

APPLICATION GUIDE: PRODUCTION & PROCESSING OF ACIDS & BASES

The Problem:

Equipment and process issues arise when heating and cooling highly corrosive fluids such as Sulfuric, Nitric, Hydrochloric Acids, Hydrofluoric Acids, and bases such as Liquid Caustic. Most materials used in heat exchangers are affected by changes in temperature, concentration, or pH of the corrosive stream. This leads to fouling, scaling, and premature failure of both metal and graphite heat exchangers.

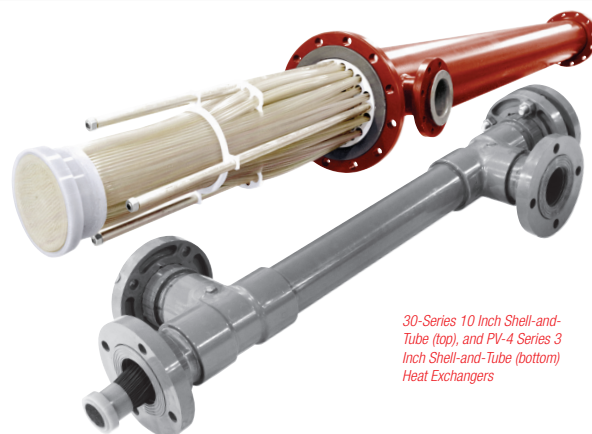
The Solution:

AMETEK Fluoropolymer Shell and Tube Heat Exchangers provide the ideal solution for heat exchange in processing corrosive liquids. Our Heat Exchangers provide unmatched resistance to corrosion, thermal/mechanical shock, and differential expansion. The original heat transfer efficiency of the exchanger is preserved by minimizing external fouling and internal scaling without surface passivation.

The Fluoropolymer Advantage:

AMETEK has been the original and the leading manufacturer of Fluoropolymer Shell and Tube Heat Exchangers for over 50 years. Our extensive, global experience in the Chemical Processing Industry allows us to provide customers with the experience and expertise needed to meet the ever-changing challenges in this competitive market.

AMETEK Fluoropolymer Heat Exchangers



30-Series 10 Inch Shell-and-Tube (top), and PV-4 Series 3 Inch Shell-and-Tube (bottom) Heat Exchangers

provide the user with increased productivity, efficiency, value-in-use through savings in plant maintenance, and extended heat exchanger service life. All units feature our proven, unique honeycomb structure which provides a lightweight, compact bundle design. The material is inert to nearly all chemicals, and affords heat exchanger versatility in plants with multiple corrosive streams. Fluoropolymer Heat exchangers are backed by AMETEK's excellent quality, service, and support.

AMETEK Fluoropolymer Shell and Tube Heat Exchangers are part of AMETEK's full product line of Fluoropolymer Heat Exchangers. A wide variety of capacities and sizes are available to meet virtually any type of process heat transfer requirement. AMETEK also provides coil configurations and specialty heat exchangers to meet the needs of custom applications.

The Competitive Summary:

Our Fluoropolymer material solves the typical problems which plague heat exchange equipment used in the Chemical Processing Industry. In demanding chemical processing applications, operational performance and overall life expectancy of AMETEK's heat exchangers are not compromised by these problems. AMETEK's superior performance and lead time advantage are summarized below.

	No Fouling	No Scaling	No Thermal Shock	No Differential Expansion	No Corrosion	Typical Availability
Fluoropolymer	✓	✓	✓	✓	✓	6-8 weeks
Titanium	✗	✗	✓	✓	✗	18-20 wks
Zirconium	✗	✗	✓	✓	✗	22-24 wks
Tantalum	✗	✗	✓	✓	✗	30-32 wks
Hastalloy	✗	✗	✓	✓	✗	18-20 wks
Graphite	✗	✗	✗	✗	✓	12-14 wks
Glass	✗	✗	✗	✗	✓	14-16 wks

IMMERSION COILS

Supercoil Models 100, 168, 280 FEP, PFA and Q-Series

AMETEK Supercoil Heat Exchangers are high efficiency immersion coils designed for heating and cooling a wide range of metal finishing solutions. Applications include: electroplating, electroforming and electroless plating baths; acidic and alkaline solutions for etching, chemical milling, anodizing, cleaning, stripping, electropolishing and other similar operations. The well-known non-stick characteristics of fluoropolymer resins resist corrosion and fouling, and its high electrical resistance minimizes the effects of stray currents in electroplating tanks.

Supercoids are available in FEP and PFA as well as in proprietary Q-Series tubing formulations. Q-Series coils are made using a special fluoro-carbon compound that significantly improves thermal efficiency and increases temperature and pressure capabilities. Q-Series Supercoids are ideal for most metal finishing operations, particularly those involving electroless nickel and copper plating.

Supercoil Model 280 (right)
 and Ultrahigh Purity (UHP)
 Model 168 (below)



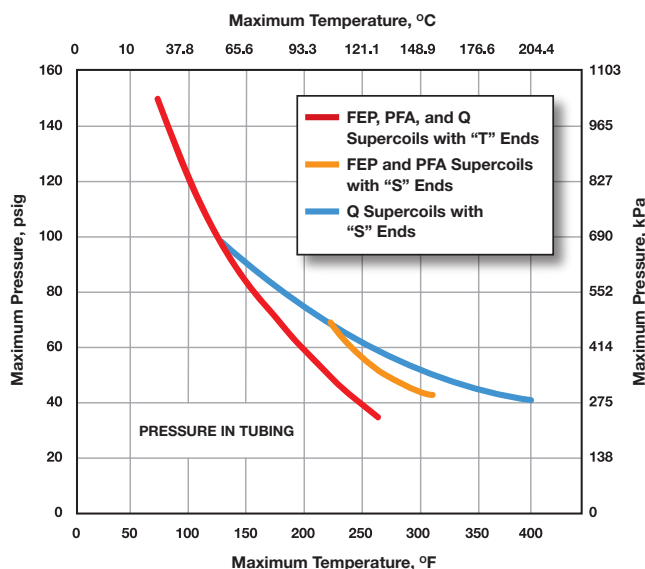
Specifications

Description	Spec
Tube Outside Diameter	0.10 inch (2.54 mm)
Tube Wall Thickness	0.01 inch (.254 mm)
Average Heat Transfer Coefficient Q	80 to 120 BTU/Hr.-ft. ² -°F (454 to 682 watts/m ² -°K)
Average Heat Transfer Coefficient FEP	40 to 60 BTU/Hr.-ft. ² -°F (227 to 341 watts/m ² -°K)

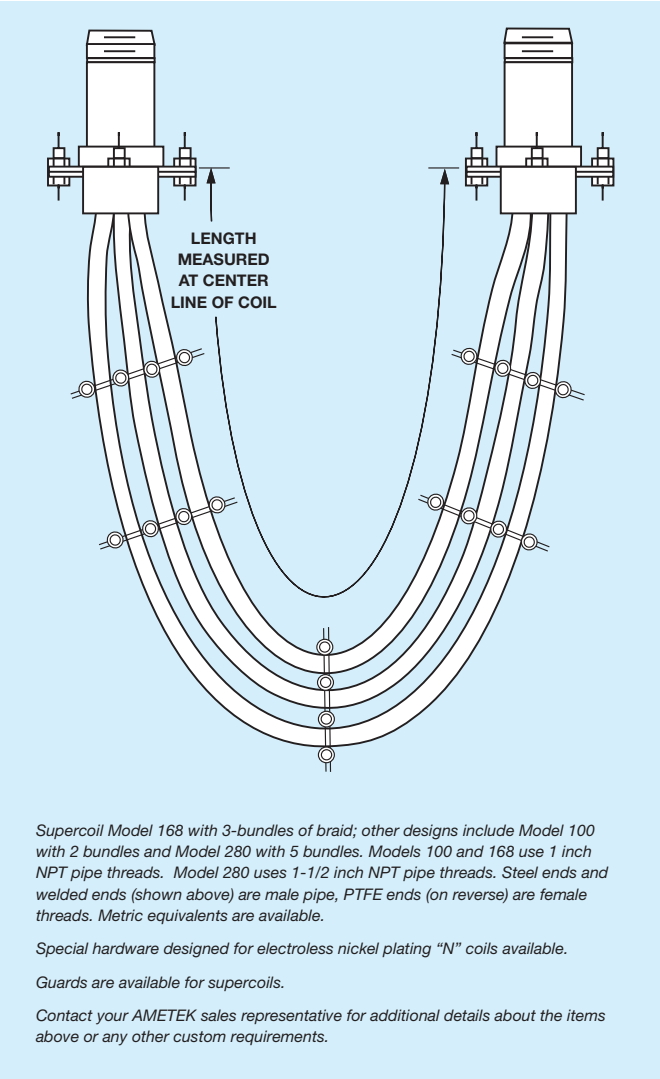
Model Number

EXAMPLE: Q M 280 N S M 4 8		
Q	RESIN TYPE	P = PFA
		Q = PFA/Graphite
		(blank) = FEP
M	SUPERCIL	
280	MODEL NUMBER	100
		168
		280
N	SPACERS	N = Polypropylene
		(blank) = CPVC
S	END CONNECTIONS	S = Stainless Steel
		T = PTFE
		W = Welded
M	END THREADS	M = Metric
		(blank) = NPT
4	GENERATION	
8	NOMINAL LENGTH (ft.)	

Operating Limits



Dimensions – Model 168 Supercoil

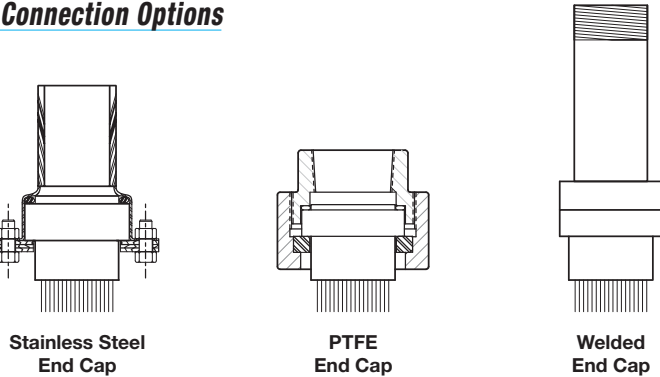


Heat Transfer Area

MODEL 100		MODEL 168		MODEL 280		
AREA		AREA		AREA		NOMINAL LENGTH*
ft ²	m ²	ft ²	m ²	ft ²	m ²	feet
6.5	0.6	11.0	1.0	18.3	1.7	3
9.2	0.9	15.4	1.4	25.6	2.4	4
11.8	1.1	19.8	1.8	33.0	3.1	5
14.4	1.3	24.2	2.2	40.3	3.7	6
		28.6	2.7	47.6	4.4	7
		33.0	3.1	54.9	5.1	8
		37.4	3.5	62.3	5.8	9
		41.8	3.9	69.6	6.5	10
		46.2	4.3	76.9	7.1	11
		50.6	4.7	84.3	7.8	12
		54.9	5.1	91.6	8.5	13
		59.3	5.5	98.9	9.2	14
		63.7	5.9	106.2	9.9	15
		68.1	6.3	113.6	10.5	16

* As measured at center line of coil

Connection Options



AMETEK®
FLUOROPOLYMER PRODUCTS

42 MOUNTAIN AVENUE
NESQUEHONING, PENNSYLVANIA, 18240-2201 U.S.A.
TEL: +1 570-645-6917 • 800-441-7777 (U.S. and Canada only)
FAX: +1 570-645-6950
www.ametekfpp.com
E-mail: info.fpp@ametek.com

© 2017, by AMETEK, Inc. All rights reserved.
617PDF (040084)

Fluoropolymer resins are generally considered inert to most chemicals. Under certain conditions of pressure and temperature, or combinations of chemicals, fluoropolymer tubing should not be used. Please contact AMETEK for discussion of your specific process to be certain that our products are appropriate for your intended use.

Adequate ventilation should be used where fluoropolymers are heated during tube repairs. Flu-like symptoms may occur from exposure to vapors evolved from fluoropolymers at very high temperatures, up to 800°F or from smoking materials that contain particles of fluoropolymers. Symptoms pass within 48 hours and are the only adverse effects observed in humans to date. Unheated fluoropolymers are essentially inert and are nonirritating to the skin.

This information set forth herein is furnished free of charge and is based on technical data which AMETEK believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with your use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

FLUOROPOLYMER HEAT EXCHANGERS AND TUBING

Slimline Coil™ Model D 500 & QD 500 Heat Exchangers

FEATURES

AMETEK Slimline Coil™ Fluoropolymer Heat Exchangers are widely used in the metal finishing and chemical processing industries, and are especially suited to batch and continuous steel pickling applications. The inherent non-stick characteristics of fluoropolymer resins resist corrosion and fouling, extend heat exchanger service life, and improve value-in-use through savings in plant maintenance costs.

AMETEK Q-Series Slimline Coil™ Heat Exchangers are constructed from a proprietary resin compound that improves durability, and pressure and temperature capabilities over conventional coils—high performance that enables AMETEK Q-Series Slimline Coils™ to handle many steam heating applications without desuperheating. In metal processing, high efficiency AMETEK Slimline Coil™ Heat Exchangers also save energy...reduce waste...and cut processing costs by minimizing acid consumption and spent pickle liquor disposal.

SPECIFICATIONS

AMETEK Slimline Coil™ Heat Exchangers are available in Q-Series as well as FEP, in U-shape as well as straight configurations ranging in lengths from 4 to 16 feet (1.2 to 4.9 m).

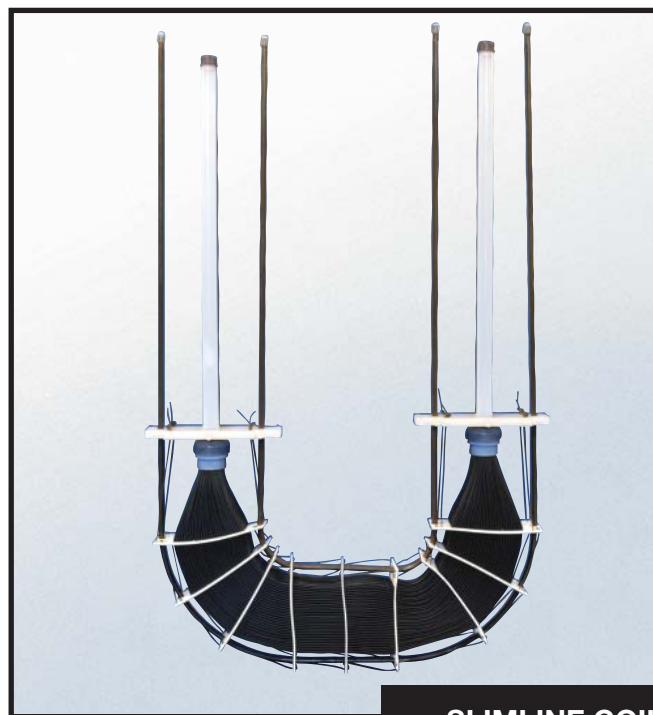
Heat Transfer Area—49 to 245 ft.² (4.6 to 22.8 m²).

PRODUCT DESCRIPTION

Tube Outside Diameter	.125 inch (3.175 mm)
Tube All Thickness	.0125 inch (.3175 mm)
Average Heat Transfer Coefficient (U) Q Resin	60-100 BTU/Hr.-ft. ² -°F (293-488 Kcal/Hr.-m ² -°C)
Average Heat Transfer Coefficient (U) FEP, PFA	30-50 BTU/Hr.-ft. ² -°F (146-244 Kcal/Hr.-m ² -°C)

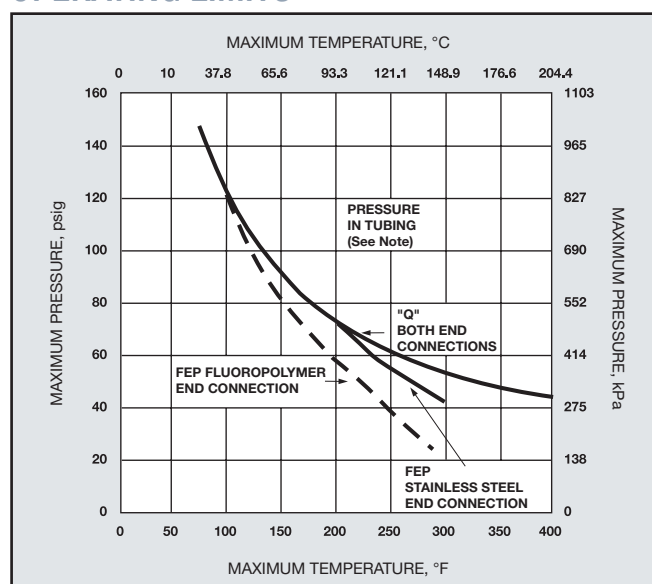
APPLICATION LIMITATIONS

Contact an AMETEK representative for chemical resistance data on your application.



SLIMLINE COIL

OPERATING LIMITS



NOTE: Maximum steam pressure tubeside—50 psig (345 kPa) using Q-tubing

FEP Series coils are considered inert to corrosive chemicals. Contact an AMETEK representative for chemical resistance data on your specific application.
Q-Series heat exchangers are inert to most corrosive chemicals except for certain concentrated hot, oxidizing acids.

**Fluoropolymer
HEAT EXCHANGERS**

HEAT TRANSFER AREA

NOMINAL LENGTH	AREA	
	ft. ²	m ²
4	49.0	4.6
5	65.0	6.1
6	82.0	7.6
7	98.0	9.1
8	114.0	10.6
10	147.0	13.6
12	180.0	16.7
14	213.0	19.7
16	245.0	22.8

NOMENCLATURE Q-D-C-500-SM-8-10-2

RESIN TYPE

(Blank) = FEP
Q = PFA/G

SLIMLINE COIL

SUPPORT RODS (TEFLON® COATED)

(Blank) = Carbon Steel
C = Stainless Steel

MODEL NUMBER

END CONNECTIONS

S = Stainless Steel
T = TEFLON® Type
SM = SS/Metric

COIL CONFIGURATION

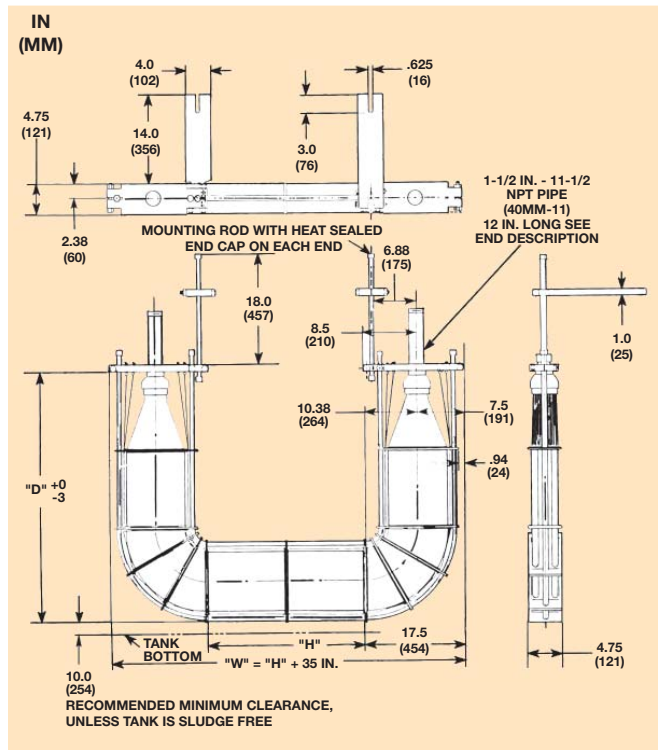
0-12 = H Dimension (0-12 ft.)
SS = Straight coil – side-mounted
SB = Straight coil – bottom-mounted
U = Tight "U"

NOMINAL LENGTH (FT.)

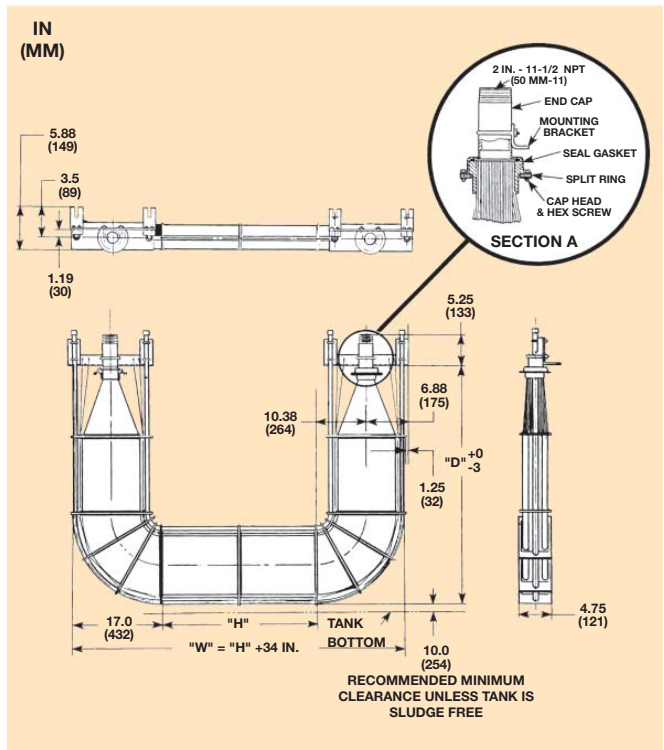
GENERATION

TEFLON® is a registered Trademark of DuPont used under license

EXTENDED SLIMLINE COIL—GENERATION 8 ("T" End)



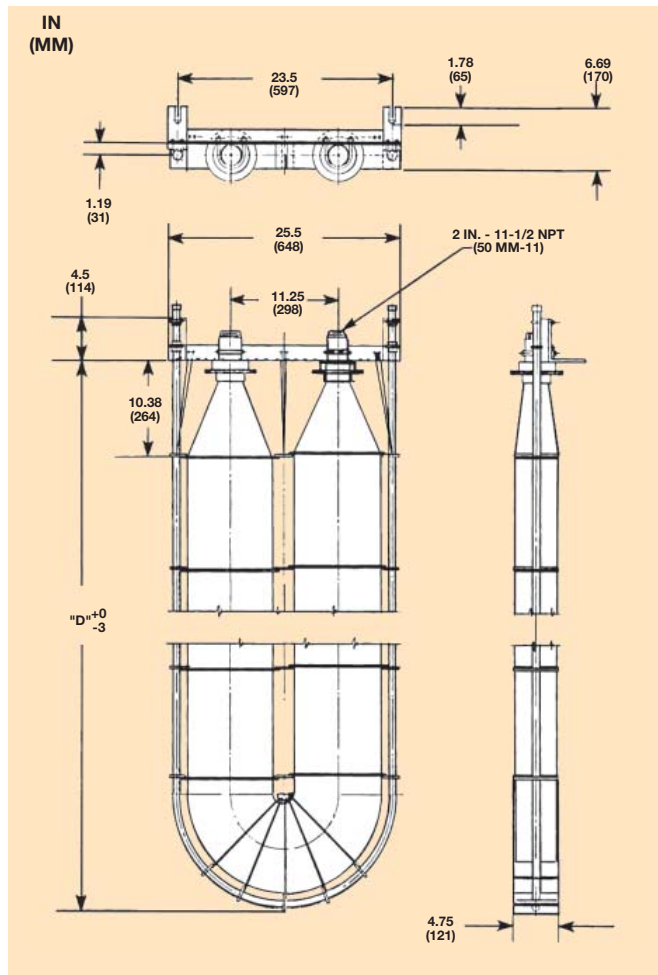
EXTENDED SLIMLINE COIL—GENERATION 8 ("S" End)



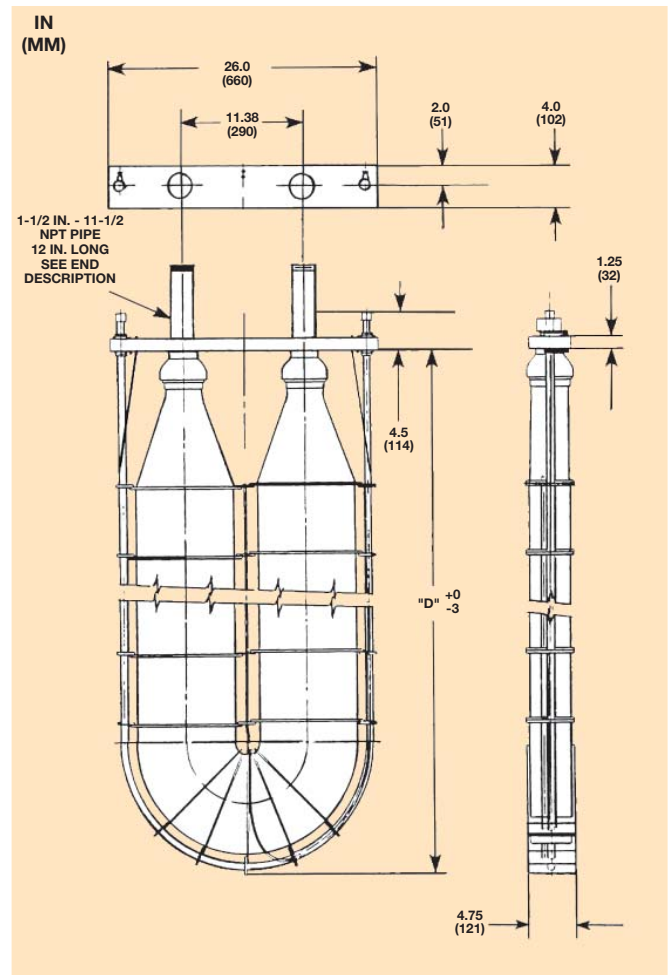
EXTENDED SLIMLINE COILS

NOM. LENGTH, FEET	"H" DIMENSION, (ft.)												
	0	1	2	3	4	5	6	7	8	9	10	11	12
	"D" DIMENSION +0 IN. -3 IN.												
5	3 ft. 2-1/4 in.	2 ft. 8-1/4 in.											
6	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.										
7	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.									
8	4 ft. 5-1/4 in.	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.								
10	5 ft. 5-1/4 in.	4 ft. 11-1/4 in.	4 ft. 5-1/4 in.	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.						
12	6 ft. 5-1/4 in.	5 ft. 11-1/4 in.	5 ft. 5-1/4 in.	4 ft. 11-1/4 in.	4 ft. 5-1/4 in.	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.				
14	7 ft. 5-1/4 in.	6 ft. 11-1/4 in.	6 ft. 5-1/4 in.	5 ft. 11-1/4 in.	5 ft. 5-1/4 in.	4 ft. 11-1/4 in.	4 ft. 5-1/4 in.	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.		
16	8 ft. 5-1/4 in.	7 ft. 11-1/4 in.	7 ft. 5-1/4 in.	6 ft. 11-1/4 in.	6 ft. 5-1/4 in.	5 ft. 11-1/4 in.	5 ft. 5-1/4 in.	4 ft. 11-1/4 in.	4 ft. 5-1/4 in.	3 ft. 11-1/4 in.	3 ft. 5-1/4 in.	2 ft. 11-1/4 in.	2 ft. 5-1/4 in.

"U"=TIGHT "U" SLIMLINE COIL—GENERATION 6 ("S" End)



"U"=TIGHT "U" SLIMLINE COIL—GENERATION 6 ("T" End)



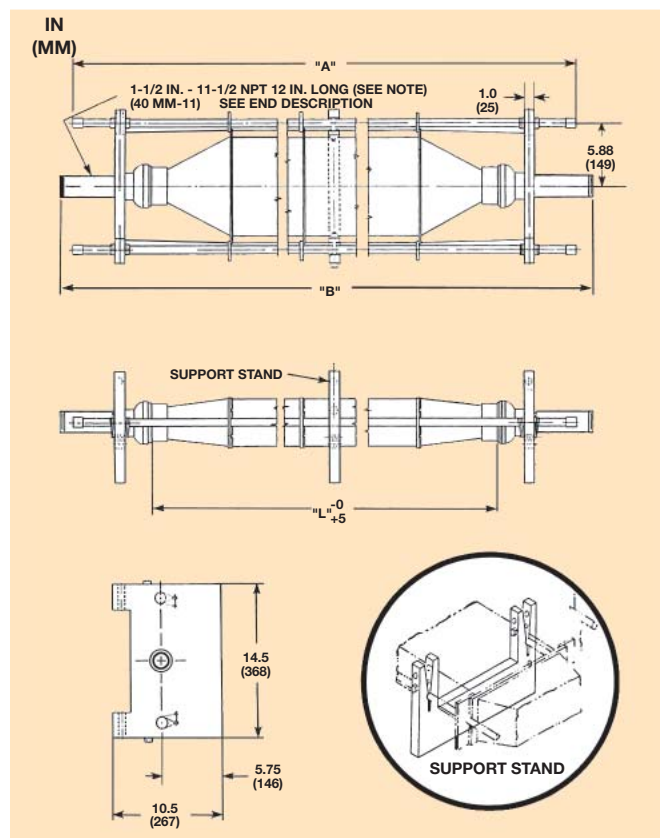
TIGHT "U" SLIMLINE COIL—GENERATION 6

LENGTH (ft.)	"D" DIMENSION
5	3 ft. 1/2 in.
6	3 ft. 6-1/2 in.
7	4 ft. 1/2 in.
8	4 ft. 6-1/2 in.
10	5 ft. 6-1/2 in.
12	6 ft. 6-1/2 in.
14	7 ft. 6-1/2 in.
16	8 ft. 6-1/2 in.

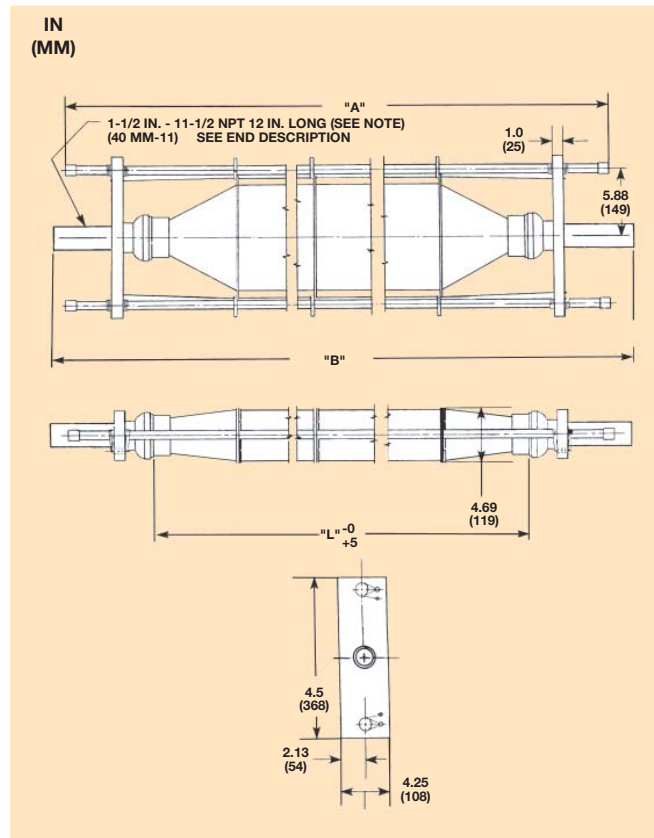
TIGHT "U" SLIMLINE COIL—GENERATION 6

LENGTH (ft.)	"D" DIMENSION
5	3 ft. 1-3/4 in.
6	3 ft. 7-3/4 in.
7	4 ft. 1-3/4 in.
8	4 ft. 7-3/4 in.
10	5 ft. 7-3/4 in.
12	6 ft. 7-3/4 in.
14	7 ft. 7-3/4 in.
16	8 ft. 7-3/4 in.

STRAIGHT SLIMLINE COIL—GENERATION 8-SB



STRAIGHT SLIMLINE COIL—GENERATION 8-SS



LENGTH (ft.)	QD500-T-8-NL-SB & SS			NUMBER OF SUPPORT STANDS REQUIRED
	"A"	"B"	"L"	
4	5 ft. 8-1/4 in.	6 ft. 11 in.	4 ft. 5 in.	0
5	6 ft. 8-1/4 in.	7 ft. 11 in.	5 ft. 5 in.	0
6	7 ft. 8-1/2 in.	8 ft. 11 in.	6 ft. 5 in.	0
7	8 ft. 8-1/4 in.	9 ft. 11 in.	7 ft. 5 in.	1
8	9 ft. 8-1/4 in.	10 ft. 11 in.	8 ft. 5 in.	1
10	11 ft. 8-1/4 in.	12 ft. 11 in.	10 ft. 5 in.	1
12	13 ft. 8-1/4 in.	14 ft. 11 in.	12 ft. 5 in.	2
14	15 ft. 8-1/4 in.	16 ft. 11 in.	14 ft. 5 in.	2
16	17 ft. 8-1/4 in.	18 ft. 11 in.	16 ft. 5 in.	2

END DESCRIPTION

The 12 inch welded pipe shown as "T" end hardware is standard only for units produced from Q tubing (QD500T-). Units produced from FEP tubing (D500T-) are supplied with 1-1/2 inch NPT female threads in the endbell.

Fluoropolymer resins are generally considered inert to most chemicals. Under certain conditions of pressure and temperature, or combinations of chemicals, fluoropolymer tubing should not be used. Please contact AMETEK for discussion of your specific process to be certain that our products are appropriate for your intended use.

Adequate ventilation should be used where fluoropolymers are heated during tube repairs. Flu-like symptoms may occur from exposure to vapors evolved from fluoropolymers at very high temperatures, up to 800°F or from smoking materials that contain particles of fluoropolymers. Symptoms pass within 48 hours and are the only adverse effects observed in humans to date. Unheated fluoropolymers are essentially inert and are nonirritating to the skin.

This information set forth herein is furnished free of charge and is based on technical data which AMETEK believes to be reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside our control, we make no warranties, express or implied, and assume no liability in connection with your use of this information. Nothing herein is to be taken as a license to operate under or a recommendation to infringe any patents.

AMETEK®
CHEMICAL PRODUCTS

455 CORPORATE BOULEVARD, NEWARK, DELAWARE 19702 U.S.A.

TEL: (302) 995-0400 • (800) 441-7777 • FAX: (302) 456-4444 • www.ametekhaveg.com • E-mail: info.haveg@ametek.com

© 2005, by AMETEK, Inc. All rights reserved.
605PDF (040038)