

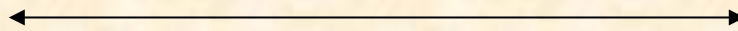
Fire Test Report

API Standard 6FA, Fourth Edition, 2018
“Specification for Fire Testing of Valves”

Performed for

Total Valve Systems

www.totalvalve.com



6 inch Class 150 Flanged Inline
Excess Flow Valve / Check Valve
with Fire Safe Bypass or No Bypass
Product Code: 2120-06H-BDJ-AP

Project Number: 218306

Test Date: November 13, 2018

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: 11/13/2018

Specification: API Standard 6FA, Fourth Edition, 2018

6 inch Class 150 Flanged Inline Excess Flow Valve / Check Valve with Fire

Product Description: Safe Bypass or No Bypass

Product Code: 2120-06H-BDJ-AP

Project Number: 218306

Equipment Confirmed to be in Calibration to NIST Standards: Yes

Burn and Cool Down Test

Burn Start Time:	13:24:00	
Average Pressure During Burn:	211	psig
Seat Leak Rate During Burn:	0	ml/min
Allowable Seat Leak Rate:	2400	ml/min
External Leak Rate During Burn/Cool Down:	26	ml/min
Allowable External Leak Rate:	600	ml/min
Amount of Time of Avg. Cal. Blocks > 650 deg. C:	17.5	minutes
Were Test Conditions Within Compliance?	Yes	
Were the Valve Leakages Below the Allowables?	Yes	

Post-burn Test

Average Pressure During Test:	31	psig
Seat Leak Rate:	2.8	ml/min
Allowable Seat Leak Rate:	240	ml/min
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Allowable Leak Rate:	120	ml/min
Was the Leakage Below the Allowable?	Yes	

Operational Test

Did Valve Unseat and Open Fully?:	Yes	
Average Pressure During Test:	211	psig
External Leak Rate After Operating:	1.0	ml/min
Allowable External Leak Rate:	1200	ml/min
Was the Leakage Below the Allowable?	Yes	
Does Valve Pass or Fail the Test Standard?	PASS	

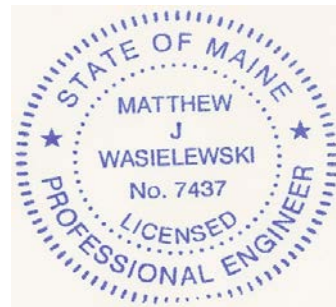
Certified By:



Matthew Wasielewski, PE

President and Manager

Yarmouth Research and Technology, LLC

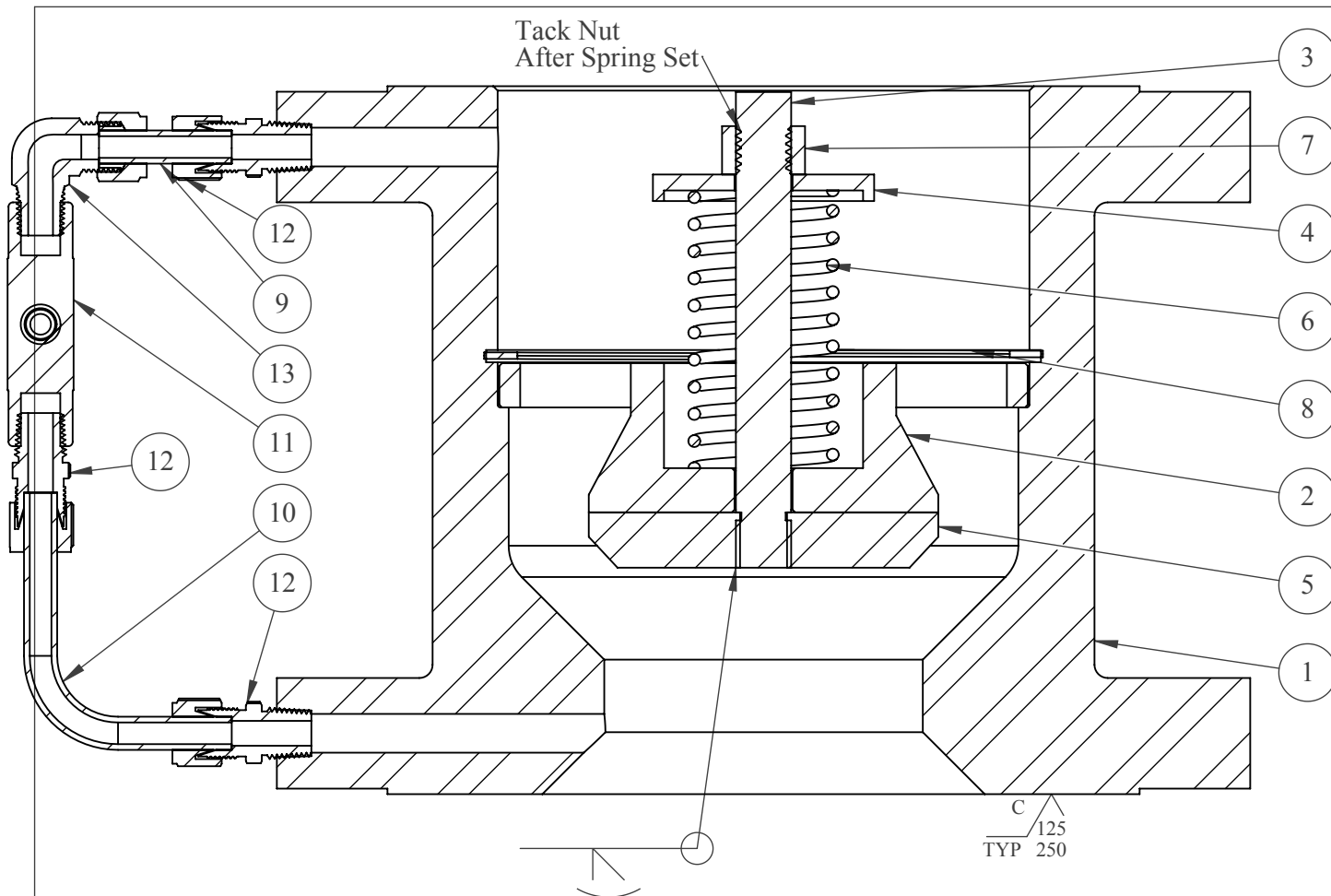


YARMOUTH RESEARCH AND TECHNOLOGY, LLC

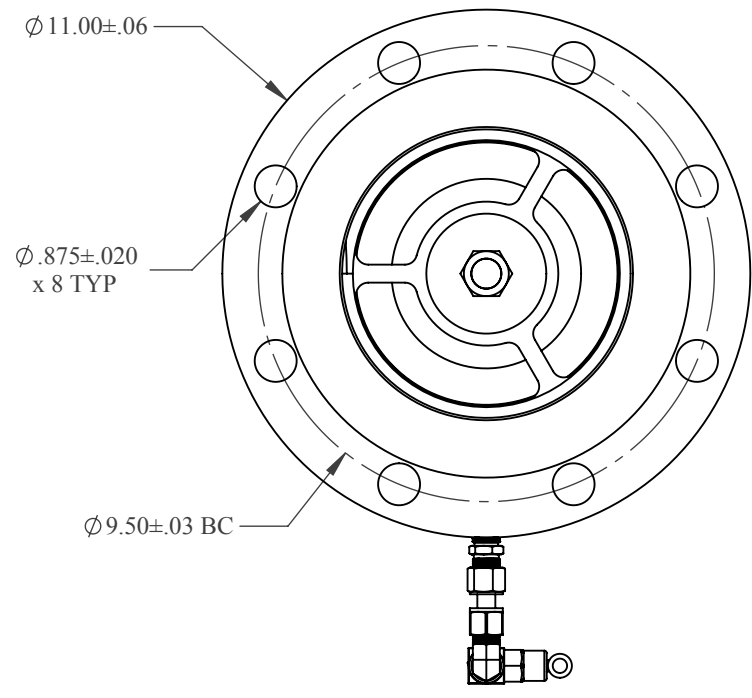
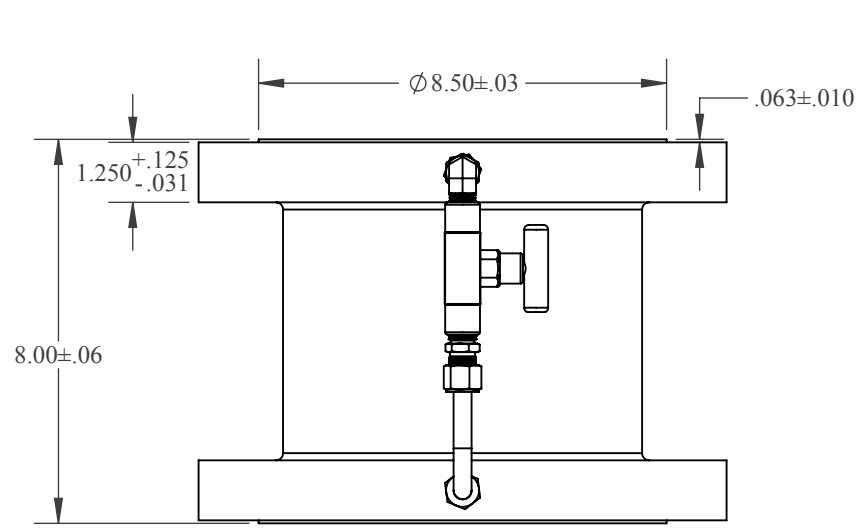
Fire Test Information Sheet

Fire Test Specification and Revision: (ie. API 607 7th, API 6FA 3rd, etc)	API 6FA Latest
Yarmouth Proposal Number:	218306B
Customer Purchase Order Number:	13188
Customer's Contact Name:	Jud Smalley
Valve Manufacturer's Name (used in test report as specified):	Total Valve Systems
Company Web Address for Report Cover:	www.totalvalve.com
Valve Manufacturer's Address:	1300 E Memphis Broken Arrow, OK 74012
Did valve meet all required hydrostatic, leakage and other production pressure tests?	Yes, API 598 Metal Seated
Valve Description for Report Cover:	Flanged Inline Excess Flow Valve / Check Valve with Fire Safe Bypass or No Bypass
Valve Product Code:	Tested Model - 2120-06H-BDJ-AP
Valve Description	
Size:	6 inch
Pressure Rating/Class:	150#
Pressure Rating at 100F:	285 psig
Type:	Excess flow Valve
Weight:	88 Lbs
Reduced or Full Bore:	Full Bore Non Piggable
Body/Bonnet Material:	A350-LF2 Cl1
Trim Material:	316 SS
Seat Material:	A350-LF2 Cl1
Stem Seal Material:	na
Body Seal Material:	na
Bolting Material:	na
Is valve considered "Soft-Seated"?	No
Valve Markings	
Nameplate Information:	2120-06H-BDJ-AP 200102FT
Casting Markings:	None
Assembly Drawing Number / Revision / Date of Issue:	2120-06H-BDJ-AP / REV 1 / 9-12-2018
Emailed (PDF) to Yarmouth: Date:	10/29/2018
If valve is fitted with gearbox, state gearbox manufacturer, model number and mechanical advantage:	No
If valve is non-symmetric, state direction of flow for test:	Flow direction for the test will be Inlet is thread stem side, As shown on drawing. Internals are switched for Fire test.
For double-seated valves, state maximum allowable cavity pressure:	None
Form Submission Date:	10/29/2018

PLEASE RETURN AS AN EXCEL DOCUMENT

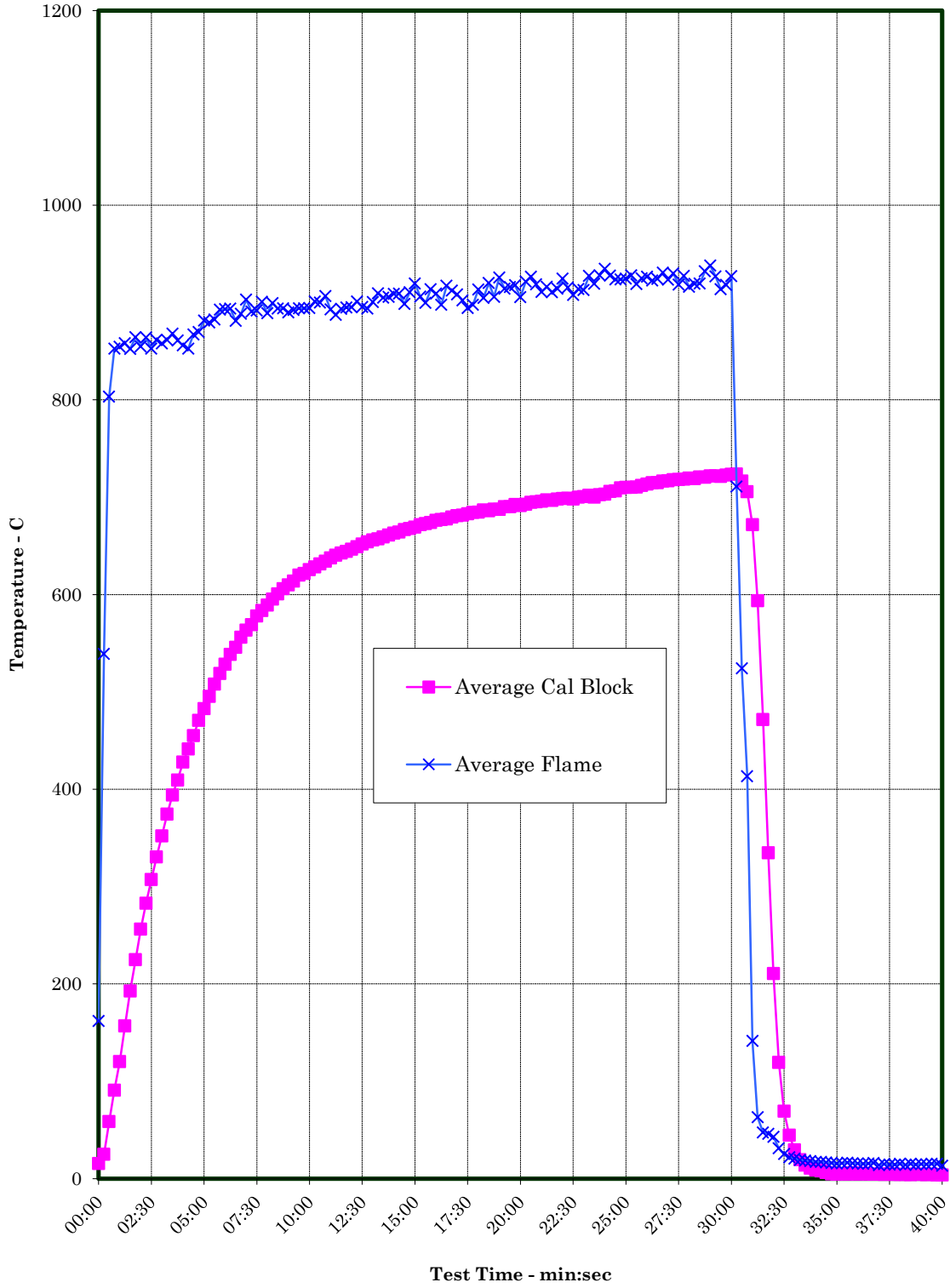


ITEM NO.	PART NUMBER	Rev	DESCRIPTION	QTY.	Material	Stock Size	Length	Item Type	HEAT#
1	2120-06-000016	1	Body 150#, Integral Flange	1	SA350-LF2 CL1	11.00	8.25	Bar	
2	2120-06-000002	2	Guide	1	SA182-F316 / SA479-316 / SA276-316	6.00	1.75	Bar	
3	2120-06-000004	1	Stem	1	SA182-F316 / SA479-316 / SA276-316	0.625	5.50	Bar	
4	2120-06-000005	1	Spring Washer	1	SA182-F316 / SA479-316 / SA276-316	2.50	0.50	Bar	
5	2120-06-000017	1	Disc	1	SA182-F316 / SA479-316 / SA276-316	4.00	0.75	Bar	
6	2120-06AJ-SPR	1	Spring, X-750	1	Inconel X750	Varies	Varies	Wire	
7	HN-09G-B	1	Hex Nut - 5/8-11 SS	1	316 SS	5/8-11 (94804A351)	0.547	Hex Nut	
8	WHT-600-S02	1	Retaining Ring - 6.0" Internal	1	302 SS / 316 SS (Chem Only)	6.0 Bore / 6.27 Groove	0.139 Groove	Ring	
9	2120-06BD-BPT2	1	By-Pass Tubing	1	A269-TP316 / A511-TP316 / Similar	0.375 OD x 0.065 Wall	1.50	Tubing	
10	2120-06BD-BPT3	1	By-Pass Tubing	1	A269-TP316 / A511-TP316 / Similar	0.375 OD x 0.065 Wall	5.00	Tube	
11	A103F03FAIAX	1	Needle Valve - 1/4in FNPT 6000 psig Fire Tested	1	SS/SS	1.125 Wide	2.75 Long	Needle Valve	
12	SS-600-1-4	1	SS Tube Fitting Straight, 3/8 Tube x 1/4 MNPT	3	316 SS	3/8 Tube x 1/4 MNPT	na	Adapter - Straight	
13	SS-600-2-4	1	SS Tube Fitting Elbow, 3/8 Tube x 1/4 MNPT	1	316 SS	3/8 Tube x 1/4 MNPT	na	Adapter - Elbow	

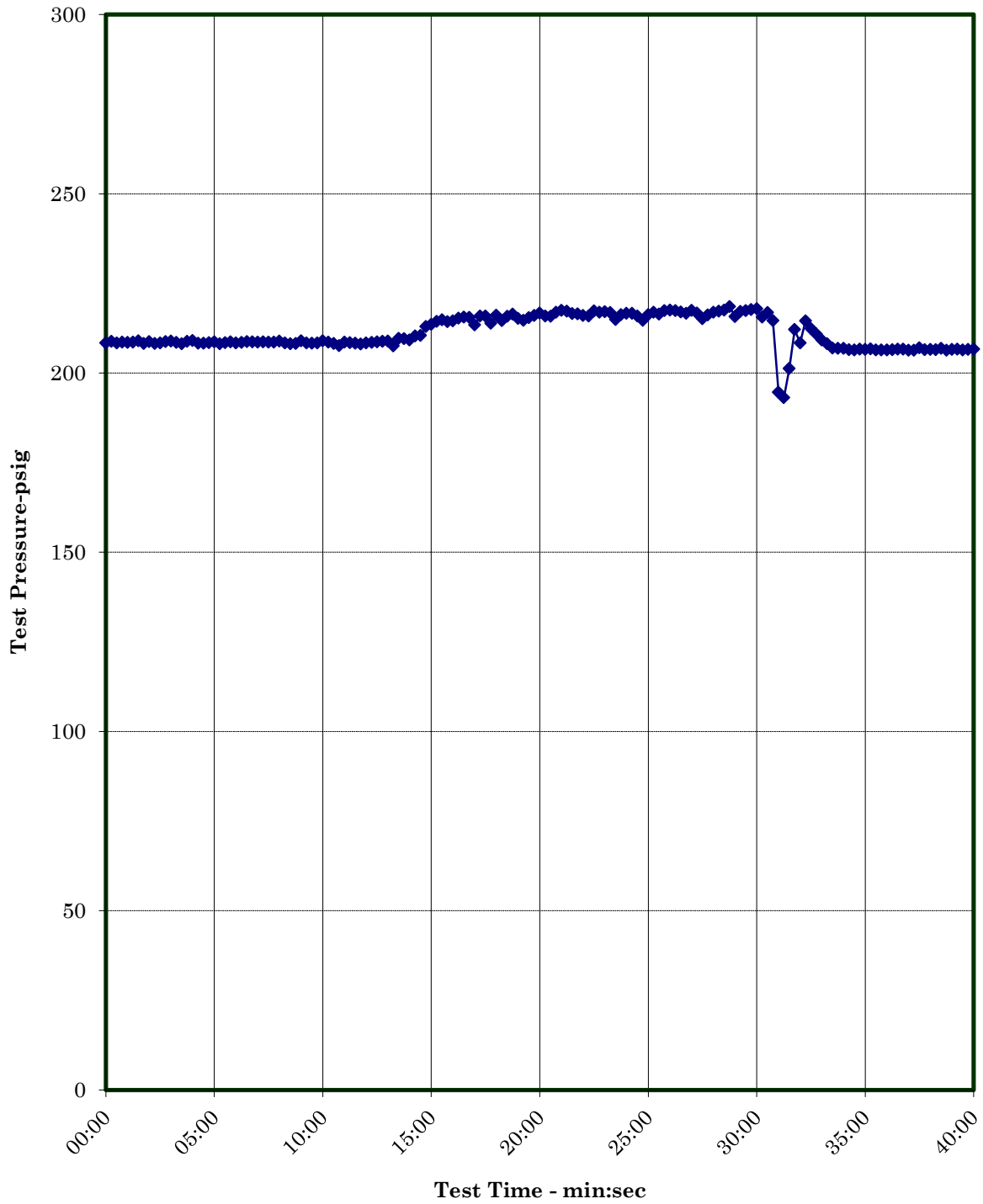


UNLESS OTHERWISE SPECIFIED:		NAME	DATE	TOTALVALVE.COM (918) 258-7035
For Part Drawings Only DIMENSIONS ARE IN INCHES		DRAWN	AJB 07/02/2018	
TOLERANCES:		ENG APPR	JDS 09/12/2018	Description Assembly - 2120 6" 150#, Intg Flange, LTCS/SS, w/ Fire Safe BP
FRACTIONAL ± 1/16"				
ANGULAR: MACH ± .5 BEND ± 1.5				
TWO PLACE DECIMAL ± .010		COMMENTS:		Valve is tested to API 6FA WT: 87.20 LBS
THREE PLACE DECIMAL ± .005		Surface Finish: 63 RA 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.		SIZE B	DWG. NO. 2120-06H-BDJ-AP	REV 1
DO NOT SCALE DRAWING				

Temperature verses Time Chart



Pressure versus Time Chart



Yarmouth Research and Technology, LLC



Valve Tag Information



Test Valve Prior to Burn

Yarmouth Research and Technology, LLC



Test Valve During Burn

Yarmouth Research and Technology, LLC

Fire Test Information

Customer: Total Valve Systems

Date: 11/13/2018

Product Code: 6 inch Class 150 Flanged Inline Excess Flow Valve / Check Valve with Fire Safe Bypass or No Bypass

Project Number: 218306

Fire Test Raw Data

Time (EST)	Pressure (psig)	Water Volume (mls)	Cal. Block 1 Temp-C	Cal. Block 2 Temp-C	Avg. Cal Block Temp-C	Bonnet Flame Temp-C	Body Flame Temp-C	Average Flame Temp-C
13:24:00	208	33916	16	16	16	179	144	162
13:24:15	209	33901	26	24	25	613	466	539
13:24:30	208	33905	64	53	59	844	763	803
13:24:45	209	33914	93	88	91	880	825	853
13:25:00	209	33899	119	121	120	888	821	854
13:25:15	209	33898	153	161	157	891	826	858
13:25:30	209	33909	187	199	193	892	813	852
13:25:45	208	33885	215	235	225	889	839	864
13:26:00	209	33862	245	268	256	898	812	855
13:26:15	208	33884	269	297	283	895	833	864
13:26:30	208	33884	291	323	307	897	808	853
13:26:45	209	33877	314	347	331	899	824	862
13:27:00	209	33868	332	372	352	898	817	858
13:27:15	209	33836	355	394	374	904	819	862
13:27:30	208	33860	374	414	394	904	832	868
13:27:45	209	33898	387	432	409	911	812	861
13:28:00	209	33854	405	451	428	913	798	856
13:28:15	208	33856	418	465	441	917	788	853
13:28:30	208	33863	429	481	455	927	808	867
13:28:45	208	33894	444	498	471	932	807	870
13:29:00	209	33903	456	509	483	931	832	881
13:29:15	208	33870	470	521	495	934	824	879
13:29:30	208	33862	483	533	508	934	831	883
13:29:45	209	33880	494	544	519	937	848	893
13:30:00	208	33943	503	554	528	933	853	893
13:30:15	208	33894	514	563	538	928	859	894
13:30:30	209	33928	522	569	546	931	832	881
13:30:45	209	33937	533	579	556	936	841	888
13:31:00	209	33920	541	586	563	929	877	903
13:31:15	209	33906	546	592	569	932	849	891
13:31:30	209	33904	555	601	578	932	851	892
13:31:45	209	33925	562	605	584	929	872	901
13:32:00	209	33897	567	611	589	928	849	889

Yarmouth Research and Technology, LLC

Fire Test Data - continued

13:32:15	208	33911	572	618	595	928	871	899
13:32:30	208	33890	578	623	601	928	859	894
13:32:45	208	33906	586	626	606	934	854	894
13:33:00	209	33904	588	632	610	934	845	890
13:33:15	208	33915	594	634	614	938	847	892
13:33:30	208	33891	599	641	620	944	843	894
13:33:45	208	33912	601	643	622	946	842	894
13:34:00	209	33890	605	646	626	944	844	894
13:34:15	209	33901	607	650	628	948	854	901
13:34:30	208	33909	609	654	631	948	852	900
13:34:45	208	33938	612	656	634	945	868	907
13:35:00	209	33897	615	660	638	939	847	893
13:35:15	208	33927	618	663	640	945	829	887
13:35:30	208	33921	622	663	643	943	843	893
13:35:45	208	33965	623	666	644	952	838	895
13:36:00	208	33927	626	668	647	947	843	895
13:36:15	209	33937	628	671	649	947	855	901
13:36:30	209	33954	631	673	652	949	842	896
13:36:45	209	33964	633	676	654	957	830	894
13:37:00	209	33923	636	677	656	963	838	901
13:37:15	208	34027	637	678	657	962	857	909
13:37:30	210	34018	639	679	659	959	851	905
13:37:45	210	34088	642	680	661	966	846	906
13:38:00	209	34257	644	682	663	960	858	909
13:38:15	210	34345	646	683	664	956	862	909
13:38:30	210	34643	648	685	667	953	844	899
13:38:45	213	34735	648	687	668	951	871	911
13:39:00	214	35094	651	688	669	949	890	919
13:39:15	214	35309	653	691	672	948	864	906
13:39:30	215	35431	654	692	673	954	846	900
13:39:45	214	35990	655	693	674	949	878	914
13:40:00	215	35331	658	694	676	948	871	909
13:40:15	215	36425	660	694	677	953	842	898
13:40:30	216	36012	658	697	678	949	886	917
13:40:45	216	35075	663	696	679	954	870	912
13:41:00	213	34827	662	699	681	948	869	908
13:41:15	216	36582	664	699	682	947	858	902
13:41:30	216	35396	666	700	683	958	831	894
13:41:45	214	36126	667	702	684	961	835	898
13:42:00	216	35795	666	703	685	961	866	913
13:42:15	215	36061	670	704	687	956	853	905
13:42:30	216	35559	670	702	686	954	886	920
13:42:45	216	36783	671	704	688	958	853	906

Yarmouth Research and Technology, LLC

Fire Test Data - continued

13:43:00	215	36023	669	706	688	953	898	926
13:43:15	215	34729	673	708	690	956	872	914
13:43:30	215	34795	673	708	690	952	880	916
13:43:45	216	35018	676	709	693	953	882	918
13:44:00	217	35153	674	709	691	954	857	906
13:44:15	216	35425	674	711	693	952	891	921
13:44:30	216	35306	677	712	695	957	896	926
13:44:45	217	36728	677	713	695	953	884	919
13:45:00	217	37017	677	715	696	951	871	911
13:45:15	217	36460	679	716	697	956	876	916
13:45:30	217	35455	680	713	697	959	862	911
13:45:45	217	35459	682	714	698	957	872	914
13:46:00	216	35818	682	716	699	964	885	924
13:46:15	216	35315	683	714	699	958	872	915
13:46:30	217	37026	681	716	698	959	856	908
13:46:45	217	35572	683	717	700	959	869	914
13:47:00	217	36307	683	718	701	961	864	913
13:47:15	217	35313	684	719	702	963	891	927
13:47:30	215	34571	684	716	700	947	891	919
13:47:45	216	35528	687	718	703	951	905	928
13:48:00	217	36192	688	718	703	952	917	935
13:48:15	217	36164	692	720	706	948	907	928
13:48:30	216	37320	692	721	706	944	903	924
13:48:45	215	35016	697	722	709	948	899	924
13:49:00	216	35184	698	722	710	946	903	924
13:49:15	217	36029	699	721	710	943	913	928
13:49:30	216	36107	700	721	710	946	892	919
13:49:45	217	37850	702	722	712	952	898	925
13:50:00	218	35815	703	723	713	946	907	926
13:50:15	217	36663	706	724	715	948	897	923
13:50:30	217	36261	706	724	715	949	899	924
13:50:45	217	36157	710	723	717	947	914	931
13:51:00	218	37569	708	726	717	948	899	923
13:51:15	217	35483	712	724	718	953	907	930
13:51:30	215	36064	712	724	718	951	886	918
13:51:45	216	35340	714	723	719	948	906	927
13:52:00	217	35890	715	724	720	954	878	916
13:52:15	217	36114	713	725	719	954	884	919
13:52:30	218	37457	716	726	721	957	882	919
13:52:45	219	37789	716	726	721	957	907	932
13:53:00	216	34585	716	728	722	956	921	938
13:53:15	217	36250	717	727	722	951	902	927
13:53:30	217	36153	716	727	721	958	869	914

Yarmouth Research and Technology, LLC

Fire Test Data - continued

13:53:45	218	36218	719	727	723	956	881	918
13:54:00	218	37198	720	727	724	957	897	927
13:54:15	216	35723	719	728	724	759	663	711
13:54:30	217	36159	709	723	716	563	485	524
13:54:45	215	35606	696	715	706	451	376	413
13:55:00	195	30342	664	679	672	213	69	141
13:55:15	193	29664	603	584	594	67	59	63
13:55:30	201	27223	528	415	472	52	43	48
13:55:45	212	27124	416	253	335	57	35	46
13:56:00	208	26495	273	148	211	59	27	43
13:56:15	215	25857	151	88	119	36	27	31
13:56:30	212	25507	82	57	69	27	23	25
13:56:45	211	25299	51	38	45	24	19	22
13:57:00	209	24760	31	28	29	21	21	21
13:57:15	208	24441	19	20	19	19	19	19
13:57:30	207	24253	13	15	14	19	18	19
13:57:45	207	24155	10	12	11	19	17	18
13:58:00	207	24084	8	9	9	17	17	17
13:58:15	206	23985	7	9	8	17	17	17
13:58:30	206	23995	6	7	6	17	16	17
13:58:45	207	23919	4	6	5	16	16	16
13:59:00	207	23957	4	5	5	16	15	16
13:59:15	207	23932	5	6	5	16	16	16
13:59:30	206	23959	4	6	5	17	16	16
13:59:45	206	23908	6	7	6	16	16	16
14:00:00	206	23896	4	4	4	16	15	16
14:00:15	207	23884	6	6	6	16	15	15
14:00:30	207	23868	6	4	5	16	15	16
14:00:45	207	23859	4	5	4	17	16	16
14:01:00	206	23886	4	5	4	15	13	14
14:01:15	206	23848	4	4	4	15	15	15
14:01:30	207	23891	5	5	5	14	14	14
14:01:45	207	23870	4	4	4	14	14	14
14:02:00	207	23825	4	4	4	16	15	15
14:02:15	206	23864	3	5	4	14	14	14
14:02:30	207	23859	3	4	4	16	15	15
14:02:45	206	23879	4	5	4	14	15	14
14:03:00	207	23835	4	4	4	15	15	15
14:03:15	207	23817	3	4	4	14	15	15
14:03:30	206	23855	5	4	4	15	16	15
14:03:45	207	23860	3	4	4	16	15	15
14:04:00	207	23870	3	4	4	13	13	13

Yarmouth Research and Technology, LLC

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:	0	mls
Average Leak Rate Over 30 Minute Duration:	0	ml/min
Allowable Leak Rate:	2400	ml/min
<hr/>		
Total Through Seat Leakage Collected Over 10 Minute Cool Down:	9000	mls
<hr/>		
Total Water Volume Lost Over 40 Minute Burn and Cool Down:	10046	mls
Water Collected in System Relief Valve:	0	mls
Calculated External Leakage During 40 Minute Duration:	1046	mls
Average Leak Rate Over 40 Minute Duration:	26	ml/min
Allowable Leak Rate:	600	ml/min

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

Yarmouth Research and Technology, LLC

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:	219	psig
Average Pressure During Burn/Cool Down:	211	psig
Minimum Pressure During Burn/Cool Down:	193	psig
Amount of Time of Avg. Cal Block > 650 deg.C:	17.5	minutes
Minimum Allowable Time at Temperature:	15.0	minutes
Maximum Avg Cal Block Temperature:	724	deg. C
Average Cal Block Temperature:	480	deg. C
Lowest Avg Cal. Block Temperature:	4	deg. C
Maximum Body Flame Temperature During Burn:	921	deg. C
Average Body Flame Temperature During Burn:	853	deg. C
Maximum Bonnet Flame Temperature During Burn:	966	deg. C
Average Bonnet Flame Temperature During Burn:	934	deg. C
Average of Both Flame Temperatures During Burn:	893	deg. C

Note

Were Test Conditions Within Compliance?	Yes
---	-----

Yarmouth Research and Technology, LLC

Post-Burn Seat Test Information

Customer: Total Valve Systems

Date: 11/13/2018

6 inch Class 150 Flanged Inline Excess Flow Valve / Check Valve

Product Code: with Fire Safe Bypass or No Bypass

Project Number: 218306

Test Data

Time	Pressure (psig)	Cal Block Temp - C
14:11:41	31	10
14:11:56	31	10
14:12:11	31	10
14:12:26	31	10
14:12:41	31	10
14:12:56	31	10
14:13:11	31	9
14:13:26	31	10
14:13:41	31	10
14:13:56	31	9
14:14:11	30	10
14:14:26	30	10
14:14:41	31	10
14:14:56	31	9
14:15:11	30	9
14:15:26	31	9
14:15:41	31	9
14:15:56	30	9
14:16:11	30	10
14:16:26	31	8
14:16:41	30	8

Total Seat Leakage Collected Over 5 Minute Duration:	14	mls
Average Leak Rate Over 5 Minute Duration:	2.8	ml/min
Allowable Leak Rate:	240	ml/min
Total External Leakage Collected Over 5 Minute Duration:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Allowable Leak Rate:	120	ml/min

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

Yarmouth Research and Technology, LLC

Operational Test Information

Customer: Total Valve Systems

Date: 11/13/2018

6 inch Class 150 Flanged Inline Excess Flow Valve / Check Valve

Product Code: with Fire Safe Bypass or No Bypass

Project Number: 218306

Test Data

Time	Pressure (psig)	Cal Block Temp - C
14:20:40	213	7
14:20:55	210	7
14:21:10	209	8
14:21:25	209	9
14:21:40	208	8
14:21:55	207	8
14:22:10	213	8
14:22:25	212	8
14:22:40	212	9
14:22:55	211	7
14:23:10	211	7
14:23:25	211	9
14:23:40	211	8
14:23:55	211	9
14:24:10	211	9
14:24:25	211	8
14:24:40	211	8
14:24:55	211	7
14:25:10	211	9
14:25:25	210	9
14:25:40	210	10

Leakages were collected manually.

Total External Leakage Collected Over 5 Minute Duration:	5	mls
Average Leak Rate Over 5 Minute Duration:	1.0	ml/min
Allowable Leak Rate:	1200	ml/min

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