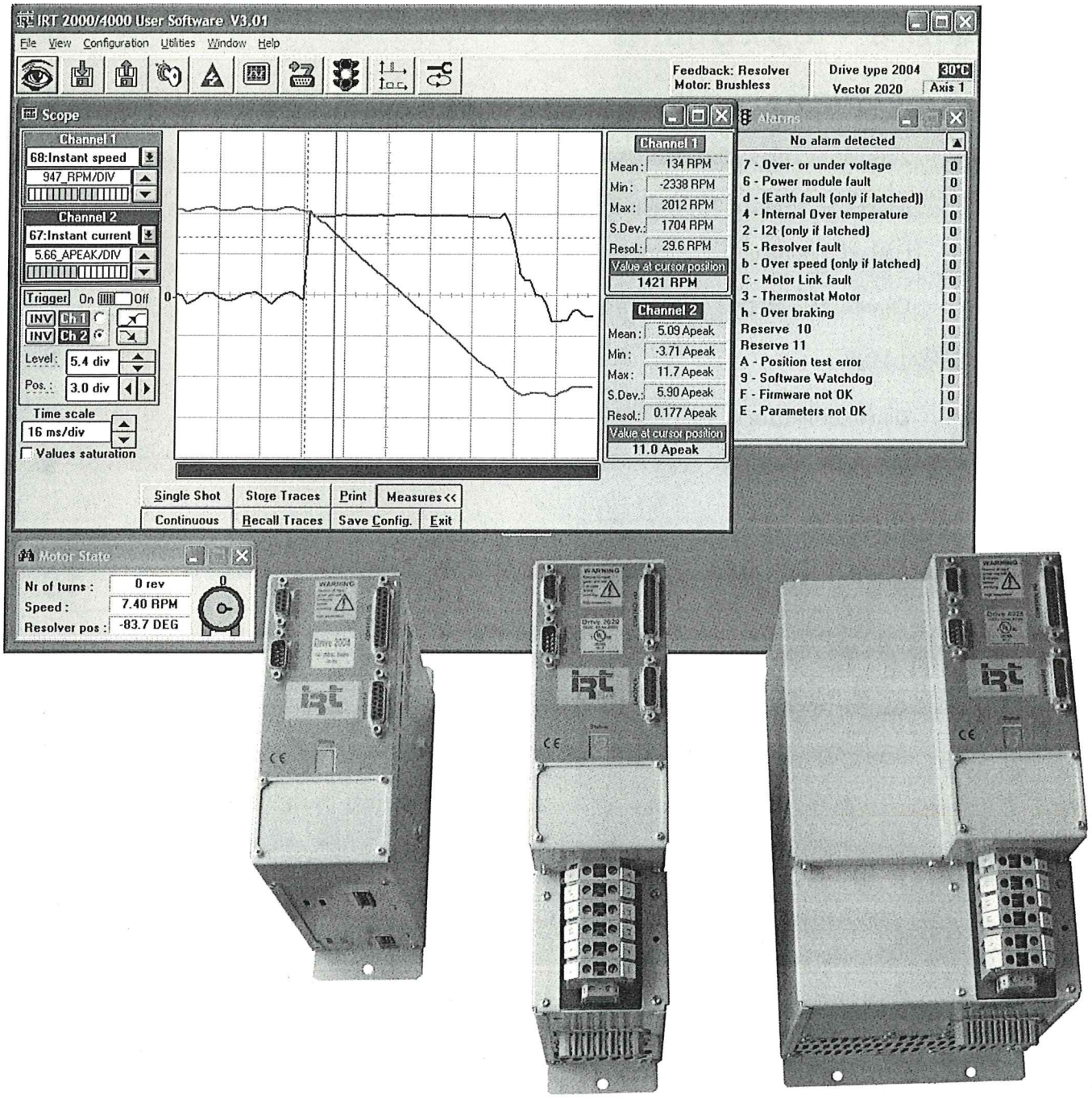
DRIVES 2000 / 4000

OPERATING MANUAL



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Your drive provider

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CHAPTER B - USER UTILITIES

This section of the manual describes the use of customer utilities. The software is for PC compatible computer.

1. Windows Users

The Windows user software runs under Windows XP or later.
This software regroups all functions of the old DOS programs and advanced functions such as integrated scope (if the firmware includes this function).

1.1 2000WU : 2000 Windows User

Like many Windows applications, this software must be installed by starting the SETUP.EXE file, delivered on the installation disk (the SETUP can be executed from the file menu or from the file manager). This operation installs all libraries needed and the application icons.

Installation problems :

1) Installation message :
COMMDLG is in use. Please close all applications and re-attempt Setup.
Solution :
Choose Ignore

Using 2000WU

A double click on the  icon starts the application.

Much information are included in the help file, it can be called by the menu « Help » or by a strike of F1 KEY anywhere in the software, to obtain help on the current opened window.

If the drive is correctly connected, the drive type appears below *DRIVE* in the grey box at the right of the toolbar. To uploading, click on the  icon included in the toolbar. Message *WAITING FOR DRIVE RESPONSE* appears, and if the drive is correctly connected, it disappears after a few seconds. Then, a click on the *SEARCH FILE* button enable the search of the update file (i.e. IRT2007.HEX) in the system (on the hard disk or on a disk). After selection of the file a click on the *TRANSFER PROGRAM INTO DRIVE* button start the update of the firmware or a click on the *COMPARE WITH DRIVE CONTENTS* button enable the check of the FLASH memory contents.

1.4 Change parameters values with 2000WU

Similarly to the firmware update, the Drive must be ONLINE, if not, read the first part of the firmware update procedure.

Click on the  icon to start the *DRIVE PARAMETERS UTILITY* window. it is now possible to read or write parameters values.

The values are given in three different numbers; decimal value, hexadecimal value and meaning value. The decimal and the hexadecimal value are the real internal value of the drive (16 bit), and the meaning is a corrected value with a unit. Only a few parameters have a meaning value. For the others, meaning value is the same as the decimal value, without unit.

To change parameter value, use the scroll bar to move the grid on the parameter, click on the value that you want to modify, edit it and strike ENTER key.
There are three possibilities to write the value :

- Decimal (i.e. : 15567 or -23203)
- Hexadecimal (i.e. : (800)h)
- Meaning value(i.e. : 8 A or 8)

When the ENTER key is pressed, the value is sent to the drive and is read again for checking the modification.

A click on the *SAVE PARAMETERS IN DRIVE* button stores all parameters in the FLASH memory of the drive.

Answers format :

<STX><ADDRESS><COMMAND><PARAM1><PARAM2><PARAMn><ETX><BCC>
or
<ACK>
or
<NAK>

The answers are different depending on received command :

Write parameter :
Command : No Axis Write Address Data
Answer : ACK if order understood and executed
NAK if BCC wrong and No Axis OK

Read parameter :
Command : No Axis Read Address
Answer : No Axis Read Address Data
NAK if BCC wrong and No Axis OK

2.2 Dialogue examples

Command	Drive answer
Read parameter no 11 axis no 2 {02}{50}{82}{59}{03}{90}	Parameter no 11 = 27 = (1B)h {02}{50}{82}{59}{48}{48}{49}{66}{03}{41}
Write 127 the parameter no 28 of axis no 13 {02}{61}{87}{76}{48}{48}{55}{70}{03}{86}	ACK {06}
Store parameters in FLASH of axis no 2 {02}{50}{83}{84}{03}{52}	Nothing

1.1 Global list of parameters

Addr.	St.	R/W	Unit	Limits	Description
0	S	R/W	-	1..6	Pair of motor poles
1		R/W	$1/2^{16}$ turns	8000h..7FFFh	Resolver shift angle
2	S	R/W	-	0,1	Motor Thermostat n/o or n/c
3		R/W	$\frac{1}{7FFF_h} \cdot I_{MAX\_DRIVE}$	0..7FFFh	Maximum motor current
4	S	R/W	$\frac{1}{7FFF_h} \cdot I_{MAX\_DRIVE}$	0..3FFFh	Nominal motor current
5	S	R/W	ms	10..7FFFh	I^2t motor limited to maximal drive I^2t
6		R/W		1..1000	Current loop Proportional gain (Kp)
7		R/W		0..100	Current loop Integral gain (Ki)
8		R/W		0..7FFFh	Current loop Differential gain (Kd)
9		R/W	$\frac{0.1\ Electric\ degree}{1'000\ RPM}$	0..100	Phase advance
10		R/W	$\frac{1}{7FFF_h} \cdot I_{MAX\_DRIVE}$	-1,0..7FFFh	External I-limit/Loop select V2005→ negative value enable the selection speed or current loop.
11		R/W			
12		R/W	$1/8000_h$	6000h...A000h	Adj.factor sine/cosine
13	O	R/W	-	0,1	Power down back-up
14	S	R/W	-	0..3	Encoder Input configuration bit0:encoder inputs direct to output bit1:count reset on Z input

Addr.	St.	R/W	Unit	Limits	Description
28		R/W	$\frac{1}{7FFF_h} \cdot V_{MAX}$	-255..255	Analogue command offset with speedloop control
			$\frac{1}{7FFF_h} \cdot I_{MAX\_DRIVE}$		Analogue command offset with currentloop control
29		R/W	55.6 RPM/s	0,1..7FFFh	Command Slope 0 : No ramp
30	S	R/W	-	0,2	Monitoring Relay Rdy/Ala/Ena 0 : Relay-Ready (Alarm inverted) 1 : Relay-Alarm 2 : Relay-Enable (V2005→)
31	n.i.	R/W	-	0,1,2	Enable hardware/serial/edge
32		R/W	ms	0..32000	Watchdog software communication (V2005→)
33	S	R/W	-	0..FFFFh	Alarm latch
	Bit		**Description**		
	0		Latch alarm 7 (over or under voltage alarm)		
	2		Latch alarm d (earth fault)		
	4		Latch alarm 2 (I^2t) (V2005→)		
	6		Latch alarm b (over speed)		
34		R/W	REV/4096	0..256	Encoder dead window (V2005→)
35		R/W	ms	0,1..136	Motor brake delay (V2005→)
36		R/W			
37		R/W			
38	O	R/W	-	0,32	SSI number total of bit
39	O	R/W		0,20	SSI number of bit per revolution

Addr.	St.	R/W	Unit	Limits	Description
62		R/W			Internal register
63		R/W			Internal register
64		R			Status register

Bit	Description		Drive display
0	Fault Int : Over or under voltage of DC Bus		
1	FO N	Power module fault (over I, over Temp)	
2	FO UP		
3	FO VP		
4	FO WP		
5			
6	Setup mode		
7	End-switch or direction stop active		
8	Thermostat motor		
9	V6 OK		
10	End-switch 1		
11	End-switch 2		
12	Power down		
13	External I-limit/Loop select input		
14	AC fail		
15	Enable/disable		0/1

65		R			Alarm register

Bit	Description	Drive display
0	Fault Int : Over or under voltage alarm	7
1	Power module fault	6
2		
3	Internal over temperature (>80°C)	4
4	I^2t (only if latched)	2
5	Resolver fault	5
6	Over Speed	b
7	Motor link fault	C
8	Thermostat motor	3
9	Over braking	h
10	Over speed asynchronous	u
11		
12	Position error (Profil, Stepper functions)	PA, A
13	Software watchdog	9
14	Firmware not OK	F
15	Parameters not OK	E

Addr.	St.	R/W	Unit	Limits	Description
86		R	A_{RMS}		Maximum drive current (I_{MAX_DRIVE})
87		R	A_{RMS}		Nominal continuous drive current
88		R	ms		Maximum drive I^2t
89		R	-		Power modules
90		R	V_{RMS}		Line voltage input
91		R	-		Options 1
92		R	-		Hardware version
93		R	-		Delivery date
94		R	-		Customer
95		R	-		Serial Number
96		R	-		Firmware abilities

Bit	Description
0	Asynchronous motor
1	High speed (> 6000 rmp, until 12000 rmp)
3	Stepper function
10	Software limits
11	Hiperface
13	EnDat
14	Setup tools

97		R	$\frac{-10}{7FFF_h}$ V	8000..7FFFh	External analogue command 10V
98		R	$\frac{2.5}{7FFF_h}$ V	8000..7FFFh	External analogue command 2.5V
99		R	see parameter 50		Internal digital command
100	O	R			Scope values
...	O	R			Scope values
179	O	R			Scope values

1.2 Scope parameters

Scope parameters :

5 parameters for scope settings (Address 41..45).
80 read only parameters for the measuring values (Address 100..179).

Use of scope function

When a time scale different of 0 is written, the drive starts the measurement, the parameters 100..179 are filled cyclically with samples.
When trigger condition is satisfied, the drive saves the position (trigger position parameter) and continues the measurement during the number of post-trig samples defined. At the end of the measurements, time scale parameter is set to 0 to indicate the end.

Add		Description	Comment
41		Time scale	Factor of 133 us for the sampling time.
42	HB	Parameter 1 address (channel 1)	Address of parameter 1 to measure
	LB	Parameter 1 scale	Number of shift (left shift for positive value and right shift for negative value)
43	HB	Parameter 2 address (channel 2)	Address of parameter 2 to measure
	LB	Parameter 2 scale	Number of shift (left shift for positive value and right shift for negative value
44	HB	Slope positive/negative or null	null for no trigger
	LB	Trigger value	Threshold value
45	HB	Trigger position	Address where the trig point is (100..179)
	LB	Number of Post-trig samples	0 : 100 % pretrig 80 : 0 % pretrig
46	Scope options (since firmware V2005)		bit 15 = 0 → saturation (when values overshoot with the defined scale). bit 15 = 1 → no saturation (for bit wise operations or low bits watching)
100	HB	Value 1 of parameter 1	Measured value
	LB	Value 1 of parameter 2	Measured value
..			
179	HB	Value 80 of parameter 1	Measured value
	LB	Value 80 of parameter 2	Measured value

1.2 Global wiring plan

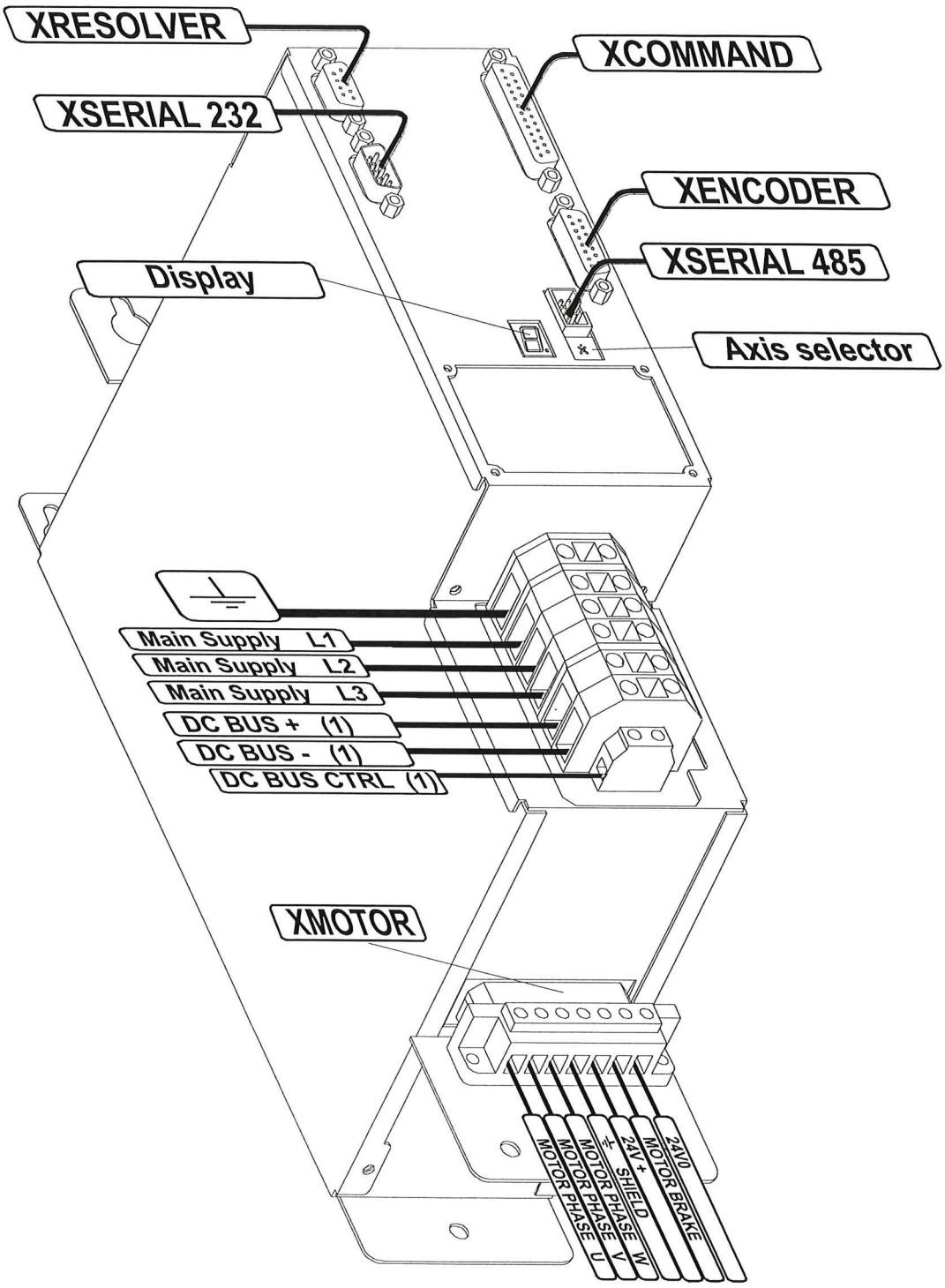


Figure 1 - Global wiring plan

(1) Note :

DC BUS +/- and DC BUS CTRL terminals are not present when drive is equipped with « EMC filter » option.

1.3.1 XRESOLVER

Correct wiring of the resolver is the **precondition** for good and reliable operation of the servo-amplifiers series 2000 & 4000. Non-compliance of the instructions operations in this manual will cause **a deterioration of the specified performances**.

A cable with the following characteristics is needed :

- 3 pairs of conductors 0,14 mm^2 twisted in pairs and shielded separately.
- 2 conductors of 0,5 mm^2 shielded separately
- an overall shield contacted with the previous shields.

The cable wiring should be done as Figure 2.

The overall shield must be connected to both the motor and the amplifier. It should be noted that the contact from the overall shield to amplifier and motor must be made by using as much contact area as possible. The use of "Pig Tail" on the overall shield should be avoided. It is recommended to follow the convention (signal / conductor colour) used in this manual.

Contacts 2 and 6 are intended for the motor thermal switch wiring. The contact should be either of type normally closed, or of type normally open.
It should have the following characteristics :

contact closed : 1 k ohm
contact opened : 10 k ohm

N.B. : Take care to the polarity with semiconductor temperature sensor.

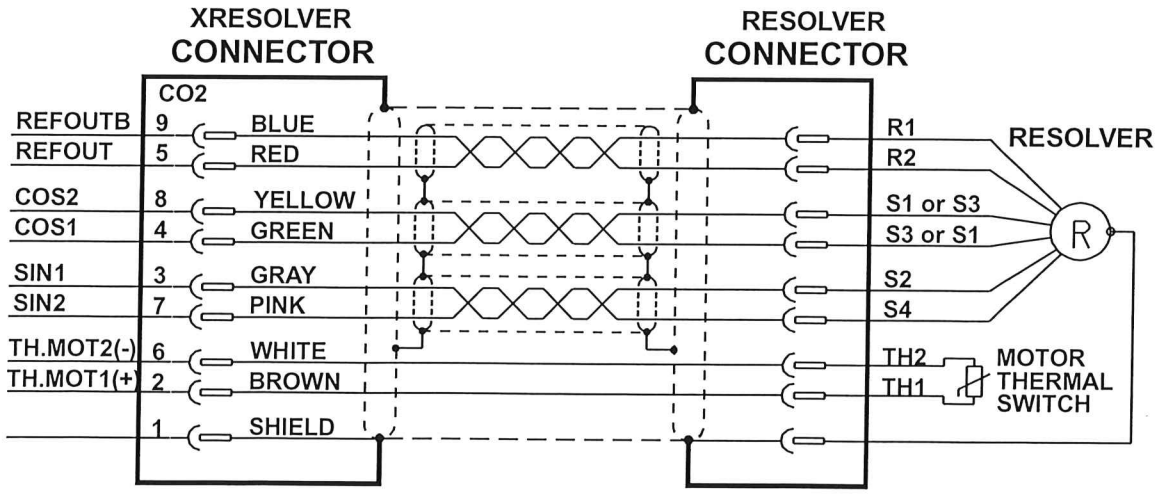


Figure 2 - Resolver and motor thermal switch wiring

(2) Close this input to GND to inhibit or to free the movement (depend of parameter 24 configuration).

The on-board relay is **normally open contact**. The rating of his contact is as follows:

24 V - 0,5 A - 10 VA

1.3.3 XENCODER

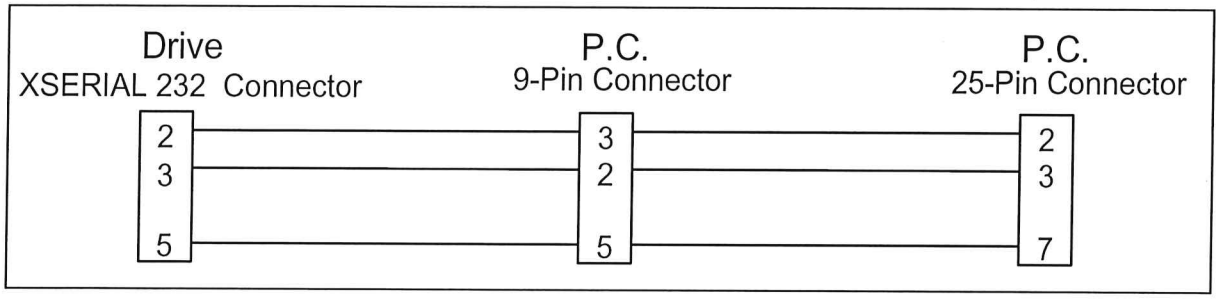
The connector XENCODER provides simulated encoder signals and allows to read signals coming from an external encoder.

Pin Nr.	Pin name	Function	Pin type
1,2 & 12	GND	Internal ground of the CU board	Power ground
3	AI	Non-inverted impulse A input	Differential input
4	AI\	Inverted impulse A input	Differential input
5	BI	Non-inverted impulse B input	Differential input
6	Z\	Inverted zero impulse output	Differential output
7	Z	Non-inverted zero impulse output	Differential output
8	B\	Inverted impulse B output	Differential output
9	B	Non-inverted impulse B output	Differential output
10	A\	Inverted impulse A output	Differential output
11	A	Non-inverted impulse A output	Differential output
13	BI\	Inverted impulse B input	Differential input
14	ZI	Non-inverted zero impulse input	Differential input
15	ZI\	Inverted zero impulse input	Differential input

Pin-out of the RS232 connector (XSERIAL 232)

Pin Assignment for Serial Port on the Drive			Pin Nr. for Serial Port on P.C.	
Pin Nr.	Pin name	Function	9-Pin connector	25-Pin Connector
1,6,7,8 & 9	N.C.	Not connected (potential free).		
2	RX232	Transmit Data output	3	2
3	TX232	Receive Data input	2	3
4	RTS	Request To Send output	6 & 8	6 & 5
5	GND	Common ground	5	7

The minimal wiring of the RS232 serial cable is as follows:



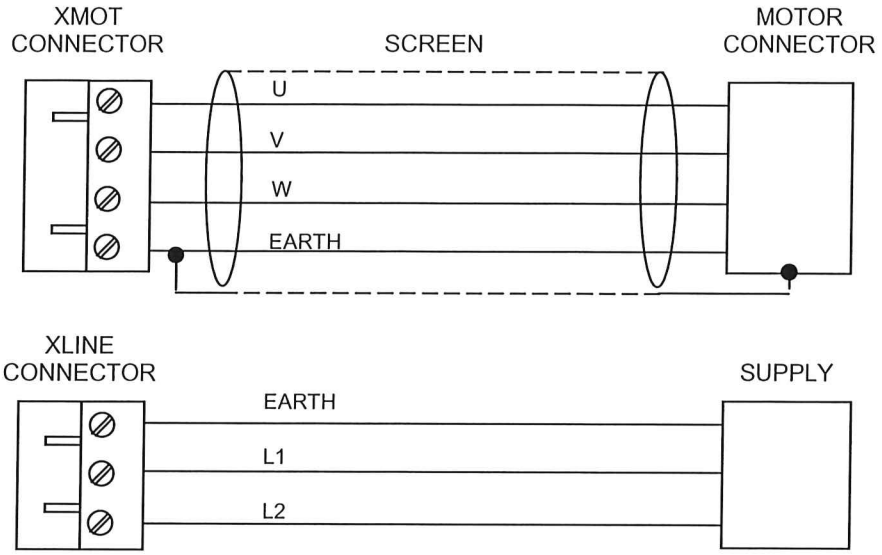
Pin-out of the RS485 connector (XSERIAL 485)

Pin Nr.	Pin name	Function
1	TX485	Non-inverted Transmit Data output
2	TX485\	Inverted Transmit Data output
3	RX485	Non-inverted Receive Data input
4	RX485\	Inverted Receive Data input
5 & 6	GND	Common ground

1.4 Power Connectors

1.4.1 Mini drive type 2004

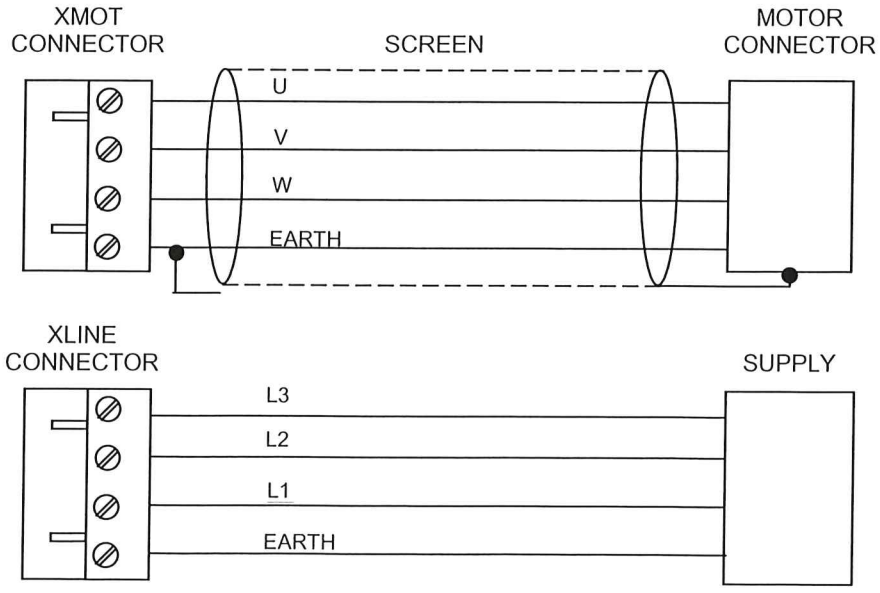
The power and motor connectors are Weidmüller, BLZ 7.50/3B and BLZ 7.50/4B (7.5 size).



Safety note : For safety use, XMOT must always be connected.

1.4.2 Mini drive types 2006 and 2009

The power and motor connectors are Weidmüller BLZ 7.50/4B (7.5 size).



1.4.4 Determining the motor phases (without drive)

> ***Important :***
> ***This operation will be done only when the three-phase motor order is unknown (motor prototype or no documentation).***

A DC supply of about 3A is necessary for this operation.

The procedure is as follows :

1. Determine arbitrarily phase **U** as one of the 3 motor phases.
2. Connect **U** to «+» and a **2nd phase** motor to «-» of the DC supply.
3. Switch supply on. The shaft will move to a stable position.
4. Mark the new shaft position with a pencil, at top center.
5. Switch supply off, disconnect the «-» from the **2nd motor phase** and reconnect the «-» to the **3rd motor phase**. Switch supply on and observe the axis rotation direction (report the direction in the table below).
6. Mark with a pencil the new shaft axis position.
7. With the help of the table below, determine the 2 unknown motor phases :

Sense of axis rotation	2nd Motor phase	3rd motor Phase
Clockwise	V	W
Anti-clockwise	W	V

When this operation is done, it is important to define the resolver shift angle parameter (P1), see section 4.1 of chapter D.

2.1 Alarms

The alarm H has the most priority (following F, E, 9, C, h, 7, 6, 5, b, 4, 3, 2). If some alarms takes place simultaneously, only the one with the higher priority will be displayed.


I^2t
(only if latched)


Thermostat motor


Internal over temperature (>80°C)


Resolver fault
If >110% or <60%


Power module fault


Over or under voltage


Software watchdog


Over speed when 125% of max. motor speed is reached.
(only if latched)


Motor link fault


Parameters not OK


Firmware not OK


Hardware incompatibility
blinking


Over braking

The Parameter 33 (Alarm latch) allows you to define which alarm must be latched.

2.2 Warnings

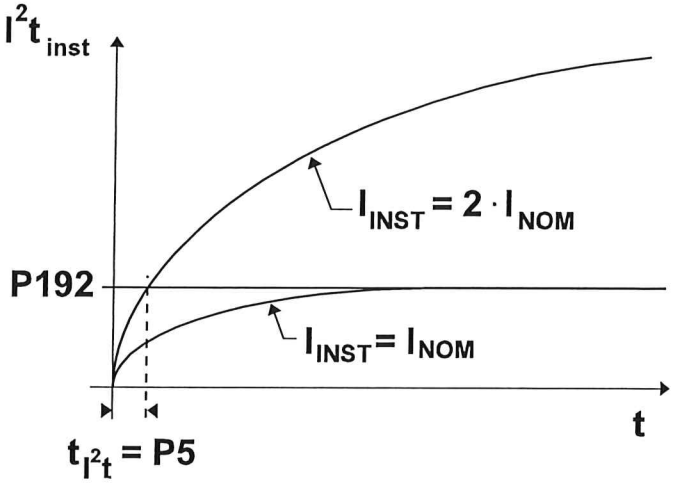

Over current, appears during 1 sec when 120% of maximum drive current is reached (bad regulation parameters).


I^2t reached.
(if not latched)

I2T MOTOR, ADDRESS 5

The I^2t motor (P5) is defined as elapsed time in « ms » when I^2t value progresses from zero to I^2t threshold (P192) when drive current equals the double of nominal current (P4).

I^2t evolution for $I_{INST} = I_{NOM}$ and $I_{INST} = 2 \cdot I_{NOM}$:



Instant I2t, Address 193 :
Instant I^2t (P193) is the instantaneous value of the I^2t. In comparison of the I^2t threshold, this parameter gives an information about motor load.

I2t threshold, Address 192 :
The I^2t threshold (P192) is defined as equal to the I^2t value when continuous drive current equals nominal current.

I^2t warning (if I^2t not latched) :
When I^2t value reaches the I^2t threshold, the maximal current is limited to nominal current and 2 is displayed while I^2t value is higher than I^2t threshold.

I^2t alarm (if I^2t latched) :
The drive power stage is disabled when the I^2t value reaches the I^2t threshold and 2 is displayed.

The instant I^2t in comparison of I^2t threshold can be observed on the Scope of the user software. This method is useful to determine and to check the I^2t value and the motor load.

DRIVE TYPE 2010 FEATURES :

I_{NOM_DRIVE} = 10 A
I_{MAX_DRIVE} = 20 A

{ PAIR OF MOTOR POLES, ADDRESS 0 } ⇐ 4

{ RESOLVER SHIFT ANGLE, ADDRESS 1 } ⇐ 0

Supposition : ideal combination between the resolver and the motor.

{ MOTOR THERMOSTAT N/O OR N/C, ADDRESS 2 } ⇐ 0

Thermostat motor normally opened.

{ MAXIMUM MOTOR CURRENT, ADDRESS 3 } ⇐ 21790

With maximum motor current equal at the double of the nominal current.

I_{MAX_MOTOR} = 13.3 A

$$\frac{I_{MAX\_MOTOR} \cdot 7FFFh}{I_{MAX\_DRIVE}} = \frac{13.3 \cdot 7FFFh}{20} = 21790 = 551Eh$$

{ NOMINAL MOTOR CURRENT, ADDRESS 4 } ⇐ 10945

$$\frac{I_{NOMINAL\_MOTOR} \cdot 7FFFh}{I_{MAX\_DRIVE}} = \frac{6.68 \cdot 7FFFh}{20} = 10945 = 2AC1h$$

{ I2T MOTOR, ADDRESS 5 }

{ MAXIMUM SPEED (FOR 10V INPUT), ADDRESS 23 } ⇐ 3243

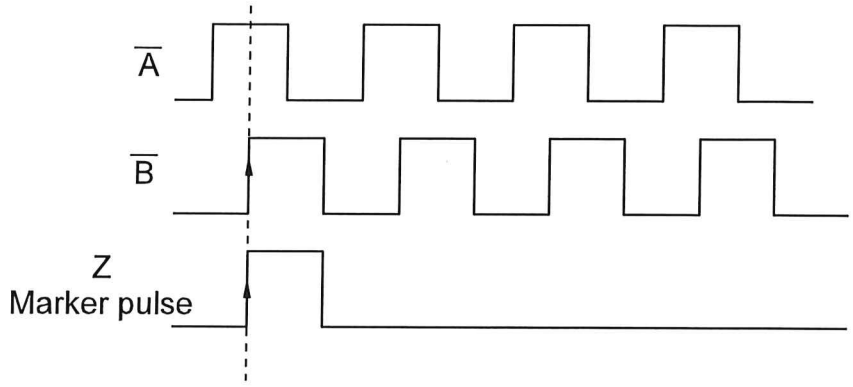
n_{MAX} / 0.925 = 3000 / 0.925 = 3243.2

ENCODER OUTPUT SIGNALS EXAMPLE :

ENCODER MARKER PULSE WIDTH = 1

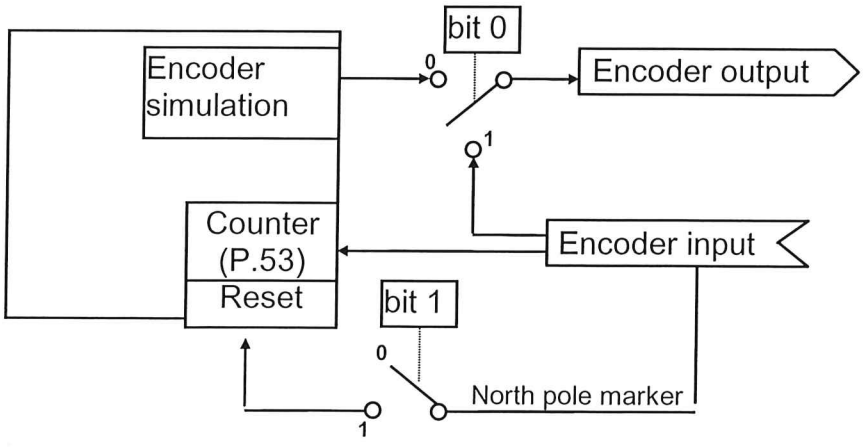
ENCODER MARKER PULSE POSITION = 0

With a positive speed (display dot off) :



ENCODER INPUT CONFIGURATION, ADDRESS 14 (OPTION).

Options for the encoder input, bit 0 and 1 must be set to change the encoder input configuration :



IU/CU COMMAND, ADDRESS 48 (OPTION).

SSI internal register.

CYCLIC PARAMETER ADDRESS, ADDRESS 49 (OPTION)

SSI internal parameter.

3.2.4 General configuration

MONITORING RELAY RDY/ALA/ENA, ADDRESS 30.

0: Relay ready, the relay is activated at power up and it is deactivated when an alarm is set (Relay alarm inverted).
1: Relay alarm, the relay is activated only when an alarm is set.

Firmware version 2005 or higher :

2: Relay enable, the relay is activated when the power stage of the drive is enabled

ALARM LATCH, ADDRESS 33.

Bit 0 : Alarm 7 Over or under voltage alarm
Bit 2 : Alarm d Earth fault
Bit 4 : Alarm 2 I^2t (fimware version 2005 and higher)
Bit 6 : Alarm b Over speed

Set or clear these bits to activate or deactivate the latch of the corresponding alarm.

EXTERNAL I-LIMIT/LOOP SELECT, ADDRESS 10.

When the « EXTLIMI\ » input (XCOMMAND/PIN 7) is closed to GND, this value becomes the maximum motor current (the value of parameter 3 is disregarded).

When P.10 = 0, the limitation of maximum current by external input is disabled.

Firmware version 2005 or higher :

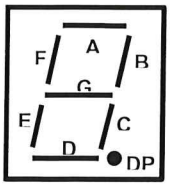
When P.10 = -1 :

EXTLIMI\ input select the speed or current regulation loop :
EXTLIMI\ = 1 ➔ Speed loop.
EXTLIMI\ = 0 ➔ Current loop.

STATUS DISPLAY 7 SEGMENT VALUE, ADDRESS 51

0: Internal status (the display indicates drive alarms or status)
Change this value to force the display of any information (drive alarms are hidden).

bit7 = DP
bit6 = SEGMENT A
bit5 = SEGMENT B
bit4 = SEGMENT C
bit3 = SEGMENT D
bit2 = SEGMENT E
bit1 = SEGMENT F
bit0 = SEGMENT G



MOTOR REVOLUTIONS COUNTER, ADDRESS 52.

This value can be read for motor position consulting and can be reset at a chosen position.

3.3 Regulation parameters

3.3.1 Configuration

SPEED OR CURRENT LOOP CONTROL, ADDRESS 26.

0 for speed loop and 1 for current loop control. When speedloop is chosen, the command is read as a speed, when currentloop the command is read as a current.

DIGITAL, ANALOGUE OR OTHER COMMAND, ADDRESS 27.

0 for digital and 1 for analogue.
Digital command :
parameter 50 (Digital command) is read to set the command value.
Analogue command :
Input voltage SPEED IN is converted to set the command value.

DIGITAL COMMAND (SPEED OR CURRENT), ADDRESS 50.

When digital command mode is set, this parameter defines the command value.

ANALOGUE COMMAND OFFSET, ADDRESS 28.

When analogue command mode is chosen, the input offset voltage can be adjusted with this parameter.

DIGITAL PID EQUATION :

$$U_{CM} = Kp \cdot i_{e[N]} + Ki \cdot \sum_{i=0}^{N} (i_{e[i]} \cdot \Delta T) + Kd \frac{i_{e[N]} - i_{e[N-1]}}{\Delta T}$$

$i_{e[N]}$: Last sample

ΔT : Sampling time

The drive values are obtained with the following equations :

CURRENT LOOP PROPORTIONAL GAIN (KP), ADDRESS 6.

2000 series : $$Kp = \frac{P_{CURRENT}}{\hat{I}_{MAX}} \quad [V/A]$$

4000 series : $$Kp = \frac{\sqrt{3} \cdot P_{CURRENT}}{\hat{I}_{MAX}} \quad [V/A]$$

$P_{CURRENT}$ = Parameter 6

CURRENT LOOP INTEGRAL GAIN (KI), ADDRESS 7.

2000 series : $$Ki = \frac{7500 \cdot I_{CURRENT}}{\hat{I}_{MAX}} \quad [V/As]$$

4000 series : $$Ki = \frac{7500 \cdot \sqrt{3} \cdot I_{CURRENT}}{\hat{I}_{MAX}} \quad [V/As]$$

$I_{CURRENT}$ = Parameter 7

DIGITAL PID EQUATION :

$$i_c = Kp \cdot \omega_{e[N]} + Ki \cdot \sum_{i=0}^{N} (\omega_{e[i]} \cdot \Delta T) + Kd \frac{\omega_{e[N]} - \omega_{e[N-1]}}{\Delta T}$$

$\omega_{e[N]}$: Last sample

ΔT : Sampling time

The drive values are obtained with the following equations :

SPEED LOOP PROPORTIONAL GAIN, ADDRESS 20.

$$Kp = 4{,}92 \cdot 10^{-6} \cdot \hat{I}_{MAX} \cdot P_{SPEED} \quad [\hat{A}s/rad]$$

P_{SPEED} = Parameter 20

SPEED LOOP INTEGRAL GAIN, ADDRESS 21.

$$Ki = 3{,}73 \cdot 10^{-2} \cdot \hat{I}_{MAX} \cdot I_{SPEED} \quad [\hat{A}/rad]$$

I_{SPEED} = Parameter 21

SPEED LOOP DIFFERENTIAL GAIN, ADDRESS 22.

$$Kd = 6{,}5 \cdot 10^{-10} \cdot \hat{I}_{MAX} \cdot D_{SPEED} \quad [\hat{A}/(rad \bullet s)]$$

D_{SPEED} = Parameter 22

4.1 How to set the resolver shift angle parameter

This operation should be done when the resolver shift angle is unknown. In this case, the two following procedures are available :

4.1.1 Procedure using the motor setup tool from Windows user

❑ **A)**

Double click on the « Feedback : Resolver Motor : Brushless » button.

❑ **B)**

Click on the « Motor Setup tool » button and enable the drive.

❑ **C)**

Click on the « GO » button to find an electric zero position.

❑ **D)**

Once the position is stable, disable the drive and click on the << Store >> button to store the new resolver shift angle.

4.1.2 Procedure for manual setting

❑ **A)**

Click on the « Regulation loop » icon and click on the « M » (motor) button in the « Regulation loop » window.

❑ **B)**

Set the « Maximum motor current » to 25% of the Nominal motor current in the « Motor features » window.

❑ **C)**

Click on the « Speed command » button in the « Regulation loop » window. Then click on the « Single-polarity periodical pulse mode » button in the « Automatic command mode » window.

Enter : A = 120 rpm
tx = 200 ms
T = 200 ms

And click on the « Run » button.

4.2 How to set the current loop parameters

The procedure for the manual setting is as follows :

❑ A)

Click on the « Regulation loop » icon and select the « current loop » control.

❑ B)

Click on the « PID » button of the current controller and set :

- Current loop Integral gain to 0.
- Current loop Differential gain to 0.
- Phase advance to 0.
- Maximum motor current to the max. value.

❑ C)

Click on the « Resolver » button and set the « Resolver Shift angle » to its optimal value added or subtracted by 90°.

❑ D)

Click on the « Current Command » button. Then click on the single pulse mode button in the « Automatic command mode » window.

Enter : A = Max. peak value of the motor
tx = 100 ms
select the square edge wave form.

❑ E)

Click on the « scope function » icon and select :

- Channel 1 : Current command (Parameter 182)
- Channel 2 : Instant current (Parameter 67)
- Suggested configuration :
  - Time scale : 1 ms/div
  - Vertical scale channel 1 and 2 : $\approx I_{DRIVE\ NOM}$ / div

❑ F)

Enable the drive and click on the « Run » button in the « Automatic command mode » window.

4.3 How to set the speed loop parameters

The procedure is as follows :

❑ **A)**

Click on the « Regulation loop » icon and select the « speed loop » control.

❑ **B)**

Click on the « PID » button of the Speed controller and set :
speed loop Integral gain to 0.
speed loop Differential gain to 0.
maximum speed (for 10V input) at max motor speed

❑ **C)**

Click on the « Speed command » button.
Then click on the « single pulse mode » button in the « Automatic command mode » window.
Enter : A = 1/5 of the application speed.
tx = 200 ms (for example).
select the square edge wave form.

❑ **D)**

Click on the « scope function » icon and select :

- Channel 1 : Digital command (Parameter 50)
- Channel 2 : Instant speed (Parameter 68)
- Suggested configuration :
  - Time scale : 16 ms/div (with free running motor)
  - Vertical scale channel 1 and 2 : ≈ 1/10 appl. speed / div

❑ **E)**

Enable the drive and click on the « Run » button in the « Automatic command mode » window.

❑ G1)

Method without the « Scope function »

The « Speed loop Integral Gain » is too low when the axis moves « step by step » with a small speed command. The motor axis is too smooth.

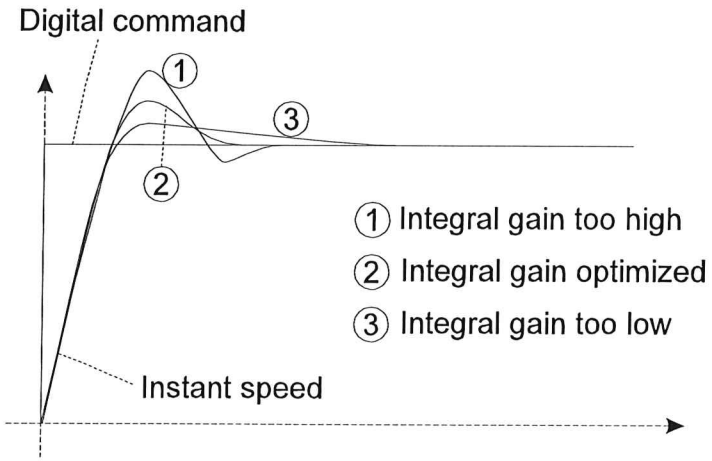
This gain is too high when the motor axis oscillates with a small speed command.

This gain is optimized when the motor axis doesn't oscillates and when the stiffness of the motor axis is sufficient to avoid its motion « step by step ».

❑ G2)

Method with the « Scope function »

The respond at a single speed step command looks as follows :



Store the optimal gain by striking F2.

❑ H)

The « speed loop Differential Gain » remains in most applications at 0.

Display	Trouble shooting
	Parameter not OK (wrong checksum of stored parameter) • Check parameter and store parameters.
	Firmware not OK (only after an update of the firmware) • Reload firmware.
	Over braking • Reduce the speed • Reduce the ramp or inertia
 blinking	Hardware incompatibility. • The firmware is incompatible with drive hardware.

Trouble	Possible cause
Display 0 but the motor doesn't move when a speed command is applied	• End-limit switch enable • Max. drive current too low (P3) • Motor brake engaged
The motor jump to a position and stay blocked.	• Pair of motor poles parameter (P0) misadjusted. • Motor wiring on terminal U, V, W not in the correct sequence.
Motor noisy	• Check resolver cable • Check separation between resolver and motor cable (also inside the motor). • Check earth link • Check regulation parameters.
No link with Drive (Drive Offline appears in User software while the drive is connected to the computer).	• Check **AXIS SELECTOR** position (if present) : RS232 : Position 0 RS485 : Position 1-15 The drive must be resetted to enable a change of the Axis selector position (for more information about Axis selector, see page 28). • Check link cable. • Check Serial Port number in User software.
Firmware upgrade cannot be performed.	• The firmware upgrade is possible only with RS232 link. • Check RS232 link

2. Special parameters for asynchronous motors

Addr.	St.	R/W	Unit	Limits	Description
9		R/W	$\frac{100}{7FFF_h}$ %	0..15%	Slip factor
11		R/W	-	0..1	Cosinus phii
54		R/W	1/revolution	0..7FFFh	Encoder input resolution
55		R/W	0.925 RPM	8000h..7FFFh	Field weakening speed
65		R			Alarm register

Bit	Description	Drive Display
10	Overspeed asynchronous	

SLIP FACTOR, ADDRESS 9.

Slip factor defined the ratio : $\frac{Speed_{synchronous} - Speed}{Speed_{synchronous}}$

Standard value=1..7%, usually, 4% is a good value.

COSINUS PHII, ADDRESS 11.

The cosinus phi is given from the manufacture, usually, a value between 0.8 and 0.9.

2.1 Field weakening

FIELD WEAKENING SPEED, ADDRESS 55.

If field weakening is needed, this parameter must be set to the speed value the field weakening must begin.

2.2 Asynchronous alarm

Asynchronous overspeed, set when the motor speed is higher than 133% of synchronous speed (only if field weakening is disabled).

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.

DRIVE 2000/4000, OPERATING MANUAL EVOLUTION

CHAPTER	SECTION	PAGE (OLD MANUAL)	PAGE	REVISION	DESCRIPTION
		1		2	New pictures
1	1	20	20	3	New drives type
				4	New layout design

Last modification : September 2013-Rev. 4