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Recommendation for die casting

Classifications	Recommendations
Die Making	<ol style="list-style-type: none"> 1. To use the material which size is as near as possible to the die size. 2. To avoid rough tool marks and deteriorated layers made by EDM and/or WEDM. 3. To smooth the inside surfaces and round the tips of cooling holes. 4. The machining depth after heat treatment should be decided through discussions with the heat treatment maker to avoid the remain of decarburized layer. 5. When welding, to use the same material of the die for welding rod, and follow the procedure suggested for the die material. (See table.1) 6. For the die which is supposed to severe condition, to consider adopting proper die materials, heat treatment, and nitriding 7. To restrain heat checking, we would like to recommend shallow, 0.05~0.10mm deep, nitriding without compound layer. 8. To restrain erosion, we would like to recommend the nitriding with compound layer. It would be also possible to use coating like CVD.
Work	<ol style="list-style-type: none"> 1. It's desirable to pre-heat the die to 150~250°C for aluminum die casting. Meanwhile, it's desirable to pre-heat to 150~220°C for zinc die casting. 2. It's desirable to pre-heat as even and moderate as possible. It's undesirable to heat up rapidly by waste casting. 3. In the beginning of casting production, cooling water should be run properly only near sprue hole, distributor and gate. As the temperature goes up, water should be increased to necessary amount. 4. At the first injection, the pressure to the die should be decreased and the injection should be done carefully 5. Die lubricant should be as less as possible, and the amount should be aimed the same. 6. Die lubricant should be applied selectively to the penetrated parts and deep hollows. 7. To minimize the scattering of casting cycle. 8. To clean the die certainly, especially parting surface and sliding surface.

Maintenance	<ol style="list-style-type: none"> 9. After casting, the penetrated parts should be polished, and the damaged parts of ejector pins, movable cores and cooling holes should be corrected. 10. The cooling hole should be maintained to avoid interruption and/or leak. 11. In the case of bad water, dirt tends to gather in the cooling holes and lower cooling efficiency. The cooling holes should sometimes be cleaned. 12. Core pins easily broken should be exchanged statistically, based on the past results, regardless of extent of damage. 13. If there are similar pins in one die, all pins should be exchanged when one of them damaged. 14. To remove remain of die lubricant around air vent. 15. To apply rust preventive to avoid rust. 16. When welding, to use the maraging steel for welding rod, and follow the procedure suggested for the die material. (See table.1) 17. It's possible to apply stress relieving tempering periodically.
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Reference

1. Handbook for technicians of die casting: by Nippon national die casting co-operative union.
2. Die casting check card: by Nippon national die casting co-operative union.

Table 1 Welding procedure for DAC, DAC10 and DAC55

金型熱処理状態 State of Die	溶接棒 Welding Rod	溶接法 Welding Method	溶接条件 Welding Condition	溶接施工線図 Welding Process Chart	溶接層間温度 Temp. between weldlayers
焼なまし 態 Annealed State	DAC 又は共金 DAC or same steel	TIG	○溶接棒 Welding bar 1.6~4.0φ ○電流; Current 80~200A ○アルゴン ガス流量; Flux of Ar gas 8~15 ℓ/min	<p>〔注〕太物はAを2回くり返して下さい Annual 2 times in case of Large block.</p>	250°C以上 Above
焼入 焼戻し状態 Hardened State	YAG			<p>金型の焼戻し 温度以下 below Tempering Temperature of Die</p>	250°C以上 Above

(注) (Remarks)

- YAGとは当社ブランドの高級溶接棒（マルエージング鋼）です。YAG溶接棒を使用しますと溶接欠陥（ビード割れ、ピンホール等）が従来の溶接棒に比較し著しく発生しにくいことが特長です。

YAG is a brand name of Hitachi Maraging Steel used for various applications including high grade welding rod. Using YAG welding rod remarkably decreases such welding defects as "bead crack" or "pin holes".
- TIG溶接法（タングステンイナートガス溶接法）とはアルゴンガスで包まれたタングステン電極と被溶接材との間にアークを発生せしめ、その熱でできたプールの中にワイヤーを挿入して溶接が進められる方法です。

TIG Welding Method(Tangsten Inert Gas Welding Method) is to make arc between tangsten electrode covered by argon gas and objects to be welded, and then wire is inserted into the heat pool generated by the arc.
- 溶接上の注意

溶着金属の性能を良くするため、電流は低め、ワイヤーは細目のものを用いてください。

クレータ割れ防止のため、前のパス上に後パスのクレータが重なり合わないようしてください。

母材の過熱を防ぐため、短いビードで断続溶接をしてください。

Use lower current and finer welding wire in order to get better efficiency of welding metal. In order to prevent crater cracks, avoid an overlap of the crater of backward pass on the crater of foregoing pass.

To avoid an overheat of mother material, conduct an interrupted welding with short bead
- 後熱〔焼戻し〕〔焼きなまし〕の保持時間は1h/肉厚25mmにしてください。

Keeping time of Temper and Anneal after welding should be 1h/25mm in thickness.
- 研磨時の研磨割れには十分注意してください。

A careful attention is to be paid of crack during grinding.