SPEED AMPLIFIER

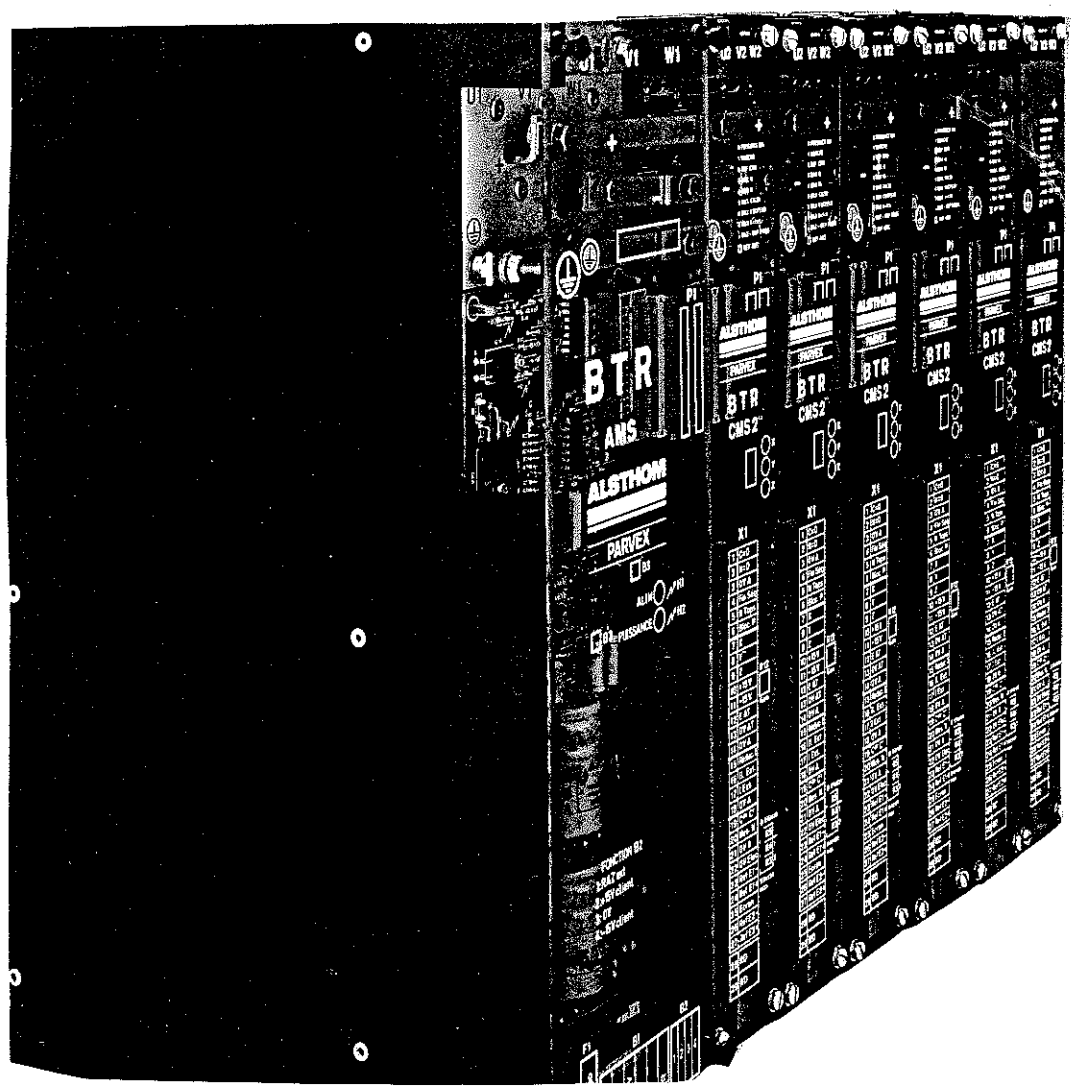
FOR BRUSHLESS LC-TYPE

SERVO-MOTOR

PVD 3362-GB-09/90

	Rated Current A	Max Current A
CMS 2 7,5/15	7,5	15
CMS 2 15/30	15	30
CMS 2 30/60	30	60
CMS 2 45/90	45	90

fitted with personality module



CONTENTS

1 - GENERAL DESCRIPTION

Connected to brushless, LC-type servo-motors, CMS 2 speed amplifiers are suitable for all types of numerical control, machine tool axis or special machine applications.

The control interface is identical to that of a conventional d.c. amplifier.

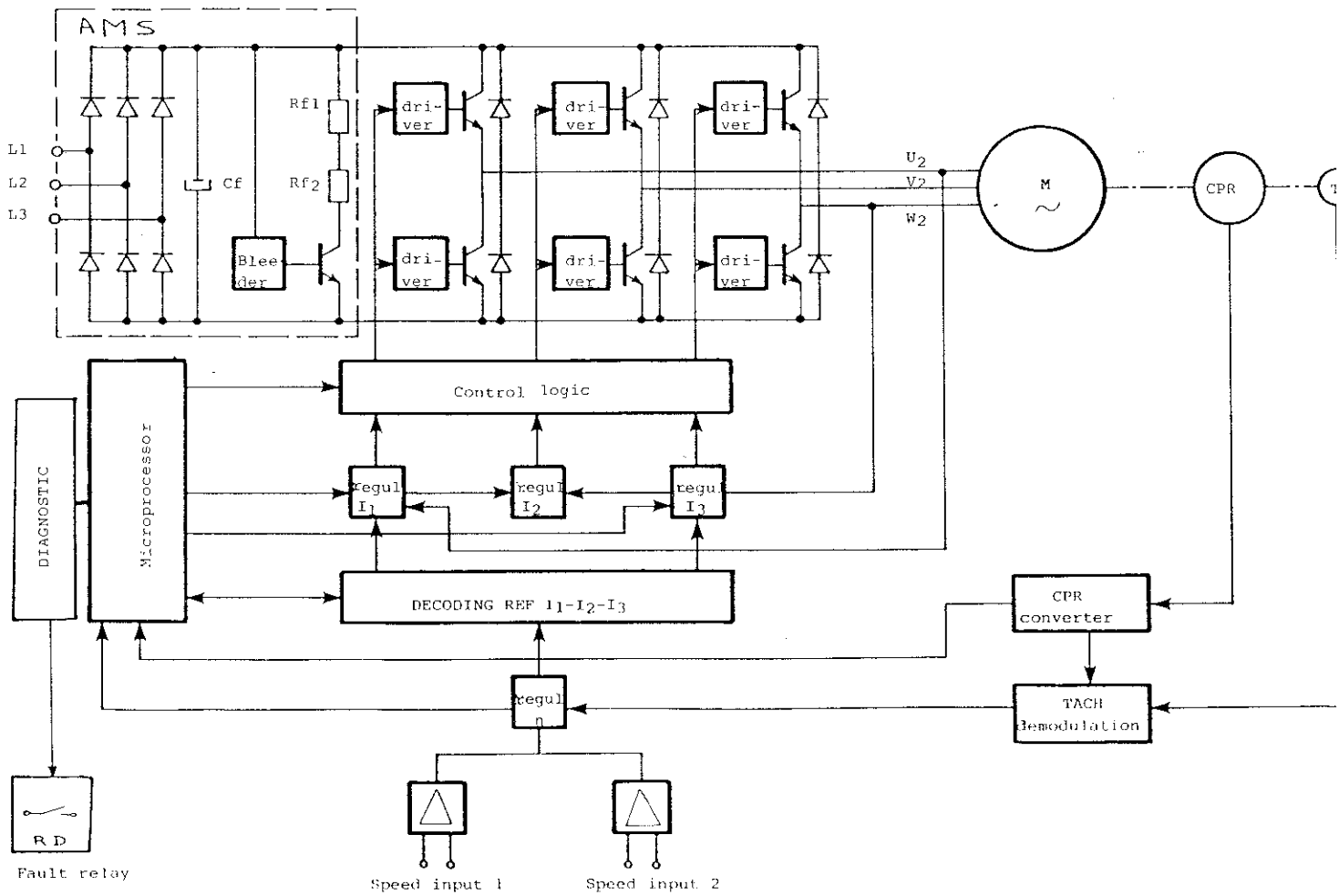
There are two types of CMS 2 amplifiers available:

- CMS 2 amplifier with personalizing components fitted directly on the front face,

- CMS 2 amplifier with removable personalizing circuit allowing for rapid amplifier change-over, if required.

1.2 Composition

The block diagram below shows the drive system.



The following components are included in a brushless modular drive system:

- Input transformer or auto-transformer which adapts the network voltage to the three-phase, 220V input voltage of the AMS power supply module.

- AMS power supply module which supplies power for up to six CMS 2 inverter amplifier modules.

- FMS power dissipation module where necessary which is connected to the AMS power supply module.

- The 2 bar / 1 flat cable connection allows the supply modules and amplifiers to be connected rapidly without error.

- Brushless, LC-type servo-motors are autosynchronous motors fitted with permanent magnets. They are extremely reliable and comprise an integrated switching encoder and brushless tachometer.

2 - POWER SUPPLY TO THE AMS MODULE

2.1 Connection to the network

2.1.1 Use of an auto-transformer

The network should be balanced, three-phase 380V with non-impeding, earthed neutral.

2.1.2 Direct connection

The network should be balanced, three-phase 220V with neutral connected to the non-impeding earth.

In this case, the current draw on switching on should be limited by 3 line resistors that can be short-circuited.

2.1.3 Use of a transformer

Use of a transformer is necessary for networks with non-earthed neutrals or for networks likely to be unbalanced.

The (-) AMS bar is connected to the earth and the neutral of the transformer secondary left unconnected.

2.1.4 Use of an auto-transformer or transformer with power rating greater than 10 KVA

The current draw on switching-on should be limited by 3 line resistors that can be short-circuited.

See drawing FELX 301854.

2.2 Dimensions

a) Auto-transformer dimensions:

$$Pn = 0.62 \cdot 220 \cdot \sum_{i=1}^{N} I \text{ motor rated value}$$

b) Transformer dimensions:

$$Pn = 1.085 \cdot 220 \cdot \sum_{i=1}^{N} I \text{ motor rated value}$$

c) Choice of fuses:

A high current flow is caused by the AMS capacitor charge when the power is switched on.

Fast, URE-type fuses should be used.

AMS 50/150 A : 63 A
AMS 100/200 A : 120 A

d) Choice of main contactor CP:

This contactor should comprise 3 closing contacts rated as follows:

$$In = 0.82 \cdot \sum_{i=1}^{N} I \text{ motor rated value}$$

and one opening contact rated as follows:

AMS 50/150 A : In = 16 A
AMS 100/200 A : In = 32 A

This contact is compulsory.

e) Choice of CR contactor (in the case of input current limiting resistors):

This contact should comprise 3 closing contacts rated as follows:

$$In = 0.82 \cdot \sum_{i=1}^{N} I \text{ motor rated value}$$

f) Automation:

Connection diagrams should be fully respected for correct working order of the amplifier.

3 - AMS SUPPLY MODULES

3.1 Presentation

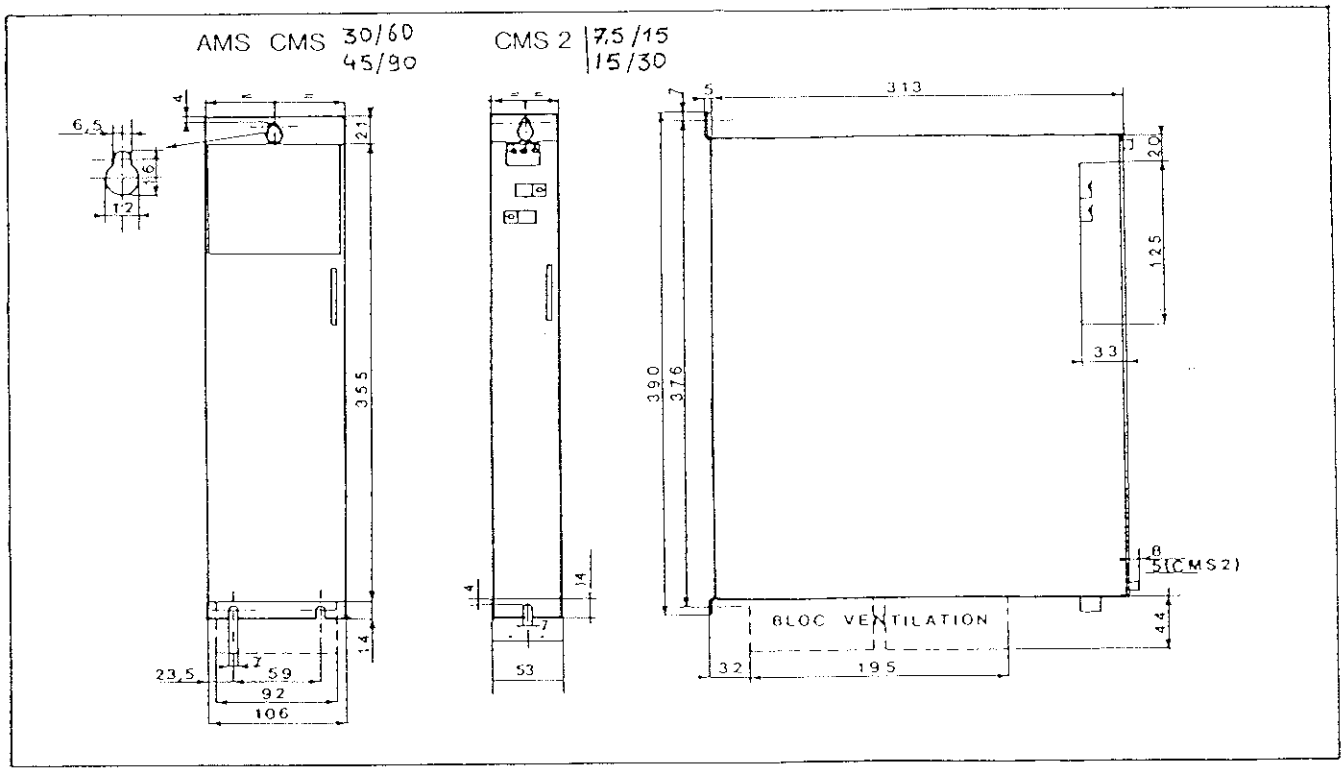
The dimensions of the AMS module are as follows:

width	106 mm
height	390 mm
total depth	326 mm

Fixation: in accordance with diagram below FELX 301 583.

There are three different supplies available:

AMS	Rated Current	Peak Current
50/150 A	50	150
50/150 A	50	150 ventilated
100/200 A	100	200 ventilated



Weight : 14 kg

This module comprises the following:

- low level supply for CMS modules (-15V, +15V, +24V)
- power supply for CMS modules
  The three-phase 220V 50 Hz (tolerance limit +10% to -15%) supplies a diode bridge which after filtering supplies the 310V direct voltage to the CMS modules.
- rectified voltage monitor (max. and min.)
- braking resistor and activate/deactivate logical controls
- fault and axis locking unit.

3.2 Description of AMS Module

3.2.1 Fault display

2 red LED's on the front face indicate the following:

- H1 "Supply" : low level supply fault
- H2 "Power" : power supply or braking fault

3.2.2 Power monitoring

The following thresholds are monitored:

- Minimum rectified U = 260 V, fault corresponding to disappearance of network

- Maximum rectified U = 390 V, fault corresponding to either failure of the braking resistor RF or to the presence of too much power to be dissipated on braking.

A rectified voltage less than 260V or greater than 390V will cause the following:

- The red H2 "Power" LED lights up.
- All CMS axes become blocked (zero torque).
- The main contactor CP opens (by way of the CMS axes RD fault relays if connection diagrams have been respected).

3.2.3 Monitoring low-level supplies

A drop in voltage on the +24V or +/-15V supplies causes the following:

- The red H1 "Supply" LED lights up.
- The CMS axes become blocked (zero torque).
- The main contactor CP opens
- The red H2 "Power" LED lights up.

3.2.4 Removal of fault signal (RESET)

By one of the following:

- Push-button S1 on the front face of the module.
- Switching low-levels off and then on.
- Resetting terminal 1 of terminal box B2 (external RESET).

NOTE:

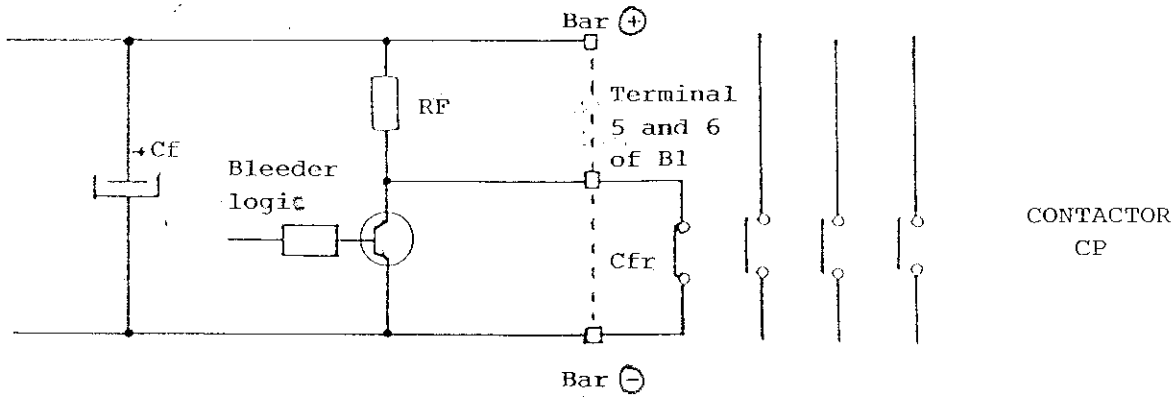
The main contactor CP can only be closed when all faults have been removed.

3.2.5 Power recovery circuit

The "recovery" or "braking" resistor RF is used to dissipate braking power from the motor and which cannot be absorbed by the input capacitor.

The following thresholds are monitored:

370 V : RF resistor activated
365 V : RF resistor de-activated



When the line contactor CP opens, the opening contact CFr closes and resistor RF is activated. This allows for the following:

- rapid discharge of the CF capacitor via RF,

- emergency braking of the motor if necessary.

For heavily demanding applications, use of an additional FMS braking module may be necessary.

Too heavy braking can cause abnormal overheating of the braking resistor RF and a fault is detected causing the following:

- The red H2 "Power" LED lights up.
- All CMS axes become blocked (zero torque).
- The main contactor CP opens.
- The contact CFr closes.

NOTE:

The unit must be allowed to cool down before switching on again.

CONNECTIONS

a) Terminal box B1

- Terminals 1-2 : Input 220V-50Hz - Single-phase
  P = 500 VA. The module is fitted with a fuse to protect the supplies (6.3A delayed type)

- Terminals 1-3 : Input 380V-50Hz - Single-phase
  P = 500 VA (identical 6.3A fuse).

Reminder: Do not feed this 220V or 380V supply via the main contactor CP for fault memorizing.

- Terminal 4: Supply transformer mass and shields to be earthed.

- Terminals 5-6: Discharge output for capacitor CF. The opening contact of contactor Cfr should be connected between the (-) bar and terminals 5 or 6.

b) Terminal Box B2 (multi-stranded 0.5 mm2)

- Terminal 1-3 : "RESET" external contact or fault acknowledgement: If connection 1-3 is closed, the amplifier is re-initialized by erasing the fault memories.

When the power is switched on (with low level power maintained), any faults present must be erased in order to close the main contactor CP.

- Terminal 2 : Customer +15V supply (maximum 10mA, 470 ohms series resistor).

- Terminal 3 : 0V

- Terminal 4 : Customer -15V supply (maximum 10mA, 470 ohms series resistor).

c) AMS-FMS-B3 Lead
This lead is used for the AMS/FMS connections.

d) Flat cable connector P1

This is used for the inter-module low level connections.

e) Screwed connecting terminals L1,L2,L3 + earth

These are used to connect the transformer to the AMS module.

AMS 50/150 A : 3 x 10 mm2 + 1 x 6 mm2
AMS 100/200 A : 3 x 25 mm2 + 1 x 10 mm2

f) Power connections per set of bars between AMS, CMS and FMS.

These concern the following:

- the 310V + power
- the 0V - power
- the mechanical mass

g) Ventilation connection

For ventilated modules, the single-phase, 220V, 50Hz supply is connected directly to the ventilator unit terminal box.

4 - FMS MODULE

The FMS power recovery module enables an increase in the dissipation of braking power in the event of operation involving high inertia.

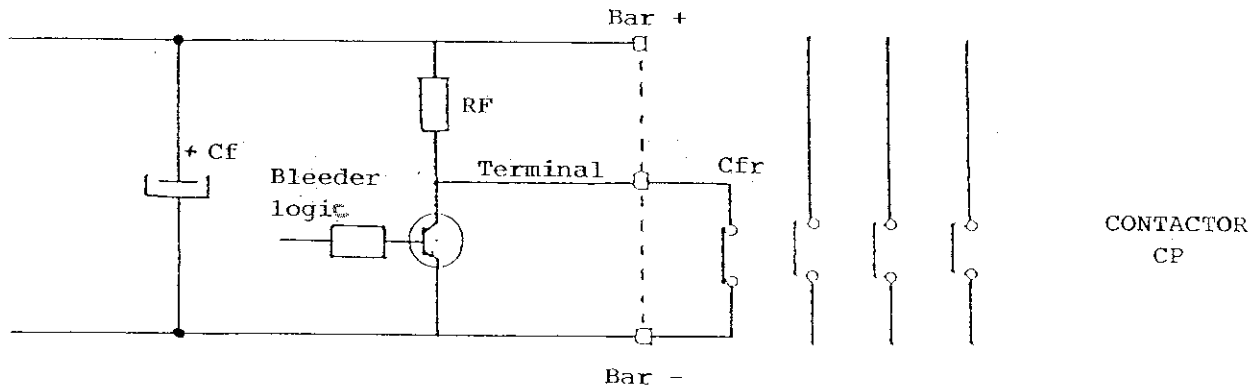
4.1 Presentation

Terminal box and dimensions according to drawing: FELX 301 677
Wiring diagram according to drawing : FELX 301 855.

Weight : 6 kg

This additional braking module includes:

- an additional RF resistor
- an additional CF capacitor



The addition of an FMS module doubles the amount of power that can be dissipated by the AMS.

Use of this module is required for heavily demanding applications, i.e.: cycles with long deceleration times compared with the total time of the cycle, heavy load applied to the motor.

4.2 Connections

a) AMS-FMS-B3 Lead

This lead is used for AMS/FMS low level connections.

b) CFr Terminal

Discharge output for the two CF capacitors (AMS+FMS).

The opening contact of the main contactor CP should be connected between the (-) bar and the CFr terminal.

Note:

This terminal is used in place of AMS terminals 5 or 6.

Calculation of power that can be dissipated via the braking resistor RF

The direct and peak powers of the recovery circuit are limited by the characteristics of the "braking" resistor RF and should not exceed Pn and Pmax respectively.

For applications involving heavy cycles or long decelerations, the mean recovery power to be dissipated must be calculated per axis:

$$pi = \frac{1}{2} \cdot Ji \cdot Wi^2 \cdot fi \qquad (W)$$

where:

Ji : moment of inertia of motor and applied load in kgm^2.

Wi : angular velocity of motor shaft at start of braking in rd/s.

fi : frequency of repetition of braking cycles in s^{-1}.

The sum of the mean recovery powers for all the CMS axes should not exceed the permissible power Pn for the braking resistor.

The brake operating factor must not exceed the maximum value given in the table below (if this value is exceeded, please consult us).

	AMS 50/150A	AMS 50/150A + FMS 50	AMS 100/200A	AMS 100/200A + FMS 100
RF ohm	24	12	13.6	6.8
Pmax W	5700	11400	10000	20000
Pn W	285	570	250	500
Max. brake operating factor in % time	5 % max. 0.2s every 4s	5 % max. 0.2s every 4s	2.5 % max. 0.075s every 3s	2.5 % max. 0.075s every 3s

CMS 2 AMPLIFIER WITH PERSONALIZING CIRCUIT FOR BRUSHLESS, LC/GC-TYPE SERVO-MOTORS

1 - GENERAL INFORMATION

1.1 RATINGS

These amplifiers are designed for use with AMS supply modules.

The rated bus voltage is therefore 310V (between 260V and 390V).

MODEL	I Perm.	I Peak	VENTILATION	STANDARD N°
CMS 2 - 7.5 - 15	7.5	15	NO	CMS 325-701
CMS 2 - 15 - 30	15	30	YES *	CMS 325-103

* Ventilation system automatically connected to the single-phase, 220V supply source.

1.2 MAIN FEATURES

A) "Trapezoidal FEM" control for motor types LC400/LC600 or GC15/GC19 fitted with rotor position sensor and tachometric generator (AT + CPR).

B) The power bridge is a reversible PWM voltage inverter with current servo-controlled and a switching frequency of 10kHz determined by internal oscillator.

C) Galvanic insulation between power and control devices with:

- current measured by Hall effect current sensors
- transistor bases controlled via 6 optical insulating devices with 4 "separate switching" supplies.

D) A microcontroller is used for the following:

- Calculation of the current set values required for the 3 current loops in terms of:

  * CPR position data (X,Y,Z signals)
  * current set value on output from the speed amplifier.

- Displacement of the current phase to keep current and FEM in phase at high speed. This allows maximum torque to be obtained at high speed.

- Management of the safety devices via a 0 to 9 display on the front face.

- Generation of internal test programs.

1.3 DIMENSIONS AND CONNECTIONS

Dimensions: 53 x 355 x 310. See drawings FELX 302 145 and 302 042 compatible with AMS or CMS 1 modules.

Front face connections via disconnectable vertical terminal boxes for all test and regulating signals. These terminals boxes are divided into four sections, one of which is used for connecting the CPR + AT motor encoder.

All connections are separate.

Bar connection for the rectified voltage from the AMS.

Flat cable connection to the AMS for the test and low level supply signals.

U2 V2 W2 terminal box for the output to the motor. See drawing FELX 302 145.

The AMS, CMS 1 and CMS 2 modules can be interconnected.

2 - INPUT-OUTPUT TERMINAL BOX

Terminal 1 : N=0 (-)

If this input is not connected to the 0V supply, rotation is inhibited in the anti-clockwise direction when observed from the shaft end. (N=0 anti-clockwise direction, with zero or non-zero torque depending on terminal 16 C=0). This terminal and the following are useful for wiring the axis safety end-of-run buffers.

Terminal 2 : N=0 (+)

If this terminal is not connected to the 0V supply, there is zero speed in the clockwise direction (observed from the shaft end).

Terminal 3 : 0V "Supply"

0V from the AMS supply module.

Terminal 4 : END OF SEQUENCE

"0" logical signal (0V, open collector max. 10 mA, or "1" = 24V) indicating condition of RD fault relay

In the absence of a fault, the RD relay is closed and the terminal 4 signal "0".

If a fault occurs, the relay opens and the terminal signal is set to "1". This signal is unaffected by the N=0(-), N=0(+) (terminal 2) or C=0 (terminal 16) contacts.

Terminal 5 : N TOPS or INT : 2 functions depending on bridge ST4 (See drawing FELX 302 089).

a) N TOPS output if ST4 is in position 1-2.

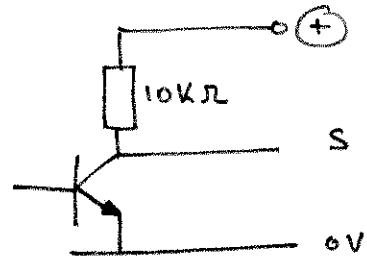
This output emits a logical signal "1" for 4 us on each transition of the X-Y-Z signals from the CPR (Rotor Position Sensor).

If the motor has 2p poles, there are 6 x p pulses per motor revolution.

Open collector output connected to 24V via R = 10 k.ohms.

"0" Level : max. 20mA.

This output gives a pulse sequence in terms of the motor rotation which can be useful, for example, for monitoring movement.



b) INT input if ST4 is in position 2-3.

Terminal 5 is then an input. Connection of 5 to 0V cancels the integral action of the speed amplifier which is useful for short, rapid positioning (several times per second).

Terminal 6 : "BLOCKED POWER" OUTPUT

If the power bridge is locked, either by C=0 or an internal fault, this signal is set to "1", i.e. 24V (open collector output).

Connection to terminals 7-8-9 : RETURN OF CPR SIGNALS FROM THE MOTOR ENCODER

X Y Z towards axis, 3 logical 6.5V signals. Ratio 1:1, 120° phase displacement.

Care should be taken to fully respect the wiring diagram.

Terminals 10-11 :

+15V and -15V are used to supply the CPR only (max. consumption 20mA).

Not to be used otherwise.

Terminal 12 : TACHOMETER RETURN VOLTAGE

Depending on the maximum motor velocity, the voltage is 10V for the following:

2000 r.p.m.
3000 r.p.m.
4000 r.p.m.
5000 r.p.m.

See table.

Terminal 13 : 0V AT TACHOMETER REFERENCE NEUTRAL

Terminal 14 : 0V CPR SUPPLY (SHIELDING)

Terminals 7 to 14 are grouped together on a disconnectable terminal box reserved for the CPR + AT encoder.

Terminal 15 :

Analog reduction of I. The maximum current that can be delivered per axis is 15A or 30A depending on the model. This current can be reduced by analog voltage, i.e. by external resistor.

Terminal 16 : C=0

If this terminal is not connected to the 0V supply (0V terminal 3), the motor is unblocked and runs freely, the current is set to zero as the fundamental controls are blocked, and
the speed amplifier is short-circuited (clamped).

This is not considered to be a fault as the RD relay remains closed and the "ready" condition remains displayed, i.e. "1".

Terminal 17 :

External current reference. If internal strap ST2 is set to position 2-3, the system operates in torque regulation mode (and not speed regulation mode).

10V = 15A or 30A (limit I), input impedance = 44 k.ohms.

Terminal 18 : 0V

Terminal 19 : "CURRENT CONTROL"

Calibrated current reference output +/-10V from either the speed amplifier or the current reference (depending on ST2).

This output is direct if strap ST1 is absent or non-direct if strap ST1 is present.

USE: Current control of two motors using one speed loop and two CMS 2 converters.

Terminal 20 : SCALING TO N.MAX

10V output corresponding to maximum speed for the application concerned.

Amplifier output via R = 47 ohms.
Max.I = 3 mA.

Terminal 21 : 0V SUPPLY

Terminal 22 : 0V ELECTRONICS (to be connected to general "star" 0V

Terminals 23 and 24 :

Speed reference no.1 differential amplifier input.

Terminal 25 :

0V

Terminals 26 and 27 :

Speed reference no.2 differential amplifier input.

Terminals 28 and 29 :

Fault relay dry contact output.

Contact normally open.

Maximum permissible voltage = 220V

Maximum break power = 500 V A

3 - TUNING

3.1 SYSTEM PARAMETERS

- kE = Tachometric generator FEM constant in V/1000 r.p.m. (type 10V = k λ 500 r.p.m.)
- Nnom = Rated motor velocity in r.p.m.
- Nmax = Maximum motor velocity in r.p.m. for application concerned
- P = Number of motor poles
- Tn = Rated torque
- I.lim = Maximum dynamic current for application concerned, or maximum dynamic current of the amplifier, or rating = 15A for CMS 2 - 7.5/15.
- a = Phase displacement angle required at speed Nm (angle in degrees)

3.2 USE OF THE MICROCONTROLLER

The phase displacement of current I depends on the velocity and also the type of motor used (KT, Self).

For CMS 2 rating 7.5/15, six standard curves are stored in the memory. The most suitable phase displacement is selected as follows:

- by analog voltage obtained by using a pinned resistor. The logical signal required is obtained via an analog-digital converter and a threshold detector.

- always by resistance (choice of maximum amplitude for the motor speed ("scale expansion")).

a) Choice of tables:

Tables are selected using R112 on the personalizing circuit.

Table 1:

$Tn = T1 = 3.33 \times 10^{-3}$ °/r.p.m.

R112 = 0 ohm (one wire !)

Table 2:

Tn = T2 = 4.25×10^{-3} °/r.p.m.

R112 = 2.7 k.ohms

Table 3:

Tn = T3 = 5.42×10^{-3} °/r.p.m.

R112 = 6.8 k.ohms

Table 4:

Tn = T4 = 6.87×10^{-3} °/r.p.m.

R112 = 15 k.ohms

Table 5:

Tn = T5 = 8.77×10^{-3} °/r.p.m.

R112 = 39 k.ohms

Table 6:

Tn = T6 = 11.11×10^{-3} °/r.p.m.

R112 = ∞ (no resistance)

b) Setting the Phase Displacement Ramp - Table Selection

The ramp is set using resistor R111 on the personalizing circuit.

$$R111 = \frac{2.21}{(20 - \frac{a}{3}) \cdot \frac{4}{TnNmP} - \frac{1}{3}}$$

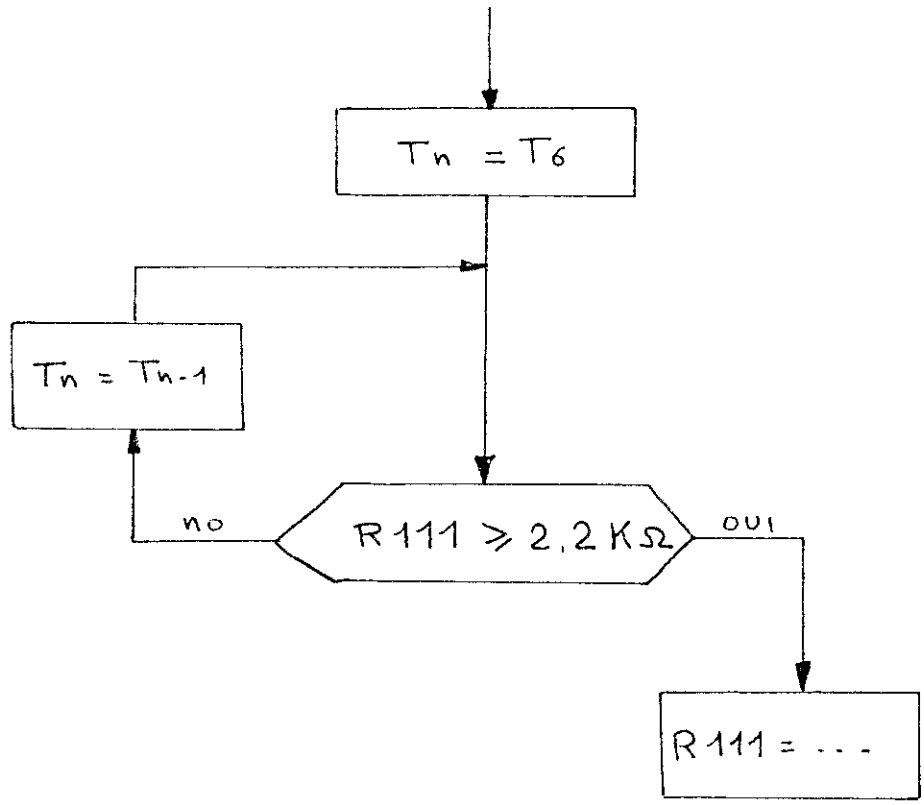
where: - a is selected with the motor

- R111 in k.ohms

- Tn = 1,2,3,4,5,6 of the table

c) Method of Selection of R111 and Table

To calculate R111, Tn is taken equal to T6. If the calculated value for R111 is greater than 2.2 k.ohms, the value is retained, if not, the next table down is considered and the procedure repeated.



Resistors R111 and R112 are mounted on the personalizing circuit.

3.3 SPEED LOOP TUNING

TACHOMETER RETURN R11:

The maximum application speed Nm is obtained by a 10V reference.

R104 (k.ohms) = (0.0012 . KE . Nmax)- 1

R104 takes the nearest standard value that is greater than the calculated value. R104 is in k.ohms.

FINE TUNING OF THE TWO INPUTS REFERENCED R106 OR R110
(potentiometric)

Range : -25 to +16 % of Nmax.

LIMITS IN USE OF Nmax

It is preferable that Nmax is approximately equal to Nnom in value.

Nmax ≤ Nnom - The lowest useful speed is obtained for R104 = 0 ohms and R110 (or R106) minimum. N is in the order of Nnom/10. With this configuration, where maximum utilization speed is small with respect to rated speed, the speed loop parameters must be altered for R101 - C101 - R102 and C102.

3.4 SPEED SCALING

Scaling resistor R105 = +/- 10V for +/- Nmax application (terminal 20 output).

$$R105 = \frac{10^6}{kE \cdot Nmax}$$ in k.ohms kE from the AT

R105 and R111 represent an indissociable pair.

takes the nearest standard value that is smaller than the theoretical value of R105.

3.5 SPEED AMPLIFIER STRAPS AND ACTION

- Integral action : C101 and R101

- Differential action : C102 and R102

- Proportional gain : adjusted by potentiometer, 1 rev. 10 k.ohms. This potentiometer R108 preserves the value of the integration constant.

  * variation range: from 1 to 6
  * min. R108 : R101 and C101
  * max. R108 : 6xR101 and C101/6

- Strap ST3 : Enables speed amplifier gain to be limited on start-up to 1/10. This strap must be removed to enable use of the amplifier.

- Offset tuned by potentiometer R3 ("0" velocity).

3.6 CURRENT LOOP

A) No action tuning. Scale = +/- 10V for the axis pulse current.

e.g. rating 7.5/15A - +/- 5V ⇒ In = 7.5A
- +/-10V ⇒ Imp = 15A

B) Strap ST2

- in position 1-2 : axis in speed regulation mode (current value from speed amplifier)

- in position 3-2 : axis in current regulation mode. There is therefore torque and the current value is from outside (terminal 17).

In both cases, the Zener diodes prevent exceeding of this current value.

3.6.2 CURRENT LIMITING RESISTOR R113

This resistor limits the amplifier current signal, and therefore the value of the peak motor torque, in terms of the motor and the type of application concerned.

Amplifier CMS 2 7,5/15	
Peak current(A)	R113 Kohm
12	13
10	6,7
9	5
7,5	3,3
5	1,6
2	500 ohm

Amplifier CMS 2 15/30	
Peak current(A)	R 113 K ohm
30	∞
25	16
20	6,5
15	3,3
10	1,6
5	600 ohm

3.6.3 EXTERNAL LIMITING OF PEAK CURRENT (Terminal 15)

This input enables motor torque to be reduced when required (e.g. motor at end of run) by connecting terminal 15 and the OV (terminal 21) externally via a resistor or potentiometer.

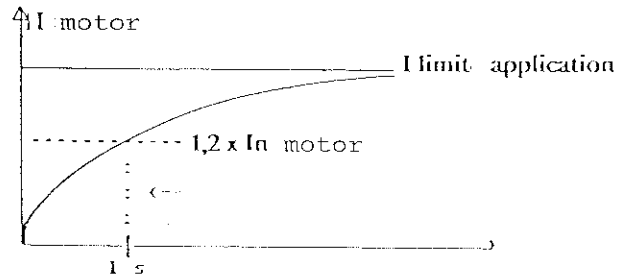
Amplifier CMS 2 7,5/15	
Peak current % de I max	Resistor value K ohm
10 %	1,2
20 %	5
50 %	20
75 %	40
90 %	60
100 %	nothing resistor

Amplifier CMS 2	
Peak current % de I max	Resistor value K ohm
10 %	1,3
20 %	5
50 %	20
75 %	40
90 %	60
100 %	nothing resistor

3.6.4 TUNING THE SAFETY CURRENT I=f(t)

The safety current I=f(t) enables the duration of the peak current period to be limited (e.g. to supply torque during acceleration). This function is pre-set at the works. To re-tune, proceed as follows:

The evolution of I.mean (t) is monitored via an RC filter and tripping threshold device.



Resistor R103 enables the threshold to be set to trip in 1s for 1.2 motor In after integration by the RC filter.

This in fact enables I.limit for the application for 1 second.

* Rating 7.5/15

$$R103 = \frac{In - 1}{1.1 - \frac{3}{20} In} \qquad \text{in k.ohms}$$

R103 = ∞ for In = 7.5A (max. permissible value)

* Rating 15/30

$$R103 = \frac{In - 2}{2.2 - \frac{3}{20} In} \qquad \text{in k.ohms}$$

R103 = ∞ for In = 15A (max. permissible value)

The time taken for tripping (by the RC filter) is determined by resistor R109.

$$R109 = - \frac{0.45 \cdot 10^3}{Ln \left(1 - 1.2 \times \frac{\text{motor In}}{\text{I limit application}}\right)}$$

R109 is in k.ohms, In and I.lim are in A.

4. PERSONALIZING CIRCUIT

STANDARD SETTINGS

The front face includes a removable personalizing circuit which groups together all settings for the application concerned.

It comprises the following:

- R106 / R110 = fine tuning of Nmax by potentiometer :
  R110 : signal. E1
  R106 : signal. E2

- C101 / R101 = integral action

- R108 = speed loop gain by potentiometer

- R104 = tuning of useful maximum speed

- R102 / C102 = differential action

- R103 = I=f(t) tripping threshold

- R111 / 112 = phase displacement tuning

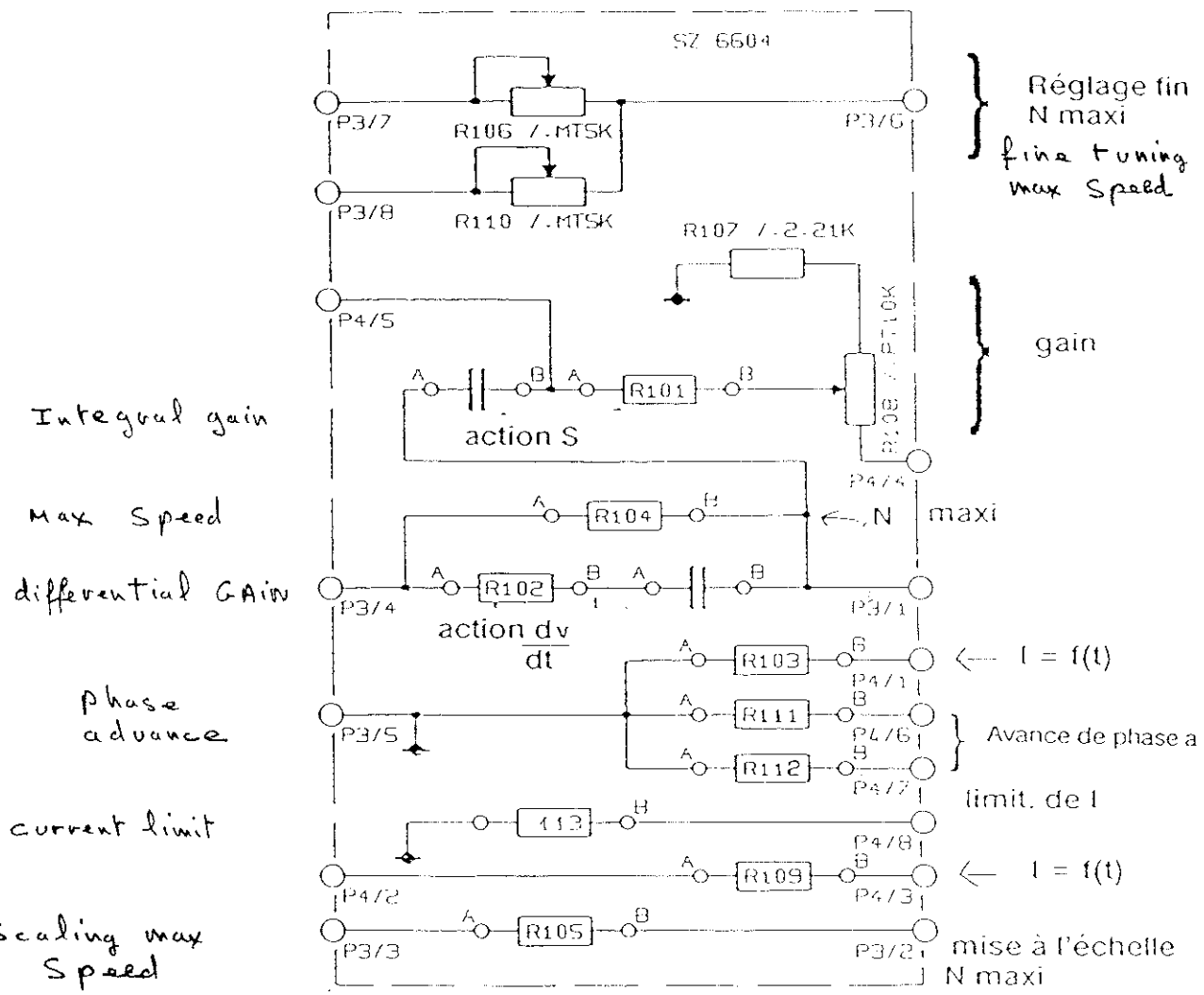
- R113 = internal current limiter

- R109 = tuning of I=f(t) time

- R105 = scaling of maximum speed measurement

GEC ALSTHOM
Etablissement PARVEX

Position	Texte	Numéro d'identification
	SZ 6604	FELX 402115



GEC ALSTHOM PARVEX 27-29, rue L-Joly - BP 249	Titre : SZ 6604 SCHEMA DE PRINCIPE	Format : A4	Famille : FEUILLE : Indice Folio FELX 402115

STANDARD SETTINGS

CMS 2 WITH PERSONALIZING CIRCUIT

In	: Rated motor current	(A)
Iimp	: Maximum motor current	(A)
Nn	: Rated motor velocity	(r.p.m.)
KE	: Tachometric generator constant	(V/1000 r.p.m.)
Ph	: Phase displacement	(0°)
f	: PWM frequency	(kHz)

CMS 2 WITH PERSONALIZING CIRCUIT

13-10-1988

TOS	MOTEUR	CMS2	In	Iimp	Nn	K_E	R113	R103	R109	R111	R112	R105	R104	R36	R101	C101	Ph.	f
S01	LC310TH	7.5/15	2.5	9.3	6000	1.43	5.6	2.2	1500	6.8	0	120	10	2.2	15	220	20°	5
S02	LC320TE	7.5/15	3.4	10.8	4500	2	8.2	3.9	1200	4.7	0	100	10	2.2	15	220	25°	5
S03	LC410TQ	7.5/15	3.3	9.8	4900	1.43	6.8	3.9	1000	10	0	135	7.5	2.2	68	100	20°	5
S04	LC420TL	7.5/15	5.3	18	3900	2		15	1000	6.8	0	120	8.2	2.2	68	100	20°	5
S05	LC430TJ	7.5/15	5.9	20	3400	2.5		22	825	4.7	0	120	10	2.2	68	100	20°	5
S06	LC440TG	7.5/15	6.9	23.4	3350	2.5		100	680	4.7	0	120	10	2.2	68	100	20°	5
S07	LC440TG	15/30	6.9	23.4	3350	2.5	12.1	3.9	1500	4.7	0	120	10		68	100	20°	5
S08	LC615TN	7.5/15	7.3	22.5	3500	2		1200	560	4.7	0	120	7.5	2.2	68	100	20°	5
S09	LC615TN	15/30	7.3	22.5	3500	2	10	4.7	1200	4.7	0	120	7.5		68	100	20°	5
S10	LC620TH	7.5/15	7.7	27	2500	3.33			560	3.3	0	120	10	2.2	68	100	20°	5
S11	LC620TH	15/30	7.7	27	2500	3.33	33	5.6	1200	6.8	6.8	120	10		68	100	20°	5
S12	LC630TF	15/30	15	47.5	3550	2.5			560	5.6	0	100	10		68	100	20°	5
S13	LC630TH	7.5/15	7.5	25	1340	5			560	3.3	15	150	7.5	2.2	68	100	20°	5
S14	LC630TH	15/30	7.5	25	1340	5	18	5.6	1200	3.3	15	150	7.5		68	100	20°	5
S15	LC640TE	15/30	18.3	53	3000	2.5			560	3.9	0	120	8.2		68	100	20°	5
S16	LC640TG	15/30	13.7	40	2060	3.33		82.5	681	3.3	2.7	120	7.5		68	100	20°	5
S17	LC815TL	15/30	19	53.5	3000	2.5			560	3.9	0	120	8.2		68	100	20°	5
S18	LC815TP	15/30	13.9	39.4	2000	3.33		100	680	3.3	2.7	150	7.5		68	100	20°	5
S19	LC820TP	15/30	14.7	42	1300	5			560	3.3	15	150	6.8		68	100	20°	5
S20	LC620TJ	15/30	10.8	38	3900	2		15	1000	6.8	0	120	8.2		68	100	20°	5

CMS 2 WITH PERSONALIZING CIRCUIT (TDS n°500 to 699) :

R113	: Pulse current limiter	(k.ohms)
R103	: I=f(t) threshold	(k.ohms)
R109	: I=f(t) time constant	(k.ohms)
R111	: Phase displacement	(k.ohms)
R112	: Phase displacement	(k.ohms)
R105	: Speed scaling	(k.ohms)
R104	: Tuning of speed return	(k.ohms)
R36	: Max I Alim threshold	(k.ohms)
R101	: PI resistor	(k.ohms)
C101	: PI capacitor	(nF)

5 - DETECTION OF OPERATING FAULTS

Faults are generally processed by the microcontroller and displayed on the front face by a code ,*,0...9 and a full stop. * : display off.

CODE 0: +/-15V SUPPLY PRESENT

This is normally displayed when the system is switched on and the power has not been started up.

Absence of the low levels = +/-15V (<12V) locks the bridge, opens the RD fault relay and causes the LEDs and display to go out.

If this is the case, see "AMS Faults".

CODE 1: AMPLIFIER READY TO OPERATE

This is normally displayed when there are no faults and both low levels and power are present, even if the power bridge remains locked by C=0.

In the absence of power, the code * is displayed and the RD fault relay opens. If this is the case, see "AMS Faults".

CODE 2: CPR + AT MOTOR ENCODER MONITORING

Absence of AT or rupture in X-Y-Z has been detected. Fixed: x, y, z fault

Power bridge locks. blinked: Tach fault

CODE 3: OVERHEATING

Power bridge monitoring : maximum temperature of the dissipating system.

CODE 4: OVERSPEED

This code is displayed if the speed exceeds 20% of the maximum useful speed.

CODE 5: SHORT-CIRCUIT

A current measuring device upstream from the power bridge detects any internal short-circuiting or earthing of the motor phases.

If this is the case, the power bridge is immediately blocked by a wired logical signal.

CODE 6: OVERCURRENT

This code is displayed if the sum of the three current values exceeds the amplifier rating.

As in the case of code 5, the power bridge is rapidly blocked by a logical signal.

CODE 7: I = f(t)

Peak current is only allowed for a limited period of time determined by a time delay device.

For I.mean = 0, t = 1s
For I.mean = In, t = 0.2s

This fault locks the bridge via the microcontroller.

See paragraph 3.6.4.

AMS FAULT

INDICATED BY *

This is mainly caused by a fault in power or low levels and transmits a locking request via the flat cable (see AMS paragraph).

MICROCONTROLLER FAULT

INDICATED BY EXTINCTION OF ALL FIGURES AND DISPLAY OF FULL STOP.

This fault occurs when a RESET is carried out or if the microcontroller fails.

ALL THESE FAULTS CAUSE THE FOLLOWING:

- Display of fault concerned

- Zero current (power blocked)

- Blocking of speed regulation function

- Opening of fault contact which causes opening of the main contactor.

THESE FAULTS ARE ERASED BY THE FOLLOWING:

- Switching on,

- RESET signal from the AMS ("acknowledgement" BP or AMS terminal box contact).

RD FAULT RELAY OPERATION:

This relay is closed when:

- the +/-15V command voltage from the AMS is present,

- the power is present (bus voltage from the AMS), even if the power bridge is locked by C=0,

- there are no faults.

The relay opens in the event of any one of the faults mentioned above.

6 - TUNING OF CMS 2 WITH PERSONALIZING CIRCUIT

The CMS 2 can be tuned simply according to the component values given for the standard motor types. These standards associate a given motor type with electronic controls of a given rating, e.g. LC410TQ motor with BTR-CMS 2 rating 7.5/15A. It should be noted that data concerning these standard associations of motors and electronic units is given for the rated speed of rotation, the speed of rotation being an essentially variable parameter dependent on the customer application. The other setting parameters are characteristic of the motor and therefore do not need to be reconsidered.

In this case, only three resistors need to be re-calculated:

R104 - R105 - R111

Considering the following:

Nm : speed of rotation of the motor for the standard model

R104n : rated value of R104 in the standard model

R105n : rated value of R105 in the standard model

R11n : rated value of R111 in the standard model

and:

Napp : speed of rotation of the motor for the application concerned

R104app : new value of R104 for the application concerned at speed of rotation Napp

R105app : new value of R105 for the application concerned

R111app : new value of R111 for the application concerned

In the following formulae, all resistances are in k.ohms and speeds of rotation in r.p.m.

$$R104app = \frac{Napp}{Nn} \times (R104n + 1) - 1$$

$$R105app = \frac{Nn}{Napp} \times R105n$$

$$R111app = \frac{2.21}{\frac{Nn}{Napp} \times \left(\frac{2.21}{R111n} + 1\right) - 1}$$

In practice, use of the nearest standard values is recommended. For R105app, the nearest, smaller standard value should be used.

Note:
It should be noted that the two resistors R105/R111 represent an indissociable pair.

7 - START-UP

PROCEDURE FOR : (CMS2 with personalizing circuit
(CMS2 without personalizing circuit

7.1 Check the power connection:

To the AMS supply	- Power bars + and - - Earth bar - Flat cable connection on plug P1 - Check that the earthing is correct.
Motor power	- 3 motor power phases to terminal box B2, earth connected.
Motor servo-control cable	- Servo-control cable (CPR encoder) connected to terminal box B1, terminal 7 to 14 - Terminal 14 comprises two connections: 0V and servo-control cable shielding

7.2 Minimum wiring requirements

Connect terminals: 1 and 3 | Limit switch connection
2 and 3 |

For CMS 2 with personalizing circuit only, connect terminals 16 and 3.

7.3 Switching on

7.3.1 -

Switch on the AMS auxiliary 220V (power pack).

The AMS unit light should be off.

The X,Y,Z diodes on the CMS2 light up one after the other when the motor is rotated by hand.

Check the emergency shutdown system if the motor is coupled to the mechanics.

7.3.2 - Switch on the power

The CMS 2 display shows "1".

The fault relay contact is closed.

The motor is not rotating.

7.4 - Motor rotation

Transmit a voltage input signal between terminals 23 and 24 (+/-10V).

The motor starts to rotate with low torque. Check that it is rotating in the right direction compared with the reference.

Set the reference to zero. Remove strap ST3 from its position on the front face at the level of terminal 14. The motor should be rigid and not deviating. If it is deviating, adjust the offset (potentiometer R5, 0 velocity). This parameter is pre-set at the works.

NOTE:

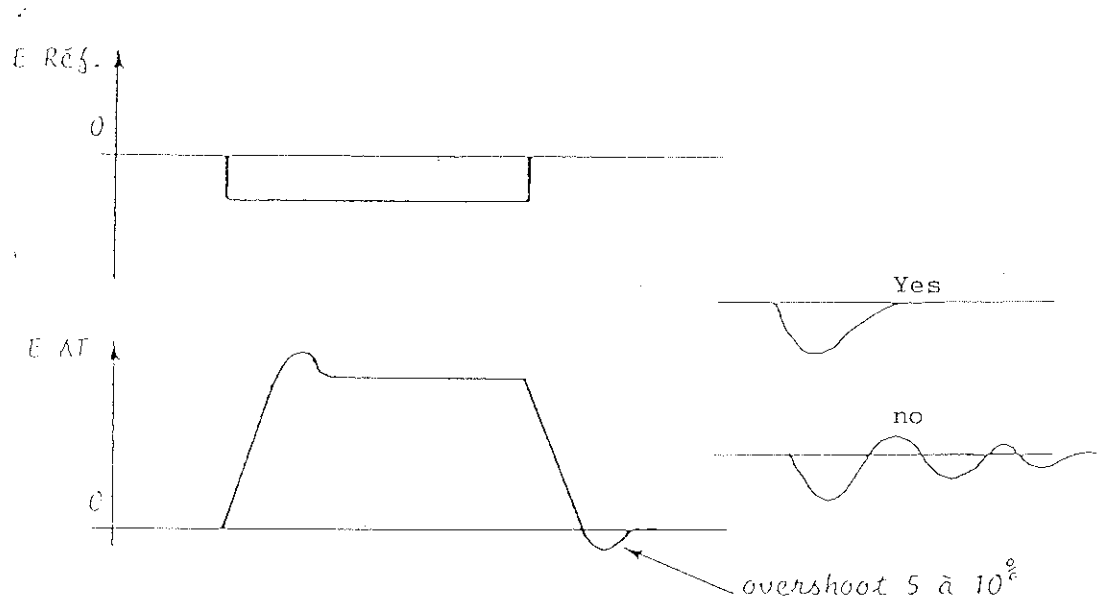
In the event of uncontrolled rotation, use the emergency shutdown and re-check the connections.

Before rotation, check that the brake is off.

Check that the mechanics are not blocked.

If necessary, re-tune the following on the CMS:

- motor speed offset using R15,
- maximum speed using R9,
- dynamic gain using R23 to give a speed overshoot of 5 to 10%.



Machine shutdown

Shut down the motors (zero reference speed).

Press the shutdown push-button At. The main contactor CP opens. The CP opening contact closes allowing the AMS capacitor to discharge and the motor brakes to operate.

The AMS H2 "Power" LED lights up (Note: if power is to be switched on again, RESET the AMS).

Open the main section switch. AMS and CMS are now fully shut down.

8 - ANOMALIES

8.1 - The main contactor does not stay in position

- Check the end of run buffers, emergency shutdown system and relays.
- Check input voltages.

8.2 - The resistor discharge circuit is activated

- Check the input power voltage.
- Operating cycle too heavy for the motor.

8.3 - Absence of motor torque

- Remove strap ST3 from the front face.
- Strap ST2 should be in position 1-2.
- The amplifier is locked: contact C=0 is open and should be closed.

8.4 - Slow motor deviation

- Check that the speed signal is equal to zero.
- The numerical control position loop is open.
- The numerical control is incorrectly earthed.
- The deviation can be set to zero (potentiometer R5).

8.5 - Intermittent motor operation

- The X,Y,Z signals are not in the correct order or are incorrectly connected.
- C=0 or set value contacts incorrectly screwed down.
- +/-15V supply voltage overloaded: check value using oscilloscope (terminals 10 and 11).
- Speed signal unstable on input.

8.6 - Motor unstable

- Faulty tachometer: remove C=0, switch off power, rotate the motor by hand and check tachometer signal.
- Incorrect position loop, position gain too high.
- Incremental encoder incorrectly connected.

9 - GENERAL VERIFICATIONS

9.1 - Preventive maintenance

No preventive maintenance, changing of parts or lubrication is necessary.

9.2 - Cleaning

Clean out any dust and accumulated lubricant from the motors to improve cooling.

Avoid use of strong cleaning agents which may damage the acrylic paint.

Use compressed air at low pressure to clean the printed circuits or dissipating systems.

9.3 - Visual verification

Check for good condition of cables, absence of damaged wires, loose or unwelded connections. Check mechanical couplings after start-up.

9.4 - Maintenance and repair

Maintenance and repair is carried out using interchangeable modules to replace the units concerned and during their repair at the works.

Standard setting values must be correctly indicated.

After-Sales Service: telephone : 80 42 41 36
IN FRANCE telex : 351 509 F

APPENDIX

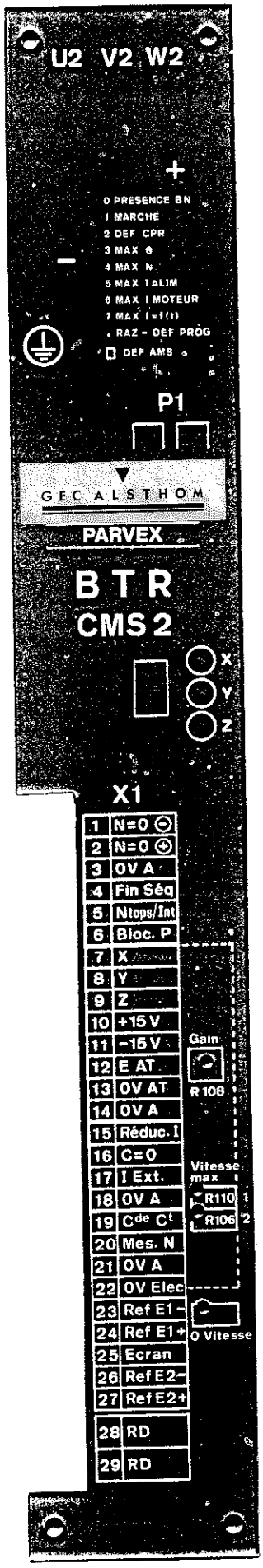
CONNECTION OF CMS 2 ratings 7.5A/15A AND 15A/30A WITH 1 AMS

AMS	50A/150A
+ 6 x	CMS2 7.5A/15A
AMS	50A/150A
+ 3 x	CMS2 15A/30A
AMS	100A/200A
+6 x	CMS2 15A/30A

In practice, the AMS auxiliary supply (+15V, -15V) can be used for up to 6 axes.

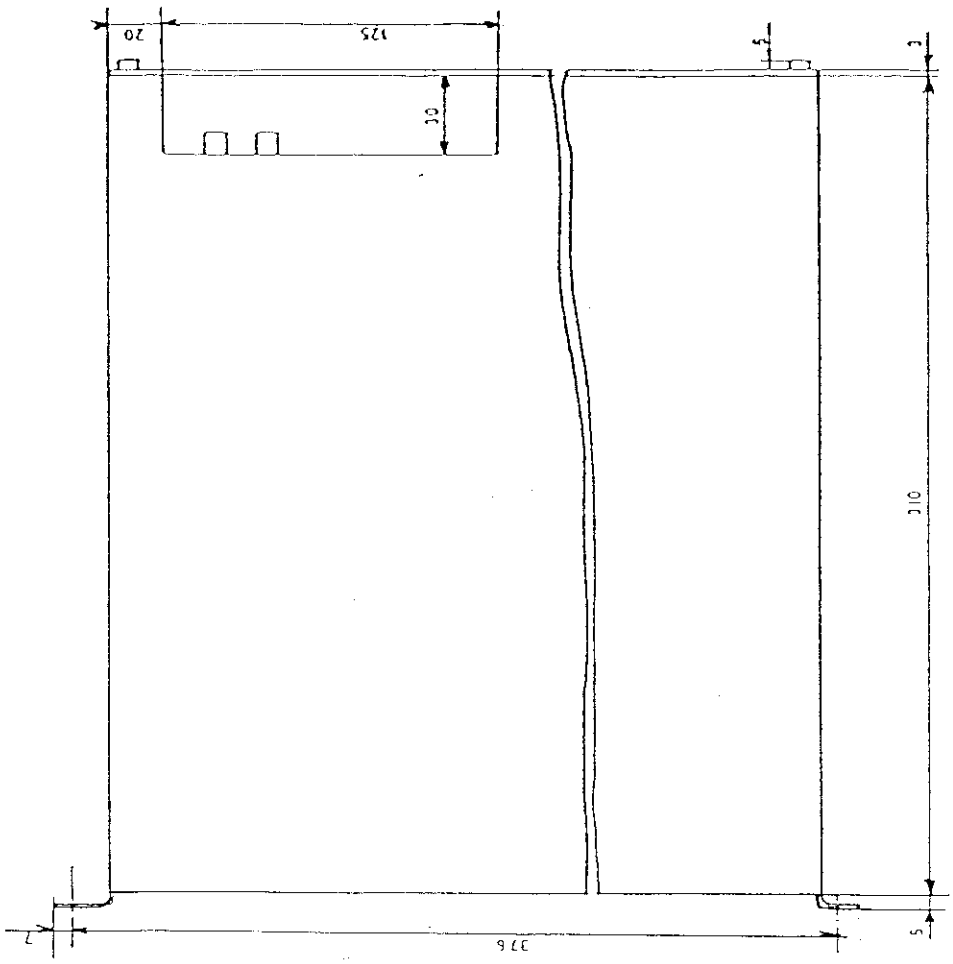
The number of axes is limited by the effective power delivered by the AMS supply.

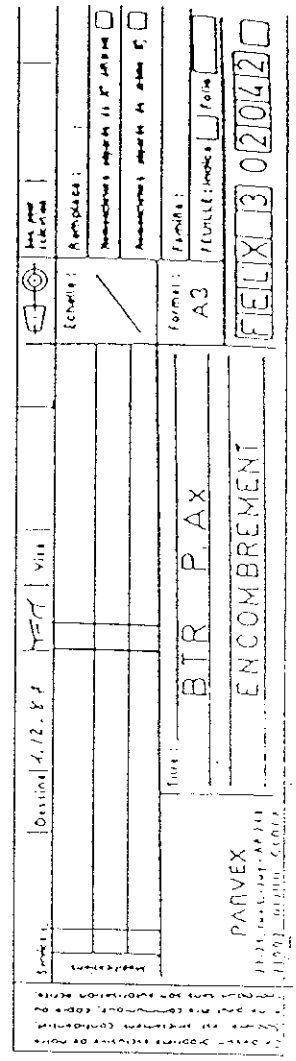
This power depends on the coefficient of simultaneous operation of the different axes.

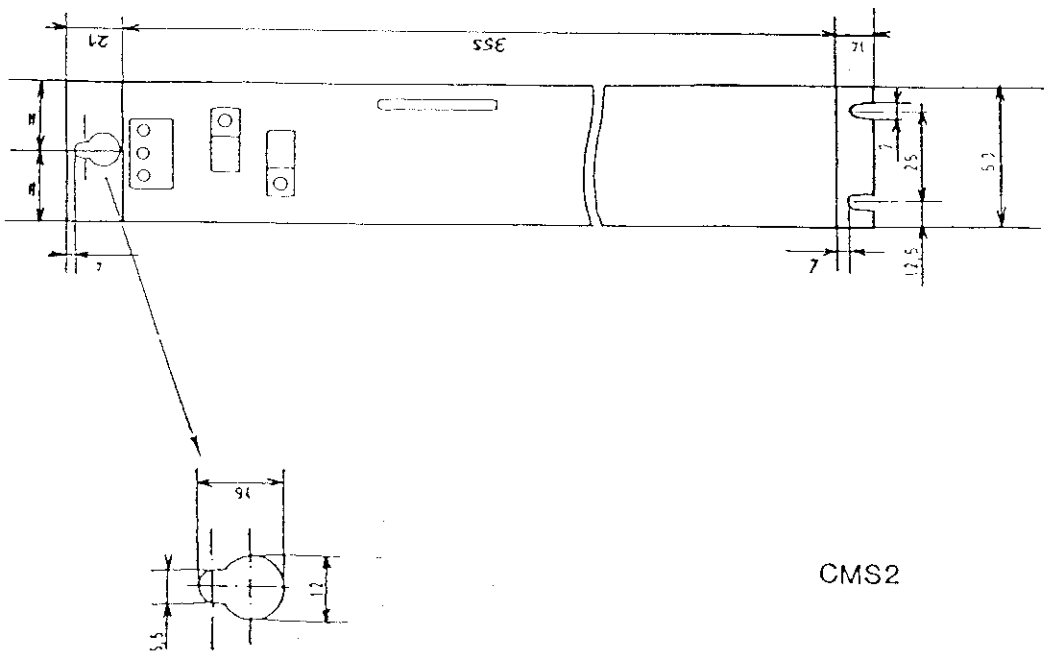


Front panel

CMS2

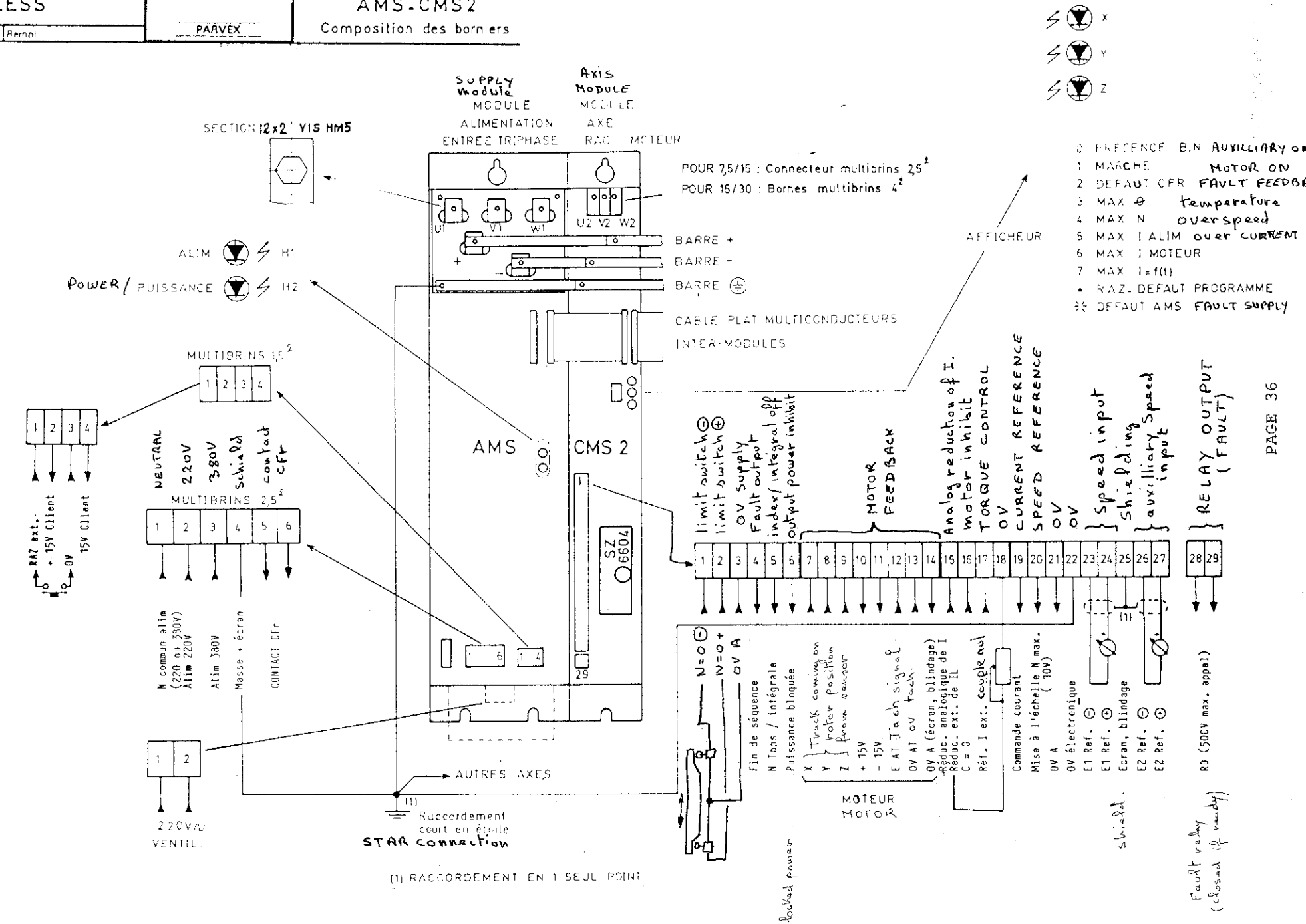

20
125
10
310
5
7
336

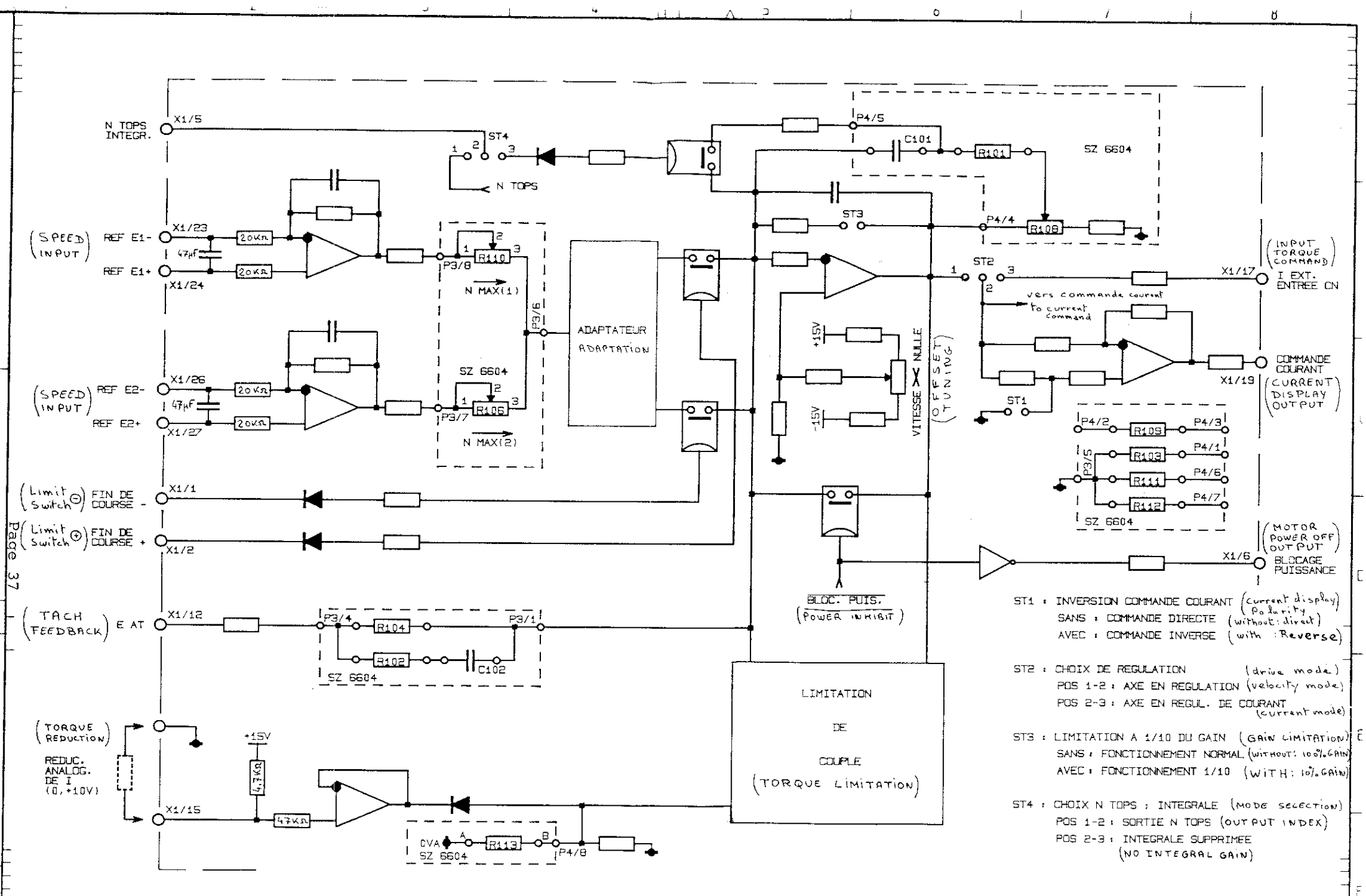

FELIX 13 02042
ENCOMBREMENT
BTR PAX
PARVEX
A3


21
355
14
52
25
12,5
7
16
12
5,5

CMS2

BRUSHLESS	PARVEX	Type AMS-CMS2
Rempl		Composition des borniers





ST1 : INVERSION COMMANDE COURANT (current display Polarity)
SANS : COMMANDE DIRECTE (without: direct)
AVEC : COMMANDE INVERSE (with : Reverse)

ST2 : CHOIX DE REGULATION (drive mode)
POS 1-2 : AXE EN REGULATION (velocity mode)
POS 2-3 : AXE EN REGUL. DE COURANT (current mode)

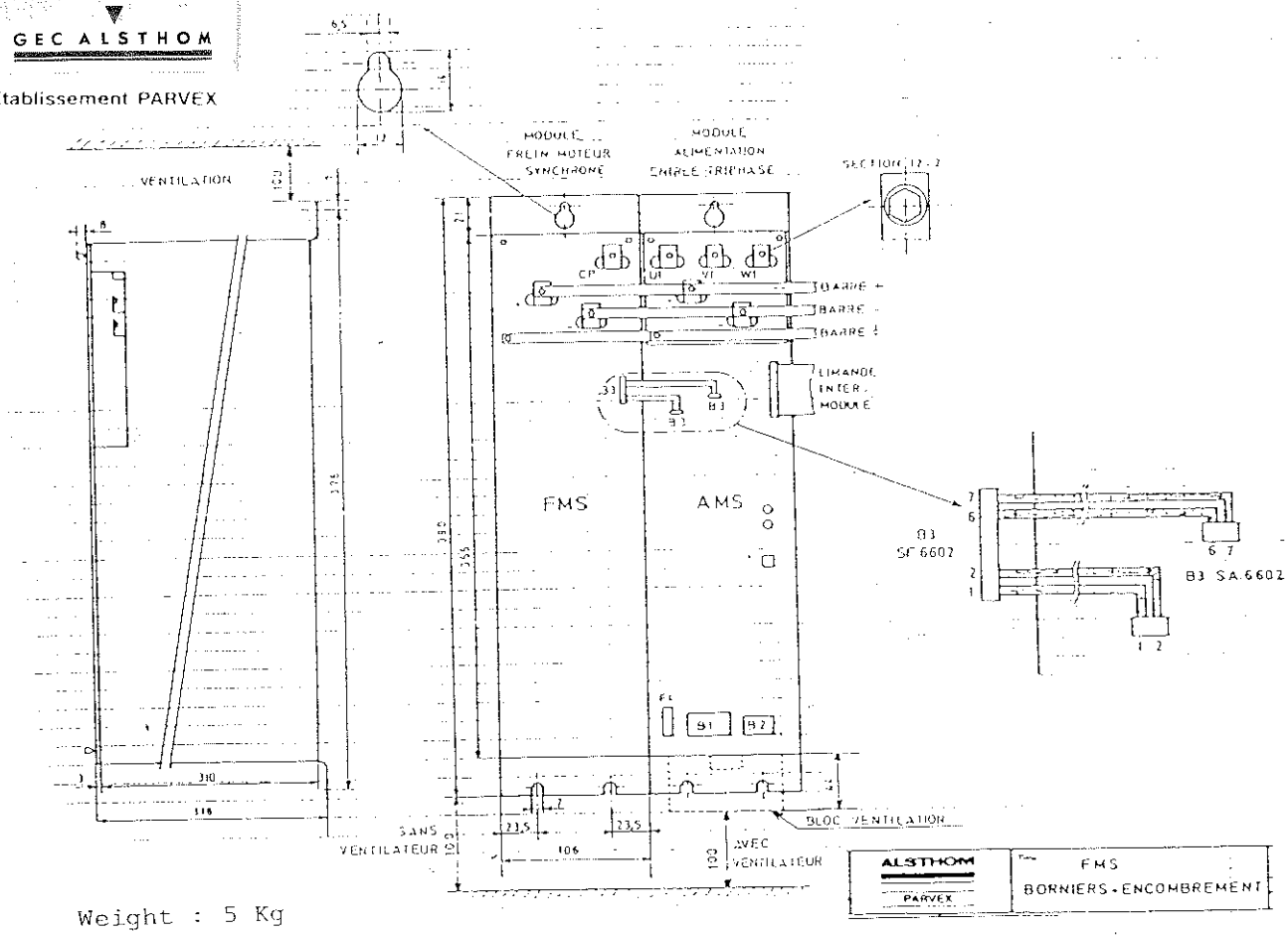
ST3 : LIMITATION A 1/10 DU GAIN (GAIN LIMITATION)
SANS : FONCTIONNEMENT NORMAL (WITHOUT: 100% GAIN)
AVEC : FONCTIONNEMENT 1/10 (WITH: 10% GAIN)

ST4 : CHOIX N TOPS : INTEGRALE (MODE SELECTION)
POS 1-2 : SORTIE N TOPS (OUTPUT INDEX)
POS 2-3 : INTEGRALE SUPPRIMEE (NO INTEGRAL GAIN)

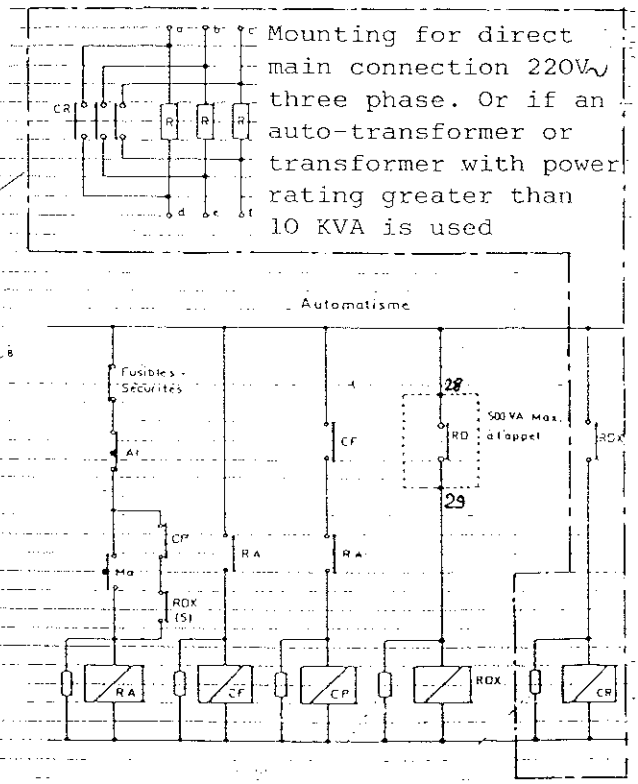
Modif	Etabli : 31.1.83 - FM	SYNOPTIQUE AMPLI VITESSE	PARVEX	Titre : CMS 2	FELX 302 344
	Contrôlé :				
	Contr. normes :				
	Bon pr ex. :	Issu de :	Rempl. :	Liste doc. / Gre doc. / Format 3 / Langue	N° feuille 1 / Nb. feuilles 1

GEC ALSTHOM

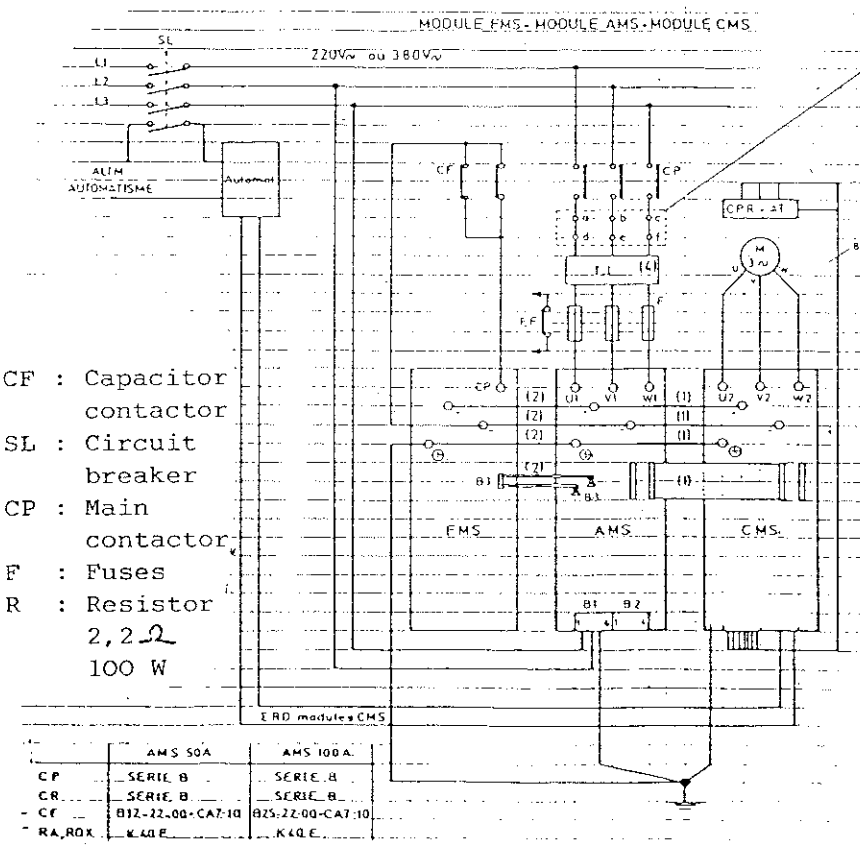
Etablissement PARVEX



Weight : 5 Kg



Mounting for direct main connection 220V~ three phase. Or if an auto-transformer or transformer with power rating greater than 10 KVA is used



	AMS 50A	AMS 100A
CP	SERIE B	SERIE B
CR	SERIE B	SERIE B
CF	B32-22-00-CA7:10	B25-22-00-CA7:10
RA,ROX	K40E	K40E

CF : Capacitor contactor
SL : Circuit breaker
CP : Main contactor
F : Fuses
R : Resistor 2,2Ω 100 W

1- Is delivered with CMS
2- Is delivered with FMS
3- Bar connection and earth only for mounting with transformer
4- Transformer or autotransformer
5- If no contactor CR, RDX is not fitted and is replaced by RD

CMS2 WITH BLEEDER MODULE