

RIAG Pass 404

Hexavalent black chromate passivation

The **RIAG Pass 404** is a hexavalent black chromate process that produces glossy black colour finish on zinc plated surfaces . The coating provides high corrosion resistance.

The **RIAG Pass 404** additives are supplied in easy to use liquid concentrates.

Make up

	Range	Optimum
RIAG Pass 404 Additive 3 (density = 1.44 g/mL)	50 – 80 mL/L	60 mL/L
Acetic acid 99 % (density = 1.05 g/mL)	10 – 50 mL/L	40 mL/L
RIAG Pass 404 Additive 2 (density = 1.08 g/mL)	18 – 22 mL/L	20 mL/L
pH	Rack	1.8
	Barrel	2.4

Procedure for a make up of 100 litres

Put 80 L DI water in the process tank. Add 2 L **RIAG Pass 404 Additive 2**, mix well. Now add 4 L acetic acid 99 % and finally 6 L **RIAG Pass 404 Additive 3**. Fill-up to the final volume and stir well. Adjust the pH with diluted sulphuric acid to lower it or to increase it with sodium hydroxide solution 5 %. The passivation is now ready to use.

Operating conditions

Temperature:	15 – 35 °C, optimum 20 °C (depending on the process line, parts)
Time:	30 – 300 sec. (depending on pH, temperature, concentration)
pH-Value:	0.8 – 3.0 (optimum depends on process line, parts, pH, temperature, concentration). Regular control is necessary.
Agitation:	Air or mechanically movement
Fume extraction:	Recommended
Equipment:	Steel tank with acid resistant plastic liner (e.g. polypropylene lining)
Heating:	Glass or teflon tube heaters (usually not necessary)
Pre dip activation:	This will improve the RIAG Pass 404 bath life as well as the adhesion and corrosion resistance. The tank make up is 0.3 – 1.0 % nitric acid. Frequent tank changes are necessary for uniform production quality.
Post treatment	We recommend our RIAG post treatment for enhanced corrosion protection

Process sequence

1. Zinc plating (acid, cyanide or alkaline cyan free)
2. Water rinse
3. Water rinse
4. Activation in nitric acid (0.3 – 1.0 % nitric acid)
5. DI water rinse
6. **RIAG Pass 404**
7. Static rinse 5 % **RIAG Pass 404** in DI water
8. DI water rinse
9. DI water rinse
10. **RIAG Seal *** * different options possible
11. Dry

In order to achieve consistent and uniform glossy black colour, it is most important to maintain the highest level of brightness in plating. Always maintain zinc plating bath parameters at optimum level at all times. The higher the concentration and temperature of the solution, the lower will be the immersion time.

Replenishment and Maintenance

The concentration of **RIAG Pass 404 Additive 3** is titrimetric determined as **RIAG Pass 404 Additive 1**.

Additions are usually done on the basis of this analysis or experience.

When replenishing the ratio of **RIAG Pass 404 Additive 1** and **RIAG Pass 404 Additive 2** should approx. be 3.0 : 1.0. An overuse of **RIAG Pass 404 Additive 2** indicates a drag-in of chloride. The concentration of **RIAG Pass 404 Additive 2** can be analysed by AAS or ICP.

We recommend the following analytical target values:

RIAG Pass 404 Additive 1 70 mL/L

RIAG Pass 404 Additive 2 20 mL/L

Regeneration / Dilution

Once the concentration of zinc has reached 20 g/L we recommend a dilution of 20 – 30 %.

The discarded amount will be replenished in the following ratio:

75 mL/L RIAG Pass 404 Additive 1: 20 mL/L RIAG Pass 404 Additive 2: 30 mL/L acetic acid

Safety considerations

For further information please consult the material safety data sheets. Protective gear such as face shields and gloves should be worn during bath make up and operation. Chemicals shall not be stored below 10 °C.

Pure acetic acid will get solid if stored below 17°C.

Effluent control

The **RIAG Pass 404** passivation contains hexavalent chromium salts but no complexing agents. Spent solution has to be treated and discharged according to local waste water laws.

Liability

This instruction manual was compiled with reference to the state of the art and all current standards, and is based on the long-term knowledge and experience of RIAG. However, RIAG cannot monitor compliance with this instruction manual and the methods described herein at the customer/end-user's premises. Work carried out with RIAG products must be adapted accordingly to meet local conditions. In particular, RIAG cannot accept liability for damage, loss or cost incurred due to a failure to adhere to this instruction manual, improper application of the methods, unauthorised technical modifications, insufficient maintenance or the absence of maintenance in respect of the requisite technical hardware or equipment, or in the event of use by unqualified personnel. RIAG is not liable for damage or loss caused by RIAG or its employees except where intention or gross negligence can be proved. RIAG furthermore reserves the right to make changes in relation to products, methods and the instruction manual without prior notice.

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Analysis

Sample preparation

Take the sample at a homogeneously mixed position and let it cool down to room temperature. If turbid, allow to settle and decant or filter.

Reagents	Hydrochloric acid conc. Potassium iodide Sodium thiosulphate solution 0.1 mol/L Starch solution 1 % (freshly prepared)
Procedure	Pipette 2 mL passivation bath into a 250 mL erlenmeyer flask, add 100 mL DI water and 10 mL hydrochloric acid conc., add 1 g potassium iodide, titrate with sodium thiosulphate 0.1 mol/L until the solution is only slightly yellowish, then add 0.5 mL starch solution and titrate until the blue colour disappears
Calculation	$\text{mL/L RIAG Pass 404 Additive 1} = \text{Consumption in mL} \times 4.4$
Additions	Replenish RIAG Pass 404 Additive 1 to the desired value of 60 – 90 mL/L

Error index – cause and remedy

Error	Cause	Remedy
<p>Parts are not black (iridescent, grey, brown)</p>	<p>RIAG Pass 404 Additive 1 and RIAG Pass 404 Additive 2 concentration too low</p> <p>RIAG Pass 404 Additive 1 too low</p> <p>Dip time too short</p> <p>Temperature of passivation too low</p> <p>pH of activation too high</p> <p>pH of RIAG Pass 404 too high</p>	<p>Analyze RIAG Pass 404 Additive 1 and adjust concentration of RIAG Pass 404 Additive 1 / RIAG Pass 404 Additive 2 in the correct ratio 3 : 1</p> <p>Add RIAG Pass 404 Additive 1 in 10 – 20 mL/L increments</p> <p>Increase dip time</p> <p>Heat to prescribed temperature</p> <p>Adjust pH with nitric acid</p> <p>Adjust pH with sulfuric acid</p>
<p>Parts are not glossy or insufficient glossy</p>	<p>Temperature of passivation too high</p> <p>Temperature of first water rinse too high</p> <p>Hard water in first water rinse</p>	<p>Reduce dip time</p> <p>Reduce temperature</p> <p>Apply DI water</p>
<p>Corrosion protection unsatisfactory</p>	<p>Temperature too high</p> <p>Coating too thick</p> <p>Temperature of first water rinse too high</p>	<p>Reduce temperature</p> <p>Reduce dip time</p> <p>Reduce temperature</p>
<p>Chromate coating is not adhesive or soft</p>	<p>Concentration too high</p> <p>Temperature too high</p> <p>Dip time too long</p> <p>pH of RIAG Pass 404 too low</p>	<p>Dilute with DI water</p> <p>Reduce temperature</p> <p>Reduce dip time</p> <p>Increase pH with sodium hydroxide</p>