

FieldbusTde Macno

User's Manual

**Anybus**

Cod. MB00101E00 V\_1.6





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The Anybus-CompactCom software interface is designed to be network protocol independent, allowing the drive to support all major networking systems using the same software driver, without loss of functionality.

The typical role of a network interface is to exchange information in different ways:

- Acyclical data management = generally these are slowly configuration messages. The available communication objects are taken from Modbus Dictionary Object.
- Diagnostic messages = these are particular messages produced when an alarm appears or disappears
- Cyclic exchanging = consists of few data (maximum 10 words) exchanged frequently (from 1ms cycle). It's possible to map the desired objects referring to those found in the CAN Dictionary, indicating the Index and Subindex

## 1 ANYBUS- COMPACTCOM CONFIGURATION

### 1.1 NODE CONFIGURATION

To enable the manage of Anybus-CompactCom module, set connection **C64=3**

With OPDEplorer it's possible to set the following parameters:

Name	Description
<b>NODE_SLAVE_ADDR</b>	<b>device address</b>
<b>NODE_BAUDRATE</b>	<b>communication baud rate (network depending)</b>
<b>DATA_CONSISTANCE</b>	<b>consistency of the data exchanged</b>
<b>EN_BIG_ENDIAN</b>	with this representation the first byte transmitted is the most significant

**Ethernet configuration:**

<b>IP_ADDR</b>	IP Address , default = 192.168.0.1
<b>SUBNET_MASK</b>	Subnet Mask, default = 255.255.255.0
<b>GATEWAY</b>	Gateway, default = 0.0.0.0
<b>DHCP</b>	DHCP, default = 1 (enabled)

**And to see the node state:**

<b>ANYBUS_EN</b>	<b>Anybus module presents and enabled (C64=3)</b>
<b>ANYBUS_STATE</b>	<b>Fieldbus node state:</b>  <b>SETUP = Anybus Setup in progress.</b>  <b>NW_INIT = The Anybus module is currently performing network-related initialisation tasks.</b>  <b>WAIT_PRCS = The network Process Data channel is temporarily inactive</b>  <b>IDLE = The network interface is idle. The exact interpretation of this state is network specific.</b>  <b>PRCS_ACT= The network Process Data channel is active and error free.</b>  <b>ERROR = There is at least one serious network error</b>

**After executing configuration:**

- Save the data in FLASH (C63=1)
- Turn the drive off and on.

## 2 ACYCLICAL DATA MANAGEMENT

With acyclical data management it's possible read and write objects from the following Modbus Dictionary Object. Access is always made with one word register at time, if the internal objects is 32 bits long it's necessary to execute two consecutive access, taking into account the little-endian internal representation.

### 2.1 MODBUS DICTIONARY

ADI (hex)	Name	Description	Access
0 + C7	Tab_par	Actual values of the parameters	reading/writing
C8 + 12B	Tab_con	Actual values of the connection	reading/writing
12C + 190	Tab_dati_applicazione	Actual values of the application parameters	reading/writing
200	stato	Variable of the drive's status	reading
202	allarmi	Drive alarms' status	reading
203	abilitazione_allarmi	Word for enabling drive's alarms	reading
206 + 216	Tab_codice_allarmi	Alarm subcodes table	reading
2C0	f_fieldbus	Speed reference in % of n <sub>MAX</sub> in 16384	reading/writing
2C1	limit_fieldbus	torque limit in % di Tnom in 4095	reading/writing
2C2	trif_fieldbus	torque reference in % di Tnom in 4095	reading/writing
2C3 + 2C4	quota_att	Actual position	reading
2C5	ingressi	Logical status of the 8 inputs of the terminal board	reading
2C7	uscite_hw	Logical status of the 4 digit outputs	reading
300 + 301	Inp_dig	Reading inputs logical functions	reading
320 + 321	Out_dig	Reading standard outputs logical functions	reading
340+ 341	Out_dig_appl	Reading application outputs logical functions	reading
360 + 361	Inp_dig_field	Writing inputs logical functions	writing
380 + 400	Tab_int	Actual values of the internal data	reading
C00 + C64	Tab_osc	Actual values of the monitor data	reading
B00 + B27	tabProcessData	Process data address	reading/writing
B60 + B69	Dati_processo_Rx	Received process data	reading/writing
B80 + B89	Dati_processo_Tx	Transmitted process data	reading
2000 + 2FA0	Area applicativa	Application data available	reading/writing

The correspondence between the internal objects ADI (Application Data Object) and physical addresses depends on the fieldbus used. Please refer to specific fieldbus paragraph.

## 3 DIAGNOSTIC MESSAGES

This service provides a standardized way of reporting diagnostic events to the network. Exactly how this is represented on the network differs. The event code created is processed by the Anybus module, to transfer correct network-specific information about the event to the network used:

Event codes	Description	OPDE alarms
0x23	Current, device output side	A0 , A3 e A6
0x32	Voltage inside the device	A10 e A11
0x40	Temperature	A05
0x50	Device Hardware	A1, A2, A8, A9, A13
0x61	Internal Software	A4, A7, A12, A14, A15

## 4 CYCLIC EXCHANGING

Cyclic exchanging consists of few data (maximum 10 words) exchanged quickly and frequently (from 1ms cycle): I/O, diagnostic, set point, internal value....

These references are used by control only if it is enabled connection "Enable Fieldbus references".

It's possible to map the desired objects with OPDEplorer or with acyclic communication referring to ADI B00 ÷ B27, choosing the words to exchange, referring to objects found in the CAN Dictionary

ADI	Name	Description
B00	RX0_INDEX	Receive Object0 Index
B01	RX0_SUB_INDEX	Receive Object0 Sub-Index
B02	RX1_INDEX	Receive Object1 Index
B03	RX1_SUB_INDEX	Receive Object1 Sub-Index

.....  
.....

B12	RX9_INDEX	Receive Object9 Index
B13	RX9_SUB_INDEX	Receive Object9 Sub-Index

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B14	TX0_INDEX	Transmit Object0 Index
B15	TX0_SUB_INDEX	Transmit Object0 Sub-Index
B16	TX1_INDEX	Transmit Object1 Index
B17	TX1_SUB_INDEX	Transmit Object1 Sub-Index

.....  
.....

B26	TX9_INDEX	Transmit Object9 Index
B27	TX9_SUB_INDEX	Transmit Object9 Sub-Index

To configure Process Area:

- Set transmission and reception objects, indicating CAN Dictionary Objects Index and Subindex (the sub-index is the array index).
- Store data in permanent memory (C63=1)
- Switch-off and than switch-on again the drive.

After drive restart see mapping results into OPDEplorer watching the following internal values:

Name	Displayed	Description
MAP_ERROR_CODE	Ok	configuration ok
	OBJ_NOTFOUND	the object indicated on the following MAP_ERROR_OBJ was not found in the dictionary
	OBJ_NOTMAPPABLE	the object indicated on the following MAP_ERROR_OBJ is not mappable
	OBJ_INVDATASIZE	the object indicated on the following MAP_ERROR_OBJ is larger than double word
	OBJ_NOTWRITABLE	the object indicated on the following MAP_ERROR_OBJ is not writable
	OBJ_NOTREADABLE	the object indicated on the following MAP_ERROR_OBJ is not readable
	MAXRX_DATA	Too many words in reading process area (more than 10)
	MAXTX_DATA	Too many words in transmitting process area (more than 10)
MAP_ERROR_OBJ	Mapping Error Object	

In the following there is CAN Dictionary  
At application level it's possible to extend the CAN Dictionary objects.

## 4.1 CANOPEN DICTIONARY

The words reported in bold type can be mapped in Process area

Index (hex)	Object	Type	Name	Description	Access
<b>200D</b>	<b>ARRAY</b>	<b>INTEGER16</b>	<b>Tab_par [200]</b>	<b>Actual values of the parameters</b>	<b>Reading/writing</b>
<b>200E</b>	<b>ARRAY</b>	<b>INTEGER16</b>	<b>Tab_con [100]</b>	<b>Actual values of the connection</b>	<b>Reading/writing</b>
200F	ARRAY	INTEGER16	Tab_int [128]	Actual values of the internal words	Reading
2010	ARRAY	INTEGER16	Tab_inp_dig [32]	Actual values of the logical input's functions	Reading
2011	ARRAY	INTEGER16	Tab_out_dig [32]	Actual values of the logical output's functions	Reading
2012	ARRAY	INTEGER16	Tab_osc [100]	Actual values of the checked words	Reading
2013	VAR	UNSIGNED16	ingressi	Logical status of the 8 inputs of the terminal board	Reading
2014	VAR	UNSIGNED16	ingressi_hw	Logical status of the 3 inputs from the power	Reading
2015	VAR	UNSIGNED16	uscite_hw	Logical status of the 4 digit outputs	Reading
2016	VAR	UNSIGNED32	Out_dig_appl	Reading application logical output functions	Reading
2017	VAR	UNSIGNED16	stato	Variable of the drive's status	Reading
2018	VAR	UNSIGNED16	allarmi	Drive alarms' status	Reading
2019	VAR	UNSIGNED16	abilitazione_allarmi	Word for enabling drive's alarms	Reading
201A	VAR	INTEGER16	f_fieldbus	Speed reference in % of n <sub>MAX</sub> in 16384	Reading/writing
201B	VAR	INTEGER16	limit_fieldbus	torque limit in % di T <sub>nom</sub> in 4095	Reading/writing
201C	VAR	INTEGER16	trif_fieldbus	torque reference in % di T <sub>nom</sub> in 4095	Reading/writing
201D	VAR	INTEGER16	theta_fieldbus	Speed reference in electr. pulses x T <sub>pwm</sub>	Reading/writing
201E	ARRAY	INTEGER16	Tab_dati_applicazione [100]	Data Area available for the application	Reading/writing
201F	VAR	UNSIGNED32	Inp_dig_field	Writing logical input functions	Writing
2020	VAR	UNSIGNED32	Inp_dig	Reading logical input functions	Reading
2021	VAR	UNSIGNED32	Out_dig	Reading standard logical output functions	Reading
2022	VAR	UNSIGNED16	word_vuota	Unused Word	Reading/writing
2023	VAR	UNSIGNED32	double_vuota	Unused Double word	Reading/writing
2025	ARRAY	INTEGER16	Tab_codice_allarmi[16]	Alarm subcodes Table	Reading
2026	VAR	INTEGER32	quota_att	Actual position	Reading
<b>2027</b>	<b>ARRAY</b>	<b>UNSIGNED16</b>	<b>tabProcessData</b>	<b>Process data address</b>	<b>Reading/writing</b>

In the following some objects are explained:

- o Index 0x200F "Tab\_int" on internal values (word)

Name	Description	UM	Scale
FW_REV	D00 - Software version		256
ACTV_POW	D01 - Active power delivered	kW	16
PRC_TOT_APP_SPD_REF	D02 - Speed reference value before ramp	% MOT_SPD_MAX	163.84
PRC_END_SPD_REF	D03 - Speed reference value after ramp	% MOT_SPD_MAX	163.84
PRC_MOT_SPD	D04 - Speed reading	% MOT_SPD_MAX	163.84
PRC_T_REF	D05 - Torque request	% MOT_T_NOM	40.96
PRC_IQ_REF	D07 - Request torque current I <sub>q</sub> rif	% DRV_I_NOM	40.96
PRC_ID_REF	D08 - Request magnetizing current I <sub>d</sub> rif	% DRV_I_NOM	40.96
V_REF	D09 - Voltage reference value at max. rev.	% MOT_E_NOM	40.96
PRC_APP_T_REF	D10 - Torque reference value (application generated)	% MOT_T_NOM	40.96
MOT_I	D11 - Current module	A rms	16
REF_FRQ_IN	D12 - Frequency in input	KHz	16
EL_FRQ	D13 - Rotor flux frequency	Hz	16
PRC_APP_FRQ_SPD_REF	D14 - Frequency speed reference value (application generated)	% MOT_SPD_MAX	163.84
PRC_IQ	D15 - Current torque component	% DRV_I_NOM	40.96
PRC_ID	D16 - Current magnetizing component	% DRV_I_NOM	40.96
MOT_V	D17 - Stator voltage reference value module	V rms	16
PRC_MOT_V	D18 - Stator voltage reference value module	% MOT_E_NOM	40.96
MOD_INDEX	D19 - Modulation index		40.96
PRC_VQ_REF	D20 - V <sub>q</sub> rif	% DRV_E_NOM	40.96
MOT_SPD	D21 - Motor rotation speed	rpm	1
PRC_VD_REF	D22 - V <sub>d</sub> rif	% DRV_E_NOM	40.96

MOT_POS	D23 - Actual position	±16384	1
DC_BUS	D24 - Bus voltage	V	16
DRV_TEMP	D25 - Radiator temperature reading	°C	16
MOT_TEMP	D26 - Motor temperature	°C	16
PRC_DRV_I_THERM	D28 - Motor thermal current	% soglia All	40.96
PRC_DRV_I_MAX	D29 - Current limit	% DRV_I_NOM	40.96
PRC_DRV_T_MAX	D30 - Maximum torque	% MOT_T_NOM	40.96
PRC_DRV_I_T_MAX	D31 - Maximum torque by current limit	% MOT_T_NOM	40.96
PRC_APP_T_MAX	D32 - Maximum torque limit by application	% MOT_T_NOM	40.96
PRC_APP_SPD_REF	D33 - Speed reference (application generated)	% MOT_SPD_MAX	163.84
PRC_MOT_T	D35 - Actual torque produced	% MOT_T_NOM	40.96
MOT_TURN_POS	D36 - Absolute mechanical position (on current revolution)	±16384	1
MOT_N_TURN	D37 - Number of revolutions		1
OFFSET_SINCOS_ENC	D38 - Compensation Sin/Cos analog/digital term	pulses	1
SENSOR_FRQ_IN	D39 - Input frequency	kHz	16
REG_CARD_TEMP	D40 - Regulation card temperature	°C	16
MOT_PRB_RES	D41 - Thermal probe resistance	Ohm	1
AI1	D42 - Analog Input AI1	%	163.84
AI2	D43 - Analog Input AI2	%	163.84
AI3	D44 - Analog Input AI3	%	163.84
SPD_ISR	D45 - Speed routine duration	us	64
I_ISR	D46 - Current routine duration	us	64
I_LOOP_BAND	D47 - Current loop bandwidth	Hz	1
PRC_APP_T_MIN	D48 - Minimum torque limit by application	% MOT_T_NOM	40.96
WORK_HOURS	D49 - Work Hours	hours	1
ENC_HALL_SECTOR	D50 - Encoder and Hall sens sector read		1
SENS2_SPD	D51 - Second sensor rotation speed	rpm	1
SENS2_TURN_POS	D52 - Second sensor Absolute mechanical position (on current revolution)	16384	1
SENS2_N_TURN	D53 - Second sensor Number of revolutions	16384	1
SENS2_FRQ_IN	D54 - Second sensor Frequency input	KHz	16
SENS1_ZERO_TOP	D55 - Sensor1 Zero Top	pulses	1
SENS2_ZERO_TOP	D56 - Sensor2 Zero Top	pulses	1
SYNC_DELAY	D57 - Delay from SYNC reception to Speed routine execution	us	1
PWM_SYNC_OFFSET	D58 - PWM offset for SYNC delay control	pulses	1
SERIAL_NUMBER	D59 - Drive Serial Number		1
FLD_CARD	D60 - Fieldbus Card		1
APPL_REV	D61 - Application Revision		40.96
HW_SENSOR2	D62 - Sensor2 presence		1
HW_SENSOR1	D63 - Sensor1 presence		1

At application level could be defined other 64 internal values from D64 to D127.

- o Index 0x2012 "Tab\_osc" on monitor values

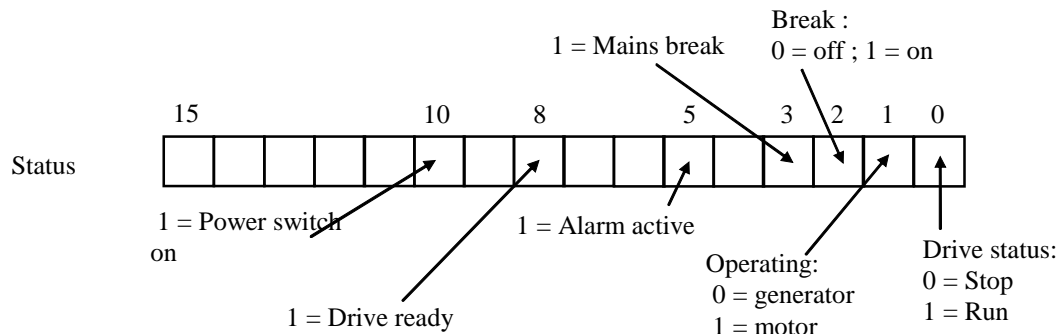
Name	Description	UM	Scale
ACT_POS	O00 Actual mechanical position read by sensor	100%=180	327.67
ELECTRIC_POS	O01 Actual electrical position read by sensor	100%=180	327.67
PRC_TOT_APP_SPD_REF	O02 Reference speed value before ramps	% MOT_SPD_MAX	163.84
PRC_END_SPD_REF	O03 Reference speed value after ramps	% MOT_SPD_MAX	163.84
PRC_MOT_SPD	O04 Filtered Rotation speed	% MOT_SPD_MAX	163.84
PRC_T_REF	O05 Torque request	% MOT_T_NOM	40.96
PRC_IQ_REF	O07 Torque current request	% DRV_I_NOM	40.96
PRC_ID_REF	O08 Flux current request	% DRV_I_NOM	40.96
PRC_V_REF	O09 Request voltage at maximum rev.	% MOT_E_NOM	40.96
ALARMS	O10 Internal value: alarms		1
PRC_MOT_I	O11 Current module	% DRV_I_NOM	40.96
ZERO_TOP	O12 Zero top	pulses	1
PRC_IU	O13 U phase current reading	% DRV_I_MAX	40.96
INPUTS	O14 Physical inputs		1
PRC_IQ	O15 Torque component of current reading	% DRV_I_NOM	40.96
PRC_ID	O16 Magnetizing component of current reading	% DRV_I_NOM	40.96
TU	O17 U phase voltage duty-cycle		327.67
PRC_MOT_V	O18 Stator voltage reference value module	% MOT_E_NOM	40.96



MOD_INDEX	O19 Modulation index		40.96
PRC_VQ_REF	O20 Request Q axis voltage (Vq_rif)	% DRV_E_NOM	40.96
PRC_POWER	O21 Delivered power	%MOT_POW_NOM	40.96
PRC_VD_REF	O22 Request D axis voltage (Vd_rif)	% DRV_E_NOM	40.96
PRC_T_OUT	O23 Torque produced	% MOT_T_NOM	40.96
PRC_DC_BUS	O24 Bus voltage	%900V	40.96
PRC_DRV_TEMP	O25 Radiator temperature reading	%37.6°	40.96
PRC_MOT_TEMP	O26 Motor temperature reading	% 80°	40.96
PRC_DRV_I_THERM	O28 Motor thermal current	% soglia All	40.96
PRC_DRV_I_MAX	O29 Current limit	% DRV_I_NOM	40.96
PRC_DRV_T_MAX	O30 CW maximum torque	% MOT_T_NOM	40.96
PRC_DRV_T_MIN	O31 CCW maximum torque	% MOT_T_NOM	40.96
OUTPUTS	O32 Physical outputs		1
PRC_IV	O34 V phase current reading	% DRV_I_MAX	40.96
PRC_IW	O35 W phase current reading	% DRV_I_MAX	40.96
ALFA_FI	O36 Actual electrical position (alfa_fi ) [		327.67
AI1	O37 Analog input A.I.1	100%=16383	163.84
AI2	O38 Analog input A.I.2	100%=16383	163.84
AI3	O39 Analog input A.I.3	100%=16383	163.84
SYS_SPD_PERC_REF	O41 Application speed reference value (sysSpeedPercReference)	% MOT_SPD_MAX	163.84
SYS_T_PERC_REF	O42 Application torque reference value (sysTorqueReference)	% MOT_T_NOM	40.96
SYS_T_MAX	O43 Application torque limit reference value (sysMaxTorque)	% MOT_T_NOM	40.96
SYS_SPD_REF_PULS	O44 Frequency speed reference value from application (sysSpeedRefPulses)	Pulses per TPWM	1
SYS_POS_REF_PULS	O45 Overlapped space loop reference value from application (sysPosRefPulses)	Pulses per TPWM	1
RES_AMPLITUDE	O46 Amplitude to the square of sine and cosine feedback signals	1=100%	1
RES_SIN	O47 Sen_theta		1
RES_COS	O48 Cos_theta		1
PRC_MOT_SPD	O49 Rotation speed not filtered	% MOT_SPD_MAX	163.84
PULSES_RD	O50 Delta pulses read in PWM period in frequency input	Pulses per PWM	1
MEM_POS_LSW	O51 Overlapped space loop memory lsw	electrical pulses	1
MEM_POS_MSW	O52 Overlapped space loop memory msw	electrical pulses	1
INCR_SIN	O53 Incremental SIN theta Sin/Cos Encoder		1
INCR_COS	O54 Incremental COS theta Sin/Cos Encoder		1
INIT_RESET	O55 Initial reset ended		1
PTM_TH_PRB	O56 PTM motor thermal probe		40.96
PTR_TH_PRB	O57 PTR radiator thermal probe		40.96
SENS_PULSES_RD	O58 Pulses read by sensor		1
PRC_SENS2_SPD	O59 SENS2 Rotation speed not filtered	% MOT_SPD_MAX	163.84
ACT_SENS2_POS	O60 SENS2 Actual position		327.67
SENS2_SIN	O61 SENS2 Sin_theta		1
SENS2_COS	O62 SENS2 Cos_theta		1
SYNC_DELAY	O63 Delay on SYNC reception		1
SYS_T_MIN	O64 Application minimum torque limit reference value	% MOT_T_NOM	40.96
BRAKE_EN	O65 Energy dissipated on breaking resistance	Joule	1

At application level could be defined other 32 monitor values from O68 to O99.

- **Index 0x2017 is available as status word of the drive with the following meaning:**



- **Index 0x2018 is available as the status of the different alarms of the drive bit by bit; for example, the status of A8 alarm is shown by the bit n.8 of the word**
- **Index 0x2019 the alarm enabling mask. Again the meaning is bit by bit.**
- **Index 0x201A “f\_fieldbus” = speed reference in percent of the max speed set. Base representation is equal to 16384; thus 16384 is equal to 100%**
- **Index 0x201D “theta\_fieldbus” = reference in pulses per period of PWM, with 65536 pulses per revolution**
- **Index 0x201C “trif\_fieldbus” = torque reference in percent of the nominal torque of the motor. Base of Representation = 4095 : thus 4095 is = 100%**
- **Index 0x201A “limit\_fieldbus” = torque limit in percent of the nominal torque of the motor ( it is in alternative to the other existing limits, the most restricted is the one that values). Representation base is 4095 : thus 4095 = 100%**

## Configuration example

At OPD level, wanting to get in the process data in the first 2 words the logical input functions and in the third word the speed reference and to have in output in the first 2 words the logical output functions and in the third the actual speed, should be set:

RX0_INDEX	201F	logical input functions
RX0_SUB_INDEX	0	
RX1_INDEX	201A	speed reference
RX1_SUB_INDEX	0	
TX0_INDEX	2021	logical output functions
TX0_SUB_INDEX	0	
TX1_INDEX	2012	actual speed
TX1_SUB_INDEX	4	

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## 5 DEVICENET

### 5.1 NODE CONFIGURATION

With OPDEplorer it's possible to set:

Name	Description
NODE_SLAVE_ADDR	MacID
NODE_BAUDRATE	admitted values:  00 = "125 Kbps"  01 = "250 Kbps"  02 = "500 Kbps"  03 = "Autobaud"

### 5.2 ACYCLIC COMMUNICATION

This paragraph specifies the CIP-objects implementation in the Anybus module.  
Mandatory objects are:

- "Identity Object (01h)"
- "Message Router (02h)"
- "DeviceNet Object (03h)"
- "Assembly Object (04h)"
- "Connection Object (05h)"
- "Parameter Object (0Fh)"
- "Acknowledge Handler Object (2Bh)"

**Vendor specific objects:**

- **"ADI Object (A2h)"**

**ADIs are represented on DeviceNet through the ADI Object (CIP-object). Each instance within this objects corresponds directly to an instance in the Application Data Object on the host application side.**

### 5.3 CYCLIC COMMUNICATION

**Process Data is represented on DeviceNet through dedicated instances in the Assembly Object. Note that each ADI element is mapped on a byte-boundary, i.e. each BOOL occupies**





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**ECS**  
**TDE MACNO**

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