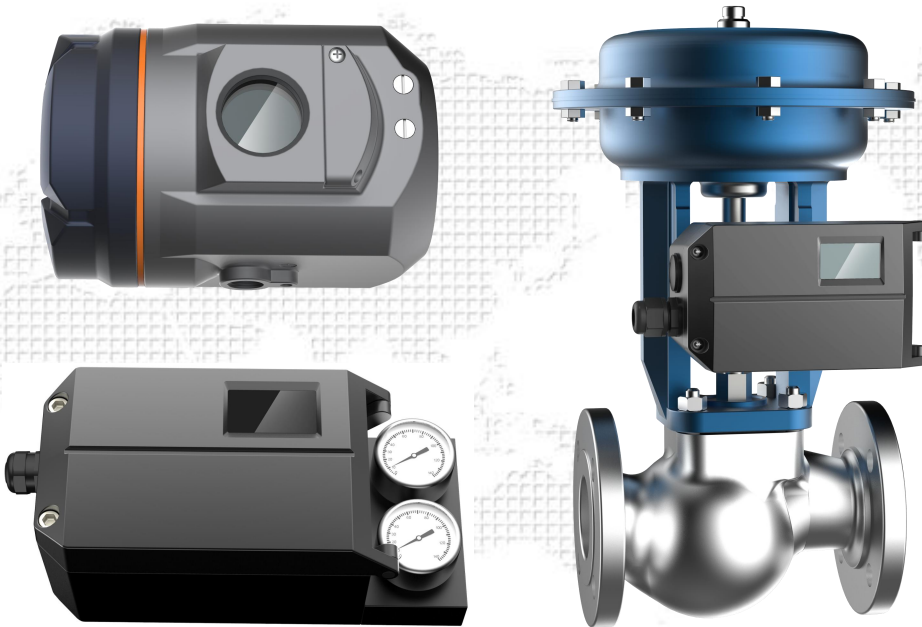


IP6000系列定位器

IP6000 Series Intelligent Valve Positioner Brief Introduction



POWERFLOW
Expertise in flow control

IP6000系列智能阀门定位器和气动调节阀配套使用。通过接收来自控制系统的4-20mA DC电流信号得到阀位控制设定值，同时采集位置传感器信号得到实际的阀位值，两者通过控制软件的计算处理，从而控制气动执行机构的进气和排气，驱动阀位到达设定点。



1 技术描述



隔爆直行程



本安常规型直行程

- **外壳材质**
本安：
铝合金(Ex ia IIC T4/T6 Ga
Ex ia IIIC T₂₀₀ 135°C/T₂₀₀ 85°C Da)
不锈钢 316L(Ex ia I Ma)
隔爆：
铝合金(Ex db IIC T6 Gb: Ex tb IIIC T85°C Db)
不锈钢 316L(Ex db I Mb)
- **压力表组件**
铝,阳极氧化
- **信号输入**
输入阻抗: 120Ω
限制电压: 28V
- **输出信号**
反馈方式: 二线制4~20mA信号,内阻120Ω
- **数字通讯协议**
HART 7
- **最小工作电流**
3.8mA
- **稳态耗气量**
≤ 0.4 L/min

● 行程范围

常规型直行程：10~100mm
 常规型角行程：30~100°
 本安分体式：5~50mm
 隔爆分体式：5~25mm
 安装支架可选：硬连接或软连接
 注：远传型行程范围同常规型一致

● 气动数据

空气质量符合ISO 8573-1标准
 压力：1.4~7bar(20.3~101.5psi)
 固体颗粒大小和密度：等级3
 压力露点：等级3（最低比环境温度低20K (36° F)）
 含油量：等级3

● 流量

进气：
 2 bar 4.8 Nm³/h
 4 bar 8.0 Nm³/h
 6 bar 11.2 Nm³/h
 排气(复位)：
 2 bar 5.9 Nm³/h
 4 bar 9.8 Nm³/h
 6 bar 13.7 Nm³/h
 排气(保位)：
 2 bar 6.6 Nm³/h
 4 bar 11.1 Nm³/h
 6 bar 15.6 Nm³/h

隔爆型 (IP6000d) 的数值约减少20 %

● NAMUR本安防爆限位开关技术参数

额定工作电压(U_e): 8.2DC
 供电电压(U_B): 8-9VDC
 输出电流：不动作：≥2.2mA；动作：≤1mA
 环境温度范围(T_a): -25°C~+70°C
 开关频率：800Hz

● 电气接口

NPT1/2 (默认)
 M20×1.5

● 气动接口

NPT1/4 (默认)
 G1/4

● 防护等级

IP69K

● 抗震动性

0.15mm, 10Hz-60Hz, 20次循环/轴
 20m/s², 60Hz-500Hz, 20次循环/轴
 整个控制阀连续运行时的推荐范围 ≤ 20 m/s²,
 无谐振峰值

● 线性度及回差

线性度：≤ 0.5%
 回差：≤ 0.5%

● 环境温度

非防爆常规版本：-20°C ~ +80°C
 非防爆低温版本：-40°C ~ +80°C
 防爆常规版本：-20°C ~ +80°C(T4)
 -20°C ~ +40°C(T6)
 -20°C ~ +60°C(EAC-T4)
 -20°C ~ +40°C(EAC-T6)
 防爆低温版本：-40°C ~ +80°C(T4)
 -40°C ~ +40°C(T6)
 -55°C ~ +60°C(EAC-T4)
 -55°C ~ +40°C(EAC-T6)
 隔爆常规版本：-20°C ~ +60°C(CCC)
 -20°C ~ +40°C(EAC-T6)
 隔爆低温版本：-40°C ~ +60°C(CCC)
 -55°C ~ +40°C(EAC-T6)

1 技术描述

● 防爆等级域

本安: Ex ia I Ma
 Ex ia IIC T4/T6 Ga
 Ex ia IIIC T₂₀₀ 135°C/T₂₀₀ 85°C Da

隔爆: Ex db I Mb
 Ex db IIC T6 Gb
 Ex tb IIIC T85°C Db



本安型



隔爆型

本安防爆型电气参数

回路名称	最高输入电压 U _i (V)	最大输入电流 I _i (mA)	最大输入功率 P _i (W)	最大内部等效参数	
				C _I (nF)	L _I (mH)
4~20mA 设定	28	93	0.66	近似为0	近似为0
4~20mA 输出	28	93	0.66	近似为0	近似为0

电磁兼容性结果摘要

测试对象	测试项目描述	基本标准	测试级别	检测结果
本安型	静电放电抗扰度	GB/T 17626.2	±4kV 触点 ±8Kv 空气	通过
本安型	射频电磁场辐射抗扰度	GB/T 17626.3	3V/m, 80%AM (1kHz), 80MHz~1000MHz	通过
本安型	工频磁场抗扰度	GB/T 17626.8	50Hz, 100A/m	通过
本安型	电快速瞬变脉冲群抗扰度	GB/T 17626.4	±1.0 kV	通过
隔爆型	射频电磁场辐射抗扰度	GB/T 17626.3	10V/m, 80%AM (1kHz), 80MHz~1000MHz	通过

● 额定条件—高度

海平面以上2000m。
 在海拔2000m以上的位置, 请使用合适的电源。

● 额定条件—安装位置

任意。在潮湿环境中, 气动接头和排气口不朝上, 正确安装。

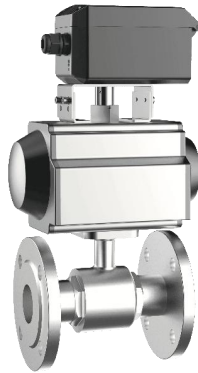
● 位置反馈模块

用于位置反馈直流输出，2线制连接

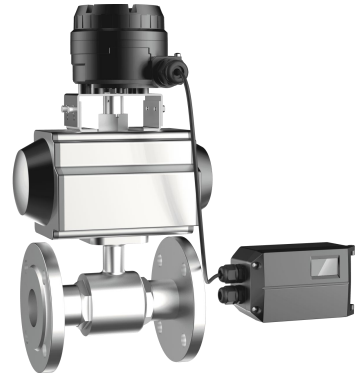
电流输出	端子OUT1和OUT2
输出额定信号范围	4~20mA，防短路
动态范围	3.8~20.5mA
外部负载 R_B [k Ω]	$\leq (U_{Aux}[v]-12v)I$ [mA]
传动误差	$\leq 0.5\%$
温度影响	$\leq 0.1\%/10K$ ($\leq 0.1\%/18^\circ F$)
分辨率	$\leq 0.1\%$
有效内部电容	C_i =近似为零
有效内部电感	L_i =近似为零



隔爆型角行程



本安常规型角行程



本安远传型角行程



隔爆分体式



本安分体式

2 优点及应用



优点

- 安装简单，一键初始化
- 德国原装进口，成熟可靠的压电式气动模块
- 操作简便，使用4个按键和LCD进行本地操作
- 多种菜单功能配置。如特性曲线，行程限制等
- 稳态工作耗气量可忽略不计
- 紧密关闭功能
- 保位功能（根据产品选型选择）
- 直行程和角行程执行机构采用同一型号的定位器
- 抗震性好
- 极端环境可选择外部远传型位置传感器
- 可对4-20mA输入信号进行现场校正



应用

IP6000定位器应用行业：

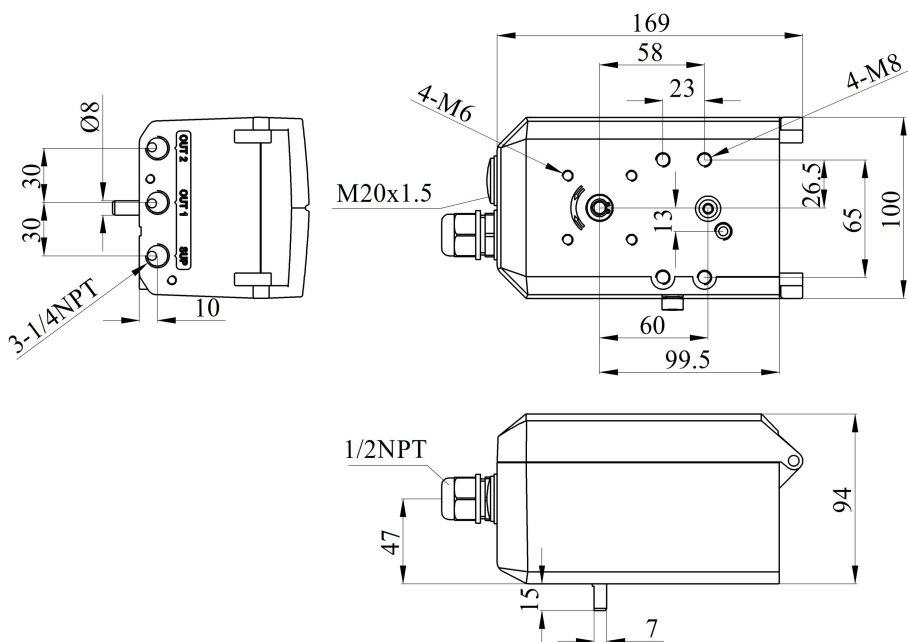
- 炼油/石化/核电/电厂
- 造纸和玻璃/水和污染
- 食品和制药
- 海上平台

IP6000定位器应用形式：

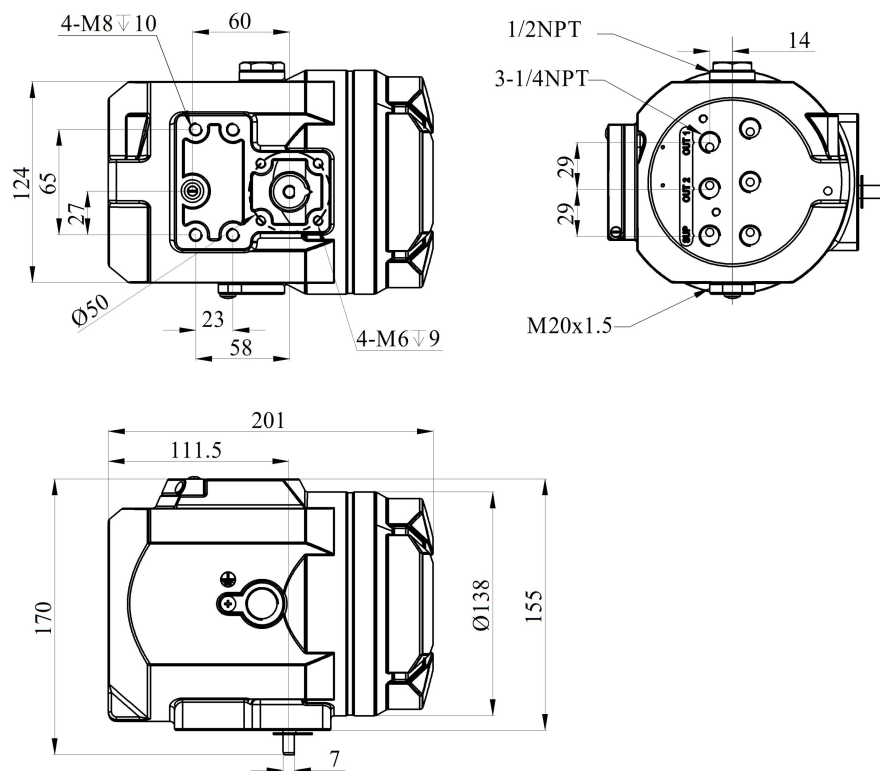
- 用于单/双作用执行机构：铝外壳以及隔爆铝外壳
- 用于非危险场所
- 用于危险场所的类型：
本安防爆型“Ex ia”
隔爆型“Ex d”，铝隔爆外壳
Ex db、Ex tb（粉尘防爆）、Ex ia



本安远传型直行程

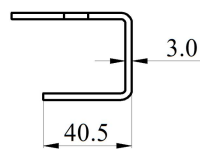
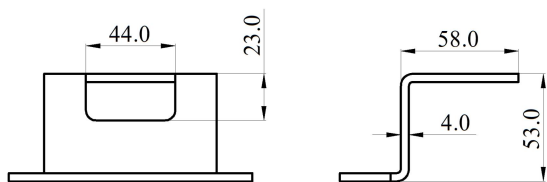
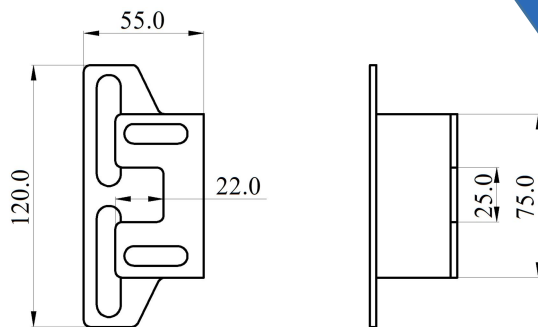
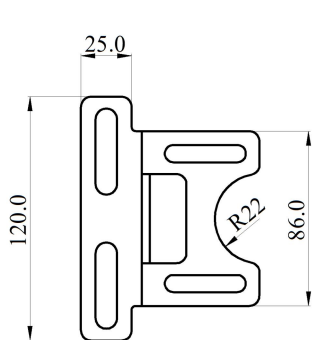


本安定器机械尺寸



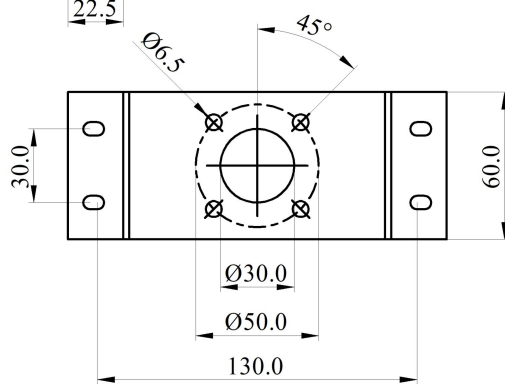
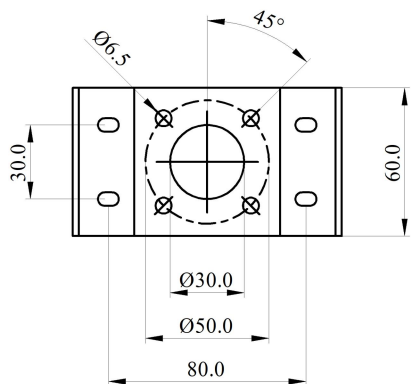
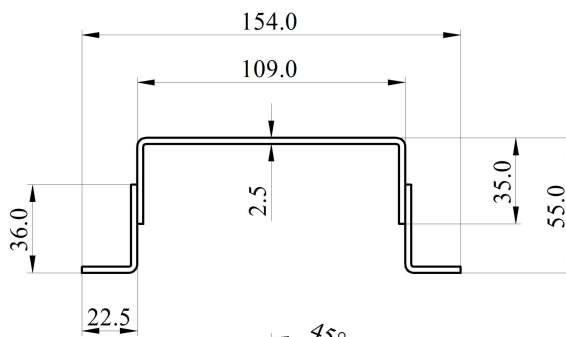
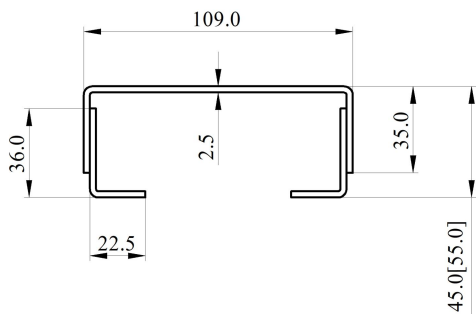
隔爆定位器机械尺寸

3 机械尺寸



直行程安装支架

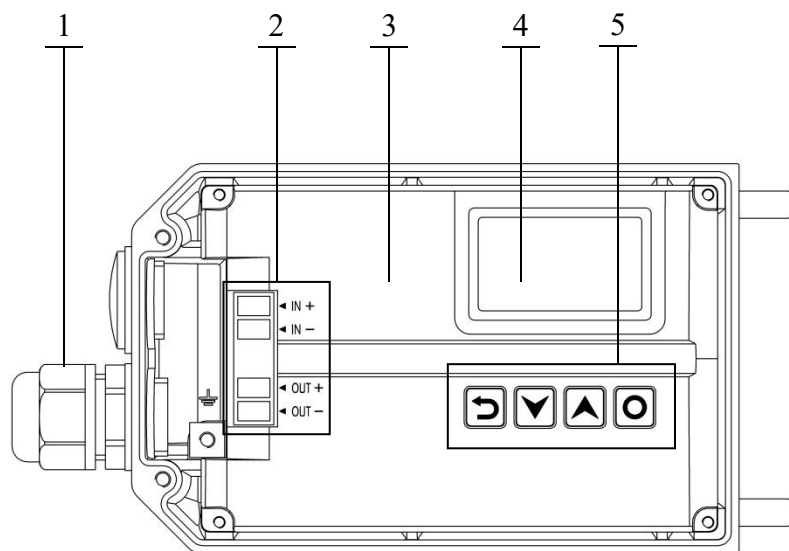
远传型直行程安装支架



角行程安装支架组装形式1

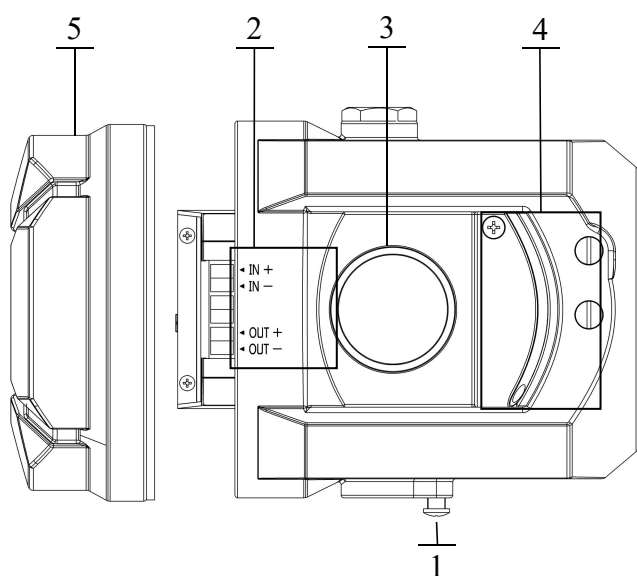
角行程安装支架组装形式2

4 产品结构



1. 电气线缆接入
2. 电气接线位置
3. 保护盖
4. 液晶显示
5. 按键

本安版本产品结构

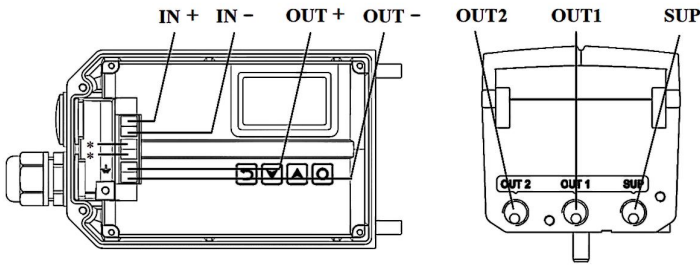


1. 电气线缆接入
2. 电气接线位置
3. 液晶显示
4. 按键
5. 端盖

隔爆版本产品结构

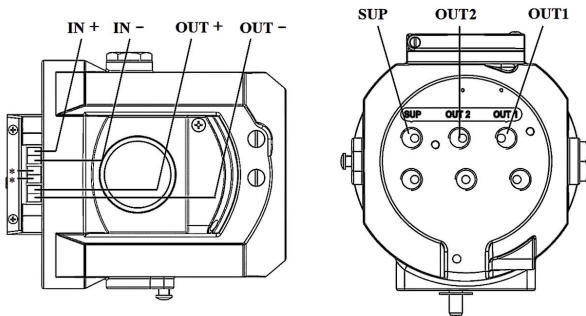
5

气动接口、电气接口及接线图



本安型

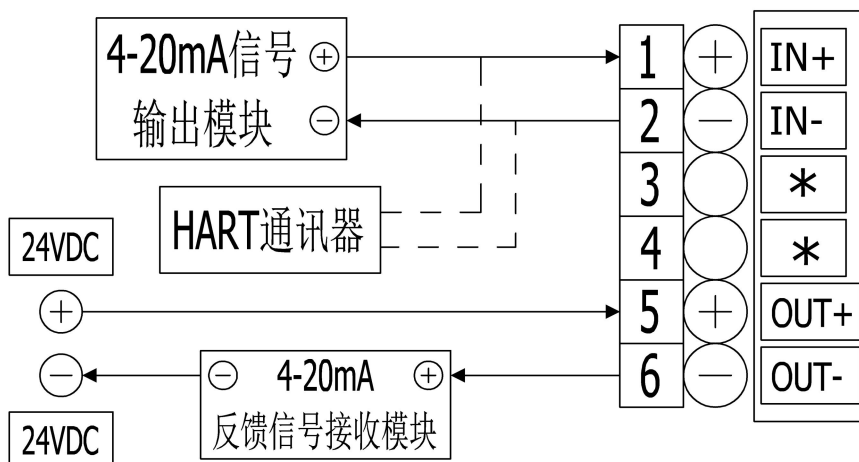
气动接口	描述
SUP	气源进入
OUT1	先导气口1
OUT2	先导气口2, 先导气口2, 双作用时使用

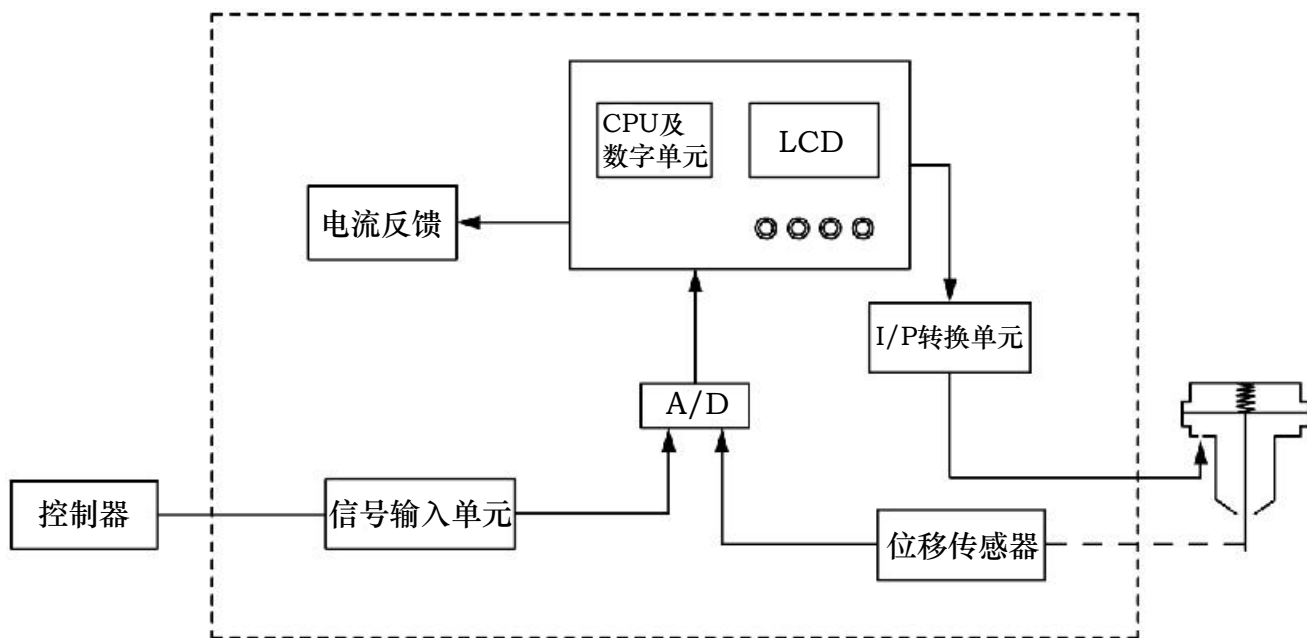


隔爆型

电气接口	描述
IN+	4-20 mA 设定信号 +
IN-	4-20 mA 设定信号 -
OUT+	反馈信号模块18-30 V DC+
OUT-	反馈信号模块4-20 mA输出
*	两个接口相互连接后设备处于低阻抗模式

接线图





软件附加功能

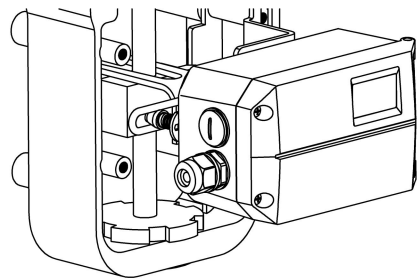
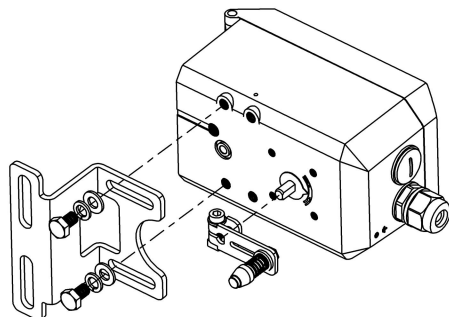
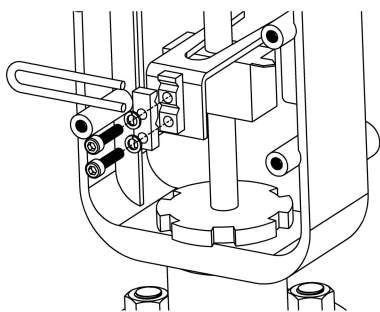
- 设定信号校正
- 特性曲线选择和设置
- 死区设置
- 信号方向设置
- 紧闭功能
- 行程方向设置
- 行程限制
- 恢复出厂设置

产品优势

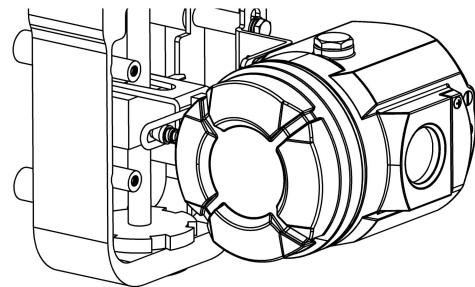
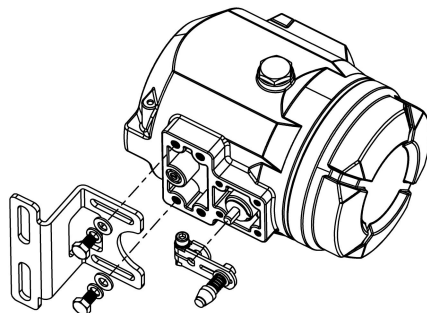
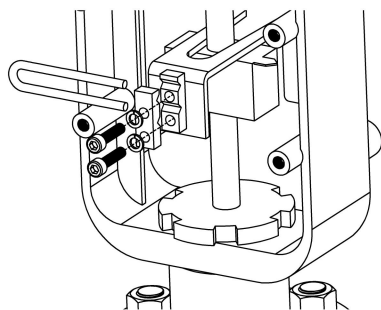
IP6000系列智能阀门定位器采用微处理器和新型压电阀代替传统定位器中的喷嘴、挡板调压系统来实现对输出压力的调节控制。通过CPU运算处理来实现对阀门开度的输入信号和阀位的反馈信号的控制。压电阀由于质量小，可以释放很短的控制脉冲，从而达到很高的定位精度，且压电阀只有在阀门有偏差并执行调节动作时才耗气，所以可以实现低耗能的目的。

直行程执行机构安装组件：

1. U型杆*1
2. 夹板*1
3. M6内六角螺钉*2
4. M6弹簧垫圈*2
5. 反馈杆*1
6. M6内六角螺栓*1
7. 直行程安装支架*1
8. M8六角头螺栓*2
9. M8弹簧垫圈*2
10. M8平垫圈*2



本安直行程

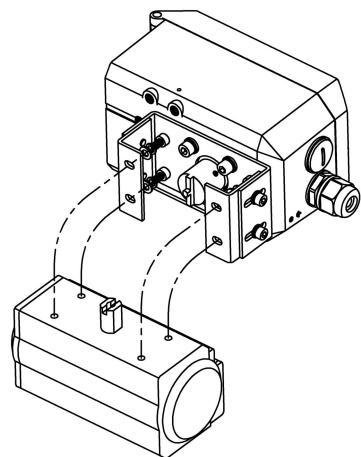
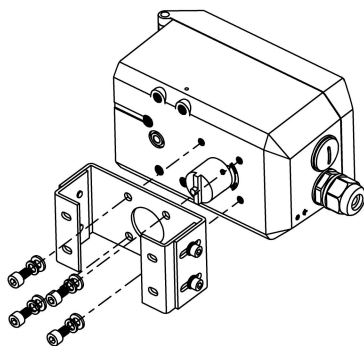
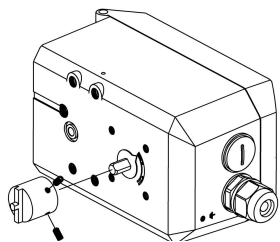


隔爆直行程

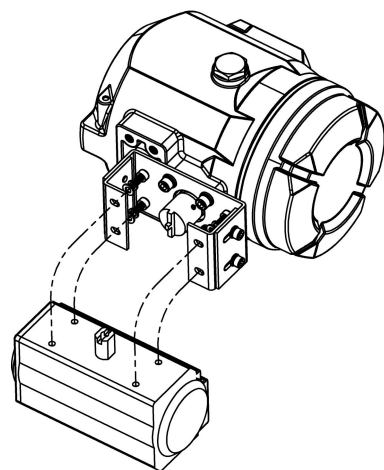
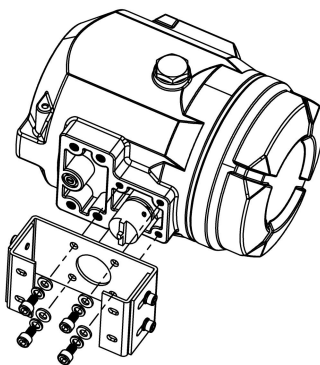
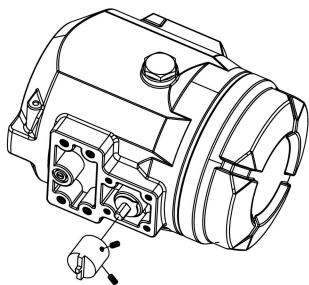
7 安装组件

角行程执行机构安装组件：

1. 适配器*1
2. 内六角紧定螺钉*4
3. 角行程安装支架*1
4. M6平垫圈*4
5. M6弹簧垫圈*4
6. M6内六角螺钉*4
7. M5内六角螺钉*4
8. M5弹簧垫圈*4
9. M5平垫圈*4



本安角行程



隔爆角行程

L 常规型直行程 FL 远传型直行程 R 常规型角行程 FR 远传型角行程 S 分体式*	行程类型
--	------

S 单作用 D 双作用	作用形式
----------------	------

n 不防爆 i Ex ia IIC T4/T6 Ga; Ex ia IIIC T200 135°C/ T200 85°C Da k Ex ia I Ma	防爆标志
---	------

0 无 1 有	反馈信号
------------	------

0 无 1 有	HART通信
------------	--------

0 无 1 直行程支架 2 角行程支架	安装支架
---------------------------	------

0 无 1 有	压力表组件
------------	-------

S 复位 F 保位	断电状态
--------------	------

N -20°C L -40°C	最低环境温度
--------------------	--------

IP6000-L-S-n-0-0-0-0-S-N

备注:

行程类型选项中, *标记选项S不支持最低环境温度选项L。

L 直行程 R 角行程	行程类型
S 单作用 D 双作用	作用形式
d Ex db IIC T6 Gb; Ex tb IIIC 85°C Db k Ex db I Mb	防爆标志
0 无 1 有	反馈信号
0 无 1 有	HART通讯
0 无 1 直行程支架 2 角行程支架	安装支架
0 无 1 有	压力表组件
S 复位 F 保位	断电状态
N -20~60°C L -40~60°C	环境温度
IP6000d - L - S - d - 0 - 0 - 0 - 0 - S - N	

IP6000 intelligent valve positioner is mounted on pneumatic control valves. It's used to control air intake and exhaust of the pneumatic actuators to drive the valve position to the set point by calculating both data from 4-20mA DC signal and feedback position.



1 Technical Description



Ex d linear type



Ex ia linear type

- **Enclosure material**
Intrinsic safety:
Aluminum alloy (Ex ia IIC T4/T6 Ga
Ex ia IIIC T₂₀₀ 135°C/T₂₀₀ 85°C Da)
Stainless steel 316L (Ex ia I Ma)
Flameproof:
Aluminum alloy (Ex db IIC T6 Gb; Ex tb IIIC T85°C Db)
Stainless steel 316L (Ex db I Mb)
- **Pressure gauge block material**
Aluminum, anodized
- **Input signal**
Input resistance: 120Ω
Limit voltage: 28V
- **Output signal**
Feedback type: 2-wire 4~20mA signal,
internal resistance 120Ω
- **Digital communication protocol**
HART 7
- **Minimum operating current**
3.8mA
- **Steady state air consumption**
≤ 0.4 L/min

● Stroke range

Default linear type: 10~100mm

Default rotary type: 30~100°

Separate type: 5~50mm

Flameproof separate type: 5~25mm

Optional mounting bracket: Hard connection or soft connection

Note: The stroke range of remote type is the same as that of default type

● Pneumatic data

Auxiliary power (air supply):

compressed air, carbon dioxide, nitrogen, inert gas, clean natural gas

Air quality meets ISO 8573-1 standard

Pressure range: 1.4~7bar(20.3~101.5psi)

Solid particle size and density: Grade 3

Pressure dew point: Class 3 (minimum 20K (36° F) lower than the ambient temperature)

Oil content: Class 3

● Flow rate

Intake:

2 bar 4.8 Nm³/h

4 bar 8.0 Nm³/h

6 bar 11.2 Nm³/h

Exhaust (fail-safe):

2 bar 5.9 Nm³/h

4 bar 9.8 Nm³/h

6 bar 13.7 Nm³/h

Exhaust (fail-freeze):

2 bar 6.6 Nm³/h

4 bar 11.1 Nm³/h

6 bar 15.6 Nm³/h

The value of the flameproof type (IP6000d) is reduced by about 20%

● NAMUR intrinsically safe explosion-proof limit switch technical parameters

Rated working voltage (Ue): 8.2DC

Supply voltage (UB): 8-9VDC

Output current: No action: ≥2.2mA; Action: ≤1mA

Ambient temperature range (Ta): -25°C~+70°C

Switching frequency: 800Hz

● Electrical connection

NPT1/2(default)

M20×1.5

● Pneumatical connection

NPT1/4(default)

G1/4

● Protection class

IP69K

● Vibration resistance

0.15mm, 10Hz-60Hz, 20 cycle/axis 20m/s², 60Hz-500Hz, 20 cycle/axis Recommended range for control valve

≤ 20 m/s², no resonance peak

● Linearity & Hysteresis

Linearity: ≤ 0.5%

Hysteresis: ≤ 0.5%

● Ambient temperature

Normal version for non-explosion-proof:
-20°C ~ +80°C

Low temperature for non-explosion-proof:
-40°C ~ +80°C

Normal version for explosion-proof:

-20°C ~ +80°C(T4)

-20°C ~ +40°C(T6)

-20°C ~ +60°C(EAC-T4)

-20°C ~ +40°C(EAC-T6)

Low temperature version for explosion-proof:

-40°C ~ +80°C(T4)

-40°C ~ +40°C(T6)

-55°C ~ +60°C(EAC-T4)

-55°C ~ +40°C(EAC-T6)

Ex d default type:

-20 °C ~ +60 °C(CCC)

-20°C ~ +40°C(EAC-T6)

Ex d low temperature type :

-40°C ~ +60 °C(CCC)

-55°C ~ +40°C(EAC-T6)

1 Technical Description

● Explosion-proof grade

Intrinsic safety: Ex ia I Ma

Ex ia IIC T4/T6 Ga

Ex ia IIIC T₂₀₀ 135°C/T₂₀₀ 85°C Da

Flameproof: Ex db I Mb

Ex db IIC T6 Gb

Ex tb IIIC T85°C Db



Ex ia type



Ex d type

Intrinsically safe type electrical parameters

Circuit name	Max input voltage U _i (v)	Max input current I _i (mA)	Max input power P _i (W)	Max internal equivalent parameters	
				C _I (nF)	L _I (mH)
4~20mA Input	28	93	0.66	≈ 0	≈ 0
4~20mA Output	28	93	0.66	≈ 0	≈ 0

Summary of electromagnetic compatibility results

Object	Description	Standard	Test level	Result
Ex ia type	Electrostatic discharge immunity	GB/T 17626.2	±4kV 触点 ±8Kv 空气	Pass
Ex ia type	Radio frequency electromagnetic field radiation immunity	GB/T 17626.3	3V/m, 80%AM (1kHz), 80MHz~1000MHz	Pass
Ex ia type	Power frequency magnetic field immunity	GB/T 17626.8	50Hz, 100A/m	Pass
Ex ia type	Electrical fast transient pulse group immunity	GB/T 17626.4	±1.0 kV	Pass
Ex d type	Radio frequency electromagnetic field radiation immunity	GB/T 17626.3	10V/m, 80%AM (1kHz), 80MHz~1000MHz	Pass

● Rated conditions-height

2000m above sea level.

At locations above 2000m above sea level, please use a suitable power supply.

● Rated conditions-installation position

Anywhere. In a humid environment, the pneumatic connector and exhaust port are not facing upwards, please install correctly

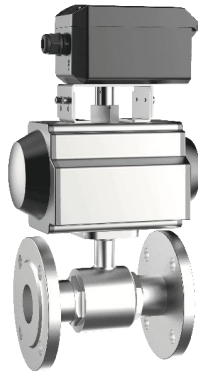
● Position feedback module

For position feedback DC output, 2-wire connection

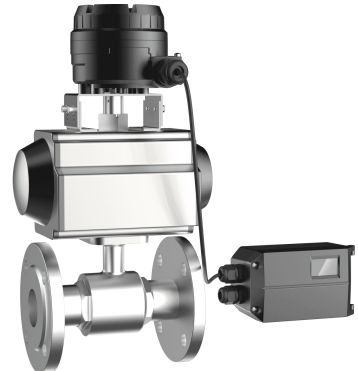
Current output	Terminals OUT1 and OUT2
Output rated signal range	4~20mA, short-circuit proof
Dynamic Range	3.8~20.5mA
External load R_B [k Ω]	$\leq (U_{Aux}[v]-12v)I$ [mA]
Transmission error	$\leq 0.5\%$
Temperature effect	$\leq 0.1\%/10K$ ($\leq 0.1\%/18^\circ F$)
Resolution	$\leq 0.1\%$
Effective internal capacitance	C_i =Approximately 0
Effective internal inductance	L_i =Approximately 0



Ex d rotary type



Ex ia default rotary type



Ex ia remote rotary type



Ex d separate type



Ex ia separate type

2 Advantages & applications



Advantages

- Simple mounting and one-key automatic commissioning
- Mature and reliable piezo module, imported from Germany
- Simple operation and configuration of the device using 4 buttons and LCD local display
- Numerous functions can be activated(e.g. characteristic curves and limits)
- Negligible air consumption in stationary operation
- Tight closing function
- Fail-freeze function (Optional according to product selection chart)
- One device variant for linear and rotary actuators
- Excellent shock resistance
- External remote sensor as option for extreme ambient conditions
- On-site calibration of 4-20mA input signal can be performed



Applications

IP6000 positioner application industry :

- Refining/Petrochemical/Nuclear Power/Power Plant
- Paper and glass/water and wastewater industry
- Food & beverage, pharmaceutical industry
- Marine Industry

IP6000 positioner application form :

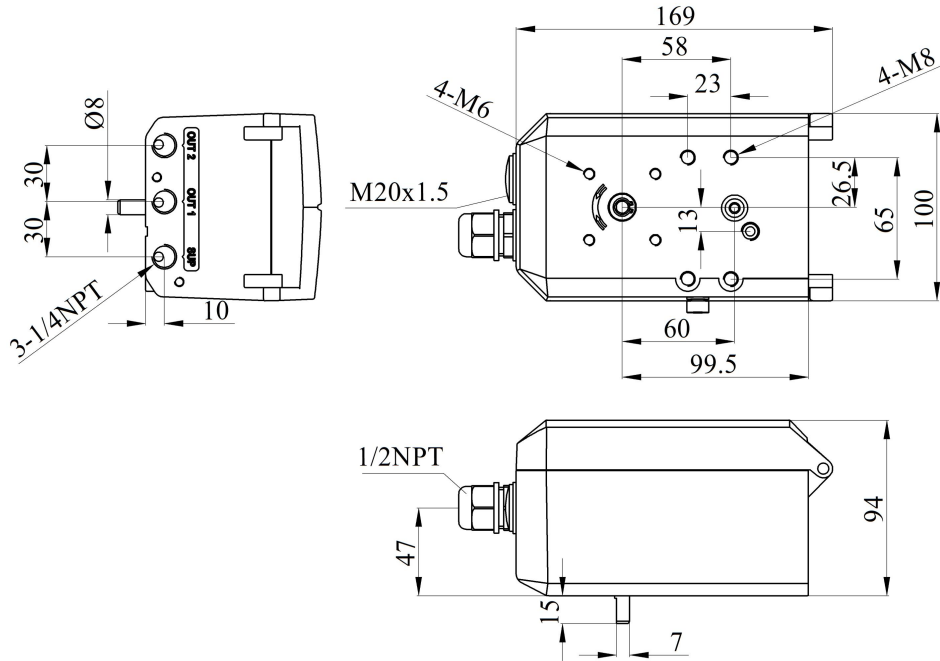
- For single/double acting actuators: aluminum enclosure and flameproof aluminum enclosure
- Used in non-hazardous locations
- Types used in hazardous locations: Intrinsically safe explosion-proof type "Ex ia"
Flameproof type "Ex d", aluminum flameproof enclosure
Ex db 、 Ex tb (Dust explosion-proof) 、 Ex ia



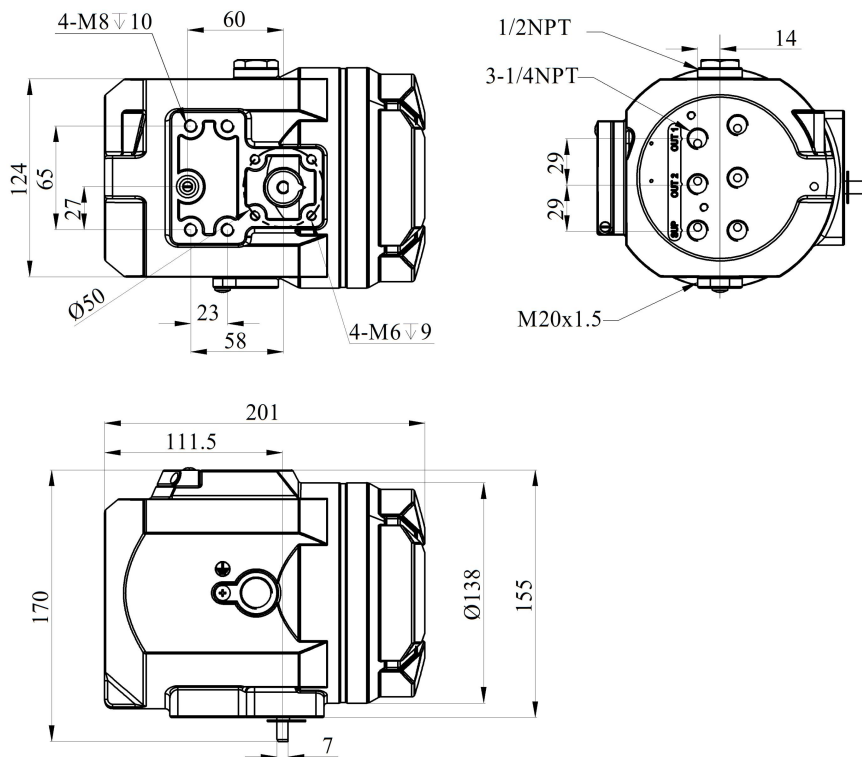
Ex ia remote linear type

3

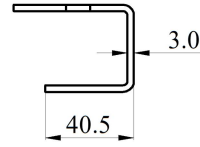
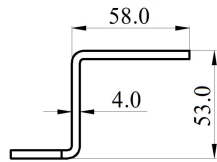
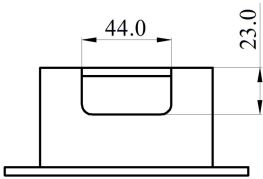
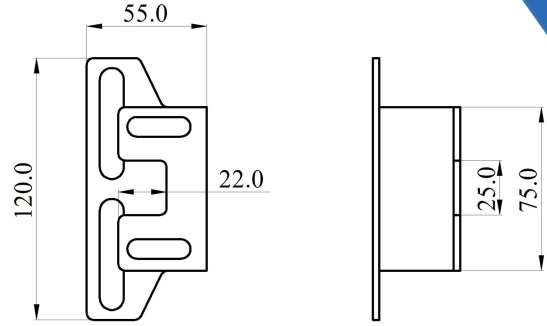
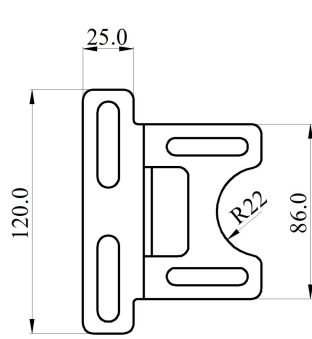
Mechanical Dimensions



Ex ia type mechanical dimensions

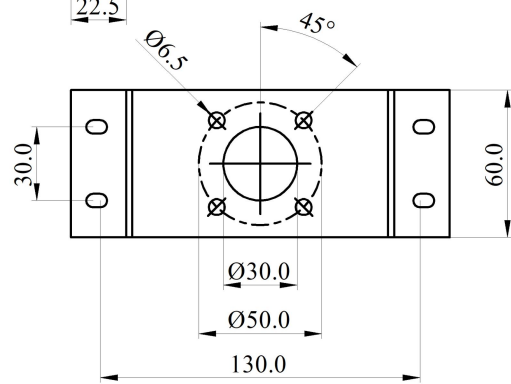
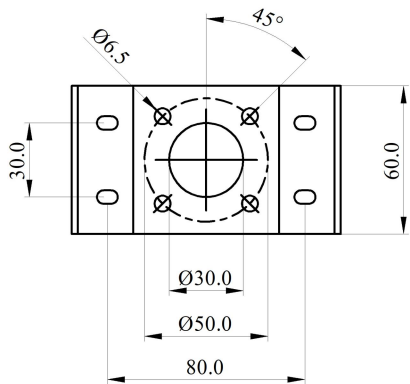
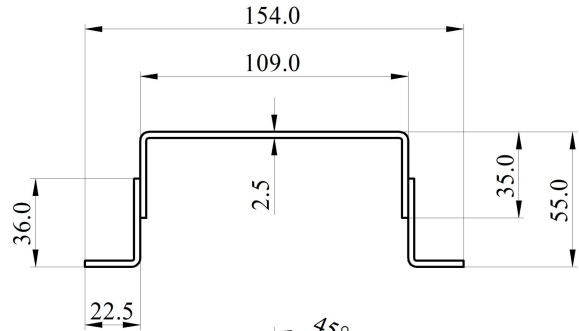
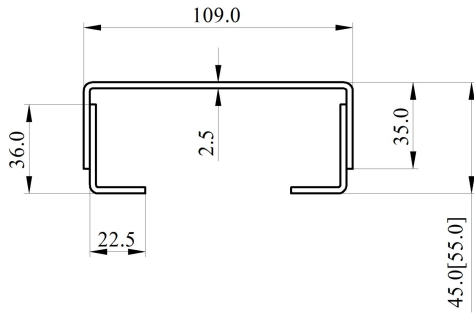


Ex d type mechanical dimensions



Linear mounting bracket

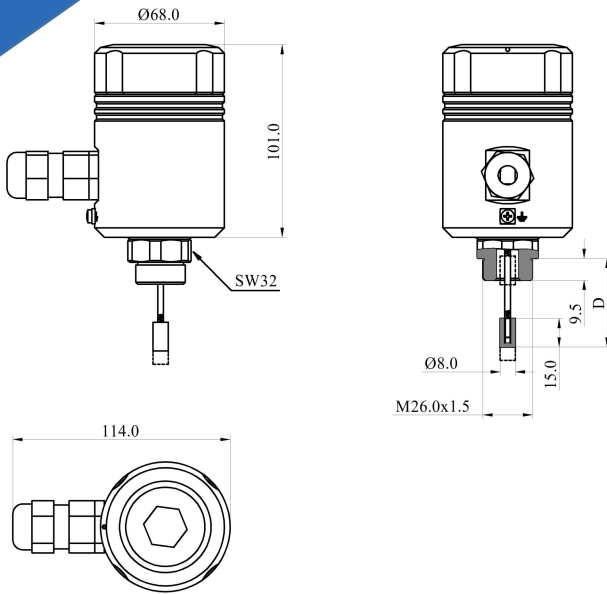
Remote type linear mounting bracket



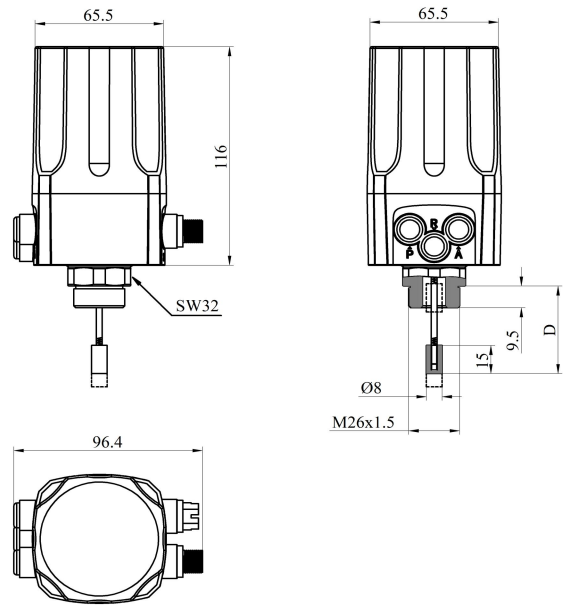
Rotary mounting bracket (Form 1)

Rotary mounting bracket (Form 2)

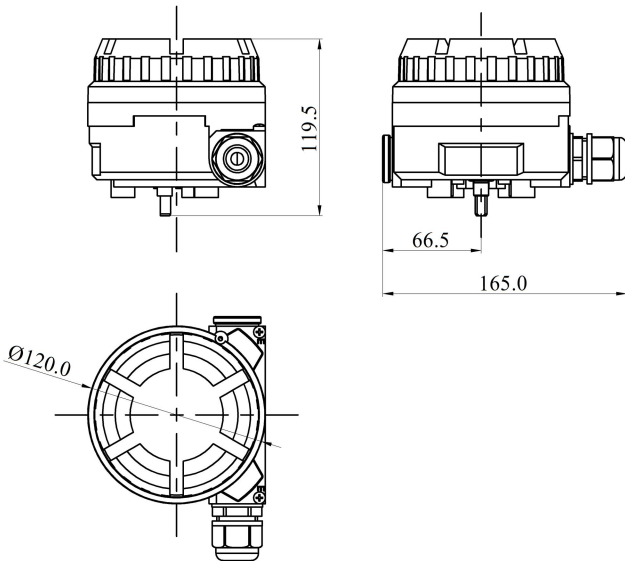
3 Mechanical Dimensions



Dimensions of Ex d separate type sensor

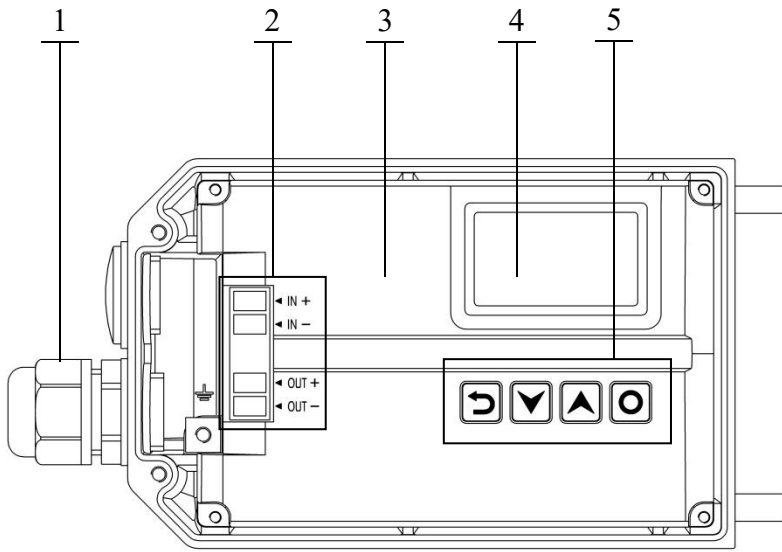


Dimensions of Ex ia separate type sensor



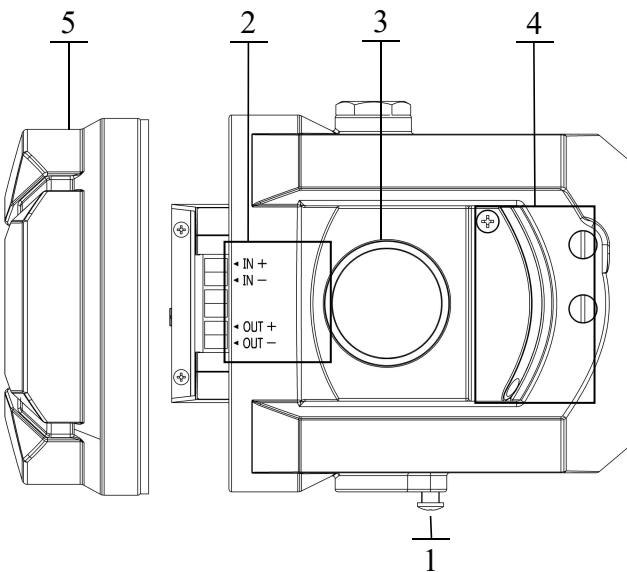
Dimensions of remote type sensor

4 Structure



1. Electrical cable access
2. Electrical wiring position
3. Shell
4. LCD screen
5. Buttons

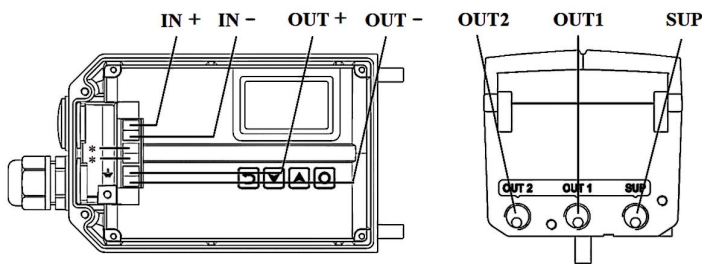
Ex ia positioner structure



1. Electrical cable access
2. Electrical wiring position
3. LCD screen
4. Buttons
5. End cover

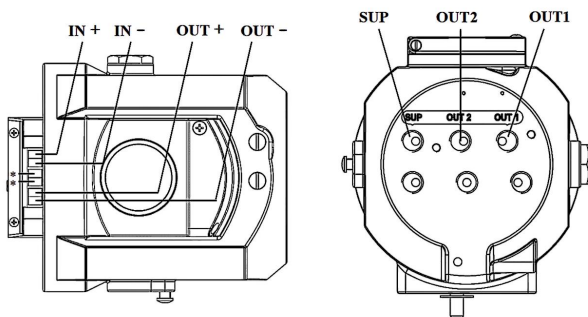
Ex d positioner structure

5 Electrical & pneumatic connections, wiring diagram



Ex ia type

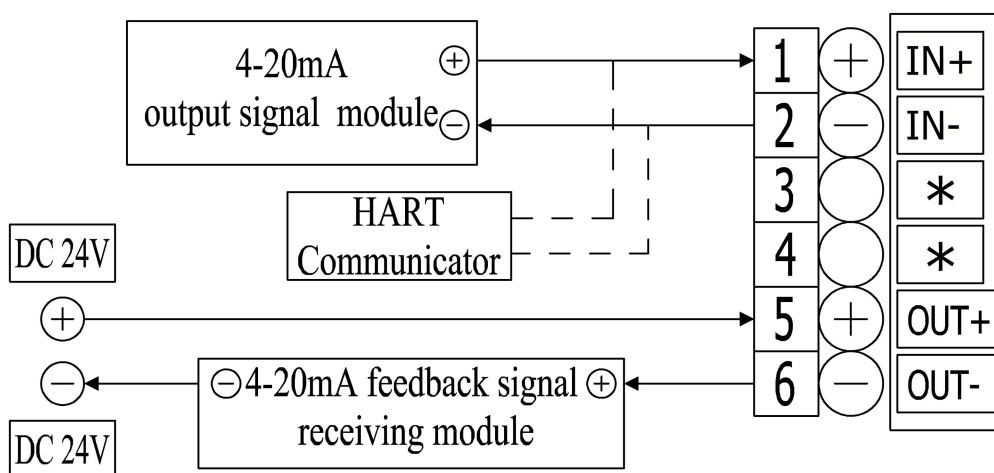
Pneumatical	Description
SUP	Air supply enter
OUT1	Pilot air outlet 1
OUT2	Pilot air outlet 2, used for double acting type.

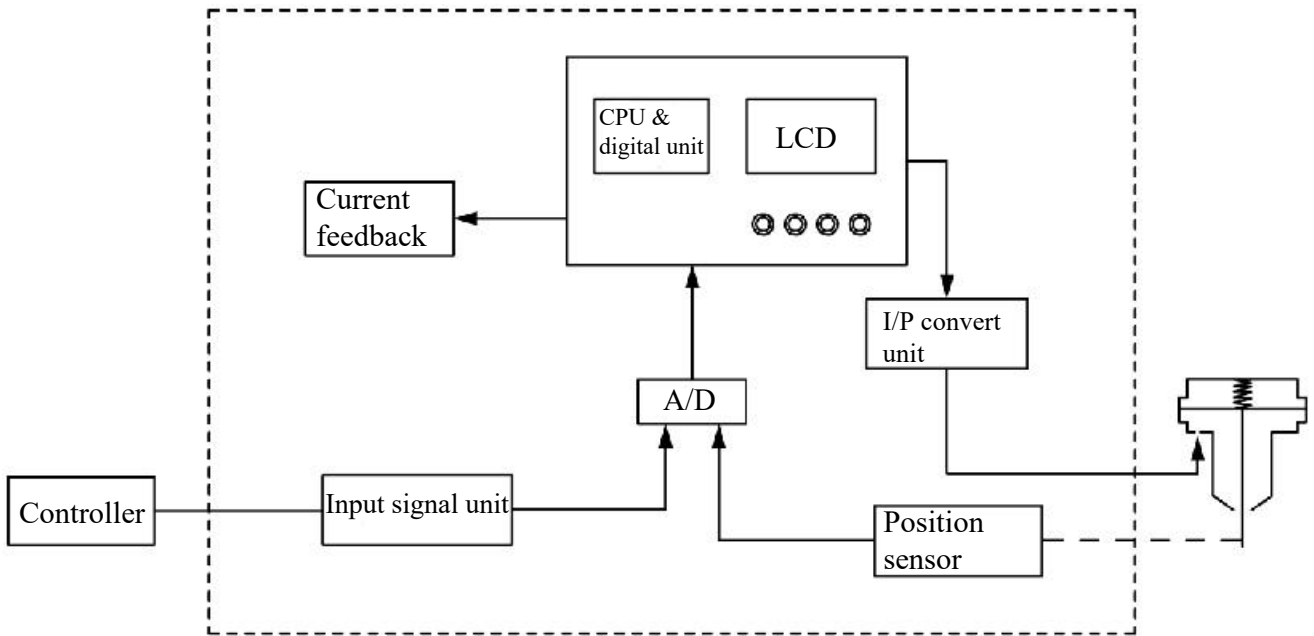


Ex d type

Electrical	Description
IN+	4-20 mA input signal +
IN-	4-20 mA input signal -
OUT+	Feedback signal module 18-30 V DC +
OUT-	Feedback signal module 4-20mA output
*	The two interfaces are connected with each other, and the device is in low impedance mode.

Wiring diagram





Additional Software Functions

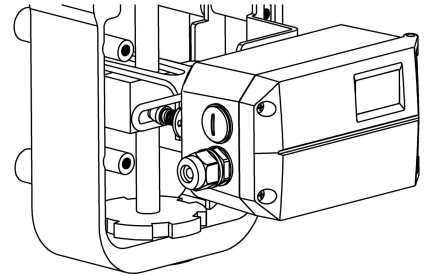
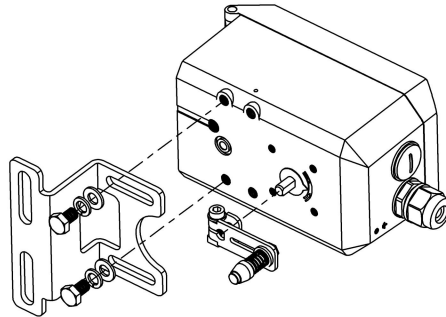
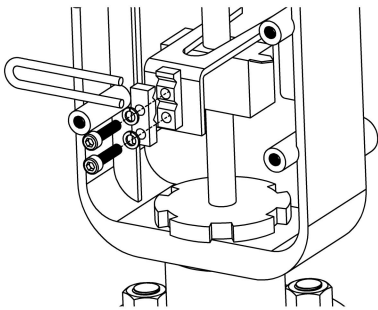
- Calibrating the input signal.
- Calibrating the set-point signal.
- Tight closing function
- Stroke limit function
- Setting and selection of characteristic curves
- Selection of signal direction.
- Selection of stroke direction.
- Reset function

Advantages

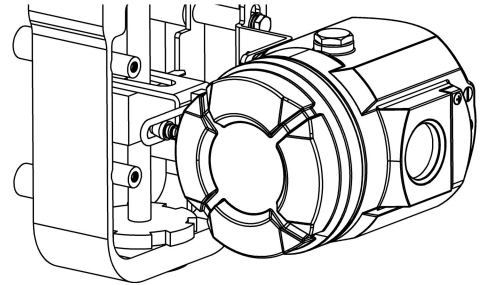
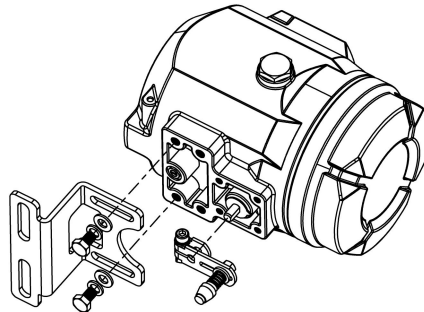
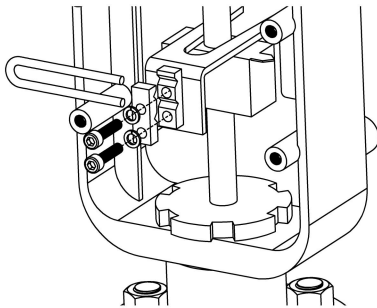
The IP6000 series intelligent valve positioner uses a microprocessor and a new type of piezo valve to replace the nozzle and baffle pressure regulating system in the traditional positioner to realize the regulation and control of the output pressure. The control of the input signal of the valve opening and the feedback signal of the valve position is realized by CPU calculation processing. The piezo valve can release a short control pulse due to its small mass, thereby achieving high precision, and the piezo valve consumes air only when the valve is deviated and performing adjustment actions, so there is a low consumption.

Linear actuator mounting components :

1. U-shaped rod*1
2. Clamping assembly*1
3. M6 hexagon socket screw*2
4. M6 spring washer*2
5. Feedback lever*1
6. M6 hexagon socket bolt*1
7. Linear mounting bracket*1
8. M8 hexagon head bolt*2
9. M8 spring washer*2
10. M8 flat washer*2



Ex ia linear type

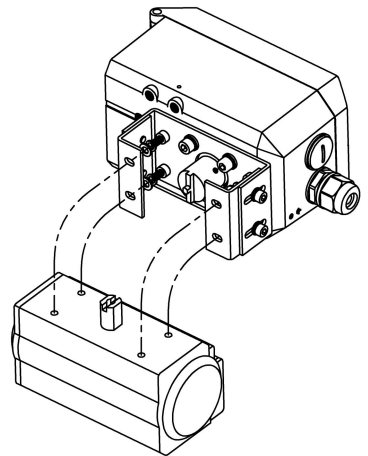
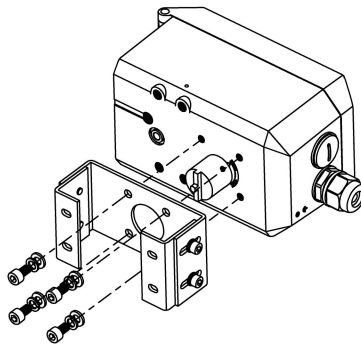
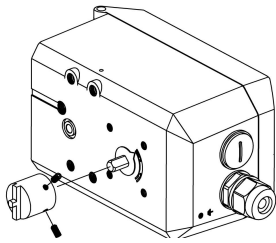


Ex d linear type

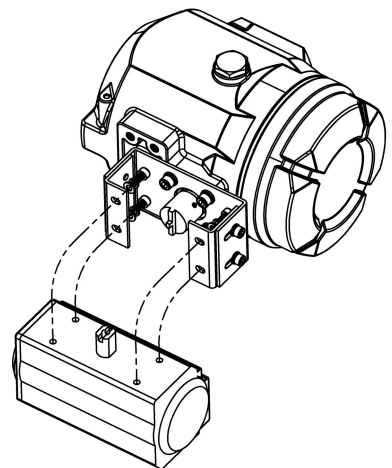
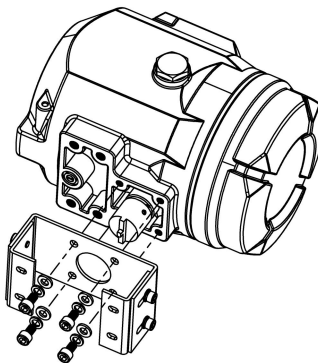
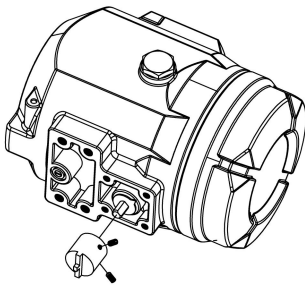
7 Mounting components

Linear actuator mounting components:

1. Adapter*1
2. Hexagon socket set screw*4
3. Rotary mounting bracket*1
4. M6 flat washer*4
5. M6 spring washer*4
6. M6 hexagon socket screw*4
7. M5 hexagon socket screw*4
8. M5 spring washer*4
9. M5 flat washer*4



Ex ia rotary type



Ex d rotary type

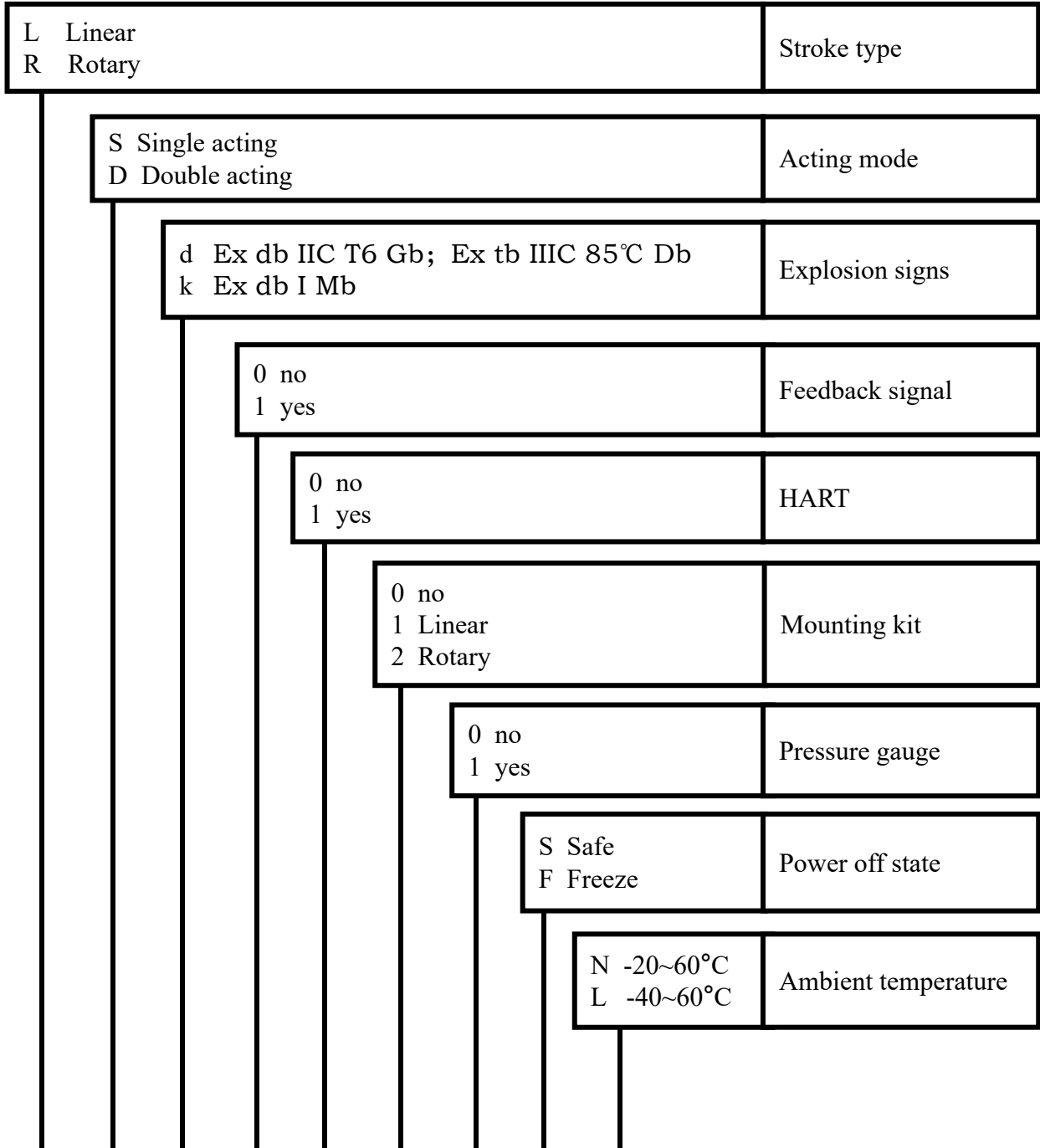
L Normal linear FL Remote linear R Normal rotary FR Remote rotary S Separate *	Stroke type
S Single acting D Double acting	Acting mode
n No explosion i Ex ia IIC T4/T6 Ga; Ex ia IIIC T200 135°C/ T200 85°C Da k Ex ia I Ma	Explosion signs
0 no 1 yes	Feedback signal
0 no 1 yes	HART
0 no 1 Linear Bracket 2 Rotary Bracket	Mounting Bracket
0 no 1 yes	Pressure gauge
S Safe F Freeze	Power off state
N -20°C L -40°C	Lowest ambient temperature
IP6000 - L - S - n - 0 - 0 - 0 - 0 - S - N	

Remark:

In **Stroke type** options, the option **S** marked with * does not support **Lowest ambient temperature** option **L**.

8

Selection and ordering data(Ex d)



IP6000d - L - S - d - 0 - 0 - 0 - 0 - S - N