

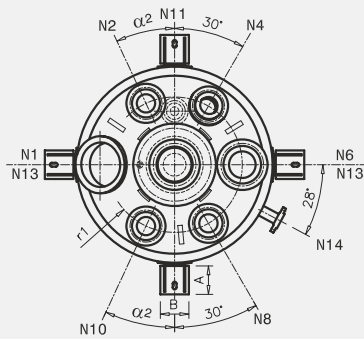
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GLASCOAT

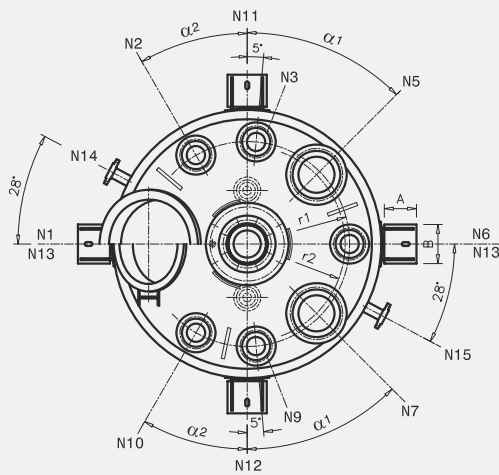
GLASS-LINED REACTORS

AE SERIES: 63-8000 Ltrs
CE SERIES: 1600-50000 Ltrs

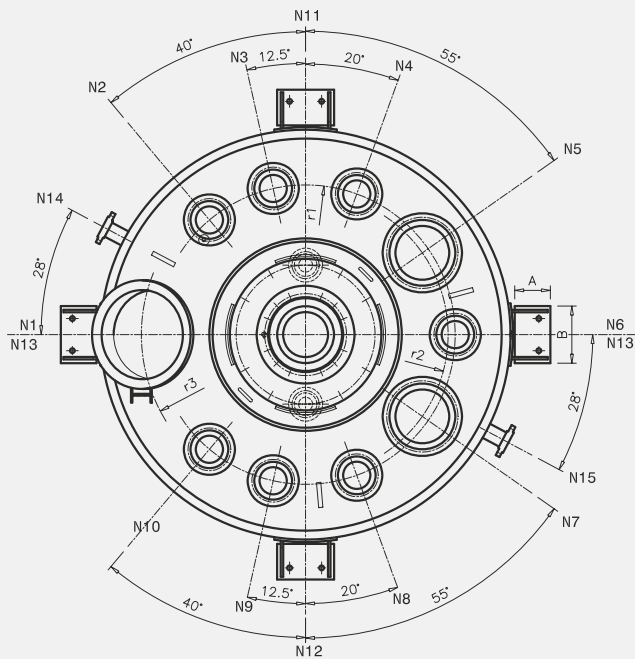




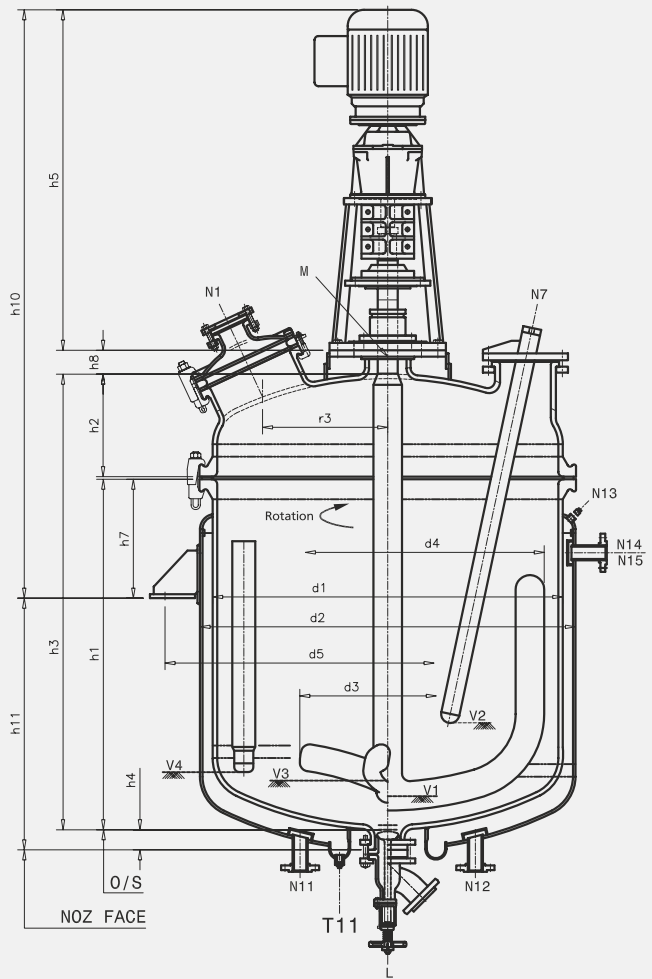
AE 63 - AE 630 Plan View



AE 1000 - AE 6300 Plan View



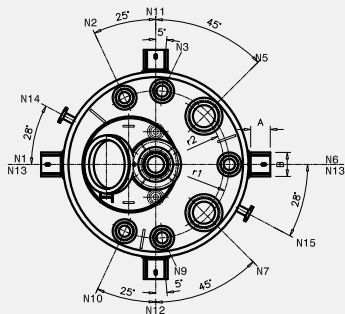
AE 8000 Plan View



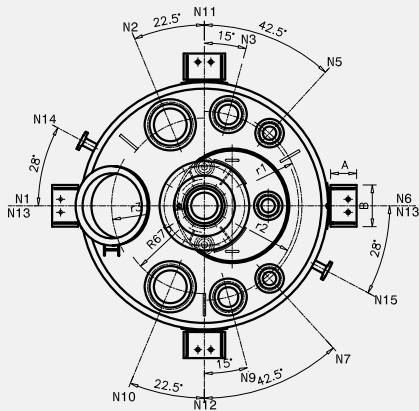
AE GLASS-LINED REACTORS - DIN 28136

Gross volume (ltrs.)		63	100	160	250	500	630	1000	1600	2000	2500	3000	4000	5000	6300	8000
Total volume (ltrs.)		93	135	250	408	730	855	1470	2300	2580	3500	3800	5385	6700	8200	10500
Jacket volume (ltrs.)		22	33	71	95	150	165	210	287	340	375	455	522	605	630	765
Min. Stirrable volume V1 (with ANC) (ltrs.)		6	6	15	15	32	32	35	60	60	69	69	102	117	158	158
Min. Sensible volume V2 (with ANC) (ltrs.)		34	34	72	90	204	204	305	465	465	604	634	900	733	1185	1930
Min. Stirrable volume V3 (with IMP) (ltrs.)		12	12	32	32	62	62	78	150	150	126	126	250	242	242	289
Min. Sensible volume V4 (with IMP) (ltrs.)		19	19	78	85	87	87	102	215	215	277	282	540	1132	1000	1968
Approx heat surface Area (sq. mtrs.)		0.6	0.9	1.2	1.8	2.7	3.1	4.6	6.2	7.3	8.3	9.3	11.7	13	16.1	18.5
D I M E N S I O N S	d1	508	508	800	800	1000	1000	1200	1400	1400	1600	1600	1800	2000	2000	2200
	d2	600	600	900	900	1100	1100	1300	1500	1500	1700	1700	1900	2100	2100	2300
	d3	300	300	480	480	600	600	720	840	840	960	960	1100	1100	1100	1100
	d4	420	420	670	670	880	880	1060	1250	1250	1440	1440	1630	1630	1810	1810
	d5	756	756	1056	1056	1355	1355	1559	1780	1780	1980	1980	2210	2414	2414	2618
	h1	400	600	522	714	845	1000	1200	1400	1600	1600	1755	2000	2000	2500	2620
	h2	180	180	280	280	300	300	350	400	400	460	460	500	550	550	580
	h3	590	790	810	1004	1155	1310	1560	1810	2010	2070	2225	2510	2560	3060	3210
	h4	70	70	70	70	78	78	76	80	80	80	80	80	86	86	86
	h5	828	828	1026	1026	1072	1072	1072	1282	1282	1348	1348	1577	1700	1700	1875
	h7	300	300	320	360	405	435	435	475	475	485	485	630	640	640	700
	h8	70	70	90	90	90	90	90	100	100	100	100	130	130	130	130
	h10	1388	1388	1406	1766	1887	1907	1957	2267	2267	2403	2403	2847	3050	3050	3235
	h11	170	370	272	424	508	643	841	1005	1230	1195	1350	1450	1446	1946	2006
	α1	- -	- -	- -	- -	- -	- -	22.5	30	30	25	25	25	30	30	- -
	α2	25	25	30	30	25	25	47.5	45	45	45	45	45	45	45	- -
	r1	210	210	310	310	380	380	500	575	575	675	675	725	800	800	840
	r2	- -	- -	- -	- -	- -	- -	450	550	550	625	625	675	750	750	800
	r3	210	210	310	310	370	370	440	500	500	580	580	630	700	700	850
	A x B	100x140	100x140	100x140	100x140	160x160	160x160	160x160	180x220	180x220	180x220	180x220	200x320	200x320	200x320	200x320
Drain valve		80x50	80x50	100x80	100x80	100x80	100x80	100x80	100x80	100x80	100x80	100x80	100x80	150x100	150x100	150x100
Drive power (hp)		1	1	2	2	3	3	3	5	5	7.5	7.5	10	15	15	20
Approx. weight (kg)		445	500	935	1038	1532	1630	2122	2835	3014	3592	3762	5572	6190	6924	8500

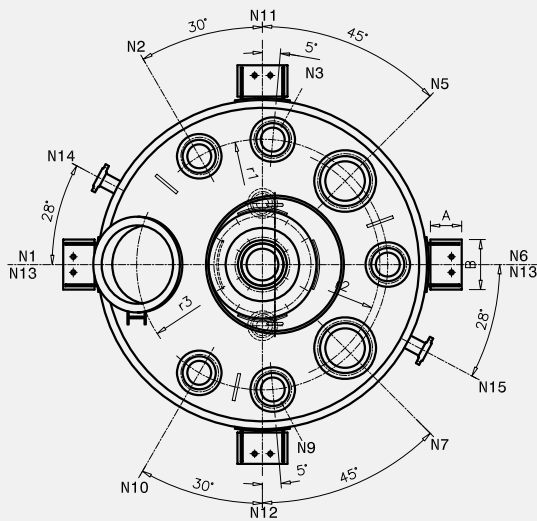
N O Z Z L E S	N1	100	100	150	150	250	250	350x450	350x450	350x450	350x450	350x450	500	500	500	500
	N2,N10	40	40	50	50	100	100	100	100	100	100	100	150	150	150	150
	N3	- -	- -	- -	- -	- -	- -	100	100	100	100	100	150	150	150	150
	N4	80	80	80	80	100	100	- -	- -	- -	- -	- -	- -	- -	- -	150
	N5,N7	- -	- -	- -	- -	- -	- -	200	200	200	200	200	250	250	250	300
	N6	80	80	80	80	150	150	100	100	100	100	100	150	150	150	150
	N8	50	50	80	80	100	100	- -	- -	- -	- -	- -	- -	- -	- -	150
	N9	- -	- -	- -	- -	- -	- -	100	100	100	100	100	150	150	150	150
	L	80	80	100	100	100	100	100	100	100	100	100	100	150	150	150
	M	50	50	80	80	125	125	125	150	150	150	150	200	200	200	250
	N11	40	40	40	40	50	50	50	50	50	50	50	50	80	80	80
	N12	- -	- -	- -	- -	- -	- -	- -	50	50	50	50	50	80	80	80
	N14	40	40	40	40	50	50	50	50	50	50	50	50	80	80	80
	N15	- -	- -	- -	- -	- -	- -	- -	50	50	50	50	50	80	80	80
	N13,T11	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP	½" BSP



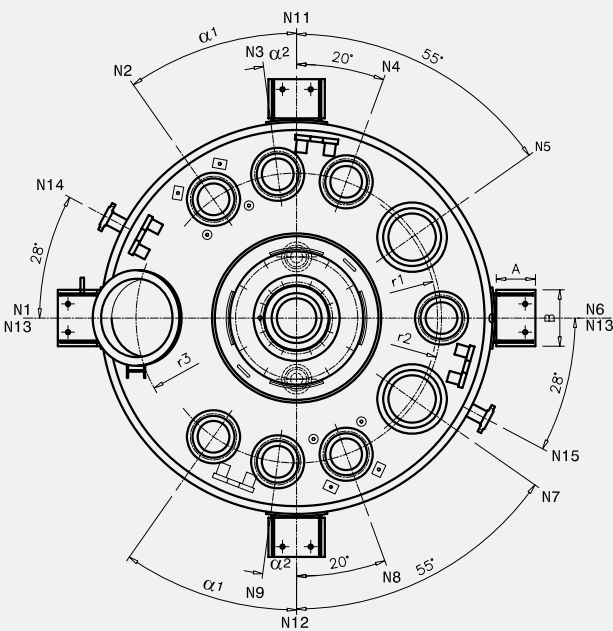
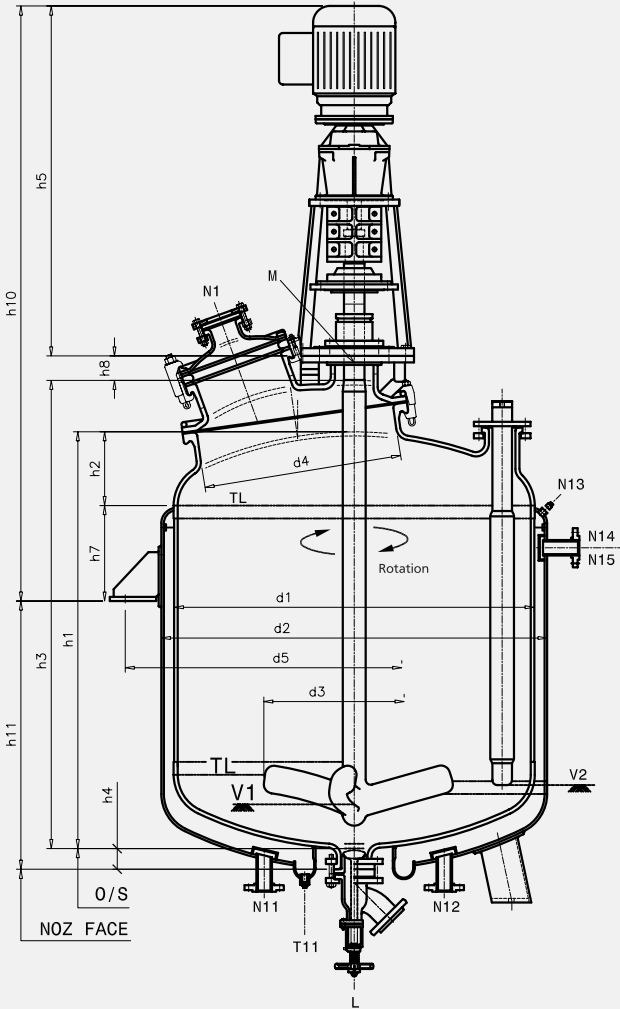
CE 1600 - CE 3000 Plan View



CE 4000 Plan View



CE 5000 - CE 6300 Plan View



CE 8000 - CE 40000 Plan View

CE GLASS-LINED REACTORS - DIN 28136

Gross volume (ltrs.)		1600	2000	2500	3000	4000	5000	6300	8000	10000	12500	16000	20000	25000	32000	40000	50000
Total volume (ltrs.)		2045	2360	3100	3400	4920	6060	7595	9557	11770	15065	18756	22632	28584	36600	45545	55845
Jacket volume (ltrs.)		320	355	415	455	570	552	755	847	900	1050	1120	1306	1510	2972	3640	4008
Min. Stirrable volume V1 (ltrs.)		115	115	195	195	195	210	210	215	345	345	536	536	710	-	-	-
Min. Sensible volume V2 (ltrs.)		205	205	244	244	337	412	412	798	1940	1940	2650	2650	3020	-	-	-
Approx. heat surface Area (sq. mtrs.)		6.5	7.5	8.6	10	12	13.4	16.6	18	20.7	25.2	29	34	39.5	45.9	55.4	65.6
D I M E N S I O N S	d1	1400	1400	1600	1600	1800	2000	2000	2200	2400	2400	2800	2800	3000	3400	3400	3600
	d2	1500	1500	1700	1700	1900	2100	2100	2300	2500	2500	2900	2900	3100	3550	3550	3750
	d3	840	840	960	960	1100	1100	1100	1100	1300	1300	1500	1500	1500	1700	1700	1800
	d4	770	770	770	770	770	770	770	770	965	965	1160	1160	1160	1350	1350	1350
	d5	1780	1780	1980	1980	2210	2414	2414	2618	2918	2918	3200	3200	3552	-	-	-
	h1	1611	1811	1859	2014	2297	2325	2840	3000	3180	3780	3806	4385	4755	4875	5795	6365
	h2	285	285	344	344	372	424	424	574	614	614	732	732	708	867	863	902
	h3	1800	2000	2060	2215	2500	2545	3060	3210	3400	4000	4060	4640	5010	5150	6070	6650
	h4	80	80	80	80	80	86	86	86	84	84	82	82	82	120	120	120
	h5	1280	1280	1347	1345	1512	1663	1580	1622	1810	1855	1867	1869	1953	-	-	-
	h7	380	380	380	380	545	535	535	540	605	605	800	800	840	1000	1000	1500
	h8	115	115	115	115	130	130	130	110	135	135	135	135	135	135	135	135
	h10	2257	2257	2391	2382	2767	2972	2911	3119	3384	3429	3790	3795	3950	-	-	-
	h11	1026	1226	1215	1370	1460	1452	1967	1972	2045	2645	2356	2935	3229	3128	4629	4083
	α1	-	-	-	-	-	-	-	40	40	40	40	40	40	40	40	-
	α2	-	-	-	-	-	-	-	12.5	7.5	7.5	12.5	12.5	12.5	12.5	12.5	-
	r1	575	575	675	675	750	800	800	840	925	925	1100	1100	1175	1300	1300	1400
	r2	550	550	625	625	725	750	750	800	900	900	1000	1000	1075	1200	1200	1300
	r3	-	-	-	-	650	740	740	850	950	950	1150	1150	1200	1250	1250	1350
	A x B	180x220	180x220	180x220	180x220	200x320	200x320	200x320	200x320	250x360	250x360	250x360	250x360	350x500	-	-	-
Drain valve		100x80	100x80	100x80	100x80	100x80	150x100	150x100	150x100	150x100	150x100	150x100	150x100	150x100	150x100	150x100	150x100
Drive power (hp)		5	5	7.5	7.5	10	12.5	12.5	15	15	20	25	25	30	-	-	-
Approx. weight (kg)		2682	2860	3437	3606	5241	5756	6498	7648	9527	10743	13680	15202	18979	28850	33500	37500

N O Z Z L E S	N1	350x450	350x450	350x450	350x450	500	500	500	500	500	500	500	500	500	500	500	500
	N2,N10	-	-	100	100	250	150	150	150	200	200	200	200	200	200	200	200
	N3	100	100	100	100	150	150	150	150	200	200	200	200	200	200	200	200
	N4	-	-	-	-	-	-	-	150	250	250	200	300	300	400	400	400
	N5,N7	200	200	200	200	100	250	250	300	300	300	300	300	300	400	400	400
	N6	100	100	100	100	100	150	150	150	200	200	200	200	200	200	200	200
	N8	-	-	-	-	-	-	-	150	200	200	200	200	200	200	200	200
	N9	100	100	100	100	150	150	150	150	250	250	200	300	300	400	400	400
	L	100	100	100	100	100	150	150	150	150	150	150	150	150	150	150	150
	M	150	150	150	150	200	200	200	200	250	250	250	250	250	250/ 300	250/ 300	250
	N11,N15	50	50	50	50	50	80	80	80	80	80	80	80	80	100	100	100
	N12,N14	50	50	50	50	50	80	80	80	80	80	80	80	80	100	100	100
	N13,T11	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP	½ "BSP

OUTSTANDING FEATURES



- Our reactors are designed to be user-friendly and offer a long trouble-free service life. They are built in accordance with DIN 28136 standards. Based on requests from several customers we have also developed capacities of Reactors not specified in DIN standard.



- Our versatile, GEL-2200 glass offers resistance against corrosion across the entire pH range as well as excellent thermal shock resistance.

- Baffles and agitators are lined with special GEL-2200 glass, which has significantly higher impact, abrasion and thermal shock resistance.

- Computer-controlled electric furnaces ensures uniform temperature for consistent glass-lining.

- Highly efficient & silent agitator drive seldom needs maintenance. The swing-free agitator with lowest possible run-out at sealing surface has negligible wear on agitator and seal face gland. This is possible because a consistent high vacuum can be achieved without frequent replacement of gland packing.



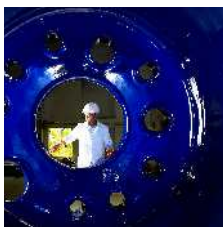
- An agitator shaft is coupled to the reduction gear by a specially designed two-piece muff coupling with a hanger bolt in between. This arrangement facilitates the replacement of the mechanical seal/gland packing or shaft bearing without disturbing the alignment and shifting of motor or gearbox.

- Each component of the drive is step-mounted making assembly effortless & less time consuming while ensuring the highest level of alignment.



- Glascoat reactors use six types of standard drives over the twenty seven different capacities of reactors from 63 ltrs. to 50,000 ltrs. This allows for the best possible interchangeability of spares and reduces inventory at the user's end.

- A variety of agitators like impeller, anchor, pitch blade and hydro-foil types are available for specific applications. Additionally white bands marking can also be provided on the agitator shaft to facilitate volumetric measurement visually.



- PTFE envelope gaskets with a corrugated stainless steel inserts are provided for leak-free operation.

- Specially glass-lined protection rings cushion manhole contact surfaces from direct impact and abrasion.

- A stainless steel wire rope retains all the c-clamps and prevent them from falling when loosen - a tremendous convenience in maintenance work.

- Spring-loaded manhole cover for safe and easy operation.

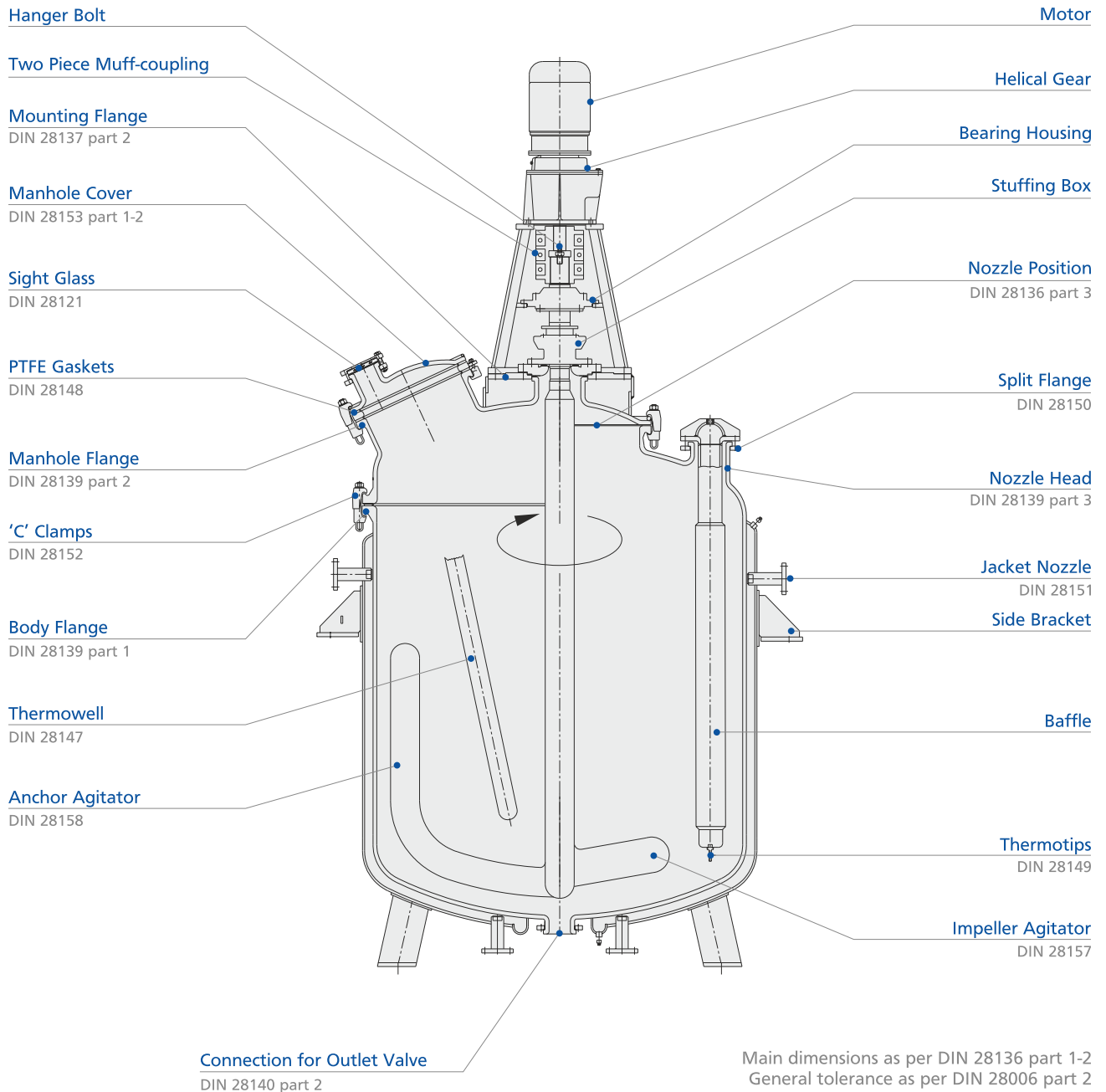
- Narrow-annuals jacketing improves heat transfer and speeds drainage.

- Pre-welded nuts on jacket facilitates quick and easy insulation of reactor.

- Long lasting epoxy zinc-rich primer and polyurethane finish coats protect against severe atmospheric corrosion.



COMPONENT IDENTIFICATION CHART WITH HELICAL GEAR DRIVE UNIT



Standard Sizes

63 ltrs. to 50000 ltrs.

Design Data

Pressure: Full vacuum and 6 kg/cm² internal and jacket

Temperature

-25 / +200°C construction and inspection in accordance with ASME section VIII, division 1.

Glass-lining

High voltage spark test after glass-lining: at 20000V; before shipment: at 10000V as per DIN 28006.

Agitating System

Standard drive with anchor agitator (50 rpm)/impeller (100 rpm) and baffle. As an alternative pitched blade or axial propeller can also be installed for specific needs. Drive unit consists of a synchronous three phase explosion proof/energy efficient direct coupled helical gear unit. Lantern stool housing, self-aligning double ball-bearing and specially designed two piece muff coupling for perfect alignment. Either single or double mechanical seals are provided to suit process conditions.

The drive unit is designed to facilitate easy and quick replacement of components without disturbing alignment or dismantling of major drive components.

Standard Accessories

Glass-lined manhole protection ring sight and light glass, split flanges for operating nozzles, glass-lined bottom outlet valve and spring loaded device for opening manhole cover.

Optional Accessories

Tantalum tip with RTD sensor for temperature measurement, PTFE lined dip pipe/sparger, reducing flange, bellow sealed valve, agitation nozzles on jacket and electronic variable speed drive.



SWISS
GLASCOAT
EQUIPMENTS LIMITED

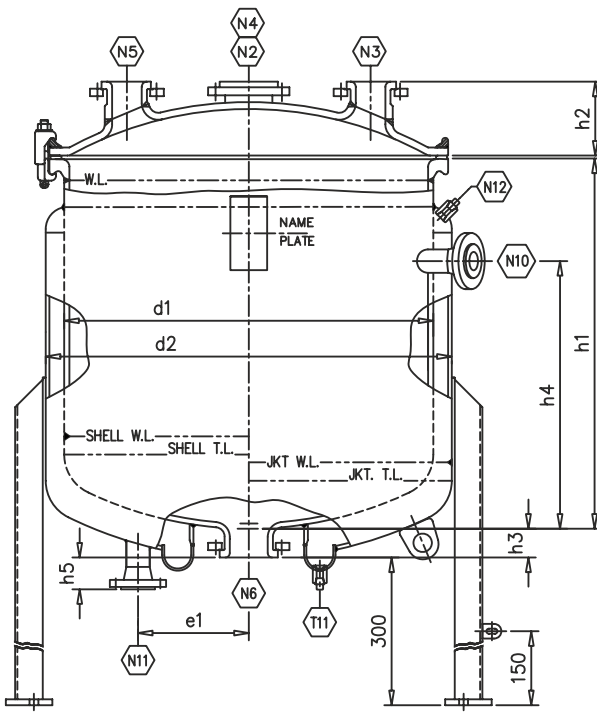
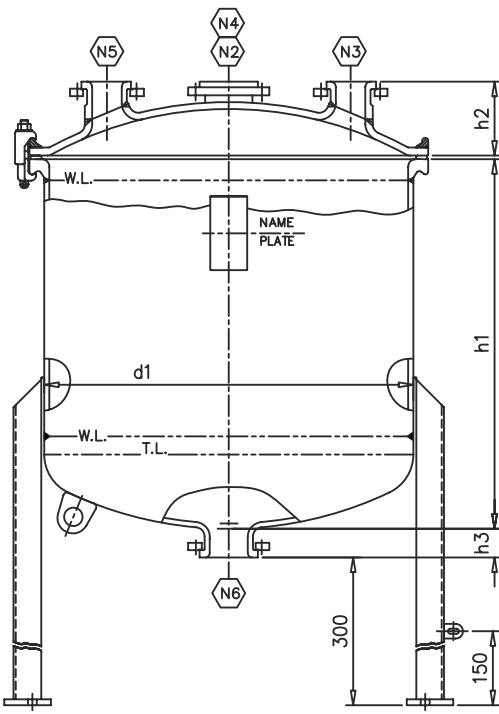
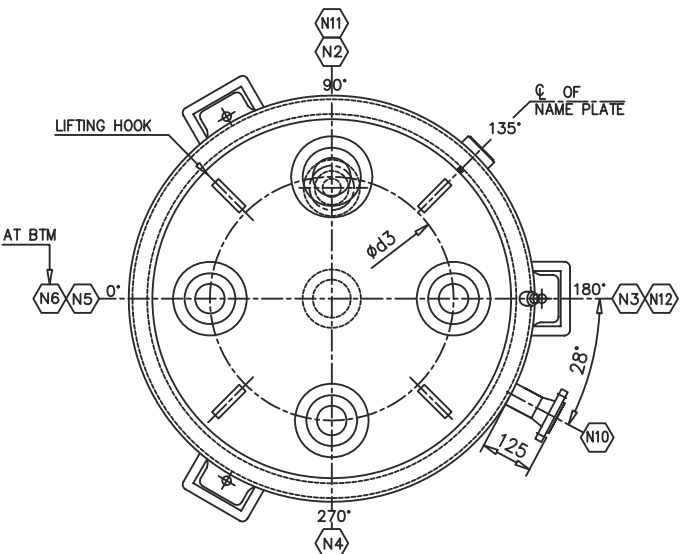
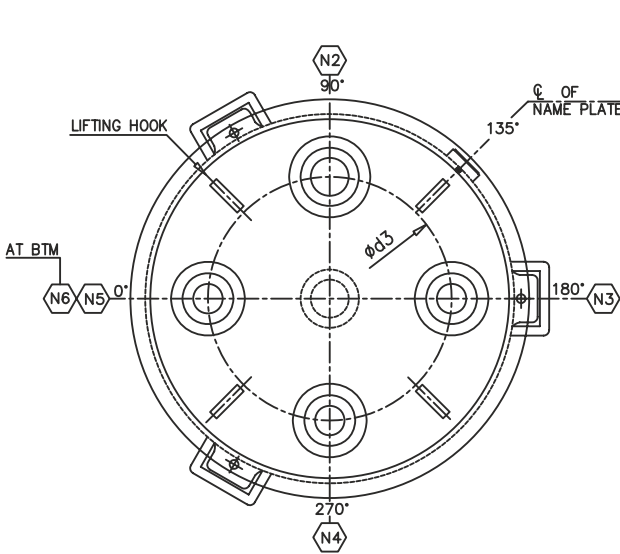
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GLASCOAT



**GLASS-LINED
STORAGE VESSELS / RECEIVERS**



Un-Jacketed

Jacketed

DIMENSIONAL DETAILS

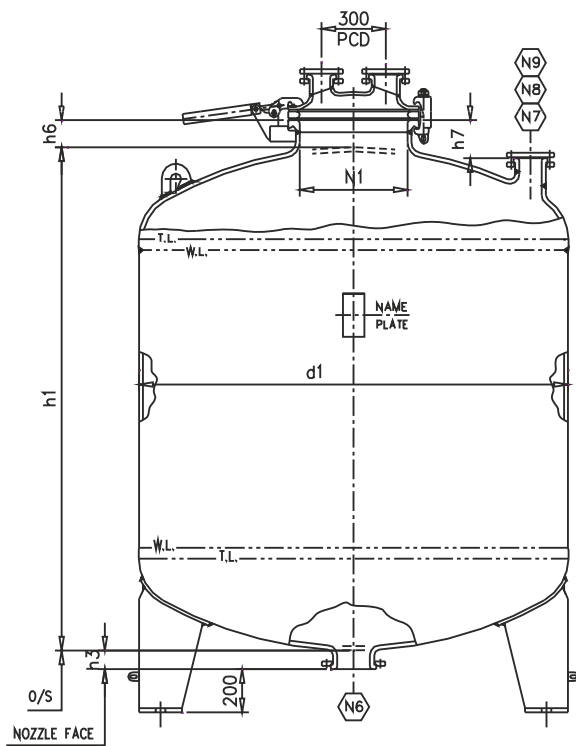
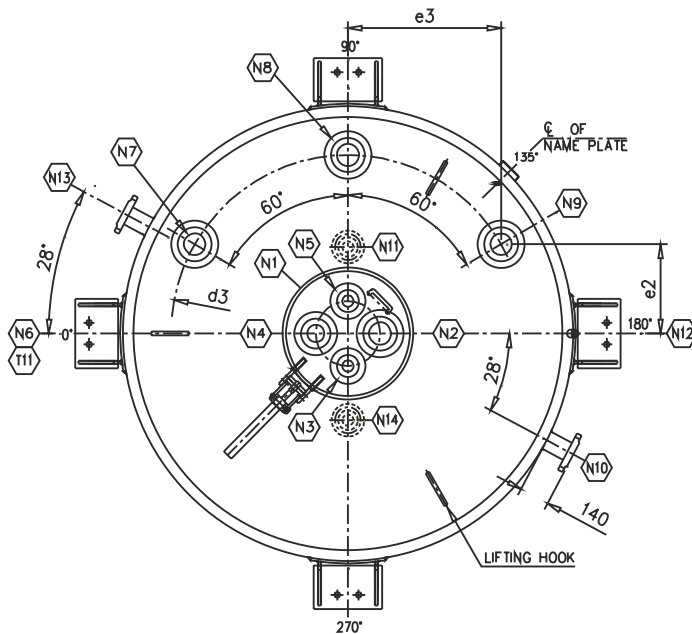
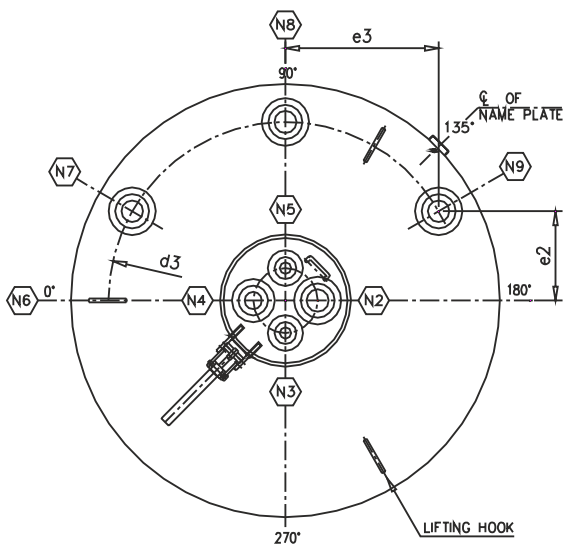
63 - 630 LITRE VERTICAL STORAGE VESSEL / RECEIVER (DIN 28018)

GROSS VOLUME (LTRS.)		63	100	160	250	400	500	630
TOTAL VOLUME (LTRS.)		80	120	190	295	485	585	790
JACKET VOLUME (LTRS.)		22	36	54	88	110	132	140
APPROX HEAT SURFACE (Sq. Mtrs.)		0.58	0.88	1.25	1.7	2.5	3	3.1
D I M E N S I O N S	d1	508	508	600	700	800	800	1000
	d2	600	600	700	800	900	900	1100
	d3	320	320	360	440	540	540	660
	h1	400	600	700	800	1000	1200	1000
	h2	150	150	160	170	170	170	200
	h3	80	80	80	80	90	90	90
	h4	245	445	545	630	830	1041	810
	h5	94	94	99	102	76	76	86
	e1	225	225	225	225	300	300	300
UN-JACKETED APPROX WEIGHT (Kg)		200	250	350	440	500	550	700
JACKETED APPROX WEIGHT (Kg)		250	320	450	550	640	736	920

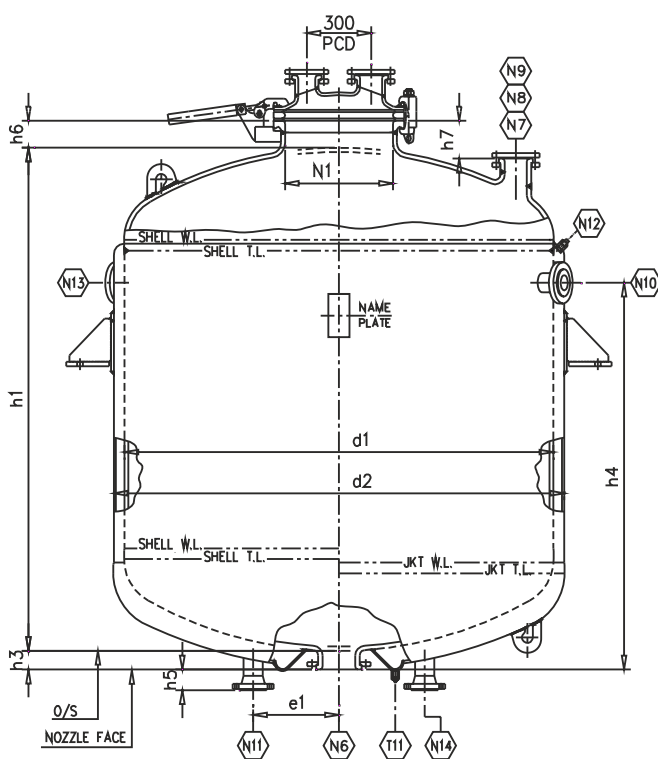
GROSS VOLUME (LTRS.)		63	100	160	250	400	500	630
N O Z Z L E S	N2	100	100	100	100	100	100	100
	N3 ,N5	50	50	50	50	80	80	80
	N4	80	80	80	80	80	80	80
	N6	80	80	80	80	100	100	100
	N10, N11	40	40	40	40	50	50	50
	N12	G 1/2 "						

DIMENSIONAL DETAILS

1000 - 4000 LITRE VERTICAL STORAGE VESSEL / RECEIVER (DIN 28018)

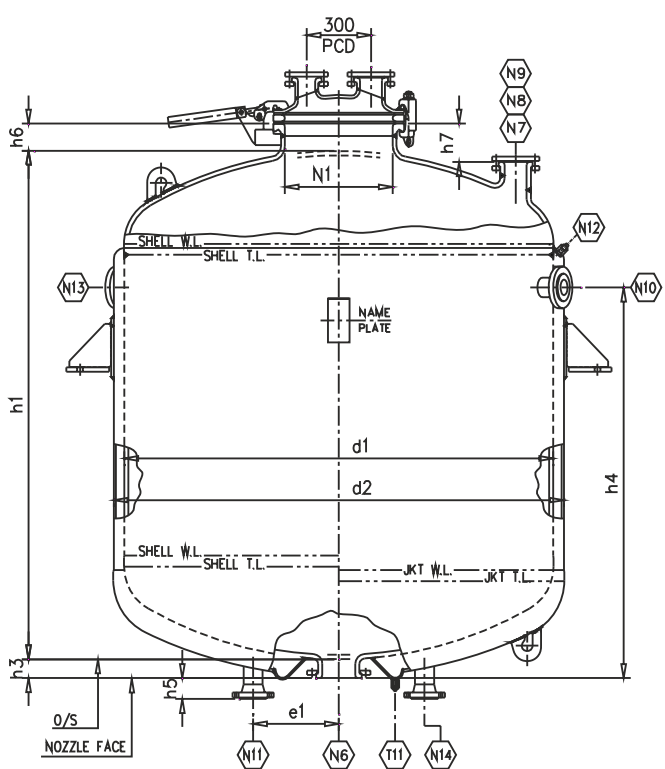
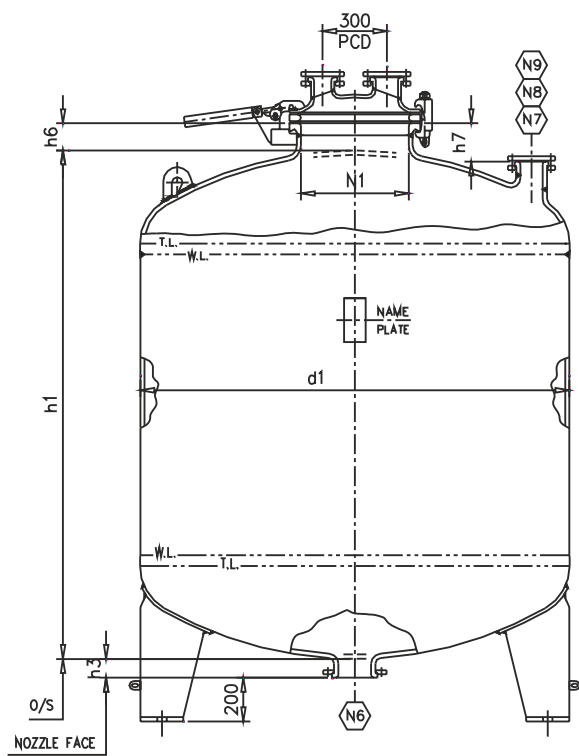
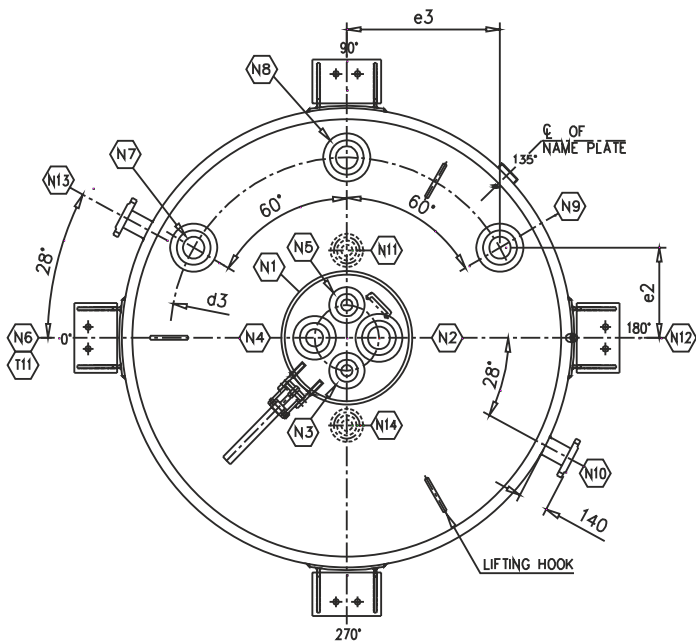
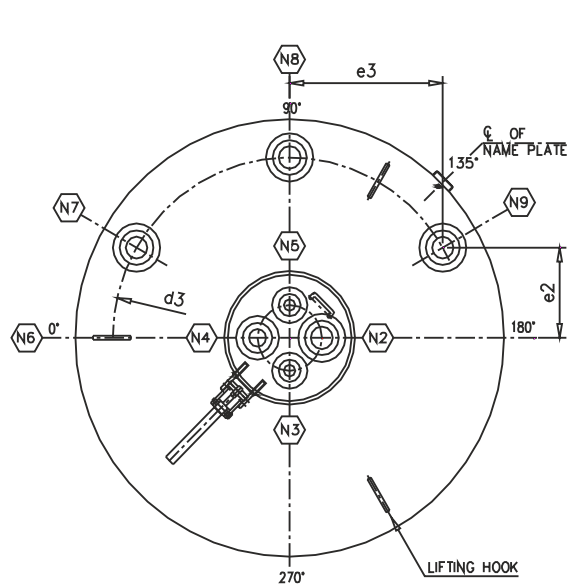


Un-Jacketed



Jacketed

GROSS VOLUME (LTRS.)		1000	1600		2000	2500		3000	4000	
TOTAL VOLUME (LTRS.)		1260	1800	1770	2170	2870	2650	3150	4460	4700
JACKET VOLUME (LTRS.)		180	280	205	262	370	245	306	460	360
APPROX HEAT SURFACE (Sq. Mtrs.)		4.3	6.5	4.9	6.25	8.5	6.3	7.76	11.5	9.3
D I M E N S I O N S	d1	1000	1000	1200	1200	1200	1400	1400	1400	1600
	d2	1100	1100	1300	1300	1300	1500	1500	1500	1700
	d3	-	-	920	920	920	1040	1040	1040	1200
	h1	1800	2500	1800	2170	2800	2000	2340	3200	2500
	h3	90	90	90	90	90	90	90	90	90
	h4	1550	2250	1510	1880	2510	1665	2005	2865	2125
	h5	86	86	92	92	92	97	97	97	101
	h6	85	85	85	85	85	85	85	85	100
	h7	-	-	70	70	70	70	70	70	100
	e1	300	300	300	300	300	300	300	300	300
	e2	-	-	230	230	230	260	260	260	300
	e3	-	-	398	398	398	450	450	450	520
UN-JACKETED APPROX WEIGHT (Kg)		850	1050	1000	1153	1350	1400	1588	2000	1900
JACKETED APPROX WEIGHT (Kg)		1200	1530	1600	1872	2250	2400	2715	3500	3400
GROSS VOLUME (LTRS.)		1000	1600		2000	2500		3000	4000	
N O Z Z L E S	N1	500	500	500	500	500	500	500	500	500
	N2	100	100	100	100	100	100	100	100	100
	N3, N5	50	50	50	50	50	50	50	50	50
	N4	80	80	80	80	80	80	80	80	80
	N6	100	100	100	100	100	100	100	100	100
	N7,N8	-	-	50	50	50	80	80	80	80
	N9	-	-	-	-	-	-	-	-	-
	N10,N11	50	50	50	50	50	50	50	50	50
	N12	G 1/2 "								
	N13,N14	-	-	-	-	-	50	50	50	50



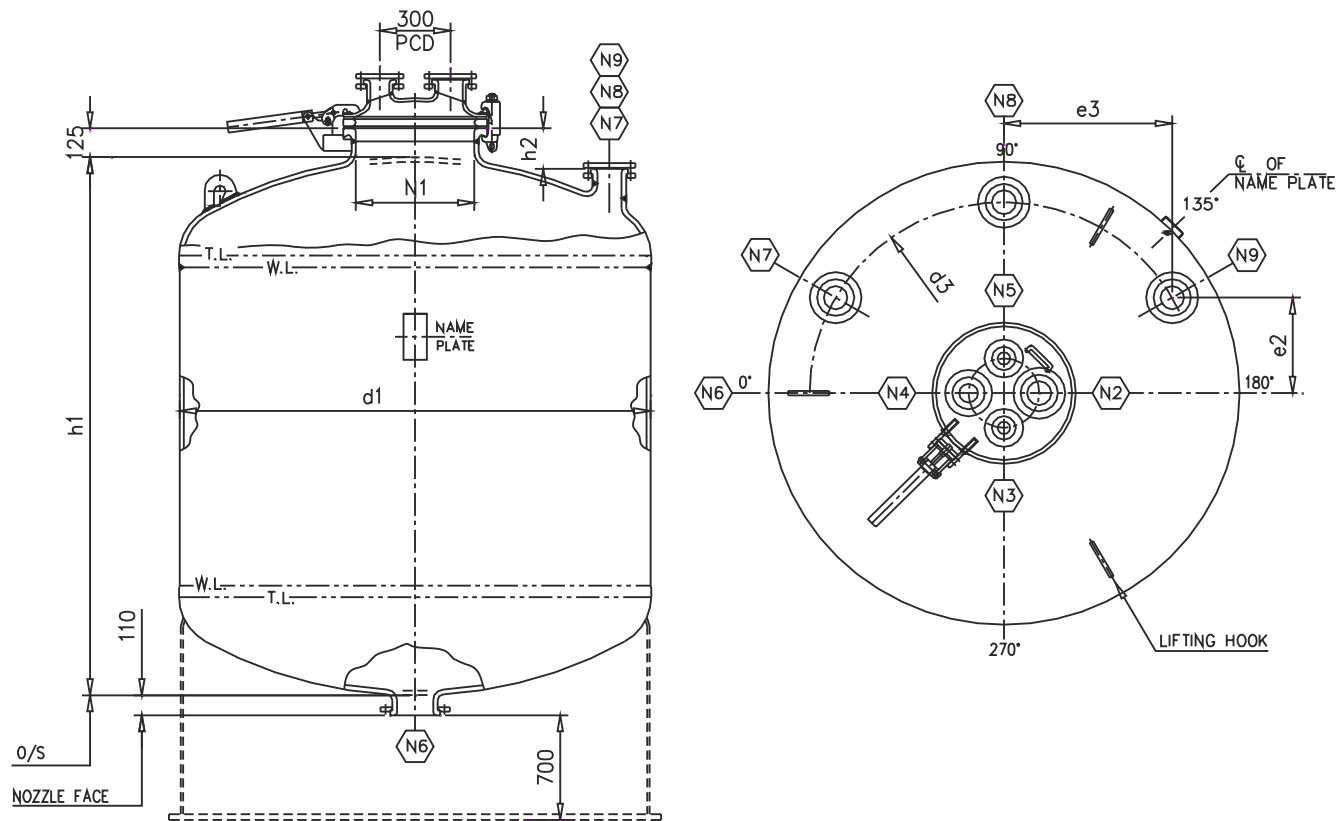
Un-Jacketed

Jacketed

GROSS VOLUME (LTRS.)		5000	6300		8000		10000		12500	
TOTAL VOLUME (LTRS.)		5700	7300	7240	9240	8870	10420	11310	14410	13620
JACKET VOLUME (LTRS.)		467	680	510	690	550	800	750	995	970
APPROX HEAT SURFACE (Sq. Mtrs.)		11.9	16.8	14	18.5	15.1	21.3	20.2	26.48	25.28
D I M E N S I O N S	d1	1600	1600	1800	1800	2000	1800	2000	2000	2200
	d2	1700	1700	1900	1900	2100	1900	2100	2100	2300
	d3	1200	1200	1360	1360	1500	1360	1500	1600	1600
	h1	3020	4000	3200	4000	3200	4500	4000	5000	4000
	h3	90	110	110	110	110	110	110	110	110
	h4	2645	3625	2785	3585	2745	4085	3545	4545	3330
	h5	101	75	79	76	82	76	82	82	100
	h6	100	100	80	80	120	80	120	80	120
	h7	100	100	100	100	100	100	100	150	150
	e1	300	375	375	390	390	390	390	390	390
	e2	300	300	340	340	375	340	375	400	400
	e3	520	520	589	589	650	589	650	693	693
UN-JACKETED APPROX WEIGHT (Kg)		2270	2600	2900	3200	3300	3600	3650	3950	4200
JACKETED APPROX WEIGHT (Kg)		3987	5000	5250	6750	6100	7100	7300	8920	9350
GROSS VOLUME (LTRS.)		5000	6300		8000		10000		12500	
N O Z Z L E S	N1	500	500	500	500	500	500	500	500	500
	N2	100	100	100	100	100	100	100	100	100
	N3, N5	50	50	50	50	50	50	50	50	50
	N4	80	80	80	80	80	80	80	80	80
	N6	100	150	150	150	150	150	150	150	150
	N7,N8	80	80	100	100	100	100	100	100	100
	N9	-	-	-	-	-	100	100	100	100
	N10,N11	50	50	80	80	80	80	80	80	80
	N12	G 1/2 "								
	N13,N14	50	50	80	80	80	80	80	80	80

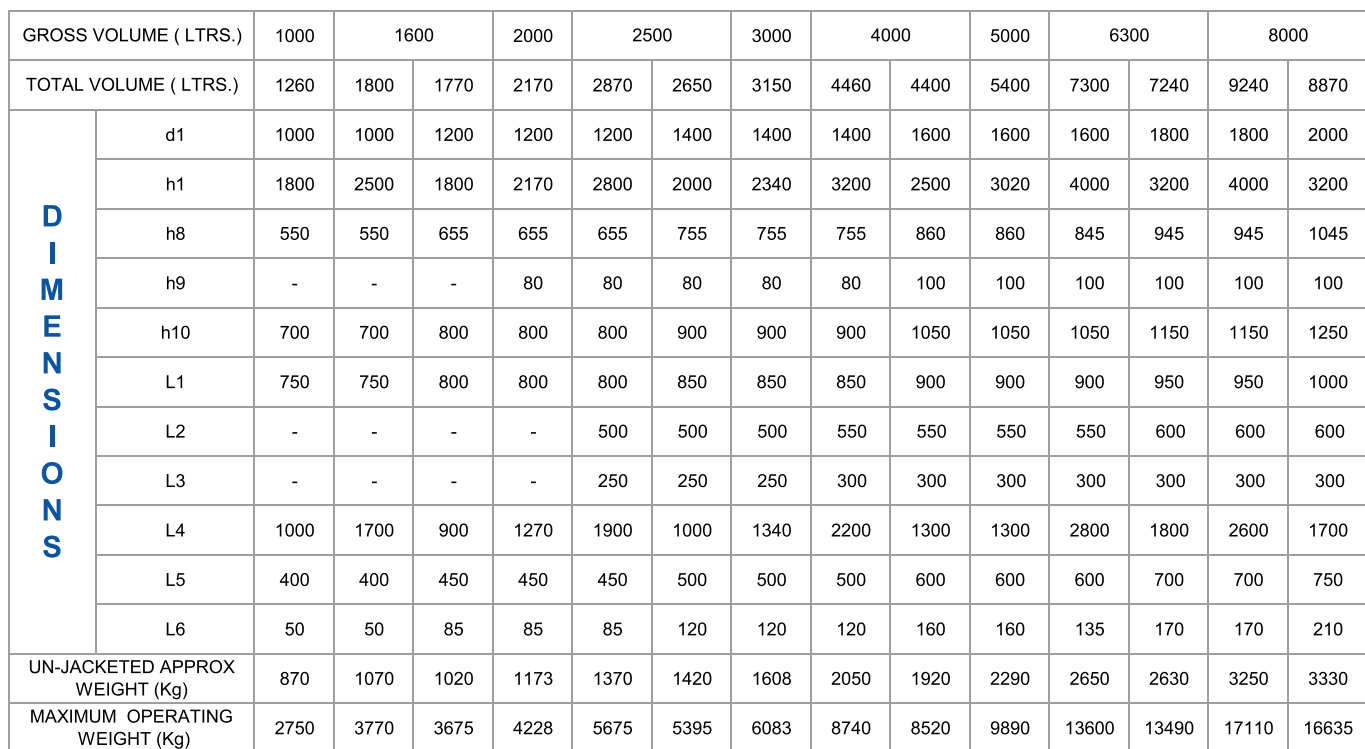
DIMENSIONAL DETAILS

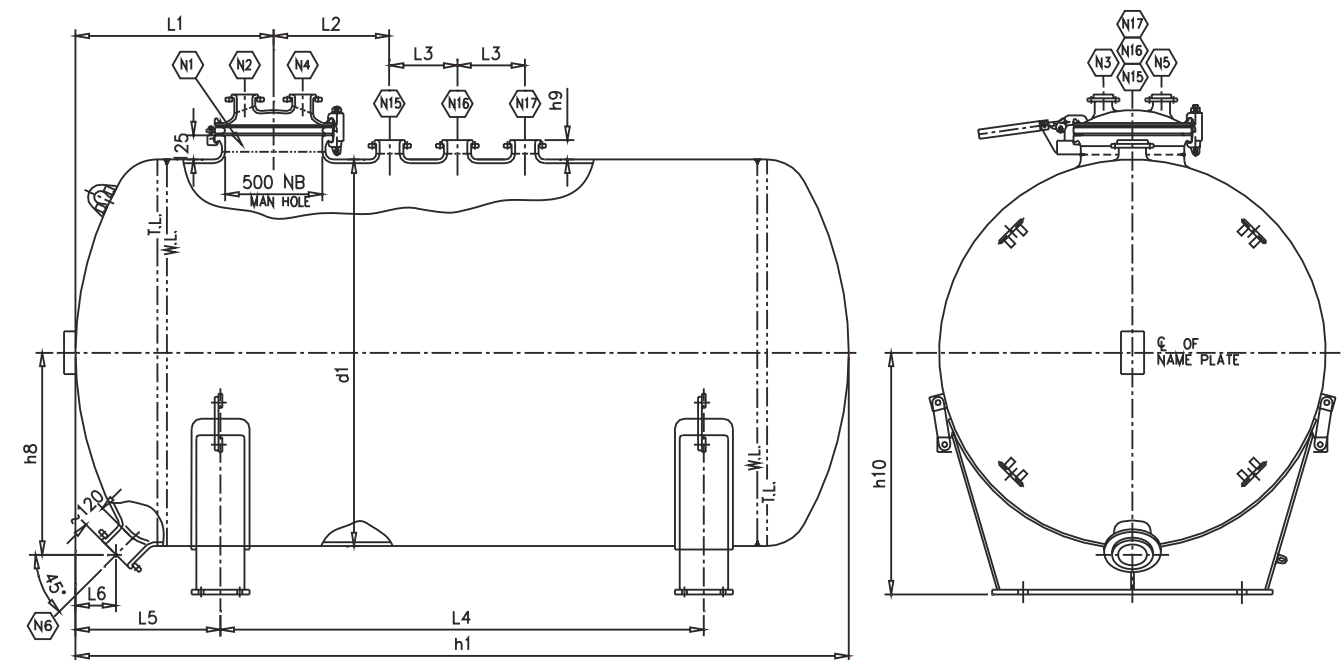
16000L TO 63000L UN-JACKETED
VERTICAL STORAGE VESSEL / RECEIVER (DIN 28019)



GROSS VOLUME (LTRS.)		16000		20000		25000			32000		40000	50000	63000
TOTAL VOLUME (LTRS.)		17315	18330	23180	21330	27020	27535	28050	35915	35625	45350	51800	65750
D I M E N S I O N S	d1	2200	2400	2400	2600	2600	2800	3000	2800	3000	3200	3400	3800
	d3	1600	1600	1600	1600	1600	2000	2000	2000	2000	2000	2000	2600
	h1	5000	4500	5600	4500	5600	5000	4500	6400	5600	6400	6500	6700
	h2	150	150	150	150	150	150	150	170	170	170	170	170
	e2	400	400	400	400	400	500	500	500	500	500	500	617
	e3	693	693	693	693	693	866	866	866	866	866	866	1126
UN-JACKETED APPROX WEIGHT (Kg)		5050	5050	6100	6250	7500	7700	8250	9450	9900	12300	19100	23500
GROSS VOLUME (LTRS.)		16000		20000		25000			32000		40000	50000	63000
N O Z Z L E S	N1	500	500	500	500	500	500	500	500	500	500	500	500
	N2	100	100	100	100	100	100	100	100	100	100	100	100
	N3, N5	50	50	50	50	50	50	50	50	50	50	50	50
	N4	80	80	80	80	80	80	80	80	80	80	80	80
	N6	150	150	150	150	150	150	150	150	150	150	150	150
	N7,N8 , N9	100	100	100	100	100	150	150	150	150	150	150	150

1000L TO 8000L UN-JACKETED HORIZONTAL STORAGE VESSEL / RECEIVER (DIN 28018)

[illegible]



GROSS VOLUME (LTRS.)		10000		12500		16000		20000		25000		32000		40000	50000	63000
TOTAL VOLUME (LTRS.)		10420	11310	14410	13620	17315	18330	23180	21330	27535	28050	35915	35625	45350	51800	65750
D I M E N S I O N S	d1	1800	2000	2000	2200	2200	2400	2400	2600	2800	3000	2800	3000	3200	3400	3800
	h1	4500	4000	5000	4000	5000	4500	5600	4500	5000	4500	6400	5600	6400	6500	6700
	h8	945	1045	1045	1150	1150	1250	1250	1350	1450	1550	1450	1550	1680	1786	1940
	h9	100	100	100	100	100	100	100	100	100	100	100	100	125	125	125
	h10	1150	1250	1250	1350	1350	1450	1450	1550	1650	1750	1650	1750	1850	2150	2300
	L1	950	1000	1050	1050	1050	1300	1300	1100	1200	1250	1200	1250	1400	1400	1632
	L2	600	600	600	600	600	600	600	600	600	600	600	600	650	800	800
	L3	300	300	300	300	300	300	300	300	350	350	350	350	450	600	600
	L4	3000	2500	3700	2700	3700	3100	4200	2900	3300	2700	4700	3800	4400	3900	3600
	L5	750	750	650	650	650	700	700	800	850	900	850	900	1000	1300	1550
	L6	170	210	210	245	245	280	280	320	360	395	360	395	488	480	525
UN-JACKETED APPROX WEIGHT (Kg)		3630	3680	3950	4200	5050	5050	6100	6250	7700	8250	9450	9900	12300	19100	23500
MAXIMUM OPERATING WEIGHT (Kg)		19260	20645	22565	24630	31020	32545	40870	38245	49000	50325	63325	63340	-	-	-
GROSS VOLUME (LTRS.)		10000		12500		16000		20000		25000		32000		40000	50000	63000
N O Z Z L E S	N3, N5	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
	N4	80	80	80	80	80	80	80	80	80	80	80	80	80	80	80
	N6	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150
	N15, N16	100	100	100	100	100	100	100	100	150	150	150	150	150	150	150
	N17	100	100	100	100	100	100	100	100	150	150	150	150	150	150	150



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**GLASS-LINED
HEAT EXCHANGERS**

TECHNICAL SPECIFICATIONS

Design Data		
Description	Main Vessel	Jacket
Design & Manufacturing Code	Generally as per ASME Sec. VIII Div. I	
Design Pressure	2 Kg/cm ² (g)/F.V.	4 Kg/cm ² (g)
Design Temperature	-25°C to 200°C	-25°C to 200°C
Maximum Allowable Working Pressure	2 Kg/cm ² (g)/F.V.	4 Kg/cm ² (g)
Minimum Design Metal Temperature	- 25°C	- 25°C
Hydro Test Pressure (After G.L.)	2 Kg/cm ² (g)	6 Kg/cm ² (g)
Corrosion Allowance (Wetted/Non-wetted/G.L.)	1.0/0/0 (mm)	1.0/0 (mm)
Heat Treatment	YES (During Glass-lining Process)	-
Radiography	SPOT (T+10%)	NIL

Material Specifications	
Plate for Shell & Formed Head	SA 516M GR. 380
Glass-lined Nozzles & Flanges	SA 836M
Split Flanges	SA 216M Gr. WCB
Jacket Nozzles	SA 105M
Gaskets for Main Flanges	Metal strip encapsulated by viton rubber covered by nitrile rubber With PTFE envelope
Gaskets for Nozzles	PTFE envelope CAF with SS corrugated ring insert
Clamping Studs	SA 193M Gr. B7
All Fasteners	IS 1367 Cl. 4/4.6

QUALITY ASSURANCE AND ACCEPTANCE CRITERIA

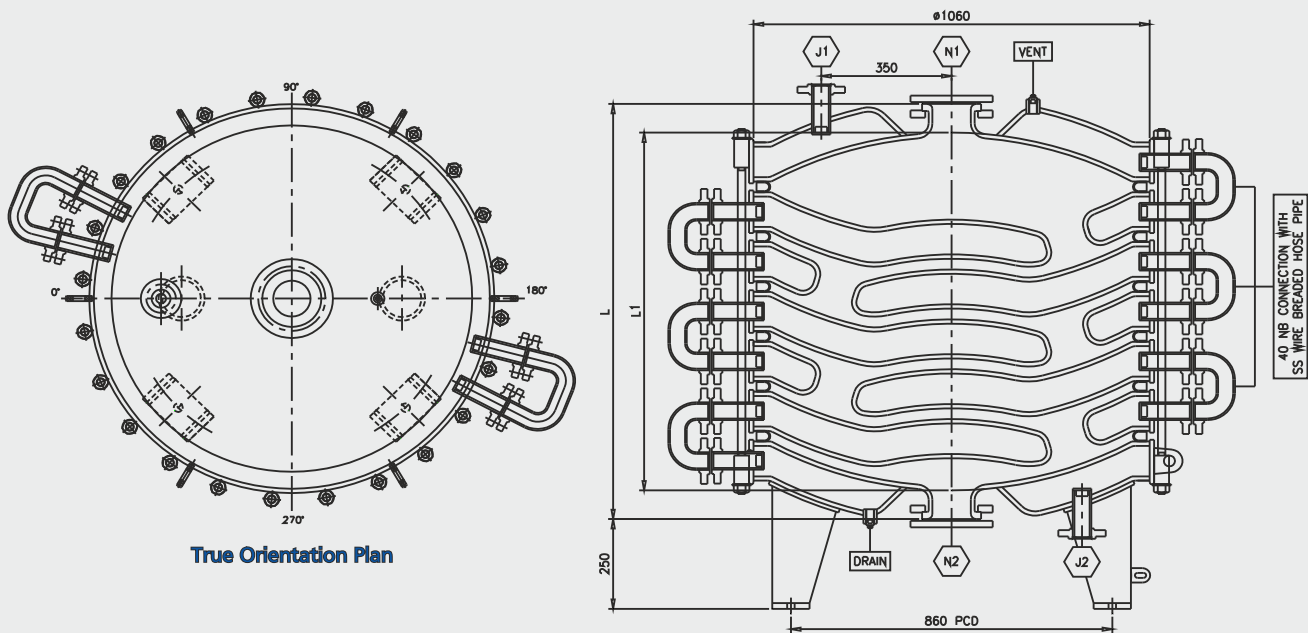
- 1
- Stagewise inspection conducted by internal Q.C. as per approved quality plan & final inspection by TPI or client .
- 2
- General tolerance as per DIN, SGEL (Doc. No : QMS : F : DES-008)
- 3
- Hydrostatic Test shall be carried out as per the approved Q.A. plan.
- 4
- Glass lining quality control according to DIN EN:28721-1

GENERAL NOTES

1 All dimensions are in mm unless otherwise specified.

2 The dimensions described herein are for guidelines only. We reserve the right to modify due to continuing innovations in technology.

GLASS-LINED HEAT EXCHANGERS



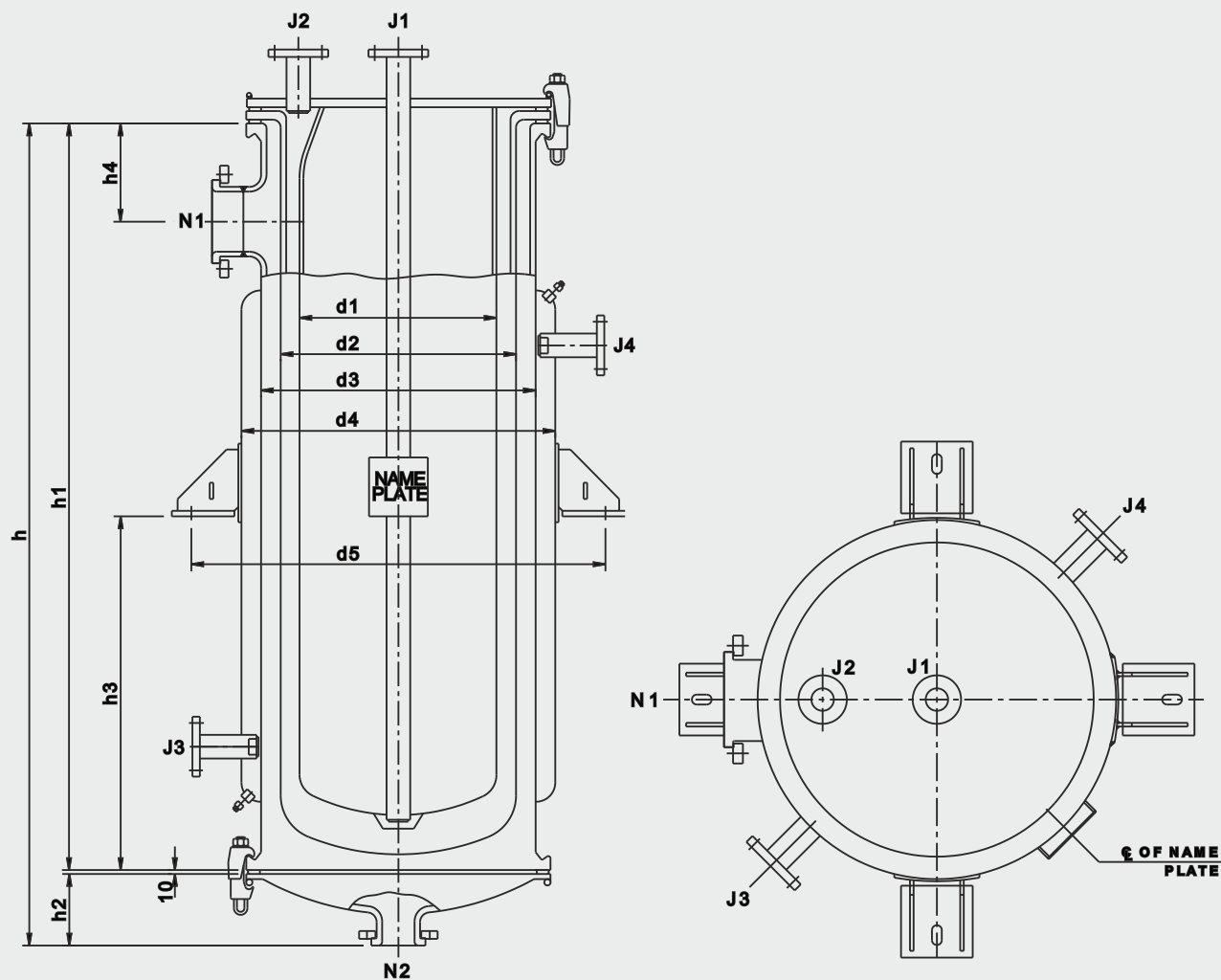
DIMENSIONAL DETAILS

Model No.	Unit	4 M ²	6 M ²	8 M ²	10 M ²
Full Volume in Main Vessel	M ³	0.159	0.181	0.203	0.225
Full Volume in Jacket	M ³	0.28	0.352	0.424	0.496
Heat Transfer Area	sq.mt	4.5	6	8	9.8
Dimensions	L	740	859	986	1119
	L1	556	690	818	951

NOZZLE DETAILS

Steam Inlet	N1	100	100	100	100
Condensate Outlet	N2	100	100	100	100
Jacket Outlet	J1	40	40	40	40
Jacket Inlet	J2	40	40	40	40
Jacket Vent	-	½" BSPT	½" BSPT	½" BSPT	½" BSPT
Jacket Drain	-	½" BSPT	½" BSPT	½" BSPT	½" BSPT

GLASS-LINED SHELL IN SHELL TYPE HEAT EXCHANGERS



DIMENSIONAL DETAILS

Area (sq. mtr.)	D I M E N S I O N S										N O Z Z L E S						Approx. Weight kg.
	d1	d2	d3	d4	d5	h1	h2	h3	h4	h	N1	N2	J1	J2	J3	J4	
2	219.1	323.8	406.4	508	670	1150	140	450	200	1450	80	50	25	25	25	25	550
4	400	500	600	700	956	1600	160	850	250	1925	100	50	25	25	25	25	1200
6	500	600	700	800	1055	1900	182	900	250	2285	150	80	40	40	40	40	1500
8	650	750	850	950	1230	2050	200	1050	275	2455	200	80	50	50	50	50	2200
10	650	750	850	950	1230	2450	200	1450	275	2855	200	80	50	50	50	50	2330
12	800	900	1000	1100	1380	2485	225	1300	325	2905	200	80	50	50	50	50	3190
14	900	1000	1100	1200	1480	2500	235	1300	325	3056	200	80	50	50	50	50	3950
16	1000	1100	1200	1300	1580	2700	265	1400	325	3295	250	80	50	50	50	50	4620
20	1100	1200	1300	1400	1680	3010	280	1600	375	3660	300	100	50	50	50	50	5650



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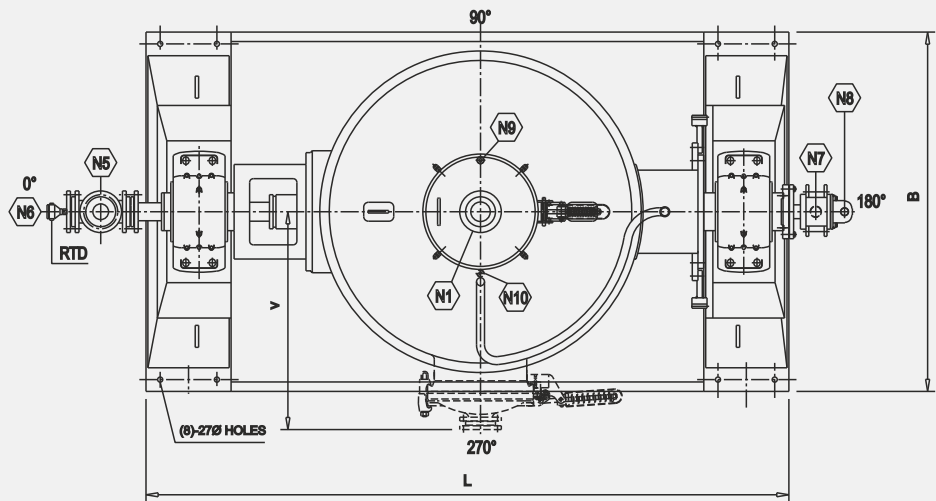
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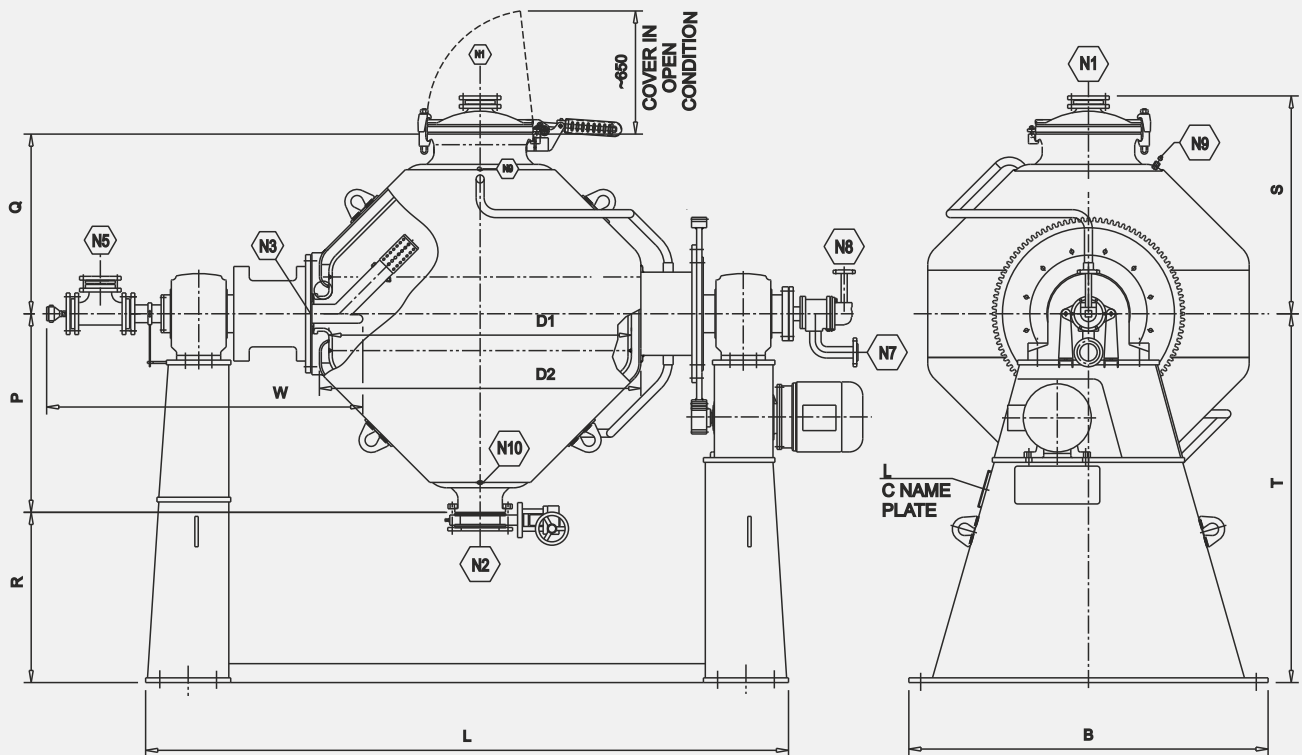


**GLASS LINED
ROTARY CONICAL VACUUM DRYERS (RCVD)**

GLASS-LINED ROTARY CONICAL VACUUM DRYERS (RCVD)



Top View



Elevation

Side View

DIMENSIONAL DETAILS

Model No.		RVD-150	RVD-250	RVD-500	RVD-1000	RVD-2000	RVD-3000	RVD-4500
Gross Volume	ltrs.	160	260	630	1180	2030	3400	4550
Working Volume [Ref. G.Note 3]	ltrs.	REFER GENERAL NOTE NO. 3						
Jacket Volume	ltrs.	56	68	90	230	325	425	644
Heating Surface Area	sq. mt.	1.3	1.84	3.2	5.6	7.8	9.5	13.3
D I M E N S I O N S	D1	600	728	1000	1300	1600	1800	2100
	D2	700	820	1100	1400	1700	1900	2200
	P	440	535	730	872	1050	1310	1350
	Q	440	535	650	770	950	1215	1275
	R	600	600	600	650	900	900	925
	S	583	622	870	998	1128	1264	1489
	T	1075	1135	1330	1522	1920	2110	2275
	V	550	641	830	970	1150	1310	1450
	W	1035	1123	1166	1420	1570	1845	1670
	B	955	1060	1350	1500	1900	1800	2430
	L	1805	1920	2450	2850	3400	4000	4100

NOZZLE DETAILS

Manhole	N1	250	250	400	450	450	450	500
Outlet	N2	250	250	200	200	200	250	250
Suction Nozzle	N3	50	80	125	150	150	150	200
Vacuum Line	N5	40	50	50	80	100	100	125
Temperature Probe Conn.	N6	40	50	50	80	100	100	125
Condensate Outlet	N7	32	32	32	40	40	40	40
Steam/Hot Water Inlet	N8	40	40	40	50	50	50	50
Vent	N9	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Drain	N10	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

OTHER DETAILS

Suction Pipe Size	od	40	50	60	80	100	100	125
Rotational Speed	rpm	6-10	6-10	6-10	6-10	5-12	5-10	2-7
Motor H.P.	hp	2	3	5	7.5	10	15	15
Approximate Wt.	kg	700	1600	1750	2800	4950	5600	6320

- GENERAL NOTES
- All dimensions are in mm unless otherwise specified.
 - The dimensions & weights described herein are for guidelines only. We reserve the right to modify due to continuing innovations in technology.
 - Working volume will be 50-60% of gross volume.
 - Electronic Speed Variator provided upon request.
 - Temperature sensing probe is provided in vacuum pipe assembly.
 - The perforated end of hastelloy vacuum pipe inside the dryer is covered by PP cloth (sieve size 5 microns) and clamped by PTFE clamps with hastelloy bolts and nuts.
 - Sealing at the vacuum pipe entry in the dryer is provided by single mechanical seal assembly.
 - Optionally glasswool insulation with SS cladding will be provided.

TECHNICAL SPECIFICATIONS

Design Data		
Description	Main Vessel	Jacket
Design & Manufacturing Code	Generally as per ASME Sec. VIII Div. I	
Design Pressure	2 kg/cm ² (g)/F.V	6 kg/cm ² (g)/F.V
Design Temperature	-25°C to 200°C	-25°C to 200°C
Maximum Allowable Working Pressure	2 kg/cm ² (g)/F.V	6 kg/cm ² (g)/F.V
Hydrotest Pressure (After G.L)	2 kg/cm ² (g)	6 kg/cm ² (g)
Corrosion Allowance [Wetted/ Non-wetted/G.L.]	1.5/0/0 (mm)	1.5/0 (mm)
Heat Treatment	Yes (During glass-lining process)	-
Radiography	Spot (T+10%)	NIL

Material Specification	
Plate for Shell & Conical Head	SA 516M GR. 380
Glass-lined Nozzles & Flanges	SA 836M CL 1 OR SA 181 CL 60
Vacuum Pipe	HASTELLOY - C
Driven Side Trunion	CS EQVT. IS 2062
Drive Side Trunion	CS EQVT. IS 2062
Filter Cloth	PP [5 microns]
Rotary Joint	ULNARQ model / RXRURSP-CL
Pad Plate for Mech. Seal Mounting	SA 836M CL 1 OR SA 181 CL 60
Base Plate for Pad Plate and Driven Side Trunion	CS EQVT. IS 2062
Flange for Jacket Nozzle	SA 105M
Sealing	Single dry mechanical seal
Bearing with Plummer Block	As per Mfg. Standard
Gasket for G.L. Nozzle	PTFE envelope CAF with SS corrugated ring insert
Gear Wheel & Pinion	IS 2707 C.S. GR.-1
Split Flanges	SA 516 GR380/415/485
C-clamp and J-clamp	SA 105M
Fasteners	IS 1367 CL. 4/4.6
Supports	MS EQVT. IS 2062
Glass-lining	GEL- 2200
Painting	Final coat of polyurethane paint

QUALITY ASSURANCE AND ACCEPTANCE CRITERIA

- 1
- Stage-wise inspection conducted by internal Q.C. as per approved quality plan & final inspection by TPI or client.
- 2
- General tolerance as per DIN SGEL (DOC. NO. QM5:F:DEZ:008), final dimensions may vary by ±15 mm, due to multiple heat treatment cycle for glass-lining proces.
- 3
- Hydrostatic Test & Vacuum Hold Test shall be carried out as per the approved Q.A. Plan.
- 4
- Glass lining quality control according to DIN EN:28721-1



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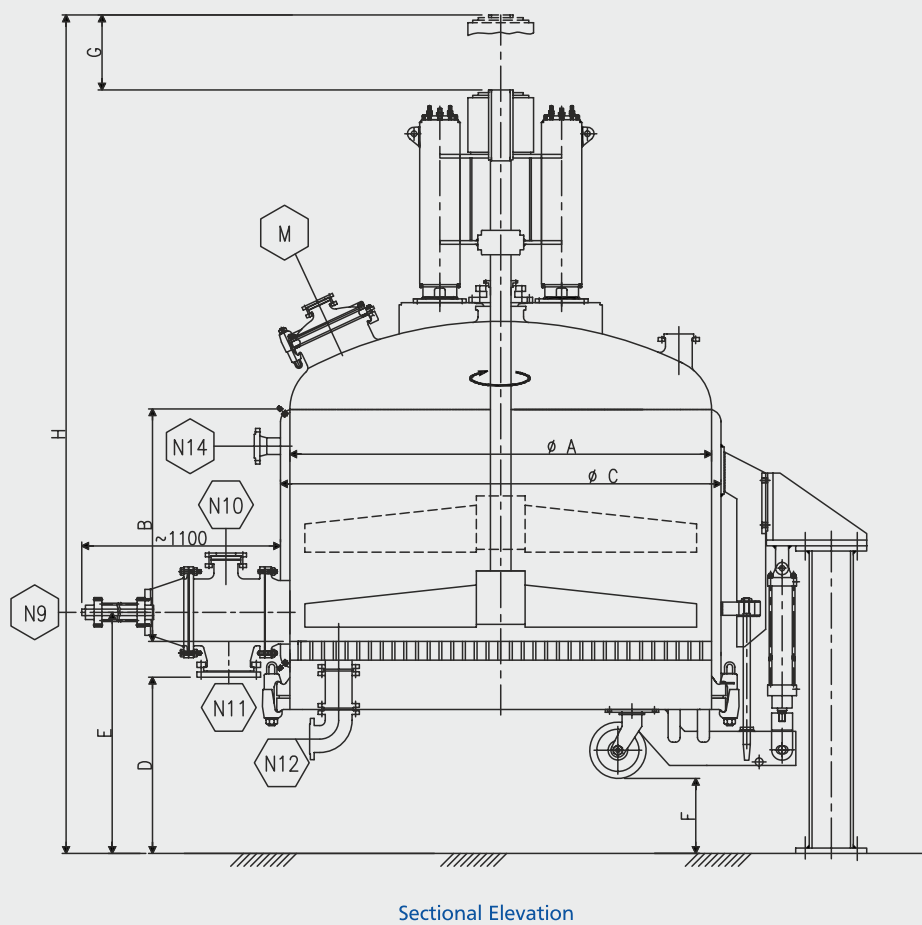
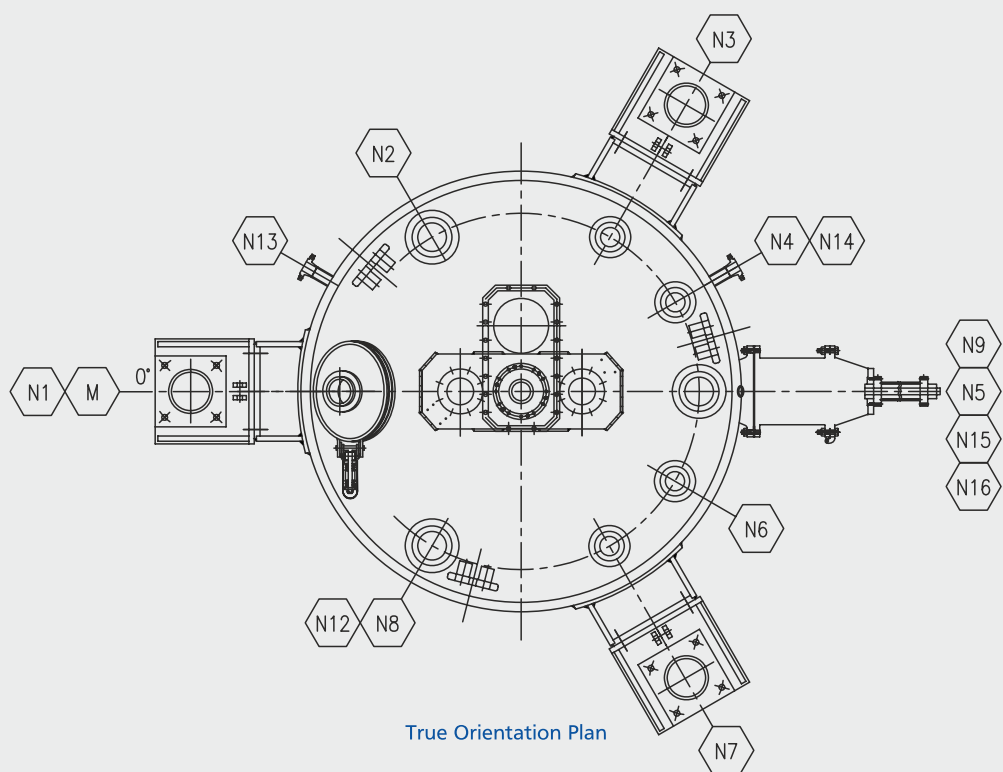
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**GLASS-LINED
AGITATED NUTSCHE FILTERS (ANFD)**



DIMENSIONAL DETAILS

Model No.		GNF500	GNF850	GNF1200	GNF1500	GNF2500	GNF3100	GNF3800	GNF4500
Working Volume	Ltrs.	450	800	1100	1400	2400	2800	3600	4300
Jacket Volume	Ltrs.	75	105	116	185	215	220	245	289
Jacket Heating Surface Area	Sq. M	1.9	2.7	2.9	4.5	5.5	7.5	7.8	8.2
Filter Area	Sq. M	0.75	1.1	1.4	2	2.5	3.1	3.6	4.3
Max. Cake Volume	Ltrs.	200	400	550	700	1000	1400	1700	2000
D I M E N S I O N S	A	1000	1200	1400	1600	1800	2000	2200	2400
	B	650	750	750	750	1000	1000	1000	1000
	C	1100	1300	1500	1700	1900	2100	2300	2500
	D	800	800	800	800	800	900	900	900
	E	1100	1100	1100	1100	1100	1200	1200	1200
	F	350	350	350	350	350	400	400	400
	G	400	400	400	400	400	450	450	450
	H	3250	3350	3450	3550	4100	4300	4500	4700
Motor Power	HP	5	7.5	7.5	10	10	15	15/20	15/20
RPM		22	22	22	20	13	13	13	13

NOZZLE DETAILS

Agitator Nozzle	M	200	200	200	200	200	250	250	250
Manhole/Hanhole	N1	150	250	250	350 x 450	350 x 450	350 x 450	350 x 450	350 x 450
Process	N2	100	100	100	100	100	100	100	100
Process	N3	80	80	100	100	100	100	100	100
Process	N4	80	80	80	100	100	100	100	100
Process	N5	–	–	80	100	100	100	100	100
Process	N6	–	–	80	100	100	100	100	100
Process	N7	–	–	100	100	100	100	100	100
Process	N8	–	–	–	–	–	150	150	150
Discharge	N9	300	300	300	300	300	350	350	350
View Glass	N10	100	100	100	100	100	100	100	100
Outlet	N11	200	200	200	200	200	200	200	200
Liquid Out	N12	50	50	50	80	80	100	100	100
Jacket Inlet	N13	50	50	50	50	50	50	50	50
Jacket Outlet	N14	50	50	50	50	50	50	50	50
Vent	N15	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"
Drain	N16	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"	1/2"

GENERAL NOTES

- 1 All dimensions are in mm unless otherwise specified.
2 The dimensions described herein are for guidelines only. We reserve the right to modify due to continuing innovations in technology.

TECHNICAL SPECIFICATIONS

Design Data

Description	Main Vessel	Jacket	
Design Code	Generally As per ASME Sec VIII Div. I		
Desing Pressure for Shell	Kg/cm ²	3/F.V	6/F.V
Design Pressure for Jacket	Kg/cm ²	3	6
Design Temperature	°C	0 to 150 ^o	0 to 150 ^o
Agitator up/down Stroke	mm	~350 to 400	
Agitator Ratational Speed	RPM	7 to 9	
Motor Power	HP	20	

Material Specifications

Innver Vessel	CS (SA 516 GR. 380) + Glasslined
Jacket	CS (SA 516 GR. 380)
Filter Base along with Jacketed	SS/CS + Hastelloy-C Cladding
Filter Plate	100% PTFE
Filter Cloth	Polypropylene [10 Microns]
Agitator Shaft	SS/CS + Hastelloy-C Bellow
Agitator Blade	SS/CS + Hastelloy-C Cladded
Supports and Structure	MS Equivalent to IS 2062
O-rings	Neoprene Rubber
Side Discharge Valve	CS+Tefzel/PFA/FEP Coating or Hastelloy C
All External Fastners	IS 1367 CL 4/4.6
All Internall Fastners	Hastelloy
Insulation and Cladding (Optional)	50 mm Thick Rock Wool + 3 mm Thick SS Cladding
External Surface Preparation	Steel Shot Blasting Base coat of Epoxy Read oxide primer for Exposed Carbon steel Top coat of PU light gray paint. S.S. External Surface shall be 180 to 220 grit mirror finish

QUALITY ASSURANCE AND ACCEPTANCE CRITERIA

- 1
- Stage-wise inspection conducted by internal Q.C. as per approved quality plan & final inspection by TPI or Client.
- 2
- General tolerance as per DIN SGEL (Doc. No. : QMS:F:DES:008), final dimensions may vary by ± 15 mm, due to multiple heat treatment cycle for glass-lining process.
- 3
- Hydrostatic test shall be carried out as per the approved Q.A. Plan.
- 4
- Glass-lining quality control according to DIN EN 28721-1

SCOPE OF SUPPLY

- 1 Main Vessel in Two Piece Construction
- 2 Detachable Filter Base
 - a PTFE Perforated Filter Plate
 - b PP Filter Cloth (10 micron)
 - c Nylon Castor Wheel for Mobility
 - d Detachable Filter Base
- 3 S - Type Agitator in Single Piece Construction with or without Heating Arrangement
- 4 Side Discharge Valve
- 5 Drive System including:
 - a Mechanical seal stuffing Box for Agitator Shaft sealing
 - b Hollow Shaft Helical Gearbox for Agitator
 - c Two Pillar Drive Unit
- 6 Hydraulic System for the following:
 - a Filter base raising and lowering
 - b Agitator Up & Down
 - c Side Discharge Valve Opening & Closing
- 7 Optional PTFE Spray Ball (Make Lechler)
- 8 Flame Proof Control Panel includes following functions:
 - a Main Supply On/Off
 - b Agitator Motor Power On/Off
 - c Hyd. Power Pack Motor On/Off
 - d Agitator Up/Down
 - e Bottom Cover Up/Down
 - f Valve Open/Close
 - g Agitator Reverse/Forward
 - h Volt Meter
 - i RPM Meter
 - j RPM Pot (Regulator)
 - k R. Y. B. (V.S.S.)
- 9 Documentation
 - a As Built Drawing
 - b Electrical Wiring Diagram for Control Panel
 - c PQ/DQ
 - d Maintenance and Operational Manual

SAFETY FEATURES

- 1 Hydraulic & Mechanical lock for Side Discharge Valve
- 2 Pressure Relief Valve for Hydraulic Power Pack
- 3 Limit Switch Agitator Vertical Travel



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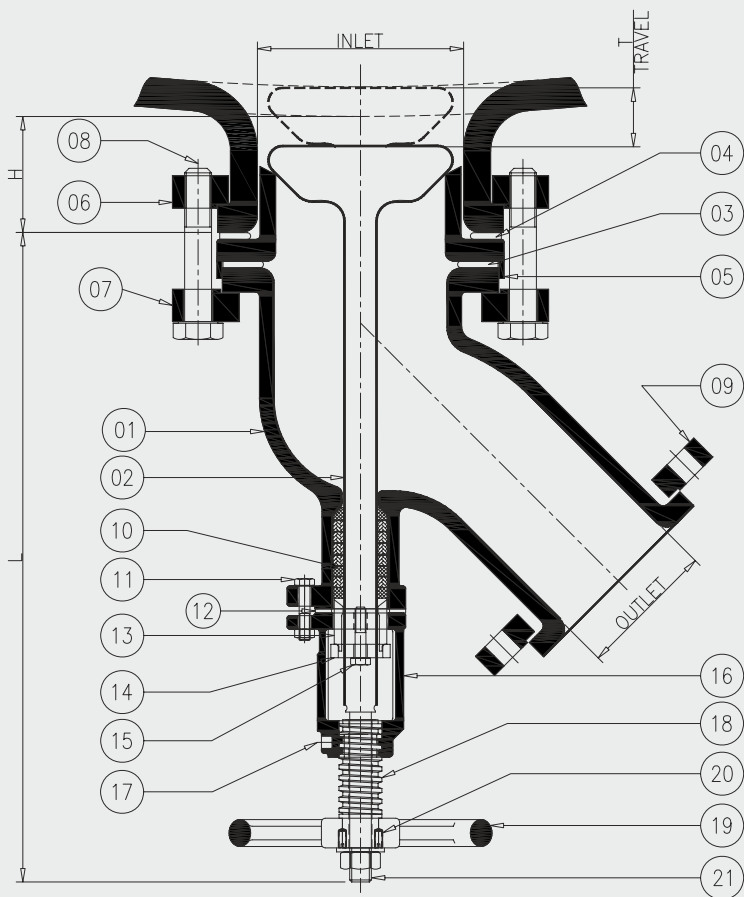
Catalogue No. : 2015/001

GLASCOAT



**GLASS-LINED
VALVES & FITTINGS**

G.I. FLUSH BOTTOM OUTLET VALVE



1 G.I. Valve Body

2 G.I. Spindle

3 PTFE Envelope Gasket

4 PTFE Envelope Gasket

5 Valve Seat

6 Split Flange on Vessel Nozzle

7 Split Flange on Valve Body

8 Bolt

9 Split Flange on Valve Body

10 Gland

11 Bolt with Nut

12 Gasket

13 Packing Sleeve

14 Packing Sleeve Flange (Pusher)

15 Bolt For Gland Plsher

16 Valve Bonnet

17 Greese Nipple

18 Screw

19 Hand Wheel

20 Gub Screw

21 Lock Nut

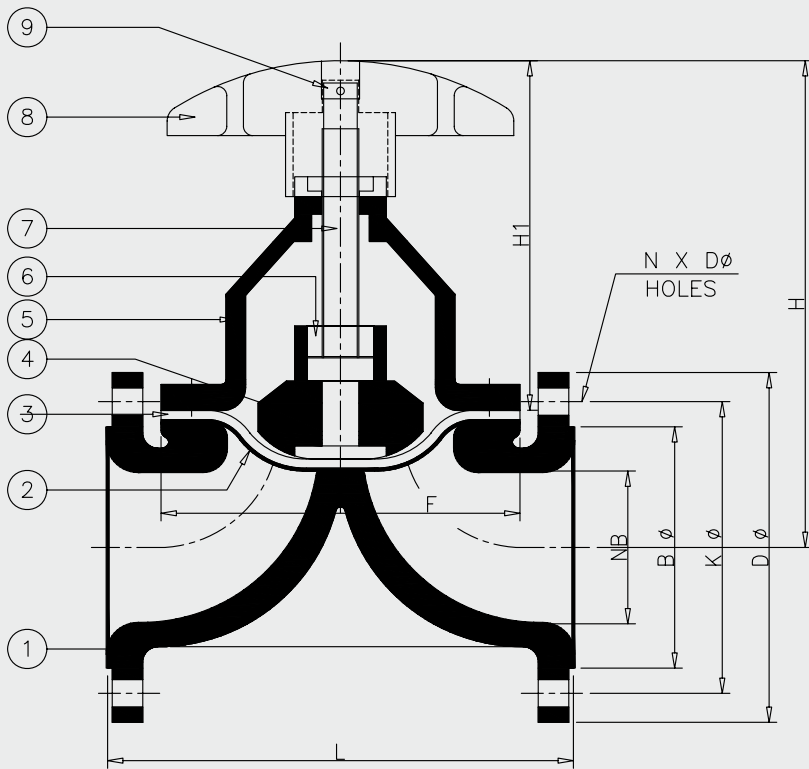
DIMENSIONAL DETAILS

Valve Size (mm.)	Inlet Size	Outlet Size	H	L	T
80 / 50	80	50	70	406	38
100 / 80	100	80	80	427	43
150 / 100	150	100	86	482	43

NOTE

1. All dimensions are in mm unless otherwise specified.
2. Operating temp -25°C to 200°C and operation pressure -1 to +6 kg/cm² g.
3. Hydrostatic Test 6 kg/cm² g.
4. Glass-lining Thickness: 1.0 to 2.0 mm.
5. Glass type: gel 2200.
6. Spark test: Internal 10 KV and External 05 KV.
7. Optional features: • Pnuematically Operated Actuated Valve • Tantalum Tip with RTD Sensor • SS Glass-lined Valve.

G.L. DIAPHRAGM VALVE



- | | | |
|----------------------|----------|----------------------|
| 1 G.L. Valve Body | 4 Piston | 7 Spindle |
| 2 Pin Type Diaphragm | 5 Bonnet | 8 Handwheel |
| 3 Cushioning Pad | 6 Nut | 9 Pin for Hand Wheel |

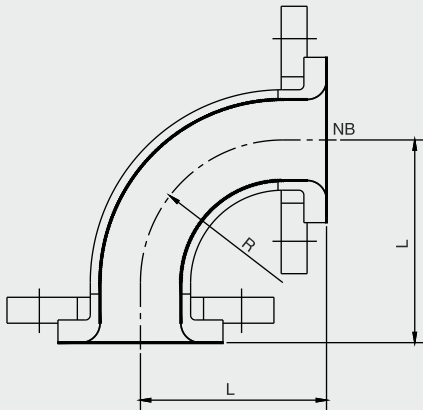
DIMENSIONAL DETAILS

NB	D Ø		K Ø		B Ø		N x DØ		F	L	H1	H
mm	PN-10	ASA-150	PN-10	ASA-150	PN-10	ASA-150	PN-10	ASA-150				
25	115	108	85	79.5	-	-	4 x 14	4 x 15	74 x 78	127	-	105
40	150	127	110	98.5	88	80	4 x 18	4 x 15	96 x 100	159	95	140
50	165	152	125	121	100	100	4 x 18	4 x 19	108 x 125	191	135	171
80	200	191	160	152	138	130	8 x 18	4 x 19	184 x 156	254	189	238
100	220	229	180	191	158	158	8 x 18	8 x 19	230 Ø	305	228	318
150	285	279	240	241	212	212	8 x 23	8 x 23	310 Ø	406	270	357

NOTE

1. All Dimensions are in mm unless specified.
2. Design Pressure: 6 kg/cm².
3. Design Temperature: -25°C to 200°C.
4. Flange dimension & drilling as per ANSI 150 B, 16.5.
5. Testing: • Spark Test Internal: 10,000 V • External: 5,000 V
6. Hydro Test at 6 kg/cm².
7. Glass-lining Thickness: 1.0 To 2.2 mm.

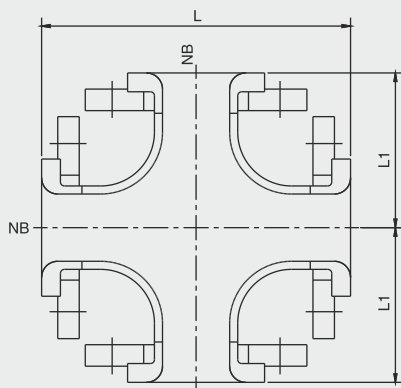
FLANGED ELBOWS 90°



NB	mm	25	32	40	50	65	80	100	125	150	200	250	300	400	500
	inch	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	16"	20"
L		90	100	105	115	120	135	155	175	195	260	315	350	450	550
R		63	73	78	88	95	115	101	127	152	203	255	305	406	508



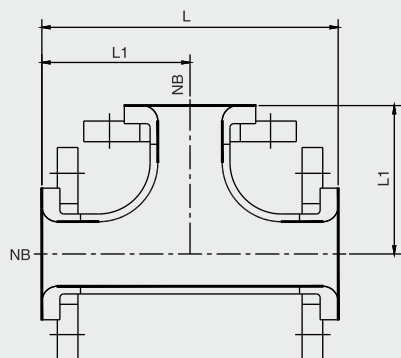
FLANGED CROSSES



NB	mm	25	32	40	50	65	80	100	125	150	200	250	300	400	500
	inch	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	16"	20"
L		180	200	210	230	240	270	310	350	390	520	630	700	900	1100
L1		90	100	105	115	120	135	155	175	195	260	315	350	450	550



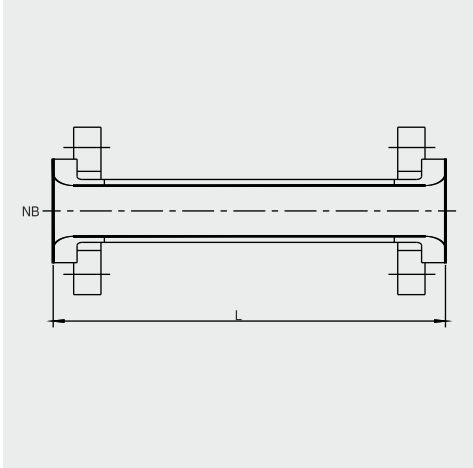
FLANGED T - PIECES



NB	mm	25	32	40	50	65	80	100	125	150	200	250	300	400	500
	inch	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	16"	20"
L		180	200	210	230	240	270	310	350	390	520	630	700	900	1100
L1		90	100	105	115	120	135	155	175	195	260	315	350	450	550



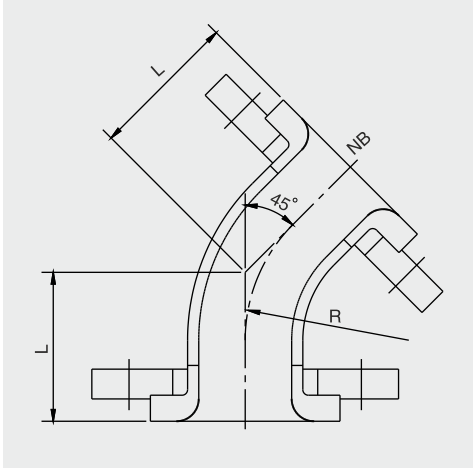
FLANGED PIPES



NB	mm	25	32	40	50	65	80	100	125	150	200	250	300	400	500
	inch	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	16"	20"
L		100-500	100-500	100-500	100-500	100-500	100-750	100-1000	150-1000	150-1250	150-1250	150-1250	150-1500	150-1500	150-2000



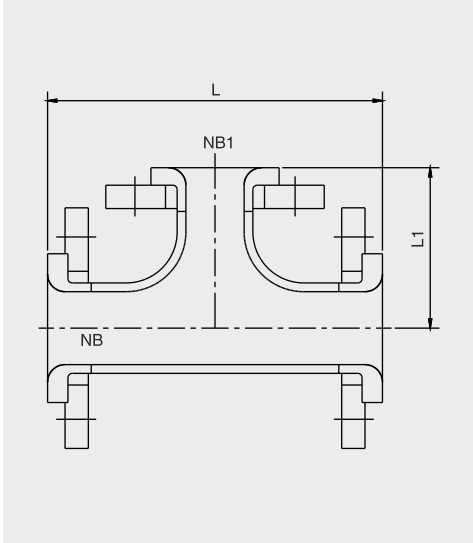
FLANGED ELBOWS 45°



NB	mm	25	32	40	50	65	80	100	125	150	200	250	300	400	500
	inch	1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	12"	16"	20"
L		60	65	70	80	85	95	105	125	150	180	220	260	300	360
R		63	73	78	88	95	115	152	190	228	305	381	457	610	762

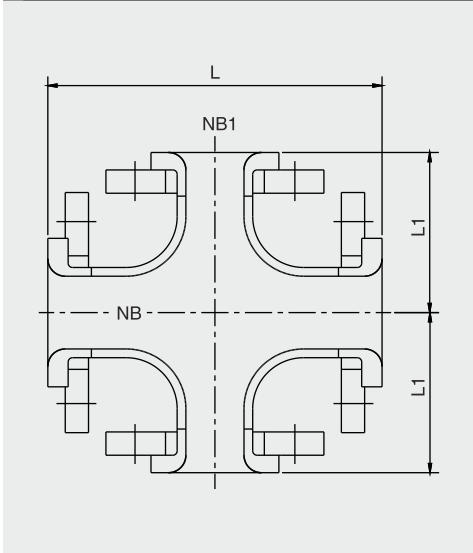


FLANGED T - PIECES WITH REDUCED CONNECTION



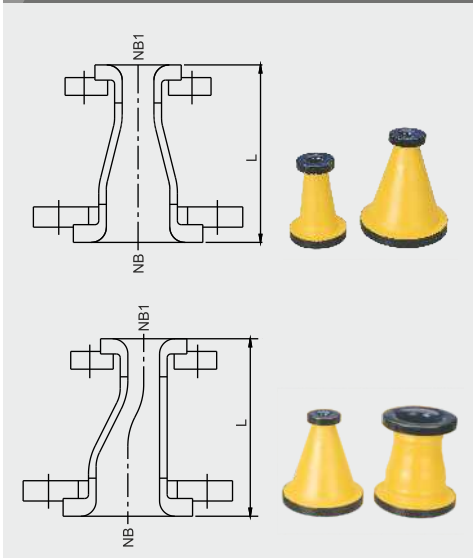
NB		L	NB1	25	32	40	50	65	80	100	125	150	200	250
mm	inch			1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"
32	1 ¼"	200	↑	95										
40	1 ½"	210		95	100									
50	2"	230		100	105	110								
65	2 ½"	240		105	110	115	120							
80	3"	270	↑	115	120	125	130	135						
100	4"	310		125	130	135	140	145	150					
125	5"	350		140	145	150	155	160	165	170				
150	6"	390		155	160	165	170	175	180	185	190			
200	8"	520	↑	185	190	195	200	205	210	215	220	225		
250	10"	630		230	235	240	245	250	255	260	265	270	275	
300	12"	700		220	225	230	235	240	245	255	260	270	310	330
400	16"	900		270	275	280	285	290	295	305	310	320	360	380
500	20"	1100	↓	320	325	330	335	340	345	355	360	370	410	430

FLANGED CROSSES WITH REDUCED CONNECTION

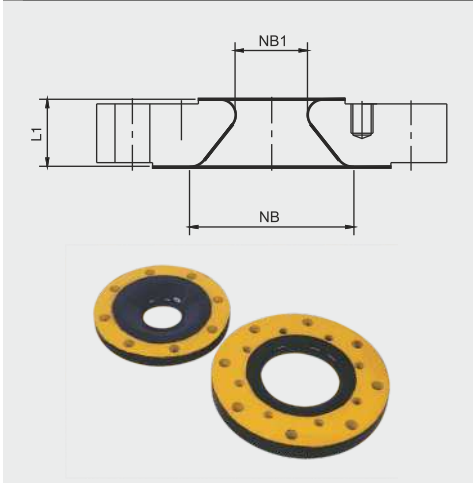


NB			NB1	25	32	40	50	65	80	100	125	150	200	250	
mm	inch	L		1"	1 ¼"	1 ½"	2"	2 ½"	3"	4"	5"	6"	8"	10"	
32	1 ¼"	200		95											
40	1 ½"	210		95	100										
50	2"	230		100	105	110									
65	2 ½"	240		105	110	115	120								
80	3"	270		115	120	125	130	135							
100	4"	310	L1	125	130	135	140	145	150						
125	5"	350		140	145	150	155	160	165	170					
150	6"	390		155	160	165	170	175	180	185	190				
200	8"	520		185	190	195	200	205	210	215	220	225			
250	10"	630			230	235	240	245	250	255	260	265	270	275	
300	12"	700		220	225	230	235	240	245	255	260	270	310	330	
400	16"	900		270	275	280	285	290	295	305	310	320	360	380	
500	20"	1100			320	325	330	335	340	345	355	360	370	410	430

REDUCER

[illegible]

REDUCING FLANGES

[illegible]



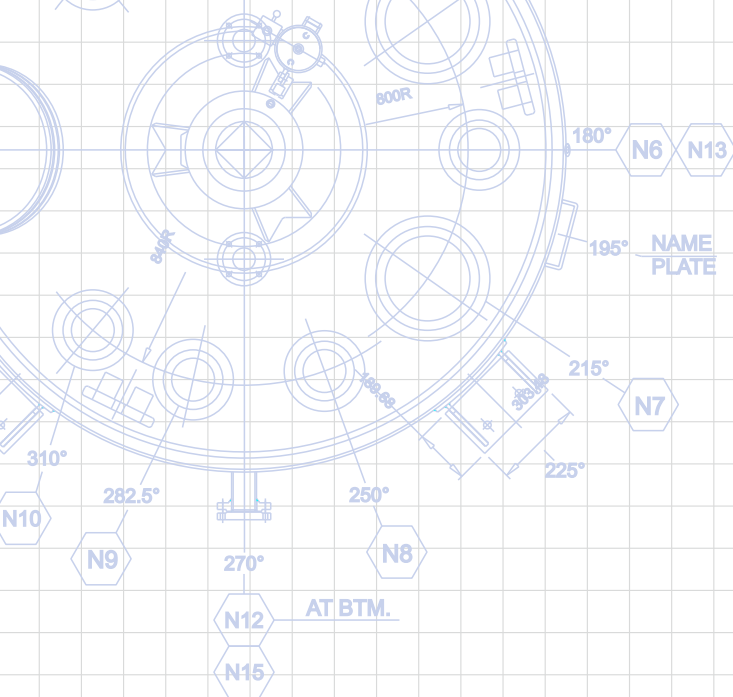
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Vitthal Udyognagar,
Anand - 388 121
India

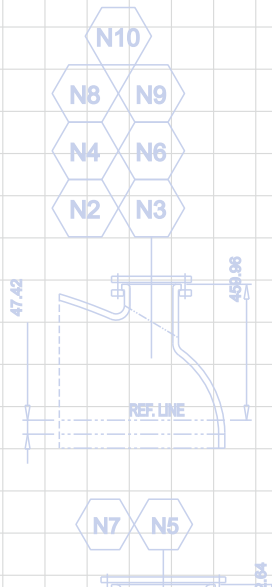
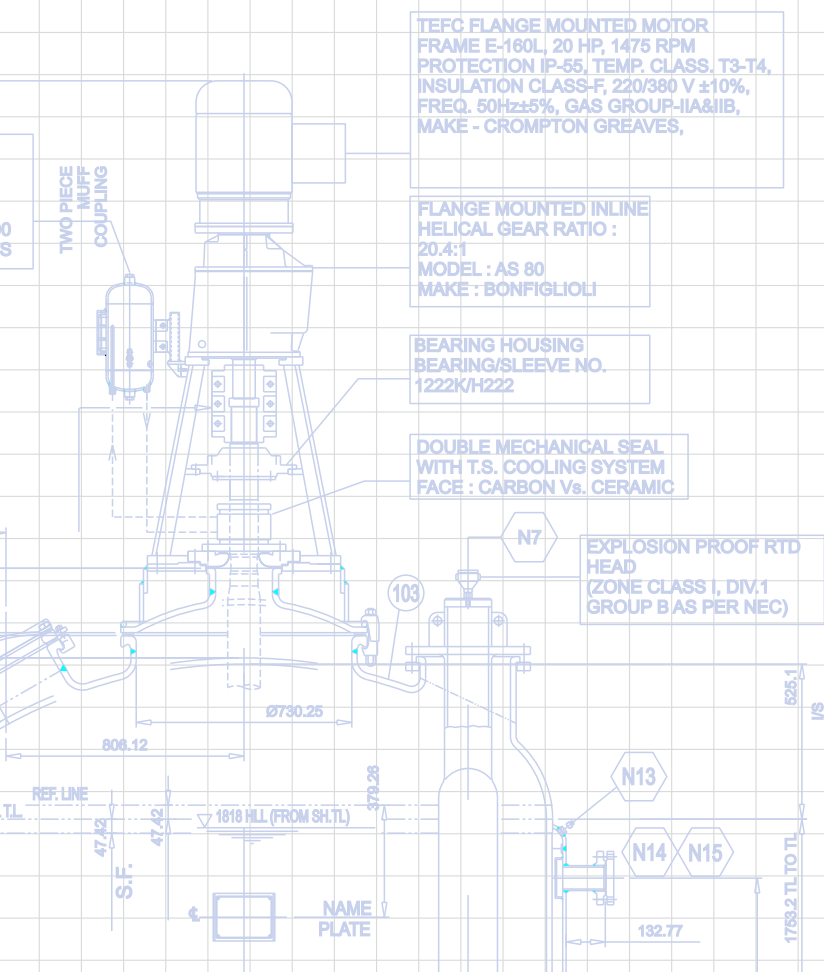
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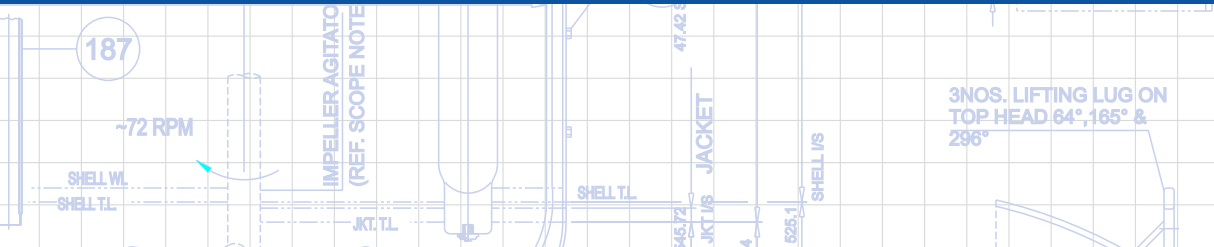
Catalogue No. : 2015/001



UTRUE ORIENTATION PLAN



TECHNICAL SPECIFICATIONS



SCOPE OF MANUFACTURING

1	M.S. Glass-lined Reaction Vessels	63 ltrs. to 50,000 ltrs.
2	M.S. Glass-lined Storage Tanks	63 ltrs to 63,000 ltrs.
3	Distillation Columns & Towers	150-2500 mm. Diameter.
4	M.S. Glass-lined Filtration Vessels	0.75 to 4.5 square meter.
5	M.S. Glass-lined Heat Exchanger	
	• Shell in Shell Type	2 to 40 m ²
	• Plate Type	3 to 14 m ²
6	M.S. Glass-lined Conical Vacuum Dryers	150 ltrs to 4500 ltrs.
7	M.S. Glass-lined Agitating Systems	Turbine, Anchor, Pitch Blade, Axial Propeller, Hydrofoil etc.
8	M.S. Glass-lined Valves	Diaphragm and Flush Bottom Outlet Valves with or without Pneumatic Actuator.
9	M.S. Glass-lined Pipes and Fittings	Flanged Elbows, Crosses, T-Pieces, Reducing Flanges, Reducers etc.

CODES AND STANDARDS

Glass-lined equipment are manufactured to the highest quality standards of workmanship and material. The reactors are generally as per DIN 28136 standards and manufactured in accordance with ASME code for unfired pressure vessels, section VIII division I. All clamps and flanges comply with ANSI/ DIN standard. Equipment are also specially designed and constructed to the client's own specifications.

DESIGN DATA

Description	Inner Vessel	Jacket
Design Pressure	6 kg/cm ² /F.V	6 kg/cm ²
Design Temperature	-25°C to 200°C	-25°C to 200°C
Allowable Operating Pressure	6 kg/cm ² /F.V	6 kg/cm ²
Final Hydrostatic Test	6 kg/cm ²	6 kg/cm ²
Radiography Shell / Head	Spot/Full	Nil/Full
Joint Efficiency	0.85/1.0	0.70/1
Corrosion Allowance	1.0/0.0/0.0	1.0/0.0/-

(wetted/not wetted/GL)

MATERIAL AND GRADES

1	Main Shell, Heads, Blind Flange, Manhole Covers & Center Opening Cover (COC)	Enamel quality steel A 516M GR. 380
2	Manhole (MH), Main Shell & COC Body Flange, Main Shell Nozzles, MH Protection Ring, Spindle	Enamel quality forging SA 836M Class I or SA 181M CI 60
3	Pad Plate, Agitator Connecting Head, Reducing Flange	Enamel quality forging SA 836M Class I / SA 181M CI 60
4	Agitator & Baffle Pipes	Enamel quality pipe SA 106 GR.B
5	Nozzle Backing Flange (Split Flange)	SA 516M GR. 380/415/485
6	'C' Clamp & 'J' Bolts	A 193M GR. B7/SA 194M GR. 2H or equivalent
7	Gasket	PTFE enveloped gasket CAF or Asbestos free with S.S. corrugated ring insert
8	Nozzle Bolt & Nuts	IS 1367 CL 4/4.6
9	Jacket Shell, Heads & Closer Ring	SA 516M GR. 380
10	Jacket Nozzle Necks	SA 106M GR.B
11	WNRF/SORF Flange for Jacket Nozzle	SA 105M
12	Drive Unit Components	Carbon steel equivalent to IS 2062 / CI IS 210 GR.150 or equivalent
13	Valves (Flush & Diaphragm Type)	IS 210 GR. 150 or equivalent
14	Fittings (Bend, Tee, Reducer etc.)	IS 210 GR.150 or SA 234M GR. WPB

ADDING SPIRIT TO THE SUBSTANCE

The history of fortifying storage or process equipment with one thing or the other, for different usages, is more than 100 years old. There use to be some specific ways to maintain the ease of process, stability of quality and momentum of function. Glass-lining is one of the best ways that aptly serves the purpose due to its insuperable characteristics and exclusive nature. Glass and steel together offer chemical inertness and absence of catalytic effect and contamination at higher operational temperature and pressure.

Basically, there are three applications where glass-lined equipment is used:

- 1 Those involving highly corrosive acids and bases;
- 2 High-purity process where cleanliness is important, for the ability to clean as well as to minimize the risk of metal contamination;
- 3 In polymerisation, to prevent polymers from sticking on vessels.

Glascoat offers a product range that leads on all fronts!

The Glascoat range consists of both ready-made (for standard requirement) and custom-built (for unique requirement) equipment and accessories of versatile nature. This includes an impressive array of Glass-lined Reactors, Process Tanks, Evaporation Vessels, Distillation Columns, Mixers and Agitators, Heat Exchangers, Dryers, Blenders, Agitated Filters, Pipes, Valves & Fittings and other paraphernalia.

Over the years Glascoat has developed various glass formulations to suit most demanding process requirements.

PRODUCT RANGE



GEL 2200 (BLUE GLASS)

This glass offers complete protection against corrosion across the entire pH range, with excellent resistance to radii spiraling, allowing easy and safe application on curved and complex surfaces. It also has unique combination of having higher impact, wear resistance with higher thermal conductivity.



GEL 2201 (LIGHT BLUE GLASS)

This glass formulation is a specially developed for pharmaceutical industry. Over and above the standard blue glass this has some outstanding features as under:

- Light blue colour to improve optical monitoring by increased contrast with process fluids.
- Excellent hydrophilic surface finish due to its siliceous ionic structure which also facilitates ease in inter-batch cleaning.
- Heavy metal free glass to keep up purity of active ingredients.
- Improved resistance to alkalis.



GEL 2202 (WHITE GLASS)

White glass specially developed for photochemical reactions for observing and monitoring changes in fluid colour during reactions.



GEL 2203 (GREEN GLASS)

A glass formulation that provides exceptional resistance to extraordinary high temperatures. Suitable for operating temperature up to 270°C

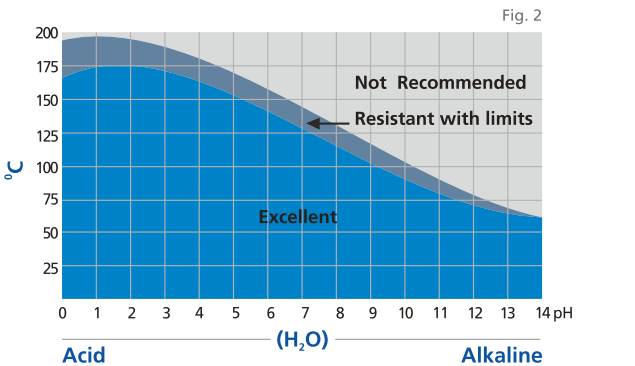
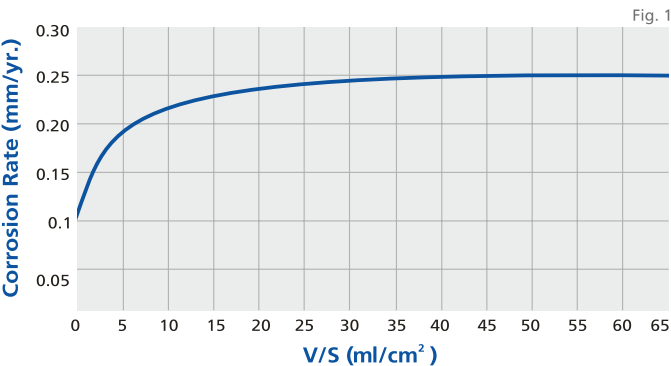
DIN - ISO TEST FOR GLASS SERIES

Table 1

STANDARD	LIQUID PHASE	VAPOUR PHASE
DIN - 51157/ISO 2743 Hydrochloric Acid	0.01 mm/year	0.04 mm/year
DIN - 51156/ISO 2745 Sodium Hydroxide	0.21 mm/year	--
DIN-51156/ISO 2744 Water	0.008 mm/year	0.013 mm/year
DIN - 51167	Temperature of Failure 260°C Statiflux surface cracks	--
Abrasion Porcelain Enamel Institute, Ohio U.S.A.	3.5 mg/min	--

EFFECT OF VOLUME TO SURFACE AREA RATIO (V/S) ON CORROSION RATE

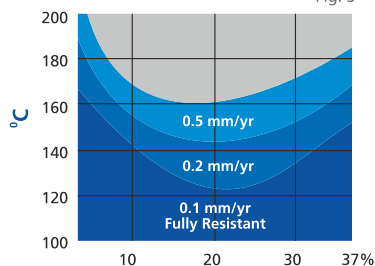
CORROSION RESISTANCE



ACIDS

HCl

Fig. 3

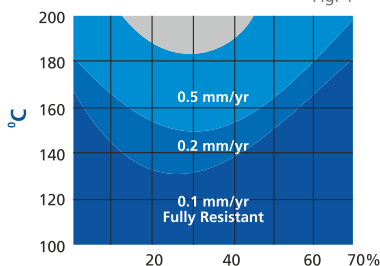


Hydrochloric Acid

Volume to surface Area Ratio (V/S)=20

HNO₃

Fig. 4

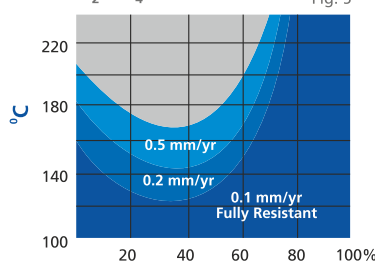


Nitric Acid

Volume to surface Area Ratio (V/S)=20

H₂SO₄

Fig. 5

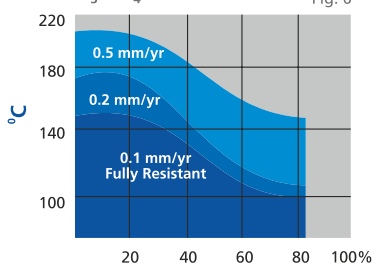


Sulfuric Acid

Volume to surface Area Ratio (V/S)=20

H₃PO₄

Fig. 6

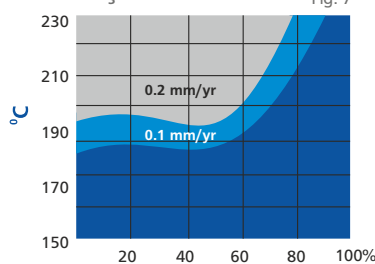


Phosphoric Acid

Volume to surface Area Ratio (V/S)=20

CH₃COOH

Fig. 7



Acetic Acid

% Weight by Volume

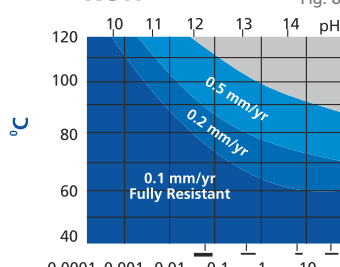
Glascoat's GEL Series of glass has excellent resistance to all acids - organic and inorganic, oxidizing and reducing. The iso-corrosion curves are established for most common acids. Reagent grade acids are used in laboratory test which are bases of these curves. In actual practice other factors such as velocity, phase type, chemical grade etc. can affect the corrosion rate.

Only hydrofluoric acid damages glass-lining at all concentrations. When phosphoric acid concentration is increased, it becomes more destructive. Maximum operating temperature is 95°C at highest concentration (85%).

BASES

KOH

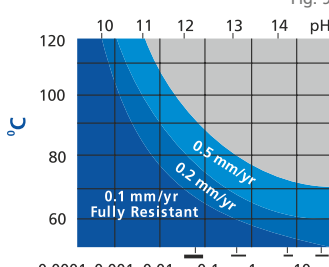
Fig. 8



Potassium Hydroxide

NaOH

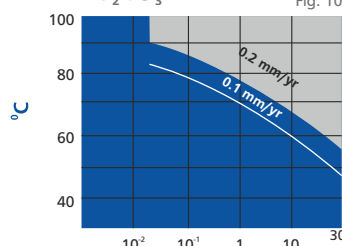
Fig. 9



Sodium Hydroxide

Na₂CO₃

Fig. 10

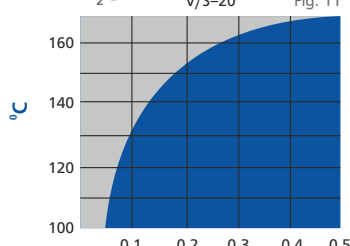


Sodium Carbonate

% Weight by Volume

H₂O

Fig. 11

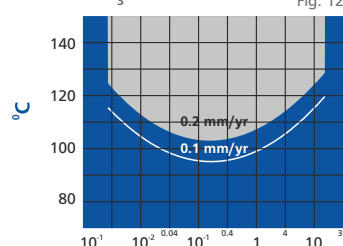


Water

Corrosion Ratio (mm/yr)

NH₃

Fig. 12



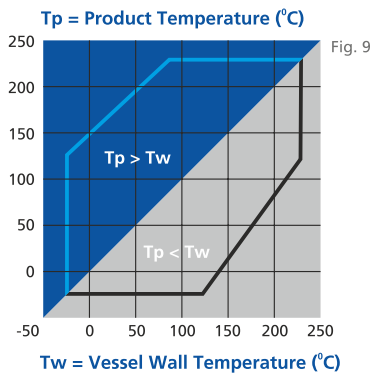
Ammonia

% Weight by Volume

Bases are more corrosive in nature than acids. As concentration & temperature increases rate of corrosion also increases.

An increase of 10°C doubles the chances of damage on glass-lining. Therefore, one needs to be cautious while using hot alkalies.

THERMAL SHOCK EXAMPLES



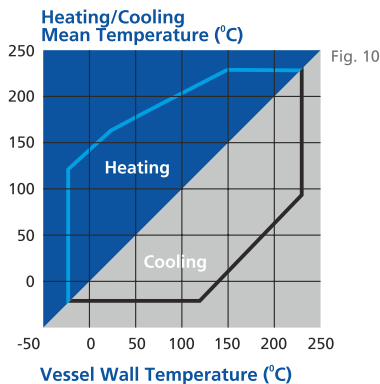
GLASS-LINED SIDE

When $T_p > T_w$

A vessel with a wall temperature of 0°C should not be filled with process fluid above the temperature of 148°C .

When $T_p < T_w$

A vessel with a wall temperature of 150°C should not be filled with process fluid below the temperature of 15°C .



JACKET SIDE

When Heating

Temperature of heating media should be below 190°C when process fluid is at 75°C .

When Cooling

Temperature of cooling media should not be below 60°C when temperature of process fluid is at 200°C .

THERMAL CONDUCTIVITY

Table 2

Steel allows the glass-lining to be kept relatively thin compared to self-supporting glass equipment. Thus, the low thermal conductivity of the glass is counter-balanced by the high heat transfer coefficient of the steel.

Due to the chemical bond between glass and steel, no inter-face heat transfer resistance needs to be taken into account.

Chart gives the values of overall heat transfer coefficient for various heating and cooling conditions.

OVERALL HEAT TRANSFER COEFFICIENT (U) $\text{W/m}^2\text{K}$

	Fluid in Jacket	Fluid in Vessel	U
Heating	Steam	Organic Liquid	345 ~ 469
		Aqueous Liquid	403 ~ 520
Condensing	Water	Organic Vapor	155 ~ 180
		Water Vapor	178 ~ 219
Cooling	Water	Organic Liquid	113 ~ 187
		Aqueous Liquid	123 ~ 178
	Brine	Aqueous Liquid	74 ~ 145

PHYSICAL CHARACTERISTICS

Thickness	1-2.2 mm
Specific Weight	2.5 g/cm ³
Tensile Strength	70 N/mm ²
Compressive Strength	800 N/mm ²
Hardness HV	700 kg/mm ² (5.5 Mohs Scale)
Coefficient of Thermal Conductivity	1.2 W/mK
Specific Heat	0.82 KJ/kg K
Electric Resistivity	10 ¹³ ohm-cm at ambient temperature
Dielectric Strength	20-30 kV/mm
Modulus of Elasticity	75000 N/mm ²
Elongation	0.1%
Abrasion	3.5 mg/min
Flexibility	Lined glass bends with the base metal until the latter reaches permanent deformation.
Chipping Tendency	None, under normal conditions.
Surface	Exceptionally smooth, hence easier to clean, excellent resistance to wear, impermeability to gases, prevents sticking and the growth of micro-flora. Biologically sterilisable easily.
Chemical Resistance	Highly resistant to almost all substances. Insensitive to the action of oxidizing or reducing agents. No catalytic effect. No product contamination. (i.e. colour, smell, taste, etc.).
Structural	Dielectric in nature, hence no electrochemical corrosion. It does not age as it is amorphous in structure and does not weather.

Corrosion Resistance of Glass-lining with chemicals at different temperatures

Agent	CONC.	°C	RESISTANCE
Acetic acid	-	-	See Fig. 7
Acrylic acid	-	150	A
Aluminum acetate	melt	200	A
Aluminum chlorate	a.s	110	A
Aluminum chloride	10%a.s.	bp	A
Aluminum potassium sulfate	50%a.s.	120	A
Aminoethanol	-	120	A
In-aminophenol	-	150	A
Aminophenol sulfuric acid	-	130	A
Ammonia	-	-	See Fig. 12
Ammonium-carbonate	a.s.	bp	A
Ammonium chloride	10%a.s.	150	A
Ammonium nitrate	a.s.	bp	A
Ammonium phosphate	a.s.	bp	A
Ammonium sulfate	a.s.	bp	A
Ammonium sulfate	a.s.	220	C
Ammonium sulfite	melt	80	A
Ammonium sulfide	a.s.	140	C
Aniline	100	180	A
Antimony (iii) chloride	a.s.	220	A
Antimony (v) chloride	100	150	A
Aqua regia	100	150	A
Barium hydroxide	a.s.	bp	B
Barium sulfate	a.s.	150	A
Benzaldehyde	100	150	A
Benzene	-	-	B
Benzole	-	200	A
Benzoic acid	-	150	A
Benzyl chloride	100	130	A
Boric acid	a.s.	150	A
Boron trifluoride ether complex bromine	-	-	B
Bromine	-	100	A
Butanol	100	140	A
Calcium chloride (free of cao)	a.s	150	A
Carbon dioxide (200mg/l)	a.s	150	A
Carbon dioxide	a.s	220	A
Carbon disulfide	100	200	A
Carbon tetrachloride	100	200	A
Chloride bleaching agent	a.s.	150	A
Chlorinated paraffin	-	180	A
Chlorine	vapor	200	A
Chlorine water	a.s.	180	A
Chlorosulfonic acid	100	150	A
Chlorpropionic acid	a.s.	175	A
Chromic acid	30%a.s.	100	A
Chormic acid	a.s.	150	A
Chromic sulfuric acid	a.s.	200	A
Citric acid	10%a.s.	bp	A
Cupric chloride	5%a.s.	150	A
Cupric nitrate	50%a.s.	100	A
Cupric sulfate	a.s.	150	A

Agent	CONC.	°C	RESISTANCE
Cyano acetic acid	a.s.	100	A
Cyanoacetamide	-	100	A
o-m-dichlorobenzene	100	200	A
dichloro-acetic acid	a.s.	150	A
dichloro-propionic acid	100	175	A
dichlorobenzol	-	220	A
diethylamine	100	100	A
diethylamino-propanol	100	150	A
diethyl ether	100	100	A
dimethylamino-propanol	100	150	A
dimethyl sulfate	100	150	A
ethyl acetate	100	200	A
ethyl alchol	100	200	A
ethylene diamine	98%a.s.	80	A
fatty acid diethanolamide	-	105	A
fatty acids	-	150	A
ferric chloride	10%a.s.	bp	A
ferric (II) Chloride	a.s.	150	A
ferric (III) Chloride	a.s.	150	A
floride in aqu. sol.	-	-	A
formic acid	98%a.s.	180	C
formaldehyde	-	150	A
furmaric acid	-	150	A
gallic acid	-	100	A
glutamic acid	-	40	A
glycerine	100	100	A
glycol	100	150	A
glycolic acid	57%a.s.	150	A
heptane	-	-	C
haxane	-	-	B
hydrazine hydrate	80%a.s.	90	A
hydrazine hydrate	40%a.s.	90	B
hydrazine sulfate	10%a.s.	50	A
hydrochloric acid	-	-	See Fig. 3
hydrogen peroxide	30%a.s.	70	A
hydrogen sulfide	a.s.	150	A
hydroiodic acid	20%a.s.	160	B
hydroiodic acid	60%a.s.	130	A
iodine	-	200	A
iron sulfate	a.s.	150	A
isoamyl alcohol	100	150	A
isopropyl alcohol	100	150	A
lactic acid	95%a.s.	bp	A
lead acetate	a.s.	220	A
lithium chloride	4%a.s.	80	B
lithium chloride	30%a.s.	bp	B
lithium hydroxide conc.	a.s.	60	A
lithium hydroxide conc.	a.s.	80	C
magnesium Carbonate	a.s.	100	A
magnesium chloride	30%a.s.	110	A
magnesium sulfate	a.s.	150	A

Corrosion resistance of Glass-lining with chemicals at different temperatures

Agent	CONC.	°C	RESISTANCE
Maleic acid	a.s.	150	A
Menthol	100	200	A
Methyl ester	-	150	A
Methyl 4-hydroxybenzoate	-	150	A
Monochloroacetic acid	a.s.	bp	A
Naphthtalene	melt	215	A
Napthalene sulfonic acid	a.s.	180	A
Notrogen ofides	a.s.	200	A
Nitrobenzene	100	150	A
Nitric acid	-		See Fig. 4
Octanol	100	140	A
O-hydroxy-benzoic acid	a.s.	150	A
Oleum	10%SO3	170	A
Ortho chloro benzoic acid	a.s.	220	A
Oxalic acid	50%a.s.	150	A
Palmitic acid	-	100	A
Perchloric acid	70%a.s.		A
Perfluoro cyclic ether, anhydrous	-	bp	B
Phenol	100		A
Phenolphthanlein	-	200	A
Phosphoric acid	-	100	See Fig. 6
Phosphoric ethyl ester	100	90	A
Phosphorous acid (f free)	a.s.	80	A
Phosphorous acid(f free)	a.s.	100	B
Phosphorous oxychloride(f free)	a.s.	110	A
Phosphorous trichloride (f free)	-	100	A
Phosphorous chloride(f free)	-	100	A
Phthalic anhydride	-	220	A
Picric acid	-	150	A
Poly phoesphoric acid	a.s.	140	A
Potassium bisulfate	melt	200	A
Potassium hydrogen sulphate	-	200	A
Potassium bromide	a.s.	bp	A
Potassium chloride	a.s.	bp	A
Potassium hydroxide	-		See Fig. 8
Potassium hypochloride	a.s.	70	A
Pyridine	100	bp	A
Pyridine chloride	-	150	A
Pyridine hydrochloride	-	150	A
Pyrogalllic acid	5%a.s.	bp	A
Pyrrolidine	100	90	A
Sodium bicarbonate	a.s.	bp	B

Agent	CONC.	°C	RESISTANCE
Sodium bicarboante, in	a.s.	95	A
Sodium biphosphate	50%a.s.	bp	A
Sodium bisulfate	a.s.	220	A
Sodium bisulfite	2%a.s.	150	A
Sodium carbonate	-	-	See Fig. 10
Sodium chlorate	a.s.	80	A
Sodium chloride	a.s.	bp	A
Sodium ethylate	-	bp	A
Sodium fluoride	-	-	C
Sodium glucamate	a.s.	150	A
Sodium hydroxide	-	-	See Fig. 9
Sodium hypochloride	a.s.	70	A
Sodium methylate	-	90	A
Sodium nitrate	a.s.	220	A
Sodium sulfate	4%a.s.	50	B
Sulphochrmic acid	-	200	A
Steatic acid	-	160	A
Succinic acid	a.s.	200	B
Sulfur	-	150	A
Sulfur dioxide	a.s.	200	A
Sulfuric acid	-	-	See Fig. 5
Tannic acid	a.s.	150	A
Tartaric acid	a.s.	140	A
Tetrachloroethylene	100	150	A
Tin chloride	a.s.	220	A
Toluene	-	-	B
Trichloro-acetic acid	a.s.	150	A
Triethylamine	30%a.s.	80	A
Triethylamine	a.s.	130	C
Triethylamine	25%a.s.	130	C
Triethylamine	50%a.s.	130	C
Trifluiracetic acid, anhdrous	-	-	C
Trimenthyl-amine	30%a.s.	80	A
Trisodium phosphate	50%a.s.	80	A
Trisodium phosphate	5%a.s.	bp	B
Vinylphosphoric acid (water free)	-	120	C
Urea	-	150	A
Water	-	-	See Fig. 11
O,m,p,xylenes	-	-	B
Zinc bromide	a.s.	bp	A
Zinc chloride	melt	330	A
Zinx chloride	a.s.	140	A

NOTES :

The table above exhibits the behaviour of the different types of Ingredient/Media. It shows the instant view of the properties of glass GEL-2200 series. The data are generated from our experience and laboratory test on glass GEL-2200 series. These will be treated as a guide only. For applications which are not displayed in the table, we strongly recommend to conduct corrosion tests before use.

LEGEND

Good Resistance	A
Contact Glascoat	B
Not Resistant	C
Aqueous solution	a.s.
Boiling point	bp

THE NATIONAL BOARD
OF
BOILER & PRESSURE VESSEL INSPECTORS

Certificate of Authorization



This is to certify that

SWISS GLASCOAT EQUIPMENTS LIMITED
H-106, GUJARAT INDUSTRIAL DEVELOPMENT
CORPORATION, VITTHAL UDYOGNAGAR
ANAND, GUJARAT, 388121
INDIA

*is authorized to use the "R" SYMBOL in accordance with the
provisions of the National Board.*

The scope of Authorization is limited as follows:

**METALLIC REPAIRS AND/OR ALTERATIONS AT THE
ABOVE LOCATION**

CERTIFICATE NUMBER: R-6823

ISSUE DATE: FEBRUARY 9, 2015

EXPIRATION DATE: FEBRUARY 3, 2018

Executive Director

A handwritten signature in black ink, likely belonging to the Executive Director.





CERTIFICATE OF AUTHORIZATION

The named company is authorized by the American Society of Mechanical Engineers (ASME) for the scope of activity shown below in accordance with the applicable rules of the ASME Boiler and Pressure Vessel Code. The use of the certification mark and the authority granted by this Certificate of Authorization are subject to the provisions of the agreement set forth in the application. Any construction stamped with this certification mark shall have been built strictly in accordance with the provisions of the ASME Boiler and Pressure Vessel Code.

COMPANY:

**Swiss Glascoat Equipments Limited
H-106, Gujarat Industrial Development Corporation
Vitthal Udyognagar
Anand, Gujarat 388121
India**

SCOPE:

Manufacture of pressure vessels at the above location only

AUTHORIZED:

December 10, 2014

EXPIRES:

February 3, 2018

CERTIFICATE NUMBER: 35,604

A handwritten signature in black ink, reading 'Byron A. Eiler'.

Vice President, Conformity Assessment



A handwritten signature in black ink, reading 'David N. Wight'.

Director, Conformity Assessment



Lloyd's Register
LRQA

CERTIFICATE OF APPROVAL

This is to certify that the Quality Management System of:

Swiss Glascoat Equipments Limited
H-106, GIDC, Vitthal Udyog Nagar,
V.V. Nagar - 388 121,
Gujarat,
INDIA

has been approved by Lloyd's Register Quality Assurance
to the following Quality Management System Standard:

ISO 9001:2008

The Quality Management System is applicable to:

**The design, manufacture, repair and provision of spares for
glasslined equipment.**

Approval
Certificate No: MUM0060226

Original Approval: 22 March 2003

Current Certificate: 01 April 2015

Certificate Expiry: 31 March 2018

Issued by: Lloyd's Register Quality Assurance Limited



001

This certificate replaces and supersedes certificate no. MUM0060226, issue dated 22 April 2012
LRQA Ltd, Unit 63 & 64, 6th Floor, Level 5, Kalpataru Square, Kondivita Lane, Off Andheri - Kurla Road, Andheri (East), Mumbai - 400 059, India
For and on behalf of LRQA Ltd, Hiramford, Middlemarsh Office Village, Siskin Drive, Coventry, CV3 4FJ, United Kingdom
This approval is carried out in accordance with the LRQA assessment and certification procedures and monitored by LRQA.
The use of the UKAS Accreditation Mark indicates Accreditation in respect of those activities covered by the Accreditation Certificate Number 001

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QUALITY ASSURANCE PLAN

Sr. No.	Inspection Activity	Characteristic		Category	Type/ Method of Check	Extent of Check	Reference Documents	Acceptance Norms	Report Required	Inspection Organisation			Remark
										SGEL	TPI	CLIENT	
(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.0 Material													
1.1	Properties (Plates, Pipes, Forgings, Castings, Fitting & Other Pressure Parts)	Chemical and mechanical properties		C	Chemical Analysis & Mechanical Tests	Test Coupon	Approved Drawing / Approved Material Technical Specification (MTS)	ASME Sec.II, Part A and Applicable Material Technical Specification	Manufacturer's/ Lab Test Certificate	H	R	R	Check test if correlatable TC is not available
1.2	Overall dimensions and visual inspection (Plates, Pipes, Forgings, Castings, Fittings & other Pressure Parts)	Dimensions		M	Measurement, Visual and QMS:WI-QCD-01	100%	ASME Sec.II, Part A/ DIN Standard , Purchaser Order and Approved drawing	ASME Sec.II, Part A/ DIN Standard , Purchaser Order and Approved drawing	QMS: F-QCD-09 QMS: F-QCD-18 QMS: F-QCD-20	H	R	R	
1.3	Bought out components like: Mechanical Seal, Electric Motor, Gear Box, RTD Sensors, PTFE Sparger, Rupture Disc	Dimensions, M.O.C.		M	Review Material Test Certificate (MTC) & Visual Check	100%	Approved Drawing, Purchase Order	Approved Drawing, Purchase Order	Test Certificate	H	R	R	
1.4	Identification	Marking / Punching		C	Visual	100%	ASME Sec.II, Part A, Approved Drawing & MTS and Purchase Order	ASME Sec.II, Part A, Approved Drawing & MTS	Manufacturer's T.C.	H	R	R	Check test (If Required)
2.0 Fabrication													
2.1	Marking and stamp transfer (All Pressure Parts)	ASME Sec.II, Part A / DIN / Approved Drawing		M	Visual	100%	ASME Sec.II, Part A Approved Drawing	ASME Sec.II, Part A Approved Drawing	QMS: F-QCD-02	H	R	R	
2.1.1	Dimensional Verification and Surface Defect of formed D'end	I	Dimension	M	Measurement	100%	Approved Drawing & ASME Sec.VIII, Div.I	Approved Drawing & ASME Sec.VIII, Div.I	QMS:F-QCD-03	H	R	R	Report Verified of Forming Vendor
		II	Surface Defect & Lamination	M	LPT	100%	ASME Sec.V	ASME Sec.V	QMS:F-QCD-11	H			
2.2	Marking for nozzle openings on top and bottom dished ends	Dimension		M	Measurement and Visual	100%	Approved Drawing	Approved Drawing	QMS: F-PRD-03, 04, 05	H	R	R	
2.3	All weld joint setup of Main Shell, Jacket Shell & Dished End and Weld Geometric	Weld Setup and Weld Geomatic		M	Measurement	100%	ASME Sec.VIII, Div.I & Approved Weld Plan	Drawing & ASME Sec.VIII, Div.I & Approved Weld Plan	QMS-F-PRD-03, 04, 05, 14	H	R	R	
2.4	Agitator, Baffle, Thermowell, C.O.C. M.W. Cover	Dimension		M	Visual / Measurement	100%	Approved Drg.	Approved Drg.	QMS:F-QCD-06	H	R	R	
3.0 Welding													
3.1	WPS, PQR & WPQ	Qualification Test		C	Mechanical Test / Radiograph	Test coupon	ASME Sec.IX	ASME Sec.IX	Qualification Records (WPQ)	H	R	R	SGEL Records Only
3.2	Out of roundness for Main Shell & Jacket Shell	Dimension		M	Measurement	100%	ASME Sec.VIII, Div.I / Approved Drawing and DIN Standard	ASME Sec.VIII, Div.I / Approved Drawing and DIN Standard	QMS:F-PRD-03 QMS:F-PRD-04 QMS:F-PRD-14	H	R	R	
3.3	Visual inspection for weld bead	Reinforcement		M	Measurement and Visual	100%	ASME Sec.VIII, Div.I and Weld Plan	ASME Sec.VIII, Div.I	QMS:F-QCD-05	H	R	R	

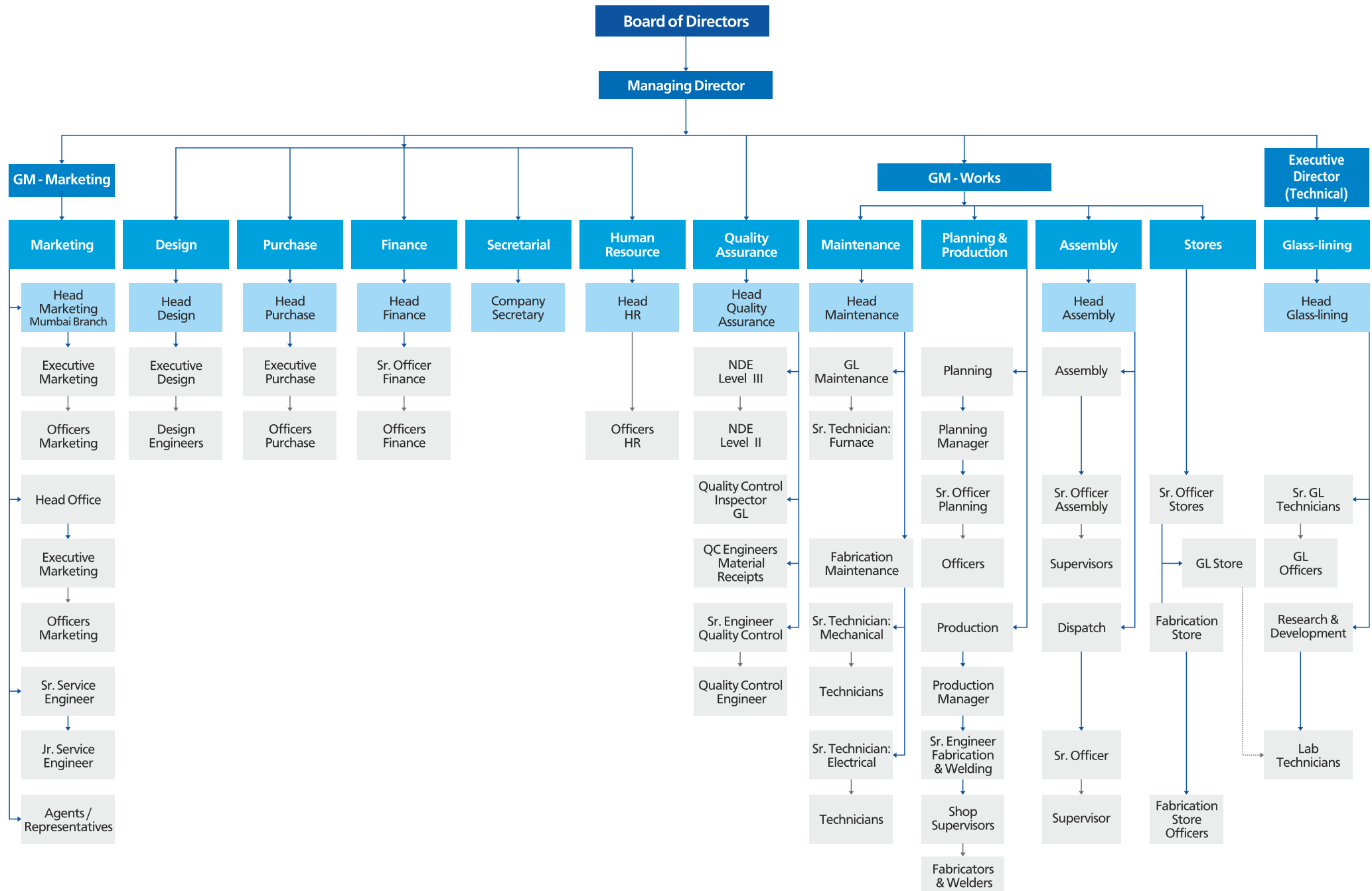
QUALITY ASSURANCE PLAN

Sr. No.	Inspection Activity	Characteristic		Category	Type/ Method of Check	Extent of Check	Reference Documents	Acceptance Norms	Report Required	Inspection Organisation			Remark
										SGEL	TPI	CLIENT	
(1)	(2)	(3)		(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
4.0 N.D.T.													
4.1	Penetrant Test (PT) of Weld Joint	Welding Surface Defect		M	Liquid Penetrate Test	100%	ASME Sec.V & ASME Sec.VIII, Div.I	ASME Sec.V & ASME Sec.VIII, Div.I	QMS: F-QCD-11	H	R	R	
4.2	Ultrasonic Testing (UT) of Weld Joint	Welding Soundness		M	Ultrasonic Testing	100%	ASME Sec.V & ASME Sec.VIII, Div.I	ASME Sec.V, ASME Sec.VIII, Div. I	QMS: F-QCD-12	H	R	R	
4.3	Radiographic Testing (RT) of Weld Joint	Welding Soundness		M	Radiographic (Gamma Rays)	Approved Drawing	ASME Sec.V & ASME Sec.VIII, Div.I	ASME Sec.V, ASME Sec.VIII, Div.I	QMS: F-QCD-13	H	R	R	
5.0 Surface Preparation													
5.1	Grit Blasting	Surface Roughness		M	Visual	100%	SGEL Standard	SGEL Standard	SGEL Internal Record	H	R	R	
6.0	Glass-lining	Surface Finish & Thickness Check		M	Visual / Spark Test at 20 KV	100%	QMS: WI-GLN-04	DIN Standard and SGEL Standard	QMS: F-QCD-26 QMS: F-QCD-27	H	R	R	
7.0 Jacket Fitting													
7.1	Jacket Shell to Main Shell	Setup & Welding		M	Visual	100%	Approved Drg. / Approved Weld Plan	Approved Drg. / Approved Weld Plan	QMS: F-PRD-14	H	R	R	
7.2	Side Bracket Setup with Jacket	Setup & Welding		M	Visual	100%	Approved Drg. / Approved Weld Plan	Approved Drg. / Approved Weld Plan	QMS: F-PRD-14	H	R	R	
8.0 Final Testing													
8.1	Hydrostatic Test for Vessel, Pipes and Fittings	Hydrostatic Test		C	Pressure Test	100%	ASME Sec.VIII, Div.I QMS: WI-QCD-06 & Approved Drawing	ASME Sec.VIII, Div.I & Approved Drawing	QMS: F-QCD-15	P	H	H	QMS: WI-QCD-06
8.2	Run Test at full load	Run out and Power drawn		C	Measurement	100%	QMS: WI-QCD-06	SGEL Standard	QMS: F-QCD-15	P	H	H	
8.3	Glass-lining Test	I	Glass-lining Continuity (Spark Test)	C	Integrity	100%	QMS: WI-GLN-07	DIN Standard and SGEL Standard	QMS: F-QCD-15 QMS: F-QCD-16	P	H	H	
		II	Glass-lining Thickness	C	Measurement	100%	QMS: WI-GLN-04	DIN Standard and SGEL Standard	QMS: F-QCD-15 QMS: F-QCD-16	P	H	H	
9.0	Final Dimensions & Visual	Dimension & Visual Check		M	Measurement and Visual	100%	Approved Drawing / Internal W.O. or P.O.	Approved Drawing	QMS: F-QCD-5 QMS: F-QCD-15 QMS: F-QCD-16 QMS: F-QCD-21	P	H	H	Dimensions are incorporated in as built drg.
10.0	Final Documentation Review	Review Applicable documents for Compliance to Specification											

Legends

H: Hold | R: Review | P: Perform | C: Critical | M: Major

ORGANIZATIONAL CHART



PARTNERING WITH THE BEST TO LEAD THE PACK

Abhilash Chemicals Pvt. Ltd.	Maprimed S.A.
Alchymars ICM SM Pvt. Ltd.	Mylan Laboratories Ltd.
Alembic Ltd.	Meghmani Group
Anthem Biosciences Pvt. Ltd.	Metrochem API Pvt. Ltd.
Anshul Specialty Molecules Ltd.	Micas Organics Ltd.
Apicore Pharmaceuticals Pvt. Ltd.	Millennium Chemi Pharma Pvt. Ltd.
Arch Pharmalabs Ltd.	Navdeep Chemicals Pvt. Ltd.
Atul Ltd.	Navin Fluorine International Ltd.
Aurobindo Pharma Ltd.	Nectar Lifesciences Ltd.
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Benzo Chem Industries Pvt. Ltd.	Ordnance Factory
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EOC Group	SRF Ltd.
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Exemed Pharmaceuticals Ltd.	Tagros Chemical India Ltd.
Gujarat Agrochem Ltd.	Teva Api India Ltd.
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Hikal Ltd.	United Phosphorus Ltd.
IOL Chemicals & Pharmaceuticals Ltd.	V.B. Medicare Pvt. Ltd.
ION Exchange (India) Ltd.	Vertellus Specialty Material (India) Pvt. Ltd.
Jubilant Life Sciences Ltd. (Jubilant Organosys Ltd.)	Virchow Chemicals Pvt. Ltd.
Kiri Industries Ltd.	Virupaksha Organics Pvt. Ltd.
Lanxess India Pvt. Ltd.	Vivin Laboratories Pvt. Ltd.
Mahavir Synthesis Pvt. Ltd.	Zydus Takeda Healthcare Pvt. Ltd.