

Continuous Cast Bronze



الشركة السعودية للصناعات الميكانيكية
SAUDI MECHANICAL INDUSTRIES CO.

VISION

To be a leading local manufacturer and reliable partner providing engineered products and solutions to our customers.

MISSION

Supporting the socio-economic development of the Kingdom.

- Enhance local content through technology transfer and human capital development.
- Contribute to the development of Oil & Gas, Water and upcoming industrial initiatives.

Manufacturer of engineered metal products and provider of solutions to our customers.

- Exceed customer expectations through partnerships, high quality and timely delivery.
- Focus on operational excellence in the manufacturing of engineered products.

Involved proactively with our key stakeholders.

- Care for our employees, community and the environment.
- Maximize shareholder value through innovation and effective resource utilization.

VALUES

Commitment

Be reliable and add value to our customers.

Empowerment

Trust our employees to make the right decisions.

Integrity

Show transparency in everything we do.

Excellence

Operate professionally, safely and effectively.

Collaboration

Deliver through cooperation and team work.



Saudi Mechanical Industries Company

SMI is a world-class precision manufacturing company, offering a comprehensive service with emphasis on total customer satisfaction. With a dedicated and experienced team of skilled personnel, we provide an efficient service to achieve the required specifications and quality set by our customers.

SMI utilizes Continuous Casters, fed by premelt induction furnaces, in the production of its high quality continuous cast bronze. The new facility Continuous Casts up to 7" outside diameter in both solid and hollow bar. Centrifugal Castings are produced to a maximum outside diameter of 21" in maximum lengths of 48". Extensive facilities and operational versatility enables SMI to produce a variety of bronze alloys. SMI is ISO 9001-2015 certified and , with full in-house testing facilities, is able to provide dimensional, mechanical and chemical analysis on request. Material traceability is also a standard procedure.

LG2 Bronze

Sizes and Weights

SMI manufactures both continuous and centrifugally cast bronzes, ranging in size from ½ (12.7mm) to 21" (533mm) diameter. Alloys include bearing bronzes, leaded bronzes, aluminium bronzes, gear bronzes and manganese bronzes. Some bronzes and special sections may require a minimum order quantity. The advantages of continuous and centrifugal casting of bronze include:

- Reduced machining allowance
- Higher machining speeds
- Reduced tool wear
- Excellent mechanical properties
- Homogeneous close-grain structure

Machining Allowance

All sizes have the following allowance for finish machining.

≤3¾"		OD	+	.040"
		ID	-	.060"
≥4"	≤5"	OD	+	.070"
		ID	-	.090"
>5"	≤6"	OD	+	.094"
		ID	-	.108"
>6"	≤7"	OD	+	.109"
		ID	-	.120"
>7"	<21"	OD	+	.125"
		ID	-	.125"

(Note: Allowances are approximate)

Material Specification

BS	1400	LG2	
Equivalent to:			
USA	SAE 40	C83600	
Japan	JIS	H5111	BC6C
Germany	DIN	1705	RG5
Australia	AS	1565	83600

Nominal Chemical Analysis %

Copper	85
Tin	5
Zinc	5
Lead	5

Mechanical Properties

UTS	17.5 - 22.0 tons/in² (270 - 340 MPa)	
Proof Stress	0.2%	6.5 - 9 Tons/in² (100 - 140 MPa)
Elongation	13 - 35%	
Hardness	75 - 90 BHN	

Standard Lengths

- ≤7" diameter: 10ft
- >7" diameter: 48" max.

(Bar length may be cut to order)

Continuous Cast

Imperial: Solid

O/D	kg/ft	kg/m	O/D	I/D	kg/ft	kg/m
1/2	0.40	1.31	3	1	11.45	37.57
5/8	.61	1.99		1 1/4	10.72	35.17
3/4	.86	2.81		1 1/2	9.82	32.22
7/8	1.15	3.77		1 3/4	8.75	28.71
				2	7.50	24.61
1	1.48	4.86	3 1/4	2 1/4	6.09	19.98
1 1/8	1.86	6.10		2 1/2	4.50	14.76
1 1/4	2.28	7.48		1	13.62	44.68
1 3/8	2.74	8.99		1 1/4	12.89	42.29
1 1/2	3.25	10.66		1 1/2	11.99	39.34
1 5/8	3.80	12.47	3 1/2	1 3/4	10.91	35.79
1 3/4	4.39	14.40		2	9.67	31.73
				2 1/4	8.26	27.10
2	5.70	18.70		2 1/2	6.67	21.88
2 1/4	7.18	23.56		2 3/4	4.91	16.11
2 1/2	8.84	28.99	3 3/4	1	15.95	52.33
2 3/4	10.66	34.98		1 1/4	15.22	49.93
				1 1/2	14.32	46.98
3	12.66	41.53		1 3/4	13.25	43.47
3 1/4	14.83	48.65		2	12.01	39.40
3 1/2	17.16	56.30	4	2 1/4	10.60	34.78
3 3/4	19.67	64.53		2 1/2	9.01	29.56
				2 3/4	7.25	23.79
4	22.69	74.44		3	5.33	17.49
4 1/2	28.61	93.86		1	18.46	60.56
			5	1 1/4	17.73	58.17
5	35.21	115.52		1 1/2	16.83	55.22
5 1/2	42.86	140.62		1 3/4	15.76	51.71
				2	14.52	47.64
6	50.87	166.90		2 1/4	13.11	43.01
			6	2 1/2	11.52	37.80
7	69.22	227.10		2 3/4	9.76	32.02
				3	7.84	25.72
				3 1/4	5.74	18.83

Imperial: Hollow

O/D	I/D	kg/ft	kg/m	O/D	I/D	kg/ft	kg/m
1	1/2	1.22	4.00	4	1	21.55	70.70
	3/4	.83	2.72		1 1/4	20.85	68.41
	1 1/8	1.21	3.97		1 1/2	19.97	65.52
	1 1/4	2.01	6.59		1 3/4	18.91	62.04
	3/4	1.63	5.35		2	17.69	58.04
1 1/8	1	1.07	3.51	4 1/2	2 1/4	16.30	53.48
	1 3/8	1.53	5.02		2 1/2	14.73	48.33
	1 1/2	2.98	9.78		2 3/4	13.00	42.65
	3/4	2.60	8.53		3	11.09	36.38
	1	2.04	6.69		3 1/4	9.01	29.56
1 1/4	1 1/4	1.31	4.30	5	3 1/2	6.76	22.18
	1 5/8	2.59	8.50		2	23.61	77.46
	1 1/4	1.86	6.10		2 1/2	20.65	67.75
	1 3/4	3.74	12.27		3	17.01	55.81
	1	3.18	10.43		3 1/2	12.68	41.60
1 1/2	1 1/4	2.45	8.04	5 1/2	4	7.67	25.16
	1 1/2	1.55	5.09		2	30.21	99.11
					2 1/2	27.35	89.73
					3	23.61	77.46
					3 1/2	19.28	63.25
2	3/4	5.05	16.57	6	4	14.27	46.82
	1	4.49	14.73		4 1/2	8.57	28.12
	1 1/4	3.76	12.34		2	37.96	124.54
	1 1/2	2.86	9.38		2 1/2	35.02	114.89
	2 1/4	6.53	21.42		3	31.41	103.05
2 1/4	1	5.97	19.59	7	3 1/2	27.10	88.91
	1 1/4	5.24	17.19		4	22.11	72.54
	1 1/2	4.34	14.24		4 1/2	16.44	53.94
	1 3/4	3.27	10.73		5	10.08	33.07
	2	2.03	6.66	7 1/2	2	45.96	150.79
2 1/2	3/4	8.18	26.84		2 1/2	43.03	141.17
	1	7.63	25.03		3	39.41	129.30
	1 1/4	6.90	22.64		3 1/2	35.11	115.19
	1 1/2	6.00	19.69		4	30.12	98.82
2 3/4	1 3/4	4.92	16.14		4 1/2	24.45	80.22
	2	3.68	12.07		5	18.09	59.35
	1	9.45	31.00	8	3	57.86	189.83
	1 1/4	8.72	28.61		4	48.60	159.45
	1 1/2	7.82	25.66		5	36.60	120.08
	1 3/4	6.75	22.15		6	21.86	71.72
	2	5.51	18.08				
	2 1/4	4.09	13.42				

Imperial: Hollow

O/D	I/D	Wt./ft.	KG	m	
8	4	69.50	228.02		
	5	57.50	188.65		
	6	42.70	140.09		
	7	25.20	82.68		
8 1/2	4	80.90	265.42		
	5	68.90	226.05		
	6	54.20	177.82		
	7	36.70	120.41		
9	4	93.00	305.12		
	5	81.00	265.75		
	6	66.30	217.52		
	7	48.80	160.10		
9 1/2	4	28.60	93.83		
	5	105.90	347.44		
	6	93.90	308.07		
	7	79.10	259.51		
10	7	61.60	202.10		
	8	41.40	135.83		
	10 1/2	5	107.40	352.36	
		6	92.60	303.81	
7		75.10	246.39		
8		54.90	180.12		
11	9	32.00	104.99		
	5	121.50	398.62		
	6	106.80	350.39		
	7	89.30	292.98		
11 1/2	8	69.10	226.71		
	9	46.20	151.57		
	5	136.40	447.51		
	6	121.70	399.28		
12	7	104.20	341.86		
	8	84.00	275.59		
	9	61.00	200.13		
	10	35.30	115.81		
12 1/2	5	152.00	498.69		
	6	137.20	450.13		
	7	119.80	393.04		
	8	99.50	326.44		
13	9	76.60	251.31		
	10	50.90	166.99		
	5	168.20	551.84		
	6	153.50	503.61		
14	7	136.00	446.19		
	8	115.80	379.92		
	9	92.80	304.46		
	10	67.10	220.14		
15	6	188.00	616.80		
	7	170.50	559.38		
	8	150.30	493.11		
	9	127.40	417.98		
16	10	101.70	333.66		
	11	73.20	240.16		
	7	207.80	681.76		
	8	187.60	615.48		
17	9	164.70	540.35		
	10	139.00	456.04		
	11	110.50	362.53		
	12	79.40	260.50		
18	7	247.80	812.99		
	8	227.60	746.72		
	9	204.70	671.59		
	10	179.00	587.27		
19	11	150.50	493.77		
	12	119.40	391.73		
	13	85.50	280.51		
	20	8	270.40	887.14	
9		247.40	811.68		
10		221.70	727.36		
11		193.30	634.19		
21	12	162.10	531.82		
	13	128.20	420.60		
	14	91.60	300.52		

C95400 Aluminium Bronze

Continuous and Centrifugally Cast

Alloy C95400 has excellent strength, is hard and resistant to abrasion, wear, corrosion and impact. These physical properties remain good at elevated temperatures making C95400 a suitable alloy for high strength bearings, gears and worm wheels. The tensile strength of C95400 can be further enhanced with heat treatment if required.



Machining Allowance

All sizes have the following allowance for finish machining.

<3"	OD	+	.072"
			ID - .125"
≥3" ≤4"	OD	+	.110"
			ID - .125"
>4" ≤6"	OD	+	.130"
			ID - .145"
>6" ≤7"	OD	+	.190"
			ID - .200"
>7" ≤21"	OD	+	.125"
			ID - .125"

(Note: Allowances are approximate)

Material Specification

USA	ASTM	B505/B271	C95400
	SAE	J461	C95400
Equivalent to:			
Australia	AS	1565	C95400
Germany	DIN	1714	CuAl11Fe4
Italy	UNI	5274	CuAl11Fe4

Nominal Chemical Analysis %

Copper	85
Aluminium	11
Iron	4

Mechanical Properties

	Min	Typ
Tensile	75kpsi (620MPa)	95kpsi (655MPa)
Yield	30kpsi (210MPa)	35kpsi (240MPa)
Elongation	12%	18%
Hardness (typical)	180BHN (3000kg)	

Standard Lengths

≤7" diameter: 12ft
>7" diameter: 48" max.

(Bar length may be cut to order)

Sizes and Weights

Imperial: Hollow

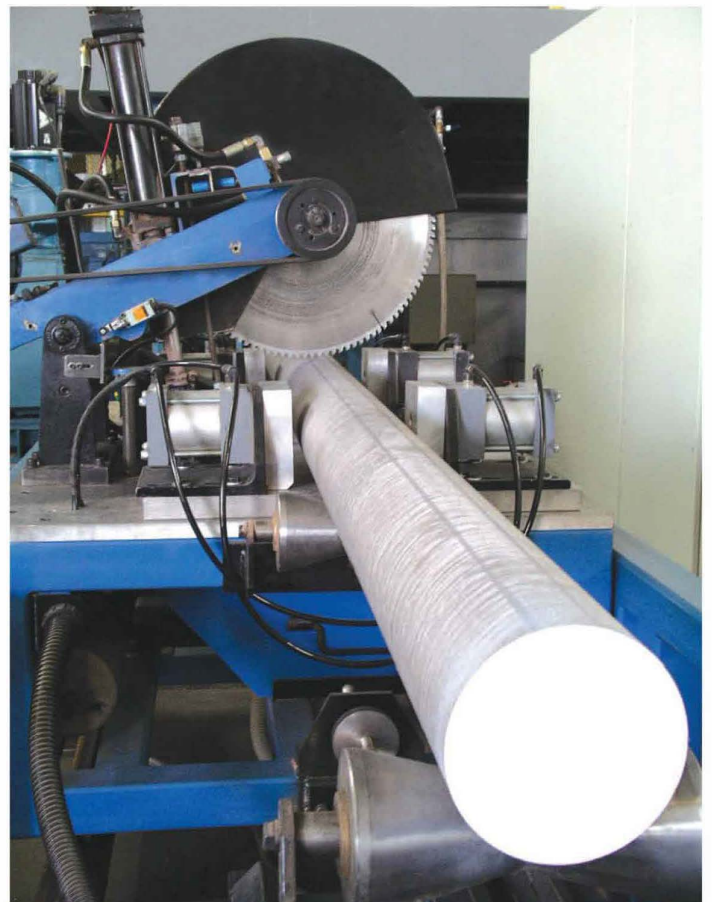
O/D	I/D	kgs/ft	Lbs/ft	kgs/m
1 1/4	3/4	1.56	3.44	5.12
1 1/2	3/4	2.39	5.27	7.84
	1	1.96	4.32	6.43
1 3/4	1	2.94	6.48	9.65
	1 1/4	2.36	5.20	7.74
2	3/4	4.47	9.85	14.67
	1	4.06	8.95	13.32
	1 1/4	3.48	7.67	11.42
	1 1/2	2.76	6.08	9.06
2 1/4	1	5.32	11.73	17.45
	1 1/4	4.74	10.45	15.55
	1 1/2	4.02	8.86	13.19
	1 3/4	3.16	6.97	10.37
2 1/2	1	6.72	14.81	22.05
	1 1/4	6.15	13.56	20.18
	1 1/2	5.43	11.97	17.81
	1 3/4	4.57	10.08	14.99
	2	3.56	7.85	11.68
2 3/4	1	8.42	18.56	27.62
	1 1/4	7.70	16.98	25.26
	1 1/2	6.98	15.39	22.90
	1 3/4	6.12	13.49	20.08
	2	5.11	11.27	16.77
	2 1/4	3.96	8.73	12.99
3	1	9.97	21.98	32.71
	1 1/4	9.39	20.70	30.81
	1 1/2	8.68	19.14	28.48
	1 3/4	7.81	17.22	25.62
	2	6.81	15.01	22.34
	2 1/4	5.66	12.48	18.57
	2 1/2	4.36	9.61	14.30
3 1/4	1	12.31	27.14	40.39
	1 1/4	11.73	25.86	38.48
	1 1/2	10.81	23.83	35.47
	1 3/4	9.94	21.91	32.61
	2	8.94	19.71	29.33
	2 1/4	7.79	17.17	25.56
	2 1/2	6.49	14.31	21.29
3 1/2	1	14.00	30.86	45.93
	1 1/2	12.81	28.24	42.03
	2	10.94	24.12	35.89
	2 1/2	8.50	18.74	27.89
	3	5.48	12.08	17.98
3 3/4	1	16.54	36.46	54.26
	1 1/2	14.96	32.98	49.08
	2	13.09	28.86	42.95
	2 1/2	10.64	23.46	34.91
	3	7.63	16.82	25.03
4	1	18.44	40.65	60.50
	1 1/2	17.25	38.03	56.59
	2	15.38	33.91	50.46
	2 1/2	12.93	28.51	42.42
	3	9.62	21.21	31.56
	3 1/2	6.32	13.93	20.73
4 1/2	1 1/2	22.53	49.67	73.92
	2	20.69	45.61	67.88
	2 1/2	18.27	40.28	59.94
	3	15.27	33.66	50.10
	3 1/2	11.70	25.79	38.39
5	2	26.30	57.98	86.29
	2 1/2	23.88	52.65	78.35
	3	20.88	46.03	68.50
	3 1/2	17.31	38.16	56.79
	4	13.17	29.03	43.21
5 1/2	2	32.48	71.61	106.56
	2 1/2	30.60	67.46	100.39
	3	27.07	59.68	88.81
	3 1/2	23.50	51.81	77.10

O/D	I/D	Kgs/ft	Lbs/ft	Kgs/m
	4	19.35	42.66	63.48
	4 1/2	14.64	32.28	48.03
6	2	39.83	87.81	130.68
	2 1/2	36.70	80.91	120.41
	3	34.43	75.90	112.96
	3 1/2	30.86	68.03	101.25
	4	26.72	58.91	87.66
	4 1/2	21.20	46.74	69.55
	5	16.72	36.86	54.86
7	3	51.31	113.12	168.34
	4	43.59	96.10	143.01
	5	33.53	73.92	110.01

Sizes over 7"OD, up to and including 21"OD are available in maximum lengths of 48" and produced to customer order. Maximum cast weight is 1,000 kg.

Imperial: Solid

O/D	Kgs/ft	Lbs/ft	Kgs/m
3/4	0.78	1.72	2.56
1	1.32	2.91	4.33
1 1/4	2.01	4.43	6.59
1 1/2	2.84	6.26	9.32
1 3/4	3.82	8.42	12.53
2	4.94	10.89	16.21
2 1/4	6.20	13.67	20.34
2 1/2	7.60	16.75	24.93
2 3/4	9.16	20.19	30.05
3	10.85	23.92	35.60
3 1/4	12.98	28.62	42.58
3 1/2	14.98	33.02	49.15
3 3/4	17.13	37.76	56.20
4	19.42	42.81	63.71
4 1/2	24.64	54.32	80.84
5	30.25	66.69	99.25
5 1/2	36.44	80.34	119.55
6	43.76	96.47	143.57
7	60.48	133.33	198.42



Bronze Alloys

Similar Specifications

UNS/CDA/SAE		ASTM		Federal			Other	
Designation	Centrifugal	Continuous	B51400	AS1565	QQ-C-390B	DIN	BSEN 1982:1999	
Aluminium Bronzes								
C95200	B271	B505	AB14	C952104	C95200	CuAl10Ni	CuAl10Fe24	SAE 68A2
C95300	B271	B505		C95400	C95300			SAE 68B2
C95400	B271	B505			C95400			AMS 4870C
C95400HT	B271	B505			C95400HT			
C95410	B271	B505						AMS 4872B
C95500	B271	B505	AB24		C95500	CuAl10Ni	CuAl10Fe5Ni54	AMS4880
C95500HT	B271	B505			C95500HT			
C95800	B271	B505	AB24	C958104	C95800		CuAl10Fe5Ni54	
C95900	B271	B505						
Gear Bronzes								
C90700		B505	PB14	C907104	C90700	CuSn104	CuSn11P	SAE652
C90800		B505	PB2	C90810	C90800	CuSn12	CuSn12	
C91600					C91600			
C91700				C91700	C91700			
C92900		B505			C92900			
Bearing Bronzes								
C83600	B271	B505	LG2	C83600	C83600	CuSn5ZnPb	CuSn5ZnPb5	SAE 402
C84400	B271	B505		C83810A4				
C90300	B271	B505			C90300	CuSn10Zn		SAE 6202
C90500	B271	B505	G1	C92610	C90500			SAE 622
C92200	B271	B505			C92200			SAE 6222
C92500		B505			C92500			SAE 6402
C92700	B271	B505			C92700	CuSn7ZnPb4		SAE 632
C93200	B271	B505		C93200	C93200		CuSn7Zn4Pb74	SAE 6602
C93700	B271	B505	LB2	C93700	C93700		CuSn10Pb104	SAE 642
C93800	B271	B505			C93800	CuPb15Sn	CuSn7Pb15	SAE 672
Manganese Bronzes								
C86200	B271	B505	HTB34	C86300	C86200	CuZn25Al5	CuZn25Al5Mn4Fe34	SAE 430A2
C86300	B271	B505	HTB14	C86500	C86300	CuZn35Al1		SAE 430B2
C86500	B271	B505			C86500		CuZn35Mn2Al1Fe14	SAE 432

- KEY
- [1] QQ-C-390B Alloys are produced as centrifugal castings (Type II) or continuous castings (Type III)
- [2] For cross-reference only - specification discontinued
- [3] Consult individual specifications for physical properties.
- [4] Similar, but not identical



UNS Designation	Nominal Chemical Composition (%)					
	Copper	Alum	Iron	Nickel	Mang	Other
Aluminium Bronzes						
C95200	88	9	3			
C95300	89	10	1			
C95400	85	11	4			
C95400HT	85	11	4			
C95410	84	10	4		2	
C95500	81	11	4		4	
C95500HT	81	11	4		4	
C95800	81	9	4		5	
C95900	80	13	4.5			
Gear Bronzes						
C90700	88.8	11				Phos 0.2
C90800	87.8	12				Phos 0.2
C91600	88	10.3				1.5 Phos 0.2
C91700	86.3	12				1.5 Phos 0.2
C92900	83.5	10	2.8			3.5 Phos 0.2
Bearing Bronzes						
C83600	85	5	5	5		
C84400	81	3	7	9		
C90300	88	8		4		
C90500	88	10		2		
C92200	88	6	1.5	4.5		
C92500	86.5	11	1			1
C92700	88	10	2			
C93200	83	7	7	3		
C93700	80	10	10			
C93800	78	7	15			
Manganese Bronzes						
C86200	63	4	3	3	27	
C86300	63	6	3	3	25	
C86500	58	1	1	1	39	

Mechanical Properties								
Specific Gravity	Tensile (KPSI)		Yield (KPSI)		Elongation (%)		Brinell Hardness	
	Min	Typ	Min	Typ	Min	Typ	Min	Typ
7.64	65	86	25	32	20	38		140
7.53	65	85	25	38	20	30		159
7.45	75	95	30	35	12	18		187
7.45	90	110	45	50	6	14		207
7.45	75	95	30	35	12	18		187
7.53	90	110	40	62	6	12		212
7.53	110	115	60	70	5	10		229
7.64	85	100	35	40	15	20		183
7.18	75	80	50	55	1	1.5	241	277
8.78	40	56	25	32	10	25		95
8.73	50	60	28	32	12	20		95
8.87	45	60	25	32	10	25		85
8.75	50	60	28	32	12	20		95
8.87	45	58	25	32	8	12		75
8.83	30	45	14	20	20	40		70
8.69	30	35	15	18	16	20		
8.83	40	55	18	26	20	32		80
8.73	40	55	18	28	20	25		85
8.65	34	50	16	22	18	35		65
8.73	40	55	24	23	10	20		90
8.78	38	54	20	26	8	25		80
8.93	30	47	14	22	15	30		70
8.87	30	42	12	25	15	18		70
9.25	26	36	14	20	12	17		60
7.85	90	100	45	58	18	23		192
7.84	110	115	60	75	12	15		229
8.30	65	80	25	32	20	25		149

Extensive facilities and operational versatility enables SMI to furnish virtually any non-ferrous alloy.



Quality Control

The principals of Quality Management and Continuous Improvement are the foundation of our business. SMI's documented quality management system conforms to ISO9001/2000.

The quality of SMI Continuous Cast Bar starts with the introduction of the raw material where experienced Foundry staff monitor incoming feed-stock to ensure only the best material for the required alloy is selected. From here the feed-stock is introduced to pre-melt induction furnaces and samples of each melt are analysed by spectrometer to ensure correct chemical composition is maintained throughout the production process. Upon confirmation of correct chemical analysis molten bronze is transferred from the pre-melt furnaces to the Continuous cast line.

Because of the bottom pouring conditions utilized by the horizontal casting process and the rapid cooling that the metal receives in the cooling zone, inclusions are completely eliminated; grain structure is tight and even giving excellent pressure tightness, tensile strength and wearing qualities.

The Continuous Cast Bar stock is then straightened, inspected for dimensional compliance, cut to length and racked ready for dispatch. With full in-house testing facilities, SMI is able to provide dimensional, mechanical and chemical analysis on request. Material traceability is also a standard procedure.

SMI - manufacturers of Continuous and Centrifugally Cast Bronze product that meets and exceeds the rigorous expectations of a Global Customer base.



Quality Management System





MEETING
REQUIREMENTS

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