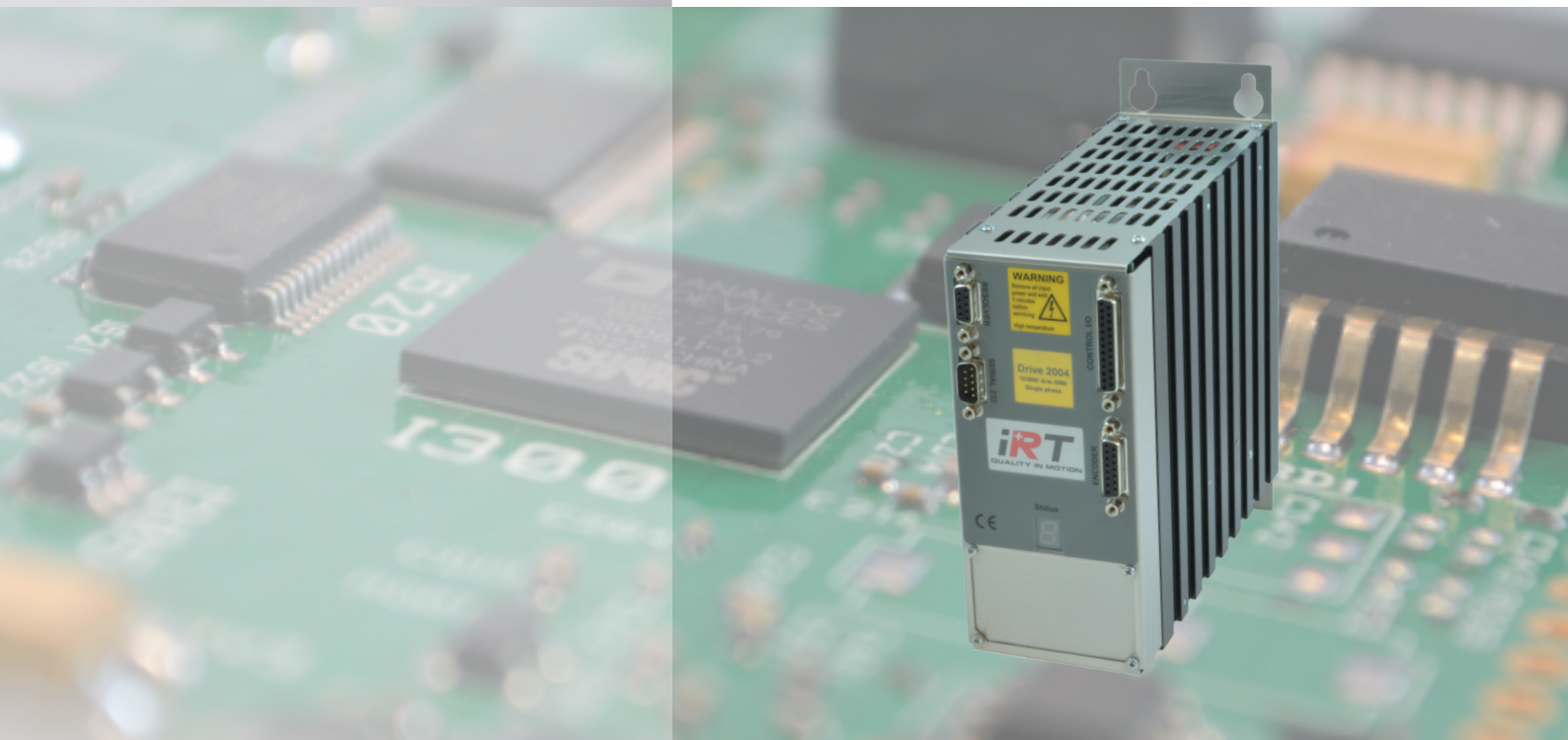


2000 Mini Evo



Technical Manual

CE

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1. Introduction

The servo-amplifiers series 2000 Mini are intended for the control of 3 phases brushless servo-motors and asynchronous servo-motors.

The motors regulated by the series 2000 Mini servo-amplifiers should have the following characteristics:

- Rotor constructed with permanent magnets or winding cage arranged in 1, 2, 3, 4, 5 or 6 pole pairs, without commutator.
- Stator constructed with 3 windings connected in star or delta.
- Brushless motors: electronic commutation is performed by means of a feedback type:

With control unit 2001

Speed one resolver
Incremental encoder with U, V and W signals

With control unit 2002

Absolute encoder SinCos Hiperface® compatible
EnDat 2.1

With control unit 2115

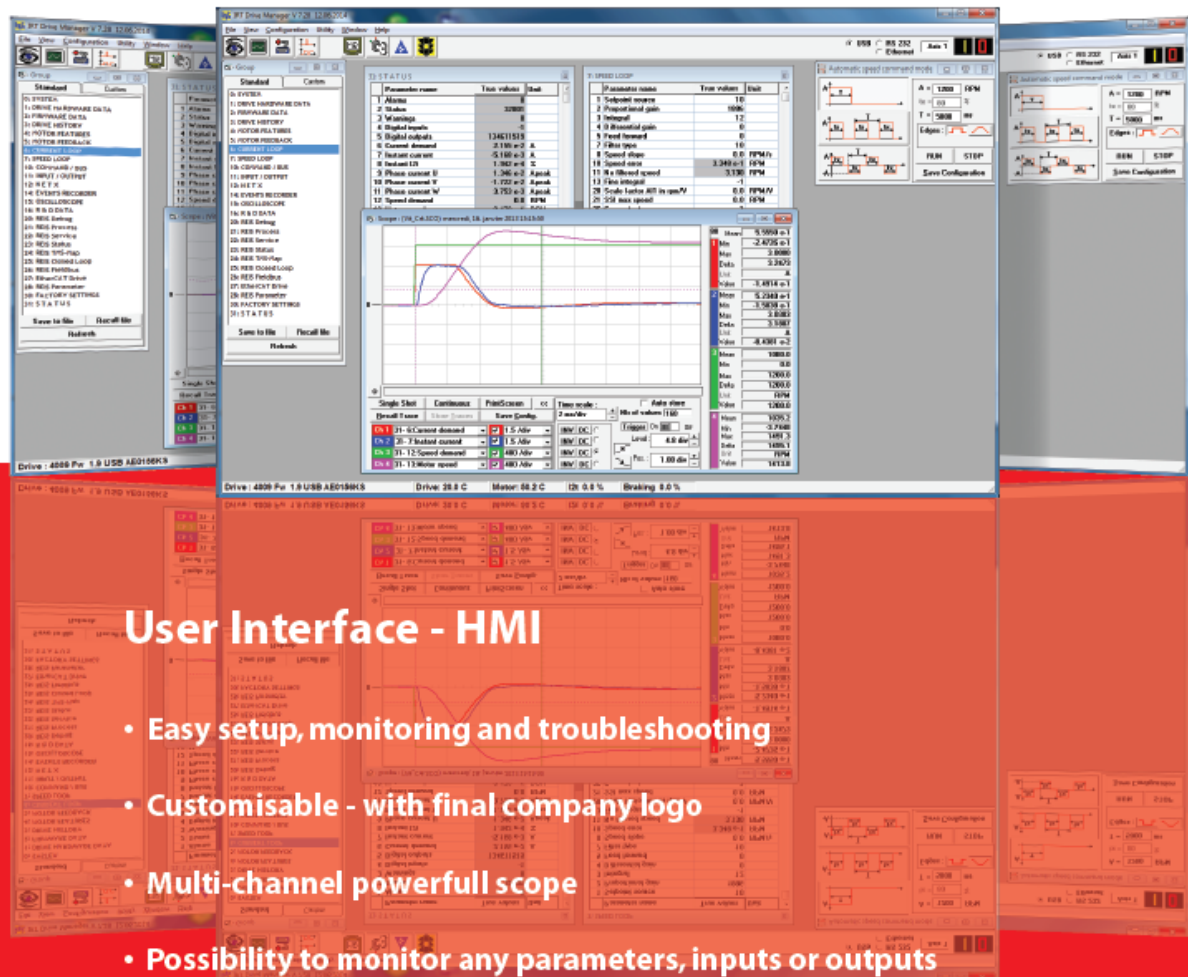
Speed one resolver
EnDat 2.1 / 2.2
Hiperface® DSL (single cable solution)

- Asynchronous motors: electronic commutation is only performed by means of a feedback type:
Speed one resolver
Incremental encoder.
- Motors with Hall effect sensors and tachogenerator are not suitable.

The servo-amplifiers 2004 MiniEvolution are fully digital. High-performance torque, speed and positioning control fulfils all requirements for rapid response and control accuracy.

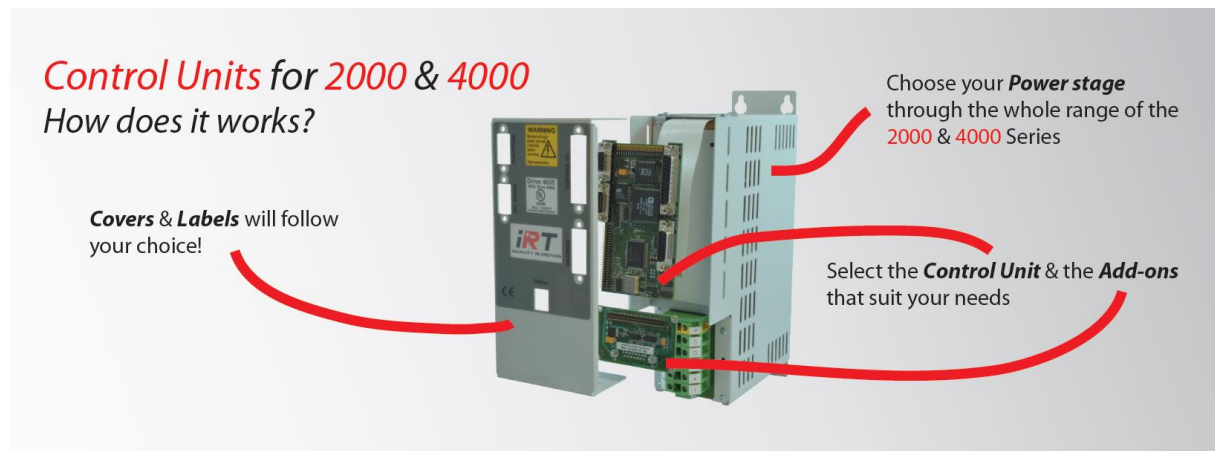
Digital control allows comprehensive diagnostics, motor parameters tuning, data and fault logging, etc.. using a PC based user program.

Simplicity Versatility Functionality



A wide range of firmware assures to meet the requirements of practically any application.

The 2004 MiniEvolution is part of the Servo Drive 2000 series of IRT and thus is very modular, it can be fitted with 3 different Control units and diverse option boards with the CU2001.



2. Description

The features of the servo-amplifiers series 2000 Mini are described thereunder:

Power supply

- Single-Axis unit incorporating braking module
- 230V single phase (drive 2004)

Power driver

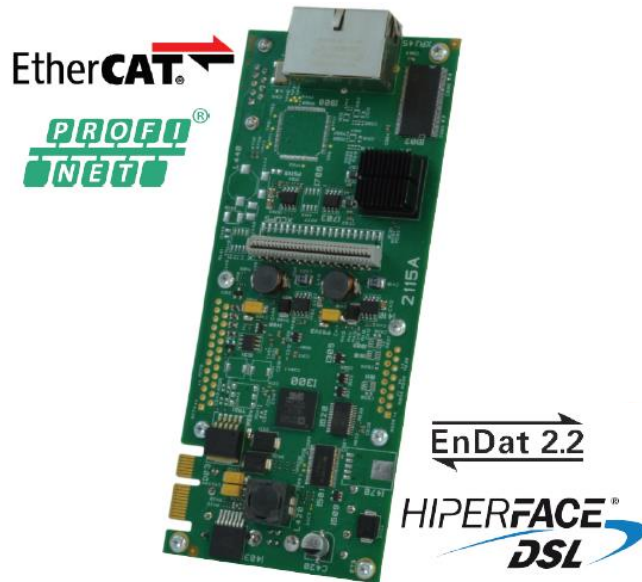
- Galvanic isolation between control and power electronics.
- IGBT output stage.
- Digital PWM current loop providing very low ripple motor currents and high motor efficiency.

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.
- Natural convection cooling
- Multi loops control (torque and speed).
- Sinusoidal current output ensures smooth torque and optimal performance at low speed.
- Display for status & diagnostic.

User's inputs / outputs

A - Control unit 2115



- Ethercat ® or Profinet ®
- USB port for programming and diagnosis.
- External power supply to the Control and Interface boards to keep position data and alarms in case of main power supply interruption.

B - Control unit 2001



- Analogue Speed or Current input command +/- 10V
- Digital input command.
- Pulse/Dir
- SSI command interface
- 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.
- CNC feedback virtual encoder 1024 PPR
- Ready relay
- With Add-on boards:
 - CAN interface
 - 24VDC auxiliary supply
 - Encoder motor feedback
 - Dual Analogue bipolar output
 - Profile (motion control by PLC 24V logic)

C - Control unit 2002

- Analogue Speed or Current input command +/- 10V
- Digital input command.
- SSI command interface
- RS232 serial port
- 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.
- CNC feedback virtual encoder 1024 PPR
- Ready relay

Protections

- Rugged industrial construction for use in adverse conditions.
- Power stage fully protected against short-circuit and over-temperature.
- Motor protection by I^2t limitation.
- Detection of feedback fault, motor wiring failure, motor overheating.

3. Technical data**3.1 General data for all types**

Description	Unit	Series 2000 Mini
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

3.2 Specific data

Description	Drive Mini type	Unit	Value
Supply Voltage	2004	VAC	1x110 to 230 +/-15%
Max. output voltage to motor	All	V	(input AC-10), 3 phases
ON-Switching threshold of brake module	2004	VDC	400
OFF-Switching threshold of brake module	2004	VDC	390
ON-Trip threshold of overvoltage	2004	VDC	420
OFF-Trip threshold of overvoltage	2004	VDC	410
OFF-Trip threshold of undervoltage	All	VDC	110
ON-Trip threshold of undervoltage	All	VDC	100
Cooling	2004		Natural air convection
Indicative weight	All	kg	2.2

3.3 Power data

Drive type		Rated rms current	Rated pk. current	Max. rms current	Max. peak current	Rated power	Max. power
		($I_{rms \text{ rated}}$)	($I_{peak \text{ rated}}$)	($I_{rms \text{ max}}$)	($I_{peak \text{ max}}$)	(P_{rated})	(P_{max})
		(A)	(A)	(A)	(A)	(kW)	(kW)
Mini							
	2004	4	5.7	8	11.3	1.5	3

Note: $I_{rms} = I_{peak} / 1,41$ $V_{rms} = 220V$ or $390V$
 $P = 1,73 \times I_{rms} \times V_{rms}$ or $P = 3 \times I_{rms/phase} \times V_{rms/phase}$

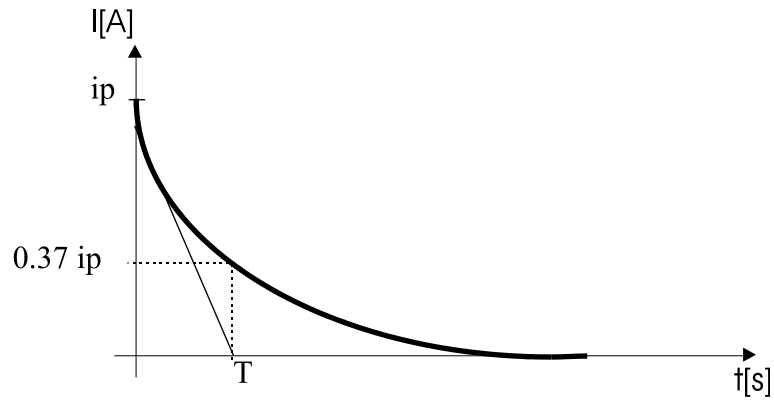
Braking power :

Drive type		Rbraking	Peak braking power	Max. continuous braking power	Surge energy ($\Delta T=300K$)
		(Ω)	(W)	(W)	(J)
Mini					
	2004	100	1500	100	

The surge energy rating is the maximum permitted dynamic brake application from cold. To a first approximation, heat is then removed at the rate given by the continuous power figure, thus about 20 seconds interval must be allowed between full energy stops.

3.3.1 Inrush current

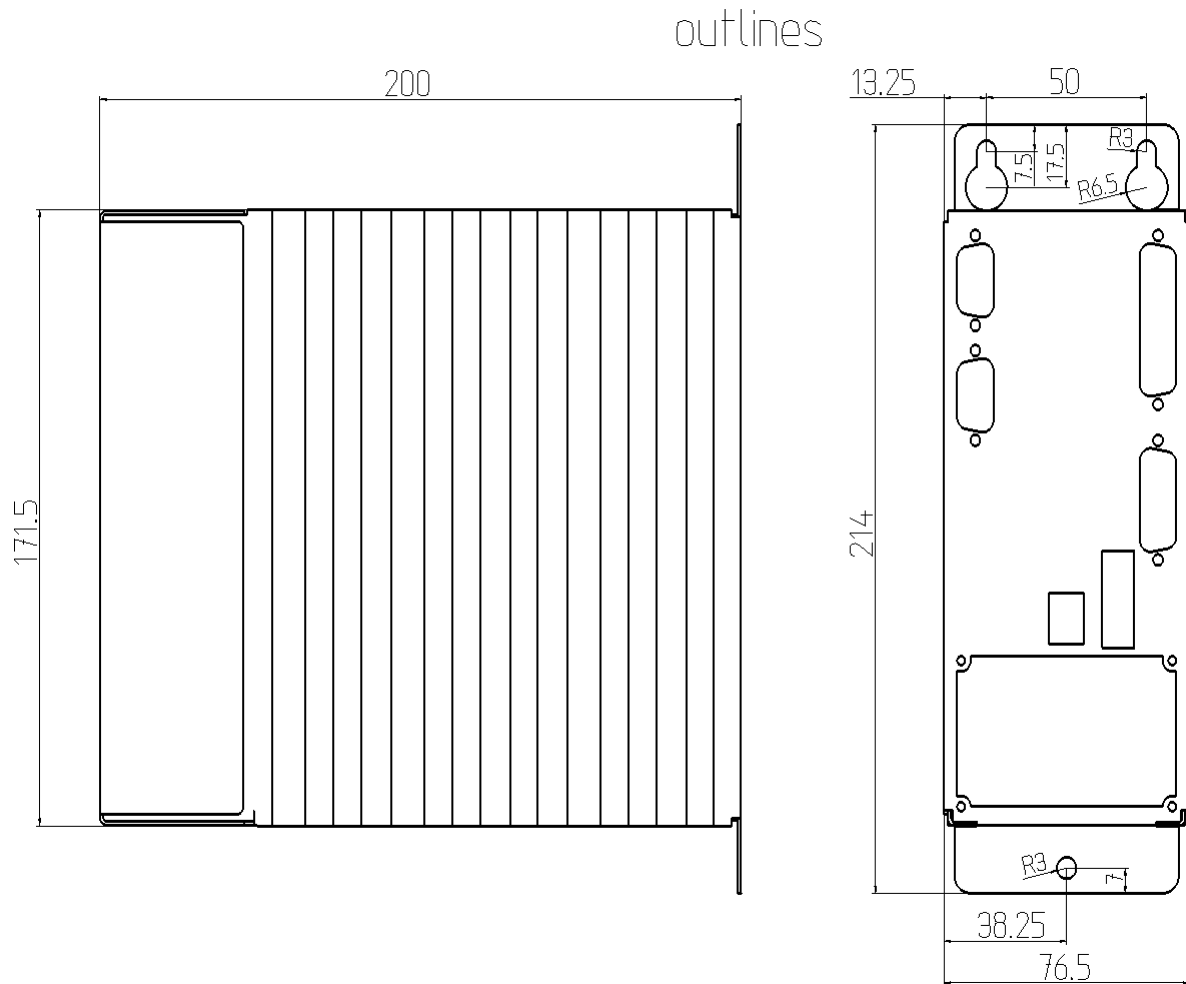
Wave shape for the nominal values



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

Series 2000 Mini : $i_p = 7 \text{ A}$ and $T = 80 \text{ ms} \Rightarrow i^2 t = 2.0 \text{ A}^2 \text{ s}$

3.4 Mini Evo drive outlines



3.5 Compatible Motors

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

3.6 Position feedback solutions

- **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 absolut (single/multi turn) encoder 2.1 / 2.2**
- **Hiperface[®] DSL (single/multi turn) encoder (Single cable solution)**

4. Fuses

Drive Type Mini	DC-BUS (FBUS)
2004	16A/500V 6.3x32 (on line input for the type 2004) SIBA, art. 70 065 65 UL: E167295 Art. IRT: 2410.158.16

NB : No replacement of any fuse should be carried out until the reason for it's blowing has been rectified.

5. Option list

See Control Units

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 : <ul style="list-style-type: none">• 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.

Add-on boards compatible with series 2000 Small drives	
UVW ENCODER FEEDBACK	
See Special functions specification.	
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.
CAN Add-on	
Proprietary CANopen interface module for IRT Series 2000 & 4000 drives. See Special functions specification.	

DRIVE 2000 MINI EVO, TECHNICAL MANUAL EVOLUTION

CHAPTER	PAGE (OLD VERSION)	PAGE	MODIF REV.	DESCRIPTION
			1	Manual adapted Technical manual for drives 2000 Mini Evolution

Last modification : October 2016