



S50

Smoke Detector

Revision 06.2

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Manufactured by:
Ningi Manufacturing (PTY) Ltd
22 Langa Crescent
Corridor Hill
Witbank, MP
1035
South Africa
Phone +27 13 692 3501
Fax +27 86 502 8348



Authorized Distributors:
Ningi Services
22 Langa Crescent
Corridor Hill
Witbank, MP
1035
South Africa
Phone +27 13 656 3147/ 0746
Fax +27 86 546 8584

sales@ningi.com

www.ningi.com

www.ningi.co.za

INTRODUCTION

Purpose

The purpose of this manual is to provide the user with a comprehensive guide to understanding the use, set-up, and the configuration of the S50 Smoke Sensor to enable the user to obtain best results from the S50.

About

The S50 is a state of the art Smoke Sensor which utilizes the very latest in intelligent technology to achieve excellent capability and is approved and certified compliant for use in explosive atmospheres (Group I) Underground mines and (Group II) Surface.

The S50 is South African manufactured and is certified to the International Standards and Compliance IEC (SANS) 10086-2:2006.

HMI

The S50 Smoke Detector operates as a user friendly device with real time monitoring available to the user. All the measurements and data are available via audio/visual indicators and RS485 network. Some parameters are adjustable via personal computer depending on local requirements. Modbus RTU (a fully documented public domain protocol) is standard on the S50 which allows communication to the control room via SCADA. (**See *COMMUNICATIONS*).

When installed in a hazardous area such as; Zone 1, Group I, Methane or Coal Dust, -20°C to 55°C; the S50 (MASC M/11-437X) shall form part of the System Loop Approval, for details about the S50 Approved System Loop please contact your Ningi Services representative.

Relays

The S50 is supplied with 2 x on-board voltage free relays. (Special conditions of safe use (X); the relays;

- May only switch I.S. circuits
- The relays may not switch more than the nominal value of 5Arms or 250Vrms or 100VA

Audio

The S50 uses a 93dB audible device configured to sound at pre-set alarm levels depending on the customer's requirements.

Visual

The visual indication is visible 360° around the unit. Four colours, red, green, yellow and blue, are standard on all models. Red and green are default for alarm and no alarm conditions respectively. Alarms can however be mapped to any of the four colours.

SENSORS

The following sensors are available in configuration on the S50 and can be specifically setup to operate in varying environmental climates depending on your requirements;

- NS50
- CO
- SO2

SENSING METHOD

NS50 Sensor

The NS50 sensor is the latest and most intelligent smoke detector sensor available which utilizes a MOS (Metal Oxide Semiconductor) sensor manufactured using silicon wafer technology and using special adapted algorithms for early fire detection and smoke.

CO Sensor

The CO Sensor offers low drift, long term stability with fast response times during sensing operation, the CO Sensor works in conjunction with a specific algorithm with the NS50 and the SO2 Sensor for optimum accuracy and response.

SO2 Sensor

The SO2 Sensor is also specific to specially adapted algorithms which are designed to function with the NS50 and the CO Sensors to enable very accurate and fast response times during sensing operations.

MODELS

Intrinsic safe Ex ia

The S50 is approved for use in hazardous locations including underground mines.

The operating voltage range is 9 to 20VDC powered from an intrinsic safe power supply.

Non-intrinsic safe

The S50 is also available as a non-intrinsic safe version* for use in non-hazardous locations.

The non-intrinsic safe version is available with an operating voltage range of 9 to 48VDC or 115/240VAC.

* See ordering information

Battery Backup

All models include battery backup to ensure operation in case of a power failure. The backup battery is maintenance free and is automatically charged when connected to the supply line.

Power Off

In order to save battery power, the S50 will shut down when the external power is removed and the S50 unit is placed upside down. The S50 will resume normal operation when the external power is restored regardless of the orientation of the S50.

Ordering information

Model	Intrinsic safe	Operating Voltage	Part No
S50 Ex ia	Yes	9 to 20VDC	S50Exia
S50 non-IS	No	9 to 48VDC	S50nonExia
S50 Mains	No	85 to 265VAC	S50Mains

APPROVALS

Marking:

Manufacturer: Ningi Services
Type: P50/S50 Sensor
Ex rating: Ex ia I (-20°C to +55°C)
IA No: MASC M/11-437V
Serial Numbers: (See validity of report)
Ingress protection: IP65

ELECTRICAL SPECIFICATIONS

Description	Min	Nom	Max	Unit
Operating voltage Exia	9	12	18	VDC
Operating Voltage non IS	9	12/24	48	VDC
Operating Voltage Mains	85	115/240	265	VAC
Current Consumption	100	180	250	mA
Battery Backup	4	6	8	hours
Battery capacity	2200	2200	4400	mAh
Battery Voltage	3.6	3.7	4.2	VDC
RS485 baud rate	2400	9600	57600	Bps
Local alarm		93		dB
Relay Contacts S50 220V	95	220	250	VAC
Relay Contacts S50 220V			2	A
Relay Contacts S50 Exia	9	12	18	VCD(Ex)
Relay Contacts			2	A (Ex)

Connections

220V

Grey Cable

220V Neutral

Yellow

S50 EXIA

Grey Cable

0V	Yellow
12V	1
RS485 A/+	2
RS485 B/-	3
COM 1	4
N/O 1	5
COM 2	6
N/O 2	7

220V Live	1
RS485 A/+	2
RS485 B/-	3
COM 1	4
N/O 1	5
COM 2	6
N/O 2	7

COMMUNICATIONS

For the communications sections below it is important to understand that depending on the type of SCADA system being used will determine the register set indexing numbers to be used, as such; “INDEX SET A” (immediately below) refers to most standard SCADA systems, whereas “INDEX SET B” refers to SCADA systems such as WINCC and ADROIT (and some other types).

Figure 1 - INDEX SET A

Coils 10 000

Register	Description	Min	Max
00010	Slave reset	0	1
00016	Save Settings	0	1

Input registers 30 000

Register	Description	Min	Max	Divide	Unit
30001-32	User defined	-	-	-	-
30224	Smoke	0	10000	100	%
30120	Barometric pressure	300	1100	1	mBar/hPa
30122	Supply Voltage	0	400/2500	10	VDC
30201	Firmware Version	-	-	-	-
30119	Humidity	0	1000	10	%
30118	Ambient Temperature	0	800	10	°C
30101	Communication counter Long	0	255	-	Count

30102	Communication counter Short	0	255	-	Count
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Alarm Trigger

Register	Description
30130	Warning Status Word
30131	Alarm Status Word

Status Word Bit Conditions Warning and Alarm - 1 = Triggered

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
-	-	-	Buzzer	Yellow LED's	Blue LED's	Green LED's	Red LED's
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	Relay 2	Relay 1

Figure 2 - INDEX SET A (continued)

Holding Registers 40 000

Register	Description	Min	Max	DEF	R/W	Unit
40000-31	User Defined	-	-	-	R	-
40440	Smoke Warning Delay Up	0	65535	50	R/W	Sec/10
40480	Smoke Warning Delay Down	0	65535	100	R/W	Sec/10
40520	Smoke Warning Level	0	65535	250	R/W	%/100
40560	Smoke Alarm Level	0	65535	500	R/W	%/100
40600	Smoke Alarm Delay Up	0	65535	50	R/W	Sec/10
40640	Smoke Alarm Delay Down	0	65535	100	R/W	Sec/10
40860	Smoke Trigger Direction	<	=	>	R/W	-
40940	Smoke Warning Trigger ¹	0	65535	2049	R/W	-
40980	Smoke Alarm Trigger ¹	0	65535	4355	R/W	-

41000	Serial no. High	0	65535	Ser. H	R	-
41001	Serial no. Low	0	65535	Ser. L	R	-
41002	Last Calibration Date High	0	65535	30	R	Unix H
41003	Last Calibration Date Low	0	65535	130	R	Unix L
41004	Next Calibration Date High	0	65535	30	R	Unix H
41005	Next Calibration Date Low	0	65535	240	R	Unix L
40099	Address	0	247	247	R/W	-
40821	Power On Delay	0	65535	60	R	Sec

¹Used for setting up Warning and Alarm Triggers.

Default Warning Trip – Yellow LED's & Relay 1

Default Alarm Trip – Red LED's, Relay 2 & Buzzer

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
-	-	-	Buzzer	Yellow LED's	Blue LED's	Green LED's	Red LED's
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	Relay 2	Relay 1

Figure 3 - INDEX SET B

Coils 10 000

Register	Description	Min	Max
00011	Slave reset	0	1
00017	Save Settings	0	1

Input registers 30 000

Register	Description	Min	Max	Divide	Unit
30001-32	User defined	-	-	-	-
30225	Smoke	0	10000	100	%
30221	Barometric pressure	300	1100	1	mBar/hPa
30123	Supply Voltage	0	400/2500	10	VDC
30202	Firmware Version	-	-	-	-
30120	Humidity	0	1000	10	%
30119	Ambient Temperature	0	800	10	°C
30102	Communication counter Long	0	255	-	Count
30103	Communication counter Short	0	255	-	Count

Alarm Trigger

Register	Description
30131	Warning Status Word
30132	Alarm Status Word

Status Word Bit Conditions Warning and Alarm - 1 = Triggered

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
-	-	-	Buzzer	Yellow LED's	Blue LED's	Green LED's	Red LED's
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	Relay 2	Relay 1

Figure 4 - INDEX SET B (continued)

Holding Registers 40 000

Register	Description	Min	Max	DEF	R/W	Unit
40001-32	User Defined	-	-	-	R	-
40441	Smoke Warning Delay Up	0	65535	50	R/W	Sec/10
40481	Smoke Warning Delay Down	0	65535	100	R/W	Sec/10
40521	Smoke Warning Level	0	65535	250	R/W	%/100
40561	Smoke Alarm Level	0	65535	500	R/W	%/100
40601	Smoke Alarm Delay Up	0	65535	50	R/W	Sec/10
40641	Smoke Alarm Delay Down	0	65535	100	R/W	Sec/10
40861	Smoke Trigger Direction	<	=	>	R/W	-
40941	Smoke Warning Trigger ¹	0	65535	2049	R/W	-

40981	Smoke Alarm Trigger ¹	0	65535	4355	R/W	-
41001	Serial no. High	0	65535	Ser. H	R	-
41002	Serial no. Low	0	65535	Ser. L	R	-
41003	Last Calibration Date High	0	65535	30	R	Unix H
41004	Last Calibration Date Low	0	65535	130	R	Unix L
41005	Next Calibration Date High	0	65535	30	R	Unix H
41006	Next Calibration Date Low	0	65535	240	R	Unix L
40100	Address	0	247	247	R/W	-
40822	Power On Delay	0	65535	60	R	Sec

¹Used for setting up Warning and Alarm Triggers.

Default Warning Trip – Yellow LED's & Relay 1

Default Alarm Trip – Red LED's, Relay 2 & Buzzer

Bit 15	Bit 14	Bit 13	Bit 12	Bit 11	Bit 10	Bit 9	Bit 8
-	-	-	Buzzer	Yellow LED's	Blue LED's	Green LED's	Red LED's
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
-	-	-	-	-	-	Relay 2	Relay 1

MAINTENANCE PROCEDURES

Calibration

To ensure the correct operation and safety compliance, the S50 is to be submitted for calibration on a 6 monthly basis.

The calibration includes a detailed functionality check and all smoke sensors are tested and certified to comply with the required operational specifications, also; each S50 on-board sensor is checked for its end of life (EOL) cycle whereby if found to be EOL then a new sensor will be fitted before it is allowed to be calibrated.

Maintenance

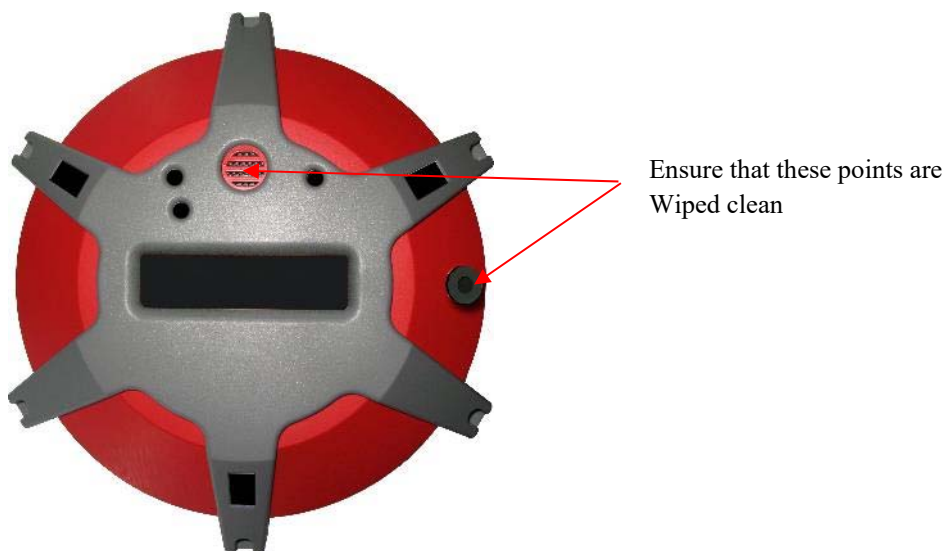
The S50 includes no user serviceable parts and the warranty will be rendered void if the unit is opened or tampered with in any way.

The IS certification will be rendered void if the unit is opened by anyone other than the manufacturer, or if there is physical damage to the unit.

The only maintenance and care that can be done on the unit is to wipe it down with a damp lint free cotton cloth.

When the S50 is wiped down with a damp cloth particular attention should be made to ensuring that the sensors are clean and free of dirt, as indicated in the diagram below.

Figure 5 – Maintenance of your S50



FAULT FINDING

General

1. Ensure there is no damage to the unit, this will void the warranty and the IS approval where applicable

2. Ensure the correct cable is used, IS certification will indicate the correct cable for IS installations. For non-IS installations, the incorrect cable will result in larger voltage drops and the unit may not function as intended.
3. Ensure that all terminations are done correctly and are secure
4. Ensure the correct power source is utilized especially for IS installations
5. Minimum measured voltage required at the head with the head connected and operational is 9.5V (IA Model)
6. Ensure cable is free of any damage

Communication problems

1. Ensure that communication barriers are functional
2. Ensure the earth on the communication barrier is connected to a high quality earth
3. Ensure that the terminations are correct and secure
4. Ensure no damage on the cable
5. Determine if the gateway, where used, has its termination on or off, can be swapped to test.
6. A Ningi 485 Filter can be added to the gateway to clean up communication, termination on the gateway may need to be changed.
7. Ensure the Earth on the Ningi 485 Filter, where used, is connected to a high quality earth

WARRANTY

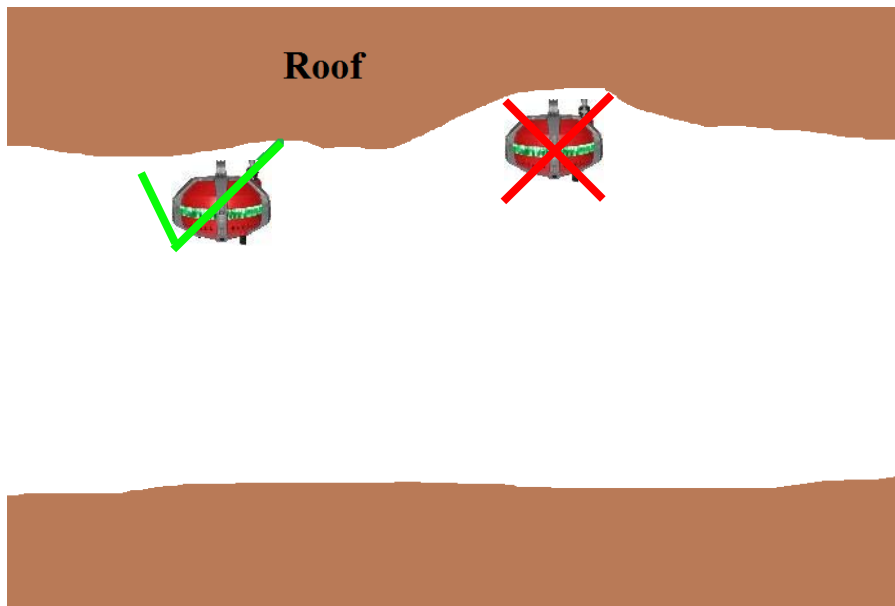
The S50 carries a one year limited warranty on all parts and labour.

BEST INSTALLATION PRACTICE

This section of the manual is intended as a **guideline only** for the installation of the S50 Smoke Sensor as shown in a typical underground operation.

This guideline does not supersede local authority or rules for your environment as installations are required to be approved by the authoritative person responsible for the ventilation/environmental monitoring where the device is to be located.

Figure 6 – A typical mine installation – Roof Position



The S50 should be installed as illustrated above, that it is correctly positioned from the roof in order to detect smoke and should not be hung in a roof cavity as this will cause inaccurate readings due to the improper flow of air.

SAFETY INFORMATION

(Refer to ELECTRICAL SPECIFICATIONS of this manual)

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

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