



MASTER FLO VALVE INC.
Head Office
4611 - 74 Avenue
Edmonton, Alberta
Canada, T6B 2H5

CUSTOMER: MASTER FLO VALVE (USA) INC. (USD) /
NEWFIELD EXPLORATION COMPANY

P.O. #: 2402 NEWFIELD AFE22806

MFV PART #: REP HRV-494-I

SERIAL #: HRV-494, ROT-2118

WO. #: 54022

DS#: 65784

THE LEADER IN CHOKE TECHNOLOGY

Tel: 1 780 468-4433 Fax: 1 780 469-9853

Info@masterflo.com

www.masterflo.com



MASTER FLO VALVE INC.
Head Office
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Canada, T6B 2H5

CERTIFICATION PACKAGE

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1. STATEMENT OF CONFORMANCE
2. TRACEABILITY REPORT, MATERIAL TEST REPORTS,
NDE REPORT, HARDNESS TEST REPORT
3. FAT TEST RECORDS
4. FILL AND FLUSH REPORT
5. PRESSURE TEST REPORT
6. PACKING LIST / COMMERCIAL INVOICE



MASTER FLO VALVE INC.
Head Office
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STATEMENT OF CONFORMANCE



MASTER FLO VALVE INC.

Head Office

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Edmonton, Alberta

Canada, T6B 2H5

STATEMENT OF CONFORMANCE

MASTER FLO VALVE INC. CERTIFIES THAT THE MATERIALS, PROCESSES, FINISHES AND TESTING OF THE PRODUCTS LISTED BELOW CONFORM TO SUPPLIED CONTRACT SPECIFICATIONS, MASTER FLO ENGINEERING STANDARDS AND API 6A AND 17D LATEST EDITION, PSL 3, MEETING SPECIFICATIONS SET FORTH IN NACE MR-01-75, 2003, WHICH INCLUDES HARDNESS OF MATERIALS USED IN CONSTRUCTION UNDER SPECIFICATION.

CUSTOMER: MASTER FLO VALVE HOUSTON (USA) INC./ NEWFIELD
EXPLORATION COMPANY

DESCRIPTION: TO DEBIT YOUR ACCOUNT FOR THE PARTS AND LABOUR
REQUIRED TO REPAIR HRV-494 AND ROT-2118

PO#: 2402 NEWFIELD AFE22806

PART NUMBER: REP HRV-494-I

VALVE S/N: HRV-494, ROT-2118

DATE: Oct 8/10

SIGNED BY: Sond Mahn

TITLE: Q.A. ACCEPTANCE

THE LEADER IN CHOKE TECHNOLOGY

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TRACEABILITY REPORT, MATERIAL TEST, NDE, HARDNESS TEST REPORTS



SUBSEA VALVE TRACEABILITY RECORD

MASTER FLO W.O. NO:	5A022	SERIAL NO. P / HRV / ROT :	HRV-494
VALVE BODY SERIAL NO:	—	VALVE BODY HEAT NO.	—

2.2	BONNET ASSY PART NO.		2.7	BONNET SEAL PART NO.	23290-209-01
	SERIAL NO.			HEAT NO.	C66C-1
	HEAT NO.		2.8	BEAN SEAL PART NO.	23290-328-01
	BONNET INSERT			HEAT NO.	C83B-3
	HEAT NO.		2.9	STEM SEAL PART NO.	213C9-001
	CANNISTER SERIAL NO.			HEAT NO.	LT3G36EY11
	HEAT NO.		2.10	BONNET BOLTING PART NO.	
2.3	STEM PART NO.	23290-254-06		HEAT NO.	
	SERIAL NO.	189044-1-2		HEAT NO.	
	HEAT NO.	LT2156EY12	2.11	ACTUATOR TO BONNET BOLTING PN.	
2.4	FLOW RING PART NO.	23290-250-01		HEAT NO.	
	SERIAL NO.	186319-2-10		ACTUATOR TO BONNET BOLTING PN.	
	HEAT NO.	247058		HEAT NO.	
2.5	BALANCE SLEEVE PART NO.	23290-431-02			
	SERIAL NO.	186268-01-01	2.12	NOZZLE PART NO.	23290-243-01
	HEAT NO.	04684		SERIAL NO.	183551-1-4
2.6	STEM STUD PART NO.				
	SERIAL NO.		2.13	SEAT PART NO.	23290-341-03
	HEAT NO.			SERIAL NO.	191147-1-4

3.0 CLAMP ASSEMBLY TRACEABILITY: PN:

WO:

3.1	LARGE SEGMENT HT NO.		3.3	CLAMP PINS	
	SMALL SEGMENT HT NO.			HEAT NO.	
	SMALL SEGMENT HT NO.			HEAT NO.	
3.1	CLAMP STEM HEAT NO.				

4.0 ACUTATOR TRACEABILITY

4.1	ACTUATOR HOUSING PN		4.4	CYLINDER BARREL PN	
	HEAT NO.			HEAT NO.	
4.2	BEARING HOUSING PN		4.5	CYLINDER CAP PART NO.	
	HEAT NO.			HEAT NO.	
4.3	PISTON PART NO.		4.6	LVDT PART NO.	
	HEAT NO.			SERIAL NO.	

White copy - to QA for databook

Yellow copy - to W.O. folder

HUNTINGTON ALLOYS CORPORATION

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

CERTIFIED MATERIAL TEST REPORT

HA ORDER NO./ITEM 300018087 1

DATE 04/17/09

INSPECTED BY

HA/SHC

MARK ORDER NO.

HOV-601825-01

DESCRIPTION OF MATERIAL

INGONEL ALLOY 718 HOT FIN END ROUGH GRD OR ROUGH T SOL ANN & AGE HI

QUANTITY 6.330 LBS

CHARGE ORDER NO.

HOV-601825-01

DESCRIPTION OF MATERIAL

INGONEL ALLOY 718 HOT FIN END ROUGH GRD OR ROUGH T SOL ANN & AGE HI

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QUANTITY 6.330 LBS

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THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLINGS INSPECTIONS AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE TEST REPORT REPRESENTS THE ACTUAL ATTRIBUTES OF THE MATERIAL FURNISHED AND THE VALUES SHOWN ARE CORRECT AND TRUE. THE MATERIAL DESCRIBED BY THIS CERTIFICATE IS IN FULL COMPLIANCE WITH ALL ORDER AND INSPECTION REQUIREMENTS. WE HEREBY CERTIFY THAT THE BELOW FIGURES ARE IN ACCORDANCE WITH THE SPECIFIED CONTRACT REQUIREMENTS.

REV. 004

*****THIS REPORT RELATES ONLY TO THE ITEM(S) TESTED AND MAY NOT BE REPRODUCED EXCEPT IN FULL.*****
SPECIFICATIONS: HOWCO PURCHASE SPECIFICATION HG 718 BAR REV 5 (GRADE 125)\
SMC HA 79 REV 7 (GRADE 125)\
NACE MR0175-ISO 15156-3 1ST EDITION\
API 6A718 1ST EDITION (MAR 2004)\SMC QCP 285 REV 2\
SMC QCP 332 REV 1\
QUALITY SYSTEM CERTIFICATION: ISO 9001:2000 (ABS-QE CERT. 30125);
EN 10 204/DIN 50049 (TYPE 3.1)

MTR APPROVED

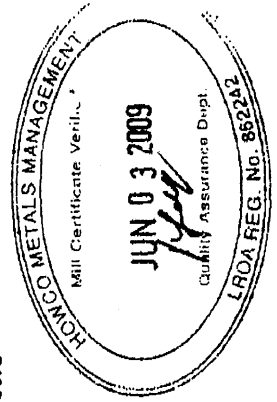
BY JB DATE March 02/10

HEAT#	C	FE	SI	CU	TA	NI	CR	AL
LT2156EY	0.016	17.95	0.09	0.08	53.40	0.008	18.66	0.52
	1.01	0.25	5.05	<0.01	0.008	0.008	0.002	0.001
	<0.1	<0.1	5.05					

TO CONVERT PPM TO WT.X, MOVE DECIMAL POINT FOUR PLACES TO THE LEFT.
MELT METHOD: DUVAC (VIM ELECTRODE; VAR INGOT)

PO 189044
WO 1026030
PN 23290-254-06
HT LT2156EY 12
SN 189044-1-#1 to #11

HEAT/LOT	QUANTITY	HARDNESS	GRAIN SIZE	YIELD STRENGTH	TENSILE STRENGTH	ELONGATION
LT2156EY 12	75 PCS	36.4	2"	1787	29.0	43.6
ROOM TEMP-	-AS SHIPPED	35.4				
HARDNESS -HRC	-AS SHIPPED	36.1				
HARDNESS -HRC	-AS SHIPPED	36.2				
HARDNESS -HRC	-AS SHIPPED	34.7				
HARDNESS -HRC	-AS SHIPPED	35.4				



HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY
HEAT NO. LT2156EY 12
SO NO. 36219
O. NO. 8413
AUTH. SIGNATURE: [Signature]
DATE: 10/13/09
FOR HOWCO METALS MANAGEMENT PAGE 1 OF 1

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

HUNTINGTON, WEST VIRGINIA 25705-1771

NOTE: THE RECORDING OF FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTE.

SOUTHERN U.S.

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 641329
HOUSTON, TX 77264-1329

CERTIFIED MATERIAL TEST REPORT				No.
HA ORDER NO./ITEM	DATE	PAGE	OF	80609
300018087 1	04/17/09	2	9	
QUANTITY	INSPECTED BY			
6330 LBS	HA/SNC			
CHANGE ORDER NO.	MARK ORDER NO.			
HOU-601825-01	HOU-601825-01			
DESCRIPTION OF MATERIAL	INCONEL ALLOY 718 HOT FIN END ROUGH GRD OR ROUGH T SOL ANN & AGE HI			
WEIGHT	1.5000 IN 144-288 IN NOM			

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REV. 808

HARDNESS -HRC	-AS SHIPPED	35.8
HARDNESS -HRC	-AS SHIPPED	34.2
HARDNESS -HRC	-AS SHIPPED	35.4
HARDNESS -HRC	-AS SHIPPED	35.6
HARDNESS -HRC	-AS SHIPPED	35.6
HARDNESS -HRC	-AS SHIPPED	35.0
HARDNESS -HRC	-AS SHIPPED	36.5
HARDNESS -HRC	-AS SHIPPED	36.0
HARDNESS -HRC	-AS SHIPPED	36.1
HARDNESS -HRC	-AS SHIPPED	35.3
HARDNESS -HRC	-AS SHIPPED	36.0
HARDNESS -HRC	-AS SHIPPED	36.0
HARDNESS -HRC	-AS SHIPPED	33.8
HARDNESS -HRC	-AS SHIPPED	36.1
HARDNESS -HRC	-AS SHIPPED	36.7
HARDNESS -HRC	-AS SHIPPED	34.8
HARDNESS -HRC	-AS SHIPPED	34.6
HARDNESS -HRC	-AS SHIPPED	36.2
HARDNESS -HRC	-AS SHIPPED	35.3
HARDNESS -HRC	-AS SHIPPED	34.7
HARDNESS -HRC	-AS SHIPPED	34.2
HARDNESS -HRC	-AS SHIPPED	34.6
HARDNESS -HRC	-AS SHIPPED	35.5
HARDNESS -HRC	-AS SHIPPED	34.7
HARDNESS -HRC	-AS SHIPPED	35.4
HARDNESS -HRC	-AS SHIPPED	36.0
HARDNESS -HRC	-AS SHIPPED	35.2
HARDNESS -HRC	-AS SHIPPED	34.1
HARDNESS -HRC	-AS SHIPPED	35.7
HARDNESS -HRC	-AS SHIPPED	35.6
HARDNESS -HRC	-AS SHIPPED	36.2
HARDNESS -HRC	-AS SHIPPED	35.2
HARDNESS -HRC	-AS SHIPPED	35.4
HARDNESS -HRC	-AS SHIPPED	35.7

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

8-17

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

SOUTHERN U.S.
ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77284-1329

HUNTINGTON, WEST VIRGINIA 25705-1771

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HA ORDER NO. 300018067 1		DATE 04/17/09	NO. 80609
QUANTITY 6330 LBS		INSPECTED BY HA/SNC	PAGE 3 OF 9
CHARGE ORDER NO. HOU-601825-01		MARK ORDER NO. HOU-601825-01	
DESCRIPTION OF MATERIAL INCONEL ALLOY 718		HOT FIN END ROUGH GRD OR ROUGH T SOL ANN & AGE HI	
WEIGHT 1.5000 IN 144-288 IN NOM			

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REV. 808

HARDNESS -HRC	-AS SHIPPED	35.4
HARDNESS -HRC	-AS SHIPPED	36.9
HARDNESS -HRC	-AS SHIPPED	33.7
HARDNESS -HRC	-AS SHIPPED	35.1
HARDNESS -HRC	-AS SHIPPED	34.8
HARDNESS -HRC	-AS SHIPPED	36.0
HARDNESS -HRC	-AS SHIPPED	34.8
HARDNESS -HRC	-AS SHIPPED	35.6
HARDNESS -HRC	-AS SHIPPED	35.1
HARDNESS -HRC	-AS SHIPPED	35.0
HARDNESS -HRC	-AS SHIPPED	36.5
HARDNESS -HRC	-AS SHIPPED	36.3
HARDNESS -HRC	-AS SHIPPED	35.0
HARDNESS -HRC	-AS SHIPPED	34.3
HARDNESS -HRC	-AS SHIPPED	35.3
HARDNESS -HRC	-AS SHIPPED	36.3
HARDNESS -HRC	-AS SHIPPED	35.8
HARDNESS -HRC	-AS SHIPPED	35.8
HARDNESS -HRC	-AS SHIPPED	34.1
HARDNESS -HRC	-AS SHIPPED	33.7
HARDNESS -HRC	-AS SHIPPED	35.6
HARDNESS -HRC	-AS SHIPPED	36.2
HARDNESS -HRC	-AS SHIPPED	35.9
HARDNESS -HRC	-AS SHIPPED	35.7
HARDNESS -HRC	-AS SHIPPED	33.9
HARDNESS -HRC	-AS SHIPPED	35.7
HARDNESS -HRC	-AS SHIPPED	34.8
HARDNESS -HRC	-AS SHIPPED	34.7
HARDNESS -HRC	-AS SHIPPED	34.5
HARDNESS -HRC	-AS SHIPPED	35.5
HARDNESS -HRC	-AS SHIPPED	34.9
HARDNESS -HRC	-AS SHIPPED	36.5

HARDNESS-HRC-AS SHIPPED 02 0'CLOCK

06 0'CLOCK

10 0'CLOCK

HOWCO METALS MANAGEMENT
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PAGE 3 OF 17
HT #

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

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SOUTHERN U.S. D

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HUNTINGTON, WEST VIRGINIA 25705-1771

CERTIFIED MATERIAL TEST REPORT		No. 80601
HA ORDER NO./ITEM	DATE	PAGE
300018087 1	04/17/09	4 OF 9
QUANTITY	INSPECTED BY	
6330 LBS	HA/SMC	
CHARGE ORDER NO.	MARK ORDER NO.	
HOU-601825-01	HOU-601825-01	
DESCRIPTION OF MATERIAL	HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HI	
1.5000 IN 144-288 IN NOM		

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REV. 808

OD	MR	CEN	OD	MR	OD	MR
37.3	37.1	38.3	37.4	37.9	37.2	37.7

GRAIN SIZE-AS SHIPPED AGS ASTM NO. 3. (PHOTOS ATTACHED)

NORMAL - LONG

GRAIN SIZE-AS SHIPPED AGS ASTM NO. 3.

NORMAL - LONG

GRAIN SIZE-AS SHIPPED AGS ASTM NO. 3.

NORMAL - LONG

IMPACT RESULTS-AS SHIPPED

SPECIMEN SIZE 10MM X 10MM

IMPACT RESULTS-AS SHIPPED

SPECIMEN SIZE 10MM X 10MM

IMPACT RESULTS-AS SHIPPED

SPECIMEN SIZE 10MM X 10MM

DEG F- 75	080.50 FT/LBS	LATERAL EXPANSION	0.039 IN	XSHEAR	30 LONG
DEG F- 75	083.20 FT/LBS	LATERAL EXPANSION	0.040 IN	XSHEAR	35 LONG
DEG F- 75	083.00 FT/LBS	LATERAL EXPANSION	0.043 IN	XSHEAR	35 LONG
	62.20 IMPACT AVG.				

YIELD STRENGTH WAS DETERMINED USING A STRESS STRAIN CURVE

MACROETCH GRADED PER ASTM A604 AND RATED AS FOLLOWS:

CLASS 1	SEVERITY	HEAD	TOE
CLASS 2	SEVERITY	A	A
CLASS 3	SEVERITY	A	A
CLASS 4	SEVERITY	A	A

MICROSTRUCTURE TEST(S): SATISFACTORY (PHOTOS ATTACHED)

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PAGE 4 OF 17

III 4

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

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SOUTHERN U.S. ATTN: JODY BRITTAN HOWCO METALS MANAGEMENT LP 9611 TELGE RD HOUSTON, TX 77095		D HUNTINGTON, WEST VIRGINIA 25705-1771	
HOWCO METALS MANAGEMENT LP P O BOX 841329 HOUSTON, TX 77284-1329		CERTIFIED MATERIAL TEST REPORT NO. 80609 HA ORDER NO. 300018087 1 DATE 04/17/09 QUANTITY 6330 LBS INSPECTED BY HA/SMC CHARGE ORDER NO. HOU-601625-01 MARK ORDER NO. HOU-601625-01 DESCRIPTION OF MATERIAL INCONEL ALLOY 718 PART NO. 1.5000 IN 144-288 IN NOM	

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REV. 008

FORM H-2245 HUNTINGTON ALLOYS CORPORATION

ULTRASONIC TEST REPORT

FORM H2245 IS COMPOSED OF THREE SECTIONS FOR EACH HEAT/LOT REPORTED.
SECTION I IS PRINTED ONE TIME FOR EACH HEAT AND LOT
SECTION II MAY BE PRINTED MULTIPLE TIMES FOR EACH HEAT AND LOT.
SECTION III IS PRINTED ONE TIME FOR EACH HEAT AND LOT.

SECTION <<I>>

HEAT/LOT: LT2156EY12 MATERIAL TESTED 04/09/09 BY NICK MYERS

SERIAL #: N/A

PIECE #: N/A

1. IAI IDENTIFICATION:

(A) SNT-TC-1A-LEVEL: II

(B) MIL-STD-2132: INSPECTOR

2. TESTED MATERIAL

75 PIECE(S) WERE TESTED PRIOR TO CUT LGTH/WDTH AT FINAL CROSS SECTION
YIELDING 75 PIECE(S) FOR SHIPMENT AFTER CUTTING

3. PROCEDURE

APPROVED PROCEDURE NUMBER, REVISION NUMBER, APPLICABLE SPECIFICATIONS
AND/OR CONTRACTUAL REQUIREMENTS WHICH WERE USED FOR THE EXAMINATION ARE
FOUND IN THE SPECIFICATION BLOCK AND REMARKS SECTION OF THE MATERIAL TEST REPORT.

QCP #: 332 QCP-REV: 1 DATED: 12/08/03

4. EXAMINATION CONDITIONS:

TEST METHOD: AUTOMATIC IMMERSION

COUPLANT: WATER

SCANNING EQUIPMENT: TANK BRIDGE SCANNER TUBE, BAR, OR PLATE FOLLOWER

SCANNING SPEED (INCHES PER SECOND): 25

SECTION <<II>> HEAT/LOT: LT2156EY12

(A) TEST MODE: LONGITUDINAL

(B) WAVE PROPGATION: NORMAL

(C) INSTRUMENT MANUFACTURER: SONIC

(D) SERIAL NUMBER: 237P-196PB

(E) LINEARITY CALIBRATION DATE: 04/06/09

(F) SEARCH UNIT MANUFACTURER/SERIAL NUMBER: HARRISONIC/E6538

(G) FREQUENCY (MHZ): 5.00

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

PAGE 5 OF 17

HT #

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

SOUTHERN U.S.
ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP
9611 TELCE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77284-1329

HUNTINGTON, WEST VIRGINIA 25705-1771

CERTIFIED MATERIAL TEST REPORT				No.	80609
HA ORDER NO./ITEM	DATE	PAGE	OF		
300018087 1	04/17/09	6	9		
QUANTITY	INSPECTED BY				
6330 LBS	HA/SMC				
CHARGE ORDER NO.	MARK ORDER NO.				
HOU-601825-01	HOU-601825-01				
DESCRIPTION OF MATERIAL					
INCONEL ALLOY 718					
1.5000 IN 144-288 IN NOM					

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REV 008

FOR T SOL ANN & AGE HI

- (H) SIZE (INCHES): .500
- (I) TYPE: SINGLE FOCUSED CYLINDRICAL
- (J) FOCAL LENGTH (IN): 2
- (K) CABLE LENGTH (FT): 6
- (L) ATTENUATION CORRECTION DB:000
- (M) REFERENCE AMPLITUDE: XFS:80
- (N) ALARM/EVAL LEVEL XCAL:50 X BR LOSS:50
- (O) REJECT: OFF
- (P) DISTANCE AMPLITUDE CORRECTION: YES
- (Q) AREA GATED:
- FRONT SURFACE TO BACK REFLECTION
- BACK REFLECTION
- CALIBRATION STANDARD(S):
- (A) W763.
- (S) FLAT BOTTOM HOLE(S):
- (A) DIAMETER: .0640 TEST METAL DISTANCE:0.755 DEPTH:
- (T) NOTCHES):

SECTION <<II>> HEAT/LOT:LT2156EY12 PART:02 OF 02.

S. (A) TEST MODE: SHEAR

(B) WAVE PROPGATION: CIRCUMFERENTIAL ONE-DIRECTION

(C) INSTRUMENT MANUFACTURER: SONIC MODEL:237

(D) SERIAL NUMBER: 237-157PA

(E) LINEARITY CALIBRATION DATE: 01/06/09

(F) SEARCH UNIT MANUFACTURER/SERIAL NUMBER: GE/01MTW7

(G) FREQUENCY (MHZ): 5.00

(H) SIZE (INCHES): .750

(I) TYPE: SINGLE FOCUSED CYLINDRICAL

(J) FOCAL LENGTH (IN): 2

(K) CABLE LENGTH (FT): 6

(L) ATTENUATION CORRECTION DB:000

(M) REFERENCE AMPLITUDE: XFS:80

(N) ALARM/EVAL LEVEL XCAL:50

(O) REJECT: OFF

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

6 of 17

HUNTINGTON ALLOYS CORPORATION A Special Metals Company

NOTE: THE RECORDING OF FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTE.

HUNTINGTON, WEST VIRGINIA 25705-1771

SOUTHERN U.S. D

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77264-1329

HA ORDER NO./ITEM		DATE	PAGE	No.
300018087 1		04/17/09		
QUANTITY		INSPECTED BY		
6330 LBS		HA/SNC		
CHARGE ORDER NO.		MARK ORDER NO.		
HOU-601825-01		HOU-601825-01		
DESCRIPTION				
INCONEL ALLOY 718 HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HI				
WEIGHT				
1.5000 IN 144-288 IN NOM				

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING INSPECTIONS AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE TEST REPORT REPRESENTS THE ACTUAL ATTRIBUTES OF THE MATERIAL FURNISHED AND THE VALUES SHOWN ARE CORRECT AND TRUE. THE MATERIAL DESCRIBED BY THIS CERTIFICATE IS IN FULL COMPLIANCE WITH ALL ORDER AND INSPECTION REQUIREMENTS. WE HEREBY CERTIFY THAT THE BELOW FIGURES ARE IN ACCORDANCE WITH THE SPECIFIED CONTRACT REQUIREMENTS.

REV. 808

(P) DISTANCE AMPLITUDE CORRECTION: NONE

(Q) AREA GATED:

FRONT SURFACE TO 1.25 NODE TWD

(R) CALIBRATION STANDARD(S):

NOT APPLICABLE

(S) FLAT BOTTOM HOLE(S):

NOT APPLICABLE

(T) NOTCH(ES):

NOT APPLICABLE

SECTION <III> HEAT/LOT: LT2156EY12

6. SURFACE FINISH CALIBRATION STANDARD: NO SMOOTHER THAN MATERIAL

SURFACE FINISH MATERIAL: LESS THAN 250 RHR.

7. ULTRASONIC EVALUATION OF WALL THICKNESS: N/A

8. INSPECTED MATERIAL ACCEPTED: YES

REPORTABLE INDICATIONS: NONE

9. REMARKS:

TRANSDUCER SN-E6538, MODEL-14-0508-T, GRAIN- 56.2 DB.
TRANSDUCER SN-01TM7, MODEL-ALPHA, ANGLE 45, GAIN- 62.4 DB.
THE ULTRASONIC TESTING PERFORMED IN ACCORDANCE WITH QCP 332
REFERENCED ABOVE AND DETAILED IN THIS REPORT MEETS AND FULLY
SATISFIES ALL ULTRASONIC TEST REQUIREMENTS OF QCP 285 REV. 2
AS WELL.

10. PITCH DATA: PITCH VALUE: 0.1875 IN

HEAT TREATMENT FURNANCES ARE CALIBRATED TO AMS 2750, AS REQUIRED BY MIL-H-6075.

NO WELD REPAIR HAS BEEN PERFORMED ON THIS MATERIAL.

ACTUAL HOT WORKING REDUCTION RATIO: 1600:1
REHEAT INGOT SIZE: 20"

QUALIFICATION TEST COUPON WAS A PROLONGATION CUT FROM PRODUCTION MATERIAL AFTER HEAT TREATMENT.

HEAT TREAT FURNANCE WAS MONITORED BY HEAT SINK THERMOCOUPLES.

HEAT SINK REQUIREMENTS OF API 6A INCLUDING EQUIVALENT ROUND WERE SATISFIED.

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

PAGE 7 OF 17

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

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SOUTHERN U.S.

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HUNTINGTON, WEST VIRGINIA 26005-1771

CERTIFIED MATERIAL TEST REPORT		No.	80611
HA ORDER NO./ITEM	300010087 1	DATE	04/17/09
QUANTITY	6330 LBS	INSPECTED BY	HA/SNC
CHARGE ORDER NO.	HOU-601825-01	MARK ORDER NO.	HOU-601825-01
DESCRIPTION OF MATERIAL	INCONEL ALLOY 718	HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HI	
	1.5000 IN 144-288 IN NON		

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING INSPECTIONS AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE TEST REPORT REPRESENTS THE ACTUAL ATTRIBUTES OF THE MATERIAL FURNISHED AND THE VALUES SHOWN ARE CORRECT AND TRUE. THE MATERIAL DESCRIBED BY THIS CERTIFICATE IS IN FULL COMPLIANCE WITH ALL ORDER AND INSPECTION REQUIREMENTS. WE HEREBY CERTIFY THAT THE BELOW FIGURES ARE IN ACCORDANCE WITH THE SPECIFIED CONTRACT REQUIREMENTS.

REV. 008

FOR ALL PRODUCTS 3/4" DIA & OVER, TENSILE TEST SPECIMENS WERE .500 GA. DIA. X 2" GA. LENGTH STANDARD
ASTM E8 SPECIMENS.

CHEMISTRY IS REPORTED FROM REMELTED INGOT.

MATERIAL HEAT TREAT: SOL ANN 1805 DEG. F. FOR 1 HOUR AND 5 MINUTES. WATER QUENCHED.
QUENCH TEMP: IN 79 DEG. F.; END 82 DEG. F.
AGED: HEATED 7 HOURS AT 1450 DEG. F. AIR COOLED.
HEAT TREAT CHARTS ATTACHED.

MATERIAL CAPABLE OF MEETING THE LIQUID PENETRANT REQUIREMENTS OF THE ORDER AFTER ADEQUATE SURFACE PREPARATION BY THE CUSTOMER TO PERFORM A VALID TEST.

ULTRASONICALLY TESTED AND ACCEPTABLE TO API 6A CLAUSES 7.4.2.3.15 AND 7.4.2.4.11 AND SATISFACTORY PER IAI QCP 285.

MICROSTRUCTURE SPECIMENS HAVE BEEN REMOVED FROM BAR PROLONGATIONS OBTAINED FROM EVERY HEAT TREAT LOT AFTER FINAL HEAT TREATMENT. A HEAT TREAT LOT CONSIST OF BARS FROM THE SAME REMELT INGOT, OF THE SAME SIZE (EXCEPT LENGTH) AND PROCESSED IN THE SAME FURNACE LOADS FOR BOTH ANNEALING AND AGING.

MICROSTRUCTURE SPECIMENS HAVE BEEN EXAMINED FROM LOCATIONS OF BAR PROLONGATION REPRESENTING NEAR SURFACE, MID-RADIUS AND CENTER LOCATIONS AND CONFIRMS ABSENCE OF TOPOLOGICAL DUPLEX GRAIN SIZE (I.E. CROSS-SECTION CONDITION, NECKLACE CONDITION AND BANDING) PER ASTM E1181; MATERIAL IS FREE FROM LAVES PHASE; MATERIAL IS FREE OF CONTINUOUS GRAIN BOUNDARY NETWORKS OF SECONDARY PHASES (E.G. DELTA PHASE, CARBIDES); ASSESSMENT OF DELTA PHASE CONTENT EQUAL TO OR BETTER THAN LEVEL 2/D2; NO INDIVIDUAL GRAINS FOUND TO BE COMPLETELY SURROUNDED WITH ACICULAR DELTA; INDIVIDUAL OR ISOLATED GRAINS CONTAINING ACICULAR DELTA NOT REPRESENTATIVE OF THE BULK MICROSTRUCTURE IS NOT A CAUSE FOR

HOWCO METALS MANAGEMENT
THIRD TRUE COPY

8.17

HUNTINGTON ALLOYS CORPORATION

A Special Metals Company

NOTE: THE RECORDING OF FALSE EVIDENCES OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTE.

SOUTHERN U.S.

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77284-1329

D HUNTINGTON, WEST VIRGINIA 25705-1771

CERTIFIED MATERIAL TEST REPORT		No.	80609
HA ORDER NO./ITEM	DATE	PAGE	OF
300018087 1	04/17/09	9	9
QUANTITY	INSPECTED BY		
6330 LBS	HA/SMC		
CHARGE ORDER NO.	WORK ORDER NO.		
HOU-601825-01	HOU-601825-01		
DESCRIPTION OF MATERIAL	MARK		
INCONEL ALLOY 718	HOT FIN RND		
1.5000 IN 144-288 IN NOM			

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLINGS INSPECTIONS AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE TEST REPORT REPRESENTS THE ACTUAL ATTRIBUTES OF THE MATERIAL FURNISHED AND THE VALUES SHOWN ARE CORRECT AND TRUE. THE MATERIAL DESCRIBED BY THIS CERTIFICATE IS IN FULL COMPLIANCE WITH ALL ORDER AND INSPECTION REQUIREMENTS. WE HEREBY CERTIFY THAT THE BELOW FRAMES ARE IN ACCORDANCE WITH THE SPECIFIED CONTRACT REQUIREMENTS.

REV. 808

HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HI

REJECTION; ISOLATED AREAS NOT REPRESENTATIVE OF THE BULK MICROSTRUCTURE IS NOT A CAUSE FOR REJECTION.

TOTAL OF ALL CHEMICAL ELEMENTS NOT REPORTED IS CONSIDERED RESIDUAL, AND DOES NOT EXCEED. 0.50%.

CALCIUM AND MAGNESIUM WERE INTENTIONALLY ADDED. COLUMBIUM (CB) EQUALS NIOBIUM (NB).

THE MAXIMUM AND MINIMUM DIAMETERS IN THE HEAT TREAT BATCH ARE WITHIN 2 INCHES.

SMC-HA WAS THE MELTING SOURCE AND TESTING FACILITY.

COUNTRY OF ORIGIN: MELTED AND MANUFACTURED IN THE USA

VISUAL AND DIMENSIONAL EXAMINATION SATISFACTORY.

MATERIAL, WHEN SHIPPED, IS FREE FROM CONTAMINATION BY MERCURY, RADIUM, ALPHA SOURCE, & LOW MELTING ELEMENTS

"CHEMICAL ANALYSIS AS REQUIRED FOR CARBON, SULFUR, NITROGEN OR OXYGEN IS PERFORMED BY COMBUSTION TECHNIQUES. ALL OTHER REPORTED ELEMENTS ARE ANALYZED BY X-RAY AND/OR EMISSION SPECTROSCOPY."

"QUALITY SYSTEM MEETS REQUIREMENTS OF DIRECTIVE 97/23/EC (PRESSURE EQUIPMENT DIRECTIVE), ANNEX 1, CHAPTER 4.3 PER ABS GROUP LTD CERTIFICATE 41734 (EXPIRES JULY 31, 2011)."

AUTHORIZED QUALITY CERTIFICATION REPRESENTATIVES :

W.E. BOKEN, P.D. CUSTER, M.A. MORRISON, P. WAUGH, D.K. MILLER

J. D. Custer

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

9.17

NONDESTRUCTIVE EXAMINATION REPORT

FIELD REPORT NUMBER

P-001056 Rev 0.

Page: 1 of 1

Client: MASTER FLO

4611-74 AVENUE

EDMONTON, AB T6B 2H5

Location: Nortech Shop

Delivery
11:30am
MAR 30 2010
By *[Signature]*

Date: MAR.30, 2010

Invoice#

Job # 1026030 ✓

P.O.# 190252 ✓

TYPE OF EXAMINATION Visible, Water Washable, Liquid Penetrant Examination

TEST METHOD QAS-03-008 Rev. I

ACCEPTANCE STANDARD QAS-03-008 Rev. I / API 6A PSL 3 ✓

TECHNIQUE DETAILS

1. PROCEDURE NO. PTP-01 IIA

2. EXAMINATION EQUIPMENT: CLEANER:MAGNAFLUX(SKC-S)BATCH#09G16K / WASH:H2O(Surface Temp: 20°C)

Manufacturer: _____ Type: _____ Serial No: _____ Last Calibration: _____

Penetrant: Magnaflux Type: SKL WP1(BATCH#08J13K) Dwell Time: 20 minutes

Developer: Magnaflux Type: SKD S2(BATCH#08L03K) Dwell Time: 20 minutes

3. SURFACE CONDITION: ☒ Clean Bare Metal ☐ As Ground ☒ Machined ☐ Sandblasted ☐ Painted ☐ Loose Scale Removed

EXAMINATION RESULTS & COMMENTS

Visible, Water Washable, Liquid Penetrant Examination was performed on wetted end only of the following: (c/w external threads)

10) P35-15K STEM (PART NUMBER: 23290-254-06 REV. D)

SER#	HT#	HT#	PN#
189044-1-1 ✓	46129 ✓	LT2156EY12 ✓	23290-254-06 REV. D ✓
189044-1-2 ✓	46129	LT2156EY12 ←	
189044-1-3 ✓	46129	LT2156EY12	
189044-1-4 ✓	46129	LT2156EY12	
189044-1-5 ✓	46129	LT2156EY12	
189044-1-6 ✓	46129	LT2156EY12	
189044-1-7 ✓	46129	LT2156EY12	
189044-1-8 ✓	46129	LT2156EY12	
189044-1-9 ✓	46129	LT2156EY12	
189044-1-10 ✓	46129	LT2156EY12	

PO 190252
WO 1026030
PN 23290-254-06
HT 46129 / LT2156EY12
SN 189044-1-1 TO -10

RESULTS:

NO RELEVANT INDICATIONS WERE DETECTED AT TIME OF EXAMINATION. IN ACCEPTANCE WITH QAS-03-008 REV. I AND API 6A PSL 3 ✓

AS PER M-5304

Material: INCONEL 718(TC COATED)WETTED END

Material: AISI 4140(THREADED END)

Q.C. APPROVED
JL 03/31/10

SIGNATURES

CLIENT REPRESENTATIVE* MICHAEL DAY

TECHNICIAN (SIGN) *[Signature]*

TECHNICIAN (PRINT) F.OUELLETTE

CGSB
LEVEL

CGSB
REG.#

SNT-TC-1A
LEVEL

II

ASSISTANT (PRINT) MIKE CARREIRO

NS10-0287

*Client Representative's Signature indicates acceptance of reports and results. Nortech Advanced NDT Ltd. is liable for examination costs only.

Job #

PSL 3 HARDNESS TEST RECORD

P/N: 23290-254-06	PART DESCRIPTION: STEM P35	
W.O. 1026030	DS# —	P.O. 189044

	MATERIAL / E.S.	TOLERANCE
1	INCONEL 718	MIN 32 - MAX 40 HRC
2		MIN MAX

EQUIPMENT USED	VERSITRON	STARRETT	KING	KING	KING
SERIAL NUMBER	7240	6791	VS-49	VS-34	UG-53

[illegible]

COMPLETED BY Jyoti

DATE 4 MAR '10

PAGE 1 OF 1



VALBRUNA

SLATER STAINLESS, INC.

2400 Taylor Street West, P.O. Box 636

Fort Wayne, Indiana USA 46801

Phone: 800-434-2882 Fax: 219-434-2805

Product Certification Report

Report Number: 4406080

Certified on Oct 23, 2008 Page 1 of 1

Order No.	Order Date	Domestic Code			
0802290 006	10/09/08				
Dim 1	Dim 2	Dim 3	Heat ID.	Order No.	Customer Order
4.7500	.0000	.0000	247058	002500	HOU-62810
Product Shape	Product Surface			Customer Grade	
Rounds	HR & Rough Turned			17-4	
Length (Inches)	B/H of Length		Weight		
132.000 Min. 156.000 Max.	408887				

Ship
To

HOWCO METALS MANAGEMENT
9611 TELGE ROAD
HOUSTON, TEXAS 77095

Sold
To

VALBRUNA STAINLESS, INC.
2400 TAYLOR STREET WEST
FORT WAYNE, IN 46802

Lifts: 0080 0081

CONDITION A

ASTMA 564-04

ASMESA 564 01 ED 2002 ADD

AMS 2303E

AMS 5643E

CHEMICAL ANALYSIS

C	Mn	P	S	Si	Cr	Ni	Mo	Cu	N	Co	Ti	Al
0.034	1.60	0.023	0.025	46	15.61	7.73	18	3.15	0.04	0.22	0.01	0.21

TENSILE PROPERTIES

CAPABILITY

HB	TS (PSI)	2XYS (PSI)	YEL(2")	YRA	AGE(F)
429	199200	174500	16.4	51.2	900

MAGNETIC PARTICLE TEST

FREQ SEV

AVG .00 .00

PRODUCTION HEAT TREATMENT

SOL-ANN(F)	SOL-ANN(HR)	QUENCH
1900	8.25	Air

MACRO ASTM E340/E381

MACRO

OK

OK

OK

PERCENT FERRITE

% FERRITE

AVG .8

Electric Furnace melted; AOD refined.

Solution heat treated at 1900 degrees F plus or minus 25 degrees, one hour minimum and air cooled.

Chemical testing performed to one or several of the following ASTM methods: E415, E572, E1019, E1085, E1086.

No mercury or low melting alloy contamination. No weld repair.

Material melted in Italy, manufactured in the United States.

Material conforms to listed specifications.

Quality system is compliant with ISO 9001:2000. Produced in accordance with EN 10204 3.1B.

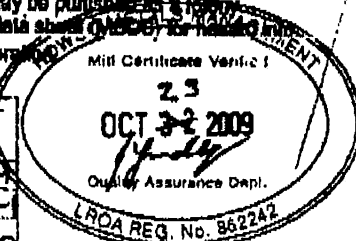
Results relate only to the items tested. Certification shall not be reproduced except in full, without written approval of Valbruna Stainless Inc. The recording of false, fictitious, or fraudulent statements on this document may be punishable under federal statutes, including Federal law, Title 18, Chapter 47. Consult material safety data sheet (MSDS) for handling information. I hereby certify that the reported figures are correct as contained in the records of the corporate laboratory.

Manager Laboratory Services

Dennis Hackett

HOWCO METALS MANAGEMENT	
CERTIFIED TRUE COPY	
HEAT No.	ED No.
247058	35230
AUTH SIGNATURE	P.O. No.
10/23/09	151049
DATE	
10/23/09	
HOWCO METALS MANAGEMENT PAGE 1 OF 3	

MTA APPROVED
BY: [Signature] DATE 12/21/05



SHT 10

WO# 314986

SPECIALTY HEAT TREAT, INC.**CERTIFICATE OF HEAT TREATMENT**

CUST NO: H004
 CUST NAME: HOWCO METALS MANAGEMENT, LP
 CUST ADDR: 9611 TELGE ROAD
 HOUSTON, TX 77095

CUST PH: 281-649-8800/FAX 8900
 CUST PO# HOU-69050 RON MOERS
 CUST REF# HN# 247058

QUANTITY: 3
 LOCATION/DATA: N-13
 DATE RECD: 10/6/09

MATERIAL: 17-4 ANN

WGT: 2,181

DUE DATE: 10/15/09

STICKER #: 18542

DESC: 4 3/4"OD X 1 @ 143 1/2"LG; 1 @ 144 3/4"LG; 1 @ 146 1/2"LG

PROCESS INSTRUCTIONS: HEAT TREAT AND TEST TO SPEC MASTERFLO ES-02-015-001
 OPTION# 2 SECTION 7.3

PROCESSED AS FOLLOWS:

4 3/4" = MCS

CONTROLLED BY FURNACE INSTRUMENT:

PROCESS	TIME	TEMP IN DEG F	COOLING METHOD
AGE HARDEN	2 HOURS	1400	AIR COOLED
AGE HARDEN	4 HOURS	1150	A/C TO AMBIENT

HARDNESS TESTED: CK 6" PROLONGATION (2 PLCS) = 31-32 RC
 CK 1" PC = 32 RC

MECHANICAL PROPERTIES OF A 0.501" DIA TP PER ACCU-TEST LAB#: 442398.0

TENSILE	YIELD .2% OFF	YIELD EUL	ELONG IN 2"	REDUCTION
131,800 PSI	95,000 PSI	PSI	25.4%	63.7%

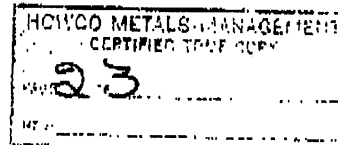
CHARPY IMPACTS 10 X 10 MM

DIRECTION	TEMPERATURE	FT/LBS	MILS LAT EXP	%SHEAR-ED/F
LONGITUDINAL	-50 DEG F	112-96-118	67-56-70	100-100-100

ALL MATERIALS ON THIS ORDER WERE
 PROCESSED IN ACCORDANCE WITH OUR
 QUALITY MANUAL QM REV 4 DATED 1/31/99.

SPECIALTY HEAT TREAT, INC.

BY





P.O. Box 802404 • Houston, TX 77280-2404 • Telephone (713) 460-3655 • FAX (713) 460-3695

Report Date: 10/20/09

Report No: 443088.0

Rev.: A

Cust Acct: HOW284

To: Howco Metals Management, LP
P.O. Box 841329
Houston, TX 77284-1329

Ordered By: PO#: 735491
Material: 17-4 PH SA & Double Aged 4.750"DIA x 140.00" - 144.00" R/L
ID/Heat: 247058 Tag: 399142,399144,399141 Qty: 3
Job Info: Line: 1 PO/Rev# 7190

Ultrasonic Examination Report

Specification: QAS-03-007 Rev.G / ATL-002 Rev.4 All accessible volume
Acceptance Criteria: Same Manual Contact Method
Equipment: Masterscan 340 S/N: 3401581TC
Part Condition: Clean
Couplant: Cellulose

Longitudinal Wave Examination

Transducer: Parametrix Size: 1.0" Freq.: 2.25 MHz
Standardization: 80% FSH DB 50 +6 SN: 558418

Shear Wave Examination

Transducer: Technisonic Size: 50" Freq.: 2.25 MHz Angle: 45°
Standardization: 80% FSH DB 47 +6 SN: J-7492

Comments/Test Notes

DAC established on FBH: 1/8" w/ 3% EDM notch
Cal. Blk. S/N: 17-4-0150-0600 SW Std# 19443-02
Cable RG-59, 75 Ohm BNC 5'.00", 1.8m
Examination from OD

No. Pcs. Tested: 3

No. Pcs. Accepted: 3

No. Recordable Ind.: 0

No. Rejected: 0

Operator: Kevin Mouton

SNT Level: II

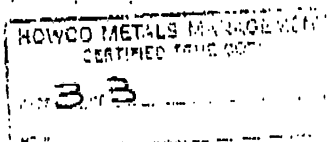
Signed: Kevin Mouton

KEVIN D. MOUTON

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Page No: 1

This report contains 1 page(s)



NONDESTRUCTIVE EXAMINATION REPORT

FIELD REPORT NUMBER

P- 000495 Rev 0.

Page: 1 of 1

Date: DEC.18, 2009

Client: PENN UNITED

196 Alwine Road

Saxonburg, PA 16056

Location: Nortech Shop

Invoice#

Job #

P.O.# 157108

TYPE OF EXAMINATION Fluorescent Water Washable, Liquid Penetrant Examination

TEST METHOD QAS-03-008 Rev. G

ACCEPTANCE STANDARD QAS-03-008 Rev. G / API 6A PSL 3

TECHNIQUE DETAILS

1. PROCEDURE NO. PTP-01 IA

2. EXAMINATION EQUIPMENT:

Manufacturer: Spectrolinc Type: SB 100 PXR Serial No: 1715755 Last Calibration: 10/22/09

Penetrant: Magnaflux Type: ZL-60D/Batch# 08C 12K Dwell Time: 20 minutes

Developer: Magnaflux Type: ZP-9F/Batch # 06H 09K Dwell Time: 20 minutes

3. SURFACE CONDITION: ☐ Clean Bare Metal ☐ As Ground ☐ Machined ☐ Sandblasted ☐ Painted ☐ Loose Scale Removed

EXAMINATION RESULTS & COMMENTS

Fluorescent Water Washable, Liquid Penetrant Examination was performed on TC INSERT only of the following:

12) P35-15K FLOW RING (Part Number: 23290-250-01 REV.E)

SER#	WO	HT#	OP#
------	----	-----	-----

186319 LN2-1	927918/1	247058	560
--------------	----------	--------	-----

THRU TO

186319 LN2-12

RESULTS:

NO RELEVANT INDICATIONS WERE DETECTED AT TIME OF EXAMINATION. IN ACCEPTANCE

WITH QAS-03-008 REV. G, AND API 6A PSL 3

Surface Temperature: 19.5°C

Material: 17-4(CARRIER)

Material: PUC-5S(INSERT)

AS PER M-03359

SIGNATURES

CLIENT REPRESENTATIVE* MIKE HITE

TECHNICIAN (SIGN)

TECHNICIAN (PRINT) MIKE CARREIRO

CQSB
LEVEL

CQSB
REQ.#

SNT-TC-1A
LEVEL 2

ASSISTANT (PRINT)

NS09-0264

Job #

*Client Representative's Signature indicates acceptance of reports and results. Nortech Advanced NDT Ltd. is liable for examination costs only.

PSL 3 HARDNESS TEST RECORD

P/N: 23290-250-01	PART DESCRIPTION: FLOW RING P35	
W.O. —	DS# —	P.O. 186319

	MATERIAL / E.S.	TOLERANCE
1	UNS 8 17400	MIN 24 — MAX 33 HRC
2		MIN — MAX

EQUIPMENT USED	VERSITRON	STARRETT	KING	KING	KING
SERIAL NUMBER	✓ 7240	6791	VS-49	VS-34	UG-53

SERIAL NUMBER	HEAT #	RESULT <i>HRe</i>	NOTES
186319-2-1	247058	26	
-2		27	
-3		26	
-4		28	
-5		27	
-6		25	
-7		26	
-8		25	
-9		26	
-10		25	
-11	29		
186319-2-12	247058	27	

Q.C. APPROVED

BY NS/URMIL DATE 21 Dec '09

PO 186319

WO —

PN 23290-250-01

HT 247058

SN 186319-2-1 to 12

COMPLETED BY NS/URMIL DATE 21 Dec '09 PAGE 1 OF 1

BALANCE SLEEVE

FORONI S.p.A. 21055 Gorta Minore (VA) Italia		  		CERTIFIED MATERIAL TEST REPORT Inspection certificate EN 10204-3.1		Cert. n° 2008/1764 Rev. 0 Date 9/10/2008																																																																																																																																																																												
Customer: FORONI METALS OF TEXAS, INC. Material: UNS S39277; AF 918 Gr. 2.		Order n°: 08 056 + Order confirmation Delivery condition: Forged, solution annealed and peeled.		Item: 2																																																																																																																																																																														
Specifications: 918-TDS Rev.1; ASTM A182-08a; ASME/07 SA182; SA479-06a; NACE MR0175/ISO 15156-3:2005/Cir.1:2007; (*Chemical and mechanical properties only)																																																																																																																																																																																		
Heat Treatment: - Solution annealing at 2048°F x 30/finch - W.Q. - Furnace calibration in accordance with AMS-H-6875A.		Lot n°:		CIT n°:		Description: R.P. Bars N° of pieces 8																																																																																																																																																																												
Steel making process: E.A.F./A.O.D.		Size 5.25 inches		Weight 12070 Lbs		Bar identification: 19 to 26																																																																																																																																																																												
Length inches 16.5		Forging ratio: 16.5																																																																																																																																																																																
Chemical analysis		Mechanical properties		Other properties		Results:																																																																																																																																																																												
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ULTRASONIC EXAMINATION REPORT

FIELD REPORT NUMBER

U - No 000448

Page: 1 of 1

Date: OCTOBER 29, 2009

Client: SPIRIT MACHINE

P.O. #: 186240-MF

Job #:

Location: EDMONTON, AB

ITEM EXAMINED AS LISTED BELOW

TEST METHOD ASME VART 23 / QAS-03-007 REV G.

ACCEPTANCE STANDARD QAS-03-007 REV G / API 6A 17th ED PSL 3

TECHNIQUE DETAILS

1. PROCEDURE NO. UTP-04 REV 0

2. ULTRASONIC INSTRUMENT

Manufacturer: PANAMETRICS

Manufacturer:

Manufacturer:

Serial No.:

091276307

Type: AL045 # 677295 / C106 # 676894

Type: 6' BNC TO BNC / BNC TO MICRODOT

Type: EPOCH XT

Last Calibration: 7/21/2009

3. COUPLANT: SONOTECH UT-X

4. SURFACE CONDITION: ☒ Clean Bare Metal ☐ As Ground ☒ Machined ☐ Sandblasted ☐ Painted ☐ Loose Scale Removed

5. CALIBRATION BLOCK (S): MINI LW # 19292 / ASTM FBH # 225-19, 24, 26

SCAN TYPE (degree)	PROBE	SIZE (mm)	FREQUENCY (MHz)	PRIMARY RESPONSE (%)	RANGE (mm)	SCAN (dB)
0	Single	12.7	2.25	11.0 @ 80% FBH	250	+18
0	↓	25.4	↓	13.0 @ 80% FBH	500	↓

EXAMINATION RESULTS & COMMENTS

ULTRASONIC VOLUMETRIC EXAMINATION PERFORMED ON 100% OF THE FOLLOWING:

MAT TEMP: 20.6 °C

5) 2.5" Ø x 18.625" 17-4 MATERIAL BAR STOCK HT# 331920
 5) 2.5" Ø x 14.5" 17-4 MATERIAL BAR STOCK HT# 238679
 12) 5.3" Ø x 3.35" SUPER DUPLEX MAT. BAR STOCK HT# 04684
 2) 6.25" Ø x 2.675" INC. 625 MAT. BAR STOCK HT# 320846
 1) 5.0" Ø x 8.20" INC. 718 MAT. BAR STOCK HT# LT 194754 II//
 2) 4.75" Ø x 7.250" 17-4 MAT. BAR STOCK HT# 331874
 1) 5.030" Ø x 8.650" 17-4 MAT. BAR STOCK HT# 421107

RESULTS: NO REJECTABLE REFLECTORS @ TIME OF EXAMINATION

SIGNATURES

CLIENT REPRESENTATIVE

TECHNICIAN (SIGN)

TECHNICIAN (PRINT)

ASSISTANT (PRINT)

CGSB LEVEL

2

CGSB REG #

12290

SNT-TC-1A LEVEL

2

Job #

* Clients Representative's Signature indicates acceptance and results. Nortech Advanced NDT Ltd. is liable for examination costs only.



ISO 9001:2000
REGISTERED (Alberta)

Nondestructive Inspection Report

Customer: Spirit Machining Ltd.
2228 - 80 Avenue
Edmonton, AB
T6P 1N2

Report Notes:

Test Technique: PT-1

Test Method: QAS-03-008

Acceptance Standard: QAS-03-008 REV. G
API 6A PSL 3

Location: CORRPRO NDT

Date: 12/09/2009

Invoice No.:

P.O. Number: 186268-MF

Job Number:

Items Examined

Test Description:

VISIBLE WATER WASHABLE LIQUID PENETRANT EXAMINATION WAS PERFORMED ON THE OF
THE FOLLOWING:

Item Examined	Serial Number	Rig Number	Company #	Heat Number	Part Number
12) P35 15K BALANCE SLEEVES					23290-431-02
1	186268-01-01			04684	
2	186268-01-02			04684	
3	186268-01-03			04684	
4	186268-01-04			04684	
5	186268-01-05			04684	
6	186268-01-06			04684	
7	186268-01-07			04684	
8	186268-01-08			04684	
9	186268-01-09			04684	
10	186268-01-10			04684	
11	186268-01-11			04684	
12	186268-01-12			04684	

Test Results:

NO RELEVANT INDICATIONS WERE DETECTED @ TIME OF EXAMINATION.

THE ABOVE TESTED ITEMS ARE ACCEPTED TO THE MASTERFLO QAS-03-008 REV. G
COMPLIANCE STANDARD.

Comments

BI JOB# S09-1769

MATERIAL: DUPLEX



Borza Inspections Ltd.
140 Portage Close
Sherwood Park, Alberta T8H 2W2
Business: (780) 416-0999 / Fax: (780) 416-0966
24 Hour Service

Page 2 of 2

P506650

ISO 9001:2000
REGISTERED (Alberta)

Nondestructive Inspection Report

SURFACE CONDITION: CLEAN BARE METAL/MACHINED
CLEANER: MAGNAFLUX SKC-S BATCH# 08H05K(POST CLEAN)
PENETRANT: MAGNAFLUX SKL-WP1 BATCH# 08J13K(DWELL TIME 20MIN)
WASH: H2O
DEVELOPER: MAGNAFLUX SKD-S2 BATCH# 07C03K(DWELL TIME 10MIN)
INFRARED DIGITAL THERMOMETER: POWER FIST(SER# C0805003406)
AVERAGE SURFACE TEMPERATURE @ TIME OF INSPECTION IS(19.0)DEGREES CELSIUS

SIGNATURES

Client Representative: **DAVE**

Technician (Sign) _____

Technician (Print) **JOHN HERMANUTZ** CGSB Level SNT-TC-1A Level II

Assistant (Print) **MATT QUALE**

* Client Representative's Signature indicates acceptance of report and results.

MASTER FLO

PSL 3 HARDNESS TEST RECORD

P/N: 23290-431-02	PART DESCRIPTION: BAL SLV P35-15K	
W.O. —	DS# —	P.O. 186268

	MATERIAL / E.S.	TOLERANCE
1	UNS S 39277	MIN ^{HRC} 93 - MAX 31 HRC
2		MIN MAX

EQUIPMENT USED	VERSITRON	STARRETT	KING	KING	KING
SERIAL NUMBER	7240	6791	VS-49	VS-34	UG-53

SERIAL NUMBER	HEAT #	RESULT	NOTES
186268-1-1	04684	26 HRC	
2		27	
3		26	
4		27	
5		27	
6		27	
7		26	
8		28	
9		26	
10		25	
11		26	
12	04684	25 HRC	
13			
14			
15			

Q.C. APPROVED
BY as/ulm DATE 14/12/19

PO 186268
WO —
PN 23290-431-02
HT —
SN 186268-1

COMPLETED BY as/ulm

DATE

14/12/19PAGE 1 OF 1

PO 1893339
WO —
PN 81242-0
HT 0000-1
SN —

1/8 MTR APPROVED

BY CHRIS DATE 05/18/10

Test Certificate

To: SA
HOWCO METALS MANAGEMENT
C/O JO GOODING,
9811 TELGE ROAD,
HOUSTON,
TEXAS,
U.S.A.

Customer Order Number	7579 - 01	Test Number	336627
Customer Order Date	18Feb10	Part Number	81242-002 REV F.
Sales Order Number	EUR-293231-1	Cast Number	C66C-1
Report Date	22Apr10	Cert Number	EUR-212983
Quantity	20 Pos 151 Kgs 8.43"OD X 5.75"ID X 1.8800"		
IN		Steel Type	718

Description ALLOY 718 RINGS SOL ANN AGED & TURN

Results quoted only refer to the items tested.

Material Specification	ES-02-011-003REVC
------------------------	-------------------

Bonnet Seal

Heat Treatment Spec						Test Spec	
Melt Practice				Production Method		Test Spec	
VIM/VAR				INGOT			
Heat Treatment	Temp (°C)	Soak	Coolant	Charge Ref	Quenchant (°C)		
SOLUTION TREAT	1035	2 HRS	WATER QUENCH	SHF-138607	Initial	Max	30
AGE HARDEN	775	7 HRS	TABLE COOL	SHF-138607			
					Qtc size 8.875Inch OD X 5.375Inch ID		
					Req. Min/Max		Achieved
					Hardness on T/P		298 363 HBW 321 HBW
					Hardness on Material		298 363 HBW 321 HBW
Tensile	Impact						

										CORROSION																			
Pitting Resistance										Ferrite										Microstructure									
Carbon Equivalent																				Max									
										Grain Size										Min									
C	Si	Mn	P	S	Cr	Mo	Ni	Al	Cu	Ti	Nb/Ta	Co																	
0.0180	0.0100	0.0500	0.0030	0.0006	17.9500	2.9500	53.7100	0.5690	0.0300	0.5300	4.9740	0.0000																	
TOTAL RED RATIO = .9196-1																													
CERTS TO BS EN 10204:2004.3.2, LLOYDS APPLIES																													
WITNESSED / REVIEWED																													

TOTAL RED RATIO = 91.88-1

CERTS TO BS EN 10204:2004.3.2, LLOYDS APPLIES
MS-000-05-002 REV C, QAS-04-014 REV O

OPERATIVE, CONSTRUCTION

[Signature] Lloyd's Register

224/100

Third party inspection :

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This report is not to be reproduced without written approval.

APR 27 2010

[Signature]
Quality Assurance Dept.

LROA REC'D 66722

Signature

**HOWCO METALS MANAGEMENT
CERTIFIED ~~DRUG~~ COPY**

HEAT No.	SO No.
	37499

CLC-1 P.O. No. 8933

DATE
AUTH SIGNATORY

FOR HOWCO METALS MANAGEMENT PAGE 1 OF 7



Customer

Master Flo Valve Inc
 1611-74 Avenue
 Edmonton
 Alberta
 Canada
 T6B 2H5

Delivery Address

Master Flo Valve Inc
 4611-74 Avenue
 Edmonton
 Alberta
 Canada
 T6B 2H5

Report No. 076113 **Date** 19/12/08
Test No. 116811 **Specification** A718 TO ES-02-011-002 REV F*
Despatch Note No. 066809

TEST CERTIFICATE

Item	Quantity	Weight Kg	Part No.	Heat No.	Batch No.	Description
104	20	2.2 Each	81242-003	C83B-3	5878B/0810	PROOF MACHINED RINGS SUPPLIED TO:- DRAWING NO 81242 REV E CERTIFICATION TO BS EN 10204 3.2 (2004) *IN ACCORDANCE WITH MS-000-05-002 REV B **LLOYDS FEES EXTRA AT COST** DELIVERY TERMS: EX-WORKS 174741 L4

A. HEAT TREATMENT SUPPLY CONDITION 2HRS 1028 DEG C W/Q + 6 HRS 790 DEG C A/C

B. TEST PIECE TREATMENT CONDITION AS A BOVE (CONTACT THERMOCOUPLE)

MELTING PRACTICE VIM/VAR

H/T LOT NO H119089 (CALIBRATED FURNACES AMS-2750), QUENCH LIMITATIONS MET.
 MECH TEST ACC ASTM A370 @ 1/2T. REDUCTION RATIO 45.51:1.
 MATERIAL MELTED BY ALLVAC, HOT WORKED BY SPECIAL FORGED PRODUCTS, H/T BY SPECIAL
 STEELS, MECH/MET TESTED BY STW (REPORT 116811 REFERS).
 TOPOLOGICAL GRAIN SIZE SATISFACTORY ACC ASTM E1181. MACRO SATISFACTORY ACC ASTM A718
 A604 (SEVERITY LEVEL A OR BETTER CLASSES 1-4). MICRO SATISFACTORY TO API-6A 718
 EDITION 1 (2004) & ERRATA (2005).
 MATERIAL IN ACC WITH ES-02-011-002 REV F & NACE MR-0175/ISO 15156 1st EDITION

TEST COUPON SIZE SACRIFICIAL

MTR APPROVED
 1/12
 DATE 02/04/09
 BY [Signature]

Impact Tests

Tensile Tests		Units		Psi		Shear %		Lateral Expansion	
Temp	0.20% Proof	Maximum Stress	%Elong	%Reduction	Temp	Charpy V	1	2	3
oC	Result	Result	Result	Result	oC	Joules	100	100	100
20	129000	120000	27	20	46	35	71	76	74
	Spec-Min	Spec-Min	Result	Spec-Min		MIN	AV	AV	AV
	177000	150000	20	46	35	-60	41	47	47
	129000	120000	27	20	46	-60	71	76	74
	Result	Result	Result	Result		MIN	AV	AV	AV
	129000	120000	27	20	46	-60	41	47	47
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	Result	Result	Result	Result		MIN	AV	AV	AV
	129000	120000	27	20	46	-60	41	4	



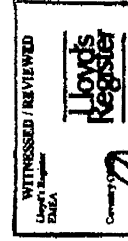
Customer	Delivery Address
Master Flo Valve Inc 4611-74 Avenue Edmonton Alberta Canada T6B 2H5	Master Flo Valve Inc 4611-74 Avenue Edmonton Alberta Canada T6B 2H5

Customer	Delivery Address
Master Flo Valve Inc 4611-74 Avenue Edmonton Alberta Canada T6B 2H5	Master Flo Valve Inc 4611-74 Avenue Edmonton Alberta Canada T6B 2H5

Report No. 076113	Date 19/12/08	TEST CERTIFICATE
Test No. 116811	Specification A718 TO ES-02-011-002 REV F*	
Despatch Note No. 066809	Our Ref. 033761	
	Customer O/No. 174741	

Heat No.	C	Si	Mn	S	P	Ni	Cr	Mo	Ti	Nb	Al	Cu	Fe	B	Co	Ta	Pb	Bi	Se	Ca	Mg
C83B-3	.020	.04	.08	.0003	.003	54.03	17.83	2.94	.96	4.93	.52	.04	18.49	.0020	.07	.006	.0001	<.3PPM	.0001	.0004	.0006
	NT																				
C83B-3	4.936 .0005																				

* L = Longitudinal; T = Transverse; Q = Tangential NT = Nb + Ta / Cb + Ta	Signature <i>P Taylor</i>	Position P Taylor: Certification
No welding carried out on this material. Free from mercury contamination.		



P Taylor
19/12/08

718 inc 2 1/4 Ø HT LT3G-36EY 11

STEM 88AL

NOTE: THE RECORDING OF FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTE.

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77284-1329

HUNTINGTON ALLOYS
A Special Metals Company
HUNTINGTON, WEST VIRGINIA 25720

CERTIFIED MATERIAL TEST REPORT		No. 68418
HA ORDER NO. ITEM	DATE	PAGE
300017375 1	09/22/08	1 OF 8
QUANTITY	INSPECTED BY	
5030 LBS	HA/SMC	
CHANGE ORDER NO.	MARK ORDER NO.	
HOU-601547-01	HOU-601547-01	
INGONEL ALLOY 718	HOT FIN END ROUGH GRD OR ROUGH T SOL ANN & AGE HD	
2.2500 IN 216-288 IN NOM		

THIS IS TO CERTIFY THAT ALL LISTED SAMPLES WERE INSPECTED AND TESTED IN ACCORDANCE WITH THE TEST REPORT REQUIREMENTS AND THE VALUE REPORTED THEREIN IS THE RESULT OF THE ANALYSIS PERFORMED BY THE QUALITY CERTIFICATION REPRESENTATIVE. ALL OTHERS AND MATERIALS NOT LISTED ARE NOT COVERED BY THIS REPORT. MECHANICAL PROPERTIES ARE THE PROPERTY OF THE QUALITY CERTIFICATION REPRESENTATIVE.

*****THIS REPORT RELATES ONLY TO THE ITEM(S) TESTED AND MAY NOT BE REPRODUCED EXCEPT IN FULL.*****

SPECIFICATIONS: HOWCO PURCHASE SPECIFICATION HG 718 BAR REV 5 (GRADE 125) \\
SMC HA 79 REV 7 (GRADE 125) \\
NACE MR0175-ISO 15155-3 1ST EDITION \\
API 6A718 1ST EDITION (MAR 2004) \\
SMC QCP 332 REV 1 \\
QUALITY SYSTEM CERTIFICATION: ISO 9001:2000 (ABS-QE CERT. 30125) \\
EN 10 204/DIN 50049 (TYPE 3.1)

UNS: N07718

PO 185206

WO

PN 21309-001

HT LT3G-36EY 11

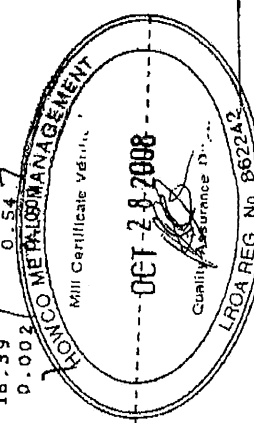
SN CA 185006-17161

HEAT#	C	TI	PB/PPM	MN	MG	SN/PPM	FE	CO	BI/PPM	S	NO	SE/PPM	SI	NB	NB+TA	CU	TA	NI	P	CR	B
LT3G36EY	0.017	0.99	0.03	0.03	0.03	0.03	18.16	0.13	0.17	0.0006	2.99	0.06	0.06	5.05	5.06	0.05	0.01	53.57	0.007	18.39	0.002
	<0.1	12.2	12.2	12.2	12.2	12.2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1

TO CONVERT PPM TO WT.%, MOVE DECIMAL POINT FOUR PLACES TO THE LEFT.
MELT METHOD: DUVAC (VIM ELECTRODE; VAR INGT)

HEAT/LOT	QUANTITY	HARDNESS	QUANTITY	HARDNESS
LT3G36EY 11	15 PCS	37.3	15 PCS	37.3
ROOM TEMP.	-AS SHIPPED	37.2	-AS SHIPPED	37.2
HARDNESS -HRC	-AS SHIPPED	36.3	-AS SHIPPED	36.3
HARDNESS -HRC	-AS SHIPPED	38.4	-AS SHIPPED	38.4
HARDNESS -HRC	-AS SHIPPED	36.2	-AS SHIPPED	36.2

MECHANICAL PROPERTIES	GRAIN	YIELD	TENSILE	WELG	R/A	DEG
SIZE	2XPSI	PSI	2"	X	F	
X 100 X 100	1335	17927	28.8	41.4	7	LONG



LRQA REG. NO. 8622A2
DATE 07/14/11

HOWCO METALS MANAGEMENT CERTIFIED TRUE COPY	
HEAT No. LT3G36EY 11	SO No. 35819
AUTH SIGNATORY	P.O. No. 2830
DATE 09/29/09	
FOR HOWCO METALS MANAGEMENT PAGE 1 OF 14	



NOTE: THE RECORDING OF FALSE, FICTITIOUS OR FRAUDULENT STATEMENTS OR ENTRIES ON THIS DOCUMENT MAY BE PUNISHABLE AS A FELONY UNDER FEDERAL STATUTE.

HUNTINGTON ALLOYS

A Special Metals Company

HUNTINGTON, WEST VIRGINIA 25720

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

CERTIFIED MATERIAL TEST REPORT

HA ORDER NO./ITEM	DATE	No.	68418
300017375 1	09/22/08	PAGE	2
QUANTITY	INSPECTED BY	OF	8
5030 LBS	HA/SKC		
CHARGE ORDER NO.	MARK ORDER NO.		
HOU-601547-01	HOU-601547-01		
DESCRIPTION OF MATERIAL			
INCONEL ALLOY 718 HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HD			
2.2500 IN 216-288 IN NOM			

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLES WERE TAKEN AND TESTS WERE PERFORMED IN ACCORDANCE WITH THE ORDER AND THE RESULTS OF THE TESTS WERE REPORTED IN THE ACTUAL REPORT OF THE NATIONAL BUREAU OF STANDARDS AND THE NATIONAL BUREAU OF STANDARDS HAS REVIEWED THE REPORT AND ALL DATA AND CONCLUSIONS ARE IN FULL COMPLIANCE WITH THE NATIONAL BUREAU OF STANDARDS REQUIREMENTS AND THE NATIONAL BUREAU OF STANDARDS HAS REVIEWED THE REPORT AND ALL DATA AND CONCLUSIONS ARE IN FULL COMPLIANCE WITH THE NATIONAL BUREAU OF STANDARDS REQUIREMENTS.

[Signature]
QUALITY CERTIFICATION REPRESENTATIVE

HARDNESS -HRC -AS SHIPPED 34.9
HARDNESS -HRC -AS SHIPPED 37.3
HARDNESS -HRC -AS SHIPPED 36.0
HARDNESS -HRC -AS SHIPPED 35.7
HARDNESS -HRC -AS SHIPPED 36.1
HARDNESS -HRC -AS SHIPPED 37.0
HARDNESS -HRC -AS SHIPPED 35.2
HARDNESS -HRC -AS SHIPPED 36.5
HARDNESS -HRC -AS SHIPPED 37.3
HARDNESS -HRC -AS SHIPPED 36.2

HARDNESS-HRC-AS SHIPPED 02 O'CLOCK
OD MR CEN
36.6 37.0 37.6

GRAIN SIZE-AS SHIPPED AGS ASTM NO. 3. (SEE ATTACHED)
NORMAL - LONG
GRAIN SIZE-AS SHIPPED AGS ASTM NO. 3.
NORMAL - LONG
GRAIN SIZE-AS SHIPPED AGS ASTM NO. 4.
NORMAL - LONG

06 O'CLOCK
OD MR
37.1 37.3

10 O'CLOCK
OD MR
37.8 38.0

LONG SUR
LONG MR
LONG CEN

IMPACT TEST - KOON-HALL-ADRIAN METALLURGICAL - SEE ATTACHED

YIELD STRENGTH WAS DETERMINED USING A STRESS STRAIN CURVE

MACROETCH GRADED PER ASTM A604 AND RATED AS FOLLOWS:

CLASS	SEVERITY	HEAD	TOE
CLASS 1	A	A	A
CLASS 2	A	A	A
CLASS 3	A	A	A
CLASS 4	A	A	A

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY
PAGE 214
HT #

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SOUTHERN U. S.

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP

9611 TELGE RD

HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP

P O BOX 841329

HOUSTON, TX 77284-1329

HUNTINGTON ALLOYS A Special Metals Company

HUNTINGTON, WEST VIRGINIA 25720

CERTIFIED MATERIAL TEST REPORT		No. 68418
HA ORDER NO./ITEM	DATE	PAGE OF
300017375 1	09/22/08	3 8
QUANTITY	INSPECTED BY	
5030 LBS	HA/SAC	
CHARGE ORDER NO.	MARK ORDER NO.	
HOU-601547-01	HOU-601547-01	
DESCRIPTION OF MATERIAL	INCONEL ALLOY 718	HOT FIN END ROUGH GRD OR
SHEET	2.2500 IN 216-288 IN	NOM

THIS IS TO CERTIFY THAT ALL REQUIREMENTS SPECIFIED IN THE ORDER AND TEST REQUIREMENTS HAVE BEEN FULFILLED IN ACCORDANCE WITH THE HUNTINGTON ALLOYS POLICY. THE TEST REPORT REPRESENTS THE ACTUAL ATTACHMENT TO THE ORDER. THE MATERIAL IS PROVIDED BY THE HUNTINGTON ALLOYS COMPANY AND ALL MATERIAL IS PROVIDED BY THE HUNTINGTON ALLOYS COMPANY. THE HUNTINGTON ALLOYS COMPANY IS NOT RESPONSIBLE FOR THE RESULTS OF THE TESTS PERFORMED BY THE CUSTOMER. THE HUNTINGTON ALLOYS COMPANY IS NOT RESPONSIBLE FOR THE RESULTS OF THE TESTS PERFORMED BY THE CUSTOMER.

QUALITY CERTIFICATION REPRESENTATIVE
DATE: 09/22/08
SIGNATURE: [Signature]

MICROSTRUCTURE TEST(S): SATISFACTORY (PHOTOS ATTACHED)

FORM H-2245 HUNTINGTON ALLOYS CORPORATION
ULTRASONIC TEST REPORT

FORM H2345 IS COMPOSED OF THREE SECTIONS FOR EACH HEAT/LOT REPORTED.
SECTION I IS PRINTED ONE TIME FOR EACH HEAT AND LOT.
SECTION II MAY BE PRINTED MULTIPLE TIMES FOR EACH HEAT AND LOT.
SECTION III IS PRINTED ONE TIME FOR EACH HEAT AND LOT.

SECTION <<I>> HEAT/LOT: LT3G36EY11 MATERIAL TESTED 09/11/08 BY JEFF BERRY
SERIAL #: N/A
PIECE #: N/A

1. IAI IDENTIFICATION:

- (A) SNT-TC-1A-LEVEL: II
- (B) MIL-STD-2132: INSPECTOR

2. TESTED MATERIAL

15 PIECE(S) WERE TESTED PRIOR TO CUT LGTH/WDTH AT FINAL CROSS SECTION
YIELDING 15 PIECE(S) FOR SHIPMENT AFTER CUTTING

3. PROCEDURE

APPROVED PROCEDURE NUMBER, REVISION NUMBER, APPLICABLE SPECIFICATIONS
AND/OR CONTRACTUAL REQUIREMENTS WHICH WERE USED FOR THE EXAMINATION ARE
FOUND IN THE SPECIFICATION BLOCK AND REMARKS SECTION OF THE MATERIAL TEST REPORT.
QCP #: 332 QCP-REV: 1 DATED: 12/08/03

4. EXAMINATION CONDITIONS:

TEST METHOD: AUTOMATIC IMMERSION
COUPLANT: WATER
SCANNING EQUIPMENT: TUBE, BAR, OR PLATE FOLLOWER STUFFING-BOX
HARD GASKETS AND MANIPULATOR
SCANNING SPEED (INCHES PER SECOND): 25

SECTION <<II>> HEAT/LOT: LT3G36EY11

PART: 01 OF 02

5. (A) TEST MODE: LONGITUDINAL

(B) WAVE PROPAGATION: NORMAL

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SOUTHERN U.S.

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP

9611 TELGE RD

HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP

P O BOX 841329

HOUSTON, TX 77284-1329

HUNTINGTON ALLOYS

A Special Metals Company

HUNTINGTON, WEST VIRGINIA 25720

CERTIFIED MATERIAL TEST REPORT				No.	58418
HA ORDER NO./ITEM	DATE	INSPECTED BY	PAGE	OF	
300017375 1	09/22/08	HA/SMC	4	8	
QUANTITY					
5030 LBS					
CHARGE ORDER NO.					
HOU-601547-01					
DESCRIPTION OF MATERIAL SHIPPED					
INCONEL ALLOY 718					
2.2500 IN 216-288 IN NOM					
MARK ORDER NO.					
HOU-601547-01					

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING, INSPECTION AND TEST REQUIREMENTS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE TEST RESULTS INDICATE THAT THE MATERIAL FURNISHED IS IN COMPLIANCE WITH THE ORDER AND SPECIFICATION REQUIREMENTS. THE MATERIAL FURNISHED AND THE VALIDITY OF THE TEST RESULTS ARE THE RESPONSIBILITY OF THE MATERIAL FURNISHER. THE MATERIAL FURNISHER IS NOT RESPONSIBLE FOR THE RESULTS OF THE TESTS PERFORMED BY THE MATERIAL FURNISHER. THE MATERIAL FURNISHER IS NOT RESPONSIBLE FOR THE RESULTS OF THE TESTS PERFORMED BY THE MATERIAL FURNISHER. THE MATERIAL FURNISHER IS NOT RESPONSIBLE FOR THE RESULTS OF THE TESTS PERFORMED BY THE MATERIAL FURNISHER.

QUALITY CERTIFICATION REPRESENTATIVE

ANN & AGE HD

- (C) INSTRUMENT MANUFACTURER: SONIC MODEL: 237
- (D) SERIAL NUMBER: 237-157PAB
- (E) LINEARITY CALIBRATION DATE: 07/07/08
- (F) SEARCH UNIT MANUFACTURER/SERIAL NUMBER: HARISONIC/E6538
- (G) FREQUENCY (MHZ): 5.00
- (H) SIZE (INCHES): .500
- (I) TYPE: SINGLE FOCUSED CYLINDRICAL
- (J) FOCAL LENGTH (IN): 2
- (K) CABLE LENGTH (FT): 8
- (L) ATTENUATION CORRECTION DB: 000
- (M) REFERENCE AMPLITUDE: XFS:80
- (N) ALARM/EVAL LEVEL XCAL:50 % BR LOSS:50
- (O) REJECT: OFF
- (P) DISTANCE AMPLITUDE CORRECTION: YES
- (Q) AREA GATED: FRONT SURFACE TO BACK REFLECTION

(R) CALIBRATION STANDARD(S):

(A) K582

(S) FLAT BOTTOM HOLE(S):

(A) DIAMETER: .1240 TEST METAL DISTANCE: 1.523 DEPTH:

(B) DIAMETER: .1240 TEST METAL DISTANCE: 1.144 DEPTH:

(C) DIAMETER: .1240 TEST METAL DISTANCE: 0.579 DEPTH:

(T) NOTCH(ES):

NOT APPLICABLE

SECTION <<II>>

HEAT/LOT: LT3G36EY11

PART: 02 OF 02.

- 5. (A) TEST MODE, SHEAR
- (B) WAVE PROPOGATION: CIRCUMFERENTIAL ONE-DIRECTION
- (C) INSTRUMENT MANUFACTURER: SONIC MODEL: 237
- (D) SERIAL NUMBER: 237-192PB
- (E) LINEARITY CALIBRATION DATE: 07/07/08
- (F) SEARCH UNIT MANUFACTURER/SERIAL NUMBER: AEROTECH/000RPPB

HOWCO METALS MANAGEMENT
CERTIFIED TRUE COPY

PAGE 4 OF 14

HT #

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HUNTINGTON ALLOYS
A Special Metals Company
HUNTINGTON, WEST VIRGINIA 25720

ATTN: JODY BRITTAN
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

HOWCO METALS MANAGEMENT LP
P O BOX 841329
HOUSTON, TX 77284-1329

CERTIFIED MATERIAL TEST REPORT				No.	68418
HA ORDER NO/ITEM	DATE	PAGE	OF		
300017375 1	09/22/08	5	8		
QUANTITY	INSPECTED BY				
5030 LBS	HA/SMC				
CHARGE ORDER NO.	MARK ORDER NO.				
HOU-601547-01	HOU-601547-01				
DESCRIPTION OF MATERIAL SHIPPED					
INCONEL ALLOY 718	HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HD				
2.2500 IN 216-268 IN NOM					

THIS IS TO CERTIFY THAT ALL REMAINING SAMPLES INSPECTED AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND THE REQUIREMENTS OF THE TEST REPORT REPRESENTS THE ACTUAL MATERIAL OF THE ORDER. THE VALUES SHOWN ARE CORRECT AND TRUE TO THE MATERIAL. EXCEPT WHERE SHOWN OTHERWISE, ALL DIMENSIONS ARE IN INCHES. ALL DIMENSIONS ARE TO BE TAKEN AT THE POINT OF THE ORDER. ALL DIMENSIONS ARE TO BE TAKEN AT THE POINT OF THE ORDER. ALL DIMENSIONS ARE TO BE TAKEN AT THE POINT OF THE ORDER.

- (G) FREQUENCY (MHZ): 5.00
- (H) SIZE (INCHES): .750
- (I) TYPE: SINGLE FOCUSED CYLINDRICAL
- (J) FOCAL LENGTH (IN): 2
- (K) CABLE LENGTH (FT): 8
- (L) ATTENUATION CORRECTION DB: 000
- (M) REFERENCE AMPLITUDE: XFS: 80
- (N) ALARM/EVAL LEVEL: XCAL: 50
- (O) REJECT: OFF
- (P) DISTANCE AMPLITUDE CORRECTION: NONE
- (Q) AREA GATED: FRONT SURFACE TO 1.25 NODE TMD
- (R) CALIBRATION STANDARD(S): NOT APPLICABLE
- (S) FLAT BOTTOM HOLE(S): NOT APPLICABLE
- (T) NOTCH(ES): NOT APPLICABLE

SECTION <<III>> HEAT/LOT: LT3036EY11

- 6. SURFACE FINISH CALIBRATION STANDARD: NO SMOOTHER THAN MATERIAL
- 7. SURFACE FINISH MATERIAL: LESS THAN 250 RHR.
- 8. ULTRASONIC EVALUATION OF WALL THICKNESS: N/A
- 9. INSPECTED MATERIAL ACCEPTED: YES
- REPORTABLE INDICATIONS: NONE
- REMARKS:
TRANSDUCER S/N-E6538, MODEL-14-0508-T, GAIN-41.6 DB.
TRANSDUCER S/N-000RPB, MODEL-ALPHA, ANGLE-45, GAIN-58.0 DB.
THE ULTRASONIC TESTING PERFORMED IN ACCORDANCE WITH QCP 332
REFERENCED ABOVE AND DETAILED IN THIS REPORT MEETS AND FULLY
SATISFIES ALL ULTRASONIC TEST REQUIREMENTS OF QCP 285 REV. 2
AS WELL.
- 10. PITCH DATA: PITCH VALUE: 0.1875 IN

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SOUTHERN U.S.

HUNTINGTON ALLOYS
A Special Metals Company

HUNTINGTON, WEST VIRGINIA 25720

D

ATTN: JODY BRITTAN

HOWCO METALS MANAGEMENT LP

9611 TELGE RD

HOUSTON, TX 77095

CERTIFIED MATERIAL TEST REPORT

No. 68418

PAGE 6 OF 8

HA ORDER NO. 300017375 1

DATE 09/22/08

QUANTITY 5030 LBS

INSPECTED BY HA/SNC

MARK ORDER NO. HOU-601547-01

CHARGE ORDER NO. HOU-601547-01

DESCRIPTION OF MATERIAL SHIPPED INCONEL ALLOY 718 HOT FIN RND ROUGH GRD OR RUGH T SOL ANN & AGE HD

WEIGHT 2.2500 IN 216-288 IN NOM

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING, INSPECTIONS AND TESTS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE ORDER AND PROVISIONS OF THE MATERIAL SPECIFICATION AND THE MATERIALS THE ACTUAL EXTENT OF THE MATERIALS FURNISHED AND THE MATERIALS THE ACTUAL EXTENT OF THE MATERIALS FURNISHED BY THE CONTRACTOR. THE MATERIALS FURNISHED BY THE CONTRACTOR ARE IN ACCORDANCE WITH THE MATERIAL SPECIFICATION AND THE MATERIALS FURNISHED BY THE CONTRACTOR ARE IN ACCORDANCE WITH THE MATERIAL SPECIFICATION.

QUALITY CERTIFICATION REPRESENTATIVE

SOL ANN & AGE HD

HEAT TREATMENT FURNANCES ARE CALIBRATED TO ANS 2750, AS REQUIRED BY MIL-H-6875.

NO WELD REPAIR HAS BEEN PERFORMED ON THIS MATERIAL.

ACTUAL HOT WORKING REDUCTION RATIO: 79:1
REMELT INGOT SIZE: 20"

QUALIFICATION TEST COUPON WAS A PROLONGATION CUT FROM PRODUCTION MATERIAL AFTER HEAT TREATMENT.
HEAT TREAT FURNANCE WAS MONITORED BY HEAT SINK THERMOCOUPLES.
HEAT SINK REQUIREMENTS OF API 6A INCLUDING EQUIVALENT ROUND WERE SATISFIED.
FOR ALL PRODUCTS 3/4" DIA & OVER, TENSILE TEST SPECIMENS WERE .500 GA. DIA. X 2" GA. LENGTH STANDARD
ASTM E8 SPECIMENS.

CHEMISTRY IS REPORTED FROM REMELTED INGOT.

MATERIAL HEAT TREAT: SOL ANN 1885 DEG. F. FOR 1 HOUR AND 5 MINUTES. WATER QUENCHED.
QUENCH TEMP: IN 78 DEG. F.; END 88 DEG. F.

AGED: HEATED 7 HOURS AT 1450 DEG. F. AIR COOLED.
HEAT TREAT CHARTS ATTACHED.

MATERIAL CAPABLE OF MEETING THE LIQUID PENETRANT REQUIREMENTS OF THE ORDER AFTER ADEQUATE SURFACE PREPARATION BY THE CUSTOMER TO PERFORM A VALID TEST.

ULTRASONICALLY TESTED AND ACCEPTABLE TO API 6A CLAUSES 7.4.2.3.15 AND 7.4.2.4.11 AND SATISFACTORY PER IAI QCP 285.

MICROSTRUCTURE SPECIMENS HAVE BEEN REMOVED FROM BAR PROLONGATIONS OBTAINED FROM EVERY HEAT TREAT LOT AFTER FINAL HEAT TREATMENT. A HEAT TREAT LOT CONSIST OF BARS FROM THE SAME REMELT INGOT, OF THE SAME SIZE (EXCEPT LENGTH) AND PROCESSED IN THE SAME FURNACE LOADS FOR BOTH ANNEALING AND AGING.

REV. 9004

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HUNTINGTON ALLOYS A Special Metals Company

ATTN: JUDY BRITTON
HOWCO METALS MANAGEMENT LP
9611 TELGE RD
HOUSTON, TX 77095

D

HUNTINGTON, WEST VIRGINIA 25720

CERTIFIED MATERIAL TEST REPORT		No. 68418
HA ORDER NO./ITEM	DATE	PAGE
300017375 1	09/22/08	7
QUANTITY	INSPECTED BY	OF
5030 LBS	HA/SHC	8
CHARGE ORDER NO.	MARK ORDER NO.	
HOU-601547-01	HOU-601547-01	
DESCRIPTION OF MATERIAL	TEST METHOD	
INCONEL ALLOY 718	HOT FIN RND ROUGH GRD OR ROUGH T 50L ANN & AGE HD	
2.2500 IN 216-288 IN NOM		

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING, INSPECTIONS AND TESTS HAVE BEEN PERFORMED IN ACCORDANCE WITH THE ORDER AND INFORMATION CONTAINED HEREIN. THE TEST REPORT NO. 68418 IS THE ACTUAL ATTACHMENT OF THE MATERIAL FURNISHED AND THE VALUES SHOWN THEREON ARE THE VALUES OF THE MATERIAL FURNISHED. IF THE CERTIFICATE OF FULL COMPLETION IS NOT RECEIVED, THE MATERIAL IS NOT IN CONFORMITY WITH THE ORDER. THE BELOW VALUES ARE THE VALUES OF THE MATERIAL FURNISHED. THE BELOW VALUES ARE THE VALUES OF THE MATERIAL FURNISHED.

[Signature]
QUALITY CERTIFICATION REPRESENTATIVE

MICROSTRUCTURE SPECIMENS HAVE BEEN EXAMINED FROM LOCATIONS OF BAR PROLONGATION REPRESENTING NEAR SURFACE, MID-RADIUS AND CENTER LOCATIONS AND CONFIRMS ABSENCE OF TOPOLOGICAL DUPLEX GRAIN SIZE (I.E. CROSS-SECTION CONDITION, NECKLACE CONDITION AND BANDING) PER ASTM E1181; MATERIAL IS FREE FROM LAVES PHASE; MATERIAL IS FREE OF CONTINUOUS GRAIN BOUNDARY NETWORKS OF SECONDARY PHASES (E.G. DELTA PHASE, CARBIDES); ASSESSMENT OF DELTA PHASE CONTENT EQUAL TO OR BETTER THAN LEVEL 2/D2; NO INDIVIDUAL GRAINS FOUND TO BE COMPLETELY SURROUNDED WITH ACICULAR DELTA; INDIVIDUAL OR ISOLATED GRAINS CONTAINING ACICULAR DELTA NOT REPRESENTATIVE OF THE BULK MICROSTRUCTURE IS NOT A CAUSE FOR REJECTION; ISOLATED AREAS NOT REPRESENTATIVE OF THE BULK MICROSTRUCTURE IS NOT A CAUSE FOR REJECTION.

TOTAL OF ALL CHEMICAL ELEMENTS NOT REPORTED IS CONSIDERED RESIDUAL, AND DOES NOT EXCEED .050%.

CALCIUM AND MAGNESIUM WERE INTENTIONALLY ADDED.

COLUMBIUM (CB) EQUALS NIOBIUM (NB).

THE MAXIMUM AND MINIMUM DIAMETERS IN THE HEAT TREAT BATCH ARE WITHIN 2 INCHES.

SHC-HA WAS THE MELTING SOURCE AND TESTING FACILITY.

COUNTRY OF ORIGIN: MELTED AND MANUFACTURED IN THE USA

VISUAL AND DIMENSIONAL EXAMINATION SATISFACTORY.

MATERIAL, WHEN SHIPPED, IS FREE FROM CONTAMINATION BY MERCURY, RADIUM, ALPHA SOURCE, & LOW MELTING ELEMENTS. "CHEMICAL ANALYSIS AS REQUIRED FOR CARBON, SULFUR, NITROGEN OR OXYGEN IS PERFORMED BY COMBUSTION TECHNIQUES. ALL OTHER REPORTED ELEMENTS ARE ANALYZED BY X-RAY AND/OR EMISSION SPECTROSCOPY."

HOWCO METALS MANAGEMENT	
CERTIFIED TRUE COPY	
PAGE 7	OF 14
LOT #	

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HUNTINGTON ALLOYS A Special Metals Company HUNTINGTON, WEST VIRGINIA 25720

D

ATTN: JODY BRITTAN HOWCO METALS MANAGEMENT LP 9611 TELGE RD HOUSTON, TX 77095		CERTIFIED MATERIAL TEST REPORT		No. 68418
		HA ORDER NO./ITEM 300017375 1	DATE 09/22/08	PAGE OF 8 8
		QUANTITY 5030 LBS	INSPECTED BY HA/SMC	
		CHARGE ORDER NO. HOU-601547-01	MARK ORDER NO. HOU-601547-01	
HOWCO METALS MANAGEMENT LP P O BOX 841329 HOUSTON, TX 77284-1329		DESCRIPTION INCONEL ALLOY 718 HOT FIN RND ROUGH GRD OR ROUGH T SOL ANN & AGE HD 2.2500 IN 216-288 IN NOM		

THIS IS TO CERTIFY THAT ALL REQUIRED SAMPLING, INSPECTIONS AND TESTS HAVE BEEN COMPLETED IN ACCORDANCE WITH THE UNDER AND INSPECTION REQUIREMENTS OF THE ABS GROUP LTD CERTIFICATE 41734 (EXPIRES JULY 31, 2011). THE MATERIAL SUBMITTED AND THE VALUES THEREON ARE CORRECT AND THE ALL OTHERS ARE IN ACCORDANCE WITH THE CERTIFICATE REQUIREMENTS. ALL OTHERS ARE IN ACCORDANCE WITH THE CERTIFICATE REQUIREMENTS. ALL OTHERS ARE IN ACCORDANCE WITH THE CERTIFICATE REQUIREMENTS.

QUALITY CERTIFICATION REPRESENTATIVE
[Signature]

"QUALITY SYSTEM MEETS REQUIREMENTS OF DIRECTIVE 97/23/EC (PRESSURE EQUIPMENT DIRECTIVE), ANNEX 1, CHAPTER 4.3 PER ABS GROUP LTD CERTIFICATE 41734 (EXPIRES JULY 31, 2011)."

AUTHORIZED QUALITY CERTIFICATION REPRESENTATIVES:
W.E. BOLEN, P.D. CUSTER, M.A. MORRISON, P. WAUGH

Nozzle



ISO 9001:2000

LIQUID PENETRANT EXAMINATION FORM

P - 073520

 CLIENT
 ATTENTION
 ADDRESS

 MASTER FLO VALVE
 C. NEUFELD

 PROJECT
 ITEM(S) EXAMINED

 40# 1025052 / NCR # 901682
 QTY 1, P35-15K NOZZLE

 DATE
 ACUREN JOB NO.
 POWO NO.
 WORK LOCATION
 ACCEPTANCE
 STANDARD
 PROCEDURE NO.
 TECHNIQUE NO.

 NO 024/09
 231-48155-84
 187179-
 ACUREN
 API 6A PSL-3
 QAS-03-008 LEUG
 LT-0002 TECH 2
 PAGE 1 OF 1
 TIME 1:00 PM
 REV./DATE 19TH ED
 REV./DATE 08/09
 REV./DATE 04/07

JOB DESCRIPTION

 PART NO. 23290-243-01 MATERIAL TUNGSTEN CARBIDE THICKNESS .375" - .562"
 SCOPE PERFORM FLUORESCENT LIQUID PENETRANT ON 1, P35-15K NOZZLE;
 EXAMINE ALL ACCESSIBLE SURFACES

TEST DETAILS

METHOD	☒ FLUORESCENT	☐ VISIBLE	☒ WATER WASH	☐ SOLVENT REMOVABLE	☐ POST EMULSIFIED
FAMILY BRAND	AAROX		BLACK LIGHT S/N 1637783	OUTPUT > 1000 μ W/cm ²	☒ AMBIENT < 2 fc
PENETRANT	976 PSE	MINIMUM DWELL TIME 15 MIN.	LIGHTING EQUIP.	☒ FLASHLIGHT	☐ TROUBLELIGHT
PENETRANT REMOVER	WATER	MINIMUM DRY TIME MAX. 30 MIN.	OTHER	N/A	
DEVELOPER	9DIB	MINIMUM DWELL TIME 10 MIN.	LIGHT METER S/N	409503	CAL DUE DATE 5/4/10
DEVELOPER TYPE	☒ NON AQUEOUS	☐ AQUEOUS	OTHER	N/A	

TEST SURFACE

SURFACE CONDITION	☐ AS GROUND	☐ AS WELDED	☒ MACHINED	☐ SHOT BLASTED	☒ CLEAN BARE METAL
SURFACE TEMPERATURE	☐ < -4°C/ 20°F	☐ -4°C/ 20°F TO 10°C/ 50°F	☒ 10°C/ 50°F TO 52°C/ 125°F	☐ > 52°C/ 125°F	

RESULTS

DRAWING

 QTY 1, P35-15K NOZZLE
 S/N 183551-4
 RESULTS: QTY OF 1, P35-15K
 NOZZLE IS ACCEPTED TO
 API 6A PSL-3, QAS-03-008 LEUG.

 23290-243-01 LEUG
 40 918125/1.2
 183551 LN1-4.

 Delivery
 10:50am
 28 2009
 CF

 O.C. APPROVED
 DATE 11/26/09

 187179
 NO 1025052
 23290-243-01
 183551-1-4

SIGNATURES

CLIENT REPRESENTATIVE

TECHNICIAN (SIGN)

PRINT NAME

SIGNATURE

DTR No.

REPORT
REVIEW

INITIAL

1ST TECHNICIAN2ND TECHNICIAN

CGSB LEVEL

SNT LEVEL

2

CGSB LEVEL

SNT LEVEL

CGSB REG. No

CGSB REG. No

SCOPE OF SERVICE

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EDDY CURRENT EXAMINATION FORM

WWB E- 0076

CLIENT MASTER FLO VALVE INC. DATE 25 NOVEMBER 2009 PAGE 1 OF 1
ATTENTION ACUREN JOB No. 231-48155-84 TIME 1100 HRS
ADDRESS 4611-74 AVE POWO No. 187179
EDMONTON AB, T6B 2H5 WORK LOCATION ACUREN SHOP
PROJECT WO 1025052 NCR #901682 ACCEPTANCE API 6A, PSL III, REV./DATE DEC 15, 1999
ITEM(S) EXAMINED QTY 1 P 35 15K NOZZLE STANDARD QAS-03-011 REV A REV./DATE SEPT 09, 2003
PROCEDURE No. ET-0002 REV./DATE N/A
TECHNIQUE No. N/A

JOB DESCRIPTION

PART No. 23290-243-01 MATERIAL TUNGSTEN THICKNESS 0.250 INCH
SCOPE PERFORM A GENERAL EDDY CURRENT SURFACE EXAMINATION ON 1 P35 15K NOZZLE

TEST DETAILS

INSTRUMENT ZETEC MODEL MIZ 21A SERIAL No. 375 CALIBRATION DUE DATE 10 FEB 2010
PROBE No. 1 ZETEC S/N 350998 SIZE 0.125" TYPE ☒ SINGLE ☐ ABSOLUTE ☒ DIFFERENTIAL ☐ REFLECTION
PROBE No. 2 N/A S/N N/A SIZE N/A TYPE ☐ SINGLE ☐ ABSOLUTE ☐ DIFFERENTIAL ☐ REFLECTION
REF. STD. CLIENT PROVIDED S/N N/A

REF. STD.	FREQUENCY 1	FREQUENCY 2	FREQUENCY 3	GAIN	PHASE	THICKNESS	LENGTH	MATERIAL TYPE
1	200 KHZ	N/A	N/A	61	160	0.250 INCH	N/A	TUNGSTEN
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

TEST SURFACE

SURFACE CONDITION ☐ AS GROUND ☐ AS WELDED ☒ MACHINED ☐ SHOT BLASTED ☒ CLEAN BARE METAL
SURFACE TEMPERATURE ☐ < -4°C/ 20°F ☐ -4°C/ 20°F TO 10°C/50°F ☒ 10°C/50°F TO 52°C/125°F ☐ > 52°C/125°F

RESULTS

ITEM	SERIAL NUMBER	ACCEPT	REJECT	ITEM	SERIAL NUMBER	ACCEPT	REJECT
1	S/N 183551-4	X		11			
2				12			
3				13			
4				14			
5				15			
6							
7							
8							
9							
10							

Q.C. APPROVED
BY Ron DATE 11/26/09

PART I.D.
QTY 1 P35 15K NOZZLE
P/N 23290-243-01 REV B
WO 918125/1.2
183551 LN 1-4

HT
SN 183551-1-4

THE NOZZLES AS NOTED ABOVE ARE ACCEPTABLE TO QAS 03-011 REV A
FOR EDDY CURRENT EXAMINATION

SIGNATURES

CLIENT REPRESENTATIVE

DTR No. A 311247

TECHNICIAN (SIGN)

SIGNATURE

REPORT REVIEW

PRINT NAME

WAYNE BLUETT

INITIAL

1ST TECHNICIAN

2ND TECHNICIAN/ASSISTANT

CGSB LEVEL 1 SNT LEVEL 2

CGSB LEVEL SNT LEVEL

CGSB REG. No 872

CGSB REG. No

Scope of Services

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Standard of Care

In performing the services provided, Acuren Group Inc. uses the degree, care and skill ordinarily exercised under similar circumstances by others performing such services in the same or similar locality. No other warranty, expressed or implied or intended by Acuren Group Inc.

Seat



160 Portage Close, Sherwood Park, Alberta, T8H 2W2
 Phone: 780-449-5013 Fax: 780-449-5036
 www.nortechadvanced.com

L-030233

Liquid Penetrant Examination Report

Client: Penn United Technologies Inc.	Date: 21-Jun-2010	WO #:
Box 399	Location: Nortech Inspection Office	Job #:
Saxonburg, PA, USA 16056	Project:	PO #: 162137
		Invoice #:

TECHNIQUE DETAILS

Examination Type: Liquid Penetrant Examination, Fluorescent, Water-washable

Test Method: QAS-03-008 REV. I, 02/10 Accept Std: API 6A 19th ED. PSL 3/QAS-03-008 REV. I, 02/07 Procedure #: PTP-01 Type I Method A Rev.1, Mar. 24, 2010

Equipment Used:

Manufacturer: Spectroline Type: SB-100 Serial #: 1715755 Last Calibration: 15-Apr-2010

Materials Consumed:

Manufacturer: MAGNAFLUX Type: ZL 60D Batch: 08C12K Dwell Time: 20 Minutes

Manufacturer: MAGNAFLUX Type: ZP 9F Batch: 06H09H Dwell Time: 20 Minutes

Manufacturer: MAGNAFLUX Type: SKC-S Batch: 10B16K Dwell Time:

Manufacturer: Type: H2O Batch: Dwell Time:

Surface Condition ☒ Clean/Bare ☐ As Ground ☒ Machined ☐ Sandblasted ☐ Painted ☐ Welded ☐ Scale Rmvd
 Source of Light ☐ Halogen 250W ☐ Incandescent 100W ☐ Maglight 6 Volt ☐ 20.3°C ☐ Surface Temp

Examination Results & Comments

FLUORESCENT WATER WASHABLE LIQUID PENETRANT EXAMINATION WAS PERFORMED ON TC INSERT ONLY:(AS ACCESSIBLE)

Description: 5) P35-15K SEAT ASSY. MATERIAL THICKNESS RANGE(INCHES): 0.488,0.894,1.006

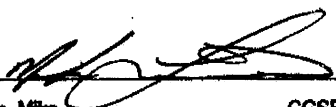
Part Description	WO ID	Serial #	Work Order	Heat #	Part #	Material Type
P35-15K SEAT		191147 LN1-1	W1013301/1	773562 / 518440	23290-341-03 REV. E	AISI 17-4 (CARRIER) / PUC- 10N(INSERT)
P35-15K SEAT		191147 LN1-2	W1013301/1	773562 / 518440	23290-341-03 REV. E	AISI 17-4 (CARRIER) / PUC- 10N(INSERT)
P35-15K SEAT		191147 LN1-3	W1013301/1	773562 / 518440	23290-341-03 REV. E	AISI 17-4 (CARRIER) / PUC- 10N(INSERT)
P35-15K SEAT	→	191147 LN1-4	W1013301/1	773562 / 518440	23290-341-03 REV. E	AISI 17-4 (CARRIER) / PUC- 10N(INSERT)
P35-15K SEAT		191147 LN1-5	W1013301/1	773562 / 518440	23290-341-03 REV. E	AISI 17-4 (CARRIER) / PUC- 10N(INSERT)

NO RELEVANT INDICATIONS WERE DETECTED @ TIME OF EXAMINATION ON REMAINING ITEM IN ACCEPTANCE WITH QAS-03-008 REV. I 02/10 / API 6A PSL 3

POST EXAMINATION CLEANING APPLICABLE

NORTECH ADVANCED NDT LTD.

Signatures

Technician (Sign): 

Technician: Carneiro, Mike

CGSB Lvl:

CGSB Reg:

SNT-TC-1A Lvl: II

Assistant:

CGSB Lvl:

CGSB Reg:

SNT-TC-1A Lvl:

Client Signature

Client Representative: Michael Hite

*Client Representative's Signature indicates acceptance of reports and results. Nortech Advanced NDT Ltd. is liable for examination costs only.



MASTER FLO VALVE INC.

Head Office

4611 - 74 Avenue

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FAT TEST RECORDS

THE LEADER IN CHOKE TECHNOLOGY

Tel: 1 780 468-4433 Fax: 1 780 469-9853

Info@masterflo.com

www.masterflo.com

100 #54022

FAT For P35-15K HRV Insert c/w SL Actuator VETCO GRAY/NEWFIELD-WRIGLEY

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	0	11 Aug 10			FAT for P35-15K HRV Insert c/w SL Actuator Vetco Gray/Newfield-Wrigley			
					Design File	SDF 100801		
					Created By	S. Tu	Date	11-Aug-10
					Approved By	P. Brzezinski	Date	16 Aug 10
					Document Number	FAT-10-067		
	Rev	0	Date	11 Aug 10	Page 1 of 13			

1.0 SCOPE:

- 1.1 This procedure provides details of the testing required to be carried out on P35-15K HRV with 5,000 psig series II SL actuators chokes for use on the Vetco Gray Newfield-Wrigley project.
- 1.2 Each actuated valve shall be subjected to the following F.A.T.

2.0 GENERAL REQUIREMENTS:

- 2.1 The FAT is not completed until a final QA and Engineering review has been carried out.
- 2.2 At each point where "(SR)" appears in the text a sign off confirming successful completion of the that section and, where applicable, relevant data collected must be recoded in the corresponding location in Appendix I.
- 2.3 Testing activities in the FAT must be carried out by properly trained personnel using appropriate equipment and procedures in accordance with Master Flo HSE standard HSE-02-SWP-213. All Safe Work Procedures (SWP) associated with the type of testing being performed and the equipment being used must be followed.
- 2.4 All proof testing (shell) of valve body must be carried out within a designated test bay.
- 2.5 Ensure that the most recent version of drawing 49566-B03-01 is available.

3.0 EQUIPMENT REQUIREMENTS:

- 3.1 The test requirements as specified under Section 4.0 of PS-01-A-005 shall apply.
- 3.2 Where specified in the test procedure, nitrogen gas will be substituted.
- 3.3 Hydraulic fluid to be used is Oceanic HW443 (SR).
- 3.4 All components exposed to hydraulic actuation fluid are to be ultrasonically cleaned.
- 3.5 Upon completion and acceptance of F.A.T., actuator cylinders are to be flushed per PS 01-A-009. Flushing fluid shall be **Oceanic HW443**. Cleanliness level shall be to **SAE AS4059 Class 6B-F**.
- 3.6 Complete Table Ia of Appendix I and record actuator serial number and choke serial number. (SR)
- 3.7 The running tool is to be used with lower clamp guide cage P/N **41022-003**, clamp override adapter **80331-001** and actuator override adapter P/N **80331**. Record the cage serial no (SR).
- 3.8 The following is required throughout all areas of testing to most accurately simulate worst-case subsea conditions.
 - 3.8.1 Hydraulic supply to choke shall be through maximum 12 feet 3/8" OD (0.065" wall) rigid tubing.
 - 3.8.2 All fittings utilized between hydraulic supply cart and choke shall be full-bore.
 - 3.8.3 Quick-connect couplers shall not be utilized.
 - 3.8.4 When product being tested is an HRV type or similar type that utilizes subsea mateable connectors, the hydraulic supply shall be plumbed through the connectors.
 - 3.8.5 Hydraulic supply cart shall be plumbed to accommodate both supply flows of standard $C_v=0.15$ and $C_v=.28$. Flow of $C_v=.28$ shall be used for test in section 8.0 only, all other sections shall use standard $C_v=0.15$.



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4.0 ACTUATOR TEST DURING ASSEMBLY

- 4.1 Verify the performance of the actuator check valves prior to actuator assembly. The check valves are to release between 21 psi and 29 psi, and to reset by 17 psi. (SR)
- 4.2 Pressure test housing per PS 01-R-006. (SR)
- 4.3 SL Actuator Pawl Spring Force Measurement and Pawl Setting Procedure Steps: (SR)
 - 4.3.1 Assemble drive rings complete with pawls and springs.
 - 4.3.2 Mark drive rings clearly to ensure that it is clear in which side of the actuator the drive ring will be installed.
 - 4.3.3 Measure the pawl spring force in accordance with FAT 08-003 and record the results in Appendix II. (SR)
 - 4.3.4 Ensure that the springs sit correctly in the drive rings and that the ends sit evenly in the slot in the drive ring. Both ends of the springs should protrude past the spring pin by at least .125". (SR)
 - 4.3.5 Ensure that the drive rings are assembled in the correct position as specified above. (SR)
 - 4.3.6 Set the pawl stops using the "wire method" per Section 4.0 of PS 01-R-005.
- 4.4 Assemble flow collar to stem, verifying that in the fully open position the flow collar bottoms out on the balance sleeve or bonnet before the stem bottoms out on the stem nut. (SR)
- 4.5 Piston Spring Return Test;
 - 4.5.1 Prior to each test run, cycle the actuator two steps in both directions to verify the correct operation of the ratchet mechanism.
 - 4.5.2 Use the hand pump to fully extend the open piston.
 - 4.5.3 Ensure the piston is fully retracted with a 95 PSI minimum back pressure. Record the back pressure. (SR)
 - 4.5.4 Repeat steps 4.5.2 – 4.5.3 for the close piston. (SR)
- 4.6 Complete assembly of the actuator and verify orientation of actuator and all accessories as per interface drawing 49566-B03-01 (SR)
- 4.7 After the check valves are assembled into the actuator housing, confirm the release pressure of the housing assembly is between 50 psi and 100 psi. (SR)
- 4.8 Assemble actuator override and position indicator assembly. Ensure drive stem cover is centered and seals are lubricated. Verify override location per interface drawing 49566-B03-01 (SR)
- 4.9 Verify that local position indicator moves within two steps of direction change of actuator. (SR)
- 4.10 Using a multi-meter, perform a resistance check on the LVDT by testing each pin of the electrical connector to the actuator housing. Ensure that no short circuit exists. (SR).
- 4.11 Close valve utilizing 5,000 psig effective pressure through the actuator. Calibrate position transmitter with 24 volt D.C. supply, connected per position transmitter connection detail in interface drawing 49566-B03-01 at full closed position and check at full open. Transmitter reading at full closed position shall be 4 mA $\pm$ (output range over nominal choke travel (16 mA)/number of steps for nominal choke travel (160)), which is equivalent to 4 mA $\pm$ 0.10 mA. Record the actual full close and full open readings. (SR)
- 4.12 Pour fill the actuator housing with Mobilgear 600 XP 68. Final vacuum oil fill the actuator housing per PS 01-R-003 prior to the oil fill verification test in Section 11.0. (SR)



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4.13 Perform electrical continuity test between the following and record the results below. Record the maximum resistance. This should be $\leq 0.1\Omega$. (SR)

- ROV Override Bucket and Bonnet:
- ROV Override Drive Shaft and Bonnet:
- Local Indicator Shaft and Bonnet
- Electrical Connector Housing and Bonnet

4.14 Install blind flange onto choke body.

4.15 Mount running tool guide funnel onto choke body.

4.16 Pick up choke insert from transportation body with Master Flo Valve Master running tool or a running tool which has passed FAT PS-02-O-005. Align CIRT orientation indicator line with an extreme corner of the CIRT orientation marked capture range on the funnel and lower insert into choke body. Verify that the initial and final landing marks on the funnel correspond with the markings on the running tool. Verify that running tool does not bind as it passes the blind flange when running tool enters and exits the funnel. Repeat on the opposite extreme corner. (SR)

4.17 With running tool still engaged to insert, make up insert clamp connector with a torque of 2,500 ft-lb (3,400 Nm) (Torque wrench set at 2,500/18.5 ft-lb (135 Nm) and a multiplier efficiency of 18.5:1). Record make-up torque, range is 2,500-3,000 (3,400-4,080Nm), and number of turns required. Verify that the alignment marks for the clamp align at both the open and closed positions. (SR)

4.18 Ensuring that the clamp is not backed off more than 1/2 a turn, measure and record the clamp break-out torque. The torque should be less than recorded in Section 4.17. Make-up the clamp again to the torque recorded in Section 4.17. Note: At no time during this section is the clamp to be released/reversed more than 1/2 a turn. (SR)

4.19 Raise running tool from insert. Align CIRT orientation indicator line with an extreme corner of the CIRT orientation marked capture range on the funnel and lower running tool into choke funnel. Verify that the initial and final landing marks on the funnel correspond with the markings on the running tool. Verify that the running tool engages properly and does not bind when entering the funnel. Repeat on the opposite extreme corner of the CIRT orientation marked capture range. (SR)

4.20 With the insert in the body and clamped and with the funnel attached, perform electrical continuity test between the following and record the results below: This should be $\leq 0.1\Omega$. (SR)

ROV Override Shaft and Body Inlet Bore
Drive Shaft and Clamp ROV Override Bucket
ROV Override Shaft and Clamp Drive Shaft
Clamp Drive Shaft and All 4 Clamp Pins

5.0 BODY SHELL AND SEAT TESTS:

5.1 Mount the valve on hydrotest rack.

5.2 Ensure that the choke inlet is not facing the front wall of the test bay.

5.3 With the valve in the partially open position, shell test the choke body at 22,500 psig. Test procedure and acceptance criteria shall be as per PS-01-A-005 Section 6.0. (SR)

5.4 Fully close the valve using 4,500 psig hydraulic control pressure. Ensure that the LVDT reading is the same as that obtained in Section 4.11. (SR)

5.5 Pressurize the valve to 16,500 psig hydrostatic from upstream side and monitor the through-valve leakage for 3 minutes minimum. The seat test criterion is per F.C.I. 70-2 2003 Class V Type B which allows a rate of 89.7 mL over 3 minutes. (The maximum allowable leakage of each seat closure



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shall be 5×10^{-4} ml/min of liquid per inch of seat diameter per psi differential test pressure). Vent all pressure. (SR)

6.0 CHOKE VALVE AND ACTUATOR OPERATION TEST:

6.1 Tests at Zero Bore Pressure.

6.1.1 With zero pressure in the valve, operate 3 complete cycles using the manual override drive. Running torque is not to exceed **50 ft-lbs (68 Nm)**. Torque to initiate movement is not to exceed **50 ft-lbs (68 Nm)**. Operation shall be smooth throughout. Record torques required and the number of turns during each cycle. (SR).

6.1.2 Repeat 6.1.1 using hydraulic supply of **4,500 psig** to step the actuator. Count and record the number of steps required from full close to full open. Steps are to be counted for all full steps plus the partial steps at the ends of the choke travel. Once the partial step occurs, no further counting will occur. Once the partial step occurs, step the actuator an additional **5** times with **5,000 psig** hydraulic pressure (do not count these steps). Verify that the valve reverses from the end of travel with **4,500 psig** maximum hydraulic pressure (ensure to count this step). Acceptance criteria = **160 steps $\pm$ 5** steps. Record maximum hydraulic pressure required to operate actuator in each direction. (SR)

6.1.3 Verify that the hydraulic port labels are installed and are correct. (SR)

6.2 Tests at choke **15,000 psi** Bore Pressure.

6.2.1 At **15,000 psig** valve pressure, use the actuator mechanical override to cycle the valve through 5 complete cycles. Check local calibration indicator and ensure correct readings. Operation shall be smooth throughout. Running torque is not to exceed **500 ft-lbs (680 Nm)**. Torque to initiate movement is not to exceed **500 ft-lbs (680 Nm)**. Ensure actuator retains choke position in "fail in last position". i.e. no backdriving. (SR)

6.2.2 Repeat 6.2.1 using hydraulic supply to step the actuator. Record minimum hydraulic pressures required to step actuator in each cycle. Pressure is not to exceed **4,500 psig**. (SR)

6.2.3 Vent all pressure.

Note: Ensure valve is in partially open position prior to depressurization.

7.0 POSITION TRANSMITTER READING

Valve pressure is to be maintained at no less than 5,000 psig, but not greater than working pressure of valve, while transmitter readings are measured.

Variable definition

a	=	output at choke closed position (zero steps)
b	=	output at choke nominal travel ('n' steps)
x	=	number of actuator steps from closed position that reading is taken at
g	=	output at $x = 5$ steps
f	=	output at $x = n/2$ steps
h	=	output at $x = (n - 5)$ steps
r	=	output range over nominal choke travel (16 mA)
n	=	number of actuator steps for nominal choke travel (160)

7.1 Transmitter calibration check:

The "transmitter calibration check" is required to ensure correct calibration of transmitter feedback.



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- 7.1.1 Close choke utilizing 5,000 psig effective actuator pressure and record transmitter reading as reading 'a'. Ensure reading is: $4\text{ mA} \pm .10\text{ mA}$. Set local indicator at the close position "S". (SR)
- 7.1.2 Open choke 5 steps from closed position utilizing actuator. Record transmitter reading as reading 'g'. (SR)
- 7.1.3 Open choke to 50% nominal travel ($n/2$). Record transmitter reading as reading 'f'. Record local indicator reading. (SR)
- 7.1.4 Open choke 'n - 5' steps from closed position utilizing actuator. Record transmitter reading as reading 'h'. (SR)
- 7.1.5 Open choke 'n' steps from closed position utilizing actuator. Record transmitter reading as reading 'b'. Record local indicator reading. (SR)
- 7.1.6 Ensure reading is: $20\text{ mA} \pm .26\text{ mA}$. (SR)
- 7.1.7 Open choke to open travel stop utilizing actuator. Record transmitter reading and local indicator reading. (SR)
- 7.2 Vent all pressure.

Note: Ensure valve is in partially open position prior to depressurization.

8.0 Stepping Test

- 8.1 Ensure hydraulic supply flow is controlled to $C_v=.28$. With zero pressure in the choke, operate one complete cycle using hydraulic supply of 5,000 psig to the actuator. Monitor stepping to ensure no skipping is observed in either direction. Partial steps at the ends of choke travel are acceptable (SR).

9.0 Cylinder Test

- 9.1 With the crossover connections installed on the double acting cylinders, pressurize open side hydraulic cylinder to 1,000 psig and hold pressure for 3 min. Record initial and final pressures. Increase pressure to 5,000 psig and repeat procedure. (SR)
- 9.2 Pressurize close side hydraulic cylinder to 1,000 psig and hold pressure for 3 minutes. Record initial and final pressures. Increase pressure to 5,000 psig and repeat procedure. (SR)
- 9.3 Ensure that the containment shroud is in place.
- 9.4 Hydrotest entire hydraulic circuit (open and closed cylinders simultaneously) at 8,250 psig for 15 minutes. Depressurize and record initial and final pressures. Re-pressurize to 8,250 psig and repeat procedure. Acceptance criteria shall be per PS-01-A-005 Section 6.4. (SR)

10.0 GAS TEST – API 6A PSL 3G:

- 10.1 Remove valve from hydrotest rack. With the valve set up for gas test, immerse in test tank. Ensure valve is partially open. Valve pressure is to be brought up gradually with all personnel well clear of tank.
- 10.2 Gas test the choke at 15,000 psig. Test procedure and acceptance criteria shall be per PS-01-A-005 Section 7.0. (SR)



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11.0 OIL FILL VERIFICATION TEST:

- 11.1 Prior to performing the oil fill verification test in Section 11.2 below, an oil fill per **PS-01-R-003** must be completed. The oil fill per **PS-01-R-003** may be completed at any time after step 4.12 but prior to step 11.2. (SR)
- 11.2 Complete the oil fill verification test per PS-01-R-003. The acceptance criteria shall be per the latest version of the calculator referenced in PS-01-R-003. During the test, verify the oil does not eject from the check valve assembly. (SR)

12.0 FINAL POSITION VERIFICATION

- 12.1 Ensure that the valve is moved to fully closed prior to shipping. (SR)

13.0 HYDRAULIC SYSTEM FLUSHING

- 13.1 Flush the actuator hydraulic lines and cylinders in accordance with PS 01-A-009. Flushing fluid shall be **Oceanic HW443**. Cleanliness level shall be to SAE AS4059 Class 6B-F. (SR)



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APPENDICES

APPENDIX I Test Review and Data Recorded

Table Ia Serial Numbers

3.6	Choke Serial No		Work Order No	54022
3.6	HRV Serial No	HRV-494	ROT Serial No	ROT-2118
3.6	Part Number	42005-007-01-1		
3.6	Description	P35-151c Choke Valve		
3.6	Actuator Working Pressure	5000 psi	Choke Working Pressure	15000 psi
3.7	Running Tool Guide Cage Part No.		Running Tool Guide Cage Serial No.	

Table Ib Completed Test Sign Off and Data Collection

Table 1b Completed Test Sign Off and Data Collection							
Sect	Test				Completed by Date	QA Review Date	Customer Witness Date
3.3	Hydraulic Fluid Confirmed Oceanic HW443				Sept 2/10 J.W.	Sept 03/10 MM	
4.1	Inner Check Valve Release and Reset				24 Aug/10 JF	Sept 03/10 MM	
	Release (21-29 psi)	Reset Pressure ($\geq$ 17psi)					
	29	27					
4.1	Outer Check Valve Release and Reset				24 Aug/10 JF		
	Release (21-29 psi)	Reset Pressure ($\geq$ 17psi)					
	28	24					
4.2	Housing Pressure Test				JOH F 24 AUG/10		
4.3.3	Pawl Spring Force Measurement (3.75 lbf min)				JOH F 24 AUG/10		
	Close lbf	4.9	Open lbf	5.2			
4.3.4	Pawl springs sit correctly, end protrude by .125"				JOH F 24 AUG/10		
4.3.5	Drive Rings assembled in correct location				JOH F 24 AUG/10		
4.4	Flow collar bottoms out on balance sleeve.				JOH F 24 AUG/10		
4.5.3	Open Piston Fully Retracted at 95 psi min back pressure	Pressure	150		JOH F 24 AUG/10		
4.5.4	Closed Piston Fully Retracted at 95psi min back pressure	Pressure	150		JOH F 24 AUG/10		
4.6	Verification of correct orientation				Aug 30/10 J.W.		
4.7	Check valves release pressure between 50 and 100 psi.				24 AUG/10 JF		
4.8	Override Location Verified				Aug 30/10 J.W.		
4.9	Local position indicator moves within one step of direction change				Aug 30/10 J.W.		
4.10	LVDT Short Circuit Test				Aug 30/10 J.W.		
4.11	Fully Closed LVDT Reading 4 +/- .10 mA	1.03	mA		Aug 30/10 J.W.	Sept 03/10 MM	
4.11	Fully Open LVDT Reading	19.97	mA		Aug 30/10 J.W.	Sept 03/10 MM	

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Sect	Test	Completed by Date	QA Review Date	Customer Witness Date
4.12	Actuator Oil Fill with Mobilgear 600 XP68	Aug 30/10 S.L.		
4.13	Electrical Continuity Test (Resistance $\leq 0.1\Omega$)	9-01-10 T.C		
	ROV Override Bucket and Bonnet:	9-01-10 T.C		
	ROV Override Drive Shaft and Bonnet	9-01-10 T.C		
	Local Indicator Shaft and Bonnet	9-01-10 T.C		
	Electrical Connector Housing and Bonnet	9-01-10 T.C		
4.16	Running Tool Interface Verification	9-02-10 T.C		
	Proper Insertion of Insert into Test Body:	9-02-10 T.C		
	Verification of Orientation marking range:	9-02-10 T.C		
	Verification of Initial and Final Landing Markings:	9-02-10 T.C		
	Free movement of running tool past blind flange:	9		
4.17	HRV Clamp Make Up	9-01-10 T.C		
	Torque (2,500-3,000 lbf ft / 3,400-4,080 Nm)	2516 9-01-10 T.C		
	Turns 36 3/4 Alignment Marks Verified	✓ 9-01-10 T.C		
4.18	Clamp Break Out Torque	1554 lbf ft 9-01-10 T.C		
4.19	CIRT Verification			
	Verification of Initial and Final Landing Markings	9-02-10 T.C		
	Proper Engagement of Running Tool	9-02-10 T.C		
4.20	Electrical Continuity Test (Resistance $\leq 0.1\Omega$)	T.C 9-01-10		
	ROV Override Shaft and Body Inlet Bore	T.C 9-01-10		
	Drive Shaft and the Clamp ROV Bucket	T.C 9-01-10		
	ROV Override Shaft and Clamp Drive Shaft	T.C 9-01-10		
	Clamp Drive Shaft and All 4 Clamp Pins:	T.C 9-01-10		
5.3	Body hydrostatic shell test	T.C 9-01-10	Sept 03/10 MM	
5.4	Verification of LVDT reading at closed	4.03 mA T.C 9-01-10	Sept 03/10 MM	
5.5	Seat Test (89.7 mL in 3 minutes)	T.C 9-01-10	Sept 03/10 MM	
	Leakage	15 ml Time 3 min T.C 9-01-10	Sept 03/10 MM	



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6.1.1	Manual Override Test at Zero Bore Pressure			Completed by Date	QA Review Date	Customer Witness Date		
				T.C 9-01-10		Sept 03/10 MM		
Cycle No	Choke Pressure	Torque Required to Initiate Movement (Max 50 ft lbs 68 Nm)		Running Torque Required (Max 50 ft lbs 68 Nm)		Verification Choke Moved Smoothly and Without Backdriving Within Specified Torque Limit		
		Close Choke	Open Choke	Close Choke	Open Choke	During Opening	During Closing	No Backdriving
1	Atmospheric	43	15	38	10	✓	✓	✓
2	Atmospheric	25	13	20	8	✓	✓	✓
3	Atmospheric	20	12	15	7	✓	✓	✓

number
of turns
17
17
17

6.1.2	Hydraulic Stepping Test At Zero Bore Pressure			Completed by Date	QA Review Date	Customer Witness Date		
				T.C 9-01-10		Sept 03/10 MM		
Cycle No	Choke Pressure	Hydraulic Pressure Required (Max 4,500 psi)		Verification Choke Moved Smoothly and Without Backdriving		Choke Reversed Properly		
		Close Choke	Open Choke	During Opening	During Closing	After Opening	After Closing	
1	Atmospheric	450	450	✓	✓	✓	✓	
2	Atmospheric	450	450	✓	✓	✓	✓	
3	Atmospheric	450	450	✓	✓	✓	✓	
Number of Steps Open to Close 160 +/- 5				160				
6.1.3	Hydraulic Ports Verified			N/A				

6.2.1	Manual Override Test at Working Pressure			Completed by Date	QA Review Date	Customer Witness Date		
				9-01-10 T.C		Sept 03/10 MM		
Cycle No	Choke Pressure	Torque Required to Initiate Movement (Max 500 ft lbs 680 Nm)		Running Torque Required (Max 500 ft lbs 680 Nm)		Verification Choke Moved Smoothly and Without Backdriving Within Specified Torque Limit		
		Close Choke	Open Choke	Close Choke	Open Choke	During Opening	During Closing	No Backdriving
1	Working Pressure	320	170	310	160	✓	✓	✓
2	Working Pressure	305	160	295	150	✓	✓	✓
3	Working Pressure	315	165	305	155	✓	✓	✓
4	Working Pressure	305	150	295	140	✓	✓	✓
5	Working Pressure	325	145	315	135	✓	✓	✓



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6.2.2	Hydraulic Stepping Test At Working Pressure			Completed by	QA Review	Customer Witness Date	
				Date	Date		
				9-01-10 T.C	Sept 03/10 MM		
Cycle No	Choke Pressure	Minimum Hydraulic Pressure Required (Max 4,500 psi)		Verification Choke Moved Smoothly and Without Backdriving		Choke Reversed Properly	
		Close Choke	Open Choke	During Opening	During Closing	After Opening	After Closing
1	Working Pressure	2800	1640 1700	✓	✓	✓	✓
2	Working Pressure	3000	1120 1450	✓	✓	✓	✓
3	Working Pressure	3000	1400	✓	✓	✓	✓
4	Working Pressure	3000	1400	✓	✓	✓	✓
5	Working Pressure	3000	1400	✓	✓	✓	✓

7.1	Transmitter Calibration Check	Completed by	QA Review	Customer
		Date	Date	Witness Date
		9-01-10	Sept 03/10	MM
Test Supply Voltage		0.6 24	VDC	Local Indicator
Transmitter Signal at Fully Closed (4.00 +/- .10 mA)		a = 4.05	mA	0%
Transmitter Signal at 'x' = 5 Steps from Closed		g = 4.53	mA	
Transmitter Signal at 'x' = n/2 steps from Closed		f = 19.10	mA	50%
Transmitter Signal at 'x' = n-5 Steps from Closed		h = 19.65	mA	
Transmitter Signal at 'x' = n Steps from Closed (20 +/- .26 mA)		b = 19.99	mA	95%
Transmitter Signal at Fully Open -		20.06	mA	100%

8.1	Stepping Test -5,000 psi Supply		Completed by Date	QA Review Date	Customer Witness Date	
			9-01-10 <i>OB</i>	Sept 03/10 <i>MM</i>		

9.0	Hydraulic Cylinder Test		Completed by Date	QA Review Date	Customer Witness Date	
			OB Sept 01/10	Sept 03/10 <i>MM</i>		
Test Pressure	Open Cylinder		Closed Cylinder		Hydraulic Circuit Test	
	Start Pressure	End Pressure	Start Pressure	End Pressure	Start Pressure	End Pressure
1,000 psi	1,040	1,040	1,040	1,040		
5,000 psi	5,280	5,280	5,200	5,200		
8,250 psi #1					8,400	8,360
8,250 psi #2					8,400	8,390

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Date

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10.2	Gas Test	Completed by Date	QA Review Date	Customer Witness Date
		OB Sept. 01/10	Sept 03/10 MM	

					Completed by Date	QA Review Date	Customer Witness Date
11.1	Oil Fill per PS-01-R-003				OB Sept. 01/10	Sept 03/10 ^{MM}	
11.2	Oil Fill Verification Test 1.2				OB Sept. 01/10	Sept 03/10 ^{MM}	
Choke Size		P35	Oil Type	MobilgearXP68	Stem Sealing Dia	1.375	Threads Per Inch 6
Initial Volume Vi		385		Final Volume Vf	315	Number of turns N	12.3
Oil Ejection		no	Pressure Reading Pg	30	Depth Rating from Calculator (Must Exceed 10,000 feet)		10913

12.1	Final Position Verified (Fully Closed)	Completed by Date	QA Review Date	Customer Witness Date
		OB Sept. 01/10	Sept 03/10 MM	

13.1	Actuator Hydraulic Circuit Flushed to SAE AS4059 Class 6B-F	Completed by Date	QA Review Date	Customer Witness Date
		SEP. 2/10	Sept 03/10 MM	

Comments

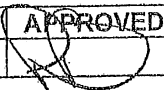
QA Review	
Engineering Review	9.5 Jimmy 9 Sept 2010
Customer Witness	



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TITLE: REVISION RECORD

REVISION	DATE	DESCRIPTION	PREPARED	APPROVED
0	11-Aug-10	Initial Release	ST	



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Document Number

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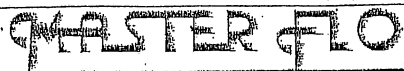
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0

Date

11 Aug 10

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FACTORY ACCEPTANCE TEST PROCEDURE

FAT 08-003

PAGE: 3 OF 5

DATE: JAN 18, 2008

REVISION: B (09/08)

TITLE: FAT TO MEASURE PAWL SPRING FORCES AS INSTALLED IN DRIVE RING FOR SL SERIES
SUBSEA ACTUATORS

Appendix 1: Test Summary and Data

Actuator Data

Work Order No.	54022	Pawl Spring Part Number	27031-001
Actuator Serial No.	205-2113	Choke Serial No.	
Part Number	27389	HRV Number	REV-494

Test Check List

Sect	Test	Conducted By and Date	3 rd Party Sign and Date
3.2	Drive Ring Assemblies Clearly Labelled	JWF 24 Aug/10	
3.3	Spring Leg Protrusion Verified (.125" minimum)		
3.7	Spring Force Measured (3.75 lbf minimum)		
3.10	Data Record Complete		

Data Collection Table

Sect	Description	Side	Force (lbf)		
3.7	Spring Force Measured	OPEN	5.2	5.2	5.2
3.9	Spring Force Measured	CLOSE	4.9	4.9	4.9
Comments:					

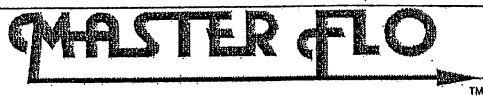
NOTE: Attach this completed form to the work order



MASTER FLO VALVE INC.

Head Office
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Canada, T6B 2H5

FILL AND FLUSH REPORT



PRODUCTION STANDARD

PS NO. 01-R-009

PAGE: 3 OF 4

DATE: OCT 31, 2007

REVISION: F (05/08)

TITLE: SL SUBSEA ACTUATOR FILL VERIFICATION TEST

- 4.2. Open the latest version of the Master Flo oil verification calculator located in O:\Engineering\Oil Fill Verification, or by double clicking on the following attachment icon when viewing this document from Globalnet. Enter the input numbers into the blue input cells. Ensure all input cells are correct. For field service, ensure that the latest version of the calculator is obtained by one of the above two methods as the calculator may be updated without notice.
- 4.3. Enter the depth rating obtained from the calculator into the FAT if applicable or in Table 2 below. Note: If not specified in the FAT, use the depth rating from Row "C" of the calculator. Enter the version number of the oil verification calculator used.
- 4.4. Obtain Q.A. Review. If Tables below are used, attach to the FAT.

SECTION	REF SECTION	RESULT	UNITS
4.5. Choke Stem sealing diameter	N/A	1.375	[in ²]
4.6. Choke Stem thread pitch	N/A	6	[TPI]
4.7. Initial Volume in graduated cylinder, V _i	Section 3.7	385	[mL]
4.8. Final Volume in graduated cylinder, V _f	Section 3.8	315	[mL]
4.9. Number of turns to the nearest tenth, N	Section 3.10	12.3	[-]
4.10. Pressure reading, P _g	Section 3.10	30	[PSI]
4.11. Ambient temperature at oil fill	Section 3.11	70	°F

Table 1: Input Values

SECTION	OIL VERIFICATION CALCULATOR VERSION NO.	REF SECTION	RESULT	UNITS
4.12. Depth Rating	1.2	Depth calculator Row "C"	10913	[ft]

Table 2: Depth Rating

Acceptance Criteria: Min. 10,000 ft. unless otherwise specified on the FAT.

Q.A. Reviewl: H Date: Sept 03/10

	Mobilgear 600
	XP68
	Single
	P35 HRV
T_{fill}	70
d	1.375
tpi	6
V_i	385
V_f	315
N	12.3
P_g	30

°F
in
tpi
mL
mL
N
PSI

Oil: Choose from drop down list
Compensation: Single or Dual bladder
Choke Size: Choose from drop down list.
Temperature during actuator oil fill
Choke Stem Diameter. Choose from drop down list. Consult Engineering if unsure
Choke Stem Threads Per Inch. Choose from drop down list. Consult Engineering if unsure.
Initial graduated cylinder reading (with vacuum)
Final graduated cylinder reading (atmospheric)
Number of turns to reach pressure P_g
Pressure after N turns

μ	0.0004
V_{max}	28.88
V_{act}	460
	2.66
	3.95
V_b	70
V_{bin}	4.27
V_{air}	4.54

(vol/vol)/°F Oil Thermal Expansion
Maximum Bladder Volume
Total Actuator Internal Void Volume
Choke travel
Choke stem swept volume
Bladder volume used with choke closed (mL)
Bladder volume used with choke closed (in³)
Volume of Trapped air in Actuator

C	10913	Depth rating: 150°F Storage temp with choke fully closed
D	5842	Depth rating: 150°F Storage temp with choke fully open
	150	Temperature rating of the actuator subsea

MASTER FLO

PRODUCTION
STANDARD

PS NO. 01-A-009

DATE: NOV 4, 1998

REVISION: D 05/09

TITLE: HYDRAULIC FLUSHING PROCEDURE

Form 1: Fluid Evaluation Report

Date: SEP. 2/10

Customer: VETCO GRAY

Act Serial No: ROT-2118

WO No: 54022

Valve Serial No: HRV-494

Hydraulic Fluid: OCEANIC HW443

PARKER LCM20
S/N JX.84027.L

ON LINE TEST

TEST NUMBER 008
WO-54022 ROT2118
HRV494 HW443

D M Y

Date 02-09-10
Time 08-46
NAS CLASS 4(c)
SAE AS4059
Count/100ml

4/6µ	22107
6/14µ	3479
NAS CLASS	4(c)
14/21µ	21
21/38µAS	0
38/70µAS	0
>70µCLAS	0
NAS CLASS	00
NOTES	

PARKER LCM20
S/N JX.84027.L

ON LINE TEST

TEST NUMBER 010
WO-54022 ROT2118
HRV494 HW443

D M Y

Date 02-09-10
Time 09-02
NAS CLASS 3(c)
SAE AS4059
Count/100ml

4/6µ	10186
6/14µ	1671
NAS CLASS	3(c)
14/21µ	14
21/38µAS	0
38/70µAS	0
>70µCLAS	0
NAS CLASS	00
NOTES	

PARKER LCM20
S/N JX.84027.L

ON LINE TEST

TEST NUMBER 011
WO-54022 ROT2118
HRV494 HW443

D M Y

Date 02-09-10
Time 09-17
NAS CLASS 3(c)
SAE AS4059
Count/100ml

4/6µ	7015
6/14µ	1793
NAS CLASS	3(c)
14/21µ	92
NAS CLASS	2(c)
21/38µ	0
38/70µAS	0
>70µCLAS	0
NAS CLASS	00
NOTES	

The above sample has been tested to the requirements of SAE AS 4059 with a Hiac Royco ABS2/8000A Particle Analyzer.

Technician: WES D

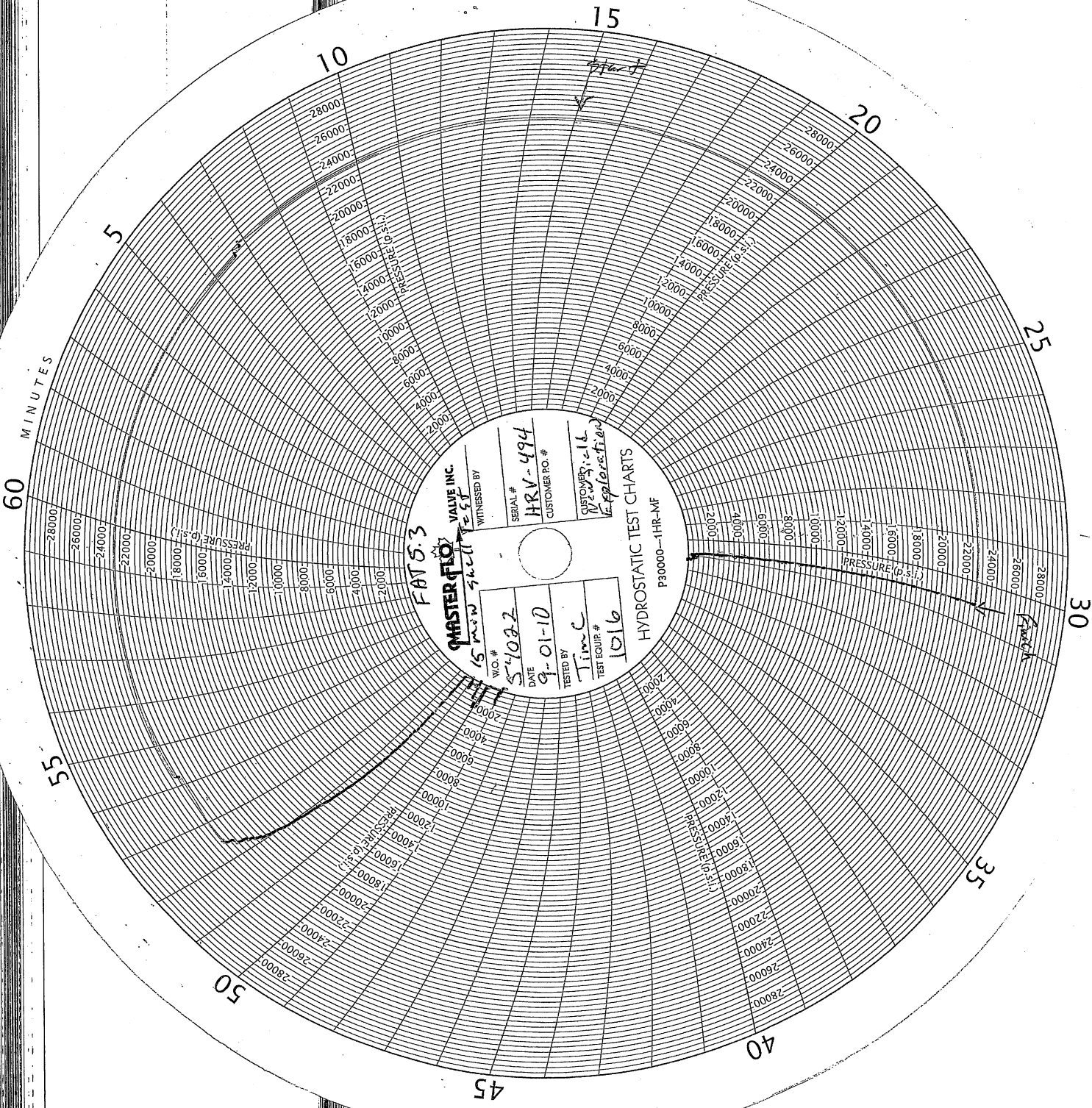
Date: SEP. 2/10



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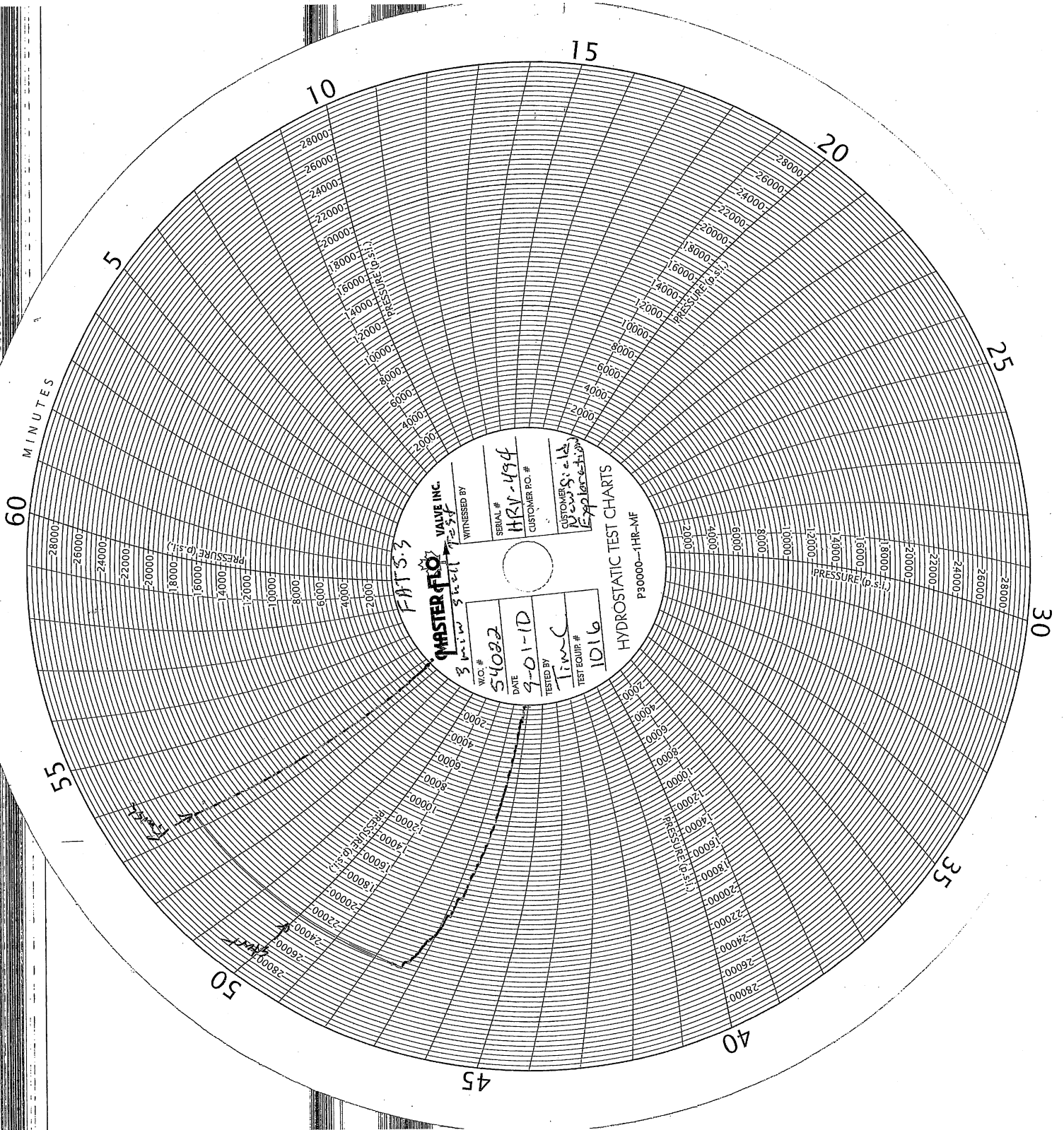
PRESSURE TEST REPORT

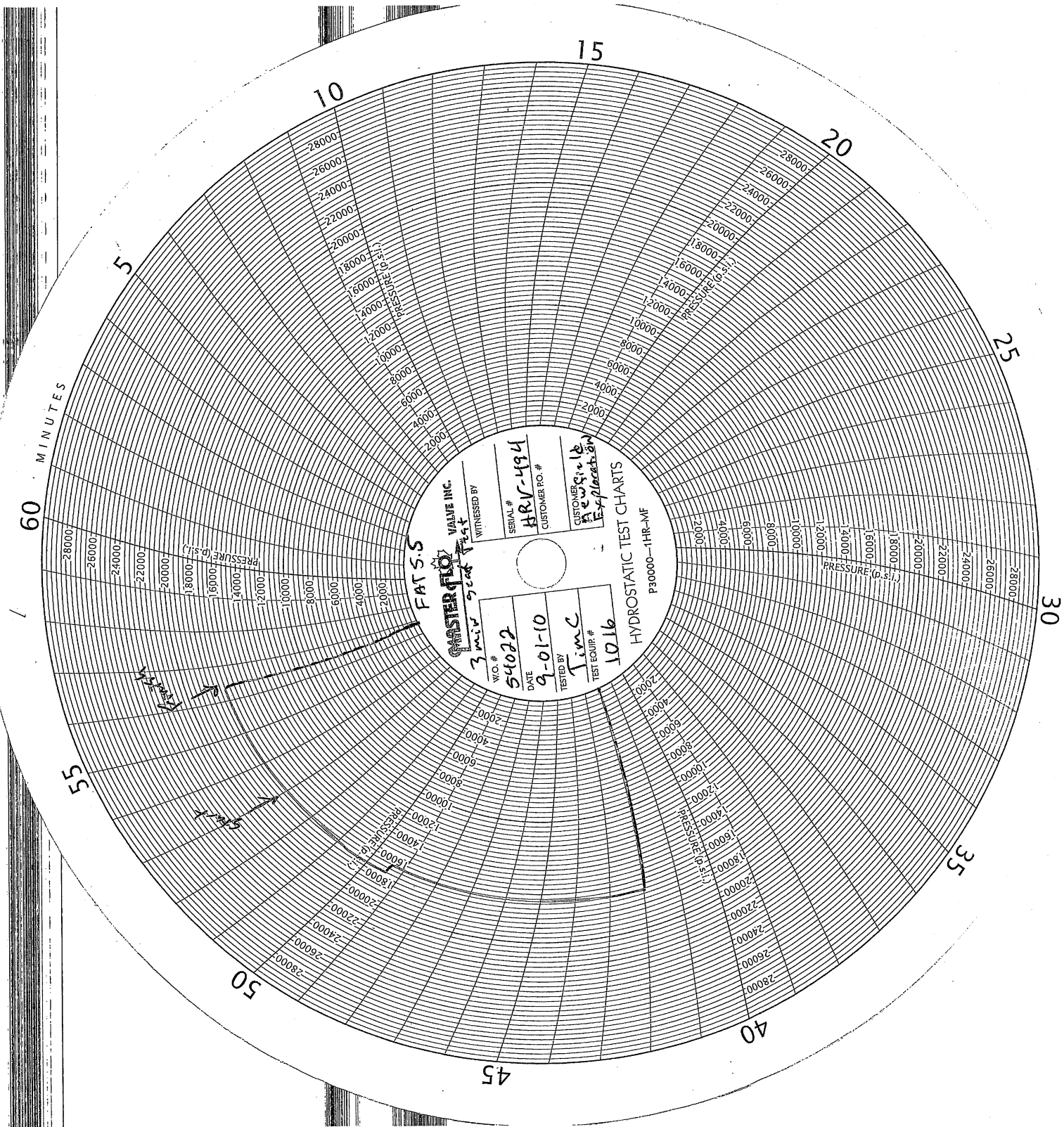


MASTER FLO VALVE INC.
W.C. # 54022
DATE 9-01-10
TESTED BY Tim C
TEST EQUIP # 1016

FAT 5.3
WITNESSED BY [Signature]
SERIAL # HRV-494
CUSTOMER P.O. #
CUSTOMER NAME [Signature]
[Signature]

HYDROSTATIC TEST CHARTS
P30000-1HR-MF





1 HOUR

15 MIN.

30 MIN.

MADE IN CANADA

45 MIN.

MASTER FLO VALVE INC.

WITNESSED BY

SERIAL #

HRV-494

CUSTOMER PO#

CUSTOMER

Exp 10/11/01

TEST EQUIP #

2769

DATE

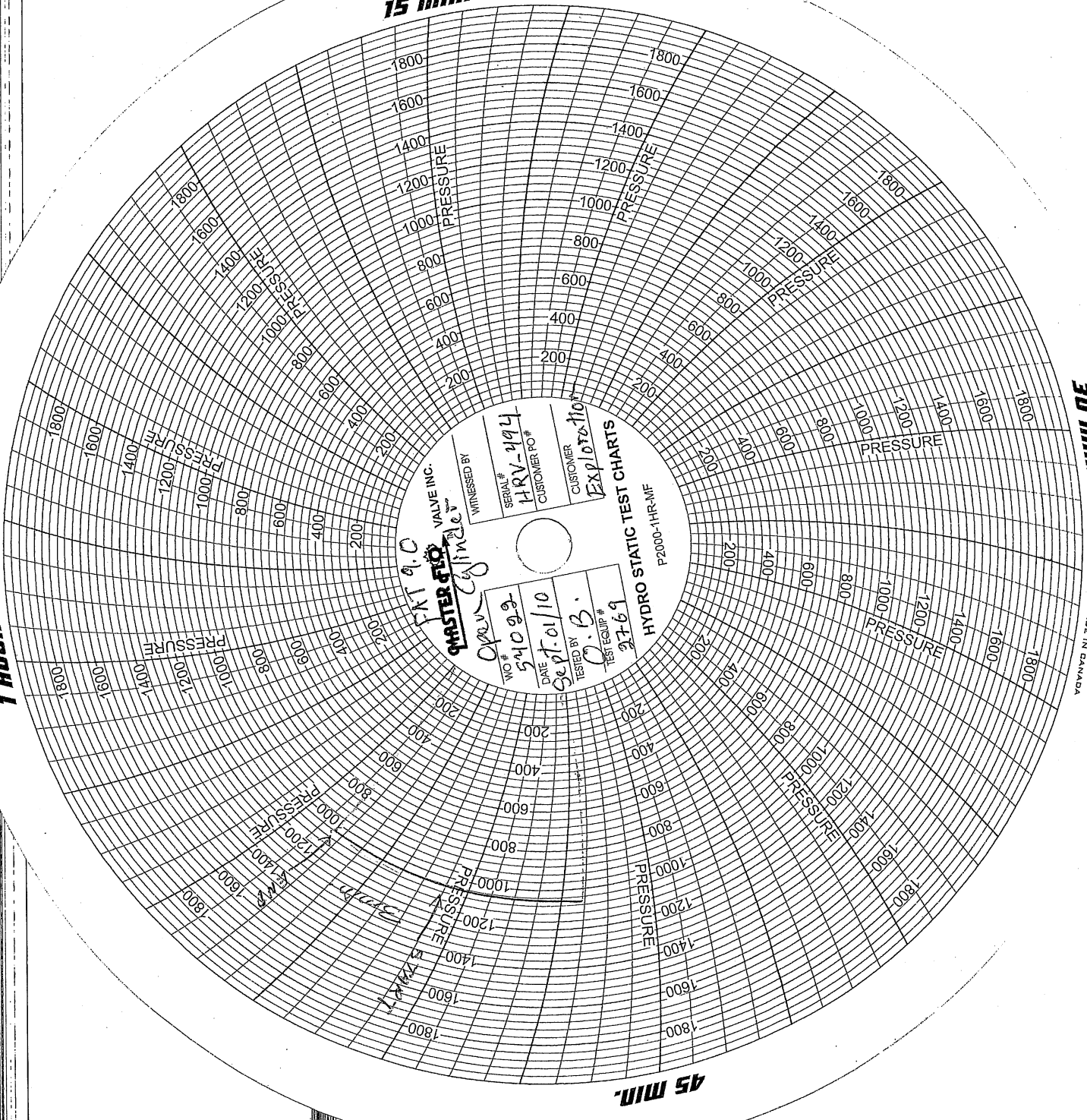
Sept 01/10

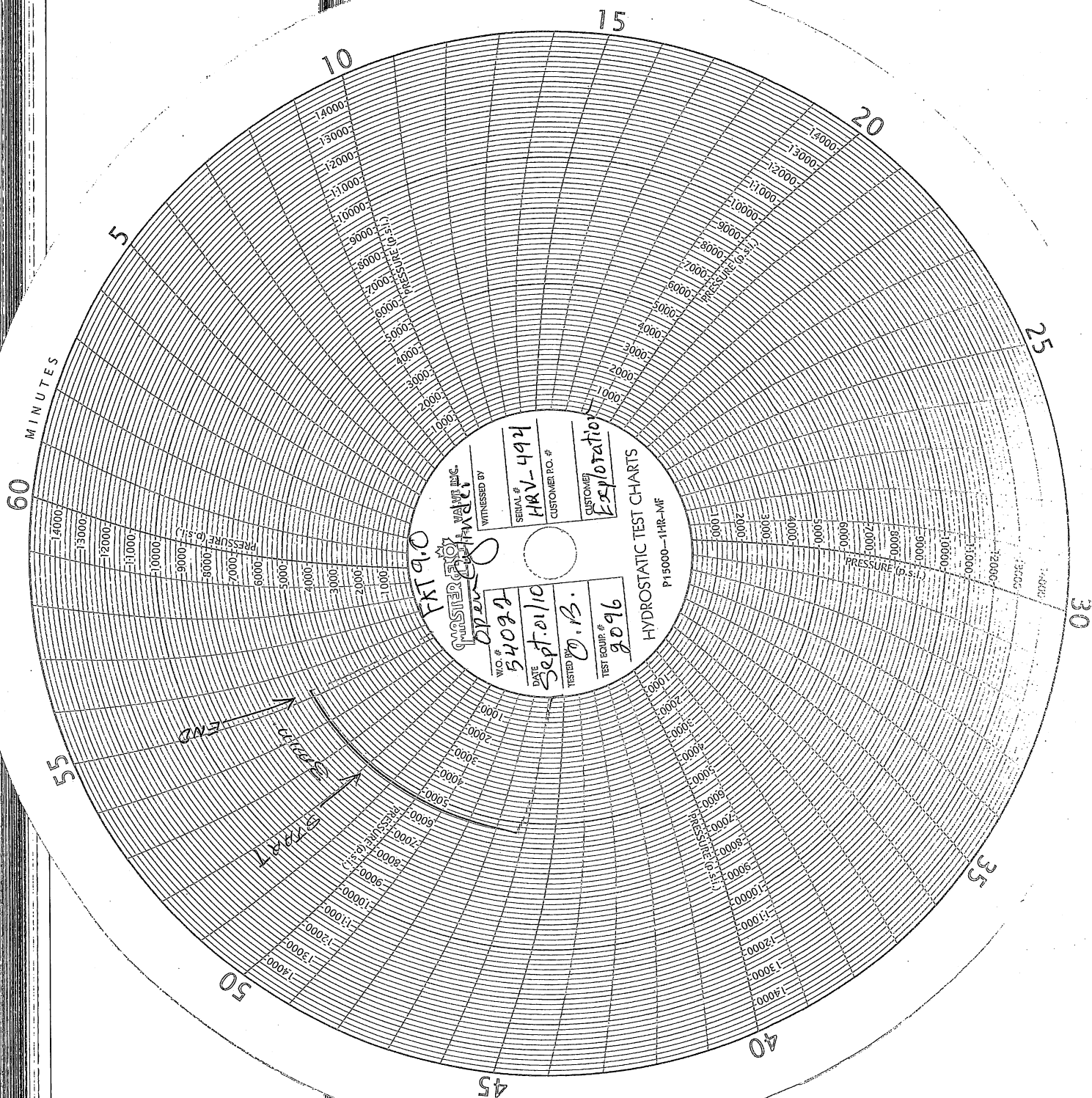
TESTED BY

O.B.

HYDRO STATIC TEST CHARTS

P2000-1HR-MF





1 HOUR

15 MIN.

30 MIN.

45 MIN.

START
3 min
1200 PSI
1000 PSI
800 PSI
600 PSI
400 PSI
200 PSI

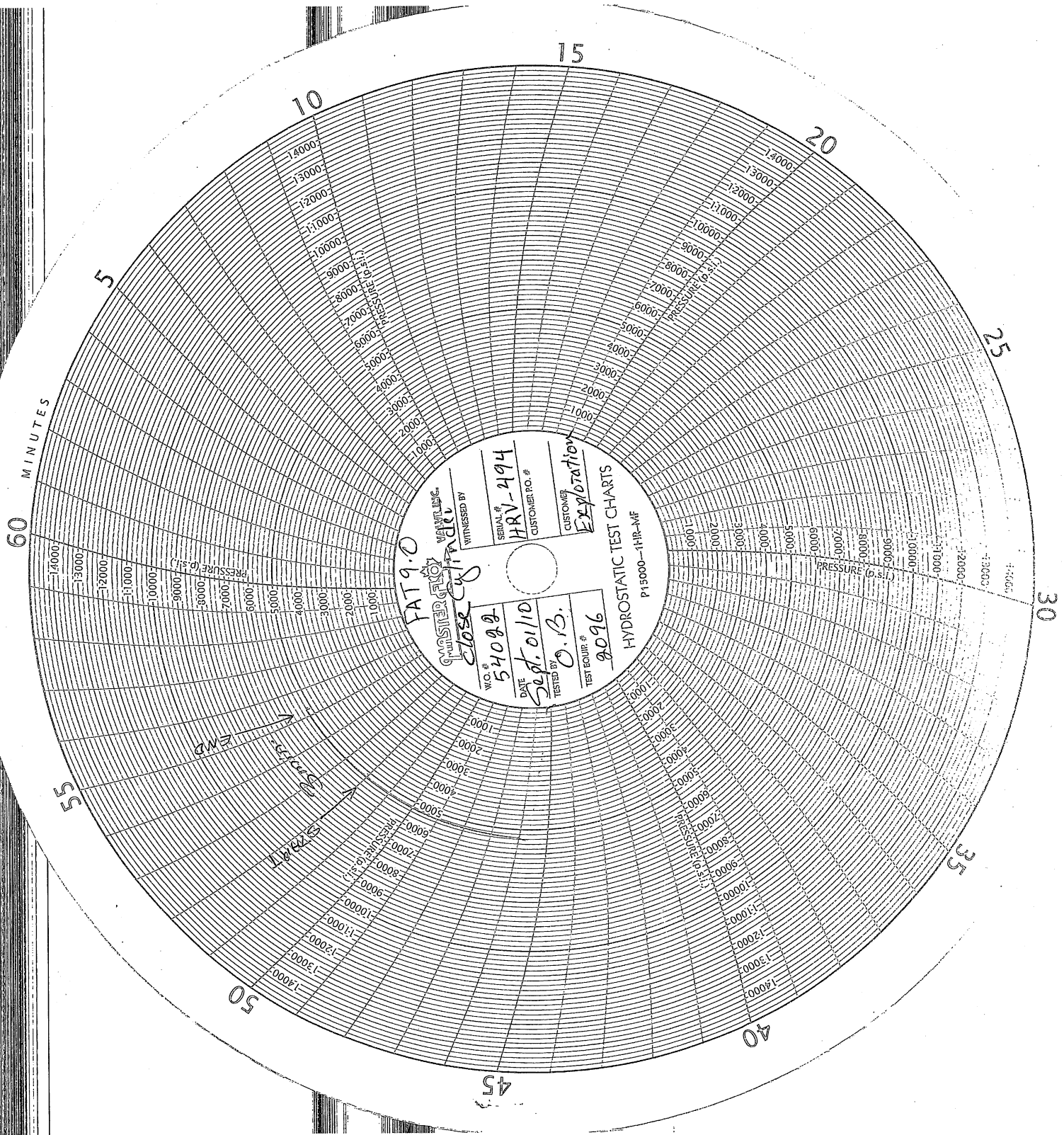
MASTER FLO
Close Control
VALVE INC.

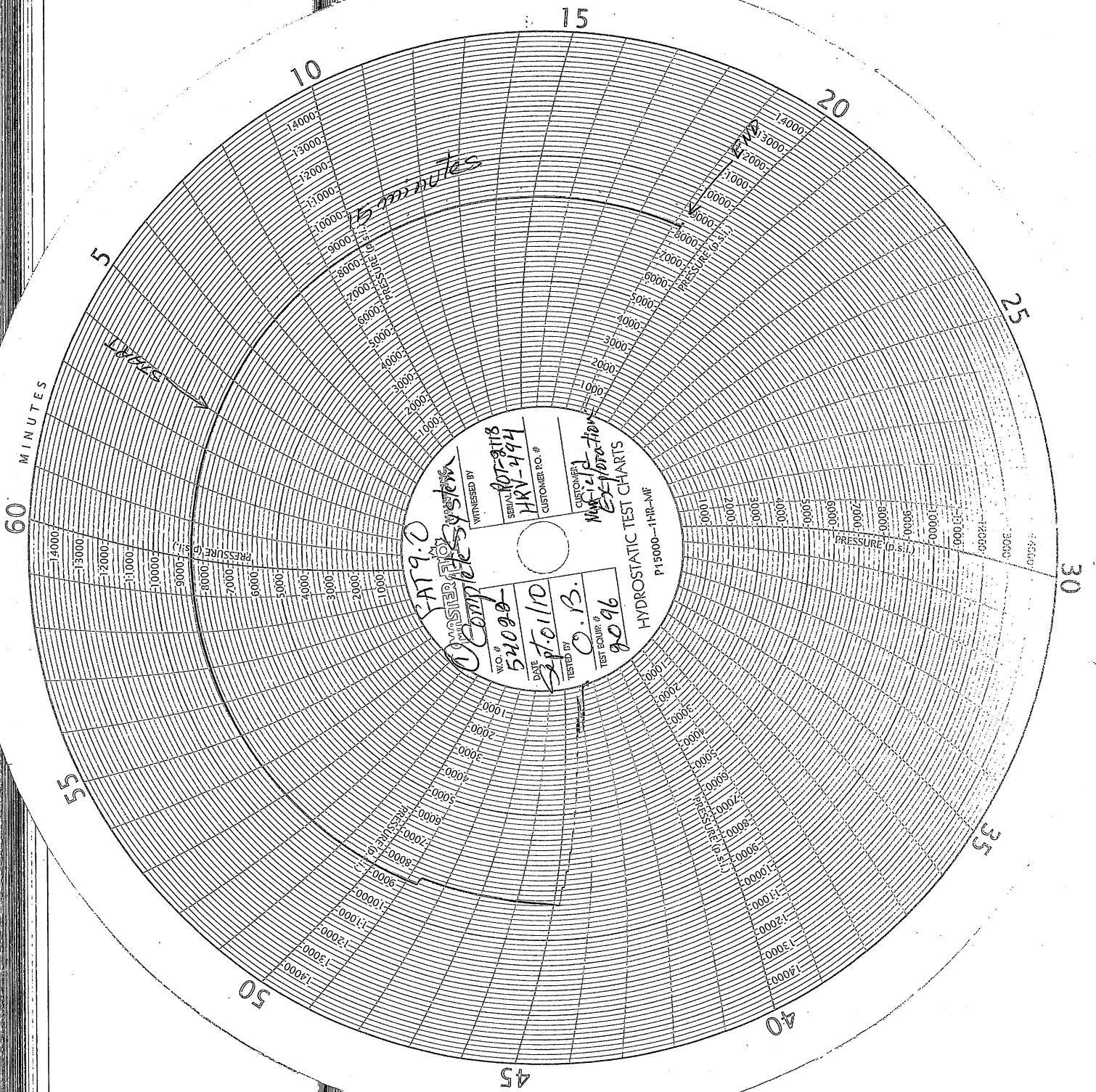
W.O. # **54092**
DATE **Sept. 01/10**
TESTED BY **O.B.**
TEST EQUIP. # **2769**

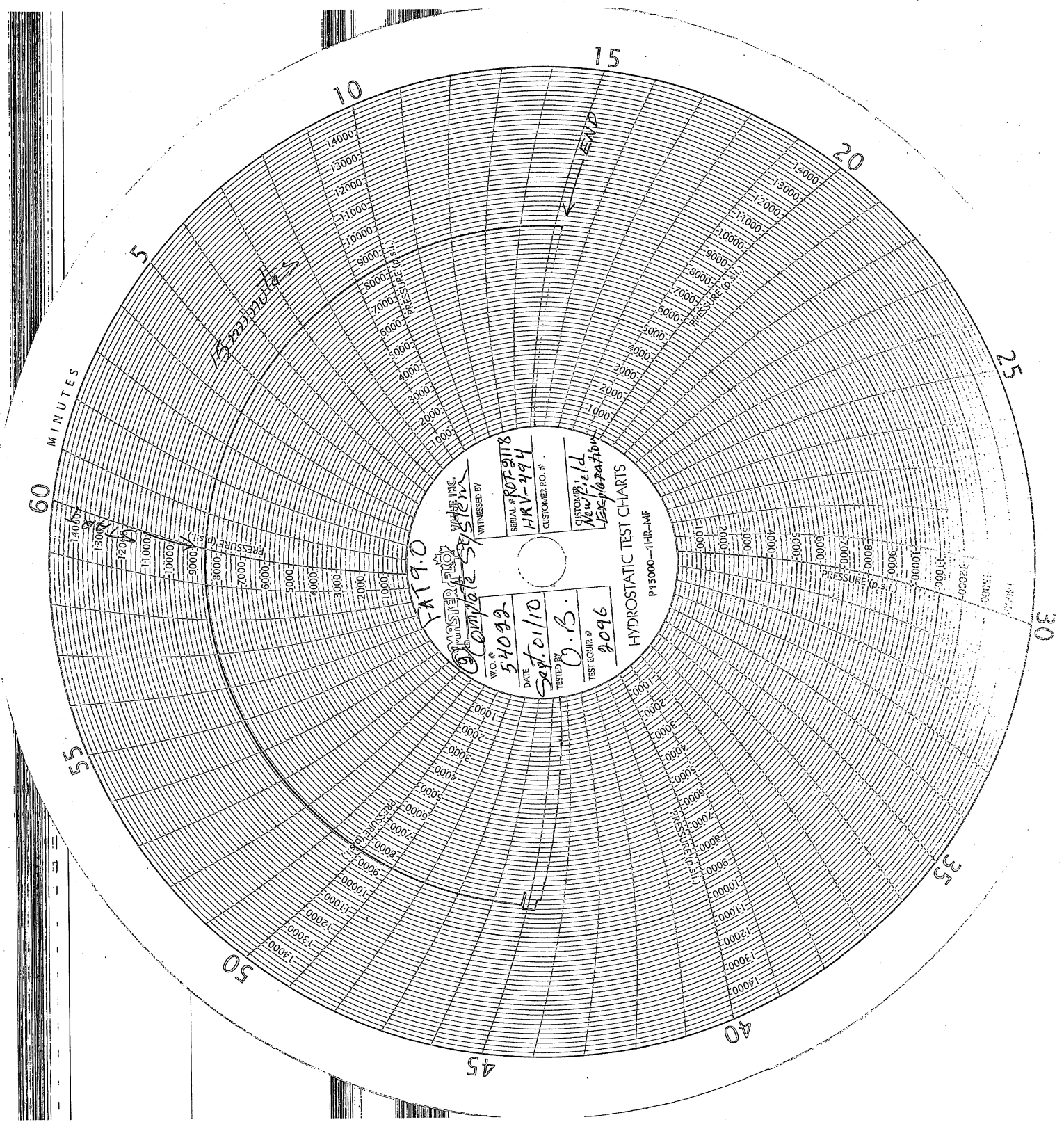
WITNESSED BY
SERIAL # **HRV-494**
CUSTOMER PO #
CUSTOMER
Exploration

HYDRO STATIC TEST CHARTS
P2000-1-HR-MF

MADE IN CANADA



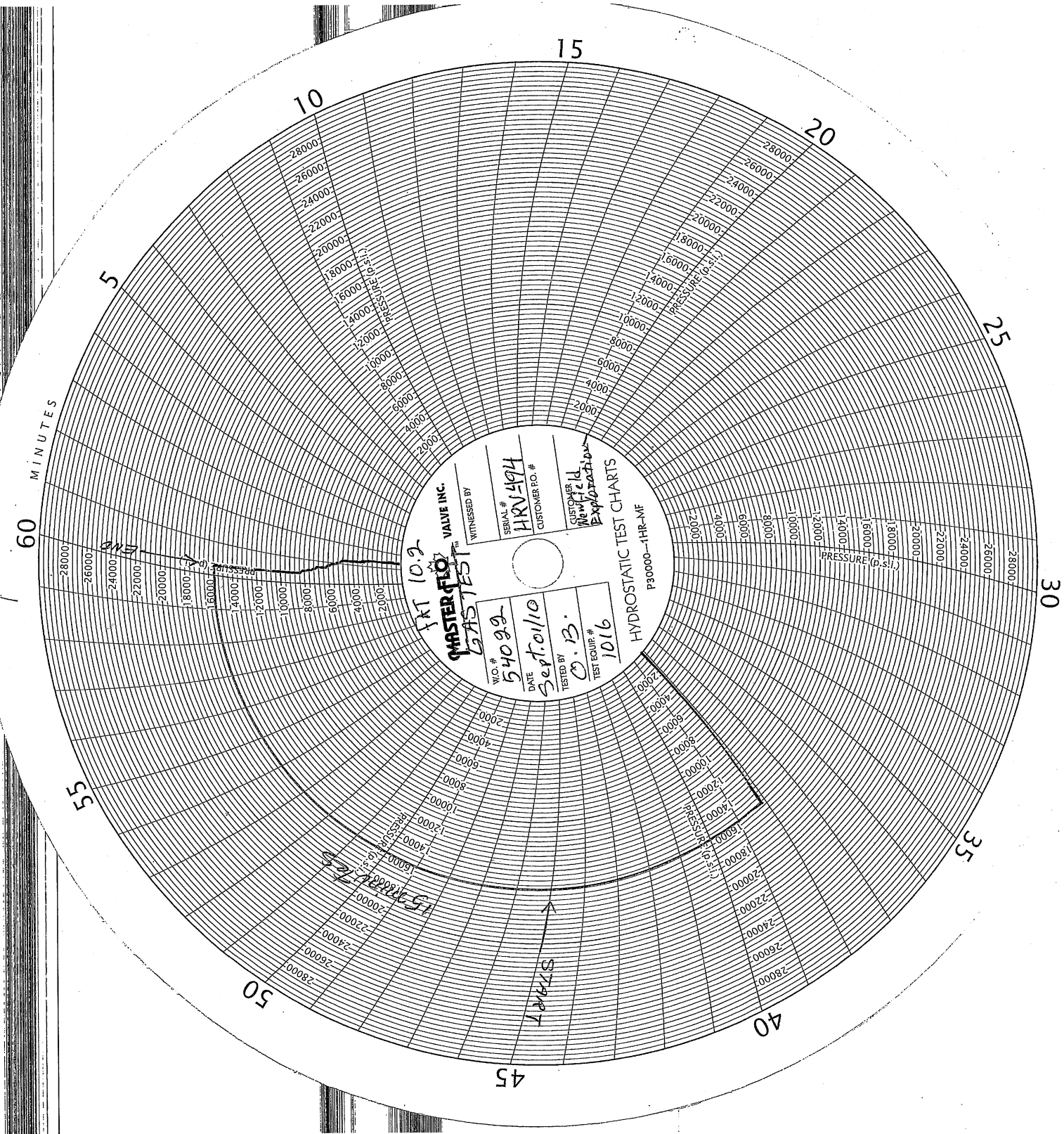




WITNESSED BY
Complete System
W.O. # **54092**
DATE **Sept. 01/10**
TESTED BY **O.B.**
TEST EQUIP. # **2096**
SERIAL # **RKF-2118**
HKV-444
CUSTOMER P.O. #
CUSTOMER **New Field**
Exploration

FAT 9.0

HYDROSTATIC TEST CHARTS
P15000-1HR-MF





MASTER FLO VALVE INC.

Head Office

4611 - 74 Avenue

Edmonton, Alberta

Canada, T6B 2H5

PACKING LIST / COMMERCIAL INVOICE

THE LEADER IN CHOKE TECHNOLOGY

Tel: 1 780 468-4433 Fax: 1 780 469-9853

Info@masterflo.com

www.masterflo.com

**MASTER FLO VALVE INC.****Head Office**

4611 - 74 Avenue
Edmonton, Alberta
Canada, T6B 2H5

Packing list

Date: September 07, 2010
D.S. #: 65784
P.O. #: MF Houston: 2402
Newfield: AFE22806
Quote #: 30923
MFV GST #: R103556536RM0001

Pieces: 1 Crate
Dimensions: 1 @ 56 x 52 x 63 inches
Weight: 972 kg

ATTN: Kristine Fayard
Freight: Collect

Sold To: MASTER FLO VAVLE (USA) INC. (USD)
8726 Fallbrook Drive
Houston, TX 77064
USA

Ship To: MASTER FLO VAVLE (USA) INC. (USD)
8726 Fallbrook Drive
Houston, TX 77064
USA

Markings:

Newfield Exploration PO# AFE22806
Project: Wrigley Mississippi Canyon 506

MF Part Number	Description	Newfield P.O. #
42005-009-03-1	P35-15K HRV (SN HRV-494)	AFE22806

Qty	Part Number	HS Tariff	Description
1	REP HRV-494-I	8481.8090	TO DEBIT YOUR ACCOUNT FOR PARTS AND LABOUR REQUIRED TO REPAIR HRV-494/ROT-2118 (Original Value \$132,000.00USD)

Wood Packing In This Shipment Is Derived From Tree's Harvested In Canada
Cratex Cert # CA-00245 HT

Via: Waggoner's

Country of Origin: Canada

We certify that the above to be true and correct to the best of our knowledge.

Authorized Signature: _____

O:\Shipping\Commercial Invoices\C-65408 FMC HOUSTON.doc

THE LEADER IN CHOKE TECHNOLOGY

Tel: (780) 468-4433 **Fax:** (780) 469-9853 **E-Mail:** info@masterflo.com

**MASTER FLO VALVE INC.****Head Office**

4611 - 74 Avenue
Edmonton, Alberta
Canada, T6B 2H5

COMMERCIAL INVOICE
(Do Not Pay / For Customs Use Only)

Date: September 7, 2010
D.S. #: 65784
P.O.#: 2402 NEWFIELD AFE22806
Quote #: 30923
MFV GST #: R103556536 RM0001

Pieces: 1 Crate
Dimensions: 1 @ 56 x 52 x 63 inches
Weight: 972 kg
Freight: Collect
Brokerage: UPS (Prepaid)

Sold To: MASTER FLO VALVE (USA) INC.
8726 FALLBROOK DRIVE
HOUSTON TX 77064
USA
Tel. 713-690-2789
Federal ID #: 98-0354106

Ship To: MASTER FLO VALVE (USA) INC.
8726 FALLBROOK DRIVE
HOUSTON TX 77064
USA

Qty	Part Number	HS Tariff	Description	Price	Extension
1	REP HRV-494-I	8412.9000	TO DEBIT YOUR ACCOUNT FOR THE PARTS AND LABOUR REQUIRED TO REPAIR HRV-494; ROT-2118		

Total US Dollars:

Via: Waggoners

Province of Origin: Alberta XA

We certify the above to be true and correct to the best of our knowledge.

Authorized Signature: _____
O:\Shipping\Commercial Invoices\C-65784 MF Houston.doc

THE LEADER IN CHOKE TECHNOLOGY

Tel: (780) 468-4433 **Fax:** (780) 469-9853 **E-Mail:** info@masterflo.com