مواسير البحرين ش.م.ب(م)

Bahrain Pipes B.S.C.(c)

it's plastic engineering

Tested & Certified by

NSF/ANSI 14 & 61

Germany

ISO 9001
BUREAU VERITAS
Certification

ZERTIFIKAT

SKZ Certification Body

CONFORMITY CERTIFICATE

Reg.-No. **6098**

Herewith we confirm in accordance with article 15 and article 22 of the Bavarian Building Regulations (BayBO), as published on 14 August 2007 (GVBl. 2132-1-I, p. 588), last amended by decision of the Bavarian Constitutional Court - Vf. 14-VII-14; Vf. 3-VIII-15; VF. 4-VIII-15 - of 09.05.2016 (GVBl p. 89) that the building products

Fittings made of unplasticized polyvinylchloride (PVC-U) for waste discharge within the building structure

of the producer: **BAHRAIN Pipes BSC. Building 780, Road 228 SALMABAD 705 KINGDOM OF BAHRAIN**

production plant: BAHRAIN Pipes BSC. Building 780, Road 228 SALMABAD 705 KINGDOM OF BAHRAIN

according to the results of the internal production control and the third-party control carried out by the testing institute, recognized under building regulations,

SKZ - Testing GmbH Friedrich-Bergius-Ring 22 97076 Wuerzburg Germany

comply with the regulations of standard

DIN EN 1329-1:1999-12 in conjunction with **DIN CEN/TS 1329-2**:2012-09

Additional valid: **DIN 4102-1**:1998-05 and **DIN 4102-4**:1994-03 in conjunction with annex **0.2.1** or **DIN EN ISO 11925-2**:2011-02 in conjunction with **DIN EN 13501-1**:2010-01 and annexes **0.2.2, 0.2.3** and **12.5**

as specified in the Building Regulations List A part 1, edition 2015/2 of 6 October 2015.

Thus, the producer is authorized to mark the building product with the conformity mark (Ü-mark) in accordance with the conformity mark rules.

Date of initial certification: ---
Date of expiry: 31 December 2019

Wuerzburg, 11 July 2016

SKZ-PÜZ-Stelle SKZ

i. V. Dipl.-Ing. Hans-Peter Krause Certification Body

The original language of this certificate is German. In case of doubt, the German version is obligatory.

ZERTIFIKAT

SKZ Certification Body

CONFORMITY CERTIFICATE

Reg.-No. **6061**

Herewith we confirm in accordance with article 15 and article 22 of the Bavarian Building Regulations (BayBO), as published on 14 August 2007 (GVBl. 2132-1-I, p. 588), last amended by decision of the Bavarian Constitutional Court - Vf. 14-VII-14; Vf. 3-VIII-15; VF. 4-VIII-15 - of 09.05.2016 (GVBl p. 89) that the building products

Fittings for non-pressure underground drainage and sewerage-unplasticized polyvinylchloride PVC-U and for plants to store and rack-off liquid manure, silage percolating juice

of the producer: **BAHRAIN Pipes BSC. Building 780, Road 228 SALMABAD 705 KINGDOM OF BAHRAIN**

production plant: BAHRAIN Pipes BSC. Building 780, Road 228 SALMABAD 705 KINGDOM OF BAHRAIN

according to the results of the internal production control and the third-party control carried out by the testing institute, recognized under building regulations,

SKZ - Testing GmbH Friedrich-Bergius-Ring 22 97076 Wuerzburg Germany

comply with the regulations of standard

DIN EN 1401-1:2009-07 in conjunction with **DIN CEN/TS 1401-2**:2012-09

Additional valid: annex **12.3**

as specified in the Building Regulations List A part 1, edition 2015/2 of 6 October 2015.

Thus, the producer is authorized to mark the building product with the conformity mark (Ü-mark) in accordance with the conformity mark rules.

Date of initial certification: ---
Date of expiry: 30 June 2020

Wuerzburg, 11 July 2016

SKZ-PÜZ-Stelle SKZ

i. V. Dipl.-Ing. Hans-Peter Krause Certification Body

The original language of this certificate is German. In case of doubt, the German version is obligatory.

NSF International
789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Bahrain Pipes BSC©
Bahrain

AS COMPLYING WITH NSF/ANSI 14, 61 AND ALL APPLICABLE REQUIREMENTS. PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE AUTHORIZED TO BEAR THE NSF MARK.

NSF International
789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Bahrain Pipes BSC©
Facility: Manama, Bahrain

AS COMPLYING WITH NSF/ANSI 14, 61 AND ALL APPLICABLE REQUIREMENTS. PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE AUTHORIZED TO BEAR THE NSF MARK.

Tested & Certified by SKZ Germany

Tested & Certified by NSF NSF/ANSI 14 & 61 For UltraTUFF CPVC for Hot & Cold Applications

Note: "ULTRA TUFF certified products are listed in nsf.org"

Profile

With an innovative vision, we aim at providing the highest level of integrity, value and service in manufacturing and supplying of superior quality PVC and CPVC fittings. Our fittings are manufactured to stringent industry standards, with a reputation for quality product, innovation, and technical leadership. We produce and supply to provide the customers an inexpensive, consistent, trouble-free source of product for this competitive market.

The team of Bahrain Pipes is dedicated to satisfy the customers. With the most reputed management, we assure our clients value added superior quality products.

All our customers can rely upon a product that passes through stringent testing & widely accepted and relied upon by contractors and end users regionally. We have provided the experience in transporting liquids from source to application with reliability and ease.

We ensure that our manufacturing standards surpass expectations when it comes to PVC and CPVC Pipe fittings in the market.

A Division of

HAJI HASSAN GROUP

Quality Management

Quality as **"conformance to specifications"** is a position that we follow and promote in our quality control division. Implemented with every aspect of the international standards, we tend ascertain the lifetime durability of our products. During the past years, Bahrain Pipes have successfully utilised quality tools and methodologies as part of a successful effort to become a leading manufacturer and supplier of a vast array of PVC and CPVC fittings.

The first and foremost objective of our Quality Department is to ensure the health and safety factor when it comes to testing the products. Our quality testing methods signify our pipe fittings ability to inert attack by a wide variety of chemicals. Our fittings are highly resilient, tough and durable products that have high-tensile and high-impact strength & withstand high pressure for longer periods.

We understand that quality is the degree to which a specific product satisfies the wants of a specific need.

Our quality management will ensure the effective design of processes that verify consumer needs, plan product life cycle & design, produce and deliver that product. This also incorporates measuring all process elements, the analysis of performance and the continual improvement of the products, services and process that deliver them to the customer.

Content

Product Standards

BSEN 1329-1:2000
BSEN 1401-1:2009

- The specified standard BSEN 1329-1:2000 partially supersedes the obsolete clauses of the standard **BS4514:1983 & BS5255:1989**

Fittings for non pressure soil and waste applications as per standard BSEN 1329-1:2000
Area code "B" : Used for inside the building or fixed onto the wall outside the building.
Area code "BD" : Inside building and buried within the building structure.

- The specified standard BSEN 1401-1:2009 supersedes BS5481:1977 and partially supersedes **BS4660:1989**

Fittings for non pressure underground drainage & sewerage as per standard BSEN1401-1:2009
Area code "U" : Used for outside the building structure.
Arera code "UD" : Buried in ground within the building structure and outside the building.

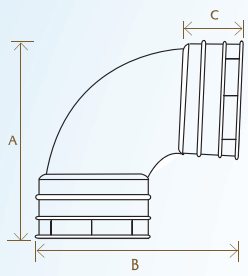
DRAINAGE FITTINGS

WASTE, SOIL AND UNDERGROUND

BSEN 1329 & BSEN 1401

Bend 90º

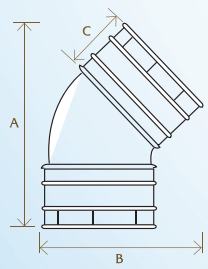
Colour | Grey Golden Brown



Code	Description	Height (A)	Width (B)	Socket Length (C)
F 90 DW 042 T	1 1/2"(42) BEND 90	088.7	085.80	27.33
F 90 DW 056 T	2"(056) BEND 90	098.5	098.73	31.00
F 90 DW 082 T	3"(082) BEND 90	152.0	152.57	45.00
F 90 DW 110 T	4"(110) BEND 90	186.0	183.38	50.00
F 90 DW 110 G	4"(110) BEND 90	186.0	183.38	50.00
F 90 DW 160 T	6"(160) BEND 90	297.4	290.90	76.10
F 90 DW 160 G	6"(160) BEND 90	297.4	290.90	76.10

Bend 45º

Colour | Grey Golden Brown

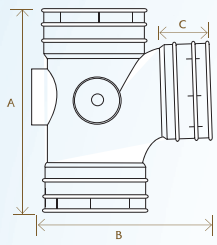


Code	Description	Height (A)	Width (B)	Socket Length (C)
F 45 DW 042 T	1 1/2"(42) BEND 45	080.9	067.29	28.0
F 45 DW 056 T	2"(056) BEND 45	094.2	081.80	31.0
F 45 DW 082 T	3"(082) BEND 45	162.7	133.65	45.0
F 45 DW 110 T	4"(110) BEND 45	171.0	157.60	50.0
F 45 DW 110 G	4"(110) BEND 45	171.0	157.60	50.0
F 45 DW 160 T	6"(160) BEND 45	267.0	168.22	76.1
F 45 DW 160 G	6"(160) BEND 45	267.0	168.22	76.1

BSEN 1329 & BSEN 1401

Swept Tee

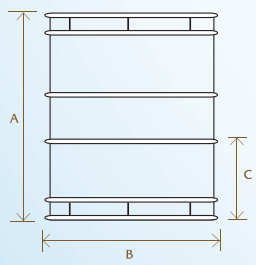
Colour | Grey Golden Brown



Code	Description	Height (A)	Width (B)	Socket Length (C)
F 65 DW 056 T	2"(056)TEE	131.8	103.30	31.0
F 65 DW 082 T	3"(082)TEE	199.2	157.60	45.0
F 65 DW 110 T	4"(110)TEE	235.6	195.66	50.00
F 65 DW 110 G	4"(110)TEE	235.6	195.66	50.00
F 65 DW 160 T	6"(160)TEE	364.0	274.60	76.1
F 65 DW 160 G	6"(160)TEE	364.0	274.60	76.1

Coupler

Colour | Grey Golden Brown

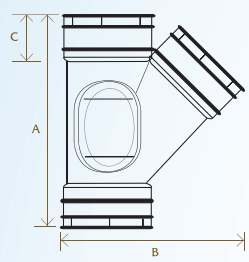


Code	Description	Height (A)	Width (B)	Socket Length (C)
F 60 DW 042 T	1 1/2" (42mm) Coupler	058.7	049.00	28.0
F 60 DW 056 T	2"(56mm) Coupler	064.5	062.61	31.0
F 60 DW 082 T	3"(82mm) Coupler	092.5	094.20	45.0
F 60 DW 110 T	4"(110mm) Coupler	102.5	121.80	50.0
F 60 DW 110 G	4"(110mm) Coupler	102.5	121.80	50.0
F 60 DW 160 T	6"(160mm) Coupler	161.0	167.20	76.1
F 60 DW 160 G	6"(160mm) Coupler	161.0	167.20	76.1

BSEN 1329 & BSEN 1401

WYE 45º

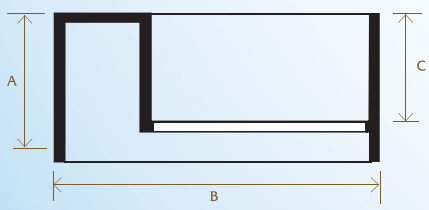
Colour | Grey Golden Brown



Code	Description	Height (A)	Width (B)	Socket Length (C)
F 88 DW 056 T	2"(056) WYE	149.00	120.00	31
F 88 DW 082 T	3"(082) WYE	216.4	196.00	45.0
F 88 DW 110 T	4"(110) WYE	263.8	235.44	50.0
F 88 DW 110 G	4"(110) WYE	263.8	235.44	50.0
F 88 DW 160 T	6"(160) WYE	393.0	285.00	76.1
F 88 DW 160 G	6"(160) WYE	393.0	285.00	76.1

Reducer

Colour | Grey Golden Brown

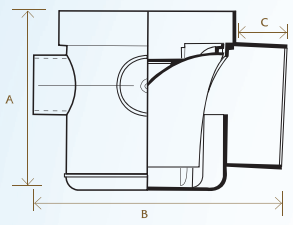


Code	Description	Height (A)	Width (B)	Socket Length (C)
F 20 DW 302 T	3" x 2" Reducer	38.0	082.52	28.0
F 20 DW 402 T	4" x 2" Reducer	50.0	110.00	28.0
F 20 DW 403 T	4" x 3" Reducer	50.0	110.00	38.0
F 20 DW 604 T	6" x 4" Reducer	77.5	171.00	50.5
F 20 DW 604 G	6" x 4" Reducer	77.5	171.00	50.5

BSEN 1329 & BSEN 1401

Trapped Floor Gully

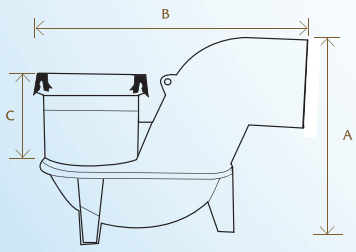
Colour | Grey



Code	Description	Height (A)	Width (B)	Socket Length (C)
F 42 DW 302 T	3" x 2" Trapped floor gully	110.50	185.17	38.27
F 40 DW 403 T	4" x 3" Trapped floor gully	169.00	206.00	53
F 42 DW 304 T	4" x 3" Trapped floor gully	110.50	191.00	35

P-Trap

Colour | Golden Brown

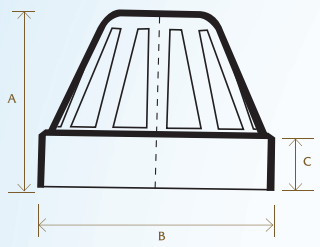


Code	Description	Height (A)	Width (B)	Socket Length (C)
F 40 DW 110 G	4" (110) P TRAP	244.8	330.4	93.79

BSEN 1329 & BSEN 1401

Vent Cowl

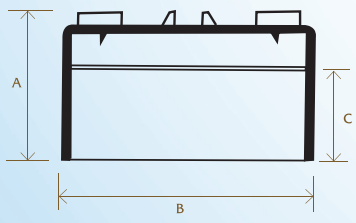
Colour | Grey



Code	Description	Height (A)	Width (B)	Socket Length (C)
F62 DW 056 T	2" (056)Vent cowl	57.00	61.00	24
F62 DW 082 T	3" (082)Vent cowl	70.30	88.10	25
F62 DW 110 T	4" (110")Vent cowl	88.00	115.40	26

Clean Out

Colour | Grey

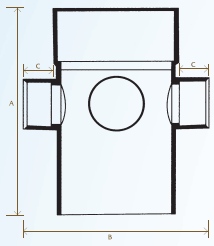


Code	Description	Height (A)	Width (B)	Socket Length (C)
F70 DW 056 T	2" (056)Clean out	57.50	55.80	33.5
F70 DW 082 T	3" (082)Clean out	115.35	82.60	55.72
F70 DW 110 T	4" (110)Clean out	108.00	110.00	65.63

BSEN 1329 & BSEN 1401

RAISER

Colour | Grey



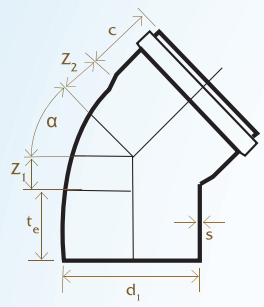
Code	Description	Height (A)	Width (B)	Socket Length (C)
F41DW 403T	110 mm (4") Raiser	184.3	173.00	28


BP
4" x 3"

BSEN 1329 & BSEN 1401

Bend 45º * (RR)

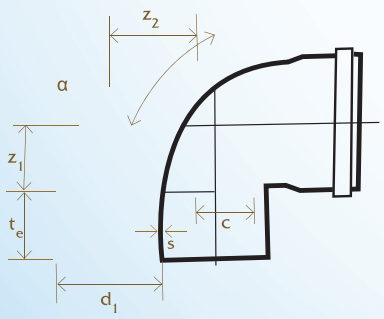
Colour | ● Golden Brown ● Grey



Code	d_1	α = 45º		s	t_e	c
		z_1	z_2			
F 45 DW 110 G RR	110	23	41	3.6	76	066
F 45 DW 160 G RR	160	33	45	5.0	100	087
F 45 DW 200 G RR	200	41	70	6.30	117	096
F 45 DW 250 G RR	250	52	90	7.6	180	140
F 45 DW 110 T RR	110	23	41	3.6	76	066
F 45 DW 160 T RR	160	33	45	5.0	100	087
F 45 DW 200 T RR	200	41	70	6.30	117	096
F 45 DW 250 T RR	250	52	90	7.6	180	140

Bend 87.50 * (RR)

Colour | ● Golden Brown ● Grey

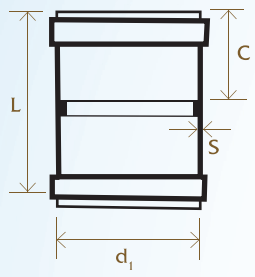


Code	d_1	α = 87.50		s	te	c
		z_1	z_2			
F 90 DW 110 G RR	110	053	070.5	3.6	76	066
F 90 DW 160 G RR	160	077	098.4	5.0	100	087
F 90 DW 200 G RR	200	096	124.6	6.3	117	096
F 90 DW 250 G RR	250	120	153.5	7.6	180	140
F 90 DW 110 T RR	110	053	070.5	3.6	76	066
F 90 DW 160 T RR	160	077	098.4	5.0	100	087
F 90 DW 200 T RR	200	096	124.6	6.3	117	096
F 90 DW 250 T RR	250	120	153.5	7.6	180	140

BSEN 1329 & BSEN 1401

Double Socket Coupler (RR)

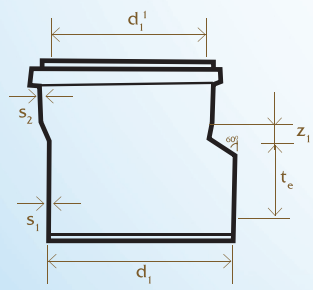
Colour | ● Golden Brown ● Grey



Code	d_1	s	L	c
F 60 DW 110 G RR	110	3.6	147.5	073.75
F 60 DW 160 G RR	160	5.0	197.0	095.80
F 60 DW 200 G RR	200	6.3	230.0	112.30
F 60 DW 250 G RR	250	7.7	314.0	153.00
F 60 DW 110 T RR	110	3.6	147.5	073.75
F 60 DW 160 T RR	160	5.0	197.0	095.80
F 60 DW 200 T RR	200	6.3	230.0	112.30
F 60 DW 250 T RR	250	7.7	314.0	153.00

Invert Reducers (RR)

Colour | ● Golden Brown ● Grey

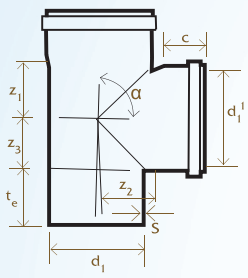


Code	d_1	d_1^1	WT		z_1	te
			s_1	s_2		
F 20 DW 604 G RR	160	110	5.0	3.6	49	66
F 20 DW 806 G RR	200	160	6.3	5.0	55	87
F 20 DW 128 G RR	250	200	7.5	6.3	58	96
F 20 DW 604 T RR	160	110	5.0	3.6	49	66
F 20 DW 806 T RR	200	160	6.3	5.0	55	87
F 20 DW 128 T RR	250	200	7.5	6.3	58	96

BSEN 1329 & BSEN 1401

Single Tee (RR)

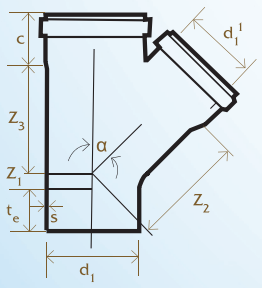
Colour | ● Golden Brown ● Grey



Code	d_1	d_1^1	α = 87.50º			s	te	c
			z_1	z_2	z_3			
F 65 DW 110 G RR	110	111	071	053	52.7	3.4	076	066
F 65 DW 160 G RR	160	161	101	073	76.6	4.8	100	087
F 65 DW 200 G RR	200	201	128	095	96.0	6.0	117	096
F 65 DW 250 G RR	250	251	158	120	120	7.7	180	140
F 65 DW 110 T RR	110	111	071	053	52.7	3.4	076	066
F 65 DW 160 T RR	160	161	101	073	76.6	4.8	100	087
F 65 DW 200 T RR	200	201	128	095	96.0	6.0	117	096
F 65 DW 250 T RR	250	251	158	120	120	7.7	180	140

Single Wye 135º (RR)

Colour | ● Golden Brown ● Grey

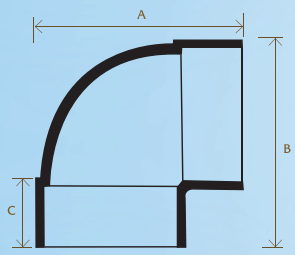


Code	d_1	d_1^1	α = 135º			s	te	c
			z_1	z_2	z_3			
F 88 DW 110 G RR	110	111	23.0	207	141.0	3.4	076	066
F 88 DW 160 G RR	160	161	33.0	292	204.6	4.8	100	087
F 88 DW 200 G RR	200	201	41.5	355	259.0	6.0	117	096
F 88 DW 250 G RR	250	251	51.8	463	374.8	7.7	180	140
F 88 DW 110 T RR	110	111	23.0	207	141.0	3.4	076	066
F 88 DW 160 T RR	160	161	33.0	292	204.6	4.8	100	087
F 88 DW 200 T RR	200	201	41.5	355	259.0	6.0	117	096
F 88 DW 250 T RR	250	251	51.8	463	374.8	7.7	180	140

ASTM D 2665 / DIN

Elbow 90º

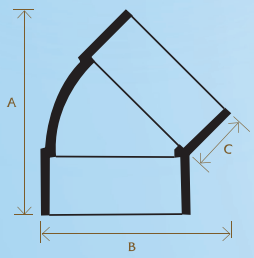
Colour | ○ White



Code	Description	Height (A)	Width (B)	Socket Length (C)
F90 SH 048 W	1 1/2" elbow 90º SCH40	084.64	083.32	28.0
F90 SH 060 W	2" elbow 90º SCH40	098.21	097.00	29.5
F90 SH 088 W	3" elbow 90º SCH40	148.61	147.19	48.0
F90 SH 114 W	4" elbow 90º SCH40	178.51	176.75	51.0
F90 SH 110 W	110 mm elbow 90º	173.5	173.05	51.0

Elbow 45º

Colour | ○ White

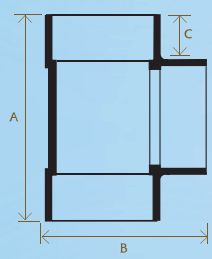


Code	Description	Height (A)	Width (B)	Socket Length (C)
F45 SH 048 W	1 1/2" elbow 45º SCH40	081	056.54	28.0
F90 SH 060 W	2" elbow 45º SCH40	089	068.71	29.5
F90 SH 088 W	3" elbow 45º SCH40	140	100.61	48.0
F90 SH 114 W	4" elbow 45º SCH40	157	127.51	51.0
F90 SH 110 W	110 mm elbow 45º	155	122.50	51.0

ASTM D 2665 / DIN

Tee 90º

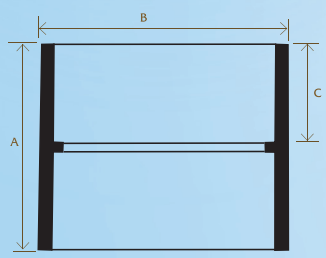
Colour | ○ White



Code	Description	Height (A)	Width (B)	Socket Length (C)
F65 SH 048 W	1 1/2" Tee 90º SCH40	113.0	084.64	28.0
F65 SH 060 W	2" Tee 90º SCH40	125.1	098.21	29.5
F65 SH 082 W	3" Tee 90º SCH40	196.0	148.61	48.0
F65 SH 114 W	4" Tee 90º SCH40	230.0	178.57	51.0
F65 SH 110 W	110 mm Tee 90º	230.0	173.50	51.0

Double Socket Coupler

Colour | ○ White

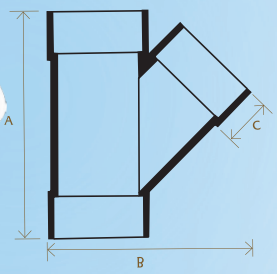


Code	Description	Height (A)	Width (B)	Socket Length (C)
F60 SH 048 W	1 1/2" coupler SCH40	058.40	057.04	28.0
F60 SH 060 W	2" coupler SCH40	061.38	069.11	29.5
F60 SH 088 W	3" coupler SCH40	100.76	101.21	48.0
F60 SH 114 W	4" coupler SCH40	106.80	128.48	51.0
F60 SH 110 W	110 mm coupler	106.80	123.10	51.0

ASTM D 2665 / DIN

WYE 135º

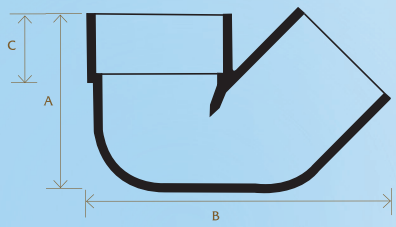
Colour | ○ White



Code	Description	Height (A)	Width (B)	Socket Length (C)
F 88 SH 110 W	110 mm WYE 135º	279.5	250	51
F 88 SH 114 W	4" WYE135º SCH 40	292.0	245	51

Siphon 135º

Colour | ○ White



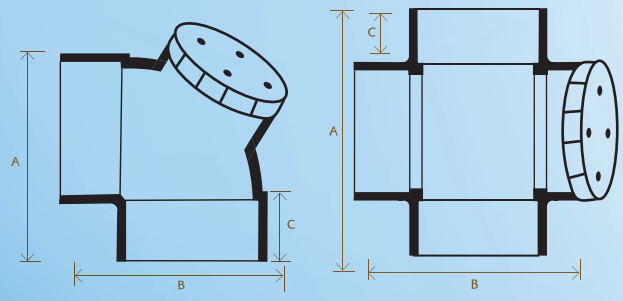
Code	Description	Height (A)	Width (B)	Socket Length (C)
F 40 SH 110 W	110 mm siphon 135º	152	255	51
F 40 SH 114 W	4" siphon 135º SCH 40	155	265	52

Note: Product Also Available Assemble With Elbow 45º

Door Tee & Elbow

Colour | ○ White

Code	Description	Height (A)	Width (B)	Socket Length (C)
F 65 SH DR 110 W	110 mm door tee 90º	218.50	199.25	50
F 65 SH DR 114 W	4" door tee 90º SCH40	218.50	199.25	50
F 90 SH DR 110 W	110 mm door elbow 90º	170.55	170.55	50
F 90 SH DR 114 W	4" door elbow 90º SCH40	172.95	172.95	50

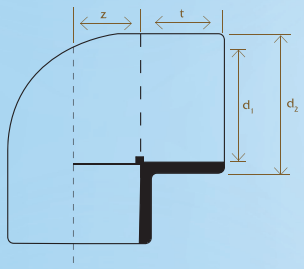



CPVC
23mm-45°
BPC-32-25

DIN STANDARD

Elbow 90º

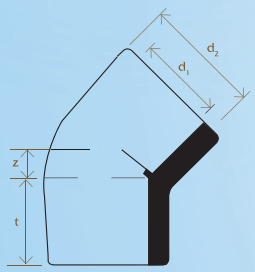
Colour | Cream Dark Grey



Code	Size (d_1)	d_2	t	z
F 90 CP 020 C	20	27.5	16.5	12.0
F 90 CP 025 C	25	33.3	19.5	14.2
F 90 CP 032 C	32	41.0	22.5	19.3
F 90 CP 040 C	40	49.7	26.0	22.3
F 90 CP 050 C	50	61.0	31.0	27.5
F 90 CP 063 C	63	75.0	38.0	34.4
F 90 PR 020 D	20	27.5	16.5	12.0
F 90 PR 025 D	25	33.3	19.5	14.2
F 90 PR 032 D	32	41.0	22.5	19.3
F 90 PR 040 D	40	49.7	26.0	22.3
F 90 PR 050 D	50	61.0	31.0	27.5
F 90 PR 063 D	63	75.0	38.0	34.4

Elbow 45º

Colour | Cream Dark Grey

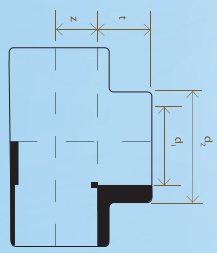


Code	Size (d_1)	d_2	t	z
F 45 CP 020 C	20	27.5	16.5	05.5
F 45 CP 025 C	25	33.3	19.5	06.6
F 45 CP 032 C	32	41.0	22.5	08.6
F 45 CP 040 C	40	50.0	26.0	10.0
F 45 CP 050 C	50	61.0	31.0	13.0
F 45 CP 063 C	63	75.0	38.0	15.5
F 45 PR 020 D	20	27.5	16.5	05.5
F 45 PR 025 D	25	33.3	19.5	06.6
F 45 PR 032 D	32	41.0	22.5	08.6
F 45 PR 040 D	40	50.0	26.0	10.0
F 45 PR 050 D	50	61.0	31.0	13.0
F 45 PR 063 D	63	75.0	38.0	15.5

DIN STANDARD

TEE 90º

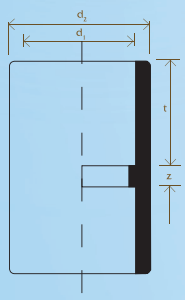
Colour | Cream Dark Grey



Code	Size (d_1)	d_2	t	z
F 65 CP 020 C	20	27.5	16.5	10.7
F 65 CP 025 C	25	33.3	19.5	14.2
F 65 CP 032 C	32	41.0	22.5	16.5
F 65 CP 040 C	40	50.0	26.0	22.5
F 65 CP 050 C	50	61.7	31.0	28.1
F 65 CP 063 C	63	76.8	38.0	34.5
F 65 PR 020 D	20	27.5	16.5	10.7
F 65 PR 025 D	25	33.3	19.5	14.2
F 65 PR 032 D	32	41.0	22.5	16.5
F 65 PR 040 D	40	50.0	26.0	22.5
F 65 PR 050 D	50	61.7	31.0	28.1
F 65 PR 063 D	63	76.8	38.0	34.5

Double Socket Coupler

Colour | Cream Dark Grey

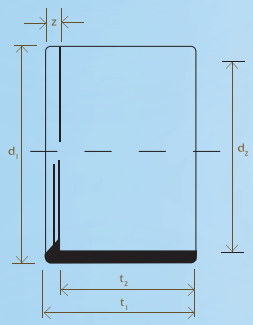


Code	Size (d_1)	d_2	t	z
F 45 CP 020 C	20	27.5	16.5	05.5
F 45 CP 025 C	25	33.3	19.5	06.6
F 45 CP 032 C	32	41.0	22.5	08.6
F 45 CP 040 C	40	50.0	26.0	10.0
F 45 CP 050 C	50	61.0	31.0	13.0
F 45 CP 063 C	63	75.0	38.0	15.5
F 45 PR 020 D	20	27.5	16.5	05.5
F 45 PR 025 D	25	33.3	19.5	06.6
F 45 PR 032 D	32	41.0	22.5	08.6
F 45 PR 040 D	40	50.0	26.0	10.0
F 45 PR 050 D	50	61.0	31.0	13.0
F 45 PR 063 D	63	75.0	38.0	15.5

DIN STANDARD

Reducing Bush

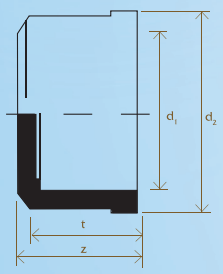
Colour | Cream Dark Grey



Code	Size (d_1 x d_2)	t_1	t_2	z
F 20 CP O25 C	25x20	19.5	16.5	3.0
F 20 CP O32 C	32x20	22.5	16.5	6.0
F 20 CP O40 C	40x32	26.5	22.5	4.0
F 20 CP O50 C	50x32	31.0	22.5	8.5
F 20 CP O63 C	63x50	38.0	31.0	7.0
F 20 PR O25 D	25x20	19.5	16.5	3.0
F 20 PR O32 D	32x20	22.5	16.5	6.0
F 20 PR O40 D	40x32	26.5	22.5	4.0
F 20 PR O50 D	50x32	31.0	22.5	8.5
F 20 PR O63 C	63x50	38.0	31.0	7.0

End Cap

Colour | Cream Dark Grey

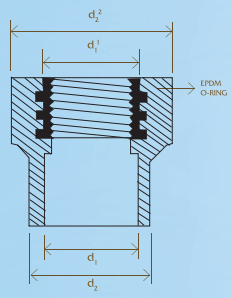


Code	Size (d_1)	d_2	t	z
F 29 CP 020 C	20	27.6	16.5	23.20
F 29 CP 025 C	25	33.2	19.5	26.30
F 29 CP 032 C	32	41.1	22.5	30.85
F 29 CP 040 C	40	52.0	32.0	37.45
F 29 PR 020 D	20	27.6	16.5	23.20
F 29 PR 025 D	25	33.2	19.5	26.30
F 29 PR 032 D	32	41.1	22.5	30.85
F 29 PR 040 D	40	52.0	32.0	37.45

DIN STANDARD

Female Adaptor

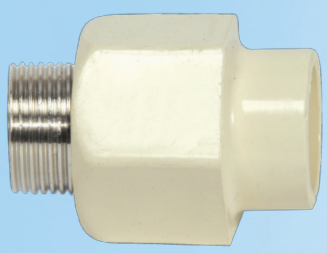
Colour | Cream Dark Grey

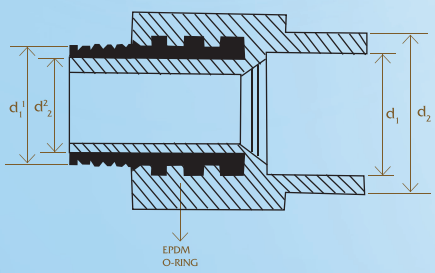


Code	Size (d_1xd_1^1)	d_2	d_2^2
F 80 CP 020 C	20 x 1/2"	22.3	35.7
F 80 CP 025 C	25 x 3/4"	33.4	45.7
F 80 CP 032C	32 x 1"	44.2	55.6
F 80 CP 040 C	40 x 1 1/4"	54.1	64.9
F 80 CP 050 C	50 x 1 1/2"	65.0	75.2
F 80 CP 063 C	63 x 2"	75.3	85.4
F 80 PR 020 D	20 x 1/2"	22.3	35.7
F 80 PR 025 D	25 x 3/4"	33.4	45.7
F 80 PR 032 D	32 x 1"	44.2	55.6
F 80 PR 040 D	40 x 1 1/4"	54.1	64.9
F 80 PR 050 D	50 x 1 1/2"	65.0	75.2
F 80 PR 063 D	63 x 2"	75.3	85.4

Male Adaptor

Colour | Cream Dark Grey



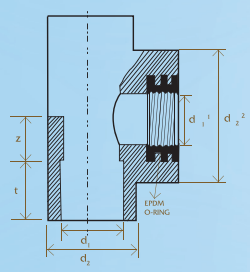


Code	Size (d_1xd_1^1)	d_2	d_2^2
F 85 CP 020 C	20 x 1/2"	27.1	10.0
F 85 CP 025 C	25 x 3/4"	32.0	15.2
F 85 CP 032 C	32 x 1"	40.2	22.3
F 85 CP 040 C	40 x 1 1/4"	49.7	27.7
F 85 CP 050 C	50 x 1 1/2"	62.7	33.1
F 85 CP 063 C	63 x 2"	75.0	38.5
F 85 PR 020 D	20 x 1/2"	27.1	10.0
F 85 PR 025 D	25 x 3/4"	32.0	15.2
F 85 PR 032 D	32 x 1"	40.2	22.3
F 85 PR 040 D	40 x 1 1/4"	49.7	27.7
F 85 PR 050 D	50 x 1 1/2"	62.7	33.1
F 85 PR 063 D	63 x 2"	75.0	38.5

DIN STANDARD

TEE 90º Adaptor

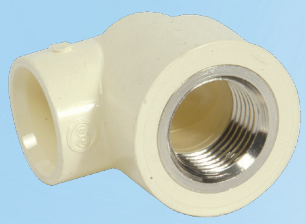
Colour | Cream Dark Grey

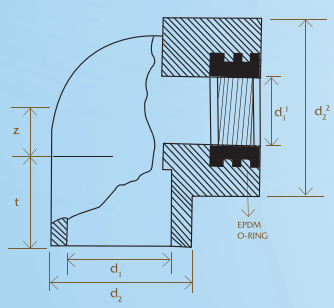


Code	Size (d_1 x d_1^1)	d_2	d_2^2	t	z
F 68 CP O20 C	20 x 1/2”	27.5	37.0	16.5	12.25
F 68 CP O25 C	25 x 1/2”	34.2	43.0	19.5	15.00
F 68 PR O20 D	20 x 1/2”	27.5	37.0	16.5	12.25
F 68 PR O25 D	25 x 1/2”	34.2	43.0	19.5	15.00

Elbow 90º Adaptor

Colour | Cream Dark Grey



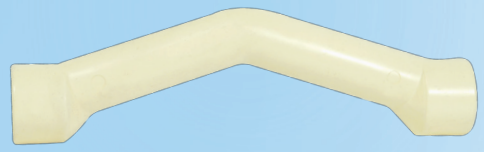


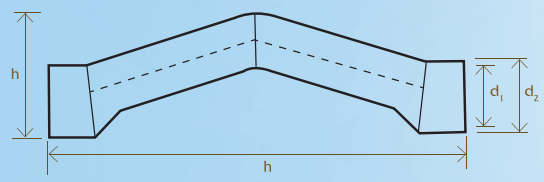
Code	Size (d_1 x d_1^1)	d_2^2	t	z
F 93 CP 020 C	20 x 1/2”	37.5	16.5	12.5
F 95 CP 025C	25 x 1/2”	43.0	16.5	15.5
F 93 CP 025 C	25 x 3/4”	43.0	19.5	15.5
F 93 CP 032 C	32 x 1”	49.0	22.5	17.0
F 93 PR 020 D	20 x 1/2”	37.5	16.5	12.5
F 95 PR 025 D	25 x 1/2”	43.0	16.5	15.5
F 93 PR 025 D	25 x 3/4”	43.0	19.5	15.5
F 93 PR 032 D	32 x 1”	49.0	22.5	17.0

DIN STANDARD

Step Over Bend

Colour | Cream Dark Grey

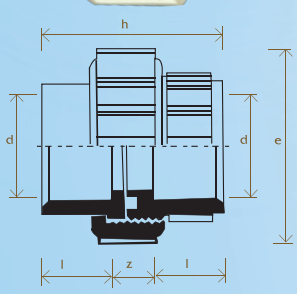




Code	Size (d_1)	d_2	l	h
F 10 CP 020 C	20	29.0	172.8	47.2
F 10 CP 025 C	25	35.3	216.0	61.1
F 10 PR 020 D	20	29.0	172.8	47.2
F 10 PR 025 D	25	35.3	216.0	61.1

Union Coupler

Colour | Cream Dark Grey

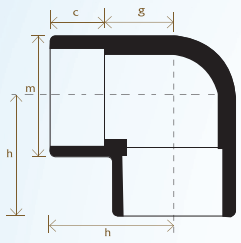


Code	Size (d)	h	l	z	e
F 15 CP 020 C	20	45	16	13	41.0
F 15 CP 025 C	25	51	19	13	50.0
F 15 CP 032 C	32	57	22	13	58.0
F 15 PR 020 D	20	45	16	13	41.0
F 15 PR 025 D	25	51	19	13	50.0
F 15 PR 032 D	32	57	22	13	58.0

ASTM F 439
ASTM D 2467

Elbow 90º

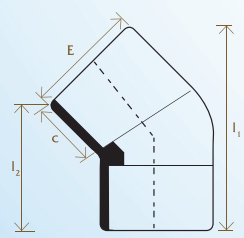
Colour | ● Light Grey ● Dark Grey



Code	Size	m	c	h	g
F 90 CP 021 L	1/2”	45.00	16.00	35.20	12.20
F 90 CP 026 L	3/4”	35.00	26.00	40.80	15.50
F 90 CP 033 L	1”	43.50	29.95	46.70	17.50
F 90 CP 042 L	1 1/4”	52.12	31.75	22.22	57.81
F 90 CP 048 L	1 1/2”	58.72	34.93	25.40	64.28
F 90 CP 060 L	2”	71.70	38.10	31.76	73.95
F 90 CP 089 L	3”	104.50	47.63	46.04	93.67
F 90 CP 114 L	4”	131.88	57.15	58.74	115.89
F 90 PR 021 D	1/2”	30.00	22.95	35.20	12.20
F 90 PR 026 D	3/4”	35.00	26.00	40.80	15.50
F 90 PR 033 D	1”	43.50	29.95	46.70	17.50
F 90 PR 042 D	1 1/4”	52.12	31.75	22.22	57.81
F 90 PR 048 D	1 1/2”	58.72	34.93	25.40	64.28
F 90 PR 060 D	2”	71.70	38.10	31.76	73.95
F 90 PR 089 D	3”	104.50	47.63	46.04	93.67
F 90 PR 114 D	4”	131.88	57.15	58.74	115.89

Elbow 45º

Colour | ● Light Grey ● Dark Grey

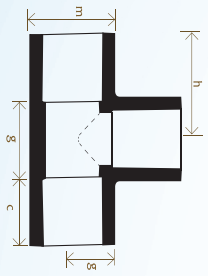


Code	Size	l_1	l_2	m	c
F 45 CP 021 L	1/2”	59.04	38.00	29.04	22.22
F 45 CP 026 L	3/4”	69.18	48.00	34.68	25.40
F 45 CP 033 L	1”	77.45	50.42	42.74	28.58
F 45 CP 042 L	1 1/4”	88.90	56.42	52.12	31.75
F 45 CP 048 L	1 1/2”	99.38	72.32	58.78	34.93
F 45 CP 060 L	2”	117.96	98.90	71.70	38.10
F 45 CP 089 L	3”	150.7	120.65	104.55	47.63
F 45 CP 114 L	4”	185.99	146.85	131.88	57.15
F 45 PR 021 D	1/2”	59.04	38.00	29.04	22.22
F 45 PR 026 D	3/4”	69.18	48.00	34.68	25.40
F 45 PR 033 D	1”	77.45	50.42	42.74	28.58
F 45 PR 042 D	1 1/4”	88.90	56.42	52.12	31.75
F 45 PR 048 D	1 1/2”	99.38	72.32	58.78	34.93
F 45 PR 060 D	2”	117.96	98.90	71.70	38.10
F 45 PR 089 D	3”	150.7	120.65	104.55	47.63
F 45 PR 114 D	4”	185.99	146.85	131.88	57.15

ASTM F 439
ASTM D 2467

TEE 90º

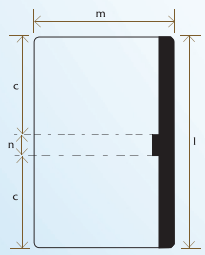
Colour | ● Light Grey ● Dark Grey



Code	Size	m	c	g	h
F 65 CP 021 L	1/2”	30.00	22.50	14.60	37.10
F 65 CP 026 L	3/4”	36.25	26.20	15.20	41.40
F 65 CP 033 L	1”	44.00	28.90	21.70	50.6
F 65 CP 042 L	1 1/4”	52.12	31.75	44.45	53.97
F 65 CP 048 L	1 1/2”	58.72	34.93	50.80	60.33
F 65 CP 060 L	2”	71.71	37.10	63.50	69.85
F 65 CP 089 L	3”	103.93	47.63	92.08	93.67
F 65 CP 114 L	4”	131.18	57.15	117.48	115.89
F 65 PR 021 D	1/2”	30.00	22.50	14.60	37.10
F 65 PR 026 D	3/4”	36.25	26.20	15.20	41.40
F 65 PR 033 D	1”	44.00	28.90	21.70	50.6
F 65 PR 042 D	1 1/4”	52.12	31.75	44.45	53.97
F 65 PR 048 D	1 1/2”	58.72	34.93	50.80	60.33
F 65 PR 060 D	2”	71.71	37.10	63.50	69.85
F 65 PR 089 D	3”	103.93	47.63	92.08	93.67
F 65 PR 114 D	4”	131.18	57.15	117.48	115.89

Double Socket Coupler

Colour | ● Light Grey ● Dark Grey

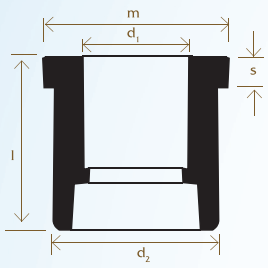


Code	Size	m	l	c	n
F 60 CP 021 L	1/2”	30.20	48.00	22.60	2.80
F 60 CP 026 L	3/4”	37.45	54.35	26.00	2.35
F 60 CP 033 L	1”	43.90	63.00	29.10	4.80
F 60 CP 042 L	1 1/4”	52.12	65.88	31.75	2.38
F 60 CP 048 L	1 1/2”	58.72	72.24	34.93	2.38
F 60 CP 060 L	2”	71.71	79.00	38.10	2.80
F 60 CP 089 L	3”	104.10	100.00	47.63	4.76
F 60 CP 114 L	4”	131.00	119.10	57.15	4.76
F 60 PR 021 D	1/2”	30.20	48.00	22.60	2.80
F 60 PR 026 D	3/4”	37.45	54.35	26.00	2.35
F 60 PR 033 D	1”	43.90	63.00	29.10	4.80
F 60 PR 042 D	1 1/4”	52.12	65.88	31.75	2.38
F 60 PR 048 D	1 1/2”	58.72	72.24	34.93	2.38
F 60 PR 060 D	2”	71.71	79.00	38.10	2.80
F 60 PR 089 D	3”	104.10	100.00	47.63	4.76
F 60 PR 114 D	4”	131.00	119.10	57.15	4.76

ASTM F 439
ASTM D 2467

Reducing Bush

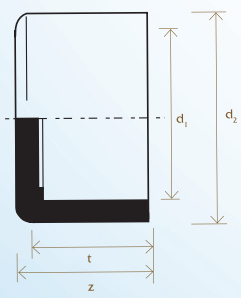
Colour | ● Light Grey ● Dark Grey



Code	Size	m	l	s	d_1	d_2
F 20 CP 026 L	3/4" x 1/2"	34.67	30.00	2.47	1/2"	3/4"
F 20 CP 033 L	1" x 1/2"	39.00	37.00	6.65	1/2"	1"
F 21 CP 033 L	1 x 3/4"	38.00	35.90	6.90	3/4"	1"
F 20 CP 042 L	1 1/4" x 3/4"	46.50	39.30	7.30	3/4"	1 1/4"
F 21 CP 042 L	1 1/4" x 1"	46.50	39.30	7.30	1"	1 1/4"
F 20 CP 048 L	1 1/2" x 3/4"	53.00	43.50	7.50	3/4"	1 1/2"
F 21 CP 048 L	1 1/2" x 1"	53.00	43.50	7.50	1"	1 1/2"
F 22 CP 048 L	1 1/2" x 1 1/4"	53.00	43.50	7.50	1 1/4"	1 1/2"
F 20 CP 060 L	2" x 3/4"	62.00	46.90	7.90	3/4"	2"
F 21 CP 060 L	2" x 1"	62.00	46.90	7.90	1"	2"
F 22 CP 060 L	2" x 1 1/4"	62.00	46.90	7.90	1 1/4"	2"
F 23 CP 060 L	2" x 1 1/2"	62.00	46.90	7.90	1 1/4"	2"
F 20CP 088 L	3" x 2"	95.00	48.50	9.80	2"	3"
F 20 CP 114 L	4" x 2"	121.20	68.10	9.80	2"	4"
F20 PR 026 D	3/4" x 1/2"	34.67	30.00	2.47	1/2"	3/4"
F20 PR 033 D	1" x 1/2"	39.00	37.00	6.65	1/2"	1"
F21 PR 033 D	1" x 3/4"	38.00	35.90	6.90	3/4"	1"
F20 PR 042 D	11/4" x 3/4"	46.50	39.30	7.30	3/4"	11/4"
F21 PR 042 D	11/4" x 1"	46.50	39.30	7.36	1"	11/4"
F20 PR 048 D	11/2" x 3/4"	53.00	43.50	7.50	3/4"	11/2"
F21 PR 048 D	11/2" x 1"	53.00	43.50	7.50	1"	11/2"
F22 PR 048 D	11/2" x 11/4"	53.00	43.50	7.50	11/4"	11/2"
F22 PR 060 D	2" x 3/4"	62.00	46.90	7.90	3/4"	2"
F21 PR 060 D	2" x 1"	62.00	46.90	7.90	1"	2"
F22 PR 060 D	2" x 11/4"	62.00	46.90	7.90	11/4"	2"
F23 PR 060 D	2" x 11/2"	62.00	46.90	7.90	11/2"	2"
F23 PR 088 D	3" x 2"	95.00	48.50	9.80	2"	3"
F23 PR 114 D	4" x 2"	121.20	68.10	9.80	2"	4"

End Cap

Colour | ● Light Grey ● Dark Grey

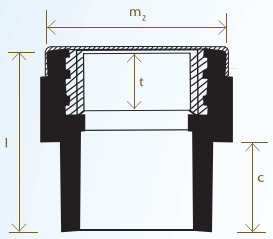


Code	Size (d_1)	d_2	t	z
F 29 CP 021 L	1/2"	30.16	23.00	31.35
F 29 CP 026 L	3/4"	35.72	26.19	34.13
F 29 CP 033 L	1"	43.66	29.37	41.28
F 29 PR 021 D	1/2"	30.16	23.00	31.35
F 29 PR 026 D	3/4"	35.72	26.19	34.13
F 29 PR 033 D	1"	43.66	29.37	41.28

ASTM F 439
ASTM D 2467

Female Adaptor

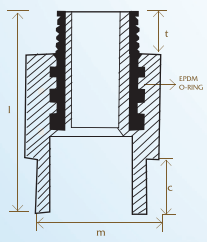
Colour | ● Light Grey ● Dark Grey



Code	Size	m_1	m_2	c	t	l
F 80 CP 021 L	1/2" x 1/2"	29.80	37.60	23.00	12.50	38.60
F 82 CP 021 L	1/2" x 3/4"	35.20	37.60	26.00	12.50	44.90
F 80 CP 026 L	3/4" x 3/4"	35.80	45.00	28.00	12.50	44.90
F 80 CP 033 L	1" x 1"	43.60	51.90	30.07	15.00	49.50
F 80 PR 021 D	1/2" x 1/2"	29.80	37.60	23.00	12.50	38.60
F 82 PR 021 D	1/2" x 3/4"	35.20	37.60	26.00	12.50	44.90
F 80 PR 026 D	3/4" x 3/4"	35.80	45.00	28.00	12.50	44.90
F 80 PR 033 D	1" x 1"	43.60	51.90	30.07	15.00	49.50

Male Adaptor

Colour | ● Light Grey ● Dark Grey

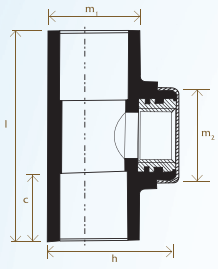


Code	Size	m	l	c	t
F 85 CP 021 L	1/2" x 1/2"	29.80	42.00	18.70	14.00
F 85 CP 026 L	3/4" x 3/4"	35.90	49.50	25.00	15.00
F 85 CP 033 L	1" x 1"	43.25	52.00	26.30	16.50
F 85 CP 048 L	1 1/2" x 1 1/2"	62.00	82.71	34.00	22.50
F 85 CP 060 L	2" x 2"	76.00	91.00	38.00	26.00
F 85 PR 021 D	1/2" x 1/2"	29.80	42.00	18.70	14.00
F 85 PR 026 D	3/4" x 3/4"	35.90	49.50	25.00	15.00
F 85 PR 033 D	1" x 1"	43.25	52.00	26.30	16.50
F 85 PR 048 D	1 1/2" x 1 1/2"	62.00	82.71	34.00	22.50
F 85 PR 060 D	2" x 2"	76.00	91.00	38.00	26.00

ASTM F 439
ASTM D 2467

TEE 90º Adaptor

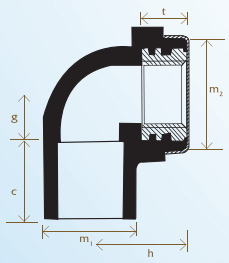
Colour | ● Light Grey ● Dark Grey



Code	Size	m_1	m_2	h	t	c	l
F 68 CP 021 L	1/2" x 1/2"	29.80	37.60	27.75	12.50	21.20	78.20
F 68 CP 026 L	3/4" x 1/2"	35.00	37.60	33.40	12.50	25.40	80.00
F 68 PR 021 D	1/2" x 1/2"	29.80	37.60	27.75	12.50	21.20	78.20
F 68 PR 026 D	3/4" x 1/2"	35.00	37.60	33.40	12.50	25.40	80.00

Elbow 90º Adaptor

Colour | ● Light Grey ● Dark Grey

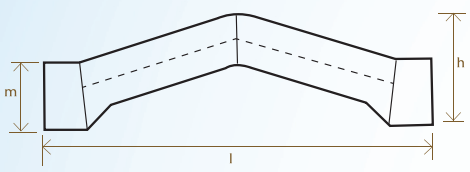


Code	Size	m_1	m_2	h	t	c	g
F 93 CP 021 L	1/2" x 1/2"	29.80	37.60	28.00	12.50	23.40	14.50
F 95 CP 021 L	3/4" x 1/2"	34.75	37.60	30.30	12.50	25.50	14.50
F 93 CP 026 L	3/4" x 3/4"	35.80	45.00	35.10	12.50	27.00	19.40
F 93 CP 033 L	1" x 1"	43.50	41.94	42.06	15.00	30.45	21.00
F 93 PR 021 D	1/2" x 1/2"	29.80	37.60	28.00	12.50	23.40	14.50
F 95 PR 021 D	3/4" x 1/2"	34.75	37.60	30.30	12.50	25.50	14.50
F 93 PR 026 D	3/4" x 3/4"	35.80	45.00	35.10	12.50	27.00	19.40
F 93 PR 033 D	1" x 1"	43.50	41.94	42.06	15.00	30.45	21.00

ASTM F 439
ASTM D 2467

Step Over Bend

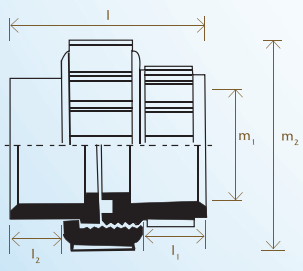
Colour | ● Light Grey ● Dark Grey



Code	Size	m	l	h
F 10 CP 021 L	1/2“	21.50	200.0	50.00
F 10 CP 026 L	3/4“	26.70	211.0	56.00
F 10 CP 033 L	1“	33.50	243.0	66.00
F 10 PR 021 D	1/2“	21.50	200.0	50.00
F 10 PR 026 D	3/4“	26.70	211.0	56.00
F 10 PR 033 D	1“	33.50	243.0	66.00

Union Coupler

Colour | ● Light Grey ● Dark Grey



Code	Size	m_1	m_2	l	l_1	l_2
F 15 CP 021 L	1/2”	21.50	49.00	57.00	18.00	14.00
F 15 CP 026 L	3/4”	26.70	63.00	59.00	18.00	13.50
F 15 CP 033 L	1”	33.50	72.00	64.00	22.00	16.00
F 15 PR 021 D	1/2”	21.50	49.00	57.00	18.00	14.00
F 15 PR 026 D	3/4”	26.70	63.00	59.00	18.00	13.50
F 15 PR 033 D	1”	33.50	72.00	64.00	22.00	16.00
F 15 CP 042 L	$1^1/_4$”	42.49	76.10	71.20	24.55	18.00
F 15 CP 048 L	$1^1/_2$”	48.63	84.00	80.00	21.83	27.83
F 15 CP 060 L	2”	60.70	96.90	84.70	23.80	28.80
F 15 PR 042 D	$1^1/_4$”	42.49	76.10	71.20	24.55	18.00
F 15 PR 048 D	$1^1/_2$”	48.63	84.00	80.00	21.83	27.83
F 15 PR 060 D	2”	60.70	96.90	84.70	23.80	28.80

TECHNICAL INFORMATION

Bahrain Pipes CPVC Ultratuff Cell Classification

UltraTuff CPVC is one of our premium pipe fittings' brands which meets a higher compound cell classification produced by **Bahrain Pipes B.S.C**(c) Time and again UltraTuff has proven to have the highest impact resistance and long term performance qualities. Our product is certified by NSF/ANSI 14 & 61 standards and all applicable requirements for performance and health features.

Hydraulic Design

Design Velocity
The linear velocity of a flowing fluid in a pipe is calculated from:

$$V = \frac{0.4085g}{d^2}$$

Where:

V = linear fluid flow velocity in feet per second
g = flow rate in gallons per minute
d = inside diameter of pipe in inches.

Linear fluid flow velocity in a system should generally be limited to 5 ft/s for industrial applications particularly for pipe sizes 6″ and greater. Following this guidelines will minimize risk of hydraulic shock damage due to water hammer surge pressures.

Water Hammer Surge Pressure

Whenever the flow rate of fluid in a pipe is changed there is a surge in pressure known as water hammer. The longer the line and the faster the fluid is moving, the greater the hydraulic shock will be. Water hammer may be caused by opening or closing a valve, starting or stopping a pump, or the movement of entrapped air through the pipe. The maximum water hammer surge pressure may be calculated from:

$$P_{wh} = \frac{\rho \triangle V}{144\ g_c}\left[\frac{\rho}{144\ g_c}\left(\frac{1}{K} + \frac{d}{bE}\right)\right]^{-1/2}$$

Where:

P_{wh} = maximum surge pressure, psi
ρ = fluid density, lb/ft^3 (62.4 lb/ft^3 for water)
$\triangle V$ = change in fluid velocity, ft/sec
g_c = gravitational constant, 32.17 ft/sec
K = bulk modulus of elasticity of fluid, psi (312,000 for water at 73°F)
d = pipe inside diameter, in.
b = pipe wall thickness, in.
E = pipe material bulk modulus of elasticity, psi

The water hammer surge pressure plus the system operating pressure should not exceed 1.5 times the recommended working pressure rating of the system.

In order to minimize hydraulic shock due to water hammer, linear fluid flow velocity should generally be limited to 5ft/sec for industrial applications, particularly for pipe size of 6" or larger. Velocity at system start up should be limited to 1ft/sec during filling until it is certain that all air has been flushed from the system and the pressure has been brought up to operating conditions. Air should not be allowed to accumulate in the system while it is operating. Pumps should not be allowed to draw in air.

Where necessary, extra protective equipment may be used to prevent water hammer damage. Such equipment might include pressure relief valves, shock absorbers, surge arrestors, and vacuum air relief valves.

Hazen-William C Factor

A great advantage that CPVC pipe over metallic pipe is a smooth inner surface which is resistant to scaling and fouling. This means that friction pressure losses in the fluid flow are minimized from the beginning and do not significant increase as the system ages, as can be the case with metal pipes subjected to scaling.

The Hazen-Williams formula is the generally accepted method of calculating friction head losses in piping systems. The values in the following fluid flow table are based on this formula and a surface roughness constant of C-150 for CPVC pipe. Surface roughness constants for other piping materials are given below

Constant (C)	Type of Pipe
150	CPVC pipe, 45+ years
130-140	Steel/cast iron pipe, new
125	Steel pipe, old
120	Cast iron, 4-12 years
110	Galvanized steel; cast iron, 13-20 years
60-80	Cast iron, worn/pitted

Head-Loss Characteristics – Pipe

The flow characteristic of water flowing through piping system are affected by several factor including system configuration, pipe size and length, friction at the pipe and fitting surfaces etc. These and other factors cause a reduction in pressure over the length of the system.

The following formula was used to calculate water velocities, head losses and pressure drops as a function of flow rates. The Hazen William formula can be used to adequately describe these losses.

$$f = 0.2083 \times \left(\frac{100}{C}\right)^{1.852} \frac{g^{1.852}}{d^{4.8655}}$$

Where:

- f = friction head in feet of water per 100 feet of pipe
- d = inside diameter of pipe in inches
- g = flow rate in gallons per minute
- c = pipe surface roughness constant (150 for CPVC Pipe)

One foot of water.= 0.4335psi

Head-Loss Characteristics

Friction losses through fittings are calculated from the equivalent length of straight of the straight pipe which would produce the same friction loss in the same friction loss in the fluid. Pressure drop in valves and strainers is calculated using flow coefficient values which are published by the valve manufacturer.

The equation for calculating pressure drop is:

$$P = \frac{G^2}{C_v^2}$$

Where:

P = pressure drop in psi

G = flow rate in gallons per minute

C_v = the valve flow coefficient

Typical flow coefficients for different valves and strainers can be found in the valve/strainer manufacturer's literature. Pressure drops for fluids other than water may be calculated by multiplying the value calculated from the above equation by the specific gravity of the fluid.

Thermal Expansion and Thermal Stresses

It is important to consider thermal expansion when designing a system with pipe and fittings. Most thermo plastic have a coefficient of thermal expansion which is significantly higher than metals. The thermal expansion of a piping system subject to a temperature change can therefore be significant, and may need compensation in the system design. The expansion or the contraction of thermoplastic pipe may be calculated from the following formula:

$$\triangle L = L_p C \triangle T$$

Where:

$\triangle L$ = change.in.length due to change in temperature (in.)

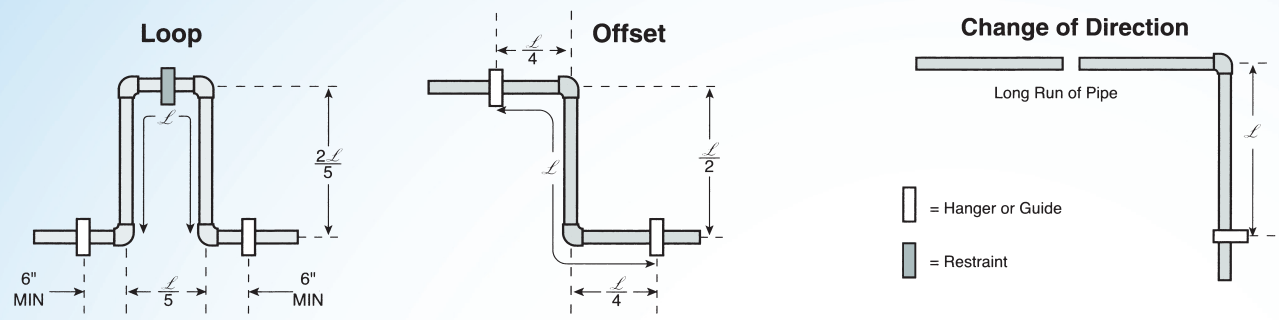
L_p = length of pipe (in.)

C = coefficient of theral expansion (in/in./°F)
(3.8 x 10-5 in./in./°F for CPVC)

$\triangle T$ = change in temperature (°F)

Expansion Loops and Offsets

As a rule of thumb, if the total temperature change is greater than 30°F (17°C), compensation for thermal expansion should be included in the system design. The recommended method of accommodating thermal expansion is to include expansion loops offsets or changes in direction where necessary in the system design. An expansion loop schematic is presented below:



Expansion Loop and Offset Configuration

Expansion loop Formula

$$\mathcal{L} = \sqrt{\frac{3\,ED\,(\triangle L)}{2S}}$$

Where:

- $\mathcal{L}$ = loop length (in.)
- E = modulus of elasticity at maximum temperature (psi)
- S = working stress at maximum temperature (psi)**
- D = outside diameter of pipe (in.)
- $\triangle$L = change in length due to change in temperature (in.)

** Modulus of Elasticity and Working Stress for CPVC

Temperature (°F)	Modulus, E (psi)	Stress, S (psi)
73	423,000	2000
90	403,000	1800
110	371,000	1500
120	355,000	1300
140	323,000	1000
160	291,000	750
180	269,000	500

Expansion loops and offsets should be constructed with straight pipe and 90 deg Elbows which are solvent cemented together. If threaded pipe is used in the rest of the system, it is still recommended that expansion loops and offsets be constructed with solvent cement in order to better handle the bending stresses incurred during expansion. The expansion loops or offsets should be located approximately at the midpoint of the pipe run and should not have any supports or anchors installed in it. Valves or strainers should not be installed within an expansion loop or offset.

Thermal Stresses

If thermal expansion is not accommodated, it is absorbed in the pipe as an internal compression. This creates a compressive stress in the pipe. The stress included in a pipe which is restrained from expanding in calculated with the following formula.

$$S = Ey\triangle T$$

Where:

S = stress induced in the pipe(psi)
E = modulus of elasticity at maximum temperature (psi).
Y = coefficient of thermal expansion (3.8×10^{-5} in/in/°F for CPVC Pipe
$\triangle T$ = total temperature change in ºF of the system

Because of the coefficient of thermal expansion of steel is 5 times lower than CPVC, dimensional changes due to thermal expansion will be five times less. However as can be seen by the equation above the stress induced in the piping system due to restrained thermal expansion are dependent on the materials modulus as well as its coefficient of thermal expansion.

Because of the modulus of steel is approximately 80 times higher than that of CPVC, the stresses resulting from restrained expansion over a given temperature change will approximately 16 times higher for steel than for CPVC.

For instance, restrained expansion over a 50°F temperature change will be produce approximately 600 psi of stress in a CPVC system, but 9800 psi of stress in a steel system. CPVC's relatively more flexible nature will usually allow it to absorb its lower stress in a buckling or snaking of the line if necessary. Because steel piping is too rigid to buckle, its higher stress are often transferred to surrounding structures, resulting in damaged supports, anchors, or even abutting walls.

The project and local conditions should be considered and the recommendation of construction /design professionals and building department inspectors should be controlling on the thermal expansion and contraction issues.

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Saudi Standards, Metrology and Quality Org.

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تاريخ الإنتهاء : ١٤٣٨/٠٣/٢٢هـ

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BUREAU VERITAS
Certification

BAHRAIN PIPES B.S.C (C)

BUILDING 780, BLOCK 702, ROAD 228, SALMABAD,
P.O.BOX.530, MANAMA - KINGDOM OF BAHRAIN

Bureau Veritas Certification Holding SAS – UK Branch certifies that the Management System of the above organisation has been audited and found to be in accordance with the requirements of the management system standards detailed below

ISO 9001:2008

Scope of certification

MANUFACTURING & SALE OF PVC, CPVC, PP, LDPE, MDPE, HDPE & PB PIPES AND FITTINGS

Original cycle start date: 01-JUNE-2000
Expiry date of previous cycle: 27-JUNE-2016
Recertification Audit date: 31-MAY-2016
Recertification cycle start date: 20-JUNE-2016

Subject to the continued satisfactory operation of the organization's Management System, this certificate expires on: 14-SEPTEMBER-2018

Certificate No. IND 16.4087U /Q

Version: 01, Revision Date: 20-JUNE-2016

Signed on behalf of BVCH SAS UK Branch

Certification body address: 6th Floor, 66 Prescot Street, London E1 8HG, United Kingdom
Local office: Bureau Veritas Certification Bahrain Flat No. 11, Building No. 574, Road 1111, Tubli 711, Kingdom of Bahrain.

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September 19, 2014
Certificate# AQ640 - 01

David Parkin
General Manager, Water Systems

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