![MSA The Safety Company]

梅思安(中国)安全设备有限公司
MSA(CHINA) SAFETY EQUIPMENT CO.,LTD

DF-8500

气体探测器
Gas Detector

用户手册
User Manual

P/N:10147177 Rev.5
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1 安全规则

1.1 正确使用

　　DF-8500气体探测器是固定式气体探测器，用于检测有毒或氧气，适合任何室外和室内用途，如石油化工与天然气行业，煤化工行业，制药行业、化工行业等。探测器的信号可结合梅思安控制器（如 SUPREMA，Gasgard XL，9010/9020，8010/8020）一起使用。

　　使用本产品时必须阅读和遵守本操作手册，特别是安全说明、使用信息以及产品操作部分，必须仔细阅读和切实遵守。此外还需考虑用户所在国的国家安全使用法规。

⚠ **危 险**

　　• 本产品保护生命健康，使用、维护或保养不当可能影响设备功能，从而严重危及使用者人身安全。

　　• 使用本产品前必须验证产品的可操作性。如果产品未通过功能测试，或产品损坏，或某一部件的保养维修没有完成，或没有使用梅思安原厂的备件，则产品不能使用。

　　代替使用或使用超出本规范范围则属于违规操作，并且未经授权的擅自改装以及由梅思安或授权人以外进行的调试工作也属于违规操作。

1.2 责任

　　梅思安对产品不当使用或用于非既定用途所导致后果不负责，每个操作人员必须自行负责产品的选择和使用。

　　如产品的使用、维护或保养不遵循本手册说明，则梅思安提供的产品责任声明和质量保证等承诺无效。

1.3 需采取的安全预防措施

注 意

必须绝对遵守如下安全说明，只有这样才能保证操作人员的安全健康以及仪表的正常功能。

本手册中描述的设备必须严格按照其标签、警告、指示说明和规定限制范围安装、操作和保养。

— 本设备设计用于探测空气中的气体或蒸汽。

— 防止设备过度振动，严禁将传感器安装在阳光直射处，否则会导致传感器过热。

— 设备安装时必须确保传感器进口朝下，避免颗粒或液体堵塞气体进口。

— 电化学传感器是一个密封部件，内含腐蚀性电解液。如传感器出现泄漏，则必须立即将它从仪表上拆除，并妥善处理，要求谨慎操作，防止电解液接触皮肤、衣服或电路，否则可能导致人员烧伤或设备损坏。

— 可以用浓度已知的气体检查设备，这是唯一保证设备整体操作正确的方法，所以标定检查必须是系统常规检测的一部分。

— 与其他此型式的设备一样，曝露在高浓度或长期曝露在测试气氛所含的某些化合物下不会污染传感器。在设备可能曝露接触这些物质的环境下，必须经常校准设备，确保操作可靠，显示准确。

— 设备不得油漆。如果设备位置处有油漆作业，则必须谨慎操作，确保油漆不会积存在气体传感器进口内的隔爆片上，这些油漆积存物会干扰气体扩散过程。

— 按本手册规定程序进行保养时，只能使用梅思安原厂的替换部件。如不这样操作，可能严重损害仪表性能。设备维修或改装如超出保养范围，或由非梅思安授权维修人员执行维修或改装，则会导致产品无法达到设计性能。

— 设备设计用于大气条件下的危险区域。

— 传感器上积存过多灰尘会延长设备的响应时间，因此必须经常定期检查灰尘积存情况。

1.4 梅思安固定仪表质保

参照梅思安公司质量保证声明。

按照梅思安公司的要求，正确地安装、调试和使用本产品，梅思安公司将提供本产品在质保期的相关责任。梅思安公司不承担以下因素引起的产品质保责任：

1、由非梅思安公司人员或非经梅思安公司授权人员进行的标定、调试和维护等；

2、由于产品不正确地放置、使用、改装；

未经梅思安公司授权，任何人员对本产品所做的确认、陈述或保证，将视为无效条款。

梅思安公司对非自产部件或者附件不承担质保责任；梅思安公司保留将这些部件或者附件制造商提供的质保责任移交给相关采购方的权利。

2 概 述

2.1 装置识别

图 1 DF-8500气体探测器

2.2 概述

本探测器由工厂标定好，交付即可安装，每个设备仅针对某一特定气体或蒸汽进行配置和校准。当探测器在投入正常运行后，梅思安推荐**每两个月**进行一次标定。

设备包括：

– 一个气体传感器

– 一个四位数显示的15段的LED显示器

– 四个用于显示当前探测器状态的发光二极管

本设备的输出信号是（4~20）mA，防护等级是IP67（不包含传感器部分）。

图2 DF–8500探测器各部分说明

1 电源接线端口	7 绿色LED指示（正常）
2 4位15段LED显示器	8 传感器
3 红色LED指示（低报）	9 传感器锁紧装置
4 红色LED指示（高报）	10 铭牌
5 遥控信号接收头	11 盖子锁紧装置
6 黄色LED指示（故障）	

3 安 装

本探测器必须安装在预计会出现气体泄漏的地方。安装位置根据气体密度确定，如果探测气体的密度小于空气，则可以将设备安装在室内天花板下方；如果探测气体的密度大于空气，则可以将设备安装在靠近地面的地方。此外还必须考虑气流对设备探测气体能力的影响。安装还必须保证设备正面的显示屏清晰可辨，视线不得有阻挡。

注 意
安装开始前，对照装箱清单检查交付部件是否完整准确。

注 意
准备组装时，确保安装布局与设备相符。
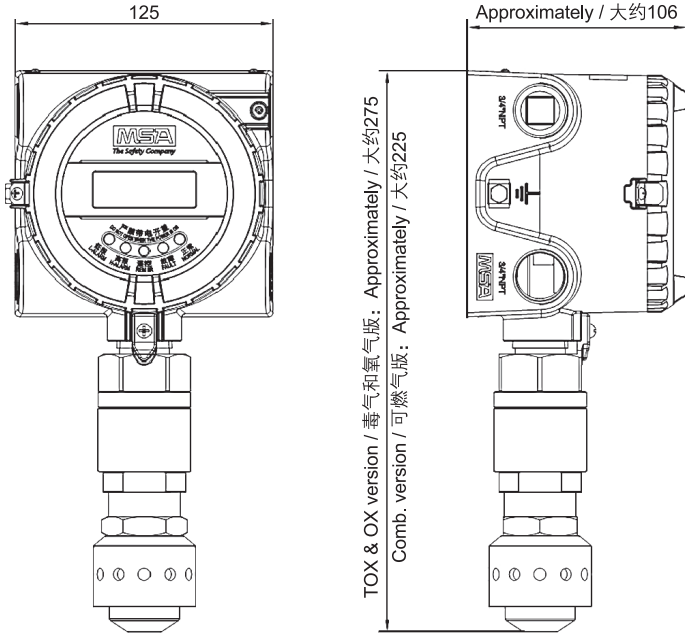

3.1 机械安装

3.1.1 外形尺寸示意图（单位：mm）

图3 DF−8500外形尺寸示意图

3.1.2 DF-8500安装示意图

Nut/螺母 M6

Washer/弹簧垫圈 6

Mounting plate/安装板

Clamp/卡箍 2″

DF-8500

Washer/弹簧垫圈6

Bolt/螺栓 M6×12

Pipe/管道2″
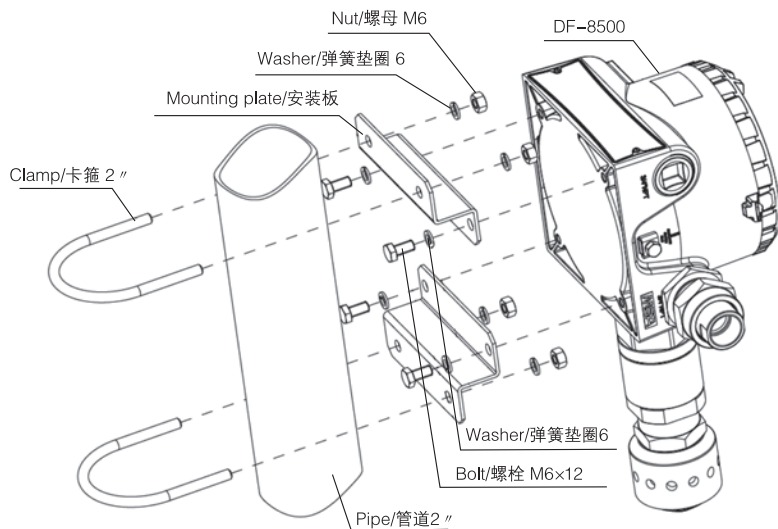
DF-8500 Mounting on Vertical pipe
DF-8500 竖直管安装

DF-8500

Nut/螺母 M6

Washer/弹簧垫圈 6

Mounting plate/安装板

Clamp/卡箍 2″

Pipe/管道2″

Washer/弹簧垫圈6

Bolt/螺栓 M6×12
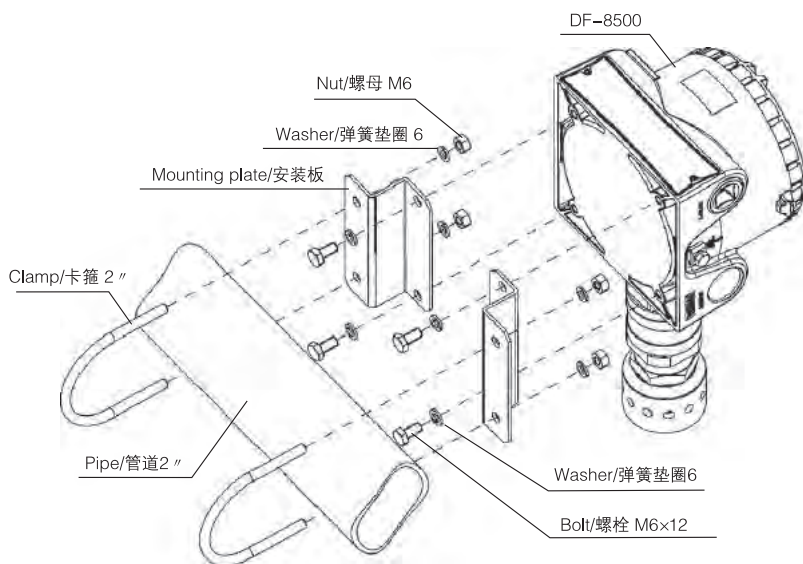
DF-8500 Mounting on horizontal pipe
DF-8500 水平管安装

图4 DF-8500安装示意图

3.1.2 DF−8500安装板示意图

图5 安装板示意图

3.2 电气安装

电气连接说明

ℹ️ **注 意**

探测器的安装必须符合适用的规章制度，否则无法保证其安全操作。

— **必须给探测器使用屏蔽电缆。如果不使用屏蔽电缆，将不能保证达到探测器设计的抗干扰性能。**

— 始终遵守最大电缆长度和横截面（见6.2节）。

— 水或杂质会通过电缆渗透进入探测器。在危险区域，建议将探测器入口前的那部分电缆绕成一个圈，或略微弯折电缆，防止水进入探测器。

ℹ️ **注 意**

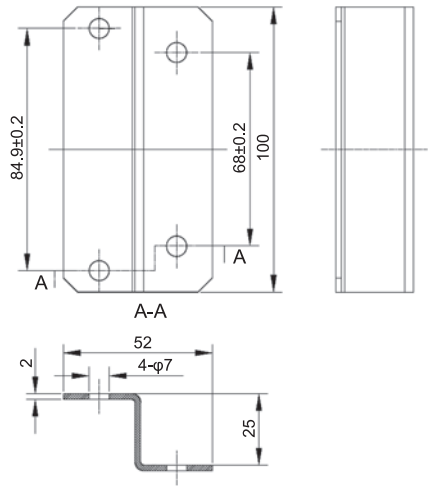电源是24V直流电。如果到达探测器接线端的输入电压小于11V，则设备自行断电。

电气连接请见下图及下表

DF-8500接线图（图中接线为低报警继电器配置为有源输出状态下）
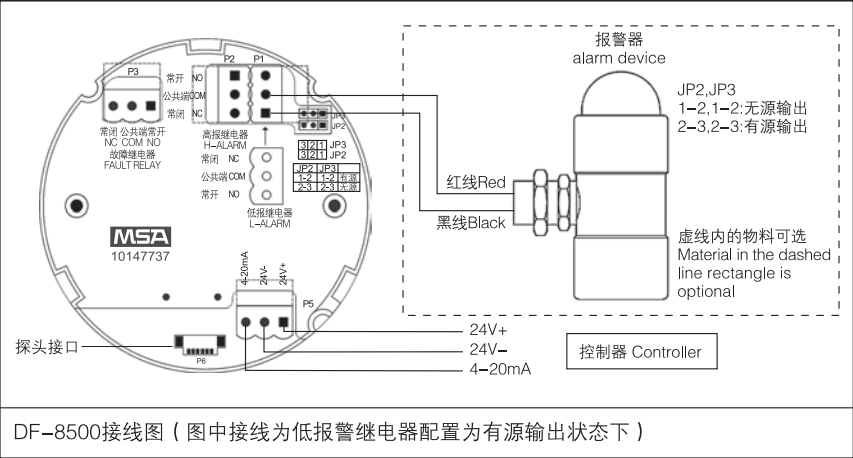
图6 DF-8500内部接线示意图

端子名	用途
24V +	接DC 24V+
24V −	接DC 24V−
4 − 20mA	仪表(4~20)mA输出端
NO	不通电常开端
COM	公共端
NC	不通电常闭端

表1 端子名称及相应的用途
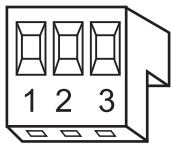
图7 DF-8500电源接线端

端子号	端子名
1	DC 24V+
2	DC 24V−
3	(4~20)mA信号
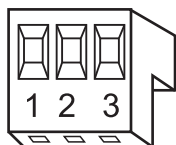
端子号	端子名
1	不通电常开端
2	公共端
3	不通电常闭端

图8 DF−8500继电器接线端
（适用于所有的继电器）

电源DC24V+
电源DC24V−
(4 ~ 20)mA信号
外壳接地
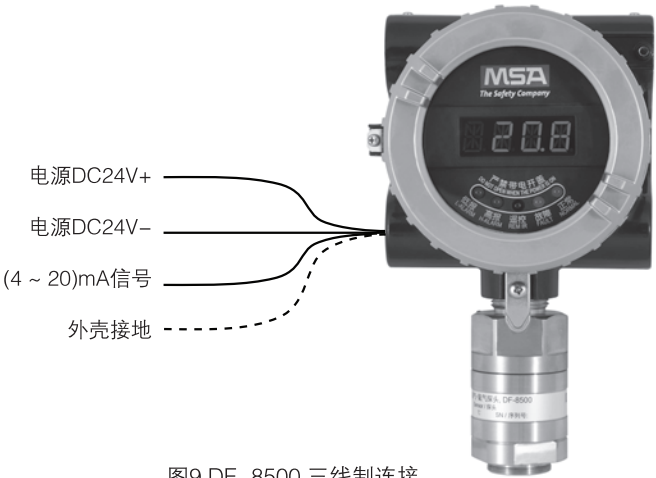
图9 DF−8500 三线制连接

（1）拧下探测器盖和壳体上的互锁装置。

（2）拧下外壳铝盖。

（3）用一只手抓住电子模块塑料壳的左右两个突起，将电子模块从外壳中拔出来。

（4）将连接电缆插入设备。

（5）连接电缆和接线端。

·对于电源和信号线，请使用3线屏蔽电缆。

·继电器用线无需使用屏蔽电缆。

（6）将接好线后的电子模块重新插入到外壳中。

（7）重新盖好外壳盖，固定互锁装置。

4 操 作

注 意

设备由工厂标定好，交付即可安装，每个设备仅针对某一特定气体进行配置和标定。

4.1 启动

在启动期间进行自检，并将输出信号设定为工作电流（默认：4.0mA），显示出如下信息：

・显示测试

上电后，显示屏上所有段亮，LED指示灯会按照绿 -> 红 -> 红 -> 黄的次序逐个点亮，全部点亮完毕后绿色LED开始闪烁，表示进入启动状态。

・软件版本

显示屏显示固件版本。

・传感器类型

显示屏显示不同类型的传感器的配置信息，如CO和H_2S等等。

・量程

显示屏显示预先设定的气体传感器量程，如1000表示1000μmol/mol等等。

・报警上下限

显示屏显示预先设定的报警动作值，如100和300分别表示100μmol/mol和300μmol/mol等等。

・倒数记时

显示传感器稳定性的倒数记时。

・正常操作

倒数记时后，显示气体浓度。

注：1μmol/mol = 1ppm

4.2 菜单顺序

4.2.1 遥控器功能描述
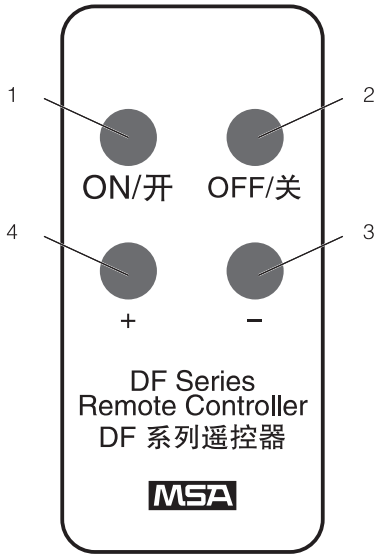
序号	键名	作用
1	ON/开	进入某个菜单项/保存
2	OFF/关	退出/放弃修改
3	━	下翻菜单项/减少数值
4	+	上翻菜单项/增加数值

图10 遥控器功能描述

4.2.2 菜单顺序

菜单项目	文本信息	是否需要密码
M-00	报警(继电器)复位	需要
M-01	零点标定	不需要
M-02	增益标定	不需要
M-03	探测器的参数查看	不需要
M-04	标定参数的设置	需要
M-05	传感器更换	需要
M-06	LED测试	不需要
M-07	回路测试	不需要
M-09	传感器信息显示	不需要
M-10	继电器参数设置	需要
M-11	继电器测试	需要
M-13	手动零点标定	不需要
M-14	手动增益标定	不需要

表2 DF-8500菜单项

[M-00] -- 报警（继电器）复位

本菜单用于重设探测器的报警。仅当继电器被设定为锁定时，本菜单才会显示。

（1）按"+"键，选择菜单M-00。

（2）按"ON/开"键，此时出现密码输入菜单。

（3）输入密码（见4.4节）。

（4）若输入的密码正确，并且当前的报警条件已经不存在了，则锁定的报警被复位。

[M-01] -- 零点标定

（1）按"+"键，选择菜单M-01。

（2）按"ON/开"键后，显示倒计时时间，默认为30秒。

（3）通入零点气。

（4）再次按"ON/开"键后，开始倒计时。

（5）等待倒记计时结束后，屏幕闪烁显示当前的零点值(注：此零点值的显示不一定为0)。

（6）零点标定通过后，闪烁显示三下"OK"。

（7）返回到测量模式下运行。

注 意

对于氧气，硫化氢和一氧化碳等常规气体，请确保在探测器上电一小时以后再进行零点标定，对于环氧乙烷，甲醇，氯乙烯等稀有气体，此时间需要加大到二十四小时。

[M-02] -- 增益标定

1）按"+"键，选择菜单M-02。

（2）按"ON/开"键后，显示倒计时时间，对于常规气体，默认为30秒；对于环氧乙烷(ETO)，氯乙烯(VCM)和甲醇(Methanol)气体，默认为180秒。

（3）通入标定气。

（4）再次按"ON/开"键后，开始倒计时。

（5）等待倒记计时结束后，屏幕闪烁显示当前测量到的浓度。

（6）增益标定通过后，闪烁显示三下"OK"。

（7）然后开始下一个倒计时，在此倒记计时过程中可以停止或者不停止供应测试气体。

（8）倒计时结束后返回到测量模式下运行。

注 意

对于氧气，硫化氢和一氧化碳等常规气体，请确保在探测器上电一小时以后再进行增益标定，对于环氧乙烷，甲醇，氯乙烯等稀有气体，此时间需要加大到二十四小时。

[M-03] -- 探测器的参数查看

在此菜单上显示设备信息，包括气体类型、量程和固件版本。

（1）按"+"键，选择菜单M-03。

（2）按"ON/开"键，则滚动显示"参数名= 参数值"，表示现在显示的参数的名称和内容，有多个参数可以显示。在此子菜单上用"+"或"-"键可以选择要查看的的参数（TEST GAS=⋯, SENSOR USED DAYS=⋯, GAS=⋯）。

子菜单	参数含义
TEST GAS=	标定气浓度
SENSOR USED DAYS=	传感器已经使用时间显示，单位为天
GAS=	当前配置的气体类型
RANGE=	量程
VER=	固件版本

[M-04] -- 标定参数的设置

本菜单用于设定仪表工作和标定过程中需要用到的一些参数。

（1）按"+"键，选择菜单 M-04。

（2）按"ON/ 开"键，此时出现密码输入菜单。

（3）输入密码（见 4.4 节）。

（4）若密码输入正确，则进入下一层子菜单，有多个参数可以设置，进入下一层子菜单时菜单滚动显示"参数名 = 参数值"，表示现在设置的参数的名称和内容，有多个参数可以设置。在此子菜单上用"+"或"-"键可以选择要更改的参数（TEST GAS =⋯, CURRENT OFFSET =⋯）。

（5）当定位到需要更改的参数时，按"ON/ 开"键则参数闪烁显示进入编辑状态。

（6）进行参数更改（见下表）。

（7）参数更改完毕后，可以按"+"或"-"键继续进行其他参数的更改，或者按"OFF/ 关"键返回上一层菜单 M-04。

子菜单	参数含义	默认值	可调范围
TEST GAS=	标定气浓度设定		
CURRENT OFFSET=	（4 ~ 20）mA 输出微调	120	90 ~ 150
ALARM_L=	低报警点设置	10%量程(氧气25% 量程 19.5%)	(5% ~ 99%)量程, 且必须小于高报警点
ALARM_H=	高报警点设置	30%量程(氧气25% 量程 23.0%)	(5% ~ 99%)量程, 且必须大于低报警点
ZERO TIME=	零点标定倒计时(秒)	30	10 ~ 99
SPAN TIME=	增益标定倒计时(秒)	30	10 ~ 900
IDLE TIME=	增益标定完后的 倒计时(秒)	30	10 ~ 99
4-20MA OUTPUT MODE	增益标定时电流 输出模式	FLOT	4mA：标定时输出 电流固定为4mA FLOT：标定时输出 电流跟随显示浓度 变化
FACTORY DEFAULT=	恢复工厂默认设置	0	1: 恢复工厂默认设置

注："FACTORY DEFAULT"菜单项平时显示为 0，当设成 1 后，则仪表自动重新启动，并且显示"BOOT"，此时所有的参数都恢复为工厂默认设置，需要重新进行气体类型设定，零点标定和增益标定等等。

[M-05] -- 传感器更换

对于毒气探测器，通过本菜单在上电状态下更换传感器，同时重设传感器使用时间（天数）计数器。

（1）按"+"键，选择菜单 M-05。

（2）按"ON/ 开"键，此时出现密码输入菜单。

（3）输入密码（见 4.4 节）。

（4）若密码输入正确，则进入下一层子菜单，同时从 900 秒（共计 15 分钟）开始倒计时，表示在此时间内更换传感器将不会引起报警，再次按下"ON/ 开"键则传感器工作时间被清零，倒计时中断后返回浓度测量界面；按"OFF/ 关"键中断倒计时，并清除探头使用时间，返回 M-05 菜单项。

（5）按"OFF/ 关"则返回上一层菜单 M-05。

注意：对于环氧乙烷 (ETO)，氯乙烯 (VCM) 和甲醇 (Methanol) 传感器，由于其预热时间比较长（24 小时），所以在更换传感器后的 24 小时左右内，会出现超量报警，这个属于正常情况。

[M-06] -- LED 测试

LED 测试。显示数码管的所有区段，LED 也闪烁。

（1）按"+"键，选择菜单 M-06。

（2）按"ON/ 开"键，此时闪烁显示"OFF"。

（3）按"+"键，则数码管的所有笔端和 LED 发光二极管被全部点亮。

（4）按"OFF/ 关"键退出菜单 M-06。

[M-07] -- 回路测试

在此菜单上可以执行 (4 ~ 20)mA 回路测试。

（1）按"+"键，选择菜单 M-07。

（2）按"ON/ 开"键，则显示 04 表示初始电流为 4mA。

（3）再次按"ON/ 开"键则 04 开始闪烁显示，表示此时已经进入了回路测试阶段，同时此时回路的输出电流为 4mA。

（4）按"+"或者"-"键更改，此时闪烁值也跟着改变，同时输出电流也跟着改变。

（5）按"OFF/ 关"键则退出回路测试状态，同时显示变成 04。

（6）按"ON/ 开"键可以继续进行回路测试，或"OFF/ 关"键返回上一层菜单 M-07。

[M-09] -- 传感器信息显示

本菜单显示一些与传感器有关的信息，通过这个可以对传感器的工作状态进行初步的判断。

（1）按"+"键，选择菜单 M-09。

（2）按"ON/ 开"键，则滚动显示"参数名 = 参数值"，在此子菜单上用"+"或 "-"键可以选择要查看的参数（TEMP =…, CURRENT =…, S+=… ）。

子菜单	参数含义
TEMP=	当前探测器所处环境温度显示
CURRENT=	输出的（4 ~ 20）mA电流显示
SIGNAL=	传感器输出信号显示（对于CO，H_2S，此信号约为1V左右； 对于O_2，此信号约为1.5V左右； 对于ETO，VCM，CH_3OH，此信号约为1.3V左右； 以上均指在洁净空气中)
V_REF=	参考电压信号显示，1V左右
VCC=	24V电压值
VDD=	5V电压值

[M-10] -- 继电器参数设置

本菜单项用来对探测器的继电器的动作进行设置。

（1）按"+"键，选择菜单 M-10。

（2）按"ON/ 开"键，此时出现密码输入菜单。

（3）输入密码（见 4.4 节）。

（4）若密码输入正确，则进入下一层子菜单，有多个参数可以设置，第一次进入下一层子菜单时菜单滚动显示"参数名 = 参数值"。在此子菜单上用"+"或"-"键可以选择要更改的参数（L_ALARM DIR = … , H_ALARM DIR = … , ALARM RELAY =…）。

（5）当定位到需要更改的参数时，按"ON/ 开"键则参数闪烁显示进入编辑状态。

（6）进行参数更改（见 4.6 节）。

（7）参数更改完毕后，可以按"+"或"-"键继续进行其他参数的更改，或者按"OFF/ 关"键返回上一层菜单 M-10。

子菜单	参数含义
L_ALARM DIR=	低报警继电器报警方向
H_ALARM DIR=	高报警继电器报警方向
ALARM RELAY=	报警继电器激励、非激励
ALARM RELAY=	报警继电器自锁、非自锁
FAULT RELAY=	故障继电器激励、非激励

[M-11] -- 继电器测试

本菜单项用来对探测器的继电器的动作进行测试，这样的话方便在现场进行联动测试。

（1）按"+"键，选择菜单 M-11。

（2）按"ON/ 开"键，此时出现密码输入菜单。

（3）输入密码（见 4.4 节）。

（4）若密码输入正确，则进入 M-11 的下一层菜单，此时闪烁显示"OFF"，此时按"+"键的话，则继电器的状态取反，即原来闭合的现在断开，原来断开的则现在闭合。继续按"+"键的话，则状态继续取反。测试完毕后按"ON/ 开"或者"OFF/ 关"键，则继电器恢复原来的状态，同时返回到 M-11 菜单。

[M-13] —— 手动零点标定

本菜单用于对探测器的零点进行手动标定。注：请尽量利用 M-01 进行自动零点标定，仅在现场由于风速过大或者其他因素导致气体流量不稳定，从而不能利用 M-01 完成自动零点标定时才使用 M-13 手动完成零点标定。

（1）按"+"键，选择菜单 M-13。

（2）按"ON/ 开"键，此时出现密码输入菜单。

（3）输入密码（见 4.4 节）。

（4）若密码输入正确，则进入 M-13 的下一层菜单，此时会闪烁显示"0"，表示此时准备进行手动零点标定工作，按"OFF/ 关"键则取消手动零点标定工作返回菜单项 M-13；按"开 /ON"键则完成零点标定工作，并且自动返回到测量模式，此时可以看到浓度显示已经为 0。

注意：对于氧气，硫化氢和一氧化碳等常规气体，请确保在探测器上电一小时以后再进行零点标定，对于环氧乙烷，甲醇，氯乙烯等稀有气体，此时间需要加大到二十四小时。

[M-14] —— 手动增益标定

本菜单用于对探测器的增益进行手动标定。注：请尽量利用 M-02 进行自动增益标定，仅在现场由于风速过大或者其他因素导致气体流量不稳定，从而不能利用 M-02 完成自动增益标定时才使用 M-14 手动完成增益标定。

（1）通入 M-03 中显示的浓度的增益气体一分钟之后。

（2）按"+"键，选择菜单 M-14。

（3）按"ON/ 开"键，此时出现密码输入菜单。

（4）输入密码（见 4.4 节）。

（5）若密码输入正确，则进入 M-14 的下一层菜单，此时会闪烁显示 M-03 中显示的浓度，表示此时准备进行手动增益标定工作，按"OFF/ 关"键则取消手动增益标定工作返回菜单项 M-14；按"开 /ON"键则完成增益标定工作，并且自动返回到测量模式，此时可以看到浓度显示已经为 M-03 中指定的浓度。

（6）拿掉增益标定气体。

注意：对于氧气，硫化氢和一氧化碳等常规气体，请确保在探测器上电一小时以后再进行增益标定，对于环氧乙烷，甲醇，氯乙烯等稀有气体，此时间需要加大到二十四小时。

4.3 标 定

概 述

为确保产品的性能稳定，梅思安推荐用户每两个月进行一次标定，标定流量为0.25升/分，并且标定应该采用梅思安规定的标定帽。长期不进行标定或者使用不正确的标定流量及不正确的标定帽会对产品的性能造成不良影响。

尽管设备出厂前已经标定，但是仍然建议安装后进行二次标定。传感器的使用期和化学曝露度决定标定操作的频率。

注 意
调试时必须标定设备，之后也应定期标定，保证传感器的最佳操作。

注 意
推荐标定前连接所有标定部件，以便在倒记时期间向设备输入标定气体。

等待标定气体

一旦标定开始就必须提供标定气体（零点或增益气体），标定结束前不得中断供气。

标定步骤

调零操作请参照4.2.2的M-01； 增益标定操作请参照4.2.2的M-02。

注 意
按"OFF/ 关"键随时可以退出标定程序，退出后设备仍使用探测器上一次的标定结果。

4.4 密码

用一个4位数的密码锁定某些只能由具备资质的授权人修改的菜单。

注 意

默认密码是0000。

进入密码菜单后，从左到右设置数值，闪烁位表示正在编辑的位。

（1）按"+"或"-"键，修改数值。

（2）按"ON/开"键，进入下一个数字位（千位->百位->十位->个位）。

（3）4个数字全部输入后，密码生效。

4.5 可修改参数

仪表可修改参数

参数	默认值	最小值	最大值
跨度/测试气体值	氧气，25%量程：20.8%Vol/Vol	5%Vol/Vol	<23%Vol/Vol
	其他气体：40% ~ 60%满量程，优先使用50%量程的		
零点标定时间	30秒	10秒	99秒
跨度标定时间	30秒	10秒	900秒
标定后空闲时间	30秒	10秒	99秒
量程	见6.4中的可检气体及量程列表		
回路测试	4mA	4mA	22mA

继电器可修改参数

参数	默认值	最小值	最大值
报警限制值	**毒气：**	5%量程	99%量程
	低报：10%满量程		
	高报：30%满量程		
	氧气（25.0%量程）：		
	低报：19.5%V/V		
	高报：23.0%V/V		
	氧气（10.0%量程）：		
	低报：1.0%V/V		
	高报：3.0%V/V		
报警时才激励报警继电器	是	是	否
锁定报警	否	是	否
报警方向	**毒气：**	可更改	
	低报：向上		
	高报：向上		
	氧气：		
	低报：向下		
	高报：向上		

5 维护保养

5.1 传感器更换

⚠️ **危 险**

仔细拆下再重新装上传感器，确保不造成部件损坏；否则会对设备准确性造成不利影响，产生错误读数，并造成严重人员伤亡。

ℹ️ **注 意**

进行传感器更换时，请用M-05重新设定传感器使用寿命计数器。

6 技术数据

6.1 探测器主要技术参数

外壳	铝制外壳 隔爆 防护等级：IP 67(不包含传感器部分)
尺寸，毫米（高×宽×深）	约275X125X106
防爆标志	Ex d IIC T6 Gb；DIP A21 TA T6
重量	2公斤
湿度	15%至95%相对湿度，非凝露
电源	(21.0~28.0)V
功率消耗	1.5W(不含声光报警器)
温度范围（仪表） 温度范围（传感器）	(−40~+70)℃ 见传感器标签
信号输出 继电器	(4~20)mA 可选
压力	(80~120)千帕
最大负载电阻	300欧姆
空气流速	(0~6)米/秒
继电器触点容量	DC 30V, 2A

6.2 电缆长度和横截面

毒性气体传感器，(4 ~ 20)毫安的信号输出

电源	24V 直流	
配置	不带继电器	带继电器
横截面积1.0mm^2	3000米	1500米
横截面积1.5 mm^2	4000米	2000米
信号输出的最大负载电阻	300欧姆	

6.3 主要性能规格

气体类型	预热时间	存储温度
氧气/硫化氢/一氧化碳	1小时	(0~+50)℃
环氧乙烷（ETO）	24小时	(0~+50)℃
甲醇（CH$_3$OH）	24小时	(0~+50)℃
氯乙烯（VCM）	24小时	(0~+50)℃

测量对象	检测误差	响应时间 (T90)	重复性误差
氧气（O$_2$）	±0.5% Vol/Vol	≤20s	≤1%
一氧化碳（CO）	±10%(显示值)/ ±5μmol/mol	≤15s	≤2%
硫化氢（H$_2$S）	±5% F.S	≤25s	≤2%
环氧乙烷（ETO）	±10% F.S	≤120s	≤5%
甲醇（CH$_3$OH）	±10% F.S	≤120s	≤5%
氯乙烯（VCM）	±10% F.S	≤120s	≤5%

气体类型	SPAN时间(秒)
氧气（O$_2$）	30
一氧化碳（CO）	30
硫化氢（H$_2$S）	30
环氧乙烷（ETO）	180
氯乙烯（VCM）	180
甲醇（CH$_3$OH）	300

6.4 可检测气体及量程列表

气体	默认范围	可选范围	温度范围
氧气（O₂）		10%Vol/Vol. 25%Vol/Vol.	(−20~50)℃
一氧化碳（CO）		100μmol / mol 200μmol / mol 500μmol / mol 1000μmol / mol 2000μmol / mol	(−40~55)℃
硫化氢（H₂S）		10.0μmol / mol 20.0μmol / mol 50μmol / mol 100μmol / mol	(−20~50)℃
环氧乙烷（ETO）		10.0μmol / mol 30.0μmol / mol	(−20~50)℃
甲醇（CH₃OH）		50μmol / mol 100μmol / mol	(−20~50)℃
氯乙烯（VCM）		50μmol / mol 100μmol / mol	(−20~50)℃

注：1μmol / mol = 1ppm

6.5 传感器对干扰的反应

注 意

传感器类型和使用寿命不同，其干扰因子也各不相同。
梅思安不建议客户使用干扰气体进行标定。
本表格有可能不完整。传感器还有可能对其他气体敏感。

DF-8500 氧气探头使用注意事项：

中毒：

　　DF-8500 所使用的氧气，一氧化碳和硫化氢探头是被设计成可以在很广泛的环境和严酷的条件下使用的，但是要注意的是不管是保存，还是装在仪表中使用，都要避免将探头暴露在高浓度的溶剂蒸汽中。

交叉灵敏度：

氧气传感器的交叉灵敏度：

　　在阈限值（TLV）值以下的毒气对氧气传感器没有交叉灵敏度，但是高浓度（比如超过 1%），强氧化性的气体（比如臭氧和氯气）会影响到氧当量，但是其他大部分常见的气体没有影响。

DF-8500 硫化氢传感器的交叉灵敏度表：

气体	使用浓度值	读数
一氧化碳	100	<2
二氧化硫	2	0
二氧化氮	3	0
一氧化氮	25	0
氯气	0.5	0
乙烯	100	0
二氧化碳	5000	0
氨气	50	0

DF-8500一氧化碳传感器的交叉灵敏度表：

气体	使用浓度值	读数
乙炔	100	88
乙烯	100	97
氢气	100	<28
一氧化氮	48.6	14
二氧化氮	19.5	<0.5
氯气	13.7	<0.5
乙醇	200	0
硫化氢	50	0
二氧化硫	20	0
氨气	20	0

注意：酸性气体比如二氧化碳和二氧化硫，会被氧气传感器的电解液所吸收而且有助于增加流向电极的氧气的含量，这样相当于增加了氧气的含量，每1%的二氧化碳大概增加0.3%的显示量。DF-8500使用的氧气探头不适合用在二氧化碳浓度连续超过25%的场合。

DF-8500 环氧乙烷、氯乙烯和甲醇传感器使用注意事项：

1）标定时必须采用聚四氟乙烯（特氟龙）软管，管子尽可能的短，防止对气体的吸附。

2）标定阀必须采用不锈钢材质的，防止对气体的吸附。

3）标定用的软管必须是干燥的，不能是潮湿的，防止水分对气体的吸附。

4） 初次开始标定时，必须通电 24 小时以等待传感器稳定，若传感器没有稳定就开始标定，则标定后显示浓度会出现负漂。

5） 增益的标定时间，环氧乙烷和氯乙烯气体的默认值为 180 秒，甲醇气体默认值为 300 秒，若减小增益标定的时间，则由于标定时气体浓度还不太稳定，所以会导致标定不准确。

注 意

电化学传感器只能在立即更换时订购。储存温度范围为(20 ± 5)℃。
请按照专业要求对电化学传感器进行处理。

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7 附 件

DF−8500包装内包含防雨罩，安装板，卡箍，螺钉和垫圈，CD和快速指南等标准的用于安装的附件。

7.1 传感器防雨罩

任何时间传感器防雨罩都必须盖上，除非使用气流适配器或导管安装组件。周围的环境会影响传感器防雨罩内部的气体混合物。传感器防雨罩仅用于功能测试。推荐使用标定帽来进行传感器标定。

8 备件

DF-8500替换备件表

备件名	部件号
电子类	
电子模块,SP,DF-8500,毒气,继电器	10147143-SP
电子模块,SP,DF-8500,氧气,继电器	10147143-SP1
电子模块,SP,DF-8500,毒气,不带继电器	10154664-SP
电子模块,SP,DF-8500,氧气,不带继电器	10154664-SP1
DF 系列遥控器	3450154
机械类	
探头导体,备件,DF-8500,氧气	10146990-SP
探头导体,备件,DF-8500,毒气	10146989-SP
毒气300探头导体,备件,环氧乙烷,DF-8500	10160403-SP
毒气300探头导体,备件,甲醇,氯乙烯,DF-8500	10161697-SP
PCBA外壳,备件,DF-8500,毒气	10145768-SP1
PCBA外壳,备件,DF-8500,氧气	10145768-SP2
安装组件,备件,DF-8500	10147141-SP
标定帽	3450792
探头类	
探头,备件,DF-8500,一氧化碳，2000 μmol / mol	10152366-SP
探头,备件,DF-8500,硫化氢，100 μmol / mol	10152365-SP
探头,备件,DF-8500,氧气，25% VOL.	10152364-SP
探头,备件,DF-8500,环氧乙烷，30.0 μmol / mol	10160486-SP
探头,备件,DF-8500,氯乙烯，100 μmol / mol	10161341
探头,备件,DF-8500,甲醇，100 μmol / mol	10161342

9 附 录

9.1 输出状态

数码管显示	LED颜色	状态	信号电流
数字	绿色或红色	正常或报警	(4~20)mA
	绿色（闪动）	启动	4mA
	绿色（闪动）	标定	4mA或跟随
E-XX	黄色	故障	2mA
HI↑	黄色	超过100%量程	20.5mA
BOOT	黄色	仪表没有被配置	0mA
− 0	绿色	负漂	3.2mA

9.2 故障代码

E-28 若检测到故障，会显示代码 E，以及数字代码和简短描述。
在这种情况下，装置的正常操作模式不会对气体起反应，且输出信号电流为故障值（默认为 2mA）。

故障代码	含义	可能原因	采取对策
BOOT	探测器气体类型没有被配置	线路板是全新的	配置气体类型
E-28	没有检测到传感器	1)主板损坏 2)传感器损坏 3)没有连接传感器	1)更换新的主板 2)更换新的传感器 3)重新连接传感器
E-32	温度传感器出错	1)主板损坏 2)探头转接头损坏	2)更换主板 1)更换探头转接头
E-20	零点标定超时	零点气流量不稳定	稳定零点气流量
E-21	增益标定超时	增益气流量不稳定	稳定增益气流量
E-33	毒气传感器参考电压不在范围内	主板损坏	更换主板

若显示出错代码，装置不可能进行正常运作。若重启后仍然显示出错代码，则该装置为故障设备。

9.3 超时

自动标定有4分钟的超时时间，即4分钟内不能完成自动标定时则显示出错代码。在其他界面上并且不按任何按钮超过8分钟的情况下，菜单自动返回浓度测量模式。

9.4 接线图（以可燃气探测器为例）
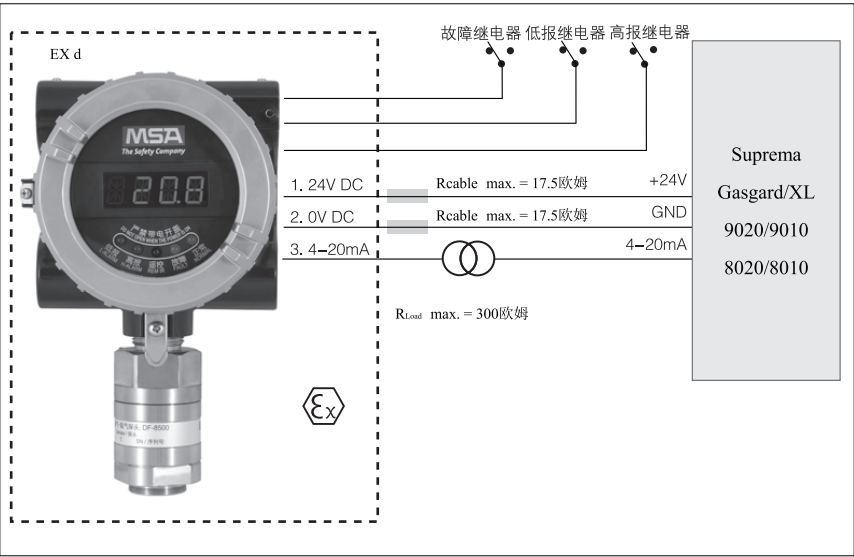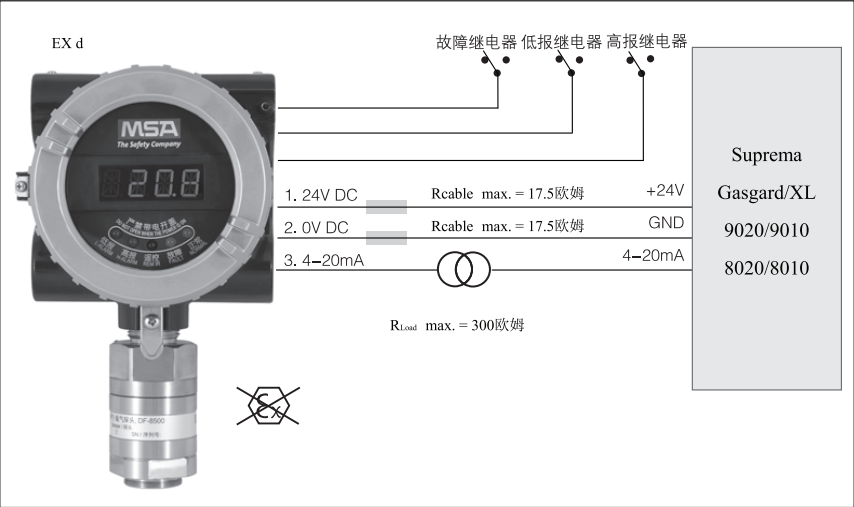
部件名称	有 害 物 质					
	铅 （Pb）	汞 （Hg）	镉 （Cd）	六价铬 ［Cr（Ⅵ）］	多溴联苯 （PBB）	多溴二苯醚 （PBDE）
DF−8500 气体探测器	×	○	○	○	○	○

本表格依据SJ/T 11364的规定编制。

○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量
要求以下。

×：表示该有害物质至少在该部件的某一均质材料中的含量超出GB/T 26572规定
的限量要求。

Contents

1. Safety Regulations

1.1. Correct Use

DF-8500 Gas Transmitters are fixed gas transmitters for measuring toxic gases or oxygen. They are suitable for outdoor and indoor applications without limitations, e.g. petrochemical and gas industry, coal chemical industry, pharmaceutical industry and chemical industry. The signal of the transmitter can be used in combination with MSA control units, e. g. MSA SUPREMA, Gasgard XL, 9010/9020 and 8010/8020.

It is imperative that this operating manual be read and observed when using the product. In particular, the safety instructions, as well as the information for the use and operation of the product, must be carefully read and observed. Furthermore, the national regulations applicable in the user's country must be taken into account for a safe use.

⚠️ **Danger !**

- This product is supporting life and health. Inappropriate use, maintenance or servicing may affect the function of the device and thereby seriously compromise the user's life.
- Before use the product operability must be verified. The product must not be used if the function test is unsuccessful, it is damaged, a competent servicing/maintenance has not been made for certain component, genuine MSA spare parts have not been used.

Alternative use, or use outside this specification will be considered as noncompliance. This also applies especially to unauthorised alterations to the product and to commissioning work that has not been carried out by MSA or authorized persons.

1.2. Liability Information

MSA accepts no liability in cases where the product has been used inappropriately or not as intended. The selection and use of the product are the exclusive responsibility of the individual operator.

Product liability claims, warranties also as guarantees made by MSA with respect to the product are voided, if it is not used.

1.3. Safety and Precautionary Measures to be Adopted

⚠️ **Attention!**
The following safety instructions must be observed absolutely. Only in this way can the safety and health of the individual operators, and the correct functioning of the instrument, be guaranteed.

- The device described in this manual must be installed, operated, and maintained in strict accordance with their labels, cautions, instructions, and within the limitations stated.
- The device is designed to detect gases or vapours in air.
- Protect the device from extreme vibration. Do not mount the sensing head in direct sunlight as this may cause overheating of the sensor.
- The device must be installed with the sensor inlet pointing downwards to avoid clogging of the gas inlet by particles or liquids.
- Electrochemical sensors are sealed units which contain a corrosive electrolyte. Should a sensor develop leakage, it must be immediately removed from service and disposed of properly. Caution must be exercised so that the electrolyte does not contact skin, clothing or circuitry otherwise personal injury (burns) and/or equipment damage may result.
- The only absolute method to ensure proper overall operation of the device is to check it with a known concentration of the gas for which it has been calibrated. Consequently, calibration checks must be included as part of the routine inspection of the system.
- As with all devices of these types, high levels of, or long exposure to, certain compounds in the tested atmosphere could contaminate the sensor. In atmospheres where the device may be exposed to such materials, calibration must be performed frequently to ensure that the operation is dependable and display indications are accurate.
- The device must not be painted. If painting is done in an area where a device is located, care must be exercised to ensure that paint is not deposited on the sintered metal flashback arrestor in the gas sensor inlet, if so equipped. Such paint deposits would interfere with the gas diffusion process.
- Use only genuine MSA replacement parts when performing any maintenance procedures provided in this manual. Failure to do so may seriously impair instrument performance. Repair or alteration of the device, beyond the scope of these maintenance instructions or by anyone other than an authorised MSA service personnel, could cause the product to fail to perform as designed.
- The device is designed for applications in hazardous areas under atmospheric conditions.

- The response time of the device will be increased by the significant dust deposits on the sensor. Inspections for dust deposits must be done at regular intervals.

1.4. MSA Permanent Instrument Warranty

Please refer to MSA quality assurance statement. MSA will bear the relevant responsibilities for this product during the warranty period provided the product is properly installed, debugged, and used in accordance with MSA's requirements. MSA shall be released from all obligations under this warranty in the events:

1. Calibration, debugging, maintenance, etc., are performed by persons other than personnel from MSA or authorized by MSA;

2. The product is inappropriately placed, utilized, or modified;

Without explicit authorization by MSA, any affirmation, representation or warranty concerning this product made by any personnel is invalid.

MSA makes no warranty concerning components or accessories not manufactured by MSA. MSA reserves the right to pass onto the Purchaser.

2. Description

2.1. Identifying the Unit

Fig.1 DF-8500 Gas Detector

2.2. Overview

The device is factory-calibrated and delivered ready for installation. After the transmitter is put into normal operation, it is recommended by MSA to perform calibration once every two months.

The device has:

- A gas sensor
- a four digit 15-segment LED display
- four LEDs for displaying the current status of the transmitter.

The device operates with a (4~20) mA output signal and an IP 67 ingress protection (the sensor part is not included).

Fig.2 Description of the Various Part of DF-8500 Transmitter

1 Terminal for power connection 15-segment LED display
2 4-digit 15-segment LED display
3 Red LED Indicator (low alarm point)
4 Red LED Indicator (high alarm point)
5 Receiver of remote control
6 Yellow LED indicator (fault)

7 Green LED Indicator (normal)
8 Sensor
9 Locking device of sensor
10 Identification plate
11 Locking device of lid

3. Installation

The device should be installed where gas leaks are expected. The installation position depends on the gas density, either in the upper area of the room under the ceiling for gases lighter than air or closer to the ground for gases heavier than air. Also consider how air movement may affect the ability of the device to detect as. The display on the front of the instrument must always be clearly visible, and he view must not be obstructed.

ℹ	Before beginning the installation, check that the delivered components are complete and correct, referring to the shipping documents and the sticker on the shipment carton.

ℹ	When preparing the assembly, make sure that the mounting arrangement is correct for the particular device.

3.1. Mechanical Installation

3.1.1 Dimensions Diagram(Unit: mm)
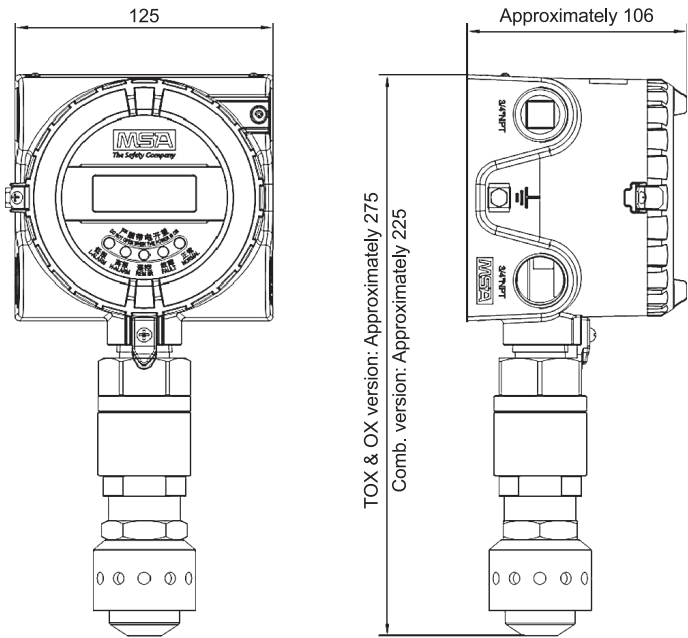
Fig.3 DF-8500 Dimension Diagram

3.1.2 DF-8500 Installation Diagram

Nut M6
Washer 6
Mounting plate
Clamp 2 ″
DF-8500
Washer 6
Bolt M6×12
Pipe 2 ″

DF-8500 Mounting on Vertical pipe

DF-8500
Nut M6
Washer 6
Mounting plate
Clamp 2 ″
Pipe 2 ″
Washer 6
Bolt M6×12
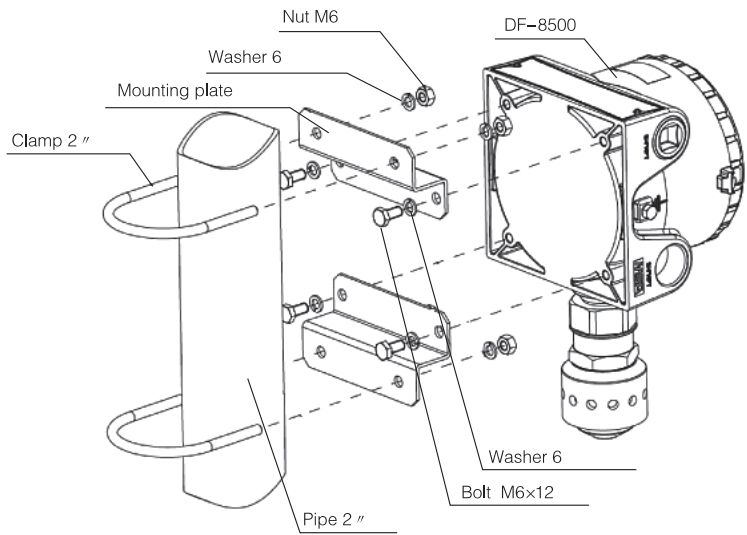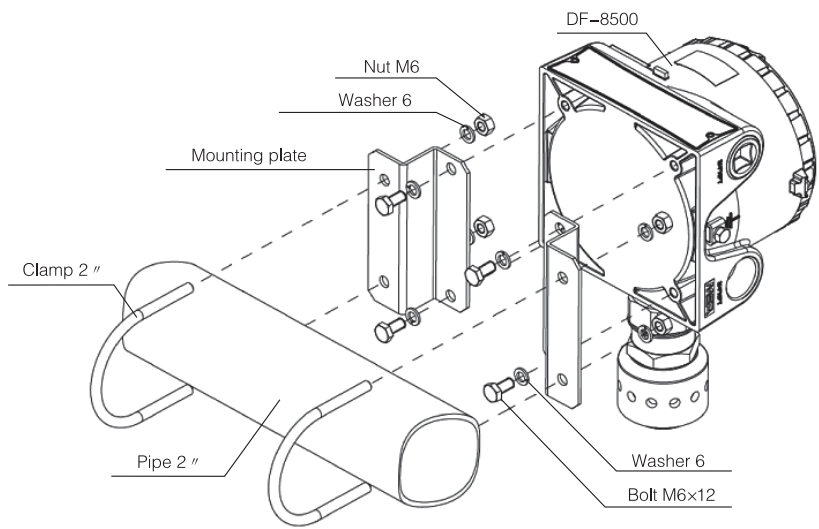
DF-8500 Mounting on horizontal pipe

Fig.4 DF-8500 Installation Diagram

3.1.3 DF-8500 Mounting Plate Diagram
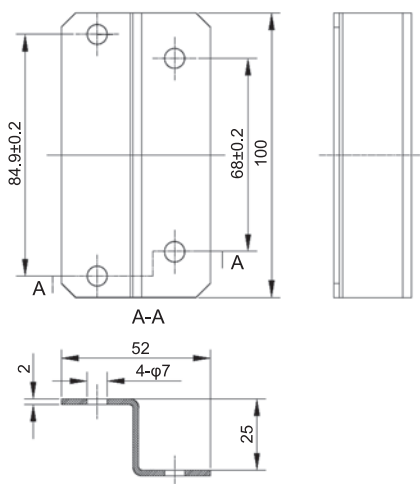
Fig.5 Mounting Plate Diagram

3.2. Electrical Installation

Instructions for Electrical Connection

⚠️ **Attention!**

The device must be installed only in compliance with the applicable regulations, otherwise the safe operation of the instrument is not guaranteed.

-Shielded cables for measuring devices are recommended. The designed anti-interference function of the transmitter will not be guaranteed without shielded cables.

- Always observe maximum cable lengths and cross-sections (see chapter 6.2).

- Water or impurities can penetrate the instrument through the cable. In hazardous areas, it is recommended to install the cable in a loop just before entry into the instrument or to slightly bend it to prevent water from entering.

🛈 The power supply is defined as 24 VDC. If the input supply voltage at the terminal of the transmitter is less than 11V, the device will shut down.

Please see the picture and table below for electrical connection

DF-8500 Wiring Diagram (Wiring in the drawing is low alarm relay under the status of active output.)
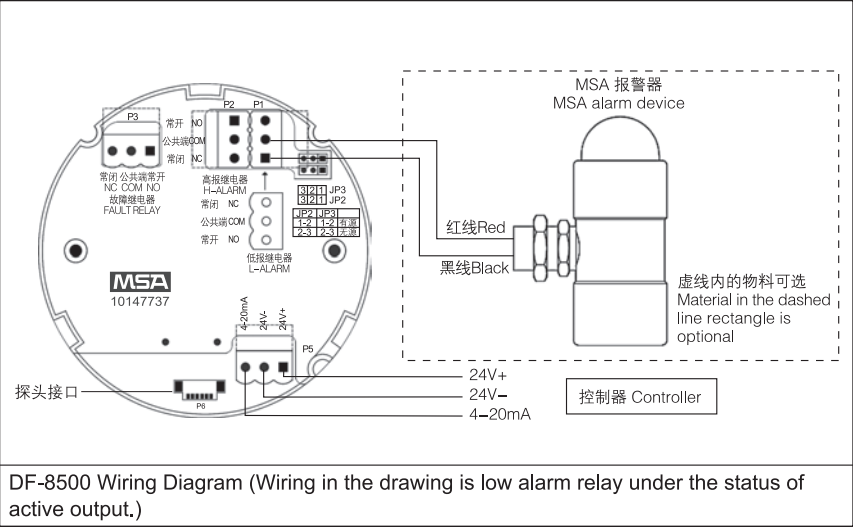
Fig.6 DF-8500 Internal Wiring Diagram

Terminal name	Application
24V+	Connect to DC 24V+
24V-	Connect to DC 24V-
4-20mA	(4~20)mA output of device
NO	Not energized, normally open
COM	Common terminal
NC	Not energized, normally closed

Table 1. Terminal Names and Corresponding Applications
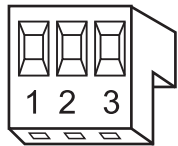
Terminal No.	Terminal Name
1	DC 24V+
2	DC 24V-
3	(4~20)mA signal

Fig.7 DF-8500 Power Connection Terminals

Terminal No.	Terminal Name
1	Not energized,normally open
2	Common terminal
3	Not energized,normally closed
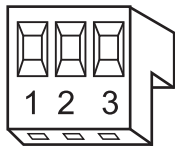
Fig.8 DF-8500 relay terminals
(Applicable to all relays)

Fig.9 DF-8500 3-wire Connection

1 Power supply DC 24V+   3 (4~20)mA signal
2 Power supply DC 24V-   4 Ground

(1) Unscrew the interlocking device on the cover of the transmitter and the enclosure.
(2) Unscrew the aluminum cover of the enclosure.
(3) Use one hand to grab the two projections on the left and right side of the plastic housing and pull the electronic module out of the enclosure.
(4) Insert the cable into the device.
(5) Connect the wire to the terminal.
   • **Please use 3-wire shielded cables for power and signal lines.**
   • **Shielded cables are not required for the relay.**
(6) Reinsert the properly connected electronic module into the enclosure.
(7) Reinstall the cover and fix the interlock devices.

4. Operation

[i] The device is factory-calibrated and delivered ready for installation. Each device is configured and calibrated for only one specific gas.

4.1. Startup

The device conducts self-checking during it starts up, and sets the operating current as output signal (default: 4.0mA), then displays below information:

• Display testing

After power on, all segments on the display screen light, LED indicators are turned on one by one as the sequence: green->red->red->yellow, and after all the LED indicators light, the green LED starts to flicker.

• Software version

The screen displays the firmware version.

• Sensor type

The screen displays the configuration information from different types of sensors, such as CO, H_2S, etc.

• Measuring range

The display displays the preset range of the gas sensor. 1000 stands for 1000 μ mol/mol, and so on.

• Alarm operation value

The display shows the preset alarm operation value. E.g. 100 and 300 stand for 100 μ mol/mol and 300 μ mol/mol respectively.

• Countdown

The screen displays the countdown of sensor's stability.

• Normal operation

After countdown, the screen displays the gas concentration.

Note: 1μmol/mol = 1ppm

4.2. Menu Sequence

4.2.1 Function Description of Remote Controller
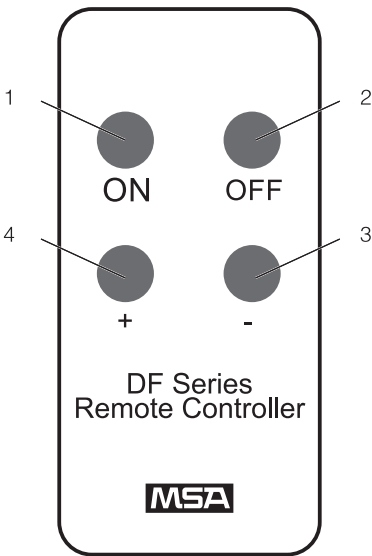
Fig.10 Function Description of Remote Controller

No.	Key name	Function
1	ON	Enter one menu item/Save
2	OFF	Exit/Abandon modifications
3	-	Scroll down the menu items/Decrease value
4	+	Scroll up the menu items/Increase value

4.2.2 Menu Sequence

Menu item1	Text information	Password needed
M-00	Alarm (relay) reset	Yes
M-01	Zero calibration	No
M-02	Gain calibration	No
M-03	Transmitter parameters view	No
M-04	Calibration parameter setting	Yes
M-05	Sensor replacement	Yes
M-06	LED testing	No
M-07	Loopback testing	No
M-09	Sensor information display	No
M-10	Relay parameter setting	Yes
M-11	Relay testing	Yes
M-13	Manual zero calibration	No
M-14	Manual gain calibration	No

Table 2. DF-8500 Menu Items

[M-00] -- Alarm(relay)reset

This menu item is used to reset the alarm of sensor. This menu item will be displayed only when the relay is set as locked.

(1) Press "+" to select the menu item M-00.

(2) Press "ON", and the menu of entering password appears.

(3) Enter the password (see Section 4.4).

(4) If the password is correct and the current alarm condition doesn't exist, then the locked alarm is reset.

[M-01] -- Zero calibration

(1) Press "+" to select the menu item M-01.

(2) The screen displays countdown time after pressing "ON", with a default value of 30 seconds.

(3) Ventilate the gas for zero.

(4) Start countdown after pressing "ON" again.

(5) After finishing countdown, the screen flickers to display the current concentration that is measured.

(6) After zero calibration, the screen flickers to display "OK" 3 times.

(7) Return to the measurement mode.

Note: For conventional gas, e.g. O2, H2S and CO, please make sure the transmitter has been energized for at least one hour before attempting a zero calibration. For rare gas, e.g. ETO, Methanol and VCM, it needs to be 24 hours.

[M-02] -- Gain calibration

(1) Press "+" to select the menu item M-02.

(2) The screen displays countdown time after pressing "ON", with a default value of 30 seconds for conventional gas; for the rare gas, ETO, VCM, Methanol, the default value is 180 seconds.

(3) Ventilate the gas for gain.

(4) Start countdown after pressing "ON" again.

(5) After finishing countdown, the screen flickers to display the current concentration that is detected.

(6) After gain calibration, the screen flickers to display "OK" 3 times.

(7) You can stop or continue ventilating testing gas during the countdown process.

(8) Return to run the measure mode after finishing countdown.

Note: For conventional gas, e.g. O2, H2S and CO, please make sure the transmitter has been energized for at least one hour before attempting a gain calibration. For rare gas, e.g. ETO, Methanol and VCM, it needs to be 24 hours.

[M-03] -- Transmitter parameter view

This menu item displays the device information, including gas type, measuring range, and firmware version.

(1) Press "+" to select the menu item M-03.

(2) Press the "ON" key and the scroll display will show "parameter name = parameter value" which represent the name and content of the parameter displayed. Multiple parameters can be displayed. Press the "+" or "-" on the submenu to select the parameter you want to view

(TEST GAS=..., SENSOR USED DAYS=..., GAS=...).

Submenu Parameter	Meaning
TEST GAS=	Calibration gas concentration
SENSOR USED DAYS=	Display the time the sensor has been used in days
GAS=	Current gas type configuration
RANGE=	Measuring range
VER=	Firmware version

[M-04] -- Calibration parameter setting

This menu item is used to set some parameters that are needed when setting operation and calibration of the instrument.

(1) Press "+" to select the menu item M-04.

(2) Press "ON" and the screen will display the menu for entering password.

(3) Enter the password (see Section 4.4).

(4) If the password is correct, you will enter the next submenu and be able to set multiple numerous parameters. When you enter the next submenu, the scroll display will displays "parameter name = parameter value", which represents the name and content of the parameter being set. You will be able to set multiple parameters. The parameters (TEST GAS =..., CURRENT OFFSET=...) that need to change can be selected by using "+" or "-" in this submenu item.

(5) When the parameters that need to be changed are addressed, press "ON" and then the parameters will flicker to indicate that the device has enter the edit status.

(6) Change the parameters (see Table below).

(7) After the parameters are changed, you can continue to change other parameters by pressing "+" or "-" , or return to the upper menu M-04 by pressing "OFF" .

Submenu Parameter	Meaning	Default	Adjustable Range
TEST GAS=	Calibration gas concentration setting		
CURRENT OFFSET=	(4~20)mA output fine tuning	120	90 ~ 150
ALARM_L=	Low alarm point setting	10% range (O2 25% range: 19.5%)	(5%~99%) range, and must less than high alarm point
ALARM_H=	High alarm point setting	30% range (O2 25% range: 23.0%)	(5%~99%) range, and must more than low alarm point
ZERO TIME=	Zero calibration countdown (second)	30	10 ~ 99
SPAN TIME=	Gain calibration countdown (second)	30	10 ~ 900
IDLE TIME=	Countdown after gain calibration (second)	30	10 ~ 99
4 – 20MA OUTPUT MODE	Current output mode during gain calibration	FLOT	4mA: The output current is fixed at 4mA during the calibration FLOT: the output current changes with displayed concentration during calibration
FACTORY DEFAULT=	Restore factory default setting	0	1: Restore factory default setting

Note：The menu item "FACTORY DEFAULT" usually displays 0. When set at 1, instrument will automatically restart and display "BOOT". In addition, all parameters will be restored to factory default setting, there is a need to reset gas type, zero calibration and gain calibration.

[M-05] -- Sensor replacement

For the toxic gas transmitter, you can replace the sensor through this menu item with the device energized and reset the counter of sensor service time (in days).

(1) Press "+" to select menu item M-05.

(2) Press "ON" and the screen will display the menu for entering password.

(3) Enter the password (see Section 4.4).

(4) If you enter the correct password, you will enter the next submenu, and the countdown starts from 900second(total 15 minutes), it means there will be no alarm when you replace the sensor during this time, the sensor service time will be cleared when pressing "ON" again, and return to the concentration measurement screen after the countdown is interrupted; press "OFF" to interrupt the countdown, and return to menu M-05 with clearing the sensor service time.

(5) Press "OFF" to return to the previous menu M-05.

Note: For ethylene oxide (ETO), chloroethylene (VCM) and Methanol Sensor, their warm-up time is quite long so excessive alarm will be appeared 24 hours after changing the sensor, which is a normal condition.

[M-06] -- LED testing

LED testing. All segments of the nixie tube displays and the LED flickers.

(1) Press "+" to select menu item M-06.

(2) Press "ON" , and then the screen flickers to display "OFF" .

(3) Press "+" , and then all the segments of the nixie tube with the LED diodes are lighted.

(4) Press "OFF" to exit menu item M-06.

[M-07] -- Loopback testing

This menu can be used to conduct (4~20) mA loopback testing.

(1) Press "+" to select menu item M-07.

(2) Press "ON" and the screen will display 04, which means that the initial current is 4 mA.

(3) Press "ON" again, and 04 starts to flicker. This means that the device has enter loopback testing stage, and the output current of the loopback is 4 mA.

(4) Press "+" or "-" to change data. At this time, both the flicker value and the output current will also change.

(5) Press "OFF" to exit the loopback testing status and the display changes to 04.

(6) Press "ON" to continue loopback testing, or press "OFF" to return to upper menu M-07.

[M-09] -- Sensor information display

This menu is used to display information related to the sensor, through which the sensor working status can be determined preliminarily.

(1) Press "+" to select the menu item M-09.

(2) Press "ON" and the scroll display will show "parameter name = parameter value." Press "+" or "-" to select the parameter you want to see (TEMP=..., CURRENT=..., S+=...).

Submenu	Parameter Meaning
TEMP=	Current temperature display
CURRENT=	Output current (4~20)mA display
SIGNAL=	Sensor output signal display (for CO，H2S，the signal is approximately 1V；for O2，it is approximately 1.5V；for ETO，VCM，CH3OH，it is approximately1.3V；all in clean air)
V_REF=	Refer to voltage signal，approximately 1V
VCC=	24V voltage
VDD=	5V voltage

[M-10] -- Relay parameter setting

This menu is used to set the relay operation of the transmitter.

(1) Press "+" to select the menu item M-10.

(2) Press "ON" and the screen will display the menu for entering password.

(3) Enter the password (see Section 4.4).

(4) If the password is correct, you will enter the next submenu and be able to set multiple numerous parameters. At the first time you enter the next submenu, the scroll menu will show "parameter name = parameter value" . Press the "+" or "-" on the submenu to select the parameter you want to change (L_ALARM DIR =..., H_ALARM DIR =..., ALARM RELAY =...).

(5) When the parameters that need to be changed are addressed, press "ON" and then the parameters will flicker to indicate that the device has entered the edit status.

(6) Change the parameters (see Section 4.6).

(7) After the parameters are changed, you can continue to change other parameters by pressing "+" or "-" , or return to the upper menu M-10 by pressing "OFF" .

Submenu	Parameter Meaning
L_ALARM DIR=	Alarm direction of low alarm relay
H_ALARM DIR=	Alarm direction of high alarm relay
ALARM RELAY=	Alarm relay energized, de-energized
ALARM RELAY=	Alarm relay self-locking、non selflocking
FAULT RELAY=	Fault relay energized, de-energized

[M-11] -- Relay Testing

This menu is used to test the relay operation of the transmitter, so that it is convenient to conduct field linkage testing.

(1) Press "+" to select the menu item M-11.

(2) Press "ON" and the screen will display the menu for entering password.

(3) Enter the password (see Section 4.4).

(4) If the password is correct, then the device enters the next level menu of M-11, and the screen displays "OFF". If you press "+", the relay status will inverse, i.e. the original closed relay disconnects while the original disconnected relay closes. If you continue to press "+", the relay status will continue to inverse. Press "ON" or "OFF" after you have finish the testing, then the relay will return back to the original status and back to menu M-11.

[M-13] ——Manual zero calibration

This menu is used to manually calibrate the zero point. Note: Please use M-01 to perform automatic zero calibration as far as possible. Manual zero calibration through M-13 shall only be performed when automatic zero point calibration cannot be completed through M-01 when unstable gas flow is caused by strong wind or other factors at the site.

(1) Press "+" select the menu item M-13.

(2) Press "ON" and the screen will display the menu for entering password.

(3) Enter the password (see Section 4.4).

(4) If the password is correct, you will enter the next level of submenu M-13. At this time, a flashing "0" will appear in the display, which indicates that manual zero calibration is ready. Press "OFF" to cancel the manual zero calibration and return to M-13 menu item. Press the "ON" key to complete the zero calibration and return to the measurement mode automatically. At this time, you can see that the concentration display has been reset to 0.

Note: For conventional gas, e.g. O2, H2S and CO, please make sure the transmitter has been energized for at least one hour before attempting a zero calibration. For rare gas, e.g. ETO, methanol and VCM, it needs to be 24 hours.

[M-14] -- Manual gain calibration

This menu is used for manual gain calibration. Note: Please use M-02 to perform automatic gain calibration as far as possible. Manual gain calibration through M-14 shall only be performed when automatic gain calibration cannot be completed through M-02 when unstable gas flow is caused by strong wind or other factors at the site.

(1) Ventilate the gain gas with the concentration level as shown in M-03 for one minute.

(2) Press "+" select the menu item M-14.

(3) Press "ON" and the screen will display the menu for entering password.

(4) Enter the password (see Section 4.4).

(5) If the password is correct, you will enter the next level of submenu M-14. At this time, the concentration as shown in M-03 will flash in the display, which indicates that manual gain calibration is ready. Press "OFF" to cancel the manual gain calibration and return to M-14 menu item. Press the "ON" key to complete the gain calibration and return to the measurement mode automatically. At this time, you can see that the concentration display has been reset to the concentration as shown in M-03.

（6） remove gain calibration gas.

Note: For conventional gas, e.g. O2, H2S and CO, please make sure the transmitter has been energized for at least one hour before attempting a gain calibration. For rare gas, e.g. ETO, methanol and VCM, it needs to be 24 hours.

4.3. Calibration

Overview

To ensure the stable performance of the product, MSA recommends the users to perform the calibration once every two month. The calibration flow should be 0.25 liter/minute and calibration should use calibration cap regulated by MSA. Failure to perform calibration for a long time or use of incorrect calibration flow and calibration cap may have adverse effects on the product performance.

The device is calibrated at the factory. Nevertheless, it is recommended to recalibrate the device after installation. The frequency of calibration depends on the duration of use and the chemical exposure of the sensor.

i	Carry out the calibration during commissioning as well as at regular intervals. This ensures optimum operation of the sensor.

i	It is recommended that all calibration components are connected before starting a calibration as it is necessary to apply test gas to the device during a countdown.

Wait for calibration gas

After starting any calibration, calibration gas (zero or test gas) must be provided until the calibration is completed.

Calibration steps

Zero calibration please refers to M-01 in Chapter 4.2.2; Gain calibration please refers to M-02 in Chapter 4.2.2.

i	Press "OFF" can exit calibration procedure at any moment and device still use the last calibration result of transmitter when exit.

4.4. Password

A 4 digit password is used to lock the menus that can be modified only by certificated and authorized personnel.

ℹ	The default password is 0000.

After entering the password menu, set the number from left to right, and the flicker bit means that the bit is being edited.

(1) Press "+" or "-" to modify the number.

(2) Press "ON" to enter the next bit (thousands->hundreds->tens->units).

(3) After all 4 digits has been entered, the password becomes effective.

4.5. Changeable parameters

Changeable instrument parameters

Parameter	Default	Minimum	Maximum
Span/Testing gas	Oxygen, 25% range : 20.8%Vol/Vol Other gases : 40% ~ 60% full range, 50% range is preferable	5%Vol/Vol	<23%Vol/Vol
Zero calibration time	30s	10s	99s
Span calibration time	30s	10s	990s
Idle time after calibration	30s	10s	99s
Measuring range	See 6.4 for the list of detectable gases and measuring ranges		
Loopback testing	4mA	4mA	22mA

Changeable relay parameters

Parameter	Default	Minimum	Maximum
Alarm limits	**Toxic gas:** Low alarm: 10% full range High alarm: 30% full range **Oxygen (25.0% range):** Low alarm: 19.5%V/V High alarm: 23.0%V/V **Oxygen (10.0% range):** Low alarm: 1.0%V/V High alarm: 3.0%V/V	5% range	99% range
Alarm relay is energized only during alarm	Yes	Yes	Yes
Alarm locked	No	No	No
Alarm direction	**Toxic gases:** Low alarm: upward High alarm: upward **Oxygen:** Low alarm: downward High alarm: upward	Changeable	

5. Maintenance

5.1. Sensor replacement

⚠ **Danger !**

Remove and reinstall the sensors carefully, ensuring that the components are not damaged; otherwise, the accuracy may be adversely affected, wrong readings may occur, and persons relying on this product for their safety may sustain serious personal injury or death.

ℹ When replacing a sensor, please use M-05 to reset the sensor service time counter.

6. Technical Data
6.1. Major technical parameters of the transmitter

Detected gas	Methane
Enclosure	Aluminium enclosure Explosion-proof Protection level: IP 67(not including the sensor)
Dimensions, mm (height × width × depth)	Approximately 275X125X106
Explosion-proof sign	Ex d IIC T6 Gb; DIP A21 TA T6
Weight	2 kg
Humidity	15% to 95% RH, non-condensation
Power source	(21.0~28.0)V
Power consumption	3W (not including the audible and visual alarm)
Temperature range (Instrument) Temperature range (Sensor)	(-40~+70) ℃ See sensor tags
Output signal Relay	(4~20)mA Optional
Pressure	(80~120)kPa
Maximum load resistance	300 Ohm
Air flow rate	(0~6) m/s
Relay contact capacity	DC 30V, 2A

6.2. Cable Lengths and Cross-sections
Toxic gas and oxygen sensor, (4~20)mA signal output

Power source	24V DC	
Configuration	Without relay	With relay
Cross-section area 1.0mm²	3000m	1500m
Cross-section area 1.5 mm²	4000m	2000m
Maximum load resistance of output signal	300ohm	

6.3. Primary Performance Specifications

Gas type	Warm up time	Storage temperature
Oxygen/Hydrogen sulfide/Carbon monoxide	1h	(0~+50)℃
Ethylene oxide(ETO)	24h	(0~+50)℃
Methanol(CH$_3$OH)	24h	(0~+50)℃
Chloroethylene(VCM)	24h	(0~+50)℃

Measurement object	Detection error	Response time (τ90)	Repeatability error
Oxygen(O$_2$)	±0.5% Vol/Vol	≤ 20s	≤ 1%
Carbon monoxide(CO)	±10%(show value) / ±5μmol/mol	≤ 15s	≤ 2%
Hydrogen sulfide (H$_2$S)	±5% F.S	≤ 25s	≤ 2%
Ethylene oxide (ETO)	±10% F.S	≤ 120s	≤ 5%
Methanol (CH$_3$OH)	±10% F.S	≤ 120s	≤ 5%
Chloroethylene (VCM)	±10% F.S	≤ 120s	≤ 5%

Gas type	SPAN Time(s)
Oxygen(O$_2$)	30
Carbon monoxide(CO)	30
Hydrogen sulfide (H$_2$S)	30
Ethylene oxide (ETO)	180
Chloroethylene (VCM)	180
Methanol (CH$_3$OH)	300

6.4. List of Detectable Gases and Measuring Ranges

Gas	Default Range	Adjustable Range	Temperature Range
Oxygen(O2)		0%Vol/Vol. 25%Vol/Vol.	(-20~50)℃
Carbon monoxide(CO)		100μmol / mol 200μmol / mol 500μmol / mol 1000μmol / mol 2000μmol / mol	(-40~55)℃
Hydrogen sulfide(H2S)		10.0μmol / mol 20.0μmol / mol 50μmol / mol 100μmol / mol	(-20~50)℃
Ethylene oxide(ETO)		10.0μmol / mol 30.0μmol / mol	(-20~50)℃
Methanol(CH3OH)		50μmol / mol 100μmol / mol	(-20~50)℃
Chloroethylene(VCM)		50μmol / mol 100μmol / mol	(-20~50)℃

Note：1μmol / mol = 1ppm

6.5. Sensor Response to Interferants

> [i] The interference factors vary with sensor type and life time.
> MSA does not recommend the customers to use interference gases for calibration.
> This table may be incomplete. The sensors may be sensitive to other gases.

Precautions for using DF-8500 oxygen probe: Poisoning:

The oxygen, carbon monoxide, and hydrogen sulfide sensors of DF-8500 are designed to be used under a wide range of environments and harsh conditions. However, please note that the sensors must be protected from exposure to high concentration solvent vapours for storage or installation and use in the instrument.

Cross Sensitivity:
Cross sensitivity of the oxygen sensor:

There is no cross sensitivity for toxic gas or oxygen sensors under the threshold limit value (TLV). However, high concentration (such as over 1%) and strong oxidizing gas (such as ozone and chlorine) will affect the oxygen equivalent, but most of the other common gases will not be affected.

DF-8500 cross-sensitivity list for the hydrogen sulfide sensor:

Gas	Concentration values	Reading
Carbon monoxide	100	<2
Sulfur dioxide	2	0
Nitrogen dioxide	3	0
Nitric oxide	25	0
Chlorine	0.5	0
Ethylene	100	0
Carbon dioxide	5000	0
Ammonia	50	0

DF-8500 cross-sensitivity list for the carbon monoxide sensor:

Gas	Concentration values	Reading
Acetylene	100	88
Ethylene	100	97
Hydrogen	100	<28
Nitric oxide	48.6	14
Nitrogen dioxide	19.5	<0.5
Chlorine	13.7	<0.5
Ethanol	200	0
Hydrogen sulfide	50	0
Sulfur dioxide	20	0
Ammonia	20	0

Note: Acidic gases such as carbon dioxide and sulfur dioxide will be absorbed by the electrolyte oxygen sensors and can help to increase the oxygen that flows to the electrodes. This is equivalent to increasing the oxygen content. The display value will increase approximately 0.3% with 1% increase of the carbon dioxide. The DF-8500 oxygen sensor is not suitable for use in occasions where the carbon dioxide concentration exceeds 25% continuously.

Precautions for using DF-8500 ETO, VCM and methanol sensor:

1) Must use polytetrafluoroethylene(Teflon)tube for calibration, and the tube is short as much as possible to prevent adsorbing the gas.

2) Must use stainless steel for the calibration valve material to prevent absorbing the gas.

3) The tube used for calibration must be dry, can' t be moist, this can prevent water absorbing to the gas.

4) For the first time calibration, the device must be energized for 24h to wait until the sensor is stable, if start the calibration when the sensor is not stable, then the display concentration will appear negative drift after the calibration.

5) For the gain calibration time, the default value of Ethylene oxide and Chloroethylene is 180s, and the default value of Methanol is 300s. If the calibration time is reduced, then the calibration is inaccuracy since the gas concentration is not stable when calibration.

i	Only order the electrochemical sensors for immediate replacement. Storage temperature range is (20±5)℃。Please handle the electrochemical sensors in accordance with the professional requirements.

7. Accessories

The DF-8500 package contains the standard installation accessories such as the sensor guard, mounting plates, clamps, screws and washers, CDs, and quick guides.

7.1. Sensor Guard

The sensor guard must be installed at all times except when an airflow adapter or conduit installation kit is used. Ambient weather condition can affect the gas mixture inside of the sensor guard. Use the sensor guard for functionality tests only. The calibration cap is recommended for sensor calibration.

8. Spare Parts

DF-8500 replacement parts list

Spare Parts	Part No.
Electronic	
ELECTRONIC MODULE,TOX ,DF-8500,RELAY	10147143-SP
ELECTRONIC MODULE,OX,DF-8500,RELAY	10147143-SP1
ELECTRONIC MODULE,TOX ,DF-8500	10154664-SP
ELECTRONIC MODULE,OX ,DF-8500	10154664-SP1
DF series remote controller	3450154
Mechanical	
SENSOR CONDUCTOR,SP,DF-8500,OX	10146990-SP
SENSOR CONDUCTOR,SP,DF-8500,TOX	10146989-SP
SENSOR CONDUCTOR,SP,TOX300,ETO,DF-8500	10160403-SP
SENSOR CONDU.,SP,TOX300,CH4O,VCM,DF-8500	10161697-SP
PCBA HOUSING,SP,DF-8500,TOX	10145768-SP1
PCBA HOUSING,SP,DF-8500,OX	10145768-SP2
MOUNTING ASSY,SP,DF-8500&Primax IR PRO	10147141-SP
Calibration cap	3450792
Sensors	
Sensor, spare part, DF-8500, carbon monoxide，2000 µmol / mol	10152366-SP
Sensor, spare part, DF-8500, hydrogen sulfide，100 µmol / mol	10152365-SP
Sensor, spare part, DF-8500, oxygen，25% VOL.	10152364-SP
Sensor, spare part, DF-8500, ethylene oxide，30.0 µmol / mol	10160486-SP
Sensor, spare part, DF-8500, chloroethylene，100 µmol / mol	10161341
Sensor, spare part, DF-8500 methanol，100 µmol / mol	10161342

9. Appendix

9.1. Output Status

Digital Display	LED Color	Status	Current Signal
NO.	Green or Red	Normal or alarm	(4~20)mA
	Green (flicker)	Start	4mA
	Green (flicker)	Calibration	4mA or follow
E-XX	Yellow	Fault	2mA
HI ↑	Yellow	100% range is exceeded	20.5mA
BOOT	Yellow	Instrument is not configured	0mA
- 0	Green	Negative drift	3.2mA

9.2. Error Code

E-28   If the device detects fault, it will displays code E, digital code and short description.
In this situation, the normal operation mode of the device doesn't react to the gas, and the output current is the fault value (default is 2mA).

ErrorCode	Meaning	Possible cause	Countermeasure
BOOT	Transmitter gas type has not been configured	The circuit board is brand new	Configure the gas type
E-28	The sensor has not been detected	1)Motherboard damage 2)Sensor damage 3)Sensor not connected	1)Replace new motherboard 2)Replace new sensors 3)Reconnect the sensors
E-20	Zero calibration timeout	Unstable zero gas flow	Stabilize the zero gas flow
E-21	Gain calibration timeout	Unstable gain gas flow	Stabilize the gain gas flow
E-32	The detected temperature is not within the range of (-40~80)℃	1)Damaged temperature sensor in the sensor adapter 2)Damaged temperature detection circuit on the motherboard	1)Replace the sensor adapter 2)Replace the motherboard
E-33	Gas sensor reference voltage is out of range	Motherboard damage	Replace the motherboard

If any error code is displayed, the device will not be able to function properly. If the error code persists after the restart, the device is faulty.

9.3. Timeout

The automatic calibration has a 4-minute timeout; that is, the error code will appear if the automatic calibration cannot be completed within 4 minutes. When no keys are pressed for over 8 minutes, the menu will automatically return to the concentration measurement mode from any other screen.

9.4. Wiring diagram
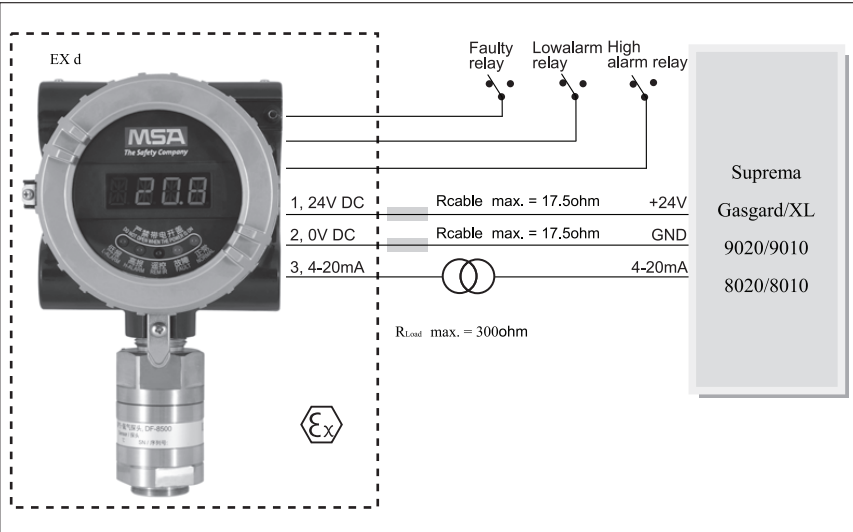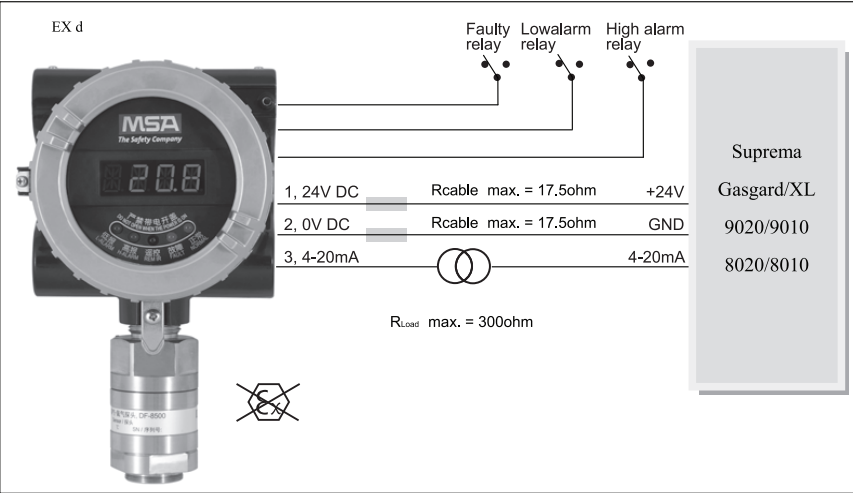
Part Name	Hazardous Substances					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr(VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
DF-8500 gas detector	×	○	○	○	○	○

O: Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.

X: Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572.
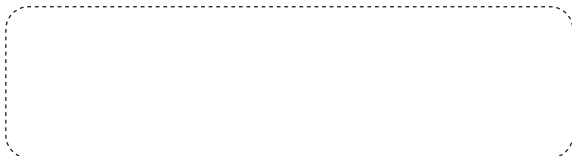
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