



**ACO PIPE® System**

# ACO PIPE®

ACO PIPE® stainless steel socketed pipe systems provide the modern metal alternative to plastic and galvanized soil and waste pipeworks. The range is completely compatible with ACO Marine floor gullies and channel systems, which make up the uniquely comprehensive ACO Marine product offering for engineered drainage solutions.

The ACO PIPE® system is manufactured from grade AISI 304 (DIN 1.4301) or AISI 316Ti (DIN 1.4571) Stainless steel fitted with either EPDM or Viton seals.

## Certification

ACO PIPE® socketed stainless steel pipe systems are approved by all major ship registers.

## Hydraulic Performance

### Introduction

Compared to other pipe systems, stainless steel pipes have a considerably smoother bore and in general, stainless steel pipes are less susceptible to internal scaling when compared to most traditional pipe systems.

### Flow Tables

Two sets of flow tables are presented within this design guide. The first table is for pipes installed with varying gradients and the velocity and volumetric flow rate figures are based on the Colebrook-White steady, uniform flow equation using an appropriate roughness coefficient for stainless steel.

## Operating Pressure

The ACO PIPE® socketed stainless steel pipe systems are fitted with a unique, double seal manufactured from either EPDM or Viton. The double seal arrangement provides added security for the ultimate in long term reliability.

## Product Benefits

- Highly corrosion resistant
- Light and easy to handle
- High reliability double sealed jointing system
- Fire resistance
- Simple push-fit assembly
- Low expansion co-efficient
- No painting required
- Aesthetically pleasing
- Electro-polished option
- 100% recyclable

The second table is for pipes installed with level or nearly level gradients where the steady, uniform flow equations are not applicable. The performance figures therefore have been generated from the ACO hydraulic design program that is based on spatially-varied flow theory and which has been verified following full-scale laboratory testing.

This second table will be of particular interest to the designer who is unable to provide a significant gradient due to installation restrictions.

### Self Cleansing Velocity

When draining waste water applications, it is inevitable that sediment deposits will occur within the drainage system.

Some pipe manufacturers often make many claims on self-cleansing velocity, but recent research has shown that there are no unique design criteria to achieve a self-cleansing installation.

This is because the sediment type, size, concentration, flow rates and pipe size all play an important part in the self-cleansing process.

Sediment and scale deposits will reduce the flow rate through any pipe system and it is recommended that an allowance is made for this within the design.

The ACO PIPE® system is approved for operating pressure in gravity and vacuum systems.



**Table 1a. Full Bore Flow Rate Tables for Varying Gradients**

*For rainwater/storm drainage applications* – Roughness Coefficient  $k_s = 0.6$  mm

Flow rates based on Colebrook-White formula.

**Roughness Coefficient  $k_s = 0.6$  mm**

Gradient (%)	Pipe Dia 50 mm		Pipe Dia 75 mm		Pipe Dia 110 mm		Pipe Dia 160 mm	
	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)
10.0	2.71	1.50	8.33	1.99	23.65	2.58	63.82	3.30
7.5	2.35	1.30	7.21	1.72	20.46	2.23	55.22	2.85
5.0	1.91	1.06	5.87	1.40	16.68	1.82	45.03	2.33
4.5	1.81	1.00	5.57	1.33	15.81	1.73	42.70	2.21
4.0	1.71	0.94	5.24	1.25	14.90	1.63	40.24	2.08
3.5	1.59	0.88	4.90	1.17	13.93	1.52	37.62	1.94
3.0	1.47	0.81	4.53	1.08	12.89	1.41	34.81	1.80
2.5	1.34	0.74	4.13	0.99	11.75	1.28	31.75	1.64
2.0	1.20	0.66	3.69	0.88	10.49	1.15	28.36	1.47
1.5	1.03	0.57	3.19	0.76	9.07	0.99	24.52	1.27
1.0	0.84	0.46	2.59	0.62	7.38	0.81	19.96	1.03
0.9	0.79	0.44	2.45	0.59	6.99	0.76	18.92	0.98
0.8	0.75	0.41	2.31	0.55	6.58	0.72	17.82	0.92
0.7	0.70	0.39	2.16	0.52	6.15	0.67	16.65	0.86

For shallow gradients, the Colebrook-White formula underestimates flow rates, for example, when gradient tends to 0%, velocity also tends to zero. As a result, the shaded area above gives lower flow rates than shown in Table 2.

For level or nearly level installations, spatially varied flow tables should be used and refer to Table 2.

**Table 1b. Full Bore Flow Rate Tables for Varying Gradients**

*For soil/foul water drainage applications* – Roughness Coefficient  $k_s = 1.5 \text{ mm}$

Flow rates based on Colebrook-White formula.

*Roughness Coefficient  $k_s = 1.5 \text{ mm}$*

Gradient (%)	Pipe Dia 50 mm		Pipe Dia 75 mm		Pipe Dia 110 mm		Pipe Dia 160 mm	
	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)	Flow Rate Q (l/s)	Velocity v (m/s)
10.0	2.29	1.27	7.11	1.70	20.39	2.23	55.47	2.87
7.5	1.98	1.09	6.16	1.47	17.65	1.93	48.02	2.48
5.0	1.62	0.89	5.02	1.20	14.40	1.57	39.18	2.02
4.5	1.53	0.85	4.76	1.14	13.66	1.49	37.16	1.92
4.0	1.44	0.80	4.49	1.07	12.87	1.41	35.03	1.81
3.5	1.35	0.75	4.20	1.00	12.04	1.31	32.76	1.69
3.0	1.25	0.69	3.88	0.93	11.14	1.22	30.32	1.57
2.5	1.14	0.63	3.54	0.85	10.16	1.11	27.67	1.43
2.0	1.02	0.56	3.17	0.76	9.08	0.99	24.73	1.28
1.5	0.88	0.49	2.74	0.65	7.86	0.86	21.40	1.11
1.0	0.72	0.40	2.23	0.53	6.40	0.70	17.45	0.90
0.9	0.68	0.37	2.11	0.51	6.07	0.66	16.55	0.85
0.8	0.64	0.35	1.99	0.48	5.72	0.62	15.59	0.81
0.7	0.60	0.33	1.86	0.44	5.35	0.58	14.58	0.75

For shallow gradients, the Colebrook-White formula underestimates flow rates, for example, when gradient tends to 0%, velocity also tends to zero. As a result, the shaded area above gives lower flow rates than shown in Table 2.

For level or nearly level installations, spatially varied flow tables should be used and refer to Table 2.

**Table 2. Full Bore Flow Rate Tables for Level or Nearly Level Gradients**

*Strickler Coefficient = 90. Flow rates based on spatially-varied flow formula.*

Pipe Dia (mm)	Length (m)	Gradient				
		0.0% Flow Rate Q (l/s)	0.5% Flow Rate Q (l/s)	1.0% Flow Rate Q (l/s)	1.25% Flow Rate Q (l/s)	1.5% Flow Rate Q (l/s)
50	5	0.45	0.85	1.20	1.30	1.40
50	10	0.35	0.85	1.20	1.30	1.40
50	15	0.30	0.85	1.20	1.30	1.40
50	20	0.25	0.85	1.15	1.25	1.35

Pipe Dia (mm)	Length (m)	Gradient				
		0.0% Flow Rate Q (l/s)	0.5% Flow Rate Q (l/s)	1.0% Flow Rate Q (l/s)	1.25% Flow Rate Q (l/s)	1.5% Flow Rate Q (l/s)
75	5	1.50	2.50	3.16	3.40	3.60
75	10	1.15	2.40	3.00	3.30	3.60
75	15	1.00	2.40	3.00	3.20	3.40
75	20	0.90	2.30	2.99	3.10	3.20

Pipe Dia (mm)	Length (m)	Gradient				
		0.0% Flow Rate Q (l/s)	0.5% Flow Rate Q (l/s)	1.0% Flow Rate Q (l/s)	1.25% Flow Rate Q (l/s)	1.5% Flow Rate Q (l/s)
110	5	4.50	6.75	8.10	8.55	9.00
110	10	3.60	6.60	8.00	8.43	9.00
110	15	3.20	6.40	7.84	8.20	8.60
110	20	2.80	6.15	7.75	8.15	8.55

Pipe Dia (mm)	Length (m)	Gradient				
		0.0% Flow Rate Q (l/s)	0.5% Flow Rate Q (l/s)	1.0% Flow Rate Q (l/s)	1.25% Flow Rate Q (l/s)	1.5% Flow Rate Q (l/s)
160	5	13.00	16.90	20.06	21.00	22.00
160	10	11.00	16.10	19.40	20.50	21.40
160	15	9.50	16.50	19.31	20.00	20.70
160	20	7.80	16.00	18.69	19.50	20.30

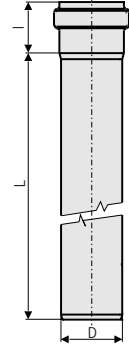
Using spatially varied flow equations and with level, or nearly level pipes, the length to an outlet determines the flow rate through the pipe.

The flow rates shown in Table 2 assume a free outlet from the given pipe length. For installations without a free outlet, this table cannot be reliably used.

## Pipes

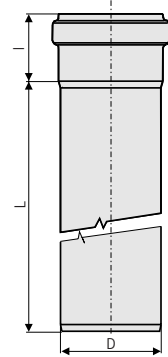
### AP Socketed Pipe 50 mm

<i>D</i> (mm)	<i>Active Length</i> <i>L</i> (mm)	<i>Socket Length</i> <i>l</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	150	42	1.0	0.2	98500	98550
50	250	42	1.0	0.4	98502	98552
50	500	42	1.0	0.7	98504	98554
50	750	42	1.0	1.0	98506	98556
50	1000	42	1.0	1.3	98508	98558
50	1500	42	1.0	1.9	98510	98560
50	2000	42	1.0	2.6	98512	98562
50	3000	42	1.0	3.8	98514	98564



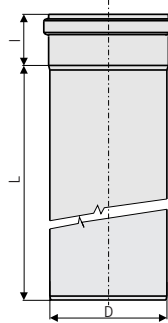
### AP Socketed Pipe 75 mm

<i>D</i> (mm)	<i>Active Length</i> <i>L</i> (mm)	<i>Socket Length</i> <i>l</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
75	150	50	1.0	0.4	98516	98566
75	250	50	1.0	0.6	98518	98568
75	500	50	1.0	1.0	98520	98570
75	750	50	1.0	1.5	98522	98572
75	1000	50	1.0	2.0	98524	98574
75	1500	50	1.0	2.9	98526	98576
75	2000	50	1.0	3.6	98528	98578
75	3000	50	1.0	5.7	98530	98580



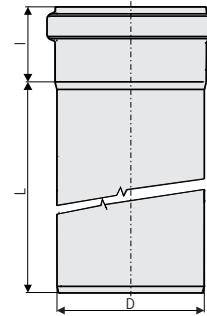
### AP Socketed Pipe 110 mm

<i>D</i> (mm)	<i>Active Length</i> <i>L</i> (mm)	<i>Socket Length</i> <i>l</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
110	150	57	1.0	0.6	98532	98582
110	250	57	1.0	0.9	98534	98584
110	500	57	1.0	1.5	98536	98586
110	750	57	1.0	2.2	98538	98588
110	1000	57	1.0	2.9	98540	98590
110	1500	57	1.0	4.3	98542	98592
110	2000	57	1.0	5.7	98544	98594
110	3000	57	1.0	8.4	98546	98596



## AP Socketed Pipe 160 mm

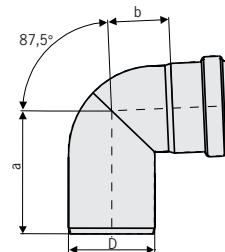
<i>D</i> (mm)	<i>Active Length</i> <i>L</i> (mm)	<i>Socket Length</i> <i>l</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
160	150	70	1.25	1.1	98548	98598
160	250	70	1.25	1.6	98600	98650
160	500	70	1.25	2.9	98602	98652
160	750	70	1.25	4.1	98604	98654
160	1000	70	1.25	5.4	98606	98656
160	1500	70	1.25	7.9	98608	98658
160	2000	70	1.25	10.4	98610	98660
160	3000	70	1.25	15.4	98612	98662



## Fittings

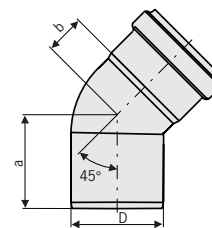
### AP Bend 87.5°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	86	40	1.0	0.2	98700	98750
75	107	53	1.0	0.4	98702	98752
110	134	67	1.0	0.7	98704	98754
160	181	105	1.25	1.7	98706	98756



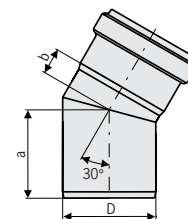
### AP Bend 45°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	62	24	1.0	0.2	98708	98758
75	76	32	1.0	0.3	98710	98760
110	93	42	1.0	0.5	98712	98762
160	131	55	1.25	1.3	98714	98764



### AP Bend 30°

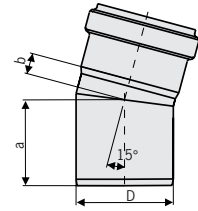
<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	57	16	1.0	0.2	98716	98766
75	71	21	1.0	0.3	98718	98768
110	85	27	1.0	0.5	98720	98770
160	110	40	1.25	1.2	98722	98772



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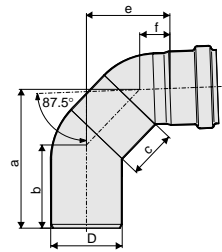
## AP Bend 15°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	54	12	1.0	0.1	98724	98774
75	66	16	1.0	0.3	98726	98776
110	78	15	1.0	0.4	98728	98778
160	99	29	1.25	1.0	98730	98780



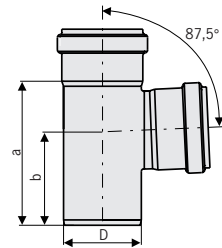
## AP Long Bend 87.5°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	<i>e</i> (mm)	<i>f</i> (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	123	71	50	75	25	0.3	419146	419000
75	146	87	50	88	32	0.47	419148	419002



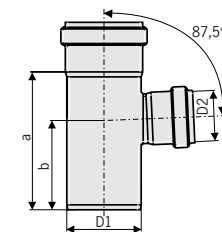
## AP Single Branch 87.5°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	106	71	1.0	0.3	98732	98782
75	139	90	1.0	0.5	98734	98784
110	183	117	1.0	0.8	98736	98786
160	288	184	1.25	2.3	98738	98788



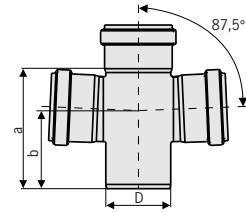
## AP Single Branch Reduction 87.5°

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order <b>304</b> grade	Order <b>316Ti</b> grade
75	50	139	90	1.0	0.3	98928	98930
110	50	183	117	1.0	0.5	98932	98934
110	75	183	117	1.0	0.8	98936	98938
160	110	288	184	1.25	2.3	400691	400693



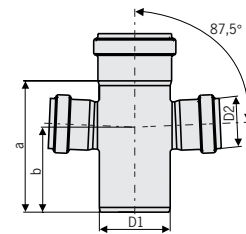
**AP Double Branch 87.5°**

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	106	71	1.0	0.3	98740	98790
75	139	90	1.0	0.6	98742	98792
110	183	117	1.0	0.9	98744	98794
160	288	184	1.25	2.7	98746	98796



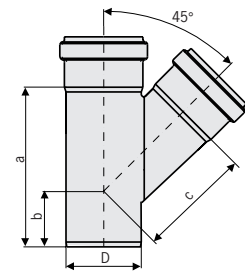
**AP Double Branch Reduction 87.5°**

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order <b>304</b> grade	Order <b>316Ti</b> grade
75	50	139	90	1.0	0.3	98940	98942
110	50	183	117	1.0	0.6	98944	98946
110	75	183	117	1.0	0.9	98900	98902
160	110	288	184	1.25	2.7	400695	400697



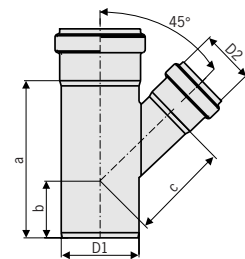
**AP Single Branch 45°**

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	128	57	76	1.0	0.3	98748	98798
75	179	74	110	1.0	0.5	98800	98850
110	233	88	149	1.0	1.0	98802	98852
160	332	119	222	1.25	2.6	98804	98854



**AP Single Branch Reduction 45°**

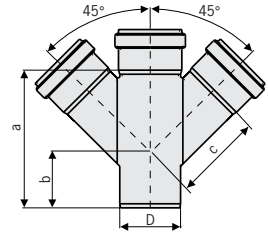
<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order <b>304</b> grade	Order <b>316Ti</b> grade
75	50	144	56	94	1.0	0.3	400661	400663
110	50	147	42	119	1.0	0.5	400665	400667
110	75	182	60	135	1.0	1.0	400669	400671
160	110	332	119	190	1.25	2.6	400699	400701



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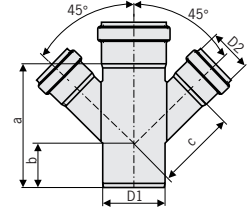
## AP Double Branch 45°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
75	128	57	76	1.0	0.4	98806	98856
110	179	74	110	1.0	0.7	98808	98858
110	233	88	149	1.0	1.2	98810	98860
160	332	184	222	1.25	3.5	98812	98862



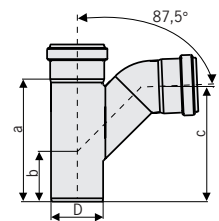
## AP Double Branch Reduction 45°

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall thickness (mm)	Weight (kg)	Order <b>304</b> grade	Order <b>316Ti</b> grade
75	50	144	56	94	1.0	0.4	400673	400675
110	50	147	42	119	1.0	0.7	400677	400679
110	75	182	60	135	1.0	1.2	400681	400683
160	110	332	119	190	1.25	3.5	400703	400705



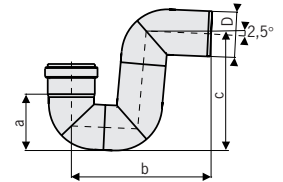
## AP Swept Branch 87.5°

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	128	57	117	1.0	0.3	98814	98864
75	179	74	157	1.0	0.6	98816	98866
110	233	88	209	1.0	1.1	98818	98868
160	332	184	302	1.25	2.8	98820	98870



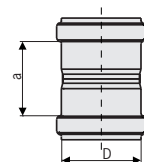
## AP P-Trap

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	68	187	149	1.0	0.5	98822	98872
75	94	232	193	1.0	0.7	98824	98874
110	132	300	254	1.0	1.3	98826	98876
160	190	404	347	1.25	3.3	98828	98878



## AP Straight Coupling

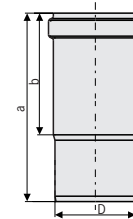
<i>D</i> (mm)	<i>a</i> (mm)	Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	54	1.0	0.1	98920	98970
75	75	1.0	0.2	98922	98972
110	84	1.0	0.4	98924	98974
160	110	1.25	0.8	98926	98976



Order numbers of products equipped with Viton seal on request.

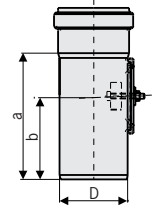
**AP Expansion Socket**

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>Wall</i> <i>Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	102	159	1.0	0.2	98664	98666
75	113	175	1.0	0.3	98668	98670
110	121	200	1.0	0.5	98672	98674
160	170	292	1.25	1.4	98676	98678



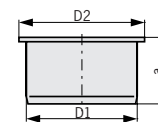
**AP Access Unit**

<i>D</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>Wall</i> <i>Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
75	139	90	1.0	0.5	98913	98963
110	183	117	1.0	0.8	98915	98965
160	288	184	1.25	2.3	98917	98967



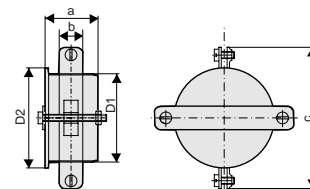
**AP Socket Plug**

<i>D1</i> (mm)	<i>a</i> (mm)	<i>D2</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	42	58	0.1	98888
75	42	85	0.3	98889
110	42	120	0.5	98890
160	47	170	0.5	98891



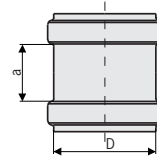
**AP Socket Plug with Clamp**

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>b</i> (mm)	<i>c</i> (mm)	<i>Weight</i> (kg)	<i>Order</i> <b>316Ti</b> <i>grade</i>
50	58	45	18	88	0.4	419138
75	85	45	20	120	0.55	419139
110	120	45	22	167	0.8	419140
160	170	50	22	214	1.1	419141



## AP Repair Coupling

<i>D</i> (mm)	<i>a</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	44	1.0	0.1	98830	98880
75	46	1.0	0.2	98832	98882
110	52	1.0	0.3	98834	98884
160	76	1.25	0.7	98836	98886



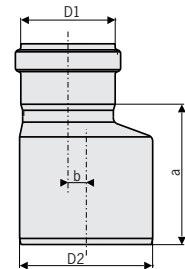
Repair Couplings are used to aid a convenient repair to a damaged in-situ pipe. Unlike the standard Straight Coupling, there is no central registration to limit the insertion depth of the pipe.

The Repair Coupling slides completely over a pipe joint and simply re-positioned to bridge the required pipe joint.

Installation tip: mark the final position of the repair coupling on the installed pipe system to ensure the coupling seals are positioned symmetrically about the pipe joint.

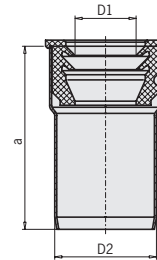
## AP Eccentric Increaser Coupling

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>Offset b</i> (mm)	<i>Wall Thickness</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	75	88	7	1.0	0.31	98892
50	110	103	25	1.0	0.38	98978
75	110	116	15	1.0	0.52	98894
110	160	123	22	1.25	1.12	98896



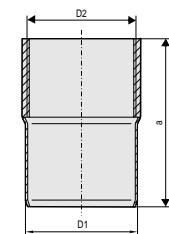
## AP Increaser Connector

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
32	50	90	0.15	419373
40	50	90	0.15	419374



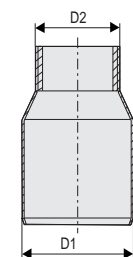
## AP Connector with inner Screw and Spigot

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>a</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	1 1/4"	72	0.2	98956
50	1 1/2"	75	0.28	98957
50	2"	80	0.3	98958



## AP Connector with outer Screw and Spigot

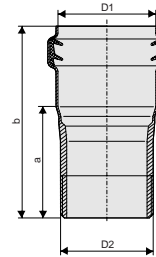
<i>D1</i> (mm)	<i>D2</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	1 1/4"	0.2	419330
50	1 1/2"	0.28	419331
50	2"	0.3	419332



Order numbers of products equipped with Viton seal on request.

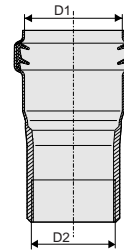
## AP Connector with Socket and outer Screw

D1 (mm)	D2 (mm)	a (mm)	b (mm)	Weight (kg)	Order No <b>316Ti</b> grade
50	1 1/4"	58	100	0.2	419250
50	1 1/2"	58	100	0.25	419252
50	2"	58	100	0.3	419254



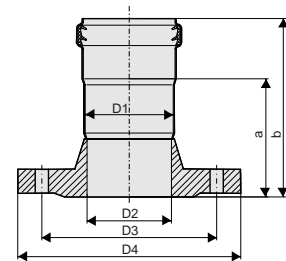
## AP Connector with Socket and inner Screw

D1 (mm)	D2 (mm)	Seal material	Weight (kg)	Order No <b>316Ti</b> grade
50	1 1/4"	EDPM	0.2	419333
50	1 1/2"	EDPM	0.25	419335
50	2"	EDPM	0.3	419337



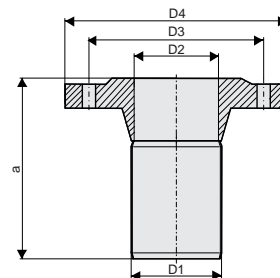
## AP Connector with Socket and Flange

D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	a (mm)	b (mm)	Weight (kg)	Order No <b>316Ti</b> grade
50	DN 40	110	150	100	142	2.25	419256
50	DN 50	125	165	100	142	2.65	419258
75	DN 65	145	185	100	150	3.35	419260
110	DN 100	180	220	100	157	4.85	419262



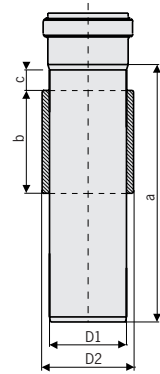
## AP Connector with Flange and Spigot

D1 (mm)	D2 (mm)	D3 (mm)	D4 (mm)	a (mm)	Weight (kg)	Order <b>316Ti</b> grade
50	DN 40	110	150	150	2.25	419264
50	DN 50	125	165	150	2.65	419265
75	DN 65	145	185	150	3.3	419266
110	DN 100	180	220	150	4.85	419267



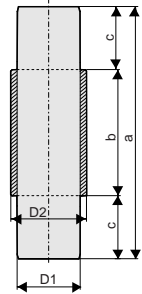
## AP Penetration Pipe

D1 (mm)	D2 (mm)	a (mm)	b (mm)	c (mm)	Pipe Wall Thickness (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	60	150	50	33	1.0	0.5	419060	98990
50	60	250	100	33	1.0	1.0	419062	98898
50	60	500	100	33	1.0	1.3	419064	98980
75	85	150	50	24	1.0	0.8	419068	98982
75	85	250	100	24	1.0	1.5	419070	98950
75	85	500	100	24	1.0	2.0	419072	98984
110	120	150	50	18	1.0	1.0	419076	98986
110	120	250	100	18	1.0	2.1	419078	98952
110	120	500	100	18	1.0	2.5	419080	98988
160	170	250	100	10	1.25	3.2	419084	98954



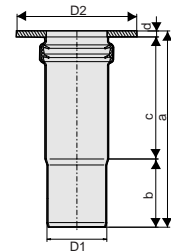
## AP Toilet Penetration

D1 (mm)	D2 (mm)	a (mm)	b (mm)	c (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	60	200	100	50	1.0	419272	419273



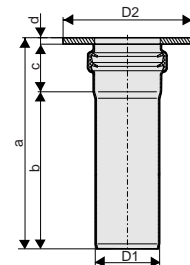
## AP Flange Penetration with Expansion Socket

D1 (mm)	D2 (mm)	a (mm)	b (mm)	c (mm)	d (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	100	164	57	102	5	0.6	419088	419006
75	125	180	62	113	5	1.0	419094	419008
110	160	205	79	121	5	1.25	419100	419010



## AP Flange Penetration with Standard Socket

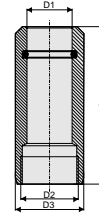
D1 (mm)	D2 (mm)	a (mm)	b (mm)	c (mm)	d (mm)	Weight (kg)	Order No <b>304</b> grade	Order No <b>316Ti</b> grade
50	100	89	42	42	5	0.5	419090	419022
50	100	164	117	42	5	0.6	419092	419024
75	125	105	50	50	5	0.85	419096	419026
75	125	180	125	50	5	1.0	419098	419028
110	160	117	55	57	5	1.0	419102	419030
110	160	205	143	57	5	1.25	419104	419032



Order numbers of products equipped with Viton seal on request.

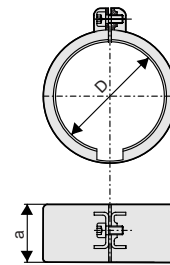
## AP Wash Basin Penetration

<i>D1</i> (mm)	<i>D2</i> (mm)	<i>D3</i> (mm)	<i>a</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>304</b> <i>grade</i>	<i>Order No</i> <b>316Ti</b> <i>grade</i>
32	1 1/4"	50	115	1.0	419132	419012



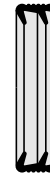
## AP Socket Clamp

<i>D</i> (mm)	<i>a</i> (mm)	<i>Weight</i> (kg)	<i>Order No</i> <b>316Ti</b> <i>grade</i>
50	40	0.07	419134
75	40	0.21	419135
110	43	0.3	419136
160	45	0.4	419137



## AP Pipe Seal

<i>Nominal</i> <i>Pipe Dia</i> (mm)	<i>Pack</i> <i>Quantity</i>	<i>Weight</i> (kg)	<i>Order No</i> <b>EPDM</b>	<i>Order No</i> <b>Viton</b>
50	1	0.01	98400	98404
75	1	0.02	98401	98405
110	1	0.04	98402	98406
160	1	0.05	98403	98407



### Note

To aid identification, the seals are colour coded as follows:

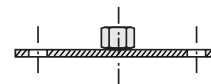
EPDM seals are **BLACK**.

Viton seals are **GREEN**.

## Fixing Accessories

### AP Fixing plate

Weight (kg)	Order No <b>Galvanised Steel</b>	Order No <b>316Ti grade</b>
0.05	400525	400521

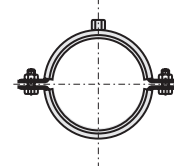


#### Note

Use with support bracket, support pole or for horizontal fixing.

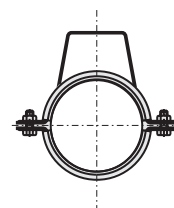
### AP Support Bracket with Rubber

Outside Pipe Dia D (mm)	Weight (kg)	Order No <b>Galvanised Steel</b>	Order No <b>316Ti grade</b>
50	0.14	400533	400529
75	0.23	400534	400530
110	0.33	400535	400531
160	0.39	400536	400532



### AP Support Bracket with Rubber and Stirrup

Outside Pipe Dia D (mm)	Weight (kg)	Order No <b>Galvanised Steel</b>	Order No <b>316Ti grade</b>
50	0.18	400541	400537
75	0.28	400542	400538
110	0.41	400543	400539
160	0.48	400544	400540

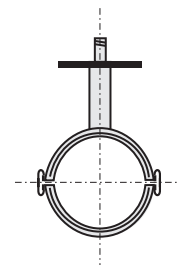


#### Note

Side stress resistant.

### AP Support Bracket with Rubber and Key

Outside Pipe Dia D (mm)	Weight (kg)	Order No <b>Galvanised Steel</b>	Order No <b>316Ti grade</b>
50	0.16	400549	400545
75	0.26	400550	400546
110	0.38	400551	400547
160	0.44	400552	400548



Order numbers of products equipped with Viton seal on request.

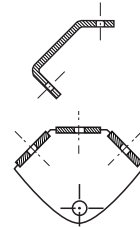
**AP Threaded Support Pole**

<i>Length (mm)</i>	<i>Weight (kg)</i>	<i>Order No Galvanised Steel</i>	<i>Order No 316Ti grade</i>
1000	0.39	400557	400553
90	0.03	400558	400554
40	0.016	400559	400555



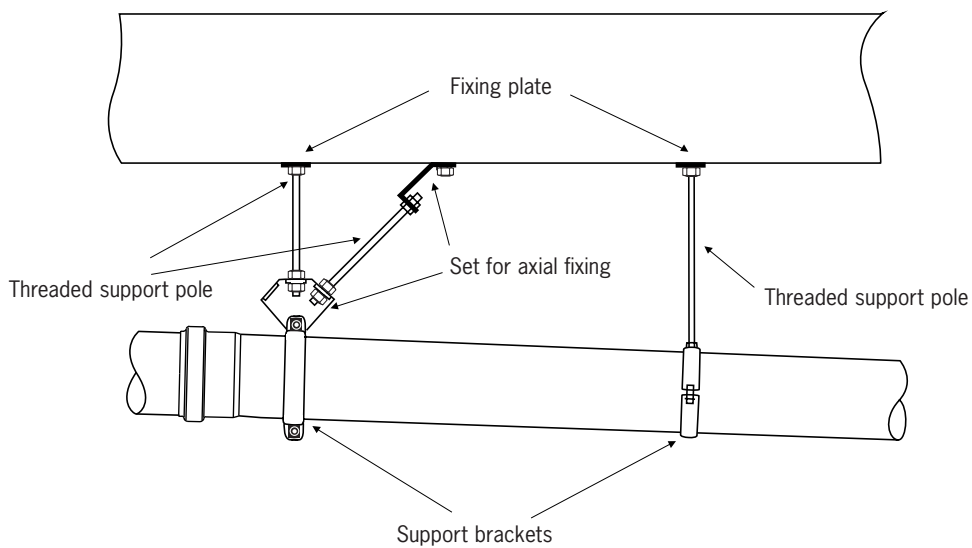
**AP Set for axial fixing**

<i>Weight (kg)</i>	<i>Order No Galvanised Steel</i>	<i>Order No 316Ti grade</i>
0.11	400565	400561



**Note**

Six M8 nuts included.



# ACO PIPE®

## AP ACO PIPE® Cutter Manual 50-110 mm

	Order No
In plastic case	419363
In stainless steel case	419364



## AP Replacement discs for ACO PIPE® Cutters Manual

	Order No
	419365

Minimum Order quantity – 10pcs.

## AP Pipe Cutter Manual

D (mm)	Order No
50-110	400737
110-160	400738

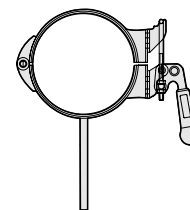


## AP Replacement Manual Cutter Disc

Weight (kg)	Order No
0.05	400578

## AP Holder for Manual Cutting

D (mm)	Order No
50	400739
75	400740
110	400741
160	400742



## AP Lubricant 500 ml

Weight (kg)	Order No
0.6	400520

Lubricant is applied to the seals to aid the installation process.



**Seal Material Data**

**EPDM (Ethylene Propylene Diene Monomer)**

EPDM was originally developed during the 1950's for vehicle tyre applications. It reached wider applications because of its suitability for outdoor use.

**Properties include:**

- ✓ The most water-resistant type of rubber – also very resistant to most water based chemicals.
- ✓ Inert structure and remains stable over long periods of time.
- ✓ Withstands elevated temperatures up to 130 °C for extended periods (months).
- ✓ Easily compounded and processed.

**Limitations**

- ✗ Not resistant to oil or oil based products.

**Viton \***

Viton\* is a fluorocarbon and the best material for resistance to hostile chemical and oil environments at normal and elevated temperatures. This material is widely used in the chemical and pharmaceutical industries, however is significantly more expensive than EPDM.

**Properties include:**

- ✓ Good resistance to water.
- ✓ Good resistance to oils, fuels and most chemicals.

**Limitations**

- ✗ Not resistant to ketone solvents.

\* Du Pont Registered Trade Mark

		<b>EPDM</b>	<b>Viton*</b>
Water Resistance		Excellent	Good
Chemical Resistance	Acids	Good	Excellent
	Bases	Good	Good
Solvent Resistance (20 °C)	Alcohol	Good	Good
	Acetone	Good	Unsuitable
	Benzene	Unsatisfactory	Good
Oil Resistance	ASTM Oil No. 1 @ 20 °C	Fair	Excellent
		@ 100 °C	150 °C Excellent
	ASTM Oil No. 3 @ 20 °C	Unsatisfactory	Excellent
		@ 100 °C	Unsatisfactory
Fuel Resistance	ASTM Fuel B @ 20 °C	Unsatisfactory	Excellent
Resistances	Oxidation	Excellent	Outstanding
	Ozone & Weathering	Outstanding	Outstanding
Heat Resistance	Maximum Continuous	130 °C	205 °C
	Maximum Intermittent	150 °C	300 °C
Low Temperature Resistance		-50 °C	-20 °C
Gas Permeability		Fairly Low	Very Low
Physical Strength		Good	Good
Compression Set Resistance		Good	Good
Tear & Abrasion Resistance		Good	Good
Cost Factor (1 = low)		1	20

## Installation

### Vertical Pipe Stacks

When designing a rainwater or soil and waste system, pipework must be supported at not more than 2 metre centres and vertical pipes should be fixed to the wall not closer than 30mm to facilitate maintenance and painting. Allow at least one bracket per fitting preferably at the downstream end of the fitting with additional brackets at changes of direction or junction points.

### Horizontal Pipe Runs

Horizontal pipework should be supported with at least two brackets per 3 metre pipe length. One bracket should be within 300mm of the pipe joint and the other approximately at the midpoint of the pipe length, but not more than 2 metres from the next bracket. Additional brackets should be used at changes of direction and at junction points immediately downstream of the fitting. Horizontal pipe runs may be installed at a fall of 1 in 50 and feeder connections should be achieved using 45° branches. Where long pipe runs occur i.e. greater than 15 metres, a fixing arm should be attached to the bracket to prevent pendulum movement within the system.

### Thermal Movement

ACO PIPE® stainless steel pipework systems have a low coefficient of thermal expansion, of approximately 1 in 1000mm per 60°C of temperature change. The requirement for thermal tolerance on pipe systems is otherwise confined to hot water conditions. A comparison of approximate thermal movement between different pipe materials in mm per metre with a temperature change of 60°C is given below.

■ Aluminium Alloy	1.44 mm
■ Copper	0.98 mm
■ HDPE	9.0 mm
■ PVCu	3.0 mm
■ Stainless Steel	0.99 mm

Coefficient of linear expansion for various materials are as follows (°K<sup>-1</sup>)

Aluminium	24 x 10 <sup>-6</sup>
Copper	16.4 x 10 <sup>-6</sup>
HDPE	150 x 10 <sup>-6</sup>
PVCu	50 x 10 <sup>-6</sup>
Stainless Steel	16.5 x 10 <sup>-6</sup>

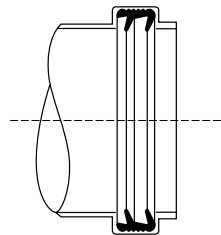
### Pipe Seals

ACO PIPE® sockets are fitted with EPDM seals for regular drainage applications having a practical soil and waste application within working temperatures from - 50 °C to + 130 °C. Where extreme corrosion conditions are required to be managed, it is recommended that ACO PIPE® Viton seal option should be specified.

### Seal Assembly

The double lip seal is easily removed and replaced from the female end of all pipe and fittings. This allows the on-site upgrade of seal material from EPDM to Viton, for example without the need for specialist tools.

**Important:** the seal MUST be fitted as per the diagram and notes below.



### Seal Installation Notes

1. If changing the seal, ensure the correct size and grade of seal is selected for the application. For reference, EPDM seals are BLACK in colour and Viton seals are GREEN. If in doubt, contact ACO Marine for assistance.
2. Ensure the seal itself and the zone around the pipe and/or fitting receiving the seal is clean, dry and free from dust, grit and any metallic particles.

3. Insert the dry seal into the pipe/fitting recess as shown in the above diagram. NOTE: the seal MUST be inserted so the double sealing lips face **away** from the opening of the pipe/fitting.
4. When assembling pipes and fittings, apply lubricant (ACO Order No 400520) sparingly to the lips to aid insertion.
5. Do not use tools to aid the assembly process otherwise damage to the pipes, fittings and seals may occur.

### Pipe Jointing

The assembly of pipe joints is quick and straightforward requiring only a light application of silicone lubricant available from ACO Marine to the pipe seal and the chamfered pipe end. Ensure that the mating ends of the pipes and fittings are clean and free from contamination. Push-fit the pipe end into the socket but do not push fully home into the socket recess so as to allow for thermal expansion within the system.

### Pipe Cutting

If it is necessary to adapt or shorten pipe lengths then whatever tools are used, the cut must be square, clean and ready chamfered. Suitable cutters and whole cutter sets are to offer through this catalogue.

**Care and Maintenance**

**General Information**

All grades of stainless steel will stain and discolour due to surface deposits and can never be accepted as completely maintenance free. In order to achieve maximum corrosion resistance, the surface of the stainless steel must be kept clean. Provided the grade of stainless steel and the surface finish are correctly selected and cleaning schedules carried out on a regular basis, good performance and long service life are assured.

**Factors Affecting Maintenance**

Surface contamination and the formation of deposits must be prevented in order to maintain a durable and hygienic surface.

These deposits may be minute particles of iron or rust from other sources used on the ships of new or refurbished premises and not removed until after the stainless steel drainage products have been installed. Care must be taken to avoid the cutting of carbon steels, including rebar for example and the storage and erection of scaffolding, near to stainless steels without careful protection. Industrial and even naturally occurring atmospheric conditions can produce deposits that can be equally corrosive, e.g. salt deposits from marine conditions.

The working environment also offers more aggressive conditions e.g. high humidity, such as in a swimming pool, increases the speed of discoloration and therefore requires the maintenance to be on a more frequent basis. Modern processes use many cleaners, sterilizers and bleaches for hygienic purposes. All these proprietary solutions, when used in accordance with manufacturers instructions are safe, but if used incorrectly (e.g. warm or concentrated) they can cause discoloration and corrosion on the surface of any quality of stainless steel.

Strong acid solutions are sometimes used to clean masonry and tiling but they should never be permitted to come into contact with metals, including stainless steel. If this should happen the acid solution must be removed immediately by copious applications of clean water.

Wire brushes and wire wool must not be used to remove marks or cement spillage as this will only serve to introduce iron impurities into the material surface.

**Maintenance Programme**

With care taken during fabrication and installation, cleaning before handing over to the client should present no special problems, although more attention than normal may be required if the installation period has been prolonged.

Where surface contamination is suspected, immediate attention to cleaning after site fixing will encourage a trouble free product.

Food and beverage handling, pharmaceutical and chemical applications require extremely high levels of cleanliness applicable to each case.

Advice is often sought concerning the frequency of cleaning stainless steel and the answer is quite simple – clean the metal when it is dirty in order to restore its original appearance. This may vary from once to four times a year for external applications or it may be once a day for an item in hygienic or aggressive applications.

Frequency and cost of cleaning is lower with stainless steel than with many other materials and will often outweigh the initial higher cost of this superior product.

Stainless steel is easy to clean. Washing with soap or mild detergent and warm water followed by a clear water rinse is usually quite adequate for many industrial applications. An enhanced aesthetic

appearance will be achieved if the cleaned surface is finally wiped dry.

**Precautions**

Acids should only be used for on-site cleaning when all other methods have been proved unsatisfactory. Rubber gloves should be used and care taken to see that acid cleaners are not spilt over adjacent areas. Special precautions are necessary with oxalic acid. Solvents should not be used in closed places without adequate ventilation. Smoking must be avoided when using solvents. Manufacturer's directions should be followed.

**Conclusion**

If all the suggestions and actions on the next page have been attempted, stainless steel has the facility to be mechanically cleaned or electropolished by specialists on site, as the material is complete and not a surface plating. Please contact ACO Marine for further assistance.

## Care and Maintenance

<b>Problem</b>	<b>Cleaning Agent</b>	<b>Comments</b>
Routine cleaning.	Soap or mild detergent and water (such as washing up liquid).	Sponge, rinse with clean water, and wipe dry if necessary.
Fingerprints.	Soap or warm water or organic solvent (e.g. acetone, alcohol).	Rinse with clean water, wipe dry if necessary.
Stubborn stains and discolouration.	Mild cleaning solutions (e.g. Cif*, GODDARD'S** STAINLESS STEEL CARE).	Rinse well with clean water and wipe dry.
Oil and grease marks.	Or organic solvents (e.g. acetone, alcohol).	Clean after with soap and water, rinse with clean water and dry.
Rust and other corrosion products.	Oxalic acid. The cleaning solution should be applied with a swab and allowed to stand for 15–20 minutes before being washed away with water. May continue using Cif* to give final clean.	Rinse well with clean water (precautions for acid cleaners should be observed).

\* Trade mark of Unilever plc.

\*\* Trade mark of S C Johnson & Son, Inc.



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