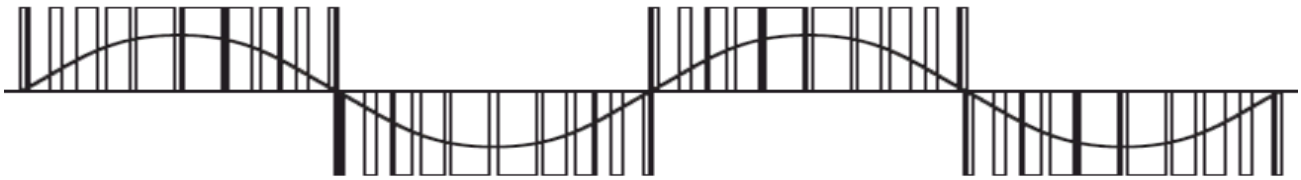
350 SERIES INVERTERS



V
H T
Hz

V/F SCALAR CONTROL WITH HIGH TORQUE

CE

RS 485

MODBUS RTU
Serial communication

Rowan Elettronica
Motors, drives, accessories and services for automation
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CSQ UNI EN ISO 9001

CERTIFIED IQNet MANAGEMENT SYSTEM

Description of symbols used in the manual

Attention! Indicates that the following topic is very important for the function described and must be read carefully.

Indicates that the following topic concerns danger to security.

Indicates that the following topic signals the presence of dangerous voltage.
Indicates that there are conditions of High Voltage which can cause serious injury or death.

When handling equipment or internal cards, this symbol indicates to be careful not to generate electrostatic discharge (ESD), because it could irreparably damage some components of the inverter.

General safety instructions

Attention !

- Before the installation, connection and any other operation on the inverter or motor, read this manual carefully in order to perform the correct operations and adopt the relative safety precautions.
  It is absolutely forbidden to use Rowan inverters or motors in any way other than that described in this manual.
- **Before the installation, connection and any other operation on the inverter with STO function,it is absolutely necessary to read and understand what written on the "Safety Manual for C350, C400 and C700 Inverters" to be requested to Rowan Elettronica srl.**
- This instruction manual is intended for **qualified technicians** who know the norms to be followed for installation and operation, in accordance with the standards of safety and security related to this type of equipment.
  The inverter and the motor attached can create dangerous situations for the safety of persons and things; the user is responsible for the installation which must be in accordance with the norms in force.
- The inverter belongs to the class of restricted commercialization in accordance with EN 61800-3. In a domestic environment this product may cause radio interference, in which case the user must take adequate precautions.
- The inverter, any external filter and the connected motor must be permanently and effectively grounded and protected from the power supply in accordance with the norms in force.
- Maximum protection of the inverter is achieved only with type B differentials, preferably of 300mA.
  The anti E.M.I. internal or external filters of the equipment, have an earth leakage current <18mA; keep in mind that standard EN50178 specifies that, in the presence of leakage currents to ground greater than 3.5mA, the power ground connection must be of the fixed type and doubled for redundancy.
- In cases where it is necessary to remove the cover of the inverter, for example for the setting of micro-switches or maintenance work, you **must** wait at least 5 minutes after switching off the inverter to allow the internal capacitors to discharge. **In any case**, it is possible to touch the internal components and the terminals subject to dangerous voltages (L1, L2, L3, U, V, W, F, F+, -) only without power supply and with the voltage between the terminals F+ and -, **less** than 50Vdc.

Dangerous situations

- Under particular conditions of inverter programming, after a power failure, the motor may start automatically. The manual controls for rotation of the motor executable via the keypad, must be used with maximum attention to avoid damage to the safety and security of persons and to the applied mechanics. Programming errors could cause involuntary start-ups. At the first start-up, in situations of inverter or power failure, it may not be possible to control the speed and direction of the applied motor. The main stop button can not be considered valid for a safe stop; under certain conditions of programming or inverter failure, its deactivation may not corrispond to the immediate halt of the motor. Only the electromechanical cut-off of the inverter from the power line safely excludes any control on the motor. The installation of the inverter in dangerous areas, where flammable substances, combustable vapors or powders are present, can cause fires or explosions; the inverter must be installed far away from theses areas.
  Avoid in any case the penetration of water or other fluids inside the equipment.
  Do not perform dielectric tests on parts of the drive.

Liability and Warranty

- **ROWAN ELETTRONICA s.r.l.** declines any responsibility for any inaccuracies contained in this manual, due to printing errors and/or transcription. It also reserves the right to make at its discretion and without notice the changes it deems necessary for the better functioning of the product.
- **As for the details and characteristics** reported in this manual there is a maximum tolerance of ±10%, unless otherwise stated. The relative diagrams are approximate and are to be perfected by the user.
- **The warranty** on the products is understood as ex-works under the conditions specified in the appropriate document to be requested to the Commercial Department or downloaded through the website www.rowan.it

Inverter power supply to terminals L1 L2 L3

Three-phase power supply voltage ..... 180VAC to 270VAC (standard voltage 220/240VAC)
..... 320VAC to 460VAC (standard voltage 380/400/415VAC)
..... 320VAC to 490VAC (standard voltage 380/460VAC) only for models from 350/R to 350/3,5
..... on request 380VAC to 560VAC (standard voltage 440/460VAC)
..... on request 560VAC to 760VAC (standard voltage 690VAC) only for models from 350/5 to 350/G

U V W motor output

Types of motors connectable ..... asynchronous three-phase caged
Motor control techniques: ..... SCALAR V/F
Output voltage ..... from 0 to 100% of the power supply voltage
Output frequency 0Hz-800Hz
Waveform ..... sinusoidal
Technique to reconstruct the waveform ..... PWM (Pulse With Modulation)
PWM frequency ..... adjustable from 0.50KHz to a maximum dependent on the size (max 16.00KHz)
Overload capacity with PWM at 5Khz:
..... <110% (not over) of the rated current of the inverter in continuous mode
..... over 110% the temperature control starts with intervention of the fault if the following limits are overpassed:
.....max 110% of the rated current of the inverter per 300sec (value varies depending on size)
.....max 175% of the rated current of the inverter for 30 sec (value varies depending on size)
..... max 250% of the rated current of the inverter for 3 sec (value varies depending on size)

Regenerative braking control

With braking module ..... on request
Regenerated energy dissipation system ..... via external resistence connected to terminals F+ and F (when brak. module present).

Digital inputs

N° of digital inputs ..... 7 (from I1 to I7)
Input isolation ..... optoisolated if you use an external power supply
Connection logic ..... NPN or PNP
Activation voltage ..... min 15Vdc, max 30Vdc
Programmability ..... Input I1 (RUN) with fixed function, the others completely programmable
Input resistance ..... about 3,6Kohm
Time of activation/deactivation I1... I6 ..... 2 ms
Time of activation/deactivation I7 ..... 51 ms

Input for motor protector PTC probe

Type of probe ..... max 250 ohm to 25°C (DIN 44081)
Inverter fault activation resistance ..... >2850 ohm ±20%
Recovery resistance ..... <1000 ohm ±20%

Relay outputs

N° of relays 3 (O1,O2,O3)
Programmability ..... completely programmable
Relay contacts ..... one in exchange NO and NC
Contacts flow rate ..... 0.5A 120Vac -1A 24Vac
Activation/deactivation times ..... 5 ms

Digital outputs

N° of outputs 1 (O4)
Output isolation ..... optoisolated if an external power supply is used
Connection logic ..... NPN or PNP
Programmability ..... completely programmable
Work voltage ..... max 100Vdc
Maximum current ..... 80 mA
Activation/deactivation times ..... 50 ms

Analog inputs

AI1 ..... differential +/-10Vdc...12 bit ...sampling time 1 ms
AI2 ..... differential +/-10Vdc,4-20mA, 0-20mA...12 bit...sampling time 1 ms
AI3, AI4 ..... +/-10Vdc....12 bit...sampling time 1 ms
Programmability ..... completely programmable

Analog outputs

AO0 ..... 12 bit...response rise time 65ms
AO1 ..... 12 bit...response rise time 65ms
Ouput voltage ..... +/-10Vdc
Output current ..... max 10mA
Programmability ..... NO (fixed function)

RS485 serial connection

Standard protocols ..... MODBUS RTU...ROWAN
Baud rate ..... 9600..19200..38400..57600..76800..115200
Isolation ..... optoisolated

Power supply voltages available

+10Vdc, -10Vdc (for powering potentiometers) ..... max 10mA
+24Vdc (for powering inputs or other devices) ..... protected against short-circuit...max 500mA
+5Vdc ..... protected against short-circuit....max 200mA
+15Vdc ..... protected against short-circuit....max 200mA

Protections

to Inverter ..... electronic thermal protection (I x I x t) on extended overload to terminals U, V, W
..... protection on the maximum peak current U, V, W
..... programmable timed threshold protection on the ouput current to terminals U, V, W
protection against short-circuit between the U, V, W phases (all sizes) and between the phases and earth (from /5 to /G)
..... over-voltage protection of the BUS DC
..... over-temperature protection of the IGBT modules
..... alarm without fault of the BUS DC capacitors
..... protection against short-circuit on terminals F and F+ for the braking resistor connection
to Motor ..... protection from external PTC probe connected to the input of the dedicated inverter
to Braking resistance ..... threshold electronic thermal protection on prolonged overload

Special applications (forseen for the future but not yet active)

..... REGULATOR specializing in the control of compresors, pumps and ventilators
..... ROLLER IN BEND CONTROL

Environmental characteristics

Room temperature ..... from -5°C to +40°C
Heat sink temperature ..... from -5°C to +70°C
Storage temperature ..... from -25°C to +70°C
Altitude ..... maximum 1000mt a.s.l (beyond, the load should be reduced by 1% every 100mt)
Degree of protection IP20
Relative humidity ..... from 5% to 95% without the presence of condensation.

Compliance standards and electromagnetic compatibility

The 350 series drives are designed to operate in industrial environments. They are EU products in conformity with **Directive EMC 2014/30/EU**, with reference to product norm **CEI EN 61800-3 (Cat. C2)**, only if connected respecting the wiring system indicated in Ch.4 and Ch.7.
For models without internal filter, conformity with directive EMC is met only if they are connected to the appropriate filtering devices provided separately (see "***Table with matching of the inverter to the anti E.M.I. three-phase filters and ferrite rings***" in chapter 4 "ELECTRICAL INSTALLATION").
They also comply with **Low Voltage Directive 2014/35/EU** with reference to norm **EN 61439-1/2** and **CEI EN 60204-1**.
WARNING: this product belongs to the class of restricted commercialization in compliance with **EN 61800-3 (Cat.2).** In a domestic environment this product may cause radio interference, in which case the user must take adequate precautions.

Summary table of electrical power characteristics of inverter 350 series from /R to /6

INVERTER POWER SIZE				/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6
RATED POWER on U - V - W OUTPUTS	LINE 230Vac	motor P* kW		1,3	1,7	2,3	3,5	4,5	6,5	8,1	10	13	18,5	22
		Smax* kVA		1,8	2,7	3,6	4,7	6	8,7	10,5	13	17	23,8	28,6
	LINE 400Vac	motor P* kW		2,25	3	4	6	7,5	11	15	18,5	22	30	37
		Smax* kVA		3	4,8	6,4	8	10	15	20	25	30	41	50
	LINE 690Vac	motor P* kW		-	-	-	-	-	-	-	-	-	50	55
		Smax* kVA		-	-	-	-	-	-	-	-	-	60	65
INPUT RATED CURRENT L1 - L2 - L3	LINE 230-400Vac	A		5	7	9	12	15	22	30	35	45	60	72
	LINE 230-400Vac with reactance	A		3,75	5,2	7	9,2	11,5	17,5	25	29	36	48	58
OUTPUT RATED CURRENT U - V - W	LINE 230-400Vac	A	MAX SETTABLE	5	7	9	12	15	22	30	35	45	60	72
			ABSOLUTE*	5,5	7,7	9,9	13,2	16,5	24,2	33	38,5	49,5	66	79,2
	LINE 690Vac	A	MAX SETTABLE	-	-	-	-	-	-	-	-	-	50	55
			ABSOLUTE*	-	-	-	-	-	-	-	-	-	55	60,5
MAX LOCKING DRIVE CURRENTS on U - V - W OUTPUTS		A		13	20	25	34	42	62	84	98	126	170	200
INPUT PROTECTION FUSES L1 - L2 - L3 gL or gG TYPE		A		6	10	16	16	20	25	32	40	63	80	80
BRAKING CURRENT IN CONTINUOUS SERVICE with MINIMUM BRAK.MODULE OUTPUT F F+	LINE 230-400Vac	A		5,3	11	11	11	14	25	36	36	42	64	125
	LINE 690Vac	A		-	-	-	-	-	-	-	-	-	64	125
MINIMUM BRAKING RESISTANCE - OUTPUT F F+	LINE 230Vac	OHM		150	73	73	73	57	32	22	22	19	12	6
	LINE 400Vac	OHM		150	73	73	73	57	32	22	22	19	12	6
	LINE 690Vac	OHM		-	-	-	-	-	-	-	-	-	17	9
MAX POWER DISSIPATED by CASE with 5KHz PWM		kW		0,1	0,2	0,25	0,3	0,4	0,5	0,55	0,6	0,7	1,0	1,2
COOLING FANS				NO	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES
BUILT-IN FILTER		LINE 230-400Vac		YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
		LINE 690Vac		-	-	-	-	-	-	-	-	-	NO	NO

* **Pmotor KW =** Maximum power of the motor applicable in output of the inverter based on the data plate of a 4-pole standard asynchronous motor. In case of motors with different poles, check the compatibility with the maximum current in output of the inverter. (6 - 8 poles).
* **Smax KVA =** Maximum power applicable with cos phi = 1
* **ABSOLUTE =** Maximum limit of the current in continuous service on U-V-W outputs, without intervention of the inverter fault.

Summary table of electrical power characteristics of inverter 350 series from /6,5 to /G

INVERTER POWER SIZE				/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F PWM 5KHz	/F PWM 3KHz	/G PWM 5KHz	/G PWM 3KHz
RATED POWER on U - V - W OUTPUTS	LINE 230Vac	Pmotore* kW		26	32	45	52	63	76	90	121	147	170	200	228	260	288
		Smax* kVA		35	42	55	65	81	97	119	162	183	219	270	308	310	345
	LINE 400Vac	Pmotore* kW		45	55	75	90	110	132	160	220	250	315	355	400	450	500
		Smax* kVA		60	73	95	114	142	170	208	282	318	381	453	516	540	600
	LINE 690Vac	Pmotore* kW		62	75	105	135	160	200	250	345	355	-	443	500	540	600
		Smax* kVA		78	96	131	167	203	250	298	385	418	-	497	561	600	668
INPUT RATED CURRENT L1 - L2 - L3	LINE 230-400Vac	A		87	106	138	165	205	245	300	410	460	550	655	745	780	868
	LINE 230-400Vac with reactance	A		70	82	110	135	164	200	240	325	370	460	550	627	655	730
OUTPUT RATED CURRENT U - V - W	LINE 230-400Vac	A	MAX SETTABLE	87	106	138	165	205	245	300	410	460	550	655	746	780	868
		A	ABSOLUTE*	95	116	151	181	225	269	330	451	506	605	720	820	858	954
	LINE 690Vac	A	MAX SETTABLE	65	80	110	140	170	210	250	330	350	-	412	470	490	560
		A	ABSOLUTE*	71	88	121	154	187	231	275	363	385	-	453	517	539	616
MAX LOCKING DRIVE CURRENT on U - V - W OUTPUTS		A		245	300	385	460	575	685	840	1000	1290	1540	1800		2090	
INPUT PROTECTION FUSES L1 - L2 - L3 gL or gG TYPE		A		100	125	160	200	250	315	400	500	630	630	1000		1250	
BRAKING CURRENT IN CONTINUOUS SERVICE with MINIMUM RESISTANCE OUTPUT F F+	LINE 230-400Vac	A		125	125	187	187	187	114	114	250	250	250	250		250	
	LINE 690Vac	A		125	125	187	187	187	114	114	250	250	-	250		250	
MINIMUM BRAKING RESISTANCE - OUTPUT F F+	LINE 230Vac	OHM		6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 400Vac	OHM		6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 690Vac	OHM		9	9	6	6	6	10	10	4,5	4,5	-	4,5		4,5	
MAX POWER DISSIPATED by CASE with 5KHz PWM		kW		1,4	1,5	2,0	2,0	2,5	3,5	3,5	5	6,5	8	9,5		10	
COOLING FANS				SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI		SI	
BUILT-IN EMI FILTER	LINE 230-400Vac			SI	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	
	LINE 690Vac			NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	

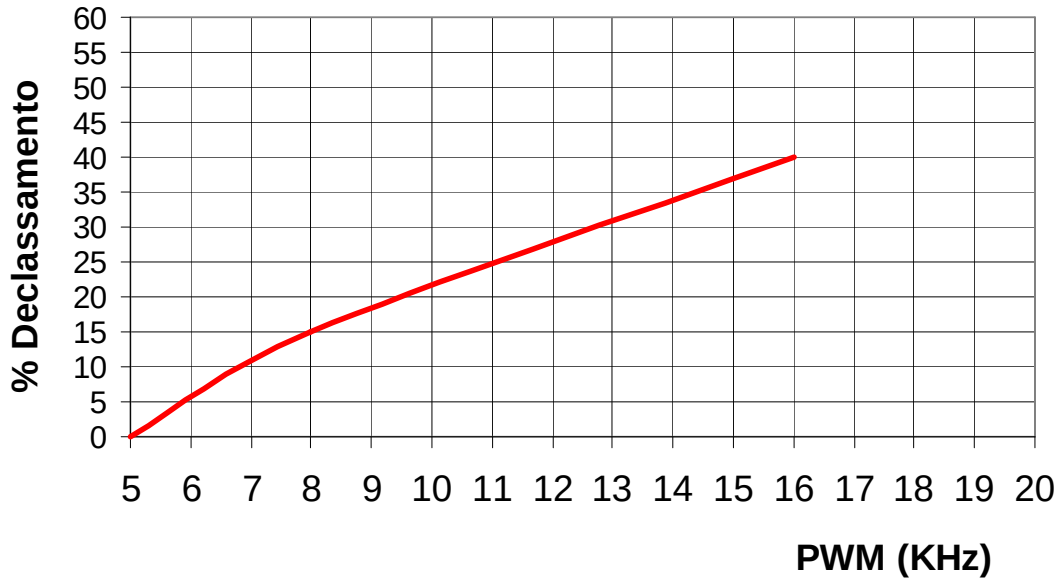
On request: 650kW / 400V Inverter in air-conditioned cabinet

* **Pmotor KW =** Maximum power of the motor applicable in output of the inverter based on the data plate of a 4-pole standard asynchronous motor. In case of motors with different poles, check the compatibility with the maximum output current of the inverter. (6 - 8 poles).
* **Smax KVA =** Maximum power applicable with cos phi = 1
* **ABSOLUTE =** Maximum limit of the current in continuous service on U-V-W outputs, without intervention of the inverter fault.

Inverter derating according to PWM frequencies

Attention !

The rated power expressed in the tables, are allowed for PWM frequencies up to 5 KHz. At higher frequencies it is necessary to downgrade the inverter according to the chart drawn on the right.
To set the PWM frequency, consult the group of parameters:
2.4. PWM MODULATOR.



Efficiency level and power losses of Rowan Inverter

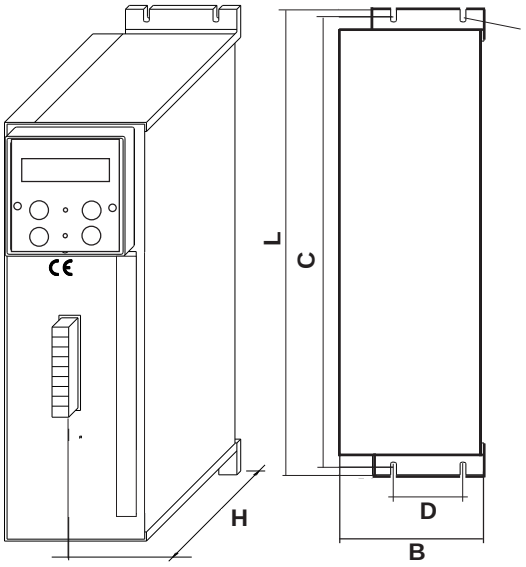
Three-phase Rowan Inverters driving motors rated for direct line start operation on 50/60Hz lines fall within the scope of Commission Regulation (EU) nr 2019/1781 laying down ecodesign requirements for electric motors and variable speed drives pursuant to Directive 2009/125/EC of the European Parliament.
It shall apply from 1 July 2021.

Regulation requires that Variable Speed Drives (VSD) fall within the efficiency class IE2 and to provide to users "power losses in % of the rated apparent output power at the following different operating points for relative motor stator frequency versus relative torque-producing current (0;25) (0;50) (0;100) (50;25) (50;50) (50;100) (90;50) (90;100), as well as standby losses, generated when the VSD is powered up but is not providing current to the load, rounded to one decimal place".

As required by Regulation power dissipations of Rowan inverters do not exceed the maximum power losses corresponding to the IE2 efficiency level.
Below the table with power losses for each inverter:

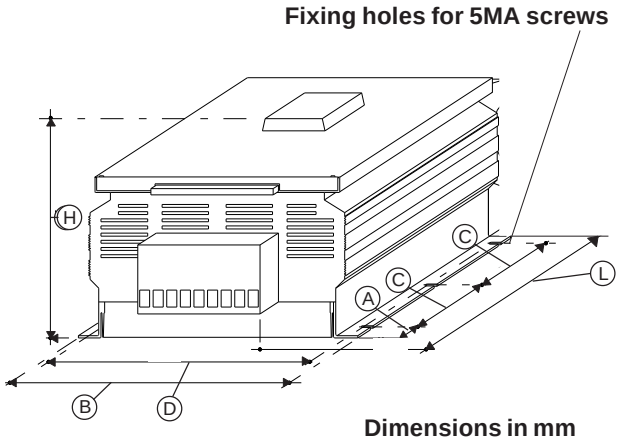
Inverter (CDM) Efficiency Level according to Reg. EU n°2019/1781 (nomenclature as described in CEI EN 61800-9-2)												
POWER SIZES	Efficiency Level	$S_{r,equ}$ [kVA]	$P_{L,STANDBY}$ [W]	$p_{L,CDM}$ (0;25)	$p_{L,CDM}$ (0;50)	$p_{L,CDM}$ (0;100)	$p_{L,CDM}$ (50;25)	$p_{L,CDM}$ (50;50)	$p_{L,CDM}$ (50;100)	$p_{L,CDM}$ (90;50)	$p_{L,CDM}$ (90;100)	$P_{L,CDM}$ (90;100) [kW]
/P	IE2	2	15,0	4,0%	4,3%	5,0%	4,1%	4,5%	5,6%	4,8%	6,3%	0,13
/R	IE2	3	15,0	2,4%	2,7%	3,3%	2,5%	2,9%	3,9%	3,2%	4,7%	0,16
/0	IE2	5	15,0	1,9%	2,0%	2,5%	2,0%	2,2%	3,0%	2,5%	3,5%	0,17
/0M	IE2	6	20,0	1,9%	2,1%	2,5%	2,0%	2,3%	3,1%	2,6%	3,8%	0,24
/1	IE2	8	20,0	1,6%	1,8%	2,5%	1,7%	2,1%	3,2%	2,3%	4,1%	0,34
/L	IE2	10	20,0	1,6%	1,8%	2,5%	1,7%	2,0%	3,2%	2,3%	4,1%	0,43
/2	IE2	15	22,0	1,4%	1,6%	2,3%	1,5%	1,9%	2,9%	2,1%	3,8%	0,58
/2,5	IE2	21	25,0	1,5%	1,8%	2,6%	1,6%	2,0%	3,1%	2,2%	3,8%	0,78
/3	IE2	24	27,2	1,4%	1,6%	2,3%	1,5%	1,8%	2,9%	2,1%	3,7%	0,89
/3,5	IE2	31	28,5	1,5%	1,7%	2,5%	1,6%	2,0%	3,1%	2,2%	3,9%	1,21
/5	IE2	42	22,0	1,2%	1,4%	2,0%	1,3%	1,6%	2,7%	1,9%	3,7%	1,54
/6	IE2	50	22,0	1,1%	1,3%	2,0%	1,2%	1,6%	2,6%	1,9%	3,5%	1,76
/6,5	IE2	60	22,0	1,1%	1,3%	2,0%	1,2%	1,5%	2,7%	1,8%	3,5%	2,12
/7	IE2	73	22,0	0,9%	1,1%	1,8%	1,0%	1,4%	2,4%	1,6%	3,1%	2,31
/8	IE2	96	22,3	1,0%	1,2%	1,9%	1,1%	1,5%	2,6%	1,8%	3,5%	3,31
/8,5	IE2	114	22,5	0,9%	1,1%	1,8%	1,0%	1,4%	2,4%	1,6%	3,0%	3,47
/9	IE2	142	23,0	0,8%	0,9%	1,5%	0,9%	1,2%	2,1%	1,4%	2,9%	4,11
/A	IE2	170	23,0	0,7%	0,9%	1,4%	0,8%	1,1%	2,0%	1,4%	2,8%	4,81
/B	IE2	208	23,0	0,7%	0,8%	1,3%	0,8%	1,1%	1,9%	1,3%	2,7%	5,60
/C	IE2	284	57,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,1%	1,3%	2,9%	8,11
/D	IE2	319	64,0	0,7%	0,9%	1,6%	0,8%	1,2%	2,2%	1,4%	3,0%	9,64
/E	IE2	381	66,0	0,7%	1,0%	1,6%	0,8%	1,2%	2,2%	1,4%	3,0%	11,31
/F	IE2	517	83,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,1%	1,4%	2,9%	14,89
/G	IE2	601	86,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,2%	1,4%	2,9%	17,74

Inverter sizes and weights from 350/R to 350/L



POWER SIZES	H	B	L	C	D	WEIGHT KG	BUILT-IN EMI FILTER
/R	200	114	285	275	60	2,8	YES
/0 /0M	200	134	365	353	60	3,5	YES
/1	200	134	365	353	60	3,6	YES
/L	200	134	365	353	60	4	YES

Sizes and weights from 350/2 to 350/G



POWER SIZES	H	B	L	A	C*	D	WEIGHT KG	BUILT-IN EMI FILTER
/2	180	265	385	75	200x1	253	8	YES
/2,5 /3	200	315	430	95	200x1	305	10	YES
/3,5	280	310	420	75	235x1	295	14,5	YES
/5	280	280	515	65	233x1	265	18,5	YES
/6 /6,5	295	380	570	60	360x1	365	30	YES
/7	295	380	570	60	360x1	365	30	NO
/8	295	380	620	110	360x1	365	40	NO
/8,5	295	480	830	100	300x2	465	55	NO
/9 - /A	295	480	950	100	300x2	465	80	NO
/B	295	480	1070	100	300x2	465	85	NO
/C	295	480	1270	100	450x2	460	100	NO
/D/E/F	400	680	1250	110	225x4	655	170	NO
/G	400	885	1270	110	225x4	860	200	NO

* The C dimension value depends on the number of fixing holes

AN EXTERNAL COOLING is available on request for /5 to /G models.

Instructions for proper mechanical installation

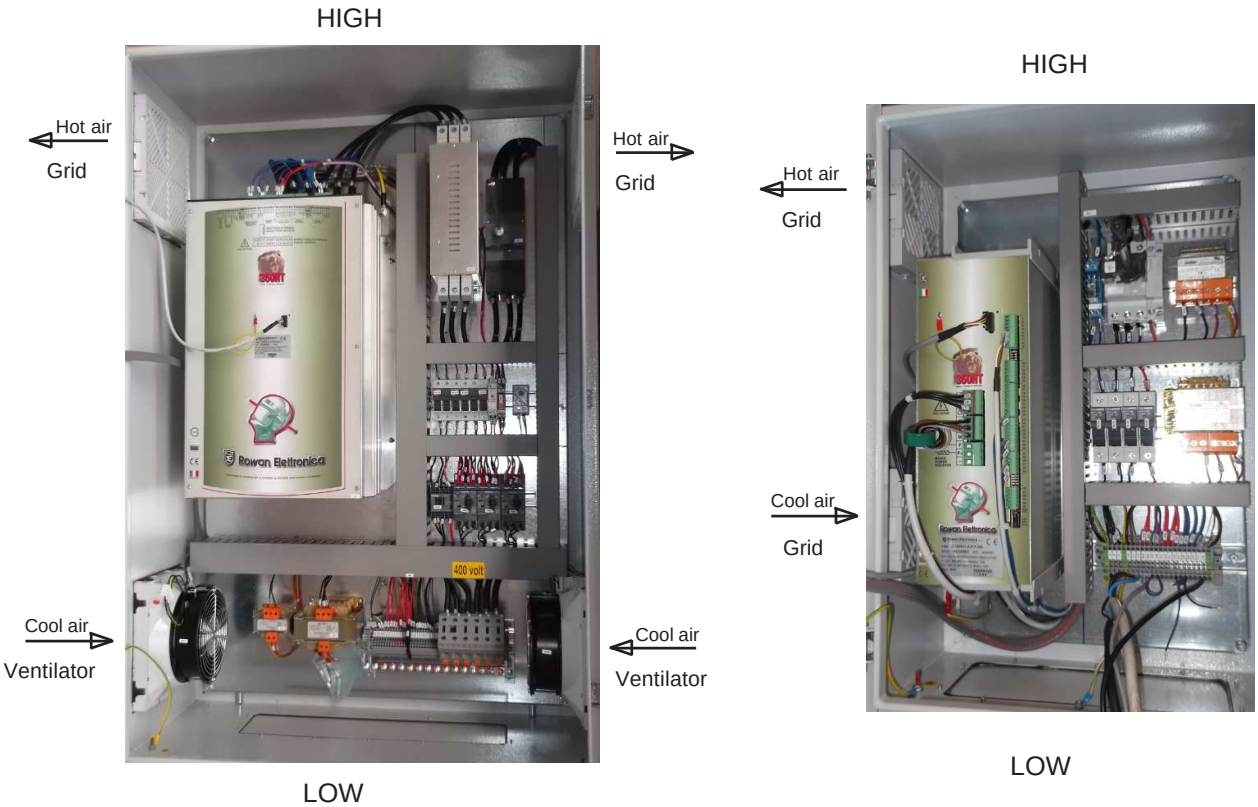
- Check that the environment in which the inverter is installed falls within the environmental characteristics reported in Ch. 2 TECHNICAL CHARACTERISTICS (temperature - humidity - degree of protection - altitude).
- Install it in a space dedicated to the power part of the panel, avoiding proximity with cards in low analog or digital voltage (e.g., the opposite side of the sheet).
- Allow the maximum flow of cooling air, avoid stacking the drives and leave a space of at least 100 mm above and below the drive and at least 50 mm laterally.
- Avoid vibrations and shocks.
- Leave place for any anti-interference filters.

The drive must be installed vertically with the ventilators at the bottom and placed in a cabinet with good ventilation; furthermore the inverter must always be mounted on a rigid floor panel to force the passage of air driven out by the ventilators through the heat sink.
Whether the inverter is installed inside a container of any kind, on the container itself there must be suction grids in the bottom part and ventilators with a hot-air expulsion grid in a position higher than the highest rim of the inverter, as shown in the drawing below. The flow of outgoing air from the highest part of the inverter must not be hindered in its normal route towards the expulsion ventilators.
For particularly aggressive environments or if it is not possible to have sufficient ventilation of the panel, use heat exchangers or air conditioners.

To choose the correct ventilation system inner to the cabinet, consider the data of the MAXIMUM POWER DISSIPATED from THE CASE at 5kHz PWM written in tables from Chap.2.
If there are higher pwm values, increase the ventilation according to the downgrading diagram.
If the relay fault signal (of default =O2) is used to remove the power supply from the inverter in case of Fault, please note that this will exclude, at the verification of the Fault, the operation of the cooling ventilators. In case of Fault 14 (cooler overtemperature power modules) to speed the cooling of the heat sink, it will be necessary to power the inverter inhibiting, however, gear (I1), in such a way that relay O2 will not de-energize and the cooling ventilators will continue to work.
All inverters from /5 to /G have, on the cooler, a thermostat that activates the cooling ventilators only when the temperature of the heat sink exceeds 50°C, the ventilators are deactivated when the temperature of the heat sink is less than 40°C.

IMPORTANT: at least once a year it is recommended to check the tightening of the terminals, especially the power ones, both of the inverter and the motor, in order to avoid possible loosening with consequent overheating of the contact and the connected cable.

Example of housing an inverter in a panel

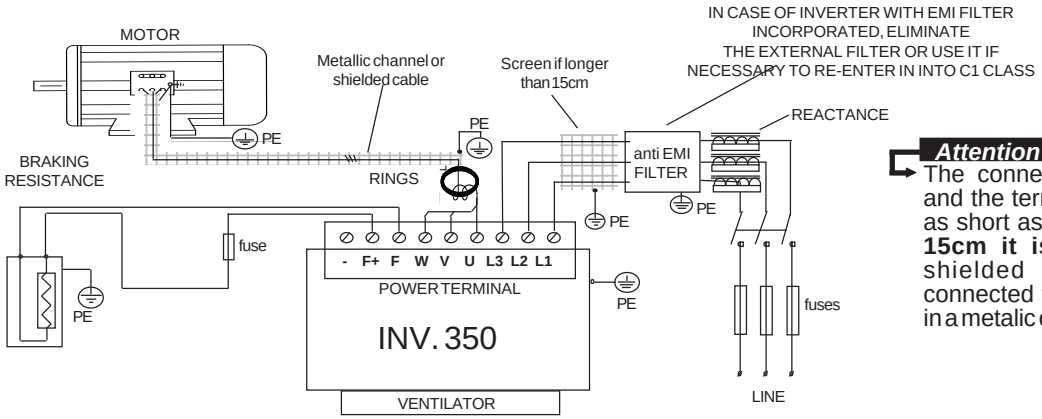


General instructions before connecting the three-phase power supply line

Connection with TN networks (Three-phase+Neutral to Earth) and TT networks (Three-phase + To Earth)
The ROWAN inverters are designed to be fed with this type of standard three-phase networks, which is electrically symmetrical with respect to the Earth. The connection to Earth of the inverter is mandatory.
Connection with IT networks (Three-phase without Earth)
In case of power supply through IT networks it is strictly neccesary to use an isolation triangle/star transformer with secondary triad directed to earth otherwise, any loss of isolation of one of the devices connected to the same network, may be the cause of inverter malfunctioning.

Wiring system for E.M.C. electromagnetic compatibility

The 350 series drives are designed to operate in industrial environments with safety requirements laid down by general norm CEI EN 60204-1. In particular, with regard to electromagnetic compatibility (EMC), they conform with Directive EMC 2014/30/EU with reference to product norm CEI EN 61800-3 (C2 Cat.); to satisfy these norms, the drives **without filter** built-in **must be connected via an anti E.M.I. (Electro Magnetic Interference) filtrage device** as indicated in the connection diagram shown below, made up of a three-phase power supply filter. To chose the filter consult:
"***Table with matching of the inverter to the anti E.M.I. three-phase filters and ferrite rings***".
It is furthermore necessary to pass several times the U - V - W cables in a ferrite ring placed as close as possible to the drive.
Furthermore the installer, in the wiring phase, must take the following precautions:
it is neccessary to avoid passing through the same channel, the comand terminal connection cables, those of power of the same drive or other equipment (distance at least 30 cm).
it is necessary to connect the analog inputs/outputs with a shielded cable in a channel different than those used for power cables.
it is necessary to connect one end of each screen individually to the common mass point of the panel, avoiding mass rings.
it is necessary to connect the motor-card power to the shielded cable, or with cables inserted in a metal tube without gap (as shown below).
it is necessary to use the three-phase filter (reactance) for reducing the harmonic distorsion.



Attention !
The connections between the filter and the terminals L1 L2 L3 must be as short as possible, **if they exceed 15cm it is neccesary to use** a shielded cable with shielding connected to ground or put the cables in a metalic conduit connected to earth.

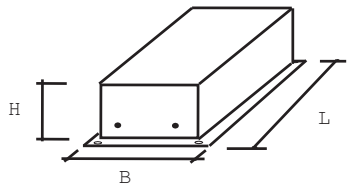
The inverters with built-in EMI filter have capacitors connected between the phases and the metal casing, for the safety of people it is absolutely forbidden to power the inverters without having first connected their PE terminal to earth. For the same reason, it is absolutely forbidden to power the external EMI filters without having first connected their PE terminal to earth.

Attention ! For the proper functioning of the anti EMI filter, for greater protection against electrostatic discharge (ESD) and for reasons of work injuries prevention, before supplying the inverter, the PE terminal must absolutely be grounded. The anti filters and the inverters with internal filter must be used only with power supply directed to ground (TN).
Before connecting the inverter and/or EMI filter, check the correct state of the earth grounding system. Any bad ground connection can affect the operation of the filter and damage it.
The anti E.M.I. filters internal or external to the equipment, have an earth leakage current <18mA, keep in mind that norm EN50178 specifies that, in the presence of leakage currents to earth greater than 3,5mA, the earth connection cable must be of a fixed type and doubled for redundancy.
The maximum protection of the inverter is obtained only with differentials of B type, preferably not lower than 300mA.

Attention !
This product belongs to the class of restricted commercialization in compliance with EN 61800-3, in a domestic environment this product can cause radio interference, in which case the user must take adequate precautions.

Table of electrical and dimensional characteristics for external anti E.M.I. three-phase filters

EMC FILTER CODE LINE 230-400VAC	FILTER Rated Current (A)	DIMENSIONS (mm)			WEIGHT (Kg)
		H	B	L	
FT.ROW10A.400	10	55	106	116	1
FT.ROW25A.400	25	60	135	232	2,5
FT.ROW50A.400	50	85	122	250	3
FT.ROW130A.400	130	150	90	270	3
FT.ROW200A.400	200	125	225	440	6
FT.ROW400A.400	400	125	225	440	6,5
FT.ROW600A.400	600	200	385	640	18
FT.ROW850A.400	850	200	385	640	19



Anti-E.M.I. filter dimensions

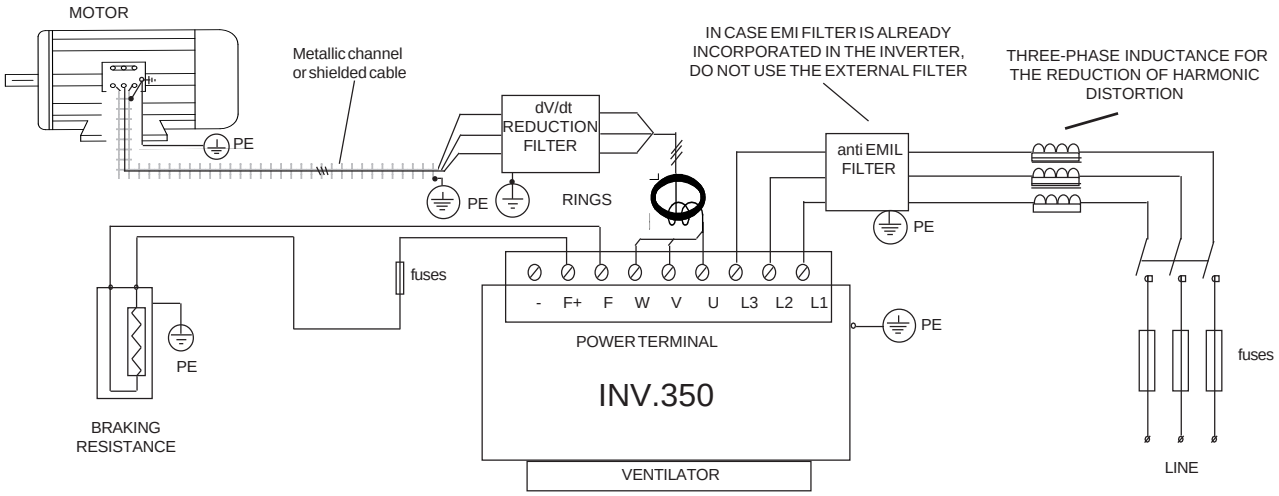
Table of matchings for inverters to the anti-E.M.I. three-phase filters and ferrite rings

INVERTER POWER SIZE LINE 230VAC-400VAC	EMC FILTER CODE	FILTER Rated Current (A)	FILTER LEAKAGE CURRENT (1) (mA)	INVERTER OUTPUT CABLES SECTION (mm^2)	No OF PASSAGES THROUGH FERRITE RING	Quantity OF FERRITE RINGSI	RING CODE
/R	BUILT-IN FILTER	/	3,5	1	3	1	NUFT19
/0	BUILT-IN FILTER	/	3,5	1,5	3	1	NUFT19
/0M	BUILT-IN FILTER	/	3,5	1,5	3	1	NUFT19
/1	BUILT-IN FILTER	/	3,5	2,5	3	1	NUFT19
/L	BUILT-IN FILTER	/	3,5	2,5	3	1	NUFT19
/2	BUILT-IN FILTER	/	3,5	4	3	1	NUFT38
/2,5	BUILT-IN FILTER	/	3,5	6	3	1	NUFT38
/3	BUILT-IN FILTER	/	3,5	6	3	1	NUFT38
/3,5	BUILT-IN FILTER	/	3,5	10	3	1	NUFT38
/5	BUILT-IN FILTER	/	38	16	3	1	NUFT38
/6	BUILT-IN FILTER	/	38	16	3	1	NUFT38
/6,5	BUILT-IN FILTER	/	38	25	2	2	NUFT38
/7	FT.ROW130A.400	130	18	35	2	2	NUFT38
/8	FT.ROW200A.400	200	18	50	1	2	NUFT38
/8,5	FT.ROW200A.400	200	18	70	1	2	NUFT38
/9	FT.ROW200A.400	200	18	95	1	2	NUFT38
/A	FT.ROW400A.400	400	18	* 2x50 x fase	1	1	NUFT104
/B	FT.ROW400A.400	400	18	* 2x70 x fase	1	1	NUFT104
/C	FT.ROW400A.400	400	18	* 2x95 x fase	1	1	NUFT104
/D	FT.ROW600A.400	600	18	* 2x120 x fase	1	1	NUFT104
/E	FT.ROW600A.400	600	18	* 3x95 x fase	1	2	NUFT104
/F	FT.ROW850A.400	850	18	* 4x95 x fase	1	2	NUFT104
/G	FT.ROW850A.400	850	18	* 4x120 x fase	1	3	NUFT104

(1) - It is the max leakage current of the EMI filters to ground under normal and properworking conditions (460Vac/50Hz)
* In case of connections to many high section cables, ROWAN can provide terminals that facilitate the connection (ask Rowan Elettronica's Technical Dept.).
To obtain information about Emi filters for 690Vac, please contact Rowan Elettronica's Technical Dept.

Reduction of harmonic distortion (Reactances)

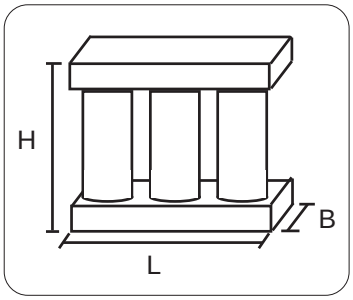
If it is necessary to reduce the harmonic distortion it is possible to furnish upon request a three-phase inductor to insert between the power supply network and EMI filter, as shown in the diagram below:



Such inductor, other than reducing the harmonic distortion, provides greater protection of the drive from any power interruptions or power peaks coming from the power supply; in particular it reduces the current peaks that go through the condensers inside the inverter further extending its life.

Table of matchings for inverters to harmonic distortion reduction filters

CODE (case)	RATED CURRENT (A)	POWER given at Rated Curr. (w)	MAXIMUM DIMENSIONS and WEIGHT				INVERTER SIZES 230-400Vac LINE	INVERTER SIZES 690Vac LINE
			L (mm)	B (mm)	H (mm)	WEIGHT (KG)		
RTZ.5A.5,6	5	16	120	66	115	3	/R (3,75A) /0 (5,2A)	-
RTZ.12A.2,2	12	27	150	90	147	6	/0M (7A) /1 (9,2A) /L (11,5A)	-
RZT.22A.1,3	22	42	180	89	147	7	/2 (17,5A)	-
RZT.35A.0,76	35	65	180	100	175	9	/2,5 (25A) /3 (29A) /3,5 (36A)	-
RZT.50A.0,56	50	87	180	110	175	10,5	/5 (48A)	/5, /6
RZT.72A.0,39	72	123	240	110	242	14,2	/6 (58A) /6,5 (70A)	/6,5 /7
RZT.106A.0,26	106	195	240	120	242	17,5	/7 (82A)	/8
RZT.165A.0,16	165	187	240	145	242	24,8	/8 (110A) /8,5 (135A) /9 (164A)	/8,5 /9
RZT.245A.0,11	245	225	300	130	260	27	/A (200A) /B (240A)	/A /B
RZT.370A.0,074	370	285	300	150	320	39	/C (325A) /D (370A)	/C /D
RZT.460A.0,059	460	438	360	165	370	54	/E (460A)	-
RZT.550A.0,049	550	465	360	200	370	69	/F (550A-5kHz)	/F
RZT.655A.0,042	655	500	360	210	370	84	/F (627A-3kHz) /G (655A-5kHz	/G



Maximum dimentions harmonic distortion reduction filters

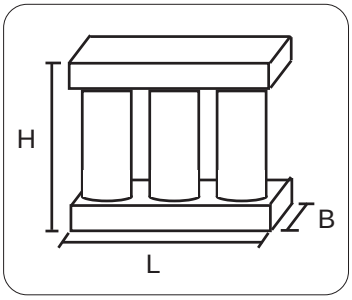
Reduction of the transient dv/dt to the motor

The voltage supplying the motor connected to the inverter is generated with the PWM technique, such voltage is therefore created by a sequence of pulses of variable duration. The high speed of increasing of the voltage of such dV/dt pulses, may cause high current leakages through the power supply cables of the motor as well as between the windings of the motor and between these and the casing of the same. The high dV/dt causes, furthermore, through intrinsic inductance of the connecting cables, high voltage peaks on the motor winding.
With the aim of reducing all the problems originated from the presence of current leakage and of the high overvoltage on the windings Rowan El. has studied a range of filters to reduce the dV/dt .
Find codes and their respective power levels, as well as sizes, in the table below:

Table of matchings for inverters to the dv/dt reduction filters

CODE	MAXIMUM CURRENT (A)	POWER given at Rated Curr. (W)	MAXIMUM DIMENSIONS and WEIGHT				INVERTER POWER SIZE 230-400Vac LINE	INVERTER POWER SIZE 690Vac LINE
			L (mm)	B (mm)	H (mm)	WEIGHT (KG)		
FIT.DV/DT.25A	25	27	150	82	147	3,6	/R.../2	-
FIT.DV/DT.80A	80	62	180	130	175	8,6	/2,5.../6	/5.../7
FIT.DV/DT.120A	120	78	180	160	170	10,9	6,5/7	/8
FIT.DV/DT.200A	200	156	240	140	230	14,6	/8,/8,5	/8,5 /9
FIT.DV/DT.300A	300	195	240	165	225	21,5	/9,/A,/B	/A /B
FIT.DV/DT.400A	400	215	300	155	280	26	/C	-
FIT.DV/DT.500A	500	270	300	175	280	38	/D	/C /D
FIT.DV/DT.600A	600	382	300	200	280	48	/E	/F /G
FIT.DV/DT.750A	750	430	360	195	330	53,5	/F	-

The filters for the reduction of the dV/dt should always be used in case of motors where you don't know the insulation degree of the windings, or in the case of motors not specifically built to be matched to inverters.
Such filters should also be used every time the length of the cable between the inverter and the motor exceeds 15m.
The filter for the reduction of the dV/dt must be interposed between the ferrite rings and the motor just behind said rings and as shown in the diagram on the previous page.



Maximum dimensions of dV/dt reduction filters

Electrostatic discharge (ESD)

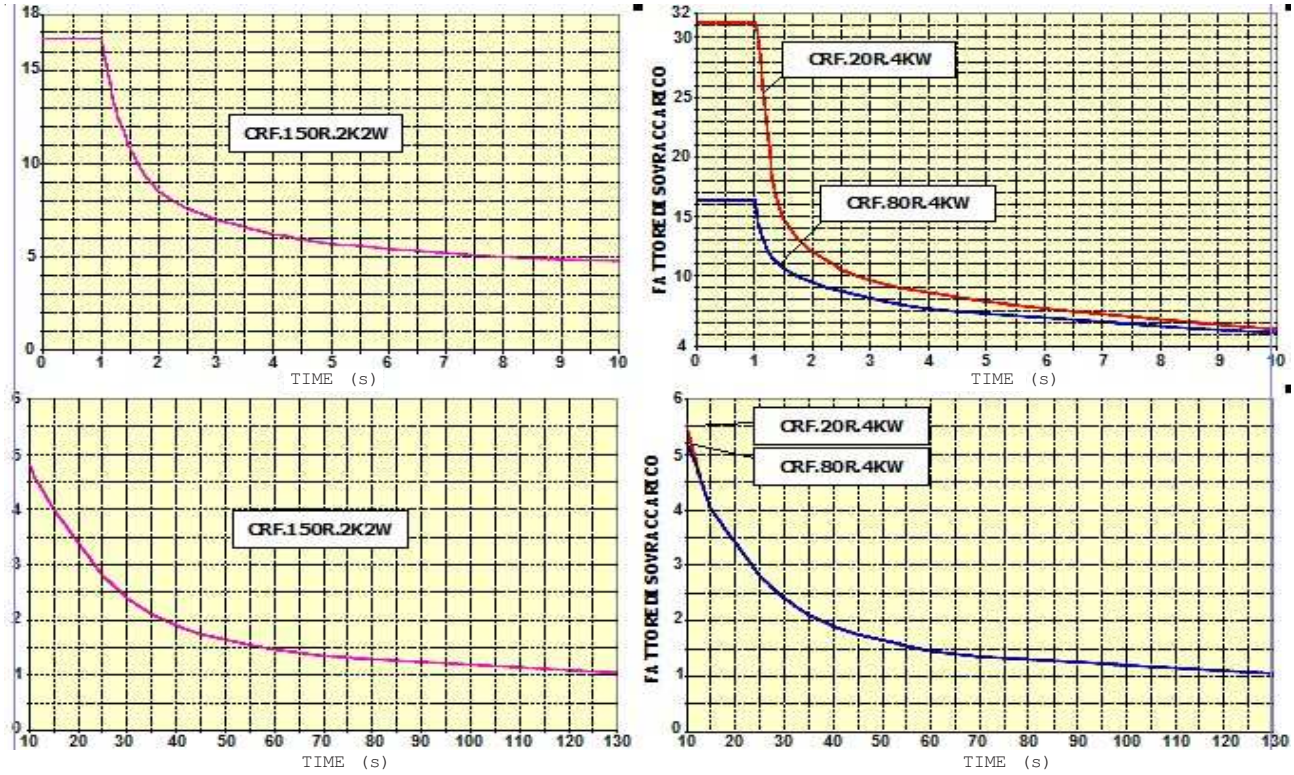
The inverter contains components that can be damaged by electrostatic discharge (ESD).
It is therefore important to keep in mind the following suggestions:

- touch the internal cards only if absolutely necessary.
- before handling the cards, the human body must be electrostatically discharged.
- the cards must not come in contact with superisolating materials (e.g. textile fibers) especially during their use in movement.

Table for the characteristics of use of the Rowan braking resistors

DATA/SETTINGS	units	RES.180R.600	CRF.150R.2K2	RES.20R.2K5	RES.30R.2K5	RES.40R.2K5	CRF.20R.4KW	CRF.80R.4KW
RATED POWER	W	600	2200	2500	2500	2500	4000	4000
RESISTANCE	ohm	180	150	20	30	40	20	80
RATED CURRENT	A	1.8	3.8	11	9	7.9	14.1	7.0
MAX CURRENT for 5 secs	A	2.5 (5s ON- 25s OFF)	9.2 (5s ON- 30min OFF)	16.7 (5s ON- 1min OFF)	12.9 (5s ON- 1min OFF)	10.6 (5s ON- 1min OFF)	39.5 (5s ON- 30min OFF)	18.0 (5s ON- 30min OFF)
gL PROTECTION FUSE	A	2	4	16	10	10	16	8

To semplify the choice of the **CRF resistance** (and eventual combinations series/parallel) according to the working cycle, we illustrate the following overload curves. **ATTENTION!** The curves refer to one single overload with environment temperature max 40°C and resistor installed where there is a correct air flow. The average time for the resistor to reach the environment temperature is beetween 20 and 30 minutes in function to the cooling conditions.



There are 2 typical cases of installation for the braking resistors:

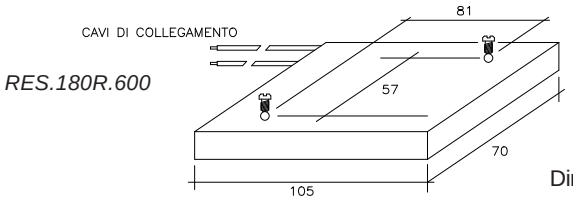
Installation inside the panel
Usually this type of installation is used in case of intermittent use of the resistors, with high but short peaks of current that are distanced so that they don't eccessively raise the temperature of the panel and of other existing equipment beyond their work limit in continuous mode. In this case the nominal values of current and power must be applied but with a **duty cycle of 5%.**
Furthermore the following assembly conditions must be respected:
The **RES.180R.600** and **RES.xxR.2K5** resistors, built in ceramic protected in ultrathin case, must be fixed and have good contact with the support sheet of the panel's components.
The **CRF.xxR.xKxW** resistor, built in a IP22 container in non ventilated version, must be mounted in a vertical position as shown in the diagrams on the facing page.

External installation
This type of installation is used when it is necessary to dissipate in continuous mode the maximum power possible of the braking resistor ventilated or not. The characteristics of current and power in **continuous mode (duty cycle 100%),** indicated in the table, are relative to the following assembly conditions:
The **RES.180R.600** and **RES.xxR.2K5** resistors, used at rated power, must be attached to a cooler that is able to dispose of **0,5W/°C.**
Attention ! → With these characteristics the external temperature of the flat resistor can reach approximately **300°C.** Use appropriate protection against accidental contact.

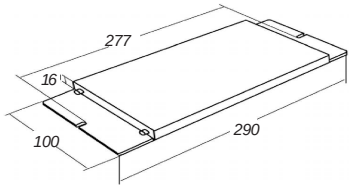
The resistors in container IP22 in non ventilated version **CRF.xxR.xKxW**, and ventilated **CRF.xxR.xKxW.V** must be mounted in a vertical position as indicated in the diagrams on the facing page.
Attention ! → With these characteristics the temperature of the air that exists from the slit of the container can reach approximately **400°C.** Use appropriate protection against accidental contact.

The ohmic value of the braking resistor can never be inferior to the data:
"*MINIMUM BRAKING RESISTOR OUTPUT F F+* " reported in the tables in Ch.2 TECHNICAL CHARACTERISTICS.
With inverters size /3 to /G, outputs F and F+ are protected against a short circuit, reported with the locking of the inverter by FAULT13. For sizes from /R to /2 there is no protection, therefore we suggest using a protection fuse on terminal F+.
For safety reasons, insert a protection fuse in series connection with the resistance on F+ terminal, as shown in the table.

Overall dimensions of resistors RES.180R.600



Dimensions in mm

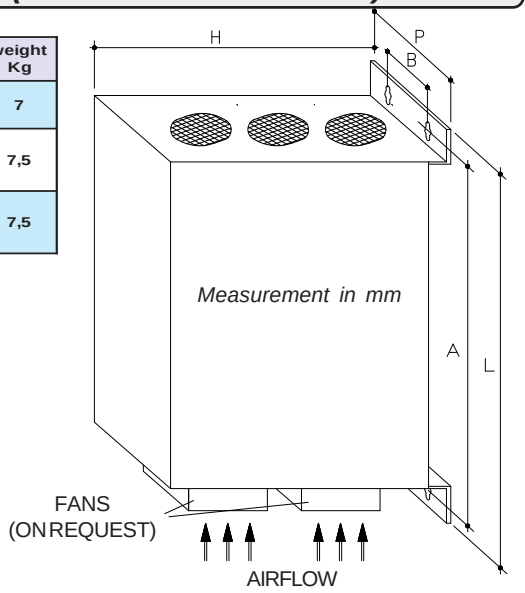


Overall dimensions of resistors in container (code CRF. xx R . xKx W)

CODE	H	B	L	A	P	weight Kg
CRF.150R.2K2W	322	67	486	458	120	7
CRF.20R.4KW	322	67	486	458	120	7,5
CRF.80R.4KW	322	67	486	458	120	7,5

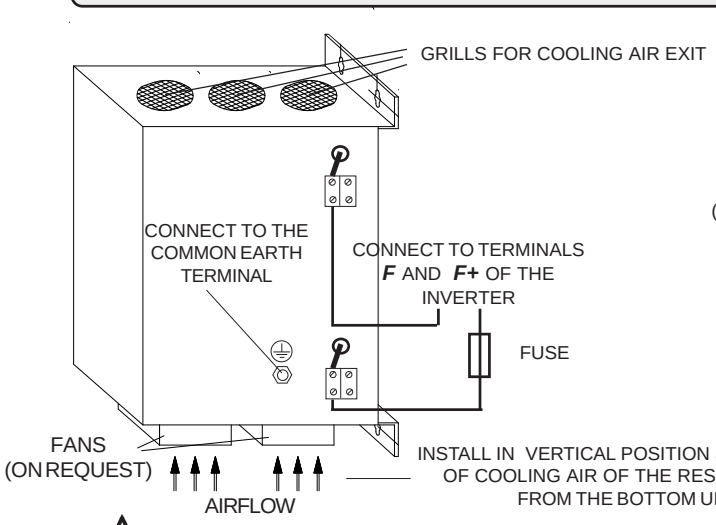
RESISTIVE VALUE

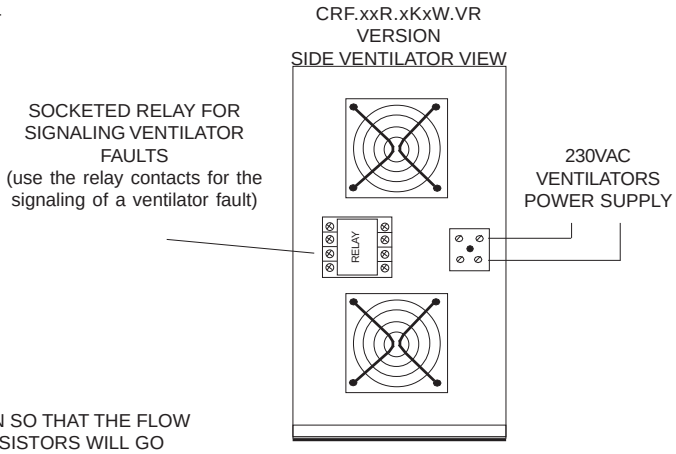
POWER



Versions available:
C R F. x x R . x K x W: *Standard non ventilated version*
C R F. x x R . x K x W.V: *Standard ventilated version*
C R F. x x R . x K x W.VR:
Standard ventilated version with relay that signals ventilator fault

Mechanical installation and electrical C R F. x x R . x K x W resistor connection



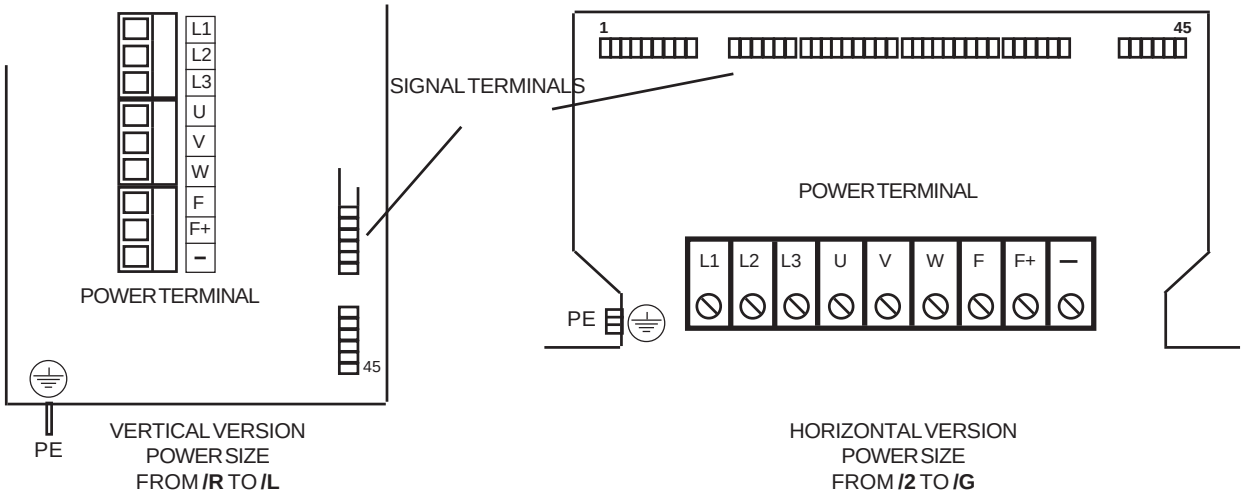


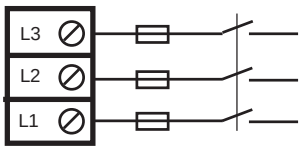
In cases where it is necessary to open the container for maintenance work, it is **mandatory** to turn off the inverter and wait at least 5 minutes before touching the electrical resistor.

Parameterization of the inverter for dynamic braking

The inverter has an electronic overload control on the braking resistor; to this end it is necessary to insert the rating of the resistor in the following parameters:
In ***par. 2.5.1 BRAKE RESISTANCE,*** insert the ohmic value of the resistor. In case of connecting many resistors with equal characteristics in parallel or in series, insert the equivalent resistive value.
In ***par. 2.5.2 NOMINAL CURRENT***, insert the nominal current of the resistor in the work conditions chosen. In case of connecting many resistors with equal characteristics in parallel, insert the sum of the single currents; in the case of series, the current of the single resistor. If this value is surpassed for a preestablished time the inverter gets locked and shows FAULT 18.
In ***par. 2.5.3 5 SEC CURRENT***, insert the maximum value of the current for 5 sec. In case of connecting many resistors with equal characteristics in parallel, insert the sum of the single currents; in the case of series, the current of the single resistor.
If this value is surpassed for a preestablished time the inverter locks and shows FAULT19.
With regard to the Rowan braking resistors get the rating from the table on the previous page:
"Table with the characteristics of use of the Rowan braking resistors". In connections with many resistors in parallel, the protection fuse indicated in the table must be inserted in series at each single resistor.

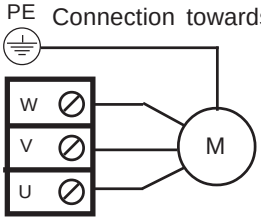
Description of power terminal





Three-phase inverter power supply.
For the value of the protection fuses see TABLES SUMMARIZING THE ELECTRICAL POWER CHARACTERISTICS OF INVERTER SERIES 350 in ch.2 TECHNICAL CHARACTERISTICS.

PE Connection towards earth



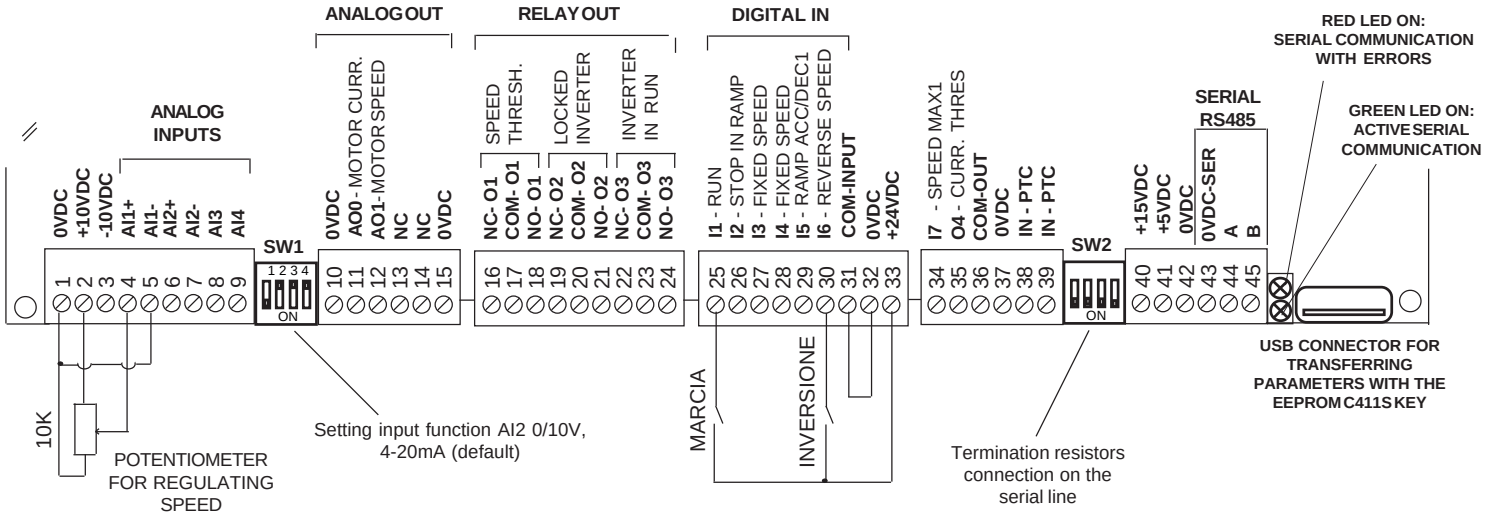
Three-phase asynchronous motor connection

Negative busdc
Positive busdc

Useful connections in case of common BUS DC connection to other inverters (through opportune protection fuse)

Braking resistor. For the value of the protection fuse see table in Ch.5 BRAKING RESISTORS.

Description of terminals and connectors for signals



0VDC 1 — Common negative

+10VDC 2 — Voltage reference for external potentiometer +10Vdc /10mA.

-10VDC 3 — Voltage reference for external potentiometer -10Vdc /10mA.

AI1+ 4
AI1- 5

Analog input **differential +/-10Vdc**, programable, 12 bit resolution.
Plant settings: input 0/+10VDC (***par.8.18 TYPE INPUT AI1= 0/+10V***)
Functions set at the plant: SPEED REFERENCE (***par.3.1 SPEED SOURCE=AI1***)

AI2+ 6
AI2- 7

Analog input **differential +/-10Vdc,0-20mA, 4-20mA,** programable, 12 bit resolution.
Plant settings: input 4-20mA (***par.8.19 TYPE INPUT AI2=4/20mA***)
Functions set at the plant: NONE.
It is possible to set the AI2 input even for an input signal with voltage 0Vdc/+10Vdc o +/-10Vdc; to do so it is necessary to set the micro **SW1:** 1OFF, 2ON, 3 ON.
The standard predisposition is for input 0-20mA, 4-20mA with micro **SW1** 1ON , 2OFF, 3 OFF.
The SW1 microswitches are accessible from the outside between terminals 9 and 10.

0VDC 1
AI3 8

Analog input **non differential +/-10Vdc**, programable, 12 bit resolution.
Plant settings: input 0/+10VDC (***par.8.20 TYPE INPUT AI3=0/+10V***).
Functions set at the plant: NONE

0VDC 1
AI4 9

Analog input **non differential +/-10Vdc**, programable, 12 bit resolution.
Plant settings: input 0/+10VDC (***par.8.21 TYPE INPUT=0/+10V)***
Functions set at the plant: NONE

0VDC 10 — Common negative

0VDC 10
AO0 11

Analog output **0/+10Vdc** 12 bit resolution.
Plant settings: MOTOR CURRENT (the analog output is proportionale to var.6.4 MOTOR CURRENT).

0VDC 10
AO1 12

Analog output **0/+10Vdc** 12 bit resolution.
Plant settings: MOTOR SPEED (the analog output is proportional to var.6.2 MOTOR SPEED).

NC 13 — No function

NC 14 — No function

0VDC 15 — Common negative

NC- O1 16
COM - O1 17
NO - O1 18

Contact of the digital output programable with **relay O1**. Contact capacity 0,5A-120Vac / 2A-30Vdc
Plant settings: par.9.1 ***O1 FUNCTION =****SPEED TH*.
Function: THRESHOLD ON THE SPEED OF THE MOTOR (ZERO RELAY)
Relay ON with motor speed superior than the threshold of ***par.3.7 SPEED THRESHOLD***
Relay OFF with motor speed inferior to the threshold of ***par.3.7 SPEED THRESHOLD***

NC- O2 19
COM - O2 20
NO - O2 21

Contact of the digital output programable with **relay O2**. Contact capacity 0,5A-120Vac / 2A-30Vdc
Plant settings: par.9.3 ***O2 FUNCTION =*** *INV. FAULT*
Functions set at the plant: INVERTER IN FAULT
Relay ON in regular functioning, OFF with the inverted in fault.
At the moment of powering the inverter, the relay stays OFF for approximately 3 seconds and then, if there are no FAULTS, it goes to ON.

NC- O3 22
COM - O3 23
NO - O3 24

Contact of the digital output programable with **relay O3**. Contact capacity 0,5A-120Vac / 2A-30Vdc
Plant settings: par.9.5 ***O3 FUNCTION =*** *INV. RUN*
Function: INVERTER IN RUN
Relay ON with inverter in run, OFF with inverter in run OFF or in FAULT

I1 25 — Digital input **non** programable with fixed inverter RUN fuction.
Even if this input is already active, the inverter goes into RUN only after the time set in par.8.4 I1 TIME OFF.

I2 26 — Digital input programable, plant settings par.8.5 **I2 FUNCTION** = *STOP SPEED*.
Function: STOP IN RAMP
Input OFF the motor accelerates in ramp to reach the speed set.
Input ON the motor decelerates in ramp and then maintains the stop position.

I3 27 — Digital input programable, plant settings par.8.7 **I3 FUNCTION =** *IN1 FIX S.*.
Function: SELECTION 1° FIXED SPEED (set with par.3.2.1 **SET SPEED1**)
With the input in OFF, the regulation of speed from input AI1 remains active.

I4 28 — Digital input programable, plant settings par.8.9 **I4 FUNCTION =** *IN2 FIX S.*
Function : SELECTION 2° FIXED SPEED (set with par.3.2.2 **SET SPEED2**).
With input in OFF, the regulation of speed from input AI1 remains active.

I5 29 — Digital input programable, plant settings par.8.11 **I5 FUNCTION =** *IN1 RMP S.*
Function: SELECTION 1°RAMP ACC/DEC FIXED (set with par.4.1 **SET ACC1** and par.4.2 **SET DEC1.** With input in OFF, the settings of the ramps set in the parameters 1.6 **RAMP ACCEL. TIME** and 1.7 **RAMP DECEL. TIME** remain active.

I6 30 — Digital input programable, plant settings par.8.13 **I6 FUNCTION =** *REV. SPEED* Function: REVERSE SENSE OF ROTATION

COM-I 31 — Polarization terminal of the digital inputs max 30Vdc.
Connect to the power positive to activate the inputs in logic **NPN**
Connect to the power negative to activate the inputs in logic **PNP**

OVDC 32 — Common negative

+24VDC 33 — Polarization positive of the digital inputs, **+24VDC/250mA**
Protected by an autoresetting fuse of 650mA.

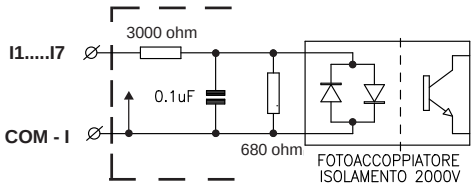
I7 34 — Digital input programable.
Functions set at the plant: SELECTION OF THE 2° MAX SPEED LIMIT
(par.8.15 **I7 FUNCTION =** ***IN1 MAX S.****)*

O4 35 — Static digital output programable, NPN/PNP, max 100VDC/80mA
Plant settings: par.9.7 **O4 FUNCTION =***CURRENT TH*.
Function: MOTOR CURRENT THRESHOLD
Relay ON with motor absorption superior to the threshold of par.5.4 ***CURRENT THRESHOLD***
Relay OFF with motor absorption inferior to the threshold of par.5.4 ***CURRENT THRESHOLD***

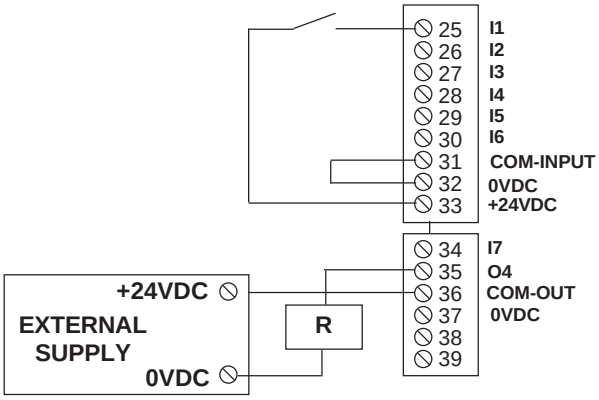
COM-OUT 36 — Polarization terminal of the digital output O4 max 30Vdc.
Connect to the power positive to activate the inputs in logic **NPN**
Connect to the power negative to activate the inputs in logic **PNP**

OVDC 37 — Common negative

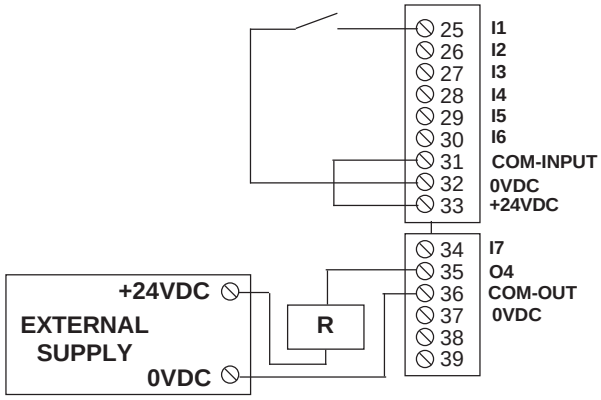
Internal electrical diagram of the digital inputs from I1 to I7



Example of digital inputs/outputs connections with PNP logic



Example of digital inputs/outputs connections with NPN logic



IN-PTC 38
IN-PTC 39

Input dedicated to a PTC probe for the thermal protection of the motor.
It is possible to connect a maximum of 3 probes of 250 ohm/25°C in series (total resistance of the circuit probe 750 ohm). The control of the PTC probe must be activated by setting par.2.6 PTC ENABLE=YES
Characteristics of intervention on the resistive value:
2850 Ohm ± 20% once this value is exceeded the inverter locks with the activation of fault 33
1000 Ohm ± 20% below this value run returns.

+15VDC 40
0VDC 42

Power supply for transducers of signal +15Vdc/200mA.
Protected against short circuit by autoresetting fuse of 250mA

+5VDC 41
0VDC 42

Power supply for transducers of signal +5Vdc/200mA.
Protected against short circuit by autoresetting fuse of 250mA

0VDC-SER 43 Common serial negative RS485
A 44 Channel A serial line
B 45 Channel B serial line

CONNECTION OF SERIAL LINE RS485
WITH STANDARD PROTOCOL MODBUS RTU
For activation consult the parameters of the menu
12. SERIAL COMUNIC.

USB CONNECTOR

USB CONNECTOR FOR THE BIDIRECTIONAL TRANSFER OF PARAMETERS FROM EEPROM KEY (**C411S**) TO INVERTER AND VICEVERSA
(see **Ch.10 description of parameters 100.6 Copy KEY>>INV and 100.7 Copy INV>>KEY)**

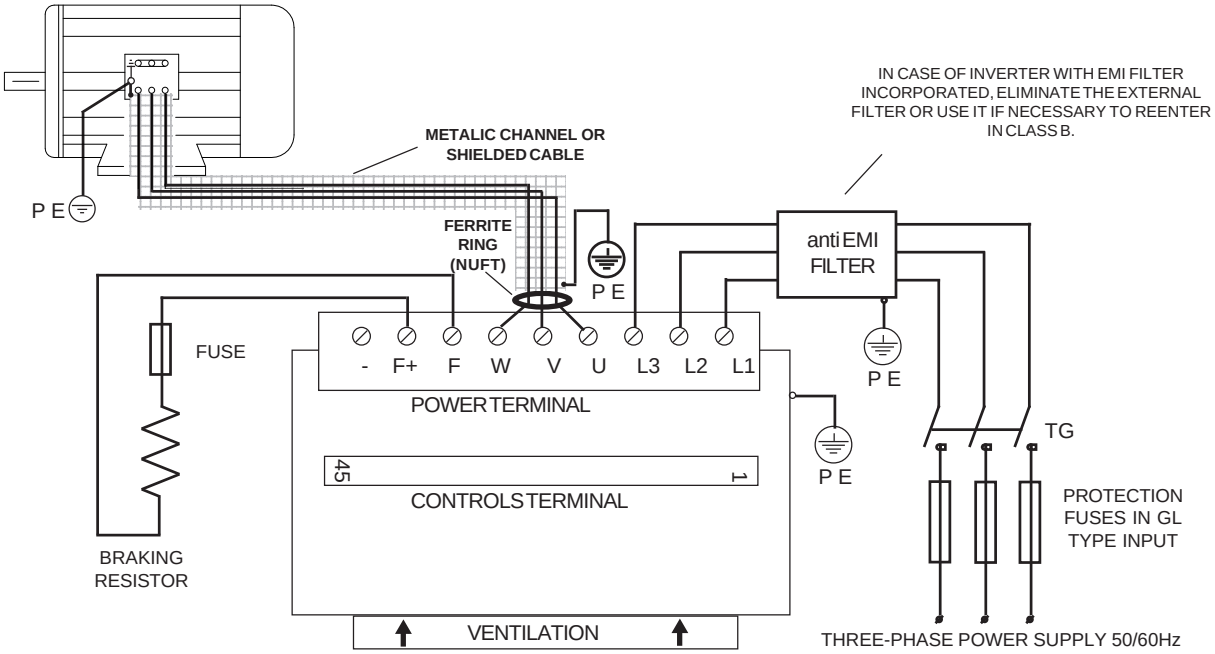
Attention ! This does not work with normal USB keys

Start of installation in scalar control

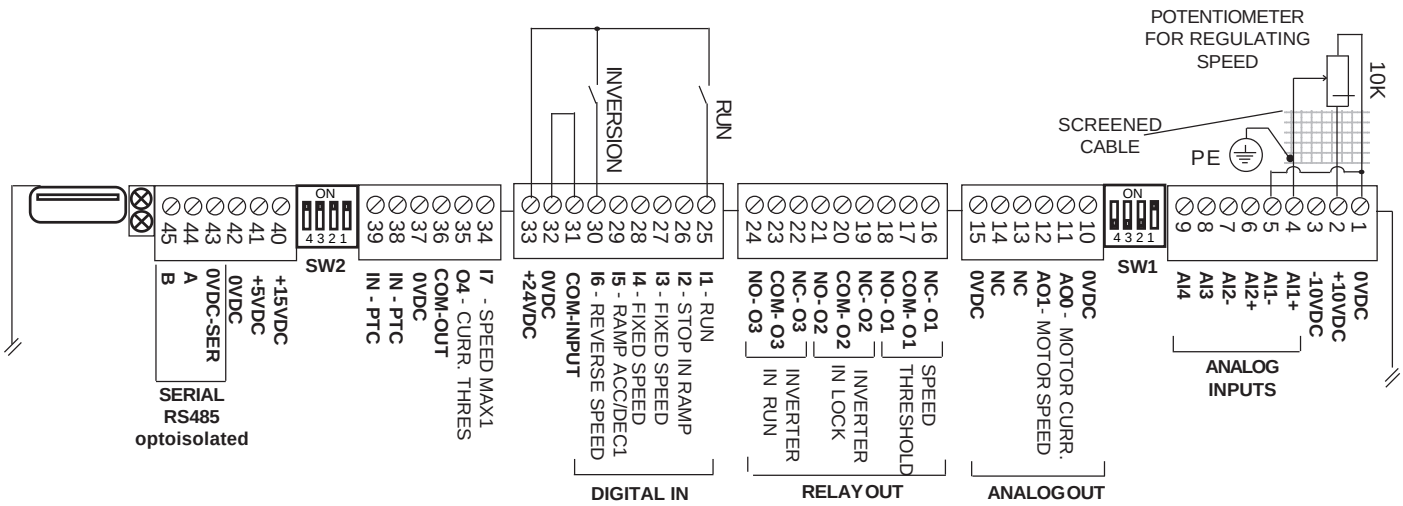
The goal of this paragraph is to help the user, in a quick and correct manner, regulate the speed, through the potentiometer, of a normal asynchronous motor controlled in scalar with the V/F (Voltage/Frequency) technique.
Proceed in the following manner:
> Before the installation carefully read Ch.1 GENERAL INFORMATION BEFORE INSTALLATION
> Consult Ch.8 DESCRIPTION OF KEYPAD OPERATION
> Information on the correct way of installing are found in the following chapters of the complete MANU.350S manual:
- Ch.3 MECHANICAL INSTALLATION for the housing of the inverter in the panel.
- Ch.4 ELECTRICAL INSTALLATION for connection of the inverter and the E.M.C. aspects
- Ch.5 BRAKING RESISTORS if the connection is necessary.

> Connect the inverter according to the following ***connection diagrams:***

Connection diagram of the power terminal *(Example of motor with a star connection)*



Connection diagram of the command terminal



The analog/digital inputs and outputs are freely programable except for I1, AO0, AO1, PTC.
The functions indicated in this diagram are relative to default programming.
It is possible to control the state of the I/O with the following menu variables **6. GENERAL VARIABLE**:
6.22 DIG. INPUT I1..8 for the digital inputs and **6.23 DIG. OUTPUT O1..8** for the digital outputs.

Attention ! → Storing the inverter for more than 3 years after its purchase, may damage the working capacity of the condensers of the DC link which will have to be "reset"; to do this, before starting it is advisable to supply power to the inverter for at least one hour in run off.

Begin the programming with the RUN contact deactivated. The run contact can not be however considered valid for a safety stop, since in certain programming conditions or failure of the inverter, its deactivation may not correspond to the immediate stop of the motor.
For safety reasons it is opportune to have at near reach the emergency pushbutton that immediately activates the system's safety functions and, if provided, the STO function (see safety manual MANU.STO.350-400-700).
> Feed the inverter (in run OFF) and check the correct regulation of the potentioneter in the following manner:
Select the ***SPEED REFERENCE*** variable using the UP or DOWN button.
> Regulate the potentiometer to the minimum and maximum and check in ***SPEED REFERENCE*** the regulation from 0 to 1500rpm. Leave the potentiometer at the minimum with ***SPEED REFERENCE*** at 0rpm.
Press the PROGRAM button to modify the following parameters of the menu ***1.BASIC DATA***:

LINE VOLTAGE ***1.1 400.V***	***Set the power supply voltage of the inverter to terminals L1, L2, L3.*** Choose the voltage that is closest to the real value of the power supply voltage. Setting field from 150.V to 600.V
MOTOR NOM CURREN ***1.2 10.0A***	***Set the nominal current of the motor connected to the inverter.*** Setting field: from 0.0A to the value set to a plant parameter.
MOTOR NOM FREQUE ***1.3 50.0Hz***	***Set the nominal frequency of the motor (frequency to the nominal voltage).*** Obtain the value from the rating plate of the motor. Setting field: from 1.0Hz to 800.0Hz
MOTOR NOM VOLTAG ***1.4 400.V***	***Set the nominal voltage of the motor (voltage to the nominal frequency).*** Obtain the value from the rating plate of the motor according to the connection (star or triang.) Setting field: from 1.V to 2000.V
MOTOR POLES ***1.5 4_POLES***	***Set the number of poles of the motor.*** Obtain the value from the rating plate of the motor. Setting field: 2 POLES, 4 POLES, 6 POLES, 8 POLES.
RAMP ACCEL. TIME ***1.6 10.00s***	***Set the acceleration ramp of the motor.*** Setting field: from 0.01s to 600.00s
RAMP DECEL. TIME ***1.7 10.00s***	***Set the deceleration ramp of the motor.*** Setting field: from 0.01s to 600.00s
MAX MOTOR SPEED ***1.8 1500.rpm***	***Set the maximum speed of the motor.*** Setting field: from 0 rpm to 30000 rpm
MIN MOTOR SPEED ***1.9 0.rpm***	***Set the minimum speed of the motor.*** Setting field: from 0 rpm to 30000 rpm
FIXED BOOST ***1.10 1.0%***	***Set the fixed voltage on the motor active from 0.0Hz to 20.0Hz, starting with the default value 1.0% . Subsequently, if you need to increase the torque at low revolutions, it is possible to increase this value but without exceeding the In of the motor.*** Setting field: from 0.0% to 25.0%

Perform the rotation test regulating the speed with the potentiometer:
Press ESCAPE and select the ***MOTOR SPEED*** variable by pressing the keys UP or DOWN.
> Close the RUN (I1) contact; the RUN pilot light should light up on the keypad
> Regulate the potentiometer and check that the motor rotates at the speed shown from the minimum to the maximum pre-set.
> Select the ***MOTOR CURRENT*** variable and check that the absorption of the motor is correct.
> To change the sense of rotation of the motor, close the INVERSION contact.
End of quick installation.

Procedure to restore default settings

It is possible to cancel all the settings that have been made and return to the original plant settings in the following manner:
> Deactivate the run (pilot light RUN is off)
> Hold down the ESCAPE key until this parameter appears in the display:

RESTORE SETUP ***100.2 DEFAULT***	Set the parameter = ***DEFAULT***

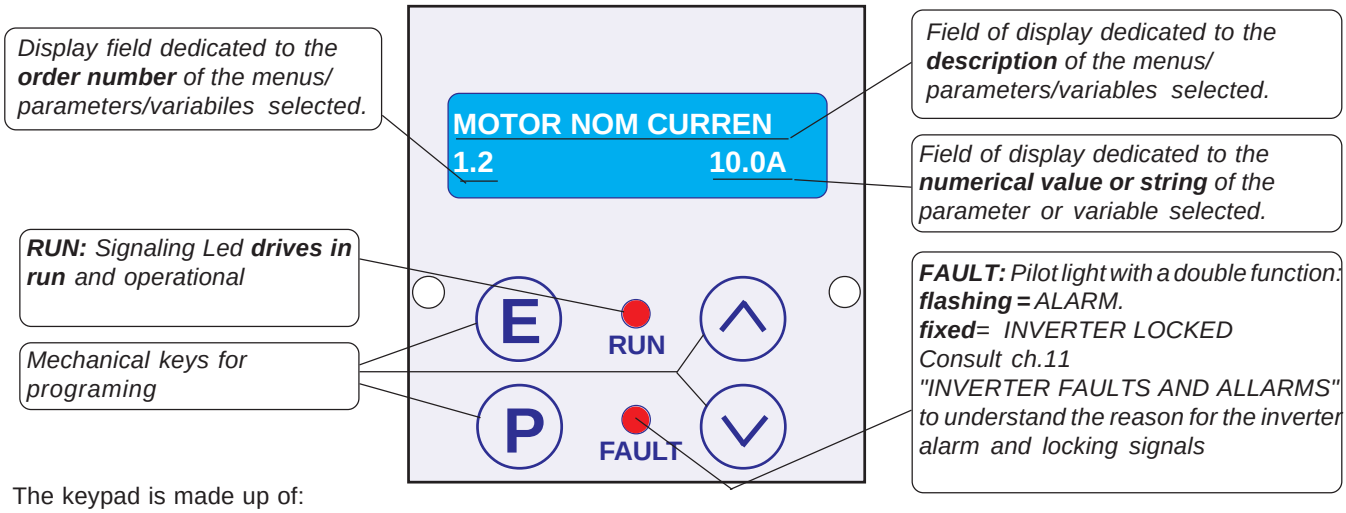
> Using the UP key select the next parameter:

ENABLE RESTORE ***100.23 NO***	Select ***YES*** and confirm with the PROGRAM key; ***YES*** will remain on display until the complete restoration of the original settings and then return to ***NO.***

Attention ! → **After this operation the personalized settings are definitively cancelled.**

General description of the keypad

The keypad allows for the modification of the operation parameters (memorised in an eeprom) and to view useful quantities in the working phase such as: speed reference, speed and frequency of the motor, motor current, the last fault that occurred and many other variables available in the relative menu. Thanks to the serial connection the keypad can be remote on the panel of a control board, at a maximum distance of 25 meters.
Rowan Elettronica provides, upon request, the remoting cable of the keypad.



The keypad is made up of:

- An alphanumeric led 2x16 characters backlit display.
- Four mechanical keys that give the feeling the key is pressed.
- Two leds that signal running (RUN) and locking due to fault (FAULT).

Key functions

ESCAPE key, return to the main menu or to the upper level and save the settings.

PROGRAM key, enter in the sub-menus, modify the parameters with the selection of one number at a time in the case of numeric value.

UP key, scroll FORWARD the variables viewed and set by increasing the numerical digit selected from the PROGRAM key.

DOWN key, scroll BACK the variables viewed and set by decreasing the numerical digit selected from the PROGRAM key.

Procedure for modifying a parameter

For example, to modify the parameter 1.2 MOTOR NOM CURRENT from the menu 1. BASIC DATA, :
> Press the P key, at this point the 1. BASIC DATA menu will appear
> Press the P key to view the first parameter of the menu 1.BASIC DATA, parameter 1.1 LINE VOLTAGE.
> Press the UP key to select par.1.2 MOTOR NOM CURRENT.
> Press the P key to modify the parameter:
in the display field dedicated to the numerical value to be set the first number to the right (the least significative) will begin to flash to indicate that it is now possible to modify its value using the UP and DOWN keys.
> Press the UP key to increase the value and the DOWN to decrease it.
> To modify the other numbers it is enough to impulsively press the P key, at each pressure the following number is selected on the left, until the most significative to then return to the least significative and so on.
> In the case of a positive and negative parameter, the sign will appear after most significative number; to modify it press the P key until its selected and then, with the UP key set the sign **+** and with the DOWN key the sign -
>To memorize the value set press the ESCAPE key (the selection will stop flashing).
> To return to the starting level (DISPLAY STATE) press the ESCAPE key again. The procedure to modify the parameters with a selection string is exactly the same, in this case the UP and DOWN keys will select the strings available in the menu instead of the numerical values.

Attention ! → **The keypad does not contain parameter memory, which can only be copied onto the EEPROM cod. C411S key**
(see **Ch.10 description of parameters 100.6 Copy KEY>>INV and 100.7 Copy INV>>KEY)**

Block diagram of the basic structure of the menus

PARAMETER 100.

Settings: operations on the parameter memory areas, management of the EEPROM key, locking the keypad, selection function of 2 motors of different sizes with the same inverter.

E *Press ESCAPE for 5 sec to access the menu 100.*

MONITOR VARIABLES + SET OPERATOR

This is the menu that is activated at the start up of the inverter, and contains: 8 monitoring variables extracted from the 6.DISPLAY VARIABLE menu and, if enabled, personalized settings for an operator. The configuration can be modified using the parameters of the 7. DISPLAY CONFIG menu.

P *Press PROGRAM to access menus 1. to 12.*

1. BASIC DATA — Fundamental parameters for quick work setting.

With the UP key go to the next menu

2. INV MOTOR SETUP — **Settings**: boost controls, quick restart, pwm frequency, braking resistor, pts probe motor protection.

3. SPEED CONTROL — **Settings**: source of speed set, fixed speed, manual speed setting, speed jumps, selection 2° max speed, threshold on the motor speed.

4. RAMP ACC/DEC — **Settings**: fixed ramps, change ramps based on the motor speed.

5. CURRENT CONTROL — **Settings**: overload control, limitation speed of the motor current, limitation of the boost voltage, increment function of the static torque (HIGH TORQUE), threshold on the motor current.

6. DISPLAY VARIABLE — Monitor of all the inverter displays

7. DISPLAY CONFIG — **Settings**: choice of 8 default displays at startup, choice of the OPERATOR settings.

8. INPUTS SETTING — **Settings**: functions of the I1 input, functions of digital inputs from I2 to I7 and virtual input, functions of the analog inputs from AI1 to AI4.

9. OUTPUT SETTING — **Settings**: functions of relay outputs O1, O2, O3 and static O4, offset/scale of the analog outputs AO1 and AO2.

10. SPECIAL FUNCTION — **Settings**: motopotentiometer function, braking in continuous current.

11. FAULT MANAGEMENT — **Settings**: autorestart after a fault, history of the last 5 faults with manual reset.

12. SERIAL COMUNICAT — **Settings**: serial transmission MODBUS RTU.

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
1. BASIC DATA								
1.1 LINE VOLTAGE	V	0	2000	400		-	1000	R/W
1.2 MOTOR NOM CURREN	A	0.1	factory setting	depends on size		-	1001	R/W
1.3 MOTOR NOM FREQUE	Hz	0.1	800.0	50.0		-	1002	R/W
1.4 MOTOR NOM VOLTAG	V	0	2000	400		-	1003	R/W
1.5 MOTOR POLES	-	*0=2 POLES *1=4 POLES *2=6 POLES *3=8 POLES		1=4 POLES		-	1004	R/W
1.6 RAMP ACCEL. TIME	s	0.01	600.00	10.00		-	1005	R/W
1.7 RAMP DECEL. TIME	s	0.01	600.00	10.00		-	1006	R/W
1.8 MAX MOTOR SPEED	rpm	0	30000	1500		-	1007	R/W
1.9 MIN MOTOR SPEED	rpm	0	par. 1.8	0		-	1008	R/W
1.10 FIXED BOOST	%	0.0	25.0	depends on size		-	1009	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
2. INV/MOTOR SETUP								
2.1 START BOOST FREQ.	Hz	0.0	20.0	depends on size		-	1010	R/W
2.2 STOP BOOST FREQ.	Hz	0.0	par. 1.3	25.0		-	1011	R/W
2.3 FLYING RESTART								
2.3.1 ENABLE FLYING VF	-	*0=NO *1=YES		NO		-	1013	R/W
2.3.2 DEMAGNETIZE TIME	s	0.01	10.00	1.00		-	1014	R/W
2.3.3 VOLT RAMP START	s	0.01	10.00	0.50		-	1015	R/W
2.4 PWM MODULATOR								
2.4.1 PWM FREQUENCY	Khz	0.50	factory setting	3.00		-	1016	R/W
2.4.2 START PWM FREQ.	Khz	0.50	factory setting	1.00		-	1017	R/W
2.4.3 CHANGE PWM SPEED	rpm	0	par. 1.8	500		-	1018	R/W
2.4.4 PWM MODE	-	0=STANDARD 1=RANDOM		0=STANDARD		-	1222	R/W
2.4.5 FREQ. DEVIATION	%	0.0	100.0	30.0		-	1223	R/W
2.5 BRAKE UNIT								
2.5.1 BRAKE RESISTANCE	ohm	0.0	200.0	depends on size		-	1019	R/W
2.5.2 NOMINAL CURRENT	A	0.0	3000.0	depends on size		-	1020	R/W
2.5.3 5 SEC CURRENT	A	0.0	3000.0	depends on size		-	1021	R/W
2.6 PTC ENABLE	-	*0=DISABLE *1=ENABLE		DISABLE		-	1012	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
3. SPEED CONTROL								
3.1 SPEED SOURCE	-	*0=REMOTE *1=AI1 *2=AI2 *3=AI3 *4=OPERATOR *5=MOTOPOT		AI1		-	1024	R/W
3.2 FIXED SPEED SEL.								
3.2.1 SET SPEED 1	rpm	-30000	+30000	500		-	1031	R/W
3.2.2 SET SPEED 2	rpm	-30000	+30000	1000		-	1032	R/W
3.2.3 SET SPEED 3	rpm	-30000	+30000	-500		-	1033	R/W
3.3 SPEED OPERATOR								
3.3.1 SAVE OPERATOR	-	*0=NO *1=YES		YES		-	1034	R/W
3.3.2 (setting + view)								
SET OP	rpm	- par. 1.8	+ par. 1.8	0		1035	1036	R/W
SPEED	rpm	-30000	+30000	display		-	501	R
3.4 JUMP SPEED	rpm	0	24000	0		-	1025	R/W
3.5 JUMP BAND	rpm	0	24000	0		-	1026	R/W
3.6 SET SPEED MAX1	rpm	0	par.1.8	1250		-	1027	R/W
3.7 SPEEDTHRESHOLD	rpm	0	par.1.8	100		-	1028	R/W
3.8 THRESHOLD DELAY	s	0.0	300.0	0.0		-	1029	R/W
3.9 SPEED HYSTERESIS	rpm	0	1000	10 rpm		-	1030	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
4. RAMP ACC/DEC								
4.1 SET ACC1	s	0.01	600.0	1.00		-	1039	R/W
4.2 SET DEC1	s	0.01	600.0	1.00		-	1040	R/W
4.3 SET ACC2	s	0.01	600.0	2.00		-	1041	R/W
4.4 SET DEC2	s	0.01	600.0	2.00		-	1042	R/W
4.5 ACC UNDER SPEED	s	0.01	600.0	30.00		-	1022	R/W
4.6 SPEED ACC LEVEL	rpm	0	30000	0		-	1023	R/W
4.7 DEC UNDER SPEED	s	0.01	600.0	30.00		-	1118	R/W
4.8 SPEED DEC LEVEL	rpm	0	30000	0		-	1121	R/W
4.9 TIME FIRST RAMP	s	0.01	600.0	5.00		-	1231	R/W
4.10 FIRST RAMP	s	0.01	600.0	0.00		-	1232	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
5. CURRENT CONTROL								
5.1 OVERLOAD FUNC								
5.1.1 MAX OVERLOAD CUR	%	0.0	300.0	300.0		-	1043	R/W
5.1.2 START SPEED CNTR	rpm	0	30000	200		-	1044	R/W
5.1.3 MIN OVERLOAD SPE	rpm	0	par. 1.8	depends on size		-	1045	R/W
5.1.4 MIN SPEED TIME	s	0.0	1800.0	0.0		-	1046	R/W
5.1.5 DEC. RAMP. OVERLO.	s	0.01	300.00	10.00		-	1047	R/W
5.1.6 KP REG OVERLOAD	-	0	1000	20		-	1048	R/W
5.1.7 KI REG OVERLOAD	-	0	1000	10		-	1049	R/W
5.2 FAST CURR. LIMIT								
5.2.1 Imax ACC RAMP	A	0.0	factory setting	depends on size		-	1050	R/W
5.2.2 Imax STEADY	A	0.0	factory setting	depends on size		-	1051	R/W
5.2.3 KP CURR.	_	0	1000	1000		-	1052	R/W
5.2.4 KI CURR.	_	0	1000	10		-	1053	R/W
5.2.5 ENABLE BOOST PI	-	*0=NO *1=YES		YES		-	1054	R/W
5.2.6 KP Imax BOOST	-	0	1000	50		-	1055	R/W
5.2.7 KI Imax BOOST	-	0	1000	20		-	1056	R/W
5.2.8 PERC UP V/f	%	0.0	25.0	depends on size		-	1057	R/W
5.2.9 KP UP V/f	-	0	100	depends on size		-	1058	R/W
5.2.10 HT MAX TIME ms	s	0.000	30.000	10.000		-	1059	R/W
5.2.11 HT OVERL. SPEED	rpm	0	30000	1300		-	1060	R/W
5.3 RESET MAX Imax	-	*0=NO *1=YES		NO		-	1062	R/W
5.4 CURRENT THRESHOLD	A	0.0	factory setting	depends on size		-	1063	R/W
5.5 THRESHOLD DELAY	s	0.0	300.0	3.0		-	1064	R/W
5.6 CURR. HISTERESIS	A	0.1	200.0	depends on size		-	1065	R/W

PARAMETERS MENU	UNIT	VALUE RANGE		MODBUS ADDRESS		
		MIN	MAX	MSW	LSW	R=READ W=WRITE
6. DISPLAY VARIABLE						
6.1 SPEED REFERENCE	rpm	- 30000	+30000	-	500	R
6.2 MOTOR SPEED	rpm	- 30000	+30000	-	501	R
6.3 MOTOR FREQUENCY	Hz	0.0	800.0	-	502	R
6.4 MOTOR CURRENT	A	0.0	3000.0	-	503	R
6.5 INVERTER I x I	%	0	100	-	504	R
6.6 I MAX MONITOR	A	0.0	3000.0	-	505	R
6.7 MEMO MAX Imax	A	0.0	3000.0	-	506	R
6.8 IGBT BRAKE CURR.	A	0.0	3000.0	-	507	R
6.9 BUS DC VOLTS	V	0	3000	-	508	R
6.10 MOTOR VOLTAGE	V	0	3000	-	509	R
6.11 ACTIVE POWER	KW	0.00	900.00	561	562	R
6.12 COS (PHI)	-	0.00	1.00	-	511	R
6.13 ANALOG INPUT AI1	%	-100.00	+100.00	-	512	R
6.14 ANALOG INPUT AI2	%	-100.00	+100.00	-	513	R
6.15 ANALOG INPUT AI3	%	-100.00	+100.00	-	514	R
6.16 ANALOG INPUT AI4	%	-100.00	+100.00	-	515	R
6.17 MOTOPOT SET%	%	0.00	100.00	-	516	R
6.18 ACTIVE VAR AO0	%	-100.00	+100.00	-	517	R
6.19 ACTIVE VAR AO1	%	-100.00	+100.00	-	518	R
6.20 (DOUBLE DISPLAY)						
SPE. REF	rpm	- 30000	+30000	-	500	R
MOT.SPE	rpm	- 30000	+30000	-	501	R
6.21 (DOUBLE DISPLAY)						
SPE. REF	rpm	- 30000	+30000	-	500	R
MOT.CUR	A	0.0	3000.0	-	503	R
6.22 DIG. INPUT I1..8	-	00000000	11111111	-	521	R
6.23 DIG. OUTPUT O1..8	-	00000000	11111111	-	522	R
6.24 LAST FAULT	-	0	100	-	523	R
6.25 COUNT AUTORESTAR	-	0	3	-	524	R
6.26 OPERATE HOURS	h	0.00	100.000	558	559	R
6.27 ALARM	-	0	9999	-	527	R
6.28 LAST TWO ERR COM	-	0	9999	-	528	R
6.29 COUNT ERRORS COM	-	0	30000	-	529	R
6.30 HARDWARE VERSION	-	0	30000	-	531	R
** 6.31 FIRMWARE VERSION	-	0.00	9.99	-	530	R
6.32 (DOUBLE DISPLAY)						
SET	-	0.0	9000.0	544	545	R
FDB	-	0.0	9000.0	546	547	R
6.33 (DOUBLE DISPLAY)						
RSET	-	0.0	9000.0	548	549	R
FDB	-	0.0	9000.0	546	547	R
6.34 (DOUBLE DISPLAY)						
MOT.SPE	rpm	- 30000	+30000	-	501	R
FDB	-	0.0	9000.0	546	547	R
6.35 TEMPERATURE (C)	--	- 120	+ 120	-	543	R
6.36 OIL LIFE (Hours)	-	0.0	100000.0	554	555	R
6.37 (DOUBLE DISPLAY)						
PID ERR	--	- 9000.0	+ 9000.0	550	551	R
PID OUT	-	- 100.0	+ 100.0	552	553	R
6.38 I x COS (PHI)	A	0.0	3000.0	-	560	R
6.39 POWER LOSS COUNT	-	0	30000	-	563	R

** When you print this manual, the firmware version is: 5.12

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
7. DISPLAY CONFIG.								
7.1 DEFAULT DIS1	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		SPEED REFERENCE		-	1066	R/W
7.2 DEFAULT DIS2	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR SPEED		-	1067	R/W
7.3 DEFAULT DIS3	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR FREQUENCY		-	1068	R/W
7.4 DEFAULT DIS4	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR CURRENT		-	1069	R/W
7.5 DEFAULT DIS5	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		BUS DC VOLTS		-	1070	R/W
7.6 DEFAULT DIS6	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		Imax MONITOR		-	1071	R/W
7.7 DEFAULT DIS7	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		LAST FAULT		-	1072	R/W
7.8 DEFAULT DIS8	-	*0=var.6.1 SPEED REF ..... *38=var.6.39 POWER LOSS COUNT.		FIRMWARE VERSION		-	1073	R/W
7.9 OPERATOR SET1	-	*0=NO *1=YES		NO		-	1075	R/W
7.10 OPERATOR SET2	-	*0=NO *1=YES		NO		-	1076	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	DEFAULT SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
8. INPUTS SETTING								
8.1 RUN+STOP SPEED I1	-	*0=NO *1=YES		NO		-	1077	R/W
8.2 RUN+RST FAULT I1	-	*0=NO *1=YES		NO		-	1078	R/W
8.3 RUN+DC BRAKE I1	-	*0=NO *1=YES		NO		-	1079	R/W
8.4 I1 TIME OFF	s	0.00	30.00	0.02		-	1080	R/W
8.5 I2 FUNCTION	-	*0=NO FUNCT. *1=STOP SPEED *2=REV. SPEED *3=RES. FAULT *4=IN1 FIX S. *5=IN2 FIX S. *6=IN1 RMP S. *7=IN2 RMP S. *8=IN1 MAX S. *9=INC MOTOPOT *10=DEC MOTOPOT *11=DC BRAKE *12=SETUP 1/2 *13=STOP PID *14=MIN S. UN.		STOP SPEED		-	1081	R/W
8.6 LOGIC CONFIG. I2	-	*0=NORMAL *1=INVERT *2=FORCE EN		NORMAL		-	1082	R/W
8.7 I3 FUNCTION	-	as par. 8.5		IN1 FIX S.		-	1083	R/W
8.8 LOGIC CONFIG. I3	-	as par. 8.6		NORMAL		-	1084	R/W
8.9 I4 FUNCTION	-	as par. 8.5		IN2 FIX S.		-	1085	R/W
8.10 LOGIC CONFIG. I4	-	as par. 8.6		NORMAL		-	1086	R/W
8.11 I5 FUNCTION	-	as par. 8.5		IN1 RMP S.		-	1087	R/W
8.12 LOGIC CONFIG. I5	-	as par. 8.6		NORMAL		-	1088	R/W
8.13 I6 FUNCTION	-	as par. 8.5		REV. SPEED		-	1089	R/W
8.14 LOGIC CONFIG. I6	-	as par. 8.6		NORMAL		-	1090	R/W
8.15 I7 FUNCTION	-	as par. 8.5		IN1 MAX S.		-	1091	R/W
8.16 LOGIC. CONFIG.. I7	-	as par. 8.6		NORMAL		-	1092	R/W
8.17 VIRT. FUNCTION	-	as par. 8.5		NO FUNCT.		-	1093	R/W
8.18 TYPE INPUT AI1	-	*0= 0/+10V *1= -10/+10V		0/+10V		-	1096	R/W
8.19 TYPE INPUT AI2	-	*0= 0/+10V *1= -10/+10V *2= 4-20mA *3= 0-20mA		2= 4-20mA		-	1099	R/W
8.20 TYPE INPUT AI3	-	*0= 0/+10V *1= -10/+10V		0/+10V		-	1102	R/W
8.21 TYPE INPUT AI4	-	*0= 0/+10V *1= -10/+10V		0/+10V		-	1105	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
9. OUTPUT SETTING								
9.1 O1 FUNCTION	-	*0=INV. RUN *1=INV. FAULT *2=SPEED TH *3=CURRENT TH *4=EN MOTOR1 *5=EN MOTOR2 *6=OIL OVERTEM *7=OIL UNDERTM *8=MIN FDB ALR *9=MAX FDB ALR *10=MIN-MAX ALR *11=AUTORST END *12=REMOTE CTRL		SPEED TH		-	1106	R/W
9.2 LOG. INVERT O1	-	*0=NO *1=YES		NO		-	1107	R/W
9.3 O2 FUNCTION	-	as par. 9.1		INV. FAULT		-	1108	R/W
9.4 LOG. INVERT O2	-	*0=NO *1=YES		YES		-	1109	R/W
9.5 O3 FUNCTION	-	as par. 9.1		INV. RUN		-	1110	R/W
9.6 LOG. INVERT O3	-	*0=NO *1=YES		NO		-	1111	R/W
9.7 O4 FUNCTION	-	as par. 9.1		CURRENT TH		-	1112	R/W
9.8 LOG. INVERT O4	-	*0=NO *1=YES		NO		-	1113	R/W
9.9 SCALE AO0	%	0.00	300.00	100.00		-	1115	R/W
9.10 OFFSET AO0	%	-10	+10	0.00		-	1116	R/W
9.11 SCALE AO1	%	0.00	300.00	100.00		-	1119	R/W
9.12 OFFSET AO1	%	-10	+10	0.00		-	1120	R/W
9.13 SELECT VAR AO0	-	Var. 6.2, Var. 6.4, Var. 6.11, Var. 6.38		Var. 6.4		-	1126	R/W
9.14 SELECT VAR AO1	-	Var. 6.2, Var. 6.4, Var. 6.11, Var. 6.38		Var. 6.2		-	1228	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
10. SPECIAL FUNCTION								
10.1 MOTOPOTENTIOM.								
10.1.1 SAVE MOTOPOT	-	*0=NO *1=YES		YES		-	1122	R/W
10.1.2 START RAMP MOTP	s	0.001	600.00	100.00		-	1123	R/W
10.1.3 ACC DEC MOTP SET	s	0.001	600.00	10.00		-	1124	R/W
10.2 DC BRAKING								
10.2.1 DC BRAKE LEVEL	%	0.0	300.0	100.0		-	1125	R/W
10.2.2 DC BRAKE TIME	s	0.1	300.0	10.0		-	1126	R/W
10.2.3 BRAKE LEVEL RAMP	se	0.1	300.0	2.0		-	1127	R/W
10.2.4 DEFLUX TIME	s	0.1	300.0	0.5		-	1128	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
11. FAULT MANAGEMENT								
11.1 ENABLE AUTO REST	-	*0=NO *1=YES		NO		-	1129	R/W
11.2 RESTART DELAY	s	1.0	300.0	3.0		-	1130	R/W
11.3 RESET TIME	s	1.0	3000.0	1000.0		-	1114	R/W
11.4 FAULT HISTORY								
11.4.1 FAULT 1	-	0	100	display		-	538	R
11.4.2 FAULT 2	-	0	100	display		-	539	R
11.4.3 FAULT 3	-	0	100	display		-	540	R
11.4.4 FAULT 4	-	0	100	display		-	541	R
11.4.5 FAULT 5	-	0	100	display		-	542	R
11.5 RESET HIST. FAULT	-	*0=NO *1=YES		NO		-	1131	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
12. SERIAL COMUNICAT								
12.1 ADDRESS	-	0	100	0		-	1132	R/W
12.2 BAUD RATE	bps	*0=9600 *1=19200 *2=38400 *3=57600 *4=76800 *5=115200		115200		-	1133	R/W
12.3 PARITY	-	*0=NONE *1=EVEN *2=ODD		NONE		-	1134	R/W
12.4 BIT STOP	-	1	2	1		-	1135	R/W
12.5 ENABLE FAST MODE	-	*0=NO *1=YES	NONE	NO		-	1061	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
13. PID REGULATOR								
13.1 ENABLE FUNCTION	-	*0=STANDARD *1=COMPRESSOR		STANDARD		-	1176	R/W
13.2 SET SOURCE	-	*0=REMOTE *1=AI1, *2=AI2, *3=AI3 *4=OPERATOR *5=MOTOPOT		AI1		-	1177	R/W
13.3 MAX REG SET	-	0.0	9000.0	10.0		1178	1179	R/W
13.4 MAX REG FEEDBACK	-	0.0	9000.0	12.0		1180	1181	R/W
13.5 KP REG	-	0.0	250.0	120.0		-	1182	R/W
13.6 KI REG	-	0.0	250.0	30.0		-	1183	R/W
13.7 KD REG	-	0.0	250.0	0.0		-	1184	R/W
13.8 REGULATOR ON/OFF	-	*0=NO *1=YES		NO		-	1185	R/W
13.9 PID OUT INVERS.	-	*0=NO *1=YES		NO		-	1186	R/W
13.10 SET ACC TIME	sec	0.01	600.00	10.0		-	1187 unsigned	R/W
13.11 SET DEC TIME	sec	0.01	600.00	10.0		-	1188 unsigned	R/W
13.12 COMPRESSOR FUNC.								
13.12.1 +%SET TRIG STOP	%	0.0	300.0	15.0		-	1193	R/W
13.12.2 STOP ON SPEED	rpm	0	10000	500		-	1194	R/W
13.12.3 STOP SPE. DELAY	sec	0.0	300.0	3.0		-	1195	R/W
13.12.4 -%SET TRG START	%	0.0	300.0	5.0		-	1196	R/W
13.12.5 OIL TEMP FUNC.	-	*0=DISABLE *1=ENABLE		DISABLE		-	1197	R/W
13.12.6 PROBE type	-	*0=ntc 4K7		ntc 4K7		-	1198	R/W
13.12.7 MAX TEMPERATURE	°C	-120	+120	+85		-	1199	R/W
13.12.8 OVER TEMP HYST	°C	0	20	5		-	1200	R/W
13.12.9 OVER TEMP SPEED	rpm	0	par.1.8	1000		-	1201	R/W
13.12.10 MAX TIME OVER T.	sec	0.0	250.0	10.0		-	1202	R/W
13.12.11 OIL UNDER TEMP.	°C	-25	+20	-10		-	1203	R/W
13.12.12 UNDER TEMP HIST.	°C	0	20	5		-	1204	R/W
13.12.13 DISABLE RUN	-	*0=NO *1=YES		YES		-	1205	R/W
13.12.14 OIL TIMEL. COUNT	-	*0=NO *1=YES		NO		-	1189	R/W
13.12.15 SET OIL LIFE (h)	-	0.0	100000.0	1000.0		1190	1191	R/W
13.12.16 RESET OIL LIFE	-	*0=NO *1=YES		NO		-	1192	R/W
13.13 FEEDBACK ALARM								
13.13.1 ENABLE MIN FDB	-	*0=DISABLE *1=ALARM *2=FAULT		DISABLE		-	1206	R/W
13.13.2 ENABLE MAX FDB	-	*0=DISABLE *1=ALARM *2=FAULT		DISABLE		-	1207	R/W
13.13.3 DELAY OK MIN MAX	sec	0.0	250.0	20.0		-	1208	R/W
13.13.4 MIN FDB ALARM	-	1.0	par.13.4	1.0		1210	1211	R/W
13.13.5 MAX FDB ALARM	-	1.0	par.13.4	10.0		1212	1213	R/W
13.13.6 DELAY MIN ALARM	sec	0.0	250.0	5.0		-	1214	R/W
13.13.7 DELAY MAX ALARM	sec	0.0	250.0	5.0		-	1215	R/W
13.14 SET PID OPERATOR								
13.14.1 SAVE OPERATOR	-	*0=NO *1=YES		YES		-	1216	R/W
13.14.2	IMPOSTAZIONE + VISUALIZZAZIONE							
SET	-	0.0	9000.0	0.0		1224	1225	R/W
FDB	-	0.0	9000.0	-		546	547	R
13.15 REGULATOR ADJ								
13.15.1 MAX REG OUTPUT	%	0.00	100.00	100.00		-	1217	R/W
13.15.2 MIN REG OUTPUT	%	-100.00	+100.00	0.00		-	1218	R/W
13.15.3 MAX INTEGRAL OUT	%	0.00	100.00	100.00		-	1219	R/W
13.15.4 MIN INTEGRAL OUT	%	-100.00	+100.00	0.00		-	1220	R/W
13.15.5 KD MODE	-	*0=ERROR *1=FEEDBACK *2=BOTH		ERROR		-	1221	R/W
13.15.6 KD LOW PASS FILT	Hz	1	250	20		-	1222	R/W

PARAMETERS MENU	UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	JOB SETTINGS	MODBUS ADDRESS		
		MIN	MAX			MSW	LSW	R=READ W=WRITE
PARAMETRI 100.								
100.1 EN MOTOR SWITCH	-	*0=NO *1=YES		NO		-	1117	R/W
100.2 RESTORE SETUP	-	*0=SETUP1 *1=SETUP2 *2=DEFAULT		DEFAULT		-	1136	R/W
100.3 ENABLE RESTORE	-	*0=NO *1=YES		NO		-	1037	R/W
100.4 SAVE SETUP	-	*0=SETUP1 *1=SETUP2		SETUP1		-	1137	R/W
100.5 ENABLE SAVE	-	*0=NO *1=YES		NO		-	1038	R/W
100.6 Copy KEY >> INV	-	0	99	0		-	-	-
100.7 Copy INV >> KEY	-	0	99	0		-	-	-
100.8 PARAM BLOCK	-	*0=NO *1=YES		NO		-	1138	R/W
100.9 V/F TYPE	-	*0=STANDARD *1=IND.VOLT *2= GEN.V/F		STANDARD		-	1227	R/W

Description of parameters on menu 1. BASIC DATA

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.1	LINE VOLTAGE	V	1	2000	400	-	1000	R/W

Voltage of the power supply line connected to terminals L1, L2, L3.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.2	MOTOR NOM CURREN	A	0.1	3000.0	depends on size	-	1001	R/W

Rated current of the motor.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.3	MOTOR NOM FREQUE	Hz	0.1	800.0	50.0	-	1002	R/W

Rated frequency of the motor (frequency to the nominal voltage).

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.4	MOTOR NOM VOLTAG	V	1	2000	400	-	1003	R/W

Rated voltage of the motor (voltage to the nominal frequency).

MENU > 1 . BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.5	MOTOR POLES	-	*0=2 POLES *1=4 POLES *2=6 POLES *3=8 POLES		4 POLES	-	1004	R/W

Number of motor poles.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.6	RAMP ACCEL. TIME	s	0.001	600.00	10.00	-	1005	R/W

Motor speed ramp acceleration time.

MENU' > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.7	RAMP DECEL. TIME	s	0.001	600.00	10.00	-	1006	R/W

Motor speed ramp deceleration time.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.8	MAX MOTOR SPEED	rpm	0	30000	1500	-	1007	R/W

Maximum motor speed.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.9	MIN MOTOR SPEED	rpm	0	par. 1.8	0	-	1008	R/W

Minimum motor speed.

MENU > 1. BASIC DATA		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
1.10	FIXED BOOST	%	0.0	25.0	depends on size	-	1009	R/W

Boost voltage applied to the motor in a permanent manner, in % on the power line L1 L2 L3.
To determine the ideal value to insert as the ***boost voltage,*** lead the **motor loadless** barely at a low speed and set in this parameter a value that leads the current absorbed by the motor between 1/2 and 3/4 of the nominal value.

Boot voltage applied to the motor in a permanent manner and added to the V/F voltage in function of the parameter settings 2.1 START BOOST FREQ. and 2.2 STOP BOOST FREQ (see Fig.1).
Setting in % on the power supply line L1 L2 L3.
To determine the ideal value to insert as the ***boost voltage***, lead the **motore loadless** at a slow speed, included between START BOOST FREQ. and STOP BOOST FREQ and set in this parameter a value that leads the current absorbed by the motor to between 1/2 and 3/4 of the nominal value.

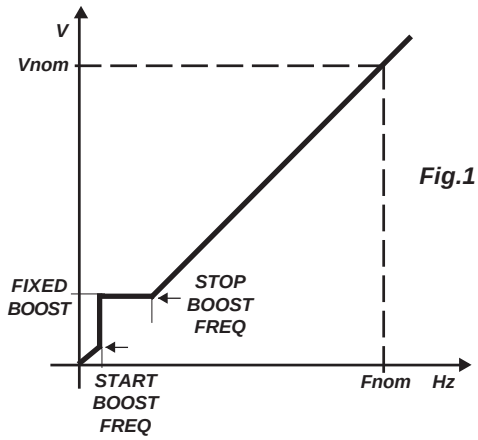


Fig.1

Description of the parameters of menu 2. INV/ MOTOR SETUP

MENU > 2. INV/MOTOR SETUP		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.1	START BOOST FREQ	Hz	0.0	20.0	0.0	-	1010	R/W

See description of par. 1.10 FIXED BOOST and Fig.1.

MENU > 2. INV/MOTOR SETUP		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.2	STOP BOOST FREQ	Hz	0.0	par. 1.3	25.0	-	1011	R/W

See description of par. 1.10 FIXED BOOST and Fig.1.

MENU > 2. INV/MOTOR SETUP > 2.3 FLYING RESTART		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.3.1	ENABLE FLYING VF	-	*0=NO *1=YES		NO	-	1013	R/W

Enables the quick motor restart at the moment run is activated.
NO = quick restart disabled; ***YES*** = quick restart enabled

MENU > 2. INV/MOTOR SETUP > 2.3 FLYING RESTART		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.3.2	DEMAGNETIZE TIME	s	0.01	10.00	1.00	-	1014	R/W

Minimum delay in run activation and a new re-activation, active only if quick restart has been enabled.
Extend the time until the quick coupler is perfectly synchronized with the real speed of the motor.

MENU > 2. INV/MOTOR SETUP > 2.3 FLYING RESTART		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.3.3	VOLT RAMP START	s	0.01	10.00	2.00	-	1015	R/W

Voltage ramp on the motor after a consensus active with quick restart enabled.

MENU > 2. INV/MOTOR SETUP >2.4 PWM MODULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.4.1	PWM FREQUENCY	Khz	0.5	factory setting	2.00	-	1016	R/W

PWM frequency when the speed of the motor exceeds that set in par.2.4.3 CHANGE PWM SPEED.

MENU > 2. INV/MOTOR SETUP > 2.4 PWM MODULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.4.2	START PWM FREQ.	Khz	0.5	factory setting	1.00	-	1017	R/W

PWM frequency at the start of the motor until the speed set in par.2.4.3 CHANGE PWM SPEED.

MENU > 2. INV/MOTOR SETUP > 2.4 PWM MODULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.4.3	CHANGE PWM SPEED	rpm	0	30000	500	-	1018	R/W

Threshold on the motor speed, for the automatic change of the PWM frequency. (see description par. 2.4.1 e 2.4.2.

By setting the parameter at 0. rpm the automatic frequency change of the PWM is excluded; in this case the PWM frequency will be that set in par.2.4.1 PWM FREQUENCY.
The automatic frequency change of the PWM in scalar control is useful when managing motors with a lot of power and there is the need to reduce instability due to the dead time of the modulation impulse; for this reason a **low** PWM frequency is set at the starting phase (even 0.5KHz) in par.2.4.2, in order to also improve the effect of the internal compensation of dead time. Once the speed threshold set in par.2.4.3 CHANGE PWM SPEED has been overcome, the PWM frequency can resume higher values that allow the reduction of the current ripple on the motor like for example 2KHz (to be inserted in par.2.4.1).

Attention ! → PWM frequencies above 5KHz result in a downgrading of the inverter as indicated in paragraph: ***Downgrading of the inverter in function of the PWM frequency*** in ch.2 TECHNICAL CHARACTERISTICS.

MENU' > 2. INV/MOTOR SETUP >2.4 PWM MODULATOR		UNIT	RANGE DEI VALORI		IMPOSTAZIONE DEFAULT	INDIRIZZO MODBUS		
N°	NOME PARAMETRO		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.4.4	PWM MODE	-	*0=STANDARD *1= RANDOM		STANDARD	-	1222	R/W

Seleziona il tipo di modulazione PWM.
STANDARD = modulazione standard a frequenza fissa.
RANDOM = modulazione standard a frequenza variabile casuale, con deviazione massima impostabile nel par.2.4.5 FREQ.DEVIATION.

MENU' > 2. INV/MOTOR SETUP >2.4 PWM MODULATOR		UNIT	RANGE DEI VALORI		IMPOSTAZIONE DEFAULT	INDIRIZZO MODBUS		
N°	NOME PARAMETRO		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.4.5	FREQ. DEVIATION	%	0.0	100.0	30.0	-	1223	R/W

Valore espresso in %, il quale stabilisce la finestra di lavoro entro la quale la frequenza del del modulatore PWM può essere deviata rispetto a quella di base nel caso impostazione del par.2.4.4 PWM MODE = RANDOM.

MENU > 2. INV/MOTOR SETUP > 2.5 BRAKE UNIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.5.1	BRAKE RESISTANCE	ohm	0.0	200.0	depends on size	-	1019	R/W

Ohmic value of the braking resistance. By setting 0.0 the braking is unabled.

MENU > 2. INV/MOTOR SETUP > 2.5 BRAKE UNIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.5.2	NOMINAL CURRENT	A	0.0	3000.0	depends on size	-	1020	R/W

Rated current of the braking resistor.

MENU > 2. INV/MOTOR SETUP > 2.5 BRAKE UNIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.5.3	5 SEC CURRENT	A	0.0	3000.0	depends on size	-	1021	R/W

Maximum current per 5 seconds, of the braking resistor.

If a braking resistor supplied by ROWAN EL. is used, get this rating plate data from the "***Table with the characteristics of use of the Rowan braking resistors***" in Ch.5 BRAKING RESISTORS.

Attention ! The inverter has an electronic control on the overload of the braking unit and resistance which is connected to it, to this end the precision of the setting of the rating plate date of the resistor is important to avoid dangerous overheating of the resistor itself.
For further information consult Ch.8 BRAKING RESISTORS.

MENU > 2. INV/MOTOR SETUP		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
2.6	PTC ENABLE	-	*0=DISABLE *1=ENABLE		DISABLE	-	1012	R/W

Enables the control of an overload cutout PTC temperature probe, connected to terminals 38-39 (see ch.2 TECHNICAL CHARACTERISTICS).

Description of parameters on menu 3. SPEED CONTROL

MENU > 3. SPEED CONTROL		UNIT	VALUES RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.1	SPEED SOURCE	-	*0=REMOTE *1=AI1 *2=AI2 *3=AI3 *4=OPERATOR *5=MOTOPOT		AI1	-	1024	R/W

Assigns the regulation source of the motor speed.
REMOTE = Regulates speed from a word transferred in serial with **modbus address: 1167**. Initial value = 0
AI1.....AI3 = Regulates speed from the analog input selected.
100% of the input (+/-10VDC) corresponds to the absolute value set in par.1.8 MAX MOTOR SPEED.
MOTOPOT = Regulates speed through 2 digital increase/decrease inputs similar to a motopotentiometer.
The digital inputs must be programed in 8. INPUTS SETTING, while the regulation characteristics can be set in the menu parameters 10.1 MOTOPOTENTIOM.
OPERATOR = Setting of speed from the keypad through par. 3.3.2
In any case the maximum regulation corresponds to the value set in par.1.8 MAX MOTOR SPEED.

MENU > 3. SPEED CONTROL > 3.2 FIXED SPEED SEL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.2.1	SET SPEED 1	rpm	0	par.1.8	500	-	1031	R/W

Setting of fixed speed N.1. This speed can be selected through the binary combination of the digital inputs available (see Table). To enable this function consult menu 8.INPUTS SETTING.

MENU > 3. SPEED CONTROL > 3.2 FIXED SPEED SEL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.2.2	SET SPEED 2	rpm	0	par.1.8	1000	-	1032	R/W

Setting of fixed speed N.2. This speed can be selected through the binary combination of the digital inputs available (see Table). To enable them to this function consult menu 8.INPUTS SETTING .

MENU > 3. SPEED CONTROL > 3.4 FIXED SPEED SEL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.2.3	SET SPEED 3	rpm	0	par.1.8	-500	-	1033	R/W

Setting of fixed speed N.3. This speed can be selected through the binary combination of the digital inputs available (See Table). To enable them to this function consult menu 8.INPUTS SETTING

Table with the modality to select the fixed speed:

INPUTS FUNCTION MENU' 8. INPUTS SETTING		RESULT OF BINARY COMBINATION
IN1 FIX S.	IN2 FIX S.	
OFF	OFF	The source of speed reference is set in par.3.1 SPEED SOURCE
ON	OFF	Fixed speed reference is set in par.3.2.1 SET SPEED 1
OFF	ON	Fixed speed reference is set inpar.3.2.2 SET SPEED 2
ON	ON	Fixed speed reference is set in par.3.2.3 SET SPEED 3

MENU > 3. SPEED CONTROL > 3.3 SPEED OPERATOR		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.3.1	SAVE OPERATOR	-	*0=NO *1=YES		YES	-	1034	R/W

Enable or not the saving in eeprom at shutdown, of the manual speed settings of par.3.3.2 SET OP

MENU > 3. SPEED CONTROL > 3.3 SPEED OPERATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.3.2	SET OP	rpm	- par. 1.8	+ par.1.8	0	-	1036	R/W
	SPEED	rpm	-30000	+30000	display	-	501	R

Contains the manual setting, through the keypad, of the motor speed and the display of the real speed.
It is a parameter of the **OPERATOR** type that can be set even at the first level of display of the keypad if it is enable through par.7.9 OPERATOR SET1, in this way the operator does not have to enter in the complexity of the menu.
SET OP = setting of the motor speed active only with par.3.1 SPEED SOURCE = OPERATOR.
SPEED = setting the real speed of the motor. Corresponds to the display of var 6.2 MOTOR SPEED

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.4	JUMP SPEED	rpm	0	24000	0	-	1025	R/W

Set of speed within which the motor must absolutely not pause in the SCALARE V/F control according to the hysteresis programmed in par.3.5 JUMP BAND. The speed is expressed in absolute value in both senses of rotation.

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.5	JUMP BAND	rpm	0	24000	0	-	1026	R/W

Hysteresis around the speed to be jumped set in par.3.4 JUMP SPEED.
If set to 0 it eliminates the function of the jump speed.

JUMP SPEED FUNCTION

It is a useful function to avoid the speeds of the motor that cause resonance with mechanical transmission.
The passage for the speed to be jumped is however allowed during the ramp.
To avoid oscillation around the jump speed, set in par.3.4 JUMP SPEED, increase the hysteresis in par.3.5 JUMP BAND.
To exclude the jumps set par. 3.5 JUMP BAND=0.

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.6	SET SPEED MAX1	rpm	0	par.1.8	1250	-	1027	R/W

Setting of the second maximum speed limit in alternative to par.3.1 MAX MOTOR SPEED.
The selection of the second maximum limit can be assigned to a digital input in the menu 8.INPUTS SETTING.
For example, to use input I7 to select 2 maximum speeds:
- Set par.8.15 I7 FUNCTION = IN1 MAX S.
I7 OFF = set the maximum speed active through par.1.8 MAX MOTOR SPEED.
I7 ON = set the maximum speed active through par.3.6 SET SPEED MAX1.

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.7	SPEED THRESHOLD	rpm	0	par.1.8	100	-	1028	R/W

Threshold on the motor speed displayed in var.6.2 MOTOR SPEED.
The threshold function can be assigned to a digital output in menu 9.OUTPUT SETTING.

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.8	THRESHOLD DELAY	s	0.0	300.0	0.0	-	1029	R/W

Delay of intervention of the threshold on the motor speed.

MENU > 3. SPEED CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
3.9	SPEED HYSTERESIS	rpm	0	1000	10 rpm	-	1030	R/W

Hysteresis on the tripping of the threshold on the motor speed.

Description of parameters on menu 4. RAMP ACC/DEC

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.1	SET ACC1	s	0.01	600.0	1.00	-	1039	R/W

Setting the fixed acceleration ramp N.1. This ramp can be selected through the binary combination of the digital inputs available (see Table) . To enable them to this function consult menu 8.INPUTS SETTING

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.2	SET DEC1	s	0.01	600.0	1.00	-	1040	R/W

Setting the fixed decelaration ramp N.1. This ramp can be selected through the binary combination of the digital inputs available (see Table) . To enable them to this function consult menu 8.INPUTS SETTING

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.3	SET ACC2	s	0.01	600.0	1.00	-	1041	R/W

Setting the fixed acceleration ramp N.2. This ramp can be selected through the binary combination of the digital inputs available (see Table) . To enable them to this function consult menu 8.INPUTS SETTING

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.4	SET DEC2	s	0.01	600.0	1.00	-	1041	R/W

Setting the fixed deceleration ramp N.2. This ramp can be selected through the binary combination of the digital inputs available (see Table) . To enable them to this function consult menu 8.INPUTS SETTING

INPUT FUNCTION MENU 8. INPUTS SETTING		RESULT of THE BINARY COMBINATION
IN1 RMP S.	IN2 RMP S.	
OFF	OFF	Acc. Ramp from par.1.6 ACCEL. TIME and Dec. ramp from par.1.7 DECEL. TIME
ON	OFF	Acc. Ramp from par.4.1 SET ACC1 and Dec. ramp from par.4.2 SET DEC1
OFF	ON	Acc. Ramp from par.4.3 SET ACC2 and Dec. ramp from par.4.4 SET DEC2

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.5	ACC UNDER SPEED	s	0.01	600.0	30.00	-	1022	R/W

Ramp acceleration time with the motor speed inferior to the threshold of par.4.6 SPEED ACC LEVEL.

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.6	SPEED ACC LEVEL	rpm	0	par.1.8	0	-	1023	R/W

Threshold on the motor speed set for the change of acceleration ramp (see Fig.2).

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.7	DEC UNDER SPEED	s	0.01	600.0	30.00	-	1118	R/W

Ramp deceleration time with motor speed inferior to the threshold of par.4.6 SPEED DEC LEVEL.

MENU > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.8	SPEED DEC LEVEL	rpm	0	par.1.8	0	-	1121	R/W

Threshold on the motor speed set for the change of the deceleration ramp (see Fig.2).

RAMP CHANGE FUNCTION BASED ON THE MOTOR SPEED:

In ACCELERATION:
- with a speed inferior to the value set in the threshold of **par.4.6 SPEED ACC LEVEL**, the active acceleration ramp is that set in **par.4.5 ACC UNDER SPEED,** instead with superior speed, the active ramp is that set in **par.1.6 RAMP ACCEL TIME** (or one of the fixed ramps if selected).

In DECELERATION:
- with speed inferior to the value set in the threshold of **par.4.8 SPEED DEC LEVEL**, the active deceleration ramp is that set in **par.4.8 DEC UNDER SPEED,** instead with superior speed, the active ramp is that set in **par.1.7 RAMP DECEL TIME** (or one of the fixed ramps if selected).

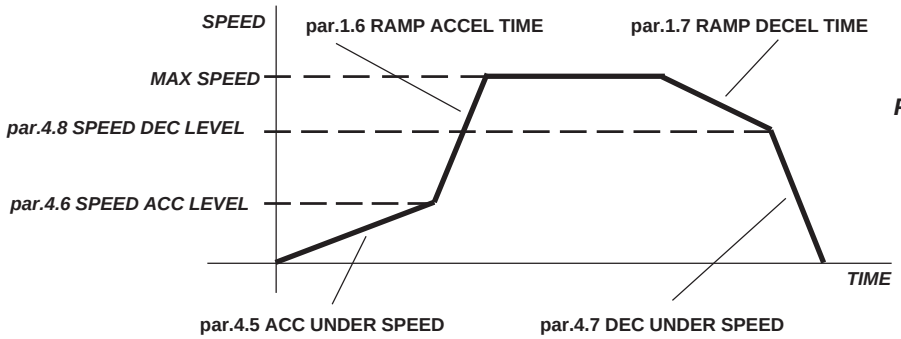


Fig.2

The change ramp function is escluded by setting **par.4.6 SPEED ACC LEVEL**=0 and **par.4.8 SPEED DEC LEVEL**=0

MENU' > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.9	TIME FIRST RAMP	s	0.01	600.0	0.00	-	1231	R/W

Time necessary to enable the stop ramp settable in par.1.10 FIRST RAMP, active for the managing of power losses and failures.

MENU' > 4. RAMP ACC/DEC		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
4.10	FIRST RAMP	s	0.01	600.0	5.00	-	1232	R/W

Time of the first deceleration ramp or the managing of power losses and failures, only active with par.100.10 POWER LOSS CONTROL = YES (see parameter description).

Description of parameters on menu 5. CURRENT CONTROL

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.1	MAX OVERLOAD CUR	%	0.0	300.0	100.0	-	1043	R/W

Maximum current overload in % on the nominal current of the motor set in par.1.2 MOTOR NOM CURREN. When the motor current exceeds the value set in this parameter, the management of overload begins.

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.2	START SPEED CNTR	rpm	0	par. 1.8	200	-	1044	R/W

Once the speed of the motor is exceeded, overload control is enabled.

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.3	MIN OVERLOAD SPE	rpm	0	par. 1.8	dipende dalla taglia	-	1045	R/W

It is the minimum speed that the motor can reach during overload control.

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.4	MIN SPEED TIME	s	0.0	1800.0	10.00	-	1046	R/W

Maximum time of autoholding at the minimum speed of par. 5.1.3 MIN OVERLOAD SPE, during overload management.

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.5	DEC. RAMP. OVERLO.	s	0.0	300.0	10.00	-	1047	R/W

Deceleration ramp during overload (dowstream of the PI regulator).

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.6	KP REG OVERLOAD	-	0	1000	20	-	1048	R/W

Proportional gain of the PI regulator that manages the speed of the motor in overload.

MENU > 5. CURRENT CONTROL > 5.1 OVERLOAD FUNC		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.1.7	KI REG OVERLOAD	-	0	1000	10	-	1049	R/W

Integral gain of the PI regulator that manages the speed of the motor in overload.

DESCRIPTION OF THE OVERLOAD CONTROL

This function allows to limit, slowly, the absorption of the motor at a maximum setting value in parameter ***par.5.1.1 MAX OVERLOAD CUR*** in percentage on the nominal current set in par.1.2 ***MOTOR NOM CURREN***; it is efficient especially in cases where an increase in the motor speed is accompanied by an increase in load, as for example with ventilators.
The parameters that regulate the overload control are grouped together in menu ***5.1 OVERLOAD FUNC.***
The control is enabled only when the motor exceeds the speed set in ***par.5.1.2 START SPEED CNTR.***
When the current absorbed by the motor exceeds the value set in ***par.5.1.1 MAX OVERLOAD CUR*** a P/I regulator tries to lower the speed, with the minimum deceleration ramp of ***par.5.1.5 DEC. RAMP. OVERLO***. To maintain the absorption of the motor constant; if the overload remains, the reduction of speed stops in any case at the value set in ***par.5.1.3 MIN OVERLOAD SPE*** and it autoholds at this speed; the control restarts the speed set only after the time of ***par.1.5.9.7 MIN SPEED TIME,*** or if it activates an input with the function ***MIN S. UN*** (see menu 8.1 INPUTS SETTING)
In case of overload control instability, reduce the regulator gains in parameters ***5.1.6 KP REG OVERLOAD*** and ***5.1.7 KI REG OVERLOAD.***

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.1	Imax ACC RAMP	A	0.0	par.99	dipende dalla taglia	-		R/W

Set the maximum current of the motor in ACCELERATION ramp phase, with speed limitation.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.2	Imax STEADY	A	0.0	par.99	dipende dalla taglia	-	1051	R/W

Set the maximum current of the motor at a STEADY RATE, with speed limitation.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.3	KP CURR.	_	0	1000	1000	-	1052	R/W

Proportional gain of the PI regulator for the FAST limitation function of the current, in ACCELERATION and at a STEADY RATE. In case of instability of the fast limitation of the current, reduce the gain.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.4	KI CURR.	_	0	1000	1	-	1053	R/W

Integral gain of the PI regulator for the FAST limitation function of the current, in ACCELERATION and at a STEADY RATE. In case of instability of the fast limitation of the current, reduce the gain.

FAST limitation of the motor current in acceleration phase

This function allows to quickly limit the current during the start at full charge or at locked rotor avoiding the intermediate intervention of the FAULT1 MAX PEAK CURRENT.
The parameters that regulate the fast limitation of the current are grouped together in the menu ***5.2 FAST CURR. LIMIT***
When the instant current exceeds the value set in ***par.5.2.1 Imax ACC RAMP***, the PI regulator is activated; the regulator output is removed at the set of velocity in added ramp.
The PI regulator gains can be set in parameters ***5.2.3 KP CURR*** and ***5.2.4 KI CURR.***

FAST limitation of the motor current at a steady rate

This function allows to quickly limit the motor current in the functioning at constant speed, at the end of the acceleration phase in this case, when the set of speed has finished the acceleration ramp and the instant current exceeds the value set in ***par.5.2.2 Imax STEADY***, the PI is activated; the regulator output is removed at the set of the speed in the added ramp.
The PI regulator gains can be set in parameters ***5.2.3 KP CURR*** and ***5.2.4 KI CURR.***

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.5	ENABLE BOOST PI	-	*0=NO *1=YES		YES	-	1054	R/W

Activates the P/I regulator for the function of limiting the current due to BOOST voltage.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.6	KP Imax BOOST	-	0	1000	1000	-	1055	R/W

Proportional gain of the PI regulator for the function of limiting the current due to BOOST voltage.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.7	KI Imax BOOST	-	0	1000	1	-	1056	R/W

Integral gain of the PI regulator for the function of limiting the current due to BOOST voltage.

Limitation of the BOOST voltage

The function is useful in the case of low environmental temperature and above all in motors with a lot of power; in this case the boost voltage, which is necessary for starting the motor hot, can create an overabsorption when starting the motor cold. The function is completed with a regulator that lowers the boost voltage (sum of all the voltage boost possible) in order to avoid the overflow of the maximum current set. The limitation happens based on ***par.5.2.1 Imax ACC RAMP*** during the acceleration phase, and to the ***par.5.2.2 Imax STEADY*** at a steady rate.
The stability of the control system is determined by ***par.5.2.6 KP Imax BOOST*** and ***par.5.2.7 KI Imax BOOST.***
The function can be disabled by setting ***par.5.2.5 ENABLE BOOST PI*** = NO

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.8	PERC UP V/f	%	0.0	25.0	depends on size	-	1057	R/W

Maximum boost voltage, incremented to the motor, by the HIGH TORQUE control regulator. In % on the power supply line L1 L2 L3.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.9	KP UP V/f	-	0	1000	depends on size	-	1058	R/W

Proportional gain of the HIGH TORQUE control regulator.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.10	HT MAX TIME ms	s	0.00	30.000	10.000	-	1059	R/W

Maximum duration of the automatic boost applied to the motor by the HIGH TORQUE control regulator.

MENU > 5. CURRENT CONTROL > 5.2 FAST CURR. LIMIT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.2.11	HT STOP SPEED	rpm	0	30000	1300	-	1060	R/W

Threshold on the motor speed, when exceeded deactivates the HT control.

Incremental function of the static torque (HIGH TORQUE)

The function, also called **automatic boost**, allows high torques to be reached even at low revolutions through the balancing voltage of the V/F curve. The compensation system works in the following manner:
When the speed set exceeds the minimum speed of ***par. 2.1 START BOOST FREQ*** the balancing voltage becomes activated; at this point if the absorbed current of the motor exceeds the value set in ***par.1.2 MOTOR NOM CURRENT,*** the inverter intervenes incrementing (in a directly proportional manner) the voltage applied to the motor through a regulator whose gain is set in ***par.5.2.9 KP UP V/f***, until the maximum value set in ***par.5.2.8 PERC UP V/F.*** The maximum duration of the increment of the boost is fixed with ***par.5.2.10 HT MAX TIME ms.***
When the set of ramp speed exceeds the value set in ***par.5.2.11 HT STOP SPEED***, the HT function is disabled.
With ***par.5.2.12 SPEED DISABLE HT****=NO,* the HT function is always active.
The HIGH TORQUE function is disabled when one of the 2 ***par.5.2.8 PERC UP V/F*** and ***par.5.2.9 KP UP V/f*** parameters is set to 0.
The parameters that regulate the HT function and that depend on the motor size applied, are those indicated in the following table; from surveys done on drives combined with motors of different sizes and different makers, the indicative values to be used for the parameters in the subject line were determined. Such values (which are also the default settings of each inverter) are the ones on the table that follows and are valid for motors of current/power indicated in the table, of 4 poles and PWM frequency of the inverter of 2KHz. The rest of the parameters that have an influence on the function, but that do not depend on the size of the motor, are already set by default for optimal operation.
If motors with data different from that in the table are applied consult Rowan Elettronica's Technical Office.

Table with default pre-settings for the HIGH TORQUE function, for each inverter size (for motors with 4 poles)

PARAMETERS		INVERTER POWER SIZE										
		/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6
MOTOR NOM CURREN par.1.2	A	5.0	7.0	9.0	12.0	15.0	22.0	30.0	35.0	45.0	60.0	72.0
FIXED BOOST FREQ par.1.10	%	3.0	3.0	2.9	2.8	2.7	2.5	2.3	2.2	2.0	1.9	1.8
START BOOST FREQ par.2.1	Hz	5.3	4.6	4.3	4.0	3.3	2.7	2.3	2.0	1.7	1.3	1.3
PERC UP V/f par. 5.2.8	%	5.0	4.0	3.6	3.2	2.9	2.4	2.2	1.9	1.8	1.6	1.4
KP UP V/f par. 5.2.9	adim	30	23	21	19	17	15	13	11	10	8	7

PARAMETERS		INVERTER POWER SIZE										
		/ 6,5	/ 7	/ 8	/ 8,5	/ 9	/ A	/ B	/ C	/ D	/ E	/ F	/G
MOTOR NOM CURREN par.1.2	A	87.0	106.0	138.0	165.0	205.0	245.0	300.0	370.0	460.0	550.0	655.0	780.0
FIXED BOOST par.1.10	%	1.7	1.6	1.4	1.3	1.1	1.0	0.9	0.8	0.7	0.6	0.5	0.4
START BOOST FREQ par.2.1	Hz	1.3	1.3	1	1	1	1	1	0.7	0.7	0.7	0.7	0.6
PERC UP V/f par. 5.2.8	%	1.3	1.2	1.0	0.9	0.8	0.7	0.6	0.5	0.4	0.3	0.2	0.1
KP UP V/f par. 5.2.9	adim	6	6	5	5	4	4	3	3	3	2	2	2

MENU > 5. CURRENT CONTROL		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.3	RESET MAX Imax	-	*0=NO *1=YES		NO	-	1062	R/W

Setting to **YES** zeroes the **6.7 MEMO MAX Imax** variable.
The YES setting remains for 2 seconds, and then automatically returns to NO.

MENU > 5. CURRENT CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.4	CURR. THRESHOLD	A	0.0	par.99	depends on size	-	1063	R/W

Threshold on the motor current displayed in var.6.4 MOTOR CURRENT.
When the current of the motor exceeds the threshold set in this parameter for the time in par.5.5 THRESHOLD DELAY, the output to which this function has been assigned is activated.
The threshold function can be assigned to a digital output in menu 9.OUTPUT SETTING.

MENU > 5. CURRENT CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.5	THRESHOLD DELAY	s	0.0	300.0	3.0	-	1064	R/W

Delay of intervention of the threshold on the motor current, set in par.5.4.CURR. TRESHOL

MENU > 5. CURRENT CONTROL		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
5.6	CURR. HISTERESIS	A	0.1	200.0	0.3	-	1065	R/W

Hysteresis on the release of the threshold on the motor current.

Description of parameters on menu 6. DISPLAY VARIABLE

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.1	SPEED REFERENCE	rpm	- 30000	+ 30000	-	500	R

Reference of speed set without ramp.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.2	MOTOR SPEED	rpm	- 30000	+30000	-	501	R

Motor speed.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.3	MOTOR FREQUENCY	Hz	0.0	800.0	-	502	R

Frequency of the voltage on the motor.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.4	MOTOR CURRENT	A	0.0	3000.0	-	503	R

Current absorbed by the motor.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.5	INVERTER I x I	%	0	100	-	504	R

Average current squared, absorbed by the motor, calculated on a window of control of 300sec.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.6	I MAX MONITOR	A	0.0	3000.0	-	505	R

Every second displays the maximum current peak detected on a window of observation of 1 second.
This display makes it possible to capture even a single current peak lasting a minimum of 50 microseconds, maintaining it on display for 1 second, it is useful therefore for checking the margin during overloads before protection FAULT 1 (MAX PEAK CURRENT) intervenes.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.7	MEMO MAX Imax	A	0.0	3000.0	-	506	R

Memorization of the highest absolute value of the maximum instant current detected on the motor and displayed in var. 6.6 I MAX MONITOR. This value is memorized in eeprom at shutdown and re-proposed at startup.
It is useful for example to check the maximum current reached in a day or several working days of an inverter or the level of current that has created a fault. The variable can be zeroed through par.5.3 RESET MAX Imax.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.8	IGBT BRAKE CURR.	A	0.0	3000.0	-	507	R

Current absorbed by the braking resistor connected to terminals F and F+. The current displayed is not directly measured, but deducted based on the resistive value inserted in par.2.5.1 BRAKE RESISTANCE and the value measured of the busdc, also displayed in var. 6.9 BUSDC VOLTS; the calculation of the current does not take into account however the parasitic inductance characteristic of the wire resistance, for this reason, aboveall with very low working duty cycles, the value displayed could reach a maximum error of +10% with respect to the real value.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.9	BUS DCVOLTS	V	0	3000	-	508	R

BUSDC voltage to power terminals F+ and - .

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.10	MOTOR VOLTAGE	V	0	3000	-	509	R

Motor voltage.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.11	ACTIVE POWER	KW	0.00	900.00	561	562	R

Active power absorbed by the motor.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.12	COS (PHI)	-	0.00	1.00	-	511	R

Cosine of the phase angle between voltage and motor current.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.13	ANALOG INPUT AI1	%	-100.00	+100.00	-	512	R

Display % of the signal at analog input AI1.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.14	ANALOG INPUT AI2	%	-100.00	+100.00	-	513	R

Display % of the signal at analog input AI2.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.15	ANALOG INPUT AI3	%	-100.00	+100.00	-	514	R

Display % of the signal at analog input AI3.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.16	ANALOG INPUT AI4	%	-100.00	+100.00	-	515	R

Display % of the signal at analog input AI4.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.17	MOTOPOT SET %	%	0.00	100.00	-	516	R

Display % of the set realized with the motopotentiometer.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.18	ACTIVE VAR AO0	%	-100.00	+100.00	-	517	R

Display % of the voltage signal of analog output AO1. 100.00% = 10Vdc.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.19	ACTIVE VAR AO1	%	-100.00	+100.00	-	518	R

Display % of the voltage signal of analog output AO2. 100.00% = 10Vdc.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.20	SPE.REF	rpm	- 30000	+30000	-	500	R
	MOT.SPE	rpm	- 30000	+30000	-	501	R

Double display: speed set (SPE. REF) and motor speed (MOT.SPE).

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.21	SPE.REF	rpm	- 30000	+30000	-	500	R
	MOT.CUR	A	0.0	3000.0	-	503	R

Double display: speed set (SPE. REF) and motor current (MOT.CUR).

MENU > 6. DISPLAY VARIABLE		UNI-T	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.22	DIG INPUT I1..8	-	00000000	11111111	-	521	R

Monitors the state of digital inputs from I1 to I7 and of the PTC probe (I8).
The state of the inputs corresponds to that of every single bit: 1=input ON, 0=input OFF.
The first bit starting from the right is relative to input I1 and goes in sequence towards the left until I8.
For example: with par.6.22 = 11000001, digital inputs I1, I7, and I8 are ON, all the others are OFF.
N.B. I8 =1 > PTC probe not connected or in overtemperature.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.23	DIG OUTPUT O1.8	-	00000000	11111111	-	522	R

Binary display of the state of digital outputs from O1 to O4.
The state of the outputs corresponds to that of every single bit: 1=output ON, 0=output OFF.
For relay outputs O1, O2, O3, 1=energized contactor, 0=deenergized contactor.
The first bit starting from the right is relative to output O1 and goes in sequence towards the left until O8(max 4 output present) .
For example: with par.6.23 = 00000101, digital outputs O1, O3 are ON, all the others are OFF.

MENU > 6. DISPLAY VARIABLE		UNI-T	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.24	LAST FAULT	-	0	100	-	523	R

Number of the last fault that has caused the locking of the inverter.
To know the type of fault related to this number, consult chapter 11 INVERTER FAULTS AND ALARMS .
At each restart the fault number in this variable is zeroed . The most recent fault however remains memorized in par.11.4.1 FAULT 1 of the menu 11.4 FAULT HISTORY.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.25	COUNT AUTORESTAR	-	0	3	-	524	R

Autorestart counter (max 3) for the automatic restart function after a fault if the function is enabled with par.11.1ENABLE AUTOREST=YES. The counter is zeroed automatically after 1000sec.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.26	OPERATE HOURS	h	0.00	100.000	-	-	-

Operating time in run of the inverter.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.27	ALARM	-	0	9999	-	527	R

Number of alarms active in the inverter.
To know which type of alarm is related to this number, consult chapter 11 INVERTER FAULTS AND ALARMS.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.28	LAST TWO ERR COM	-	0	9999	-	528	R

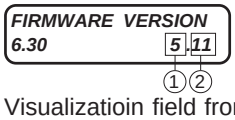
Contains the number relative to the last 2 errors on the serial communication. For example: 1902
02=number of the last error, 19=number of the previous error. To know what type of error is related to these numbers, see the description of the parameters in menu 12. SERIAL COMUNICAT.
The numbers are zeroed at every startup of the inverter.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.29	COUNT ERRORS COM	-	0	30000	-	529	R

Counter of the number of errors on the serial communication. The counter is zeroed at every startup of the inverter.

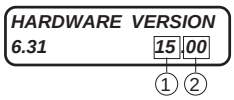
MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.30	FIRMWARE VERSION	-	0.00	9.99	-	530	R

Number of the firmware version of the inverter.



Visualizatioin field from 0.00 to 99.99 shared in 2 parts:
1) firmware version number;
2) additional number referred to firmware modifications when parameters have not to be changed.

MENU' > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.31	HARDWARE VERSION	-	0.00	300.00	-	531	R



Identification code with reference to the inverter hardware

Visualizatioin field from 0.00 to 300.00 shared in 2 parts:
1) number referred to the inverter size: 15=/R, 20=/0, 25=/1, 30=/L, 35=/2, 40=/3, 45=/3.5, 50=/4, 55=/5, 60=/6, 65=/6.5, 70=/7, 75=/8, 80=/8.5, 85=/9, 90=/A, 95=/B, 100=/C, 105=/D, 110=/E, 115=/F, 120=/G.
2) Parameters setting version.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.32	double display						
SET		-	0.0	9000.0	544	545	R
FDB		-	0.0	9000.0	546	547	R

SET = current value of the PID regulator, also displayed on the run off.
FDB = current value of the feedback signal of the PID regulator.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.33	double display						
RSET		-	0.0	9000.0	548	549	R
FDB		-	0.0	9000.0	546	547	R

RSET =current value of the PID regulator in ramp.
FDB = current value of the feedback signal of the PID regulator.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.34	double display						
MOT.SPE		rpm	- 30000	+ 30000	-	501	R
FDB		-	0.0	9000.0	546	547	R

MOT.SPE = motor speed
FDB = current value of the feedback signal of the PID regulator.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.35	TEMPERATURE (C)	-	-120	+120	-	543	R

Compressor oil temperature measured by the probe NTC 47K connected to the analog input AI4 with the polarization resistor 10K (see also chapter 6).
The visualization is always active regardless of the activation of the function REGULATOR.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.36	OIL LIFE HOURS	-	0.0	100000.0	554	555	R

It Shows working hours of the compressor oil with the inverter is running.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.37	double display						
PID ERR		-	- 9000.0	+ 9000.0	550	551	R
PID OUT		-	-100.0	+100.0	552	553	R

PID ERR = error between the SET and the feedback signal FDB
PID OUT = output of the PID controller which controls the speed of the motor; 100.0 = maximum speed.

MENU > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.38	I x COS (PHI)	A	0.0	3000.0	-	560	R

Active current given by the inverter.

MENU' > 6. DISPLAY VARIABLE		UNIT	VALUE RANGE		MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX	MSW	LSW	R=READ W=WRITE
6.39	POWER LOSS COUNT	-	0	30000	-	563	R

Power loss counter

Description of parameters on menu 7. DISPLAY CONFIG

MENU' > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.1	DEFAULT DIS1	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		SPEED REFERENCE	-	1066	R/W

Selects the order number of the variable to insert as the **1st display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.2	DEFAULT DIS2	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR SPEED	-	1067	R/W

Selects the order number of the variable to insert as the **2nd display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.3	DEFAULT DIS3	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR FREQUENCY	-	1068	R/W

Selects the order number of the variable to insert as the **3rd display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.4	DEFAULT DIS4	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		MOTOR CURRENT	-	1069	R/W

Selects the order number of the variable to insert as the **4°display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.5	DEFAULT DIS5	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		BUS DC VOLTS	-	1070	R/W

Selects the order number of the variable to insert as the **5th display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.6	DEFAULT DIS6	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		Imax MONITOR	-	1071	R/W

Selects the order number of the variable to insert as the **6th display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.7	DEFAULT DIS7	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		LAST FAULT	-	1072	R/W

Selects the order number of the variable to insert as the **7th display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.8	DEFAULT DIS8	-	*0=var.6.1 SPEED REF. ..... *38=var.6.39 POWER LOSS COUNT.		FIRMWARE VERSION	-	1073	R/W

Selects the order number of the variable to insert as the **8th display** in the initial menu MONITOR VARIABLES.

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.9	OPERATOR SET1	-	*0=NO *1=YES		NO	-	1075	R/W

With the setting to YES it adds, after the 8°display of the initial menu MONITOR VARIABLES, par.3.3.2 (manual setting of the motor speed).

MENU > 7. DISPLAY CONFIG		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
7.10	OPERATOR SET2	-	*0=NO *1=YES		NO	-	1076	R/W

NO FUNCTION.

Description of parameters on menu 8. INPUTS SETTING

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.1	RUN+STOP SPEED I1	-	*0=NO *1=YES		NO	-	1077	R/W

Selects the type of motor stop at the deactivation of run.
NO = When run is deactivated, the voltage to the motor is immediately removed.
YES = When run is deactivated, the motor is taken to zero revolutions with the deceleration ramp set and then the voltage to the motor is immediately removed.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.2	RUN+RST FAULT I1	-	*0=NO *1=YES		NO	-	1078	R/W

Enables the possibility to reset the state of lock (when the pilot light FAULT is turned on) with the activation of the motion control.
NO = The lock can be reset only by turning off and turning on the inverter.
YES =The lock can be reset by turning off and turning on the inverter or by deactivating the motion control.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.3	RUN+DC BRAKE I1	-	*0=NO *1=YES		NO	-	1079	R/W

Enables braking in continuous current at the deactivation of run.
NO = Braking is disabled
YES=When run is deactivated the DC braking cycle starts according to the parameters set in menu 10.2 DC BRAKING

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.4	I1 TIME OFF	s	0.00	30.00	0.02 s	-	1080	R/W

Delay on the run control.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.5	I2 FUNCTION	-	*0=NO FUNCT. *1=STOP SPEED *2=REV. SPEED *3=RES. FAULT *4=IN1 FIX S. *5=IN2 FIX S. *6=IN1 RMP S. *7=IN2 RMP S. *8=IN1 MAX S. *9=INC MOTOPOT *10=DEC MOTOPOT *11=DC BRAKE *12=SETUP 1/2 *13=STOP PID *14=MIN S. UN.		STOP SPEED	-	1081	R/W

Functionality assignable to the I2 digital input and managable in serial through the writing of the single bits of the control word with **address modbus 1168** . The bit in modbus works in logic OR with the eventual input enabled for the same function.
NO FUNCT. (bit0 word modbus) = No function assigned.
STOP SPEED (bit1 word modbus) = With the input at ON the motor stops with the deceleration ramp active.
REV.SPEED (bit2 word modbus) = With the input at ON the motor inverts the sense of rotation.
RES.FAULT (bit3 word modbus) = With the input at ON the fault state is reset.
IN1 FIX S. (bit4 word modbus) = Selects the fixed speed pre-set in the menu 3.2 FIXED SPEED SEL.
IN2 FIX S. (bit5 word modbus) = Selects the fixed speed pre-set in the menu 3.2 FIXED SPEED SEL.
IN1 RMP S. (bit6 word modbus) = Selects the fixed ramps pre-set in the menu 4. RAMP ACC/DEC.
IN2 RMP S.(bit7 word modbus) = Selects the fixed ramps pre-set in the menu 4. RAMP ACC/DEC.
IN1 MAX S. (bit8 word modbus) = at ON selects the 2°max speed limit, set in par.3.6 SET SPEED MAX1
INC MOTOPOT (bit9 word modbus) = at ON increases the set of the motopotentiometer.
DEC MOTOPOT (bit10 word modbus) = at ON decrements the set of the motopotentiometer.
DC BRAKE (bit11 word modbus) = at ON the DC braking cycle begins with the parameters set in menu 10.2 DC BRAKING.
SETUP 1/2 (bit12 deactivated) = at OFF loads all the parameters in the SETUP1 memory to the WORK memory; at ON loads all the parameters in the SETUP2 memory to the WORK memory.
The function is active only with par.100.1 EN MOTOR SWITCH = YES and RUN I1 OFF.
STOP PID (bit13 word modbus) = No function.
MIN S. UN. (bit14 word modbus) = at ON the motor exits the minimum speed reached in overload (***par.5.1.3 MIN OVERLOAD SPE)*** and resumes the set speed.
The state of the control word can be read in modbus with address 537.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.6	LOGIC CONFIG. I2	-	*0=NORMAL *1=INVERT *2=FORCE EN		NORMAL	-	1082	R/W

Modifies the control of the input:
NORMAL = standard control (NO); ***INVERT*** =inverted control (NC); ***FORCE EN*** =control always at ON indipendent of the logic state of the input.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.7	I3 FUNCTION	-	as par. 8.5		IN1 FIX S.	-	1083	R/W

Functionality assignable to digital input I3 (as par.8.5 I2 FUNCTION).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.8	LOGIC CONFIG. I3	-	as par. 8.6		NORMAL	-	1084	R/W

Modifies input control I3 (as par.8.6 LOGIC CONFIG. I2).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.9	I4 FUNCTION	-	as par. 8.5		IN2 FIX S.	-	1085	R/W

Functionality assignable to digital input I4 (as par.8.5 I2 FUNCTION).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.10	LOGIC CONFIG. I4	-	as par. 8.6		NORMAL	-	1086	R/W

Modifies input control I4 (as par.8.6 LOGIC CONFIG. I2).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.11	I5 FUNCTION	-	as par. 8.5		IN1 RMP S.	-	1087	R/W

Functionality assignable to digital input I5 (as par.8.5 I2 FUNCTION).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.12	LOGIC CONFIG. I5	-	as par. 8.6		NORMAL	-	1088	R/W

Modifies input control I5 (as par.8.6 LOGIC CONFIG. I2).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.13	I6 FUNCTION	-	as par. 8.5		REV. SPEED	-	1089	R/W

Functionality assignable to digital input I6 (as par.8.5 I2 FUNCTION).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.14	LOGIC CONFIG. I6	-	as par. 8.6		NORMAL	-	1090	R/W

Modifies input control I6 (as par.8.6 LOGIC CONFIG. I2).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.15	I7 FUNCTION	-	as par. 8.5		NO FUNCT.	-	1091	R/W

Functionality assignable to digital input I7 (as par.8.5 I2 FUNCTION).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.16	LOGIC CONFIG. I7	-	as par. 8.6		IN1 MAX S.	-	1092	R/W

Modifies input control I7 (as par.8.6 LOGIC CONFIG. I2).

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.17	VIRT. FUNCTION	-	as par. 8.5		NO FUNCT.	-	1093	R/W

Selects and forces a function to ON (as par.8.5 I2 FUNCTION) without assigning it to a physical digital input.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.18	TYPE INPUT AI1	-	*0= 0/+10V *1= -10/+10V		0/+10V	-	1096	R/W

Establishes the type of signal connected to analog input AI1.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.19	TYPE INPUT AI2	-	*0= 0/+10V *1= -10/+10V *2= 4-20mA *3= 0-20mA		4-20mA	-	1099	R/W

Establishes the type of signal connected to analog input AI2.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.20	TYPE INPUT AI3	-	*0= 0/+10V *1= -10/+10V		0/+10V	-	1102	R/W

Establishes the type of signal connected to analog AI3.

MENU > 8. INPUTS SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
8.21	TYPE INPUT AI4	-	*0= 0/+10V *1= -10/+10V		0/+10V	-	1105	R/W

Establishes the type of signal connected to analog input AI4.

Description of parameters on menu 9. OUTPUT SETTING

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.1	O1 FUNCTION	-	*0=INV. RUN, *1=INV. FAULT *2=SPEED TH, *3=CURRENT TH *4=EN MOTOR1, *5=EN MOTOR2 *6=OIL OVERTEM, *7=OIL UNDERTM *8=MIN FDB ALR, *9=MAX FDB ALR *10=MIN-MAX ALR, *11=AUTORST END, *12=REMOTE CTRL, *13= SET SPEED TH, *14= POW LOSS CNT		SPEED TH	-	1106	R/W

Functionality assignable to relay output O1; the ON/OFF state of the functions is leggible even in serial through the single bits of the control word with **address modbus 519** even if a physical output has not been assigned to the function.
INV. RUN (bit0 word modbus) = Assigns to the output the state of drive in run. Drive in run = output ON. Drive not in run = output OFF.
INV. FAULT (bit1 word modbus) = Assigns to the output the state of drive in lock.
Drive in lock = output OFF. Drive not in lock = output ON.
At the moment of powering the inverter, the digital output remains OFF for about 5 seconds and then, if there is no FAULT, it goes to ON.
SPEED TH (bit2 word modbus) =Assigns to the output the state of the threshold on the motor speed which can be set in par.3.7 SPEED THRESHOLD
CURRENT TH (bit3 word modbus) = Assigns to the output the state of the threshold on the motor current which can be set in par.5.4 CURRENT THRESHOL
EN MOTOR 1 (bit4 word modbus) = Useful function when 2 different motors are selected with only one inverter using an input with the function ***"SETUP 1/2"*** (see menu 8. INPUT SETTING); with the input at OFF this output will be activated and will go on to control the power supply solenoid of MOTOR 1.
EN MOTOR 2 (bit5 word modbus) = Useful function when 2 different motors are selected with only one inverter using an input with the function ***"SETUP 1/2"*** (see menu 8. INPUT SETTING); with the input at ON this output will be activated and will go on to control the power supply solenoid of MOTOR 2.
OIL OVERTEM (bit6 word modbus) = Function not yet active.
OIL UNDERTEM (bit7 word modbus) = Function not yet active.
MIN FDB ALR (bit8 word modbus) = Function not yet active.
MAX FDB ALR (bit9 word modbus) = Function not yet active.
MIN - MAX ALR (bit10 word modbus) = Function not yet active.
AUTORST END (bit11 word modbus) = Assigns to the output the state that the maximum number of autorestart attempts has reached (3 tries = output ON).
REMOTE CTRL = At the output no function has been assigned and it remains at OFF (only serial control).
SET SPEED TH = ON when the motor has reached the speed set (var. SPEED REFERENCE). To set an intervention delay and one hysteresis on the threshold, use parameters 3.8 THRESHOLD1 DELAY and 3.9 SPEED HYSTERESIS.
POW LOSS CNT = ON when there is a power loss or a phase loss by par.100.10 POWER LOSS CONTROL=YES, (see description par.100.10)

Attention ! → The state of the outputs can be controlled in logic or with the controls of the functions assigned, through the bits of the serial control word with **address modbus 1169 :**
bit0 word modbus > controls output O1
bit1 word modbus > controls output O2
bit2 word modbus > controls output O3
bit3 word modbus > controls output O4

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.2	LOG. INVERT O1	-	*0=NO *1=YES		NO	-	1107	R/W

Inverts the logic of relay output O1 from NO to NC.

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.3	O2 FUNCTION	-	as par. 9.1		INV. FAULT	-	1108	R/W

Functionality assignable to relay output O2 (like par.9.1 O1 FUNCTION).

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.4	LOG. INVERT O2	-	*0=NO *1=YES		YES	-	1109	R/W

Inverts the logic of relay output O2 from NO to NC.

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.5	O3 FUNCTION	-	as par. 9.1		INV. RUN	-	1110	R/W

Functionality assignable to relay output O3 (as par.9.1 O1 FUNCTION).

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.6	LOG. INVERT O3	-	*0=NO *1=YES		NO	-	1111	R/W

Inverts the logic of relay output O3 from NO to NC.

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.7	O4 FUNCTION	-	as par. 9.1		CURRENT TH	-	1112	R/W

Functionality assignable to static output O4 (as par.9.1 O1 FUNCTION).

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.8	LOG. INVERT O4	-	*0=NO *1=YES		NO	-	1113	R/W

Inverts the logic of static output O4 from NO to NC.

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.9	SCALE AO0	%	0.00	300.00	100.00	-	1115	R/W

Adapts the full-scale of the analog output AO0; the output has a **fixed** function proportional to the value displayed in var.6.4 MOTOR CURRENT.

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.10	OFFSET AO0	%	-10	+10	0.00	-	1116	R/W

Zeroes the offset of analog output AO0;

MENU > 9. OUTPUT SETTING		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.11	SCALE AO1	%	0.00	300.00	100.00	-	1119	R/W

Adapts the full-scale of analog output AO1;

MENU' > 9. OUTPUT SETTING		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.12	OFFSET AO1	%	-10	+10	0.00	-	1120	R/W

Zeroes the offset of analog output AO1

MENU' > 9. OUTPUT SETTING		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
9.13	SELECT VAR AO0	-	Var. 6.2, Var. 6.4, Var. 6.11, Var. 6.38		Var. 6.4	-	1126	R/W

Through this parameter it is possible to assign the following variable arrangment to the analog output AO0:
Var. 6.2 = the output is proportional to var. 6.2 MOTOR SPEED.
The output is **+10Vdc** at the max motor speed (**par.1.8**) and at **par.9.11 = 100%**.
Var. 6.4 = the output is proportional to var. 6.4 MOTOR CURRENT.
The output is **+10Vdc** when twice the rated motor current (**par.1.2**) and at **par.9.9 = 100%**
Var. 6.11 = the output is proportional to var. 6.11 ACTIVE POWER.
The output is **+10Vdc** if the active power corresponds to twice the inverter rated power calculated as follows:

$$P_{N\_Inv} = \sqrt{3} \cdot V_{Line} \cdot I_{N\_inv}$$

V_{Line} is par.1.1 (LINE VOLTAGE) and I_{IN_Inv} is the inverter rated current.

Var. 6.38 = the output is proportional to var. 6.38 I x COSPHI.
The output is **+10Vdc** if the variable IxCOS(PHI) corrisponds to twice the value of par.1.2 MOTOR NOM CURRENT, or id the active current corrisponds to twice the motor rated current with unitarycos(phi).

Description of parameters on menu 10. SPECIAL FUNCTION

MENU > 10. SPECIAL FUNCTION > 10.1 MOTOPOTENTIOM.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.1.1	SAVE MOTOPOT	-	*0=NO *1=YES		YES	-	1122	R/W

Setting to YES, at the power shutdown of the inverter, the set reached by the motopotentiometer is saved in eeprom and recharged at the next power supply; at NO the set of the motopotentiometer is zeroed at each startup of the inverter.

MENU > 10. SPECIAL FUNCTION > 10.1 MOTOPOTENTIOM.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.1.2	START RAMP MOTP	sec	0.001	600.00	100.00	-	1123	R/W

It is the acceleration and deceleration ramp on the INCREASE and DECREASE controls of the set to motopotentiometer for the first 3 sec. of activation.

MENU > 10. SPECIAL FUNCTION > 10.1 MOTOPOTENTIOM.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.1.3	ACC DEC MOTP SET	sec	0.001	600.00	10.00	-	1124	R/W

It is the acceleration and deceleration ramp on the INCREASE and DECREASE controls of the set to motopotentiometer after the 3 sec. of activation.

MENU' > 10. SPECIAL FUNCTION > 10.2 DC BRAKING		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.2.1	DC BRAKE LEVEL	%	0.0	300.0	100.0	-	1125	R/W

Continuous braking current, in % on the nominal current of the motor of par.1.2 MOTOR NOM CURREN.

MENU > 10. SPECIAL FUNCTION > 10.2 DC BRAKING		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.2.2	DC BRAKE TIME	sec	0.1	300.0	10.0	-	1126	R/W

Duration of the injection of the continuous braking current.

MENU > 10. SPECIAL FUNCTION > 10.2 DC BRAKING		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.2.3	BRAKE LEVEL RAMP	sec	0.1	300.0	10.0	-	1127	R/W

Ramp on the set of the continuous braking current.

MENU > 10. SPECIAL FUNCTION > 10.2 DC BRAKING		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
10.2.4	DEFLUX TIME	sec	0.1	300.0	20.0	-	1128	R/W

Delay at the injection of the continuous current.

Description of the functioning of the braking cycle of the motor through the injection of continuous current.

The start of the braking cycle can begin in 2 ways:
1) directly with the deactivation of run; in this case it is necessary to set par.8.3 RUN+ DC BRAKE I1 =YES.
2) with the deactivation of run but only with consent at ON of a digital input with the function "DC BRAKE"
When run I1 is deactivated, after the delay of par.10.2.4 DEFLUX TIME, the injection of the continuous current with the ramp set in par.10.2.3 BRAKE LEVEL RAMP begins, until the value set in par.10.2.1 DC BRAKE LEVEL.
The duration of the injection of DC current is equal to the time set in par.10.2.2 DC BRAKE TIME.
At the end of the braking cycle run is automatically taken away from the inverter (pilot light RUN is off).

Description of parameters on menu 11. FAULT MANAGEMENT

MENU > 11. FAULT MANAGEMENT		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.1	ENABLE AUTO REST	-	*0=NO *1=YES		NO	-	1129	R/W

Enables or does not enable the autorestart after a fault.

MENU > 11. FAULT MANAGEMENT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.2	RESTART DELAY	sec	0.1	300.0	3.0	-	1130	R/W

Delay of the autorestart of the inverter after a fault.

MENU > 11. FAULT MANAGEMENT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.3	RESET TIME	sec	1.0	3000.0	1000.0	-	1114	R/W

Time of autozero setting of the softstart counter displayed also in var.6.25 COUNT AUTORESTAR.

Automatic restart after a fault

It is enabled by setting par. 11.1 ENABLE AUTOREST=YES; when there is a fault, after the time set in par.11.2 RESTART DELAY, the inverter automatically resets itself; the maximum number of attempts to restart is fixed at 3 and once this is reached the inverter remains in fault and the output programmed for the function "AUTORST END" is activated.
The restart counter is displayed in var.6.25 COUNT AUTORESTAR and automatically zeroes itself after the time set in par. 11.3 RESET TIME.

MENU > 11. FAULT MANAGEMENT > FAULT HISTORY		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.4.1	FAULT 1	-	0	100	display	-	537	R

Displays the number of the 1°FAULT (the most recent)

MENU > 11. FAULT MANAGEMENT > FAULT HISTORY		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.4.2	FAULT 2	-	0	100	display	-	538	R

Displays the number of the 2° FAULT.

MENU > 11. FAULT MANAGEMENT > FAULT HISTORY		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	parameter name		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.4.3	FAULT 3	-	0	100	display	-	539	R

Displays the number of the 3° FAULT.

MENU' > 11. FAULT MANAGEMENT > FAULT HISTORY		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMTER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.4.4	FAULT 4	-	0	100	display	-	540	R

Displays the number of the 4° FAULT.

MENU > 11. FAULT MANAGEMENT > FAULT HISTORY		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.4.5	FAULT 5	-	0	100	display	-	541	R

Displays the number of the 5° FAULT (the less recent).

MENU > 11. FAULT MANAGEMENT		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
11.5	RESET HIST. FAULT	-	*0=NO *1=YES		NO	-	1131	R/W

Setting to YES resets the history of the last 5 faults.

Description of parameters on menu 12. SERIAL COMUNICAT

MENU > 12. SERIAL COMUNICAT		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
12.1	ADDRESS	-	1	100	2	-	1132	R/W

Serial address of the inverter.

MENU > 12. SERIAL COMUNICAT		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
12.2	BAUD RATE	bps	*0=9600 *1=19200 *2=38400 *3=57600 *4=76800 *5=115200		115200	-	1133	R/W

Speed of transmission.

MENU > 12. SERIAL COMUNICAT		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
12.3	PARITY	-	*0=NONE *1=EVEN *2=ODD		NONE	-	1134	R/W

Selects the type of parity on the control of the character transmitted.

MENU > 12. SERIAL COMUNICAT		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
12.4	BIT STOP	-	1	2	1	-	1135	R/W

Selects the type of parity on the control of the character transmitted.

MENU > 12. SERIAL COMUNICAT		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
12.5	ENABLE FAST MODE	-	*0=NO *1=YES		NO	-	1061	R/W

NO = response time to the messages of the standard master (~ 10ms).
YES = response time to the messages of the fast master (~ 1ms).

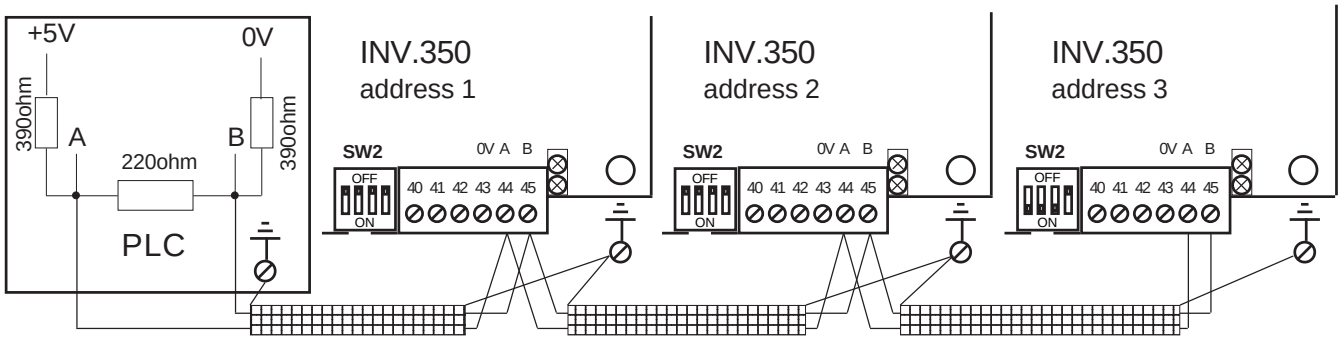
Description of the serial transmission MODBUS RTU

The MODBUS RTU protocol establishes asynchronous communication between one MASTER device (plc, pc, etc. etc.) and many SLAVE devices (in this case the series 350 inverters) connected through interface RS485 of the HALF-DUPLEX type (transmission and reception cannot be simultaneous) with 2 wire connection.
Only the master can ask the slave which in turn can only respond.
Each single character of the message is composed in the following manner:
1 bit of start, 8bit for the data, 1 bit for the parity, 1 or 2 bit of stop
In the 350 series inverter the type of parity and the number of over stop bits are programmable in the parameters described previously. At the same time the speed of transmission can be chosen between the following baudrate:
9600, 19200, 38400, 57600, 76800, 115200.
For each correct message by the master written or read, a responding message by the slave is foreseen
The integrity of the data exchanged between master and slave is checked through the CRC16 algorythm.
If the slave verifies an incorrect CRC it cancels the message that responds to the master.
The master/slave message contains the slave's univocal address to be interrogated comprised of between **1** and **247**
The master/slave message contains the CODE of the FUNCTION requested of the slave.
The modbus protocol foresees different functions but in the 350 series inverters only the following are active:
- READING OF 1 OR MORE WORD (maximum 45) (FUNCTION CODE=03H)
- READING OF 1 OR MORE WORD (in RAM maximum 45, in EEPROM maximum 10) (CODE FUNCTION=10H)
With the writing in EEPROM, the parameters remain in memory even with the shutdown of the inverter.
N.B.: in case of writing in EEPROM it is necessary to add to the MODBUS address tables, the value of 10000.
FOR EXAMPLE: writing address par 12.1 ADDRESS, RAM = 1132, EEPROM = 11132.
Between one EEPROM writing message and the next, it is opportune to wait for a time superior to the writing in RAM (~ 100ms).

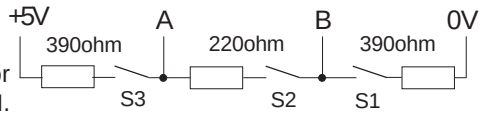
If the master sends to the slave a message with incorrect instructions, the protocal foresees a response from the slave containing an error code (MODBUS EXCEPTION CODE).
The 350 series inverters are programmed to communicate the following error codes to the master:
- ILLEGAL FUNCTION (Modbus exception code=01H)
- ILLEGAL DATA ADDRESS (Modbus exception code=02H)
- ILLEGAL DATA VALUE (Modbus exception code=03H)
For more indepth information on the modbus standard visit http://www.modbus.org

Serial connection

Example of an electric serial diagram for 3 drives series 350 controlled by a plc:



The connections of the serial bus components must be executed in cascade as in the example. The first and last components of the bus must end the serial line with the resistive network as shown here beside, which for the 350 inverters is inserted by setting the microswitches 1,2,3 of SW2 to ON. (micro4 indifferent) accessible outside the inverter, near terminals 40,41.



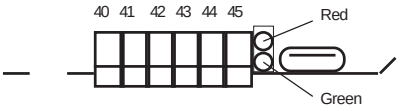
In our example of a connection, we therefore have the Plc (first of the line) and the INV.350 address 3 (last of the line), both finished with the characteristic resistive network. By default micros 1,2,3 of SW2 are closed and, if desired, up to 3 inverters on the same serial bus micros 1,2,3 of SW2 can be left closed.

Where possible, the connections of the common 0V between master and slaves, avoids dangerous potential differences between the components of the serial bus and improves in general the immunity to the EMI (terminal 43, 0V)

For the electrical connection keep to the following recommendations:
Maximum connectable length 1200mt.
Use shielded cable with 2 wires twisted with characteristic impedence of 120 ohm.
Connect the cable shield to each node on a wide ground plane.
Use where possible shielded cables to connect the motor; at the very least apply ferrite rings.
Avoid passing the motor or braking resistor cables parallel to the serial connection cable, and if this is not possible, remain at least at a distance of 200mm.
If the serial cable must go through the motor or braking resistor connections or other power cables that can generate interference, make sure to maintain an angle of intersection of 90°.

In the case of particularly disturbed environments, the insertion of a ferrite ring in the arrival and departure connection cable of the A B serial connection, improves immunity to the EMI.

It is possible to check the state of the serial transmission through the led housed near the serial connection terminal of the inverter:



Green led = lights up for 2 seconds at each valid message received.
Red led = lights up for 2 seconds at each transmission error counted in var.6.29 COUNT ERRORS COM.
The codes of the last 2 errors are displayed in var.6.28 LAST TWO ERR COM and are the following:
01 = The master has requested a modbus function not supported by the slave; the slave executes the response message with "MODBUS EXCEPTION CODE" = 1 (ILLEGAL FUNCTION).
02 = The master wants to write/read a parameter with an address that is not allowed; the slave executes the response message with "MODBUS EXCEPTION CODE" = 2 (ILLEGAL DATA ADDRESS).
03 = The master tries to write a parameter with values that are outside the range; the slave executes the response message with "MODBUS EXCEPTION CODE" = 3 (ILLEGAL DATA VALUE).
19 = Wrong checksum and the interpretation of the message is not executed.

Serial addresses of the parameters and writing in RAM and EEPROM

The modbus address specified in the description of the parameters is represented **in decimal format.**
The values of the parameters with this address are written in the RAM memory area and are not saved by the inverter at shutdown. To make it so the inverter saves the value written in a permanent way in the EEPROM area, it is enough to add the value of 10000 to the address of the tables.
FOR EXAMPLE: to save in EEPROM a value in par.1.2 MOTOR NOM CURREN, the address to write in the writing message (function 10H) will be **10001** (1001+10000).

Description of the menu parameters 13. PID REGULATOR

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.1	ENABLE FUNCTION	-	*0=STANDARD *1=COMPRESSOR		STANDARD	-	1176	R/W

STANDARD = motor controlled by the PID regulator without any special function.
COMPRESSOR = motor controlled by the PID regulator, with the specific function for the compressors and pumps managed by the menu parameters 13.12 COMPRESSOR FUNC.
Attention! → To enable the PID regulator, you must set the par. 3.1 SPEED SOURCE = REGULAT.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.2	SET SOURCE	-	*0=REMOTE *1=AI1, *2=AI2, *3=AI3 *4=OPERATOR *5=MOTOPOT		AI1	-	1177	R/W

It assigns the adjustment SET source of the PID regulator.
REMOTE = No active source for adjusting the SET (for the control in modbus, please select OPERATOR).
AI1.....AI3 = SET adjustment at the analogical inlet selected.
The input 100% (+/- 10VDC) corresponds to the absolute value set in par. 13.3 MAX REG SET.
OPERATOR = Setting the SET from the keypad through par. 13.14.2.
In any case, maximum adjustment is the value set in par 13.3 MAX REG SET.
MOTOPOT = SET adjustment through 2 digital inlets increases/decreases the motopotentiometer type.
The digital inputs must be set in the menu 8. INPUTS SETTING, while the adjustment characteristics can be set in the parameters of menu 10.1 MOTOPOTENTIOM.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.3	MAX REG SET	-	1.0	9000.0	10.0	1178	1179	R/W

It adjusts the SET; it's value displayed in SET with the active source at full scale (for example, +10 Vdc in the case of adjustment of analogical input AI1...AI3).
The maximum setting value of this parameter is limited to a value equal to set in the parameter 13.4 MAX REG FEEDBACK

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.4	MAX REG FEEDBACK	-	1.0	9000.0	12.0	1180	1181	R/W

It adjust the FEEDBACK signal that must be connected to the analogical input AI2; it is the value displayed in FDB with AI2 at full scale (20 mA or 10 Vdc).

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.5	KP REG	-	0.0	250.0	120.0	-	1182	R/W

PROPORTIONAL gain of PID regulator.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.6	KI REG	-	0.0	250.0	30.0	-	1183	R/W

INTEGRAL gain of the PID regulator.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.7	KD REG	-	0.0	250.0	0.0	-	1184	R/W

DERIVATIVE gain of the PID regulator.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.8	REGULATOR ON/OFF	-	*0=NO *1=YES		NO	-	1185	R/W

It defines 2 operation modes of the PID operation:
NO = normal operation with gains KP, KI, KD
YES = operation as it would have an infintite KP gain.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.9	PID OUT INVERS.	-	*0=NO *1=YES		NO	-	1186	R/W

It sets the adjustment mode of the PID regulator motor speed:
NO = if the feedback (FDB) increases compared to the fixed SET, the regulator output decreases the motor speed; on the contrary, if the SET increases compared to the feedback (FDB), the output of the regulator increases the motor speed.
Example: **Control of the pressure in the compressors.**
YES = if the feedback (FDB) increases compared to the fixed SET, the regulator output decreases the motor speed; on the contrary, if the SET increases compared to the feedback (FDB), the output of the regulator decreases the motor speed.
Example: **Control of the temperature in cooling environments**.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.10	SET ACC TIME	sec	0.01	600.0	10.0	-	1187	R/W

Time of the ACCELERATION ramp on the SET of the PID regulator.

MENU > 13. PID REGULATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.11	SET DEC TIME	sec	0.01	600.0	10.0	-	1188	R/W

Time of the DECELERATION ramp on the SET of the PID regulator.

Menu 13.12 COMPRESSOR FUNCTION: these parameters are active only when the par. 13.1 = COMPRESSOR

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.1	+% SET TRIG STOP	%	0.0	300.0	15.0	-	1193	R/W

When the feedback (FDB) exceeds the value (in % on the SET) set in this parameter, the engine running (RUN) consent is removed, regardless of the speed set by the PID regulator.
The running consent managed by the COMPRESSOR function of the PID regulator works in logical AND with the running consent from the terminal board (I1) while maintaining all the features of the parameters 8.2, 8.2, 8.3.
If the par. 13.9 PID OUT INVERS = YES, the running consent is removed when the FEEDBACK falls below the SET.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.2	STOP ON SPEED	rpm	0	10000	500	-	1194	R/W

When the motor speed managed by the PID regulator falls below the value set in this parameter, after the time of the par. 13.12.3 STOP SPE. DELAY, the motor running consent (RUN) is removed.
ATTENTION! if the speed set in the par. 1.9 MIN MOTOR SPEED is greater than the one of this parameter, the running detachment feature does not intervene.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.3	STOP SPE. DELAY	sec	0.0	300.0	3.0	-	1195	R/W

Delay in the motor running detachment, after reaching the speed set in the par. 13.12.2 STOP ON SPEED.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.4	-%SET TRG START	%	0.0	300.0	5.0	-	1196	R/W

When the feedback (FDB) falls below the value (in % on the SET) set in this parameter, the engine running consent (RUN) is restored.
If the par. 13.9 PID OUT INVERS = YES, the running consent is restored when the FEEDBACK exceeds the SET value.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.5	OIL TEMP FUNC.	-	*0=DISABLE *1=ENABLE		DISABLE	-	1197	R/W

DISABLE = management of the compressor oil temperature **disabled.**
ENABLE = management of the compressor oil temperature **enabled.**

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.6	PROBE type	-	*0= ntc 4K7		ntc 4K7	-	1198	R/W

It selects the type of probe for reading the temperature of the oil; now, it is only available the temperature probe NTC 4K7/ 25°C. The reserved inlet to the connection of the probe is fixed an AI4 (see Chap. 6).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.7	MAX TEMPERATURE	°C	-120	+120	+85	-	1199	R/W

Level of intervention of oil overtemperature. If the oil temperature is equal or greater than this parameter:
- the PID regulator output is saturated so that the motor speed does not exceed the value set in par. 13.12.9 OVER TEMP SPEED.
- it turns to ON the digital outlet set in the menu 9. OUTPUT SETTING with the OIL OVERTEM setting. (usually this outlet is used to **drive an oil cooling device).**
- it begins flashing the FAULT light on the keypad to indicate the presence of an alarm encoded in var. 6.27 ALARM with the number **103**.
- after the time set in the par. 13.12.10 MAX TIME OVER T., the motor running is removed.

After the oil overtemperature intervention, the operation recovery takes place when the oil temperature falls below the value **(MAX TEMPERATURE - OVER TEMP HIST.)**; therefore, in this case:
- it's reset the alarm 103
- it's disabled the digital outlet set
- the motor running is restored.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.8	OVER TEMP HIST.	°C	0	+20	5	-	1200	R/W

Hysteresis on the intervention of oil overtemperature on the command of the digital output set and the running of the motor (see description par. 13.12.7 MAX TEMPERATURE).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.9	OVER TEMP SPEED	rpm	0	par.1.8	1000	-	1201	R/W

Speed limit imposed on the motor with the oil under overtemperature conditions (see description par. 13.12.7 MAX TEMPERATURE).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.10	MAX TIME OVER T.	sec	0.0	250.0	10.0	-	1202	R/W

Maximum operating time with the oil under overtemperature conditions (see description par. 13.12.7 MAX TEMPERATURE).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.11	OIL UNDER TEMP.	°C	-25	+20	-10	-	1203	R/W

Level of intervention of oil overtemperature. If the oil temperature is equal or lower than this parameter:
- it turns to ON the digital outlet set in the menu 9. OUTPUT SETTING with the “OIL UNDERTM” setting. (usually this outlet is used to **drive an oil pre-cooling device).**
- it begins flashing the FAULT light on the keypad to indicate the presence of an alarm encoded in var. 6.27 ALARM with the number **104**.
- if the par. 13.12.13 DISABLE RUN = YES, it’s also removed the motor running.

After the intervention of the oil undertemperature, the operation recovery takes place when the oil temperature rises above the value **(OIL UNDER TEMP. + UNDER TEMP HIST.)**; therefore, in this case:
- it resets the alarm 104
- it disables the digital outlet set
- the motor running is restored.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.12	UNDER TEMP HIST.	°C	0	+20	5	-	1204	R/W

Hysteresis on the intervention of oil undertemperature on the command of the digital output set and the running of the motor (see description par. 13.12.11 OIL UNDER TEMP.).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.13	DISABLE RUN	-	*0=NO *1=YES		YES	-	1205	R/W

NO = the motor continues to remain in motion even if it’s intervened the undertemperature
YES = with the intervention of the undertemperature also the motor running is removed.
See description par. 13.12.11 OIL UNDER TEMP.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.14	OIL TIMEL. COUNT	-	*0=NO *1=YES		NO	-	1189	R/W

NO = oil working hour meter disabled
YES = oil working hour meter enabled
The oil life hours calculation is displayed in the var. 6.36 OIL LIFE HOURS and starts with the motor running (RUN light ON).

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.15	SET OIL LIFE (h)	-	0.0	100000.0	1000.0	1190	1191	R/W

It sets the compressor oil working hours, after which occur the alarm encoded in the var. 6.27 ALARM with the number **105** and the flashing of the FAULT light.

MENU > 13. PID REGULATOR > 13.12 COMPRESSOR FUNC.		UNIT	VALUE RANGE * modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.12.16	RESET OIL LIFE	-	*0=NO *1=YES		NO	-	1192	R/W

If you set on YES, you will reset the life hours of the compressor oil (after the reset, the setting automatically returns to NO).

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.1	ENABLE MIN FDB	-	*0=DISABLE *1=ALARM *2=FAULT		DISABLE	-	1206	R/W

It enables the ALARM or FAULT events on the MINIMUM feedback value.
***DISABLE* =** events disabled.
***ALARM* =** activation of the ALARM event.
***FAULT* =** activation of the FAULT event.
The control on the ***ALARM*** and ***FAULT*** events is activated under ON running.
If after the time set in par. 1 3.13.3 DELAY OK MIN MAX, the feedback is lower than the value set in the par. 13.13.4 MIN FDB ALARM for the time of the par. 13.13.6 DELAY MIN ALARM, occurs the event.
If you select ***ALARM*** :
- the FAULT light starts flashing and the var. 6.27 ALARM shows the number **100.**
- it's enabled the outlet set in the menu 9. OUTPUT SETTING with the ""MIN FDB ALR" setting.

Despite the alarm, however, the inverter continues to operate without any type of lock.
The ALARM event can be reset as follows:
- running OFF
- switching off and start-up of the inverter.

If you select ***FAULT*** :
- the FAULT light turns ON and the var. 6.24 LAST FAULT shows the number **100.**
- the motor running is permanently removed (see description of the FAULT status, chap. 11).

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.2	ENABLE MAX FDB	-	*0=DISABLE *1=ALARM *2=FAULT		DISABLE	-	1207	R/W

It enables the ALARM or FAULT events on the MAXIMUM feedback value.
***DISABLE* =** events disabled.
***ALARM* =** activation of the ALARM event.
***FAULT* =** activation of the FAULT event.
The control on the ***ALARM*** and ***FAULT*** events is activated under ON running.
If after the time set in par. 13.13.3 DELAY OK MIN MAX, the feedback is greater than the value set in the par. 13.13.5 MAX FDB ALARM for the time of the par. 13.13.7 DELAY MAX ALARM, occurs the event.
If you select ***ALARM*** :
- the FAULT light starts flashing and the var. 6.27 ALARM shows the number **101.**
- it's enabled the outlet set in the menu 9. OUTPUT SETTING with the "MAX FDB ALR" setting.

Despite the alarm, however, the inverter continues to operate without any type of lock.
The ALARM event can be reset as follows:
- running OFF
- switching off and start-up of the inverter.

If you select ***FAULT*** :
- the FAULT light turns ON and the var. 6.24 LAST FAULT shows the number **101.**
- the motor running is permanently removed (see description of the FAULT status, chap. 11).

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.3	DELAY OK MIN MAX	sec	0.0	250.0	20.0	-	1208	R/W

Initial delay on the intervention of the ALLARM or FAULT events on the minimum and maximum feedback value.

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.4	MIN FDB ALARM	-	1.0	par.13.4	1.0	1210	1211	R/W

Intervention level of the ALARM or FAULT events on the MINIMUM feedback value.

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.5	MAX FDB ALARM	-	1.0	par.13.4	10.0	1212	1213	R/W

Intervention level of the ALARM or FAULT events on the MAXIMUM feedback value..

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.6	DELAY MIN ALARM	sec	0.0	250.0	5.0	-	1214	R/W

Delay on the intervention of the ALARM or FAULT events on the MINIMUM feedback value.

MENU > 13. PID REGULATOR > 13.13 FEEDBACK ALARM		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.13.7	DELAY MAX ALARM	sec	0.0	250.0	5.0	-	1215	R/W

Delay on the intervention of the ALARM or FAULT events on the MAXIMUM feedback value.

MENU > 13. PID REGULATOR > 13.14 SET PID OPERATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.14.1	SAVE OPERATOR	-	*0=NO *1=YES		YES	-	1216	R/W

NO = the SET setting of the par. 13.14.2 is reset at every switching on of the inverter.
YES = the SET setting of the par. 13.14.2 is stored upon switching off and is recalled upon switching on of the inverter.

MENU > 13. PID REGULATOR > 13.14 SET PID OPERATOR		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.14.2	SET	-	0.0	9000.0	0.0	1224	1225	R/W
	FDB	-	0.0	9000.0	visualizzazione	546	547	R

It contains the manual setting, through the keypad, of the PID regulator SET.
It's an **OPERATOR** - the parameter that you can also set in the first level of display on the keypad if enabled via the par. 7.10 OPERATOR SET2, so the operator should not access the complexity of the menus.
SET = regulator SET setting; it's enabled only with the par. 13.2 SET SOURCE = OPERATOR.
FDB = display of the real feedback.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.1	MAX REG OUTPUT	%	0.00	100.00	100.00	-	1217	R/W

It defines the maximum POSITIVE limit of the outlet signal of the PID regulator.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.2	MIN REG OUTPUT	%	-100.00	100.00	0.0	-	1218	R/W

It defines the maximum NEGATIVE limit of the outlet signal of the PID regulator.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.3	MAX INTEGRAL OUT	%	0.0	100.0	100.0	-	1219	R/W

It defines the maximum POSITIVE of the integral part of the outlet signal of the PID regulator.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.4	MIN INTEGRAL OUT	%	-100.00	100.00	0.00	-	1220	R/W

It defines the maximum NEGATIVE of the integral part of the outlet signal of the PID regulator.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.5	KD MODE	-	*0=ERROR *1=FEEDBACK *2=BOTH		ERROR	-	1221	R/W

Choosing the type of derivative action of the PID regulator.
ERROR = the derivative effect acts on the tracking error (difference between set and feedback).
FEEDBACK = the derivative effect is introduced by the signal feedback; this is the best choice to limit the speed overshoot intervention in the step response.
BOTH = it simultaneously enables the ERROR and FEEDBACK actions.

MENU > 13. PID REGULATOR > 13.15 REGULATOR ADJ		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
13.15.6	KD LOW PASS FILT	Hz	1	250	20	-	1222	R/W

Cut-off frequency of the low-pass filter placed at the exit on the derivative action of the regulator.

Description of the PID regulator functions

To enable the motor speed control from the PID regulator, you must set the par. 3.1 SPEED SOURCE=REGULAT.
In the par. 13.1 ENABLE FUNCTION, you can set 2 functions for the PID control:
STANDARD = motor controlled by the PID regulator without any special function.
COMPRESSOR = motor controlled by the PID regulator, with the specific function for the compressors managed by the menu parameters 13.12 COMPRESSOR FUNC.
The function **COMPRESSOR** was designed to improve the performance of the automatic control of pressure in the compressors. In this case, the P/I regulator controls the compressor motor speed to maintain constant the pressure set for the circuit using compressed air; the FEEDBACK is taken from a probe that detects the pressure at output by default connected to the analogical input AI2.
Compared to the traditional snap-in control, this feature allows greater precision in the supply of the pressure and a significant energy savings.
In addition to the basic features of the PID regulator, the feature **COMPRESSOR** allows the following checks:

1) Check of the motor speed according to the oil temperature in the compressor.
The check must be enabled by setting the **par. 13.12.5 OIL TEMP FUNC=YES**
The oil temperature is acquired by a probe NTC 4K7/25°C connected to the analogical inlet AI4.
The oil temperature check is carried out making reference to the undertemperature settings (**par. 13.12.11 OIL UNDER TEMP**) and oil overtemperature (**par. 13.12.7 MAX TEMPERATURE**).
See the description of these parameters for the working cycle at oil temperature limits.

2) Automatic running management if the PID regulator imposes too low speed to the motor.
The check works as follows:
When the motor speed managed by the PID regulator falls below the value set in the par. 13.12.2 STOP ON SPEED, after the time of the **par. 13.12.3 STOP SPE. DELAY**, the motor running consent (RUN) is removed.
ATTENTION! if the speed set in the **par. 13.12.2 STOP ON SPEED** is lower than the **par. 1.9 MIN MOTOR SPEED**, the running detachment function doesn't intervene.
In any case, however, the motor running consent is removed if the feedback (FDB) exceeds the value in **par. 13.12.1 +%SET TRIG STOP** (it's the percentage of the SET imposed).
The motor running is re-established only when the feedback falls down the value in % on the set set on the **par. 1 3.12.4 SET TRG START**.

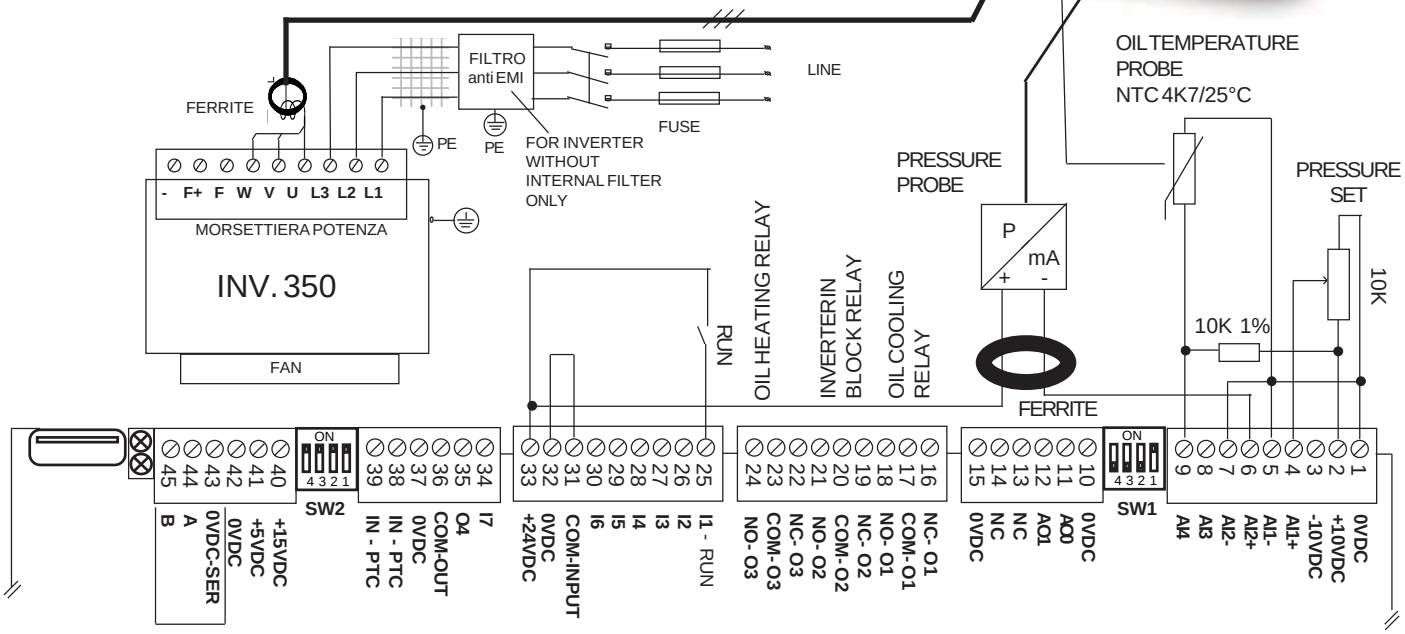
3) Check of the life hours of the oil in the compressor:
In addition to the temperature, you can also check the number of oil life hours in the compressor as follows:
In **par. 13.12.15 SET OIL LIFE (h),** , you can set the number of life hours on running, exceeded which, it's recommended the oil change; when this time is exceeded, an ALLARM status is activated (with the FAULT light flashing) and the variable **6.27 REGULATOR ALARM** shows the corresponding code **105.**
The alarm is removed only resetting manually the hours through the **par. 13.12.16 RESET OIL LIFE**.
The life hours under running conditions are displayed in the variable **6.36 OIL LIFE HOURS.**

Example for using the PID regulator to check a compressor

Installation features::

- **Compressor motor** : three-phase, asynchronous, standard;
- **Pressure probe** : 12 bar F.S., outlet 4-20mA, power supply 10Vdc...50Vdc;
- **Pressure settings from 0 bar to 10 bar** : through potentiometer;
- **Checks on the min./max. oil temperature and life hours**: enabled (default +85°C/ -10°C/1000 h);
- **Oil thermostat cooling**: through the O1 relay outlet of the inverter;
- **Oil thermostat heating**: through the O3 relay outlet of the inverter;
- **Oil temperature probe** : NTC 4.7 Kohm at 25°C;

Basic electrical diagram



Starting installation

Attention! ➡ ***The parameters of the menu 13. PID REGULATOR not mentioned in this installation must be set according to the default setting.***

- Start-up the inverter and the motor by see the chap. 7 QUICK INSTALLATION UNDER SCALAR CHECK.
- Disabled the inverter RUNNING and set the following parameters:
- **3.1 SPEED SOURCE = REGULAT** (it enables the motor check through the PID regulator).
- **9.1 O1 FUNCTION = OIL OVERTEM** (it enables O1 outlet as oil overtemperature intervention in the compressor).
- **9.5 O3 FUNCTION = OIL UNDERTEM** (it enables O3 outlet as oil undertemperature intervention in the compressor).
- **13.1 ENABLE FUNCTION = COMPRESSOR** (it enables the compressors function of the PID regulator).
- **13.2 SET SOURCE = AI1** (it enables the AI1 inlet as SET of the pressure through the potentiometer).
- **13.3 MAX REG SET = 10.0** (it defines the maximum adjustment range of the potentiometer of the pressure at 10.0bar).
- **13.4 MAX REG FEEDBACK = 12.0** (with AI2 at scale bottom (20 mA), it's displayed the pressure of 12.0 bar in **FDB**).
- **13.12.5 OIL TEMP FUNC. = ENABLE** (it enables the checks on the oil temperature in the compressor).
- **7.5 DEFAULT DIS5 = 32** (It allows seeing the var. 6.32 at the 5th position of the list of the MONITOR VARIABLES without accessing the menu 6. DISPLAY VARIABLE; therefore, you can check the pressure setting (SET) and the real value (FDB) directly by the PRESSURE PROBE.
- Adjust the PRESSURE SET potentiometer in order to set the desired pressure in **SET** .
- Enable the RUNNING and pay attention to the real pressure in **FDB** that will be equal to **SET** after the initial ramp; the check must be quick and stable. On the contrary, you should set the KP and KI parameters of the regulator as follows: set the **par. 13.6 KI REG= 0** (integral gain disabled); set the proportional gain with the **par. 13.5 KP REG** in order that the check is stable; now, with KI on zero, maybe the real pressure **FDB** will not be precisely the same set in **SET**, to reach the maximum accuracy, set in the **par. 13.6 KI REG** a value that doesn't cause oscillation while checking.
- As already described in the PID regulator functions, check that, if the pressure increase decreases the motor speed under the set of the **par. 13.12.2 STOP ON SPEED,** after the time of the **par. 13.12.3 STOP SPE. DELAY,** the inverter running is automatically removed and that the running and the regulator automatically restore according to the hysteresis of the **par. 13.12.4 SET TRG START.**

NOTE The PID regulator outlet is always subject to the ramps on the speed set of the par. 1.6 and 1.7.

Function for checking the pressure with water pumps under hysteresis ON/OFF check

t's a variation of the check function of the compressors previously explained and usually used to check the water pressure with the pumps that have the **cavitation effect problem; in this case, if you use the P/I regulator, there could arise the pump speed self-maintaining phenomenon even if you don't take water (pump outlet completely closed). To enable the hysteresis function, you must set** the par. 13.8 REGULATOR ON/OFF=YES and the par. 8.1 RUN+STOP SPEED I1=YES.
It works as follows:
When the SET exceeds the FDB of the value set in the par. 13.12.4 - %SET TRG START, the inverter running enables and the motor goes up with the acceleration ramp set in par. 1.6 ACCEL. TIME up to the maximum values set in the par. 1.8 MAX MOTOR SPEED; when the pressure in FDB returns to exceed the SET of the value set in the par. 13.12.1 +%SET TRG STOP, the motor reduces its speed to zero rpm with the deceleration ramp set in the 1.7 DECEL. TIME, with automatic running snap-in.
When the SET exceeds the FDB of the value set in the par. 13.12.4 - %SET TRG START, the inverter running restarts and the cycle is repeated.

Description of parameters on menu 100

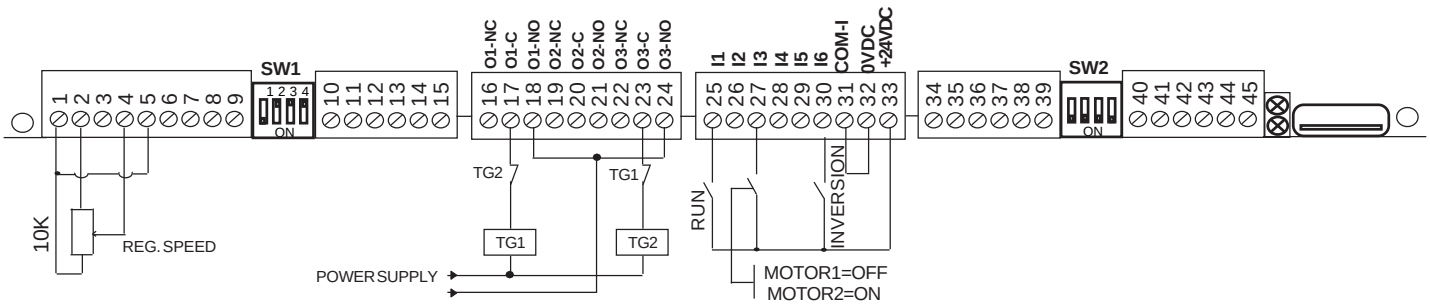
Attention ! → **In menu 100. there are critical parameters that concern the basic functions of the inverter such as the copy and transfer of parameters, the management of the EEPROM key and the keypad lock, for this reason they must be set with the utmost attention.**
To enter into the programming of the 100 parameters, the display must be in the initial display stage of the MONITOR VARIABLES. Pressing the ESCAPE key for 5 seconds makes it possible to enter and program the first parameter:

MENU > 100.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.1	EN MOTOR SWITCH	-	*0=NO *1=YES		NO	-	1117	R/W

Setting to YES, enables the function "***SETUP 1/2***" assignable to the digital inputs of menu 8. INPUTS SETTING.
The input enabled to this function in the state of:
- OFF loads all the parameters of the SETUP1 memory area to the WORK area
- ON loads all the parameters of the SETUP2 memory area to the WORK area.

As in the example that follows, the function is useful in the case where alternatively 2 motors of different sizes with the same inverter are used selecting them through a digital input.
Note: Selection must be done in RUN OFF mode only. If the inverter is supplied in RUN ON, the DEFAULT memory area is loaded.

Example of using the same inverter with 2 motors of different sizes
The example makes reference to the basic configuration in ch.7 QUICK INSTALLATION IN SCALAR CONTROL with the addition of the following settings to be executed in sequence:
1) Assign to input I3 the selection of the 2 motors, setting the par.8.7 I3 FUNCTION = SETUP 1/2
2) Assign to the output O1 the control of the contactor of MOTOR1 (TG1), with par.9.1 O1FUNCTION = EN MOTOR1
3) Assign to the output O3 the control of the contactor of MOTOR2 (TG2), with par.9.5 O3FUNCTION = EN MOTOR2
4) Set the parameters for MOTOR 1 and then save them in the SETUP1 memory area (see parameters 100.4 and 100.5).
5) Set the parameters for MOTOR 2 and then save them in the SETUP2 memory area (see parameters 100.4 and 100.5).
6) Enable the function by setting par.100.1 EN MOTOR SWITCH =YES.
7) When supplying the inverter, wait for 5 sec. at least before enabling the RUN I1 input ; in that way you will allow the download of the choosen memory area.
8) When the inverter is supplied, **for changing the motor size**, unable the RUN, do the selection and re-enable the RUN after 1 sec.



MENU > 100.		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.2	RESTORE SETUP	-	*0=SETUP1 *1=SETUP2 *2=DEFAULT		DEFAULT	-	1136	R/W

Selects the memory area of the parameters to restore in the WORK MEMORY, through the manual control of par.100.3 ENABLE RESTORE. The eeprom memory of the inverter and of the eeprom key, is divided into the following 4 zones each one containing the copy of all the parameters of the inverter:
WORK MEMORY: all the parameters modifiable with the keypad, are saved in this eeprom memory area and presented again at each starting up of the inverter.
MEMORY DEFAULT: contains the copy of all the original plant parameters of the inverter non modifiable by the operator. If no parameter is modified, the WORK MEMORY is equal to the DEFAULT memory.
MEMORY SETUP_1: personalized copy of all the parameters available to the operator (initial = DEFAULT).
MEMORY SETUP_2: personalized copy of all the parameters available to the operator (initial = DEFAULT).

MENU > 100.		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.3	ENABLE RESTORE	-	*0=NO *1=YES		NO	-	1037	R/W

Contains the manual control that restores in the WORK MEMORY all the parameters of the memory area selected in par.100.3 RESTORE SETUP. To enable restore select **YES** and confirm with the P key. The writing **YES** will remain for the entire duration of the restoration at the end of which the selection will automatically return to **NO**.

MENU > 100.		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.4	SAVE SETUP	-	*0=SETUP1 *1=SETUP2		SETUP_1	-	1137	R/W

Selects the type of SETUP memory in which all the parameters of the WORK MEMORY will be copied using the manual control of par.100.5 ENABLE SAVE.

MENU > 100.		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.5	ENABLE SAVE	-	*0=NO *1=YES		NO	-	1038	R/W

Contains the control that copies all the parameters of the WORK MEMORY in the SETUP memory selected in par.100.4 SAVE SETUP. To enable the save select **YES** and confirm with the P key. The word **YES** will remain for the entire duration of the copy and at the end the selection will automatically change to **NO**.

MENU > 100.		UNIT	VALUE RANGE *modbus value		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.6	Copy KEY >> INV	-	0	99	0	-	-	-

Typing **password 37**copies all the memory areas of the parameters contained in the external EEPROM KEY, to the inverter memory. The parameter settings of the inverter will be overwritten and it will not longer be possible to recover them.

MENU > 100.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.7	Copy INV >> KEY	-	0	99	0	-	-	-

Typing **password 71** copies all the memory areas of the parameters contained in the memory of the inverter, to the external EEPROM KEY.
The parameter settings of the EEPROM KEY will be overwritten and it will no longer be possible to recover them.

MENU > 100.		UNIT	VALUE RANGE		DEFAULT SETTINGS	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.8	PARAM BLOCK	-	*0=NO *1=YES		NO	-	1138	R/W

By setting to YES, access to the menu of parameters 1. to 13. is not allowed.

MENU' > 100.		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS SETTING		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.9	V/f TYPE	-	*0=STANDARD *1=IND.VOLT		STANDARD	-	1074	R/W

STANDARD = the inverter works under the standard SCALAR V/F function to check the asynchronous motors speed.
IND. VOLT = at outlet, the inverters supplies a tension with independent adjustment of the frequency and the efficient value.

DESCRIPTION OF THE INVERTER OPERATION WITH THE PAR.100.9 V/f TYPE = IND.VOLT

This type of operation has its main application in checking of the high-slip motors applied to winding/unwinding constant tension systems; in this case, in fact, you act on the supply voltage of the motors to determine the shot on the material, while the separate setting of the frequency is limited to the maximum speed.

START-UP

Set all the parameters of the menu 1. BASIC DATA bearing in mind that:
- The parameters 1.6 RAMP ACCEL.TIME and 1.7 RAMP DECEL.TIME now set the ramps on the tension going to the motor while the frequency, at running, takes immediately the value corresponding to the speed set in the par. 1.8 MAX MOTOR SPEED.
- The par. 1.9 MIN MOTOR SPEED has no function.
- The par. 1.10 FIXED BOOST adjusts the minimum tension on the motor.

Choose the tension adjustment source in the par. 3.1 SPEED SOURCE
The minimum tension adjustment range depends, as already said, on the par. 1.10 FIXED BOOST, while the maximum one depends on the par. 1.8 MAX MOTOR SPEED based on the V/F feature derived from the parameters 1.3 MOTOR NOM FREQUE and 1.4 MOTOR NOM VOLTAG.
The controls “STOP SPEED” and “REV. SPEED” that can be assigned to a digital inlet in the menu 8.INPUTS SETTING, which, in the standard function, acted on the motor speed, now drive the tension on the motor in the same manner.
You can manage the motor with the constant current system by setting the value in the par. 5.1.1 MAX OVERLOAD.

GEN. V/F = the inverter works as voltage generator with V/F acceleration and deceleration ramps; at the end of the V/F ramp, voltage and frequency can be set independently from each other.

DESCRIPTION OF THE PAR.100.9 V/f TYPE = "GEN. V/F" INVERTER FUNCTIONING

1 - "GEN. V/F" open loop function

By parameter 3.1 SPEED SOURCE we define the Set source, if the setting is different from REGULATOR, we have an open loop functioning.
For the description of the functioning, refer to fig.1 showing the V/F curve followed by the generator during the starting phase (acceleration) and during the switching off (deceleration).
The V/F curve is determined by two parameters: par.1.4 MOTOR NOM VOLTAG and par.1.3 MOTOR NOM FREQUE.
The Vnom is the rated voltage value set by parameter 1.4 MOTOR NOM VOLTAG and it is the max voltage possible to come from the generator under GEN. V/F function.
The Fnom is the rated frequency valur set by parameter par.1.3 MOTOR NOM FREQUE and defines the V/F curve gradient.
See the following example (fig.1):

The inverter is supplied at 400Vac, so I foresee to reach 400Vac with the inverter output. The motor used is 230Vac 50Hz 4pole, I need a V/F ramp ending, for the starting, at 230V/50Hz allowing me to adjust the voltage up to maximum 400Vac.
To do this I have to set:

par.1.4 MOTOR NOM VOLTAGE = 400V
par.1.5 MOTOR POLES = 4 poles
par.1.3 MOTOR NOM FREQUE = 87.0Hz (this value is obtained by this proportion: at 230Vac I need 50Hz, so par.1.3 will be 50Hz x 400V/230V)
par.1.8 MAX MOTOR SPEED = 2610rpm; this value is obtained with this formula (1):

$$rpm = \frac{(f_x) \cdot 120}{(n^\circ poli)} \quad (1)$$

in this case: 87x120/4 = 2610rpm

In this way we get the correct V/F ramp and, by setting 1500rpm (50Hz, 230V), we will get an acceleration ramp from 0 to 230V/ 50Hz; the curve and the possible working points are shown by picture 1 (fig.1).

If the SET is at 1500rpm (see var.6.1 SPEED REFERENCE), when we enable RUN, the voltage and the frequency raise in ramp by following the curve of the picture; ramps can be set by par.1.6 RAMP ACCEL. TIME and 1.7 RAMP DECEL. TIME.
When the generated value (see variables MOTOR FREQUENCY, MOTOR SPEED or MOTOR VOLTAGE) has reached the value adjusted by SET, the ramp is finished and we can adjust the voltage by SET from 0V to 400V and the frequency by par. 3.2.1 always using formula(1):

$$par.3.2.1 = \frac{(f_x) \cdot 120}{(n°poli)}$$

The end of the ramp can be adjusted by parameters 3.8 THERESHOLD1 DELAY and 3.9 DPEED HYSTERESIS; the are useful to guarantee a safe end of the ramp.

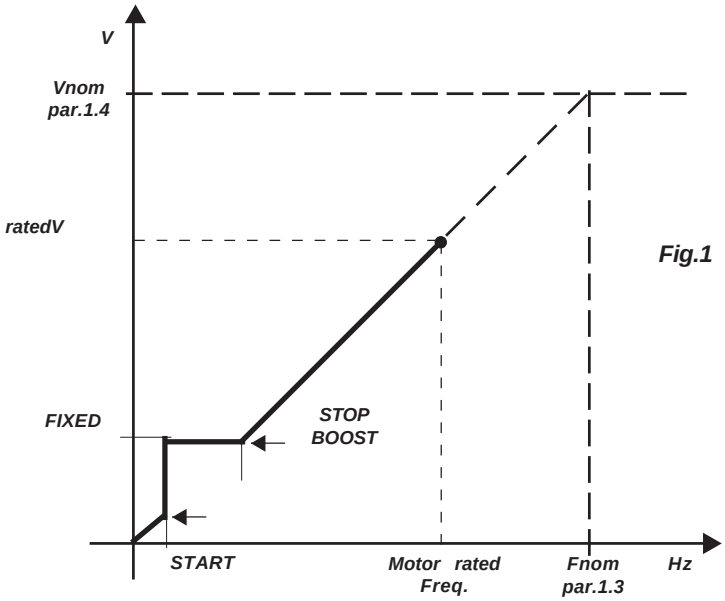


Fig.1

2 - "GEN. V/F" closed loop function

Set as follows to work with feedback:
- par.3.1 SPEED SOURCE = REGULATOR
- par.13.1 ENABLE FUNCTION = STANDARD
- par.13.2 SET SOURCE to choose the SET source.

Note: the feedback signal must be connected to input AI2 only.
Now acceleration and deceleration ramp for the SET are the ones from par.13.10 SET ACC TIME and 13.11 SET DEC TIME. As already described in the previous paragraph applies for the closed loop functioning too.
In this function, the acceleration/deceleration ramp happen automatically at open loop, we adjust the set and we enable the run: voltage and frequency will follow the V/F curve until reaching the SET value (the end of the ramp is always adjustable by par.3.8 and 3.9).

At the end of the ramp, the closed loop will start working automatically.
This sequence, in addition to avoiding the regulator to having to chase the ramp of the set, It allows you to have startings not affected by problems related to voltage feedback cards that, at low frequencies, are not able to provide correct values. Consider as an example the one described previously, but now with closed loop adjustment. See fig.2.
When enabling RUN, we have an open loop, voltage and frequency will follow the V/F curve- independently by the feedback value - until reaching the end of ramp (in the example: 230V/ 50Hz).
At this point, adjusted by par.3.8 and 3.9, there is the recognition of the end of the ramp and the passage in the automatic closed-loop adjustment.

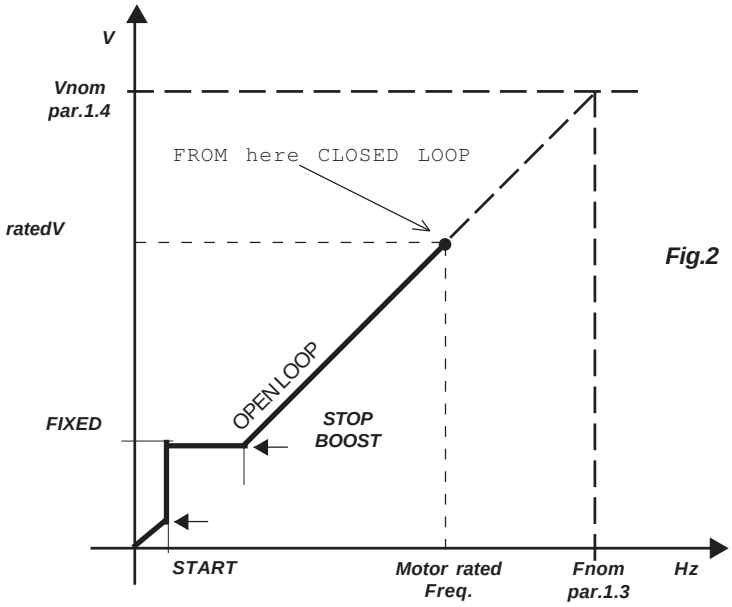


Fig.2

The regulator, if necessary, will adjust the output voltage basing on the feedback signal. Now you can vary the voltage and the frequency set at will, the frequency by par.3.2.1 and the voltage by the regulator SET.
Variable 6.32 SET FDB gives the SET and the feedback signal values.
For settings related to the controller, please refer to the description of the parameters related to the menu 13 PID REGULATOR.

3 - Stop in ramp management in "GEN. V/F" function

Valid for both open and closed loop.
When we impose a stop in the ramp, if we are in an operating point above the V/F curve, first it will take place a single voltage ramp until reaching the V/F curve and then voltage and frequency will drop in accordance with the curve.
If we are in an operating point under the V/F curve, first it will take place a single frequency ramp until reaching the V/F curve and then voltage and frequency will drop in accordance with the curve.

If we interrupt the stop ramp there are two possibilities:

1 - if the interruption occurs when the drop of voltage or frequency has not yet reached the V/F curve, then the voltage or frequency will start again to rise until it reaches the present operating point at the time at which it was enabled in the stop ramp;

2 - if the interruption occurs when the drop of voltage or frequency has already reached the V/F curve (so both V and F drop according to the curve) then the voltage and frequency will start again to rise according to the V/F curve as if it were a normal starting (so with end of ramp defined by SET and by par. 3.8 and 3.9).

MENU' > 100.		UNIT	VALUE RANGE		DEFAULT SETTING	MODBUS ADDRESS		
N°	PARAMETER NAME		MIN	MAX		MSW	LSW	R=READ W=WRITE
100.10	POWER LOSS CONTROL	-	*0=NO *1=YES		NO	-	1230	R/W

NO = standard management of network holes and lack of power (take off or give back run depending on the BUS DC voltage), active power failure detection (FAULT 2).
YES = in case of network holes or lack of power, the inverter manages the motor stopping automatically.

DESCRIPTION OF THE POWER LOSS CONTROL functioning (par.100.10 = YES)

This function allows to ensure a stop of the motor ramp in the event of a power failure, a network hole or in case of lack of a network phase.
The function is activated when - in the event of mains failure or a power failure - the voltage of the internal BUS DC falls below a predetermined threshold or - in case of lack of phase - the voltage ripple of the internal BUS DC gets over a predetermined threshold.
When the function is activated, the inverter removes quickly the run for a settable time (1s fixed plus as set in par.2.3.2 DEMAGN.) then it restores the run recovering the engine and bringing it in ramp at zero rpm.
122/5000
In the case of lack of a phase, the function is activated when the inverter is loaded at least 40% of its rated current.
At the end of the motor shutdown, to re-start it is necessary to leave out re-run through the I1 input.
It is necessary that the flying cut-off function is enabled (par.**2.3.1 ENABLE FLYING VF = YES**).
ATTENTION! Once the stop in ramp function is active for POWER LOSS CONTROL it is necessary to separate the inverter from the network until the motor deceleration ramp is finished; for this, we suggest to set up one relay of the inverter with the "POW LOSS CNT" function, for example O1 by par.9.1 O1 FUNCTION = POW LOSS CNT; this relay will be activated when the inverter detects one of the above network anomalies and allows the installer to provide for the necessary commands to open - in a manner not autoresettable - the contactor that brings the power to the inverter.
ATTENTION! in case of POWER LOSS CONTROL, **the deceleration** is formed by two successive ramps, the first is set in the parameter 4.10 FIRST RAMP and it lasts the time set in par.4.9 TIME FIRST RAMP, the second one is the default deceleration ramp (par.1.7 or other depending on the selection). This allows you to have a deceleration ramp with two slopes, one useful in the initial phase of the recovery of the fly and one useful for the next stage.
Note: if 4.9=0,00s the first ramp is de-activated.

Ex.for a machine with high inertia that uses a 200kW motor we set up 4.10=240.00s, 4.9=10.00s and 1.7=120.00s.

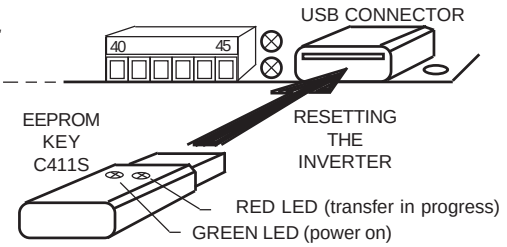
Note: param 2.3.2 DEMAGNETIZE TIME default value is 1.00s; for motors bigger than 75kW 123/5000 it is necessary to increase this time otherwise you may face some current peaks at the motor flying cut-off; for example: for a 200kW motor, we suggest to set-up 5.00s, moreover the motor recovery softens if we increase the parameter 2.3.3 VOLT RAMP START too (default 0.50s, we suggest 2.5s for big motor size).

OPERATIONS WITH THE EEPROM KEY cod. C411S

The following operations are possible, **but only with run disabled** (I1 OFF):

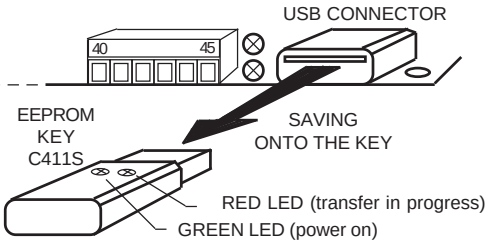
Resetting the memory of the EEPROM KEY, into the memory of the inverter.
Procedure:

Insert the key into the USB connector; the lighting up of the **green led** indicates that the key is being fed correctly. Enter in parameters 100. by pressing the ESCAPE key for 5 s; to begin saving enter in ***par.100.6 Copy KEY >> INV,*** set the number **37** and confirm with the P.E key.
The lighting up of the **red led** on the key indicates that the transfer is taking place; at the end of the resetting the red led turns off and the selection in ***par.100.6*** turns to **0**.



Saving the memory of the inverter, into the memory of the EEPROM KEY.
Procedure:

Insert the key into the USB connector; the lighting up of the **green led** indicates that the key is being fed correctly. Enter in parameters 100. by pressing the ESCAPE key for 5 s; to begin saving enter in ***par.100.7***
Copy INV >> KEY, set the number **71** and confirm with the P.E key.
The lighting up of the **red led** on the key indicates that the transfer is taking place; at the end of the save the red led turns off and the selection in ***par.100.7*** turns to **0**.



Attention! → **Currently commercial USB keys, used as external memories for PC, cannot be used to transfer parameters. Likewise, the ROWAN EL.'S EEPROM KEY cannot work as memory for PCs.**

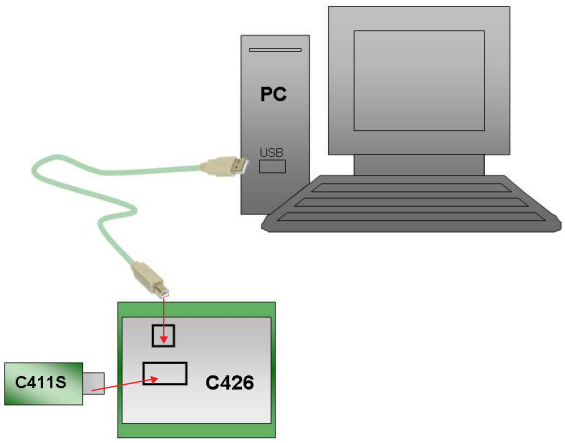
Software and accessories for the managing of parameters through PC

Software for eeprom key managing

On request, Rowan Elettronica provides the "**Rowan Key Manager**"; this software allows, through your PC, to elaborate the inverter parameters in eeprom key **cod. C411S**.

Through "**Rowan Key Manager**" it is allowed to:
> read all parameters contained in EEPROM key, in separated areas and save all datas in a file;
> export all parameters in Excel format;
> save the elaborated data in the EEPROM key;
> read the total picture of the EEPROM key and save that in a file;
> import a total picture file on the key.

For all operations with C411S key an USB cable and an interface board C426 are needed. Rowan Elettronica supplies, on request, the **KIT.426R.A**, that kit contains:
- installation cd with 2 versions of "**Rowan Key Manager**":
  > "**Rowan Key Manager**" for 350S inverter;
  > "**Rowan Key Manager**" for 400S inverter;
- USB cable A-B-M-M type;
- EEPROM key **C411S**;
- interface board **C426**.



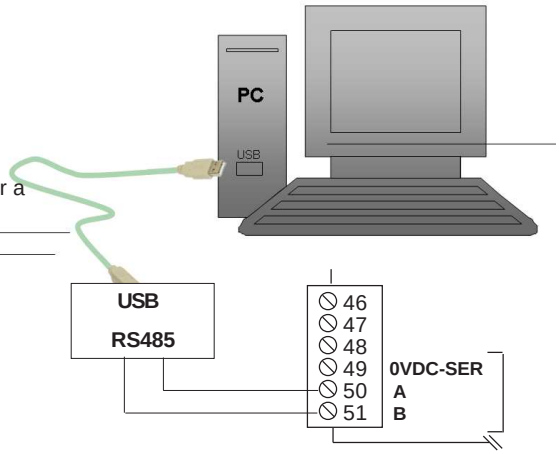
● *Software for editing the inverter parameters through PC: ROWAN DATA EDITOR*

Upon request, Rowan Elettronica can supply the "**Rowan Data Editor**", a software for Windows able to manage, through PC and RS 485 serial connection the inverter parameters.

Through "**Rowan Data Editor**" it is possible to:
> read/modify all parameters contained in the inverter and save them on a file.
> export the parameters in PDF or CSV format.
> export the parameters modified from the default setting and save them in PDF or CSV format.
> by the function "TEST MODE" it is possible to command the inverter function for a test with a running motor, checking the variables under "oscilloscope" function.

As shown besides, to connect the PC to the inverter, it is necessary to use a converter (better if insulated) beetween USB and RS485.

With this aim, Rowan Elettronica can supply, on request, the kit **KIT.ROWAN.DATAEDITOR** containing:
- the installation cd for the "**Rowan DataEditor**" software:
- the connection cable to PC and the USB/RS485 interface.



Description of the FAULT state

The inverter faults are visibly shown by the **fixed** lighting up of the FAULT pilot light on the keypad and the turning off of the RUN pilot light. The digital output to which the inverter run state has been assigned (O3 by default) is deactivated even if is the external run control with I1 digital output is present.
The digital output to which the inverter lock state (O2 by default) has been assigned is deactivated.
All the inverter functions are brought back to the state of run off.
With the default settings, to know the cause of the lock it is enough to select with the arrow key the monitor variable ***LAST FAULT***; in this variable the **number of the fault** associated with the cause of the lock described in the following table **FAULT LIST** can be seen.
If the inverter shutsdown after the fault, the ***LAST FAULT*** variable is zeroed; in this case to know the cause of the lock it is necessary to enter into the menu ***11.4 FAULT HISTORY*** and select the ***11.4.1 FAULT 1*** variable, where the number of the most recent fault is displayed up until the ***11.4.5 FAULT 5*** variable, where the least recent fault number is displayed.
Normally when the inverter locks, with the turning on of the FAULT pilot light on the keypad, it is necessary to unfeed the inverter to reset the lock. There are 2 possibilities to unlock the inverter after a fault without removing the power supply:
1) By setting ***par.8.2 RUN+RST FAULT I1= YES***; in this case the unlocking and the zeroing of the fault occurs by deactivating and reactivating the run with digital input I1.
2) Through the activation of the **RES. FAULT** control assignable to any digital input in menu ***8.1 INPUTS SETTING.***
The fault reset through digital input is not allowed in the case of the following faults:
N°1 MAX PEAK CURRENT, N°4 SHORT IGBT MODUL, N°5 BUS DC OVERVOLTAGE, N°13 SHORT IGBT BRAKE and N°22 INVERTER OVERLOAD, in these cases it is necessary to shutdown the inverter and turn it back on to zero the fault.

N° FAULT	ELENCO FAULT
1	**MAX PEAK CURRENT**
	The maximum board cut-out output current at U V W has been reached. The cut-out current is indicated in the "Summary table of electrical power characteristics of inverter 350 series".
	POSSIBLE CAUSES **- Acceleration/deceleration ramps too short.** **- Motor jammed.**
	POSSIBLE REMEDIES **- Lengthen the acceleration/deceleration ramps on set speed.** **- Check the load on the motor and mechancial transmission.** **- Enable the rapid current limitation**
2	**PHASE LOSS CONTROL**
	Phase failure detection. The detection is certain when 50% of the rated current delivered is exceeded. **Inactive if par.100.10 POWER LOSS CONTROL=YES.**
	POSSIBLE CAUSES **- Lack of a power supply phase (L1, L2, L3).**
	POSSIBLE REMEDIES **- Check the presence of all three power supply phasesL1, L2 e L3.**
4	**SHORT IGBT MODUL**
	There is a phase to phase or phase to ground short-circuit at the U V W output or strong or rapid overload on U V W output terminals. **ATTENTION: Fault 4 detects a dangerous anomaly for the inverter. If a Fault 4 occurs, before restarting, analyze the possible causes and possible solutions described below. Ignoring the meaning of Fault 4 and continuing to insistently restart despite the continuous occurrence of Fault 4 can lead to damage to the IGBT modules inside the inverter.**
	POSSIBLE CAUSES **- Motor connections shorted - Motor winding insulation damaged - Damaged part of inverter power - strong or rapid overload.**
	POSSIBLE REMEDIES **Power off the inverter and unhook the power wires at terminals U V W and then restore power:** **- if the fault continues there is a problem in the inverter power drive that has to be repaired.** **- if the fault disappears, first check the board to motor connections and then both the interwinding and ground insulation on the stator winding as well as the correctness of the parameter settings relating to the inverter-motor combination.**
5	**BUSDC OVERVOLTAGE**
	The BUSDC voltage at terminals F+ and - is over the maximum istantaneous value.
	POSSIBLE CAUSES **- Deceleration ramp is too short - Brake resistance is insufficient, connection is down or broken.**
	POSSIBLE REMEDIES **- Lengthen the deceleration ramp.** **- Check the brake resistance and its connections are in perfect repair.** **- Reduce the resistive value of the resistance according to the minimums indicated in the "Summary table of electrical power characteristics of inverter 350 series".**

N° FAULT	ELENCO FAULT
13	**SHORT IGBT BRAKE**
	There is a short-circuit in the brake resistance connection at terminals F and F+ or resistance value too low.
	POSSIBLE CAUSES - Resistance connections shorted - Brake resistance shorted - Internal inverter brake module shorted - excessively low ohmic resistance value.
	POSSIBLE REMEDIES Find the origin of the short-circuit as follows. Power off the inverter and unhook the brake resistance terminals F and F+ and then restore power: - if the fault continues there is a problem in the internal inverter module that has to be repaired. - if the fault disappears, first check the board to resistance connections and then the brake resistance.
14	**OVERTEMPERATURE**
	The inverter heatsink is over 80°C.
	POSSIBLE CAUSES - Environment temperature over 50°C - Inverter fans (if mounted on model) are not operating efficiently or obstructed.
	POSSIBLE REMEDIES - Check the environment temperature of the inverter housing, if it is over 50°C the cooling system for the cabinet has to be uprated so the temperature drops within the working range. - Check that the inverter fans operate efficiently (if mounted on model) and that the air flow is not obstructed. Naturally the inverter has to have been correctly mounted with the hot air being exhausted upwards.
15	**MAX NUMBER OF SHORT CIRCUIT**
	Five consecutive fault 4 have occurred (output short circuit). It is possible to reset the Fault 15 only through the par. 11.5 and switching off and power on the inverter.
	POSSIBLE CAUSES - refer to Fault 4.
	POSSIBLE REMEDIES - refer to Fault 4.
18,19	**BRAKING OVERLOAD**
	Detect a braking resistence overloading on F,F+ terminals.
	18=nominal overload braking, 19=5sec overload braking.
	POSSIBLE CAUSES Deceleration ramps too short and frequent - Motor brake torque too high (e.g. unwinders).
	POSSIBLE REMEDIES - Increase the deceleration ramp time. - Limit the motor brake torque. - Increase the brake resistance power.
20,21,22	**INVERTER OVERLOAD**
	Detect an inverter overload on output terminals U V W.
	20=inverter overload IxI 3sec, 21=inverter overload IxI 30sec, 22=inverter overload IxI 300sec.
	POSSIBLE CAUSES - Frequent start-stopping with short ramps. - the motor is not compatible with the inverter ID plate data.
	POSSIBLE REMEDIES - Limit the starts and stops and lengthen the acc/dec ramps. - Adapt the motor power and inverter size.
33	**MOTOR PTC OVER TEMPERATURE**
	Motor PTC which is connected to terminal 38-39 signal terminals has detected overheating.
	POSSIBLE CAUSES - The motor is in overload - Motor ventilator is off - PTC is interrupted.
	POSSIBLE REMEDIES - Check the connection - Check the actual motor load - Check cooling functioning / efficiency. To by-pass the PTC put par..2.6 PTC ENABLE= DISABLE.
80,81,82 83,84,85,86	**EEPROM KEY INCOMPATIBILITY**
	Show incompatibility problems of the C411S eeprom key with the inverter at the moment of the command by par.100.6 Copy KEY>>INV =37 and forbid the parameters transferring into the inverter.
	80=Product Code, Firmware Version, Hardware Version; 81=Product Code, Firmware Version 82=Product Code, Hardware Version; 83=Product Code; 84=Firmware Version, Hardware Version; 85=Firmware Version; 86=Hardware Version.
	POSSIBLE CAUSES - See description by numerical code.
	POSSIBLE REMEDIES - Contact the Rowan Elettronica technical dept..

N° FAULT	ELENCO FAULT
100	**MIN FDB**
	In the PID REGULATOR function, the feedback is fallen down the limit set in the par. 13.13.4 MIN FDB ALARM. This fault is enabled if setting par.13.13.1 ENABLE MIN FDB = FAULT.
	POSSIBLE CAUSES: - Feedback signal interrupted. - Feedback signal setting parameters not correct.
	POSSIBLE REMEDIES: - Check the feedback connection. - Check the setting parameter in menù 13.13 FEEDBACK ALARM.
101	**MAX FDB**
	In the PID REGULATOR function, the feedback is increase above the limit set in the par. 13.13.5 MAX FDB ALARM. This fault is enabled if setting par.13.13.2 ENABLE MAX FDB = FAULT.
	POSSIBLE CAUSES: - Feedback signal interrupted. - Feedback signal setting parameters not correct.
	POSSIBLE REMEDIES: - Check the feedback connection. - Check the setting parameter in menù 13.13 FEEDBACK ALARM.

Description of the ALARM state

When the FAULT pilot light on the keypad **flashes** on and off this means that the inverter wants to communate an alarm message that does not necessarily entail the immediate lock of the run; infact the RUN pilot light remains on and the inverter functions continue to work normally.
The reason for the alarm message is found in variable ***6.27 ALARM.*** and described in the following table:

N° ALARM	ALARM LIST
100	**MIN FDB**
	In the PID REGULATOR function, the feedback is fallen down the limit set in the par. 13.13.4 MIN FDB ALARM.
101	**MAX FDB**
	In the PID REGULATOR function, the feedback is increase above the limit set in the par. 13.13.5 MAX FDB ALARM.
102	**CAP LIFE**
	The BUSDC capacity is at its maximum working hours recommended for safe operation. The inverter requires servicing by Rowan Elettronica.
103	**MAX OIL TEMPERATURE**
	In the PID REGULATOR function, the oil temperature reached or exceeded the limit value set in the par. 13.12.7 MAX TEMPERATURE.
104	**MIN OIL TEMPERATURE**
	In the PID REGULATOR function, the oil temperature reached or is fallen below the limit value set in the par. 13.12.11 OIL UNDER TEMP.
105	**OIL LIFE**
	In the PID REGULATOR function, the compressor oil exeeceded the maximum life hours number set in the par. 13.12.15 SET OIL LIFE (h).
106	**IGBT DRIVE UNPOWERED**
	Power failure detection in the Driver section, with opening of the connection between the STO1 terminals and STO2. It is present only in inverters with "STO" function. Refer to: "Safety Manual for C350, C400 and C700 Inverters".

Inverter order codes

Code : **C350 S / 1 . A . E . N . NN . N**

S = standard
M = single-phase output

RELEASE HARDWARE (identifyable in the inverter through variable 6.30 HARDWARE VERSION

"STO" SAFETY FUNCTION
N = NO FUNCTION
S = WITH FUNCTION

CUSTOMIZED VERSION
NN = NO CUSTOMIZATION

BRAKING MODULE
N = WITHOUT
F = WITH

DRIVER POWER SIZE
R - 0 - 0M - 1 - L - 2 - 2,5- 3 - 3,5 - 5 - 6 - 6,5 - 7 - 8 - 8,5 - 9 - A - B - C - D - E - F - G

POWER SUPPLY VOLTAGE (50/60Hz)

Power supply voltages for inverters from /P to /3.5	*Power supply voltages for inverters from /5 to /E*
D = 220/240VAC	**D** = 220/240VAC
P = 380/460 VAC	**E** = 380/400/415 VAC
M = 220/240 VAC SINGLE-PHASE	**O** = 440/460 VAC
N = 500 VAC	**W** = 690 VAC (only from /5 to /G)

Rowan Elettronica

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