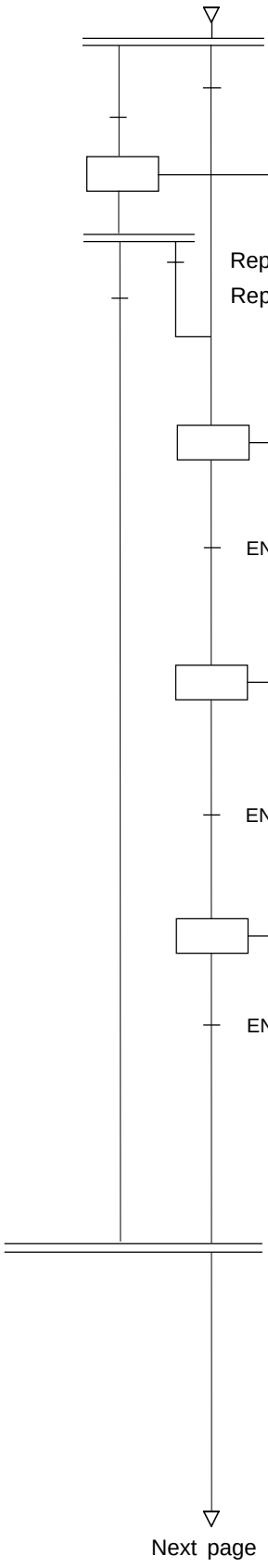


Low speed signal taken into account above. From 0 to the previous max. speed indication, by default, 20% of this indication.

Next page

Simple optional function assignment (Configuration extension)

From previous page



Statement of absence (No) or presence (Yes) of the optional controlled excitation or field weakening module.
Special case : ratings C80 or M12 or M17 or M30 with RT module type VW2-RLD651 or RHD651, response YES.

Decision Yes of No as to whether to operate with field weakening (in the event of a No reply, the device operates with controlled excitation : the field current is regulated to the reference below irrespective of mains voltage or temperature variations).

Indication of nominal current reference value.
Adjustment from 0 to 100 %, 1 % by default.
100 % values scaled up, see page 1/63 :
this value can be reset in dynamic adjustment.
The value 100 % is the maximum rated current value.
Selection by link.

Yes or No decision for use this function

Operation at reduced flux while the operation command is not present : in this case, the excitation current is reduced to 50 % of the set value in adjustments, p.1/61.
Flux reduction operates 7 mn after disappearance of the Foward/Reverse command.

Note concerning the "Excitation" fault
• With fixed excitation, the excitation current (i <) must be higher than the threshold set in normal adjustments. The fault is not recognized until the controller is unlocked by RUN, which enables the adjustment.
• In controlled excitation or field weakening (ei >) too large an error on the excitation current regulation, with non-adjustable threshold, becomes systematic and replaces the fault (i <).

Next page

Simple optional function assignment (Configuration extension)

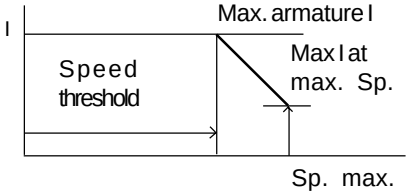
From previous page

Variable I limit ?
No

Yes or No decision to use this function

Reply No and ENTER

Linearly decreasing current limitation function depending on the speed using a speed threshold and the Max armature current configuration/adjustment. This function makes the motor Max I decr. and the brake Max I decr invisible. It makes the assignment of AI to Ext. arm. I decr. impossible (p.2/14). When changing from No to Yes, if, AI was assigned to this function, it changes to "Not assigned". Any change of response from No to Yes or vice versa causes the systematic change to assignments of the inputs/outputs, during the configuration in progress.



Possible utilisations : - Torque motor
- Field weakening

Reply Yes and ENTER

Speed threshold
0 rpm

Presignalling of the adjustment (p 1/61) of the speed threshold, by which the current limitation will be reduced : from 0 to the max. speed indication.
• By default : 0 rpm

ENTER

Max I at max. Sp.
Amps

Presignalling of the adjustment (p 1/60) of the required current limitation to the max. speed configured :
• from 0 to 100 % of the max arm. current indication
• By default, this indication in amps.

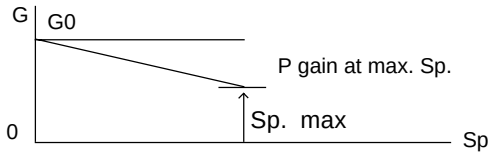
ENTER

Sp. gain fading ?
No

Yes or No decision to use this function

Reply No and ENTER

Speed loop proportional gain reduction function, depending on the speed type G = Go - KN



Utilisation : Precise positioning requiring very good gain at low speed

Reply Yes and ENTER

P gain at max. sp
20 %

Pre-indication of the adjustment (p 1/61) of the required proportional gain at max. speed :
• 0 to P gain N value %
• By default, the factory setting of proportional gain i.e. 20 %. This indication is given depending on the normal proportional gain set in dynamic adjustment mode, i.e. GO. P. Gain at max. speed is only active when it is lower than the Speed proportional gain setting.

ENTER

Next page

Simple optional function assignment (Configuration extension)

From previous page

Integ. reset/sp=0
No

Yes or No decision to use this function

Yes or No + ENTER

Speed amplifier integration bypass function when the speed is lower than 0,02 x maximum speed.

Note : this bypass function is also possible by assigning to it one of the 4 configurable logic inputs, see page 2/14.

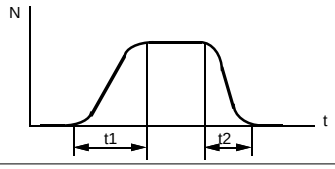
Rounded ramps ?
No

Yes or No decision to use this function

Reply No and ENTER

Reply Yes and ENTER

Obtaining of acceleration and deceleration ramps with the beginning and end of the parabolic form, called rounded ramps, designed to eliminate transient current peaks. Caution : times t1 and t2, accessible in adjustments, do not take the rounding into account



Rounding coeff.
1%

ENTER

Preindication of rounding coefficient K from 1 to 254%, by default 1% which is equivalent to traditional ramps. The K coefficient prolongs the times (acceleration t1, deceleration t2) in the following way :
If aK < t , t'= t + aK a= 13,3 ms
If aK > t , t'= t 2 $\sqrt{ak.t}$

Ex 1 : t = 2s, k = 100 : ak = 1,33s < 2s t' = 2 + 1,33 = 3,33s if ramp < 100 s
Ex 2 : t = 1s, k = 200 : ak = 2,66s < 1s t' = 2$\sqrt{2,66}$ = 3,26s if ramp ≥ 100 s

Internal sp. ref ?
No

Yes or No decision to use this function

Yes and ENTER

No and ENTER

Keypad internal speed reference function.
When configured, this function provides an additional adjustment of the same name, which replaces references E1, E2, Ec (+AI, if used). The FORWARD and REVERSE commands remain necessary. The speed reference is changed by using the ⬆ or ⬇ keys.

Internal sp. ref
0 rpm

ENTER

Pre-indication of reference given on p 1/61.
By default, 0 rpm on each configuration of the function.
Warning, the configured value is immediately taken into account on quitting the configuration procedure if the run command is present.

① ②

Next page

Simple optional function assignment (Configuration extension)

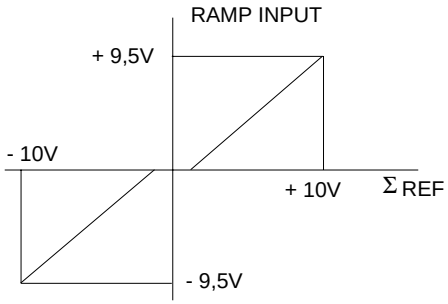
From previous page ①

Reference detect. ?
No

Yes or No decision to use this function

Yes or No + ENTER

The FORWARD and REVERSE signals for operating direction are automatically detected by a non zero speed reference signal (≥ ± 5 % of the maximum speed).
The 5 % of minimum detection, or 0,5V of reference, are substracted from the sum of the references at the ramp input, which enables starting at zero speed.



NOTE : Obtaining maximum speed is possible at 9,5 V by adapting the configuration indication page 1/45 or the "Maximum speed" adjustment page 1/62 by adding 5,3 % of the value given on the motor nameplate.

As the answer changes from No to Yes, FORWARD and REVERSE disappear from the LI3 and LI4 menus respectively. In addition, if LI3 was assigned to FORWARD, as in standard factory setting, it will change to "No assigned".

If LI4 was assigned to REVERSE, as in standard factory setting, it will change to "No assigned". Any change of response from No to Yes or vice-versa, causes the systematic entry into assignment of inputs/outputs, during the configuration in progress.

From previous page ②

RTV-84
RTV-74

2 quadrants
Non

Yes or No decision to use this function

Reversing of the motor/brake thyristors, only occurs at zero speed after natural braking on the inertias.
There is no further dynamic braking. The brake max. I decr no longer appears.

Yes or No + ENTER

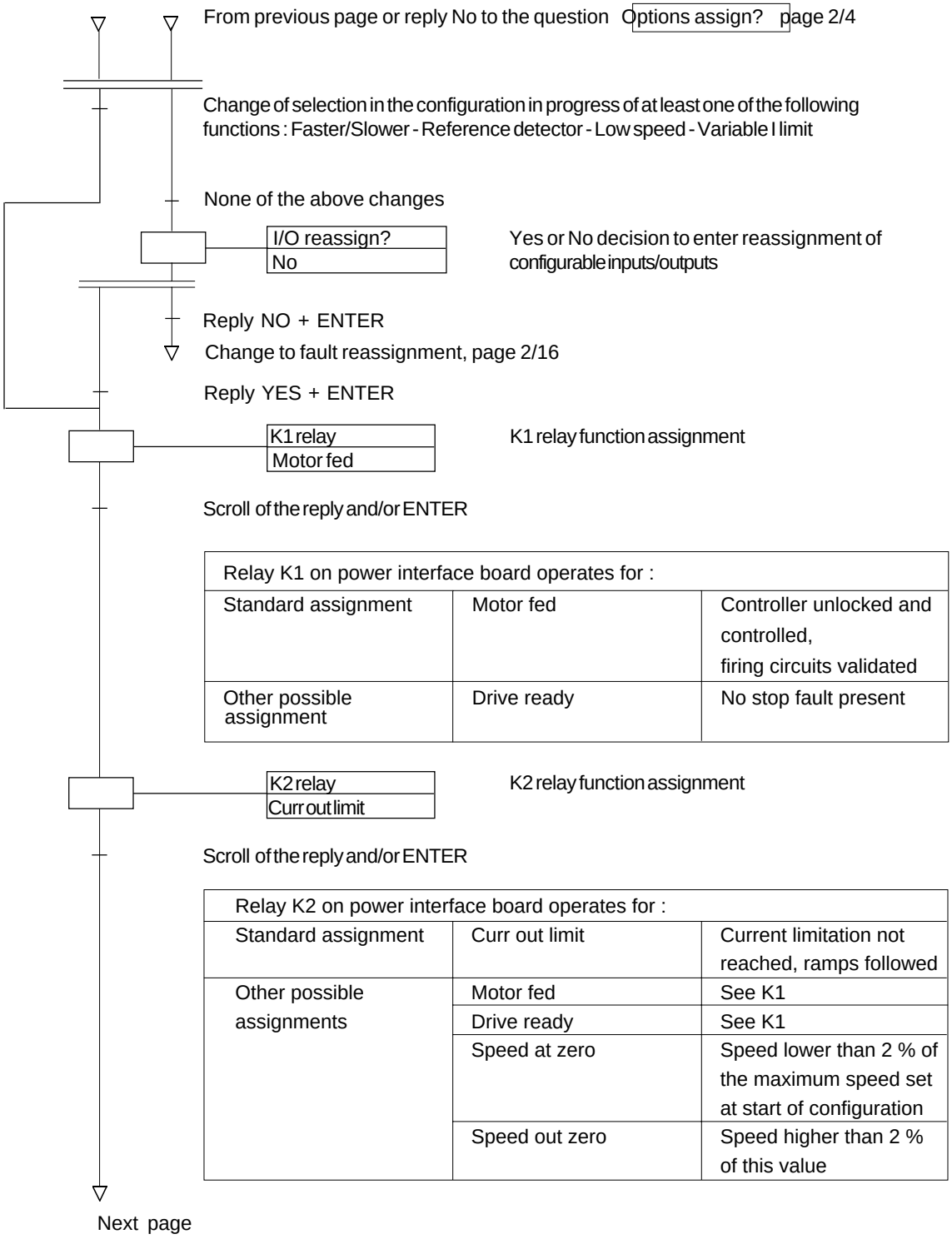
Change to configurable Inputs/Outputs reassignments
Next page.

Warning : the fitting of the special application option crtridges may prolong this part of the configuration.
See corresponding manuals.

Reassignment of configurable inputs/outputs (Configuration extension)

As a reminder, the speed controller includes the following configurable inputs/outputs :

- 1 analogue input AI	See characteristics page 1/12
- 2 analogue outputs AO1 and AO2	" "
- 4 logic inputs LI1 to LI4	" "
- 2 logic outputs LO1 and LO2	" "
- 2 relay contacts K1 and K2	" "



Relay K1 on power interface board operates for :		
Standard assignment	Motor fed	Controller unlocked and controlled, firing circuits validated
Other possible assignment	Drive ready	No stop fault present

Relay K2 on power interface board operates for :		
Standard assignment	Curr out limit	Current limitation not reached, ramps followed
Other possible assignments	Motor fed	See K1
	Drive ready	See K1
	Speed at zero	Speed lower than 2 % of the maximum speed set at start of configuration
	Speed out zero	Speed higher than 2 % of this value

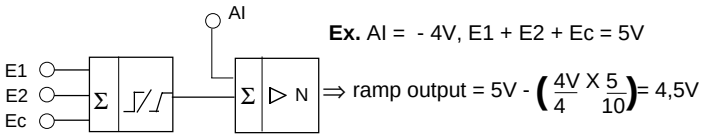
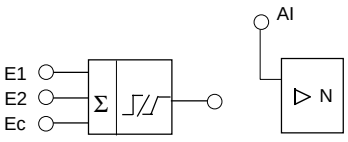
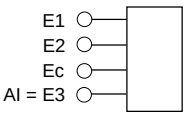
Configurable inputs/outputs reassignment (Configuration extension)

From previous page

AI input ?
Add ref. sp ampli

Assignment of AI analogue input function

Scroll of the reply and/or ENTER

Factory standard assignment	Add ref. sp ampli Definition 2000 points
	Summing reference on speed amplifier This function operates as speed reference independent of the internal ramp speed reference. After division by four (i.e. ±10V becomes± 2,5 V) and being made proportional to the ramp output, it adds itself algebraically to the ramp output. Standard inputs, E1, E2 and Ec, remain active after peak limiting of their sum to ± 10 V.  **Ex.** AI = - 4V, E1 + E2 + Ec = 5V ⇒ ramp output = 5V - $\left(\frac{4V}{4} \times \frac{5}{10}\right)$ = 4,5V
Possible reassignment	Dir. ref Sp. ampli Definition 2000 points
	Direct reference on speed amplifier. This function operates as speed reference independent of the internal ramp. When AI is assigned to this function, the internal ramp is uncoupled from the speed amplifier and standard inputs E1, E2, Ec no longer have any effect. Also, the FORWARD and REVERSE logic signals become unnecessary (systematic reference detector function). 
Possible reassignment	Ref. before ramp Definition 2000 points
	Summing speed reference algebraically before ramp. This function consists of assigning to AI a third speed reference input of ±10V, with a rôle identical to that of inputs E1 and E2. 

See other assignments on following page

Next page

Configurable inputs/outputs reassignment (Configuration extension)

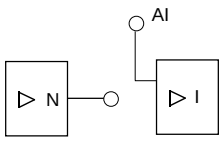
From previous page : reassignment of AI analogue input, continued

Possible reassignment	Max. I ext decr	Definition 1600 points

External decrease of armature current.
This function acts like the Motor max. I lim or Brake max. I lim (page 1/64) with peak limiting of the current adjusted by Max. arm. current (page 1/63).
When AI is assigned to this function, the max. I lim adjustments are not visible, and instead the absolute value of the analogue input is taken into account to limit the current peak whatever the quadrant, during operation.
Value 0 ± 10 V read as an absolute value on the AI input reduces in a linear way, the current limit adjusted by Max. arm. current.
If AI = 0 V → the limitation = Max. arm. current
If AI = ± 10 V → the limitation = 0.
Example : D32 rating speed controller, 44A peak current.
Max. arm. current is adjustable from 8,8A to 44A.
Given an adjustment of Max. arm. current to 30A.
Input AI is active from 0 to ± 10V that is from 30A to 0.
Therefore, a value of ± 9V peaks the current at $30 - \frac{9 \times 30}{10} = 3$ A
in the motor or brake quadrant currently operating.
Choice impossible if the Variable I limit function is configured (p.2/7)

Possible reassignment	Dir. ref I ampli	Definition 1600 points

Direct reference on armature current amplifier.
This function acts as a current reference independent from the speed amplifier.
When AI is assigned to this function, the standard reference inputs E1, E2, Ec, the speed ramp and the speed amplifier no longer have any effect.



If AI = + 10 V, I ref = Max. arm. current on FORWARD bridge
If AI = - 10 V, I ref = Max. arm. current on REVERSE bridge

Ec input ?
0 - 20 mA

Assignment of current reference input function

Scroll down of the reply and/or ENTER

Standard assignment	0 - 20 mA	0 mA →	0 V	20 mA →	10V
Other assignment	4 - 20 mA	4 mA →	0 V	20 mA →	10V

Next page

Reassignment of configurables inputs/outputs (Configuration extension)

From previous page

AO1 output ?
Speed feedback

Scroll of the reply and/or ENTER

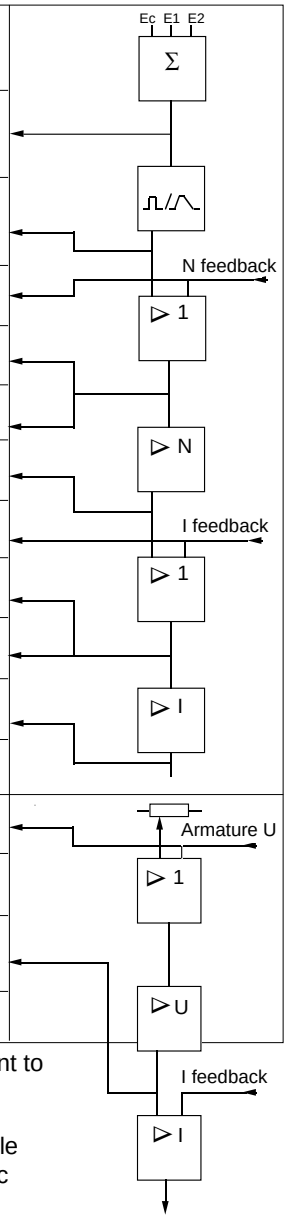
AO2 output ?
Arm. curr. Fback

Scroll of the reply and/or ENTER

Function assignment of the two analogue outputs A01 and A02
The 2 outputs can have the same function.
They are converted from digital signals with a resolution of ±127 points (8 bit D/A converter)

Text on the display	Scale of the signal	Factory assignment	Other assignment
Ramp input	10V = Max ref		A01 / A02
Ramp output	10V = Max ref		A01 / A02
Speed feedback	9V = speed f'back set to max speed	A01	A02
Speed error	9V = max error/2 ex. Inp 9V, Fb -9V		A01 / A02
Speed ampl input	9V = max sp ref for max speed		A01 / A02
Speed ampl output	9V = max curr ref for max arm curr		A01 / A02
Arm. curr. Fback	8V = max arm current setting	A02	A01
Arm. curr. error	8V = max error = max arm curr		A01 / A02
Curr. ampl. input	8V = max curr ref = max arm curr		A01 / A02
Curr. ampl. output	10V = 180° of firing angle		A01 / A02
Armature voltage	9V = configured arm voltage		A01 / A02
*Field curr. ref.	10V = excitation rating = 100 %		A01 / A02

-9V=10 2048



* With controlled excitation or field weakening, it is the reference sent to the excitation control board. In fixed excitation, this signal is at 0V.

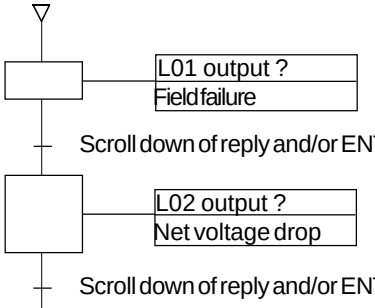
AO adjustment ?
No

Yes/No decision regarding the possible reassignment of the AOs, in Dynamic adjustment (p 1/61)

Next page

Reassignment of configurable inputs/outputs (Configuration extension)

From previous page



Function assignments of logic outputs L01 and L02.
These two outputs can have the same function. They are open collector type outputs. When the chosen assignment is true, the logic output is non conducting, so that if a relay is connected between this output and PL (+24V), it is de-energised.

Standard assignment	Other assignment	Text on display	Comments
L01	L02	Field failure	Fixed or controlled excitation current fault
L02	L01	Net voltage drop	Control voltage fault lower than 75 % of the rated voltage
	L01 L02	Motor quadrant	The speed controller operates in one of the two motor quadrants
	L01 L02	Speed to forward	Speed feedback is a positive sign, corresponding by convention to Forward
	L01 L02	Speed at zero	Speed feedback at a value lower than 2 % of maximum speed
	L01 L02	Serial link	The exchanges by serial link are not carried out
	L01 L02	Motor stalling	The speed controller is in current limitation at zero speed for more than 10 seconds
	L01 L02	Ramp unfollowed	The acceleration or deceleration ramps are not followed for more than the time configured, p 2/16
	L01 L02	Short power fail	Short control voltage loss > 3,3 ms≤ 10 ms for 50 Hz > 2,8 ms≤ 8,4 ms for 60 Hz
	L01 L02	Thermal protect. (Alarm)	Threshold at 100 % if thermal protection is an alarm, or 90 % if thermal protection is stop fault.
	L01 L02	Alarm faults	OR function for all systematic and configured alarm faults

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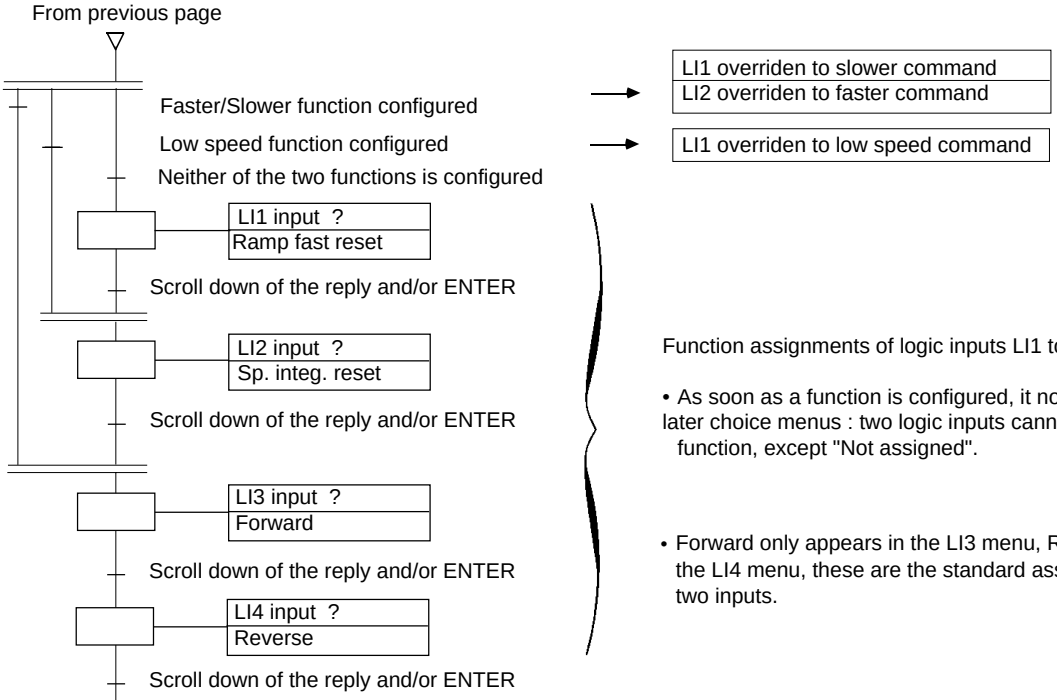
Part 2 - Special applications

Reassignment of configurable inputs/outputs (Configuration extension)

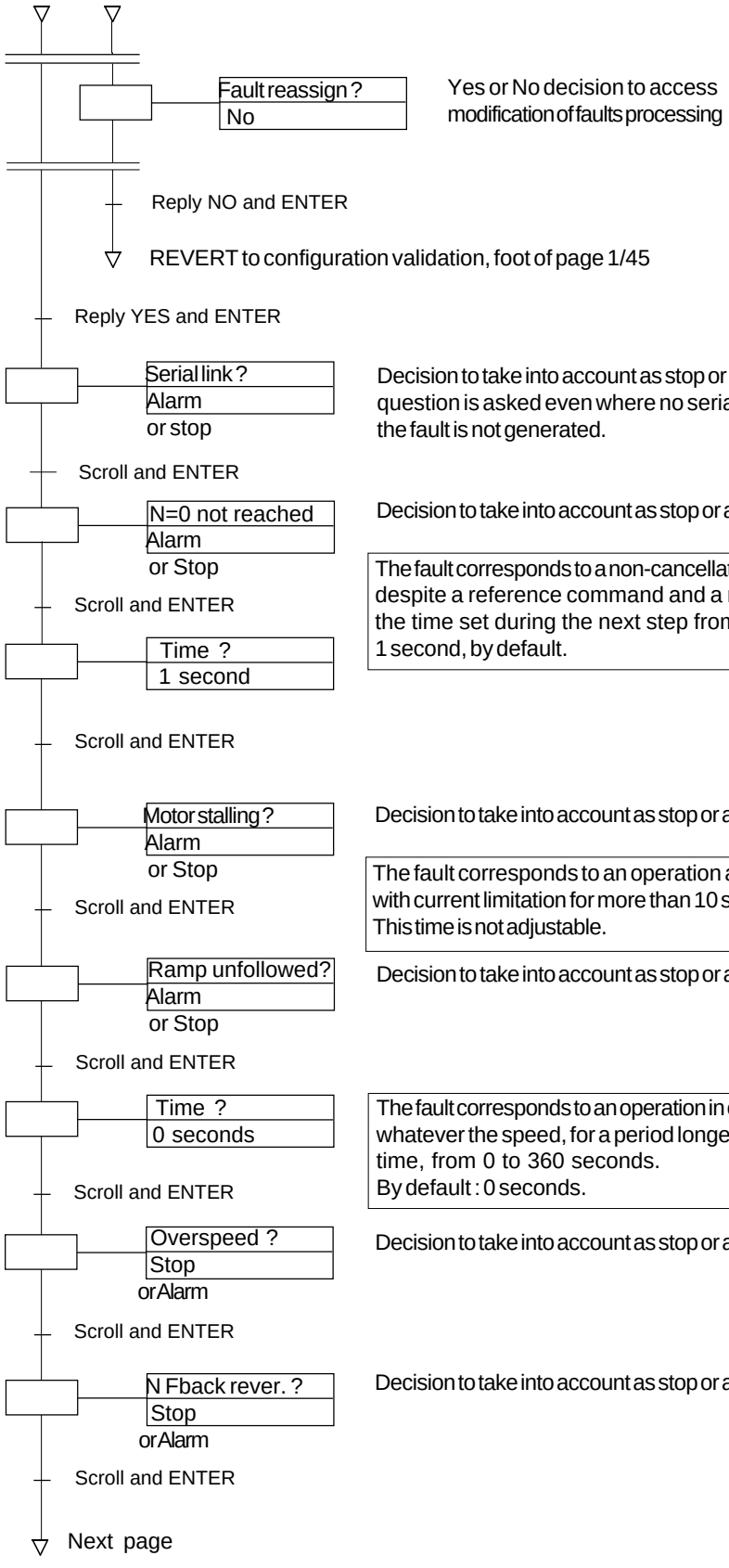


Ramp fast reset	Fast ramp resetting
Assignments : LI1 standard LI2 to LI4 possible	When configured, this function resets the ramp when the input is activated with priority over the references and the speed feedback overspill function.
Sp. integ. reset	Speed loop integral gain reset
Assignments : LI2 standard LI1, LI3, LI4 possible	When configured, this function adjusts the speed loop integral gain to zero with priority over the adjustment value when the input is activated. Example : Avoiding a speed drift near to the stop zone. *Note* : The function can be configured to be active systematically at zero speed without using a logic input (see configuration page 2/8).
Stop exter. fault	External stop fault. **CAUTION** : Not active in logic line mode with serial link.
Possible assignment LI1 to LI4	When configured, this input is involved, under this name, in the processing of stop faults which lock the RECTIVAR (see page 1/49). Examples : Radiator and thyristor temperature probes, motor thermistor protection relay Line fuse blowing …
Alarm ext. fault	External alarm fault
Possible assignment LI1 to LI4	When configured, this input is involved, under this name, in processing faults which do not cause the RECTIVAR to stop (see page 1/49). Example : motor thermistor protection relay…
Ramp bypass	Ramp function by-pass (times set to zero)
Possible assignment LI1 to LI4	When configured, this input connects the reference calculation output (after input addition) at the directly to the speed amplifier input (see block diagram at the end of this manual).
Sp. ampli. bypass	Ramp and speed amplifier by-pass
Possible assignment LI1 to LI4	When configured, this input connects the reference calculation output (after input addition) at the directly to the current amplifier input = pure current regulator (see block diagram at the end of this manual).
Clear	Latching faults acknowledgement function
Possible assignment LI1 to LI4	When configured, this input is involved in fault processing as for the CLEAR key. The logic input, however, has no effect during the configuration and adjustments procedures using the display .
Not assigned	The LI1 to LI4 input (or inputs) are not taken into account.

Next page

Adaptation of the fault processing

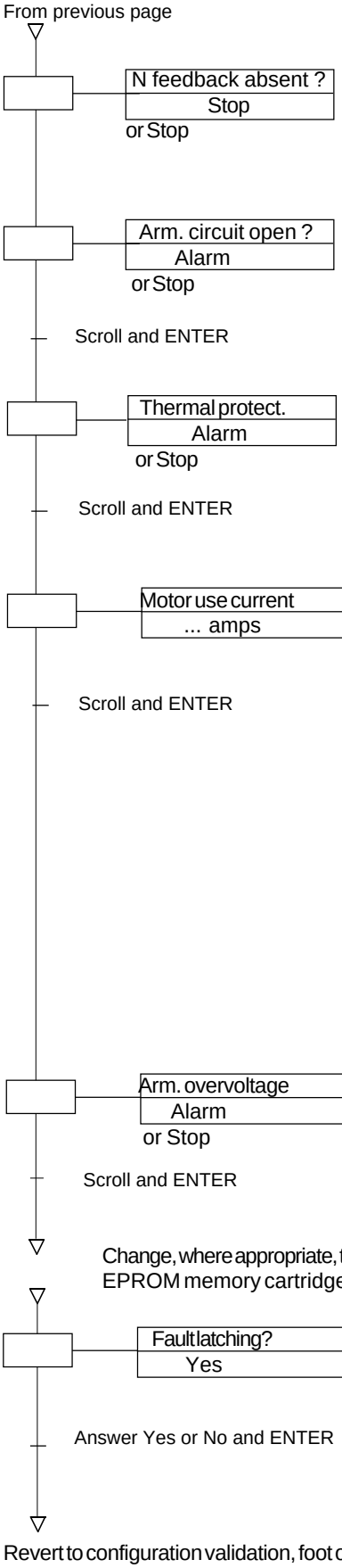
From the previous page or from a "No" reply to Inputs/Outputs special assignments
Page 2/10



Adaptation of the fault processing (ctd.)

From previous page

From previous page



Decision whether to take into account as stop fault or alarm fault.

Decision whether to take into account as stop fault or alarm fault.

The fault corresponds to no current flowing, despite a command.
The fault is perceived immediately and at zero speed.

Decision whether to take into account as stop fault or alarm fault. The stop fault is not active unless RUN = 1

Thermal protection.
The processing recreates thermal exceeding image of the motor using measured armature current.
The motor use current indication corresponds to the maximum continuous current which never causes tripping.
Adjustment is possible in amps, form 10% to 100% of the Max arm current configuration, this indication by default.
The thermal image increases from 0 to 100% if the real current exceeds the motor operating I, in a progression depending on the difference squared.
The thermal image is constantly reduced if the real current is lower than the motor use current.
The times are based on motor manufacturers' average characteristics.
The thermal exceeding value is available in thermal state mode on the display or by a read word in serial link (p. 2/28).
* This fault processing does not replace monitoring by thermal probe and LT2SA protection relay, always recommended

Decision whether to take into account as stop fault or alarm fault (where there is fixed excitation this fault can appear in cold state with some motors).

Change, where appropriate, to faults controlled by the "Special applications" optional EPROM memory cartridges, then revert. See corresponding manuals.

Yes or No decision whether to apply the latching function to all those faults which are not latching as standard (see p. 1/47).
The CLEAR key must be actuated to acknowledge the latching faults. This action has no effect unless RUN = 0.

Revert to configuration validation, foot of page 1/45.

Part 2 - Special applications

Extension of initial setting up
Reversion to factory settings

Procedure

As indicated in the diagram on page 1/49, one of the operating modes accessible is the response

Operation mode ?
Factory settings

validated by pressing ENTER

Without quitting the Operation mode, the display presents the confirmation question

Factory settings
<CLEAR> <ENTER>

Pressing CLEAR causes reversion to the question "Operation mode ?".
This procedure can be obligatory when installing new software.
Pressing ENTER causes the operating mode to be quit, the EEPROM memory to be cancelled and checked and the automatic copying of the standard factory configuration and setting replies (known as "by default", in the manual), as well as the standard display calibration. **DO NOT FORGET TO RECALIBRATE**.
In addition, the faults memory zones are reset to zero.
Reversion to Operation mode is carried out by a systematic change to Configuration mode.

Summary of the contents of "Factory settings"

CONFIGURATION

Dialogue ? / Français
F = 50/60 Hz, Voltage / 400 volts (1)
Sp. Fback mode ? / Tachogenerator
Tachogenerator / 0,06V/rpm
Pulse encoder / 1000 pulse/rev
Sp feedback conn. / Direct
Rated speed / 100 rpm
Maximum speed / 100 rpm
Armature voltage / volts (2)
Isolation board / Position 4
Armature RI / volts (6)
Max. armature current / amps (3)

Options assign ? / No
Faster/slower ? / No
Low speed ? / No
Low speed / rpm (5)
VW3-RZD104• / No
Field weakening ? / No
Field current ref. / 1%
Flux reduction ? / No
Variable I limit ? / No
Speed threshold / 0 rpm
Max I at max speed / amps (3)
Sp. gain fading / No
P gain at max sp / 20 %
Integ. reset sp = 0 / Non
Rounded ramps ? / No
Rounding coeff. / 1 %
Internal sp. ref ? / Non
Internal sp. ref. / 0 rpm
Refer. detection / No
2 quadrants / Non

I/O reassign. ? / No
K1 relay / Motor fed
K2 relay / Curr. out limit
AI input ? / Add ref. sp. ampli.
Ec input ? / 0,20 mA
AO1 output ? / Speed feedback
AO2 output / Arm. cur. Fback
AO adjustment ? / No
LO1 output ? / Field failure
LO2 output ? / Net. voltage drop
LI1 input ? / Speed integ. reset
LI2 input ? / Sp. integ. reset
L3 input ? / Forward
L02 output ? / Reverse

Fault reassign. ? / No
Serial link / Alarm
N = 0 not reached / Alarm
Delay ? / 1 second
Motor stalling ? / Alarm
Ramp unfollowed ? / Alarm
Time ? / 0 seconds
Arm. circuit open ? / Alarm
Overspeed ? / Stop
N Fback rever. / Stop
N Fback absent / Stop
Thermal protection / Alarm
Motor use current / amps (3)
Arm. overvoltage / Alarm
Fault latching ? / Yes

ADJUSTMENTS

Acceleration / 0 x 0,1 seconds
Deceleration / 0 x 0,1 seconds
Rounding coeff. / 1 % (4)
Maximum speed / rpm (4)
Max. arm. current / amps (4)
Field current ref. / 1% (4)
Motor max. I decr. / amps (4)
Brake max. I decr. / amps (4)
Speed threshold / rpm (4)
Max. I at max. sp. / amps (4)
Sp. proport. gain / 20%
Sp. integral gain / 10 %
P gain at max. sp / 20 % (4)
I response gain / 10 %
I proport. gain / 3%
Internal sp ref / 0 rpm (4)
Armature RI / volts (4)
Armature voltage / volts (4)
Arm. voltage gain / 10% (7)
AO1 output / (4)
AO2 output / (4)

(1) = 50/60 Hz by automatic recognition
(2) = 1,05 mains voltage for RTV-84, 1,16 mains voltage for RTV-74
(3) = rating recognized
(4) = configuration copied
(5) = 20 % of max. speed indication
(6) = 5 % of armature voltage indication
(7) = Armature voltage loop proportional gain with field weakening

Optional form
for recording configurations/adjustments in local mode

RECTIVAR ☐ RTV-74 ☐ RTV-84	Rating		A	Product N°	Dialogue	☐ Français	☐ Deutsch
Ref. code	Mains voltage		V			☐ English	☐ Italiano
	Mains frequency		Hz	Software V.			☐ Español ☐ Potugues

CONFIGURATION

N feedback: ☐ U ± RI ☐ TG ☐ encoder

☐ Direct ☐ Reverse

Characteristic: _____ V/rpm Pulses/rev

Max speed _____ rpm — Armature voltage _____ V — Isolation board links: Position _____

Rated speed _____ rpm — Max arm current _____ A

Functions

	PL	BL	O
☐ Faster/slower			
☐ Low speed → rpm	☐	☐	☐
☐ Controlled excitation			
☐ Field weakening → Field. curr. ref. %			
☐ Flux reduction			
☐ Variable I limit → A / rpm			
☐ Sp gain fading → %			
☐ Sp integ. reset			
☐ Rounded ramps → %			
☐ Refer detection			
☐ Internal sp. ref → rpm			
☐ 2 quadrants			

Inputs/outputs assignments

☐ AO adjustment

LI1		L01		Ec	-20 mA
LI2		L02		AI	
LI3		K1		A01	
LI4		K2		A02	

Adjustments

Acceleration	x 0,1 s	Sp. proport. gain	%
Deceleration	x 0,1 s	Sp. integral gain	%
Rounding coeff.	%	I response gain	%
Maximum speed	rpm	I. proport. gain	%
Max. arm current	amps	Internal N ref.	rpm
Field curr. ref.	%	Armature RI	Volts
Motor max. I decr	amps	Armature voltage	Volts
Brake max. I decr	amps	Arm. voltage gain	%

Stop fault assignments and faults adjustments

☐ Serial link — ☐ N = 0 not reached → Seconds — ☐ Motor stalling — ☐ Ramp unfollowed → Seconds — ☐ Arm. circuit open — ☐ Thermal protect. → Amps — ☐ Latching of all stop faults

☐ Arm. overvoltage — ☐ Overspeed — ☐ N Feedback reverse — ☐ N Feedback absent

Options / Notes

☐ VW3-RZD1042 Excitation module	☐ VW1-RZD101 Interface board	☐ VW2-RLD221 Vertical movement cartridge	☐ VW2-RLD124 rewinder/unwinder cartridge

Comments :

Part 2 - Special applications

Initial setting up extensions

Display calibration

Access procedure

The two display calibration operating modes are accessible via each of the following answers, when validated by the ENTER key :

Operation mode ?
Sp display adj.

or

Operation mode ?
I display adjust

These two operating modes do not quit the working state; the motor can run. After calibration, reversion to the question "Operation mode ?", is also carried out by the ENTER key which memorizes the set values.

Note : In the factory, the speed controller display is calibrated, theoretically, according to perfect current and speed value scaling. In reality, this cannot be the case, because of uncertainty in the measurement system. One may, in particular, have to slightly correct the display signals having exchanged the power interface board or the microprocessor control board, and after reversion to "factory settings".

Speed calibration procedure

In normal operation, with a high speed reference, the real motor speed is read via the tachogenerator voltage, or an accurate tachometer.
The ↓ or ↑ keys enable the motor speed to be aligned to the value signalled on the display. The display appears as follows :

Sp. display adj.
xxxx rpm

Keys PAR and DATA have no effect

Precautions : The motor speed changes, not the display. Avoid, therefore rapid scrolling, and monitor the machine closely.

Current calibration procedure

In normal operation, the motor under control but with locked rotor, read the motor armature current with an accurate measuring device. The motor operates in current limitation, and the ↓ or ↑ keys enable the real current measurement to be aligned with the display. The display appears as follows :

I display adjust
xxx amps

Keys PAR and DATA have no effect

Precautions : As the motor is operating in current limitation; don'ta take too long over this adjustment. It is recommended to change the current limitation adjustment to a comparatively low value, which does not adversely affect the accuracy of the display.

Part 2 - Special applications

Initial setting up extensions

Field weakening

Principle

As a reminder, this function assumes :

- use of the optional VW3-RZD1042 module for ratings 16 to 650A or use of a 800 to 3000A rating controller in which the function is incorporated in the VW3-RZD1122 control module.

- to configure, if necessary, the variable I limit function p.2/7
  and the flux reduction function p.2/8

When using a RECTIVAR RTV 74-84, microprocessor n°2 sends a current reference to the excitation control board.

This reference is :
- The value of the field curr. ref. adjustment (p. 1/63), as long as the speed is lower than that producing the configured armature voltage value p. 1/45,
- Half the value of the field curr. ref. adjustment if the run command is absent for 7 minutes, if the flux reduction function is configured, (p. 2/6).
- A value lower than the field curr. ref. adjustment beyond rated speed and up to maximum speed. This value is derived by the internal generation of a curve and an armature voltage regulation loop at its configured/adjusted value. Proportional adjustment of this loop is accessible via Armature voltage gain.

Setting up

Preset the potentiometers and links as shown on page 1/35.
Apart from the difference of operation with fixed or controlled excitation, the maximum speed reference (10V or 20mA), should correspond to maximum speed in field weakening, and not to rated speed at full flux corresponding to rated armature voltage.

Example : given a motor with an armature voltage of 400V and a rated speed of 1000 rpm, which must be field weakened at a ratio of 2,5 i.e. to 2500 rpm :

- The configurations on p. 1/45 should be, Max speed = 2500 rpm
  Armature voltage = 400V

- After configuration, as soon as the device is in the working state, but before controlling the motor, change to adjustment mode and adjust the excitation current "Field curr. ref." = X% = rated excitation current as shown on the motor nameplate. See p. 1/62 for scaling.

- Then select RUN and then FORWARD or REVERSE with a speed reference increasing from 0 to the value corresponding to rated speed at full flux, giving, in the example:

  Ref 10V x 1000/2500 = 4V.

- Without changing the commands, adjust "Field curr. ref." to obtain the armature voltage (400V, in the example) at the rated speed (1000 rpm, in the example).

- By making slight alterations to the speed reference, check that the armature voltage remains stable (above 4V in the example). If the armature voltage is unstable, adapt, using the arm. voltage gain adjustment.

- If the mechanical and safety conditions allow (e.g. motor uncoupled), increase the reference gradually up to 10V, monitoring the stability of the armature voltage. Check that the required maximum speed is obtained (2500 rpm for 10V in the example), if not, modify the "Maximum speed" adjustment.

- It may be necessary to change the speed loop adjustments if it is not possible to obtain perfect stability at high speed.

Note : A simple way of locking the change to field weakening via an external signal, is to configure the Low Speed function in peak limitation which would limit the reference to 4V, in the above example.

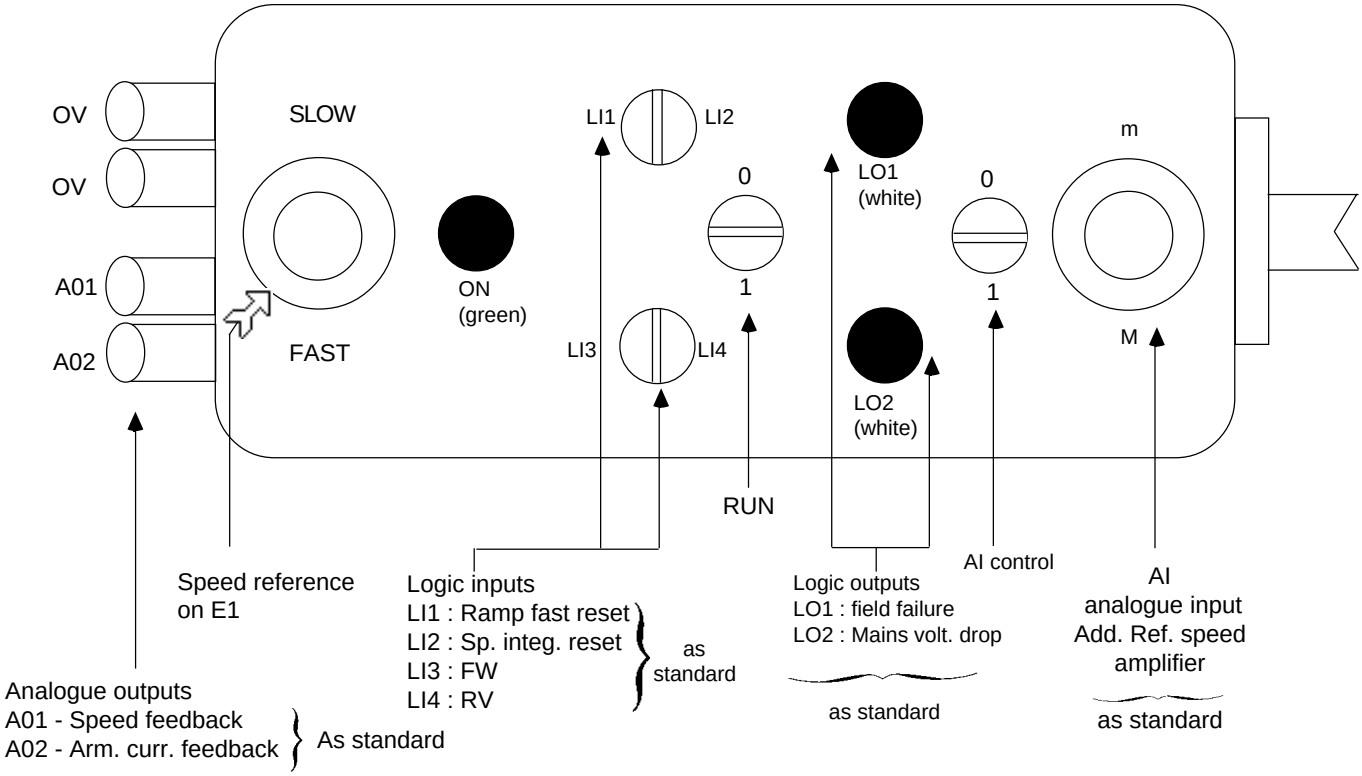
Part 2 - Special applications

Initial setting up extensions

Initial setting up/debugging optional unit

The unit, reference SD2 MB 2101, includes :

- 2 potentiometers
- 4 selector switches
- 1 speed controller on indicator light
- 2 logic output indicator lights
- 4 banana plugs for connection to the measurement devices
- One 1,50 m cable with connector for connection to the J1 terminal on the control board

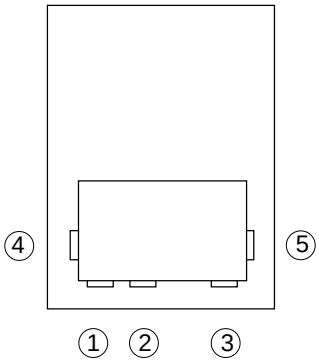


The assignable inputs/outputs operate according to their configuration.

WARNING : Because the J1 terminal is occupied by the connector, the sequence circuit safety devices are no longer operational.
If the serial link is active, ensure that you are in LOCAL mode (or at least not in logic line or analogue line mode)..

Interface extensions

This extension is achieved by fitting and connecting the VW1-RZD101 reference option board in the lower part, and at the front of the control rack.
The basic configuration is modified, in particular with recognition of the board.



1. Connector for connection to the two incremental encoders.
2. Connector for connection to a digital binary input.
3. Connector for connection of the RS485 serial link.
4. Optional interface board internal connector.
5. Connection bundle for the supply from control transformer.

This board's functions are :

1 - digital frequency conversion of the two signals F1 and F2, of which F1 is always considered as a speed feedback and F2 is considered as a frequency speed reference.

2 - direct control of a digital speed reference (12 bits + sign), cumulative on the speed amplifier.

3 - the processing of an RS485 serial link with UNI-TE protocol for the provision of a UNI-TELWAY bus, or with MODBUS® protocol.

For further information, refer to the appropriate technical data (42096).

Part 2 - Special applications

Concise description of the "option" cartridges

Each of these cartridges is covered by a separate, detailed user's manual.

They are designed to extend the basic RECTIVAR software and make the controller suitable for certain special applications.

They are only usable with software version V3.1.

They are supplied in the form of an programmed EPROM memory in a plastic casing, to be inserted into the display board.
Insertion with the supply off and subsequently switching on can cause an initial fault :

Proms/options

which signifies that the basic software version and that of the option are incompatible.
Consult the appropriate user's manual.

Where the two are compatible, there is obligatory change to configuration after change to "Option factory settings" validated by ENTER, the only reply possible.

Opt. fact. setting
ENTER

Configuration, in particular with cartridge recognition, the adjustments and the fault processing can be modified with respect to the indications given in this manual.

Vertical movement VW2-RLD221

This option takes into account the logic controls for a mechanical brake and the possibility of a second motor configuration.
For further details, refer to the appropriate user's manual.

Unwinder/Rewinder VW2-RLD124

This option transforms the software and enables it to control current regulation based on the calculation of a radius, static and dynamic losses, traction corrections and regulation, etc…

Part 2 - Special applications

Dialogue extensions
Serial link

The RECTIVAR 4 series 84 can be incorporated into automated system architectures in several ways :

- By simple connection with the 0-20mA serial link on a controller, communication is established in Telemecanique ASCII point to point protocol as described on the following pages.

- By connection with the 0-20mA serial link via a VW3-A45103 communication coupler, communication is established on UNI-TELWAY bus or in MODBUS® protocol (see coupler user's manual).

- By addition of the VW1-RZD101 "Option interfaces" board to the product, communication is established on UNI-TELWAY bus, or MODBUS® protocol (see user's manual for the board).

Whatever the protocol used, adjustments, control, monitoring and supervision of the speed controller are carried out via data (or objects), whose addresses are independent of the protocol used.

This concerns :
- Bi bits, for example : B1, B2...
- 16 bit words, called Wi, for example : W1,W2...

The bits of the words above, non-addressable individually, are described in the form Wi, j, examples W1,3-W36,A with j expressed in hexadecimal from 0 to F, and i expressed in decimal.

- Read

  All speed controller data is available at any time by serial link reading (transfer from the RECTIVAR to the controller for screen display, recording…)

- Write

  The speed controller can be commanded (transfer from the controller to the RECTIVAR) either by serial link in LINE mode, or by local control to terminals and using the keypad in LOCAL mode, according to the hierarchised access described in the following pages.

Dialogue extension
Serial link

STRUCTURE OF THE SPEED CONTROLLER DATA

Definition of the bits.

Active in state 1,
accessible in read and write.

Number	Name	Description	Access condition
B0		Reserved	
B1	RST*	Acceptance of stop faults, equivalent of CLEAR key for fault control	In any LINE mode
B2	CLO*	Commands and adjustments in LOCAL mode DLI=ALI=PLI=O	Independant of the LINE modes
B3	CLI*	Commands and adjustments in LINE mode by serial link DLI=ALI=PLI=1	Independant of the LINE modes but CLC = 0 (p2/29)
B4	NTO	No serial link control	Independant of the LINE modes
B5	RUN	RUN signal, in series with RUN terminal. Set to 1on initialisation of the speed controller, if the latter is in local mode.	Independant of the LINE modes
B6	VER	Equivalent of Stop exter. fault (1)	In logic LINE mode

*These bits initiate the actions described as soon as they are written at 1.
They are reset to 0 by the speed controller. Writting at 0, therefore, has no effect and reading them always produces 0.
(1) A Stop exter. fault test on LI, active in LOCAL mode, is replaced by B6 in logic line mode.

Partial LINE modes

The partial LINE modes (or command assignments) are controlled by bits B2 and B3 above, as are three register bits, assigned W25,1-W25,2-W25,3, which are active at 1.

W25,1	DLI	Logic commands are given in LINE	None
W25,2	ALI	Analogue commands are given in LINE	None
W25,3	PLI	Adjustments are made in LINE	CLC = 0 (p2/29)

Bits W25,1-W25,2-W25,3 are cumulative, even when in succession.
The rising edge of B3 is equivalent to setting all three to 1.

See LINE mode control, pages 2/32 and 2/33.

Definition of the adjustment words.

Commands which can be accessed in read and write.

STRUCTURE OF THE SPEED CONTROLLER DATA

Adjustments		Write possible if (PLI)=1		
Number	Name	Description	Definition of the unit value in decimal	Access condition
W0 to W4		Reserved	-	-
W5	GPI	I loop proportional gain	1 %	-
W6	GPNM	P gain at maximum N	1 %	Variable gain configured
W7	SVIT	Speed threshold	1 rpm	Lim I = f(N) configured
W8	IMNM	Maximum I at maximum N	0,1 A cal < 72 A 1A cal ≥ 72 A	As above
W9	ARR	Rounding coefficient	1 %	Rounded ramps configured
W10	N INT	Internal speed reference	1 rpm	Internal speed ref. configured
W11	RI	RI compensation	1 volt	Speed feedback configured
W12	U	Maximum armature voltage	1 volt	Field weakening configured or armature U feedback
W13	GU	Armature voltage loop prop. gain	1 %	Field weakening configured
W14	GPN	Speed loop proportional gain	1 %	-
W15	GIN	Speed loop integral gain	1 %	-
W16	GRI	Current response gain	1 %	-
W17	DIM	Motor max. I decrease	0,1 A cal < 72 A 1A cal ≥ 72 A	if the configuration enables access
W18	DIF	Brake max. I decrease	0,1 A cal < 72 A 1 A cal ≥ 72 A	if the configuration enables access
W19	RIE	Excitation current reference	1 %	-
W20	I MAX	Armature current limitation (1)	0,1 A cal < 72 A 1 A cal ≥ 72 A	-
W21	N MAX	Maximum speed (1)	1 rpm	-
W22	ACC	Acceleration ramp time	0,1 s	-
W23	DEC	Deceleration ramp time	0,1 s	-

Logic commands		Write possible if (DLI)=1
W24	Logic command register	See definition p2/29

Command assignments		Write not conditional
W25	Assignment register	See definition p2/29

Analogue commands		Write possible if (ALI)=1	
W26	Reference before ramp (= E1+E2)	± 32767 = max. ref	-
W27	Direct reference speed amplifier	As above	AI or F2 configured for this function
W28	Sum reference speed amplifier	As above	-
W29	Direct reference current amplifier	As above	AI configured for this function

These last 4 words are copies of the CJ1 terminal strip if not operating in analogue line mode (ALI = 0).
The complementary word addresses are used by the options. Refer to corresponding technical data.

(1)*W20 (I max) and W21 (N max)* : change between 2 programme cycles, limited to 10 % of maximum value, minimum cycle time 500 ms between 2 writing actions.

Analogue commands		True resolution of the command words
W26	Reference before ramp	3600 points
W27	Direct reference speed amplifier	If speed reference frequency = F2 : 28800 points Otherwise 3600 points
W28	Sum reference speed amplifier	7200 points
W29	Direct reference current amplifier	1600 points

Definition of the signalling words accessible in read only

STRUCTURE OF THE SPEED CONTROLLER DATA

Number	Name	Description	Definition
W30	STR	Speed controller state register	See page 2/29
W31	DVSI	Internal static stop fault register	In order given on p. 1/47
W32	DVSE	External static stop fault register	As above
W33	DVDI	Internal dynamic stop fault register	As above
W34	DVDE	External dynamic stop fault register	As above
W35	S REF.	Reference sum (= A01, A02 menu)	± 4095 (= N max)
W36	RO	Ramp output " "	As above
W37	RN	Speed feedback " Filtered at 0.5s	± 4095 (= 1,11 N max)
W38	EN	Speed error " "	± 4095 (= 2,11 N max)
W39	SAI	Speed ampli input " "	± 4095 (= 1,11 N max)
W40	RETI	Armature I feedback " "	± 4095 (= 1,25 I max)
W41	RU	Armature voltage " "	± 4095 (= 1,11 U max) (2)
W42	REFI	Field I reference " "	± 4095 (= 100 %)
W43	VISN	Speed display contents	rpm
W44	VISI	Current display contents	1 amp *
W45	THER	Motor thermal exceeding value	1 %
W46 to 49		Reserved	
W50		Logic input/output state register	See page 2/30
W51		Reserved	
W52	E12	E1+E2 analogue input	±4095 (= ±10 volts)
W53	EC	Ec analogue input (according to configuration)	±4095 (= 20 mA)
W54	AI	AI analogue input (according to configuration)	±4095 (= max. value)
W55	A01	AO1 analogue output (according to config.)	As above
W56	A02	AO2 analogue output (according to config.)	As above
W57	CFLO	Configuration of K1, K2, L01, L02	See page 2/30
W58	CFLI	Configuration of LI1 to LI4	See page 2/30
W59	CFAI	Configuration of AI	See page 2/30
W60	CFA0	Configuration of AO1, AO2	See page 2/30
W61	DASI	Internal static actual fault register	In order given on p. 1/47
W62	DASE	External static actual fault register	As above
W63	DADI	Internal dynamic actual fault register	As above
W64	DADE	External dynamic actual fault register	As above
W65 to W127		Reserved	

(*) 0,1 Amp for ratings D16-D32-D48.

The complementary word addresses are used by the options. See the corresponding technical data.

(1) This word is ± 4095 points, but filtered on a time base of 0,17 s from a value of ± 32000 points compatible with the digital speed loop.

(2) See page 1/45.

STRUCTURE OF THE SPEED CONTROLLER DATA

Contents of register words

W24	Logic command register Copy of terminal CJ1 unless in logic line mode (DLI = 0)	
W24,0	FW	FORWARD
W24,1	RV	REVERSE
W24,2	PLV	Faster (active if the function is configured)
W24,3	MOV	Slower (active if the function is configured)
W24,4	LS	Low speed (active if the function is configured) LS = LI1
W24,5	RZR	Ramp fast reset
W24,6	SIN	Speed amplifier integ reset
W24,7	BPN	Ramp and speed amplifier bypass
W24,8	BPR	Ramp bypass
W24,9 to F		Reserved

W25	Assignments register	
W25,0	RST	Acknowledgement of stop faults, equivalent to B1 page 2/26
W25,1	DLI	Line logic commands by serial link
W25,2	ALI	Line analogue commands by serial link
W25,3	PLI	Line adjustments by serial link
W25,4	NTO	No serial link control
W25,5	RUN	RUN signal, in series with RUN terminal, equivalent to B5 page 2/26
W25,6	MEM	Storage condition (see note, below)
W25,7 to F		Reserved

W30	State register	
W30,0	LOC	All commands in LOCAL mode
W30,1	RDY	Speed controller ready : with RUN present, no faults
W30,2	FAI	Stop fault
W30,3	REN	Reset authorisation; latching fault already disappeared
W30,4	ODM	Internal operation command
W30,5	CLC	Local keypad occupation
W30,6	NTO	Serial link control not established
W30,7	CFA T	Correctable faults (non systematic latching)
W30,8	RNG	Operating, motor supplied
W30,9	NFW	Speed in FORWARD direction
W30,A	QMO	Operation in motor quadrants
W30,B	NNUL	Zero speed (< 2% of maximum speed)
W30,C	CLE	Speed controller key on LOCK
W30,D	LIMI	Speed controller in current limitation
W30,E	ALA	OR function of all alarm faults
W30,F	REC	Writing of a non-formatted adjustment (clipped)

NOTE : **W25 assignments register** : Bit W25,6 conditions the storage of a change of value in the EEPROM memory. If the bit is at zero, the adjustment values remain in the RAM working memory while the control voltage is present. It is strongly recommended only to enter adjustments with W25,6 =1 where this is absolutely necessary, in order to prolong the life of the EEPROM memory.

Dialogue extension
Serial link

STRUCTURE OF THE SPEED CONTROLLER DATA

W50	Speed controller logic input/output state recording	
W50,1	LI1	LI1 logic input (depending on its configuration)
W50,2	LI2	LI2 logic input " " "
W50,3	LI3	LI3 logic input " " "
W50,4	LI4	LI4 logic input " " "
W50,0	RUN	RUN on terminal CJ1
W50,5		Reserved
W50,6	LO1	LO1 logic output (depending on its configuration)
W50,7	LO2	LO2 logic output " " "
W50,8	K1	K1 output relay " " "
W50,9	K2	K2 output relay " " "
W50,A to		Reserved
W50,F		Reserved

W57	Configuration of K1.K2. LO1.LO2		
W57,0	CK1	For each logic output, decimal value on 4 bits	
W57,1		defining the assignment according to the following codes :	
W57,2		K1 : 0 = Motor fed	
W57,3		1 = Speed controller ready	
W57,4	CK2	K2 : 0 = Motor fed	4 = Speed not zero
W57,5		1 = Drive ready	
W57,6		2 = Outside limit	
W57,7		3 = Zero speed	
W57,8	CL01	LO1 and LO2 : 0 = Excitation	8 = Short interrrupt
W57,9		1 = Mains voltage drop	9 = Thermal alarm
W57,A		2 = Motor quadrant	10 = Alarm faults
W57,B		3 = Zero speed	
W57,C	CL02	4 = Forward speed	
W57,D		5 = Serial link	
W57,E		6 = Motor stalling	
W 57,F		7 = Ramp unfollowed	

STRUCTURE OF THE SPEED CONTROLLER DATA

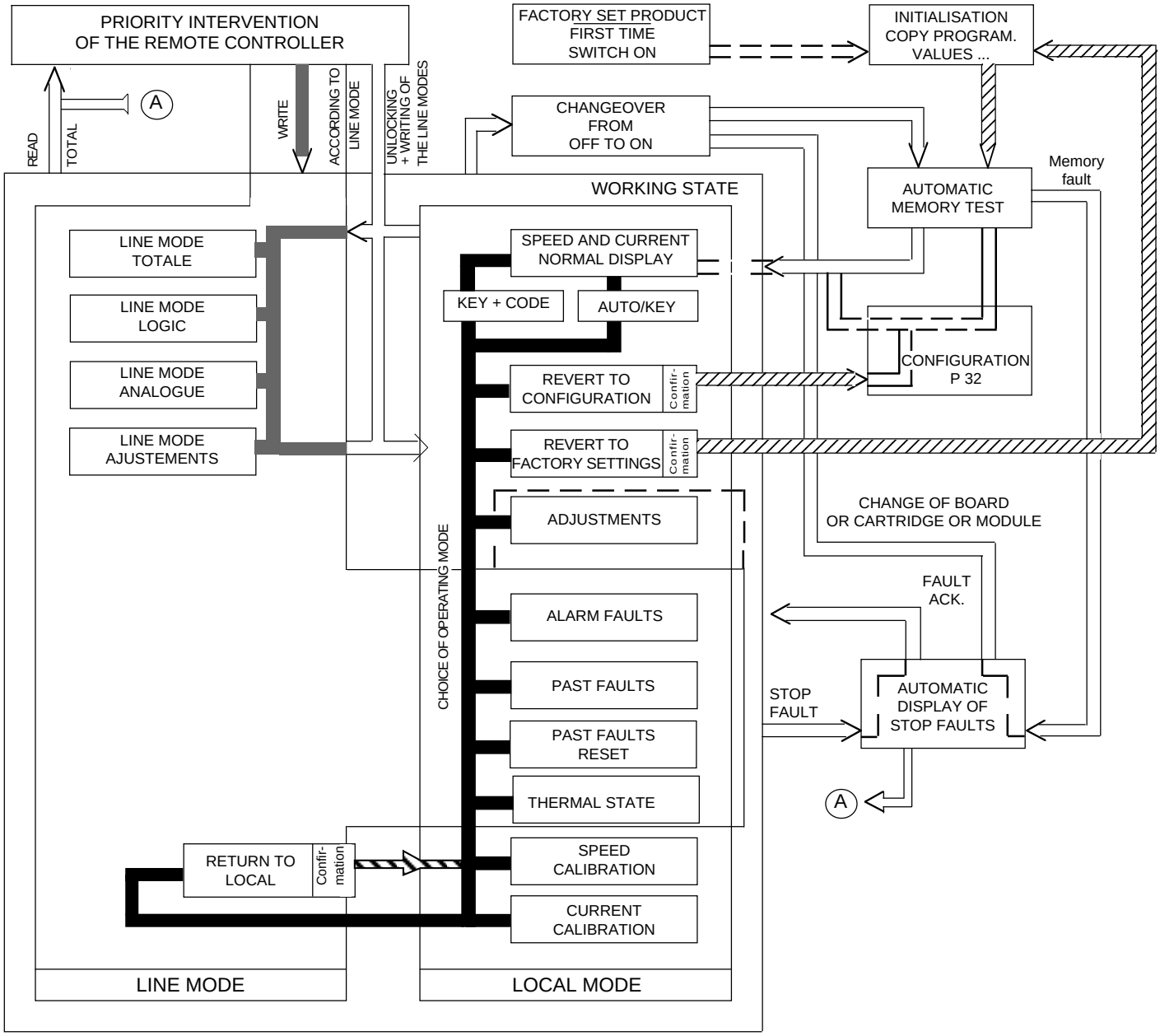
W58	Configuration of LI1 to LI4	
W58,0 W58,1 W58,2 W58,3	CLI1	For each logic input, decimal value on 4 bits defining the assignment according to the following codes
W58,4 W58,5 W58,6 W58,7	CLI2	0 : FORWARD 1 : REVERSE } only for LI3 - LI4 2 : Ramp fast reset 3 : Speed integ. reset 4 : Ramp bypass 5 : Sp. ampli bypass 6 : Ext. stop fault 7 : Ext. alarm fault 8 : CLEAR 9 : Input not assigned 10 : Slower only for LI1 11 : Low speed only for LI1 12 : Faster only for LI2
W58,8 W58,9 W58,A W58,B	CLI3	
W58,C W58,D W58,E W58,F	CLI4	

W59	Configuration AI	
W59,0 W59,1 W59,2 W59,3	CAI	Decimal value on 4 bits defining the assignment according to the following code : 0 : Not assigned 1 : Ref. before ramp 2 : Add ref speed ampli 3 : Direct ref speed ampli 4 : Armature I ext. lim 5 : Direct ref I ampli
W59,4 W59,5 W59,6 W59,7 W59,8 W59,9 W59,A W59,B W59,C W59,D W59,E W59,F	Not used, are at 0	

W60	Configuration of A01 - A02	
W60,0 W60,1 W60,2 W60,3 W60,4 W60,5	CA01	Decimal value on 5 bits defining the assignment according to the following code : 0 : Ramp input 1 : Ramp output 2 : Speed feedback 3 : Speed error 4 : Speed ampli. input 5 : Speed ampli. output 6 : Armature I feedback 7 : Armature I error 8 : I ampli. input 9 : Armature voltage 10 : Field I ref. 11 : I ampli. output
W60,6 W60,7 W60,8 W60,9 W60,A	CA02	
W60,B W60,C W60,D W60,E W60,F	Not used. are at 0	

Dialogue extension
Serial link

LINE MODE CONTROL :
Complementary access to operating modes.
The diagram on page 1/42 is extended as follows.



Dialogue extension
Serial link

The types of assignments of commands

- On the first occasion the RECTIVAR is switched on after leaving the factory, the speed controller has LOCAL mode as its priority position.
  In this mode, the serial link can only read the speed controller data.
- The remote controller can, at any moment, request changeover to line mode or return to local mode via bits B2, B3 and W25,1, W25,2 or W25,3 (for the latter, if CLC = 0).
- On other occasions when the controller is switched on, the possible validation of bits W25,1 (DLI), W25,2 (ALI), and W25,3 (PLI) is stored in EEPROM : the speed controller repositions itself in the corresponding mode.

The partial modes

- *W25,1 (DLI) = 1* (with W25,2 and W25,3 = 0)

- Logic LINE mode : enables the writing of logic commands via the link : the assigned and assignable analogue controls remain active on the controller's CJ1 connector, the internal adjustments are not modifiable via this link.

- *W25,2 (ALI) = 1* (with W25,1 and W25,3 = 0)

- Analogue LINE mode : enables the writing of analogue commands via the link : the RUN logic commands and assignable inputs remain active on the controller's CJ1 connector.

- *W25,3 (PLI) = 1* (with W25,1 and W25,2 = 0)

- Adjustment LINE mode : enables the writing of adjustments via the link : the local adjustment procedure is locked; all the logic and analogue commands are active on the controller's CJ1 connector.

This request is not taken into account if bit W30,5 (CLC) is at one.
In any one of the above line modes, it is still possible to access operation mode local access procedure, but :
- whatever the LINE mode, reversion to configuration, reversion to factory settings and display calibrations becomes impossible.
- in adjustment LINE mode, adjustment mode is accessible but for parameter read only. Actuation of the DATA key giving access to adjustment modifications via keys ↑ and ↓ on the keypad, is inactive. Only the controller can write adjustments.
- The Faults analysis, Reset past faults and Thermal state modes remain available.

Modification of the keyboard procedure

Whatever the LINE mode, a new operation mode appears which, via ENTER, brings the confirmation

Operation mode ?
Return to local

Return to local
<CLEAR> <ENTER>

CLEAR brings back the question "operation mode ?", without any other effect.
Confirmation by ENTER causes bits W25,1 , W25,2 and W25,3 to be reset to zero and thus a priority return to local mode.
The remote controller must renew its request for change to LINE mode.

Dialogue extension
Serial link

ASCII code

In this protocol, exchanges with the controller (programmable controller, microprocessor, computer), are made in ASCII.

Dec	Hex	Character	Dec	Hex	Character
10	0A	LF line feed	56	38	8
13	OD	CR carriage return	57	39	9
32	20	SP space	62	3E	>
43	2B	+	63	3F	?
45	2D	-	64	40	@
48	30	0	65	41	A
49	31	1	66	42	B
50	32	2	67	43	C
51	33	3	68	44	D
52	34	4	69	45	E
53	35	5	77	4D	M
54	36	6	78	4E	N
55	37	7	89	59	Y

Definition of the link

Isolated and passive 0-20 mA current loop :
the supply is not provided by the speed controller .

Asynchronous serial link at 9600 baud, see wiring diagram on the following page.

Format of a word : 1 start bit
8 data bits
1 parity bit : Odd
1 stop bit

All these parameters are fixed.

The link is of the master/slave type, the speed controller being the slave.

Speed controller response time : 10 ms < t < 100 ms

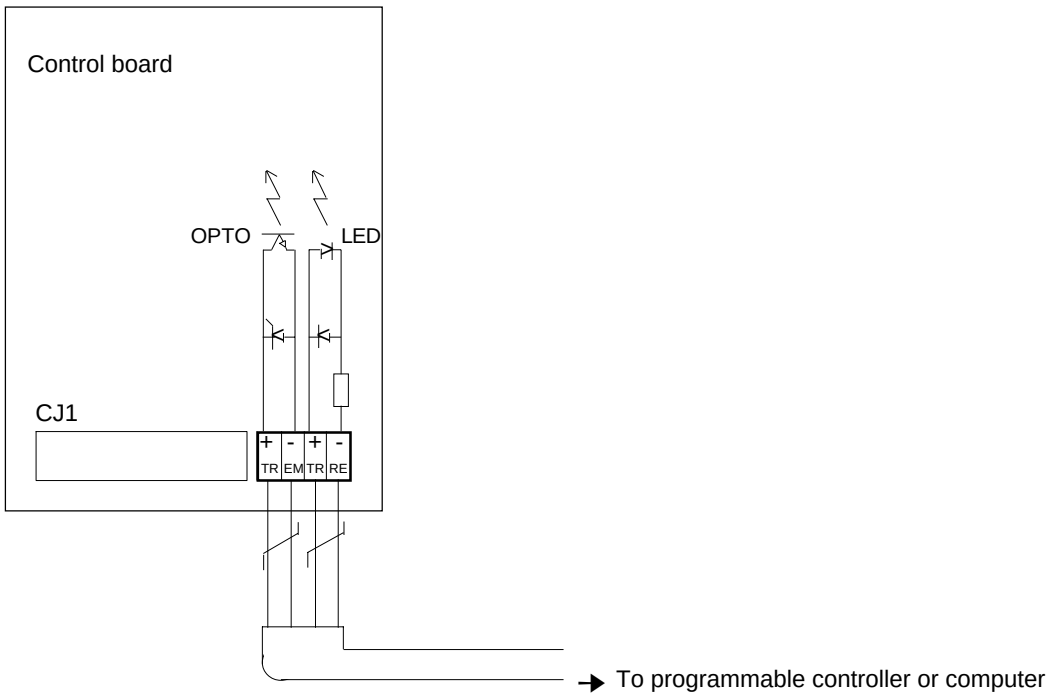
Only one of the two stations can transmit at a given moment (half duplex link).

Part 2 - Special applications

Dialogue extension
Point to point serial link

Hardware installation

Connection



The use of cable with two screened twisted pairs is recommended.
The minimum cross section of the conductors is 0,5 mm².

Under these conditions and in order ro respect the speed of 9600 baud :
- limit the length of the link to 500 metres.
The cable screening should be connected at the programmable controller or computer end.

Voltage charateristics

- Maximum and typical loop supply voltage : 24 Volts d.c.

- Minimum loop supply voltage : 12 Volts d.c.

- Voltage drop at receiver terminals at 20mA : supply voltage.

- Voltage drop at transmitter terminals at 20mA : less than 1V.

- Provision to be made for current limitation on the supply side.

Dialogue extension
Point to point serial link

Communication protocol

The dialogue is in the question/answer form:

The master asks a question and waits for the answer to be given within a certain time limit (less than 100 ms). In the event of any doubt (parity error, frame…), the speed controller does not reply. In this case, check that all the link parameters are correct.

The messages are delimited by a start character : ? for a question, > for an answer, and two end characters : LF CR.

MESSAGE FORMAT

• **Question**

In write only

Start	Question code	Data 1	Separator	Data 2	End
?	See table on next page	Number of word or bit	1 or 2 characters < SP > or @	Value	< LF > < CR >

Data 1 : Bit or word number, or first word in a table of ten consecutive words is a whole number between 0 and + 32767 inclusive.
The + is optional, as are the leading zeros.

Example : 55 or + 00055

Data 2 : Value of the word or bit :
- word : whole number between - 32768 and + 32767.
The + is optional, as are the leading zeros.

Examples : 55 or + 00055
- 2345 or - 02345

- bit : 0 or 1

• **Answer**

In read only

9 times in table reading only

Start	Answer code	Data 3	End	Separator	Data 4 to 13	End
>	See table on next page	Value	< LF > < CR >	1 or 2 characters < SP > or @	Value	< LF > < CR >

Data 3: - word : 6 characters, fixed format.

Example : + 00034, - 21254

- bit : 0 or 1.

Dialogue extension
Point to point serial link

Request table

	Question code	Answer code Positive	Negative
Read bit	A	A	N
Write bit	B	Y	N
Read word	C	C	N
Write word	D	Y	N
Read table of 10 consecutive words	E	E	N
Mirror	M	M	N

Case of negative reply by speed controller to request from the master controller.
They are general to all communication protocols but considered as follows :
- question code does not exist or incorrect question format,
- attempt to write a bit at a reserved address or where the access conditions are not satisfied, or where the value of the entry is outside the limit

- attempt to write a word at an address which is reserved or greater than 29 or where the access condition is not satisfied. For adjustment words ≤ W23 where the attempt to write is outside the configured adjustment limits or that calculated by the speed controller, the input is accepted but peak limited. Limiting of any word is visible by bit W30,F = 1 until the next data input within the limits,

- attempt to write a table of words, where the group of words is in the refusal conditions above. Writing of a table of words is accepted if at least one word can be written, within the limit of words accepted by the above conditions. If W25 is included in the table, writing of the table is always accepted with W25 written first, which validates the selection of line mode for the writing operation in progress.

Communication monitoring

When the speed controller is in LINE mode (total or partial), and if bit W25,4 (NTO) = 0, exchange monitoring is carried out permanently. The speed controller must receive at least one byte every second. If the link between the control system and the speed controller is interrupted, the "serial link" fault appears.

Alphabetical index

CF = configuration

1 : type of speed feedback
2 : speed feedback reversal
3 : assignment of analogue input AI
4 : assignment of analogue outputs AO1-AO2
5 : assignment of current reference
6 : selection of low speed function
7 : selection of faster/slower function
8 : selection of rounded ramps function
9 : complement AI to dir. ref. sp. amp assignment
10 : Selection of integration reset at zero speed
11 : complement AI to dir. ref. I amp assignment
12 : complement AI to max arm I ext lim aasign. or to selection of function I lim = f (N)
13 : selection of function I lim = f (N)
14 : incremental encoder configuration
15 : tachogenerator configuration
17 : assignment of logic outputs AO1-AO2 and relays K1-K2
18 : assignment of logic inputs LI1 to LI4
19 : selection of reference detector function
20 : configuration of fault processsing

RG = adjustments

1 : acceleration
2 : deceleration
3 : maximum speed
4 : speed proportional gain
5 : speed integral gain
6 : motor quadrants current limiting
7 : brake quadrants current limiting
8 : current response gain
9 : adjustment of RI term
10 : maximum current adjustment (4Q)