507-Series Automated Water Jacket Volumetric Test System Manual

This manual incorporates the following models manufactured by Hydro-Test Products Inc. Please carefully read this entire manual before operating the equipment for the first time. Should you have any questions or concerns, please contact us prior to operating.

	Water Jacket Size		Maximum Cylinder Size		
Model No.	**Dia (")**	**Height (")**	**Dia (")**	**Height (")**	**Type of Water Jacket Lid Closure**
507-HP-14S-M	14	40	12	34	Manual
507-HP-14S-P	14	40	12	34	Pneumatic
507-HP-14-M	14	66	12	60	Manual
507-HP-14-P	14	66	12	60	Pneumatic
507-HP-18S-M	18	40	16	34	Manual
507-HP-18S-P	18	40	16	34	Pneumatic
507-HP-18-M	18	72	16	66	Manual
507-HP-18-P	18	72	16	66	Pneumatic
507-HP-24S-M	24	40	22	34	Manual
507-HP-24S-P	24	40	22	34	Pneumatic
507-HP-24-M	24	72	22	66	Manual
507-HP-24-P	24	72	22	66	Pneumatic
507-HP	Test Console Only - No Water Jacket, Calibrated Cylinder or Test Adapters				

Your Model Number: _____

Your Serial Number: _____

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Introduction

Water Jacket Volumetric Testing has been a method of re-qualifying compressed gas cylinders since the early 1900's. The test is designed to measure the expansion value of a cylinder at it's designed test pressure (typically 5/3 rds the operating pressure) and again measure any residual expansion after the pressure is released. If the residual expansion value is greater than a percentage (typically 10%) of the expansion value at the test pressure the cylinder fails the test. The determination of failure is due to excessive permanent expansion which indicate that the cylinder walls have thinned during the life of the cylinder and thus has been deemed dangerous to be refilled with a pressurized gas.

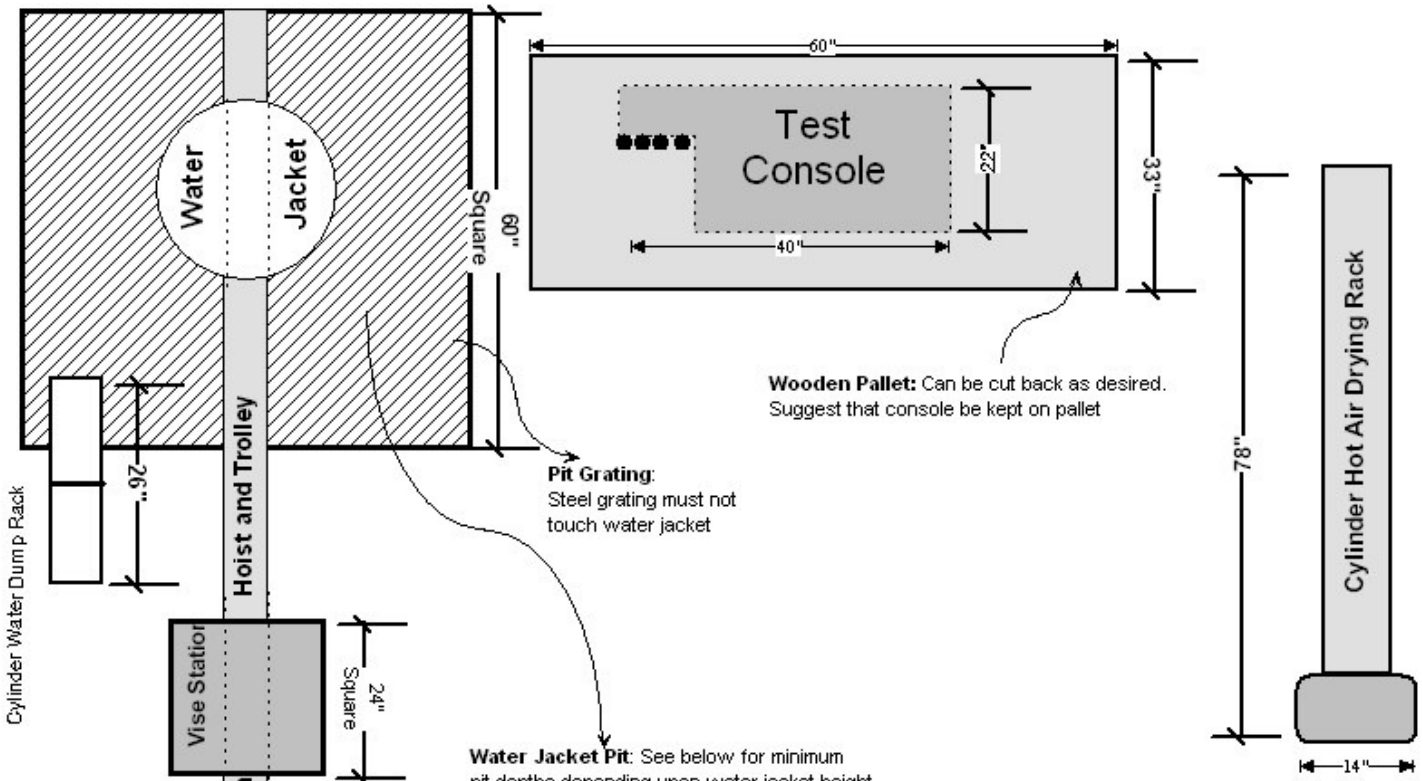
In the last 25+ years with the influx of specialized software designs, automated software driven test systems are more common to the cylinder testing industry. Hydro-Test has been supplying automated test systems since the 1990's and with the 507-series has completely re-designed the software taking advantage of todays' technology.

When you purchase equipment from Hydro-Test you are entitled to receive initial training free of charge at our facility in Stow, Massachusetts (20 miles west of Boston). We also have technicians that travel around the world training hundreds of cylinder re-esters every year. Contact our training department at training@hydro-test.com for more information and cost.

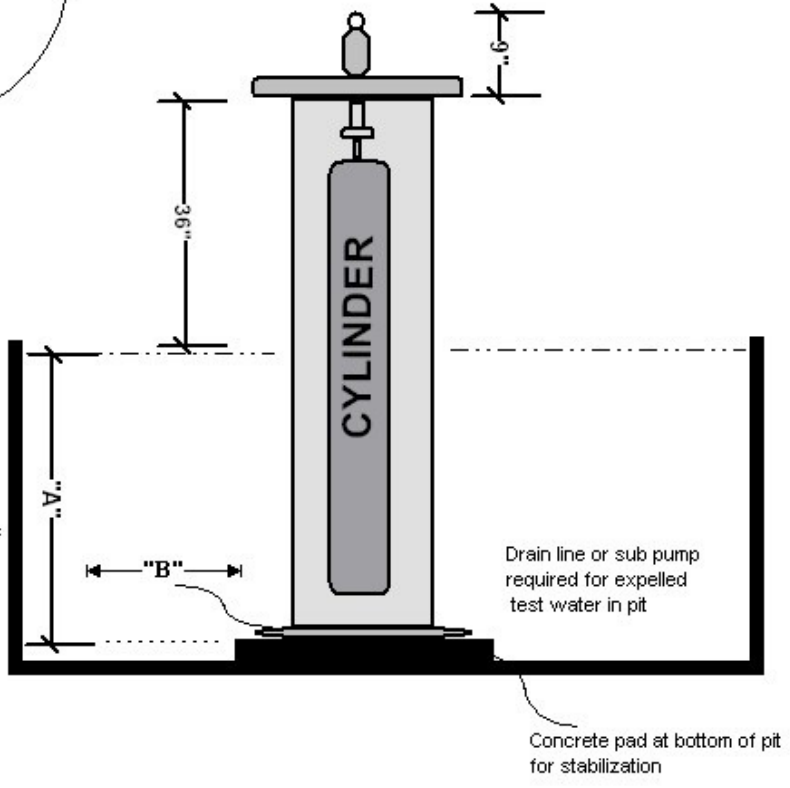
It is strongly suggested that you enroll in one of training classes. There are elements and circumstances that are not covered in this manual that will be addressed in a formal training program for your company.

Utilities required check off list:

- 100psi @ 8CFM of pre-regulated shop air to back of test console
- Inlet water supply to back of test console
- Pit for water jackets over 40" tall - see next page for typical floor and pit plan
- Overhead I-beam with hoist and trolley
- 115V-60Hz-15 amp dedicated electrical outlet within 6' of test console
- Any additional utilities that may be required for options or additional equipment purchased - see quotation or manuals for those requirements.



Length of Jacket	Dia of Jacket	Pit Depth ("A")	Base Plate Dia. ("B")
40"	14"	No Pit Required	30"
40"	18"	No Pit Required	36"
40"	24"	No Pit Required	42"
66"	14"	30"	20"
72"	18"	36"	24"
72"	24"	36"	30"



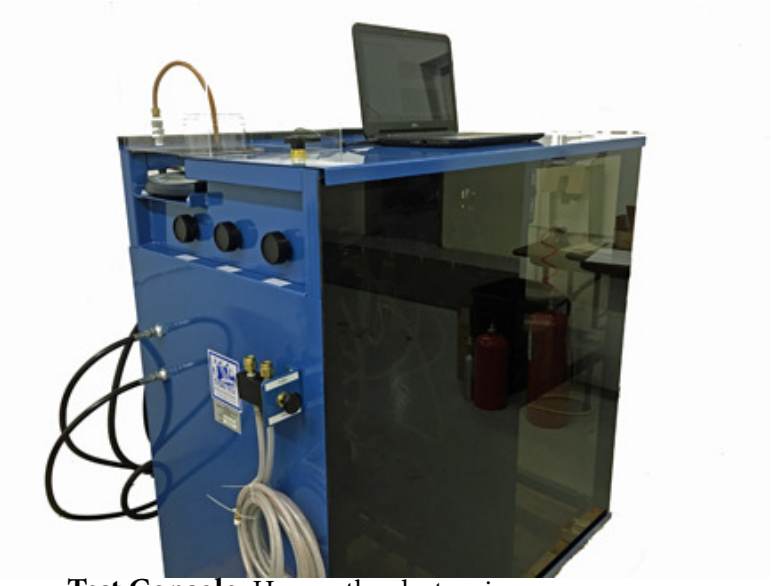
IMPORTANT NOTES

The above dimensions are for our standard size water jackets If your water jacket size is not listed, please call us and we will be pleased to advise you on a floor plan and pit size.

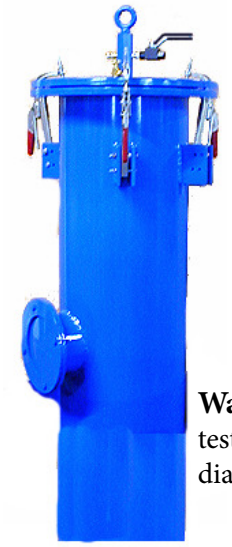
Pit is shown 60" x 60". You may want to go larger for future expansion, or you may want to go smaller in size due to room size constraints.

Pit depths are predicated upon 12' height from floor to underside of I-beam. If I-Beam / ceiling are lower than 12', you may need to increase the depth of your pit

Identifying Major Components of 507-Series Test System



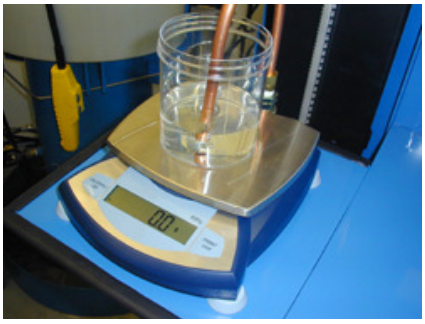
Test Console: Houses the electronics, pump, expansion device, valves, hoses, etc...



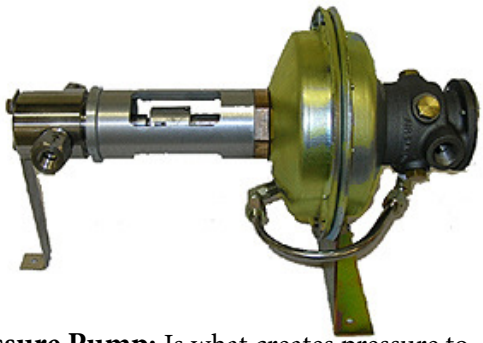
Water Jacket: Also referred to as a test chamber. Available in a variety of diameters and heights.

Calibrated Cylinder: Used to verify system accuracy on a daily basis

Dial Gauge: Used when operating the system in manual mode and also to periodically verify the electronic pressure transducer



Expansion Device: A digital scale that is used to measure the expansion values of a cylinder under test pressure



Pressure Pump: Is what creates pressure to the cylinder under test. Includes soft seated check valves, lubricator, inlet air regulator

Test Adapters: A standard set is sent with each complete test system. Many additional adapters are available for purchase.

Parts List for 507-Series Test Console

Part No.	Description	Qty per System
100-224	Gauge Adapter	1
110-015	1/4" Quick Disconnect	3
110-016	Nipple, 1/4" Quick Connect	2
120-003	Ball Valve, Water Control	2
120-056	Needle Valve, Air Control	1
120-094	Check Valve Seal Kit	2
120-112	Safety Relief	1
120-300-24DC	2-Way Solenoid Valve	4
120-301-24DC	3-Way Solenoid Valve	1
120-306	High Pressure Bleed Valve	1
140-402	Master Dial Pressure Gauge	1
140-011	Inlet Air Pressure Gauge	1
140-500-15000	Pressure Transducer	1
140-501-Laptop	Laptop	1
140-501-Printer	Ink Jet Printer	1
140-505	Speed Control Valve for Pump	2
160-010	Inlet Air Filter/Regulator	1
160-013	Inlet Air Regulator	1
160-021	Replacement Gauge for 160-010	1
160-061	Oil Lubricator for Pump	1
160-064	Muffler for Pump	1
160-102	Inlet Water Pressure Regulator	1
160-103	Inlet Water Filter Assembly	1
170-117-24DC	24VDC Transformer	1
170-119-Proof	Controller Board	1
170-140	Battery Back-Up (UPS)	1
180-062	Replacement Beaker for Scale	1
190-416	Pressure Pump	1
200-100	Outlet Pressure Hose, 8'	1
210-102	3-Way Brass Valve	1
230-501	Expansion Scale	1
393-507	Software, supplied on USB	1


#100-224


#110-015


#110-016


#120-003


#120-056


#120-094


#120-112


#120-300-24DC


#120-301-24DC


#120-306


#140-402


#140-011


#140-500-15000


#140-501-Laptop


#140-501-Printer


#140-505


#160-010


#160-013


#160-021


#160-061


#160-064


#160-102


#160-103


#170-24DC


#170-119-Proof


#170-140


#180-062


#190-416

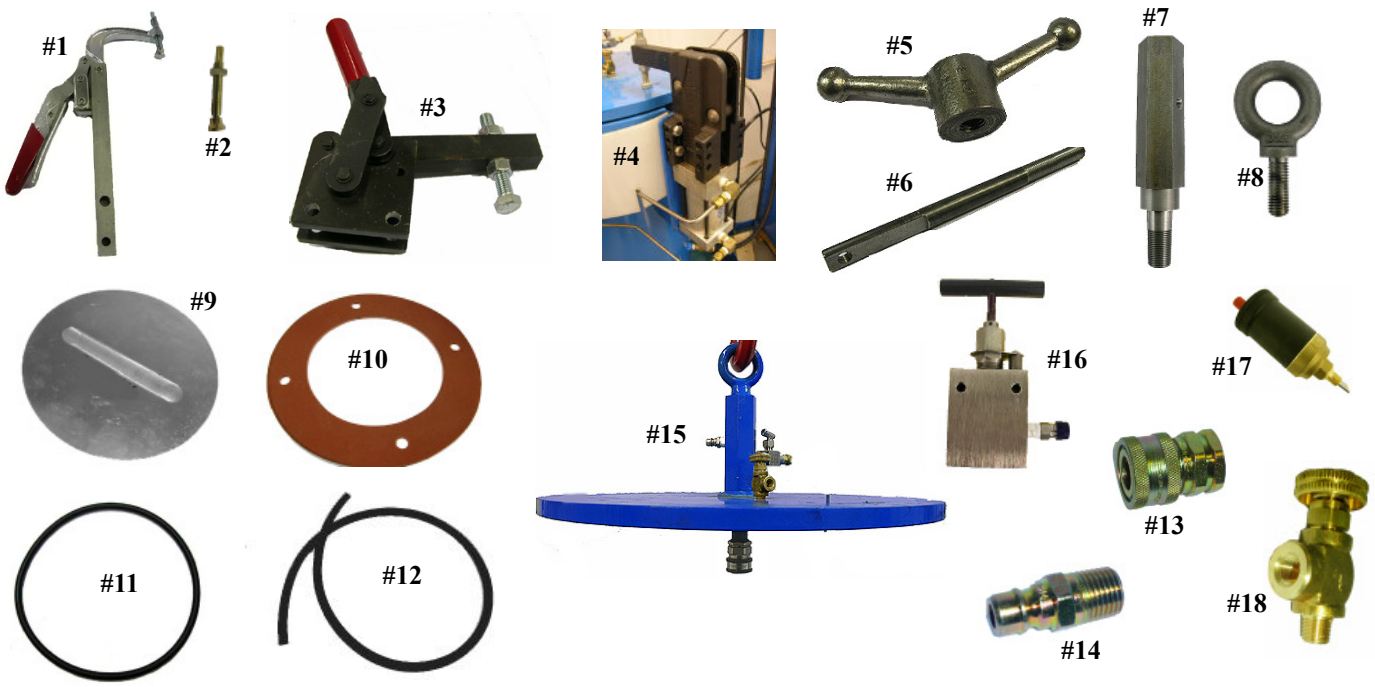

#200-100


#210-102


#230-501

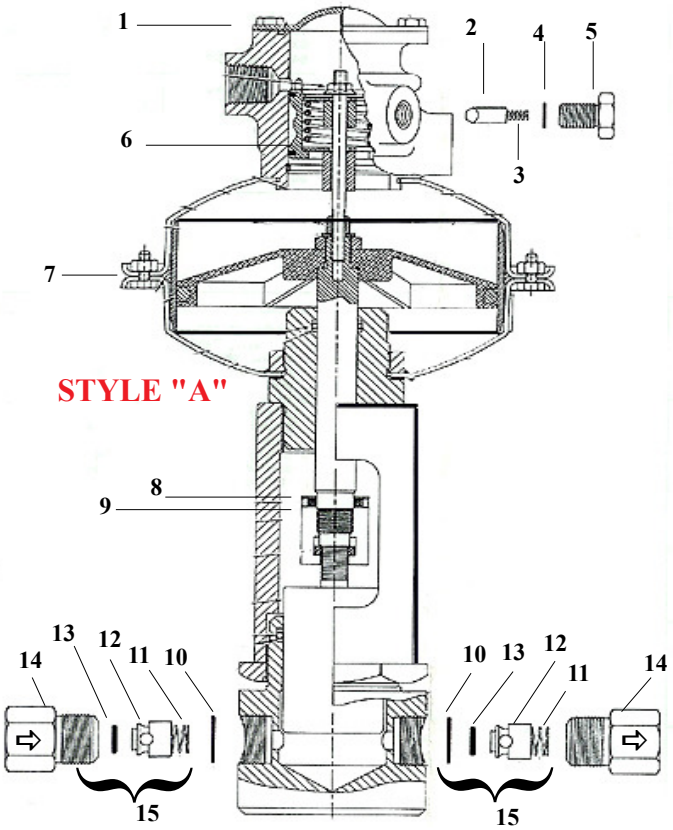
#393-507

Parts List for Water Jackets



Key	Part No.	Description	
		LID CLOSURES	
1	**210-040**	Quick acting cam style clamp used on 10" & 14" diameter water jackets	
2	**210-041**	Replacement threaded swivel tip adjustment for 210-040 clamp	
3	**210-043**	Quick acting cam style clamps (heavy duty design) used on 18" & 24" diameter water jackets	
4	**210-115**	Pneumatic operated replacement clamp	
N/S	58-115	*Replacement seal kit for pneumatic clamp #210-115*	
5	**240-129**	Wing nut for Hydro-Test Products manufactured water jackets	
6	**240-131**	Swing bolt for Hydro-Test Products manufactured water jackets (3/4"-10 thread x 10" long)	
		COMPONENT ITEMS FOR WATER JACKETS	
7	**240-124**	Replacement spud, 1/2"(M)NPT, with threaded ports for valve and nipple	
8	**240-133**	Eyebolt (lifting eye)	
9	**300-055**	Aluminum rupture disc for all Hydro-Test Products manufactured water jackets	
10	**130-015**	Rubber gasket for all Hydro-Test Products manufactured water jackets, 4 bolt hole pattern	
11	**58-200**	O-ring lid seal for 10" diameter water jacket: *Actual size of o-ring 11 5/8" ID x 12 5/8" OD*	
11	**58-201**	O-ring lid seal for 14" diameter water jacket: *Actual size of o-ring 14 7/8" ID x 15 7/8" OD*	
11	**58-202**	O-ring lid seal for 18" diameter water jacket: *Actual size of o-ring 19" ID x 20" OD*	
11	**58-203**	O-ring lid seal for 24" diameter water jacket: *Actual size of o-ring 25" ID x 26" OD*	
12	**130-017**	Non-collapsable rubber tubing, from jacket to expansion device *(sold by the foot)*	
13	**110-001**	Quick coupler 1/2"FNPT plated steel	
14	**110-002**	Nipple 1/2"MNPT plated steel	
		COMPLETE LID ASSEMBLIES	
15	**500-880**	**Water Jacket Lid Assembly**	For 10" diameter water jacket
15	**500-882**	***Includes:*** Steel lid cover	For 14" diameter water jacket
15	**500-884**	Spud & eyebolt	For 18" diameter water jacket
15	**500-886**	Enamel painted finish	For 24" diameter water jacket
		VALVES	
16	**120-100**	High pressure manual release valve for cylinder pressure release in manual mode	
17	**120-080**	Automatic air bleed valve for water jacket lid	
18	**120-059**	Manual air bleed valve for water jacket lid	

Pressure Pump Parts Breakdown

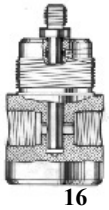


Replacement Pump Part No.	Pressure Rating (psi)
190-404	1850
190-408	6100
190-412	8800
190-416	16,000

Inlet Air Accessory Kit
Part No. 190-450
Includes:

- Air lubricator
- Air filter
- Regulator w/gauge
- Air control valve
- Quart of oil
- Fittings/tubing

If parts other than those illustrated are required, it is suggested that the pump assembly be returned to Hydro-Test for repair. Special tools are required for some internal adjustments.



For Pump Rated To: (psi)

Key	Part No.	Description	Qty Rqd'	1000	1850	6100	8800	16,000
1	190-554	Gasket, top cover	1	●	●	●	●	●
2	190-080	Detent pin	4	●	●	●	●	●
3	190-079	Detent spring	4	●	●	●	●	●
4	190-560	Detent o-ring	4	●	●	●	●	●
5	190-559	Detent bolt	4	●	●	●	●	●
6	190-417	Spring	1	●	●	●	●	●
7	190-566	O-ring, housing	1	●	●	●	●	●
8	190-593	O-ring, piston	1					●
8	190-592	O-ring, piston	1				●	
8	190-591	O-ring, piston	1			●		
8	190-590	O-ring, piston	1		●			
8	190-589	O-ring, piston	1	●				
9	190-586	Teflon backup o-ring, piston	2					●
9	190-585	Teflon backup o-ring, piston	2				●	
9	190-584	Teflon backup o-ring, piston	2			●		
9	190-583	Teflon backup o-ring, piston	2		●			
9	190-582	Teflon backup o-ring, piston	2	●				
10	190-068	Brass washer for check valve body	2	●	●	●	●	●
11	210-067	Spring, check valve	2	●	●	●	●	●
12	240-115	Poppet shuttle, check valve	2	●	●	●	●	●
13	58-031	O-ring for poppet shuttle	2	●	●	●	●	●
14	240-114	Check valve body	2	●	●	●	●	●
15	120-090	Check valve assembly - includes items 10-14	2	●	●	●	●	●
N/S	120-091	Check valve rebuild kits - includes items 10-13	2	●	●	●	●	●
N/S	120-094	Check valve seal kit - includes items 10,13	2	●	●	●	●	●
16	190-081	Body / Piston assembly (1/2" diameter piston)	1					●
16	190-119	Body / Piston assembly (5/8" diameter piston)	1				●	
16	190-121	Body / Piston assembly (3/4" diameter piston)	1			●		
16	190-123	Body / Piston assembly (7/8" diameter piston)	1		●			
16	190-124	Body / Piston assembly (1" diameter piston)	1	●				

Set-Up of Test System and Water Jacket

Before operating the 507-series test system, there are electrical, water and air connections that are made. Also connections between the water jacket and test console. All connections are tagged with a short description of where they are to be made. The following steps should be taken only after the equipment is in it's operating position, water jacket pit has been constructed (if required) and overhead I-beam with hoist is in place and operational.

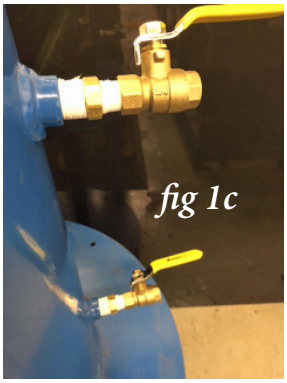
Step 1:

a) Located spare parts box and remove all of the items.

b) Attach the (2) 1/4"(m) x 3/8"(m) to each of the ball valves - be sure to teflon tape the fittings

c) Tighten the fitting and the ball valves into the two lower openings on the water jacket as pictured (***see fig.1c***)

d) Turn both ball valves to the open position



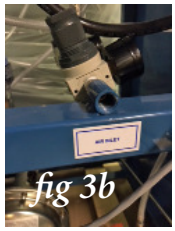
Step 2:

a) On test console locate the 2 hoses marked "hoses to water jacket upper and lower connections. Teflon tape the hose fittings and screw and tighten into ball valves on water jacket from Step 1 (***see fig.2a***)

Step 3:

a) On back of test console locate water inlet fitting. Securely fasten your water supply to the 1/4" female coupling (**do not turn water on**) - (***see fig.3a***)

b) On back of test console locate air inlet fitting. Securely fasten your inlet air supply (100psi @ 8CFM) to the 1/4" female coupling (**do not turn on air supply**) - (***see fig. 3b)***

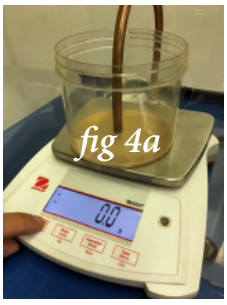


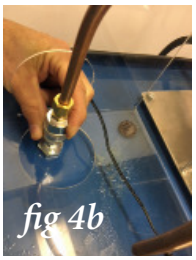
Step 4:

a) Locate expansion scale device with weight bowl and dip tube assembly. Place the scale on the test console as pictured (***see fig. 4a***) and quick connect the dip tube as pictured (***see fig.4b***)

b) Locate the laptop and printer and remove from package. Place laptop on top of test cabinet and printer on side shelf. Connect printer USB cable to laptop. **Note:** Printer software has already been installed on your laptop.

c) Connect supplied power cords to both laptop and printer





Step 5:

a) Unpack Uninterrupted Power Supply (UPS) electrical box. Have a minimum 15 amp - 115V electrical outlet nearby. Position the UPS device so that all electrical outlets from the machine are able to reach.

b) Connect power cords from scale, laptop, printer and electronics board to the UPS in the available outlets

c) Connect the power cord from the UPS to the 115V electrical outlet and turn the UPS on. Then turn on each component (scale, laptop, printer, electronics board) to verify electrical connections.

Set-Up of Test System and Water Jacket

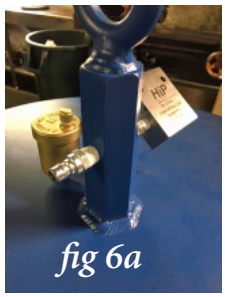
Step 6:

a) Locate the high and low pressure water jacket lid bleed valves and quick disconnect fitting #110-016. Teflon tape and tighten into the appropriate openings on the water jacket lid. (***see fig. 6a***). Please note high pressure bled valve requires handle and stem to be removed prior to attaching to lid (***see fig.6b***)

b) Located 1/2" quick coupler, part no. 110-001. Teflon tape exposed spud on the underside of water jacket lid and tighten the 1/2" quick coupler onto spud.

c) Once fittings are tightened, bring hoist hook over to top of lid and connect to eyebolt. Use hoist to lift lid off of water jacket.

d) Remove o-ring from water jacket lid and lightly lubricate with an o-ring lubricant such as Parker O-Lube or equivalent. Return o-ring to o-ring groove.



Step 7:

a) Fill the water jacket with water. This can be done by either placing a garden hose directly into the water jacket (recommended) or by turning on the main water supply to the test console and turning on valve on left side of cabinet labeled water to water jacket. (***see fig.7a***)

Step 8:

a) Locate the calibrated cylinder and fill with water by placing a garden hose into the cylinder opening.

b) Attach test adapter (located in spare parts kit box) by first Teflon taping and then tightly thread into cylinder opening.

c) Roll calibrated cylinder under I-beam and position water jacket lid over cylinder.

d) Carefully lower lid to approximately 1" above quick disconnect coupler on test adapter. With forefinger and thumb lift up the quick coupler until bearings are visible. Slowly lower coupler down to mate to nipple. Once mated, release the quick coupler so that it attached to nipple. Raise lid and connected cylinder a few inches off the ground and lightly pull down on cylinder to confirm quick coupler is engaged. (***see figs.8d & 8e***)

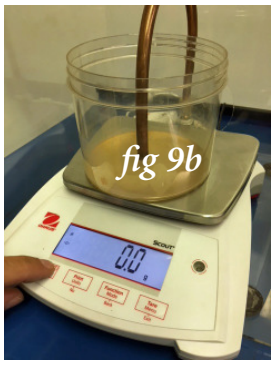
e) Slowly raise lid and calibrated cylinder slightly above water jacket and lower into water jacket until the lid meets the main o-ring and slack is felt on hoist chain.

Step 9:

a) Be sure that beaker is on top of scale and that copper siphon tube is securely coupled in place.

b) Turn on the expansion device scale by depressing the On/Off button. (***see fig.9b***)

c) A Plexiglas cover is supplied to assist in stabilizing the scale readings in adverse conditions where heat or air conditioning breeze is blowing towards test system.



Software Review

The software that operates the test system is a Windows based operating system and has been pre-loaded onto the laptop shipped with the test system. The software is also sent to you on a USB stick along with a video on the operation. Please keep this USB in a safe place in case you are required to re-install the software.

Some requirements for operating the laptop and software under Windows protocol are:

a) The software cannot be used as a server application. Due to Windows software requirements, all files must be saved to the laptop hard drive or a attached drive. Saving files to a server is not possible.

b) We highly recommend that the laptop used to run your 507-series test system be dedicated for that purpose only. It is possible that the addition of other software may conflict or corrupt the hydrotest files.

c) As with any data it is important that you have a backup plan in place. There are many 3rd party backup options that can be used. These are discussed in our video and also during a formal training session.

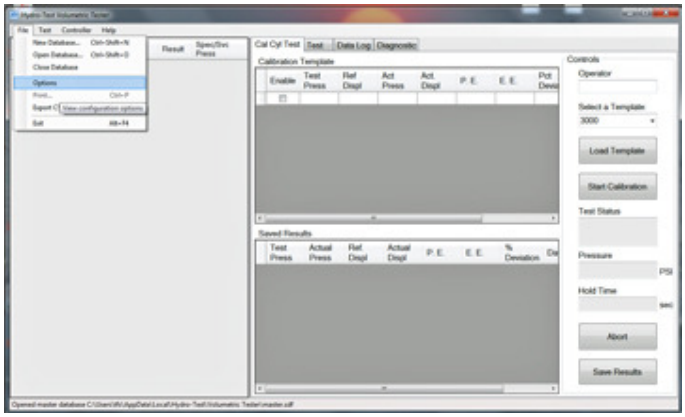
d) A thorough cleaning of the laptop and printer should be performed regularly.

e) The software is saved as a shortcut to the desktop, it is pre loaded onto the "C" drive and the records by default are saved to "My Documents" folder

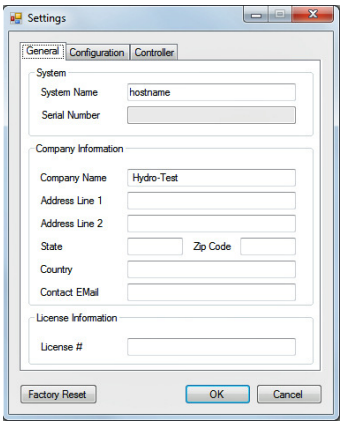
Software Operation

To start the software: "double click" on the Volumetric Tester Icon

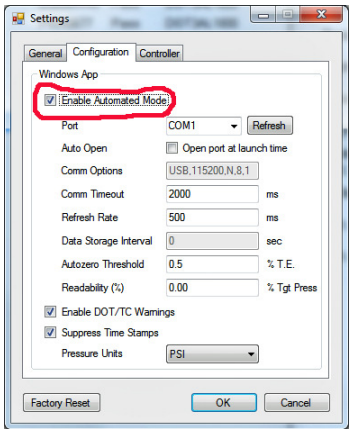
Step 1: Click on File Tab and Select Options



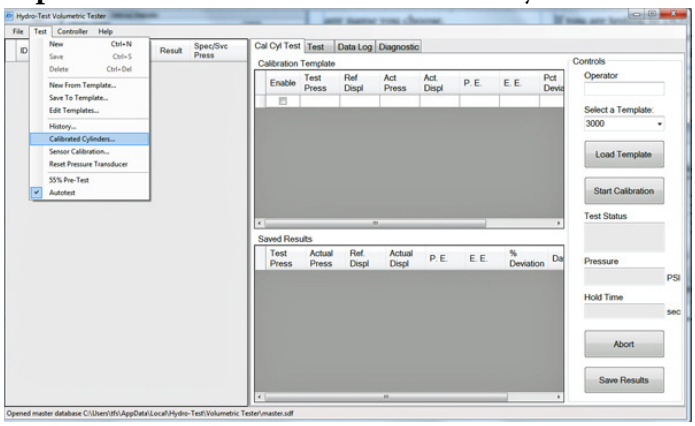
In Options screen review and change your company data as needed. You can name your 507-tester any name you choose.
Be accurate as this information will print on your test record forms



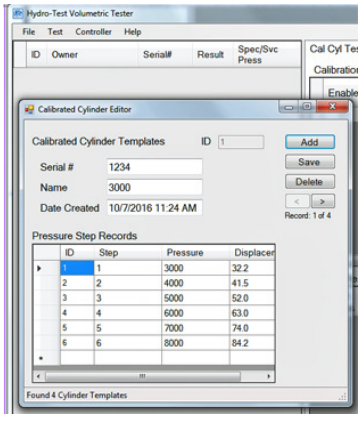
Click on Configuration sub menu and verify that "enable automated mode" is checked.
If you are testing to DOT/TC requirements, be sure the "enable DOT/TC warnings" box is checked



Step2: Click on Test Tab and Select Calibrated Cylinders

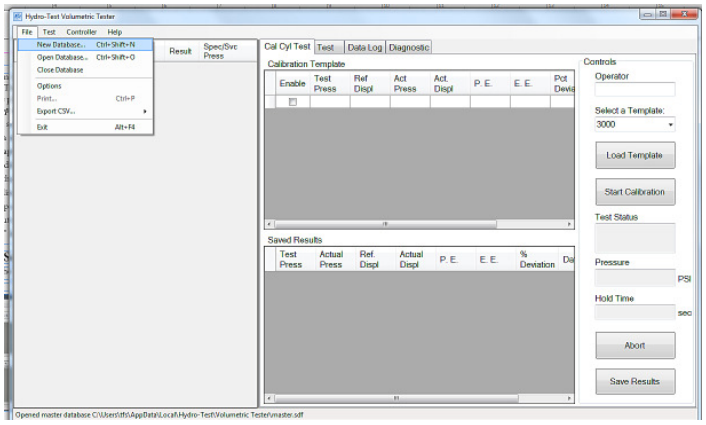


A template screen is used to enter data for your calibrated cylinder(s). Refer to your certificate of calibration for values. This data is pre-loaded at the factory. However if you replace or have multiple calibrated cylinders you will need to enter this information here. Click on add and use the tab key to forward to each data box. Once data is entered click on save

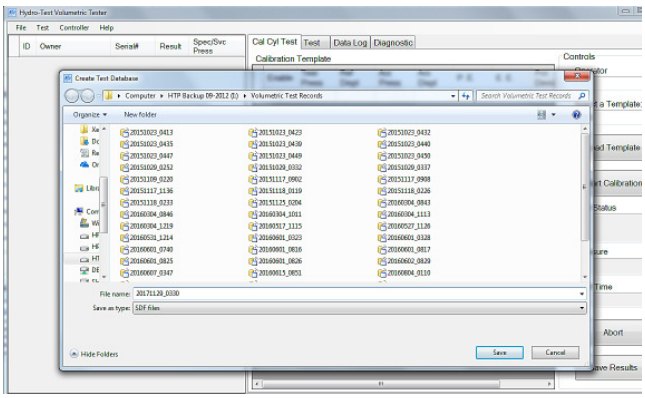


Software Operation

Step 3: Click on File Tab and New Database

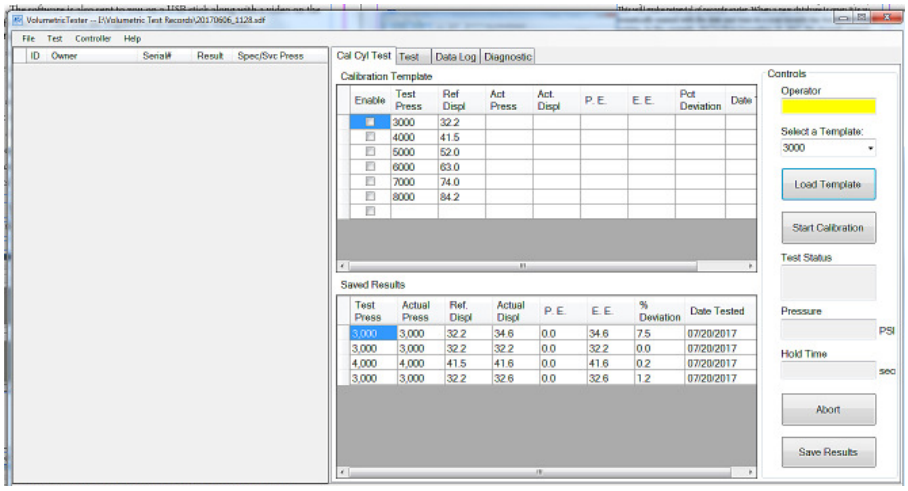


To start the operation of the software, you must open a new database or open an existing database. It is required that a new database be opened every day. This will make retrieval of records easier. When a new database is open it is automatically named with the date and time in a year/month/day format for easier sorting. In this example: 20171129 is November 29, 2017. We strongly suggest that you take the default name.



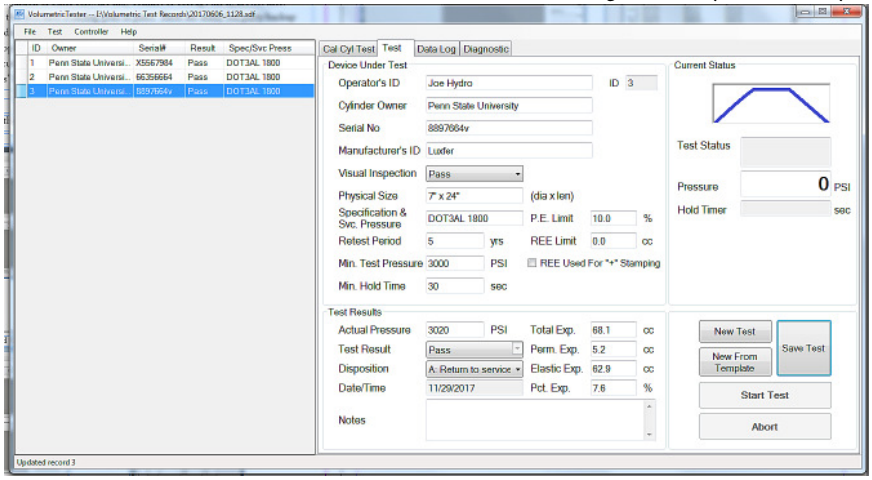
Step 4: Operating Calibrated Cylinder

Prior to starting this step - be sure that set-up of the equipment is completed, lid of water jacket is locked down and that all of the previous software set-up steps have been completed.



To operate the calibrated cylinder, click on the Cal Cyl Test tab. Enter an operators name or initials and click on the "load template" tab. If you have more than one calibrated cylinder loaded you will be able to pick what cylinder you want to use. Once the data is loaded onto to the top screen, check the box or boxes of what pressures you want to verify at. Then click the "start calibration" tab. The test system will then automatically pressurize the calibrated cylinder to each checked off pressure and at each pressure will release the pressure and record total, elastic and permanent expansion values. The software will compensate for any overshooting of target pressure and calculate a new expansion value based on the actual pressure that was registered.
After the test at each pressure is completed the results are shown on the bottom screen. If they are acceptable then you can click on the "save results" tab. If you need to rerun the verification simply click on the "start calibration" tab again. If the "enable DOT / TC warnings" box is checked in options then the screen will automatically advise you if the run met the requirements or not.

Step 5: Loading Data for Testing Cylinders

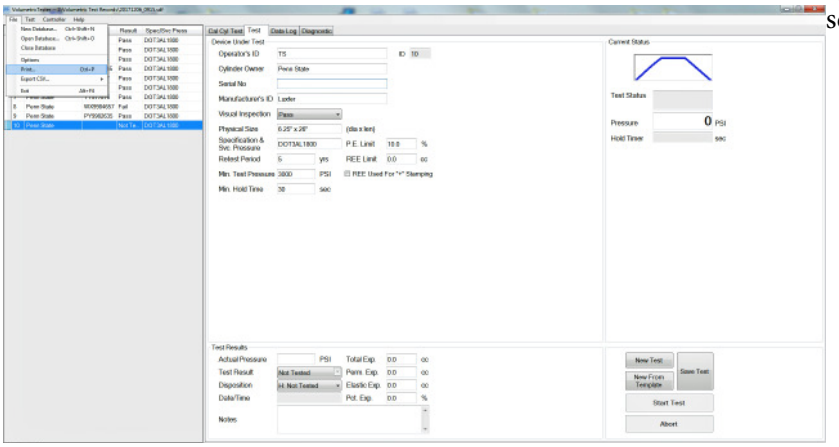


After successful verification has been completed, click on the "Test" tab and you can start entering data for cylinders that you will be testing. The data entry can be done for a single cylinder and then test that cylinder or for a number of cylinders and then test them as they are ready.
Prior to testing any cylinder, remember to perform a complete external and internal visual inspection to the standards of the Authority Having Jurisdiction (AHJ) - in most cases either the U.S. Department of Transportation (DOT) or Transport Canada (TC). The screen is self explanatory and requires all fields to be filled in . Once all data is entered, you can either click on the "Start Test" tab or "Save Test" tab depending upon if you want to test that cylinder now or hold it for later test. Once a test is completed it will automatically be saved. To start a new entry of cylinder data click on the "New Test" tab. Saved records and completed test are shown on the left side of the screen.

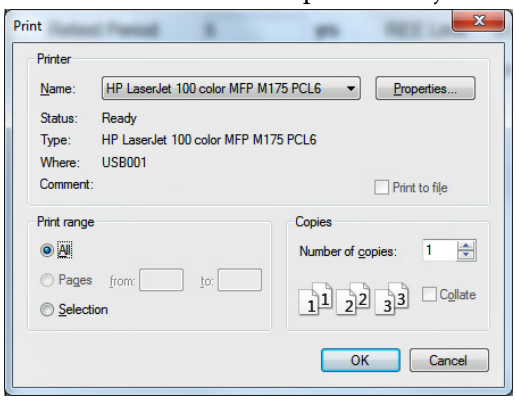
Software Operation

Printing: The Hydro-Test software allows printing from either the daily record keeping screen or the history screen

From main record keeping screen select file tab -



Standard windows print screen appears - select the appropriate printer. You can also select print all or just selected files.



When printing from the test record form screen - the daily verification report associated with this file will automatically print as page 1.

Test System: hostname
Test Machine Serial#:
License:

Calibrated Cylinder Test Data
Hydrostatic Volumetric Test Method

Hydro-Test

Calibrated Cylinder: 3000
Serial Number: 1234

ID	Target Pressure	Actual Pressure	Reference T.E.	Corrected T.E.	Actual T.E. @ Pressure	Elastic Expansion	Permanent Expansion	Percent Deviation	Date/Time	Operator
1	3000	3000	32.2	32.2	32.3	32.3	0.0	0.3	12/06/2017	TS
2	4000	4000	41.5	41.5	41.4	41.4	0.0	0.2	12/06/2017	TS
3	5000	5000	52.0	52.0	52.0	52.0	0.0	0.0	12/06/2017	TS

All of the test for that days file will print if print range of all was selcted on the print screen. If only the selected option was checked then only those records selected will print. Selection of multiple records can be made by holding down the "ctrl" key and clicking on records pryor to going to file-print screen.

Test System: hostname
Test Machine Serial#:
License:

Cylinder Retest Data Sheet
Hydrostatic Volumetric Test Method Report

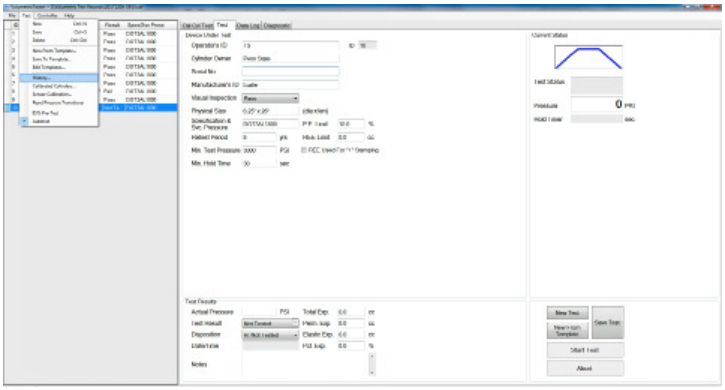
Hydro-Test

Test ID	Cylinder Owner / Test Date/Time	Retest Yrs	Operator	Serial # / Disposition	Mfgr's ID	Size (D x L)	Spec/Svc Press	Visual Insp.	Test Time	Actual Press	Total Exp.	Perm. Exp.	Elastic Exp.	REE	Pct Exp.	Test Result
1	Penn State		X556487	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3040 PSI	55.2	2.3	52.9	0.0	4.2	Pass
	12/06/2017	5	TS	A: Return to service	Notes: CHANGE VALVE										
2	Penn State		6654845	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3020 PSI	54.2	2.3	51.9	0.0	4.2	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
3	Penn State		Z4545656	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3040 PSI	58.2	2.1	56.1	0.0	3.6	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
4	Penn State		D35564445	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3000 PSI	60.2	3.8	56.4	0.0	6.3	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
5	Penn State		P4545677	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3040 PSI	58.2	1.5	56.7	0.0	2.6	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
6	Penn State		sx889797	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3000 PSI	62.5	4.0	58.5	0.0	6.4	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
7	Penn State		TT577876	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3020 PSI	54.2	1.5	52.7	0.0	2.8	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
8	Penn State		WX9984657	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3000 PSI	61.2	7.8	53.4	0.0	12.7	Fail
	12/06/2017	5	TS	D: Condemned	Notes: Failure: Excessive expansion percentage.										
9	Penn State		PY9982635	Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	3000 PSI	48.8	4.2	44.6	0.0	8.6	Pass
	12/06/2017	5	TS	A: Return to service	Notes:										
10	Penn State			Luxfer	6.25" x 26"	DOT3AL1800	Pass	30	0 PSI	0.0	0.0	0.0	0.0	0.0	Not Tested

Software Operation

Another option of printing is to use the history screen.

The history screen is a powerful tool that can be used to sort by fields, by date or date range. You can also select a file or a group of files by pointing your cursor at the table and while holding down the mouse key select a group of files. These selected files can then be copied with the "ctrl c" keyboard shortcut and then pasted, by keyboard shortcut "ctrl v" into other software such as Microsoft Excel for further report writing capabilities.



To access the history screen - click on the "test" tab and select history.

The history screen will open and display all test. You can easily find the test date range needed by using the start and end dates of the date filter boxes. Click on any of the test data headers a sort function will occur based on the header name. This feature will allow you to print just specified customers, cylinder spec, pass/fail or any other field required.

Test History

Filter: Custom Start: 12/06/2017 End: 12/31/2017 Refresh Print...

ID	Owner	Serial #	Mfg ID	Size	Spec/Svc. Press	Min. Test Pressure	Hold Time	Actual Pressure	Visual Inspection	Test Result	Disposition	Date Tested	Operator
31	Penn State	X556487	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
32	Penn State	6654845	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,020	Pass	Pass	A: Return ...	12/06/2017	TS
33	Penn State	Z4545656	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
34	Penn State	D35564445	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS
35	Penn State	P4545677	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
36	Penn State	sx889797	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS
37	Penn State	TT577876	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,020	Pass	Pass	A: Return ...	12/06/2017	TS
38	Penn State	WX9984657	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Fail	D: Conde...	12/06/2017	TS
39	Penn State	PY9982635	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS

After sorting, you can further narrow down the records you want to print or export by clicking on any of the rows and holding down the "ctrl" key click on another row. This allows printing or exporting of only records you require. Once selection is completed, click on the "print" button and the standard windows print screen will appear as discussed on previous page.

You can also select a a continuous group of records by selecting the first record of your group and while holding down the "shift" scroll for the last record of your desired group and click on it. All of the records between the first and last click are selected and can be printed or exported by the "ctr c" and "ctr v" keyboard shortcut.

Test History

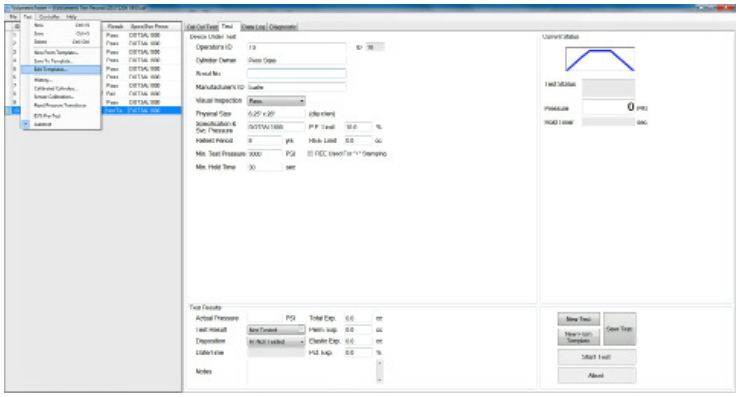
Filter: Custom Start: 12/06/2017 End: 12/31/2017 Refresh Print...

ID	Owner	Serial #	Mfg ID	Size	Spec/Svc. Press	Min. Test Pressure	Hold Time	Actual Pressure	Visual Inspection	Test Result	Disposition	Date Tested	Operator
31	Penn State	X556487	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
32	Penn State	6654845	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,020	Pass	Pass	A: Return ...	12/06/2017	TS
33	Penn State	Z4545656	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
34	Penn State	D35564445	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS
35	Penn State	P4545677	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,040	Pass	Pass	A: Return ...	12/06/2017	TS
36	Penn State	sx889797	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS
37	Penn State	TT577876	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,020	Pass	Pass	A: Return ...	12/06/2017	TS
38	Penn State	WX9984657	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Fail	D: Conde...	12/06/2017	TS
39	Penn State	PY9982635	Luxfer	6.25" x 26"	DOT3AL1800	3,000	30	3,000	Pass	Pass	A: Return ...	12/06/2017	TS

Please note: The history screen is not designed to be used as a daily print function - this should be done as discussed on the previous page from the test record entry page. The history screen does not have the capabilities of accessing the verification reports. During an audit the inspectors will most likely want to see verification reports as well as tests.

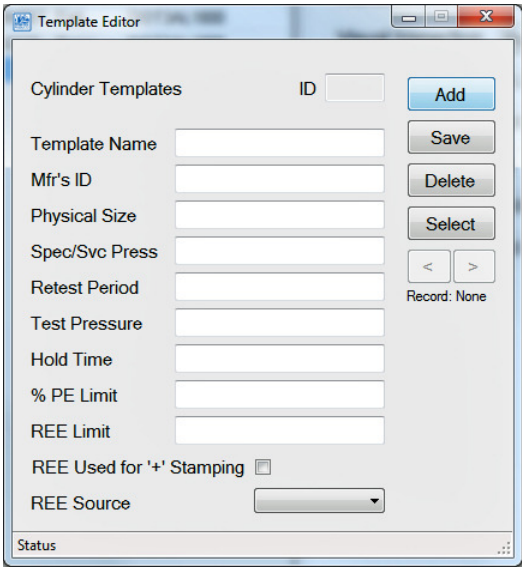
Software Operation

One of the **Advanced Options** that are included in the software is the ability to make user defined templates of popular cylinders that you company test. This is not required but may be an option that your company will decide to use if testing the same type of cylinder on a daily basis. As an example a company that has a contract to re-qualify CO2 carbonic cylinders, as 90% of these are DOT3AL-1800 cylinders of the same size, this will alleviate you from having to type in the cylinder information for each test.

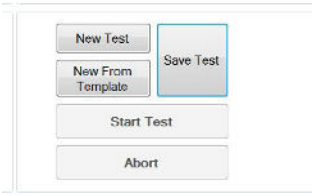


To access cylinder templates: Click on "Test" tab and select "edit templates".

The add template screen allows you to add, edit and delete templates. By clicking on the "Add" box, use the tab key to enter all of the required information.
You can name the template anything that you want. We suggest something relative to the cylinder for ease in recognizing.
As an example: Coca Cola 20LB CO2.



This screen allows you to make up a template for any type of cylinder. It includes REE limit and wether that value is to be used for star stamping.



To access the templates on the test record screen, simply select "New From Template" option rather than New Test.

Note: Many companies will most likely not utilize the Template option. In normal operation all of the information of the last cylinder tested will carryover to a New Test, excluding the serial number and test results.

There are other advance options that can be used to make the software more streamline for your company. There are also some calibration, readability and accuracy options that should not be changed unless instructed to do so by Hydro-Test Products.
These advance options are covered in our formal training classes - please see page 17 for more information on the training opportunities that we currently offer.

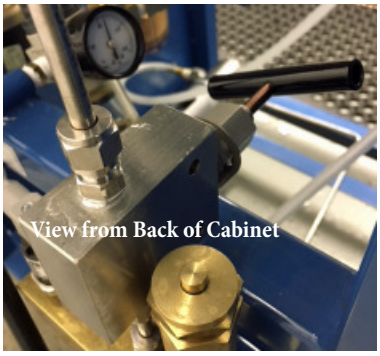
Operation in Manual Mode

The 507-series test system allows the machine to be operated in a manual mode.
Typically this is used for troubleshooting of issues. By operating in the manual mode this will isolate any possible electronic hardware or software issues.
This mode may also be used when/if testing very small sized cylinders such as "M6" size Oxygen or SCUBA "Spare Air" cylinders. By operating in the manual mode you will have more control over pump speed so that grossly overshooting of test pressure is kept to a minimum.

Step 1: Locate main isolation valve on back of test console ***(see fig 1)*** and turn off (clockwise)

Step 2: Connect cylinder to lid and load into water jacket as normal.

fig. 1



Step 3: Connect high pressure hose to dial pressure gauge and hose from dial pressure gauge to lid ***(see fig. 3)***. Lock water jacket lid clamps in place. Turn on needle valve located on left side of cabinet labeled "water to water jacket" on ***(see fig. 3a)***. Observe the beaker on the expansion scale ***(see fig. 3b)***, once water is flowing into beaker and is a minimum of 1/2" over siphon tube - shutoff the needle valve on console.

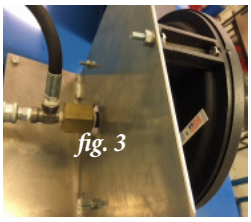


fig. 3

fig. 3a

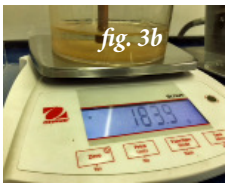


fig. 3b

Step 4: Once readings have stabilized on scale, gently press the zero button to tare out the scale reading. ***(see fig. 4)***

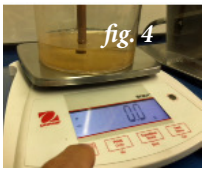


fig. 4

Step 5: Turn on needle valve located on left hand side of cabinet labeled "Water to Pump and Cylinder" ***(see fig. 5)*** and leave on. Notice that the expansion scale reading will increase. **DO NOT RE-ZERO** out the scale. This is city water pressure causing expansion. If you re-zero this will result in false lower expansion readings of the test.

fig. 5

Step 6: Slowly turn on needle valve located on left hand side of cabinet, labeled "Pump Control" ***(see fig. 6)***. Pressure will now start to be applied to the cylinder. Observe the dial pressure gauge and turn off the needle valve when test pressure is reached. Hold the pressure for required time (typically 30 seconds) and record the expansion value on the scale. This is your total expansion value ***(see fig. 6a)***.

fig. 6

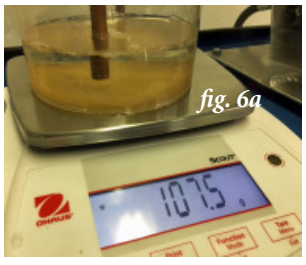


fig. 6a

Step 7: Shut off the needle valve labeled "water to pump/cylinder". Release the cylinder pressure by slowly opening high pressure bleed valve on water jacket lid ***(see fig. 7)***.
Observe expansion reading on scale - once it has stabilized record this number - this is your permanent expansion ***(see fig. 7a)***.


fig. 7

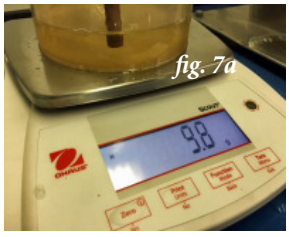
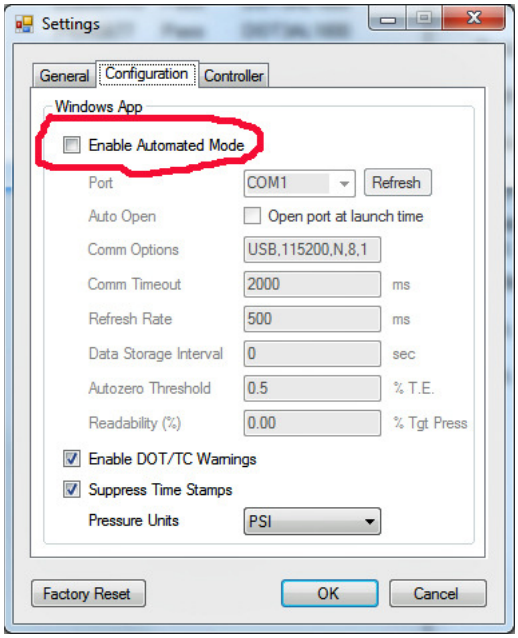


fig. 7a

Operation in Manual Mode

If the 507-series test system is being operated in the manual mode, the software can still be used as a record keeping form. This will allow the manual test records to be incorporated in the history or daily reports just like they were tested in the automated mode.

To do this the software automated mode must be turned off so that the software can be used in the standalone mode. This is done by going to the File-Options - Configuration screen and un-checking the "Enable Automated Mode" box.



In the standalone software mode - all pressures and expansion values will be required to be entered manually. The software will still calculate the test results and incorporate the DOT/TC warnings if enabled. Use the Tab key to move from each data box and remember to click on "Save Test" after entry of all fields.

Note: The manual mode can be used utilizing the above software standalone feature at any time and for whatever reason. It is recommended that the machine be used in the automated mode whenever possible. If due to troubleshooting , small cylinder testing or employees that prefer to operate manually, the records kept manually will look identical and will be able to use all of the history features. They will be integrated into the software just as a automated record would be.

Steps to recover scale communication

1. Unlock locking mechanism under scale make sure you hear it click (leave unlocked).
2. Turn on scale
3. Press and hold menu until (MENU) is displayed, Release button
4. Display will show (C.A.L.) press NO button until display shows (P.r.i.n.t)
5. Display shows (P.r.i.n.t) press YES button
6. Display will show (RESET) press NO until (A.Print) is displayed
7. Display shows (A.Print) press YES
8. Display will show (OFF) blinking press NO until (CONT) is displayed
9. Display shows (CONT) press YES
10. (Content) is displayed press NO until (E.N.D) is displayed
11. (End) is displayed press YES
12. (R.S.2.3.2) is displayed press NO until (E.N.D) is displayed
13. (E.N.D) is displayed press YES

Digital Expansion Scale Re-Calibration Procedure

The scale is calibrated prior to shipping - do not re-calibrate unless instructed to by our tech support department.

Step 1: Turn the scale off by depressing and holding the "ZERO" button ***(see fig. 1).*** Remove the plastic beaker from the scale and wipe any residue from the scale platform.

Turn scale over and slide switch to unlocked position ***(see fig. 1a).***

fig. 1


fig. 1a

Step 2: Turn the scale back on by depressing and holding the "ZERO" button. Press and hold the "MENU" button until "MENU" shows on the display ***(see fig. 2)***

Release the "MENU" button and the display will now show "CAL" ***(see fig. 2a)***

fig. 2

fig. 2a

Step 3: Press the "YES" button to accept. "SPAN" will then show on display. ***(see fig. 3)***

Press the "YES" button again to begin the calibration. ***(see fig. 3a)***

fig. 3

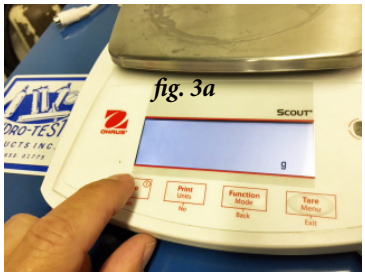


fig. 3a

Step 4: Place the supplied 2000g and additional offset weight on scale. ***(see fig. 4)*** "C" will be displayed while the reading is being stored.

The display will then show "DONE" when calibration is finished. ***(see fig. 4a)***

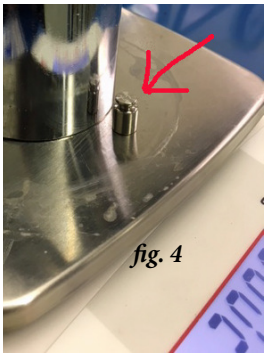


fig. 4

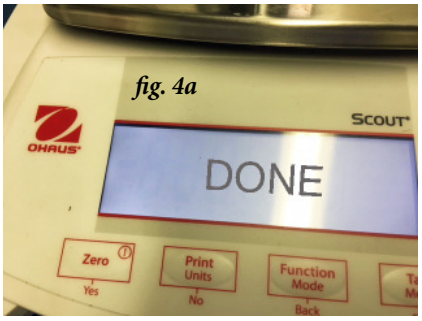


fig. 4a

Step 5: Remove weights from the scale.

Turn scale off by depressing and holding the "ZERO" button. ***(see fig. 1)***

Turn scale over and slide switch to locked position ***(see fig. 1a).***

Turn scale back on and it is now ready to use.

Notes:

1) Calibration of the scale should only be done if directed by our tech department. Do not send the scale out for periodic calibration as a calibration house will not use the additional weight to compensate for the siphon tube being used.

2) After calibration of the scale - use your calibration cylinder to verify system accuracy before proceeding to test cylinders. Verification must be in accordance with **49CFR section 180.205(g)(3)**.

3) The weights are sent with a statement of accuracy. Please keep this statement with the weights in a safe place. An inspector will want to see this accuracy statement during an inspection

Water Jacket Clamp Adjustment Procedure

There are currently 3 diiferent style of clamps being used on the 507-series test systems.

First identify your clamps as follows:

Part No. 210-040:
Used on 14" diameter water jackets

Part No. 210-043:
Used on 18" & 24" diameter water jackets

Part No. 210-115:
Optional pneumatic lid closure for all size water jackets

Adjustments

The clamps are sent on the water jackets properly adjusted. However, over time you may need to re-adjust the clamps back to factory specifications.

It is important to know that the water jacket does not see any pressure other than your incoming water pressure. All of the high pressure is being directed to the cylinder that is being tested. Therefore, there is no reason to overtighten the clamps. The manual clamps should be able to be closed with one hand.

1. Release all clamps to the open position. Back off the adjustment bolt all the way. Return clamps to closed position
2. Screw the adjustment bolt clockwise all on clamps until it touches the lid of the water jacket
3. Release all clamps to open position again
4. Further screw the adjustment bolt 2 turns on all clamps
5. Return the clamps to the closed position and they should now be able to be closed with one hand and a firm click should be heard.
6. Tighten the locking nut to avoid slippage of bolt

adjustment bolt

1. Release all clamps to the open position. Back off the adjustment bolt all the way. Return clamps to closed position
2. Screw the adjustment bolt clockwise all on clamps until it touches the lid of the water jacket
3. Release all clamps to open position again
4. Further screw the adjustment bolt1.5 turns on all clamps
5. Return the clamps to the closed position and they should now be able to be closed with one hand and a firm click should be heard.
6. Tighten the locking nut to avoid slippage of bolt

Set Up of pneumatic clamps: The body of the control valve (located on test console) has numbers stamped in it next to the hose connections.#4 goes to the bottom connection on the #1 clamp. #2 goes to the top connection on the #1 clamp. #3 and #5 are vent holes and are not to be touched. #1 is for your air supply connection.

Your air supply **must be pre-regulated** to 100 PSI before it is attached to the valve inlet.

To adjust the clamps

1. Pull the control knob out to open the clamps.
2. Loosen the lock nuts on the bolts that hold the lid down.
3. Push the control knob in so that the clamps are in the closed position. At this point you should be able to move the clamps from side to side because the hold-down bolt is not touching the lid.
4. Adjust the hold-down bolts so that they are finger tight against the lid.
5. Open the clamps.
6. Re-adjust each clamp by turning the lock nuts 1/4 turn more so that the hold-down bolts will put a slight amount of pressure on the lid. Check to see that the lock nuts are tight.
7. Close the clamps.
8. A distinctive click should be heard for all of the clamps - if not repeat above but go 1/2 turn tighter on the adjustment

Trouble Shooting

When trouble shooting the system - the calibrated cylinder should be used. Do not attempt to trouble shoot with a customers cylinder in place.

Problem	Cause	Solution
Calibrated cylinder not returning to zero	a) Leak in quick disconnect under lid b) Air temperature is rising and causing water in water jacket to expand. c) Water jacket clamps are adjusted improperly d) Valve labeled water to water jacket is leaking	a) Replace quick disconnect b) Control ambient air temperature. Load cal. cyl. into jacket overnite and attempt verification in early AM c) Readjust clamps d) Replace valve
Calibrated cylinder not registering expansion numbers with 1%	See above causes ***And:*** Pressure gauge or Transducer may require re-calibration	See above solutions Contact our Tech Support Team for further information on re-calibration procedure
Pressure is not holding and expansion scale values are dropping	a) High pressure bleed valve on water jacket is leaking b) Outlet check valve on pressure pump is failing c) Visible leak on high pressure side of system	a) Replace the valve b) Remove and clean or replace seals on check valve c) Identify item that is leaking and repair or replace
Pressure is not holding and expansion scale values are rising	a) Leak in quick disconnect under lid b) Leak between test adapter and cylinder	a) Replace quick disconnect b) Tighten adapter or replace o-ring seal
Water level in expansion device is unable to stabilize prior to testing	a) Leak on/around water jacket b) An air breeze directed at scale	a) Check / tighten for leaks or replace i)lower connections on water jacket ii) o-ring seal on lid iii) rupture port(s) b) Install scale Plexiglas shield or redirect air flow away from scale
After loading cylinder data, the "Start Test" button is greyed out	a) Software is not in enable automated mode b) A new test record database form was not started prior to entering information c) Bluetooth is not configured properly or has lost connection with the hardware	a) In Options screen enable the automated mode b) Go to file - new database and start a new database for the day c) Reconnect the bluetooth in Windows settings
Steps to recover scale communication ***see page 15***		

The above are common issues with cylinder test systems. There may be other issues / problems that are not covered in the above. Hydro-Test has a dedicated technical support staff to assist you in troubleshooting your test system.

Maintenance

Maintenance Item	Maintenance Period
Check condition of all quick connects and replace as necessary	Daily
Perform back-up of test record files	Daily
Check condition of test adapter threads	Daily
Lubricate o-ring on water jacket with o-ring lubricant	Weekly
Check oil level in pressure test pump	Monthly
Change incoming water filter cartridge	Monthly (or as needed)
Replace high pressure water jacket pressure bleed valve	Bi-yearly (or as needed)
Replace high pressure hose from console to lid	Yearly (or as needed)
Have dial gauge re-calibrated to specification of AHJ	Yearly (or as required by AHJ)
Calibrated cylinder - empty of water and inspect for excessive corrosion and thread distortion	Yearly (recommend replacing every 10 years)

Training Requirements for U.S. Department of Transportation

In the USA, any employer / employee who performs re-qualification testing on DOT specification or DOT exemption / special permit cylinders is classified as a Hazmat employee.

The employer shall ensure that each Hazmat employee is trained to be knowledgeable of applicable hazardous materials and regulations.
Effective October 1, 1995 (and within three year intervals thereafter) those who perform hydrostatic test on DOT cylinders must be fully trained, tested and certified.

Training is required covering a wide range of occupational duties, including, (but not restricted to) handling, recharging, transportation, etc... of hazardous materials. Our training relates only to the hydrostatic testing of cylinders when re qualified in accordance with 49CFR §180 Subpart C.

See §172.704 of 49CFR for complete regulation

Training may be provided by the Hazmat employer or other public or private sources.

Hazmat training shall include:

- **General awareness & familiarity training**
- **Safety Training**
- **Function specific training**
- **Security awareness training**
- **In-Depth Security awareness training (in some instances)**

Initial training is required within 90 days of an employee assuming the Hazmat task(s). During the 90 days the trainee can work under the direct supervision of a properly trained Hazmat employee.

Subsequent training must be provided at least once every three years.

Training Opportunities Offered by Hydro-Test

Hydro-Test offers 4 options for training to meet DOT requirements for cylinder re-qualifiers under §172.704 of the 49CFR:

	Includes	
	Operational	**Hazmat**
At our facility in Stow, Massachusetts	X	X
At your facility	X	X
Zoom over the internet	X	
On-line course		X
Mail out training guide		X

All of the Hydro-Test Training includes the required components for Hazmat Training for cylinder re-testers. Training at our location and your location also includes hands on operational training.

email: training@hydro-test.com for a detailed quotation for desired training option

Please visit **www.tc.gc.ca** for Transport Canada (TC) training requirements. To re qualify cylinders in Canada, or operate outside of Canada and be TC certified, an inspection of your facility is required after equipment is installed & operational and TC training has been completed.

DOT Licensing and Inspection Procedure

An Independent Inspection Agency (IIA) must visit your facility and make recommendations to the Approvals Branch for your RIN number. The inspector will review the equipment for 1% accuracy and make sure that all of the operators listed on the facility license are capable of performing the re-qualification procedure properly and that they have been trained and tested to §172.704 requirements.

Inspection Company	E-mail	Telephone	Fax
Steigerwalt Associates	ees2@ptd.net	610-437-1704	610-437-4545
Authorized Testing, Inc	f.jensen@authorizedtesting.com	951-682-4110	951-682-6090
Cylinder Services, Inc.	cylserv@msn.com	414-479-0500	414-328-0500
Arrowhead Industrial Services	rgwilson@arrowheadindustrial.com rherbert@arrowheadindustrial.com	336-578-2777 941-924-0109	336-578-2929 941-924-6626
Professional Services, Inc.	paul.medwig@psiusa.com	412-922-4000	412-922-4043
T.H. Cochrane Labratories, Ltd	john@cochranelabs.com	414-476-2500	414-464-1870

There is a cost involved with this inspection. Pricing depends on many circumstances and should be negotiated directly with the Independent Inspection Agency providing the service.

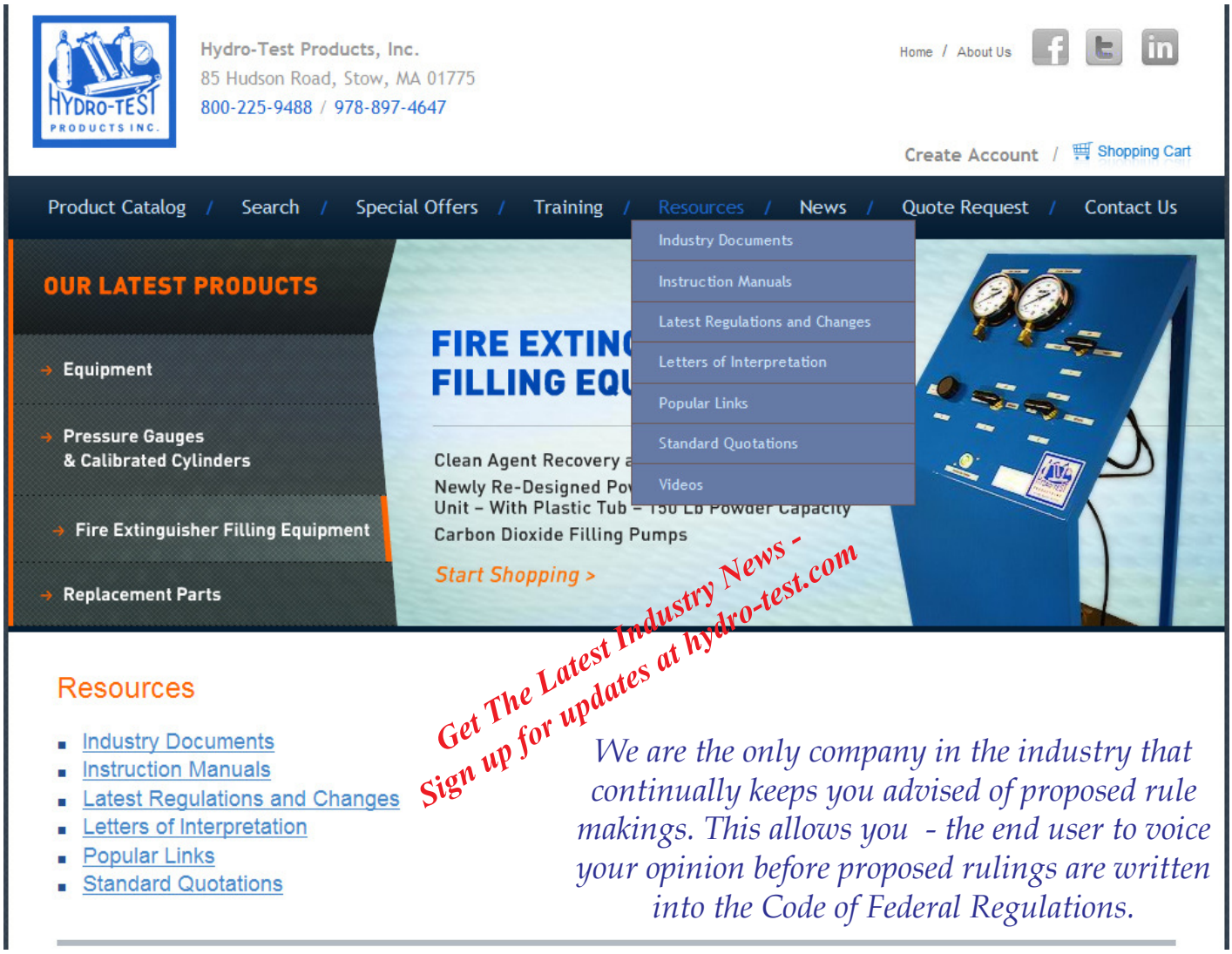
It is suggested that you contact all of the above for the best price / value for the inspection.

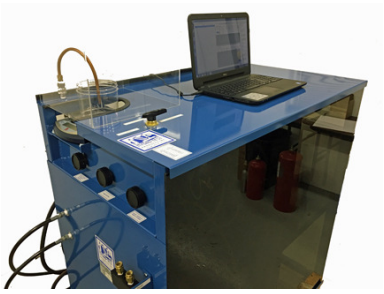
It is recommended that you secure an IIA that will assist you with any DOT questions or regulations that may occur during your 5 year license period.

What will the Independent Inspection Agency (IIA) be looking for?

- **Test machine accuracy of 1%**
- **Certificates of calibration for pressure gauge(s) and calibrated cylinder**
- **All equipment to re-qualify cylinders (dryers, test adapters, vise, visual inspection parts, etc...)**
- **Proper record keeping of verification and retest.**
- **Compliance with requirements for hazmat training**
- **Certificate of training and training material for all cylinder re-testers**
- **Understanding of the regulations of section 180**
- **Proper CGA pamphlets cited under §171.7 and current title 49 CFR**

Most IIA's will provide a check off list prior to the inspection.
If the IIA does not offer a check off list - ask for one.
You want to make sure that you are properly prepared for the inspection that you are paying for.





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HYDRO-TEST Products Inc.

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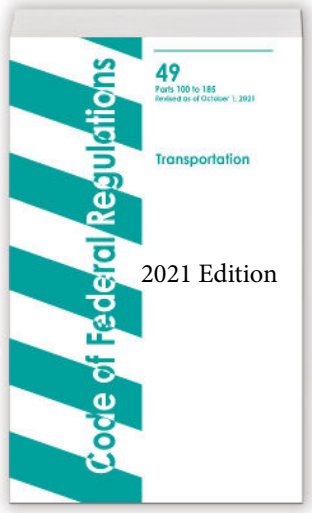
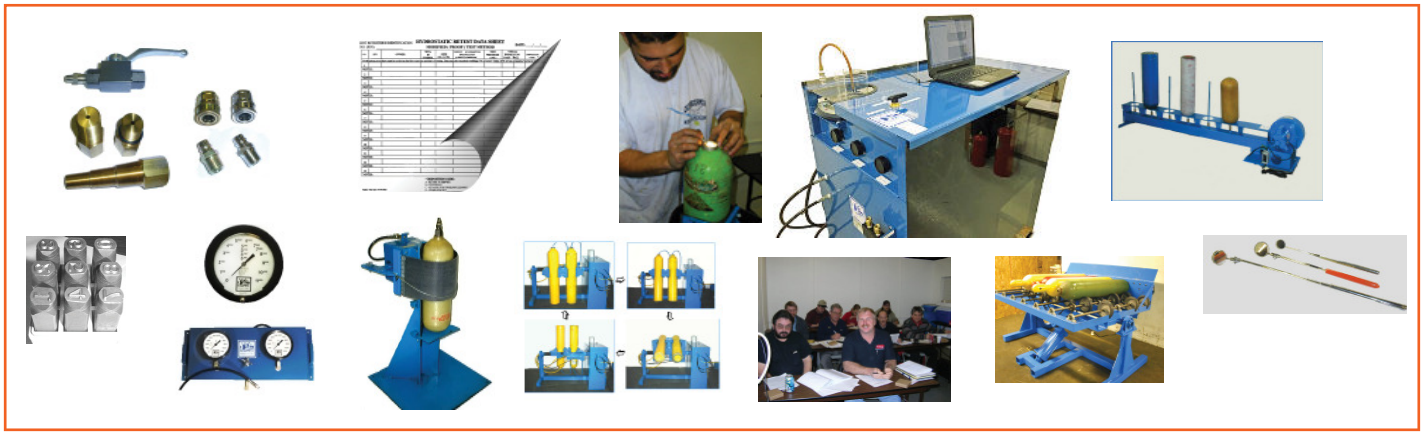
#1 SOURCE FOR ALL YOUR CYLINDER RE-QUALIFICATION NEEDS



507-Series
Automated Cylinder Volumetric Expansion Test System



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