User Manual

V series

3 - 7.5 kW
11 - 18.5 kW

Inverter general purpose

Table of Contents

1. Safety Precautions

KEY TO SAFETY SYMBOLS

This symbol identifies procedures or operating conditions that may lead to injury or even death if the specified precautions are not followed.

This symbol identifies procedures or operating conditions that may lead to damage to or destruction of the equipment if the specified precautions are not followed.

This symbol identifies procedures or operating conditions that are essential to the correct functioning of the equipment.

NOTE! This symbol identifies information, procedures or operating conditions of particular relevance.

This section lists the safety precautions that must be followed when using this equipment.
Failure to observe these precautions can lead to serious injury and even death as well as to damage to the drive itself and other equipment connected to it.

Grounding (earthing)

Drives and the motors they control must be electrically grounded in accordance with applicable electrical standards.
It is strictly forbidden to operate the drive without an adequate earth connection.
To avoid electromagnetic interference, the body of the motor must be grounded by a separate cable, independent of the ground cables of other items of equipment.
Drives and input filters generate earth leakage currents in excess of 3.5 mA. Standard EN 50178 specifies that in the presence of earth leakage currents greater than 3.5 mA, the ground cable must be fixed and doubled for redundancy.

Electrical risks

Internal parts of the drive are live during normal functioning.

Make sure that all covers are in place before switching the drive on. Failure to observe this precaution can lead to serious injury or even death.
Never open the drive or remove its covers while it is powered on. Respect the minimum safety delay defined in 'Safety delay before working on the drive' later in this manual before attempting to work on the terminals or inside the drive.
Never work on the motor connections if the drive is powered on.

Mechanical risks

Drives are installed in systems that generate mechanical movement. It is the responsibility of the person in charge of the entire system to ensure that these mechanical movements do not cause danger. Never bypass or tamper with the equipment's safety interlocks or operating limitations.
In the event of a fault, even if the drive has been disabled it may still cause sudden movements if it has not been disconnected from the mains power.
The drive provides no protection against overspeed apart from its software-controlled protection logic.
Always respect the maximum speed declared by the motor manufacturer, irrespective of the maximum frequency the drive can deliver.

Fire and explosion risks

Installation of the drive in hazardous areas and in the presence of flammable substances or combustible vapours or powders can lead to fire or explosion. Install the drive well away from hazardous areas. Whenever any residual risk remains, controlled motors must be explosion-proof.
Never use water-based fire extinguishers to combat fires near the equipment.
Take great care to prevent water or any other fluids from penetrating inside the equipment.

Conformity to CEE directives

Always make sure that systems destined for use in Europe have been designed and built with the safety devices required by European industrial automation directive 89/392/CEE in place and operative before powering on and using the drive or the motor it controls.

Measuring instruments

When using test apparatus like oscilloscopes to take measurements from electrically live equipment, always connect the body of the oscilloscope to ground and always use differential probes. To ensure accurate readings, choose probes and terminals with care, and make sure that the oscilloscope is correctly set up. Refer to the manual provided by the oscilloscope manufacturer for details of how to operate and adjust the oscilloscope correctly .
Never perform dielectric rigidity testing on any parts of the drive. Only use appropriate test instruments (with a minimum internal resistance of 10 kΩ/V) to measure signal voltage.

Other precautions

Make sure that ventilation is always adequate to dissipate heat from the drive.

Never connect up power supplies that operate at voltages outside the drive's permitted voltage range. Excess voltage can damage the internal parts of the drive.

The drive must be installed on a partition made from heat-resistant materials. The drive's cooling fins can reach 90°C during normal operation.

Do not connect capacitive loads like power factor correction capacitors to the drive's output terminals (U2, V2, W2).

Make sure that the motor controlled by the drive is protected against overload.

If the drive is not equipped with suitable filters, and is connected to low voltage public power networks, it may generate radio frequency interference.

Proper use and installation

Modifications or operations not specified in this manual must never be performed without the explicit authorisation of the manufacturer, and even then must only be carried out by qualified personnel. The manufacturer declines all responsibility for the consequences of failure to observe these precautions, which also invalidates the warranty.

Variable frequency inverter drives are electrical devices designed for industrial use.
The manufacturer declines all responsibility for uses of the drive other than those described in this manual.

Only qualified electricians should install and start up the drive. The electrician so doing is directly responsible for ensuring that all applicable safety standards and legislation is complied with.

NOTE!

Storage of the drive for periods longer than two years could lead to malfunctioning of the DC link capacitors. These must be regenerated before the drive can be used. Before starting up the drive, power it on for at least two hours with no load and without enabling output.

NOTE!

The terms 'inverter', 'controller' and 'drive' are interchangeable in industrial automation contexts. This manual may use the terms 'drive' and 'inverter' interchangeably.

1.1. Power and ground connections

TN and TT mains power supplies

STMDRIVE drives are designed for use with standard three phase mains power supplies, symmetrical with respect to ground.
Single phase drives must be connected to one phase, neutral and ground. Three phase drives must be connected to all three phases plus ground.

IT mains power supplies

In the case of an IT mains supply, always use a star/delta transformer with secondary wiring referenced to ground.

Attenzione!

If IT mains power is used, loss of insulation in one of the other devices connected to the same circuit can cause the drive to malfunction if no star/delta transformer is provided.

2. General Description

V SERIES drives offer a perfect combination of performance, functional simplicity and compact dimensions.
They are specifically designed for use in applications that demand high levels of performance and reliability, dynamic response and ease of operation.
V SERIES drives are designed for use with three phase power supplies from 230 to 460 V, and to control motor between 3 and 18.5 kW (400 V) and from 4 to 25 HP (400 V).
The drive rectifies the voltage of the mains power supply to obtain an intermediate circuit voltage, then uses an inverter bridge applying sinusoidal PWM modulation to generate a three phase power supply with variable voltage and frequency permitting regular, smooth motor control even at very low speeds.

Feed voltages to the various control cards are obtained from a switching power supply that also draws its power from the intermediate circuit.
The inverter bridge is based on IGBT (Insulated Gate Bipolar Transistor) devices. Output is protected against short circuits between the phases and to ground. If more than one motor is driven in parallel by a single drive (obviously of adequate power) motors can be switched in and out independently even during normal drive functioning (see 'The inverter bridge' in the 'Electrical Connections' section).
If the motors used are not specifically designed for inverter control, a drop in output current of around 5 - 10% must be allowed for. If nominal torque is demanded from such a motor at low speeds, an auxiliary motor cooling fan will be necessary to dissipate the heat generated. If the necessary cooling assistance cannot be provided, then the motor will have to be over-sized. In either case the user should contact the technical service of the motor manufacturer for further information.
If a motor has to function at a frequency greater than its nominal frequency, the user should again contact the manufacturer's technical service to ascertain what mechanical problems (bearing wear, balancing problems, etc.) could be incurred.

V SERIES drives can be controlled in a number of ways

- via their control terminals
- using the control keys and display
- over an RS 485 serial line
- using a standard PC control program

NOTE!

The electronic control circuit terminals are electrically separate from the power circuit terminals.

2.1. Standard functions

- Reduced motor noise thanks to special PWM control technology.
- Output protected against short circuits between phases and to ground.
- Protection against over-current, over-voltage and under-voltage.
- Ability to withstand mains power outages of up to 15 ms.
- Sinusoidal output current from sinusoidal PWM.
- Smooth, controlled motor rotation even at very low speeds.
- Programmable slip compensation to minimise load-related speed variation.
- Manual or automatic low speed voltage boost.
- Automatic voltage and frequency control in case of overload to avoid motor stalling.
- Keypad or RS 485 serial line parameter control.
- Referencing with 0...10 V, -10...10 V, 0...20 mA, 4...20 mA analog signal, or via serial line.
- Programmable DC braking.
- Wide selection of V/f ratios.
- Overload level control.
- Non-volatile memory for the last 4 alarm event messages; messages not lost even if power is switched off.
- Choice of open loop or closed loop functioning.
- RS 485 serial line control.
- IP 23 or IP 40 protection rating with special covers (supplied) fitted.
- 4 sets of linear or 'S' acceleration/deceleration ramps.
- 8 multi-speeds.
- Drive potentiometer with or without memory.
- Independent PID function.
- Critical frequency skipping.
- DCBUS control overvoltage prevention.
- Maximum output frequency 500Hz.
- PWM regulation up to 18 kHz.
- 150% overload for 60 secs. every 10 minutes.
- Integrated EMI filter (class A or B).
- 6 programmable digital inputs.
- 1 TTL/HTL encoder input that becomes +2 digital inputs.
- 2 NO/NC programmable relay outputs.
- 1 analog input for 0...10 V, 0...20 mA, 4...20 mA signals.
- 1 differential analog input for 0...10 V, 0...20 mA, 4...20 mA signals.
- 1 +/- 10V dc analog output.
- 2 programmable digital outputs.
- Integrated braking unit.

Options

- → Field Bus options.
- → E^2PROM key for saving custom settings for specific applications.
- → Remote keyboard kit.
- → Serial keyboard.
- → Class A or class B EMC filter
- → External braking resistance.

3. Description, Components and Specifications

3.1. Storage and transport

3.1.1 General

V SERIES drives are carefully packed for shipment. Transport must be undertaken using adequate means for the weights involved. Respect all instructions and symbols printed on the packaging. The same applies to drives removed from their transport packaging for installation in control cabinets.

Perform the following checks as soon as you receive your drive.
Check that the packaging has not been visibly damaged.
Check that the details on the delivery bill correspond to those of the original order.

Unpack the drive carefully and perform the following checks.
Check that no part of the drive has been damaged during transport.
Check that the drive delivered corresponds to that ordered.

If any damage is found, or if the drive is either incomplete or incorrect, notify the supplier's sales department immediately.
The drive must only be stored in dry places and within the specified storage temperature range.

NOTE!

Excessive temperature variations can cause condensation to form inside the drive. While this may be acceptable under certain storage conditions (see 'Ambient conditions and standards'), the presence of condensation is absolutely unacceptable under normal drive operating conditions. Before powering your drive on for the first time, always make sure that there is no condensation inside it!

3.1.2 Drive identification

The drive's basic technical details are shown in its model identification and on its data plate:

Power Range [kW]	Drive Series	Voltage Supply		Power	Software	I/O	EMC Filter	Brake Unit
0,25÷1,1	A	X	X	000	X	X	X	-
0,37÷2,2	R	X	X	000	X	X	X	X
3,0÷18,5	V	-	-	000	X	X	X	-
22÷132	T	-	-	000	X	X	X	X
'-' dont used field		**2** 220V -15% 240V +10% **4** 380V -15% 460V +10%	**M** Single phase **T** Three phase	**002** =250W **004** =370W **005** =550W **008** =750W **011** =1,1 kW **015** =1,5 kW **022** =2,2 kW **030** =3,0 kW **040** =4,0 kW **055** =5,5 kW **075** =7,5 kW **110** =11 kW **150** =15 kW **185** =18,5kW **220** ...	**X**=Standard	See detail for specified series	**X** assente **A** A class Industrial level **B** B class domestic level	**X** not present **B** presente

V series example:

	Power*		Software	I/O	Filter
V	**055**		**X**	**X**	**A**
Series with 3 x 230...460 Vac -15% +10% 50/60Hz +/-5% power supply	**055 = 5,5kW**		**X** = Standard	**X** = Standard	**A =** class A[1] filter inside
	030 = 3kW	Size 1	**I/O**		Cl.A Filter inside: Power 3kW: Size 1 X
	040 = 4kW	1	**Different options need insert plug-in :**		4kW: Size 1 X
	055 = 5,5kW	1			5,5kW: Size 1 X
	075 = 7,5kW	1 e 2	**O = PL-RS485I (optoinsulated RS 485)**		7,5kW: Size 1 - / Size 2 X
	110 = 11kW	2	**T = PL-CANBUS**		11kW: Size 2 X
	150 = 15kW	2	**P = PL-Profibus**		15kW: Size 2 X
	185 = 18,5kW	2			18,5kW: Size 2 -
					B = external class B filter

* Power values refer to a voltage of 400V; [1] EMC filter to EN55011 Class A standards

Choose a drive to suit the nominal current of the controlled motor. The drive's nominal output current must be equal to or greater than that required by the controlled motor.

The speed of an asynchronous motor depends on the number or terminal pairs it has and on its operating frequency (as specified on the data plate and in the catalogue). If a motor has to be run

above its nominal speed, consult the manufacturer's technical service to ascertain what mechanical problems may be incurred (bearing wear, balancing problems, etc.). Also contact the manufacturer's technical service to ascertain what thermal problems may be incurred if the motor has to be run at a frequency below approximately 20 Hz (e.g. insufficient cooling if no auxiliary ventilation is provided).

3.1.3 Data plate

Check that the specifications on the drive's data plate correspond to the original order.

3.2. Component identification

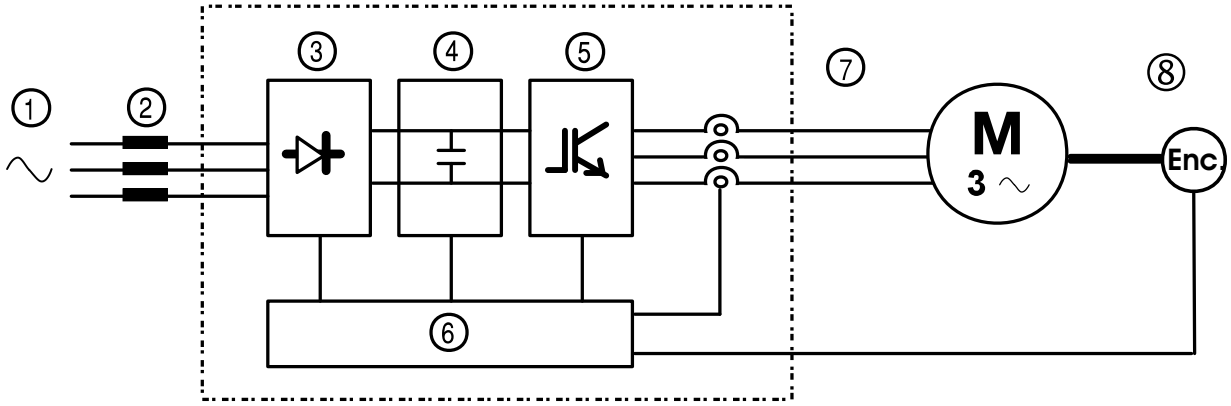


Figure 3.2.1: Basic schematic of a frequency inverter

Inverters convert a constant frequency, constant voltage mains supply into DC voltage. From this DC voltage, they then generate a three phase AC supply with variable voltage and frequency. This variable three phase power enables smooth speed control of three phase asynchronous motors.

1 Mains supply: 230 V – 460 V three phase.

2 Mains choke (see 'Chokes and filters')

3 Rectifier bridge.
Uses full wave technology to convert AC into DC voltage.

4 Intermediate circuit.
- Comprises precharge resistors and smoothing capacitors.
- DC voltage (U_{DC}) = 1.41 x mains line voltage (U_{LN}).
- Braking unit also integrated in this stage to control external braking resistance.

5 IGBT inverter bridge.
Converts DC voltage into three phase AC voltage with variable amplitude and frequency.

6 Configurable control section.
Comprises all the necessary cards for the control and regulation of the closed or open loop power section. Commands, references and feedbacks are all connected to these cards.

7 Output.
AC voltage variable between 0 and 94% of mains power (U_{LN}).

8 Speed feedback (e.g. encoder, tachometer, serial line etc.).

3.3. General specifications

3.3.1 Ambient conditions and standards

Table 3.3.1.1: Ambient conditions and standards

AMBIENT CONDITIONS		
Ambient temperature TA	[°C]	0…+40; +40…+50 declassed
	[°F]	32…+104; +104…+122 declassed
Installation environment		Pollution level 2 or better (out of direct sunlight, free from vibration, dust, corrosive or inflammable gases, mist, oil vapour and water droplets; salt mist to be avoided).
Installation altitude		Up to 1000 m (3281 feet) above sea level. For installations at greater altitudes, declass current by 1.2% for every additional 100 m (328 feet) of altitude.
Temperature:		
Functioning [1)]		0…40°C (32°…104°F)
Functioning [2)]		0…50°C (32°…122°F)
Storage		-25…+55°C (-13…+131°F), EN 50178 class 1K4
Transport		-20…+55°C (-4…+131°F), for drives with keypads
		-25…+70°C (-13…+158°F), EN 50178 class 2K3
		-20…+60°C (-4…+140°F), for drives with keypads
Airborne humidity:		
Functioning		From 5% to 85%, from 1 g/m^3 to 25 g/m^3 non-condensing, non-freezing (EN 50178 class 3K3)
Storage		From 5% to 95%, from 1 g/m^3 to 29 g/m^3 (EN 50178 class 1K3)
Transport		95 % [3)] 60 g/m [4)]
		Slight condensation may form occasionally and for short periods only while the drive is not in use (EN 50178 class 2K3).
Air pressure:		
Functioning	[kPa]	From 86 to 106 (EN 50178 class 3K3)
Storage	[kPa]	From 86 to 106 (EN 50178 class 1K4)
Transport	[kPa]	From 70 to 106 (EN 50178 class 2K3)
STANDARDS		
General conditions		EN 61800-1, IEC 143-1-1.
Safety		EN 50178
Climatic conditions		EN 60721-3-3, class 3K3. EN 60068-2-2, test Bd.
Distances and leakage levels		EN 50178, UL508C, UL840. Input circuit overvoltage class III; pollution rating 2
Vibrations		EN 60068-2-6, test Fc.
EMC		EN 61800-3 (see the "EMC Guide")
Input voltage		IEC 60038
Protection rating		IP20 conforming to EN 60529
		IP40 for cabinets with external heat sink
Certification		CE

1) Ambient temperature = 0 ... 40°C (32°...104°F)
Over 40°C (104°F) and up to 50°C: 2% reduction in output current per K.

2) Ambient temperature = 0 ... 50°C (32°...122°F):
20% reduction in output current.

3) Higher airborne humidity values with temperature at 40°C (104°F) or if drive temperature suddenly rises between -25 ...+30°C (-13°...+86°F).

4) Higher airborne humidity values if drive temperature suddenly drops between 70...15°C (158°...59°F).

Disposing of the drive

V SERIES drives must be disposed of as electronic waste in compliance with national legislation.

The front covers are made from recyclable ABS.

3.3.2 Mains input and drive output connections

V SERIES drives must be connected to a mains supply capable of providing symmetrical short circuit power better than or equal to the values given in table 3.3.2.1. See 'Chokes and filters' for information on the addition of mains chokes.
See table 3.3.2.1 for the permitted mains voltages. Cyclical phase direction is irrelevant. Voltages below the minimum tolerance threshold cause the drive to lock.
The drive can be restarted automatically after an alarm condition occurs.

NOTE!

Under certain circumstances it may be essential to add mains chokes and EMI filters to the drive input. Refer to the 'Chokes and filters' section.

V SERIES drives and mains input filters have earth leakage currents greater than 3.5 mA. Standard EN 50178 requires that in the presence of earth leakage currents greater than 3.5 mA, the ground connection (to the PE terminal) must be fixed and double for redundancy.

Table 3.3.2.1: I/O specifications for drive models in Kw/Hp at 400 V

V series drive model		030	040	055	075	110	150	185
O U T P U T								
Drive output (IEC 146 class 1) Continuous duty (@ 400 Vac)	[kVA]	5,40	6,50	9,10	12,30	18,10	23,90	27,50
Drive output (IEC 146 class 2) 180% overload for 40 s every 10 mins (@ 400Vac) [for 18.5 kW, 150% for 40 s every 10 mins (@ 400Vac)]	[kVA]	4,90	5,90	8,20	11,20	16,50	21,70	25,00
P_N mot (recommended motor power):								
@ U_{LN} = 230 Vac; f_{SW} = default; IEC 146 class 1	[kW]	1.5	2.2	3	4	6.6	7.5	11
@ U_{LN} = 230 Vac; f_{SW} = default; IEC 146 class 2	**[kW]**	**1.5**	**2.2**	**3**	**4**	**6.6**	**7.5**	**11**
@ U_{LN} = 230 Vac; f_{SW} = default; IEC 146 class 1	[Hp]	2	3	4	5	8.8	10	14.7
@ U_{LN} = 230 Vac; f_{SW} = default; IEC 146 class 2	[Hp]	2	3	4	5	8.8	10	14.7
@ U_{LN} = 400 Vac; f_{SW} = default; IEC 146 class 1	[kW]	3	4	5.5	7.5	11	15	18.5
@ U_{LN} = 400 Vac; f_{SW} = default; IEC 146 class 2	**[kW]**	**3**	**4**	**5.5**	**7.5**	**11**	**15**	**18.5**
@ U_{LN} = 460 Vac; f_{SW} = default; IEC 146 class 1	[Hp]	3	5	7.5	10	14,7	20	24,7
@ U_{LN} = 460 Vac; f_{SW} = default; IEC 146 class 2	[Hp]	3	5	7.5	10	14,7	20	24,7
Maximum output voltage U_2	[V]	0.95 x U_{LN} (AC input voltage)						
Maximum output frequency f_2	[Hz]	1000						
Nominal output current I_{2N}:								
@ U_{LN} = 230..400 Vac; f_{SW} = default; IEC 146 class 1	[A]	8,3	9,9	13,8	18,7	27,5	36,3	41,8
@ U_{LN} = 230..400 Vac; f_{SW} = default; IEC 146 class 2	**[A]**	**7,5**	**9,0**	**12,5**	**17,0**	**25,0**	**33,0**	**38,0**
@ U_{LN} = 460 Vac; f_{SW} = default; IEC 146 class 1	[A]	7,2	8,6	12,0	16,3	23,9	31,6	36,3
@ U_{LN} = 460 Vac; f_{SW} = default; IEC 146 class 2	[A]	6,5	7,8	10,9	14,8	21,7	28,7	33,0
Switching frequency f_{SW} (default)	[kHz]	12						10
Switching frequency f_{SW} (higher)	[kHz]	18						
Reduction factor:								
Voltage factor K_Va 460 Vac		0.87	0.87	0.87	0.87	0.87	0.87	0.87
Ambient temperature factor K_T		0.8 @ 50°C (122°F)						
Switching frequency factor K_F		0.82 for f_{sw} values above 12 kHz						
I N P U T								
AC input voltage U_{LN}	[V]	230 V -15% … 460 V +10%, Trifase						
AC input frequency	[Hz]	50/60 Hz ±5%						
AC input current for continuous duty I_N :								
- Connections with input choke								
@ 230 Vac; IEC 146 class 1	[A]	5,5	7,0	9,5	14	25,4	32,6	38,7
@ 400 Vac; IEC 146 class 1	[A]	6,2	7,9	10,7	15,8	28,8	38,0	43,7
@ 460 Vac; IEC 146 class 1	[A]	5,4	7,0	9,3	13,8	25,0	33,0	38,0
- Connections without input choke								
@ 230 Vac; IEC 146 class 1	[A]	8,9	10,7	14,7	20,0	28,9	38,3	44,1
@ 400 Vac; IEC 146 class 1	[A]	10,0	12,0	16,5	22,5	32,5	43,0	49,5
@ 460 Vac; IEC 146 class 1	[A]	8,7	10,4	14,4	19,6	28,3	37,4	43,1
Overvoltage threshold	[V]	400 VDC (for a 230 VAC mains) 800 VDC (for a 400 VAC mains) 800 VDC (for a 460 VAC mains)						
Undervoltage threshold	[V]	230 VDC (for a 230 VAC mains) 250 VDC (for a 400 VAC mains) 250 VDC (for a 460 VAC mains)						
V series drive model		**030**	**040**	**055**	**075**	**110**	**150**	**185**

3.3.3 Mains input current

The mains input current to the drive depends on the duty status of the controlled motor.

NOTE!

Table 3.3.2.1 shows nominal continuous duty values (IEC 146 class 1) with typical output power factors for each model of drive.

3.3.4 Output and connections

The output from V SERIES drives is protected against short circuits between phases and to ground. It is forbidden to connect any external voltage to the drive's output terminals! Nevertheless, once a motor has been disabled, it can be disconnected from the drive output while the drive is still functioning.

The nominal continuous output current value (I_{CONT}) depends on mains voltage (K_v), ambient temperature (K_T) and switching frequency (K_F) if higher than the default frequency:

$I_{CONT} = I_{2N} \times K_V \times K_T \times K_F$ (see table 3.3.2.1 for reduction factors), with a maximum overload capacity of

$I_{MAX} = 1.8 \times I_{CONT}$ for 40 seconds every 10 minutes or

$I_{MAX} = 1.5 \times I_{CONT}$ for 60 seconds every 10 minutes.

NOTE!

I_{CONT}, which is derived from I_{2N} according to the settings made on the drive and the formula given above, can be read from parameter **d.950**_.

Recommended motor power

The combinations of nominal motor power and drive model specified in table 3.3.2.1 is based on the use of motors whose nominal voltages correspond to that of the mains power supply.
If the motors involved have other voltages, select the drive model on the basis of nominal motor current.

3.3.5 The regulation and control section

2 analog inputs

1 programmable analog input:
- in voltage -10/+10 V, 0.5 mA max, 10 bit (+ sign)
- in voltage 0-10 V, 0.5 mA max, 10 bit [default]
- in current 0...20 mA, 10 V max, 10 bit
- in current 4...20 mA, 10 V max, 10 bit

1 programmable differential analog input:
- in voltage -10/+10 V, 0.5 mA max, 10 bit (+ sign)
- in voltage 0-10 V, 0.5 mA max, 10 bit [default]
- in current 0...20 mA, 10 V max, 10 bit

in current 4...20 mA, 10 V max, 10 bit

6 digital inputs 6 programmable digital inputs: 24V / 6 mA

Digital input 1 = Run (default)

Digital input 2 = Reverse (default)

Digital input 3 = Frequency select 1 (default)

Digital input 4 = Frequency select 2 (default)

Digital input 5 / Input A+ Encoder (J4 for A-)

Digital input 6 / Input B+ Encoder (J5 for B-)

4 digital outputs 3 programmable digital outputs:

Open collector output 1 = Drive ready (default)

Open collector output 2 = Steady State (default)

Relay type output (A) = Motor running (230 Vac - 0.2 A / 30 Vdc – 1A)

1 digital alarm output:

Relay type output (B) = Alarm state (230 Vac - 0.2A / 30 Vdc - 1A)

Auxiliary voltages from drive terminals

Capacity:	+ 24 Vdc, 300 mA
	+ 10 Vdc, 50 mA
	- 10 Vdc, 50 mA
Tolerance:	+ 24 Vdc ±5 %
	+/- 10Vdc ±3 %

3.3.6 Precision

Reference:	Resolution of reference from analog inputs to terminals (full scale function and 1 bit for sign)	0.1 Hz
	Resolution of reference from serial line	0.01 Hz

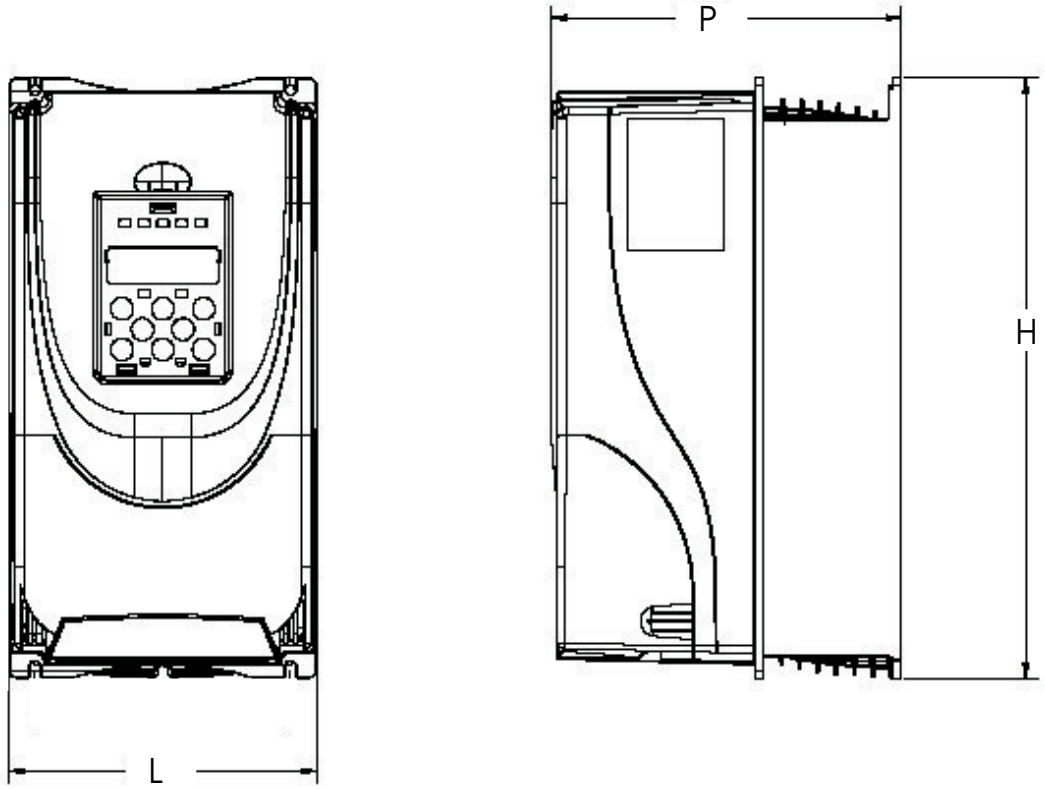
Open loop speed: Load related speed loss can be partly compensated for using slip compensation.

Precision nevertheless also depends on the characteristics of the controlled motor (number of poles and torque/speed characteristics).

4. Installation

4.1. Mechanical and installation specifications

4.1.1 Dimensions and mounting distance



V SERIES	Dimensions			Minimum ventilation gaps		
measure unit [mm]	L	P	H	Above and below	Sides	Front
Size 1	145,0	165,0	260,0	150	25	50
Size 2	165,5	188,2	323,0	150	25	50

Maximum allowed angle to the vertical is 30°.

Respect the distances given in this manual when installing the drive. Use only appropriate tools and equipment. Incorrect handling and the use of improper tools can damage the drive.

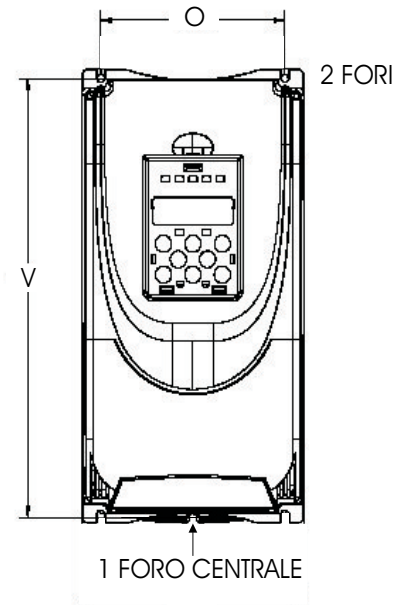
Do not install other items of equipment that generate heat near the drive.

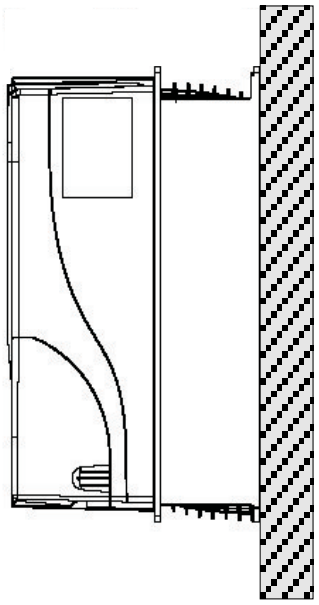
Check the terminal connections for tightness after a few days of operation.

4.1.2 INVERTER COOLING

Internal ventilation is provided by a fan with a micro-controller. The fan functions for one minute intervals when the drive is switched on, and for one minute after the stop command is given. During normal functioning, the micro-controller starts the fan whenever the temperature inside the drive so requires.

4.1.3 Wall fixing

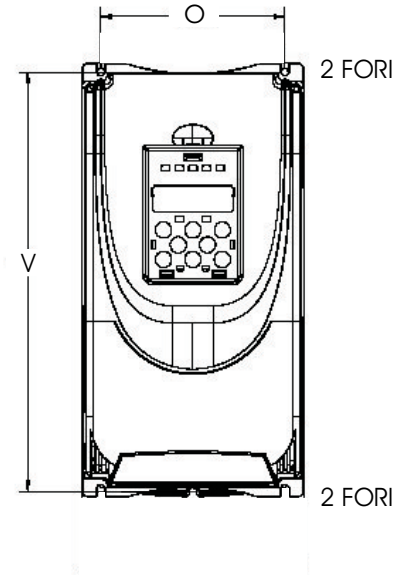


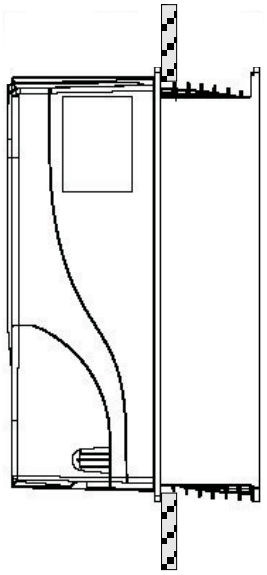


SERIE V series	Fixing holeFori di Fissaggio	
MEASURE UNIT [mm]	O	V
Size 1	120,0	251,0
Size 2	137,0	312,5

Figura 4.1-1

4.1.4 Fixing with external heatsink





Backframe

V series	Fixing hole	
MEASURE UNIT [mm]	O	V
Size 1	120,0	251,0
Size 2	137,6	311,0

Figura 4.1-2

4.2. Motors

V SERIES drives are designed for the open or closed loop control of standard asynchronous motors.

4.2.1 Asynchronous AC motors

Choose an asynchronous motor with a minimum slip of 3-5 %, with a single cage rotor, designed for use with an inverter.
a) Minimum motor size. Nominal motor current must not be less than 30% of nominal drive current @ 400 V.
b) General purpose motors (i.e. motors not specifically designed for inverter control) must only be used if an additional output choke is fitted.
c) We recommend that you use special motors with reinforced insulation designed for inverter control. Motors of this type do not require the drive to be fitted with an output choke.

The electrical and mechanical specifications of standard asynchronous motors refer to a specific functioning range. When controlling motors of this type with an inverter, always bear the following points in mind.

Can standard asynchronous motors be used?
V SERIES series drives can be used with standard asynchronous motors. Certain characteristics of these motors, however, have a major influence on performance. The motor's torque/speed specifications, available from the motor manufacturer, must be used to qualify the complete system comprising drive and motor.
Motor manufacturers also take greater care over the insulation of motors designed specifically for use with inverter drives.

Star or delta connection?
Motors can be wired up either in a star or a delta configuration. Star wired motors are generally easier to control and star wiring is therefore to be preferred under most circumstances.

Cooling
Asynchronous motors are normally cooled by a fan keyed directly on to the motor shaft. Care must be taken, however, because fan efficiency drops at low motor speeds and the motor may receive insufficient cooling. Discuss motor operating conditions with the motor manufacturer's technical service to ascertain whether it is necessary to provide additional ventilation (forced cooling).

Functioning at speeds above nominal speed
If a motor has to operate above its nominal speed, contact the manufacturer's technical service to

ascertain what mechanical problems (bearing wear, balancing problems etc.) and what electrical losses may occur as a result.

Motor specifications you must know for inverter control

Motor data plate specifications:

- Nominal motor voltage
- Nominal motor current
- Nominal motor frequency
- Nominal motor speed
- Power factor (Cos φ)
- Number of terminal pairs
- Connection type (star/delta)

Motor protection

Use of Klixon protectors in motor windings

The contacts of the Klixon overheating protectors can be used to disable the motor either via auxiliary control circuits or using the input to signal an alarm condition.

NOTE!

The motor's Klixon interface circuit can be considered and managed to all intents and purposes like a signalling circuit. Connections to the motor's Klixon protectors must therefore use a shielded twisted pair cable laid if possible not parallel with other motor cables or at a distance of at least 20 cm (8 inches) from them.

Drive current limitation

Current limitation can be used to protect the motor against damaging overloads. To do so, the current limit and overload control parameters must be set so that current to the motor always remains within the motor's acceptable limits.

NOTE!

Bear in mind that current limitation can only protect the motor against overheating caused by overload, and not against overheating caused by inadequate cooling.

Always fit the windings of motors destined for use at low speeds with the necessary over-heating protectors!

Output chokes

In certain cases output chokes may be needed to protect the winding insulation of standard motors. See 'Output chokes'.

5. Electrical Connections

5.1. Accessing the electrical terminals

NOTE!

Observe the safety precautions given elsewhere in this manual. The terminal covers can be removed without the use of force.

Disconnect the drive from the mains and wait for the capacitors to discharge before you start work on the power or control terminals.
The red LED to the left of the terminals B1, B2 and B3 signals that the capacitors still hold charge.

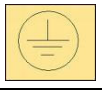
Figure 5.1.1: Accessing the power and control terminals

Remove the terminal cover to access the control card terminals.

5.2. The power section

Table 5.2-1: Power terminal identification and functions

NAME	FUNCTION	MAX
L1 L2 L3	Three phase power	Table 3.3-2
-	DC stage negative	
R	Connections for	
+	DC stage positive braking resistance (R and +)	
U V W	Motor connection	

PE	**Connection heart must be made on plate under power leads where is marked with apposit symbol.**	

5.2.1 Power terminal wire cross sections

V SERIES		030	040	055	075	110	150	185
L1,L2,L3,U,V,W	mm^2	2	4	4	4	8	10	10
+,R,-	mm^2	2	4	4	4	8	10	10
PE	mm^2	2	4	4	4	8	10	10

NOTE! Use only copper wire rated for 75°C.

If the output of a V SERIES drive short circuits to ground, current in the motor's ground wire may reach up to twice nominal current I_{2N}.

5.2.2 The rectifier bridge and intermediate circuit

Mains power is rectified and filtered by capacitors. All V series drive models incorporate a precharge resistance diode bridge.

If over-voltage ('OV' signal) or under-voltage ('UV' signal) occurs in the intermediate circuit, no power can be drawn from it because the inverter bridge locks.

During normal functioning, the DC voltage of the intermediate circuit U_{DC} has a value equal to U_{LN} *√2. If the motor is turned by its load (as occurs during deceleration or braking), power flows into the intermediate circuit through the inverter bridge. Voltage in the intermediate circuit therefore increases. The inverter bridge locks at a predetermined voltage, and the contacts of the relay programmed to signal an alarm state open.

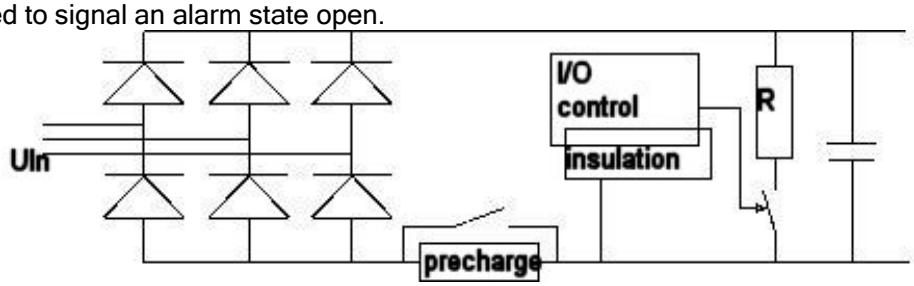


Figure 5.2.3.1 The rectifier bridge and intermediate circuit

The drive can be restarted automatically after an alarm condition.

In certain cases, locking can be prevented by extending the deceleration ramp.

5.2.3 The inverter bridge

The inverter bridge features IGBT (Insulated Gate Bipolar Transistor) technology in all models of V SERIES drive. The inverter bridge is protected by internal circuitry against over-voltage, over-current, short circuit between phases and short circuit to ground. In the event a fault, the inverter

bridge locks and trips the contacts of the relay programmed to signal an alarm state.
The drive can be restarted automatically after an alarm condition.

Inverter bridge protection alarm signalling

Signal	Lock caused by
OV	Overvoltage
OC	Overcurrent, short circuit between phases
OC	Short circuit to ground

Variable voltage output is derived from the intermediate circuit voltage using PWM technology. Special sinusoidal modulation in conjunction with the motor's own inductance produces an extremely good sinusoidal curve for the output current I_2. The voltage/frequency ratio is programmable and can be adapted to suit the motor being controlled.
More than one motor can be connected in parallel to the drive output. Motors may run at different speeds even though they have the same number of terminal pairs, because motor slip can vary with the load applied and motor characteristics may vary too. Motors can also be switched in and out individually, though great care must be taken when doing so.
Switching a motor in or out causes voltage peaks by interrupting an inductive current flow. These voltage peaks do not normally disturb the drive output provided the motor is a low power model and other motors remain connected to the inverter after it is switched out.


Attenzione!

If the motor being switched out is the last motor connected to the drive, make sure that the motor's magnetising current has dropped to zero before switching it out. The best way of doing this is to lock the inverter bridge and disconnect the motor only after a fixed delay calculated to suit the characteristics of the motor, in practice from about 0.5 seconds up to a number of seconds.

Motors can likewise be switched in to an already functioning drive one at a time. If you wish to do so, bear in mind that the instant the motor is connected its inrush current far higher than its nominal current. The drive must therefore be carefully selected so that inrush currents do not exceed the drive's nominal current. You must also consider the overload that the drive is able to cope with if the duty cycle during which the new motor is connected coincides with the limited period for which overload is permitted.


Attenzione!

Outputs from more than one inverter cannot work directly in parallel.

5.3. The control section

5.3.1 Control card terminal identification

Figure 5.3.1a: Control card terminals STRIP 1

Strip1	Description	Function	Default	Electrical caracteristicse
A1 A2 A3	Digital Output RLA - NO Digital Output RLA-COM Digital Output RLA - NC	Programmable relè Digital output	[I 102=3] Motor running	Resistance load: lifetime:500.000 switch 230Vac or 30Vdc 2A lifetime:100.000 switch 230Vac or 30Vdc 5A
1	Digital Input 1	Programmable digital input	[I000=1] Run	6mA @ +24V
2	Digital Input 2	Programmable digital input	[I001=2] Reverse	
3	Digital Input 3	Programmable digital input	[I002=7] Freq. Sel. 1	
4	Digital Input 4	Programmable digital input	[I003=8] Freq. Sel. 2	
5	COM-IN Digital Inputs	Programmable digital input		-
6	+ 24V OUT	+ 24 V refered to 0V24 for digital inputsper		+24 V / 300 mA
7	0V24 GND Dig. Inputs	Reference 0V24 (insulated respect lead 22)		-
8	Digital Input 6 [#] / B+ Enc.	(*) programmable digital input / encoder channel B+	[I 005=6] Jog	6mA @ 24V Enc. HTL 24V / 17mA Enc. TTL 5V / 9mA
9	Digital Input 5 [#] / A+ Enc.	(*)programmable digital input / encoder channel A+	[I 004=9] Freq. Sel. 3	
10	- 10V OUT / B- Enc.	(*)-10V refered to a 0V10 for analog inputs / encoder channel B-		-10V / 50mA
11	Analog Input 2N / A- Enc.	(*) Differential Analog Input Negative / Channel encoder A-	[I 210=0]	+/-10V / 5mA
12	Analog Input 2P	(*) Differential analog input Positive [terminal disabled if J4 is not in factory configuration]		+/-10V / 5mA

(*) function selection with Jumper

[#] in order to use digital inputs 5 and 6 with PNP commands see fig. 5.5.1.2: diagram for PNP commands

Figure 5.3.1b: Control card terminals STRIP 2

Strip2	Description	Function	Default	Electrical caracteristics
B1 B2 B3	Digital Output RLB – NO Digital Output RLB – COM Digital Output RLB - NC	Programmable relè digital output	[I 103=1] Alarm State	Resistance load: lifetime:500.000 switch 230Vac or 30Vdc 2A lifetime:100.000 switch 230Vac or 30Vdc 5A
13	GROUND REF	Round reference for shield cable		-
14	V-	Reference 0V for external supply		0V
15	FB+	Field Bus communication (serialRS485/ CAN) [High]		
16	FB-	Field Bus communication (serial / CAN) [Low]		-
17	V+	External positive supply		+11 ÷ 30 V
18	COM Digital outputs	Common reference digital output		-
19	Digital Output 1	Digital output open-collector programmable	[I100=0] Drive ready	+50V / 50 mA
20	Digital Output 2	Digital output open-collector programmabile	[I 101=6] Steady state	
21	Analog Output 1 +/-10V	Analog output programmable	[I 300=0] Freq out abs	+/-10V / 5mA
22	0V10 GND Analog input	Reference 0V10 for analog input/output		-
23	Analog Input 1	(*) voltage /current analog input	[I200=1] 0-10V/0..20mA	+/-10V / 0,5mA; 0..20mA
24	+ 10V OUT	+ 10 V refered to 0V10 for analog inputs		+10V / 50mA

(*)function selection with Jumper

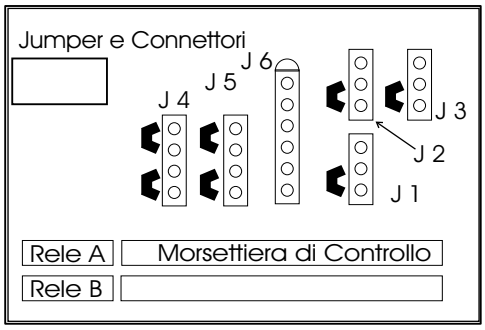
5.3.2 Jumper function description

Jumper	Terminal	Function
J1	23	Analog Input 1: default voltage (or current) input
J2	12	Analog Input 2P : default voltage (or current) input
J3	21	Analog Output : default 0-10 V (or +/- 10 V)
J4	11	Selects function of terminal 11: default Analog input 2N (or Enc.A-)
J5	10	Selects function of terminal 10: default -10 V (or Enc.B-)
J6	-	Programming key connector

configuration

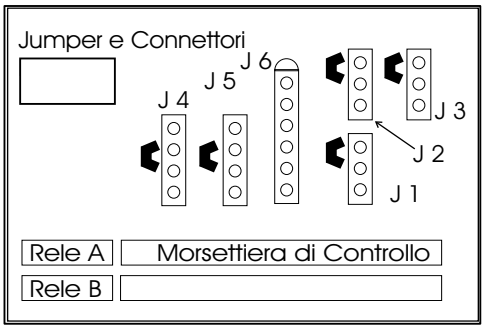
Jumper	Terminal	Function	Factory Configuration	Alternative Configuration
J1	23	Analog Input 1	VOLTAGE	CURRENT
J2	12	Analog Input 2P	VOLTAGE	CURRENT
J3	21	Analog Output	0 -10V	-10 / +10V
J4	11	Multifunction input	Analog input 2N	Encoder Ch.A-
J5	10	Multifunction input	-10V	Encoder Ch.B-

Factory Configuration



Alternative Configuration

[all jumper are indipendent]



In this configuration terminal 12 is disabled

note:

With encoder A, B let factory configuration and connect encoder only for leads 8 and 9

5.3.3 Cable specification for regulation board connection

Table 5.3.2: Maximum wire sections for control card terminals

Rigido / Flessibile / Dim. Conduttori	**[mm²] / [mm²] / AWG**	0,22-1 / 0,22-1 / 26-18
Flessibile con capocorda a puntale senza / con collare isolante	**[mm²]**	0,25 - 0,34 / 0,25 - 0,34
Lunghezza di spelatura	**[mm]**	10

Multi-core / flexible / AWG	**[mm²]/ [mm²]/AWG**	0,22-1/0,22-1/26-18
	[mm²]	0,25-0,34/0,25-0,34
	[mm²]	10

5.3.4 Maximum wire length

Table 5.3.3: Maximum wire length

Sezione cavo [mm^2]	0.22	0.5	0.75	1
Lunghezza max. m [feet]	27 [88]	62 [203]	93 [305]	125 [410]

Cable section mm^2	0,22	0,5	0,75	1
Max Length m / [feet]	27 [88]	62 [203]	93 [305]	125 [410]

5.4. Typical Connection Schematics

5.4.1 V SERIES drive connections

Figura 5.4.1.1: diagram for PNP commands: input enable with high level voltage

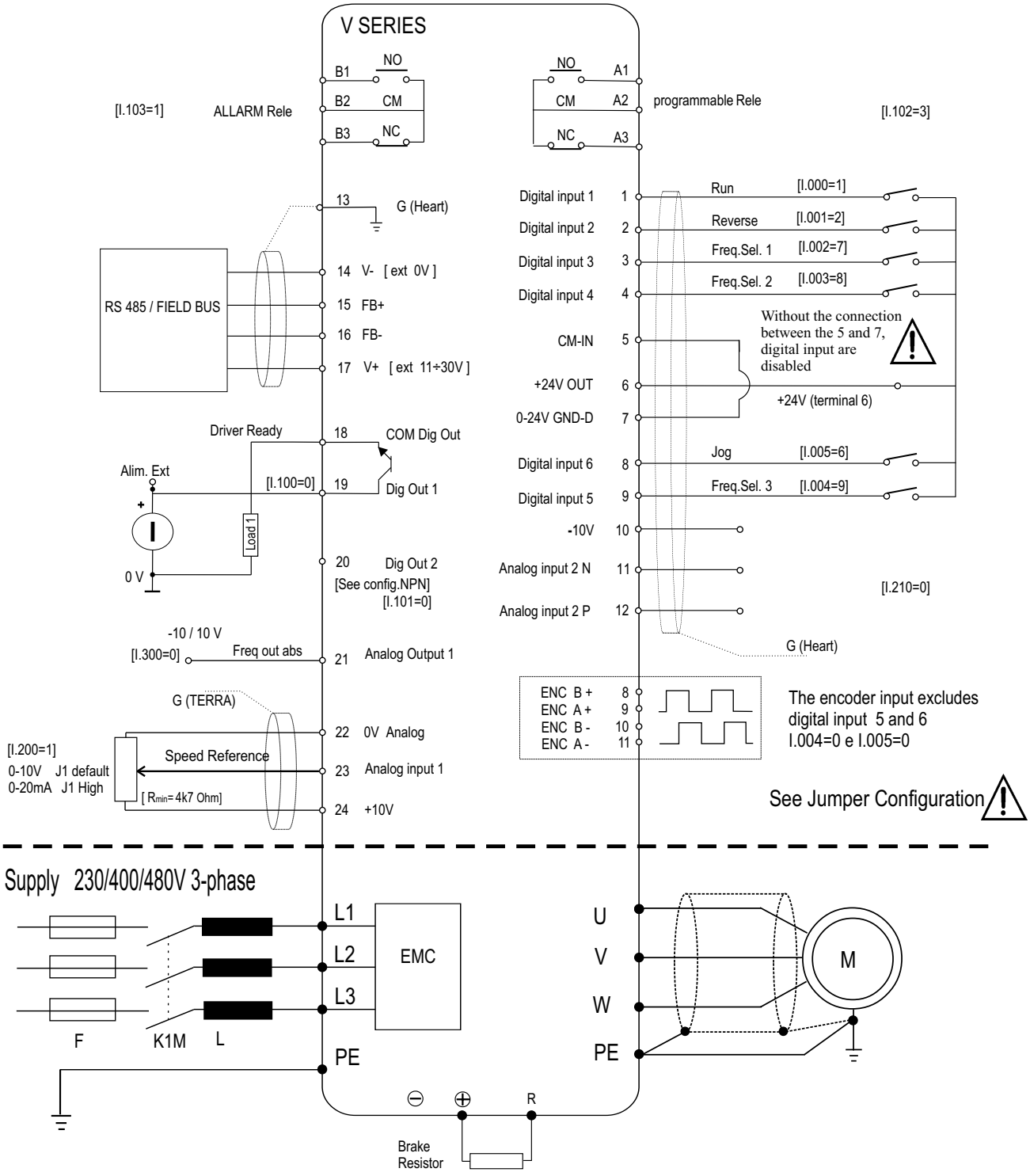
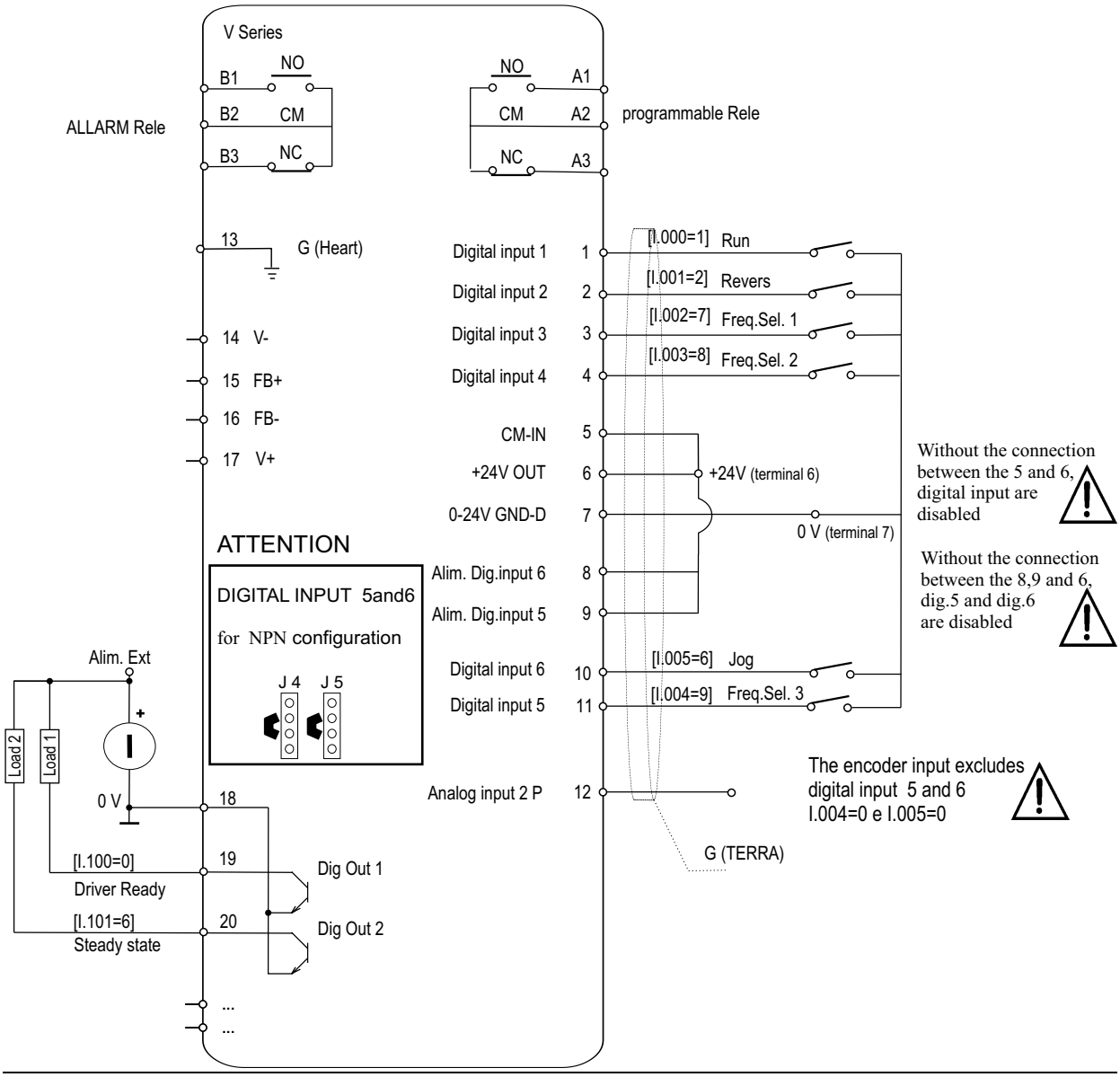
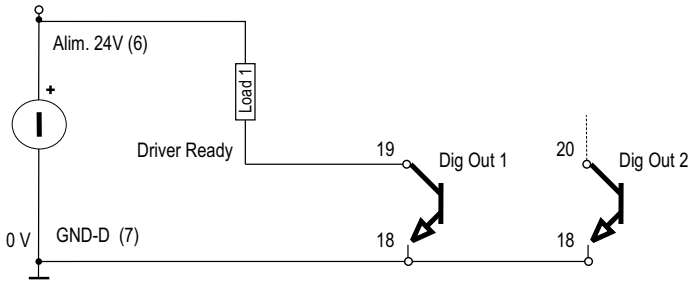


Fig. 5.4.1.2: diagram for PNP commands: input enable with high level voltage



Digital Output



5.4.2 Design constraints

The wires for the analog signals must be shielded (connection to terminals 22, 23, 24).
The shielding must be connected to the PE or 13 (GROUND REF) terminal at only one side.

Grounding of the reference potential

The terminal wire shielding potential must normally be grounded.
Terminal 13 provides the control signals ground connection to link the potential of the shielding or the control itself (terminal 7 to 13)
If a single installation comprises more than one drive, the different potentials of their terminal wire shields must be connected in common to the control panel's ground bus.

Direct connection to PLC inputs/outputs

Observe the following points if control commands or references are obtained directly from PLC inputs/outputs.
The PLC's 0V terminal must normally be grounded. if this is done, the drive control reference potential must not be grounded (i.e. terminal 13 must NOT be used).
To ensure good immunity to interference, connect a 0.1µF 250 V DC capacitor between terminal 22 and ground. If more than one drive is present in a single installation, this must be done for each individual drive.

Drive relays

To ensure good immunity to interference, install RC filters in parallel with the coils of contactors connected to the drive's potential-free contacts.

5.4.3 Parallel mains AC input connections to more than one drive

Characteristics and limitations

Drives installed in homogeneous groups must all be of the same model.
All input chokes must be identical (same specifications and same supplier).
All drives must receive power simultaneously. In other words they must all share the same switch/line contactor.
No more than 6 drives must be connected in parallel to the same mains supply.

5.5. The RS 485 serial interface

5.5.1 General

With V SERIES drives, an RS 485 serial line can be used to transmit data over a twisted pair cable made of two symmetrical twisted wires with a common shield. Maximum data transmission speed is 38.4 KBaud.

Transmission uses a standard differential RS 485 signal (half-duplex).

Up to a maximum of 32 V SERIES drives can be connected in Multidrop configurations.

The serial line is not opto-isolated.

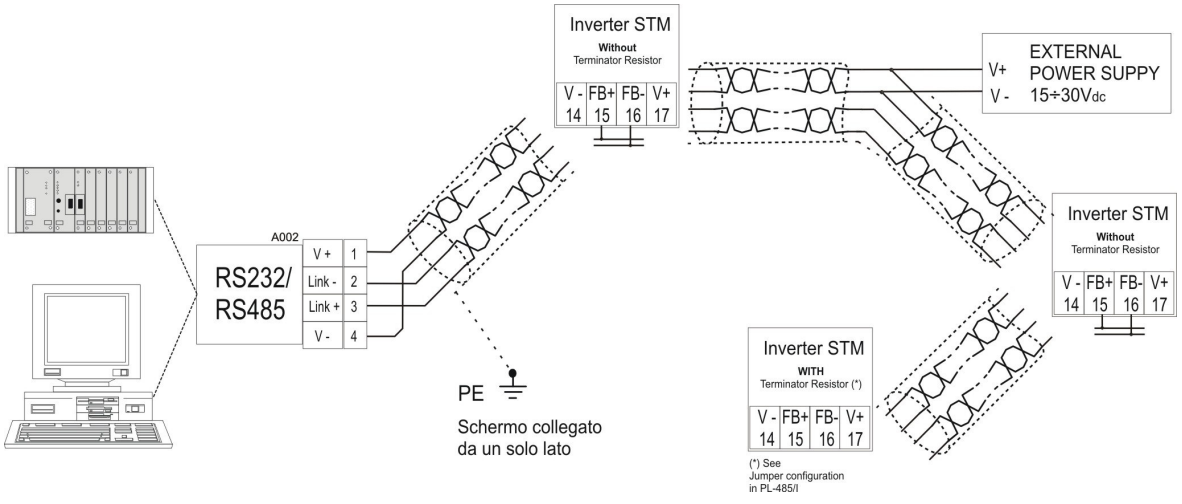
Plug-in cards are available for the following field bus types:

Field Bus plug-in cards				
Article	**Bus**	**Maximum number of nodes**	**Max. distance in metres**	**Baud Rate**
PL-485	RS485	32	1000	38.4kb/s
PL-ProfiBus	ProfibusDP ProfiDrive	32	1200	12Mb/s
PL-Can	CANopen	64	1000	1Mb/s
PL-485	MODBus	32	1000	38.4Kb/s
PL-Can	DeviceNet	64	500	500kb/s
PL-EnetX	Enet_X	32	100	3Mb/s

The serial connection

The RS485 serial line is supported by terminals V-, FB+, FB-, V+ on the V SERIES drive's control card.

To prevent interference, termination resistors (100 Ohm) must be fitted at the beginning and end of the RS 485 serial line's physical connection cables.



NOTE!

When connecting and laying serial lines, make sure that the power cables are laid in separate cable runways from the switchgear and relay cables.

Serial protocol

Serial protocol is set using the I.600 (Serial link cfg) parameter, which provides a choice of the following protocols: FoxLink proprietary protocol, Modbus RTU (default) and Jbus protocols.
The device address on the serial line is set using the I.602 (Device address) parameter.
See 'INTERFACE /Serial Configuration' later in this manual for further details about data transmission parameters, protocols, ranges and values. See chapter 8 later in this manual for instructions on the use of Modbus RTU communication protocol with V SERIES drives.

5.6. Protections

5.6.1 External blow fuses , side power supply

It is necessary provide protection side power supply. Can be used blow fuses slow type also fast fuses offer best protection
Intervention current councilied:

	Size	Fuses advised side power supply
V SERIES 230V - 440V	**030**	16 A
	040	20 A
	055	25 A
	075	35 A
	110	40 A
	150	50 A
	185	50 A

Table 5.6-1

Code examples of manufacturer:

Z22 … 22x58 mm	Jean Muller, Eltville
A70 ...	Ferraz
FWP ...	Bussmann

5.7. Chokes and filters

NOTE!

A choke can be fitted to the mains input to V SERIES drives to limit RMS input current. Inductance can be provided either by a single phase choke or by a mains transformer.

NOTE!

Contact your nearest STMDRIVE office for information on the use of sinusoidal output filters.

5.7.1 Mains input chokes

Use of a mains choke is recommended for all drive models:

- to extend the life of the intermediate circuit capacitors and improve the reliability of the input diodes;
- to reduce harmonic distortion in the mains;
- to reduce the problems caused by power feed from a low impedance line.

NOTE!

Determine the nominal current of chokes on the basis of the nominal current of the standard motors whose power ratings are specified in table 3.3-2

5.7.2 Output chokes

V SERIES drives can be used with general purpose motors as well as motors specifically designed for inverter control. Motors designed for inverter control normally have better insulation to withstand PWM voltages.

The following are generally applicable rules.

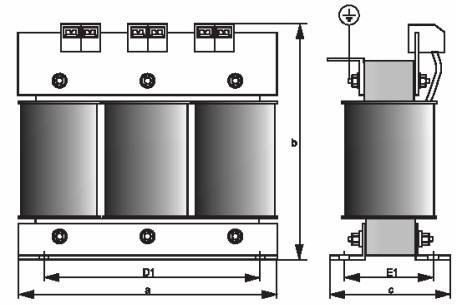
Motors designed for control by inverters do not require special inverter output filters. Standard motors on the other hand, especially those with long cables (typically longer than 30 metres) may need a choke on the inverter output to keep the voltage wave form within specified limits.

The nominal current of these chokes must be approximately 20% greater than that of the inverter itself to compensate for additional losses caused by modulation of the output wave form.

NOTE!

At the drive's nominal current and a frequency of 50 Hz, output chokes cause an output voltage drop of about 2%.

V Series	Mains input choke				Output choke			
	Code	Dimensions in mm			Code	Dimensions in mm		
		A	B	C		A	B	C
030	**IF3F-030**	120	125	65	**IU3-030**	180	170	110
040	**IR3F-040**				**IU3-055**			
055	**IR3F-055**			75				
075	**IR3F-075**	150	155	79	**IU3-110**	180	180	130
110	**IR3F-110**							
150	**IR3F-150**		168	100	**IU3-185**	180	160	170
185	**IR3F-185**	180	180	130				

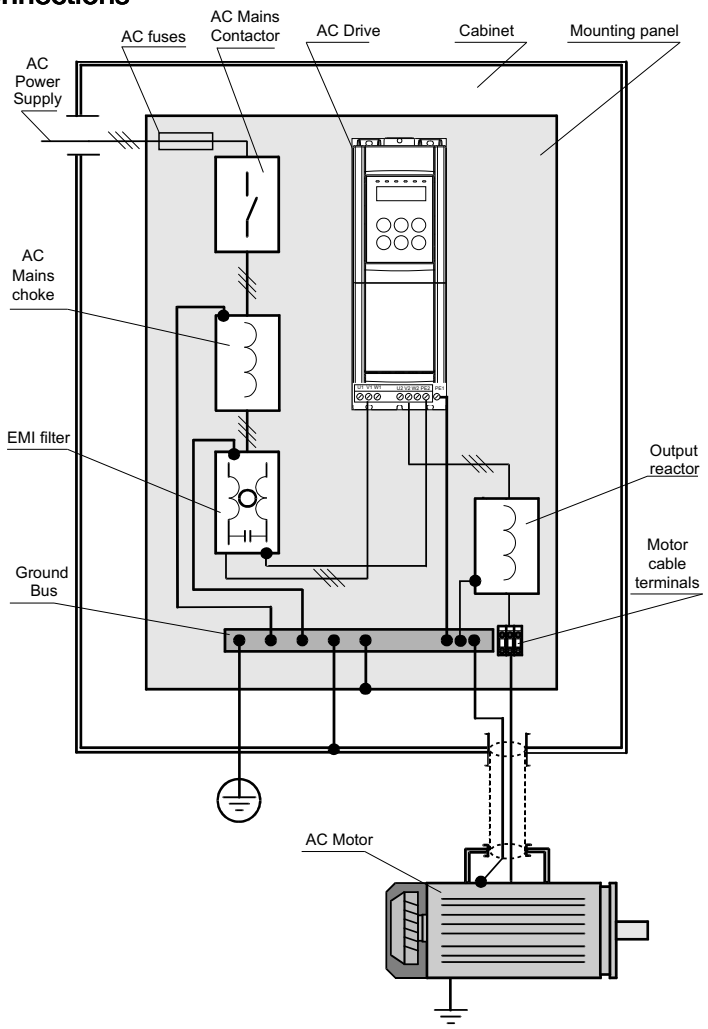


5.7.3 Noise filters

V SERIES drives are fitted with an EMI filter to limit radio frequency interference that could affect the mains.
See 'Drive identification' to identify the type of filter fitted.

Consult the Electro-Magnetic Compatibility Guide for further information on the subject of noise filters. You can request a copy of the 'Electro-Magnetic Compatibility Guide' from your nearest STMDRIVE office.
The Guide lists the power and control panel installation standards that must be followed to ensure EMC conformity according to Directive 89/336/EEC. (These standards cover the installation, whenever necessary, of external filters and mains chokes, cable shielding, ground connections, etc..)
The Guide also explains the background to EMC standards and lists the various conformity tests performed on STMDRIVE equipment.

External EMI filter connections



5.8. DC braking

V SERIES drives provide DC braking as a standard function. The DC braking function applies a DC current to two of the motor phases to generate braking torque. The machine's kinetic energy is dissipated inside the motor in the form of heat.

The DC braking function cannot provide intermediate braking (e.g. rapid braking from 1400 to 1200 rpm), but only braking to zero speed from already low speeds. If required, braking current can be measured from phase 'U'.

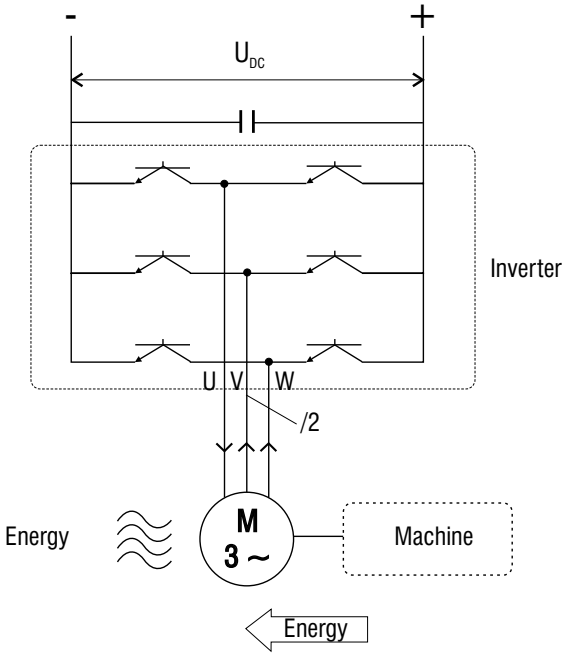


Figure 5.8.7: Principle of functioning of DC braking

5.9. Braking with an external resistance

During regenerative functioning, voltage in the intermediate stage can increase enough to trigger the overvoltage alarm. By connecting a resistance of suitable Ohms and Wattage to the 'R' and '+' terminals, you can dissipate the energy accumulated in the capacitors and reduce intermediate circuit voltage.

Extremely short braking times can be achieved in this way, even from high frequencies.

Braking resistance

INVERTER	R min. [ohm]	CODE	R [ohm]	Power [Watt]	A	B	D	IP	Fig.
-	-	**RRE 0,8-100R**	100	80	112	30	25	54	1
V 030 XXX	75	**RRE 2-100R**	100	200	309	30	25	54	1
V 040 XXX	75	**RRE 3,5-100R**	100	350	160	80	20	54	2
V 055 XXX	40	**RRE 3,5-75R**	75	350	160	80	20	54	2
V 075 XXX	25	**RRE 13-70R**	70	1300	240	80	20	54	2
V 110 XXX	25	**RRE 13-50R**	50	1300	240	80	20	54	2
V 150 XXX	20	**RRE 13-30R**	30	1300	240	80	20	54	2
V 185 XXX	15	**RRE 22-28R**	28	2200	506	107	300	23	3
-	-	**RRE 40-15R4**	15,4	4000	626	107	300	23	3

(*) Mounting on heat sink

The rating of the braking resistance must be determined according to the duty cycle, especially for models marked with an asterisk.

($P_R=(V^2/R)*d$ where d = (Ton/T) with Ton = braking time and T = complete cycle time)

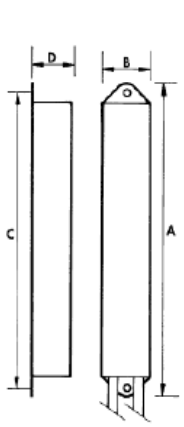


FIG.1

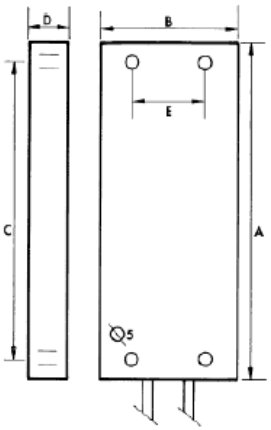


FIG.2

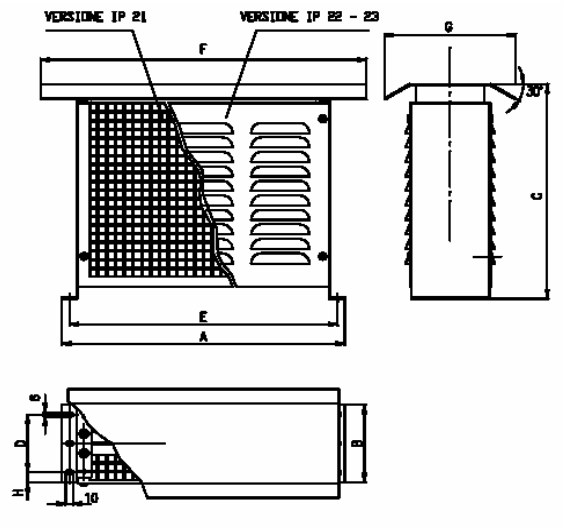


FIG.3

5.10. Safety delay before working on the drive

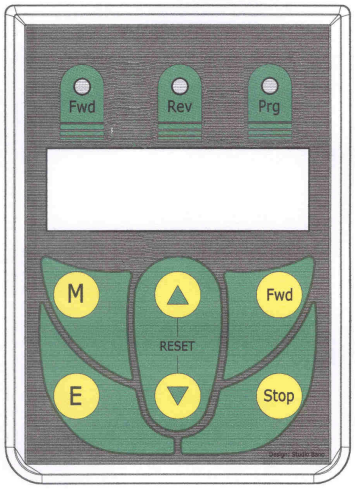
After disconnecting a V SERIES drive from the mains supply, always respect a minimum delay of 180 seconds before starting any work on its internal parts.

6. Use keyboard DRIVE

In this following charter are described the operations of management parameter, using programming keyboard .

6.1. Control keyboard and signalling

The modifications operated on the values of the parameters, also entering in action immediately, are not stored in way automatic , but require a specific action of storage that is obtained by means of the command “C.000” [Save parameters].



M Scroll menu`: Consent change menu’ parameter (d.xxx, S.xxx, I.xxx, F.xxx, P.xxx, A.xxx and C.xxx).

E key Enter: used to begin setting parameter And/or confirm value

▲ key UP: Used to increase displaying parameter and/or numerical value; moreover can be used to increase motopotentiometer reference, when is displayed; "F.000 - Motorpot ref" (menu F: FREQ & RAMP).

▼ key DOWN: used to decrease displaying parameter and/or numerical value; moreover can be used to decrease motopotentiometer reference , when is displayed "F.000 - Motorpot ref" (menu F: FREQ & RAMP).

▲ + ▼ key UP + key DOWN = RESET pushed both execute manual reset drive

Fwd Forward: run command if setted by apposite parametrisation and enabled by terminal connector

Stop STOP: stop command if setted by apposite parametrisationand enabled by terminal connector

Meaning of of LED :

Fwd (green Led): rotating motor Run command enabled and active

Rew (green Led): rotating motor Run command enabled and reverse active Motore.

Prg (yellow Led): inverter supplied; lighting when a parameter modification is not

saved;

6.2. Selection Menu

When drive is powered display go to parameter d.000 [Output frequency] of menu DISPLAY(starting display default).

To display parameter value, modificate or to execute functionn C.xxx make following procedure :

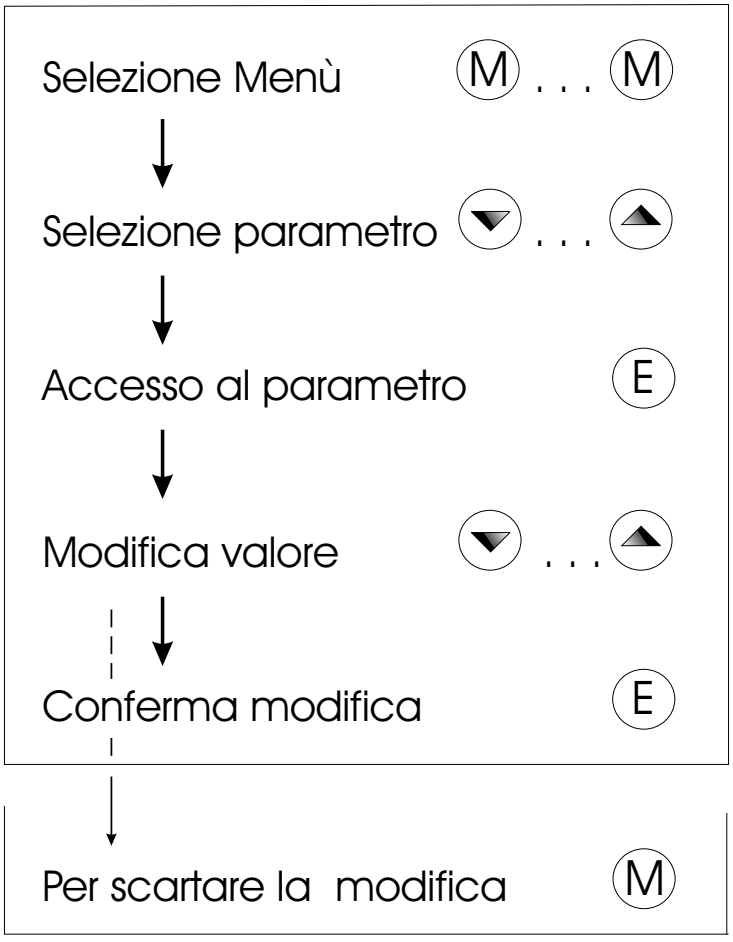


Fig. 6.2-1

For DISPLAY menu automatic display value appear after 2 seconds and obviously is not possibile modification value (only read).

6.3. Quick start

Step	Setting sequence	Description
1	Go to S-Startup	Push '**M**' to go S menu
2	Voltage supply	Set **S.000** voltage supply : 230,380,400,420,440,460,480
3	Frequency supply	Set **S.001** frequency supply: 50 Hz or 60 Hz
4	Maximum inverter output voltage	Set **S.100** Maximum inverter output voltage to apply to the motor (data plate)
5	Rated frequency motor	Set **S.101** rated frequency motor (data plate)
6	Rated current motor	Set **S.150** rated current (data plate)
7	Pairs motor poles	Set **S.151** the pairs poles motor (poles/2)
8	Motor Power factor (cosφ)	Set **S.152** power factor motor (data plate)
9	Setting commands	Set **S.200** command mode S.200=[0] START and STOP by keyboard (with enable) - S.200=[1] START and STOP by terminal connector (default) - S.200=[2] START e STOP by serial line (H menu)
10	Maximum frequency reference	Set **S.201** for maximum frequency reference.
11	Reference speed source	Set **S.202** for Reference speed source (speed): - S.202=[1] analog input (default) - S.202=[3] digital refeence setted on **S.203**
12	Acceleration and deceleration time	Set **S.300** acceleration time (5 sec default) Set **S.301** deceleration time (5 sec il default)
13	Manual Boost voltage	Set manual voltage Boost **S.400** (% of Vn, for low speed, only if necessary)
14	Autotuning stator resistance	Enable with **S.900 =do + 'E'** autotuning procedure
15	Saving setting	Enable with **S.901 =do + 'E'** saving configuration procedure for permanent storage .

7. Parameter

7.1. Parameter LIST

Legenda of drive menu.

Menu **d** – DISPLAY	Only read Menu of parameter d.xxx (display).
Menu **S** – START-UP	Setting Menu for base parameter drive.
Menu **I** – INTERFACE	Setting Menu` for Input/Output parameter drive (digital/analog).
Menu **F** – FREQ & RAMP	Setting Menu for multispeed and ramps (acc./dec.) drive.
Menu **P** – PARAMETER	Setting Menu for parameter function drive.
Menu **A** – APPLICATION	Setting Menu for PID function parameters .
Menu **C** – COMMAND	Menu command function (Saving configuration parameter, Load default, Autotuning, etc.)
Menu **H** - HIDDEN	Menu` Hidden not avalaible with keyboard but only by serial line or Field Bus.

NOTE!

On Chapter 7 ther's description code and name for every parameter drive, moreover default value and range.

On following Chapter are reported functional description on detail of every inverter parameter .

NOTE!

Meaning note:

(alias)	Only on STARTUP menu. Parameter Code repeteated in other menu
(*)	Parameter Value depending from drive size.
(**)	Parameter Value depending from voltage and rated frequency .
(***)	Parameter Value depending from other set paramenter .
(****)	Parameter Value depending from rated voltage supply.

7.1.1 Menu d - Display

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA (ALIAS)
Basic										
d.000	Output Frequency	**Drive output frequency**						Hz	0.01	001
d.001	Frequency ref	**Drive frequency reference**						Hz	0.01	002
d.002	Output current	**Drive output current (rms)**						A	0.1	003
d.003	Output voltage	**Drive output voltage (rms)**						V	1	004
d.004	DC link voltage	**DC Bus drive voltage (DC)**						V	1	005
d.005	Power factor	**Power factor (cosφ)**							0.01	006
d.006	Power [kW]	**Power**						kW	0.01	007
d.007	Output speed	**Motor speed (d.000)*Krpm*K**		K_{rpm} e K selectable with P602				Hz RPM	0.01/ 1	008
d.008	Speed ref	**Drive speed reference (d.001)*Krpm*K**		K_{rpm} e K selectable with P602				Hz RPM	0.01/ 1	009
d.009	Estimate speed	**Estimated drive speed**		K_{rpm} e K selectable with P602				Hz RPM		062
Overload										
d.050	Heatsink temp	**Drive heatsink temperature (linear sensor measured)**						°C	1	010
d.051	Drive OL	**Drive overload (100% = alarm threshold)**						%	0.1	011
d.052	Motor OL	**Motor overload (100% = alarm threshold)**						%	0.1	012
d.053	Resistor OL	**Braking resistor overload (100% = alarm threshold)**						%	0.1	013
d.054	Regulation Temperature	**Temperature card Regulation**						°C		058
Input/Output										
d.100	Dig inp status	**Digital inputs acquired by the drive (terminal or virtual)**								014
d.101	Term inp status	**Digital inputs terminal of the drive regulation board**								015
d.102	Vir dig Inp stat	**Virtual digital inputs received by drive serial link or field bus card**								016
d.120	Exp.dig inp stat	**Expansion digital inputs acquired by the drive** (terminal or virtual)								017
d.121	Exp.term inp	**Expansion digital inputs terminal of the drive expansion board**								018

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA (ALIAS)
d.122	Vir Exp dig inp	Expansion virtual digital inputs received by drive serial link or field bus card								019
d.150	Dig out status	Digital outputs executed by the drive (terminal or virtual)								020
d.151	Term dig out stat	Digital outputs terminal of the drive regulation board								021
d.152	Vir dig out stat	Virtual digital outputs executed by drive serial link or field bus card								022
d.170	Exp dig out stat	Expansion digital outputs executed by the drive (terminal or virtual)								023
d.171	Exp term out stat	Expansion digital outputs terminal of the drive expansion board								024
d.172	Exp vir dig out	Expansion virtual digital outputs executed by drive serial link or field bus card								025
d.200	An in 1 cnf mon	Analog input 1 destination; it shows like the signal is programmed	[0] Null funct [1] Freq ref 1 [2] Freq ref 2 [3] Best lev fact [4] OT lev fac [5] Vred lev fac [6] DCB lev fact [7] RampExt fact							026
d.201	An 1 monitor	Analog input 1 output block % value								027
d.202	An in 1 term mon	Analog input 1 input terminal block % value								028
d.210	An in 2 cnf mon	Analog input 2 destination; it shows where the signal is programmed	As for d.200							029
d.211	An in 2 monitor	Analog input 2 output block % value								030
d.212	An in 2 term mon	Analog input 2 input block % value								031
d.220	An in 3 cnf mon	Analog input 3 destination; it shows where the signal is programmed	As for d.200							032
d.221	An in 3 monitor	Analog input 3 output block % value								033

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA (ALIAS)
d.222	An in 3 term mon	**Analog input 3 input block % value**								034
d.250	Term an out 1 state mon	**terminal signal (%) of analog output 1**								063
d.260	Term an out 2 state mon	**terminal signal (%) of analog output 2**								064
d.270	Term exp an out 1 state mon	**terminal signal (%) of analog output optional 1**								065
Encoder										
d.300	Enc Pulses/Sample	**Reading of pulses sampling of encoder pulses (I.504)**							1/100	035
d.301	Encoder freq	**Encoder frequency (Motor frequency)**						Hz	0.01	036
d.302	Encoder speed	**Encoder speed (d.301)*(P.600)**							0.01/1	037
Options										
d.350	Option 1 state	**Drive option 1 state (expansion board type programmed)**	**Option board 1 state**							038
d.351	Option 2 state	**Drive option 2 state (expansion board type programmed)**	**Option board 2 state**							039
d.352	Par port state	**It monitors the 16-bit parallel port state (option)**								040
d.353	SBI state	**Communication state between SBI and Master**	**0** **1** **2** **3**	**Wait parametrizzation** **Wait configuration** **Data exchange** **Error**						059
d.354	SBI baude rate	**Communication speed between SBI and Master**	**0** **1** **2** **3** **4** **5** **6** **7** **8** **15**	**12 Mbit / s** **6 Mbit / s** **3 Mbit / s** **1.5 Mbit / s** **500 Kbit / s** **187.5 Kbit / s** **93.75 Kbit / s** **45.45 Kbit / s** **19.2 Kbit / s** **unknow**						060
Pid										
d.400	PID reference	**PID reference signal**						%	0.1	041
d.401	PID feedback	**PID feedback signal**						%	0.1	042
d.402	PID error	**PID error signal**						%	0.1	043
d.403	PID integr comp	**PID integral component**						%	0.1	044
d.404	PID output	**PID output signal**						%	0.1	045
Alarm list										
d.800	1st alarm-latest	**Last alarm stored by the drive alarm list**								046
d.801	2nd alarm	**Second to last alarm**								047
d.802	3rd alarm	**Third to last alarm**								048

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA (ALIAS)
d.803	4th alarm	**Fourth to last alarm**								049
Drive identification										
d.950	Drive rated curr	**Drive rated current (it depends on the drive size)**							0.1	050
d.951	SW version (1/2)	**Software version - part 1**							0.01	051
d.952	SW version (2/2)	**Software version - part 2**							0.01	052
d.953	Power ident code	**Reserved**								053
d.954	Param ident code	**Reserved**								054
d.955	Regul ident code	**Reserved**								055
d.956	Startup id code	**Reserved**								056
d.957	Drive size	**Drive size code**								057
d.958	Drive cfg type	**Drive display test**								061
Utility										
d.999	Display Test	**Display test drive**								099

7.1.2 Menu S – STARTUP

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	ALIAS IPA
S.000	Mains voltage	Rated value of the line voltage	230 380 400 420 440 460 480	230V 380V 400V 420V 440V 460V 480V	400	230	480	V		P020 404
S.001	Mains frequency	Rated value of the line frequency	50 60	50Hz 60Hz	(****)	(****)	(****)	Hz		P021 405
S.100	Max out voltage	Maximum value of the voltage applied to the motor			(**)	50	(**)	V	1	P061 413
S.101	Base frequency	Rated frequency of the motor			(**)	25	1000	Hz	0.1	P062 414
S.150	Motor rated curr	Rated current of the motor			(*)	(*)	(*)	A	0.1	P040 406
S.151	Motor pole pairs	Pole Pairs of the motor		Default 4 poles: S.151=2	2	1	60		0.01	P041 407
S.152	Motor powerfact	Motor power factor (cos ϕ)			(*)	0.01	1		0.01	P042 408
S.153	Motor stator R	Measurement of the stator resistance of the motor			(*)	0	99.99	Ohm		P043 409
S.200	Cmd source sel	Source of the START and STOP commands	[0] Keypad [1] Terminals [2] Virtual [3] H-command [4] ControlWord	START & STOP via keypad (+24V between 5 & 8 terminals required). START & STOP via terminal Main command via Virtual & Terminal setting Main command via serial line Reserved	1	0	4			P000 400
S.201	Max ref freq	Maximum frequency reference threshold and / or digital reference (both directions)			(****)	25	1000	Hz	0.1	F020 305
S.202	Ref 1 channel	Source of the Reference 1	[0] Null [1] Analog inp 1 [2] Analog inp 2 [3] Freq ref x [4] Multispeed [5] Motorpotent [6] Analog inp 3 [7] Encoder [8] FieldBus	Null Analog input 1 Analog input 2 Frequency reference S.203 (F.100) Multi frequencies Motorpotientometer reference Analog input 3 Encoder signal Reference by Profibus	1	0	8			F050 307
S.203	Frequency ref 0	Digital speed reference (F.100)			0	-S201	S201			F100 311
S.300	Acc time 1	Acceleration ramp delay time 1			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	F201 329
S.301	Dec time 1	Deceleration ramp delay time 1			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	F202 330

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	ALIAS IPA
S.400	Manual boost [%]	**Manual boost at low revolutions**			2	0	25	% of S100		**P120** 421
S.401	Auto boost en	**Automatic boost function enabling**	**[0] Disable** **[1] Enable**	**Automatic boost function disabled** **Automatic boost function enabled**	0	0	1			**P122** 423
S.450	Slip compensat	**Slip compensation**			0	0	250	%		**P100** 419
S.451	Slip comp filter	**It is the response time for the reaction of the function**			0.1	0	10	Sec	0.1	**P101** 420
S.900	Measure stator R	**Motor tuning command**	**Off** **Do**	**No action** **Autotune command execution** **No action**	Off	Off	Do			**C100** 806
S.901	Save parameters	**Save parameters**	**Off** **Do**	**Save parameters** **command execution**	Off	Off	Do			**C000** 800

7.1.3 Menu I - INTERFACE

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
Digital Input - Regulation board										
I.000	Dig input 1 cfg	**Digital Input 1 configuration**	**[0] None** **[1] Run** **[2] Reverse** **[3] Ext Fault NO** **[4] Ext Fault NC** **[5] Alarm reset** **[6] Jog** **[7] Freq sel 1** **[8] Freq sel 2** **[9] Freq sel 3** **[10] Freq sel 4** **[11] Ramp sel 1** **[12] Ramp sel 2** **[13] Enable NO** **[14] Enable NC** **[15] DCBrake en** **[16] DCBrake** **[17] Autocapature** **[18] Ramp enable** **[19] Zero ref** **[20] PID enable** **[21] PID Freeze** **[22] PID gain sel** **[23] Motorpot Up** **[24] Motorpot Dn** **[25] Reset Motorpot** **[26] Fast stop** **[27] Zero freq** **[28] Stop 3-wire**	Not active RUN command for the motor START Speed REVERSE command External fault with NO (Normal Open) contact External fault with NC (Norm. Closed) contact Alarm reset command JOG frequency reference enabling Binary selection for Multispeed Binary selection for Multispeed Binary selection for Multispeed Binary selection for Multispeed Binary selection for Multiramp Binary selection for Multiramp Drive Enable with NC (Norm. Closed) contact Drive Enable with NO (Normal Open) contact Enabling of the DC braking function Command for execution of DC braking Execution of the flying restart Enabling / Disabling of the Ramp block Ramp to 0Hz & main commands active Enabling of the PID regulation. Enabling PID freeze output signal. Selection of the PID regualtor gain. Motorpotentiometer reference increasing Motorpotentiometer reference decreasing Reset of Motorpotentiometer ref. Emergency stop Enabling output freq. to zero. Stop command (NC) 3-wires mode (P001=2)	1	0	28			100
I.001	Dig input 2 cfg	**Digital Input 2 configuration**	**Same as I.000**		2	0	28			101
I.002	Dig .input 3 cfg	**Digital Input 3 configuration**	**Same as I.000**		7	0	28			102

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
I.003	Dig. Input 4 cfg	Digital Input 4 configuration	Same as I.000		8	0	28			103
I.004	Dig. Input 5 cfg	Digital Input 5 configuration	Same as I.000		9	0	28			104
I.005	Dig. Input 6 cfg	Digital Input 6 configuration	Same as I.000		6	0	28			105
I.006	Dig. Input 7 cfg	Digital Input 7 configuration	Same as I.000	Blocked	0	0	0			106
I.007	Dig. Input 8 cfg	Digital Input 8 configuration	Same as I.000	Blocked	0	0	0			107
Digital Input - Options										
I.050	Exp dig in 1 cfg	Expansion Digital Input 1 configuration (on Expansion board)	Same as I.000	Not available	0	0	28			108
I.051	Exp dig in 2 cfg	Expansion Digital Input 2 configuration (on Expansion board)	Same as I.000	Not available	0	0	28			109
I.052	Exp dig in 3 cfg	Expansion Digital Input 3 configuration (on Expansion board)	Same as I.000	Not available	0	0	28			110
I.053	Exp dig in 4 cfg	Expansion Digital Input 4 configuration (on Expansion board)	Same as I.000	Not available	0	0	28			111
Digital Output - Regulation board										
I.100	Dig output 1 cfg	Digital Output 1 configuration	[0] Drive ready [1] Alarm state [2] Not in alarm [3] Motor running [4] Motor stopped [5] REV Rotation [6] Steady state [7] Ramping [8] UV running [9] Out trq>thr [10] Current lim [11] DC-link lim [12] Limit active [13] Autocapt run [14] Reserved [15] Neg pwrfact	Drive ready to start Positive logic for alarm signalling Negative logic for alarm signalling Run command active (Fwd, Rev, DCB) Run command not active and frequency = 0Hz Anti-clockwise rotation of the motor. Motor is running in steady state.(No Ramp) Acceleration or Deceleration Ramp on progress. Undervoltage detectetion during motor running. Output torque higher than the value of P.241. Current limit (during ramp or at steady state). DC Bus limit (during ramp or at steady state). General signalling of drive limit condition. Autocapture on progress. Reserved. Negative condition of the	0	0	45			112

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
				power factor .						
			[16] PID err><	PID error is >A.058 & <=A.059.						
			[17] PID err>thr	PID error is >A.058.						
			[18] PID err<thr	PID error is <=A.059.						
			[19] PID er><(inh)	PID error is >A.058 & <=A.059 (see chapter 7.7).						
			[20] PID err>(inh)	PID error is >A.058 (see chapter 7.7).						
			[21] PID err<(inh)	PID error is <=A.059 (see chapter 7.7).						
			[22] FWD enc rot	Clockwise rotation of the couter-encoder.						
			[23] REV enc rot	Anti-clockwise rotation of the encoder.						
			[24]Encoder stop	Encoder not rotating.						
			[25]Encoer run	Encoder rotation general signalling.						
			[26] Extern fault	Positive logic for Ext. fault alarm signalling.						
			[27] No ext fault	Negative logic for Extern. fault alarm signalling.						
			[28] Serial T0	Serial link communication time out.						
			[29] freq=thr1	Output frequency = to P.440 & P.441 values.						
			[30] freq≠thr1	Output frequency ≠ of P.440 & P.441 values.						
			[31] freq>thr1	Output frequency > than P.440 & P.441 values.						
			[32] freq<thr1	Output frequency < than P.440 & P.441 values.						
			[33] freq=thr2	Output frequency = to P.442 & P.443 values.						
			[34] freq≠thr2	Output frequency ≠ of P.442 & P.443 values.						
			[35] freq>thr2	Output frequency > than P.442 & P.443 values.						
			[36] freq<thr2	Output frequency < than P.442 & P.443 values.						
			[37] HS temp=thr	Heatsink temp = to P.480 & P.481 values.						
			[38] HS temp≠thr	Heatsink temp ≠ of P.480 & P.481 values.						
			[39] HS temp>thr	Heatsink temp > than P.480 & P.481 values.						
			[40] HS temp<thr	Heatsink temp < than P.480 & P.481 values.						
			[41] Output freq	Frequency in synchronism with output frequency.						
			[42] Out freq x 2	Frequency value x 2 in synchronism with output frequency.						
			[43] Out Coast Thru	Coast thru stopping.						
			[44] Out Emg Stop	Emergency stop.						
			[45] DC Brake	DC braking in progress						
			[46] Drv OL status	Set when the integrator d.051=100% and reset when d.051=0%						
			[47] Drv OL warn	Set if d.051 is greater or						

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
				equal to 90%						
			[48] Mot OL state	Set when the integrator d.052=100% and reset when d.052=0%						
			[49] False	False assume value 0						
			[50] True	True assume value 1						
			[51] Reserved							
			[52] Reserved							
			[53] Reserved							
			[54] Reserved							
			[55] Reserved							
			[56] DI 1	State of digital input 1						
			[57] DI 2	State of digital input 2						
			[58] DI 3	State of digital input 3						
			[59] DI 4	State of digital input 4						
			[60] DI 5	State of digital input 5						
			[61] DI 6	State of digital input 6						
			[62] DI 7	State of digital input 7						
			[63] DI 8	State of digital input 7						
			[64] Exp DI 1	Digiatal input 1 expansion state						
			[65] Exp DI 2	Digiatal input 2 expansion state						
			[66] Exp DI 3	Digiatal input 3 expansion state						
			[67] Exp DI 4	Digiatal input 4 expansion state						
			[68] AND 1 out	Output block AND 1 state						
			[69] AND 2 out	Output block AND 2 state						
			[70] AND 3 out	Output block AND 3 state						
			[71] OR 1 out	Output block OR 1 state						
			[72] OR 2 out	Output block OR 2 state						
			[73] OR 3 out	Output block OR 3 state						
			[71] NOT 1 out	Output block NOT 1 state						
			[72] NOT 2 out	Output block NOT 2 state						
			[73] NOT 3 out	Output block NOT 3 state						
			[77] NOT 4 out	Output block NOT 4 state						
I.101	Dig output 2 cfg	**Digital Output 2 Configuration**	**Same as I.100**		6	0	45			113
I.102	Dig output 3 cfg	**Digital Output 3 Configuration**	**Same as I.100**	Relais A	3	0	45			114
I.103	Dig output 4 cfg	**Digital Output 4 configuration**	**Same as I.100**	Relais B [ALARM]	1	0	45			115
Digital Output - Options-										
I.150	Exp DigOut 1cfg	**Expansion Digital Output 1 configuration (on Expansion board)**	**Same as I.100**		0	0	45			116
I.151	Exp DigOut 2cfg	**Expansion Digital Output 2 configuration (on Expansion board)**	**Same as I.100**		0	0	45			117
I.152	Exp DigOut 3cfg	**Expansion Digital Output 3 configuration (on Expansion board)**	**Same as I.100**		0	0	45			180
Analog Input - Regulation Board										
I.200	An In 1 Type	**Setting of the Analog Input 1 type reference**	**[0] -10/+10V** **[1] 0-10V/0-20mA** **[2] 4-20mA**	Bipolar -/+10V Unipolar +10V or 0-20mA Unipolar 4-20mA	1	0	2			118

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
I.201	An In 1 offset	Analog Input 1 offset			0	-99.9	99.9			119
I.202	An In 1 gain	Analog Input 1 gain			1	-9.99	9.99			120
I.203	An In 1 minimum	An Input 1 minimun value			0	0	99.99			121
I.204	An in 1 filter	Response time of the signal reaction			0.1	0.001	0.250		0.001	122
I.205	An in 1 Clip lev	Clipping analog input 1			0.05	0	2.50		0.01	181
I.210	An In 2 Type	Setting of the Analog Input 2 type reference	[0] -10/+10V [1] 0-10V/0-20mA [2] 4-20mA	Bipolar -/+10V Unipolar +10V or 0-20mA Unipolar 4-20mA	0	0	2			123
I.211	An In 2 offset	Analog Input 2 offset			0	-99.9	99.9		0.1	124
I.212	An In 2 gain	Analog Input 2 gain			1	-9.99	9.99		0.01	125
I.213	An In 2 minimum	An Input 2 minimun value			0	0	99.99		0.01	126
I.214	An in 2 filter	Response time of the signal reaction			0.1	0.001	0.25		0.001	127
I.215	An in 2 Clip lev	Clipping analog input 2			0.05	0	2.50		0.01	182
I.220	An In 3 Type	Setting of the Analog Input 3 type reference	[1] 0-10V/0-20mA [2] 4-20mA	0.20mA 4.20mA	1	1	2			128
I.221	An In 3 offset	Analog Input 3 offset			0	-99.9	99.9		0.1	129
I.222	An In 3 gain	Analog Input 3 gain			1	-9.99	9.99		0.01	130
I.223	An In 3 minimum	An Input 3 minimun value			0	0	99.99		0.01	131
I.224	An in 3 filter	Response time of the signal reaction			0.1	0.001	0.25		0.001	132
I.225	An in 3 Clip lev	Clipping analog input 3			0.05	0	2.5		0.01	183
Analog Output - Regulation Board										

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
I.300	Analog out 1 cfg	Analog Output 1 configuration	[0] Freq out abs [1] Freq out [2] Output curr [3] Out voltage [4] Out trq (pos) [5] Out trq (abs) [6] Out trq [7] Out pwr (pos) [8] Out pwr (abs) [9] Out pwr [10] Out PF [11] Enc freq abs [12] Encoder freq [13] Freq ref abs [14] Freq ref [15] Load current [16] Magn current [17] PID output [18] DClink volt [19] U current [20] V current [21] W current [22] Freq ref fac	Output Frequency absolute value. Output Frequency. Output Current. Output Voltage. Output Torque positive value. Output Torque absolute value. Output Torque. Output Power positive value. Output Power absolute value. Output Power. Output Power Factor. Encoder frequency absolute value. Encoder frequency. Frequency reference absolute value. Frequency reference Load Current. Motor Magnetizing Current. PID regulator output. DC bus capacitors level. Output phase U current signal. Output phase V current signal. Output phase W current signal. Multiplier factor for frequency reference	0	0	22			133
I.301	An out 1 offset	Analog output 1 offset			0	-9.99	9.99		0.01	134
I.302	An out 1 gain	Analog output 1 gain			1	-9.99	9.99		0.01	135
I.303	An out 1 filter	Time constant of output			0	0	2.5		0.01	136
I.304	An out 1 Type	Type analog output	[0] Unipolar [1] Bipolar (+/-)	Set with Jumper J3	0	0	1			184
I.310	Analog out 2 cfg	Analog Output 2 configuration	Same as I.300	Not avalaible HW	2	0	22			137
I.311	An out 2 offset	Analog output 2 offset			0	-9.99	9.99		0.01	138
I.312	An out 2 gain	Analog output 2 gain			1	-9.99	9.99		0.01	139
I.313	An out 2 filter	Time constant of output			0	0	2.5		0.01	140
Analog Output - Exp Board										
I.350	Exp An out 1 cfg	Expansion Analog Output 1	Same as I.300		3	0	22			141
I.351	Exp An out 1 offset	Expansion Analog Output 1 offset			0	-9.99	9.99		0.01	142
I.352	Exp An out 1 gain	Expansion Analog Output 1 gain			1	-9.99	9.99		0.01	143
I.353	Exp An out 1 filter	Time constant of output filter			0	0	2.5		0.01	144

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
Enabling Virtual I/O										
I.400	Inp by serial en	**Virtual Digital enabling**			0	0	255			145
I.410	Exp in by ser en	**Expansion Virtual Digital**			0	0	15			146
I.420	Out by ser en	**Inputs enabling**			0	0	15			147
I.430	Exp out by ser en	**Virtual Digital Outputs**			0	0	3			148
I.450	An out by ser en	**Setting enabling**			0	0	255			149
Encoder Config										
I.500	Encoder enable	**Enabling of the encoder feedback**	**[0] Disable** **[1] Enable**	Encoder feedback disabled Encoder feedback enabled	0	0	1			150
I.501	Encoder ppr	**Encoder channels configuration**			100	1	9999		1	151
I.502	Encoder channels cfg	**Encoder nameplate pulses per revolution**	**[0] one channel** **[1] two channels**	A (A+A-) encoder channel A and B (A+A-B+B-) encoder channels	0	0	1			152
I.503	Enc spd mul fact	**Multiplier factor of the encoder pulses, set in the I.501**			1	0.01	99.99		0.01	153
I.504	Enc update time	**Encoder pulses sampling time**			0.1	0	25		0.1	150
Serial Line Config										
I.600	Serial link cfg	**Serial line configuration protocol & mode**	**Protocol type** **[0] Foxlink 7E1** **[1] Foxlink 7O1** **[2] Foxlink 7N2** **[3] Foxlink 8N1** **[4] ModBus 8N1** **[5] JBus 8N1** **[6] ENET-X** **[7] Reserved** **[8] Profibus**	PROT Type BIT Parity S Foxlink 7E1 7 Even 1 Foxlink 7O1 7 Odd 1 Foxlink 7N2 7 None 2 Foxlink 7O1 8 None 1 ModBus 8N1 8 None 1 Jbus 8N1 8 None 1 Easy Net - X … Profibus DP / Profidrive	4	0	8			155
I.601	Serial link bps	**Serial line baudrate**	**[0] 600 baud** **[1] 1200 baud** **[2] 2400 baud** **[3] 4800 baud** **[4] 9600 baud** **[5] 19200 baud** **[6] 38400 baud**	600 baud rate 1200 baud rate 2400 baud rate 4800 baud rate 9600 baud rate 19200 baud rate 38400 baud rate	4	0	6			156
I.602	Device address	**Serial line address of the drive**			1	0	99		1	157
I.603	Ser answer delay	**Serial line answer delay time**			1	0	250	ms	1	158
I.604	Serial timeout	**Serial line transmission timeout**			0	0	25	Sec	0.1	159
I.605	En timeout alm	**Setting time out alarm**	**[0] Disable** **[1] Enable**	Drive NOT in alarm and signal on a digital output Drive IN alarm and signal on a digital output	0	0	1			160
Option Config Board										
I.700	Option 1 type	**Expansion optional 1 card type RESERVED**	**[0] Board Off** **[1] Board master** **[2] I/O Board** **[3] Board free** **[4] SBI Board**	**RESERVED** **RESERVED** **RESERVED** **RESERVED** **RESERVED**	0	0	4			161

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
I.701	Option 2 type	Expansion optional 2 card type RESERVED	[0] Board Off [1] Board master [2] I/O Board [3] Board free [4] SBI Board	Reserved Reserved Reserved Reserved Reserved	0	0	4			162
Field Bus Configuration										
I.750	SBI Address	SBI Address			3	0	255			163
I.751	CAN baudrate	CAN Open baudrate	[0] 10 KHz [1] 20 KHz [2] 50 KHz [3] 125 KHz [4] 250 KHz [5] 500 KHz [6] 1000 KHz		5	0	6			164
I.752	SBI Profibus mod	SBI Profibus Mode	[0] Custom [1] PPO1 [2] PPO2 [3] PPO3 [4] PPO4	Reserved Reserved Reserved Reserved Reserved	2	0	4	Sec	0.1	165
I.753	SBI CAN mode	Selection of the Bus protocol	[0] OFF [1] CAN Open [2] DeviceNet	Reserved Reserved	0	0	2			166
I.754	Bus Flt Holdoff	Delay time for Bus Fault Alarm			0	0	60	Sec	0.1	179
I.760	SBI to Drv W 0	Word 0 da SBI al drive			0	0	1999			167
I.761	SBI to Drv W 1	Word 1 from SBI to drive			0	0	1999			168
I.762	SBI to Drv W 2	Word 2 from SBI to drive			0	0	1999			169
I.763	SBI to Drv W 3	Word 3 from SBI to drive			0	0	1999			170
I.764	SBI to Drv W 4	Word 4 from SBI to drive			0	0	1999			171
I.765	SBI to Drv W 5	Word 5 from SBI to drive			0	0	1999			172
I.770	Drv to SBI W 0	Word 0 from drive to SBI			1	0	1999			173
I.771	Drv to SBI W 1	Word 1 from drive to SBI			2	0	1999			174
I.772	Drv to SBI W 2	Word 2 from drive to SBI			3	0	1999			175
I.773	Drv to SBI W 3	Word 3 from drive to SBI			4	0	1999			176
I.774	Drv to SBI W 4	Word 4 from drive to SBI			5	0	1999			177
I.775	Drv to SBI W 5	Word 5 from drive to SBI			6	0	1999			178

7.1.4 Menu F - FREQ & RAMP

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
MOTOPOTENTIOMETER										
F.000	Motorpot	**Motopotentiometer reference**			0	0	F.020	Hz	0.01	300
F.001	Motorpotref	**Motopotentiometer reference x Krpm*K (scaled)**		P602 set K_{rpm} and K	0	0	F.020 xK_{rpm} x K			343
F.010	Acc/Dec time mp	**Ramp time motopotentiometer (accel/decel)**			10	0.1	999.9	Sec	0.1	301
F.011	Motorpot offset	**Minimum Motopotentiometer reference**			0	0	F.020	Hz	0.1	302
F.012	Mp output mode	**Motopotentiometer unipolar / bipolar**	**[0] Unipolar** **[1] Bipolar**	Motorpotentiometer unipolar Motorpotentiometer bipolar	0	0	1			303
F.013	Mp auto save	**Motopotenziometer auto save function**	**[0] Disable** **[1] Enable**	Motorpot auto save function disabled Motorpot auto save function enabled	1	0	1			304
Reference frecuency limit										
F.020	Max ref freq	**Motor maximum frequency value (for both the directions)**			(****)	25	1000	Hz	0.1	305
F.021	Min ref freq	**Minimum frequency value**			0	0	50	Hz	0.1	306
Reference Source selection										
F.050	Ref 1 channel	**Source of the Reference 1**	**[0] Null** **[1] Analog inp 1** **[2] Analog inp 2** **[3] Freq ref x** **[4] Multispeed** **[5] Motorpotent** **[6] Analog inp 3** **[7] Encoder** **[8] FieldBus**	Null Analog input 1 Analog input 2 Frequency reference F.100 (S.203) Multi frequncies Motorpotientometer reference Analog input 3 Encoder signal Reference by Profibus	1	0	8			307
F.051	Ref 2 Channel	**Source of the Reference 2**	**[0] Null** **[1] Analog inp 1** **[2] Analog inp 2** **[3] Freq ref x** **[4] Multispeed** **[5] Motorpotent** **[6] Analog inp 3** **[7] Encoder** **[8] FieldBus**	Null Analog input 1 Analog input 2 Frequency reference F.101 Multispeed Motorpotientometer reference Analog input 3 Encoder signal Reference by Profibus	0	0	8			308
F.060	MltFrq channel 1	**Source of the Multispeed 1**	**Same as F.050**		3	0	8			309
F.061	MltFrq channel 2	**Source of the Multispeed 2**	**Same as F.051**		3	0	8			310

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
Selection source factor multiplier reference										
F.080	Ref fact source	**Selector source factor multiplier reference**	**[0] Disabled [1] Analog inp 1 [2] Analog inp 2 [3] Analog inp 3**	See fig.7.5.1	0	0	3			342
Multi Frequency Function										
F.100	Frequency ref 0	**Frequency reference 0**			0	-F020	F020	Hz	0.1	311
F.101	Frequency ref 1	**Frequency reference 1**			0	-F020	F020	Hz	0.1	312
F.102	Frequency ref 2	**Frequency reference 2**			0	-F020	F020	Hz	0.1	313
F.103	Frequency ref 3	**Frequency reference 3**			0	-F020	F020	Hz	0.1	314
F.104	Frequency ref 4	**Frequency reference 4**			0	-F020	F020	Hz	0.1	315
F.105	Frequency ref 5	**Frequency reference 5**			0	-F020	F020	Hz	0.1	316
F.106	Frequency ref 6	**Frequency reference 6**			0	-F020	F020	Hz	0.1	317
F.107	Frequency ref 7	**Frequency reference 7**			0	-F020	F020	Hz	0.1	318
F.108	Frequency ref 8	**Frequency reference 8**			0	-F020	F020	Hz	0.1	319
F.109	Frequency ref 9	**Frequency reference 9**			0	-F020	F020	Hz	0.1	320
F.110	Frequen ref 10	**Frequency reference 10**			0	-F020	F020	Hz	0.1	321
F.111	Frequen ref 11	**Frequency reference 11**			0	-F020	F020	Hz	0.1	322
F.112	Frequen ref 12	**Frequency reference 12**			0	-F020	F020	Hz	0.1	323
F.113	Frequen ref 13	**Frequency reference 13**			0	-F020	F020	Hz	0.1	324
F.114	Frequen ref 14	**Frequency reference 14**			0	-F020	F020	Hz	0.1	325
F.115	Frequen ref 15	**Frequency reference 15**			0	-F020	F020	Hz	0.1	326
F.116	Jog frequency	**Frequency for JOG mode**			1	-F020	F020	Hz	0.1	327
Ramp Config										
F.200	Ramp resolution	**Ramp Resolution accel/decel.**	**[0] 0.01 [1] 0.1s [2] 1s**	From 0.01s to 99.99s From 0.1s to 999.99s From 1s to 9999s	1	0	2			328
F.201	Acc time1	**Acceleration time1**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	329
F.202	Dec time 1	**Deceleration time 1**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	330
F.203	Acc time 2	**Acceleration time2**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	331
F.204	Dec time 2	**Deceleration time 2**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	332
F.205	Acc time 3	**Acceleration time3**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	333
F.206	Dec time 3 / FS	**Deceleration time 3 / deceleration fast stop**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	334
F.207	Acc time 4 / JOG	**Acceleration time 4/deceleration time JOG**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	335

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
F.208	Dec time 4 / JOG	**Deceleration time 4/Tempo di decel. JOG**			5	0.1 (***)	999.9 (***)	Sec	0.1 (***)	336
F.250	Ramp S-shape	**S -Ramp shape**			0	0	10	Sec	0.1	337
F.260	Ramp extens src	**Source of extension signal ramp**	**[0] Null** **[1] Analog inp 1** **[2] Analog inp 2** **[3] Analog inp 3**	Null Analog input 1 Analog input 2 Analog input 3	0	0	3			338
Jump frequency										
F.270	Jump amplitude	**Jump frequencies hysteresys**			0	0	200	Hz	0.1	339
F.271	Jump frequ. 1	**Jump frequency 1**			0	0	1000	Hz	0.1	340
F.272	Jump frequ. 2	**Jump frequency 2**			0	0	1000	Hz	0.1	341

7.1.5 Menu P - PARAMETER

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
Commands										
P.000	Cmd source sel	**It defines the use of START and STOP commands**	**[0] Keypad** **[1] Terminals** **[2] Virtual** **[3] H-command** **[4] ControlWord**	START & STOP via keypad (+24V between 5 & 8 terminals required). START & STOP via terminal Main command via Virtual & Terminal setting Main command via serial line Reserved	1	0	4			400
P.001	RUN Input config	**Command logic**	**[0] Run / Rev** **[1] Fwd / Rev** **[2] 3 wire mode**	Disable negative rotation of the motor. Enable negative rotation of the motor. Three wires command Start e Stop pulsed +Reverse	0	0	2			401
P.002	Reversal enable	**Reversal enabling**	**[0] Disable** **[1] Enable**	Disabling of the HW reverse command Enabling of the HW reverse command	1	0	1			402
P.003	Safety	**Safe start definition**	**[0] OFF** **[1] ON**	START allowed with RUN temirnal connected at the power on START not allowed with RUN temirnal connected at the power on	1	0	1			403
P.004	Stop mode	**Motor stop control function**	**[0] In ramp** **[1] Ramp to stop**	Decel. ramp up to 0Hz. Ramp to stop	0	0	1			493
P.005	Deflt rot revers	**Invert sense rotation**	**[0] Disable** **[1] Enable**	Disabled function Invert sense rotation	0	0	1			502
Power Supply										
P.020	Mains voltage	**Rated value of the line voltage**	**230** **380** **400** **420** **440** **460** **480**	230V 380V 400V 420V 440V 460V 480V	400	230	480	V		404
P.021	Mains frequency	**Rated value of the line voltage frequency**	**50** **60**	50Hz 60Hz	(****)	(****)	(****)	Hz		405
Motor Data										
P.040	Motor rated curr	**Rated current of the motor**			(*)	(*)	(*)	A	0.1	406
P.041	Motor pole pairs	**Pole Pairs of the motor**			(*)	1	60			407
P.042	Motor power fact	**Motor power factor**			(*)	0.01	1		0.01	408
P.043	Motor stator R	**Stator resistance measure of the motor**			(*)	0	99.99	Ohm	0.01	409
P.044	Motor cooling	**Motor type cooling**	**[0] Natural** **[1] Forced**	Self ventilated Assisted ventilation	1	0	1			410
P.045	Motor thermal K	**Motor thermal constant**			30	1	120	Min		411
P.046	Motor nom slip	**Motor Nominal Slip**		$(n_o-n)/n_o$	(***)	0	25	%	0.1	501
P.047	Motor nom eff	**Efficiency nom Motor**			(***)	50	100	%		504

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
V / F Curve										
P.060	V/f shape	**V/F Curve Type**	**[0] Custom** **[1] Linear** **[2] Quadratic**	V/F curve defined by the user Linear characteristic Quadratic characteristic	1	0	2			412
P.061	Max out voltage	**Maximum output voltage**			(**)	50	(**)	V	1	413
P.062	Base frequency	**Base frequency**			(**)	25	1000	Hz	0.1	414
P.063	V/f interm volt	**V/F intermediate voltage**			(*)	0	P.061	V		415
P.064	V/f interm freq	**V/F intermediate frequency**			25	10	P.062	Hz	0.1	416
Output. Freq. Limit										
P.080	Max output freq	**Maximum output frequency**			110	1	110	%	1	417
P.081	Min output	**Minimum output frequenc**			0.0	0.0	25.0	% of F.020	0.1	418
Slip Compensator										
P.100	Slip compensat	**Slip compensation**			0	0	250	%		419
P.101	Slip comp filter	**Time constant of slip compensation**			0.1	0	10	Sec	0.1	420
Boost										
P.120	Manual boost [%]	**Torque boost level**			2	0	25	% of P.061	0.1	421
P.121	Boost factor src	**Boost level source**	**[0] Null** **[1] Analog inp 1** **[2] Analog inp 2** **[3] Analog inp 3**	Null Analog input 1 Analog input 2 Analog input 3	0	0	3			422
P.122	Auto boost en	**Automatic boost enabling**	**[0] Disable** **[1] Enable**		0	0	1			423
Automatic Flux Regulation										
P.140	Magn curr gain	**Magnetizing current regulator gain**			0	0	100	%	0.1	424
Anti Oscillation function										
P.160	Osc damping gain	**Damping gain**			0	0	100			425
SW Current Clamp										
P.180	SW clamp enable	**Current clamp enable**	**[0] Disable** **[1] Enable**		1	0	1			426
Current Limit										
P.200	En lim in ramp	**Enable current limitation during ramp**	**[0] None** **[1] PI Limiter** **[2] Ramp freeze**		2	0	2			427
P.201	Curr lim in ramp	**Current limit in ramp**			170	20	180	% I nom		428
P.202	En lim in steady	**Enable current limitation in steady state**	**[0] Disable** **[1] Enable**		1	0	1			429
P.203	Curr lim steady	**Current limit at constant speed**			170	20	180	% of I nom		430
P.204	Curr ctrl P-gain	**Current limiter proportional gain**			10.0	0.1	100	%	0.1	431

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
P.205	Curr ctrl I-gain	**Current limiter integral gain**			30.0	0.0	100	%	0.1	432
P.206	Curr ctr feedfwd	**Current limiter feed-forward**			0	0	250	%		433
P.207	Curr li mdec ram	**Current limit during decelaration ramp**			170	20	180	% of Inom		494
DC Link Limit										
P.220	En DC link ctrl	**Stall prevention during dec. for overvoltage**	**[0] None** **[1] PI Limiter** **[2] Ramp freeze**		2	0	2			434
P.221	DC-link ctr Pgain	**DC link voltage limiter proportional gain**			3.0	0.1	100	%	0.1	435
P.222	DC-ink ctr Igain	**DC link voltage limiter integral gain**			10.0	0.0	100	%	0.1	436
P.223	DC-link ctr FF	**DC link voltage limiter feedforward**			0	0	250	%	1	437
Over Torque Alarm Config										
P.240	OverTorque mode	**Overtorque mode**	[0] No Alm,Chk on [1] No Alm,Chk ss [2] Alm always (no autorest) [3] Alm steady st (no autorest) [4] Alm always [5] Alm steady st	0: Overtorque detection always active and Overtorque alarm disabled. 1: Overtorque detection in steady state and Overtorque alarm disabled. 2: Overtorque detection always active and Overtorque alarm enabled. 3: Overtorque detection in steady state and Overtorque alarm enabled. 4: Overtorque detection always active and Overtorque alarm enabled. 5: Overtorque detection in steady state and Overtorque alarm enabled.	0	0	5			438
P.241	OT curr li mthr	**Current limit for overtorque**			110	20	200	%		439
P.242	OT level fac src	**Overtorque level factor source**	**[0] Null** **[1] Analog inp 1** **[2]** **[3]**	Null Analog input 1 Not used Not used	0	0	3			440
P.243	OT signal deley	**Delay time for overtorque signaling**			0.1	0.1	25	Sec	0.1	441
Motor Overload Configuration										
P.260	Motor OL prot er	**Enabling of motor overload protection**	**[0] Disable** **[1] Enable**		1	0	1		0.1	444
Brake Unit										
P.280	Brake res OL en	**Enabling of braking resistor overload protection**	**[0] Disable** **[1] Enable**		0	0	1			445
P.281	Brake res value	**Ohmic value of braking resistor**			75	1	250	Ohm		446
P.282	Brake res Power	**Braking resistor power**			(*)	0.01	25	KW	0.01	447

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
P.283	Br res Thermal K	**Braking resistor thermal constant**			(*)	1	250	sec		448
DC Brake Config										
P.300	DC braking level	**DC braking level**			0	0	100	% of Inom		449
P.301	DCB lev fac src	**DC braking level factor Source**	**[0]Null** **[1] Analog inp 1** **[2] Analog inp 2** **[3] Analog inp 3**	Null Analog input 1 Analog input 2 Analog input 3	0	0	3			450
P.302	DC braking freq	**Frequency for DC braking Enabling**			0	0	1000	Hz	0.1	451
P.303	DC braking start	**DC braking time at start**			0	0	60	Sec	0.1	452
P.304	DC braking stop	**DC braking time at stop**			0	0	60	Sec	0.1	453
Mechanical Brake Configuration Command										
P.310	Mec braking delay start	**delay time inactivate brake at start**			0	0	2.5	Sec	0.01	498
P.311	Mec braking delay stop	**delay time inactivate brake at stop**			0	0	2.5	Sec	0.01	499
Autocapture function										
P.320	Autocapture mode	**Flying restart mode**	**[0] Disable** **[1] 1st run only** **[2] Always**	Null Flying restar at power on Flying restart at run command	0	0	2			454
P.321	Autocapture Ilim	**Catch on flight current limit**			120	20	180	% of Inom		456
P.322	Demagnetiz time	**Demagnetization minimum time**			(*)	0.01	10	Sec	0.01	457
P.323	Autocap f scan t	**Frequency scanning time during Pick Up**			1	0.1	25	Sec	0.1	458
P.324	Autocap V scan t	**Voltage scanning time during Pick Up**			0.2	0.1	25	V	0.1	459
P.325	Autocap spd src	**Source of the reference for Pick Up function**	**[0] Frequency ref** **[1] Max freq ref** **[2] Last freq ref** **[3] Encoder**	From active frequency reference From the Max fre ref parameter From freq. set desired From encoder	0	0	3			460
Undervoltage Config										
P.340	Undervoltage thr	**Undervoltage threshold**			40	0	80	% of P.061		462
P.341	Max pwrloss time	**Restart time from Undervoltage**			0	0	25	Sec	0.1	463
P.342	UV alarm storage	**Enabling of undervoltage alarm storage**	**[0] Disable** **[1] Enable**		1	0	1			464
P.343	UV Trip mode	**Undervoltage tripping mode**	**[0] Disable** **[1]CoastThrough** **[2] Emg stop**	Function disabled Coast Through mode Emergency stop mode	0	0	2			491
Overvoltage Config										
P.360	OV prevention	**Automatic PickUp enabling after Overvoltage**	**[0] Disable** **[1] Enable**		0	0	1			465
Autoreset Config										
P.380	Autoreset attmps	**Number of autoreset attempts**			0	0	255			466

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
P.381	Autoreset clear	En. automatic reset of autorestart attempts			10	0	250	Min		467
P.382	Autoreset delay	Autoreset time delay			5	0.1	50	Sec	0.1	468
P.383	Autores flt rly	Alarm relay contacts behaviour during autoreset	[0] OFF [1] ON	inactive active	1	0	1			469
External Fault Config										
P.400	Ext fault mode	External fault mode	[0] Alm alw, No AR [1] Alm run, No AR [2] Alm alw, AR [3] Alm run, AR	- Drive in alarm Alarm always active Alarm autoreset is not possible. - Drive in alarm Alarm active only with running motor. Alarm autoreset is not possible. - Drive in alarm Alarm always active Alarm autoreset is possible. - Drive in alarm Alarm active only with running motor Alarm autoreset is possible.	0	0	3			470
Enabling Sensor 'Phase Loss'										
P.410	Ph Loss detec en	Phase Loss detection enabling	[0] Disable [1] Enable		1	0	1			492
Voltage Reductuction Config										
P.420	Volt reduc mode	Voltage reduction mode	[0] Always [1] Steady state	Always Costant speed only	0	0	1			471
P.421	V reduction fact	Output voltage reduction factor			100	10	100	Sec	1	458
P.422	V fact mult src	Source of voltage reduction factor multiplier	[0] Null [1] Analog inp1 [2] [3]	Null Analog input 1 Analog input 2 Analog input 3	0	0	3			473
Frequency Threshold										
P.440	Frequency thr 1	Frequency 1 level detection			0	0	50	Hz	0.1	474
P.441	Freq prog 1 hyst	Hysteresis amplitude related to P-420			0.5	0	50	Hz	0.1	475
P.442	Frequency thr 2	Frequency 2 level detection			0	0	50	Hz	0.1	476
P.443	Freq prog 2 hyst	Hysteresis amplitude related to P-422			0.5	0	50	Hz	0.1	477
Steady State Signalling										
P.460	Const speed tol	Tolerance at constant speed			0.5	0	25	Hz	0.1	478
P.461	Const speed dly	Ramp end signalling delay			0.1	0	25	Sec	0.1	479
Heatsink Temperature Threshold										
P.480	Heatsnk temp lev	Heatsink temperature signalling level			70	10	110	°C		480
P.481	Heatsnk temp hys	Hysteresis band related to P.480			5	0	10	%		481

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
PWM Settings										
P.500	Switching freq	Modulation frequency	**[0] 1kHz [1] 2kHz [2] 3kHz [3] 4kHz [4] 6kHz [5] 8kHz [6] 10kHz [7] 12kHz [8] 14kHz [9] 16kHz [10] 18kHz**		(*)	0	10			482
P.501	Sw freq reducen	**Enabling of switching frequency reduction under 5Hz**	**[0] Disable [1] Enable**		0	0	1			483
P.502	Min sw freq	**Minimum frequncy modulation**			1	0	P500			495
P.503	Flat sw enable	**Enabling modulation flat**	**[0] Disable [1] Enable**	Sinusoidal flat modulation	1	0	1			503
P.520	Overmod max lev	**Overmodulation level**			0	0	100	%		484
P.540	Out Vlt auto adj	**Automatic adjustment of output voltage**	**[0] Disable [1] Enable**		1	0	1			485
Dead Time Compensation										
P.560	Deadtime cmp lev	**Dead times compensation limit**			(*)	0	255			486
P.561	Deadtime cmp slp	**Dead times compensation slope**			(*)	0	255			487
Display Settings										
P.580	Startup dsplay	**Display IPA at start up**			1	1	1999		1	488
P.600	Speed dsplay fact	**Mantissa Constant conversion**	K= P600x10^(P601)	Used to display d.007-8-9 and F.001 computation	1	0.01	99.99		0.01	489
P.601	Speed dsplay exp	**Exponent Of Constant conversion**	K= P600x10^(P601)	Used to display d.007-8-9 and F.001 computation	0	-4	1			496
P.602	Speed unit selec	**Selector Krpm and K time d.007-d.008-d.009- F.001_**	**[0] Hz [1] Hz * K [2] RPM [3] RPM * K**	display Hz K defined by P.600-P.601 display RPM ($Hz*K_{rpm}$) K defined by P.600-P.601	3	0	3			497
Protection										
P.998	Menu enable mask									500
P.999	Param prot code	**Parameters protection code**		0: All parameters are not protected 1: Parameters F.100.F.116 are not protected; protected the others. 2: All parameters are protected. 3: All parameters are not protected; storage allowed while motor running. NOT RECOMMENDED.	0	0	3			490

7.1.6 Menu A - APPLICATION

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
PID Settings										
A.000	PID mode	**PID mode**	**[0] Disable** **[1] Freq sum** **[2] Freq direct** **[3] Volt sum** **[4] Volt direct** **[5] Stand alone** **[6] St-AI always**	Null PID out in sum with ramp out ref (Feed forward) PID out not in sum with ramp out ref (no Feed forward) PID out not in sum with voltage ref (no Feed forward) PID out not in sum with voltage ref (no Feed forward) PID function as generic control (only with drive in RUN) PID function as generic control (any drive status)	0	0	6			1200
A.001	PID ref sel	**PID reference selector**	**[0] Null** **[1] Analog Inp 1** **[2] Analog Inp 2** **[3] Analog Inp 3** **[4] Frequency ref** **[5] Ramp output** **[6] Digital ref** **[7] Encoder Freq**	Null Analog input 1 Analog input 2 Analog input 3 Frequency reference Ramp output Internal reference Encoder frequency	0	0	7			1201
A.002	PID fbk sel	**PID feedback selector**	**[0] Null** **[1] Analog Inp 1** **[2] Analog Inp 2** **[3] Analog Inp 3** **[4] Encoder Freq** **[5] Output curr** **[6] Output torque** **[7] Output power**	Null Analog input 1 Analog input 2 Analog input 3 Encoder frequency Output peak current Output torque Output power	0	0	7			1202
A.003	PID digital ref	**PID digital reference**			0	-100	100	%	0.1	1203
A.004	PID activat mode	**PID active in steady state only**	**[0] Always** **[1] Steady state**		0	0	1			1204
A.005	PID-Encodersync	**Enabling of encoder / PID synchronism**	**[0] Disable** **[1] Enable**		0	0	1			1205
A.006	PID err sign rev	**Error sign reversal**	**[0] Disable** **[1] Enable**		0	0	1			1206
A.007	PID Integ init en	**Integral term initialization at start**	**[0] Disable** **[1] Enable**		0	0	1			1207
A.008	PID update time	**PID updating time**			0	0	2.5	Sec	0.01	1208
PID Gains										
A.050	PID PRop gain 1	**Proportional term gain 1**			0	0	99.99		0.01	1209
A.051	PID int tconst 1	**Integral action time 1**			99.99	0	99.99		0.01	1210
A.052	PID Deriv gain 1	**Derivative action time 1**			0	0	99.99		0.01	1211
A.053	PID Prop gain 2	**Proportional term gain 2**			0	0	99.99		0.01	1212
A.054	PID int tconst 2	**Integral action time 2**			99.99	0	99.99		0.01	1213
A.055	PID Deriv gain 2	**Derivative action time 2**			0	0	99.99		0.01	1214

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
PID Limits										
A.056	PID high limit	**PID output upper limit**			100	0	100	%	0.1	1215
A.057	PID low limit	**PID output lower limit**			-100	-100	0	%	0.1	1216
A.058	PID max pos err	**PID max. positive error**			5	0.1	100	%	0.1	1217
A.059	PID min neg err	**PID max. negative error**			5	0.1	100	%	0.1	1218

7.1.7 Menu C - COMMAND

CODE	NAME	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	UNIT	VARIATION	IPA
Basic										
C.000	Save parameters	**Save parameters command**	**Off 0 (#)** **Do 1 (#)**	No action. Save parameters command.	Off 0 (#)	Off 0 (#)	Do 1 (#)			800
C.001	Recall param	**Recall of the previous stored parameters**	**Off** **Do**	No action. Recall previously parameters set.	Off	Off	Do			801
C.002	Load default	**Recall of the factory parameters**	**Off** **Do**	No action. Load default parameters	Off	Off	Do			802
Alarm Reset										
C.020	Alarm clear	**Completer reset of the the Alarm List register**	**Off** **Do**	No action. Clear alarm register command.	Off	Off	Do			803
External Key										
C.040	Recall Key prog	**Recalling and storage of the parameters in the external key**	**Off** **Do**	No action. Recall parameter from key.	Off	Off	Do			804
C.041	Save pars to key	**Storage of the inverter parameter on the external key**	**Off** **Do**	No action. Storage parameters to key.	Off	Off	Do			805
Tuning										
C.100	Measure stator R	**Motor Autotune command**	**Off** **Do**	No action. Autotune command.	Off	Off	Do			806
C.101	Measure dead time	**Autotunig command dead time**	**Off** **Do**	No action. Disabled command	Off	Off	Do			807

(#) Command by serial line, valid for all Functions C.XXX

7.1.8 Menu H - HIDDEN

NOTE!

This menu is not available on the keypad. The setting and the reading of the parameters here contained, can be performed exclusively via serial line or through SBI card.

CODE	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	IPA (ALIAS)
Virtual I/Os Commands							
H.000	Virtual digital command			0	0	255	1000
H.001	Exp virtual digital command			0	0	255	1001
H.010	Virtual digital state			0	0	255	1002
H.011	Exp Virtual digital state			0	0	255	1003
H.020	Virtual An Output 1			0	-32768	32767	1004
H.021	Virtual An Output 2			0	-32768	32767	1005
H.022	Exp Virtual An Output 1			0	-32768	32767	1006
Profidrive Profile							
H.030	Profidrive Control word (see Profibus instruction manual)			0	0	65535	1007
H.031	Profidrive Status word (see Profibus instruction manual)			0	0	65535	1008
H.032	Profidrive reference (see Profibus instruction manual)			0	-16384	16384	1040
H.033	Profidrive actual reference (see Profibus instruction manual)			1	-16384	16384	1041
Drive Status							
H.034	Drive status			0	0	65535	1042
H.040	Progress			0	0	100	1009
Parameters Reading Extension							
H.050	Drive output frequency 16 bit low (d.000)	Al posto di P.600	Non ci dovrebbe essere P.600*10^P.6001?	0	-2^{31}	$2^{31}-1$	1010
H.051	Drive output frequency 16 bit high (d.000)	??????	???????	0	-2^{31}	$2^{31}-1$	1011
H.052	Drive reference frequency 16 low (d.001)			0	-2^{31}	$2^{31}-1$	1012
H.053	Drive reference frequency 16 high (d.001)			0	-2^{31}	$2^{31}-1$	1013
H.054	Output speed (d.000)*(P.600) 16 bit low (d.007)			0	-2^{31}	$2^{31}-1$	1014
H.055	Output speed (d.000)*(P600) 16 bit high (d.007)			0	-2^{31}	$2^{31}-1$	1015
H.056	Speed Ref (d.001)*(P.600) 16 bit low (d.008)			0	-2^{31}	$2^{31}-1$	1016
H.057	Speed Ref (d.001)*(P.600) 16 bit high (d.008)			0	-2^{31}	$2^{31}-1$	1017
H.058	Encoder freq 16 bit low (d.301)			0	-2^{31}	$2^{31}-1$	1018
H.059	Encoder freq 16 bit high (d.301)			0	-2^{31}	$2^{31}-1$	1019

CODE	DESCRIPTION	[CODE] FUNCTION	DESCRIPTION	DEFAULT	MIN	MAX	IPA (ALIAS)
H.060	Encoder speed (d.000)*(P.600) 16 bit low (d.302)			0	-2^{31}	$2^{31}-1$	1044
H.061	Encoder speed (d.000)*(P.600) 16 bit high (d.302)			0	-2^{31}	$2^{31}-1$	1045
H.062	Active alarm s low						1060
H.063	Active alarm s high						1061
H.064	Velocità reale stimata 16 bit low			0	-2^{31}	$2^{31}-1$	1046
H.065	Velocità reale stimata 16 bit high						1047
	Remote I/Os Control						
H.100	Remote Digital inputs (0..15)			0	0	65535	1021
H.101	Remote Digital inputs (16..32)			0	0	65535	1022
H.110	Remote Digital outputs (0..15)			0	0	65535	1023
H.111	Remote Digital outputs (16..32)			0	0	65535	1024
H.120	Remote Analog inputs 1			0	-32768	32767	1025
H.121	Remote Analog inputs 2			0	-32768	32767	1026
H.130	Remote Analog outputs 1			0	-32768	32767	1027
H.131	Remote Analog outputs 2			0	-32768	32767	1028
	Serial Link Commands						
H.500	Reset hardware			0	0	1	1029
H.501	Alarm Reset			0	0	1	1030
H.502	Inertial stop			0	0	1	1031
H.503	Ramp stop			0	0	1	1032
H.504	Start clockwise			0	0	1	1033
H.505	Start counterclockwise			0	0	1	1034
H.506	JOG clockwise			0	0	1	1035
H.507	JOG counterclockwise			0	0	1	1036
H.508	Flying Autocapture motor clockwise			0	0	1	1037
H.509	Flying Autocapture motor counterclockwise			0	0	1	1038
H.510	DC Brake(Direct current)			0	0	1	1039
H.511	Reserved						1043
	Standard Profibus Commands						
H.918	Profidrive 918		Station address	3	0	126	918
H.947	Profidrive 947		Fault number				947
H.967	Profidrive 967		Last control word		0	255	967
H.968	Profidrive 968		Last status word		0	255	968

7.2. FUNCTION PARAMETER DESCRIPTIONS

The functions described in the present chapter are managed from software STMDRIVE in co-ordinate way and homogenous for the entire product line it assigns to the induction motors.
The particularitities of each family (A, R, V, T) involve the fact that in some models is not present all the described I/O below described.
Chapter 7.2 is common for all STM DRIVE inverter while in order to verify the technical characteristics of I/O of the drive in use it sends back to paragraph 3.3.5 "Part of Regulation and Control" and to understood it "the 7.1 LISTS PARAMETERS" that contain all and the parameters of the specific family.

The functions marked from the symbol [**] are not available in all the models.

7.2.1 Menu d – DISPLAY

Basic	d-DISPLAY

d.000 Output frequency

Drive output frequency [Hz].

d.001 Frequency ref

Drive frequency reference [Hz].

d.002 Output current

Drive output current (rms) [A].

d.003 Output voltage

Drive output voltage [Vrms].

d.004 DC link voltage (DC-Bus Voltage)

DC Bus drive voltage (DC-Bus) [Vdc].

d.005 Power factor (Power factor)

Cos φ motor

d.006 Power (Power)

Electric real power from drive [kW]

d.007 Output speed (Output speed)

Output speed drive (d.000)* K_{rpm}*K

See parameters P.600, P.601 and P.602 to use display cofficients K_{rpm} e K_

d.008 Speed ref (speed reference)

speed reference drive (d.001)*K_{rpm}*K

See parameters P.600, P.601 and P.602 to use display cofficients K_{rpm} e K_

d.009 Estimate Speed (Estimated speed)

Estimated speed shaft motor (d.000)* K_{rpm}*K *(1-S) with S=f(So,Iout,...).

Analog to d.007, but use slip speed lossed when load increase.

For a correct estimation need set following parameters : P.040, P.041, P.042, P.046, P.062.

Estimation slip is not available for inverter without current sensors (then d.009 is equal to d.0007)

Sovraccarico

d.050 Heatsink temp (heatsink Temperature)

heatsink Temperature drive [°C] (measured by linear sensor)

d.051 Drive OL (drive overload)

drive overload (100% = alarm threshold)

d.052 Motor OL (Overload motor)

Overload motor (100% = alarm threshold)

d.053 Brake res OL (Overload brake resistor)

Overload brake resistor (100% = alarm threshold)

d.054 Reg boar temp (regulation board Temperature)

regulation board Temperature (°C) linear sensor measured.

Input/Output

d.100 Dig inp status (Digital inputs status)

Status of the digital inputs acquired by the drive. They can come from drive regulation board terminal inputs or

virtual inputs (ex.: by serial or field bus cards).

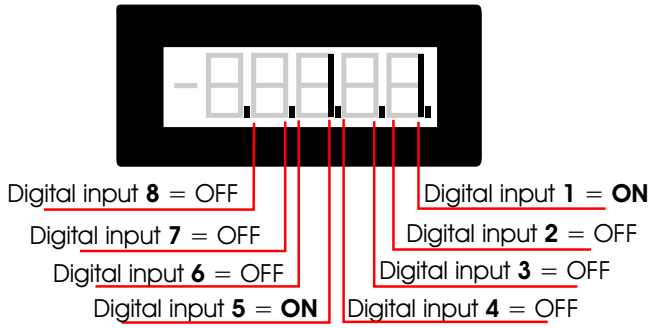


Figura 7.2-1.1

d.101 Term inp status (Teminal inputs status)
Status of the digital inputs terminal of the drive regulation board.

See example d.100, fig 7.2-1

d.102 Vir dig inp stat (Virtual digital inputs status)
Status of the virtual digital inputs received by serial link or field bus card.
See example d.100, fig 7.2-1

d.120 Exp dig inp stat (Digital inputs status option board)

Teminal inputs status aquired from option board . Inputs can be aquired from option board or virtual input (example : serial line or field bus).

See example d.100, fig 7.2-1

d.121 Exp term inp (Digital inputs status terminal option board)

Digital inputs status terminal option board.

See example d.100, fig 7.2-1

d.122 Vir exp dig inp (Digital virtual inputs status option board)

Digital virtual inputs status option board receveid from serial line drive or field bus

See example d.100, fig 7.2-1

d.150 Dig out status (Digital outputs status)

Status of the digital outputs executed by the drive, on the drive regulation terminal outputs or virtual outputs (ex.:by serial or field bus cards).

Example of displaying, of digital outputs with 7 segments display:

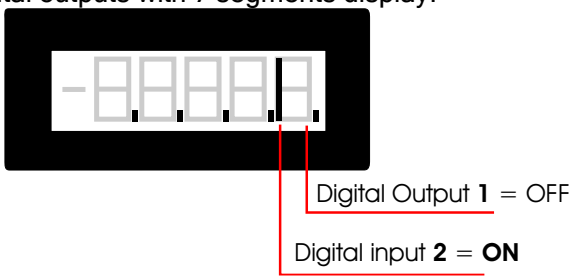


Figura 7.2-2.

d.151 Term dig out sta (Terminal digital outputs status)

Status of the digital outputs terminal of the drive regulation board.

See ex. d.150, fig 7.2-2

d.152 Vir dig out stat (Virtual digital outputs status)

Status of the virtual digital outputs executed by the drive serial link or field bus card.

See example d.150, fig 7.2-2

d.170 Exp dig out stat (Expansion board digital outputs status)
Status of the expansion digital outputs executed by the drive, on the expansion terminal outputs or virtual outputs (example: by serial or field bus cards).

d.171 Exp term out sta (Expansion board terminal outputs status)
Status of the expansion digital outputs terminal.

d.172 Exp vir dig out (digital outputs status virtual option board)

Status of the expansion virtual digital outputs, executed via serial link or field bus card.

d.200 An in 1 cnf mon (Analog input 1 configuration monitor)

It monitors the analog input 1 signal destination; it is possible to know which function is associated to this input:

[0] Null funct None function setted

[1] Freq ref 1 Frequency reference 1chapter FREQ & RAMPS, section Reference sources (F.050)

[2] Freq ref 2 Freq ref 2 Frequency reference 2 chapter FREQ & RAMPS, section Reference sources (F.051)

[3] Boost lev fac Boost lev fac Level of voltage boost chapter PARAMETERS, section Boost (P.121)

[4] OT level fact OT level fact Level of over torque chapter PARAMETERS, section OT level factor src (P.242)

[5] V red lev fac V red lev fac Output voltage reduction level chapter PARAMETERS, section Voltage Red Config P.422)

[6] DCB level fac DCB level fac DC braking current level chapter PARAMETERS, section DC brake Config (P.301)

[7] Ramp ext fact Ramp ext fact Ramp extension factor chapter PARAMETERS, section Ramp Config (F.260)

d.201 An in 1 monitor (Analog input 1 monitor)

Analog input 1 terminals monitor - output block (% value).

d.202 An in 1 term mon (Analog input 1 terminals monitor)

Analog input 1 input block % value (regulation board).

It monitors the input signal depending on the selection of An inp 1 Type (I.200) parameter:

- selection: [0] +/- 10V: 0V = 0%, -10V = -100%, +10V = +100%
- selection: [1] 0-10V/0-20mA: 0V = 0%, +10V = +100% or 0mA = 0%, 20mA = +100%
- selection: [2] 4-20mA: 4mA = 0%, 20mA = +100%

d.210 An in 2 cnf mon (Analog input 2 configuration monitor)

It monitors the analog input 1 signal destination; it is possible to know which function is associated to this input(see list parameter d.200):

d.211 An in 2 monitor (Analog input 2 monitor - output block)

display % of output signal value , for block of Analog input 2.

d.212 An in 2 term mon (Analog input 2 terminals monitor – input block 2)

Analog input 2 input block % value (regulation board).

It monitors the input signal depending on the selection of An inp 2 Type (I.210):

- selection: [0] +/- 10V: 0V = 0%, -10V = -100%, +10V = +100%
- selection: [1] 0-10V/0-20mA: 0V = 0%, +10V = +100%

d.220 An in 3 cnf mon (Analog input 3 configuration monitor)

It monitors the analog input 3 signal destination; it is possible to know which function is associated to this input (see parameter list d.200).

d.221 An in 3 monitor (Analog input 3 monitor - output block)

display % of output signal value , for block of Analog input 3.

d.222 An in 3 term mon (Analog input 3 terminals monitor – input block 3)

Analog input 3 input block % value (Analog input 3 terminals monitor).

It monitors the input signal depending on the selection of An inp 3 Type (I.210):

• selection: [1] 0-10V/0-20mA: 0mA = 0%, 20mA = +100%
• selection: [2] 4-20mA: 4mA = 0%, 20mA = +100%

d.250 Term an out 1 state mon (terminal signal (%) of analog output 1)
display % of analog output 1 signal

d.260 Term an out 2 state mon (terminal signal (%) of analog output 1)
display % of analog output 2 signal

d.270 Term an out 1 state mon (terminal signal (%)of analog output optional 1)
display % of optional analog output 1 signal

Encoder [**]

d.300 EncPulses/Sample (encoder pulse sample)
Number of encoder pulses recorded in a single encoder sampling period (I.504).
d.301 Encoder freq (encoder frequency)
Display encoder frequency (motor frequency) [Hz]

d.302 Encoder speed (encoder speed)
display encoder speed (d.301)*(P.600)
the same arguments of d.007 where substitute d.000 with encoder frequency d.301.

Options [**]

d.350 Option 1 state (option status 1)
It monitors the drive option 1 state; it is possible to know the expansion board type programmed.
d.351 Option 2 state (option status 2)
It monitors the drive option 2 state; it is possible to know the expansion board type programmed.
d.352 Par port state (parallel port status)
It monitors the 16-bit parallel port state (option).
d.353 SBI State SBI status)
Communication state between SBI and Master.

d.354 SBI Baud rate
Communication speed (Baud rate) between SBI and Master

Pid

d.400 PID reference (PID reference)

PID reference signal.

d.401 PID feedback (PID feedback)

PID feedback signal.

d.402 PID error (PID error)

PID error signal.

d.403 PID integr comp (PID integral component)

PID integral component.

d.404 PID output (Uscita PID output)

PID output signal.

Alarm list

d.800 1st alarm-latest (1st alarm-latest)

Last alarm memory stored by the drive alarm list.

d.801 2nd alarm (Second to last alarm)

Second to last alarm memory stored by the drive alarm list.

d.802 3rd alarm (Third to last alarm)

Third to last alarm memory stored by the drive alarm list.

d.803 4th alarm (Fourth to last alarm)

Fourth to last alarm memory stored by the drive alarm list.

Drive identification

d.950 Drive rated curr

Drive rated current (it is dependent on the drive size): IEC146 Class 2 (overload 150%).

d.951 SW version (1/2) (Software version - part 1)
Display example: 03.00

03 = index of software identification

00 = index of software revision (new functions or parameters)

d.952 SW version (2/2) (Versione software - parte 2)
Display example: 00.00

00 = index of revision (fixing bugs)

00 = index of identification (special version)

NOTE!

d.951 e **d.952** are necessari to STM DRIVE staff to identication software inverter.

d.953 Power ident code (Power identification code)

Reserved.

d.954 Param ident code (Parameters identification code)

Reserved.

d.955 Regul ident code (Regulation identification code)

Reserved..

d.956 Startup id code (Startup identification code)

Reserved.

d.957 Drive size (Drive size code)

Reserved.

d.958 Drive cfg type (Drive configuration type)

Utility

d.999 Display Test (Drive display test)

light every segment display to check function

7.2.2 Menu S – START-UP

NOTE!

START UP menu contents a parameter and function group that permit a quickly start up drive and relative motor.

On 'S' menu are putted in evidence and grouped ,paramater more frequently used respect to the other parameters drive .The correspondence between S parameter and equivalent is highlighted black on the last column (chapter Parameter / List Parameter / Menu S) with '**ALIAS**'.

Modification of one of parameter update automatically the twin parameter , but keeping these parameter on **Start-Up** menu make easy installation for a great number of simple applications.

For parameter description see the explanation into relative paragraphs of corresponding parameters, highlighted black on 'ALIAS / IPA' column 'ALIAS / IPA'_

7.2.3 Menu I - INTERFACE

Digital inputs regulation board	I-INTERFACE

I.000 Dig input 1 cfg (Digital input 1 configuration)
I.001 Dig input 2 cfg (Digital input 2 configuration)
I.002 Dig input 3 cfg (Digital input 3 configuration)
I.003 Dig input 4 cfg (Digital input 4 configuration)
I.004 Dig input 5 cfg (Digital input 5 configuration)
I.005 Dig input 6 cfg (Digital input 6 configuration)
I.006 Dig input 7 cfg (Digital input 7 configuration) Not disposable
I.007 Dig input 8 cfg (Digital input 8 configuration) Not disposable

Regulation board supply like standard , 6 opto-coupled digital inputs. A logic level PNP or NPN, can be applied like shoved at paragraph 'typical schematic connections'
Every input is programmable with a specific code and function like listed below.

DIGITAL INPUTS SELECTION LIST:

Code	Name	Description
0	**None**	NOT active
1	**Run**	RUN command for the motor START to enable drive
2	**Reverse**	Speed REVERSE command
3	**Ext Fault NO**	External fault with NO (Normal Open)
4	**Ext Fault NC**	External fault with NC (Norm. Closed)
5	**Alarm reset**	Alarm reset command
6	**Jog**	JOG frequency reference enabling
7	**Freq sel 1**	Binary selection for Multispeed
8	**Freq sel 2**	Binary selection for Multispeed
9	**Freq sel 3**	Binary selection for Multispeed
10	**Freq sel 4**	Binary selection for Multispeed
11	**Ramp sel 1**	Binary selection for Multispeed
12	**Ramp sel 2**	Binary selection for Multispeed
13	**Enable NO**	Drive Enable with NC (Norm. Closed)
14	**Enable NC**	Drive Enable with NO (Normal Open)
15	**DCBrake en**	Enabling of the DC braking function
16	**DCBrake**	Command for execution of DC braking
17	**Autocapture**	Execution of the flying restart

18	**Ramp enable**	Enabling / Disabling of the Ramp block
19	**Zero ref**	Ramp to 0Hz & main commands active
20	**PID enable**	Enabling of the PID regulation
21	**PID freeze**	Enabling PID freeze output signal.
22	**PID gain sel**	Selector PID gain reference
23	**Motorpot Up**	Motorpotentiometer reference increasing
24	**Motorpot Dn**	Motorpotentiometer reference decreasing
25	**Reset Motorp**	Reset of Motorpotentiometer reference
26	**Fast stop**	Emergency stop (without ramp time setted)
27	**Zero freq**	Enabling output freq. to zero.
28	**Stop 3-wire**	Stop command (NC) in 3-wires mode (see P.001=2)

set factory of digital inputs are following:

Dig input 1 cfg (Terminal 1) = **1 Run**
Dig input 2 cfg (Terminal 2) = **2 Reverse**
Dig input 3 cfg (Terminal 3) = **7 Freq sel 1**
Dig input 4 cfg (Terminal 4) = **8 Freq sel 2**
Dig input 5 cfg (Terminal 9) = **9 Freq sel 3**
Dig input 6 cfg (Terminal 8) = **6 Jog**
Dig input 7 cfg (N.D.) = **0 Null**
Dig input 8 cfg (N.D.) = **0 Null**

Digital inputs expansion board

I.050 Exp dig in 1 cfg (Expansion digital input 1 configuration)
I.051 Exp dig in 2 cfg (Expansion digital input 2 configuration)
I.052 Exp dig in 3 cfg (Expansion digital input 3 configuration)
I.053 Exp dig in 4 cfg (Expansion digital input 4 configuration)

Every input is programmable with a specific code and function like described for parameters I.000 and following .

Digital output regulation board

I.100 Dig output 1 cfg (Digital output 1 configuration)
Define function of digital output 1, follow setting function list .

I.101 Dig output 2 cfg (Digital output 2 configuration)
Define function of digital output 2, follow setting function list.
I.102 Dig output 3 cfg (Digital output 3 configuration) e

Define function of digital output 3, follow setting function list.

I.103 Dig output 4 cfg (Digital output 4 configuration 4)

Define function of digital output 4, follow setting function list.

See electric diagram at paragraph 'Tipical schematic Connection' to corresponding digital output described.

DIGITAL OUTPUTS SELECTION LIST:

Code	Name	Description
0	**Drive Ready**	Drive ready to start
1	**Alarm state**	Positive logic for alarm signalling
2	**Not in alarm**	Negative logic for alarm signalling
3	**Motor running**	Direction command active (Fwd or Rev)
4	**Motor stopped**	Direction command not active and frequency = 0Hz
5	**REV rotation**	Anti-clockwise rotation of the motor
6	**Steady state**	Motor is running in steady state
7	**Ramping**	Acceleration or Deceleration Ramp in progress
8	**UV running**	Undervoltage detection during motor running
9	**Out trq>thr**	Output torque higher than the value of P.241
10	**Current lim**	Current limit (during ramp or at steady state)
11	**DC-link lim**	DC Bus limit (during ramp or at steady state
12	**Limit active**	General signalling of drive limit condition
13	**Autocapt run**	Autocapture on progress
14	**BU fault**	Overload of the braking resistor
15	**Neg pwrfact**	Negative condition of the power factor
16	**PID err ><**	PID Error >A.058 & <=A.059
17	**PID err>thr**	PID Error >A.058
18	**PID err<thr**	PID Error <=A.059
19	**PIDer><(inh)** (*)	PID Error >A.058 & <=A.059
20	**PIDerr>(inh)** (*)	PID Error >A.058
21	**PIDerr<(inh)** (*)	PID Error <=A.059
22	**FWD enc rot**	Clockwise rotation of the encoder
23	**REV enc rot**	Anti-clockwise rotation of the encoder
24	**Encoder stop**	Encoder stop rotation
25	**Encoder run**	Encoder rotation general signalling
26	**Extern fault**	Positive logic for Ext. fault alarm signalling
27	**No ext fault**	Negative logic for Ext. fault alarm signalling
28	**Serial TO**	Serial link communication time out
29	**freq=thr1**	Output frequency = to P.440 & P.441

30	**freq≠thr1**	Output frequency ≠ of P.440 & P.441 values
31	**freq>thr1**	Output frequency > than P.440 & P.441
32	**freq<thr1**	Output frequency < than P.440 & P.441
33	**freq=thr2**	Output frequency = to P.442 & P.443
34	**freq≠thr2**	Output frequency ≠ of P.442 & P.443 values
35	**freq>thr2**	Output frequency > than P.442 & P.443
36	**freq<thr2**	Output frequency < than P.442 & P.443
37	**HS temp=thr**	Heatsink temp = to P.480 & P.481 values
38	**HS temp≠thr**	Heatsink temp ≠ of P.480 & P.481 values
39	**HS temp>thr**	Heatsink temp > than P.480 & P.481 values
40	**HS temp<thr**	Heatsink temp < than P.480 & P.481 values
41	**Output freq** (#)	Frequency in synchronism with output frequency
42	**Out freq x 2** (#)	Frequency value x 2 in synchronism with output frequency
43	**OutCoastThru**	Coast Through stopping
44	**OutEmgStop**	Emergency stop
45	**BrakeOff**	Disabling mechanical brake

(*) see section PID Limit.

(#) NOT USE FOR OUT RELE

Digital output optional

I.150 Exp DigOut 1 cfg (Expansion Digital Output 1 configuration)

Reserved.

I.151 Exp DigOut 2 cfg (Expansion Digital Output 1 configuration)

Reserved.

I.152 Exp DigOut 3 cfg (Expansion Digital Output 1 configuration)

Reserved.

Every output of option board is programmable with a specified code and function , like described I.100 and following.

Analog inputs of regulation board

The drawing following , describes block diagram "analog inputs standard" of the drive.

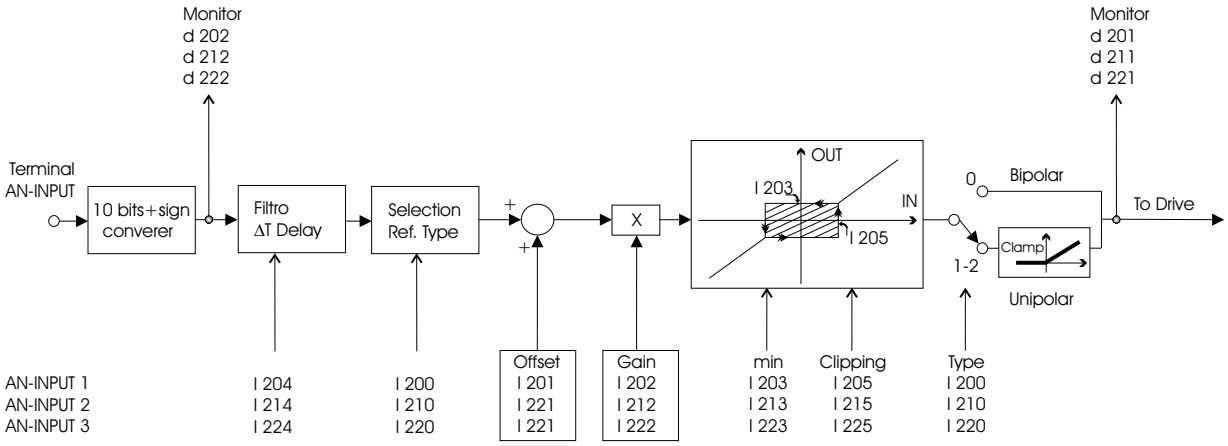


Figura 7.2-3.: Analog Inputs

Regulation board have standard **2** analog inputs.

Resolution analog inputs:

Voltage selection: 10 bits + sign

Current selection: 10 bits

Assignment to an analog input of a specific function , is described on chapter FREQ & RAMPS.

I.200 An In 1 type (Analog Input 1 type)

Setting of the Analog Input 1, in accordance with the type of reference control, available on its HW.

I.200 = 0 Bipolar -10V / +10V

I.200 = 1 Unipolar 0/+10V or 0-20mA

I.200 = 2 4-20mA

NOTE !

Software configuration of analog input must be compatible with hardware configuration of associated jumper, when is provided (see 'typical schematic connections').

I.201 An In 1 offset (Analog Input 1 offset)

Set of Analog Input 1 offset

I.202 An In 1 gain (Analog Input 1 gain)

Gain of the analog input.
It can be used to amplify or reduce the ratio between signal and controlled variable, or also to set different types of control curves via analog reference

Some examples are described in figure .

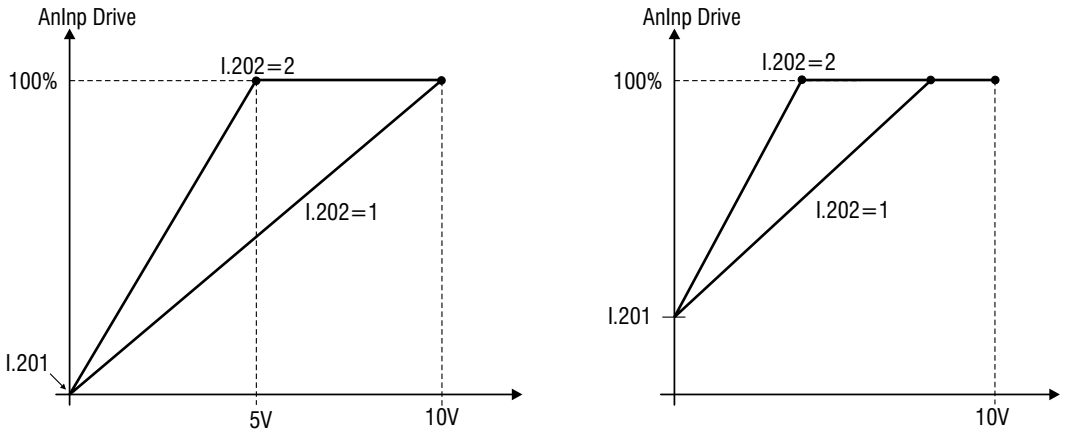


Figura 1.1-4.: analog input scaling 1

I.203 An In 1 minimum (Analog Input 1 minimum value)

It represents the minimum value of the parameter, on which the analog input is programmed
Example: if the analog input 1 is programmed as speed reference, in this case I.203 represents the minimum speed reference.

Each parameters acts on the relative analog input..

I.204 An In 1 filter (Analog Input 1 filter)

It is the response time of the signal reaction to the reference variations.

Each parameters acts on the relative analog input.

The use of the Analog Inputs parameters set, can be useful to customize the analog reference ratio.

I.205 An In 1 Clip (Analog Input 1 clip level)

Minimum value read from control : saturation inferior

I.210 An In 2 type (Analog Input 2 type)

Setting of the Analog Input 2

I.210 = 0 Bipolar -10V / +10V
I.210 = 1 Unipolar +10V or 0-20mA
I.210 = 2 4-20mA

NOTE !

Software configuration of analog input must be compatible with hardware configuration of associated jumper, when is provided (see 'typical schematic connections').

I.211 An In 2 offset (Analog Input 2 offset)

I.212 An In 2 gain (Analog Input 2 gain)

I.213 An In 2 minimum (Analog Input 2 minimum value)

I.214 An In 2 filter (Analog Input 2 filter)

It is the response time of the signal reaction to the reference variations.

I.215 An In 2 Clip (Analog Input 2 clip level)

Minimum value read from control : saturation inferior

I.220 An In 3 type (Analog Input 3 type)

Setting of the Analog Input 3

I.200 = 1 Unipolar 0/+10V or 0-20mA
I.200 = 2 4-20mA

I.221 An In 3 offset (Analog Input 3 offset 3)

I.222 An In 3 gain (Analog Input 3 gain)

I.223 An In 3 minimum (Analog Input 3 minimum value)

I.224 An In 3 filter (Analog Input 3 filter)

It is the response time of the signal reaction to the reference variations

I.225 An In 3 Clip (Analog Input 3 clip level)

Minimum value read from control : saturation inferior

Analog outputs regulation board

Drawn below , descrive diagram block of "standard analog output" drive.

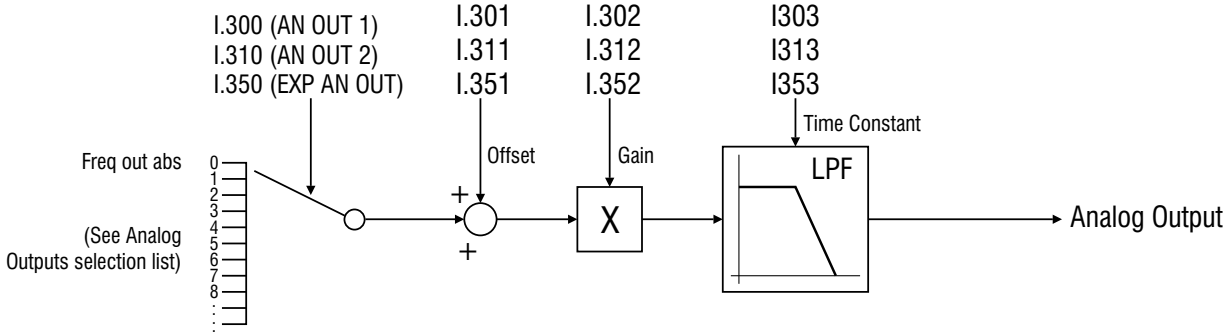


Figura 1.1-5.: analog outputs

Regulation board have 2 analog output.

Resolution analog output: 10 bits

Both analog output , are unipolar signal 0V / +10Vdc (if programmed like ‘absolute’ or ‘positive’ value) or bipolar +/-10Vdc (if programmed like "generic signalling"), in function of assigned parameter .

I.300 Analog out 1 cfg (analog output 1 configuration)

Every output is programmable with a specific code and function, as shown in the list below.

ANALOG OUTPUTS SELECTION LIST:

Code	LCD display	Description
0	Freq out abs	output frequency absolute (absolute value)
1	Freq out	output frequency
2	Output curr	output current
3	Out voltage	output voltage
4	Out trq (pos)	output torque (positive value)
5	Out trq (abs)	output torque (absolute value)
6	Out trq	output torque
7	Out pwr (pos)	output power (positive value)
8	Out pwr (abs)	output power (absolute value)
9	Out pwr	output power
10	Out PF	output Power Factor
11	Enc freq abs	encoder frequency (absolute value)
12	Encoder freq	encoder frequency
13	Freq ref abs	Frequency reference drive (absolute value)
14	Freq ref	Frequency reference drive
15	Load current	load current
16	Magn current	magnetizing motor Current
17	PID output	PID regulator output
18	DClink volt	DC bus capacitors level
19	U current	Output phase U current signal
20	V current	Output phase V current signal
21	W current	Output phase W current signal
22	Freq ref fac	multiplying factor time reference frequency for slave drive

I.301 An out 1 offset (Analog output 1 offset)

Setting value with parameter can be used for compensation an offset coming from external device connected to the output.

This parameter can be used also for definition set-point display variable , with a full scale value

customized.

I.302 An out 1 gain (Analog output 1 gain)

Gain of the analog output.

It can be used to amplify or reduce the variable full scale value, as showed in figure 7.4.6.

I.303 An out 1 filter (Analog output 1 filter)

It is the response time of signal reaction for the variable to be displayed.

I.304 An out 1 type (Analog output 1 type signal)

setting :

I.304 = 0 Unipolar 0 / +10V

I.304 = 1 Bipolar -10V / +10V

NOTE !

Software configuration of analog output must be compatible with Jumper J3 Hardware configuration .

Following are some examples of output signal setting:

NOTE !

Examples showing programmations of analog output 1, but both output are programmable in the same manner.

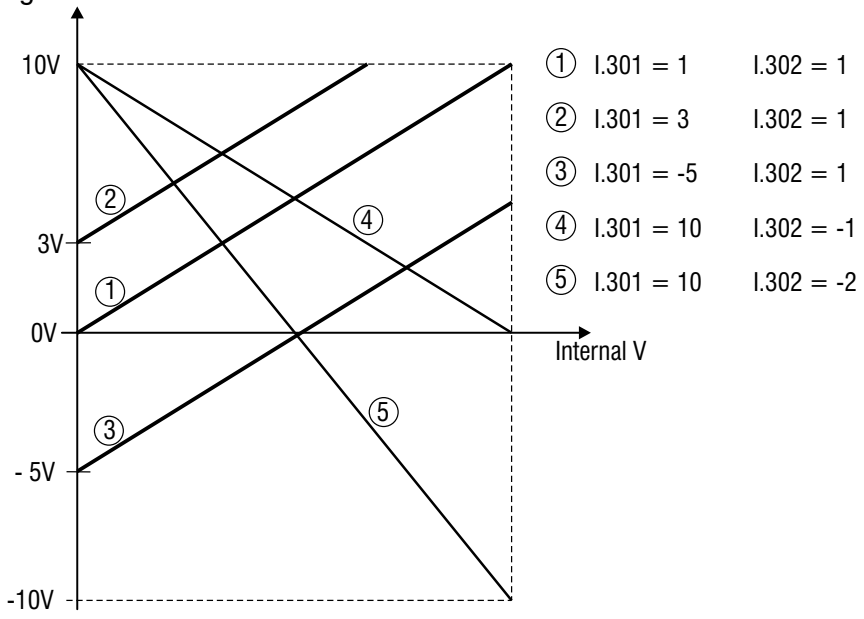


Figure 1.1-6.: reference and minimum value scaling

On the table below are reported the value corresponding at full scale relative to unite measure used.

Code	Variable	Full value (+/-10V)
0	Freq out abs	F.020 x P.080/100 [Hz] (Maximum output frequency)
1	Freq out	as for CODE 0
2	Output curr	2 x D.950 [Arms] (2 x nominal current drive)
3	Out voltage	P.061 [Vrms] (Maximum output voltage)
4	Out trq (pos)	2 x nominal torque motor[Nm]
5	Out trq (abs)	as for CODE 4
6	Out trq	as for CODE 4
7	Out pwr (pos)	2 x nominal power motor [W]
8	Out pwr (abs)	2 x nominal power motor [W]
9	Out pwr	2 x nominal power motor [W]
10	Out PF	Power factor = 1
11	Enc freq abs	F.020 x P.080/100 [Hz] (Maximum output frequency)
12	Encoder freq	F.020 x P.080/100 [Hz] (Maximum output frequency)
13	Freq ref abs	F.020 x P.080/100 [Hz] (Maximum output frequency)
14	Freq ref	F.020 x P.080/100 [Hz] (Maximum output frequency)
15	Load current	as for CODE 17
16	Magn current	as for CODE 17
17	PID output	100% output PID signal
18	DClink volt	voltage DC BUS
19	U current	as for CODE 17
20	V current	as for CODE 17
21	W current	as for CODE 17

Analog output 2 have the same parameter description corrispondig to analog output 1

I.310 Analog out 2 cfg (analog output 2 configuration) *HW NOT AVAILABLE*

I.311 An out 2 offset (Analog output 2 offset)

I.312 An out 2 gain (Analog output 1 gain)

I.313 An out 2 filter (Analog output 2 filter)

Analog output expansion board

I.350 Exp an out 1 cfg (Expansion analog output 1 configuration)

I.351 Exp AnOut 1 offs (Expansion Analog output 1 offset)

I.352 Exp AnOut 1 gain (Expansion Analog output 1 gain)

I.353 Exp AnOut 1 filt (Expansion Analog output 1 filter)

Analog output of expansion board (option) is programmable with a specific code and function: have the same parameter description corresponding to analog output 1

Virtual I/O Enabling

Through a "virtual setting" via serial line or fieldbus, it is possible to use all the functions available on the digital inputs
and perform a direct control of the digital and analog outputs.
The setting can be carried out in such configurations, where the digital commands are a mix of "virtual" and terminals
and the outputs are a mix of "virtual" and drive function.
The virtual assignment can be performed through the parameters H.000...H.022 in the HIDDEN menu (for further
information please see this chapter).
Below are the reported the drawings describing the combination between the byte of the virtual I/Os and the drive
terminals, with the relative decoder mask.
The switch between the "virtual" commands and the terminal ones and between the "virtual" output or the drive
functions, is determined by programmable mask I.400...I.450.
These parameters have to be managed bitwise. At each bit corresponds a switch, as follows.

Bit value	Inputs	Outputs
0	terminal signal	Drive function
1	Virtual Input	Virtual Control

Following formula describe the result of I/O virtual setting:

[Input/Output AND (NOT Mask)] OR [Virtual AND Mask]

TECNICHAL DATA CONFIGURATION INPUT DIGITAL VIRTUAL

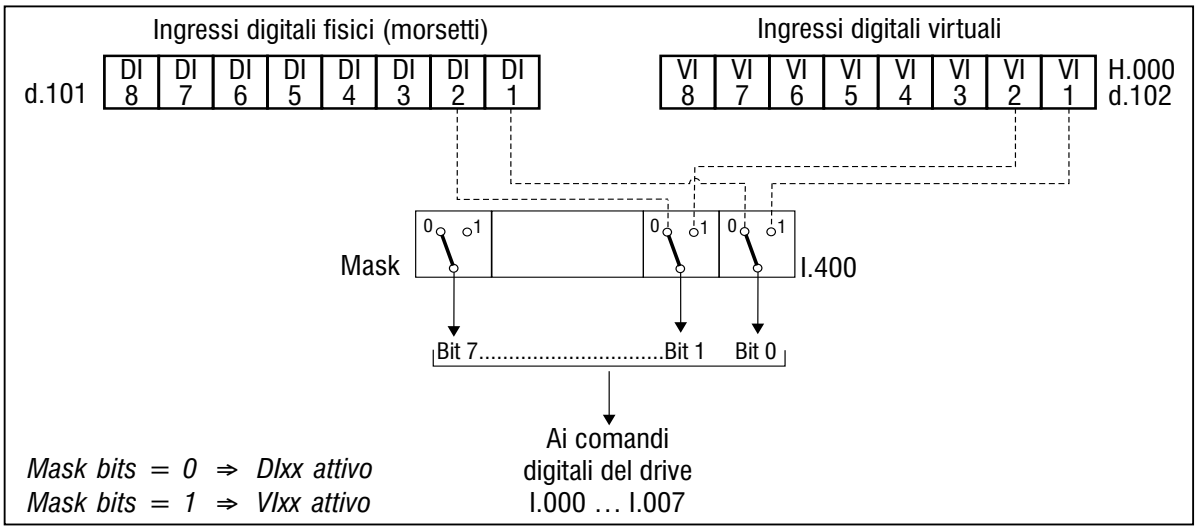


Figure 1.1-7.: digital input virtual configuration

TECNICHAL DATA CONFIGURATION OUTPUT DIGITAL VIRTUAL

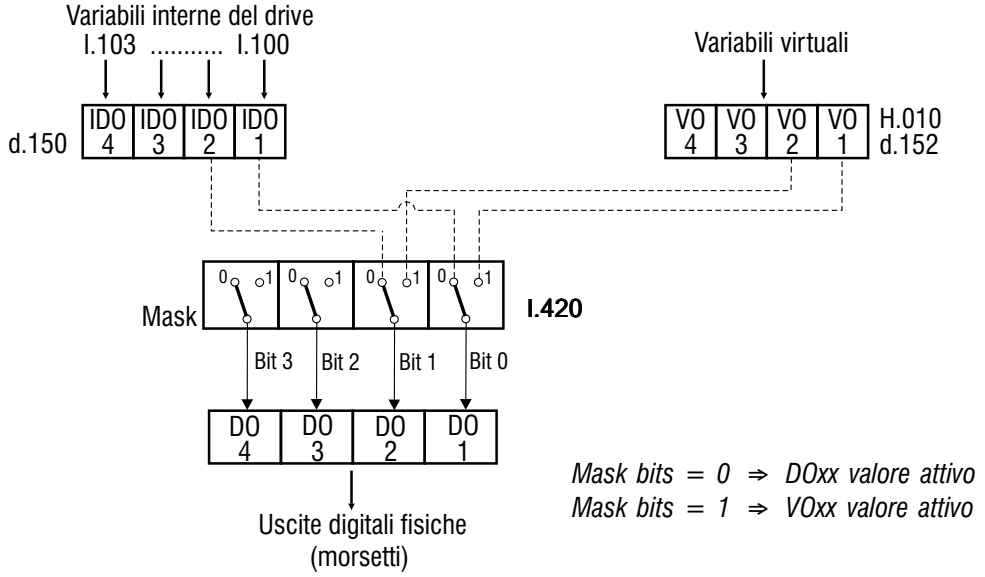


Figura 1.1-8.: digital output virtual configuration

CONFIGURATION OUTPUT DIGITAL VIRTUAL

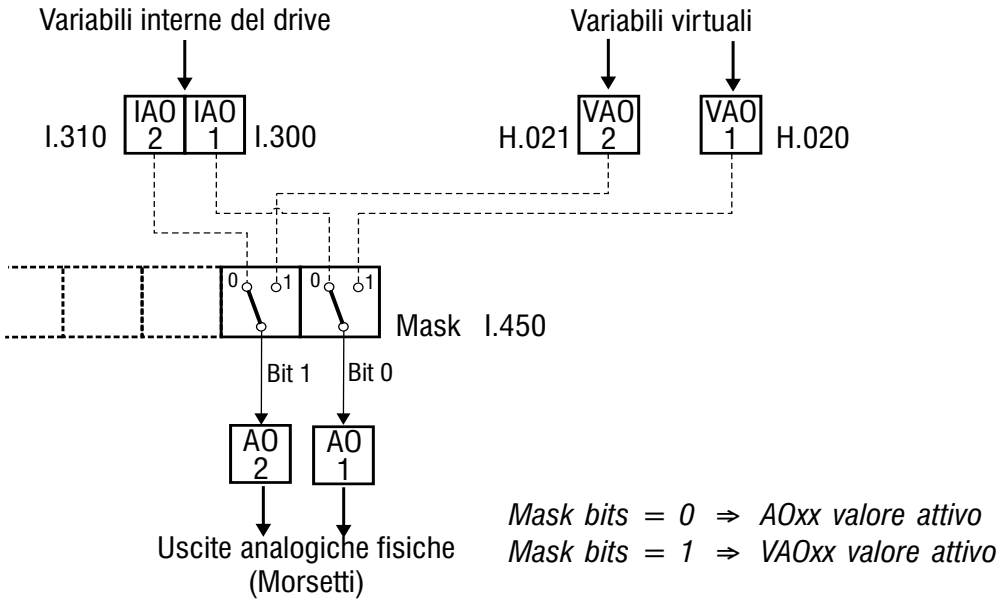


Figure 1.1-9.: digital output virtual configuration

Below are described some examples of programmation of base function by virtual assignment.

A) DIGITAL INPUTS

Programming example for :

- RUN e REVERSE commands via "virtual assignment"
- EXT FAULT command via "terminal"

P.000 = 2 Function mode enabled
I.400 = 3 bit 0 and bit 1 are "high" (1) and bit 5 is "low" (0)
I.000 = 1 RUN (programmed on digital input 1)
I.001 = 2 REVERSE (programmed on digital input 2)
I.005 = 3 EXTERNAL FAULT (programmed NO on digital input 6)

writing **H.000 = 1** motor will turn FORWARD direction
writing **H.000 = 3** motor will turn REVERSE direction
writing **H.000 = 0** motore will stop (STOP)

For further information of parameter H.000, see chapter 7.9.

EXTERNAL FAULT command will be actived closing contact on terminal 8.

B) DIGITAL OUTPUTS

Programming example for:

- ALARM STATE signalling on digital output 1
- VIRTUAL FUNCTION signalling (generic) on digital output 1

P.000 = 2 Function mode enabled
I.420 = 2 bit 1 is "high" (1) and bit 0 is "low" (0)
I.100 = 1 ALARM STATE (programmed on digital output 1)
I.101 = 2 ANY SELECTION (programmed on digital output 2)

digital output 1 active with alarm state drive
digital output 2 active if bit 1 of H.010 = 1
disactive if bit 1 of H.010 = 0

C) ANALOG OUTPUT

Programmation example for:

- OUTPUT FREQUENCY signalling on analog output 1
- VIRTUAL SETTING on analog output2

P.000 = 2 enable function

I.450 = 2 bit 1 is "high" (1) and bit 0 is "low" (0)

I.300 = 0 OUTPUT FREQUENCY (programmed on analog output 1)

I.310 = 2 EVERY SELECTION (programmed on analog output 2)

analog output 1 signal proportional to OUTPUT FREQUENCY drive

analog output 2 signal proportional to set of H.021

H.021: + 32767 output= +10V

H.021:- 32767 output = - 10V

I.400 Inp by serial en (Digital Input virtual enable)

It defines the bits of the mask, that are active for the virtual assignment. A byte is available for the selection of 8 digital inputs, whose setting has to be carried out as decimal value.

For evevry input is associated a bit corresponding a weight, summing the weights of the bits to 1 (virtual inputs) we obtain decimal value mask.

Input	weight
IN 1	Bit 0 = 1
IN 2	Bit 1 = 2
IN 3	Bit 2 = 4
IN 4	Bit 3 = 8
IN 5	Bit 4 = 16
IN 6	Bit 5 = 32
IN 7	Bit 6 = 64
IN 8	Bit 7 = 128

Example: IN1, IN2, IN6 Virtual Mask= 1+2+32=35

I.410 Exp in by serial en (Expansion inputs by serial line enabling)

Definisce i bit della maschera che vengono attivati per l'assegnazione virtuale. E' disponibile un byte per la selezione dei 4 ingressi digitali dell'espansione (opzionale), la cui impostazione dovrà essere eseguita come valore decimale.

I.420 Out by serial en (Abilitazione uscite digitali virtuali)

It defines the bits of the mask, that are active for the virtual assignment. A 4 bits structure is available for the selection of 4 digital outputs, whose setting has to be carried out as decimal value.

For evevry output is associated a bit corresponding a weight, summing the weights of the bits to 1 (virtual inputs) we obtain decimal value mask.

Output	Weight
OUT 1	Bit 0 = 1
OUT 2	Bit 1 = 2
OUT 3	Bit 2 = 4
OUT 4	Bit 3 = 8

Example: OUT 2, OUT 3 virtual Mask= 2 + 4 = 6

I.430 Exp out by ser en

Reserved

I.450 An out by serial en (Analog outputs by serial line enabling)

It defines the bits of the mask, that are active for the virtual assignment. A 2 bits structure is available for the selection of 2 analog outputs, whose setting has to be carried out as decimal value.

Output	weight
AN OUT 1	Bit 0 = 1 Enabled
AN OUT 2	Bit 1 = 2 Enabled

See description parameter I.400 and I.420

Encoder Configuration [**]

It is possible to provide feedback or an external frequency reference to the drive.

See paragraph “regolation board” to configurate the terminal multifunction where presents.

To connect encoder , see connection description .

NOTE!

Maximum encoder frequency input: 50 kHz

NOTE!

The setting of encoder feedback must have effected through the use of PID function.

I.500 Encoder enable (Encoder enabling)

Enabling of the encoder feedback management .

I.501 Encoder ppr (Encoder pulses)

Setting of the encoder nameplate pulses per revolution(data plate).

I.502 Enc channels cfg (Encoder channels configuration)

Setting of the encoder channels.

It is possible the reading of double or single channel encoders.

I.503 Enc spd mul fact (Encoder speed multiply factor)

Multiplier factor of the encoder pulses, set in the P.501.

The setting of P.501can be useful when the encoder is mounted on the "slow shaft side" of a gearbox or in any case when it is not mounted directly on the motor shaft.

I.504 Enc update time (Encoder update time)

It sets the encoder pulses sampling time.

This affects both the measurement accuracy and the speed of the reading up-to-dating.
At the maximum drive speed, this setting must not exceed such a value, for which the number of pulses counted exceeded 32767.
Using a double channel encoder, the number of pulses counted is 4 times the one detected on a single channel.

The function is active only if the encoder control is enabled (I.500).

The following formulas are for the calculation of the encoder shaft frequency.

F_{mot}[Hz]= N_{imp}[ppr] x (1/Ec) x (P.041[polepairs]) / (I.501[ppr]xI.503[fact]xI.504[s])
N_{imp}[ppr] = F_{mot}[Hz] x (1/Ec) x (I.501[ppr]xI.503[fact]xI.504[s]) / (P.041[polepairs])
N[rpm]= (60[s] x f [Hz]) / (2p [polepairs])
f[Hz]= (n[rpm] x 2p [polepairs]) / (60[s])
dove:

F_{mot}	Motor frequency, detected by the encoder
N_{imp}	is the pulses number, measured in the period set in I.504 (displayed as d.300))
Ec = 1	(Ec = encoder channel) when a single channel encoder is selected in I.502
Ec = ¼	(Ec = encoder channel) when a double channel encoder is selected in I.502

The accuracy of Fmot depends on the number of pulses counted: its value is 1/N imp. At low speed the accuracy could be reduced.

NOTE!

L'impostazione di N imp (I.504) dipende sia dal numero di impulsi e dall'applicazione da eseguire.

The setting N imp (I.504) depends on the encoder pulses and from the application to carry out.
When the pulses of the encoder used is low (200...600 pulses/rev), the I.504 has to be set with a high value, in order to obtain a good average value of the signal (eg: when used for monitoring the speed on an analog output).
Using an encoder with an higher number of pulses (1000...4096 pulses/rev), the setting of I.504 can be set to the minimum values, in order to increase the sampling speed (eg. for closing the speed loop with the PID function).

Configurazione Bus di campo

The inverter STMDRIVE have the possibility to communicate via RS485 serial line.
Through the serial line, all the parameters and variables can be written and read.
When control of the main command through serial line is needed, it is necessary to set the Cmd source sel (P.000) as follows:

P.000 = 2 Terminal or Virtual

P.000 = 3 Serial

Further information are reported at the chapter PARAMETER, section Commands ..

I.600 Serial link cfg (Serial link configuration)

Selection of the serial line protocol.

Each protocol can be chosen through the setting of the following codes. The structure of them is below reported.

DEFAULT VALUE = 4 (Modbus protocol)

I.601 Serial link bps (Serial link bit per second)

It defines the Baud rate (bit per second) concerning the serial line communication speed.

The selection is through the following code:

I.602 Device address

Address at which the drive can be accessed if it is networked via the RS485 interface. The range of the selectable addresses is between 0 and 99.

As reported in the chapter 5.4.1 (Serial Line General), it is possible to perform a Multidrop configuration with a maximum of 32 devices..

Further information about are reported in this chapter.

I.603 Ser answer delay (Serial link answer delay)

Minimum delay setting between the reception of the last byte and the start of its answer.

The delay will help avoid conflicts on the serial line, when the RS485 interface is not preset for an automatic Tx/Rx communication.

The Ser answer delay (I.603) parameter is specific for the standard serial line RS485..

Eg: if on the master the Tx/Rx delay communication is 20ms max, the setting of Ser answer delay (I.603) parameter will have to be higher than 20ms: 22ms.

I.604 Serial timeout (Serial link timeout)

It sets the time that elapses between the sending/receiving of a byte and the next one.

If this time is longer than the setting and no byte is detected (sending/receiving), the action will be the one programmed in the parameter I.605

The alarm won't be active when set at 0 second.

It will be displayed with the message "St".

NOTE!

Even if the timeout control function is enabled at the drive power-on, the detection of "St" alarm is temporary non active.

The detection of the alarm will be automatically activated after the first restore of the communication between master and slave.

I.605 En timeout alm (Enabling serial link timeout alarm)

Setting of the behaviour for Serial time out alarm.

I.605 = 0 Signalling of the alarm on a digital output (programmed to this purpose)

I.605 = 1 Drive in alarm and signalling on a digital output (programmed to this purpose)

Options Configuration Board

I.700 Option 1 type (option type 1)

Reserved.

I.701 Option 2 type (option type 2)

Reserved.

Field Bus Configuration

In this menu it is possible to perform the configuration of the SBI field bus card.

Further detailed information about the filedbus interfacing, are reported in the specific instruction manuals of the SBI cards.

I.750 SBI Address (SBI address)

Setting of the different addresses of the slaves connected to the bus.

I.751 CAN baudrate (Baudrate CAN Open)

CAN Open baudrate.

I.752 SBI Profibus Mode (Modalità Profibus SBI)

Definition of the data exchange structure, between the SBI card of the drive and the Profibus master.

The setting is possible in 5 different configurations: PP0-0....PP0-4

PP0-0 User defined structure

PP0-1…PP0-4 Structures in accordance with Profidrive profile.

I.753 SBI CAN Mode (field bus CAN mode)

Selection of the fieldbus protocol for:

I.753 = 0 OFF

I.753 = 1 CANOpen

I.753 = 2 DeviceNet

I.754 Bus Flt Holdoff (Bus fault hold off)

A communication drop with the fieldbus master, is detected by the SBI card.

This parameter allows the setting of a delay for the intervention of the BUS FAULT alarm..

If the communication is restored within this time, the drive will continue working.

If this time is elapsed and the communication is still missing, an alarm will occur stopping the drive., storage code "bF"

During this stage, the information data (received and sent) are frozen at the status precedent the communication drop.

At the restoring of the transmission, the first data sent and received will be the one frozen.

I.760 SBI to Drv W 0 (Word 0 da SBI a Drive)
I.761 SBI to Drv W 1 (Word 1 da SBI a Drive)
I.762 SBI to Drv W 2 (Word 2 da SBI a Drive)
I.763 SBI to Drv W 3 (Word 3 da SBI a Drive)
I.764 SBI to Drv W 4 (Word 4 da SBI a Drive)
I.765 SBI to Drv W 5 (Word 5 da SBI a Drive)
I.770 Drv to SBI W 0 (Word 0 da Drive a SBI)
I.771 Drv to SBI W 1 (Word 1 da Drive a SBI)
I.772 Drv to SBI W 2 (Word 2 da Drive a SBI)
I.773 Drv to SBI W 3 (Word 3 da Drive a SBI)
I.774 Drv to SBI W 4 (Word 4 da Drive a SBI)
I.775 Drv to SBI W 5 (Word 5 da Drive a SBI)

Setting of the "word exchange" between drive and SBI card and vice versa.
The data exchanging structure is available as a 6 words format.
In each word the parameters reading or writing, has to be addressed setting the relative number of IPA.

7.2.4 Menu F - FREQ & RAMP

For generate REFERENCE SPEED' "Reference" drive use following equation:

Reference = F.080 x (Ref.1 + Ref.2)

The drawing below, describes the logic for the "Reference selection", reading from right to left.
In output ther's Reference ;
Ref.1 e **Ref.2** are setted by **F.050** e **F.051** and can have one of 8 function described more function "Null"= inactive_
If **Ref.1** and **Ref.2** are setted on position **4 [MULTISPEED]** then can assume one of 16 frequency value defined from block "**Digital Input HW**"
Finally ,the first two values settable with selector "**Multi freq.Sel**" assume value defined through **F.060** and **F.061** with default have the reference **F.100** and **F.101**_

If used , the control of block "Digital Input HW" is made with binary code of four operator **Freq sel 1÷ Freq sel 4** programmable on digital input . [see I.000 and following ...]_

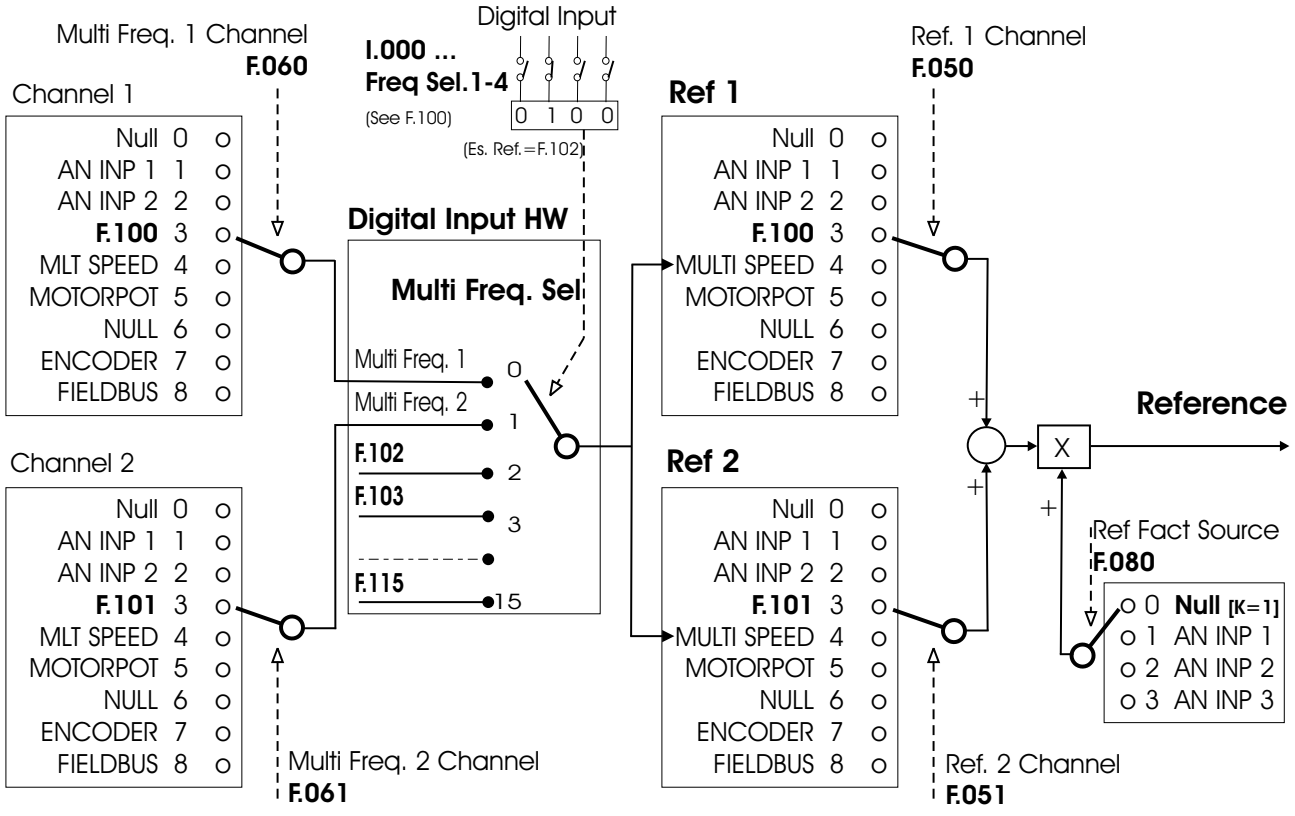


Figure 7.2-10. Selection reference

F.000 Motorpot ref (Motopotentiometer reference)

Displaying this parameter keys UP and DOWN of keypad are enabled to increase or decrease the output frequency value. The step of inrease and decrease for motopontentiometer is 0,1Hz. The maximum value settable is correlated to Max ref freq (F.020).

For the frequency reference inverter by F.000 is necessary set F.050=5. (see diagram “Selection reference” at paragraph 7.2.4)

To START the motor it is necessary a RUN command. By terminal (equivalent to an enable).

The Motorpotentiometer reference can also be changed via digital inputs, programmed as Motorpot up and Motorpot down.

The reset of the reference value, can be executed via digital input programmed as Reset Motorpot.

F.001 Motorpot ref unit (Motopotentiometer reference x K)

Display a value F000 x P600 x EXP(P601)

It is possible give the reference to the motor not measured in Hz but in other unit measure like rpm. With a 4 poles motor (P.041=2, K_{rpm}=60/P.041=30) and a gear box 1:100 [P600=30/100=0,3 and P601=0] , in F001 is setted speed reference the speed output of gear box.

Pay attention that a single pressure of a arrow key , keys UP and DOWN, could make a variation displayed of much digit , or at the opposite , could be necessary push continuosly then keys (or pressed for some seconds) before to see changed digit less significant.

F.010 Mp Acc / Dec time (Motorpotentiometer Acceleration / Deceleration time)

It sets the acceleration and deceleration ramp time delay (in seconds), for the Motorpotentiometer function.

The delay times are equal for the acceleration and deceleration.

F.011 Motorpot offset (Motorpotentiometer offset)

Giving the RUN command, the motor will rich automatically the frequency set (offset) following the ramp time.

The Motorpot up command will be effect starting from this value, which represent the frequency minimum

value attainable by Morotpot down command.

For further detail see also the section Reference Limits in this chapter.

F.012 Mp output mode (Motorpotentiometer output mode)

It defines positive and/or negative settings of the Motorpotentiometer reference value.

In either setting the HW Reverse command is active (when enabled)..

F.013 Mp auto save (Motorpotentiometer auto save)

Enabling this function will cause the Motorpot reference to be continuously saved into non-volatile memory. At

power on, the reference will start from the last saved value.

Disabling this function will cause the Motorpot reference to be always zero after power-on.

Saving drive parameters by command C.000 (or S.901) will not save the Motorpot ref value..

Limitation for Reference Limits

F.020 Max ref freq (Maximun reference frequency)

It is the maximum speed for both directions.

This parameter applies to the sum of the different reference value available on the drive (Reference 1 and Reference 2).

F.021 Min ref freq (Mimimun reference frequency)

It defines the minimum frequency value, under which any regulation with analog or digital references has no effect.

The START of the motor will be carried out (with the ramp delay) at this frequency value also with null reference.

As described in the following figure, this behaviour is correlated also to the setting of Min output freq (P.081).

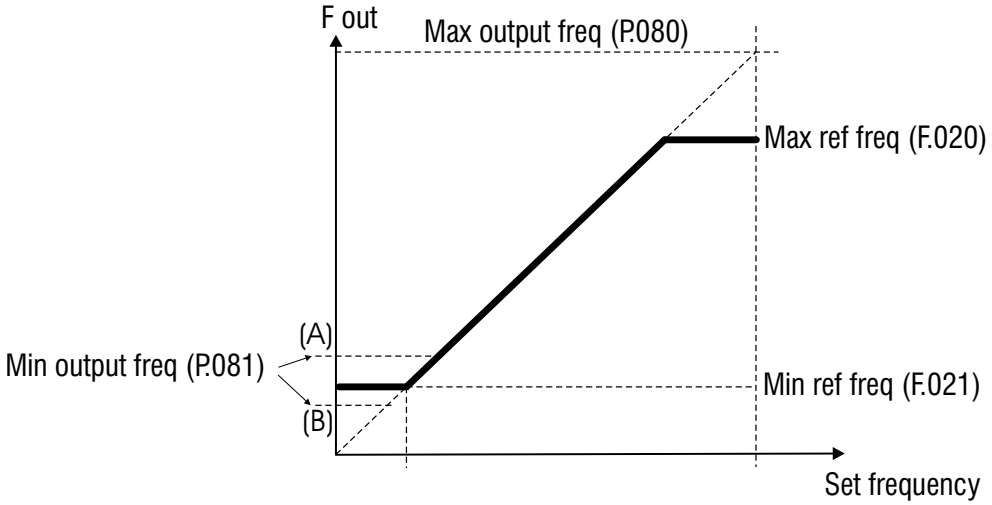


Figure 1.1-11.: Min & Max Frequency reference

Drive behaviour around minimum values

P.081 settings in A condition

• Giving the RUN command, the motor will rich the frequency set of P.081 (A) without to follow the setting of acceleration ramp time..

• The reference action on the frequency curve, will have effect starting from the setting value of

P.081 parameter.

P.081 settings in B condition.

• Giving the RUN command, the motor will rich the frequency set of P.081 (A) without to follow the setting of acceleration ramp time.
• The increasing of the reference will have effect on the frequency output, starting from the setting value of F.021 parameter (the variation will follow the setting of acceleration ramp time).
• The reference action on the frequency curve, will have effect starting from the setting value of F.021 parameter.
The Max output freq (P.080) and the Min output freq (P.081) are expressed as percentage of the values of Max ref freq (F.020)

Reference Sources

F.050 Ref 1 Channel (Reference 1 channel)
F.051 Ref 2 Channel (Reference 2 channel)
These parameters consent to select "the source "from which the 2 speed references are provided and controlled.
The values of 2 reference will be algebric sum, when employed both.

F.060 Mlt Frq Channel 1 (Multi frequency channel 1)
F.061 Mlt Frq Channel 2 (Multi frequency channel 2)
These parameters allow to select the source, from where the First and Second frequency reference of the Multispeed function, can be provided and controlled).

Multiplicative Factor per Reference

F.080 Reference Factor Source (Reference factor source multiplying for reference)
It is possible join to the setting of reference a multiplying factor proportional to an analog input .
The parameter F.080 select which of the input will have this function.

Example : in a system with 'Master' and 'Slave', in the phase of stop for hole line , it is possible to make to the 'slave' the speed profile of master connecting the analog output peviously analog output programmed to tha analog input of slave.

Multi frequency function

F.100 Frequency Ref 0 (Frequency Reference 0)

- • (Frequency Reference 1)
- •
- •

F.115 Frequency Ref 15 (Frequency Reference 15)

It is possible to select up to 16 frequencies, whose value can be set in these parameters.

The selection of these frequencies can be performed through a binary setting of 4 programmable digital inputs.

The limit of the output frequency will be clamped by Max ref freq (F.020).

The following table describes the basis sequence of the binary setting, for a complete Multispeed Function selection.

Active Dig ref Frequency	Freq sel 1	Freq sel 2	Freq sel 3	Freq sel 4
F.000 (Freq Ref 0)	0	0	0	0
F.001 (Freq Ref 1)	1	0	0	0
F.002 (Freq Ref 2)	0	1	0	0
F.003 (Freq Ref 3)	1	1	0	0
F.004 (Freq Ref 4)	0	0	1	0
F.005 (Freq Ref 5)	1	0	1	0
F.006 (Freq Ref 6)	0	1	1	0
F.007 (Freq Ref 7)	1	1	1	0
F.008 (Freq Ref 8)	0	0	0	1
F.009 (Freq Ref 9)	1	0	0	1
F.010 (Freq Ref 10)	0	1	0	1
F.011 (Freq Ref 11)	1	1	0	1
F.012 (Freq Ref 12)	0	0	1	1
F.013 (Freq Ref 13)	1	0	1	1
F.014 (Freq Ref 14)	0	1	1	1
F.015 (Freq Ref 15)	1	1	1	1

The following figure shows the setting of a 8 Multispeed control.

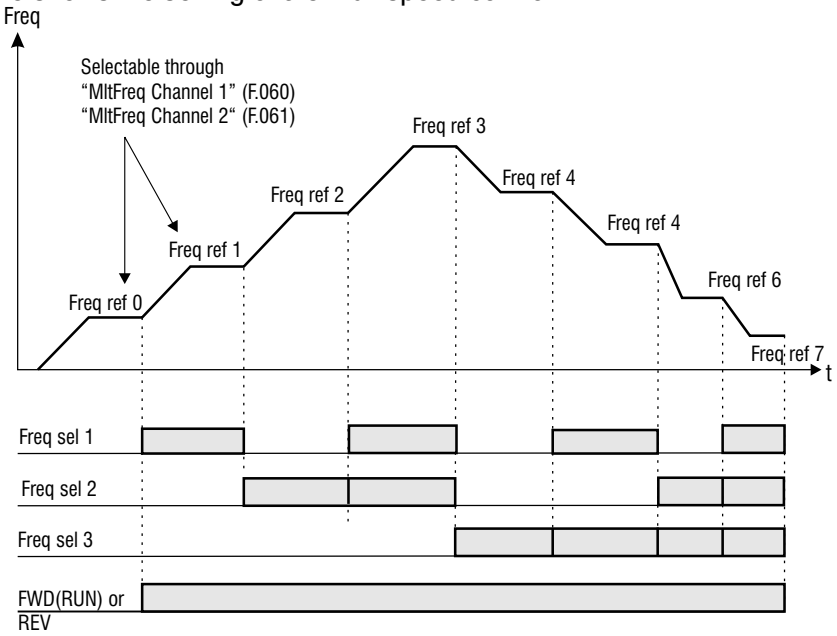


Figure 1.1-12.: Multispeed

F.116 Jog frequency (Jog frequency)

It is the frequency reference for the JOG speed.

This speed is activated through a programmed digital input.

The RUN command via terminal must not be given. This command will enable the main frequency reference.

The limit of the output frequency will be clamped by Max ref freq (F.020).

The setting of the JOG reference value, can be either positive or negative.

In both the setting the HW Reverse command is active (when enabled).

Ramp Configuration

F.200 Ramps resolution (Ramps resolution)

It defines the range and the accuracy with which the ramps time will be set.

F.200=**0**	resolution	0,01 seconds	max=99,99 seconds
F.200=**1**	resolution	0,1 seconds	max=999,9 seconds
F.200=**2**	resolution	1 second	max=9999 seconds

F.201 Acc time 1 (Acceleration time 1)

F.202 Dec time 1 (Deceleration time 1)

Are the ramps used from drive to go to maximum frequency (F.020).
(See NOTE)

F.203 Acc time 2 (Acceleration time 2)

F.204 Dec time 2 (Deceleration time 2)

F.205 Acc time 3 (Acceleration time 3)
F.206 Dec time 3 / FS (Deceleration time 3)

F.207 Acc time 4 (Acceleration time 4)
F.208 Dec time 4 (Deceleration time 4)
Ramps Set setted for Jog function.

NOTE!

The ramps are with constant slope : the value setted in F.201 is the time to go at maximum F.200;
Example : F.200=50 Hz, F201=10s, Reference =30 Hz : the time necessary to go from frequency 0 to 30 Hz will be 6 seconds .

NOTE!

When the JOG function is activated, Acc time 4 (F.207) and Dec time 4 (F.208) are selected automatically.
When the "FAST STOP" is activated (through digital input command), the function is executed with the DEC TIME 3 delay.

The ramp control can be set for a programmable delay for the acceleration and deceleration times of the drive reference. This delay time will have to be set on the final system (motor and load), being strictly dependant from the inertia of the load machine.
The time values are expressed in seconds. The ramps time delay are calculated in accordance with the Max ref freq (F.020).

It is possible to select up to 4 different time, whose value can be set in these parameters.
The selection of these ramps can be performed through a binary setting of 2 digital inputs, programmed as Ramp sel 1 and Ramp sel 2.

It is reported below the basis sequence for the full selection.

Active Ramp time	Ramp sel 1	Ramp sel 2
F.201 (Acc time 1) **F.202 (Dec time 1)**	0	0
F.203 (Acc time 2) **F.204 (Dec time 2)**	1	0
F.205 (Acc time 3) **F.206 (Dec time 3)**	0	1
F.207 (Acc time 4) **F.208 (Dec time 4)**	1	1

F.250 Ramp S-shape (Ramp S-shape)

The S-shaped ramp can be useful to obtain a smooth behaviour of the system during the end of the acceleration or close to the zero speed during the deceleration.

The value (in seconds) of the S-shaped ramp is added to the ramp time of the linear profile.

The ramp time is thus lengthened by the value of the S-curve constant.

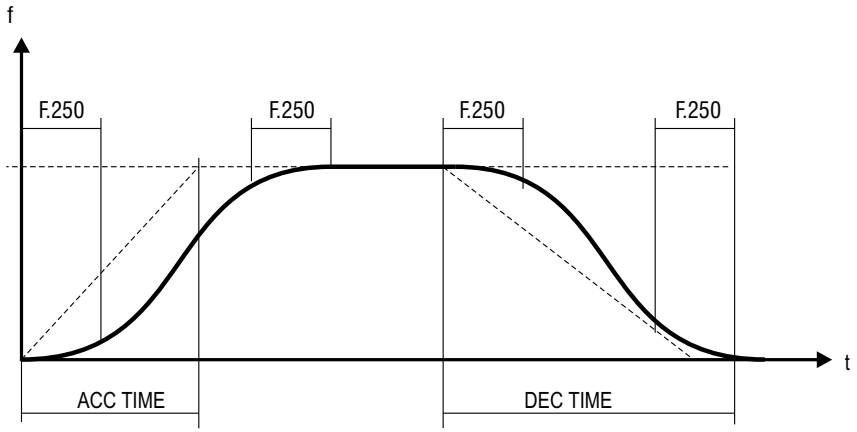


Figure 1.1-13.: Ramp S-shape

F.260 Ramp extens src (Ramp extension source)

When an extension of the set ramps time is needed, it can be achieved through the Analog Inputs.

This extension will change linearly according to the value applied on the Analog Input.

The function allows the ramp times extension in a range includes between multiply factor 1 (0V, 0mA o 4mA) and multiply factor 10 (+/-10V o 20mA).

The parameter select the source from where this function is provided and controlled..

F.260=**0** Null

F.260=**1** Signal source of extention = Analog input 1

F.260=**2** Signal source of extention = Analog input 2

F.260=**3** Signal source of extention ramp = Analog input 3

Frequency Jump

F.270 Jump amplitude (Jump amplitude)

F.271 Jump frequency1 (Jump frequency1)

F.272 Jump frequency2 (Jump frequency2)

In a system composed by motor and drive, at certain frequencies values, it is possible to meet the generation of noisy vibrations, characterized by mechanical resonances.
Through the parameters F.271 and F.272, it is possible to avoid the working of the inverter around the frequencies here set.

The parameter F.270 defines the tolerance band of the critical zone..

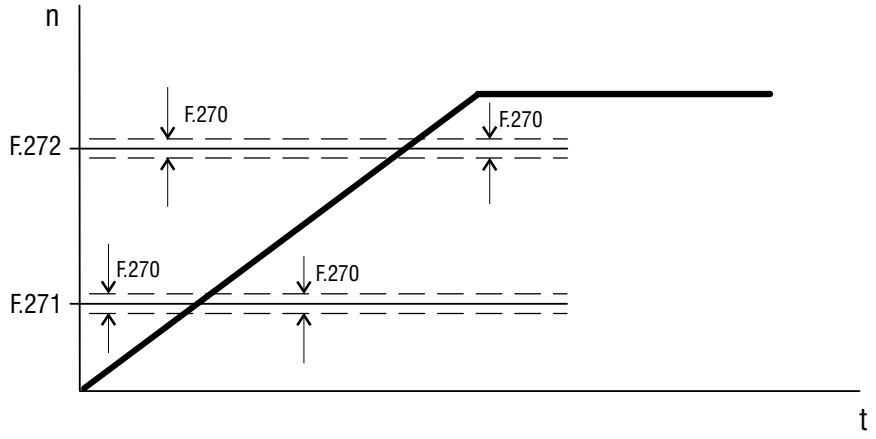


Figure 1.1-14.: Jump Frequencies

When the frequency reference is set to a value within the tolerance band, the frequency output assumes the following behavior..

Example :

A) Increasing the reference from lower value of F.271 or F.272
F.271 = 30Hz (first forbidden frequency threshold)
F.270 = 1Hz (tolerance band: 29Hz….31Hz)
Setting of frequency reference = 29,5Hz
Frequency output = 29Hz
Reference speed setted = 30,5Hz
Output frequency = 29Hz

B) Decreasing the reference from higher value of F.271 or F.272

F.271 = 30Hz (first forbidden frequency threshold)

F.270 = 1Hz (tolerance band: 29Hz….31Hz)

Setting of frequency reference = 30,5Hz

Frequency output = 31Hz

Setting of frequency reference = 29,5Hz

Frequency output = 31Hz

The user can set any frequency reference, but if its value is within the forbidden range, the inverter will maintain automatically the speed out the limit of the tolerance band.

During the ramp execution the forbidden frequencies have not any influence, so the output frequency will be linearly generated..

7.2.5 Menu P - PARAMETER

Grafica Comandi	P -PARAMETER

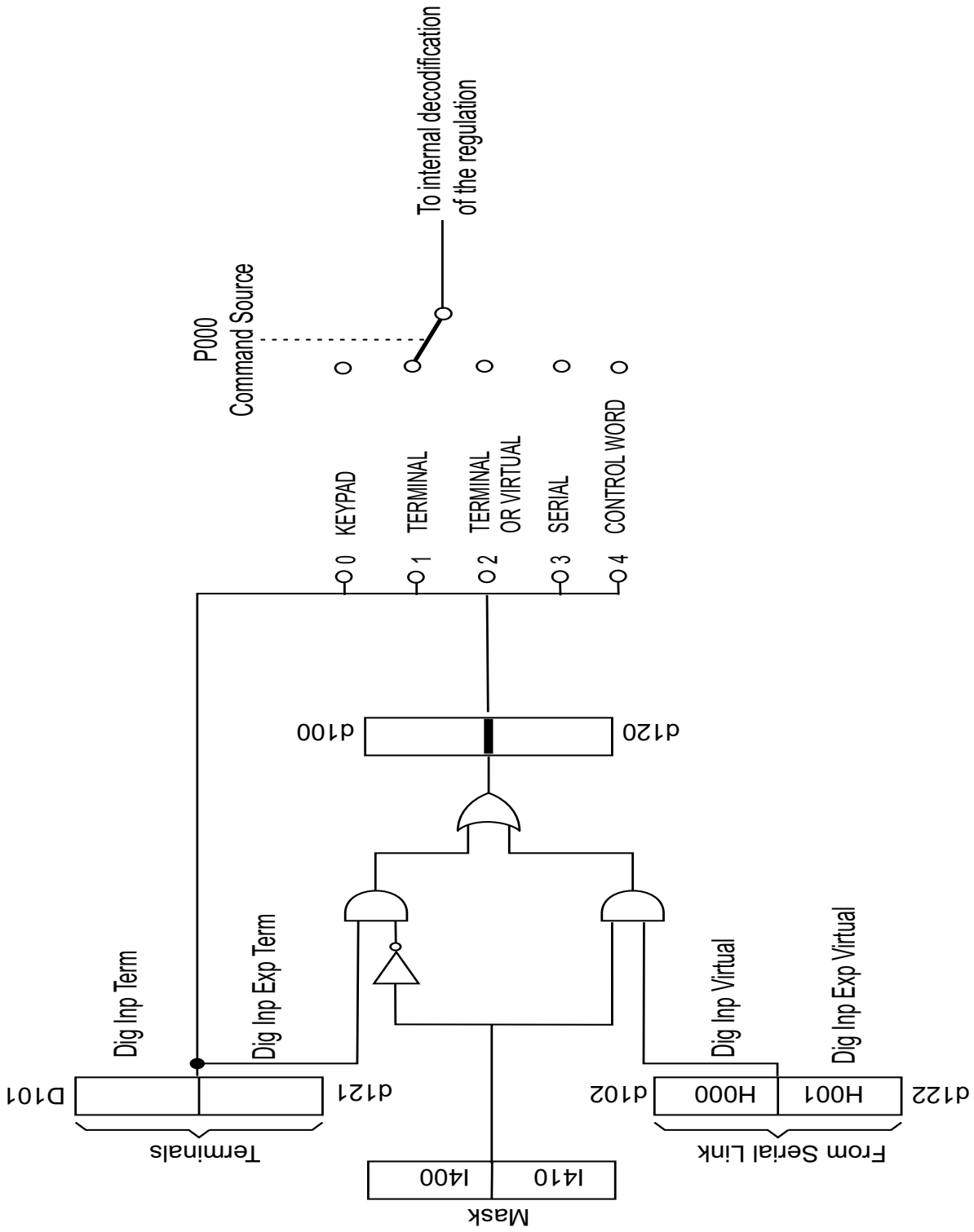


Figure 7.2-15.: Logica base di selezione dei comandi

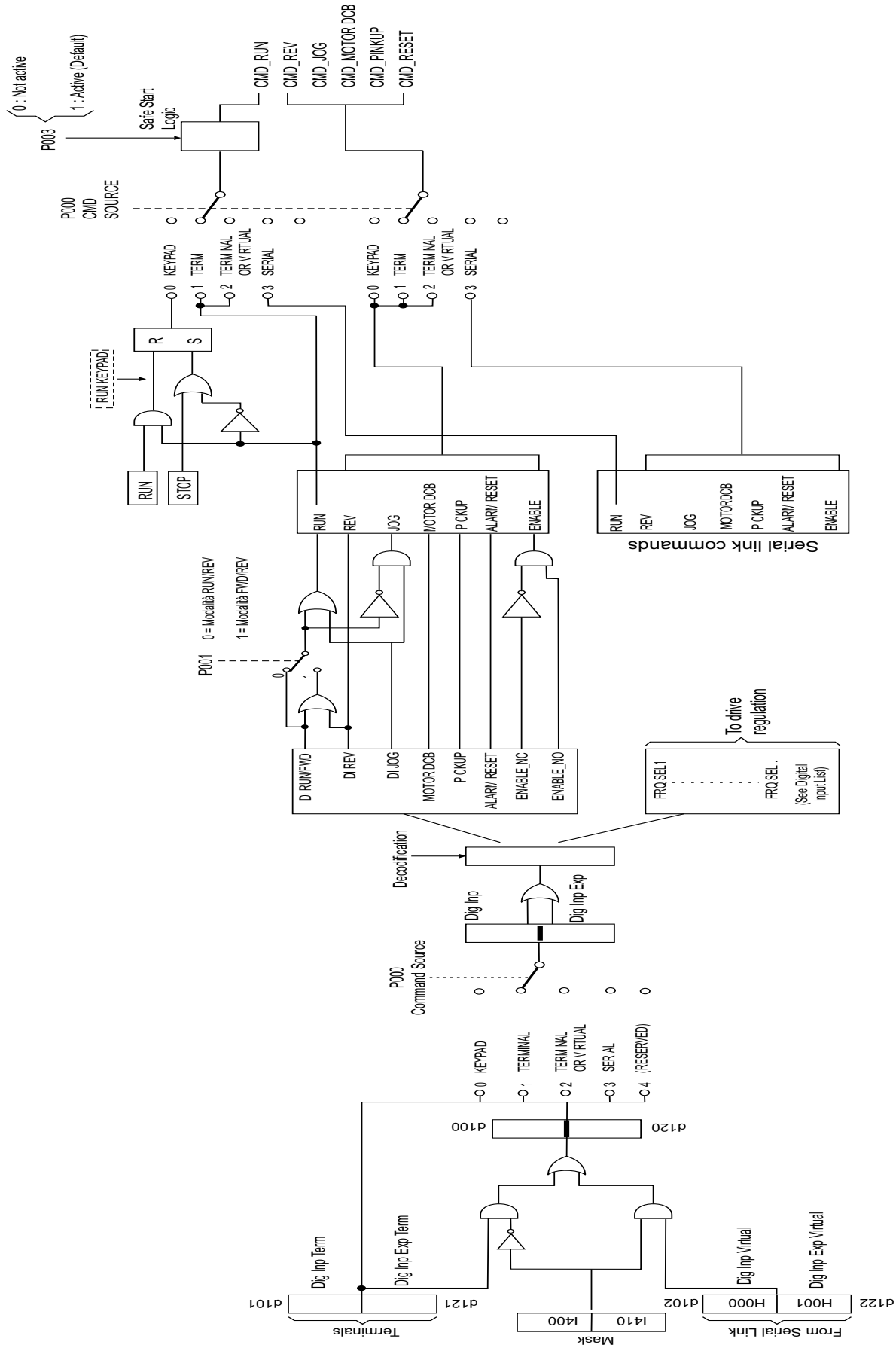


Figure 1.1-16.: Logica Completa di selezione dei comandi

P.000 Cmd source sel (Command source selection)

It defines the selection mode for the main commands START and STOP.

P.000 = 0 Keypad: START & STOP via keypad [**]

In this configuration the commands are active through the keypad buttons.

(Fwd) RUN command (Stop) STOP command

The Digital Input 1, factory programmed as RUN , must be connected to a specific logic level (NPN or PNP), in order to allow the motor START. This connection must be considered like enabling hardware.

If this connection is removed, the motor will STOP with the set ramp time.

P.000 = 1 Terminals: START & STOP via terminals

In this configuration the commands are active through the terminals.

The motor START can be performed applying the specific logic level (high level or low level), to the terminal factory set as RUN.

If this connection is removed, the motor will STOP with the set ramp time.

NOTE!

After a cycle of main supply voltage, the drive can be started only according to the settings of P.003 Safety parameter, which allows the Start/Stop commands to respond to Edge or Level sensitive signals.

NOTE!

The command Drive enable available as a selection of the digital inputs, adds additional safety logic for the motor running sequences.

The releasing of it, will produce a coast to stop of the motor. (see chapter INTERFACE, section Digital inputs).

P.000 = 2 Virtual: commands via virtual channels or terminals

In this configuration, the commands programmable on the digital inputs or the signalling of the digital and analog outputs, can be assigned as follows:

- Complete selection via serial line or fieldbus as "Virtual setting "
- Complete selection via "Terminals setting"
- Mix of "Virtual and Terminal selection"

NOTE!

The requirements of commands via terminal strip is depending by virtual I/O settings.

Further information about this function, can be found in the chapters:

INTERFACE section Enabling Virtual I/O

Commands addressing is described in the chapter HIDDEN

P.000 = 3 H-command: START & STOP & main commands via Serial line (SERIAL)

It define the selection of the main commands exclusively via serial line or fieldbus.

NOTE!

Commands via terminal strip are not required.

Further information about the serial line, can be found in the chapters:

INTERFACE section Serial configuration

Commands addressing is described in the chapter HIDDEN, section Commands for serial link.

P.000 = 4 ControlWord: Reserved (N.D.)

P.001 RUN input config (RUN input configuration)

Definition of the RUN and Reverse logic control.

P.001 = 0 Run / Rev

FWD (clockwise direction) with terminal RUN = ON

REV (anti-clockwise direction) with terminal RUN = ON and terminal REV = ON

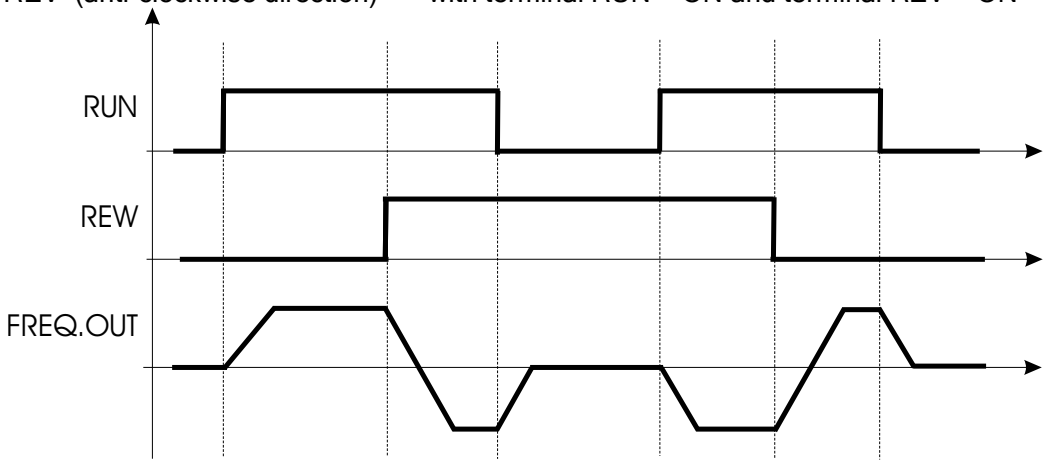


Figura 1.1-17.

P.001 = 1 Fwd / Rev

FWD (clockwise direction) with terminal RUN = ON

REV (anti-clockwise direction) with terminal RUN = OFF and terminal REV = ON

P.002 Reversal enable

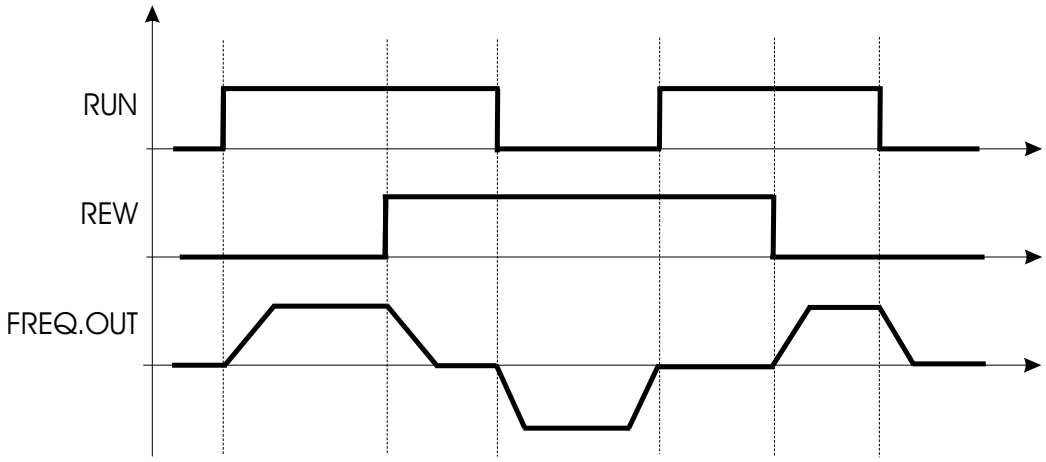


Figure 1.1-18.

P.001 = 2 3 wire mode

FWD (clockwise direction) with terminal RUN = ON impulsive

REV (anti-clockwise direction) with terminal RUN = ON impulsive and REV = ON

STOP with terminal STOP 3WIRES (NC) = OFF impulsive

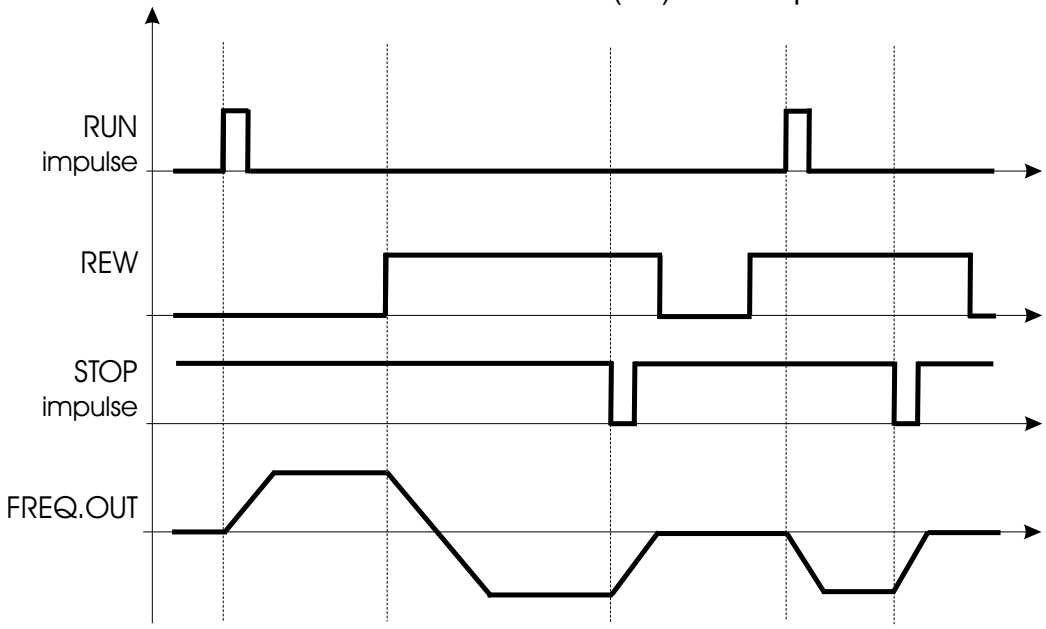


Figure 1.1-19.

Connections for P001=2 and I.002=28

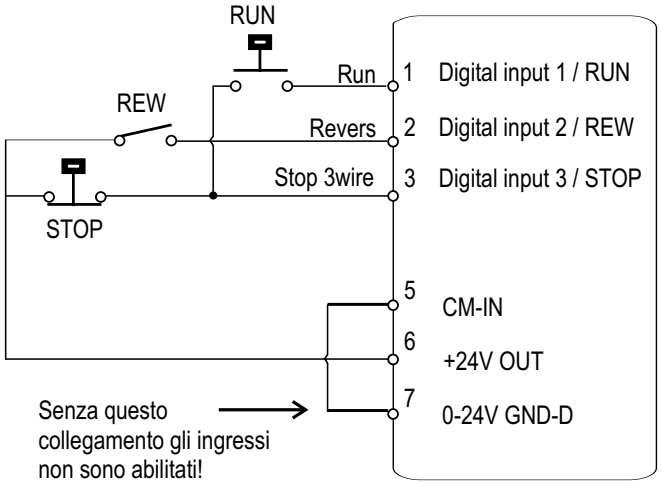


Fig. 1.1-20.

P.002 Reversal enable (reversal enable)

Block of the command direction of the motor.

P.002 = 0 REV (inversion of rotation sense) DISABLED

P.002 = 1 REV (inversion of rotation sense) ENABLED

The function will be applied at any kind of REV logical command (digital input, negative reference and serial line).

P.003 Safety (Safety Run)

The parameter defines the RUN (or REVERSE) command behavior at the drive power on:

P.003 = 0 RUN command via a Level sensitive signal.

At the drive power on, the starting of the motor is allowed when the RUN command is already present on terminal strip.

P.003 = 1 RUN command via an Edge sensitive signal.

At the drive power on, the starting of the motor is not allowed when the RUN command is already present on terminal strip.

The starting of the motor can be execute cycling RUN command.

Mapping a digital output as "Ready", the drive state condition can be displayed according to the above parameter setting.

P.004 Stop mode (Motor stop control function)

P.004 = 0 The control sets the motor ramp deceleration up to 0 Hz.

P.004 = 1 The control cuts off the output voltage, so the motor coasts to stop

P.005 Default rotation riverse (Inversione software del senso di marcia)

Permette di invertire il senso di rotazione senza effettuare alcun intervento sui cablaggi della regolazione o del motore.

Alimentazione

P.020 Mains voltage (Electric line voltage)

Rated value of the line voltage [Vrms].

The undervoltage trip function is based on this value (see also chapter PARAMETERS, function Undervoltage configuration).

P.021 Mains frequency (Electric line Frequency)

Rated value of the line voltage frequency [Hz].

P.040 Motor rated curr (Motor rated current)

Rated current [A_{rms}] of the motor at rated kilowatt/horsepower and voltage (given on the nameplate). In case of control with multiple motors, enter a value equal to the sum of the rated currents of all the motors.

NOTE. When you control more than one motor do not perform any self tune operations

P.041 Motor pole pairs

Pole pairs of the motor.

PAIA POLI: read on data plate , usually on Type field the last digit is , second norm IEC 34-1, Pole pairs of the motor.

E.g:

if "Type : ABC 90 L**4**" ABC is a manufacturer code

90 L size motor (height shaft on B3 version and length stator, coded by norms)

4 number poles

the value to set **P.041** is p (pole pairs) = 4 (n°poles) / 2 = **2**

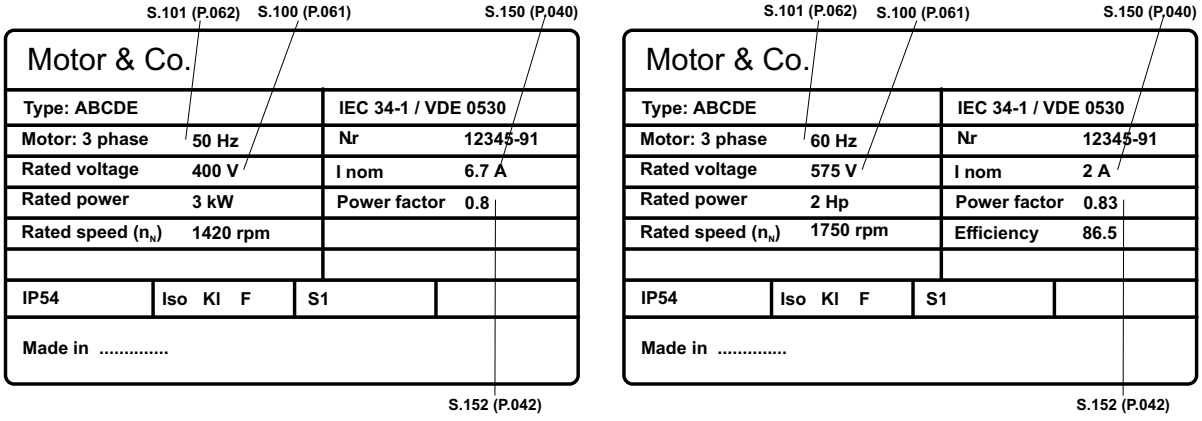


Figure 1.1-21.: Data plate motor (E.g for motor in kW(left) , 400V and in Hp(right) , 575V)

Alternative is possible to calculate P.041 from data plate applying the following formula:

No [rpm] = (60 [s] * f [Hz]) / p then :

p = (60 [s] * f [Hz]) / No [rpm]

Where : p = polepairs

f = rated frequency motor (S.101)

No = synchronous speed motor

(Usually No=Nnominal [rpm]+0,5÷5%)

Es. Motor 2 poles , 50Hz , No=3000 **p=1**, Motor 4 poles 50Hz No=1500 **p=2**

This information need for internal calculation of K_{rpm}, to display correctly using P.602.

P.042 Motor power fact (Motor power factor)

Motor power factor (given on the nameplate).

A signalling of the "negative power factor" condition is available on the digital output as "Neg pwr fact ".

P.043 Motor stator R (Motor stator Resistance)

Measurements of the stator resistance of the motor.

This value will be automatically updated, after performing the self tune procedure [see C.100].

P.044 Motor cooling (motor cooling type)

Set the type of cooling motor .Is it possible to set value in percent , depending of torque level or duty cycle of application and speed applied to motor.

P.045 Motor thermal K (Motor thermal constant)

Thermal characteristic of the motor connected.

The value can requested to the motor manufacturer.

P.046 Motor nominal slip (Motor nominal slip)

Calculate using data plate : S = (No-N) / No %

Where N is nominal speed , No [rpm] = (60 [s] * f [Hz]) / p [pole pairs] synchronous speed motor

E.g.: N=1420, No=(60*50)/2=1500 then

S=[(1500-1420)/1500] x 100 =5,3 you set on parameter following value P046=5 %

P.047 Motor nom eff (Motor nominal efficiency)

This value is on manufacturer catalogueo or by Pn = 1,73 * Vn * In * cos $\varphi * \eta$ then , on example P.047=81 because efficiency is η=81% .

[P.047=$\eta(\%)$ = Pn / (1,73 * Vn * In * cos φ) $* 100$]

V/F Curve

P.060 V/f shape (V/f shape)

Selection V/F shape.

P.060 = 0 (custom)

The intermediate values of voltage and frequency, are defined by the parameters P.063 and P.064 as well as the link of the manual Boost on the characteristic.

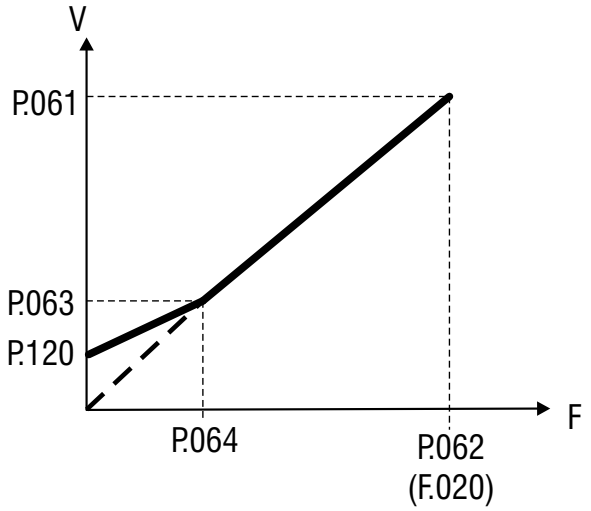


Figure 1.1-22.: V/F custom curve

P.060 = 1 Linear

The factory setting provides a Linear V/F ratio, having the middle points fixed by the half value of P.063 and P.064.

The joint of Boost on curve will be automatic.

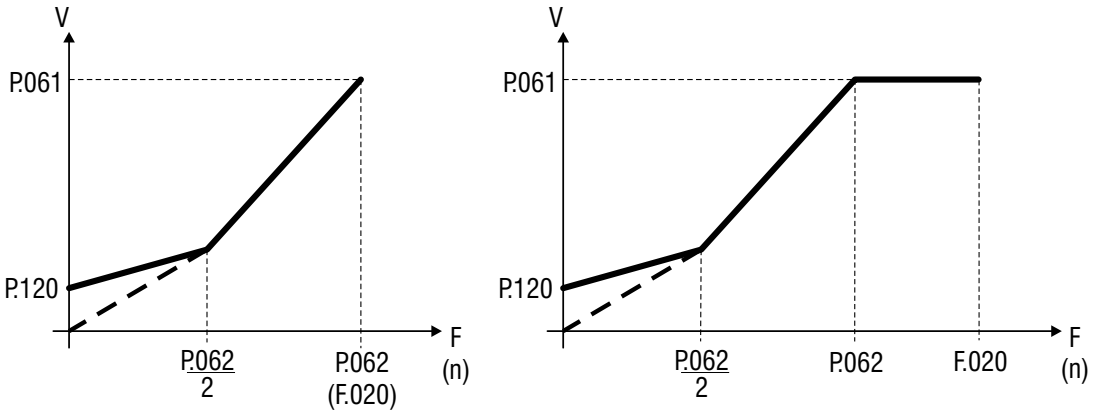


Figure 1.1-23.: V/F curve Linear

P.060 = 2 Quadratic

The Quadratic characteristic is useful when a pump or fan has to be controlled (load where the torque is proportional to the speed squared).

The factory setting, when this ratio is selected, provides a setting of P.063 equal to

the 0,25% the Max output voltage, at a frequency equal to 50% of P.062 Rated frequency of the motor.

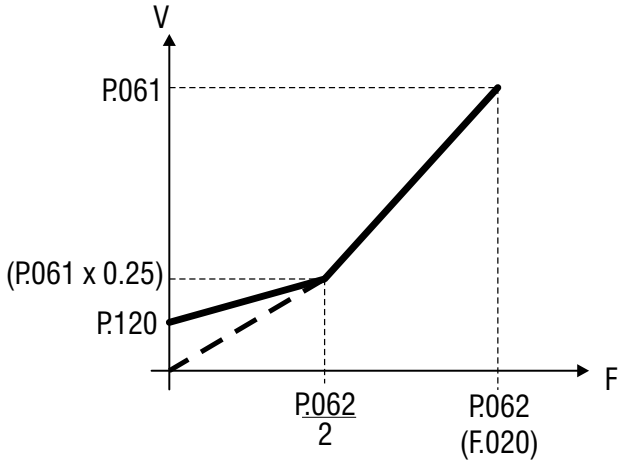


Figure 1.1-24.: V/F curve Quadratic

P.061 Max out voltage (Maximum output voltage)
Maximum value of the voltage applied to the motor (usually setted as the nameplate).

P.062 Base frequency (Frequenza base)
Rated frequency of the motor (given on the nameplate)
It represents the working frequency of the drive, at which the Max out voltage is associated (P.061).

P.063 V/f interm volt (V/f intermediate voltage)
Intermediate "voltage" value of the V/F characteristic selected.

P.064 V/f interm freq (V/f intermediate frequency)
Intermediate "frequency " value of the V/F characteristic selected.

NOTE!
When custom V/f shape is selected (P.060 = 0):
P.064 parameter represents the return point of the output voltage, on the linear characteristic of V/f (see figure 7.2-8).

Ouput Frequency Limit

P.080 Max output freq (Maximun output frequency)
It is the maximum level of the output frequency, expressed as percentage of Max ref freq (F.020).

This parameter takes into account the sum of all the reference frequencies and frequency variables of the drive, deriving by :

P.081 Min output freq (Minimun output frequency)

Minimum value of output frequency, under which no reference regulation has effect.

It is expressed as percentage of Max output freq (P.080).

The parameter is correlated to the Min ref freq (F.021), as reported in the figure below.

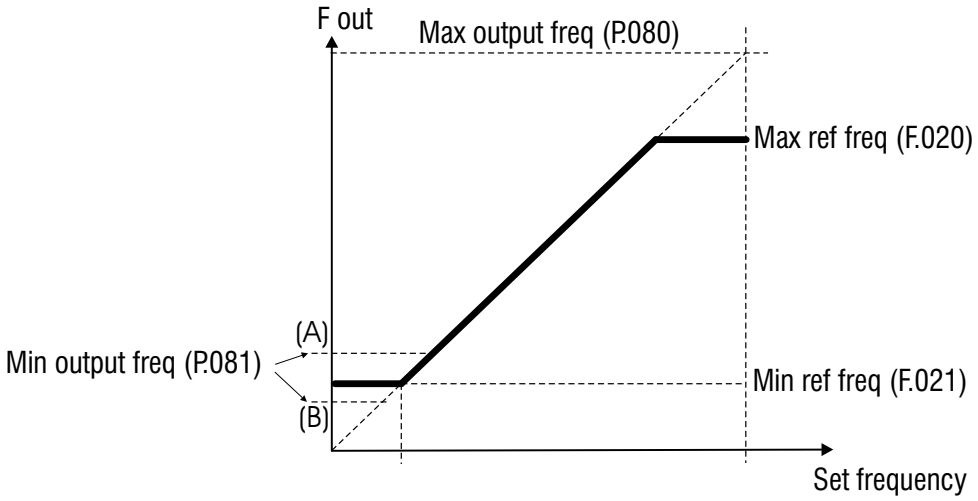


Figure 1.1-25.: Minimum and Maximum of frequency reference

A signalling of the "output frequency" status is available on the digital output as "Out freq<set".

Slip Compensation

P.100 Slip compensat (Slip Compensation)

If an induction motor is being used, the mechanical speed will vary with the load due to the slip of the motor.

In order to adjust for this speed error the slip compensation can be used.

During this calibration, make sure that the drive is not in a current limit condition. In this case tuning is not possible.

If this compensation is set too high it can cause instability.

The changing will be carried out as a percentage of the nominal slip, calculated when set the motor plate date.

The Slip compensation will act directly on the output frequency of the drive.

For this purpose the parameter Max output freq (P.080) expressing the percentage of the Max ref freq (F.020), has to be set to a value including:

Max ref freq value + Slip compensat value.

See chapter "PARAMETERS", section "Output Frequency Limit".

NOTE !

The Slip compensation must be disabled when a multiple motor connection is being used.

P.101 Slip comp filter (Slip compensation filter)

It is the response time (in seconds) for the reaction of the function.

Increasing this value helps avoid damping oscillations that may arise with load steps (especially negative ones).

Boost

P.120 Manual boost [%] (Manual voltage boost)

The resistive impedance of the stator windings causes a voltage drop within the motor, which result in a reduction in torque in the lower speed range.

Compensation can be made for this effect by boosting the output voltage. Setting is in percent of parameter **Max out voltage (P.061)**.

The action of manual boost ,setted in P.120, acts starting from null frequency and decrease with increasing frequency up to zero at the intermediate frequency .

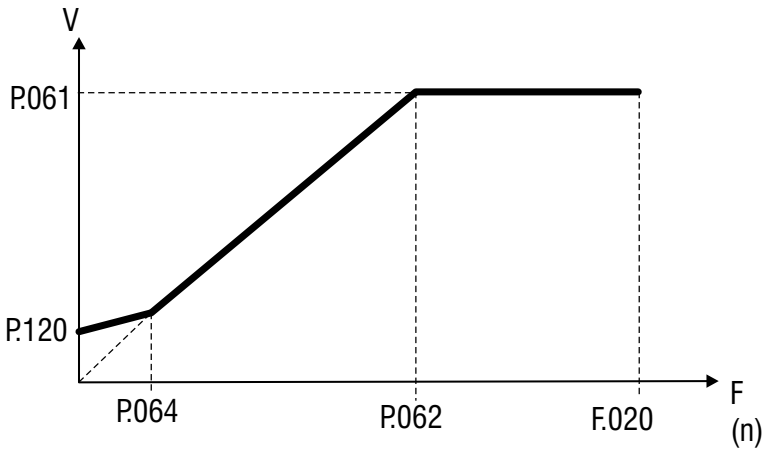


Figure 1.1-26.: Manual voltage boost

P.121 Boost factor src (Factor extension source of manual Boost)

The manual Boost level can be linearly regulated through an analog reference signal.

The regulation of the Boost level will be between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the percentage value set in P.120 (+/- 10V - 20mA).

This parameter selects the source from where this function is provided and controlled.

P.122 Auto boost en (Automatic boost enabling)

The boost can be automatically controlled by the enabling of this parameter. The control is continuously carried out in the whole speed range, and operate proportionally to the output current.It will have maximum effect near low speed .

NOTE!

The automatic boost is automatically calculated during the execution of drive/motor self tuning (P.043 parameter).
It is anyway possible to obtain an "Oveboost" at low speed, increasing the value of the manual boost (P.120 parameter).

The Auto boost must be disabled when a multiple motor connection is being used.

Automatic Flux Regulation

P.140 Magn curr gain (Magnetizing current gain)

The magnetizing current of the motor, has approximately the no load current value at rated voltage and frequency. Condition when motor is supplied by reted voltage and frequency.
A control of this variable is performed with the changing of its gain.
The benefit is substantially an availability of motor higher torque at low speeds, obtained with a modality similar to the "boost voltage" function.
A too high setting can cause undesired oscillation.

NOTE!

t is not reconmmended to use this function if sustained operation below 1 Hz is required.

Anti Oscillation Function

P.160 Osc damping gain (Anti Oscillation damping gain)

The parameter (current symmetry) is used to eliminate any oscillation or beat in the motor current resulting from tolerances or configurations capable of generating oscillations within the Inverter/cable/ motor system.
The "0" value set at the factory is effective in many cases. If necessary this value can be altered (0...100) to provide adaptation to the application in question.
During the calibration of the optimum value it is recommended to set the variations of this parameter with slight increases..
The frequency operation range is around 10Hz...30Hz .

Current Clamp

P.180 SW clamp enable (Software current clamp enabling)

To optimize the performance of the inverter, it is necessary to be able to accelerate and decelerate during the

whole ramp time with the maximum current that the inverter can supply to the motor.

The setting of very short ramp times, that would cause an exceeding of the allowable current limits of the drive,

activates the "Current Clamp"circuit avoiding to reach the overcurrent limits and the consequent "OC" trip.

The intervention of the "Current Clamp" circuit, has as consequence an increase of the real time in which the final speed is obtained.

It is anyway possible the disabling of the function, setting this parameter at zero.

Current Limit

The drive is provided with an active current limited function.

It is possible to select different current limits, during the ramps or at steady state.

Current limitation is achieved by a PI regulator effect on speed reference (see P.206 parameter).

P.200 En lim in ramp (Enabling limit in ramp)

Define the kind of control wanted from application

P.200 = 0 None: Function disabled.

P.200 = 1 PI Limiter: Enabling of the current limit control during the ramps, when the current have the value setted by P.201 (Current limit in ramp), the ramp is modified froma PI control in order to keep current under limit setted. Execution of this function increaese ramp presetted.

P.200 = 2 Ramp-freeze: During speed acceleration or deceleration, if the current value exceeds the setting of P.201 (Current limit during the ramp), the ramp stage will be momentary blocked and the speed kept at the value reached in this moment. When the current will decrease again below this limit, the ramp will be restarted with the profile set. Execution of this function increaese ramp presetted.

P.201 Curr lim in ramp (Current limit in ramp)

Value of the current limit during the ramps. It is as percentage of the nominal current of the drive (see also parameter d.950, chapter DISPLAY)

P.202 En lim in steady (Enabling limit in steady)

Enabling of the current limit control during the ramps..

P.203 Curr lim steady (Current limit in steady)

Value of the current limit during steady state. It is as percentage of the nominal current of the drive (see also parameter d.950, chapter DISPLAY).

P.204 Curr ctrl P-gain (Current control proportional gain)

Proportional gain of the current regulator.
a setting too low could have a slow reaction on the regulation response.
a setting too high could can have a too fast reaction with consequent oscillations of the system.

P.205 Curr ctrl I-gain (Current control integral gain)

Integral gain of the current regulation.
a setting too low could have a slow reaction on the regulation response.
a setting too high could can have a too fast reaction with consequent oscillations of the system.

P.206 Curr ctr feedfwd (Current control feed forward)

As described in the figure below, the setting of the feed-forward, allows to avoid the drive trip for overcurrent (OC) during fast acceleration of the load.
When the current exceeds the value of Curr lim in ramp, a quick frequency step (percentage of the motor rated slip), is automatically subtracted to the reference.
In this case the ramp is extended in order to keep the current level under this limit.
A shortening of the extended ramp time, can be of course achieved excluding the load.
This function operates only during the ramp time (not in steady state).

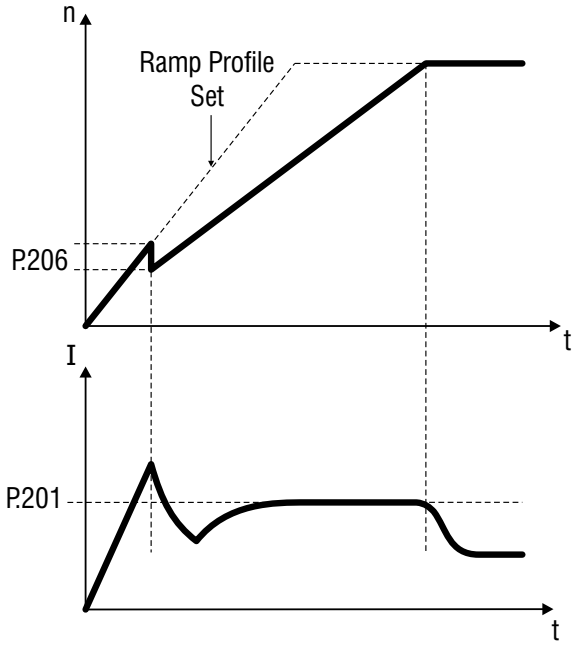


Figure 1.1-27.: Current Limit Control in Ramp

A signalling of the "current limit" condition is available on the digital output as "Current limit".
A signalling of the "overcurrent" condition is available on the digital output as "Alarm state".

P.207 Current limit in deceleration ramp (Current Limit in deceleration ramp)

Value of Current Limit in deceleration ramp. It is as percentage of the nominal current of the drive (see also parameter d.950, chapter DISPLAY).

DC Bus Limit

The function when enabled, performs a control on the voltage level of the DC link bus capacitor.
During fast deceleration if the load has a big inertia, the DC link value (Voltage on condenser of dc stage) can suddenly increase close to the alarm threshold. In this case the ramp is controlled keeping the voltage level within safety values.
Consequently the deceleration ramp time is automatically extended, in order to achieve the deceleration of the load,
trying to avoid an eventual block for "overvoltage" (OV alarm).
As for the current limiter, the DC-Link controller is PI-based, with the addition of a programmable feed forward term (P.220, P.221 e P.222) with or without an action feed-forward (P.223).

P.220 En DC link ctrl (Enabling DC link control)

P.220 = 0 None: Function disabled. Drive execute ramp setted and , if DC Link go over maximum threshold voltage , drive goes on Over Voltage [OV] alarm . This configuration , and if present braking resistance , offer maximum probability of setted time ramp.

P.220 = 1 PI Limiter: Enabling of the DC link control function during ramp phase , if the voltage go to threshold value , the ramp is modified by a PI control , in order to keep voltage under limit setted. The execution of this function can increase time ramp setted .

P.220 = 2 Ramp Freeze: with fast decelarations , if DC link level increase to alarm threshold , execution ramp will be stopped momentary and speed maintain value reached. When DC link voltage go to lower values ramp reprise with the profile set .
The execution of this function can increase time ramp setted .

P.221 DC-lnk ctr Pgain (DC link control proportional gain)

Proportional gain of the DC link control regulation.
A setting too low could have a slow reaction on the regulation response.
A setting too high could have a too fast reaction with consequent oscillations of the system(DC link).

P.222 DC-lnk ctr Igain (DC link control integral gain)

Integral gain of the DC link control regulation.
A setting too low can have a slow reaction on the regulation response.
A setting too high can have a too fast reaction with consequent oscillations of the DC link.

P.223 DC-link ctr FF (DC link control feed forward)

Setting of the feed-forward for the DC control function.

At the increasing of the DC link level, a quick frequency step (percentage of the motor slip), is automatically added to the reference. The voltage level decreases toward its rated value, and is mantained near , increasing deceleration ramp . The system will be ready to react , when load increase DC link toward alarm threshold.

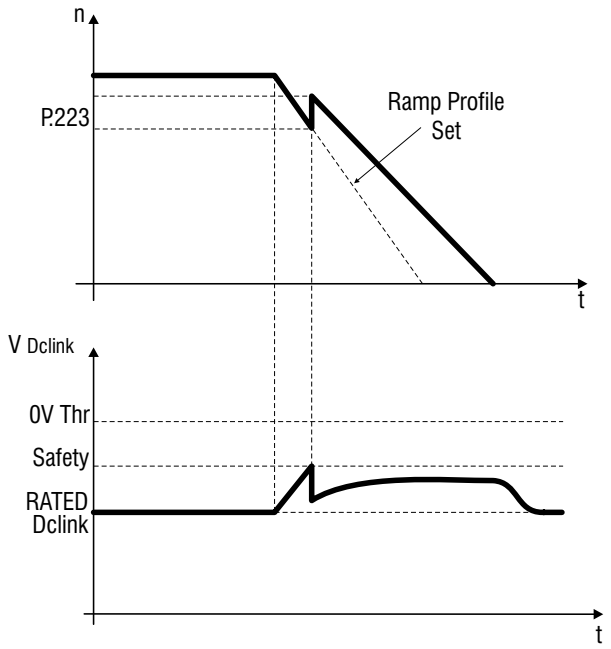


Figure 1.1-28.: DC Link Voltage Control

The "overvoltage " alarm will be displayed with the message "OV".
A signalling of the "DC link" status is available on the digital output as "DC bus limit". (programmation code 13) .

Over Torque Alarm Configuration

The torque of the motor (active current) can be monitored through this function. In particular the overtorque condition and the behaviour of the drive itself, are manageable by these parameters.

P.240 OverTorque mode (OverTorque control mode)
It defines the status of the drive during its overtorque condition.

P.240 = 0 Overtorque signalling during ramps and at steady state. (No alarm will be generated)

P.240 = 1 Overtorque signalling only at steady state.
(No alarm will be generated)

P.240 = 2 Overtorque alarm and signalling during ramps and at steady state.
(The AUTORESET is NOT POSSIBLEnon è possibile l'autoreset)

P.240 = 3 Overtorque alarm and signalling only at steady state.
(The AUTORESET is NOT POSSIBLEnon è possibile l'autoreset))

P.240 =4 Overtorque alarm and signalling during ramps and at steady state.
(The AUTORESET is POSSIBLEè possibile l'autoreset)

P.240 =5 Overtorque alarm and signalling only at steady state.
(The AUTORESET is POSSIBLEè possibile l'autoreset)

Schematic summarySchema riassuntivo

	Overtorque signalling		Alarm signalling	
	ramp	Steady state	ramp	Steady state
P.240 = 0	X	X	-	-
P.240 = 1	-	X	-	-
P.240 = 2	X	X	X	X
P.240 = 3	-	X	-	X

P.241 OT curr lim thr (Overtorque current limit threshold)
Overtorque signalling threshold.
It is a percentage of the Motor rated curr (P.040).

P.242 OT level fac src (Overtorque level factor source)
The overtorque level can be linearly regulated through an analog reference signal.
The regulation of this level will be performed between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the percentage value setted with P.241 (+/- 10V - 20mA).
This parameter selects the source from where this function is provided and controlled.

P.242 = 0 OFF
P.242 = 1 Analog Inp 1 (setting through I.200…I.205)
P.242 = 2 Analog Inp 2 (setting through I.210…I.215) [**]
P.242 = 3 Analog Inp 3 (setting through I.220…I.225) [**]

P.243 OT signal delay (Overtorque signalling delay)
Delay time for the alarm signalling.
The alarm will be displayed with the message "Ot"
A signalling of the "overtorque" condition is available on the digital output as "Out trq>thr".

Motor Overload Configuration

P.260 Motor OL prot en (Motor overload protection enabling)
Enabling of the motor thermal protection.

The control is performed as an I^2t, calculated on the basis of the setting of Motor rated curr (P.040) and Motor thermal K (P.045).
An overload of the motor, will cause the intervention of the alarm "Motor overload".
The parameter d.052 (menu DISPLAY), is the monitoring of the motor overload level.
A value of 100% represent the threshold for the alarm.
The alarm will be displayed with the message "OLM"
Signalling "OLM" displayed is available also on digital output setted as "Alarm state".

Brake Unit Configuration [**]

P.280 Brake res OL en (Braking resistor overload protection enabling)

Enabling of the thermal protection of the braking resistance.
The protection efficiency is dependant on the accuracy of the parameters concerning the rated value of the braking resistance (Power, ohmic value, costant time), will be setted on apposite parameters.
An overload of the braking resistor, will cause the intervention of the alarm "Braking resistor overload"; will be displayed with message "OLr".

P.281 Brake res value (Braking resistor value)

Rated Ohm value of the braking resistance connected.

P.282 Brake res power (Braking resistor power)

Rated power of the braking resistance connected. [pay attention to mounting mode : difference between thermal resistance and maximum power appliable]

P.283 Br res thermal K (Braking resistor thermal costant)

Thermal constant of the braking resistance connected.
This data is expressed in seconds, and it is normally provided by the manufacturer of the device, as the time that the resistor takes to reach its nominal working temperature while dissipating its rated power.
Further information on the use of the braking resistance and braking devices, can be see at chapter "Braking with external resistance".

The parameter d.053 (menu DISPLAY), is the monitoring of the braking resistor overload level.
A value of 100% represent the threshold for the alarm.
The alarm will be displayed with the message "OLr".

DC Brake Configuration

The drive provides as a standard a set of parameters for the DC braking management.
With this function the drive injects a DC current into the motor windings, arousing in this way a

braking torque.

The function can be useful to brake motor near zero speed , either at the START and at the STOP stage, maintaining also the motor shaft locked for a short time.

It should not be used to obtain an intermediate braking.

The function parameters, allow a full control of the function.

At every DC braking command, the message "DCB" will appear on the display.

P.300 DC braking level

Setting of the DC current level to be injected on the motor phases.

It is a percentage of the Motor rated current (P.040).

P.301 DCB lev fac src (DC Braking level factor source)

The DC braking level can be linearly regulated through an analog reference signal.

The regulation of the DC braking level will be between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the value setted with P.300 (+/- 10V - 20mA).

This parameter selects the source from where this function is provided and controlled:

[0] NONE, (default)

[1] IN ANALOG 1_

[2] IN ANALOG 2_

[3] IN ANALOG 3_

P.302 DC braking freq (DC Braking frequency)

It defines the frequency threshold, at which will be activated the DC braking at the STOP.

P.303 DC braking start

Defines the DC braking duration in seconds, at the START (RUN or Reverse).

The motor will be locked until this time is elapsed.

P.304 DC braking stop

Defines the DC braking duration in seconds, at the STOP (RUN or Reverse commands released).

NOTE!

a DC brake command can be carried out also via digital inputs (see chapter INTERFACE,section Digital inputs). In this case a DC brake will be possible at every speed and independently if the drive is in STOP or START condition (digital input as DC brake).

The injection of direct current remanin active for all the transition time of the DC Brake command.

A DC brake while the drive is controlled with a JOG command, can be obtained by the setting ofa digital input as DC brake.

A momentary disabling of the DC braking function, is possible via digital input (digital input as DC brake en).

Mechanical brake configuration

It is possible, with a digital output, give the command closing and opening an external mechanical brake (I.100 = 45). The figure describes the function of the parameters with which to entrust the inverter control brake mechanic configuration.

P.310 Mec braking delay start (Delay time to start desabling brake)

Through P.310 is defined time delay, compared to START command sended from drive.

P.311 Mec braking delay stop (delay time activation brake at stop)

with P.311 it setted delay time , necessary per la logica della particolare applicazione, rispetto al comando di STOP che arriva all'inverter. P.311is the time begin from instant end ramp stop (see fig.)_

Council to set : 0 < P.310 < P.303

0 < P.311 < P.304

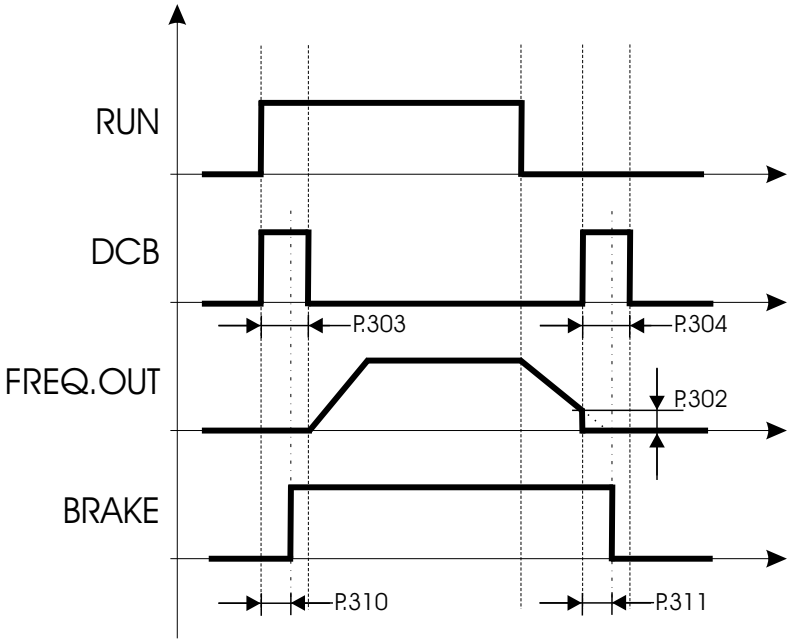


Figura 1.1-29.

NOTE

Output is disactivated (mechanical brake inserted) during execution of auto-tuning (C.100).

NOTE

Output disactivated (inserction of mechanical brake) is immediate icase of alarm.

Autocapture Function

The Autocapture function, allows to engage a motor already running.

An engaging of a motor already running, without the aid of this function, may cause the drive to trip in overvoltage (OV alarm) or overcurrent (OC alarm) when the drive is started.

Enabling the function, the inverter frequency output will be forced to match the motor speed,

according to the command type selected in the Autocapture mode and the setting of the other regulation parameters of this function.
The main uses are:

- · case of pumps with flow present
- · restart after a fault alarm
- · engage of a motor running directly under the mains

The signal of state of function “Autocapture” is avalaible on digital output programmed as “Autocapture run”.

P.320 Autocapture mode (Autocapture Mode - flying restart)

P.320 = 0 Disable: Function disabled (default)
P.320 = 1 1st Run Only : The engaging of the motor is carried out only once, when the first valid RUN command is given after drive power on.
P.320 = 2 Always: The engaging of the motor is carried out at every valid RUN command.

NOTE!

The function can be enabled also through the digital inputs (see chapter INTERFACE, section Digital inputs).
In this case it will be possible to have a Autocapture at any time the command is applied (independent by the setting of P.320).

P.321 Autocapture Ilim (Autocapture current limit)

Current limit threshold for the utocapture function.
For current operation, this limit must be higher than the no-load current of the motor in use.
% of inverter nominal current (compare d.002 current without load with rated value d.950).

P.322 Demagnetiz time (Autocapture demagnetizzation time)

Delay for the beginning of the Autocapture function.
It is the time necessary for the demagnetization the motor. Times too longer can cause the tripping of "Overcurrent" alarm.

P.323 Autocap f scan t (Autocapture frequency scanning time)

Ramp time for the frequency scanning.
The initial scanning frequency type, must be chosen via the selection of parameter P.325.

P.324 Autocap V scan t (Autocapture voltage scanning time)

Ramp time for the voltage recovering.

The function is correlated to the parameter P.323.
The output voltage will be restored, controlling automatically the current limit set in P.321.

P.325 Autocap spd src (Autocapture speed source)
Selection of the source for the initial scanning frequency.

P.325 = 0 Frequency ref:Autocapture scanning start from reference value(default)

P.325 = 1 Max freq Ref.: Autocapture scanning start from maximum value for frequency reference .

P.325 = 2 Last freq ref: Autocapture scanning start from last value setted.

P.325 = 3 Encoder: Autocapture scanning start from frequency value equivalent read from encoder.

NOTE! A signalling of the "Autocapture" status is available on the digital output as "Autocapture run" .

Undervoltage Configuration

A temporary phase loss of line input voltage, can be detected by the inverter intermediate circuit (DC-bus) as variation of its low voltage threshold level.
This condition will cause the tripping of inverter "Undervoltage" (UV) alarm.
A correct configuration of the inverter parameters, can avoid undesired system alarms caused by main dip or instability of the line voltage.
Therefore, considering the above points the inverter will have the following behaviour:
· detection of undervoltage threshold setted with Undervoltage thr (P.340) parameter
· disabling of output control voltage: the motor will coast to stop
· enabling of Autocapture function, if the main dip of the line voltage is lower than the time sets with Max pwrloss time (P.341) parameter; an higher value will cause a tripping of undervoltage inverter alarm (UV)
The enabling of the function depends by the configuration of the following parameters(mre of configuration threshold “undervoltage”:

P.321 Autocapture Ilim **P.322 Demagnetiz time**
P.323 Autocap f scan t **P.324 Autocap V scan t**

NOTE!

The configuration above described is refered to the setting of UV Trip mode (P.343) = 0 parameter.

P.340 Undervoltage thr (Undervoltage threshold)
"Undervoltage" alarm (UV) threshold detection expressed in percent of range.
The undervoltage threshold can be set in a range, within the minimum value allowed (P.340=0%)

and its nominal input voltage selected(default 40%).

Nominal Voltage [Vac]	Voltage Supply [Vac]	Minimum threshold UV [Vdc]	Nominal DC-BUS [Vdc]
230	110	90	155
230	220	125	310
400	230	230	325
400	400	250	565
400	460	250	650

Example:

Parameter S.000 (P.020) Mains voltage = 400Vac
Minimum threshold UV = 250Vdc
DC-Bus nominal value = 565Vdc.
With P.340 = 0% UV = 250Vdc
With P340 = 50% UV= 250 + [(565-250) * 50] / 100 = 408 Vdc
Drive will go on UV alarm when condenser will have Vdc=408V .
With P340 = 80% [Max] UV= 250 + [(565-250) * 80] / 100 = 502 Vdc
Drive will go on UV alarm when condenser will have Vdc=502V .

P.341 Max pwrloss time (Maximun power loss time)

It defines the time before the drive trip for undervoltage alarm.
If the main dip lasts a time longer than the one here set, the undervoltage alarm is issued.

Default P.431=0s, maximum value settable 25s.

P.342 UV alarm storage (Undervoltage alarm storage)

This parameter defines wheter UV alarms have to be stored into the alarm stack during the counting of Max pwrloss time (see chapter DISPLAY, section Alarm list). The alarm will be displayed with the message "UV".
A signalling of the "undervoltage" condition is available on the digital output as "UV running" (programmation code 10).

P.343 UV Trip mode (Undervoltage tripping mode)

This function allows the controlled stop of a single drive/motor configuration, in case of a.c. mains power loss.

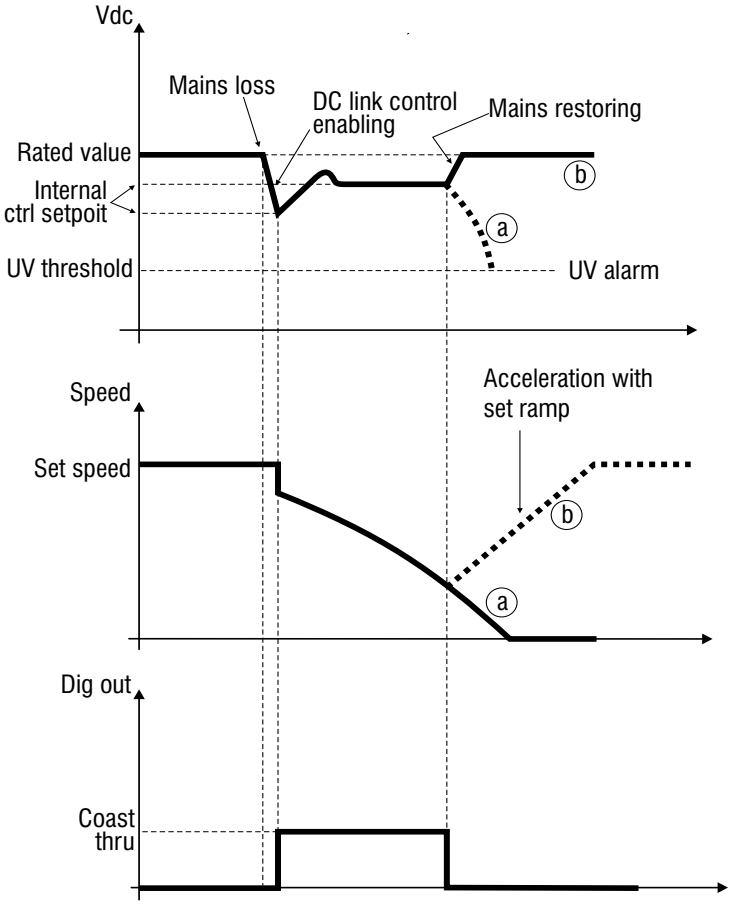
Its working is correctly carried out, only if the load has a sufficient quantity of kinetics energy (eg. Inertial loads). When the DC link voltage drops under the power loss detection threshold, the function is activated.
Automatically an internal threshold is detected and selected, to be higher than the undervoltage level.
The drive will act in accordance with the setting of the function and the behaviour of the mains. This is described in the drawings below.

P.343 = 0 Disable: A mains power loss, will trip the drive for undervoltage alarm (UV)

P.343 = 1 'Coast Through' **Power loss get through**;
see fig. 'COAST THROUGH'

P.343 = 2 'Emg Stop' **Emergency stop**;
see fig. 'EMG STOP'

COAST THROUGH (Power loss get through)



a) the load energy exhausts before the mains is recovered

b) the mains is recovered before the load exhausts its energy

Figure 1.1-30.: Coast thru Stop

• At the mains power loss, the drive will lead the motor to zero speed, with a ramp internally defined and depending by the load inertia (not the one set).

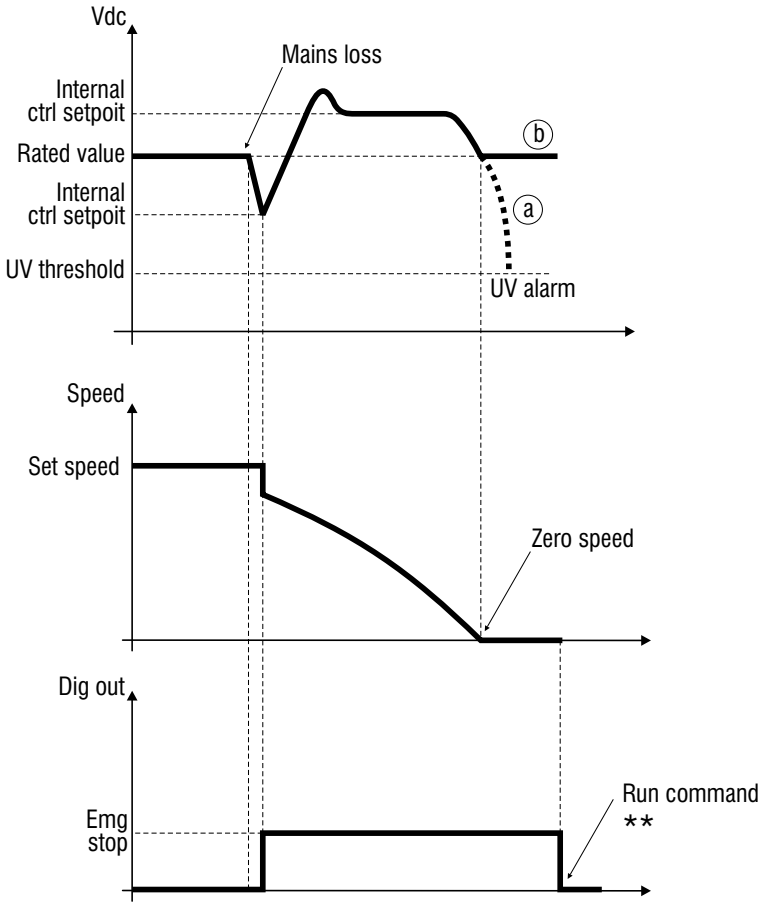
• <u>If during stop phase, will have recovering the mains power, the motor will be led back to its original speed, with the defined acceleration ramp.</u>

• On stop phase deceleration ramp have automatic mode , in function of load inertia, increasing probabilità stop (dont used normal setted ramp).

• When reached the zero speed and exhausted the load energy, if the mains is not recovered, the DC link will drop under the UV threshold.

• The status of the "Coast Trough" function, is available on digital output, programmed as "Coast Thru" .

EMG STOP (Stop emergency)



a) the mains power has not been recovered during the stop procedure
b) the mains power has been recovered during the stop procedure

N.B.

** once speed zero is obtained , if mains power is recovered , in order to make another start motor will be necessary disable RUN command and apply again.

Figure 1.1-31.: Emergency Stop

• EMG STOP function dont forecast possibility to report motor to initial speed when main power is recovered

• At the mains power loss, the drive will lead the motor to zero speed, with a ramp internally defined and depending by the load inertia (not the one set). Will not used ramp setted into the relative parameter for normal function, but begin with fast stop ramp (F.208 - Dec time 4).

• Exhausted the load energy, if the mains is not recovered, the DC link will drop under the UV threshold.

• The status of the "Emergency Stop" function, is available on digital output, programmed as "Emg Stop" .

• In case of high inertias, using braking resistance offer advantage to reduce deceleration time near possibile to fast stop ramp setted.

P.360 OV prevention (Overvoltage alarm prevention)

Enabling this function it is possibile to prevennt drive stop for alarm (OV) " overvoltage" normally occours when system have high inertia and system request short time deceleration is setted.

Using this function the drive will act as follows:

When is reached "overvoltage" threshold , without storage and display alarm, is disabled output stage (or inverter bridge) drive, the motor begin to decelerate per inertia and wait DC-link reduce until safety value.

Automatic enabling of the Autocapture function, and engaging of the motor at the last frequency value, detected before the alarm "Autocapture" .

Normal function drive is recovered and motor folloe ramp setted.

For corrent operations it is necessary to enter the proper settings of the Autocapture parameters "Flying restart", rather:**P.321** Autocapture Ilim

P.322 Demagnetiz time

P.323 Autocap f scan t

P.324 Autocap V scan t

If during the stop phase, the load inertia leads again the DC bus at the limit level, the procedure described above will be iterated.

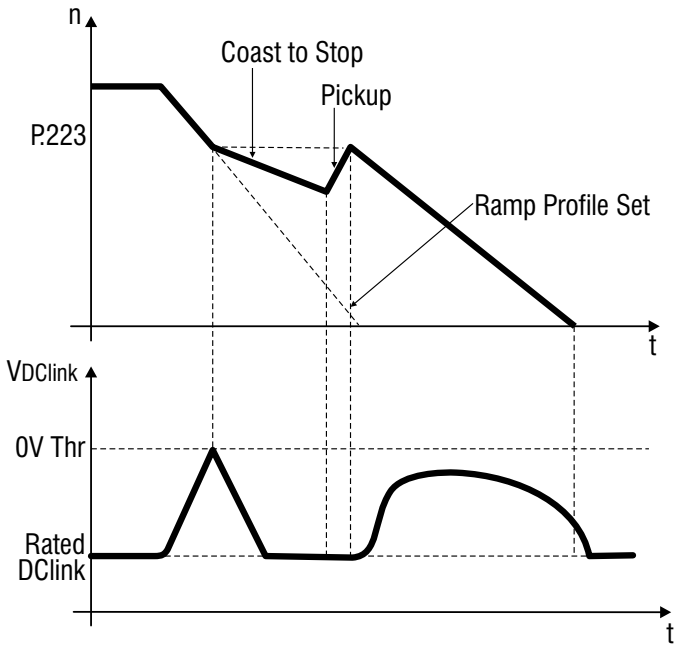


Figure 1.1-32.: Overvoltage Prevention alarm

During prevention alarm, the "overvoltage " alarm will be displayed with the message "OV". Alarm and memory alarm dont store this event.

Autoreset Configuration

The Autoreset function allows the automatic restoring of the working of the drive, after the detection of some alarms.
It will be active only with an appropriate setting of the following parameters and if these alarms have been caused by:

- external fault (programmable) (EF)
- overcurrent (OC)
- overvoltage (OV)
- undervoltage (UV)
- serial time out (St)

P.380 Autoreset attmps (Autoreset attemps)

Setting of the maximum number of attempts for the restarting, after the detection of the alarms.

P.381 Autoreset clear (wait time to reset Autoreset attemps)

When enabled, it clears the number of events setted with Autoreset attmps (P.380) parameter, if for 10 minutes no alarm has been detected.

P.382 Autoreset delay (Time Autoreset delay)

Delay that elapses between the failure detection and the beginning of the autoreset sequence.

P.383 Autores flt rly (Rele status Autoreset fault relay)

Definition of the status for the relays and digital outputs, during the autoreset function, when programmed as follows:

Parameters	**"Relays & Dig Out" programming**		
P.383	***Drive OK***	***Alarm state***	***No alarm state***
0	ON	OFF	ON
1	OFF	ON	OFF

NOTE!

"Reset" normal command , can be supplied also through digital input (see chapter INTERFACE, section Digital inputs). Reset command will be execute only if drive is in fault condition (RUN and Reverse disabled) and alarm cause removed .

External Fault Configuration

P.400 Ext fault mode (External fault mode)

Configuration of signalling for the "External fault alarm".

P.400 = 0	Always signalled	- Autoreset not possible
P.400 = 1	Signalling only when applied the RUN command	- Autoreset not possible
P.400 = 2	Always signalled	- Autoreset possible
P.400 = 3	Signalling only when applied the RUN command	- Autoreset possible

The alarm will be displayed with the massage "EF".

A signalling of the "external fault" condition is available on the digital output as "Extern fault".

Phase Loss Detection [**]

P.410 Ph Loss detec en (Phase Loss detection enabling)

The enabling of this function allows to detect the missing of any phase of the input supply. :

P.410 = 0 Disabled

P.410 = 1 Enabled

The alarm will be displayed with the message "PH".

A signalling of the "phase loss " condition is available on the digital output as "Alarm state".. (Only for drive three phase type, 2T e 4T)

Voltage Reduction Configuration

When a motor is found to use only partial power during normal running conditions, enabling this function reduces the motor flux current to save energy coast.

P.420 Volt reduc mode (Voltage reduction mode)

Definition of the mode for the output voltage reduction.

P.420 = 0 The output voltage reduction is always applied.

P.420 = 1 The output voltage reduction is not applied during the ramp, providing in this way the availability of the full torque up to the achieving of the maximum setup of the V/F ratio.

The voltage reduction will be activated only at constant speed (end of ramp).

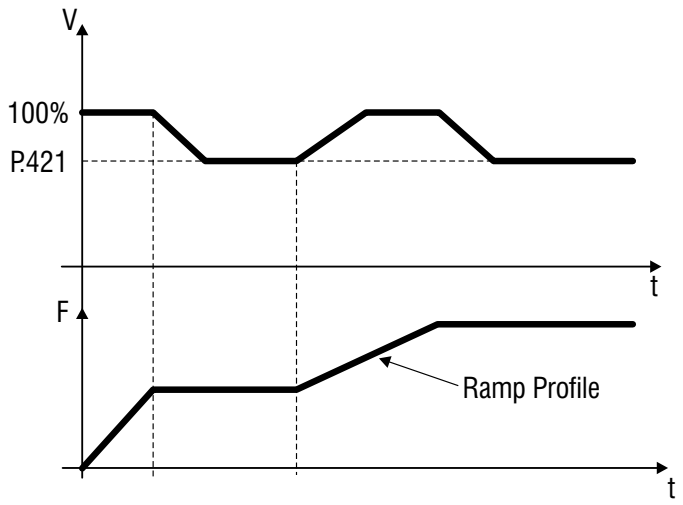


Figure 1.1-33.: The output voltage reduction with P.420 = 1

P.421 V reduction fact (Voltage reduction factor)

Level of the output voltage, that will be applied on the motor terminals.

It is percentage of the voltage, resulting from the V/F ratio (vedi figura).

P.422 V fact mult src (Voltage reduction factor multiply source)

The output voltage level reduction, can be linearly regulated through an analog reference signal.

Its regulation will be performed in a range between 10% (setting the input at 0V - 0mA - 4mA) and 100% of the value setted with P.421 parameter (+/- 10V - 20mA).

NOTE!

The level of voltage reduction, will be applied in accordance to the output voltage value, based on the characteristic of the V/F ratio.

Example:

P.421 = 30%

V/f motor characteristic= 220V / 50Hz

Motor supply voltage= 220V / 50Hz: 220 - (220 x 30) / 100 = 154

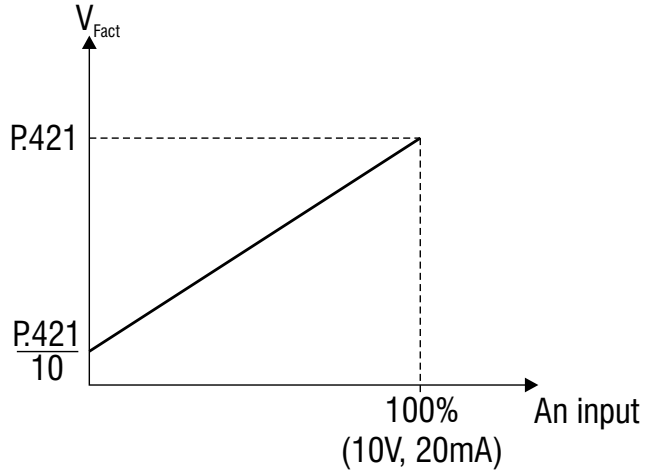


Figure 1.1-34.: Voltage reduction factor multiply

NOTE!

the function can be enabled also through the digital inputs (see chapter INTERFACE, section Digital inputs). In this case it will be possible to have the Output Voltage reduction and vice versa, at any time the command is applied.

Frequency Threshold

P.440 Frequency thr 1 (Frequency programmed 1)
Set point for the detection of the first frequency threshold.
The signalling of the frequency level detection, can be programmed on the digital outputs.

P.441 Freq prog 1 hyst (Frequency programmed 1 hysterisis)
Defines a tolerance band around the Frequency prog 1 (P.440).

P.442 Frequency thr 2 (Frequency programmed 2)
Set point for the detection of the second frequency threshold.
The signalling of the frequency level detection, can be programmed on the digital outputs.

P.443 Freq prog 2 hyst (Frequency programmed 2 hysterisis)
Defines a tolerance band around the Frequency prog 2 (P.442).

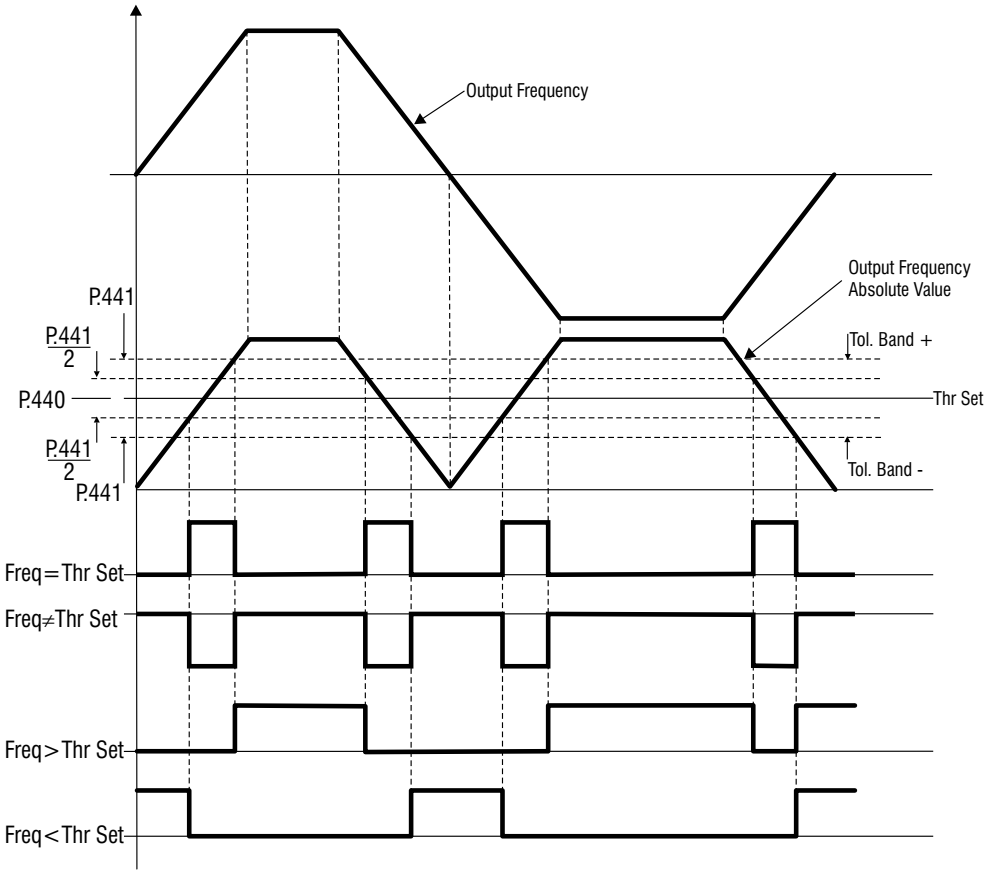


Figura 1.1-35.: Program Frequency Tresholds (example of P.440 and P.441)

A signalling of the "frequency threshold" status is available on the digital output as "Freq thr 1" and "Freq thr 2". (programming code I.100 = 30 … 36)

Steady State Signalling

The signalling of a speed variation when running in steady state, is possible with this parameters.

P.460 Const speed tol (Constant speed tollerance)
It defines the tollerance band of the speed variation. [$f_n \pm$ P.460]

P.461 Const speed dly (Constant segnalling delay)
Delay time for the signalling.

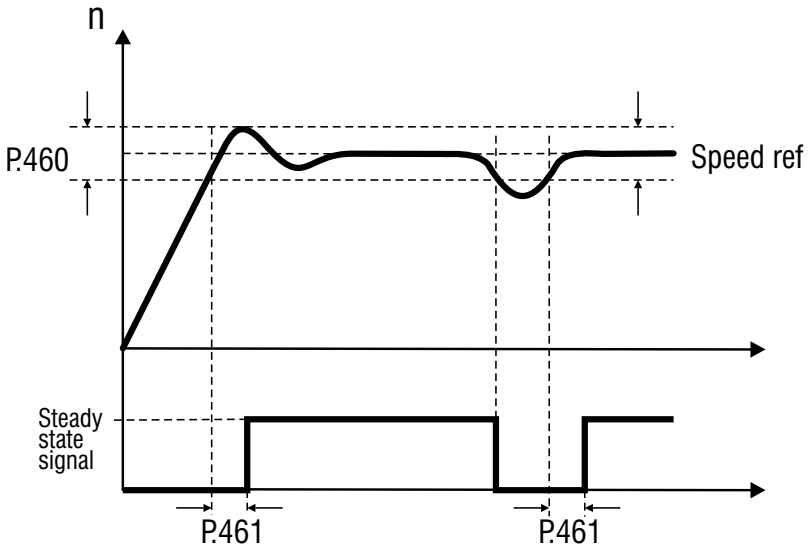


Figure 1.1-36.: Constant Speed Control

A signalling of the "steady state" condition is available on the digital output as "Steady state". (programming code 6).

Heatsink Temperature Threshold [**]

Control and monitoring of the drive heatsink temperature.

P.480 Heatsnk temp lev (Heatsink temperature level)
Setting of the temperature threshold in °C.
P.481 Heatsnk temp hys (Heatsink temperature hysterisis)
Tolerance band for he signalling of the temperature threshold.
The parameter d.050 (menu DISPLAY), is the monitoring of the heatsink temperature level .
The alarm will be displayed with the massage "OHS".
A signalling of the "heatsink temperature" status is available on the digital output as "Hs temp thr".

Modulation Frequency

P.500 Switching freq (Switching frequency)
Setting of the modulation frequency of the drive.

P.501 Sw freq reduc en (Switching frequency reduction enabling)
When enabled, the modulation frequency is automatically reduced, when the output frequency of the drive is below 5Hz.
This in particular, can avoid the overheating of the motor at low speed ,caused by high commutation in its winding. Furthermore it improves the output sinuswave form, providing a smoother rotation.

P.502 min switching frequency (Minimum Switching frequency)

Define minimum frequency modulation during ridution made when output frequency goes under 5 Hz.

P.503 flat switching enable (Flat switching enable)

P.503= 0	Sinusoidal Modulation with 3° harmonic in tutto il range di frequenze di uscita.	
P.503= 1	Flat Modulation; optimize thermal performance.	(default)

P.520 Overmod max lev (Overmodulation maximun level)

Setting of the overmodulation maximum level.

This function increases the output voltage, providing as consequence a higher torque availability.

This function is useful when $f_{out}>f_{rete}$ or when voltage is reduced

A setting too high of the parameter could be increases the distortions of the output voltage and create undesired vibrations of the system.

P.540 Out Vlt auto adj (Output voltage automatic adjustement)

The voltage applied to the motor terminal is defined by the parameter Max output voltage (P.061), and it is strictly correlated to the value of the mains voltage.

This function can make independent the motor output voltage from eventual fluctuation of the mains, through an automatic adjustment of the first.

Dead Time Compensation

The "dead time compensation" fucnction allows for compensation of the output voltage distorsion due to IGBT voltage drop and its switching characteristics.

Distorsion of output voltage may cause non uniform, non smooth shaft rotation in open loop control.

Through the two parameters it is possible to set a voltage value and the compensation variation, called Gradient.

P.560 Deadtime cmp lev (Dead time compensation level)

This function consent to control Dead time compensation level

P.561 Deadtime cmp slp (Dead time compensation slope)

Compensation gradient value.

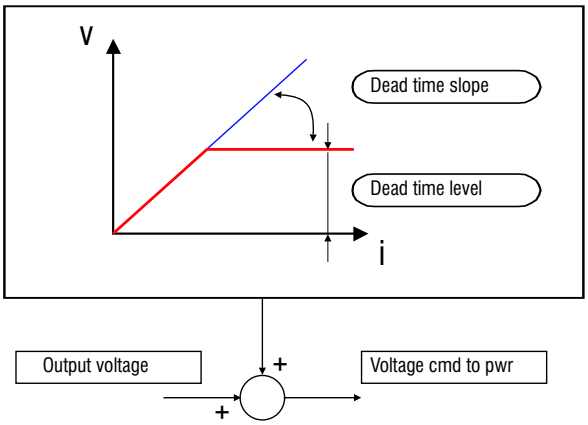


Figure 1.1-37.: Dead time compensation

NOTE!

For autotuning of parameter P.560 and P.561 see C.101_

Display Setting

P.580 Startup display (Startup display parameter)

It is possible to define the first parameter that will be displayed at every power-on of the drive.

The choice can be carried out by the setting of the corresponding "IPA", reported in the parameters list table.

P.600 Speed dsply fact (Display factor conversion, [Mantissa]) [see P.601]

Costant conversion for variables displaying, as speed and speed reference : d.007, d.008, d.009 and F.001.

The parameters can be applied at the variable reported at the chapter DISPLAY, section Basic and Encoder , choosing **P602**

Example

Setting P.600, considering of reduction coefficient of a gearbox, it is possibile display with d.007, d.008 e d.009 variables on the output shaft .

P.601 Speed dsplay exp (Display factor conversion exponent)

Factor convention used in d.007, d.008, d.009 and F.001 is gived by **K=P.600 x 10^(P.601)**

With default, P.601=0, obtain **K=P.600 x 1=P.600**

P.602 Speed unit selec (Selector K_{rpm} and K)

P.602 define display mode of variable relative to reference speed **d.007**, output speed **d.008**, estimation real speed **d.009** and to the reference speed with motopotentiometer **F.001**

P.602 = 0 display frequency values [Hz]

P.602 = 1 display frequency values [Hz] multiplied for K
with **K=P.600 x 10^(P.601).** Ex. P.600=10, P.601=0 : K=10

P.602 = 2 display values speed in RPM
(routes per minute). [display: Hz***Krpm**=Hz***60/P.041**]

P.602 = 3 display value speed in RPM
(giri al minut) multiplied for K.
[display: Hz*Krpm*K=Hz*(60/P.041)*(P.600 x 10^(P.601) where
'Hz' is refered to the frequency displayed in d.000 for d.007, evidenced in d.001 for d.008, evidenced in d.000, less estimation speed, for d.009_

computation of Krpm=60/P.041 is made from drive.

NOTE

For a correct estimation of d.009 it is necessari to set P.040, P.041, P.042, P.046, P.062.

Parameter Protection

P.999 Param prot code (Parameters protection code)
Protection against undesired modification of the parameters.

P.999 = 0 No protection and storage of the parameters with motor stopped. (default)

P.999 = 1 All the parameters are protected a part the digital frequencies F.100...F.116.

P.999 = 2 All the parameters are protected.

P.999 = 3 No protection and storage of the parameters with the motor running (NOT RECOMENDED).

7.2.6 Menu A – APPLICATION

PID Setting	A -APPLICATION

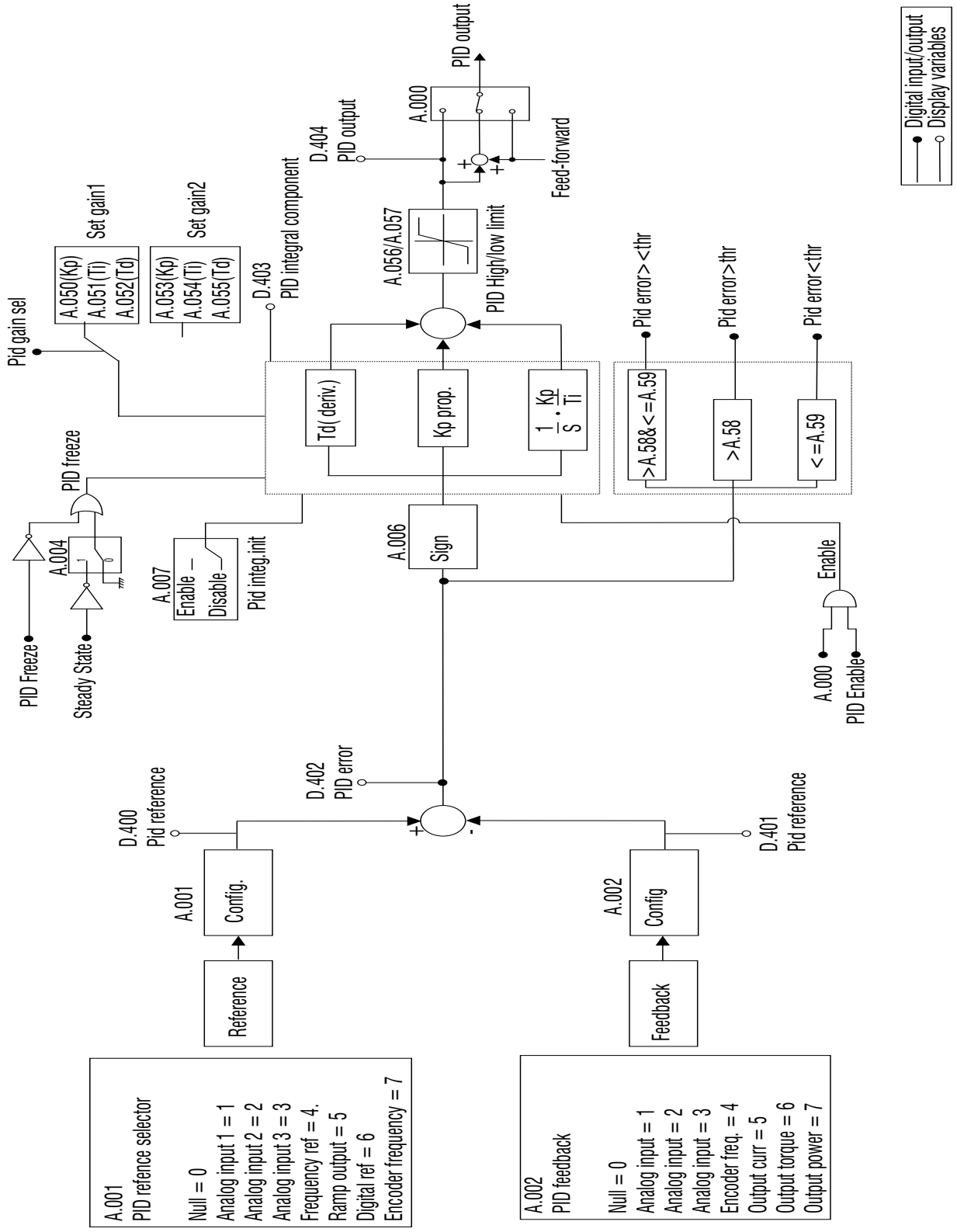


Figure 1.1-38.

In the PID menu are contained all the parameters concerning the setting of the PID function.
This function on inverter STMDRIVE is studied to following applications:

- nip rolls with dancer or load cell
- pressure regulation for pumps and extruders
- speed loop control with encoder or tachometer dynamo

A use of the PID block as stand-alone is also possible, correlated (or not) to the RUN status of the drive, enabling an analogue output as output function PID.

A.000 PID Mode (PID MODE)

This parameter allows to set regulation mode of the PID function

A.000 = 0 Disable disabled function.

A.000 = 1 Freq.sum The output of the PID regulator is added to the ramp output reference value (with feed-forward).

A.000 = 2 Freq.direct The PID regulator output is directly input to the V/f profile generator.

A.000 = 3 Volt sum The PID regulator output is added to the voltage reference, calculated in accordance with the setting of the V/F ratio (with feed-forward).

A.000 = 4 Volt direct The output of the PID controller is the voltage applied to the motor. The curve V / f is not used.

A.000 = 5 Stand alone The PID function can be used as generic control. The regulator will be active only when the drive will be in RUN..

A.000 = 6 St-al always The PID function can be used as generic control. The regulator is not correlated to the drive status

Figure 1.1-39.: PID Mode as Frequency Sum or Direct

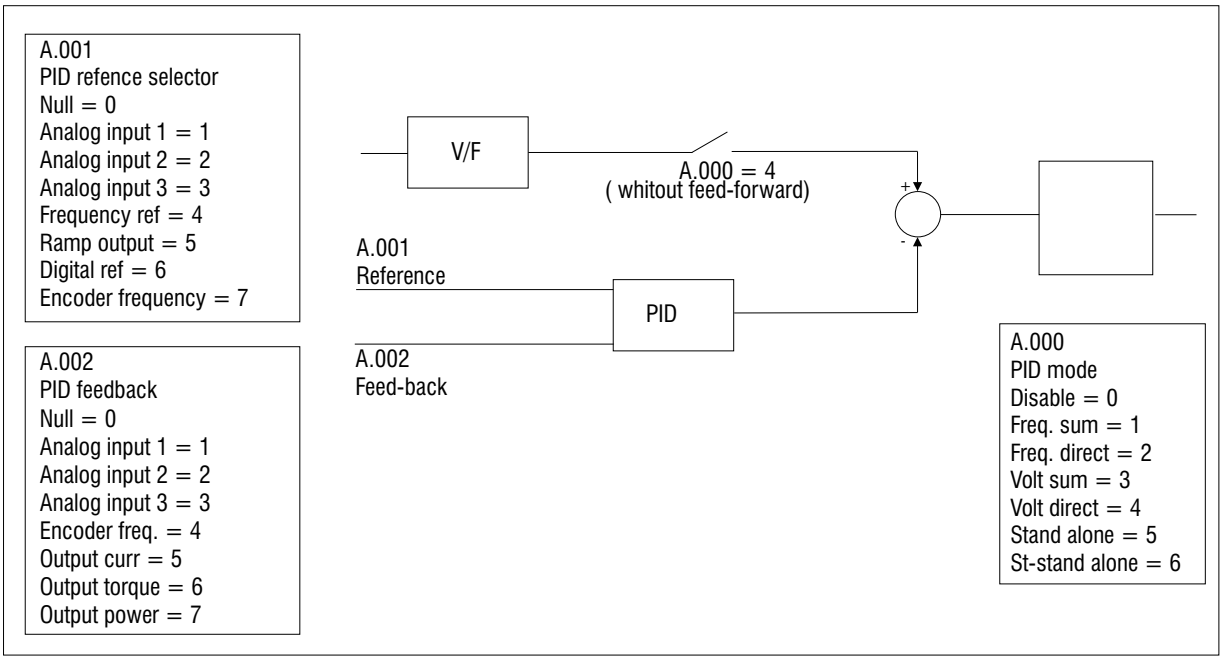


Figure 1.1-40.: PID Mode as Voltage Sum or Direct

A.001 PID reference selector (Selettore riferimento PID)

This parameter define and select the source reference signal of PID regulator.

A.001 = 0	Null	None reference selected
A.001 = 1	Analog inp 1	Reference connected to analog input 1
A.001 = 2	Analog inp 2	Reference connected to analog input 2
A.001 = 3	Analog inp 3	Reference connected to analog input 3
A.001 = 4	Frequency ref	Reference connected to the variable Frequency reference
A.001 = 5	Ramp output	Reference connected to the block ramp output
A.001 = 6	Digital ref	Reference setted from parameter "PID digital ref" A.003_
A.001 = 7	Encoder freq	Reference connected to the encoder input

A.002 PID Fbk sel (PID feedback selector)

It defines and selects the source, from where the PID feed-back signal is provided and controlled.

A.002 = 0	Null	Nessun feedback selezionato
A.002 = 1	Analog inp 1	PID Feed-back connected to Analog input 1
A.002 = 2	Analog inp 2	PID Feed-back connected to Analog input 2
A.002 = 3	Analog inp 3	PID Feed-back connected to Analog input 3
A.002 = 4	Encoder freq	PID Feed-back connected to Encoder frequency
A.002 = 5	Output curr	PID Feed-back connected to Output current signal

A.002 = 6	Output torque	PID Feed-back connected to Output torque signal
A.002 = 7	Output power	PID Feed-back connected to Output power signal

A.003 PID digital ref (PID digital reference)

Setting of the reference for the PID function.

It will be active only if PID Fbk sel (A.002) is set as "6"

A.004 PID activate mode ( )

It defines if the PID function has to always be enabled or if it has active in steandy state only:

A.004 = 0	Always	The PID function is always enabled
A.004 = 1	Steady state	The PID function is enabled only at steady state

A.005 PID-Encoder Sync (PID encoder syncronism)

The function syncronizes the updating time of the PID regulator, with the ones of the encoder feedback reading.

A.005 = 0	Disable	The function is not enabled. Setting to parameter PID update time (A.008).
A.005 =1	Enable	The function is enabled. Setting of parameter A.008 has no effect PID regulation will be updated according to I.504.

A.006 PID err sign rev (PID error signal reverse)

It allows to invert the polarity of the error signal between the reference and the feed-back (as consequence also the regulation effect is modified).

A.007 PID Integ Init en (PID integral initializzation enabling)

The function allows to initialize the "integral parts" at the RUN command or during the passage from "gains setting 1" to "gains setting 2". This allows to avoid abrupt oscillation of the regulator output.

When the function is active, the value of the integral component, will take on a value equal to:

Iinit = Pid output - ((Kp x err) + (Kd x Derr).

A.008 PID update time (PID update time)

It defines the updating time of the PID regulator. The value 0.00 means minimum updating time (5ms).

PID Gains

The enabling of the PID regulator and the selection of two different gains setting, can be carried out via programmable

digital inputs. Below are reported the parameters concerning the gains regulation.
Switching between the two sets of gains is possible through the programmation of a digital input as Pid gain sel (code 21) [es. I.100=21].
Enabling PID function is possible through the programmation of a digital input as PID Enable (code 20).
To avoid abrupt fluctuations following the modification of set income might be necessary to activate the function PID Integ Init en (A.007).

A.050 PID Prop gain 1 (PID proportional gain 1)
Proportional part gain (set 1)

A.051 PID Int t const 1 (PID integral constant 1)
Integral action time (set 1)

A.052 PID Deriv gain 1 (PID derivative gain 1)
Derivative action time (set 1)

A.053 PID Prop gain 2 (PID proportional gain 2)
Proportional part gain (set 2).

A.054 PID Int t const 2 (PID derivative gain 2)
Integral action time (set 2)

A.055 PID Deriv gain 2 (PID integral constant 2)
Derivative action time (set 2)

PID Limits

A.056 PID high limit (PID high limit)
Setting of the maximum allowed PID output.

A.057 PID low limit (PID low limit)
Setting of the minimum allowed PID output.

A.058 PID max pos err (PID maximun positive error)
Setting of the maximum positive limit of the regulator error. It is expressed as percentage of the full scale value.It defines the threshold for the digital output signalling.

A.059 PID max neg err (PID minimun positive error)
Setting of the maximum negative limit of the regulator error. It is expressed as percentage of the full

scale value

It defines the threshold for the digital output signalling :

18	PID err><	PID error is >A.058 &<=A.059
19	PID err>thr	PID error is >A.058
20	PID err<thr	PID error is <=A.059
21	PID er ><(inh)	PID error is >A.058 &<=A.059 (*)
22	PID er >(inh)	PID error is >A.058 (*)
23	PID er <(inh)	PID error is <=A.059 (*)

(*)he control through the digital output, can become active only when the error returns the first time in the preset interval.

The PID variables can be monitored in the following parameters:

D.400	PID reference	monitor Reference signal
D.401	PID feedback	monitor Feedback signal
D.402	PID error	monitor Signalling of the error between reference and feedback
D.403	PID integral comp	Actual value of the integral component
D.404	PID output	Actual value of the PID regulator output

7.2.7 Menu C – COMMAND

All the parameters of the COMMAND menu require to be executed according to the procedure listed below.

Save parameters command is used as example. :

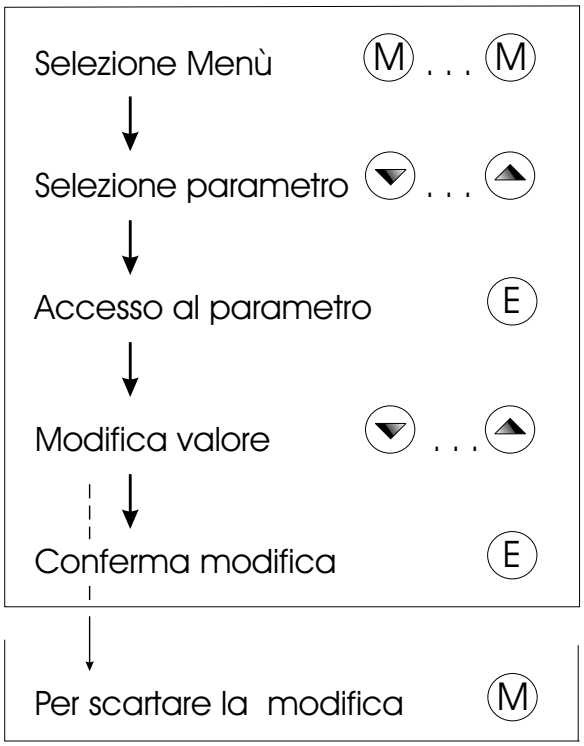


Figura 1.1-41.

The parameters Commands have access to 'off' button and the UP leads them to 'do' at this point with the 'E' button you execute, and display the words' done '. The Command was execute_

Basic Commands	C -COMMAND

C.000 Save parameters (Save parameters command)

Every changing of each parameter, is immediately accepted and executed by the drive.

However, permanent storage of them, is performed only by the execution of this command.

Unsaved modifications to any parameter will be lost when the drive is turned off.

C.001 Recall param (Recall param command)

The function recalls the parameters that were previously stored, replacing the ones currently in use.

C.002 Load Default (Load Default factory command)

Recall of the factory parameters.

The storage of them is a choice of the user using C.000 command.

Alarm Register Reset

C.020 Alarm clear (Reset alarm clear)

The function reset completely the Alarm List register (d.800...d.803)).

Programmamig Key

C.040 Recall key prog (Recall key programming)

Recalling and storage of the parameters contained in the optional external key KN-PRGE.

C.041 Save pars to key (Save parameters to key)

Storage of the inverter parameter on the optional external key KN-PRGE (optional)
Option key will be inserted into the connector on the board of adjustment.

Autotuning

C.100 Measure stator R (Autotaratura resistenza statorica)

It measures the stator resistance of the motor connected and at the same time also makes an estimate of nominal slip.
I due valori vengono memorizzati rispettivamente in P.043 e P.046. Tali parametri sono impostabili anche manualmente nel caso in cui non si possa effettuare l'autotaratura o se ne vogliano modificare le letture.
This will help to provide a smooth and uniform value of the output torque through the whole speed range. The control is helped by the use of the Automatic boost P.122_

NOTE !

Do not perform any tune when a multiple motor connection is being used.

C.101 Measure dead time (measure dead time command)

Optimize on the electrical characteristics of the system which is connected, the values of the parameters P.560 and P.561 relating to the compensation of dead time.

7.2.8 Menu H - HIDDEN

This menu is not available on the keypad. The setting and the reading of the parameters here contained, can be performed exclusively via serial line or through interface card.

Virtual I/O Commands	H -HIDDEN

H.000 Virtual digital command (Virtual digital command)

Settings of virtual commands.

Setting of the bits for the virtual commands assignment.

A byte is available for the selection of 8 digital commands, whose setting will interact with the "decoder mask".

The status of this mask will determine the switch for a virtual command (high status) or terminal command (low status).

Defining the mask for a virtual command, the function programmed on the digital inputs (I.000...I.007), will be executed by this parameter in accordance with the setting of its bits.

	Weight	
IN 1	Bit 1 = 1	Virtual command 1 Enabled
IN 2	Bit 2 = 2	Virtual command 2 Enabled
IN 3	Bit 3 = 4	Virtual command 3 Enabled
IN 4	Bit 4 = 8	Virtual command 4 Enabled
IN 5	Bit 5 = 16	Virtual command 5 Enabled
IN 6	Bit 6 = 32	Virtual command 6 Enabled
IN 7	Bit 7 = 64	Virtual command 7 Enabled
IN 8	Bit 8 = 128	Virtual command 8 Enabled

The setting of the bits at "0", will mean the disabling of the respective function.

For further information about the function programming, see chapter INTERFACE section Enabling Virtual I/O

H.001 Exp virtual digital command (virtual digital command optional board)

Analog function of H.000, but for setting on digital input of optional board.

H.010 Virtual digital state (Virtual digital state command)

Setting of the bits for the virtual digital output function assignment.

A structure of 4 bits is available for the selection of the 4 digital outputs, whose setting will interact with the "decoder mask". The status of this mask will determine the switch for a virtual digital output function (high status) or the function of the drive (low status).

Defining the mask as virtual, the digital outputs function will be executed by this parameter, in accordance with the setting of its bits. (I.100…I.103), will be performed does bits of H.010

	Weight	
OUT 1	Bit 1 = 1	Virtual function digital output 1 Enabled
OUT 2	Bit 2 = 2	Virtual function digital output 2 Enabled
OUT 3	Bit 3 = 4	Virtual function digital output 3 Enabled
OUT 4	Bit 4 = 8	Virtual function digital output 4 Enabled

The setting of the bits at "0", will mean the disabling of the respective function.
For further information about the function programming, see chapter INTERFACE section Enabling Virtual I/O.

H.011 Exp Virtual digital state (State commands digital virtual option card)

Reserved

H.020 Virtual An Output 1 (Virtual Analog Output 1)

H.021 Virtual An Output 2 (Virtual Analog Output 2)

Setting of the value of the virtual analog outputs.
According to the status of the "decoder mask", is determined if the analog outputs will provide a signalling deriving from the drive function (low status) or from a setting of the virtual control (high status).
Defining the mask as virtual, the value on the analog outputs can be regulated by the setting of these parameters.

H.020 and H.021 = 0 analog outputs value = 0V
H.020 and H.021 = +32767 analog outputs value = +10V
H.020 and H.021 = -32767 analog outputs value = -10V

For further information about the function programming, see chapter INTERFACE section Enabling Virtual I/O.

H.022 Exp Virtual An Output 1 (Analog output virtual 1 expanded board)

Reserved

Profidrive Profile

H.030 Profidrive Control word (Control word profidrive)

Drive control word in accordance with the Profidrive profile.
For further information please refer to the instruction manual of the interface card (Profibus).

H.031 Profidrive Status word (Status word profidrive)

Drive status word in accordance with the Profidrive profile.

For further information please refer to the instruction manual of the interface card (Profibus).

H.032 Profidrive Reference (Profidrive Reference)

Using a Profibus SBI card, the speed reference of the drive has to be set through this parameter, in accordance with the Profidrive profile.

H.031 = 0 Reference = 0Hz
H.031 = +4000 hex Reference = Max ref freq (F.020)
H.031 = -4000 hex Reference = Max ref freq (F.020)

H.033 Profidrive Actual Frequency (Profidrive Actual Frequency)

Reading of the drive output frequency, in accordance with the Profidrive profile.
For details how program the functions, see chapter INTERFACE, section Enabling Virtual I/O..

Drive Status

H.034 Drive Status (Drive Status)

A structure of 4 bits, allows to monitor the drive status.
The meaning of them is the following:

Bit 0 Drive ready
Bit 1 Alarm state
Bit 2 Motor running
Bit 3 Steady state

H.040 Progress (State commands execution)

It is the indication in percentage of the progress about the "Save parameters" function.
A displaying of 100% means that the function has been completed.

0÷100	Function running
100	Function completed successfully
356	Function completed unsuccessfully

Parameters Reading Extension

When used a high conversion factor (P.600), the speed parameters reading must not exceed the values included between +32767 and -32767.
Over this threshold, it is possible to monitor the variables through this parameters, whose structure allows a reading extension structure at 32 bits..

H.050 Drive output frequency 16 bit low (Drive output frequency 16 bit low)

(d.000)

H.051 Drive output frequency 16 bit high (Drive output frequency 16 bit high) (d.000)

H.052 Drive reference frequency 16 low (Drive reference frequency 16 low) (d.001)

H.053 Drive reference frequency 16 high (Drive reference frequency 16 high) (d.001)

H.054 Output speed (d.000)*(P.600) 16 bit low (Output speed (d.000)*(P.600) 16 bit low) (d.007)

H.055 Output speed (d.000)*(P600) 16 bit high (Output speed (d.000)*(P600) 16 bit high) (d.007)

H.056 Speed Ref (d.001)*(P.600) 16 bit low (Speed Ref (d.001)*(P.600) 16 bit low) (d.008)

H.057 Speed Ref (d.001)*(P.600) 16 bit high (Speed Ref (d.001)*(P.600) 16 bit high) (d.008)

H.058 Encoder freq 16 bit low (Encoder frequency 16 bit low) (d.301)

H.059 Encoder freq 16 bit high (Encoder frequency 16 bit high) (d.301)

H.060 Encoder speed (d.000)*(P.600) 16 bit low (Encoder speed (d.000)*(P.600) 16 bit low) (d.302)

H.061 Encoder speed (d.000)*(P.600) 16 bit high (Encoder speed (d.000)*(P.600) 16 bit high)(d.302)

H.062 Active alarms low

H.063 Active alarms high

H.064 Velocità reale stimata LOW (d.009)

H.065 Velocità reale stimata HIGH (d.009)

Remote I/Os Control

For control inputs and outputs on I / O cards remote connection of the inverter refer to the documentation that comes with the option card.

H.100 Remote Digital Inputs (0..15) (Remote Digital Inputs - 0..15)

H.101 Remote Digital Inputs (16..31) (Remote Digital Inputs - 16..31)

H.110 Remote Digital Outputs (0..15) (Remote Digital Outputs - 0..15)

H.111 Remote Digital Outputs (16..31) (Remote Digital Outputs - 16..31)

H.120 Remote Analog input 1 (Remote Analog input 1)

H.121 Remote Analog input 2 (Remote Analog input 2)

H.130 Remote Analog output 1 (Remote Analog output 1)

H.131 Remote Analog output 2 (Remote Analog output 2)

Serial Link Commands

As reported at the chapter PARAMETERS section Commands, setting the P.000 =3 (SERIAL), the main commands are selectable exclusively via serial line or fieldbus.
The parameters listed below, are all the commands available when this function is selected..

H.500 Hardware Reset (Reset Harware)
Reset Hardware

H.501 Alarm Reset (Alarm Reset)
Alarm Reset

H.502 Coast to stop (Coast to stop)
Coast to stop

H.503 Stop with ramp (Stop with ramp)
Stop with ramp

H.504 Clockwise Start (Clockwise Start)
Clockwise Start

H.505 Anti-clockwise Start (Anti-clockwise Start)
Anti-clockwise Start

H.506 Clockwise Jog (Clockwise Jog)
Run Clockwise Jog

H.507 Anti-clockwise Jog (Anti-clockwise Jog)
Run Anti-clockwise Jog

H.508 Clockwise Autocapture (Clockwise Flying restart)
Clockwise Flying restart

H.509 Anti-clockwise Autocapture (Anti-clockwise Flying restart)
Anti-clockwise Flying restart

H.510 DC Brake (DC Brake)
DC Braking command

H.511 Reserved

Standard Commands Profibus

Refer to the documentation attached to the optional Profibus interface

H.918	**Profidrive 918**	(Station Adress)
H.947	**Profidrive 947**	(Fault Number)
H.967	**Profidrive 967**	(Last control Word)
H.968	**Profidrive 968**	(Last Status Word)

8. Modbus RTU Protocol

8.1. Introduction

In the chapter the Drive parameters are referred to as 16-bit Modbus registers; a 32-bit Drive parameter covers therefore two Modbus registers.
See chapter 7 for the following correspondences: parameter index and Modbus register.

8.2. MODBUS Protocol

The MODBUS protocol defines the format and the communication modes between a system controlling "master" and one or more "slaves" aimed at answering to the master requests. The protocol states how the master and the slaves start and stop their communication, how the messages can be exchanged and how the errors can be detected. A common line can host one master and 247 slaves; this is a protocol logic limit, the device number can be further limited by the physical interface;the present implementation foresees a maximum number of 32 slaves to be line-connected.
A transaction can be started exclusively by the master. A transaction can have a direct demand/response format or a
broadcast format. The former is addressed to a single slave, the latter to all the line slaves, which, on their turn, give no response. A transaction can have a single demand/single response frame or a single broadcast message/no response frame.
Some protocol features have not been defined. They are: interface standard, baud rate, parity, stop bit number. The protocol allows also to choose between two communication "modes": ASCII and RTU (Remote Terminal Unit). The RTUmode, which is the most efficient, is implemented in the Drives.
The JBUS protocol is similar to the MODBUS protocol; the only difference is given by the address numbering system: in MODBUS the numbering system starts from zero (0000 = 1st address) while in JBUS it starts from one (0001 = 1st address); this variance is maintained throughout the whole system. The following descriptions, if not otherwise stated, refer to both protocols.

8.3. Message format

In order to communicate between the two devices, the message has to be contained into a "casing". The casing leaves the
transmitter via a "port" and it is "brought" along the line to a similar "port" on the receiver. MODBUS states the format of the
casing, which, both for the master and for the slave, contains:

- The slave address for the master stated transaction (the address 0 corresponds to a broadcast message sent to all the slaves).
- The code of the function (already performed or to be performed).

- The data to be exchanged.
- The error control according to the CRC16 algorithm.

If a slave detects an error in the received message (a format, parity or CRC16 error), the message is invalid and therefore rejected; when a slave detects an error in the message, it does not perform the required action and does not answer to the demand as if the address does not correspond to an on-line slave.

8.3.1 The address

As stated above, the MODBUS transactions always involve the master (which controls the line) and one slave at the time
(with the exception of broadcast messages). In order to detect the message receiver, the first sent character is a byte
containing the numeric address of the selected slave. Each slave owns therefore a different address number for its identification. The legal addresses go from 1 to 247, while a master message starting with the address 0 means that this is a "broadcast" message simultaneously addressed to all the slaves (the address 0 can not be allocated to a slave).
Broadcast messages are those messages which do not need a response to perform their function, i.e. the allocations.
Within address the current implementation of a Slave maximum is 99.

8.3.2 Function code

The second character of the message states the function to be performed by the master message; the slave response contains the same code, thus stating that the function has been performed.
It implemented a subset of the functions MODBUS including:

- 01 Read Coil Status
- 02 Read Input Status
- 03 Read Holding Registers
- 04 Read Input registers
- 05 Force Single Coil
- 06 Preset Single register
- 07 Read Status
- 15 Force multiple Coils
- 16 Preset Multiple Registers

The 01 and 02 functions, so as the 03 and 04 functions, are similar and interchangeable. See chapter 4 for a complete and detailed description of the functions.

8.3.3 CRC16

The last two characters of the message contain the cyclic redundancy code (Cyclic Redundancy Check) calculated according to the CRC16 algorithm.
As for the calculation of these two characters, the message (address, function code and data

thus rejecting the parity and the start and stop bits) is considered as a single and continuous binary number whose most significative bit (MSB) is transmitted as first.
The message is multiplied by x16 (it undergoes a 16-bit shift on the left) and
then it is divided by x16+x15+x2+1; it is stated as a binary number (1100000000000101). The integer quotient is rejected and the 16-bit remainder (it is initialized with FFFFh in order to avoid a zero made message) is added to the sent message.
The obtained message, when the receiver slave has divided it by the same polynomial (x16+x15+x2+1), must have a zero remainder if no error occurred (if not the slave calculates the CRC again).
Considering that the data serializing device (UART) transmits first the less significative bit (LSB) instead of the MSB as required by the CRC calculation, such calculation is performed by inverting the polynomial. Furthermore, as the MSB polynomial influences only the quotient and not the remainder, the remainder is deleted by making it equal to 1010000000000001.
The step by step procedure for the CRC16 calculation is the following:

1) Load a 16-bit register with FFFFh (the bit value is 1).
2) Perform the exclusive OR of the first character with the highest byte in the register; place the result in the register.
3) Perform a one-bit shift of the register on the right.
4) If the bit outcoming the register right side (flag) is 1, perform the exclusive OR between the 1010000000000001 generating polynomial and the register.
5) Repeat the steps 3 and 4 for eight times.
6) Perform the exclusive OR of the following character with the highest byte in the register; place the result in the register.
7) Repeat the steps from 3 to 6 for all the message characters.
8) The content of the 16-bit register is the CRC redundancy code to be added to the message.

8.3.4 Message synchronization

The message synchronization between the transmitter and the receiver is obtained by interposing a pause between the messages, such pause being equal to 3.5 times the character period. If the receiver does not receive for a period equal to 4 characters, the message is considered to be over; as a consequence the following received byte is treated as the first byte of a new message: an address.

8.3.5 Serial line setting

The communication foresees the following settings:

- 1 bit di start
- 8 data bitsi (RTU protocol)
- 1 stop bit
- no parity

The baud rate can be selected among the following values:

Baudrate	Timeout byte-byte
1200	33 ms
2400	16 ms
4800	8 ms
9600	4 ms
19200	2 ms
38400	1 ms
57600	668 μs
76800	501 μs
115200	334 μs

The selectable baudrate Max depends on the hardware available.

8.4. Modbus functions for the drive

Here following is a detailed description of the MODBUS functions implemented for the Drive. All the values listed in the tables are hexadecimal.

8.4.1 Read Output Registers (03)

This function allows to require the value of 16-bit (word) registers containing Drive parameters. The broadcast mode is not allowed.

Request

Together with the Drive address and the function code (03), the message contains the register starting address (Starting Address) and the number of the registers to be read; they are both stated on two bytes. The maximum number of registers which can be read is 125. The register numbering system starts from zero (word1 = 0) for the MODBUS and from one (word1 = 1) for the JBUS.

Example:

Modbus Drive address 25 (19hex)

Registri from 0069 (0044hex for Modbus and 0045hex for Jbus) to 0071 (3 register=0003hex).

ADDR	FUNC	DATA Start Addr HI	DATA Start Addr LO	DATA Bit # HI	DATA Bit # LO	CRC LO	CRC HI
19	03	00	44	00	03	46	06

Response

Together with the Drive address and the function code (03), the message includes a character

containing the data byte number and some other characters containing the data. The registers require two bytes where the first one contains the most significative section.
Example: Response to the above mentioned request.

ADDR	FUNC Byte	DATA Word Count	DATA Word 69 HI	DATA Word 69 LO	DATA Word 70 HI	DATA Word 70 LO	DATA Word 71 HI	DATA Word 71 LO	CRC LO	CRC HI
19	03	06	02	2B	00	00	00	64	AF	7A

NOTE!
in case the register selected range includes some reserved or missing registers, the value of these registers is set with 0.

8.4.2 Read Input Registers (04)

This function is similar to the previous one.

8.4.3 Preset Single Register (06)

This function allows to set the value of a single 16-bit register. The broadcast mode is allowed.

Request

Together with the Drive address and the function code (06), the message contains the register address (parameter) on two bytes and the value to be allocated. The numbering system of the register addresses starts from zero (word1= 0) for the MODBUS and from one (word1 = 1) for the JBUS.

Example: Modbus

- Drive address 38 (26hex)
- Register 26 (0019hex for ModBus, 001Ahex for JBus)
- Value 926 (039Ehex)

ADDR	FUNC	DATA Bit # HI	DATA Bit # LO	DATA Word HI	DATA Word LO	CRC LO	CRC HI
26	06	00	19	03	9E	DF	82

Response

The response is given by transmitting again the received message after the register has been modified.

Example: Response to the above mentioned request.

ADDR	FUNC	DATA Bit # HI	DATA Bit # LO	DATA Word HI	DATA Word LO	CRC LO	CRC HI
26	06	00	19	03	9E	DF	82

8.4.4 Read Status (07)

This function allows to read the status of eight predefined bits with a compact message. The broadcast mode is not allowed.

Request

The message contains only the Drive address and the function code (07).

Example: Modbus

Drive address 25 (19hex)

ADDR	FUNC	CRC LO	CRC HI
19	07	4B	E2

Response

Together with the Drive address and the function code (07), the message includes a character containing the status bits.

Example: Response to the above mentioned request.

ADDR	FUNC	DATA Status byte	CRC LO	CRC HI
19	07	6D	63	DA

The bit meaning is the following:

Bit number	Bit meaning
0	Digital Output 1
1	Digital Output 2
2	Digital Output 3
3	Digital Output 4
4	Run
5	Steady state
6	Drive limit state
7	Not used

8.4.5 Preset Multiple Registers (16)

This function allows to set the value of a consecutive block made of 16-bit registers. The broadcast mode is allowed.

Request

Together with the Drive address and the function code (16), the message contains the starting address of the registers to be written (starting Address), the number of registers to be written, the number of bytes containing the data and the data characters. The register numbering system starts from zero (word1 = 0) for the MODBUS and from one (word1 = 1) for the JBUS.

Example: Modbus

Drive address 17 (11hex)

Starting Register 35 (0022hex for Modbus, 0023hex for JBus)

Number of registers to be written 1 (0001hex)

Value 268 (010Chex)

ADDR	FUNC start	DATA Start addrHI	DATA Word# addrLO	DATA Word# HI	DATA byte LO	DATA Word count	DATA Word 35 HI	DATA 35 LO	CRC LO	CRC HI
11	10	00	22	00	01	02	01	0C	6C	87

Response

Together with the Drive address and the function code (16), the message contains the starting address (starting Address) and the number of written registers.

Example: Response to the above mentioned request.

ADDR	FUNC	DATA Start addrHI	DATA Start addrLO	DATA Word# HI	DATA Word# LO	CRC LO	CRC HI
11	10	00	22	00	01	A3	53

8.5. Error management

In MODBUS there are two kinds of errors which are managed in different ways: transmission errors and operating errors.

The transmission errors change the format, the parity (if used) or the CRC16 of the message. When the Drive detects such errors, it considers the message invalid and gives no response. If the message format is the right one but its function can not be performed, the error is an operating one. The Drive answers to this error with a particular message. This message contains the Drive address, the code of the required function, an error code and the CRC. In order to underline

that the response is aimed at stating the presence of an error, the function code is returned with the most significative bit set with "1".

Example: Modbus

Drive address 10 (0Ahex)

Coil 1186 (04A2hex)

ADDR	FUNC	DATA Start addrHI	DATA Start addrLO	DATA bit# HI	DATA bit# LO	CRC HI	CRC LO
0A	01	04	A1	00	01	AC	63

Response

The request refers to the content of the Coil 1186 which does not exist in the Drive slave. The slave answers withthe error code "02" (ILLEGAL DATA ADDRESS) and goes back to the function code 81h (129).

Example: Exception to the above mentioned request.

ADDR	FUNC	DATA Except Code	CRC HI	CRC LO
0A	81	02	B0	53

8.5.1 Exception codes

This protocol implementation foresees only four exception codes:

Code	Name	Meaning
01	ILLEGAL FUNCTION	The received function code does not correspond to a function allowed on the addressed slave.
02	ILLEGAL DATA ADDRESS	The address number(IPA), which the data field refers to, is not a register allowed on the addressed slave..
03	ILLEGAL DATA VALUE	The value to be allocated, which the data field refers to, is not allowed for this register.
07	NAK – NEGATIVE ACKNOWLEDGEMENT	The function can not be performed with the present operating or conditions or attempt to write an only-reading parameter.

8.6. System configuration

In order to select the configuration of the serial line, the DS drives of are supplied in the main INTERFACE menu with a submenu called "Serial config"; some parameters are common to the different kinds of implemented protocols (fOX LINK, Modbus, Profibus, etc); the menu contains the following parameters: (Fox Link, Modbus, Profibus, ecc.); the menu contains the following

parameters:I.600, I.601, I.602, I.603, I.604, I.605.

9. Troubleshooting

9.1. Drive Alarm Condition

The alarm situations are reported, with associated code related to the specific event, to the keypad and physically on support of digital output to notify the state of alarm.

9.2. Alarm Reset

The alarm reset operation can be executed following three possibilities:

-Alarm reset by keypad buttons: pressing simultaneously Up and Down; the reset action will take effect when the buttons when released.
Reset allowed only with drive disabled.

- Alarm reset by digital input: it can be performed through a programmable digital input as "[5] Alarm reset".
The function is activated on rise front command.
Reset allowed only with drive disabled.

Alarm reset by Autoreset function: it allows an automatic reset of some drive alarms (see tables 9.4.1), by the settings of P.380, P.381, P.382 and P.383 parameters.
Autoreset allowed with drive enabled too.

9.3. List of Drive Messages Alarm Events

Table 9.3-1 provides a description regulation alarm events occurred during a drive alarm situation.

ALARM DISPLAY	ALARM Serial Code	DESCRIPTION	AUTORESET
EF	1	It trips when External fault input is active programmed as “External fault NO” or “External fault NC” .	YES / NO settable
OC	2	It trips when an Overcurrent value is detected by output current sensor. Check the type of load applied and ramps setted	YES
OU	3	It trips when the drive DC Bus voltage is higher than the maximun threshold for the given main voltage setting. Check the type of load applied and ramps setted	YES
UU	4	It trips when the drive DC Bus voltage is lower than the maximun threshold for the given main voltage setting	YES
OH	5	It trips when the drive heatsink temperature detected by the switch sensor exceeds its threshold (…°C)	NO
OLI	6	It trips when the drive overload accumulator exceeded the trip threshold for drive	NO
OLM	7	It trips when the drive overload accumulator exceeded the trip threshold for motor.Check the cycle executed and data motor inserted	NO
OLR	8	It trips when the motor overload accumulator exceeded the trip threshold for braking resistance	NO
OT	9	It trips when the torque requested from load exceeds the programmed level for the preset P.241	YES / NO settable

PH	10	It trips when the supply phase lack: enabled 30 seconds after one of the supply phases has been disconnected (Three phase)	NO
OCH	12	IGBT desaturation or instantaneous overcurrent have been detected	
ST	13	It trips when the serial link time out exceeds the programmed level (I.604)	YES
OP1	14	Communication failure between drive regulation board and option 1 expantion board	NO
OP2	15	Communication failure between drive regulation board and option 2 expantion board	NO
BF	16	Drive comunication Bus failure	NO
OHS	17	It trips when the drive heatsink temperature detected by the analog sensor exceeds its threshold	NO
SHC	18	Short Circuit between output phases or Ground fault .	NO
OHR	19	It trips when the temperature detected by the analog sensor on board exceeds its threshold	NO
LF	20	It trips when drive is a limit state caused by the output current or the DC link voltage; can be origin by wrong settings of PI regulator gains or by the motor load or by ramp setted values.	NO
TSER	21	Failure temperature sensor	NO
OC-	22	It trips when an Overcurrent value is detected by software	YES

NOTE! OH switch sensor threshold and OHS analog sensor threshold are depending by the drive size (75 °C ... 85 °C)

10. Function Index