• 16B0301B3•

DCREG

OPERATION MANUAL

- DCREG INTERFACE VIA MODBUS-RTU -

Agg. 08/04/04
R. 00
Version 3.09

English

ENERTRONICA SANTERNO

Enertronica Santerno S.p.A.
Via della Concia, 7 - 40023 Castel Guelfo (BO) Italia
Tel. +39 0542 489711 - Fax +39 0542 489722
santerno.com info@santerno.com

INDEX

INDEX 2
1 COMMUNICATION SPECIFICATIONS 3
2.1 MEASURE PARAMETERS 4
2.2 PROGRAMMING PARAMETERS 6
2.3 CONFIGURATION PARAMETERS 11
2.4 SPECIAL PARAMETERS 13
3 MESSAGE FORMAT 17
3.1 FUNCTIONS SUPPORTED 18
3.1.1 03h: Read Holding Registers 18
3.1.2 10h: Preset Multiple Registers 18
4 DESCRIPTION OF BOARD es733 20
5 HALF DUPLEX CONTROL FOR LINE RS485 21
6 ALARM A027 – serial communication FAILURE 21

1 COMMUNICATION SPECIFICATIONS

Baud rate:	configurable between 1200 and 128000 bps via parameter **C161** (default: 9600 bps)
Datum format:	8 bits
Start bit:	1
Parity:	configurable between None, Even and Odd through parameter **C162** (default: None)
Stop bit:	2 if **C162**=None, 1 if **C162**=Even or Odd
Electric standard:	RS232 or RS485 half duplex or RS485 full duplex configurable via jumper on optional board ES733
Protocol:	MODBUS RTU
DCREG address :	configurable between 1 and 247 through parameter **C160** (default 1)
Initial address of data area:	configurable between 0 and 32767 through parameter **C163** (default 0)
Time out for end of message:	configurable between 0 and 2000 ms through parameter **C164** (default 300 ms)
Response delay:	configurable between 0 and 2000 ms through parameter **C165** (default 0 ms)

This manual describes how to interface a DCREG (slave) converter to an intelligent outside control unit (master) via MODBUS-RTU. **In order to perform this interface, an optional board ES733 must be installed on the DCREG (see paragraph 4).**

Via MODBUS-RTU

it is possible to:
read every parameter of the converter
modify and save on EEPROM the parameters marked **R/W** in the following paragraph 2;

it is not possible to:
perform converter auto-tuning;
manage the EEPROM in the same manner as the remotable keyboard (Default Restore, WorkArea Backup, Backup Restore).

The following table shows the MODBUS addresses allowing to access DCREG internal parameters via serial communication. The table shows:

1) the parameter name and number,
2) its configuration,
3) its MODBUS address,
4) the extremes which do not include 03 ILLEGAL DATA VALUE exception (see p.14/15),
5) its unit of measure (displayed),
6) the ratio between the DCREG internal value (sent via serial communication) and the physical value mentioned (displayed),
7) the access type (RO reading only or R/W reading and writing),
8) the logical blocks allowing it to be modified (writing).

N.B.: unless otherwise specified, each parameter is exchanged as integer with sign at 16 bit (between –32768 and +32767).

For further details on the parameter configuration (in particular for the alphanumeric parameters, pointed out as AlfaNum in column 5) and the logical blocks refer to "OPERATION MANUAL 15P0059A3 DCREG2 DCREG4" R.01 Software Vers. D3.09.

1) Name	2) Configuration	3) MODBUS Address	4) Range	5) Unit of measure	6) Ratio	7) RO R/W	8)

2.1 MEASURE PARAMETERS

M000 Vref	Speed / voltage reference applied to ramps	**10**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M001 nFdbk	Speed / voltage feedback	**11**	-100 ÷ +100	%	-100 / 3FFFh	RO	-
M002 NSetPoint	Speed / voltage error	**12**	-200 ÷ +200	%	100 / 3FFFh	**RO**	-
M003 Iref	Armature Current Reference	**13**	-150 ÷ +150	%	100 / 1FFh	**RO**	-
M004 Iarm	Armature current	**14**	-1.5 **DriveSize**÷ +1.5 **DriveSize**	A	**DriveSize** / 2400	**RO**	-
M005 Alfa	Thyristor Firing Delay Angle	**15**	**P230** ÷ **P231**	°	100	**RO**	-
M006 Varm	Armature voltage	**16**	-1000 ÷ +1000	V	1	**RO**	-
M007 BackEMF	Back-Electromotive force	**17**	-1000 ÷ +1000	V	1	RO	-
M008 Mfreq	Mains frequency	**18**	40 ÷ 70	Hz	10	**RO**	-
M009 Vmains	Mains voltage	**19**	0 ÷ 1000	V	1	**RO**	-
M010 AnIn1	Auxiliary analog input 1 to terminals 11 and 13	**20**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M011 AnIn2	Auxiliary analog input 2 to terminal 17	**21**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M012 AnIn3	Auxiliary analog input 3 to terminal 19	**22**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M013 UpDnRef	Internal UP/DOWN speed / voltage reference	**23**	-100 ÷ +100	%	100 / 3FFFh	RO	-
M014 TermRef	Speed / voltage reference to terminals 5 and 7	**24**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M015 SLRef	Speed / voltage reference from MODBUS	**25**	-100 ÷ +100	%	100 / 3FFFh	**R/W**	**97**
M016 FBRef	Speed / voltage reference from PROFIBUS	**26**	-100 ÷ +100	%	100 / 3FFFh	**RO**	-
M017 RefFld	Field Current Reference	**27**	0 ÷ 100	%	100 / FFFh	**RO**	-
M018 Ifld	Field current	**28**	0 ÷ 40	A	40 / 3FFh	**RO**	-
M019 AnOut1	Analog output 1 on terminal 8	**29**	-10 ÷ +10	V	10 / FFFh	RO	-
M020 AnOut2	Analog output 2 on terminal 10	**30**	-10 ÷ +10	V	10 / FFFh	**RO**	-
M021 DigIn	Digital input state after the OR	**31**	00000000b ÷ 11111111b	**Note A)**		**RO**	-
M022 MDO	Digital output state	**32**	00000xxxb ÷ 11111xxxb	**Note B)**		**RO**	-
M023 FldReg	State Of Field Regulator Internal Digital Inputs	**33**	xx00xxxxb ÷ xx11xxxxb	**Note C)**		**RO**	-
M024 Pout	Electrical output power	**34**	0 ÷ 5250	kW	1 / 10	**RO**	-
M025 Torque	Motor torque	**35**	0 ÷ 180	%	100 / 2AAAh	**RO**	-
M026 EFreq	Encoder frequency	**36**	-102.4 ÷ +102.4	kHz	10 / 3FFFh	**RO**	-
M027 DriveLife	Drive life	**468**	0 ÷ 235926000	s	1	**RO**	–

M028 PhaseSeq	Phase Sequence	38	0 ÷ 1	AlphaNu Note E)	RO	-
M029 TermDigIn	Digital input state to terminals 24, 26, 28, 30, 32, 34, 36 and 38	39	00000000b ÷ 11111111b	Note A)	RO	-
M030 SLDigIn	Digital input state from MODBUS	40	00000000b ÷ 11111111b	Note A)	R/W	98
M031 FBDigIn	Digital input state from PROFIBUS	41	00000000b ÷ 11111111b	Note A)	RO	-

2.2 PROGRAMMING PARAMETERS

P000 Key	Programming code	50	0 ÷ 2	AlphaNu		R/W	10
P001 AutoTune	Auto Tune Command	51	0 ÷ 3	AlphaNu Note F)		R/W	-
P002 ParmsCopy	Copy parameters command	52	0 ÷ 3	AlphaNu Note G)		R/W	-
P003 ProgLevel	Programming level	53	0 ÷ 1	AlphaNu		R/W	-
P004 FirstPage	Page displayed at power on	54	0 ÷ 1	AlphaNu		R/W	-
P005 FirstParm	Measure parameter display on KEYPAD page	55	1 ÷ 33	Note H)		R/W	-
P006 MeasureSel	Selection of measure parameters in page KEYPAD	463 ÷ 466		Nota J)		R/W	–
P010 nFdbkMax	Max speed	60	300 ÷ 6000	RPM	1	R/W	-
P011 VarmMax	Max armature voltage	61	50 ÷ 2000	V	1	R/W	19
P012 SpdDmndPol	Speed / Voltage Reference Polarity	62	0 ÷ 2	AlphaNu		R/W	113
P013 nMaxPos	Speed / Voltage Max. Positive Reference	63	0 ÷ 100	%	1	R/W	40
P014 nMinPos	Speed/ Voltage Min. Positive Reference	64	0 ÷ 100	%	1	R/W	111
P015 nMaxNeg	Speed / Voltage Max. Negative Reference	65	-100 ÷ 0	%	1	R/W	41
P016 nMinNeg	Speed / Voltage Min. Negative Reference	66	-100 ÷ 0	%	1	R/W	112
P030 RampUpPos	Positive Reference Ramp Up	75	0 ÷ 300	S	100	R/W	87
P031 RampDnPos	Positive Reference Ramp Down	76	0 ÷ 300	S	100	R/W	87
P032 RampUpNeg	Negative Reference Ramp Up	77	0 ÷ 300	S	100	R/W	87
P033 RampDnNeg	Negative Reference Ramp Down	78	0 ÷ 300	s	100	R/W	87
P034 RampStopPos	Positive Reference Stop Ramp	79	0 ÷ 300	s	100	R/W	-
P035 RampStopNeg	Negative Reference Stop Ramp	80	0 ÷ 300	s	100	R/W	-
P036 RampUpJog	Jog Reference Ramp Up	81	0 ÷ 300	s	100	R/W	-
P037 RampDnJog	Jog Reference Ramp Down	82	0 ÷ 300	s	100	R/W	-
P038 InitialRndg	Ramp initial rounding	83	0 ÷ 10	s	100	R/W	87
P039 FinalRndg	Ramp final rounding	84	0 ÷ 10	s	100	R/W	87
P040 RampIncDec	UP/DOWN internal reference ramp	85	0.1 ÷ 100	s	100	R/W	-
P050 Ilim1A	Bridge A First Current Limit	90	0 ÷ 300	%	1	R/W	-
P051 Ilim1B	Bridge B First Current Limit	91	0 ÷ 300	%	1	R/W	101
P052 Ilim2A	Bridge A Second Current Limit	92	0 ÷ 300	%	1	R/W	-
P053 Ilim2B	Bridge B Second Current Limit	93	0 ÷ 300	%	1	R/W	101
P054 Speed 1→2	1→2 Current Limit Speed Rate	94	0 ÷ 100	%	1	R/W	-
P055 IlimHyper	Current Limit For Hyperbola End	95	0 ÷ 300	%	1	R/W	-
P056 SpeedHyper1	Hyperbolic Limit Start Speed	96	0 ÷ 100	%	1	R/W	50
P057 SpeedHyper2	Hyperbolic Limit End Speed	97	0 ÷ 100	%	1	R/W	51
P058 Clim	Current Limit Decrease Per Cent	98	0 ÷ 100	%	1	R/W	-

P059 dI/dtMax	Ramp over current reference	99	0.01 ÷ 1	%/µs	500	R/W	-
P060 OverLimA	Bridge A Current Overlimit	100	100 ÷ 300	%	1	R/W	-
P061 OverLimB	Bridge B Current Overlimit	101	100 ÷ 300	%	1	R/W	101
P062 TFullOvLim	Overlimit Digital Output Delay	102	0.2 ÷ 60	s	10	R/W	-
P070 KpSpeed	Speed loop proportional gain	110	0.1 ÷ 100		300	R/W	-
P071 TiSpeed	Speed loop integral time	111	0.01 ÷ 5	s	1000	R/W	-
P073 KpSpdAdapt	Speed loop adapted proportional gain	113	0 .1÷ 100		300	R/W	-
P074 TiSpdAdapt	Speed loop adapted integral time	114	0.01 ÷ 5	s	1000	R/W	-
P076 KpSpeed2	Speed Loop Second Proportional Gain	116	0.1 ÷ 100		300	R/W	-
P077 TiSpeed2	Speed Loop Second Integral Time	117	0.01 ÷ 5	s	1000	R/W	-
P079 KpSpdAdapt2	Speed Loop Second Adapted Proportional Gain	119	0.1 ÷ 100		300	R/W	-
P080 TiSpdAdapt2	Speed Loop Second Adapted Integral Time	120	0.01 ÷ 5	s	1000	R/W	-
P082 AdaptCtrl	Speed Parameter Auto-Adaptation	122	0 ÷ 1	AlphaNu		R/W	-
P083 Verr1	First speed error for auto-adaptation	123	0 ÷ 100	%	10	R/W	30
P084 Verr2	Second speed error for auto-adaptation	124	0 ÷ 100	%	10	R/W	31
P085 TiRampScale	Ramp Speed Integral Time Increase	125	1 ÷ 1000		1	R/W	-
P086 ArmatureCmp	Armature compensation	126	0 ÷ 200	%	1	R/W	-
P087 VerrOffset	Speed / voltage error offset	127	-1 ÷ +1	%	100 / 3FFFh	R/W	-
P088 RxI	Armature resistive drop	128	0 ÷ 100	V	1	R/W	18
P100 KpCurr	Current loop proportional gain	135	0 ÷ 1		20000	R/W	-
P101 TiCurrDisc	Current Loop Integral Time With Discontinuous Current Conduction	136	1 ÷ 100	ms	100	R/W	-
P102 TiCurrCont	Current loop integral time in With Continuous Current Conduction	137	1 ÷ 320	ms	100	R/W	-
P103 RxI Pred	Armature equivalent resistive drop	138	0 ÷ 282.8	V	20 / 1.414	R/W	-
P104 LdI/dt Pred	Armature equivalent inductive drop	139	0 ÷ 2.828	V	2000 / 1.414	R/W	-
P110 KpFld	Voltage Loop Proportional Gain For Field Regulator	145	0.005 ÷ 1.500		2	R/W	-
P111 TiFld	Voltage Loop Integral Time For Field Regulator	146	0.1 ÷ 1	s	100	R/W	-
P120 VrefPol	Speed / voltage Main Analog Input Polarity	150	0 ÷ 2	AlphaNu		R/W	-
P121 VrefBias	Speed/voltage Main Analog Input Bias	151	-400 ÷ +400	%	10	R/W	-
P122 VrefGain	Speed/voltage Main Analog Input Gain	152	-800 ÷ +800	%	10	R/W	-
P123 IrefPol	Current Main Analog Input Polarity	153	0 ÷ 2	AlphaNu		R/W	-
P124 IrefBias	Current Main Analog Input Bias	154	-400 ÷ +400	%	10	R/W	-

P125 IrefGain	Main Current Analog Input Gain	155	-800 ÷ +800	%	10	R/W	-
P126 AnIn1Pol	Polarity for auxiliary analog input 1	156	0 ÷ 2	AlphaNu		R/W	-
P127 AnIn1Bias	Bias for auxiliary analog input 1	157	-400 ÷ +400	%	10	R/W	-
P128 AnIn1Gain	Gain for auxiliary analog input 1	158	-800 ÷ +800	%	10	R/W	-
P129 AnIn2Pol	Polarity for auxiliary analog input 2	159	0 ÷ 2	AlphaNu		R/W	-
P130 AnIn2Bias	Bias for auxiliary analog input 2	160	-400 ÷ +400	%	10	R/W	-
P131 AnIn2Gain	Gain for auxiliary analog input 2	161	-800 ÷ +800	%	10	R/W	-
P132 AnIn3Pol	Polarity for auxiliary analog input 4	162	0 ÷ 2	AlphaNu		R/W	-
P133 AnIn3Bias	Bias for auxiliary analog input 3	163	-400 ÷ +400	%	10	R/W	-
P134 AnIn3Gain	Gain for auxiliary analog input 3	164	-800 ÷ +800	%	10	R/W	-
P150 AnOut1Cfg	Analog Output 1 Configuration	175	0 ÷ 13	AlphaNu		R/W	-
P151 AnOut1Bias	Analog output 1 bias	176	-400 ÷ +400	%	10	R/W	-
P152 AnOut1Gain	Analog output 1 gain	177	-800 ÷ +800	%	10	R/W	-
P153 AnOut2Cfg	Analog Output 2 Configuration	178	0 ÷ 13	AlphaNu		R/W	-
P154 AnOut2Bias	Analog Output 2 Bias	179	-400 ÷ +400	%	10	R/W	-
P155 AnOut2Gain	Analog Output 2 Gain	180	-800 ÷ +800	%	10	R/W	-
P156 IOutPol	Analog Output IOut Polarity	181	0 ÷ 1	AlphaNu		R/W	101
P157 AnOut1Pol	Analog Output 1 Polarity	182	0 ÷ 1	AlphaNu		R/W	-
P158 AnOut2Pol	Analog Output 2 Polarity	183	0 ÷ 1	AlphaNu		R/W	-
P170 MDO1Cfg	Digital Output 1 Configuration	190	0 ÷ 13	AlphaNu		R/W	-
P171 MDO1OnDelay	Digital output 1 Enabling delay	191	0 ÷ 600	s	50	R/W	-
P172 MDO1OffDelay	Digital output 1 Disabling delay	192	0 ÷ 600	s	50	R/W	-
P173 MDO1Level	Digital output 1 switching level	193	0 ÷ 200	%	1	R/W	60
P174 MDO1Hyst	Digital output 1 switching hysteresis	194	0 ÷ 200	%	1	R/W	61
P175 MDO1Logic	Digital output 1 contact logic	195	0 ÷ 1	AlphaNu		R/W	-
P176 MDO2Cfg	Digital Output 2 Configuration	196	0 ÷ 13	AlphaNu		R/W	-
P177 MDO2OnDelay	Digital output 2 Enabling delay	197	0 ÷ 600	s	50	R/W	-
P178 MDO2OffDelay	Digital output 2 Disabling delay	198	0 ÷ 600	s	1	R/W	-
P179 MDO2Level	Digital output 2 switching level	199	0 ÷ 200	%	1	R/W	62

P180 MDO2Hyst	Digital output 2 switching hysteresis	200	0 ÷ 200	%	1	R/W	63
P181 MDO2Logic	Digital output 2 contact logic	201	0 ÷ 1	AlphaNu		R/W	-
P182 MDO3Cfg	Digital Output 3 Configuration	202	0 ÷ 13	AlphaNu		R/W	-
P183 MDO3OnDelay	Digital output 3 Enabling delay	203	0 ÷ 600	s	1	R/W	-
P184 MDO3OffDelay	Digital output 3 Disabling delay	204	0 ÷ 600	s	1	R/W	-
P185 MDO3Level	Digital output 3 switching level	205	0 ÷ 200	%	1	R/W	64
P186 MDO3Hyst	Digital output 3 switching hysteresis	206	0 ÷ 200	%	50	R/W	65
P187 MDO3Logic	Digital output 3 contact logic	207	0 ÷ 1	AlphaNu		R/W	-
P188 MDO4Cfg	Digital Output 4 Configuration	208	0 ÷ 13	AlphaNu		R/W	-
P189 MDO4OnDelay	Digital output 4 Enabling delay	209	0 ÷ 600	s	1	R/W	-
P190 MDO4OffDelay	Digital output 4 Disabling delay	210	0 ÷ 600	s	1	R/W	-
P191 MDO4Level	Digital output 4 switching level	211	0 ÷ 200	%	50	R/W	66
P192 MDO4Hyst	Digital output 4 switching hysteresis	212	0 ÷ 200	%	50	R/W	67
P193 MDO4Logic	Digital output 4 contact logic	213	0 ÷ 1	AlphaNu		R/W	-
P194 MDO5Cfg	Digital Output 5 Configuration	214	0 ÷ 10	AlphaNu		R/W	-
P195 MDO5OnDelay	Digital output 5 Enabling delay	215	0 ÷ 600	s	1	R/W	-
P196 MDO5OffDelay	Digital output 5 Disabling delay	216	0 ÷ 600	s	50	R/W	-
P197 MDO5Level	Digital output 5 switching level	217	0 ÷ 200	%	50	R/W	68
P198 MDO5Hyst	Digital output 5 switching hysteresis	218	0 ÷ 13	%	1	R/W	69
P199 MDO5Logic	Digital output 5 contact logic	219	0 ÷ 1	AlphaNu		R/W	-
P211 PresetSpd1	Preset Speed/voltage 1 Reference	226	-100 ÷ +100	%	10	R/W	-
P212 PresetSpd2	Preset speed/voltage 2 reference	227	-100 ÷ +100	%	10	R/W	-
P213 PresetSpd3	Preset speed/voltage 3 reference	228	-100 ÷ +100	%	10	R/W	-
P214 PresetSpd4	Preset speed/voltage 4 reference	229	-100 ÷ +100	%	10	R/W	-
P215 PresetSpd5	Preset speed/voltage 5 reference	230	-100 ÷ +100	%	10	R/W	-
P216 PresetSpd6	Preset speed/voltage 6 reference	231	-100 ÷ +100	%	10	R/W	-
P217 PresetSpd7	Preset speed/voltage 7 reference	232	-100 ÷ +100	%	10	R/W	-
P221 JogSelect	Jog ramp selection	236	0 ÷ 2	AlphaNu		R/W	-
P222 Jog1	Jog 1 reference	237	-100 ÷ +100	%	10	R/W	-
P223 Jog2	Jog 2 reference	238	-100 ÷ +100	%	10	R/W	-

P224 Jog3	Jog 3 reference	239	-100 ÷ +100	%	10	R/W	-
P230 AlfaMin	Firing Min. Angle	245	0 ÷ 80	°	100	R/W	-
P231 AlfaMax	Firing Max. Angle	246	100 ÷ 180	°	100	R/W	-
P240 LowPassConst	Low Pass Filter Over The Voltage / Speed Error	250	0 ÷ 300	ms	100	R/W	-
P250 UpDnRefPol	UP/DOWN internal reference polarity	255	0 ÷ 2	AlphaNu		R/W	-
P251 UpDnRefMem	UP/DOWN internal reference reset at start-up	256	0 ÷ 1	AlphaNu		R/W	-

2.3 CONFIGURATION PARAMETERS

NOTE R/W parameters may be changed only when drive DCREG is not in RUN mode.

C000 Inom	Motor nominal current	**310**	1 ÷ 100	%	1	R/W	-
C001 MotThrshold	Current For Motor I^2t Protection	**311**	1 ÷ 120	%	1	R/W	-
C002 MotThConst	Time Constant For Motor I^2t Protection	**312**	0 ÷ 10800	s	1	R/W	-
C010 IfldNom	Motor field nominal current	**320**	3 ÷ 100	%	10	R/W	-
C011 BaseSpeed	Field Regulation Start Nominal Speed	**321**	5 ÷ 100	%	1	R/W	-
C012 VarmNom	Nominal Armature Voltage at field regulation start	**322**	50 ÷ 1000	V	1	R/W	-
C014 FldEcoLevel	Standstill Field Current	**324**	0 ÷ 100	%	1	R/W	-
C015 FldEcoDelay	Standstill Field Current Decrease Delay	**325**	0 ÷ 300	s	50	R/W	-
C016 IfldMin	Min. Field Current In Field Regulation Mode	**326**	5 ÷ 100	%	1	R/W	-
C017 FldFrcLevel	Field Current Boost	**327**	100 ÷ 120	%	1	R/W	-
C018 FldFrcTime	Field Current Boost Time	**328**	0 ÷ 60	s	50	R/W	-
C030 VmainsNom	Power Supply Nominal Voltage	**330**	10 ÷ VmainsMax	V	1	R/W	**20**
C050 SpdLoopSel	Speed Loop Operation	**335**	1 ÷ 3	AlphaNu		R/W	**86**
C051 CurrLoopSel	Current Loop Operation	**336**	0 ÷ 1	AlphaNu		R/W	-
C052 FldLoopSel	Field Regulator Voltage Loop Operation	**337**	0 ÷ 1	AlphaNu		R/W	-
C060 1stQ-FwdMot	First Quadrant Selection	**340**	0 ÷ 1	AlphaNu		R/W	-
C061 2ndQ-RevReg	Second Quadrant Selection	**341**	0 ÷ 1	AlphaNu		R/W	-
C062 3rdQ-RevMot	Third Quadrant Selection	**342**	0 ÷ 1	AlphaNu		R/W	**101**
C063 4thQ-FwdReg	Fourth Quadrant Selection	**343**	0 ÷ 1	AlphaNu		R/W	**101**
C070 nFdbkSelect	Speed feedback selection	**345**	0 ÷ 4	AlphaNu		R/W	-
C072 EncoderPls	Encoder pulses / rev	**347**	100 ÷ 10000	Pulses	1	R/W	-
C074 Tach Volts	Tacho transduction ratio	**349**	5 ÷ 120	V / 1000 RPM	1	R/W	-
C075 nFdbkSwitch	Feedback autoswitch	**350**	0 ÷ 1	AlphaNu		R/W	-
C090 AutoReset	Alarm autoreset number	**355**	0 ÷ 10	AlphaNu		R/W	-
C091 AutoResTime	Autoreset Number Time	**356**	1 ÷ 999	s	1	R/W	-
C092 PwrOnReset	Power-On Autoreset	**357**	0 ÷ 1	AlphaNu		R/W	-
C093 MainsReset	Autoreset after mains Cut Out	**358**	0 ÷ 1	AlphaNu		R/W	-
C094 StartSafety	Restart Safety	**359**	0 ÷ 1	AlphaNu		R/W	-
C100 LocRemSel	LOCAL / REMOTE Selection Enabling	**365**	0 ÷ 1	AlphaNu		R/W	-
C101 PwrOnDelay	Waiting time for starting	**366**	0 ÷ 10	s	1000	R/W	–
C102 ZeroingTime	Current zeroing time	**367**	30 ÷ 3000	ms	10	R/W	–
C103 EmergStop	Emergency stop	**368**	0 ÷ 1	AlphaNu		R/W	-

C105 RefSelect1	Speed / voltage reference source 1	**370**	0 ÷ 4	AlphaNu		R/W	**122**
C106 RefSelect2	Speed / voltage reference source 2	**371**	0 ÷ 4	AlphaNu		R/W	**122**
C107 RefSelect3	Speed / voltage reference source 3	**372**	0 ÷ 4	AlphaNu		R/W	**122**
C108 RefSelect4	Speed / voltage reference source 4	**373**	0 ÷ 4	AlphaNu		R/W	**122**
C110 CommandSel1	Command source 1	**375**	0 ÷ 4	AlphaNu		R/W	**122**
C111 CommandSel2	Command source 2	**376**	0 ÷ 4	AlphaNu		R/W	**122**
C112 CommandSel3	Command source 3	**377**	0 ÷ 4	AlphaNu		R/W	**122**
C120 AnIn1Cfg	Analog Input 1 Configuration	**385**	0 ÷ 10	AlphaNu		R/W	–
C121 AnIn2Cfg	Analog Input 2 Configuration	**386**	0 ÷ 10	AlphaNu		R/W	–
C122 AnIn3Cfg	Analog Input 3 Configuration	**387**	0 ÷ 10	AlphaNu		R/W	–
C123 ExtLimPol	External Limit Polarity	**388**	0 ÷ 1	AlphaNu		R/W	-
C130 MDI1Cfg	Digital Input 1 Configuration	**395**	0 ÷ 20	AlphaNu		R/W	-
C131 MDI2Cfg	Digital Input 2 Configuration	**396**	0 ÷ 20	AlphaNu		R/W	-
C132 MDI3Cfg	Digital Input 3 Configuration	**397**	0 ÷ 20	AlphaNu		R/W	-
C133 MDI4Cfg	Digital Input 4 Configuration	**398**	0 ÷ 20	AlphaNu		R/W	-
C134 MDI5Cfg	Digital Input 5 Configuration	**399**	0 ÷ 20	AlphaNu		R/W	-
C135 MDI6Cfg	Digital Input 6 Configuration	**400**	0 ÷ 20	AlphaNu		R/W	-
C141 A016/7 (VAC)	Alarm A016/17 Trip Delay	**406**	0 ÷ 2000	ms	2	R/W	-
C142 A027	Alarm A027 Trip Delay	**407**	1 ÷ 100	s	50	R/W	-
C143 A028	Alarm A028 Trip Delay	**408**	1 ÷ 100	s	50	R/W	-
C150 A001 (Fld)	Alarm A001 disabling	**410**	0 ÷ 1	AlphaNu		R/W	-
C151 A004 (Load)	Alarm A004 disabling	**411**	0 ÷ 1	AlphaNu		R/W	-
C153 A006 (fUnst)	Alarm A006 disabling	**413**	0 ÷ 1	AlphaNu		R/W	-
C154 A007 (Mains)	Alarm A007 disabling	**414**	0 ÷ 1	AlphaNu		R/W	-
C155 A008 (nFdbk)	Alarm A008 disabling	**415**	0 ÷ 1	AlphaNu		R/W	-
C156 A010 (ArmOV)	Alarm A010 disabling	**416**	0 ÷ 1	AlphaNu		R/W	-
C157 A016/7 (VAC)	Alarm A016/17 disabling	**417**	0 ÷ 1	AlphaNu		R/W	-
C158 A027	Alarm A027 disabling	**418**	0 ÷ 1	AlphaNu		R/W	-
C159 A028	Alarm A028 disabling	**419**	0 ÷ 1	AlphaNu		R/W	-
C160 DeviceID	Converter address in serial connection	**420**	1 ÷ 247	AlphaNu		R/W	-
C161 BaudRate	Serial Connection Baud Rate	**421**	0 ÷ 7	AlphaNu		R/W	-
C162 Parity	Serial Connection Parity Control	**422**	0 ÷ 2	AlphaNu		R/W	-
C163 BaseAddress	Master Data Area Starting Address	**423**	0 ÷ 32767	AlphaNu		R/W	-
C164 RTUTimeOut	Serial time out	**424**	0 ÷ 2000	ms	2	R/W	-
C165 Rx→TxDelay	Serial Response Delay	**425**	0 ÷ 2000	ms	2	R/W	-
C170 LoadType	Load type	**430**	0 ÷ 1	AlfaNum		R/W	-

2.4 SPECIAL PARAMETERS

NOTE R/W parameters may be modified only when drive DCREG is not in RUN mode.

AlarmNumber	Alarm or warning code	8	0 ÷ 36	AlphaNum Note K)		RO	-
Imax	Posizione trimmer T2	467	0 ÷ 3FFh		1	RO	
LED	LED state on remotable keyboard	471	00000000b ÷ 11111111b	Note L)		RO	-
SaveAddress	EEPROM Save Address	472	0 ÷ 511	Note M)	1	RO	-
SWVersion	SW Version (e.g. D3.09)	475		Note N)	100	RO	-
DriveType	Uni / Bidirectional DCREG	480	0 ÷ 2	AlphaNu Note O)		RO	-
DriveSize	DCREG Size	481	10 ÷ 3500	A	1	RO	-
VmainsMax	Mains Max. Voltage To Be Applied To The Power Section	482	0 ÷ 3	AlphaNu Note P)		RO	-
VarmOffset	Offset over the armature voltage reading	483	-500 ÷ +500	V	1	R/W	-
FieldSize	DCREG field circuit size	484	0 ÷ 3	AlphaNu Note Q)		RO	-

Note A)
Bit 0 ENABLE
Bit 1 START
Bit 2 MDI1
Bit 3 MDI2
Bit 4 MDI3
Bit 5 MDI4
Bit 6 MDI5
Bit 7 MDI6

Note B)
Bit 3 MDO5
Bit 4 MDO1
Bit 5 MDO2
Bit 6 MDO3
Bit 7 MDO4

Note C)
Bit 4 → /60HZ
5 → /RUN

Note E)
= 0: RST; = 1: TSR.

Note F)
It is possible to read and write the values of parameter **P002** at any time ,but it is not possible to interact completely with the auto-tuning (it is necessary to press keys on the remotable keyboard and close the ENABLE contact) except directly on the converter.

Note G)
It is possible to read and write the values of parameter **P003** at any time, but it is not possible to manage the EEPROM completely (it is necessary to press keys on the remotable keyboard) except directly on the converter.

Note H)
KEYPAD if **FirstParm** = 1;
Mxxx = **FirstParm**-2 if **FirstParm** > 1;

Nota J)
The 8 measures parameter chosen from P006 are settled as byte (8 bit) in the following way, setting in parameter 1 the first parameter displayed in KEYPAD, with parameter 2 the second and so on:

466 hight side	466 bottom side	465 hight side	465 bottom side	464 hight side	464 bottom side	463 hight side	463 bottom side
parameter 8	parameter 7	parameter 6	parameter 5	parameter 4	parameter 3	parameter 2	parameter 1

- **Nota K) !!!**

Drive OK if **Allarm number** (Special parameter) = 0;
Allarm = **Allarm number** if **Allarm number** ≤ 33;
Warning = **Allarm number** –33 if **Allarm number** > 33.

Note L)
Bit 0 RUN
Bit 1 FORWARD
Bit 2 LOC SEQ
Bit 3 BRAKE
Bit 4 REF
Bit 5 REVERSE
Bit 6 LOC REM
Bit 7 I LIMIT

Note M)
If a parameter value is to be saved on EEPROM, set **SaveAddress** (SPECIAL PARAMETER) = MODBUS address of the parameter to be saved. Once saved, such address will be automatically reset to 0.

Note N)
SWVersion (SPECIAL PARAMETER) = 309 (for example) means D3.09

Note O)
= 0: DCREG4;
= 1: DCREG2;
= 2: DCREG2F.

Note P)
= 0: 440V;
= 1: 500V;
= 2: 600V;
= 3: 690V.

Note Q)
= 0: Standard;
= 1: 5A
= 2: 15A;
= 3: 35A.

Note 10
Greater limit = 1 if ENABLE is closed.

Note 18
Is to be less than **P011 VarmMax**.

Note 19
Is to be greater than **P088 RxI**.

Note 20
Is to be less than **VmainsMax** (SPECIAL PARAMETER).

Note 30
Is to be less than **P084 Verr2**.

Note 31
Is to be greater than **P083 Verr1**.

Note 40
Is to be greater than **P014 nMinPos**.

Note 41
Is to be less than **P016 nMinNeg**.

Note 50
Is to be less than P057 SpeedHyper2.

Note 51
Is to be greater than P056 SpeedHyper1.

Note 60
Is to be greater than P174 MDO1Hyst.

Note 61
Is to be less than P173 MDO1Level.

Note 62
Is to be greater than P180 MDO2Hyst.

Note 63
Is to be less than P179 MDO2Level.

Note 64
Is to be greater than P186 MDO3Hyst.

Note 65
Is to be less than **P185 MDO3Level**.

Note 66
Is to be greater than **P192 MDO4Hyst**.

Note 67
Is to be less than **P191 MDO4Level**.

Note 68
Is to be greater than **P198 MDO5Hyst**.

Note 69
Is to be less than **P197 MDO1Level**.

Note 86
May be changed only if any MDI configured as MASTER/SLAVE is disabled (see DCREG2(F) DCREG4 OPERATION MANUAL).

Note 87
May be changed only if any MDI configured as RAMP RESET is disabled (see DCREG2(F) DCREG4 OPERATION MANUAL).

Note 97
May be changed only if at least one out of C105 RefSelect1, C106 RefSelect2, C107 RefSelect3, C108 RefSelect4=3.

Note 98
May be changed only if at least one out of C110 CommandSelect1, C111 CommandSelect2, C112 CommandSelect3=3.

Note 101
May be changed only if **DriveType** (SPECIAL PARAMETER) = 0.

Note 111
May be changed only if **P012 SpdDmndPolarity** = 1. Is to be less than **P013 nMaxPos**.

Note 112
May be changed only if **P012 SpdDmndPolarity** = 2. Is to be greater than **P015 nMaxNeg**.

Note 113
May be changed only if **P015 nMinPos** = **P016 nMinNeg** = 0.

Note 122
May be changed only if the keys LOC/REM on the remotable keyboard have not been pressed.

3 MESSAGE FORMAT

The messages and data are sent through standard MODBUS protocol in RTU mode. Said protocol has control procedures using an 8-bit binary system.

In standard RTU mode, the message sending is determined by a standstill interval equal to 3.5 times the transmission time of a character (marked with T1-T2-T3-T4 in the table below). If the communication is cut out for a time longer than 3.5 times the transmission time of a character, this will be considered as the message end by DCREG drive. Similarly, if a message starts with a lower standstill interval, it will be considered as the continuation of the previous message.

Message sending	Address	Function	Data	Error control	Message end
T1-T2-T3-T4	8 bit	8 bit	n x 8 bit	16 bit	T1-T2-T3-T4

In order not to have any problem with those systems that do not comply with said standard timing, parameter **C164 RTUTimeOut** allows to extend such time interval up to 2000ms.

Address
The values acknowledged by the Address field range from 0 to 247 as the slave peripheral address. The master queries the peripheral pointed out in said field, which responds with a message containing its address. The master may then acknowledge the responding slave. A master query characterised by address 0 will concern every slave – in this case, any slave will respond (BROADCAST mode).

Function
The message function may be chosen among 0 to 255. If the slave response is correct (i.e. no error occurs) the function code is just sent to the master again; on the other hand, if an error takes place, the most significant bit in this field will be set at 1.
However, the only two functions allowed are 03h and 10h (see below).

Data
The data field contains any further information required for the function being used.

Error control
Any error is controlled via CRC (Cyclical Redundancy Check) method: the 16-bit value of the relevant field is computed when the transmitter sends the message, then it will be computed and checked by the receiver again.

Register CRC is computed as follows:
At the beginning, register CRC is set at FFFFh
Exclusive OR operation is performed between CRC and the first 8 bits in the message; the result is stored in a 16-bit register.
Said register is shifted to the right by one step.
If the bit on the right is 1, exclusive OR will be performed between the 16-bit register and value 1010000000000001b.
Steps 3 and 4 are repeated up to 8 shiftings.
Exclusive OR is now performed between 16-bit register and the following 8 bits in the message.
Repeat steps 3 to 6 until any message byte has been processed.
The result is a CRC which will be annexed to the message by sending the less significant byte as the first byte

3.1 FUNCTIONS SUPPORTED

3.1.1 03H: READ HOLDING REGISTERS

Allows to read the state of one or more slave device registers. The broadcast mode is inhibited (address 0).
The additional parameters are the basic digital register address to be read and the output number to be read.

Query	Response
Slave address	Slave address
03h function	**03h function**
Register address (High)	Byte number
Register address (Low)	Data
Register number (High)	…
Register number (Low)	Data
CRC (Low)	CRC (Low)
CRC (High)	CRC (High)

3.1.2 10h: Preset Multiple Registers

Allows to set the state of one or more slave device registers. The broadcast mode (address 0) is enabled: in that case, the function sets the state of the same register in any slave that is connected.
The additional parameters are the basic register address, the register number to be set, their value and the byte number used for the data.

Query	Response
Slave address	Slave address
10h function	**10h function**
Register address (High)	Register address (High)
Register address (Low)	Register address (Low)
Register number (High)	Register number (High)
Register number (Low)	Register number (Low)
Byte number	CRC (Low)
Register value (High)	CRC (High)
Register value (Low)	
…	
Register value (High)	
Register value (Low)	
CRC (Low)	
CRC (High)	

In both functions, the register address is the number displayed in column 3) MODBUS address **in the table on page 3/15 and following. To said address, the master may sum up a basic value which is the same for any parameter: such value is to match with** C163 BaseAddress **and will be automatically subtracted by DCREG while receiving.**

Exceptions

If DCREG detects a message error, the master will be sent a message like the one below:

Slave address
Function (MSB = 1)
Error code
CRC (Low)
CRC (High)

The code meaning is the following:

Code	Name	Meaning
01h	ILLEGAL FUNCTION	This function is not implemented in DCREG drive
02h	**ILLEGAL DATA ADDRESS**	The address pointed out in the relevant field is not correct for DCREG drive
03h	**ILLEGAL DATA VALUE**	The value is not allowable for the address pointed out

4 DESCRIPTION OF BOARD Es733

NOTE

This optional board is to be used for the serial connection. The board is to be fit in connector CN7 in board ES800 (DCREG control) and fastened with the three nylon clamps. It does not require any further setting – except for the jumper setting below.

CN1: RS485
CN1: 1 GND
CN1: 2 n.c
CN1: 3 RX+
CN1: 4 TX+
CN1: 5 GND
CN1: 6+5v.
CN1: 7 n.c.
CN1: 8 RX–
CN1: 9 TX–
CN2: RS232
CN2: 1 DCD
CN2: 2 RXD
CN2: 3 TXD
CN2: 4 DTR
CN2: 5 GND
CN2: 6 DSR
CN2: 7 RTS
CN2: 8 CTS
CN2: 9 RI
JP1: 1–2 = RS485 2 FILI (HALF DUPLEX)
JP1: 2–3 = RS485 4 FILI (FULL DUPLEX)
JP2: 1–2 = SWAP TX/RX
JP2: 2–3 = ECHO ON
JP3: 1–2 = RS232
JP3: 2–3 = RS485
JP4: 1–2 = BIAS ON
JP4: 2–3 = BIAS OFF
JP5:1–2 = TERMINATION ON
JP5:2–3 = TERMINATION OFF
JP6: 1–2 = BIAS ON
JP6: 2–3 = BIAS OFF
L1: TX
L2: RX

5 HALF DUPLEX CONTROL FOR LINE RS485

When managing bus RS485, the master must be in reception mode and the bus is to be left free: keep signal DTR equal to 0 (its driver RS485 output is high impedance). Only during transmission the bus is to be engaged by setting DTR at 1. Instead of using DTR signal, a different signal might be used (e.g. RTS), depending on the converter RS232-RS485 being used.
DCREG drive will start controlling the serial line as soon as it acknowledges the message sent, i.e. in the first 20ms cycle soon after the master transmission is over. Said transmission may start from 0 to 20 ms after the master message is over.
By that time, if the master does not release the serial line, a clash will take place. To avoid any trouble with the systems which slowly release the serial line, parameter **C165 Rx→TxDelay** allows a DCREG response delay up to max. 2000 ms.

6 ALARM A027 – SERIAL COMMUNICATION FAILURE

This alarm trips if the DCREG does not receive any valid message through serial communication within a timeout which can be set using parameter **C142 A027Delay.** This alarm can be inhibited by the parameter **C158 A027Inhibit.**