P16 Ex ia Group 1

P16 220 Vac

ENVIRONMENTAL MONITOR

TECHNICAL REFERENCE GUIDE VOLUME 1.3

FIGURE 1 P16 ENVIRONMETAL MONITOR

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1. Introduction

About this manual

This manual was prepared to aid the engineer in the configuration, setup and implementation of the P16 with easy to understand terms and procedures.

About the P16

The P16 environmental monitor is the most advanced monitor to date. It is a fully configurable monitor with a highly visible LCD display and RS485 communication for real time monitoring over long distance.

The P16 offers:

- Air velocity measurement
- CO measurement
- CH4 measurement
- Ambient temperature measurement
- RS485 Modbus RTU communication
- Visual Red/Green display
- Relay output
- 3 x 4-20mA outputs

The P16 is manufactured to international standards utilizing the best components available. We offer 24/7 toll free technical support, backup service and training.

P16 HMI (human machine interface)

The P16 operates as a user friendly device with real time data available to the operator. All the data is available on the large LCD Display and all parameters are adjustable via handheld infra red remote control

All the measurements and data are available to the network via MODBUS RTU RS485.

FIGURE 2 P16 LCD DISPLAY LAYOUT

The easy to use handheld infra red remote control is used to navigate through the menu and adjust any of the settings.

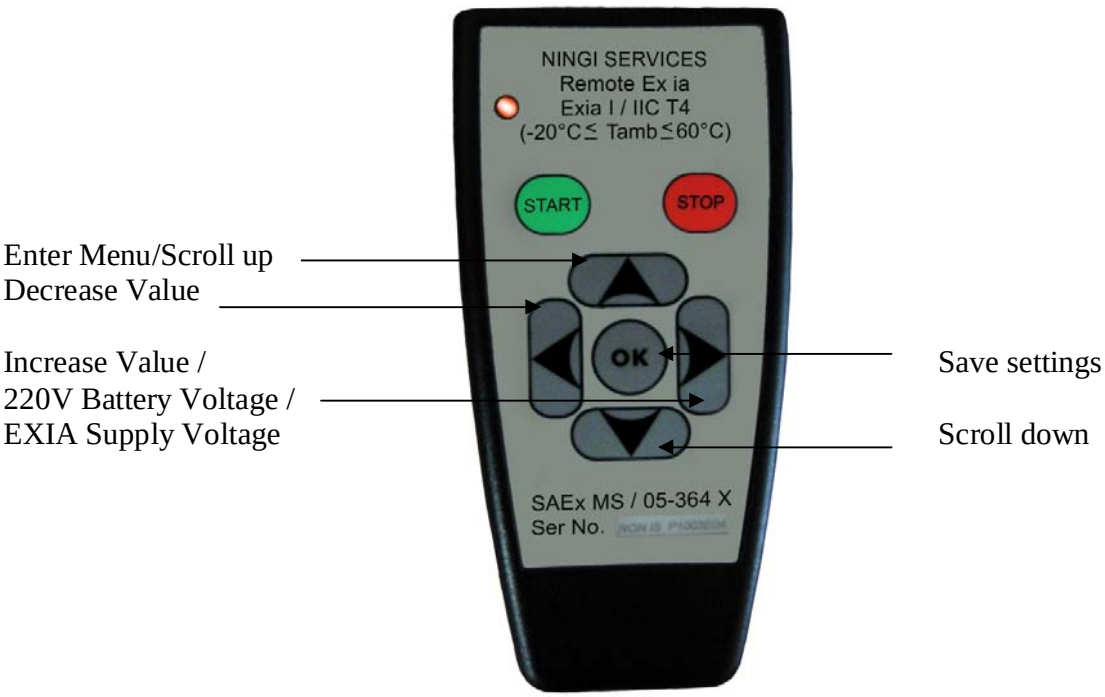


FIGURE 3 INFRA RED REMOTE CONTROL

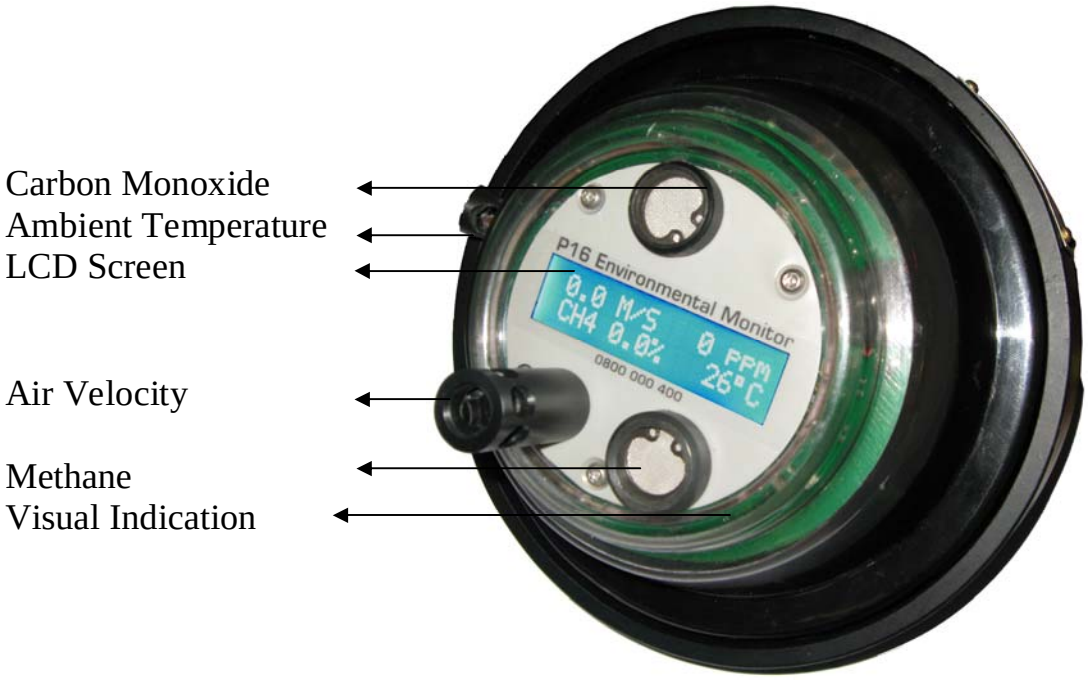
2. Warranty

The P16 carries a one year limited warranty on all parts and labour

3. Safety information

- Dangerous voltages can occur on the connectors, even if the auxiliary voltage has been disconnected.
- Only a certified electrician is allowed to carry out the electrical installation.
- Breaking the seal on the fixing screws of the device will result in loss of warranty.
- Electrical safety regulations must always be followed.

4. P16 Sensor Description



5. P16 Menu

About the Menu

The P16 menu contains all the settings for the trip levels and trip delays as well as the communication settings. The menu settings are located in non volatile memory (settings remain unchanged when powered down). The P16 menu settings can be changed by infra red remote control or network.

Note: To enable setting changes via the RS485 network set MODE to 211.

How to change the settings

Press the button on the local keypad or infra red remote control to enter the menu. From there press to scroll up through the menu, press to scroll down through the menu. or will decrease or increase the value for that specific setting.

Press the button to exit the menu. To save the settings press the button again within 10 seconds.

List of Menu Settings

SETTING	*MIN*	*MAX*	*DEFAULT*	*UNIT*
Mode	OFF	255	0	-
Air Velocity	OFF	10.0	1.0	M/S
Trip Delay m/s	OFF	120	5	Sec
Methane CH4	OFF	2.0	1.0	%
Trip delay CH4	OFF	120	5	Sec
Carbon Monoxide CO	OFF	1000	30	ppm
Trip delay CO	OFF	120	5	Sec
Power down delay	OFF	240	30	Min
RS485 Address	OFF	247	5	-
Baud Rate	OFF	19200	9600	bps
Parity	OFF	-	OFF	-
WS 20mA gain	OFF	10.0	4.0	M/S
CH4 20mA gain	OFF	1.5	1.5	%
CO 20mA gain	OFF	1000	200	ppm
4.0mA WS Offset – Advanced menu setting	OFF	50	OFF	-
4.0mA CH4 Offset – Advanced menu setting	OFF	50	OFF	-
4.0mA CO Offset – Advanced menu setting	OFF	50	OFF	-

MODE (Default 0)

This setting will activate different operating modes.

- MODE 4 – Test 4-20mA current loops
- MODE 10 – Enable relay to pulse every 60 seconds if system healthy
- MODE 11 – Disable relay from pulsing every 60 seconds if system healthy
- MODE 25 – Clear hour meter 2
- MODE 29 – Enable 4-20mA offset adjustments
- MODE 100 – Display CH4 raw value
- MODE 101 – Display CO raw value
- MODE 102 – Display WS raw value
- MODE 103 – Display Ambient temperature raw value
- MODE 211 – Enable write to settings over RS485 network

Air Velocity (Default 1.0 M/S)

Air velocity trip level

Trip delay (Default 5 Sec)

Trip delay if air velocity is below trip level.

CH4 Methane trip level (Default 1.0%)

CH4 - Methane trip level.

Trip delay (Default 5 Sec)

Trip delay if CH4 is above trip level.

CO Carbon Monoxide (Default 30 ppm)

CO - Carbon Monoxide trip level.

Trip delay (Default 5 Sec)

Trip delay if CO is above trip level.

Power down delay (30 Minutes)

Power down after mains failure to reserve battery power. Only operational in the 220Vac non IS battery backup monitors.

RS485 address (Default 5)

RS485 communication address.

Baud rate (Default 9600 bps)

Baud rate for RS485.

Parity (default OFF)

Parity bit for RS485.

WS Gain (Default 4.0 M/S)

The 4-20mA current loop will output 20mA at this level.

CH4 Gain (Default 1.5%)

The 4-20mA current loop will output 20mA at this level.

CO Gain (Default 200ppm)

The 4-20mA current loop will output 20mA at this level.

WS 4mA Offset (Factory calibrated)

Adjust this setting to output 4mA at zero reading.

CH4 4mA Offset (Factory calibrated)

Adjust this setting to output 4mA at zero reading.

CO 4mA Offset (Factory calibrated)

Adjust this setting to output 4mA at zero reading.

6. Communication

About communication

The P16 offers RS485 (Modbus RTU) communication.

Modbus RTU Protocol

The protocol for Modbus RTU consists of a string of bytes. The string starts with the RS485 address, the function required, addresses, data bytes and ends with CRC (cyclic redundancy check).

Holding registers 40000 (Read/Write Function 3)

The real time sensor measurements and other important data are available on the holding registers.

Below is a list of the available holding registers. Any amount of data may be requested by the Modbus RTU protocol.

REGISTER	NAME	DESCRIPTION
40001	Air Velocity	Air velocity measurement
40002	CH4	CH4 measurement
40003	CO	CO measurement
40004	VDC	Input voltage on P16
40005	Temperature	Ambient temperature
40009	Mode	Operating Mode
40010	WS Trip	Air velocity trip level
40011	WS Delay	Air velocity trip delay
40012	CH4 Tip	CH4 trip level
40013	CH4 Delay	CH4 trip delay
40014	CO Trip	CO trip level
40015	CO Delay	CO trip delay
40016	Power down	Power down delay
40017	Address	RS485 address (Default 5)
40018	Baud rate	Baud rate (Default 9600 bps)
40019	Parity	Parity bit (Default OFF)
40020	ID 4	Left most serial no. digit in HEX
40021	ID 3	2nd serial no. digit in HEX
40022	ID 2	3rd serial no. digit in HEX
40023	ID 1	Right most serial no. digit in HEX
40024	System	System healthy register
40025	Communication	Communication healthy register
40026	Co raw	Raw value from CO sensor
40027	Ch4 raw	Raw value from CH4 sensor
40028	Ws raw	Raw value from Air velocity sensor

All input registers are 16 bit in length (high byte and low byte). 4.5 M/S equals 45 decimal and 0x2D hex is send as 0x00Hbyte & 0x2DLbyte.

System Healthy register description 40024

Register 30021 Bitwise *Register Read only*

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Calibration due	RAM	Memory	Led's	Ambient	CO	CH4	WS

If bit reads as a one the sensor is healthy. A Zero indicates that service is required.

Calibration due bit 7– 0 indicates that the sensor needs re-calibration.
RAM bit 6 – 0 indicates Random access memory faulty
Memory bit 5 – 0 indicates Eeprom memory faulty
Led bit 4 – 0 indicates Led driver faulty
Ambient bit 3 – 0 indicates ambient sensor faulty
CO bit 2 – 0 indicates CO sensor and/or circuit faulty
CH4 bit 1 – 0 indicates CH4 sensor and/or circuit faulty
WS bit 0 – 0 indicates Air velocity sensor and/or circuit faulty

Example – Read first 5 holding registers

Example - Slave address = 5

Read request

Slave Address	Function	Start Address Hi	Start Address Lo	No Points Hi	No Points Lo	CRC Lo	CRC Hi
05	03	00	00	00	05	84	4D

Read response

Slave Address	Function	Byte Count	Data Hi	Data Lo	]….[	Data Hi	Data Lo	CRC Lo	CRC Hi
05	03	0A	XX	XX	XX	XX	XX	XX	XX

Example – Write to holding registers (Only in MODE 211)

Example - Slave address = 5

Write request

Slave Address	Function	Start Address Hi	Start Address Lo	No Registers Hi	No Registers Lo	Byte Count	Data Hi	Data Lo	CRC Lo	CRC Hi
05	10	00	00	00	XX	XX	XX	XX	XX	XX

Write response

Slave Address	Function	Start Address Hi	Start Address Lo	No of Registers Hi	No of Registers Lo	CRC Lo	CRC Hi
05	10	00	00	00	XX	XX	XX

7.Approvals and Marking

SAEx M/03056 X
SANS 60079-0:2000 Part 0
SANS 60079-11:1999 Part II
SABS 549

MARKING ON MAIN UNIT
Manufacturer NINGI Services
Type: P16 Ver 1.1
Serial No's: E 06 0031 to E06 0070 (inclusive) Example
Ex Rating: Ex ia I
IA No: SAEx M/03056 X
Ui = 15 V Ii = 2.8 A Ci = 1.2µF Li = 0
Warning: Static Hazard - Wipe only with a damp cloth.

ADDITIONAL MARKING
RS485:
Uo = 5,88Vdc Ui = 18V
Io = 130mA
Po = 200mW Pi = 3W
Co = 100µF Ci = 1,2µF
Lo = 20mH

Special Conditions of use (X):
• No connections (data lines) may be made to the equipment unless it forms part of a certified system, incorporating the assigned safety parameters.
• A barrier / isolator connected to the RS485 interface shall have a 100mA or lower fuse in place, or Po (Power Out) of the barrier / isolator shall not exceed 1,2W.
• The programming connector may only be used outside the hazardous location, with no connected circuits into the hazardous location.

8. Electrical specifications

	Min	Typical	Max	Unit
Control voltage P16 Ex ia	8	12	15	VDC
Control voltage P16 220Vac	85	240	275	VAC
Operating current		250	300	mA
Ci		1.2		uF
Power consumption P16 Ex ia		2	3	W
Power consumption P16 220 Vac		2	3	W
Relay contacts P16 Ex ia	5		15	VDC
Relay contacts P16 220 Vac	5		440	Vac
Air velocity measurement	0.2		5.0	M/S
CH4 measurement	0.5		5.0	%
CO measurement	30		1000	ppm
Temperature measurement	0		100	°C
Enclosure protection		IP20		
RS485 Uo			5.88	Vdc
RS485 Io			130	mA
RS485 Po			200	mW
RS485 Co			100	uF
RS485 Lo			20	mH
RS485 Ui			18	V
RS485 Pi			3	W
RS485 C1			1.2	uF
Communication channel RS485 (MODBUS RTU)	600		19200	Bps

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