

AMERİKAN VE İNGİLİZ ÖLÇÜ SİSTEMLERİ İLE METRİK SİSTEMİN BİRBİRİNE DÖNÜŞÜM CETVELİ

UZUNLUK ÖLÇÜLERİ

UZUNLUK ÖLÇÜLERİ	mm	cm	dm	m	km	inch parmak (")	foot ayak (ft)	Yard Yarda (Yrd)	State mile Kara mili	Naut mile Deniz mili
1 mm	1	0,1	0,01	0,001	1,0x10 ⁻⁶	0,03937	0,00328	1,094x10 ⁻³	-	-
1 cm	10	1	0,1	0,01	1,0x10 ⁻⁵	0,3937	0,03281	1,094.10 ⁻²	6,214 10 ⁻⁶	5,396 10 ⁻⁶
1 dm	100	10	1	0,1	-	3,937	0,3281	0,1094	-	-
1 m	1000	100	10	1	0,001	39,37	3,281	1,094	6,214 10 ⁻⁴	5,396 10 ⁻⁴
1 km	10 ⁶	10 ⁵	10 ⁴	1000	1	39 370	3 281	1 094	0,6214	0,5396
1 inch, pus parmak	25,40	2,54	0,254	0,0254	2,835 10 ⁻⁵	1	0,0833	0,0278	1,578 10 ⁻⁵	1,371 10 ⁻⁵
1 foot (ft) ayak	304,80	30,48	3,048	0,3048	3,048/10 ⁻⁴	12	1	0,3333	1,894 10 ⁻⁴	1,645 10 ⁻⁴
1 Yard (Yd)	914,4	91,44	9,144	0,9144	6,35 10 ⁻³	36	3	1	5,682 10 ⁻⁴	4,934 10 ⁻⁴
1 State mil kara mili	-	160 900	-	1609	1,609	63 360	5 280	1 760	1	0,8684
1 naut mil deniz mili	-	185 200	-	1803	1,803	72 960	6 080	2 027	1,152	1

ALAN (YÜZEY) ÖLÇÜLERİ

ALAN (YÜZEY) ÖLÇÜLERİ	cm ²	m ²	a (Ar)	ha	km ²	sa inch inç kare	sa foot ayak kare	sa Yard Yarda kare	sa mile mil kare	Acre kare
1 cm ²	1	0,0001	10 ⁻⁶	10 ⁻⁸	10 ⁻¹⁰	0,155	1,076 10 ⁻³	1,196 10 ⁻⁴	3,861 10 ⁻¹¹	2,47 10 ⁻⁸
1 m ²	10.000	1	0,01	0,0001	10 ⁻⁶	1555	10,76	1,196	3,86 10 ⁻⁷	2,47 10 ⁻⁴
1 a (Ar)	10 ⁶	100	1	0,01	0,0001	155 10 ³	1076	119,6	3,861 10 ⁻⁵	0,0247
1 ha (Hektar)	10 ⁸	10 ⁴	100	1	10 ⁻²	155 10 ⁵	107 600	11 960	0,0039	2,47
1 km ² (kilometre kare)	10 ¹⁰	10 ⁶	10 000	100	1	155.10 ⁷	1076 10 ⁴	1 196 10 ³	0,3861	247,1
1 sq inch kare	6,452	-	-	-	6,452 10 ⁻¹⁰	1	6,944 10 ⁻³	7,716 10 ⁻⁴	-	-
1 sq foot kare	929	0,093	-	-	9,29 10 ⁻⁸	144	1	0,1111	3,587 10 ⁻⁸	-
1 sq (Yarda kare)	8 361	0,8361	-	-	8,361 10 ⁻⁷	1 296	9	1	3,288 10 ⁻⁷	-
1 sq mile kare	-	-	25 900	259	2,59	-	278 10 ⁻⁷	3,098 10 ⁶	1	640
1 acre	-	4 050	40,5	0,405	4,05 10 ⁻³	-	43 640	4 850	0,0016	1

HACİM ÖLÇÜLERİ

HACİM ÖLÇÜLERİ	mm ³	cm ³	dm ³ (litre)	m ³	cubic inch in ³	cubic foot yd ³	cubic yard	us fl oz	imp fl oz	us gallon	imp gallon	imp pint
1 mm ³	1	0,001	-	-	0,000061	-	-	-	-	-	-	-
1 cm ³	1000	1	0,001	10 ⁻⁶	0,061	-	-	0,0338	0,0353	-	-	-
1 dm ³	10 ⁶	1000	1	0,001	61,02	0,035	1,308 10 ⁻³	33,81	35,3	0,2642	0,22	1,76
1 m ³	10 ⁹	10 ⁶	1000	1	61 020	35	1,308	33 810	35 300	264,2	220	1750
1 cubic inch (inç küp)	16 390	16,39	0,0164	-	1	5,78 10 ⁻⁴	-	0,5541	0,5768	0,0043	0,0036	0,288
1 cubic foot (ayak küp)	-	28 320	28,32	0,0285	1 728	1	0,0370	957,5	996,6	7,481	6,232	49,83
1 cubic yard (Yarda küp)	-	-	764,6	0,7646	46 656	27	1	25 853	26 909	202	168,2	1 345
1 us fı oz	29 570	29,57	0,0296	-	1,805	0,00104	-	1	1,041	0,0078	0,0065	0,520
1 Brit fl oz	28 410	28,41	0,0284	-	1,734	-	-	0,9607	1	-	-	0,05
1 us gallon	-	3 785	3,785	0,0037	231	0,1337	-	128	133,20	1	0,8327	6,662
1 imp gallon ing	-	4 546	4,546	0,00456	277,4	0,1603	-	153,7	160	1,201	1	8
1 imp pint	-	568,2	0,5682	-	34,68	0,02	-	19,21	20	0,1501	0,125	1

AĞIRLIK ÖLÇÜLERİ

AĞIRLIK ÖLÇÜLERİ	g	kg	k	t(m) metrik	1 oz	ib	ton (long) us
1 gr	1	10 ⁻³	10 ⁻⁵	10 ⁻⁶	3 527x10 ⁻²	2 205x10 ⁻³	0,984x10 ⁻⁶
1 kg	1000	1	10 ⁻²	10 ⁻³	35,27	2 205	0,984x10 ⁻³
1 k	10 ⁵	100	1	0,100	3 527	220,5	9,840x10 ⁻²
1 lt (metrik)	10 ⁶	1000	10	1	3 527x10 ⁴	2205	0,984
1 oz	28,35	2 835x10 ⁻²	2 835x10 ⁻⁴	2 835x10 ⁻⁵	1	6,250x10 ⁻²	2,790x10 ⁻⁵
1 ib	453,6	0,453	0,453x10 ⁻²	0,453x10 ⁻⁴	16	1	4 464,10 ⁻⁴
1 t büyük us	1,016x10 ⁶	1016	10,16	1,016	3 584x10 ⁴	2 240	1

ÇEVİRİM TABLOSU: GÜÇ BİRİMLERİ

	KW	BG (PS)	HP	kgms ⁻¹	kcal ⁻¹	btus ⁻¹	ftlbs ⁻¹
1 kilowatt = 1000 watt	1	1,36	1,34	102	2,39x10 ⁻¹	9,48x10 ⁻¹	737,8
1 beygir gücü (metrik)	7,36x10 ⁻¹	1	9,86x10 ⁻¹	75	1,76x10 ⁻¹	6,97x10 ⁻¹	542,5
1 beygir gücü (HP)	7,46x10 ⁻¹	1,014	1	76,04	1,78x10 ⁻¹	7,07x10 ⁻¹	550
1 kilogram metre / saniye	9,81x10 ⁻³	1,33x10 ⁻²	1,31x10 ⁻²	1	2,34x10 ⁻³	9,3x10 ⁻³	7,233
1 kilokalori / saniye	4,19	5,69	5,61	427	1	3,97	3,088
1 İNG. ısı birimi / saniye	1,06	1,43	1,41	108	2,52 10 ⁻¹	1	778
1 foot pound / saniye	1,36x10 ⁻³	1,84x20 ⁻³	1,82x10 ⁻³	1,38x10 ⁻¹	3,24x10 ⁻³	1,29x10 ⁻³	1

ÇEVİRİM TABLOSU: GÜÇ BİRİMLERİ

	W	KW	ft lb dak ⁻¹	Btu dak ⁻¹	g cm s ⁻¹	kcal dak ⁻¹	HP	Btu sa ⁻¹
watt	1	10 ⁻³	44,25	5,688x10 ⁻²	10 200	1,4333x10 ⁻²	1,341x10 ⁻³	3,413
kilowatt	1000	1	44 250	56,88	...	14,33	1,341	3,413
foot pound / dakika	2,260x10 ⁻²	2,260x10 ⁻⁵	1	1,285x10 ⁻³	230,5	3,239x10 ⁻⁴	3,030x10 ⁻⁵	7,712x10 ⁻²
İNG. ısı birimi / dakika	17,58	1,758x10 ⁻²	778	1	1,793x10 ⁻²	2,520x10 ⁻¹	2,358x10 ⁻²	60
gram santimetre / saniye	9,807x10 ⁻⁵	...	4,340x10 ⁻³	5,578x10 ⁻⁶	1	1,405x10 ⁻⁶	...	3,347x10 ⁻⁴
kilokalori / dakika	69,77	6,977x10 ⁻²	3 087	3,968	7,117x10 ⁻⁵	1	9,356x10 ⁻²	238,1
beygir gücü	745,7	7,457x10 ⁻²	33 000	42,42	...	10,69	1	2 545
İNG. ısı birimi / saat	2,930x10 ⁻¹	2,930x10 ⁻⁴	12,96	1,667x10 ⁻²	2 989	4,2x10 ⁻³	3,929x10 ⁻⁴	1

KUVVET BİRİMLERİ

	kg	dyn-din	j/cm	New kgm/sn
Kg	1	9,81 10 ⁵	0,0981	9,81
dyn-din	10,2 10 ⁻⁷	1	10 ⁻⁷	10 ⁻⁵
j/cm	10,2	10 ⁷	1	10 ²
New kgm/sn	0,102	10 ⁵	0,01	1

İŞ BİRİMLERİ

	ws = jül	kwh	psh	mkp(mkg)	kcal = WE
ws = jül	1	0,278.10 ⁻⁶	0,378.10 ⁻⁶	0,102	0,239.10 ⁻³
kwh	3,60.10 ⁶	1	1,36	0,367.10	860
psh	2,65.10 ⁶	0,736	1	0,270.10	632
mkp (mkg)	9,81	2,72.10 ⁻⁶	3,70.10 ⁻⁶	1	2,345.10 ⁻³
kCal = We		3,70.10 ⁻⁶			1

GÜÇ BİRİMLERİ

	watt = j/s	kw	ps	mkp/s	kCal/h : WE/h
Watt = j/s	1	10 ⁻³	0,00136	0,102	0,860
kw	1000	1	1,36	102	860
ps	735	0,736	1	75	635
mkp/s	9,81	0,00981	0,0133	1	8,45
kCal/h X WE/h	1,16	1,16.10 ⁻³	1,58.10 ⁻³	0,118	1

ELEKTROTEKNİK İŞ

İŞ = GÜÇ x ZAMAN

$$A = P \times t = U \times I \times t = I^2 \times R \times t = \frac{U^2}{R} t \text{ [WS]}$$

İŞ BİRİMLERİNİN KARŞILIKLARI

	Ws = jul	kWh	Psh	kCal = WE	nkgm
WS = JUL	1	0,278.10 ⁻⁶	0,378.10 ⁻⁶	2,39.10 ⁻⁴	0,102
kWh	3,6.10 ⁶	1	1,36	859	3,67.10 ⁵
Psh	2,64.10 ⁶	0,736	1	635	2,7.10 ⁵
kCal = We	4 190	1,16.10 ⁻³	1,58.10 ⁻³	1	427
kpm (kgm)	9,8	2,72.10 ⁻⁶	3,7.10 ⁻⁶	2,34.10 ⁻³	1

KARŞILAŞTIRMA TABLOLARI

Tablo 1: Uzunluk

	milimetre	santimetre	metre	kilometre	inç	adım	yard	mil
milimetre	1	0.1	0.001	-	0.03937	-	-	-
santimetre	10	1	0.01	-	0.393701	0.032808	-	-
metre	1000	100	1	0.001	39.3701	3.28084	1.09361	-
kilometre	-	-	1000	1	-	3280.84	1093.61	0.621371
inç	25.4	2.54	-	-	1	0.083333	0.027778	-
adım	304.8	30.48	0.3048	-	12	1	0.33333	-
yard	914.4	91.44	0.9144	0.000914	36	3	1	0.000568
mil	-	-	1609.344	1.609344	-	5280	1760	1

Tablo 2: Alan

	cm ²	m ²	km ²	in ²	ft ²	yd ²	dönüm	mil ²
cm ²	1	0.0001	-	0.155	0.001076	0.0001196	-	-
m ²	10000	1	0.000001	1550	10.7639	1.19599	0.0002471	-
km ²	-	1000000	1	-	-	-	247.105	0.386102
inç ²	6.4516	0.000645	-	1	0.006944	0.000772	-	-
ft ²	929.03	0.092903	-	144	1	0.111111	0.000023	-
yd ²	8361.27	0.836127	-	1296	9	1	0.0002066	-
dönüm	-	4046.86	0.004047	-	43560	4840	1	0.001562
mil ²	-	-	2.589987	-	-	-	640	1

Tablo 3: Kütle

	kg	ton	lb	UK cwt	UK ton	US cwt	US ton
kg	1	0.001	2.20462	0.019684	0.000984	0.022046	0.001102
ton	1000	1	2204.62	19.6841	0.984207	22.0462	1.10231
lb	0.453592	0.000454	1	0.008929	0.000446	0.01	0.0005
UK cwt	50.8023	0.050802	112	1	0.05	1.12	0.056
UK ton	1016.05	1.01605	2240	20	1	22.4	1.12
US cwt	45.3592	0.045359	100	0.892857	0.044643	1	0.05
US ton	907.185	0.907185	2000	1785.17	0.892857	20	1

Tablo 4: Hacim

	cm ³	m ³	litre (dm ³)	in ³	ft ³	yd ³	UK pint	UK gall	US pint	US gall
cm ³	1	-	0.001	0.061024	0.0000353	-	0.001760	0.00022	0.002113	0.000264
m ³	-	1	1000	61023.7	35.3147	1.30795	1759.75	219.969	2113.38	264.172
litre (dm ³)	1000	0.001	1	61.0237	0.035315	0.001308	1.75975	0.219969	2.11338	0.264172
in ³	16.3871	-	0.016387	1	0.0005787	0.0000214	0.028837	0.003605	0.034632	0.004329
ft ³	28316.8	0.028317	28.3168	1728	1	0.037037	49.8307	6.22883	59.8442	7.48052
yd ³	764555	0.764555	764.555	46656	27	1	1345.429	168.1784	1615.793	201.974
UK pint	568.261	0.0005683	0.568261	34.6774	0.020068	0.000743	1	0.125	1.20095	0.150119
UK gall	4546.09	0.0045461	4.54609	277.42	0.160544	0.005946	8	1	9.6076	1.20095
US pint	473.176	0.0004732	0.473176	28.875	0.01671	0.000619	0.832674	0.104084	1	0.125
US gall	3785.41	0.0037854	3.785411	231	0.133681	0.004951	6.661392	0.832674	8	1

Tablo 5: Basınç

	atm	mm Hg	m bar	bar	pascal	in H ₂ O	in Hg	psi
atm	1	760	1013.25	1.0132	101325	406.781	29.9213	14.6959
mm Hg	0.0013158	1	1.33322	0.001333	133.322	0.53524	0.03937	0.019337
m bar	0.0009869	0.750062	1	0.001	100	0.401463	0.02953	0.014504
bar	0.9869	750.062	1000	1	100000	401.463	29.53	14.504
pascal	0.0000099	0.007501	0.01	0.00001	1	0.004015	0.0002953	0.000145
in H ₂ O	0.0024583	1.86832	2.49089	0.002491	249.089	1	0.073556	0.036127
in Hg	0.033421	25.4	33.8639	0.0338639	3386.39	13.5951	1	0.491154
psi	0.068046	51.7149	68.9476	0.068948	6894.76	27.6799	2.03602	1
Pascal = 1 N/m ²								

Tablo 6: Hacimsel Debi

	L/s(dm ³ /s)	L/h	m ³ /s	m ³ /h	cfm	ft ³ /h	UK gall/m	UK gall/h	US gall/m	US gall/h
L/s(dm ³ /s)	1	3600	0.001	3.6	2.118882	127.133	13.19814	791.8884	15.85032	95.1019
L/h	0.000278	1	-	0.001	0.000588	0.035315	0.003666	0.219969	0.004403	0.264172
m ³ /s	1000	3600000	1	3600	2118.88	127133	13198.1	791889	15850.3	951019
m ³ /h	0.277778	1000	0.000278	1	0.588578	35.3147	3.66615	219.969	4.402863	264.1718
cfm	0.471947	1699.017	0.000472	1.699017	1	60	6.228833	373.73	7.480517	448.831
ft ³ /h	0.007866	28.3168	-	0.028317	0.016667	1	0.103814	6.228833	0.124675	7.480517
UK gall/m	0.075768	272.766	0.0000758	0.272766	0.160544	9.63262	1	60	0.120095	72.057
UK gall/h	0.001263	4.54609	-	0.004546	0.002676	0.160544	0.016667	1	0.020016	1.20095
US gall/m	0.06309	227.125	0.0000631	0.227125	0.133681	8.020832	0.832674	49.96045	1	60
US gall/h	0.001052	3.785411	-	0.003785	0.002228	0.133681	0.013878	0.832674	0.016667	1

Tablo 7: Güç

	Btu/h	W	Kcal/h	KW
Btu/h	1	0.293071	0.251996	0.000293
W	3.41214	1	0.859845	0.001
Kcal/h	3.96832	1.163	1	0.001163
KW	3412.14	1000	859.845	1

Tablo 8: Enerji

	Btu	Therm	J	KJ	Cal
Btu	1	0.00001	1055.06	1.055	251.996
Therm	100000	1	-	105 500	25 199 600
J	0.00094	-	1	0.001	0.2388
kJ	0.9478	0.000009478	1000	1	238.85
Cal	0.0039683	0.0039683x10 ⁻⁵	4.1868	-	1

Tablo 9: Özgül Isı

	Btu/lb °F	J/kg °C
Btu/lb °F	1	4186.8
J/kg °C	0.00023	1

Tablo 10: Isı Akısı

	Btu/ft ² h	W/m ²	Kcal/m ² h
Btu/ft ² h	1	3.154	2.712
W/m ²	0.3169	1	0.859
Kcal/m ² h	0.368	1.163	1

Tablo 11: Isı Transfer Katsayısı

	Btu/ft ² h °F	W/m ² °C	Kcal/m ² h °C
Btu/ft ² h °F	1	5.67826	4.88243
W/m ² °C	0.176110	1	0.859845
Kcal/m ² h °C	0.204816	1.163	1

Tablo 12: Entalpi

	Btu/lb	kJ/kg
Btu/lb	1	2.326
kJ/kg	0.4299	1

Tablo 13: Lineer Hız

	ft/dak	ft/s	m/s
ft/dak	1	0.016666	0.00508
ft/s	60	1	0.3048
m/s	196.850	3.28084	1

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ÇEVİRİM TABLOSU: HIZ BİRİMLERİ

	in / dak	ft / s	ft / dak	mi / sa	cm / s	m / s	m / dak	km / sa
inch / dakika	1	1,389x10 ⁻³	8,333x10 ²	-	4,233x10 ⁻²	4,233x10 ⁻⁴	2,540x10 ⁻²	-
foot / saniye	720	1	60	6,818x10 ⁻¹	30,48	3,048x10 ⁻¹	18,29	1,097
foot / dakika	12	1,667x10 ⁻²	1	1,136x10 ⁻²	5,080x10 ⁻¹	5,080x10 ⁻³	3,048x10 ⁻¹	1,829x10 ⁻²
mile / saat	-	1,467	88	1	-	4,470x10 ⁻¹	26,82	1,609
santimetre / saniye	23,62	3,281x10 ⁻²	1,968	-	1	1,0x10 ⁻²	6,0x10 ⁻¹	-
metre / saniye	2 362	3,281	196,8	2,237	100	1	60	3,6
metre / dakika	39,37	5,468x10 ⁻²	3,281	3,728x10 ⁻²	1,667	1,667x10 ⁻²	1	6,0x10 ⁻²
kilometre / saat	-	9,113x10 ⁻¹	54,68	6,214x10 ⁻¹	-	2,778x10 ⁻¹	16,67	1

ÇEVİRİM TABLOSU: ISI AKIŞI

	$\frac{W}{Js^{-1}}$ $kg\ m^2s^{-3}$	int. kcal/h	int. kcal/s	Btu/h	Btu/s
W	1	8,598x10 ⁻¹	2,388x10 ⁻⁴	3,412	9,478x10 ⁻⁴
int kcal/h	1,163	1	2,778x10 ⁻⁴	3,968	1,102x10 ⁻³
int kcal/s	4 187	3 600	1	14 290	3,968
But/h	2,931x10 ⁻¹	2,520x10 ⁻¹	7,0x10 ⁻⁵	1	2,778x10 ⁻⁴
But/s	1 055	907,2	2,520x10 ⁻¹	3 600	1

ÇEVİRİM TABLOSU: ISI MİKTARI

	$\frac{J}{Nm}$ kgm^2/s^2	int. kcal	Btu (British thermal unit)	CHU (centigrade heat unit)	th (Thermie)
J	1	2,388x10 ⁻⁴	9,478x10 ⁻⁴	5,263x10 ⁻⁴	2,389x10 ⁻⁷
int. kcal	4 187	1	3,968	2,204	9,997x10 ⁻⁴
Btu	1 055	2,520x10	1	5,553x10 ⁻¹	2,521x10 ⁻⁴
CHU	1 900	4,536x10 ⁻¹	1,8	1	4,537x10 ⁻⁴
th	4,186x10 ⁶	1 002	3 967	2 204	1

BASINÇ ÖLÇÜLERİ

BASINÇ ÖLÇÜLERİ	atm	at	psi	torricelli torr	bar
1 standart atmosfer (atm) (0Ω C de 760 mm CIVA)	1	1,0332	14,7	760	1,0133
1 metrik atmosfer (at) kg/cm ²	0,9678	1	14,2	735,56	0,9807
1 libre/inç ² (psi)	0,068	0,07	1	-	-
1 torr (0Ω C de 1 mm civa)	1,32x10 ⁻³	1,36x10 ⁻³	-	1	1,33x10 ⁻³
1 bar	0,9869	1,0197	-	750,06	1

ÇOK KULLANILAN GÜÇ BİRİMLERİ

	watt	kW	PS	kCal/s = WE/s	kpm/s
watt	1	10 ⁻³	1,36.10 ⁻³	2,4.10 ⁻⁴	0,102
kW	10 ³	1	1,36	0,239	102
PS	736	0,736	1	0,17564	75
kCal/s = WE/s	4 187	4,187	5,693	1	724
kmp/s	9,8061	9,81.10 ⁻³	1,33.10 ⁻²	2,34.10 ⁻³	1

ÇEVİRİM TABLOSU: ENERJİ, İŞ VE ISI BİRİMLERİ

	J	kg m kgf m	ft lb ft lb f	kW s kW hr	BG hr	BG hr	lt atm	k cal	Btu
Joule	1	1,019 72x10 ⁻¹	7,37562x10 ⁻¹	2,778x10 ⁻⁷	3,777x10 ⁻⁷	3,725x10 ⁻⁷	9,869x10 ⁻³	2,388x10 ⁻⁴	9,478x10 ⁻⁴
kilogram metre kilogram - kuvvet	9,806 65	1	7,233	2,724x10 ⁻⁴	3,7037x10 ⁻⁶	3,653x10 ⁻²	9,678x10 ⁻²	2,342x10 ⁻³	9,295x10 ⁻³
foot pound foot pound- kuvvet	1,356	1,383x10 ⁻¹	1	3,766x10 ⁻⁷	5,1206x10 ⁻⁷	5,0505x10 ⁻⁷	1,338x10 ⁻²	3,238x10 ⁻⁴	1,285x10 ⁻³
kilowatt, saat	3,600x10 ⁶	3,671x10 ⁵	2,655x10 ⁶	1	1,3596	1,341	35 528	859,9	3 412
beygircü, saat (metrik)	2,648x10 ⁶	273 700	1,9529x10 ⁶	6,355x10 ⁻¹	1	9,863x10 ⁻¹	26 131	632,4	2 510
beygircü saat	2,6845x10 ⁶	273 750	1,98x10 ⁶	7,457x10 ⁻¹	1,0139	1	26 493	641,2	2 544
litre atmosfer	101,33	10,333	74,74	2,815x10 ⁻⁵	3,827x10 ⁻⁵	3,775x10 ⁻⁵	1	2,420x10 ⁻²	9,604x10 ⁻²
kilokalori	4 187	426,9	3,087	1,163x10 ⁻³	1,561x10 ⁻³	1,560x10 ⁻³	41,32	1	3,968
british thermal unit	1 055	107,6	778,2	1,931x10 ⁻⁴	3,985x10 ⁻⁴	3,930x10 ⁻⁴	10,41	2,520x10 ⁻¹	1

Enerji, iş ve ısı birimleri	J	Kwh ¹	Kgfm	KCal	Erg	Psh	Hph	Btu	FtXlbf	l atm
1 J(jul)=Nxm=Wxs	1	2,778x10 ⁻⁷	0,101972	2,388x10 ⁻⁴	10 ⁷	3,777x10 ⁻⁷	3,725x10 ⁻⁴	9,478x10 ⁻⁴	0,737561	0,009869
1 KWh (Kilowatsaat)	3,6x10 ⁶	1	3,671x10 ⁵	859.845	3,6x10 ¹³	1,35962	1,34102	3412,14	2,65522x10 ⁶	35528
1 Kgfm (Kilogram kuvvetxmt)	9.80665	2,724x10 ⁻⁶	1	0.002342	9.80665x10 ⁷	3,70370x10 ⁻⁶	3,653x10 ⁻⁶	0,009297	7,233	0,09678
1 Kcal (Kilo kalori)	4186,8	0,001163	426.939	1	4187x10 ⁷	0,001581	0,001560	3,96832	3088,02	41,32
1 Erg	10 ⁻⁷	2,778x10 ⁻¹⁴	1,0197x10 ⁻⁸	2,388x10 ⁻¹¹	1	3,777x10 ⁻¹⁴	3,725x10 ⁻⁴	9,478x10 ⁻¹¹	7,376x10 ⁻⁸	9,869x10 ¹⁰
1 Psh (Metrikbeygirgücü saat)	2,648x10 ⁶	0,735499	270.000	632,41	2,648x10 ¹³	1	0,986320	2509,62	1,95291x10 ⁶	26131
1 Hph (Beygirgücüsaaat)	2,6845x10 ⁶	0,7457	2,7375x10 ⁵	641,186	2,6845x10 ¹³	1,0139	1	2544,43	1,98x10 ⁶	26439
Btu (İng. ısı birimi)	1055,06	2,931x10 ⁻⁴	107,586	0,251996	1055x10 ⁷	3,985x10 ⁻⁴	3,930x10 ⁻⁴	1	778,168	10,41
FtXlbf (Foot libre kuvvet)	1,35582	3,76617x10 ⁻⁷	0,138255	3,23832x10 ⁻⁴	1,35582x10 ⁷	5,12056x10 ⁻⁷	5,05051x10 ⁻⁷	0,001285	1	0,01338
lxatm (Litre atmosfer)	101.33	2,815x10 ⁻⁵	10,333	0,02420	101,33x10 ⁷	3,827x10 ⁻⁵	3,775x10 ⁻⁵	0,09604	74,74	1

¹(IT Kalori) lca 1IT = 4,1868 J [Milletlerarası kalori]

¹(Thermochem) 1 Cal = 4,1840 J [İsı kimyası kaloris]

GÜÇ	kgfcm/s	Kw	Kcal/s	erg/s	PS	Hp	Fxtb/s	Fxtb/min	Btu/s	Btu/min
1 kgfcm/s	1	0,009807	0,002342	9,807x10 ⁷	0,013333	0,0131509	7,23301	433,98	0,009295	0,5577
Kilogram kuvvet mt/sn	1	0,009807	0,002342	9,807x10 ⁷	0,013333	0,0131509	7,23301	433,98	0,009295	0,5577
1 Kw (Kilowat)	101,972	1	0,238846	10 ¹⁰	1,35962	1,34102	737,562	4,426x10 ⁴	0,92781	56,89
1 KCal/s (Kilokalori/sn)	426,9	4,1868	1	4187x10 ⁷	5,692	5,614	3088,05	185280	3,96832	238,08
1 Erg/s (Erg/sn)	1,020x10 ⁻⁸	10 ⁻¹⁰	2,388x10 ⁻¹¹	1	1,360x10 ⁻¹⁰	1,341x10 ⁻¹⁰	7,376x10 ⁻⁸	4,426x10 ⁻⁸	9,481x10 ⁻¹¹	5,689x10 ⁻⁹
1 PS (Metrikbeygirgücü)	75	0,735499	0,175671	7,355x10 ⁹	1	0,986320	542,476	3,255x10 ⁴	0,69712	41,83
1 HP (Beygirgücü)	76,0402	0,7457	0,1781	7,457x10 ⁹	1,01387	1	550	3,3x10 ⁴	0,70679	42,41
1 Fxtb/s (Font libre kuvvet/sn)	0,138255	0,001356	3,238x10 ⁻⁴	1,356x10 ⁷	0,001843	0,001818	1	60	0,001285	0,07712
1 Fxtb/min (Font libre kuvvet/dakika)	2,305x10 ⁻³	2,260x10 ⁻⁵	5,396x10 ⁻⁶	2,259x10 ⁵	3,072x10 ⁻⁵	3,030x10 ⁻⁵	0,01667	1	2,141x10 ⁻⁵	1,285x10 ⁻³
Btu/s (İng. ısı birimi/sn)	107,586	1,05505	0,251993	1055x10 ⁷	1,4345	1,4149	778,17	4,670x10 ⁴	1	60
Btu/min (İng. ısı birimi/dakika)	1,793	0,01758	4,2x10 ⁻³	1,758x10 ⁸	0,02390	0,02357	12,97	778,0	0,01667	1

1 Poncelet = 100 kgf.m/s

BASINÇ	atm Atmosfer	at kgf/cm ²	psi lbf/in ²	Torr mm Hg	Bar	Paskal N/m ²
1 atm (Normal Atmosfer 0 °C'de 760 mm cıvannın ağırlığı)	1	1,03323	14,6559	760	1,013250	101325
1 at (Metrik Atmosfer)	0,967841	1	14,2233	735,559	0,980665	98066,5
1 Psi	0,0680460	0,0703070	1	51,7149	0,0689476	6895
1 Torr	1,31579x10 ⁻³	1,35951x10 ⁻³	0,0193368	1	1,33322x10 ⁻³	133,32
1 Bar=10 ⁶ Dyn/cm ²	0,986923	1,01972	14,5038	750,062	1	10 ⁵

KUVVET	Birim Analizi	N	Dyn	kgf	lbf	Poundal
1 Newton (N) = kg m/s ²		1	10 ⁵	0,101972	0,224809	7233
MKS Sistem		1	10 ⁵	0,101972	0,224809	7233
1 DIN (DYN) = gr.cm/sn ²		10 ⁵	1	1,01972x10 ⁻⁶	2,24809x10 ⁻⁶	7,233x10 ⁻⁵
Metrik Mutlak Sistem CGS		10 ⁵	1	1,01972x10 ⁻⁶	2,24809x10 ⁻⁶	7,233x10 ⁻⁵
1 Kilogram kuvvet (kgf) = kg x 9,80665 m/sn ²		9,80665	980665	1	2,20462	70,93
Metrik (Teknik) Yerpçkimi Sistemi		9,80665	980665	1	2,20462	70,93
1 Libre kuvvet (lbf) = lbf x 32,174 lb/sn ²		4,4480	444805	0,4536	1	32,17
İng Teknik yerpçkimi sistemi		4,4480	444805	0,4536	1	32,17
1 Poundal = lb $\frac{ft}{sn^2}$		0,1383	13825	0,0141	0,03108	1
İng Mutlak dinamik sistemi		0,1383	13825	0,0141	0,03108	1

BİRİMLERİN AS VE ÜS KATLARINA GÖRE ALDIKLARI ÖN TAKILAR

10 un katları	Ön takı	Ön takı işareti
10 ¹⁸	Exa	E
10 ¹⁵	Peta	P
10 ¹²	Tera	T
10 ⁹	Giga	G
10 ⁶	Mega	M
10 ³	Kilo	k
10 ²	Hekto	h
10	Deka	da
10 ⁻¹	Desi	d
10 ⁻²	Santi	c
10 ⁻³	Mili	m
10 ⁻⁶	Mikro	µ
10 ⁻⁹	Nano	n
10 ⁻¹²	Piko	p
10 ⁻¹⁵	Femto	f

Özgül Isı	J/m ³ C	kWh/m ³ C	kcal/m ³ C	BTU/in ³ F	BTU/ft ³ F	Özgül Isı	J/kg C	kWh/kgC	kcal/kgf C	BTU/lb F
1 J/m ³ C	1	2,77778 x 10 ⁻⁷	2,38846 x 10 ⁻⁴	8,62885 x 10 ⁻⁹	1,49107 x 10 ⁻⁵	1 J/kg C	1	2,77778 x 10 ⁻⁷	2,38846 x 10 ⁻⁴	BTU/lb F
1 kWh/m ³ C	3,6 x 10 ⁶	1	859,845	3,10639 x 10 ⁻²	53,67838	1 kWh/kg C	3,6 x 10 ⁶	1	859,845	
1 kcal/m ³ C	4168,8	1,163 x 10 ⁻³	1	3,61273 x 10 ⁻⁵	6,2428 x 10 ⁻²	1 kcal/kgf C =				
1 BTU/in ³ F	1,1589 x 10 ⁹	32,19173	2,76799 x 10 ⁴	1	1728	1 BTU/lb F	4168,8	1,163 x 10 ⁻³	1	
1 BTU/ft ³ F	6,70661 x 10 ⁴	1,86295 x 10 ⁻²	16,01847	1/1728	1					

1 kJ/kg C = 0,2388 Kcal/kpc

Isı Akısı	W/m ²	kcal/m ² h	BTU/in ² sec	BTU/ft ² sec	BTU/ft ² hr
1 W/m ²	1	0,859845	6,11494 x 10 ⁻⁷	8,0551 x 10 ⁻⁵	0,316998
1 kcal/m ² h	1,163	1	7,11167 x 10 ⁻⁷	1,02408 x 10 ⁻⁴	0,368669
1 BTU/in ² sec	1,63534 x 10 ⁶	1,40614 x 10 ⁶	1	144	5,184 x 10 ⁵
1 BTU/ft ² sec	1,13565 x 10 ⁴	9764,86	1/144	1	3600
1 BTU/ft ² hr	3,15459	2,71246	1,92901 x 10 ⁻⁶	1/3600	1

Isıl Değer	J/kg	kcal/kp	BTU/lb
1 J/kg	1	2,38846 x 10 ⁻⁴	4,299232 x 10 ⁻⁴
1 kcal/kp	4168,8	1	1,8
1 BTU/lb	2326	0,55556	1

Isı İletim Katsayısı	W/mC	kcal/h m C	BTU in/ft ² hr F	BTU/ft hr F	BTU/in hr F
1 W/mC	1	0,859845	6,93347	0,57789	4,81491 x 10 ⁻²
1 kcal/h m C	1,163	1	8,06363	0,671969	5,59974 x 10 ⁻²
1 BTU in/ft ² hr F	0,144228	0,124014	1	1/12	1/144
BTU/ft hr F	1,73073	1,48816	12	1	1/12
BTU/in hr F	20,76882	17,85797	144	12	1

Isıl Değer	J/m ³	kcal/m ³	BTU/ft ³
1 J/m ³	1	2,38846 x 10 ⁻⁴	2,68392 x 10 ⁻⁵
1 kcal/m ³	4168,8	1	0,11237
1 BTU/ft ³	3,7259 x 10 ⁴	8,89915	1

Dinamik Viskozite	N s/m ² = Pa x s = 10 P	kg/h m	kp s/m ²	lb mass/ft sec	lb force sec ft ²
1 N s/m ²	1	3600	0,101972	0,67197	2,08854 x 10 ⁻²
1 kg/h m	2,77778 x 10 ⁻⁴	1	2,83255 x 10 ⁻⁵	1,86658 x 10 ⁻⁴	5,80151 x 10 ⁻⁶
1 kp s/m ²	0,80665	3,53039 x 10 ⁴	1	6,58976	0,204816
1 lb mass/ft sec	1,48816	5357,39	0,151751	1	3,1081 x 10 ⁻²
1 lb force sec ft ²	47,88027	1,72369 x 10 ⁵	4,88243	32,17405	1

Film Katsayısı	W/m ² C	kcal/m ² h C	BTU/ft ² hr F
1 W/m ² C	1	0,859845	0,17611
1 kcal/m ² h C	1,163	1	0,20482
1 BTU/ft ² hr F	5,67826	4,88243	0,20482

Isıl İlinim Katsayısı	W/m ² (K) ⁴	kcal/m ² h(K) ⁴	BTU/ft ² hr (R) ⁴	Yüzey Gerilimi	N/m = 10 ³ dyn/cm	mp/mm	lb/in
1 W/m ² (K) ⁴	1	0,859845	3,01972 x 10 ⁻²	1 N/m	1	101,97162	5,71015 x 10 ⁻³
1 kcal/m ² h(K) ⁴	1,163	1	3,51194 x 10 ⁻²	1 mp/mm	9,80665 x 10 ⁻³	1	5,59974 x 10 ⁻⁵
1 BTU/ft ² hr(R) ²	33,11564	28,47432	1	1 lb/in	175,127	1,7858 x 10 ⁴	1

Kinematik Viskozite
Boyut: 1 m ² /s = 10 ⁴ Stokes = 10 ⁶ cSt

ÇEŞİTLİ METALLERİN FİZİKSEL ÖZELLİKLERİ

Metaller	Sembol	Atom Ağırlığı	Yoğunluğu (20°C'de) (g/cm ³)	Ergime Nok. (760 Torr) (°C)	Ergime Isısı (entalpisi) (kcal/kg)	Kaynama Noktası (°C)	Brinell Sertliği (kg/mm ²)	Isıl Uzama katsayısı (10 ⁻⁶ /drc)
Altın	Au	196,967	19,281	1 063	15,98	2 710	18-20	14,2
Alüminyum	Al	26,9815	2,6989	660,24	94,6	2 447	16-25	23,5
Atimon	Sb	121,75	6,692	630,74	39,5	1 637	30-42	10,4
Bakır	Cu	63,546	8,933	1 083	50,5	2 595	42-50	16,6
Bizmut	Bi	208,980	9,803	271,3	12,7	1 560	7-9	12,7
Çinko	Zn	65,39	7,134	419,58	27,5	908	31-35	33
Cıva	Hg	200,59	13,546	-38,85	2,79	356	-	60-181
Demir	Fe	55,847	7,876	1 537	64,4	3 070	45-60	11,8
Gümüş	Ag	107,568	10,500	961,28	25,2	2 180	20-28	19,7
Katmiyum	Cd	112,41	8,647	320,9	13,5	765	21-35	31
Kalay	Sn	118,71	7,285	231,97	14,3	2 687	4-5	23
Kalsiyum	Ca	40,08	1,53	840	78,7	1 487	13-17	22
Kobalt	Co	51,9332	8,89	1 494	65,3	2 880	48-125	13,3
Krom	Cr	51,996	7,194	1 860	70	3 642	70-108	7,3
Kurşun	Pb	207,2	11,344	327,5	5,75	1 751	3	29
Lityum	Li	6,941	0,533	180,54	158,5	1 340	0,4	58
Magnezyum	Mg	24,305	1,730	648,8	50	1 110	30	26
Mangan	Mn	54,9380	7,473	1 244	64,8	2 095	-	22,4
Molibden	Mo	95,94	10,222	2 617	68,8	4 800	147-160	5,3
Nikel	Ni	58,69	8,9	1 455	72,1	2 750	70-110	13,3
Platin	Pt	195,08	21,45	1 770	24,1	4 200	42-50	9
Potasyum	K	39,0983	0,862	63,25	14,6	754	0,037	84
Sodyum	Na	22,9898	0,966	97,81	27,4	884	0,07	71
Silisyum	Si	28,0855	2,329	1 410	395	2 600	204	5,9
Tantal	Ta	180,9479	16,67	2 996	-	5 300	70-120	6,5
Titanyum	Ti	47,88	4,508	1 665	104	3 280	160	8,5
Uranyum	U	238,029	19,05	1 132	20	3 930	185	-
Vanadyum	V	50,9415	5,96	1 890	-	3 200	150-260	8,3
Wolfram	W	183,85	19,254	3 400	45,7	5 900	250-290	4,5
Zirkonyum	Zr	91,224	6,504	1 852	60	3 600	60-160	10

ÇEŞİTLİ METALLERİN FİZİKSEL ÖZELLİKLERİ

Metaller	Sembol	Elastikiyet Modülü 10 ⁵ kp/cm ²	Isı İletkenlik kcal/m h drc	Özgül Isınma Isısı kcal/kg dre	Özgül Elektrik Direnci Ω mm ² /m	Elektrik direncinin Sıcaklık Katsayısı 10 ⁻³ /drc	Akım Alt. Özgül Elek. direnci Ω mm ² /m
Altın	Au	7,9	267	0,0319	0,0206	4,0	-
Alüminyum	Al	7,3	197	0,214	0,0265	4,7	0,24
Atimon	Sb	8	198	0,05	0,386	5,4	1,28
Bakır	Cu	11,3	332	0,092	0,017241	4,3	0,248
Bizmut	Bi	3,2	7,2	0,0298	1,11	4,5	-
Çinko	Zn	8,4	97,2	0,0925	0,057	4,2	0,336
Cıva	Hg	-	6,92	0,0332	0,9407	0,99	1,19
Demir	Fe	20	63,8	0,112	0,100	4,6	-
Gümüş	Ag	8,16	357	0,0559	0,0149	4,1	0,17
Kadmiyum	Cd	5,6	82,7	0,0556	0,0724	4,2	0,335
Kalay	Sn	4,2	56,8	0,054	0,115	4,6	0,546
Kalsiyum	Ca	2,5	-	0,163	0,040	4,2	-
Kobalt	Co	21	59,2	0,102	0,056	5,9	-
Krom	Cr	-	-	0,105	0,150	-	-
Kurşun	Pb	1,8	30,3	0,0306	0,21	4,2	1,03
Lityum	Li	-	57,8	0,82	0,085	4,9	-
Magnezyum	Mg	4,6	148	0,0243	0,043	4,1	-
Mangan	Mn	-	43,2	0,116	0,39	5,3	-
Molibden	Mo	35	126	0,059	0,050	4,7	-
Nikel	Ni	21	79,2	0,106	0,069	6,7	0,095
Platin	Pt	17,1	60,1	0,032	0,0981	3,9	-
Potasyum	K	-	82,8	0,177	0,063	5,7	-
Sodyum	Na	-	119	0,278	0,043	5,4	0,11
Silisyum	Si	11	-	0,169	10	-	-
Tantal	Ta	-	46,8	0,033	0,14	3,5	-
Titanyum	Ti	11	13,1	0,147	0,42	5,4	-
Uranyum	U	21	25,67	0,0252	0,21	2,8	-
Vanadyum	V	13	-	0,116	-	3,9	-
Wolfram	W	35	143	0,0321	0,055	4,8	-
Zirkonyum	Zr	9	-	0,069	0,41	4,4	-

AKIŞKANLARIN FİZİKSEL ÖZELLİKLERİ

Akışkan	Kaynama Noktası °C	Özgül Ağırlığı g/cm ³	Isıl İletkenliği kcal/m h drc	Özgül Isınma Isısı kcal/kg drc
Alkol	64,5	0,789	0,172	0,60
Aseton	56,1	0,791	–	0,5
Asetik Asit (derişik)	118	1,053	0,170	0,48
Balık yağı	–	0,92	–	–
Benzol	80,1	0,878	0,127	0,415
Benzin	67–100	0,68–072	0,103	0,5
Bezir yağı	316	0,94	0,13	–
Eter	–	0,73	–	–
Fuel oil	175–350	0,92	0,10	0,49
Gaz yağı	200–350	0,86	0,13	0,48
Gliserin	290	1,26	0,245	0,58
Ham petrol	–	0,7–1,04	–	0,39
HCl (%10)	102	1,05	0,43	0,75
HCl (%40)	–	1,20	–	–
Hidroflorik asit	19,5	0,99	–	–
Hint yağı	–	0,97	–	0,46
Karbon sülfür	–	1,29	–	–
Karbon tekrar klorür	–	1,599	–	0,2
Katran	300	1,2	0,12	0,35 (40°C'de)
Katran	–	–	–	0,45(200°C'de)
Kolza yağı	300	0,91	0,15	0,47
Makina yağı	380–400	0,91	0,108	0,40

BAZI KATI MADDELERİN ÖZGÜL AĞIRLIKLARI

Antrasit.....	1,50	Kükürt.....	2,07
Arduaz.....	2,70	Linyit.....	1,20
Asfalt.....	1,20	Maden kömürü.....	1,50
Barut.....	0,84	Mermer.....	2,80
Beton.....	1,90-2,80	Meşe kömürü.....	0,45
Buz (0°C).....	0,92	Meşin (kuru).....	0,86
Cam.....	2,50	Meşin (yaşlı).....	1,02
Elmas.....	3,52	Mika.....	2,7-3,1
Fiber.....	1,45	Mum.....	0,96
Fildişi.....	1,9	Mütacanis kalker.....	2,70
Granit.....	2,7	Odun kömürü (toz).....	1,50
Gre.....	2,5	Porselen.....	2,30
Jips (toz).....	2,27	Potasyum nitrat.....	2,09
Kalsiyum klorür.....	1,98	Amonyum klorür.....	1,52
Kauçuk.....	0,93	Selüloid.....	1,50
Keçe.....	0,20	Sodyum nitrat.....	2,24
Killi toprak.....	1,3-2,0	Sodyum klorür.....	2,15
Kireç.....	1,30	Sülyen.....	9,00
Kırmızı cıva oksidi.....	11,14	Şeker.....	1,60
Kola.....	1,50	Tahta tozu.....	0,55
Kok kömürü.....	1,40	Tebeşir.....	1,25
Kornü Kömürü.....	1,88	Tereyağı.....	0,94
Kristal.....	2,96	Tuğla.....	1,60
Kuartz.....	2,65	Çinko oksid.....	5,60
Kum (kuru).....	1,64	Buğday unu.....	0,6

BAZI SIVI MADDELERİN ÖZGÜL AĞIRLIKLARI

Alkol (saf).....	0,79	Katran.....	1,20
Asetik asit.....	1,06	Klorür asidi.....	1,20
Benzin.....	0,72	Mazot.....	0,85
Benzol.....	0,88	Nitrat asidi %40.....	1,25
Brom.....	3,18	Petrol.....	0,80
Deniz suyu.....	1,02	Sülfat asidi %87.....	1,80
Eter.....	0,73	Şarap.....	0,99
Gliserin.....	1,26	Terebentin ruhu.....	0,86
Hint yağı.....	0,96	Zeytinyağı.....	0,92
Karbon sülfür.....	1,29		

MALZEMELERİN KİMYASAL DAYANIMI

E : Mükemmel
G : İyi
F : Zayıf
U : Uygun değil

Malzeme	Dökme Demir	Paslanmaz Çelik	Bronz	Monel	EPDM	NBR	Viton	Doğal Lastik
Aseton	G	E	E	E	G	U	U	U
Amonyak	U	E	U		G			
Amonyum Fosfat	U	G	U	G	E	E		G
Amonyum Klorit	U	G	Y	G				
Amonyum Nitrat	F	E	U	G		E		
Amonyum Sülfat	U	G	U	G	E	E	E	
Aseti Asit	U	E	U	F	G	U		F
Asfalt	E	E	E	E		U	E	U
Atık Su	U	E	E	E	E	G		
Bakır Sülfat	F	E	U	U	E	E	E	G
Bira	U	E	U		E			
Biütan	G	E	E	E	U	G	G	U
Boraks	U	E	U	E		G		G
Borik Asit	U	E	F	G	E	E		
Buhar	U	E	G	E	E	U	U	U
Çamur	G	E		E	U	E		U
Deniz Suyu	U	G	G	E	E	G	E	
Dizel Yakıtlar	F	E	G	E	U	E	E	
Doğal Gaz	G	E	E		U	E	E	U
Eterler	U	E	E	G	U	U		U
Etil Alkol	U	E	E	E	E	G	G	G
Etilenoksit	G	E			U	U	U	U
Freon	F	E	E	E	U	G	G	U
Fuel Oil	F	E	E	G	U	F	E	U
Gaz Yağı	F	E	G	G	U	E	E	U
Gliküz	U	E	G	G		E	E	
Hava	E	E	E	E	E	E		
Hidroklorik Asit %15 60' F	U	U	U	U	E	U	E	
Hidroklorik Asit %20	U	U	U	F		U	E	U
Hidroklorik Asit %20-60	U	G	U	E		U	G	U
Hidroklorik Asit %37, 60' F	U	U	U	U	U	U	E	U
Kahve	U	E	U		E	U	E	E
Kalsiyum Hipoklorit	-	G				F		
Zeytin Yağı		E			G	E	E	U

MALZEMELERİN KİMYASAL DAYANIMI

E : Mükemmel
 G : İyi
 F : Zayıf
 U : Uygun değil

Malzeme	Dökme Demir	Paslanmaz Çelik	Bronz	Monel	EPDM	NBR	Viton	Doğal Lastik
Kalsiyum Karbonat	F			E	E	E	E	E
Kalsiyum Klorit		E		G				
Kalsiyum Klorit Çözeltisi	F	E	F		E	E	E	G
Kalsiyum Sülfat	F	E	E	G	E	E	E	E
Karbon dioksit	F	E	E		G	G	E	G
Karbonik Asit	U	G		G		E		
Kerosen	E	E	E	E	U	E	E	U
Laktik Asit	U	G	U	G		F		
Metan	U	E	E		U	E	E	U
Metil Alkol	U	E	E	E	E	G	U	G
Meyve Suları	U	E	Y		G	G		
Magnezyum Klorit	F	G	F	G	E	E	E	E
Mineral Su	F	E	E	E	E	G		
Mineral Yağ	F	F			U	E	E	U
Nitrik Asit	U		U	U	U	U	E	U
Oksijen 200' F	U	U	U	U	U	U	F	U
Oksijen 300' F	E	E	E	E	E	G	E	F
Petrol	U	G	F	G	U	E	E	U
Potasyum Nitrit	F	E	F	G	E	E	E	E
Potasyum Sülfat	U	E				E		
Propan	F	E	E		U	E	E	
Sitrik Asit	U	E	F	G	E	G	E	U
Sodyum Karbonat	U	E	G	E	E	E	E	E
Sodyum Klorit	U	E	E	E	E	E	E	E
Sodyum Nitrat	U	E	G	G	E	G		G
Sülfirik Asit %10	U	G	U	U	E	U	E	F
Sülfirik Asit %50	U	U	U	U	F	U	E	U
Sülfirik Asit %90, 70' F	U	U	U	U	U	U	E	U
Süt	U	E			E	E	E	E
Şarap ve Viski	U	E	G	E	E	E		
Tatlı Su	F	E	E	E	E	G		E
Tuzlu Su-Deniz Suyu	U			G	E	E		
Yağlama Yağı	E	E	E	E	U	E	E	U

Malzeme	Elastite modülü E, GPa	Rijitlik modülü G, GPa	Poisson sayısı ν	Yoğunluk ρ , Mg/m ³
Alüminyum (tüm alaşımlar)	71.0	26.2	0.334	2.71
Berilyum bakırı	124.0	48.3	0.285	8.22
Pirinç	106.0	40.1	0.324	8.55
Karbon çeliği	207.0	79.3	0.292	7.81
Kır dökme demir	100.0	41.4	0.211	7.20
Bakır	119.0	44.7	0.326	8.91
Douglas fir	11.0	4.1	0.33	0.44
Cam	46.2	18.6	0.245	2.60
Inconel alaşımı	214.0	75.8	0.290	8.90
Kurşun	36.5	13.1	0.425	11.38
Magnezyum	44.8	16.5	0.350	1.80
Molibdenyum	331.0	117.0	0.307	10.19
Monel alaşımı	179.0	65.5	0.320	8.83
Nikel gümüşü	127.0	48.3	0.322	8.75
Nikel çeliği	207.0	79.3	0.291	7.75
Fosfor tuncu	111.0	41.4	0.349	8.17
Paslanmaz çelik (18-8)	190.0	73.1	0.305	7.75

YUNAN ALFABESİ












































Alfa	A	α	α	Nü	N	ν	
Beta	B	β		Ksi	Ξ	ξ	
Gama	Γ	γ		Omikron	O	o	
Delta	Δ	δ	δ	Pi	Π	π	
Epsilon	E	ϵ	ϵ	Ro	P	ρ	
Zeta	Z	ζ		Sigma	Σ	σ	
Eta	H	η		To	T	τ	
Teta	Θ	θ	θ	İpsilon	Υ		
Yota	I	ι	ϵ	Fi	Φ	ϕ	ϕ
Kapa	K	κ		Hi	X	χ	
Lamda	Λ	λ		Psi	Ψ	ψ	
Mü	M	μ		Omega	Ω	ω	

INCH - MİLİMETRE KARŞILIKLARI

Ondalık ve Milimetre Eşdeğerleri

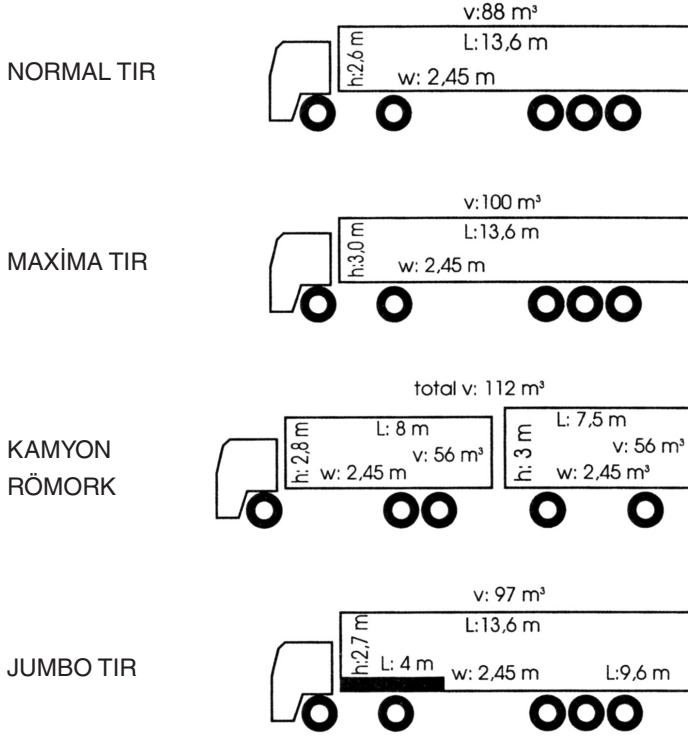
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1/2 — 1/4 ve 1/8			1/64		
1/8	0,125	3,175	1/64	0,015 625	0,397
1/4	0,250	6,350	3/64	0,046 875	1,191
3/8	0,375	9,525	5/64	0,078 125	1,984
1/2	0,500	12,700	7/64	0,109 375	2,778
5/8	0,625	15,875	9/64	0,140 625	3,572
3/4	0,750	19,050	11/64	0,171 875	4,366
7/8	0,875	22,225	13/64	0,203 125	5,159
1/16			15/64	0,234 375	5,953
1/16	0,0625	1,588	17/64	0,265 625	6,474
3/16	0,1875	4,763	19/64	0,296 875	7,541
5/16	0,3125	7,938	21/64	0,328 125	8,334
7/16	0,4375	11,113	23/64	0,359 375	9,128
9/16	0,5625	14,288	25/64	0,390 625	9,922
11/16	0,6875	17,463	27/64	0,421 875	10,716
13/16	0,8125	20,638	29/64	0,453 125	11,509
15/16	0,9375	23,813	31/64	0,484 375	12,303
1/32			33/64	0,515 625	13,097
1/32	0,031 25	0,794	35/64	0,546 875	13,891
3/32	0,093 75	2,381	37/64	0,578 125	14,684
5/32	0,156 25	3,969	39/64	0,609 375	15,478
7/32	0,281 75	5,556	41/64	0,640 625	16,272
9/32	0,218 75	7,144	43/64	0,671 875	17,066
11/32	0,343 75	8,731	45/64	0,703 125	17,859
13/32	0,406 25	10,319	47/64	0,734 375	18,653
15/32	0,468 75	11,906	49/64	0,765 625	19,447
17/32	0,531 25	13,494	51/64	0,796 875	20,241
19/32	0,593 75	15,081	53/64	0,828 125	21,034
21/32	0,656 25	16,669	55/64	0,859 375	21,828
23/32	0,718 75	18,256	57/64	0,890 625	22,622
25/32	0,781 25	19,844	59/64	0,921 875	23,416
27/32	0,843 75	21,431	61/64	0,953 125	24,209
29/32	0,906 25	23,019	63/64	0,984 375	25,003
31/32	0,968 75	24,606	63/64	1,000 000	25,400

ULUSLARARASI MAL TESLİM ŞEKİLLERİ

Belirtilen Yerde, İşyerinde, Mağazada Teslim	EXW					
Belirtilen Yükleme Limanında, Gemi Yanında Teslim	FAS					
Belirtilen Yerde Taşıyıcıya Teslim	FCA					
Belirtilen Yükleme Limanında, Gemi Güvertesinde Teslim	FOB					
Belirtilen Varış Limanında, Mal Bedeli ve Navlunu Ödenmiş Olarak Teslim	CFR					
Belirtilen Varış Yerine Kadar, Navlunu Ödenmiş Olarak Teslim	CPT					
Belirtilen Varış Limanında, Mal Bedeli, Sigorta ve Navlunu Ödenmiş Olarak Teslim	CIF					
Belirtilen Varış Yerine Navlun ve Sigorta Primi Ödenmiş Olarak Teslim	CIP					
Belirtilen Sınırdaki Teslim	DAF					
Belirtilen Varış Limanında Gemide Teslim	DES					
Belirtilen Varış Limanında Rıhtımda Teslim	DEQ					
Belirtilen Varış Yerinde, Gümrük Vergisi Ödenmeksizin Teslim	DDU					
Belirtilen Varış Yerinde, Gümrük Vergisi Ödenmiş olarak Teslim	DDP					



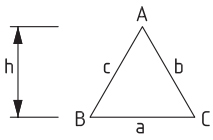
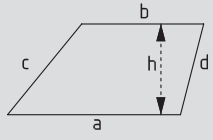
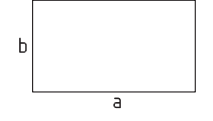
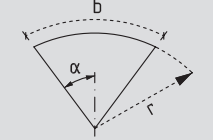
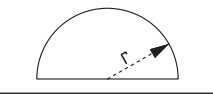
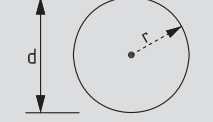
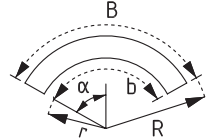
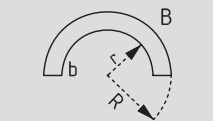
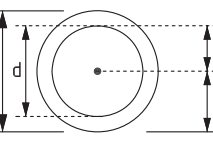
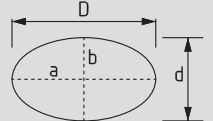
ULUSLARARASI NAKLİYE ARAÇ EBATLARI



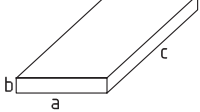
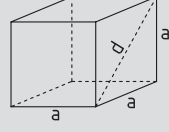
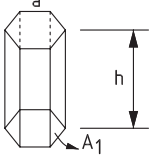
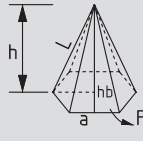
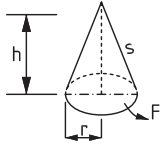
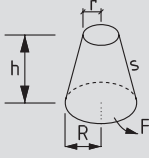
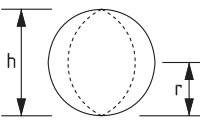
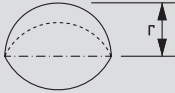
İÇ EBATLAR

		Uzunluk	Genişlik	Yükseklik	Maximum Yükseklik	Net Hacim
20 FT Konteyner		5,89 m	2,34 m	2,37 m	24,850 kg	33 m ³
40 FT Konteyner		11,90 m	2,34 m	2,38 m	28,800 kg	67 m ³
40 FT High Cube		11,90 m	2,34 m	2,67 m	30,200 kg	76 m ³
45 FT High Cube		13,00 m	2,34 m	2,67 m	27,820 kg	86 m ³

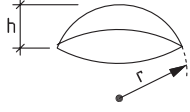
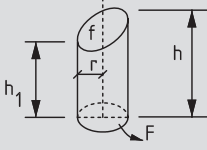
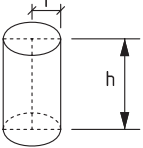
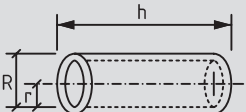
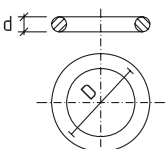
ALAN VE ÇEVRE HESAPLARI

		ALAN	ÇEVRE
ÜÇGEN		$A = \frac{1}{2} \cdot a \cdot h$	$U = a + b + c$
YAMUK (Trapez)		$A = \frac{a+b}{2} \cdot h$	$U = a + b + c + d$
DİKDÖRTGEN		$A = a \cdot b$	$U = 2(a + b)$
DAİRE DİLİMİ		$A = \frac{b \cdot r}{2} = \frac{\alpha^\circ}{180} \cdot r^2 \cdot \pi$ $b = r \cdot \pi \frac{\alpha^\circ}{90}$ yay boyu	$U = 2r + b$
YARIM DAİRE		$A = \frac{1}{2} \cdot \pi \cdot r^2$	$U = r(2 + \pi) = 5,14 \cdot r$
DAİRE		$A = r^2 \cdot \pi = \pi \frac{d^2}{4}$	$U = 2\pi \cdot r = \pi \cdot d$
DAİRE HALKASI DİLİMİ		$A = \frac{a}{180} \cdot \pi \cdot (R^2 - r^2)$	$U = 2(R - r) + B + b$
YARIM DAİRE HALKASI		$A = \frac{\pi}{2} \cdot (R^2 - r^2)$	$U = 2(R - r) = B + b$
DAİRE HALKASI		$A = \pi \cdot (R^2 - r^2)$	$U = 2\pi(R + r)$
ELİPS ÇEMBERİ		$A = \frac{\pi \cdot d \cdot D}{4}$	$U = \frac{a+b}{2} \cdot \pi$

HACİM VE ALAN HESAPLARI

		HACİM	ALAN
DİKDÖRTGEN PRİZMA		$V = a \cdot b \cdot c$	$A = 2(a \cdot a + a \cdot c + b \cdot c)$
KÜP		$V = a^3 = \frac{d^3}{2.828}$	$A = 6 \cdot a^2 = 3d^2$
PRİZMA		$A = A_1 \cdot h$ $A_1 = 2,598 \cdot a$	U = Altıgen çevresi $A_1 =$ Altıgen yüzey h = Yükseklik $A = U \cdot h + 2A_1$ $A_1 = 2,598 \cdot a$
PİRAMİT		$A = \frac{1}{3} \cdot F \cdot h$	$h_b = \sqrt{h^2 + \frac{a^2}{4}}$ L = $\sqrt{hb^2 \frac{a^2}{4}}$ $A = F + 6 \left(\frac{hb \cdot a}{2} \right)$ $F = 2,598 \cdot a^2$
KONİ		$A = \frac{1}{3} \cdot F \cdot h$	$A = \pi \cdot r \cdot s + \pi \cdot r^2$ $S = \sqrt{h^2 + r^2}$
KESİK KONİ		$V = (R^2 + r^2 + R \cdot r) \frac{\pi \cdot h}{3}$	$A = (R + r) \cdot \pi \cdot S + \pi(R^2 + r^2)$ $S = \sqrt{h^2 + (R - r)^2}$
KÜRE		$V = \frac{4}{3} \cdot \pi \cdot r^3$ $V = 4,189 \cdot r^3$ $V = 0,5236 \cdot d^3$	$A = 4 \cdot \pi \cdot r^2$ $A = \pi \cdot d^2$
KESİK KÜRE		$V = \frac{2}{3} \cdot \pi \cdot r^3$	$A = 3\pi \cdot r^2$

HACİM VE ALAN HESAPLARI

		HACİM	ALAN
KÜRE PARÇASI		$V = \pi \cdot h^2 \left(r - \frac{1}{3}h \right)$	$a = 2\pi \cdot r \cdot h + \pi(2 \cdot r \cdot h - h^2)$ $A = \pi \cdot h(4r - h)$
KESİK SİLİNDİR		$V = \pi r^2 \cdot \frac{h + h_1}{2}$	$A = \pi \cdot r \cdot (h + h_1) + F + f$
SİLİNDİR		$V = \pi \cdot r^2 \cdot h$	$A = 2\pi \cdot r \cdot h + 2\pi \cdot r^2$
İÇİ BOŞ SİLİNDİR		$V = \pi \cdot h(R^2 - r^2)$	$A = 2 \cdot \pi \cdot h(R + r) + 2\pi \cdot (R^2 - r^2)$
SİLİNDİRİM HALKA		$V = \frac{\pi \cdot d^2}{4} \cdot \pi \cdot D$	$A = \pi \cdot d \cdot \pi \cdot D$

GÜNCEL TESİSAT MALZEME FİYATLARI (www.kar-el.com.tr)'de

Not: Her fiyat sayfasının altında iskantomuzu görebilirsiniz. İskontomuzu görebilmek için en alt satırın altını seçerek tarayınız.

Adres : Aski Arkası Hamit Kaplan Sokak No: 1/A Ulus - ANKARA

Tel : (0312) 311 24 44 (pbx) **Fax :** (0312) 311 74 31

KESİTLERİN ÖZELLİKLERİ

A = Alan

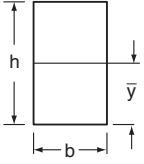
I = Ak^2 = Atalet Momenti

J = Polar Atalet Momenti

Z = Mukavemet Momenti

k = Dönme Yarıçapı

\bar{y} = Ağırlık Merkezi Uzaklığı



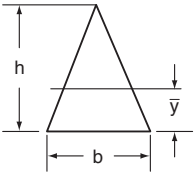
$$A = bh$$

$$k = 0.28 h$$

$$I = \frac{bh^3}{12}$$

$$\bar{y} = \frac{h}{2}$$

$$Z = \frac{bh^2}{6}$$



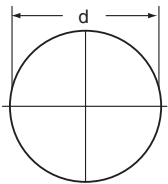
$$A = \frac{bh}{2}$$

$$k = 0.236 h$$

$$I = \frac{bh^3}{36}$$

$$\bar{y} = \frac{h}{3}$$

$$Z = \frac{bh^2}{24}$$



$$A = \frac{\pi d^2}{4}$$

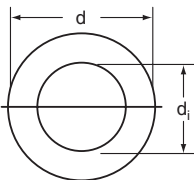
$$J = \frac{\pi d^4}{32}$$

$$I = \frac{\pi d^4}{64}$$

$$k = \frac{d}{4}$$

$$Z = \frac{\pi d^3}{32}$$

$$\bar{y} = \frac{d}{2}$$



$$A = \frac{\pi}{4}(d^2 - d_i^2)$$

$$J = \frac{\pi}{32}(d^4 - d_i^4)$$

$$I = \frac{\pi}{64}(d^4 - d_i^4)$$

$$k = \sqrt{\frac{d^2 + d_i^2}{16}}$$

$$Z = \frac{\pi}{32d}(d^4 - d_i^4)$$

$$\bar{y} = \frac{d}{2}$$

AÇISAL FONKSİYONLAR

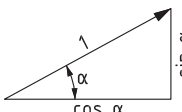
α	$0^\circ \dots 90^\circ$	$90^\circ \dots 180^\circ$	$180^\circ \dots 270^\circ$	$270^\circ \dots 360^\circ$
sin	$+\sin\alpha$ $+\cos(90^\circ-\alpha)$	$+\sin(180^\circ-\alpha)$ $+\cos(\alpha-90^\circ)$	$-\cos(270^\circ-\alpha)$ $-\sin(^\circ-180^\circ)$	$-\sin(360^\circ-\alpha)$ $-\cos(^\circ-270^\circ)$
cos	$+\cos\alpha$ $+\sin(90^\circ-\alpha)$	$-\cos(180^\circ-\alpha)$ $-\sin(\alpha-90^\circ)$	$-\sin(270^\circ-\alpha)$ $-\cos(^\circ-180^\circ)$	$+\cos(360^\circ-\alpha)$ $+\sin(\alpha-270^\circ)$
tan	$+\tan\alpha$ $+\cot(90^\circ-\alpha)$	$-\tan(180^\circ-\alpha)$ $-\cot(180^\circ-\alpha)$	$+\cot(270^\circ-\alpha)$ $+\tan(\alpha-180^\circ)$	$-\tan(360^\circ-\alpha)$ $-\cot(\alpha-270^\circ)$
cot	$+\cot\alpha$ $+\tan(90^\circ-\alpha)$	$-\cot(180^\circ-\alpha)$ $-\tan(\alpha-90^\circ)$	$+\tan(270^\circ-\alpha)$ $+\cot(\alpha-180^\circ)$	$-\cot(360^\circ-\alpha)$ $-\tan(\alpha-270^\circ)$

MİSAL: $\sin 120^\circ = \begin{cases} +\sin(180^\circ - \alpha) = +\sin 60^\circ = +0,866 \\ +\cos(\alpha - 90^\circ) = +\cos 30^\circ = +0,866 \end{cases}$

$\tan 320^\circ = \begin{cases} -\tan(360^\circ - \alpha) = -\tan 40^\circ = -0,8391 \\ -\cot(\alpha - 270^\circ) = -\cot 50^\circ = -0,8391 \end{cases}$

AÇISAL FONKSİYONUN ÜÇGENLERDEKİ HESABI

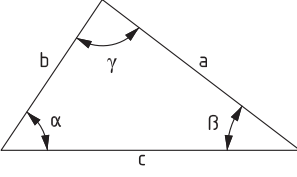
BİR AÇIDA FONKSİYONLARIN KARŞILIKLI DURUMU

	PİSAGORA GÖRE $\sin^2 + \cos^2 = 1$	$\tan = \frac{\text{Karşı Kenar}}{\text{Yan Dik Kenar}}$ $\tan \alpha = \frac{\sin \alpha}{\cos \alpha}$	$\tan = \frac{\text{Yan dik kenar}}{\text{Karşı dik kenar}}$ $\cot \alpha = \frac{\cos \alpha}{\sin \alpha}$	$\tan \alpha \cdot \cot \alpha = 1$
$\sin(\alpha \pm \beta) = \sin \alpha \cdot \cos \beta \pm \cos \alpha \cdot \sin \beta$		$\cos(\alpha \pm \beta) = \cos \alpha \cdot \cos \beta \pm \sin \alpha \cdot \sin \beta$		
$\tan(\alpha \pm \beta) = \frac{\tan \alpha \pm \tan \beta}{1 \pm \tan \alpha \cdot \tan \beta}$		$\cot(\alpha \pm \beta) = \frac{\cot \alpha \cdot \cot \beta \pm 1}{\cot \alpha \pm \cot \beta}$		
$\sin 2\alpha = 2 \cdot \sin \alpha \cdot \cos \alpha$ $\cos 2\alpha = \cos^2 \alpha - \sin^2 \alpha$	$\tan 2\alpha = \frac{2 \cdot \tan \alpha}{1 - \tan^2 \alpha}$ $\cot 2\alpha = \frac{\cot^2 \alpha - 1}{2 \cdot \cot \alpha}$	$\sin \alpha = \sqrt{\frac{1 - \cos 2\alpha}{2}}$ $\cos \alpha = \sqrt{\frac{1 + \cos 2\alpha}{2}}$	$\cos \alpha \pm \sin \alpha = \sqrt{1 \pm \sin 2\alpha}$ $\tan \alpha = \sqrt{\frac{1 - \cos 2\alpha}{1 + \cos 2\alpha}}$	

ÖNEMLİ AÇISAL FONKSİYONLAR

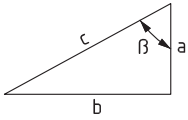
	0°	30°	45°	60°	90°		0°	30°	45°	60°	90°
sin	0	$\frac{1}{2} = 0,5$	$\frac{1}{2}\sqrt{2} = 0,707$	$\frac{1}{2}\sqrt{3} = 0,866$	1	tan	0	$\frac{1}{3}\sqrt{3} = 0,577$	1	$\sqrt{3} = 1,732$	∞
cos	1	$\frac{1}{2}\sqrt{3} = 0,866$	$\frac{1}{2}\sqrt{2} = 0,707$	$\frac{1}{2}\sqrt{2} = 0,707$	0	cot	∞	$\sqrt{3} = 1,732$	1	$\frac{1}{3}\sqrt{3} = 0,577$	0

GENİŞ AÇILI ÜÇGENLERDE AÇISAL FONKSİYONLAR

	SİNÜS DEĞERİ	KOSİNÜS DEĞERİ
	$a : b : c = \sin \alpha : \sin \beta : \sin \gamma$	$a^2 = b^2 + c^2 - 2bc \cdot \cos \alpha$
	$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} = \frac{c}{\sin \gamma}$	$b^2 = a^2 + c^2 - 2ac \cdot \cos \beta$ $c^2 = a^2 + b^2 - 2ab \cdot \cos \gamma$

SİNÜS VE KOSİNÜSÜN KULLANIMI

KENAR HESABI	AÇI HESABI		YÜZEY HESABI
$a = \frac{b \cdot \sin \alpha}{\sin \beta} = \frac{c \cdot \sin \alpha}{\sin \gamma}$	$\sin \alpha = \frac{a \cdot \sin \beta}{b} = \frac{a \cdot \sin \gamma}{c}$	$\cos \alpha = \frac{b^2 + c^2 - a^2}{2bc}$	$A = \frac{a \cdot b \cdot \sin \gamma}{2}$
$b = \frac{a \cdot \sin \beta}{\sin \alpha} = \frac{c \cdot \sin \beta}{\sin \gamma}$	$\sin \beta = \frac{b \cdot \sin \alpha}{a} = \frac{b \cdot \sin \gamma}{c}$	$\cos \beta = \frac{a^2 + c^2 - b^2}{2ac}$	$A = \frac{b \cdot c \cdot \sin \alpha}{2}$
$c = \frac{a \cdot \sin \alpha}{\sin \alpha} = \frac{b \cdot \sin \gamma}{\sin \beta}$	$\sin \gamma = \frac{c \cdot \sin \alpha}{a} = \frac{c \cdot \sin \beta}{b}$	$\cos \gamma = \frac{a^2 + b^2 - c^2}{2ab}$	$A = \frac{a \cdot c \cdot \sin \beta}{2}$



β AÇISINA GÖRE KENAR FONKSİYONLARI HESABI

$$\cos \beta = \frac{b}{c} \cdot \cos \beta = \frac{a}{c} \cdot \tan \beta = \frac{b}{a} \cdot \cot \beta = \frac{a}{b}$$

$a = c \cdot \sin \alpha$ $= b \cdot \tan \alpha$ $= \frac{b}{\cot \alpha}$	$b = c \cdot \sin \alpha$ $= \frac{a}{\tan \alpha}$ $= a \cdot \cot \alpha$	$c = \frac{a}{\sin \alpha}$ $= \frac{b}{\cos \alpha}$	$a = c \cdot \cos \beta$ $= \frac{b}{\tan \beta}$ $= b \cdot \cot \beta$	$b = c \cdot \sin \beta$ $= a \cdot \tan \beta$ $= \frac{a}{\cot \alpha}$	$c = \frac{b}{\sin \beta}$ $= \frac{a}{\cos \beta}$
---	---	--	--	---	--

SİNÜSSEL İŞARETLERİN DÖNÜŞTÜRME ÇARPANLARI

BİLİNEN	ORTALAMA	RMS	TEPE	TEPEDEN TEPEYE
ORTALAMA	1.0	1.11	1.57	3.14
R.M.S.	0.9	1.0	1.414	2.828
TEPE	0.637	0.707	1.0	2.0
TEPEDEN TEPEYE	0.32	0.535	0.5	1.0

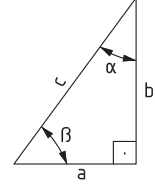
TRİGONOMETRİ

$$\sin \alpha = \frac{\text{Karşı Kenar}}{\text{Hipotenüs}} = \frac{a}{c}$$

$$\cos \alpha = \frac{\text{Yan Kenar}}{\text{Hipotenüs}} = \frac{b}{c}$$

$$\operatorname{tg} \alpha = \frac{\text{Karşı Dik Kenar}}{\text{Yan Dik Kenar}} = \frac{a}{b}$$

$$\operatorname{Cotg} \alpha = \frac{\text{Yan Dik Kenar}}{\text{Karşı Dik Kenar}} = \frac{b}{a}$$



AÇILARIN TRİGONOMETRİK FONKSİYONLARI

DERECE	0°	30°	45°	60°	90°	180°	270°	360°
Sin α	0	0,5	0,707	0,866	1	0	-1	0
Cos α	1	0,866	0,707	0,5	0	-1	0	1
tg α	0	0,577	1	1,732	∞	0	∞	0
Cotg α	∞	1,732	1	0,577	0	∞	0	∞

YUNAN (GREEK) ALFABESİ

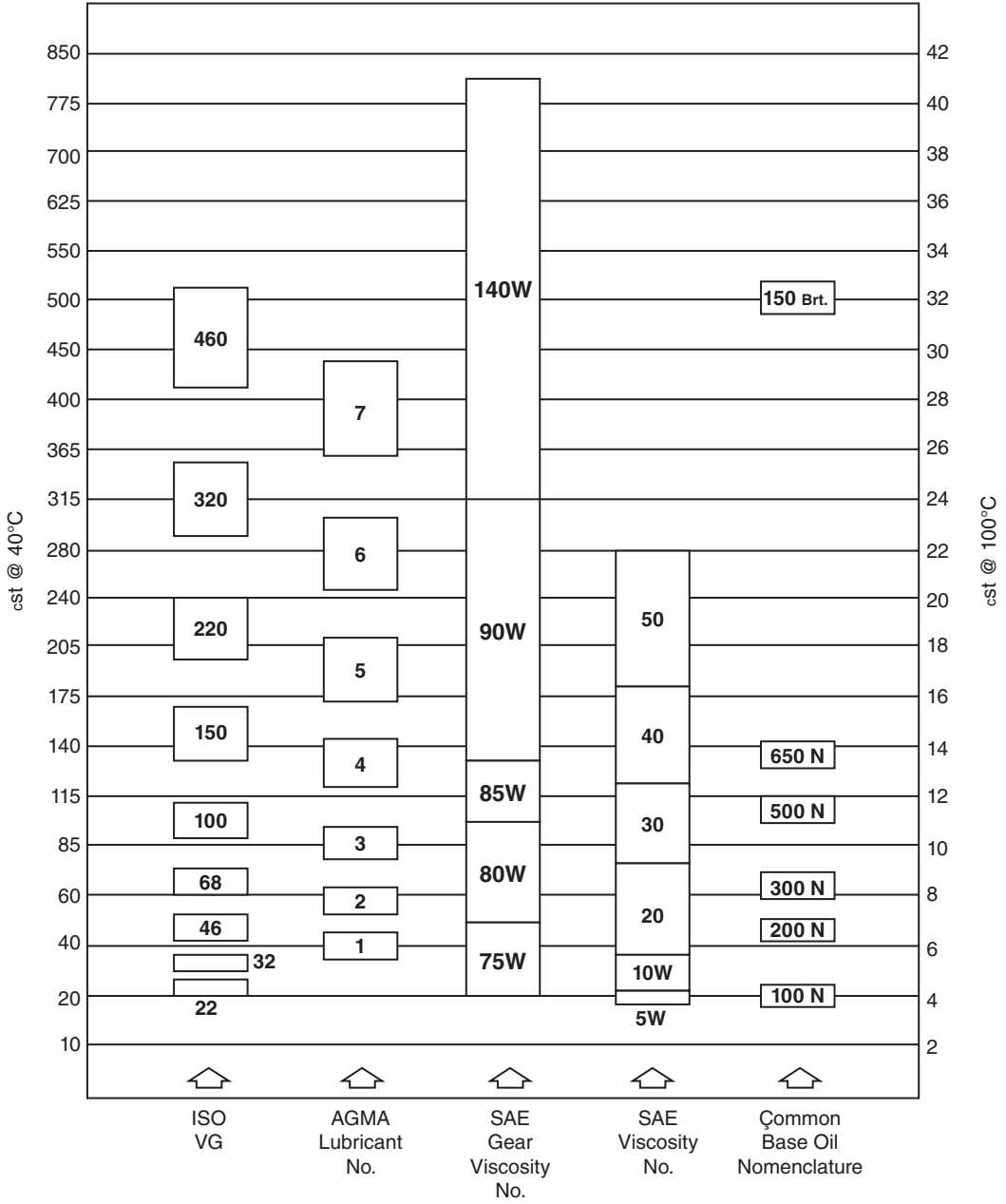
alfa	A	α	A	α	nu	N	γ	N	γ
beta	B	β	B	β	ksi	E	ε	E	ε
gama	r	γ	r	γ	omikron	O	o	O	o
delta	Δ	δ	Δ	δ	pi	π	$\pi\omega$	π	$\pi\omega$
epsilon	E	ε, ϵ	E	ε, ϵ	ro	P	ρ	P	ρ
zeta	Z	ζ	Z	ζ	sigma	Σ	σ	Σ	σ
eta	H	η	H	η	tau	T	τ	T	τ
teta	θ	ν, θ	θ	ν, θ	upsilon	Υ	ν	Υ	ν
ita	I	ι	I	ι	fi	Φ	Φ, Φ	Φ	Φ, Φ
kaba	K	χ, κ	K	χ, κ	ki	X	χ	X	χ
lamda	λ	λ	λ	λ	psi	Ψ	Ψ	Ψ	Ψ
znu	M	μ	M	μ	omega	Ω	ω	Ω	ω

(n) DEĞERİNİN ÜST KATLARI

(n) DEĞERİNİN ALT KATLARI

Exa (E) = 10^{18} = 1.000.000.000.000.000.000	Dezi (d) = 10^{-1} = 0,1
Peta (P) = 10^{15} = 1.000.000.000.000.000	Zenti (c) = 10^{-2} = 0,01
Tera (T) = 10^{12} = 1.000.000.000.000	Mili (m) = 10^{-3} = 0,001
Giga (G) = 10^9 = 1.000.000.000	Mikro (M) = 10^{-6} = 0,000.001
Mega (M) = 10^6 = 1.000.000	Nano (n) = 10^{-9} = 0,000.000.001
Kilo (K) = 10^3 = 1.000	Pico (p) = 10^{-12} = 0,000.000.000.001
Hekto (h) = 10^2 = 100	Femto (f) = 10^{-15} = 0,000.000.000.000.001
Deka (D) = 10^1 = 10	Atto (a) = 10^{-18} = 0,000.000.000.000.000.001

VİZKOZİTE SINIFLANDIRMALARININ KARŞILAŞTIRMASI



HİDROLİK SİLİNDİR FORMÜLLERİ

Strok hacmi $V = \frac{A \cdot h}{10\,000}$ [lt]

V = Strok hacmi [lt]

t = Strok süresi [s]

Strok süresi $t = \frac{A \cdot h \cdot 6}{Q \cdot 1000}$ [s]

h = Strok [mm]

Düz borularda basınç kayıpları

$$\Delta p = \lambda \cdot \frac{l \cdot p \cdot v^2 \cdot 10}{d \cdot 2} \quad [\text{bar}]$$

Δp = Düz borudaki basınç kaybı (Katmanlı veya tedirgin akış)

Katmanlı akışta boru sürtünme katsayısı $p = \text{Yoğunluk} \left[\frac{\text{kg}}{\text{dm}^3} \right] \sim 0.89$

$$\lambda_{\text{kat}} = \frac{64}{Re}$$

λ = Boru sürtünme katsayısı

l = Boru boyu [m]

Tedirgin akışta boru sürtünme katsayısı $v = \text{Borudaki akış hızı} \left[\frac{\text{m}}{\text{s}} \right]$

$$l_{\text{ted}} = \frac{0,316}{\sqrt[4]{Re}}$$

d = Boru iç çapı [mm]

Reynolds sayısı

$$Re = \frac{v \cdot d}{\nu} \cdot 10^3$$

ν = Kinematik viskozite [cSt] veya $\left[\frac{\text{mm}^2}{\text{s}} \right]$

Q = Borudaki yağ debisi $\left[\frac{\text{lt}}{\text{dak}} \right]$

Akış hızı

$$v = \frac{Q}{6 \cdot d^2 \cdot \frac{\pi}{4}} \cdot 10^2$$

Piston halka yüzeyi =

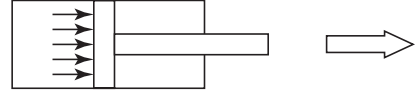
Piston yüzeyi . piston kolu yüzeyi

$$A_R = \frac{(d_1^2 \cdot d_2^2) \cdot 0,785}{100} \quad [\text{cm}^2]$$

Silindirdeki kuvvetler

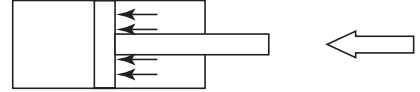
Basınç kuvveti
 F_D

$$F_D = \frac{p \cdot d_1^2 \cdot 0,785}{10\,000} \text{ [kN]}$$



Çekme kuvveti
 F_Z

$$F_Z = \frac{p \cdot (d_1^2 \cdot d_2^2) \cdot 0,785}{10\,000} \text{ [kN]}$$



Piston kolu kuvveti
($\hat{=}$ hızlandırılmış devredeki
basınç kuvveti)
 F_S

$$F_S = \frac{p \cdot d_2^2 \cdot 0,785}{10\,000} \text{ [kN]}$$



Hidrolik silindirlerin verimi yaklaşık 0,85 - 0,95'dir.

Kuvvet $F = p \cdot A$ [daN] $F = \text{Kuvvet [daN]}$

Basınç $p_{th} = \frac{F}{A}$ [bar] $p = \text{Çalışma basıncı [bar] veya } \left[\frac{\text{daN}}{\text{cm}^2} \right]$

Strok hızı $v = \frac{h}{t \cdot 1000}$ $\left[\frac{\text{m}}{\text{s}} \right]$ $A = \text{Etkili yüzey [cm}^2 \text{]}$

$v = \frac{Q}{A \cdot 6}$ $\left[\frac{\text{m}}{\text{s}} \right]$ $p_{th} = \text{Sürtünme kayıplarının dikkate alınmadığı teorik basınç}$

Gerekli debi $Q_{th} = A \cdot v \cdot 6$ $\left[\frac{\text{lt}}{\text{dak}} \right]$ $v = \text{Strok hızı } \left[\frac{\text{m}}{\text{s}} \right]$

$Q_{th} = \frac{V}{t} \cdot 60$ $\left[\frac{\text{lt}}{\text{dak}} \right]$ $Q = \text{Sızıntı kayıplarının dikkate alındığı debi } \left[\frac{\text{lt}}{\text{dak}} \right]$

$Q = \frac{Q_{th}}{\eta_{vol}}$ $\left[\frac{\text{lt}}{\text{dak}} \right]$ $\eta_{vol} = \text{Sızıntı kayıplarının dikkate alındığı volumetrik verim [~0,95]}$

ALÜMİNYUM LEVHALAR

TRAPEZ ALÜMİNYUM LEVHALARIN TEKNİK ÖZELLİKLERİ

UZUNLUK: Min. 1.7 m. - Max. 12.0 m

LEVHA GENİŞLİĞİ: 932 mm

FAYDALI GENİŞLİK: 888 mm

LEVHA KALINLIĞI (mm)	1.20	1.00	0.90	0.70	0.60	0.56	0.50
BOY AĞIRLIĞI (Kg/m)	3.89	3.24	2.92	2.27	1.95	1.81	1.62
HESAP AĞIRLIĞI (Kg/m ²)	4.36	3.65	3.29	2.56	2.20	2.04	1.82
ATALET MOMENTİ (cm ⁴ /m)	42.0	33.5	29.3	20.8	16.6	14.9	12.4

ARASINDA CAM YÜNÜ İZOLASYON MALZEMESİ BULUNAN

İKİ KAT ALÜMİNYUM ÇATI ÖRTÜSÜNÜN ISI İLETİM KATSAYILARI

İZOLASYON KALINLIĞI	cm	0	2	2.5	3	4	5	6	7	8	9	10	12	12.5	15	20	25	30
ISI İLETİM KAT SAYISI	kcal m.C.h	5.2	1.31	1.10	0.95	0.75	0.62	0.52	0.46	0.40	0.36	0.33	0.28	0.27	0.22	0.17	0.14	0.11

OLUKLU LEVHALARIN ÇEŞİTLİ EĞİMLERDEKİ YÜZEYLERDE

BİNDİRME PAYLARI VE YARARLI ALANLARI

PROFİL 6	EĞİM	EN/AZ BİNDİRME BOYU mm	Standart Boy 2500 mm		Standart Boy 2000 mm		Standart Boy 1600 mm		Standart Boy 1250 mm	
			Aşık Arası m	Yararlı Alan m ²	Aşık Arası m	Yararlı Alan m ²	Aşık Arası m	Yararlı Alan m ²	Aşık Arası m	Yararlı Alan m ²
ÇATI	8.5°'den küçük (15 %'den küçük)	250	1.125	2.36	0.875	1.84	1.35	1.42	1.00	1.05
	8.5 - 15° (15 % - 27 %)	200	1.15	2.42	0.90	1.89	1.40	1.47	1.05	1.10
	15°'den büyük (27 %'den büyük)	150	1.175	2.47	0.925	1.94	1.45	1.52	1.10	1.16
CEPHE	75° - 90°	100	1.20	2.52	0.95	2.00	1.50	1.58	1.15	1.21

ELYAFLI ÇİMENTODAN OLUKLU LEVHALAR

STANDART BOY mm	STANDART GENİŞLİK mm	BİR LEVHA ALANI m ²	YARARLI GENİŞLİK mm	YARARLI ALANI m ²	STANDART KALINLIK mm	Ağırlık (Yaklaşık) kg Levha
2500 + 12	1097 + 6	2.74	1050	2.42	6 + 0.4	36.0
2000 + 10	1097 + 6	2.19	1050	1.89	6 + 0.4	29.0
1600 + 8	1097 + 6	1.76	1050	1.47	6 + 0.4	23.0
1250 + 6	1097 + 6	1.37	1050	1.10	6 + 0.4	18.0

GALVANİZLİ SAÇLAR

TRAPEZ GALVANİZLİ SAÇLAR

AŞIK ARALIĞI (m)	ET KALINLIĞINA GÖRE TAŞIYABİLECEĞİ YAYILI YÜK (Kg/m ²)													
	0.30 mm	0.35 mm	0.40 mm	0.45 mm	0.50 mm	0.55 mm	0.60 mm	0.65 mm	0.70 mm	0.75 mm	0.80 mm	0.85 mm	0.90 mm	1.00 mm
1.00	296	352	400	440	480	530	584	630	680	724	768	816	864	940
1.10	245	290	330	365	400	440	480	520	560	595	630	670	710	775
1.20	206	243	276	305	334	370	405	437	470	500	530	565	600	650
1.40	152	180	204	225	245	273	300	322	345	366	388	415	443	480
1.50	132	155	178	196	213	236	260	280	300	320	340	361	383	419
1.80	92	108	124	136	148	164	180	195	210	223	236	252	268	290
2.00	74	87	100	110	120	133	146	158	170	181	192	204	216	230
2.20	60	71	83	91	100	110	120	130	140	149	158	168	178	192
2.40	51	60	69	76	83	91	100	109	118	124	130	140	150	164
2.50	47	55	64	70	77	86	94	101	108	116	123	130	138	150
2.80	38	45	52	56	61	68	75	80	86	92	98	104	110	120
3.00	33	38	44	48	53	59	65	70	75	80	85	90	96	104

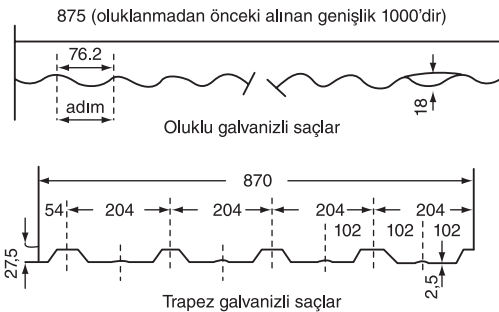
Emniyet gerilmesi 1200 Kg/cm² Hesaplar tek açıklıklı basit kirişe göre yapılmıştır.

OLUKLU GALVANİZLİ SAÇLAR

AŞIK ARALIĞI (m)	ET KALINLIĞINA GÖRE TAŞIYABİLECEĞİ YAYILI YÜK (Kg/m ²)												
	0.35 mm	0.40 mm	0.45 mm	0.50 mm	0.55 mm	0.60 mm	0.65 mm	0.70 mm	0.75 mm	0.80 mm	1.00 mm	1.20 mm	1.50 mm
1.00	165	188	211	231	254	275	296	318	343	361	452	535	665
1.10	136	155	174	191	210	227	245	263	283	298	374	442	550
1.20	116	131	146	160	176	191	205	221	238	251	314	371	462
1.40	85	96	108	118	130	140	151	162	175	184	230	273	339
1.50	74	84	94	103	113	122	132	141	152	160	201	238	296
1.80	51	58	65	71	78	85	91	98	106	111	140	165	205
2.00		47	53	58	63	69	74	79	86	90	113	134	166
2.20				48	52	57	61	66	71	75	93	110	137
2.40						48	51	55	60	63	78	93	115
2.50								51	55	58	72	86	106
2.80									44	46	58	68	85
3.00											50	59	74

Emniyet gerilmesi 1200 Kg/cm² Hesaplar tek açıklıklı basit kirişe göre yapılmıştır.

STANDART ÜRETİM ÖLÇÜLERİ

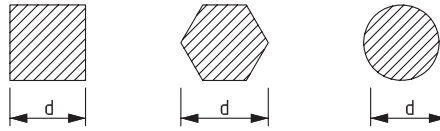


Kalınlık mm	Ağırlık kg/m ²	Düz galvanizli saç mm	Oluklu galvanizli saç mm	Trapez galvanizli saç mm	Stor galvanizli saç mm
0.30	2.5	1000 x 2000 . 2400	875 x 2000 . 3000	870 x 2000 . 2400 . 3000	810 x 2000 . 2400 . 3000
0.35	2.75				
0.40	3.1				
0.45	3.4				
0.50	3.8				
0.55	4.25				
0.60	4.6				
0.65	4.95				
0.70	5.35				
0.75	5.7				
0.80	6.1				
1.00	7.5				
1.25	8.75				
1.50	11.0				
2.00	14.5				

**MUHTELİF MADENİ LEVHALARIN BİR METRE KARESİNİN
KG OLARAK AĞIRLIKLARI**

Kalınlık mm	Demir	Bakır	Pirinç	Kurşun	Alüminyum	Çinko
0,2	1,56	1,78	1,71	2,27	0,51	1,44
0,5	3,90	4,45	4,27	5,68	1,28	3,60
1	7,80	8,90	8,55	11,37	2,56	7,20
2	15,60	17,80	17,10	23,74	5,12	14,40
3	23,40	26,70	26,65	34,11	7,63	21,60
4	31,20	35,60	34,20	45,48	10,25	28,80
5	39,00	44,50	42,75	56,85	12,80	36,00
6	46,80	53,40	51,30	68,22	15,30	43,20
7	51,60	62,30	59,85	79,59	17,85	50,40
8	62,40	71,20	68,40	90,96	20,40	57,60
9	70,20	80,10	76,95	102,33	22,95	64,60
10	78,00	89,00	86,50	113,70	25,60	72,00
11	85,80	97,90	94,05	125,07	28,16	79,20
12	93,60	106,80	102,60	136,44	30,60	86,40
13	101,40	115,70	111,15	147,81	35,15	93,60
14	109,20	124,60	119,70	159,18	35,70	100,80
15	117,00	133,50	128,25	170,55	33,40	108,00
16	124,80	142,40	136,80	181,92	40,90	115,20

BİR METRE BOYUNDAKİ ŞEKİLLİ DEMİR ÇUBUKLARIN AĞIRLIĞI



Kalınlık d mm	Dört Köşe Kg/m	Altı Köşe Kg/m	Yuvarlak Kg/m
5	0,196	0,170	0,154
6	0,283	0,245	0,222
7	0,385	0,333	0,302
8	0,502	0,438	0,395
9	0,636	0,551	0,499
10	0,785	0,680	0,617
11	0,950	0,823	0,746
12	1,130	0,979	0,888
13	1,327	1,149	1,042
14	1,539	1,332	1,208
15	1,766	1,530	1,387
16	2,010	1,740	1,578

ÇUBUKLAR
DİN: 1767 Norm

Kulur Dia mm	Pirinç Brass Kg/m.			Bakır Copper Kg/m.
				
3,0	0,060	3,066	0,076	0,063
4,0	0,106	0,117	0,136	0,112
5,0	0,167	0,184	0,212	0,175
6,0	0,240	0,265	0,306	0,252
6,5	0,282	0,311	0,359	0,296
7,0	0,327	0,361	0,416	0,343
8,0	0,428	0,481	0,544	0,448
9,0	0,542	0,596	0,688	0,567
9,5	0,604	0,664	0,766	0,632
10,0	0,669	0,736	0,849	0,700
11,0	0,809	0,890	1,027	0,847
12,0	0,963	1,062	1,224	1,008
12,5	1,043	1,152	1,328	1,024
13,0	1,128	1,245	1,437	1,183
14,0	1,308	1,444	1,666	1,372
15,0	1,502	1,656	1,912	1,575
16,0	1,709	1,886	2,177	1,792
17,0	1,929	2,128	2,456	2,023
18,0	2,163	2,387	2,754	2,268
19,0	2,410	2,660	3,070	2,527
20,0	2,670	2,946	3,400	2,800
22,0	3,231	3,565	4,114	3,388
23,0	3,532	3,897	4,497	3,503
24,0	3,845	4,243	4,897	4,032
25,0	4,173	4,603	5,313	4,275
26,0	4,513	4,978	5,745	4,732
27,0	4,867	5,370	6,196	5,103
28,0	5,234	5,750	6,663	5,488
30,0	6,009	6,630	7,652	6,300
32,0	6,835	7,529	8,703	7,168
35,0	8,178	9,020	10,420	8,575

LAMALAR
DİN: 1768 Norm

Ebat Size mm.	Pirinç Bass Kg/m.	Bakır Copper Kg/m.	Alü. Al. Kg/m.
2x10	0,170	0,177	0,054
15	0,255	0,266	0,081
20	0,340	0,355	0,108
25	0,425	0,444	0,135
30	0,510	0,533	0,162
3x10	0,255	0,266	0,081
15	0,382	0,400	0,121
20	0,510	0,533	0,152
25	0,637	0,666	0,202
30	0,705	0,800	0,243
40	1,020	1,066	0,324
50	1,275	1,335	0,405
4x15	0,510	0,533	0,162
20	0,680	0,711	0,216
25	0,850	0,889	0,270
30	1,020	1,006	0,324
40	1,300	1,422	0,432
50	1,700	1,778	0,540
60	2,550	2,670	0,810
80	3,400	3,556	1,080
100	4,250	4,445	1,350
5x10	0,425	0,444	0,135
15	0,637	0,666	0,202
20	0,850	0,889	0,270
25	1,062	1,111	0,338
30	1,275	1,333	0,405
35	1,488	1,555	0,473
40	1,700	1,778	0,540
50	2,125	2,222	0,675
6x20	1,020	1,066	0,324
25	1,275	1,333	0,405
30	1,530	1,600	0,486
40	2,040	2,133	0,648
50	2,550	2,667	0,810
60	3,060	3,200	0,972
8x20	1,360	1,422	0,432
25	1,700	1,778	0,540
30	2,040	2,133	0,648
40	2,720	2,844	0,864
50	3,400	3,556	1,080
60	4,080	4,267	1,296
10x15	1,275	1,333	0,405
20	1,700	1,778	0,540
25	2,125	2,222	0,675
30	2,550	2,660	0,810
40	3,400	3,556	1,080
50	4,250	4,440	1,350
60	5,100	5,330	1,640
75	6,375	6,667	2,025
80	6,800	7,112	2,160
100	8,500	8,890	2,710
120	10,20	10,668	3,240
150	12,750	13,336	4,050
160	13,600	14,224	4,320

Lamalar;

1. Piyasaya 2-6 m. arasında değişen uzunluklarda satırları düzgün, kenarları keskin köşeli çıplak boylar halinde arz olunur.
2. 30-20 mm. kalınlıkta, aynı ölçülerde imal edilir. Çubuklar ambalaj 1-6 uzunluğunda çıplak boylar halindedir.

ÖRGÜLÜ BAKIR TELLER**DİN: 48201 Norm**

Kesit mm ²	Tel Adedi 1	Tel Çapı	Standart kg	Asgari Minimum kg	Azami Maximum kg
10	7	1,32	89,5	84	99
16	7	1,7	142,5	136	155
25	7	2,12	218	208	236
35	7	2,5	309	298	332
50	7	3	440	428	467
60	19	1,8	440	416	471
70	19	2,12	600	565	642
95	19	2,5	850	808	902
120	19	2,8	1050	1019	1126

KURŞUN LEVHA

KALINLIK mm	Kg/m ²
1,00	11,000
1,50	16,500
2,00	22,000
2,50	27,500
3,00	33,000
3,50	38,500
4,00	44,000
4,50	49,500
5,00	55,000
5,50	60,500
6,00	66,000
7,00	77,000
8,00	88,000
10,00	110,000

Ambalaj: Ortalama 100 kg kangallar halindedir. 1000 m/kg

TS-380**PIRİNÇ VE BAKIRDAN MAMÜL BORULARIN Kg/m. AĞIRLIKLAR**

Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
6x10	0,133	0,140
1,5	0,180	0,188
2,0	–	0,223
7x1,0	0,160	0,168
1,5	0,220	0,230
2,0	–	0,279
8x1,0	0,187	0,195
1,5	0,260	0,272
2,0	0,320	0,335
2,5	–	0,384
9x1,0	0,214	0,223
1,05	0,300	0,314
2,0	0,374	0,391
2,5	–	0,454
10x1,0	0,240	0,251
1,5	0,340	0,356
2,0	0,427	0,447
2,5	–	0,524
3,0	–	0,586

Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
11x1,0	0,267	0,279
1,5	0,380	0,398
2,0	0,41	0,502
2,5	0,567	0,594
3,0	–	0,670
12x10	0,294	0,308
1,5	0,420	0,440
2,0	0,534	0,558
2,5	0,634	0,663
3,0	–	0,754
13x1,0	0,320	0,335
1,5	0,461	0,482
2,0	0,587	0,615
2,5	0,701	0,733
3,0	–	0,838
14x1,0	0,347	0,363
1,5	0,501	0,524
2,0	0,641	0,670
2,5	0,768	0,804
3,0	–	0,921

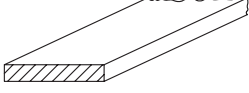
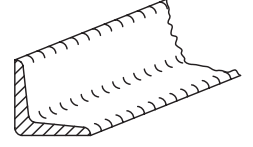
Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
15x1,0	0,374	0,391
1,5	0,541	0,565
2,0	0,694	0,726
2,5	0,834	0,873
3,8	0,961	1,004
16x1,0	0,400	0,419
1,5	0,581	0,607
2,0	0,748	0,782
2,5	0,901	0,942
3,0	1,050	1,089
17x1,0	0,427	0,447
1,5	0,621	0,649
2,0	0,801	0,838
2,5	0,968	1,012
3,0	1,121	1,173
18x1,0	0,454	0,475
1,5	0,662	0,692
2,0	0,854	0,892
2,5	1,035	1,081
3,0	1,202	1,57

PİRİNÇ VE BAKIRDAN MAMÜL BORULARIN kg/m AĞIRLIKLARI

Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
19x1,0	0,481	0,502
1,5	0,701	0,732
2,0	0,908	0,949
2,5	1,101	1,152
3,0	1,282	1,341
20x1,0	0,507	0,531
1,5	0,741	0,776
2,0	0,961	1,005
2,5	1,168	1,222
3,0	1,362	1,424
21x1,0	0,534	0,559
1,5	0,781	0,817
2,0	1,015	1,061
2,5	1,235	1,291
3,0	1,442	1,508
22x1,0	0,561	0,587
1,5	0,821	0,860
2,0	1,068	1,117
2,5	1,300	1,360
3,0	1,522	1,591
24x1,0	0,614	0,642
1,5	0,901	0,943
2,0	1,175	1,229
2,5	1,435	1,501
3,0	1,682	1,760
25x1,0	0,641	0,670
1,5	0,941	0,984
2,0	1,228	1,285
2,5	1,502	1,571
3,0	1,762	1,843
26x1,0	0,668	0,698
1,5	0,981	1,026
2,0	1,282	1,340
2,5	1,569	1,641
3,0	1,842	1,927

Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
28x1,0	0,721	0,753
1,5	1,061	1,111
2,0	1,389	1,452
2,5	1,702	1,780
3,0	2,003	2,095
30x1,0	0,774	0,809
1,5	1,140	1,192
2,0	1,495	1,564
2,5	1,836	1,920
3,0	2,163	2,262
35x1,0	0,908	0,950
1,5	1,342	1,403
2,0	1,762	1,843
2,5	2,170	2,268
3,0	2,563	2,681
40x1,0	1,041	1,089
1,5	1,542	1,613
2,0	2,029	2,122
2,5	2,503	2,618
3,0	2,964	3,100
45x1,0	1,175	1,228
1,5	1,742	1,822
2,0	2,301	2,402
2,5	2,837	2,967
3,0	3,364	3,519
50x1,0	1,309	1,369
1,5	1,943	2,032
2,0	2,564	2,681
2,5	3,171	3,317
3,0	3,765	3,939
55x1,0	1,442	1,509
1,5	2,143	2,241
2,0	2,830	2,960
2,5	3,504	3,665
3,0	4,166	4,357

Dia & Wall Kutur ve et mm	Brass Pirinç Kg/m	Cooper Bakır Kg/m
60x1,0	1,575	1,647
1,5	2,343	2,450
2,0	3,097	3,239
2,5	3,839	4,015
3,0	4,566	4,776
65x1,0	1,709	1,788
1,5	2,544	2,660
2,0	3,364	3,519
2,5	4,173	4,364
3,0	4,967	5,195
70x1,0	1,842	1,926
1,5	2,744	2,870
2,0	3,631	3,798
2,5	4,505	4,712
3,0	5,367	5,613
80x1,0	2,108	2,206
1,5	3,144	3,288
2,0	4,166	4,357
2,5	5,174	5,411
3,0	6,168	6,451
90x1,5	3,544	3,707
2,0	4,700	4,915
2,5	5,841	6,109
3,0	6,970	7,290
10x1,5	3,945	4,129
2,0	5,233	5,473
2,5	6,508	6,807
3,0	7,771	8,127

SİLME - LAMA**LEVHA - SAC****EŞİTKENAR
KÖŞEBENTLER**

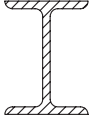
KALINLIK	Kg/m
16x3	0,384
20x3	0,470
20x5	0,785
25x5	0,981
30x3	0,700
30x5	1,180
35x5	1,375
40x5	1,570
50x5	1,963
60x5	2,355
70x5	2,747
80x5	3,140
100x5	3,925
20x10	1,570
25x10	1,960
30x10	2,360
35x10	2,750
40x10	3,140
40x12	3,770
45x10	3,530
45x12	4,240
50x10	3,925
50x12	4,710
50x16	6,280
50x20	7,850
60x10	4,170
75x10	5,890
100x10	7,850
110x10	8,640
115x10	9,030
120x10	9,420
120x12	11,305
125x10	9,810

KALINLIK	Kg/m
0,30 mm	2,355
0,40 mm	3,140
0,50 mm	3,980
0,80 mm	6,280
1 mm	7,850
1,25 mm	9,810
1,50 mm	11,800
2 mm	15,700
2,50 mm	19,600
3 mm	23,600
3,50 mm	27,500
4 mm	31,400
5 mm	39,250
6 mm	47,100
7 mm	54,300
8 mm	62,800
9 mm	70,650
10 mm	78,500
11 mm	86,300
12 mm	94,200
13 mm	102,000
14 mm	109,900
15 mm	117,700
16 mm	125,600
17 mm	133,400
18 mm	141,300
19 mm	149,100
20 mm	157,000
21 mm	164,800
22 mm	172,700
23 mm	180,500

KALINLIK	Kg/m
20x20x3	0,880
25x25x3	1,120
30x30x3	1,330
30x30x4	1,780
35x35x4	2,100
40x40x4	2,420
50x50x5	3,770
65x65x7	6,830
65x65x9	8,620
60x60x6	5,240
70x70x7	7,380
80x80x8	9,660
80x80x10	11,900
100x100x10	15,100
120x120x11	19,900
150x150x15	31,600

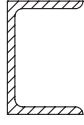
PRATİK
NOT: DEMİR MALZEMEDE
AMPİRİK OLARAK AĞIRLIK
HESABI
KİTLE = HACİM x 8'dir.

NP I DEMİRİ



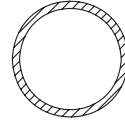
KALINLIK	Kg/m
80x42	5,950
100x50	8,320
120x58	11,200
140x66	14,370
160x74	17,900
180x82	21,900
200x90	26,300
220x98	31,100
240x106	36,200
260x113	41,900
300x125	54,250
380x149	84,000

NP U DEMİRİ



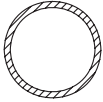
KALINLIK	Kg/m
30x15	2,000
40x20	2,700
50x25	4,320
50x38	5,590
60x30	5,070
65x42	7,090
80x45	8,640
100x50	10,600
120x55	13,400
140x60	16,000
160x65	18,800
180x70	22,000
200x75	25,300
220x80	29,400
240x90	33,200
260x90	37,900
280x95	41,800
300x100	46,200

ORTA AĞIRLIKTAKİ BORULAR



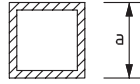
Parmak İnç	Çap mm	Dış Çap	Et Kalınlığı	Ağırlık Kg/m manson
1/8"	6	10,2	2,0	0,410
1/4"	8	13,5	2,35	0,654
3/8	10	17,2	2,35	0,858
1/2	15	21,3	2,65	1,23
3/4	20	26,9	2,65	1,59
1	25	33,7	3,25	2,46
1 1/4	32	42,4	3,25	3,17
1 1/2	40	48,3	3,25	3,65
2	50	60,3	3,65	5,17
2 1/2	65	76,1	3,65	6,63
3	80	88,9	4,05	8,64
4	100	114,3	4,5	12,4
5	125	139,7	4,85	16,7
6	150	165,1	4,85	19,8
8"	200	219	4,5	23,7

SİRAL BORU



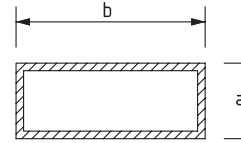
NOMİNAL ÇAP	ÇAP mm	ET KALINLIĞI mm	Metre Ağırlığı Kg/m	DENEY BASINCI	
				ST 33 Kg/ cm ²	ST 37 Kg/cm ²
200	219	4,5	23,7	33	52
250	273	5,0	33,0	35	47
300	323,9	5,6	43,8	28	44
350	355,6	5,6	48,2	25	40
400	406	6,3	62,4	25	39
450	457,2	6,3	70,3	22	35
500	508	6,3	78,2	20	31
550	558,8	6,3	86,1	18	29
600	609,8	6,3	94,1	16	26
650	660,4	7,1	115	17	27
700	711,2	7,1	124	16	25
750	762,0	8,0	148	17	27
800	812,4	8,0	158	16	25
900	914,4	9,0	200	16	25
1000	1016,0	10,0	248	16	25

KARE PROFİL



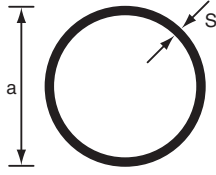
a mm	ET KALINLIĞI mm	AĞIRLIĞI Kg/m
10	1,2	0,320
	1,5	0,390
	2,0	0,500
15	1,2	0,526
	1,5	0,647
	2,0	0,838
20	1,2	0,705
	1,5	0,807
	2,0	1,130
25	1,2	0,911
	1,5	1,130
	2,0	1,480
30	1,5	1,350
	2,0	1,800
40	1,5	1,820
	2,0	2,425
	3,0	3,650
50	2,0	3,06
	3,0	4,50
	3,5	5,20
60	2,0	3,68
	3,0	5,40
	3,5	6,20

DİKDÖRTGEN PROFİL

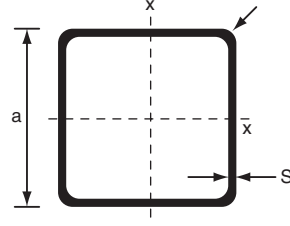


a mm	b mm	ET KALINLIĞI mm	AĞIRLIĞI Kg/m	
15	25	1,2	0,705	
		1,5	0,870	
		2,0	1,130	
20	30	1,2	0,911	
		1,5	1,130	
		2,0	1,480	
		3,0	2,78	
30	35	1,5	1,610	
		2,0	2,120	
	40	1,5	1,610	
		2,0	2,120	
40	50	2,0	2,425	
		3,0	3,650	
		3,5	4,100	
	60	50	2,0	2,75
			3,0	4,00
			3,5	4,70
80	60	2,0	3,06	
		3,0	4,50	
	3,5	3,5	5,20	
		3,5	5,20	
100	80	2,0	3,68	
		3,0	5,40	
		3,5	6,20	
4,5	100	3,5	8,50	
		4,5	10,80	

SANAYİ BORULARI



KARE PROFİLLER

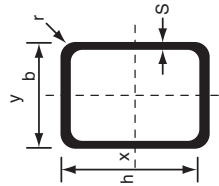


DIŞ ÇAP mm	ET KALINLIĞI mm				
	1.0	1.2	1.5	1.8	2.0
	AĞIRLIK Kg/m				
8	0.173				
9.3	0.197				
10	0.222	0.260	0.314		
13	0.296	0.349	0.425		
16	0.370	0.438	0.536	0.630	0.690
17.2	0.395	0.486	0.573	0.675	0.740
19	0.444	0.527	0.647	0.763	0.838
21	0.493	0.586	0.721	0.852	0.937
22	0.518	0.616	0.758	0.891	0.986
25	0.592	0.704	0.869	1.030	1.134
28.6	0.666	0.793	0.980	1.163	1.282
30	0.715	0.852	1.054	1.252	1.381
32	0.764	0.911	1.128	1.341	1.480
35	0.838	1.000	1.239	1.474	1.628
38	0.912	1.089	1.350	1.607	1.776
40	0.962	1.148	1.424	1.696	1.874
42		1.207	1.498	1.784	1.973
45		1.296	1.609	1.918	2.121
48		1.385	1.720	2.051	2.269
50		1.444	1.794	2.140	2.367
51		1.474	1.831	2.184	2.417
55		1.592	1.979	2.361	2.614
60		1.740	2.164	2.583	2.861
63		1.829	2.275	2.717	3.009
70			2.534	3.027	3.354
76			2.756	3.294	3.650
80			2.904	3.471	3.847
89				3.871	4.291
90				3.915	4.340
100					4.833
110					5.327
114					5.600

EBAT		Köşe yar çapı r mm	Kesit alanı F cm ²	Ağırlık G Kg/m	Atalet momenti J cm ⁴	Atalet yarıçapı l cm	Mukavemeti moment w cm ³
a mm	Et Kalınlığı mm						
10	1.0	2	0.36	0.28	0.05	0.10	0.37
	1.0	2	0.56	0.44	0.18	0.24	0.57
15	1.2	2	0.66	0.52	0.21	0.28	0.56
	1.5	3	0.81	0.64	0.25	0.33	0.55
	1.0	2	0.76	0.60	0.46	0.46	0.78
20	1.2	2	0.90	0.71	0.53	0.53	0.77
	1.5	3	1.11	0.87	0.64	0.64	0.76
	2.0	3	1.44	1.13	0.79	0.79	0.74
	1.0	2	0.96	0.75	0.92	0.74	0.98
25	1.2	2	1.14	0.90	1.08	0.86	0.97
	1.5	3	1.41	1.11	1.30	1.04	0.96
	2.0	3	1.84	1.44	1.63	1.30	0.94
	1.0	2	1.16	0.91	1.63	1.09	1.19
30	1.2	2	1.38	1.08	1.91	1.27	1.18
	1.5	3	1.71	1.34	2.32	1.55	1.16
	2.0	3	2.24	1.76	2.94	1.96	1.14
	1.2	3	1.86	1.46	4.68	2.34	1.59
40	1.5	3	2.31	1.81	5.72	2.86	1.57
	2.0	3	3.04	2.39	7.34	3.67	1.55
	2.6	4	3.75	2.94	8.83	4.41	1.53
	3.2	5	4.44	3.49	10.20	5.10	1.51
50	1.5	3	2.91	2.28	11.42	4.57	1.98
	2.0	3	3.84	3.02	14.77	5.91	1.96
	2.6	4	4.75	3.73	17.91	7.16	1.94
	3.2	5	5.64	4.43	20.85	8.34	1.92
60	2.0	3	4.64	3.64	26.04	8.68	2.37
	2.6	4	5.75	4.51	31.74	10.58	2.35
	3.2	5	6.84	5.37	37.14	12.38	2.33
	2.6	4	6.75	5.30	51.33	14.66	2.76
70	3.2	5	8.04	6.31	60.27	17.22	2.74
	4.0	5	9.31	7.31	68.81	19.66	2.72
	2.5	4	7.75	6.08	77.66	19.41	3.16
80	3.2	5	9.24	7.25	91.44	22.86	3.14
	4.0	5	10.71	8.41	104.68	26.17	3.12
	3.2	5	10.44	8.20	131.86	29.30	3.55
90	4.0	5	12.11	9.51	151.26	33.61	3.54
	4.2	6	13.76	10.80	169.98	37.77	3.52

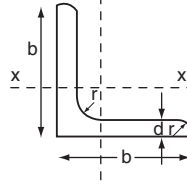
DİKDÖRTGEN PROFİLLER

EBAT b x h mm	Et kalınlığı s mm	Köşe yarı çapı r mm	Kesit alanı F cm ²	Ağırlık G kg/m	Dış Alan O m ² /m	Atalet momenti J x cm ⁴	Mükavemet momenti W x cm ³	Atalet yarıçapı I x cm	Atalet momenti J y x cm ⁴	Mükavemet momenti W y x cm ³	Atalet yarıçapı I y cm
10 x 20	1,0	2	0,56	0,44	0,06	0,28	0,28	0,71	0,09	0,18	0,40
10 x 20	1,2	2	0,66	0,52	0,06	0,32	0,32	0,69	0,10	0,20	0,39
10 x 20	1,5	3	0,81	0,64	0,06	0,38	0,38	0,68	0,12	2,24	0,38
10 x 30	1,0	2	0,76	0,60	0,08	0,79	0,52	1,02	0,13	0,26	0,41
10 x 30	1,2	2	0,90	0,71	0,08	0,92	0,61	1,00	0,15	0,30	0,41
10 x 30	1,5	3	1,11	0,87	0,08	1,10	0,73	1,00	0,17	0,34	0,39
10 x 30	2,0	3	1,43	1,13	0,08	1,37	0,91	0,98	0,20	0,41	0,37
15 x 20	1,0	2	0,66	0,52	0,07	0,37	0,37	0,75	0,23	0,31	0,59
15 x 20	1,2	2	0,78	0,61	0,07	0,43	0,43	0,74	0,27	0,36	0,59
15 x 25	1,0	2	0,76	0,60	0,08	0,63	0,50	0,91	0,28	0,37	0,61
15 x 25	1,2	2	0,90	0,71	0,08	0,74	0,59	0,90	0,32	0,43	0,60
15 x 25	1,5	3	1,11	0,87	0,08	0,89	0,71	0,89	0,38	0,50	0,59
15 x 25	2,0	3	1,43	1,13	0,08	1,10	0,88	0,88	0,47	0,62	0,57
15 x 30	1	2	0,86	0,68	0,09	1,00	0,67	1,08	0,38	0,44	0,62
15 x 30	1,2	2	1,02	0,80	0,09	1,17	0,78	1,07	0,42	0,51	0,61
15 x 30	1,5	3	1,26	0,99	0,09	1,40	0,83	1,05	0,45	0,60	0,60
15 x 30	2,0	3	1,64	1,29	0,09	1,76	1,17	1,03	0,55	0,73	0,58
20 x 20	1,0	2	0,96	0,76	0,10	1,20	0,80	1,12	0,64	0,64	0,82
20 x 20	1,2	2	1,14	0,90	0,10	1,42	0,94	1,11	0,75	0,75	0,81
20 x 20	1,5	3	1,41	1,11	0,10	1,71	1,14	1,10	0,89	0,89	0,79
20 x 20	2,0	3	1,84	1,45	0,10	2,16	1,44	1,08	1,11	1,11	0,77
20 x 40	1,0	2	1,16	0,91	0,12	2,44	1,22	1,45	0,82	0,82	0,83
20 x 40	1,2	2	1,38	1,09	0,12	2,87	1,44	1,44	0,96	0,96	0,83
20 x 40	1,5	3	1,71	1,34	0,12	3,49	1,75	1,43	1,15	1,15	0,82
20 x 40	2,0	3	2,24	1,76	0,12	4,44	2,22	1,41	1,44	1,44	0,80
25 x 40	1,2	2	1,50	1,18	0,13	3,32	1,66	1,49	1,59	1,27	1,03
25 x 40	1,5	3	1,86	1,46	0,13	4,04	2,02	1,47	1,93	1,54	1,01
25 x 40	2,0	3	2,44	1,92	0,13	5,17	2,59	1,45	2,43	1,94	1,00
25 x 40	2,6	4	3,00	2,36	0,13	6,19	3,10	1,43	2,88	2,30	0,98



EBAT b x h mm	Et kalınlığı s mm	Köşe yarı çapı r mm	Kesit alanı F cm ²	Ağırlık G kg/m	Dış Alan O m ² /m	Atalet momenti J x cm ⁴	Mükavemet momenti W x cm ³	Atalet yarıçapı I x cm	Atalet momenti J y x cm ⁴	Mükavemet momenti W y x cm ³	Atalet yarıçapı I y cm
30 x 40	1,2	2	1,61	1,27	0,14	3,77	1,88	1,53	2,41	1,60	1,22
30 x 40	1,5	3	2,04	1,58	0,14	4,60	2,30	1,51	2,93	1,95	1,20
30 x 40	2,0	3	2,64	2,07	0,14	5,89	2,94	1,49	3,73	2,48	1,19
30 x 40	2,6	4	3,25	2,55	0,14	7,07	3,53	1,47	4,44	2,96	1,17
30 x 50	1,5	3	2,31	1,81	0,16	7,89	3,16	1,85	3,54	2,36	1,23
30 x 50	2,0	3	3,04	2,39	0,16	10,16	4,06	1,83	4,51	3,01	1,22
30 x 50	2,6	4	3,75	2,95	0,16	12,27	4,90	1,81	5,39	3,59	1,20
30 x 50	3,2	5	4,44	3,49	0,16	14,21	5,68	1,79	6,18	4,12	1,18
30 x 60	1,2	2	2,10	1,65	0,18	10,00	3,33	2,18	3,41	2,27	1,27
30 x 60	1,5	3	2,61	2,05	0,18	12,33	4,11	2,17	4,15	2,77	1,26
30 x 60	2,0	3	3,44	2,70	0,18	15,95	5,31	2,15	5,30	3,53	1,24
30 x 60	2,6	3	3,84	3,01	0,20	23,46	6,70	2,47	6,08	4,05	1,26
30 x 70	2,6	4	4,75	3,73	0,20	28,53	8,15	2,45	7,28	4,85	1,24
30 x 70	3,2	5	5,64	4,43	0,20	33,32	9,52	2,43	8,38	5,58	1,22
30 x 90	2,6	4	4,63	3,64	0,24	44,43	9,87	3,09	7,65	5,10	1,28
30 x 90	2,6	4	5,75	4,51	0,24	54,31	12,07	3,07	9,18	6,12	1,26
30 x 90	3,2	5	6,84	5,37	0,24	63,71	14,16	3,05	10,57	7,04	1,24
40 x 50	1,2	2	2,10	1,65	0,18	7,87	3,14	1,93	5,58	2,79	1,63
40 x 50	1,2	2	2,34	1,84	0,20	12,12	4,04	2,27	6,48	3,24	1,66
40 x 50	1,5	3	2,86	2,25	0,20	14,80	4,87	2,26	7,96	3,98	1,67
40 x 50	2,0	3	3,84	3,01	0,20	19,31	6,44	2,24	10,22	5,11	1,63
40 x 50	2,6	2	4,75	3,73	0,20	23,47	7,82	2,22	12,35	6,17	1,61
40 x 50	3,2	3	5,64	4,43	0,20	27,38	9,13	2,20	14,31	7,15	1,60
40 x 80	2,0	3	4,84	3,64	0,24	38,97	9,74	2,90	13,11	6,55	1,68
40 x 80	2,6	4	5,75	4,51	0,24	47,62	11,91	2,88	15,87	7,94	1,66
40 x 80	3,2	5	6,84	5,37	0,24	55,85	13,96	2,86	18,43	9,21	1,64
40 x 100	2,6	4	6,75	5,30	0,28	83,26	16,65	3,51	19,39	9,70	1,69
40 x 100	3,2	5	8,04	6,31	0,28	98,00	19,60	3,49	22,54	11,27	1,67
40 x 100	4,0	5	9,31	7,31	0,28	121,13	22,42	3,47	25,48	12,74	1,66
50 x 70	2,0	3	4,64	3,64	0,24	32,70	9,34	2,66	19,38	7,75	2,04
50 x 70	2,6	4	5,75	4,51	0,24	39,93	11,41	2,63	23,56	9,42	2,02
50 x 70	3,2	5	6,84	5,37	0,24	46,79	13,37	2,61	27,48	10,99	2,00
50 x 90	2,6	4	6,75	5,30	0,28	73,45	16,32	3,30	29,20	11,68	2,08
50 x 90	3,2	5	8,04	6,31	0,28	86,42	19,20	3,28	34,12	13,65	2,06
50 x 90	4,0	5	9,31	7,31	0,28	98,86	21,97	3,25	38,76	15,50	2,04
60 x 80	2,6	4	6,75	5,30	0,28	62,64	15,66	3,05	40,01	13,34	2,44
60 x 80	3,2	5	8,04	6,31	0,28	73,65	18,41	3,03	46,90	15,63	2,42
60 x 80	4,0	5	9,31	7,31	0,28	84,18	21,04	3,01	53,43	17,81	2,40
60 x 120	3,2	5	10,44	8,20	0,36	197,50	32,88	4,34	66,41	22,14	2,52
60 x 120	4,0	5	12,11	9,51	0,36	226,72	37,79	4,33	75,81	25,27	2,49
80 x 120	4,2	6	13,76	10,80	0,36	255,19	42,53	4,31	84,76	28,25	2,48
80 x 120	3,2	5	10,44	8,20	0,36	154,47	30,89	3,85	109,24	27,31	3,23
80 x 120	4,0	5	12,11	9,51	0,36	177,95	35,47	3,82	125,18	31,29	3,21
80 x 120	4,2	6	13,76	10,80	0,36	199,45	39,89	3,81	140,51	35,13	3,20

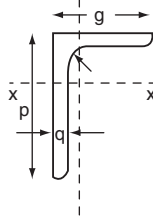
EŞİT KOLLU KÖŞEBENTLER



İşaret L	Ölçüler (mm)				F cm ²	G kg/m	U m ² /m
	b	d	r	r ₁			
20-20-3 20-20-4	20	3 4	3,5	2	1,42 1,45	0,88 1,14	0,077
25-25-3 25-25-4 25-25-5	25	3 4 5	3,5	2	1,42 1,85 2,26	1,12 1,45 1,77	0,097
30-30-3 30-30-4 30-30-5	30	3 4 5	5	2,5	1,74 2,27 2,78	1,36 1,78 2,18	0,116
35-35-4 35-35-5 35-35-6	35	4 5 6	5	2,5	2,67 3,28 3,87	2,10 2,57 3,04	0,136
40-40-4 40-40-5 40-40-6	40	4 5 6	6	3	3,08 3,79 4,48	2,42 2,97 3,52	0,155
45-45-5 45-45-7	45	5 7	7	3,5	4,30 5,86	3,38 4,60	0,174
50-50-5 50-50-6 50-50-7 50-50-9	50	5 6 7 9	7	3,5	4,80 5,69 6,96 8,24	3,77 4,47 5,15 6,47	0,194
55-55-6 55-55-8 55-55-10	55	6 8 10	8	4	6,31 8,23 10,1	4,95 6,46 7,90	0,213
60-60-6 60-60-8 60-60-10	60	6 8 10	8	4	6,91 9,03 11,1	5,42 7,09 8,69	0,233
65-65-7 65-65-9 65-65-11	65	7 9 11	9	4,5	8,70 11,0 13,20	6,83 8,62 10,30	0,252
70-70-7 70-70-9 70-70-11	70	7 9 11	9	4,5	9,40 11,90 14,30	7,30 9,34 11,20	0,272
75-75-7 75-75-8 75-75-10 75-75-12	75	7 8 10 12	10	5	10,1 11,5 14,1 16,7	7,94 9,03 11,1 13,1	0,291

İşaret L	Ölçüler (mm)				F cm ²	G kg/m	U m ² /m
	b	d	r	r ₁			
80-80-8 80-80-10 80-80-12 80-80-14	80	8 10 12 14	10	5	12,3 15,1 17,9 20,6	9,65 11,9 14,1 16,1	0,31
90-90-9 90-90-11 90-90-13 90-90-16	90	9 11 13 16	11	5,5	15,5 18,7 21,8 26,4	12,2 14,7 17,1 20,7	0,35
100-100-10 100-100-12 100-100-14 100-100-16	100	10 12 14 16	12	6	19,2 22,7 26,2 29,6	15,1 17,8 20,6 23,2	0,39
110-110-10 110-110-12 110-110-14	110	10 12 14	12	6	21,2 25,1 29,0	16,6 19,7 22,8	0,430
120-120-11 120-120-13 120-120-15 120-120-17	120	11 13 15 17	13	6,5	25,4 29,7 33,9 38,1	19,9 23,3 26,6 29,9	0,46
130-130-12 130-130-14 130-130-16	130	12 14 16	14	7	30,0 34,7 39,3	23,6 27,2 30,9	0,508
140-140-13 140-140-15 140-140-17	140	13 15 17	15	7,5	35,0 40,0 45,0	27,5 31,4 35,3	0,547
150-150-14 150-150-16 150-150-18	150	14 16 18	16	8	40,3 45,7 51,0	31,6 35,9 40,1	0,586
160-160-15 160-160-17 160-160-19	160	15 17 19	17	8,5	46,1 51,8 57,5	36,2 40,7 45,1	0,625
180-180-16 180-180-18 180-180-20	180	16 18 20	18	9	55,4 61,9 68,4	43,5 48,6 53,7	0,705
200-200-16 200-200-18 200-200-20	200	16 18 20	18	9	61,8 69,1 76,40	48,5 54,3 59,9	0,785

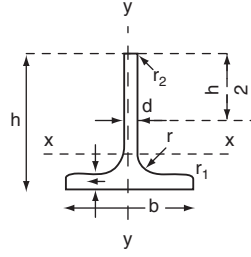
EŞİT OLMAYAN KOLLU KÖŞEBENTLER



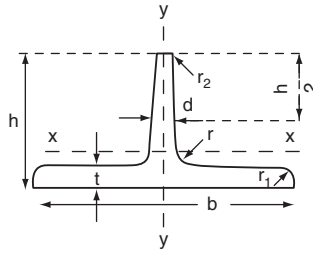
İşaret L	Ölçüler (mm)					F cm ²	G kg/m	U m ² /m
	a	b	d	r	r ₁			
30-20-3 30-20-4	20	30	3 4	3,5	2	1,42 1,45	1,11 1,45	0,097
40-20-3 40-20-4	20	40	3 4	3,5	2	1,72 2,25	1,35 1,77	0,117
40-30-4 40-30-5	30	45	4 5	4	2	2,87 3,53	2,25 2,77	0,146
50-40-3 50-40-4 50-40-5	40	50	3 4 5	4	2	2,63 3,46 4,27	2,06 2,71 3,35	0,177
60-30-5 60-30-7	30	60	5 7	6	3	4,29 5,85	3,37 4,59	0,175
60-40-5 60-40-6 60-40-7	40	60	5 6 7	6	3	4,79 5,68 6,55	3,76 4,46 5,14	0,195
65-50-5 65-50-7 65-50-9	50	65	5 7 9	6,5	3,5	5,54 7,60 9,58	4,35 5,97 7,52	0,224
75-55-5 75-55-7 75-55-9	55	75	5 7 9	7	3,5	6,30 8,66 10,9	4,95 6,80 8,59	0,254
75-65-6 75-65-8 75-65-10	65	75	6 8 10	8	4	8,11 10,6 13,1	6,37 8,34 10,3	0,273
80-40-6 80-40-8	40	80	6 8	7	3,5	6,89 9,01	5,41 7,07	0,234
80-65-6 80-65-8 80-65-10 80-65-12	65	80	6 8 10 12	8	4	8,41 11,0 13,6 16,0	6,60 8,66 10,7 12,6	0,283
90-60-6 90-60-8 90-60-10	60	90	6 8 10	7	3,5	8,69 11,4 14,1	6,82 8,96 11,0	0,294
90-75-7 90-75-9 90-75-10	75	90	7 9 11	8,5	4,5	11,1 14,1 17,0	8,74 11,1 13,4	0,322

İşaret L	Ölçüler (mm)					F cm ²	G kg/m	U m ² /m
	a	b	d	r	r ₁			
100-50-6 100-50-6 100-50-6	50	100	6 8 10	9	4,5	8,73 11,5 14,1	6,85 8,99 11,1	0,292
100-65-7 100-65-9 100-65-11	65	100	7 9 11	10	5	11,2 14,2 17,1	8,77 11,1 13,4	0,321
100-75-7 100-75-9 100-75-11	75	100	7 9 11	10	5	11,9 15,1 18,2	9,32 11,8 14,3	0,341
115-65-8 115-65-10	65	11	8 10	8	4	13,8 17,1	10,9 13,4	0,35
120-80-8 120-80-10 120-80-12 120-80-14	80	12	8 10 12 14	11	5,5	15,5 19,1 22,7 26,2	12,2 15,0 17,8 20,5	0,39
130-65-8 130-65-10 130-65-12	65	130	8 10 12	11	5,5	15,1 18,6 22,1	11,9 14,6 17,3	0,381
130-75-8 130-75-10 130-75-12	75	130	8 10 12	10,5	5,5	15,9 19,6 23,3	12,5 15,4 18,3	0,401
130-90-10 130-90-12 130-90-14	90	130	10 12 14	12	6	21,2 25,1 29,0	16,6 19,7 22,8	0,430
150-75-9 150-75-11 150-75-13	75	150	9 11 13	10,5	5,5	19,5 23,6 27,7	15,3 18,6 21,7	0,441
150-100-10 150-100-12 150-100-14	100	150	10 12 14	13	6,5	24,2 28,7 33,2	19,0 22,6 26,1	0,489
160-80-10 160-80-12 160-80-14	80	160	10 12 14	13	6,5	23,2 27,5 31,8	18,2 21,6 25,0	0,469
200-100-10 200-100-12 200-100-14 200-100-16	100	20	10 12 14 16	15	7,5	29,2 34,8 40,3 45,7	23,0 27,3 31,6 35,9	0,58

T PROFİLLER

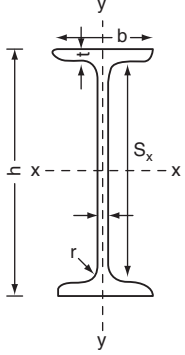


T	Boyutlar mm					F	G	U
	b	h	d	r ₁	r ₂	cm ²	kg/m	m ² /m
(2)	20	20	3	1.5	1	1.12	0.88	0.075
21/2	25	25	3.5	2	1	1.64	1.29	0.094
3	30	30	4	2	1	2.26	1.77	0.114
(31/2)	35	35	4.5	2.5	1	2.97	2.33	0.133
4	40	40	5	2.5	1	3.77	2.96	0.153
(41/2)	45	45	5.5	3	1.5	4.67	3.67	0.171
5	50	50	6	3	1.5	5.66	4.44	0.191
6	60	60	7	3.5	2	7.94	6.23	0.229
7	70	70	8	4	2	10.6	8.32	0.268
8	80	80	9	4.5	2	13.6	10.7	0.307
(9)	90	90	10	5	2.5	17.1	13.4	0.345
10	100	100	11	5.5	3	20.9	16.4	0.383
12	120	120	13	6.5	3	29.6	23.2	0.459
14	140	140	15	7.5	4	39.9	31.3	0.537

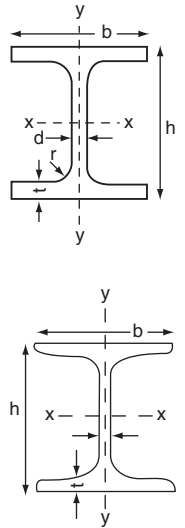


T	Boyutlar mm					F	G	U
	b	h	d	r ₁	r ₂	cm ²	kg/m	m ² /m
6-3	60	30	5.5	3	1.5	4.64	3.64	0.171
(7-3 1/2)	70	35	6	3	1.5	5.94	4.66	0.201
8-4	80	40	7	3.5	2	7.91	6.21	0.233
(9-4 1/2)	90	45	8	4	2	10.2	8.01	0.258
10.5	100	50	8.5	4.5	2	12.0	9.42	0.287
12.8	120	60	10	5	2.5	17.0	13.4	0.345
(14.7) ¹	140	70	11.5	6	3	22.8	17.9	0.402
(16.8) ¹	160	80	13	6.5	3.5	29.5	23.2	0.460
(18.9)	180	90	14.5	7.5	3.5	37.0	29.1	0.518
(20.10) ¹	200	100	16	8	4	45.4	35.6	0.576

NPI PROFİLLER

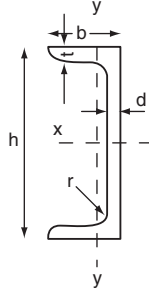


İşaret I	Boyutlar mm					F cm ²	G kg/m	U m ² m
	h	b	d	t	r ₁			
(8)	80	42	3.9	5.9	2.3	7.58	5.95	0.304
(10)	100	50	4.5	6.8	2.7	10.6	8.32	0.370
12	120	58	5.1	7.7	3.1	14.2	11.2	0.439
14	140	66	5.7	8.6	3.4	18.3	14.4	0.502
16	160	74	6.3	9.5	3.8	22.8	17.9	0.575
18	180	82	6.9	10.4	4.1	27.9	21.9	0.640
20	200	90	7.5	11.3	4.5	33.5	26.3	0.709
22	220	98	8.1	12.2	4.9	39.6	31.1	0.775
24	240	106	8.7	13.1	5.2	46.1	36.2	0.844
26	260	113	9.4	14.1	5.6	53.4	41.9	0.906
(28)	280	119	10.1	15.2	6.1	61.1	48.0	0.966
30	300	125	10.8	16.2	6.5	69.1	54.2	1.030
(32)	320	131	11.5	17.3	6.9	77.8	61.1	1.091
34	340	138	12.2	18.3	7.3	86.8	68.1	1.152
36	360	143	13.0	19.5	7.8	97.1	76.2	1.208
38*	380	149	13.7	20.5	8.2	107	84.0	1.266
40	400	155	14.4	21.6	8.6	118	92.6	1.330
42 ½	425	163	15.3	23.0	9.2	132	104	1.407
45	450	170	16.2	24.3	9.7	147	115	1.478
47 ½	475	178	17.1	25.6	10.3	163	128	1.550
50	500	185	18.0	27.0	10.8	180	141	1.626
55	550	200	19.0	30.0	11.0	213	167	1.797
60	600	215	21.6	32.4	13.0	254	199	1.924



İşaret II ¹	Boyutlar mm					F cm ²	G kg/m	U m ² m
	h	b	d	t	r			
18*)	180	180	9	14	14	65.8	51.6	1.038
20*	200	200	10	16	15	82.7	64.9	1.154
22*)	220	220	10	16	15	91.1	71.5	1.274
24	240	240	11	18	17	111	87.4	1.389
26	260	260	11	18	17	121	94.8	1.509
28	280	280	12	20	18	144	113	1.623
30	300	300	12	20	18	154	121	1.745
23*)	320	300	13	22	20	171	135	1.780
34*)	340	300	13	22	20	174	137	1.820
36*)	360	300	14	24	21	192	150	1.856
38*)	380	300	14	24	21	194	153	1.896
40*)	400	300	14	26	21	209	164	1.936
(42 ½*)	425	300	14	26	21	212	166	1.986
45*)	450	300	15	28	23	232	182	2.031
47 ½*)	475	300	15	28	23	235	185	2.081
50*)	500	300	16	30	24	255	200	2.127
55*)	550	300	16	30	24	263	207	2.227
60*)	600	300	17	32	26	289	227	2.321
65*)	650	300	17	32	26	297	234	2.421
70*)	700	300	18	34	27	324	254	2.517
75*)	750	300	18	34	27	333	261	2.637
80*)	800	300	18	34	27	342	268	2.717
90*)	900	300	19	36	30	381	299	2.911
100*)	1000	300	19	36	30	400	314	3.111
I	Flaşların iç yüzü %9 eğimli profiller							
10.10	100	100	7.5	10.25	10	26.8	21.0	0.556
12.12	120	120	8	11	11	34.6	27.2	0.665
14.14	140	140	8	12	12	43.3	34.0	0.780
16.16	160	160	9	14	14	57.4	45.0	0.888
18.18*)	180	180	9	14	14	64.7	50.8	1.018

U PROFİLLER



İşaret l	Boyutlar mm				r_1	F cm ²	G kg/m	U m ² /m
	h	b	d	t = r				
8	80	45	6	8	4	11.0	8.64	0.312
10	100	50	6	8.5	4.5	13.5	10.6	0.372
12	120	55	7	9	4.5	17.0	13.4	0.434
14	140	60	7	10	5	20.4	16.0	0.489
16	160	65	7.5	10.5	5.5	24.0	18.8	0.546
18	180	70	8	11	5.5	28.0	22.0	0.611
20	200	75	8.5	11.5	6	32.2	25.3	0.661
22	220	80	9	12.5	6.5	37.4	29.4	0.718
24	240	85	9.5	13	6.5	42.3	33.2	0.775
26	260	90	10	14	7	48.3	37.9	0.834
28	280	95	10	15	7.5	53.3	41.8	0.890
30	300	100	10	16	8	58.8	46.2	0.950
32	320	100	14	17.5	8.75	75.8	59.5	0.982
35	350	100	14	16	8	77.3	60.6	1.047

Kazan Boruları

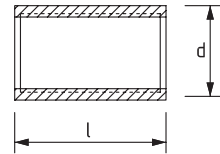
Kazan, buhar ve eşanjör boruları aşağıdaki normlara uygun olarak imal edilirler.

Boyutlar: TS 416, DIN 2458, ASTM 178'e göre,

Malzeme: DIN 17100, St 33, St 37 veya St 42

Ticari ve özel kalitelere imal edilebilen bütün kazan borularının, iç kapakları alınır, tavlınır ve ayrı ayrı kontrole tabi tutulur

Maşonlar



KAZAN BUHAR VE EŞANJÖR BORULARININ

Dış Çap mm	Et Kalınlığı mm	Ağırlık kg/m
21,3	2	0,952
25	2	1,130
31,8	2,5	1,81
38	2,5	2,19
44,5	2,5	2,59
51	3	3,55
57	3	4,00
63,5	3	4,48
70	3	4,96
76,0	3	5,40
82,5	3,2	6,26
88,9	3,2	6,76

ANMA ÖLÇÜSÜ		Dış Çap d mm	Uzunluk l mm
mm	İnç		
8	1/4	175	25+2
10	3/8	21,5	26+2
15	1/2	27	34+3
20	3/4	33,5	36+3
25	1	40,5	43+3
32	1 1/4	50	48+3
40	1 1/2	57	48+3
50	2	70	56+4
65	2 1/2	86	65+4
80	3	100	71+4
100	4	126	83+6
125	5	152	92+6
150	6	180	92+6

Boru aplarına Gre Basıncılı Hava Kapasitesi (dm³/s)

Hız m/s	15	20	25	32	40	50	65	80	100	125	150	200
3.0	0.6	1.1	1.7	3.0	4.1	6.5	10.9	15.1	25.7	39.2	56.2	98.5
3.5	0.7	1.3	2.0	3.5	4.7	7.6	12.7	17.6	30.0	45.7	65.5	115.0
4.0	0.8	1.4	2.3	4.0	5.4	8.7	14.6	20.1	34.2	52.2	74.9	131.0
4.5	0.9	1.6	2.6	4.5	6.1	9.8	16.4	22.6	38.5	58.8	84.2	147.0
5.0	1.0	1.8	2.8	5.0	6.8	10.8	18.2	25.1	42.8	65.4	93.6	164.0
5.5	1.1	2.0	3.1	5.5	7.4	11.9	20.0	27.6	47.1	71.9	103.0	181.0
6.0	1.2	2.1	3.4	6.0	8.1	13.0	21.8	30.1	51.3	78.5	112.0	197.0
6.5	1.3	2.3	3.7	6.5	8.8	14.1	23.7	32.6	55.6	85.0	122.0	213.0
7.0	1.4	2.5	4.0	7.0	9.5	15.1	25.5	35.1	59.9	91.5	131.0	230.0
7.5	1.5	2.7	4.3	7.5	10.1	16.2	27.3	37.6	64.2	98.0	140.0	246.0
8.0	1.6	2.8	4.5	8.0	10.8	17.3	29.1	40.1	68.5	105.0	150.0	263.0
8.5	1.7	3.0	4.8	8.5	11.5	18.4	31.0	42.6	72.8	111.0	159.0	278.0
9.0	1.8	3.2	5.1	9.0	12.2	19.5	32.8	45.1	77.1	118.0	169.0	296.0

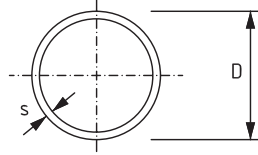
Serbest Havanın Basıncı Altındaki Hacim Deęerleri

Serbest Hava Hacmi dm ³	Basıncılı Hava Hacmi (dm ³)		
	4 bar	5 bar	7 bar
5	1.01	0.84	0.63
10	2.02	1.68	1.26
15	3.03	2.52	1.90
20	4.04	3.37	2.53
25	5.05	4.21	3.16
30	6.06	5.05	3.79
35	7.07	5.89	4.42
40	8.08	6.73	5.06
50	10.1	8.42	6.32
60	12.1	10.1	7.58
70	14.1	11.8	8.85
80	16.2	13.5	10.1
90	18.2	15.1	11.4
100	20.2	16.8	12.6
125	25.2	21.0	15.8
150	30.3	25.2	19.0
175	35.3	29.5	22.1
200	40.4	33.7	25.3
225	45.4	37.9	28.4
250	50.5	42.1	31.6
275	55.5	46.3	34.8
300	60.6	50.5	37.9
350	70.7	58.9	44.2
400	80.8	67.3	50.6
500	101.0	84.2	63.2
750	151.0	126.0	95.0
1000	202.0	168.0	126.0
1250	252.0	210.0	158.0

TESİSAT BORULARI

ÇAP inch	ÇAP mm	DIŞ çap	ET.KA mm	SİYAH BORU AĞIRLIĞI kg/m	GALVANİZ BORU MANŞONLU AĞIRLIĞI kg/m
1/2"	15	21.3	2.65	1.21	1,22
3/4"	20	26.9	2.65	1.56	1,57
1"	25	33.7	3.25	2.41	2,43
1¼"	32	42.4	3.25	3.10	3,13
1½"	40	48.3	3.25	3.56	3,60
2"	50	60.3	3.65	5.03	5,10
2½"	65	76.1	3.65	6.42	6,54
3"	80	88.9	4.05	8.36	8,53
4"	100	114.3	4.50	12.2	12,5
5"	125	139.7	4.85	16.6	17,1
6"	150	165.1	4.85	19.8	20,4
8"	200	219.0	4.50	23.7	24,0
10"	250	273.0	5.00	33.0	34,0
12"	300	323.9	5.60	43.8	44,5

SANAYİ BORULARI



Üretim Tablosu

Et Kalınlığı Dış Çap mm S mm		0,70	0,80	1,00	1,20	1,50	2,00
		Et Kalınlığı Toleransı ±% 10					
Ø D	Tolerans	Birim Ağırlık Kg/mt					
4,7	± 0,12	0,070					
6		0,091	0,102				
8		0,126	0,142	0,173			
9		0,148	0,162	0,197			
10		0,161	0,182	0,222			
13		0,212	0,240	0,296	0,349	0,425	
16			0,300	0,370	0,438	0,536	
17			0,320	0,394	0,468	0,573	0,740
19			0,359	0,444	0,527	0,647	0,838
21	± 0,15		0,398	0,493	0,586	0,721	0,937
22			0,418	0,518	0,616	0,758	0,986
25			0,477	0,592	0,704	0,869	1,134
25,4			0,485	0,602	0,716	0,884	1,154
28			0,537	0,666	0,743	0,980	1,282
28,6			0,548	0,680	0,811	1,002	1,312
32	± 0,20		0,615	0,764	0,911	1,128	1,480
35				0,838	1,000	1,239	1,628
38				0,912	1,089	1,350	1,776
40					1,148	1,424	1,874
42	± 0,30				1,207	1,498	1,973
45					1,296	1,609	2,121
48					1,385	1,720	2,269
51					1,474	1,831	2,417
57					1,651	2,053	2,713
60		± 0,40				1,740	2,164
63,5					1,829	2,275	3,009
76						2,756	3,650