BETATHERMWHITE

(Therm & White)
بيتا
ثيرم - وايت

PP-R & U.PVC
PIPES & FITTINGS

Call center | +20 01284000984
Office | +20 24730440 +20 24730550
Factory | 24/25 Biad El Arab Bani Swief
Office | Flat 404 Floor 4 Block 35 Building 7 Nasr City Cairo Egypt

WWW.BETATHERMEG.COM

تكنولوجيا المانية

صنعتها ايادي مصرية

In 1980 started our story by trading and distributing sanitary ware, hence it become we have enough experience to determine the requested and the needed quality in the Egyptian market. So we took the manufacturing decision, the main large objective and biggest challenge were how to produce with high quality and competitive price to enable us from continuity in the market between the giants of plastic industry in Egypt ,we established the united for trade and industry company in 2010, it made its way with determination and persistence to confirm its efficiency on the all levels inside the Egyptian market and it succeeded
in manufacturing
products from pipes and fittings from PPR for drinking and portable water with international quality specification , then and with thanks of our customers it were the following steps :
in 2013 we started to manufacture pipes and its fitting
of UPVC
We established the plant in Baniswef city for creating jobs in Upper Egypt, we do our best and a big efforts for reaching to innovative design and extremely quality.
Our company went ahead by its two types of product to export prospects and we enabled from storming Arab and African markets, and with thanks to our god and our accuracy of manufacturing as well as laborers efforts from the two teams of production and quality,
Our products had been succeeded in all technical tests and we have obtained many local and international quality certificates and conformity.
As we follow up our customer at home and abroad,
we always strive for continuous development so we add new production lines of multi layers pipes and grey pelletizing pipe
We committed to quality development,
community development,
team development and preserving the environment.
We are proud that our products are made in Egypt

OUR PREVIOUS WORK

Youth Housing Project in October Gardens.

Implemented by Sahmoud Integrated Contracting Company. Implemented ASEC Trading & Contracting Company

Social Housing Project in Jamsa city

Social Housing Project.

Armed Forces Engineering Corps Future City for Armed Forces Officers Accommodation in Haikstep

Badr City Authority

In all the housing units that are held in the city of Badr and under the supervision of the Badr city through the companies (Mahmoudia General Contracting – Egyptian International Group for Construction and Construction)

Social Housing Project 6 October.

Southern Upper Egypt Reconstruction Authority. Egypt Good Foundation

Educational Buildings Authority .

Engineering for construction and reconstruction in Hurghada.

Sadat City Authority

n the establishment of six thousand housing units in the city of Sadat through companies (Mahmoudia General Contracting – Egyptian International Group for Construction and Building – the company for development, trade and contracting)

Engineering Authority of the Armed Forces

New Ismailia Project

Social housing project in Dahshour

sayidi karir Village Armed Forces Discipline K 33 Alex Matrouh Road

New Ismailia Project.

Social Housing Project 6 October.

New Assiut City.

U.PVC

INDEX

P.P.R

INDEX

Contact us

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Factory
Bany Sweif

Standards and Prescriptions

Standards for U-PVC Pipe and Fitting for Drainage
Unplasticized Poly Vinyl Chloride

Standards

E.S 1717	Pipe and fittings mad of Unplasticized Poly Vinyl Chloride (U-PVC) for sewage.
ASTM D 1785	Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 1201
ASTM D 2241	Standard specification for Poly Vinyl Chloride Presser rated pipe
ASTM D 2466	Standard specification for Poly Vinyl Chloride Plastic Pipe – Fitting, Schedule 40
ASTM D 3311	Standard specification for Drain, Waste and Vent (DWV) Plastic Fitting Patterns
B.S 5481	specification for Unplasticized PVC Pipe and Fitting for gravity sewers

Standards and Prescriptions

Feature	Benefits
Flow Capacity	Extremely small bores, precision joints and lack of internal projections encourage flow capacity over the total life of the system.
Flammability	U-PVC does not support combustion.
Non-conductivity	U-PVC is a non conductor of electricity .
Corrosion resistance	U-PVC has excellent chemical resistance to hydrogen sulphide and the acids

بيتا ثيرم - وايت
Beta (Therm & White)

★ شهادة ضمان ★

CERTIFICATE

المسلسل
التاريخ
إسم المالك
العنوان
إسم التاجر
القائم بالعملية
إسم الفنى
العملية

www.Betatherm.eg.com
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01148848585
02-24730440
35 بلوك 7 قطعة المنطقة التاسعة
شقة 404 مصطفى النحاس مدينة نصر

بيتا ثيرم - وايت
Beta (Therm & White)

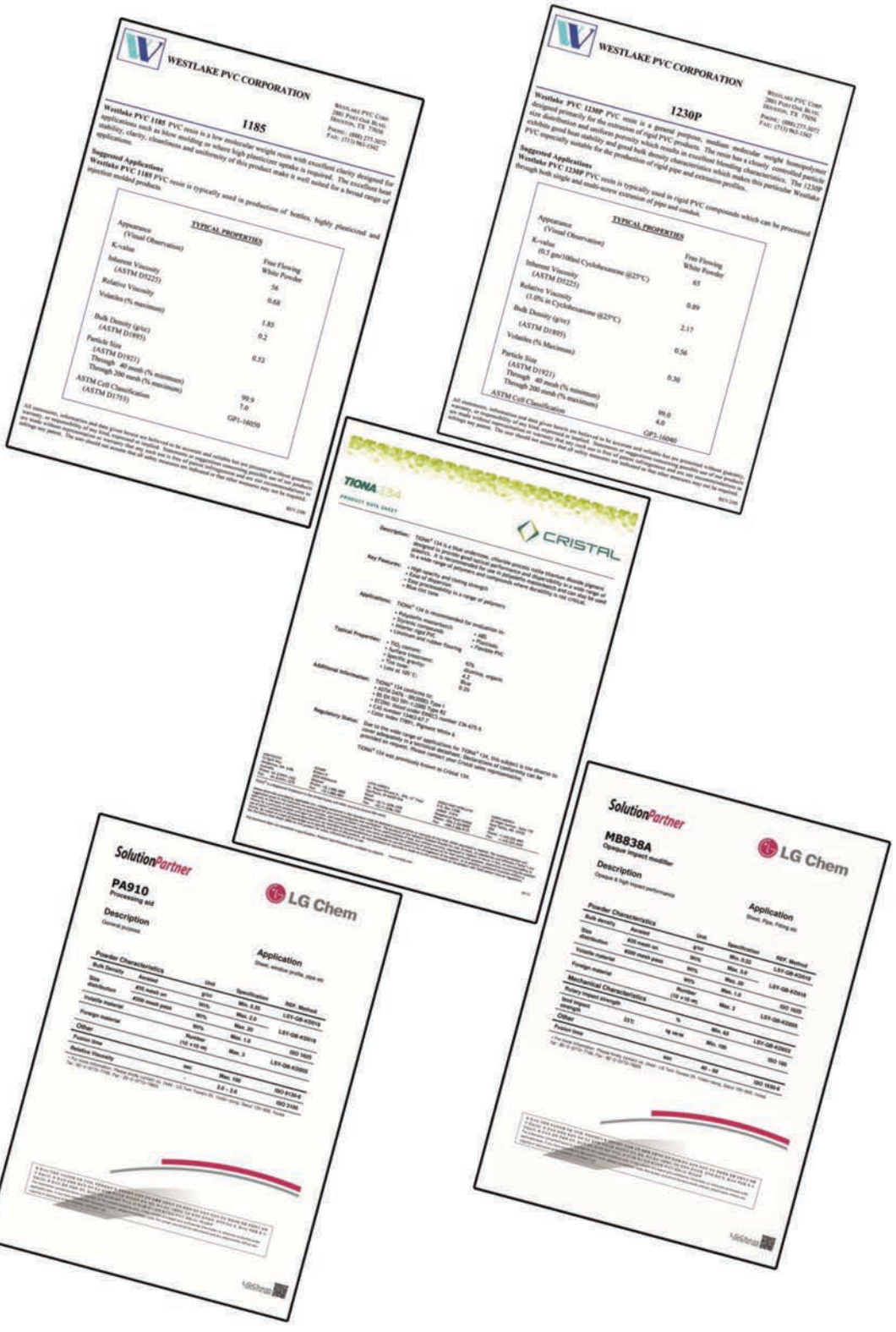
الشركة المتحده للصناعه والتجاره تكنولجيا الماني
أجود الأنظمة الألمانيه لتغذية المياه من البولى بروبلين

- إن قرارك بشـــراء أي منتج من منتجات بيتا ثيرم ذات التكنولجيا الألمانيه المتطوره يعنى أنك تقدر الجوده والتميز
- تتميز خدمه مابعد البيع بتقديم شهاده ضمان ساريه خمسون عام
- منذ أن انشأنا هذا الكيان الصناعى الكبير وكنا حرص على الإرتقاء بالصناعه فى مصر لإرضاء عملائنا
- تؤكد الشركه على أن سر التفوق يكمن فى تقديم الخدمه المميزه - والجوده العاليه - وإرضاء العميل

ضمان بيتا ثيرم يعطيك هذه المزايا
- مجانا . . ضمان شامل لجميع منتجات بيتا ثيرم
- مجانا . . إستبدال واصلاح أي جزء يثبت به عيب صناعى

فضلا انتبه
لايسرى هذا الضمان فى الحلات الاتيه
- عيوب التركيب
- عيوب الاستخدام
- فقدان شهاده الضمان

customer.service@betherm-eg.com



WESTLAKE PVC CORPORATION

1185

TYPICAL PROPERTIES

WESTLAKE PVC CORPORATION

1230P

TYPICAL PROPERTIES

TIONA 134

CRISTAL

SolutionPartner

PA910

Processing aid

LG Chem

SolutionPartner

MB838A

Opaque impact modifier

LG Chem

CHAPTER

1

Products

Product List

1.1– Product List:

BWPI

ASTM BW2SPH DIN BW1SPH	DIN BW1FD10	DIN BW1FD7	ASTM BW2SF
ASTM BW2R DIN BW1R	DIN BW1TC87.5	ASTM BW2CO DIN BW1CO	DIN BW1C
ASTM BW2EF	ASTM BW2E90D BW2E87.5D DIN BW1E87.5D	ASTM BW2E90 BW2E87.5 DIN BW1E90 BW1E87.5	ASTM BW2E45 DIN BW1E45
ASTM BW2T90D BW2T87.5D	DIN BW1T87.5D	ASTM BW2T90 BW2T87.5	DIN BW1T90 BW1T87.5
ASTM BW2T87.5RD	DIN BW1T87.5RD	ASTM BW2T87.5R	DIN BW1T87.5R
ASTM BW2T45 DIN BW1T45	ASTM BW2T45R DIN BW1T45R	ASTM BW2SO DIN BW1SO	ASTM BW2AV DIN BW1AV

According to ASTM American Standard / DIN German Standard

QR CODE
BAR CODE
LOGO

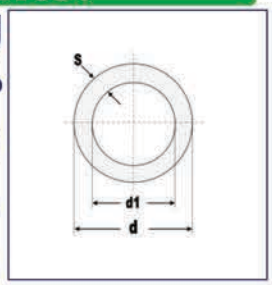
Product List

1.2 – Product details:

D	d	S	kg/m
50mm	50.1	1.8	0.47
50mm	50.1	2.2	0.56
50mm	50.1	3	0.71
63mm	63.1	3	1
63mm	63.1	4	1.2
75mm	75.3	3	1.1
75mm	75.3	4	1.34
90mm	75.3	3	1.41
90mm	75.3	4	1.84
110mm	110.3	3	1.58
110mm	110.3	4	2.08
110mm	110.3	5	2.58
160mm	160.4	3	2.33
160mm	160.4	4	3.17
160mm	160.4	5	3.75
1½"	48.2	3	0.73
1½"	48.2	4	0.9
2"	60.2	3	0.93
2"	60.2	4	1.08
3"	88.3	3	1.4
3"	88.3"	4	1.75
4"	114.3	3	1.66
4"	114.3	4	2.18
6"	168.4	4	3.5
6"	168.4	5	4.1

DIN
ASTM
BWPI

Pipes



ASTM D-1785 SCH40 - SCH80

NOMINAL DIAMETER (INCHES)	OUTSIDE DIAMETER (MM)		SCH40			SCH80		
	MIN	MAX	THICKNESS (MM)	weight kg / m	WORKING PRESSURE (PSI)23	THICKNESS (MM)	weight kg / m	WORKING PRESSURE (PSI)23
1 1/2	48.11	48.41	3.68	0.779	330	5.08	1.03	470
2	60.17	60.47	3.91	1.040	280	5.54	1.43	400
3	88.70	89.1	5.49	2.60	260	7.62	2.91	370
4	114.07	114.53	6.02	3.070	220	8.56	4.26	320
6	168	168.56	7.11	5.41	180	10.97	8.13	280

D	L	H	W	gm	pcs/box
75	45	100	85	120	65
110	52	100	122	223	90

DIN
BW1AV

ASTM
BW2AV

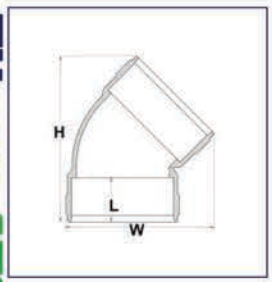
Air Vent

D	L	H	W	gm	pcs/box
50	31	92	79	75	125
75	45	143	120	265	28
110	52	179	162	600	32
160	70	260	232	1324	10
1½"	31	92	79	84	125
2"	38	117	98	140	64
3	46	169	133	350	24
4"	52	184	169	663	24
6"	75	290	240	1476	10

DIN
BW1E45

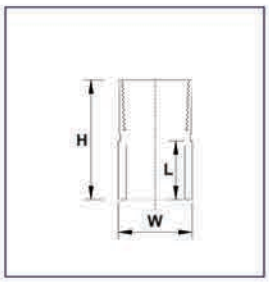
ASTM
BW2E45

Elbow 45°



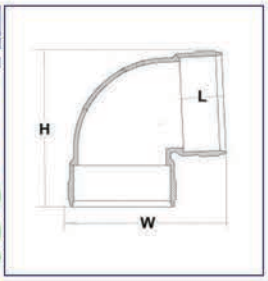
D	L	H	W	gm	pcs/box
1½*1½	31	55	56	90	90

ASTM
BW2SF



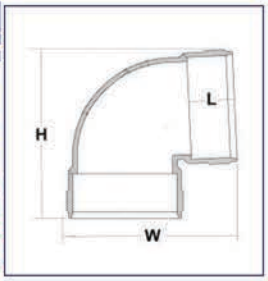
Elbow 90°

D	L	H	W	gm/	pcs/box
50	31	88	88	108	93
1½"	31	89	89	106	80
2"	38	106	106	174	54



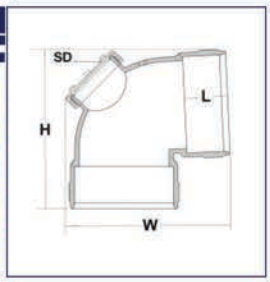
Elbow 87.5°

D	L	H	W	gm/	pcs/box
75	45	135	135	324	24
110	52	177	177	630	24
160	70	260	260	1620	8
3"	46	150	150	436	40
4"	52	188	188	833	20
6"	75	266	266	1832	8



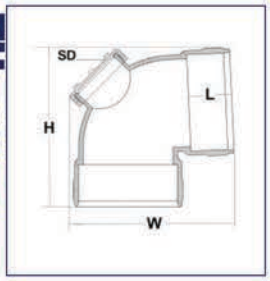
Elbow with Access Door 90°

D	L	H	W	SD	gm/	pcs/box
2"	38	112	112	2"	207	38



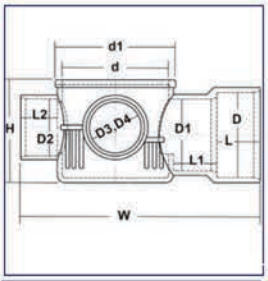
Elbow with Access Door 87.5°

D	L	H	W	SD	gm/	pcs/box
75	45	140	135	3"	391	63
110	52	192	177	4"	737	22
160	70	260	255	4"	1773	6
3"	46	150	152	3"	492	40
4"	52	196	188	4"	852	18
6"	75	266	255	4"	2016	6

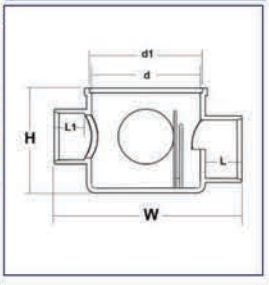


Floor Drain 10 Cm

D	D1	D2	D3	D4	d	d1	L	L1	H	W	gm	pcs/box
3"	75	2"	2"	2"	110	125	45	38	107	248	785	18
3"	1½	1½	1½	1½	110	125	38	31	107	191	610	22



D	D1	D2	D3	d	d1	L	L1	H	W	gm	pcs/box
2"	1½	1½	1½	110	125	38	31	107	191	590	24
2"	2	2	2	110	125	38	38	107	197	636	28

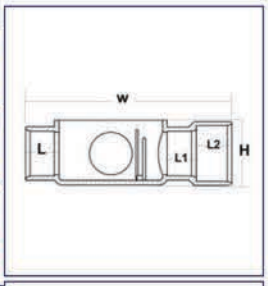


Elbow with Thread

D	L	H	W	gm/	pcs/box
1½ * 1½	38	88	88	140	45

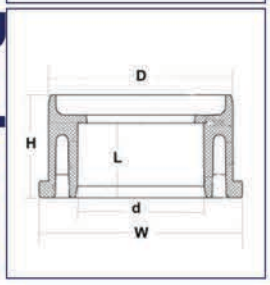
Floor Drain 7Cm

D	D1	D2	D3	d	L	L1	H	W	gm	pcs/box
2	1½	1½	1½	110	31	38	70	221	512	35
2	2	2	2	110	38	38	70	197	532	40



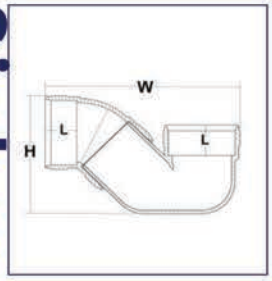
Reducer

D	d	L	H	W	gm	pcs/box
75	50	38	53	82	140	120
75	2"	38	53	82	120	100
110	2"	38	62	121	244	45
110	50	31	62	121	298	43
110	75	45	62	121	280	45
160	110	52	70	175	574	20
2"	1½"	32	46	66	70	180
3"	2"	38	57	98	183	60
4"	2"	38	62	125	297	43
4"	3"	46	62	125	291	43
6"	4"	52	80	183	714	15

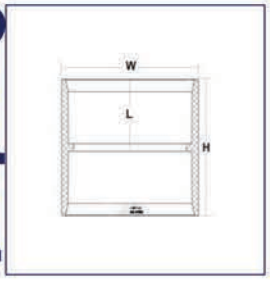


Siphon Socket

D	L	H	W	gm	pcs/box
110	52	205	317	1420	12
4"	52	212	335	1653	11

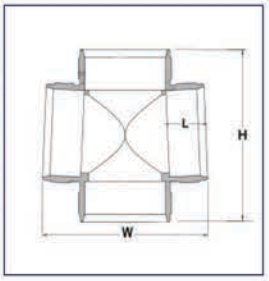


D	L	H	W	gm	pcs/box
50	31	65	56	50	140
75	45	95	85	172	45
110	52	110	122	350	45
160	70	146	173	724	14
1½"	31	65	56	60	140
2"	38	80	68	92	95
3"	46	100	100	205	36
4"	52	110	128	373	45
6"	75	156	183	840	14

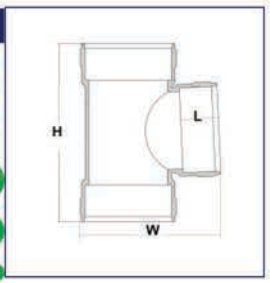


cross Tee 90°

D	L	H	W	gm	pcs/box
75	45	182	136	290	34
110	52	226	177	1040	15

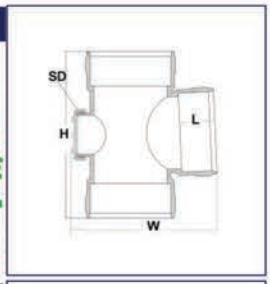


D	L	H	W	gm	pcs/box
1½"	31	116	88	148	55
2"	38	140	106	226	32



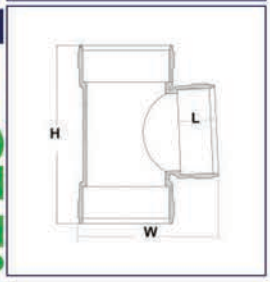
D	L	H	W	SD	gm	pcs/box
2"	38	140	125	2"	265	24

Tee with Access Door 90°



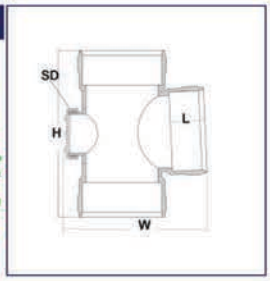
D	L	H	W	gm	pcs/box
50	31	116	85	158	55
75	45	182	136	448	42
110	52	226	177	940	20
160	70	337	258	2223	5

Tee 87.5°



D	L	H	W	SD	gm	pcs/box
75	45	182	150	3"	524	36
110	52	226	198	4"	1048	15
160	70	337	277	4"	1822	4

Tee with Access Door 87.5°

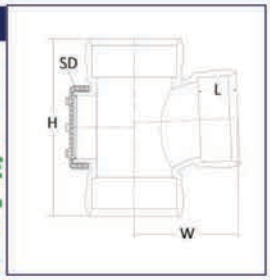


D	L	H	W	gm	pcs/box
3"	46	219	175	696	24
4"	52	240	207	1200	13
6"	76	337	269	2500	5

Tee 87.5°

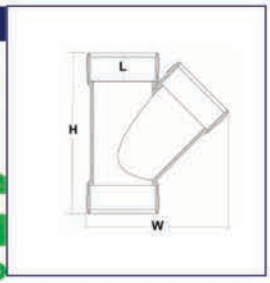
D	L	H	W	SD	gm	pcs/box
3"	46	219	175	3"	757	22
4"	52	240	225	4"	1250	11
6"	76	337	282	6"	2578	4

Tee with Access Door 87.5°



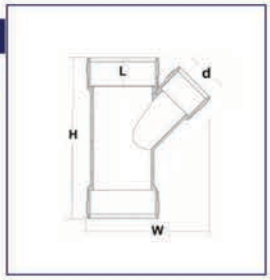
D	L	H	W	gm	pcs/box
50	31	142	120	183	40
75	45	214	180	555	13
110	52	288	250	1120	12
160	70	395	350	2740	4
1½"	31	142	120	180	40
2"	38	172	142	310	20
3"	46	260	210	836	20
4"	52	314	261	1664	10
6"	72	410	360	3100	4

Tee 45°



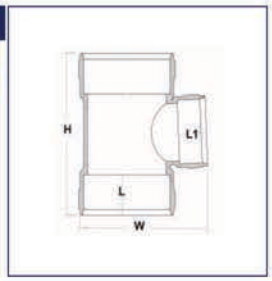
D	d	L	H	W	gm	pcs/box
110	50	52	288	210	980	20
110	75	52	288	210	800	18
110	2	52	288	185	970	20
4	2	52	314	190	911	15
4	3	52	314	215	1180	12

Tee Reducer 45°



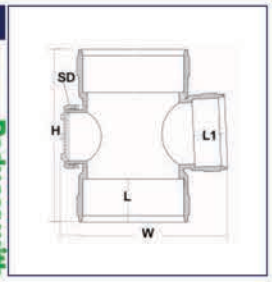
D	D1	D	L	L1	H	W	gm	pcs/box
75	2"	75	45	38	178	125	399	45
110	2"	110	52	38	210	169	798	22
110	50	110	52	45	210	180	840	22
110	75	110	52	45	210	180	818	22
160	110	160	70	52	280	240	1676	7

Tee Reducer 87.5°



D	D1	D	L	L1	H	W	SD	gm	pcs/box
75	2"	75	45	38	178	155	2"	438	30
110	2"	110	52	38	210	186	2"	860	20
110	75	110	52	45	210	192	3"	891	20
160	110	160	70	52	280	258	4"	1825	5

Tee Reducer with Access Door 87.5°

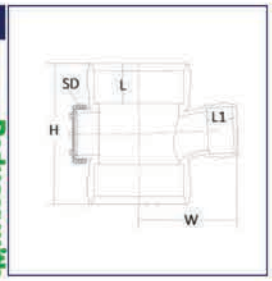


D	D1	D	L	L1	H	W	gm	pcs/box
3"	2"	3"	46	38	180	158	498	34
4"	2"	4"	52	38	183	190	829	22
4"	3"	4"	52	46	222	200	989	18
6"	4"	6"	76	52	280	240	1883	6

Tee Reducer 87.5°

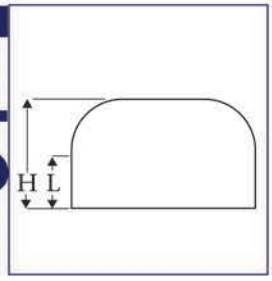
D	D1	D	L	L1	H	W	SD	gm	pcs/box
3"	2"	3"	46	38	180	173	2"	535	24
4"	2"	4"	52	38	183	201	2"	879	20
4"	3"	4"	52	46	222	215	3"	1055	15
6"	4"	6"	76	52	280	251	4"	2008	6

Tee Reducer with Access Door 87.5°



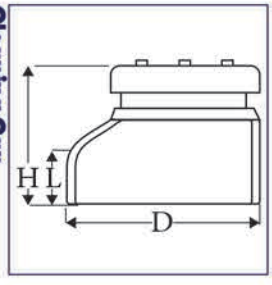
D	L	H	gm	pcs/box
110	52	111	221	90

End Cap



D	L	H	gm	pcs/box
75	45	84	200	60
110	54	100	333	80
2	38	75	120	120
3	46	88	220	75
4	52	100	370	72

Cleaning Cap With Access Door



CHAPTER 2

General Properties for U-PVC

2.1- Introduction.

2.2- Material properties of U-PVC (Thermal – Mechanical).

2.3- Chemical Resistance of U-PVC.

2.4- Effect of low temperature.

2.5- Expansion and contraction.

General Properties for U-PVC

2.1- Introduction

Plastics are synthetic macromolecular materials which, by processing acquire their specific functions. They are produced by chemical processes, the principle raw material being oil. The macromolecular structure of plastics is achieved by polymerization of individual molecules or monomers into chain molecules that are between 1000 and 100000 times larger than those naturally occurring in water or salt. This macro molecular composition from a spatial net-like structure with numerous internal chemical bonds. Plastics can be divided into two main groups.

- Thermoplastic materials which, upon heating, soften and can be reheated and reformed.
- Thermosetting materials which soften and melt with the initial heating but then set permanently in their final shape.

Unplasticized polyvinyl chloride or U-PVC is one of the most widely used thermoplastic materials, due to its flexibility of usage and competitive price. It is manufactured by the petrochemical industry who produce a chloride from ethane and chloride and pyrolysis above 400 C to cause splitting into vinyl chloride and hydrochloric acid.

The basic polymer is mixed with additives such as color, filler, lubricants and stabilizers in accordance with a recipe determined by the properties of the finished product. The mix of compound is transported to either extruders or injection molding machines to be converted into the product.

U-PVC pipe and fitting will not deteriorate under attack from bacteria or other micro organism and will not provide food source to micro / macro organisms and fungi. These pipe and fitting are also suitable for chemical industries as they have chemical resistance to most acids and alkalis. U-PVC being thermoplastic materials are prone to variance in physical properties based on variation in temperature. It is important to take into account

pipe (will thickness of pipe).

2.2- Material properties of U-PVC (Thermal–Mechanical)see table-1.

- U-PVC (Unplasticized Polyvinyl Chloride) without flexibilizer and materials.

Table -1

Properties	Measuring method	Unit	U-PVC Value
Water absortion	DIN 8061	(mg/cm^2)	< 4
Density	ISO R 1183	g/cm^3	1,39 – 1,40
Flammability	---	---	Self Extinguishing
-Vicat Softening Point (pipe) -Vicat Softening Point (Fitting)	ISO 2507	°C	76 72
Yield Stress tear resistance Tensile strength@20°C Modulus of elasticity Elongation	ISO / R 527 Feed Speed Test bar	N/mm^2 --- Kg/cm^2 N/mm^2 %	50 - 60 800 600 ≥3000 80
Impact strength (charpy)	---	---	No break>10%
Hardness Shore	---	Rockwell	90 - 100
Expansion coefficient	VDE 0304 Part 1&4	$°C^{-1}$	3×10^{-5}
Thermal conductivity	DIN 52612	W/km	0.15
Specific heat	Adiabatic calorimeter	Kcal./kg/ºc	0.25
Volume Resistively	---	Ohm/cm	$>10^{14}$
Surface Resistance	---	Ohm	$>10^{12}$
Dielectric strength	---	Kv/mm	>40
Power Factor (at10^6Cycle)	---	---	3.3

Table (1)

2.3- Chemical Resistance of U-PVC

A pipe system may be subject to a number of aggressive chemical exposures, accidental or otherwise. Resistance of U-PVC pipe to attacks by chemical agents has been determined through years of research and field experience, demonstrating the capability to endure a broad range of both acidic and caustic environments.

Factors Affecting Resistance

Chemical reactions can be very complex. There are so many factors affecting the reaction of a piping system to chemical attack that it is impossible to construct charts to cover all possibilities. Some of the factors affecting chemical resistance are:

1. Temperature
2. Chemical (or mixture of chemicals) present
3. Concentration of chemicals
4. Duration of exposure
5. Frequency of exposure

U-PVC Pipe and Fittings

The chemical resistance information for U-PVC pipe provided in the following tables is based on short-term immersion of unstressed strips of U-PVC in various chemicals (usually undiluted), and may be useful in assessing the suitability of U-PVC under unusual or specific operating environments. Results of this type of test can be used only as a guide to estimate the response of U-PVC. These tables provide guidance to industrial users of pipe for conveying the chemicals listed, rather than design criteria for sewers that may experience occasional exposures or when diluted by other wastewater discharges.

An additional source of information on the chemical resistance of U-PVC pipe is the National Association of Corrosion Engineers publication entitled, "Corrosion Data Survey, Nonmetals Section." For critical applications it is recommended that testing be performed under conditions that approximate the anticipated field conditions.

In applications where exposure to harmful chemicals is frequent, of long duration or in high concentrations, further testing is recommended.

The following chemical resistance legend is used in the following U-PVC tables:

R	Generally resistant
C	Less resistant than R but still suitable for some conditions
N	Not resistant

Chemical	23°C	60°C
A		
Acetaldehyde	N	N
Acetaldehyde, aq 40%	C	N
Acetamide	-	-
Acetic acid, vapor	R	R
Acetic acid, glacial	R	N
Acetic acid, 25%	R	R
Acetic acid, 60%	R	N
Acetic acid, 85%	R	N
Acetic anhydride	N	N
Acetone	N	N
Acetylene	N	N
Acetyl chloride	N	N
Acetylnitrile	N	N
Acrylonitrile	N	N
Acrylic acid	N	N
Adipic acid	R	R
Alcohol, allyl	R	C
Alcohol, amyl	N	N
Alcohol, benzyl	N	N
Alcohol, butyl (n-butanol)	R	R
Alcohol, diacetone	N	N
Alcohol, ethyl (ethanol)	R	R
Alcohol, hexyl (hexanol)	R	R
Alcohol, isopropyl (2-propanol)	R	R
Alcohol, methyl (methanol)	R	R
Alcohol, propyl (1-propanol)	R	R
Alcohol, propargyl	R	R
Allyl chloride	N	N
Alums	R	R
except Aluminim fluoride	R	N
Ammonia, gas	R	R
Ammonia, liquid	N	N
Ammonium salts	R	R
except Ammonium Dichromate	R	N
Ammonium fluoride, 10%	R	R
Ammonium fluoride, 25%	R	C
Amyl acetate	N	N
Amyl chloride	N	N
Aniline	N	N

Chemical	23°C	60°C
Aniline chlorohydrate	N	N
Aniline hydrochloride	N	N
Anthraquinone	R	R
Antimony trichloride	R	R
Anthraquinone sulfonic acid	R	R
Aqua regia	C	N
Arsenic acid, 80%	R	R
Aryl-sulfonic acid	R	R
B		
Barium salts	R	R
except Barium nitrate	R	N
Beer	R	R
Beet sugar liquor	R	R
Benzaldehyde, 10%	R	N
Benzene (benzol)	N	N
Benzene sulfonic acid, 10%	R	R
Benzene sulfonic acid, > 10%	N	N
Benzoic acid	R	R
Black liquor – paper	R	R
Bleach, 12% active chlorine	R	R
Bleach, 5% active chlorine	R	R
Borax	R	R
Boric acid	R	R
Brine	R	R
Bromic acid	R	R
Bromine, aq	R	R
Bromine, liquid	N	N
Bromine, gas, 25%	R	R
Bromobenzene	N	N
Bromotoluene	N	N
Butadiene	R	R
Butane	R	R
Butynediol	R	N
Butyl acetate	N	N
Butyl stearate	R	N
Butyl phenol	R	N
Butylene, liquid	R	R
Butyric acid	R	N

Chemical	23°C	60°C
C		
Cadmium Cyanide	R	R
Calcium salts	R	R
except Calcium bisulfide	N	N
Calcium hypochlorite, 30%	R	R
Calcium hydroxide	R	R
Calcium Nitrate	R	R
Calcium Oxide	R	R
Calcium Sulfate	R	R
Camphor	R	N
Cane sugar liquors	R	R
Carbon disulfide	N	N
Carbon dioxide	R	R
Carbon dioxide, aq	R	R
Carbon monoxide	R	R
Carbitol	R	N
Carbon tetrachloride	R	N
Carbonic Acid	R	R
Castor oil	R	R
Caustic potash, (potassium hydroxide), 50%	R	R
Caustic soda, (sodium hydroxide), < 40%	R	R
Cellosolve	R	N
Cellosolve acetate	R	N
Chloral hydrate	R	R
Chloramine, dilute	R	N
Chloric acid, 20%	R	R
Chlorine, gas, dry	C	N
Chlorine, gas, wet	N	N
Chlorine, liquid	N	N
Chlorine water	R	R
Chloracetic acid, 50%	R	R
Chloroacetyl Chloride	R	N
Chlorobenzene	N	N
Chlorobenzyl chloride	N	N
Chloroform	N	N
Chloropicrin	N	N
Chlorosulfonic acid	R	N
Chromic acid, 10%	R	R
Chromic acid, 30%	R	R
Chromic acid, 40%	R	C

Chemical	23°C	60°C
Chromic acid, 50%	N	N
Chromium potassium sulfate	R	N
Citric acid	R	R
Coconut oil	R	R
Coffee	R	R
Coke oven gas	R	R
Copper acetate	R	N
Copper salts, aq	R	R
Corn oil	R	R
Corn syrup	R	R
Cottonseed oil	R	R
Cresote	N	N
Cresol, 90%	N	N
Cresylic acid, 50%	R	R
Croton aldehyde	N	N
Crude oil, sour	R	R
Cupric Salts, aq	R	R
Cyclohexane	N	N
Cyclohexanol	N	N
Cyclohexanone	N	N
D		
Detergents, aq	R	R
Dextrin	R	R
Dextrose	R	R
Dibutoxyethyl phthalate	N	N
Diesel fuels	R	R
Diethylamine	N	N
Diethyl Ether	R	N
Disodium phosphate	R	R
Diglycolic acid	R	R
Dioxane -1,4	N	N
Dimethylamine	R	R
Dimethyl formamide	N	N
Dibutyl phthalate	N	N
Dibutyl sebacate	R	N
Dichlorobenzene	N	N
Dichloroethylene	N	N

Chemical	23°C	60°C
E		
Ether	N	N
Ethyl ether	N	N
Ethyl halides	N	N
Ethylene halides	N	N
Ethylene glycol	R	R
Ethylene oxide	N	N
F		
Fatty acids	R	R
Ferric salts	R	R
Fish Oil	R	R
Fluorine, dry gas	R	N
Fluorine, wet gas	R	N
Fluoboric acid	R	R
Fluosilicic acid, 50%	R	R
Formaldehyde	R	R
Formic acid	R	N
Freon - F11, F12, F113, F114	R	R
Freon - F21, F22	N	N
Fructose	R	R
Furfural	N	N
G		
Gallic acid	R	R
Gas, coal, manufactured	N	N
Gas, natural, methane	R	R
Gasolines	C	C
Gelatin	R	R
Glucose	R	R
Glue, animal	R	R
Glycerine (glycerol)	R	R
Glycolic acid	R	R
Glycols	R	R
Grape Sugar	R	R
Green liquor, paper	R	R

Chemical	23°C	60°C
H		
Heptane	R	R
Hexane	R	N
Hexanol	R	R
Hydraulic Oil	R	N
Hydrobromic acid, 20%	R	R
Hydrochloric acid	R	R
Hydrofluoric acid, 30%	R	N
Hydrofluoric acid, 50%	R	N
Hydrofluoric acid, 100%	N	N
Hydrofluosilic acid	R	R
Hydrocyanic acid	R	R
Hydrogen	R	R
Hydrogen cyanide	R	R
Hydrogen fluoride	N	N
Hydrogen phosphide	R	R
Hydrogen peroxide, 50%	R	R
Hydrogen peroxide, 90%	R	R
Hydrogen sulfide, aq	R	R
Hydrogen sulfide, dry	R	R
Hydroquinone	R	R
Hydroxylamine sulfate	R	R
Hydrazine	N	N
Hypochlorous acid	R	R
I		
Iodine, aq, 10%	N	N
J		
Jet fuels, JP-4 and JP-5	C	C
K		
Kerosene	R	R
Ketones	N	N
Ketchup	R	N
Kraft paper liquor	R	R

Chemical	23°C	60°C
L		
Lactic acid, 25%	R	R
Lactic acid, 80%	R	N
Lard oil	R	R
Lauric acid	R	R
Lauryl acetate	R	R
Lauryl chloride	R	R
Lead salts	R	R
Lime sulfur	R	N
Linoleic acid	R	R
Linoleic oil	R	R
Linseed oil	R	R
Liqueurs	R	R
Lithium salts	R	R
Lubricating oils	R	R
M		
Magnesium salts	R	R
Maleic acid	R	R
Malic acid	R	R
Manganese sulfate	R	R
Mercuric salts	R	R
Mercury	R	R
Methane	R	R
Methoxyethl oleate	R	N
Methyl acetate	N	N
Methyl amine	N	N
Methyl bromide	N	N
Methyl cellosolve	N	N
Methyl chloride	N	N
Methyl chloroform	N	N
Methyl ethyl ketone	N	N
Methyl isobutyl carbinol	N	N
Methyl isobutyl ketone	N	N
Methyl isopropyl ketone	N	N
Methyl methacrylate	R	N
Methyl sulfate	R	N
Methyl sulfuric acid	R	R
Methylene bromide	N	N

Chemical	23°C	60°C
Methylene chloride	N	N
Methylene iodide	N	N
Milk	R	R
Mineral oil	R	R
Molasses	R	R
Monochloroacetic acid	R	R
Monochlorobenzene	N	N
Monoethanolamine	N	N
Motor oil	R	R
N		
Naphtha	R	R
Naphthalene	N	N
Natural Gas	R	R
Nickel acetate	R	N
Nickel salts	R	R
Nicotine	R	R
Nicotinic acid	R	R
Nitric acid, 0 to 40%	R	R
Nitric acid, 50%	R	C
Nitric acid, 70%	R	N
Nitric acid, 100%	N	N
Nitrobenzene	N	N
Nitroglycerine	N	N
Nitrous acid, 10%	R	R
Nitrous oxide, gas	R	N
Nitroglycol	N	N
O		
Oleic acid	R	R
Oleum	N	N
Olive oil	R	R
Oxalic acid	R	R
Oxygen, gas	R	R
Ozone, gas	R	R

Chemical	23°C	60°C
P		
Palmitic acid, 10%	R	R
Palmitic acid, 70%	R	N
Paraffin	R	R
Pentane	C	C
Peracetic acid, 40%	R	N
Perchloric acid, 15%	R	N
Perchloric acid, 70%	R	N
Perchloroethylene	C	C
Perphosphate	R	N
Phenol	R	N
Phenylhydrazine	N	N
Phosphoric anhydride	R	N
Phosphoric acid	R	R
Phosphorus, yellow	R	N
Phosphorus, red	R	N
Phosphorus pentoxide	R	N
Phosphorus trichloride	N	N
Photographic chemicals, aq	R	R
Phthalic acid	C	C
Picric acid	N	N
Plating solutions, metal	R	R
Potash	R	R
Potassium amyl xanthate	R	N
Potassium salts, aq	R	R
except Potassium iodide	R	N
Potassium permanganate, 10%	R	R
Potassium permanganate, 25%	R	N
Propane	R	R
Propylene dichloride	N	N
Propylene oxide	N	N
Pyridine	N	N
Pyrogallic acid	R	N
R		
Rayon coagulating bath	R	R

Chemical	23°C	60°C
S		
Salicylic acid	R	R
Salicylaldehyde	N	N
Selenic acid, aq.	R	R
Silicic acid	R	R
Silicone oil	R	N
Silver salts	R	R
Soaps	R	R
Sodium salts, aq	R	R
except Sodium chlorite	N	N
except Sodium chlorate	R	N
except Sodium hypochlorite	R	N
Stannic chloride	R	R
Stannous chloride	R	R
Starch	R	R
Stearic acid	R	R
Stoddard solvent	N	N
Succinic acid	R	R
Sulfamic acid	N	N
Sulfate & Sulfite liquors	R	R
Sulfur	R	R
Sugars, aq	R	R
Sulfur dioxide, dry	R	R
Sulfur dioxide, wet	R	N
Sulfur trioxide, gas, dry	R	R
Sulfur trioxide, wet	R	N
Sulfuric acid, up to 80%	R	R
Sulfuric acid, 90 to 93%	R	N
Sulfuric acid, 94 to 100%	N	N
Sulfurous acid	R	R
T		
Tall Oil	R	R
Tannic acid	R	R
Tanning liquors	R	R
Tar	N	N
Tartaric acid	R	R
Terpineol	C	C
Tetrachloroethane	C	C

Chemical	23°C	60°C
Tetraethyl lead	R	N
Tetrahydrofuran	N	N
Tetralin	N	N
Tetra sodium	R	R
Thionyl chloride	N	N
Thread cutting oils	R	N
Titanium tetrachloride	C	N
Toluene	N	N
Tomato juice	R	R
Transformer oil	R	R
Tributyl phosphate	N	N
Tributyl citrate	R	N
Trichloroacetic acid	R	R
Trichloroethylene	N	N
Triethanolamine	R	N
Triethylamine	R	R
Trimethyl propane	R	N
Trisodium phosphate	R	R
Turpentine	R	R
U		
Urea	R	R
Urine	R	R
V		
Vaseline	N	N
Vegetable oils	R	R
Vinegar	R	R
Vinyl acetate	N	N
W		
Water, deionized	R	R
Water, distilled	R	R
Water, salt	R	R
White Liquor	R	R
Whiskey	R	R

Chemical	23°C	60°C
Wines	R	R
X		
Xylene	N	N
Z		
Zinc salts	R	R

2.4- Effect of low temperature:

The impact strength of U-PVC pipe and fittings decreases with reduction in temperature therefore increased care should be exercised if installations are carried out near 0° C.

2.5- Expansion and contraction

Piping which is being laid in hot weather will be in an expanded condition and will subsequently contract on cooling. It must be remembered that every 6m length of U-PVC will expand or contract approximately 5mm for every 10ºC rise or fall in temperature. Precautions against damage due to contraction can be taken. Probably the most effective being to cool the line immediately before backfilling, by filling it with cold water (not under pressure within 24 hours of making solvent weld joints), taking care to examine pipe joints and connections to fittings to ensure that no disturbance has occurred. It may be helpful to "snake" pipes of smaller diameters in the trench, when contraction will tend to straight out the line, thus reducing direct pull on the joints. Backfilling in cool early morning conditions is also effective.

CHAPTER 3

Handling And Storage

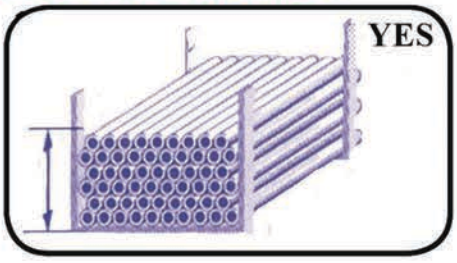
Handling and storage

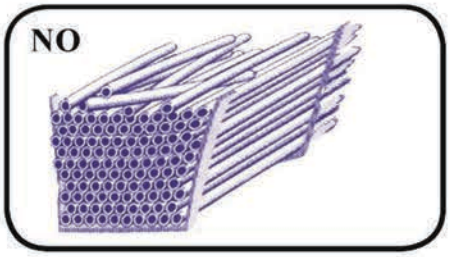
3.1- Handling and Storage.

Careless Unloading of pipe and fitting should not be allowed.Storage area is necessary near the workplace. The area should be smooth and level ground or a flat timber base to avoid the risk of bent or damage pipe. Where long term storage or strong sunlight is experienced, screening from the direct rays of the sun is recommended. Maximum height of stacking is 1.5 m.While U-PVC pipes are light and easy to handle, careless handiling can cause unnecessry damage. Pipe and fitting should not be dropped or thrown onto hard surfaces or alloed to come into contact with sharp objects that could result in deep scratches. U-PVC pipe should not be allowed to slide across sharp edges.U-PVC is subject to distortion under high loads, Particularly at elevated temperatures, and also to bowing due to uneven heating; stscks should therefore be protected from direct sunlight, or other heat source, if stored for extended periods

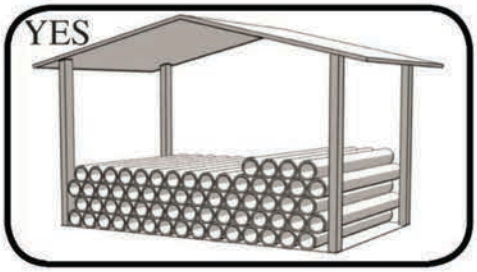
3.2- Transporting.

3.3- Avoiding excessive loads.





3.4- Storage.



CHAPTER

4

Welding

Welding

4.1- Cutting.

The pipe must be squarely cut to allow for the proper interfacing of the pipe end and the fitting socket bottom. This can be accomplished with a miter box saw.

4.2- Deburring.

Use file to remove burrs from the end of pipe. A slight chamfer about 15° should be added to the end to permit easier insertion of the pipe into the fitting. Failure to chamfer the edge of the pipe may remove cement from the socket, causing the joint to leak.

4.3- Solvent cement.

Use file Apply the solvent cement evenly and quickly around the outside of the pipe at a width a little greater than the depth of the fitting socket. Apply a light coat of cement evenly around the inside of the fitting socket.

4.4- Joint assembly

Immediately insert the pipe into the socket up to the entry mark, align pipe and socket, and hold in position for a few seconds.

Standards and Prescriptions

Standards for cold and hot water pipes of Polypropylene PP-R

Standards	Prescriptions
DIN 8077	Polypropylene Pipes, Dimensions.
DIN 8078	Polypropylene Pipes, General Quality Requirements.
DIN 16962	Pipe Joint Assemblies and Fittings for polypropylene Pressure Pipes.
ISO 1133	Determination of the melt mass-flow rate of thermoplastics.
ISO 18553	Method for the assessment of the degree of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds.
DIN 2999	Pipe Threads for tubes and fittings.
ISO 7	Pipe threads where pressure-tight joints are made on the threads.
E.S 3703/1	Polypropylene Pipes, General Quality Requirements.
E.S 3703/2	Polypropylene Pipes, Dimensions.

**Characteristics of the raw materials used

INNOPOL CS 4-8000

INNO-COMP

Product Information

Product description
INNOPOL® CS 4-8000 is a polypropylene random copolymer. This grade is available in nature and custom coloured form.

Recommended application
INNOPOL® CS 4-8000 is highly suitable for pressure pipe manufacturing, including hot, drinking water systems and floor-hearing application.

Physical properties: Typical values	Test method	Unit	Mean value
Properties			PP-R
Abbreviated term	ISO 1043	-	nature
Colour	-	-	0.9
Density 23°C	ISO 1183	g/cm³	
Rheology			0,3
Melt Mass Flow Rate MFR (230°C/2,16kg)	ISO 1133	g/10 min	
Mechanical properties			850
Tensile Modulus (1 mm/min)	ISO 527-1,-2	MPa	25
Tensile Stress at Yield (50 mm/min)	ISO 527-1,-2	MPa	12
Tensile Strain at Yield (50 mm/min)	ISO 527-1,-2	%	NB
Charpy Impact Strength at 23°C	ISO 179/1eU	kJ/m²	70
Charpy Impact Strength at -20°C	ISO 179/1eU	kJ/m²	20
Charpy Impact Strength notched at 23°C	ISO 179/1eA	kJ/m²	2,5
Charpy Impact Strength notched at -20°C	ISO 179/1eA	kJ/m²	
Thermal properties			70
Heat Deflection Temperature 0.45 MPa (HDT/B)	ISO 75-1,-2	°C	

- MFR is measured at 230°C under a load of 2.16 kg with standard nozzle having a diameter of 2.095 mm.
- Average mechanical property values of several measurements carried out on standard injection moulded specimens (ISO 3167) conditioned at room temperature (ISO 291).
- Data contain above represent typical values of individual properties. They are informative, please do not construed as specifications.

Physical form and storage
Standard packaging includes the 25 kg bags, the 1000 kg octabin (octagonal container) or the 1250 kg big-bag. All containers are tightly sealed and should be opened only immediately prior to processing.
INNOPOL® CS 4-8000 should generally have a moisture content of less than 0,05% when being processed. In order to ensure reliable production pre-drying is suggested before processing of material at 80°C/2h.
INNOPOL® CS 4-8000 should be stored in dry conditions at temperatures below 60 °C and protected from UV-light. The quality of product may suffer due to storage under improper condition.

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Polypropylene RA140E

Product Data Sheet
Polypropylene
RA140E
Polypropylene Random Copolymer for Pressure Pipes Systems

DESCRIPTION
RA140E is a BNT Nucleated high molecular weight, low melt flow rate polypropylene rimdom copolymer (PP-R) natural colored.

APPLICATIONS
RA140E together with the appropriate additive package is recommended for the production of PP-R pipes and fittings used in: Heating, Plumbing, Domestic water, Refining, and Industrial applications
The product is suitable for both plastic and aluminum multilayer pipes.

SPECIFICATIONS
RA140E is intended to fulfill the following standards and regulations, providing the appropriate industrial manufacturing standard procedures are used and a continuous quality system is implemented: DIN 8078, DIN 8077 and EN ISO 15874.

SPECIAL FEATURES
RA140E is a natural grade used for production of pipes and fittings. The material is in pellet form and includes selected additive package which ensure:

- Enhanced process ability
- Economical pipe production
- Excellent product consistency
- High temperature resistance
- Low incidence on taste and odour
- Good impact strength.

The pipe systems will show high durability, no corrosion, good weld ability, homogeneous joints, low tendency to incrustations and fast and easy installation.

PHYSICAL PROPERTIES

Property	Typical Value	Test Method
Density	905 kg/m3	ISO 1183
Melt Flow Rate (230 °C/2.16 kg)	0,30 g/10min	ISO 1133
Flexural Modulus (2 mm/min)	900 MPa	ISO 178
Tensile Strain at Yield (50 mm/min)	800 MPa	ISO 527
Tensile Stress at Yield (50 mm/min)	13,5 %	ISO 527-2
Thermal Conductivity	25 MPa	ISO 527-2
Coefficient of Thermal Expansion (0 °C/70 °C)	0,24 W/(m K)	DIN 52612
	1,5*10E-4/K	DIN 53752

* Data should not be used for specification work

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HYOSUNG CORPORATION

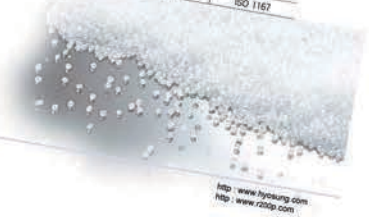
Physical Properties

Properties		Test Method	Unit	Data
Density		ASTM D792	g/cd	0.91
Melt Index	230℃, 2.16kg	ASTM D1238	g/10min	0.25
Tensile Strength	190℃, 5.0kg			0.45
	yield point	ASTM D638	kg/cd	270
	break point			230
Elongation		ASTM D638	%	>400
Flexural Modulus		ASTM D790	kg/cd	8,500
Izod Impact Strength	23℃	ASTM D256	kg · cm/cm	30
	0℃			8
	-20℃			3
Vicat Softening Point		ASTM D1525	℃	130
Melting Temperature		HS Method	℃	141
Surface Resistance		HS Method	Ω	>10¹³
Mean coefficient of linear thermal expansion (0℃ - 110℃)		Dilatometer	K⁻¹	1.5×10⁻⁴

* The data of table are relative and represent empirical values obtained in various tests.

Resistance to internal hydrostatic pressure

Condition		Required	Typical Value of R200P	Test Method
20℃	16 MPa	1 hr	>10 hrs	ISO 1167
95℃	3.5 MPa	1,000 hrs	>5,000 hrs	ISO 1167
110℃	1.9 MPa	8,760 hrs	>10,000 hrs	ISO 1167



R200P HYOSUNG PP

http : www.hyosung.com
http : www.r200p.com

basell

Hostalen PP H5416

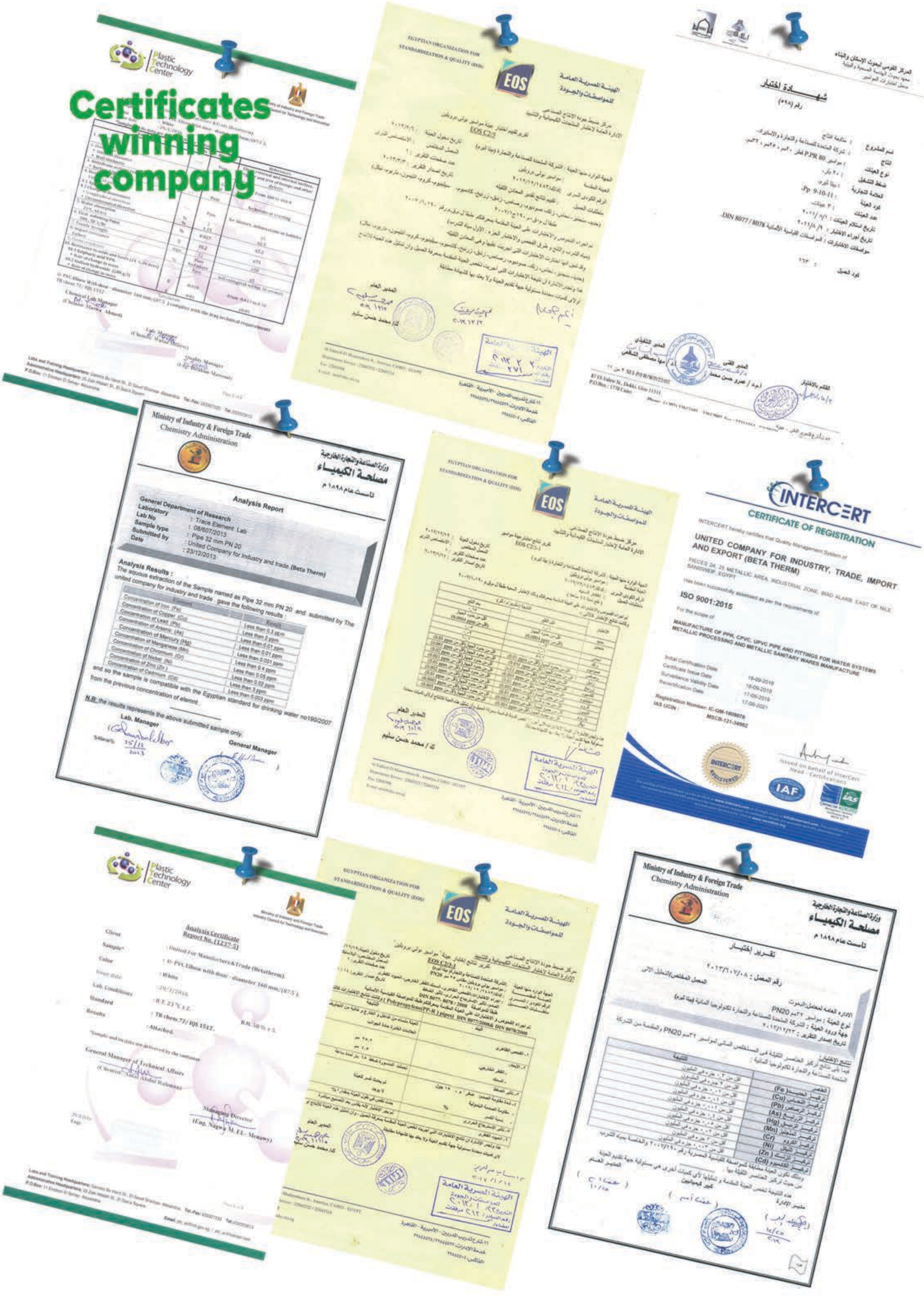
Polypropylene, Random Copolymer

Product Description
***Hostalen* PP H5416 is** a polypropylene random copolymer.

Typical Properties	Method	Value	Unit
Physical			
Density	ISO 1183	0.909	g/cm³
Melt flow rate (MFR)	ISO 1133	0.5	g/10 min
(190°C/5.0kg)		0.3	g/10 min
(230°C/2.16Kg)		1.3	g/10 min
(230°C/5.0kg)			
Mechanical			
Tensile Modulus (23 °C, v = 1 mm/min)	ISO 527-1, -2	850	MPa
Tensile Stress at Yield (23 °C, v = 50 mm/min)	ISO 527-1, -2	24	MPa
Tensile Strain at Yield (23 °C, v = 50 mm/min)	ISO 527-1, -2	10	°C
Tensile Creep Modulus 1h	ISO 899-1	650	MPa
Tensile Creep Modulus 1000h	ISO 899-1	350	MPa
Typical Properties	Method	Value	Unit
Impact			
Charpy unnotched impact strength	ISO 179		
(23 °C)		No Break	kJ/m²
(0 °C)		No Break	kJ/m²
(-30 °C)		43	kJ/m²
Charpy notched impact strength	ISO 179		
(23 °C)		22	kJ/m²
(0 °C)		4.5	kJ/m²
(-30 °C)		2.5	kJ/m²
Hardness			
Shore hardness (Shore D (3 sec))	ISO 868	65	
Ball indentation hardness (H 132/30)	ISO 2039-1	45	MPa
Thermal			
Heat deflection temperature B (0.45 MPa) Unannealed	ISO 75B-1, -2	70	°C
Heat deflection temperature A (1.80 MPa) Unannealed	ISO 75A-1, -2	49	°C
Vicat softening temperature	ISO 306	132	°C
(VST/A/50 K/h (10 N))		69	°C
(VST/B/50 K/h (50 N))		147	°C
Melting Temperature	ISO 3146	70	°C
Heat deflection temperature B (0.45 MPa) Unannealed	ISO 75B-1, -2		
Additional Information			
Odor treshold	EN 1622/EN 1240	< 2	
Note: Pellets, 70 °C / 4 h			
Notes			

Typical properties; not to be construed as specifications.

Certificates winning company



CHAPTER

5

Products

1.1– Product List:

BP2210

BP2160

BP2200

BP2200B


BC3500T


BE3145


BE300


BE3300


BC3500


BS3200


BS3200R


BS3300R


BS3200M


BS3200F


BV4001

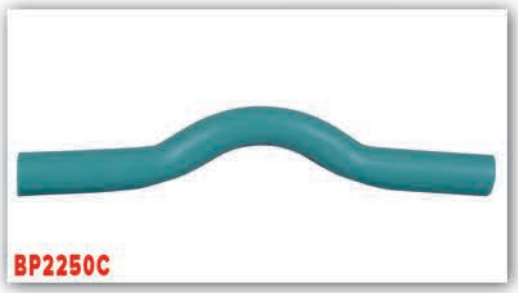

BV4000


BV4000B


BE3100F


BE3150F


BT3300F


BP2250C


BC2250S

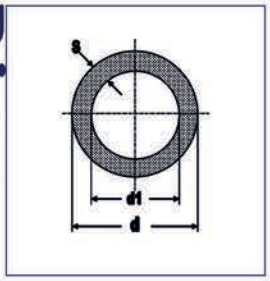

BDE3150F

5.2 Product Details.

For Cold Water Only

D	d	d1	S	m/bag
32	32.3	26.2	2.9	60
40	40.4	32.6	3.7	40
50	50.5	40.8	4.6	20
63	63.6	51.4	5.8	16
75	75.7	61.4	6.8	8
90	90.9	73.6	8.2	8
110	110.9	90	10	8

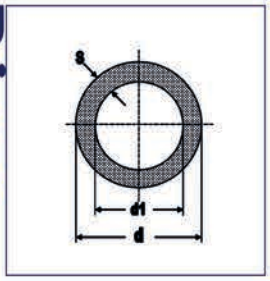
Pipe PN10



For Cold Water Only

D	d	d1	S	m/bag
20	20.3	14.7	2.8	100
25	25.3	18.3	3.5	100
32	32.3	23.5	4.4	60
40	40.4	29.4	5.5	40
50	50.5	36.7	6.9	20
63	63.6	46.4	8.6	16
75	75.7	55.1	10.3	8
90	90.9	66.3	12.3	8
110	110.9	80.7	15.1	8

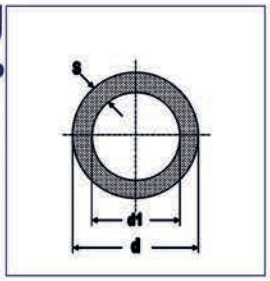
Pipe PN16



Hot & Cold Water

D	d	d1	S	m/bag
20	20.3	13.5	3.4	100
25	25.3	16.9	4.2	100
32	32.3	32.5	5.4	60
40	40.4	27	6.7	40
50	50.5	33.9	8.3	20
63	63.6	42.6	10.5	16
75	75.7	50.7	12.5	8
90	90.9	60.9	15	8
110	110.9	74.3	18.3	8

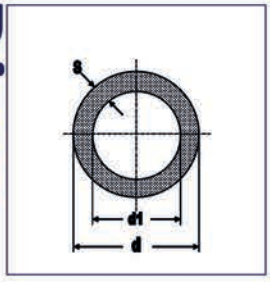
Pipe PN20



Anti UV Pipe

D	d	d1	S	m/bag
20	20.3	13.5	3.4	100
25	25.3	16.9	4.2	100
32	32.3	32.5	5.4	60
40	40.4	27	6.7	40
50	50.5	33.9	8.3	20
63	63.6	42.6	10.5	16
75	75.7	50.7	12.5	8
90	90.9	60.9	15	8
110	110.9	74.3	18.3	8

Pipe PN20

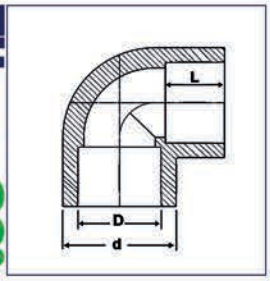


D	d	L	pcs/box
20	28.5	14.5	150
25	34.5	16	100

Elbow 45°

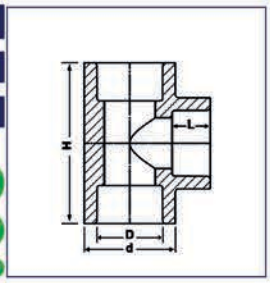
Elbow 90°

D	d	L	pcs/box
20	28.5	14.5	150
25	34.5	16	100
32	43	18	50
40	53.5	22	40
50	65.5	23.5	15
63	83	28	10



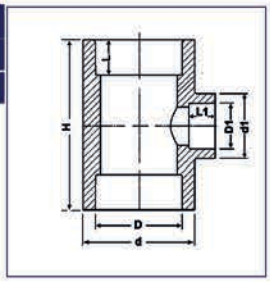
TEE 90°

D	d	L	H	pcs/box
20	28.5	14.5	57	100
25	34.5	16	64	60
32	43	18	75.5	30
40	53.4	22	90	20
50	63.5	25	104.5	15
63	84.5	28	122.5	5



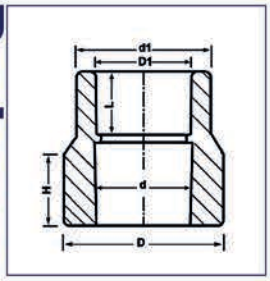
TEE Reducer 90°

D	D1	d	d1	L	L1	H	pcs/box
25	20	34	29	16	14.5	63	60
32	20	43	29	18	14.5	75	40
32	25	42.5	34	18	16	75.5	40
40	20	53.5	29	22	14.5	90	25
40	25	53.5	34	22	16	90	25
40	32	53.5	43	22	18.5	90	25
50	20	63	33.5	25	14.5	104	15
50	25	63	33.5	25	16	104	15
50	32	63	42.5	25	18	104	15
50	40	63	53.5	25	22	104	15
63	20	85	30	28	14	122	5
63	25	85	34.5	28	16.5	122	5
63	32	85	43.5	28	18	122	5
63	40	85	53.5	28	22	122	5
63	50	85	65.5	28	23.5	122	5



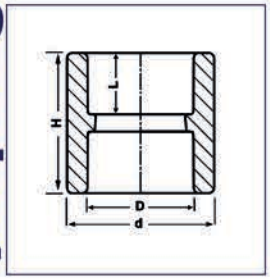
Reducer

D	D1	d	d1	L	H	pcs/box
25	20	15	29	14	15	200
32	20	19.3	28	14	17	200
32	25	19.3	33.5	15	17	150
40	20	25.5	29	14	21	120
40	25	25.5	33.5	15	21	120
40	32	25.5	43.5	16.5	21	120
50	20	29.3	33	14	23.5	60
50	25	29.3	42.5	16.5	24.5	60
50	32	29.3	42.5	16.5	24.5	60
50	40	29.3	53.5	19.5	24.5	60
63	20	38.3	34	15	27.5	30
63	25	38.3	34	16.5	27.5	30
63	32	38.3	43	18.5	27.5	30
63	40	38.3	53.5	19.5	27.5	30
63	50	38.3	65	23.5	27.5	30



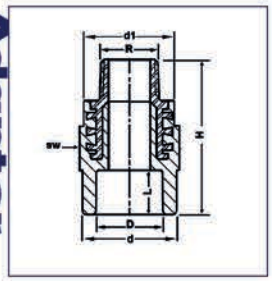
Socket

D	d	L	H	pcs/box
20	29	14.5	34	200
25	34	16	37	150
32	42.5	17.5	41	80
40	53.5	22	46	50
50	64.5	23.5	53	30
63	84.5	27.5	59	20



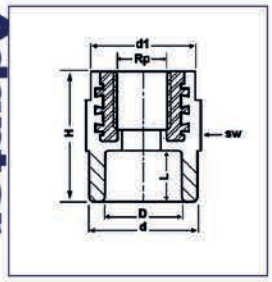
D	R	d	sw	H	L	d1	pcs/box
20	½	29	36.5	54.5	15	36	80
25	½	34.5	38.5	56	16	36	80
25	¾	33.5	43	56	16	42.5	60
32	1	42	51.5	63.5	17.5	51	40
40	1¼	53.5	57	70	22	56.5	25
50	1½	64.5	76.5	78.5	24.5	76	15
63	2	82.5	85.5	94	28	86	10

Adaptor
male bronze

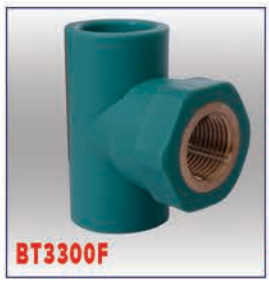


D	Rp	d	sw	H	L	d1	pcs/box
20	½	29	36.5	40	15	36	100
25	½	34.5	38.5	41	16	36	100
25	¾	33.5	43	41.5	16	42	80
32	¾	42	51.5	46	17.5	51	80
32	1	42	51.5	46	17.5	51	50
40	1¼	53.5	57	51	22	56.5	30
50	1½	64.5	76.5	58	24.5	76	15
63	2	82.5	85.5	68	29	86	10

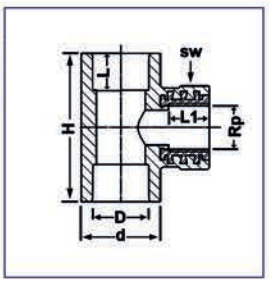
Adaptor
female bronze



D	Rp	d	Sw	L1	L	H	pcs/box
20	½	29.5	38	19	16	62	60
25	½	33.5	37.5	19	16	64.5	50
25	¾	35.5	46	20.5	16	75.5	30
32	1	43	52	22	18	75.5	20

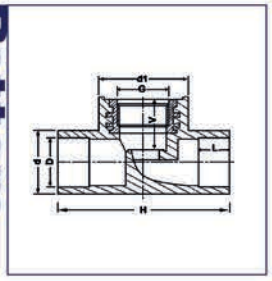


Tee
female bronze



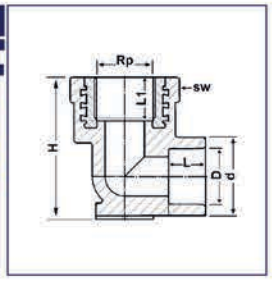
D	G	d	d1	L	V	H	pcs/box
20	¾	32	47.5	15.5	28.5	82.5	35
25	¾	37	47.5	16	28.5	84	35
32	¾	43	47.5	22	28.5	86	30

Bottom
part of valve



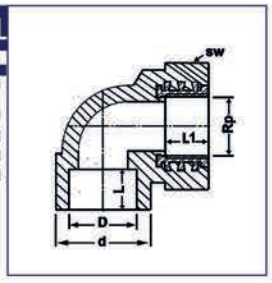
D	Rp	d	L	L1	H	Sw	pcs/box
20	½	30	14.5	19	49	38	60
25	½	34	18	19.5	56.5	38	60
25	¾	34	18	20	62	45.5	40

Elbow
female bronze (Bracket)



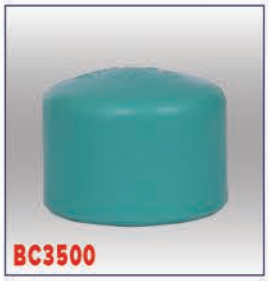
D	Rp	d	L	L1	Sw	pcs/box
32	1	43	18.5	22	52	30

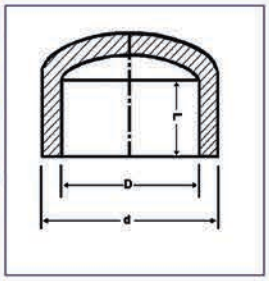
Elbow
female bronze



End Cap

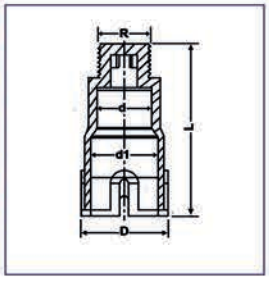
D	d	L	pcs/box
20	30	16.5	300
25	34	18.5	200
32	43	19.5	90
40	52	21.5	60
50	65	23.5	15
63	79	28	10





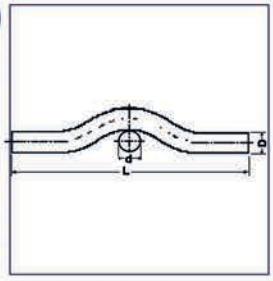
Test Cap

R	D	d	d1	L	pcs/box
½	33	20.7	25.5	68.5	100



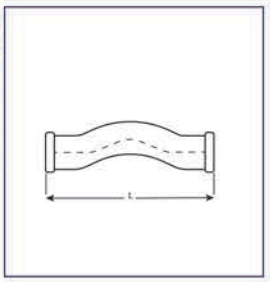
Crossover

D	d	L	pcs/box
20	20	285	140
25	25	285	100
32	32	285	80



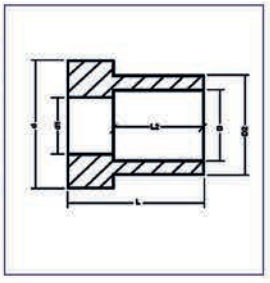
Short crossover

D	L	pcs/box
20	82	250
25	97	150
32	112	100



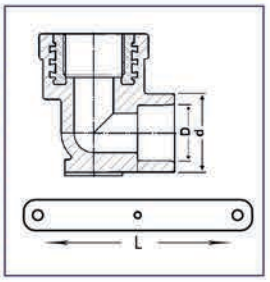
Ball Valve

D	D2	d	d1	L	L2	pcs/box
20	26.5	29.7	15	20.5	15.5	50
25	30.5	32.7	20	22	17	40
32	40	45	26	26.5	21.5	30
50	62.5	68	43	27	20.5	20
63	78.0	84	50	30	25	15



DOUBL ELBOW

D	d	L	pcs/box
25	½	28.5	50



5.3- PROCESSING TOOLS.

5.3.1- Welding Machines.

- We have different types of welding machine for size from (20mm to 63mm)see fig (1a, 1b).
- The thermostatically controlled heating element has at (220 V) a power up to (1800 W) for coated heating socket and diameter.
- This device completed by a post and tools is delivered in a metal case then carton box.

fig(1a)

Bar Welding Machine (20, 25,32mm)

fig(1b)

Welding Machine (20, 25, 32, 50,63mm)

5.3.2- Pipe cutter

- Daily practices provide tube cutters and pipe scissors to be the optimum tools for cutting PP-R tubes. Both devices make the clear rectangular cuts indispensable for professional weld joints. PP-R
  tubes are very easy to cut with these tools.
- We have different types of pipe cutter see fig (1c, 1d, 1e).

fig(1c)

fig(1d)

fig(1e)

5.3.3- Test Machine

See fig (1f)

fig(1f)

CHAPTER 6

General Properties PPR

6.1- Material properties of PP-R (Physical - Thermal – Mechanical).

6.2- Chemical Resistance of PP-R.

6.3 - Jointing.

6.4- Dimensions.

6.5- Utilization.

6.6- Application areas / max. Operating pressures.

6.1-Material properties of PP-R(Physical-Thermal-Mechanical)

- PP-R (Polypropylene Random-copolymer) of high molecular weight and stabilized to high temperature.
- Material properties of PP-R see table (2a).
- The material corresponds to KTW-recommendation of the german board of health see fig (2a).

Properties	Measuring technique	Unit	PP-R Value
Melting index			
MFR 190/5	ISO /R 1133	g/10 min.	0.5
MFR 230/2.16		g/10 min.	0.24 – 0.36
Density	ISO /R 1183	g/cm^3	0.895
Melting range	Polarizing microscope	C°	140 - 150
Yield Stress	ISO / R 527	N/mm^2	21
Tensile Strength	Feed Speed	N/mm^2	40
Tensile Expansion	Test bar	%	600
Bending Stress at 3.5%	ISO 178	N/mm2	20
Marginal fibre expansion	Test specimen 5.1		
Modulus of elasticity	ISO 178	N/mm^2	800
Mechanical properties			
Following impact			
Bending test at 0°C	DIN 8078	15 Jul	No fracture
Expansion coefficient	VDE 0304 Part 1&4	K^{-1}	1.5×10^{-4}
Thermal conductivity			
at 20°C	DIN 52612	W/m K°	0.24
Specific heat at 20°C	Adiabatic calorimeter	KJ/kg K°	2.0
Pipe friction factor	---	---	0.007

Table(2a)

TZW
Prüfstelle Wasser

DVGW-Werkstoffliste Polypropylen für die Trinkwasser-Installation
Hygieneprüfung an PP-Granulaten und PP-Rohren der Rohstoffhersteller

1. Quartal 2013

Rohstoffhersteller	Werkstofftyp	
Borealis AB	Borealis RA 130 E	(geprüft als grün)
	Borealis RA 7050	(geprüft als grün)
Inno-Comp. Ltd.	CS4-8000	(geprüft als weiss)
SABIC Polyolefine GmbH	Vestolen P 9421	(geprüft als grün)
Basell Poliolefine Italia S.r.l.	Hostalen PP H5416	(geprüft als natur)
	Hostalen PP RP2585	(geprüft als natur)
	Hostalen PP RP1887	(geprüft als natur)
Repsol Quimica S.A.	PR 210 T 312	(geprüft als grün)

Karlsruhe, den 03.06.2013

(Dr. J. Klinger / i.A. Dr.-Ing. R. Turković)

Das Technologiezentrum Wasser ist eine Einrichtung des DVGW Deutscher Verein des Gas- und Wasserfaches e.V. – Technisch-wissenschaftl. Verein –

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BIC: GENO DE 61 ORH

IBAN: DE53 6639 1600 0013 1919 13
USt.ID-Nr.(VAT): DE 114 341 970
Steuer-Nr.: 206 5887 0745

fig(2a)

6.2- Chemical Resistance of PP-R

- Detailed information on chemical resistance of polypropylene pipes and pipelines is available in Table 1 to DIN 8078.
- The Polypropylene family of polyolefin polymer that features. A high molecular weight. Therefore, it is more resistant to chemicals suh as (acid, lime or cement) see table(2b).

Chemical or Product	Concen-tration	Temperature °C		
		20	60	100
Acetic acid	Up to 40 %	S	S	-
Acetic acid	50 %	S	S	L
Acetic acid, glacial	> 96 %	S	L	NS
Acetic anhydride	100 %	S	-	-
Acetone	100 %	S	S	-
Aceptophenone	100 %	S	L	-
Acrylonitrile	100 %	S	-	-
Air	----	S	S	S
Ally alcohol	100 %	S	S	-
Almond oil	----	S	-	-
Alum	Sol	S	S	-
Ammonia, aqueous	Sat.sol	S	S	-
Ammonia, dry gas	100 %	S	-	-
Ammonia, liquid	100 %	S	-	-
Ammonium acetate	Sat. sol	S	S	-
Ammonium chloride	Sat.sol	S	S	-
Ammonium fluoride	Up to 20 %	S	S	-
Ammonium hydrogen carbonate	Sat.sol	S	S	-
Ammonium met phosphate	Sat.sol	S	S	S
Ammonium nitrate	Sat.sol	S	S	S
Ammonium persul-phate	Sat.sol	S	S	-
Ammonium phosphate	Sat.sol	S	-	-
Ammonium sulphate	Sat.sol	S	S	S
Ammonium sulphide	Sat.sol	S	S	-
Amyl acetate	100 %	L	-	-
Amyl alcohol	100 %	S	S	S
Aniline	100 %	S	S	-
Apple juice	----	S	-	-
Aqua regia	HCl/HNO_3 =3/1	NS	NS	NS
Barium bromide	Sat.sol	S	S	S
Barium carbonate	Sat.sol	S	S	S
Barium chloride	Sat.sol	S	S	S
Barium hydroxide	Sat.sol	S	S	S
Barium sulphide	Sat.sol	S	S	S
Beer	-----	S	S	-
Benzene	100 %	L	NS	NS
Benzoic acid	Sat.sol	S	S	-
Benzyl alcohol	100 %	S	L	-
Borax	Sol	S	S	-
Boric acid	Sat.sol	S	-	-
Boron trifluoride	Sat.sol	S	-	-
Bormine, gas	----	NS	NS	NS
Bromine, liquid	100 %	NS	NS	NS
Butane, gas	100 %	S	-	-
Butanol	100 %	S	L	L
Butyl acetate	100 %	L	NS	NS
Butyl glycol	100 %	S	-	-
Butyl phenols	Sat.sol	S	-	-
Butyl phthalate	100 %	S	L	L
Calcium carbonate	Sat.sol	S	S	S
Calcium chlorate	Sat.sol	S	S	-
Calcium chloride	Sat.sol	S	S	S
Calcium hydroxide	Sat.sol	S	S	S
Calcium hypochlorite	Sol	S	-	-
Calcium nitrate	Sat.sol	S	S	-
Camphor oil	----	NS	NS	NS
Carbon dioxide, dry gas	----	S	S	-
Carbon dioxide, wet gas	----	S	S	-
Carbon disulphide	100 %	S	NS	NS
Carbon monoxide, gas	----	S	S	-
Carbon tetrachloride	100 %	NS	NS	NS
Castor oil	100 %	S	S	-
Caustic soda	Up to 50 %	S	L	L
Chlorine, aqueous	Sat.sol	S	L	-
Chlorine, dry gas	100 %	NS	NS	NS
Chlorine, liquid	100 %	NS	NS	NS
Chloroacetic acid	Sol	S	-	-
Chloroethanol	100 %	S	-	-
Chloroform	100 %	L	NS	NS
Chlorosulphonic acid	100 %	NS	NS	NS
Chrome alum	Sol	S	S	-
Chromic acid	Up to 40 %	S	L	NS
Citric acid	Sat.sol	S	S	S
Coconut oil	----	S	-	-
Copper (II) chloride	Sat.sol	S	S	-
Copper (II) nitrate	Sat.sol	S	S	S
Copper (II)	Sat.sol	S	S	-
Corn oil	----	S	L	-
Cottonseed oil	----	S	S	-
Cresol	Greater than 90 %	S	-	-
Cyclohexane	100 %	S	-	-

Cyclohexanol	100 %	S	L	-
Cyclohexanone	100 %	L	NS	NS
Decalin (decahydro-naphthalene)	100 %	NS	NS	NS
Dextrin	Sol	S	S	-
Dextrose	Sol	S	S	S
Dibutyl phthalate	100 %	S	L	NS
Dichloroacetic acid	100 %	L	-	-
Dichloroethylene (A and B)	100 %	L	-	-
Diethanolamine	100 %	S	-	-
Diethyl ether	100 %	S	L	-
Diethylene glycol	100 %	S	S	-
Diglycolic acid	Sat.sol	S	-	-
Diisooctyl	100 %	S	L	-
Dimethyl amine, gas	----	S	-	-
Dimethyl formamide	100 %	S	S	-
Dioctyl phthalate	100 %	L	L	-
Dioxane	100 %	L	L	-
Distilled water	100 %	S	S	S
Ethanolamine	100 %	S	-	-
Ethyl acetate	100 %	L	NS	NS
Ethyl alcohol	Up to 95 %	S	S	S
Ethyl chloride, gas	----	NS	NS	NS
Ethylene chloride (mono and di)	----	L	L	-
Ethyl ether	100 %	S	L	-
Ethylene glycol	100 %	S	S	S
Ferric chloride	Sat.sol	S	S	S
Formaldehyde	40 %	S	-	-
Formic acid	10 %	S	S	L
Formic acid	85 %	S	NS	NS
Formic acid, anhydrous	100 %	S	L	L
Fructose	Sol	S	S	S
Fruit juice	----	S	S	S
Gasoline, petrol (aliphatic hydrocar-bons)	----	NS	NS	NS
Gelatine	----	S	S	-
Glucose	20 %	S	S	S
Glycerine	100 %	S	S	S
Glycolic acid	30 %	S	-	-
Heptane	100 %	L	NS	NS
Hexane	100 %	S	L	-
Hydrobromic acid	Up to 48 %	S	L	NS
Hydrochloric acid	Up to 20 %	S	S	S
Hydrochloric acid	30 %	S	L	L
Hydrochloric acid	From 35 to 36 %	S	-	-
Hydrofluoric acid	Dil.sol	S	-	-
Hydrofluoric acid	40 %	S	-	-
Hydrogen	100 %	S	-	-
Hydrogen chloride, dry gas	100 %	S	S	-
Hydrogen peroxide	Up to 10 %	S	-	-
Hydrogen peroxide	Up to 30 %	S	L	-
Hydrogen sulphide, dry gas	100 %	S	S	-
Iodine, in alcohol	----	S	-	-
Isoctane	100 %	L	NS	NS
Isopropyl alcohol	100 %	S	S	S
Isopropyl ether	100 %	L	-	-
Lactic acid	Up to 90 %	S	S	-
Lanoline	----	S	L	-
Linseed oil	----	S	S	S
Magnesium carbonate	Sat.sol	S	S	S
Magnesium chloride	Sat.sol	S	S	-
Magnesium hydroxide	Sat.sol	S	S	-
Magnesium sulphate	Sat.sol	S	S	-
Maleic acid	Sat.sol	S	S	-
Mercury (II) chloride	Sat.sol	S	S	-
Mercury (II) cyanide	Sat.sol	S	S	-
Mercury (I) nitrate	Sol	S	S	-
Mercury	100 %	S	S	-
Methyl acetate	100 %	S	S	-
Methyl alcohol	5 %	S	L	L
Methyl amine	Up to 32 %	S	-	-
Methyl bromide	100 %	NS	NS	NS
Methyl ethyl ketone	100 %	S	-	-
Methylene chloride	100 %	L	NS	NS
Milk	----	S	S	S
Monochloroacetic acid	>85 %	S	S	-
Naphtha	----	S	NS	NS
Nickel chloride	Sat.sol	S	S	-
Nickel nitrate	Sat.sol	S	S	-
Nickel sulphate	Sat.sol	S	S	-
Nitric acid	Up to 30 %	S	NS	NS
Nitric acid	From 40 to 50 %	L	NS	NS
Nitric acid, fujming (with nitrogen dioxide)	----	NS	NS	NS
Nitrobenzene	100%	S	L	_
Oleic acid	100 %	S	L	-
Oleum (sulphuric acid with 60 % of SO3)	----	S	L	-
Olive oil	----	S	S	L
Oxalic acid	Sat.sol	S	L	NS
Oxygen, gas	----	S	-	-
Paraffin oil (FL65)	----	S	L	NS
Peanut oil	----	S	S	-
Peppermint oil	----	S	-	-
Perchloric acid	(2 N) 20 %	S	-	-
Petroleum ether (ligroine)	----	L	L	-
Phenol	5 %	S	S	-
Phenol	90 %	S	-	-
Phosphine, gas	----	S	S	-
Phosphoric acid	Up.to 85 %	S	S	S
Phosphorus oxychlo-ride	100 %	L	-	-
Picric acid	Sat.sol	S	-	-
Potassium bicarbonate	Sat.sol	S	S	S

Potassium borate	Sat.sol	S	S	-
Potassium bromate	Up to 10 %	S	S	-
Potassium bromide	----	Sat. sol	S	S
Potassium carbonate	----	Sat. sol	S	S
Potassium chlorate	----	Sat. sol	S	S
Potassium chlorite	----	Sat. sol	S	S
Potassium chromate	----	Sat. sol	S	S
Potassium cyanide	----	Sol	S	-
Potassium dichromate	Sat.sol	S	S	S
Potassium ferricyanide	Sat.sol	S	S	-
Potassium fluoride	Sat.sol	S	S	-
Potassium hydroxide	Up to 50 %	S	S	S
Potassium iodide	Sat.sol	S	-	-
Potassium nitrate	Sat.sol	S	S	-
Potassium perchlorate	10 %	S	S	-
Potassium permanganate	(2 N) 30 %	S	-	-
Potassium persulphate	Sat.sol	S	S	-
Potassium sulphate	Sat.sol	S	S	-
Propane, gas	100 %	S	-	-
Propionic acid	>50 %	S	-	-
Pyridine	100 %	L	-	-
Seawater	----	S	S	S
Silicon oil	----	S	S	S
Silver nitrate	Sat.sol	S	S	L
Sodium acetate	Sat.sol	S	S	S
Sodium benzoate	35 %	S	L	-
Sodium bicarbonate	Sat.sol	S	S	S
Sodium carbonate	Up to 50 %	S	S	L
Sodium chlorate	Sat.sol	S	S	-
Sodium chloride	Sat.sol	S	S	-
Sodium chlorite	2 %	S	L	NS
Sodium chlorite	20 %	S	L	NS
Sodium dichromate	Sat.sol	S	S	S
Sodium hydrogen carbonate	Sat.sol	S	S	S
Sodium hydrogen sulphate	Sat.sol	S	S	-
Sodium hydrogen sulphite	Sat.sol	S	-	-
Sodium hydroxide	1 %	S	S	S
Sodium hydroxide	From 10 to 60 %	S	S	S
Sodium hypochlorite	5 %	S	S	-
Sodium hypochlorite	10 % - 15 %	S	-	-
Sodium hypochlorite	20 %	S	L	-
Sodium metaphosphate	Sol	S	-	-
Sodium nitrate	Sat.sol	S	S	-
Sodium perborate	Sat.sol	S	S	-
Sodium phosphate (neutral)	----	S	S	S
Sodium silicate	Sol	S	S	-
Sodium sulphate	Sat.sol	S	S	-
Sodium sulphide	Sat.sol	S	-	-
Sodium sulphite	40 %	S	S	S
Sodium thiosulphate (hypo)	Sat.sol	S	-	-
Soybean oil	----	S	L	-
Succinic acid	Sat.sol	S	S	-
Sulphuric acid	Up to 10 %	S	S	S
Sulphuric dioxide, dry or wet	100 %	S	S	-
Sulphur acid	From 10 to 30 %	S	S	-
Sulphuric acid	50 %	S	L	L
Sulphuric acid	96 %	S	L	NS
Sulphuric acid	98 %	L	NS	NS
Sulphurous acid	Up to 30 %	S	-	-
Tartaric acid	Sat.sol	S	S	-
Tetrahydrofuran	100 %	L	NS	NS
Tetralin	100 %	NS	NS	NS
Thiophene	100 %	S	L	-
Tin (IV) chloride	Sol	S	S	-
Tin (II) chloride	Sat.sol	S	S	-
Toluene	100 %	L	NS	NS
Trichloroacetic acid	Up to 50 %	S	S	-
Trichloroethylene	100 %	NS	NS	NS
Triethanolamine	Sol	S	-	-
Turpentine	----	NS	NS	NS
Urea	Sat.sol	S	S	-
Vinegar	----	S	S	-
Water brackish, mineral, potable	----	S	S	S
Whiskey	----	S	S	-
Wines	----	S	S	-
Xylene	100 %	NS	NS	NS
Yeast	Sol	S	S	S
Zinc chloride	Sat.sol	S	S	-
Zinc sulphate	Sat.sol	S	S	-

Table(2b)

S = Satisfactory

L = Limited

NS = Not satisfactory

Sat.sol Saturated aqueous solution, prepared at 20oC

Sol Aqueous solution at a concentration higher than 10 % but not saturated

Dil.sol Dilute aqueous solution at a concentration equal to or lower than 10 %

Work.sol Aqueous solution

6.3-Jointing

6.3.1-Welding joints

- PP-R products jointed by heating elements. This welding process is easy for workers and give high jointing properties and preventing any leakage

6.3.2-Threaded joints

- The threaded joints af adaptor pipe-fittings correspond to the requirements of DIN 2999 resp. ISO 7, cylindrical female threads, for connecting back nuts correspond to the requirements of DIN-ISO 228, part 1
- The shape and external threaded joints design gives greater cohesion with polypropylene bringing durability link (torque) between polypropylene and threaded joints in within 200 Newton see fig(2b)

fig(2b)

6.4-Dimensions

- Pipes dimension According to DIN 8077 (Pipes of polypropylene PP).
- Fittings dimension According to DIN 16962, part 6 to 9 (Pipe connections ang fittings for polypropylene PP) injection moulded fittings, The dimensions tolerance up to ±3mm and we reserve the right to modify dimensions without previous notice.

6.5-Utilization:

- The system of Piping of PP-R, as described in this catalogue,. Has primarily been developped for application in the sanitary field for cold and hot water.
- This system can be applied as will in the industrial section.
- The pipe and fittings are dimensioned in a way to assure, according to actual results of long-term tests a utilisation of at least 50 years, based om max. 10 bar and a constant temperature of 70 degrees Celsius.
- Pipe are available in lenghts of 4 m.
- Plastic pipes and fittings of PP-R generally have all advantages which have been registered in all sections of industry and of installation technics. Most of all the excellent resistance of corrosion gives proof of an extensively long utilization of installation tubing in the building technic, without risk of damages known from metallic materials.
- Therefore PP-R as installation-material represents an excellent choice for piping of cold and hot water.

6.6- Application areas / max. operating pressures:

Application areas for fittings and pipes made of PP-R according to DIN 8077,
See Table (2c) and see diagram of operating pressure Fig(2c)

Cold water pipelines:

- Continuous operation temperature up to 20°C
- Continuous operation pressure up to 20 bars

Warm water pipelines:

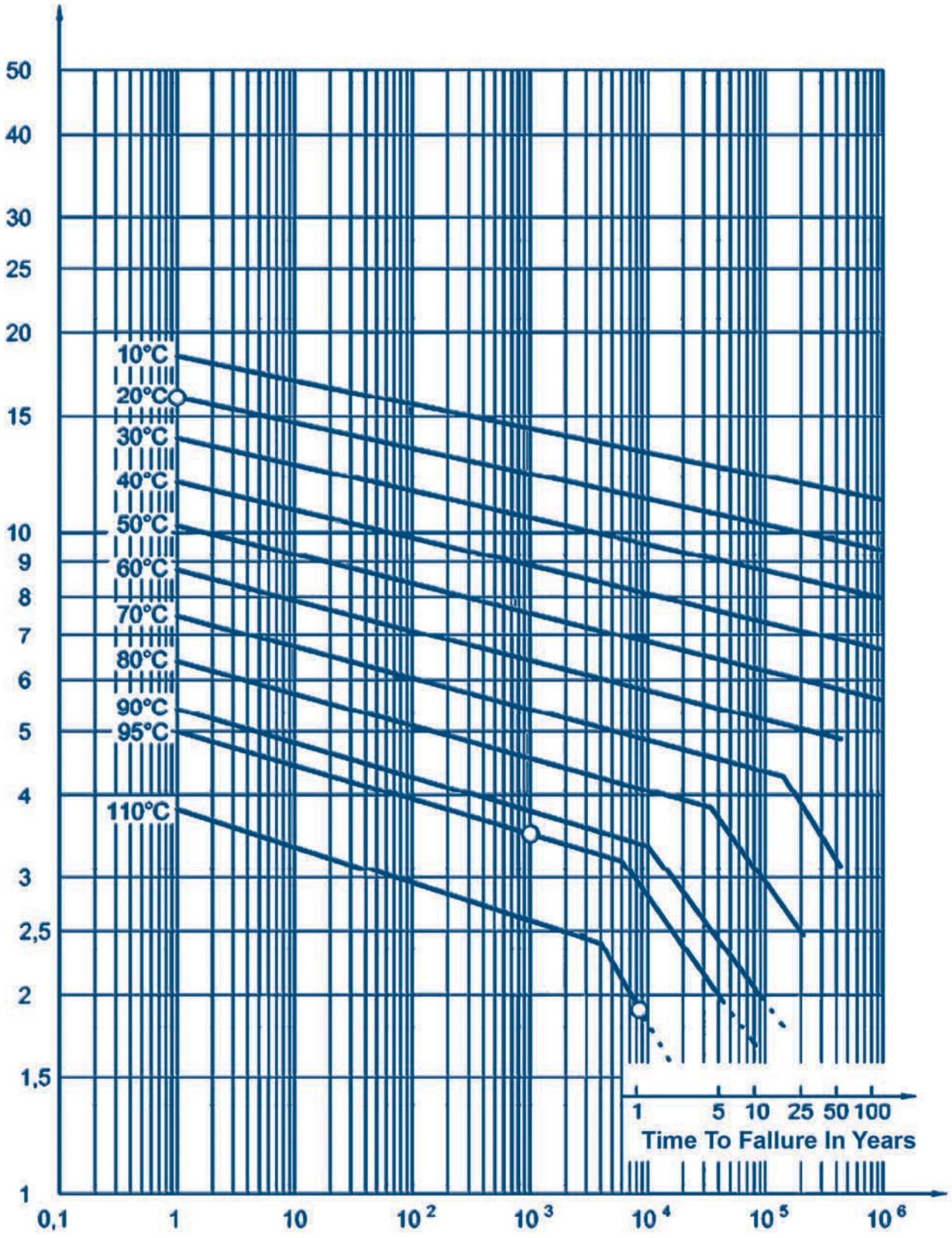
- Continuous operation temperature up to 70°C
- Continuous operation pressure up to 10 bars

Heating pipelines:

- Continuous operation temperature up to 70°C
- Continuous operation pressure up to 3 bars
- Installation pressure according to DIN EN 12828

		Operating Years					
		1	5	10	25	50	100
	Temperature °C	Max. Operating pressure(bar) according to DIN 8077					
BP2100 PP-R Pressure Pipe 20° C/1.0 MPa, 70° C/0.3 MPa	10	17.5	16.5	16.1	15.6	15.2	14.8
	20	15.0	14.1	13.7	13.2	12.9	12.5
	30	12.7	11.9	11.6	11.2	10.9	10.6
	40	10.8	10.1	9.8	9.4	9.2	8.9
	50	9.1	8.5	8.2	7.9	7.7	7.5
	60	7.7	7.1	6.9	6.6	6.4	-
	70	6.5	6.0	5.8	5.0	4.2	-
	80	5.4	4.8	4.0	3.2	-	-
	95	3.8	2.6	2.2	-	-	-
BP2160 PP-R Pressure Pipe 20° C/1.6 MPa, 70° C/0.8 MPa	10	27.8	26.2	25.6	24.7	24.1	23.5
	20	23.7	22.3	21.7	21.0	20.4	19.9
	30	20.2	18.9	18.4	17.7	17.2	16.8
	40	17.1	16.0	15.5	15.0	14.5	14.1
	50	14.5	13.5	13.1	12.6	12.2	11.8
	60	12.2	11.3	11.0	10.5	10.2	-
	70	10.3	9.5	9.2	8.0	6.7	-
	80	8.6	7.6	6.4	5.1	-	-
	95	6.1	4.1	3.4	-	-	-
BP2200 PP-R Pressure Pipe 20° C/2.0 MPa, 70° C/1.0 MPa	10	35.1	33.0	32.2	31.1	30.3	29.6
	20	29.9	28.1	27.4	26.4	25.7	25.0
	30	25.4	23.8	23.2	22.3	21.7	21.1
	40	21.6	20.2	19.6	18.8	18.3	17.8
	50	18.2	17.0	16.5	15.9	15.4	14.9
	60	15.4	14.3	13.9	13.3	12.9	-
	70	12.9	12.0	11.6	10.0	8.5	-
	80	10.8	9.6	8.1	6.5	-	-
	95	7.6	5.2	4.3	-	-	-
BP2250 PP-R Pressure Pipe 20° C/2.3 MPa, 70° C/1.6 MPa	10	44.1	41.6	40.5	39.2	38.2	37.2
	20	37.7	35.4	34.5	33.3	32.4	31.5
	30	32.0	30.0	29.2	28.1	27.4	26.6
	40	27.2	25.4	24.7	23.7	23.1	22.4
	50	23.0	21.4	20.8	20.0	19.4	18.8
	60	19.4	18.0	17.5	16.7	16.2	-
	70	16.3	15.1	14.6	12.7	10.7	-
	80	13.7	12.1	10.2	8.1	-	-
	95	9.6	6.5	55	-	-	-

table (2c)



Long term - Behaviour OF PP-R Pipes

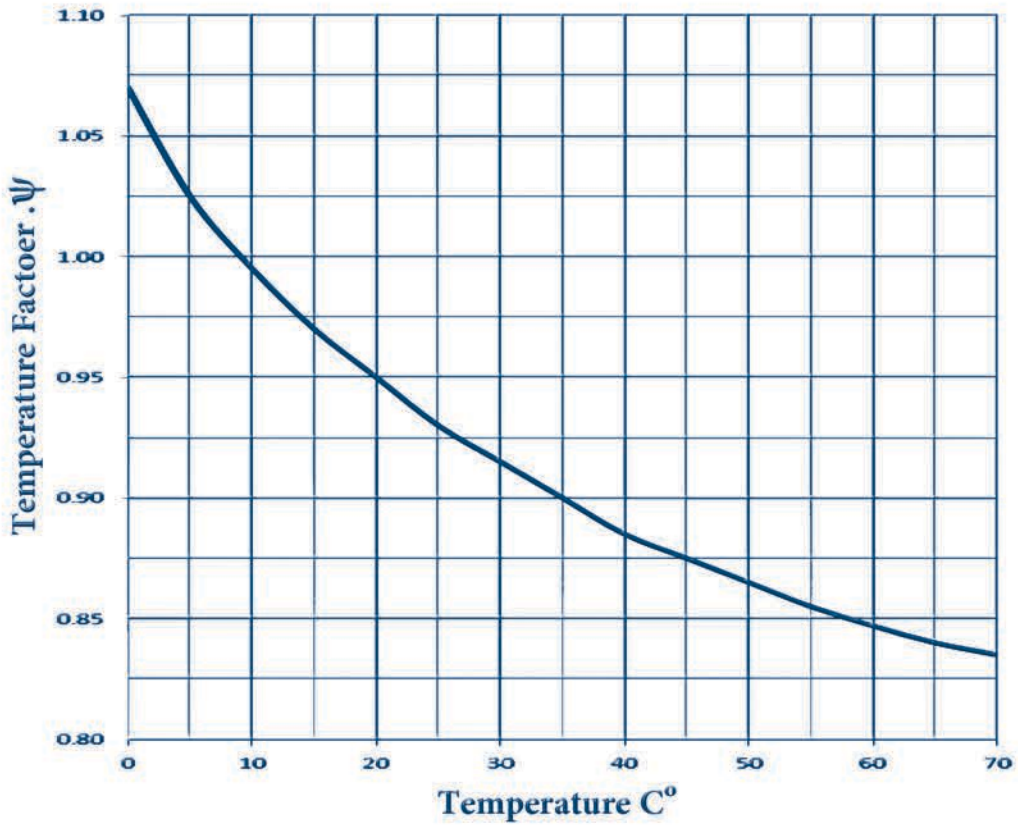
CHAPTER

7

Working Instruction And Installation

7.1- Planning.

7.1.1- Temperature of the flow medium see Fig (3a)



7.1.2-Individual resistance values for fitting and the drag coefficient

For the individual fitting resistance values given in the chart below Figure (3b) can be applied by approximation The individual joint resistances values can be determined altogether As a standard value add an extra of 3% to 5% to the overall pressure drop.

Outside pipe diam-eter (d) mm	20 25	32	50 63	≥63
Fitting Type	Drag coefficient (ξ)			
	2.0	1.7	1.1	0.5
		0.3		
		1.5		
Stram in		0.5		
Stram out		1.0		

Pressure drop in fittings fig(3b)

7.2- Linear deformation of PP-R under heat influence.

Thermoplastic plastics PP-R pipes are exposed to thermal expansion The linear extension of such pipes is higher than with steel pipes. This fact must be all means is taken into consideration in the laying process. Already in the pipe arrangement planning stage each possibility should therefore be utilized fully to compensate all extension processes within a pipe section.

The linear thermal expansion coefficient for PP-R pipes is

$$\varepsilon t = 1.5 * 10^{-4} .....(K^{-1})$$

The linear deformation of a pipe is thus calculated according to the following formula:

$$\Delta L = \varepsilon t * L * \Delta T \quad .....(mm)$$

ΔL =Linear extension in ..... (mm)
εt = Thermal expansion coefficient in ..... (mm/m°c)
L = Pipe length ..... (m)
ΔT = Temperature difference ..... (°K)

The calculation of the linear deformation is based on the laying temperature. The following example gives you an idea of how to calculate.

Example for a pipe length of 8 m:

1. Lowest pipe wall temperature + 9° C (cold-water pipe)

Difference 7 ° K

2. Laying temperature + 16°C

Difference 54° K

3. Highest pipe wall temperature + 70 °C (hot-water pipe)

To 1. Shortening of the pipe: 800 mm * 7 ° * 0.0015 = 8.4 mm
To 3. Extension of the pipe: 800 mm * 54 ° * 0.0015 = 54.0mm

7.3-Minimum flow pressures

Reference values for the minimum flow pressures and calculated flows for generally used drinking water service points see Table (3a).

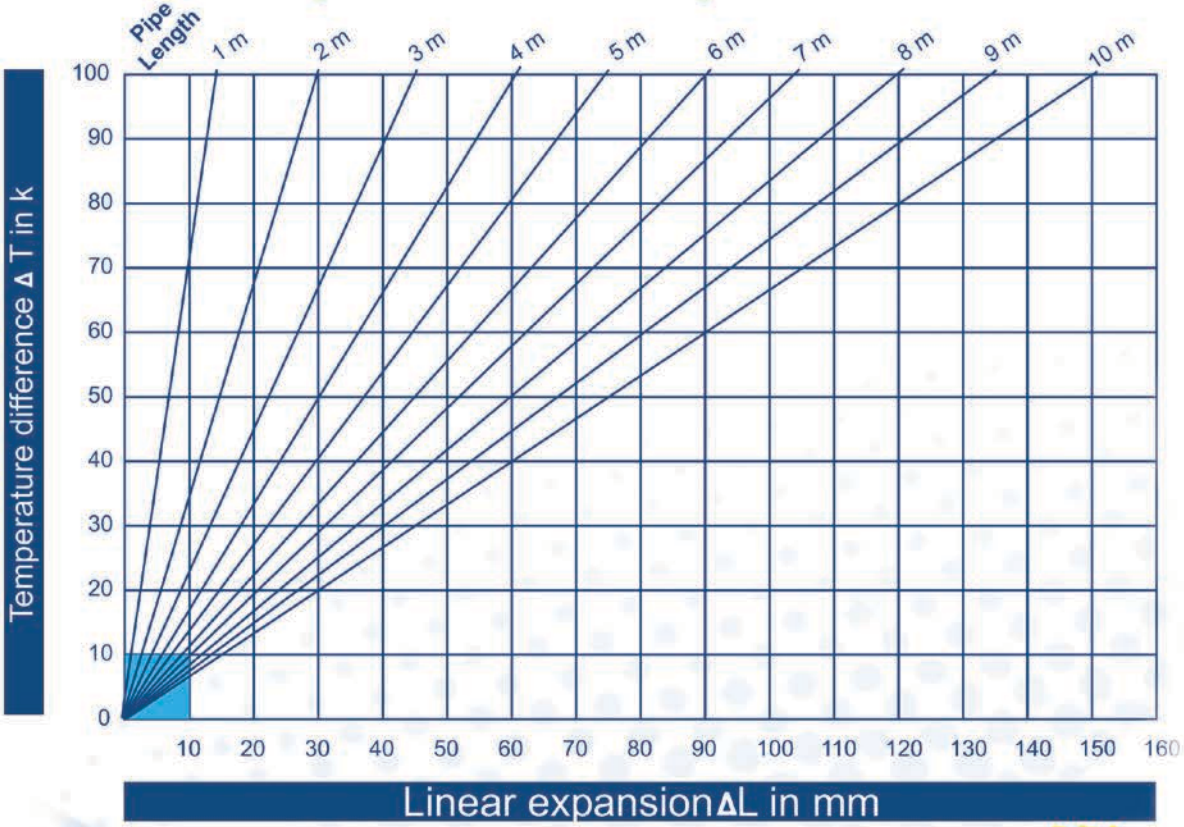
Minimum flow pressure $P_{min\ Fl}$ bar	Type of drinking water service points		Calculated flow outlet of		
			Mixed water		Either cold or hot water
			Volume flow cold l/s	Volume flow hot l/s	Volume flow l/s
	Outlet valve				
0.5	Without air whirled	DN15	-	-	0.30
0.5		DN20	-	-	0.50
0.5		DN25	-	-	1.00
1.0		DN10	-	-	0.15
1.0	With air whirled	DN15	-	-	0.15
1.0	Shower heads for clinging showers	DN15	0.10	0.10	0.20
1.2	Pressure rinses in according to DIN 3265 part1	DN15	-	-	0.70
1.2	Pressure rinses in according to DIN 3265 part1	DN20	-	-	1.00
0.4	Pressure rinses in according to DIN 3265 part1	DN25	-	-	1.00
1.0	Pressure rinses for urinals	DN15	-	-	0.30
0.5	Corner valve for urinals	DN15	-	-	0.30
1.0	Household dishwasher	DN15	-	-	0.15
1.0	Household washing machine	DN15	-	-	0.25
	Mixer for				
1.0	Showers	DN15	0.15	0.15	-
1.0	Bath tubs	DN15	0.15	0.15	-
1.0	Kitchen sinks	DN15	0.07	0.07	-
1.0	Wash-stands	DN15	0.07	0.07	-
1.0	Bidet	DN15	0.07	0.07	-
1.0	Mixer	DN20	0.30	0.30	-
0.5	Flushing box according to DIN 19542	DN15	-	-	0.13
	Heater for drinking water				
	For supply of service point				
	(included. fitting for mixed outlet)				
1.0	Electric water boiler	DN15	-	-	0.10*
	Electric hot water tank and boiler				
1.1**	With nominal contents 5 - 15 L	DN15	-	-	0.10
1.2**	With nominal contents 30 -150 L	DN15	-	-	0.20
	Electric flow water heater with hydraulic test, without flow limitation				
1.5	Nominal capacity	12kw	-	-	0.06
1.9		18kw	-	-	0.08
2.1		21kw	-	-	0.09
2.4		24kw	-	-	0.10
1.0	Gas flow water heater	12kw	-	-	0.10

table (3a)

* With fully opened throttle valve
* Values under unfavorable conditions (shower)

NOTE: Service points which are not included in the table and devices of similar kind with larger flow of fittings than indicated are to be taken into account according to the recommendations of the producer as far as determination of pipe diameter is concerned

7.4-Diagram and chart to establish the temperature dependent linear expansion of PP-R Pipes see Figure (3c) and Table (3b).



fig(3c)

	Temperature difference ΔT in mm									
Tube length (m)	10	20	30	40	50	60	70	80	90	100
0.1	0.10	0.30	0.45	0.60	0.75	0.90	1.05	1.20	1.35	1.50
0.2	0.30	0.60	0.90	1.20	1.50	1.80	2.10	2.40	2.70	3.00
0.3	0.45	0.90	1.35	1.80	2.25	2.70	3.15	3.60	4.05	4.50
0.4	0.60	1.20	1.80	2.40	3.00	3.60	4.20	4.80	5.40	6.00
0.5	0.75	1.50	2.25	3.00	3.75	4.50	5.25	6.00	6.75	7.50
0.6	0.90	1.80	2.70	3.60	4.50	5.40	6.30	7.20	8.10	9.00
0.7	1.05	2.10	3.15	4.20	5.25	6.30	7.35	8.40	9.45	10.50
0.8	1.20	2.40	3.60	4.80	6.00	7.20	8.40	9.60	10.80	12.00
0.9	1.35	2.70	4.05	5.40	6.75	8.10	9.45	10.80	12.15	13.50
1.0	1.50	3.00	4.50	6.00	7.50	9.00	10.50	12.00	13.50	15.00
2.0	3.00	6.00	9.00	12.00	15.00	18.00	21.00	24.00	27.00	30.00
3.0	4.50	9.00	13.50	18.00	22.50	27.00	31.00	36.00	40.50	45.00
4.0	6.00	12.00	18.00	24.00	30.00	36.00	42.00	48.00	54.00	60.00
5.0	7.50	15.00	22.50	30.00	37.50	45.00	52.50	60.00	67.00	75.00
6.0	9.00	18.00	27.00	36.00	45.00	54.00	63.00	72.00	81.00	90.00
7.0	10.50	21.00	31.50	42.00	52.00	63.00	73.00	84.00	94.50	105.00
8.0	12.00	24.00	36.00	48.00	60.00	72.00	84.00	96.00	108.00	120.00
9.0	13.50	27.00	40.50	54.00	67.50	81.00	94.00	108.00	121.50	135.00
10.0	15.00	30.00	45.00	60.00	75.00	90.00	105.00	120.00	135.00	150.00

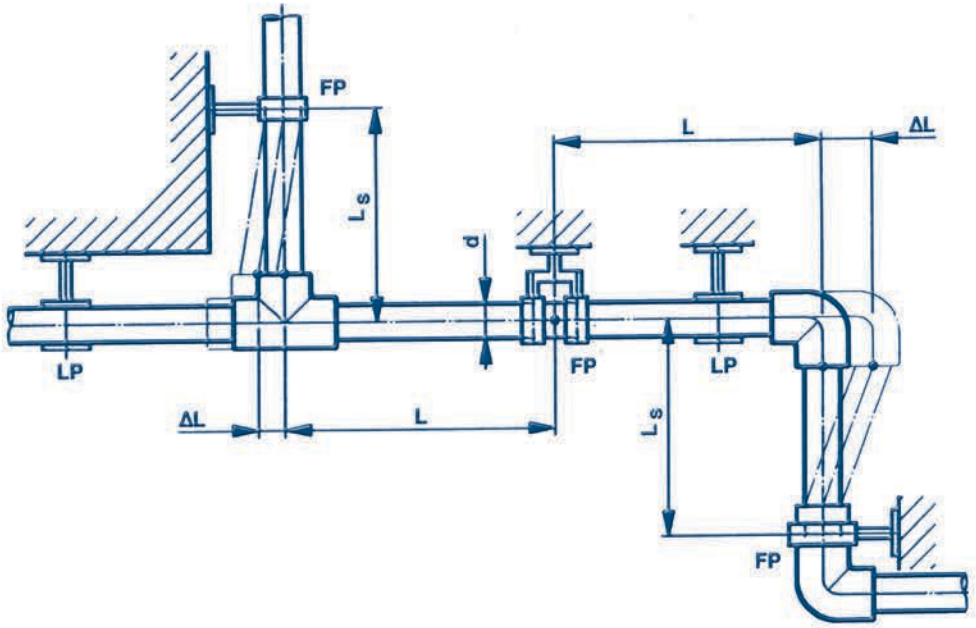
table (3b)

7.5- Linear extension compensation of PP-R Pipes.

The linear extension of PP-R pipe can in most of the cases be compensated by a change in direction. Should linear extension compensation by directional change not be possible, the fitting in of an expansion bend is required. Axial bellow expansion joints are mostly unfit and uneconomical.
For optimum resiliency of the pipe the size of the bending limb is important.
It is calculated by the opposite formula.
The figures (3e) and (3f) show the effects of the linear deformation and its compensation.
With regard to the required bending limbs (Ls) make sure to chose the correct location points .

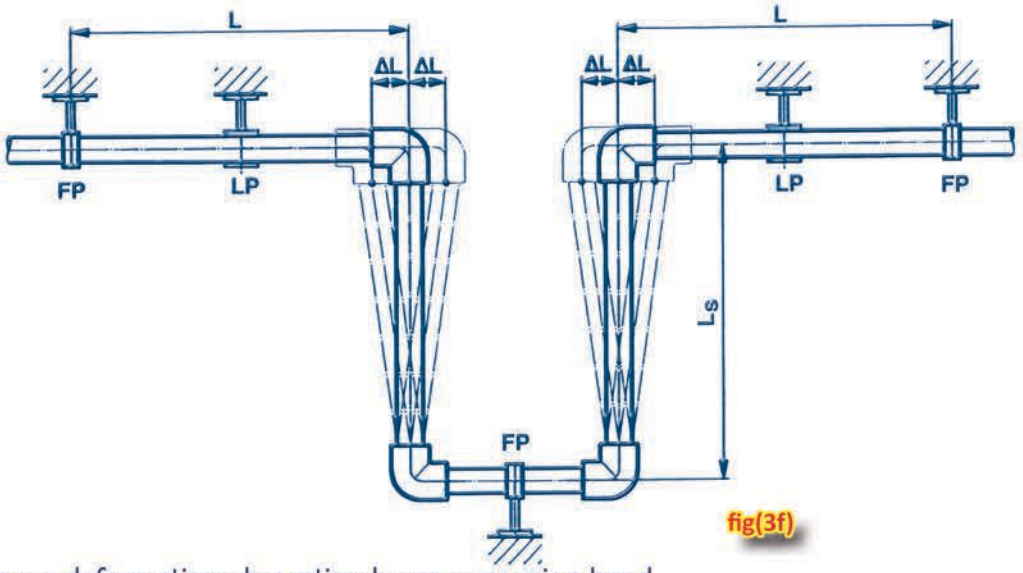
$$Ls = C \cdot \sqrt{(d * \Delta L)} \qquad (mm)$$

Ls = Length of bending limb (mm)
D = Outside pipe diameter (mm)
ΔL = Linear deformation (mm)
C = Material (depending constant for PP-R = 15)



fig(3e)

Principle of linear deformation absorption by bending limbs, related to length (L)
FP = Locating point
LP = Loose point

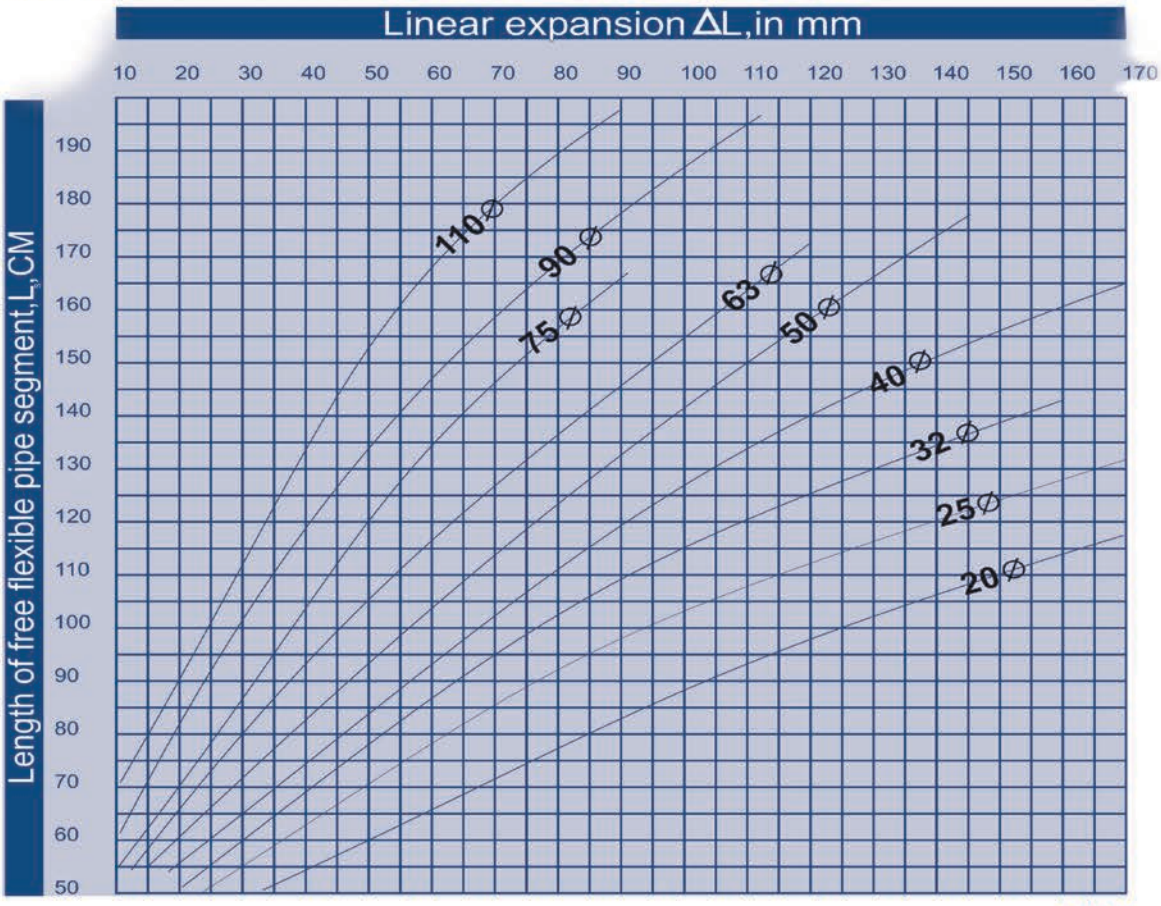


fig(3f)

Principle of linear deformation absorption by an expansion bend
FP = Locating point
LP = Loose point

7.6-Construction of expansion bends.

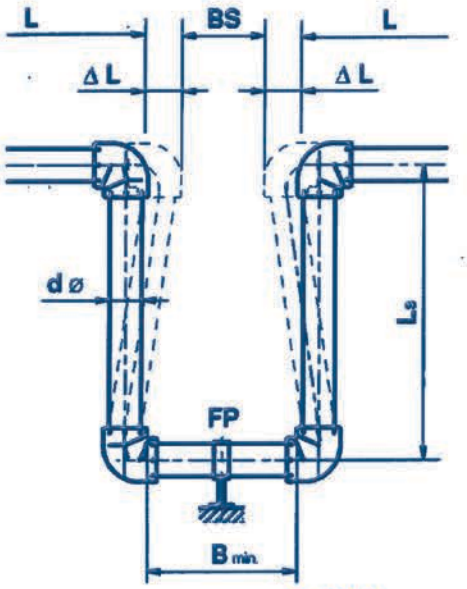
Expansion bends can easily be made right at the site. Beside the required pipe length 4 elbows (BE3100) is needed. To construct an expansion bend, the bending limb (Ls) is calculated in dependence on the linear deformation (ΔL). As standard value, the (Ls) value given in the figure (3g) diagram can be used. Spacing (Bmin) should be at least (210 mm).



fig(3g)

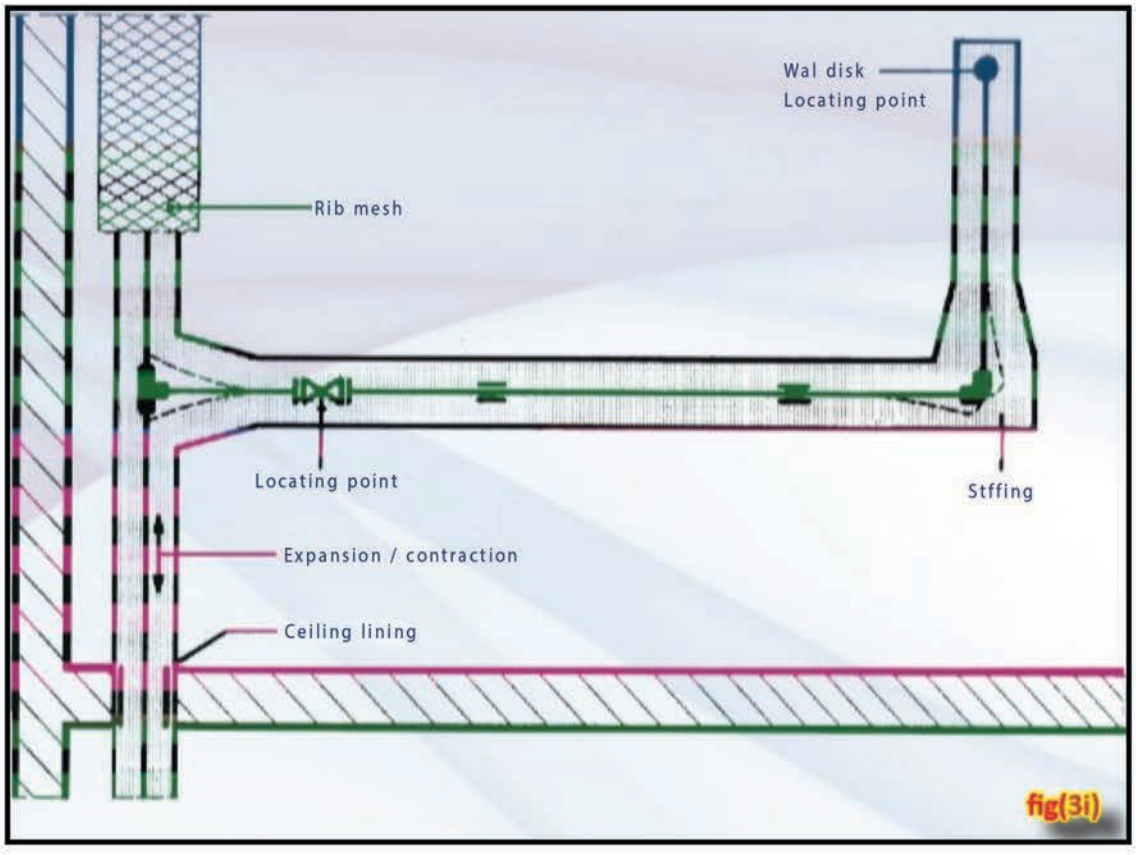
See Figure (3h)
Expansion bend, made of PP-R pipe and 90º elbow
d = Outer diameter of pipe
L = Length of pipe
ΔL = Linear elongation of pipe (longitudinal)
Ls = Length of bending shank
Bmin = Width of bending shank
Bs = Safety distance (min. 150 mm).
* Calculation of expansion bends

B_min=2*ΔL+Bs



fig(3h)

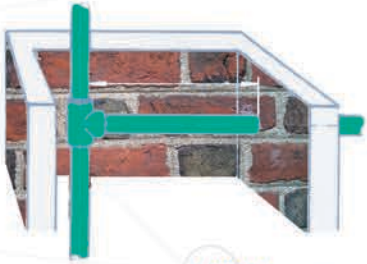
7.7-Piping examples



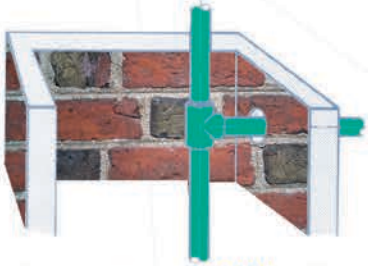
fig(3i)

7.8- Applications in sanitary installation shaft.

- When making the apartment pipe connection from main pipe, the following alternative techniques can be applied in order to compensate the pipe thermal expansions:
- Pipe connection can be made at some distance «a» away from the wall, see (Figure 3j).
- The connecting pipe can be passed through a hole much larger than the pipe diameter, see (Figure 3k).
- The connecting pipe can be made through a branch pipe to provide flexibility, see (Figure3I)



fig(3j)



fig(3k)

fig(3L)

7.9- Installation instructions.

The kind and number of pipe fixings depends among other things on the pipe size and linear expansion. Locating points shall divide the pipe into individual pipe sections that allow expansion or contraction. The arrangement of such sections is dome by loose clips. The clip distances conditions, pipe material, and the weight of the filled pipe. In practical use, the spans given in the table (3C)

d	Spans L cm bei T° C						
mm	20º	30º	40º	50º	60º	70º	80º
20	65	65	60	60	60	55	50
25	75	75	70	70	65	60	55
32	90	90	85	85	80	75	70
40	110	110	105	100	95	90	85
50	125	120	115	110	105	100	90
63	140	135	130	125	120	115	105
75	155	150	145	135	130	125	115
90	165	160	155	145	140	130	120
110	185	180	170	165	155	150	140

table (3c)

Spans for PP-R pipes, No (BP2160, and BP2200)

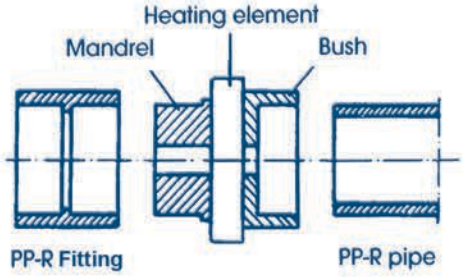
CHAPTER 8

Welding

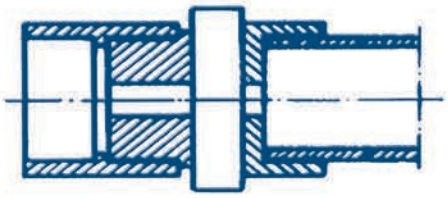
8.1- Welding procedure.

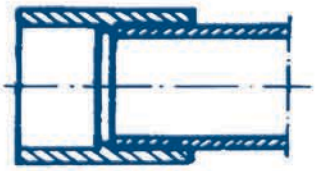
- The PP-R pipe work is coupled by socket fusion welding. The pipes and fittings are connected longitudinally overlapping.
- The heating of pipe ends and fitting faucets is done by a heating element with fitted bushes. After the necessary welding temperature is reached, the joining process is done.
- The pipe and fitting faucet diameters as well as the respective heated bush diameters are matched to build up the necessary pressure during the joining process.
- The heating element is electrically heated. It complies with DIN-DVS-2208 part 1 in construction and accuracy.

Figures (4a), (4b) and (4c) Schematically show the three welding process stages.



fig(4a)


fig(4b)


fig(4c)

8.2- Preparations.

Cut pipes square into sections. Thoroughly clean joint faces, the pipe end and fitting faucet with spirit and absorbent paper. Mark bush depth on the pipe.
Bring the heating element to 260ºC. Check the set temperature before the welding process.
Temperature tolerance ± 10ºC.
The heating element should have an integrated thermometer; otherwise the temperature of the heating element must be controlled by an appropriate measuring device.

Note: Do not start heating the joint parts before the heating temperature is a 260ºC.
The mandrel and bush must be clean and have to be purified before each following welding process.

8.3- Welding.

Push the pipe first and fitting quickly and axially up to the stop of the mandrel and the marked insertion depth respectively and keep them fast without torsion. The heating of the joint faces is done according to the (Table 5a) after the end of the heating period pull the pipe and fitting abruptly from the heating element and joint them immediately axially aligned and without torsion. In doing so, mind the correct insertion depth see (Table 5a).
The pipe must be pushed in up to marked insertion depth of the push bottom. We recommend fixing the tow joint parts again for a certain time (approximately the heating period) see (Table 5a).

Note: Do not expose the welded joint to mechanical stress but after expiration of the cooling period. Standard values for socket fusion welding at a room temperature of 20 ºC. With a room temperature below + 5º C the heating phases should be increased by up to 100%

Pipe diameter (mm)	Insertion depth (mm)	Heating phase (sec)	Maximum interval time (sec)	Cooling time (min)
20	14.5	5	4	2
25	16.0	7		
32	18.0	8		
40	20.5	12	6	4
50	23.5	18		
63	27.5	24	8	6
75	30.0	30		
90	33.0	40	10	8
110	37.0	50		

table (5a)

8.4- Flow of work (Socket welding).

1- When you cutting should be perpendicular to the pipe axis 90º see (Figure 5d).
2- Marking on the pipe insertion depth by pen see (Figure 5e) and (table 5a).
3- The pipe end and the socket of fitting are pushed to heaters in axial direction.
Pipe and fitting should be heated simultaneously see (Figure 5f).
4- After heating phase pipe and fitting are separated from the heating elements see (Figure 5g).
5- Pipe and fitting are quickly joined together in the axial direction.
During joining, the pipe end should not be turned around its axis in the socket see (Figure 5h).
6- Directly after the cooling time the fused joints can fully work under pressure.

fig (4d)

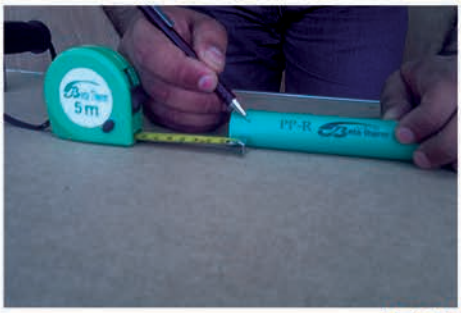


fig (4e)

fig (4f)

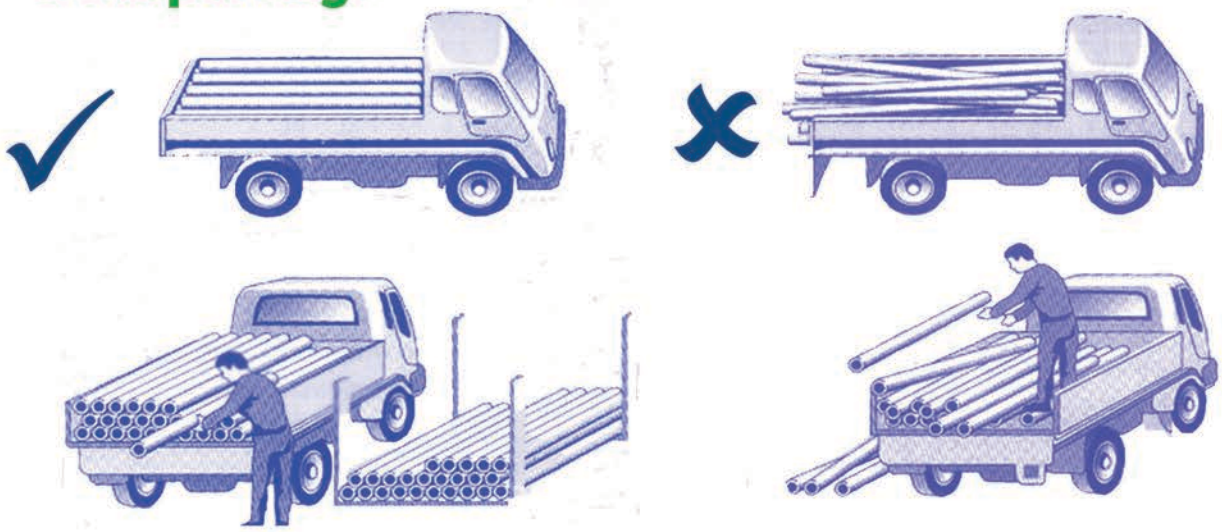
fig (4g)

fig (4h)

CHAPTER 9

Transport And Storage

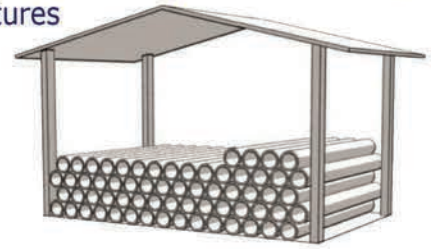
9.1- Transporting.



9.2- Avoiding excessive loads

9.3- Avoiding impacts.

- At temperatures lower than 0ºC, Prevent impact (especially against pipe ends), excessive loads, crushing or bending. Please handle pipe with care at low temperatures



9.4- Avoiding UV radiation

- The UV radiations have influence on Polypropylene products

CHAPTER 10

Dainage & Irrigation Pipes

Dainage & Irrigation Pipes

Dainage & Irrigation Pipes

According to German Standerd

DIN 8061 / 8062

Nominal Outside Diameter mm	Class I 2bar		Class II 4bar		Class III 6 bar		Class Iv 10 bar		class v 16 bar	
	No.thick of wall mm	No.wt kg /m	No.thick of wall mm	No.wt kg /m	No.thick of wall mm	No.wt kg /m	No.thick of wall mm	No.wt kg /m	No.thick of wall mm	No.wt kg /m
50	...	...	...	...	1.8	.0422	2.4	0.552	3.7	0.809
63	...	...	...	...	1.9	0.562	3.0	0.854	4.7	1.289
75	...	...	1.8	0.642	2.2	0.782	3.6	1.22	5.6	1.82
90	1.8	1.8	1.8	0.774	2.7	1.13	4.3	1.75	6.7	2.61
110	1.8	0.950	2.2	1.16	3.2	1.64	5.3	2.61	8.2	3.90
125	1.8	1.08	2.5	1.48	3.7	2.13	6.0	3.34	9.3	5.01
140	1.8	1.21	2.8	1.84	4.1	2.65	6.7	4.18	10.4	6.27
160	1.8	1.39	3.2	2.41	4.7	3.44	7.7	5.47	11.9	8.17
180	1.8	1.57	3.6	3.02	5.3	4.37	8.7	6.88	13.4	10.4
200	1.8	1.74	4.0	3.70	5.9	5.37	9.6	8.51	14.9	12.8
225	1.8	1.96	4.5	4.70	6.6	6.76	10.8	10.8	16.7	16.1
250	2.0	2.40	4.9	5.65	7.3	8.31	11.9	13.2	18.6	19.9
280	2.3	3.11	4.5	7.11	8.2	10.4	13.4	16.6	20.8	24.9
315	2.5	3.78	6.2	9.02	9.2	13.2	15.0	20.9	23.4	31.5

U-P.V.C Pipes Adventages

- Easy installation& Maintenance
- High Efficiency In liquid transportation due to high smooth internal surface
- Self flame retardant
- Good resistance to acids & alkalis
- No corrosion no rust
- High electrical isolation
- High flexibility internal surface

U-P.V.C Pipes Uses

- In human drainage networks
- In industrial drainge networks
- In irrigation networks
- In electrical&telicommunication networks