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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

CHOCKING OF DIESEL ENGINE /GENERATOR/GEAR BOX

主机/发电机/齿轮箱等

ITW PERFORMANCE POLYMER & FLUIDS CHINA

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EPOCAST 36®主机垫块安装工艺

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, BV, CCS, DNV, GL, LR, NK and others.

EPOCAST 36®环氧树脂垫块是由德国**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、BV、CCS、DNV、GL、LR、NK等各大船级社的认可。

EPOCAST 36® epoxy resin material, as a chocking compound material, is widely used 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。

EPOCAST 36® is a pourable epoxy based resin for machinery installation where accurate alignment is important. It can be used for Main Engine, Gear box, generator, Steering Gear, Deck Machine, Stern tube etc. The foundation with **EPOCAST 36®** is much better and cheaper than the traditional method with steel chocks. When pour, **EPOCAST 36®** flows readily into prepared chock area, and because of its low viscosity and low surface tension, It fills any irregularity in the chocking interface. This makes the machining of base plates or foundations unnecessary and provides perfect fitting chocks.

EPOCAST 36® 是一种浇注型的环氧树脂，特别适用于对中定位要求很高的机械设备。已广泛的用于主机、发电机、齿轮箱、舵机、甲板机械和艉轴管等设备的安装定位。

EPOCAST 36®垫块和传统的钢垫块相比，具有施工周期短和质优价廉的特点。由于**EPOCAST 36®**的黏度低且表面张力小，因而在浇注时可以很容易的注入浇注模框内，并与模框内任何不规则的表面完全接触，从而不需要设备表面的机械预加工就能得到理想的安装。



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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，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依工聚合与流体化学工业，中国的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 18 months.
EPOCAST 36[®] 包含双组份的液体材料：环氧树脂和固化剂。它们的储藏应防止冰冻。使用有效期为出厂后 18 个月。
4. **EPOCAST 36[®]** chock from 13 to 100mm can easily be installed without difficulty.
EPOCAST 36[®] 环氧树脂垫块的浇注厚度通常为 13~100 毫米。

三、 Material And Tools Required

材料和施工工具

1. Damming material supplied by **ITW**, including:-
由 ITW 公司提供的施工材料，包括：
-

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(1).Damming foam;

海绵围条;

(2).Jiffy mixer;

搅拌浆叶;

(3).Release Agent;

脱膜剂

(4).Sealing Compound

密封腻子;

(5).High Tem Grease;

耐高温油脂;

(6).Rubber Plugs

橡胶管塞

(7).Glue

胶水

(8).Portable Temperature Gauge

便携式温度计

(9).Barcol Hardness Tester: 1 pc

巴氏硬度计: 1 个, 用于测量环氧样块硬度;

2. Material and tools prepared and supplied by shipyard, including:

由船厂准备和提供的材料, 包括:

(1). 5~10 litres acetone and sufficient rags, for removing grease ,oil, dirt in the chocking area;

5~10 升丙酮和足够的抹布, 用于环氧树脂浇注区域的清洁;

(2). Inside damming steel plate with thickness 3mm and front damming steel plate with thickness 1.5~2mm;

厚度约为 3 毫米的内挡板和厚度约为 1.5~2 毫米的外挡板若干;

(3). 220V / 50Hz 1 Phase power supply for mixing drill;

220V / 50Hz 的电源插座, 用于驱动手提电钻;

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- (4). 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。
- (5). 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。
- (6). 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®** pouring to shorten the cure time.
足够的热风机、电加热器或碘钨灯，用于浇注后加热 **EPOCAST 36®** 环氧树脂区域至 20°C 以上，以促使并缩短固化时间。

四、 Preparation work before pouring EPOCAST 36®

浇注前的准备工作

1. Prepare **EPOCAST 36®** resin to the required temperature well ahead of time. (See attached Mixing and Pouring Guide 1.3.2). The temperature of pouring is 20°C at least to ensure suitable mixing and pouring viscosity. The hardener should be at the ambient temperature. Check the mixing temperature is within $\pm 5^{\circ}\text{C}$ of the required temperature. In hot days avoid exposing **EPOCAST 36®** under sunshine directly.
预先将 **EPOCAST 36®** 预热到要求的温度。（参见附表 Mixing and Pouring Guide 1.3.2）浇注温度应不低于 20°C 以保证合适的搅拌和浇注年度。固化剂应保持室温。搅拌温度应在要求温度 $\pm 5^{\circ}\text{C}$ 范围内。在夏季，使用前应避免 **EPOCAST 36®** 暴露在阳光直射下。

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2. Tack weld the inside damming steel plate to the back edge of the foundation to facilitate installation of foam damming. Its height is smaller than chock thickness 10~15mm. For example, if the chock thickness is 50mm, then the height of the inside damming steel plate is to be 35~40mm.

在机器吊装上机座之前，将内当板点焊在基座面板的内沿以防止围框海绵围条在浇注过程中翻倒。其高度比环氧树脂垫块的厚度低 10~15 毫米。即假如垫块的厚度为 50 毫米，那么内挡板的有效高度即为 35~40 毫米。

3. A satisfactory alignment and crankshaft deflection reading should be obtained. Allowance is made for initial chock compression when the foundation bolts are tightened is calculated by multiplying chock height in mm by 0.001 times (e.g. chock height = 50mm x 0.0001 = 0.05mm) the **EPOCAST 36®** will compress due to Engine Weight & total bolt tension force. Therefore, the engine's center line is aligned 0.05mm higher than the tail shaft center line to compensate.

由于主机的重量及底脚螺栓的预紧力，**EPOCAST 36®**会有所压缩，压缩量为垫块厚度的 0.001 倍，即：如果垫块厚度为 50mm，则压缩量为 $50\text{mm} \times 0.001 = 0.05\text{mm}$ ，因此，主机中心线的定位应比尾轴中心线高出 0.05mm，（当垫块厚度为 50mm 时），其他厚度时以此类推。

4. Align the engine together with a representative of the shipowner and/or the Classification surveyor. 轴系对中及曲轴的挠曲度测量数据应符合有关标准和要求。并将船东、船检认可之轴系对中数据提供给 **EPOCAST 36®**服务商。

5. Welding of side-stoppers & other major welding works should be completed.

主机两侧止动块座的焊接及其他主要的焊接工作应该完成。

6. Engine foundation & bed plate surfaces are cleaned thoroughly to remove all grease, oil, mill scale, rust & paint where in contact with **EPOCAST 36®**.



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主机座板底平面及基座面板上平面全部清洁干净，在 **EPOCAST 36®**接触的表面应无任何油脂、油迹、锈斑、斑剥的油漆和任何应力集中点。

7. Flexible damming foam is cut to appropriate size and inserted to fit snugly between the bed plate and foundation to a form liquid-tight according to measurements provided in the approved chocking plan.

将柔性的泡沫条切割成相应的尺寸，通常泡沫围条的高度应比环氧垫块的厚度要高出 5-6 毫米。根据所批准的图纸尺寸塞入主机座与基座平面之间，并紧密贴合上下平面，形成垫块模壳。

8. The jacking screws are wrapped around with thin rubber strips to facilitate loosening & removal of the jacking bolts after **EPOCAST 36®** cured.

在定位螺栓的表面（仅在主机座与基座之间），包覆一层薄薄的泡沫条或者用 Sealing Compound 一种专用密封胶泥包覆，以便在 **EPOCAST 36®**固化后能将定位螺栓取出和防止应力集中点。

9. Rubber tubes are inserted to plug up the bolt holes. Care must be taken after insertion to check rubber tubes are straightened to avoid leaking and bolt hole is clear for insertion of foundation bolts after **EPOCAST 36®**.

将泡沫管条插入底脚螺栓孔内，完全插入后检查泡沫管条是否有凹陷不平处（在主机座及基座之间）并纠正，以防泄漏 **EPOCAST 36®**，当环氧树脂固化后，螺孔内光顺整齐，便于塞入底脚螺栓。

10. If necessary, fix measuring pins as required by Classification surveyor or shipowner.

如果需要，按照船东或船级社现场代表的要求安装测量销。

11. Spray lightly release agent into the prepared moulds. Steel front dams (about 2~3mm thickness) surface in contact with **EPOCAST 36®** should be sprayed heavily with release agent or apply high temp grease to facilitate removal after **EPOCAST 36®** cured.

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将脱模剂喷入已形成的垫块模壳内，要求是把脱模剂摇晃均匀后沿着浇注口缓慢的来回喷一遍。并在铁挡板（约 2 - 3mm 厚）与 **EPOCAST 36®** 接触的一面喷两层脱模剂，或者将耐高温牛油均匀抹一层在该表面，环氧树脂固化后便于移去挡板，防止粘结。

12. Apply a thin smear of grease to the outside damming steel plate in contact with **EPOCAST 36®** so that it can be taken away easily after the **EPOCAST 36®** cured fully. And then tack weld it in place so the pouring opening is 20~30mm wide and the top of the dam is approximately 20~40mm above the underside of the bedplate. Seal the lower edge of the outside damming steel plate with sealing compound.

将外挡板与 **EPOCAST 36®** 环氧树脂接触的表面涂上一层薄薄的牛油，以便在环氧树脂固化后可以方便地拆除。然后点焊在基座表面，沿设备底座边缘形成 20~30 毫米宽，比垫块厚度高 20~40 毫米的浇注口。在铁挡板的底边，用 Sealing Compound 密封填料填密缝隙，以防止环氧树脂渗漏。

13. Final alignment and crankshaft deflection readings are taken for record.

将最后的对中、曲轴挠度及下沉间隙测量结果记录在案，便于对照和查证。

五、Mixing And Pouring

搅拌和浇注

1. **EPOCAST 36®** of sufficient quantity to be preparative before pouring.
浇注前应备有足够数量的 **EPOCAST 36®** 在机舱里。
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. From see attached Mixing and Pouring Guide1.3.2 for quantity of hardener and temperature guides.

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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，固化剂的用量以及搅拌温度详见附件 **Mixing and Pouring Guide** 1.3.2。

3. Pouring should be done shortly after mixing, **EPOCAST 36®** is poured slowly into the moulds through the gap between engine bed plate and steel front dams. To avoid air entrapment, always pour from lowest end of chocks until moulds are filled up the over pour. Overpour must be at least 25-30mm.

混合后的 **EPOCAST 36®**应立即进行浇注，倒入时应选择在浇注槽口的最低点，缓缓倒入，直到液面升至浇口高度为止。浇口高度一般为垫块厚度+25 - 30mm。同时，做二只 50×50×50mm 的试样。

4. Until the resin sets keep a careful watch for leaks. The setting and curing of **EPOCAST 36®** will start from the central area. During this process **EPOCAST 36®** will be drawn into the chock from the overpour. Where chocks are large this reservoirs may need to be refilled during the setting. **KEEP A CAREFUL WATCH.** After the **EPOCAST 36®** has hardened the overpour may look untidy normally.

Ensure any air heating does not cause local hot-spots which may promote excessive exothermic reaction during initial setting process.

在浇注完成后应仔细检查，防止有泄漏。**EPOCAST 36®** 环氧树脂的沉积固化是从垫块的中心区域开始，在此过程中有一定收缩，浇注冒口中多余的部分将用于进行补充。对尺寸较大的垫块，必要时还需要向浇口中补充环氧树脂。因而在 **EPOCAST 36®** 环氧树脂沉积固化的过程中应注意观察。在 **EPOCAST 36®** 环氧树脂完全固化后，浇注口看上去不会很平整，这是正常的。

加热设备的布置应防止热点的出现，这可能会引起在最初的固化过程中过度的放热反应。

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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 36 hours

Above 25°C About 24 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 36 小时；

25°C 以上 约需 24 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.

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 to the hardness test to class and ship-owner with test sample after the full cure. Minimum Barcol hardness reading required is 40 on each side of the poured chocks and the test sample

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surface.

待环氧树脂固化后，向船东、船检报验样块硬度。垫块和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) Remove the wedges or back off the jack screws.

松掉调整楔块或螺钉，使环氧垫块承受设备的负荷。

- f) Remove the bolts plugs and the steel front damming plate carefully, and then grind the overpour if required by shipowner.

拔除螺栓孔橡皮塞，拆除外挡板并将浇注口区域高出有效高度部分的环氧垫块用砂轮机切除并修整其边缘。

- g) Insert the holding down bolts and then tighten according to the requirements indicated in the installation plan.

塞如地脚螺栓并按照安装图上的要求的扭矩进行紧固。

EPOCAST 36 MIXING AND POURING GUIDE 1.3.2									
Steel / Stahl °C	0°	5°	10°	15°	20°	25°	30°	35°	40°
Gap thickness (mm) between housing and bearing bush Spaltbreite (mm) zwischen Stevennuss und Stevenrohrlager	35								
	30								
	25								
	20								
	15								
	10								
	5								
"A"	35°	35°	30°	30°	30°	25°	25°	25°	25°
Mix the resin at this temperature Mische das Gießharz bei dieser Temperatur									

Mix the resin at this temperature
Mische das Gießharz bei dieser Temperatur