



COMMUNICATION PROTOCOL

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ENERGY METER

FIRMWARE

Nemo 96HD/HD+/HDLe Variable modules for Profibus

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1.0 ABSTRACT

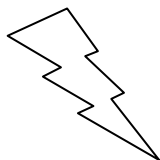
The IF96007A is a plug in hardware module for the following devices :

NEMO 96HD
NEMO 96HD+
NEMO 96HDLe

The measurements that are available are described in the following section and are grouped accordingly to a logical distribution to allow the user to compose his own population of variables as desired.

Physical level

Profibus – 5V according to the standard EN 50170 / up to 12 Mbit



See the installation user manual for details on how to plug in the module in safety.

2.0 VARIABLE DESCRIPTION

The following tables reports the variable descriptions with the correspondent measuring unit and the length. Then see in the following part of the document how variables have been grouped.

What to do in brief for a 315-2-DP Siemens CPU

1. Set up the hardware rack importing the CPU + the bar
2. Import over the rail bar the NEMO
3. Import from the NEMO the modules with the measurements that are necessary and write a little software to copy from the process image of the NEMO, from start address to end address (DP address), all WORDS into a DB.
4. The variables are ready in the process image and what the user must do is to manage the same variables that are split onto 4 BYTES (2 WORDS)
As all variables are 2 WORDS length, it is necessary to "re-assemble" the data from the high and low WORDS (e.g. the energy values are split onto 4 BYTES – 2 WORDS and they must be grouped into 1 DOUBLE WORD)

The following types of format are used for the data values :

- * UD_WORDS : two WORDS - unsigned
- * SD_WORDS : two WORDS - signed

E.g.

In the process image of the PLC, if the area that is in use is mapped @address 256 and if the first variable of this area is a long (DOUBLE WORD) variable the user will find the BYTES in the following sequence :

```
256 : BYTE 0      (LSB)
257 : BYTE 1
258 : BYTE 2
259 : BYTE 3      (MSB)
```

The variable may be read by a L instruction

```
L  PED 256
```

And stored @address 100 by a T instruction :

```
T  MD 100
```

Variable description

Format	Description	Unit	Variables
UD_WORD	Phase 1 : phase voltage	0.1 V	U1
UD_WORD	Phase 2 : phase voltage	0.1 V	U2
UD_WORD	Phase 3 : phase voltage	0.1 V	U3
UD_WORD	Chained voltage : L1-L2	0.1 V	U12
UD_WORD	Chained voltage : L2-L3	0.1 V	U23
UD_WORD	Chained voltage : L3-L1	0.1 V	U31
UD_WORD	Phase 1 / 12 : phase voltage min	0.1 V	Umin1
UD_WORD	Phase 2 / 23 : phase voltage min	0.1 V	Umin2
UD_WORD	Phase 3 / 31 : phase voltage min	0.1 V	Umin3
UD_WORD	Phase 1 / 12 : phase voltage Max	0.1 V	UMax1
UD_WORD	Phase 2 / 23 : phase voltage Max	0.1 V	UMax2
UD_WORD	Phase 3 / 31 : phase voltage Max	0.1 V	UMax3
UD_WORD	Phase 1 : current	0.1 A	I1
UD_WORD	Phase 2 : current	0.1 A	I2
UD_WORD	Phase 3 : current	0.1 A	I3
UD_WORD	Phase 1 : current demand	0.1 A	Idmd1
UD_WORD	Phase 2 : current demand	0.1 A	Idmd2
UD_WORD	Phase 3 : current demand	0.1 A	Idmd3
UD_WORD	Phase 1 : current peak max demand	0.1 A	IMpd1
UD_WORD	Phase 2 : current peak max demand	0.1 A	IMpd2
UD_WORD	Phase 3 : current peak max demand	0.1 A	IMpd3
UD_WORD	Neutral current	0.1 A	In
UD_WORD	3-phase average current (I1+I2+I3)/3	0.1 A	Iav
SD_WORD	3-phase : active power	1 W	P
SD_WORD	Phase 1 : active power	1 W	P1
SD_WORD	Phase 2 : active power	1 W	P2
SD_WORD	Phase 3 : active power	1 W	P3
SD_WORD	3-phase : reactive power	1 var	Q
SD_WORD	Phase 1 : reactive power	1 var	Q1
SD_WORD	Phase 2 : reactive power	1 var	Q2
SD_WORD	Phase 3 : reactive power	1 var	Q3
UD_WORD	3-phase : apparent power	1 VA	S
UD_WORD	Phase 1 : apparent power	1 VA	S1
UD_WORD	Phase 2 : apparent power	1 VA	S2
UD_WORD	Phase 3 : apparent power	1 VA	S3
UD_WORD	3-phase : positive active energy / low value	1 Wh	EAL+
UD_WORD	3-phase : positive active energy / high value	1 MWh	EAH+
UD_WORD	3-phase : positive reactive energy / low value	1 varh	ERL+
UD_WORD	3-phase : positive reactive energy / high value	1 Mvarh	ERH+
UD_WORD	3-phase : negative active energy / low value	1 Wh	EAL-
UD_WORD	3-phase : negative active energy / high value	1 MWh	EAH-
UD_WORD	3-phase : negative reactive energy / low value	1 varh	ERL-
UD_WORD	3-phase : negative reactive energy / high value	1 Mvarh	ERH-
UD_WORD	3-phase : partial active energy / low value	1 Wh	EAPL+
UD_WORD	3-phase : partial active energy / high value	1 MWh	EAPH+
UD_WORD	3-phase : partial reactive energy / low value	1 varh	ERPL+
UD_WORD	3-phase : partial reactive energy / high value	1 Mvarh	ERPH+

UD_WORD	3-phase : active power demand	1 W	PDmd
UD_WORD	3-phase : reactive power demand	1 var	QDmd
UD_WORD	3-phase : apparent power demand	1 VA	SDmd
UD_WORD	3-phase : active Max power demand	1 W	PMpd
UD_WORD	3-phase : reactive Max power demand	1 var	QMpd

UD_WORD	3-phase : apparent Max power demand	1 VA	SMpd
UD_WORD	Frequency	0.1 Hz	Freq
SD_WORD	3-phase : power factor	0.001	PF
SD_WORD	Phase-1 : power factor	0.001	PF1
SD_WORD	Phase-2 : power factor	0.001	PF2
SD_WORD	Phase-3 : power factor	0.001	PF3
UD_WORD	3-phase : power factor sector	0 : PF=1 1 : ind 2 : cap	SPF
UD_WORD	Phase-1 : power factor sector	0 : PF=1 1 : ind 2 : cap	SPF1
UD_WORD	Phase-2 : power factor sector	0 : PF=1 1 : ind 2 : cap	SPF2
UD_WORD	Phase-3 : power factor sector	0 : PF=1 1 : ind 2 : cap	SPF3
UD_WORD	THD U1-phase voltage/THD U12-phase-phase voltage	0.1 %	THDU1/THDU12
UD_WORD	THD U2-phase voltage/THD U23-phase-phase voltage	0.1 %	THDU2/THDU23
UD_WORD	THD U3-phase voltage/THD U31-phase-phase voltage	0.1 %	THDU3/THDU31
UD_WORD	THD I1 - phase current	0.1 %	THDI1
UD_WORD	THD I2 - phase current	0.1 %	THDI2
UD_WORD	THD I3 - phase current	0.1 %	THDI3
UD_WORD	Phase-1 : Harmonics of voltage U3,5,7,9	0.1 %	H1V3,5,7,9
UD_WORD	Phase-1 : Harmonics of current I3,5,7,9	0.1 %	H1I3,5,7,9
UD_WORD	Phase-2 : Harmonics of voltage U3,5,7,9	0.1 %	H2V3,5,7,9
UD_WORD	Phase-2 : Harmonics of current I3,5,7,9	0.1 %	H2I3,5,7,9
UD_WORD	Phase-3 : Harmonics of voltage U3,5,7,9	0.1 %	H3V3,5,7,9
UD_WORD	Phase-3 : Harmonics of current I3,5,7,9	0.1 %	H3I3,5,7,9
UD_WORD	Run hour meter	h	RHM
UD_WORD	Current transformer ratio	No unit	KTI
UD_WORD	Voltage transformer ratio	0.1	KTU
UD_WORD	Voltage phase diagnostic		VPHD
UD_WORD	Active alarms		AL
UD_WORD	Pulse number input 1 (if module IF96011 or 012 present)	No unit	PN1
UD_WORD	Pulse number input 2 (if module IF96011 or 012 present)	No unit	PN2
UD_WORD	Pulse number input 3 (if module IF96011 or 012 present)	No unit	PN3
UD_WORD	Pulse number input 4 (if module IF96011 or 012 present)	No unit	PN4
UD_WORD	Input status 1	(**)	IS

UD_WORD	Input status 2	(**)	IS
UD_WORD	Input status 3	(**)	IS
UD_WORD	Input status 4	(**)	IS
UD_WORD	Reset of the quantities	(***)	RES
UD_WORD	KTI - current transform ratio	No unit	KTI
UD_WORD	KTU - voltage transformer ratio	Tenths (*)	KTU

(*) e.g. 690/100 => KTU = 69

(**) 0 : open // 1 : close or powered (for NEMO HD/HD+) ; 0 always for NEMO 96HDLe

(***) see section 4.0

3.0 MODULE DESCRIPTION

All variables have 2 WORDS length. The relative address refers to the PLC Profibus process image map

Designed for 3n3e wiring		Designed for 3-2e wiring		Designed for 1n1e wiring	
Variables	M1 - relative address	Variables	M2 - relative address	Variables	M3 - relative address
U1	0	U12	0	U1	0
U2	4	U23	4	THDU1	4
U3	8	U31	8	I1	8
U12	12	THDU12	12	THDI11	12
U23	16	THDU23	16	Freq	16
U31	20	THDU31	20	P	20
I1	24	I1	24	Q	24
I2	28	I2	28	S	28
I3	32	I3	32	PF	32
THDI1	36	THDI1	36	SPF	36
THDI2	40	THDI2	40	EAL+	40
THDI3	44	THDI3	44	EAH+	44
Freq	48	Freq	48	ERL+	48
P	52	P	52	ERH+	52
Q	56	Q	56	EAL-	56
S	60	S	60	EAH-	60
P1	64	PF	64	ERL-	64
P2	68	SPF	68	ERH-	68
P3	72	EAL+	72		
Q1	76	EAH+	76		
Q2	80	ERL+	80		
Q3	84	ERH+	84		
PF	88	EAL-	88		
SPF	92	EAH-	92		
EAL+	96	ERL-	96		
EAH+	100	ERH-	100		
ERL+	104				
ERH+	108				
EAL-	112				
EAH-	116				
ERL-	120				
ERH-	124				

Voltages module		Currents module		Min & max values module	
Variables	M4 - relative address	Variables	M5 - relative address	Variables	M6 - relative address
U1	0	I1	0	Umin1	0
U2	4	I2	4	Umin2	4
U3	8	I3	8	Umin3	8
U12	12	In	12	UMax1	12
U23	16	Iav	16	UMax2	16
U31	20			UMax3	20
				Idmd1	24
				Idmd2	28
				Idmd3	32
				IMpd1	36
				IMpd2	40
				IMpd3	44

Harmonics module		Energies module		Power module		Power factor module	
Variables	M7 - relative address	Variables	M8 - relative address	Variables	M9 - relative address	Variables	M10 - relative address
THDU1	0	EAL+	0	P	0	PF	0
THDU2	4	EAH+	4	Q	4	PF1	4
THDU3	8	ERL+	8	S	8	PF2	8
THDI1	12	ERH+	12	P1	12	PF3	12
THDI2	16	EAL-	16	P2	16	SPF	16
THDI3	20	EAH-	20	P3	20	SPF1	20
H1V3	24	ERL-	24	Q1	24	SPF2	24
H1V5	28	ERH-	28	Q2	28	SPF3	28
H1V7	32	EAPL+	32	Q3	32	Freq	32
H1V9	36	EAPH+	36	S1	36	RHM	36
H2V3	40	ERPL+	40	S2	40		
H2V5	44	ERPH+	44	S3	44		
H2V7	48			PDmd	48		
H2V9	52			QDmd	52		
H3V3	56			SDmd	56		
H3V5	60			PMpd	60		
H3V7	64			QMpd	64		
H3V9	68			SMpd	68		
H1I3	72						
H1I5	76						
H1I7	80						
H1I9	84						
H2I3	88						
H2I5	92						
H2I7	96						
H2I9	100						
H3I3	104						
H3I5	108						
H3I7	112						
H3I9	116						

General variable			THD module			Variable Reset		
Variables	M11 - relative address		Variables	M12 - relative address		Variables	M13 - relative address	
VPHD	0		THDU1	0		RES	0	This is the only writable module and is used to reset the quantities of the meter.
AL	4		THDU2	4				
PN1	8		THDU3	8				
PN2	12		THDI1	12				
PN3	16		THDI2	16				
PN4	20		THDI3	20				
IS1	24							
IS2	28							
IS3	32							
IS4	36							
KTI	40							
KTU	44							

4.0 VARIABLE RESET

To reset desired measurements write the following word (in binary)
 The LSW (Low Significant Word) is used.

```

MSB                                     LSB
0|0|0|0|0|0|0|0|0|b8|b7|b6|b5|b4|b3|b2|b1|b0
    
```

- b0 = 1 => Reset Hour Meter
- b1 = 1 => Reset Peak Maximum Demand
- b2 = 1 => Reset Maximum Voltage values
- b3 = 1 => Reset Maximum Current values
- b4 = 1 => Reset Minimum Voltage values
- b5 = 1 => Reset Active Partial Energy
- b6 = 1 => Reset Reactive Partial Energy
- b7 = 1 => Reset Counter Input 1
- b8 = 1 => Reset Counter Input 2

b9 .. b15 = 0