

YG 系列伺服油缸（直线伺服油缸）

HYG series servo cylinders (linear servo cylinders)

产品简介

Product overview

液压伺服油缸不同于液压传动中所用的工程油缸（液压缸），伺服油缸主要由活塞、缸筒、耳环及左右端盖等组成。其品质优劣直接决定了伺服系统的动态响应能力、静态控制精度和系统稳定性。

The hydraulic servo cylinder is different from the engineering oil cylinder (hydraulic cylinder) used in hydraulic transmission. The servo cylinder mainly consists of piston, cylinder tube, ear loop, left and right end covers. Its quality directly decides dynamic response capability, static control accuracy and system stability of the servo system.



产品特点

Product features

- 集成度高、负载容积小
High integration level and small load capacity
- 零内漏
Zero internal leakage
- 可实现闭环控制，精度高
Closed-loop control can be achieved; high accuracy
- 液压固有频率高
High hydraulic natural frequency
- 启动压力小，低速无爬行，运动平稳，响应快
Small starting pressure, low velocity, no crawling, stable movement, quick response
- 静压轴承可耐受侧向载荷
Hydrostatic bearing can tolerate side load
- 无隙球钗结构定位精度高
Zero-clearance ball hairpin structure, good positioning accuracy
- 低摩擦、长寿命
Low friction, long life time

工作液要求

Working fluid requirements

- ◆ 液压油：符合 SY1181、Q/SY11507 规定的航空液压油、石油基抗磨液压油、汽轮机油、透平油等。

Hydraulic oil: aviation hydraulic oil, petroleum-based anti-wear hydraulic oil, steam turbine oil and turbine oil in accordance with SY1181 and Q/SY11507.

- ◆ 工作温度：-25°C~+85°C

Working temperature: -25°C~+85°C

- ◆ 油液清洁度：ISO4406 标准 20/18/15NAS16389 级，安装过滤精度为 10 μ m 的进油过滤器（10 β ≥75 推荐值）

Oil cleanliness: Level 20/18/15NAS16389 in ISO4406 standard; the oil inlet filter with filtration accuracy of 10 μ m is installed (recommended value 10 β ≥75)

选型指南

Model selection guidance

1、 选型一般原则

1. General principles

满足伺服系统对伺服缸的结构安装要求；满足伺服系统对伺服缸的性能要求；满足伺服系统对伺服缸的质量要求。

The structure installation requirements of the servo system for the servo cylinder should be met. The performance requirements of the servo system for the servo cylinder should be met. The quality requirements of the servo system for the servo cylinder should be met.

2、 传感器的安装形式分为：位置传感器（可以选择内置式传感器和外置式传感器）；压力传感器；力传感器。

2. Installing form of sensors: position sensor (the built-in sensor and external sensor can be chosen); pressure sensor; force sensor.

3、 连接支承形式种类分为：耳座；径向底座；切向底座；轴向底座；头部销轴；中部销轴；尾部销轴；头部外法兰；尾部外法兰等安装形式。

3. Connection and supporting forms: lug; radial base; tangential base; axial base; head pin roll; middle pin roll; tail pin roll; head external flange; tail external flange.

4、 输出端结构形式：耳叉式、螺纹连接式、杆端关节轴承式。

4. Structural form of output end: ear fork, threaded connection, rod end joint bearing.

5、 活塞杆的结构形式分为：双向活塞杆（输出速度：双向对称）；单向活塞杆（输出速度：双向不对称）。

5. Structural form of piston rod: two-way piston rod (output speed: two-way symmetrical); one-way piston rod (output speed: two-way asymmetrical).

6、 缸筒内径 D 和活塞杆直径 d 尺寸应在设计图纸中标注。

6. Diameter D of cylinder tube and diameter d of piston rod shall be indicated on the design drawing.

性能指标

Performance indicators

1、 额定工作压力

1. Rated working pressure

液压伺服油缸的工作压力为（1-31.5）MPa。

The working pressure of hydraulic servo cylinder is (1-31.5) MPa.

2、 最低启动压力

2. Minimum starting pressure

液压伺服油缸在空载条件下，驱动伺服油缸活塞运动的最小工作压差。航宇智星设计制造的液压伺服油缸的最低启动压力 $\Delta P \leq 0.02 \text{MPa}$ 。

Minimum working differential pressure of the hydraulic servo cylinder driving the servo cylinder piston under no-load conditions. The minimum starting pressure of the hydraulic servo cylinder designed and manufactured by Hangyu WitStar is: $\Delta P \leq 0.02 \text{MPa}$.

3、 全行程和工作行程

3. Full stroke and working stroke

活塞在缸筒中运动的最大位移（即活塞杆最大伸缩量）称液压伺服油缸的全行程，以 mm 表示。

The maximum displacement of the piston moving in the cylinder (i.e. the maximum expansion of the piston rod) is called the full stroke of the hydraulic servo cylinder, expressed with mm.

液压伺服油缸工作所需要的直线行程叫工作行程，工作行程 \leq 全行程。

The linear stroke required by the hydraulic servo cylinder is called the working stroke, working stroke \leq full stroke.

双向工作的液压伺服油缸的工作行程可用 \pm 工作行程表示， \pm 工作行程 \leq 全行程/2。

The working stroke of the hydraulic servo cylinder working in two directions can be expressed with \pm working stroke, \pm working stroke \leq full stroke.

4、 最大输出力与最大负载力

4. Maximum output force and maximum load force

在负载条件下，当进油为额定压力，回油为零压，输出速度为零时液压伺服油缸输出的作用力称为最大输出力。

The maximum output force is the force output by the hydraulic servo cylinder when oil is fed at the rated pressure and returned at zero pressure and the output speed is zero under load conditions.

在伺服系统中，液压伺服缸工作时需要承受的最大负载称为最大负载力，最大输出力应不小于最大负载力。

In the servo system, the maximum load required by the hydraulic servo cylinder is called the maximum load force, and the maximum output force shall not be lower than the maximum load force.

最大输出力由用户的技术协议中规定。

The maximum output force is stipulated by users in the technical agreement.

最大输出力可按下式简化计算：

The maximum output force can be calculated according to the following formula:

$$F_{\max} = A \rho P_s$$

式中 F_{\max} ---最大输出力 (N)

Wherein, F_{\max} - maximum output force (N)

A ---活塞有效工作面积 (m^2)

A - effective working area of piston (m^2)

ΔP ---油缸有效工作压差 (MPa)

ΔP - effective working differential pressure of cylinder (MPa)

5、全行程和工作行程

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The working stroke of the hydraulic servo cylinder working in two directions can be expressed with \pm working stroke, \pm working stroke \leq full stroke.

6、内漏

6. Internal leakage

在空载额定压力条件下，伺服油缸活塞两工作腔间油液的内部泄漏量。航宇智星设计制造的液压伺服油缸的最低内漏 $\leq 0.5\text{mL/min}$ 。

Internal leakage of oil between two working chambers of the piston of servo cylinder under no-load rated pressure. The minimum internal leakage of the hydraulic servo cylinder designed and manufactured by Hangyu WitStar is: $\leq 0.5\text{mL/min}$.

7、静压密封性

7. Static-pressure sealing

伺服油缸两工作腔在 2 米高液柱的静压作用下，静置 24 小时后，不得有明显的外部泄漏（允许湿润，不允许滴下）。

After the two working chambers of the servo cylinder are placed still for 24h under the static pressure of 2m high liquid column, obvious external leakage is not allowed (wetting is allowed, but dripping is not allowed).

8、超压密封性

8. Over-pressure sealing

伺服油缸在 1.5 倍（额定压力 $\leq 16\text{MPa}$ ）或 1.25 倍（额定压力 $\geq 16\text{MPa}$ ）额定压力作用下保持 3 分钟后，不得出现永久变形和明显的外部泄漏（允许湿润，不允许滴下）。

After the servo cylinder keeps 1.5 (rated pressure $\leq 16\text{MPa}$) or 1.25 (rated pressure $\geq 16\text{MPa}$) times of rated pressure for 3min, there shall be no permanent deformation and obvious external leakage (wetting is allowed, but dripping is not allowed).

9、外部密封

9. External sealing

在使用条件下，伺服油缸工作时不得有明显的外部泄漏（允许湿润，不允许滴下）。

Under the use conditions, the servo cylinder shall not have obvious external leakage when working (wetting is allowed, but dripping is not allowed).

10、 液压固有频率

10. Hydraulic natural frequency

伺服油缸的液压固有频率可用下式简化计算

The hydraulic natural frequency of the servo cylinder can be calculated according to the following formula:

$$\omega = \sqrt{\frac{4ED^2}{VJ}} \text{ (rad/s)}$$

式中： A---活塞有效面积（ m^2 ）

Wherein, A - effective working area of piston (m^2)

E---油液弹性模量（ N/m^2 ）

E - elasticity modulus of oil (N/m^2)

V---伺服油缸的总容积（ m^3 ）

V - Total volume of servo cylinder (m^3)

M---活塞杆与负载质量之总和（ kg ）

M - Sum of piston rod and load weight (kg)

液压固有频率应满足伺服系统稳定工作的要求，它与系统负载、油缸全行程、最大输出力、设计与制造质量有关。由用户在技术协议中规定。

The hydraulic natural frequency shall meet the stable working requirements of the servo system, and it is related to system load, full stroke of oil cylinder, maximum output force, design and manufacturing quality. It is stipulated by users in the technical agreement.

11、使用环境要求

11. Requirements for service environment

环境温度：-10°C~40°C

Ambient temperature: -10°C~40°C

相对湿度：≤80%

Relative humidity: ≤80%

油液温度：-10°C~60°C

Oil temperature: -10°C~60°C

工作液清洁度：ISO4406 15/12, NAS16386 级。工作液清洁度直接影响伺服油缸的使用寿命和性能，系统工作液越清洁伺服油缸的使用寿命越长，性能越好。

Cleanliness of working fluid: ISO4406 15/12, NAS16386. The cleanliness of working fluid directly affects the service life and performance of a servo cylinder. The cleaner the working fluid is, the longer the service life of and the better the performance of the servo cylinder is.

振动：不产生振动。

Vibration: no vibration.

无线电干扰和磁场干扰：没有强无线电干扰环境和强磁场干扰环境。

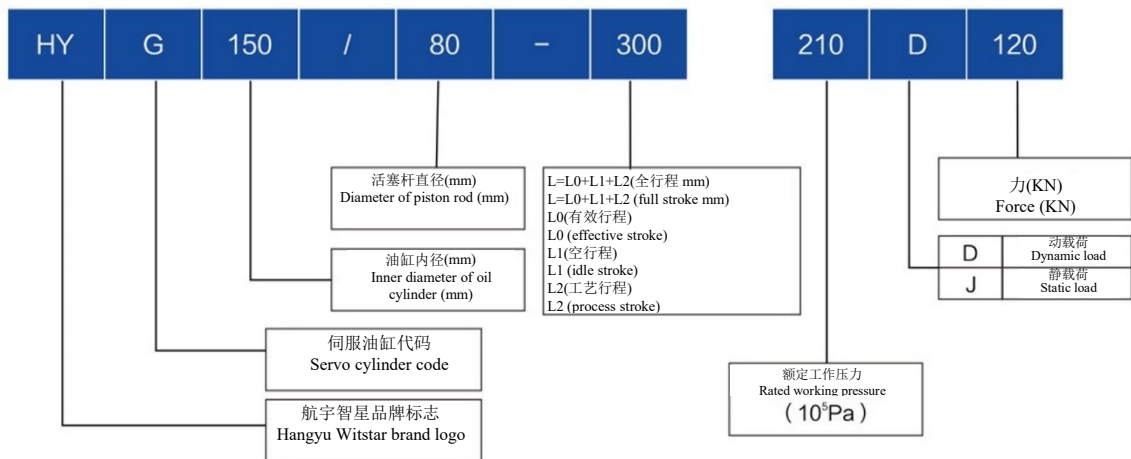
Radio interference and magnetic field interference: no strong radio interference environment and strong magnetic interference environment.

接地：要求配装电液伺服阀、伺服放大器时与传感器良好接地，接地电阻≤4Ω。

Grounding: good grounding with sensors when the electrohydraulic servo valve and the servo amplifier are equipped, with an earth resistance not more than 4Ω

HYG 系列伺服油缸系列号

Serial No. of HYG series servo cylinders



注：航宇智星可按用户的特殊要求定制各种液压伺服油缸

Note: Hangyu WitStar can customize various kinds of hydraulic servo cylinders as required by users.

伺服油缸定制功能参数表见附录二

See Appendix II for customized function parameter list of servo cylinder