Exxon Requirements to API Standard 607 Fourth Edition Fire Test Report

Performed for

SGL Technic Inc.
Polycarbon Division

Sigraflex Hochdruck
6 inch Class 300 Gaskets
Project Number: 20292
February 2003

Performed by

YARMOUTH RESEARCH AND TECHNOLOGY

92 East Elm Street
Yarmouth, ME 04096 USA
(207) 829-5359
yrtlab@maine.rr.com
www.yarmouthresearch.com

Yarmouth Research and Technology

Exxon Additional Requirements to API 607 4th Edition Fire Test

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Project Number: PN20292

Specification: Exxon additional requirements to API 607 4th Edition

Product Code: Sigraflex Hochdruck

Gasket Thickness: 0.063 inches

Flange Mfgr: Weldbend **Nut Mfgr:** Shih Hsang

Bolt Mfgr: Alloy & Stainless Fasteners VA

Comments: 0

YRT Technician: Matthew J. Wasielewski, P.E.

Bolt Torques (ft-lbs)

Bolt Location	At Start of Test	Before Adjustments	At Test Completion
Upstream #1	200	40	200
Upstream #2	200	40	200
Upstream #3	200	55	200
Upstream #4	200	50	200
Downstream #1	200	50	200
Downstream #2	200	50	200
Downstream #3	200	70	200
Downstream #4	200	25	200

Post Burn Leakage Tests

Maximum allowable combined leakage: 150 ml/min

Test Pressure (psig)	Side A Leak Rate (ml/min)	Side B Leak Rate (ml/min)	Total Leak Rate (ml/min)	Flange Bolt Retorques
30	20	96	116	
50	10	442	452	Yes, Side B
100	724	0	724	Yes, Side A
200	0	0	0	
300	0	0	0	
700	0	0	0	

Witnesses

Yarmouth Research and Technology

Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 30

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
11:21:53	30	105	111	117	113
11:22:08	30	105	111	118	113
11:22:23	30	105	111	118	113
11:22:38	30	105	111	118	113
11:22:53	30	105	111	118	113
11:23:08	30	105	111	118	113
11:23:23	30	105	112	118	113
11:23:38	30	105	112	118	113
11:23:53	30	105	112	118	113
11:24:08	30	105	112	118	113
11:24:23	30	105	112	118	113
11:24:38	30	105	112	118	113
11:24:53	30	105	112	118	113
11:25:08	30	105	112	118	113
11:25:23	30	105	112	118	113
11:25:38	30	105	112	118	113
11:25:53	30	105	112	118	113
11:26:08	30	105	112	118	113
11:26:23	30	106	112	118	113
11:26:38	30	105	112	118	113
11:26:53	30	106	112	118	113

Leakage Collected from Upstream Flange Gasket A:	100	mls
Average Leak Rate Over 5 Minute Duration:	20	ml/min
Leakage Collected from Downstream Flange Gasket B:	480	mls
Average Leak Rate Over 5 Minute Duration:	96	ml/min
Were Both Flange Leakages Below 150 ml/min?	Yes	

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Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 50

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
11:35:06	51	104	110	111	109
11:35:21	50	104	110	111	109
11:35:36	50	104	110	110	109
11:35:51	50	104	110	110	109
11:36:06	50	104	110	110	108
11:36:21	50	104	109	110	108
11:36:36	50	104	109	109	108
11:36:51	49	104	109	109	108
11:37:06	49	104	109	109	108
11:37:21	49	104	109	108	107
11:37:36	49	104	109	108	107
11:37:51	49	103	108	108	107
11:38:06	49	103	108	108	107
11:38:21	49	103	108	107	107
11:38:36	50	103	108	107	106
11:38:51	51	103	108	107	106
11:39:06	51	103	108	107	106
11:39:21	50	103	107	106	106
11:39:36	50	103	107	106	106
11:39:51	50	103	107	106	106
11:40:06	50	103	107	106	105

Leakage Collected from Upstream Flange Gasket A:	49	mls
Average Leak Rate Over 5 Minute Duration:	9.8	ml/min
Leakage Collected from Downstream Flange Gasket B:	2210	mls
Average Leak Rate Over 5 Minute Duration:	442	ml/min
Were Both Flange Leakages Below 150 ml/min?	No	

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Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 100

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
12:03:23	100	77	93	93	77
12:03:38	100	77	93	93	77
12:03:53	100	77	93	93	77
12:04:08	100	77	92	93	77
12:04:23	100	77	92	93	77
12:04:38	101	77	92	92	77
12:04:53	100	77	92	92	77
12:05:08	100	77	92	92	77
12:05:23	100	77	92	92	78
12:05:38	101	77	92	92	79
12:05:53	100	77	92	92	79
12:06:08	100	77	92	92	79
12:06:23	100	77	92	92	79
12:06:38	100	77	92	92	79
12:06:53	100	77	92	92	79
12:07:08	100	77	92	92	79
12:07:23	100	77	92	92	79
12:07:38	100	76	92	92	79
12:07:53	100	76	92	92	79
12:08:08	100	76	92	92	78
12:08:23	100	76	92	92	78

Leakage Collected from Upstream Flange Gasket A:	3620	mls
Average Leak Rate Over 5 Minute Duration:	724	ml/min
Leakage Collected from Downstream Flange Gasket B:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Were Both Flange Leakages Below 150 ml/min?	No	

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Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 200

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
12:33:53	201	72	88	88	72
12:34:08	201	72	88	88	72
12:34:23	201	72	88	88	72
12:34:38	200	72	87	88	72
12:34:53	200	72	87	88	72
12:35:08	200	72	87	87	72
12:35:23	200	72	87	87	72
12:35:38	200	72	87	87	72
12:35:53	200	72	87	87	73
12:36:08	200	72	87	87	74
12:36:23	200	72	87	87	74
12:36:38	200	72	87	87	74
12:36:53	200	72	87	87	74
12:37:08	200	72	87	87	74
12:37:23	200	72	87	87	74
12:37:38	200	72	87	87	74
12:37:53	200	72	87	87	74
12:38:08	200	71	87	87	74
12:38:23	200	71	87	87	74
12:38:38	200	71	87	87	73
12:38:53	200	71	87	87	73

Leakage Collected from Upstream Flange Gasket A:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Leakage Collected from Downstream Flange Gasket B:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Were Both Flange Leakages Below 150 ml/min?	Yes	

Yarmouth Research and Technology

Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 300

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
12:46:41	300	71	86	86	73
12:46:56	300	71	86	86	73
12:47:11	300	71	86	86	73
12:47:26	300	71	86	86	73
12:47:41	300	71	86	86	73
12:47:56	300	71	86	86	72
12:48:11	300	71	86	86	72
12:48:26	300	71	86	86	72
12:48:41	300	71	86	86	72
12:48:56	300	71	86	86	72
12:49:11	300	71	86	86	72
12:49:26	300	71	86	86	72
12:49:41	300	71	86	86	72
12:49:56	299	71	86	86	72
12:50:11	299	71	86	86	72
12:50:26	299	71	86	86	72
12:50:41	299	71	86	86	72
12:50:56	299	70	86	86	72
12:51:11	299	70	86	86	72
12:51:26	299	70	86	86	72
12:51:41	299	70	86	86	72

Leakage Collected from Upstream Flange Gasket A:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Leakage Collected from Downstream Flange Gasket B:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Were Both Flange Leakages Below 150 ml/min?	Yes	

Yarmouth Research and Technology

Post Burn Test Information

Customer: SGL Technic Inc. -Polycarbon Div. **Date:** 2/4/2003

Product Code: Sigraflex Hochdruck

Project Number: PN20292

Test Pressure: 700

Raw Data

Time	Pressure (psig)	Flange 1 Temp - F	Flange 2 Temp - F	Flange 3 Temp - F	Flange 4 Temp - F
12:57:22	701	70	85	86	72
12:57:37	701	70	85	86	72
12:57:52	700	70	85	86	72
12:58:07	700	71	85	86	72
12:58:22	700	71	85	86	72
12:58:37	700	71	85	86	72
12:58:52	699	71	85	86	72
12:59:07	699	71	85	86	72
12:59:22	699	71	85	86	72
12:59:37	699	71	85	86	72
12:59:52	698	71	85	86	72
13:00:07	698	71	85	86	72
13:00:22	698	71	85	86	72
13:00:37	698	71	85	85	72
13:00:52	698	71	85	85	72
13:01:07	698	71	85	85	72
13:01:22	698	71	85	85	72
13:01:37	698	71	85	85	72
13:01:52	698	71	85	85	72
13:02:07	698	71	85	85	73
13:02:22	698	71	85	85	73

Leakage Collected from Upstream Flange Gasket A:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Leakage Collected from Downstream Flange Gasket B:	0	mls
Average Leak Rate Over 5 Minute Duration:	0	ml/min
Were Both Flange Leakages Below 150 ml/min?	Yes	

ATTACHMENT II

EXXON FIRETEST PROCEDURES FOR PIPE GASKETS
Revision Date: February, 1995

A) GENERAL

- The fire test will consist of a modified API-607 Fourth Edition firetest.
- The fire test will require at least 3 flange thermocouples to reach 1200°F for 15 minutes. See Figure 1 for thermocouple locations.

B) INSTALLATION PROCEDURES:

- The gasket shall be installed between two 6" - raised face ANSI 300 flanges (see Attachment II, Page 2).
- 3/4" B7 bolts and 2H nuts shall be used torqued to 60% of yield (200 ft/lbs).
- Thermocouples shall be installed in upstream flanges at the 9 o'clock position, and downstream flanges at the 3 o'clock position as shown in Figure 1.
- Hydro at 110%. No leaks allowed. If a leak occurs, the test is terminated.
- The test flanges may only be used once in a firetests and the manufacturer shall be approved by Exxon.

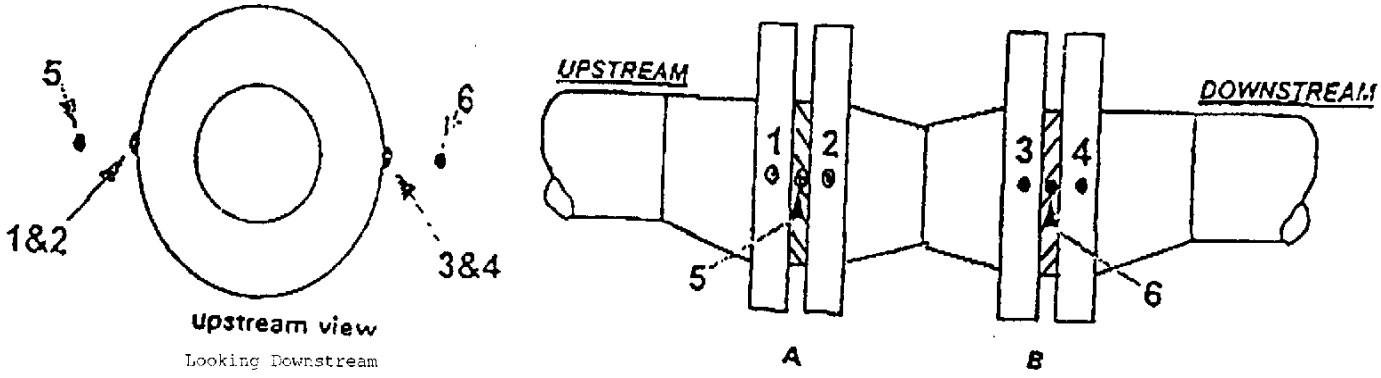
C) FIRETEST:

- Heat up, cool down, duration and leak testing (except as modified below) shall follow API-607 Fourth Edition.
- Observe and record any leakage during firetest and cooldown.
- Perform leakage tests as follows after cooldown:
  + Pressure levels are: 30, 50, 100, 200, 300, and 700 psig.
  + Allowable leakage rates: For 30 psig tests = 150 ml/min maximum (25 ml/min/inch)
  + Note at what pressure 150 ml/min is exceeded (pressure A). Reduce pressure to zero psig and measure the "after leak test" bolt torques. Increase the pressure again to pressure A and try to stop the leak by tightening the bolts.

D) Dismantle, take pictures, and make note of condition of gasket in reports.

Note: This test verifies gaskets for refinery services only up to ANSI 300 class, due to the low pressure testing performed.

Note: Thermocouples 1, 2, 3, and 4 are welded to the flange. Thermocouples 5 and 6 are for flame temperature located 1" away from flange thermocouples respectively.



exxon4.tif

INSTALLATION, LUBRICATING, AND TORQUING PROCEDURES FOR EXXON FIRE TEST FOR GASKETS

1. Make sure studs, nuts, and flange surfaces which will be in contact with the nuts are free from burrs and debris. Flange raised face surface finish shall be per ASME B16.5 para. 6.4.4.1 or equivalent. No radial grooves or similar damage in the sealing area of the gasket is allowed. New ASTM A193 B-7 studs and ASTM A194, 2H nuts shall be used for each firetest. The test shall consist of two 6" Class 300 flange joints in conformance with ASME B16.5 and made of ASTM A-105 material

2. Coat entire surface of each stud with Anti-Seize.

3. Cover coat the flange nut bearing surface around each bolt hole with a coating of Anti-Seize.

4. Install bolt numbers (10, 6, 2, 11, and 7) and place the gasket between the flange faces. See Figure 2.

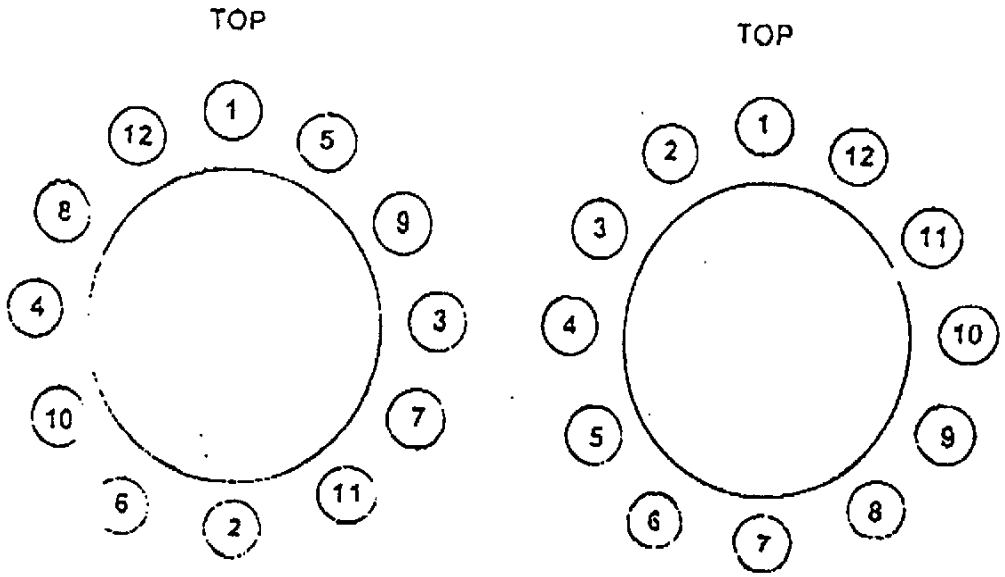
5. Install the remaining studs and nuts and tighten finger tight.

6. Using a calibrated torque wrench, torque the 3/4" B-7 studs in the sequence provided in Figure 2.
   a) to 50 ft-lbs. (outboard nuts)
   b) to 100 ft-lbs. (outboard nuts)
   c) to 150 ft-lbs. (outboard nuts)
   d) to 200 ft-lbs. (inboard nuts)

7. A bolt-to-bolt torque check is required to even out bolt stresses. One revolution is required per the bolt sequence shown in Figure 3 Perform this tightening on the inboard nuts. Torque to 200 ft-lbs.

8. Repeat step 7 but on the "outboard" nuts.

9. Check final torque on the outboard nuts at 1, 2, 3, and 4 and record. See Figure 2. (The target torque is minimum 185 ft/lbs, maximum 215 ft/lbs. Nuts shall not be loosened if 215 ft/lbs is exceeded.)



6600 South Harlem Avenue
Argo, IL 60501-1930
Phone: (708) 594-1700
Fax: (708) 458-0106

WELDBEND

To: W.L. BLAKE COMPANY
366 WEST COMMERCIAL ST.
PORTLAND, ME 04102
Attn: HOLLY

MATERIAL TEST REPORT
FLANGES

Description					Heat I		Steel Producer									
Qty	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Cb	V	Ten	Yield	Elong	RO	BHN
Carbon Equivalence	Notes:															
8" Class 300 Welding Neck StdB RF					PBC		SHEFFIELD						Hot Formed			
	.200	.840	.009	.015	.250	.200	.090	.110	.020	.000	.025	86300	58700	28.40	57.50	187
0.390																
6" Class 300 Blind RF					OWZ		SMI						Hot Formed			
	.200	.850	.004	.020	.260	.260	.160	.080	.035	.000	.002	80400	55600	31.00	60.30	174
0.393																

Meets the requirements of ASTM A-105,
(and SA-105).
ISO 9002 CERTIFIED MANUFACTURER
All flanges meet NACE MRO-175 - Latest Revision

GLOBAL REGISTRARS INC.

A2LA ACCREDITED

January 17, 2003

By _____

Quality Assurance Department
Test Results herein are correct as contained in test records retained by the company.
In accordance with EN 10 204 Para 3.1.B

ALLOY & STAINLESS FASTENERS VA
VIRGINIA - 757-427-0111
PENNSYLVANIA -215-628-9598
VA FAX 757-427-2305
PA 215-628-0670

* C E R T I F I C A T E * * O F T E S T *

Attn: Matt

TO: K. L. JACK & CO.
145 WARREN AVE.
PORTLAND, ME 04103

Customer P/O # T37224

Our Order # 193936

ITEM	QUANTITY	DESCRIPTION	LOT
2	110 EA	3/4-10 x 4 1/2 HEAVY HEX BOLT ASTM A193 B7	33855

ASTM SPEC DATE: 95
TEMPERING TEMP: 650 DEG C
WEDGE TENSILE 131700

MERCURY FREE AND NO WELD

CARBON	MANGANESE
.43	.88

Heat No.	TENSILE (PSI)	YIELD (PSI)	PHOSPHORUS	SULFUR	SILICON
2M392	132500	119000	.021	.009	.22

ELONGATION	RED. OF AREA	HARDNESS (HB)	CHROMIUM	MOLY.
19.0	58.0	277	.94	.17

MACRO ETCH
S1/R1/C1

Date: 01/20/03

We hereby certify that the foregoing data is a true copy of the data furnished to us by the producing mill.

ALLOY & STAINLESS FASTENERS VA

Please call our office if you require a signed certificate of test.

ISO 9002
B S M I
7M4Y025
VALID : APRIL.11.2002

SHIH HSANG YWA INDUSTRIAL CO., LTD.

134, SHIN-LO STREET, KANGSHAN 82001 KAOHSIUNG, TAIWAN R. O. C.
TEL : (07)6212286 FAX : (07)6222273 E mail : shyindco@ms5.hinet.net

F029
VALID : FEB.29.2004

CERTIFICATE OF INSPECTION

NAME OF CUST : HEADS AND THREADS COMPANY
ADDRESS OF CUST : 200 KENNDY DRIVE, SAYREVILLE,NEW JERSEY 08872,USA
COMMODITY : ANSI B18.2.2 ASTM A194 GR-2H HEX HEAVY S.C.W. NUT
<MFG ID&2H> HT&PLN
PACKING LIST NO : S01070194 PO#107062/05/18/2001ISSUE DATE :08/06/2001
MATERIAL TYPE : 1045SK LOT NO. : W801-170703AM1
SAMPLE SIZE : ACC. TO ASME B18.18.2M-87 CERT. NO. : 01080072
MANU. DATE : 07/21/2001 HEAT NO. : 3F707
MANUFACTURER : SHIH HSANG YWA COMP. SIZE : 3/4 -10
ADDRESS : SAME AS LAB LOT SIZE : 45,000 PCS

DIMENSIONAL INSPECTIONS SPECIFICATION:ASME/ANSI B18.2.2-87
INSPECTOR:/QC SAMPLER :/QC TEST DATE:07/31/2001

CHARACTERISTICS	TEST METHOD	SPECIFIED	ACTUAL RESULT	ACC.	REJ
APPEARANCE	ASTM F812-97		PASSED	100	0
ACROSS FLATS		30.79-31.75 mm	30.93-31.17 mm	32	0
THREAD	ASME B1.1-89 2B		PASSED	32	0
HEIGHT		18.03-19.25 mm	18.46-18.62 mm	8	0
MARK	◇ 2H		PASSED	100	0

MECHANICAL PROPERTIES SPECIFICATION:ASTM A194-00 GR-2H
INSPECTOR:J.L.HSIEH/QC SAMPLER :J.L.HSIEH/QC TEST DATE:07/31/2001

CHARACTERISTICS	TEST METHOD	SPECIFIED	ACTUAL RESULT	ACC.	REJ
HARDNESS	ASTM E18-98	24-38 HRC	29.5-31.0 HRC	8	0
PROOF LOAD	ASTM F606-98	MIN 175000 PSI	MIN 175000 PSI	5	0
DECARBURIZATION	SAE J121-97		PASSED	1	0
HARDNESS AFTER 24H AT 540CASTM A194MIN 89 HRB			100.6-103.2 HRB	5	0

INSPECTION RESULT:SAMPLES TESTED CONFORM TO ALL OF THE STANDARD LISTED ABOVE.

LAB. CHIEF/CERT. SIGNER: James Yu (JAMES YU) PAGE: 1 OF 1
*ACCREDITED BY BSMI ISO 9002 1996(CNS 12682) 7M4Y025-01;VALID TO APRIL 11 2002
*SHIH HSANG YWA Q.C DEP. OPERATES INDEPENDENTLY OF THE MANUFACTURING DEP.
*THE RESULTS RELATE ONLY TO THE ITEMS TESTED.
*THIS REPORT MUST NOT BE REPRODUCED EXCEPT IN FULL, WITHOUT THE WRITTEN APPROVAL OF THE LABORATORY. *TOTAL SAMPLE SIZE = ACC. + REJ.
*NUTS HARDNESS: ONLY INSPECT THE 2 POINTS ON THE MIDDLE OF THE BEARING OF THE NUTS.(THE 2 POINTS MUST BE 180 DEGREE SEPARATELY) QE20E

S.H.Y