Profibus communication protocol for EMA-N series

EMS MULTIMETER PROFIBUS DP-V0

This manual describes the communication protocol for the EMA-N profibus interface.
This interface implement the DP-V0 slave in profibus DP network.

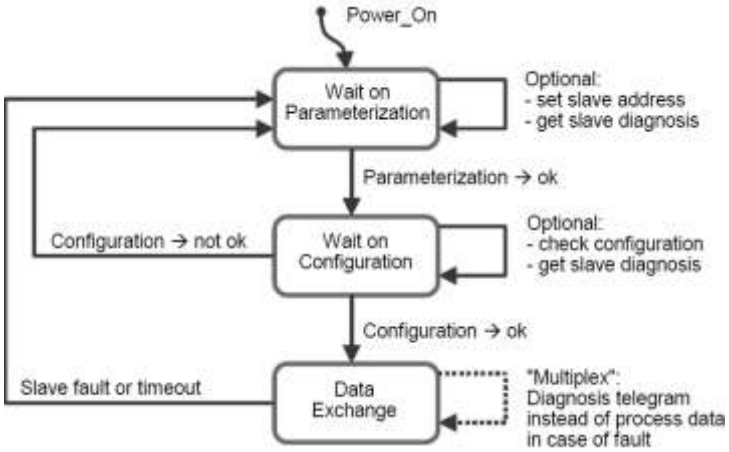
PROFIBUS AND EMA-N

Profibus-DP is a multi-master systems. In the networks it's possible to have up to 126 devices on the same bus.
In profibus-DP networks, the interchange of data between peripheral modules and the master is made automatically by the profibus controller, which 'virtualise' the data exchange memory of the DP devices in the memory of the master.

EMA-N baudrate supported

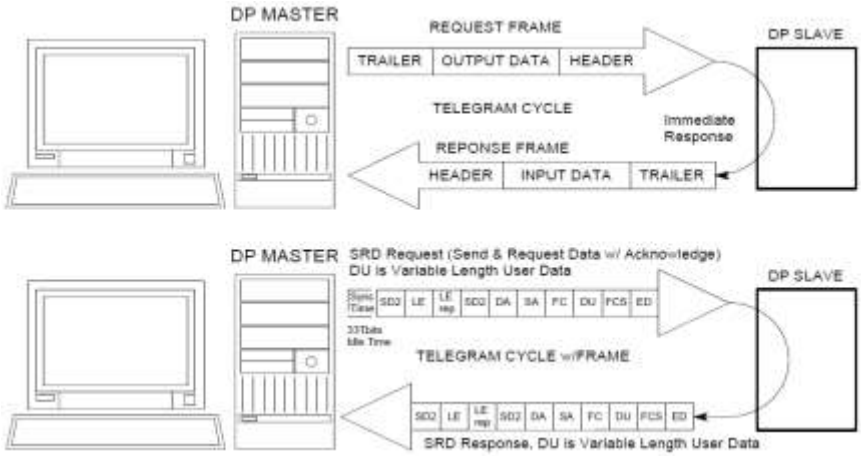
The EMA-N supported the following communication baud rate:
- 9,6 Kbit/s
- 19.2 Kbit/s
- 45,45 Kbit/s
- 93,75 Kbit/s
- 187.5 Kbit/s
- 500 Kbit/s
- 1.5 Mbit/s
- 3 Mbit/s
The EMA-N detect the baud rate network **automatically**.

Example of profibus parameterization and configuration sequence:

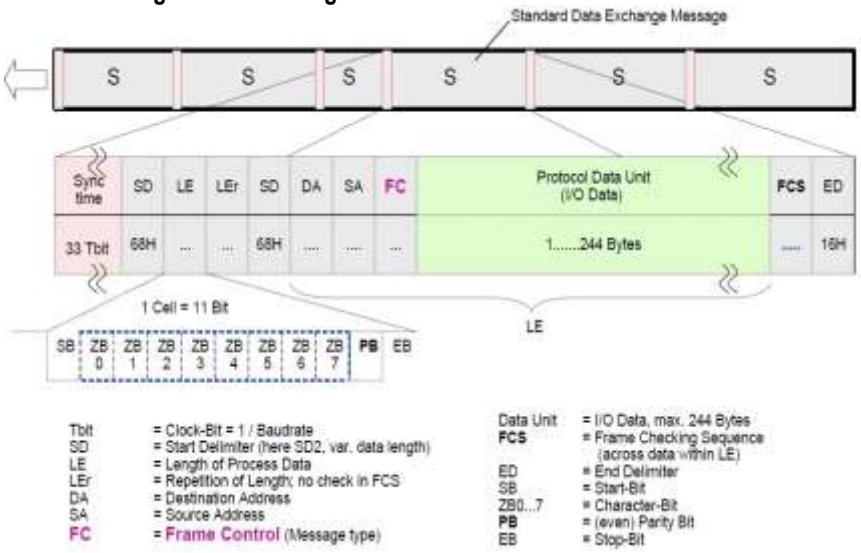


Data exchange handshake from Master to EMA-N:

1) The Master place in output memory the indexes (or indexes + values)
2) Data are transferred from output memory of the master to input memory of the EMA-N slave
3) EMA-N read the indexes send by the master and write on its output memory area the data (measures) requested
4) Measures are transferred from output data of the EMA-N to profibus master input memory area.
5) The application program, present in the master profibus, read the data from input memory and show the measures to the user



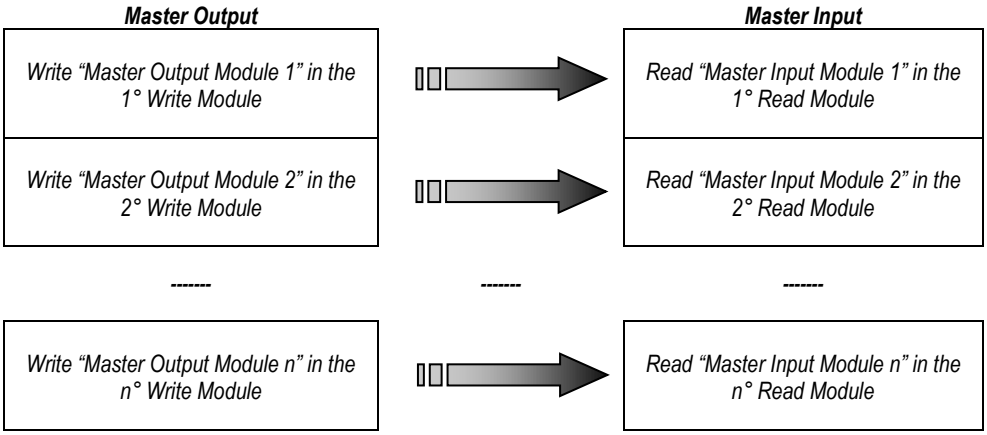
Format message - data exchange



Communication structure EMA-N:

The communication with the instrument is projected "in Module". The input (master) module is 4 byte long and the output (master) module is 6 byte long. Each "write" module allow to send one index (see Read Commands Table) corresponding at the measure that it must read from master module (input). If it sent the index value in the *first master* output module the read value will be return in the *first master input module*, if it sent the index value in the *second master output module* the read value will be return in the *second master input module*, etc.

Comunication Structure Example



This structure allow to change in "real time" order and type of measure to read from EMA-N instrument.
Each *Master Input Module* is formed by **4 Byte / 2 Word** (it's possible to read max 28 module at the same time) and the *Master Output Module* is format by **6 Byte / 3 Word** (it's possible to write max 28 module at the same time).

WARNING: *Before read the measures (*Master Input Module*), the Master must send the indexes corresponding (*Master Output Module*).*

WARNING: *If it send a only wrong Index or Parameter the instrument won't return any value until all Indexes and Parameters will be corrected. The EMA-N will produce a Diagnostic Message for notify the error presence.*

For example if you send:

n° Master Output Module	*Index Value*	*Measure to Read*	*n° Master Input Module*	*Measure Value*
1	0x0102	PHASE VOLTAGE L_{1-N}	1	Long Value (4 byte)
2	0x0106	LINE TO LINE VOLTAGE L_{2-3}	2	Long Value (4 byte)
3	0x0101	3-PHASE SYSTEM VOLTAGE	3	Long Value (4 byte)
4	0x0108	3-PHASE SYSTEM CURRENT	4	Long Value (4 byte)

This is the Master Outputs Structure for Read the measures:

N° Master Output Module	*N° Measure*	*Measure*	*Used Byte*
Index 1	0x0102	PHASE VOLTAGE L_{1-N}	1° - 2° Byte
Parameter 1.1	xxxx	Not used	3° - 4° Byte
Parameter 1.2	xxxx	Not used	5° - 6° Byte
Index 2	0x0106	LINE TO LINE VOLTAGE L_{2-3}	7° - 8° Byte
Parameter 2.1	xxxx	Not used	9° - 10° Byte
Parameter 2.2	xxxx	Not used	11° - 12° Byte

WARNING: *It is necessary to send at least 3 words (index1+parameter1.1+parameter1.2).*

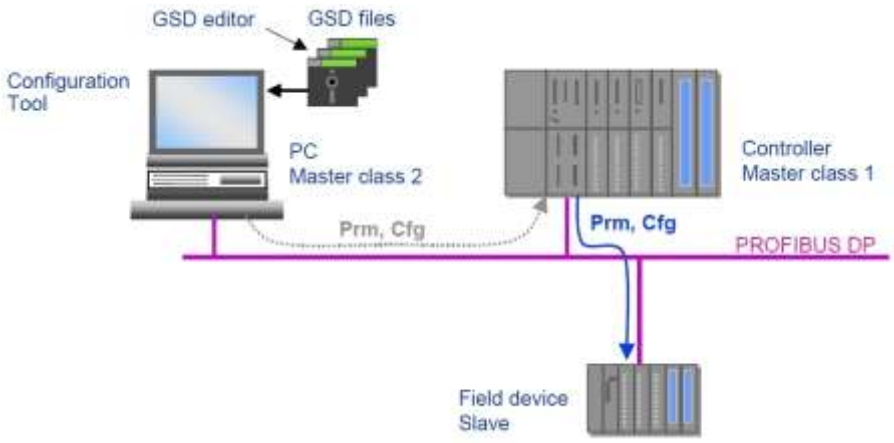
WARNING: *The read or write operation must be completed without interruption by other parts of the program.*

GSD file

The GSD files supplied with the EMA-N instrument:

GSD Name: EMA-N-PF-S
N° Input Byte: 112 Byte
N° Master Input Module: 28
N° Output Byte: 168 Bytes
N° Master Output Module: 28
N° Tot Module: 56

The GSD file designed for improve the input/output space and speed on profibus master, because it is possible to insert from 1 to 28 modules for input and from 1 to 28 modules to output.



Configuration Steps EMA-N:

1) Load GSD file;
2) Set profibus node ID (with frontal panel keys → see instruction manual);
3) Send index value from the output master space (each module is format by 6 bytes);
4) Receive in the input master space the measure value (4 bytes);
5) Repeat point 3 and 4 for each module insert in the hardware configuration;

In the master program:

1) Load GSD File;
2) Setting the EMA-N Node Id in you project (Node ID on the instrument is setting with frontal panel);
3) Insert the Module that it necessary for application (if not insert automatically from program during loading gsd file);
4) Write the module index (corresponding at the measure that must read) in the master output space;
5) Receive in the master the measure value (first module if you send the first module in master output);
6) Repeat point 4 and 5 for all modules;

For example see the following figure (Master Output – **DB2** *Step 7*):

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale
0.0	index1	WORD	W#16#1	W#16#0101
2.0	Parameter_1_1	WORD	W#16#0	W#16#0000
4.0	Parameter_1_2	WORD	W#16#0	W#16#0000
6.0	index2	WORD	W#16#2	W#16#0102
8.0	Parameter_2_1	WORD	W#16#0	W#16#0000
10.0	Parameter_2_2	WORD	W#16#0	W#16#0000
12.0	index3	WORD	W#16#3	W#16#0103
14.0	Parameter_3_1	WORD	W#16#0	W#16#0000
16.0	Parameter_3_2	WORD	W#16#0	W#16#0000
18.0	index4	WORD	W#16#4	W#16#0104
20.0	Parameter_4_1	WORD	W#16#0	W#16#0000
22.0	Parameter_4_2	WORD	W#16#0	W#16#0000

For each measure to read it's necessary to send the corresponding index (the first 2 bytes for each module). In this example are read the first nine measures, but it's possible to read any measure (max 28) in any order. In this way it's possible to read the measures in the Master input space (**DB1** *Step 7*).

Indirizzo	Nome	Tipo	Valore iniziale	Valore attuale
0.0	M1	DWORD	DW#16#0	DW#16#00000000
4.0	M2	DWORD	DW#16#0	DW#16#00000000
8.0	M3	DWORD	DW#16#0	DW#16#00000000
12.0	M4	DWORD	DW#16#0	DW#16#00000000
16.0	M5	DWORD	DW#16#0	DW#16#00000000

Index table - Instantaneous measures

Index HEX	Index DEC	Description	M.U. LMH = 0	M.U. LMH = 1	M.U. LMH = 2	Type
0x0101	257	SYSTEM VOLTAGE	mV	mV	V	Unsigned
0x0102	258	PHASE VOLTAGE L_{1-N}	mV	mV	V	Unsigned
0x0103	259	PHASE VOLTAGE L_{2-N}	mV	mV	V	Unsigned
0x0104	260	PHASE VOLTAGE L_{3-N}	mV	mV	V	Unsigned
0x0105	261	LINE TO LINE VOLTAGE L_{1-2}	mV	mV	V	Unsigned
0x0106	262	LINE TO LINE VOLTAGE L_{2-3}	mV	mV	V	Unsigned
0x0107	263	LINE TO LINE VOLTAGE L_{3-1}	mV	mV	V	Unsigned
0x0108	264	SYSTEM CURRENT	mA	mA	A	Unsigned
0x0109	265	LINE CURRENT L_1	mA	mA	A	Unsigned
0x010A	266	LINE CURRENT L_2	mA	mA	A	Unsigned
0x010B	267	LINE CURRENT L_3	mA	mA	A	Unsigned
0x010C	268	SYSTEM POWER FACTOR (*2*)	±1000	±1000	±1000	Signed
0x010D	269	POWER FACTOR L_1 (*2*)	±1000	±1000	±1000	Signed
0x010E	270	POWER FACTOR L_2 (*2*)	±1000	±1000	±1000	Signed
0x010F	271	POWER FACTOR L_3 (*2*)	±1000	±1000	±1000	Signed
0x0110	272	SYSTEM COS φ (*2*)	±1000	±1000	±1000	Signed
0x0111	273	PHASE COS φ_1 (*2*)	±1000	±1000	±1000	Signed
0x0112	274	PHASE COS φ_2 (*2*)	±1000	±1000	±1000	Signed
0x0113	275	PHASE COS φ_3 (*2*)	±1000	±1000	±1000	Signed
0x0114	276	SYSTEM APPARENT POWER	mVA	VA	kVA	Unsigned
0x0115	277	APPARENT POWER L_1	mVA	VA	kVA	Unsigned
0x0116	278	APPARENT POWER L_2	mVA	VA	kVA	Unsigned
0x0117	279	APPARENT POWER L_3	mVA	VA	kVA	Unsigned
0x0118	280	SYSTEM ACTIVE POWER	mW	W	kW	Signed
0x0119	281	ACTIVE POWER L_1	mW	W	kW	Signed
0x011A	282	ACTIVE POWER L_2	mW	W	kW	Signed
0x011B	283	ACTIVE POWER L_3	mW	W	kW	Signed
0x011C	284	SYSTEM REACTIVE POWER	mVAR	VAR	kVAR	Signed
0x011D	285	REACTIVE POWER L_1	mVAR	VAR	kVAR	Signed
0x011E	286	REACTIVE POWER L_2	mVAR	VAR	kVAR	Signed
0x011F	287	REACTIVE POWER L_3	mVAR	VAR	kVAR	Signed
0x0120	288	NEUTRAL CURRENT (*1*)	mA	mA	A	Unsigned
0x0121	289	FREQUENCY	mHz	mHz	mHz	Unsigned
0x0122	290	TEMPERATURE	d °C	d °C	d °C	Signed
0x0123	291	THD VOLTAGE L_1 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0124	292	THD VOLTAGE L_2 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0125	293	THD VOLTAGE L_3 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0126	294	THD CURRENT L_1 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0127	295	THD CURRENT L_2 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0128	296	THD CURRENT L_3 (*3*)	% * 100	% * 100	% * 100	Unsigned
0x0129	297	$ANGLE_{1-2}$ (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x012A	298	$ANGLE_{2-3}$ (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x012B	299	$ANGLE_{3-1}$ (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x012C	300	SYSTEM TANGENT φ (*2*))	±100000	±100000	±100000	Signed
0x012D	301	PHASE TANGENT φ_1 (*2*)	±100000	±100000	±100000	Signed
0x012E	302	PHASE TANGENT φ_2 (*2*)	±100000	±100000	±100000	Signed
0x012F	303	PHASE TANGENT φ_3 (*2*)	±100000	±100000	±100000	Signed
0x0130	304	EXPECTED SYS ACTIVE POWER (mobile or fixed prevision)	mW	W	kW	Signed
0x0131	305	EXPECTED ACTIVE POWER L_1 (mobile or fixed prevision)	mW	W	kW	Signed
0x0132	306	EXPECTED ACTIVE POWER L_2 (mobile or fixed prevision)	mW	W	kW	Signed
0x0133	307	EXPECTED ACTIVE POWER L_3 (mobile or fixed prevision)	mW	W	kW	Signed
0x0134	308	ANGLE V_1-A_1 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x0135	309	ANGLE V_2-A_2 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x0136	310	ANGLE V_3-A_3 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x0137	311	ANGLE A_1-A_2 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x0138	312	ANGLE A_2-A_3 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x0139	313	ANGLE A_3-A_1 (*4*)	0 - 3600	0 - 3600	0 - 3600	Unsigned
0x013A	314	FREQUENCY COMBINED (AVG L1-L2-L3)	mHz	mHz	mHz	Unsigned
0x013B	315	FREQUENCY L_1	mHz	mHz	mHz	Unsigned
0x013C	316	FREQUENCY L_2	mHz	mHz	mHz	Unsigned
0x013D	317	FREQUENCY L_3	mHz	mHz	mHz	Unsigned
0x013E	318	FREQUENCY L_{12}	mHz	mHz	mHz	Signed
0x013F	319	FREQUENCY L_{23}	mHz	mHz	mHz	Signed
0x0140	320	FREQUENCY L_{31}	mHz	mHz	mHz	Signed
0x0141	321	VOLTAGE UNBALANCED	mV	mV	V	Signed
0x0142	322	CURRENT UNBALANCED	mV	mV	V	Signed
0x0143	323	CREST FACTOR VOLTAGE L_1	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0144	324	CREST FACTOR VOLTAGE L_2	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0145	325	CREST FACTOR VOLTAGE L_3	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0146	326	CREST FACTOR CURRENT L_1	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0147	327	CREST FACTOR CURRENT L_2	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0148	328	CREST FACTOR CURRENT L_3	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned
0x0149	329	CREST FACTOR NEUTRAL CURRENT	*[thousandths]*	*[thousandths]*	*[thousandths]*	Unsigned

(*1*): calculated or measured, according with device version and command NEUTRAL CURRENT USED

(*2*): Examples: +1000 is equal to +1.000 and -200 is equal to -0.200

(*3*): Examples: 100'00 equal to 100,00% and 50'00 equal to 50,00%

(*4*): Example: 1200 equal to 120,0°

Index table - Harmonics voltage L1 (option)

Index HEX	Index DEC	Description	Measure Unit	Type
0x0201	513	01ST HARMONIC *(Fundamental)*	% * 100	Unsigned
0x0202	514	02ND HARMONIC	% * 100	Unsigned
0x0203	515	03RD HARMONIC	% * 100	Unsigned
0x0204	516	04TH HARMONIC	% * 100	Unsigned
0x0205	517	05TH HARMONIC	% * 100	Unsigned
0x0206	518	06TH HARMONIC	% * 100	Unsigned
0x0207	519	07TH HARMONIC	% * 100	Unsigned
0x0208	520	08TH HARMONIC	% * 100	Unsigned
0x0209	521	09TH HARMONIC	% * 100	Unsigned
0x020A	522	10TH HARMONIC	% * 100	Unsigned
0x020B	523	11TH HARMONIC	% * 100	Unsigned
0x020C	524	12TH HARMONIC	% * 100	Unsigned
0x020D	525	13TH HARMONIC	% * 100	Unsigned
0x020E	526	14TH HARMONIC	% * 100	Unsigned
0x020F	527	15TH HARMONIC	% * 100	Unsigned
0x0210	528	16TH HARMONIC	% * 100	Unsigned
0x0211	529	17TH HARMONIC	% * 100	Unsigned
0x0212	530	18TH HARMONIC	% * 100	Unsigned
0x0213	531	19TH HARMONIC	% * 100	Unsigned
0x0214	532	20TH HARMONIC	% * 100	Unsigned
0x0215	533	21TH HARMONIC	% * 100	Unsigned
0x0216	534	22TH HARMONIC	% * 100	Unsigned
0x0217	535	23TH HARMONIC	% * 100	Unsigned
0x0218	536	24TH HARMONIC	% * 100	Unsigned
0x0219	537	25TH HARMONIC	% * 100	Unsigned
0x021A	538	26TH HARMONIC	% * 100	Unsigned
0x021B	539	27TH HARMONIC	% * 100	Unsigned
0x021C	540	28TH HARMONIC	% * 100	Unsigned
0x021D	541	29TH HARMONIC	% * 100	Unsigned
0x021E	542	30TH HARMONIC	% * 100	Unsigned
0x021F	543	31TH HARMONIC	% * 100	Unsigned
0x0220	544	32TH HARMONIC	% * 100	Unsigned
0x0221	545	33TH HARMONIC	% * 100	Unsigned
0x0222	546	34TH HARMONIC	% * 100	Unsigned
0x0223	547	35TH HARMONIC	% * 100	Unsigned
0x0224	548	36TH HARMONIC	% * 100	Unsigned
0x0225	549	37TH HARMONIC	% * 100	Unsigned
0x0226	550	38TH HARMONIC	% * 100	Unsigned
0x0227	551	39TH HARMONIC	% * 100	Unsigned
0x0228	552	40TH HARMONIC	% * 100	Unsigned
0x0229	553	41TH HARMONIC	% * 100	Unsigned
0x022A	554	42TH HARMONIC	% * 100	Unsigned
0x022B	555	43TH HARMONIC	% * 100	Unsigned
0x022C	556	44TH HARMONIC	% * 100	Unsigned
0x022D	557	45TH HARMONIC	% * 100	Unsigned
0x022E	558	46TH HARMONIC	% * 100	Unsigned
0x022F	559	47TH HARMONIC	% * 100	Unsigned
0x0230	560	48TH HARMONIC	% * 100	Unsigned
0x0231	561	49TH HARMONIC	% * 100	Unsigned
0x0232	562	50TH HARMONIC	% * 100	Unsigned
0x0233	563	51TH HARMONIC	% * 100	Unsigned
0x0234	564	52TH HARMONIC	% * 100	Unsigned
0x0235	565	53TH HARMONIC	% * 100	Unsigned
0x0236	566	54TH HARMONIC	% * 100	Unsigned
0x0237	567	55TH HARMONIC	% * 100	Unsigned
0x0238	568	56TH HARMONIC	% * 100	Unsigned
0x0239	569	57TH HARMONIC	% * 100	Unsigned
0x023A	570	58TH HARMONIC	% * 100	Unsigned
0x023B	571	59TH HARMONIC	% * 100	Unsigned
0x023C	572	60TH HARMONIC	% * 100	Unsigned
0x023D	573	61TH HARMONIC	% * 100	Unsigned
0x023E	574	62TH HARMONIC	% * 100	Unsigned
0x023F	575	63TH HARMONIC	% * 100	Unsigned

Note: fundamental harmonic is ALWAYS considered at 100.00%. [Read Examples: 10000 equal to 100,00% - 5000 equal to 50,00%].

Harmonics voltage L2 (option) Start address 0x0301 (769 dec), last address 0x033F (831 dec).
Harmonics voltage L3 (option) Start address 0x0401 (1025 dec), last address 0x043F (1087 dec).
Harmonics current L1 (option) Start address 0x0501 (1281 dec), last address 0x053F (1343 dec).
Harmonics current L2 (option) Start address 0x0601 (1537 dec), last address 0x063F (1599 dec).
Harmonics current L3 (option) Start address 0x0701 (1793 dec), last address 0x073F (1855 dec).

Index table - Total energies

Index HEX	Index DEC	Description	M.U. LMH = 0	M.U. LMH = 1	M.U. LMH = 2	Type
0x0801	2049	SYSTEM ACTIVE ENERGY IN	100*mWh	100*Wh	100*kWh	Unsigned
0x0802	2050	SYSTEM ACTIVE ENERGY OUT	100*mWh	100*Wh	100*kWh	Unsigned
0x0803	2051	SYSTEM REACTIVE ENERGY IN	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0804	2052	SYSTEM REACTIVE ENERGY OUT	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0805	2053	SYSTEM APPARENT ENERGY	100*mVAh	100*VAh	100*kVAh	Unsigned
0x0806	2054	ACTIVE ENERGY IN L_1	100*mWh	100*Wh	100*kWh	Unsigned
0x0807	2055	ACTIVE ENERGY OUT L_1	100*mWh	100*Wh	100*kWh	Unsigned
0x0808	2056	REACTIVE ENERGY IN L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0809	2057	REACTIVE ENERGY OUT L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x080A	2058	APPARENT ENERGY L_1	100*mVAh	100*VAh	100*kVAh	Unsigned
0x080B	2059	ACTIVE ENERGY IN L_2	100*mWh	100*Wh	100*kWh	Unsigned
0x080C	2060	ACTIVE ENERGY OUT L_2	100*mWh	100*Wh	100*kWh	Unsigned
0x080D	2061	REACTIVE ENERGY IN L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x080E	2062	REACTIVE ENERGY OUT L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x080F	2063	APPARENT ENERGY L_2	100*mVah	100*Vah	100*kVah	Unsigned
0x0810	2064	ACTIVE ENERGY IN L_3	100*mWh	100*Wh	100*kWh	Unsigned
0x0811	2065	ACTIVE ENERGY OUT L_3	100*mWh	100*Wh	100*kWh	Unsigned
0x0812	2066	REACTIVE ENERGY IN L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0813	2067	REACTIVE ENERGY OUT L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0814	2068	APPARENT ENERGY L_3	100*mVAh	100*VAh	100*kVAh	Unsigned
0x0815	2069	SYSTEM REACTIVE ENERGY Q1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0816	2070	SYSTEM REACTIVE ENERGY Q2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0817	2071	SYSTEM REACTIVE ENERGY Q3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0818	2072	SYSTEM REACTIVE ENERGY Q4	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0819	2073	REACTIVE ENERGY Q1 L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081A	2074	REACTIVE ENERGY Q2 L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081B	2075	REACTIVE ENERGY Q3 L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081C	2076	REACTIVE ENERGY Q4 L_1	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081D	2077	REACTIVE ENERGY Q1 L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081E	2078	REACTIVE ENERGY Q2 L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x081F	2079	REACTIVE ENERGY Q3 L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0820	2080	REACTIVE ENERGY Q4 L_2	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0821	2081	REACTIVE ENERGY Q1 L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0822	2082	REACTIVE ENERGY Q2 L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0823	2083	REACTIVE ENERGY Q3 L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0824	2084	REACTIVE ENERGY Q4 L_3	100*mVARh	100*VARh	100*kVARh	Unsigned

Warning: All the energy values restart from 0 after the 100'000'000 kWh [1'000'000'000 * 100*Wh]

Index table - Timeband 1 energies (option)

Index HEX	Index DEC	Description	M.U. LMH = 0	M.U. LMH = 1	M.U. LMH = 2	Type
0x0901	2305	SYSTEM ACTIVE ENERGY IN	100*mWh	100*Wh	100*kWh	Unsigned
0x0902	2306	SYSTEM ACTIVE ENERGY OUT	100*mWh	100*Wh	100*kWh	Unsigned
---	---	---	---	---	---	---
0x0923	2339	REACTIVE ENERGY OUT L_3	100*mVARh	100*VARh	100*kVARh	Unsigned
0x0924	2340	APPARENT ENERGY L_3	100*mVARh	100*VARh	100*kVARh	Unsigned

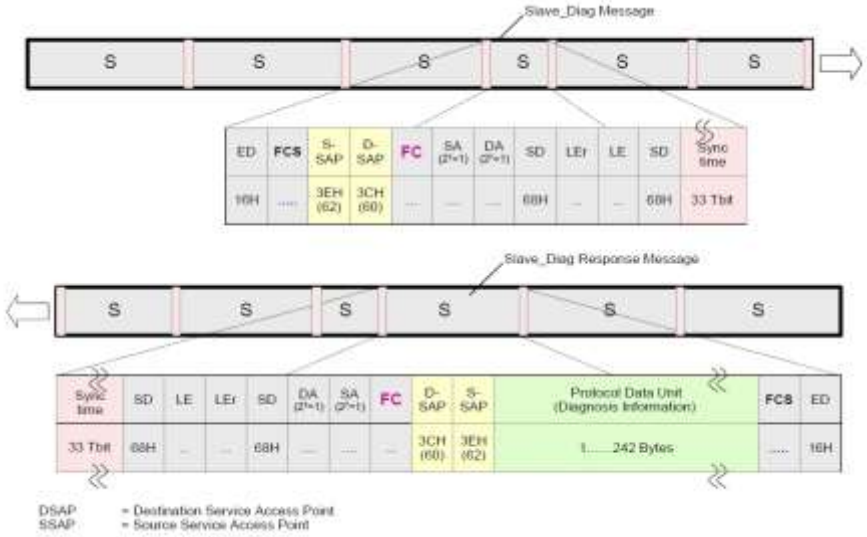
Warning: All the energy values restart from 0 after the 100'000'000 kWh [1'000'000'000 * 100*Wh]

Timeband 2 energies (option)**:** Start address 0x0A01, Last address 0x0A24.
Timeband 3 energies (option)**:** Start address 0x0B01, Last address 0x0B24.
Timeband 4 energies (option)**:** Start address 0x0C01, Last address 0x0C24.
Timeband 5 energies (option)**:** Start address 0x0D01, Last address 0x0D24.
Timeband 6 energies (option)**:** Start address 0x0E01, Last address 0x0E24.
Timeband 7 energies (option)**:** Start address 0x0F01, Last address 0x0F24.
Timeband 8 energies (option)**:** Start address 0x1001, Last address 0x1024.
Timeband 9 energies (option)**:** Start address 0x1101, Last address 0x1124.
Timeband 10 energies (option)**:** Start address 0x1201, Last address 0x1224.
Timeband 11 energies (option)**:** Start address 0x1301, Last address 0x1324.
Timeband 12 energies (option)**:** Start address 0x1401, Last address 0x1424.
Timeband 13 energies (option)**:** Start address 0x1501, Last address 0x1524.
Timeband 14 energies (option)**:** Start address 0x1601, Last address 0x1624.
Timeband 15 energies (option)**:** Start address 0x1701, Last address 0x1724.
Timeband 16 energies (option)**:** Start address 0x1801, Last address 0x1824.

DIAGNOSTIC

The EMA-N is able to generate, in case of errors, some diagnostics, automatically. These diagnostics can be send to the Master profibus through a standard mechanism expected from the profibus protocol.

Format Message – Slave Diagnosis



Diagnostics generation mechanism

In the polling normal cycle, done by a Master station, there is not the request of the diagnostics message. It is the slave that informs the master that a diagnostics variation is occurred and that this message has to be asked.
When there is a diagnostics variation (appears or disappears), during the formatting of the answer message from a normal data request, the EMA-N set the field FC (Frame Control).
The EMA-N generates a diagnostic message with this format (6+12 Byte long):

Default Profibus Diagnostic Data-Unit:

1° Byte	2° Byte	3° Byte	4° Byte	5° Byte	6° Byte
Station Status 1	Station Status 2	Station Status 3	Diag. Master Add	Ident Number High	Ident Number Low

Specific Profibus Diagnostic:

7° Byte	8° Byte	9° Byte	10° Byte	11° Byte	12° Byte
N° Byte Instrument Diag	Status High 31-24 bit	Status High 23-16 bit	Status High 15-8 bit	Status High 7-0 bit	Status Low 31-24 bit

13° Byte	14° Byte	15° Byte	16° Byte	17° Byte	18° Byte
Status Low 23-16 bit	Status Low 15-8 bit	Status Low 7-0 bit	In/out error	Module	N° Error

The Master could receive the following error:

- Internal Communication break 31° bit = 1 in Status Low
- Communication fail 30° bit = 1 in Status Low
- Illegal index 29° bit = 1 in Status Low
- Illegal data 28° bit = 1 in Status Low

EXTERNAL DIAGNOSTIC – LED

Data Exchange 1	Data Exchange 2	Parameterized	Instrument Status
Blinking	Blinking	Fixed ON	Parameterized and communication
Fixed	Blinking	Fixed ON	Parameterized but not receive a query
Blinking one led at time			Not parameterized

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