SHS ELECTRONICS

User Guide

STEPPING MOTOR DRIVE

Series

HT7

Models

HT7_X

ISO 9001
BUREAU VERITAS
Certification

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Safety notes

The SHS automation products should be handled, installed and maintained by qualified personnel trained on installation of automation components, and only for the purposes described in the user manual.
Installers must pay particular attention to the potential risks caused by mechanical and electrical equipment.

It is very important that applications and installations meet all applicable safety requirements.

Each installer has an obligation to take responsibility to verify their knowledge and understanding of all applicable safety standards.

Any use which does not meet the safety requirements can damage equipment and injure the user.

SHS s.r.l. does not consider itself responsible for, and assumes no liability for damage caused by handling products and / or improperly installed, or in cases where the customer has allowed, or executed, modifications and / or repairs not authorized by SHS s.r.l.

The SHS drives are devices for automation high performance capable of generating rapid movements and high forces.

Pay high attention, especially during installation and application development.

Only use equipment properly sized for the application..

The SHS devices are considered components for automation and are sold as finished products to be installed only by qualified personnel and in accordance with all local safety regulations.

The technicians must be able to recognize possible dangers that may result from programming, by changing parameter values and generally by the mechanical, electrical and electronic.

SHS s.r.l recommends to always follow basic safety rules. Failure to heed them can result in injury to persons and / or property.

General precautions:

- This manual is subject to change due to product improvement, specification changes or improvements of the manual
- SHS s.r.l. He is not responsible for damage to property and / or persons caused by faulty installation and / or unauthorized modifications of the product.

The damaged drive sys- tems must not be installed or put into operation in order to avoid injury persons and damage to property. Changes or modifications made to the drive systems is prohibited and It involves the extinction of any right to warranty or of any obligation of responsibility.

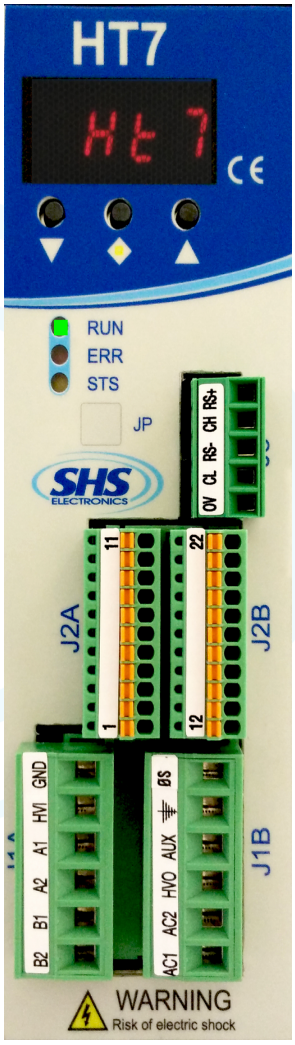
Index

1. TECHNICAL DATA

1.1 Power supply / Motor connector

J1A (Left)	
SIGNAL	**FUNCTION**
B2	Phase B2 of the motor
B1	Phase B1 of the motor
A2	Phase A2 of the motor
A1	Phase A1 of the motor
HVI	Power supply input DC (connect to HV0 or use as input DC power)
GND	0V power supply

J1B (Right)	
SIGNAL	**FUNCTION**
AC1	Power supply Vac
AC2	Power supply Vac
HV0	Rectified output
AUX	Logic power supply input (connect to HV0 or use an power supply external from +24 to 140Vdc)
SHIELD	Schield
0S	0V power supply AUX

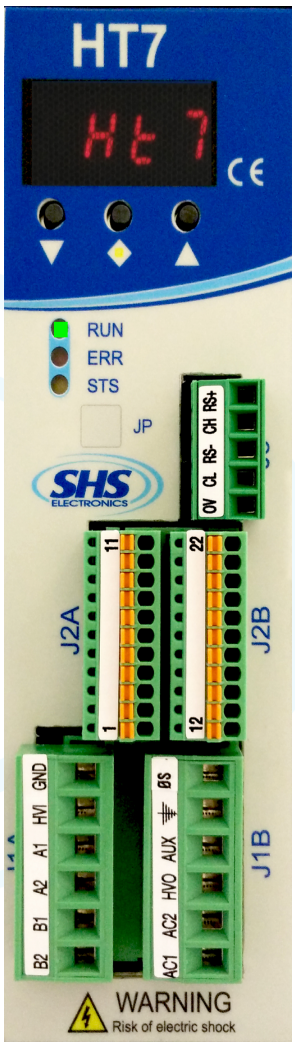


1.2 FIELDBUS Connector

J3	SIGNAL	FUNCTION
1	0V	Serial GND (isolated)
2	CL	CAN BUS L
3	RS-	RS485 - (Half duplex)
4	CH	CAN BUS H
5	RS+	RS485 + (Half duplex)

1.3 Input / Output Connectors

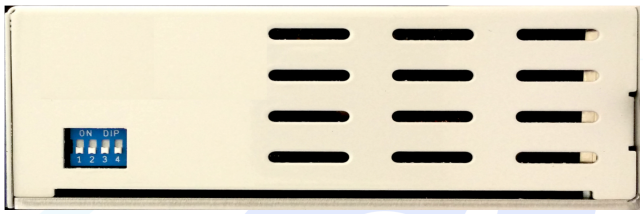
J2A (Left)	SIGNAL	FUNCTION
1	ENC_AH	Encoder A+
2	ENC_AL	Encoder A-
3	ENC_BH	Encoder B+
4	ENC_BL	Encoder B-
5	ENC_ZH	Encoder Z+
6	ENC_ZL	Encoder Z-
7	ENC_COM	Encoder common (don't use in differential mode)
8	ENA/DIS	Input ENABLE/DISABLE
9	IN3	Input IN3 - (CURRENT REDUCTION)
10	IN2	Input IN2 - (DIRECTION)
11	IN1	Input IN1 - (STEP IN)

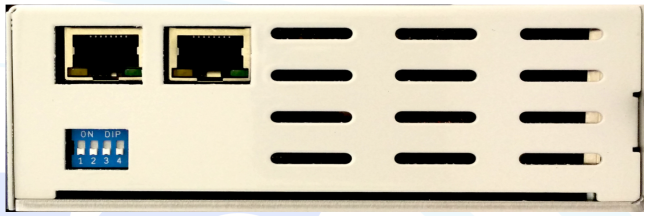


J2B (Right)	SIGNAL	FUNCTION
12	OUT_COM	Output common (OUT1, OUT2, OUT3)
13	OUT1	Output OUT1 - (default motor Step Out)
14	OUT2	Output OUT2 - (default Drive Ready)
15	OUT3	Output OUT3 - (default unused)
16	IN_COM	Input common (IN1, IN2, IN3, ENA/DIS)
17	AN_IN0	Analog Input IN0
18	AN_IN1	Analog Input IN1
19	AN_IN2	Analog Input IN2
20	AN_OUT	Analog Output
21	GND_SIGNAL	0V (relative at EXT_12V, AN_IN, AN_OUT)
22	EXT_12V	Output +12V

1.4 DIP SWITCH

DIP1	ON	OFF
1	Insert termination CAN	Not Insert termination CAN
2	Insert termination RS485	Not Insert termination RS485
3	Not used	Not used
4	Input function En / Dis = ENABLE	Input function En / Dis = DISABLE





Only HT7xx_PN model is supplied of PROFINET interface (upper right pictures)
The profiNET connections can be used interchangeably.

Phisical Features	Connection Type	Cable / trasmission type	Speed	Max Cable Lenght
Electrical	RJ45 Connector	100base-TX Shield cable CAT 5 IEEE 802.3	100MBit/s full duplex	100 mt

1.5 Status LEDS

LED	FUNCTION	
RUN	Drive OK	Light ON steady
	Drive Error	Light OFF
ERR	Drive OK	Light ON steady
	Drive Error	Light OFF
STS	Drive OK	Light slow blinking
	Drive Error	Light fast blinking

1.6 Protection / Display messages

DISPLAY	DESCRIPTION
rdy	Drive OK at STOP motor
run	Motor in movement
dIS	Drive DISABLE
ocur	Overcurrent Error
tEnP	Overtemperature Error
uuoL	Undervoltage Error
ouoL	Overvoltage Error
Ph1o	A Phase motor Error
Ph2o	B Phase motor Error
rSt	Reset phase

Drive is provided with protections against overtemperature, overvoltage, undervoltage, short-circuits among outputs and among outputs and the positive power pole, no-phase motor connection.
If one of the mentioned conditions occurs, drive disables the power bridge and shows an error condition on the display.

To restore the drive in the case of the following errors:

- Overcurrent
- A Phase motor Error
- B Phase motor Error

You must reset the unit.

The decimal point to the left indicates the status RX, while the one on the right indicates the status of the communication interface TX.

1.7 Parameters setting

By using the buttons below the display (hereinafter referred to as [\/] , [<>], [/\]) you can parameterize the drive:

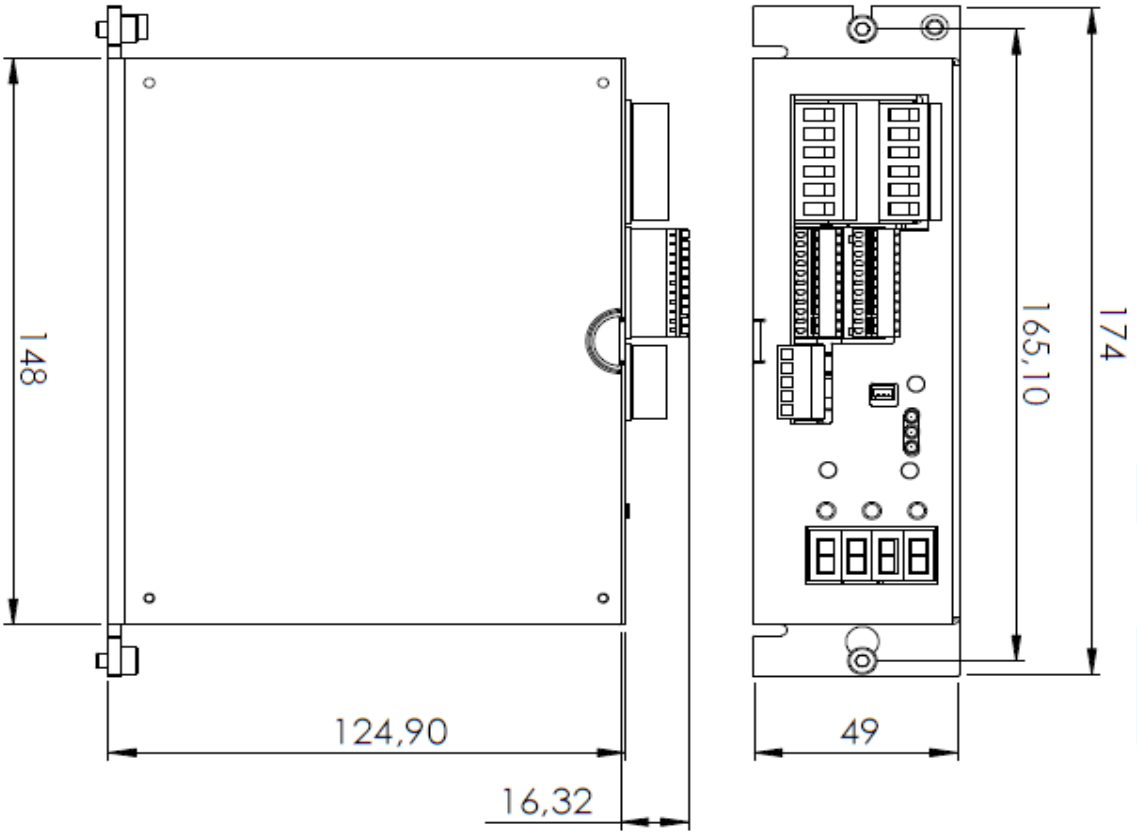
- To access to main menù, press [\/] + [<>] , it will visualized "menu" for 1 sec , after the parameter "P001"
- From the main menu to select the parameter to be changed press the button [\/] or [/\].
- From main menù to visualize the actual value of parameter press [<>].
- From the parameter to change the value press [\/] or [/\]
- From the parameter to store the value press the button [<>] for 1 sec and it will appear "memo"
- From the parameter to come back at main menù without modify any conditions, press [<>] less than 1 sec (don't will appear "memo").
- From the main menù to go out press [<>] + [/\].

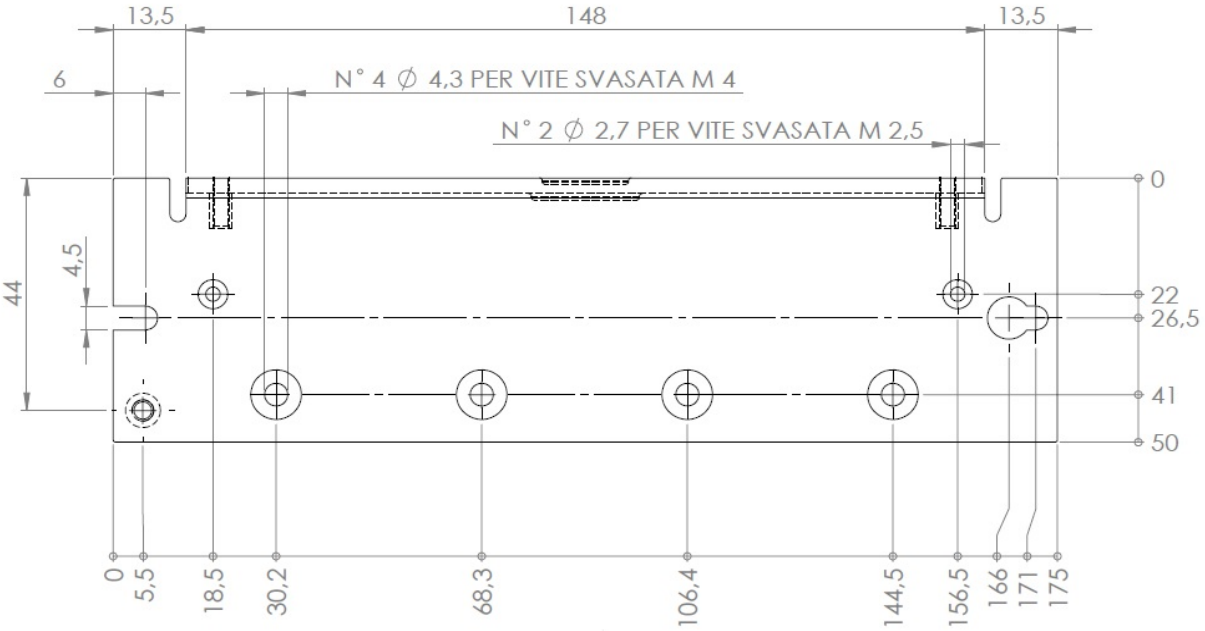
PARAMETER	MODE	FUNCTION
P001	ST+WS+MB+CO	0par : when this parameter is stored, all parameters will be set to default value and it will appear "rst" then restart the driver.
P002	ST+WS+MB+CO	Set the serial mode "SEr" or step/Direction "StEP", if the mode is changed, after "memo" will appear "rSt" and the drive will restart
P003	ST+WS+MB	Current setting [A]
P004	WS+MB+CO	Setting serial Baud Rate
P005	WS+MB+CO	Setting serial address
P006	ST+WS+MB	Setting step resolution (1/2, …, 1/20)
P007	ST+WS+MB	Setting stand-by current (0, 25, 50, 100%)
P008	ST+WS+MB	Setting parameter resonance1 reduction (fd0, …, fd4)
P009	ST+WS+MB	Setting parameter resonance2 reduction (small, big)
P010	ST+WS+MB	Setting wave mode (wav0, wav1)
P011	ST+WS+MB	Setting to operate high frequency
P012	Reserved	Reserved parameter for diagnostic
P013	MB	Setting serial parity (n, e, o)

NOTE: For settings PROFINET parameters refer to attach

Legend MODE:
ST = Step/Direction
WS = RS485 SHS Protocol
MB = Modbus
CO = CanOpen

1.8 Mechanical dimension





Model HT7xx-	Weight [gr]
WS-MB-CO-PB	655
PN-EC	720

2. CONNECTIONS

2.1 INSTALLATION NOTES

ATTENTION

DANGER OF ELECTRICAL SHOCK

ONLY QUALIFIED PERSONNEL SHOULD WORK ON THIS EQUIPMENT. DISCONNECT ALL POWER BEFORE WORKING ON EQUIPMENT. DANGEROUS VOLTAGES MAY EXIST AFTER POWER IS REMOVED! BEFORE WORKING ON EQUIPMENT CHECK DC BUS VOLTAGE OF DRIVES EACH TIME POWER IS REMOVED.

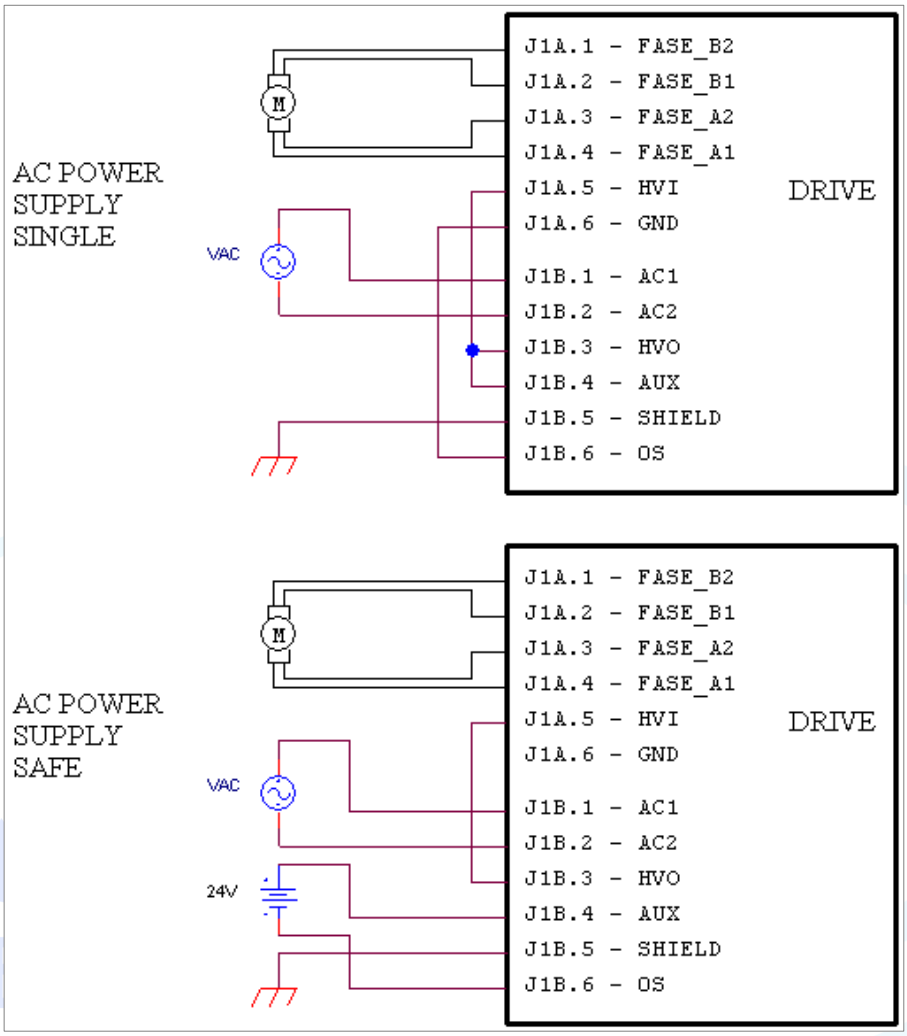
2.2 AC Power Supply

The transformer power is $P=Vac*(Inf(tot) + 1)$
Where P is VA power, Vac is secondary voltage in Volts and $Inf(tot)$ is the sum of all nominal currents set in all the drive to be supplied.

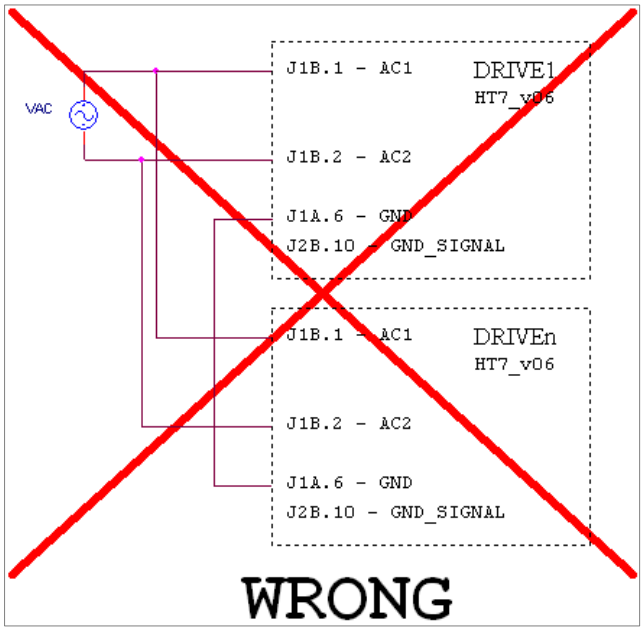
NOTE: use a transformer with an isolated secondary, don't connect the secondary at ground.

	Unit	HT710	HT720	HT730	HT740
Vac nom	[V]	From 18 to 60	From 18 to 60	From 18 to 60	From 18 to 90
Vac max	[V]	75	75	75	110
Vac min	[V]	15	15	15	15
I max	[A]	4	7	12	12
I min	[A]	1	1	1	1
Operation temperature	[°C]	0 - 45	0 - 45	0 - 45	0 - 45
Vdc aux(*)	[V]	From 24 to 90	From 24 to 90	From 24 to 90	From 24 to 125

Vac nom, : Range value of voltage by which the drive can be powered.
Vac max: Opertative Maximum voltage. Over this limit, the protection of maximum voltage inhibits the drive.
Vac min: Operative Minimum voltage. Under this limit, the protection of minimum voltage inhibits the drive.
I max: Maximum value of phase current.
I min: Minimum value of phase current.
Operating temperature: For any temperature over 45°C and any current over 6A a forced ventilation is necessary.
Vdc aux: Logic power supply.
(*) Not apply to models PN and EC that require only 24Vdc



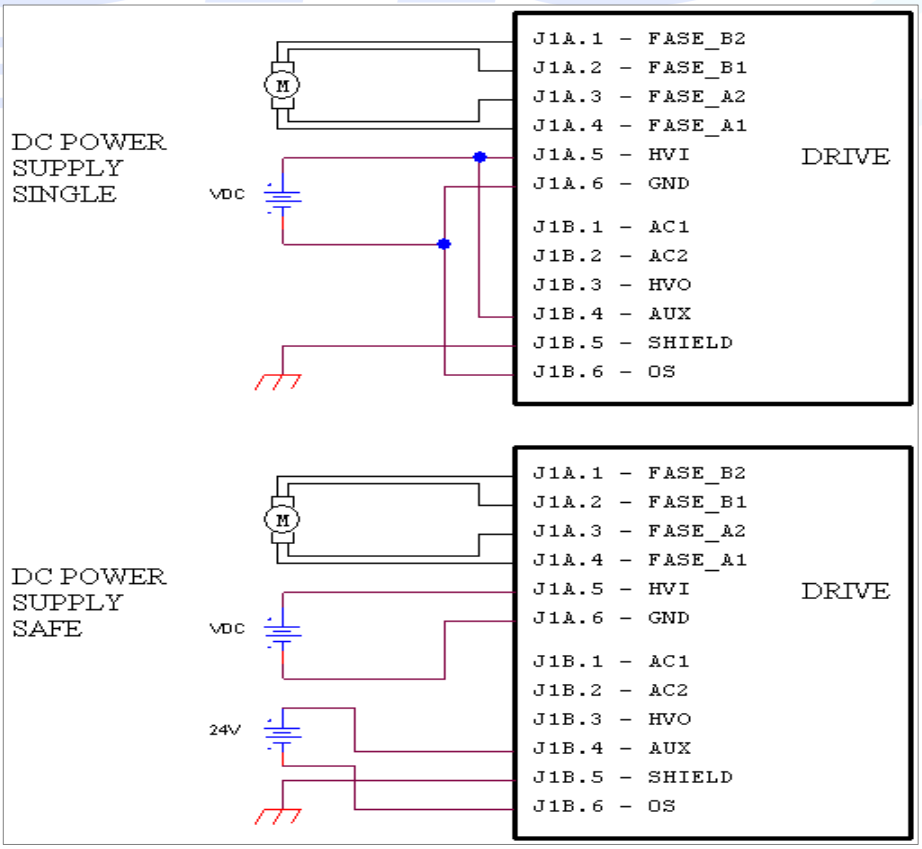
In AC power mode do not connect GND signals between two or more HT7 drives:



2.3 DC POWER SUPPLY

	Unit	HT710	HT720	HT730	HT740
Vdc nom	[V]	From 24 to 90	From 24 to 90	From 24 to 90	From 24 to 125
Vdc max	[V]	110	110	110	160
Vdc min	[V]	20	20	20	20
I max	[A]	4	7	12	12
I min	[A]	1	1	1	1
Operating temperature	[°C]	0 - 45	0 - 45	0 - 45	0 - 45
Vdc aux (*)	[V]	From 24 to 90	From 24 to 90	From 24 to 90	From 24 to 125

Vdc nom, : Range value of voltage by which the drive can be powered.
Vdc max: Operating Maximum voltage. Over this limit, the protection of maximum voltage inhibits the drive.
Vdc min: Operating Minimum voltage. Under this limit, the protection of minimum voltage inhibits the drive.
I max: Maximum value of phase current.
I min: Minimum value of phase current.
Operating temperature: For any temperature over 45°C and any current over 6A a forced ventilation is necessary.
Vdc aux: Logic power supply.
(*) Not apply to models PN and EC that require only 24Vdc



2.4 Inputs / Outputs

Digital inputs and outputs pins are isolated from power.

- Single Ended inputs are NPN/PNP type selectable through COM-IN pin.
- Differential input are TTL compatible, and can be 24V compatible PNP through COM-ENC pin.
- Outputs are NPN/PNP type selectable through COM-OUT (10mA max for OUT1, 100mA max for OUT2 and OUT3). On request the outputs can be equipped with OptoMOS devices (maximum current 400mA, 60V).

Analog inputs and outputs pins are not isolated from power, they have range 0 to 10V.

INPUTS FEATURES:

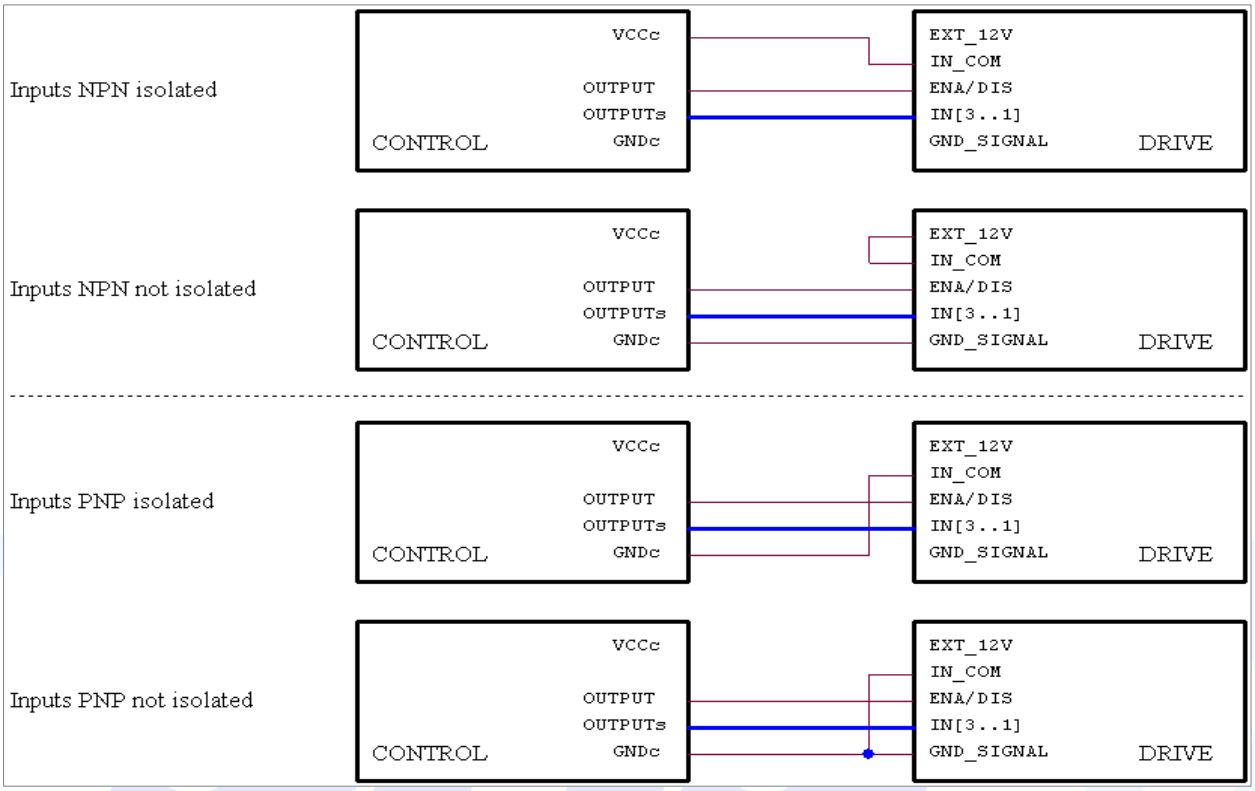
(IN1, IN2, IN3, ENABLE)	VOLTAGE LEVEL
LOW LEVEL	FROM 0 TO 7V
HIGH LEVEL	FROM 10 TO 24V
MAX CURRENT	13 mA

DIFFERENTIAL INPUTS (ENCAx, ENCBx, ENCZx)	TTL	SINGLE ENDED 24V
LOW LEVEL	FROM 0 TO 2V	FROM 0 TO 6V
HIGH LEVEL	FROM 4 TO 5V	FROM 9 TO 24V
MAX CURRENT	5 mA	13 mA

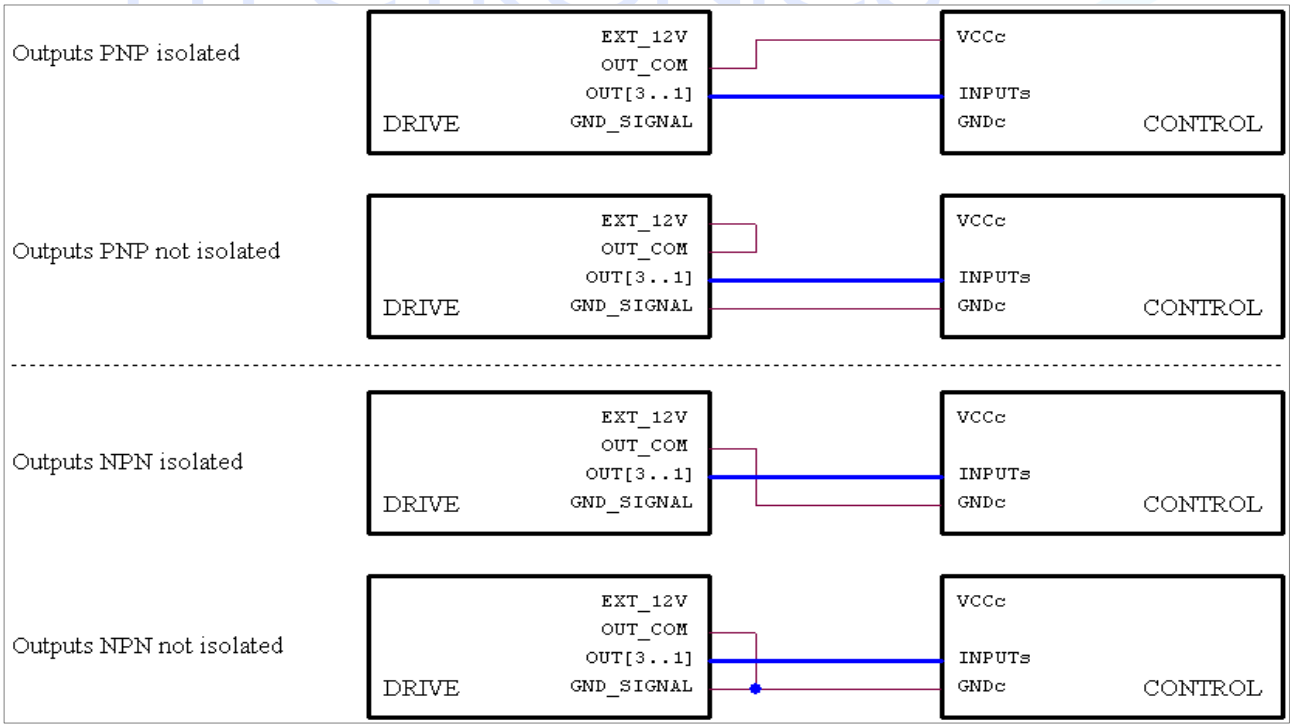
OUTPUTS		VOLTAGE LEVEL
PNP OUT	OUT ON	COM_OUT VOLTAGE - 2V
	OUT OFF	0V
NPN OUT	OUT ON	2V
	OUT OFF	COM_OUT VOLTAGE

ANALOG INPUTS	VOLTAGE LEVEL
INPUT	FROM 0 TO 10V
OUTPUT	FROM 0 TO 10V

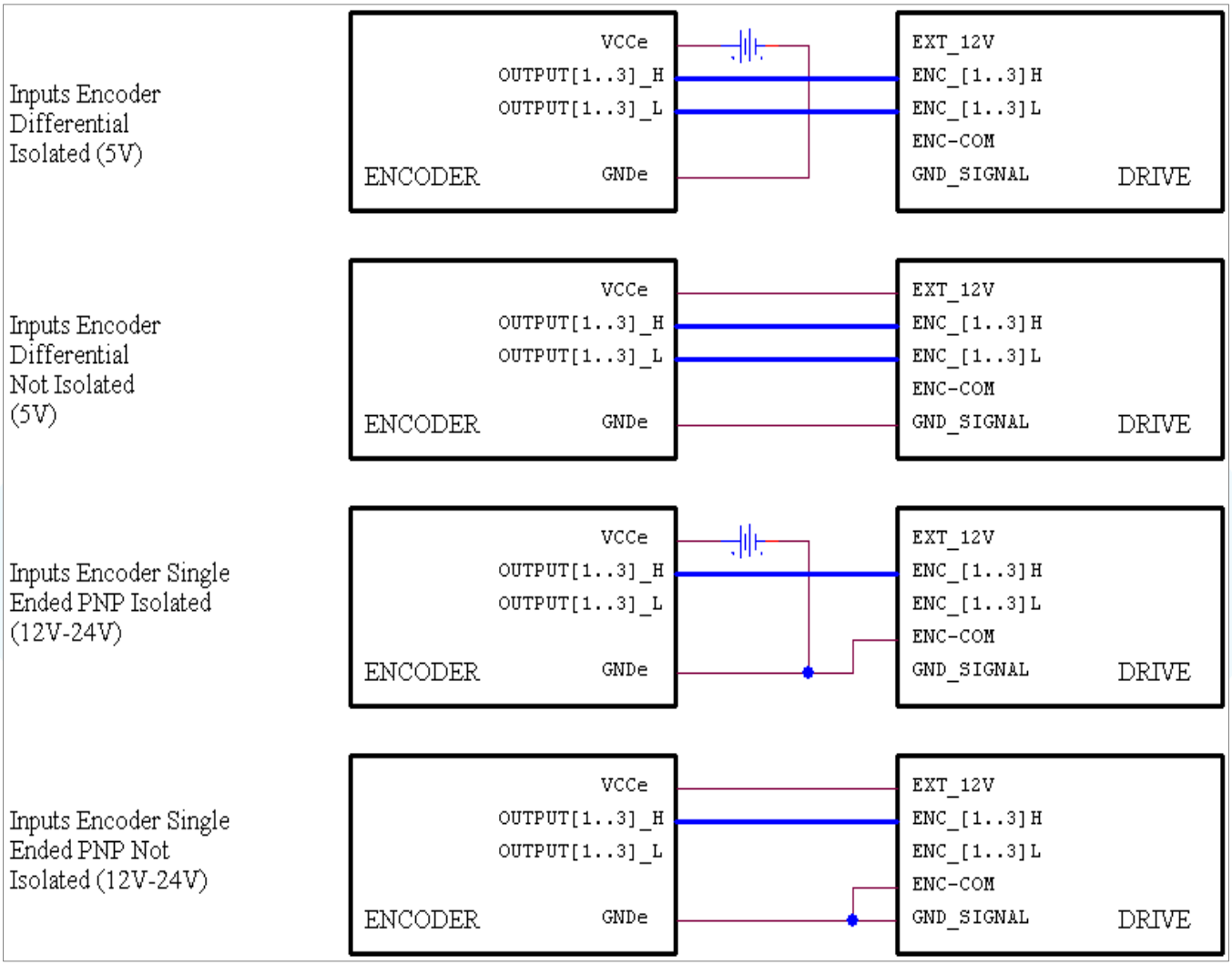
2.5 Digital Inputs



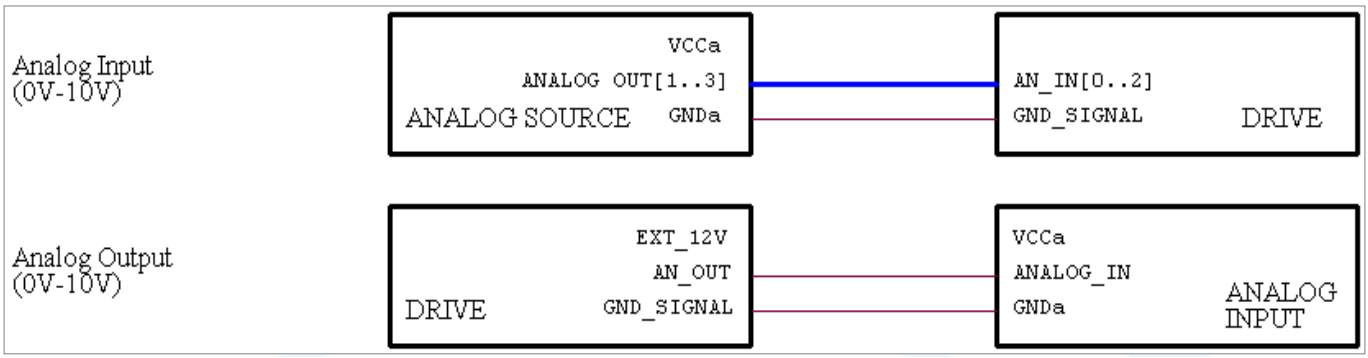
2.6 Digital Outputs



2.7 Encoder Inputs



2.8 Analog Inputs / Outputs



Note: we suggest to use isolated inputs scheme, no electrical connections between control and drives.

2.9 FIELDBUS Interface

The drives are supplied with half duplex RS485 and CAN interface.
The FIELDBUS is isolated from the power stage.
To enable different protocols must be loaded different firmware.

3. OPERATING MODE

The driver can be operated in the follwing modes:

- SHS PROTOCOL
- MODBUS
- CANOPEN

To change the use mode use the keyboard and change the p002 parameter.
When the operating mode is changed, restart the drive.

Note: In SHS PROTOCOL and MODBUS mode, the drive can be use in Step/Direction mode.

3.1 Step/Direction Mode

The Inputs and the outputs are the following

Inputs:

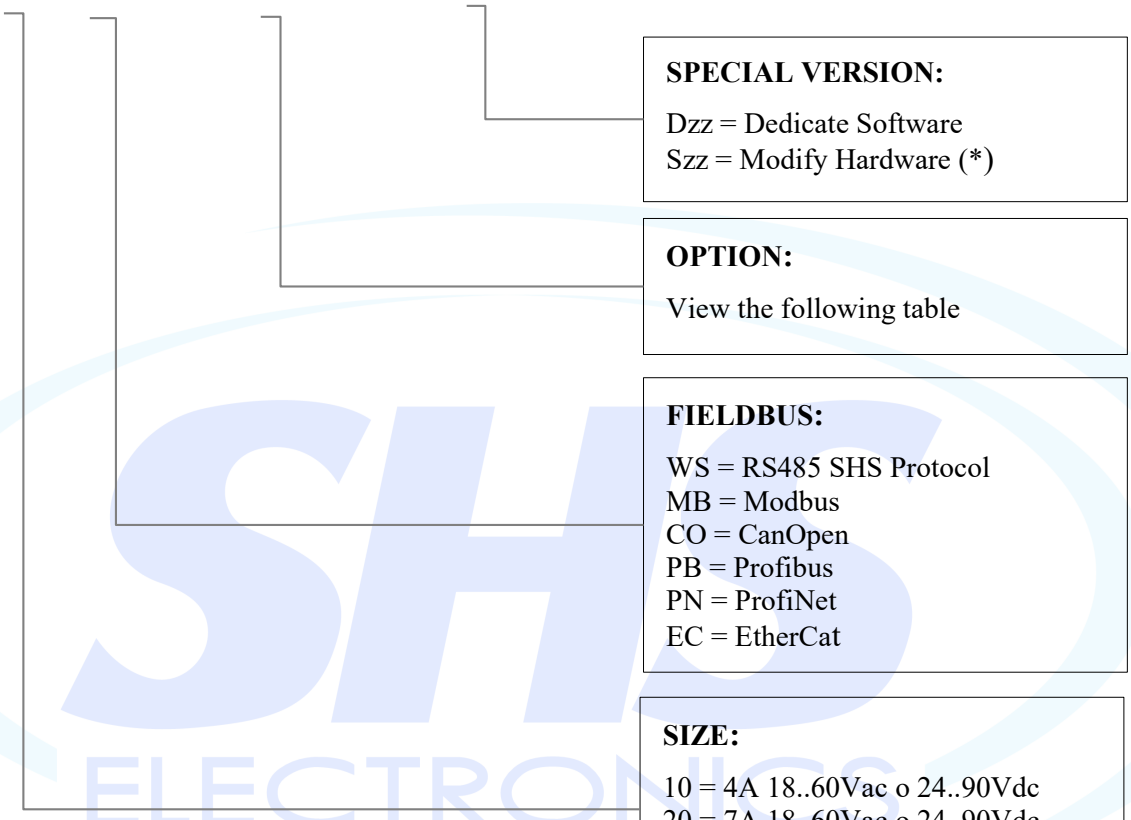
SIGNAL	FUNCTION
IN1 (J2A.11)	STEP-IN Execute the step on the LOW/HIGH transition of this signal. Use a square wave with duty-cycle of 50%. Signal absence for 0.5 seconds determines the automatic current reduction (stand-by condition). Percentage of reduction in stand-by can be set to 25% or to 50% of the regulated current through P007. Max Frequency 70KHz at Half Step (increase resolution and proportionally increase the max step in frequency)
IN2 (J2A-10)	DIRECTION Select the motor rotation wise Signals must be stable for at least 50 microseconds before and 50 microseconds after the low/high transition of the STEP-IN signal.
IN3 (J2A-9)	CURRENT REDUCTION It reduces the motor current. The percentage of current reduction can be set from 0% to 100% (p007).
ENA/DIS (J2A-8)	This input can be used as ENABLE or DISABLE using the DIP1.4 DIP1.4 ON → DISABLE: When the input is activated the motor will be stopped. DIP1.4 OFF → ENABLE: When the input is deactivated the motor will be stopped.

Outputs:

SIGNAL	FUNCTION
OUT1 (J2B-2)	STEP OUT Toggle every step-in
OUT2 (J2B-3)	DRIVER-READY Drive in protection: OUT2 OFF Drive ready : OUT2 ON
OUT3 (J2B-4)	Unused

4. HT7 MODELS CODE

HT7xxKK - yyyyy / Zzz



SPECIAL VERSION:

Dzz = Dedicate Software
Szz = Modify Hardware (*)

OPTION:

View the following table

FIELDBUS:

WS = RS485 SHS Protocol
MB = Modbus
CO = CanOpen
PB = Profibus
PN = ProfiNet
EC = EtherCat

SIZE:

10 = 4A 18..60Vac o 24..90Vdc
20 = 7A 18..60Vac o 24..90Vdc
30 = 12A 18..60Vac o 24..90Vdc
40 = 12A 18..90Vac o 24..125Vdc

The defaul configuration it:

- Input and encoder from 12 to 24V
- Opto Outputs (not static relè)

Code	yyyyy OPTION	
1	Differential Encoder	(*)
2	Encoder TTL	(*)
4	Input TTL	
8	OUT1 PNP OptoRelay	(*)
16	OUT1 NPN/PNP Optorelay	
32	OUT2 PNP OptoRelay	(*)
64	OUT2 NPN/PNP OptoRelay	
128	EEprom special Firmware	
256	Analog Input	
512	Fieldbus crimp connector	(*)
1024	Fieldbus DB9 connector	(*)
2048	IO crimp connector	(*)

(*) not available for this drive
EXAMPLE 1: the default configuration will become option 0 (00000)
EXAMPLE 2: TTL Input + OUT1 NPN/PNP relay + EEprom Firmware, will become option 4+16+128 = 148 (00148)

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