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Use care when installing and removing reusable fittings. Result: A copy of the plate definition is created with a new name and revised needle depth. Caution: To avoid damaging the needle, follow the guidelines in this section, and use the appropriate needle-height setting for your sample plates or vials. Wash solvent effects: Property Organic species Solvent composition pH Concentration of wash solvent Solubility of sample Sample dilution Cycle times Effect As a general principle, purge and wash solvents must include the same organic species, which is not always practicable. Press down on tab to release connector Leak sensor connector 4651 3. Restriction: The first injection of a sample set, and injection sets with different methods, cannot utilize load-ahead mode. A.1 well position Sample plate TP03232 Sample plate vial positions: A B C D E F Using the SM-FTN 2530 5. Take the loop offline: Before the first gradient change reaches the injection valve After the gradient returns to the initial conditions Determining the correct time to take the loop offline At the point the loop is eliminated from the flow path, it contains the mobile phase composition. Otherwise, phone the Waters corporate headquarters in Milford, Massachusetts (USA), or contact your local Waters subsidiary. Load the plate onto the tray so that well position A.1 is at the rear, left-hand corner, and the forward edge of the plate is behind the spring inside the front of the carrier. To waste Sample syringe Needle or extension loop From injection port To column From solvent manager 4. Required material/ Gloves: clean, powder-free, chemical-resistant To install the waste tubing: 1. Click Maintain > Calibrate needle Z axis. Note that the SM-FTN beeps three times whenever the sample compartment door is open, and the needle assembly mechanism is about to move. Alternative: Right-click the SM-FTN control panel in the data application, and then click Wash Needle. The needle presses against the seat, compressing the spring, which creates the required load between the needle and the seat. Tip: Using a smaller needle increases cycle times. THIS DOCUMENT OR PARTS THEREOF MAY NOT BE REPRODUCED IN ANY FORM WITHOUT THE WRITTEN PERMISSION OF THE PUBLISHER. Delivers wash solvent to the inject/wash port. For easier accessibility, use long compression screws to attach tubes to the injector and vent valve. 3641 To choose the load-ahead and loop-offline options: 1. Due to part tolerances, fittings that have already been mated to one part may become a source of carryover when used with a different part. Use a nonabrasive, lint-free wipe to dry the leak sensor prism. After approximately 1.5 ml of liquid accumulates in the leak sensor reservoir, an alarm sounds indicating that the leak sensor detected a leak. Specify a duration, in seconds, for priming the wash solvent and the number of cycles for priming the purge solvent, and then click OK. 1217 Installing the waste tubing Caution: To prevent contamination to system components, wear clean, chemical-resistant, powder-free gloves when installing or removing the waste tubing. The purge solvent, if used for auto-dilution, must reflect as closely as possible the same composition as the initial gradient mobile phase. 3 Functional systems... 48 Caution: To avoid damaging electrical parts, never disconnect an electrical assembly while power is applied to an instrument. Locating system serial numbers Each system instrument or device bears a serial number that facilitates service and support. Alternative: Right-click the SM-FTN control panel in the data application, and then click Reset SM. Disabling motors, which you do before manually moving the sample tray and R-carriage. Cross-view of injection needle and seal: Force applied through the needle carriage Overflow cup Aluminum housing Needle motion Needle NEEDLE Seal Seal High-pressure seal Spring cup Location of Force sensor The following figures show a standard ACQUITY UPLC system cycle time and load-ahead cycle time. In Empower software, open the Configure System window. The loop offline time must not occur if the contents of the needle and optional extension loop are of a higher concentration than the initial gradient conditions. If you initiate the loop-offline option before the gradient reaches its final conditions, the highly organic portion of your gradient does not pass through the needle. Required materials 5/16-inch open-end wrench 1/4-inch open-end wrench 1/2-inch open-end wrench T10 TORX driver T20 TORX driver Gloves: clean, powder-free, chemical-resistant Seal kit To replace the seal: 1. You can choose two external needle washes, pre-injection or post-injection. See page 72. Warning: To avoid the harmful effects of personal contact with solvents, including inhalation, observe Good Laboratory Practice when you handle them. If you are taking the loop offline before the first gradient change, flush the needle and extension loop with at least five loop volumes of solvent at the initial gradient composition to completely flush the sample onto the column. ii Overview... 10. PRINTED IN THE UNITED STATES OF AMERICA AND IN IRELAND. Observe these warning and caution advisories when you perform maintenance operations on your system. You install them between the needle and the injection valve port. Tip: In the SM-FTN, a programmed gradient typically flows through all parts of the instrument that contact the sample. If the message reads Leak Detected, locate the source of the leak, and make the repairs necessary to stop it. Mark the box to Enable dilution. Under Plate Type, type a suitable name for the plate. Close the sample compartment door. Auto dilution Choose the auto-dilution option to dilute dissolved samples (containing no solids) with a solvent the sample syringe delivers. Extracts sample from vials. Plug the sample tray out. ALL RIGHTS RESERVED. Requirement: You must take the needle and optional extension loop off-line when you use the load-ahead option. Functional systems R0 positioning mechanism The R0 (R-theta) positioning mechanism s two axes control the orientation of the sample plates within the sample compartment and the relative position of the sample needle carriage. Calibrating the needle s z-axis, which calibrates the vertical position of the needle. 4045 4. Required materials Gloves: clean, powder-free, chemical-resistant Leak sensor To install the leak sensor: Caution: To avoid damaging electrical parts, never disconnect an electrical assembly while power is applied to an instrument. 6 Injection mechanics... The information in this document is subject to change without notice and should not be construed as a commitment by Waters Corporation. Using a flow-through-needle mechanism, in which the needle is part of the high-pressure sample flow path, the Sample Manager injects the samples it draws from the plates and vials onto a chromatographic column. The components within are not user-serviceable. The purge solvent used for priming is also the solvent used to move sample through the injection flow path. By default, the system washes the exterior of the needle after an injection. Replacing the needle, seal, and sample syringe. In the console, select Sample Manager > Control > Reset SM. Front view with doors closed: On/off switch Power LED Run LED Sample compartment door Fluidics compartment door Overview 38 Front view, with doors open: Chamber temperature sensor Plate selector switch Access panel Location of column heater leak sensor Injection valve Sample syringe valve Location of back pressure regulator Sample syringe Sample tray Location of sample manager leak sensor 49 Sample compartment components visible with access panel removed: Compartment lighting Location of sample needle carriage Location of column heater leak sensor cable connector Location of sample manager leak sensor cable connector Injection port wash drain Injection/wash port Location of wash tube SM-FTN components: Component Access panel Compartment lighting Injection/wash port Description Removable panel (requires a TORX driver) that allows access to sample compartment components such as the seal assembly and needle carriage. Reducing carryover In a chromatographic system, any substance that creates unwanted peaks or excessive background noise is contamination. A PEEK support sleeve prevents buckling and helps ensure proper alignment with the seat. If you need additional information, see the Column Compartments Operator s Overview and Maintenance Information document. Plug the leak sensor connector into the front of the instrument. Process waste port Corrugated Teflon tubing Pass-through on upper drip tray of the solvent manager Front boss fitting on lower drip tray of the solvent manager 2. Result: The needle wash begins. Warning: To avoid electric shock, do not remove the instrument s protective panels. Tip: To modify needle placement for vials, click Instrument Method Editor > ACQ-FTN > General tab > Advanced, and change the Needle Placement (from bottom) value. Select Configure > Volumes. Tighten fittings as needed. Contact Waters for inserts that allow you to use 2-mL vials in these positions. Characterize the needle seal (see the ACQUITY UPLC online Help). You can specify an interval, to allow the time for sample mixing. Specify volumes for pre-aspirate and post-aspirate air gaps, and then click OK. Loading sample plates The SM-FTN is compatible with ANSI standard well-plates, vial-trays, vials, and cap-mats/seals that are approved for use with the ACQUITY UPLC system. The calibrable to use in the SM-FTN is the same for all needles. For best performance if you use the auto-dilution option, the purge solvent must be similar or identical to your isocratic or initial gradient solvent conditions, excluding buffers. 9. Drainage flow from solvent bottle Mobile phase from solvent manager Sample Inject valve To column Degassed solvent from solvent manager Sample syringe valve Secondary drainage to solvent manager Secondary drainage to solvent manager Primary drainage to solvent manager Primary drainage to solvent manager 27 SM-FTN major components The following diagrams show the SM-FTN s major components. Ensure the drip tray does not collide with any surface. Solutes that deposit in the extension loop due to poor solubility are not transferred to the column until the gradient composition dissolves the sample and flushes it onto the column. The default air-gap volume is 0 µl. An assembly that houses the injection port, needle seal, needle wash mechanism, and force sensor. Carefully unpack the new leak sensor. By setting threshold limits and monitoring these usage counters regularly, you can minimize unexpected failures and unscheduled downtime during important work. Press down on the tab to detach the leak sensor connector from the front of the instrument. Carryover can result from incorrectly installed tubing, fittings, or other hardware or by selecting ineffective wash solvents. Maintaining the SM-FTN 4752 7. See also: page 9 General guidelines For best performance, follow these guidelines when selecting purge and wash solvents. Purge solvent prime, where the degassed purge solvent flows through the sample syringe. 2025 Caution: To avoid damaging the solvent valve seats and seals in the solvent path, do not use a nonvolatile buffer as the purge or wash solvent. The following metal sample needles are available for the SM-FTN: Needle size 15-µl (24-inch l x 1-inch ID) Default 30-µl (24-inch l x 1-inch ID) Recommended maximum injection volume 10 µl 25 µl Extension loops Extension loops, which increase the volume of sample that can be drawn and held for injection, are an optional part of the injection system. Prime the SM-FTN The priming process fills the wash system with wash solvent or the injection pathway with purge solvent. Open the sample compartment and the fluids compartment. For information on setting maintenance warnings, consult the ACQUITY UPLC Console online Help. 7. Screw the extension loop fitting into port 4 of the injection valve, and then use the 1/4-inch open-end wrench to tighten the fitting 3/4-turn past finger-tight. To optimize system performance, carryover must be minimized and held to an acceptable level (often, below the limits of detection). Poorly seated connections create unnecessary space-reservoirs that retain sample, increasing carryover. Replacing the seal Warning: To avoid personal contamination with biologically hazardous or toxic materials, wear clean, chemical-resistant, powder-free gloves when performing this procedure. Replace the leak sensor As needed See page 46. Tip: For instructions on preparing the solvent manager, see ACQUITY UPLC Quaternary Solvent Manager Operator s Overview and Maintenance Information or ACQUITY UPLC Binary Solvent Manager Operator s Overview and Maintenance Information. For more information about plates and vials, see Using Plates and Vials with ACQUITY UPLC Systems, part number Warning: To avoid eye injury, wear safety glasses when loading sample plates. Use a purge solvent with low organic content (~5% to 10%), to minimize dissolved gas while still preventing microbial growth. 2227 Observing vial and plate recommendations Waters recommends that you observe these usage guidelines for sample vials and plates in the SM-FTN: Vials Use only Waters-certified vials. Select the plate type ANSI-48Tube0.65mHolder. The SM-FTN holds two ANSI/SBS plates that you load through the sample compartment door. Requirement: The total volume of an Auto additions injection must be less than the sample loop volume. Sample tray handle Caution: To avoid damaging the sample needle, the sample plates must be positioned correctly and the sample tray must be fully engaged. Serrations 4. Mark the boxes for the load-ahead and loop-offline options. The sample tray rotates slowly when the system is idle, to help maintain a uniform temperature across the plates. The Module Information dialog box displays this information: Serial number Firmware version Firmware checksum Component software version Alternatives: From the main window, hover the pointer over the visual representation of the system instrument or device you want information about. 1. 12. Choosing the sample syringe The following sample syringe sizes are available to use in the SM-FTN: 50 µl 100 µl Default 250 µl 500 µl Choose a syringe size that allows you to draw your desired total sample volume into the sample needle (and optional extension loop). Vial type Waters Supplied Total Recovery Vial Waters Supplied Max. Align the leak sensor s T-bar with the slot in the side of the leak sensor reservoir, and slide the leak sensor into place. Standard ACQUITY UPLC system cycle time definition: Standard injection mode Total ACQUITY UPLC system cycle time System setup SM-FTN sample preparation and positioning Pre-wash Post-wash Chromatographic run time Start Sample injection End 349 ACQUITY UPLC system load-ahead cycle time definition: Load-ahead mode after the first injection Total ACQUITY UPLC system cycle time System setup and sample positioning Chromatographic run time Time buffer delay Start Sample injection SM-FTN wash time SM-FTN sample preparation Loop comes off-line End Tip: The time buffer delay is a wait time that compensates for variations in the time it takes to load a sample. For buffered aqueous, reversed-phase chromatographic conditions and MS applications, it is best to use a wash solvent of 100% methanol or acetonitrile or a mixture of methanol or acetonitrile with 0% to 20% water. Alternative: Right-click in the SM-FTN control panel, in the data application, and then click Prime. 1419 Calibrating the needle s z axis You must calibrate the needle s z axis before you use the FTN for the first time and whenever you replace the sample needle. The following figures show a standard ACQUITY UPLC system cycle time and load-ahead cycle time. Tip: To easily and efficiently achieve the correct needle setting, slide a business card under the needle. If you want to recover the maximum amount of sample, change the needle placement setting. Caution: When installing or removing a column, be sure that you turn the column itself and not the fitting (compression screw and ferrule). 1 Location of SM-FTN in the ACQUITY UPLC system... With a cotton swab, absorb any remaining liquid from the corners of the leak sensor reservoir and its surrounding area. See the Material Safety Data Sheets for the solvents you use. Remove the leak sensor from its reservoir, grasping it by its serrations, and pull upward on it. Use of non-pre-slit cap mats and vial caps can cause clogging in the wash lines. 3643 The Maintain menu also lists these functions: Characterizing the needle seal, which determines the seal location. To completely interrupt power, set the power switch to Off, and then unplug the power cord from the AC source. In no event shall Waters Corporation be liable for incidental or consequential damages in connection with, or arising from, its use. Plug the leak sensor connector into the front of the SM-FTN. When using the system throughout the day (and on nights and weekends), or when using aggressive solvents such as buffers, perform these maintenance tasks more frequently. To offset adverse effects on peak shape caused by the matrix s composition, adjust the purge solvent composition. In addition, observe these considerations when determining the correct loop offline time: If the wash solvent volume has been significantly increased, the washing process may not be complete when the loop switches back. If necessary, clean or replace the guide. Do not reuse stainless steel fittings more than six times. Click Save > Yes, and then click Close. 2. To prevent sample spillage or needle damage, use only Waters-approved covers on the sample vials. Toggle switch used to select either plate position 1 or 2. Tip: Press the plate selector switch twice to toggle between loading a sample plate and loading positions that accept 4-mL vials. When it ends, the status returns to idle. To create a new plate type and correct the depth value: 1. In the instrument method editor, click the ACQ-FTN tab and then the Dilution tab. Maintaining the SM-FTN 4550 Configuring maintenance warnings Maintenance counters provide real-time usage status information that can help you determine when to schedule routine maintenance for specific components. In the Advanced Settings dialog box, mark the box for the air-gap option. Prism Lint-free wipe TP Roll up a nonabrasive, lint-free wipe, and use it to absorb the liquid from the leak sensor reservoir and its surrounding area. Overview 712 3. Waters recommends metal needles for samples known to be 2631 attracted to hydrophobic polymers and also when you use hexane and tetrahydrofuran. Obtain the serial number from the printed labels on the device s rear panel or inside the sample compartment door. Failing to calibrate the needle can damage it. Power-off the SM-FTN. 4. TP02892 T-bar Slot in leak sensor reservoir Leak sensor installed in reservoir 6. Adjust the pH of the purge and wash solvents for best peak shape and carryover performance. The entire injection port assembly rests on a spring and is guided in an aluminum housing. In the Volume Configuration dialog box, select the appropriate needle or extension loop size from the list, and then click OK. The solvent begins to flow before the needle is lowered to this wash position. Click Start, and then click OK in the confirmation window. Using the SM-FTN 3338 Load-ahead and loop offline options Load ahead The load-ahead option instructs the sample manager to aspirate the next sample in a sample list while a current sample is running, thus reducing the overhead time (time in addition to the chromatographic analysis time) of an injection cycle. Sample needle Vial depth 2 mm offset Using the SM-FTN 3136 Recovering maximum sample from vials The current ANSI plate (48 vials) definition for the 2-mL maximum Recovery Vials can leave some sample in the vial. Replace the sample syringe Clean the injection port Replace the injection valve cartridge Clean the instrument with a soft, lint-free cloth, or paper dampened with water Maintenance considerations Safety and handling During scheduled routine maintenance or as needed Weekly or monthly, according to system usage During scheduled routine maintenance or as needed See page 69. Choosing the sample syringe draw rate The ideal syringe draw rate depends on sample volume, sample viscosity, and desired cycle time. Tips: You do not need to defrost the sample compartment. Choosing needles and extension loops Sample needles Waters offers multiple needle sizes, so you can choose the best option for your injection volume and sample viscosity. Neither wash sequence allows wash solvent to enter the sample stream. Use pre-slit cap-mats/seals and vial caps. Flow path diagram: Union Wash solvent Purge solvent Pressure transducer Inject valve Inject position To waste To column From solvent manager Sample syringe In TP Wash pump Solenoid valve To waste Sample Injection port Sample compartment Injection mechanics During an injection: 1. Switch the plate selector switch on the top, center of the flow path diagram. 2. Using the SM-FTN, you also can prime the injected samples (auto-dilution). Wash solvent must be no stronger than the concentration needed to reduce carryover to an acceptable level. Otherwise, you can increase the risk of carryover. Take these actions to reduce carryover: Restrict extension loop usage to one system. Skip to content Filter Results Browse 1 ACQUITY UPLC Sample Manager - Flow Through Needle Overview and Maintenance Information Revision C Copyright notice WATERS CORPORATION. All rights reserved. © Copyright notice WATERS CORPORATION. When you perform auto-dilutions, ensure purge solvent and sample solutions/buffers are miscible and soluble. The second high-pressure seal on the seat is formed during assembly when the seat is locked into place between the support sleeve and overflow cup via a compression nut. Optional extension loops (installed between the sample needle and the injection valve) increase the volume of your injections beyond that of the sample needle, do not submerge it in a cleaning bath. The compartment light automatically turns on when the SM-FTN s sample compartment door is opened and turns off when the door is closed. Remove the card. Recommended routine maintenance schedule: Maintenance procedure Frequency For information... Requirement: During system operation, ensure solvent does not leak from the connection between the sample needle fitting and the extension 2833 loop. Choosing the correct time to take the extension loop offline ensures that all of the peaks are flushed out of the loop. Follow the guidelines in page 20 when selecting wash solvents. Ensure that the SM-FTN can accept drainage from the column heater and provide a path to waste. If the wash time and the sample prep time are equal to or greater than the chromatographic run time then load ahead does not improve the cycle time. You also use purge solvent to prime the syringe. Each priming cycle takes approximately 0.5 minutes. In the ACQUITY UPLC Console, select an instrument from the system tree. Position the sample needle in the sample compartment. Extension loop union Extension loop union Extension loop fitting TP Screw the sample needle fitting into the extension loop union, and then use the 1/4-inch open-end wrench to tighten the fitting 3/4-turn past finger-tight. The displacement increment to 0.1 millimeter, and lower the needle until it is almost touching the surface of the business card. You can also prime the wash system with wash solvent to ascertain proper flow through the waste tubing and to confirm that the wash system is operating properly. To aspirate more sample from the vial, decrease the value so that the needle tip is closer to the bottom of the vial. Result: The mechanism moves to the home position, with the needle above the wash station. Higher viscosity wash solvents lengthen wash cycles. Waters recommends using a sample syringe volume that is at least two times your sample volume. Larger extension loops require a larger sample syringe. The flow rate of the wash solvent is 20 ml/min +/- 20%. The R-linear axis is the axis along which the sample needle carriage is oriented. At that point, the solute s Using the SM-FTN 3540 high retention factor (k') causes it to elute from the column in one column volume. Open the fluidics compartment door. Required materials Extension loop kit 1/4-inch open-end wrench Gloves: clean, powder-free, chemical-resistant Using the SM-FTN 2732 To install an extension loop: 1. Flow path through the sample management system The following diagram shows how the SM-FTN functions as part of the ACQUITY UPLC system. Do not use seal buffers in purge or wash solvents. 2429 Tip: A represents the row number. 1 represents the vial position. 5. Proper operating procedures To ensure your system runs efficiently, follow the procedures on page 10. If this is the case, extend the loop offline time. Remove the plates from the trays. TP02892 T-bar Slot in leak sensor reservoir Leak sensor installed in reservoir 5. Interface requirements Ventilation Allow at least 15.2 cm clearance at the rear and at least 1.3 cm clearance on the right-hand side of the SM-FTN for ventilation. See also: Empower 3 online Help for additional information about using the Auto additions function. The theta-rotary axis is a belt-driven shaft that rotates a pair of sample plates 360 from a reference point. Press the plate selector switch on the top, center of the flow path diagram. 2. Using the SM-FTN, you also can prime the injected samples (auto-dilution). Wash solvent must be no stronger than the concentration needed to reduce carryover to an acceptable level. Otherwise, you can increase the risk of carryover. Take these actions to reduce carryover: Restrict extension loop usage to one system. Skip to content Filter Results Browse 1 ACQUITY UPLC Sample Manager - Flow Through Needle Overview and Maintenance Information Revision C Copyright notice WATERS CORPORATION. All rights reserved. © Copyright notice WATERS CORPORATION. When you perform auto-dilutions, ensure purge solvent and sample solutions/buffers are miscible and soluble. 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