SUMMARY

1. *DESCRIPTION.*

Some measuring instruments can be equipped, for integration in supervision and / or control systems, of a PROFIBUS DP-V0 interface (optional).

This type of interface allows a fast exchange of data between the master (typically a PLC) and various slaves.

However, measuring instruments and in particular multi-function analyzers provide a large amount of measurements that, when transmitted all even when not required for specific applications, would lead to an unnecessary aggravation of communication with a corresponding lengthening of the time involved, and to an useless consumption of the usually limited memory in the PLC..

In order to minimize the amount of data transferred we have adopted a modular solution that allows choosing the appropriate module to transfer only the measurements actually of interest to the application, without however limit the possibility of using all available measurements.

To simplify the selection of modules, three of them have been defined for general use:

- *Module#1: STANDARD*
  Designed to be used in most applications, contains all the key measurements and represents a good compromise between the completeness of the information and the need to limit the amount of data exchanged.
- *Module#2: EXTENDED*
  Contains measurements of the standard module plus some additional (as the negative energies and neutral current), making it suitable for use in monitoring applications of complex systems.
- *Module#3: COMPACT*
  Particularly small, contains key measurements and is useful when it is necessary to limit the amount of data transferred.

All other modules can be used, or in addition to those described above to be complemented by measures of particular interest, or alone or together to compose the package of data as needed.

In any case, the maximum number of modules that can be used is equal to 14, while the total amount of data (i.e. the sum of the sizes of all modules used) must not exceed 240 bytes.

2. AVAILABLE VARIABLES.

The measures that can be read by Langer Messtechnik GmbH measuring instruments through the PROFIBUS interface depend on the specific model of instrument used.

The table below shows what measures are available on different models.

The measures that are not available for a particular model, but are still included in one or more module later described, return a value of zero.

VARIABLE	UNIT	NOTES	AVAILABILITY							
			C 15/96 …L	MCU / MCUU	Q 15/96 U2 L/X100	Q 96 U4L	Q 96 U4H	Q 15 U2H / MCUH	Q 15/96 B4W	C/Q 15/96 UCL
V L1-N	1mV			☺	☺	☺	☺	☺	☺	
V L2-N	1mV			☺	☺	☺	☺	☺	☺	
V L3-N	1mV			☺	☺	☺	☺	☺	☺	
V L1-L2	1mV			☺	☺	☺	☺	☺	☺	
V L2-L3	1mV			☺	☺	☺	☺	☺	☺	
V L3-L1	1mV			☺	☺	☺	☺	☺	☺	
I L1	1mA			☺	☺	☺	☺	☺	☺	
I L2	1mA			☺	☺	☺	☺	☺	☺	
I L3	1mA			☺	☺	☺	☺	☺	☺	
F	1mHz	L1		☺	☺	☺	☺	☺	☺	
P Sys (P for C/Q 15/96 UCL)	1W	P L1 + P L2 + P L3	☺	☺	☺	☺	☺	☺	☺	☺
Q Sys	1VAr	Q L1 + Q L2 + Q L3	☺	☺	☺	☺	☺	☺	☺	
P.F. Sys	0.001	P Sys / S Sys		☺	☺	☺	☺	☺		
kWh+ Sys	1Wh		☺	☺	☺	☺	☺	☺	☺	☺
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)		☺	☺	☺	☺	☺	☺	☺	☺
Energy multiplier	1		☺	☺	☺	☺	☺	☺	☺	☺
V L-L Sys	1mV	(V L1-L2 + V L2-L3 + V L3-L1) / 3				☺	☺		☺	
V L-N Sys (V for C/Q 15/96 UCL)	1mV	(V L1-N + V L2-N + V L3-N) / 3					☺			☺
I Sys (I for C/Q 15/96 UCL)	1mA	(I L1 + I L2 + I L3) / 3				☺	☺			☺
Delta V L-L	%	(V LL max - V LL min) / V LL med					☺			
Delta V L-N	%	(V LN max - V LN min) / V LN med					☺			
Delta I	%	(I L max - I L min) / I L med					☺			
I Neutral	1mA	Vector sum I L1 + I L2 + I L3					☺	☺		
Cos Phi Sys	0.001	P Sys / S Sys (Fundamentals)					☺	☺		
P.F. Avg Sys	0.001	Atan kVArh+ / kWh+					☺	☺		
THD V L1	0.1 %	THD / V L (nominal or RMS or Fundamental)					☺	☺		
THD V L2	0.1 %	THD / V L (nominal or RMS or Fundamental)					☺	☺		
THD V L3	0.1 %	THD / V L (nominal or RMS or Fundamental)					☺	☺		
THD I L1	0.1 %	THD / I L (nominal or RMS or Fundamental)					☺	☺		
THD I L2	0.1 %	THD / I L (nominal or RMS or Fundamental)					☺	☺		
THD I L3	0.1 %	THD / I L (nominal or RMS or Fundamental)					☺	☺		
kWh- Sys	1Wh		☺	☺	☺	☺	☺	☺		☺
kVArh- Sys	1VArh		☺	☺	☺	☺	☺	☺		☺

VARIABLE (Ah- for C/Q 15/96 UCL)	UNIT (1mAh)	NOTES	AVAILABILITY							
			C 15/96 ...L	MCU / MCUU	Q 15/96 U2 L/X100	Q 96 U4L	Q 96 U4H	Q 15 U2H / MCUH	Q 15/96 B4W	C/Q 15/96 UCL
S Sys	1VA	S L1 + S L2 + S L3		☺	☺	☺	☺	☺	☺	
P L1	1W					☺	☺		☺	
P L2	1W					☺	☺		☺	
P L3	1W					☺	☺		☺	
Q L1	1VAr					☺	☺		☺	
Q L2	1VAr					☺	☺		☺	
Q L3	1VAr					☺	☺		☺	
S L1	1VA	V L1 rms x I L1 rms				☺	☺			
S L2	1VA	V L2 rms x I L2 rms				☺	☺			
S L3	1VA	V L3 rms x I L3 rms				☺	☺			
P.F. L1	0.001	P L1 / S L1	☺	☺	☺	☺	☺	☺	☺	
P.F. L2	0.001	P L2 / S L2	☺	☺	☺	☺	☺	☺	☺	
P.F. L3	0.001	P L3 / S L3	☺	☺	☺	☺	☺	☺	☺	
Cos Phi L1	0.001	P L1 / S L1 (Fundamentals)					☺	☺		
Cos Phi L2	0.001	P L2 / S L2 (Fundamentals)					☺	☺		
Cos Phi L3	0.001	P L3 / S L3 (Fundamentals)					☺	☺		
P max Sys	1W		☺	☺	☺	☺	☺	☺	☺	☺
P avg Sys	1W	Moving average	☺	☺	☺	☺	☺	☺		☺
I max L1 (I max Sys for C/Q 15/96 UCL)	1mA			☺	☺	☺	☺	☺	☺	☺
I max L2	1mA			☺	☺	☺	☺	☺	☺	
I max L3	1mA			☺	☺	☺	☺	☺	☺	
I avg L1 (I avg Sys for C/Q 15/96 UCL)	1mA	Moving average		☺	☺	☺	☺	☺	☺	☺
I avg L2	1mA	Moving average		☺	☺	☺	☺	☺	☺	
I avg L3	1mA	Moving average		☺	☺	☺	☺	☺	☺	
Phases sequence	123/132	123 = Correct					☺	☺		
Total hours run	0.1h					☺	☺	☺	☺	
Temperature	0.1°C	Internal switchboard							☺	

3. *MODULES DESCRIPTION.*

Module #1: STANDARD

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset kWh+ Sys; Bit 1 = 1: Reset kVArh+ Sys

Input frame: 64 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
V L1-N	1mV	Signed Long (Int 32)
V L2-N	1mV	Signed Long (Int 32)
V L3-N	1mV	Signed Long (Int 32)
V L1-L2	1mV	Signed Long (Int 32)
V L2-L3	1mV	Signed Long (Int 32)
V L3-L1	1mV	Signed Long (Int 32)
I L1	1mA	Signed Long (Int 32)
I L2	1mA	Signed Long (Int 32)
I L3	1mA	Signed Long (Int 32)
F	1mHz	Signed Long (Int 32)
P Sys (P for C/Q 15/96 UCL)	1W	Signed Long (Int 32)
Q Sys	1VAr	Signed Long (Int 32)
P.F. Sys	0.001	Signed Long (Int 32)
kWh+ Sys	1Wh	Signed Long (Int 32)
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
Energy multiplier	1	Signed Long (Int 32)

Module #2: EXTENDED

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset kWh+ Sys and kWh- Sys; Bit 1 = 1: Reset kVArh+ Sys and kVArh- Sys

Input frame: 80 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
V L1-N	1mV	Signed Long (Int 32)
V L2-N	1mV	Signed Long (Int 32)
V L3-N	1mV	Signed Long (Int 32)
V L1-L2	1mV	Signed Long (Int 32)
V L2-L3	1mV	Signed Long (Int 32)
V L3-L1	1mV	Signed Long (Int 32)
I L1	1mA	Signed Long (Int 32)
I L2	1mA	Signed Long (Int 32)
I L3	1mA	Signed Long (Int 32)
I Neutral	1mA	Signed Long (Int 32)
F	1mHz	Signed Long (Int 32)
P Sys (P for C/Q 15/96 UCL)	1W	Signed Long (Int 32)
Q Sys	1VAr	Signed Long (Int 32)
S Sys	1VA	Signed Long (Int 32)
P.F. Sys	0.001	Signed Long (Int 32)
kWh+ Sys	1Wh	Signed Long (Int 32)
kWh- Sys	1Wh	Signed Long (Int 32)
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)

kVArh- Sys (Ah- for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
Energy multiplier	1	Signed Long (Int 32)

Module #3: COMPACT

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset kWh+ Sys; Bit 1 = 1: Reset kVArh+ Sys

Input frame: 44 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
I L1	1mA	Signed Long (Int 32)
I L2	1mA	Signed Long (Int 32)
I L3	1mA	Signed Long (Int 32)
F	1mHz	Signed Long (Int 32)
P Sys (P for C/Q 15/96 UCL)	1W	Signed Long (Int 32)
Q Sys	1VAr	Signed Long (Int 32)
P.F. Sys	0.001	Signed Long (Int 32)
kWh+ Sys	1Wh	Signed Long (Int 32)
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
Energy multiplier	1	Signed Long (Int 32)
V L-L Sys	1mV	Signed Long (Int 32)

Module #4: MINIMAL

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset kWh+ Sys; Bit 1 = 1: Reset kVArh+ Sys

Input frame: 24 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
P Sys (P for C/Q 15/96 UCL)	1W	Signed Long (Int 32)
Q Sys	1VAr	Signed Long (Int 32)
P.F. Sys	0.001	Signed Long (Int 32)
kWh+ Sys	1Wh	Signed Long (Int 32)
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
Energy multiplier	1	Signed Long (Int 32)

Module #5: LINE AND DELTA VOLTAGES

Input frame: 24 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
V L1-N	1mV	Signed Long (Int 32)
V L2-N	1mV	Signed Long (Int 32)
V L3-N	1mV	Signed Long (Int 32)
V L1-L2	1mV	Signed Long (Int 32)
V L2-L3	1mV	Signed Long (Int 32)
V L3-L1	1mV	Signed Long (Int 32)

Module #6: CURRENTS

Input frame: 16 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
I L1	1mA	Signed Long (Int 32)
I L2	1mA	Signed Long (Int 32)
I L3	1mA	Signed Long (Int 32)
I Neutral	1mA	Signed Long (Int 32)

Module #7: MEAN VOLTAGES AND UNBALANCES

Input frame: 16 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
V L-L Sys	1mV	Signed Long (Int 32)
V L-N Sys (V for C/Q 15/96 UCL)	1mV	Signed Long (Int 32)
Delta V L-L	%	Signed Long (Int 32)
Delta V L-N	%	Signed Long (Int 32)

Module #8: MEAN CURRENT AND UNBALACE

Input frame: 8 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
I Sys (I for C/Q 15/96 UCL)	1mA	Signed Long (Int 32)
Delta I	%	Signed Long (Int 32)

Module #9: THD's

Input frame: 24 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
THD V L1	0.1 %	Signed Long (Int 32)
THD V L2	0.1 %	Signed Long (Int 32)
THD V L3	0.1 %	Signed Long (Int 32)
THD I L1	0.1 %	Signed Long (Int 32)
THD I L2	0.1 %	Signed Long (Int 32)
THD I L3	0.1 %	Signed Long (Int 32)

Module #10: ENERGIES

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset kWh+ Sys and kWh- Sys; Bit 1 = 1: Reset kVArh+ Sys and kVArh- Sys

Input frame: 20 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
kWh+ Sys	1Wh	Signed Long (Int 32)
kWh- Sys	1Wh	Signed Long (Int 32)
kVArh+ Sys (Ah+ for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
kVArh- Sys (Ah- for C/Q 15/96 UCL)	1VArh (1mAh)	Signed Long (Int 32)
Energy multiplier	1	Signed Long (Int 32)

Module #11: SYSTEM POWERS, POWER FACTOR AND COSPHI

Input frame: 20 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
P Sys (P for C/Q 15/96 UCL)	1W	Signed Long (Int 32)
Q Sys	1VAr	Signed Long (Int 32)
S Sys	1VA	Signed Long (Int 32)
P.F. Sys	0.001	Signed Long (Int 32)
Cos Phi Sys	0.001	Signed Long (Int 32)

Module #12: PHASE ACTIVE AND REACTIVE POWERS, POWER FACTORS

Input frame: 36 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
P L1	1W	Signed Long (Int 32)
P L2	1W	Signed Long (Int 32)
P L3	1W	Signed Long (Int 32)
Q L1	1VAr	Signed Long (Int 32)
Q L2	1VAr	Signed Long (Int 32)
Q L3	1VAr	Signed Long (Int 32)
P.F. L1	0.001	Signed Long (Int 32)
P.F. L2	0.001	Signed Long (Int 32)
P.F. L3	0.001	Signed Long (Int 32)

Module #13: PHASE APPARENT POWERS AND COSPHI's

Input frame: 24 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
S L1	1VA	Signed Long (Int 32)
S L2	1VA	Signed Long (Int 32)
S L3	1VA	Signed Long (Int 32)
Cos Phi L1	0.001	Signed Long (Int 32)
Cos Phi L2	0.001	Signed Long (Int 32)
Cos Phi L3	0.001	Signed Long (Int 32)

Module #14: SYSTEM AVERAGE AND MAX AVERAGE POWERS

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset P max Sys; Bit 1 = 1: Reset P avg Sys

Input frame: 8 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
P max Sys	1W	Signed Long (Int 32)
P avg Sys	1W	Signed Long (Int 32)

Module #15: AVERAGE AND MAX AVERAGE CURRENTS

Output frame: 2 Bytes

Reset options	Bit 0 = 1: Reset I max; Bit 1 = 1: Reset I avg

Input frame: 24 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
I max L1 (I max Sys for C/Q 15/96 UCL)	1mA	Signed Long (Int 32)
I max L2	1mA	Signed Long (Int 32)
I max L3	1mA	Signed Long (Int 32)
I avg L1 (I avg Sys for C/Q 15/96 UCL)	1mA	Signed Long (Int 32)
I avg L2	1mA	Signed Long (Int 32)
I avg L3	1mA	Signed Long (Int 32)

Module #16: FREQUENCY

Input frame: 4 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
F	1mHz	Signed Long (Int 32)

Module #17: OTHER MEASUREMENTS

Input frame: 12 Bytes

VARIABLE	*UNIT*	*DATA TYPE*
Phases sequence	123/132	Signed Long (Int 32)
Total hours run	0.1h	Signed Long (Int 32)
Temperature	0.1°C	Signed Long (Int 32)

4. *PROFIBUS WIRING.*

It is of fundamental importance, for the proper functioning of the PROFIBUS installation, that the wiring of the line is carried out correctly.

For this purpose, see the attached "Inst_Guide_DP_FMS_2112_V10_Sep98.pdf" which can also be downloaded from the official site "http://www.profibus.com.

It is also necessary to use cables and connectors suitable and approved for use in PROFIBUS installations.

5. *ADDRESS SETTING.*

To each device connected to a PROFIBUS installation must be assigned a different logical address.

The addressing range available on our devices is from 1 to125 (but usually address 1 is reserved for diagnostics devices, and address 2 is used by the master).

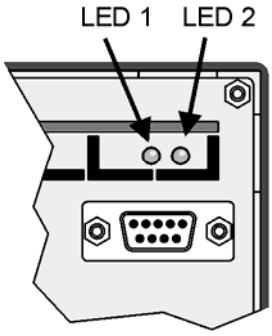
Set the device address before activating the master by means of the device keyboard and display (see how to set the configuration parameters on the instruction manual of the specific instrument used).

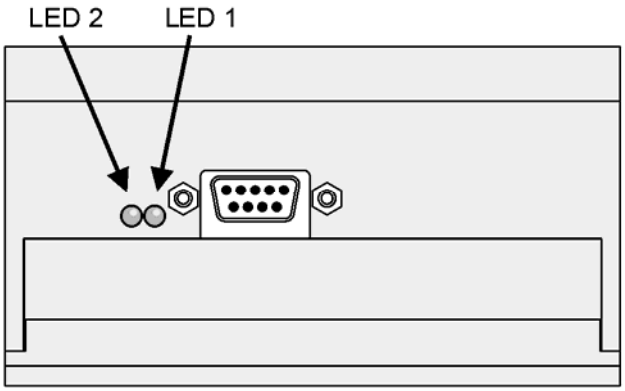
NOTE: Each device, together with address setting, provides also for setting the communication speed (i.e. 9600 or 19200 bps) and setting the parity bit (i.e. none, even or odd);
In devices with PROFIBUS interface, those two last settings (communication speed and parity bit) are ignored and are therefore irrelevant, for whatever value is assigned to them.

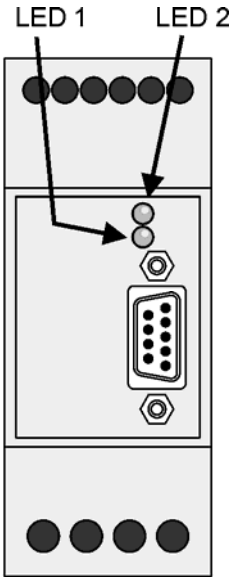
Our devices leave the factory with the address preset to 3.

6. *STATUS LED INDICATIONS*

In the close proximity of the PROFIBUS connector, on our devices, there are two yellow LED's indicating the operating state of the device and of the PROFIBUS connection.







LED indicator	*LED status*	*Meaning*
LED 1	*Off*	*No measuring data available.*
	Blinking	*Measuring data available.*
LED 2	*Off*	*No activity on the PROFIBUS (the bus is disconnected or the master is offline).*
	Steady on	*There is activity on the PROFIBUS but the device is not in data exchange (the master is in stop or the device is not configured).*
	Blinking	*The device is exchanging data on the PROFIBUS.*

7. TROUBLE SHOOTING.

In the event of operating problems check the following list and fill and send it to us before contacting the technical support.

7.1 Is the wiring of the line made using cables and connectors approved for use in PROFIBUS?

Cable: Brand _____ Code _____

Connectors: Brand _____ Code _____

7.2 Are start and end of the line properly terminated (with no further terminations along the line itself)?

Yes ☐ No ☐

7.3 Is the cable shield grounded at both end?

Yes ☐ No ☐

7.4 Are, for each segment of the PROFIBUS line, connected no more than 32 devices?

Number of connected devices: _____

7.5 Has been assigned, for each device (including the master) a different logical address?

Yes ☐ No ☐

7.6 Is the communication speed compatible with the length of the line?

Communication speed: _____ kbit/s Line length: _____ m.

7.7 Was the operation tested at the lowest possible speed (9.6 kbit/s)?

Yes ☐ No ☐

7.8 Was the operation of a single slave alone (the one connected closest to the master) tested after disconnecting the rest of the line and moving the termination on the sole remaining slave device?

Yes ☐ No ☐

7.9 In which state are the yellow LED's close to the PROFIBUS connector on the devices?

LED 1: Off ☐ Blinking ☐

LED 2: Off ☐ Steady on ☐ Blinking ☐