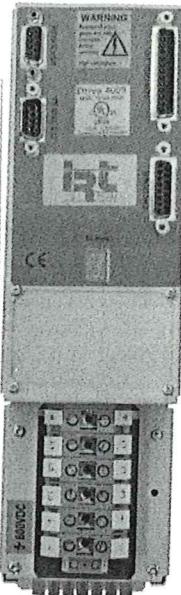




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**4000 SMALL****Data****Technical data**

Description	Unit	Serie 4000 AT
Supply voltage	VAC	3x400 +10% -20%
Supply frequency	Hz	45 à 65
Environment temperature	°C	0 à 60
Operating temperature at full power (from 45 ° C, reduction of the output current of 2% / ° C to 60 ° C)	°C	0 à 45
Storage temperature	°C	-25 à +55
PWM switching frequency	kHz	7.5
Differential input (setpoint)	V	+10 à -10
Reference range speed		1/32768
Speed loop bandwidth	Hz	max. 150
Current loop bandwidth	Hz	max. 2000
Dissipation capacity during braking with standards resistors	W	250
Motor output maximum voltage	V	3 x 390
Motor output frequency	Hz	0 à 500
Incremental encoder simulation	ppr	1 to 1024
Maximum theoretical speed. motor with resolver "speed one"	RPM	7500
On threshold braking	VDC	670
Threshold braking	VDC	660
On threshold over voltage	VDC	710
Threshold over voltage	VDC	690
Threshold under voltage	VDC	395
On threshold under voltage	VDC	380
Serial transmission	Type	RS232 and/or USB
Degree of protection		IP20
Approximate weight	kg	3,3

**4000 Series**
[4000 Small](#)  
[4000 Medium](#)  
[4000 Large](#)
**2000 Series**
[2000 Mini](#)  
[2000 Small](#)  
[2000 Dual](#)  
[Low Voltage](#)
**Control units for 2000 & 4000 Series**
[CU 2115](#)
**700 Series**
[700](#)
**Support**
[4000 and 2000 Series](#)  
[User 2000/4000 \(16 bit\)](#)  
[IDM \(32 bit\)](#)

Drive type	Rated rms current [A]	Rated pk. current [A]	Max. rms current [A]	Max. peak current[A]	Rated power [kW]	Max. power [kW]
4003	3.5	5	7	10	2.5	5
4005	5	7	10	14	3.5	7
4009	9	13	18	25	6	12

**Braking power**

Drive type AT	R braking [Ohm]	Peak braking power [W]	Max. continuous braking power [W]
4003, 4005, 4009 60	7500	250	

**Feed back**

Compatible with :

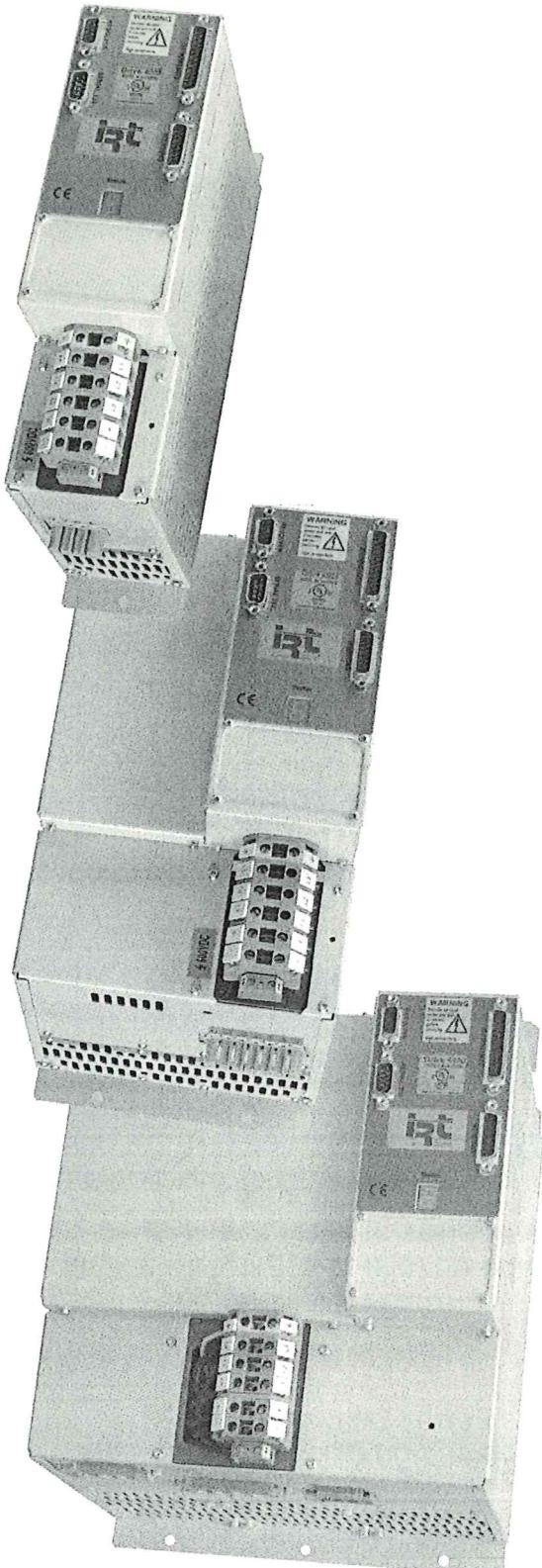
- ResolvEUR
- EncodEUR
- Sick-Stegmann Hiperface
- Sick-Stegmann Hiperface DSL
- HEIDENHAIN EnDat

**Interface**

- Profile
- Ethercat
- Profinet

Compatible with :

- Asynchrone
- Brushless



# TECHNICAL MANUAL

## DRIVES 4000 S-AT SMALL

## 4000 M-AT MEDIUM

## 4000 L-AT LARGE



IRT SA  
Rue du Puits-Godet 16  
CH-2000 Neuchâtel

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Fax +41 (0)32 724 10 23  
e-mail [info@irtsa.com](mailto:info@irtsa.com)  
<http://www.irtsa.com>

Your drive provider



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## 2. Description

The particular features of the servo-amplifiers serie 4000 AT are described thereunder:

### Power supply

- Single-Axis unit incorporating braking module for connection to 3 phases power supply. Possibility to connect the drives to a common DC-bus voltage.
- Direct 400V three-phase main supply.
- Option: Internal filters in power source reducing noise emission.

### Power driver

- Galvanic isolation between control and power electronics.
- IGBT output stage.
- Digital PWM current loop providing very low ripple motor currents and high motor efficiency.

### Digital controller

- Full-digital servo-amplifier for Brushless motor with resolver.
- Easy software update and fully programmable through serial link RS232 or RS485.
- Possibility to integrate a customised *INTERFACE* board.
- Energy managing system for fan-cooling.
- Multi loops control (torque and speed).
- Sinusoidal current output ensures smooth torque and optimal performance at low speed.
- 7 segment status indicator for diagnostic display.

### User's inputs

- Analogue speed or current input command +/- 10V or digital input command.
- RS232 serial port and RS485 serial port for multi axis controller system.
- Limit switches for overrun protection in both directions.
- External power supply to the Control and Interface boards to keep position data and alarms in case of main power supply interruption.

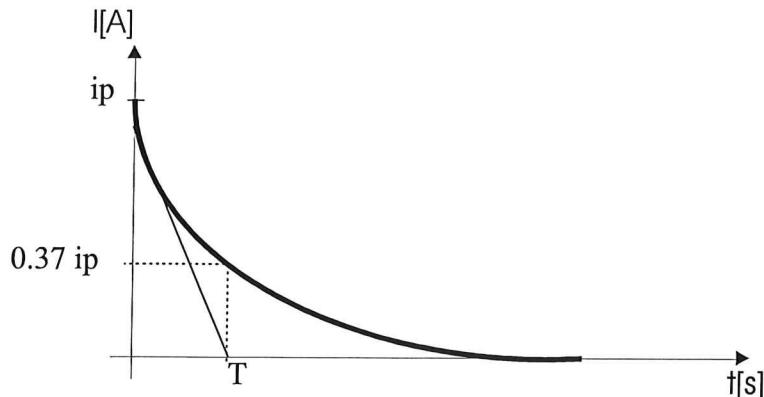
### 3. Technical data

#### 3.1 General data for all types

Description	Unit	4000 AT Serie	
Supply frequency	Hz	45 to 65	
Operating temperature range	° C	0 to 60	
Operating temperature range at full power (from 45°C, reduce output current by 2%/°C to 60°C)	° C	0 to 45	
Storage temperature range	° C	-25 to +55	
PWM chopper frequency	kHz	7.5	
Differential input reference	V	+ 10 to -10	
Speed control range		1/32768	
Speed loop bandwidth	Hz	max. 150	
Current loop bandwidth	Hz	max. 2000	
Output frequency to motor	Hz	0 to 500	
Incremental encoder simulation	ppr	1 to 1024 (2048)	
Theoretical max. speed for motor with resolver "speed one"	rpm	7500 or 12000 depending on firmware version	
Serial link	Standard baud rate	Bd.	9600
	Transmission		Full duplex
	Format		1 START bit, 8 DATAS bit, no parity, 1 STOP bit
Time between power on and enable drive	sec	Max. 3	
International Protection		IP20	
Supply Voltage	VAC	3x400 +10% -20%	
Max. output voltage to motor	V	3 x 390	
ON-Switching threshold of brake module	VDC	670	
OFF-Switching threshold of brake module	VDC	660	
ON-Trip threshold of overvoltage	VDC	710	
OFF-Trip threshold of overvoltage	VDC	690	
OFF-Trip threshold of undervoltage	VDC	395	
ON-Trip threshold of undervoltage	VDC	380	
Cooling		Natural air convection Air fan forced over 40°C	
Indicative weight :	Small AT Medium AT Large AT	kg	3.3 6.2 10,5

### 3.2.1 Inrush current

Wave shape for the nominal values



$$i(t) = i_p \cdot e^{-t/T} \quad \Rightarrow \quad i^2 \cdot t = \frac{1}{2} \cdot i_p^2 \cdot T$$

**Inrush current  $i_p$  :**

Small 4003, 4005, 4009 AT:

$$i_p = 9.3 \text{ A} \quad \text{and} \quad T = 14 \text{ ms} \quad \Rightarrow \quad i^2 t = 0.6 \text{ A}^2 \text{s}$$

Medium 4015 AT:

$$i_p = 18.7 \text{ A} \quad \text{and} \quad T = 21 \text{ ms} \quad \Rightarrow \quad i^2 t = 3.7 \text{ A}^2 \text{s}$$

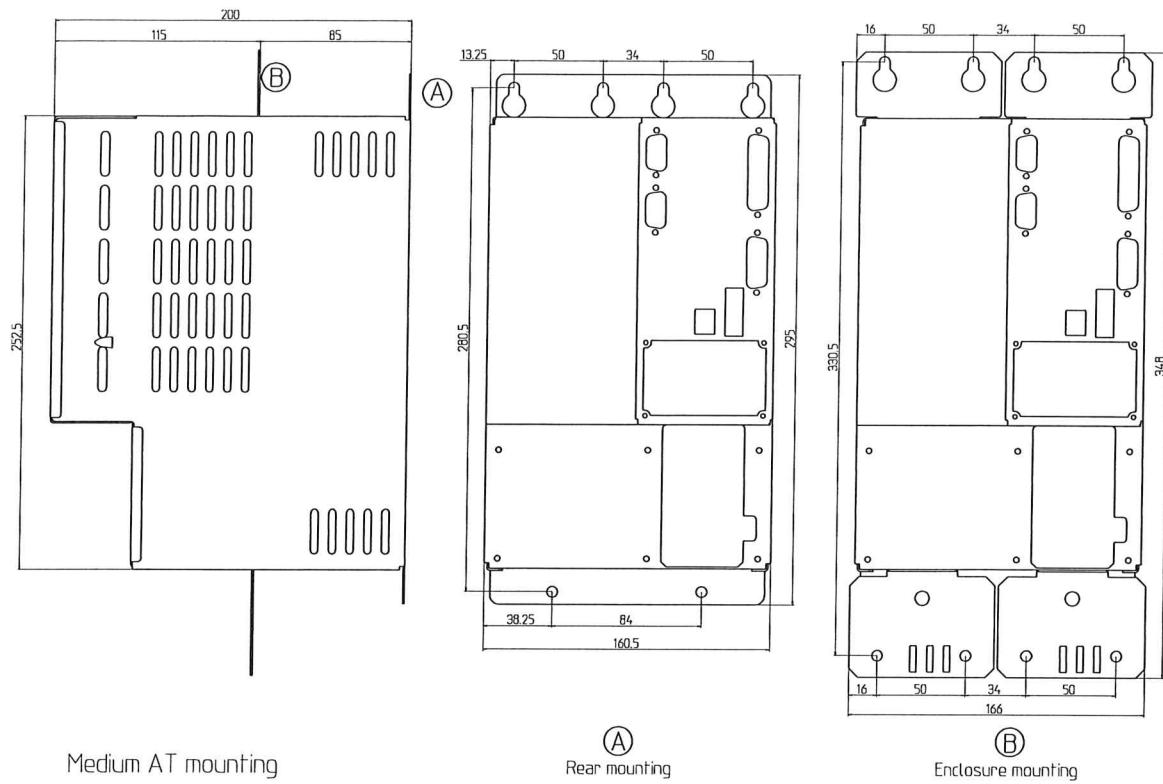
Medium 4025 AT:

$$i_p = 34 \text{ A} \quad \text{and} \quad T = 11.5 \text{ ms} \quad \Rightarrow \quad i^2 t = 6.7 \text{ A}^2 \text{s}$$

Large 4050 AT:

$$i_p = 51 \text{ A} \quad \text{and} \quad T = 10.3 \text{ ms} \quad \Rightarrow \quad i^2 t = 13.4 \text{ A}^2 \text{s}$$

### 3.3.2 Medium AT drive outlines

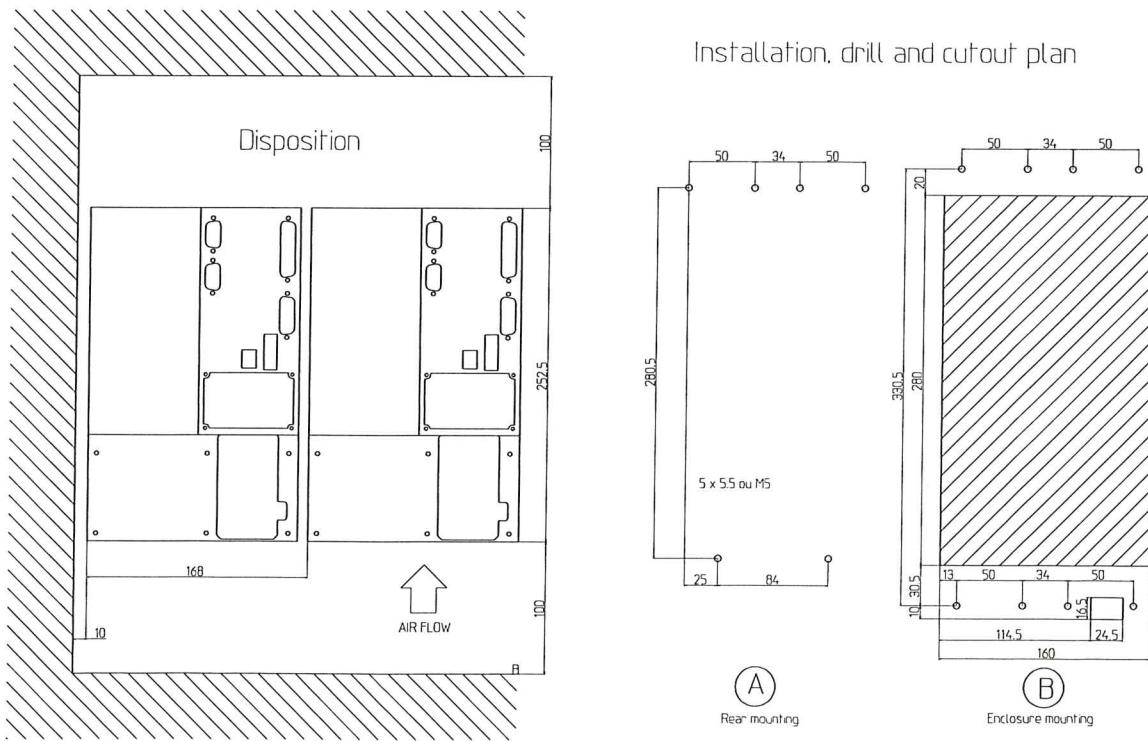


Medium AT mounting

(A)  
Rear mounting

(B)  
Enclosure mounting

### Installation, drill and cutout plan :



### 3.4 Motors

- Brushless 3 phases servo-motors
- Asynchronous, 3 phases motors

### 3.5 Position feedback

- Resolver :

Characteristics :

- Speed One (1 sine period and 1 cosine period per revolution)
- Ratio  $0.5 \pm 10\%$
- Reference frequency : 5..10 kHz
- $Z_{RO} > 95\Omega$  @ 7,5 kHz (Input impedance)
- $Z_{SO} < 1000\Omega$  @ 7,5 kHz (Output impedance)

- Incremental encoder for asynchronous motor only.
- Absolute encoder Stegmann SinCos Multi and Single turn SRS/M 50/60(HIPERFACE compatible).
- Incremental encoder with U, V and W signals for synchronous motor.
- EnDat encoder.



## 6. Add-on boards

Add-on boards compatible with series 2000 Small drives

### IRT PROFILE

Add-on board to perform simple movements and interfacing with 24V systems (PLS).

Main characteristics :

- 24 V powered.
- DC-DC conversion for drive power back-up (the position value is kept when main supply of the drive is switched off).
- 14 Outputs potential free (24V 100 mA).
- 16 Inputs 24V potential free.
- Windows Profile User software for easy setting.

To obtain more information about Profile board, contact your IRT distributor.

Distributed by :

Official IRT distributors.

### UVW ENCODER FEEDBACK

See Special functions specification.

Distributed by :

Official IRT distributors.

### Dual analogic bipolar output

Outputs range : +/- 10V

Output SPEED : 1V corresponds to 1000 RPM

Output CURRENT : 10V corresponds to  $I_{MAX\ DRIVE}$

Distributed by :

Official IRT distributors.



DRIVE SERIES 4000 AT, TECHNICAL MANUAL EVOLUTION

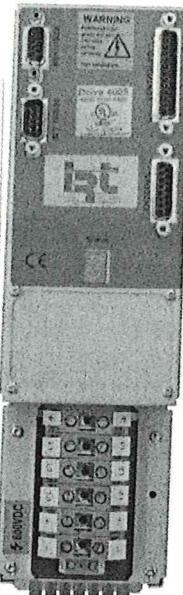
Last modification : September 2013



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**4000 SMALL****Data**

Technical data		Unit	Serie 4000 AT
Supply voltage	VAC	3x400 +10% -20%	
Supply frequency	Hz	45 à 65	
Environment temperature	°C	0 à 60	
Operating temperature at full power (from 45 ° C, reduction of the output current of 2% / ° C to 60 ° C)	°C	0 à 45	
Storage temperature	°C	-25 à +55	
PWM switching frequency	kHz	7.5	
Differential input (setpoint)	V.	+10 à -10	
Reference range speed		1/32768	
Speed loop bandwidth	Hz	max. 150	
Current loop bandwidth	Hz	max. 2000	
Dissipation capacity during braking with standards resistors	W	250	
Motor output maximum voltage	V	3 x 390	
Motor output frequency	Hz	0 à 500	
Incremental encoder simulation	ppr	1 to 1024	
Maximum theoretical speed. motor with resolver "speed one"	RPM	7500	
On threshold braking	VDC	670	
Threshold braking	VDC	660	
On threshold over voltage	VDC	710	
Threshold over voltage	VDC	690	
Threshold under voltage	VDC	395	
On threshold under voltage	VDC	380	
Serial transmission	Type	RS232 and/or USB	
Degree of protection		IP20	
Approximate weight	kg	3,3	

**4000 Series**
[4000 Small](#)  
[4000 Medium](#)  
[4000 Large](#)
**2000 Series**
[2000 Mini](#)  
[2000 Small](#)  
[2000 Dual](#)  
[Low Voltage](#)
**Control units  
for 2000 &  
4000 Series**
[CU 2115](#)
**700 Series**
[700](#)
**Support**
[4000 and 2000 Series](#)  
[User 2000/4000 \(16 bit\)](#)  
[IDM \(32 bit\)](#)

Drive type	Rated rms current [A]	Rated pk. current [A]	Max. rms current [A]	Max. peak current[A]	Rated power [kW]	Max. power [kW]
AT						
4003	3.5	5	7	10	2.5	5
4005	5	7	10	14	3.5	7
4009	9	13	18	25	6	12

**Braking power**

Drive type AT R braking [Ohm]	Peak braking power [W]	Max. continuous braking power [W]
4003, 4005, 4009 60	7500	250

**Feed back**

## Compatible with :

- Resolveur
- Encodeur
- Sick-Stegmann Hiperface
- Sick-Stegmann Hiperface DSL
- HEIDENHAIN EnDat

**Interface**

- Profile
- Ethercat
- Profinet

## Compatible with :

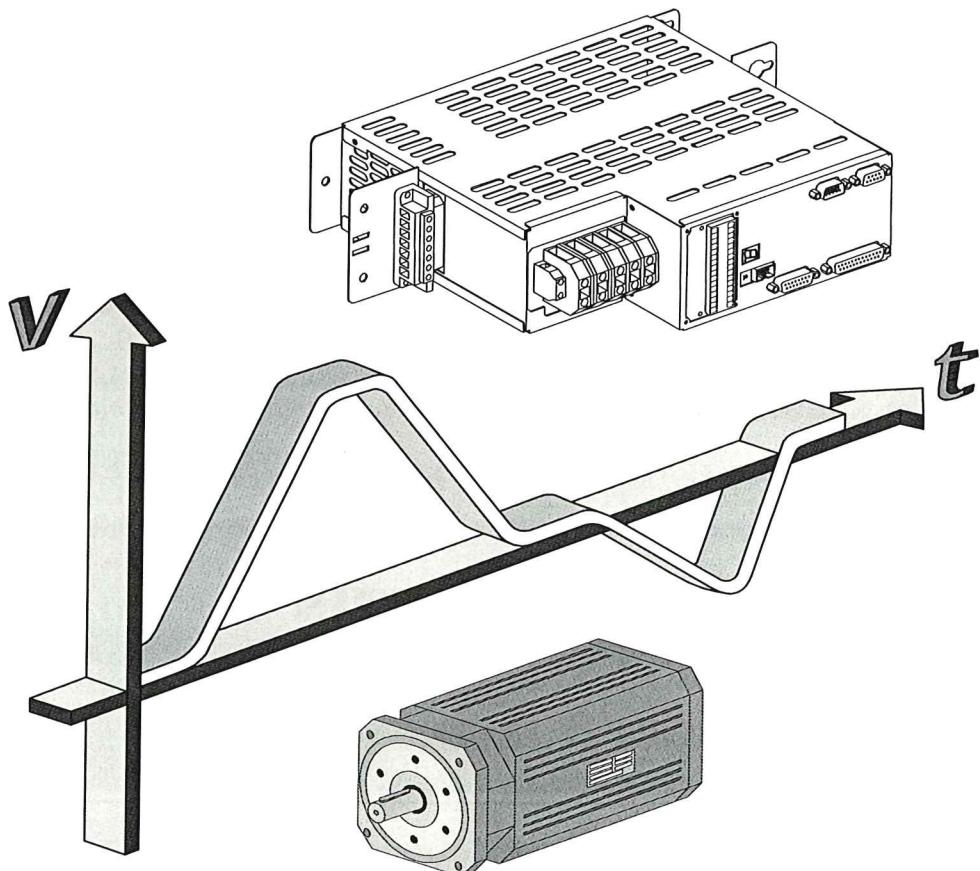
- Asynchrone
- Brushless

**March 1999**

## **INSTRUCTION MANUAL**

# **PROFILE**

## **DRIVE 2000 / 4000**



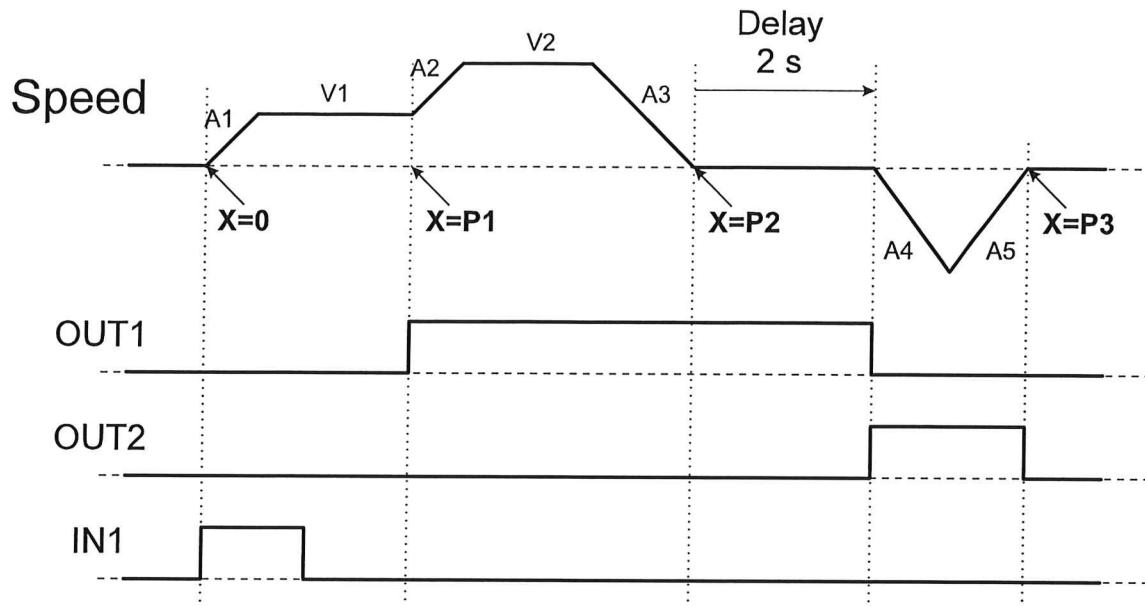
**IRT SA**  
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**CH-2005 Neuchâtel**

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Fax +41 (0)32 724 10 23  
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<http://www.irtsacom>

**Your drive provider**

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## 1.1 Example of movement



This example is composed of two movements and one delay. The first movement, from  $x=0$  to  $x = P_2$  contains a speed change at  $x=P_1$ . For the second movement, from  $x=P_2$  to  $x=P_3$ , the maximum speed is not reached.

The input IN1 starts the programmed sequential operations.

The output OUT1 is set when  $x=P_1$  and cleared 2 seconds after the position  $x=P_2$  is reached.

The output OUT2 is set when OUT1 is cleared. OUT2 is cleared when position  $P_3$  is reached.

### 3. Electrical characteristics

#### SUPPLY :

Supply voltage :  $U_{\text{supply}} = 24 \text{ VDC} \pm 25\%$   
(=18..30 VDC)

#### INPUTS (IN1..IN16):

Input impedance :  $Z_{\text{IN}} = 7,1 \text{ k}\Omega$

High level detection :  $U_{\text{IH}} = 16..30 \text{ V}$

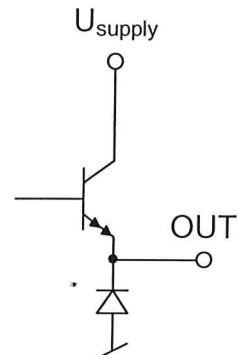
Low level detection :  $U_{\text{IL}} = 0..5 \text{ V}$

#### OUTPUTS (OUT1..OUT14):

Max. output current :  $I_{\text{OH}} = 100 \text{ mA}$

Output voltage :  $U_{\text{OH}} = U_{\text{supply}} - 1.6$   
( @  $I_{\text{OH}} = 100 \text{ mA}$ )

All outputs are short-circuit protected.



#### NOTES :

- Inputs and outputs voltage with respect to GND
- The inputs and outputs are fully potential free with the internal voltage (opto-coupler separation).
- The input IN16 is directly hardware wired to the drive **TORQUE ENABLE**.
- When a short-circuit is detected, the output is desactivated and an indication is shown by display (Profile Status P-F). The short-circuit can be reset by the « INIT DRIVE » input or by a serial link « RESET » command.

### 3.2 Fixed inputs/outputs functions

Some inputs and outputs are already fixed for specified functions :

#### FIXED OUTPUTS

##### OUT12, POSITION OK

Activated when the motor position equals to the pointed position (the positioning window value defines the tolerance for the pointed position).

##### OUT13, HOMING ENDED

Activated when a homing function is ended. This output is cleared when the drive is initialised or when a new homing is started.

##### OUT14, DRIVE OK

Indicate when the drive is ready (no drive alarm and torque enable). This following events will disable the **DRIVE OK** output :

- Any drive alarm.
- Torque disable.
- Following error (profile status P-A).
- No profile loaded or CRC check error (profile status P-E).
- Unknow command (profile status P-9).
- No 24V supply or output short-circuit (profile status P-F).

#### FIXED INPUTS

##### IN1-6, PROFILE SELECTION AND VALIDATION

See section 3.3, profile selection.

##### IN12, END-LIMIT+

Stop the positive speed (active when 24V is applied).

**Firmware version 2305 or higher :**

If the bit 0 of drive parameter 24 is set, the **END-LIMIT+** input is inverted (active when 0V is applied, see section 5, page 23, description of parameter 24).

##### IN13, END-LIMIT-

Stop the negative speed (active when 24V is applied).

**Firmware version 2305 or higher :**

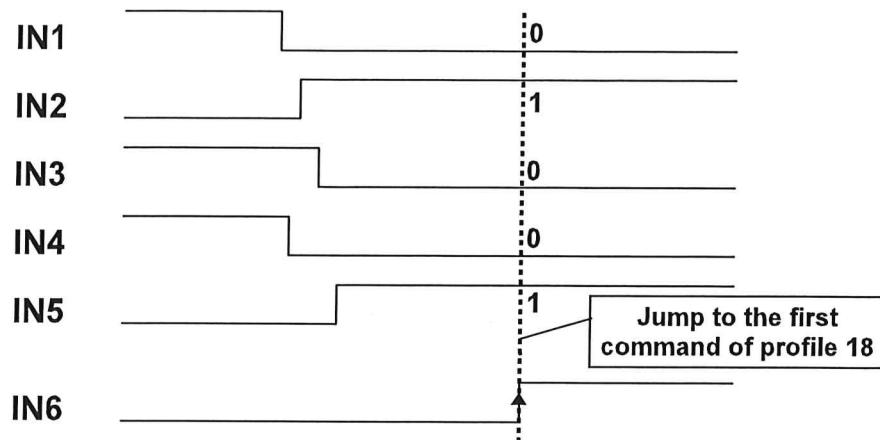
If the bit 1 of drive parameter 24 is set, the **END-LIMIT-** input is inverted (active when 0V is applied, see section 5, page 23, description of parameter 24).

**Profile validation (INPUT6) :**

INPUT6 enables the start in a profile after power on or after the END of a profile.

The profile is selected at the positive edge on INPUT6.

Example for selection of profile number 18 :



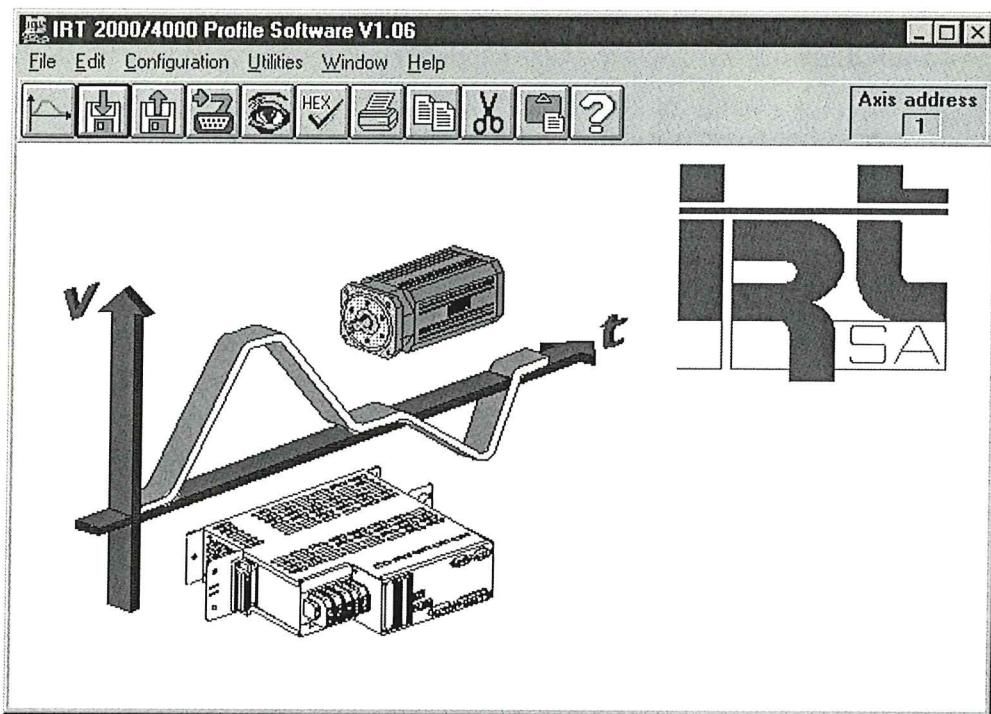
If the selected profile is empty or not defined in software, no jump is performed and a new valid profile selection is waited.

When a profile is running, a new profile selection is possible only after an END command or after an initialization (only one profile can run).

COMMAND NAME	DESCRIPTION	EXAMPLE
IFPOSLTJMP <b>(V2305→)</b>	At the last check position command (CHKPOS or CHKPOSREL), if the real position was less than the check position then jump to label name.	IFPOSLTJMP LABEL1
SETOUT	Set one or several outputs (to ease the entry, « 2;5;6 » can be written « 2 5 6 »).	SETOUT 2;5;6
CLROUT	Clear one or several outputs (to ease the entry, « 3;11;13 » can be written « 3 11 13 »).	CLROUT 3;11;13
WAITINP	Wait a defined state of the inputs (to ease the entry, « IN3=0; IN5=1; IN12=0 » can be written « 3 0 5 1 12 0 »),	WAITINP IN3=0; IN5=1; IN12=0
TESTINP	Test a defined state of the inputs for conditional jump (to ease the entry, « IN3=0; IN5=1; IN12=0 » can be written « 3 0 5 1 12 0 »)	TESTINP IN3=0; IN5=1; IN12=0
IFTRUEJUMP	If the last input test (TESTINP command) was true, jump to label name.	IFTRUEJUMP LABEL0
IFFALSJUMP <b>(V2305→)</b>	If the last input test (TESTINP command) was false, jump to label name	IFFALSJUMP LABEL2
JUMP	Jump to a label name	JUMP LABEL1
JUMPPROF	Jump to the beginning of a profile	JUMP 1
WAITDELAY	Wait a delay time, in ms	WAITDELAY 1000
HOME	Search of origin. An input number must defined the home switch, in addition, the rotation direction (+ or -) and for synchronisation with zero pulse, a « Z » can be added	HOME +5 or -5 +5Z or -5Z
STOPMOVE <b>(V2305→)</b>	Stop the motor with normal deceleration. This command is passed only when motor speed = 0.	STOPMOVE
AUTOSTART <b>(V2305→)</b>	This command can be only used at the first line of Profile 0. It set the drive in AUTOSTART mode.	AUTOSTART
END	end of a profile (must be the last command of each profile).	END

## 4.2 Windows software description

### 4.2.1 Main window description



#### Toolbar buttons :



Open a new empty program with default configuration :  
1 profile  
Position Unit : REV (4096 inc.  $\Rightarrow$  1 REV)



Save the selected program in the current filename (command « Save as » in the file menu allows you to save the program in a different filename).



Open a program file.



Transfer utility :  
a) Transfer program into Drive.  
b) Compare program with drive contents  
c) Import program from drive (open a new program window)

**a) Column label :**

Line address to define a destination for a jump as example. A label name cannot be a command name and size is limited to 12 characters .

**b) Column command :**

Instruction name, can be selected in the command list at the right of the window or entered manually.

**c) Column parameter :**

Parameter value for the specified instruction. An help box can be enabled by a click on the right button of the mouse.

**d) Column comment :**

This column allows the programmer to enrich the profile with annotations. It is useful when complex profiles are developed. The size of each comment line is limited to 100 characters, the view of comment column can be expanded with the horizontal scroll bar situated bellow the main table.

**e) Profile name box :**

This box can be edited for each profile to give a little description of selected profile.

**Important note :**

Profile names and comments are ignored by the compilation. Profile name, comments, labels, conversion factors and special unit are only stored in the profile file. When a program is imported from drive, the profile names and comments will be left blank, the labels will have default names (LABEL0, LABEL1, ..), conversion factor and unit will be defined as default (4096 → 1 and REV unit).

**c) Position unit and conversion factor**

The position unit will be the string added at the end of all positions values. It can be one of the list or another that you can define.

The conversion factor is used for all position, to convert the motor increments to the correct value depending of wanted unit.

The maximum range correspond to the maximal position unit with the chosen conversion factor. And the resolution is the position value for one motor increment.

### 4.3 Program example

Example program :

Line	Label	Command	Parameter
1		SETDECEL	7007
2		SETACCEL	7007
3		STOPDECEL	29998
4	START	WAITINP	IN6=1
5		CLRROUT	1 ;2 ;3 ;4 ;5 ;6
6		SETMAXSPD	2000
7		MOVETOPOS	0.0000 REV
8		WAITPOS	0.0000 REV
9		SETOUT	1
10		MOVETOPOS	35.0000 REV
11		WAITPOS	20.0000 REV
12		SETOUT	2
13		SETMAXSPD	1000
14		WAITPOS	0.0000 REV
15		SETOUT	3
16		WAITDELAY	200
17		SETOUT	4
18		SETMAXSPD	2000
19		MOVETOPOS	0.0000 REV
20		WAITPOS	20.0000 REV
21		SETMAXSPD	2000
22		SETOUT	5
23		WAITPOS	0.0000 REV
24		SETOUT	6
25		WAITDELAY	200
26		JUMP	START
27		END	

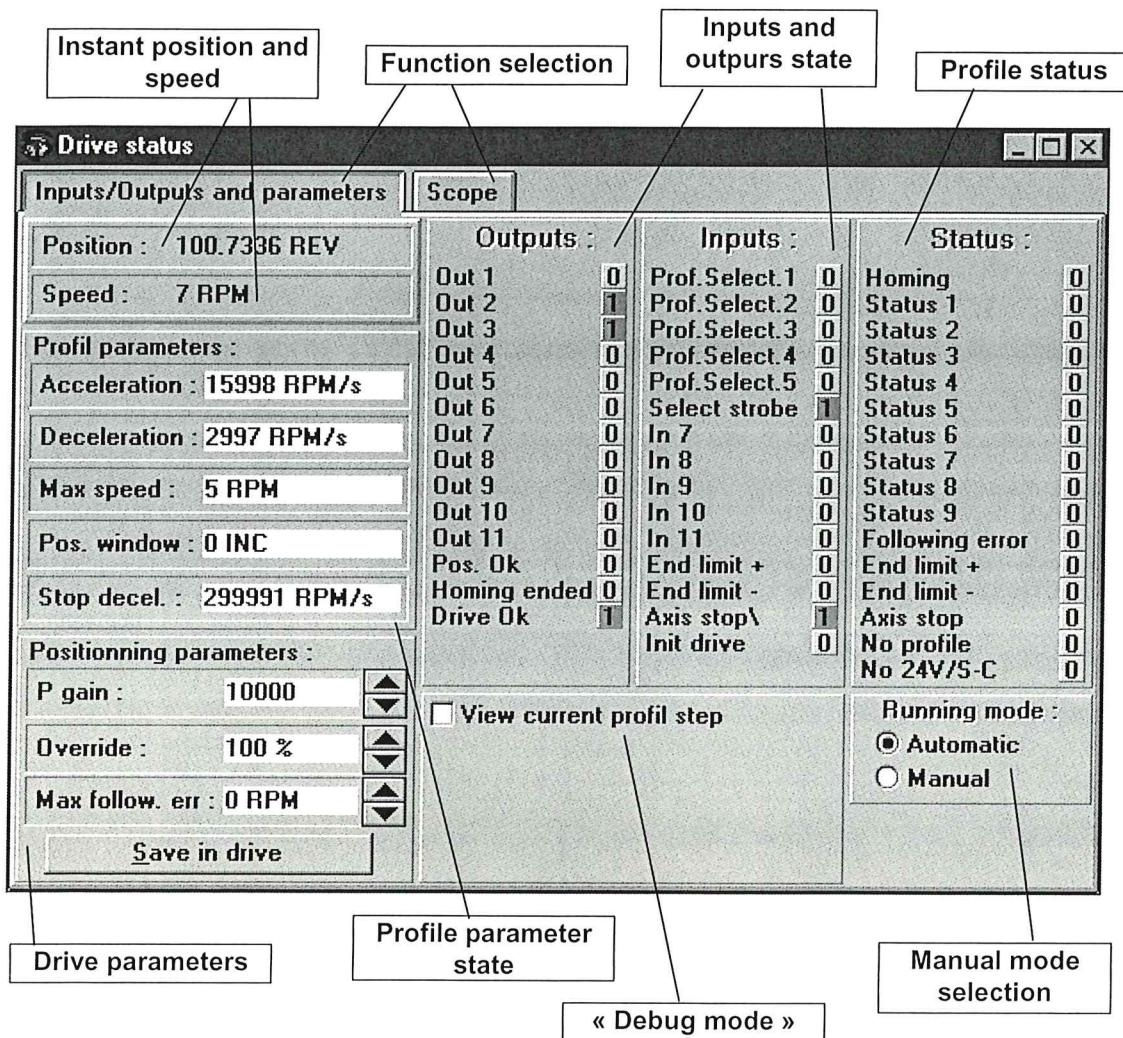
This example is realised with the default configuration (configuration when a new program is opened)

## 4.4 Status window



A click on the icon of the toolbar open a status window. If the drive is connected to the PC, this window shows the profile status. Two functions are available:

- Input/output state, instantaneous position, speed, max speed...
- Scope



- The unit of the instantaneous position corresponds to the unit of the last selected program (if no program is opened, unit is defined as default in REV)
- The debug mode (« View current profile step » option) is usable only when the running program is opened (the « Import program from drive » function allows you to read the running program).

## 5. Drive parameters (particular to profile)

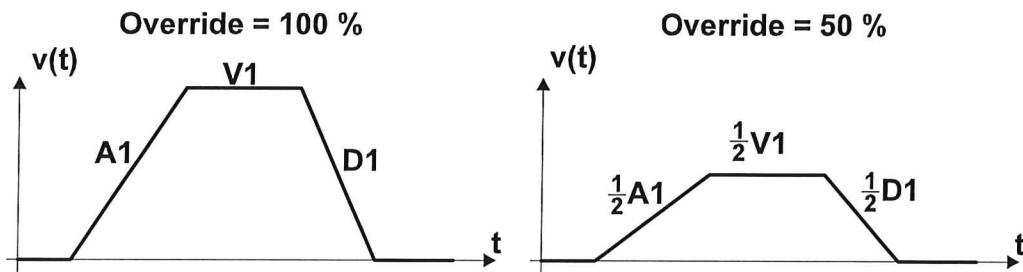
This parameters belongs to the drive parameters list, they can be modified by the standard User software or by the Profile software.

When you modifies a drive parameter value, you have to select the « Save in drive » function else the changes will be lost at power down or at initialization.

### OVERRIDE, ADDRESS 57

This value affects all speed and acceleration/deceleration values. When a command set a speed or an acceleration/deceleration, the value is multiplied by the override value. This function is useful for testing slowly a profile.

*Example (same profile executed with Override=100% and 50%) :*



*Important :*

The override value is considered only at the execution of a set speed or set acceleration/deceleration command. If a profile is running in a loop which not includes a set speed or a set acceleration command, a change of the override value will never affect the profile.

### POSITIONING PROPORTIONAL GAIN, ADDRESS 58

Define the positioning proportional gain, usually 10000 is a good value.

*Important :*

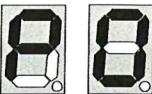
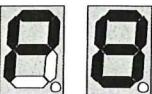
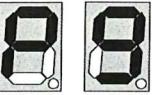
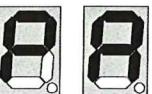
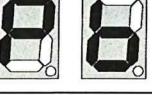
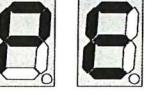
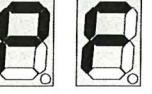
The speed loop integral gain must be different of 0 for a good position regulation.

### FOLLOWING SPEED ERROR, ADDRESS 59

If this value is different of zero, the following error detection is enabled. When the difference between the speed and the command speed reach this value, the motor stops and following error (« P » - « A ») is shown on the display. The following error can be reset only by an initialization (« Init » input of power off/on).

## 5.1 Profile status

The drive shows profile status on the 7-segment display. To indicate a profile status, the display shows « P » alternate with status number :

Display	Status description	Effect
	Homing function in progress	
	Autostart end (firmware version 2305 or higher). When a END command is encountered in Autostart mode.	<ul style="list-style-type: none"> <li>• The current move is ended (move to last pointed position).</li> <li>• No possibility to start an other profile.</li> </ul>
	Unknown command encountered (the current profile command is unknown from current firmware).	<ul style="list-style-type: none"> <li>• Stop with defined stop deceleration.</li> <li>• <b>DRIVE OK</b> output disabled.</li> </ul>
	Following error.	<ul style="list-style-type: none"> <li>• Stop with defined stop deceleration.</li> <li>• <b>DRIVE OK</b> output disabled.</li> </ul>
	« End-limit + » activated.	If speed > 0 : <ul style="list-style-type: none"> <li>• Stop with motor maximal current.</li> </ul>
	« End-limit - » activated	If speed < 0 : <ul style="list-style-type: none"> <li>• Stop with motor maximal current.</li> </ul>
	Axis stop (input STOP\ activated).	<ul style="list-style-type: none"> <li>• Stop with defined stop deceleration.</li> </ul>
	No profile loaded or CRC check error.	<ul style="list-style-type: none"> <li>• <b>DRIVE OK</b> output disabled.</li> </ul>
	No 24V supply or output short-circuit detected.	<ul style="list-style-type: none"> <li>• <b>DRIVE OK</b> output disabled.</li> <li>• Stop with defined stop deceleration.</li> </ul>

**Important note :**

Drive errors have higher priority than profile status, when a drive error occurs, the profile status is not more indicated by the drive display.

## APPENDIX A - VARIABLES (PRELIMINARY)

### 1. Introduction

Variables are used to perform an interaction with a system. The variable values can be changed by the system through a serial link (RS232 or RS485).

The variables are grouped by blocks of eight. The variables are named with the following syntax :

V<block number (0..3)><variable number (0..7)>

Example : V13 = Variable 3 of block 1

Four blocks of eight variables are usable :

Bloc0	Bloc1	Bloc2	Bloc3
V00	V10	V20	V30
V01	V11	V21	V31
V02	V12	V22	V32
V03	V13	V23	V33
V04	V14	V24	V34
V05	V15	V25	V35
V06	V16	V26	V36
V07	V17	V27	V37

Every case corresponds to one 16-bit variable, for acceleration, deceleration, speed and time values, 16 bits are needed but for position, 32 bits are needed. That's why a position variable uses two variables (Example : V10 is used to define a position, V11 is also not usable because the case is used by the position V10).

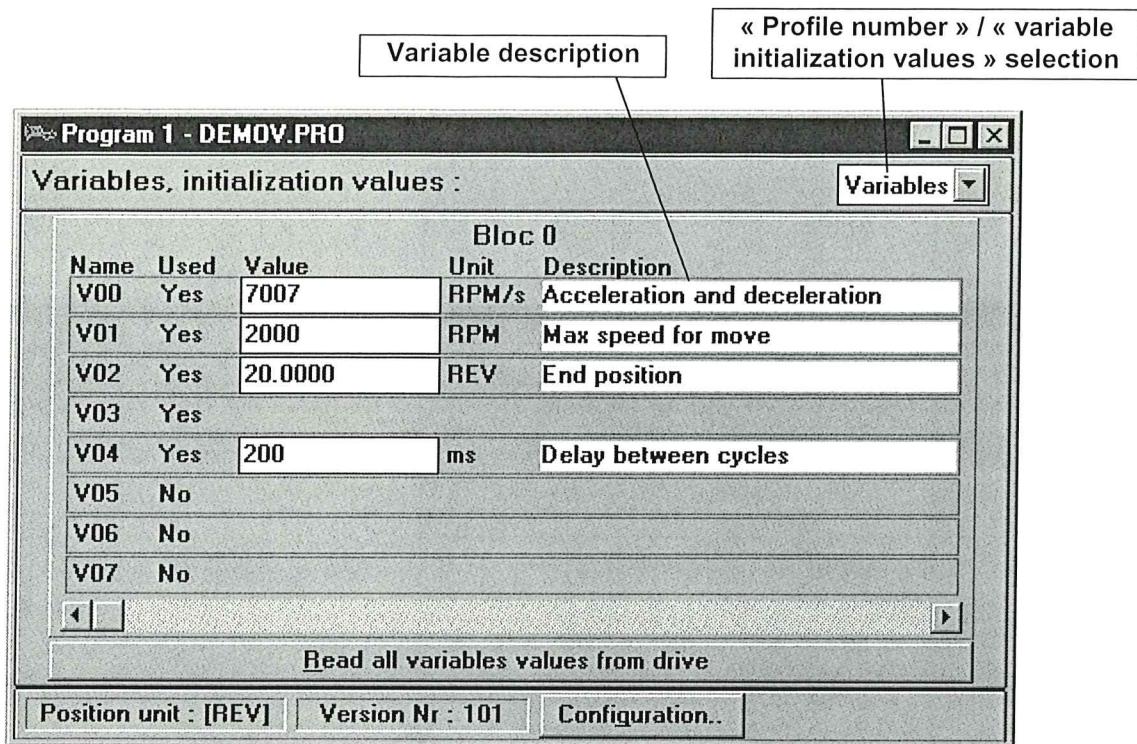
#### **Important note :**

The variables use is possible only with the following version of softwares :

**Firmware version : 2400 and greater.**

**Windows Profile version : 2.00 and greater.**

*Variables, initialization values :*



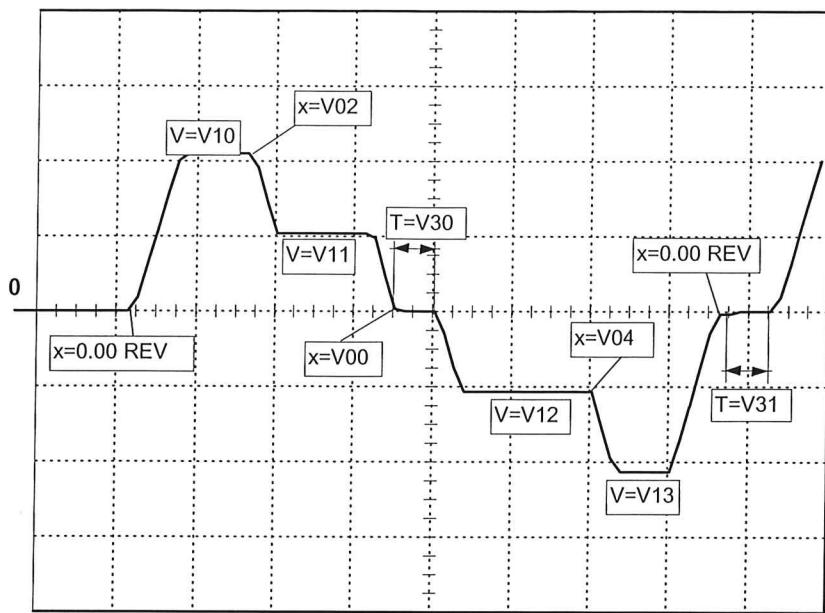
Only used variables can be edited. The initialization values must be edited only after the write of program (the type of the variable must be known to display the right unit and the variable size).

The Description box can be edited to describe the variable function (optional). Like the profile names and the comments, the variable description is not saved in the drive.

**Important :**

When you edit a program zone that contains variables (cut or copy a program zone with variable), the used variable list can be wrong, to refresh the list, start a verification (icon )

Speed profile  $V=f(t)$  :



Horizontal scale : 500ms/div

Vertical scale : 948 RPM/div

## 2.1 Profile Blocs

Eight blocs (only four if variables are not used) are used for the dialogue between the drive and the command system :

Bloc Addr.	Access	Nr.	Description
32	Read/ write	0	0:Automatic/1:Manual mode
		1	Positionning window
		2	Acceleration
		3	Deceleration
		4	Stop Deceleration
		5	Max Speed
		6	
		7	
33	Read/ write	0	Manual : Move relative HW
		1	Manual : Move relative LW
		2	
		3	
		4	
		5	
		6	
		7	
34	Read only	0	Status
		1	Input
		2	Output
		3	Speed command
		4	Instantaneous speed
		5	Profile, address pointer
		6	Instantaneous position HW
		7	Instantaneous position LW
35	Read only	0	
		1	
		2	
		3	
		4	
		5	
		6	End position HW
		7	End position LW
36	R/W	0..7	Variable bloc 0, values V00..V07
37	R/W	0..7	Variable bloc 1, values V10..V17
38	R/W	0..7	Variable bloc 2, values V20..V27
39	R/W	0..7	Variable bloc 3, values V30..V37

*Note :*

When manual mode is set ( $\{ \text{bloc } 32, 0 \} = 1$ ) the motor stop to the last pointed position, the profile execution is suspended. In manual mode, a manual move can be set by writing a relative position in cases 0 and 1 of bloc 33. The manual mode is used by the Profile software, in status window to ease the search of motor position. When automatic mode is set again ( $\{ \text{bloc } 32, 0 \} = 0$ ), profile execution is resumed.

Then, the two words values are defined as follows :

$$1^{\text{st}} \text{ word} = <\text{Number of revolution}> = \text{INT}\left(\frac{<\text{Number of increments}>}{4096}\right)$$

Limits : -16384..16384

$$2^{\text{nd}} \text{ word} = <\text{Position within a revolution}> = (<\text{Nr.of inc.}> \text{ MOD } 4096) \cdot 16$$

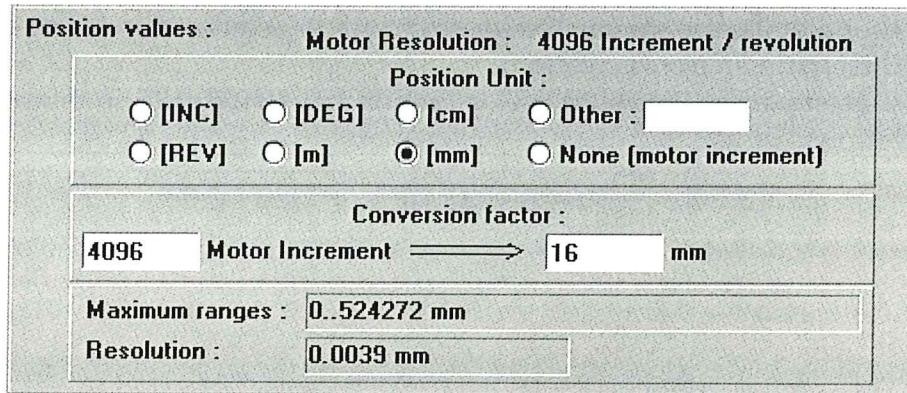
Limits : 0..65535

#### **Notes:**

- « INT(*number*) » function return the first integer less than or equal to *number*.  
Examples : « INT(4.2) = 4 », « INT(5.8) = 5 », « INT(-7.2) = -8 ».
- « *number1* MOD *number2* » operation return the remainder of the integer division *number1*/*number2*.  
Examples : « 5000 MOD 4096 = 904 », « 9096 MOD 4096 = 904 ».

#### **Position values conversion, examples**

##### a) V00 = 110 mm, with following configuration :



$$\text{Number of increments} : 110 \text{ mm} \rightarrow 110 \cdot \frac{4096}{16} = 28160 \text{ INC}$$

$$\text{Number of revolutions} : V00 = \text{INT}\left(\frac{28160}{4096}\right) = \text{INT}(6.875) = 6 = 0006_H$$

$$\text{Position within a rev.} : V01 = (28160 \text{ MOD } 4096) \cdot 16 = 57344 = E000_H$$

Example : Write in Variable Bloc 0, Axis address 2

V00 = 1234 = \$04D2 \$ = Hexadecimal

V01 = -100 = \$FF9C

V03..V08 = 0 = \$0000

Bloc address : 36 (= \$24),

Axis address : 2 (+48 = 50 = \$32)

Parameter coding 16 bits -> 3 bytes:

<u>1234</u> = 000001 001101 0010
↓
\$1+\$30=\$31    \$D+\$30=\$3D    001000 -> \$8+\$30=\$38

<u>-100</u> = 111111 111001 1100
↓
\$3F+\$30=\$6F    \$39+\$30=\$69    110000 -> \$30+\$30=\$60

Hexadecimal codes for the write :

\$02, \$32, \$57, \$24, \$31, \$3D, \$38, \$6F, \$69, \$60, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$03, \$12

The drive replies ACK (\$06) when the message is correctly received. When checksum is not correct the drive replies nothing.

#### ***Serial protocol for read bloc :***

<STX><AXIS\_ADDRESS+48><R><BLOC\_ADDR><ETX><BCC>

Hexadecimal codes for the read of variable bloc 0, axis 2 :

\$02, \$32, \$52, \$24, \$03, \$45

Hexadecimal reply of the drive :

\$02, \$32, \$52, \$24, \$31, \$3D, \$38, \$6F, \$69, \$60, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$30, \$03, \$17



## W

## Windows software

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These instructions have been written and checked to the best of our knowledge and belief.  
However, IRT will not be liable for errors and reserves the right for changes at any time without notice.