Fire Test Report

API Standard 6FA, Third Edition, April 1999
"Specification for Fire Testing of Valves"

Performed for

Total Valve Systems

www.totalvalve.com

Model 2400 8" 300#
In-Tank Excess Flow Valve
Product Code: 2400

Project Number: 213295
Test Date: December 10, 2013

Performed by

YARMOUTH RESEARCH AND TECHNOLOGY, LLC

434 Walnut Hill Road
North Yarmouth, ME 04097 USA
(207) 829-5359
info@yarmouthresearch.com
www.yarmouthresearch.com

Yarmouth Research and Technology, LLC

Customer:	Total Valve Systems	**Date:**	12/10/2013
Specification:	API Standard 6FA, Third Edition, April 1999 (R2008)		
Product Description:	Model 2400 8" 300# In-Tank Excess Flow Valve		
Project Number:	PN213295		
Product Code:	2400		

Equipment Confirmed to be in Calibration to NIST Standards: Yes

Burn and Cool Down Test

Burn Start Time:	9:06:00	
Average Pressure During Burn:	537	psig
Seat Leak Rate During Burn:	53.3	ml/min
Allowable Seat Leak Rate:	3200	ml/min
External Leak Rate During Burn/Cool Down:	6.5	ml/min
Allowable External Leak Rate:	800	ml/min
Amount of Time of Avg. Cal. Blocks > 650 deg. C:	21.5	minutes
Were Test Conditions Within Compliance?	Yes	
Were the Valve Leakages Below the Allowables?	Yes	

Post-burn Test

Average Pressure During Test:	51	psig
Seat Leak Rate:	0.0	ml/min
Allowable Seat Leak Rate:	320	ml/min
Average Leak Rate Over 5 Minute Duration:	0.0	ml/min
Allowable Leak Rate:	160	ml/min
Was the Leakage Below the Allowable?	Yes	

Operational Test

Did Valve Unseat and Open Fully?:	Yes	
Average Pressure During Test:	561	psig
External Leak Rate After Operating:	0.8	ml/min
Allowable External Leak Rate:	1600	ml/min
Was the Leakage Below the Allowable?	Yes	

Does Valve Pass or Fail the Test Standard?	**PASS**

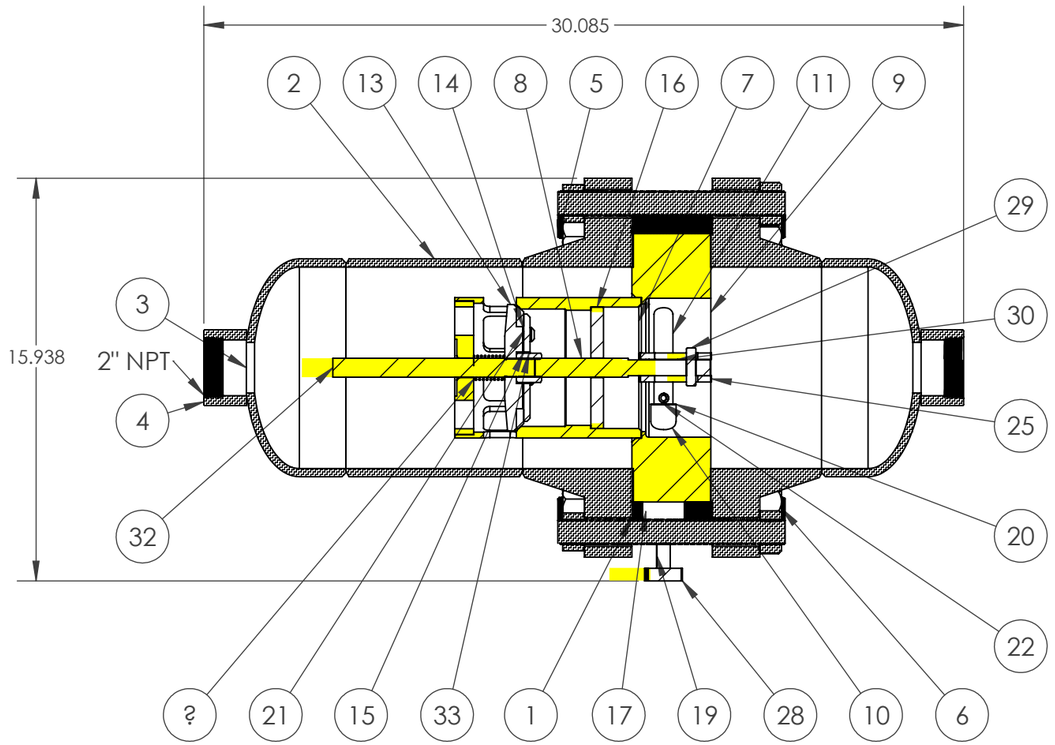
Certified By:

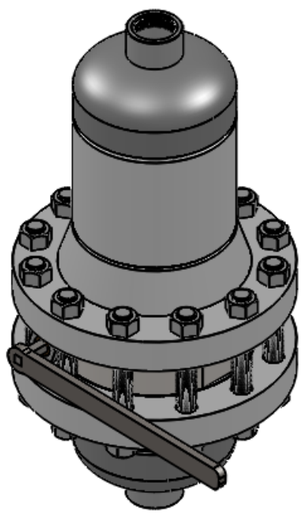
President and Manager
Yarmouth Research and Technology, LLC

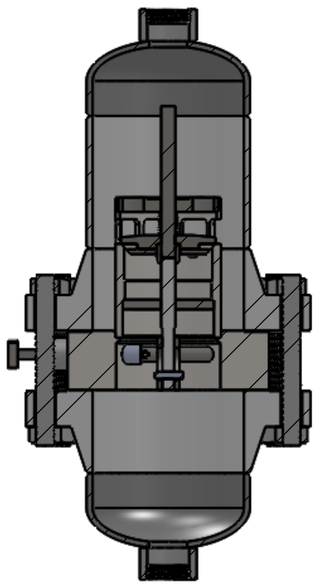
Fire Test Information Sheet

Fire Test Specification and Revision: (ie. API 607 6th, API 6FA 3rd, etc)	API 6FA-3rd
Yarmouth Proposal Number:	
Customer Purchase Order Number:	
Customer's Contact Name:	Total Valve Systems (Jud Smalley)
Valve Manufacturer's Name (used in test report as specified):	Total Valve Systems
Company Web Address for Report Cover:	http://www.totalvalve.com/
Valve Manufacturer's Address:	1300 East Memphis Broken Arrow, OK 74012, US
Did valve meet all required hydrostatic, leakage and other production pressure tests?	Yes
Valve Description for Report Cover:	Model 2400 6"-8" 150/300# In-Tank Excess Flow Valve
Valve Product Code:	2400
Valve Description Size:	6"-8"
Pressure Rating/Class:	150/300#
Pressure Rating at 100F (psig):	740 [psig]
Type:	Excess Flow
Weight:	84 lbs
Reduced or Full Bore:	Full Bore
Body/Bonnet Material:	A105/A106 CS (also available in SS and LTCS)
Trim Material:	316 SS
Seat Material:	Teflon
Stem Seal Material:	Graphite Packing
Body Seal Material:	
Bolting Material:	
Is valve considered "Soft-Seated"?	Yes
Valve Markings	
Nameplate Information:	Sample test valve is unmarked
Casting Markings:	
Assembly Drawing Number / Revision /	2400-000245 Rev. 0
Date of Issue:	11/25/13
Emailed (PDF) to Yarmouth: Date:	12/9/13
If valve is fitted with gearbox, state gearbox manufacturer, model number and mechanical advantage:	
If valve is non-symmetric, state direction of flow for test:	

Yellow is the actual valve. The rest is the spool piece.
* VALVE TESTED POSITION DURING BURN - CLOSED -
with small spring to hold disc before pressure is applied







Total Weight is approximately 300 lbs.

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED

ITEM NO.	PART NUMBER	DESCRIPTION	QTY.	Material
1	6-8in 300lb fire test flange	8" 300# Weld Neck Flange	2	A105 Carbon Steel
2	fire test spool piece	Fire test Pipe	1	A105 Carbon Steel
3	43425K246	8" Weld On Pipe Cap	2	A105 Carbon Steel
4	4513K78	2" NPT Weld on Coupling	2	A105 Carbon Steel
5	8.5in L x 1in	1" OD 8.5L Stud	12	CARBON STEEL B7
6	94895A850	Hex Nut	24	A105 Carbon Steel
7	2400-000246 fire test	2400-M 5" SCH 120 Pipe Body	1	Plain Carbon Steel
8	2400-000249 fire test	2400-M 6" Lower Stem	1	410 SS Q&T
9	2400-000251 fire test	2400-M 6" Wafer	1	Plain Carbon Steel
10	2400-000242	2400-M 6" Handle Shaft Spacer	1	Plain Carbon Steel
11	2400-000243	Handle Stem - piece 2	1	AISI 316 Annealed Stainless Steel Bar (SS)
12	2400-000247	2400-M 6" Top Guide	1	AISI 316 Annealed Stainless Steel Bar (SS)
13	2400-000248A	2400-M 6" Top Disc	1	AISI 316 Annealed Stainless Steel Bar (SS)
14	2400-000248B	2400-M 6" - PTFE Seat	1	AISI 316 Annealed Stainless Steel Bar (SS)
15	2400-000248C	2400-M 6" Lower Disc	1	AISI 316 Annealed Stainless Steel Bar (SS)
16	2400-000250	2400-M 6" Lower Guide	1	ASTM A36 Steel
17	2400-000253	Plug Coupling	1	A350-LF2
18	2400-000254	Shaft Packing Plug	1	A350-LF2
19	2400-000255	Handle Shaft - piece 1	1	AISI 316 Annealed Stainless Steel Bar (SS)
20	91124A065 - 0.01 Steel Shim	Shaft Shim	1	1023 Carbon Steel Sheet (SS)
21	91255A381	Disc Screw	4	Stainless Steal
22	92373A558	Spring Pin	1	Stainless Steal
23	PTFE Insert	PTFE Insert	1	PTFE (general)
24	rope packing	Carbon Rope Packing	5	Graphite
25	2400-000186	THE CLAW	2	ASTM A36 Steel
26	1677K15 BRONZE BEARING	3/4" Bronze Bearing	2	Commercial Bronze, UNS C22000 (90-10 Bronze)
27	2-113 VITON	Oring	2	VITON
28	2400-000193	Handle	1	ASTM A36 Steel
29	2400-000195	Lifting Pin	1	410 SS
30	2400-000197	2400-M CLAW SPACER	1	316 SS
31	95606A570	Flat Washer	2	Nylon 6/10
32	2400-000188	Upper Valve Stem	1	AISI 316 Annealed Stainless Steel Bar (SS)
33	90268A355	Threaded Coupling	1	316 SS
34	2400-M-FIRE TEST SPRING	Spring	1	17-7 SS

CUSTOMER	
PROJECT	
ASSEMBLY	
VALVES	
STOCK SIZE	
MATERIAL	
QTY/VALVE	
Heat Number	

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
FRACTIONAL ± 1/16"
ANGULAR: MACH ± .5 BEND ± 1.5
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005

INTERPRET GEOMETRIC TOLERANCING PER: ANSI

PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF TOTAL VALVE SYSTEMS. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF TOTAL VALVE SYSTEMS IS PROHIBITED.

	NAME	DATE
DRAWN	JDS	10-25-2012
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

COMMENTS:

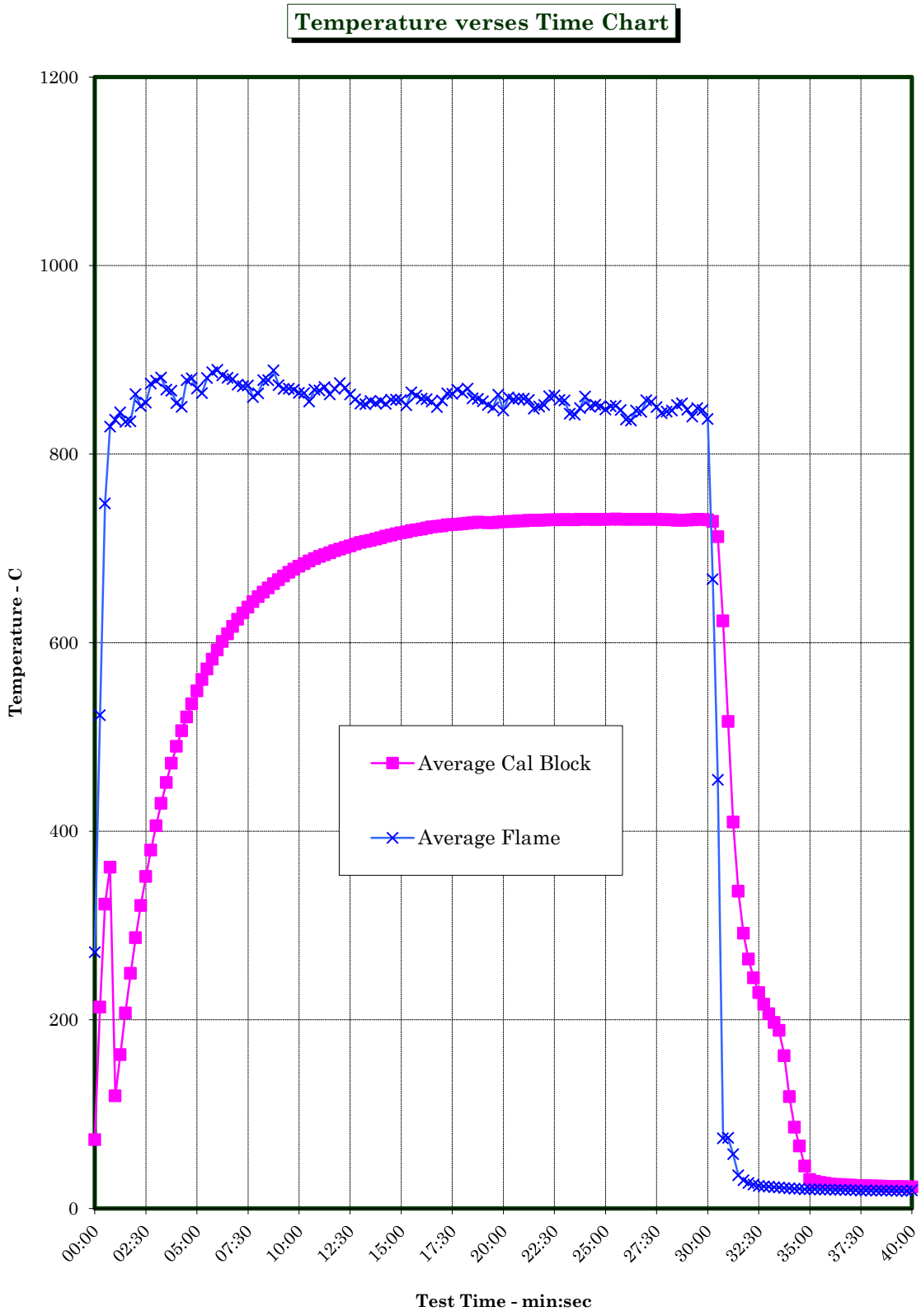
totalvalve.com
(918) 258-7035

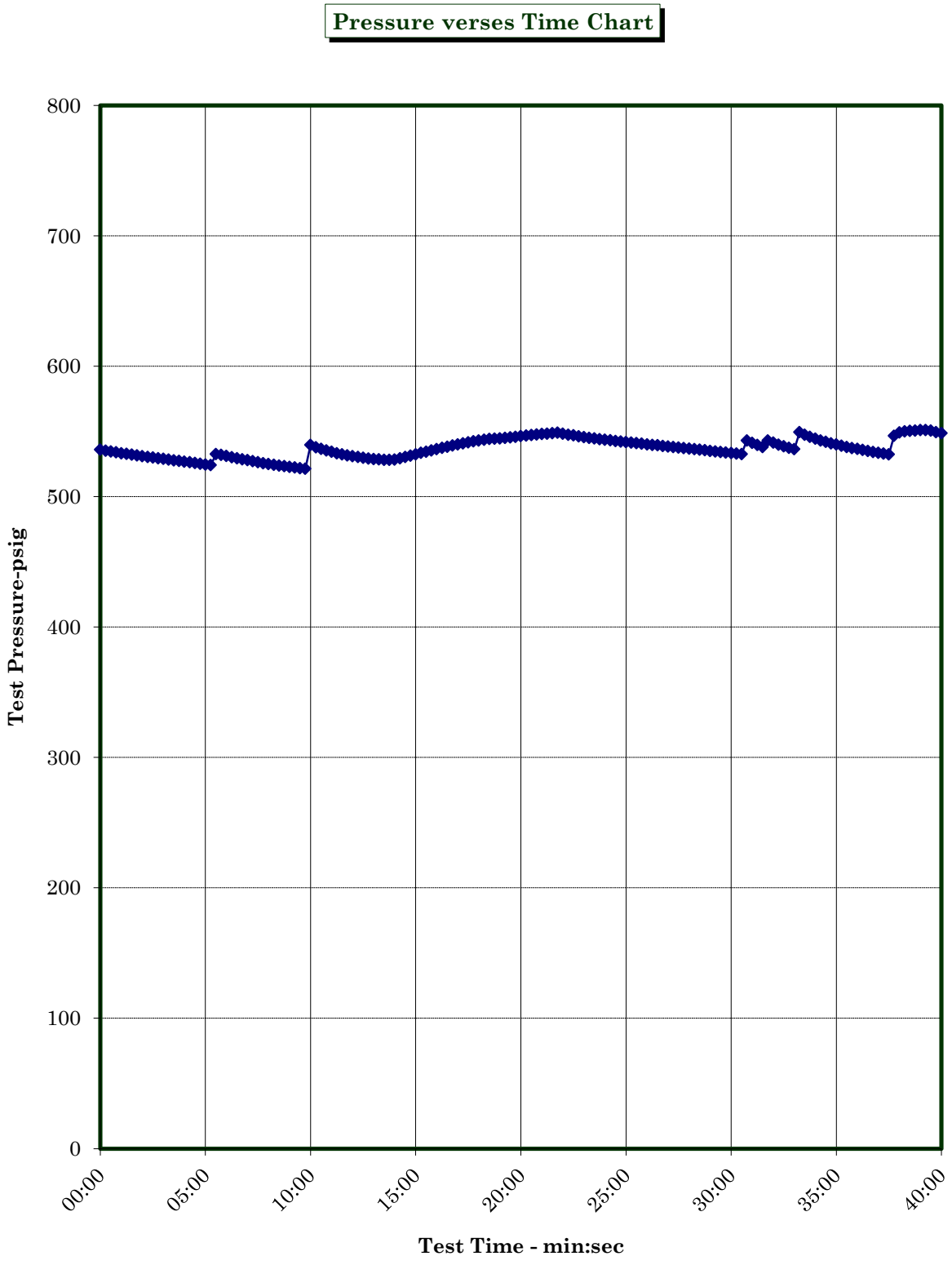
TITLE:
6-8" 300# IT EFV 2400-M-300

SIZE	DWG. NO.	REV
B	2400-000245	0

DO NOT SCALE DRAWING

8 7 6 5 4 3 2 1


Temperature verses Time Chart
1200
1000
800
600
400
200
0
Temperature - C
Average Cal Block
Average Flame
00:00
02:30
05:00
07:30
10:00
12:30
15:00
17:30
20:00
22:30
25:00
27:30
30:00
32:30
35:00
37:30
40:00
Test Time - min:sec


Pressure verses Time Chart
800
700
600
500
400
300
200
100
0
Test Pressure-psig
00:00
05:00
10:00
15:00
20:00
25:00
30:00
35:00
40:00
Test Time - min:sec

Test Valve Setup Prior to Burn

Test Valve During Burn

Fire Test Information

Customer: Total Valve Systems **Date:** 12/10/2013

Product Code: Model 2400 8" 300# In-Tank Excess Flow Valve

Project Number: PN213295

Fire Test Raw Data

Time (EST)	Pressure (psig)	Water Volume (mls)	Cal. Block 1 Temp-C	Cal. Block 2 Temp-C	Cal. Block 3 Temp-C	Avg. Cal Block Temp-C	Bonnet Flame Temp-C	Body Flame Temp-C	Average Flame Temp-C
9:06:00	536	45644	23	47	38	36	157	387	272
9:06:15	535	45647	26	67	48	47	487	559	523
9:06:30	535	45641	37	108	84	76	779	716	748
9:06:45	534	45639	57	119	109	95	869	789	829
9:07:00	533	45628	85	150	123	119	874	798	836
9:07:15	533	45628	120	199	170	163	884	804	844
9:07:30	532	45631	158	247	217	207	874	794	834
9:07:45	532	45623	197	291	261	249	869	800	835
9:08:00	531	45616	236	326	300	287	894	833	864
9:08:15	531	45609	274	354	335	321	889	812	851
9:08:30	530	45592	309	381	366	352	888	821	854
9:08:45	529	45601	342	403	394	380	901	848	875
9:09:00	529	45592	372	426	419	406	904	851	878
9:09:15	528	45586	400	447	442	430	908	854	881
9:09:30	528	45590	425	468	462	452	902	834	868
9:09:45	527	45575	447	488	481	472	902	833	867
9:10:00	527	45581	467	505	498	490	882	826	854
9:10:15	526	45573	484	522	513	506	865	835	850
9:10:30	526	45565	500	536	527	521	903	854	878
9:10:45	525	45561	516	549	541	535	904	856	880
9:11:00	525	45553	531	562	553	549	886	853	869
9:11:15	524	45550	543	575	564	561	882	848	865
9:11:30	533	45512	555	586	575	572	902	859	881
9:11:45	532	45503	567	596	584	582	910	863	887
9:12:00	531	45487	578	606	593	592	910	868	889
9:12:15	530	45481	588	614	601	601	907	860	883
9:12:30	529	45477	597	623	608	609	906	856	881
9:12:45	529	45470	606	631	615	617	905	854	879
9:13:00	528	45464	614	638	622	625	899	848	874
9:13:15	527	45459	621	645	628	631	892	852	872
9:13:30	527	45441	627	652	634	638	890	856	873
9:13:45	526	45420	633	658	639	643	878	843	861
9:14:00	525	45409	638	663	644	649	885	844	864

Fire Test Data - continued

9:14:15	524	45413	643	668	649	654	896	861	878
9:14:30	524	45392	649	672	653	658	894	862	878
9:14:45	523	45394	654	676	658	663	902	876	889
9:15:00	523	45401	659	679	662	667	894	852	873
9:15:15	522	45386	663	684	666	671	891	848	869
9:15:30	522	45346	667	688	669	674	893	846	869
9:15:45	521	45350	671	691	672	678	894	843	868
9:16:00	540	45296	674	693	675	681	891	839	865
9:16:15	538	45272	677	696	678	684	892	838	865
9:16:30	537	45260	680	699	681	687	878	833	856
9:16:45	535	45259	682	702	683	689	884	853	868
9:17:00	534	45237	684	703	686	691	886	849	868
9:17:15	533	45253	687	705	688	693	886	856	871
9:17:30	532	45217	688	707	691	695	877	849	863
9:17:45	532	45247	691	709	693	697	889	849	869
9:18:00	531	45235	692	711	695	699	896	854	875
9:18:15	530	45238	694	712	697	701	889	852	870
9:18:30	530	45209	696	713	698	703	884	842	863
9:18:45	529	45212	698	716	701	705	877	839	858
9:19:00	529	45196	699	717	702	706	872	834	853
9:19:15	529	45189	699	719	704	707	874	832	853
9:19:30	528	45174	700	721	705	709	882	831	856
9:19:45	528	45208	701	722	707	710	874	834	854
9:20:00	528	45178	702	723	708	711	884	828	856
9:20:15	529	45174	704	724	710	713	883	823	853
9:20:30	530	45183	705	726	712	714	881	834	858
9:20:45	532	45161	706	727	713	715	878	837	858
9:21:00	532	45147	707	728	714	717	877	837	857
9:21:15	534	45148	708	729	716	717	871	832	852
9:21:30	535	45133	708	731	717	719	891	840	866
9:21:45	535	45132	709	731	718	720	889	836	862
9:22:00	536	45099	711	732	719	721	877	841	859
9:22:15	537	45106	712	733	721	722	882	834	858
9:22:30	538	45079	712	734	722	723	882	829	856
9:22:45	539	45091	712	735	723	723	879	821	850
9:23:00	540	45082	712	736	724	724	878	836	857
9:23:15	541	45060	713	736	725	725	887	842	864
9:23:30	542	45052	714	736	726	725	879	848	864
9:23:45	542	45045	714	736	726	726	885	852	868
9:24:00	543	45034	715	737	727	726	888	842	865
9:24:15	544	45026	716	737	727	727	889	850	869
9:24:30	544	45017	716	737	728	727	886	833	859
9:24:45	544	45000	717	738	728	728	888	829	858

Fire Test Data - continued

9:25:00	545	44990	717	736	729	727	887	825	856
9:25:15	545	44969	717	734	729	727	882	822	852
9:25:30	545	44956	717	735	729	727	873	825	849
9:25:45	546	44946	717	736	730	728	884	842	863
9:26:00	546	44935	718	737	731	728	868	824	846
9:26:15	547	44918	718	737	731	728	873	848	860
9:26:30	547	44912	718	737	731	729	874	841	858
9:26:45	548	44903	718	738	732	729	879	838	859
9:27:00	548	44889	718	738	732	729	877	841	859
9:27:15	548	44878	718	739	732	730	875	839	857
9:27:30	549	44873	717	739	732	730	863	833	848
9:27:45	549	44856	717	740	733	730	865	836	850
9:28:00	548	44849	716	741	733	730	874	830	852
9:28:15	548	44850	716	741	734	730	880	843	861
9:28:30	547	44843	716	741	734	730	880	844	862
9:28:45	546	44823	716	741	733	730	872	843	857
9:29:00	546	44820	716	742	734	731	876	837	857
9:29:15	545	44810	716	742	733	730	861	825	843
9:29:30	545	44823	716	742	733	730	856	828	842
9:29:45	544	44801	716	743	734	731	863	834	849
9:30:00	544	44806	715	743	734	731	877	845	861
9:30:15	543	44799	715	743	734	731	873	827	850
9:30:30	543	44787	715	743	733	731	871	834	852
9:30:45	542	44768	715	744	733	731	863	838	851
9:31:00	542	44778	715	744	733	731	866	829	847
9:31:15	541	44755	714	745	733	731	872	829	851
9:31:30	541	44738	715	745	733	731	866	837	851
9:31:45	541	44747	714	745	733	731	854	839	847
9:32:00	540	44734	714	746	733	731	848	825	837
9:32:15	540	44749	714	746	732	731	848	823	836
9:32:30	539	44731	713	747	733	731	861	832	846
9:32:45	539	44703	713	747	732	731	863	827	845
9:33:00	538	44725	713	747	732	731	873	841	857
9:33:15	538	44688	713	747	733	731	868	842	855
9:33:30	538	44699	713	747	732	731	861	838	850
9:33:45	537	44681	713	747	732	731	861	826	843
9:34:00	537	44704	713	747	731	730	861	829	845
9:34:15	536	44688	713	748	730	730	863	829	846
9:34:30	536	44661	713	748	729	730	868	836	852
9:34:45	536	44627	713	748	729	730	870	837	854
9:35:00	535	44658	713	748	729	730	863	831	847
9:35:15	535	44642	713	748	729	730	858	822	840
9:35:30	534	44630	713	749	730	731	870	827	849

Fire Test Data - continued

9:35:45	534	44599	713	749	729	731	863	831	847
9:36:00	533	44598	713	749	729	730	850	824	837
9:36:15	533	44590	712	748	726	729	671	664	667
9:36:30	533	44598	704	720	712	712	449	459	454
9:36:45	543	44545	644	533	692	623	54	94	74
9:37:00	541	44531	500	379	669	516	56	94	75
9:37:15	540	44510	360	221	648	410	42	73	58
9:37:30	538	44455	265	116	628	336	28	42	35
9:37:45	543	44432	201	66	608	292	26	34	30
9:38:00	541	44391	157	47	589	264	24	30	27
9:38:15	540	44388	124	38	572	245	23	27	25
9:38:30	539	44359	100	33	554	229	22	26	24
9:38:45	537	44336	82	31	537	216	22	25	23
9:39:00	536	44296	69	29	521	206	22	24	23
9:39:15	549	44259	59	28	504	197	21	24	23
9:39:30	547	44212	52	27	487	189	21	23	22
9:39:45	546	44205	46	27	414	162	21	23	22
9:40:00	544	44183	41	26	288	119	21	22	21
9:40:15	543	44182	37	26	195	86	20	22	21
9:40:30	542	44152	34	25	139	66	20	22	21
9:40:45	541	44145	32	25	77	45	19	21	20
9:41:00	540	44113	30	24	37	31	19	21	20
9:41:15	539	44107	29	24	33	29	19	21	20
9:41:30	538	44101	27	24	31	28	19	21	20
9:41:45	537	44085	27	24	29	27	19	21	20
9:42:00	537	44069	26	24	28	26	19	21	20
9:42:15	536	44044	25	23	28	25	19	21	20
9:42:30	535	44017	24	23	28	25	19	21	20
9:42:45	534	44005	24	23	27	25	19	20	19
9:43:00	534	44001	24	23	27	25	19	20	19
9:43:15	533	43981	23	23	27	24	19	20	19
9:43:30	532	43989	23	23	27	24	18	19	19
9:43:45	547	43939	23	23	26	24	18	20	19
9:44:00	549	43876	23	23	26	24	18	19	19
9:44:15	550	43898	23	23	26	24	18	19	19
9:44:30	550	43870	22	23	26	24	18	19	19
9:44:45	551	43858	22	22	26	23	18	19	19
9:45:00	551	43823	22	22	26	23	18	19	19
9:45:15	551	43806	22	22	25	23	18	19	19
9:45:30	551	43788	22	22	25	23	18	19	19
9:45:45	550	43791	22	22	25	23	18	19	18
9:46:00	549	43786	22	22	25	23	19	19	19

Leakage Summary for Burn and Cool Down Periods

All pressure transducers and thermocouples are in calibration per YRT's QA program.
Seat leakages were collected manually. External leakage was collected electronically.

Total Through Seat Leakage Collected Over 30 Minute Duration:	1600.0	mls
Average Leak Rate Over 30 Minute Duration:	53	ml/min
Allowable Leak Rate:	3200	ml/min
Total Through Seat Leakage Collected Over 10 Minute Cool Down:	0.0	mls
Total Water Volume Lost Over 40 Minute Burn and Cool Down:	1858	mls
Water Collected in System Relief Valve:	0	mls
Calculated External Leakage During 40 Minute Duration:	258	mls
Average Leak Rate Over 40 Minute Duration:	6.5	ml/min
Allowable Leak Rate:	800	ml/min

Were the Valve Leakages Below the Allowables?	**Yes**

Summary of Test Parameters During Burn and Cool Down Periods

Amount of Time Pressure Dropped Below 50%:	0.0	minutes
Maximum Allowable Low Pressure Time:	2.0	minutes
Maximum Pressure During Burn/Cool Down:	551	psig
Average Pressure During Burn/Cool Down:	537	psig
Minimum Pressure During Burn/Cool Down:	521	psig
Amount of Time of Avg. Cal Block > 650 deg.C:	21.5	minutes
Minimum Allowable Time at Temperature:	15.0	minutes
Maximum Avg Cal Block Temperature:	731	deg. C
Average Cal Block Temperature:	517	deg. C
Lowest Avg Cal. Block Temperature:	23	deg. C
Maximum Body Flame Temperature During Burn:	876	deg. C
Average Body Flame Temperature During Burn:	830	deg. C
Maximum Bonnet Flame Temperature During Burn:	910	deg. C
Average Bonnet Flame Temperature During Burn:	871	deg. C
Average of Both Flame Temperatures During Burn:	850	deg. C

Note

Were Test Conditions Within Compliance?	**Yes**

Yarmouth Research and Technology, LLC

Post-Burn Seat Test Information

Customer: Total Valve Systems **Date:** 12/10/2013

Product Code: Model 2400 8" 300# In-Tank Excess Flow Valve

Project Number: PN213295

Test Data

Time	Pressure (psig)	Cal Block Temp - C
9:54:38	51	23
9:54:53	51	23
9:55:08	51	23
9:55:23	51	23
9:55:38	51	23
9:55:53	51	23
9:56:08	51	23
9:56:23	51	23
9:56:38	51	23
9:56:53	51	23
9:57:08	51	23
9:57:23	51	23
9:57:38	50	23
9:57:53	50	23
9:58:08	50	23
9:58:23	50	23
9:58:38	51	22
9:58:53	50	22
9:59:08	50	22
9:59:23	50	22
9:59:38	50	22

Total Seat Leakage Collected Over 5 Minute Duration:	0.0	mls
Average Leak Rate Over 5 Minute Duration:	0.0	ml/min
Allowable Leak Rate:	320	ml/min
Total External Leakage Collected Over 5 Minute Duration:	0.0	mls
Average Leak Rate Over 5 Minute Duration:	0.0	ml/min
Allowable Leak Rate:	160	ml/min

Was the Valve Leakage Below the Allowable?	**Yes**

Yarmouth Research and Technology, LLC

Operational Test Information

Customer: Total Valve Systems **Date:** 12/10/2013

Product Code: Model 2400 8" 300# In-Tank Excess Flow Valve

Project Number: PN213295

Water flow was reversed so pressure could reach stem

Test Data

Time	Pressure (psig)	Cal Block Temp - C
10:19:14	546	21
10:19:29	548	21
10:19:44	551	21
10:19:59	555	21
10:20:14	557	21
10:20:29	559	21
10:20:44	560	21
10:20:59	561	21
10:21:14	562	21
10:21:29	563	21
10:21:44	563	21
10:21:59	564	21
10:22:14	564	21
10:22:29	564	21
10:22:44	564	21
10:22:59	565	21
10:23:14	565	21
10:23:29	565	21
10:23:44	565	21
10:23:59	565	21
10:24:14	565	21

Leakages were collected manually.

Total External Leakage Collected Over 5 Minute Duration:	4.0	mls
Average Leak Rate Over 5 Minute Duration:	0.8	ml/min
Allowable Leak Rate:	1600	ml/min

Was the Valve Leakage Below the Allowable?	**Yes**