

3760 型
气动阀门定位器
电气阀门定位器



图 1 • 3760 型定位器

安装与操作说明

EB 8385 ZH



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通用安全指导

- ▶ 该定位器仅能由熟悉此产品经过专门培训并富有经验的人员来装配，启动及操作。
根据本安装操作说明的解释，经过专门培训的人员指的是基于其所受的专业训练、知识和经验以及他对相关标准的了解能够判断分配给他的工作并意识到可能危险的人员。
- ▶ 防爆型定位器只能由受过专业培训或指导或授权在危险区域从事防爆设备工作的人员来操作。
- ▶ 任何由于过程介质、操作压力、信号压力或控制阀可动部件引起的危害均应通过采取适当的措施加以预防。
如果由于供气压力造成执行器产生不许可的动作或力，必须通过合适的供气压力减压站加以限制。
- ▶ 要保证正确的运输和储存。
- ▶ **注意！**
带有 CE 标记的设备符合 94/9/EC(ATEX)和 89/336/EEC(EMC)指令要求。
按要求,可提供符合性声明, 查看及下载网址为 www.samson.de

选型

定位器		型号	3760-	X	X	X	X	X	X
防爆保护	不带		0						
	根据 ATEX 指令的 Ex II 2G EEx iA IIC T6		1						
	CSA/FM		3						
	根据 ATEX 指令的 Ex II 3 G EEx nA II T6		8						
附件	不带		0						
	感应接近开关		1						
气动连接	G1/8				1				
	1/8NPT				2				
电气连接	不带						0		
	M20 x 1.5 蓝色						1		
	M20 x 1.5 黑色						2		
	插塞接头符合 DIN 43650						3		
输入控制信号	0.2 至 1 bar / 3 至 15 psi						0	0	
	4 至 20 mA 带 i/p 模块 6109						1	1	
	0 至 20 mA 带 i/p 模块 6112						2	2	
	1 至 5 mA 带 i/p 模块 6112						2	3	

行程范围		0 至 5, 0 至 7, 7, 0 至 15 (见 11 页表“弹簧范围”)
输入控制参数	气信号	0.2 至 1 巴 (3 至 15psi)
	5 电信号	4 到 20mA (带 i/p 模块 6112 可以 0 到 20mA) 01 到 5 mA
分程 0 到 50% 或者 50 到 100% 于 7.5 及 15mm 行程	0	在+20°C时的内部阻抗 4 到 20mA: 对于安全区域 200 Ω, 对于危险区域 250 Ω, 0 到 20mA: 200 Ω 1 到 5mA: 850 Ω
气源		1.4 至 6 巴 (20 到 90psi)
信号压力		0 到 6 巴 (0 到 90psi)
特性		线性, 基于终端的一致性偏差≤1.5%
操作方向		可逆
迟滞		≤0.5%
灵敏度		≤0.1%
静态耗气量		在信号压力为 0.6 巴和气源压力为 6 巴时≤100 l/h
输出气量		在 Δp1.4 巴时为 1600 l/h, 6 在 Δp6 巴时为 5000 l/h
带 3277 型执行器时的传输时间 (行程 15mm, 信号压力 0.2 至 1 巴)		120cm ² ≤2 秒 240cm ² ≤6 秒 350cm ² ≤8 秒
允许环境温度		-20 到+70°C 带金属电缆密封接头, 最低到-30°C 带金属电缆密封接头和 6112 型 i/p 转换器, 最低到-40°C 对于防爆型, 在检验证书中单独规定。 -40 到+70°C适用于 3760-00x000 无感应阀位开关型气动定位器。
影响		温度零点: ≤0.03%/°C 量程: ≤0.03%/°C 振动: 在 5 至 120Hz 和 2g 时≤0.5% 气源: ≤0.6%/1 巴
旋转 180° 时的位置变化		<3.5%
保护等级		IP54 (IP65, 带过滤单向阀, 见附件)
重量		大约 0.6kg
材料		外壳为聚酰胺, 外部部件为不锈钢
可选电气附件		
感应阀位开关		SJ2-SN 型
控制电路		取决于下游开关放大器
在额定行程时的偏差		≤1%

1 设计和工作原理

气动或电气阀门定位器保证阀杆位置(被控变量 x)与输入控制信号(给定值 w)相匹配。来自控制系统的输入控制信号与控制阀的行程相比较,并产生相应的气动信号压力(输出值)。

定位器由气动部件构成,主要有夹紧卡箍(10)、测量弹簧(7)、膜片杆(4)及带双阀芯(13)的气动放大器(12)。

电气定位器还配备一个电气转换器(2)。

定位器可以直接集成装配到 SAMSON 3277 型气动执行器上。

来自控制系统的控制信号,如果是气动信号,那么该信号作为压力信号 p_e ,将直接作用到测量膜片(3)上。

如果是一个直流电流信号,比如 4 至 20mA,则会传送到电气转换器(i/p 转换器)上,并转换成等比例的压力信号 P_e 。

压力信号 P_e 在测量膜片(3)上产生一个力,该力由测量弹簧(7)的力平衡。测量膜片(3)的偏移,引起膜片杆(4)动作。气动放大器(12)中的双阀芯(13)也随之动作,从而产生了信号压力 P_{st} 。

随着输入控制信号的增大,信号压力可以增大(作用方式 $>>$)或减小(作用方式 $<<$),这由气动放大器的位置决定,此位置可转动 180° 。

输入控制信号或阀杆位置改变,会导致气动放大器的压力变化。气动放大器的输出压力 P_{st} 使得阀杆移动到与输入控制信号(给定值)相符的位置上。

在 ZERO(零点)(5)和 SPAN(量程)(8)调节螺钉用于调节输入控制信号的最小和

最大值。

测量弹簧(7)的选择一定要符合控制阀额定行程和输入控制信号的额定量程。

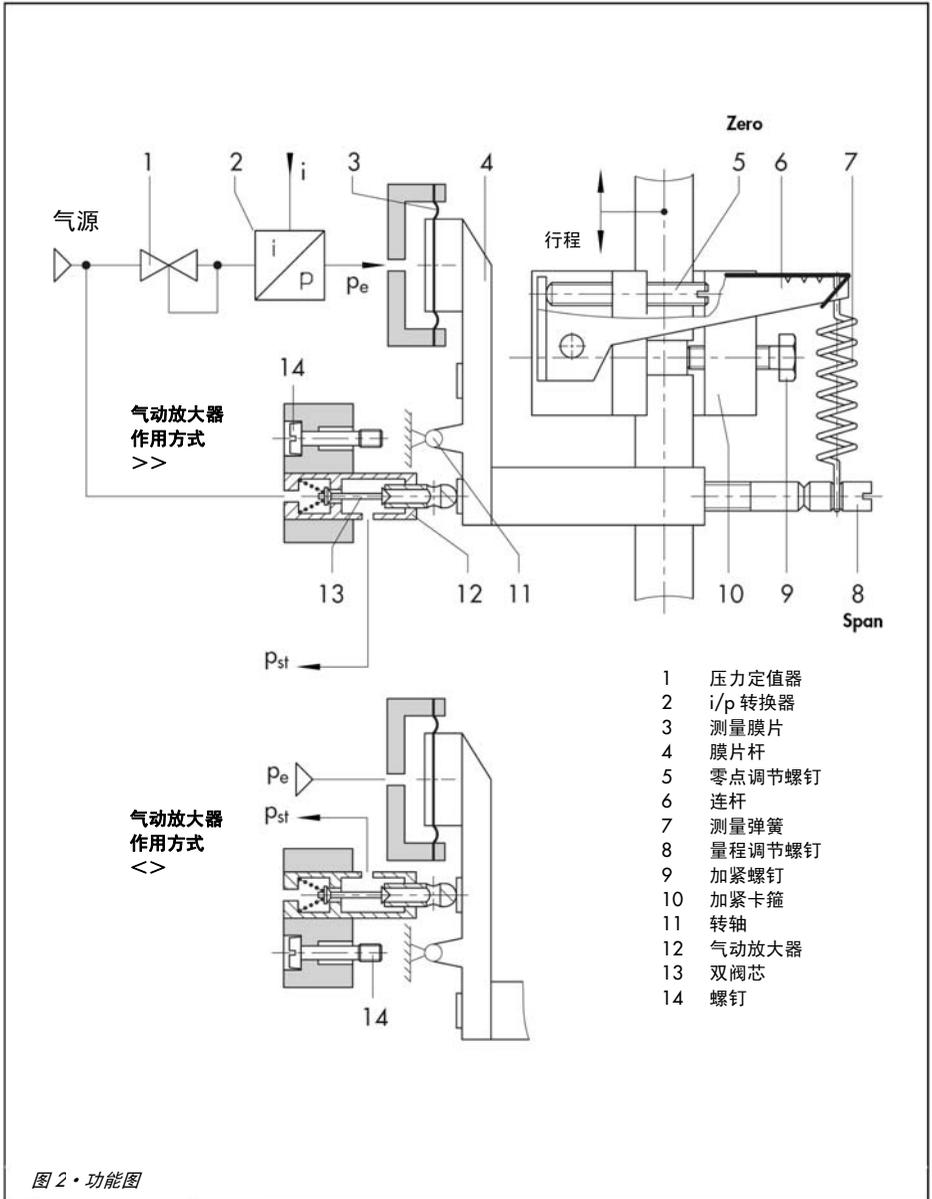


图 2 · 功能图

2 装配到气动执行器上

定位器必须用两个位于外壳内的紧定螺钉安装在气动执行器支架上。橡胶充当定位器外壳和支架之间的密封。

安装定位器时需要用到的附件有：夹紧卡箍、盖板和带密封圈的塞子。所需的安装套件可以在 12 页表中查到。

对于装配到 120cm²气动执行器 (图 3)，需将安装在侧面的信号压力接口上的过滤网取出。须用附件中带密封的塞子将连接（输出 36）塞住（见附件）。

信号压力通过背面的信号压力孔经过支架直接进入相应的膜片室中。

在将定位器安装到支架时，要确保带有滤网的密封放在了支架侧面的孔中。

信号压力作用到执行器的方式取决于定位器安装在支架的左侧还是右侧。因此，带有相应符号的切换板一定要对准支架上的标记点。

如果除了定位器外，还有电磁阀或者类似设备要装配到执行器上，定位器外壳后面的信号压力孔一定要堵上。即旋出安装在信号压力孔下面的孔中的螺钉（备用位置），把它旋到信号压力孔中。

这种情况下，信号压力必须从信号压力连接口“OUTPUT”通过一个连接块传送到执行器。切换板不再使用。

注意！切换板和连接板是用于 120cm² 气动执行器的附件，详情参见 12 页。

对于装配到 240cm² 和 350cm² 的气动执行器 (图 4)，信号压力必须通过合适的管路传送到气动执行器的信号压力连接处。所需的管路安装套件可从 12 页表中查阅。

另外，必须将定位器外壳后面的信号压力孔塞住。为此，要即旋出安装在信号压力孔下面的孔中的螺钉（备用位置），把它旋到信号压力孔中（图 3）。

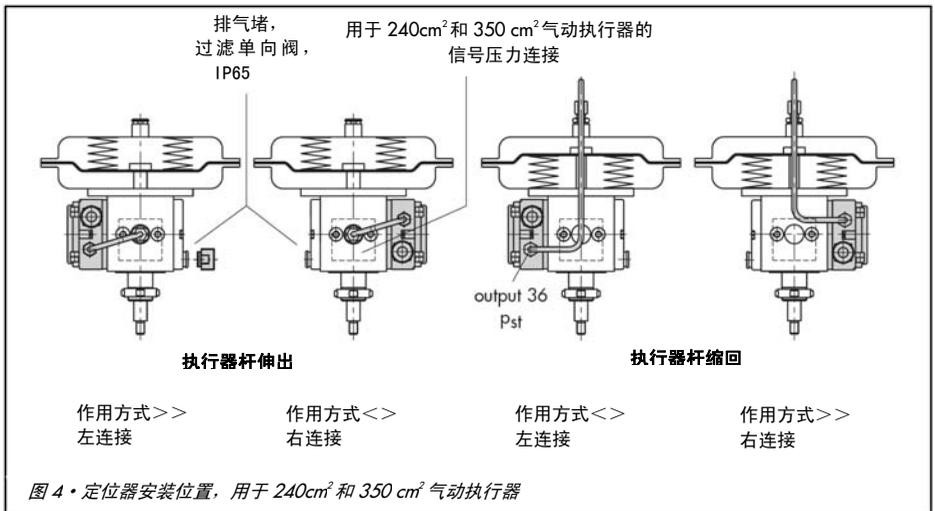
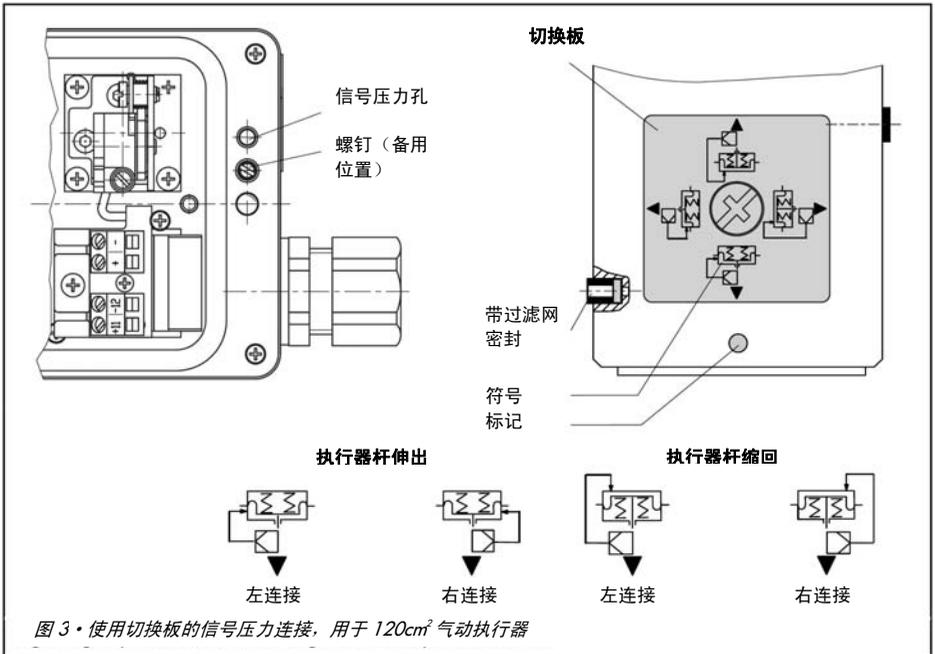
2.1 调节作用方式

定位器的作用方式也与其在气动执行器支架上的安装位置（左连接或右连接）相关（图 4）。气动放大器（12）的位置必须正确。

当输入控制信号（给定值）增大时，信号压力 P_{st} 可以是增加（正作用 $>>$ ）或减小（反作用 $<>$ ）。

当输入控制信号 i 减小时同样如此。正作用（ $>>$ ）时，信号压力减小；反作用（ $<>$ ）时，信号压力增加。

在气动放大器上有指示作用方式的标记。所要求的标记必须指向定位器外壳。



如果指示的符号不符合要求的作用方式，那么可按以下操作：将安装螺钉和气动放大器移出，将气动放大器旋转 180°，重新安装并用螺钉固定。

注意！ 如果装配完成的定位器需要改变操作方式，气动放大器的位置和定位器的安装位置要同时改变。

左连接或右连接是指：朝着切换板或信号压力连接方向看上去，定位器应固定在执行器支架的右侧或左侧。定位器的信号压力输出（OUTPUT 36）必须同接口位于同一侧（图 4）。

2.2 安装夹紧卡箍

定位器安装到支架后，应把夹紧卡箍固定到执行器杆的对面（图 5）。

1. 把夹紧卡箍插入到执行器杆对面的支架中（对于 120cm² 执行器，插入前要倾斜 90°）。
2. 把夹紧卡箍套到执行器杆上，用夹紧螺钉固定。确保夹紧螺钉位于执行器杆的凹槽中，夹紧卡箍完全垂直。
3. 然后，必须将测量弹簧挂到在夹紧卡箍杆上和 SPAN(量程)调整螺栓之间。5 和 6mm 行程置于外部凹槽，10.5 和 12mm 行程置于内部凹槽。调整 ZERO(零点)调整螺栓，使得弹簧轻轻地拉紧。

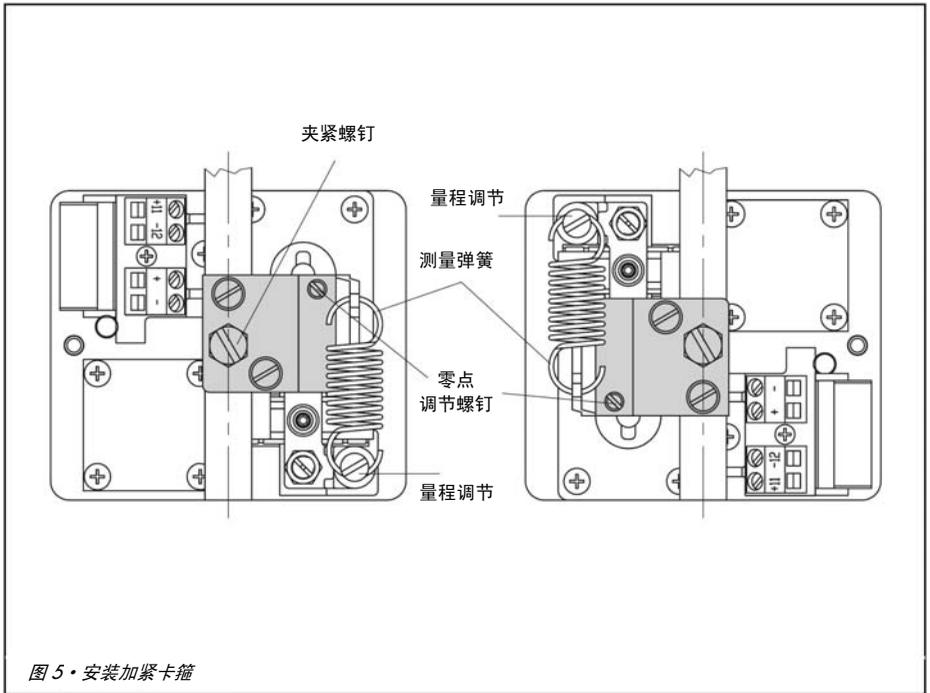
应该为不同行程和输入信号区域选择测量弹簧，请参阅 11 页表。测量弹簧用不同颜色标记。

在调整好定位器后，用盖板将执行器支架盖住（见第 4 节）。



如在运行时进行调整，此时执行器处于带压状态。执行器杆的动作可能引起对手或手指的严重伤害。

在操作夹紧卡箍和测量弹簧时一定要用工具！



测量弹簧	颜色标记	给定值	行程	订货号
1	黄色	0...100%	12/15	1400-6892
		0...50%	6/7.5	
2	红色	50...100%	6/7.5	1400-6893
		0...100%	6/7.5	
3	绿色	0...50%	12/15	1400-6894
4	蓝色	50...100%	12/15	1400-6895
5	白色	0...100%	5	1400-6896
6	棕色	0...100%	20	1400-6975
7	黑色	0...50%	5	1400-6976
		50...100%	5	

装配到气动执行器

附件		订货号				
安装套件 夹紧卡箍和盖板		120cm ² 执行器		240 和 350cm ² 执行器		
		1400-6898		1400-6899		
用于 240 和 350cm ² 执行器的 6×1mm 配管,						
执行器		执行器推杆伸出		执行器推杆缩回		
		左连接	右连接	左连接	右连接	
240cm ²	镀锌	1400-6919		1400-6921	1400-6923	
	不锈钢	1400-6920		1400-6922	1400-6924	
350cm ²	镀锌	1400-6919		1400-6925	1400-6927	
	不锈钢	1400-6920		1400-6926	1400-6928	
压力表 安装套件 用于输出控制信号, 不带 配管形式					1400-6900	
压力表 安装套件 用于输出控制信号, 带 配管形式					1400-6900	
附加三通管 (CrNiMo)					8582-0721	
附加管道接头 (CrNiMo)					8582-3330	
附件, 用于 3277-5 型气动执行器 (120cm ²)		切换板 (旧) 用于 3277-5XXXXXX. 00 (旧) 气动执行器			1400-6819	
		切换板 (新) 用于 3277-5XXXXXX. 01 (新) 气动执行器			1400-6822	
		连接板 (旧)		G1/8		1400-6820
		用于 3277-5XXXXXX. 00 (旧)		NPT 1/8		1400-6821
		用于 3277-5XXXXXX. 01 (新) 执行器的连接板 (新)			1400-6823	
提示! 所有新的切换板和连接板只能用在具有代码 01 的气动执行器上。 旧与新板不能互相更换!						
电缆密封接头 M20×1.5 黑色塑料					8808-1011	
蓝色塑料					8808-1012	
最低到-40℃的金属电缆密封接头					1890-4875	
适配器 M20×1.5 至 1/2" NPT 铝粉涂装					0310-2149	
过滤单向阀 更换排气塞 (图 4) 以及提高保护级别到 IP65					1790-7408	

3 连接

3.1 气动连接

气动连接方式采用 1/8-18NPT 或 ISO228/1-G1/8 螺纹孔。气源入口 (SUPPLY 9) 配备有一个过滤器来清洁进气。过滤器有固定支撑, 必要时能用螺丝刀工具拆卸清洁或更换 (过滤器定货号 1400-6897)。可以使用金属、铜管或塑料软管的常规外螺纹接头。

提示!

供应空气必须是干燥的和无油、无粉尘的。必须遵守上游空气过滤减压阀的维护操作指导。

在连接前, 必须仔细清洗吹扫所有气路。

3.1.1 信号压力指示

为了精确地调整定位器, 建议在定位器上安装一个压力表, 以测量信号压力 (OUTPUT 36)。

安装套件以附件形式列在 12 页表中。

3.1.2 气源压力

需要的供气压力取决于执行器的工作范围及作用方式 (故障-安全动作)。

工作范围以弹簧范围或信号压力范围形式显示在铭牌上; 作用方式由符号表示。

执行器推杆伸出:

故障-安全动作 “控制阀关闭”

(用于单座阀和角阀)

需要的气源压力 = 工作范围上限值 + 0.2 巴, 至少 1.4 巴。

执行器推杆缩回:

故障-安全动作 “阀门打开”

(用于单座阀和角阀)

紧密关闭控制阀所需要的气源压力可按如下公式粗略计算, 最大信号压力 p_{stmax} :

$$p_{stmax} = F + \frac{d^2 \cdot \pi \cdot \Delta p}{4 \cdot A} \quad [\text{巴}]$$

d = 阀座直径[cm]

Δp = 控制阀的压差 [巴]

A = 有效膜片面积[cm²]

F = 气动执行器的工作范围上限值[巴]

如果缺少数据, 可如下计算:

所需要的供气压力=工作范围上限值+1 巴

3.1.3 保护级别 IP65

为了把保护级别从 IP54 提高到 IP65, 用过滤单向阀 (附件) 更换执行器盖上的排气堵。详见图 4。

3.2 电气连接



对于电气安装，必须遵守该设备使用地国家相关的电气技术规定和事故防范规定。在德国，适用的规定为 VDE 规定和雇主责任保险协会的事故防范规定。

以下标准适用于在危险地区进行装配和安装：

EN 60079-14: 2003 (VDE 0165 的第 1 部分/8.98) “爆炸性气体环境使用的电气设备” 和 EN 50281-1-2: 1999 (VDE 0165 的第 2 部) “可燃性粉尘环境使用的电气设备”。

对于符合指令 79/196/EEC 的本质安全型电气装置，其本质安全电路的连接应适用其在符合性检验证书中的数据。

对于符合指令 94/9/EC 的本质安全型电气装置，其本质安全电路的连接应适用其在 EC 型检验证书中的数据。

注意!

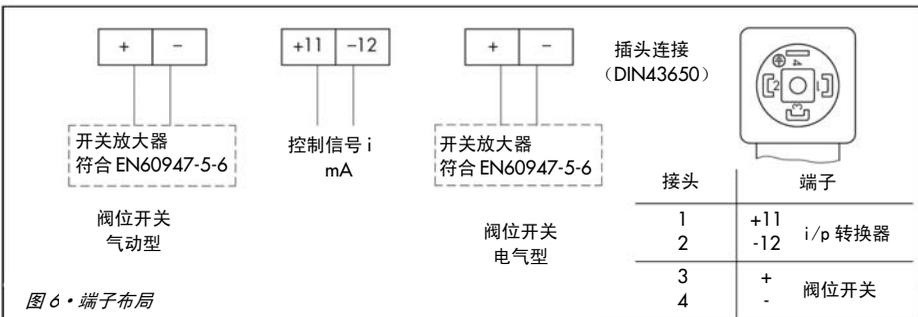
必须遵守证书中规定的端子连接。
如果电器端子的分配被改变，可能会导致防爆保护无效。
不能损坏内部或外壳上的涂瓷螺丝。

对于电气定位器，需要将输入控制信号电缆通过电缆密封接头连接到壳体端子 +11 和 -12 上。带阀位开关的型号需要将电缆连接到端子 + 和 - 上。

电缆密封接头可作为附件提供。详见 12 页表。

3.2.1 开关放大器

为使感应阀位开关工作，需在输出回路上连接开关放大器。对于在危险区域的安装，需遵守相关规定。



4 操作-调节

4.1 起始值和给定值

定位器配备的测量弹簧与控制阀的额定行程和输入控制信号（给定值）相关，详见 11 页表“测量弹簧”。

在通常情况下，输入控制信号量程为 $100\% = 0.8\text{bar}$ 或 16mA 。

小量程仅用于分程控制如 $50\% = 0.4\text{bar}$ 或 8mA （图 7）。

通过更换测量弹簧，可以改变量程。

在定位器上进行调节时，行程必须与输入控制信号（给定值）相对应，反之亦然。

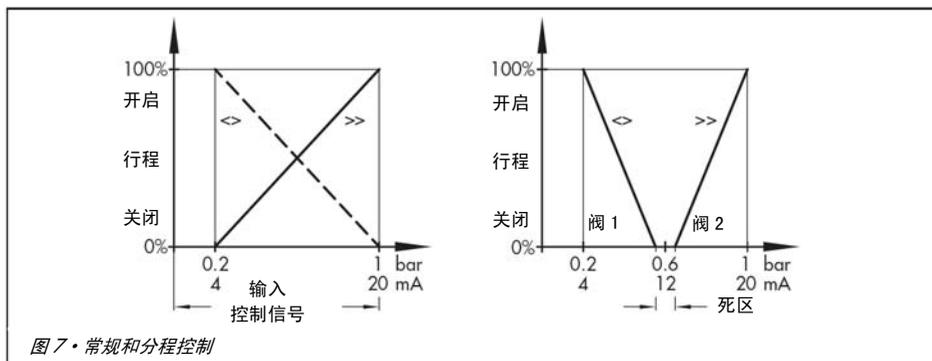
给定输入控制信号如 0.2 至 1 巴或 4 至 20mA 时，控制阀必须走完整个行程范围，如从 0 至 100% 。起始值（零点）是 0.2 巴或 4mA ，上限值是 1 巴或 20mA 。

分程控制时，控制器输出控制信号分为 2 部分来取得 2 个控制阀，因此每个控制阀得到一半控制信号范围来走完整个行程（如第 1 台控制阀设定在 0.2 至 0.6 巴或 4 至 12mA ，第 2 台控制阀设定在 0.6 至 1 巴或 12 至 20mA ）。

为了防止交叉冲突，允许存在 ± 0.05 巴或 $\pm 0.5\text{mA}$ 的死区（图 7）。

起始值（零点）是用零点调节螺钉(ZERO)（5）设定的。输入控制信号量程即上限值是用量程（SPAN）调整螺钉（8）设定的。

- ▶ 对于气动定位器，需配备远程调节器和压力表将气源（最大 1.5 巴）连接到定位器输入端（IN SIGNAL 27）。
- ▶ 对于电气定位器，在接线端子+11 和 -12 处连接信号源。
- ▶ 把压缩空气连接到气源输入端（SULLPY 9）；见 3.1.2 节。



4.2 “执行器杆伸出”的调节

提示!

为了保证控制阀的最大关断力，在输入控制信号达到下限值（作用方式 $>>$ ）或上限值（作用方式 $<>$ ）时，执行器膜片室必须彻底排气。

在作用方式为 $>>$ 时，设定输入控制信号从起始点略微增加，即 0.23 巴（4.5mA）；在作用方式为 $<>$ 时，设定输入控制信号从起始点略微减少，即 0.97 巴（19.5mA）。

这尤其适用于输出控制信号范围限定到 4 至 20mA 的控制器和控制系统。

起始值（零点）

例如：0.23 巴（4.5mA）

1. 转动零点调节螺钉（5）直至控制阀阀杆正好从静止位置开始运动（通过行程指示标牌观察阀杆动作）。
2. 减少输入控制信号，然后再缓慢增加，检查阀杆是否正好在 0.23 巴（4.5mA）时开始运动，如有偏差，就进行校准。

上限值（行程）

例如：1 巴（20mA）

3. 在起始位置调好后，增加输入控制信号。当达到上限值 1 巴（20mA）时，阀杆必须稳定在上限值位置，并且正好走完 100%行程（观察控制阀上的行程显示!）。如果上限值不对，就必须用量程调节螺钉（8）(SPAN)进行调整。旋转该螺钉指向连杆的支点，将增加行程，反之减小行程。

提示!

调节定位器时要将测量弹簧（7）保持垂直。若有必要，可改动连杆（6）上的悬挂点。

注意! 如果改变量程，必须重新调整零点。

4. 再次检查上限值。重新调整这 2 个数值直到全部正确。

4.3 “执行器杆缩回”的调节

提示!

气动执行器为杆缩回型的，其膜片室必须必须负载足够的压力保证控制阀的紧密关闭，即便在装置上游超压的情况下也能保证关断力。输入控制信号的上限值必须为 1 巴或 20mA(作用方式 >>) 并且下限值必须为 0.2 巴或 4mA (作用方式 <>反作用)。

需要的输入控制信号压力可依据 13 页 3.1.2 节的公式大致计算需要的气源压力来确定。

起始值 (零点)

例如: 1 巴 (20mA)

- 1 通过远程调节器 (信号源) 将输入控制信号设定为 1 巴 (20mA)。
- 2 转动零点调节螺钉 (ZERO) (5)直到阀杆刚好从初始位置开始移动。
- 3 增大输入控制信号然后缓慢降低到 1 巴 (20mA)，观察阀杆是否恰好在 1 巴开始移动。
- 4 如有偏差，用零点调节螺钉 (ZERO) 进行修正。

上限值 (行程)

例如: 0.2 巴 (4mA)

5. 在起始位置调好后，通过远程调节器 (信号源)设定输入控制信号为 0.2 巴 (4mA)。此时阀杆必须稳定在上限值

位置，并且正好走完 100%行程 (观察控制阀上的行程显示!)

6. 如果上限值不对，就必须用量程调节螺钉 (8) (SPAN) 进行调整。旋转该螺钉指向连杆的支点，将增加行程，反之减小行程。

注意! 如果改变量程，必须重新调整零点。

7. 再次检查上限值。重新调整这 2 个数值直到全部正确。
8. 当修正全部完成后，再次将输入控制信号设定在 1 巴或 20mA。
9. 再次转动零点调节螺钉 (ZERO) 直到要求的输入信号压力 (13 页 3.1.2 节) 在信号压力管线上的压力表上显示出来。

如果没有安装压力表，可以设定起始点为 0.97 巴 (19.5 mA)。

提示!

定位器调节完毕后，用盖板将气动执行器支架封闭。

控制阀在现场安装后，应使定位器盖板上的排气塞向下，以防止冷凝水在定位器内部集聚。

5 调节阀位开关

3760-X1XXXX 型定位器带有感应式阀位开关，可以发送如行程末端位置等信号。

阀杆的行程通过销钉（5）和连杆（3）传递到阀位开关的金属片上。

配有感应阀位开关时，必须在输出回路连接开关放大器（3.2.1 节）。

通常当控制阀到达其中一个末端阀位时，阀位开关会发出信号。当然也可以设置成在行程的中间位置时发出信号。

调节切换点：

在调整切换点之前，必须已调整好定位器的起始值和上限值。

1. 黄色切换点指示器（7）必须位于槽口标记（6）的范围内。否则要旋转调节螺钉（4）。
2. 将控制阀阀杆移动到要求的切换位置，旋转调节螺钉（4）直到达到切换点。可以从开关放大器进行显示。

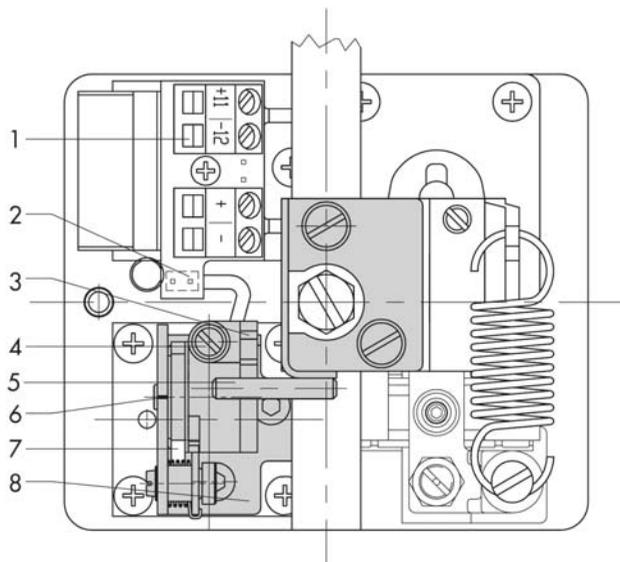
切换元件和连杆会对温度变化有一点敏感性。为了保证安全切换，在调节定位器时，必须考虑温度变化时切换的滞后和切换点的偏移。

连接阀位开关的端子（41/42 或 51/52）可以从定位器前盖内粘贴的功能标签上查询。在另一个标签上标注设定后的切换功能，如切换点是位于控制阀开启位置还是关闭位置。

5.1 改装阀位开关

如要以后在 i/p 定位器（索引号.02 及以上；型号索引.00 和.01 不带防爆保护）中安装阀位开关，使用改装套件（订货号 1400-8803）。改装限位开关，必须将定位器从气动执行器上拆卸下来。

1. 把阀位开关的电缆插头插入到印刷电路板（PCB）的插座（2）中。
2. 然后，将支撑板（8）用两个螺钉固定到端子座板旁边的铝板上。
3. 将定位器装配到气动执行器上。
4. 将带销钉（5）的角板放置到执行器推杆的夹紧卡箍上并旋紧。确保销钉（5）位于连杆（3）的槽中。
5. 通过电缆密封接头，将端子+和-连接到开关放大器上。
6. 按第 5 节进行调节。



- 1 印刷电路板 (PCB)
- 2 插座
- 3 连杆
- 4 调节螺钉
- 5 销钉
- 6 缺口标记
- 7 切换点指示器
- 8 支撑板

图 8 · 定位器左侧连接的限位开关安装 (右侧连接需要旋转 180°)

6 定位器改装

可以使用转换工具套件将阀门定位器从气动型转换为电气型，反之亦然。除了需要 21 页表中所示的转换套件外，还需要一个 i/p 模块。

6.1 从气动型 (p/p) 转换为电气型 (i/p)

1. 拆下安装在控制信号输入端 (SIGNAL 27) 的螺纹接头 (4)。更换为改装套件中的带密封的堵头。

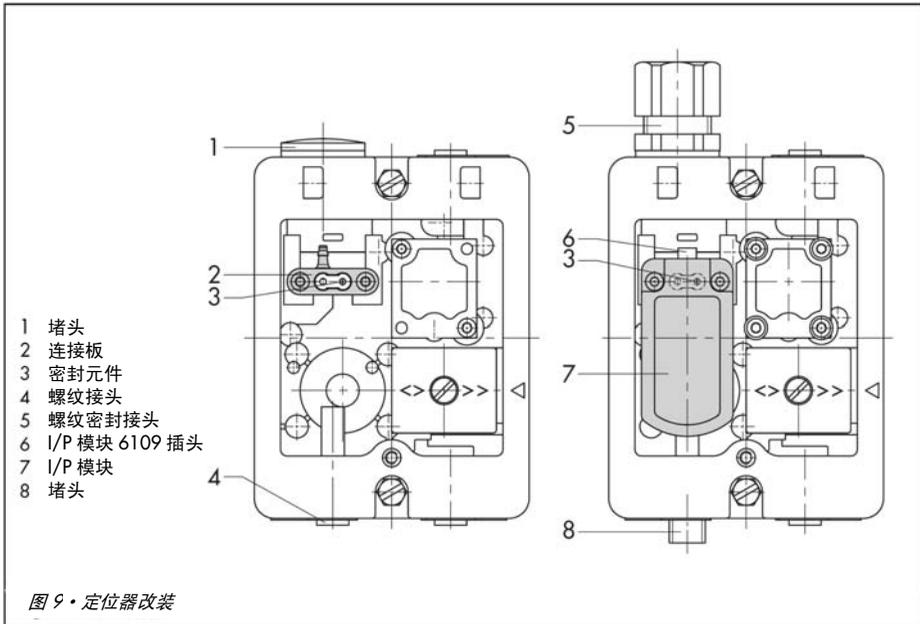
2. 从外壳处拆下堵头 (1)，更换为电缆密封接头或连接堵头。

3. 松开外壳上的两个安装螺钉。拆下带有密封元件 (3) 的连接板 (2)。

4. 从接线端子座上拆下 PCB (印刷线路板)。

5. 将改装套件中的连接电缆插入到外壳内的接线端子座上。

6. 将蓝色插头插入到中间的连接插头。将另一端与 i/p 模块相连接 (6109 模块的连接插头为蓝色-和绿色+; 6112 模块的端子为蓝色-和绿色+)。



- 用 2 个螺钉将 i/p 模块固定在壳内。确保带节流口的密封元件 (3) 放置在模块的正确位置上。节流口必须位于外壳的右侧钻孔上 (图 9)。

6.2 从电气型 (i/p) 转换为气动型 (p/p)

- 拆下控制信号输入端 (SIGNAL 27) 的带密封的堵头 (8), 替换上合适的 G 1/8 或 1/8 NPT 螺纹密封接头 (5)。

- 拆下安装螺钉。去掉电气连接后将 i/p 模块从外壳内取出。

- 用带密封元件 (3) 的连接板 (2) 紧密封闭壳底部的孔。确保连接板安装在正确的位置。

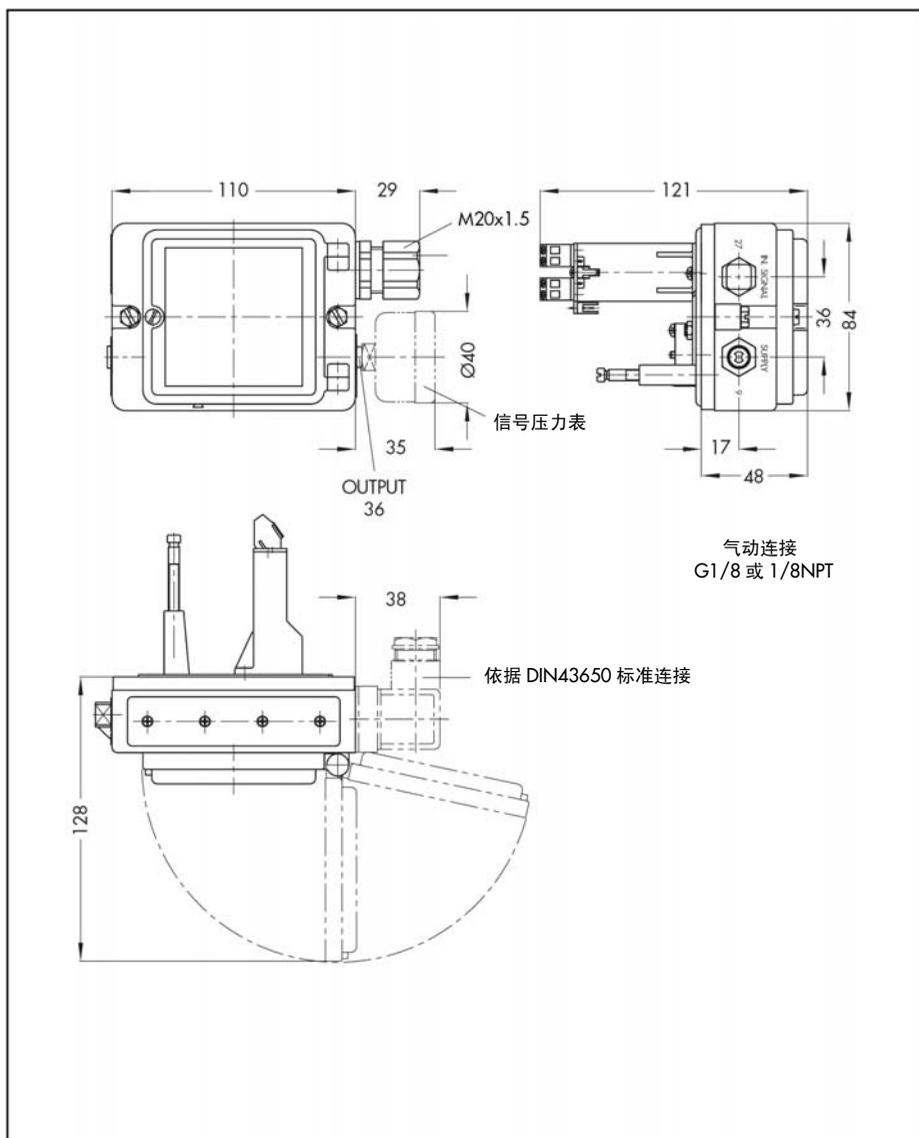
- 从端子座板上拆下印刷电路板 PCB。拔掉蓝色插头并拉出蓝色电缆。

- 重新将印刷电路板安装到端子座板上。

转换改装套件	订货号	
气动改为电气型 型号代码 01 或更高	带 6109 型 ¹⁾ i/p 模块 (mA)	
不带限位开关 1400-6898	4 至 20 非防爆	6109-0010
带限位开关 1400-6904		
气动改为电气型 型号代码 01 或更高	带 6112 型 ¹⁾ i/p 模块 (mA)	
不带限位开关 1400-6989	4 至 20 非防爆	6112-041110 0 至 20 非防爆 6112-042110
带限位开关 1400-6906	1 至 5 非防爆	6112-043110
电气型改为气动型	1400-6931	
电气连接改装 带插头连接	DIN 43650-AF3-Pg11	
	1400-6902	

¹⁾表中型号代码为粗体字的 i/p 模块必须单独订货, 因为其没有包含在改装套件中。

7 尺寸 (mm)



TRANSLATION

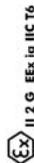
EC TYPE EXAMINATION CERTIFICATION

- (1) **EC TYPE EXAMINATION CERTIFICATION**
- (2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**
- (3) EC Type Examination Certificate Number
PTB 02 ATEX 2076
- (4) Equipment: Model 3760-1... I/P Positioner
- (5) Manufacturer: SAMSON AG, Mess- und Regeltechnik
- (6) Address: Weismüllerstr. 3, D-60314 Frankfurt, Germany
- (7) This equipment and any acceptable variations thereof are specified in the schedule to this certificate.
- (8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 in accordance to Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres as specified in Annex II to the Directive.
- (9) The examination and test results are recorded in confidential report
PTB-Ex 02-22052.
- (9) The Essential Health and Safety Requirements are satisfied by compliance with
EN 50014: 1997+A1+A2 EN 50020: 1994
- (10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.
- (11) According to the Directive 94/9/EC, this EC TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified equipment. If applicable, further requirements of this Directive apply to the manufacture and supply of the equipment.

EC Type Examination Certificate, without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedule included.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

- (12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionsschutz Braunschweig, 18. July 2002
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirktor

EC Type Examination Certificate, without signature and seal are invalid.
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Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

Pls28-3740.doc

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

S c h e u l e

(14) EC TYPE EXAMINATION CERTIFICATE No. PTB 02 ATEX 2076

(15) Description of Equipment

The Model 3760-1.. I/P Positioner is a modular unit intended for attachment to pneumatic control valves. It serves for converting control signals of 0...20 mA and/or 1...5 mA from a controlling system into a pneumatic supply pressure of 6 bar max. For auxiliary power non-combustible media are used.

The I/p converter circuit and the contact circuit are passive two-terminal networks which may be connected to any certified intrinsically safe circuits, provided the permissible maximum values of U_i , I_i and P_i are not exceeded.

The device is intended for use inside and outside of hazardous locations.

The correlation between version, temperature classification, permissible ambient temperature ranges and maximum short-circuit currents is shown in the table below:

Version 3760-1...1. with Model 6109 I/P Module

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-45 °C ... 60 °C	85 mA
T5	-45 °C ... 70 °C	
T4	-45 °C ... 80 °C	100 mA
T5	-45 °C ... 70 °C	
T4	-45 °C ... 80 °C	

Version 3760-1...2. with Model 6112 I/P Module

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-45 °C ... 60 °C	85 mA or
T5	-45 °C ... 70 °C	100 mA
T4	-45 °C ... 80 °C	120 mA

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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

PTB3-3760.doc

Physikalisch-Technische Bundesanstalt

Braunschweig und Berlin

Electrical data

Model 3760-1..

Signal circuit
(terminals 11/12)

Type of protection: intrinsic safety EEx ia IIC
only for connection to a certified
intrinsically safe circuit

Maximum values:

U_i = 28 V
 I_i = 100 mA or 85 mA
 P_i = 0.7 W
 or
 U_i = 25 V
 I_i = 120 mA
 P_i = 0.7 W
 C_i = negligible
 L_i = negligible

Model 3760-11.. with inductive limit switch

Inductive limit
switch...(terminals -/+)

Type of protection: intrinsic safety EEx ia IIC
only for connection to a certified intrinsically safe
circuit

Maximum values:

U_i = 16 V
 I_i = 52 mA
 P_i = 169 mW
 C_i = 30 nF,
 L_i = 100 μ H

or

U_i = 16 V
 I_i = 25 mA
 P_i = 64 mW
 C_i = 30 nF,
 L_i = 100 μ H

EC Type Examination Certificates without signature and seal are invalid.

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Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

PTB3-3760.doc

The correlation between temperature classification, permissible ambient temperature ranges, maximum short-circuit currents and power for analysers is shown in the table below:

Temperature class	Permissible ambient temperature range	I_0/P_0
T6	-45 °C...45 °C	52 mA / 169 mW
T5	-45 °C...60 °C	
T4	-45 °C...70 °C	
T6	-45 °C...60 °C	25 mA / 64 mW
T5	-45 °C...80 °C	
T4	-45 °C...80 °C	

(16) **Test Report PTB Ex 02-22052**

(17) **Special conditions for safe use**

None

(18) **Essential Health and Safety Requirements**

In compliance with the standards specified above.

Zertifizierungsstelle Explosionsschutz

Braunschweig, 19. July 2002

By order

(Signature) (seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirektor

EC Type Examination Certificates without signature and seal are invalid.
This EC Type Examination Certificate may only be reproduced in its entirety and without any changes, schedule included.
Extracts or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt, Bundesallee 100, D-38116 Braunschweig

PTB28-03760.doc

TRANSLATION

Statement of Conformity

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres – **Directive 94/9/EC**

(3) EC Type Examination Certificate Number

PTB 03 ATEX 2181 X

(4) Equipment: Model 3760-8.../P Positioner

(5) Manufacturer: SAMSON AG Mess- und Regeltechnik

(6) Address: Weismüllerstr. 3,
60314 Frankfurt am Main, Germany

(7) The equipment and any acceptable variation thereof are specified in the schedule to this certificate and the documents referred to therein.

(8) The Physikalisch-Technische Bundesanstalt, notified body number 0102 according to Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres specified in Annex II to the Directive.

The examination and test results are recorded in confidential report.

PTB Ex 03-23302

(9) The essential health and safety requirements are satisfied by compliance with

EN 50021: 1999

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use as specified in the schedule to this certificate.

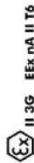
(11) In compliance with the Directive 94/9/EC this Statement of Conformity relates only to the design and construction of the equipment specified. Further requirements of this Directive apply to manufacture and marketing of this equipment.

Statements of Conformity without signature and seal are invalid.
This Statement of Conformity may be reproduced only in its entirety without any changes.
Errata or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt Bundesallee 100 D-38116 Braunschweig

PTB2Ex n.doc

(12) The marking of the equipment shall include the following:



Zertifizierungsstelle Explosionschutz Braunschweig, 30. September 2003
By order

(Signature) (Seal)

Dr. Ing. U. Johannsmeyer
Regierungsdirigitor

Statements of Conformity without signature and seal are invalid.
This Statement of Conformity may be reproduced only in its entirety without any changes.
Errata or changes shall require the prior approval of the Physikalisch-Technische Bundesanstalt.

Physikalisch-Technische Bundesanstalt Bundesallee 100 D-38116 Braunschweig

PTB2Ex n.doc

13) **Schedule**

(14) **Statement of Conformity PTB 03 ATEX 2181 X**

(15) **Description of Equipment**

The model 3760-8... Positioner is a modular unit intended for attachment to pneumatic control valves. It serves for converting control signals of (0) 4...20 mA and/or 1...5mA from a controlling system into a pneumatic supply pressure of 6 bar max.

For instrument air non-combustible media are used.

The devices is intended for use inside and outside of hazardous areas.

The correlation between temperature classification and the permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-45 °C ... 60 °C
T5	-45 °C ... 70 °C
T4	-45 °C ... 80 °C

Electrical data

Signal circuit
(terminals 11/12) Type of protection EEx nA II

Inductive limit switch Type of protection EEx nA II

(16) **Test report PTB Ex 03-23302**

(17) **Special conditions for safe use**

The signal circuit (terminals 11/12) shall be preceded by a fuse installed outside of the hazardous location. This fuse shall comply with IEC 60127-2/II, 250 V F or with IEC 60127-2/VI, 250 V T with a maximum fuse nominal current $I_N \leq 50$ mA.

The cable entries of the enclosure of the Model 3760-8... Positioner shall provide at least Degree of protection IP 54 in compliance with EN 60529.

The wiring shall be connected in such a manner that the connection facilities are not subjected to pull and twisting.

(18) **Basis health and safety requirements**

Are satisfied by compliance with the standard specified above.

Zertifizierungsstelle Explosionsschutz Braunschweig, 30. September 2003
By order

(Signature) (seal)

Dr.-Ing. U. Johannsmeyer
Regierungsdirektor

Addendum Page 1

Installation Manual for apparatus certified by CSA for use in hazardous locations.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	U _i or V _{max}	I _i or I _{max}	P _i or P _{max}	C _i	L _i
Signal circuit	28V	115mA	0.7W	0 nF	0 µH
Limit switch	16V	25/52mA	64/168mW	30 nF	100 µH

U_o or V_{oc} ≤ U_i or V_{max} / I_o or I_{sc} ≤ I_i or I_{max} / P_o ≤ P_i or P_{max}; C_o ≥ C_i and L_o ≥ L_i

Table 2: CSA – certified barrier parameters of signal circuit

Barrier	Supply barrier		Evaluation barrier	
	V _{max}	R _{min}	V _{max}	Diode Return
Signal circuit	≤ 28V	≥ 280Ω	≤ 28V	Diode Return

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	-40°C ... 60°C
T5	-40°C ... 70°C
T4	-40°C ... 80°C

Table 4: For the Model 3760-31 Positioner the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	-40°C ... 45°C	52mA
T5	-40°C ... 60°C	
T4	-40°C ... 75°C	
T6	-40°C ... 60°C	25mA
T5	-40°C ... 80°C	
T4	-40°C ... 80°C	

Revisions Control Number: 1 May 2005

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Intrinsically safe if installed as specified in manufacturer's installation manual.

CSA- certified for hazardous locations

Ex in IIC T6; Class I, Zone 0

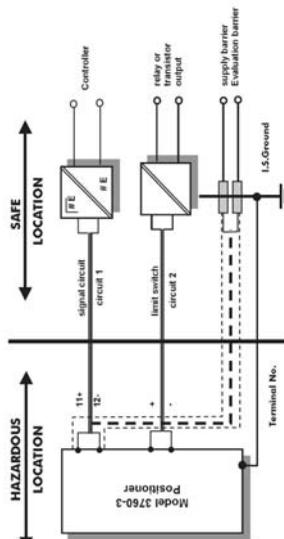
Class I; Groups A, B, C, D;

Class II; Groups E, F + G, Class III

Type 3 Enclosure

Notes:

1.) The installation shall be in accordance with the Canadian Electrical Code Part 1.



Version: Model 3760-31 with inductive limit switch.

Relay or transistor output resp. CSA certified.

Supply and evaluation barrier CSA- certified

For the permissible maximum values for the intrinsically safe circuits see Table 1

Cable entry M20 x 1.5 or metal conduit according to drawing No. 1050 – 0539 T or 1050 – 0540 T

On interconnection to form ground-free signal circuits, only evaluation barriers shall be installed in the return line. Correct polarity must be ensured.

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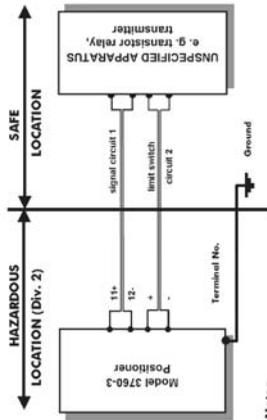
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CSA- certified for hazardous locations

Class I; Div. 2, Groups A, B, C, D
Class II; Div. 2, Groups E, F + G, Class III

Type 3 Enclosure

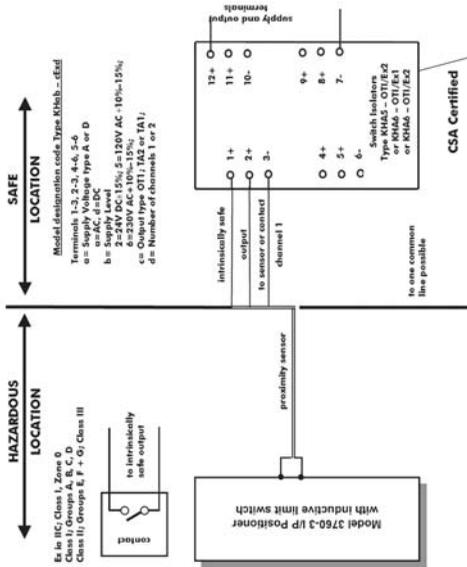
Positioner with limit switch.



Notes:

- 1.) The installation shall be in accordance with the Canadian Electrical Code Part 1.
- 2.) For the maximum values for the individual circuits see Table 1 and 2.
- 3.) The cables shall be protected by conduits.
- 4.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T

Installation drawing Control Relay KHAS-OTI/E2, KHAS-OTI/E1 or KHAS-OTI/E2 with Model SJ-B-N Proximity Sensors



Model designation code: Type KHAS...E2/E1

Terminals 1-2, 3-4, 4-6, 5-6
a = AC, b = DC
c = Supply Level
d = Output Type
e = 120V AC - 10%~15%;
f = 230V AC - 10%~15%;
g = Output type OT1, IAS2 or IA1;
h = Number of channels 1 or 2

The total inductive inductance and short-circuit impedance of shield wiring shall be restricted to the following maximum values

System parameters

Control Relay Terminal No.	Groups	L [mH]	C [pF]	V _{OC} [V]	I _{SC} [mA]	V _{max} [V]	R _{min} [Ω]
1-3; 7-3	A + B	64.88	1.273	↑	↑	↑	↑
4-6; 2-4	C + D	298.7	3.82	12.6	10.8	12.6	650
	E, F, G	744.4	10.18	↑	↑	↑	↑

maximum impedance of each inductive sensor 30ΩF
maximum inductance of each inductive sensor 100μH

Division 2 wiring method shall be in accordance to the Canadian Electrical Code Part 1.

Installation Manual for apparatus approved by FM for use in hazardous locations.

Electrical rating of intrinsically safe apparatus and apparatus for installation in hazardous locations.

Table 1: Maximum values

	U _i or V _{max}	I _{or} I _{max}	P _{or} P _{max}	C _i	L _i
Signal circuit	28V	115mA	0,7W	0nF	0 µH
Limit switches (inductive)	16V	25/52mA	64/165mW	30nF	100 µH

Notes: U_i or V_{oc} or V_i ≤ U_i or V_{max} / I_{or} or I_{oc} or I_i ≤ I_{or} I_{max}
P_i or P_{max} ≤ P_i or P_{max}

Table 2: CSA/FM - approved barrier parameters of signal circuit

Barrier	Supply barrier			Evaluation barrier		
	V _{oc}	R _{min}	I _{oc}	V _{oc}	R _{min}	I _{oc}
Signal circuit	≤ 28V	≥ 280Ω	≤ 115mA	≤ 28V	#	0mA

Table 3: The correlation between temperature classification and permissible ambient temperature ranges is shown in the table below:

Temperature class	Permissible ambient temperature range
T6	60°C
T5	-40°C ≤ t _a ≤ 70°C
T4	80°C

Table 4: For the Model 3760-31 Positioner the correlation between temperature classification, permissible ambient temperature ranges and maximum short-circuit current is shown in the table below:

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	45°C	
T5	-40°C ≤ t _a ≤ 60°C	52mA
T4	75°C	

Temperature class	Permissible ambient temperature range	Maximum short-circuit current
T6	60°C	
T5	-40°C ≤ t _a ≤ 80°C	25mA
T4	80°C	

FM- approved for hazardous locations

Class I, Zone 0 A Ex ia IIC T6

Class I, II, III Division 1, Groups A, B, C, D, E, F + G

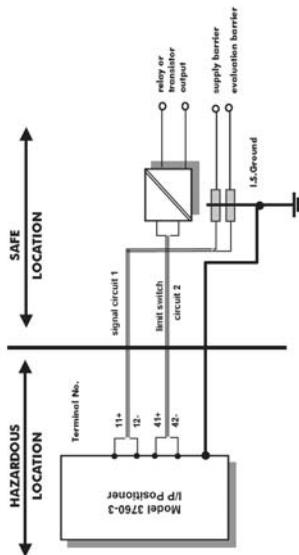
NEMA Type 3R

Notes:
1.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved apparatus. For maximum values of U_i or V_{max}, I_{or} or I_{max}, P_{or} or P_{max}, C_i and L_i of the various apparatus see Table 1.

2.) The apparatus may be installed in intrinsically safe circuits only when used in conjunction with the FM approved intrinsically safe barrier. For barrier selection see Table 2.

3.) Installation shall be in accordance with the National Electrical Code (ANSI/NFPA 70) and ANSI/ISA RP 12.06.01

4.) Use only supply wires suitable for 5°C above surrounding temperature.



Version: Model 3760-31 with limit switch.

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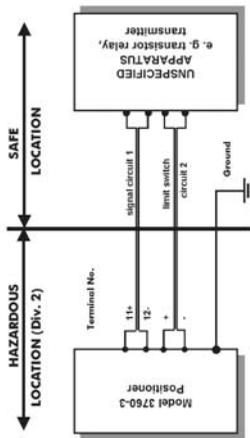
For the permissible maximum values for the intrinsically safe circuits see Table 1
 Cable entry M 20 x 1.5 or metal conduit according to drawing No. 1050 - 0539 T
 or 1030 - 0540 T

FM- approved for hazardous locations

Class I, Division 2, Groups A, B, C, D
Class II Division 2, Groups F + G; Class III

NEMA Type 3R

Positioner with limit switch.



Notes:

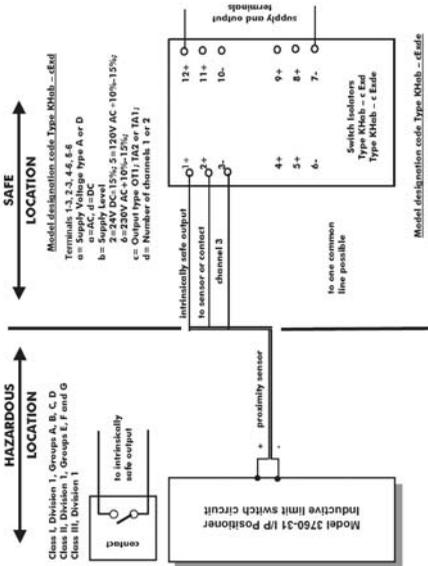
- 1.) For the maximum values for the individual circuits see Table 1 and 2.
- 2.) Cable entry only rigid metal conduit according to drawing No. 1050-0539 T and 1050-0540 T
- 3.) The installation shall be in accordance with the National Electrical Code ANSI/NFPA 70

Revisions Control Number: 1 May 2005

Addendum to EB 8385 EN

Addendum Page 8

Installation drawing Control Relay Hub - cEx de with Model SJ-b-n Proximity Sensors



Model destination code Type: KHeb - cEde
 a= Supply Voltage Type A or D
 an=AC, d=DC

b= Supply Level
 b1= 230V AC ±10%, b2= 110V AC ±10%, b3= 15%
 b4= 230V AC ±10%, b5= 110V AC ±10%, b6= 15%
 c= Output Type RTA; RW1; S51; S52; S53; S54; S55; S56; S57; S58; S59; S60; S61; S62; S63; S64; S65; S66; S67; S68; S69; S70; S71; S72; S73; S74; S75; S76; S77; S78; S79; S80; S81; S82; S83; S84; S85; S86; S87; S88; S89; S90; S91; S92; S93; S94; S95; S96; S97; S98; S99; S100; S101; S102; S103; S104; S105; S106; S107; S108; S109; S110; S111; S112; S113; S114; S115; S116; S117; S118; S119; S120; S121; S122; S123; S124; S125; S126; S127; S128; S129; S130; S131; S132; S133; S134; S135; S136; S137; S138; S139; S140; S141; S142; S143; S144; S145; S146; S147; S148; S149; S150; S151; S152; S153; S154; S155; S156; S157; S158; S159; S160; S161; S162; S163; S164; S165; S166; S167; S168; S169; S170; S171; S172; S173; S174; S175; S176; S177; S178; S179; S180; S181; S182; S183; S184; S185; S186; S187; S188; S189; S190; S191; S192; S193; S194; S195; S196; S197; S198; S199; S200; S201; S202; S203; S204; S205; S206; S207; S208; S209; S210; S211; S212; S213; S214; S215; S216; S217; S218; S219; S220; S221; 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Manufacturer Declaration

made out to:
BASF Aktiengesellschaft, Carl-Boesch-Str. 38, D- 67056 Ludwigshafen

types:

Pepperl+Fuchs GmbH, Mannheim declares in its sole responsibility that the products and accessories manufactured following the standard EN 50 021:1999.

inductive sensors FJ..., NB..., NC..., NJ..., RG..., RJ..., TG..., SC..., SJ...,
capacitive sensors CB..., CC..., CJ...,

Applies only to sensors that have an EC-Type Examination Certificate according Directive 94/9/EC category 2G or 1G.

Pepperl+Fuchs GmbH Mannheim declares in its sole responsibility that the above mentioned sensors are according to the requirements of Zone 2.
The type of protection is

☉ II 3G EEx nL IIC T6

conform to standard: EN50201:1999
In deviation to this standard the sensors are not marked with ☉ II 3G EEx nL IIC T6.
The sensors are marked according to the EC-Type Examination Certificate category 2G or 1G.

The sensors have to be connected to energy-limited circuits only with type of protection **EEx nL**.
The values of the equivalent internal reactances C, and L and the maximum permissible ambient temperature are given in the EC-Type Examination Certificate category 2G.

The maximum permissible ambient temperature has to be taken from the temperature EC-T, which is subdivided into different types and temperature classes, of the assigned EC-Type Examination Certificate.
The maximum input values U, I, P, are given in the following table (type 4 only if this type is listed in the assigned EC-Type Examination Certificate).

	Type 1	Type 2	Type 3	Type 4
U,	20V	20V	20V	20V
I,	25 mA	25 mA	52 mA	76 mA
P,	34 mW	64 mW	109 mW	242 mW

The special conditions of the EC-Type Examination Certificate category 2G and the instructions according category 2G have to be taken into account.

For use according to Directive 94/9/EC within the European Community this manufacturer declaration is not sufficient, because the following requirements of the Directive 94/9/EC are not met: marking on the sensor, instruction, declaration of conformity.

Pepperl+Fuchs Mannheim is subject to the rules of a quality management system according to DIN EN ISO 9001

Signature of Manufacturer:
Function of the signer:
date: 2003-03-14

I.V. Ehrenfeld
factory automation

I.A. Wanninger
standards expert
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