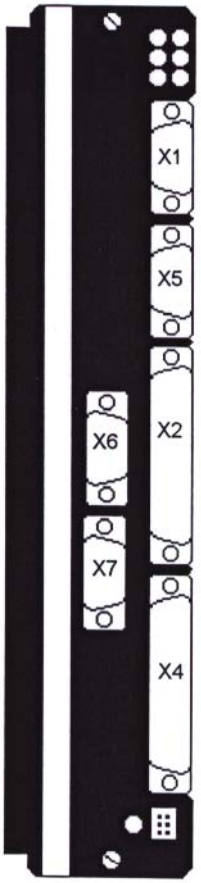
INFRANOR
SERVO DRIVES & MOTION CONTROL

SMT-BD1/m

gb



SMT-BD1/m
Positioner

INFRANOR®

WARNING !

This is a general manual describing a series of servo amplifiers having output capability suitable for driving AC brushless sinusoidal servo motors.

Instructions for storage, use after storage, commissioning as well as all technical details require the MANDATORY reading of the manual before getting the amplifiers operational.

Maintenance procedures should be attempted only by highly skilled technicians having good knowledge of electronics and servo systems with variable speed (EN 60204-1 standard) and using proper test equipment.

The conformity with the standards and the "CE" approval is only valid if the items are installed according to the recommendations of the amplifier manuals. Connections are the user's responsibility if recommendations and drawings requirements are not met.

Any contact with electrical parts, even after power down, may involve physical damage.
Wait for at least 5 minutes after power down before handling the amplifiers (a residual voltage of several hundreds of volts may remain during a few minutes).

ESD INFORMATION (ElectroStatic Discharge)
INFRANOR amplifiers are conceived to be best protected against electrostatic discharges. However, some components are particularly sensitive and may be damaged if the amplifiers are not properly stored and handled.

STORAGE

- The amplifiers must be stored in their original package.
- When taken out of their package, they must be stored positioned on one of their flat metal surfaces and on a dissipating or electrostatically neutral support.
- Avoid any contact between the amplifier connectors and material with electrostatic potential (plastic film, polyester, carpet…).

HANDLING

- If no protection equipment is available (dissipating shoes or bracelets), the amplifiers must be handled via their metal housing.
- Never get in contact with the connectors

ELIMINATION
In order to comply with the 2002/96/EC directive of the European Parliament and of the Council of 27 January 2003 on waste electrical and electronic equipment (WEEE), all INFRANOR devices have got a sticker symbolizing a crossed-out wheel dustbin as shown in Appendix IV of the 2002/96/EC Directive.
This symbol indicates that INFRANOR devices must be eliminated by selective disposal and not with standard waste.

INFRANOR does not assume any responsibility for any physical or material damage due to improper handling or wrong descriptions of the ordered items.
Any intervention on the items, which is not specified in the manual, will immediately cancel the warranty.

Infranor reserves the right to change any information contained in this manual without notice.

Issue: 5.1

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Chapter 1 - General description

1 - INTRODUCTION

Series SMT-BD1/m servo modules are PWM servo drives that provide speed control for AC sinusoidal motors (brushless) with transmitter resolver.

The SMT-BD1/m positioner is available with two different mains supplies: 220 VAC or 400 VAC.
The plug-in positioner in **220 VAC** is available either as a single-axis block version or as a multiaxis version that can receive up to six axes in a standard 19" rack.
Both versions are including a power supply unit.
The plug-in positioner in **400 VAC** is only available as a multiaxis version that can receive up to three axes in a standard 19" rack including a power supply unit.

2 - GENERAL DESCRIPTION

The SMT-BD1/m servo modules have their own DC/DC converter to provide appropriate logic voltage to the modules (+5 V / +/-15 V). The supply used for the logic board is the 310 V_{DC} auxiliary supply which allows the saving of the position signal when the power supply is off.

Each module is packaged as two 6U "double Eurocard":
- one power board with IGBT transistors and
- one logic board with DSP (Digital Signal Processing).

The SMT-BD1/m positioner can operate as a stand-alone system or in connection with a PLC or a PC.
It can execute up to 128 motion sequences. The sequences can generate position, speed or torque motions.
The SMT-BD1/m positioner generates itself the positioning trajectory by waiting for the START signal or for a command via the serial link for starting the programme.

3 - COMPLIANCE WITH THE STANDARDS

Series SMT-BD1/m positioners with 220 VAC supply and operating in the BF rack equipped with the mains filter BF 35 or 70, have been approved with regard to their conformity with the Electromagnetic Compatibility standards:
- EN 55011, group 1, class A, regarding the conducted and radiated radioelectric disturbances,
- CEI 801 - 2 - 3 - 4 regarding immunity.

The SMT-BD1/m positioners with 220 VAC supply, operating in the single-axis racks BM20A - BMM05F - BMM05AF equipped with the pertaining mains filter (FN 612-20/06 or FN 356-16/06 or BF-35) have been approved with regard to their conformity with the Electromagnetic Compatibility standards
- EN 55011, group 1, class A, regarding the conducted and radiated radioelectric disturbances,
- CEI 801 - 2 - 3 - 4 regarding immunity.

Series SMT-BD1/m positioners with 400 VAC supply and operating in the BF rack equipped with the mains filter BF 400-35 or 400-70, have been approved with regard to their conformity with the Electromagnetic Compatibility standards
- EN 55011, group 1, class A, regarding the conducted and radiated radioelectric disturbances,
- CEI 801 - 2 - 3 - 4 regarding immunity.

Standard to be applied to the electrical equipment of industrial machines: EN 60204-1.

Series SMT-BD1 drives have been **CE** marked since 1995.

4 - OTHER DOCUMENTS TO BE USED OR THE DRIVE COMMISSIONING

- BF/400 rack – for the use of 400 VAC drives in multi-axis racks.
- BF rack – for the use of 220 VAC drives in multi-axis racks.
- BM20A / BMM05F / BMM05AF racks – for the use of 220 VAC drives in single-axis racks.

Chapter 2 - Specifications

1 - MAIN TECHNICAL DATA

1.1 - Current ratings 220 VAC drive version

Operating voltage	310 VDC (270 VDC < DC bus < 340 VDC)
Auxiliary supply voltage	310 VDC (200 VDC < Uaux < 340 VDC)
Motor phase-phase output voltage	200 Vrms for 310 VDC bus

Output current ratings in pulse current mode (I^2t protection in "fusing" mode)

DRIVE TYPE	Urated (Vrms)	Imax (Arms) 1 s	Max. authorized rated current (Arms) of the drive		
			No fan*	Fan 1*	Fan 2*
SMT-BD1/m-220/04	240	4.4	2		
SMT-BD1/m -220/08	240	8.8	4		
SMT-BD1/m-220/12	240	13.8	6		
SMT-BD1/m-220/17	240	17.7	8.5		
SMT-BD1/m-220/30	240	30.8	10	12	15
SMT-BD1/m-220/30r	240	30.8	10	15	
SMT-BD1/m-220/45	240	48.6	10	15	20
SMT-BD1/m-220/45r	240	48.6	10	20	23
SMT-BD1/m-220/60	240	61	10	19	25
SMT-BD1/m-220/60r	240	61	12	26	30
SMT-BD1/m-220/70	240	70	25	30	35
SMT-BD1/m-220/100	240	100	25	30	35

Output current ratings in pulse current mode (I^2t protection in "limiting" mode)

DRIVE TYPE	Urated (Vrms)	Imax (Arms) 1 s	Max. authorized rated current (Arms) of the drive		
			No fan*	Fan 1*	Fan 2*
SMT-BD1/m-220/04	240	4,4	2		
SMT-BD1/m -220/08	240	8.8	4		
SMT-BD1/m-220/12	240	13.8	6		
SMT-BD1/m-220/17	240	17.7	8.5	8.5	
SMT-BD1/m-220/30	240	30.8	8.5	12	15
SMT-BD1/m-220/30r	240	30.8	10	15	
SMT-BD1/m-220/45	240	48.6	8.5	15	18
SMT-BD1/m-220/45r	240	48.6	10	20	23
SMT-BD1/m-220/60	240	61	8.5	17	20
SMT-BD1/m-220/60r	240	61	12	26	30
SMT-BD1/m-220/70	240	70	17	30	35
SMT-BD1/m-220/100	240	100	25	30	35

* Maximum ambient temperature = 40° C, fan 1 = 56 l/s, fan 2 = 90 l/s.

Note: SMT-BD1-X/X r drive types are equipped with an additional heatsink in order to improve the heat dissipation and increase their rated current. The width of these drives is then 18 TE instead of 12 TE.

Minimum inductance between phases 1 mH

Compliance with the standards: **CE** approval for multi-axis operation in the BF rack with mains filter BF35 or 70 or in single-axis racks BM20A or BMM05F/05AF with filters FN 612-20/06 or FN 356-16/06 or BF-35. 360° shield and equipotential according to the wiring rules	- EMC standards Immunity: CEI standards 801- 2 - 3 - 4 Conducted and radiated disturbances: EN 55011, Group 1, class A - Electrical standards for industrial machines: EN 60204.1: - Insulator: 1500 VAC/1 min. - Leakage current > 3 mA (EMI filters)
Temperature	* storage - 20°C to + 70°C * operation 5°C to +40°C From 40°C on, the rated currents must be reduced of 3 %/°C. Max. temperature: 50°C

1.2 - Current ratings for 400 VAC drive version

Operating voltage	565 VDC (480 VDC < DC bus < max. 685 VDC)
Auxiliary supply voltage	310 VDC (200 VDC < Uaux < 340 VDC)
Motor phase-phase output voltage	380 Vrms for 565 VDC bus

Output current ratings in pulse current mode (I^2t protection in "fusing" mode)

DRIVE TYPE	Urated (Vrms)	Imax (Arms) 1 s	Max. authorized rated current (Arms) of the drive	
			No fan*	Fan 2*
SMT-BD1/m-400/15	400	15.5	5	7.5
SMT-BD1/m-400/30	400	30	8	15
SMT-BD1/m-400/45	400	48	10	19
SMT-BD1/m-400/60	400	60	not used	28
SMT-BD1/m-400/100	400	100	not used	35

Output current ratings in pulse current mode (I^2t protection in "limiting" mode)

DRIVE TYPE	Urated (Vrms)	Imax (Arms) 1 s	Max. authorized rated current (Arms) of the drive	
			No fan*	Fan 2*
SMT-BD1/m-400/15	400	15.5	not used	5
SMT-BD1/m-400/30	400	30	not used	10
SMT-BD1/m-400/45	400	48	not used	15
SMT-BD1/m-400/60	400	60	not used	23
SMT-BD1/m-400/100	400	100	not used	28

Maximum room temperature: 40°C, fan type 2: 90 l/s.

Minimum inductance between phases	2 mH
Compliance with the standards: **CE** approval for multi-axis operation in the BF rack with mains filter BF-400/35 or 400/70. 360° shield and equipotential according to the wiring rules.	- EMC standards Immunity: CEI standards 801- 2 - 3 - 4 Conducted and radiated disturbances: EN 55011, Group 1, class A - Electrical standards for industrial machines: EN 60204.1: - Insulator: 2500 VAC/1 min. - Leakage current > 3 mA (EMI filters)
Temperature	* storage - 20°C to + 70°C * operation 5°C to +40°C From 40°C on, the rated currents must be reduced of 3 %/°C. Max. temperature: 50°C

1.3 - Other specifications

PWM switching frequency	10 kHz
Current regulator (PI)	adjusted to motor
Current loop bandwidth	Cut-off frequency for 45° phase shift > 1 kHz
Internal current limitation	Imax: 20 % to 100 % and I rated: 20 % to 50 % Imax duration =1 second
Speed and position regulators	Sampling period = 0,5 ms Anti-wind-up system of the integrator Adjustable digital gains
Speed loop bandwidth	Selectable cut-off frequency for 45° phase shift: 50 Hz, 75 Hz or 100 Hz
Max motor speed	Adjustable from 100 rpm to 10 000 rpm
Encoder position output	Two A and B channels in quadradure + n zero pulses per revolution. Programmable resolution: max. 8 192 ppr up to 900 rpm max. 4 096 ppr up to 3 600 rpm max.1 024 ppr up to 10 000 rpm Accuracy: 8 arc minutes +1/4 point (optional: 2 arc minutes + 1/4 point) Note: The total position accuracy must take into account the accuracy of the resolver used
Analog outputs (test connector)	Speed input command (CV): ±10 V for ± max speed. Speed monitor (GT): ±8 V for ±14 000 rpm, linearity: 10% Current input command (Idc): ±10 V for ± current rating, resolution: 8 bits Current monitor (Imes): ±10 V for ± current rating; resolution: 8 bits
Logic inputs	Enable/Disable: ENABLE Limit switch +: FC+ Limit switch - : FC- Homing input: INDEX Error reset: RAZ
Optocoupled logic inputs	START, STOP, JOG+, JOG-, IN1 to IN8
Relay outputs	Relay contact: Umax = 60 V Imax = 200 mA, Pmax = 10 W "Amp. ready": closed if drive OK, open if error "Power ready": closed if power OK, open if error Brake control
Optocoupled logic outputs	SEQ, POS, SPEED, OK, OUT1 to OUT8
Error display	Front panel LEDs and diagnostic via serial link RS-232
Motor and application parameter setting	Serial link RS-232
Automatic functions	Drive adjustment to the motor (AUTO-PHASING) Automatic regulator tuning (AUTO-TUNING)
Altitude	1000 m

Moisture	< 50% at 40°C and < 90% at 20°C: EN 60204-1 standard Condensation prohibited
Cooling	Natural convection or forced air according to the rated current. Condensation prohibited.

2 - MAIN PROTECTIONS

2.1 - STORED PROTECTIONS

PROTECTION	ERROR DISPLAY	LED
Drive rated current overload *: - blinking display = Idyn warning (I^2t threshold reached) - continuous display = drive disabled (I^2t error)	I^2t	● ❍ ❍ ❍
Position following error	Position	❍ ❍ ❍ ●
Resolver cable interruption	Resolver	❍ ● ❍ ❍
Power stage error: - power supply overvoltage - internal switch protection - short-circuit between phases - drive overtemperature for 4 A to 60 A current ratings	Power stage	● ● ❍ ❍
Resolver converter error	R.D.C	❍ ❍ ● ❍
Drive overtemperature for 70 A and 100 A current ratings	°C Ampli	● ❍ ● ❍
Power supply undervoltage	Undervoltage	❍ ● ● ❍
Motor overtemperature	°C Motor	● ● ● ❍
Drive parameter memory error	NovRAM	● ❍ ● ●
Automatic procedure of the drive - blinking display = procedure running - continuous display = operating error	Busy	● ● ● ●

❍ : Led is unlit ● : Led is lit

* The operation mode of the I^2t protection is described in chapter 8, section 5. 3.
All these errors are stored in the drive, except for the "Undervoltage" error.

The reset of a stored error can be made:
- via the error RESET input of X4, pin 13,
- by switching off the drive power supply.

2.2 - FUSE PROTECTION OF THE SMT-BD1/M DRIVE VERSION 220 VAC

F1 : Control of the average DC current of the power board supply.
F2 : Control of the average DC current of the logic board supply.

DRIVE TYPE	F1 - POWER	F2 - LOGIC
SMT-BD1/m-220/04 to 12	10 AT	1 A
SMT-BD1/m-220/17 and 30	15 AT	1 A
SMT-BD1/m-220/45	20 AT	1 A
SMT-BD1/m-220/60	20 AT	1 A
SMT-BD1/m-220/70	-	1 A
SMT-BD1/m-220/100	-	1 A

2.3 - FUSE PROTECTION OF THE SMT-BD1/M DRIVE VERSION 400 VAC

F2 : Control of the average DC current of the logic board supply.

DRIVE TYPE	F2 - LOGIC
SMT-BD1/m-400/15	1 A
SMT-BD1/m-400/30	1 A
SMT-BD1/m-400/45	1 A
SMT-BD1/m-400/60	1 A
SMT-BD1/m-400/100	1 A

Chapter 3 - Inputs-Outputs

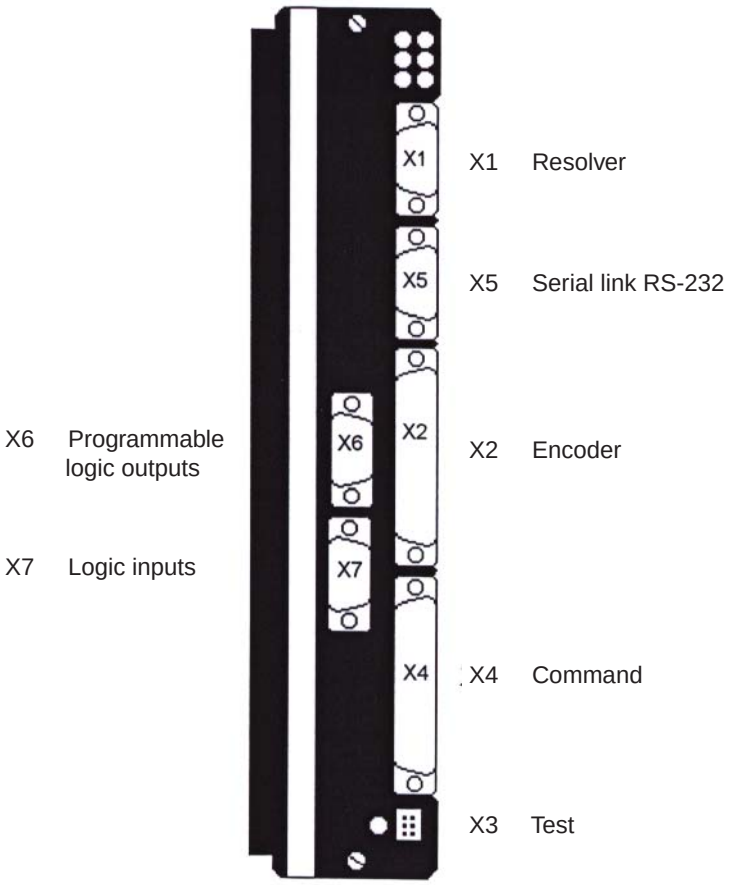
1 - CONNECTORS

1.1 - Rack connectors

For the 400 VAC drive version, see manual **BF/400 RACK**.
For the 220 VAC drive version, see manuals **SMT-BM20A SINGLE-AXIS RACK** or **BF RACK**.

1.2 - Drive connectors

Front panel connectors



2 - X1: RESOLVER CONNECTOR

Sub D 9 pins female.

PIN	FUNCTION	REMARKS
1	TC (pin H sensor connector)	If thermal switch connected to X1
6	Shield connection	If no "360°" connection on the connector
2	TC (pin I sensor connector)	If thermal switch connected to X1
7	S1 (pin C sensor connector)	MAVILOR motor
3	S3 (pin D sensor connector)	MAVILOR motor
8	S4 (pin B sensor connector)	MAVILOR motor
4	S2 (pin A sensor connector)	MAVILOR motor
9	R2 (pin F sensor connector)	MAVILOR motor
5	R1 (pin E sensor connector)	MAVILOR motor

For the connection of other resolvers than the resolver used on MAVILOR motors, see Chapter 8, section 4.

3 - X2: ENCODER CONNECTOR

Sub D 25 pins female

PIN	SIGNAL	I/O	DESCRIPTION
1	/CZ	O	Differential output of the encoder marker pulse (5 V 20 mA max.)
2	CZ	O	Differential output of the encoder marker pulse
3	/CA	O	Differential output of the encoder channel A (5 V 20 mA max.)
4	CA	O	Differential output of the encoder channel A
5	/CB	O	Differential output of the encoder channel B (5 V 20 mA max.)
6	CB	O	Differential output of the encoder channel B
7, 10, 11	0 V		
14	START	I	Optocoupled logic input
15	STOP	I	Optocoupled logic input
16	WAIT	I	Optocoupled logic input
17	TEACH	I	Optocoupled logic input
24	5 V		5 V jumper must be closed
8	JOG+	I	Optocoupled logic input
18	JOG-	I	Optocoupled logic input
9	SEQ	O	Optocoupled logic output
20	POS	O	Optocoupled logic output
21	SPEED	O	Optocoupled logic output
22	OK	O	Optocoupled logic output
23	GND (24 V)		Mass of external 24 V
12	24 V	I	24 V input. This input must be used only if one of the outputs SEQ, SPEED, POS and OK is used and if the OUT1 to OUT8 outputs are not wired.
25	GND		

4 - X4: COMMAND CONNECTOR - Sub D 25 pins male

PIN	FUNCTION	I/O	REMARKS
1	Limit switch +	I	Positive or negative logic
14	Limit switch -	I	Positive or negative logic
24	0V limit switch	I	
20	ENABLE	I	Positive or negative logic
23	0 Volt ENABLE	I	
4	RUN	I	Positive or negative logic
7	INDEX/CLR	I	Positive or negative logic
25	0 V logic input		
13	RESET	I	Error RESET via 0 volt (contact between pins 13 and 12)
12	0V RESET	I	
15	Reserved		
16	0 V analog	I	
17	Analog input	I	Speed reduction option
3	Reserved		
10	Speed monitor GT	O	
2	Current monitor Imes (DAC OUT2)	O	
11	0 Volt analog output	O	
18, 19	Amp. ready	O	Relay contact, closed when drive OK Pmax = 10 W with Umax = 60 V or Imax = 200 mA
8, 9	Brake control output	O	Relay contact. Pmax = 10 W with Umax = 60 V or Imax = 200 mA
21	+15 Volts	O	Max. 50 mA
22	-15 Volts	O	Max. 50 mA
5, 6	Unconnected		

5 - X6: LOGIC OUTPUTS CONNECTOR - Sub D 9 pins female

PIN	SIGNAL	DESCRIPTION
1	OUT1	Programmable output n° 1
2	OUT2	Programmable output n° 2
3	OUT3	Programmable output n° 3
4	OUT4	Programmable output n° 4
5	OUT5	Programmable output n° 5
6	OUT6	Programmable output n° 6
7	OUT7	Programmable output n° 7
8	OUT8	Programmable output n° 8
9	24 V	This 24 V must be used if one of the OUT1 to OUT8 outputs is wired

6 - X7: LOGIC INPUTS CONNECTOR - Sub D 9 pins male

PIN	SIGNAL	DESCRIPTION
1	IN1	Logic input n° 1
2	IN2	Logic input n° 2
3	IN3	Logic input n° 3
4	IN4	Logic input n° 4
5	IN5	Logic input n° 5
6	IN6	Logic input n° 6
7	IN7	Logic input n° 7
8	IN8	Logic input n° 8
9	GND 24 V	Mass of external 24 V

7 - X5: RS-232 CONNECTOR - Sub D 9 pins male

PIN	FUNCTION	REMARKS
5	0 V	GND (shield connection if no "360°" connection on the connector)
3	TXD	Transmit data RS 232
2	RXD	Receive data RS 232
6	TXH	Transmit data RS 422
7	TXL	Transmit data RS 422
8	RXL	Receive data RS 422
9	RXH	Receive data RS 422

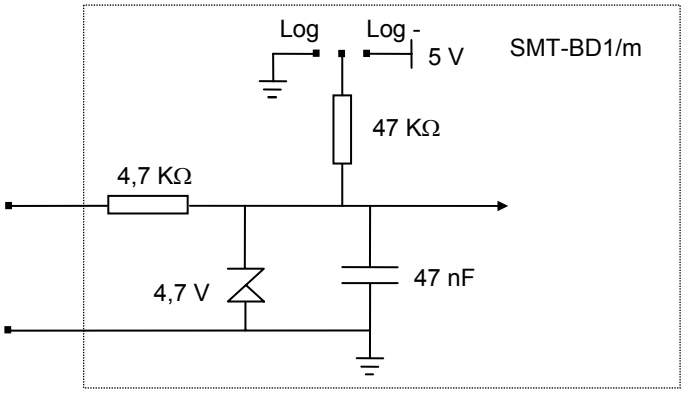
8 - X3: TEST CONNECTOR

PIN	FUNCTION	REMARKS
1 - 6	0 Volt	
2	Current input command I_{DC}	± 10 V; resolution: 8 bits, linearity: 10 % (DAC out 1)*
3	Reversed analog input	± 10 V for ± max. speed
4	Speed monitor GT	± 8 V for ± 14000 rpm
5	Current monitor I_{mes}	± 10 V; resolution: 8 bits, linearity: 10 % (DAC out 2)*

* : 10 V for drive current rating.

9 - SPECIFICATIONS OF THE LOGIC INPUTS-OUTPUTS

9.1 - DEDICATED LOGIC INPUTS: FC+, FC-, INDEX, RUN AND ENABLE

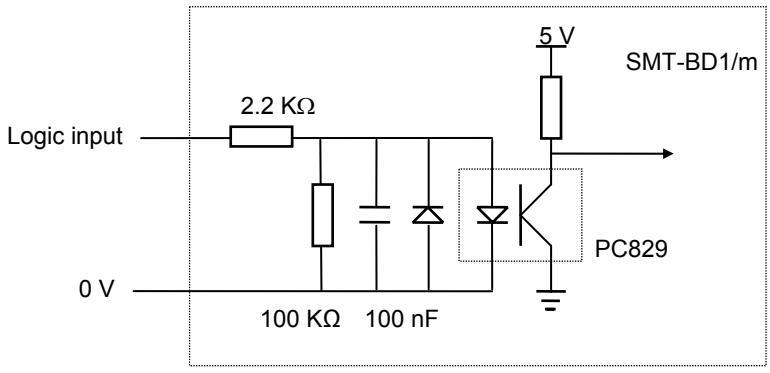


Input impedance : 4,7 kΩ

Response time : 500 µs

These inputs can be configurated in positive or negative logic by means of jumpers (see chapter 8, section 6.1 "Positive or negative logic inputs")

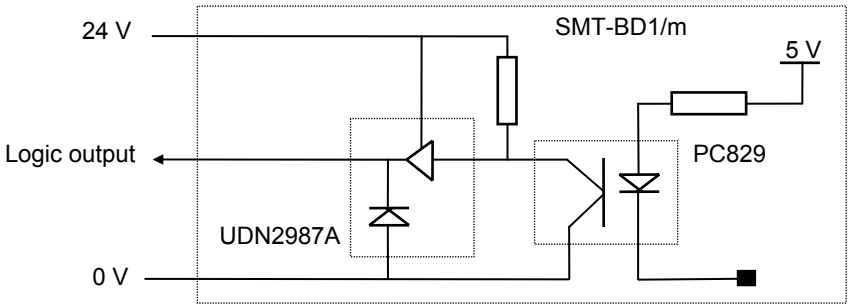
9.2 - LOGIC INPUTS START, STOP, JOG+, JOG-, IN1 TO IN8



The input voltage corresponds to level 1 and is between 5 V and 24 V

The polarity of these inputs can be reversed by a software parameter (see chapter 6, section 4.3.1 "Inputs - outputs configuration").

9.3 - LOGIC OUTPUTS SEQ, POS, SPEED, OK, OUT1 TO OUT8



The output current is 350 mA for the 8 outputs OUT1 to OUT8.

The polarity of these inputs can be reversed by a software parameter (see chapter 6, section 4.3.1 "Inputs - outputs configuration").

The parallel connection of these outputs must be made by means of diods.

IMPORTANT NOTE
If the 24 V is available when the drive is off, the logic SEQ, POS, SPEED, OK, OUT1 to OUT8 are set at 24 V.

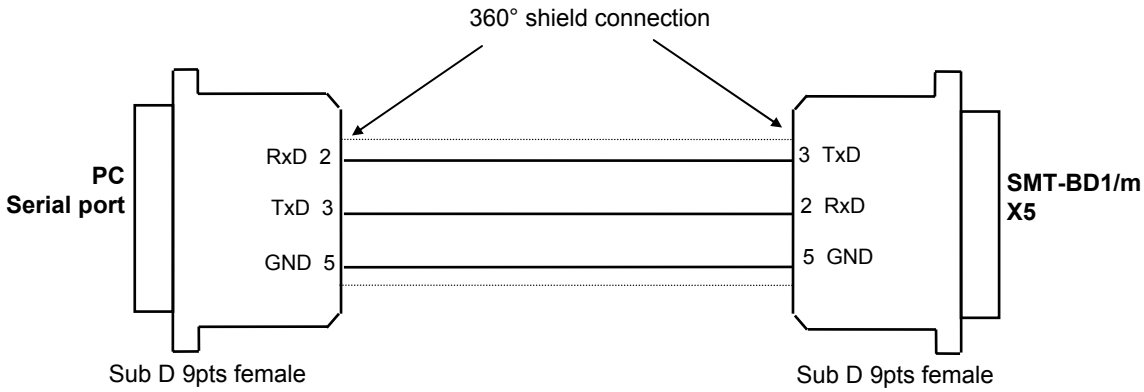
Chapter 4 - Connections

1 - CONNECTION DIAGRAMS

1.1 - POWER SUPPLY AND MOTOR CONNECTIONS

For the 400 VAC drive, see manual **BF/400 Rack**.
For the 220 VAC drive, see manuals **BF Rack** or **SMT-BM20 A / BMM05F/AF single-axis racks**.

1.2 - SERIAL LINK CONNECTION



2 - WIRING RECOMMENDATIONS

(according to standards CEI 801 and EN55011 - see diagram "Shield connection on the connectors" – Chapter 4, section 2.2).

2.1 - GND WIRING AND GROUNDING

CAUTION !
Each potential conducting element MUST be shielded. Several wires in the same sleeve must be twisted and shielded.

A shield has no effect if it is not connected:

- to a reference potential,
- via a connection as short as possible (some centimeters; 10 cm is prohibited),
- by a "360°" shield connection, that means that the whole circumference of the shield sleeve must be connected to the reference conductor by a metal collar.

According to the CEI 801 standard, connectors must be made of metal or metal plated and must allow a 360° shield connection.

Long reference potential connections (especially with the ground) are suitable ONLY if these connections have a very low impedance (less than 0,1 Ω). Any shield that is not used as a conductor can be connected at both ends if it is connected at both ends over 360° by means of metal connections ensuring the shield continuity.

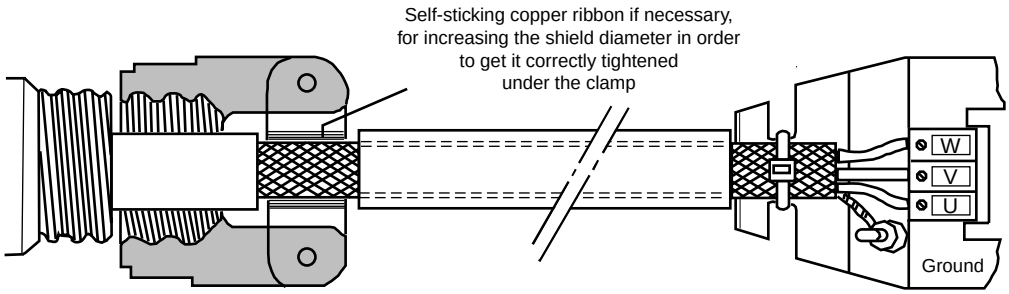
The reference potential is the **ground**.

Cables with low potential should NEVER run in the proximity of power lines.

If there is a potential reference, like a main chassis or a cabinet with a low impedance between its various elements, it should be used for short connections and be grounded itself.

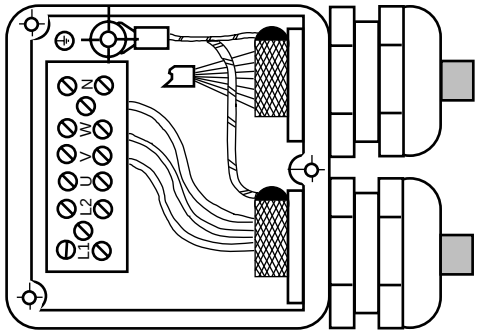
2.2 - SHIELD CONNECTION ON THE CONNECTORS

RULE
The shield must never be interrupted over the whole cable length.



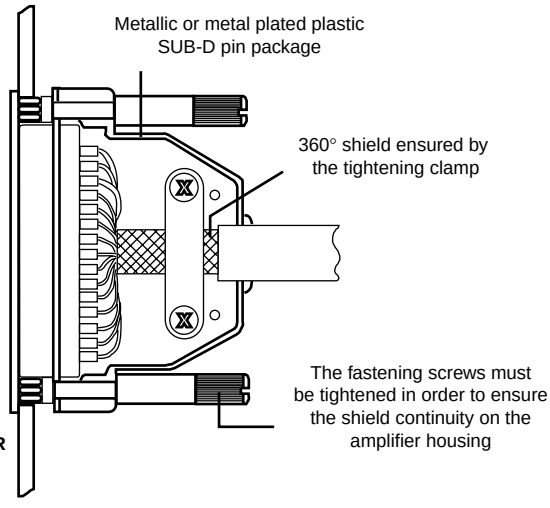
Motor connector for resolver and motor

BF RACK

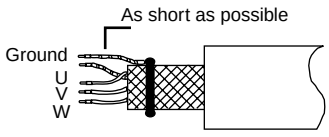


The cable can be soldered on the shield because the connector box is metallic. This solution does not exactly meet the EMC requirements but it is acceptable.

Motor connector box



SUB-D connectors



SMT.AS / M.AS
SMT-BM 20 A

NOTE
When the shield connection over 360° is made by means of a collar, there is no need for an additional connection on the appropriate SUB-D connector.

2.3 - MOTOR AND RESOLVER CABLES

Motors and resolvers are grounded via their housing.

Cable ends should have a metal connectors with collars allowing a 360° shield connection.

The resolver cable must be pair twisted and shielded (sin, cos, ref.). Motor cables MUST also be shielded.

2.4 - SERIAL LINK CABLE

The serial link cable must also be shielded according to the above mentioned shielding recommendations.

CAUTION !
Command cables (resolver, serial link, inputs/outputs) and power cables must be connected and disconnected with the drive **OFF**.

3 - FIRST POWERING OF THE DRIVE

The auxiliary power supply must be switched on before the power supply.

Test the auxiliary supply:

- **Rated value: 230 Vrms single-phase**
- **Maximum value (must not be exceeded) < 260 Vrms (all mains variation tolerances included).**

Switch on the auxiliary supply. The green "ON" Led must be lit and the UNDERVOLT. error displayed.

Test the power supply:

- 220 V drive version: **Rated value = 230 Vrms between phases**.
  Maximum value (must not be exceeded) < 260 Vrms (all mains variation tolerances included).
- 400 V drive version: : **Rated value = 400 Vrms between phases**.
  Maximum value (must not be exceeded) < 480 Vrms (all mains variation tolerances included).

Switch on the power supply. The UNDERVOLT. error Leds must be off. The braking resistor must remain cold.

NOTE
The ENABLE and RUN signals must be inactive.

CAUTION
The braking resistor is under high voltage.
After switching off the drive, wait at least 5 seconds before switching it on again.

Chapter 5 - Functional features

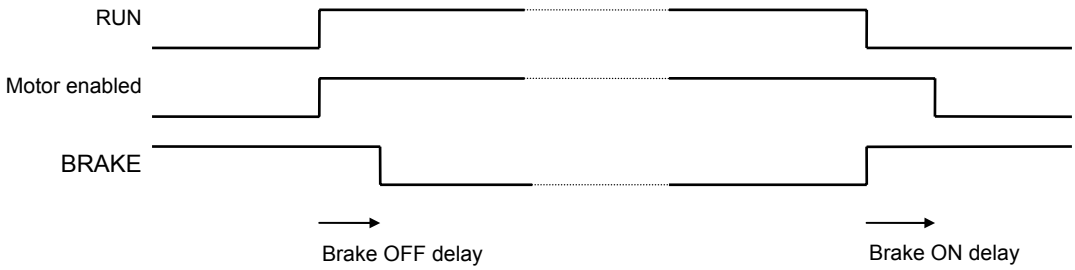
1 - DESCRIPTION OF THE LOGIC INPUTS-OUTPUTS

1.1 - LOGIC INPUTS

ENABLE Enabling authorized. This signal is a necessary conditions for the motor enabling (see also signal RUN).

RUN Enabling signal.

The motor can be enabled only when the signals ENABLE and RUN are activated. Use in priority the RUN signal if using the brake control.

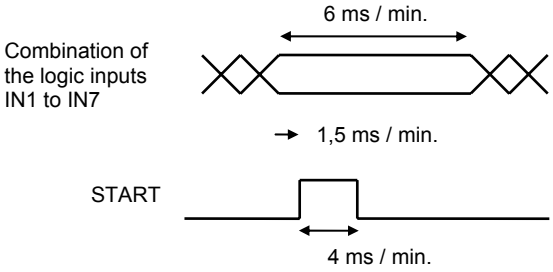


INDEX/CLR Index input for the axis homing. This input can be used for resetting the position counter.

FC+ Limit switch input, positive direction.

FC- Limit switch input, negative direction.

START This signal starts the sequence which number is defined by the inputs IN1 to IN7. This signal must be disabled before the sequence is over.



STOP This input stops the motor with a programmed deceleration

CLR This input resets the position counter when this function is configurated.

WAIT When this signal is activated, it inhibits the execution of a sequence. The sequence will start when this signal is disabled.

TEACH This input allows to read the value of the current motor position and to program the sequence defined by the logic inputs (IN1 to IN7) with this value. If the sequence contains an index research procedure (HOME), this function has no effect.
The TEACH input does not save the position in the EEPROM. This means the loss of the information after switching off the supply.

JOG+ Manual movement in positive direction.

JOG- Manual movement in negative direction.

IN1 to IN8 These inputs allow to define, in natural binary code, the sequence that will be executed. They also allow to define a sequence starting condition.

1.2 - LOGIC OUTPUTS

Amp OK This signal indicates that the drive is ready (without error).
During the saving in the EEPROM, the "AMP OK" signal remains active.

Power OK This signal indicates that the power supply is OK.

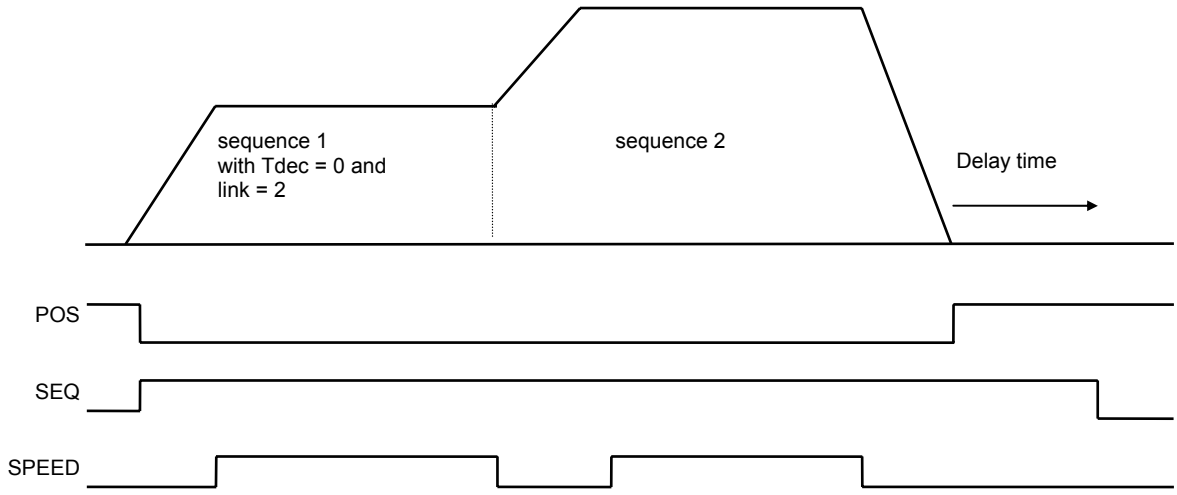
BRAKE This output controls the brake.

SEQ This signal indicates that a sequence is presently executed.

POS This signal is activated when the motor reaches the position, and remains enabled until the next motor movement.
In case of a forced movement, this signal remains enabled

SPEED This signal indicates that the speed stage is reached during a movement of the motor.

OK This signal indicates that the drive is ready for a movement (no error and drive enabled).



OUT to OUT8 Programmable logic outputs. These outputs are operating only during a programmed sequence. The OUT1 output can be used by activating the "Digital CAM" function (see section 5: Programmation).

2 - ADDRESSING

Each drive can have an address ≠ 0. The drive has 4 micro-switches (SW1) allowing to define an address from 0 to 15 (see location of these switches in chapter 8, section 3: Hardware adjustments).

The allocation of an address to a drive allows to communicate, from one single host, with several drives via the serial link (RS-232 or RS-422).

3 - REDUCTION OF THE PROGRAMMED SPEED VIA AN ANALOG INPUT

It is possible to get an optional analog input allowing to reduce the programmed speed. The displacement speed is reduced with regard to the programmed speed, inversely proportionally to the analog input value. This speed reduction is applied to the programmed speed of all sequences as well as the manual movement speeds.

Reversal of the analog input

This function allows to reverse the speed limitation.

Analog input	Speed limitation	Limitation of the reversed speed
0 Volts	No limitation	Maximum limitation
10 Volts	Maximum limitation	No limitation

Chapter 6 - Commissioning

1 - CHECKING THE DRIVE CONFIGURATION

The drive standard configuration for MAVILOR motors with its resolver is the following:

- Resolver adaptation card P RES: 4 x 12,7 KΩ 1%.
- Current loops adjustment according to table of chapter 8, section 1.
- Motor thermal probe PTC: Jumper MN.
- Positive control logic: Jumpers E. F. G closed.
- No auxiliary supply: Jumper JK closed and jumper KL open.

For the drive adjustment to other motor or resolver types, or to another control logic, see chapter 8, sections 2, 3 and 4.

2 - INSTALLING THE PC SOFTWARE

2.1 - Basic configuration

For running the VDSetup software required for the commissioning of the SMT-BD1/m positioner, the ***minimum*** PC configuration must be the following:

- Pentium processor 75
- RAM = 32 MB
- Screen: 256 colours, resolution 800x600
- keyboard + mouse
- Operating system: Windows95© or WindowsNT4©
- 8 MB available on the hard disk.

2.2 - Installation

Insert disk n° 1 and double-click on the "setup.exe" file of the disk.
Follow the instructions until the complete installation of the software.

IMPORTANT: The software must be installed on the hard disk C:

NOTES

- If the installation program has found some system files o the PC are not up-to-date, a message is displayed, asking for the PC to be re-started. The file "setup.exe" will then have to be executed again for going on with the installation of the **VDSetup** software.
- During the installation, one or several messages may appear, indicating that a currently copied file is older than the equivalent file already existing on the PC. In this case, keep the already existing file.
- The installation program will also try to copy the file "msvcrt.dll" on the hard disk as this file is necessary for the execution of **VDSetup**. But, if this file is already available in the system and is used by Windows at the start, an access violation message will be displayed. Ignore this error and continue the installation.

For any other information regarding the installation, please see "readme.txt" file.

2.3 - Connection to a drive and start of the software

Connect the serial link of the drive (marked "RS232") with a serial link (COM port) of the PC.
Switch on the drive and start the software on the PC (file "VDSetup.exe").

NOTES

- It is mandatory to use the "." as a decimal symbol for any numerical values entered by means of the keyboard.
- Series SMT-BD1/m positioners can work either in hexadecimal or in decimal mode. As the **VDSetup** software only manages the hexadecimal mode, it is necessary to configure this positioner type in this mode before starting the software.

When starting, VDSetup is testing the communication between the drive and the PC ports COM1 to COM3. If no communication can be settled, a warning message is displayed and **VDSetup** is running in off-line mode.

For more information in case of communication problems with the drive, see ***Visual Drive Setup Manual***, *Chapter 2: Installation of the software*.

3 - PUTTING INTO OPERATION

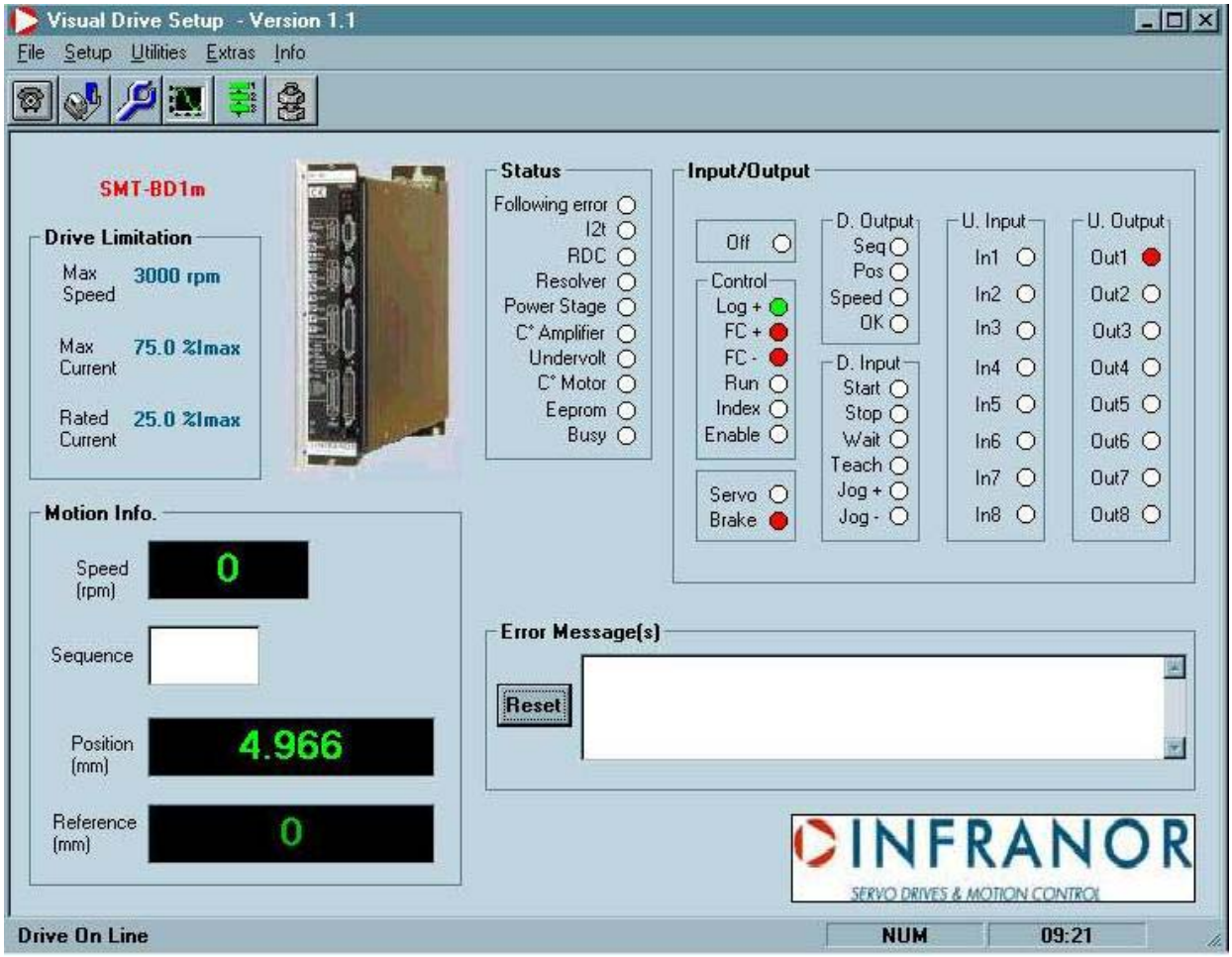
See Chapter 4: Connections, section 3: First powering of the drive.

Recall: ENABLE and RUN signals must be disabled.

CAUTION
When turning the off drive, wait at least 5 seconds before turning power on again.

4 - DRIVE COMMISSIONING AND ADJUSTMENT

Main screen of the PC software tool when the communication via the serial link is settled



4.1 - PARAMETER SETTING OF MOTOR AND DRIVE

(shortcut button )

The parameter setting software tool allows a quick commissioning thanks to the WIZARD function.
Clicking on the shortcut button will open a new window with several notebook tabs: **Servo motor**, **current limit**, **speed limit**, **encoder output**, **servo loop**.
A **Wizard** function is available at the bottom of the screen for helping the user to the easy and accurate adjustment of the motor/drive system. The Wizard successively leads through the notebook tabs mentioned above.
For a best use of the software tool, it is advisable to refer to the VISUAL DRIVE SETUP Manual.

If the user does not want to use the Wizard help, he will have to follow the instructions below:

Select the motor in the **Motor list**.

Check that the "**Current limitation**" parameters are complying with the motor and drive specifications.
It is advisable to use the I^2t "fusing" mode for the commissioning phases.

If the motor used in the application is not contained in the **Motor list**, proceed like follows:
- Adjust the "**Current limitation**" parameters according to the motor specifications.
- Uncouple the motor from its mechanical load and check that the motor shaft is free and that its rotation over one revolution is not dangerous for the operator.
- Start the **Autophasing** procedure.

Check that the "**Speed limitation**" parameters are complying with the motor specifications.
Select the **Encoder resolution** if the encoder emulation is used in the application. The encoder resolution window also allows to parameter set:
- the number of ZERO pulses per revolution (1 to 4)
- the ZERO pulse origin within one revolution (0 to 32767)
- the ZERO pulse width.

Couple the motor to its load and select the speed regulator (P, PI or PI^2). In the case of a vertical load, see *section 4.2*.

Start the **Auto-tuning** procedure and check that the axis rotation over one revolution is not dangerous for the operator. In the case of a vertical load, see *section 4.2*.

WARNING

The auto-tuning procedure should be executed in control mode by the PC and at standstill.

It is the user's responsibility to take the appropriate measures for reducing the risk due to uncontrolled motions of the axis during the auto-tuning procedure.

In case of loud noise in the motor at standstill or when running, check the transmission rigidity between motor and load (backlashes in the gears and couplings). If necessary, renew the **Auto-tuning** procedure by selecting a **lower** bandwidth. If the problem remains, renew the **auto-tuning** procedure by activating the **anti-resonance filter**.

Check that the motor is correctly running in both directions by activating the **logic inputs JOG+** and **JOG-**. If necessary, re-adjust the speed regulator parameters by means of the **Stability** button.

4.2 – MOTOR / DRIVE PARAMETER SETTING WITH A VERTICAL LOAD

Execute the **Auto-tuning** procedure with the motor **uncoupled from its mechanical load** in order to initialize the speed loop gains.

Select the **Limiting** mode of the I^2t function (see *chapter 8, section 5.3*). Then select the speed regulator type PI or PI^2.
Couple the motor to the load and move the axis by means of the digital speed input command until its stall position where **one axis revolution is not dangerous for operator and machine**.

Then execute the **Auto-tuning** procedure with the motor **enabled at its stall position** (zero speed input command).

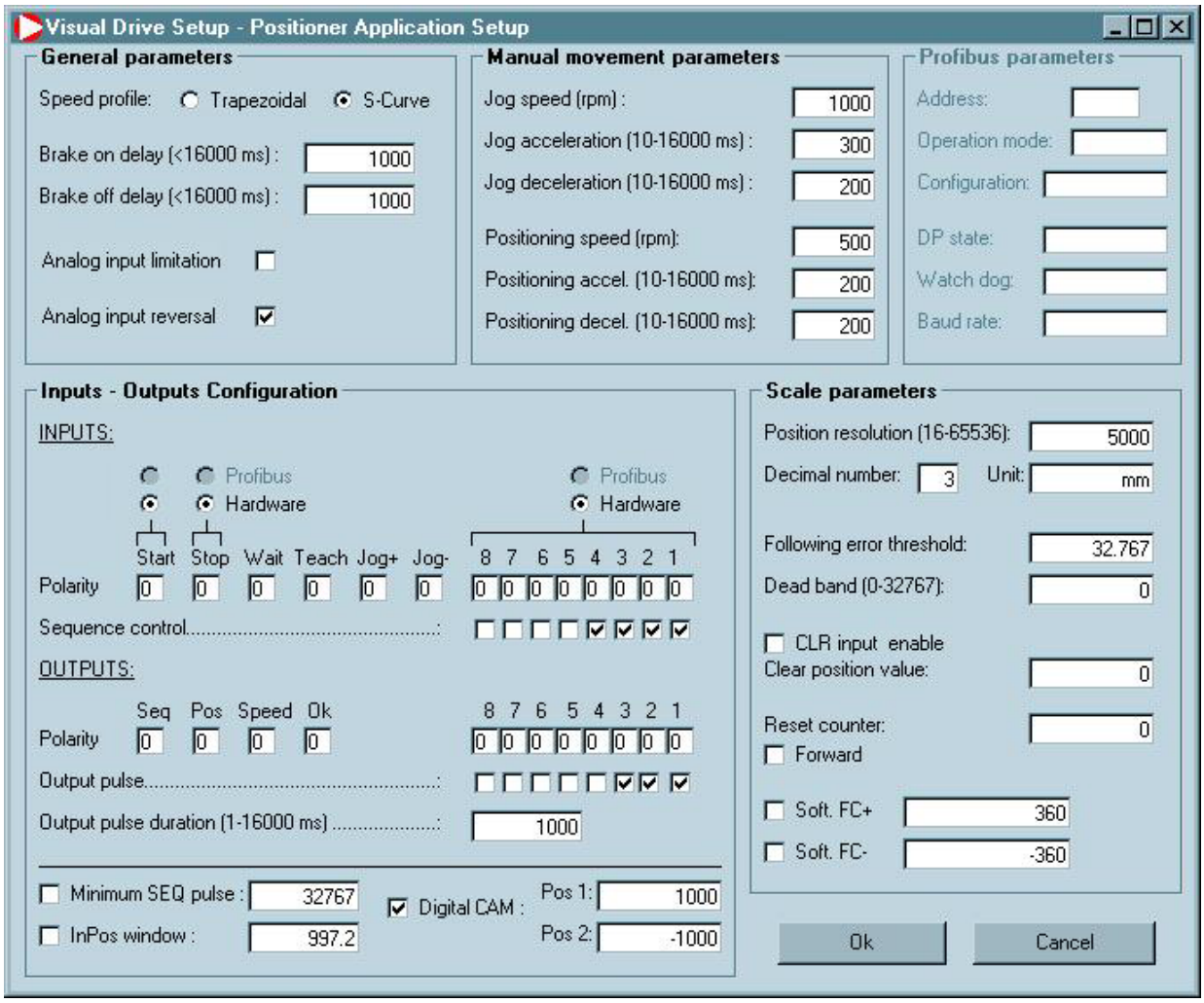
In case of loud noise in the motor at standstill or when running, check the rigidiy of the transmission between motor and load (backlashes in gearings and couplings). If necessary, renew the **Auto-tuning** procedure by selecting a lower bandwidth. If the problem remains, renew the **Auto-tuning** procedure while activating the antiresonance filter.

4.3 - SAVING THE DRIVE PARAMETERS

Save all the parameters in the EEPROM by means of the function **Save parameters to EEPROM**.

4.3.1 - INPUTS - OUTPUTS CONFIGURATION

Open the window "Position application setup" by means of the shortcut button 



Window "Inputs - Outputs Configuration".

Inputs polarity: Defines the polarity of the optocoupled inputs START, STOP, JOG+, JOG-, IN1 to IN8: if the box is marked with "1", the input is active on +24 V.

Sequence control: The inputs IN1 to IN7 can be used for selecting sequences (checked off). There are maximum 128 sequences that can be selected this way by the inputs IN1 to IN7 (in all-binary code). The other inputs can be used for the start condition.

Output polarity: Defines the polarity of the optocoupled outputs SEQ, POS, SPEED, OK, OUT1 to OUT8: if the box is marked with "1", the output is active on +24 V.

Output pulse: the outputs OUT1 to OUT8 can be defined as pulse outputs (checked off) which duration is defined by the parameter **output pulse duration** (1 to 16000 ms).

New functions

1. Minimum SEQ duration

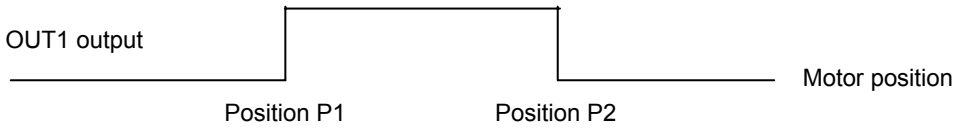
When activated, this function defines the minimum duration of the SEQ output.

2. Positioning window

When activated, this function defines the position window in which the Pos output is activated (only for a positioning).
Window = Arrival position +/- programmed value.
Note: The window is equal to twice the programmed value.

3. Digital CAM

When activated, this function activates the OUT1 logic output when the motor passes an area defined by positions P1 and P2.



4.3.2 - SCALE PARAMETERS

This menu allows the definition of following parameters:

Position resolution: defines the position resolution for one motor revolution according to the desired number of decimals and the desired unit. The value range is between 16 and 65536/rev.

Decimal: number of decimals.

Unit: defines the unit used.

Example: For a resolution of 4 mm/motor rev., if the number of decimals = 3, the parameters are:
Resolution = 4000
Decimal = 3
Unit = mm

Following error threshold: defines the triggering threshold of the following error.

Dead band : defines the dead band for the position control.

CLR input enable: when activated (checked off), allows to use the INDEX input for re-initializing the position counter: at the inactive-active transition of this signal, the value 0 will be loaded again in the position counter.

Reset counter: this function allows to reset the position counter when it reaches a pre-defined value. If the value is set at 0, this function is not activated.

Forward: with the function "Reset counter" activated,
- if this parameter is activated (ticked off), the motor turns in positive direction for an absolute displacement lower than the value of the "Reset counter" parameter,
- if this parameter is not activated (not ticked off), for an absolute displacement lower than the value of the "Reset counter" parameter, the motor follows the shortest way.

Soft FC+/-: This function is configurable.
The "limit switch" function is only active when the HOME procedure has been previously executed. The limit switches are inactive for a 0 homing sequence. When the motor passes the software limits defined in both fields, it is stopped with a controlled braking which deceleration is defined by the deceleration parameter defined for the "Jog" function. The withdrawal from the software limit switches is possible when the function is not active anymore or by a manual movement (Jog).

4.3.3 - GENERAL PARAMETERS

This menu allows the definition of following parameters:

Speed profile: trapezoidal or S-curve.

"Brake ON" delay: defines the time between the brake enabling and the drive disabling:
- brake ON (contact open),
- delay time,
- drive disabled.

"Brake OFF" delay: defines the time between the brake enabling and disabling:
- drive enabling,
- delay time,
- brake OFF (contact closed).

Analog input limitation: validates, by an analog input, the option "programmed speed reduction"; this is possible only when the option "analog input" is available.

The displacement speed is then limited with regard to the programmed speed value in an inversely proportional way to the analog input value. This speed reduction is applied to the programmed speed :
- modulation of the programmed speed for positioning sequences (ABS, REL),
- limitation for speed and torque sequences.

When the analog input is 0 V, the motor runs at the programmed speed. A 5 V input controls the motor at half of the programmed speed.

A 15 V signal is available on the X4 connector and allows to realize a "speed reduction" potentiometer.

Analog input reversal: Allows to reverse the polarity of the analog limitation input command. In this case, when the analog input is set at 0 V, the programmed speed is equal to 0.

4.3.4 - MANUAL MOVEMENT PARAMETERS

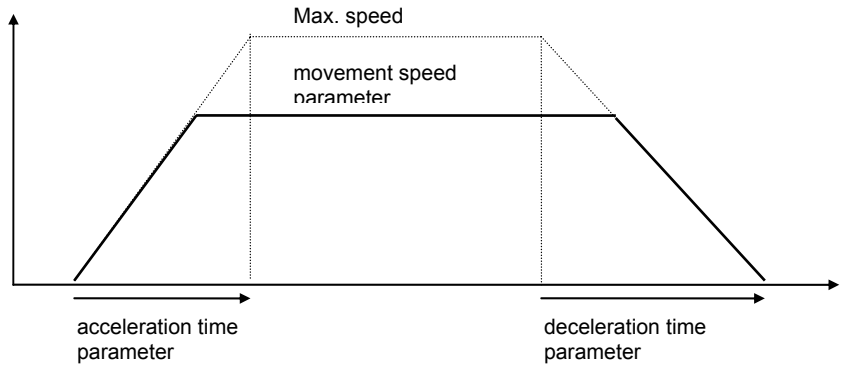
Frame "Manual movement parameters"

⇨ This menu defines the parameters **movement speed**, **acceleration time** and **deceleration time** during a movement via JOG+, JOG- or via the serial link. Control by means of the shortcut button

Software Control 

This function displays a control screen that allows the local control of a positioning via the serial link after having entered the position to be reached.

The parameters **acceleration time** and **deceleration time** define the time with regard to the maximum speed (defined by the parameter "Speed limitation"). When the movement speed is lower than the maximum speed, the trajectory acceleration and deceleration times are proportionally smaller.



4.3.5 - PARAMETERS SAVING

Menu "File", submenu "Store parameters to EEPROM".

When all adjustments are made, the parameters must be saved in the drive non volatile memory. This is made by executing the menu **Store parameters to EEPROM** with the ENABLE signal inhibited.

4.3.6 - PARAMETER FILES

Menu "File", submenu "Save parameters".

The menu "Save parameters" allows the access to following functions:
- saving of parameters on the disk (Save parameters)
- download of the saved parameters on the disk (Load parameters).

The menu "File", submenu "Parameters report" allows to save the parameters as a text file which can then be printed.

4.4 - ENABLING

The drive can be enabled only when the ENABLE and RUN signals are enabled.

ENABLE is a "hardware" signal that allows the drive inhibition in critical situations.

RUN is a "software" signal that allows the delay time control via the BRAKE output. During the Auto-phasing procedure, this signal must be inhibited and the ENABLE signal enabled.

If the brake is not used, the potential of the RUN signal should be set and the ENABLE signal should be used for the enabling/disabling (and not the contrary).

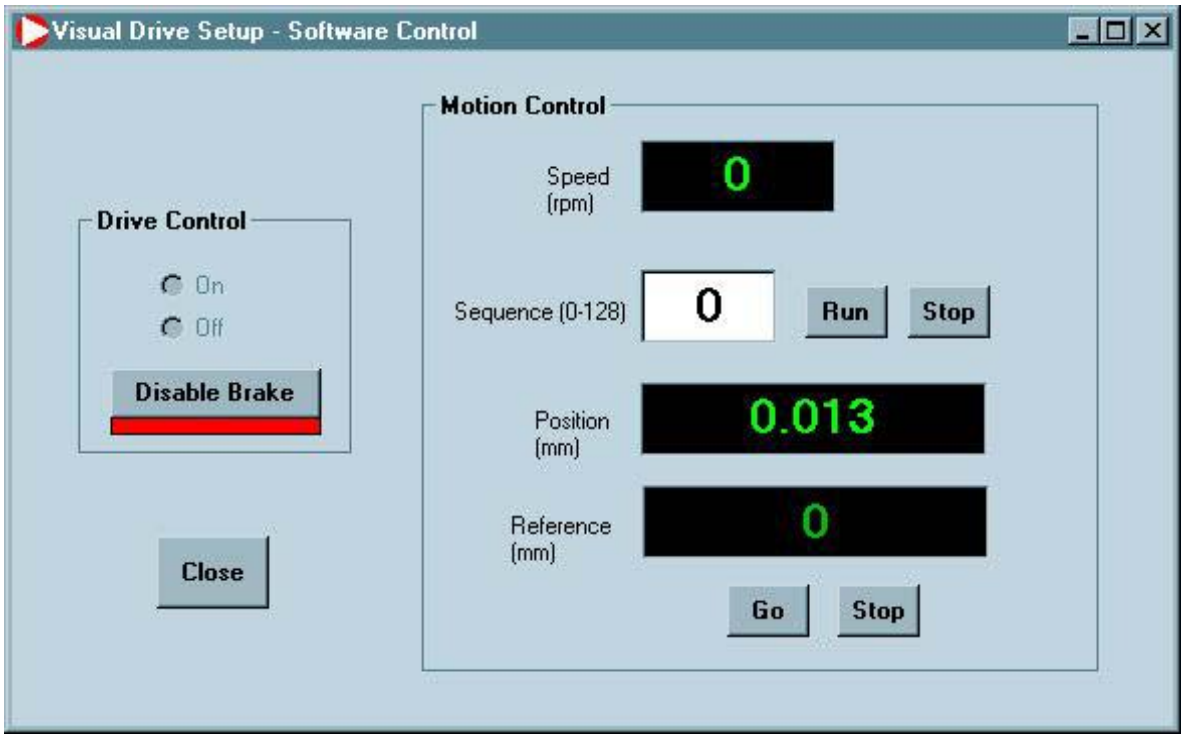
The brake control signal (BRAKE) is a low power signal that cannot directly control the brake. It must be connected to an external power relay for controlling the motor brake.

The brake control is enabled (contact open) or disabled (contact closed) according to the drive status (disabled or enabled).

4.5 - MANUAL MOVE

The manual move can be made as follows:

- via the inputs JOG+ and JOG-: the motor moves at the programmed speed (Manual movement parameters)
or
- via the serial link.



- When option **OFF** is checked off, the motor is disabled under control of the software.

- When option **ON** is checked off, the motor is enabled.

The operator has then got two possibilities:

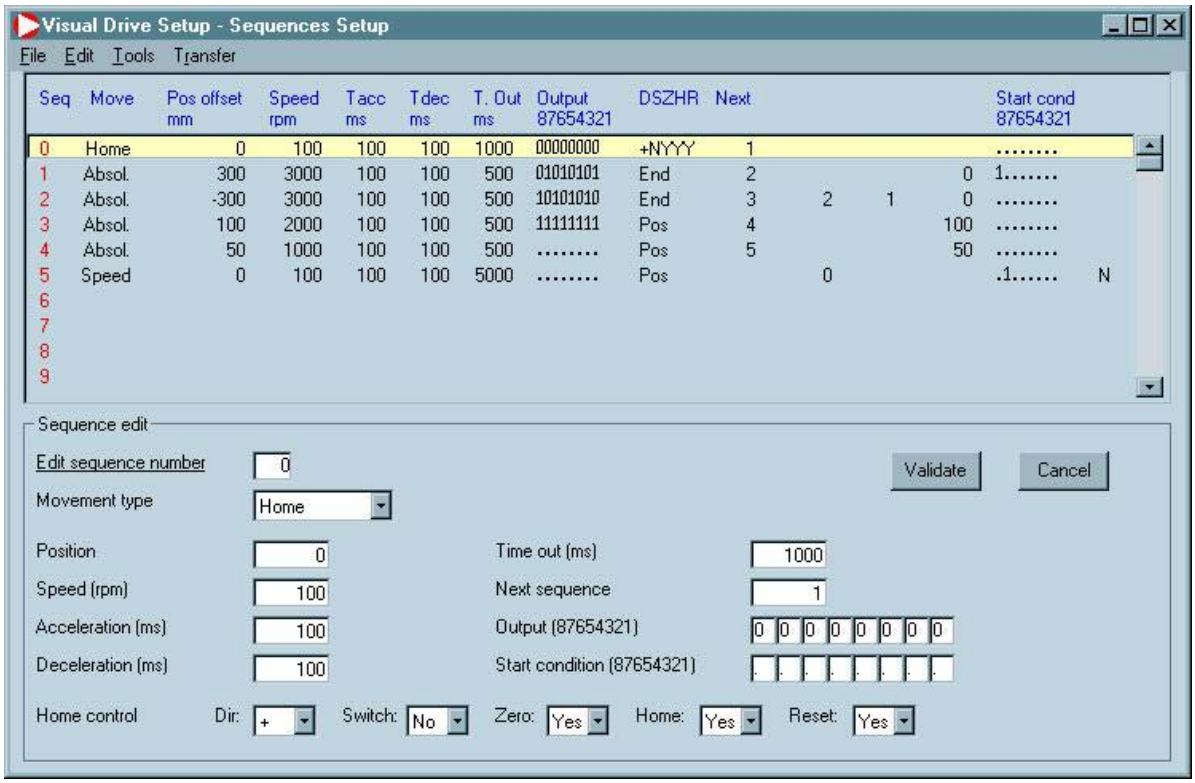
1) Define a position reference and a speed (by means of the cursor or by entering a value in the frame "speed") and click on button **Go**. The axis position is displayed and will be updated during the rotation until the reference position. Clicking on button **Stop** stops the current motion. If the STOP button is not activated, the motion is going on until the required position.

2) Enter a sequence number between 0 and 127. Sequences are motion sequences that are pre-stored in the drive. Click on button **Run** for starting the selected sequence. Click on button **Stop** for stopping the running sequence. If the STOP button is not activated, the sequence motion is going on until the required position.

5 - PROGRAMMATION

5.1 - GENERAL DESCRIPTION

The sequences programmation is accessible via a sequence editor which is accessible via the shortcut button "Sequence setup"  .



In the "Edit" menu, following functions are accessible:

- Function "Copy sequence" : copies the highlighted sequence.
- Function "Paste sequence" : pastes the sequence copied before (by F2) instead of the highlighted one.
- Function "Delete sequence": deletes the highlighted sequence.
- Function "Delete all sequences": deletes all sequences. CAUTION: the edited sequences are deleted but the sequences stored in the drive remain unchanged.

In the menu "Transfer", following function are accessible:

- Function "Load sequences from the drive": transfers the programme (128 sequences) from the drive to the PC. The drive must be disabled during the transfer.
- Function "Send sequences to drive": transfers the programme (128 sequences) from the drive to the PC. The drive must be disabled during the transfer.

In the menu "Tools", the following function is accessible:

- Function "Compare sequences": compares the parameters of the currently edited sequences with those stored in the drive. If a difference is found, a message displays the number of the differing sequence.

In the menu "File", the following functions are accessible:

- Saving a programme (sequences list) on the disk (Save sequences to disk)
- Loading a saved programme on the disk (Load sequences from disk)
- Saving the sequences list as a text file (Save report as)
- Printing the sequences list (Print report).

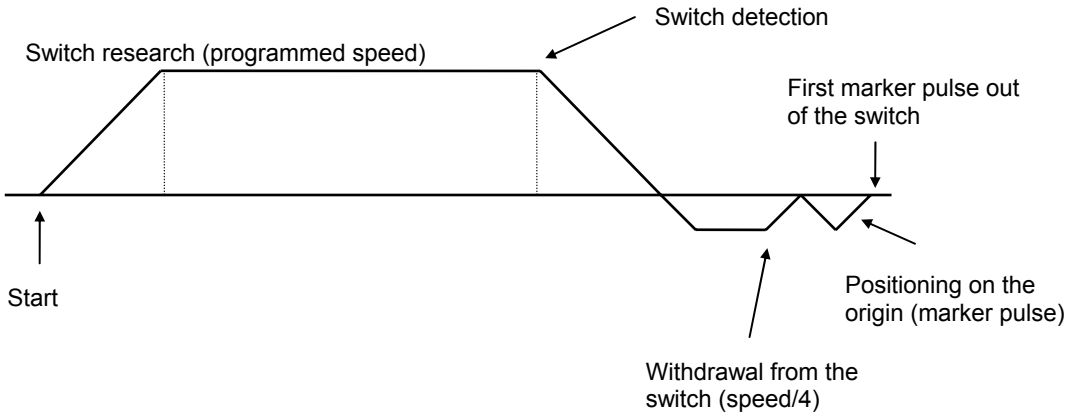
CAUTION !
When the "Resolution" parameter is modified, all position values in the sequences are also modified. When the parameter "Max. motor speed" is modified, all speed parameters in the sequences are also modified. Consequently, when a sequence file is sent to the SMT-BD1/m positioner, it must be programmed before with the correct parameters "Position resolution" and "Max. motor speed".

5.2 - EDITION OF A SEQUENCE

Parameters of a sequence:

Move Defines the movement type.
ABS: positioning in absolute dimension.
REL: positioning in relative dimension.
HOME: research procedure of the axis origin.
SPEED: motion in speed mode.
TORQUE: motion in speed mode with torque limitation.

Procedure diagram of the origin research:



When sequence 0 includes a homing procedure (HOME), no other sequence can be executed before sequence 0 at power up.

Pos Dimension to be reached, absolute or relative according to the parameter above. If **Move** is the origin research procedure, **Pos** is the value to be loaded into the position counter for the origin position found.
The value range is between (-32768 x resolution) and (+32768 x resolution -1).

Speed Defines the movement speed in rpm.

Tacc Defines the acceleration time in ms.

Tdec Defines the deceleration time in ms. This parameter can be = 0 when a chaining can be made without stopping the motor.
See also section 4.3.4 "Manual move parameters" for the definition of the parameters **Movement speed**, **Acceleration time** and **Deceleration time**.

Delay or **TimeOut** Defines, in ms, the delay time at the end of the positioning.
If the movement is the origin research procedure, this parameter defines, in seconds, the "time out" after which the drive releases an error (if it does not find the index position). If this value is set at 0, the "time out" protection is not activated.

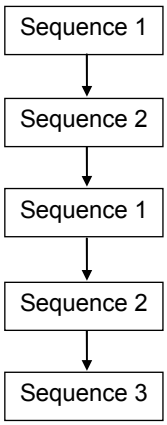
Next Defines the sequence to be executed after the current one.

Counter Defines how many times the sequence must be executed. This counter will be decremented at each executed sequence.

Counter link Defines the number of the sequence to be executed if the above counter is not at zero.
Example : sequence 1: Next = 2
Counter =
Counter link =

sequence 2:	Next = 3
	Counter = 2
	Counter link = 1
sequence 3:	Next =
	Counter =
	Counter link =

If the execution starts at sequence 1, the programme course will be the following:



start at sequence n° 1 then link (parameter "Next") to sequence n° 2.

first execution of sequence n° 2, then connection to sequence n° 1 (parameter "Counter link").

execution of sequence n° 1, then link to sequence n° 2 (parameter "Next")

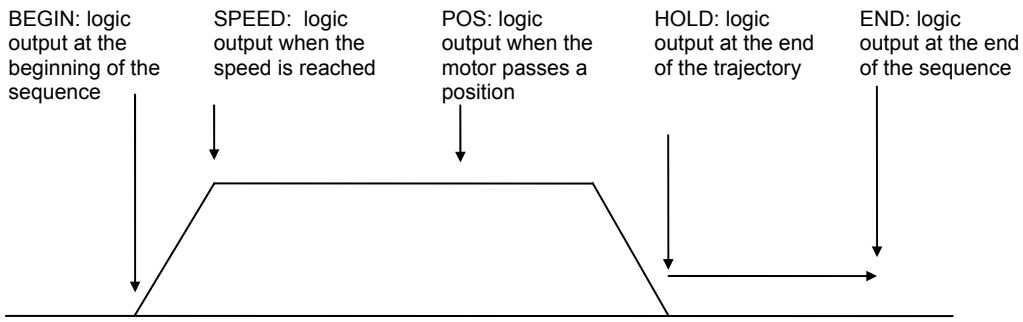
second execution of sequence n° 2, then connection to sequence n° 3 (parameter "Next").

execution of sequence n° 3, then programme over.

Output Defines the statement of the 8 outputs:

- **.** do not change the output statement
- **1** set the output at 1,
- **0** set the output at 0,
- **T** reverse the output (toggle).

Output trigger Defines the triggering moment of the outputs according to one of the five solutions below:



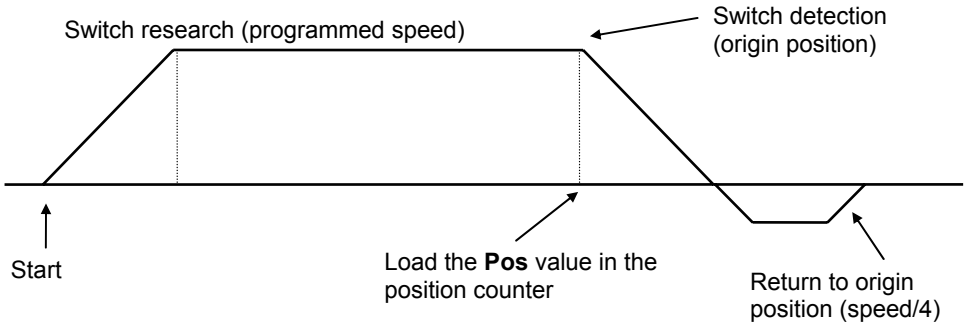
The outputs can also be preset as pulse outputs (cannot be modified by means of a programme) with a preset duration. This type of output only concerns the outputs set at 1 or "toggle" (see section 4.3.1 "Inputs - outputs configuration").

Regarding the origin research, the parameters are:

Dir	Research direction, "+" for the positive direction and "-" for the negative direction
Switch	Origin research with switch detection.
Zero	Origin research with marker pulse direction.
Origin	In the case with switch, this parameter allows to come back to the origin position (movement reversal); otherwise, the motor will be stopped after the braking.

Reset Load the **Pos** value in the position counter at the origin position.

Diagram of the procedure with switch:



If **Switch** = Y and **Zero** = Y or **Origin** = Y, the speed reversal is made by the switch detection or by a limit switch.

Output pos. Defines the position where the output must be triggered if it has been programmed (see above).

Start condition The inputs that are not defined as sequences selection inputs can be programmed here in order to define a starting condition for the programmed sequence.

Example : As the inputs 1 to 5 are sequences selection inputs, the inputs 6 to 8 can be used for the starting condition.
Conditions: inputs 6 to 1
inputs 8 to 0
input 7: unused
"Start conditions "0.1....." (inputs 7 and 1 to 5 are not concerned by the starting condition).
In these conditions, this sequence can only be executed if input 6 is set at 1 and input 8 at 0.
A conditional sequence connection can be programmed via the inputs by combining the "start condition" for the inputs with the « counter link » parameter. The counter parameter must be empty. The sequence will be executed if the "start condition" inputs are ready. Otherwise, it will not be executed and the programme directly switches on to the sequence indicated by the "counter link" parameter.

Example : Sequence 1 Next = 2
Counter =
Counter link = 4
Start condition = 1 ..... (IN8 input)
When executing this sequence:
if IN8 input = 1, sequence 1 will be executed and the programme switches on to sequence 2.
if IN8 input = 0, sequence 1 will not be executed and the programme directly switches on to sequence 4.
If, in the example above, the parameter "counter link" is empty, the programme waits until the "start condition" inputs are ready for executing sequence 1.

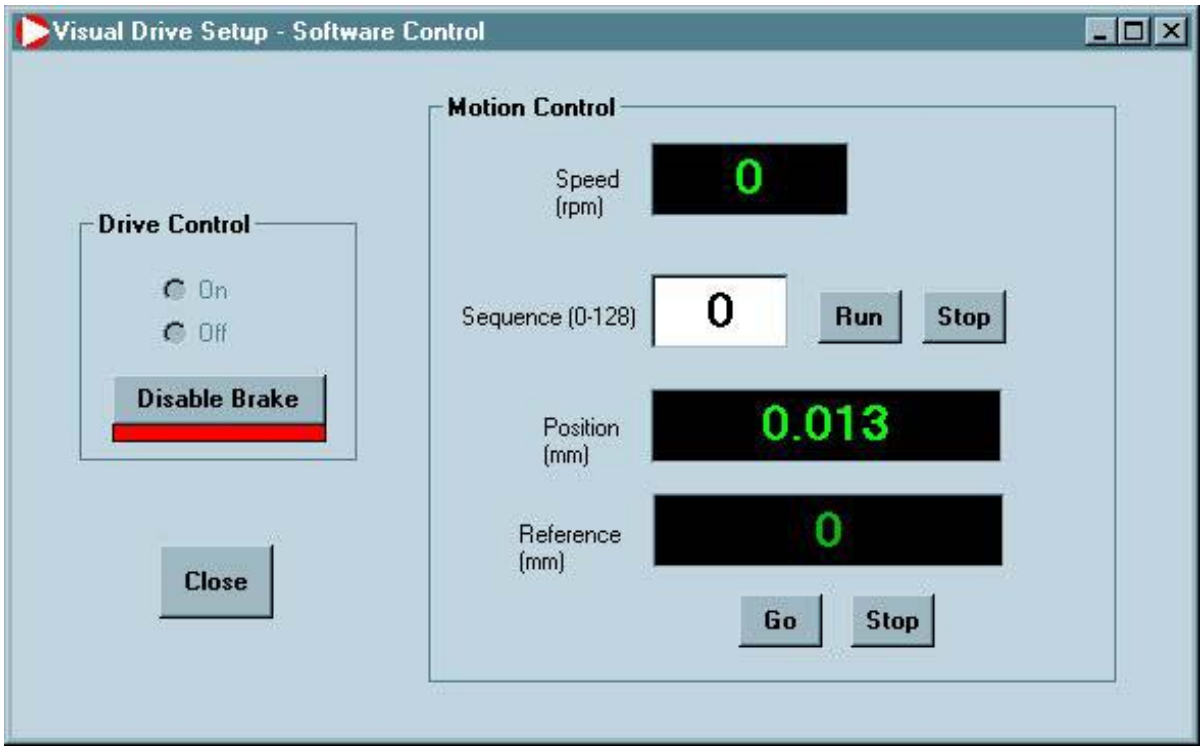
Stop condition The motion types "Speed" and "Torque" allow the use of the inputs defined as Start conditions as conditional STOP inputs for stopping the axis.

6 - PROGRAMME EXECUTION

The execution of a sequence can be made:

- via the logic input START: this input triggers the execution of the sequence defined by the inputs IN1 to IN7 (in natural binary code),
- via the serial link. The shortcut button 'Software Control' =>  allows the execution of any sequence.

Enter a sequence number between 0 and 127. Sequences are motion sequences that are pre-stored in the drive. Click on button **Run** for starting the selected sequence. Click on button **Stop** for stopping the running sequence. If the STOP button is not activated, the sequence will be completely executed.



NOTE : A sequence execution requires the enabling of the **OK** signal.

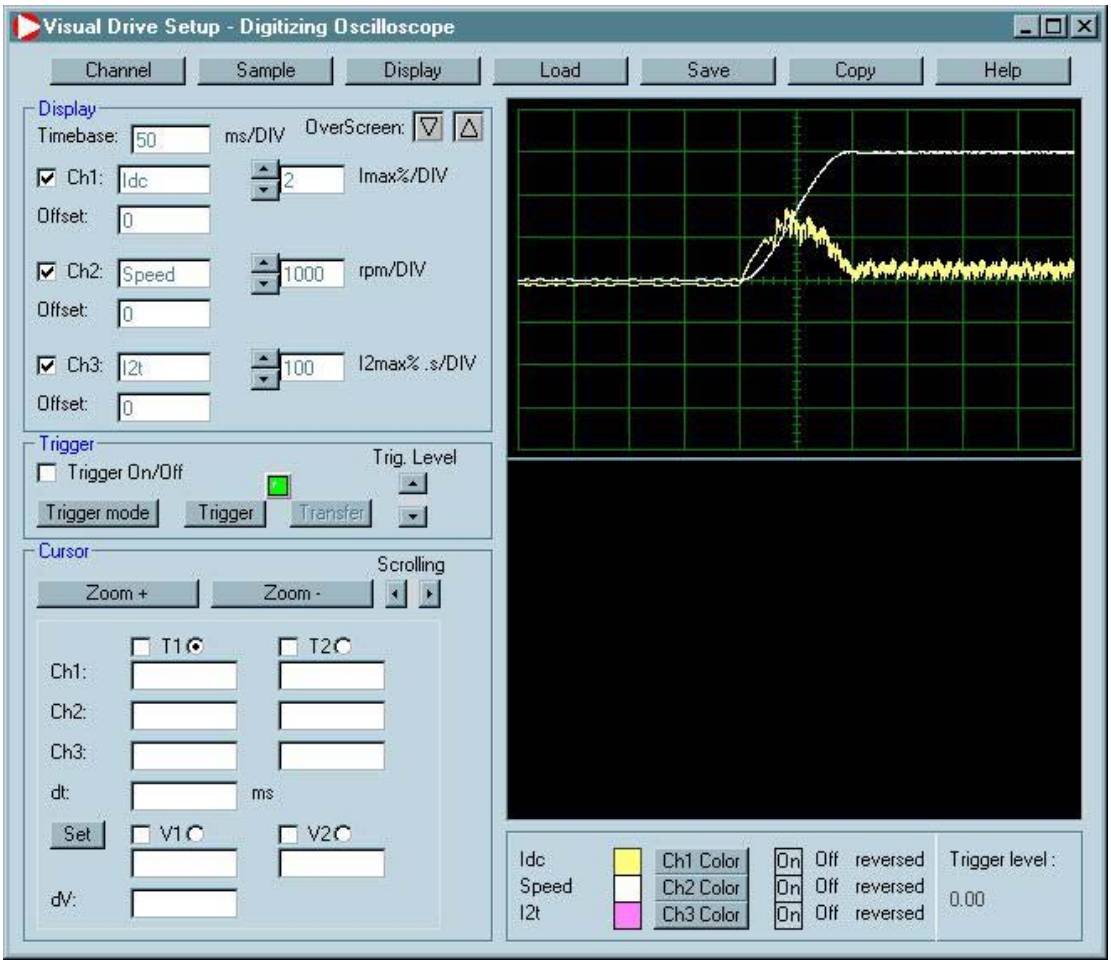
7 - USE OF THE OSCILLOSCOPE

The shortcut button "Oscilloscope" =>  displays the oscilloscope screen.

NOTE: Series SMT-BD1/m drives do not allow to display more than two oscilloscope channels at the same time. Channel 3 cannot be significant and must consequently not be validated.
For the detailed operation of the oscilloscope, see the VISUAL DRIVE SETUP Manual, Chapter 6: Oscilloscope.

The signals which can be displayed are the following:

Signal	Unit	Description
Speed	rpm	Speed monitor
Speed ref	rpm	Speed input command
Imes	% Imax	Current monitor
Idc	% Imax	Current input command
Iq	% Imax	4Q current monitor
Id	% Imax	Direct current monitor
Resolver	pts	Position provided by the resolver
Pos error	encoder edges	Position error
I flux ref	% Imax	Magnetization current input command
I flux mes	% Imax	Magnetization current monitor
I2t	% Imax.S	Current consumption measurement
DC bus	volts	DC bus voltage measurement
Threshold	pts	Dynamic following threshold



Chapter 7 - Troubleshooting and maintenance

1 - SYSTEM ERROR

If the red LED "SYS" is lit when turning on the drive, the logic board is defective.
- Check that the EPROM (firmware memory) is correctly plugged on the drive.
- Check that the EPROM version is actually x.x8.
- Check for the possible presence of conducting dust that may involve short-circuits on the drive logic board

2 - STORED ERRORS

If an error occurs on the drive, it can generate the detection of several other errors which are only a consequence of the initial one. In order to simplify the diagnostic and the maintenance, the errors are displayed and processed with the decreasing priority described in this chapter. For safety reasons, the elimination of some errors requires the POWER TO BE TURNED OFF; in this case, the RESET is automatic when turning power on again. If power is not turned off, do not forget to make a RESET immediately after the error elimination.

2.1 - "BUSY"

- If the BUSY error is continuously displayed after applying power to the drive, the AUTOTEST procedure has failed and the board is not ready for operation.

- If the BUSY error is continuously displayed after the execution of the AUTO-PHASING function, the procedure has failed because of an external cause and the calculated parameters are wrong. Check that the ENABLE input is actually closed. Then check that the motor is unloaded and the shaft movement is free during the procedure.

- If the BUSY error is continuously displayed after the execution of the AUTO-TUNING function, the procedure has failed because of an external cause and the calculated parameters are wrong. Check that the ENABLE input is actually closed. Then check that the motor is unloaded and the shaft movement is free during the procedure.

- This error may also occur during an origin research procedure which time out is too low.

2.2 - "NovRAM" or "EEPROM"

- Check the presence of the parameter memory NovRAM on its support and check its correct orientation.

- If the error remains, the NovRAM is not correctly initialized (CHECKSUM) or is not compatible with the drive software version.

- This error may occur when enabling the motor during a parameter saving or during a sequences transfer between PC and drive.

- For cancelling this error, if it is actually an error:
  - due to the parameters, make again the drive parameter setting and save the parameters again,
  - due to the sequences, send the sequences again in the drive.

It is important, when handling the memory, to avoid any physical contact with the circuit pins or to avoid any short-circuit between the pins (especially when plugging it on its support).

2.3 - "°C MOTOR"

- If the error occurs when starting the drive:
  * Check the configuration of the MN and OP jumpers with regard to the motor thermal probe.
  * Check the connection between the thermal probe and the drive on the front panel connector X1 or the X6 connector on the back of the rack.

- If the error occurs during the operation:
  * Check the motor temperature and look for the reason of this overheating (mechanical shaft overload, duty cycle too high, ...).

2.4 - "UNDERVOLT"

- If the error occurs when turning on the drive:
  * Check that the power supply is on.

2.5 -"°C AMPLIFIER"

Check that the fan type is correct with regard to the rated current required (see current table in chapter 2, section 1).

2.6 - "POWER STAGE"

- If the error occurs when turning on the drive:
  * Check the DC bus voltage and the terminal voltage of the power transformer secondary:
    - **SMT-BD1/m-230/I** (DC bus < 370 V_{DC} and V secondary < 260 V_{AC}), all mains variation tolerances included.
    - **SMT-BD1/m-400/I** (DC bus < 680 V_{DC} and V secondary < 480 V_{AC}), all mains variation tolerances included.
- If the error occurs during the operation:
  * Check the braking system during the motor deceleration phases.
  * Check the sizing of the braking resistor with regard to the deceleration phases.
  * Check that the current cycle corresponds to the current table (chapter 2, section 1).
  * Check for any short-circuit in the motor wiring and at the motor terminals

2.7 - "RESOLVER"

- Check the resolver connection on the drive connector X1
- Check the presence of the P-RES components on the drive.
- Check that the resolver type is correct with regard to the P-RES components (see chapter 8, section 2).
- Check the connections between resolver and drive and at the resolver terminals.

2.8 - "R.D.C"

- If the error occurs when turning on the drive:
  * Check that the value of the P-RES components corresponds to the resolver transformation ratio.
- If the error occurs during the operation:
  * Check that the motor speed does not exceed the maximum speed defined below:
  If Maximum speed ≤ 900 rpm, then limit speed = 900 rpm.
  If 900 rpm < Maximum speed ≤ 3 600 rpm, then limit speed = 3 600 rpm.
  If 3 600 rpm < Maximum speed ≤ 14 000 rpm, then limit speed = 14 000 rpm.
  CAUTION: in torque mode operation, the motor speed is given by the load.

2.9 - "I^2T"

- Check the rated current value required with regard to the current table in pulse mode cycle (chapter 2, section 1).
- Check the drive rated current value defined in the **Rated current** parameter with regard to the current required for the operation cycle.

3 - OPERATION PROBLEMS

3.1 - NO MOTOR MOVEMENT

- Check that the drive is on.
- Check that the power supply is on.
- Check the drive fuses (F1 and F2) and the motor connection.
- Check the logic wiring of the signals FC+, FC-, ENABLE and RUN (see chapter 8, section 4).
- Check that the drive is enabled.

3.2 - MOTOR SUPPLIED BUT NO TORQUE

- Check that the parameters **Max. current** and **Rated current** are ≠ 0.

3.3 - SHAFT LOCKED, ERRATIC OSCILLATIONS OR ROTATION AT MAXIMUM SPEED

- Check the resolver wiring on the X1 connector and the mechanical mounting of the resolver on the motor.
- Check the value of the motor parameters (number of pole pairs, resolver adjustment, motor phase).

3.4 - DISCONTINUOUS MOTOR ROTATION WITH ZERO TORQUE POSITIONS

- Check the connection of the three phase cables between motor and drive.

3.5 - LOUD CRACKLING NOISE IN THE MOTOR AT STANDSTILL

- Check that the Motor-Positioner-PLC groundings are made according to the recommendations of chapter 4.

3.6 - LOUD NOISE IN THE MOTOR AT STANDSTILL AND WHEN RUNNING

- Check the rigidity of the mechanical coupling between motor and load (backlash and elasticity in the gearboxes and couplings).
- Execute the AUTO-TUNING command again by choosing a lower bandwidth (Medium or Low).

4 - SERVICE AND MAINTENANCE

When exchanging a drive on a machine, proceed as follows:
- Check that the new drive has the same hardware configuration as the old one (including its address),
- Plug the parameter NovRAM of the old drive on the new one.

The new drive is now configurated like the old one.

Chapter 8 - Appendix

1 - USING SMT-BD1/m WITH A DISPLAY TERMINAL

1.1 - CONFIGURATION

1.1.1 - TERMINAL CONFIGURATION

- A display with 4 lines of 20 characters each:

- A keyboard with:
  0..9 keys,
  ENTER key,
  arrow keys.

- A serial link RS232:
  19200 baud, 1 stop bit, no parity,
  Protocol VT-100.

1.1.2 - POSITIONER CONFIGURATION

SMT-BD1/m with EPROM version 5.98 or higher.

Switch SW2.4 = OFF	PC mode: this mode is used to communicate with the PC software VDSetup, version 1.07 and higher.
Switch SW2.4 = ON	Terminal mode to communicate with a VT-100 terminal.

The switch SW2 is next to the X4 connector.

It is also possible to switch between these modes by means of the push button (Offset) on the front panel.

1.2 - USE

1.2.1 - MAIN MENU

```
1     Display position
2     Modify sequence
3     Run sequence
4     Move_
```

In the main menu, it is possible, with keys 1, 2, 3 or 4:
1 - to display the motor position and the user can move the motor (Jog+ or Jog-) by means of the arrow keys.
2 - to modify a defined sequence:
    modification of the position of a defined sequence: the operator enters the sequence number and its new programmed position.
    modification of the speed of a defined sequence: the operator enters the sequence number and its new programmed speed.
3 - to run a sequence: the operator enters the sequence number to execute.
4 - to move to a position: the operator enters the position to move to.

1.2.2 - DISPLAY POSITION

```
SMT-BD1/m
      103.ØØØ mm
```

The arrow keys [←] [→] [↓] [↑] allow to move the motor (jog+ or jog-), when the ENABLE and RUN signals are active.

The key [RETURN] allows the operator to go back to the main menu.

While in this screen, the user can stop the motor (if running) by pressing the key [0] .

```
STOP?_
```

The user must press the [RETURN] key to confirm motor stop or any other key to abort.

1.2.3 - MODIFICATION OF A SEQUENCE

This menu gives the operator the possibility to modify position or speed of a defined sequence.

```
MODIFY SEQUENCE
1     POSITION
2     SPEED_
```

The operator enters first the sequence number (this sequence must exist):

```
MODIFY POS
Sequence:_
Pos:
Pos:
```

The former position is displayed, and the operator can then enter a new position, or cancel by pressing only the ENTER key.

```
MODIFY POS
Sequence: 1
Pos: 45.ØØØ
Pos:_
```

The operator can modify the same way the speed of a defined sequence

```
MODIFY SPEED
Sequence: 1
Pos: 1000
Speed:_
```

1.2.4 - EXECUTE A SEQUENCE

When - the positioner is not executing any sequence,
- signals ENABLE and RUN are active.

the operator can enter a sequence number to be executed:

```
RUN SEQUENCE
Sequence:_
```

1.2.5 - MOVEMENT

When - the positioner is not executing any sequence,
- signals ENABLE and RUN are active,

the operator can enter the position to move to:

```
MOVEMENT
POS:_
```

2 - SMT-BD1/m INSTRUCTIONS LIST

2.1 - OVERVIEW

The specifications of the SMT-BD1/m positionier serial link are:
- 8 data bits, 1 stop bit, no parity,
- 19200 baud.

The parameters can be sent to the drive by an ASCII terminal using the instructions list given in this manual. Each instruction is coded as 2 ASCII characters with or without parameter.

Each instruction, which can be followed by one or two parameters sent to the drive, must end with a "carriage return" character (ASCII code 13). The parameters must be separated by a ',' (ASCII code 44).

All these characters, except for the "carriage return", will be sent back by the drive (echo).

The drive answer starts with a separation character ":" (ASCII code 58) possibly followed by a value. The drive will then send a "carriage return", a "line feed" (ASCII code 10) and ">" (ASCII code 62).

These instructions allow to modify or to read the value of a variable. If there is a parameter, the variable corresponding to the instruction will take this value. Otherwise, the drive will send back the actual variable value.

Notes :
- If the drive does not know the instruction, it will send back "?" instead of ":".
- Some instructions are only valid when the drive is disabled.

- If the entered parameter is out of the appropriate variable range or if the restrictive condition (drive disabled) is not answered, the parameter will not be taken into account (the drive will keep the former variable value).

- The drive normally works in hexadecimal. The switch SW2.1 (the switch SW2 is near the X4 connector) allows to switch to decimal mode at power up.
  SW2.1 = OFF hexadecimal mode,
  SW2.1 = ON decimal mode.
  The Visual Drive Setup software always changes the drive in hexadecimal mode independently of the status of SW2.1.
  It is necessary to exit Visual Drive Setup correctly to configurate the drive in mode by default (hexadecimal or decimal mode).

Dialog examples:
The user sends the NP instruction (number of motor pole pairs):
NP4
and a « carriage return » character for ending the instruction.
The drive will answer with:
NP4:
>
"NP4" is the echo of the characters sent. ":" indicates that the instruction has been decoded. The value 4 is stored in the variable corresponding to the number of motor pole pairs. After the character "carriage return", the drive will also send the ">" character in order to indicate that it is ready for a new instruction.

If the user sends the instruction:
NP

The drive will answer with:
NP:4
>

As there is no parameter in the instruction, the drive sends back the actual number of pole pairs.

2.2 - INSTRUCTIONS LIST

All instructions described below are specific of the SMT-BD1/m positioner. Other standard instructions are described in the standard "instructions list manual" of the SMT-BD1 standard drive.

The UP, US, UA and UD instructions are available and save position, speed, acceleration and deceleration in the EEPROM.

Modify position of a sequence

Instruction	UP
Parameters	1st parameter: sequence number. 2nd parameter: position value. If there is no 2nd parameter, the drive will return the actual position value of the sequence (1st parameter).
Conditions	This instruction can be sent only if there is no sequence executed. The sequence must exist.
Unit	The unit of the position value is defined by "position resolution" and "decimal number" defined in the BD1m software. The value must be sent without the decimal point. Example : position resolution : 5000 decimal number : 3 unit : mm If the user wants to set a value 100 mm to sequence 3, the instruction will be: UP3,100000 (in decimal mode)

Modify speed of a sequence

Instruction	US
Parameters	1st parameter: sequence number. 2nd parameter: speed. If there is no 2nd parameter, the drive will return the actual speed of the sequence (1st parameter).
Conditions	This instruction can be sent only if no sequence is executed. The sequence must exist. The minimum speed is 20 rpm.
Unit	rpm

Modify acceleration of a sequence

Instruction	UA
Parameters	1st parameter: sequence number. 2nd parameter: acceleration time. If there is no 2nd parameter, the drive will return the actual acceleration time of the sequence (1st parameter).
Conditions	This instruction can be sent only if no sequence is executed. The sequence must exist.
Unit	Second
Range	16 s - 16000 s
Remark	See SMT-BD1/m manual for the "acceleration time" signification.

Modify deceleration of a sequence

Instruction	UD
Parameters	1st parameter: sequence number. 2nd parameter : deceleration time. If there is no 2nd parameter, the drive will return the actual deceleration time of the sequence (1st parameter).
Conditions	This instruction can be sent only if no sequence is executed. The sequence must exist.
Unit	second
Range	16 s - 16000 s
RemarK	See SMT-BD1/m manual for the "deceleration time" signification.

Execution of a sequence

Instruction	GO
Parameters	1st parameter : sequence number.
Conditions	This instruction can be sent only if no sequence is executed. "Enable" and "Run" signals are activated. "Wait" and "Stop" inputs are not activated. The sequence must exist.
Remark	This instruction executes a sequence (with parameter as sequence number) regardless of the logic inputs status.

Position feedback

Instruction	PF
Parameters	none
Conditions	Read only
Remark	This instruction reads the position of the motor.
Unit	see *« modify position of a sequence »*.

Inputs/Outputs status

Instruction IO
Parameters None
Conditions Read only
Remarks This instruction reads the logic inputs and outputs status

bit	meaning
0	START
1	STOP
2	WAIT
3	TEACH
4	JOG+
5	JOG-
8	SEQ
9	POS
10	SPEED
11	OK
16	IN1
17	IN2
18	IN3
19	IN4
20	IN5
21	IN6
22	IN7
23	IN8
24	OUT1
25	OUT2
26	OUT3
27	OUT4
28	OUT5
29	OUT6
30	OUT7
31	OUT8

- Bit SEQ indicates that the positioner is running a sequence.
- A sequence can be executed when bit OK is set and bit STOP is reset, and also if the security of the first sequence is disabled.

Absolute move

Instruction MP
Parameters absolute position
Conditions "Enable" and "Run" signals are activated.
Remark
Unit see « *modify position of a sequence* ».

Speed (absolute movement)

Instruction DS
Defines the speed for absolute movement (MP).
Parameters Speed
Conditions
Remark This parameter is saved in the positioner memory.
Unit rpm

Acceleration (absolute movement)

Instruction DA
defines the acceleration for absolute movement (MP).
Parameters acceleration time
Conditions
Remark See SMT-BD1/m manual for the "acceleration time" signification.
This parameter is saved in the positioner memory.
Unit ms

Deceleration (absolute movement)

Instruction	DD defines the deceleration for absolute movement (MP).
Parameters	Deceleration time
Conditions	
Remark	See SMT-BD1/m manual for "deceleration time" signification. This parameter is saved in the positioner memory.
Unit	ms

Stop

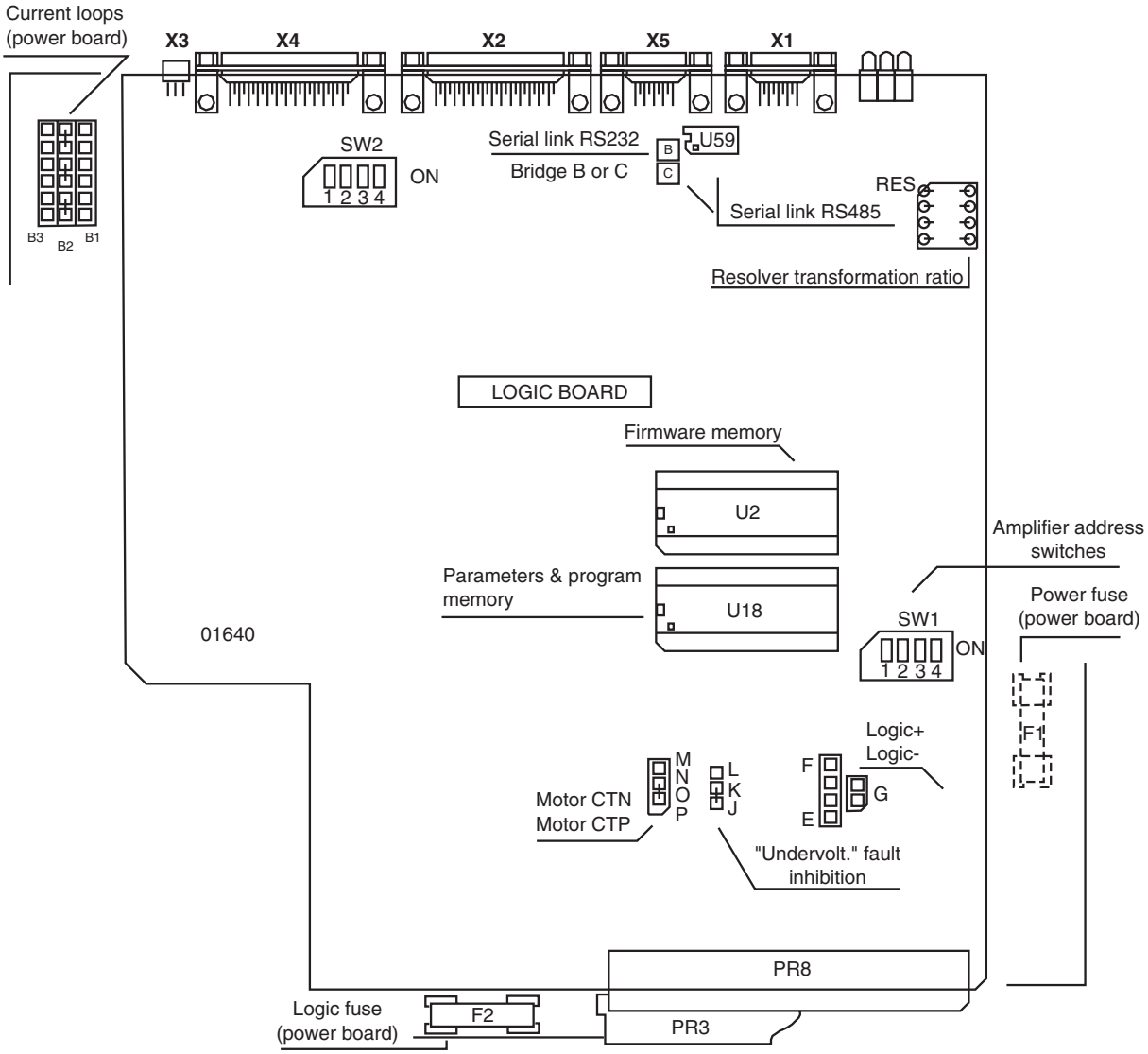
Instruction	SOFF
Parameters	
Conditions	
Remark	Stops all movements except for jog.
Unit	

Reading of the logic inputs

The ASCII character VI allows the reading of following instructions:

Bit	*Meaning*
0	Software limit switch +
1	Software limit switch -
4	Hardware limit switch +
5	Hardware limit switch -
6	Index
8	ENABLE

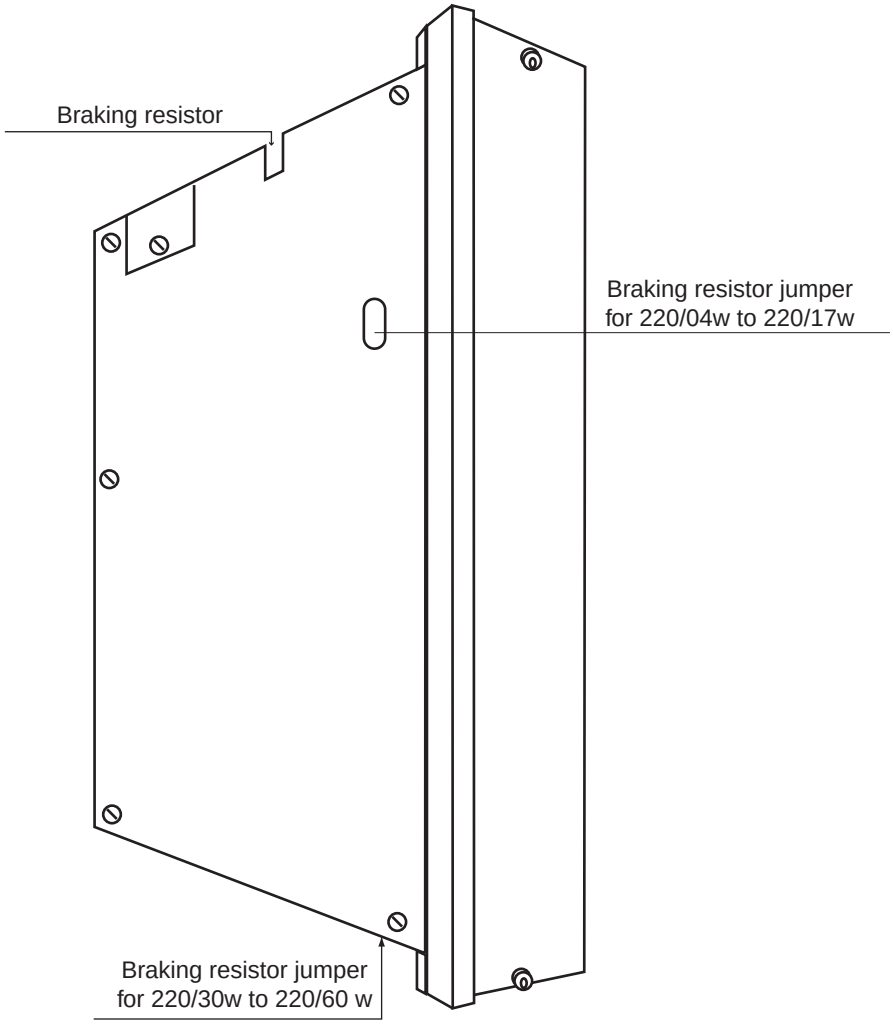
3 - HARDWARE ADJUSTMENTS LOCATION



For amplifier ratings 4 A to 100 A

CAUTION !
For amplifier versions with 70 A and 100 A current ratings in 220 V and serial numbers lower than 260600, please contact INFRANOR.

BRAKING SYSTEM SELECTION ON SMT-BD1/m-220/04w TO 220/60w

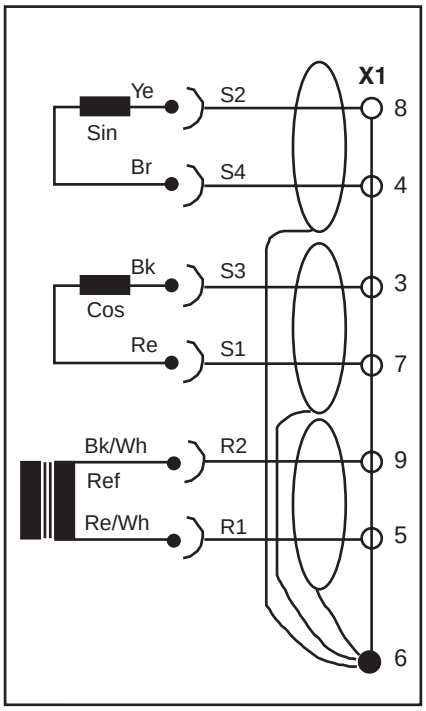


SMT-BM20 A single-axis rack: Braking resistor jumper closed.
BF-rack: Braking resistor jumper open.

NOTE:
This braking resistor system selection is only available on « **w** » referenced drives.

4 - ADJUSTMENT TO VARIOUS RESOLVERS

For the use of other resolvers than those mounted on MAVILOR motors, see X1 wiring diagram below as well as the manufacturer's diagram:



For the use of **resolvers** with other **transformation ratios** than 0,5, the Cos and Sin signal amplitude must be adjusted by means of the "**P-RES**" components according to the table below:

	P-RES			
Transformation ratio	0,3	0,45	0,5	1
A - B - C - D (tolerance < 1 %)	21 K	14,3 K	12,7 K	6,34 K

It may sometimes be necessary, for some resolvers, to adjust the phase shift between the Reference and the Cos and Sin feedback signals, by means of a specific "C60" capacitor. This adjustment is made by INFRANOR.

Note
When using resolvers with a number of pole pairs N > 1, all speed values displayed in the drive are equal to N times the motor rotation speed.

5 - ADJUSTMENT TO THE MOTOR

5.1 - CONFIGURATION OF THE MOTOR THERMAL SENSOR

Select jumper MN or OP according to the motor thermal sensor type (PTC or NTC).

5.1.1 - THERMAL SENSOR PTC

On motors equipped with a PTC thermal sensor (triggering on high impedance), the amplifier configuration is the following: MN jumper closed and OP jumper open. The triggering threshold adjustment for the PTC thermal sensor is made by means of the PSTH components, as described below : PSTH-D = 14,3 kΩ; PSTH-B = 28 kΩ; PSTH-A = 3 x RPTC (120°C) in kΩ. RPTC (120°C) = ohmic value of the PTC thermal sensor resistor at 120°C; the default adjustment is RPTC (120°C) # 3 kΩ with PSTH-A = 10 kΩ.

5.1.2 - THERMAL SENSOR NTC

On motors equipped with a NTC thermal sensor (triggering on low impedance), the amplifier configuration is the following: OP jumper closed and MN jumper open. The triggering threshold adjustment for the NTC thermal sensor is made by means of the PSTH components, as described below: PSTH-D = 14,3 kΩ; PSTH-B = 28 kΩ; PSTH-A = 3 x RNTC (120°C) in kΩ. RNTC (120°C) = ohmic value of the NTC thermal sensor resistor at 120°C; the default adjustment is RNTC (120°C) # 3 kΩ with PSTH-A = 10 kΩ.

5.2 - CURRENT LOOPS

5.2.1 - CURRENT LOOPS ADJUSTMENT ON DRIVES WITH 400 VAC SUPPLY

Select the current loop jumpers corresponding to the motor and drive specifications (position B1, B2 or B3).

For the 400 VAC range of the MAVILOR BL motors, the current loops adjustment is made according to the table below:

DRIVE / MOTOR	15 A	30 A	45 A	60 A	100 A
BL 113	B2				
BL 114	B2				
BL 115	B2	B1			
BL 141	B1	B1			
BL 142	B2	B1			
BL 143	B1	B1	B1		
BL 144	B1	B1	B1		
BL 191			B3	B3	B2
BL 192			B3	B3	B2

On other motor types, the current loops are adjusted according to the **drive current rating** and to **the inductance between the motor terminals** like follows:

15 A and 30 A DRIVES
- Calculation of **G = 0.8 x Drive current rating (A) x Inductance between phases (mH).**
- If **G < 60**, current loop jumpers (x3) on **B3** position.
- If **60 < G < 100**, current loop jumpers (x3) on **B2** position.
- If **G > 100**, current loop jumpers (x3) on **B1** position.

45 A, 60 A and 100 A DRIVES
- Calculation of **G = 0.8 x Drive current rating (A) x Inductance between phases (mH).**
- If **G < 100**, current loop jumpers (x3) on **B3** position.
- If **100 < G < 250**, current loop jumpers (x3) on **B2** position.
- If **G > 250**, current loop jumpers (x3) on **B1** position.

5.2.2 - CURRENT LOOPS ADJUSTMENT ON DRIVES WITH 220 VAC SUPPLY

Select the current loop jumpers corresponding to the motor and drive specifications (position B1, B2 or B3).
On the MAVILOR motor series BL and MA, the current loops adjustments are made according to the table below:

Drive / Motor	4 A	8 A	12 A	17 A	30 A	45 A	60 A	70 A	100 A
MA 3		B1							
MA 6		B1	B1						
MA 10		B2	B1	B1	B1				
MA 20		B2	B1	B1	B1	B1	B1		
MA 30				B2	B2	B2	B1	B1	
MA 45					B2	B2	B1	B1	B1
MA 55						B2	B2	B2	B1
BL 55-3	B1								
BL 55-5	B1								
BL 71		B2							
BL 72		B2	B1	B1					
BL 73		B2	B2	B1					
BL 74		B2	B2	B1					
BL 111		B1	B1						
BL 112		B2	B2	B1	B2				
BL 113		B3	B3	B2	B2	B2			
BL 114				B3	B3	B2	B2		
BL 115				B3	B3	B2	B2	B2	
BL 141				B2	B2	B2	B1	B1	
BL 142				B3	B3	B2	B2	B1	
BL 143				B3	B2	B2	B1	B1	B1
BL 144				B2	B2	B2	B1	B1	B1

On other motor types, the current loops are adjusted according to the **drive current rating** and to **the inductance between the motor terminals** like follows:

4 A, 8 A, 12 A AND 17 A DRIVES
- Calculation of **G = 1.4 x Drive current rating (A) x Inductance between phases (mH).**
- If **G < 60**, current loop jumpers (x3) on **B3** position.
- If **60 < G < 100**, current loop jumpers (x3) on **B2** position.
- If **G > 100**, current loop jumpers (x3) on **B1** position.

30 A, 45 A, 60 A, 70 A AND 100 A DRIVES
- Calculation of **G = 1.4 x Drive current rating (A) x Inductance between phases (mH).**
- If **G < 100**, current loop jumpers (x3) on **B3** position.
- If **100 < G < 250**, current loop jumpers (x3) on **B2** position.
- If **G > 250**, current loop jumpers (x3) on **B1** position.

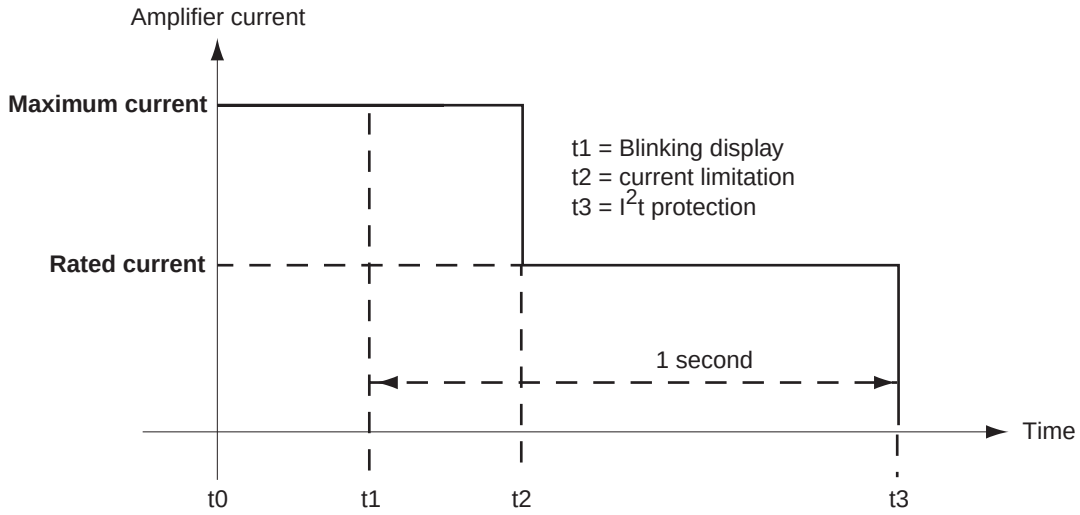
5.3 - I^2t PROTECTION

Current limitation in **Fusing** mode

When the amplifier RMS current (I^2t) reaches 85 % of the **Rated current**, the Idyn signal output is activated and the I^2t error display is blinking on the amplifier front panel. If the RMS current (I^2t) has not dropped below 85 % of the **Rated current** within 1 second, the I^2t fault is released and the amplifier is disabled (otherwise, the Idyn signal and the blinking I^2t error display are both cancelled).

When the amplifier RMS current (I^2t) reaches the **Rated current** value, the I^2t protection limits the amplifier current at this value.

The amplifier current limitation diagram in an extreme case (motor overload or locked shaft) is shown below.



The maximum current duration before the release of the Idyn signal depends on the value of the **Rated current** and **Maximum current** parameters. This value is calculated as follows:

$$T\ dyn\ (second) = t1 - t0 = 3.3 \times [\ \textbf{Rated current (\%)}\ /\ \textbf{Maximum current (\%)}\ ]^2$$

The maximum current duration before the limitation at the rated current also depends on the value of the **Rated current** and **Maximum current** parameters. This value is calculated as follows:

$$T\ max\ (second) = t2 - t0 = 4 \times [\ \textbf{Rated current (\%)}\ /\ \textbf{Maximum current (\%)}\ ]^2$$

NOTE 1
The above formulas are valid as long as the **Maximum current** / **Rated current** ratio is higher than 3/2. When the **Maximum current** / **Rated current** ratio is close to 1, the calculated values of Tdyn and Tmax are quite below the real values. For example when **Maximum current** / **Rated current** = 1.2, the measured Tdyn = 3.4 seconds and the measured Tmax = 4.4 seconds. When the **Maximum current** / **Rated current** ratio is equal to 1, the I^2t protection is no more disabling the amplifier but the current is limited at the **Rated current** value.

NOTE 2
The amplifier I^2t signal can be displayed on the digitizing oscilloscope by selecting the "**I^2t**" signal in the "**Channel**" menu. The I^2t signal threshold values according to the I^2t protection mode described above are calculated in the following manner :

Idyn signal activation threshold (%) = $[\textbf{Rated current (\%)}]^2$ / 70
Current limitation threshold (%) = $[\textbf{Rated current (\%)}]^2$ / 50

The corresponding amplifier RMS current value can be calculated according to following formula :

Amplifier RMS current (%) = $[\textbf{I}^2\textbf{t signal value (\%)} \times 50]^{1/2}$

CAUTION

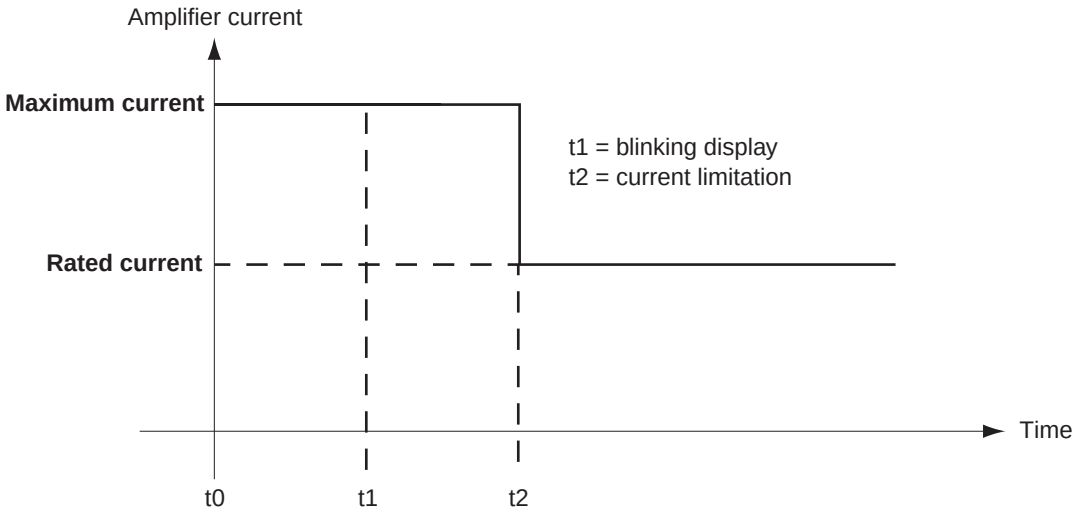
In Fusing mode, the amplifier Rated current value must be adjusted in order to be lower or equal to the Maximum authorized rated current of the amplifier (see chapter 2, section 1).

Current limitation in **Limiting** mode

When the amplifier RMS current (I^2t) reaches 85 % of the **Rated current**, the Idyn signal output is activated and the I^2t error display is blinking on the amplifier front panel. When the RMS current (I^2t) drops below 85 % of the **Rated current**, the Idyn signal and the blinking I^2t error display are both cancelled.

When the amplifier RMS current (I^2t) reaches the **Rated current** value, the I^2t protection limits the amplifier current at this value.

The amplifier current limitation diagram in an extreme case (motor overload or locked shaft) is shown below:



The maximum current duration before the release of the Idyn signal output (t1 - t0) and before limitation at the rated current (t2 - t0) is calculated the same way as for the **Fusing** mode.

The I^2t signal threshold values and the amplifier RMS current value on the digitizing oscilloscope, are also calculated the same way as for the **Fusing** mode.

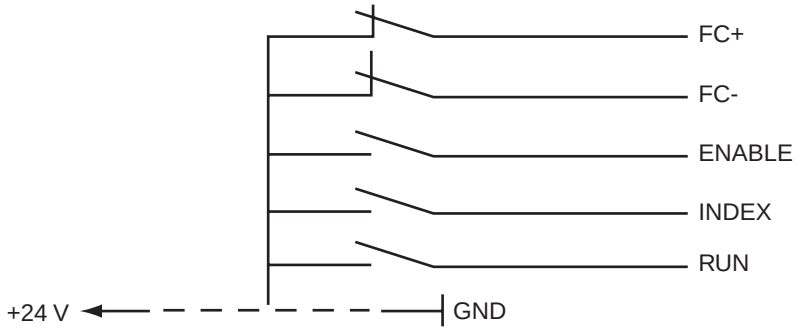
CAUTION

In **Limiting mode**, the amplifier **Rated current** value must be adjusted in order to be lower or equal to the **Maximum authorized continuous current** of the amplifier (see chapter 2, section 1).

6 - LOGIC CONTROL ADJUSTMENT

6.1 - POSITIVE OR NEGATIVE LOGIC INPUTS

The logic inputs **FC+**, **FC-**, **ENABLE**, **RUN** and **INDEX** of the logic connector **X4** can be configurated in positive logic (control by +24 V) or in negative logic (control by 0 V) as described below:



POSITIVE LOGIC : E-F-G jumpers closed	Range: active at level 5 < V < 30 V. Input impedance : 4,7 KΩ. Response time: 500 µs.
NEGATIVE LOGIC: E-F-G jumpers open	Range: inactive or open at level 5 < V < 30 V. Input impedance: 4,7 KΩ. Response time: 500 µs.

Note: The inputs (**FC+**, **FC-**, **ENABLE, RUN, INDEX**) of the **X4** connector must all be in positive logic, or all in negative logic.

6.2 - USE OF THE "AMP. READY" AND "POWER READY" OUTPUTS

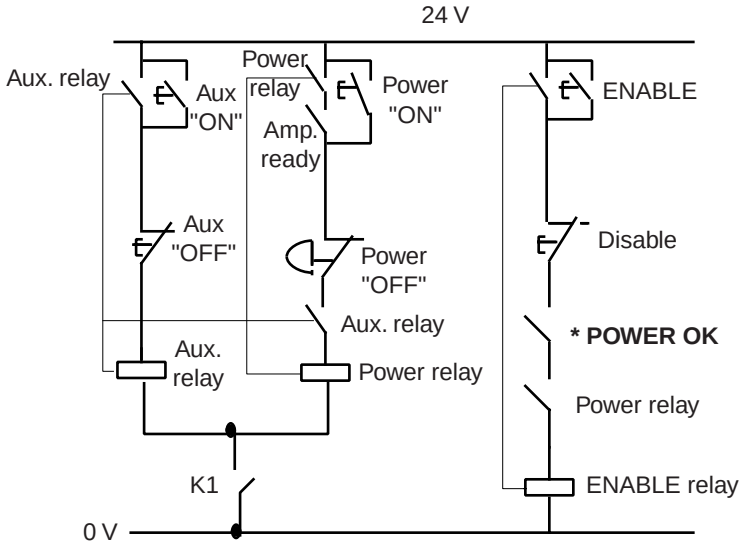
When an amplifier error is released, the **AMP. READY** output is immediatly disabled (contact is open). After elimination of the error source, the amplifier can be reset via pins 12 and 13 of the X4 connector.

If the amplifier control board must be kept active when a stored fault is released on the amplifier and the power supply turned off, it is necessary to have an auxiliary supply for the logic board which is independent from the power supply. In this case, the **JK** and **KL** jumpers of the logic board allow to inhibit or to release the "Undervolt." fault when the amplifier is turned on.

JK jumper closed and **KL** jumper open configuration :
If the auxiliary supply is turned on before the main power supply, the "Undervolt." fault is displayed and can hide a fault of lower priority. The **AMP READY** and **POWER READY** outputs are both inactive (contact is open) until the power supply in on.

JK jumper open and **KL** jumper closed configuration :
The "Undervolt." fault is inhibited when turning on the auxiliary supply before switching on the main power supply. The **AMP READY** output is then active and **POWER READY** remains inactive (contact open) until the main power supply is on.

NOTE
The **POWER READY** output is only available in the BF rack housing. Please see the **BF RACK** or the **BF/400 RACK** manuals. If the **POWER READY** signal is not used, make the **JK** jumper on the amplifier in order to have the **AMP. READY** signal taking into account the power statement



Amp ready	"Amp ready" signals of all axes
Power ready	"Power ready" signals of all axes
Power relay	Relay for power ON
Logic relay	Relay for logic ON
ENABLE Relay	Servo control relay
K.1	Auxiliary contact of the main isolation switch

CAUTION !

***Power OK** : only available on rack rear connector X5.
If not using the Power OK signal, make jumper JK on the drive in order to have the Amp. Ready signal taking into account the power status.

7 - SERIAL LINK

In standard, the serial link is an RS-232 link with **jumper B closed**. Optional, the drive can be delivered with an RS-422 serial link, that is with **jumper C closed**.

8 - DRIVE TYPES