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ITW Performance Polymers & Fluids China
依工聚合与流体化学工业，中国

EPOCAST 36[®]

POURABLE CHOCKING COMPOUND

APPLICATION PROCEDURE

环氧树脂安装工艺

艙管定位

ITW PERFORMANCE POLYMERS & FLUIDS, CHINA

依工聚合与流体化学工业，中国

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EPOCAST 36® 艉轴管安装工艺

一、 General **简述**

EPOCAST 36® epoxy resin chock is an engineering product which is manufactured by **H.A.SPRINGER marine + industrie service GmbH** in Germany, and is approved worldwide by all the major classification societies like: ABS, LR, GL, DNV, BV, KR, NK, CCS and others. **EPOCAST 36®** 环氧树脂浇注垫块是由德国 **H.A.SPRINGER marine + industrie service GmbH** 公司生产的环氧化合物，并获得了世界上诸如 ABS、LR、GL、DNV、BV、KR、NK、CCS 等各大船级社的认可。

EPOCAST 36® epoxy resin material, as a chocking compound material, is widely used in marine industry for machinery installation where accurate alignment is important. **ITW Performance Polymers & Fluids, China**, as one of business departments of **Illinois Tool Works Company** in China, is in charge of business of **H.A. Springer marine + industrie service GmbH** to promote **EPOCAST 36®** in china marine industry. Our service engineers have many years' installation experience in practice and are certificated by **H. A. Springer marine + industrie service GmbH**. 当前，环氧树脂浇注垫块在船舶机械的安装定位上已经得到广泛应用。ITW中国作为 **Illinois Tool Works Company** 在中国的事业部之一，负责 **H.A.SPRINGER marine + industrie service GmbH** 公司在华的业务，在中国积极推广该产品在船舶修造上的应用。我们的服务工程师均通过 **H.A.SPRINGER marine + industrie service GmbH** 公司专业的培训并具有长期的工作实践经验。

For the installation of stern tube, we are applying the **EPOCAST 36®** by pumping under pressure, using our special designed pump. Comparing with the filling by the primitive gravity way, the big advantage for you is that by our pressure method, we can assure that gap between the Stern tube and Stern Frame boss is 100% filled. And the acceptable minimum gap is only 5mm. So shipyard will be more flexible to install the stern tube.

在艉轴管安装时，环氧树脂通过一台特殊设计的泵进行浇注。与普通的重力式浇注方法相比，采用泵入式压力浇注，艉管和艉柱间允许的空隙可以更小（最小5毫米），船厂可以拥有更大的轴系对中余度。我们可以保证环氧树脂100%填满艉管和艉柱间的空隙。



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**GENERAL OPERATION PROCEDURE FOR THE STERN TUBE
INSTALLATION WITH EPOCAST 36[®]**

EPOCAST 36[®]环氧树脂应用于艉轴管安装时的操作程序主要如下：

二、 Main Points To Be Noted In Advance

施工前应注意的要点：

1. Ensure that appropriate Classification Society has been informed of the proposed application of **EPOCAST 36[®]** and written approval has been obtained where necessary.
确保 **EPOCAST 36[®]** 环氧树脂垫块的浇注已经通知相关的船级社和船东，并且必要时相应图纸应获得书面认可。
 2. Ensure the **EPOCAST 36[®]** material will be carried out by the service engineer from **ITW Performance Polymers & Fluids, China** or other persons with the Identity Card issued by **H.A.SPRINGER marine + industrie service GmbH**.
确保 **EPOCAST 36[®]** 环氧树脂垫块的浇注由 ITW 公司的专职服务工程师或者其它具有 **H.A.SPRINGER marine + industrie service GmbH** 公司资质认可的人员实施。
 3. **EPOCAST 36[®]** consists of 2 liquid components, the resin and the hardener, which should be stored protected against freeze. Shelf life of **EPOCAST 36[®]** is more than 18 months.
EPOCAST 36[®] 包含双组份的液体材料：环氧树脂和固化剂。贮藏时应注意防冻。使用有效期为出厂后 18 个月以上。
 4. Due to the special designed filling pump, normally the thickness of **EPOCAST 36[®]** epoxy resin should not be less than 5mm.
由于采用特殊设计的浇注泵进行压力式浇注，**EPOCAST 36[®]** 环氧树脂垫块在艉管上的应用，其允许的最小厚度为 5 毫米。
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三、 Material And Tools Required

材料和施工工具

1. Damming material is supply by ITW, including:-

由 ITW 公司提供的施工材料，包括：

(1). Foam rubber sealing ring:

专用硅胶密封条；

(2). Jiffy mixer;

搅拌浆叶；

(3). Sealing Compound;

密封腻子；

(4). Adhesive;

胶水

(5). Portable Temperature Gauge;

便携式温度计

(6). Barcol Hardness Tester: 1PC

巴氏硬度计：1 个，用于测量环氧样块硬度；

(7). Special Pump;

专用浇注泵；

(8). Funnel and pipe (1/4");

浇注用漏斗和管子(1/4")

(9). Drilling machine (200~500rpm);

手提电钻，转速 200~500rpm，用于搅拌环氧树脂；

2. Material and tools to be prepare and supply by shipyard, including

由船厂需提供和准备的材料，包括：

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- (1). 10~20 litres acetone and sufficient rags, for removing grease, oil in the chocking area and cleaning the filling pump after pumping;
10~20 升丙酮和足够的抹布，用于环氧树脂浇注区域和浇注完毕后泵的清洁；
 - (2). Flange damming steel plate with thickness about 1mm;
厚度约为 1 毫米的法兰面密封挡圈；
 - (3). “Half ring plates” with thickness 3~5mm; 2 pairs (4 pcs), please see the attached 1 for its position and dimensions;
3~5 毫米厚的对半分的密封压板：2 对（4 只）其位置和尺寸详见附图 1；
 - (4). 220V / 50Hz 2 Phase power supply for mixing drill, 380V/50Hz 3 Phase power supply for filling pump;
220V / 50Hz 的两相电源，用于驱动手提电钻，380V/50Hz 的三相电源用于浇注泵；
 - (5). 3~10 men (including 1 welder) for the installation work;
3~10 名工人（含 1 名电焊工）进行施工配合。
 - (6). Sufficient 36v work-lights in the chocking areas;
如施工区域亮度不够或者在晚上施工，还需要准备足够的 36V 安全照明灯，并预先安装到位。
 - (7). Sufficient wooden bolt plugs for sealing the bolt holes on stern-tube flange; Diameter: bolt hole diameter + 0.5~1.0mm; Length: \geq (flange thickness + epoxy thickness) x 1.2;
足够的松木塞，用于艉管法兰面螺栓通孔的封堵。其直径比螺栓孔径大 0.5~1.0 毫米，长度应不小于法兰厚度及环氧厚度总和的 1.2 倍，数量根据法兰面螺栓孔的数量来决定；
 - (8). In winter or at below an ambient and / or steel temperature of 13°C, the additional preparation work must be carried out in advance as follows:-
在冬季或者环境温度过低 < 13°C 时，还需要准备下列加热设备：
 - (a). Sufficient electric heater for preheating the **EPOCAST 36®** resin
足够的电烘箱或电加热，用于预热环氧树脂和浇注区域。
 - (b). Sufficient electric hot air machine or heater to heat the chocking area to at least 20°C after the **EPOCAST 36®** resin pouring to shorten the cure time.
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足够的热风机、电加热器或碘钨灯，用于浇注后加热环氧树脂区域至 20℃ 以上，以促使并缩短固化时间。

- (9). Stopping plate made by channel steel for preventing the movement along the shaft line after pushing the stern tube into the stern frame boss, the width shall be less than distance between two immediate bolts, length = diameter of sternpost + 150mm; weld two bolts on sternpost for fixing the stopping plate, see attached 2;

为防止艏管塞入艏柱后发生轴向位移，需采用槽钢制作几只法兰面压板。其宽度应小于法兰面两相邻螺栓间的间距，长度比艏柱直径长约 150mm；同时在艏柱上焊两只螺栓，用于固定法兰面压板，见附图二。

四、 Preparation work before pouring EPOCAST 36® 浇注前的准备工作

1. Prepare the **EPOCAST 36®** resin to the required temperature well ahead of time. (See the attached *Mixing & Pouring Guide 1.3.2*). The temperature of the pouring is 20℃ at least to ensure suitable mixing and pouring viscosity. The hardener to be at the ambient temperature, check the mixed temperature is within +/-5℃ of the required temperature. In hot climates avoid leaving **EPOCAST 36®** in direct sunlight before use.

预先将环氧树脂预热到要求的温度（参见附件 *Mixing & Pouring Guide 1.3.2*）。浇注的温度需不低于 20℃，以保证适宜的搅拌和浇注黏度。固化剂应保持室温，搅拌的温度应在要求的温度 +/- 5℃ 的范围内。在夏季，使用前 **EPOCAST 36®** 环氧树脂应防止阳光直晒。

2. Pre-drill following holes on the stern frame boss, 2 vent holes on the top of each bearing side, 1 filling hole on the bottom, please see the attached 4 for their positions and dimensions;
预先在艏柱上开孔，每个轴承应在轴承顶端各开 2 个透气孔，底部开 1 个浇注孔，并焊接浇注孔和透气孔的接长管，其位置和尺寸详见附图 4;

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3. Clean the stern frame boss and stern tube surfaces, including the inside surface of the filling and air ventilation holes & pipes, where it would be in contact with **EPOCAST 36®** resin. Remove all grease, oil, mill scale, ruse, paint etc.
艉柱内表面及艉管外表面等与环氧树脂接触的表面（含浇注、透气孔/管内表面）均需清除铁锈、油污、毛刺、焊渣、油漆和灰尘等。
 4. Recheck the clean of the boss and stern tube surfaces by service engineer. Insert active sealing in the corner between stern frame boss and stern-tube flange and then push the stern-tube into the stern boss.
待 ITW 公司服务工程师检查清洁并满足要求后，黏结法兰面密封条然后塞入艉管。注意，塞入艉管过程中应避免带入灰尘和油污。
PS: If the stern tube is not integrated but subsection, the o ring slot should be done on the fwd stern tube section and the stern frame boss section, 7mm wide, 3~4mm depth, detail please see attached 3;
注：如果艉管类型非整体式而是分段类型的，则艉管前端平面和艉柱本体接触面上必须加工密封环槽。密封环槽的加工尺寸为，宽度 7mm；深度 3~4mm 的圆弧状加工面，详见附图 3。
 5. Use the adjustment screw for alignment.
调节调整螺栓，进行轴系安.装定位、校中。
 6. After obtaining the approval for the alignment from shipowner and classification surveyor, prepare the **EPOCAST 36®** damming work.
待轴系对中报验船东、船检后，对环氧浇注区域各端口进行密封。
 - (a). Insert the special silicone rubber into the section of stern frame boss, put on 3~mm depth damming plate, take weld on the section to prevent leakage of **EPOCAST 36®**.
使用专用密封硅胶条，压入各艉柱端面，并将 3~5mm 厚的密封压板点焊在相应的艉柱端面，以防止注入的环氧树脂渗漏。
 - (b). Tack weld steel plate on the aft flange, put on the silicone sealant to seal the gap to prevent leakage of **EPOCAST 36®**
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在艙管法兰端面用铁皮点焊固定密封，并用硅胶密封存在的间隙，以防止注入的环氧树脂渗漏。

7. It is recommended to re-check the stern tube alignment readings before starting the **EPOCAST 36®** pumping work.

建议在搅拌、浇注 **EPOCAST 36®** 环氧树脂之前，再校验一下定位、对中读数是否满足要求。

五、 Mixing And Pouring

搅拌和浇注

1. **EPOCAST 36®** material of sufficient quantity to preparative before pouring

浇注前应备有足够数量的 **EPOCAST 36®** 在现场。

在混合 **EPOCAST 36®** 及浇注过程中，应保持周围环境无打磨、电焊气割等工作的进行。

2. Add hardener into **EPOCAST 36®** and power mix at speed not exceeding 500rpm for 2~3 minutes to ensure homogenous mixture. Traverse side and bottom of the can to ensure complete mixing all resin and hardener. Care must be taken from start to end of mixing **EPOCAST 36®** that the jiffy mixer blade is completely immersed below the top surface of the **EPOCAST 36®** to avoid air bubbles during mixing. See attached *Mixing & Pouring Guide* 1.3.2 for quantity of hardener and temperature guides.

将固化剂加入 **EPOCAST 36®** 环氧树脂中，搅拌浆叶安装到搅拌电钻，接通电源以不超过 500rpm 的转速搅拌 2~3 分钟，以保证搅拌均匀。沿桶体转动搅拌浆叶，使罐底和边缘的环氧树脂也能与固化剂均匀混合。搅拌时浆叶必须全部埋入环氧树脂里面，以防将空气泡混入环氧树脂，固化剂的用量及搅拌温度请参阅附表 *Mixing & Pouring Guide* 1.3.2。

3. Firstly start the pouring in flange area until it overflows through the air vents;
首先浇注法兰面区域，直至 **EPOCAST 36®** 环氧树脂从透气口溢出。
4. After pour **EPOCAST 36®** in flange area about 2~4 hours, mix **EPOCAST 36®** with hardener and then start pumping **EPOCAST 36®** into the gap between stern tube and stern frame boss until it overflows through the vent holes. Do not scrap the residue out of the can.

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在法兰面区域浇注结束约 2~4 小时后，将树脂与固化剂混合搅拌后启动浇注泵将混合后的环氧树脂泵入艉管与艉柱之间的间隙，直至环氧树脂从透气口溢出，即表示环氧树脂已经全部充满。罐底残留的部分应弃留在罐中。

5. Make the hardness test sample simultaneously.
在浇注的同时，制作硬度测试所需的样块。

六、 Final Works

浇注结束后的工作

- a) Allow **EPOCAST 36®** to cure before carrying out be further works In general, with steel temperature as detailed below, and with out application of external heat, the cure of the resin may occur after the time indicated as follow:

Steel temperature:	14°C ~ 17°C	About 48 hours
	18°C ~ 20°C	About 24 hours
	Above 25°C	About 18 hours

So in winter or ambient temperature lower than 13°C, the external heaters are recommended to ensure the curing and reducing the curing time.

在开展进一步工作之前应保证 **EPOCAST 36®** 环氧树脂已经完全固化。通常情况，在无其他外部加热器的情况下，环氧树脂固化所需的时间与钢板温度（环境温度）的关系如下：

钢板温度（环境温度）	14°C ~ 17°C	约需 48 小时；
	18°C ~ 20°C	约需 24 小时；
	25°C 以上	约需 18 小时；

因而在环境温度低于 13°C 的情况下，建议增加额外的秒加热保温设备来加热整个环氧树脂垫块的浇注区域，以促进固化所需的时间。

- b) During the **EPOCAST 36®** setting and curing, heavy lifting, welding, burnishing, filling water and so on is not acceptable near the machinery.

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在环氧树脂的完全固化期间，浇注的机械设备周围不得进行吊装重物、电焊、打磨、浸水等作业。

- c) Make the hardness test to class and ship owner with test sample after the full cure. Minimum Barcol hardness reading required is 40 on the test sample surface.

待环氧树脂固化后，向船东、船检报验样块硬度。样块表面巴氏硬度最小应大于 40。

- d) Ensure the resin cool to ambient temperature before the further works in the case that the external heaters are provided.

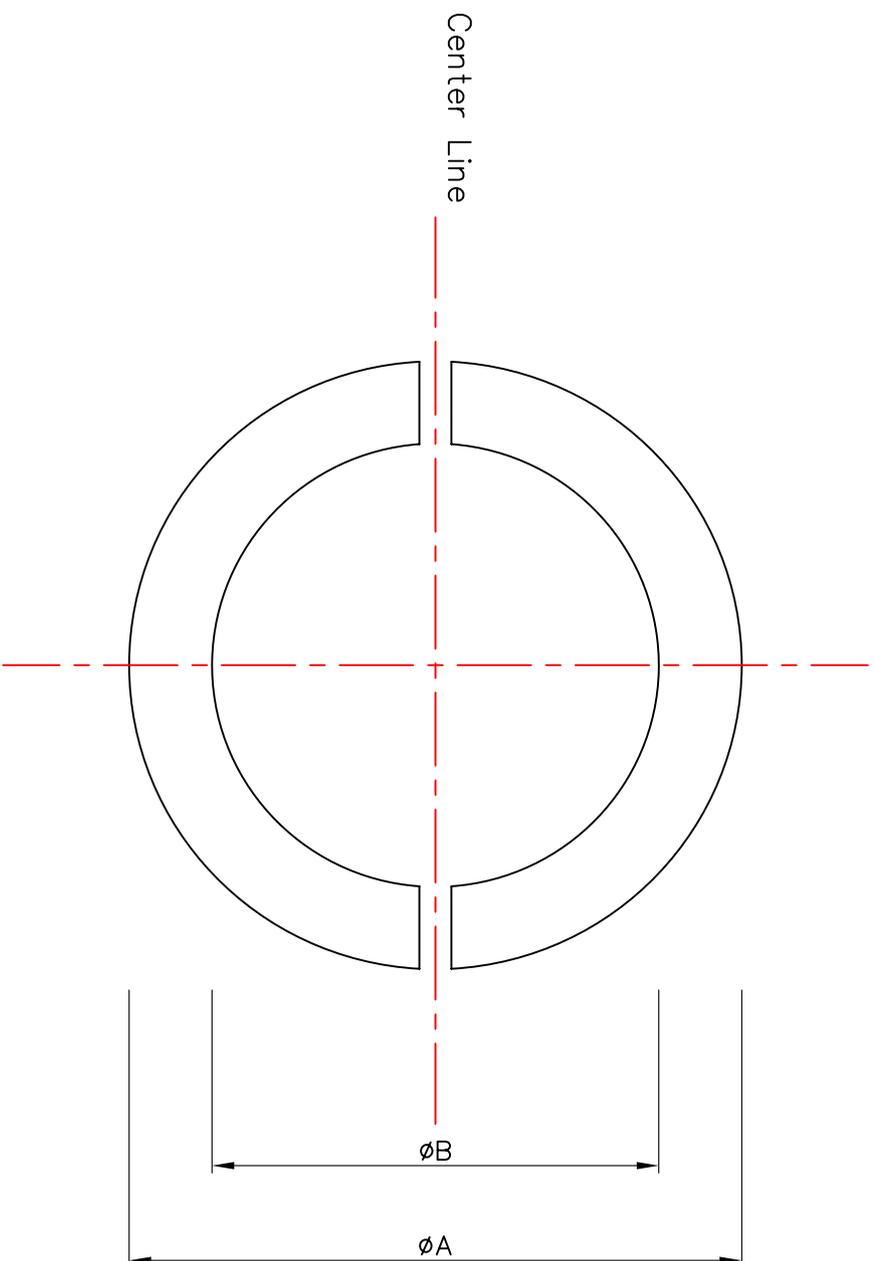
在使用加热器或者热风机来促进固化的情况下，应保证在进一步的施工前，环氧树脂和机械设备底座的温度已冷却到环境温度。

- e) All air fill pipe, air vent holes and alignment bolts must grind off and sealed by welding a steel cover plate of approximately 8mm thickness.

用砂轮机割除透气管、注入管及调整螺栓高出艉柱表面的部分，并打磨平整，不得直接敲掉。然后用尺寸略大厚度约为 8 毫米的钢板将透气口、注入口及调整螺栓凹口封住，并满焊牢

- f) Pull away the wooden bolt plugs in stern tube flange and drill the installation holes, and then for the installation of the shaft.

拔除法兰面螺栓通孔中的木塞，钻孔并攻丝。然后进行塞轴等轴系安装工作。



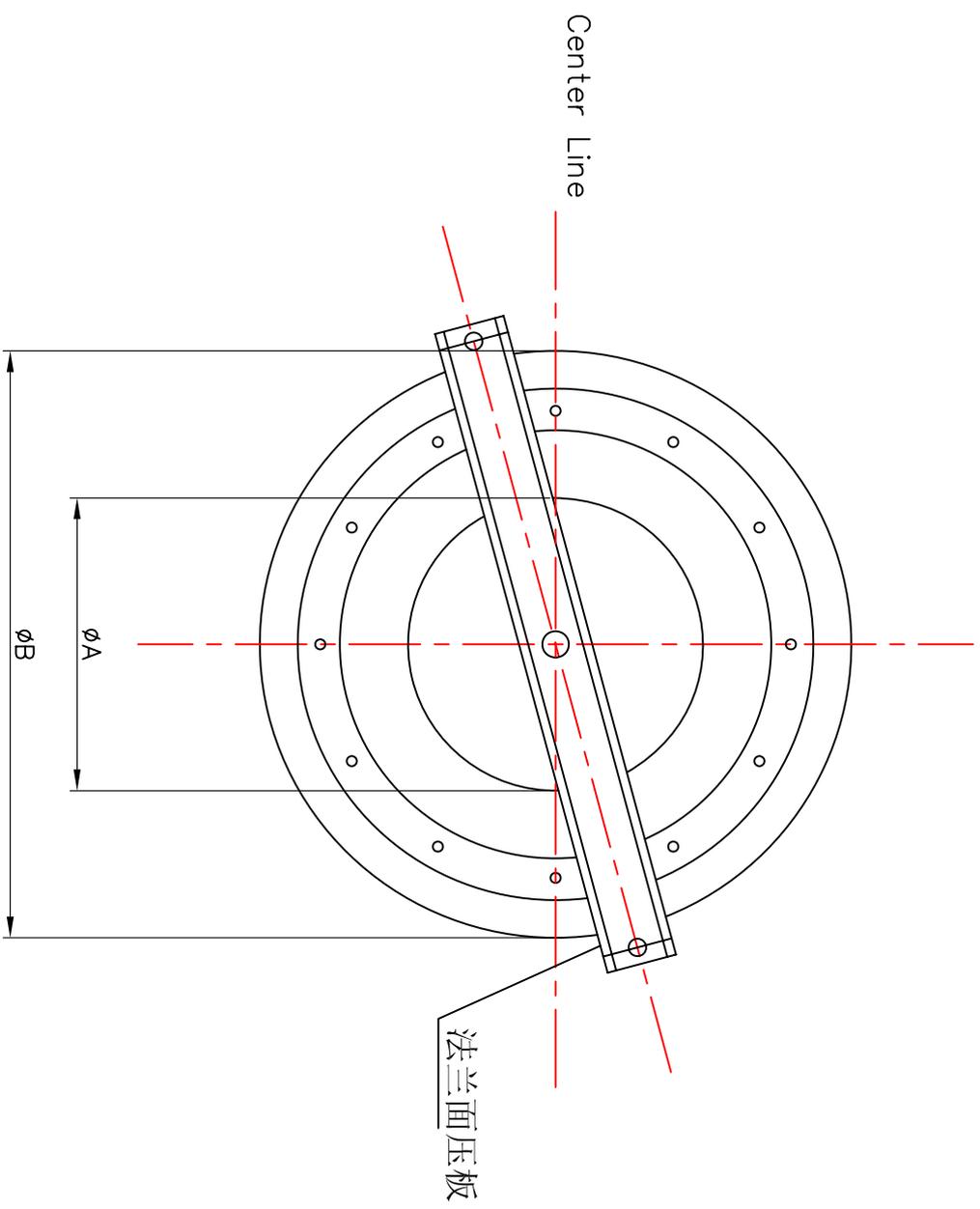
□B :根据艉管外径

□A :

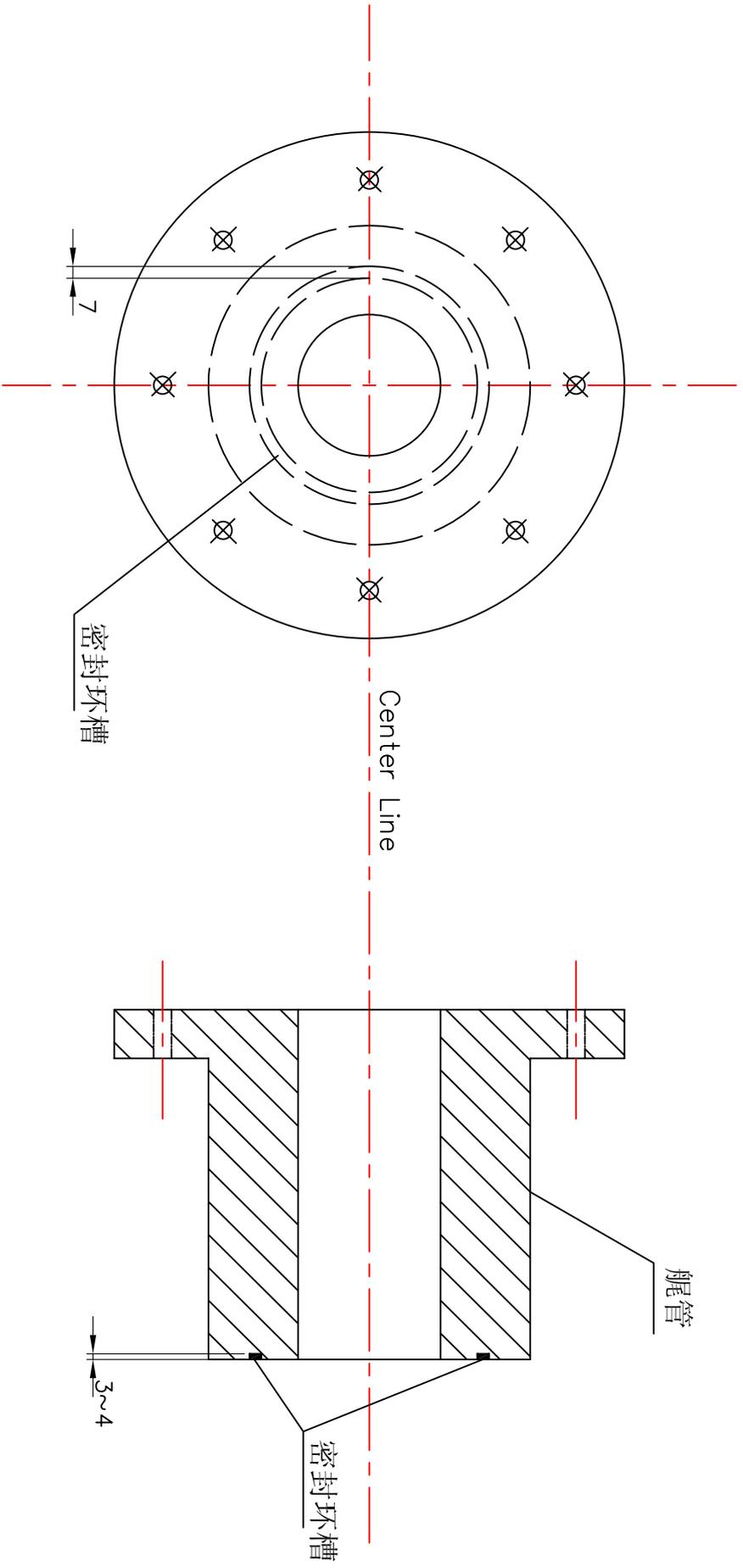
Thickness :

附图一： HALF RING

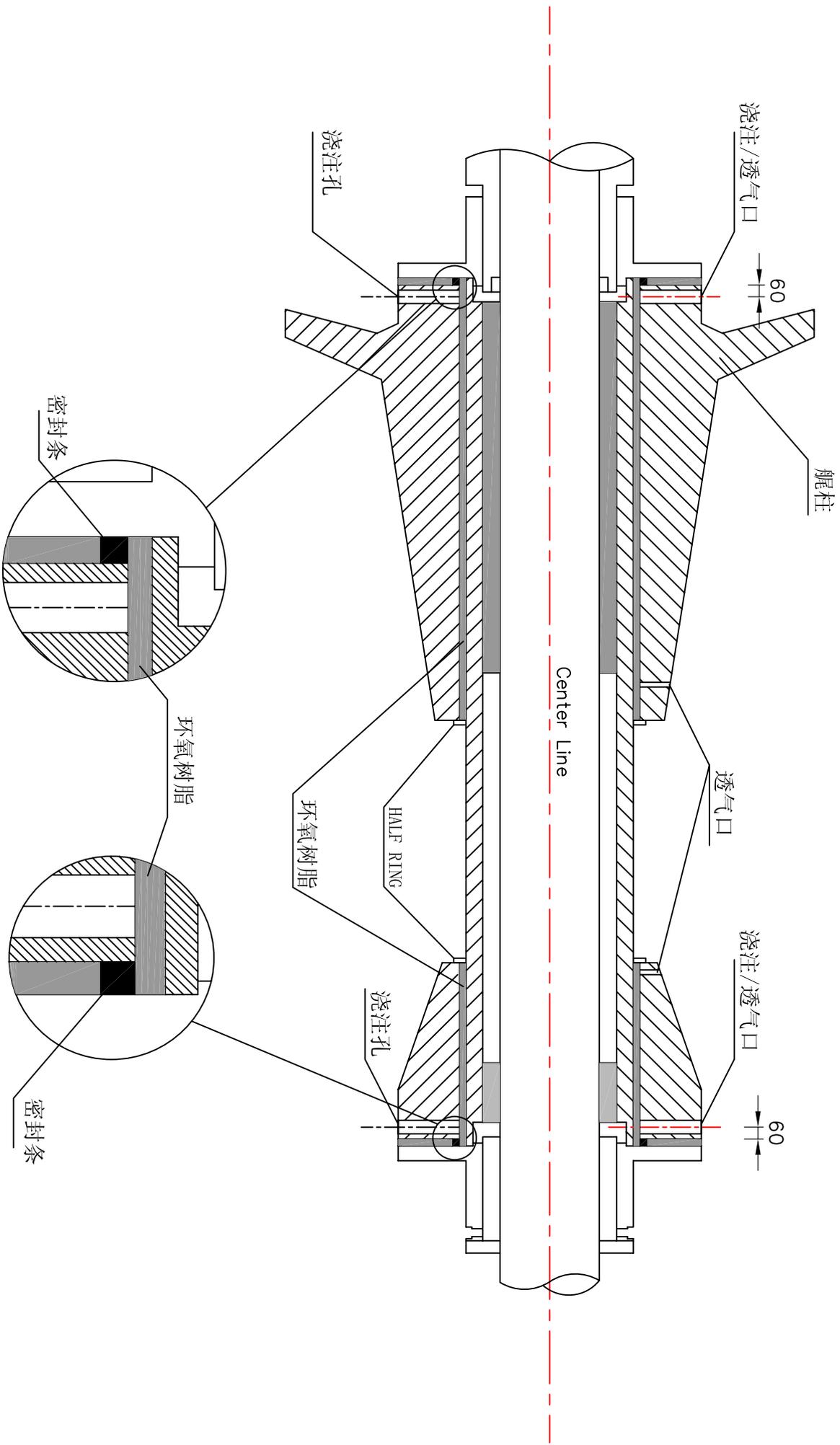
ϕA =
 ϕB =



附图二：法兰压板



附图三：O型圈环槽



附图四：艙管示意图

EPOCAST 36 MIXING AND POURING GUIDE 1.3.2

Steel / Stahl °C	0°	5°	10°	15°	20°	25°	30°	35°	40°
35									
30									
25									
20									
15									
10									
5									
Gap thickness (mm) between housing and bearing bush Spaltbreite (mm) zwischen Stevennuss und Stevenrohrlager									
“A”		35°	35°	30°	30°	30°	25°	25°	25°
Mix the resin at this temperature Mische das Gießharz bei dieser Temperatur									