# Chapter 10 - Parameter Description

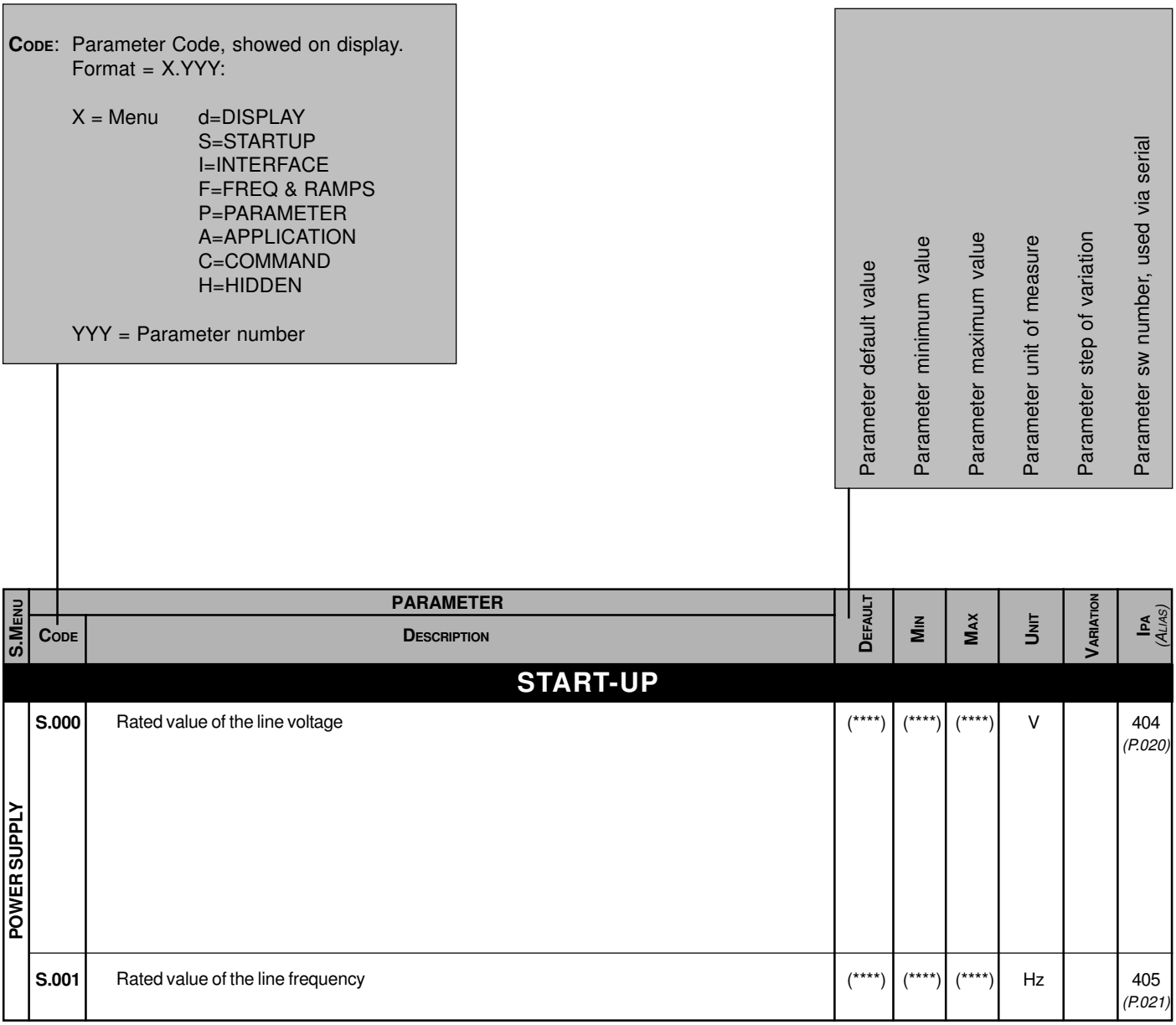
## *10.1 Parameters List*

Legend of drive menu contents.

| | |
|---|---|
| **Menu d - DISPLAY** | Menu of read-only parameters (display) |
| **Menu S - STARTUP** | Menu for basic drive start up |
| **Menu I - INTERFACE** | Menu of input/output settings (digital/analog) |
| **Menu F - FREQ & RAMP** | Menu of multi frequencies and ramps settings |
| **Menu P - PARAMETER** | Menu for drive regulation and optimization |
| **Menu A - APPLICATION** | Menu for PID function settings |
| **Menu C - COMMAND** | Menu of control-type parameters (Save, Load default, etc.) |
| **Menu H - HIDDEN** | Menu not available on the keypad. It is reserved to set the drive parameters through Serial line and/or through Field bus cards. |

***NOTE!*** In this chapter are described the functions of each drive parameter.

*Figure 10.1: Parameters Description Legend*




***NOTE!*** *(ALIAS):* On STARTUP menu only. Parameter code of same parameter on other menu .

*(*):* Parameter value dependent of the drive size.

*(**):* Parameter value dependent of the drive nominal main voltage and main frequency.

*(***):* Value dependent of the setting of another parameter.

*(****):* Value dependent of the drive type: 230 ... 480V voltage line input.

| | PARAMETER | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | |
| **DISPLAY** | | | | | | | | |
| Basic | **d.000** | Drive output frequency | | | | Hz | 0.01 | 001 |
| | **d.001** | Drive frequency reference | | | | Hz | 0.01 | 002 |
| | **d.002** | Drive output current (rms) | | | | A | 0.1 | 003 |
| | **d.003** | Drive output voltage (rms) | | | | V | 1 | 004 |
| | **d.004** | DC Bus drive voltage (DC) | | | | V | 1 | 005 |
| | **d.005** | Power factor | | | | | 0.01 | 006 |
| | **d.006** | Power | | | | kW | 0.01 | 007 |
| | **d.007** | Drive output speed (d.000)*(S.800) | | | | | 0.01/1 | 008 |
| | **d.008** | Drive speed reference (d.001)*(S.800) | | | | | 0.01/1 | 009 |
| Overload | **d.009** | Estimated speed user unit | | | | | 1 | 062 |
| | **d.050** | Drive heatsink temperature (linear sensor measured) | | | | °C | 0.1 | 010 |
| | **d.051** | Drive overload (100% = alarm threshold) | | | | % | 0.1 | 011 |
| | **d.052** | Motor overload (100% = alarm threshold) | | | | % | 0.1 | 012 |
| | **d.053** | Braking resistor overload (100%=alarm thr) | | | | % | 1 | 013 |
| Input/Output | **d.054** | Regulation card temperature | | | | °C | | 058 |
| | **d.100** | Digital inputs acquired by the drive (terminal or virtual) | | | | | | 014 |
| | **d.101** | Digital inputs terminal of the drive regulation board | | | | | | 015 |
| | **d.102** | Virtual digital inputs received by drive serial link or field bus card | | | | | | 016 |
| | **d.120** | Expansion digital inputs acquired by the drive (terminal or virtual) | | | | | | 017 |
| | **d.121** | Expansion digital inputs terminal of the drive expansion board | | | | | | 018 |
| | **d.122** | Expansion virtual digital inputs received by drive serial link or field bus card | | | | | | 019 |
| | **d.150** | Digital outputs executed by the drive (terminal or virtual) | | | | | | 020 |
| | **d.151** | Digital outputs terminal of the drive regulation board | | | | | | 021 |
| | **d.152** | Virtual digital outputs executed by drive serial link or field bus card | | | | | | 022 |
| | **d.170** | Expansion digital outputs executed by the drive (terminal or virtual) | | | | | | 023 |

| | PARAMETER | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | |
| Input/Output | **d.171** | Expansion digital outputs terminal of the drive expansion board | | | | | | 024 |
| | **d.172** | Expansion virtual digital outputs executed by drive serial link or field bus card | | | | | | 025 |
| | **d.200** | Analog input 1 destination; it shows where the signal is programmed | | | | | | 026 |
| | **d.201** | Analog input 1 output block % value | | | | | | 027 |
| | **d.202** | Analog input 1 input block % value | | | | | | 028 |
| | **d.210** | Analog input 2 destination; it shows where the signal is programmed | | | | | | 029 |
| | **d.211** | Analog input 2 output block % value | | | | | | 030 |
| | **d.212** | Analog input 2 input block % value | | | | | | 031 |
| | **d.220** | Analog input 3 destination; it shows where the signal is programmed | | | | | | 032 |
| | **d.221** | Analog input 3 output block % value | | | | | | 033 |
| | **d.222** | Analog input 3 input block % value | | | | | | 034 |
| | **d.250** | Terminal analog output 1 state monitor | | | | | | 063 |
| | **d.260** | Terminal analog output 2 state monitor | | | | | | 064 |
| | **d.270** | Terminal exp analog output 1 state monitor | | | | | | 065 |
| Encoder | **d.300** | Reading of pulses sampling of encoder pulses(I.504) | | | | | 1/100 | 035 |
| | **d.301** | Encoder frequency (Motor frequency) | | | | Hz | 0.01 | 036 |
| | **d.302** | Encoder speed (d.000)*(P.600) | | | | | 0.01/1 | 037 |
| OPTION | **d.350** | Drive option 1 state (expansion board type programmed) | | | | | | 038 |
| | **d.351** | Drive option 2 state (expansion board type programmed) | | | | | | 039 |
| | **d.352** | It monitors the 16-bit parallel port state (option) | | | | | | 040 |
| | **d.353** | Communication state between SBI and Master | | | | | | 059 |
| | **d.354** | Communication speed between SBI and Master | | | | | | 060 |
| | | | | | | | | |

OPTION

| | PARAMETER | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | |
| | | | | | | | | |
| PID | **d.400** | PID reference signal | | | | % | 0.1 | 041 |
| | **d.401** | PID feedback signal | | | | % | 0.1 | 042 |
| | **d.402** | PID error signal | | | | % | 0.1 | 043 |
| | **d.403** | PID integral component | | | | % | 0.1 | 044 |
| Alarm List | **d.404** | PID output signal | | | | % | 0.1 | 045 |
| | **d.800** | Last alarm stored by the drive alarm list | | | | | | 046 |
| | **d.801** | Second to last alarm | | | | | | 047 |
| | **d.802** | Third to last alarm | | | | | | 048 |
| | **d.803** | Fourth to last alarm | | | | | | 049 |
| Drive Identification | **d.950** | Drive rated current (it depends on the drive size) | | | | | 0.1 | 050 |
| | **d.951** | Software type | | | | | 0.01 | 051 |
| | **d.952** | Software revision | | | | | 0.01 | 052 |
| | **d.953** | identification power code | | | | | | 053 |
| | **d.954** | identification parameter code | | | | | | 054 |
| | **d.955** | identification regulation code | | | | | | 055 |
| | **d.956** | identification start-up code | | | | | | 056 |
| | **d.957** | drive siize | | | | | | 057 |
| | **d.958** | drive configuration code | | | | | | 061 |
| Utility | **d.999** | display test | | | | | | 099 |
| | | | | | | | | |
| | | | | | | | | |

| | PARAMETER | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA (ALIAS) |
|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | |
| | | **START-UP** | | | | | | |
| Power Supply | **S.000** | Rated value of the line voltage | 380V | 380 | 460 | V | | 404 *(P.020)* |
| Power Supply | **S.001** | Rated value of the line frequency | 50 | 50 | 60 | Hz | | 405 *(P.021)* |
| Commands & Referencies | **S.100** | Maximum reference frequency | 50 | 25 | 500 | Hz | 0,1 | 305 (F.020) |
| Commands & Referencies | **S.101** | Minimum reference frequency | 1,7 | 0 | S.100 | Hz | 0,1 | 306 (F.021) |
| Commands & Referencies | **S.110** | Reference speed 1 source | 5 | 0 | 8 | 1 | | 307 (F.050) |
| Commands & Referencies | **S.120** | Motopotentiometer reference user unit | 51 | -99999 | 99999 | rpm | | 343 (F.001) |
| Commands & Referencies | **S.121** | Motopotentiometer minimum speed | 1,7 | 0 | 50 | Hz | 0,1 | 302 (F.011) |
| Commands & Referencies | **S.122** | Motopotentiometer polarity | 0 | 0 | 1 | 1 | | 303 (F.012) |
| Commands & Referencies | **S.123** | Motopotentiometer memory at power on | 1 | 0 | 1 | 1 | 1 | 304 (F.013) |
| Commands & Referencies | **S.130** | Digital refrence frequency 0 | 0 | -S100 | +S.100 | Hz | 0,1 | 311 (F.100) |
| Commands & Referencies | **S.140** | Analogue input type | 1 | 0 | 2 | 1 | 1 | 118 (I.200) |
| Commands & Referencies | **S.200** | acceleration time 1 | 3 | 0,1 | 999,9 | s | 0,1 | 329 (F.201) |
| Commands & Referencies | **S.201** | deceleration time 1 | 3 | 0,1 | 999,9 | s | 0,1 | 330 (F.202 |
| Commands & Referencies | **S.300** | Commands source selector | 1 | 0 | 4 | 1 | 1 | 400 *(P.000)* |
| Commands & Referencies | **S.310** | Command logic start-stop | 0 | 0 | 1 | 1 | 0.1 | 401 *(P.001)* |
| Commands & Referencies | **S.311** | safe start at power on | 0 | 0 | 1 | 1 | 1 | 403 *(P.003)* |
| Commands & Referencies | **S.312** | stop mode | 0 | 0 | 1 | 1 | 1 | 493 *(P.004)* |
| Commands & Referencies | **S.320** | default rotation | 0 | 0 | 1 | 1 | 1 | 502 *(P.005)* |
| Commands & Referencies | **S.800** | speed conversion constant for display(mantissa) | 1 | 0,01 | 99,99 | | 0,01 | 489 *(P.600)* |
| Commands & Referencies | **S.801** | speed conversion constant for display(exponent) | 0 | -4 | 1 | 1 | 1 | 496 *(P.601)* |
| Commands & Referencies | **S.802** | speed unit selection | 3 | 0 | 3 | 1 | 1 | 497 *(P.602)* |
| Commands & Referencies | **S.810** | display at start (IPA code) | 343 | 1 | 1999 | 1 | 1 | 488 *(P580)* |
| Utility | **S.900** | Save parameters | | | | | | 800 *(C.000)* |
| Utility | **S.999** | menu enable mask | 003 | 0000 | | 1 | 1 | 500 (P998) |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| **INTERFACE** | | | | | | | | | |
| Digital Inputs Commands of the Regulation Board | **I.000** | Digital Input 1 configuration: | 0-Not active<br>1-RUN command for the motor START<br>2-Speed REVERSE command<br>3-External fault with NO (Normal Open) contact<br>4-External fault with NC (Norm. Closed) contact<br>5-Alarm reset command<br>6-JOG frequency reference enabling<br>7-Binary selection for Multispeed1<br>8-Binary selection for Multispeed2<br>9-Binary selection for Multispeed3<br>10-Binary selection for Multispeed4<br>11-Binary selection for Multiramp1<br>12-Binary selection for Multiramp2<br>13-Drive Enable with NC (Norm. Closed) contact<br>14-Drive Enable with NO (Normal Open) contact<br>15-Enabling of the DC braking function<br>16-Command for execution of DC braking<br>17-Execution of the flying restart<br>18-Enabling / Disabling of the Ramp block<br>19-Ramp to 0Hz & main commands active<br>20-Enabling of the PID regulation.<br>21-Enabling PID freeze output signal.<br>22-Selection of the PID regulator gain.<br>23-Motorpotentiometer reference increasing<br>24-Motorpotentiometer reference decreasing<br>25-Reset of Motorpotentiometer ref.<br>26-Emergency stop<br>27-Enabling output freq. to zero. | 7 | 0 | 27 | | | 100 |
| | **I.001** | Digital Input 2 configuration | as like I.100 | 8 | 0 | 27 | | | 101 |
| | **I.002** | Digital Input 3 configuration | as like I.100 | 9 | 0 | 27 | | | 102 |
| | **I.003** | Digital Input 4 configuration | as like I.100 | 6 | 0 | 27 | | | 103 |
| | **I.004** | Digital Input 5 configuration | as like I.100 | 5 | 0 | 27 | | | 104 |
| | **I.005** | Digital Input 6 configuration | as like I.100 | 3 | 0 | 27 | | | 105 |
| | **I.006** | Digital Input 7 configuration | as like I.100 | 1 | 0 | 27 | | | 106 |
| | **I.007** | Digital Input 8 configuration | as like I.100 | 2 | 0 | 27 | | | 107 |
| | | | | | | | | | |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| Digital Inputs Commands of the Expansion Board | **I.050** | Expansion Digital Input 1 configuration (on Expansion board) | Not available | 0 | 0 | 27 | | | 108 |
| | **I.051** | Expansion Digital Input 2 configuration (on Expansion board) | Not available | 0 | 0 | 27 | | | 109 |
| | **I.052** | Expansion Digital Input 3 configuration (on Expansion board) | Not available | 0 | 0 | 27 | | | 110 |
| | **I.053** | Expansion Digital Input 4 configuration (on Expansion board) | Not available | 0 | 0 | 27 | | | 111 |
| | | | | | | | | | |
| Digital Output State Regulation Board | **I.100** | Digital Output 1 configuration | 0-Drive ready to start<br>1-Positive logic for alarm signalling<br>2-Negative logic for alarm signalling<br>3-Run command active<br>4-Run command not active and frequency = 0Hz<br>5-Anti-clockwise rotation of the motor.<br>6-Motor is running in steady state.<br>7-Acceleration or Deceleration Ramp on progress.<br>8-Undervoltage detectetion during motor running.<br>9-Output torque higher than the value of P.241.<br>10-Current limit (during ramp or at steady state).<br>11-DC Bus limit (during ramp or at steady state).<br>12-General signalling of drive limit condition.<br>13-Autocapture on progress.<br>14-Reserved.<br>15-Negative condition of the power factor .<br>16-PID error is >A.058 & <=A.059.<br>17-PID error is >A.058.<br>18-PID error is <=A.059.<br>19-PID error is >A.058 & <=A.059 (see chapter 7.7).<br>20-PID error is >A.058 (see chapter 7.7).<br>21-PID error is <=A.059 (see chapter 7.7).<br>22-Clockwise rotation of the couter-encoder.<br>23-Anti-clockwise rotation of the encoder.<br>24-Encoder not rotating.<br>25-Encoder rotation general signalling.<br>26-Positive logic for Ext. fault alarm signalling.<br>27-Negative logic for Extern. fault alarm signalling. | 0 | 0 | 44 | | | 112 |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| | | | 28-Serial link communication time out.<br>29-Output frequency = to P.440 & P.441 values.<br>30-Output frequency ? of P.440 & P.441 values.<br>31-Output frequency > than P.440 & P.441 values.<br>32-Output frequency < than P.440 & P.441 values.<br>33-Output frequency = to P.442 & P.443 values.<br>34-Output frequency ? of P.442 & P.443 values.<br>35-Output frequency > than P.442 & P.443 values.<br>36-Output frequency < than P.442 & P.443 values.<br>37-Heatsink temp = to P.480 & P.481 values.<br>38-Heatsink temp ? of P.480 & P.481 values.<br>39-Heatsink temp > than P.480 & P.481 values.<br>40-Heatsink temp < than P.480 & P.481 values.<br>41-Frequency in synchronism with output frequency.<br>42-Frequency value x 2 in synchronism with output frequency.<br>43-Coast thru stopping.<br><br>44-Emergency stop. | | | | | | |
| | **I.101** | Digital Output 2 configuration | like as I.100 | 6 | 0 | 44 | | | 113 |
| | **I.102** | Digital Output 3 configuration | like as I.100 | 3 | 0 | 44 | | | 114 |
| | **I.103** | Digital Output 4 configuration | like as I.100 | 1 | 0 | 44 | | | 115 |
| **Dig. Output State Exp. Board** | **I.150** | Expansion Digital Output 1 configuration (on Expansion board) | like as I.100 | 0 | 0 | 44 | | | 116 |
| | **I.151** | Expansion Digital Output 2 configuration (on Expansion board) | like as I.100 | 0 | 0 | 44 | | | 117 |
| | **I.152** | Expansion Digital Output 3 configuration (on Expansion board) | like as I.100 | 0 | 0 | 44 | | | 180 |
| | | | | | | | | | |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| Analog Input Regulation Board | **I.200** | Setting of the Analog Input 1 type reference | 0-Bipolar -/+10V<br>1-Unipolar +10V | 1 | 0 | 1 | | | 118 |
| | **I.201** | Analog Input 1 offset | | 0 | -9.99 | 99.9 | % | 0.01 | 119 |
| | **I.202** | Analog Input 1 gain | | 1 | -9.99 | 9.99 | % | 0.01 | 120 |
| | **I.203** | An Input 1 minimun value | | 0 | 0 | 99.99 | % | 0.01 | 121 |
| | **I.204** | Response time of the signal reaction | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 122 |
| | **I.210** | Setting of the Analog Input 2 type reference | 0-Bipolar -/+10V<br>1-Unipolar +10V | 0 | 0 | 1 | | | 123 |
| | **I.211** | Analog Input 2 offset | | 0 | -99.9 | 99.9 | % | 0.1 | 124 |
| | **I.212** | Analog Input 2 gain | | 1 | -9.99 | 9.99 | % | 0.01 | 125 |
| | **I.213** | An Input 2 minimun value | | 0 | 0 | 99.99 | % | 0.01 | 126 |
| | **I.214** | Response time of the signal reaction | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 127 |
| | **I.220** | Setting of the Analog Input 3 type reference | 0- 0…20mA<br>1- 4…20mA | 1 | 1 | 2 | | | 128 |
| | **I.221** | Analog Input 3 offset | | 0 | -99.9 | 99.9 | % | 0.1 | 129 |
| | **I.222** | Analog Input 3 gain | | 1 | -9.99 | 9.99 | % | 0.01 | 130 |
| | **I.223** | An Input 3 minimun value | | 0 | 0 | 99.99 | % | 0.01 | 131 |
| | **I.224** | Response time of the signal reaction | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 132 |
| Analog Output Regulation Board | **I.300** | Analog Output 1 configuration : | 0-Output Frequency absolute value.<br>1-Output Frequency.<br>2-Output Current.<br>3-Output Voltage.<br>4-Output Torque positive value.<br>5-Output Torque absolute value.<br>6-Output Torque.<br>7-Output Power positive value.<br>8-Output Power absolute value.<br>9-Output Power.<br>10-Output Power Factor.<br>11-Encoder frequency absolute value.<br>12-Encoder frequency.<br>13-Frequency reference absolute value.<br>14-Frequency reference<br>15-Load Current.<br>16-Motor Magnetizing Current.<br>17-PID regulator output.<br>18-DC bus capacitors level.<br>19-Output phase U current signal.<br>20-Output phase V current signal.<br>21-Output phase W current signal. | 0 | 0 | 21 | | | 133 |

| | PARAMETER | | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | | |
| | **I.301** | Analog output 1 offset | | 0 | -9.99 | 9.99 | | 0.01 | 134 |
| | **I.302** | Analog output 1 gain | | 1 | -9.99 | 9.99 | | 0.01 | 135 |
| | **I.303** | Time constant of output filter | | 0 | 0 | 2.5 | sec | 0.01 | 136 |
| | **I.310** | Analog Output 2 configuration :like as I.300 | | 2 | 0 | 21 | | | 137 |
| | **I.311** | Analog output 2 offset | | 0 | -9.99 | 9.99 | | 0.01 | 138 |
| | **I.312** | Analog output 2 gain | | 1 | -9.99 | 9.99 | | 0.01 | 139 |
| | **I.313** | Time constant of output filter | | 0 | 0 | 2.5 | sec | 0.01 | 140 |
| **Analog Output Exp Board** | **I.350** | Expansion Analog Output 1 configuration (on Exp. board): :like as I.300 | | 3 | 0 | 21 | | | 141 |
| | **I.351** | Expansion Analog Output 1 offset | | 0 | -9.99 | 9.99 | | 0.01 | 142 |
| | **I.352** | Expansion Analog Output 1 gain | | 1 | -9.99 | 9.99 | | 0.01 | 143 |
| | **I.353** | Time constant of output filter | | 0 | 0 | 2.5 | sec | 0.01 | 144 |
| **Enabling Virtual I/O** | **I.400** | Virtual Digital enabling | | 0 | 0 | 255 | | | 145 |
| | **I.410** | Expansion Virtual Digital Inputs enabling | | 0 | 0 | 15 | | | 146 |
| | **I.420** | Virtual Digital Outputs setting enabling | | 0 | 0 | 15 | | | 147 |
| | **I.430** | Expansion Virtual Digital Outputs enabling | | 0 | 0 | 3 | | | 148 |
| | **I.450** | Virtual Analog Outputs enabling | | 0 | 0 | 255 | | | 149 |
| **Encoder Config** | **I.500** | Enabling of the encoder feedback | | 0 | 0 | 1 | | | 150 |
| | **I.501** | Encoder nameplate pulses per revolution | | 100 | 1 | 9999 | | | 151 |
| | **I.502** | Encoder channels configuration | 0-Encoder feeback disabled<br>1-Encoder feeback enabled | 0 | 0 | 1 | | | 152 |
| | **I.503** | Multiplier factor of the encoder pulses, set in the I.501 | | 1 | 0.01 | 99.99 | | | 153 |
| | **I.504** | Encoder pulses sampling time: | A (K1) encoder channel<br>A and B (K1 and K2) encoder channels | 0.1 | 0 | 25 | sec | 0.01 | 154 |
| | **I.505** | Reserved | | | | | | | |

| | PARAMETER | | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | | |
| Serial Line Config | **I.600** | Serial line configuration protocol & mode | PROTOCOL TYPE / DATA BIT / PARITY / STOP BIT<br>FoxLink 7E1 — 7 — Even — 1<br>FoxLink 7O1 — 7 — Odd — 1<br>FoxLink 7N2 — 7 — None — 2<br>FoxLink 7O1 — 8 — None — 1<br>Modbus 8N1 — 8 — None — 1<br>Jbus 8N1 — 8 — None — 1 | 4 | 0 | 5 | | 0.1 | 155 |
| | **I.601** | Serial line baudrate | 0- 600 baud rate<br>1- 1200 baud rate<br>2- 2400 baud rate<br>3- 4800 baud rate<br>4- 9600 baud rate<br>5- 19200 baud rate<br>6- 38400 baud rate<br>7- 57600 baud rate<br>8- 76800 baud rate<br>9- 115200 baud rate | 4 | 0 | 9 | | | 156 |
| | **I.602** | Serial line address of drive | | 1 | 0 | 99 | | 1 | 157 |
| | **I.603** | Serial line answer delay time | | 1 | 0 | 250 | msec | 1 | 158 |
| | **I.604** | Serial line transmission timeout | | 0 | 0 | 25 | sec | 0.1 | 159 |
| | **I.605** | Setting time out alarm | 0-Drive NOT in alarm and signal on a digital output<br>1-Drive IN alarm and signal on a digital output | 0 | 0 | 1 | | | 160 |
| Option Config Board | **I.700** | Expansion optional 1 card type<br>RESERVED | | 0 | 0 | 4 | | | 161 |
| | **I.701** | Expansion optional 2 card type<br>RESERVED | | 0 | 0 | 4 | | | 162 |
| Field Bus Config | **I.750** | SBI Address | | 3 | 0 | 255 | | | 163 |
| | **I.751** | CAN Open baudraute | | 5 | 0 | 6 | | | 164 |
| | **I.752** | SBI Profibus Mode | | 2 | 0 | 4 | sec | 0.1 | 165 |
| | **I.753** | Selection of the Bus protocol | | 0 | 0 | 2 | | | 166 |
| | **I.754** | Delay time for Bus Fault Alarm | | 0 | 0 | 60 | sec | | 179 |
| | **I.760** | Word 0 from SBI to drive | | 0 | 0 | 1999 | | | 167 |
| | **I.761** | Word 1 from SBI to drive | | 0 | 0 | 1999 | | | 168 |

| PARAMETER | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|
| Code | Description | | | | | | |
| **I.762** | Word 2 from SBI to drive | 0 | 0 | 1999 | | | 169 |
| **I.763** | Word 3 from SBI to drive | 0 | 0 | 1999 | | | 170 |
| **I.764** | Word 4 from SBI to drive | 0 | 0 | 1999 | | | 171 |
| **I.765** | Word 5 from SBI to drive | 0 | 0 | 1999 | | | 172 |
| **I.770** | Word 0 from drive to SBI | 1 | 0 | 1999 | | | 173 |
| **I.771** | Word 1 from drive to SBI | 2 | 0 | 1999 | | | 174 |
| **I.772** | Word 2 from drive to SBI | 3 | 0 | 1999 | | | 175 |
| **I.773** | Word 3 from drive to SBI | 4 | 0 | 1999 | | | 176 |
| **I.774** | Word 4 from drive to SBI | 5 | 0 | 1999 | | | 177 |
| **I.775** | Word 5 from drive to SBI | 6 | 0 | 1999 | | | 178 |

| | PARAMETER | | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | | |
| **FREQ & RAMP** | | | | | | | | | |
| Motorpotentiometer | **F.000** | Motopot reference (it can be set using up and down commands) | | 0 | 0 | F.020 | Hz | 0.01 | 300 |
| | **F.001** | Motopotentiometer reference user unit | | 51 | -99999 | 99999 | rpm | | 343 |
| | **F.010** | Motorpot Accel. and Decel. ramp time | | 10 | 0.1 | 999.9 | sec | 0.1 | 301 |
| | **F.011** | Motopotentiometer minimum reference | | 0 | 0 | F.020 | Hz | 0.1 | 302 |
| | **F.012** | Unipolar / bipolar Motorpotentiometer | 0-Motorpotentiometer unipolar<br>1-Motorpotentiometer bipolar | 0 | 0 | 1 | | | 303 |
| | **F.013** | Motopotenziometer auto save function | 0-Motorpot auto save function disabled<br>1-Motorpot auto save function enabled | 1 | 0 | 1 | | | 304 |
| Reference Limit | **F.020** | Motor maximum frequency value (for both the directions) | | (****) | 25 | 500 | Hz | 0.1 | 305 |
| | **F.021** | Minimum frequency value | | 0 | 0 | F.020 | Hz | 0.1 | 306 |
| Reference Sources | **F.050** | Source of the Reference 1 | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Frequency reference F.100 (S.203)<br>4-Multi frequncies<br>5-Motorpotientometer reference<br>6-Analog input 3<br>7-Encoder signal<br>8-Reference by Profibus | 3 | 0 | 8 | | | 307 |
| | **F.051** | Source of the Reference 2 | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Frequency reference F.101<br>4-Multispeed<br>5-Motorpotientometer reference<br>6-Analog input 3<br>7-Encoder signal<br>8-Reference by Profibus | 0 | 0 | 8 | | | 308 |
| | **F.060** | Source of the Multispeed 1 : | As for F.050, Reference 1 source | 3 | 0 | 8 | | | 309 |
| | **F.061** | Source of the Multispeed 2: | As for F.051, Reference 2 source | 3 | 0 | 8 | | | 310 |
| Multi Frequency Function | **F.100** | Digital Reference frequency 0 | | 0 | -F.020 | F.020 | Hz | 0.1 | 311 |
| | **F.101** | Digital Reference frequency 1 | | 0 | -F.020 | F.020 | Hz | 0.1 | 312 |
| | **F.102** | Digital Reference frequency 2 | | 0 | -F.020 | F.020 | Hz | 0.1 | 313 |
| | **F.103** | Digital Reference frequency 3 | | 0 | -F.020 | F.020 | Hz | 0.1 | 314 |
| | **F.104** | Digital Reference frequency 4 | | 0 | -F.020 | F.020 | Hz | 0.1 | 315 |
| | **F.105** | Digital Reference frequency 5 | | 0 | -F.020 | F.020 | Hz | 0.1 | 316 |
| | **F.106** | Digital Reference frequency 6 | | 0 | -F.020 | F.020 | Hz | 0.1 | 317 |
| | **F.107** | Digital Reference frequency 7 | | 0 | -F.020 | F.020 | Hz | 0.1 | 318 |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| | **F.108** | Digital Reference frequency 8 | | 0 | -F.020 | F.020 | Hz | 0.1 | 319 |
| | **F.109** | Digital Reference frequency 9 | | 0 | -F.020 | F.020 | Hz | 0.1 | 320 |
| | **F.110** | Digital Refer. frequency 10 | | 0 | -F.020 | F.020 | Hz | 0.1 | 321 |
| | **F.111** | Digital Refer. frequency 11 | | 0 | -F.020 | F.020 | Hz | 0.1 | 322 |
| | **F.112** | Digital Refer. frequency 12 | | 0 | -F.020 | F.020 | Hz | 0.1 | 323 |
| | **F.113** | Digital Refer. frequency 13 | | 0 | -F.020 | F.020 | Hz | 0.1 | 324 |
| | **F.114** | Digital Refer. frequency 14 | | 0 | -F.020 | F.020 | Hz | 0.1 | 325 |
| | **F.115** | Digital Refer. frequency 15 | | 0 | -F.020 | F.020 | Hz | 0.1 | 326 |
| | **F.116** | Jogging frequency reference | | 1 | -F.020 | F.020 | Hz | 0.1 | 327 |
| Ramp Config | **F.200** | Accuracy of the ramp setting: | 0-From 0.01s to 99.99s<br>1-From 0.1s to 999.99s<br>2-From 1s to 9999s | 1 | 0 | 2 | | | 328 |
| | **F.201** | Acceleration ramp time delay 1 | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 329 |
| | **F.202** | Deceleration ramp time delay 1 | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 330 |
| | **F.203** | Acceleration ramp time delay 2 | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 331 |
| | **F.204** | Deceleration ramp time delay 2 | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 332 |
| | **F.205** | Acceleration ramp time delay 3 | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 333 |
| | **F.206** | Deceleration ramp time delay 3 / Fast Stop decel. | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 334 |
| | **F.207** | Accel. ramp time delay 4 / Accel. time in jogging state | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 335 |
| | **F.208** | Decel. ramp time delay 4 / Decel. time in jogging state | | 5 | 0.1 (***) | 999.9 (***) | sec | 0.1 (***) | 336 |
| | **F.250** | S Ramp shaping | | 0 | 0 | 10 | sec | 0.1 | 337 |
| | **F.260** | Source for the Ramp time extension function : | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3 | 0 | 0 | 3 | | | 338 |
| Jump frequency | **F.270** | Jump frequencies hysteresys | | 0 | 0 | 100 | Hz | 0.1 | 339 |
| | **F.271** | Jump frequency 1 | | 0 | 0 | 500 | Hz | 0.1 | 340 |
| | **F.272** | Jump frequency 2 | | 0 | 0 | 500 | Hz | 0.1 | 341 |

| | PARAMETER | | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | | |
| | | **PARAMETER** | | | | | | | |
| Commands | **P.000** | It defines the mode of START and STOP commands | 0-START & STOP via keypad (+24V between 5 & 8 terminals required).<br>1-START & STOP via terminal<br>2-Main command via Virtual & Terminal setting<br>3-Main command via serial line<br>4-Control word-Reserved | 1 | 0 | 4 | | | 400 |
| | **P.001** | Command logic | 0-Disable negative rotation of the motor.<br>1-Enable negative rotation of the motor. | 0 | 0 | 1 | | | 401 |
| | **P.002** | Reversal enabling | 0- RUN-REV.Disabling of the HW reverse command<br>1- FWD-REV.Enabling of the HW reverse command | 1 | 0 | 1 | | | 402 |
| | **P.003** | Safe start definition | 0-START allowed with RUN temirnal connected at the power on<br>1-START not allowed with RUN temirnal connected at the power on | 1 | 0 | 1 | | | 403 |
| | **P.004** | Motor stop control function | 0-Decel. ramp up to 0Hz.<br>1-Ramp to stop | 0 | 0 | 1 | | | 493 |
| Power Supply | **P.020** | Rated value of the line voltage | 230V<br>400V<br>460V | (****) | (****) | (****) | V | | 404 |
| | **P.021** | Rated value of the line frequency | 50Hz<br>60Hz | (****) | (****) | (****) | Hz | | 405 |
| Motor Data | **P.040** | Rated current of the motor | | (*) | (*) | (*) | A | 0.1 | 406 |
| | **P.041** | Pole Pairs of the motor | | (*) | 1 | 60 | | | 407 |
| | **P.042** | Motor power factor (COS PHI) | | (*) | 0.01 | 1 | | 0.01 | 408 |
| | **P.043** | Measurement of the stator resistance of the motor | | (*) | 0 | 99.99 | ohm | 0.01 | 409 |
| | **P.044** | Motor type cooling | 0-Self ventilated<br>1-Assisted ventilation | 0 | 0 | 1 | | | 410 |
| | **P.045** | Motor thermal constant | | 30 | 1 | 120 | min | | 411 |
| V/F Curve | **P.060** | V/F Curve Type | 0-V/F curve defined by the user<br>1-Linear characteristic<br>2-Quadratic characteristic | 1 | 0 | 2 | | | 412 |
| | **P.061** | Maximum output voltage | | (**) | 50 | (**) | V | 1 | 413 |
| | **P.062** | Base frequency | | (**) | 25 | 500 | Hz | 0.1 | 414 |
| | **P.063** | V/F intermediate voltage | | (**) | 0 | P.061 | V | | 415 |
| | **P.064** | V/F intermediate frequency | | (**) | 1 | P.062 | Hz | 0.1 | 416 |
| Outp. Freq. Limit | **P.080** | Maximum output frequency | | 100 | 0 | 110 | % of F.020 | 0.1 | 417 |
| | **P.081** | Minimum output frequency | | 0.0 | 0.0 | 25.0 | % of F.020 | 0.1 | 418 |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| Slip Comp. | **P.100** | Slip compensation | | 0 | 0 | 250 | % | | 419 |
| | **P.101** | Time constant of slip compensation | | 0.1 | 0 | 10 | sec | 0.1 | 420 |
| Boost | **P.120** | Torque boost level | | 1 | 0 | 25 | % of P.061 | | 421 |
| | **P.121** | Boost level source: | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3 | 0 | 0 | 3 | | | 422 |
| | **P.122** | Automatic boost enabling | | 1 | 0 | 1 | | | 423 |
| Automatic Flux Regulation | **P.140** | Magnetizing current regulator gain | | 0 | 0 | 100 | % | 0.1 | 424 |
| Anti Oscillation function | **P.160** | Damping gain | | 0 | 0 | 100 | | | 425 |
| SW Curr. Clamp | **P.180** | Current clamp enable | | 1 | 0 | 1 | | | 426 |
| Current Limit | **P.200** | Enable current limitation during ramp | | 0 | 0 | 2 | | | 427 |
| | **P.201** | Current limit in ramp | | 170 | 20 | 170 | % I nom | | 428 |
| | **P.202** | Enable current limitation in steady state | | 0 | 0 | 1 | | | 429 |
| | **P.203** | Current limit at constant speed | | 170 | 20 | 170 | % of I nom | | 430 |
| | **P.204** | Current limiter proportional gain | | 30.0 | 0.1 | 100 | % | 0.1 | 431 |
| | **P.205** | Current limiter integral gain | | 10.0 | 0.1 | 100 | % | 0.1 | 432 |
| | **P.206** | Current limiter feed-forward | | 0 | 0 | 250 | % | | 433 |
| | | | | | | | | | |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| DC Link Limit | P.220 | Stall prevention during dec. for overvoltage | | 0 | 0 | 2 | | | 434 |
| | P.221 | DC link voltage limiter proportional gain | | 20.0 | 0.1 | 100 | % | 0.1 | 435 |
| | P.222 | DC link voltage limiter integral gain | | 2.0 | 0.1 | 100 | % | 0.1 | 436 |
| | P.223 | DC link voltage limiter feed-forward | | 0 | 0 | 250 | % | | 437 |
| Over Torque Alarm Config | P.240 | Overtorque mode | 0: Overtorque detection always active and Over-torque alarm disabled.<br>1: Overtorque detection in steady state and Over-torque alarm disabled.<br>2: Overtorque detection always active and Over-torque alarm enabled.<br>3: Overtorque detection in steady state and Over-torque alarm enabled.<br>4-Overtorque detection always active , Over-torque alarm enabled and autoreset.<br>5- Overtorque detection in steady state, Over-torque alarm enabled and autoreset. | 0 | 0 | 3 | | | 438 |
| | P.241 | Current limit for overtorque | | 110 | 20 | 200 | % | | 439 |
| | P.242 | Overtorque level factor source | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3 | 0 | 0 | 3 | | | 440 |
| | P.243 | Delay time for overtorque signaling | | 0.1 | 0.1 | 25 | sec | 0.1 | 441 |
| Motor Overload Config | P.260 | Enabling of motor overload protection | | 1 | 0 | 1 | | | 444 |
| BU Config | P.280 | Enabling of braking resistor overload protection | | 0 | 0 | 1 | | | 445 |
| | P.281 | Ohmic value of braking resistor | | (*) | 1 | 250 | ohm | | 446 |
| | P.282 | Braking resistor power | | (*) | 0.01 | 25 | kW | 0.01 | 447 |
| | P.283 | Braking resistor thermal constant | | (*) | 1 | 250 | sec | | 448 |
| DC Brake Config | P.300 | DC braking level | | 0 | 0 | 100 | % of I nom | | 449 |
| | P.301 | DC braking level factor source | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3 | 0 | 0 | 3 | | | 450 |
| | P.302 | Frequency for DC braking enabling | | 0 | 0 | 500 | Hz | 0.1 | 451 |
| | P.303 | DC braking time at start | | 0 | 0 | 60 | sec | 0.1 | 452 |
| | P.304 | DC braking time at stop | | 0 | 0 | 60 | sec | 0.1 | 453 |
| | | | | | | | | | |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| Autocapture function | P.320 | Flying restart mode | 0-Null<br>1-Flying restar at power on<br>2-Flying restart at run command | 0 | 0 | 2 | | | 454 |
| | P.321 | Catch on flight current limit | | 120 | 20 | 170 | % of I nom | | 456 |
| | P.322 | Demagnetization minimun time | | 1 | 0.01 | 10 | sec | 0.01 | 457 |
| | P.323 | Frequency scanning time during Pick Up | | 1 | 0.1 | 25 | sec | 0.1 | 458 |
| | P.324 | Voltage scanning time during Pick Up | | 0.2 | 0.1 | 25 | V | 0.1 | 459 |
| | P.325 | Source of the reference for Pick Up function | 0-From active frequency reference<br>1-From the Max fre ref parameter<br>2-From freq. set desired<br>3-From encoder | 0 | 0 | 3 | | | 460 |
| Undervoltage Config | P.340 | Undervoltage threshold | | 0 | 40 | 80 | % of P.061 | | 462 |
| | P.341 | Restart time from undervoltage | | 0 | 0 | 25 | sec | 0.1 | 463 |
| | P.342 | Enabling of undervoltage alarm storage | | 1 | 0 | 1 | | | 464 |
| | P.343 | Undervoltage tripping mode | 0-Function disabled<br>1-Coast Through mode<br>2-Emergency stop mode | 0 | 0 | 2 | | | 491 |
| Overvoltage Config | P.360 | Automatic PickUp enabling after Overvoltage | | 1 | 0 | 1 | | | 465 |
| Autoreset Config | P.380 | Number of autoreset attempts | | 0 | 0 | 255 | | | 466 |
| | P.381 | En. automatic reset of autorestart attempts | | 10 | 0 | 250 | min | | 467 |
| | P.382 | Autoreset time delay | | 5 | 0.1 | 50 | sec | 0.1 | 468 |
| | P.383 | Alarm relay contacts behaviour during autoreset | | 1 | 0 | 1 | | | 469 |
| External Fault Config | P.400 | External fault mode | 0- Drive in alarm<br>Alarm always active<br>Alarm autoreset is not possible.<br>1- Drive in alarm<br>Alarm active only with running motor.<br>Alarm autoreset is not possible.<br>2 - Drive in alarm<br>Alarm always active<br>Alarm autoreset is possible.<br>3 - Drive in alarm<br>Alarm active only with running motor<br>Alarm autoreset is possible. | 0 | 0 | 3 | | | 470 |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| | **P.410** | Phase Loss detection enabling | | 1 | 0 | 1 | | | 492 |
| Voltage Reductuction Config | **P.420** | Voltage reduction mode | 0-Always<br>1-Costant speed only | 0 | 0 | 1 | | | 471 |
| | **P.421** | Output voltage reduction factor | | 100 | 10 | 100 | % of P.061 | | 472 |
| | **P.422** | Source of voltage reduction factor multiplier | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3 | 0 | 0 | 3 | | | 473 |
| Frequency Threshold | **P.440** | Frequency 1 level detection | | 0 | 0 | 50 | Hz | 0.1 | 474 |
| | **P.441** | Hysteresis amplitude related to P-420 | | 0.5 | 0 | 50 | Hz | 0.1 | 475 |
| | **P.442** | Frequency 2 level detection | | 0 | 0 | 50 | Hz | 0.1 | 476 |
| | **P.443** | Hysteresis amplitude related to P-422 | | 0.5 | 0 | 50 | Hz | 0.1 | 477 |
| Steady State Signalling | **P.460** | Tolerance at constant speed | | 0 | 0 | 25 | Hz | 0.1 | 478 |
| | **P.461** | Ramp end signalling delay | | 0.1 | 0 | 25 | sec | 0.1 | 479 |
| Heatsink Temp. Threshold | **P.480** | Heatsink temperature signalling level | | 70 | 10 | 110 | °C | | 480 |
| | **P.481** | Hysteresis band related to P.480 | | 5 | 0 | 10 | % | | 481 |
| PWM Settings | **P.500** | Modulation frequency: | 0- 1KHZ<br>1- 2KHZ<br>2- 3KHZ<br>3- 4HZ<br>4- 6KHZ<br>5- 8KHZ<br>6- 10KHZ<br>7- 12KHZ<br>8- 14KHZ<br>9- 16KHZ<br>10- 18KHZ | (*) | 0 | 10 | | | 482 |
| | **P.501** | Enabling of switching frequency reduction under 5Hz | | 0 | 0 | 1 | | | 483 |
| | **P.520** | Overmodulation level | | 0 | 0 | 100 | % | | 484 |
| | **P.540** | Automatic adjustment of output voltage | | 1 | 0 | 1 | | | 485 |
| | | | | | | | | | |

| | PARAMETER | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | |
| Dead Time Compensation | **P.560** | Dead times compensation limit | (*) | 0 | 255 | | | 486 |
| | **P.561** | Dead times compensation slope | (*) | 0 | 255 | | | 487 |
| Display Settings | **P.580** | Display IPA at start up | 1 | 1 | 1999 | | | 488 |
| | **P.600** | Speed conversion constant for display(mantissa) | 1 | 0.01 | 99.99 | | 0.01 | 489 |
| | **P.601** | Speed conversion constant for display(exponent) | 0 | -4 | 1 | 1 | | 496 |
| | **P.602** | speed unit selection | 3 | 0 | 3 | 1 | 1 | 497 |
| Protection | **P.998** | menu mask enable | 0003 | 0 | FFFF | | 1 | 500 |
| | **P.999** | Parameters protection code:<br>0 : All parameters are not protected<br>1 : Parameters F.100…F.116 are not protected; protected the others.<br>2 : All parameters are protected.<br>3 : All parameters are not protected; storage allowed while motor running. NOT RECOMMENDED. | 0 | 0 | | | | 490 |

| | PARAMETER | | | DEFAULT | MIN | MAX | UNIT | VARIATION | IPA |
|---|---|---|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | | | | |
| **APPLICATION** | | | | | | | | | |
| PID Settings | **A.000** | PID mode: | 0-Null<br>1-PID out in sum with ramp out ref (Feed forward)<br>2-PID out not in sum with ramp out ref (no Feed forward)<br>3-PID out not in sum with voltage ref (no Feed forward)<br>4-PID out not in sum with voltage ref (no Feed forward)<br>5-PID function as generic control (only with drive in RUN)<br>6-PID function as generic control (any drive status) | 0 | 0 | 6 | | | 1200 |
| | **A.001** | PID reference selector: | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3<br>4-Frequency reference<br>5-Ramp output<br>6-Internal reference<br>7-Encoder frequency | 0 | 0 | 7 | | | 1201 |
| | **A.002** | PID feedback selector: | 0-Null<br>1-Analog input 1<br>2-Analog input 2<br>3-Analog input 3<br>4-Encoder frequency<br>5-Output peak current<br>6-Output torque<br>7-Output power | 0 | 0 | 7 | | | 1202 |
| | **A.003** | PID digital reference | | 0 | -100 | 100 | % | 0.1 | 1203 |
| | **A.004** | PID active in steady state only | | 0 | 0 | 1 | | | 1204 |
| | **A.005** | Enabling of encoder / PID synchronism | | 0 | 0 | 1 | | | 1205 |
| | **A.006** | Error sign reversal | | 0 | 0 | 1 | | | 1206 |
| | **A.007** | Integral term initialization at start | | 0 | 0 | 1 | | | 1207 |
| | **A.008** | PID updating time | | 0 | 0 | 2.5 | sec | 0.01 | 1208 |
| PID Gains | **A.050** | Proportional term gain 1 | | 0 | 0 | 99.99 | | 0.01 | 1209 |
| | **A.051** | Integral action time 1 | | 99.99 | 0 | 99.99 | | 0.01 | 1210 |
| | **A.052** | Derivative action time 1 | | 0 | 0 | 99.99 | | 0.01 | 1211 |
| | **A.053** | Proportional term gain 2 | | 0 | 0 | 99.99 | | 0.01 | 1212 |
| | **A.054** | Integral action time 2 | | 99.99 | 0 | 99.99 | | 0.01 | 1213 |
| | **A.055** | Derivative action time 2 | | 0 | 0 | 99.99 | | 0.01 | 1214 |
| PID Limits | **A.056** | PID output upper limit | | 100 | -100 | 100 | % | 0.1 | 1215 |
| | **A.057** | PID output lower limit | | -100 | -100 | 100 | % | 0.1 | 1216 |
| | **A.058** | PID max. positive error | | 5 | 0.1 | 100 | % | 0.1 | 1217 |
| | **A.059** | PID max. negative error | | 5 | 0.1 | 100 | % | 0.1 | 1218 |

| | PARAMETER | | | Default | Min | Max | Unit | Variation | Ipa |
|---|---|---|---|---|---|---|---|---|---|
| | Code | Description | | | | | | | |
| **COMMAND** | | | | | | | | | |
| Basic | **C.000** | Save parameters command | No action.<br>Save parameters command. | NO | NO | YES | | | 800 |
| Basic | **C.001** | Recall of the previous stored parameters | No action.<br>Recall previously parameters set. | NO | NO | YES | | | 801 |
| Basic | **C.002** | Recall of the factory parameters. | No action.<br>Load default parameters. | NO | NO | YES | | | 802 |
| Alarm Reset | **C.020** | Completer reset of the the Alarm List register | No action.<br>Clear alarm register command. | NO | NO | YES | | | 803 |
| External Key | **C.040** | Recalling and storage of the parameters in the external key | No action.<br>Recall parameter from key. | NO | NO | YES | | | 804 |
| External Key | **C.041** | Storage of the inverter parameter on the external key | No action.<br>Storage parameters to key.<br>No action. | NO | NO | YES | | | 805 |
| Tuning | **C.100** | Motor Autotune command | Autotune command. | NO | NO | YES | | | 806 |

| | PARAMETER | | DEFAULT | MIN | MAX | IPA |
|---|---|---|---|---|---|---|
| | CODE | DESCRIPTION | | | | |
| | | **HIDDEN** | | | | |
| | | This menu is not available on the keypad. The setting and the reading of the parameters here contained, can be performed exclusively via serial line or through SBI card. | | | | |
| Virtual I/Os Commands | H.000 | **Virtual digital command** | 0 | 0 | 255 | 1000 |
| | H.001 | **Exp virtual digital command** | 0 | 0 | 255 | 1001 |
| | H.010 | **Virtual digital state** | 0 | 0 | 255 | 1002 |
| | H.011 | **Exp Virtual digital state** | 0 | 0 | 255 | 1003 |
| | H.020 | **Virtual An Output 1** | 0 | -32768 | 32767 | 1004 |
| | H.021 | **Virtual An Output 2** | 0 | -32768 | 32767 | 1005 |
| | H.022 | **Exp Virtual An Output 1** | 0 | -32768 | 32767 | 1006 |
| Profidrive Profile | H.030 | **Profidrive Control word (see Profibus instruction manual)** | 0 | 0 | 65535 | 1007 |
| | H.031 | **Profidrive Status word (see Profibus instruction manual)** | 0 | 0 | 65535 | 1008 |
| | H.032 | **Profidrive reference (see Profibus instruction manual)** | 0 | -16384 | 16383 | 1040 |
| | H.033 | **Profidrive actual reference (see Profibus instruction manual)** | 1 | -16384 | 16383 | 1041 |
| Drive Status | H.034 | **Drive status** | 0 | 0 | 65535 | 1042 |
| | H.040 | **Progress** | 0 | 0 | 100 | 1009 |
| Parameters Reading Extension | H.050 | **Drive output frequency 16 bit low (d.000)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1010 |
| | H.051 | **Drive output frequency 16 bit high (d.000)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1011 |
| | H.052 | **Drive reference frequency 16 low (d.001)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1012 |
| | H.053 | **Drive reference frequency 16 high (d.001)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1013 |
| | H.054 | **Output speed (d.000)*(P.600) 16 bit low (d.007)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1014 |
| | H.055 | **Output speed (d.000)*(P600) 16 bit high (d.007)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1015 |
| | H.056 | **Speed Ref (d.001)*(P.600) 16 bit low (d.008)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1016 |
| | H.057 | **Speed Ref (d.001)*(P.600) 16 bit high (d.008)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1017 |
| | H.058 | **Encoder freq 16 bit low (d.301)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1018 |
| | H.059 | **Encoder freq 16 bit high (d.301)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1019 |
| | H.060 | **Encoder speed (d.000)*(P.600) 16 bit low (d.302)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1044 |
| | H.061 | **Encoder speed (d.000)*(P.600) 16 bit high (d.302)** | 0 | $-2^{31}$ | $2^{31}-1$ | 1045 |
| | | | | | | |

| | PARAMETER | | Default | Min | Max | IPA |
|---|---|---|---|---|---|---|
| | Code | Description | | | | |
| Remote I/Os Control | H.100 | Remote Digital Inputs (0..15) | 0 | 0 | 65535 | 1021 |
| | H.101 | Remote Digital Inputs (16..31) | 0 | 0 | 65535 | 1022 |
| | H.110 | Remote Digital Outputs (0..15) | 0 | 0 | 65535 | 1023 |
| | H.111 | Remote Digital Outputs (16..31) | 0 | 0 | 65535 | 1024 |
| | H.120 | Remote Analog input 1 | 0 | -32768 | 32767 | 1025 |
| | H.121 | Remote Analog input 2 | 0 | -32768 | 32767 | 1026 |
| | H.130 | Remote Analog output 1 | 0 | -32768 | 32767 | 1027 |
| | H.131 | Remote Analog output 2 | 0 | -32768 | 32767 | 1028 |
| Serial Link Commands | H.500 | Harware reset | 0 | 0 | 1 | 1029 |
| | H.501 | Alarm reset | 0 | 0 | 1 | 1030 |
| | H.502 | Coast to stop | 0 | 0 | 1 | 1031 |
| | H.503 | Stop with ramp | 0 | 0 | 1 | 1032 |
| | H.504 | Clockwise Start | 0 | 0 | 1 | 1033 |
| | H.505 | Anti-clockwise Start | 0 | 0 | 1 | 1034 |
| | H.506 | Clockwise Jog | 0 | 0 | 1 | 1035 |
| | H.507 | Anti-clockwise Jog | 0 | 0 | 1 | 1036 |
| | H.508 | Clockwise Flying restart | 0 | 0 | 1 | 1037 |
| | H.509 | Anti-clockwise Flying restart | 0 | 0 | 1 | 1038 |
| | H.510 | DC Brake | 0 | 0 | 1 | 1039 |

## 10.2 Menu d - DISPLAY

### Basic

#### d.000 Output frequency

Drive output frequency [Hz].

#### d.001 Frequency ref (Frequency reference)

Drive frequency reference [Hz] .

#### d.002 Output current

Drive output current (rms) [A].

#### d.003 Output voltage

Drive output voltage (rms) [V].

#### d.004 DC link voltage

DC Bus drive voltage (DC) [V].

#### d.005 Power factor

Power factor.

#### d.006 Power [kW]

Active power.

#### d.007 Output speed

Drive output speed **(d.000)*(P.600).**

#### d.008 Speed ref (Speed reference)

Drive speed reference **(d.001)*(P.600).**

#### d.009 Estimated speed reference

Motor speed estimated **es*(P.600) where es is the estimated speed , variable not accessible.**

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.000 | Output frequency | | | | | Hz | 0,01 | 001 |
| d.001 | Frequency ref | | | | | Hz | 0,01 | 002 |
| d.002 | Output current | | | | | A | 0,1 | 003 |
| d.003 | Output voltage | | | | | V | 1 | 004 |
| d.004 | DC link voltage | | | | | V | 1 | 005 |
| d.005 | Power factor | | | | | | 0,01 | 006 |
| d.006 | Power [kW] | | | | | kW | 0,01 | 007 |
| d.007 | Output speed | | | | | | 0.01 / 1 | 008 |
| d.008 | Speed ref | | | | | | 0.01 / 1 | 009 |
| d.009 | Estimated Speed | | | | | rpm | | 062 |

### Overload

#### d.050 Heatsink temp (Heatsink temperature)

Drive heatsink temperature [°C] (linear sensor measured).

### d.051 Drive OL (Drive overload)

Drive overload (100% = alarm threshold).

### d.052 Motor OL (Motor overload)

Motor overload (100% = alarm threshold).

### d.053 Brake res OL (Brake resistror overload)

Braking resistor overload (100%=alarm thr).

### d.054 Reg board temp (Regulation temperature)

Temperature of regulation board (°C).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.050 | Heatsink temp | | | | | °C | 1 | 010 |
| d.051 | Drive OL | | | | | % | 0.1 | 011 |
| d.052 | Motor OL | | | | | % | 0.1 | 012 |
| d.053 | Brake res OL | | | | | % | 0.1 | 013 |
| d.054 | Regu board temp | | | | | °C | 1 | 058 |

## Inputs/Outputs

### d.100 Dig inp status (Digital inputs status)

Status of the digital inputs acquired by the drive. They can come from drive regulation board terminal inputs or virtual inputs (ex.: by serial or field bus cards).

### d.101 Term inp status (Teminal inputs status)

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

See example d.100

### d.102 Vir dig inp stat (Virtual digital inputs status)

Status of the virtual digital inputs received by serial link or field bus card.

See example d.100

### d.120 Exp dig inp stat (Expansion board digital inputs status)

Status of the expansion digital inputs acquired by the drive, from the expansion board terminal inputs or expansion virtual inputs (ex.: by serial or field bus cards).
Example of displaying expansion digital inputs with alphanumeric LDC display and 7 segments display:

***NOTE!*** For LCD display example all the other expansion digital inputs are OFF.

### d.121 Exp term inp (Expansion board terminal inputs status)

Status of the expansion digital inputs terminal of the drive expansion board.

See example d.120

### **d.122 Vir exp dig inp** (Expansion Board virtual digital inputs status)

Status of the expansion virtual digital inputs received by drive serial link or field bus card.
See example d.120

### **d.150 Dig out status** (Digital outputs status)

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

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

Status of the digital outputs terminal of the drive regulation board.
See example d.150

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

Status of the virtual digital outputs executed by the drive serial link or field bus card.
See example d.150

### **d.170 Exp dig out stat** (Expansion board digital outputs status)

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

### **d.171 Exp term out sta** (Expansion board terminal outputs status)

Status of the expansion digital outputs terminal.
See example d.170

### **d.172 Exp vir dig out** (Expansion board virtual digital outputs status)

Status of the expansion virtual digital outputs, executed via serial link or field bus card.
See example d.170

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

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

| | | |
|---|---|---|
| **[0] Null funct** | None function programmed | |
| **[1] Freq ref 1** | Frequency reference 1 | chapter **FREQ & RAMPS,** section ***Reference sources (F.050)*** |
| **[2] Freq ref 2** | Frequency reference 2 | chapter **FREQ & RAMPS**, section ***Reference sources (F.051)*** |
| **[3] Boost lev fac** | Level of voltage boost | chapter **PARAMETERS**, section ***Boost (P.121)*** |
| **[4] OT level fact** | Level of over torque | chapter **PARAMETERS**, section ***OT level factor src (P.242)*** |
| **[5] V red lev fac** | Output voltage reduction level | chapter **PARAMETERS**, section ***Voltage Red Config P.422)*** |
| **[6] DCB level fac** | DC braking current level | chapter **PARAMETERS**, section ***DC brake Config (P.301)*** |
| **[7] Ramp ext fact** | Ramp extension factor | chapter **PARAMETERS**, section ***Ramp Config (F.260)*** |

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

Analog input 1 - output block (% value).

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

Analog input 1 input block % value (regulation board).
It monitors the input signal depending on the selection of ***An inp 1 Type (I.200)*** parameter:

- selection: **[0] +/- 10V**: 0V = 0%, -10V = -100%, +10V = +100%

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

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

It monitors the analog input 2 signal destination; it is possible to know which function is associated to this input
(see list of parameter ***d.200***).

### **d.211 An in 2 monitor** (Analog input 2 monitor)

Analog input 2 - output block (% value).

### **d.212 An in 2 term mon** (Analog input 2 terminals monitor)

Analog input 2 - input block (% value).
It monitors the input signal depending on the selection of ***An inp 2 Type (I.210)*** parameter:

• selection: **[0] +/- 10V**: 0V = 0%, -10V = -100%, +10V = +100%

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

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

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

### **d.221 An in 3 monitor** (Analog input 3 monitor)

Analog input 3 - output block (% value).

### **d.222 An in 3 term mon** (Analog input 3 terminals monitor)

Analog input 3 - input block (% value).
It monitors the input signal depending on the selection of ***An inp 3 Type (I.220)*** parameter:

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

• selection: **[2] 4-20mA**: 4mA = 0%, 20mA = +100%

### **d.250 Terminal analog out 1 state monitor**

### **d.260 Terminal analog out 2 state monitor**

### **d.270 Terminal exp analog out 1 state monitor**

| Code | display | . | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.100 | Dig inp status | | | | | | | 014 |
| d.101 | Term inp status | | | | | | | 015 |
| d.102 | Vir dig inp stat | | | | | | | 016 |
| d.120 | Exp dig inp stat | | | | | | | 017 |
| d.121 | Exp term inp | | | | | | | 018 |
| d.122 | Vir exp dig inp | | | | | | | 019 |
| d.150 | Dig out status | | | | | | | 020 |
| d.151 | Term dig out sta | | | | | | | 021 |
| d.152 | Vir dig out stat | | | | | | | 022 |
| d.170 | Exp dig out stat | | | | | | | 023 |
| d.171 | Exp term out sta | | | | | | | 024 |
| d.172 | Exp vir dig out | | | | | | | 025 |
| d.200 | An in 1 cnf mon | | | | | | | 026 |
| d.201 | An in 1 monitor | | | | | % | | 027 |
| d.202 | An in 1 term mon | | | | | % | | 028 |

| | | | | |
|---|---|---|---|---|
| d.210 | An in 2 cnf mon | | | 029 |
| d.211 | An in 2 monitor | | % | 030 |
| d.212 | An in 2 term mon | | % | 031 |
| d.220 | An in 3 cnf mon | | | 032 |
| d.221 | An in 3 monitor | | % | 033 |
| d.222 | An in 3 term mon | | % | 034 |

## Encoder

### d.300 EncPulses/Sample (Encoder Pulses / Sample)

Number of encoder pulses recorded in a single encoder sampling period (I.504).

### d.301 Encoder freq (Encoder frequency)

Encoder frequency (Motor frequency) [Hz]

### d.302 Encoder speed

Encoder speed (d.000)*(P.600).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.300 | EncPulses/Sample | | | | | | 1 / 100 | 035 |
| d.301 | Encoder freq | | | | | Hz | 0,01 | 036 |
| d.302 | Encoder speed | | | | | | 0.01 / 1 | 037 |

## Option

### d.350 Option 1 state

It monitors the drive option 1 state; it is possible to know the expansion board type programmed.

### d.351 Option 2 state

It monitors the drive option 2 state; it is possible to know the expansion board type programmed.

### d.352 Par port state (Parallel port state)

It monitors the 16-bit parallel port state (option).

### d.353 SBI State

Communication state between SBI and Master.

### d.354 SBI Baude rate

Communication speed between SBI and Master

| Code | display | | . | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| d.350 | Option 1 state | | | | | | | | 038 |
| d.351 | Option 2 state | | | | | | | | 039 |
| d.352 | Par port state | | | | | | | | 040 |
| d.353 | SBI State | 0 | Wait parametrization | | | | | | 059 |
| | | 1 | Wait configuration | | | | | | |
| | | 2 | Data exchange | | | | | | |
| | | 3 | Error | | | | | | |
| d.354 | SBI Baude rate | 0 | 12 Mbit / s | | | | | | 060 |
| | | 1 | 6 Mbit / s | | | | | | |
| | | 2 | 3 Mbit / s | | | | | | |

| | |
|---|---|
| 3 | 1.5 Mbit / s |
| 4 | 500 Mbit / s |
| 5 | 187.5 kbit / s |
| 6 | 93.75 kbit / s |
| 7 | 45.45 kbit / s |
| 8 | 19.2 kbit / s |
| 15 | unknowk |

## Pid

### d.400 PID reference

PID reference signal.

### d.401 PID feedback

PID feedback signal.

### d.402 PID error

PID error signal.

### d.403 PID integr comp (PID integral component)

PID integral component.

### d.404 PID output

PID output signal.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.400 | PID reference | | | | | % | 0.1 | 041 |
| d.401 | PID feedback | | | | | % | 0.1 | 042 |
| d.402 | PID error | | | | | % | 0.1 | 043 |
| d.403 | PID integr comp | | | | | % | 0.1 | 044 |
| d.404 | PID output | | | | | % | 0.1 | 045 |

## Alarm list

### d.800 1st alarm-latest

Last alarm memory stored by the drive alarm list.

### d.801 2nd alarm

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

### d.802 3rd alarm

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

### d.803 4th alarm

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

| Code | display | . | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.800 | 1st alarm-latest | | | | | | | 046 |
| d.801 | 2nd alarm | | | | | | | 047 |
| d.802 | 3rd alarm | | | | | | | 048 |
| d.803 | 4th alarm | | | | | | | 049 |

## Drive Identification

### d.950 Drive rated curr (Drive rated current)

Drive rated current (it is dependent on the drive size).

### d.951 SW version (1/2) (Software version - part 1)

Display example: **03.00**
**03** = index of software identification
**00** = index of software revision (new functions or parameters)

### d.952 SW version (2/2) (Software version - part 2)

Display example: **00.00**
**00** = index of revision (fixing bugs)
**00** = index of identification (special version)

### d.953 Power ident code (Power identification code)

Reserved.

### d.954 Param ident code (Parameters identification code)

Reserved.

### d.955 Regul ident code (Regulation identification code)

Reserved.

### d.956 Startup id code (Startup identification code)

Reserved.

### d.957 Drive size

Drive size code; display example: 130.

### d.958 Drive cfg type

Drive configuration type: 0 = Standard configuration 400V, 1 = American configuration 460V and 575V

| Code | LCD display | [Code] & LCD select. | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| d.950 | Drive rated curr | | | | | | | 0,1 | 050 |
| d.951 | SW version (1/2) | | | | | | | 0,01 | 051 |
| d.952 | SW version (2/2) | | | | | | | 0,01 | 052 |
| d.953 | Power ident code | | | | | | | | 053 |
| d.954 | Param ident code | | | | | | | | 054 |
| d.955 | Regul ident code | | | | | | | | 055 |
| d.956 | Startup id code | | | | | | | | 056 |
| d.957 | Drive size | 32 | 0.75 kW - 230/400/480V | | 130 | 2.0 Hp - 575 V | | | 057 |
| | | 33 | 1.5 kW - 230/400/480V | | 131 | 3.0 Hp - 575 V | | | |
| | | 34 | 2.2 kW - 230/400/480V | | 132 | 5.0 Hp - 575 V | | | |
| | | 35 | 3 kW - 230/400/480V | | 133 | 7.5 Hp - 575 V | | | |
| | | 36 | 4 kW - 230/400/480V | | 134 | 10 Hp - 575 V | | | |
| | | 37 | 5.5 kW - 230/400/480V | | 135 | 15 Hp - 575V | | | |
| | | 38 | 7.5 kW - 230/400/480V | | 136 | 20 Hp - 575 V | | | |
| | | 39 | 11 kW - 230/400/480V | | 167 | 25 Hp - 575 V | | | |
| | | 40 | 15 kW - 230/400/480V | | 168 | 30 Hp - 575 V | | | |
| | | 41 | 22 kW - 230/400/480V | | 169 | 40 Hp - 575 V | | | |
| | | 42 | 30 kW - 230/400/480V | | 170 | 50 Hp - 575V | | | |
| | | 43 | 37 kW - 230/400/480V | | 171 | 60 Hp - 575 V | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 44 | 45 kW - 230/400/480V | 172 | 75 Hp - 575 V | |
| | | 45 | 55 kW - 230/400/480V | | | |
| | | 46 | 75 kW - 230/400/480V | | | |
| | | 47 | 90 kW - 230/400/480V | | | |
| | | 48 | 110 kW - 230/400/480V | | | |
| | | 49 | 132 kW - 230/400/480V | | | |
| d.958 | Drive cfg type | 0 | | | | 061 |
| | | 1 | | | | |

# Utility

## d.999 Display Test

Drive display test

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| d.999 | Display Test | Drive display test | | | | | | 099 |

## 10.3 Menu S - START-UP

*NOTE!* The **START UP** menu is a set of parameters and functions that allow a quick start of the motor.These parameters are duplicated in other menus of the drive, Therefore, their modification can be performed in any of the menus where the parametes are present.

**S.000 = P.020 Mains voltage**

**S.001 = P.021 Mains frequency**

**S.100 = F.020**

**S.101 = F.021**

**S.110 = F.050**

**S.120 = F.001**

**S.121 = F.011**

**S.122 = F.012**

**S.123 = F.013**

**S.130 = F.100**

**S.140 = I.200**

**S.200 = F.201**

**S.201 = F.202**

**S.300 = P.000**

**S.310 = P.001**

**S.311 = P.003**

**S.312 = P.004**

**S.320 = P.005**

**S.800 = P.600**

**S.801 = P.601**

**S.802 = P.602**

**S.810 = P.580**

**S.900 = C.000**

**S.999 = P.998**

## 10.4 Menu I - INTERFACE

### Digital Inputs Regulation Board

**I.000 Dig input 1 cfg** (Digital input 1 configuration)

**I.001 Dig input 2 cfg** (Digital input 2 configuration)

**I.002 Dig input 3 cfg** (Digital input 3 configuration)

**I.003 Dig input 4 cfg** (Digital input 4 configuration)

**I.004 Dig input 5 cfg** (Digital input 5 configuration)

**I.005 Dig input 6 cfg** (Digital input 6 configuration)

**I.006 Dig input 7 cfg** (Digital input 7 configuration)

**I.007 Dig input 8 cfg** (Digital input 8 configuration)

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

***DIGITAL INPUTS SELECTION LIST**:*

| *Code* | *LCD display* | *Description* |
|---|---|---|
| **0** | **None** | Not active |
| **1** | **Run** | RUN command for the motor START |
| **2** | **Reverse** | Speed REVERSE command |
| **3** | **Ext Fault NO** | External fault with NO (Normal Open) contact |
| **4** | **Ext Fault NC** | External fault with NC (Norm. Closed) contact |
| **5** | **Alarm reset** | Alarm reset command |
| **6** | **Jog** | JOG frequency reference enabling |
| **7** | **Freq sel 1** | Binary selection for Multispeed |
| **8** | **Freq sel 2** | Binary selection for Multispeed |
| **9** | **Freq sel 3** | Binary selection for Multispeed |
| **10** | **Freq sel 4** | Binary selection for Multispeed |
| **11** | **Ramp sel 1** | Binary selection for Multiramp |
| **12** | **Ramp sel 2** | Binary selection for Multiramp |
| **13** | **Enable NO** | Drive Enable with NC (Norm. Closed) contact |
| **14** | **Enable NC** | Drive Enable with NO (Normal Open) contact |
| **15** | **DCBrake en** | Enabling of the DC braking function |
| **16** | **DCBrake** | Command for execution of DC braking |
| **17** | **Autocapture** | Execution of the flying restart |
| **18** | **Ramp enable** | Enabling / Disabling of the Ramp block |
| **19** | **Zero ref** | Ramp to 0Hz & main commands active |
| **20** | **PID enable** | Enabling of the PID regulation |
| **21** | **PID freeze** | Enabling PID freeze output signal. |
| **22** | **PID gain sel** | Initializing of the Integral value of PID |
| **23** | **Motorpot Up** | Motorpotentiometer reference increasing |
| **24** | **Motorpot Dn** | Motorpotentiometer reference decreasing |
| **25** | **Reset Motorp** | Reset of Motorpotentiometer reference |
| **26** | **Fast stop** | Emergency stop (with Dec time 3 delay) |
| **27** | **Zero freq** | Enabling output freq. to zero. |

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.000 | Dig input 1 cfg | *See Digital inputs selection list* | 7 | 0 | 27 | | | 100 |
| I.001 | Dig input 2 cfg | As for I.000 | 8 | 0 | 27 | | | 101 |
| I.002 | Dig input 3 cfg | As for I.000 | 9 | 0 | 27 | | | 102 |
| I.003 | Dig input 4 cfg | As for I.000 | 6 | 0 | 27 | | | 103 |
| I.004 | Dig input 5 cfg | As for I.000 | 5 | 0 | 27 | | | 104 |
| I.005 | Dig input 6 cfg | As for I.000 | 1 | 0 | 27 | | | 105 |
| I.006 | Dig input 7 cfg | As for I.000 | 1 | 0 | 27 | | | 106 |
| I.007 | Dig input 8 cfg | As for I.000 | 2 | 0 | 27 | | | 107 |

The digital inputs are FACTORY set as follow:

***Dig input 1 cfg*** (Terminal 22) = **7 Freq sel 1**
***Dig input 2 cfg*** (Terminal 23) = **8 Freq sel 2**
***Dig input 3 cfg*** (Terminal 24) = **9 Freq sel 3**
***Dig input 4 cfg*** (Terminal 25) = **6 JOG**
***Dig input 5 cfg*** (Terminal 7) = **5 Alarm reset**
***Dig input 6 cfg*** (Terminal 6) = **13 External fault NO**
***Dig input 7 cfg*** (Terminal 5) = **1 Run**
***Dig input 8 cfg*** (Terminal 4) = **2 Reverse**

## Digital Inputs Expansion Board

### I.050 **Exp dig in 1 cfg** (Expansion digital input 1 configuration)

Reserved.

### I.051 **Exp dig in 2 cfg** (Expansion digital input 2 configuration)

Reserved.

### I.052 **Exp dig in 3 cfg** (Expansion digital input 3 configuration)

Reserved.

### I.053 **Exp dig in 4 cfg** (Expansion digital input 4 configuration)

Reserved.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.050 | Exp dig in 1 cfg | As for I.000 | 0 | 0 | 27 | | | 108 |
| I.051 | Exp dig in 2 cfg | As for I.000 | 0 | 0 | 27 | | | 109 |
| I.052 | Exp dig in 3 cfg | As for I.000 | 0 | 0 | 27 | | | 110 |
| I.053 | Exp dig in 4 cfg | As for I.000 | 0 | 0 | 27 | | | 111 |

## Digital Ouputs Regulation Board

### I.100 **Dig output 1 cfg** (Digital output 1 configuration)

### I.101 **Dig output 2 cfg** (Digital output 2 configuration)

### I.102 **Dig output 3 cfg** (Digital output 3 configuration)

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

The regulation board provides as standard, 2 static opto-coupled digital outputs in Open Collector configuration and 2 relays with commutation contacts (see figure 5.5.1).

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

***DIGITAL OUTPUTS SELECTION LIST**:*

| *Code* | *LCD display* | *Description* |
|---|---|---|
| **0** | **Drive Ready** | Drive ready to start |
| **1** | **Alarm state** | Positive logic for alarm signalling |
| **2** | **Not in alarm** | Negative logic for alarm signalling |
| **3** | **Motor running** | Direction command active |
| **4** | **Motor stopped** | Direction command not active and frequency = 0Hz |
| **5** | **REV rotation** | Anti-clockwise rotation of the motor |
| **6** | **Steady state** | Motor is running in steady state |
| **7** | **Ramping** | Acceleration or Deceleration Ramp in progress |
| **8** | **UV running** | Undervoltage detection during motor running |
| **9** | **Out trq>thr** | Output torque higher than the value of ***P.241*** |
| **10** | **Current lim** | Current limit (during ramp or at steady state) |
| **11** | **DC-link lim** | DC Bus limit (during ramp or at steady state) |
| **12** | **Limit active** | General signalling of drive limit condition |
| **13** | **Autocapt run** | Autocapture on progress |
| **14** | **BU overload** | Overload of the braking resistor |
| **15** | **Neg pwrfact** | Negative condition of the power factor |
| **16** | **PID err ><** | PID error is >***A.058*** & <=**A.059** |
| **17** | **PID err>thr** | PID error is >***A.058*** |
| **18** | **PID err<thr** | PID error is <=***A.059*** |
| **19** | **PIDer><(inh)** | PID error is >***A.058*** & <=***A.059*** (*) |
| **20** | **PIDerr>(inh)** | PID error is >***A.058*** (*) |
| **21** | **PIDerr<(inh)** | PID error is <=***A.059*** (*) |
| **22** | **FWD enc rot** | Clockwise rotation of the encoder |
| **23** | **REV enc rot** | Anti-clockwise rotation of the encoder |
| **24** | **Encoder stop** | Encoder stop rotation |
| **25** | **Encoder run** | Encoder rotation general signalling |
| **26** | **Extern fault** | Positive logic for Ext. fault alarm signalling |
| **27** | **No ext fault** | Negative logic for Ext. fault alarm signalling |
| **28** | **Serial TO** | Serial link communication time out |
| **29** | **freq=thr1** | Output frequency = to ***P.440*** & ***P.441*** values |
| **30** | **freq!=thr1** | Output frequency ≠ of ***P.440*** & ***P.441*** values |
| **31** | **freq>thr1** | Output frequency > than ***P.440*** & ***P.441*** values |
| **32** | **freq<thr1** | Output frequency < than **P.440** & ***P.441*** values |
| **33** | **freq=thr2** | Output frequency = to ***P.442*** & ***P.443*** values |
| **34** | **freq!=thr2** | Output frequency ≠ of ***P.442*** & ***P.443*** values |
| **35** | **freq>thr2** | Output frequency > than ***P.442*** & ***P.443*** values |
| **36** | **freq<thr2** | Output frequency < than ***P.442*** & ***P.443*** values |
| **37** | **HS temp=thr** | Heatsink temp = to ***P.480*** & ***P.481*** values |
| **38** | **HS temp!=thr** | Heatsink temp ≠ of ***P.480*** & ***P.481*** values |
| **39** | **HS temp>thr** | Heatsink temp > than ***P.480*** & ***P.481*** values |
| **40** | **HS temp<thr** | Heatsink temp < than ***P.480*** & ***P.481*** values |
| **41** | **Output freq** | Frequency in synchronism with output frequency |
| **42** | **Out freq x 2** | Frequency value x 2 in synchronism with output frequency |
| **43** | **OutCoastThru** | Coast Through stopping |
| **44** | **OutEmgStop** | Emergency stop |

(*) see chapter 10.7, section PID Limit.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IP |
|---|---|---|---|---|---|---|---|---|
| I.100 | Dig output 1 cfg | *See Digital Outputs selection list* | 0 | 0 | 44 | | | 112 |
| I.101 | Dig output 2 cfg | As for I.100 | 6 | 0 | 44 | | | 113 |
| I.102 | Dig output 3 cfg | As for I.100 | 3 | 0 | 44 | | | 114 |
| I.103 | Dig output 4 cfg | As for I.100 | 1 | 0 | 44 | | | 115 |

## Digital Outputs Expansion Board

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

Reserved.

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

Reserved.

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

Reserved.

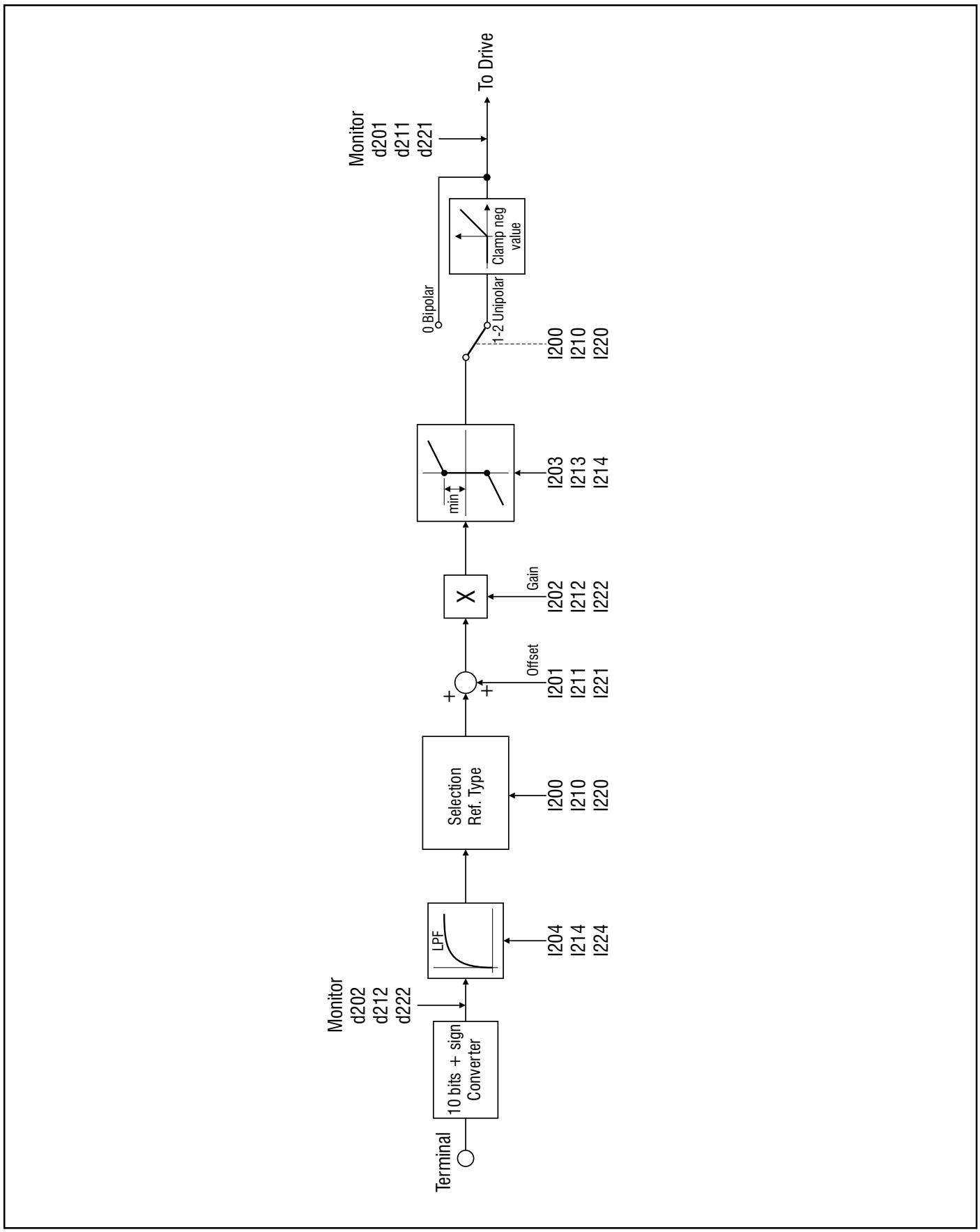
| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IP |
|---|---|---|---|---|---|---|---|---|
| I.150 | Exp DigOut 1 cfg | *See Digital Outputs selection list* | 0 | 0 | 44 | | | 116 |
| I.151 | Exp DigOut 2 cfg | As for I.100 | 0 | 0 | 44 | | | 117 |
| I.152 | Exp DigOut 3 cfg | As for I.100 | 0 | 0 | 44 | | | 180 |

## Analog Inputs Regulation Board

The drawing following, describes the block diagram of the standard "Analog Inputs" of the drive.

*Figure 10.4.1: Analog Inputs*

The regulation board provides as standard 2 analog inputs.
Analog inputs resolution:
voltage input setting: 11 bits (10 bits + sign)




current input setting: 10 bits

The assignment of the Analog Inputs for a specific function, is described in the figure 10.5.1 at the menu **FREQ** and **RAMPS.**

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

Setting of the Analog Input 1, in accordance with the type of reference control, available on its HW.
***I.200 = 0 Bipolar -/+10V***
***I.200 = 1 Unipolar +10V***
***I.200 = 2 Not used***

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

Setting of the Analog Input 2, in accordance with the type of reference control, available on its HW.
***I.210 = 0 Bipolar -/+10V***
***I.210 = 1 Unipolar +10V***
***I.210 = 2 Not used***

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

Setting of the Analog Input 3, in accordance with the type of reference control, available on its HW.
***I.220 = 0 Not used***
***I.220 = 1 0…20mA***
***I.220 = 2 4…20mA***

The functions that can be controlled through the analog inputs are listed below:

| | | |
|---|---|---|
| **[1] Freq ref 1** | Frequency reference 1 | chapter **FREQ & RAMPS,** section ***Reference sources (F.050)*** |
| **[2] Freq ref 2** | Frequency reference 2 | chapter **FREQ & RAMPS**, section ***Reference sources (F.051)*** |
| **[3] Boost lev fac** | Level of voltage boost | chapter **PARAMETERS**, section ***Boost (P.121)*** |
| **[4] OT level fact** | Level of over torque | chapter **PARAMETERS**, section ***OT level factor src (P.242)*** |
| **[5] V red lev fac** | Output voltage reduction level | chapter **PARAMETERS**, section ***Voltage Red Config P.422)*** |
| **[6] DCB level fac** | DC braking current level | chapter **PARAMETERS**, section ***DC brake Config (P.301)*** |
| **[7] Ramp ext fact** | Ramp extension factor | chapter **PARAMETERS**, section ***Ramp Config (F.260)*** |

Through the parameters ***d.200***, ***d.210*** and ***d.220*** is displayed the configuration of the analog inputs, when they have been programmed to execute one of the functions listed above.

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

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

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

It can be used to compensate an eventual offset, contained in an analog signal or when the variable assigned to the to input has already a value, also not being connected any signal.
Each parameters acts on the relative analog input.

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

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

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

Gain of the analog input.
It can be used to amplify or reduce the ratio between signal and controlled variable, or also to set different types of control curves via analog reference, as described in the figures 7.4.2, 7.4.3 and 7.4.4.
Each parameters acts on the relative analog input.

### I.203 **An In 1 minimum** (Analog Input 1 minimun)

### I.213 **An In 2 minimum** (Analog Input 2 minimun)

### I.223 **An In 3 minimum** (Analog Input 3 minimun)

It represents the minimum value of the parameter, on which the analog input is programmed (see figure 10.4.3).
Example: if the analog input 1 is programmed as speed reference, in this case ***I.203*** represents the minimum speed reference.
Each parameters acts on the relative analog input.

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

### I.214 **An In 2 filter** (Analog Input 2 fi

### I.224 **An In 3 filter** (Analog Input 3 fi

It is the response time of the signal r ns.
Each parameters acts on the relative

The use of the Analog Inputs parame nize the analog reference ratio.
In the figures below are reported son

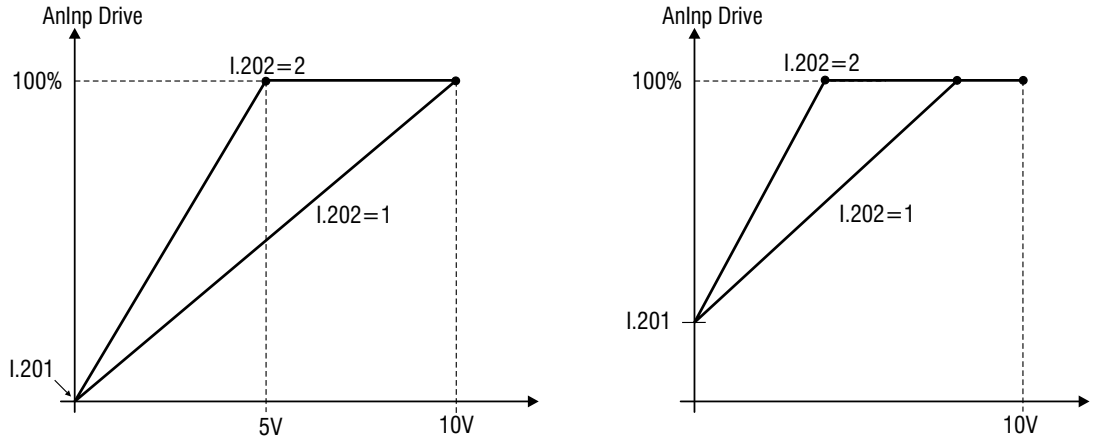



*Figure 10.4.2: Analog Input Scaling 1*

$$\text{An Inp Drive [\%]} = \text{I.202} \times \left( \text{An Inp [\%]} + \frac{\text{I.201}}{10} \times 100 \right)$$

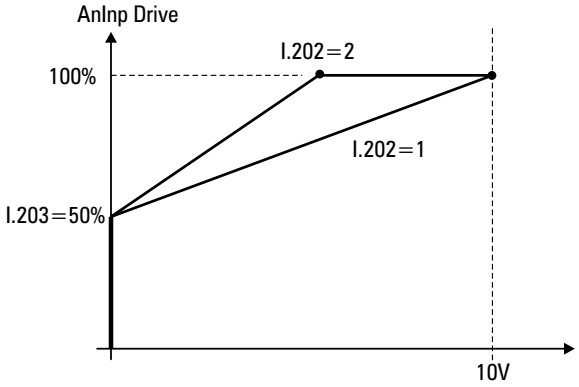



*Figure 10.4.3: Analog Input Scaling 2*

$$\text{An Inp Drive [\%]} = \text{I.203} + \frac{100 - \text{I.203}}{100} \times \text{I.202} \times \left(\text{An Inp [\%]} + \frac{\text{I.201}}{10} \times 100\right)$$

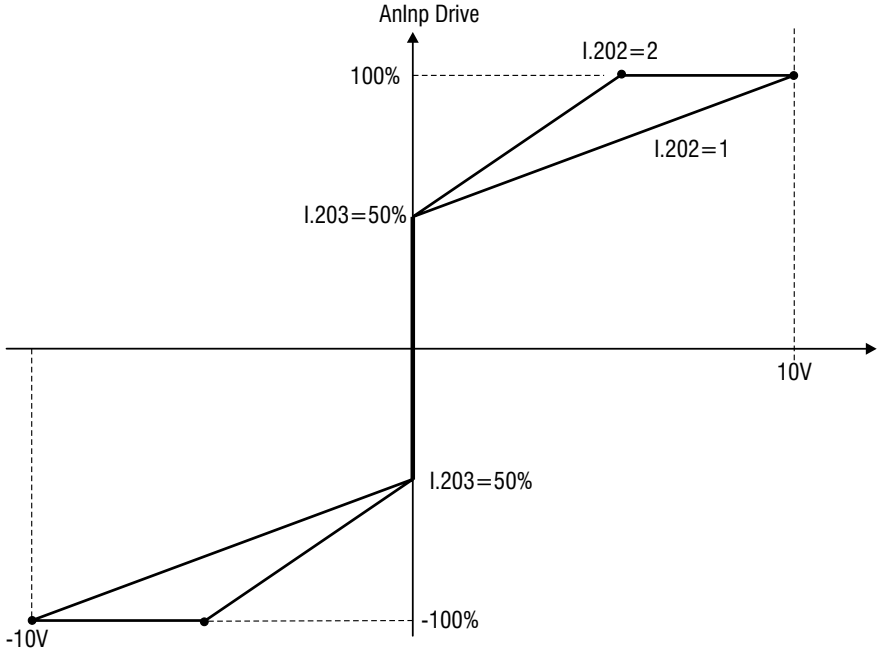



*Figure 10.4.4: Analog Input Scaling 3*

***NOTE!*** When the analog input reference is set at 0V, an eventual "noise" can cause undesired speed oscillation between positive and/or negative values of ***I.203*** parameter.

$$\left|\text{An Inp Drive [\%]} = \text{I.203} \times \text{signum}\left[\text{I.202} \times \left(\text{An Inp [\%]} + \frac{\text{I.201}}{10} \times 100\right)\right]\right| + \frac{100 - \text{I.203}}{100} \times \text{I.202} \times \left(\text{An Inp [\%]} + \frac{\text{I.201}}{10} \times 100\right)$$

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.200 | An in 1 Type | [0] +/- 10V | 1 | 0 | 1 | | | 118 |
| | | [1] 0-10V / 0-20mA | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| I.201 | An in 1 offset | | 0 | -99.9 | 99.9 | % | 0.1 | 119 |
| I.202 | An in 1 gain | | 1 | -9.99 | 9.99 | % | 0.01 | 120 |
| I.203 | An in 1 minimum | | 0 | 0 | 99.99 | % | 0.01 | 121 |
| I.204 | An in 1 filter | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 122 |
| I.210 | An in 2 Type | [0] +/- 10V<br>[1] 0-10V / 0-20mA | 0 | 0 | 1 | | | 123 |
| I.211 | An in 2 offset | | 0 | -99.9 | 99.9 | % | 0.1 | 124 |
| I.212 | An in 2 gain | | 1 | -9.99 | 9.99 | | 0.01 | 125 |
| I.213 | An in 2 minimum | | 0 | 0 | 99.99 | % | 0.01 | 126 |
| I.214 | An in 2 filter | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 127 |
| I.220 | An in 3 Type | [1] 0-10V / 0-20mA1<br>[2] 4-20mA | 1 | 2 | | | 128 | |
| I.221 | An in 3 offset | | 0 | -9.99 | 9.99 | % | 0.1 | 129 |
| I.222 | An in 3 gain | | 1 | -99.9 | 99.9 | % | 0.01 | 130 |
| I.223 | An in 3 minimum | | 0 | 0 | 99.99 | % | 0.01 | 131 |
| I.224 | An in 3 filter | | 0.1 | 0.001 | 0.25 | sec | 0.001 | 132 |

## Analog Outputs Regulation Board

The drawing below, describes the block diagram of the standard Analog Outputs of the drive

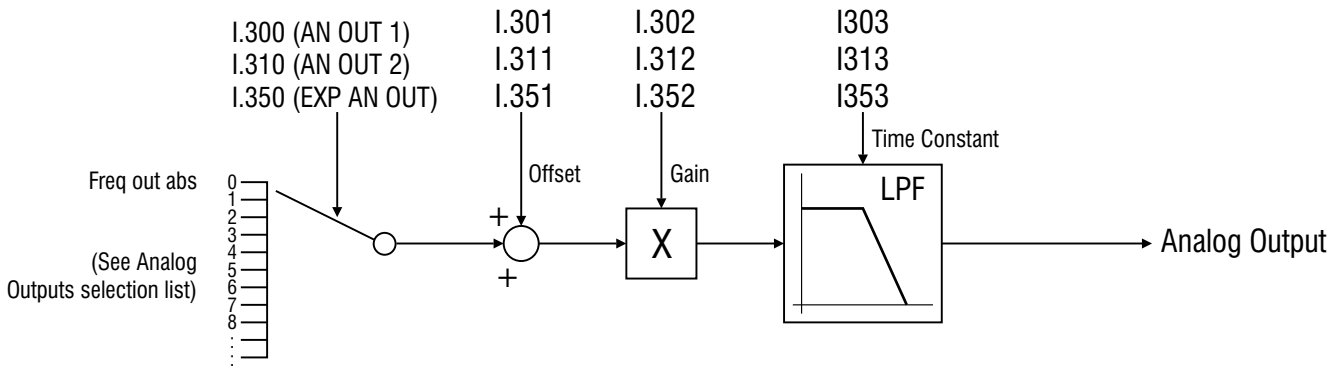



*Figure 10.4.5: Analog Ouputs*

The regulation board provides as standard 2 analog outputs.

Analog output resolution: 10 bits

A typical connection is reported in the figure 5.5.1.

Both the analog outputs, can provide a full scale signal **0V** / **+10Vdc** (absolute and positive) or **+/-10Vdc** (generic setting), according to the parameter assigned .

### I.300 **Analog out 1 cfg** (Analog output 1 configuration)

## I.310 **Analog out 2 cfg** (Analog output 2 configuration)

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

***ANALOG OUTPUTS SELECTION LIST:***

| *Code* | *LCD display* | *Description* |
|---|---|---|
| **0** | **Freq out abs** | Output Frequency absolute value |
| **1** | **Freq out** | Output Frequency |
| **2** | **Output curr** | Output Current |
| **3** | **Out voltage** | Output Voltage |
| **4** | **Out trq (pos)** | Output Torque positive value |
| **5** | **Out trq (abs)** | Output Torque absolute value |
| **6** | **Out trq** | Output Torque |
| **7** | **Out pwr (pos)** | Output Power positive value |
| **8** | **Out pwr (abs)** | Output Power absolute value |
| **9** | **Out pwr** | Output Power |
| **10** | **Out PF** | Output Power Factor |
| **11** | **Enc freq abs** | Encoder frequency absolute value |
| **12** | **Encoder freq** | Encoder frequency |
| **13** | **Freq ref abs** | Frequency reference absolute value |
| **14** | **Freq ref** | Frequency reference |
| **15** | **Load current** | Load Current |
| **16** | **Magn current** | Motor Magnetizing Current |
| **17** | **PID output** | PID regulator output |
| **18** | **DClink volt** | DC bus capacitors level |
| **19** | **U current** | Output phase U current signal |
| **20** | **V current** | Output phase V current signal |
| **21** | **W current** | Output phase W current signal |

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

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

It can be used to compensate an eventual offset, coming from the external instrument connected to the output.
This parameter can be used to regulate the set-point for a variable to be displayed, with different full scale values.
Each parameter acts on the relative analog output.

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

## I.312 **An out 2 gain** (Analog output 2 gain)

Gain of the analog output.
It can be used to amplify or reduce the variable full scale value.
The parameter allows for a different set-up of the analog output threshold, as reported in the figure 10.4.6.
Each parameter acts on the relative analog output.

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

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

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

Each parameters acts on the relative analog output.

Below are some samples of different threshold set-up.

***NOTE!*** these samples are described as taking into account the parameters of the Analog ouput 1, but both the outputs are programmable in the same mode.

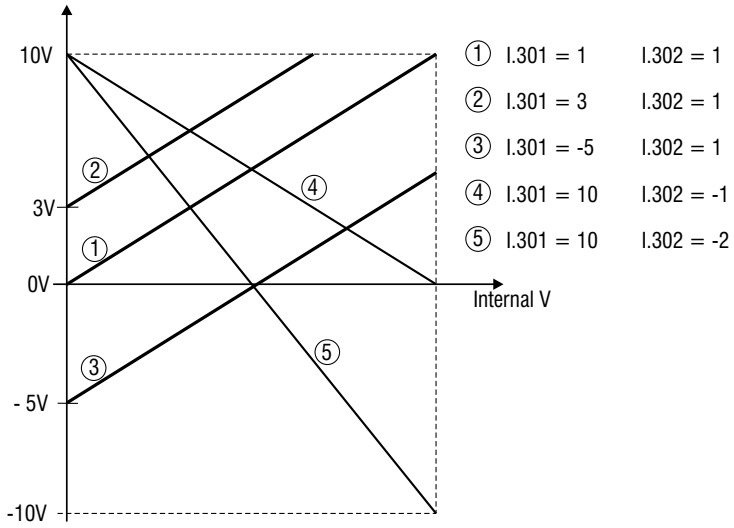



*Figure 10.4.6: Scaling References and Minimum Values*

$$Vout = 10 \times \left( \frac{Stp\ Var}{Fs\ Var} \times I.302 \right) + I.301$$

Where:

**Vout** setting of the threshold
**Stp Var** required set point of the variable threshold (units of the variable)
**Fs Var** full scale of the variable (units of the variable)

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.300 | Analog out 1 cfg | *See Analog outputs selection list* | 0 | 0 | 21 | | | 133 |
| I.301 | An out 1 offset | | 0 | -9.99 | 9.99 | | 0,01 | 134 |
| I.302 | An out 1 gain | | 1 | -9.99 | 9.99 | | 0.01 | 135 |
| I.303 | An out 1 filter | | 0 | 0 | 2,5 | sec | 0.01 | 136 |
| I.310 | Analog out 2 cfg | As for I.300 | 2 | 0 | 21 | | | 137 |
| I.311 | An out 2 offset | | 0 | -9.99 | 9.99 | | 0.01 | 138 |
| I.312 | An out 2 gain | | 1 | -9.99 | 9.99 | | 0.01 | 139 |
| I.313 | An out 2 filter | | 0 | 0 | 2.5 | sec | 0.01 | 140 |

The below table shows the analog outputs scaling.

| CODE | Variable | Full scale value (+/-10V) |
|---|---|---|
| 0 | Freq out abs | F.020 x P.080/100 [Hz] (Maximum output frequency) |
| 1 | Freq out | Same as CODE 0 |
| 2 | Output curr | 2 x D.950 [Arms] (2 x Inverter rated current) |
| 3 | Out voltage | P.061 [Vrms] (Maximum output voltage) |
| 4 | Out trq (pos) | 2 x Motor rated torque [Nm] |
| 5 | Out trq (abs) | Same as CODE 4 |
| 6 | Out trq | Same as CODE 4 |
| 7 | Out pwr (pos) | 2 x Motor rated power [W] |
| 8 | Out pwr (abs) | 2 x Motor rated power [W] |
| 9 | Out pwr | 2 x Motor rated power [W] |
| 10 | Out PF | Power factor = 1 |
| 11 | Enc freq abs | F.020 x P.080/100 [Hz] (Maximum output frequency) |
| 12 | Encoder freq | F.020 x P.080/100 [Hz] (Maximum output frequency) |
| 13 | Freq ref abs | F.020 x P.080/100 [Hz] (Maximum output frequency) |
| 14 | Freq ref | F.020 x P.080/100 [Hz] (Maximum output frequency) |
| 15 | Load current | Same as CODE 17 |
| 16 | Magn current | Same as CODE 17 |
| 17 | PID output | 100% of the PID ouput |
| 18 | DClink volt | 1111Vdc (QX2000) - 990Vdc (AGy 400…460Vac) - 1250Vdc (AGy 575Vac) |
| 19 | U current | Same as CODE 17 |
| 20 | V current | Same as CODE 17 |
| 21 | W current | Same as CODE 17 |

## Analog Outputs Exp Board

### I.350 **Exp An out 1 cfg** (Expansion analog output 1 configuration)

Reserved.

### I.351 **Exp AnOut 1 offs** (Expansion Analog Output 1 offset)

Reserved.

### I.352 **Exp AnOut 1 gain** (Expansion Analog Output 1 gain)

Reserved.

### I.353 **Exp AnOut 1 filt** (Expansion Analog Output 1 filter)

Reserved.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.350 | Exp an out 1 cfg | As for I.300 | 3 | 0 | 21 | | | 141 |
| I.351 | Exp AnOut 1 offs | | 0 | -9.99 | 9.99 | | 0.01 | 142 |
| I.352 | Exp AnOut 1 gain | | 1 | -9.99 | 9.99 | | 0.01 | 143 |
| I.353 | Exp AnOut 1 filt | | 0 | 0 | 2.5 | sec | 0.01 | 144 |

## Enabling Virtual I/O

Through a “virtual setting” via serial line or fieldbus, it is possible to use all the functions available on the digital inputs and perform a direct control of the digital and analog outputs.

The setting can be carried out in such configurations, where the digital commands are a mix of “virtual” and terminals and the outputs are a mix of “virtual” and drive function.

The virtual assignment can be performed through the parameters ***H.000…H.022*** in the **HIDDEN** menu (for further information please see this chapter).

Below are the reported the drawings describing the combination between the byte of the virtual I/Os and the drive terminals, with the relative decoder mask.

The switch between the “virtual” commands and the terminal ones and between the “virtual” output or the drive functions, is determined by programmable mask ***I.400…I.450.***

These parameters have to be managed bitwise. At each bit corresponds a switch, as follows.

| Bit value | Inputs | Outputs |
|---|---|---|
| 0 | Terminal | Drive function |
| 1 | Virtual | Virtual control |

The formula below describes the result of the virtual I/Os setting:

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

**VIRTUAL DIGITAL INPUTS CONFIGURATION**

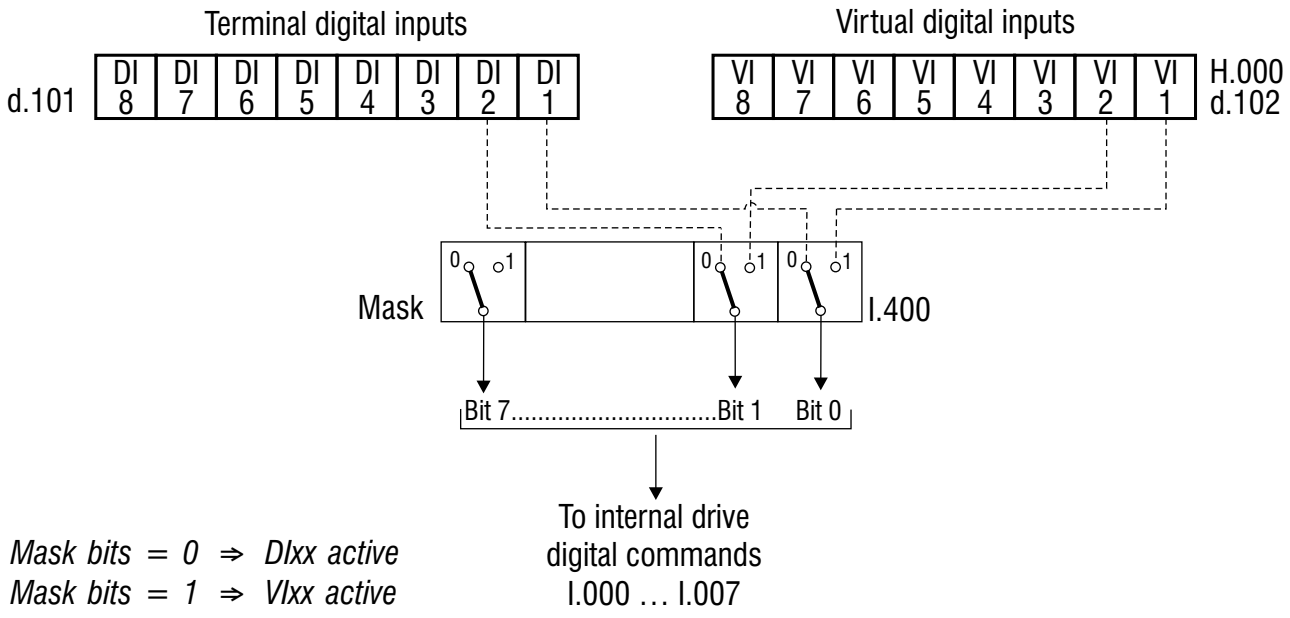



*Figure 10.4.5: Virtual digital inputs configuration*

**VIRTUAL DIGITAL OUTPUTS CONFIGURATION**

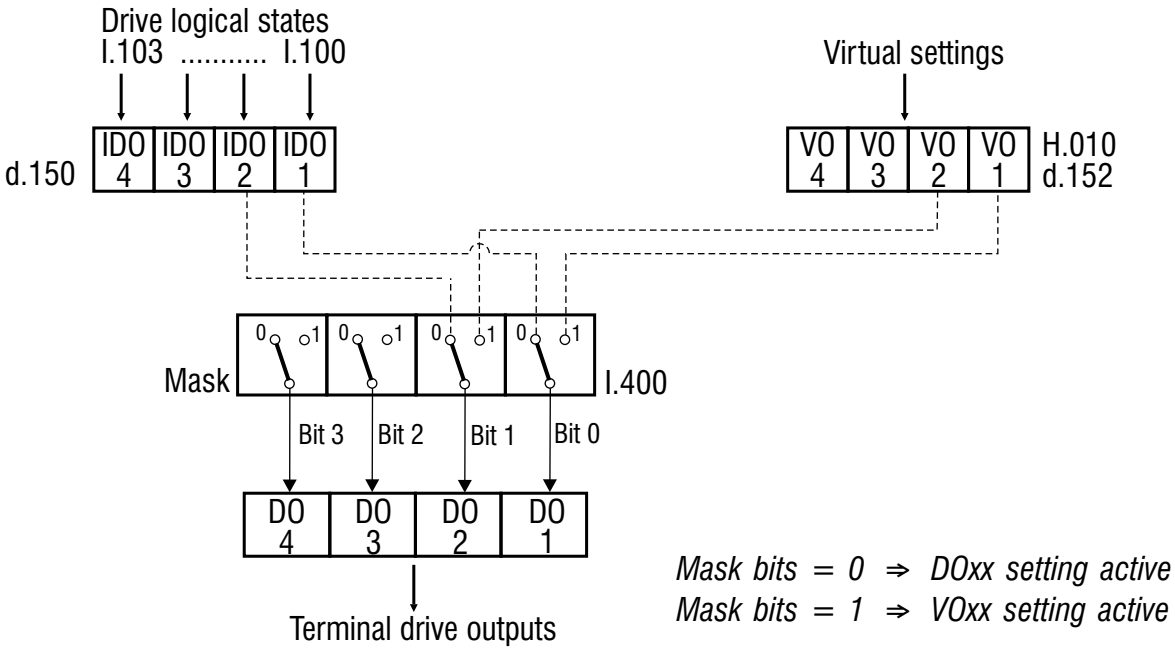



*Figure 10.4.6: Virtual digital outputs configuration*

**VIRTUAL ANALOG OUTPUTS CONFIGURATION**

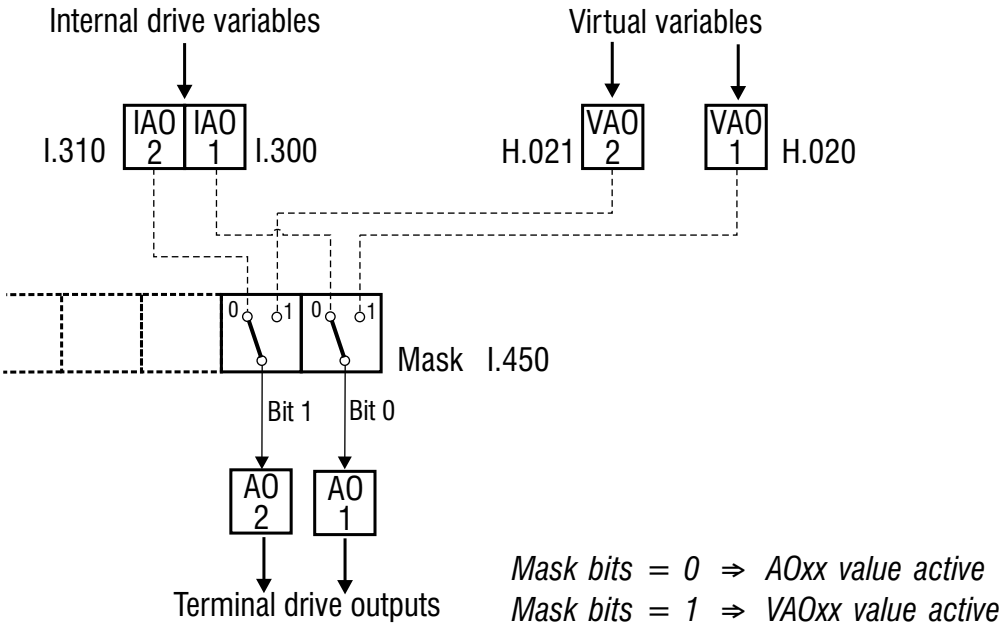



*Figure 10.4.7: Virtual analog outputs configuration*

Below are some examples about the programming of the basic function via virtual assignment.

### *A) DIGITAL INPUTS*

Programming example for:

- RUN and REVERSE commands via “virtual mode”
- EXT FAULT command via “terminal”

***P.000*** = 2 Function mode enabled
***I.400*** = 3 bit 0 and bit 1 are high (1) and bit 5 is low (0)
***I.000*** = 1 RUN (programmed on digital input 1)
***I.001*** = 2 REVERSE (programmed on digital input 2)
***I.005*** = 3 EXTERNAL FAULT (programmed on digital input 6)

Writing ***H.000*** = 1 the motor will turn in FORWARD direction
Writing ***H.000*** = 3 the motor will turn in REVERSE direction
Writing ***H.000*** = 0 the motor will STOP

Refer to chapter 7.9 for more informations on ***H.000*** parameter.
The EXTERNAL FAULT command will be applied removing the potential at the terminal 6 (programmed as digital input 6).

### *B) DIGITAL OUTPUTS*

Programming example for:

- ALARM STATE signalling on Digital output 1
- VIRTUAL FUNCTION signalling on Digital outputs

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

Digital output 1 active in accordance with the drive alarm status
Digital output 2 active if bit 1 of ***H.010*** = 1
not active if bit 1 of ***H.010*** = 0

### C) ANALOG OUTPUTS

Programming example for:

- OUTPUT FREQUENCY signalling on Analog output 1
- VIRTUAL SETTING on Analog output 2

**P.000** = 2 Function mode enabled
***I.450*** = 2 bit 1 is high (1) and bit 0 is low (0)
***I.300*** = 0 OUTPUT FREQUENCY (programmed on analog output 1)
***I.310*** = 2 ANY SELECTION (programmed on analog output 2)

Analog output 1 signal proportional to the OUTPUT FREQUENCY of the drive

Analog output 2 signal proportional to the setting of ***H.021***

***H.021****:* *+ 32767 output = +10V*

***H.021***: - 32767 output = - 10V

## I.400 Inp by serial en

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

*Bit 0 = 1 Enabled*
*Bit 1 = 2 Enabled*
*Bit 2 = 4 Enabled*
*Bit 3 = 8 Enabled*
*Bit 4 = 16 Enabled*
*Bit 5 = 32 Enabled*
*Bit 6 = 64 Enabled*
*Bit 7 = 128 Enabled*

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

Reserved.

## I.420 Out by serial en (Outputs by serial line enabling)

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

*Bit 0 = 1 Enabled*
*Bit 1 = 2 Enabled*
*Bit 2 = 4 Enabled*
*Bit 3 = 8 Enabled*

## I.430 Exp OutBySer en (Expansion Outputs by serial line enabling)

Reserved.

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

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

*Bit 0 = 1 Enabled*
*Bit 1 = 2 Enabled*

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.400 | Inp by serial en | | 0 | 0 | 255 | | | 145 |
| I.410 | Exp in by ser en | | 0 | 0 | 15 | | | 146 |
| I.420 | Out by serial en | | 0 | 0 | 15 | | | 147 |
| I.430 | Exp OutBySer en | | 0 | 0 | 3 | | | 148 |
| I.450 | An out by ser en | | 0 | 0 | 255 | | | 149 |

## Encoder Configuration

The AGy regulation terminals, include as standard the inputs for an encoder connection in order to provide feedback or an external frequency reference to the drive. The optional card **QUIX-ENC** is required for this function to be enabled on the regulation card .

The QUIX-ENC option has to be placed onto the regulation card , through two micro-connectors (JP16 and JP18, the insertion position is fixed ). This card, is necessary to enable the encoder pulses reading.

Being possible to use encoders with **HTL** logic (+15Vc…+24Vdc) or **TTL** logic (+5Vdc), the HW has to be adapted for the proper signals level.

This setting has to be carried out on the optional card, setting the two micro-switches as follows:

Encoder with HTL logic: switch 1 OFF - switch 2 OFF (FACTORY SETTING)

Encoder with TTL logic: switch 1 ON - switch 2 ON

***NOTE!*** - On the drive regulation terminal, it is available the +24Vdc, which can be used for a HTL encoder supply..
- Using a TTL encoder, the supply has to be externally provided, not being available on the drive the +5Vdc.

***NOTE!*** Maximum encoder frequency input: 50 kHz.

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

### I.500 **Encoder enable** (Encoder enabling)

Enabling of the encoder feedback management.

### I.501 **Encoder ppr** (Encoder pulses)

Setting of the encoder nameplate pulses per revolution.

### I.502 **Enc channels cfg** (Encoder channels configuration)

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

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

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

### I.504 **Enc update time** (Encoder update time)

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

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

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

$$F_{mot}[Hz] = N_{imp}[ppr] \times \frac{P.041\ [polepairs]}{I.501\ [ppr] \times I.503\ [fact] \times I.504\ [s]} \times \frac{1}{Ec}$$

$$N_{imp}[ppr] = \frac{F_{mot}[Hz] \times I.501[ppr] \times I.503\ [fact] \times I.504\ [s]}{P.041\ [polepairs]} \times \frac{1}{Ec}$$

$$N[rpm] = \frac{60\ [s] \times f\ [Hz]}{2p\ [polepairs]} \qquad f\ [Hz] = \frac{n\ [rpm] \times 2p\ [polepairs]}{60\ [s]}$$

Where:

**$F_{mot}$** Motor frequency, detected by the encoder

**N imp** is the pulses number, measured in the period set in ***I.504*** (displayed as ***d.300***)

**Ec = 1** (Ec = encoder channel) when a single channel encoder is selected in ***I.502***

**Ec = ¼** (Ec = encoder channel) when a double channel encoder is selected in ***I.502***

The accuracy of **$F_{mot}$** depends on the number of pulses counted: its value is **1/N imp**. At low speed the accuracy could be reduced

***NOTE!*** The setting ***N imp (I.504)*** depends on the encoder pulses and from the application to carry out.

When the pulses of the encoder used is low (200…600 pulses/rev), the ***I.504*** has to be set with a high value, in order to obtain a good average value of the signal (eg: when used for monitoring the speed on an analog output).

Using an encoder with an higher number of pulses (1000…4096 pulses/rev), the setting of ***I.504*** can be set to the minimum values, in order to increase the sampling speed (eg. for closing the speed loop with the PID function).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.500 | Encoder enable | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 150 |
| I.501 | Encoder ppr | | 100 | 1 | 9999 | | | 151 |
| I.502 | Enc channels cfg | [0] One Channel<br>[1] Two Channels | 0 | 0 | 1 | | | 152 |
| I.503 | Enc spd mul fact | | 1 | 0.01 | 99.99 | | 0.01 | 153 |
| I.504 | Enc update time | | 0.1 | 0 | 25 | sec | 0.1 | 154 |

## Serial Configuration

Through the serial line, all the parameters and variables can be written and read.

When control of the main command through serial line is needed, it is necessary to set the ***Cmd source sel (P.000)*** as follows:

**P.000 = 2** Terminal or Virtual

**P.000 = 3** Serial

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

### I.600 Serial link cfg (Serial link configuration)

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

DEFAULT VALUE = 4 (Modbus protocol)

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

It defines the Baud rate (bit per second) concerning the serial line communication speed.
The selection is through the following code:

## I.602 Device address

Address at which the drive can be accessed if it is networked via the RS485 interface.
The range of the selectable addresses is between **0** and **99.**
It is possible to perform a Multidrop configuration with a maximum of 20 devices.

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

Minimum delay setting between the reception of the last byte and the start of its answer.
The delay will help avoid conflicts on the serial line, when the RS485 interface is not preset for an automatic Tx/Rx communication.
The ***Ser answer delay (I.603)*** parameter is specific for the standard serial line RS485.

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

## I.604 **Serial timeout** (Serial link timeout)

It sets the time that elapses between the sending/receiving of a byte and the next one.
If this time is longer than the setting and no byte is detected (sending/receiving), the action will be the one programmed in the parameter ***I.605***
The alarm won't be active when set at 0 second.

It will be displayed with the message "St".

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

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

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

Setting of the behaviour for Serial time out alarm.

**I.605 = 0** Signalling of the alarm on a digital output (programmed to this purpose)
**I.605 = 1** Drive in alarm and signalling on a digital output (programmed to this purpose)

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.600 | Serial link cfg | [0] FoxLink 7E1 | 4 | 0 | 5 | | | 155 |
| | | [1] FoxLink 701 | | | | | | |
| | | [2] FoxLink 7N2 | | | | | | |
| | | [3] FoxLink 8N1 | | | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | [4] ModBus 8N1 | | | | | | |
| | | [5] JBus 8N1 | | | | | | |
| I.601 | Serial link bps | [0] 600 baud | 4 | 0 | 9 | | | 156 |
| | | [1] 1200 baud | | | | | | |
| | | [2] 2400 baud | | | | | | |
| | | [3] 4800 baud | | | | | | |
| | | [4] 9600 baud | | | | | | |
| | | [5] 19200 baud | | | | | | |
| | | [6] 38400 baud | | | | | | |
| | | [7] 57600 baud | | | | | | |
| | | [8] 76800 baud | | | | | | |
| | | [9] 115200 baud | | | | | | |
| I.602 | Device address | | 1 | 0 | 99 | | 1 | 157 |
| I.603 | Ser answer delay | | 1 | 0 | 250 | msec | 1 | 158 |
| I.604 | Serial timeout | | 0 | 0 | 25 | sec | 0,1 | 159 |
| I.605 | En timeout alm | [0] Disable | | | | | | 160 |
| | | [1] Enable | | | | | | |

## Options Configuration

### I.700 Option 1 type

Reserved.

### I.701 Option 2 type

Reserved.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| I.700 | Option 1 type | [0] Board Off | 0 | 0 | 4 | | | 161 |
| | | [1] Board master | | | | | | |
| | | [2] IO Board | | | | | | |
| | | [3] Board free | | | | | | |
| | | [4] SBI Board | | | | | | |
| I.701 | Option 2 type | [0] Board Off | 0 | 0 | 4 | | | 162 |
| | | [1] Board master | | | | | | |
| | | [2] IO Board | | | | | | |
| | | [3] Board free | | | | | | |
| | | [4] SBI Board | | | | | | |

## SBI Configuration

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

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

## I.750 SBI Address

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

## I.751 CAN baudrate

CAN Open baudrate.

## I.752 SBI Profibus Mode

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

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

| | |
|---|---|
| ***PP0-0*** | **User defined structure** |
| ***PP0-1…PP0-4*** | Structures in accordance with ***Profidrive profile*** |

## I.753 SBI CAN Mode

Selection of the fieldbus protocol for:

***I.753*** = 0 CANOpen
***I.753*** = 1 DeviceNet

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

A communication drop with the fieldbus master, is detected by the SBI card.
This parameter allows the setting of a delay for the intervention of the BUS FAULT alarm.

If the communication is restored within this time, the drive will continue working. If this time is elapsed and the communication is still missing, an alarm will occur stopping the drive.

During this stage, the information data (received and sent) are frozen at the status precedent the communication drop.
At the restoring of the transmission, the first data sent and received will be the one frozen.

## I.760 **SBI to Drv W 0** (SBI to Drive Word 0)

## I.761 **SBI to Drv W 1** (SBI to Drive Word 1)

## I.762 **SBI to Drv W 2** (SBI to Drive Word 2)

## I.763 **SBI to Drv W 3** (SBI to Drive Word 3)

## I.764 **SBI to Drv W 4** (SBI to Drive Word 4)

## I.765 **SBI to Drv W 5** (SBI to Drive Word 5)

## I.770 **Drv to SBI W 0** (Drive to SBI Word 0)

## I.771 **Drv to SBI W 1** (Drive to SBI Word 1)

## I.772 **Drv to SBI W 2** (Drive to SBI Word 2)

## I.773 **Drv to SBI W 3** (Drive to SBI Word 3)

## I.774 **Drv to SBI W 4** (Drive to SBI Word 4)

## I.775 **Drv to SBI W 5** (Drive to SBI Word 5)

Setting of the “word exchange” between drive and SBI card and vice versa.
The data exchanging structure is available as a 6 words format.

In each word the parameters reading or writing, has to be addressed setting the relative number of IPA.

| Code | Name | Selection | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| I.750 | SBI address | | | 3 | 0 | 255 | | | 163 |
| I.751 | CAN baudrate | [0] | 10 KHz | 5 | 0 | 6 | | | 164 |
| | | [1] | 20 KHz | | | | | | |
| | | [2] | 50 KHz | | | | | | |
| | | [3] | 125 KHz | | | | | | |
| | | [4] | 250 KHz | | | | | | |
| | | [5] | 500 KHz | | | | | | |
| | | [6] | 1000 KHz | | | | | | |
| I.752 | SBI Profibus mod | [0] Custom | | 2 | 0 | 4 | | | 165 |
| | | [1] PPO1 | | | | | | | |
| | | [2] PPO2 | | | | | | | |
| | | [3] PPO3 | | | | | | | |
| | | [4] PPO4 | | | | | | | |
| I.753 | SBI CAN mode | [0] OFF | | 0 | 0 | 2 | | | 166 |
| | | [1] CAN Open | | | | | | | |
| | | [2] DeviceNet | | | | | | | |
| I.754 | Bus Flt Holdoff | | | 0 | 0 | 60 | sec | 0.1 | 179 |
| I.760 | SBI to Drv W 0 | | | 0 | 0 | 1999 | | | 167 |
| I.761 | SBI to Drv W 1 | | | 0 | 0 | 1999 | | | 168 |
| I.762 | SBI to Drv W 2 | | | 0 | 0 | 1999 | | | 169 |
| I.763 | SBI to Drv W 3 | | | 0 | 0 | 1999 | | | 170 |
| I.764 | SBI to Drv W 4 | | | 0 | 0 | 1999 | | | 171 |
| I.765 | SBI to Drv W 5 | | | 0 | 0 | 1999 | | | 172 |
| I.770 | Drv to SBI W 0 | | | 1 | 0 | 1999 | | | 173 |
| I.771 | Drv to SBI W 1 | | | 2 | 0 | 1999 | | | 174 |
| I.772 | Drv to SBI W 2 | | | 3 | 0 | 1999 | | | 175 |
| I.773 | Drv to SBI W 3 | | | 4 | 0 | 1999 | | | 176 |
| I.774 | Drv to SBI W 4 | | | 5 | 0 | 1999 | | | 177 |
| I.775 | Drv to SBI W 5 | | | 6 | 0 | 1999 | | | 178 |

| | | | | | |
|---|---|---|---|---|---|
| I.771 | Drv to SBI W 1 | 2 | 0 | 1999 | 174 |
| I.772 | Drv to SBI W 2 | 3 | 0 | 1999 | 175 |
| I.773 | Drv to SBI W 3 | 4 | 0 | 1999 | 176 |
| I.774 | Drv to SBI W 4 | 5 | 0 | 1999 | 177 |
| I.775 | Drv to SBI W 5 | 6 | 0 | 1999 | 178 |

## 10.5 Menu F - FREQ & RAMPS

The drawing below, describes the logic for the "Reference selection".

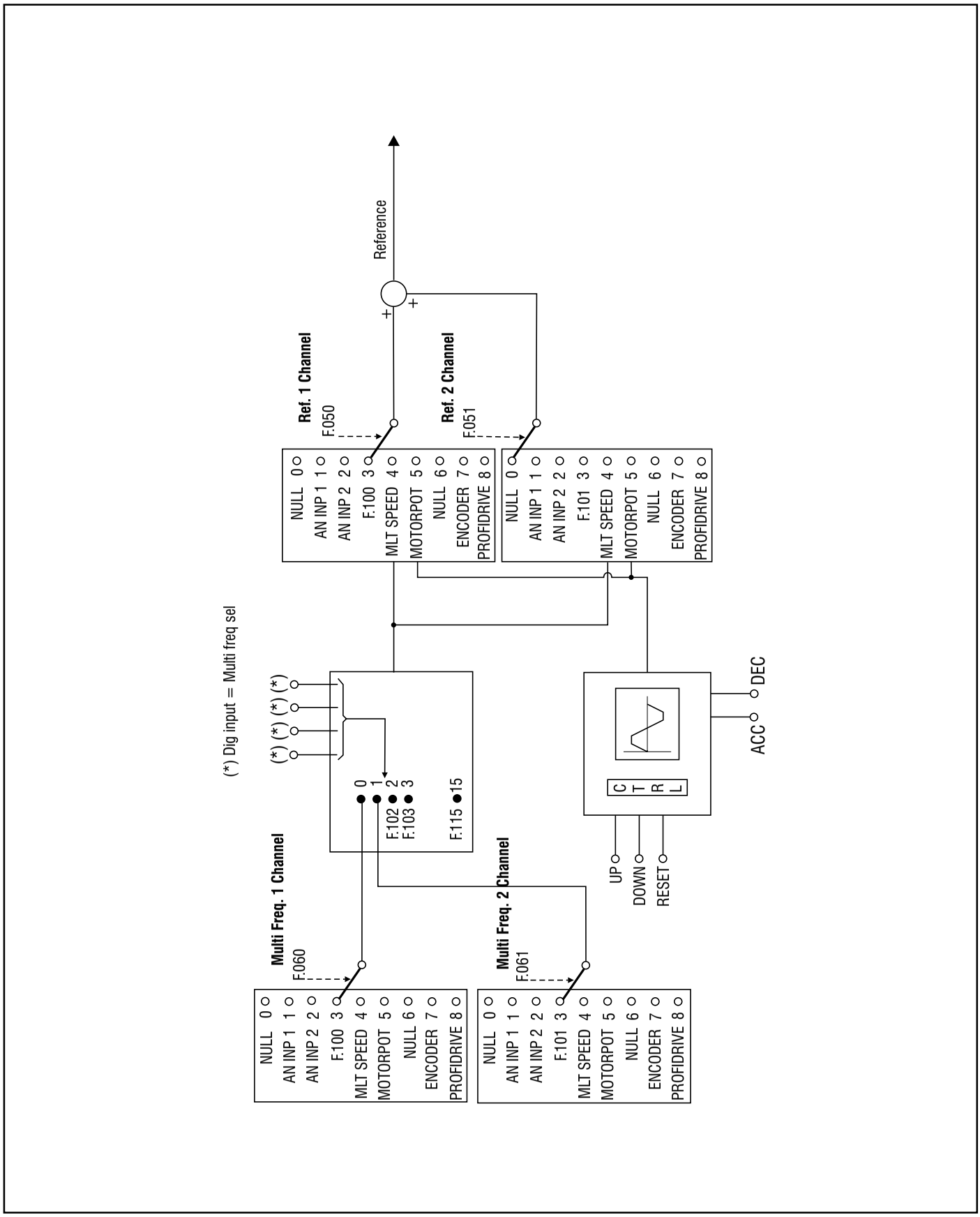



*Figure 10.5.1: Reference Selection*

## Motorpotentiometer

### F.000 **Motorpot ref** (Motorpotentiometer reference)

When this parameter is shown, the UP and DOWN keys are activated to increase or decrease the frequency value.
Pressing the UP and DOWN Keys will cause the motor to increase or decrease its speed respectively until the keys are released.
The maximum value settable is correlated to ***Max ref freq (F.020).***

To START the motor it is necessary a RUN command.

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

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

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

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

### F.011 **Motorpot offset** (Motorpotentiometer offset)

Giving the RUN command, the motor will rich automatically the frequency set (offset) following the ramp time.
The **Motorpot up** command will be effect starting from this value, which represent the frequency minimum value attainable by **Morotpot down** command.

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

### F.012 **Mp output mode** (Motorpotentiometer output mode)

It defines positive and/or negative settings of the Motorpotentiometer reference value.
In either setting the HW Reverse command is active (when enabled).

### F.013 **Mp auto save** (Motorpotentiometer auto save)

Enabling this function will cause the Motorpot reference to be continuously saved into non-volatile memory. At power on, the reference will start from the last saved value.
Disabling this function will cause the Motorpot reference to be always zero after power-on.
Saving drive parameters by command ***C.000*** (or ***S.901***) will not save the Motorpot ref value.

| Code | display | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.000 | Motorpot ref | | 0 | 0 | F.020 | Hz | 0.01 | 300 |
| F.010 | Acc/Dec time mp | | 10 | 0.1 | 999.9 | sec | 0.1 | 301 |
| F.011 | Motorpot offset | | 0 | 0 | 50 | Hz | 0.1 | 302 |
| F.012 | Mp output mode | [0] Unipolar | 0 | 0 | 1 | | | 303 |
| | | [1] Bipolar | | | | | | |
| F.013 | Mp auto save | [0] Disable | 1 | 0 | 1 | | | 304 |
| | | [1] Enable | | | | | | |

## Reference Limits

### F.020 **Max ref freq** (Maximun reference frequency)

It is the maximum speed for both directions.
This parameter applies to the sum of the different reference value available on the drive (***Reference 1*** and ***Reference 2***).

### F.021 **Min ref freq** (Mimimun reference frequency)

It defines the minimum frequency value, under which any regulation with analog or digital references has no effect.
The START of the motor will be carried out (with the ramp delay) at this frequency value also with null reference.
As described in the following figure, this behaviour is correlated also to the setting of ***Min output freq (P.081).***

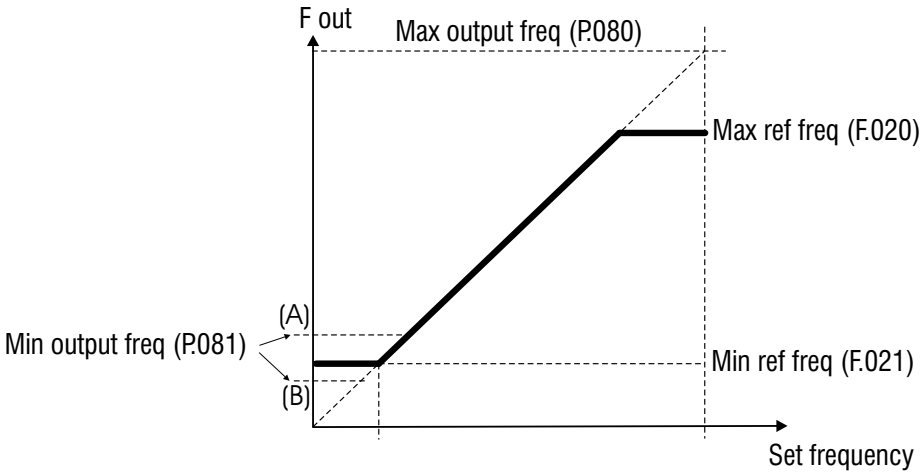



*Figure 10.5.2: Min & Max Reference Frequency*

### *Drive behaviour around minimum values*

***P.081*** settings in A condition

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

• The reference action on the frequency curve, will have effect starting from the setting value of ***P.081*** parameter.

***P.081*** settings in B condition

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

• The increasing of the reference will have effect on the frequency output, starting from the setting value of ***F.021*** parameter (the variation will follow the setting of acceleration ramp time).

• The reference action on the frequency curve, will have effect starting from the setting value of ***F.021*** parameter.

The ***Max output freq (P.080)*** and the ***Min output freq (P.081)*** are expressed as percentage of the values of ***Max ref freq (F.020).***

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.020 | Max ref freq | | (****) | 25 | 500 | Hz | 0.1 | 305 |
| F.021 | Min ref freq | | 0 | 0 | F.020 | Hz | 0.1 | 306 |

(****) parameter value depending on drive type.

## Reference Sources

### F.050 Ref 1 Channel (Reference 1 channel)

### F.051 Ref 2 Channel (Reference 2 channel)

As shown in the figure 7.5.1, the Sources from which the 2 speed references are provided and controlled, can be chosen by following the table below.
The value of the 2 references, will always be an algebric sum.

### F.060 Mlt Frq Channel 1 (Multi frequency channel 1)

### F.061 Mlt Frq Channel 2 (Multi frequency channel 2)

These parameters allow to select the source, from where the **First** and **Second** frequency reference of the ***Multispeed function***, can be provided and controlled (See figure 7.5.1).

The source can be chosen the following parameters the table below.

| Code | display | [Code] select. | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| F.050 | Ref 1 channel | [0] Null | | 3 | 0 | 8 | | | 307 |
| | | [1] Analog inp 1 | (setting through ***I.200…I.204***) | | | | | | |
| | | [2] Analog inp 2 | (setting through ***I.210…I.214***) | | | | | | |
| | | [3] Freq ref x | (setting through ***S.203 or F.100***) | | | | | | |
| | | [4] Multispeed | (setting through ***F.100…F.116***) | | | | | | |
| | | [5] Motorpotent | (setting through ***F.000…F013***) | | | | | | |
| | | [6] Analog inp 3 | (setting through ***I.220…I.224***) | | | | | | |
| | | [7] Encoder | (setting through ***I.500…I.505***) | | | | | | |
| | | [8] Profidrive | Reference by Profibus | | | | | | |
| F.051 | Ref 2 channel | [0] Null | | 0 | 0 | 8 | | | 308 |
| | | [1] Analog inp 1 | (setting through ***I.200…I.204***) | | | | | | |
| | | [2] Analog inp 2 | (setting through ***I.210…I.214***) | | | | | | |
| | | [3] Freq ref x | (setting through ***F.101***) | | | | | | |
| | | [4] Multispeed | (setting through ***F.100…F.116***) | | | | | | |
| | | [5] Motorpotent | (setting through ***F.000…F013***) | | | | | | |
| | | [6] Analog inp 3 | (setting through ***I.220…I.224***) | | | | | | |
| | | [7] Encoder | (setting through ***I.500…I.505***) | | | | | | |
| | | [8] Profidrive | Reference by Profibus | | | | | | |
| F.060 | MltFrq channel 1 | As for F.050, Ref 1 channel | | 3 | 0 | 7 | | | 309 |
| F.061 | MltFrq channel 2 | As for F.051, Ref 2 channel | | 3 | 0 | 7 | | | 310 |

## Multispeed Function

### F.100 Frequency Ref 0 (Multi frequency channel 1)

. .
. .
. .

### F.115 Frequency Ref 15 (Multi frequency channel 15)

It is possible to select up to 16 frequencies, whose value can be set in these parameters.
The selection of these frequencies can be performed through a binary setting of 4 programmable digital inputs.

The limit of the output frequency will be clamped by ***Max ref freq (F.020)***.
The following table describes the basis sequence of the binary setting, for a complete Multispeed selection.

| Active Dig ref frequency | Freq sel 1 | Freq sel 2 | Freq sel 3 | Freq sel 4 |
|---|---|---|---|---|
| **F.100 (Freq Ref 0)** | 0 | 0 | 0 | 0 |
| **F.101 (Freq Ref 1)** | 1 | 0 | 0 | 0 |
| **F.102 (Freq Ref 2)** | 0 | 1 | 0 | 0 |
| **F.103 (Freq Ref 3)** | 1 | 1 | 0 | 0 |
| **F.104 (Freq Ref 4)** | 0 | 0 | 1 | 0 |
| **F.105 (Freq Ref 5)** | 1 | 0 | 1 | 0 |
| **F.106 (Freq Ref 6)** | 0 | 1 | 1 | 0 |
| **F.107 (Freq Ref 7)** | 1 | 1 | 1 | 0 |
| **F.108 (Freq Ref 8)** | 0 | 0 | 0 | 1 |
| **F.109 (Freq Ref 9)** | 1 | 0 | 0 | 1 |
| **F.110 (Freq Ref 10)** | 0 | 1 | 0 | 1 |
| **F.111 (Freq Ref 11)** | 1 | 1 | 0 | 1 |
| **F.112 (Freq Ref 12)** | 0 | 0 | 1 | 1 |
| **F.113 (Freq Ref 13)** | 1 | 0 | 1 | 1 |
| **F.114 (Freq Ref 14)** | 0 | 1 | 1 | 1 |
| **F.115 (Freq Ref 15)** | 1 | 1 | 1 | 1 |

avy4210

DEFAULT SETTINGS:
**I.000** - **Digital Input 1** (terminal 22) = 7 programmed as **Freq sel 1**
**I.001** - **Digital Input 2** (terminal 23) = 8 programmed as **Freq sel 2**
**I.002** - **Digital Input 3** (terminal 24) = 9 programmed as **Freq sel 3**

***NOTE!*** "Freq sel 4" is one of the selection of the digital input, but it is not factory preset .

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

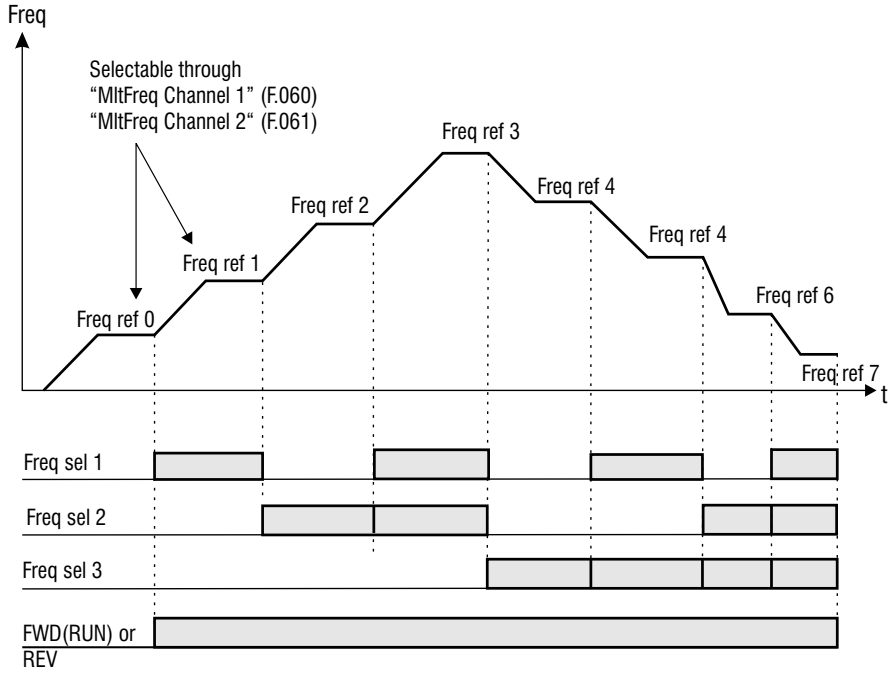



*Figure 7.5.3: Multispeed Frequencies*

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.100 | Frequency ref 0 | | 0 | -F.020 | F.020 | Hz | 0.1 | 311 |
| F.101 | Frequency ref 1 | | 0 | -F.020 | F.020 | Hz | 0.1 | 312 |
| F.102 | Frequency ref 2 | | 0 | -F.020 | F.020 | Hz | 0.1 | 313 |
| F.103 | Frequency ref 3 | | 0 | -F.020 | F.020 | Hz | 0.1 | 314 |
| F.104 | Frequency ref 4 | | 0 | -F.020 | F.020 | Hz | 0.1 | 315 |
| F.105 | Frequency ref 5 | | 0 | -F.020 | F.020 | Hz | 0.1 | 316 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| F.106 | Frequency ref 6 | 0 | -F.020 | F.020 | Hz | 0.1 | 317 |
| F.107 | Frequency ref 7 | 0 | -F.020 | F.020 | Hz | 0.1 | 318 |
| F.108 | Frequency ref 8 | 0 | -F.020 | F.020 | Hz | 0.1 | 319 |
| F.109 | Frequency ref 9 | 0 | -F.020 | F.020 | Hz | 0.1 | 320 |
| F.110 | Frequency ref 10 | 0 | -F.020 | F.020 | Hz | 0.1 | 321 |
| F.111 | Frequency ref 11 | 0 | -F.020 | F.020 | Hz | 0.1 | 322 |
| F.112 | Frequency ref 12 | 0 | -F.020 | F.020 | Hz | 0.1 | 323 |
| F.113 | Frequency ref 13 | 0 | -F.020 | F.020 | Hz | 0.1 | 324 |
| F.114 | Frequency ref 14 | 0 | -F.020 | F.020 | Hz | 0.1 | 325 |
| F.115 | Frequency ref 15 | 0 | -F.020 | F.020 | Hz | 0.1 | 326 |

### F.116 Jog frequency

It is the frequency reference for the JOG speed.
This speed is activated through a programmed digital input.
The RUN command via terminal must not be given. This command will enable the main frequency reference.

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

The setting of the JOG reference value, can be either positive or negative.
In both the setting the HW Reverse command is active (when enabled).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.116 | Jog frequency | | 1 | -500 | 500 | Hz | 0.1 | 327 |

## Ramp Configuration

### F.200 Ramps resolution

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

| Code | LCD display | [Code] & LCD select. | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| F.200 | Ramp resolution | [0] 0.01s | (From 0.01s to 99.99s) | 1 | 0 | 2 | | | 328 |
| | | [1] 0.1s | From (0.1s to 999.99s) | | | | | | |
| | | [2] 1s | From (1s to 9999s) | | | | | | |

### F.201 **Acc time 1** (Acceleration time 1)

### F.202 **Dec time 1** (Deceleration time 1)

### F.203 **Acc time 2** (Acceleration time 2)

### F.204 **Dec time 2** (Deceleration time 2)

### F.205 **Acc time 3** (Acceleration time 3)

### F.206 **Dec time 3** / **FS** (Deceleration time 3)

### F.207 **Acc time 4** (Acceleration time 4)

### F.208 **Dec time 4** (Deceleration time 4)

***NOTE!*** When the JOG function is activated, ***Acc time 4 (F.207)*** and ***Dec time 4 (F.208)*** are selected automatically.

When the "FAST STOP" is activated (through digital input command), the function is executed with the DEC TIME 3 delay.

The ramp control can be set for a programmable delay for the acceleration and deceleration times of the drive reference. This delay time will have to be set on the final system (motor and load), being strictly dependant from the inertia of the load machine.
The time values are expressed in seconds. The ramps time delay are calculated in accordance with the ***Max ref freq (F.020).***
It is possible to select up to 4 different time, whose value can be set in these parameters.
The selection of these ramps can be performed through a binary setting of 2 digital inputs, programmed as **Ramp sel 1** and **Ramp sel 2**.

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

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

avy4220

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.201 | Acc time 1 | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 329 |
| F.202 | Dec time 1 | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 330 |
| F.203 | Acc time 2 | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 331 |
| F.204 | Dec time 2 | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 332 |
| F.205 | Acc time 3 | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 333 |
| F.206 | Dec time 3 / FS | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 334 |
| F.207 | Acc time 4 / Jog | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 335 |
| F.208 | Dec time 4 / Jog | | 5 | 0.1(***) | 999.9(***) | sec | 0.1 (***) | 336 |

(***) value depends on the setting of ***F.200*** parameter.

## F.250 Ramp S-shape

The S-shaped ramp can be useful to obtain a smooth behaviour of the system during the end of the acceleration or close to the zero speed during the deceleration.
The value (in seconds) of the S-shaped ramp is added to the ramp time of the linear profile.
The ramp time is thus lengthened by the value of the S-curve constant.

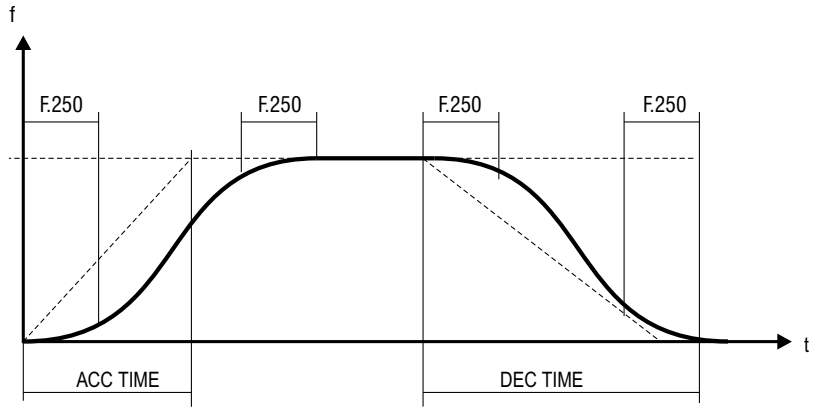



*Figure 10.5.4: Ramp S-shape*

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.250 | Ramp S-shape | | 0 | 0 | 10 | sec | 0.1 | 337 |

### F.260 **Ramp extens src** (Ramp extension source)

When an extension of the set ramps time is needed, it can be achieved through the Analog Inputs.
This extension will change linearly according to the value applied on the Analog Input.
The function allows the ramp times extension in a range includes between multiply factor 1 (0V, 0mA o 4mA) and multiply factor 10 (+/-10V o 20mA).

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

| Code | LCD display | [Code] & LCD select. | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| F.260 | Ramp extens src | [0] Null | | 0 | 0 | 3 | | | 338 |
| | | [1] Analog inp 1 | (setting through I.**200**…I.**204**) | | | | | | |
| | | [2] Analog inp 2 | (setting through I.**210**…I.**214**) | | | | | | |
| | | [3] Analog inp 3 | (setting through I.**220**…I.**224**) | | | | | | |

## Jump Frequencies

### F.270 Jump amplitude

### F.271 Jump frequency1

### F.272 Jump frequency2

In a system composed by motor and drive, at certain frequencies values, it is possible to meet the generation of noisy vibrations, characterized by mechanical resonances.

Through the parameters ***F.271*** and ***F.272***, it is possible to avoid the working of the inverter around the frequencies here set.
The parameter ***F.270*** defines the tolerance band of the critical zone.

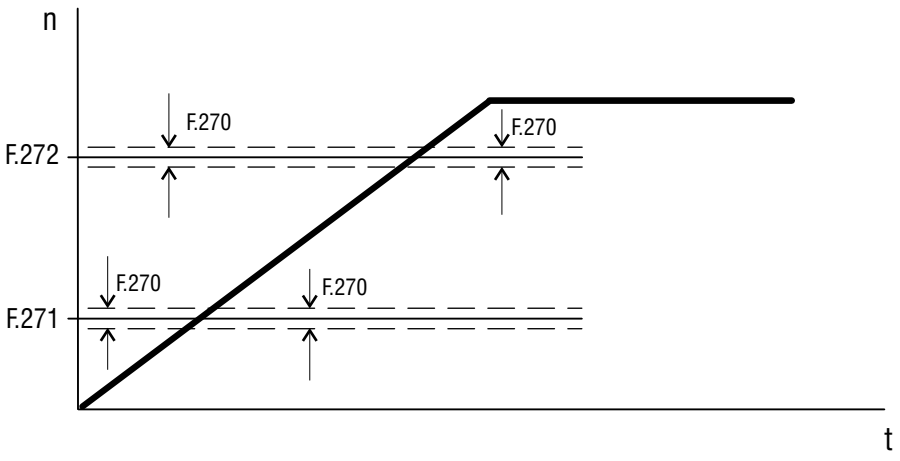



*Figure 10.5.5: Jump Frequencies*

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

Example:
**A)** Increasing the reference from lower value of ***F.271*** or ***F.272***

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

***F.270*** = 1Hz (tolerance band: 29Hz….31Hz)
Setting of frequency reference = 29,5Hz
Frequency output = 29Hz
Setting of frequency reference = 30,5Hz
Frequency output = 29Hz

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

***F.271*** = 30Hz (first forbidden frequency threshold)
***F.270*** = 1Hz (tolerance band: 29Hz….31Hz)

Setting of frequency reference = 30,5Hz
Frequency output = 31Hz

Setting of frequency reference = 29,5Hz
Frequency output = 31Hz

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

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| F.270 | Jump amplitude | | 0 | 0 | 100 | Hz | 0.1 | 339 |
| F.271 | Jump frequency 1 | | 0 | 0 | 100 | Hz | 0.1 | 340 |
| F.272 | Jump frequency 2 | | 0 | 0 | 100 | Hz | 0.1 | 341 |

## 10.6 Menu P - PARAMETERS

### Commands

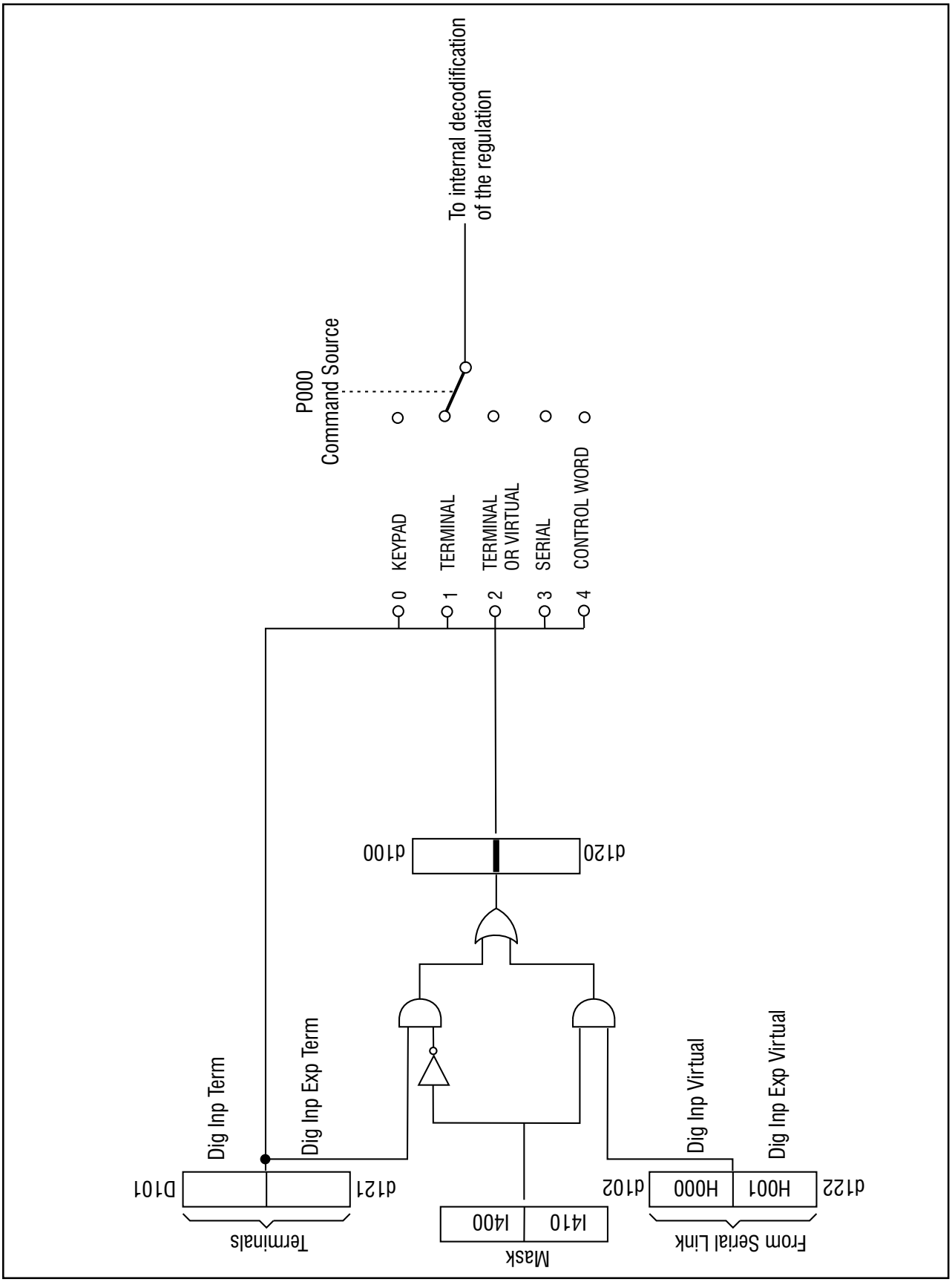



*Figure 10.6.1: Basic Commands Logic Selection*

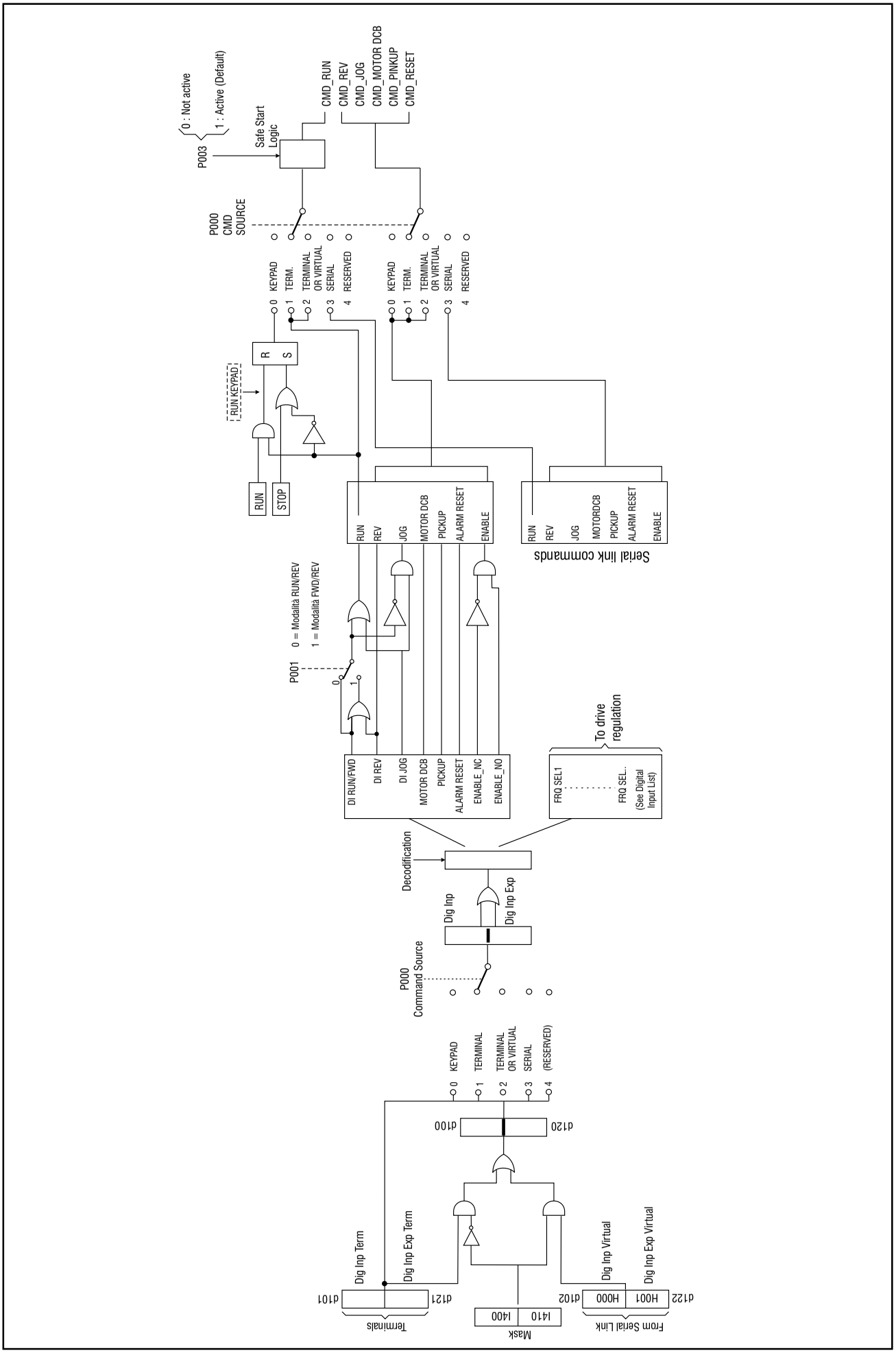



*Figure 10.6.2: Main Commands Logic Selection*

## **P.000 Cmd source sel** (Command source selection)

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

**P.000 = 0 START & STOP via keypad**
In this configuration the commands are active through the keypad buttons.

START button STOP button

The Digital Input 7, factory programmed as RUN (terminal 5), must be connected to a specific logic level (high level or low level) in order to allow the motor START.

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

**P.000 = 1 START & STOP via terminals**
In this configuration the commands are active through the terminals.

The motor START can be performed applying the specific logic level (high level or low level), to the Digital Input 7 (terminal 5), factory set as RUN.
If this connection is removed, the motor will STOP with the set ramp time.

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

***NOTE!*** The command **Drive enable** available as a selection of the digital inputs, adds additional safety logic for the motor running sequences.
The releasing of it, will produce a coast to stop of the motor. (see chapter **INTERFACE**, section **Digital inputs**).

***P.000 = 2 Main commands & I/Os setting via virtual channels or terminals***
In this configuration, the commands programmable on the digital inputs or the signalling of the digital and analog outputs, can be assigned as follows:

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

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

Further information about this function, can be found in the chapters:
**INTERFACE** section **Enabling Virtual I/O**
Commands addressing is described in the chapter **HIDDEN**

***P.000 = 3 START & STOP & main commands via Serial line (SERIAL)***
It define the selection of the main commands exclusively via serial line or filedbus.

***NOTE!*** Commands via terminal strip are not required.

Further information about the serial line, can be found in the chapters:
**INTERFACE** section **Serial configuration**
Commands addressing is described in the chapter **HIDDEN,** section **Commands** for serial link.

***P.000 = 4 Main commands & I/Os setting through Control word bits of Profidrive***
It allows the selection of the main commands exclusively via Profidrive (optional field bus).

## **P.001 RUN input config** (RUN input configuration)

Definition of the RUN and Reverse logic control.

**P.001 = 0**
FWD (clockwise direction) with terminal **RUN = ON**
REV (anti-clockwise direction) with terminal **RUN = ON** and terminal **REV = ON**
**P.001 = 1**
FWD (clockwise direction) with terminal **RUN = ON**
REV (anti-clockwise direction) with terminal **RUN = OFF** and terminal **REV = ON**

## P.002 Reversal enable

Block of the command direction of the motor.

**P.002 = 0**
REV (anti-clockwise direction) **DISABLED**
**P.002 = 1**
REV (anti-clockwise direction) **ENABLED**
The function will be applied at any kind of REV logical command (digital input, negative reference and serial line).

## P.003 Safety

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

***P.003 = 0*** RUN command via a Level sensitive signal.
At the drive power on, the starting of the motor is allowed when the RUN command is already present on terminal strip.

***P.003 = 1*** RUN command via an Edge sensitive signal.
At the drive power on, the starting of the motor is not allowed when the RUN command is already present on terminal strip.
The starting of the motor can be execute cycling RUN command.

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

## P.004 Stop mode

Motor stop control function.
**P.004 = 0** The control sets the motor ramp deceleration up to 0 Hz.
**P.004 = 1** The control cuts off the output voltage, so the motor coasts to stop.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.000 | Cmd source sel | [0] Keypad<br>[1] Terminals<br>[2] Virtual<br>[3] Serial<br>[4] Control word | 1 | 0 | 4 | | | 400 |
| P.001 | RUN input config | [0] Run / Rev<br>[1] Fwd / Rev | 0 | 0 | 1 | | | 401 |
| P.002 | Reversal enable | [0] Disable<br>[1] Enable | 1 | 0 | 1 | | | 402 |
| P.003 | Safety | [0] OFF<br>[1] ON | 1 | 0 | 1 | | | 403 |
| P.004 | Stop mode | [0] In ramp<br>[1] Ramp to stop | 0 | 0 | 1 | | | 493 |

## Power Supply

### P.020 Mains voltage

Rated value of the line voltage [$V_{rms}$].
The undervoltage trip function is based on this value (see also chapter **PARAMETERS,** function **Undervoltage configuration**).

### P.021 Mains frequency

Rated value of the line voltage frequency [Hz].

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.020 | Mains voltage | 230<br>400<br>460 | (****) | 230 | 575 | V | | 404 |
| P.021 | Mains frequency | 50<br>60 | (****) | 50 | 60 | Hz | | 405 |

(****) parameter value depending on drive type.

## Motor Data

### P.040 Motor rated curr (Motor rated current)

Rated current [$A_{rms}$] of the motor at rated kilowatt/horsepower and voltage (given on the nameplate, see figure 7.6.3).
In case of control with multiple motors, enter a value equal to the sum of the rated currents of all the motors.
Do not perform any self tune.

### P.041 Motor pole pairs

Pole pairs of the motor. The setting of this data, can be easily calculated with the following formula:

$$N[rpm] = \frac{60\ [s] \times f\ [Hz]}{2p\ [polepairs]}$$

Example: calculation of the pole pairs of a motor having the data shown in the above label:

$$p\ [polepairs] = \frac{60\ [s] \times f\ [Hz]}{n_N\ [rpm]} = \frac{60\ [s] \times 60\ [Hz]}{1750\ [rpm]} = 2$$

the value to set in the parameter ***P.041*** is "2".

Where: p = motor pole pairs; f = rated motor frequency (***P.062***); $n_N$ = rated motor speed (see figure 7.6.3)

### P.042 Motor power fact (Motor power factor)

Motor power factor (given on the nameplate, see figure 7.6.3).

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

### P.043 Motor stator R (Motor stator Resistance)

Measurements of the stator resistance of the motor.
This value will be automatically updated, after performing the self tune procedure.

## P.044 Motor cooling

Setting of the type of cooling of the motor connected.

## P.045 Motor thermal K (Motor thermal costant)

Thermal characteristic of the motor connected.
The data is normally provided by the motor manufacturer, as the time needed to reach the maximum temperature at rated current.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.040 | Motor rated curr | | (*) | (*) | (*) | A | 0.1 | 406 |
| P.041 | Motor pole pairs | | (*) | 1 | 60 | | | 407 |
| P.042 | Motor power fact | | (*) | 0.01 | 1 | | 0.01 | 408 |
| P.043 | Motor stator R | | (*) | 0 | 99.99 | ohm | 0.01 | 409 |
| P.044 | Motor cooling | [0] Natural<br>[1] Forced | 0 | 0 | 1 | | | 410 |
| P.045 | Motor thermal K | | 30 | 1 | 120 | min | | 411 |

# V/F Curve

## P.060 V/f shape

Selection of the curve for the V/F ratio.
***P.060 = 0 (Custom )***
The intermediate values of voltage and frequency, are defined by the parameters ***P.063*** and ***P.064*** as well as the link of the manual Boost on the characteristic.

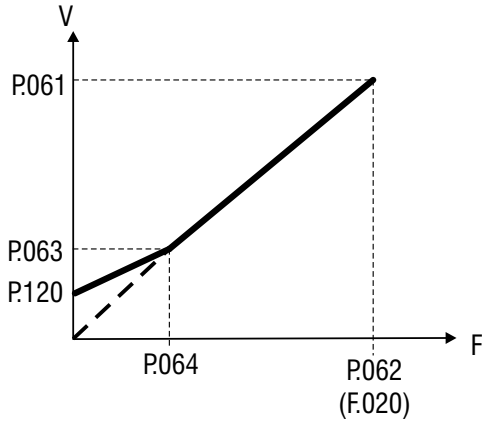



*Figure 10.6.4: Custom V/F shape*

***P.060 = 1 (Linear )***
The factory setting provides a Linear V/F ratio, having the middle points fixed by the half value of ***P.063*** and ***P.064***.

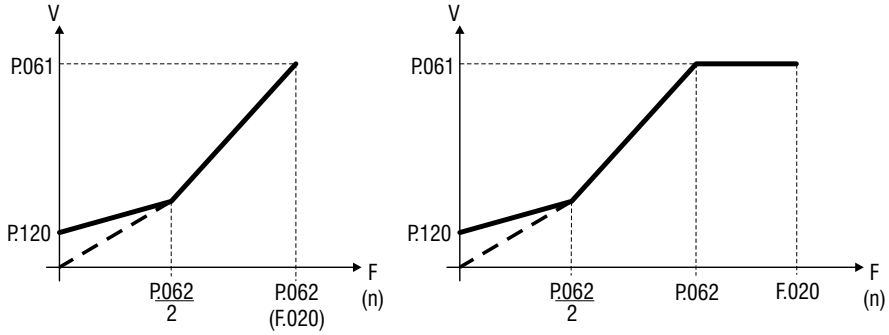



*Figure 10.6.5: Linear V/F shape*

***P.060 = 2 (Quadratic )***

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

The factory setting, when this ratio is selected, provides a setting of ***P.063*** equal to the 0,25% the Max output voltage, at a frequency equal to 50% of ***P.062***.

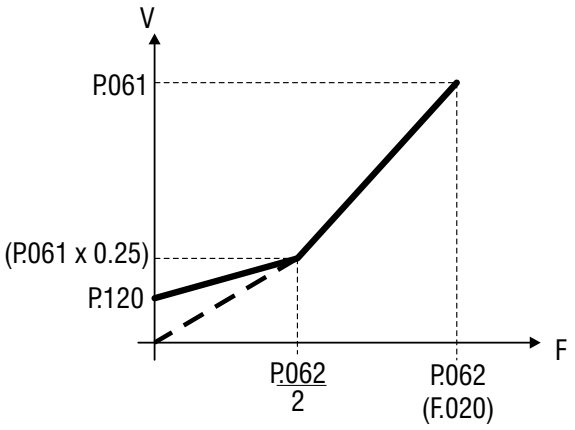



*Figure 10.6.6: Quadratic V/F shape*

## P.061 Max out voltage (Maximum output voltage)

Maximum value of the voltage applied to the motor (normally set as the nameplate, see figure 7.6.3).

## P.062 Base frequency

Rated frequency of the motor (given on the nameplate, see figure 7.6.3).

It represents the working frequency of the drive, at which the Max out voltage is associated (***P.061***).

## P.063 V/f interm volt (V/f intermediate voltage)

Intermediate "voltage" value of the V/F characteristic selected.

## P.064 V/f interm freq (V/f intermediate frequency)

Intermediate "frequency " value of the V/F characteristic selected.

***NOTE!*** When custom V/f shape is selected (***P.060*** = 0):

***P.064*** parameter represents the return point of the output voltage, on the linear characteristic of V/f ratio (see figure 7.6.4).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.060 | V/f shape | [0] Custom<br>[1] Linear<br>[2] Quadratic | 1 | 0 | 2 | | | 412 |
| P.061 | Max out voltage | | (**) | 50 | (**) | V | 1 | 413 |
| P.062 | Base frequency | | (**) | 25 | 500 | Hz | 0.1 | 414 |
| P.063 | V/f interm volt | | (**) | 0 | P.061 | V | | 415 |
| P.064 | V/f interm freq | | (**) | 1 | P.062 | Hz | 0.1 | 416 |

# Ouput Frequency Limit

## P.080 Max output freq (Maximun output frequency)

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

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

***Speed references, Slip compensation, PID regulator***

### P.081 Min output freq (Minimun output frequency)

Minimum value of output frequency, under which no reference regulation has effect.
It is expressed as percentage of **Max output freq (*P.080*).**

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

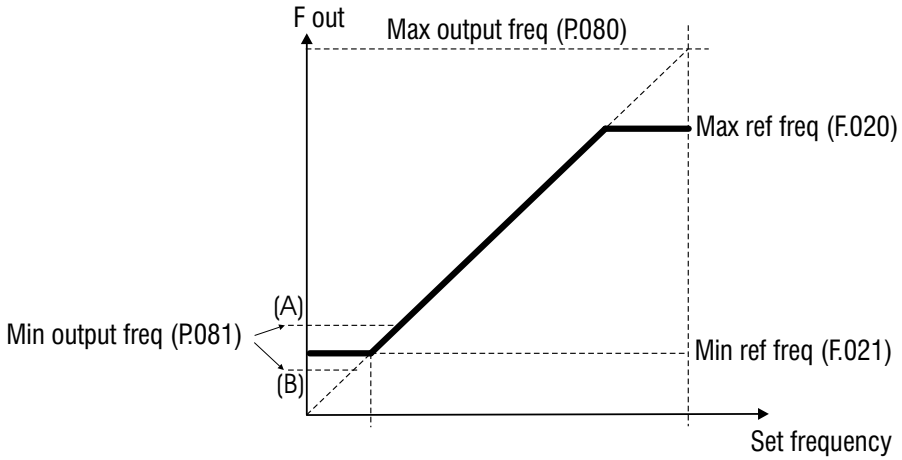



*Figure 10.6.7: Min & Max Reference Frequency*

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.080 | Max output freq | | 100 | 0 | 110 | % of F.020 | | 417 |
| P.081 | Min output freq | | 0.0 | 0.0 | 25.0 | % of F.020 | 0.1 | 418 |

## Slip Compensation

### P.100 Slip compensat (Slip compensation)

If an induction motor is being used, the mechanical speed will vary with the load due to the slip of the motor. In order to adjust for this speed error the slip compensation can be used.

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

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

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

The Slip compensation will act directly on the output frequency of the drive. For this purpose the parameter

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

**Max ref freq** value + **Slip compensat** value.

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

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

### P.101 Slip comp filter (Slip compensation filter)

It is the response time (in seconds) for the reaction of the function.
Increasing this value helps damping oscillations that may arise with load steps (especially negative ones).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.100 | Slip compensat | | 0 | 0 | 250 | % | | 419 |
| P.101 | Slip comp filter | | 0.1 | 0 | 10 | sec | 0.1 | 420 |

## Boost

### P.120 Manual boost [%]

The resistive impedance of the stator windings causes a voltage drop within the motor, which result in a reduction in torque in the lower speed range.
Compensation can be made for this effect by boosting the output voltage.
This compensation is carried out continuously across the whole speed range in proportion to the output current but it is most effective at low speed.

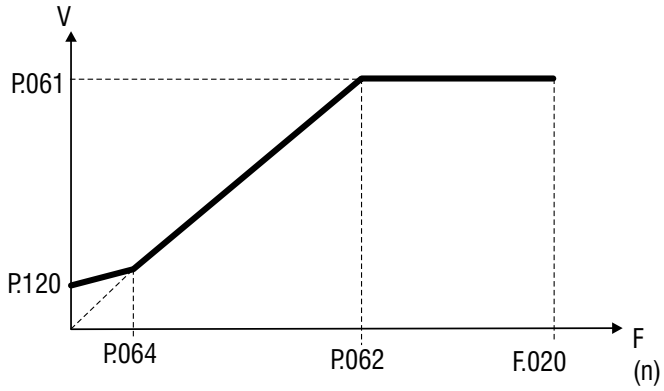



*Figure 10.6.8: Manual Boost Voltage*

The setting is in percentage of the ***Max out voltage (P.061)***.

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

The manual Boost level can be linearly regulated through an analog reference signal.
The regulation of the Boost level will be between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the percentage value set in ***P.120*** (+/- 10V - 20mA).

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

### P.122 Auto boost en (Automatic boost enabling)

The boost can be automatically controlled by the enabling of this parameter. The control is continuously carried out in the whole speed range.

***NOTE!*** The automatic boost is automatically calculated during the execution of drive/motor self tuning

(***P.043*** parameter). It is anyway possible to obtain an "Oveboost" at low speed, increasing the value of the manual boost (***P.120*** parameter).

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.120 | Manual boost [%] | | 1 | 0 | 25 | % of P.061 | 0.1 | 421 |
| P.121 | Boost factor src | [0] Null | 0 | 0 | 3 | | | 422 |
| | | [1] Analog inp 1 (setting through I.200…I.204) | | | | | | |
| | | [2] Analog inp 2 (setting through I.210…I.214) | | | | | | |
| | | [3] Analog inp 3 (setting through I.220…I.224) | | | | | | |
| P.122 | Auto boost en | [0] Disable | 1 | 0 | 1 | | | 423 |
| | | [1] Enable | | | | | | |

## Automatic Flux Regulation

### P.140 Magn curr gain (Magnetizing current gain)

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

***NOTE!*** It is not reconmmended to use this function if sustained operation below 1 Hz is required.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.140 | Magn curr gain | | 0 | 0 | 100 | % | 0.1 | 424 |

## Anti Oscillation Function

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

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.160 | Osc damping gain | | 0 | 0 | 100 | | | 425 |

## SW Current Clamp

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

To optimize the performance of the inverter, it is necessary to be able to accelerate and decelerate during the whole ramp time with the maximum current that the inverter can supply to the motor.
The setting of very short ramp times, that would cause an exceeding of the allowable current limits of the drive, activates the "Current Clamp"circuit avoiding to reach the overcurrent limits and the consequent "OC" trip.

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

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.180 | SW clamp enable | [0] Disable (not active)<br>[1] Enable (active) | 1 | 0 | 1 | | | 426 |

## Current Limit

The drive is provided with an active current limited function.

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

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

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

***P.200 = 0*** Function disabled.

***P.200 = 1*** Enabling of the current limit control during the ramps.

***P.200 = 2 Ramp-curr ctrl***

During speed acceleration or deceleration, if the current value exceeds the setting of ***P.201*** (Current limit during the ramp), the ramp stage will be momentary blocked and the speed kept at the value reached in this moment.

When the current will decrease again below this limit, the ramp will be restarted with the profile set.

The ramp time is thus lengthened by the execution of this control.

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

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

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

Enabling of the current limit control during the ramps.

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

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

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

Proportional gain of the current regulator.

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

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

Integral gain of the current regulation.

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

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

As described in the figure below, the setting of the feed-forward, allows to avoid the drive trip for overcurrent (OC) during fast acceleration of the load.
When the current exceeds the value of ***Curr lim in ramp***, a quick frequency step (percentage of the motor

rated slip), is automatically sutracted to the reference.
In this case the ramp is extended in order to keep the current level under this limit.
A shortening of the extended ramp time, can be of course achieved excluding the load.

This function operates only during the ramp time (not in steady state).

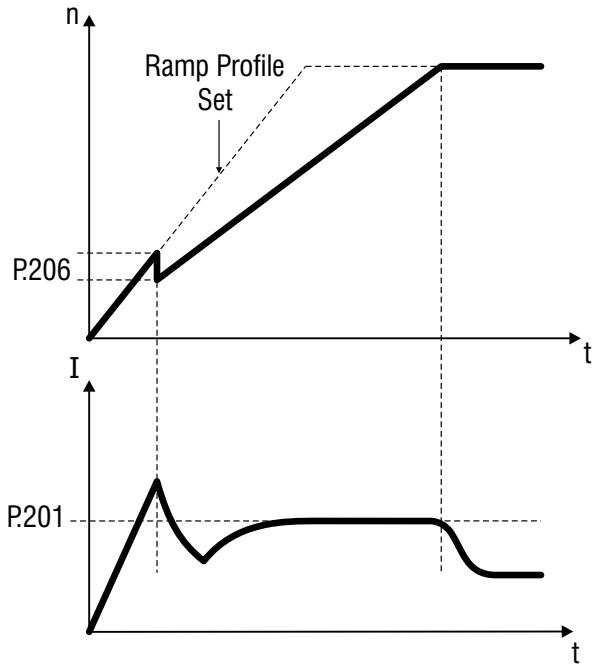



*Figure 10.6.9: Current Limit Control in Ramp*

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.200 | En lim in ramp | [0] None<br>[1] PI Limiter<br>[2] Ramp freeze | 0 | 0 | 2 | | | 427 |
| P.201 | Curr lim in ramp | | 170 | 20 | 170 | % I nom | | 428 |
| P.202 | En lim in steady | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 429 |
| P.203 | Curr lim steady | | 170 | 20 | 170 | % of I nom | | 430 |
| P.204 | Curr ctrl P-gain | | 30.0 | 0.1 | 100 | % | 0.1 | 431 |
| P.205 | Curr ctrl I-gain | | 10.0 | 0.1 | 100 | % | 0.1 | 432 |
| P.206 | Curr ctr feedfwd | | 0 | 0 | 250 | % | | 433 |

## DC Link Limit

The function when enabled, performs a control on the voltage level of the DC link bus capacitor.

During fast deceleration if the load has a big inertia, the DC link value can suddenly increase close to the alarm threshold. In this case the ramp is controlled keeping the voltage level within safety values.

Consequently the deceleration ramp time is automatically extended, in order to achieve the deceleration of the load, trying to avoid an eventual block for "overvoltage" (OV alarm).

As for the current limiter, the DC-Link controller is PI-based, with the addition of a programmable feed forward term.

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

***P.220 = 0*** Function disabled.

***P.220 = 1*** Enabling of the DC link control function.

***P.220 = 2 DC-Ramp ctrl***

During fast deceleration, if the DC link level increase close to the alarm threshold, the ramp stage will be momentary blocked and the speed kept at the value reached in this moment.
When the DC link level, will decrease again within the internal safety values, the ramp will be restarted with the profile set. The ramp time is thus lengthened by the execution of this control.

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

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

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

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

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

As described in the figure beow, this is the setting of the feed-forward for the DC control function.
At the increasing of the DC link level, a quick frequency step (percentage of the motor slip), is automatically added to the reference. The voltage level decreases toward its rated value.

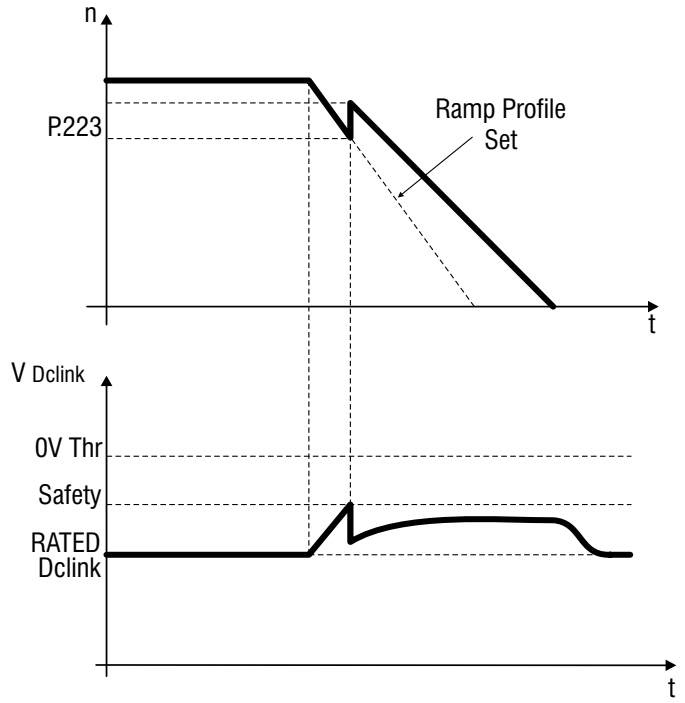



*Figure 10.6.10: DC Link Voltage Control*

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

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.220 | En DC link ctrl | [0] None<br>[1] PI Limiter<br>[2] Ramp freeze | 0 | 0 | 2 | | | 434 |
| P.221 | DC-lnk ctr Pgain | | 20.0 | 0.1 | 100 | % | 0.1 | 435 |
| P.222 | DC-lnk ctr Igain | | 2.0 | 0.1 | 100 | % | 0.1 | 436 |
| P.223 | DC-link ctr FF | | 0 | 0 | 250 | % | | 437 |

## Over Torque Alarm Configuration

The torque of the motor (active current) can be monitored through this function.

In particular the overtorque condition and the behaviour of the drive itself, are manageable by these parameters.

### P.240 OverTorque mode

It defines the status of the drive during its overtorque condition.

***P.240 = 0*** Overtorque signalling during ramps and at steady state. No alarm will be generated.
***P.240 = 1*** Overtorque signalling only at steady state. No alarm will be generated.
***P.240 = 2*** Overtorque alarm and signalling during ramps and at steady state.
***P.240 = 3*** Overtorque alarm and signalling only at steady state.

### P.241 OT curr lim thr (Overtorque current limit threshold)

Overtorque signalling threshold.
It is a percentage of the ***Motor rated curr (P.040).***

### P.242 OT level fac src (Overtorque level factor source)

The overtorque level can be linearly regulated through an analog reference signal.
The regulation of this level will be performed between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the percentage value setted with ***P.241*** (+/- 10V - 20mA).

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

***P.242 = 0*** OFF
***P.242 = 1*** Analog Inp 1 (setting through I.200…I.204)
***P.242 = 2*** Analog Inp 2 (setting through I.210…I.214)
***P.242 = 3*** Analog Inp 3 (setting through I.220…I.224)

### P.243 OT signal delay (Overtorque signalling delay)

Delay time for the alarm signalling.

The alarm will be displayed with the message "**Ot**"
A signalling of the "overtorque" condition is available on the digital output as "***Out trq>thr***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.240 | OverTorque mode | [0] No Alm,Chk on 0<br>[1] No Alm,Chk ss<br>[2] Alm always<br>[3] Alm steady st | 0 | 0 | 3 | | | 438 |
| P.241 | OT curr lim thr | | 110 | 20 | 200 | % | | 439 |
| P.242 | OT level fac src | [0] Null<br>[1] Analog inp 1<br>[2] Analog inp 2<br>[3] Analog inp 3 | 0 | 0 | 3 | | | 440 |
| P.243 | OT signal delay | | 0.1 | 0.1 | 25 | sec | 0.1 | 441 |

## Motor Overload Configuration

### P.260 Motor OL prot en (Motor overload protection enabling)

Enabling of the motor thermal protection.
The control is performed as an I2t, calculated on the basis of the setting of
***Motor rated curr (P.040)*** and ***Motor thermal K (P.045).***
An overload of the motor, will cause the intervention of the alarm "Motor overload".

The parameter ***d.052*** (menu **DISPLAY**), is the monitoring of the motor overload level.
A value of 100% represent the threshold for the alarm.

The alarm will be displayed with the message "**OLM**"
A signalling of the "overcurrent" condition is available on the digital output as "***Alarm state***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.260 | Motor OL prot en | [0] Disable<br>[1] Enable | 1 | 0 | 1 | | | 444 |

## BU Configuration

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

Enabling of the thermal protection of the braking resistance.
The protection efficiency is dependant on the accuracy of the parameters concerning the rated value of the braking resistance.
An overload of the braking resistor, will cause the intervention of the alarm "Braking resistor overload".

### P.281 Brake res value (Braking resistor value)

Rated Ohm value of the braking resistance connected.

### P.282 Brake res power (Braking resistor power)

Rated power of the braking resistance connected.

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

Thermal constant of the braking resistance connected.
This data is expressed in seconds, and it is normally provided by the manufacturer of the device, as the time that the resistor takes to reach its nominal working temperature while dissipating its rated power.

Further information on the use of the braking resistance and braking devices, can be see in chapter 5.8.

The parameter **d.053** (menu **DISPLAY**), is the monitoring of the braking resistor overload level.
A value of 100% represent the threshold for the alarm.

The alarm will be displayed with the message "**OLr**".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.280 | Brake res OL en | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 445 |
| P.281 | Brake res value | | (*) | 1 | 250 | ohm | | 446 |
| P.282 | Brake res power | | (*) | 0.01 | 25 | kW | 0.01 | 447 |
| P.283 | Br res thermal K | | (*) | 1 | 250 | sec | | 448 |

## DC Brake Configuration

The drive provides as a standard a set of parameters for the DC braking management.
With this function the drive injects a DC current into the motor windings, arousing in this way a braking torque.
The DC braking can be useful to brake the motor around the zero speed, either at the START and at the STOP stage, maintaining also the motor shaft locked for a short time.
It should not be used to obtain an intermediate braking.

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

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

### P.300 DC braking level

Setting of the DC current level to be injected on the motor phases.
It is a percentage of the ***Motor rated current (P.040).***

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

The DC braking level can be linearly regulated through an analog reference signal.
The regulation of the DC braking level will be between 0% (setting the inputs at 0V - 0mA - 4mA) and 100% of the value setted with ***P.300*** (+/- 10V - 20mA).

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

### P.302 DC braking freq (DC Braking frequency)

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

### P.303 DC braking start

Defines the DC braking duration in seconds, at the START (RUN or Reverse).
The motor will be locked until this time is elapsed.

### P.304 DC braking stop

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

***NOTE!***

- a DC brake command can be carried out also via digital inputs (see chapter **INTERFACE**, section **Digital inputs**). In this case a **DC brake** will be possible at every speed and independently if the drive is in STOP or START condition (digital input as **DC brake**).
- the injection of direct current remanin active for all the transition time of the DC Brake command.
- a DC brake while the drive is controlled with a JOG command, can be obtained by the setting of a digital input as **DC brake**.
- a momentary disabling of the DC braking function, is possible via digital input (digital input as **DC brake en**).

| Code | LCD display | [Code] & LCD select. | | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|---|
| P.300 | DC braking level | | | 0 | 0 | 100 | % of I nom | | 449 |
| P.301 | DCB lev fac src | [0] Null | | 0 | 0 | 3 | | | 450 |
| | | [1] Analog inp 1 | (setting through I.200…I.204) | | | | | | |
| | | [2] Analog inp 2 | (setting through I.210…I.214) | | | | | | |
| | | [3] Analog inp 3 | (setting through I.220…I.224) | | | | | | |
| P.302 | DC braking freq | | | 0 | 0 | 500 | Hz | 0.1 | 451 |
| P.303 | DC braking start | | | 0 | 0 | 60 | sec | 0.1 | 452 |
| P.304 | DC braking stop | | | 0 | 0 | 60 | sec | 0.1 | 453 |

## Autocapture function

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

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

Enabling the function, the inverter frequency output will be forced to match the motor speed, according to the command type selected in the Autocapture mode and the setting of the other regulation parameters of this function.

The main uses are:

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

## P.320 Autocapture mode

***P.320 = 0 Function disabled***

***P.320 = 1 1st RUN Only***
The engaging of the motor is carried out only once, when the first valid RUN command is given after drive power on.

***P.320 = 2 Always***
The engaging of the motor is carried out at every valid RUN command.

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

## P.321 Autocapture Ilim (Autocapture current limit)

Current limit threshold for the utocapture function.
For current operation, this limit must be higher than the no-load current of the motor in use.
% of inverter nominal current (***d.950***).

## P.322 Demagnetiz time (Autocapture demagnetizzation time)

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

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

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

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

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

## P.325 Autocap spd src (Autocapture speed source)

Selection of the source for the initial scanning frequency.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.320 | Autocapture mode | [0] Disable<br>[1] 1st run only<br>[2] Always | 0 | 0 | 2 | | | 454 |
| P.321 | Autocapture Ilim | | 120 | 20 | 170 | % of I nom | | 456 |
| P.322 | Demagnetiz time | | 1 | 0.01 | 10 | sec | 0.01 | 457 |
| P.323 | Autocap f scan t | | 1 | 0.1 | 25 | sec | 0.1 | 458 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| P.324 | Autocap V scan t | | | 0.2 | 0.1 | 25 | V | 0.1 | 459 |
| P.325 | Autocap spd src | [0] Frequency ref | 0 | 0 | 3 | | | 460 | |
| | | [1] Max freq ref | | | | | | | |
| | | [2] Last freq ref | | | | | | | |
| | | [3] Encoder | | | | | | | |

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

## Undervoltage Configuration

A temporary phase loss of line input voltage, can be detected by the inverter intermediate circuit (DC-bus) as variation of its low voltage threshold level.

This condition will cause the tripping of inverter "Undervoltage" (UV) alarm.

A correct configuration of the inverter parameters, can avoid undesired system alarms caused by main dip or instability of the line voltage.

Therefore, considering the above points the inverter will have the following behaviour:

- detection of undervoltage threshold setted with ***Undervoltage thr (P.340)*** parameter
- disabling of output control voltage: the motor will coast to stop
- enabling of **Autocapture** function, if the main dip of the line voltage is lower than the time sets with ***Max pwrloss time (P.341)*** parameter; an higher value will cause a tripping of undervoltage inverter alarm (UV)

The enabling of the function depends by the configuration of the following parameters:

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

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

### P.340 Undervoltage thr (Undervoltage threshold)

"Undervoltage" alarm (UV) threshold detection.
The undervoltage threshold can be set in a range, within the minimum value allowed and its nominal input voltage selected.
See the table below for more details.
Here below an example:
***S.000 (P.020) Mains voltage*** parameter = 380Vac
DC UV minimum threshold = 380Vdc
Nominal DC Link = 537Vdc.

***P.340 = 0%*** UV = 380Vdc

***P340 = 50%*** $UV = 380 + \frac{(537 - 380) \times 50}{100} = 458Vdc$

| *AC main supply* | *Minimum UV threshold* | *Nominal DC-Bus* |
|---|---|---|
| 230Vac | 230Vdc | 310Vdc |
| 400Vac | 380Vdc | 537Vdc |
| 460Vac | 415Vdc | 648Vdc |
| 575Vac | 565Vdc | 810Vdc |

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

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

### P.342 UV alarm storage (Undervoltage alarm storage)

This parameter defines wheter UV alarms have to be stored into the alarm stack during the counting of ***Max pwrloss time*** (see chapter **DISPLAY,** section Alarm list). The alarm will be displayed with the message "**UV**".

A signalling of the "undervoltage" condition is available on the digital output as "**UV running**".

## P.343 UV Trip mode (Undervoltage tripping mode)

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

| | | |
|---|---|---|
| ***P.343 = 0*** | Disable | A mains power loss, will trip the drive for undervoltage alarm (UV) |
| ***P.343 = 1*** | Coast Through | See figure 7.6.11 |
| ***P.343 = 2*** | Emg Stop | See figure 7.6.12 |

**COAST THROUGH**

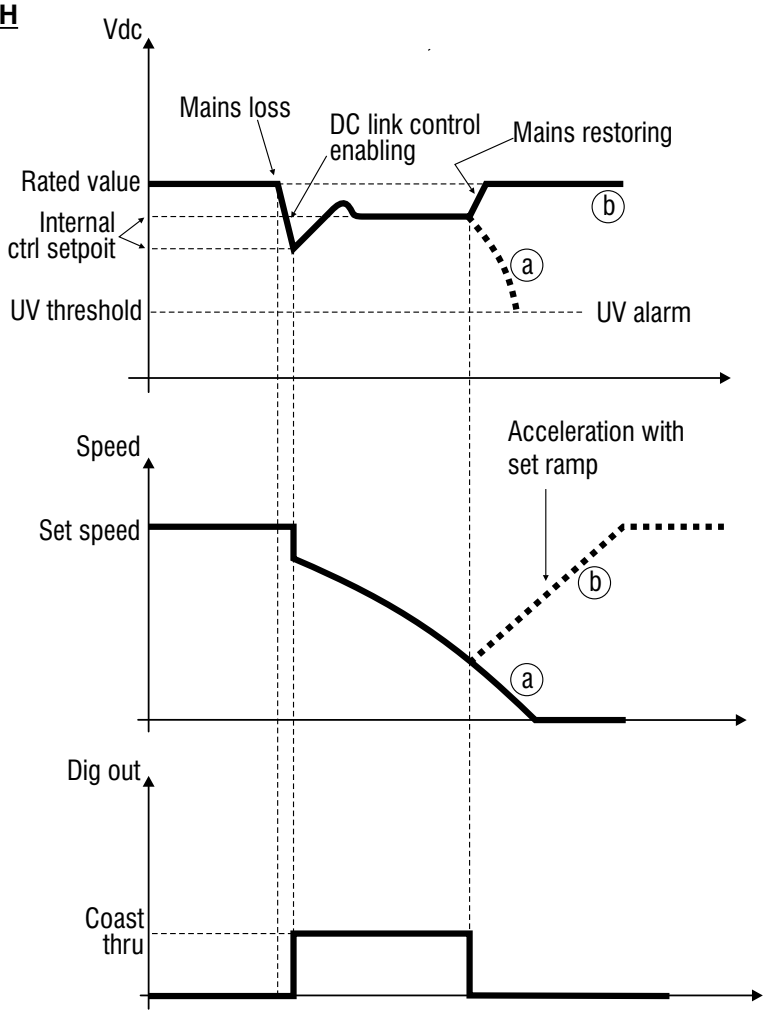



*Figure 10.6.11: Coast through*

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

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

• If used, the braking device will provide the advantage to achieve as more as possible the specified deceleration fast stop time ***(F.208 - Dec time 4***).

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

• Recovering the mains power, the motor will be led back to its original speed, with the defined acceleration ramp.

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

**EMG STOP (Emergency Stop)**

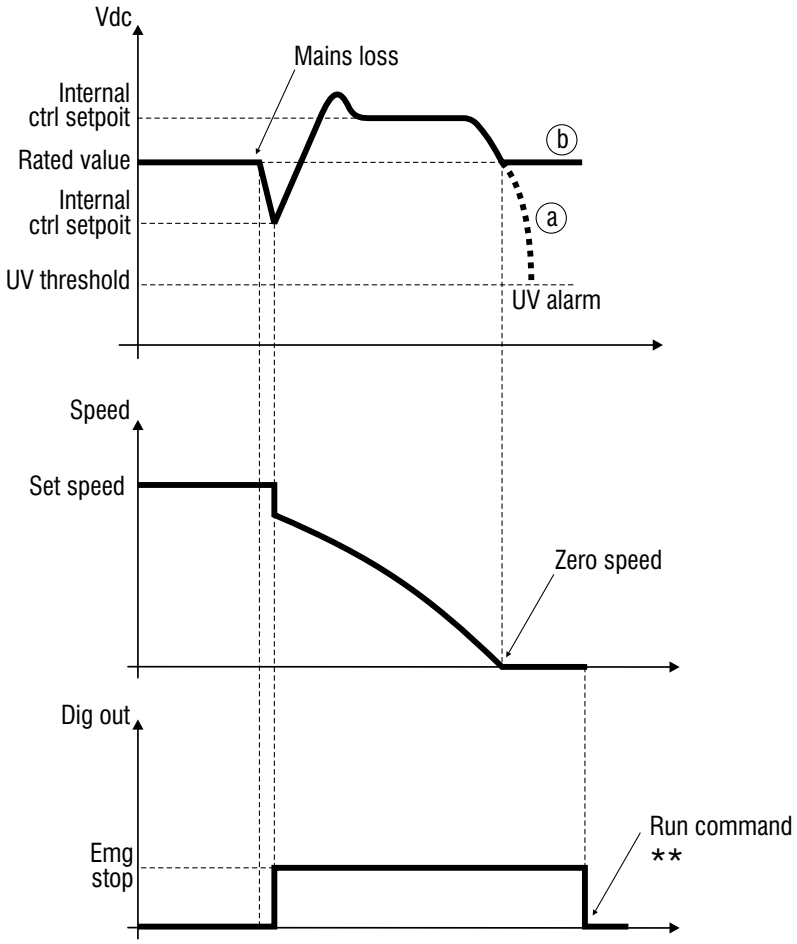



*Figure 10.6.12: Emergency Stop*

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

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

• If used, the braking device will provide the advantage to achieve as more as possible the specified deceleration n fast stop time ***(F.208 - Dec time 4***).

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

• This setting doesn't offer the possibility to lead back the motor to the original speed.

** Once at zero speed if the mains power is recovered, to restart the motor will be necessary to release the RUN command and then apply it again.

The status of the "Emergency Stop" function, is available on digital output, programmed as "***Emg Stop***" (programming code: 49).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.340 | Undervoltage thr | | 0 | 0 | 80 | % of P.061 | | 462 |
| P.341 | Max pwrloss time | | 0 | 0 | 25 | sec | 0,1 | 463 |
| P.342 | UV alarm storage | [0] Disable<br>[1] Enable | 1 | 0 | 1 | | | 464 |
| P.343 | UV Trip mode | [0] Disabled | 0 | 0 | 2 | | | 491 |

[1] CoastThrough
[2] Emg Stop

## Overvoltage Configuration

### P.360 OV prevention (Overvoltage prevention)

During fast deceleration or in case of deceleration with high inertia load, it is possible to prevent the drive trip for overvoltage alarm, by the enabling of this function.

Performing this control, the drive will act as follows:

- detection of the overvoltage level, without storing and displaying the alarm.
- disabling the inverter output bridge; the motor will coat to stop and DC-link will decrease toward safe values.
- automatic enabling of the Autocapture function, and engaging of the motor at the last frequency value, detected before the alarm.

For corrent operations it is necessary to enter the proper settings of the **Autocapture** parameters:

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

- normal operation is rersumed and the motor will be stopped following the programmed ramp.
- if during the stop, the load inertia leads again the DC bus at the limit level, the procedure described above will be iterated.

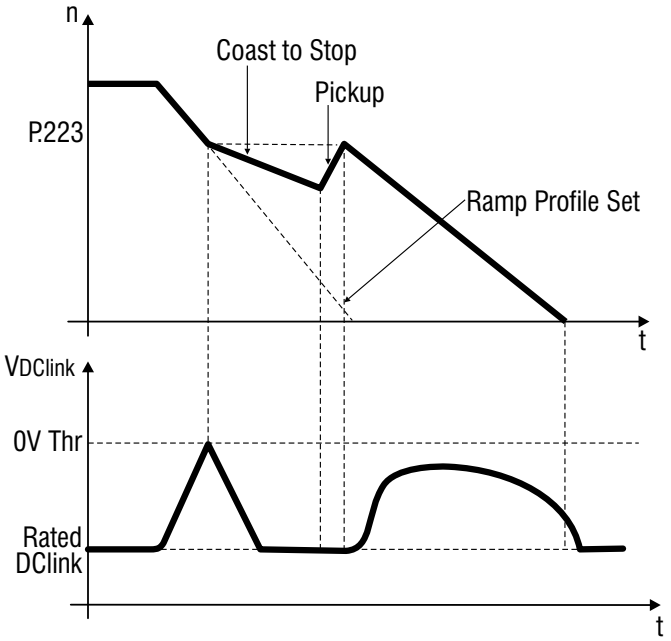



*Figure 10.6.13: Overvoltage Prevention*

The "overvoltage " alarm will be displayed with the message "**OV**".
A signalling of the "overvoltgae" condition is available on the digital output as "***Alarm state***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.360 | OV prevention | [0] Disable | 0 | 0 | 1 | | | 465 |
| | | [1] Enable | | | | | | |

## Autoreset Configuration

The Autoreset function allows the automatic restoring of the working of the drive, after the detection of some alarms.

It will be active only with an appropriate setting of the following parameters and if these alarms have been caused by :

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

### P.380 Autoreset attmps (Autoreset attemps)

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

### P.381 Autoreset clear

When enabled, it clears the number of events setted with ***Autoreset attmps (P.380)*** parameter, if for 10 minutes no alarm has been detected.

### P.382 Autoreset delay

Delay that elapses between the failure detection and the beginning of the autoreset sequence.

### P.383 Autores flt rly (Autoreset fault relay)

Definition of the status for the relays and digital outputs, during the autoreset function, when programmed as follows:

| Parameters | "Relays & Dig Out" programming | | |
|---|---|---|---|
| ***P.383*** | ***Drive OK*** | ***Alarm state*** | ***No alarm state*** |
| 0 | ON | OFF | ON |
| 1 | OFF | ON | OFF |

tgy0340

***NOTE!*** a normal "Reset" can be enabled also through the digital inputs (see chapter **INTERFACE**, section **Digital inputs**). The reset command will be executed only if the drive is blocked (no RUN or Reverse commands) and the cause of the alarm has been eliminated.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.380 | Autoreset attmps | | 0 | 0 | 255 | | | 466 |
| P.381 | Autoreset clear | | 10 | 0 | 250 | min | | 467 |
| P.382 | Autoreset delay | | 5 | 0.1 | 50 | sec | 0.1 | 468 |
| P.383 | Autores flt rly | [0] OFF<br>[1] ON | 1 | 0 | 1 | | | 469 |

## External Fault Configuration

### P.400 Ext fault mode (External fault mode)

Configuration of signalling for the "**External fault alarm**".

As per factory setting the function is programmed on the digital input 6 (terminal 6).

***P.400 = 0*** Always signalled - Autoreset not possible
***P.400 = 1*** Signalling only when applied the RUN command - Autoreset not possible
***P.400 = 2*** Always signalled - Autoreset possible
***P.400 = 3*** Signalling only when applied the RUN command - Autoreset possible

The alarm will be displayed with the massage **"EF"**.
A signalling of the "external fault" condition is available on the digital output as "**Extern fault**".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.400 | Ext fault mode | | 0 | 0 | 3 | | | 470 |

## Phase Loss Detection

### P.410 Ph Loss detec en (Phase Loss detection enabling)

The enabling of this function allows to detect the missing of any phase of the input supply.

***P.410 = 0*** Disabled Phase loss control detection disabled.
***P.410 = 1*** Enabled Phase loss control detection enabled.

The alarm will be displayed with the message "***PH***".
A signalling of the "phase loss " condition is available on the digital output as "***Alarm state***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.410 | Ph Loss detec en | [0] Disable<br>[1] Enable | 1 | 0 | 1 | | | 492 |

## Voltage Reduction Configuration

When a motor is found to use only partial power during normal running conditions, enabling this function reduces the motor flux current to save energy coast.

### P.420 Volt reduc mode (Voltage reduction mode)

Definition of the mode for the output voltage reduction.
***P.420 = 0***
The output voltage reduction is always applied.
***P.420 = 1***
The output voltage reduction is not applied during the ramp, providing in this way the availability of the full torque up to the achieving of the maximum setup of the V/F ratio.
The voltage reduction will be activated only at constant speed (end of ramp).

### P.421 V reduction fact (Voltage reduction factor)

Level of the output voltage, that will be applied on the motor terminals.
It is percentage of the voltage, resulting from the V/F ratio (see figure 7.6.14).

### P.422 V fact mult src (Voltage reduction factor multiply source)

The output voltage level reduction, can be linearly regulated through an analog reference signal.
Its regulation will be performed in a range between 10% (setting the input at 0V - 0mA - 4mA) and 100% of the value setted with ***P.421*** parameter (+/- 10V - 20mA).
The figure below describes this regulation.

***NOTE!*** The level of voltage reduction, will be applied in accordance to the output voltage value, based on the characteristic of the V/F ratio.

Example:

***P.421*** = 30%

V/f motor characteristic = 380V / 50Hz

Motor supply voltage = 380V / 50Hz

The value of ***P.422*** will be the following:

$$380 - \frac{380 \times 30}{100} = 266V$$

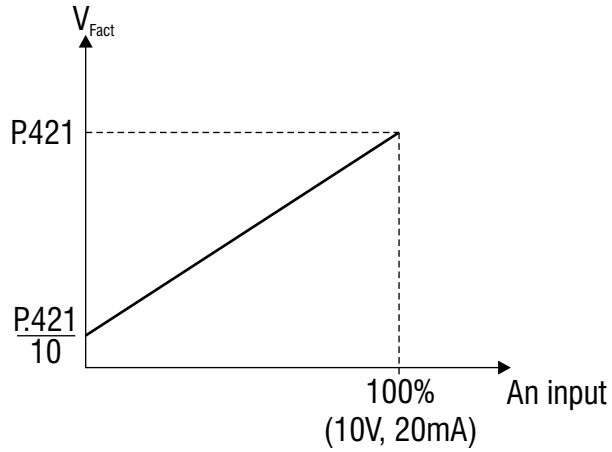



*Figure 10.6.14: Voltage reduction factor multiply*

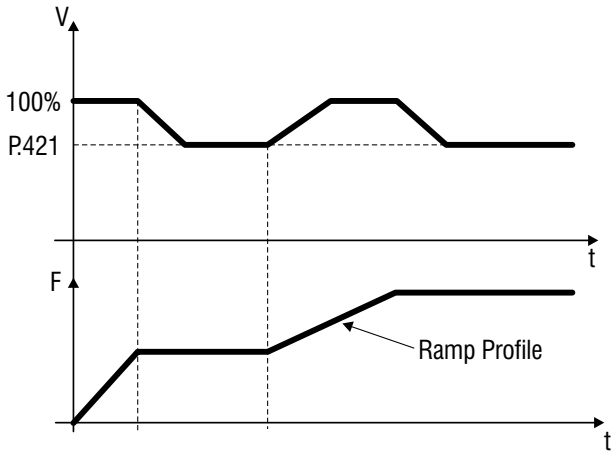



*Figure 10.6.15: Output Voltage Reduction with P.420 = 1*

***NOTE!*** the function can be enabled also through the digital inputs (see chapter **INTERFACE**, section **Digital inputs**). In this case it will be possible to have the Output Voltage reduction and vice versa, at any time the command is applied.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.420 | Volt reduc mode | [0] Always | 0 | 0 | 1 | | | 471 |
| | | [1] Steady state | | | | | | |
| P.421 | V reduction fact | | 100 | 10 | 100 | % of P.061 | | 472 |
| P.422 | V fact mult src | [0] Null | 0 | 0 | 3 | | | 473 |
| | | [1] Analog inp 1 (setting through I.200…I.204) | | | | | | |
| | | [2] Analog inp 2 (setting through I.210…I.214) | | | | | | |
| | | [3] Analog inp 3 (setting through I.220…I.224) | | | | | | |

## Frequency Threshold

### P.440 Frequency prog 1 (Frequency programmed 1)

Set point for the detection of the first frequency threshold.
The signalling of the frequency level detection, can be programmed on the digital outputs.

### P.441 Freq prog 1 hyst (Frequency programmed 1 hysterisis)

Defines a tolerance band around the ***Frequency prog 1 (P.440).***

### P.442 Frequency prog 2 (Frequency programmed 2)

Set point for the detection of the second frequency threshold.
The signalling of the frequency level detection, can be programmed on the digital outputs.

### P.443 Freq prog 2 hyst (Frequency programmed 2 hysterisis)

Defines a tolerance band around the ***Frequency prog 2 (P.442).***

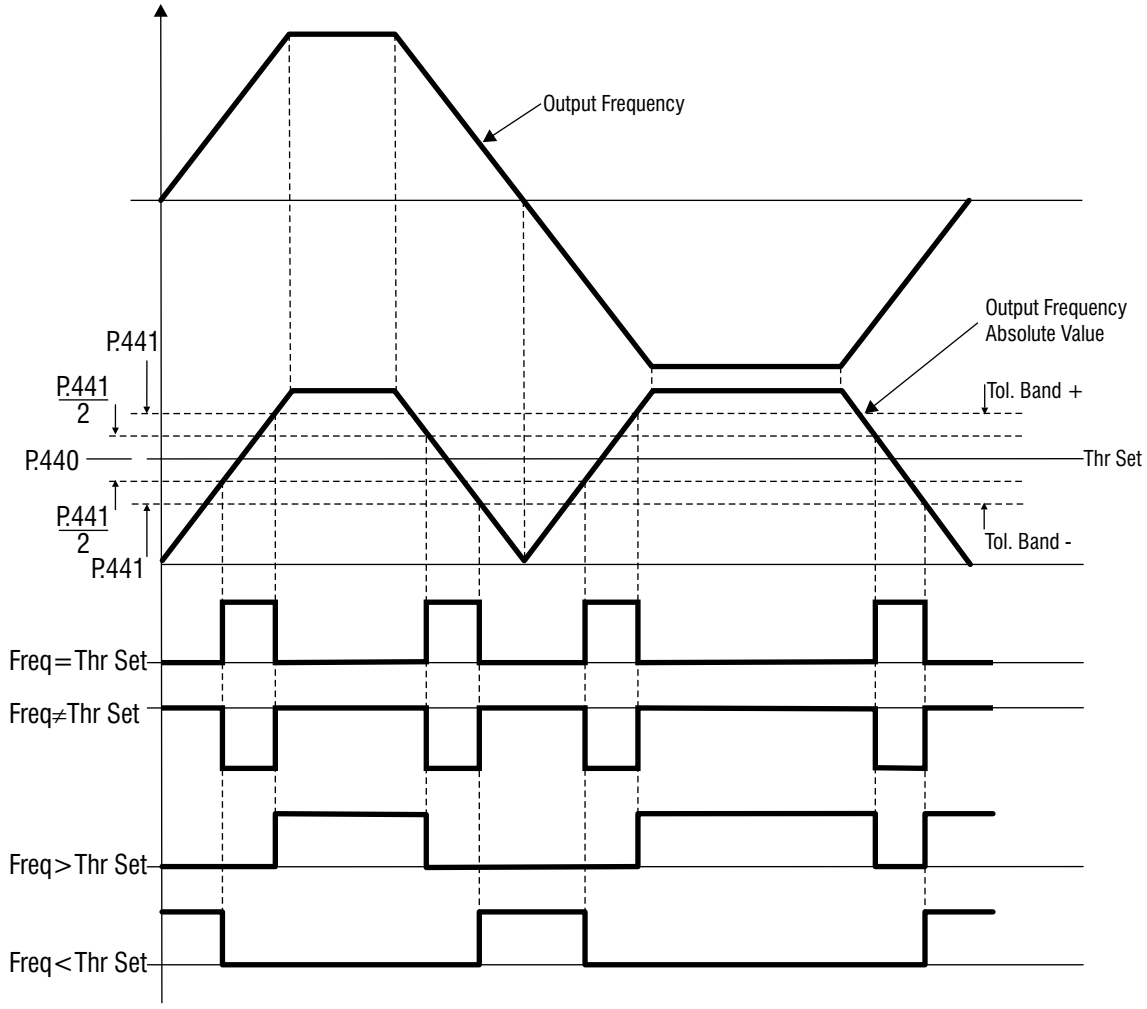



*Figure 10.6.16: Program Frequency Tresholds (example of P.440 and P.441)*

A signalling of the "frequency threshold" status is available on the digital output as "***Freq thr 1***" and "***Freq thr 2***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.440 | Frequency prog 1 | | 0 | 0 | 50 | Hz | 0.1 | 474 |
| P.441 | Freq prog 1 hyst | | 0,5 | 0 | 50 | Hz | 0.1 | 475 |
| P.442 | Frequency prog 2 | | 0 | 0 | 50 | Hz | 0,1 | 476 |
| P.443 | Freq prog 2 hyst | | 0,5 | 0 | 50 | Hz | 0,1 | 477 |

## Steady State Signalling

The signalling of a speed variation when running in steady state, is possible with this parameters.

### P.460 Const speed tol (Constant speed tollerance)

It defines the tollerance band of the speed variation.

### P.461 Const speed dly (Constant segnalling delay)

Delay time for the signalling.

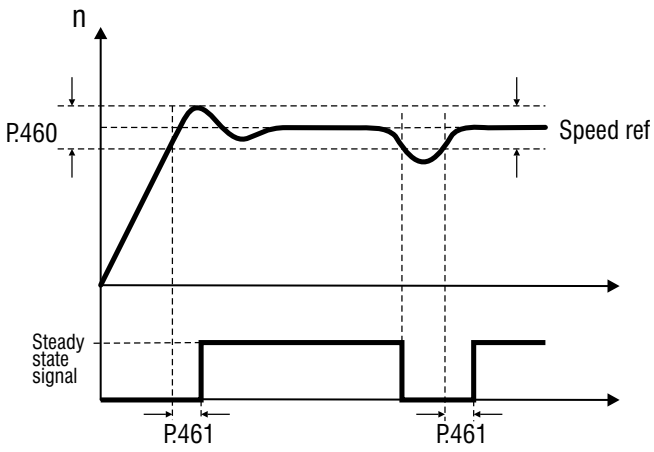



*Figure 10.6.17: Constant Speed Control*

A signalling of the "steady state" condition is available on the digital output as "***Steady state***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.460 | Const speed tol | | 0 | 0 | 25 | Hz | 0.1 | 478 |
| P.461 | Const speed dly | | 0,1 | 0 | 25 | sec | 0.1 | 479 |

## Heatsink Temperature Threshold

Control and monitoring of the drive heatsink temperature.

### P.480 Heatsnk temp lev (Heatsink temperature level)

Setting of the temperature threshold in °C.

### P.481 Heatsnk temp hys (Heatsink temperature hysterisis)

Tolerance band for he signalling of the temperature threshold.
The parameter **d.050** (menu **DISPLAY**), is the monitoring of the heatsink temperature level .

The alarm will be displayed with the massage "**OHS**".
A signalling of the "heatsink temperature" status is available on the digital output as "***Hs temp thr***".

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.480 | Heatsnk temp lev | | 70 | 10 | 110 | °C | | 480 |
| P.481 | Heatsnk temp hys | | 5 | 0 | 10 | % | | 481 |

## PWM Setting

### P.500 Switching freq (Switching frequency)

Setting of the modulation frequency of the drive.

### P.501 Sw freq reduc en (Switching frequency reduction enabling)

When enabled, the modulation frequency is automatically reduced, when the output frequency of the drive is below 5Hz.
This in particular, can avoid the overheating of the motor at low speed ,caused by high commutation in its winding. Furthermore it improves the output sinuswave form, providing a smoother rotation.

### P.520 Overmod max lev (Overmodulation maximun level)

Setting of the overmodulation maximum level.
This function increases the output voltage, providing as consequence a higher torque availability.
A setting too high of the parameter could be increases the distortions of the output voltage and create undesired vibrations of the system.

### P.540 Out Vlt auto adj (Output voltage automatic adjustement)

The voltage applied to the motor terminal is defined by the parameter ***Max output voltage (P.061)***, and it is strictly correlated to the value of the mains voltage.

This function can make independent the motor output voltage from eventual fluctuation of the mains, through an automatic adjustment of the first.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.500 | Switching freq | [0] 1kHz | (*) | 0 | 10 | | | 482 |
| | | [1] 2kHz | | | | | | |
| | | [2] 3kHz | | | | | | |
| | | [3] 4kHz | | | | | | |
| | | [4] 6kHz | | | | | | |
| | | [5] 8kHz | | | | | | |
| | | [6] 10kHz | | | | | | |
| | | [7] 12kHz | | | | | | |
| | | [8] 14kHz | | | | | | |
| | | [9] 16kHz | | | | | | |
| | | [10] 18kHz | | | | | | |
| P.501 | Sw freq reduc en | [0] Disable | 0 | 0 | 1 | | | 483 |
| | | [1] Enable | | | | | | |
| P.520 | Overmod max lev | | 0 | 0 | 100 | % | | 484 |
| P.540 | Out Vlt auto adj | [0] Disable | 1 | 0 | 1 | | | 485 |
| | | [1] Enable | | | | | | |

## Dead Time Compensation

The "dead time compensation" fucnction allows for compensation of the output voltage distorsion due to IGBT voltage drop and its switching characteristics.

Distorsion of output voltage may cause non uniform, non smooth shaft rotation in open loop control.

Throgh the two parameters it is possible to set a voltage value and the compensation variation, called Gradient.

### P.560 Deadtime cmp lev (Dead time compensation level)

Dead time compensation level.

### P.561 Deadtime cmp slp (Dead time compensation slope)

Compensation gradient value.

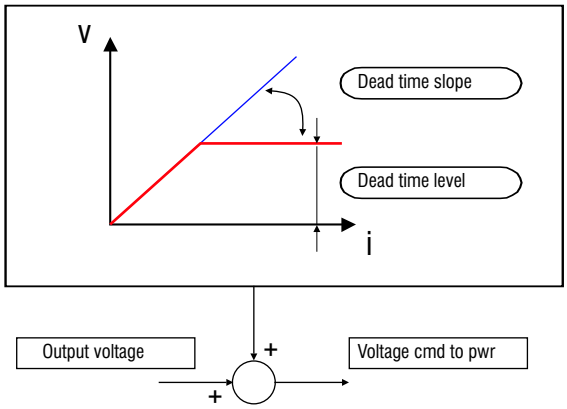



*Figure 10.6.18: Dead Time Compesation*

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.560 | Deadtime cmp lev | | (*) | 0 | 255 | | | 486 |
| P.561 | Deadtime cmp slp | | (*) | 0 | 255 | | | 487 |

## Display Setting

### P.580 Startup display

It is possible to define the first parameter that will be displayed at every power-on of the drive.
The choice can be carried out by the setting of the corresponding "IPA", reported in the parameters list table.

### P.600 Speed dsply fact (Startup display factor)

Costant conversion for variables displaying, as speed and speed reference .
The parameters can be applied at the variable reported at the chapter DISPLAY, section Basic and Encoder.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.580 | Startup display | | 1 | 1 | 1999 | | | 488 |
| P.600 | Speed dsply fact | | 1 | 0.01 | 99.99 | | 0.01 | 489 |

## Protection

### P.999 Param prot code (Parameters protection code)

Protection against undesired modification of the parameters.

***P.999 = 0*** No protection and storage of the parameters with motor stopped
***P.999 = 1*** All the parameters are protected a part the digital frequencies **F.100…F.116**
***P.999 = 2*** All the parameters are protected
***P.999 = 3*** No protection and storage of the parameters with the motor running (NOT RECCOMENDED).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| P.999 | Param prot code | | 0 | 0 | 3 | | | 490 |

## PID Setting

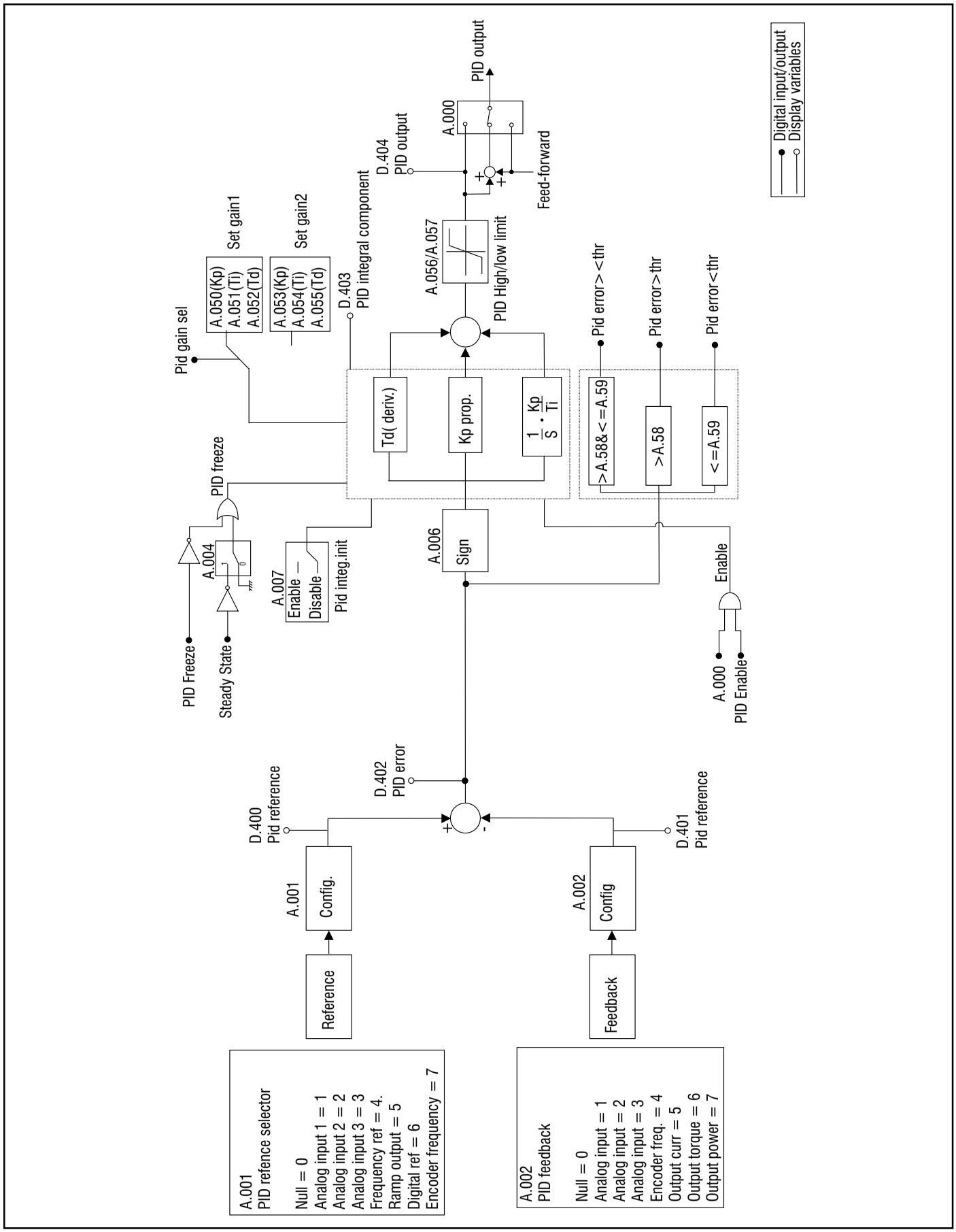



*Figure 10.7.1: PID Function Block*

In the PID menu are contained all the parameters concerning the setting of the function.

The drive provides a PID function, engineered on purpose for the following controls:

– nip rolls with dancer or load cell
– pressure regulation for pumps and extruders
– speed loop control with encoder

A use of the PID block as stand-alone is also possible, correlated (or not) to the RUN status of the drive.

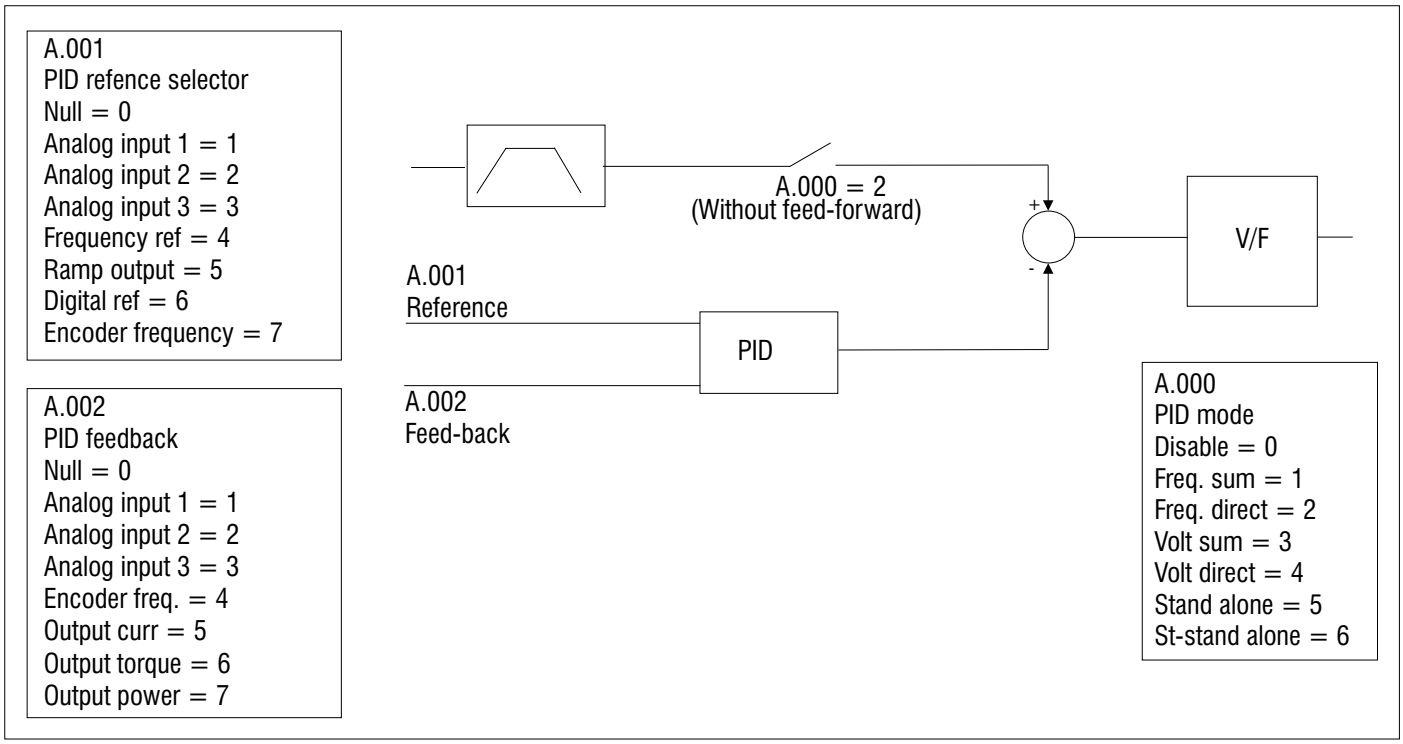



*Figure 10.7.2: PID Mode as Frequency Sum or Direct*

## A.000 PID Mode

This parameter allows to define the regulation mode of the PID function.

| | |
|---|---|
| ***A.000 = 0 Disable*** | The function is disabled. |
| ***A.000 = 1 Freq.sum*** | The output of the PID regulator is added to the ramp output reference value (with feed-forward). |
| ***A.000 = 2 Freq.direct*** | The PID regulator output is directly input to the V/f profile generator. Frequency ramp output is not used. |
| ***A.000 = 3 Volt sum*** | The PID regulator output is added to the voltage reference, calculated in accordance with the setting of the V/F ratio (with feed-forward). |
| ***A.000 = 4 Volt direct*** | The PID regulator output is the voltage to be applied to the motor. V/f curve is not used. |
| ***A.000 = 5 Stand alone*** active | The PID function can be used as generic control. The regulator will be only when the drive will be in RUN. |
| ***A.000 = 6 St-Al always*** | The PID function can be used as generic control. The regulator is not correlated to the drive status. |

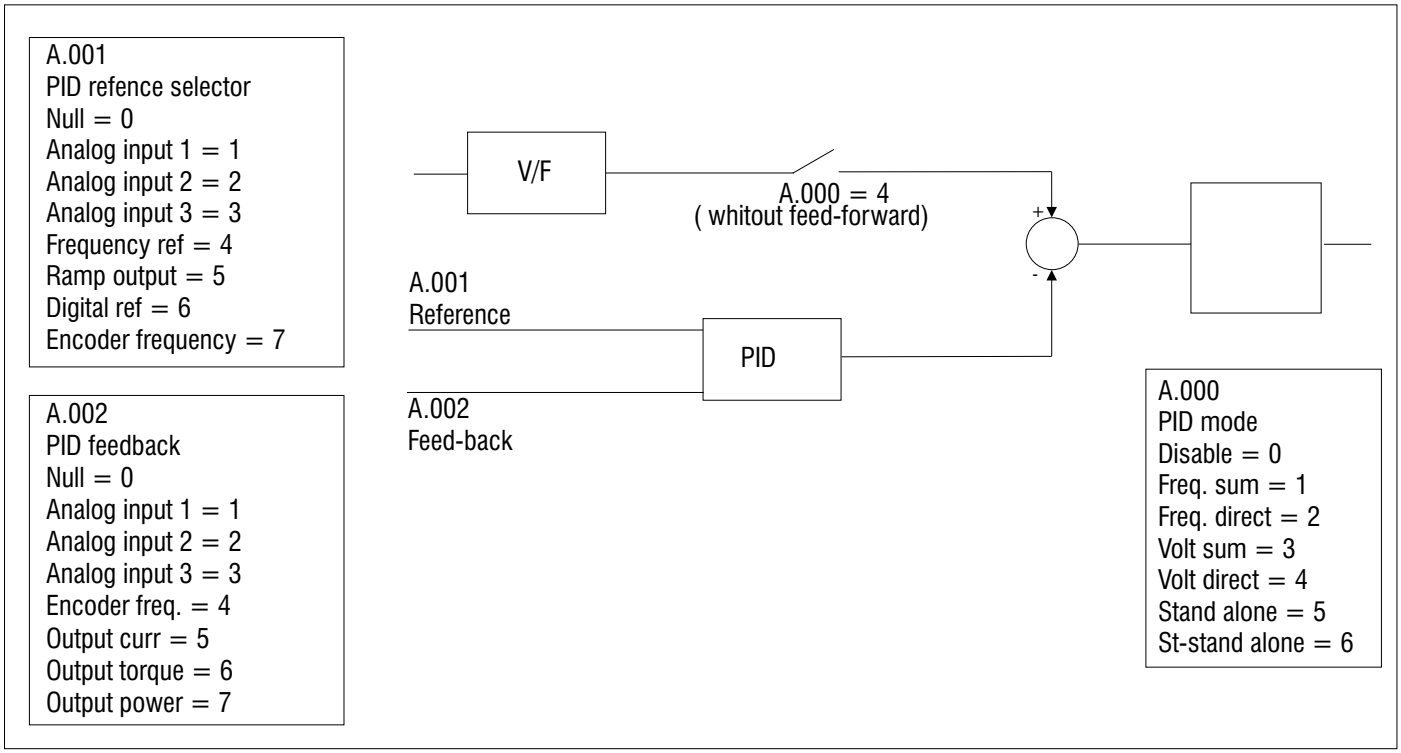



*Figure 10.7.3: PID Mode as Voltage Sum or Direct*

## A.001 PID reference selector

It defines and selects the source, from where the PID reference signal is provided and controlled.

| | |
|---|---|
| ***A.001 = 0 Null*** | Null |
| ***A.001 = 1 Analog inp 1*** | PID Reference connected to Analog input 1 |
| ***A.001 = 2 Analog inp 2*** | PID Reference connected to Analog input 2 |
| ***A.001 = 3 Analog inp 3*** | PID Reference connected to Analog input 3 |
| ***A.001 = 4 Frequency ref*** | PID Reference connected to Frequency reference |
| ***A.001 = 5 Ramp output*** | PID Reference connected to Ramp output signal |
| ***A.001 = 6 Digital ref*** | PID Reference connected to “PID digital ref”parameter |
| ***A.001 = 7 Encoder freq*** | PID Reference connected to Encoder frequency |

## A.002 PID Fbk sel (PID feedback selector)

It defines and selects the source, from where the PID feed-back signal is provided and controlled.

| | |
|---|---|
| ***A.001 = 0 Null*** | Null |
| ***A.001 = 1 Analog inp 1*** | PID Feed-back connected to Analog input 1 |
| ***A.001 = 2 Analog inp 2*** | PID Feed-back connected to Analog input 2 |
| ***A.001 = 3 Analog inp 3*** | PID Feed-back connected to Analog input 3 |
| ***A.001 = 4 Encoder freq*** | PID Feed-back connected to Encoder frequency |
| ***A.001 = 5 Output curr*** | PID Feed-back connected to Output current signal |
| ***A.001 = 6 Output torque*** | PID Feed-back connected to Output torque signal |
| ***A.001 = 7 Output power*** | PID Feed-back connected to Output power signal |

## A.003 PID digital ref (PID digital reference)

Setting of the reference for the PID function.
It will be active only if ***PID Fbk sel (A.002)*** is set as “6”

## A.004 PID activate mode

It defines if the PID function has to always be enabled or if it has active in steandy state only.

| | |
|---|---|
| ***A.004 = 0 Always*** | The PID function is always enabled. |
| ***A.004 = 1 Steady state*** | The PID function is enabled only at steady state. |

## A.005 PID-Encoder Sync (PID encoder syncronism)

The function syncronizes the updating time of the PID regulator, with the ones of the encoder feedback reading.

***A.005 = 0 Disable*** The function is not enabled. Setting to parameter ***PID update time (A.008).***

***A.005 =1 Enable*** The function is enabled. Setting of parameter ***A.008*** has no effect PID regulation will be updated according to ***I.504***.

## A.006 PID err sign rev (PID error signal reverse)

It allows to invert the polarity of the error signal between the reference and the feed-back (as consequence also the regulation effect is modified).

## A.007 PID Integ Init en (PID integral initializzation enabling)

The function allows to initialize the “integral parts” at the RUN command or during the passage from “gains setting 1” to “gains setting 2”. This allows to avoid abrupt oscillation of the regulator output.
When the function is active, the value of the integral component, will take on a value equal to:
**Iinit = Pid output - ( (Kp x err) + (Kd x** D**err)**.

## A.008 PID update time

It defines the updating time of the PID regulator. The value 0.00 means minimum updating time (5ms).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| A.000 | PID mode | [0] Disable<br>[1] Freq sum<br>[2] Freq direct<br>[3] Volt sum<br>[4] Volt direct<br>[5] Stand alone<br>[6] St-AI always | 0 | 0 | 6 | | | 1200 |
| A.001 | PID ref sel | [0] Null<br>[1] Analog inp 1<br>[2] Analog inp 2<br>[3] Analog inp 3<br>[4] Frequency ref<br>[5] Ramp output Ramp output<br>[6] Digital ref<br>[7] Encoder freq | 0 | 0 | 7 | | | 1201 |
| A.002 | PID fbk sel | [0] Null<br>[1] Analog inp 1<br>[2] Analog inp 2<br>[3] Analog inp 3<br>[4] Encoder freq<br>[5] Output curr<br>[6] Output torque<br>[7] Output power | 0 | 0 | 7 | | | 1202 |
| A.003 | PID digital ref | | 0 | -100 | 100 | % | 0,1 | 1203 |
| A.004 | PID activat mode | [0] Always<br>[1] Steady state | 0 | 0 | 1 | | | 1204 |
| A.005 | PID-Encoder sync | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 1205 |
| A.006 | PID err sign rev | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 1206 |
| A.007 | PIDInteg init en | [0] Disable<br>[1] Enable | 0 | 0 | 1 | | | 1207 |
| A.008 | PID update time | | 0 | 0 | 2.5 | sec | 0,01 | 1208 |

## PID Gains

The enabling of the PID regulator and the selection of two different gains setting, can be carried out via programmable digital inputs. Below are reported the parameters concerning the gains regulation.

### A.050 PID Prop gain 1 (PID proportional gain 1)

Proportional part gain (set 1).

### A.051 PID Int t const1 (PID integral constant 1)

Integral action time (set 1).

### A.052 PID Deriv gain 1 (PID derivative gain 1)

Derivative action time (set 1).

### A.053 PID Prop gain 2 (PID proportional gain 2)

Proportional part gain ( set 2).

### A.054 PID Int t const2 (PID derivative gain 2)

Integral action time (set 2).

### A.055 PID Deriv gain 2 (PID integral constant 2)

Derivative action time (set 2).

Digital input configuration to select parameter set 1 and set 2.
***I.100=21 PID gain sel***

Abrupt oscillation caused by the gains selection, can be avoided enabling the function.
***PID Integ. Init en ( A.007)***

The selection of the two gains setting, is possible programming the digital input as **Pid gain sel** (code 21).
The PID function enabling, is possible programming the digital inputs as **PID Enable** (code 20).

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| A.050 | PID Prop gain 1 | | 0 | 0 | 99.99 | | 0.01 | 1209 |
| A.051 | PID Int tconst 1 | | 99.99 | 0 | 99.99 | | 0.01 | 1210 |
| A.052 | PID Deriv gain 1 | | 0 | 0 | 99.99 | | 0.01 | 1211 |
| A.053 | PID Prop gain 2 | | 0 | 0 | 99.99 | | 0.01 | 1212 |
| A.054 | PID Int tconst 2 | | 99.99 | 0 | 99.99 | | 0.01 | 1213 |
| A.055 | PID Deriv gain 2 | | 0 | 0 | 99.99 | | 0.01 | 1214 |

## PID Limits

### A.056 PID high limit

Setting of the maximum allowed PID output.

### A.057 PID low limit

Setting of the minimum allowed PID output.

### A.058 PID max pos err (PID maximun positive error)

Setting of the maximum positive limit of the regulator error. It is expressed as percentage of the full scale value.
It defines the threshold for the digital output signalling.

## A.059 **PID min pos err** (PID minimun positive error)

Setting of the maximum negative limit of the regulator error. It is expressed as percentage of the full scale value
It defines the threshold for the digital output signalling.
Digital output signalling:

| | | |
|---|---|---|
| **18** | **PID err><** | PIP error is >A.058 &<=A.059 |
| **19** | **PID err>thr** | PID error is >A.058 |
| **20** | **PID err<thr** | PID error is <=A.059 |
| **21** | **PID er ><(inh)** | PID error>A.058 &<=A.059 (*) |
| **22** | **PID er >(inh)** | PID error is >A.058 (*) |
| **23** | **PID er <(inh)** | PID error is <=A.059 (*) |

(*) The control through the digital output, can become active only when the error returns the first time in the preset interval.

Variable monitoring in the DISPLAY MENU
The PID variables can be monitored in the following parameters:

| | | |
|---|---|---|
| **D.400** | **PID reference** | Reference signal |
| **D.401** | **PID feedback** | Feedback signal |
| **D.402** | **PID error** | Signalling of the error between reference and feedback |
| **D.403** | **PID integral comp** | Actual value of the integral component |
| **D.404** | **PID output** | Actual value of the PID regulator output |

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| A.056 | PID high limit | | 100 | -100 | 100 | % | 0.1 | 1215 |
| A.057 | PID low limit | | -100 | -100 | 100 | % | 0.1 | 1216 |
| A.058 | PID max pos err | | 5 | 0.1 | 100 | % | 0.1 | 1217 |
| A.059 | PID min neg err | | 5 | 0.1 | 100 | % | 0.1 | 1218 |

***APPLICATION SAMPLE : PRESSURE CONTROL***

Use of the PID function for the pressure control for pumps and extruder.

At the inverter that controls the extruder speed, must be send the analog signals relative to the setting and to the pressure transducer. If needed also the digital command for the PID enabling.

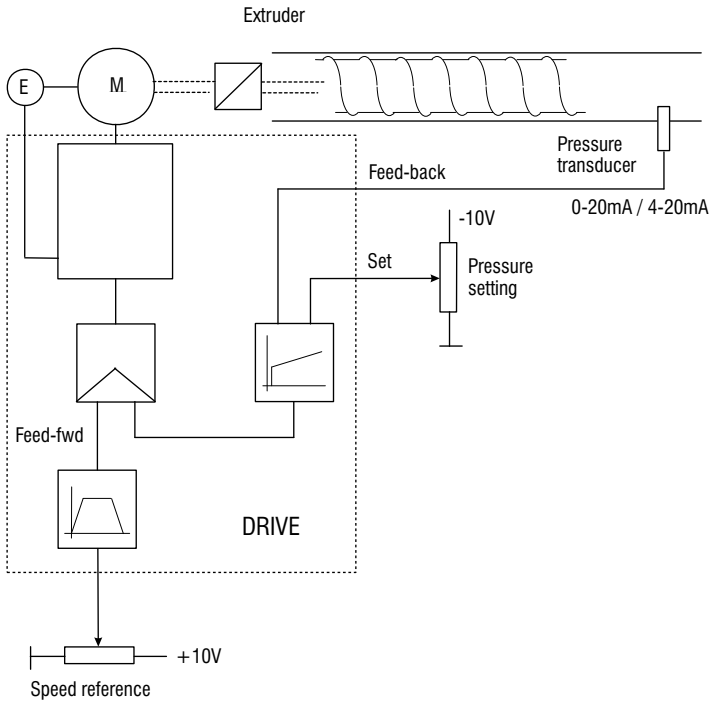



*Figure 10.7.4: PID Pressure Control for Pumps and Extruders*

Configuration of the ***Digital input 1*** for the PID regulator enabling.
***I.000 = 20*** (PID enable)

Configuration of the ***Ref 1 channel*** for the the main frequency reference.
***F.050 = 1*** (Analog input 1 as main SPEEDreference)

Configuration of the ***PID mode*** parameter.
***A.000 = 1*** (PID enabled as "Frequency sum")

Configuration of the ***PID reference selector*** parameter for the reference of the PID function.
***A.001 = 2*** (Analog input 2 as pressure setpoint)

Configuration of the ***PID fbk selector*** parameter for the feedback of the PID function.
***A.002 = 3*** (Analog input 3, only current type 0-20mA / 4-20mA, for the pressure transducer)

- In the **DISPLAY** menu, verify the correct reading of the PID reference (parameter ***d.400***) and of the PID feedback (parameter ***d.401***).
- Set the PID regulators gain as follow:
  - ***A.050 = 2*** Proportional part
  - ***A.051 = 1*** Integral part
  - ***A.052 = 0*** Derivative part

In case of it is necessary to set a limit correction on PID regulator, use ***A.056*** and ***A.057*** parameters.

Enable the PID function using the digital input 1 and execute a drive save parameters.

***ENCODER SETTINGS SAMPLE***

Use of the PID function for the speed control via encoder (closed loop).

For the closed loop control, the PID function has to be enabled.

The drive must be equipped with the optional card QUIX ENC, necessary for the encoder signals reading.

The position switch of the QUIX-ENC (S1-1 and S1-2) must to be set according to encoder power supply.

For further information on the derive configuration, when uswed in closed loop, please see the chapter **INTERFACE**, section **Encoder configuration**.

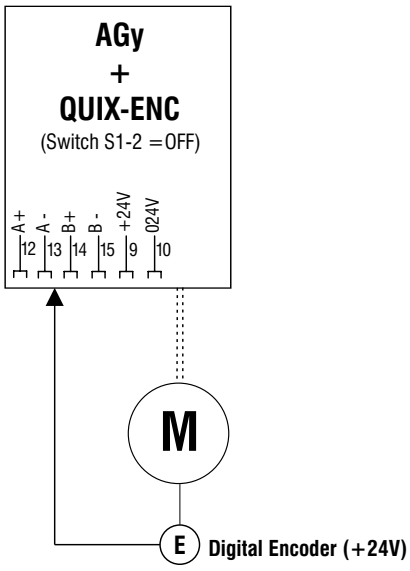



*Figure 10.7.5: PID Function as Speed Feed-back*

Example:

motor 1500rpm, 2 pole pairs, 400V, 50Hz.

encoder 1024 ppr, supply +24V, 2 channel ( A+, A-, B+, B-)

Before to carry on with the setting of the closed loop configuration, it is necessary to execute the initial start-up of the motor.

• **"Drive parameter setting" and "Parameters setting for enabling the encoder reading"**

Menu I (INTERFACE):

***I.500 = 1*** Encoder enabling

***I.501 = 1024***Encoder pulses per revolution

***I.502 = 1*** Encoder channels configuration **(0)** 1channel, **(1)** 2 channels.

PID parameter settings in the **APPLICATION** menu.

Menu A (APPLICATION):

***A.001*** - ***PID ref sel*** = [5] Ramp output

***A.002*** - ***PID Fbk sel*** = [4] Encoder freq

• Verify in the **DISPLAY** parameters, the correct monitoring of the frequency detected y the encoder

(parameter ***d.301***).

- Set the speed reference (analog or digital), for example 25Hz.

- Verify the **Reference frequency** (parameter ***d.001***) and compare it with the encoder frequency detection (parameter ***d.301***)

- The two values must be equal or differ by a small amount given by the motor slip.

In case of relevant difference, control the encoder wiring or the pulses number setting.

PID regulator gains setting:

***A.050 = 2*** Proportional part
***A.051 = 1*** Integral part
***A.052 = 0*** Derivative part

> ***NOTE!*** Initially start with low values and then increase them in accordance with the response needed by the system.

PID regulator enabling:

***A.000 = 1*** PID Mode as **Freq.sum** (PID output added to the ramp output)

Verify the correct working controlling the parameter ***D.402 (PID error)*** in the menu **DISPLAY**.

## 10.8 Menu C - COMMANDS

All the parameters of the COMMAND menu require to be executed according to the procedure listed below.
Save parameters command is used as example.

### Basic

#### C.000 Save parameters

Every changing of each parameter, is immediately accepted and executed by the drive.
However, permanent storage of them, is performed only by the execution of this command.

Unsaved modifications to any parameter will be lost when the drive is turned off.

#### C.001 Recall param

The function recalls the parameters that were previously stored, replacing the ones currently in use.

#### C.002 Load Deafult

Recall of the factory parameters.
The storage of them is a choice of the user.

### Alarm Register Reset

#### C.020 Alarm clear

The function reset completely the ***Alarm List*** register (***D.800…D.803***).

### External Key

#### C.040 Recall key prog

Recalling and storage of the parameters contained in the optional external key **QUIX-PRG.**
The key has to be set in the connector JP10 on the regulation board.

#### C.041 Save pars to key

Storage of the inverter parameter on the optional external key **QUIX-PRG.**

### Tuning

#### C.100 Measure stator R

It measures the stator resistance of the motor connected.
This will help to provide a smooth and uniform value of the output torque through the whole speed range.
The control is helped by the use of the Automatic boost (***P.401***).

Do not perform any tune when a multiple motor connection is being used.

## 10.9 Menu H - HIDDEN

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

### Virtual I/O Commands

#### H.000 Virtual digital command

Setting of the bits for the virtual commands assignment.

A byte is available for the selection of 8 digital commands, whose setting will interact with the “decoder mask”. The status of this mask will determine the switch for a virtual command (high status) or terminal command (low status).

Defining the mask for a virtual command, the function programmed on the digital inputs (***I.000…I.007***), will be executed by this parameter in accordance with the setting of its bits.

*Bit 1 = 1* *Virtual command 1 Enabled*
*Bit 2 = 2* *Virtual command 2 Enabled*
*Bit 3 = 4* *Virtual command 3 Enabled*
*Bit 4 = 8* *Virtual command 4 Enabled*
*Bit 5 = 16* *Virtual command 5 Enabled*
*Bit 6 = 32* *Virtual command 6 Enabled*
*Bit 7 = 64* *Virtual command 7 Enabled*
*Bit 8 = 128* *Virtual command 8 Enabled*

*The setting of the bits at “0”, will mean the disabling of the respective function.*

For further information about the function programming, see chapter **INTERFACE** section **Enabling Virtual I/O**.

#### H.001 Exp virtual digital command

Reserved

#### H.010 Virtual digital state

Setting of the bits for the virtual digital output function assignment.

A structure of 4 bits is available for the selection of the 4 digital outputs, whose setting will interact with the “decoder mask”. The status of this mask will determine the switch for a virtual digital output function (high status) or the function of the drive (low status).

Defining the mask as virtual, the digital outputs function will be executed by this parameter, in accordance with the setting of its bits.

*Bit 1 = 1* *Virtual function digital output 1 Enabled*
*Bit 2 = 2* *Virtual function digital output 2 Enabled*
*Bit 3 = 4* *Virtual function digital output 3 Enabled*
*Bit 4 = 8* *Virtual function digital output 4 Enabled*

The setting of the bits at “0”, will mean the disabling of the respective function.

For further information about the function programming, see chapter **INTERFACE** section **Enabling Virtual I/O**.

#### H.011 Exp Virtual digital state

Reserved

### H.020 Virtual An Output 1

### H.021 Virtual An Output 2

Setting of the value of the virtual analog outputs.

According to the status of the “decoder mask”, is determined if the analog outputs will provide a signalling deriving from the drive function (low status) or from a setting of the virtual control (high status).

Defining the mask as virtual, the value on the analog outputs can be regulated by the setting of these parameters.

***H.020*** and ***H.021*** = 0 analog outputs value = 0V
***H.020 and H.021*** = +32767 analog outputs value = +10V
***H.020*** and ***H.021*** = -32767 analog outputs value = -10V

For further information about the function programming, see chapter **INTERFACE** section **Enabling Virtual I/O**.

### H.022 Exp Virtual An Output 1

Reserved

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.000 | | | 0 | 0 | 255 | | | 1000 |
| H.001 | | | 0 | 0 | 255 | | | 1001 |
| H.010 | | | 0 | 0 | 255 | | | 1002 |
| H.011 | | | 0 | 0 | 255 | | | 1003 |
| H.020 | | | 0 | -32768 | 32767 | | | 1004 |
| H.021 | | | 0 | -32768 | 32767 | | | 1005 |
| H.022 | | | 0 | -32768 | 32767 | | | 1006 |

## Profidrive Parameters

### H.030 Profidrive Control word

Drive control word in accordance with the ***Profidrive profile.***

For further information please refer to the instruction manual of the SBI card (Profibus).

### H.031 Profidrive Status word

Drive status word in accordance with the ***Profidrive profile.***

For further information please refer to the instruction manual of the SBI card (Profibus).

### H.032 Profidrive Reference

Using a Profibus SBI card, the speed reference of the drive has to be set through this parameter, in accordance with the ***Profidrive profile.***

***H.031*** = 0 Reference = 0Hz
***H.031*** = +4000 hex Reference = ***Max ref freq (F.020)***
***H.031*** = -4000 hex Reference = ***Max ref freq (F.020)***

For details how program the functions, see chapter **INTERFACE**, section **Enabling Virtual I/O**.

### H.033 Profidrive Actual Frequency

Reading of the drive output frequency, in accordance with the ***Profidrive profile.***
For details how program the functions, see chapter **INTERFACE**, section **Enabling Virtual I/O**.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.030 | | | 0 | 0 | 65535 | | | 1007 |
| H.031 | | | 0 | 0 | 65535 | | | 1008 |
| H.032 | | | 0 | -16384 | 16383 | | | 1040 |
| H.033 | | | 1 | -16384 | 16383 | | | 1041 |

## Drive Status

### H.034 Drive Status

A structure of 4 bits, allows to monitor the drive status.
The meaning of them is the following:

Bit 0 Drive ready
Bit 1 Alarm state
Bit 2 Motor running
Bit 3 Steady state

### H.040 Progress

It is the indication in percentage of the progress about the “Save parameters” function.
A displaying of 100% means that the function has been completed.

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.034 | | | 0 | 0 | 65535 | | | 1042 |
| H.040 | | | 0 | 0 | 100 | | | 1009 |

## Parameters Reading Extension

When used a high conversion factor (***P.600***), the speed parameters reading must not exceed the values included between +32767 and –32767.

Over this threshold, it is possible to monitor the variables through this parameters, whose structure allows a reading extension structure at 32 bits.

### H.050 Drive output frequency 16 bit low (d.000)

### H.051 Drive output frequency 16 bit high (d.000)

### H.052 Drive reference frequency 16 low (d.001)

### H.053 Drive reference frequency 16 high (d.001)

### H.054 Output speed (d.000)*(P.600) 16 bit low (d.007)

### H.055 Output speed (d.000)*(P600) 16 bit high (d.007)

### H.056 Speed Ref (d.001)*(P.600) 16 bit low (d.008)

### H.057 Speed Ref (d.001)*(P.600) 16 bit high (d.008)

### H.058 Encoder freq 16 bit low (d.301)

### H.059 Encoder freq 16 bit high (d.301)

### H.060 Encoder speed (d.000)*(P.600) 16 bit low (d.302)

### H.061 Encoder speed (d.000)*(P.600) 16 bit high (d.302)

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.050 | | | 0 | - 2 31 | 2 31 -1 | | | 1010 |
| H.051 | | | 0 | - 2 31 | 2 31 -1 | | | 1011 |
| H.052 | | | 0 | - 2 31 | 2 31 -1 | | | 1012 |
| H.053 | | | 0 | - 2 31 | 2 31 -1 | | | 1013 |
| H.054 | | | 0 | - 2 31 | 2 31 -1 | | | 1014 |
| H.055 | | | 0 | - 2 31 | 2 31 -1 | | | 1015 |
| H.056 | | | 0 | - 2 31 | 2 31 -1 | | | 1016 |
| H.057 | | | 0 | - 2 31 | 2 31 -1 | | | 1017 |
| H.058 | | | 0 | - 2 31 | 2 31 -1 | | | 1018 |
| H.59 | | | 0 | - 2 31 | 2 31 -1 | | | 1019 |
| H.060 | | | 0 | - 2 31 | 2 31 -1 | | | 1044 |
| H.061 | | | 0 | - 2 31 | 2 31 -1 | | | 1045 |

## Remote I/Os Control

### H.100 Remote Digital Inputs (0..15)

### H.101 Remote Digital Inputs (16..31)

### H.110 Remote Digital Outputs (0..15)

### H.111 Remote Digital Outputs (16..31)

### H.120 Remote Analog input 1

### H.121 Remote Analog input 2

### H.130 Remote Analog output 1

### H.131 Remote Analog output 2

All the parameters are reserved

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.100 | | | 0 | 0 | 65535 | | | 1021 |
| H.101 | | | 0 | 0 | 65535 | | | 1022 |
| H.110 | | | 0 | 0 | 65535 | | | 1023 |
| H.111 | | | 0 | 0 | 65535 | | | 1024 |
| H.120 | | | 0 | -32768 | 32767 | | | 1025 |
| H.121 | | | 0 | -32768 | 32767 | | | 1026 |

| | | | | |
|---|---|---|---|---|
| H.130 | 0 | -32768 | 32767 | 1027 |
| H.131 | 0 | -32768 | 32767 | 1028 |

## Serial Link Commands

As reported at the chapter **PARAMETERS** section **Commands**, setting the ***P.000 =3 (SERIAL),*** the main commands are selectable exclusively via serial line or fieldbus.

The parameters listed below, are all the commands available when this function is selected.

### H.500 Hardware Reset

Hardware reset

### H.501 Alarm Reset

Alarm reset

### H.502 Coast to stop

Coast to stop

### H.503 Stop with ramp

Ramp to stop

### H.504 Clockwise Start

Clockwise Start

### H.505 Anti-clockwise Start

Anti-clockwise Start

### H.506 Clockwise Jog

Clockwise Jog

### H.507 Anti-clockwise Jog

Anti-clockwise Jog

### H.508 Clockwise Flying restart

Clockwise Flying restart

### H.509 Anti-clockwise Flying restart

Anti-clockwise Flying restart

### H.510 DC Brake

DCBrake

| Code | LCD display | [Code] & LCD select. | Default | MIN | MAX | Unit | Variation | IPA |
|---|---|---|---|---|---|---|---|---|
| H.500 | | | 0 | 0 | 1 | | | 1029 |
| H.501 | | | 0 | 0 | 1 | | | 1030 |
| H.502 | | | 0 | 0 | 1 | | | 1031 |
| H.503 | | | 0 | 0 | 1 | | | 1032 |
| H.504 | | | 0 | 0 | 1 | | | 1033 |
| H.505 | | | 0 | 0 | 1 | | | 1034 |
| H.506 | | | 0 | 0 | 1 | | | 1035 |
| H.507 | | | 0 | 0 | 1 | | | 1036 |
| H.508 | | | 0 | 0 | 1 | | | 1037 |
| H.509 | | | 0 | 0 | 1 | | | 1038 |
| H.510 | | | 0 | 0 | 1 | | | 1039 |