

Cadion Method

Method 10217
0.02 to 0.30 mg/L Cd
TNTplus™ 852

Scope and application: For wastewater and process control.



Test preparation

Instrument-specific information

Table 1 shows all of the instruments that have the program for this test. The table also shows the adapter and light shield requirements for the applicable instruments that can use TNTplus vials.

To use the table, select an instrument, then read across to find the applicable information for this test.

Table 1 Instrument-specific information for TNTplus vials

Instrument	Adapters	Light shield
DR 6000, DR 5000	—	—
DR 3900	—	LZV849
DR 3800, DR 2800	—	LZV646
DR 1900	9609900 or 9609800 (A)	—

Before starting

DR 3900, DR 3800, DR 2800: Install the light shield in Cell Compartment #2 before this test is started.

Review the safety information and the expiration date on the package.

The recommended sample pH is 3–10.

The recommended temperature for samples and reagents is 15–25 °C (59–77 °F).

The recommended temperature for reagent storage is 2–8 °C (35–46 °F).

To make sure that all forms of the metal are measured, digest the sample with heat and acid. Use the Metals Prep Set TNTplus 890 to digest the sample.

Use the Calcium Separation Set TNT892 for samples that have calcium and magnesium concentrations of more than 50 mg/L.

DR 1900: Go to All Programs>LCK or TNTplus Methods>Options to select the TNTplus number for the test. Other instruments automatically select the method from the barcode on the vial.

Review the Safety Data Sheets (MSDS/SDS) for the chemicals that are used. Use the recommended personal protective equipment.

Dispose of reacted solutions according to local, state and federal regulations. Refer to the Safety Data Sheets for disposal information for unused reagents. Refer to the environmental, health and safety staff for your facility and/or local regulatory agencies for further disposal information.

Items to collect

Description	Quantity
Cadmium TNT852 Reagent Set	1
Pipet, adjustable volume, 0.2–1.0 mL	1
Pipet, adjustable volume, 1.0–5.0 mL	1

Items to collect (continued)

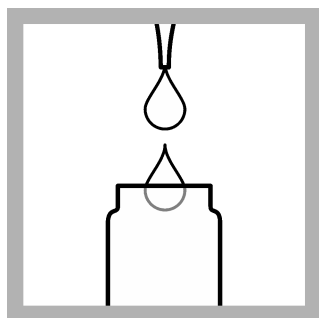
Description	Quantity
Pipet tips	1
Pipet, volumetric, Class A, 10.0 mL	1
Pipet filler, safety bulb	1

Refer to [Consumables and replacement items](#) on page 4 for order information.

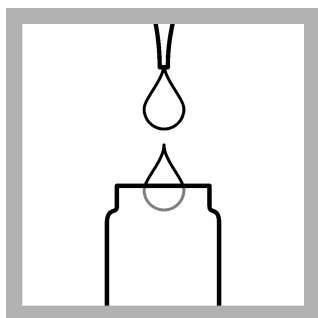
Sample collection and storage

- Collect samples in clean glass or plastic bottles that have been cleaned with 6 N (1:1) hydrochloric acid and rinsed with deionized water.
- To preserve samples for later analysis, adjust the sample pH to less than 2 with concentrated nitric acid (approximately 2 mL per liter). No acid addition is necessary if the sample is tested immediately.
- Keep the preserved samples at room temperature for a maximum of 6 months.
- Before analysis, adjust the pH to 3–6 with 5 N sodium hydroxide solution.
- Correct the test result for the dilution caused by the volume additions.

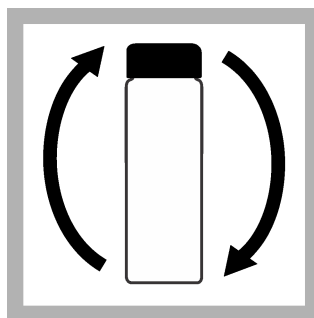
Test procedure



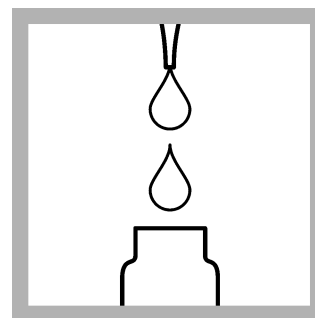
1. Use a pipet to add 10 mL of sample to a 20-mm reaction tube.



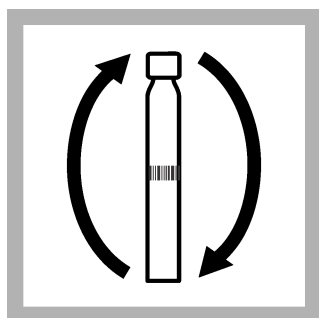
2. Use a pipet to add 1 mL of Solution A to the reaction tube.



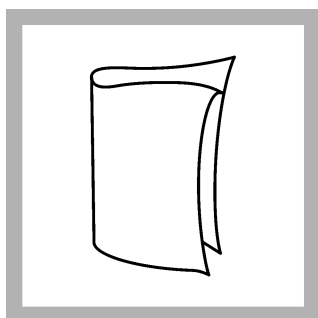
3. Tighten the cap on the reaction tube and invert the vial 2–3 times.



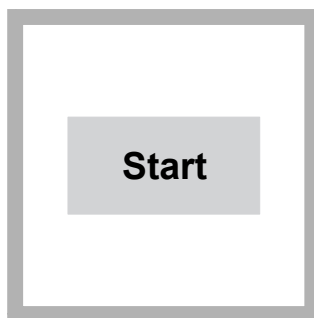
4. Use a pipet to add 0.4 mL of Solution B to the test vial.



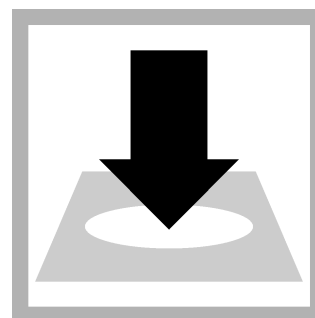
5. Tighten the cap on the vial and invert the vial 2–3 times.



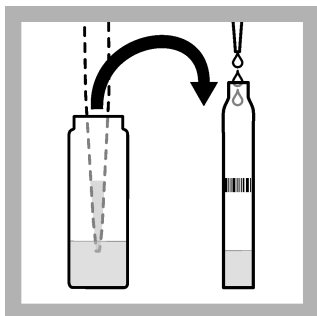
6. Clean the vial.



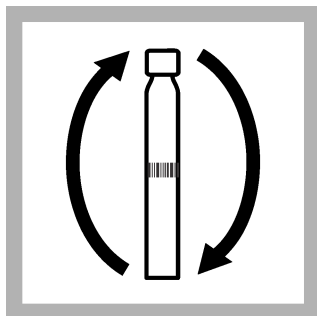
7. DR 1900 only: Select program 852. Refer to [Before starting](#) on page 1.



8. Insert the vial into the cell holder. DR 1900 only: Push **READ1**. The instrument zero is set.



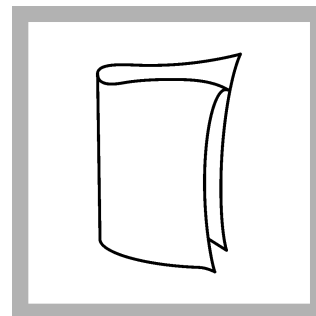
9. Use a pipet to add 4.0 mL of the treated sample from the 20-mm reaction tube to the vial.



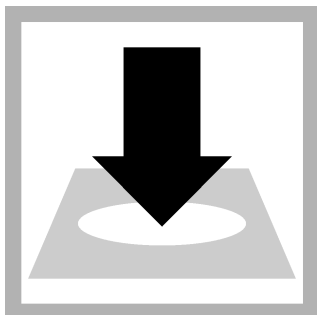
10. Tighten the cap on the vial and invert the vial 2–3 times.



11. Start the reaction time of 30 seconds.



12. When the timer expires, clean the vial.



13. Insert the vial into the cell holder. DR 1900 only: Push **READ2**. Results show in mg/L Cd.

Reagent blank correction

For the best results, measure the reagent blank value for each new lot of reagent. Replace the sample with deionized water in the test procedure to determine the reagent blank value. Subtract the reagent blank value from the sample results automatically with the reagent blank adjust option. Measure the reagent blank value when a new lot of reagent is used.

1. Use deionized water as the sample in the test procedure to measure the reagent blank value.
2. Set the reagent blank function to on. The measured reagent blank value is shown.
3. Accept the blank value. The reagent blank value is then subtracted from all results until the reagent blank function is set to off or a different method is selected.

Note: As an alternative, record or enter the reagent blank value at a different time. Push the highlighted reagent blank box and use the keypad to enter the value.

Interferences

Table 2 shows that the ions were individually examined to the given concentrations and do not cause interference. No cumulative effects or influences of other ions were found. Verify the measurement results with sample dilutions or standard additions.

Table 2 Interfering substances

Interfering substance	Interference level
SO ₄ ²⁻	1000 mg/L
Ca ²⁺ , Mg ²⁺	50 mg/L

Table 2 Interfering substances (continued)

Interfering substance	Interference level
Fe ²⁺ , Cu ²⁺ , Ni ²⁺ , Zn ²⁺ , Pb ²⁺ , Co ²⁺ , Ag ⁺ , Au ⁺ , Cr ⁶⁺	25 mg/L
Mn ²⁺	2 mg/L

Accuracy check

Standard solution method

Use the standard solution method to validate the test procedure, the reagents and the instrument.

Items to collect:

- 100-mg/L Cadmium Standard Solution
- 500-mL volumetric flask, Class A
- 1.0-mL volumetric pipet, Class A and pipet filler safety bulb
- Deionized water

1. Prepare a 0.20-mg/L cadmium standard solution as follows:
 - a. Use a pipet to add 1.0 mL of a 100-mg/L cadmium standard solution into the volumetric flask.
 - b. Dilute to the mark with deionized water. Mix well. Prepare this solution daily.
2. Use the test procedure to measure the concentration of the prepared standard solution.
3. Compare the expected result to the actual result.

Note: The factory calibration can be adjusted slightly with the standard adjust option so that the instrument shows the expected value of the standard solution. The adjusted calibration is then used for all test results. This adjustment can increase the test accuracy when there are small variations in the reagents or instruments.

Summary of Method

Cadion forms a complex with cadmium. The reduction in the color intensity of the cadion is used for the determination of cadmium. The measurement wavelength is 552 nm.

Consumables and replacement items

Required reagents

Description	Quantity/Test	Unit	Item no.
Cadmium TNT852 Reagent Set	1	25/pkg	TNT852

Required apparatus

Description	Quantity/test	Unit	Item no.
Pipet, adjustable volume, 1.0–5.0 mL	1	each	BBP065
Pipet tips, for 1.0–5.0 mL pipet	1	75/pkg	BBP068
Pipet, adjustable volume, 0.2–1.0 mL	1	each	BBP078
Pipet tips, for 0.2–1.0 mL pipet	2	100/pkg	BBP079
Light shield, DR 3900	1	each	LZV849
Light shield, DR 3800, DR 2800, DR 2700	1	each	LZV646

Recommended standards

Description	Unit	Item no.
Cadmium Standard Solution, 100-mg/L Cd	100 mL	1402442

Optional reagents and apparatus

Description	Unit	Item no.
Calcium Separation Set	each	TNT892
DRB 200 Reactor, 115 VAC option, 9 x 13 mm + 2 x 20 mm, 1 block	each	DRB20001
DRB 200 Reactor, 230 VAC option, 9 x 13 mm + 2 x 20 mm, 1 block	each	DRB20005
Flask, volumetric, Class A, 500 mL, glass	each	1457449
Metals Prep Set TNTplus	50/pkg	TNT890
Nitric Acid, concentrated	500 mL	15249
Sampling bottle with cap, low density polyethylene, 500-mL	12/pkg	2087079
Sodium Hydroxide Standard Solution, 5.0 N	100 mL MDB	245032
Test tube rack, polyethylene, for 13-mm OD vials, 90 holes	each	2497900
Water, deionized	4 L	27256



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