TITAN® 9000

Matrix Blend Series

Technical Information

Description

TITAN® 9000 matrix is a high performance emulsion specially formulated for use in areas where there is a risk of post blast fume generation.

TITAN 9000 Heavy ANFO blends contain TITAN 9000 emulsion and ANFO manufactured from porous ammonium nitrate prill (DETAPRILL®). The blends provide minimal water resistance and are suitable for use in dry and dewatered blastholes.

TITAN 9000 Gassed Blends are emulsion rich, water resistant mixtures of TITAN 9000 emulsion and ANFO. As the emulsion content of the blend increases, the water resistance of the product increases. Gassed blends are pumped from an MPU through a loading hose to the bottom of wet blastholes. Augering of selected gassed blends into dewatered blastholes may be available. Contact your Dyno Nobel representative for more information.

Advantages

TITAN 9000 matrix is specially formulated to optimise detonation when blasting in challenging conditions.

As the emulsion content of the blend increases, the water resistance of the product increases significantly.

Properties

TITAN 9000 Blend	9020	9030	9040	9050	9050G	9060G	9070G	9000G
Emulsion %	20	30	40	50	50	60	70	100
Cup Density (avg g/cm³) [1, 2]	0.98	1.10	1.26	1.31	1.15	1.15	1.15	1.15
Min. Diameter (mm)	102	102	127	200	102	89	76	76
Energy (MJ/kg) [3]	3.5	3.4	3.3	3.2	3.2	3.1	3.0	2.7
VoD (m/sec) [4]	3400 – 5600							
RWS [5]	95	92	89	86	86	84	81	73
RBS [5]	108	123	136	139	121	118	114	102
CO_2 Emissions (tCO2e/t) [6]	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.14

NOTES:

1. For gassed products this is the nominal open cup density. For design purposes refer to the Dyno Nobel Gassing Tables for average in-hole densities.
2. Average in-hole density may be higher under real loading conditions.
3. All Dyno Nobel energy and gas values are calculated using a proprietary Dyno Nobel thermodynamic code – PRODET. Other programs may give different values.
4. The values stated are typical of those recorded for the product in various hole diameters, densities and ground. The Velocity of Detonation (VoD) is dependent upon many factors, including: the initiation system used, the product density, blasthole diameter and ground confinement.
5. For calculation of Relative Weight Strength (RWS) and Relative Bulk Strength (RBS); ANFO – density 0.82g/cm³ and an energy of 3.7MJ/kg was used.
6. CO_2 Emissions calculated as tonne of CO_2 equivalents per tonne of explosive. As per National Greenhouse Accounts; July 2012; Department of Climate Change and Energy Efficiency

Hazardous Shipping Description

Explosive, Blasting, Type E, 1.1D, UN 0241

EXPLOSIVES 1.1D 1

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Phone 1800 251 872 Fax 07 3026 3999 www.dynonobel.com

DYNO® Dyno Nobel

Groundbreaking Performance®

TITAN® 9000

Matrix Blend Series

Application Recommendations

Priming: Always prime blends with a minimum 400g cast booster. Additional 400g boosters should be used where there is a risk of column disruption. Contact your Dyno Nobel representative if you intend using detonating cord down lines.

Sensitisation: TITAN 9000 blends containing 60% or more emulsion must be sensitised as the product is delivered to the blasthole. Incorrectly sensitised gassed blends may lead to poor explosive performance and the formation of excessive post blast fume (NOx).

TITAN 9050 Blends: Although not necessary in hole depths less than 11m, it is recommended that all 50% blends are sensitised. Over-sensitisation may lead to product collapse and formation of NOx. For depths exceeding 60m contact your Dyno Nobel representative.

Sleep Time: TITAN 9000 matrix blends have a maximum sleep time of 21 days under ideal conditions. Sleep time is influenced by factors including the ground conditions and initiating system.

Ground Temperature: TITAN 9000 matrix blends are suitable for use in ground temperatures up to 55°C.

Reactive Ground: Where reactive ground conditions exist please contact your Dyno Nobel representative.

Safe handling, transportation and storage

First Aid – You can find detailed first aid information on the relevant Dyno Nobel Safety Data Sheet. Refer to www.dynonobel.com for more information if required.

Safety - All explosives and explosive precursors are classified as dangerous goods and may cause personal injury and damage to property if used incorrectly.

Transportation and Storage - All explosives must be handled, transported and stored in accordance with all relevant regulations. Stock should be rotated such that older product is used first.

Product Selection Guide

TITAN 9000 matrix blends may be slept for a maximum of 21 days. Where there is a risk of post blast fume the sleep times should be reduced based on a blast specific risk assessment. For assistance please contact your Dyno Nobel representative.

<table>
<tr><th colspan="3">Emulsion Content % w/w</th><th>10</th><th>20</th><th>30</th><th>40</th><th>50</th><th>60</th><th>70</th><th>80</th><th>90</th><th>100</th></tr>
<tr><td rowspan="8">Blasthole Condition</td><td>Dry[1]</td><td>Use</td><td colspan="10">YES</td></tr>
<tr><td colspan="2">Delivery Method[2]</td><td>A</td><td>A</td><td>A</td><td>A</td><td>A</td><td>A/P</td><td>A/P</td><td>A/P</td><td>A/P</td><td>A/P</td></tr>
<tr><td>Dewatered [3]</td><td>Use</td><td colspan="3">NO</td><td colspan="7">YES</td></tr>
<tr><td colspan="2">Delivery Method</td><td></td><td></td><td></td><td>A</td><td>A</td><td>A/P</td><td>A/P</td><td>A/P</td><td>A/P</td><td>A/P</td></tr>
<tr><td>Wet [4]</td><td>Use</td><td colspan="5">NO</td><td colspan="5">YES</td></tr>
<tr><td colspan="2">Delivery Method</td><td></td><td></td><td></td><td></td><td></td><td>P</td><td>P</td><td>P</td><td>P</td><td>P</td></tr>
<tr><td>Dynamic [5]</td><td>Use</td><td colspan="6">NO</td><td colspan="4">YES</td></tr>
<tr><td colspan="2">Delivery Method</td><td></td><td></td><td></td><td></td><td></td><td></td><td>P</td><td>P</td><td>P</td><td>P</td></tr>
<tr><td colspan="3">Sensitisation Required</td><td colspan="4">NO</td><td>Note 6</td><td colspan="5">YES [7]</td></tr>
</table>

NOTES:

1. Dry hole is defined as a blasthole containing no water including no wet walls. **2.** A – Auger, P – Pumped.

3. A dewatered hole is defined as not recharging with water. **4.** A wet hole is defined as a blasthole containing static water or has a recharge rate of <1m in 30 minutes. **5.** Dynamic water is defined as a recharge rate of >1m in 30 minutes. If the level of dynamic water is such that product damage is suspected or observed, the suggested recommended sleep time should be reduced. **6.** This product has reduced sensitivity and sensitisation is recommended for all holes. Please consult your Dyno Nobel representative to check which delivery options are available at your location. **7.** The TITAN Matrix Blend Gassing Table should be used to determine the appropriate open cup density for the hole depth.

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TITAN® Matrix Blend Gassing Table

TITAN 9050G

Technical Information

USE OF TABLE

1. The left hand column in this table (Depth) indicates the height of the product column under **dry or dewatered hole conditions.**
2. This table applies for TITAN 9000 Matrix blends with an emulsion content of **50% w/w ONLY, i.e. T9050G and T9050.**
3. Emulsion explosives behave as liquids when subjected to the gravitational stress in vertical and near vertical blastholes and a pressure gradient in the explosive will be established. The higher the explosive column in the blasthole, the higher the internal pressure at the bottom of the column, and the larger the quantity of gassing chemicals that need to be added to provide sensitisation.
4. The open cup density is a measure of the level of sensitisation of the product. It is necessary to choose an open cup density to ensure that the density of the explosive at the bottom of the blasthole is less than the critical density. Inappropriate sensitisation may lead to poor detonation, fragmentation and generation of excessive post blast fume.

   Blacked out areas indicate where critical density is reached or exceeded.
5. For example, **to determine the required open cup density for an explosive** column of 40m, find 40m in the Depth column. Moving to the right, read off the density in the unshaded column under the required open cup density (a **TOE** density of 1.40g/cm^3 in the 1.10g/cm^3 open cup density column). This indicates that sufficient gassing chemicals should be added to the gassed explosive blend during delivery so that an open cup density of 1.10g/cm^3 is achieved.

   This level of gassing chemicals will ensure that the density at the bottom of the column will be below the critical density, and the column will detonate at full order upon initiation.
6. For example, **to determine the approximate average in-hole density** in a column of 40m find 40m in the Depth column. Moving to the right, read off the density in the shaded column (an **AVG. IN-HOLE** density of 1.31g/cm^3 in the 1.10 g/cm^3 open cup density column).

   For depths that are not listed, Dyno Nobel recommends rounding up to the next highest depth, e.g. a 25 m deep hole should be rounded to 26 m and corresponding densities applied.
7. Blast design should be based on the average in-hole density, whilst blasthole loading requires the MPU operator to achieve the associated open cup density.
8. The gassing reaction takes 30-40 minutes to achieve the desired open cup density at 20°C. It is necessary to allow at least this time to elapse following completion of loading and before stemming the charged blasthole. A longer period should be allowed at lower temperatures.
9. The density values shown were calculated using a laboratory mathematical model that was validated using a specially designed fit-for-purpose pressure-volume apparatus.
10. The low density explosive grade ammonium nitrate used in the model was assigned a bulk density of 0.77 g/cm^3 and a particle density of 1.58 g/cm^3.

Depth (m)	TITAN 9050G Density g/cc						Ungassed	
	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe
Open Cup	**1.10**	**1.10**	**1.15**	**1.15**	**1.20**	**1.20**	**1.31**	**1.31**
1	1.12	1.13	1.17	1.18	1.21	1.23	1.33	1.34
2	1.13	1.16	1.18	1.21	1.23	1.25	1.33	1.35
3	1.15	1.19	1.19	1.23	1.24	1.27	1.34	1.36
4	1.16	1.21	1.20	1.25	1.25	1.28	1.35	1.37
5	1.17	1.23	1.21	1.26	1.25	1.30	1.35	1.37
6	1.18	1.25	1.22	1.28	1.26	1.31	1.36	1.38
7	1.19	1.26	1.23	1.29	1.27	1.32	1.36	1.39
8	1.20	1.27	1.24	1.30	1.28	1.33	1.36	1.39
9	1.21	1.28	1.25	1.31	1.28	1.34	1.37	1.40
10	1.22	1.29	1.25	1.32	1.29	1.34	1.37	1.40
11	1.22	1.30	1.26	1.33	1.29	1.35	1.37	1.40
12	1.23	1.31	1.26	1.33	1.30	1.36		
13	1.24	1.32	1.27	1.34	1.30	1.36		
14	1.24	1.32	1.27	1.35	1.31	1.37		
15	1.25	1.33	1.28	1.35	1.31	1.37		
16	1.25	1.34	1.28	1.36	1.31	1.37		
17	1.26	1.34	1.29	1.36	1.32	1.38		
18	1.26	1.35	1.29	1.36	1.32	1.38		
19	1.27	1.35	1.30	1.37	1.32	1.38		
20	1.27	1.36	1.30	1.37	1.33	1.39		
22	1.28	1.36	1.30	1.38	1.33	1.39		
24	1.28	1.37	1.31	1.38	1.33	1.40		
26	1.28	1.37	1.31	1.39	1.34	1.40		
28	1.29	1.38	1.31	1.39	1.34	1.40		
30	1.29	1.38	1.32	1.40				
32	1.29	1.39	1.32	1.40				
34	1.30	1.39	1.32	1.40				
36	1.30	1.39	1.33	1.40				
38	1.30	1.40						
40	1.31	1.40						
45	1.31	1.40						
50	1.31	1.40						
55	1.32	1.40						
60	1.32	1.40						

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TITAN® Matrix Blend Gassing Table

TITAN 9060G

Technical Information

USE OF TABLE

1. The left hand column in this table (Depth) indicates the height of the product column under **dry hole conditions.** In **wet hole** conditions, the value selected from the left hand column must be the sum of the product column and the height of the water column in the hole. If the length of the product and water column exceeds the depth of the hole then the value selected from the left hand column must be the hole depth.
2. This table applies for TITAN 9000 Matrix blends with an emulsion content of **60% w/w ONLY, i.e. T9060G.**
3. Emulsion explosives behave as liquids when subjected to the gravitational stress in vertical and near vertical blastholes and a pressure gradient in the explosive will be established. The higher the explosive column in the blasthole, the higher the internal pressure at the bottom of the column, and the larger the quantity of gassing chemicals that need to be added to provide sensitisation.
4. The open cup density is a measure of the level of sensitisation of the product. It is necessary to choose an open cup density to ensure that the density of the explosive at the bottom of the blasthole is less than the critical density. Inappropriate sensitisation may lead to poor detonation, fragmentation and generation of excessive post blast fume.

   Blacked out areas indicate where critical density is reached or exceeded.
5. For example, **to determine the required open cup density for an explosive** column of 40m, find 40m in the Depth column. Moving to the right, read off the density in the unshaded column under the required open cup density (a **TOE** density of 1.38g/cm³ in the 1.10 g/cm³ open cup density column). This indicates that sufficient gassing chemicals should be added to the gassed explosive blend during delivery so that an open cup density of 1.10g/cm³ is achieved.

   This level of gassing chemicals will ensure that the density at the bottom of the column will be below the critical density, and the column will detonate at full order upon initiation.
6. For example, **to determine the approximate average in-hole density** in a column of 40m find 40m in the Depth column. Moving to the right, read off the density in the shaded column (an **AVG. IN-HOLE** density of 1.30g/cm³ in the 1.10 g/cm³ open cup density column).

   For depths that are not listed, Dyno Nobel recommends rounding up to the next highest depth, e.g . a 25m deep hole should be rounded to 26 m and corresponding densities applied.
7. Blast design should be based on the average in-hole density, whilst blasthole loading requires the MPU operator to achieve the associated open cup density.
8. The gassing reaction takes 30-40 minutes to achieve the desired open cup density at 20°C. It is necessary to allow at least this time to elapse following completion of loading and before stemming the charged blasthole. A longer period should be allowed at lower temperatures.
9. The density values shown were calculated using a laboratory mathematical model that was validated using a specially designed fit-for-purpose pressure-volume apparatus.
10. The low density explosive grade ammonium nitrate used in the model was assigned a bulk density of 0.77 g/cm³ and a particle density of 1.58 g/cm³.

Depth (m)	TITAN 9060G Density g/cm³													
	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe
Open Cup	**0.90**	**0.90**	**0.95**	**0.95**	**1.00**	**1.00**	**1.05**	**1.05**	**1.10**	**1.10**	**1.15**	**1.15**	**1.20**	**1.20**
1	0.92	0.94	0.97	0.99	1.02	1.04	1.07	1.09	1.12	1.13	1.16	1.18	1.21	1.22
2	0.94	0.98	0.99	1.03	1.04	1.07	1.08	1.12	1.13	1.16	1.18	1.20	1.22	1.25
3	0.96	1.02	1.01	1.06	1.05	1.10	1.10	1.14	1.14	1.18	1.19	1.22	1.23	1.26
4	0.98	1.05	1.02	1.09	1.07	1.13	1.11	1.17	1.16	1.20	1.20	1.24	1.24	1.28
5	0.99	1.07	1.04	1.11	1.08	1.15	1.12	1.19	1.17	1.22	1.21	1.26	1.25	1.29
6	1.01	1.10	1.05	1.13	1.09	1.17	1.14	1.20	1.18	1.24	1.22	1.27	1.26	1.30
7	1.02	1.12	1.06	1.15	1.11	1.19	1.15	1.22	1.19	1.25	1.23	1.28	1.26	1.31
8	1.04	1.14	1.08	1.17	1.12	1.20	1.16	1.23	1.19	1.26	1.23	1.29	1.27	1.32
9	1.05	1.16	1.09	1.19	1.13	1.22	1.17	1.25	1.20	1.27	1.24	1.30	1.28	1.33
10	1.06	1.17	1.10	1.20	1.14	1.23	1.17	1.26	1.21	1.28	1.25	1.31	1.28	1.33
11	1.07	1.19	1.11	1.21	1.14	1.24	1.18	1.27	1.22	1.29	1.25	1.32	1.29	1.34
12	1.08	1.20	1.12	1.23	1.15	1.25	1.19	1.28	1.22	1.30	1.26	1.32	1.29	1.34
13	1.09	1.21	1.13	1.24	1.16	1.26	1.20	1.28	1.23	1.31	1.26	1.33	1.29	1.35
14	1.10	1.22	1.13	1.25	1.17	1.27	1.20	1.29	1.23	1.31	1.27	1.33	1.30	1.35
15	1.11	1.23	1.14	1.25	1.17	1.28	1.21	1.30	1.24	1.32	1.27	1.34	1.30	1.36
16	1.11	1.24	1.15	1.26	1.18	1.28	1.21	1.30	1.24	1.32	1.28	1.34	1.31	1.36
17	1.12	1.25	1.15	1.27	1.19	1.29	1.22	1.31	1.25	1.33	1.28	1.35	1.31	1.36
18	1.13	1.26	1.16	1.28	1.19	1.30	1.22	1.31	1.25	1.33	1.28	1.35	1.31	1.37
19	1.14	1.26	1.17	1.28	1.20	1.30	1.23	1.32	1.26	1.34	1.29	1.35	1.31	1.37
20	1.14	1.27	1.17	1.29	1.20	1.31	1.23	1.32	1.26	1.34	1.29	1.36	1.32	1.37
22	1.15	1.28	1.18	1.30	1.21	1.32	1.24	1.33	1.27	1.35	1.29	1.36	1.32	1.38
24	1.15	1.29	1.18	1.31	1.21	1.32	1.24	1.34	1.27	1.35	1.30	1.37	1.32	1.38
26	1.16	1.30	1.19	1.32	1.22	1.33	1.25	1.35	1.27	1.36	1.30	1.37	1.32	1.38
28	1.17	1.31	1.20	1.32	1.22	1.34	1.25	1.35	1.28	1.36	1.30	1.38	1.33	1.39
30	1.17	1.32	1.20	1.33	1.23	1.34	1.25	1.36	1.28	1.37	1.31	1.38	1.33	1.39
32	1.18	1.32	1.21	1.34	1.23	1.35	1.26	1.36	1.28	1.37	1.31	1.38	1.33	1.39
34	1.18	1.33	1.21	1.34	1.24	1.35	1.26	1.36	1.29	1.37	1.31	1.39		
36	1.19	1.34	1.22	1.35	1.24	1.36	1.27	1.37	1.29	1.38	1.31	1.39		
38	1.19	1.34	1.22	1.35	1.24	1.36	1.27	1.37	1.29	1.38	1.32	1.39		
40	1.20	1.35	1.22	1.36	1.25	1.36	1.27	1.37	1.30	1.38	1.32	1.39		
45	1.20	1.35	1.23	1.36	1.25	1.37	1.28	1.38	1.30	1.38	1.32	1.39		
50	1.21	1.35	1.23	1.36	1.26	1.37	1.28	1.38	1.30	1.39	1.32	1.39		
55	1.21	1.35	1.24	1.36	1.26	1.37	1.28	1.38	1.30	1.39	1.33	1.39		
60	1.22	1.35	1.24	1.36	1.26	1.37	1.28	1.38	1.31	1.39	1.33	1.39		

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Groundbreaking Performance®

TITAN® Matrix Blend Gassing Table

TITAN 9070G

Technical Information

USE OF TABLE

1. The left hand column in this table (Depth) indicates the height of the product column under **dry hole conditions.** In **wet hole** conditions, the value selected from the left hand column must be the sum of the product column and the height of the water column in the hole. If the length of the product and water column exceeds the depth of the hole then the value selected from the left hand column must be the hole depth.
2. This table applies for TITAN 9000 Matrix blends with an emulsion content of **70% w/w ONLY, i.e. T9070G.**
3. Emulsion explosives behave as liquids when subjected to the gravitational stress in vertical and near vertical blastholes and a pressure gradient in the explosive will be established. The higher the explosive column in the blasthole, the higher the internal pressure at the bottom of the column, and the larger the quantity of gassing chemicals that need to be added to provide sensitisation.
4. The open cup density is a measure of the level of sensitisation of the product. It is necessary to choose an open cup density to ensure that the density of the explosive at the bottom of the blasthole is less than the critical density. Inappropriate sensitisation may lead to poor detonation, fragmentation and generation of excessive post blast fume.

   Blacked out areas indicate where critical density is reached or exceeded.
5. For example, **to determine the required open cup density for an explosive** column of 40m, find 40m in the Depth column. Moving to the right, read off the density in the unshaded column under the required open cup density (a **TOE** density of 1.37g/cm³ in the 1.10 g/cm³ open cup density column). This indicates that sufficient gassing chemicals should be added to the gassed explosive blend during delivery so that an open cup density of 1.10g/cm³ is achieved.

   This level of gassing chemicals will ensure that the density at the bottom of the column will be below the critical density, and the column will detonate at full order upon initiation.
6. For example, **to determine the approximate average in-hole density** in a column of 40m find 40m in the Depth column. Moving to the right, read off the density in the shaded column (an **AVG. IN-HOLE** density of 1.28g/cm³ in the 1.10 g/cm³ open cup density column).

   For depths that are not listed, Dyno Nobel recommends rounding up to the next highest depth, e.g . a 25 m deep hole should be rounded to 26 m and corresponding densities applied.
7. Blast design should be based on the average in-hole density, whilst blasthole loading requires the MPU operator to achieve the associated open cup density.
8. The gassing reaction takes 30-40 minutes to achieve the desired open cup density at 20°C. It is necessary to allow at least this time to elapse following completion of loading and before stemming the charged blasthole. A longer period should be allowed at lower temperatures.
9. The density values shown were calculated using a laboratory mathematical model that was validated using a specially designed fit-for-purpose pressure-volume apparatus.
10. The low density explosive grade ammonium nitrate used in the model was assigned a bulk density of 0.77 g/cm³ and a particle density of 1.58 g/cm³.

Depth (m)	TITAN 9070G Density g/cm³													
	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe	Avg. In-Hole	Toe
Open Cup	**0.90**	**0.90**	**0.95**	**0.95**	**1.00**	**1.00**	**1.05**	**1.05**	**1.10**	**1.10**	**1.15**	**1.15**	**1.20**	**1.20**
1	0.92	0.94	0.97	0.99	1.02	1.04	1.07	1.08	1.12	1.13	1.16	1.18	1.21	1.22
2	0.94	0.98	0.99	1.02	1.04	1.07	1.08	1.11	1.13	1.16	1.18	1.20	1.22	1.24
3	0.96	1.01	1.00	1.05	1.05	1.10	1.10	1.14	1.14	1.18	1.19	1.22	1.23	1.26
4	0.97	1.04	1.02	1.08	1.07	1.12	1.11	1.16	1.15	1.20	1.20	1.23	1.24	1.27
5	0.99	1.07	1.03	1.11	1.08	1.14	1.12	1.18	1.16	1.21	1.20	1.25	1.25	1.28
6	1.00	1.09	1.05	1.13	1.09	1.16	1.13	1.20	1.17	1.23	1.21	1.26	1.25	1.29
7	1.02	1.11	1.06	1.15	1.10	1.18	1.14	1.21	1.18	1.24	1.22	1.27	1.26	1.30
8	1.03	1.13	1.07	1.16	1.11	1.19	1.15	1.22	1.19	1.25	1.23	1.28	1.26	1.31
9	1.04	1.15	1.08	1.18	1.12	1.21	1.16	1.24	1.20	1.26	1.23	1.29	1.27	1.32
10	1.05	1.16	1.09	1.19	1.13	1.22	1.17	1.25	1.20	1.27	1.24	1.30	1.27	1.32
11	1.06	1.17	1.10	1.20	1.14	1.23	1.17	1.25	1.21	1.28	1.24	1.30	1.28	1.33
12	1.07	1.19	1.11	1.21	1.15	1.24	1.18	1.26	1.22	1.29	1.25	1.31	1.28	1.33
13	1.08	1.20	1.12	1.22	1.15	1.25	1.19	1.27	1.22	1.29	1.25	1.31	1.29	1.34
14	1.09	1.21	1.13	1.23	1.16	1.26	1.19	1.28	1.23	1.30	1.26	1.32	1.29	1.34
15	1.10	1.22	1.13	1.24	1.17	1.26	1.20	1.28	1.23	1.30	1.26	1.32	1.29	1.34
16	1.11	1.23	1.14	1.25	1.17	1.27	1.20	1.29	1.24	1.31	1.27	1.33	1.30	1.35
17	1.11	1.24	1.15	1.26	1.18	1.28	1.21	1.30	1.24	1.31	1.27	1.33	1.30	1.35
18	1.12	1.24	1.15	1.26	1.18	1.28	1.21	1.30	1.24	1.32	1.27	1.34	1.30	1.35
19	1.13	1.25	1.16	1.27	1.19	1.29	1.22	1.31	1.25	1.32	1.28	1.34	1.30	1.35
20	1.13	1.26	1.16	1.27	1.19	1.29	1.22	1.31	1.25	1.33	1.28	1.34	1.31	1.36
22	1.14	1.27	1.17	1.29	1.20	1.30	1.23	1.32	1.26	1.33	1.28	1.35	1.31	1.36
24	1.14	1.28	1.17	1.29	1.20	1.31	1.23	1.32	1.26	1.34	1.29	1.35	1.31	1.37
26	1.15	1.29	1.18	1.30	1.21	1.32	1.24	1.33	1.26	1.34	1.29	1.36	1.31	1.37
28	1.16	1.29	1.18	1.31	1.21	1.32	1.24	1.34	1.27	1.35	1.29	1.36	1.32	1.37
30	1.16	1.30	1.19	1.32	1.22	1.33	1.24	1.34	1.27	1.35	1.29	1.36	1.32	1.37
32	1.17	1.31	1.19	1.32	1.22	1.33	1.25	1.34	1.27	1.36	1.30	1.37		
34	1.17	1.31	1.20	1.33	1.23	1.34	1.25	1.35	1.28	1.36	1.30	1.37		
36	1.18	1.32	1.20	1.33	1.23	1.34	1.25	1.35	1.28	1.36	1.30	1.37		
38	1.18	1.32	1.21	1.33	1.23	1.34	1.26	1.35	1.28	1.36	1.30	1.37		
40	1.19	1.33	1.21	1.34	1.24	1.35	1.26	1.36	1.28	1.37				
45	1.19	1.33	1.22	1.34	1.24	1.35	1.26	1.36	1.29	1.37				
50	1.20	1.33	1.22	1.34	1.24	1.35	1.27	1.36	1.29	1.37				
55	1.20	1.34	1.22	1.34	1.25	1.35	1.27	1.36	1.29	1.37				
60	1.20	1.34	1.23	1.35	1.25	1.35	1.27	1.36	1.29	1.37				

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