



CAT-SLCO-2010(0)



# ***SARAVEL OPEN TYPE LIQUID CHILLERS***

50 TO 600 NOMINAL TONS



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**NOTE:**

**All specifications & dimensions subject  
to change without notice.**

**BENEFITS AND FEATURES**

*SARAVEL* open type packaged liquid chillers are designed to suit a variety of applications in commercial, institutional, and residential air conditioning as well as industrial process fluid cooling. With capacities ranging from 50 to 600 Tons, these units can provide significant installation versatility in hospitals, hotels, schools, stadiums, and apartment complexes.

Two basic systems are offered by *SARAVEL*: The water cooled package where the water cooled condenser is integrated with the package and the air cooled package where the air cooled condenser is a separate unit ( For selection of air cooled condensers refer to *SARAVEL* Cat. No. 300-95).

*SARAVEL* open type liquid chillers are designed and built to provide reliable, efficient performance and easy serviceability through the incorporation of the following features.

**COMPRESSOR**

At the heart of the *SARAVEL* open type chiller is an open type, multi-cylinder compressor designed to run at 1450 RPM, an extremely compact and rugged compressor unit which incorporates many engineering features:

Conformatic, cast aluminum pistons eliminate piston slap while maintaining a closer piston fit under all operating conditions while holding groove and ring wear to a minimum.

The compressor is fitted with a forced feed, self-reversing positive displacement type oil pump which lubricates the internal moving components through an internally channeled and piped lubricating system.

**EVAPORATOR**

The direct expansion cooler designed for highest efficiency features, the refrigerant flows in the tubes and a series of baffles direct water over the refrigerant tubes. The evaporator and low temperature lines are completely protected with closed-cell fire retardant insulation for thermal insulating, condensation prevention, and vapor seal.

**CONDENSER**

The condenser is a shell and tube heat exchanger with integrally finned tubes. Both the evaporator and the condenser are designed and constructed according to the ASME-Division VIII Unfired Pressure Vessel Code and the Standards of the Tubular Exchanger Manufacturers Association (TEMA).

**CONTROLS**

*SARAVEL* open type chillers utilize a control panel designed for automatic operation and phase control for insuring the safety of the units and sequencing control. Partial unloading and capacity control is obtained by means of a small oil-pressure operated piston which actuates the unloading mechanism via a solenoid valve and multi-stage thermostat responsive to load conditions.

A Star-Delta starter impresses the voltage across the Star-connection to reduce the current on the first step and after a predetermined time lapse the motor is connected in delta, thus permitting full current to deliver the full rated load torque.

The safety controls include high and low pressure cut-outs, oil pressure safety cut-out, motor overload protection, flow switch, and anti-freeze control. All selected from the most reliable and recognized brand names in the air-conditioning and refrigeration industry.



## PHYSICAL & ELECTRICAL DATA

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**TABLE 1. PHYSICAL DATA OF 1 & 2 COMPRESSORS**

MODEL		-50-1	-75-1	-90-1	-100-1	-120-1	-150-1	-180-2
Compressors (open type)	No. of compressor	1	1	1	1	1	1	2
	No. of cylinder (Each comp.)	3	4	5	6	7	8	5
	Optional Capacity* Unloading%	33-100	50-100	40-60- 100	33-66- 100	29-57- 100	25-50- 75-100	20-40- 60-100
Motor	No. of Motors	1	1	1	1	1	1	2
	Standard Motor HP	50	75	100	100	120	150	100
	Optional Motor HP	60	100	100	120	150	200	100
Evaporator	Shell O.D. Inch	14	16	16	16	18	18	20
	Tube Length mm	3000	3000	3000	3000	3000	3500	3500
	Outside Area Sq. F	270	360	373	373	495	495	664
	Water Volume Liters	117	140	223	218	305	282	387
Condenser	Shell O.D. Inch	12	12	14	14	14	16	2 x 12
	Tube Length mm	2000	2350	2800	2800	3000	3000	2 x 2800
	Inside Area Sq. Ft.	103	139	165	165	177	210	2 x 165
	No. of Passes	2	2	2	2	2	2	2
	Water Volume Liters	31	41	50	61	67	80	2 x 50
Operating Charges	Oil Liters	13	13	13	13	13	13	2 x 13
	R-22 W-Models Kg	37.6	50.2	62.8	75.4	87.9	100.5	126
	R-22** A-Models Kg	24.4	32.7	40.8	49	57.2	65.3	82
Operating Weight (Kg)	W-Models (Kg)	2350	2550	3000	3150	3550	3850	5550
	A-Models (Kg)	2020	2190	2590	2720	3000	3200	4750

\* Standard capacity unloading; max. 4 stages.

\*\* R-22 charge for chiller only. Total Charge = Chiller + Condenser + Piping

**TABLE 2. ELECTRICAL DATA OF 1 & 2 COMPRESSORS**

MODEL		50-1	75-1	90-1	100-1	120-1	150-1	180-2
Motor Compressor	No. of motors	1	1	1	1	1	1	2
	Standard HP	50	75	100	100	120	150	100
	Name Plate Amps	77	108	148	148	175	202	148
	Starting Amps	135	243	259	259	306	323	259
System	Full Load Amps	77	108	148	148	175	202	296
	Max. Starting Amps	135	243	259	259	306	323	407
	Wire Sizing Amps	96	135	185	185	219	253	333



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## PHYSICAL & ELECTRICAL DATA

**TABLE 1. PHYSICAL DATA OF 2 & 4 COMPRESSORS (Continued)**

MODEL		-200-2	-240-2	-300-2	-360-4	-400-4	-480-4	-600-4
Compressors (Open Type)	No. of Compresso	2	2	2	4	4	4	4
	No. of cylinder (Each comp.)	6	7	8	5	6	7	8
	Optional Capacity* Unloading	16-33-50- 66-83-100	14-29-43- 57-100	13-25-37- 50-62- 75-100	10-20-30- 40-60- 80-100	8-17-25- 33-50-67- 93-100	7-14-21- 29-50-71- 86-100	12-25-37- 50-62-75- 87-100
Motor	No. of Motors	2	2	2	2	2	2	2
	Standard Motor HP	100	120	150	200	200	250	300
	Optional Motor HP	120	150	200	200	250	300	335
Evaporator	Shell O.D. Inch	20	20	24	24	26	26	28
	Tube Length	3800	4000	5000	5000	5000	5000	5000
	Outside Area Sq.	721	788	1617	1617	1821	1821	2024
	Water Volume	417	525	548	638	914	1235	1366
Condenser	Shell O.D. Inch	2 x 14	2 x 14	2 x 16	2 x 16	2 x 16	2 x 18	2 x 18
	Tube Length	2 x 2800	2 x 3000	2 x 3000	2 x 3500	2 x 3500	2 x 3500	2 x 4000
	Inside Area	2 x 165	2 x 177	2 x 210	2 x 245	2 x 245	2 x 377	2x 430
	No. of Passes	2	2	2	2	2	2	2
	Water Volume	2 x 61	2 x 67	2 x 80	2 x 85	2 x 112	2 x 133	2 x 155
Operating Charges	Oil Liters	2 x 13	2 x 13	2 x 13	4 x 13	4 x 13	24x 13	4 x 13
	R-22 W-Models	151	176	201	252	302	352	402
	R-22** A-Models	98	114.4	131	164	196	229	262
Operating Weight (Kg)	W-Models (Kg)	5880	6650	7280	9700	10900	12600	13400
	A-Models (Kg)	5000	5550	6000	8100	8800	10200	10900

\* Standard capacity unloading: max. 4 stages.

\*\* R-22 charge for chiller only. Total Charge = Chiller + Condenser + Piping

**TABLE 2. ELECTRICAL DATA OF 2 & 4 COMPRESSORS (Continued)**

MODEL		200-2	240-2	300-2	360-4	400-4	480-4	600-4
Motor Compressor	No. of motors	2	2	2	2	2	2	2
	Standard HP	100	120	150	200	200	250	300
	Name Plate Amps	148	175	202	272	272	336	395
	Starting Amps	259	306	323	503	503	638	751
System	Full Load Amps	296	350	404	544	544	672	790
	Max. Starting Amps	407	481	525	775	775	974	1146
	Wire Sizing Amps	333	394	455	612	61	756	889



## SELECTION EXAMPLES

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### SELECTION GUIDELINE

SARAVEL reciprocating liquid chiller ratings presented in Tables 3 through 30 indicate the capacity of the chiller at conditions listed below:

- Chilled water flow rate based on 2.4 gpm per ton assuming 10°F chilled water temperature drop.
- Condenser water flow based on 3 gpm per ton, assuming 10°F water temperature rise.
- 0.00025 condenser/cooler water fouling factor.

For conditions other than those listed above, use the Chilled water correction factors tabulate below:

FACTS						
RANGE °F	0.00025 FF		0.00050 FF		0.00075 FF	
	TONS	KW	TONS	KW	TONS	KW
6	0.990	0.997	0.971	0.991	0.954	0.986
8	0.995	0.998	0.976	0.993	0.956	0.987
10	1.000	1.000	0.982	0.994	0.964	0.989
12	1.005	1.001	0.987	0.996	0.967	0.991
14	1.010	1.002	0.993	0.998	0.975	0.993

### SAMPLE SELECTION (Water Cooled Condenser)

#### Given:

Chill 600 gpm of water from 50 °F to 42°F and 0.0005 fouling factor specified for the cooler with 85 ° F to 95 °F condenser water available. A fouling factor of 0.0005 is also specified for the condenser.

#### Find:

- Unit model and size
- Unit actual capacity
- KW
- Condenser water flow rate
- Cooler/Condenser water pressure drop

#### Solution:

##### 1. Chilled Water Range:

$$50^{\circ}\text{F} - 42^{\circ}\text{F} = 8^{\circ}\text{F}$$

From the chilled water correction factors table, the Correction factors are 0.976 for Tons and 0.993 for KW.

##### 2. Capacity (TONS):

$$\begin{aligned} \text{TONS} &= \frac{\text{GPM} \times \text{Chilled Water Range}}{24} \\ &= \frac{600 \times 8}{24} = 200 \end{aligned}$$

**3. Select Model:** From the ratings, a Model SLCO-240-2W (TABLE 19) has the capacity rang required. For a cooler leaving water temperature

of 42°F and a condenser leaving water temperature of 95°F, the unit capacity rating table indicates:

$$\begin{aligned} \text{TONS} &= 206.2 \\ \text{BHP} &= 200.4 \end{aligned}$$

The corresponding KW can be calculated according to:

$$\text{KW} = \text{BHP} \times 0.746 = 200.4 \times 0.746 = 149 \text{ KW}$$

##### 4. Apply Chilled Water Correction Factor:

Ratings are based on 0.00025 fouling factor for both cooler and condenser. The actual condenser heat rejection should be computed after the appropriate correction factors for 0.0005 fouling factor have been applied to TONS and KW.

$$\begin{aligned} \text{TONS} &= 206.2 \times 0.976 = \\ &201 \\ \text{KW} &= 149 \times 0.993 \\ &= 147.9 \end{aligned}$$

##### 5. Determine Average Full Load KW at 200 Tons:

$$\text{KW} = \frac{200}{24201} \times 147.9 = 147.1$$

##### 6. Determine Condenser Water Heat Rejection:

$$\begin{aligned} \text{Heat Rejection (MBH)} &= (\text{Tons} \times 12) + (\text{KW} \times 3.415) \\ &= (200 \times 12) + (147.1 \times 3.415) = 2902 \end{aligned}$$

##### 7. Determine Condenser Water Flow Rate:

The water flow rate through the condenser may be determined using the following equation:

$$\begin{aligned} \text{GPM}_{\text{CW}} &= \frac{\text{Heat Rejection (MBH)} \times 2}{\text{Condenser Water Range}} \\ &= \frac{2902 \times 2}{95 - 85} = 850 \end{aligned}$$

##### 8. Determine Cooler/Condenser Pressure Drops:

From the curves in Figures 3 and 4, the pressure drops with 600 GPM through the cooler and 580 GPM through the condenser of a Model SLCO-240-2W are:

Cooler Pressure Drops at 600 GPM = 10 ft water  
Condenser Pressure Drops at 580 GPM = 6.5 ft water



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## SELECTION EXAMPLES

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### SAMPLES SELECTION (Air Cooler Condenser)

**Given:**

Chill 325 gpm of water from 54°F to 44°F  
(10°F Range) at 120°F condensing  
temperature.

**Find:**

- Unit actual capacity
- Unit model and size
- KW
- Condenser heat rejection
- Cooler water pressure drops

**1. Capacity (TONS):**

$$\text{TONS} = \frac{\text{GPM} \times \text{Chilled Water Range}}{24}$$

**2. Select Model:**

From the ratings, a Model SLCO-  
180-2A ([TABLE 16](#)) with an actual capacity of 135.6  
Tons with BHP = 162.8 is selected.

3. The corresponding KW can be calculated  
according to the following relation:

$$\text{KW} = \text{BHP} \times 0.746 = 162.8 \times 0.746 = 121.4$$

**4. Condenser Heat Rejection:**

From [TABLE 16](#), the heat rejection for SLCO-  
180-2A can be read as 2037  
MBH.

**5. Cooler Water Pressure Drop:**

From [FIGURE 3](#), the cooler water pressure  
drop for the selected model at 325 gpm can be  
determined as 7.1 ft of water.

TO SELECT REMOTE AIR COOLED  
CONDENSER SEE SARAVEL AIR COOLED  
CONDENSERS CATALOG NO. 300-95



## RATINGS – SINGLE COMPRESSOR MODELS

TABLE 3. WATER COOLED - SLCO-50-1W

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	47.3	40.2	114	6.1	134	4.7
	44	49.4	40.6	119	6.7	139	5.1
	45	50.4	40.8	121	6.9	141	5.2
	46	51.5	41.1	124	7.2	145	5.5
90	42	45.8	41.8	110	5.7	131	4.5
	44	47.8	42.4	115	6.2	136	4.8
	45	48.7	42.7	117	6.4	138	5.0
	46	49.7	43.0	119	6.7	141	5.2
95	42	44.1	43.6	106	5.3	128	4.3
	44	46.1	44.2	111	5.8	133	4.6
	45	47.0	44.4	113	6.0	136	4.8
	46	48.0	44.7	115	6.2	139	5.1
100	42	42.4	45.0	102	4.9	125	4.1
	44	44.3	45.7	106	5.3	129	4.4
	45	45.2	46.0	109	5.6	132	4.5
	46	46.2	46.3	111	5.8	134	4.7
105	42	40.6	46.5	97	4.4	122	3.9
	44	42.5	47.3	102	4.9	126	4.2
	45	43.4	47.6	104	5.1	128	4.3
	46	44.3	47.9	106	5.3	131	4.5

TABLE 4. AIR COOLED - SLCO-50-1A

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	40.6	46.5	97	4.4	604
	44	42.5	47.3	102	4.9	629
	45	43.4	47.6	104	5.1	641
	46	44.3	47.9	106	5.3	652
120	42	39.0	47.7	94	4.2	588
	44	40.7	48.6	98	4.5	611
	45	41.6	48.9	100	4.7	622
	46	42.4	49.3	102	4.9	633
125	42	37.3	48.9	90	3.8	571
	44	39.0	49.8	94	4.2	594
	45	39.7	50.2	95	4.3	603
	46	40.5	50.6	97	4.4	614
130	42	35.7	50.1	86	3.5	555
	44	37.3	51.0	90	3.8	576
	45	37.9	51.5	91	3.9	585
	46	38.6	51.9	93	4.1	594
135	42	34.5	51.3	83	3.2	546
	44	36.2	52.3	87	3.6	566
	45	37.1	52.8	89	3.7	578
	46	37.8	53.3	91	3.9	588



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**RATINGS – SINGLE COMPRESSOR MODELS**

**TABLE 5. WATER COOLED - SLCO-75-1W**

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	63.1	54.4	151	12.9	180	5.1
	44	65.8	55.0	158	14.1	186	5.5
	45	67.2	55.3	161	14.7	189	5.7
	46	68.6	55.6	165	15.4	193	5.9
90	42	61.0	56.7	146	12.1	175	4.9
	44	63.7	57.4	153	13.2	182	5.3
	45	65.0	57.7	156	13.8	185	5.5
	46	66.4	58.1	159	14.3	190	5.7
95	42	58.9	59.0	141	11.3	171	4.7
	44	61.5	59.7	148	12.4	178	5.1
	45	62.8	60.2	151	12.9	182	5.3
	46	64.2	60.6	154	13.4	185	5.5
100	42	56.6	61.0	136	10.5	167	4.4
	44	59.1	61.9	142	11.4	173	4.7
	45	60.4	62.3	145	11.9	177	5.0
	46	61.6	62.7	148	12.4	180	5.2
105	42	54.4	62.9	131	9.7	163	4.2
	44	56.7	64.0	136	10.5	169	4.6
	45	57.8	64.5	139	10.9	172	4.7
	46	59.0	65.0	142	11.4	175	4.9

**TABLE 6. AIR COOLED - SLCO-75-1A**

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	54.4	62.9	131	9.7	811
	44	56.7	64.0	136	10.5	842
	45	57.8	64.5	139	10.9	856
	46	59.0	65.0	142	11.4	872
120	42	52.0	64.6	125	8.8	787
	44	54.3	65.6	130	9.6	817
	45	55.4	66.2	133	10.0	832
	46	56.6	66.7	136	10.5	847
125	42	49.7	66.3	119	8.0	763
	44	51.9	67.3	125	8.8	792
	45	53.0	67.9	127	9.1	807
	46	54.2	68.5	130	9.6	823
130	42	47.4	68.0	114	7.4	740
	44	49.5	68.9	119	8.0	768
	45	50.6	69.6	121	8.3	783
	46	51.8	70.2	124	8.7	799
135	42	46.1	69.5	111	7.0	728
	44	48.3	70.8	116	7.6	758
	45	49.4	71.5	119	8.0	773
	46	50.5	72.1	121	8.2	788



## RATINGS – SINGLE COMPRESSOR MODELS

**TABLE 7. WATER COOLED - SLCO-90-1W**

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	78.7	67.4	189	8.2	223	5.9
	44	82.1	68.2	197	8.9	232	6.4
	45	83.9	68.6	201	9.3	236	6.7
	46	85.6	69.0	205	9.6	240	6.9
90	42	76.2	70.2	183	7.7	219	5.7
	44	79.5	71.1	191	8.4	227	6.2
	45	81.2	71.5	195	8.7	231	6.4
	46	82.8	71.9	199	9.1	236	6.7
95	42	73.6	73.1	177	7.2	214	5.5
	44	76.9	74.0	185	7.8	223	5.9
	45	78.5	74.5	188	8.1	226	6.2
	46	80.1	75.0	192	8.5	230	6.4
100	42	70.7	75.5	170	6.6	208	5.2
	44	73.8	76.6	177	7.2	216	5.6
	45	75.3	77.2	181	7.5	220	5.8
	46	77.0	77.8	185	7.8	225	6.1
105	42	67.8	77.9	163	6.1	203	4.9
	44	70.8	79.2	170	6.6	210	5.3
	45	72.2	79.8	173	6.9	213	5.5
	46	73.8	80.5	177	7.2	218	5.7

**TABLE 8. AIR COOLED - SLCO-90-1A**

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	67.8	77.9	163	6.1	1010
	44	70.8	79.2	170	6.6	1050
	45	72.2	79.8	173	6.9	1067
	46	73.8	80.5	177	7.2	1088
120	42	65.0	80.0	156	5.6	982
	44	67.8	81.4	163	6.1	1019
	45	69.2	82.0	166	6.3	1037
	46	70.7	82.7	170	6.6	1057
125	42	62.2	82.1	149	5.1	953
	44	64.8	83.5	156	5.6	988
	45	66.3	84.2	159	5.8	1009
	46	67.6	84.9	162	6.0	1025
130	42	59.4	84.2	143	4.7	925
	44	61.8	85.6	148	5.0	957
	45	63.3	86.4	152	5.3	977
	46	64.5	87.1	155	5.5	994
135	42	57.5	86.1	138	4.4	907
	44	60.3	87.8	145	4.8	945
	45	61.6	88.6	148	5.0	963
	46	63.1	89.4	151	5.2	983



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# RATINGS – SINGLE COMPRESSOR MODELS

**TABLE 9. WATER COOLED - SLCO-100-1W**

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	94.5	80.0	227	11.6	268	5.0
	44	98.6	80.9	237	12.7	278	5.3
	45	100.7	81.4	242	13.2	283	5.5
	46	102.8	81.8	247	13.7	289	5.8
90	42	91.4	83.4	219	10.8	261	4.7
	44	95.4	84.5	229	11.8	272	5.1
	45	97.4	85.0	234	12.3	278	5.3
	46	99.4	85.5	239	12.9	282	5.5
95	42	88.4	86.7	212	10.1	257	4.6
	44	92.3	87.9	222	11.1	267	4.9
	45	94.2	88.5	226	11.5	271	5.1
	46	96.2	89.1	231	12.0	256	5.3
100	42	84.8	89.7	204	9.4	250	4.3
	44	88.6	91.0	213	10.2	259	4.6
	45	90.5	91.7	217	10.6	264	4.8
	46	92.3	92.3	222	11.1	269	5.0
105	42	81.4	92.6	195	8.6	243	4.1
	44	84.9	94.1	204	9.4	252	4.4
	45	86.7	94.8	208	9.7	256	4.6
	46	88.5	95.6	212	10.1	262	4.8

**TABLE 10. AIR COOLED - SLCO-100-1A**

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	81.4	92.6	195	8.6	1210
	44	84.9	94.1	204	9.4	1256
	45	86.7	94.8	208	9.7	1279
	46	88.5	95.6	212	10.1	1303
120	42	77.9	95.0	187	7.9	1174
	44	81.3	96.6	195	8.6	1219
	45	83.1	97.4	199	8.9	1242
	46	84.8	98.2	204	9.4	1265
125	42	74.4	97.5	179	7.2	1139
	44	77.8	99.1	187	7.9	1183
	45	79.5	100.0	191	8.2	1206
	46	81.2	100.8	195	8.6	1228
130	42	70.9	100.0	170	6.5	1103
	44	74.3	101.6	178	7.1	1148
	45	75.9	102.6	182	7.5	1169
	46	77.5	103.4	186	7.8	1191
135	42	69.1	102.3	166	6.2	1087
	44	72.3	104.1	174	6.8	1130
	45	74.0	105.2	178	7.1	1153
	46	75.7	106.2	182	7.5	1176



## RATINGS – SINGLE COMPRESSOR MODELS

**TABLE 11. WATER COOLED - SLCO-120-1W**

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	110.5	92.4	265	7.3	313	7.5
	44	115.3	93.5	277	7.9	325	8.1
	45	117.6	94.0	282	8.2	330	8.4
	46	120.0	94.5	288	8.6	336	8.7
90	42	106.8	96.3	256	6.8	306	7.2
	44	111.4	97.6	267	7.4	317	7.8
	45	113.7	98.2	273	7.7	323	8.1
	46	116.1	98.7	279	8.0	329	8.3
95	42	103.1	100.2	247	6.3	298	6.9
	44	107.6	101.6	258	6.9	310	7.4
	45	109.9	102.3	264	7.2	316	7.7
	46	112.1	102.9	269	7.5	322	8.0
100	42	99.0	103.6	238	5.9	291	6.5
	44	103.4	105.1	248	6.4	302	7.0
	45	105.6	105.9	253	6.6	307	7.3
	46	107.8	106.7	259	6.9	313	7.6
105	42	95.0	106.9	228	5.4	283	6.2
	44	99.1	108.7	238	5.9	293	6.6
	45	101.2	109.5	243	6.1	299	6.9
	46	103.3	110.3	248	6.4	304	7.2

**TABLE 12. AIR COOLED - SLCO-120-1A**

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	95.0	106.9	228	5.4	1409
	44	99.1	108.7	238	5.9	1463
	45	101.2	109.5	243	6.1	1490
	46	103.3	110.3	248	6.4	1518
120	42	90.9	109.7	218	4.9	1367
	44	94.9	111.6	228	5.4	1420
	45	97.0	112.4	233	5.6	1447
	46	99.0	113.3	238	5.9	1474
125	42	86.8	112.6	208	4.5	1325
	44	90.8	114.5	218	4.9	1378
	45	92.7	115.4	223	5.1	1403
	46	94.7	116.3	227	5.3	1429
130	42	82.7	115.4	199	4.1	1283
	44	86.6	117.4	208	4.5	1335
	45	88.4	118.3	212	4.6	1359
	46	90.4	119.3	217	4.9	1385
135	42	80.5	118.1	193	3.9	1264
	44	84.5	120.3	203	4.3	1317
	45	86.4	121.5	207	4.4	1343
	46	88.4	122.7	212	4.6	1370



# 13

# RATINGS – SINGLE COMPRESSOR MODELS

**TABLE 13. WATER COOLED - SLCO-150-1W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	126.0	104.7	302	14.6	356	7.0
	44	131.5	105.8	316	16.0	370	7.6
	45	134.3	106.4	322	16.6	376	7.9
	46	137.1	107.0	329	17.3	384	8.2
90	42	121.8	109.0	292	13.7	348	6.7
	44	127.3	110.3	306	15.0	362	7.2
	45	129.9	111.0	312	15.6	368	7.5
	46	132.6	111.7	318	16.2	375	7.1
95	42	117.8	113.3	283	12.8	341	6.4
	44	122.9	114.9	295	13.9	353	6.9
	45	125.6	115.7	301	14.5	361	7.2
	46	128.2	116.4	308	15.2	367	7.5
100	42	113.1	117.2	271	11.8	332	6.1
	44	118.1	118.9	283	12.8	344	6.6
	45	120.5	119.8	289	13.4	351	6.8
	46	123.4	120.7	296	14.0	357	7.1
105	42	108.6	121.0	261	10.9	322	5.6
	44	113.3	122.9	272	11.8	334	6.2
	45	115.7	123.9	278	12.4	341	6.4
	46	118.0	124.8	283	12.8	347	6.7

**TABLE 14. AIR COOLED - SLCO-150-1A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	108.6	121.0	261	10.9	1608
	44	113.3	122.9	272	11.8	1669
	45	115.7	123.9	278	12.4	1701
	46	118.0	124.8	283	12.8	1731
120	42	103.9	124.2	249	9.9	1560
	44	108.5	126.2	260	10.8	1620
	45	110.8	127.3	266	11.3	1650
	46	113.1	128.2	271	11.8	1680
125	42	99.3	127.4	238	9.1	1513
	44	103.7	129.5	249	9.9	1571
	45	105.9	130.6	254	10.3	1600
	46	108.2	131.7	260	10.8	1630
130	42	94.6	130.6	227	8.3	1464
	44	98.9	132.8	237	9.0	1521
	45	101.0	134.0	242	9.4	1550
	46	103.3	135.2	248	9.8	1580
135	42	92.0	133.6	221	7.8	1441
	44	96.5	136.2	232	8.6	1501
	45	98.7	137.4	237	9.0	1531
	46	100.9	138.7	242	9.4	1560

## COOLER PRESSURE DROP

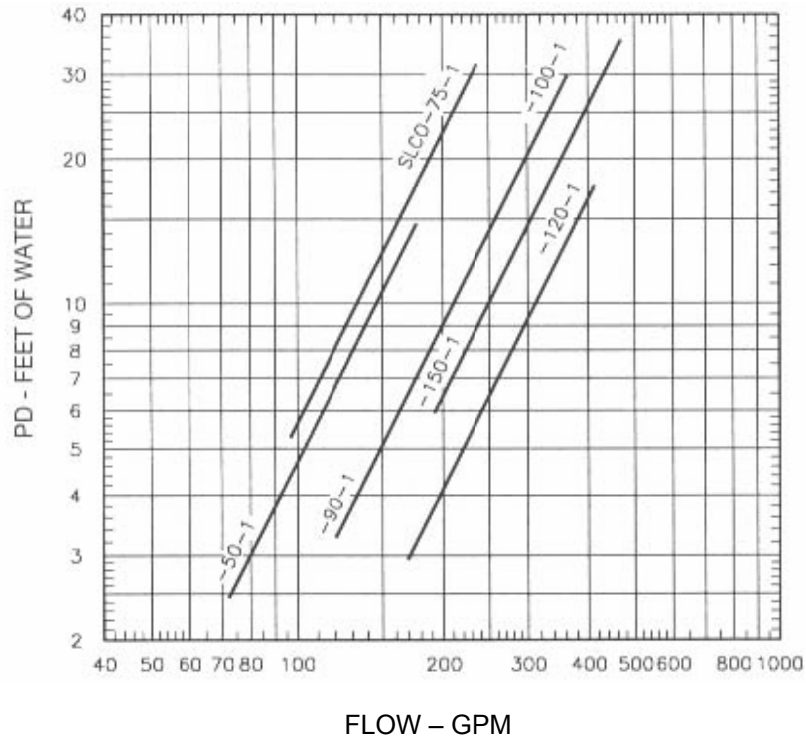


FIGURE 1

## CONDENSER PRESSURE DROP

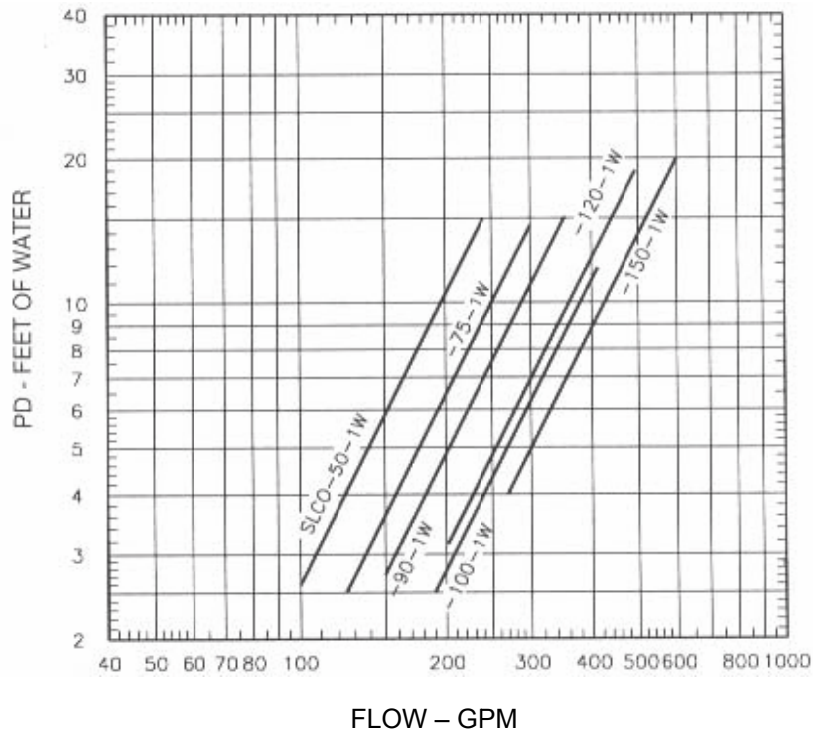


FIGURE 2



# 15

# RATINGS – TWO COMPRESSOR MODELS

**TABLE 15. WATER COOLRD – SLCO-180-2W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	157.4	134.8	378	10.6	446	5.9
	44	164.2	136.4	394	11.5	464	6.4
	45	167.8	137.2	403	12.0	473	6.7
	46	171.2	138.0	411	12.5	481	6.9
90	42	152.4	140.4	366	9.9	438	5.7
	44	159.0	142.2	382	10.8	454	6.2
	45	162.4	143.0	390	11.2	463	6.4
	46	165.6	143.8	397	11.6	471	6.7
95	42	147.2	146.2	353	9.2	427	5.5
	44	153.8	148.0	369	10.1	445	5.9
	45	157.0	149.0	377	10.5	453	6.2
	46	160.2	150.0	384	10.9	460	6.4
100	42	141.4	151.0	339	8.5	416	5.2
	44	147.6	153.2	354	9.3	432	5.6
	45	150.6	154.4	361	9.6	439	5.8
	46	154.0	155.6	370	10.1	450	6.1
105	42	135.6	155.8	325	7.8	405	4.9
	44	141.6	158.4	340	8.5	421	5.3
	45	144.4	159.6	347	8.9	427	5.5
	46	147.6	161.0	354	9.3	436	5.7

**TABLE 16. AIR COOLED – SLCO-180-2A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	135.6	155.8	325	7.8	2020
	44	141.6	158.4	340	8.5	2099
	45	144.4	159.6	347	8.9	2135
	46	147.6	161.0	354	9.3	2178
120	42	130.0	160.0	312	7.2	1963
	44	135.6	162.8	325	7.8	2037
	45	138.4	164.0	332	8.1	2074
	46	141.4	165.4	339	8.5	2114
125	42	124.4	164.2	299	6.6	1907
	44	129.6	167.0	311	7.2	1976
	45	132.6	168.4	318	7.5	2016
	46	135.2	169.8	324	7.8	2050
130	42	118.8	168.4	285	6.0	1850
	44	123.6	171.2	297	6.5	1915
	45	126.6	172.8	304	6.8	1955
	46	129.0	174.2	310	7.1	1987
135	42	115.0	172.0	276	5.6	1814
	44	120.6	175.6	289	6.2	1890
	45	123.2	177.2	296	6.5	1925
	46	126.2	178.8	303	6.8	1965



## RATINGS – TWO COMPRESSOR MODELS

**TABLE 17. WATER COOLED – SLCO-200-2W**

CONDENSER LEAVING WATER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	189.0	160.0	454	7.0	536	5.0
	44	197.2	161.8	473	7.7	552	5.3
	45	201.4	162.8	483	8.0	565	5.5
	46	205.6	163.6	493	8.3	577	5.8
90	42	182.8	166.8	439	6.6	522	4.7
	44	190.8	169.0	458	7.2	544	5.1
	45	194.8	170.0	468	7.5	554	5.3
	46	198.8	171.0	477	7.8	563	5.5
95	42	176.8	173.4	424	6.2	513	4.6
	44	184.6	175.8	443	6.7	533	4.9
	45	188.4	177.0	452	7.0	543	5.1
	46	192.4	178.2	462	7.3	552	5.3
100	42	169.6	179.4	407	5.7	499	4.3
	44	177.2	182.0	425	6.2	517	4.6
	45	181.0	183.4	434	6.5	528	4.8
	46	184.6	184.4	443	6.7	537	5.0
105	42	162.8	185.2	391	5.2	486	4.1
	44	169.8	188.2	408	5.7	504	4.4
	45	173.4	189.6	416	5.9	513	4.6
	46	177.0	191.2	425	6.2	523	4.8

**TABLE 18. AIR COOLED – SLCO-200-2A**

CONDENSER TEMP.°F	COOLER LEAVING WATER TEMP.°F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	162.8	185.2	391	5.2	2420
	44	169.8	188.2	408	5.7	2412
	45	173.4	189.6	416	5.9	2559
	46	177.0	191.2	425	6.2	2606
120	42	155.8	190.0	374	4.8	2348
	44	162.6	193.2	390	5.2	2437
	45	166.2	194.8	399	5.4	2484
	46	169.6	196.4	407	5.7	2530
125	42	148.8	195.0	357	4.4	2277
	44	155.6	198.2	373	4.8	2367
	45	159.0	200.0	382	5.0	2412
	46	162.0	201.6	390	5.2	2457
130	42	141.8	200.0	340	4.0	2206
	44	148.6	203.2	357	4.4	2295
	45	151.8	205.2	364	4.6	2339
	46	155.0	206.8	372	4.7	2381
135	42	138.2	204.6	332	3.8	2174
	44	144.6	208.2	347	4.1	2260
	45	148.0	210.4	355	4.3	2306
	46	151.4	212.4	363	4.5	2352



**TABLE 19. WATER COOLED – SLCO-240-2W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	221.0	184.8	530	7.9	625	7.5
	44	230.6	187.0	553	8.6	649	8.1
	45	235.2	188.0	564	8.9	661	8.4
	46	240.0	189.0	576	9.3	673	8.7
90	42	213.6	192.6	513	7.4	611	7.2
	44	222.8	195.2	535	8.0	635	7.8
	45	227.4	196.4	546	8.4	647	8.1
	46	232.2	197.4	557	8.7	657	8.3
95	42	206.2	200.4	495	6.9	597	6.9
	44	215.2	203.2	516	7.5	620	7.4
	45	219.8	204.6	528	7.8	632	7.7
	46	224.2	205.8	538	8.1	643	8.0
100	42	198.0	207.2	475	6.3	581	6.5
	44	206.8	210.2	496	6.9	604	7.0
	45	211.2	211.8	507	7.2	615	7.3
	46	215.6	213.4	517	7.5	625	7.6
105	42	190.0	213.8	456	5.8	566	6.2
	44	198.2	217.4	476	6.3	586	6.6
	45	202.4	219.0	486	6.6	599	6.9
	46	206.6	220.6	496	6.9	609	7.2

**TABLE 20. AIR COOLED – SLCO-240-2A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	190.0	213.8	456	5.8	2819
	44	198.2	217.4	476	6.3	2926
	45	202.4	219.0	486	6.6	2981
	46	206.6	220.6	496	6.9	3035
120	42	181.8	219.4	436	5.3	2734
	44	189.8	223.2	456	5.8	2840
	45	194.0	224.8	466	6.1	2894
	46	198.0	226.6	475	6.3	2947
125	42	173.6	225.2	417	4.9	2651
	44	181.6	229.0	436	5.3	2756
	45	185.4	230.8	445	5.6	2806
	46	189.4	232.6	455	5.8	2859
130	42	165.4	230.8	397	4.4	2566
	44	173.2	234.8	416	4.8	2670
	45	176.8	236.6	424	5.1	2718
	46	180.8	238.6	434	5.3	2771
135	42	161.0	236.2	386	4.2	2527
	44	169.0	240.6	406	4.6	2634
	45	172.8	243.0	415	4.8	2686
	46	176.8	245.4	424	5.1	2740



## RATINGS – TWO COMPRESSOR MODELS

**TABLE 21. WATER COOLED – SLCO-300-2W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	252.0	209.4	605	7.2	711	7.0
	44	263.0	211.6	631	7.8	739	7.6
	45	268.6	212.8	645	8.1	753	7.9
	46	274.2	214.0	658	8.9	768	8.2
90	42	243.6	218.0	585	6.7	695	6.7
	44	254.6	220.6	611	7.3	723	7.2
	45	259.8	222.0	624	7.6	736	7.5
	46	265.2	223.4	636	7.9	751	7.1
95	42	235.6	226.6	565	6.3	682	6.4
	44	245.8	229.8	590	6.8	707	6.9
	45	251.2	231.4	603	7.1	721	7.2
	46	256.4	232.8	615	7.4	734	7.5
100	42	226.2	234.4	543	5.8	663	6.1
	44	236.2	237.8	567	6.3	688	6.6
	45	241.0	239.6	578	6.5	701	6.8
	46	246.8	241.4	592	6.9	715	7.1
105	42	217.2	242.0	521	5.3	645	5.6
	44	226.6	245.8	544	5.8	668	6.2
	45	231.4	247.8	555	6.0	681	6.4
	46	236.0	249.6	566	6.3	694	6.7

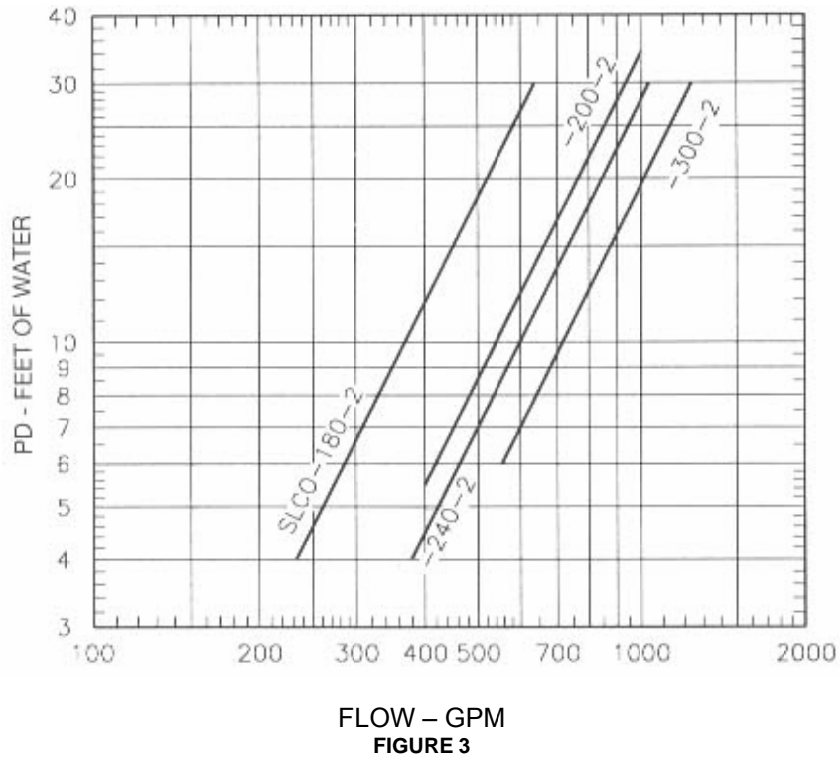
**TABLE 22. AIR COOLED – SLCO-300-2A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	217.2	242.0	521	5.3	3216
	44	226.6	245.8	544	5.8	3339
	45	231.4	247.8	555	6.0	3401
	46	236.0	249.6	566	6.3	3461
120	42	207.8	248.4	499	4.9	3120
	44	217.0	252.4	521	5.3	3240
	45	221.6	254.6	532	5.5	3301
	46	226.2	256.4	543	5.8	3360
125	42	198.6	254.8	477	4.4	3025
	44	207.4	259.0	498	4.8	3141
	45	211.8	261.2	508	5.1	3200
	46	216.4	263.4	519	5.3	3261
130	42	189.2	261.2	454	4.0	2929
	44	197.8	265.6	475	4.4	3043
	45	202.0	268.0	485	4.6	3099
	46	206.6	270.4	496	4.8	3161
135	42	184.0	267.2	442	3.8	2881
	44	193.0	272.4	463	4.2	3002
	45	197.4	274.8	474	4.4	3061
	46	201.8	277.4	484	4.6	3121

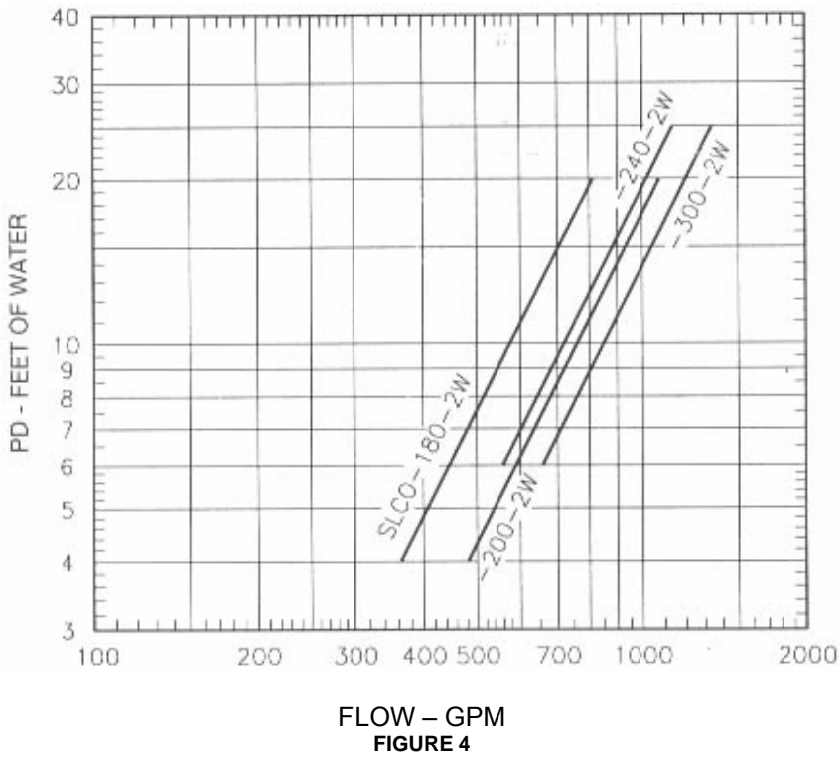


# 19 TWO COMPRESSORS MODELS PRESSURE DROPS

## COOLER PRESSURE DROP



FLOW – GPM  
FIGURE 3



FLOW – GPM  
FIGURE 4



## RATINGS – FOUR COMPRESSOR MODELS

**TABLE 23. WATER COOLED – SLCO-360-4W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
<b>85</b>	42	314.8	269.6	756	26.4	892	15.2
	44	328.4	272.8	788	28.7	928	16.4
	45	335.6	274.4	806	30.1	946	17.0
	46	342.4	276.0	822	31.3	962	17.6
<b>90</b>	42	304.8	280.8	732	24.8	876	14.6
	44	318.0	284.4	764	27.0	908	15.7
	45	324.8	286.0	780	28.2	925	16.3
	46	331.2	287.6	795	29.2	943	16.4
<b>95</b>	42	294.4	292.4	706	23.1	854	13.9
	44	307.6	296.0	738	25.2	890	15.1
	45	314.0	298.0	754	26.3	906	15.6
	46	320.4	300.0	769	27.3	921	16.1
<b>100</b>	42	282.8	302.0	679	21.3	831	13.1
	44	295.2	306.4	708	23.2	864	14.2
	45	301.2	308.8	723	24.2	879	14.7
	46	308.0	311.2	739	25.3	899	15.4
<b>105</b>	42	271.2	311.6	651	19.6	811	12.5
	44	283.2	316.8	680	21.4	842	13.5
	45	288.8	319.2	693	22.2	854	13.9
	46	295.2	322.0	708	23.2	872	14.5

**TABLE 24. AIR COOLED – SLCO-360-4A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
<b>115</b>	42	271.2	311.6	651	19.6	4040
	44	283.2	316.8	680	21.4	4200
	45	288.8	319.2	693	22.2	4268
	46	295.2	322.0	708	23.2	4352
<b>120</b>	42	260.0	320.0	624	18.0	3928
	44	271.2	325.6	652	19.7	4076
	45	276.8	328.0	664	20.4	4148
	46	282.8	330.8	680	21.4	4228
<b>125</b>	42	248.8	328.4	596	16.5	3812
	44	259.2	334.0	624	18.0	3952
	45	265.2	336.8	636	18.7	4036
	46	270.4	339.6	648	19.5	4100
<b>130</b>	42	237.6	336.8	572	15.2	3700
	44	247.2	342.4	592	16.2	3828
	45	253.2	345.6	608	17.1	3908
	46	258.0	348.4	620	17.8	3976
<b>135</b>	42	230.0	344.4	552	16.1	3628
	44	246.2	351.2	580	15.6	3780
	45	241.4	354.4	592	16.2	3852
	46	252.4	357.6	604	16.9	3932



**TABLE 25. WATER COOLED – SLCO-400-4W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	378.0	320.0	907	10.5	1071	29.2
	44	394.4	323.6	946	11.4	1110	31.4
	45	402.8	325.6	967	11.9	1131	32.6
	46	411.2	327.2	987	12.4	1155	34.0
90	42	365.6	333.6	878	9.8	1046	27.9
	44	381.6	338.0	916	10.7	1088	30.2
	45	389.6	340.0	935	11.1	1107	31.2
	46	397.6	342.0	954	11.6	1126	32.3
95	42	353.6	346.8	849	9.2	1026	26.8
	44	369.2	351.6	886	10.0	1067	29.0
	45	376.8	354.0	904	10.4	1085	30.0
	46	384.8	356.4	924	10.9	1103	31.1
100	42	339.2	358.8	814	8.4	998	25.4
	44	354.4	364.0	850	9.2	1034	27.2
	45	362.0	366.8	869	9.6	1057	28.5
	46	369.2	368.8	886	10.0	1074	29.4
105	42	325.6	370.4	782	7.8	973	24.0
	44	339.6	376.4	815	8.5	1007	25.8
	45	346.8	379.2	832	8.8	1026	26.8
	46	354.0	382.4	850	9.2	1047	27.9

**TABLE 26. AIR COOLED – SLCO-400-4A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	325.6	370.4	782	7.8	4840
	44	339.6	376.4	815	8.5	5024
	45	346.8	379.2	832	8.8	5116
	46	354.0	382.4	850	9.2	5212
120	42	311.6	380.0	748	7.1	4696
	44	325.2	387.2	780	7.7	4876
	45	332.4	389.6	796	8.1	4968
	46	339.2	392.8	816	8.5	5060
125	42	297.6	390.0	716	6.5	4556
	44	311.2	396.4	748	7.1	4732
	45	318.0	400.0	764	7.6	4824
	46	324.8	403.2	780	7.7	4912
130	42	283.6	400.0	680	5.9	4412
	44	297.2	406.4	712	6.5	4592
	45	303.6	410.4	728	6.7	4676
	46	310.0	413.6	744	7.0	4764
135	42	276.4	409.2	664	5.6	4348
	44	289.2	416.4	696	6.2	4520
	45	296.0	420.8	712	6.5	4612
	46	302.8	424.8	728	6.7	4704



## RATINGS – FOUR COMPRESSOR MODELS

**TABLE 27. WATER COOLED – SLCO-480-4W**

CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	442.0	369.6	1061	11.6	1250	28.7
	44	461.2	374.0	1107	12.7	1298	30.9
	45	470.4	376.0	1129	13.2	1321	32.1
	46	480.0	378.0	1152	13.7	1346	33.3
90	42	427.2	385.2	1025	10.9	1222	27.4
	44	445.6	390.4	1067	11.8	1270	29.6
	45	454.8	392.8	1092	12.3	1294	30.8
	46	464.4	394.8	1114	12.8	1314	31.7
95	42	412.4	400.8	990	10.1	1194	26.2
	44	430.4	406.4	1033	11.0	1241	28.3
	45	439.6	409.2	1055	11.5	1263	29.3
	46	448.4	411.6	1076	12.0	1287	30.4
100	42	396.0	414.4	950	9.3	1163	24.8
	44	413.6	420.4	993	10.2	1208	26.8
	45	422.4	423.6	1014	10.6	1230	27.8
	46	431.2	426.8	1040	11.1	1251	28.8
105	42	380.0	427.6	912	8.6	1131	23.5
	44	396.4	434.8	952	9.3	1172	25.2
	45	404.8	438.0	972	9.8	1197	26.3
	46	413.2	441.2	992	10.2	1217	27.2

**TABLE 28. AIR COOLED – SLCO-480-4A**

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	380.0	427.6	912	8.6	5636
	44	396.4	434.8	952	9.3	5852
	45	409.8	438.0	972	9.8	5960
	46	413.2	441.2	992	10.2	6072
120	42	363.6	438.8	872	7.9	5468
	44	379.6	446.4	912	8.6	5680
	45	388.0	449.6	932	9.0	5788
	46	396.0	453.2	952	9.4	5896
125	42	347.2	450.0	832	7.2	5300
	44	363.2	458.0	872	7.9	5512
	45	370.8	461.6	892	8.2	5612
	46	378.8	465.2	908	8.5	5716
130	42	330.8	461.6	796	6.6	5132
	44	346.4	469.6	832	7.2	5340
	45	353.6	473.0	848	7.4	5436
	46	361.6	477.2	868	7.8	5540
135	42	322.0	472.4	772	6.2	5056
	44	338.0	481.2	812	6.8	5268
	45	345.6	486.0	828	7.1	5372
	46	353.6	490.8	848	7.4	5480

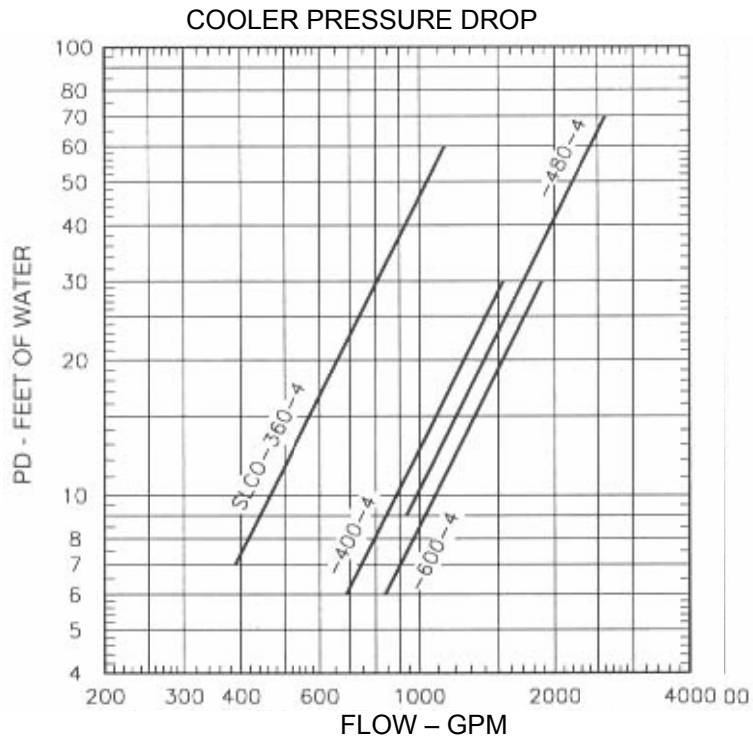


TABLE 29. WATER COOLED – SLCO-600-4W

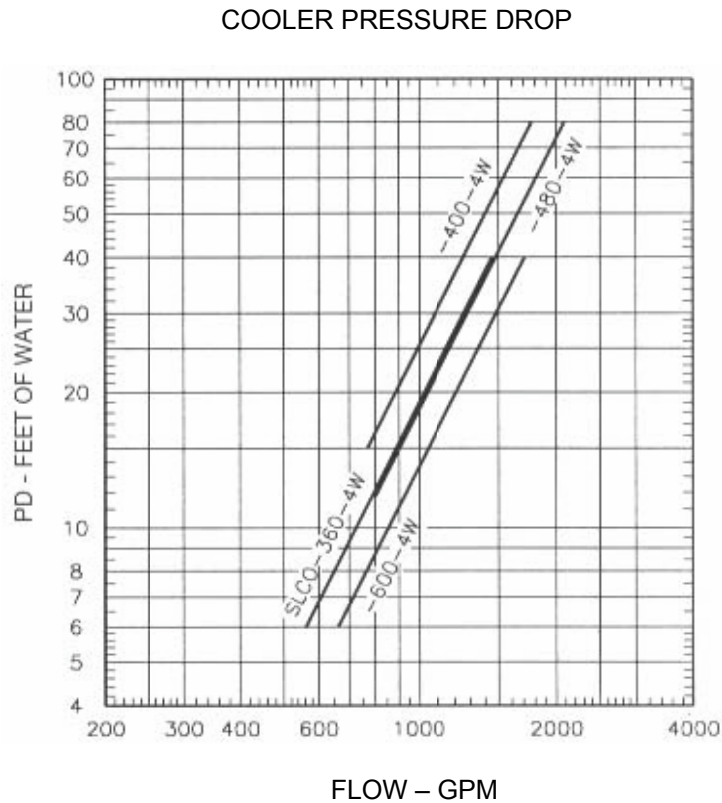
CONDENSER LEAVING WATER TEMP. °F	COOLER LEAVING WATER	CAP. TONS	BHP	COOLER WATER		CONDENSER WATER	
				GPM	PD (ft)	GPM	PD (ft)
85	42	504.0	418.8	1210	12.5	1422	27.7
	44	526.0	423.2	1262	13.6	1479	30.0
	45	537.2	425.6	1289	14.2	1506	31.1
	46	548.4	428.0	1316	14.8	1536	32.3
90	42	487.2	436.0	1169	11.7	1390	26.5
	44	509.2	441.2	1222	12.7	1446	28.7
	45	519.6	444.0	1247	13.3	1471	29.7
	46	530.4	446.8	1273	13.8	1502	31.0
95	42	471.2	453.2	1131	10.9	1364	25.5
	44	491.6	459.6	1180	11.9	1414	27.4
	45	502.4	462.8	1206	12.4	1442	28.5
	46	512.8	465.6	1231	12.9	1467	29.5
100	42	452.4	468.8	1086	10.1	1327	24.1
	44	472.4	475.6	1134	11.0	1375	25.9
	45	482.0	479.2	1157	11.4	1402	26.9
	46	493.6	482.8	1185	12.0	1429	28.0
105	42	434.4	484.0	1042	9.3	1290	22.8
	44	453.2	491.6	1088	10.1	1336	24.5
	45	462.8	495.6	1111	10.5	1363	25.5
	46	472.0	499.2	1133	10.9	1389	26.4

TABLE 30. AIR COOLED – SLCO-600-4A

CONDENSER TEMP. °F	COOLER LEAVING WATER TEMP. °F	CAP. TONS	BHP	COOLER WATER		HEAT REJECTION MBH
				GPM	PD (ft)	
115	42	434.4	484.0	1042	9.3	6432
	44	453.2	491.6	1089	10.1	6676
	45	462.8	495.6	1111	10.5	6804
	46	472.0	499.2	1133	10.9	6924
120	42	415.6	496.8	996	8.5	6240
	44	434.0	504.8	1040	9.2	6480
	45	443.2	509.2	1064	9.7	6600
	46	452.4	512.8	1084	10.0	6720
125	42	397.2	509.6	952	7.7	6052
	44	414.8	518.0	996	8.5	6284
	45	423.6	522.4	1016	8.8	6400
	46	432.8	562.8	1040	9.2	6520
130	42	378.4	522.4	908	7.0	5856
	44	395.6	531.2	948	7.7	6084
	45	404.0	536.0	968	8.0	6200
	46	413.2	540.8	992	8.4	6320
135	42	368.0	534.4	884	6.7	5764
	44	386.0	544.8	928	7.3	6004
	45	394.8	549.6	948	7.7	6124
	46	403.6	554.8	968	8.0	6240



**FIGURE 5**



**FIGURE 6**

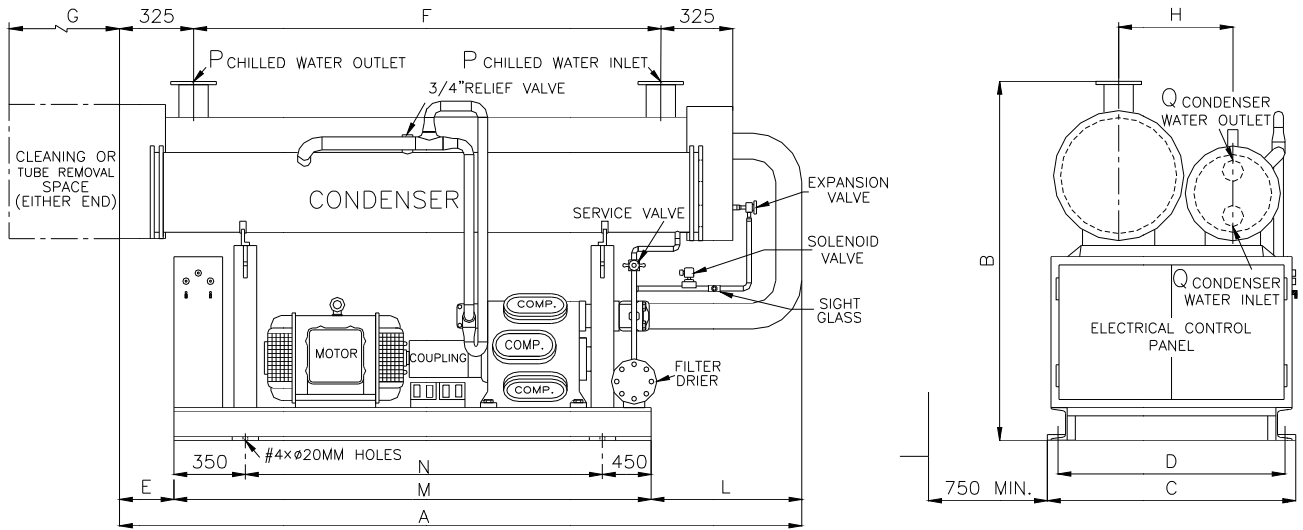


TABLE 31. WATER COOLED

MODEL	A	B	C	D	E	F	G	H	L	M	N	P
SLCO- 50 – 1w	3600	1550	1070	990	400	2600	3200	400	650	2550	1750	3"
SLCO- 75 – 1w	3600	1550	1070	990	400	2600	3200	430	650	2550	1750	4"
SLCO- 90 – 1w	3600	1600	1150	1070	400	2600	3200	450	650	2550	1750	4"
SLCO- 100-1w	3600	1600	1150	1070	400	2600	3200	470	650	2550	1750	5"
SLCO- 120-1w	3600	1660	1250	1170	350	2600	3200	500	600	2650	1850	5"
SLCO- 150-1w	4100	1660	1250	1170	550	3100	3800	530	800	2650	1950	5"

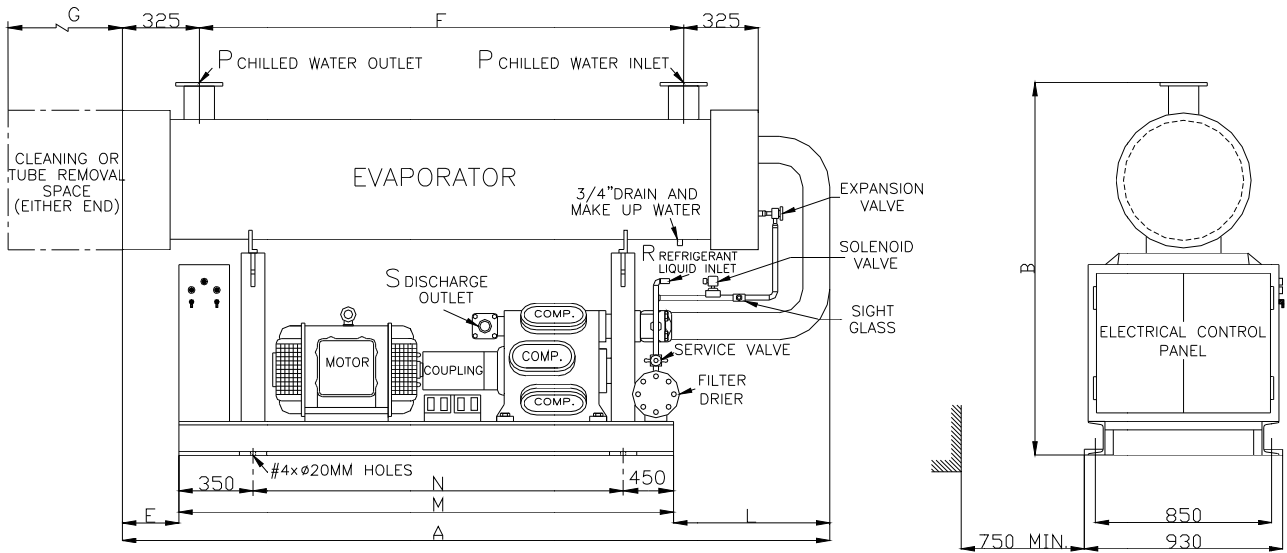
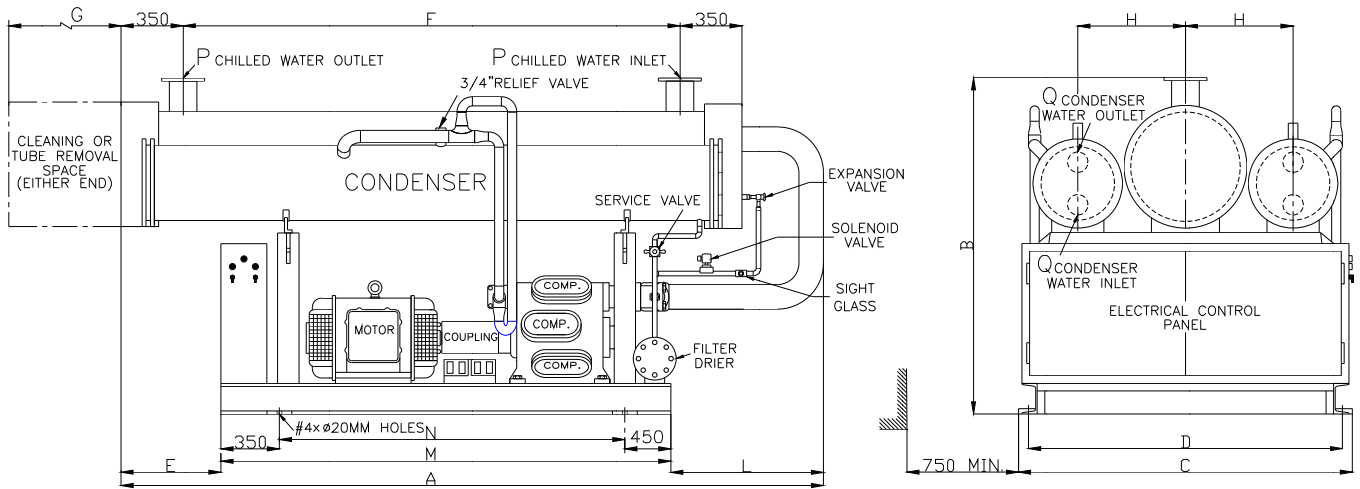


TABLE 32. AIR COOLED

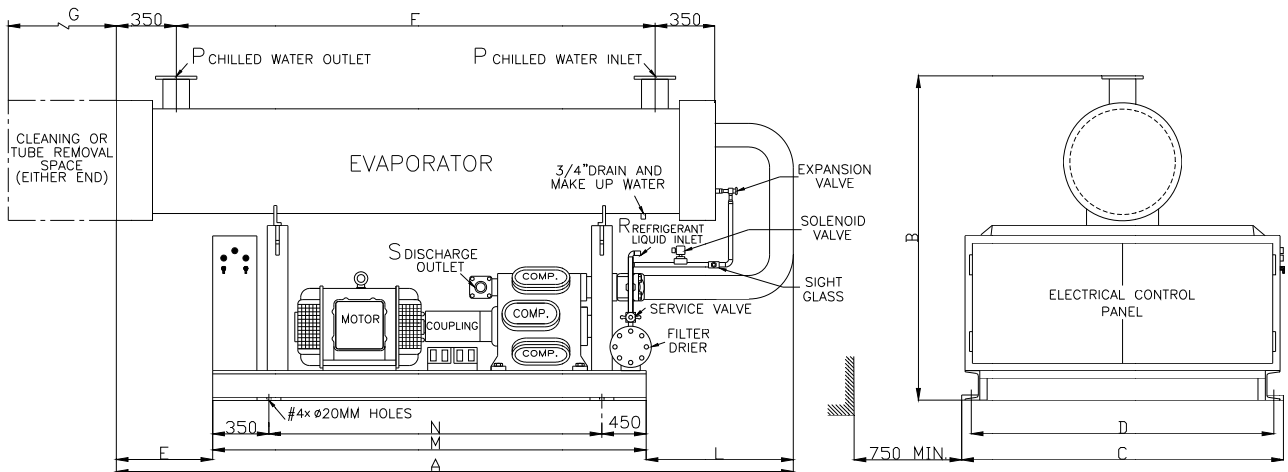
MODEL	A	B	E	F	G	L	M	N	P	R	S
SLCO- 50 – 1A	3600	1550	400	2600	3200	650	2550	1750	3"	1 1/8"	2 1/8"
SLCO- 75 – 1A	3600	1550	400	2600	3200	650	2550	1750	4"	1 1/8"	2 1/8"
SLCO- 90 – 1A	3600	1600	400	2600	3200	650	2550	1750	4"	1 3/8"	2 5/8"
SLCO- 100-1A	3600	1600	400	2600	3200	650	2550	1750	5"	1 3/8"	2 5/8"
SLCO- 120-1A	3600	1660	350	2600	3200	600	2650	1850	5"	1 5/8"	3 1/8"
SLCO- 150-1A	4100	1660	550	3100	3800	800	2650	1950	5"	1 5/8"	3 1/8"

NOTES: 1. All dimensions in mm except as specified.  
 2. Roughing in dimensions.  
 3. All dimensions are subject to change without notice.



**TABLE 33. WATER COOLED**

MODEL	A	B	C	D	E	F	G	H	L	M	N	P	No. x Q
SLCO-180-2w	4100	1770	1730	600	600	3100	3800	580	850	2650	1850	5"	2
SLCO-200-2w	4600	1770	1730	1650	680	3400	4100	580	920	2800	2000	6"	2
SLCO-240-2w	4600	1770	1730	1650	730	3600	4300	580	970	2900	2100	6"	2
SLCO-300-2w	5600	1870	1780	1700	1030	4600	5300	595	1270	3300	2500	6"	2



**TABLE 34. AIR COOLED**

MODEL	A	B	C	D	E	F	G	L	M	N	P	No. x R	No. x S
SLCO-180-2A	4100	1770	1730	1650	600	3100	3800	850	2650	1850	5"	2 x 1 3/8"	2 x 2 5/8"
SLCO-200-2A	4400	1770	1730	1650	680	3400	4100	920	2800	2000	6"	2 x 1 3/8"	2 x 2 5/8"
SLCO-240-2A	4600	1770	1730	1650	730	3600	4300	970	2900	2100	6"	2 x 1 5/8"	2 x 3 1/8"
SLCO-300-2A	5600	1870	1780	1700	1030	4600	5300	1270	3300	2500	6"	2 x 1 5/8"	2 x 3 1/8"

NOTES: 1. All dimensions in mm except as specified.  
 2. Rounding in dimensions.  
 3. All dimensions are subject to change without notice.

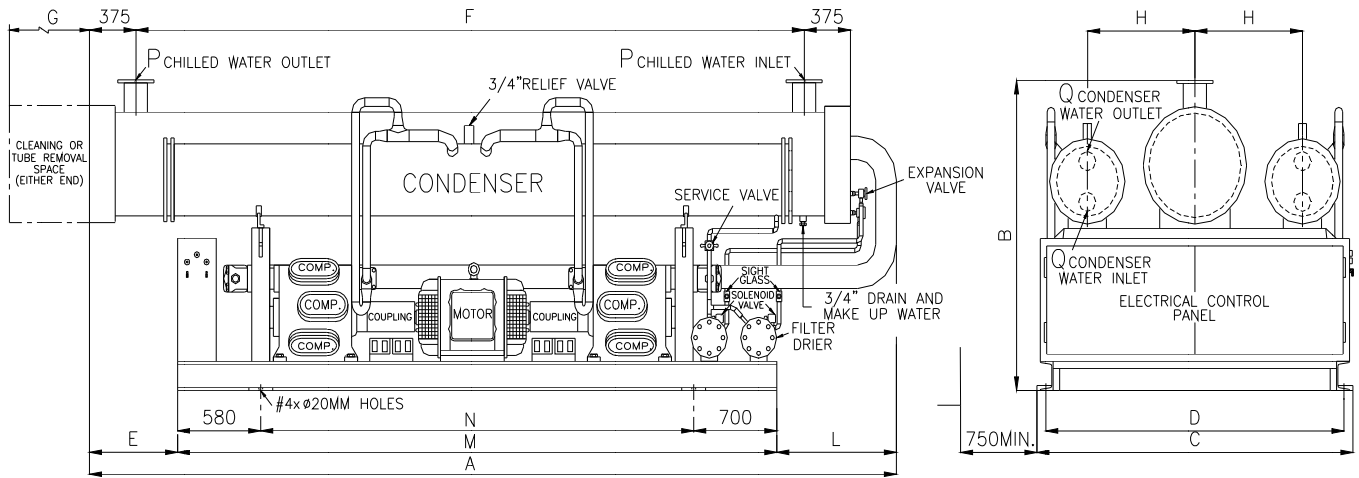


TABLE 35. WATER COOLED

MODEL	A	B	C	D	E	F	G	H	L	M	N	P	No. x Q
SLCO-360-4w	5600	1810	1860	1780	620	4550	5300	570	870	4110	2830	8"	2 x 5"
SLCO-400-4w	5600	1830	1860	1780	600	4550	5300	570	870	4110	2830	8"	2 x 5"
SLCO-480-4w	5600	1910	2040	1960	600	4550	5300	660	850	4150	2870	8"	2 x 5"
SLCO-600-4w	5600	1910	2160	2080	580	4550	5300	685	820	4200	2920	8"	2 x 6"

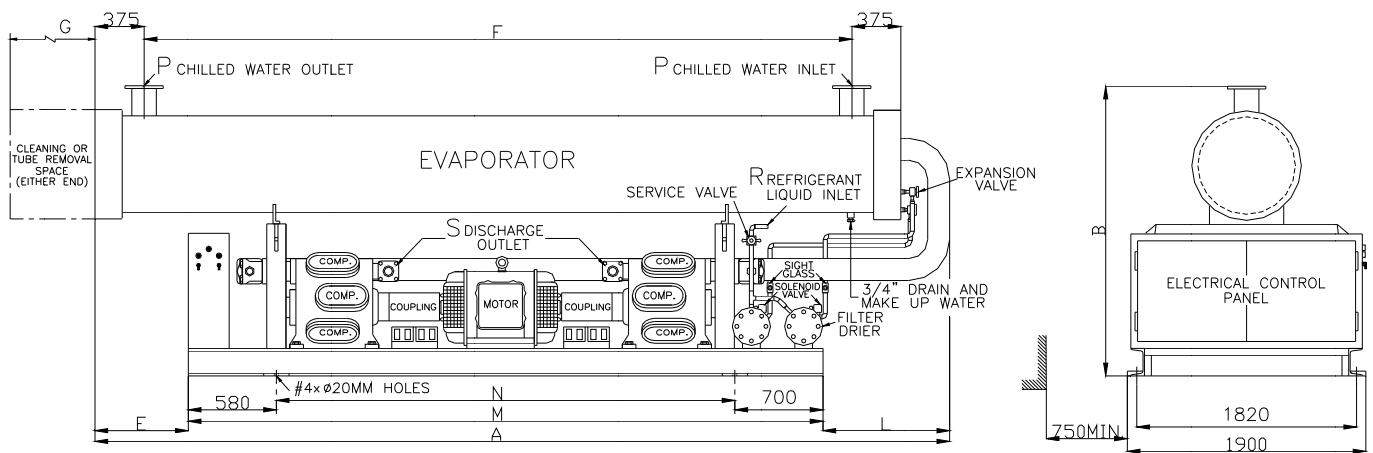


TABLE 36. AIR COOLED

MODEL	A	B	E	F	G	L	M	N	P	No. x R	No. x S
SLCO-360-4w	5600	1810	620	4550	5300	870	4110	2830	8"	2 x 2 1/8"	4 x 2 5/8"
SLCO-400-4w	5600	1830	620	4550	5300	870	4110	2830	8"	2 x 2 1/8"	4 x 2 5/8"
SLCO-480-4w	5600	1910	600	4550	5300	850	4150	2870	8"	2 x 2 5/8"	4 x 3 1/8"
SLCO-600-4w	5600	1910	580	4550	5300	820	4200	2920	8"	2 x 2 5/8"	4 x 3 1/8"

NOTES: 1. All dimensions in mm except as specified.  
 2. Roughing in dimensions.  
 3. All dimensions are subject to change without notice.



Furnish and install where indicated on the plans SARAVEL Model SLCO ..... packaged liquid chiller(s). The unit(s) shall have a capacity of ..... TONS when cooling .....GPM of water from ..... °F to .....°F when supplied with .....GPM of .....°F condenser water. The water pressure drops shall not exceed ..... Feet of water through the cooler and ..... Feed of water through the condenser.

### GENERAL

The packaged liquid chiller(s) shall be completely factory assembled including all interconnecting refrigerant piping and internal wiring of controls and motor starting equipment. Exposed surfaces shall be painted with primer-finisher prior to shipment. The unit shall be shipped with oil charge and operating refrigerant charge. The unit shall include the following:

### EVAPORATOR

The evaporator shall be direct expansion type with refrigerant in the tubes and liquid to be chilled in the shell. The evaporator shall be insulated with 19mm thick, flexible, closed cell fire retardant rubber foam sheets to prevent condensation and provide vapor seal. The evaporator shall have a design working pressure of 350 psig (water side) and 300 psig (refrigerant side) and be constructed and tested in accordance with ASME-Division VIII Unfired Pressure Vessel Code requirements.

### CONDENSER

The condenser shall be cleanable, shell and tube type, with integrally finned copper tubes and removable steel heads. The condenser shall have a design working pressure of 300 psig (water side) and 350 psig (refrigerant side), and be constructed and tested in accordance with ASME Unfired Pressure Vessel Code requirements. The condenser shall be equipped with refrigerant relief valve.

### REFRIGERANT CIRCUIT

The refrigerant circuit shall be complete with insulated suction line and liquid line including shut-off valve with charging connection, filter-drier, sight glass, solenoid valve and thermal expansion valve.

### MOTOR-COMPRESSOR

The compressor(s) shall be open type, multi-cylinder, reciprocating unit. The compressor shall have a forced fed lubrication system and shall include suction strainer, crankcase oil level sight glass, oil strainer, crankcase oil heater, back seating seal cap type suction and discharge valves.

The 4 pole,1450 RPM electric motor shall be protected with inherent all-phase overload protection. The motor shall operate on 380 Volts, 3 Phase, 50 Cycles.

### CAPACITY CONTROL SYSTEM

The capacity control system shall modulate compressor capacity automatically up to 8 stages.

Un loader shall be operated by an oil pressure actuated piston via a solenoid valve and a multistage thermostat responsive to load conditions.

### CONTROL CENTER

All motor starting equipment shall be factory wired and mounted in a fully enclosed metal cabinet complete with lock. Controls shall be wired to a terminal block suitably marked for field interlock connections. The safety and operating controls to be furnished shall include on-off, high and low pressure cut-outs, oil pressure safety cut-out, motor overload protection, water temperature thermostat, flow switch, and anti freeze control. Controls shall be for 220V. Motor starter shall be Star-Delta.

### UNIT BASE

The unit base shall be integral one-piece steel base.

Compressor, drive motor, and vessels shall be solidly mounted on rigid, structural steel base to eliminate vibration and alignment problem



TABLE 37. UNITS CONVERSION TABLE

Physical Quantity	Measurement	Multiply By	To Obtain or To Convert
Area	ft <sup>2</sup>	0.092903	m <sup>2</sup>
Density	lb <sub>m</sub> /ft <sup>3</sup>	16.018	kg/m <sup>3</sup>
Energy	Btu(IT)	1055.1	J
	Btu	1054.4	J
	cal(IT)	4.1868	J
	Cal	4.184	J
Energy flux	Btu/(h.ft <sup>2</sup> )	301525	W/m <sup>2</sup>
	cal/(s.cm <sup>2</sup> )	4.184 E+04	W/m <sup>2</sup>
Force	Kgf	9.80665	N
	Lbf	4.4482	N
Heat-transfer Coefficient	Btu/(h.ft <sup>2</sup> .°F)	5.6745	W/(m <sup>2</sup> .K)
	cal/(s.cm <sup>2</sup> .°c)	4.1184	W/(m <sup>2</sup> .K)
Length	ft	0.3048	m
	in	0.0254	m
	mi (US)	1609.3	m
Mass	lbm	0.45359	kg
	slugs	14.594	kg
Power	Btu/h	0.29288	W
	cal/s	4184	W
	hp (550ft.lbf/s)	745.70	W
Pressure	atm	101.325	Pa
	lbf /in <sup>2</sup>	6894.8	Pa
Specific heat	Btu/( lb <sub>m</sub> .°F)	4.184	kJ/(kg.K)
	cal/(g.°C)	4.184	kJ/(kg.K)
Temperature	(see below)		
Thermal conductivity	Btu.in/(h.ft <sup>2</sup> .°F)	0.14413	W/(m.K)
	Btu/(h.ft.°F)	1.7296	W/(m.K)
	cal/(s.cm.°C)	418.4	W/(m.K)
Velocity	ft/s	0.3048	m/s
Viscosity	Centipoises	0.001	Pa.s
	lb <sub>m</sub> /(h.ft)	4.1338E+04	Pa.s
	lb <sub>m</sub> /(s.ft)	1.4882	Pa.s
	lbf. s/ft <sup>2</sup>	47.880	Pa.s
Viscosity, Kinematic	centistokes	1.0000E	m <sup>2</sup> /s
	ft <sup>2</sup> /s	0.092903	m <sup>2</sup> /s
Volume	ft <sup>3</sup>	0.028317	m <sup>3</sup>
	gal (US liquid)	3.7854 E-03	m <sup>3</sup>
Volume flow rate	ft <sup>3</sup> /min	4.7195 E-04	m <sup>3</sup> /s
	gal (US liquid)/min	6.3090 E-05	m <sup>3</sup> /s
Temperature		T(K) = T(°C) + 273.15	
		T(K) = T(°R) /1.8	
		T(K) = [T(°F) + 459.67] /1.8	
		T(°C) = [T(°F) -32] /1.8	

DERIVATION OF CONSTRAINT USED IN AIR CONDITIONING PROBLEMS

**Air Constant of 4.45**

C.F.M. x 4.45 = lbs. air/hr. (std .air)  
 C.F.M. x 60 = cu. ft./hr. (C.F.H)  
 13.5 cu. ft = 1 lb. Measured at 70 °F 50% rel.hum  
 (Std. air for cooling problems when condensing moisture)

$$\frac{C.F.H.}{13.5} = C.F.M \times \frac{60}{13.5} = C.F.M \times 4.45 = lbs./hr.$$

**Air Constant of 1.087**

C.F.M. x 1.087 x Temperature rise=B.T.U./hr.(70°Fair)  
 C.F.M. x 60 = C.F.H.  
 13.34 cu. ft. = 1 lb. Dry air at 70 °F

$$C.F.M \times \frac{60}{13.34} = C.F.M \times 4.495 = lbs.air/hr.$$

Sp. Ht. of air = 0.2415 Btu/lb<sub>m</sub>.°F  
 B.T.U. = lbs. per hr. x 0.2415 x temperature rise  
 B.T.U. = CFM x 4.495 x 0.2415 x temperature  
 Rise = CFM x 1.087 x temperature rise



# LIQUID CHILLERS SELECTION FORM

**30**

Project Name:  
 Project Place:  
 Estimated by:  
 Client:

Working Pressure:  
 Altitude:  
 Date:     /     /

Chilled Water Flow =                      G.P.M.	Sens. Heat =                      MBH
	Total Heat =                      MBH
Estimated Tonnage = $\frac{\text{GPM} \times (\Delta T = \text{ } ^\circ\text{F}) \times 500}{12000} =$ Ref. Tons.	Estimated Tonnage =                      Ref. Tons.
<b>CONDENSER UNIT TYPE</b>	
Selected Tonnage                      :                      Ref. Tons	Water Cooled <input type="checkbox"/>
Selected model                      :                      Unit (s) Qty.:	Air Cooled <input type="checkbox"/>
Actual Capacity                      :                      Ref. Tons.	
Power Input                      :                      KW	
<b>CONDENSER                      COOLER</b>	
<b>Water Cooled</b>	<b>Air Cooled</b>
EWT =                      °F; ΔT=                      °F	Condensing Temp. =                      °F
LWT =                      °F	Ambient Air Temp. =                      °F
Water Flow =                      GPM	THR § =                      MBH
Water P.D. =                      Ft.	AHR ☆ =                      MBH
THR * =                      Tons	ACF =
In/Out Connection =                      /                      Inches	Ref. Liq. Out =                      Inches
No. of Condensers :	Discharge In =                      Inches
	EWT =                      °F, LWT=                      °F
	ΔT =                      °F
	Water Flow =                      G.P.M
	Water P.D. =                      Ft.
	In/Out Conn =                      /                      Inches
	Water Volume =                      Liter

### FOULING FACTOR EFFECT

Factors	Condenser	Cooler
Fouling Factor (hr. ft <sup>2</sup> .°F/BTU)		
Correction Factor (Tons)		
Correction Factor (KW)		
Corrected Tonnage =                      x                      x                      =                      Ref. Tons. =                      MBH		
Corrected Power =                      x                      x                      =                      KW.		
Average Full Load = (                      /                      ) x                      =                      KW.		
Total Heat Reject. § =                      + (                      x 0.284 ) =                      Ref. Tons. =                      MBH		

### PHYSICAL DATA

Total Length Tube =                      cm. ; Total Width =                      cm. ; Total Height =                      cm.
Removal Space =                      cm. ; Unit Operating Weight =                      Kg.
No. of Compressors =                      ; Normal Comp. Motor Power (each) =                      Hp.
Total Elect. Demand = Liquid Chiller Total KW + Remote Air cooled Cond. KW
T.E.D. =                      KW +                      KW =                      KW

Notes:

\* THR = Total Heat Reject. (Condenser G.P.M. x Δ T x 500) / 12000 = Ref. Tons.  
 § THR = Total Heat Reject. (Cooler Cap. in Tons) + (KW x 0.284) = Ref. Tons.  
 ☆ AHR = Actual Heat Rejection = THR x Altitude Correction Factor

Based on " **SARAVEL LIQUID CHILLERS UNIT** " CAT. NO. .... (Tehran / Iran)





**SARAVEL CORP.**

**Mar. 2010**

Manufacturer reserves the right to make changes in design and construction, without notice.

**(Head Office)**

No. 43, North Sheikh Bahai Avenue, Tehran 19917, IRAN

Tel: (+98-21) 88046921 (6 lines) Fax: (+98-21) 88046920

E-Mail Address: [sales@saravel.com](mailto:sales@saravel.com)

Web Site: <http://www.Saravel.com>