

### 8.9.3 Drop in Pressure Owing to Pipe Friction

Pressure drops owing to pipe friction and calculated flow speed depending on peak flow for all pipes of the Plastherm installation system.

Following charts of pressure drops resulting from pipe friction were established in analogy to DIN 1988, Section 3:

**Starting values:**

- Reference temperature 10 °C
- Reference pressure 10 bar
- Absolute roughness of interior pipe wall  $k = 0.007$  mm  
(calculation of pipe friction coefficient  $\lambda$  according to Colebrook-White)

**Note:**

Pressure losses resulting from pipe friction change only insignificantly in the operating temperature range (up to 60 °C) of drinking water systems, there fore it is customary for house installations to calculate with an overall reference temperature of 10 °C (DIN 1988, Section 3, Page 10)

The legal unit used (SI unit) for pressure is the Pa (Pascal) value, however, DIN standard refers to the bar unit or mbar, respectively. Should the loss in pressure required in practice be the Pascal value, the following ratio will apply: 1 mbar = 100 Pa.

Intermediate values not indicated in the tables may be inter polated. It should be noted, however, that no linear functions serve as basis.

Losses in pressure of the Prostab pipes may be seen from the tables of nominal pressure degree PN 20, as the inner pipes have the same dimensions.

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 10**

Peak Flow	DN 15 d <sub>a</sub> = 20 mm d <sub>i</sub> = 16.2 mm v= 0.206 l/m		DN 20 d <sub>a</sub> = 25 mm d <sub>i</sub> = 20.4 mm v= 0.327 l/m		DN 25 d <sub>a</sub> = 32 mm d <sub>i</sub> = 26.0 mm v= 0.531 l/m	
	V <sub>s</sub> l/s	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m
0,01	0,05	0,05	0,02	0,03	0,01	0,02
0,02	0,17	0,10	0,06	0,06	0,02	0,04
0,03	0,33	0,15	0,11	0,09	0,04	0,06
0,04	0,54	0,19	0,18	0,12	0,06	0,08
0,05	0,79	0,24	0,27	0,15	0,09	0,09
0,06	1,07	0,29	0,36	0,18	0,12	0,11
0,07	1,40	0,34	0,47	0,21	0,15	0,13
0,08	1,76	0,39	0,59	0,24	0,19	0,15
0,09	2,16	0,44	0,72	0,28	0,23	0,17
0,10	2,59	0,49	0,87	0,31	0,28	0,19
0,15	5,23	0,73	1,75	0,46	0,55	0,28
0,20	8,69	0,97	2,89	0,61	0,91	0,38
0,25	12,85	1,21	4,27	0,76	1,34	0,47
0,30	17,78	1,46	5,88	0,92	1,85	0,57
0,35	23,40	1,70	7,73	1,07	2,42	0,66
0,40	29,63	1,94	9,80	1,22	3,06	0,75
0,45	36,62	2,18	12,08	1,38	3,77	0,85
0,50	44,31	2,43	14,57	1,53	4,54	0,94
0,60	61,45	2,91	20,15	1,84	6,26	1,13
0,70	81,50	3,40	26,64	2,14	8,26	1,32
0,80	103,66	3,88	33,76	2,45	10,48	1,51
0,90	128,84	4,37	41,80	2,75	12,93	1,70
1,00	156,16	4,85	50,69	3,06	15,62	1,88
1,10	186,32	5,34	60,23	3,37	18,57	2,07
1,20			70,69	3,67	21,71	2,26
1,30			81,79	3,98	25,13	2,45
1,40			93,51	4,28	28,74	2,64
1,50			106,32	4,59	32,54	2,83
1,60			119,79	4,90	36,49	3,01
1,70			133,91	5,20	40,80	3,20
1,80					45,30	3,39
1,90					49,99	3,58
2,00					54,84	3,77
2,10					66,16	3,96
2,20					65,37	4,14
2,30					71,08	4,33
2,40					76,61	4,52
2,50					82,70	4,71
2,60					88,99	4,90
2,70					95,47	5,09
2,80					102,14	5,27

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow  $V_s$**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 10**

Peak Flow	DN 32 $d_a=40\text{ mm}$ $d_i=32.6\text{ mm}$ $v=0.835\text{ l/m}$		DN 40 $d_a=50\text{ mm}$ $d_i=40.8\text{ mm}$ $v=1.307\text{ l/m}$	
	$V_s$ l/s	R mbar/m	v m/s	R mbar/m
0,10	0,10	0,12	0,03	0,08
0,20	0,31	0,24	0,11	0,15
0,30	0,63	0,36	0,22	0,23
0,40	1,04	0,48	0,36	0,31
0,50	1,54	0,60	0,53	0,38
0,60	2,12	0,72	0,73	0,46
0,70	2,78	0,84	0,95	0,54
0,80	3,54	0,96	1,21	0,61
0,90	4,35	1,08	1,49	0,69
1,00	5,26	1,20	1,79	0,76
1,25	7,84	1,50	2,67	0,96
1,50	10,85	1,80	3,68	1,15
1,75	14,36	2,10	4,85	1,34
2,00	18,22	2,40	6,16	1,53
2,25	22,62	2,70	7,62	1,72
2,50	27,37	3,00	9,23	1,91
2,75	32,62	3,29	10,95	2,10
3,00	38,23	3,59	12,84	2,29
3,25	44,17	3,89	14,84	2,49
3,50	50,69	4,19	16,95	2,68
3,75	57,57	4,49	19,25	2,87
4,00	64,80	4,79	21,68	3,06
4,25	72,35	5,09	24,21	3,25
4,50	80,67	5,39	26,85	3,44
4,75			29,60	3,63
5,00			32,61	3,82
5,25			35,56	4,02
5,50			38,81	4,21
5,75			42,19	4,40
6,00			45,67	4,59
6,25			49,00	4,78
6,50			52,70	4,97
6,75			56,50	5,16
7,00			60,41	5,35

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 10**

Peak Flow	DN 50 d <sub>a</sub> = 63 mm d <sub>i</sub> = 51.4 mm v = 2.075 l/m		DN 60 d <sub>a</sub> = 75 mm d <sub>i</sub> = 61.2 mm v = 2.942 l/m		DN 70 d <sub>a</sub> = 90 mm d <sub>i</sub> = 73.6 mm v = 4.254 l/m		DN 90 d <sub>a</sub> = 110 mm d <sub>i</sub> = 90.0 mm v = 6.360 l/m	
	V <sub>s</sub> l/s	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m
0.25	0.05	0.12	0.02	0.08	0.01	0.06	0.00	0.04
0.50	0.18	0.24	0.08	0.17	0.03	0.12	0.01	0.08
0.75	0.36	0.36	0.16	0.25	0.07	0.18	0.03	0.12
1.00	0.59	0.48	0.26	0.34	0.11	0.24	0.04	0.16
1.25	0.88	0.60	0.38	0.42	0.16	0.29	0.06	0.20
1.50	1.21	0.72	0.53	0.51	0.22	0.35	0.08	0.24
1.75	1.60	0.84	0.69	0.59	0.29	0.41	0.11	0.28
2.00	2.03	0.96	0.88	0.68	0.36	0.47	0.14	0.31
2.25	2.50	1.08	1.08	0.76	0.45	0.53	0.17	0.35
2.50	3.02	1.20	1.31	0.85	0.54	0.59	0.21	0.39
2.75	3.59	1.33	1.51	0.93	0.64	0.65	0.24	0.43
3.00	4.21	1.45	1.81	1.02	0.75	0.71	0.29	0.47
3.25	4.84	1.57	2.09	1.10	0.86	0.76	0.33	0.51
3.50	5.53	1.69	2.39	1.19	0.98	0.82	0.37	0.55
3.75	6.29	1.81	2.71	1.27	1.11	0.88	0.42	0.59
4.00	7.05	1.93	3.04	1.36	1.25	0.94	0.48	0.63
4.25	7.87	2.05	3.39	1.44	1.39	1.00	0.53	0.67
4.50	8.74	2.17	3.77	1.53	1.54	1.06	0.59	0.71
4.75	9.63	2.29	4.13	1.61	1.70	1.12	0.65	0.75
5.00	10.56	2.41	4.55	1.70	1.87	1.18	0.71	0.79
5.25	11.58	2.53	4.97	1.78	2.04	1.23	0.77	0.83
5.50	12.57	2.65	5.40	1.87	2.21	1.29	0.84	0.86
5.75	13.67	2.77	5.87	1.95	2.39	1.35	0.91	0.90
6.00	14.72	2.89	6.32	2.04	2.59	1.41	0.98	0.94
6.25	15.88	3.01	6.82	2.12	2.79	1.47	1.06	0.98
6.50	17.08	3.13	7.30	2.21	3.00	1.53	1.14	1.02
6.75	18.32	3.25	7.83	2.29	3.20	1.59	1.21	1.06
7.00	19.59	3.37	8.37	2.38	3.42	1.65	1.30	1.10
7.25	20.90	3.49	8.93	2.46	3.65	1.70	1.38	1.14
7.50	22.24	3.61	9.50	2.55	3.88	1.76	1.47	1.18
7.75	23.61	3.73	10.09	2.63	4.12	1.82	1.56	1.22
8.00	25.01	3.86	10.69	2.72	4.37	1.88	1.65	1.26
8.25	26.44	3.98	11.31	2.80	4.62	1.94	1.75	1.30
8.50	27.91	4.10	11.93	2.89	4.88	2.00	1.84	1.34
8.75	29.40	4.22	12.58	2.97	5.14	2.06	1.94	1.38
9.00	31.10	4.34	13.23	3.06	5.41	2.12	2.05	1.41
9.25	32.66	4.46	13.89	3.14	5.68	2.17	2.15	1.45
9.50	34.25	4.58	14.65	3.23	5.96	2.23	2.25	1.49
9.75	36.07	4.70	15.34	3.31	6.24	2.29	2.36	1.53
10.00	37.72	4.82	16.05	3.40	6.53	2.35	2.47	1.57
10.25	39.40	4.94	16.86	3.48	6.86	2.41	2.58	1.61
10.50	41.34	5.06	17.59	3.57	7.16	2.47	2.69	1.65
10.75	43.07	5.18	18.33	3.65	7.46	2.53	2.82	1.69
11.00	45.10	5.30	19.19	3.74	7.81	2.59	2.94	1.73

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes  
(Continued)

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 10**

Peak Flow V <sub>s</sub> l/s	DN 60 d <sub>a</sub> = 75 mm d <sub>i</sub> = 61.2 mm v= 2.942 l/m		DN 70 d <sub>a</sub> = 90 mm d <sub>i</sub> = 73.6 mm v= 4.254 l/m		DN 90 d <sub>a</sub> = 110 mm d <sub>i</sub> = 90.0 mm v= 6.360 l/m	
	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m	v m/s
11.25	19.95	3.82	8.12	2.64	3.06	1.77
11.50	20.72	3.91	8.44	2.70	3.18	1.81
11.75	21.63	3.99	8.81	2.76	3.32	1.85
12.00	22.43	4.08	9.13	2.82	3.44	1.89
12.25	23.37	4.16	9.46	2.88	3.56	1.93
12.50	24.19	4.25	9.85	2.94	3.71	1.96
12.75	25.17	4.33	10.19	3.00	3.84	2.00
13.00	26.00	4.42	10.59	3.06	3.99	2.04
13.25	27.01	4.50	10.94	3.11	4.12	2.08
13.50	27.87	4.59	11.35	3.17	4.25	2.12
13.75	28.91	4.67	11.71	3.23	4.41	2.16
14.00	29.79	4.76	12.14	3.29	4.55	2.20
14.25	30.86	4.84	12.50	3.35	4.71	2.24
14.50	31.95	4.93	12.94	3.41	4.85	2.28
14.75	32.86	5.01	13.31	3.47	5.02	2.32
15.00	33.98	5.10	13.76	3.53	5.16	2.36
15.25	34.90	5.18	14.14	3.58	5.33	2.40
15.50	36.06	5.27	14.60	3.64	5.47	2.44
15.75	37.23	5.35	15.08	3.70	5.65	2.48
16.00			15.47	3.76	5.80	2.52
16.25			15.95	3.82	5.98	2.55
16.50			16.35	3.88	6.17	2.59
16.75			16.84	3.94	6.31	2.63
17.00			17.35	4.00	6.50	2.67
17.25			17.75	4.05	6.66	2.71
17.50			18.27	4.11	6.85	2.75
17.75			18.80	4.17	7.05	2.79
18.00			19.21	4.23	7.20	2.83
18.25			19.75	4.29	7.41	2.87
18.50			20.29	4.35	7.56	2.91
18.75			20.71	4.41	7.77	2.95
19.00			21.27	4.47	7.98	2.99
19.25			21.83	4.52	8.84	3.03
19.50			22.26	4.58	8.35	3.07
19.75			22.83	4.64	8.57	3.10
20.00			23.42	4.70	8.73	3.14
20.25			24.00	4.76	8.95	3.18
20.50			24.44	4.82	9.17	3.22
20.75			25.04	4.88	9.34	3.26
21.00			25.65	4.94	9.56	3.30
21.25			26.09	4.99	9.79	3.34
21.50			26.71	5.05	9.96	3.38
21.75			27.34	5.11	10.19	3.42
22.00			27.97	5.17	10.43	3.46

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow  $V_s$**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 20**

Peak Flow	DN 10 $d_a= 16 \text{ mm}$ $d_i= 10.6 \text{ mm}$ $v= 0.088 \text{ l/m}$		DN 12 $d_a= 20 \text{ mm}$ $d_i= 13.2 \text{ mm}$ $v= 0.137 \text{ l/m}$		DN 16 $d_a= 25 \text{ mm}$ $d_i= 16.6 \text{ mm}$ $v= 0.216 \text{ l/m}$	
	$V_s$ l/s	R mbar/m	v m/s	R mbar/m	V m/s	R mbar/m
0,01	0,39	0,11	0,14	0,07	0,05	0,05
0,02	1,23	0,23	0,44	0,15	0,15	0,09
0,03	2,44	0,34	0,87	0,22	0,30	0,14
0,04	3,98	0,45	1,41	0,29	0,48	0,18
0,05	5,84	0,57	2,07	0,37	0,70	0,23
0,06	8,00	0,68	2,83	0,44	0,96	0,28
0,07	10,47	0,79	3,69	0,51	1,25	0,32
0,08	13,22	0,91	4,65	0,58	1,57	0,37
0,09	16,24	1,02	5,70	0,66	1,92	0,42
0,10	19,50	1,13	6,86	0,73	2,30	0,46
0,15	39,92	1,70	13,92	1,10	4,66	0,69
0,20	66,61	2,27	23,13	1,46	7,72	0,92
0,25	99,54	2,83	34,38	1,83	11,45	1,16
0,30	138,44	3,40	47,68	2,19	15,80	1,39
0,35	183,23	3,97	62,92	2,56	20,79	1,62
0,40	233,51	4,53	79,92	2,92	26,33	1,85
0,45	289,41	5,10	99,10	3,29	32,55	2,08
0,50	351,24	5,67	119,82	3,65	39,38	2,31
0,55			142,53	4,02	46,68	2,54
0,60			167,44	4,38	54,62	2,77
0,65			193,092	4,75	72,14	3,00
0,70			21,96	5,12	82,09	3,23
0,75			251,39	5,48	92,17	3,47
0,80					103,12	3,70
0,85					114,05	3,93
0,90					125,91	4,16
0,95					138,87	4,39
1,00					151,69	4,62
1,05					164,92	4,85
1,10					179,41	5,08
1,15					193,50	5,31
1,20						5,54

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 20**

Peak Flow	DN 20 d <sub>a</sub> = 32 mm d <sub>i</sub> = 21.2 mm v= 0.352 l/m		DN 25 d <sub>a</sub> = 40 mm d <sub>i</sub> = 26.6 mm v= 0.556 l/m		DN 32 d <sub>a</sub> = 50mm d <sub>i</sub> = 33.2 mm v= 0.866 l/m	
	V <sub>s</sub> l/s	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m
0,05	0,22	0,14	0,08	0,09	0,03	0,06
0,10	0,72	0,28	0,25	0,18	0,09	0,12
0,15	1,46	0,42	0,50	0,27	0,17	0,17
0,20	2,40	0,57	0,82	0,36	0,29	0,23
0,25	3,55	0,71	1,21	0,45	0,42	0,29
0,30	4,89	0,85	1,65	0,54	0,58	0,35
0,35	6,42	0,99	2,17	0,63	0,76	0,40
0,40	8,15	1,13	2,75	0,72	0,95	0,46
0,45	10,04	1,27	3,38	0,81	1,17	0,52
0,50	12,11	1,42	4,06	0,90	1,41	0,58
0,60	16,76	1,70	5,63	1,08	1,95	0,69
0,70	22,07	1,98	7,40	1,26	2,55	0,81
0,80	28,10	2,27	9,39	1,44	3,24	0,92
0,90	34,64	2,55	11,58	1,62	3,99	1,04
1,00	42,01	2,83	14,00	1,80	4,82	1,16
1,10	49,92	3,12	16,64	1,98	5,71	1,27
1,20	58,59	3,40	19,45	2,16	6,65	1,39
1,30	67,80	3,68	22,42	2,34	7,71	1,50
1,40	77,52	3,97	25,64	2,52	8,78	1,63
1,50	88,14	4,25	29,16	2,70	9,95	1,73
1,60	98,83	4,53	32,72	2,88	11,16	1,85
1,70	110,48	4,82	36,58	3,06	12,48	1,96
1,80	122,63	5,10	40,62	3,24	13,80	2,08
1,90	135,95	5,38	44,82	3,42	15,23	2,19
2,00			49,17	3,64	16,72	2,31
2,10			53,67	3,78	18,25	2,43
2,20			58,61	3,96	19,84	2,54
2,30			63,42	4,14	21,58	2,66
2,40			68,70	4,32	23,26	2,77
2,50			73,79	4,50	25,11	2,89
2,60			79,40	4,68	26,89	3,00
2,70			85,18	4,86	28,85	3,12
2,80			91,13	5,04	30,87	3,23
2,90			97,24	5,22	32,78	3,35
3,00			103,51	5,40	34,90	3,47
3,10					37,07	3,58
3,20					39,30	3,70
3,30					41,57	3,81
3,40					43,90	3,93
3,50					46,27	4,04
3,60					48,95	4,16
3,70					51,43	4,27
3,80					53,96	4,39
3,90					56,53	4,51
4,00					59,15	4,62
4,10					62,14	4,74
4,20					64,86	4,85
4,30					67,61	4,97
4,40					70,79	5,08
4,50					73,64	5,20

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 20**

Peak Flow V <sub>s</sub> l/s	DN 40 d <sub>a</sub> = 63 mm d <sub>i</sub> = 42,0 mm v= 1,385 l/m		DN 50 d <sub>a</sub> = 75 mm d <sub>i</sub> = 50,0 mm v= 1,963 l/m		DN 60 d <sub>a</sub> = 90 mm d <sub>i</sub> = 60,0 mm v= 2,827 l/m		DN 90 d <sub>a</sub> = 110 mm d <sub>i</sub> = 73,2 mm v= 4,200 l/m	
	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m	v m/s
0,25	0,03	0,07	0,01	0,05	0,01	0,04	0,01	0,06
0,50	0,09	0,14	0,04	0,10	0,02	0,07	0,03	0,12
0,75	0,19	0,22	0,08	0,15	0,04	0,11	0,07	0,18
1,00	0,31	0,29	0,14	0,20	0,06	0,14	0,11	0,24
1,25	0,46	0,36	0,20	0,25	0,08	0,18	0,16	0,30
1,50	0,94	0,54	0,41	0,38	0,17	0,27	0,22	0,36
1,75	1,56	0,72	0,68	0,51	0,28	0,35	0,29	0,42
2,00	2,32	0,90	1,00	0,64	0,42	0,44	0,37	0,48
2,25	3,21	1,08	1,39	0,76	0,58	0,53	0,46	0,53
2,50	4,22	1,26	1,83	0,89	0,76	0,62	0,55	0,59
2,75	5,36	1,44	2,31	1,02	0,97	0,71	0,66	0,65
3,00	6,62	1,62	2,86	1,15	1,19	0,80	0,77	0,71
3,25	8,02	1,80	3,45	1,27	1,44	0,88	0,88	0,77
3,50	9,52	1,98	4,10	1,40	1,70	0,97	1,01	0,83
3,75	11,16	2,17	4,81	1,53	1,99	1,06	1,14	0,89
4,00	12,90	2,35	5,53	1,66	2,30	1,15	1,28	0,95
4,25	14,74	2,53	6,32	1,78	2,63	1,24	1,43	1,01
4,50	16,74	2,71	7,18	1,91	2,98	1,33	1,59	1,07
4,75	18,85	2,89	8,05	2,04	3,34	1,41	1,75	1,13
5,00	21,06	3,07	8,99	2,16	3,73	1,50	1,92	1,19
5,25	23,36	3,25	9,98	2,29	4,14	1,59	2,09	1,25
5,50	25,74	3,43	11,00	2,42	4,56	1,68	2,27	1,31
5,75	28,21	3,61	12,12	2,55	5,00	1,77	2,46	1,37
6,00	30,94	3,79	13,22	2,67	5,46	1,86	2,67	1,43
6,25	33,76	3,97	14,43	2,80	5,96	1,95	2,86	1,49
6,50	36,49	4,15	15,60	2,93	6,44	2,03	3,08	1,54
6,75	39,51	4,33	16,90	3,06	6,98	2,12	3,29	1,60
7,00	42,63	4,51	18,23	3,18	7,49	2,21	3,51	1,66
7,25	45,85	4,69	19,50	3,31	8,06	2,30	3,75	1,72
7,50	49,16	4,87	20,91	3,44	8,64	2,39	3,99	1,78
7,75	52,57	5,05	22,36	3,57	9,19	2,48	4,24	1,84
8,00	56,06	5,25	23,85	3,69	9,81	2,56	4,47	1,90
8,25			25,38	3,82	10,43	2,65	4,72	1,96
8,50			26,95	3,95	11,08	2,74	4,99	2,02
8,75			28,55	4,07	11,74	2,83	5,26	2,08
9,00			32,04	4,33	13,10	3,01	5,56	2,14
9,25			35,50	4,58	14,60	3,18	5,84	2,20
9,50			39,32	4,84	16,08	3,36	6,13	2,26
9,75			43,31	5,09	17,72	3,54	6,41	2,32
10,00			47,18	5,35	19,30	3,71	6,71	2,38
10,25					21,06	3,89	7,05	2,44
10,50					22,88	4,07	7,35	2,50
10,75					24,76	4,24	7,66	2,55
11,00					26,71	4,42	7,98	2,61
11,25					28,71	4,60	8,35	2,67
11,50					30,77	4,77	8,67	2,73
11,75					32,89	4,95	9,00	2,79
12,00					35,06	5,13	9,38	2,85
12,25					37,28	5,31	9,72	2,91



**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 25**

Peak Flow V <sub>s</sub> l/s	DN 12 d <sub>a</sub> =20 mm d <sub>i</sub> = 12.0 mm v= 0.1132 l/m		DN 15 d <sub>a</sub> = 25 mm d <sub>i</sub> = 15.0 mm v= 0.177 l/m		DN 20 d <sub>a</sub> = 31 mm d <sub>i</sub> = 19.2 mm v= 0.290 l/m	
	R mbar/m	v m/s	R mbar/m	v m/s	R mbar/m	v m/s
0,01	0,22	0,09	0,08	0,06	0,02	0,03
0,02	0,69	0,18	0,24	0,11	0,08	0,07
0,03	1,36	0,27	0,48	0,17	0,15	0,10
0,04	2,21	0,35	0,78	0,23	0,24	0,14
0,05	3,25	0,44	1,13	0,28	0,35	0,17
0,06	4,44	0,53	1,54	0,34	0,48	0,21
0,07	5,79	0,62	2,01	0,40	0,63	0,24
0,08	7,32	0,71	2,53	0,45	0,79	0,28
0,09	8,97	0,80	3,10	0,51	0,96	0,31
0,10	10,78	0,88	3,72	0,57	1,16	0,35
0,15	21,98	1,33	7,56	0,85	2,33	0,52
0,20	36,61	1,77	12,55	1,13	3,85	0,69
0,25	54,55	2,21	18,61	1,41	5,71	0,86
0,30	75,62	2,65	25,74	1,70	7,85	1,04
0,35	99,74	3,09	33,86	1,98	10,31	1,21
0,40	127,15	3,54	43,03	2,26	13,07	1,38
0,45	157,62	3,98	53,16	2,55	16,16	1,55
0,50	191,34	4,42	64,30	2,83	19,49	1,73
0,55	227,58	4,86	76,51	3,11	23,11	1,90
0,60	266,15	5,31	89,52	3,40	27,06	2,07
0,65			103,71	3,68	31,23	2,25
0,70			118,71	3,96	35,61	2,42
0,75			134,47	4,24	40,36	2,59
0,80			150,95	4,53	45,32	2,76
0,85			168,86	4,81	50,72	2,94
0,90			187,58	5,09	56,10	3,11
0,95			207,08	5,38	61,95	3,28
1,00					68,02	3,45
1,05					74,31	3,63
1,10					80,80	3,80
1,15					87,90	3,97
1,20					94,82	4,14
1,25					102,40	4,32
1,30					109,71	4,49
1,35					117,74	4,66
1,40					126,02	4,84
1,45					134,52	5,01
1,50					143,26	5,18
1,55					151,48	5,35

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 25**

Peak Flow V <sub>s</sub> l/s	DN 25 d <sub>a</sub> = 40 mm d <sub>i</sub> = 24.0 mm v= 0.452 l/m		DN 30 d <sub>a</sub> = 50 mm d <sub>i</sub> = 30.0 mm v= 0.707 l/m	
	R mbar/m	v m/s	R mbar/m	v m/s
0,05	0,12	0,11	0,04	0,07
0,10	0,40	0,22	0,14	0,14
0,15	0,81	0,33	0,28	0,21
0,20	1,33	0,44	0,46	0,28
0,25	1,97	0,55	0,68	0,35
0,30	2,70	0,66	0,93	0,42
0,35	3,54	0,77	1,22	0,50
0,40	4,49	0,88	1,55	0,57
0,45	5,52	0,99	1,90	0,64
0,50	6,67	1,11	2,28	0,71
0,60	9,20	1,33	3,16	0,85
0,70	12,12	1,55	4,15	0,99
0,80	15,44	1,77	5,27	1,13
0,90	19,04	1,99	6,48	1,27
1,00	23,00	2,21	7,84	1,41
1,10	27,34	2,43	9,28	1,56
1,20	31,95	2,65	10,85	1,70
1,30	36,98	2,87	12,57	1,84
1,40	42,29	3,09	14,32	1,98
1,50	48,09	3,32	16,21	2,12
1,60	53,93	3,54	18,27	2,26
1,70	60,30	3,76	20,34	2,41
1,80	66,94	3,98	22,58	2,55
1,90	73,85	4,20	24,92	2,69
2,00	81,01	4,42	27,35	2,83
2,10	88,87	4,64	29,86	2,97
2,20	96,55	4,86	32,61	3,11
2,30	104,99	5,08	35,28	3,25
2,40	113,73	5,31	38,04	3,40
2,50			41,06	3,54
2,60			44,19	3,68
2,70			47,17	3,82
2,80			50,46	3,96
2,90			53,85	4,10
3,00			57,33	4,24
3,10			60,89	4,39
3,20			64,54	4,53
3,30			68,28	4,67
3,40			72,09	4,81
3,50			75,99	4,95
3,60			80,39	5,09
3,70			84,46	5,23
3,80			88,61	5,38

**Pressure drops owing to pipe friction R and calculated flow speed v depending on peak flow V<sub>s</sub>**

Polypropylene pipes

Typ 3 in acc. with DIN 8077, nominal pressure degree **PN 25**

Peak Flow V <sub>s</sub> l/s	DN 40 d <sub>a</sub> = 63mm d <sub>i</sub> = 37.8mm v= 1.122 l/m		DN 45 d <sub>a</sub> = 75mm d <sub>i</sub> = 45.0 mm v= 1.590 l/m	
	R mbar/m	v m/s	R mbar/m	v m/s
0,10	0,05	0,09	0,02	0,06
0,20	0,15	0,18	0,07	0,13
0,30	0,31	0,27	0,14	0,19
0,40	0,51	0,36	0,22	0,25
0,50	0,76	0,45	0,33	0,31
0,75	1,55	0,67	0,67	0,47
1,00	2,58	0,89	1,12	0,63
1,25	3,84	1,11	1,66	0,79
1,50	5,32	1,34	2,30	0,94
1,75	7,01	1,56	3,03	1,10
2,00	8,91	1,78	3,85	1,26
2,25	11,06	2,00	4,76	1,41
2,50	13,32	2,23	5,74	1,57
2,75	15,88	2,45	6,81	1,73
3,00	18,62	2,67	7,98	1,89
3,25	21,52	2,90	9,23	2,04
3,50	24,57	3,12	10,54	2,20
3,75	27,91	3,34	11,98	2,36
4,00	31,42	3,56	13,42	2,52
4,25	35,09	3,79	14,99	2,67
4,50	38,92	4,01	16,63	2,83
4,75	43,12	4,23	18,43	2,99
5,00	47,26	4,46	20,20	3,14
5,25	51,81	4,68	22,03	3,30
5,50	56,54	4,90	24,05	3,46
5,75	61,11	5,12	26,14	3,62
6,00	66,16	5,35	28,14	3,77
6,25			30,37	3,93
6,50			32,66	4,09
6,75			35,02	4,24
7,00			37,44	4,40
7,25			39,94	4,56
7,50			42,49	4,72
7,75			45,11	4,87
8,00			48,06	5,03
8,25			50,82	5,19
8,50			53,62	5,34

Determination of total pressure loss of the installation

1. The calculated flow rates of the individual take-off points are summed in a direction opposite to the flow direction and are assigned to the corresponding pipe sections as cumulative flow rates.
2. The pipe dimensions are calculated from the sum of continuous flow rates and peak flow rates.
3. The continuous flow rate is regarded as the quantity which emerges when water is removed for more than 15 minutes, converted to litres per second.
4. Values for the conversion of cumulative flow rates into peak flow rates are shown in diagram 8.9.2..

5. In association with the internal pipe diameter, the peak flow rates determine the pressure gradient due to pipe friction.

6. The total pressure loss of the pipe (without equipment resistances) is the sum of the pressure losses due to pipe friction and individual resistances.

7. The coefficients of resistance of pipeline sections and individual resistances are shown in table 8.9.4..

8. The total pressure loss of the pipe can be determined with the aid of the relevant equation:

$$\Delta P = \sum (R \times L + Z)$$

$$Z = \zeta \cdot \frac{v^2 \cdot \rho}{2}$$

### 8.9.4. Resistance Coefficient Values

Resistance coefficient values  $\zeta_u$  for piping junctions

No	Designation	Graphic Symbols	Loss coefficients	No	Designation	Graphic Symbols	Loss coefficients
1	Branching, one-sided, dividing flow		1.3	16	Narrowing, steady		0.40
2	Branching, one-sided, merging flow		0.9		Reductions		0.50
3	Branching, one-sided, passage for dividing flow		0.3		1 dimensions		0.60
4	Branching, one-sided, passage for merging flow		0.6		2 dimensions		0.70
5	Branching, one-sided, counter-current for merging flow		3.0		3 dimensions		0.80
6	Branching, one-sided, counter-current for dividing flow		1.3		4 dimensions		0.80
7	Branching, one-sided, bow-shaped, dividing flow		0.9		5 dimensions		0.80
8	Branching, one-sided, bow-shaped, merging flow		0.4		6 dimensions		0.90
9	Branching, one-sided, bow-shaped, passage for dividing flow		0.3				
10	Branching, one-sided, bow-shaped, passage for merging flow		0.2				
11	Branching with 2 exit pipes (casing, reservoir)		0.5	17	Smooth comp, tube bend		0.7
12	Branching with 2 entry pipes (casing, reservoir)		1.0		Quill comp, tube bend		1.4
13	Bow 90°, smooth R = d = 2d = 4d = 6d = 10d Bow 90°, rough R = d = 2d = 4d = 6d = 10d		0.21 0.14 0.11 0.09 0.11 0.51 0.30 0.23 0.18 0.20		Corrugated comp, tube		2
14	Elbow joints 90° smooth Elbow joints 90°, rough		1.13 1.27	18	Screw-down stop globe valve		10.0 8.5 7.0 6.0 5.0
15	Widening, steady $\beta = 10^\circ$ = 20° = 30° = 40° Widening, sudden Widening, free discharge		0.20 0.45 0.60 0.75 $\zeta_1 \left(\frac{F_1}{F_2} - 1\right)^2$ 1.0		DN 15 DN 20 DN 25 DN 32 DN 40 to 100		3.5 2.5 2.0 0.7
				19	Full current valves		2 1.5 1 0.7 0.6
				20	Corner valves		4.0 2.0 3.5
				21	Main slide valve		1.0 0.5 0.3
				22	Reflux valve without shut-off		2.5 1.9
					with shut-off		4.6 3.6
				23	Flap trap		1.5 1.2 1.0
					Check valve		15 13
				24	Valve tapping clip		5.0

### 8.9.5. Comparative Table of Nominal Widths

Comparative table of nominal widths for different pipes types

Nominal width acc. DIN 2402	Platherm PP Tye 3 pipes in accordance with DIN 8087			Medium heavy zinc coated threaded pipes acc. DIN 2440	Copper pipes acc. DIN 1754 and 1786	Stainless steel conduct pipes
	PN 10	PN 20	PN 25			
10	...	16x2.7 (10.6)	...	...	12x1.0 (10)	...
12	...	20x3.4 (13.2)	20x4.0 (12)	3/8" (12.5)	15x1.0 (13)	15x1.0 (13)
15	...	...	25x5.0 (15)	...	...	...
16	20x1.9 (16.2)	25x4.2 (16.6)	...	1/2" (16)	18x1.0 (16)	...
20	25x2.3 (20.4)	32x5.4 (21.2)	32x6.4 (19.2)	3/4" (21.6)	22x1.0 (20)	22x1.2 (19.6)
25	32x3.0 (26)	40x6.7 (26.6)	40x8.0 (24)	1" (27.2)	28x1.5 (25)	28x1.2 (25.6)
[30]	...	...	50x10.0 (30)	...	...	...
32	40x3.7 (32.6)	50x8.4 (33.2)	63x12.6 (37.8)	1 1/4" (35.9)	35x1.5 (32)	35x1.5 (32)
40	50x4.6 (40.8)	63x10.5 (42)	75x15.0 (45)	1 1/2" (41.8)	42x1.5 (39)	42x1.5 (39)
50	63x5.8 (51.4)	75x12.5 (50)	...	2" (53)	54x2.0 (50)	54x1.5 (51)
[60]	75x6.9 (61.2)	90x15.0 (60)	...	...	64x2.0 (60)	...
65	...	...	...	2 1/2" (68.8)	...	...
70	90x8.2 (73.6)	110x18.4 (73.2)	...	...	76.1x2.0 (72.1)	76.1x2.0 (72.1)
90	110x10.0 (90)	...	...	...	...	...

As a rule, it is possible to employ smaller pipe widths for Platherm pipes as compared to steel pipes, owing to the considerably lower pipe friction pressure drops in addition to the fact that furring is unlikely.

In most cases, for the most frequently employed Platherm pipes of nominal pressure degree PN 20, experience suggests the following allocation:

Platherm pipe, PN 20	Medium heavy zinc coated steel pipes	
	Dimension [inch]	DN
Diameter [mm]		
16	3/8"	12
20	1/2"	15
25	3/4"	20
32	1"	25
40	1 1/4"	32
50	1 1/2"	40
63	2"	50
75	2 1/2"	65
90	-	-
110	3"	80

In all cases, however, pipe diameters should be determined in accordance with DIN 1988 "Technical Regulations for Drinking water systems". Section 3.

## 9. Installation

### 9.1. Installation Recommendations

- Handling the plastherm installation system does basically not differ from the installation scheme for metallic pipes.
- Fittings and fixtures customary in the trade as well as insulating materials in accordance with the heating installation prescriptions may be applied in the traditional manner.
- Planning and execution of drinking water systems are carried out in conformity with DIN 1988 "Technical Regulations on Drinking Water Systems".
- Use on mixed systems, e.g. during repair work is problem-free.
- The exceedingly small number of tools required, simplifies the processing of entire system.
- Owing to the extensive fitting programme, appropriate moulded parts required for each mode of installation e.g. wall installations are available.
- Coupling with existing plastherm systems can easily be carried out using welding saddles.
- Installations elements subject to frequent use can easily be pre-assembled (welded) in the workshop.

To make sure that our systems are installed in a professional manner, the following recommendations should be observed:

- Avoid the bubbles inside the piping
  - Mount piping upwards towards the tapping point
  - Install aerators and ventilation device at the upper end of the ascending part of the line, evacuation at the lower end
  - Separate cut-offs should be mounted for ascending phases, apartment piping, pressure rinsers, hot water boilers, and garden piping
  - For condensation reasons, the hotter water piping should be mounted above the cold water piping
  - Pipe fittings should always be fixed with inserts to avoid sound transmission
  - Contacts with wall structures ought to be avoided for passages through walls and ceilings to eliminate sound transmission
  - Pipe elongation should be taken into account
- Welding at outdoor temperatures below 0°C is possible only under specific conditions

### 9.2. Welding Operation

The welding operation is simple and fast:



1; Cut the pipe perpendicular to its axis



2; Heat the pipe and the fitting at the same time



3; Within the allowed time interval, connect the pipe and the fitting (do not twist.)



4; Join pipe and fittings. Finished! 100% safe welding

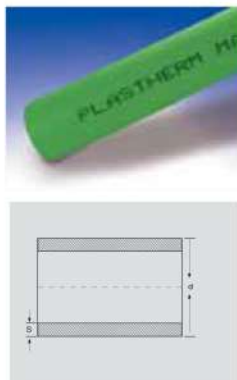
1	2	3	4	5	DVS 2207
External pipe diameter mm	Insert depths mm	Heating period secs	Processing period secs	Cooling period mins	with hand welding device
16	13	5	4	2	
20	14	5			
25	15	7			
32	16.5	8	6	4	with welding machine
40	18	12			
50	20	18			
63	24	24	8	6	
75	26	30	10	8	
90	32	40	10	8	
100	38.5	50	15	10	

Recommended values for welding of PPR pipe at an outdoor temperature of 20 °C and medium air movement (time requirement)

10. Plastherm Products

PPR PIPE PN16 – SDR 7.4

Code	Size	SDR	Packing
PN161	20x2.8mm	7.4	100
PN162	25x3.5mm	7.4	100
PN163	32x4.4mm	7.4	60
PN164	40x5.5mm	7.4	40
PN165	50x6.9mm	7.4	20
PN166	63x8.6mm	7.4	16
PN167	75x10.3mm	7.4	12
PN168	90x12.3mm	7.4	8
PN169	110x15.1mm	7.4	4
PN1610	125x17.1mm	7.4	4
PN1611	160x21.9mm	7.4	2
PN1612	200x23.2mm	9	1
PN1613	250x27.3mm	9	1



PPR PIPE PN20 – SDR 6

Code	Size	SDR	Packing
P0101	20x3.4mm	6	100
P0102	25x4.2mm	6	100
P0103	32x5.4mm	6	60
P0104	40x6.7mm	6	40
P0105	50x8.4mm	6	20
P0106	63x10.5mm	6	16
P0107	75x12.5mm	6	12
P0108	90x15.0mm	6	8
P0109	110x18.4mm	6	4
P01010	125x20.8mm	6	4
P01011	160x26.6mm	6	2
P01012	200x28.3mm	7.4	1
P01013	250x33.3mm	7.4	1

PPR WL FIBER GLASS PIPE PN20 – SDR 7.4

Code	Size	SDR	Packing
PF201	20x2.8mm	7.4	100
PF202	25x3.5mm	7.4	100
PF203	32x4.4mm	7.4	60
PF204	40x5.5mm	7.4	40
PF205	50x6.9mm	7.4	20
PF206	63x8.6mm	7.4	16
PF207	75x10.3mm	7.4	12
PF208	90x12.3mm	7.4	8
PF209	110x15.1mm	7.4	4



PPR W/ FIBER GLASS PIPE PN25 – SDR 6

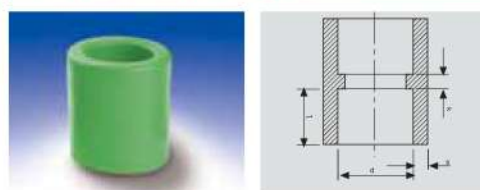
Code	Size	SDR	Packing
P0101	20x3.4mm	6	100
P0102	25x4.2mm	6	100
P0103	32x5.4mm	6	60
P0104	40x6.7mm	6	40
P0105	50x8.4mm	6	20
P0106	63x10.5mm	6	16
P0107	75x12.5mm	6	12
P0108	90x15.0mm	6	8
P0109	110x18.4mm	6	4
P01010	125x20.8mm	6	4
P01011	160x26.6mm	6	2
P01012	200x28.3mm	7.4	1
P01013	250x33.3mm	7.4	1

PPR W/ ALUMINUM PIPE PN25 – SDR 6



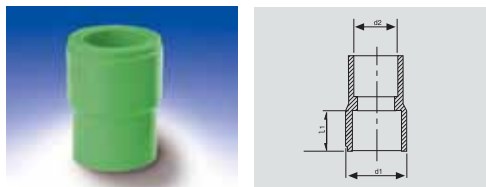
Code	Size	SDR	Packing
PS101	20x3.4mm	6	100
PS102	25x4.2mm	6	100
PS103	32x5.4mm	6	60
PS104	40x6.7mm	6	40
PS105	50x8.4mm	6	20
PS106	63x10.5mm	6	16
PS107	75x12.5mm	6	12
PS108	90x15.0mm	6	8
PS109	110x18.4mm	6	4

SOCKET, EQUAL



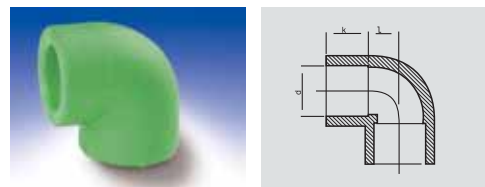
Code	Measure	Box
P0201	20 mm	500
P0202	25 mm	320
P0203	32 mm	200
P0204	40 mm	100
P0205	50 mm	60
P0206	63 mm	32
P0207	75 mm	24
P0208	90 mm	16
P0209	110 mm	10
P0210	125 mm	6

### REDUCER



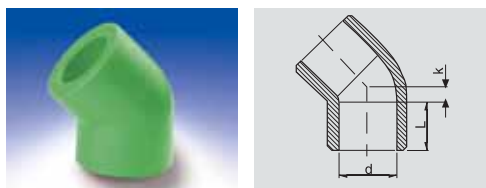
Code	Measure	Box
P0301	25/20 mm	500
P0302	32/20 mm	300
P0303	32/25 mm	300
P0304	40/20 mm	200
P0305	40/25 mm	200
P0306	40/32 mm	160
P0307	50/20 mm	100
P0308	50/25 mm	100
P0309	50/32 mm	80
P0310	50/40 mm	80
P0311	63/25 mm	80
P0312	63/32 mm	80
P0313	63/40 mm	60
P0314	63/50 mm	40
P0315	75/50 mm	40
P0316	75/63 mm	32

### ELBOW 90°



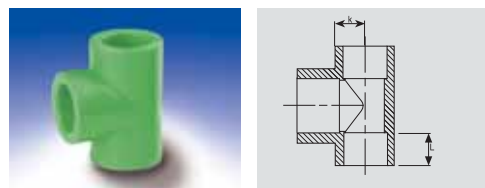
Code	Measure	Box
P0401	20 mm	320
P0402	25 mm	200
P0403	32 mm	100
P0404	40 mm	75
P0405	50 mm	32
P0406	63 mm	20
P0407	75 mm	12
P0408	90 mm	8
P0409	110 mm	3
P0410	125 mm	2

### ELBOW 45°



Code	Measure	Box
P0701	20 mm	400
P0702	25 mm	250
P0703	32 mm	150
P0704	40 mm	75
P0705	50 mm	32
P0706	63 mm	20
P0707	75 mm	12

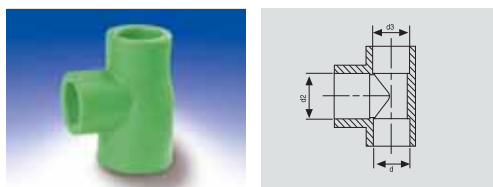
### TEE 90°



Code	Measure	Box
P0801	20 mm	250
P0802	25 mm	150
P0803	32 mm	80
P0804	40 mm	50
P0805	50 mm	30
P0806	63 mm	20
P0807	75 mm	10
P0808	90 mm	5
P0809	110 mm	3
P0810	125 mm	2

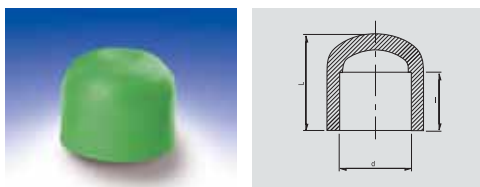


### TEE 90° REDUCING



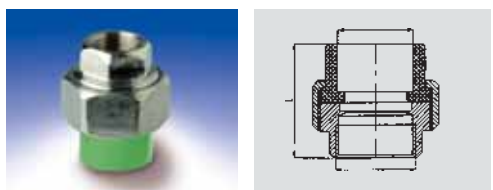
Code	Measure	Box
P0901	25x20x20 mm	180
P0902	25x25x20 mm	180
P0903	25x20x25 mm	180
P0904	32x25x32 mm	100
P0905	32x20x32 mm	100
P0906	32x20x20 mm	100
P0907	32x25x25 mm	100
P0908	32x25x20 mm	100
P0909	32x20x25 mm	100
P0910	32x32x20 mm	100
P0911	32x32x25 mm	100
P0912	40x20x40 mm	100
P0913	40x25x40 mm	100
P0914	40x32x40 mm	100

### END CAP



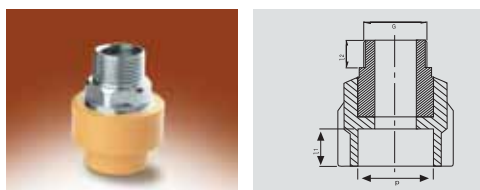
Code	Measure	Box
P1101	20 mm	500
P1102	25 mm	500
P1103	32 mm	240
P1104	40 mm	200
P1105	50 mm	100
P1106	63 mm	50
P1107	75 mm	40

### ADAPTOR UNION PP/BRASS FEMALE THREADED



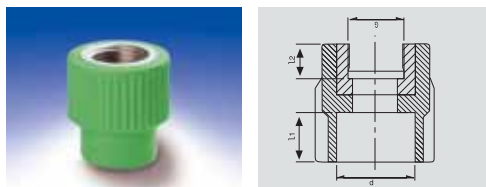
Code	Measure	Box
P3701	20x1/2"	200
P3702	25x3/4"	100
P3703	32x1"	100
P3704	40x1 1/4"	50
P3705	50x1 1/2"	40

### ADAPTOR UNION PP/BRASS MALE THREADED



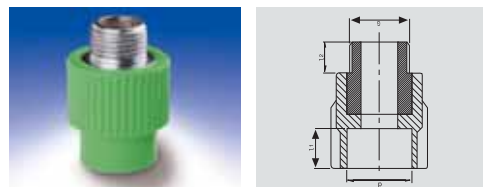
Code	Measure	Box
P3601	20x1/2"	200
P3602	25x3/4"	100
P3603	32x1"	100
P3604	40x1 1/4"	40
P3605	50x1 1/2"	32

**ADAPTOR FEMALE THREADED**



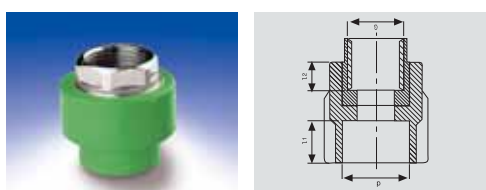
Code	Measure	Box
P1301	20x1/2"	200
P1302	20x3/4"	150
P1303	25x3/4"	150
P1304	25x1/2"	150
P1305	32x3/4"	150
P1306	32x1"	150

**ADAPTOR MALE THREADED**



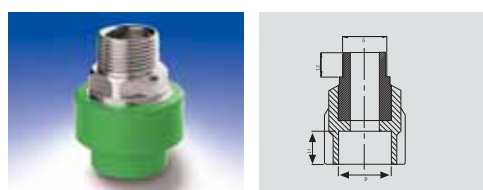
Code	Measure	Box
P1501	20x1/2"	180
P1502	20x3/4"	100
P1503	25x3/4"	100
P1504	25x1/2"	100
P1505	32x3/4"	100
P1506	32x1"	100

**HEXAGONAL ADAPTOR FEMALE THREADED**



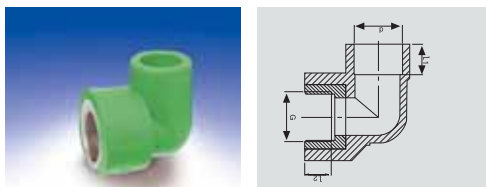
Code	Measure	Box
P1404	32x1"	80
P1405	40x1 1/4"	50
P1406	50x1 1/2"	40
P1407	63x2"	20
P1408	75x2 1/2"	15
P1409	90x3"	8
P1410	110x4"	5
P1411	125x5"	2

**HEXAGONAL ADAPTOR MALE THREADED**



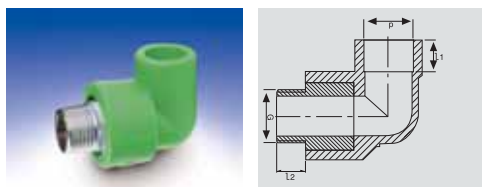
Code	Measure	Box
P1603	32x3/4"	80
P1604	32x1"	80
P1605	40x1 1/4"	40
P1606	50x1 1/2"	32
P1607	63x2"	16
P1608	75x2 1/2"	12
P1609	90x3"	8
P1610	110x4"	5
P1611	125x5"	2

**ELBOW 90° FEMALE THREADED**



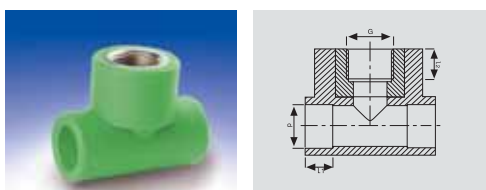
Code	Measure	Box
P1701	20x1/2"	200
P1702	20x3/4"	150
P1703	25x1/2"	150
P1704	25x3/4"	150
P1705	32x3/4"	50
P1706	32x1"	50

**ELBOW 90° MALE THREADED**



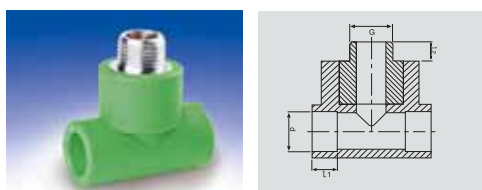
Code	Measure	Box
P1801	20x1/2"	200
P1802	20x3/4"	100
P1803	25x3/4"	100
P1804	32x3/4"	50
P1805	32x1"	50
P1806	25x1/2"	100

**TEE 90° FEMALE THREADED**



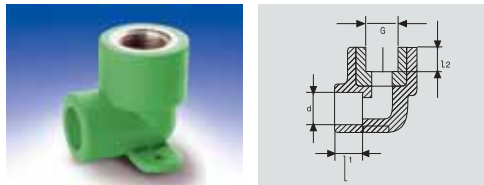
Code	Measure	Box
P1901	20x1/2x20	160
P1902	20x3/4x20	160
P1903	25x1/2x25	100
P1904	25x3/4x25	100
P1905	32x3/4x32	50
P1906	32x1x32	50

**TEE 90° MALE THREADED**



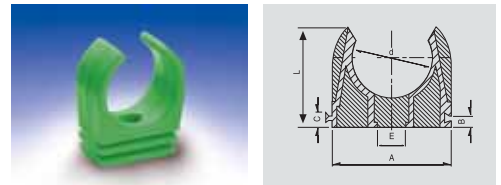
Code	Measure	Box
P2001	20x1/2x20	150
P2002	25x3/4x25	100
P2003	32x1x32	50
P2004	25x1/2x25	100

**FEMALE THREADED BATTERY CONNETTION**



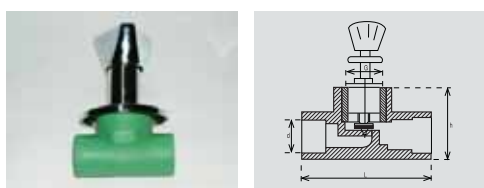
Code	Measure	Box
P1201	20x1/2"	160

**BRACELET**



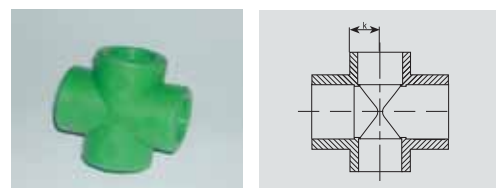
Code	Measure	Box
P2401	20 mm	1000
P2402	25 mm	800
P2403	32 mm	500
P2404	40 mm	300

**VALVE CHROMEPLATED**



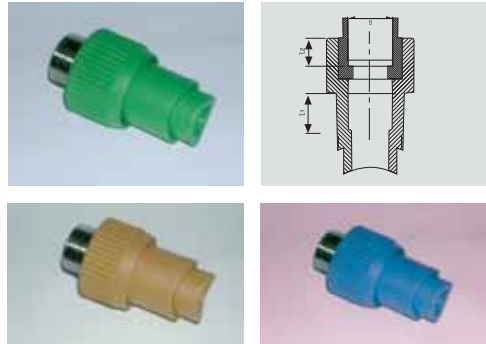
Code	Measure	Box
P2301	20x3/4	50
P2302	25x3/4	50

**CROSS TE**



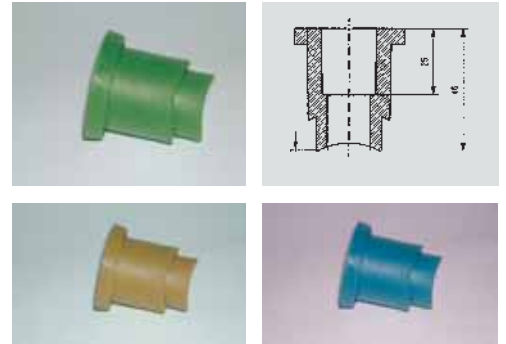
Code	Measure	Box
P0601	20 mm	200
P0602	25 mm	130
P0603	32 mm	60
P0604	40 mm	40

**WELD IN SADDLE ADAPTOR MALE**



Code	Measure	Box
P4001	25x1/2	100
P4002	25x3/4	100

**SOCKET WELD IN SADDLE**



Code	Measure	Box
P2601	25 mm	320

**CROSSOVER PIPE**



Code	Measure	Box
P0501	20 mm	100
P0502	25 mm	60
P0503	32 mm	40

**PLUG**



Code	Measure	Box
P2501	20 mm	1000
P2502	25 mm	800
P2503	32 mm	500

**DOUBLE BRACELET**



Code	Measure	Box
P3301	20 mm	900
P3302	25 mm	720
P3303	22 mm	900
P3304	27 mm	720
P3305	32 mm	720

**CHROMED UPPER PART**



Code	Measure	Box
P4201	3/4	150

**STRAIGHT VALVULA**



Code	Measure	Box
P4101	1/2	150
P4102	3/4	150
P4103	1	100
P4104	1 1/4	60

**CONCEALED CHROME - PLATED**



Code	Measure	Box
P4301	3/4	120

### WELDING MACHINE SET



Code	Measure	Box
P3001		1

### WELDING MACHINE (BIG)



Code	Measure	Box
P3003	50-160 mm	1

### PIPE CUTTER



Code	Measure	Box
P2801	16-40	1
P2802	50-110	1

### ONLY WELDING MACHINE



Code	Measure	Box
P3002	20-50 mm	1

### WELDING SOCKET



Code	Measure	Box
P2701	20 mm	1
P2702	25 mm	1
P2703	32 mm	1
P2704	40 mm	1
P2705	50 mm	1
P2706	63 mm	1
P2707	75 mm	1

### REPAIRING TOOL



Code	Measure	Box
P4401		1

### PIPE PELING APPARAT



Code	Measure	Box
P3501	20-25	1
P3502	32-40	1

### PIN FOR PIPE REPAIR



Code	Measure	Box
P4501		1

### TEMP LATE



Code	Measure	Box
P4801		1

### PLUG FOR REHEARSAL TESTS



Code	Measure	Box
P2901	20 mm	1



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