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Reference Literature

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DELO® COOL TOOLS MAINTENANCE KIT INFORMATION

Thank you for ordering the Chevron Delo Cool Tools Maintenance Kit. These tools and resources are part of the Delo Cool Tools Program to help customers execute a best in class coolants maintenance program using Delo extended life coolants.

The kit includes tools and reference materials important for executing onsite coolant testing and system performance monitoring and protection. We hope you find the "How to" series literature educational and helpful in supporting best in class cooling system protection.

Kit Contents Include:

1. Glycol Refractometer
2. pH Test Strips
3. Nitrite Test Strips
4. Carboxylate Test Strips
5. Coolant Sampling Tools
6. Cool Tools Reference Literature
   - ✓ "How to" Use a Refractometer to Measure Coolants System Dilution
   - ✓ "How to" Use the Delo Maintenance Kit Test Strips
   - ✓ Freeze Point Adjustment Charts for both Over & Under Concentrated Coolant Systems
   - ✓ "How to" Convert a vehicle coolant system using the drain, flush and fill method
   - ✓ "How to" Convert a vehicle coolant system using the drain and fill method
   - ✓ "How to" Maintain Optimal Delo ELC Performance
   - ✓ "How to" Develop a Best in Class Engine Coolant Maintenance Program
   - ✓ "How to" Reorder Delo Cool Tools Kit Materials
7. Chevron Lubricants Hat

For more information, please contact:

- Chevron LubeTek, 1-800-LUBE-TEK (1-800-582-3835)
- Your local Chevron Business Consultant

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USE A COOLANT REFRACTOMETER TO MEASURE COOLANT SYSTEM DILUTION

What is a Refractometer used for?

A coolant refractometer is used to measure the freeze point of ethylene glycol based coolants including Delo® ELC, Delo XLC and Chevron HDPF.

Refractometer Key Components

1 - Daylight Plate (also known as Prism Cover)

2 - Prism

3 - Zero Adjustment Screw

4 - Mirror Tube

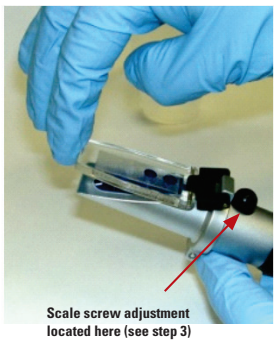
5 - Eyepiece

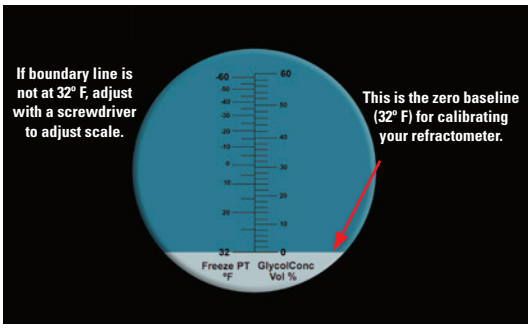
How to Calibrate a Refractometer

Step 1 - Place 2 to 3 drops of distilled water on prism surface and press cover down lightly.

Step 2 - Aim refractometer to direction of light and look through the unit eyepiece. Adjust eyepiece ring until the correct focus is obtained. Observe the light/dark boundary and ensure it coincides with the zero baseline (32˚F (0˚C) for distilled water).

Step 3 - If not at zero baseline, use the screwdriver supplied in the kit to adjust. Turn the scale adjustment screw until the light/dark boundary coincides zero baseline (32˚F (0˚C)).





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How to measure Delo ELC or Delo XLC Concentration

Step 1 - Take coolant sample from truck radiator.

Step 2 - Place 2 to 3 drops of coolant to be tested onto prism surface and press cover down lightly.

Step 3 - Aim refractometer in direction of light and look through the unit eyepiece. Record the reading. For Delo ELC/XLC, read the scale directly for either glycol vol% or freezing point °F.

If coolant is outside the freeze point range of -20°F (-29°C) to -50°F (-45°C), utilize the conversion charts below to take corrective action based on whether the system is OVER concentrated with coolant or UNDER concentrated with coolant.

UNDER CONCENTRATED

FREEZE POINT ADJUSTMENT CHART FOR UNDER CONCENTRATED SYSTEMS

(Use this chart to adjust your freeze point down to -35°F) For use with ethylene glycol based fluids.

TESTED FREEZE PROTECTION (°F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME 7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME LISTED SHOULD BE DRAINED AND REPLACED WITH DELO ELC AFC - PREMIXED 50/50								
25	10	6	7	8	9	10	10-1/2	11-1/2	12-1/2	13-1/2
20	16	5-1/2	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11-1/2	12
15	21	5	6	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11
10	25	4-1/2	5-1/2	6	6-1/2	7-1/2	8	8-1/2	9-1/2	10
5	29	4	4-1/2	5-1/2	6	6-1/2	7	7-1/2	8-1/2	9
0	33	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-1/2
-5	36	3	3-1/2	4	4-1/2	5	5-1/2	5-1/2	6	6-1/2
-10	39	2-1/2	3	3	3-1/2	4	4-1/2	4-1/2	5	5-1/2
-15	42	2	2	2-1/2	3	3	3-1/2	3-1/2	4	4
-20	44	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3
-25	46	1	1	1-1/2	1-1/2	1-1/2	2	2	2	2
-30	48	1/2	1/2	1/2	1	1	1	1	1	1
-35	50	0	0	0	0	0	0	0	0	0

Using a refractometer, measure freeze point of coolant, match reading with a value under the "Tested Freeze Protection" column. Determine cooling system volume; and using chart, determine volume of coolant to drain from cooling system. Replace drained volume with Delo ELC/XLC AFC-Premixed 50/50.

USE REFRACTOMETER TO CHECK FREEZE PROTECTION

Add Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 for UNDER Concentrated coolant systems - see chart above

OVER CONCENTRATED

FREEZE POINT ADJUSTMENT CHART FOR OVER CONCENTRATED SYSTEMS

(Use this chart to adjust your freeze point up to -35°F)

FREEZE PROTECTION OF SAMPLE MIXED 50/50 WITH WATER (°F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME 7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME TO DRAIN AND REPLACE WITH DEIONIZED WATER								
+10	50	0	0	0	0	0	0	0	0	0
+7	55	3/4	3/4	3/4	1	1	1-1/4	1-1/4	1-1/4	1-1/2
+5	60	1-1/4	1-1/4	1-1/2	1-3/4	1-3/4	2	2-1/4	2-1/4	2-1/2
0	65	1-3/4	1-3/4	2-1/4	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2
-5	70	2	2-1/4	2-3/4	2-3/4	3-1/4	3-1/2	3-3/4	4	4-1/4
-6	75	2-1/4	2-3/4	3	3-1/4	3-3/4	4	4-1/4	4-3/4	5
-12	80	2-3/4	3	3-1/2	3-3/4	4-1/4	4-1/2	5	5-1/4	5-3/4
-18	85	3	3-1/4	3-3/4	4-1/4	4-1/2	5	5-1/2	5-3/4	6-1/4
-23	90	3	3-1/2	4	4-1/2	5	5-1/4	5-3/4	6-1/4	6-3/4
-29	95	3-1/4	3-3/4	4-1/4	4-3/4	5-1/4	5-3/4	6-1/4	6-3/4	7-1/4
-35	100	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-3/4

If refractometer reading is off scale or shows a freeze point for the sample lower than -62°F, use the chart above to adjust the freeze point to -35°F. To do this, take the coolant sample and dilute it 50/50 with water. Take a new refractometer reading, and match this value to the reading under the "Freeze protection of sample mixed 50/50 with water" column. Determine your cooling system volume, and based on the chart above, drain the recommended amount of coolant and replace that volume with water. Recheck freeze point.

USE REFRACTOMETER TO CHECK FREEZE PROTECTION

Add deionized water for OVER Concentrated coolant systems - see chart above

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USE DELO® MAINTENANCE KIT TEST STRIPS

Why Use Test Strips?

Coolant test strips are a fast and economical way to check for the general performance of Delo ELC Antifreeze/Coolant or Delo XLC Antifreeze/Coolant to promote optimal life and protection of key coolant components in diesel engines. Test strips provide an easy way to conduct interim checks versus more expensive full coolant sample testing and are an important part of a best in class coolant maintenance program.

What Types of Test Strips are in the Delo Cool Tools Maintenance Kit?

In the Delo Cool Tools Maintenance Kit there are three different types of test strips provided in the standard Maintenance Kit and these include: pH Test Strips, Nitrite Test Strips and Carboxylate Test Strips. See below for instructions to use the test strips and what their results will indicate.

pH Test Strips:

This is the first set of test strips found in the kit. To use these test strips, follow these steps:

Step 1: Pull out 1 test strip and dip and hold for two seconds in the coolant found in the vehicle or equipment coolant system (a sample can be taken from the system or you can dip directly into the radiator or radiator overfill tank).

Step 2: Pull the strip out and wait for 30 seconds.

Step 3: Match the color with either side of the kit and determine if the strip is a pass or a fail.

Step 4: Determine pass/fail

a. If the coolant passes the pH reading, move to the next test strip in the kit.

b. If the strip fails, then the coolant has a high acidic level and needs to be fully changed out. Use the drain, flush, and fill method to correctly change out the coolant to prevent coolant system corrosion that can compromise cooling system integrity.

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Nitrite Test Strips:

This is the second set of test strips found in the kit to test nitrite level of Delo ELC Antifreeze/Coolant. If testing a system filled with Delo XLC Antifreeze/Coolant (a nitrite-free coolant) and the nitrite test strip is a pass, the system has been contaminated with a nitrited coolant. To use these test strips, follow these steps:

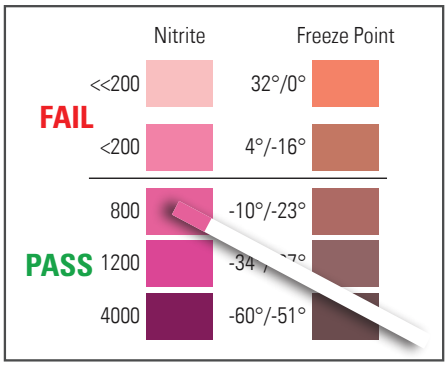
Step 1: Pull out one (1) test strip and dip and hold for two seconds in coolant found in the vehicle or equipment coolant system (a sample can be taken from the system or you can dip directly into the radiator or radiator overfill tank).

Step 2: Pull the strip out, wait for 30 seconds and match the color against the nitrite scale on the side of the bottle.

Step 3: Determine pass/fail

a. If the test strip shows a reading greater than 800 on the scale, the nitrite level is good and you can move to the next test strip in the kit.

b. If the color on the strip shows less than 200 on the scale, the nitrite level is low and additional nitrite needs to be added. Drain a minimum of 2 gallons of the system coolant, add back 2 gallons of Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 and circulate through the system for 15 minutes. Retest the system with a new nitrite test strip and if it passes, move to the next test strip. If it fails, drain another 2 gallons and add back the Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 and retest the system coolant until it passes.



Carboxylate Test Strips:

This is the final set of test strips found in the kit. To use these test strips, follow these steps:

Step 1: Pull out 1 test strip and dip and hold for two seconds in coolant found in the vehicle or equipment coolant system (a sample can be taken from the system or you can dip directly into the radiator or radiator overfill tank).

Step 2: Pull the strip out, wait for 30 seconds and match against the color square on the test strip bottle.

Step 3: Determine pass/fail

a. If the coolant passes the carboxylate reading, the coolant has passed all test strips and no other fluid maintenance is required.

b. If the strip fails, then the coolant has depleted additive and requires the addition of new Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50. Drain 2 gallons of system coolant, add back 2 gallon of fresh Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 and recirculate through the system for 15 minutes. Retest the system with a new carboxylate test strip and if it passes, the fluid is in excellent condition and suitable for continued use. If it fails, drain another 2 gallons and add back 2 new gallons of Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 and retest the system coolant until it passes.

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FREEZE POINT ADJUSTMENT CHART FOR OVER CONCENTRATED SYSTEMS

(Use this chart to adjust your freeze point up to -35˚F)

FREEZE PROTECTION OF SAMPLE MIXED 50/50 WITH WATER (˚F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME								
		7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME TO DRAIN AND REPLACE WITH DEIONIZED WATER								
+10	50	0	0	0	0	0	0	0	0	0
+7	55	3/4	3/4	3/4	1	1	1-1/4	1-1/4	1-1/4	1-1/2
+5	60	1-1/4	1-1/4	1-1/2	1-3/4	1-3/4	2	2-1/4	2-1/4	2-1/2
0	65	1-3/4	1-3/4	2-1/4	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2
-5	70	2	2-1/4	2-3/4	2-3/4	3-1/4	3-1/2	3-3/4	4	4-1/4
-6	75	2-1/4	2-3/4	3	3-1/4	3-3/4	4	4-1/4	4-3/4	5
-12	80	2-3/4	3	3-1/2	3-3/4	4-1/4	4-1/2	5	5-1/4	5-3/4
-18	85	3	3-1/4	3-3/4	4-1/4	4-1/2	5	5-1/2	5-3/4	6-1/4
-23	90	3	3-1/2	4	4-1/2	5	5-1/4	5-3/4	6-1/4	6-3/4
-29	95	3-1/4	3-3/4	4-1/4	4-3/4	5-1/4	5-3/4	6-1/4	6-3/4	7-1/4
-35	100	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-3/4

If refractometer reading is off scale or shows a freeze point for the sample lower than -62˚F, use the chart above to adjust the freeze point to -35˚F. To do this, take the coolant sample and dilute it 50/50 with water. Take a new refractometer reading, and match this value to the reading under the “Freeze protection of sample mixed 50/50 with water” column. Determine your cooling system volume, and based on the chart above, drain the recommended amount of coolant and replace that volume with water. Recheck freeze point.

USE REFRACTOMETER TO CHECK FREEZE PROTECTION

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UNDER CONCENTRATED

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FREEZE POINT ADJUSTMENT CHART FOR UNDER CONCENTRATED SYSTEMS

(Use this chart to adjust your freeze point down to -35˚F) For use with ethylene glycol based fluids.

TESTED FREEZE PROTECTION (˚F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME								
		7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME LISTED SHOULD BE DRAINED AND REPLACED WITH DELO ELC AFC - CONCENTRATE								
25	10	3	3-1/2	4	4-1/2	5	5-1/4	5-3/4	6-1/4	6-3/4
20	16	2-3/4	3-1/4	3-3/4	4	4-1/2	4-3/4	5-1/4	5-3/4	6
15	21	2-1/2	3	3-1/4	3-3/4	4	4-1/2	4-3/4	5-1/4	5-1/2
10	25	2-1/4	2-3/4	3	3-1/4	3-3/4	4	4-1/4	4-3/4	5
5	29	2	2-1/4	2-3/4	3	3-1/4	3-1/2	3-3/4	4-1/4	4-1/2
0	33	1-3/4	2	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2	3-3/4
-5	36	1-1/2	1-3/4	2	2-1/4	2-1/2	2-3/4	2-3/4	3	3-1/4
-10	39	1-1/4	1-1/2	1-1/2	1-3/4	2	2-1/4	2-1/4	2-1/2	2-3/4
-15	42	1	1	1-1/4	1-1/2	1-1/2	1-3/4	1-3/4	2	2
-20	44	3/4	3/4	1	1	1-1/4	1-1/4	1-1/2	1-1/2	1-1/2
-25	46	1/2	1/2	3/4	3/4	3/4	1	1	1	1
-30	48	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/2	1/2
-35	50	0	0	0	0	0	0	0	0	0

Using a refractometer, measure freeze point of coolant, match reading with a value under the “Tested Freeze Protection” column. Determine cooling system volume; and using chart, determine volume of coolant to drain from cooling system. Replace drained volume with Delo ELC/XLC AFC-Concentrate.

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USE REFRACTOMETER TO CHECK FREEZE PROTECTION

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FREEZE POINT ADJUSTMENT CHART FOR UNDER CONCENTRATED SYSTEMS

(Use this chart to adjust your freeze point down to -35˚F) For use with ethylene glycol based fluids.

TESTED FREEZE PROTECTION (˚F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME								
		7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME LISTED SHOULD BE DRAINED AND REPLACED WITH DELO ELC AFC - PREMIXED 50/50								
25	10	6	7	8	9	10	10-1/2	11-1/2	12-1/2	13-1/2
20	16	5-1/2	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11-1/2	12
15	21	5	6	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11
10	25	4-1/2	5-1/2	6	6-1/2	7-1/2	8	8-1/2	9-1/2	10
5	29	4	4-1/2	5-1/2	6	6-1/2	7	7-1/2	8-1/2	9
0	33	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-1/2
-5	36	3	3-1/2	4	4-1/2	5	5-1/2	5-1/2	6	6-1/2
-10	39	2-1/2	3	3	3-1/2	4	4-1/2	4-1/2	5	5-1/2
-15	42	2	2	2-1/2	3	3	3-1/2	3-1/2	4	4
-20	44	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3
-25	46	1	1	1-1/2	1-1/2	1-1/2	2	2	2	2
-30	48	1/2	1/2	1/2	1	1	1	1	1	1
-35	50	0	0	0	0	0	0	0	0	0

Using a refractometer, measure freeze point of coolant, match reading with a value under the “Tested Freeze Protection” column. Determine cooling system volume; and using chart, determine volume of coolant to drain from cooling system. Replace drained volume with Delo ELC/XLC AFC-Premixed 50/50.

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USE REFRACTOMETER TO CHECK FREEZE PROTECTION

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CONVERTING A VEHICLE COOLANT SYSTEM USING THE DRAIN, FLUSH, AND FILL METHOD

Proper Coolant System Drain Procedure:

Step 1 - Shut off engine and allow engine to cool. Engine should cool sufficiently to allow work to proceed safely.

Step 2 - Follow company lock-out tag-out procedures and ensure as a minimum that the wheels are chocked, emergency brake is applied and the transmission is set to neutral.

Step 3 - Allow engine to cool below 100°F (38°C) and remove the radiator cap or overflow tank filler cap.

Step 4 - Position a large receptacle under the radiator coolant drain plug or if reasonable, remove the lower radiator hose to increase drain rate.

Step 5 - Container should be large enough to hold total cooling system volume. Unscrew coolant drain plug and drain.

Step 6 - If the particular engine model has an engine block coolant drain plug, open it to drain any residual coolant from the engine block. Close after draining remaining coolant from the engine block.

Step 7 - While system is draining, remove the coolant SCA/chemical filter if one is installed. Ensure all coolant is drained and install back EITHER a blank (zero) chemical filter or a coolant plug in its place when switching to Delo® ELC or Delo XLC Antifreeze/Coolant. If entire fleet is converted to extended life coolant, remove SCA/chemical filter from the shop's parts inventory and reorder list. Always check with OEM on their recommendation.

Step 8 - Inspect cooling system hoses and clamps and adjust/tighten as necessary. Replace any worn hoses or clamps before adding new coolant to the system.

Step 9 - After coolant has stopped draining, close off all drain plugs.

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Proper Coolant System Flush Procedure:

Step 1 - Fill the system with clean deionized/distilled water (Tap water can be acceptable but not preferred).

Step 2 - Start truck and throttle engine to run at 1200-1500 rpm to help thoroughly circulate the deionized water through coolant system to help flush out residual coolant still in system – run for a minimum of 15 minutes.

Step 3 - Turn off truck and let engine cool down. Check radiator and hoses/clamps for any leaks and tighten/replace as needed.

Step 4 - Drain water from system and dispose of properly.

Correctly Filling the Cooling System with Delo ELC/XLC:

Step 1 - Add a full charge of Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 to the radiator system.

Step 2 - Inspect the filler cap O-ring or radiator cap seal. Replace any seal that looks damaged before tightening.

Step 3 - Start the engine and set the throttle to run the engine at 1,200 - 1,500 RPMs.

Step 4 - Allow engine to run about 15 minutes or until the thermostat opens.

Step 5 - Let engine cool to below 100°F (38°C) so you can safely remove the radiator cap or the over flow tank cap.

Step 6 - Take a sample of the fresh coolant from the radiator or an active coolant flow path.

Step 7 - Using a refractometer, read the freeze point of the coolant.

- Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 should give a reading of -34°F (-37°C) with a +/- 15°F (-9°C).
- Adjust freeze point based on ambient temperature requirements using the Chevron **Cool** Tools freeze point adjustment charts.

Step 8 - Complete topping up the cooling system to full cold line using Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50.

Step 9 - Replace and tighten overflow tank cap or radiator cap.

Step 10 - Identify cooling system with a Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 SMARTFill label on radiator overfill tank cap.

Step 11 - Check coolant level at appropriate PM intervals for the vehicle.

Step 12 - If top off is required, use only Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50.

Step 13 - Check freeze point at least two (2) times per year using a refractometer. Maintain freeze point between -20°F (-29°C) to -50°F (-45°C).

Step 14 - For Best In Class Coolant Maintenance Programs, send in a coolant sample for testing a minimum of every six months.

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CONVERTING A VEHICLE COOLANT SYSTEM USING THE DRAIN AND FILL METHOD

Proper Coolant System Drain Procedure:

Step 1 - Shut off engine and allow engine to cool. Engine should cool sufficiently to allow work to proceed safely.

Step 2 - Follow company lock-out tag-out procedures and ensure as a minimum that the wheels are chocked, emergency brake is applied and the transmission is set to neutral.

Step 3 - Allow engine to cool below 100°F (38°C) and remove the radiator cap or overflow tank filler cap.

Step 4 - Position a large receptacle under the radiator coolant drain plug or if reasonable, remove the lower radiator hose to increase drain rate.

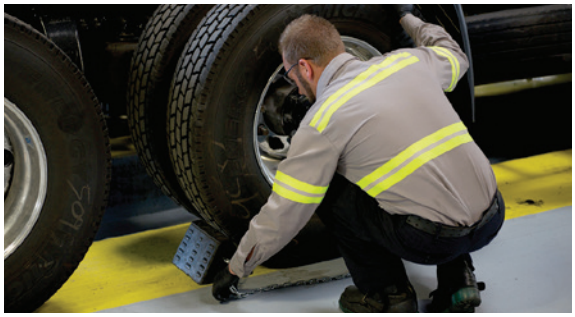
Step 5 - Container should be large enough to hold total cooling system volume. Unscrew coolant drain plug and drain.

Step 6 - If the particular engine model has an engine block coolant drain plug, open it to drain any residual coolant from the engine block. Close after draining remaining coolant from the engine block.

Step 7 - While system is draining, remove the coolant SCA/ chemical filter if one is installed. Ensure all coolant is drained and install back EITHER a blank (zero) chemical filter or a coolant plug in its place when switching to Delo ELC or Delo XLC Antifreeze/Coolant. If entire fleet is converted to extended life coolant, remove SCA/chemical filter from the shop's parts inventory and reorder list. Always check with OEM on their recommendation.

Step 8 - Inspect cooling system hoses and clamps and adjust/ tighten as necessary. Replace any worn hoses or clamps before adding new coolant to the system.

Step 9 - After coolant has stopped draining, close off all drain plugs.



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Correctly Filling the Cooling System with Delo® ELC/XLC:

Step 1 - Add a full charge of Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 to the radiator system.

Step 2 - Inspect the filler cap O-ring or radiator cap seal. Replace any seal that looks damaged before tightening.

Step 3 - Start the engine and set the throttle to run the engine at 1,200-1,500 RPMs.

Step 4 - Allow engine to run about 15 minutes or until the thermostat opens.

Step 5 - Let engine cool to below 100°F (38°C) so you can safely remove the radiator cap or the over flow tank cap.

Step 6 - Take a sample of the fresh coolant from the radiator or an active coolant flow path.

Step 7 - Using a refractometer, read the freeze point of the coolant.

- Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 should give a reading of -34°F (-37°C) with a +/- 15°F (-9°C).
- Adjust freeze point based on ambient temperature requirements using the Chevron Cool Tools freeze point adjustment charts.

Step 8 - Complete topping up the cooling system to full cold line using Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50.

Step 9 - Replace and tighten overflow tank cap or radiator cap.

Step 10 - Identify cooling system with a Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50 SMARTFill label on radiator overfill tank cap.

Step 11 - Check coolant level at appropriate PM intervals for the vehicle.

Step 12 - If top off is required, use only Delo ELC-Premixed 50/50 or Delo XLC-Premixed 50/50.

Step 13 - Check freeze point at least two (2) times per year using a refractometer. Maintain freeze point between -20°F (-29°C) to -50°F (-45°C).

Step 14 - For Best In Class Coolant Maintenance Programs, send in a coolant sample for testing a minimum of every six months.

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MAINTAIN OPTIMAL DELO® ELC OR XLC PERFORMANCE

Delo Coolants have excellent service life interval

Confirm current customer coolant performance - Delo ELC and XLC can provide 1,000,000 miles / 1,600,000 km / 15,000 hours / 8 years of performance life and system protection without additive additions.

Steps for Maintaining Optimal Delo ELC and Delo XLC Antifreeze/Coolant Service Life

1. Visually inspect coolant color and coolant level in overflow tank. Caution: Do not remove cap until system has cooled below 100°F (38°C).
   - Coolant should be clear and free of haze, debris and oil
   - Coolant color should be red for Delo ELC or pink for Delo XLC Antifreeze/Coolant
   - Coolant level should be at the full cold line
2. If coolant level is not at the full cold line, top-up as needed using only Delo ELC Antifreeze/Coolant Premixed 50/50 or Delo XLC Antifreeze/Coolant Premixed 50/50. NOTE: Dilution by more than 25% with other non-Delo extended life coolants will reduce corrosion protection.
3. Check freeze point at every scheduled inspection and adjust as needed based on environmental requirements.
   - Delo ELC Antifreeze/Coolant Premixed 50/50 and Delo XLC Antifreeze/Coolant Premixed 50/50 both have a freeze point of -34°F (-37°C)
   - Acceptable freeze point ranges: -20°F (-29°C) to -50°F (-45°C)
   - Use a freeze point adjustment chart for EG based coolants to adjust freeze point to an acceptable level- see charts on back of this document.
4. Test coolant system acidity level using pH test strips (see back for details on how to order and use).
5. Test for organic acid inhibitor level using the Carboxylate Test Strips at least twice per year. See back for order information.

Contact Chevron Lubetek at 800-582-3835 for further information.

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The Delo Cool Tools Maintenance Program is for end-users that are experiencing dilution issues when using Delo ELC or Delo XLC Antifreeze/Coolant due to improper top-up practices.

Steps to proper use and application of the Delo Cool Tools Maintenance Program:

1. Check the freeze point of Delo ELC coolant using a refractometer.
Freeze point should be between -20°F (-29°C) to -50°F (-45°C). Adjust freeze point to -34°F (-37°C) using Delo ELC Concentrate, Delo XLC Concentrate, Delo ELC-Premixed 50/50, Delo XLC-Premixed 50/50 or deionized water depending on the initial freeze point measurement. Freeze point adjustment tables are available from Chevron and are below.

UNDER CONCENTRATED

FREEZE POINT ADJUSTMENT CHART FOR UNDER CONCENTRATED SYSTEMS
(Use this chart to adjust your freeze point down to -35°F) For use with ethylene glycol based fluids.

TESTED FREEZE PROTECTION (°F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME 7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME LISTED SHOULD BE DRAINED AND REPLACED WITH DELO ELC AFC - PREMIXED 50/50								
25	10	6	7	8	9	10	10-1/2	11-1/2	12-1/2	13-1/2
20	16	5-1/2	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11-1/2	12
15	21	5	6	6-1/2	7-1/2	8	9	9-1/2	10-1/2	11
10	25	4-1/2	5-1/2	6	6-1/2	7-1/2	8	8-1/2	9-1/2	10
5	29	4	4-1/2	5-1/2	6	6-1/2	7	7-1/2	8-1/2	9
0	33	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-1/2
-5	36	3	3-1/2	4	4-1/2	5	5-1/2	5-1/2	6	6-1/2
-10	39	2-1/2	3	3	3-1/2	4	4-1/2	4-1/2	5	5-1/2
-15	42	2	2	2-1/2	3	3	3-1/2	3-1/2	4	4
-20	44	1-1/2	1-1/2	2	2	2-1/2	2-1/2	3	3	3
-25	46	1	1	1-1/2	1-1/2	1-1/2	2	2	2	2
-30	48	1/2	1/2	1/2	1	1	1	1	1	1
-35	50	0	0	0	0	0	0	0	0	0

Using a refractometer, measure freeze point of coolant, match reading with a value under the "Tested Freeze Protection" column. Determine cooling system volume; and using chart, determine volume of coolant to drain from cooling system. Replace drained volume with Delo ELC/XLC AFC-Premixed 50/50.

USE REFRACTOMETER TO CHECK FREEZE PROTECTION

OVER CONCENTRATED

FREEZE POINT ADJUSTMENT CHART FOR OVER CONCENTRATED SYSTEMS
(Use this chart to adjust your freeze point up to -35°F)

FREEZE PROTECTION OF SAMPLE MIXED 50/50 WITH WATER (°F)	%AF IN COOLANT	TOTAL COOLANT SYSTEM VOLUME 7-GAL	8-GAL	9-GAL	10-GAL	11-GAL	12-GAL	13-GAL	14-GAL	15-GAL
		VOLUME TO DRAIN AND REPLACE WITH DEIONIZED WATER								
+10	50	0	0	0	0	0	0	0	0	0
+7	55	3/4	3/4	3/4	1	1	1-1/4	1-1/4	1-1/4	1-1/2
+5	60	1-1/4	1-1/4	1-1/2	1-3/4	1-3/4	2	2-1/4	2-1/4	2-1/2
0	65	1-3/4	1-3/4	2-1/4	2-1/4	2-1/2	2-3/4	3	3-1/4	3-1/2
-5	70	2	2-1/4	2-3/4	2-3/4	3-1/4	3-1/2	3-3/4	4	4-1/4
-6	75	2-1/4	2-3/4	3	3-1/4	3-3/4	4	4-1/4	4-3/4	5
-12	80	2-3/4	3	3-1/2	3-3/4	4-1/4	4-1/2	5	5-1/4	5-3/4
-18	85	3	3-1/4	3-3/4	4-1/4	4-1/2	5	5-1/2	5-3/4	6-1/4
-23	90	3	3-1/2	4	4-1/2	5	5-1/4	5-3/4	6-1/4	6-3/4
-29	95	3-1/4	3-3/4	4-1/4	4-3/4	5-1/4	5-3/4	6-1/4	6-3/4	7-1/4
-35	100	3-1/2	4	4-1/2	5	5-1/2	6	6-1/2	7	7-3/4

If refractometer reading is off scale or shows a freeze point for the sample lower than -62°F, use the chart above to adjust the freeze point to -35°F. To do this, take the coolant sample and dilute it 50/50 with water. Take a new refractometer reading, and match this value to the reading under the "Freeze protection of sample mixed 50/50 with water" column. Determine your cooling system volume, and based on the chart above, drain the recommended amount of coolant and replace that volume with water. Recheck freeze point.

USE REFRACTOMETER TO CHECK FREEZE PROTECTION

2. Refractometer
A refractometer is an easy and accurate way to measure the freeze point of an antifreeze/coolant. Refractometers can be purchased from Chevron and are for use ONLY with Ethylene Glycol (EG) based coolants.

3. pH Test Strips
A pH test strip is used to determine acidity level of the coolant in the cooling system. Chevron offers pH test strips that are easy to use and show either "Pass" or "Fail" on system acidity. If a pass is received, move on to Item 4.

4. Nitrite Test Strips
These help test for nitrite levels that provide for cavitation protection in coolants. Typically lower nitrite levels can lead to increase in liner pitting and eventual failure of the engine. This strip provides an easy check for nitrite levels.

5. Carboxylate Test Strips
The carboxylate test strips help confirm appropriate level of carboxylates remain for systems using Delo ELC or Delo XLC Antifreeze/Coolant.

All items above may be ordered from the Chevron Signage and Merchandise Center at **chevronmerchcenter.com** or at **+1 877-491-3619** (U.S) or **chevronmarketingresources.ca** (Canada).

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DEVELOP A BEST IN CLASS ENGINE COOLANT MAINTENANCE PROGRAM

Safety Program

Ensure that Safety Comes First

- Make sure vehicles or stationary engines are turned off and properly secured with lock out, tag out procedures followed.
- Ensure the cooling system is at a workable temperature of below 100°F (38°C).
- Take precautions when opening the cooling system cap - the system is under pressure and can spray up into your face or eyes causing harm.

Assess Current Coolant Maintenance Program

Step 1: Identify current fluid being used

- Extended Life, recycled or traditional heavy-duty coolant
- Color of current coolant
- Coolant clarity - is there any haze or debris visible in the system?
- Are vehicle radiator systems currently labeled with coolant used?

Step 2: Inventory current coolant maintenance practices

- How often are coolant system checks done (hoses, clamps, test strips, etc.)?
- Are dilution tests (refractometer readings) conducted on the coolant systems?
- For coolant system checks, is the fluid drained and reused? How is it stored?
- Are any liquid or chemical filter SCAs used to reinhibit the coolant system?
- Are coolant system pressure tests conducted once per year?

Step 3: Assess site coolant storage and handling practices

- Bulk, drum or tote storage - how is the coolant dispensed?
- Is the fluid premixed already or premixed on site? What type of water is used?

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Establishing Best in Class Coolant Equipment Maintenance Program

Coolant system checks conducted at equipment oil drain interval

Step 1: Inspect the coolant system hardware

- Check the hosing and conduits for abrasion, worn and corroded areas
- Verify that the thermostat is still performing as specified
- Inspect for leaking coolant at joints and hardware components
- Double check that the system overflow tank is topped off properly.

Step 2: Take a coolant sample and visually inspect the coolant

- Clear and free of haze, debris and oil
- Free of unusual or foul odors
- If the coolant is black or brown or contains visible contaminates, then the coolant should be replaced. Reference Chevron Cool Tools document *Converting a Vehicle Coolant System.*

Step 3: Utilize appropriate test strip on coolant sample

- Check for inhibitor, pH, nitrite or SCA levels depending on coolant used
- Confirm continued use of coolant or any additional testing required

Step 4: Test for freeze point using a refractometer

- Verify freeze point is between -20°F (-29°C) and -50°F (-45°C); the typical range for a 50/50 prediluted coolant as measured by a refractometer.
- If less than -50°F (-45°C), the system is over concentrated with Glycol - add more deionized or distilled water to bring the freeze point back towards -34°F (-37C°). Reference *Chevron Over Concentrated Freeze Point Adjustment Chart* for exact amount.
- If greater than -20°F (-29°C), the system is over diluted with water - add coolant concentrate. Reference *Chevron Under Concentrated Freeze Point Adjustment Chart* for exact addition.

Step 5: Log all results in maintenance program and take appropriate corrective actions based on test results

Coolant system checks conducted once per year

Step 1: Conduct a coolant system pressure test

- Utilize a coolant system pressure test kit that can be purchased through any heavy-duty OE Dealer or independent parts company.
- Test to ensure correct seal in coolant system and radiator cap is sealed appropriately
- Poor coolant system pressure can lead to:
  - Coolant system losses
  - Corrosion leading to rust and reduced engine life
  - Pitting in liner from incorrect seal and air entrainment
  - Poor system cooling capability due to exposure to outside air - this can lead to engine overheating and piston failure

Step 2: Log all results in maintenance program and take appropriate corrective actions

Understanding Coolant Fluids

There are several types of coolant fluid technologies available to choose from today. Understanding their performance characteristics is key in helping select the right fluid for your operation.

Automotive or Conventional Coolant

- Typically green in color and are not suitable for use in heavy-duty diesel engines without the addition of Supplementary Coolant Additives (SCAs).
- Not recommended for heavy-duty applications because they do not contain sufficient additives for liner cavitation or hard water antiscale protection.
- Does not meet ASTM D-6210 unless supplemental coolant additives (SCAs) are blended into the coolant prior to filling or topping off the cooling system.
- To be used in diesel engines, a dose of SCAs must be added to the coolant and then maintained as noted in the 'Heavy Duty Fully Formulated" description below.

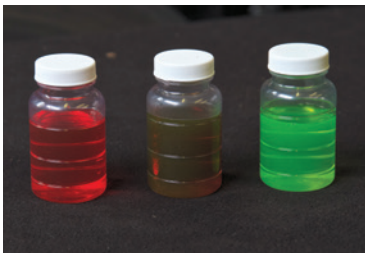
Heavy-Duty Fully Formulated Coolant

- Typically purple/pink in color and suitable for use in heavy-duty diesel engines as they already contain a dose of SCAs. However, these coolants are based on the same silicate technology as automotive coolants and require periodic maintenance to stay effective.
- Require periodic checks and maintenance to ensure that SCA levels are high enough to provide protection for the cooling system.
- SCAs may also come in a coolant filter; sometimes referred to as a water or chemical filter. SCA coolant filters come in a TMC RP 329 type A or B formulation.
- SCAs can be added in either liquid form or by installing a chemical filter on the cooling system. SCA coolant filters come in a TMC RP 329 type A or B formulation.
- Typically SCAs last approximately 25,000 miles before needing to be refreshed. Overtreating with SCAs may be harmful to the cooling system by building up silicates and scale on hot surfaces and blocking cooling passages.
- There are Extended Service Interval (ESI) chemical filters available that can be used for longer periods without change. Check OEM recommendations on use and change interval of these types of filters for maximum effectiveness.
- ESI SCA filters will need to be replaced at the OEM recommended interval; typically replaced annually.

Extended Life Coolant

- Typically red or pink in color, these are coolants that require no SCA or inhibitor additions for their stated service life.
- It is acceptable to add either a blank water / chemical free coolant filter to an extended life system or a coolant filter plug to ensure that SCAs are not added to extended life coolant.
- There are two types of extended life coolants available in market, one that contains nitrite like Delo® ELC Antifreeze/Coolant and one that is nitrite free like Delo XLC Antifreeze/Coolant. Chevron's Delo ELC/Delo XLC has been utilized in the field for many years with great performance and can be used across numerous makes and models of heavy-duty diesel equipment.
- When topping up, it is important to use the same extended life coolant brand to ensure the technology is the same and the service life is the same.
- When checked properly, extended life coolants can provide excellent system protection and long life performance.

Mixing Coolants



While the products will all mix together fine, mixing will dilute the intended protection levels.

- Ensure base fluid in the coolants being mixed are the same; EG/EG or PG/PG.
- Mixing EG and PG based coolants will yield a faulty freeze point reading on the refractometer.
- Mixing up to 25% of different coolants to Delo extended life coolants is OK, but more than that will compromise coolant system protection and performance.
- Corrective action should be scheduled to correct this dilution at the earliest convenience to maximize cooling system protection.
- When mixing different color coolants, this can cause discoloration of the coolant. In many cases, the mixed coolant may turn brown or rust colored. The color change itself is not indicative of a problem, however always ensure that the products are the same base technology.

Coolant Service Life

The service life of heavy-duty fully formulated and extended life coolants typically have some type of published service life. However, the true service life depends on final quality of the fluid, operating conditions and periodic maintenance of the fluid and system.

- Heavy-duty fully formulated coolant service life is typically 250,000 miles/5000 hours/ 2 years - this assumes that periodic SCA additions are done along with checking of pH and nitrite levels on a periodic basis.
- Heavy-duty fully formulated coolants can generally handle a maximum of 10 SCA additions before the Total Dissolved Solids (TDS) in the system become too high and require a drain, flush and fill.
- Typical extended life coolant service life is 1,000,000 miles / 1,600,000 km / 15,000 hours, or 8 years.
- If the coolant in the system exceeds these levels then the coolant should be tested as a minimum and replaced for best in class maintenance practice to ensure continued coolant system protection.

Chevron Coolant Product Service and Shelf Life Chart

Core Product	Service Claims				Shelf Life
	Mileage	Kilometers	Hours	Years	
Delo ELC Antifreeze/Coolant - Premixed 50/50	1,000,000	1,600,000	15,000	8	8 Years
Delo XLC Antifreeze/Coolant - Premixed 50/50	1,000,000	1,600,000	12,000	6	8 Years
HDAX 40/60 ELC (Stationary Engines)	--		32,000	--	8 Years
Chevron HDPF with SCA addition at every 15,000-25,000 miles (24,000 - 40,000 kilometers)	200,000 - 250,000	320,000 - 400,000	5,000	2.5	18 Months

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REORDER COOL TOOLS MAINTENANCE KIT MATERIALS

The Cool Tools Maintenance Kit and replacement parts can be ordered directly through Chevron if you have a Chevron account number. Please contact the Lubrication Business Center (LBC), place your order online through CLeO or call 1-800-822-5823. Complete kits for Canada are available on **chevronmarketingresources.ca**.

Cool Tools Maintenance Kit Includes:

1. Glycol Refractometer
2. pH Test Strips
3. Nitrite Test Strips (Delo ELC Cool Tools Maintenance Kit only)
4. Carboxylate Test Strips
5. Coolant Sampling tools (beakers & pipettes)
6. Cool Tools Reference Literature, Chevron Code: 954593995

Glycol Refractometer 1

Chevron Code: 982046995

pH Test Strips 2

Chevron Code: 982045995

Nitrite Test Strips 3

Chevron Code: 982044995

Carboxylate Test Strips 4

Chevron Code: 982043995

Beakers (set of 6) 5

Chevron Code: 982041995

Pipettes (set of 10)
Chevron Code: 900541995

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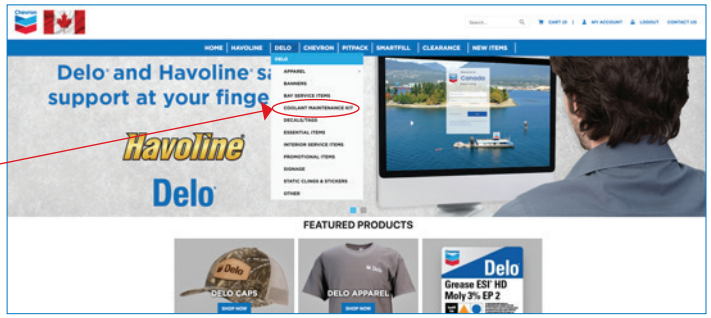
REORDER DELO COOL TOOLS MAINTENANCE KIT MATERIALS FROM THE CHEVRON MERCHANDISING CENTER

If you do not have a Chevron account, you may also make your purchase from the Chevron Merchandising Center at **www.ChevronMerchCenter.com** or call 1-877-491-3619 between 8:00 a.m. - 5:00 p.m. CST. Payment with credit card is required at time of checkout. We accept Visa®, MasterCard®, Discover® and American Express.

How To Order Online



Step 1: Visit **www.ChevronMerchCenter.com.**

Step 2: Click on the Delo link in the top navigation.

Step 3: Choose **Coolant Maintenance Kit** from the drop down menu.

Step 4: Click on the item you would like to purchase.

Step 5: Select the quantity and click **Add to Cart.**

Step 6: Once you have finished shopping, click **View Cart** in the top navigation. You may review your order, edit quantities, remove an item from your cart or choose to continue shopping.

Step 7: When you are ready to check out and complete your order, click **Checkout.**

Step 8: If you have an existing account with the Chevron Signage and Merchandise Center, enter your user name and password to login. If you do not have an account established, click **Checkout.**

Step 9: Enter your billing/shipping information.

Step 10: Choose a shipping method. For faster processing you may select Rush Processing. (Note: there is an additional $25 fee for rush processing. International shipments require special handling and freight charges.)

Step 11: Click **Continue.** These orders will be completed with a Customer Care Specialist.

Step 12: Enter your credit card payment information.

Step 13: Review your order for accuracy and click **Complete Order.**

DESCRIPTION	MERCH CENTER CODE
Chevron Delo ELC Coolant Maintenance Kit	ST250
Glycol Refractometer	ST250-GLYC
pH Test Strips	ST250-07
Nitrite Test Strips	ST250-05

DESCRIPTION	MERCH CENTER CODE
Carboxylate Test Strips	ST250-03
Beakers	ST250-04
Pipettes	ST250-06

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