



مصنع شركة رستين للبلاستيك
RUSTIN PLASTIC FACTORY CO.

Introduction :

مقدمة :

مصنع شركة رستين للبلاستيك عضو في مجموعة الشركات التابعة لشركة رستين للاستثمار التجاري والصناعي المحدودة وقد تأسست في عام 2014 .
إحدى منتجاتها هي تصنيع الأنابيب البلاستيكية من مواد (يو.بي.في.سي) و (بي.بي.آر) بمختلف الاحجام والمقاسات.

تم تجهيز قسم انتاج الأنابيب البلاستيكية بأحدث الأجهزة ومعدات الخلط المعتمدة على الحاسب الآلي وأنظمة نقل اتوماتيكي وأجهزة بثق وماكينات الحقن على مستوى عالي من التقنية , كذلك وجود مختبر داخلي لفحص المنتجات للتأكد من تطبيق المواصفات والمقاييس العالمية المعتمدة عالميا ومحليا SASO,ASTM,DIN مع الإلتزام بالجودة.

Rustin Plastic Factory Company is a member of group companies related to Rustin Trading & Industrial Investment Company founded in 2014.

Part of Rustin products is manufacturing UPVC, and PP-R pipes with wide range of sizes.

Plastic Pipes manufacturing division is equipped with the most advanced and computerized production lines including mixing, extrusion, injection, and automatic transfer system with in-house laboratory with vigorous quality control system to ensure the products comply with best international standards according to approved international and local standers such as: SASO, DIN,ASTM.

Manufacturing Standards :

مواصفات التصنيع :

ينتج مصنع شركة رستين للبلاستيك انابيب (يو.بي.في.سي) وفق المواصفات التالية:
- المواصفة السعودية (لمياه الشرب SSA 14 & 15 / 1998) ايزو (المنظمة العالمية للمعايير) 1/161 بما يتوافق مع المواصفات الألمانية DIN 8061 / 8062
- المواصفة ASTM D-17855 (ضغط 40,80) وكذلك (SDR) ASTM D-2241

كذلك ينتج مصنع شركة رستين للبلاستيك انابيب (بي.بي. آر) وفق المواصفة السعودية (SASO GSO 1189/2002) المتوافقة مع المواصفة الألمانية DIN 8077/8078

Rustin Plastic Factory Company UPVC pipes are manufactured in accordance with:

- Saudi Arabian Standard (SSA 14 & 15 /1998 for Potable water) ISO (International Organization for Standardization) 161/1 which conforms to German standard DIN 8061/ 8062

- ASTM Standards ASTM D-1785, For (Sch. 40, 80) ASTM D-2241 (SDR)

Also, Rustin Plastic Factory Company produce PP-R pipes according to Saudi Arabian Standard (SASO GSO 1189/2002) which conforms to German standard DIN 8077/8078

Material Specifications

مواصفات المواد

MATERIAL		UPVC
General Properties	الخواص العامة	All Values at 73 ^o F
Specific Gravity	الثقل النوعي	1.42 g/cm ²
Water Absorption	امتصاص الماء	< 4.0 mg/cm ²
Flammability	القدرة على الاشتعال	Will not support compustion
Softening Point	نقطة التلين	> 80 ^o C
Specific Heat	الحرارة النوعية	0.25 Cal / g ^o C
Thermal Conductivity	التوصيل الحراري	0.13 Kcal / m h ^o C
Coefficient of Linear Expansion	معامل التمدد الحراري الطولي	2.9 X 10 ⁻⁵ in/in/ ^o F
Tensile Strength	مقاومة الشد	7000 psi
Compressive Strength	القوة الضاغطة	9600 psi
Flexural Strength	قوة الثني	950 Kgf/cm ²
Izod Impact	تأثير آيزود	0.65 Ft.lbs/in of notch
Modulus of Elasticity in tensio	معامل المرونة في الشد	400.000 psi
Volume of Resistivity	كمية المقاومة	10 ¹⁴ ohm / cm
Power Factor at 60 cycle	عامل القوة عند 60 دورة	1.255%
Max. Service Temp	أقصى درجة حرارة للخدمة	140 ^o F

Material Specifications

مواصفات المواد

- يو بي في سي أنبوب غير موصل للكهرباء كما أنه لا يخضع للهجوم الجلفاني أو الاليترولي.

- يجب عدم وضع المعدات الكهربائية أرضاً تحت أنابيب يو بي في سي .

- يجب عدم استخدام أنابيب UPVC للهواء أو الغاز المضغوط فقط للمياه والمواد الكيميائية المعتمدة.

- UPVC pipe is a non conductor of electricity and also non subject to galvanic or eletrolytic attack.
- Electrical equipment's should not be earthen to UPVC pipes.
- UPVC should not be used for compressed air or gas. It is indended to use for water and apporved chemicals only.

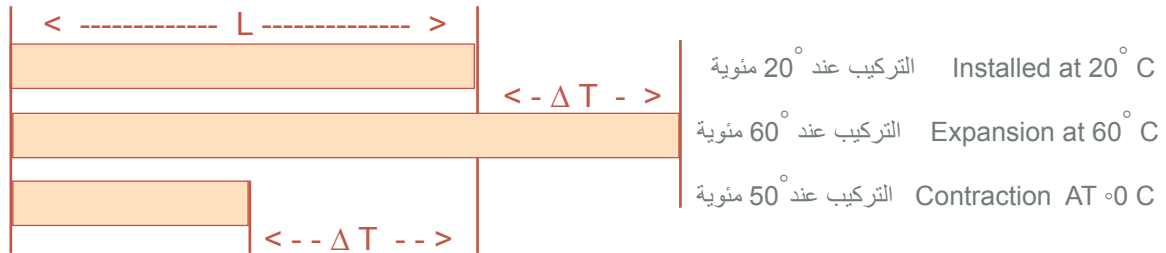


Expansion & Contraction

التمدد والانكماش

All materials under no specific stress and under temperature variations with respect to a reference temperature (temperature during installation) will expand when temperature raises and contract when temperature falls.

During installation these diemensional variations to be taken into account for the lengths.



حساب البارميتر الخاص بأنابيب يو بي في سي Calculation parameter for UPVC pipes

The coefficient of linear expansion for UPVC pipe is 0.07 mm per meter per degree centigrade (mm / m / °C)

The elongation and contraction in length = $\alpha \times L_p \times \Delta T$ التمدد والانكماش في الطول

Where as α = Coeffeicient of linear expansion

L_p = Length ot the pipe during installation in meters

ΔT = Change in temperature in degree Celsius °C

ΔL = Change of length in millimeter

Example :

Calculate the change in length of a 20meter UPVC pipe during installation at 20 °C raised by the fluid temperature to 60 °C

$$\Delta L = 0.0 \times 20 \times 40 = 56.0 \text{ mm}$$

Comparison of α Coefficient of linear expansion	
UPVC	$7.0 \times 10^{-5} \text{ m / m / } ^\circ\text{C}$
PP- R	$15 \times 10^{-5} \text{ m / m / } ^\circ\text{C}$

Note: Approximate co-efficient of thermal expansion for different materials are mentioned above.

Expansion & contraction of PVC piping in response to change in temperature will vary slightly with changes in PVC compound. However these can be considered as reasonable accurate.

UPVCE PIPE DIMENSIONS الأبعاد الخاصة بأنابيب يو بي في سي BASED NO (SSA – 14, DIN 8062) وفقاً للمواصفة

Nominal Outside Diameter القطر الخارجي مم	Outside Diameter Tolerance السماعة مم	CLASS - 1		CLASS - 2		CLASS - 3		CLASS - 4		CLASS - 5	
		2 BAR		4 BAR		6 BAR		10 BAR		16 BAR	
		Nominal weight Kg/mt. الوزن كجم/م	Nominal Wall Thick. mm السماعة مم	Nominal weight Kg/mt الوزن كجم/م	Nominal Wall Thick. mm السماعة مم	Nominal weight Kg/mt الوزن كجم/م	Nominal Wall Thick. mm السماعة مم	Nominal weight Kg/mt الوزن كجم/م	Nominal Wall Thick. mm السماعة مم	Nominal weight Kg/mt الوزن كجم/م	Nominal Wall Thick. mm السماعة مم
75	+0.3			0.642	1.8	0.782	2.2	1.22	3.6	1.82	5.6
90	+0.3			0.774	1.8	1.13	2.7	1.75	4.3	2.61	6.7
110	+0.3	0.950	1.8	1.16	2.2	1.64	3.2	2.61	5.3	3.90	8.2
125	+0.3	1.08	1.8	1.48	2.5	2.13	3.7	3.34	6.0	5.01	9.3
140	+0.4	1.21	1.8	1.84	2.8	2.65	4.1	4.18	6.7	6.27	10.4
160	+0.4	1.39	1.8	2.41	3.2	3.44	4.7	5.47	7.7	8.17	11.9
180	+0.4	1.57	1.8	3.02	3.6	4.37	5.3	6.88	8.6	10.4	13.4
200	+0.4	1.74	1.8	3.70	4.0	5.37	5.9	8.51	9.6	12.8	14.9
225	+0.5	1.96	1.8	4.70	4.5	6.76	6.6	10.80	10.8	16.1	16.7
250	+0.5	2.40	2.0	5.65	4.9	8.31	7.3	13.20	11.9	19.9	18.6

* Class - 1 pipes are classified for non pressure application only.

* All working pressure stated above are at 20°C water temperature pls check the table for working pressure related to water temperature.

UPVC PIPE DIMENSIONS أبعاد أنابيب يو بي في سي BASED ON (ASTM D 1785) حسب المواصفة

NOMINAL SIZE INCHES	O.D.(mm)		SCHEDULE40				SCHEDULE80			
	min	max	Wall Thickness (mm)		Nom-inal Weight (Kg/M)	PSI	Wall Thickness (mm)		Nom-inal Weight (Kg/M)	PSI
							min	max		
3	88.7	89.1	5.49	6.15	2.14	260	7.62	8.53	2.91	370
4	141.1	141.55	6.02	6.73	3.05	220	8.56	9.58	4.26	320
5	141.05	141.55	6.22	7.347	4.18	190	9.52	10.67	6.42	290
6	168	168.56	7.11	7.98	5.37	180	10.97	12.29	8.13	280
8	218.7	219.46	8.18	9.17	8.11	160	12.7	14.22	10.1	250

UPVC PIPE DIMENSIONS أبعاد أنابيب يو بي في سي BASED ON (ASTM D 2241) حسب المواصفة

Nominal Pipe Size inch	Outside Diameter (mm)		Wall Thickness (mm)											
			Standard Dimension Ratio (SDR).											
	41 W.P:6.9Bar		32.5 W.P:8.6Bar		26 W.P:11Bar		21 W.P:13.8Bar		17 W.P:17.2Bar		13.5 W.P:21.7Bar			
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
3	88.70	89.10	2.16	2.67	2.74	3.25	3.43	3.94	4.24	4.75	5.23	5.87	6.58	7.37
4	114.07	114.53	2.80	3.30	3.51	4.01	4.39	4.90	5.44	6.10	6.73	7.54	8.46	9.47
6	168.00	168.56	4.11	4.62	5.18	5.79	6.48	7.26	8.03	9.00	9.91	11.10	12.47	13.97
8	218.70	219.46	5.33	5.97	6.73	7.54	8.43	9.45	10.41	11.66	12.90	14.45		

* Maximum pressure stated above is based on water temperature at 73 ° F/23°.

الضغط المسموح به لاستخدام الأنابيب
PERMISSIBLE WORKING PRESSURE FOR UPVC PIPES TRANSPORTING WATER
حسب المواصفة (SSA-14 & DIN 8062)

Working temperature In °C	Design Service life in years	Class - 2	Class - 3	Class - 4	Class - 5
		Nominal working pressure in Bar			
		Bar - 4	Bar - 6	Bar - 10	Bar - 16
		working pressure in Bar			
10°C	1	5.3	7.9	13.2	21.1
	5	5	7.4	12.4	19.8
	10	4.8	7.2	12.0	19.2
	25	4.7	7.1	11.8	18.9
	50	4.6	7.0	11.6	18.6
20°C	1	4.8	7.2	12.0	19.2
	5	4.5	6.7	11.2	17.9
	10	4.3	6.5	10.8	17.3
	25	4.1	6.2	10.3	16.5
	50	4	6.0	10.0	16.0
30°C	1	3.9	5.8	9.7	15.5
	5	3.6	5.4	9.0	14.4
	10	3.5	5.3	8.8	14.1
	25	3.3	5.0	8.3	13.3
	50	3.2	4.8	8.0	12.8
40°C	1	3.0	4.6	7.6	12.2
	5	2.7	4.1	6.8	10.9
	10	2.6	4.0	6.6	10.6
	25	2.6	3.8	6.4	10.2
	50	2.5	3.8	6.3	10.1
50°C	1	2.1	3.2	5.3	8.5
	5	1.9	2.9	4.8	7.7
	10	1.8	2.7	4.5	7.2
	25	1.7	2.5	4.3	6.8
	50	1.7	2.5	4.2	6.7
60°C	1	1.4	2.1	3.5	5.6
	5	1.2	1.8	3.0	4.8
	10	1.1	1.7	2.8	4.5
	25	1	1.5	2.6	4.1
	50	1	1.5	2.6	4.0

* Maximum service temperature for UPVC pipe are 140°F (60°C)

الأنابيب البلاستيكية للتمديدات الكهربائية
ELECTRICAL PLASTIC CONDUIT

حسب المواصفة (NEMA TC -2)

Nominal Size in inches	Nominal Size in mm	EPT (EB) Wall Thickness (mm)	EPC-40 Normal Duty Wall Thickness (mm)	EPC-80 Heavy Duty Wall Thickness (mm)
3"	88.90	3.18	5.49	7.62
4"	114.30	3.81	6.02	8.56
5"	141.05	-	6.78	10.1
6"	168.0	-	7.55	11.63



الأنابيب البلاستيكية للتمديدات الكهربائية
ELECTRICAL PLASTIC CONDUIT
حسب المواصفة (NEMA TC - 6 & 8)

Nominal Size in inches	Nominal Size in mm	TC-6 Wall Thickness (mm)		TC-8 Wall Thickness (mm)	
		EB	DB	EB	DB
3"	88.90	1.55	2.34	1.93	3.00
4"	114.30	2.08	3.07	2.54	3.91
5"	141.05	2.62	3.86	3.2	4.85
6"	168.0	3.18	4.62	3.86	5.77

* Socket Type :Solvent Coment (sc / i).



اختبار مواصفات الأنابيب وفقاً للشروط

SELECTING OF PIPE SPECIFICATION ACCORDING TO REQUIREMENTS

Material	المواد	Hydrostatic design stress @ 20°C (MPa) الاجهاد التصميمي
UPVC-1120 Type-1, Grade-1 (12454-B) ASTM D 1785		13.8 (2000psi) safety factor -2
PVC-U DIN 8062		10 (1450psi) safety factor -2.5

Long term working pressure :

$$P = 2S / SDR-1 \quad (SDR = d/t)$$

Where as S = Design stress

SDR= Standard Dimension Ratio (d/t)

d = Diameter of the pipe

t = Wall thickness of the pipe

Wall thickness of the pipe(ISO equation) :

$$S_{min} = \sigma_{e,zul} \times d / (2 \times \sigma_{v,zul} \times \sigma_{e,zul})$$

Where as $\sigma_{e,zul}$ = Permissible working pressure at 20°C

$\sigma_{v,zul}$ = Hydrostatic design stress

d = Out side diameter of the pipe

Volumetric flow rate $V = 0.0036 \times A \times v$

Where as V = Volumetric flow rate in m³/h

A = Pipe cross section area in mm²

v = Flow velocity in m/s

$$\text{Inside diameter of pipe } d = 18.8 \times \sqrt{Q/v}$$

Where as d = Pipe inside diameter in mm

Q = Conveyed quantity in m³/h

v = Flow velocity in m/s

De-Rating factors for Schedule-40
& 80 pipes as per ASTM D 1785

Temp	De-Rating Factor
70°F	1.00
80°F	0.90
90°F	0.75
100°F	0.62
110°F	0.50
115°F	0.45
120°F	0.40
125°F	0.35
130°F	0.30
140°F	0.22

TO DETERMINE THE MAXIMUM NON SHOCK PRESSURE RATING AT AN ELEVATED TEMPERATURE, SIMPLY MULTIPLY THE BASE PRESSURE RATING BY THE DE-RATING FACTOR FROM THE ABOVE TABLE.

Example - 1 : What is the long term working pressure of 4" SCH—40 (t = 6.02mm)?

$$P = 2 \times 2000 / 19 - 1 = 222 \text{ psi (15.3 bar)}$$

Example -2 : What is the long term working pressure of 160mm Class-4 (t= 7.7mm)?

$$P = 2 \times 1450 / 21 - 1 = 145 \text{ psi (10 bar)}$$

Example -3 : What is the required pipe inside diameter to deliver 1000 l/h at the flow velocity of 2 m/s of water?

$$d = 18.8 \times \sqrt{1/2} = 13.3 \text{ mm}$$

High internal pressure resistance

- minimum 50 years lifetime at 60 or 70°C and 10 bar maximum pressure

- No negative influence on water

- compliance with the international standards on the use of plastic materials for the transportation of drinking water

- Very smooth surface of pipes and fittings

- No lime stone or other deposits
- head loss / pressure drop reduced to a minimum

- Welding capacity

- 100% homogeneous connections, guaranteeing leak-tight, long lasting system
- fast and easy installation

- Threaded insert fittings

- watertight assemblies with other metal elements in the installation

- Silence / sound absorption

- considerable noise reduction in comparison to metal

- Low specific weight

- easy transport and handling

- Energy saving

- low heat conductivity of PP-R leads to 10-20% energy saving

- Reduced condensation

- low heat conductivity reduces the condensation of water on the outer surface of cold water pipes

- Resistance to stray currents

- PP-R has a low electrical conductivity

- Fitness for use in seismic areas

- flexibility and toughness of the PP-R pipes allow their use also in seismic areas

(PP - R) THERMO PLASTIC PIPES

(PP-R) pipes and fittings are manufactured from polypropylene Random co-polymer PP-R 80 of type-3.

The high grade of heat resistance is the main features of this material. its physical and chemical properties are well-suited to the transfer of potable water in the heating field.

Depending on applied pressure it is possible to use PP-R Pipes for constant temperatures up to 70 °C with an extrapolated service life of more than 50 years. Peak temperatures of 100 °C arising from short disruptions are unproblematic. Permanent temperatures from >70 °C to 90 °C reduce the service life of the pipe correspondingly (see the attached table for Permissible working pressure).

PP-R fittings have been designed in compliance with the requirements of the Phi 25 pressure series, whereas standard polypropylene pipe systems are manufactured as compliance with PN 20 pressure series The PN 20 and PN 25 symbols stand for two fundamental parameters, i.e. pressure strength and resulting lifetime or durability of the system. From strength tests point of View, PN 25 means that during a short-term (one hour) pressure tests, tested elements are exposed to the pressure of 80 atmospheres at the temperature of 200C. For PN20 series, the same tests are conducted at the test pressure on the level of 64 atmospheres.

The pressure strength has been improved from class PN 20 to PN 25 through increase of wall thickness and by using other design solutions of fittings and use of tougher brass elements in the so called transition couplings (stronger contact surface that holds a brass element fused into plastic).

General properties of Polypropylene Random Co-Polymer (PP-R)

- Low density (0.90 g/cm³)
- Good balance of stiffness to toughness
- Good chemical resistance
- Low tendency to stress cracking
- Easy to weld
- Environmental friendlinerss

Resistance to abrasion and corrosion

- no corrosion by acid and alkaline fluids with pH values between 1 and 14
- high chemical resistance
- high abrasion resistance => high flow velocities possible

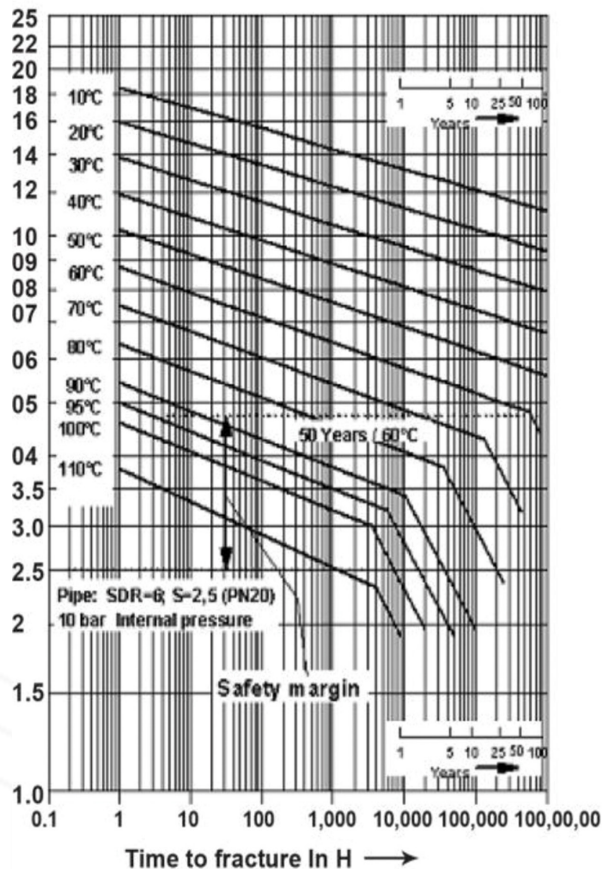


PP – R MATERIAL SPECIFICATION خواص مادة بي بي آر

Polypropylene Random Co-Polymer Type – 3

	Values	Unit
Material	PP-R type-3 Green colour	
Density	0.90	g / cm ³
Melt flow index 190°C / 5 kg	0.55	G / 10min
Elongation at yield (50mm/min)	10	%
Elongation at break	> 50	%
Tensile strength at break	32	MPa
Notched Impact strength (charpy) +23°C	22	KJ/m ²
Coefficient of Linear Expansion	15 × 10 ⁻⁵	m/m/°C
Viscat softening point VST/A/50	132	°C
Thermal conductivity	0.24	W/Mk
Tensile modulus (secant)	850	MPa
Modulus of elasticity	1350	MPa

Long Term Resistance to Internal Hydrostatic Pressure



Working temp In °C	Design Service life in years	PP-R SDR – 7.4		PP-R SDR – 6	
		Pressure in Bar			
		PN16		PN20	
		SF 1.25	SF 1.5	SF 1.25	SF 1.5
20°C	10	26.1	21.7	32.8	27.3
	25	25.3	21.1	31.8	26.5
	50	24.5	20.4	30.9	25.7
30°C	10	22.0	18.3	27.7	23.1
	25	21.3	17.3	26.8	22.3
	50	20.7	17.1	26.1	21.8
40°C	10	18.7	15.6	23.6	19.6
	25	18.0	15.0	22.6	18.8
	50	17.5	14.5	22.0	18.3
50°C	10	15.7	13.1	19.7	16.5
	25	15.2	12.6	19.1	15.9
	50	14.7	12.2	18.5	15.4
60°C	10	13.2	11.0	16.6	13.8
	25	12.6	10.5	15.9	13.3
	50	12.1	10.1	15.3	12.7
70°C	10	11.1	9.3	14.0	11.7
	25	9.6	8.0	12.1	10.1
	50	8.1	6.7	10.2	8.5
80°C	10	7.6	6.3	9.6	8.0
	25	6.1	5.1	7.6	6.4
	10	7.3	6.1	9.2	7.7
90°C	5	4.8	4.0	6.1	5.0
	10	4.0	3.4	5.1	4.2

نوعية بي بي آر ثلاثي الأبعاد والتحمل وفقاً للمواصفة

PP – R TYPE – 3 MIDENSIONS AND TOLERANGES IN ACCORDANCE WITH
(DIN 8077 – 8078 STANDARDS PN – 20 (SDR -6) & PN - 16 (SDR – 7.4)

PN-20 Working pressure 20 bar @ 20C & 10 bar @ 70C water temperature			PN-16 Working pressure 20 bar @ 20C & 8 bar @ 60C water temperature		
D (mm)	sp (mm)	Weight (Kg/m)	D (mm)	sp (mm)	Weight (Kg/m)
20 mm	3.4	0.172	20 mm	2.8	0.148
25 mm	4.2	0.266	25 mm	3.5	0.230
32 mm	5.4	0.461	32 mm	4.4	0.376
40 mm	6.7	0.675	40 mm	5.5	0.583
50 mm	8.4	1.027	50 mm	6.9	0.896
63 mm	10.5	1.700	63 mm	8.6	1.420

توصيلات الأنابيب البلاستيك لحام أنبوبة PPR PLASTIC PIPE FITTINGS PP – R PIPE WELDING

١. تجهيز ماكينة اللحام والبدء عندما تصل درجة الحرارة الى ٢٦٠ درجة مئوية.
٢. قطع الماسوره من الزوايا القائمة بحيث يكون محور الماسوره مستقيماً ونظيفاً.
٣. وضع علامة على عمق اللحام في نهاية الماسوره والوصلات.
٤. يتم دفع نهائية الماسوره بدون الرفع لعمق اللحام المحدد لأداة اللحام. وفي نفس الوقت دفع التجهيزات للخارج لأداة اللحام، وفحص وقت التسخين طبقاً للجدول.
٥. عند الوصول الى الحرارة المطلوبة يتم فصل الماسوره والتوصيلات عن قالب اللحام مع ملاحظة عدم لف الماسوره والتوصيله.
٦. ترك الوصلة لتبرد وإحتساب وقت التبريد من بداية الماسوره والوصله مع القالب واحتساب وقت التسخين من لحظة اتصال الماسوره والوصله مع القالب.
٧. لاحظ أن وقت التسخين المحدد يتم حسابه من لحظة اتصال الماسوره والوصله مع القالب. ويجب أن يتم إعادة التنظيم المطلوب ما بين الماسوره والوصله فوراً بعد اللحام و لا يتم تدويره أكثر من ٣٠ درجة.

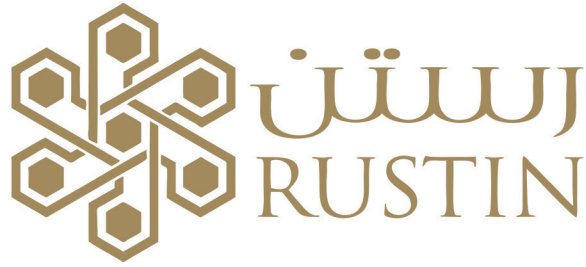
1. Prepare the welding machine and start when temperature reaches 260°C.
2. Cut the pipe at right angles and make sure that the pipe axis is straight and clean.
3. Mark the welding depth at the end of the pipe and fitting.
4. Push the end of the pipe without turning up to the marked welding depth into the welding tool. At the same time push the fitting without turning into the welding tool. Check the heating time according to table.
5. After reaching the required temperature quickly remove the pipe and fitting from the welding dies. without turning the pipe and fitting.
6. Leave the joint to cool, cooling time calculated from the moment the pipe and fitting make contact on the dies.
7. Take care that the heating time mentioned is calculated from the moment the pipe & fitting make contact on the dies. Any realigning is required between pipe & fitting in should be done immediately after the welding and should not be rotated more than 30° c.



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