



P.M.S CO., LTD
'Pioneer Manufacturing & Supply'

711 Byucksan digital valley, #303, Daedong-ro,
Sasang-ku, Busan, Korea
TEL : 82-51-713-8300 FAX : 82-51-713-8397

CERTIFICATE LIST

Client : FARNIKAN
Project : HX-127
Shipper : P.M.S

Date : 2024. 11. 28
Ref. No. :
P/O. No. : PMS-24-050

- DESCRIPTION : TUBESHEET, BAFFLE, HEAD

APPLICATION NO. : T-401

*** ENCLOSED CERTIFICATE**

		PAGE	Ref. No.
Inspection Item List (T-401)	-----	(1)	()
1. TUBESHEET			
1) Inspection Certificate	-----	(2~5)	()
2) Ultrasonic Examination Report (UT)	-----	(6)	()
3) Dimension Check Sheet	-----	(7~9)	()
2. BAFFLE			
1) Mill Test Certificate	-----	(10~11)	()
2) Dimension Check Sheet	-----	(12)	()
3. 2:1 ELLIP. HEAD			
1) Mill Test Certificate	-----	(13~16)	()
2) Heat Treatment Report	-----	(17-18)	()
3) Magnetic Particle Examination Report (MT)	-----	(19)	()
4) Dimension Check Sheet	-----	(20~21)	()
5) NDE Qualification Cert	-----	(22~23)	()
6) Calibration Cert	-----	(24~33)	()

*** REMARKS**

결	담당	팀장	이사	전무	사장
재					

1

Inspection Item List

Project : HX-127

T-401

No.	Equip.	Item	Material	Description	Q'ty	Heat No.	Remark
1	HX-127	TUBE SHEET	SA350 LF2 CL1	OD 650 x 60T	2	S85072	
2	HX-127	BAFFLE	SA516 Gr.70	OD 595 x 10T	8	SF46385	
3	HX-127	2:1 ELLIP.HEAD	SA516 Gr.70N	ID 925 x Min.12T x SF50	2	WK649236	
4	HX-127	2:1 ELLIP.HEAD	SA516 Gr.70N	ID 600 x Min.10T x SF50	2	SF41975	
TOTAL					14		

✓ REVIEWED BY
WITNESSED BY ✓
2024.11.28
S. M. KIM

검사증명서

MILL TEST CERTIFICATE



HYUNDAI STEEL

당진제철소 : 충남 당진시 송악읍 북부산업로 1480
1480 Bukbusanup-Ro, Songak-Eup, Daejeon-Si, Chungnam, Korea

주문번호
Order No. : D231009267

품명
Commodity : Slab

제품규격
Specification : ASTM A105-A350LF2

고객사
Customer : 현대아이에프씨㈜

주문자
Contractor : 현대아이에프씨㈜

증명서 번호
Certificate No. : 20231024-CN-0003-001

발행일자
Date of Issue : 2023-10-24

제품치수 Dimension	수량 Quantity	중량 Weight (Kg)	재강번호 Heat No.	제품번호 Product No.	화학성분 Chemical Composition(%)														단위 Unit			
					2:x100 3:x1,000 4:x10,000 5:x100,000																	
					C	Si	Mn	P	S	Cr	Ni	B	Ca	Cu	Mo	Nb	Ti	V	Sd	As	CEQ	
					4	3	3	4	4	2	2	4	4	3	2	4	3	3	3	3	3	
300 x 2000 x 5840	1	27,510	S95072	S95072 01	L	1,963	230	1,002	115	25	2	2	3	1	15	0	44	0	1	3	46	370
300 x 2000 x 5930	1	27,460	S95072	S95072 04	L	1,963	230	1,002	115	25	2	2	3	1	15	0	44	0	1	3	46	370
300 x 2000 x 5930	1	27,460	S95072	S95072 05	L	1,963	230	1,002	115	25	2	2	3	1	15	0	44	0	1	3	46	370
*** Sub Total(001) ***					3	82,430(Kg)																
*** Grade Total					3	82,430(Kg)																
*** Last Item					***																	

Date of Issue

606-81-95003

(주)평산엔텍

신진옥

부산광역시 강서구 녹산화전로 93(송정동)

제 조 : 도 매

부 용 산

청강빌딩건축구조재

메 매 , 립 데

606-81-95003

㈜평산엠텍 신진옥

부산광역시 강서구 녹산화전로 93(송정동)

제조:도매 철강및금속구조재

부종산 매매,입대

REVIEWED BY
WITNESSED BY
2024.11.29
S. M. KIM

원본과 같음을 확인함
2024년 9월 10일
SANGBU STAINLESS FORGING CO., LTD.
대표이사 김경
SANGBU STAINLESS FORGING CO., LTD.
Sang bu, Ju 1-82-51-310-3241

PMS
Q.A
WITNESSED BY
REVIEWED BY
Jmk

* Division - P:Product analysis, L:Ladle analysis

NOTE


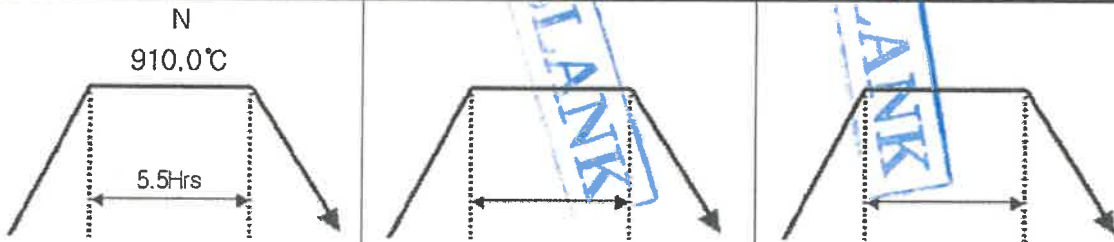

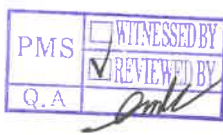

* THE SLAB IS FULLY KILLED, FINE-GRAIN PRACTICE. BASIC OXYGEN PROCESS AND VACUUM DEGASSING PROCESS WERE APPLIED.
* ANY WELDING SHALL NOT BE PERFORMED FOR THE ORDERED MATERIAL.
* The Certificate has been issued in compliance with EN 10204 Type 3.1

WE HEREBY CERTIFY THAT THE MATERIAL HAS BEEN MADE AND TESTED IN ACCORDANCE WITH THE ABOVE SPECIFICATION AND THE REQUIREMENTS.
상기의 제품용 검사의 결과지점별 규격에 일치한 것을 증명합니다.

Signature
Ju. Hee Jun
Chief Of Steel Making Quality Team

* 본 검사 증명서는 원본인 전자문서(전자서명 정보 포함)로부터 출력된 사본입니다. 전자문서의 내용을 원본과 일치함을 증명합니다. 고객은 원본과 일치함을 증명합니다. (http://san.hyundai-steel.com/cn/cn/ogn.jsp)
* This Mill Test Certificate is a copy that has been printed from original electronic document (with digital signing). You are able to check an original electronic document at hyundai-steel's customer portal (http://san.hyundai-steel.com/cn/cn/ogn.jsp)
* (사) 한국철강협회 부 인증기관에 등록된 규격 외 사용시 제품안전 및 인명상 손해가 발생할 수 있습니다.
* [Caution for Use] Damage on products and safety problems may arise if used other than the intended purpose.

HEAT TREATMENT REPORT

 SAMBU STAINLESS FORGING CO.,LTD 17,Hwajeonsandan 5-ro 14beon-gil, Gangseo-gu, Busan, Korea Tel : 051)316-3241 Fax : 051)316-3242		REPORT NO		HTR202409-128-001	
		ISSUE DATE		2024/09/10	
		CUSTOMER		피엠에스(주)	
MATERIAL	SA350LF2CL1			HEAT ID NO	SEE BELOW
DATE OF WORK	2024.09.03				
JOB NO	SBQ2024090301				
H/T METHOD	N				
HOLDING TEMP	910.0℃				
HOLDING TIME	5.5Hrs				
COOLING METHOD	A.C				
N:Normalizing, A:Annealing, Q:Quenching, T:Tempering, S:Solution, P:PWHT Simulation, S.R:Stress Relieved, S.T:Stabilization Heat Treatment, A.C:Air Cooled, F.C:Furnace Cooled, W.C:Water Cooled, O.C:Oil Cooled, AC.C:Accelerated Cooled					
HEATING CYCLE					
* Description OD650*T60 OD760*ID600*T90					
		2EA 2EA	S85072 S85072	A202408-315-001 A202408-315-002	
* Remark					
REVIEWED BY <input type="checkbox"/> WITNESSED BY <input type="checkbox"/>		 S.M. KIM			
					
					
		General Manager of QC Dep't			
		Surveyor			

✓

卷之四

SAMBU STAINLESS FORGING CO., LTD.
Sambu, Yu. T. 82-51-316-3241

PMS	<input type="checkbox"/> WITNESSED BY
QA	<input checked="" type="checkbox"/> REVIEWED BY <i>[Signature]</i>

REVIEWED BY
WITNESSED BY ☐

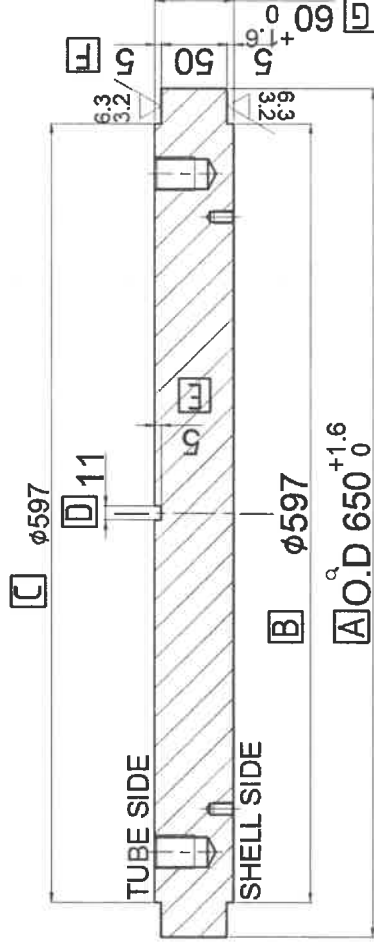
2024.11.28.

S. M. KIM

초음파탐상검사보고서 Ultrasonic Examination Report					Report No.: BK - PMS - U - 241015 - 01			
					Page No. : 1 OF 1			
Owner/Customer (주문주/고객) Pioneer Manufacturing & Supply Co., Ltd.		Project Name (공사명) HX127		Project No. (공사번호) T-401				
Item Name (제품명) SEE BELOW		Code(규격) : ASME SA388 ASME SEC.VIII DIV.2 PARA. 3.3.4.		Procedure (절차서) NEP(BK)-UT-ASME-001 Rev.1				
Item No. (제품번호) SEE BELOW		Drawing No. (도면번호) N / A		Test Time (검사시기) <input checked="" type="checkbox"/> After H.T <input type="checkbox"/> Before H.T				
Material (재질) SEE REMARK		Surface Condition (표면상태) <input checked="" type="checkbox"/> As Rough Machined (황삭) <input type="checkbox"/> As Welded		Couplant(접촉매질) <input checked="" type="checkbox"/> Oil(오일) <input type="checkbox"/> Water(물) <input type="checkbox"/> CMC				
Maker (제조사) : G E Model (모델) : USN 60 Control No. (관리번호) : E-20039 Due Date. (유효일자) : 15. Aug. 2025.		Test Method Mode (검사방법) <input checked="" type="checkbox"/> Straight Beam(수직) <input checked="" type="checkbox"/> Angle Beam(사각)		Test Mode (형태) <input checked="" type="checkbox"/> 접촉법(Contact) <input type="checkbox"/> 수침법(Immerse)				
		Standard Block(표준시험편) <input checked="" type="checkbox"/> IIW-V1(S/No.:B10265) <input type="checkbox"/> STB-A1(SS)		Reference Block (S/No.) (대비시험편) <input checked="" type="checkbox"/> Back Reference Method <input checked="" type="checkbox"/> 60°V Notch				
Equipment Calibration (장비 교정) ASTM E317 FIG1,BLOCK (S/No.:21-1334)		Straight Beam Standard Sensitivity : Back Reference Method (B1: 80 %)		Straight Beam Scanning Sensitivity Level +6 dB Above The Primary Ref' Level				
Equipment Linearity (장비 직선성) A.C.L within ±10% / S.H.L within ±5% FSH		Angle Beam Standard Sensitivity : 60° V Notch (DAC: 100 %)		Angle Beam Scanning Sensitivity Level +6 dB Above The DAC Level				
Transducer 탐촉자	Type 형태	Angle 교정각도	Frequency 주파수	Size 크기	Type 형태	Angle 교정각도	Frequency 주파수	Size 크기
	TKS2.25CFN (NCGA130)	0 °	2.25MHz	Ø1"		°	Mhz	
	1C20X22A45 (AAXB47)	45°	1 Mhz	20x22 mm		°	Mhz	
*UT Condition Sketch *EXAMINATION AREA : ENTIRE VOLUME 								
Identification No. 확인번호 (Part No./ Item / Size)		Q.TY 수량	Accept 합격	Reject 불합격	Interpretation 판정		Remark (Heat No.) /Material)	
1	(#1) TUBESHEET OD650 x 60T	2EA	V		NO RECORDABLE INDICATION		S85072 / SA350LF2CL.1	
2	(#7) GIRTH FLANGE OD760 x ID600 x 90T	2EA	V		"		S85072 / SA350LF2CL.1	
3	(#8) GIRTH FLANGE OD760 x ID600 x 90T	2EA	V		"		S98858 / SA266 Gr.2N	
4	(#16) TEST FLANGE OD760 x ID600 x 65T	1EA	V		"		S98858 / SA266 Gr.2N	
					-BLANK-			
SKETCH ON LINE, IF NECESSARY OR <input type="checkbox"/> ATTACHED 필요시 실선안에 스케치하거나 또는 첨부할 것.								
Examined by 시험자	이인섭 I. S. LEE		LEVEL II	Date of Examination 검사일자 Oct. 15. 2024.		Customer QA Manager		
Approved by 승인자	김두진 D. J. KIM		LEVEL III	Date of Report 보고서 일자 Oct. 15. 2024.				
				<input type="checkbox"/> Witnessed by 입회자 <input type="checkbox"/> Reviewed by 검토자		PMS <input type="checkbox"/> WITNESSED BY Q.A. <input checked="" type="checkbox"/> REVIEWED BY		

DIMENSION CHECK SHEET

TITLE	1) TUBE SHEET
DATE	2024-10-30
EQUIP NO.	HX-127
MATERIAL	SA350 LF2CL1
Q'TY	2 EA
HEAT NO.	S85072
H)TIE-ROD TAP	No.6-M10x1.5P
I) EYE BOLT HOLE	No.2-1"x8UNC
REMARK	

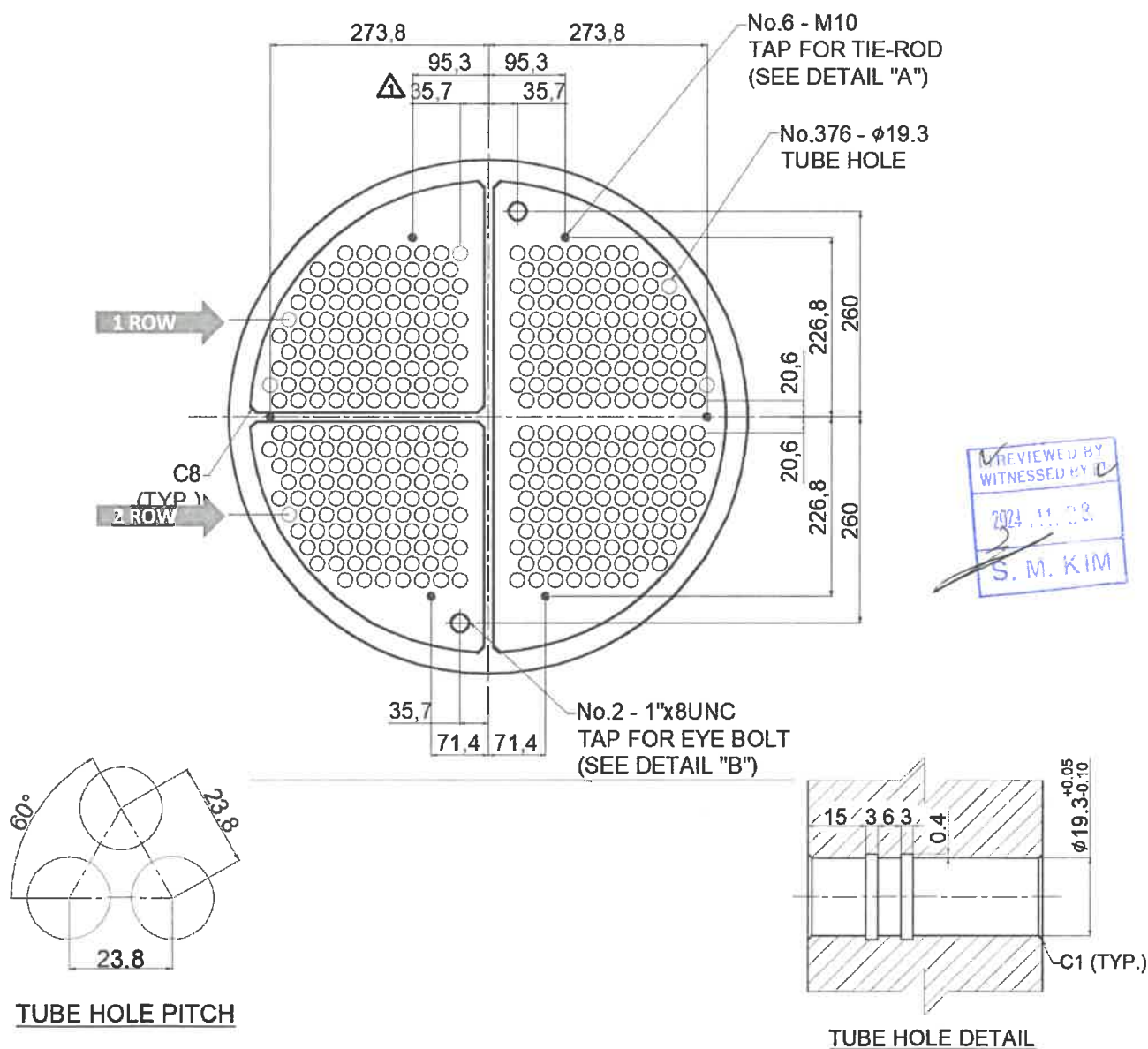


DESCRIPTION		1) OD 650 x 60T										UNIT : mm	
CHECK POINT		A	B	C	D	E	F	G	H	I			
TOLERANCE		+1.6 0	±0.8	±0.8	±0.4	±0.4	±0.4	+1.6 0					
STANDARD		650.0	597.0	597.0	11.0	5.0	5.0	60.0	6-M10	2-1"			
MEASUREMENT		1	651.2	597.5	597.5	10.9	4.9	60.8	OK	OK			
		2	651.3	597.4	597.5	10.8	5.0	5.0	60.6	OK	OK		
DESCRIPTION													
STANDARD													
MEASUREMENT													

Inspected by :											
Approved by :											
Marking : HX-127 #1, SA350 LF2CL1, S85072, 1&2											
Marking :											

DIMENSION CHECK SHEET

Title	1) TUBE SHEET	Date	2024-10-30
Equipment No.	HX-127	Dwg. No.	
Part No.	#1	Material	SA350 LF2CL1
Q'ty	2 EA	Size	OD 650 x 60T
Hole Size	Ø19.30 ^{+ 0.05} - 0.1	Hole Pitch	△ 23.80



TOTAL HOLES : 376 / CHECKED HOLES : 40

Witnessed / Reviewed by

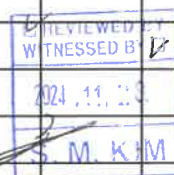
Approved by :

Reviewed by :

Prepared by :

DIMENSION CHECK SHEET

Hole Size	$\varnothing 19.30 \begin{smallmatrix} +0.05 \\ -0.1 \end{smallmatrix}$				Hole Pitch			\triangle 23.80			
No.	1		2								
	1 ROW	2 ROW	1 ROW	2 ROW							
1	19.30	19.30	19.30	19.30							
2	19.30	19.30	19.31	19.30							
3	19.30	19.30	19.30	19.30							
4	19.30	19.30	19.30	19.30							
5	19.30	19.31	19.30	19.30							
6	19.31	19.30	19.30	19.30							
7	19.30	19.30	19.30	19.30							
8	19.30	19.30	19.30	19.30							
9	19.30	19.30	19.30	19.30							
10	19.30	19.30	19.30	19.30							
11	19.30	19.30	19.30	19.30							
12	19.30	19.30	19.30	19.31							
13	19.30	19.30	19.30	19.30							
14	19.30	19.30	19.30	19.30							
15	19.30	19.31	19.30	19.30							
16	19.30	19.30	19.30	19.30							
17	19.30	19.30	19.31	19.30							
18	19.30	19.30	19.30	19.30							
19	19.30	19.30	19.30	19.30							
20	19.30	19.30	19.30	19.30							
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											





Mill Test Certificate/검사증명서

Certificate No./증명서번호 : 211014-FP01PN-0012A2-0004
Date of Issue/발행일자 : Oct., 22, 2021

Order No./계약번호 : 01S5126117

PO No./주문번호 : P4 01S5126117(CS)(2108)

Supplier /주문자 : POSCO INTERNATIONAL CORPORATION

Commodity : PLATE NACE MR0103/0175

Customer /고객사 : MYUNG SUNG STEEL

Spec & Type : SA516-70 ASME 2019ED NACE MR 0103/0175

Size/치수	Product No. /제품번호	Quantity /수량	Weight /중량 (kg)	Heat No. /제강번호	Position	Tensile Test /인장시험		Hardness /경도	A.G.S	Division	Chemical Composition/화합성분																													
						YP (MPa)	TS (MPa)				EL (%)	C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	B (ppm)	Cu (%)	Mo (%)	Nb (%)	Ti (%)	V (%)																
10x2438x12192	PC96362901-2902	2	4,666	SF46385	T	379	546	24	9.5	L	0.1867	0.334	1.330	0.0111	0.0030	0.031	0.016	0	0.017	0.006	0.002	0.0018	0.003																	
*** Sub Total (080) ***		2	4,666 (kg)		* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + Cr + Mo/6 + V/5																																			
						CEQ2 (A) = C + Mn/6																																		
12x2438x6096	PB60709306	1	1,400	SB28165	T	359	540	25	9.0	L	0.1883	0.345	1.350	0.0073	0.0023	0.021	0.013	0	0.021	0.004	0.002	0.0018	0.002																	
12x2438x6096	PB60709205-9206	2	2,800	SB28165	T	365	540	27	9.0	L	0.1883	0.345	1.350	0.0073	0.0023	0.021	0.013	0	0.021	0.004	0.002	0.0018	0.002																	
*** Sub Total (070) ***		3	4,200 (kg)		* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + Cr + Mo/6 + V/5																																			
						CEQ2 (A) = C + Mn/6																																		
12x2438x12192	PB60709301-9302	2	5,600	SB28165	T	359	540	25	9.0	L	0.1883	0.345	1.350	0.0073	0.0023	0.021	0.013	0	0.021	0.004	0.002	0.0018	0.002																	
*** Sub Total (080) ***		2	5,600 (kg)		* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + Cr + Mo/6 + V/5																																			
						CEQ2 (A) = C + Mn/6																																		

* Position - T : Top, M : Middle, B : Bottom

* Tensile Test, Direction : Transversal, Gauge Length : 200 mm(Rectangular), YP Method : 0.2 % off-set

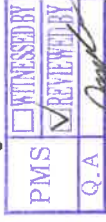
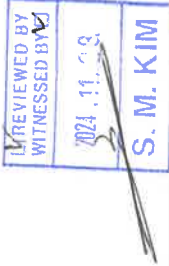
* A.G.S : Austenite Grain Size, P : Products Analysis

* Division - L : Ladle Analysis, P : Products Analysis

* Supply Condition : As-Rolled unless otherwise Heat Treated.

We hereby certify that the material herein has been made in accordance with the order and above specification. This material has been fully killed and made by basic oxygen process. This material is fine grained steel. This material has been made by vacuum degassing and calcium treated process.

No repair welding was performed to the products. Test Certificate is issued according to ISO 10474/EN 10204 3.1.



본 검사증명서 위.변조시 사문서 위조(형법 제231조)로 불이익을 당하실 수 있습니다.



Surveyor To :

T.C.BAE



Mill Test Certificate/검사증명서

Certificate No./증명서번호 : 211014-FP01PN-0012A2-0004
Date of Issue/발행일자 : Oct., 22, 2021

Order No./계약번호 : 01S5126117

PO No./주문번호 : P4 01S5126117(CS)(2108)

Supplier /주문자 : POSCO INTERNATIONAL CORPORATION

Commodity /품명 : PLATE NACE MR0103/0175

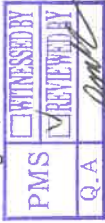
Customer /고객사 : MYUNGSUNG STEEL

Spec & Type /규격 : SA516-70 ASME 2019ED NACE MR 0103/0175

Product No. 제품번호	Division	Sol-AI (%)	CEQ (%)	CEQ2 (%)	
PC96362901-2902	L P	0.035 0.036	0.42 0.42	0.41 0.41	
*** Sub Total (060)	**		2	4,666 (kg)	* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5 CEQ2 (A) = C + Mn/6
PB60709306	L P	0.033 0.031	0.42 0.42	0.41 0.41	
PB60709205-9206	L P	0.033 0.031	0.42 0.42	0.41 0.41	
*** Sub Total (070)	**		3	4,200 (kg)	* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5 CEQ2 (A) = C + Mn/6
PB60709301-9302	L P	0.033 0.031	0.42 0.42	0.41 0.41	
*** Sub Total (090)	**		2	5,600 (kg)	* B/L Date ==> 2021/10/14 CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5 CEQ2 (A) = C + Mn/6



We hereby certify that the material herein has been made in accordance with the order and above specification.
This material has been fully killed and made by basic oxygen process. This material is fine grained steel.
This material has been made by vacuum degassing and calcium treated process.
No repair welding was performed to the products. Test Certificate is issued according to ISO 10474/EN 10204 3.1.



본 검사증명서 위·변조시 사문서 위조(형법 제231조)로 불이익을 당하실 수 있습니다.



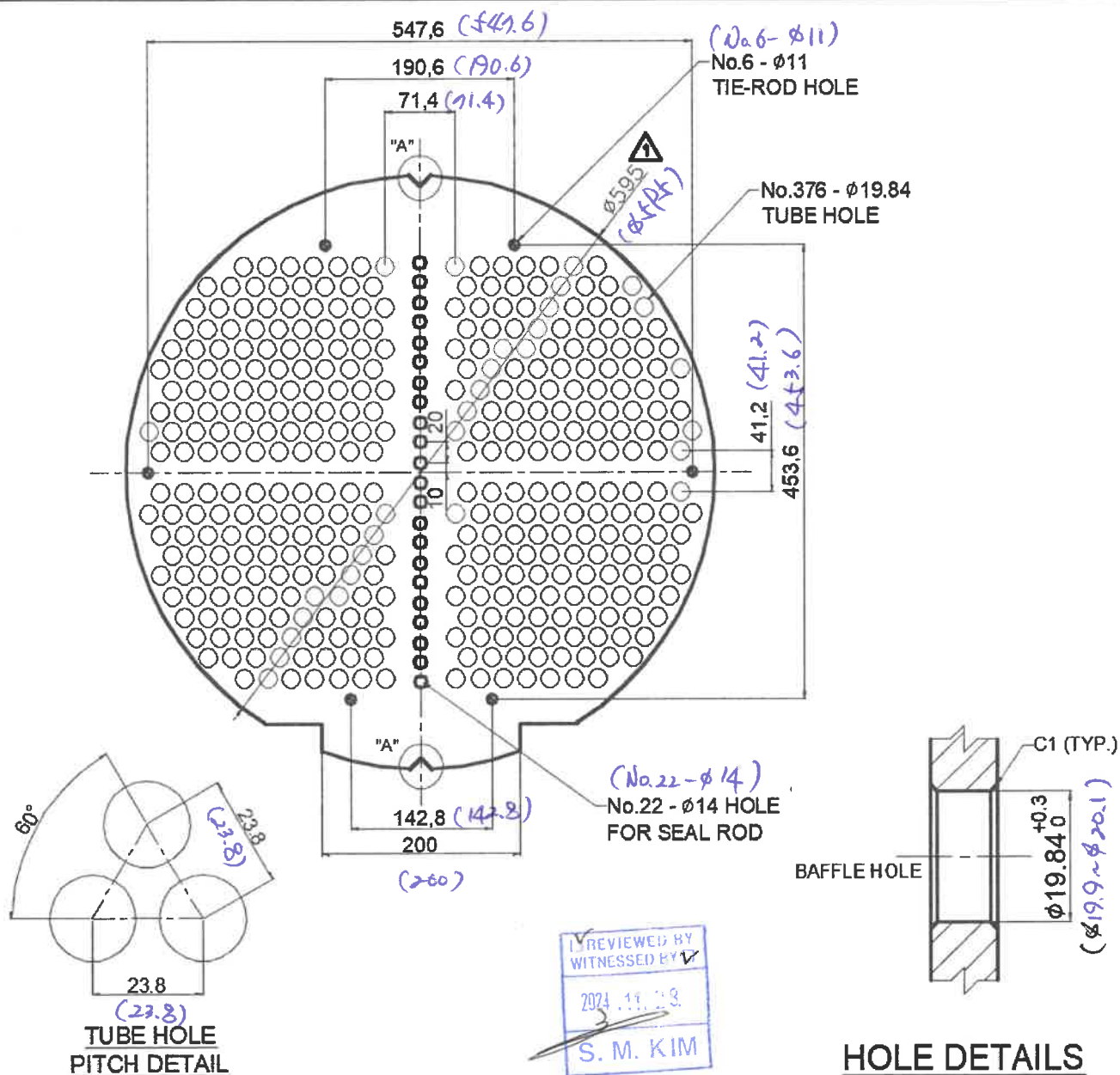
Surveyor To :

T.C.BAE

DIMENSION CHECK SHEET

Product Manufacturing & Supply

Item	11) BAFFLE	Date	2024-10-28
Equipment No.	HX-127	Dwg. No.	
Part No.	#3	Material	SA516 Gr.70
Q'ty	8 EA	Size	OD595.2 x 10T
Hole Size	Ø19.84 ^{+0.3} ₀	Hole Pitch	△ 23.80



Witnessed / Reviewed by

Approved by :

Reviewed by :

Prepared by :

ORIGINAL



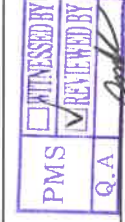
검사증명서
MILL TEST CERTIFICATE

주문번호/Order No. : P23B400235
발주번호/PO No. : MYUNGSUNG STEEL
품명/Commodity : STEEL PLATE
제품규격/Specification : ASME SA516-70 MT LTV 2021ED

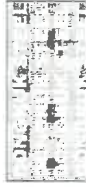
고객사/Supplier : MYUNGSUNG STEEL
수요가/Customer : MYUNGSUNG STEEL
검사증명서번호/Certificate No. : DP3-2-240129-044-003
발행일자/Date of issue : 2024-01-29

제품치수 Dimension 단위 Unit inch: ", mm: Space	제품번호 Product No	수량 Quantity	중량 Weight kg	제강번호 Heat No	인장시험 Tensile Test			충격시험 Impact Test			경도시험 Hardness	화학적분(%) Chemical Composition						Remarks
					GL	YP02	TS	EL	T S	V Notch		C	Si	Mn	P	S	Cr	
						N/mm ²	%		T P	J	HB							
14. 00*2438*12192 *Specimen No: DP10920029-a, DP10920029-c, DP10920001-d, DP10920001-e ** Normalized: 910 °C, 28min	B379179-01, 02, 03		3, 266	WK649236	1	376	547	26.2		-51 °C	149	0.15	0.35	1.49	0.016	0.003	0.01	MYUNGSUNG STEEL
	Sub Total (120)	3	9, 798									0.15	0.37	1.46	0.018	0.003	0.01	
	B378691-01		1, 866	WK457212	1	354	525	26.2		-51 °C	154	0.15	0.34	1.47	0.015	0.003	0.01	MYUNGSUNG STEEL
16. 00*2438*6096 *Specimen No: DP10932605-a, DP10932605-c, DP10932605-d, DP10932601-e ** Normalized: 910 °C, 31min	B378691-04, 05	1	1, 866									0.14	0.36	1.44	0.016	0.003	0.013	
	Sub Total (150)																	
	B378691-04, 05		3, 733	WK457212	1	354	525	26.2		-51 °C	154	0.15	0.34	1.47	0.015	0.003	0.01	MYUNGSUNG STEEL
16. 00*2438*12192 *Specimen No: DP10932605-a, DP10932605-c, DP10932605-d, DP10932601-e ** Normalized: 910 °C, 31min		2	7, 466															
	Sub Total (160)																	
We hereby certify that the material has been made by basic oxygen process (Fully killed steel. Fine grain practice) and satisfactorily tested in accordance with above specification requirement called for by the above order. If the amount of Cr, Ni, Cu, Mo, Ti or Si is blank, the heat analysis for that element is less than 0.02% and/or of Nb, V is blank, it is less than 0.008%. * Inspection documents : According to EN 10204 Type 3.1. No welding repair. NACE MR0175(ISO15156)/MR0103 Hardness only. Vacuum degassed.																		
* Tensile Test Direction - Transverse-TOP * Impact Test Direction - Longitudinal-TOP * Ceq = C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 * Comp 1 = Nb+V * Supply Condition - Normalized																		
Specimen No. : a-Tension, c-Impact, d-Hardness, e-Product Analysis. * Division : L-Ladle Analysis, P-Product Analysis * Sub(Sub Size, Real Value, mm) : Blank-Full Size, 1-7.5*10, 2-5.0*10 * GL(Gauge Length, mm) : 1-200(Rec.), 3-80(Rec.), 5-50(Round), 6-5.65*√S(Converted/Rec.), 10-50(Rec.) * T(S), AI : Total(Soluble) AI *Ti : Trace * NHL Result : G-No Break, B-Break * TTP(Through Thickness Position) : 1-Surface, 2-1/4T, 3-1/2T																		

원본검증 방법 : 동국제강 E-Biz 홈페이지 접속(http://biz.dongkuksteel.com/) → 고객포탈 선택 → 검사결과서 확인/검증(왼쪽 하단) → 정보인력후 검색
QR Code 이용 방법 : Google Play 'QReal' 검색 후 다운로드/실행 → QR Code 스캔 / iOS : App Store 'QReal' 검색 후 다운로드/실행 → QR Code 스캔



Surveyor to : _____ Surveyor to : _____
Chief of Quality Control Team / J.W.Lee



ORIGINAL

검사증명서
MILL TEST CERTIFICATE



주문번호/Order No. : P23B400235
발주번호/PO No. : MYUNGSUNG STEEL
품명/Commodity : STEEL PLATE
제품규격/Specification : ASME SA516-70 MT LTV 2021ED

검사증명서번호/Certificate No. : DP3-2-240129-044-003
발행일자/Date of issue : 2024-01-29

제품 치수 Dimension 단위 Unit inch: ", mm: Space	제품 번호 Product No	수량 Quantity y	중량 Weight kg	화학적 성분 (%) Chemical Composition								Remarks		
				Cu	Mo	Nb	Ti	V	T. Al	S. Al	Ceq		B	Comp1
14.00*2438*12192 *Specimen No: DP10920029-a, DP10920029-c, DP10920001-d, DP10920001-e ** Normalized: 910 ° C, 28min	B379179-01, 02, 03 Sub Total (120)	3	3,266 9,798	0.01 0.007	0.004 0.003	0.02 0.019	0.015 0.013	0.002 0.003	0.036 0.038	0.034 0	0.403 0.398	0.0001 0.0001	0.022 0.022	MYUNGSUNG STEEL
16.00*2438*6096 *Specimen No: DP10932605-a, DP10932605-c, DP10932605-d, DP10932601-e ** Normalized: 910 ° C, 31min	B378691-01 Sub Total (150)	1	1,866 3,733	0.01 0.012	0.003 0.002	0.02 0.018	0.014 0.012	0.003 0.003	0.039 0.04	0.037 0	0.4 0.387	0.0001 0.0001	0.023 0.021	MYUNGSUNG STEEL
16.00*2438*12192 *Specimen No: DP10932605-a, DP10932605-c, DP10932605-d, DP10932601-e ** Normalized: 910 ° C, 31min	B378691-04, 05 Sub Total (160)	2	7,466											MYUNGSUNG STEEL
Tensile Test Direction-Transverse-TOP * Impact Test Direction-Longitudinal-TOP * Ceq = C+Mn/6+(Ni+Cu)/15+(Cr+Mo+V)/5 * Comp1 = Nb+V * Supply Condition - Normalized				We hereby certify that the material has been made by basic oxygen process (Fully killed steel, Fine grain practice) and satisfactorily tested in accordance with above specification requirement called for by the above order. If the amount of Cr, Ni, Cu, Mo, Ti or Si is blank, the heat analysis for that element is less than 0.02% and/or of Nb, V is blank, it is less than 0.008%. * Inspection documents : According to EN 10204 Type 3.1, No welding repair. NACE MR0175(ISO15156)/MR0103 Hardness only. Vacuum degassed.								* Specimen No. : a-Tension, c-Impact, d-Hardness, e-Product Analysis. * Division : L-Ladle Analysis, p-Product Analysis * Sub(Sub Size, Real Value, mm) : Blank-Full Size, 1-7.5*10, 2-5.0*10 * GL(Gauge Length, mm) : 1-200(Rec.), 3-80(Rec.), 5-50(Round). 6-5.65/S(Converted/Rec.), 10-50(Rec.) * T(S) Al : Total(Soluble) Al *Tr : Trace * NRL Result : G-No Break, B-Break * TTP(Through Thickness Position) : 1-Surface, 2-1/4T, 3-1/2T		
본 국인물은 상기의 규격요도 외 타용도로 사용시 제품상 및 안전사고등의 문제가 발생할 수 있으며, 본 검사증명서를 위조 또는 변조시 형사범에 의해 처벌될 수 있습니다.														

REVIEWED BY

WITNESSED BY □

2024.11.29.

S. M. KIM

Date of Issue/발행일자 : Jul., 16, 2021

Order No./계약번호 : 01S4937689

PO No./주문번호 : P4 INN NIPA PJT(2104)(02)

Supplier /주요자 : POSCO INTERNATIONAL CORPORATION

Commodity /품명 : PLATE NACE MR 0103, 0175

Customer /고객사 : MYUNGSUNG STEEL

Spec & Type : ASME SEC II PART A 19ED SA516-70N MT LTV

Chemical Composition/화합성분												
C (%)	Si (%)	Mn (%)	P (%)	S (%)	Cr (%)	Ni (%)	B (ppm)	Cu (%)	Mo (%)	Nb (%)	Ti (%)	
0.1836	0.351	1.336	0.0076	0.0017	0.022	0.012	3	0.015	0.005	0.002	0.0022	
0.1859	0.354	1.344	0.0069	0.0020	0.023	0.011	2	0.014	0.005	0.001	0.0017	
CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5												

Division	
L	
P	

A.G.S	
Hardness /경도	HB
1: 153.1	
2: 152.3	
3: 152.2	
A: 152.5	

Impact Test /충격시험	
V Notch -48°C	Energy (Joule)
1: 209	
2: 230	
3: 126	
A: 188	

Tensile Test /인장시험	
YP (MPa)	TS (MPa)
360	539
	25

Position	
T	

Heat No. /제강번호	
SF41975	

Weight /중량 (kg)	
2,800	

Quantity /수량	
1	

Product No. /제품번호	
PC93589502	

Size/치수	
12x2438x12192	

*** Sub Total (050) ***

*** Heat Treatment ==> Normalized : 890°C 21min. ***

*** Grade Total ***

2,800 (kg)

4,200 (kg)

1

2

2024.11.29

S. M. KIM

REVIEWED BY

WITNESSED BY

2024.11.29

S. M. KIM

WITNESSED BY

REVIEWED BY

Q.A.

CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5

REVIEWED BY
WITNESSED BY
2024. 11. 29.
S. M. KIM

PMS
Q.A
REVIEWED BY
WITNESSED BY

* Position - T : Top, M : Middle, B : Bottom
* Tensile Test Direction : Transversal, Gauge Length : 200 mm(Rectangular),
YP Method : 0.2 % off-set
* Impact Test Direction : 1/4T Longitudinal, Full-Size : 10 mmX10 mm
* A.G.S : Austenite Grain Size,
* Division - L : Ladle Analysis, P : Products Analysis
* Supply Condition : As-Rolled unless otherwise Heat Treated.

We hereby certify that the material herein has been made in accordance with the order and above specification.
This material has been fully killed and made by basic oxygen process. This material is fine grained steel.
This material has been made by vacuum degassing and calcium treated process.
No repair welding was performed to the products. Test Certificate is issued according to ISO 10474/EN 10204 3.1.

본 검사증명서 위변조시 사문서 위조(형법 제231조)로 불이익을 당하실 수 있습니다.



Surveyor To :

T.C.BAE

Order No./계약번호 : 01S4937689

PO No./주문번호 : P4 INN NIPA PJT(2104)(02)

Supplier /주물자 : POSCO INTERNATIONAL CORPORATION

Commodity /품명 : PLATE NACE MR 0103, 0175

Customer /고객사 : MYUNGSUNG STEEL

Spec & Type /규격 : ASME SEC II PART A 19ED SA516-70N MT LTV

Product No. /제품번호	Division	V (%)	Sol-Al (%)	CEQ (%)	
PC93589502	L	0.003	0.035	0.41	
	P	0.002	0.032	0.42	
*** Sub Total (P50) ***					1 2,800 (kg)
*** Grade Total ***					2 4,200 (kg)

CEQ (G) = C + Mn/6 + (Ni + Cu)/15 + (Cr + Mo + V)/5

REVIEWED BY
WITNESSED BY □

2024.11.29.

S. M. KIM

WITNESSED BY

REVIEWED BY

Q.A.

Q.A.

We hereby certify that the material herein has been made in accordance with the order and above specification.
This material has been fully killed and made by basic oxygen process. This material is fine grained steel.
This material has been made by vacuum degassing and calcium treated process.
No repair welding was performed to the products. Test Certificate is issued according to ISO 10474/EN 10204 3.1.

본 검사증명서 위.변조시 사문서 위조(형법 제231조)로 불이익을 당하실 수 있습니다.

Surveyor To :

T.C.BAE




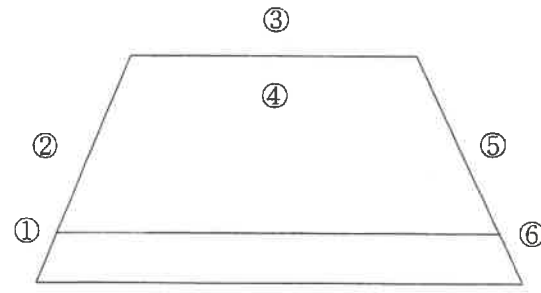
 TAE HEUNG		열 처리 성적서 HEAT TREATMENT RECORD		H.T DATE	2024. 10. 23.	
				RECORD NO	TH-241023-01	
주 문 주: CUSTOMER: P.M.S Co., LTD.			열 전 대 종 류 : KIND OF THERMO COUPLE : K-TYPE			
공 사 명: PROJECT NAME: N/A			온도기록계 (TEMP RECORD) 교정번호 (CERTIFICATE NO): UT24T-42538			
공사번호: PJT NO: HX-127			열전대 (THERMO COUPLE) UT24T-42528 ~ UT24T-42535			
부 품 명: PART NAME: 2:1 ELLIP HEAD			열처리로제원(FURNACE SIZE) 5.0m(H)×8.5m(L)×4.7m(W)			
재 질 : MATERIAL: SA516-70N			가열원: HEAT SOURCE: Gas			
열처리 종류: TYPE OF HEAT: STRESS RELIEF			기록지 속도: CHART SPEED: 25mm/hr			
열 처리 조 건 (HEAT TREATMENT CONDITION)						
조 건 Condition	요구치 온도 Required	실제 작업 온도 Actual	No	ITEM NO	SIZE	Q,TY
① 장 입 온 도 Loading Temp.	Max 425 °C	300 °C	1	HX-127	Min.10T*ID600	2EA
② 가 열 율 Heating Rate	Max 220 °C/hr	170 °C/hr	2	HX-127	Min.12T*ID925	2EA
③ 유 지 온 도 Holding Temp.	625±25 °C	629-642 °C				
④ 유 지 시 간 Holding Time	Min 60 min	90 min				
⑤ 냉 각 율 Cooling Rate	Max 280 °C/hr	150 °C/hr				
⑥ 추 출 온 도 Unloading Temp.	Max 425 °C	290 °C				
⑦ 가열, 냉각, 최대온도편차 Max. Allowable Variation in Temp. Heating and cooling.	Max 83 °C	20 °C				
						
작 성 자: (Prepared By): H.S.LEE			승 인 자: (Approved By): C.M.YOU		REMARKS: Temp Recorder, Thermocouple expiry date : 2025. 04. 18.	

CHART NO. FH-05035-2

Make this copy to the original



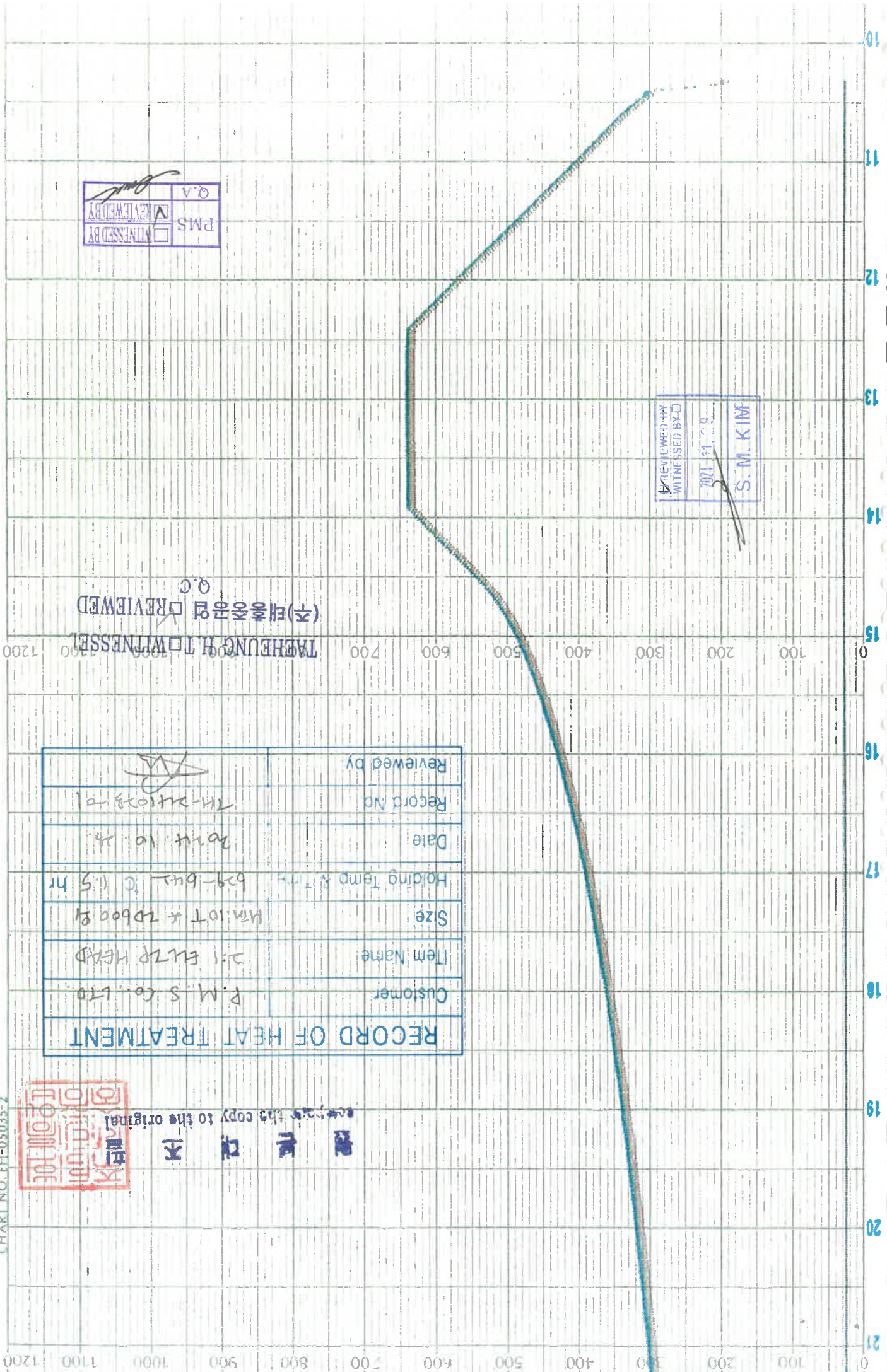
RECORD OF HEAT TREATMENT



Customer	P.M.S Co., LTD.
Item Name	2:1 FLTP HEAD
Size	Wt. 10T x 20600 g
Holding Temp & Time	629-641 °C 1.5 hr
Date	2024. 10. 24.
Record No	TH-241028-01
Reviewed by	

Q.C
(주)태웅운용팀
TAEHEUNG H. TO WITNESSE

Q.A	
REVIEWED BY	<input checked="" type="checkbox"/>
P.M.S	<input type="checkbox"/>
WITNESSED BY	

REVIEWED BY	
WITNESSED BY	
DATE	2024. 11. 28.
S. M. KIM	

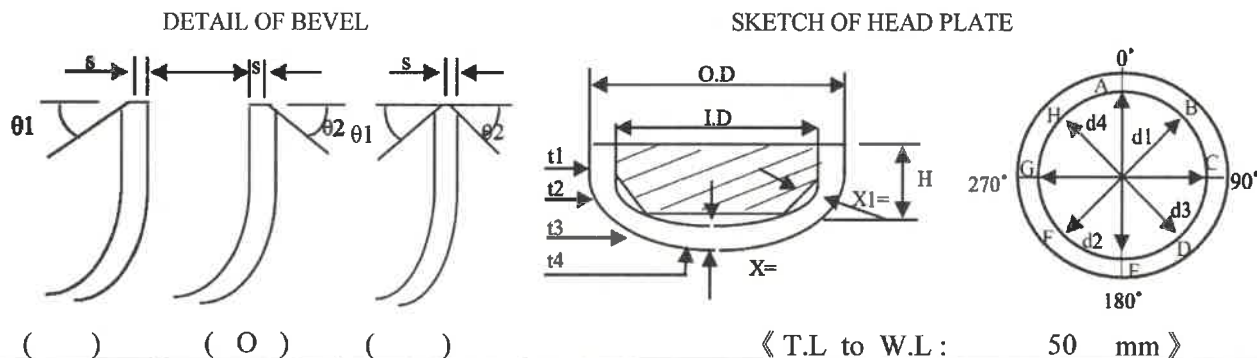


<div></div> <div>자 분 탐 상 검 사 보 고 서 Magnetic Particle Examination Report</div>					Report No.: BK - PMS - U - 241028 - 01		
					Page No. : 1 OF 1		
Owner/Customer (주문주/고객) Pioneer Manufacturing & Supply Co., Ltd.		Project Name (공사명) PV120		Project No. (공사번호)			
Item Name (제품명) 2:1 ELLIP HEAD		Code (규격) ASTM A275 ASME SA788 S18		Procedure (절차서) N / A			
Item No. (제품번호) SEE BELOW		Drawing No. (도면번호) P24050-E0000-06H Rev.0		Test Time (검사시기) ■ After Forming			
Material (재질) SA516 Gr.70N		Test Block (테스트 블록) ■ Pie indicator (ASTM A 275) ■ Lifting Block (Over 18Kg) (S/No.:MP19706)		Surface Condition (표면상태) ■ As Machined □ As Grinded □ As Welded □			
Yoke Equipment (요크 장비) □ AC(교류) : 10 Lbs. ■ DC(직류) : 40 Lbs. Brand Kyung-Do Model No. MP-A2D Serial No. MP5746 Spacing 3 ~ 5 In Due date 2025. 03. 30.		Magnetization Technique (장비) ■ Yoke (요크법) □ Prod (프로드법) □ Coil (코일법)		Direction of Magnetic Field (자화 종류) ■ Longitudinal (선형자화) □ Circular (원형자화) □ Both (양쪽)		Magnetic Particle (자분, 종류) Brand : GS Chem Co., Ltd. Model No. : MPS-B Batch No. : M240114P □ Dry(건식) ■ Wet(습식) ■ Visible(비형광) □ Fluorescent(형광)	
Illuminance Meter (조도계) Brand : TES S/N : 230607627 Model : 1330A Due Date: 2024. 12. 28. Illumination: (조명도) Min. 1100 Lux		Black Light(자외선등) □ With(사용) ■ Without(미사용) Brand : N / A Model : N / A Serial No. : N / A Intensity : N / A Due date : N / A Demagnetization (탈자) □ Yes ■ No					
Temp Meter (온도계) Brand : TES Model : 1300		Model No : 230607462 Due Date : 2024. 12. 27		Test Temp (제품 표면 온도) ■ Ambient □ Elev			
Sketch *EXAMINATION AREA : Only Knuckle Zone(Out Side & In Side) & Bevel Part							
Identification No. 확인번호 (Equi. No./ Part No. / Size)		Q.TY 수 량	Accept 합격	Reject 불합격	Interpretation 판 정	Remark 비 고	
1 (HX127) ID600 x 10Min.T x SF50		2EA	V		ACCEPTABLE		
2 (HX127) ID925 x 12Min.T x SF50		2EA	V		"		
					-BLANK-		
						<div><div>PMS</div><div>Q.A</div><div>WITNESSED BY</div><div>REVIEWED BY</div><div></div></div>	
□ SKETCH ON DOT LINE, IF NECESSARY OR □ ATTACHED. 필요시 점선안에 스케치하거나 또는 첨부할것.							
Examined by 시 험 자 이 인 섭 I. S. LEE		LEVEL II		Date of Examination 검사일자 Oct. 28. 2024.		Customer QA Manager	
Approved by 승 인 자 김 두 진 D. J. KIM		LEVEL III		Date of Report 보고서 일자 Oct. 28. 2024.		<div><div>REVIEWED BY</div><div>WITNESSED BY ()</div><div>2024.11.08</div><div>S. M. KIM</div></div>	
				□ Witnessed by 입 회 자			
				□ Reviewed by 검 토 자			

INSPECTION REPORT FOR HEAD PLATE

CUSTOMER	PMS CO., LTD.			PROJECT NAME	HX-127
ITEM NAME	HEAD	P/O No.	PMS-24-050	CODE	ASME Sect. VIII, Div. 1(2023Ed.)
FORMING METHOD	COLD	HEAD TYPE	2:1 ELLIP	INSPECTION DATE	18-Oct-24
MATERIAL SPEC.	SA516 Gr.70N	QUANTITY	2EA	DWG NO.	

SKETCH Unit : mm

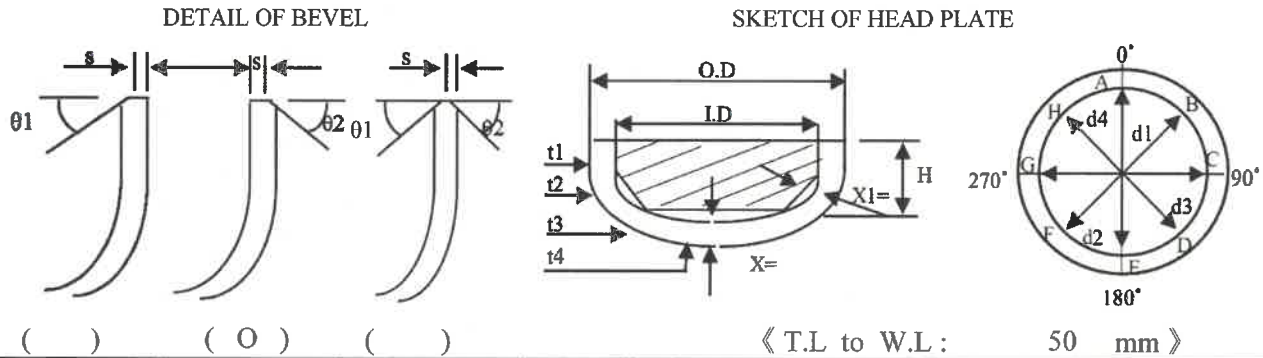


Description	Design Dimension	Tolerance	Mark	Actual Dimension							
				HEAD				HEAD			
Inside Diameter (Roundness)	925	Max-Min= 1% of Nominal I.D	I.D	d1	d2	d3	d4	d1	d2	d3	d4
				0	+1	+2	0	0	-3	-1	+1
Circumference	2906		π I.D	2907				2905			
Height	281	0~+1.25% X I.D	H	287				288			
Thickness	14	Min. 12		A	C	E	G	A	C	E	G
			t1	14.8	14.6	14.2	14.9	14.6	14.7	14.4	14.6
			t2	13.9	13.8	13.6	13.8	13.9	13.9	13.7	13.9
			t3	13.2	13.2	13.0	13.2	13.2	13.2	13.2	13.2
			t4	13.3	13.0	13.2	13.3	13.2	13.3	13.2	12.9
Shape deviation	R = 837	+1.25% of ID ~ -0.625% of ID		X		X1		X		X1	
			A.E	GOOD		GOOD		GOOD		GOOD	
	r = 160	Small Radius>r	C.G	GOOD		GOOD		GOOD		GOOD	
Bevel Angle	S= 2	± 1	S	1				1			
	$\theta 1=$	-	$\theta 1$	N/A				N/A			
	$\theta 2= 25^{\circ}$	$\pm 2.5^{\circ}$	$\theta 2$	GOOD				GOOD			
Plate No.											
Judgment				ACCEPTABLE				ACCEPTABLE			
We hereby certify that above heads made by cold forming meet all requirement of UG79(d) of ASME Sect.VIII Div.1 and heat treatment is <input type="checkbox"/> not performed. <input type="checkbox"/> performed				APPROVED BY <div><div>WITNESSED BY</div><div>Q.A</div></div> <div><div>WITNESSED BY</div><div>REVIEWED BY</div></div>							
WITNESSED BY				INSPECTED BY <div><div>2024.11.20</div><div>S.M. KIM</div></div> <div>S. J. PARK</div> <div>Y. S. PARK</div>							

INSPECTION REPORT FOR HEAD PLATE

CUSTOMER	PMS CO., LTD.			PROJECT NAME	HX-127
ITEM NAME	HEAD	P/O No.	PMS-24-050	CODE	ASME Sect. VIII, Div. 1(2023Ed.)
FORMING METHOD	COLD	HEAD TYPE	2:1 ELLIP	INSPECTION DATE	18-Oct-24
MATERIAL SPEC.	SA516 Gr.70N	QUANTITY	2EA	DWG NO.	

SKETCH Unit : mm



《 T.L to W.L : 50 mm 》

Description	Design Dimension	Tolerance	Mark	Actual Dimension							
				HEAD				HEAD			
Inside Diameter (Roundness)	600	Max-Min= 1% of Nominal I.D	I.D	d1	d2	d3	d4	d1	d2	d3	d4
				0	-1	-1	0	+1	+2	-1	0
Circumference	1885		π I.D	1884				1885			
Height	200	0~+1.25% X I.D	H	205				208			
Thickness	12	Min. 10		A	C	E	G	A	C	E	G
			t1	14.3	14.1	14.2	14.6	14.8	14.9	14.3	14.8
			t2	12.6	12.8	12.8	12.8	13.0	12.9	12.8	12.9
			t3	12.3	12.1	12.3	12.2	12.3	12.4	12.2	12.3
			t4	12.3	12.1	12.0	12.1	12.1	12.0	12.2	12.0
Shape deviation	R = 543	+1.25% of ID ~ -0.625% of ID		X		X1		X		X1	
			A.E	GOOD		GOOD		GOOD		GOOD	
	r = 104	Small Radius>r	C.G	GOOD		GOOD		GOOD		GOOD	
Bevel Angle	S= 2	±1	S	1				1			
	Θ1=	—	Θ1	N/A				N/A			
	Θ2= 25°	±2.5°	Θ2	GOOD				GOOD			

Plate No.

Judgment

ACCEPTABLE

ACCEPTABLE

We hereby certify that above heads made by cold forming meet all requirement of UG79(d) of ASME Sect.VIII Div.1 and heat treatment is ☐ not performed. ☐ performed

WITNESSED BY



APPROVED BY

S. J. PARK

INSPECTED BY

Y. S. PARK



ISO/IEC 17024
Personnel Certification Program
#0544



ASNT Certification Services LLC.

Be it known that

Du Jin Kim

Has met the established and published Requirements for Certification by ASNT Certification Services LLC. as

NDT Level III

In the following Nondestructive Testing Methods:

Method	Issue Date	Expiration Date
Liquid Penetrant Testing	2/22	2/27
Magnetic Particle Testing	2/22	2/27
Radiographic Testing	2/22	2/27
Ultrasonic Testing	2/22	2/27
Visual Testing	2/22	2/27



206623

Certificate Number

John S. [Signature]
Certification Management Committee
Chair

John J. [Signature]
ASNT Certification Services, LLC, President

Note: All ASNT NDT Level III exams are developed and maintained in accordance with ISO/IEC 17024 guidelines for certification of persons. The following exams are currently accredited by the American National Standards Institute (ANSI) - BASIC, ET, MT, PT, RT, UT, and VT. This certificate is the property of ASNT Certification Services LLC., is not official without ASNT Certification Services LLC.'s raised gold seal, and is subject to revocation prior to the listed expiration date. This certificate shall be verified on <https://asntcertification.org> or by contacting ASNT Certification Services LLC.

Certificate No: II-2013018

☐ New ☒ Re



NDE CERTIFICATE

Korea Machinery Inspection E&C Co., Ltd.

That is to certify that the individual named below has successfully completed experience, training and examination requirements in accordance with the provisions of KMI E&C Co., Ltd. Procedure for NDE personnel Qualification and Certification KMIQ-P6225 (Rev.9). which meets the requirements of SNT-TC-1A & CP-189 (2016 Ed.).

In Sub, Lee

is hereby certified to perform the following Nondestructive Examination Method(s)

Method	Technique	Level	Limitation (if any)	Certification Date	Expiration Date
Radiographic Testing	Radiography	II	-	03/04/2022	03/03/2027
Ultrasonic Testing	Manual	II	-	03/04/2022	03/03/2027
Magnetic Particle Testing	-	II	-	03/04/2022	03/03/2027
Liquid Penetrant Testing	-	II	-	03/04/2022	03/03/2027
Visual Testing	-	II	-	03/04/2022	03/03/2027



Du Jin, Kim

(ASNT CERT NO:206623)

Qualified by Designated NDE Level III

03/04/2022

Date

Moo Ung, Yoon

President of KMI E&C Co., Ltd

03/04/2022

Date

KMI Co., Ltd. (KMIQ-F6251-01, Rev.1)

Calibration Certificate

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2403326-106-001

Page (1) of (2)

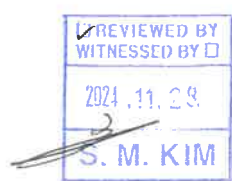


1. Client

Name : P.M.S Co., LTD
Address : 296, Dae Dong-Ro, Sasang-Gu, Busan, Korea

2. Calibration Subject

Description : Inside/Outside Caliper(Digital type)
Manufacturer & Type : Mitutoyo / (0 ~ 300) mm, 0.01 mm
Serial Number : 0023118



3. Date of Calibration : 12. Apr. 2024

4. Environment

Temperature : (20.7 ± 0.1) °C Humidity : (48 ± 2) % R.H.
Location : ☒ Permanent Calibration Lab ☐ Mobile Lab ☐ On Site Calibration
[Address : 58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea]

5. Traceability

Calibration method and/or brief description

The above instrument has been calibrated according to the calibration instruction of Inside/Outside Calipers (QECl - LE601) using the below standard instrument which is established a traceability to National Metrology Institute.

List of used standards/specifications

Description	Manufacturer and Model	Serial Number	The due date of next calibration	Calibration laboratory
Caliper Checker	Mitutoyo, 660 mm	559	18. Sep. 2026.	Q & Q Corp.
Surface Plate	Kumsung, (1 000 × 750) mm	260919	21. Jan. 2025.	Q & Q Corp.
Surface Thermometer	TES, 1300	990407368	29. Jun. 2024.	Q & Q Corp.

6. Calibration result : Refer to the attached Calibration Result.

7. Measurement uncertainty : Refer to the attached Calibration Result.

Affirmation	Measurements performed by Name : Hyung Kyu Kim (signature)	Approved by Title : Technical Manager Name : Myeon Keol Kim (signature)
-------------	---	---

The above certificate of calibration is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

15. Apr. 2024.

Q & Q Corporation
Accredited by KOLAS , Republic of Korea



(NOTE) If any significant instability or other adverse factor(overload, temperature, humidity etc.) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

Calibration Result

Q & Q Corporation

Certificate No : Q2403326-106-001



58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Page (2) of (2)

- * Manufacturer : Mitutoyo
- * Model Name : (0 ~ 300) mm, 0.01 mm
- * Serial number : 0023118

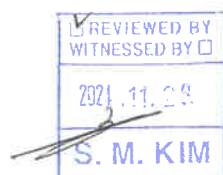
■ Inside/Outside Caliper(Digital type) Calibration

Graduation value (mm)	Correction value (mm)	
	Outside	Intside
0	0.00	-
20	-0.01	0.00
50	-0.01	0.00
100	0.00	0.00
150	0.00	-0.01
200	0.00	-0.01
300	-0.01	-0.02

Measurement uncertainty : 0.01 mm

(Coverage probability of approximately 95 % , $k = 2$)

※ The calibration value is obtained by adding the correction value to the graduation value.
The end.



* The recommended calibration interval is 12 month according to the KOLAS guide (KOLAS-G-008).

QE-R-002-1 (Rev. 3)

(210 × 297) mm

Calibration Certificate

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2407384-106-002

Page (1) of (2)



1. Client

Name : P.M.S Co., LTD

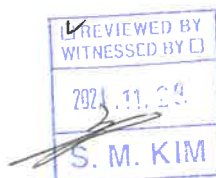
Address : 296, Dae Dong-Ro, Sasang-Gu, Busan, Korea

2. Calibration Subject

Description : Inside/Outside Caliper

Manufacturer & Type : YJ / (0 ~ 1 000) mm, 0.05 mm

Serial Number : L15071701



3. Date of Calibration : 13. Aug. 2024

4. Environment

Temperature : (20.7 ± 0.1) °C

Humidity : (48 ± 2) % R.H.

Location : ☒ Permanent Calibration Lab

☐ Mobile Lab

☐ On Site Calibration

[Address : 58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea]

Calibration method and/or brief description

The above instrument has been calibrated according to the calibration instruction of Inside/Outside Calipers

(QECI - LE601) using the below standard instrument which is established a traceability to National Metrology Institute.

List of used standards/specifications

Description	Manufacturer and Model	Serial Number	The due date of next calibration	Calibration laboratory
Gauge Block	Mitutoyo, (0.5 ~ 100) mm	1403078	20. Oct. 2026.	Q & Q Corp.
Long Gauge Block	Mitutoyo, (125 ~ 500) mm	1202813	17. Nov. 2026.	Q & Q Corp.
Long Gauge Block	None, (600 ~ 1 000) mm	2013	12. Jun. 2026.	KRISS
Gauge Block Accessory	N/A, None	None	12. Oct. 2026.	KTL
Surface Plate	Kumsung, (1 000 × 750) mm	260919	21. Jan. 2025.	Q & Q Corp.
Surface Thermometer	TES, 1300	990407368	28. Jun. 2025.	Q & Q Corp.

6. Calibration result : Refer to the attached Calibration Result.

7. Measurement uncertainty : Refer to the attached Calibration Result.

Affirmation	Measurements performed by	Approved by
	Name : Hyung Kyu Kim (signature)	Title : Technical Manager (signature) Name : Myeon Keol Kim (signature)

The above certificate of calibration is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.

13. Aug. 2024.

Q & Q Corporation
Accredited by KOLAS, Republic of Korea

(NOTE) If any significant instability or other adverse factor (overload, temperature, humidity etc.) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

Calibration Result

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2407384-106-002

Page (2) of (2)



* Manufacturer : YJ

* Model Name : (0 ~ 1 000) mm, 0.05 mm

* Serial number : L15071701

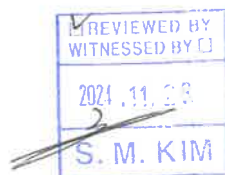
■ Inside/Outside Caliper Calibration

Graduation value (mm)	Correction value (mm)	
	Outside	Intside
0	-0.40	-
100	-0.40	-0.20
200	-0.40	-0.20
300	-0.40	-0.20
400	-0.40	-0.20
500	-0.40	-0.20
600	-0.40	-0.20
700	-0.40	-0.20
800	-0.40	-0.20
900	-0.40	-0.20
1 000	-0.40	-0.20

Measurement uncertainty : 0.03 mm

(Coverage probability of approximately 95 % , $k = 2$)

※ The calibration value is obtained by adding the correction value to the graduation value.
The end.



* The recommended calibration interval is 12 month according to the KOLAS guide (KOLAS-G-008).

QE-R-002-1 (Rev. 3)

(210 × 297) mm

Calibration Certificate

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2403326-106-003

Page (1) of (2)



1. Client

Name : P.M.S Co., LTD

Address : 296, Dae Dong-Ro, Sasang-Gu, Busan, Korea

2. Calibration Subject

Description : Cylinder Gauge

Manufacturer & Type : Mitutoyo , (18 ~ 35) mm, 0.01 mm

Serial Number : 2150402



3. Date of Calibration : 12. Apr. 2024.

4. Environment

Temperature : (20.7 ± 0.1) °C

Humidity : (48 ± 2) % R.H.

Location : ☒ Permanent Calibration Lab

☐ Mobile Lab

☐ On Site Calibration

[Address : 58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea]

5. Traceability

Calibration method and/or brief description

The above instrument has been calibrated according to the calibration instruction of Cylinder Gauges (QECI - LE603) using the below standard instrument which is established a traceability to National Metrology Institute.

List of used standards/specifications

Description	Manufacturer and Model	Serial Number	The due date of next calibration	Calibration laboratory
Dial Gauge Tester	Mitutoyo, (0 ~ 25) mm, 0.001 mm	200489	18. Aug. 2025.	Q & Q Corp.
Surface Thermometer	TES, 1300	990407368	29. Jun. 2024.	Q & Q Corp.

6. Calibration result : Refer to the attached Calibration Result.

7. Measurement uncertainty : Refer to the attached Calibration Result.

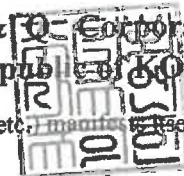
Affirmation	Measurements performed by Name : Hyung Kyu Kim (signature)	Approved by Title : Technical Manager Name : Myeon Keol Kim (signature)
-------------	---	---

The above certificate of calibration is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC-MRA.



15. Apr. 2024.

Q & Q Corporation
Accredited by KOLAS, Republic of Korea



(NOTE) If any significant instability or other adverse factor (overload, temperature, humidity etc.) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

Calibration Result

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2403326-106-003

Page (2) of (2)



Dial Gauge			Cylinder Gauge		
Manufacturer	Model Name	Serial number	Manufacturer	Model Name	Serial number
Mitutoyo	(0 ~ 10) mm	QWB117	Mitutoyo	(18 ~ 35) mm	2150402

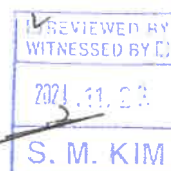
1. Dial Gauge Calibration

Graduation value (mm)	Correction value (μm)	
	Forward	Backward
0.0	0	0
0.1	0	0
0.2	0	0
0.3	0	0
0.4	-4	-4
0.5	0	0
2.0	0	0
4.0	-2	-2
6.0	0	0
8.0	-2	-2
10.0	0	0

Measurement uncertainty : 1.5 μm (Coverage probability of approximately 95 % , $k = 2$)

2. Cylinder Gauge Calibration

Graduation value (mm)	Correction value (μm)
2.0	0
2.1	0
2.2	0
2.3	0
2.4	0
2.5	-2
2.6	0
2.7	-2
2.8	-2
2.9	-2
3.0	-2

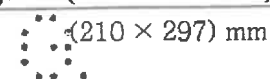
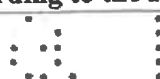


Measurement uncertainty : 1.5 μm (Coverage probability of approximately 95 % , $k = 2$)

* Technical Note:

The above calibration results are obtained by mounting the Cylinder Gauge when the needle of the Dial Gauge indicates 1.9 mm, and setting it to 0 when the needle indicates 2 mm. The end.

* The recommended calibration interval is 12 month according to the KOLAS guide (KOLAS-G-008).



CALIBRATION CERTIFICATE

Q & Q Corporation

58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2403326-105-005

page (1) of (2)



1. Client

Name : P.M.S Co., LTD

Adress : 296, Dae Dong-Ro, Sasang-Gu, Busan, Korea

2. Calibration Subject

Description : Stylus type roughness tester

Manufacturer and Model Name : Mitutoyo, SJ-210

Serial Number : 200741305

3. Date of Calibration 12. Apr. 2024.

4. Environment

Temperature : (20.7 ± 0.1) °C

Humidity : (47 ± 2) % R.H.

Location : ☒ Permanent Calibration Lab

☐ Mobile Lab

☐ On Site Calibration

[Address : 58, Hwajeonsandan 3-ro, Gangseo-gu, Busan, Korea]

5. Traceability

Calibration method and/or brief description

The above Calibration object has been calibrated according to the Q&Q's calibration method for Stylus type roughness tester(QECI-SR517) with below Standards having traceability to National Measurement Institute (KRISS).

List of used standards / specifications

Description	Manufacturer and Model	SerialNumber	The due date of next Calibration	Calibration laboratory
Roughness standard specimen	Mitutoyo, Ra 2.94 µm, Rmax 9.3 µm	332260804	28. Jun. 2025.	Q&Q Corp
Surface Thermometer	TES, 1300	990407368	29. Jun. 2024.	Q&Q Corp.

6. Calibration result : Refer to the attached Calibration Result

7. Measurement uncertainty : Refer to the attached Calibration Result

affirmation	Measurements performed by Name : Kwang Woo Son (signature)	Approved by Title : Technical Cal. Manager Name : Myeon Keol Kim (signature)
-------------	---	--

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC - MRA



15. Apr. 2024.

Q & Q Corporation
Accredited by KOLAS, Republic of Korea



(NOTE) If any significant instability or other adverse factor(overload, temperature, humidity, etc.) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

CALIBRATION RESULT

Q & Q Corporation

58, Hwajeonsadan 3-ro, Gangseo-gu, Busan, Korea
Tel : 051-292-0395, Fax : 051-292-0397

Certificate No : Q2403326-105-005

page (2) of (2)



- * Manufacturer : Mitutoyo
- * Model Name : SJ-210
- * Serial Number : 200741305

1. Calibration Condition

- * Probe Radius : 5 μm
- * Length of Measurement : 12.5 mm
- * Cutoff : 2.5 mm
- * Filter : Gaussian

2. Calibration Result

Parameter	Roughness Standard value (μm)	Indication value (μm)	Deviation (μm)	Uncertainty (CL \approx 95 %)
Ra	2.865	2.934	0.069	0.140 μm ($k = 2$)
Rz	9.030	9.228	0.198	0.459 μm ($k = 2$)
Rsm	99.798	109.9	10.102	1.702 μm ($k = 2$)

The end.



* The recommended calibration interval is 24 month according to the KOLAS guide (KOLAS-G-008).

CALIBRATION CERTIFICATE


CALITECH CO., LTD.

Certificate No : C23679-1


 67, Hwajeonsandan 2-ro, Gangseo-gu, Busan, Korea
 Tel : 051)973~3839, Fax : 051)973~3841

Page (1) of (2)

1. Client

Name : SUNG WON -STEE CO.,LTD

Address : #7, Noksansandan 262-ro 59beon-gil, Gangseo-Gu, Busan, Korea.

2. Calibration Subject

Description : Ultrasonic thickness gauges

Manufacturer and Model Name : AND, AD3253

Serial Number : K1401988

3. Date of Calibration 13. Dec. 2023.

4. Environment conditions

Temperature : (20.0 ± 0.2) °C

Humidity : (42 ± 2) % R.H.

 Location : ☒ Permanent Calibration Lab

☐ Mobile Lab

☐ On Site Calibration

(Address : 67, Hwajeonsandan 2-ro, Gangseo-gu, Busan, Korea)

5. Traceability

Calibration method and/or brief description

The above Calibration object has been calibrated according to the CALITECH's calibration method for Ultrasonic thickness gauges(CTCI-10234) with below Standards having traceability to National Measurement Institute (KRISS).

List of used standards / specifications

Description	Manufacturer and Model	Serial Number	The due date of next Calibration	Calibration laboratory
Ultrasonic test blocks	None, (2 ~ 500) mm	UTB-001	11. Aug. 2025.	CALITECH Co., Ltd.
Precision surface plates	ZUNG WOO, 2 000 mm × 1 500 mm	100315010	13. Jan. 2026.	CALITECH Co., Ltd.
Digital Thermometer	Testo, 922	33636643/701	12. May. 2024.	CALITECH Co., Ltd.

6. Calibration result : Refer to the attached Calibration Result

7. Measurement uncertainty : Refer to the attached Calibration Result

affirmation	Measurements performed by Name : Sang-Yeup Kim (signature)	Approved by Title : Technical Manager Name : Yun-Geon Lee (signature)
-------------	---	---

The above calibration certificate is the accredited calibration items by Korea Laboratory Accreditation Scheme, which signed the ILAC - MRA.

18. Dec. 2023.

CALITECH CO., LTD.

Accredited by KOLAS, Republic of KOREA

(NOTE1) If any significant instability or other adverse factor(overload, temperature, humidity, etc) manifests itself before, during or after calibration, and is likely to affect the validity of the calibration.

(NOTE2) 교정정직서 원위 확인은 홈페이지(http://www.calitech.co.kr/) 고객센터 > 공지사항 참조.

CALIBRATION RESULT

CALITECH CO., LTD.

67, Hwajeonsandan 2-ro, Gangseo-gu, Busan, Korea
Tel : 051)973~3839, Fax : 051)973~3841

Certificate No : C23679-1

Page (2) of (2)



* Description : Ultrasonic thickness gauges

* Manufacturer : AND

* Model Name : AD3253

* Serial Number : K1401988

(Calibration Value) = (Scale Value) + (Correction Value)

Scale Value(mm)	Correction Value(mm)	Uncertainty (CL≒95 %, k = 2)
4	-0.4	$\sqrt{70^2 + 0.0043^2 \times l^2} \mu\text{m}$ <p>(l : mm)</p>
6	-0.3	
8	-0.3	
10	-0.3	
25	-0.2	
50	-0.1	
75	-0.1	
100	-0.2	
200	-0.7	

The end.

