



LAFERT RTU MODBUS ON RS485 MANUAL

Release 1.6

Date 16/05/2025

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REFERENCE DOCUMENTS:

- *Lafert User Guide*

TERMS AND ABBREVIATIONS

EMCY	Emergency Parameter.
EMC	Electromagnetic compatibility.
HMI	Human Machine Interface.
I/O	Input/output.
LSB	Least significant bit/byte.
LSD	Lafert Servo Drives.
MASTER	It is a device that controls and communicates with drive.
MSB	Most significant bit/byte.
MSM	Macro State Machine of Lafert Servo Drives.
IdNode	Node address assigned to a device on the network.
PDS	Power Drive System.
REG	Register.
RO	Denotes read-only access.
RW	Denotes read/write access.
RX	Messages sent by Main Control Board and received by Drive.
STO	Safe Torque Off
TX	Messages sent by Drive and received by Main Control Box

FIRMWARE AND MANUAL RELEASED

This table shows the correlation between firmware and Modbus Manual.

Lafert Servo Drive	Firmware Released	Modbus Manual
SMARTRIS	2.4.2	1.6
SMARTRIS COMPACT	2.4.2	1.6

1. | MODBUS OPERATION

1.1 RS485 - Modbus Communication Settings

WRITE SINGLE HOLDING REGISTER (0x06) / READ HOLDING REGISTERS (0x03)

Physical Address

Variable	Address (WR)	Default Value	Choice
Address	0x0028	1	1 ÷ 247

Baud Rate

Variable	Address (WR)	Default Value	Choice
BaudRate	0x0035	192 → 19200	96 → 9600
			192 → 19200
			384 → 38400
			576 → 57600
			1152 → 115200

COM Settings

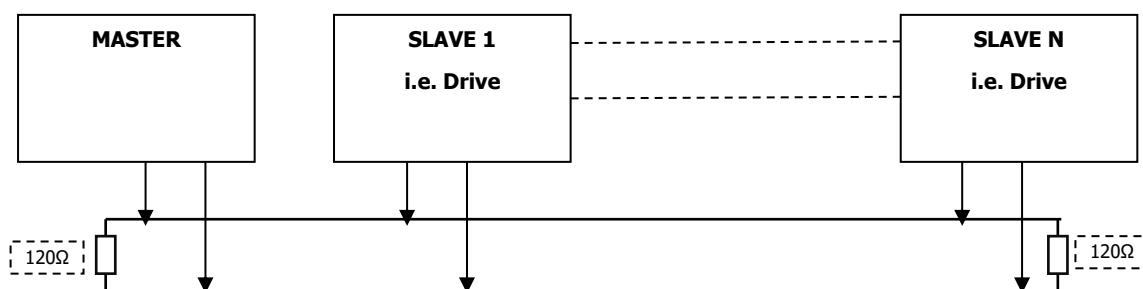
Variable	Address (WR)	Default Value	Choice
Parity/ Stop Bits / Data Bits	0x002B	0 → NO Parity / 2 Stop Bits / 8 Data Bits	0 → NO Parity / 2 Stop Bits / 8 Data Bits
			1 → ODD Parity / 1 Stop Bit / 8 Data Bits
			2 → EVEN Parity / 1 Stop Bit / 8 Data Bits



Warning

The Modbus Address is the physical address and depends if there are more devices together.

WARNING: The modifies of Baudrate or Parity can cause communication issues. They depend to Hardware connection. In case of sending different value drive gives the Exception Code 0x03



Picture 1 – Modbus Connection



Warning

Lafert Drive is always set as a slave

	Warning
	Broadcast communication it is not implemented

RTU Mode - Bits per Byte

Start Bit	Data Bits	Parity	Stop Bits
1	8 data bits, least significant bit sent first	1 bit for even / odd parity-no bit for no parity	1 stop bit if parity is used-2 bits if no parity

1.2 Examples: Change Modbus Communication Settings

	Warning
	The Modbus doesn't allow more devices with same address To Change Address it is mandatory connect one drive on the time with Master Controller

1.2.1 Change Address Sequence

In case of more devices connected it is necessary to change the address of devices (default value 1).

Variable	Address (WR)	Default Value	Choice
Address	0x0028	1	1 ÷ 247

Example: change address from 1 to 2

In this case connect the Drive where is necessary to change the address (0x0028) from 1 to 2:

Address	Function	Address (WR)		Data		CRC
01	06	00	28	00	02	16 bit

Save to EEPROM (0x0000)

Address	Function	Address (WR)		Data		CRC
01	06	00	00	00	01	16 bit

System Reset (0xA5A5)

Address	Function	Address (WR)		Data		CRC
01	06	A5	A5	00	01	16 bit

After this procedure the drive has Modbus Address set at 2

1.2.2 Change Baud Rate Sequence

Example: In case is necessary to change the Baud Rate (0x0035) from 19200 (default) to 9600 (96 = 0x60):

Address	Function	Address (WR)		Data		CRC
---------	----------	--------------	--	------	--	-----

01	06	00	35	00	60	16 bit
----	----	----	----	----	----	--------

Save to EEPROM (0x0000)

Address	Function	Address (WR)		Data		CRC
01	06	00	00	00	01	16 bit

System Reset (0xA5A5)

Address	Function	Address (WR)		Data		CRC
01	06	A5	A5	00	01	16 bit

After this procedure the drive has Modbus Baud Rate is set at 9600

1.2.3 Change COM Setting Sequence

Example: In case is necessary to change the COM Setting (0x002B) from 0 (default) to 1 (1 → ODD Parity / 1 Stop Bit / 8 Data Bits):

Address	Function	Address (WR)		Data		CRC
01	06	00	2B	00	01	16 bit

Save to EEPROM (0x0000)

Address	Function	Address (WR)		Data		CRC
01	06	00	00	00	01	16 bit

System Reset (0xA5A5)

Address	Function	Address (WR)		Data		CRC
01	06	A5	A5	00	01	16 bit

After this procedure the drive has Modbus COM Setting is set at 1 → ODD Parity / 1 Stop Bit / 8 Data Bits

* depends by COM Settings (0x002B)

1.3 Examples: Read Messages

1.3.1 Read Input Register

Example: Single - In case is necessary to read the Drive Status (0x0060) :

Address	Function	Address (RD)		Num of registers		CRC
01	04	00	60	00	01	16 bit

Example: Multiple – Read multiple Input Registers from Drive Status (0x0060) to Volt Reference (0x0070) - **17** registers.

Set the address of first register and the number of registers to read

Address	Function	Address (RD)		Num of registers		CRC
01	04	00	2B	00	17	16 bit

1.3.2 Read Holding Register

Example: Read the COM Setting (0x002B)

Address	Function	Address (WR)		Num of registers		CRC
01	03	00	2B	00	01	16 bit

Example: Read Multiple Holding register from PID VELOCITY KP (0x003C) to SPEED RAMP DOWN (0x0041) - **6** registers

Set the address of first register and the number of registers to read

Address	Function	Address (WR)		Num of registers		CRC
01	03	00	3C	00	06	16 bit

2. | READ INPUT REGISTERS (0X04)

2.1 List of Read Input Registers

READ FROM DRIVE (0x04)		UNIT
HEX	DEC	
0x0042	66	SPEED SETPOINT [RPM]
0x0047	71	CURRENT TORQUE SETPOINT [Arms / 100]
0x005E	94	DIGITAL INPUTS []
0X005F	95	DIGITAL OUTPUTS []
0x0060	96	DRIVE STATUS []
0x0061	97	WARNING CODE LOW []
0x0062	98	WARNING CODE HIGH []
0x0063	99	ERROR CODE []
0x0064	100	BUS DC LINK [V / 100]
0x0065	101	MOTOR TEMPERATURE [°C / 10]
0x0066	102	HEAT-SINK TEMPERATURE [°C / 10]
0x0067	103	BOARD TEMPERATURE [°C / 10]
0x0068	104	VELOCITY (AVERAGE) [RPM]
0x0069	105	TORQUE CURRENT [Arms / 100]
0x006A	106	I2T ENERGY VALUE [%]
0x006B	107	AXIS POSITION LOW [Pulse]
0x006C	108	AXIS POSITION HIGH [Pulse]
0X006D	109	IMPULSES [Pulse]
0X006E	110	ACTUAL VELOCITY – USER FEEDBACK [RPM]
0x006F	111	TQ CURRENT WIND [Arms / 100]
0x0070	112	VOLT REFERENCE (ANALOG INPUT) []
0x0071	113	DIGITAL INPUT FUNCTION []
0x0072	114	DIGITAL OUTPUT FUNCTION []
0x0073	115	STO STATUSWORD []
0x0074	116	STATUSWORD []
0x0075	117	STATE P402 []
0x0076	118	ERROR MAN CODE - LOW []
0x0077	119	ERROR MAN CODE - HIGH []
0x0078	120	ANALOG INPUT REF []
0x0100	256	FEEDBACK TYPE []
0x0101	257	FEEDBACK RESOLUTION []

0x0102	258	FEEDBACK INIT POSITION LOW	[]
0x0103	259	FEEDBACK INIT POSITION HIGH	[]
0x0104	260	FEEDBACK ACTUAL POSITION LOW	[]
0x0105	261	FEEDBACK ACTUAL POSITION HIGH	[]
0x0106	262	FEEDBACK ENCODER TYPE	[]
0x0107	263	RESERVED	RESERVED
0x0108	264	RESERVED	RESERVED
0x0109	265	FEEDBACK INIT ROUNDS	[]
0x010A	266	FEEDBACK INIT RELATIVE POSITION	[]
0x010B	267	RESERVED	RESERVED
0x010C	268	RESERVED	RESERVED
0x010D	269	ANALOG OUTPUT VALUE DAC	[]
0x0110	272	DIGIN 1 STATE	[]
0x0111	273	DIGIN 2 STATE	[]
0x0112	274	DIGIN 3 STATE	[]
0x0113	275	DIGIN 4 STATE	[]
0x0114	276	DIGOUT 1 STATE	[]
0x0115	277	DIGOUT 2 STATE	[]
0x0116	278	DIGOUT 3 STATE	[]
0x0117	279	DIGOUT 4 STATE	[]



Warning

If is written an address not present in list above the drive gives the Exception Code 0x02

2.2 Description of Read Input Registers

SPEED SETPOINT [rpm]

PDU Address (HEX)	Description
0x0042	SPEED SETPOINT i.e. 0x0042 = 0x64 (100) → Speed Motor = 100 rpm 0x0042 = 0xF448 (62536 = -3000) → Speed Motor = -3000 rpm

CURRENT TORQUE SETPOINT

PDU Address (HEX)	Description
0x0047	Current SETPOINT i.e. 0x0047 = 0xC8 (200) → 2 Arms 0x0047 = 0xFF38 (65336 = -200) → - 2 Arms

DIGITAL INPUTS

PDU Address (HEX)	Description															
0x005E	Reads DIGITAL INPUTS (RAW state) The default DIGITAL INPUT configuration in Modbus Command Mode is: • DIGIN1 = DCW • DIGIN2 = DCCW • DIGIN3 = EMERGENCY INPUT • DIGIN4 = RESET (see table below for further informations about digital inputs configurations) <table><tr><th>0x005E</th><th>DIG IN 4</th><th>DIG IN 3</th><th>DIG IN 2</th><th>DIG IN 1</th></tr><tr><td>0x0001</td><td>0</td><td>0</td><td>0</td><td>1</td></tr><tr><td>0x000F</td><td>1</td><td>1</td><td>1</td><td>1</td></tr></table>	0x005E	DIG IN 4	DIG IN 3	DIG IN 2	DIG IN 1	0x0001	0	0	0	1	0x000F	1	1	1	1
0x005E	DIG IN 4	DIG IN 3	DIG IN 2	DIG IN 1												
0x0001	0	0	0	1												
0x000F	1	1	1	1												

DIGITAL OUTPUTS

PDU Address (HEX)	Description				
0x005F	Reads DIGITAL OUTPUTS (RAW state)				
	The default DIGITAL OUTPUT configuration in Modbus Command Mode is				
	- DIGOUT 1 = DRIVE OK - DIGOUT 2 = WARNING - DIGOUT 3 = READY - DIGOUT 4 = BRAKE				
	i.e. 0x005F = 0x0001 → Drive OK is ON, the drive doesn't have alarm				
	0x005E	DIG OUT 4	DIG OUT 3	DIG OUT 2	DIG OUT 1
	0x0001	0	0	0	1

	0x000F	1	1	1	1
--	--------	---	---	---	---

DRIVE STATUS

PDU Address (HEX)	Description
0x0060	Status of the drive: • 0x0001 – Run in Velocity mode • 0x0002 – Drive in StandBy • 0x0004 – Drive in STOP • 0x0008 – reserved • 0x0010 – Drive in Alarm (see Error code) • 0x0020 – Run in Torque mode • 0x0040 – Drive in Init state (CANOpen) • 0x0080 – Drive in SAFE (STO active) • 0x0100 – reserved i.e. 0x0060 = 0x0002: the drive is ready in standby

WARNING

The warning bits are described with 2 registers: "WARNING CODE LOW" and "WARNING CODE HIGH"

	Warning The warning message is 32 bit data, while the Modbus parameters are 16 bit: the 32 bit are separated in 2 parameters of 16 bit, 0x0061 contains the lower 16 bit, while 0x0062 contains the higher part
--	--

WARNING CODE LOW

PDU Address (HEX)	Bit	Warning	Warning description	Autom Validation Enable
0x0061	0	reserved	Reserved (CANopen Mode)	NO
	1	Warning I2T Limit	The warning will be 1 if the drive is in i2T limitation. If the overload alarm is active, the warning will become 1 along with the fault alarm.	YES
	2	reserved	Reserved (CANopen Mode)	NO
	3	reserved	Reserved (manufacturer)	YES
	4	reserved	Reserved (manufacturer)	NO
	5	reserved	Reserved (manufacturer)	NO
	6	reserved	Reserved (Analog Mode)	NO
	7	DAC configuration	Configuration DAC is not valid	NO
	8	Heat Sink Temperature	Warning Heat Sink Temperature	YES
	9	Logic Board Temperature	Warning Logic Board Temperature	YES
	10	Motor Temperature	Warning Motor Temperature	YES
	11	reserved	reserved	YES
	12	Function Tq Limit Activated	Warning to communicate that that the Torque Limitation is activated (reg 0x44 and 0x45 value < 100%)	YES

	13	Tq Limitation	Warning enable only if object reg 0x44 and 0x45 have a value <100%, in this case if the drive is in limitation this warning will be 1	YES
	14	reserved	Reserved (Analog Mode)	NO
	15	reserved	Reserved (manufacturer)	NO

WARNING CODE HIGH

PDU Address (HEX)	Bit	Warning	Warning description	Autom Validation Enable
0x0062	0	reserved	reserved (future implementation)	NO
	1	reserved	reserved (future implementation)	NO
	2	reserved	reserved (future implementation)	NO
	3	reserved	reserved (future implementation)	NO
	4	i2t not rearmed	Warning to protection the motor. During power-on if the drive reaches the maximum number of consecutive i ² t fault, this bit is set until the time expires. If the drive will go in RUN with warning actives then the alarm 0x2352 is occurred.	YES
	5	Reserved	Reserved (speed PI)	NO
	6	Other protocol type set	Warning to communicate that the protocol used is different with protocol set	NO
	7	reserved	Reserved (S-Curve)	NO
	8 - 15	free	free	-

ERROR CODE

PDU Address (HEX)	Bit	Error Code	Error description
0x0063	0	See table below	See table below

Error	Error Code	Description	Meaning	F W	Led Code
NO ERROR	0x0000	No Error	The Fault Reset command has been executed or there was a reset with power cycle	-	-
	0x0001	No error After Reset alarm Comand	The Reset Alarm command has been executed, the drive is working	-	-
ALARM CURRENT					
SHORT CIRCUIT MOTOR	0x2340	Short circuit (motor-side)	Alarm Over Current has been occurred	F	3,1
LOAD LEVEL FAULT	0x2350	Load level fault (I²t, thermal state)	Alarm Over Current with integral i ² t (Over Load)	F	5,2
	0x2352	Load Level (i ² t) not rearmed	Alarm Over Current with integral i ² t (Over Load) not Rearmed	F	5,2
ALARM VOLTAGE					
OVER VOLTAGE	0x3210	DC link over-voltage	Over Voltage alarm has been occurred	F	4,2
DC LINK UNDER VOLTAGE	0x3220	DC link under-voltage	Under Voltage alarm has been occurred	F	4,1

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ALARM TEMPERATURE					
TEMPERATURE DRIVE	0x4300	Temperature Drive	Over Temperature Heat Sink (value depends by Manufacturer)	F	1,1
	0x4301	Warning temperature drive	Warning temperature drive (value depends by Manufacturer)	W	-
	0x4310	Excess temperature drive	Heat Sink Temperature too high of max Range	F	1,3
	0x4320	Too low temperature drive	Heat Sink Temperature too low of minimum Range	F	1,3
TEMPERATURE INT 1 – BOARD	0x4500	Temperature Logic Board	Over Board Temperature	F	1,4
	0x4501	Warning Logic Board temperature	Warning Logic Board temperature	W	-
	0x4510	Excess Logic Board temperature	Board Temperature too high of maximum Range	F	1,5
	0x4520	Too low Logic Board temperature	Board Temperature too low of minimum Range	F	1,5
TEMPERATURE EXT 1 - MOTOR	0x4A00	Temperature Motor	Over Motor Temperature	F	1,10
	0x4A01	Warning temperature Motor	Warning Motor Temperature	W	-
	0x4A10	Excess temperature Motor	Motor Temperature too high of maximum Range	F	1,6
	0x4A20	Too low temperature Motor	Motor Temperature too low of minimum Range	F	1,6
ALARM HARDWARE					
INPUT STAGES	0x5431	Offset Sensor	Offset Sensor	F	3,10
HARDWARE MEMORY	0x5501	HardwareError Write EEprom: Vbus too Low	Write is not possible because the Bus Voltage is too low to guarantee the writing complete	F	5,3
HW MEMORY E²PROM - USER	0x5530	E²PROM	Generic Error E ² prom	F	6,1
	0x5531 ... 0x556F	E ² prom Error Parameter 1 - 65	Error Writing E ² prom Parameters (contact Manufacturer)	F	6,1
HW MEMORY E²PROM - FACTORY PARAMETERS	0x5A02	Error Data Factory Parameters	Data Factory Parameters is not written	F	8,1
HW MEMORY E²PROM - FUNCTION R/W EEPROM	0x5B00	EEPROM Function R/W	Generic Error E ² prom Data Function Read/Write	F	8,3
	0x5B01 ... 0x5B19	Error Eeprom Function 1 - 25	Error Read or Write E ² prom Function (contact Manufacturer)	F	8,3
ALARM PARAMETERS					
DATA SET	0x6300	Data Set Parameters Table	Data Set Programming Error	F	7,1
	0x6301 ... 0x6423	Data record no. 1 - 50	Programming Error Data Set (contact Manufacturer)	F	7,1
PARAMETER ERROR	0x6320	Parameter Error	Generic Parameter Error	F	6,4
	0x6321 ... 0x6326	Incongruity Data Configuration 1-6	Configuration Error (contact Manufacturer)	F	6,4
ALARM ADDITIONAL MODULE					
ENCODER SINCOS	0x7350	Encoder SinCos	Error Generic Encoder SinCos	F	2,6
	0x7351	Rx Error	Error Message Received	F	2,6
	0x7352	Tx Error	Error Message Transmitted	F	2,6

	0x7353	Comand Read Position Error	Error Read Position	F	2,6
	0x7354	Comand Status Error	Error Status Encoder SinCos	F	2,6
	0x7355	Comand Type Error	Error Type Encoder SinCos	F	2,6
	0x7356	Comand Init Timeout	Error Timeout during Initialization SinCos	F	2,6
CONVERTER SINCOS	0x7360	Converter Sin/Cos	Error Generic Converter Sin/Cos	F	6,3
	0x7361	E ² prom Ext	First programming E ² prom external, we must reset the driver	F	6,3
	0x7362	Nerr Signal Amp	Fault has been occurred: Amplitude Error	F	6,3
	0x7363	Nerr Signal Freq	Fault has been occurred: Frequency Error	F	6,3
	0x7364	Nerr Signal Other	Fault has been occurred: configuration or Under voltage or System Error	F	6,3
	0x7365	Error Gen	General Error	F	6,3
RESOLVER	0x7374	Resolver Initialization	Resolver Fault Initialization has been occurred		2,4
	0x7375	Resolver Hardware Fault LOS (Loss of Signal)	Manufacturer specific value describes the cause of the triggering of the fault detection output pins	F	2,10
	0x7376	Resolver Hardware Fault DOS (Degradation of Signal)	Manufacturer specific value describes the cause of the triggering of the fault detection output pins	F	2,10
	0x7377	Resolver Hardware Fault LOT (Loss of Tracking)	Manufacturer specific value describes the cause of the triggering of the fault detection output pins	F	2,10
	0x7378	Resolver Hardware Fault LOS, DOS, LOT during phasing initialisation	Manufacturer specific value describes the cause of the triggering of the fault detection output pins	F	2,10
INCR ENCODER	0x7390	Incremental Encoder	Error Generic Incremental Encoder	F	2, 5
	0x7391	Encoder error init	Encoder has initialization error due to sequence Hall or value null	F	2, 1
	0x7392	Encoder error congruence	Encoder has congruence error between Hall	F	2, 2
	0x7393	Encoder error phasing	Encoder has phasing error	F	2, 3
	0x7394	Encoder error Distance	Encoder Error Distance Hall	F	2, 4
COMMUNICATION	0x7520	MODBUS	Modbus Generic Error	F	9,1
	0x7521	Modbus Communication Lost	The drive didn't receive any valid message during the Communication Loss Timer (see Modbus func. 03 or 06 - addr.0x0036).	F	9,1
ALARM PROTOCOL					
TORQUE PROFILE CONTROL	0x8300	Torque control	General Error for Profile Torque Controller	F	6,6
	0x8341	Torque Type	Error type selected is not managed	F	6,6
	0x8351	Torque Dynamic Stop	Error Dynamic Stop is not implemented	F	6,6
VELOCITY SPEED CONTROLLER	0x8400	Velocity speed controller	General Error for Profile Velocity Controller	F	6,7
	0x8410	Following error Current Mode	The difference between the velocity command and the actual velocity is greater than the value that is set in maximum velocity error. The drive is in Torque Profile	F	5,10
	0x8411	Following error Velocity Mode	The difference between the velocity command and the actual velocity is greater than the value that is set in maximum velocity error. The drive is in Velocity Profile	F	5,10
	0x8412	Over Speed	Actual speed exceeds the velocity over speed value	F	5,8
	0x8611	Following error	The difference between the position command and the actual position is greater than the value that is set in maximum position error	F	-
EEPROM	0x8B00 0x8B02	Store and Restore Process	General Error for Store and Restore Process	F	8,2

	0x8B10 ... 0x8B42	Init values P402 from Eeprom	Error Initialization from Eeprom.	F	6,5
	0x8E01	Mode Of Operation Error	Generic Error	F	6,5
	0x8E02	Type Profile	Type Profile not defined	F	6,5
	0x8E03	Profile Error	Profile Selected not managed	F	6,5
	0x8E04	None Profile	Run State and None Profile selected	F	6,5
	0x8E05	Analog Profile	Reserved - Internal Debug	F	6,5
	0x8D06	Warning Par	Warning Parameters Error	F	6,5
ALARM DEVICE SPECIFIC					
ALARM DEVICE SPECIFIC	0xFF00	Manufacturer Specific	Alarm Manufacturer Specific	-	-
	0xFF01	Safety Fault (<i>not available</i>)	STO Occurred	F	3,5
STO CIRCUIT (only Smartris Compact)	0xFF20	STO Circuit	General Error STO circuit	-	-
	0xFF21	STO - start control - 12V	Reserved (contact Manufacturer)	F	3,4
	0xFF22	STO - Run time - Level	Reserved (contact Manufacturer)	F	3,4
	0xFF23	STO - Run time - Congruence	Reserved (contact Manufacturer)	F	3,4
	0xFF24	STO - Run time - Feedback	Reserved (contact Manufacturer)	F	3,4

Table 1 - Error code Description

	Warning
	The alarm can be Fault (F) or warning (W), if it is a fault the drive will stop.

BUS DC LINK

PDU Address (HEX)	Description
0x0064	Bus Dc Link [V / 100] i.e. 0x0064 = 0x1356 (4950) → Bus Dc Link = 49.5 Vdc

MOTOR TEMPERATURE

PDU Address (HEX)	Description
0x0065	Temperature of motor [°C / 10] i.e. 0x0065 = 0x0163 (355) → Motor temperature = 35.5 °C

HEAT-SINK TEMPERATURE

PDU Address (HEX)	Description
0x0066	Heat-sink drive temperature [°C / 10] i.e. 0x0066 = 0x0163 (355) → Heat-sink temperature = 35.5 °C

BOARD TEMPERATURE

PDU Address (HEX)	Description
0x0067	Internal drive temperature [°C / 10] i.e. 0x0067 = 0x0163 (355) → Internal drive temperature = 35.5 °C

VELOCITY (AVERAGE)

PDU Address (HEX)	Description
0x0068	Motor Speed in rpm. <u>Average value of speed</u> Filter on Speed was a mobile average of 512 samples. <u>Variable suitable to monitor the motor speed</u> i.e. 0x0068 = 0x01F4 (500) → Motor is running at 500 rpm 0x0068 = 0xFC18 (64536 = -1000) → Motor Speed = -1000 rpm

TORQUE CURRENT

PDU Address (HEX)	Description
0x0069	Torque current [Arms/100]. This value is updated every 512 ms. i.e. 0x0069 = 0x01F4 (500) → Torque current = 5 Arms

I2T ENERGY VALUE

PDU Address (HEX)	Description
0x006A	I2T Energy Level [% of rated current] i.e. 0x006A = 0x0032 (50) → Torque current = 50% of rated current 0x006A = 0x0096 (150) → Torque current = 150% of rated current – drive it could go in alarm

AXIS POSITION

AXIS POSITION LOW

PDU Address (HEX)	Description
0x006B	Low part of mechanical axis position [lower 16 bits of total 32 bit] i.e. Position axis = 1000000 / 0x000F4240 0x006B = 0x4240

AXIS POSITION HIGH

PDU Address (HEX)	Description
0x006C	High part of mechanical axis position [higher 16 bits of total 32 bit] i.e. Position axis = 1000000 / 0x000F4240 0x006C = 0x000F



Warning

The (mechanical) Axis Position message is 32 bit data, while the Modbus parameters are 16 bit: the 32 bit are separated in 2 parameters of 16 bit, 0x006B contains the lower 16 bit, while 0x006C contains the higher part

IMPULSES

PDU Address (HEX)	Description
0x006D	Electrical impulse read – Electrical gear (electrical position of axis) This parameter is the electrical angle (it depends on feedback's resolution and number of motor pole pairs) with increment units. The electrical angle is in range of [0; feedback's resolution] for any motor pole pair For a feedback with 14 bits the range value is [0:16384] i.e. 0x006D = 0x1000 → the motor axis is at position 4096/16384 → it is at 90°

ACTUAL VELOCITY (USER)

PDU Address (HEX)	Description
0x006E	This Parameter communicates the value of Velocity filtered. The filter is a Low Pass one pole filter for velocity [Hz] (default value is 50Hz) <u>Variable suitable for monitor the velocity feedback.</u> i.e. 0x006E = 0x03E8 → Actual Average Speed → it is at 1000 RPM

TQ CURRENT WIND

PDU Address (HEX)	Description
0x006F	This object communicates the value of Torque Current with a mobile average window of 32 samples (programmable).

VOLT REFERENCE

PDU Address (HEX)	Description
0x0070	This object is the reference voltage in Analog Input

DIGITAL INPUT FUNCTION

PDU Address (HEX)	Description
0x0071	Reads word of DIGITAL INPUTS, every bit is a Function of Digital Input. Only inputs configured can change the value.

Description Bits Digital Input Function

Bit	Configuration
0	"RUN" (used only in Analog Mode): this input is the command to move the drive in RUN state.
1	"STOP" (used only in Analog Mode): this input is the command to move the drive in STOP state
2	"EMERGENCY INPUT ENABLE": when the option of digital input 3 is defined "Emergency Input Enable" this input is the command to move the drive in STANDBY state.
3	"RESET": when this function is enabled the input configured can put the drive in reset (it is an hardware reset). If the digital input is configured as reset, the reset has a filter with 100ms.
4	"DCW": this function is to configure the input with an actuator for clockwise. If the input state is 1 the drive goes in STOP state.
5	"DCCW": this function is to configure the input with an actuator for counter clockwise. If the input state is 1 the drive goes in STOP state
6	"SETVEL1" (used only in Analog Mode): This function is to configure the Set Point value defined by "File Parameters". If the digital inputs are set with this function, then the Set Points available are 2.
7	"SETVEL2" (used only in Analog Mode): This function is to configure the Set Point value defined by "File Parameters". If the digital inputs are set with the functions "SETVEL1" and "SETVEL2", then the Set Points available are 4.
8	"SETVEL3" (used only in Analog Mode): This function is to configure the Set Point value defined by "File Parameters". If the digital inputs were set with the functions "SETVEL1", "SETVEL2" and "SETVEL3", then the Set Points available are 8.
9	"SETVEL4" (used only in Analog Mode): This function is to configure the Set Point value defined by "File Parameters". If the digital inputs were set with the functions "SETVEL1", "SETVEL2", "SETVEL3" and "SETVEL4", then the Set Points available are 15. If this function is set then all digital inputs are used. When all dital inputs are 0 the drive is in STANDBY, to have the RUN function it needs to have at least one digital input as 1.
10	"VEL/CUR" (used only in Analog Mode): If the digital Input is selected with this function then the drive change the mode operation (Velocity Profile and Torque Profile), the function can be used only in standby state.
11	"DIR" (used only in Analog Mode): This function changes the direction of the motor. The set point changes the polarity.
12	"ZERO POS": if it is set the actual position will be 0, It does not move the motor in ZERO position, but it reset the actual position.

Table 2 – Programmable Inputs

DIGITAL OUTPUT FUNCTION

PDU Address (HEX)	Description
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0x0072	Reads word of DIGITAL OUTPUTS, every bit is a Function of Digital Output. Only outputs configured can change the value.
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Description Bits Digital Output Function

Bit	Configuration
0	"DRIVE OK": the level defines if the drive is in alarm or not.
1	"WARNING": the level defines if there was at least warning.
2	"TARGET REACHED": reserved
3	"BRAKE STATUS": the level defines the state of brake
4	"READY": verifies if the drive is ready to go in run
5	"MOTOR MOVE": it shows the motor moving.
6	"LIMIT ACTIVE": it shows if the drive is in i2t limitation.

Table 3– Programmable Outputs

STO STATUSWORD

PDU Address (HEX)	Description
0x0073	This value describes STO statusword

Configuration – SMARTRIS STANDARD:

Value	Description
0	Drive not in safety
1	Drive in safety – STO activated
2	Drive in safety – STO activated
3	Drive in safety – STO activated

Configuration – SMARTRIS COMPACT:

Value	Description
0	Drive not in safety
1	Drive in safety – STO activated
2	Drive in safety – STO activated
3	Drive in safety – STO activated
10	STO Circuit FAULT

STATUSWORD P402

PDU Address (HEX)	Description
0x0074	This value defines the current state of Finite State Machine and some drive informations.

Description Bits of Statusword

Bit	Name	Description
0	Ready to switch On	Bit statusword of state machine
1	Switched On	Bit statusword of state machine
2	Operation Enabled	Bit statusword of state machine
3	Fault	Bit statusword of state machine
4	Voltage Enabled	0 = Vdc-Link is smaller than Value of "under Voltage" 1 = Vdc-Link is greater than Value of "under Voltage"
5	Quick Stop	Bit statusword of state machine. This shall indicate that the drive is reacting on a quick stop request
6	Switch on disabled	Bit statusword of state machine
7	Warning	0 = No warning is present (Warning is not an error or fault)

		1 = At least warning is occurred
8	Manufacturer Specific	See table
9	reserved	reserved
10	Target reached	0 = The set-point has not been reached yet. 1 = The drive has reached the set-point.
11	Internal Limit Active	0 = Indicate that an i2T limit is not active 1 = Indicate that an i2T limit is active
12	reserved	reserved
13	reserved	reserved
14	Manufacturer Specific	See table
15	Manufacturer Specific	See table

Table 4– statusword bits

Configuration Manufacturer specific:

Value of register 0x005E	Bits of statusword 0x0074		
	Bit 8	Bit 14	Bit 15
0	Emergency In. Enable	Safety State	Fault State
1	Emergency In. Enable	Safety State	Ready
2	Emergency In. Enable	S-Ramp Error Calc Jerk	S-Ramp Error Calc Limit
3	Emergency In. Enable	Safety State	Abort Communication *

* Reserved for CANopen mode

Meaning of bits:

Name	Meaning	Description
Emergency Input Enable	It shows if the input Emergency is active	0 = not active 1= active
Safety State	It shows if the drive is in SAFETY state	0 = drive not in SAFETY state 1= drive in SAFETY state
Fault State	It shows if the drive is in FAULT state	0 = drive not in FAULT state 1= drive in FAULT state
Ready State	It shows if the drive is ready to go in RUN state (operational enabled)	0 = drive not ready 1= drive is ready: Voltage Enabled, STO digital input not active, no fault, emergency input enable not active
S-Ramp Error Calc Jerk	It shows if the calculation of S-Ramp with new target is correct	0 = S-Ramp calculation with new target is within the range of maximum allowed Jerk 1 = S-Ramp calculation with new target is outside the range of maximum allowed Jerk

S-Ramp Error Calc Limit	It shows if the calculation of S-Ramp with new target is correct	0 = S-Ramp calculation with the new target is within the range of maximum allowed acceleration 1 = S-Ramp calculation with the new target is outside the range of maximum allowed acceleration
Abort Communication *	It shows if there has been an abort communication	0 = Nothing abort communication is occurred 1 = At least abort communication is occurred

* Reserved for CANopen mode

STATE P402

PDU Address (HEX)	Description
0x0075	This register describes exactly the drive state. The drive follows a finite state machine proprietary Lafert Serve Drive that it is compliant with profile DSP402. State Value Definition: 0 = Lafert Servo Drive state INIT – p402 state not ready to switch on 1 = Lafert Servo Drive state SAFETY 2 = Lafert Servo Drive state STOP – p402 state quick stop active 3 = Lafert Servo Drive state RUN – p402 state operation enabled 4 = Lafert Servo Drive state STANDBY – p402 state switched on 5 = Lafert Servo Drive state DYNAMIC STOP (Reserved) 6 = Lafert Servo Drive state Reserved 7 = Lafert Servo Drive state Reserved 10 = Lafert Servo Drive state INIT – p402 state switch on disabled 11 = Lafert Servo Drive state INIT – p402 state ready to switch on 16 = Lafert Servo Drive state FAULT – p402 state fault reaction active 17 = Lafert Servo Drive state FAULT – p402 state fault 18 = Lafert Servo Drive state FAULT – p402 state error

ERROR MAN CODE

PDU Address (HEX)	Description
0x0076	Error Manufacturer Code Low - 16 bit LSB This register describes the manufacturer code of error code alarm

ERROR MAN CODE HIGH

PDU Address (HEX)	Description
0x0077	Error Manufacturer Code High - 16 bit MSB This register describes the manufacturer code of error code alarm

ANALOG INPUT REF

PDU Address (HEX)	Description
0x0078	This register describes the analog input reference. In "Analog mode" the analog input is used to reference to control the motor.

	The analog input can be configured: • -10V ... +10V • 0 ... 10V • -5V ... +5V • 0 ... 5V • Threshold ... 10V • Threshold ... 5V
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FEEDBACK TYPE

PDU Address (HEX)	Description
0x0100	0 = resolver, 1 = encoder, 2 = SinCos

FEEDBACK RESOLUTION

PDU Address (HEX)	Description
0x0101	Resolution of feedback. i.e. 0x0101 = 4000h → Resolution = 16384 for revolution

FEEDBACK INIT POSITION

FEEDBACK INIT POSITION LOW

PDU Address (HEX)	Description
0x0102	Absolute position L (initial) - 16 bit LSB i.e. 0x0102 = 0x7421 → pos = 0x297421 value = 0x7421

FEEDBACK INIT POSITION HIGH

PDU Address (HEX)	Description
0x0103	Absolute position H (initial) - 16 bits MSB i.e. 0x0103 = 0x7421 → pos = 0x297421 value = 0x0029

FEEDBACK ACTUAL POSITION

FEEDBACK ACTUAL POSITION LOW

PDU Address (HEX)	Description
0x0104	Absolute position L (Actual) - 16 bits LSB Absolute position is 24 bits for multi turn / 12 bit for single turn At the beginning initial and actual position are the same. Actual position is updated only after a read position command i.e. 0x0104 = 0x7421 → pos = 0x297421 value = 0x7421

FEEDBACK ACTUAL POSITION HIGH

PDU Address (HEX)	Description
0x0105	Absolute position H (Actual) - 16 bits MSB Absolute position is 24 bits for multi turn / 12 bit for single turn At the beginning initial and actual position are the same. Actual position is updated only after a read position command i.e. 0x0102 = = 0x7421 → pos = 0x297421 value = 0x0029

ENCODER TYPE

PDU Address (HEX)	Description
0x0106	Singleturn = 0x32, Multiturn = 0x37 i.e. 0x0106 = = 0x37 → Encoder SinCos is Multi-Turn

FEEDBACK INIT ROUNDS

PDU Address (HEX)	Description
0x0109	Initial Number of encoder gears (0 of single turn, N° of gears for MultiTurn) i.e. 0x297421 N° of gear = 0x0297

FEEDBACK INIT RELATIVE POSITION

PDU Address (HEX)	Description
0x010A	Relative position (initial) compared with 0 of mechanic gear (12 bits) i.e. 0x297421 Init Position = 0x0421

ANALOG OUTPUT VALUE DAC

PDU Address (HEX)	Description
0x010D	Digital value of Analog Output Value to set analog output [0 ...4095] → [0 ... 10] V

DIGITAL INPUT 1 STATE

PDU Address (HEX)	Description
0x0110	Digital value of Digital Input

	Value of digital Input 1
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DIGITAL INPUT 2 STATE

PDU Address (HEX)	Description
0x0111	Digital value of Digital Input Value of digital Input 2

DIGITAL INPUT 3 STATE

PDU Address (HEX)	Description
0x0112	Digital value of Digital Input Value of digital Input 3

DIGITAL INPUT 4 STATE

PDU Address (HEX)	Description
0x0113	Digital value of Digital Input Value of digital Input 4

DIGITAL OUTPUT 1 STATE

PDU Address (HEX)	Description
0x0114	Digital value of Digital Output Value of digital Output 1

DIGITAL OUTPUT 2 STATE

PDU Address (HEX)	Description
0x0115	Digital value of Digital Output Value of digital Output 2

DIGITAL OUTPUT 3 STATE

PDU Address (HEX)	Description
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0x0116	Digital value of Digital Output Value of digital Output 3
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DIGITAL OUTPUT 4 STATE

PDU Address (HEX)	Description
0x0117	Digital value of Digital Output Value of digital Output 4

3. | READ HOLDING REGISTERS (0X03)

3.1 List of Read Holding Registers

		READ ONLY (0x03)	UNIT	DEFAULT VALUE
HEX	DEC		[]	
0x0001	1	CONTROL WORD	[]	0
0x0003	3	FULL SCALE VELOCITY	[RPM]	Depends by motor: • L=3000 • M=4500 • S=4500
0x0028	40	MODBUS ADDRESS	[]	1
0x002B	43	COM SETTINGS	[]	0
0x0035	53	MODBUS BAUD RATE	[]	192
0x0036	54	COMMUNICATION LOSS TIME	[]	0
0x003C	60	PID VELOCITY KP	[IU]	Depends by motor
0x003D	61	PID VELOCITY KI	[IU]	Depends by motor
0x003E	62	PID VELOCITY KV	[IU]	Depends by motor
0x003F	63	SPEED RAMP STATE	[]	1 : Ramp enabled
0x0040	64	SPEED RAMP UP	[ms]	2000
0x0041	65	SPEED RAMP DOWN	[ms]	2000
0x0043	67	SPEED POLARITY	[]	0
0x0044	68	LIMIT TORQUE POSITIVE	[%]	100
0x0045	69	LIMIT TORQUE NEGATIVE	[%]	100
0x0046	70	SLOPE RAMP (TORQUE)	[rated current / (1000 * s)]	1000
0x004E	78	BRAKE MANAGED	[]	1
0x004F	79	BRAKE MODE	[]	1
0x0050	80	BRAKE TYPE	[]	Depends by motor: • Magnetic Brake = 1 • Spring Brake = 2
0X0051	81	MOVE TO STANDBY – CW (PREVIOUS DYNAMIC STOP)	[]	1
0X0053	83	READ CONFIG ANALOG OUTPUT	[]	
0X0054	84	AN. OUTPUT VALUE (GEN PURPOSE)	[]	
0X0055	85	DYNAMIC STOP STEP RAMP	[rpm*100/sec]	
0X0056	86	SPEED VELOCITY FILTERED	[]	
0x0057	87	RESERVED	RESERVED	1
0x0058	88	RESERVED	RESERVED	0
0x0059	89	MOVE TO STANDBY - EMERGENCY	[]	1
0x005A	90	MOVE TO FAULT	[]	1
0x005B	91	RESERVED	RESERVED	1
0x005C	92	STO OPT CODE	[]	0

0x005D	93	SAFETY FSM MODE	[]	0
0x005E	94	STATUSWORD CONFIG	[]	
0x005F	95	WARNING CONFIG	[]	
0x0060	96	FILTER POLO VELOCITY	[]	
0x0061	97	DECREMENT STEP S-RAMP	[]	
0x0062	98	ANALOG CFG ADC	[]	
0x0063	99	ANALOG RUN THRESHOLD	[]	
0x0064	100	RESERVED	RESERVED	RESERVED
0x0065	101	RESERVED	RESERVED	RESERVED
0x0066	102	MOTION PROFILE TYPE	[]	
0X0080	128	DIGIN 1 CONFIG	[]	See User Guide
0X0081	129	DIGIN 2 CONFIG	[]	See User Guide
0X0082	130	DIGIN 3 CONFIG	[]	See User Guide
0X0083	131	DIGIN 4 CONFIG	[]	See User Guide
0X0084	132	DIGOUT 1 CONFIG	[]	See User Guide
0X0085	133	DIGOUT 2 CONFIG	[]	See User Guide
0X0086	134	DIGOUT 3 CONFIG	[]	See User Guide
0X0087	135	DIGOUT 4 CONFIG	[]	See User Guide
0X0088	136	DIGIN 1 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X0089	137	DIGIN 2 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008A	138	DIGIN 3 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008B	139	DIGIN 4 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008C	140	DIGOUT 1 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008D	141	DIGOUT 2 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008E	142	DIGOUT 3 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0X008F	143	DIGOUT 4 LEVEL	[]	0=POS EDGE / 1=NEG EDGE
0x0090	144	WARNING ENABLE USER - LOW		
0x0091	145	WARNING ENABLE USER - HIGH		
0x0092	146	WARNING SINGLE OUT - LOW		
0x0093	147	WARNING SINGLE OUT - HIGH		
0x0120	288	RESERVED	RESERVED	RESERVED
0x0121	289	RESERVED	RESERVED	RESERVED
0x0122	290	RESERVED	RESERVED	RESERVED
0x0123	291	RESERVED	RESERVED	RESERVED
0x0124	292	RESERVED	RESERVED	RESERVED
0x0125	293	RESERVED	RESERVED	RESERVED
0x0126	294	RESERVED	RESERVED	RESERVED
0x0127	295	RESERVED	RESERVED	RESERVED
0x0128	296	RESERVED	RESERVED	RESERVED
0x0129	297	RESERVED	RESERVED	RESERVED
0x012A	298	RESERVED	RESERVED	RESERVED

0x012B	299	RESERVED	RESERVED	RESERVED
0x012C	300	RESERVED	RESERVED	RESERVED
0x012D	301	RESERVED	RESERVED	RESERVED
0x012E	302	RESERVED	RESERVED	RESERVED
0x012F	303	RESERVED	RESERVED	RESERVED
0x0130	304	PROFILE ACCELERATION - LOW	[rpm/sec]	
0x0131	305	PROFILE ACCELERATION - HIGH	[rpm/sec]	
0x0132	306	PROFILE DECELERATION - LOW	[rpm/sec]	
0x0133	307	PROFILE DECELERATION - HIGH	[rpm/sec]	
0x0134	308	MAX ACCELERATION - LOW	[rpm/sec]	
0x0135	309	MAX ACCELERATION - HIGH	[rpm/sec]	
0x0136	310	MAX DECELERATION - LOW	[rpm/sec]	
0x0137	311	MAX DECELERATION - HIGH	[rpm/sec]	
0x01FF	511	FW RELEASE CUSTOMER		Depends by FW release
0x0201	513	HW RELEASE		• 12 if STO • 22 if NO STO
0x0202	514	PARAMETER RELEASE		Depends by parameter release
0x0203	515	MOTOR TYPE		Depends by motor type: • 0 = None, • 1 = B40, • 2 = B63, • 3 = B71, • 100=RESERVED
0x0204	516	STO CHECK		• 1 → STO present • 2 → NO STO
0x0205	517	FEEDBACK		• 0 → Resolver • 1 → Incr Encoder • 2 → SinCos Encoder
0x0207	519	OPERATION MODE		• 1 → Torque mode • 2 → Velocity mode
0x0208	520	READ MOT POLES		Motor poles couple
0x0209	521	MOTOR TEMP SENSOR		
0x020A	522	MAX MOTOR SPEED	[rpm]	



Warning

If is written an address not present in list above the drive gives the Exception Code 0x02

3.2 Description of Read Holding Registers

CONTROL WORD

PDU Address (HEX)	Description
0x0001	Reads CONTROL WORD bits status: - Bit 0: RUN bit → 0 Run Disabled 1 Run Enabled - Bit 1: STOP bit → 0 Stop Enabled 1 Stop Disabled - Bit 2: BRAKE bit → 0 Brake can be disabled manually 1 Brake can be enabled manually - Bit 3: WARNING → 0 Nothing 1 Clear warning bit in Status Word / Digital Output - Bit 4: RESET ALARM → 0 Nothing 1 Clear Alarm State - Bit 5: EMERGENCY COMMAND → 0 Nothing 1 Set Emergency Event (As Default of Dig In 3) Warning: BRAKE bit is a DON'T CARE bit if the brake is NOT ACTIVE and is set to AUTO. Brake can be managed by modbus address 0x004E Brake mode (manual/auto) can be changed by modbus address 0x004F

	Warning
	<i>In case of brake set in Manual Mode it is possible to set the brake ON/OFF with bit 2 on Control Word.</i> <i>In our documentation we add a "Warning" label in case of:</i> <i>If brake is in Automatic Mode: user can not change status of Motor brake because is managed by the drive in automatic mode. So those bits will be "ignored" (don't care).</i> - If brake is in Automatic Mode: user can not change status of Motor brake because is managed by the drive in automatic mode. So those bits will be "ignored" (don't care). - If brake is disabled: user can not change Status of Motor because motor brake is disabled. Also in this case bit is "ignored" (don't care).

FULL SCALE VELOCITY

PDU Address (HEX)	Description
0x0003	Velocity Full Scale [rpm] i.e. if the motor is 4500 rpm 0x0003 = 0x1194 (4500) → Velocity Full Scale = 4500 rpm

MODBUS ADDRESS

PDU Address (HEX)	Description
0x0028	Modbus Address - Default 1 i.e. 0x0028 = 1 → Modbus Address = 1

COM SETTINGS

PDU Address (HEX)	Description
0x002B	COM Settings - Default 0 - Modbus COM settings related to parity, stop Bits and Data Bits: 0 - No Parity, 2 stop bits 1 - Odd Parity, 1 stop bit

- 2 - Even Parity 1 stop bit

MODBUS BAUD RATE

PDU Address (HEX)	Description
0x0035	Modbus Baud Rate - Default 192 i.e. 0x0035 = 0x00C0 (192) → ModBus Baud Rate = 19200

COMMUNICATION LOSS TIME

PDU Address (HEX)	Description
0x0036	Default - 0 Reads the timer (in ms) that is set to recognize modbus communication loss when the motor is running. In this time window the drive doesn't receive a VALID Modbus Message, the drive goes in alarm state and the motor will stop with inertia. If the value of this command is set to 0, this function is disabled.

PID VELOCITY KP

PDU Address (HEX)	Description
0x003C	Proportional PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application It is possible to change the Speed Pid in run time.

PID VELOCITY KI

PDU Address (HEX)	Description
0x003D	Integral PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application It is possible to change the Speed Pid in run time.

PID VELOCITY KV

PDU Address (HEX)	Description
0x003E	Parameter PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application. It is possible to change the Speed Pid in run time.

RAMP STATE

PDU Address (HEX)	Description
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0x003F	Reads if the ramps (torque and speed ramps) are enabled or not (default enabled). i.e. 0x003F = 1 : Ramp enabled 0x003F = 0 : Ramp disabled If value it is different from 0 or 1 the drive gives the Exception Code 0x03
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SPEED RAMP UP

PDU Address (HEX)	Description
0x0040	Speed ramp up in ms (Default 2000) i.e. 0x0040 = 1000 : Speed ramp up from 0 to max velocity = 1 sec

SPEED RAMP DOWN

PDU Address (HEX)	Description
0x0041	Speed ramp down in ms (Default 2000) i.e. 0x0040 = 1000 : Speed ramp down from max velocity to 0 = 1 sec

SPEED POLARITY

PDU Address (HEX)	Description
0x0043	Polarity of Speed/Torque setpoint - range [-Full scale velocity: Full scale velocity] - Default 0 The following value definition is valid: - bit value = 0: multiply the demand value by 1 - bit value = 1: multiply the demand value by -1 i.e. In case of speed setpoint = 3.000 rpm, sending 0x0043 = 1 the motor begins to run at -3000 rpm

TORQUE LIMIT POSITIVE

PDU Address (HEX)	Description
0x0044	Torque limit positive - Default 100 This parameter shall indicate the configured maximum positive torque in the motor. The value shall be given percent of peak current. Positive torque takes effect in the case of motive operation is positive velocity or regenerative operation is negative velocity. This parameter is used also Profile Velocity i.e. 0x0044= 0x0032 (50), the maximum torque positive is 50% of rated current

TORQUE LIMIT NEGATIVE

PDU Address (HEX)	Description
0x0045	Torque limit negative - Default 100

	This parameter shall indicate the configured maximum negative torque in the motor. The value shall be given percent of peak current. Negative torque takes effect in the case of motive operation is negative velocity or regenerative operation is negative velocity. This parameter is used also Profile Velocity i.e. 0x0045= 0x0032 (50), the maximum torque negative is 50% of rated current
--	--

SLOPE RAMP (TORQUE)

PDU Address (HEX)	Description
0x0046	Slope Torque Ramp [rated current/ (1000*s)] in Torque Control Mode (Default 1000) This parameter shall indicate the configured rate of change of torque. The value shall be given in units of per thousand of rated torque per second. It is controlled by some limits of drive. If the value is not correct the drive sends an Abort Code. If the value is not correct during initialization the drive sends an error messages with Emergency Protocol. i.e. 0x0046 = 0x03E8 (1000) → Torque ramp up from 0 to motor rated current = 1 sec

BRAKE MANAGED

PDU Address (HEX)	Description
0x004E	Brake Managed (value admitted 0/1) (Default 1) i.e. 0x004E = 1 → Brake managed 0x004E = 0 → NO Brake

BRAKE MODE

PDU Address (HEX)	Description
0x004F	Brake Mode Manual/Automatic (value admitted 0/1) (Default 1) i.e. 0x004F = 1 → Manual Brake enabled 0x004F = 0 → Automatic Brake enabled

BRAKE TYPE

PDU Address (HEX)	Description
0x0050	Selection of type of brake (in case of brake enabled) (value admitted 1/2): i.e. 0x0050 = 1 → Magnetic Brake 0x0050 = 2 → Spring Brake It depends to brake type mounted on motor.

MOVE TO STANDBY – COMMAND (PREVIOUS NAME: DYNAMIC STOP)

PDU Address (HEX)	Description

0x0051	Previous: Dynamic Stop (electronic controlled stop) Enable (value admitted 0/1) (Default 1) i.e. 0x0051 = 1 → Dynamic Stop enabled 0x0051 = 0 → NO Dynamic Stop NEW: this value describes the behaviour of brake during movement from RUN to STANDBY with controlword i.e. 0x0051 = 1 --> Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x0051 = 0 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. 0x0051 = -1 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 0x0051 = -2 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay 0x0051 = -3 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 and the motor brake is locked immediately 0x0051 = -4 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor brake is locked immediately
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CONFIG ANALOG OUTPUT

PDU Address (HEX)	Description
0x0053	Config Analog Output Function: 0 = Disable Analog Output 1 = General Purpose 2= Speed [0:4095] = [-Max Speed: Max Speed] 3= Current [0:4095] = [- Peak current: Peak current] i.e. 0x0053 = 1 → General Purpose

SET ANALOG OUTPUT VALUE

PDU Address (HEX)	Description
0x0054	In case of 0x0053 = 1 this value can set the value of Analog Output value: i.e. 0x0054 = 4095 → Analog Output = 10V

DYN STOP STEP RAMP

PDU Address (HEX)	Description
0x0055	Value of Ramp of Dynamic stop: "Decrement step ramp" parameter, set value 100 [rpm*100/sec] i.e. 0x0055

SPEED VELOCITY FILTERED

PDU Address (HEX)	Description
0x0056	Velocity filtered: Read velocity (rpmx4) with a one pole filter

MOVE TO STANDBY - EMERGENCY

PDU Address (HEX)	Description
0x0059	This value describes the behaviour of brake during movement from RUN to STANDBY with emergency command i.e. 0x0059 = 1 → Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x0059 = 0 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. 0x0059 = -1 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 0x0059 = -2 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay 0x0059 = -3 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 and the motor brake is locked immediately 0x0059 = -4 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor brake is locked immediately

MOVE TO FAULT

PDU Address (HEX)	Description
0x005A	This value describes the behaviour of brake during movement from ALL States to FAULT when alarm occurred i.e. 0x005A = 1 → Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x005A = 0 → NO Dynamic Stop. the drive will go in Fault will go immediately (without ramp) and the motor will stop by inertia 0x005A = -1 → NO Dynamic Stop. =the drive will go in Fault and it will stop immediately with setpoint set to 0 0x005A = -2 → NO Dynamic Stop. the drive will go in Fault and it switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay 0x005A = -3 → NO Dynamic Stop. the drive will go in Fault and it will stop immediately with setpoint set to 0 and the motor brake is locked immediately 0x005A = -4 → NO Dynamic Stop. the drive will go in Fault and it switch-off the drive power stage and the motor brake is locked immediately

STO OPTION CODE

PDU Address (HEX)	Description
0x005C	This value describes the behaviour of brake during SAFETY state when STO is activated

	i.e. 0x005C = 0 → brake released, default value 0x005C = 1 → brake closed immediately
--	---

SAFETY FSM

PDU Address (HEX)	Description
0x005D	This value describes the the different transition following STO event into Finite State Machine.

STATUSWORD CONFIG

PDU Address (HEX)	Description																							
0x005E	This value changes the configuration of Manufacturer bits of statusword register 0x0075 (bit 8, 14 and 15). <table><tr><th rowspan="2">Value</th><th colspan="3">Bits of statusword</th></tr><tr><th>Bit 8</th><th>Bit 14</th><th>Bit 15</th></tr><tr><td>0</td><td>Emergency In. Enable</td><td>Safety State</td><td>Fault State</td></tr><tr><td>1</td><td>Emergency In. Enable</td><td>Safety State</td><td>Ready</td></tr><tr><td>2</td><td>Emergency In. Enable</td><td>S-Ramp Error Calc Jerk</td><td>S-Ramp Error Calc Limit</td></tr><tr><td>3</td><td>Emergency In. Enable</td><td>Safety State</td><td>Abort Communication</td></tr></table>	Value	Bits of statusword			Bit 8	Bit 14	Bit 15	0	Emergency In. Enable	Safety State	Fault State	1	Emergency In. Enable	Safety State	Ready	2	Emergency In. Enable	S-Ramp Error Calc Jerk	S-Ramp Error Calc Limit	3	Emergency In. Enable	Safety State	Abort Communication
Value	Bits of statusword																							
	Bit 8	Bit 14	Bit 15																					
0	Emergency In. Enable	Safety State	Fault State																					
1	Emergency In. Enable	Safety State	Ready																					
2	Emergency In. Enable	S-Ramp Error Calc Jerk	S-Ramp Error Calc Limit																					
3	Emergency In. Enable	Safety State	Abort Communication																					

WARNING CONFIG

PDU Address (HEX)	Description
0x005F	The value defines the different configuration of warning. 0 = STANDARD LAFERT = When the bit of warning flag is set, the bit stays set to 1 until it is cleared with controlword. 1 = AUTOMATIC VALIDATION = The bit stays set to 1 until the warning is present, when the warning is not present, the flag is cleared automatically. (Attention not all warnings have this function active see column "Automatic Validation Enable" in the "Warning Table")

FILTER POLE VELOCITY

PDU Address (HEX)	Description
0x0060	This value defines the Filter of speed. Units (Hz)

DECREMENT STEP S-RAMP

PDU Address (HEX)	Description
-------------------	-------------

0x0061	This number is the step to decrement the Set Point during the transition from RUN (operation enabled) to STANDBY (Switch-on Disabled) when the stopping mode is configured in Ramp programmable SRAMP. The motor will stop with programmable ramp that it follows s-curve. Units [rpm/sec]
--------	---

ANALOG CFG ADC

PDU Address (HEX)	Description
0x0062	This value describes the configuration of Analog Input: 0) -10V ... +10V 1) 0 ... 10V 2) -5V ... +5V 3) 0 ... +5V 4) Threshold ... 10V 5) Threshold ... 5V 6) 0 ... 10V 7) 0 ... +5V

ANALOG RUN THR

PDU Address (HEX)	Description
0x0063	This value is the threshold to start the control in RUN for configuration 4 and 5

MOTION PROFILE TYPE

PDU Address (HEX)	Description
0x0066	This value configures type of motion profile with S-ramp. To enable S-Ramp, before it needs to set '1' the register 0x3F (RAMP ENABLE), after set this register with: • -2 = Man. Spec: S-Ramp with Jerk Limited • -3 = Man. Spec: S-Ramp without Jerk

DIGITAL INPUT 1 CONFIG

PDU Address (HEX)	Description
0x0080	Shows as is set the Digital Input 1 i.e. 0 = none function 1 = Digital Input configured as "RUN" function 2 = Digital Input configured as "STOP" function 3 = Digital Input configured as "EMERGENCY" function 4 = Digital Input configured as "RESET" function

	5 = Digital Input configured as "DCW" function 6 = Digital Input configured as "DCCW" function 7 = Digital Input configured as "SETVEL1" function 8 = Digital Input configured as "SETVEL2" function 9 = Digital Input configured as "SETVEL3" function 10 = Digital Input configured as "SETVEL4" function 11 = Digital Input configured as "VEL/CUR" function 12 = Digital Input configured as "DIR" function 13 = Digital Input configured as "ZERO POS" function
--	--

DIGITAL INPUT 2 CONFIG

PDU Address (HEX)	Description
0x0081	Shows as is set the Digital Input 2 i.e. 0 – 13 As Digital Input 1

DIGITAL INPUT 3 CONFIG

PDU Address (HEX)	Description
0x0082	Shows as is set the Digital Input 3 i.e. 0 – 13 As Digital Input 1

DIGITAL INPUT 4 CONFIG

PDU Address (HEX)	Description
0x0083	Shows as is set the Digital Input 4 i.e. 0 – 13As Digital Input 1

DIGITAL OUTPUT 1 CONFIG

PDU Address (HEX)	Description
0x0084	Shows as is set the Digital Output 1 i.e. 0 = none function 1 = Digital Output configured as "DRIVE OK" function 2 = Digital Output configured as "WARNING" function 3 = Digital Output configured as "TARGET REACHED" function 4 = Digital Output configured as "BRAKE STATUS" function 5 = Digital Output configured as "READY" function

	6 = Digital Output configured as "MOTOR MOVE" function 7 = Digital Output configured as "LIMIT ACTIVE" function
--	--

DIGITAL OUTPUT 2 CONFIG

PDU Address (HEX)	Description
0x0085	Shows as is set the Digital Output 2 i.e. 0 – 7 As Digital Output 1

DIGITAL OUTPUT 3 CONFIG

PDU Address (HEX)	Description
0x0086	Shows as is set the Digital Output 3 i.e. 0 – 7 As Digital Output 1

DIGITAL OUTPUT 4 CONFIG

PDU Address (HEX)	Description
0x0087	Shows as is set the Digital Output 4 i.e. 0 – 7 As Digital Output 1

DIGITAL INPUT 1 LEVEL

PDU Address (HEX)	Description
0x0088	Shows the level of digital Input 1 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL INPUT 2 LEVEL

PDU Address (HEX)	Description
0x0089	Shows the level of digital Input 2 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL INPUT 3 LEVEL

PDU Address (HEX)	Description
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0x008A	Shows the level of digital Input 3 i.e. 0 = Positive Edge 1 = Negative Edge
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DIGITAL INPUT 4 LEVEL

PDU Address (HEX)	Description
0x008B	Shows the level of digital Input 4 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 1 LEVEL

PDU Address (HEX)	Description
0x008C	Shows the level of digital Output 1 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 2 LEVEL

PDU Address (HEX)	Description
0x008D	Shows the level of digital Output 2 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 3 LEVEL

PDU Address (HEX)	Description
0x008E	Shows the level of digital Output 3 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 4 LEVEL

PDU Address (HEX)	Description
0x008F	Shows the level of digital Output 4 i.e. 0 = Positive Edge 1 = Negative Edge

WARNING ENABLE USER

This registers show the warning enables on the Warning register 0x61 and 0x62

WARNING ENABLE USER LOW

PDU Address (HEX)	Description
0x0090	Warning Enable User Low - 16 bit LSB

WARNING ENABLE USER HIGH

PDU Address (HEX)	Description
0x0091	Warning Enable User High - 16 bit MSB

WARNING SINGLE OUT

These registers show the warning enables on the Warning bit of statusword or digital output

WARNING SINGLE OUT LOW

PDU Address (HEX)	Description
0x0092	Warning Single Output - 16 bit LSB

WARNING SINGLE OUT HIGH

PDU Address (HEX)	Description
0x0093	Warning Single Output - 16 bit MSB

PROFILE ACCELERATION

These registers show the profile acceleration for S-Ramp profile. Units [rpm/s]

PROFILE ACCELERATION LOW

PDU Address (HEX)	Description
0x0130	Profile Acceleration Low - 16 bit LSB

PROFILE ACCELERATION HIGH

PDU Address (HEX)	Description
0x0131	Profile Acceleration High - 16 bit MSB

PROFILE DECELERATION

These registers show the profile deceleration for S-Ramp profile. Units [rpm/s]

PROFILE DECELERATION LOW

PDU Address (HEX)	Description
0x0132	Profile Deceleration Low - 16 bit LSB

PROFILE DECELERATION HIGH

PDU Address (HEX)	Description
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0x0133	Profile Deceleration High - 16 bit MSB
--------	--

MAX ACCELERATION

These registers show the max acceleration for S-Ramp profile. Units [rpm/s]

MAX ACCELERATION LOW

PDU Address (HEX)	Description
0x0134	Profile Max Acceleration Low - 16 bit LSB

MAX ACCELERATION HIGH

PDU Address (HEX)	Description
0x0135	Profile Max Deceleration High - 16 bit MSB

MAX DECELERATION

These registers show the max deceleration for S-Ramp profile. Units [rpm/s]

MAX DECELERATION LOW

PDU Address (HEX)	Description
0x0136	Profile Max Deceleration Low - 16 bit LSB

MAX DECELERATION HIGH

PDU Address (HEX)	Description
0x0137	Profile Max Deceleration High - 16 bit MSB

FIRMWARE RELEASE CUSTOMER

PDU Address (HEX)	Description
0x01FF	Read the device firmware version i.e. 0x01FF = 0x00E1 (226) → Firmware release 2.2.6

HARDWARE RELEASE

PDU Address (HEX)	Description
0x0201	Read the device hardware version i.e. 0x0201 = 0x000B (11) → Hardware release 1.1

PARAMETER RELEASE

PDU Address (HEX)	Description
0x0202	Read parameter release:

	i.e. 0x0202 = 0x0136 (310) → Parameter release 3.1.0
--	---

MOTOR TYPE

PDU Address (HEX)	Description
0x0203	Read motor type: 0 = None, 1 = B40, 2 = B63, 3 = B71, 100 = TCF - RESERVED TO MANUFACTURER i.e. 0x0203 = 1 → Selected Motor Type S

STO CHECK

PDU Address (HEX)	Description
0x0204	Reads if the drive has STO (Safe Torque Off) i.e. 0x0204 = 1 STO present 0x0204 = 2 NO STO

FEEDBACK TYPE

PDU Address (HEX)	Description
0x0205	Reads what type of feedback control has the drive 0x0205 = 0 → Resolver 0x0205 = 1 → Incremental Encoder 0x0205 = 2 → SinCos Encoder

OPERATION MODE

PDU Address (HEX)	Description
0x0207	Reads operation Mode: 0x0207 = 0 → No Operation mode 0x0207 = 1 → Torque mode 0x0207 = 2 → Velocity mode

MOTOR POLES

PDU Address (HEX)	Description
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0x0208	Reads Motor Poles Couple Mode: i.e. 0x0208 = 4 → the motor has 4 couple of poles.
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MOTOR TEMP SENSOR

PDU Address (HEX)	Description
0x0209	Motor Sense Type can be the following values: 1. KTY83 2. PT1000 3. KTY84 4. PTC ON/OFF

MOTOR MAX SPEED

PDU Address (HEX)	Description
0x020A	Max Motor Speed: i.e. 0x020A = 4500 → the motor cannot run over 4500 rpm.

4. | WRITE SINGLE HOLDING REGISTER (0X06)

4.1 List of Write Single Holding Registers

		WRITE PARAMETERS (0x06)	UNIT
HEX	DEC		[]
0x0000	0	STORE E2PROM	[]
0x0001	1	CONTROL WORD	[]
0x0028	40	MODBUS ADDRESS	[]
0x002B	43	COM SETTINGS	[]
0x0035	53	MODBUS BAUD RATE	[]
0x0036	54	COMMUNICATION LOSS TIME	[ms]
0x003C	60	PID VELOCITY KP	[IU]
0x003D	61	PID VELOCITY KI	[IU]
0x003E	62	PID VELOCITY KV	[IU]
0x003F	63	RAMP ENABLE	[]
0x0040	64	SPEED RAMP UP TIME	[ms]
0x0041	65	SPEED RAMP DOWN TIME	[ms]
0x0042	66	SPEED SETPOINT	[RPM]
0x0043	67	SPEED POLARITY	[]
0x0044	68	LIMIT TORQUE POSITIVE	[%]
0x0045	69	LIMIT TORQUE NEGATIVE	[%]
0x0046	70	SLOPE RAMP (TORQUE)	[Rated current / (1000 * s)]
0x0047	71	CURRENT TORQUE SETPOINT	[Arms / 100]
0x004E	78	BRAKE MANAGED	[]
0x004F	79	BRAKE MODE	[]
0X0051	81	MOVE TO STANDBY – CW (PREVIOUS NAME: DYNAMIC STOP)	[]
0X0052	82	SET CMD REQ FEEDBACK	[]
0X0053	83	CONFIG ANALOG OUTPUT	[]
0X0054	84	SET ANALOG OUTPUT VALUE (GEN PURPOSE)	[]
0X0055	85	DYN STOP STEP RAMP	[]
0x0056	86	FILTER POLO VELOCITA'	[]
0x0057	87	RESERVED	RESERVED
0x0058	88	RESERVED	RESERVED
0x0059	89	MOVE TO STANDBY - EMERGENCY	[]
0x005A	90	MOVE TO FAULT	[]
0x005B	91	RESERVED	RESERVED
0x005C	92	STO OPT CODE	[]
0x005D	93	SAFETY FSM MODE	[]

0x005E	94	STATUSWORD CONFIG	[]
0x005F	95	WARNING CONFIG	[]
0x0060	96	FILTER POLO VELOCITY	[]
0x0061	97	DECREMENT STEP S-RAMP	[]
0x0062	98	ANALOG CFG ADC	[]
0x0063	99	ANALOG RUN THRESHOLD	[]
0x0064	100	RESERVED	RESERVED
0x0065	101	RESERVED	RESERVED
0x0066	102	MOTION PROFILE TYPE	[]
0X0080	128	DIGITAL INPUT 1 CFG	[]
0X0081	129	DIGITAL INPUT 2 CFG	[]
0X0082	130	DIGITAL INPUT 3 CFG	[]
0X0083	131	DIGITAL INPUT 4 CFG	[]
0X0084	132	DIGITAL OUTPUT 1 CFG	[]
0X0085	133	DIGITAL OUTPUT 2 CFG	[]
0X0086	134	DIGITAL OUTPUT 3 CFG	[]
0X0087	135	DIGITAL OUTPUT 4 CFG	[]
0X0088	136	DIGITAL INPUT 1 LEVEL	[]
0X0089	137	DIGITAL INPUT 2 LEVEL	[]
0X0090	138	DIGITAL INPUT 3 LEVEL	[]
0X0091	139	DIGITAL INPUT 4 LEVEL	[]
0X0092	140	DIGITAL OUTPUT 1 LEVEL	[]
0X0093	141	DIGITAL OUTPUT 2 LEVEL	[]
0X0094	142	DIGITAL OUTPUT 3 LEVEL	[]
0X0095	143	DIGITAL OUTPUT 4 LEVEL	[]
0x0090	144	WARNING ENABLE USER - LOW	
0x0091	145	WARNING ENABLE USER - HIGH	
0x0092	146	WARNING SINGLE OUT - LOW	
0x0093	147	WARNING SINGLE OUT - HIGH	
0x0120	288	RESERVED	RESERVED
0x0121	289	RESERVED	RESERVED
0x0122	290	RESERVED	RESERVED
0x0123	291	RESERVED	RESERVED
0x0124	292	RESERVED	RESERVED
0x0125	293	RESERVED	RESERVED
0x0126	294	RESERVED	RESERVED
0x0127	295	RESERVED	RESERVED
0x0128	296	RESERVED	RESERVED
0x0129	297	RESERVED	RESERVED
0x012A	298	RESERVED	RESERVED
0x012B	299	RESERVED	RESERVED

0x012C	300	RESERVED	RESERVED
0x012D	301	RESERVED	RESERVED
0x012E	302	RESERVED	RESERVED
0x012F	303	RESERVED	RESERVED
0x0130	304	PROFILE ACCELERATION - LOW	[rpm/sec]
0x0131	305	PROFILE ACCELERATION - HIGH	[rpm/sec]
0x0132	306	PROFILE DECELERATION - LOW	[rpm/sec]
0x0133	307	PROFILE DECELERATION - HIGH	[rpm/sec]
0x0134	308	MAX ACCELERATION - LOW	[rpm/sec]
0x0135	309	MAX ACCELERATION - HIGH	[rpm/sec]
0x0136	310	MAX DECELERATION - LOW	[rpm/sec]
0x0137	311	MAX DECELERATION - HIGH	[rpm/sec]
0X0207	519	OPERATION MODE	[]
0x5A5A	23130	RESTORE MANUFACTURER DATA	[]
0xA5A5	42405	RESET DRIVE	[]



Warning

Some commands need the following procedure to make the changes of their parameters effective:

1. Save in EEPROM (command [func.06 – addr.0x0000] STORE E2PROM)
2. Drive Reset (command [func.06 – addr.0xA5A5] RESET DRIVE)

List of Commands that need this procedure:

HEX	DEC	COMMAND NAME
0x0028	40	MODBUS ADDRESS
0x002B	43	COM SETTINGS
0x0035	53	MODBUS BAUD RATE
0x0036	54	COMMUNICATION LOSS TIME
0x003F	63	RAMP ENABLE
0x004F	79	BRAKE MODE
0X0207	519	OPERATION MODE



Warning

If is written an address not present in list above the drive gives the Exception Code 0x02

4.2 Description of Write Single Holding Registers

STORE E2PROM DATA

PDU Address (HEX)	Description
0x0000	Command to store data on E2prom. Not need to send a specific value of parameter i.e. 0x0000 → Store the parameters in E2prom

CONTROL WORD

PDU Address (HEX)	Description
0x0001	CONTROL WORD bits status: • Bit 0: RUN bit → 0 Run Disabled 1 Run Enabled • Bit 1: STOP bit → 0 Stop Enabled 1 Stop Disabled • Bit 2: BRAKE bit → 0 Brake can be disabled manually 1 Brake can be enabled manually • Bit 3: WARNING → 0 Nothing 1 Clear warning bit in Status Word / Digital Output • Bit 4: RESET ALARM → 0 Nothing 1 Clear Alarm State • Bit 5: EMERGENCY COMMAND → 0 Nothing 1 Set Emergency Event (As Default of Dig In 3) Warning: BRAKE bit is a DON'T CARE bit if the brake is NOT ACTIVE and is set to AUTO. Brake can be activated by modbus address 0x004E. Brake mode (manual/auto) can be changed by modbus address 0x004F. If value it is out of range the drive gives the Exception Code 0x03



Warning

The alarm can be Fault (F) or warning (W), if it is a fault the drive will stop.



Warning

In case of Run/Stop state if is given an *Emergency Command* (Digital Input - **not Safety input**) the drive state goes to standby (T11/T12). Then if you need to give a run command (or stop command) is necessary the transition of command SAFETY → STANDBY → RUN



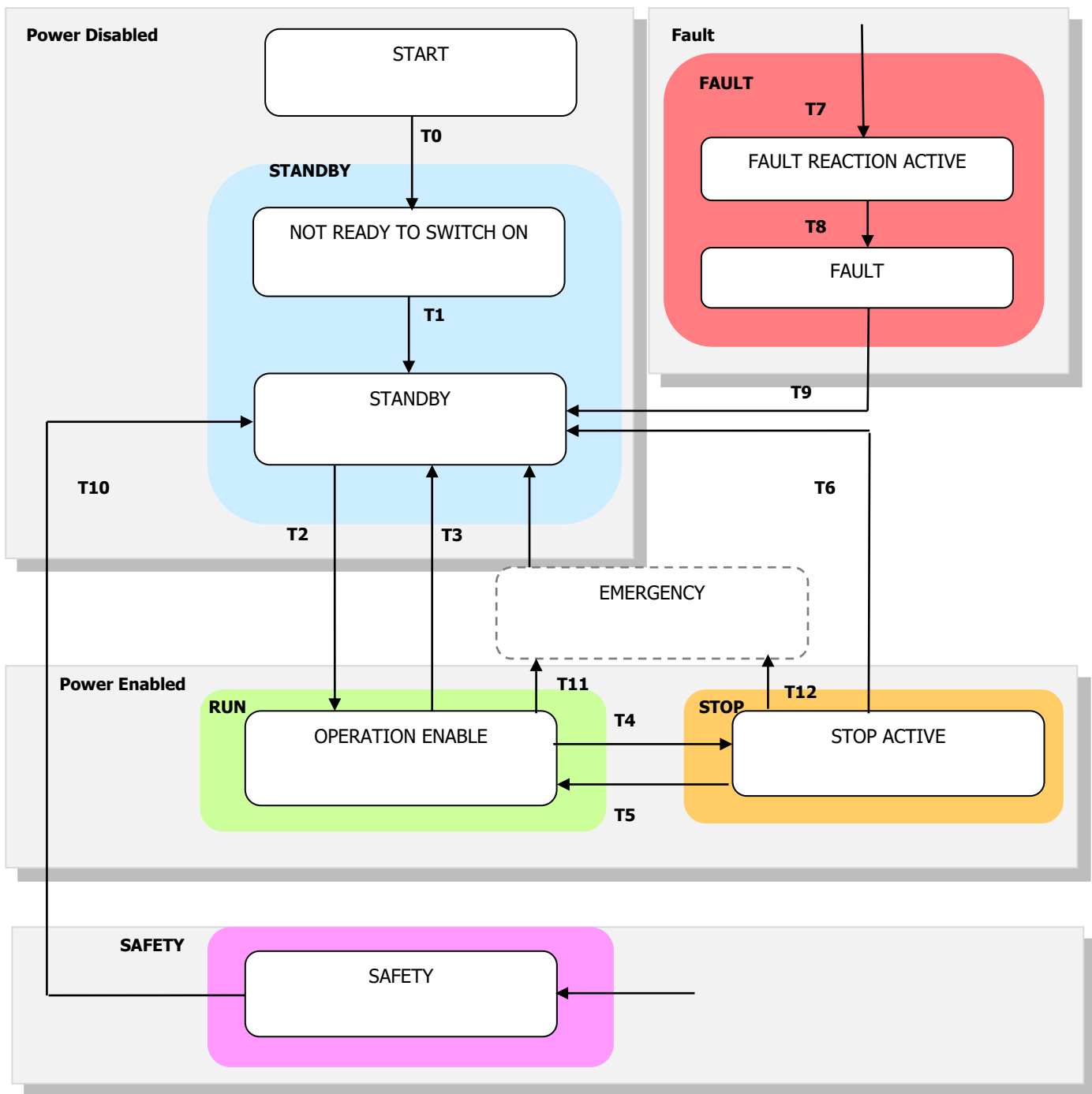
Warning

In case of Run/Stop state if is given an *STO Command* (**Safety input**) the drive state goes to standby (T11/T11a). Then if you need to give a run command (or stop command) is necessary the transition of command SAFETY → STANDBY → RUN



Warning

RESET ALARM = To clear the alarm the master must set the bit of "RESET ALARM" of controlword. Remember that the bit of RUN BIT must be 0 to have the drive in STANDBY state.



Picture 2 - State Machine Modbus Mode with Safety State

4.2.1 Run Sequence

- 1) Switch ON Power Supply [**T0**]
- 2) Wait **Standby** (*SWITCHED ON*) State [**T1**]
- 3) Verify Operation Mode by reading [func. 0x03 – addr. 0x0207] Operation Mode:
 - Value equal to 1 → Torque Mode
 - Value equal to 2 → Velocity Mode

	Warning If the customer wants to switch from Torque Mode to velocity Mode or vice-versa he must set it by write to [func.06 – addr.0x0207] Operation Mode. To make changes effective, the customer must first save to memory with command [func.06 – addr. 0x0000] Store E2PROM Data and then reset drive with command [func.06 – addr.0xA5A5] System Reset.
---	--

- 4) Verify that the Smartris Drive is in SWITCHED ON
- 5) Set **OPERATION ENABLED** State: write [0x06] Control Word → 0x0001 = 0x0003 [**T2**]
- 6) Verify LED STATUS ENABLED
 - Verify by read [func. 0x03 - addr.0x0060], that the Smartris Drive is in ENABLED [Drive Status = 0x0001 → RUN]]
 - Verify that the brake is released
- 7) If [func. 0x06 - addr. 0x0207] - Operation Mode = 2 – Velocity mode → Write to [func.0x06 – addr. 0x0042] Speed Set Point → **i.e.** 0x03e8 (1000 → 1000 rpm)
 If [func. 0x06 - addr. 0x0207] - Operation Mode = 1 – Torque mode → Write to [func.0x06 – addr. 0x0047] Torque Set Point → **i.e.** 0x03e8 (1000 → 10 Arms)
- 8) Verify if the motor is running
 - Verify the motor speed (after ramp) by read to [func. 0x04 – addr. 0x0068] Motor Speed
 - Verify the motor current by read to [func. 0x04 – addr. 0x0069] Torque Current
- 9) Stop the motor with Stop Command → write to [func. 0x06 - addr. 0x0001] - Control Word → 0x0001 [**T4**] – Drive goes immediately in Stop state with MAX torque (it's equal to a STOP command).
 If you want to Stop the motor with ramp, just write to [func.06 – addr.0x0042] Speed Set Point the value 0 (0 rpm).
 Stop the motor with Standby Command → write to [func. 0x06 - addr. 0x0001] - Control Word → 0x0002 [**T4**] – Drives goes in Standby state.

Transitions:

Transition	Description	Transition	
T0	Switch ON – Supply to drive	T7	Fault reaction active
T1	Drive after init – NO Alarm	T8	Fault – Drive in Alarm
T2	Run command–Drive Enabled Standby→Run	T9	Reset command Fault → Standby
T3	Standby command – Drive Disabled	T10	STO (SAFETY) Command
T4	Stop command – Drive Run→Stop	T11	Emergency (If active)→ the motor will decrement speed with a programmed ramp
T5	Run command–Drive Enabled Stop→Run		
T6	Standby command – Stop→Standby	T12	Emergency (If active)

Table 5 – Transition Description – State machine

NOTES:

- The STO (**SAFETY**) command may can stop the running command immediately
- The **Stop** Command can stop the running command immediately
- A **FAULT** (see table in Diagnostic) can stop the running command immediately

MODBUS ADDRESS

PDU Address (HEX)	Description
0x0028	Modbus Address. [1:247] i.e. 0x0028 = 1 → Modbus Address = 1 To change MODBUS ADDRESS is necessary save to E2prom and give a reset command If value it is out of range the drive gives the Exception Code 0x03

COM SETTINGS

PDU Address (HEX)	Description
0x002B	COM Settings. Modbus COM (Default 0) settings related to parity, stop Bits and Data Bits: 0 - No Parity, 2 stop bits 1 - Odd Parity, 1 stop bit 2 - Even Parity 1 stop bit To change COM SETTINGS is necessary save to E2prom and give a reset command If value it is out of range the drive gives the Exception Code 0x03

MODBUS BAUD RATE

PDU Address (HEX)	Description
0x0035	Modbus Baud Rate (Default 19200) 0x0035 = 96 → 9600 0x0035 = 192 → 19200 0x0035 = 384 → 38400 0x0035 = 576 → 57600 0x0035 = 1152 → 115200 i.e. 0x0035 = 0x00C0 (192) → ModBus Baud Rate = 19200 To change MODBUS BAUD RATE is necessary save to E2prom and give a reset command If value it is out of range the drive gives the Exception Code 0x03

COMMUNICATION LOSS TIME

PDU Address (HEX)	Description
0x0036	Communication Loss Time [ms] - (Default 0) i.e. 0x0036 = 0x03B8 (1000) → Loss Time = 1000 ms If 0x0036 = 0 → Communication Loss Time disabled If value it is out of range [0:32000] the drive gives the Exception Code 0x03

PID VELOCITY KP

PDU Address (HEX)	Description
0x003C	Proportional PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application. It is possible to change the Speed Pid in run time. If value it is negative the drive gives the Exception Code 0x03

PID VELOCITY KI

PDU Address (HEX)	Description
0x003D	Integral PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application. It is possible to change the Speed Pid in run time. If value it is negative the drive gives the Exception Code 0x03

PID VELOCITY KV

PDU Address (HEX)	Description
0x003E	Parameter PID Velocity -The parameter controls equivalent of PID speed parameters. i.e. The PID are defined by application. It is possible to change the Speed Pid in run time. If value it is negative the drive gives the Exception Code 0x03

RAMP ENABLE

PDU Address (HEX)	Description
0x003F	Reads if the ramps (torque and speed ramps) are enabled or not. i.e. 0x003F = 1: Speed ramp enabled 0x003F = 0: Speed ramp disabled To change RAMP STATE is necessary save to E2prom and give a reset command If value it is different from 0/1 the drive gives the Exception Code 0x03

SPEED RAMP UP

PDU Address (HEX)	Description
0x0040	Speed ramp up in ms i.e. 0x0040 = 0x03E8 (1000) → Speed ramp up from 0 to max velocity = 1 sec If value it is negative the drive gives the Exception Code 0x03

SPEED RAMP DOWN

PDU Address (HEX)	Description
0x0041	Speed ramp down in ms i.e. 0x0041 = 0x03E8 (1000) → Speed ramp down from max velocity to 0 = 1 sec If value it is negative the drive gives the Exception Code 0x03

SPEED SET POINT

PDU Address (HEX)	Description
0x0042	Speed setpoint - range [-Full scale velocity: Full scale velocity] The speed setpoint is available in range of - Full scale velocity Full scale velocity Considering a drive with Full scale velocity = 3.000 rpm Speed SetPoint (Write to VFD Function 0x06) has a range [-3000:3000] rpm i.e. 0x0042 = 0x0BB8 (3.000) is requested speed → Speed Motor = 3000 rpm 0x0042 = 0xF448 (-3.000) → Speed Motor = -3000 rpm If value it is out of range the drive gives the Exception Code 0x03

SPEED POLARITY

PDU Address (HEX)	Description
0x0043	Polarity of Speed/Torque/Position setpoint - range [-Full scale velocity: Full scale velocity] The following value definition is valid: - bit value = 0: multiply the demand value by 1 - bit value = 1: multiply the demand value by -1 i.e. In case of speed setpoint = 3.000 rpm, sending 0x0043 = 1 the motor begins to run at -3000 rpm If value it is different to 0/1 the drive gives the Exception Code 0x03

LIMIT TORQUE POSITIVE

PDU Address (HEX)	Description
0x0044	Torque limit positive [0:100] This parameter shall indicate the configured maximum positive torque in the motor. The value shall be given percent of rated current. Positive torque takes effect in the case of motive operation is positive velocity or regenerative operation is negative velocity. This parameter is used also Profile Velocity i.e. 0x0044= 0x0032 (50), the maximum torque positive is 50% of rated current If value it is out of range the drive gives the Exception Code 0x03

LIMIT TORQUE NEGATIVE

PDU Address (HEX)	Description
0x0045	Torque limit negative [0:100] This parameter shall indicate the configured maximum negative torque in the motor. The value shall be given percent of rated current. Negative torque takes effect in the case of motive operation is negative velocity or regenerative operation is negative velocity. This parameter is used also Profile Velocity. i.e. 0x0045 = 0x0032 (50), the maximum torque negative is 50% of rated current If value it is out of range the drive gives the Exception Code 0x03

SLOPE RAMP (TORQUE)

PDU Address (HEX)	Description
0x0046	Slope Torque Ramp [rated current/ (1000*s)] in Torque Control Mode This parameter shall indicate the configured rate of change of torque. The value shall be given in units of per thousand of rated torque per second. It is controlled by some limits of drive. If the value is not correct the drive sends an Abort Code. If the value is not correct during initialization the drive sends an error messages with Emergency Protocol. i.e. 0x0046 = 0x01F4 (500) → Torque ramp up from 0 to rated current in (1000 / 500) secs = 2 sec If value it is negative the drive gives the Exception Code 0x03 If Operation Mode is set on Velocity drive gives the Exception Code 0x03

CURRENT TORQUE SETPOINT

PDU Address (HEX)	Description
0x0047	Torque Setpoint [Arms / 100] in Torque Control Mode. [-peak current, peak current] Torque Setpoint range: [-Peak Current; Peak Current] i.e. 0x0047 = 0xC8 (200) → 2 Arms 0x0047 = 0xFF38 (65335 = -200) → - 2 Arms If value it is out of range the drive gives the Exception Code 0x03

BRAKE MANAGED

PDU Address (HEX)	Description
0x004E	Enable / Disable Brake manage. 0x004E = 1 → Brake ON 0x004E = 0 → Brake OFF If value it is different to 0/1 the drive gives the Exception Code 0x03

BRAKE MODE

PDU Address (HEX)	Description
0x004F	Set brake mode (Auto / Manual) 0x004F = 1 → Manual Brake 0x004F = 0 → Automatic Brake If value it is different to 0/1 the drive gives the Exception Code 0x03

MOVE TO STANDBY – COMMAND (PREVIOUS NAME: DYNAMIC STOP)

PDU Address (HEX)	Description
0x0051	Previous: Set Dynamic Stop (electronic controlled stop) Enable (value admitted 0/1) (Default 1) i.e. 0x0051 = 1 → Dynamic Stop enabled 0x0051 = 0 → NO Dynamic Stop NEW: this value set the behaviour of brake during movement from RUN to STANDBY with controlword i.e. 0x0051 = 1 --> Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x0051 = 0 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. 0x0051 = -1 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 0x0051 = -2 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay

SET CMD REQ FEEDBACK

PDU Address (HEX)	Description
0x0052	SinCos encoder command. 1. READ ENCODER STATUS (encoder status) 2. READ OUT NAME PLATE (Encoder Type) 3. Reserved 4. READ POSITION (actual position) i.e. 0x0052 = 1 → Update of READ ENCODER STATUS

CONFIG ANALOG OUTPUT

PDU Address (HEX)	Description
0x0053	Config Analog Output Function: 0 = Disable Analog Output 1 = General Purpose 2 = Speed [0:4095] = [-Max Speed: Max Speed]

	3= Current [0:4095] = [- Peak current: Peak current] i.e. 0x0053 = 1 → Set General Purpose
--	--

SET ANALOG OUTPUT VALUE

PDU Address (HEX)	Description
0x0054	In case of 0x0053 = 1 this value can set the value of Analog Output value: i.e. 0x0054 = 4095 → Analog Output = 10V

DYNAMIC STOP STEP RAMP

PDU Address (HEX)	Description
0x0055	Value of Ramp of Dynamic stop: "Decrement step ramp" parameter, set value 100 [rpm*100/sec] i.e. 0x0055

MOVE TO STANDBY - EMERGENCY

PDU Address (HEX)	Description
0x0059	This value set the behaviour of brake during movement from RUN to STANDBY with emergency command i.e. 0x0059 = 1 → Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x0059 = 0 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. 0x0059 = -1 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 0x0059 = -2 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay 0x0059 = -3 → NO Dynamic Stop. The drive will stop immediately with setpoint set to 0 and the motor brake is locked immediately 0x0059 = -4 → NO Dynamic Stop. The drive switch-off the drive power stage and the motor brake is locked immediately

MOVE TO FAULT

PDU Address (HEX)	Description
0x005A	This value set the behaviour of brake during movement from ALL States to FAULT when alarm occurred i.e. 0x005A = 1 → Dynamic Stop enabled. The drive switches-off and the motor will stop with a deceleration with a dynamic ramp. This operation mode grants a deceleration with a specific ramp that can be configured by the user. 0x005A = 0 → NO Dynamic Stop. the drive will go in Fault will go immediately (without ramp) and the motor will stop by inertia 0x005A = -1 → NO Dynamic Stop. =the drive will go in Fault and it will stop immediately with setpoint set to 0

	0x005A = -2 → NO Dynamic Stop. the drive will go in Fault and it switch-off the drive power stage and the motor will stop by inertia. When the motor is not running the drive remains stopped with torque for a time delay 0x005A = -3 → NO Dynamic Stop. the drive will go in Fault and it will stop immediately with setpoint set to 0 and the motor brake is locked immediately 0x005A = -4 → NO Dynamic Stop. the drive will go in Fault and it switch-off the drive power stage and the motor brake is locked immediately
--	---

STO OPTION CODE

PDU Address (HEX)	Description
0x005C	This value set the behaviour of brake during SAFETY state when STO is activated i.e. 0x005C = 0 → brake released, default value 0x005C = 1 → brake closed immediately

SAFETY FSM

PDU Address (HEX)	Description
0x005D	This value sets the the different transition following STO event into Finite State Machine.

STATUSWORD CONFIG

PDU Address (HEX)	Description			
0x005E	This value sets the configuration of manufacturer bits (bit 8, 14 and 15) of statusword register 0x75 with command read holding registers (0x03)			
	Value	Bits of statusword		
		Bit 8	Bit 14	Bit 15
	0	Emergency In. Enable	Safety State	Fault State
	1	Emergency In. Enable	Safety State	Ready
	2	Emergency In. Enable	S-Ramp Error Calc Jerk	S-Ramp Error Calc Limit
	3	Emergency In. Enable	Safety State	Abort Communication

WARNING CONFIG

PDU Address (HEX)	Description
0x005F	This value sets the different configuration of warning. 0 = STANDARD LAFERT = When the bit of warning flag is set, the bit stays set to 1 until it is cleared with controlword. 1 = AUTOMATIC VALIDATION = The bit stays set to 1 until the warning is present, when the warning is not present, the flag is cleared automatically. (Attention not all warnings have this function active see column "Automatic Validation Enable" in the "Warning Table")

FILTER POLE VELOCITY

PDU Address (HEX)	Description
0x0060	This value sets the Filter of speed. Units (Hz)

DECREMENT STEP S-RAMP

PDU Address (HEX)	Description
0x0061	This value sets the step to decrement the Set Point during the transition from RUN (operation enabled) to STANDBY (Switch-on Disabled) when the stopping mode is configured in Ramp programmable SRAMP. The motor will stop with programmable ramp that it follows s-curve. Units [rpm/sec]

ANALOG CFG ADC

PDU Address (HEX)	Description
0x0062	This value sets the configuration of Analog Input: 0) -10V ... +10V 1) 0 ... 10V 2) -5V ... +5V 3) 0 ... +5V 4) Threshold ... 10V 5) Threshold ... 5V 6) 0 ... 10V 7) 0 ... +5V

ANALOG RUN THR

PDU Address (HEX)	Description
0x0063	This value sets the threshold to start the control in RUN for configuration 4 and 5

MOTION PROFILE TYPE

PDU Address (HEX)	Description
0x0066	This value sets type of motion profile with S-ramp. To enable S-Ramp, before it needs to set '1' the register 0x3F (RAMP ENABLE), after set this register with: • -2 = Man. Spec: S-Ramp with Jerk Limited • -3 = Man. Spec: S-Ramp without Jerk

DIGITAL INPUT 1 CONFIG

PDU Address (HEX)	Description
0x0080	This value sets the configuration of Digital Input 1 i.e. 0 = none function 1 = Digital Input configured as "RUN" function 2 = Digital Input configured as "STOP" function 3 = Digital Input configured as "EMERGENCY" function 4 = Digital Input configured as "RESET" function 5 = Digital Input configured as "DCW" function 6 = Digital Input configured as "DCCW" function 7 = Digital Input configured as "SETVEL1" function 8 = Digital Input configured as "SETVEL2" function 9 = Digital Input configured as "SETVEL3" function 10 = Digital Input configured as "SETVEL4" function 11 = Digital Input configured as "VEL/CUR" function 12 = Digital Input configured as "DIR" function 13 = Digital Input configured as "ZERO POS" function

DIGITAL INPUT 2 CONFIG

PDU Address (HEX)	Description
0x0081	This value set the configuration of Digital Input 2 i.e. 0 – 13 As Digital Input 1

DIGITAL INPUT 3 CONFIG

PDU Address (HEX)	Description
0x0082	This value set the configuration of Digital Input 3 i.e. 0 – 13 As Digital Input 1

DIGITAL INPUT 4 CONFIG

PDU Address (HEX)	Description
0x0083	This value set the configuration of Digital Input 4 i.e. 0 – 13 As Digital Input 1

DIGITAL OUTPUT 1 CONFIG

PDU Address (HEX)	Description
0x0084	This value set the configuration of Digital Output 1 i.e. 0 = none function 1 = Digital Output configured as "DRIVE OK" function 2 = Digital Output configured as "WARNING" function 3 = Digital Output configured as "TARGET REACHED" function 4 = Digital Output configured as "BRAKE STATUS" function 5 = Digital Output configured as "READY" function 6 = Digital Output configured as "MOTOR MOVE" function 7 = Digital Output configured as "LIMIT ACTIVE" function

DIGITAL OUTPUT 2 CONFIG

PDU Address (HEX)	Description
0x0085	This value set the configuration of Digital Output 2 i.e. 0 – 7 As Digital Output 1

DIGITAL OUTPUT 3 CONFIG

PDU Address (HEX)	Description
0x0086	This value set the configuration of Digital Output 3 i.e. 0 – 7 As Digital Output 1

DIGITAL OUTPUT 4 CONFIG

PDU Address (HEX)	Description
0x0087	This value set the configuration of Digital Output 4 i.e. 0 – 7 As Digital Output 1

DIGITAL INPUT 1 LEVEL

PDU Address (HEX)	Description
0x0088	This value set the Level of Digital Input 1 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL INPUT 2 LEVEL

PDU Address (HEX)	Description
0x0089	This value set the Level of Digital Input 2 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL INPUT 3 LEVEL

PDU Address (HEX)	Description
0x008A	This value set the Level of Digital Input 3 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL INPUT 4 LEVEL

PDU Address (HEX)	Description
0x008B	This value set the Level of Digital Input 4 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 1 LEVEL

PDU Address (HEX)	Description
0x008C	This value set the Level of Digital Output 1 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 2 LEVEL

PDU Address (HEX)	Description
0x008D	This value set the Level of Digital Output 2 i.e. 0 = Positive Edge 1 = Negative Edge

DIGITAL OUTPUT 3 LEVEL

PDU Address (HEX)	Description
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0x008D	This value set the Level of Digital Output 3 i.e. 0 = Positive Edge 1 = Negative Edge
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DIGITAL OUTPUT 4 LEVEL

PDU Address (HEX)	Description
0x008F	This value set the Level of Digital Output 4 i.e. 0 = Positive Edge 1 = Negative Edge

WARNING ENABLE USER

This registers set the warning enables on the Warning register 0x61 and 0x62

WARNING ENABLE USER LOW

PDU Address (HEX)	Description
0x0090	Warning Enable User Low - 16 bit LSB

WARNING ENABLE USER HIGH

PDU Address (HEX)	Description
0x0091	Warning Enable User High - 16 bit MSB

WARNING SINGLE OUT

These registers set the warning enables on the Warning bit of statusword or digital output

WARNING SINGLE OUT LOW

PDU Address (HEX)	Description
0x0092	Warning Single Output - 16 bit LSB

WARNING SINGLE OUT HIGH

PDU Address (HEX)	Description
0x0093	Warning Single Output - 16 bit MSB

PROFILE ACCELERATION

These registers set the profile acceleration for S-Ramp profile. Units [rpm/s]

PROFILE ACCELERATION LOW

PDU Address (HEX)	Description
0x0130	Profile Acceleration Low - 16 bit LSB

PROFILE ACCELERATION HIGH

PDU Address (HEX)	Description
0x0131	Profile Acceleration High - 16 bit MSB

PROFILE DECELERATION

These registers set the profile deceleration for S-Ramp profile. Units [rpm/s]

PROFILE DECELERATION LOW

PDU Address (HEX)	Description
0x0132	Profile Deceleration Low - 16 bit LSB

PROFILE DECELERATION HIGH

PDU Address (HEX)	Description
0x0133	Profile Deceleration High - 16 bit MSB

MAX ACCELERATION

These registers set the max acceleration for S-Ramp profile. Units [rpm/s]

MAX ACCELERATION LOW

PDU Address (HEX)	Description
0x0134	Profile Max Acceleration Low - 16 bit LSB

MAX ACCELERATION HIGH

PDU Address (HEX)	Description
0x0135	Profile Max Deceleration High - 16 bit MSB

MAX DECELERATION

These registers set the max deceleration for S-Ramp profile. Units [rpm/s]

MAX DECELERATION LOW

PDU Address (HEX)	Description
0x0136	Profile Max Deceleration Low - 16 bit LSB

MAX DECELERATION HIGH

PDU Address (HEX)	Description
0x0137	Profile Max Deceleration High - 16 bit MSB

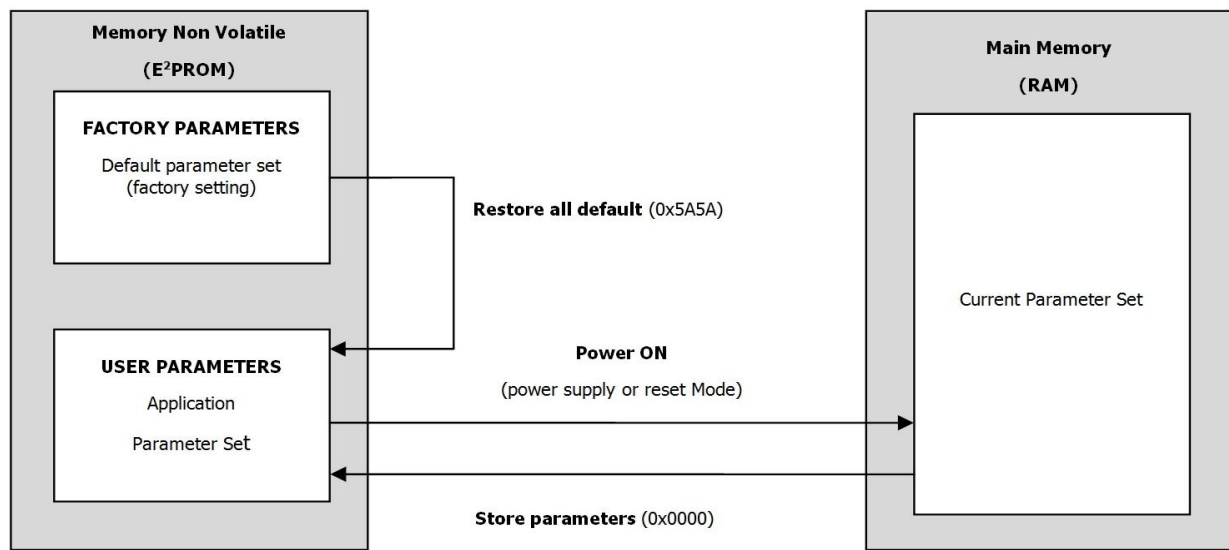
OPERATION MODE

PDU Address (HEX)	Description
0x0207	Set operation Mode:

	• 0x0207 = 1 → Torque mode • 0x0207 = 2 → Velocity mode To change OPERATION MODE is necessary save to E2prom and give a reset command. If value it is different from 1/2 the drive gives the Exception Code 0x03
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RESTORE MANUFACTURER DATA

PDU Address (HEX)	Description
0x5A5A	Command to restore Manufacturer data on E2prom. Not need to send a specific value of parameter



Picture 3 - Store - Restore Function

SYSTEM RESET

PDU Address (HEX)	Description
0xA5A5	This command gives to drive a System reset: sending this parameter the drive reset to reboot it. It is useful if the drive is on error or to make effective changes after a save in EEPROM: not need to send a specific value of parameter Drive responds to PLC, after the drive is reset wait about 2 sec for new communication.

5. | DIAGNOSTIC

The combination of leds describe the status of Finite State Machine of drive:

- The **GREEN Led** (Status 1) is the status 1 of the drive
- The **YELLOW Led** (Status 2) is the status 2 of the drive
- The **LIGHT BLUE Led** (Run) is the RUN status only Smartris "Compact"

MACRO DRIVE STATE	CANOpen STATE	STATUS 1 LED GREEN	STATUS 2 LED YELLOW	LED VIEW SMARTRIS STANDARD	LED VIEW SMARTRIS COMPACT
INIT	Not Ready To Switch On	"BLINK" simultaneously	"BLINK" simultaneously	 1 simultaneously  2 simultaneously	 2 simultaneously  3 simultaneously  4 OFF
	Switch On Disabled Ready to Switch On	"BLINK" alternately	"BLINK" alternately	 1 alternately  2 alternately	 2 alternately  3 alternately  4 OFF
STANDBY	Switched On	"BLINK"	OFF	 1 BLINK 50%  2 OFF	 2 BLINK 50%  3 OFF  4 OFF
FAULT	Fault Fault reaction fault	"BLINK" [x]	"BLINK" [y]	 1 see fault  2 chapter	 2 see fault  3 chapter  4 OFF
RUN (RUNV or RUNC)	Operation Enabled	ON	OFF	 1 ON  2 OFF	 2 ON  3 OFF  4 ON
STOP	Quick Stop Active	ON	ON	 1 ON  2 ON	 2 ON  3 ON  4 ON
SAFETY	-	OFF	"BLINK"	 1 OFF  2 BLINK	 2 OFF  3 BLINK  4 OFF
COMMUN ERROR	-	OFF	ON	 1 OFF  2 ON	 2 OFF  3 ON  4 OFF

Table 6 - Led Status Smartris

In the Smartris Standard there are 2 leds on right of the top that describe the status of drive

LED	2	3
Meaning	Status1 (green)	Status2 (yellow)
Led View	 Led Status 1	 Led Status 2

Table 7 - Led Color Smartris Standard

In the Smartris Compact there are 5 leds near Power Connector that describe the status of drive

LED	1	2	3	4	5
Meaning	Power (red)	Status1 (green)	Status2 (yellow)	Led Run (blue)	Pulse (white)
Led View	 Fixed The Drive is ON	 Led Status 1	 Led Status 2	 Fixed when motor is energized	 Rapid Blink (drive alive)

Table 8 - Led color Smartris Compact

When fault alarm is occurred the Green Led and Yellow Led blink to defined an Erro Code:

Alarm	STATUS 1 CODE LED GREEN	STATUS 2 CODE LED YELLOW	Alarm Description
	 1st Code	 2nd Code	
A Group: (Temperature)			
Motor Over Temperature	1	10	Motor Temperature over threshold. The motor has reached a too high temperature for correct operation.
Heat Sink Over Temperature	1	1	Heat Sink Temperature over threshold. The Heat Sink has reached a too high temperature for correct operation.
Heat Sink Temperature Out Of Range	1	3	Heat Sink Temperature Sensor is out of range. Potential malfunction of the temperature sensor. (Contact the supplier).
Board Over Temperature	1	4	Internal Board Temperature over threshold. Too high a temperature for correct operation inside the drive.
Board Temperature Out Of Range	1	5	Internal Temperature Sensor out of range. Potential malfunction of the temperature sensor. (Contact the supplier).
Motor Temperature Out Of Range	1	6	Motor Temperature Sensor is out of range. - Potential malfunction of the temperature sensor. (Contact the supplier).
B Group: (Feedback)			
Resolver	2	10	Check resolver connections, connectors and wiring of both sides.

Alarm	STATUS 1 CODE	STATUS 2 CODE	Alarm Description
	LED GREEN	LED YELLOW	
	 1st Code	 2nd Code	
Resolver Initialization	2	4	Initialization Fault for Resolver Device. (Contact the supplier).
Encoder	2	5	Incremental Encoder Fault
SinCosFault	2	6	SinCos Encoder Fault
Hall	2	7	Hall Sensors Fault
Distance Hall	2	8	Hall Sensors Fault
C Group: (Current and safety)			
Offset Current Sensor	3	10	Offset current sensor is out of range. ¹
Over Current	3	1	The current absorbed by the motor is beyond the set limit. Check Phase Motor connection and wire. Look for any short circuits.
STO Circuit	3	4	Reserved (contact Manufacturer)
Safety	3	5	STO occurred (If alarm activated)
D Group: (Voltage)			
Under Voltage	4	1	DC Bus voltage value lower than the limit threshold. Check mains voltage at terminals +, -.
Over Voltage	4	2	DC Bus voltage value higher than the limit threshold. Check mains voltage at terminals +, -.
E Group: (Functionality)			
Velocity Fault	5	10	Following Error: The actual speed different from the target Speed.
I²T Overload Protection	5	2	I2T overload motor protection reached.
Hardware	5	3	Error Hardware (Contact Supplier)
External HW	5	4	Error CAN Interface (Contact Supplier)
Over Speed	5	8	Over Speed
F Group: (Communication and Configuration)			
E²prom	6	1	Parameter Fault stored in E2prom.
CanOpen	6	2	Communication Faultwith CANOpen
Sincos Fault	6	3	Internal Communication Fault(Contact Supplier).
Configuration Parameters	6	4	Configuration Parameters Fault(Contact Supplier).
Profile Generic	6	5	Error Configuration Profile: Mode Of Operation
Torque Profile	6	6	Error Torque Profile
Velocity Profile	6	7	Error Velocity Profile

Alarm	STATUS 1 CODE LED GREEN	STATUS 2 CODE LED YELLOW	Alarm Description
	 1st Code	 2nd Code	
Homing Profile	6	8	Error Homing Profile
G Group: (Programming)			
Program Fault	7	1	Code Programming Fault (Contact Supplier).
H Group: (Programming)			
Factory Param	8	1	Error Programming Factory Parameters (Contact Supplier).
CAN Param	8	2	Error Programming CAN Parameters (Contact Supplier).
E2prom Function	8	3	Function Code for EEPROM R/W (Contact Supplier).
I Group: (protocol)			
ModBus	9	1	Communication Lost ModBus
L Group: (Positioner)			
Positioner	10	1	Error Positioner Profile

Table 9 - Diagnostic

6. | EXCEPTION CODE

Following a request, there are 4 possible outcomes from the slave.

1. The request is successfully processed by the slave and a valid response is sent.
2. The request is not received by the slave therefore no response is sent.
3. The request is received by the slave with a parity, CRC or LRC error. The slave ignores the request and sends no response.
4. The request is received without an error, but cannot be processed by the slave for another reason. The slave replies with an exception response.

In a normal response, the slave echoes the function code. The first sign of an exception response is that the function code is shown in the echo with its highest bit set. All function codes have 0 for their most significant bit. Therefore, setting this bit to 1 is the signal that the slave cannot process the request.

Following the Function Code is the Exception Code. The exception code gives an indication of the nature of the problem. The possible codes are shown in the table below.

The exception code shown above *0x02* is an indication that parameter has an illegal address in the slave.

6.1 List of Exception Code

Exception Code on Modbus Communication		
Exception Code	Name	Meaning
0x01	Illegal Function	The function code received in the request is not an authorized action for the slave. The slave may be in the wrong state to process a specific request.
0x02	Illegal Data Address	The data address received by the slave is not an authorized address for the slave.
0x03	Illegal Data Value	The value in the request data field is not an authorized value for the slave.

REVISION HISTORY

Rel.	Date	Description
1.0	30/04/2021	First Emission of Modbus Manual
1.0a	07/06/2021	Added new Modbus Commands
1.1	29/06/2021	Manual Review
1.2	30/07/2021	Added Exception Code Chapter
1.2a	25/08/2021	Manual Review to fix writing errors
1.3	19/10/2021	Added new Modbus Commands and Default value for Read Holding registers
1.4	28/11/2022	Added new Modbus Commands and Default value for Read Holding registers/ Input Registers Errata corrique for description of 0x0068 and 0x006E Errata corrique for measuring unit of 0x0069 and 0x006F
1.5	16/05/2024	Added new Modbus Commands and Default value for Read Holding registers/Input Registers /Write Register
1.6	13/03/2025	Errata corrique Digital IO LEVEL → the description is not correct [0=OFF / 1=ON] → [0=POS EDGE / 1=NEG EDGE] Added register in READ INPUT REGISTERS (0x04): 0x74 ... 0x78 Added register in READ HOLDING REGISTERS (0x03): 0x5E ... 0x66; 0x90 ...0x93; 0x120 ...0x12F Added register in WRITE SINGLE HOLDING REGISTER (0x06): 0x5E ... 0x66; 0x90 ...0x93; 0x120 ...0x12F Added LedCode for Compact in Diagnostic Chapter Update register command 0x4 "Warning" (0x0061 and 0x0062): added meaning bits Update register command 0x4 "Error Code" (0x0063) added codes 0x5B19, 0x6326, 0x6420, 0x6421, 0x6422, 0x6423, 0x8B41, 0x8B42 Update register 0x51,0x59 and 0x5A → added motion -5 → stop with S-ramp programmable