Immersion Coils

TITAN supplies Titanium Immersion Coils in many different configurations to meet the specific needs of the industry. Grid coils are used to achieve the maximum heat transfer area in the least amount of dimensional space, while Serpentine and "U" coils are used in situations where smaller heat transfer requirements are needed.

Sizing Heating Coils

Calculate the BTUs required to heat up a plating tank. Once the BTUs are established, calculate the amount of square footage of coil to put into the tank.

Required Input:

- Tank size
- Operating temperature
- Ambient temperature
- Solution density (1 gallon of water = 8.33 lbs)
- Total gallons (length in feet × width in feet × depth in feet × 7.5)
- Heat-up time (hours)
- Heating source (steam pressure or hot water temperature)

STEP 1: ABTUs / Hr:

$$\frac{\text{gallons} \times \text{solution density} \times \Delta T\ (\text{Oper. temp} - \text{Amb. temp})}{\text{Heat-up time}}$$

STEP 2: AMTD (average mean temperature difference) for *Steam:*

$$\frac{(\text{Steam temp} - \text{Amb. temp}) + (\text{Steam temp} - \text{Oper. temp})}{2}$$

or AMTD for *Hot Water:*

$$\frac{(\text{Hot Water temp} - \text{Amb. temp}) + ((\text{Hot Water temp} - 10°\text{F}) - \text{Oper. temp})}{2}$$

STEP 3: Total Square Footage Required:

$$\frac{\text{ABTUs / Hr}}{150\ \text{U-factor for hot water (or 200 U-factor for steam)} \times \text{AMTD}}$$

STEP 4: Square Footage per Coil:

$$\frac{\text{Total square footage required}}{\text{Number of coils per tank}}$$

Sizing Cooling Coils

Calculate the BTUs required to be removed from the plating tank. Then calculate the amount of square footage of coil to put into the tank.

Required Input:

- Tank size
- Operating temperature
- Temperature of Cooling Source
- Total AMPs
- Total Volts
- Solution Density (1 gallon of water = 8.33 lbs)

BTUs / Hr: AMPs × Volts × 3.412

Square Footage Required:

$$\frac{\text{BTUs / Hr}}{150\ \text{U-factor} \times (\text{Oper. temp} - \text{temp of Cooling Source})^*}$$

*Must have at least 15° ΔT between Oper. temp and Cooling Source

BTUs / Hr Without AMPs & Volts Input:

STEP 1:

$$\frac{\text{Gallons} \times \text{solution density}}{\text{Time it takes to build to maximum temperature}}$$

STEP 2 Max. temp – Oper. temp = Temperature Difference

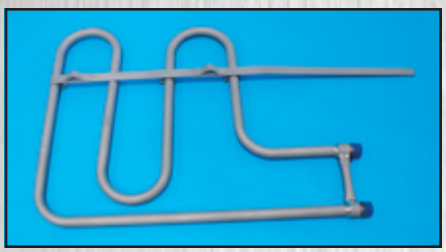
STEP 3: (Step 1) × (Step 2) = BTU / Hr to be removed

STEP 4: Complete above formula to obtain square footage needed for cooling

EXAMPLE: Input = 2000 gallons, 8.33lbs/gal Oper. Temp = 170°F Max. Temp = 200°F
4 hours to reach Max. Temp. Cooling Water Temp = 60°F

FORMULA: 2000 × 8.33 = 16,600 / 4 hours = 4165; 4165 × 30°F (Temp. Difference) = 124,950 BTUs / Hr

$$\frac{124{,}950\ \text{BTU}}{150\ \text{U-factor} \times (170°\text{F Oper. temp} - 60°\text{F Cooling Water})} = \textbf{7.6 sq. ft.}$$



QUICK REFERENCE GUIDE

TITAN Metal Fabricators has assembled this reference guide containing standard specifications, formulas and "Rules of Thumb" used in the Metal Finishing industry. These formulas cannot be used in all circumstances. For more detailed thermal evaluation, please contact **TITAN**'s technical staff.

TITAN Metal Fabricators produces a complete line of Titanium Metal Finishing Equipment including:

- Titanium Anode Baskets
- Immersion Heating & Cooling Coils
- Shell & Tube Heat Exchangers
- Titanium-Clad Copper Bus Bars
- Tanks, Tank Liners
- Anode Hooks
- Auxiliary Anodes
- Custom Fabricated Products

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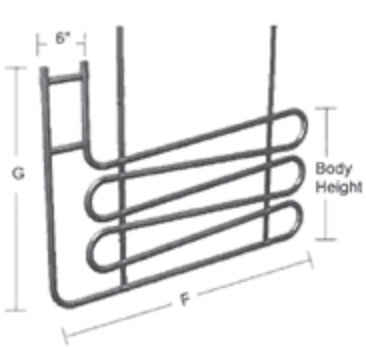
Determining Your **TITAN** Coil Model Number

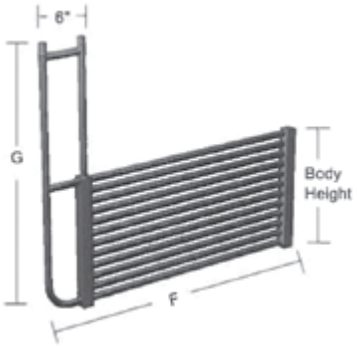
1. Match the square footage calculated from the formulas in this Reference Guide to the coils shown in the following charts.
2. Select the coil with the height and length to fit in your tank.
3. Add customer supplied information (*) for columns A, C and D.

TITAN Coil Model Numbers contain eight fields of information:

A. Material Type: Ti, Zr, Nb, Ta or SS
B. Coil Style: G = Grid; S = Serpentine; H = Helical; U = "U"
C. Orientation: H = Horizontal; V = Vertical; B = Bottom Mount
D. Heat / Cool Source: S = Steam; W = Water; F = Freon
E. Number of Passes (as below)
F. Length of Coil (as required)
G. Riser Length (as below) can be special ordered
H. Square Footage Per Coil (as below)



SERPENTINE



GRID

E X A M P L E :

A	B	C	D	E	F	G	H
TI	G	H	S	8	22	36	5.5

Model #TIGHS8-22-36-5.5

Ti; Grid; Horizontal; Steam; 8 Pass; 22″ Long; 36″ Risers; 5.5 sq. ft. / coil

Larger and custom coils available upon request.

TITAN Serpentine Coil Model Numbers

4 Pass (Body Height = 19″)

A	B	C	D	E	F	G	H
*	S	*	*	4	28	36	2.5
*	S	*	*	4	34	36	3.5
*	S	*	*	4	46	36	4.5
*	S	*	*	4	58	36	5.5
*	S	*	*	4	70	36	6.5
*	S	*	*	4	82	36	7.5
*	S	*	*	4	94	36	8.5
*	S	*	*	4	106	36	9.5
*	S	*	*	4	118	36	10.5

6 Pass (Body Height = 21″)

A	B	C	D	E	F	G	H
*	S	*	*	6	34	36	5.5
*	S	*	*	6	46	36	6.75
*	S	*	*	6	58	36	8.5
*	S	*	*	6	70	36	10
*	S	*	*	6	82	36	11.5
*	S	*	*	6	94	36	13
*	S	*	*	6	106	36	14.5
*	S	*	*	6	118	36	16

8 Pass (Body Height = 30″)

A	B	C	D	E	F	G	H
*	S	*	*	8	34	48	7.5
*	S	*	*	8	46	48	9.5
*	S	*	*	8	58	48	11.5
*	S	*	*	8	70	48	13.5
*	S	*	*	8	82	48	15.5
*	S	*	*	8	94	48	17.5
*	S	*	*	8	106	48	19.5
*	S	*	*	8	118	48	21.5

*Customer supplied information

TITAN Grid Coil Model Numbers *(20, 24 and 28 Pass Grid Coils are available upon request)*

8 Pass (Body Height = 12″)

A	B	C	D	E	F	G	H
*	G	*	*	8	22	36	4.5
*	G	*	*	8	28	36	5.5
*	G	*	*	8	34	36	6.5
*	G	*	*	8	46	36	8.5
*	G	*	*	8	58	36	10.5
*	G	*	*	8	70	36	13.5
*	G	*	*	8	82	36	15
*	G	*	*	8	94	36	17
*	G	*	*	8	106	36	19
*	G	*	*	8	118	36	21

12 Pass (Body Height = 18″)

A	B	C	D	E	F	G	H
*	G	*	*	12	22	36	6.5
*	G	*	*	12	28	36	8
*	G	*	*	12	34	36	10
*	G	*	*	12	46	36	13
*	G	*	*	12	58	36	16
*	G	*	*	12	70	36	19
*	G	*	*	12	82	36	22.5
*	G	*	*	12	94	36	25.5
*	G	*	*	12	106	36	28.5
*	G	*	*	12	118	36	31

14 Pass (Body Height = 21″)

A	B	C	D	E	F	G	H
*	G	*	*	14	22	48	8.5
*	G	*	*	14	28	48	10.5
*	G	*	*	14	34	48	12
*	G	*	*	14	46	48	15
*	G	*	*	14	58	48	18.5
*	G	*	*	14	70	48	22.5
*	G	*	*	14	82	48	26
*	G	*	*	14	94	48	29.5
*	G	*	*	14	106	48	33.5
*	G	*	*	14	118	48	37

16 Pass (Body Height = 24″)

A	B	C	D	E	F	G	H
*	G	*	*	16	22	48	9.5
*	G	*	*	16	28	48	11
*	G	*	*	16	34	48	13
*	G	*	*	16	46	48	17.5
*	G	*	*	16	58	48	21.5
*	G	*	*	16	70	48	25.5
*	G	*	*	16	82	48	30
*	G	*	*	16	94	48	34
*	G	*	*	16	106	48	38.5
*	G	*	*	16	118	48	42.5

Standard Coil Features

- 1″ O.D. titanium tubing
- ¾″ to 2″ NPT Nipples
- Horizontal or Vertical orientation for side wall mounting (bottom mounts available)
- Support braces between riser tubes for coil strength
- All styles equipped for water or steam
- Grid coils incorporate D-shaped tube vertical manifold design

- Pressure tested at 150 psi
- 100% inert gas purged welds
- 5-year warranty on workmanship

Coil Options:

- Hanger straps
- Anti-flotation Arms
- Solution Level Jackets
- Material: Titanium, Stainless Steel, Zirconium, Tantalum, Niobium

TITAN® METAL FINISHING

Please supply the following information upon submitting an inquiry to **TITAN** via phone, fax or e-mail:

1. Quantity _____
2. Material Type _____
3. Style _____
4. Accessories Required _____
5. Model Number _____
6. For Heating or Cooling _____
7. Heating / Cooling Source _____
8. Heating / Cooling Source Temperature _____
9. Tank Size & Solution Level _____
10. Operating Temperature _____
11. Ambient Temperature _____
12. Weight of Solution (if not water) _____
13. Desired Heat-up Time _____
14. Amps & Volts _____
15. Contact & Phone _____

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