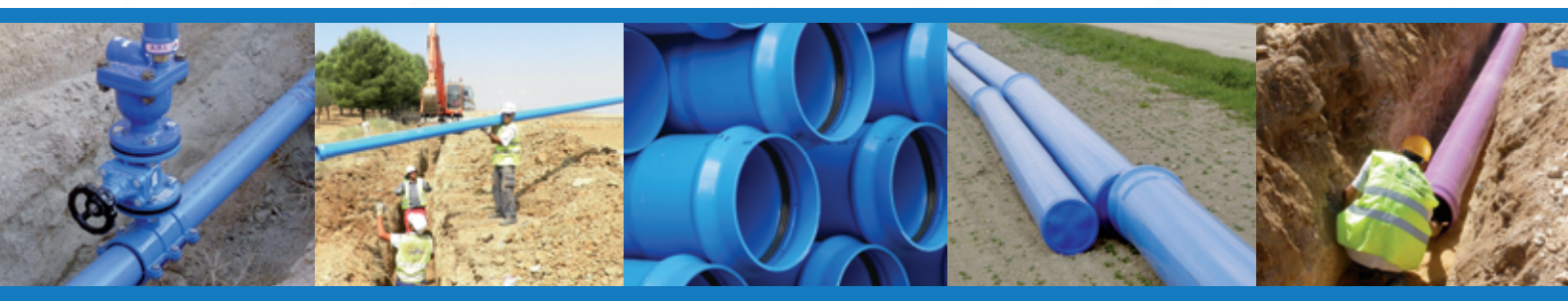
TECHNICAL SHEET

TOM

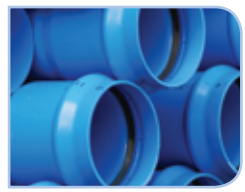
TOM PVC-O High Pressure Oriented PVC Pipes (PVC-O)



MOLECOR

Applicable standards

- **UNE-ISO 16422:2015** (Spain)"Tubos y Uniones de poli(cloruro de vinilo) orientado (PVC-O) para conducción de agua a presión" [Pipes and joints made of oriented unplasticized poly(vinyl chloride) (PVC-O) for the conveyance of water under pressure].
- **NF T54-948:2010** (France) "Tubes en poly(chlorure de vinyle) orienté biaxial (PVC-BO) et leurs assemblages" [Pipes and joints made of biaxially oriented polyvinyl chloride (PVC-BO)].
- **SANS 16422:2007** (South Africa) "Pipes and joints made of oriented unplasticezed pol(vinyl) chloride (PVC-O) for the conveyance of water under pressure".
- **NOM-001-CONAGUA-2011** (Mexico) "Sistema de agua potable, toma domiciliaria y alcantarillado sanitario – Hermeticidad – Especificaciones y métodos de prueba", norma de referencia ISO 16422.



Range and dimensions

Pipe			TOM®							
Material Class			PVC-O 500							
Nominal Pressure (bar)			PN12.5		PN16		PN20		PN25	
Nominal Diameter (DN)	Outside Diameter (OD)		Inside Diameter (ID)	Wall Tickness (e)	Inside Diameter (ID)	Wall Tickness (e)	Inside Diameter (ID)	Wall Tickness (e)	Inside Diameter (ID)	Wall Tickness (e)
	min.	max.	average	min.	average	min.	average	min.	average	min.
mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
90	90,0	90,3	-	-	84,0	2,0	84,0	2,5	82,2	3,1
110	110,0	110,4	104,4	2,2	104,0	2,4	103,2	3,1	101,4	3,8
125	125,0	125,4	118,8	2,5	117,8	2,8	117,0	3,5	115,2	4,3
140	140,0	140,5	133,0	2,8	132,4	3,1	131,2	3,9	129,2	4,8
160	160,0	160,5	152,0	3,2	151,4	3,5	150,0	4,4	147,6	5,5
200	200,0	200,6	190,0	4,0	189,2	4,4	187,4	5,5	184,4	6,9
225	225,0	225,7	213,6	4,5	212,8	5,0	210,8	6,2	207,4	7,7
250	250,0	250,8	237,4	5,0	236,4	5,5	234,2	6,9	230,6	8,6
315	315,0	316,0	299,2	6,3	298,0	6,9	295,2	8,7	290,6	10,8
355	355,0	356,1	337,4	7,1	336,0	7,8	332,4	9,8	327,2	12,2
400	400,0	401,2	379,8	8,0	378,4	8,8	374,8	11,0	369,0	13,7
450	450,0	451,4	427,6	8,9	426,0	9,9	421,4	12,4	415,0	15,4
500	500,0	501,5	474,6	9,9	472,8	11,0	468,6	13,7	461,2	17,1
630	630,0	631,9	597,8	12,6	595,8	13,8	590,4	17,3	581,0	21,6
710	710,0	712,0	674,8	14,2	671,4	15,4	665,6	19,2	654,6	24,4
800	800,0	802,0	760,4	16,3	757,8	17,4	750,4	21,6	-	-

TOM® PVC-O pipes are supplied in total lengths (including length of socket) of 5.95 metres. For other diameters and nominal pressures, please contact us.
The inside diameters may be subjected to variation according to manufacturing tolerances.
Available in blue (supply), purple (reuse) and white (resistant to UV rays). For other colours, please contact us.

Packaging

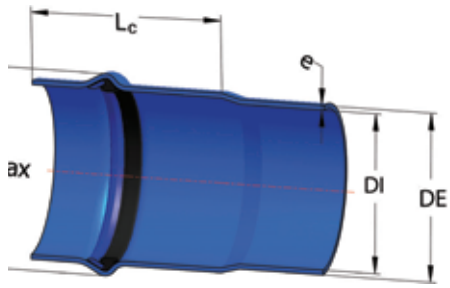
DN	Pipes/ Pallet	Pallet/ Truck	Pipes/ Truck	Meters (1)/ Truck	Pallet Width	Pallet Height	Pallet Length	Pallet Weight		
								PN16	PN20	PN25
mm	pipes	pallet	pipes	m	mm	mm	mm	kg	kg	kg
90	81	16	1296	7711	1220	670	6110	590	590	750
110	76	12	912	5426	1220	850	6130	770	775	940
125	60	12	720	4284	1220	850	6135	710	790	960
140	45	12	540	3213	1220	850	6140	690	740	900
160	33	12	396	2356	1220	800	6150	650	710	870
200	24	12	288	1714	1220	870	6185	690	790	970
225	14	16	224	1333	1220	700	6190	520	600	730
250	11	12	132	785	1100	800	6215	500	580	700
315	13	8	104	619	2200	700	6260	950	1080	1320
355	11	6	66	393	2200	800	6295	1016	1160	1410
400	11	6	66	393	2400	850	6325	1280	1470	1780
450	5	10	50	298	2200	550	6330	750	860	1060
500	4	8	32	190	1950	600	6335	730	840	1020
630	3	6	18	107	1950	730	6410	870	1000	1220
710	3	6	18	107	2200	810	6425	1100	1265	1530
800	3	6	18	107	2200	900	6425	1400	1600	-

(1) Nominal meters (5,95 metres per pipe). The effective length is the total length minus the socket length. Other packagings or lengths, on request.

Connection system and watertight seal

The connection is done by introducing the male part of the pipe in the socket of the other where the elastic joint is placed. The watertight seal includes a Polypropylene ring and a synthetic rubber lip which allows the seal to be integrated with the pipe, avoiding joint displacement or movement while the installation is taking place.

Nominal Diameter (DN)	Socket Length (SL)	Maximum Diameter (D max)	Socket limit mark (1)
mm	mm	mm	mm
90	160	117	125
110	180	140	140
125	185	154	140
140	190	174	145
160	200	197	160
200	235	243	170
225	240	271	180
250	265	301	225
315	310	374	240
355	345	419	275
400	375	472	290
450	380	527	310
500	385	587	315
630	460	734	340
710	475	815	400
800	475	925	400



(1) TOM® pipes have a mark in the spigot, being the socket limit mark to facilitate the process of assembly during installation.

Health standards for drinking water

- Tests according to the Spanish Royal Decree (**RD140/2003**): "Criterios sanitarios de la calidad del agua de consumo humano" .
- **ACS** (Attestation de Conformité Sanitaire) certificate according to the standards of the French Ministry of Health.
- **WRAS** (Water Regulations Advisory Scheme) and **DWI** (Drinking Water Inspectorate) certificates according to the standards of United Kingdom.
- **HYDROCHECK** certificate according to the Belgian requirements by Belgaqua (Federation Belge du Secteur de l'eau).

Pipe marking

The pipes are marked in order to guarantee their traceability:

	N Mark	NF Mark
Manufacturer Company and Trade Mark	MOLECOR TOM	MOLECOR TOM
Product certification (1)	AENOR 001/006537	72/01 NF
Material and Class	PVC - O 500	PVC - BO
Diameter, Wall Tickness and Nominal Diameter	200 x 4,4 - PN 16	200 PN 16 BARS
Coefficient C	C 1,4	-
Date - Hour - Batch	14/7/18 13:07 35065	14/07/18+ 13:07 35065
Reference standard	UNE-ISO 16422 SANS 16422	NF -T54-948

(1) The updated certificates of the certificated references can be downloaded at www.molecor.com

Technical features

MECHANICAL PROPERTIES OF THE PIPE	Pipe TOM® PVC-O 500			
Nominal Pressure (bar)	12.5	16	20	25
Material Class	500			
MRS (MPa)	50			
Overall Service Coefficient (C)	1.4 (1)			
Design Stress (MPa)	36			
Minimum breaking pressure in 50 years (bar) (2)	17.5	22.4	28.0	35.0
Minimum breaking pressure in 10 hours (bar) (2)	25.0	30.0	37.0	48.0
Minimum breaking pressure by burst (bar) (2))	32.0	38.0	48.0	60.0
Maximum trial pressure onsite (bar) (3)	17.5	21.0	25.0	30.0
Circumferential stiffness (kN/m^2) (4)	5	7	11	20
Standard dimension ratio (SDR)	51.0	45.8	36.0	29.0
Short-term Young Modulus (MPa)	4,000	> 4,000		
Axial traction resistance (MPa)	> 48			
Tangential traction resistance (MPa)	> 85			

(1) The applicable French standard NF T54-948 designs with an Overall Service Coefficient of 1.25.
(2) With a temperature of 20 °C.
(3) According to UNE-EN 805:2000 with an estimated Water Hammer.
(4) Average stiffness per pipe according to established tolerances.

OTHER CHARACTERISTICS OF THE MATERIAL	Units	Value
Density	Kg/dm^3	1.35 - 1.46 (1)
PVC Resin k Value	-	> 64
Shore Hardness D at 20 °C	-	81 – 85
Poisson Coefficient	-	0.35 - 0.41
Vicat Temperature	°C	> 80
Lineal expansion coefficient	°C^{-1}	$0.8 \cdot 10^{-4}$
Thermal Conductivity	Kcal/mh°C	0.14 - 0.18
Specific Heat at 20 °C	cal/g°C	0.20 - 0.28
Dielectric stiffness	kV/mm	20 – 40
Dielectric Constant at 60Hz	-	3.2 - 3.6
Transverse resistivity at 20 °C	Ω/cm	> 10^{16}
Absolute roughness (ka)	mm	0.007
Roughness C (Hazen-Williams)	-	150
Manning roughness coefficient (n)	-	0.009

(1) Although the standard allowance includes this range, TOM® PVC-O pipe is between 1.37 and 1.43 kg/dm^3.

Watertight Seal Features	Units	Value
Elastomer hardness	IRHD	60±5

Management of Quality System

Certified by AENOR according to the **UNE-ISO 9001:2015** and **UNE-ISO 14001:2015** standards for the production of PVC-O pipes for high pressure fluid transport: "La producción de tubería de Poli(Cloruro de Vinilo) Orientado (PVC-O) para transporte de fluidos a presión".

AENOR Empresa Registrada UNE-EN ISO 9001 ER-1644 / 2008

AENOR Gestión Ambiental UNE-EN ISO 14001 GA-2014/0250

Pipe tests

	TOM® PVC-O 500			
	PN12.5	PN16	PN 20	PN 25
Tests	Testing Parameters			
Dimensional [1]	Depending on DN			
Density	1370 a 1430 kg/m³			
Impact resistance (0 °C) [2]				
Ø90	98 N·m			
Ø110, Ø125	124 N·m			
Ø140, Ø160	157 N·m			
Ø200	196 N·m			
≥Ø225 - Ø800	245 N·m			
Circumferential stiffness RCE [3]	5	7	11	20
Longitudinal traction resistance	> 48 MPa			
Internal pressure resistance				
10 hours – 20 °C	25.0 bars	30.0 bars	37.0 bars	48.0 bars
1000 hours – 20 °C	22.0 bars	26.0 bars	33.0 bars	42.0 bars
1000 hours – 60 °C	11.5 bars	14.0 bars	17.5 bars	22.0 bars
Internal pressure socket resistance				
10 hours – 20 °C	25.0 bars	30.0 bars	37.0 bars	48.0 bars
Watertightness of joints with internal pressure and angular deflection (20 °C – 2° angle)	0 to 25 bars cycle	0 to 32 bars cycle	0 to 40 bars cycle	0 to 50 bars cycle
Watertightness of joints with negative pressure (20 °C – 2° angle – 5% strain)	Up to -0,8 bars cycle			
Watertightness of joints with cyclic internal pressure (24,000 cycles – 20 °C – no angular deflection nor diametric strain)	6.3 to 12.5 bars cycle	8 to 16 bars cycle	10 to 20 bars cycle	12.5 to 25 bars cycle
Watertightness with long term internal pressure				
1000 hours – 20 °C	17.5 bars	22.4 bars	28.0 bars	35.0 bars
1000 hours – 40 °C	13.8 bars	17.6 bars	22.0 bars	27.5 bars

(1) Average outside diameter, wall thickness, out-of-roundness, socket dimensions, lengths.
(2) Falling weight impact energy (depending on DN) from a 2 meters drop height tested in test-pipes tempered at 0 °C.
(3) Average stiffness per pipe according to established tolerances.

Pipe assemblies and ductile iron fitting tests

	TOM® PVC-O 500		
	PN16	PN20	PN 25
Tests	Testing Parameters		
Watertightness of joints with internal pressure and angular deflection (20 °C – Deflection DN ≤ 315: 3.5 °; 355 ≥ DN ≤ 630 2.5 °)	29.0 bars (2 hours)	35.0 bars (2 hours)	42.5 bars (2 hours)
Watertightness of joints with negative pressure (20 °C – Deflection DN ≤ 315: 3.5 °; 355 ≥ DN ≤ 630 2.5 °)	-0.8 bars (2 hours)		
Watertightness of joints with cyclic internal pressure (24,000 cycles – 20 °C – no angular deflection nor diametric strain)	8 to 16 bars cycle	10 to 20 bars cycle	12.5 to 25 bars cycle

Head loss chart (J): TOM® PVC-O 500 PN16

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

INTERNAL DIAMETER	DN90 PN16 84.0		DN110 PN16 104.0		DN125 PN16 117.8		DN140 PN16 132.4		DN160 PN16 151.4		DN200 PN16 189.2		DN225 PN16 212.8	
Speed	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
(m/s)	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
0.1	0.55	0.16	0.85	0.13	1.09	0.11	1.38	0.09	1.80	0.08	2.80	0.06	3.56	0.05
0.2	1.11	0.58	1.70	0.45	2.18	0.39	2.75	0.34	3.60	0.29	5.62	0.22	7.11	0.20
0.3	1.66	1.23	2.55	0.96	3.27	0.83	4.13	0.72	5.40	0.62	8.43	0.48	10.70	0.42
0.4	2.22	2.09	3.40	1.63	4.36	1.41	5.51	1.23	7.20	1.05	11.20	0.81	14.20	0.71
0.5	2.77	3.17	4.25	2.47	5.45	2.13	6.88	1.86	9.00	1.59	14.10	1.23	17.80	1.07
0.6	3.33	4.44	5.10	3.46	6.54	2.99	8.26	2.61	10.80	2.23	16.90	1.72	21.30	1.50
0.7	3.88	5.90	5.95	4.60	7.63	3.98	9.64	3.47	12.60	2.97	19.70	2.29	24.90	1.99
0.8	4.43	7.56	6.80	5.89	8.72	5.09	11.00	4.44	14.40	3.80	22.50	2.93	28.50	2.55
0.9	4.99	9.40	7.65	7.33	9.81	6.34	12.40	5.53	16.20	4.73	25.30	3.64	32.00	3.18
1.0	5.54	11.43	8.49	8.91	10.90	7.70	13.80	6.72	18.00	5.75	28.11	4.43	35.60	3.86
1.1	6.10	13.60	9.34	10.60	12.00	9.20	15.10	8.02	19.80	6.85	30.90	5.28	39.10	4.61
1.2	6.70	16.00	10.20	12.50	13.10	10.80	16.50	9.42	21.60	8.05	33.70	6.21	42.70	5.41
1.3	7.20	18.60	11.00	14.50	14.20	12.50	17.90	10.92	23.40	9.34	36.50	7.20	46.20	6.28
1.4	7.80	21.30	11.90	16.60	15.30	14.40	19.30	12.50	25.20	10.70	39.40	8.26	49.80	7.20
1.5	8.30	24.20	12.70	18.90	16.30	16.30	20.70	14.20	27.00	12.20	42.22	9.39	53.30	8.18
1.6	8.90	27.30	13.60	21.30	17.40	18.40	22.00	16.00	28.80	13.70	44.00	10.60	56.90	9.22
1.7	9.40	30.50	14.40	23.80	18.50	20.60	23.40	18.00	30.60	15.40	47.80	11.80	60.50	10.32
1.8	10.00	33.90	15.30	26.40	19.60	22.90	24.80	20	32.40	17.10	50.60	13.20	64.00	11.50
1.9	10.50	37.50	16.10	29.20	20.70	25.30	26.20	22.10	34.20	18.90	53.40	14.50	67.60	12.70
2.0	11.10	41.20	17.00	32.10	21.80	27.80	27.50	24.30	36.00	20.70	56.20	16.00	71.10	13.90
2.1	11.60	45.10	17.80	35.20	22.90	30.40	28.90	26.50	37.80	22.70	59.00	17.50	74.70	15.30
2.2	12.20	49.20	18.70	38.40	24.00	33.20	30.30	28.90	39.60	24.70	61.90	19.10	78.20	16.60
2.3	12.70	53.40	19.50	41.60	25.10	36.00	31.70	31.40	41.40	26.90	64.70	20.70	81.80	18.10
2.4	13.30	57.80	20.40	45.10	26.20	39.00	33.00	34.00	43.20	29.10	67.50	22.40	85.40	19.50
2.5	13.90	62.40	21.20	48.60	27.20	42.00	34.40	36.70	45.00	31.40	70.30	24.20	88.90	21.10
2.6	14.40	67.10	22.10	52.30	28.30	45.20	35.80	39.40	46.80	33.70	73.10	26.00	92.50	22.70
2.7	15.00	71.90	22.90	56.00	29.40	48.50	37.20	42.30	48.60	36.20	75.90	27.90	96.00	24.30
2.8	15.50	76.90	23.80	59.90	30.50	51.80	38.50	45.20	50.40	38.70	78.72	29.80	99.60	26.00
2.9	16.10	82.10	24.60	64.00	31.60	55.30	39.90	48.30	52.20	41.30	81.50	31.80	103.10	27.70
3.0	16.60	87.40	25.50	68.10	32.70	58.90	41.30	51.40	54.00	43.90	84.30	33.90	106.70	29.50
3.1	17.20	92.90	26.30	72.40	33.80	62.60	42.70	54.60	55.80	46.70	87.20	36.00	110.30	31.40
3.2	17.70	98.50	27.20	76.80	34.90	66.40	44.10	57.90	57.60	49.50	90.00	38.20	113.80	33.30
3.3	18.30	104.30	28.00	81.30	36.00	7030	45.40	61.30	59.40	52.40	92.80	40.40	117.40	35.20
3.4	18.80	110.20	28.90	85.90	37.10	74.30	46.80	64.80	61.20	55.40	95.60	42.70	120.90	37.20
3.5	19.40	116.30	29.70	90.60	38.10	78.40	48.20	68.40	63.00	58.50	98.40	45.10	124.50	39.30
3.6	20.00	122.50	30.60	95.50	39.20	82.60	49.60	72.00	64.80	61.60	101.20	47.50	128.00	41.40
3.7	20.50	128.90	31.40	100.50	40.30	86.90	50.90	75.80	66.60	64.80	104.00	50.00	131.60	43.60
3.8	21.10	135.40	32.30	105.50	41.40	91.30	52.30	79.60	68.40	68.10	106.80	52.50	135.20	45.80
3.9	21.60	142.10	33.10	110.70	42.50	95.80	53.70	83.50	70.20	71.44	109.60	55.10	138.70	48.00
4.0	22.20	148.90	34.00	116.10	43.60	100.30	55.10	87.60	72.00	74.90	112.50	57.70	142.30	50.30

The values for TOM® PN12.5 are very similar to those for the previous ones which means that the same table may be used for calculations.
Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

Head loss chart (J): TOM® PVC-O 500 PN16

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

DN250 PN16 236.4		DN315 PN16 298.0		DN355 PN16 336.0		DN400 PN16 378.4		DN450 PN16 426.0		DN500 PN16 472.8		DN630 PN16 595.8		DN710 PN16 671.4		DN800 PN16 757.8	
Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
4.39	0.05	6.97	0.04	8.87	0.03	11.20	0.03	14.30	0.02	17.60	0.02	27.90	0.02	35.40	0.01	45.10	0.01
8.78	0.17	13.90	0.13	17.70	0.12	22.50	0.10	28.50	0.09	35.10	0.08	55.80	0.06	70.80	0.05	90.20	0.04
13.20	0.37	20.90	0.28	26.60	0.24	33.70	0.21	42.80	0.18	52.70	0.16	83.60	0.12	106.20	0.11	135.30	0.09
17.60	0.63	27.90	0.48	35.50	0.42	45.00	0.36	57.00	0.31	70.20	0.28	111.50	0.21	141.60	0.19	180.40	0.16
21.90	0.95	34.90	0.72	44.30	0.63	56.20	0.55	71.30	0.48	87.80	0.42	139.40	0.32	177.00	0.28	225.50	0.24
26.30	1.33	41.80	1.01	53.20	0.88	67.50	0.77	85.50	0.67	105.30	0.59	167.30	0.45	212.40	0.39	270.60	0.34
30.70	1.76	48.80	1.35	62.10	1.17	78.70	1.02	99.80	0.89	122.90	0.79	195.20	0.60	247.80	0.52	315.70	0.45
35.10	2.26	55.80	1.72	70.90	1.50	90.00	1.30	114.00	1.14	140.50	1.01	223.00	0.77	283.20	0.67	360.80	0.58
39.50	2.81	62.80	2.14	79.80	1.86	101.20	1.62	128.30	1.41	158.00	1.25	250.90	0.96	318.60	0.83	405.90	0.72
43.90	3.42	69.70	2.61	88.70	2.27	112.50	1.97	142.50	1.72	175.60	1.52	278.80	1.16	354.00	1.01	451.00	0.88
48.30	4.08	76.70	3.11	97.50	2.70	123.70	2.35	156.80	2.05	193.10	1.81	306.70	1.39	389.40	1.21	496.13	1.05
52.70	4.79	83.70	3.65	106.40	3.18	135.00	2.77	171.00	2.41	210.70	2.13	334.60	1.63	424.80	1.42	541.20	1.23
57.10	5.55	90.70	4.24	115.30	3.68	146.20	3.21	185.30	2.79	228.20	2.47	362.40	1.89	460.30	1.64	586.30	1.43
61.40	6.37	97.60	4.86	124.10	4.23	157.40	3.68	199.50	3.20	245.80	2.84	390.30	2.17	495.70	1.88	631.40	1.64
65.80	7.24	104.60	5.52	133.00	4.80	168.70	4.18	213.80	3.64	263.40	3.22	418.20	2.46	531.10	2.14	676.50	1.86
70.20	8.16	111.60	6.23	141.90	5.41	179.90	4.71	228.00	4.10	280.90	3.63	446.10	2.77	566.50	2.41	721.60	2.09
74.60	9.13	118.60	6.96	150.70	6.05	191.20	5.27	242.30	4.59	298.50	4.06	474.00	3.10	601.90	2.70	766.70	2.34
79.00	10.10	125.50	7.74	159.60	6.73	202.40	5.86	256.60	5.10	316.00	4.52	501.80	3.45	637.30	3.00	811.80	2.61
83.40	11.20	132.50	8.56	168.50	7.44	213.70	6.48	270.80	5.64	333.60	4.99	529.70	3.81	672.70	3.32	856.90	2.88
87.80	12.30	139.50	9.41	177.30	8.18	224.90	7.12	285.10	6.20	351.10	5.49	557.60	4.19	708.10	3.65	902.00	3.17
92.20	13.50	146.50	10.30	186.20	8.95	236.20	7.79	299.30	6.79	368.70	6.01	585.50	4.59	743.50	3.99	947.10	3.47
96.60	14.70	153.40	11.20	195.10	9.76	247.40	8.50	313.60	7.40	386.20	6.55	613.40	5.00	778.90	4.35	992.30	3.78
101.0	16.0	160.40	12.20	203.90	10.60	258.70	9.23	327.80	8.03	403.80	7.11	641.20	5.43	814.30	4.72	1037.4	4.10
105.30	17.30	167.40	13.20	212.80	11.50	269.90	9.98	342.10	8.69	421.40	7.70	669.10	5.88	849.70	5.11	1082.5	4.44
109.70	18.60	174.40	14.20	221.70	12.40	281.10	10.80	356.30	9.38	438.90	8.30	697.00	6.34	885.10	5.51	1127.6	4.79
114.10	20.00	181.30	15.30	230.50	13.30	292.40	11.60	370.60	10.10	456.50	8.93	724.90	6.82	920.50	5.93	1172.7	5.15
118.50	21.50	188.30	16.40	239.40	14.30	303.60	12.40	384.80	10.80	474.00	9.57	752.80	7.31	955.90	6.36	1217.8	5.52
122.90	23.00	195.30	17.50	248.30	15.30	314.90	13.30	399.10	11.60	491.60	10.20	780.60	7.82	991.30	6.80	1262.9	5.91
127.30	24.50	202.30	18.70	257.10	16.30	326.10	14.20	413.30	12.30	509.10	10.90	808.50	8.34	1026.7	7.26	1308.0	6.30
131.70	26.10	209.20	19.90	266.00	17.30	337.40	15.10	427.60	13.10	526.70	11.60	836.40	8.88	1062.1	7.73	1353.1	6.71
136.10	27.80	216.20	21.20	274.90	18.40	348.60	16.00	441.80	14.00	544.30	12.40	864.30	9.44	1097.5	8.21	1398.2	7.13
140.50	29.40	223.20	22.50	283.70	19.50	359.90	17.10	456.10	14.80	561.80	13.10	892.20	10.00	1132.9	8.70	1443.3	7.60
144.80	31.20	230.20	23.80	292.60	20.70	371.10	18.00	470.40	15.70	579.40	13.90	920.00	10.60	1168.3	9.20	1488.4	8.00
149.20	32.90	237.10	25.10	301.50	21.90	382.40	19.00	484.60	16.60	596.90	14.70	947.90	11.20	1203.7	9.70	1533.5	8.50
153.60	34.80	244.10	26.50	310.30	23.10	393.60	20.10	498.90	17.50	614.50	15.50	975.80	11.80	1239.1	10.30	1578.6	8.90
158.01	36.60	251.10	27.95	319.20	24.30	404.90	21.20	513.10	18.40	632.00	16.30	1003.7	12.50	1274.5	10.80	1623.7	9.40
162.40	38.50	258.06	29.40	328.10	25.60	416.10	22.30	527.40	19.40	649.60	17.20	1031.6	13.10	1309.9	11.40	1668.8	9.90
166.80	40.50	265.00	30.90	336.90	26.90	427.30	23.40	541.60	20.40	667.20	18.00	1059.4	13.80	1345.4	12.00	1713.9	10.40
171.20	42.50	272.00	32.40	345.80	28.20	438.60	24.50	555.90	21.40	684.70	18.90	1087.3	14.40	1380.8	12.60	1759.0	10.90
175.60	44.50	279.00	34.00	354.70	29.50	449.80	25.70	570.10	22.40	702.30	19.80	1115.2	15.10	1416.2	13.20	1804.1	11.40

The values for TOM® PN12.5 are very similar to those for the previous ones which means that the same table may be used for calculations.
Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

Head loss chart (J): TOM® PVC-O 500 PN20

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

INTERNAL DIAMETER	DN90 PN20 84.0		DN110 PN20 103.2		DN125 PN20 117.0		DN140 PN20 131.2		DN160 PN20 150.0		DN200 PN20 187.4		DN225 PN20 210.8	
Speed	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
(m/s)	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
0.1	0.55	0.16	0.84	0.13	1.08	0.11	1.35	0.10	1.77	0.08	2.76	0.06	3.49	0.05
0.2	1.11	0.58	1.67	0.46	2.15	0.39	2.70	0.34	3.53	0.29	5.52	0.23	6.98	0.20
0.3	1.66	1.23	2.51	0.97	3.23	0.83	4.06	0.73	5.30	0.62	8.27	0.48	10.50	0.42
0.4	2.22	2.09	3.35	1.65	4.30	1.42	5.41	1.24	7.07	1.06	11.00	0.82	14.00	0.72
0.5	2.77	3.17	4.18	2.49	5.38	2.15	6.76	1.88	8.84	1.61	13.80	1.24	17.50	1.08
0.6	3.33	4.44	5.02	3.49	6.45	3.01	8.11	2.64	10.60	2.26	16.50	1.74	20.90	1.52
0.7	3.88	5.90	5.86	4.64	7.53	4.01	9.46	3.51	12.40	3.00	19.30	2.31	24.40	2.02
0.8	4.43	7.56	6.69	5.94	8.60	5.13	10.80	4.49	14.10	3.84	22.10	2.96	27.90	2.58
0.9	4.99	9.40	7.53	7.39	9.68	6.39	12.20	5.59	15.90	4.78	24.80	3.69	31.40	3.21
1.0	5.54	11.43	8.36	8.99	10.75	7.76	13.50	6.79	17.70	5.81	27.60	4.48	34.90	3.90
1.1	6.10	13.60	9.20	10.70	11.83	9.30	14.90	8.10	19.40	6.93	30.30	5.34	38.40	4.66
1.2	6.70	16.00	10.00	12.60	12.90	10.90	16.20	9.52	21.20	8.14	33.10	6.28	41.90	5.47
1.3	7.20	18.60	10.90	14.60	14.00	12.60	17.60	11.00	23.00	9.44	35.90	7.28	45.40	6.35
1.4	7.80	21.30	11.70	16.80	15.10	14.50	18.90	12.70	24.70	10.80	38.60	8.35	48.90	7.28
1.5	8.30	24.20	12.50	19.00	16.10	16.40	20.30	14.40	26.50	12.30	41.40	9.49	52.40	8.27
1.6	8.90	27.30	13.40	21.50	17.20	18.50	21.60	16.20	28.30	13.90	44.10	10.70	55.80	9.32
1.7	9.40	30.50	14.20	24.00	18.30	20.70	23.00	18.10	30.00	15.50	46.90	12.00	59.30	10.43
1.8	10.00	33.90	15.10	26.70	19.40	23.10	24.30	20.20	31.80	17.30	49.60	13.30	62.80	11.60
1.9	10.50	37.50	15.90	29.50	20.40	25.50	25.70	22.30	33.60	19.10	52.40	14.70	66.30	12.80
2.0	11.10	41.20	16.70	32.40	21.50	28.00	27.00	24.50	35.30	21.00	55.20	16.20	69.80	14.10
2.1	11.60	45.10	17.60	35.50	22.60	30.70	28.40	26.80	37.10	22.90	57.90	17.70	73.30	15.40
2.2	12.20	49.20	18.40	38.70	23.70	33.40	29.70	29.20	38.90	25.00	60.70	19.30	76.80	16.80
2.3	12.70	53.40	19.20	42.00	24.70	36.30	31.10	31.80	40.60	27.20	63.40	20.90	80.30	18.30
2.4	13.30	57.80	20.10	45.50	25.80	39.30	32.40	34.40	42.40	29.40	66.20	22.70	83.80	19.80
2.5	13.90	62.40	20.90	49.00	26.90	42.40	33.80	37.10	44.20	31.70	69.00	24.40	87.30	21.30
2.6	14.40	67.10	21.70	52.70	28.00	45.50	35.20	39.90	45.90	34.10	71.70	26.30	90.70	22.90
2.7	15.00	71.90	22.60	56.60	29.00	48.80	36.50	42.70	47.70	36.60	74.50	28.20	94.20	24.60
2.8	15.50	76.90	23.40	60.50	30.10	52.30	37.90	45.70	49.50	39.10	77.20	30.20	97.70	26.30
2.9	16.10	82.10	24.30	64.60	31.20	55.80	39.20	48.80	51.20	41.70	80.00	32.20	101.20	28.00
3.0	16.60	87.40	25.10	68.70	32.30	59.40	40.60	51.90	53.00	44.40	82.70	34.30	104.70	29.90
3.1	17.20	92.90	25.90	73.00	33.30	63.10	41.90	55.20	54.80	47.20	85.50	36.40	108.20	31.70
3.2	17.70	98.50	26.80	77.50	34.40	66.90	43.30	58.50	56.50	50.10	88.30	38.60	111.70	33.70
3.3	18.30	104.30	27.60	82.00	35.50	70.80	44.60	62.00	58.30	53.00	91.00	40.90	115.20	35.60
3.4	18.80	110.20	28.40	86.70	36.60	74.90	46.00	65.50	60.10	56.00	93.80	43.20	118.70	37.70
3.5	19.40	116.30	29.30	91.40	37.60	79.00	47.30	69.10	61.90	59.10	96.50	45.60	122.20	39.70
3.6	20.00	122.50	30.10	96.30	38.70	83.20	48.70	72.80	63.60	62.30	99.30	48.00	125.60	41.90
3.7	20.50	128.90	30.90	101.40	39.80	87.60	50.00	76.60	65.40	65.50	102.10	50.50	129.10	44.00
3.8	21.10	135.40	31.80	106.50	40.80	92.00	51.40	80.50	67.20	68.80	104.80	53.10	132.60	46.30
3.9	21.60	142.10	32.60	111.70	41.90	96.50	52.70	84.40	68.90	72.20	107.60	55.70	136.10	48.60
4.0	22.20	148.90	33.50	117.10	43.00	101.20	54.10	88.50	70.70	75.70	110.30	58.40	139.60	50.90

Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

Head loss chart (J): TOM® PVC-O 500 PN20

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

DN250 PN20 234.2		DN315 PN20 295.2		DN355 PN20 332.4		DN400 PN20 374.8		DN450 PN20 421.4		DN500 PN20 468.6		DN630 PN20 590.4		DN710 PN20 665.6		DN800 PN20 750.4	
Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
4.31	0.05	6.84	0.04	8.68	0.03	11.00	0.03	13.90	0.02	17.20	0.02	27.40	0.02	34.79	0.01	44.20	0.01
8.62	0.18	13.70	0.13	17.40	0.12	22.10	0.10	27.90	0.09	34.50	0.08	54.80	0.06	69.59	0.05	88.50	0.05
12.90	0.37	20.50	0.28	26.00	0.25	33.10	0.21	41.80	0.19	51.70	0.17	82.10	0.13	104.38	0.11	132.70	0.10
17.20	0.63	27.40	0.48	34.70	0.42	44.10	0.37	55.80	0.32	69.00	0.28	109.50	0.22	139.18	0.19	176.90	0.16
21.50	0.96	34.20	0.73	43.40	0.64	55.20	0.55	69.70	0.48	86.20	0.43	136.90	0.33	173.97	0.28	221.10	0.25
25.80	1.34	41.10	1.02	52.10	0.89	66.20	0.77	83.70	0.68	103.50	0.60	164.30	0.46	208.77	0.40	265.40	0.34
30.20	1.78	47.90	1.36	60.70	1.19	77.20	1.03	97.60	0.90	120.70	0.79	191.60	0.61	243.56	0.53	309.60	0.46
34.50	2.28	54.80	1.74	69.40	1.52	88.30	1.32	111.60	1.15	138.00	1.02	219.00	0.78	278.36	0.68	353.80	0.59
38.80	2.84	61.60	2.17	78.10	1.89	99.30	1.64	125.50	1.43	155.20	1.26	246.40	0.97	313.15	0.84	398.00	0.73
43.10	3.45	68.40	2.64	86.80	2.29	110.30	1.99	139.50	1.74	172.46	1.54	273.80	1.17	347.95	1.02	442.30	0.89
47.40	4.12	75.30	3.14	95.50	2.74	121.40	2.38	153.40	2.08	189.70	1.83	301.10	1.40	382.74	1.22	486.50	1.06
51.70	4.84	82.10	3.69	104.10	3.22	132.40	2.80	167.40	2.44	207.00	2.15	328.50	1.65	417.54	1.43	530.70	1.24
56.00	5.61	89.00	4.28	112.80	3.73	143.40	3.24	181.30	2.83	224.20	2.50	355.90	1.91	452.33	1.66	574.90	1.44
60.30	6.44	95.80	4.92	121.50	4.28	154.50	3.72	195.30	3.24	241.40	2.87	383.30	2.19	487.13	1.90	619.20	1.65
64.60	7.32	102.70	5.58	130.20	4.86	165.50	4.23	209.20	3.69	258.70	3.26	410.70	2.49	521.92	2.16	663.40	1.88
68.90	8.25	109.50	6.29	138.80	5.48	176.50	4.76	223.20	4.15	275.90	3.67	438.00	2.80	556.72	2.44	707.60	2.12
73.20	9.23	116.40	7.04	147.50	6.13	187.60	5.33	237.10	4.65	293.20	4.11	465.40	3.14	591.51	2.73	751.80	2.37
77.50	10.30	123.20	7.83	156.20	6.82	198.60	5.92	251.00	5.17	310.40	4.57	492.80	3.49	626.31	3.03	796.10	2.64
81.80	11.30	130.00	8.65	164.90	7.53	209.60	6.55	265.00	5.71	327.70	5.05	520.20	3.85	661.10	3.35	840.30	2.91
86.20	12.50	136.90	9.52	173.60	8.28	220.70	7.20	278.90	6.28	344.90	5.55	547.50	4.24	695.90	3.68	884.50	3.20
90.50	13.60	143.70	10.40	182.20	9.07	231.70	7.88	292.90	6.87	362.20	6.07	574.90	4.64	730.69	4.03	928.70	3.51
94.80	14.90	150.60	11.40	190.90	9.88	242.70	8.59	306.80	7.49	379.40	6.62	602.30	5.06	765.49	4.40	973.00	3.82
99.10	16.10	157.40	12.30	199.60	10.70	253.80	9.33	320.80	8.14	396.70	7.19	629.70	5.49	800.28	4.77	1017.2	4.15
103.40	17.50	164.30	13.30	208.30	11.60	264.80	10.09	334.70	8.80	413.90	7.78	657.00	5.94	835.08	5.16	1061.4	4.49
107.70	18.80	171.10	14.40	216.90	12.50	275.80	10.90	348.70	9.49	431.20	8.39	684.40	6.41	869.87	5.57	1105.6	4.84
112.00	20.30	177.90	15.50	225.60	13.50	286.90	11.70	362.60	10.20	448.40	9.02	711.80	6.89	904.67	5.99	1149.9	5.21
116.30	21.70	184.80	16.60	234.30	14.40	297.90	12.60	376.60	10.90	465.60	9.67	739.20	7.39	939.46	6.42	1194.1	5.58
120.60	23.20	191.60	17.70	243.00	15.40	308.90	13.40	390.50	11.70	482.90	10.30	766.60	7.90	974.26	6.87	1238.3	5.97
124.90	24.80	198.50	18.90	251.70	16.50	320.00	14.30	404.50	12.50	500.10	11.00	793.90	8.43	1009.1	7.33	1282.5	6.37
129.20	26.40	205.30	20.20	260.30	17.60	331.00	15.30	418.40	13.30	517.40	11.80	821.30	8.98	1043.8	7.81	1326.8	6.79
133.50	28.10	212.20	21.40	269.00	18.70	342.00	16.20	432.40	14.10	534.60	12.50	848.70	9.54	1078.6	8.30	1371.0	7.21
137.90	29.80	219.00	22.70	277.70	19.80	353.10	17.20	446.30	15.00	551.90	13.30	876.10	10.10	1113.4	8.80	1415.2	7.60
142.20	31.50	225.90	24.10	286.40	20.90	364.10	18.20	460.20	15.90	569.10	14.00	903.40	10.70	1148.2	9.31	1459.5	8.10
146.50	33.30	232.70	25.40	295.00	22.10	375.10	19.20	474.20	16.80	586.40	14.80	930.80	11.30	1183.0	9.84	1503.7	8.60
150.80	35.10	239.50	26.80	303.70	23.40	386.20	20.30	488.10	17.70	603.60	15.60	958.20	11.90	1217.8	10.39	1547.9	9.00
155.10	37.00	246.40	28.30	312.40	24.60	397.20	21.40	502.10	18.70	620.90	16.50	985.60	12.60	1252.6	10.94	1592.1	9.50
159.40	39.00	253.20	29.70	321.10	25.90	408.20	22.50	516.00	19.60	638.10	17.30	1012.9	13.20	1287.4	11.51	1636.4	10.00
163.70	40.90	260.10	31.20	329.80	27.20	419.20	23.60	530.00	20.60	655.40	18.20	1040.3	13.90	1322.2	12.09	1680.6	10.50
168.00	42.90	266.90	32.80	338.40	28.50	430.30	24.80	543.90	21.60	672.60	19.10	1067.7	14.60	1357.0	12.69	1724.8	11.00
172.30	45.00	273.80	34.30	347.10	29.90	441.30	26.00	557.90	22.70	689.80	20.00	1095.1	15.30	1391.8	13.30	1769.0	11.60

Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

Head loss chart (J): TOM® PVC-O 500 PN25

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

INTERNAL DIAMETER	DN90 PN25 82.2		DN110 PN25 101.4		DN125 PN25 115.2		DN140 PN25 129.2		DN160 PN25 147.6		DN200 PN25 184.4		DN225 PN25 207.4	
Speed	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
(m/s)	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
0.1	0.53	0.16	0.81	0.13	1.04	0.11	1.31	0.10	1.71	0.08	2.67	0.06	3.38	0.06
0.2	1.06	0.59	1.62	0.47	2.08	0.40	2.62	0.35	3.42	0.30	5.34	0.23	6.76	0.20
0.3	1.59	1.26	2.42	0.99	3.13	0.85	3.93	0.74	5.13	0.64	8.00	0.49	10.10	0.43
0.4	2.12	2.15	3.23	1.68	4.17	1.45	5.24	1.27	6.84	1.08	10.70	0.84	13.50	0.73
0.5	2.65	3.25	4.04	2.54	5.21	2.19	6.56	1.92	8.56	1.64	13.40	1.26	16.90	1.10
0.6	3.18	4.55	4.85	3.56	6.25	3.07	7.87	2.68	10.30	2.30	16.00	1.77	20.30	1.55
0.7	3.71	6.05	5.65	4.74	7.30	4.08	9.18	3.57	12.00	3.06	18.70	2.36	23.60	2.06
0.8	4.25	7.75	6.46	6.07	8.34	5.23	10.50	4.57	13.70	3.91	21.40	3.02	27.00	2.63
0.9	4.78	9.64	7.27	7.55	9.38	6.50	11.80	5.69	15.40	4.87	24.00	3.76	30.40	3.27
1.0	5.31	11.72	8.08	9.17	10.42	7.90	13.10	6.91	17.10	5.92	26.70	4.56	33.80	3.98
1.1	5.84	14.00	8.88	10.90	11.47	9.40	14.40	8.25	18.80	7.06	29.40	5.45	37.20	4.75
1.2	6.40	16.40	9.70	12.90	12.50	11.10	15.70	9.69	20.50	8.30	32.00	6.40	40.50	5.58
1.3	6.90	19.00	10.50	14.90	13.50	12.80	17.00	11.20	22.20	9.62	34.70	7.42	43.90	6.47
1.4	7.40	21.90	11.30	17.10	14.60	14.70	18.40	12.90	24.00	11.00	37.40	8.51	47.30	7.42
1.5	8.00	24.80	12.10	19.40	15.60	16.70	19.70	14.60	25.70	12.50	40.10	9.67	50.70	8.43
1.6	8.50	28.00	12.90	21.90	16.70	18.90	21.00	16.50	27.40	14.10	42.70	10.90	54.10	9.50
1.7	9.00	31.30	13.70	24.50	17.70	21.10	22.30	18.50	29.10	15.80	45.40	12.20	57.40	10.63
1.8	9.60	34.80	14.50	27.20	18.80	23.50	23.60	20.50	30.80	17.60	48.10	13.60	60.80	11.80
1.9	10.10	38.50	15.30	30.10	19.80	25.90	24.90	22.70	32.50	19.40	50.70	15.00	64.20	13.10
2.0	10.60	42.30	16.20	33.10	20.80	28.50	26.20	25.00	34.20	21.40	53.40	16.50	67.60	14.40
2.1	11.10	46.30	17.00	36.20	21.90	31.20	27.50	27.30	35.90	23.40	56.10	18.00	70.90	15.70
2.2	11.70	50.50	17.80	39.50	22.90	34.00	28.80	29.80	37.60	25.50	58.80	19.70	74.30	17.10
2.3	12.20	54.80	18.60	42.90	24.00	37.00	30.20	32.30	39.40	27.70	61.40	21.30	77.70	18.60
2.4	12.70	59.30	19.40	46.40	25.00	40.00	31.50	35.00	41.10	29.90	64.10	23.10	81.10	20.10
2.5	13.30	64.00	20.20	50.10	26.10	43.10	32.80	37.70	42.80	32.30	66.80	24.90	84.50	21.70
2.6	13.80	68.80	21.00	53.80	27.10	46.40	34.10	40.60	44.50	34.70	69.40	26.80	87.80	23.40
2.7	14.30	73.70	21.80	57.70	28.10	49.70	35.40	43.50	46.20	37.20	72.10	28.70	91.20	25.00
2.8	14.90	78.90	22.60	61.70	29.20	53.20	36.70	46.50	47.90	39.80	74.80	30.70	94.60	26.80
2.9	15.40	84.20	23.40	65.90	30.20	56.80	38.00	49.70	49.60	42.50	77.40	32.80	98.00	28.60
3.0	15.90	89.60	24.20	70.20	31.30	60.50	39.30	52.90	51.30	45.30	80.10	34.90	101.4	30.40
3.1	16.50	95.30	25.00	74.60	32.30	64.20	40.60	56.20	53.00	48.10	82.80	37.10	104.70	32.30
3.2	17.00	101.00	25.80	79.10	33.40	68.10	42.00	59.60	54.80	51.00	85.50	39.30	108.10	34.30
3.3	17.50	106.90	26.60	83.70	34.40	72.10	43.30	63.10	56.50	54.00	88.10	41.70	111.50	36.30
3.4	18.00	113.00	27.50	88.50	35.40	76.20	44.60	66.70	58.20	57.10	90.80	44.00	114.90	38.40
3.5	18.60	119.30	28.30	93.30	36.50	80.40	45.90	70.40	59.90	60.20	93.50	46.50	118.20	40.50
3.6	19.10	125.60	29.10	98.30	37.50	84.70	47.20	74.10	61.60	63.50	96.10	48.90	121.60	42.70
3.7	19.60	132.20	29.90	103.50	38.60	89.20	48.50	78.00	63.30	66.80	98.80	51.50	125.00	44.90
3.8	20.20	138.90	30.70	108.70	39.60	93.70	49.80	81.90	65.00	70.10	101.50	54.10	128.40	47.20
3.9	20.70	145.70	31.50	114.10	40.60	98.30	51.10	86.00	66.70	73.60	104.20	56.80	131.80	49.50
4.0	21.20	152.70	32.30	119.50	41.70	103.00	52.40	90.10	68.40	77.10	106.80	59.50	135.10	51.90

Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

Head loss chart (J): TOM® PVC-O 500 PN25

Pipe head loss is the energy of a hydraulic fluid that is lost along itself due to friction.
Below is the calculation of estimated water speeds depending on the selected pipe for installation.

DN250 PN25 230.6		DN315 PN25 290.6		DN355 PN25 327.2		DN400 PN25 369.0		DN450 PN25 415.0		DN500 PN25 461.2		DN630 PN25 581.0		DN710 PN25 654.6		DN800 PN25 737.8	
Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J	Flow	J
l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km	l/s	m/km
4.18	0.05	6.63	0.04	8.41	0.03	10.70	0.03	13.50	0.02	16.70	0.02	26.50	0.02	33.65	0.01	42.80	0.01
8.35	0.18	13.30	0.14	16.80	0.12	21.40	0.10	27.10	0.09	33.40	0.08	53.00	0.06	67.31	0.05	85.50	0.05
12.50	0.38	19.90	0.29	25.20	0.25	32.10	0.22	40.60	0.19	50.10	0.17	79.50	0.13	100.96	0.11	128.30	0.10
16.70	0.64	26.50	0.49	33.60	0.43	42.80	0.37	54.10	0.32	66.80	0.29	106.00	0.22	134.62	0.19	171.00	0.17
20.90	0.97	33.20	0.74	42.00	0.65	53.50	0.56	67.60	0.49	83.50	0.43	132.60	0.33	168.27	0.29	213.80	0.25
25.10	1.37	39.80	1.04	50.50	0.91	64.20	0.79	81.20	0.69	100.20	0.61	159.10	0.46	201.93	0.40	256.50	0.35
29.20	1.82	46.40	1.39	58.90	1.21	74.90	1.05	94.70	0.91	116.90	0.81	185.60	0.62	235.58	0.54	299.30	0.47
33.40	2.33	53.10	1.78	67.30	1.55	85.60	1.34	108.20	1.17	133.60	1.04	212.10	0.79	269.24	0.69	342.00	0.60
37.60	2.89	59.70	2.21	75.70	1.92	96.20	1.67	121.70	1.46	150.40	1.29	238.60	0.98	302.89	0.86	384.80	0.74
41.80	3.52	66.30	2.68	84.10	2.34	106.90	2.03	135.30	1.77	167.10	1.57	265.10	1.20	336.54	1.04	427.50	0.90
45.90	4.19	73.00	3.20	92.50	2.79	117.60	2.42	148.80	2.11	183.80	1.87	291.60	1.43	370.20	1.24	470.30	1.08
50.10	4.93	79.60	3.76	100.90	3.28	128.30	2.85	162.30	2.48	200.50	2.19	318.10	1.68	403.85	1.46	513.00	1.27
54.30	5.72	86.20	4.36	109.30	3.80	139.00	3.30	175.80	2.88	217.20	2.55	344.70	1.94	437.51	1.69	555.80	1.47
58.50	6.56	92.90	5.01	117.70	4.36	149.70	3.79	189.40	3.30	233.90	2.92	371.20	2.23	471.16	1.94	598.50	1.69
62.60	7.45	99.50	5.69	126.10	4.95	160.40	4.30	202.90	3.75	250.60	3.32	397.70	2.53	504.82	2.20	641.30	1.92
66.80	8.40	106.10	6.41	134.50	5.58	171.10	4.85	216.40	4.23	267.30	3.74	424.20	2.86	538.47	2.48	684.00	2.16
71.00	9.39	112.80	7.17	142.90	6.24	181.80	5.43	230.00	4.73	284.00	4.18	450.70	3.20	572.12	2.78	726.80	2.42
75.20	10.40	119.40	7.97	151.40	6.94	192.50	6.03	243.50	5.26	300.70	4.65	477.20	3.55	605.78	3.09	769.60	2.69
79.40	11.50	126.00	8.81	159.80	7.67	203.20	6.67	257.00	5.81	317.40	5.14	503.70	3.93	639.43	3.42	812.30	2.97
83.50	12.70	132.70	9.69	168.20	8.44	213.90	7.33	270.50	6.39	334.10	5.65	530.20	4.32	673.09	3.76	855.10	3.27
87.70	13.90	139.30	10.60	176.60	9.24	224.60	8.03	284.10	7.00	350.80	6.19	556.80	4.73	706.74	4.11	897.80	3.58
91.90	15.10	145.90	11.60	185.00	10.07	235.30	8.75	297.60	7.63	367.50	6.74	583.30	5.15	740.40	4.48	940.60	3.90
96.10	16.40	152.50	12.60	193.40	10.90	246.00	9.50	311.10	8.28	384.20	7.32	609.80	5.59	774.05	4.87	983.30	4.23
100.20	17.80	159.20	13.60	201.80	11.80	256.70	10.28	324.60	8.96	400.90	7.92	636.30	6.05	807.71	5.27	1026.1	4.58
104.40	19.20	165.80	14.70	210.20	12.80	267.40	11.10	338.20	9.67	417.60	8.55	662.80	6.53	841.36	5.68	1068.8	4.94
108.60	20.60	172.40	15.80	218.60	13.70	278.00	11.90	351.70	10.40	434.40	9.19	689.30	7.02	875.01	6.11	1111.6	5.31
112.80	22.10	179.10	16.90	227.00	14.70	288.70	12.80	365.20	11.10	451.10	9.85	715.80	7.53	908.67	6.55	1154.3	5.70
116.90	23.70	185.70	18.10	235.40	15.70	299.40	13.70	378.70	11.90	467.80	10.50	742.30	8.05	942.32	7.01	1197.1	6.09
121.10	25.30	192.30	19.30	243.80	16.80	310.10	14.60	392.30	12.70	484.50	11.20	768.80	8.59	975.98	7.48	1239.8	6.50
125.30	26.90	199.00	20.50	252.30	17.90	320.80	15.50	405.80	13.50	501.20	12.00	795.40	9.15	1009.6	7.96	1282.6	6.92
129.50	28.60	205.60	21.80	260.70	19.00	331.50	16.50	419.30	14.40	517.90	12.70	821.90	9.72	1043.3	8.46	1325.3	7.36
133.60	30.30	212.20	23.10	269.10	20.20	342.20	17.50	432.80	15.30	534.60	13.50	848.40	10.30	1076.9	8.97	1368.1	7.80
137.80	32.10	218.90	24.50	277.50	21.30	352.90	18.50	446.40	16.20	551.30	14.30	874.90	10.90	1110.6	9.50	1410.9	8.30
142.00	33.90	225.50	25.90	285.90	22.50	363.60	19.60	459.90	17.10	568.00	15.10	901.40	11.50	1144.2	10.04	1453.6	8.70
146.20	35.80	232.10	27.30	294.30	23.80	374.30	20.70	473.40	18.00	584.70	15.90	927.90	12.20	1177.9	10.59	1496.4	9.20
150.40	37.70	238.80	28.80	302.70	25.10	385.00	21.80	487.00	19.00	601.40	16.80	954.40	12.80	1211.6	11.16	1539.1	9.70
154.50	39.70	245.40	30.30	311.10	26.40	395.70	22.90	500.50	20.00	618.10	17.70	980.90	13.50	1245.2	11.74	1581.9	10.20
158.70	41.70	252.00	31.80	319.50	27.70	406.40	24.10	514.00	21.00	634.80	18.60	1007.5	14.20	1278.9	12.33	1624.6	10.70
162.90	43.70	258.70	33.40	327.90	29.10	417.10	25.30	527.50	22.00	651.50	19.50	1034.0	14.90	1312.5	12.94	1667.4	11.30
167.10	45.80	265.30	35.00	336.30	30.50	427.80	26.50	541.10	23.10	668.20	20.40	1060.5	15.60	1346.2	13.56	1710.1	11.80

Shaded values: estimation of recommended water speeds to avoid sedimentation, water hammer, noises, erosion and high values of head loss according to Manning formula.

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