

RIAG Pass 430

Trivalent black chromate passivation

The **RIAG Pass 430** is a new trivalent black chromate process that produces glossy black colour finish in combination with a **RIAG Seal** top coat on zinc and zinc/iron alloy plated surfaces. The coating has high stability while tempered at 200 °C in terms of loss of colour and brightness. The coating so obtained provides high corrosion resistance **without the presence of hexavalent Chrome**.

The **RIAG Pass 430** additives are supplied in easy to use liquid concentrates.

Make up

	Range	Optimum
RIAG Pass 430 Additive 1 (density = 1.29 g/mL)	100 – 140 mL/L	120 mL/L
RIAG Pass 430 Additive 2 (density = 1.15 g/mL)	210 – 270 mL/L	240 mL/L
RIAG Pass 430 Additive 3 (density = 1.22 g/mL)	8 – 12 mL/L	10 mL/L
pH	1.6 – 2.0	1.8

Procedure for a make up of 100 litres

Take 50 L DI water in the process tank. Heat it to 30 °C. Add 12 L **RIAG Pass 430 Additive 1**, mix well. Now add 24 L **RIAG Pass 430 Additive 2**. Finally, add 1 L **RIAG Pass 430 Additive 3**. Stir and dissolve it well. Adjust the volume to 100 litres. Adjust the pH with diluted nitric acid (or increase with a 10 % solution of sodium bicarbonate) and temperature of the operating bath to specified values. Now the bath is ready for operation.

Operating conditions

Temperature:	25 – 60 °C (depending on the process line)
Time:	45 – 90 sec.
pH-Value:	1.6 – 2.0 (optimum 1.8). Frequent control is recommended.
Agitation:	Air or parts movement
Fume extraction:	Recommended
Equipment:	Mild steel tank with polypropylene lining
Heating:	Glass or Teflon tube heaters
Filtration:	Recommended
Pre dip activation:	This will improve the RIAG Pass 430 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
2. Water rinse
3. Water rinse
4. Activation in nitric acid
5. Water rinse
6. **RIAG Pass 430**
7. Drag Out
8. Drag Out
9. DI water rinse
10. DI water rinse
11. **RIAG Seal**
12. 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. In order to get the best results in corrosion and black colour, it is important to work at the following conditions:

RIAG Pass 430 Additive 1 120 mL/L

RIAG Pass 430 Additive 2 240 mL/L

RIAG Pass 430 Additive 3 8 – 12 mL/L

Replenishment

RIAG Pass 430 Additive 3 is the only additive required during a 4 – 6 hour production run. The additions are made on the basis of visual inspection of the processed parts. As the colour changes from black to dark grey, small additions of **RIAG Pass 430 Additive 3** should be made at the rate of 2 – 5 mL/L. The content of Cobalt (Co) should be between 3.5 – 4.7 g/L (analysed by AAS), 1 mL/L will increase 0.1 g/L Co content in the bath. The addition of **RIAG Pass 430 Additive 1** should be made on the basis of analysis. The bath should be analysed every 4 – 8 hours.

The replenishment ratio of **RIAG Pass 430 Additive 1** and **RIAG Pass 430 Additive 2** should always be 1 : 2.

Effluent control

The **RIAG Pass 430** chromate conversion coating solution is acidic and contains trivalent chromium salts. Spent solution has to be treated and discharged according to local waste water laws.

Safety considerations

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.

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.

Chromium (III)

Reagents	10 % Sodium hydroxide 30 % Hydrogen peroxide (H ₂ O ₂) Hydrochloric acid conc. Potassium iodide 0.1 mol/L sodium thiosulphate 1 % starch solution (freshly prepared)
Process	<p>Pipette</p> <p>2 mL passivation bath into a</p> <p>250 mL Erlenmeyer flask, add</p> <p>50 mL DI water and sodium hydroxide to a pH-value of about 10 (colour change), then add</p> <p>0.5 mL Hydrogen peroxide and boil the solution for 30 – 40 min. It is very important to evaporate excessive H₂O₂ (boil and reduce until shortly before crystallisation)</p> <p>100 mL Cool the solution, add DI water up to and acidify with hydrochloric acid (colour change from yellow to orange), add</p> <p>1 g potassium iodide, titrate with 0.1 mol/L sodium thiosulphate until the solution is only slightly yellowish, then add</p> <p>Some mL starch solution and titrate on until the blue colour disappears.</p>
Calculation	mL/L RIAG Pass 430 Additive 1 = Consumption in mL x 15.6

Error index – cause and remedy

Error	Cause	Remedy
Parts are iridescent	RIAG Pass 430 Additive 1 and RIAG Pass 430 Additive 2 concentration low	Analyze RIAG Pass 430 Additive 1 and adjust concentration of RIAG Pass 430 Additive 1 / RIAG Pass 430 Additive 2 in the correct ratio 1 : 2
	RIAG Pass 430 Additive 3 low	Add RIAG Pass 430 Additive 3 in 2 – 5 mL/L increments
	Dip time too short	Increase dip time (5 – 10 sec.) in chromate to improve colour
	Temperature of chromate too low	Heat chromate to prescribed limit
	pH of activation too high	Adjust pH with nitric acid to 1.4 – 1.6
	pH of RIAG Pass 430 too high	Adjust pH with nitric acid to 1.6 – 1.8
Sealer coating is weak	Increase concentration of sealer	
Parts are not black	pH of chromate too high	Adjust pH with nitric acid to 1.6 – 1.8
	Zinc/Iron layer too thin	Check parameters
	Chromate too weak	Analyze RIAG Pass 430 Additive 1 and adjust concentration of RIAG Pass 430 Additive 1 / RIAG Pass 430 Additive 2 in the correct ratio 1 : 2
Black has excessive scratching after barrel processing	Poor ductility of Zinc/Iron deposit	Improve deposit ductility
	Excessive tumbling and shaking of parts in chromate solution	Reduce excessive shaking in dip basket. Increase up-dwell time
Parts are blue/violet	RIAG Pass 430 Additive 2 concentration too low	Add RIAG Pass 430 Additive 2 in 10 – 20 mL/L increments

Error	Cause	Remedy
Parts blacken too quickly	Chromate too active RIAG Pass 430 concentration too high Chromate solution too hot	Increase pH with sodium bicarbonate Analyse, dilute with water Cool chromate to desired level
Parts blacken too slowly	Chromate solution too weak Chromate solution too cold Chromate not enough active	Analyze RIAG Pass 430 Additive 1 and adjust concentration of RIAG Pass 430 Additive 1 / RIAG Pass 430 Additive 2 in the correct ratio 1 : 2 Add RIAG Pass 430 Additive 3 in 2 – 5 mL/L increments. Heat the chromate to desired level Adjust pH with nitric acid to 1.6 – 1.8
Brownish dusty film on parts before top coat	Chromate too active RIAG Pass 430 Additive 2 concentration too high Dip time too long Temperature of chromate too hot	Increase pH with sodium bicarbonate, analyse, dilute with water Dilute with water and add RIAG Pass 430 Additive 1 in 10 – 20 mL/L increments Shorten chromate time Cool chromate solution
Grey parts	RIAG Pass 430 Additive 3 concentration too low Dip time too long Chromate solution too active	Analyse, adjust concentration of RIAG Pass 430 Additive 3 Shorten chromate time Dilute with water

Error	Cause	Remedy
Parts do not get black after solution is idle for longer period	Chromate solution activity low	Add RIAG Pass 430 Additive 3 in 2 – 5 mL/L increments
Cloudy finish appearance	Sealer tank is contaminated Passive surface of the parts Contaminated post plate rinsing too short dry times Too much iron in chromate	Dump sealer tank and make up fresh Activate the plated surface with nitric acid dip prior to chromate (check pH or new make- up!) Keep post plate rinses clean Increase dryer time Dilute or discard the chromate solution
White powdery chromate film	Suspended particles in chromate solution Dissolved zinc high RIAG Pass 430 Additive 2 concentration too high	Filter the chromate solution (clean the filter) Dilute or discard the chromate solution Dilute with water or work out, wait after addition for 1 hour
Brown parts	RIAG Pass 430 Additive 3 concentration too low RIAG Pass 430 Additive 2 concentration too low Iron content in the layer too low	Analyse, adjust concentration with 2 – 5 mL/L RIAG Pass 430 Additive 3 Adjust RIAG Pass 430 Additive 2 in 10 – 20 mL/L increments Adjust Zn/Fe-electrolyte according the TDS
Not passivated spots	pH of activation too high pH of RIAG Pass 430 too high RIAG Pass 430 concentration too low	Adjust pH with nitric acid to 1.4 – 1.6 Adjust pH with nitric acid to 1.6 – 1.8 Analyse, adjust according the TDS