Pre-Engineered Service Manual

FD and MD Models

Servicing of SEA-FIRE FD and MD Models

When a cylinder arrives for service immediately inspect the box for damage before signing to except delivery. Document any damage on receiving documents. We suggest wearing safety glasses and using extreme care when receiving, unpacking and inspecting a returned cylinder. Cylinders damaged during shipment may discharge at any time. Carefully open the box and save it and the packing material then inspect the cylinder for damage.

First inspect the manifold/release bracket area for any damage. Damage in this area can cause the cylinder to discharge prematurely if bumped. Be sure the safety pin is in place. If it is not and there is no damage to the release bracket and it can be inserted without force, insert the safety pin. Do not insert the pin if the release bracket is damaged and never attempt to force a safety pin in place. If the release bracket is damaged or the pin cannot be easily inserted, carefully remove damaged release brackets before further handling of the cylinder.

After the cylinder is deemed safe to handle complete the inspection of the cylinder. If damaged document the damage. Use pictures to document damage whenever possible. If the damage is determined to have occurred during shipment decide if a damage claim on the carrier will be filed. If so hold the box, packing material and cylinder until the claim is closed. If no claim is to be filed the packing materials can be discarded and the cylinder can be processed as required.

Typical damage seen on returned cylinder

Identify the cylinder type/model and determine the correct parts needed for use in:

Repair of the cylinder

Get the model number off the label, (EX. “FD400M”). If there is no label or the label is damaged and the model number cannot be read more information will be needed. Get the agent type from the main label (EX. FM200, HFC227) Weigh and record the cylinder weight. Look at the writing stamped along the top of the cylinder (TPED cylinders have markings around the cylinder just above the base) to identify the cylinder type (EX. TC-3ALM69, DOT39, 3AL1000, 4BW500) and the cylinder manufacture date (EX. 10 08 = October 2008). An alternate method of identification is to match up the dimensions of the cylinder to the cylinder data sheet . DOT39 cylinders cannot be serviced they must be replaced. 3AL1000 and 4BW500 cylinders are certifiable for 12 years.
Owners of cylinders in for service that are over 10 years old should be informed and given a choice to repair as is, hydrostatic test to extend the service life to 6 more years then repair or to purchase a replacement.

Service Parts for FD and MD Models

Manifold Glue-Up Assembly

Model	Part #
FD 150-1000	131-137
FD 1050-1500	131-138
MD 150-1000	131-156
MD 1050-1500	131-157

Identify model, disassemble cylinder, select part and cut to match length. Install and torque all models to 120 FT.LBS.

O-Rings

Model	Part#
FD 150-1000	121-224 (3), N/A
FD 1050-1500	121-224 (3), 121-221 (1)
MD 150-1000	121-224 (3), 121-221 (1)
MD 1050-1500	121-224 (3), 121-221 (1)

Use 121-221 under Relief Valve 121-224 in all other manifold ports.

Gauges

Model	Part#	PSI
FD 150-1000	121-020	360
FD 1050-1500	121-020	360
MD 150-1000	121-020	360
MD 1050-1500	121-020	360

NOTE: 3AL-1000 and 4BW500 Cylinders use 360 gauges. Old builds using 4BW360 cylinders cannot be pressurized to 360PSI and require a different 240PSI gauge that must be special ordered.

Relief Valve

Model	Part #
FD 150-1000	N/A
FD 1050-1500	122-130
MD 150-1000	122-130
MD 1050-1500	122-130

Install and torque all models to 15 FT. LBS.

Tank Valve

Model	Part#
FD 150-1000	121-016
FD 1050-1500	121-016
MD 150-1000	121-016
MD 1050-1500	121-016

Switch

Model	Part#
FD 150-1000	124-006
FD 1050-1500	124-007
MD 150-1000	124-006
MD 1050-1500	124-007

NOTE: Switches can have three different connectors: Standard, Delphi, or Deutsch. You must match the correct connector.

Release Brackets Standard Pull

Model	Part #
FD 10-1000	130-206
FD 1050-1500	130-207
MD 150-1000	130-206
MD 1050-1500	130-207

Release Brackets Reverse Pull

Model	Part #
FD 150-1000	130-208
FD 1050-1500	130-209
MD 150-1000	130-208
MD 1050-1500	130-209

Loctite All Models

Thread Locker	Part#
Loctite 554	121-195
Loctite 545	121-071

Tie All Models	Part # 121-085
Corrosion Inhibitor All Models	Part # 121-040
Agent FM-200 (HFC227) All Models	Part # 131-100

Tags

For DOT #3AL/1000 & #4BW/500

Tag	Part #
Inspection Tag	123-029
Safety Tag	123-025
Caution Tag	123-024
Pressure/Temperature	123-231

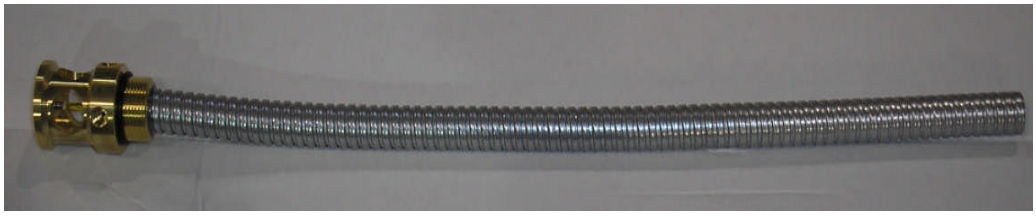
NOTE: For DOT #4BW/360 use pressure/temperature tag #123-230

Tools All Models

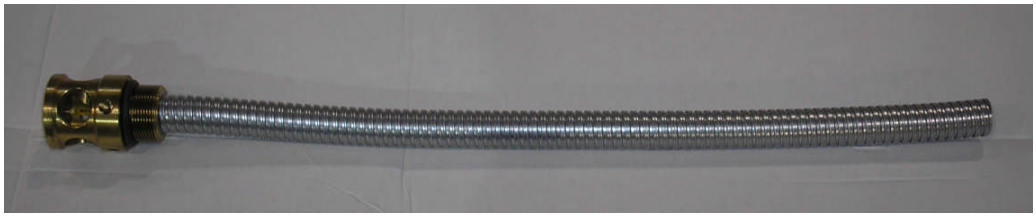
Tool	Part
Number Drive Adaptor 7/8” Manifold	128-002
Drive Adaptor ¾” Manifold	128-003
1/2” Deep socket, 1/2” Drive	N/A
Combination Wrench 7/16”	N/A
Combination Wrench 9/16”	N/A
Torque Wrench 1/2” Drive	N/A
Torque Wrench 3/8” Drive	N/A
Valve Core removal & Recovery tool	N/A
Infrared Thermometer	N/A

Manifold Glue-Up Assembly

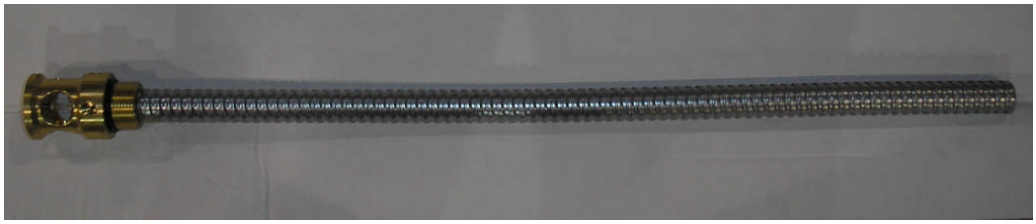
131-137



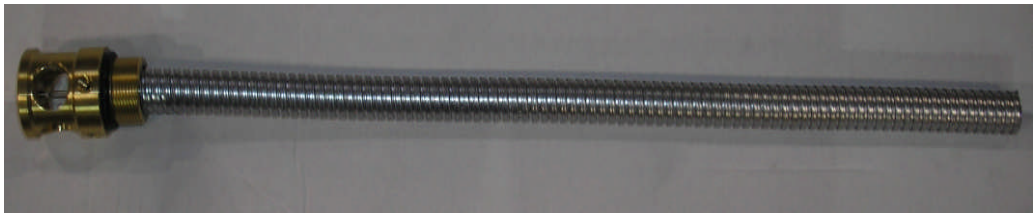
131-138



131-156



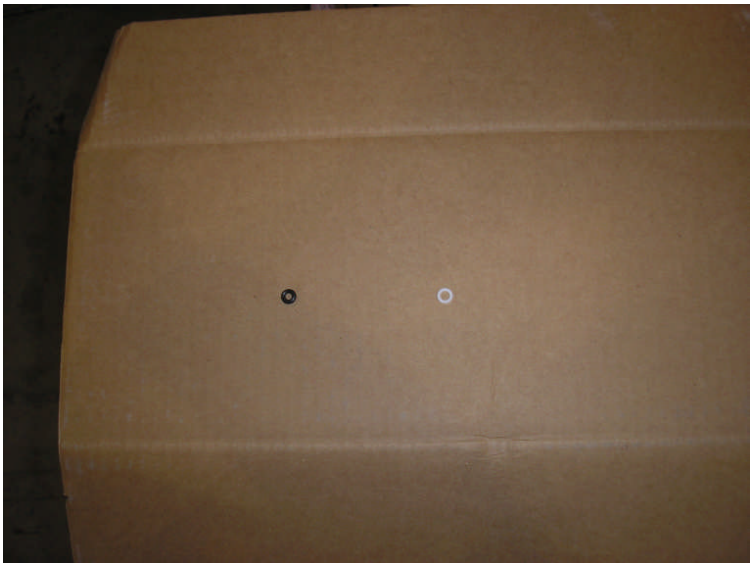
131-157



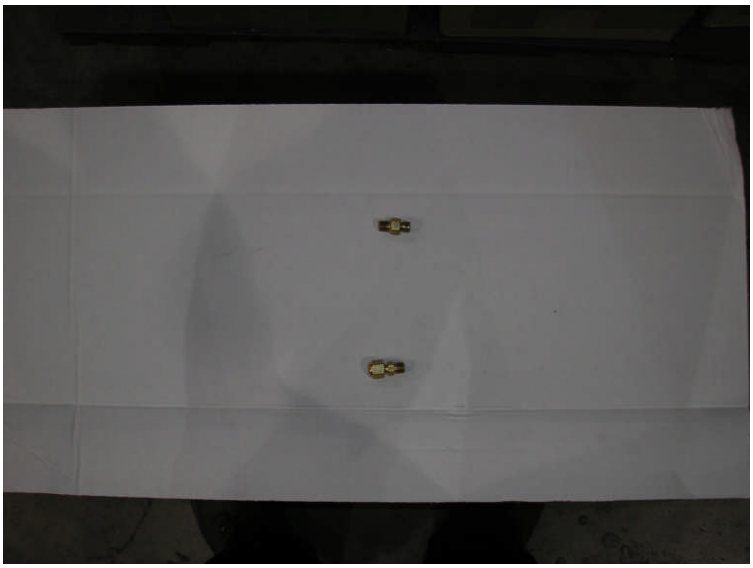
Gauge 360PSI

120-020

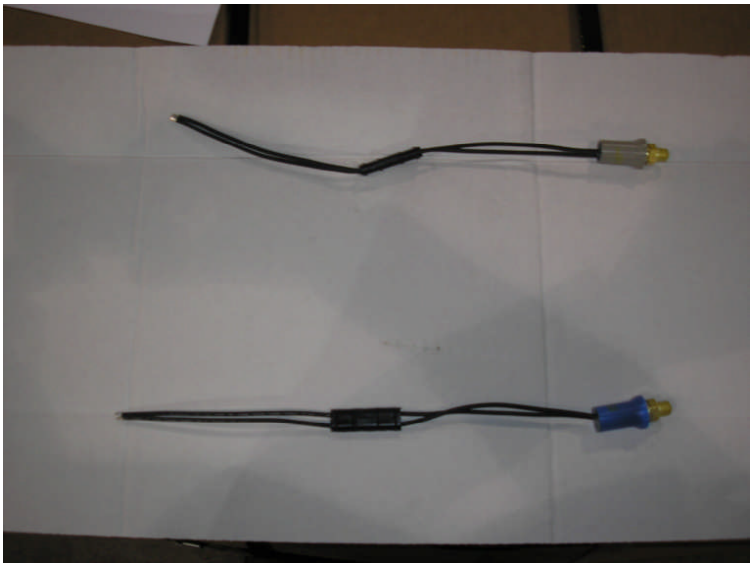
O-Rings Black 121-224 & White 121-221



Relief Valve 122-130 (Top)
Tank Valve 121-016 (Bottom)



Switch 124-006 (Grey) & 124-007 (Blue)



Release Brackets Standard Pull 130-206 (Left)
130-207 (Right)

Release Brackets Reverse Pull 130-208 (Left)
130-209 (Right)

Sea-Fire Disassembly and Rebuild Procedure

Agent Recovery and Cylinder Disassembly

1. Recover the agent from the cylinder using an approved gas recovery system.
2. Ensure the cylinder gas is expelled from the system by removing the Schrader valve cap on the rear of the system, as shown below with a 9/16 wrench, and then depress the core. A refrigerant hose with the appropriate fitting and 6" of hose works well.

Disassembly

1. Obtain an Assembly Repair Log Sheet. Record the original batch number stamped on the top of the manifold. Record the RA#, date, initials of the person performing the repair and the Model number off the label.
2. When gas is completely expelled, remove the Manifold assembly on the cylinder with the spanner wrench provided (or large pipe wrench with an extension bar if necessary), by turning it counter-clockwise. A pipe wrench will most likely gouge the manifold making it un-usable again.
3. Remove any excess material from the inner threads of the cylinder. The best method is to use either a toothbrush or a soft wire brush followed by a clean cloth.

Assembly

1. Assemble the parts to be used to make the repair. Record the part number and PO. Number of each part in each space provided.
2. Using the O-Ring lubricant provided, apply a thin coat to the O-Ring groove of the cylinder with a clean cloth or tooth brush.
3. Apply Loctite 545 to threads of the cylinder, putting the loctite bottle into the throat and rotating it. Apply a generous amount, but don't overdo it. Ensure that complete coverage – a full ring – is achieved. It is only necessary to achieve one ring (2 –3 threads, not all threads). Be aware not to get Loctite on the O-Ring groove.
4. Ensure that the manifold O-ring has some lubrication, if not apply a small amount around the whole surface.
5. Insert manifold/siphon tube assembly into the cylinder, and tighten with the manifold socket and torque wrench. Align the socket over the manifold on the FD and MD 1050 - 1500 and insert a pin through the socket and into any port in the manifold. On FD150 – 1000 models insert the pin into the unthreaded unused port. Tighten the manifold to 120 FT- Lbs.
6. Insert a black 121-224 o-ring into the ports to receive the gauge, switch and Schrader valve. Insert a white 121-221 o-ring into the port to receive the relief valve if required. Install the pressure gauge, pressure switch, shrader valve and (relief assembly - FD 1050 and larger models only). Use loctite 554 for these accessories. Do not allow the Loctite to get on the pressure gauge lens. It will crack it when it dries.
7. Let the loctite dry for 48 hours. This is a must. Our experience shows anything less will end up leaking.

Option for Auto/Manual models (Addition of manual trigger assembly)

1. Insert the lever portion of the trigger through the release bracket. Locate the bracket on top of the manifold while also aligning the trigger fingers carefully over the glass bulb. This is a down from the top and approach from the side maneuver.
2. Use two no. 10-32 screws and 10-32 stainless steel lock washers to screw down the release assembly. The lever should be somewhat loose (1/16" or less movement). This is necessary to ensure against the lever being jammed up or tight.
3. Install the safety pin through the lever and into the hole on the release assembly.
4. Install a nylon tie around the throat of the cylinder. Rotate/position the tie so that the pin holder (hole next to the clamp) is aligned for easy pin storage.

Leak Test and Pressure Switch check for All 3AL-1000 and 4BW500 cylinders.

NOTE: <u>4BW360 cylinders are pressurized to 240PSI and are not covered using this process.</u>

1. Fill unit with nitrogen to 360 p.s.i. for leak detection purposes.
2. Leak test unit with a Leak Detector or by using a bucket, tub or tote filled with water that is large enough to submerse the whole unit. Submersing the unit and check for any air bubbles that may arise. Particular attention needs to be made to each threaded mating joint, the glass bulb and piston area. It is necessary to rotate the cylinder to focus on each mating joint. Even a minor bubble is an indication of leakage. This whole process should take 5 minutes per cylinder.
3. Check the pressure switch for proper function under pressure. Connect the two leads to a voltmeter/continuity checker or other circuit tester. We have a 12V DC power supply hooked up to a piezo buzzer all in series – connecting the pressure switch makes the circuit and the buzzer sounds.

Agent Fill

1. When you are assured that the unit is leak free, release the nitrogen from the unit, and fill with the appropriate amount of FM-200 and determine the temperature of the cylinder.
2. Use the chart to determine the proper final pressure based on the cylinder temperature. Fill unit with nitrogen to that pressure. Fill to approximately 10 psi over the rated pressure to allow for absorption of the nitrogen into the agent.

3. Shake or roll the filled cylinder to agitate and mix the nitrogen into the agent. This is necessary to aid the nitrogen absorption. If not done, the cylinder pressure will drop (out of serviceable condition) within a day or two. After agitating/rolling, it will most likely be necessary to re-pressurize with nitrogen to attain the rated pressure. Repeat until the pressure is stable. Fill with nitrogen using a reliable/precise regulator and compare to a calibrated gauge and also the gauge on the cylinder as the final reference.

4. When complete, apply a small amount of Loctite 554 to the shrader valve threads and install the shrader valve cap. Tighten the cap.

Repeat the leak test procedure

1. Repeat the underwater portion of the leak test. We have seen shrader valves leak after being filled where they did not leak initially.

Corrosion Inhibitor

1. Apply a light coat of "wax" (CRC SP-400) to the entire manifold assembly. This is done by using a 1" paint brush or by setting up a dip tank and dipping the entire head assembly. The dip tank would need to be at least 6" deep and approximately 10" wide. We use the bottom portion of a 5 gallon pail, cut off. For low volume, the brushing is probably best.
2. Allow the wax to dry for 45 minutes or longer, until it is dry to the touch. A fan set up to blow across the surface helps shorten the dry time.

Final Documentation

1. When unit is filled and charged and waxed, record the weight. This will be different for each cylinder depending on weld of the cylinder and the precision/ repeatability of the filling process. Label the cylinder properly. Send a copy of the completed Assembly Repair Log Sheet (FAX or Email) to SEA-FIRE Quality Dept.

METALCRAFT / SEAFIRE AUTOMATICS

DESCRIPTION: <u>ASSEMBLY REPAIR LOG</u>

TABLE 1

RECORD OF TRACEABILITY AND INSPECTION								
ORIG BATCH#								
BATCH/RA#								
NEW ID Number								
DATE								
QTY								
OPER.								
Model								
Description	PO# BATCH#	PO# BATCH#	PO# BATCH#	PO# BATCH#	PO# BATCH#	PO# BATCH#	PO# BATCH#	PO# BATCH#
MANIFOLD Glue-Up Assy Part #	B-	B-	B-	B-	B-	B-	B-	B-
O-ring Part #								
INSPECT	TORQUE LBS	TORQUE LBS	TORQUE LBS	TORQUE LBS	TORQUE LBS	TORQUE LBS	TORQUE LBS	TORQUE LBS
GAUGE Part #								
SHRADER Part #								
SWITCH Part #								
RELIEF VALVE Part #								
RELEASE Part#								
TIE Part #								
OPERATOR								
DATE COMP.								
LOCTITE CURE DATE								
FILLER INITIALS								
LEAK TESTER								
Final Inspect STAMP								
QTY ACC.								

Instructions for Using the Fill Station

Agent Fill

1. Preparation
    a. Connect the yellow 3/8" agent supply hose from the tank liquid port to the inlet side of the Haskell pump. Open the liquid port valve on the tank and any additional valves in the hose setup.
    b. Connect a compressed air supply to the air inlet on the Filter/Regulator/Lubricator.
    c. Connect the nitrogen supply from the nitrogen supply cylinder to the nitrogen inlet valve on the fill station manifold. Set the nitrogen regulator to the desired pressure of the cylinder you are going to fill.
    d. Check the scale for being level. Turn it on and ensure its accuracy.
    e. Ensure the Fill Manifold – Nitrogen inlet valve is closed.
    f. Ensure the Fill Manifold - Cylinder fill valve is closed. Connect a red (1/4") fill hose.
    g. Open the Fill manifold – Agent inlet valve.

2. Fill Operation
    a. Agent
        i. Turn on the air supply to the fill station. The pump should cycle a few times and then stop.
        ii. Place the empty cylinder on the scale. Record the tare weight of the cylinder assembly.
        iii. Connect the agent fill hose (Red ¼") to the cylinder tank valve.
        iv. Determine the desired fill weight from the Fill chart. Depending on the length of the red fill hose, you will have to deduct 0.15 to 0.25 lbs from the desired weight. This is to account for the agent that remains in the hose before the nitrogen is put into the cylinder.
        v. Open the Fill Manifold - Cylinder fill valve (ball valve or needle valve). Agent should begin entering the cylinder and the pump should start cycling.
        vi. Carefully watch the scale and close the valve when you have reached the desired weight.
        vii. Close the Fill Manifold – Agent Inlet valve
    b. Nitrogen Charge
        i. Open the Fill manifold - nitrogen inlet valve.
        ii. Open the Fill Manifold - Cylinder fill valve. Watch the fill manifold gauge (Calibrated) as well as the gauge on the cylinder. The pressure should stabilize on the previously set pressure.

iii. Close the Fill Manifold - Cylinder fill valve. Shake, agitate or otherwise move the filled cylinder to mix the nitrogen with the agent.

1. This is necessary to aid the nitrogen absorption. If not done, the cylinder pressure will drop (out of serviceable condition) within a day or two. After agitating/rolling, it will most likely be necessary to re-pressurize with nitrogen to attain the rated pressure.

2. Fill to approximately 10 psi over the rated pressure to allow for absorption of the nitrogen into the agent.

c. After a potential few cycles of adding nitrogen, closing the nitrogen supply and shaking/ checking the pressure, close all valves and remove the fill hose.

d. When complete, apply a small amount of Loc-Tite 277 to the tank valve threads and install the tank valve cap. Tighten the cap. DO NOT over tighten the cap to where the tank valve body moves in the manifold. If necessary, use a wrench on the tank valve to hold it in place when tightening the cap.

Recycling/ Recovering Agent

1. Disconnect the yellow 3/8" Feed hose from the inlet side of the pressure gauge assembly.

2. Connect the free end of the hose to the tank where you want the recovered agent to go. This could be the vapor side of the main source tank you are using to fill out of, or another suitably rated pressure tank.

Note: when you recover FM-200 from a filled extinguisher, you will also get nitrogen. This nitrogen will eventually need to be bled off or otherwise removed. That is why we recommend a separate holding tank to recover the FM-200 into. After the nitrogen is removed, you can then fill out of this tank.

Another point is, if your main source tank is full, or near full, you will not be able to pump any recovered FM-200/ nitrogen into it. The same applies to your holding tank, if it's full; you need to pump out of it before recovering any more.

3. Ensure that the liquid/ supply valve is closed on the main supply tank.

Note: You do not need to remove the 3/8" hose that is connected from the tank to the pump as long as the valve is closed.

4. Remove the ¼" fill hose from the gauge assembly completely, or use another of the same style hose.
5. Remove the cap off the shrader valve on the ball valve, on the inlet side of the pump.

6. Connect one end of the ¼" hose to this shrader valve, the other end to the bottle that needs to be emptied.

<u>Bottle Preparation – cylinder to be emptied</u>

7. Remove the cap off the shrader valve.

   Option: Turn the shrader core ¼ to ½ turn counter clockwise. This will help the agent flow out of the bottle faster. Do not remove it too far or the agent will expel from the valve.
8. Lay the bottle horizontal.
9. Connect the ¼" hose from the pump to the cylinder (repeat of step 6)

10. Turn on the compressed air supply to the pump and drain until the gauge reads no pressure and the cylinder feels empty.

    Note: Rock the cylinder slowly until it feels like no liquid remains. The bottle should be empty.

FILL CHART - FD & MD Manual and Automatics - FM 200

MODEL FD/MD	AGENT WEIGHT (LBS.)	CHARGE PRESSURE (P.S.I.G.)@ 70F	AGENT WEIGHT (KGS.)	CHARGE PRESSURE (BAR) @ 21C
150	6.50	360	2.95	24.8
175	7.58	360	3.44	24.8
200	8.66	360	3.94	24.8
225	9.74	360	4.43	24.8
250	10.83	360	4.92	24.8
275	11.91	360	5.41	24.8
300	12.99	360	5.90	24.8
325	14.07	360	6.40	24.8
350	15.16	360	6.89	24.8
375	16.24	360	7.38	24.8
400	17.32	360	7.87	24.8
425	18.40	360	8.36	24.8
450	19.49	360	8.86	24.8
475	20.57	360	9.35	24.8
500	21.65	360	9.84	24.8
525	22.73	360	10.33	24.8
550	23.82	360	10.83	24.8
575	24.90	360	11.32	24.8
600	25.98	360	11.81	24.8
625	27.06	360	12.30	24.8
650	28.15	360	12.79	24.8
675	29.23	360	13.29	24.8
700	30.31	360	13.78	24.8
725	31.39	360	14.27	24.8

FILL CHART - FD & MD Manual and Automatics - FM 200

MODEL FD/MD	AGENT WEIGHT (LBS.)	CHARGE PRESSURE (P.S.I.G.)@ 70F	AGENT WEIGHT (KGS.)	CHARGE PRESSURE (BAR) @ 21C
750	32.48	360	14.76	24.8
775	33.56	360	15.25	24.8
800	34.64	360	15.75	24.8
825	35.72	360	16.24	24.8
850	36.81	360	16.73	24.8
875	37.89	360	17.22	24.8
900	38.97	360	17.71	24.8
925	40.05	360	18.21	24.8
950	41.14	360	18.70	24.8
975	42.22	360	19.19	24.8
1000	43.30	360	19.68	24.8
1025	44.38	360	20.17	24.8
1050	45.47	360	20.67	24.8
1075	46.55	360	21.16	24.8
1100	47.63	360	21.65	24.8
1125	48.71	360	22.14	24.8
1150	49.80	360	22.63	24.8
1175	50.88	360	23.13	24.8
1200	51.96	360	23.62	24.8
1225	53.04	360	24.11	24.8
1250	54.13	360	24.60	24.8
1275	55.21	360	25.09	24.8
1300	56.29	360	25.59	24.8
1325	57.37	360	26.08	24.8

FILL CHART - FD & MD Manual and Automatics - FM 200

MODEL FD/MD	AGENT WEIGHT (LBS.)	CHARGE PRESSURE (P.S.I.G.)@ 70F	AGENT WEIGHT (KGS.)	CHARGE PRESSURE (BAR) @ 21C
1350	58.46	360	26.57	24.8
1375	59.54	360	27.06	24.8
1400	60.62	360	27.55	24.8
1425	61.70	360	28.05	24.8
1450	62.79	360	28.54	24.8
1475	63.87	360	29.03	24.8
1500	64.95	360	29.52	24.8

FM-200 (HFC 227ea) Pressure/Temperature Chart

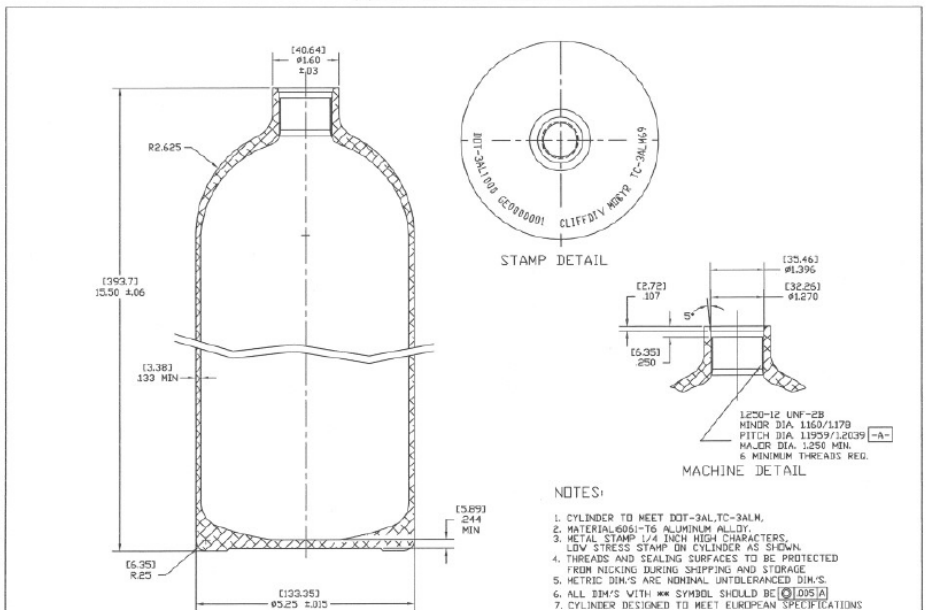
Temp	360 Psi @ 70 F(21C)
40	320
41	321
42	322
43	324
44	325
45	326
46	327
47	329
48	330
49	331
50	333
51	334
52	335
53	337
54	338
55	339
56	340
57	342
58	343
59	345
60	346
61	347
62	349
63	350
64	352
65	353
66	354
67	356
68	357
69	359
70	360
71	362
72	363
73	365
74	366
75	368

FM-200 (HFC 227ea) Pressure/Temperature Chart

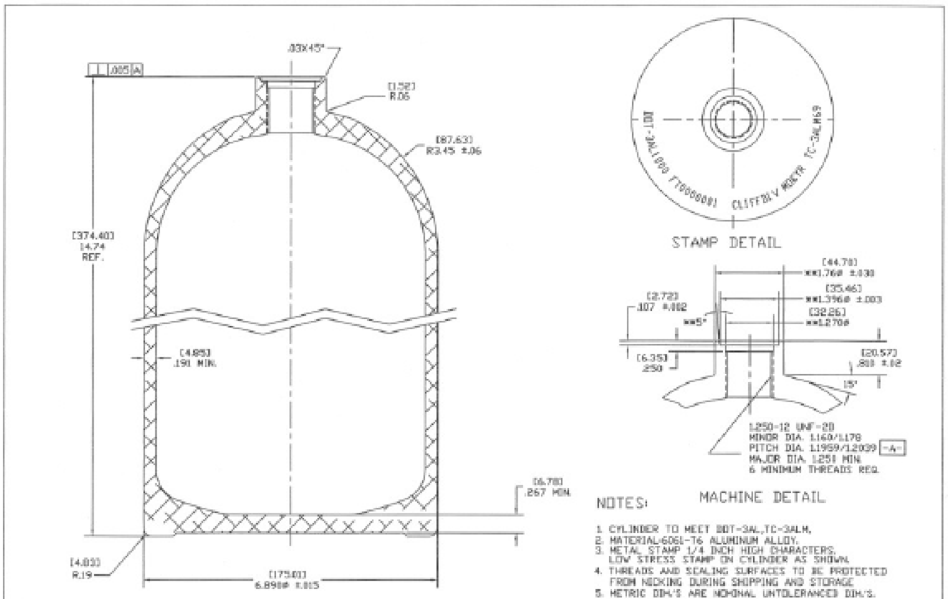
Temp	360 Psi @ 70 F(21C)
76	369
77	371
78	372
79	374
80	375
81	377
82	378
83	380
84	381
85	383
86	385
87	386
88	388
89	389
90	391
91	393
92	394
93	396
94	397
95	399

Cylinder Data Sheets

1125-073 Rev. A



125-074 Rev. A



NOTES:

1. CYLINDER TO MEET DOT-3AL,TC-3ALM.
2. MATERIAL:6061-T6 ALUMINUM ALLOY.
3. METAL STAMP 1/4 INCH HIGH CHARACTERS. LOW STRESS STAMP ON CYLINDER AS SHOWN.
4. THREADS AND SEALING SURFACES TO BE PROTECTED FROM NICKING DURING SHIPPING AND STORAGE
5. METRIC DIM'S ARE NOMINAL UNTOLERANCED DIM'S.
6. ALL DIM'S WITH ** SYMBOL SHOULD BE ◎ .005 A
7. CYLINDER DESIGNED TO MEET EUROPEAN SPECIFICATIONS EUROPEAN MARKING TO BE AVAILABLE UPON CYLINDER QUALIFICATION

MINIMUM WATER VOLUME		
CU. IN. / LBS. / LITERS		
380 / 13.73 / 6.23		
T.C TEST PRESSURE	SERVICE PRESSURE	DOT TEST PRESSURE
1500 PSI	1000 PSI	1667 PSI
103 BAR	69 BAR	115 BAR

REV	ECN#	BY	DATE
D	2304	JJS	3/1/14
C	2296	JJS	2/17/04
B	2232	BRH	[illegible]

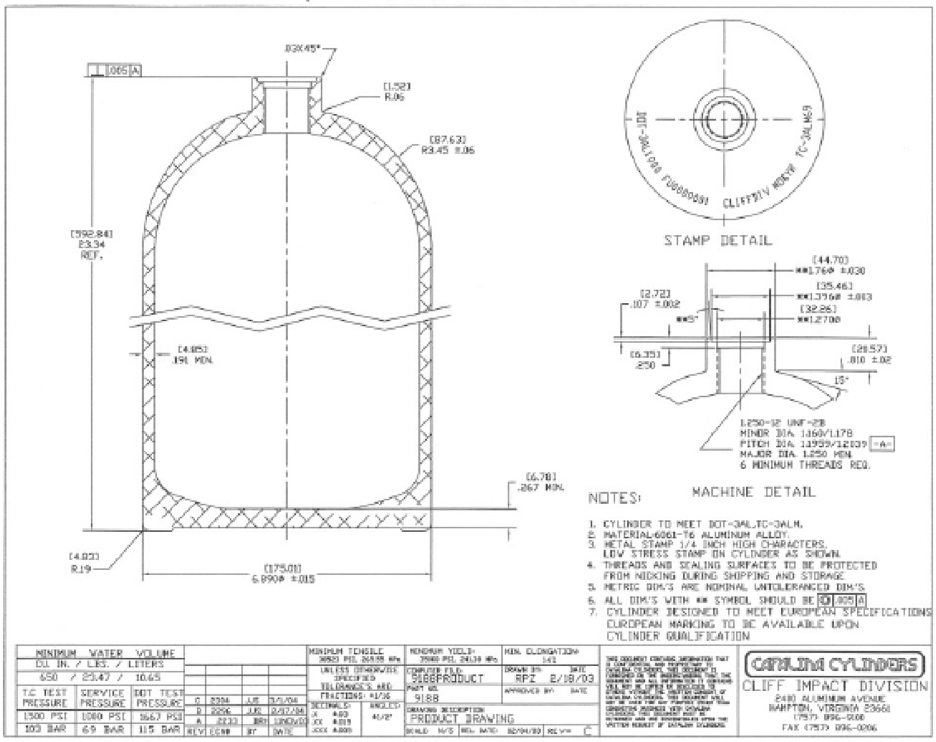
MINIMUM TENSILE: 38000 PSI, 262000 KPa
MINIMUM YIELD: 35000 PSI, 241300 KPa
MIN. ELONGATION: 14%

UNLESS OTHERWISE SPECIFIED TOLERANCES ARE: FRACTIONS ±1/16; DECIMALS .X ±.03, .XX ±.015, .XXX ±.005; ANGLES ±1/2°

COMPUTER FILE: 9187PRODUCT
PART NO. 9187
DRAWN BY: RPZ DATE: 2/18/03
APPROVED BY: DATE:
DRAWING DESCRIPTION: PRODUCT DRAWING
SCALE: N/S REL. DATE: [illegible] REV: D

CATALINA CYLINDERS
CLIFF IMPACT DIVISION
2400 ALUMINUM AVENUE
HAMPTON, VIRGINIA 23661
(757) 896-9100
FAX (757) 896-0206

125-075 Rev. A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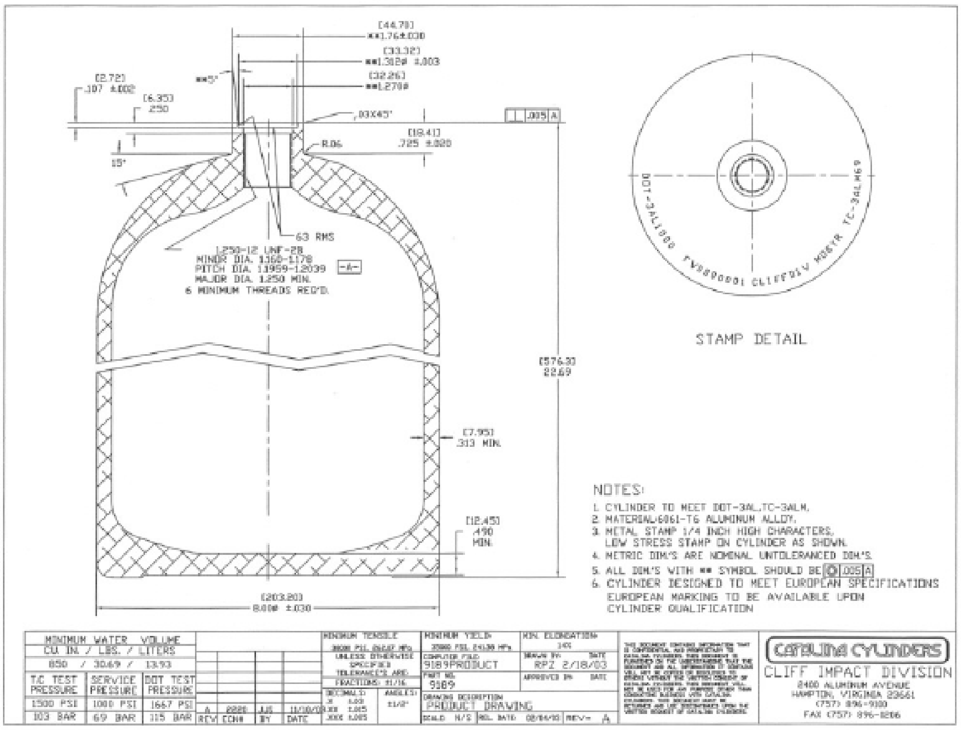
.005 A
[1.52]
R.06
[87.63]
R3.45 ±.06
[592.84]
23.34
REF.
[4.85]
.191 MIN.
[6.78]
.267 MIN.
[4.83]
R.19
[175.01]
6.890Ø ±.015
STAMP DETAIL
[44.70]
**1.760 ±.030
[35.46]
**1.396Ø ±.013
[2.72]
.107 ±.002
[32.26]
**1.2700
**5°
[6.35]
.250
[20.57]
.810 ±.02
15°
1.250-12 UNF-2B
MINOR DIA. 1.160/1.178
PITCH DIA. 1.1959/1.2039 -A-
MAJOR DIA. 1.250 MIN.
6 MINIMUM THREADS REQ.
MACHINE DETAIL
NOTES:
1. CYLINDER TO MEET DOT-3AL,TC-3ALM.
2. MATERIAL-6061-T6 ALUMINUM ALLOY.
3. METAL STAMP 1/4 INCH HIGH CHARACTERS. LOW STRESS STAMP ON CYLINDER AS SHOWN.
4. THREADS AND SEALING SURFACES TO BE PROTECTED FROM NICKING DURING SHIPPING AND STORAGE
5. METRIC DIM'S ARE NOMINAL UNTOLERANCED DIM'S.
6. ALL DIM'S WITH ** SYMBOL SHOULD BE .005 A
7. CYLINDER DESIGNED TO MEET EUROPEAN SPECIFICATIONS EUROPEAN MARKING TO BE AVAILABLE UPON CYLINDER QUALIFICATION
MINIMUM WATER VOLUME
CU. IN. / LBS. / LITERS
650 / 23.47 / 10.65
T.C TEST PRESSURE 1500 PSI 103 BAR
SERVICE PRESSURE 1000 PSI 69 BAR
DOT TEST PRESSURE 1667 PSI 115 BAR
REV ECN# BY DATE
C 2304 JJE 3/1/04
B 2296 JJE 2/17/04
A 2233 BRH 11/NOV/03
MINIMUM TENSILE
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE FRACTIONS: ±1/16
DECIMALS:
ANGLES:
MINIMUM YIELD:
MIN. ELONGATION:
COMPUTER FILE: 9188PRODUCT
DRAWN BY: RPZ DATE 2/18/03
APPROVED BY: DATE
PART NO. 9188
DRAWING DESCRIPTION PRODUCT DRAWING
SCALE N/S
REV** C
CATALINA CYLINDERS
CLIFF IMPACT DIVISION
2400 ALUMINUM AVENUE
HAMPTON, VIRGINIA 23661
(757) 896-9100
FAX (757) 896-0206

125-076 Rev. A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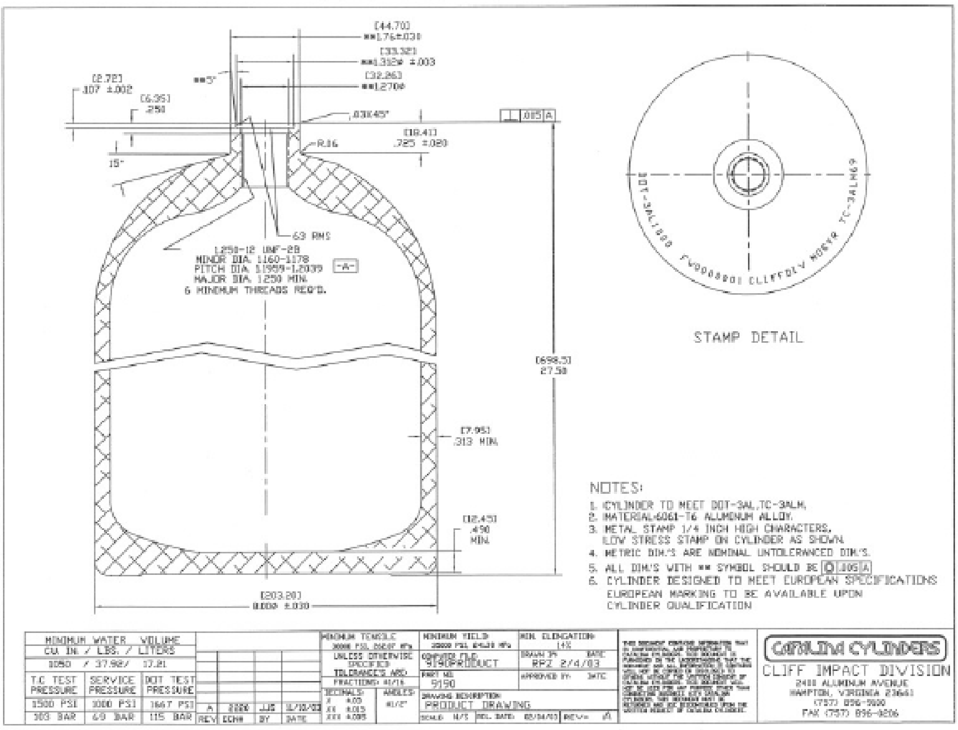
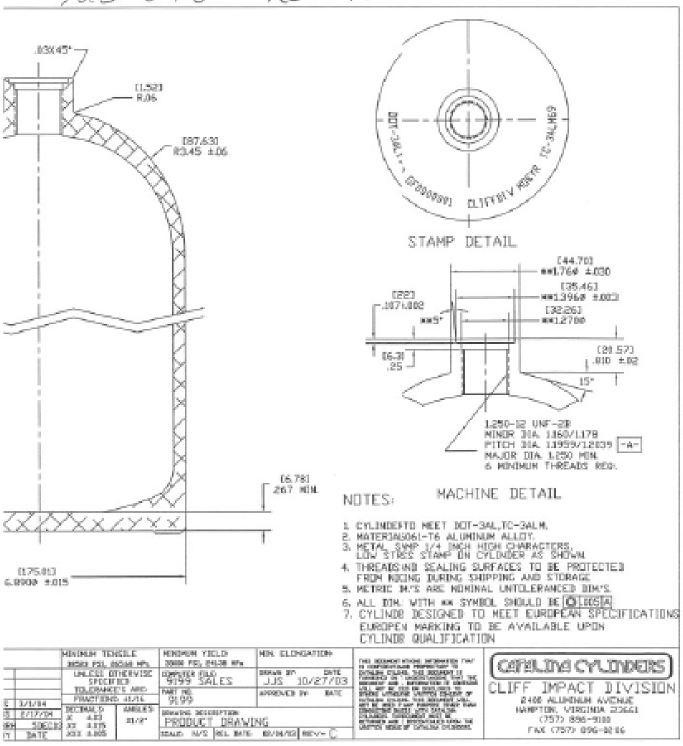
**1.76±.030
[33.32]
**1.312# ±.003
[32.26]
**1.270#
**5°
[2.72]
.107 ±.002
[6.35]
.250
.03X45°
.005 A
[18.41]
.725 ±.020
R.06
15°
63 RMS
1.250-12 UNF-2B
MINOR DIA. 1.160-1.178
PITCH DIA. 1.1959-1.2039
MAJOR DIA. 1.250 MIN.
6 MINIMUM THREADS REQ'D.
-A-
[576.30]
22.69
[7.95]
.313 MIN.
[12.45]
.490
MIN.
[203.20]
8.00# ±.030
DOT-3AL1000 FV9000001 CLIFFDIV MO6YR TC-3ALM69
STAMP DETAIL
NOTES:
1. CYLINDER TO MEET DOT-3AL,TC-3ALM.
2. MATERIAL:6061-T6 ALUMINUM ALLOY.
3. METAL STAMP 1/4 INCH HIGH CHARACTERS.
LOW STRESS STAMP ON CYLINDER AS SHOWN.
4. METRIC DIM'S ARE NOMINAL UNTOLERANCED DIM'S.
5. ALL DIM'S WITH ** SYMBOL SHOULD BE .005 A
6. CYLINDER DESIGNED TO MEET EUROPEAN SPECIFICATIONS
EUROPEAN MARKING TO BE AVAILABLE UPON
CYLINDER QUALIFICATION
MINIMUM WATER VOLUME
CU. IN. / LBS. / LITERS
850 / 30.69 / 13.93
T.C TEST PRESSURE
SERVICE PRESSURE
DOT TEST PRESSURE
1500 PSI
1000 PSI
1667 PSI
103 BAR
69 BAR
115 BAR
A
REV
ECN#
BY
DATE
MINIMUM TENSILE
UNLESS OTHERWISE SPECIFIED TOLERANCES ARE:
FRACTIONS: ±1/16
DECIMALS:
ANGLES:
±1/2°
MINIMUM YIELD:
COMPUTER FILE:
9189PRODUCT
PART NO.
9189
DRAWING DESCRIPTION
PRODUCT DRAWING
SCALE N/S
REV: A
MIN. ELONGATION:
14%
DRAWN BY:
DATE
RPZ 2/18/03
APPROVED BY:
DATE
CATALINA CYLINDERS
CLIFF IMPACT DIVISION
2400 ALUMINUM AVENUE
HAMPTON, VIRGINIA 23661
(757) 896-9100
FAX (757) 896-8206

125-077 Rev. A


[44.70]
**1.76±.030
[33.32]
**1.312ø ±.003
[32.26]
**1.270ø
[2.72]
.107 ±.002
[6.35]
.250
**5°
.03X45°
.005 A
[18.41]
.725 ±.020
R.16
15°
63 RMS
1.250-12 UNF-2B
MINOR DIA. 1.160-1.178
PITCH DIA. 1.1959-1.2039
MAJOR DIA. 1.250 MIN.
6 MINIMUM THREADS REQ'D.
-A-
[698.5]
27.50
[7.95]
.313 MIN.
[12.45]
.490
MIN.
[203.20]
8.00ø ±.030
STAMP DETAIL
NOTES:
1. CYLINDER TO MEET DOT-3AL,TC-3ALM.
2. MATERIAL:6061-T6 ALUMINUM ALLOY.
3. METAL STAMP 1/4 INCH HIGH CHARACTERS.
LOW STRESS STAMP ON CYLINDER AS SHOWN.
4. METRIC DIM.'S ARE NOMINAL UNTOLERANCED DIM.'S.
5. ALL DIM.'S WITH ** SYMBOL SHOULD BE .005 A
6. CYLINDER DESIGNED TO MEET EUROPEAN SPECIFICATIONS
EUROPEAN MARKING TO BE AVAILABLE UPON
CYLINDER QUALIFICATION
MINIMUM WATER VOLUME
CU. IN. / LBS. / LITERS
1050 / 37.92/ 17.21
T.C TEST PRESSURE
SERVICE PRESSURE
DOT TEST PRESSURE
1500 PSI
1000 PSI
1667 PSI
103 BAR
69 BAR
115 BAR
A
REV
ECN#
BY
DATE
MINIMUM TENSILE
UNLESS OTHERWISE SPECIFIED
TOLERANCE'S ARE:
FRACTIONS: ±1/16
DECIMALS:
ANGLES:
±1/2°
MINIMUM YIELD:
MIN. ELONGATION:
14%
COMPUTER FILE:
9190PRODUCT
DRAWN BY:
DATE
RPZ 2/4/03
APPROVED BY:
DATE
PART NO.
9190
DRAWING DESCRIPTION:
PRODUCT DRAWING
SCALE: N/S
REV.:
A
CATALINA CYLINDERS
CLIFF IMPACT DIVISION
2400 ALUMINUM AVENUE
HAMPTON, VIRGINIA 23661
(757) 896-9100
FAX (757) 896-9206

125-078 Rev. A

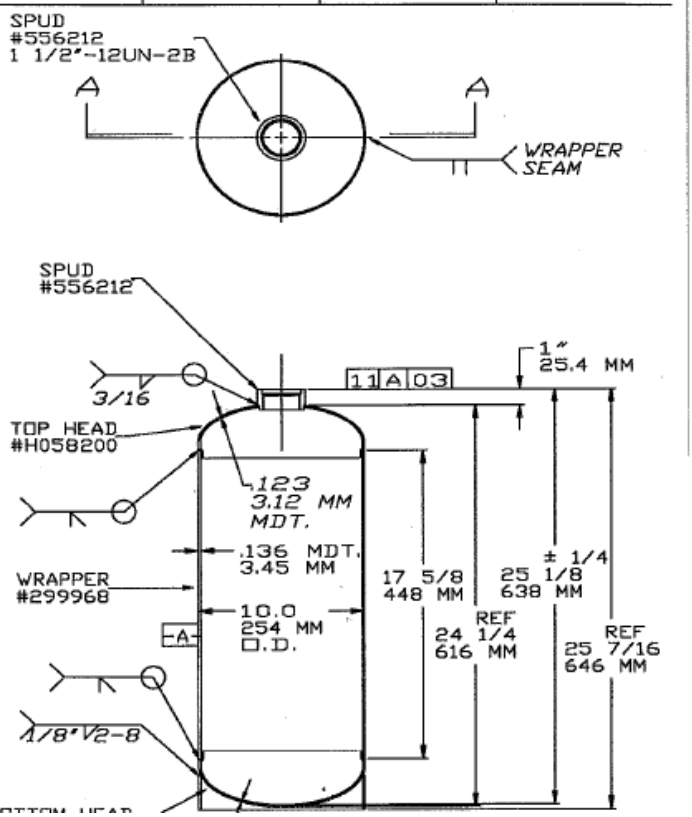

.03X45°
[1.52]
R.06
[87.63]
R3.45 ±.06
[6.78]
.267 MIN.
[175.01]
6.8900 ±.015
STAMP DETAIL
DOT-3AL
CLIFF DIV HGV
TC-3ALM
[44.70]
**1.760 ±.030
[35.46]
**1.3960 ±.003
[32.26]
**1.2700
[22]
.087±.002
**5°
[6.3]
.25
[21.57]
.810 ±.02
15°
1.250-12 UNF-2B
MINOR DIA. 1.160/1.178
PITCH DIA. 1.1959/1.2039
-A-
MAJOR DIA. 1.250 MIN.
6 MINIMUM THREADS REQ.
MACHINE DETAIL
NOTES:
1. CYLINDERTO MEET DOT-3AL,TC-3ALM.
2. MATERIAL6061-T6 ALUMINUM ALLOY.
3. METAL SWMP 1/4 INCH HIGH CHARACTERS,
LOW STRSS STAMP ON CYLINDER AS SHOWN.
4. THREADS AND SEALING SURFACES TO BE PROTECTED
FROM NICING DURING SHIPPING AND STORAGE.
5. METRIC DI.'S ARE NOMINAL UNTOLERANCED DIM'S.
6. ALL DIM. WITH ** SYMBOL SHOULD BE .005 A
7. CYLINDR DESIGNED TO MEET EUROPEAN SPECIFICATIONS
EUROPEN MARKING TO BE AVAILABLE UPON
CYLINDR QUALIFICATION
MINIMUM TENSILE
MINIMUM YIELD
MIN. ELONGATION
UNLESS OTHERWISE SPECIFIED TOLERANCE'S ARE
FRACTIONS ±1/16
DECIMALS
ANGLES
±1/2°
COMPUTER FILE
9199 SALES
DRAWN BY
DATE
JJS
10/27/03
PART NO.
9199
APPROVED BY
DATE
DRAWING DESCRIPTION
PRODUCT DRAWING
SCALE: N/S
REV- C
DATE
CATALINA CYLINDERS
CLIFF IMPACT DIVISION
2400 ALUMINUM AVENUE
HAMPTON, VIRGINIA 23661
(757) 896-9100
FAX (757) 896-9206

125-037

To: Ken w/ Metalcraft From: Aaron Sievers 4-15-03 9:39am p. 2 of 2

REVS	Ⓐ	Ⓑ	Ⓒ	Ⓓ	Ⓔ	Ⓕ

NOTES:
1) ALL DIMENSIONS IN INCHES AND MM.
2) CYLINDER MANUFACTURED IN ACCORDANCE WITH CAN/CSA B339 AND CFR PART 178.61
3) CYLINDER HEAT TREATED AFTER ALL WELDING OPERATIONS.
4) MATERIAL, HRP HSLA.
5) MIN THICKNESS BASED ON JOINT EFF. .9 SPOT X-RAY.
6) INSIDE OF CYLINDER MUST BE CLEAN, DRY, AND FREE OF SCALE, SLAG, OIL, AND ALL OTHER CONTAMINATES.
7) POWDER COAT - PER ORDER.
8) CYLINDER TO BE FM APPROVED.



SPECIFICATION
DOT-4BW500
TC-4BWM34

WORKING PRESS: 500 PSI 34 BAR