

# ABB's Railcar Rental Program is the Ticket for Power Transformer Transport Projects

Get onboard. ABB's Railcar Rental program can help make your next large power transformer transport project run smoothly from start to finish -- and save you money in the process.

If you ever managed a large power transformer relocation project, you know it requires a specially designed railcar to handle the large dimensions and extreme weight. What you may not know is that the ABB Power Transformer Division owns and operates a fleet of these unique railcars.

As customer demand for these railcars continues to grow, ABB is answering the need with a comprehensive program designed to help them meet the complex logistics associated with moving transformers by rail.

#### **Railcar Rental Arrangements and Terms**

ABB's rail specialists are available to assist customers in all areas of railcar selection, scheduling, insurance and contracting.

Rental terms typically include, but are not limited to, the following:

- Daily rental rates are applicable from the day the car departs an ABB facility until the day it returns.
- All freight charges are the customer's responsibility.
- Any damage to the railcar, whether caused by customer or railroad, is the responsibility of the customer.
- A rental contract must be executed prior to the release of any railcar to the customer.

#### Contact talks with Mr. Craig Steffey (ABB Traffic Administrator) about railcar rental.

#### Q. Why rent a railcar?

A. Companies with occasional uses for railcars cannot justify the high cost of ownership. A 12 axle depressed center car can cost \$750,000, and a 20 axle schnabel car can run as much as \$2.2 million to build. One company may need several types of railcars to carry the different transformers they own. And building these railcars can take as long as two years.

### Q. What types of transformers will ABB's railcars carry?

A. Our depressed center cars will carry any make if dimensions and weight allow. The schnabel cars are designed for certain Westinghouse, ABB and GE **Specialized Railcar Types and Uses** 



Depressed Center -12 axle depressed center flatcars are used with larger load requirements. These cars are equipped with a cushioning system to provide a smooth ride along the rails.

**Schnabel** - Certain transformers are designed to be an

integral part of the

"schnable type" car. The

transformer attaches to

railcar frames utilizing a

pinning system located

to ride approximately 6"

above the rail. These cars range in mechani-

cal design from 12 to

near the base. This allows the transformer



• ABB technical assistance is required onsite during the loading and unloading of schnable cars.

#### units. We have special adapters for our schnabel cars that allow each car to carry different makes and types. Our side rail is for use with GE side rail transformers only. **Q. What are the typical lead times** needed to rent a railcar?

A. ABB's railcars typically range from immediate availability, to three, to as much as six months lead time. Right now we have four cars in use and three are available from our depot in New Castle, PA. Our schedule for these cars changes on a day to day basis. I encourage customers to contact us at least three months in advance of a project to rent a car. Even if we have the car a customer needs, there are other time intensive issues such as contracts, insurance, special permits and other requirements that must be addressed prior to delivering a railcar to the project site. **Railcar Types and Capacities** The ABB Railcar Rental Program includes the type and class of railcars listed below.

20 axles.

<u>Car #</u>	<u>Type</u>	Load (lbs.)				
PTDX7060	Dep. Center	512,000				
PTDX7061	Dep. Center	620,000				
PTDX-201	Schnabel	750,000				
PTDX-202*	Schnabel	1,000,000				
PTDX-203	Schnabel	750,000				
PTDX-204	Schnabel	750,000				
PTDX-205	Side Rail	733,000				

\* A special train is required to move this car under load.Special train rates are charged on a per-mile basis, plus normal freight charges.

Contact the ABB Power Transformer Division toll free at 877-839-7877 for additonal technical information, scheduling and quotations.

## ABB Power T&D Services Establishes National Presence and Adds to Capabilities

NATIONAL

It has been a little over one year since ABB Power T&D Company announced plans to formally establish it's T&D Services business. Much has been accomplished during the first year operations of ABB Power T&D Services.

#### **Regional Service Centers**

ABB established a program to open Regional Service Centers across the United States. A network of people and facilities have been created and located in ten cities. ABB now has a local service presence in the following locations:

- Baton Rouge, LA
- Charlotte, NC
- Chicago, IL
- Cleveland, OH
- Houston, TX
- Minneapolis, MN
- Philadelphia, PA
- Phoenix, AZ
- St. Louis, MO
- Stockton, CA

The regional service center network is currently staffed with approximately 70 people, and is still growing. Norm White (ABB's US Manager, Service Sales) said, "We now have a critical mass of personnel in each of our locations to deliver basic operation, maintenance, construction, and testing services to our customers." With the Regional Service Center network, ABB has positioned themselves to become a business partner meeting the power transmission and distribution needs (both equipment and services) of their customers. Many of the regional service centers have integrated themselves as a regular support partner for their local client base. "Our industrial clients are focussing more on their core business processes, and looking for an outside source to support their power distribution infrastructure. Our utility customers each have a large number of projects that are required to meet the demands of general system maintenance, increased system load....combined with tying-in new merchant power plants. Our utility customers do not have the resources, in-house, to handle this huge volume of work, and they are turning to someone like ABB who has the expertise to support their total T&D system needs."

ABB plans to continue expansion, and will open additional Regional Service Centers throughout the latter half of year 2000 and year 2001.

#### **Turnkey Projects**

ABB Power T&D Services has also been active in expanding and improving power transmission and distribution systems on a turnkey basis. ABB has the combined resources to perform system analysis,

optimized system design, detailed system engineering, project management, construction management, along with installation and commissioning services. These capabilities, combined with ABB manufactured equipment, allow Power T&D Services to take total project ownership and many times provide a solution on an aggressive time schedule. Several such turnkey projects have been initiated and completed since ABB created its Power T&D Services group in March 1999 and other projects are in process.

#### **Call Center**

ABB Power T&D Services established a national Call Center [tel. 1-877-511-4222 (4ABB)] in November 1999, implemented in time to provide support during the Y2K rollover period. The Call Center has continued in operation to provide a 24 hour-a-day, seven day-a-week response capability to ABB customers. The Call Center operates under a "One Call Resolution" principle. The "Call Center" will either immediately respond to a customer's inquiry, or will acquire all necessary information and work within the ABB organization to identify the appropriate party to respond to the customer's need. Hence the ABB customer need only make "One Call" to ABB, for service or support. Activity (call volume) in the Call Center has grown steadily since its inception. The Call Center is also linked to the ABB website, and can also receive inquiries via email at: abbcallcenter@cplc.com

This is a summary of the ABB Power T&D Services business and capabilities. Look for more information about ABB Power T&D Services in future issues of *Contact*.

> ABB Power T&D Services has the equipment, technical and human resources available on a 24-hour basis to meet customer service needs either on-site or at one of its 10 Regional Service Centers located in the US.



## **IEEE/PES Creates "Streamlined" Standards** for Outdoor Apparatus Bushings

During the work on the latest revision, IEEE Std C57.19.01-2000, major changes have been incorporated. These changes were the result of feedback from the Edison Electric Institute (EEL), original equipment manufacturers (OEMs), and users. The ratings were standardized in an effort to create fewer ratings and reduce the need for large inventories of spare bushings, which have accumulated from decades of special designs. Bushings in inventory incur a large tax burden from accruing bushing costs in 2 to 5 years. In addition, the requirement for bushings for application on new bulk oil circuit breakers ceased because these breakers were no longer being produced. The working group reviewed this information and agreed to revise the standard to reduce the number of ratings, promote standardization, improve bushing characteristics for new transformers, and achieve overall cost improvements. This work has resulted in the reduction of designs/ratings from 56 to 21. These changes include the following:

Table 1, Electrical insulation characteristics. The number of voltage classes has been reduced from 19 to 7 to cover the 34.5--765 kV voltage range. Voltage/insulation classes, which were a part of Table I in IEEE Std C57.19.0l-1991, but not included in Table 1 of this standard, are included in Annex A to provide information on replacement bushings. The system voltage designation has been changed to indicate nominal rating in conformance with transformer standard IEEE Std C57.12.00-1993. The BIL rating for each

voltage class is based on the highest BIL specified in IEEE Std C57.12.00-1993 for the same voltage class. A BIL of 2050 kV has been adopted for 756 kV rating. A column on creepage distance has been added to provide information on values corresponding to contaminated (heavy) environments as per IEEE Std C57.19.100-1995.

Table 2, Dimensions for bushings up to 69 kV Current ratings of 400/1200 A, 2000 A, 3000 A, and 5000 A have been standardized. A current transformer pocket length of 534 mm (21 in) has been standardized for these ratings. The bottom-end length has been standardized in each voltage class. The top terminal diameters have been standardized at 1.5 in for current up to 2000 A, 2 in for 3000 A, and 4 in for 5000 A rating. The bottom terminal configuration for ratings 2000 A and above have been changed from threaded stud to two- and four-hole bladed configurations similar to those in NEMA CC 1-1993. Information on transformer and circuit breaker interchangeable (TBI) and breaker ratings has been taken out. The footnote on draw-lead application has been revised to define the current-carrying limit.

Table 3, Dimensions for bushings above 69 kV. Current ratings of 800/1200 A, 2000 A, and 3000 A have been standardized. A current transformer pocket length of 584 mm (23 in) has been standardized for these ratings. The bottom-end length has been standardized in each voltage class. The "D" diameter for the 196/230 kV rating has been reduced. The top terminal diameters have been standardized at 1.5 in for current up to 2000 A, and 2 in for

3000 A rating. Dimensions for 500 kV and 765 kV ratings have been added. Information on TBI and breaker ratings has been taken out. The footnote on draw-lead application has been revised to define the current-carrying limit.

Table 4, Cantilever test requirements. The table has been simplified and expanded to include information on bushings above 345 kV. The permanent deflection at the bottom end has been revised to reflect transformer bushings requirement. Information on TBI and breaker ratings has been taken out.

Table 5, Partial discharge limits. The requirement at maximum L-G voltage has been taken out.

Table 6, Power factor and capacitance limits. The limit for power factor for oilimpregnated, paper-insulated bushings has been lowered from 0.55% to 0.50%. Also, the power factor change limits for these bushings have been changed from +0.021-0.06 to +0.021 0.04

In addition, metric units have been adopted as primary units followed by inch-pound-based units in parentheses. Units/dimensions that are dependent upon inch-sized dies/tools have not been converted to metric units. Threads/inch and flange bolt hole diameters fall into this category

Annex A, Electrical insulation characteristics. This annex has been added to include the insulation characteristics for ratings, which were a part of IEEE Std C57.19.Ol-1991, but not included in Table 1 of this standard. This information has been provided for replacement purposes only.



fellow engineer with the ABB Power T&D Company Compnents Division in Alamo, TN. served as chairman of the IEEE Working Group PC57.1901 and secretary of the bushing sub committee. This group recently revised and updated many of the dimensional and other standards for the manufacture and operation of outdoor apparatus bushings.

## IEEE Dimension Standards for Bushings Up To and Above 69 kV

Tab	le 2—Dim	ensions o	f outdoor	power app	aratus bu	shings (n	iominal sy	ystern vo	oltage three	ough 69	kV) (not a	pplicable	to circ	uit bree	kers)
	Rating			Bottom end		Tube	Bettom t	terminal	Top te	rminal	Flange ga	sket space	Fla	nge bolting	details
Nominal system voltage (kV)	Basic lightning impulse insulation level (BIL) (kV)	Rated continuous current (A)	Oil end length ±3 mm (±0.125 in) [mm (in)]	Current transformer pocket length and distance from flange mounting surface to minimum all level [mm (in)]	Diameter from 25.4 mm (1 in) below the flange to lower end of bushing Maximum [mm (in)]	Inside tube diameter Minimum (in)	Lower terminal details or usable thread Minimum (mm (in))	Thread class UNF-2A	Usable thread Minimum (mm (in))	Thread class UNF-2A	Inside diameter Maximum [rom (in)]	Outside diameter Minimum (mm (in))	Na. of bolts	Hole size (in)	Balt circle diameter (mm (in))
64.1	011	~	L	w	D		A	R	A	R	P	Q			
34.5	200	400%1200	800	534	89	Cot. 7	54	Col. 9	Col. 10 54	Cal II	Cel. 12	Col. 13	Col. 14	Col. 15	Col. 16
		2000	(31.5)	(21)	(3.5)	(0.875)	(2.125)	(1.5)-12	(2.125)	(1.5)-12	(4.00)	(6.25)		(0.875)	(7.25)
		and a	(03.5)	(21)	(4.0)		righte 2.4	-	(2.50)	(1.5)-12	(4.00)	(6.25)	4	(0.875)	(7.25)
		30009	(33.5)	534 (21)	(5.0)	-	Figure 2.5	-	76 (3.00)	(2.0)-12	159 (6.25)	210 (8.25)	6	(0.875)	235.0 (9.25)
		5000 <sup>b</sup>	851 (33.5)	534 (21)	219 (8.63)	-	Figure 2,5	-	102 (4.00)	(4.0)-12	248 (9.75)	324 (12.75)	6	(0.875)	362.0 (14.25)
69	350	400%1200	952 (37.5)	534 (21)	134 (5.25)	(0.875)	54 (2.125)	(1.5)-12	54 (2.125)	(1.5)-12	152 (6.00)	210 (8.25)	6	(0.875)	235.0 (9.25)
		2000 <sup>b</sup>	1003 (39.5)	534 (21)	140 (5.5)	-	Figure 2.4	-	64 (2.50)	(1.5)-12	152 (6.00)	210 (8.25)	6	(0.875)	235.0 (9.25)
		3000 <sup>b</sup>	1003	534	165	-	Figure 2.5	-	76	20.12	178	235	6	0.50	260.4
		-													N. MAR
		Table	e 3—Dime	nsions of a	Dutdoor p	ower applica	aratus bu	shings (i	nominal s kers)	system ve	oltage abo	ove 69 kV)	)		
	Rating	Table	e 3—Dime	Detions of a	putdoor pr	ower applica Tube	aratus bu ible to cirr	shings (i cuit brea	nominal s kers) Tep ter	system vo	oltage abo	ove 69 kV	Fla	nge balling	details
Nominal System voltage (kV)	Rating Basic lightning insolution level (BIL) (kV)	Table Rated continuess current (A)	Off end krigh 23 — Dimer	Botiens and Determent transformer pocket length and distance from flange surface to minimum all level [nm (hi]] w	Diameter from 25.4 men (II al) below the flange to lawer read of beshing Maximum (mm (in))	ower appr ot applical Tube Inside tabe diameter Misimum din0	aratus bu ble to cim Bottom / Terminal details	shings (i cuit brea kerninal Washer diaraster Masimum	Top tel Usahle thread Minimare (rem (int))	rystem vo missi Thread data UNF-2A	Gaster Jasie diameter Maximum Jone (bi)	Ove 69 kV tspace Outside diameter Minierare (rere (iv))	Pla Ne. of bolts	nge beliting Hole size (in)	details Helt circle diameter (mm (int)
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14 6 6 6 12 12	nge bolting Bole size (h) Col. 15 (1.25) (1.25) (1.25) (1.25) (1.25) (1.25)	details Belt circle diamster [mm (in)) Col. 16 342 (14.25) 342 (14.25) 342 (14.25) 342 (14.25) 353.4 (21)
Nominal system veltage (KV) Cul. 1 138	Rating Rating Resic Impostation Resel (SN) Col. 2 650 900	Rable           Rable           centinaces           current           (A)           Cal. 3           800%1200           2000 <sup>p</sup> 3000 <sup>p</sup> 800%1200           2000 <sup>p</sup> 3000 <sup>p</sup> 3000 <sup>p</sup>	Offered kragth 23 mm (284.125 in) (ann (40)) L Col. 4 1188 <sup>4</sup> (46.73) 1188 (46.73) 1188 (46.73) 1188 (46.73) 1276 <sup>6</sup> (50.23) 1276 (50.25)	Betlen eed Current erange pocket length and fittante frambarter pocket length and distante fram flange mouting terel [mm (hi]] W Cel. 5 Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) Stat (23) (	Diameter from 25.4 mem (It int) below the flange to lawer end of beshing Maxbroam (mm (int)) D Col. 6 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (9.75) 248 (12) 25) 25 (12) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26 (12) 26) 26) 26) 26) 26) 26) 26) 26) 26) 2	Coll. 7 Coll.	Cel.8 Figure 3.5 Figure 3.5 Figure 3.5 Figure 3.5	shings (i cuit brea terninal Washer diameter Maximum N Col.9 — — — —	Top Im           Kers)           Top Im           Cubble           thread           Ministern           (pm (in))           A           Cut 10           51           64           (25)           76           (3)           51           (2)           64           (25)           76           (3)           51           (2)           64           (25)           76           (2)	rminal Thread class UNF-3A R Cel. U (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12 (1.5)-12	Col. 12 276 (10.88) 276 (10.89) 276 (10.89) 276 (10.89) 276 (10.89) 276 (10.89) 276 (10.89) 276 (10.89) 276 (10.89) 276 (17.13)	Q Col. 13 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.86) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.85) 327 (12.	Flat           Na, of boils           Col. 14           6           6           12           12           12           12	rage balting Bale day (b) Col. 15 (1.25) (1.25) (1.25) (1.25) (1.25) (1.25)	details Belt circle diameter [men: 0ho] Col. 16 342 (14.25) 342 (14.25) 342 (14.25) 342 (14.25) 342 (14.25) 343 (14.25) 343 (14.25) 343 (14.25) 353.4 (21) 533.4 (21)
Norminal system veltage (kV) Col. 1 138 230	Rating Rating Rating Resit Impediation Beel (RL) (KV) Cal. 2 630 900 11175	Table Rated centineces current (A) Cat. 3 800%1200 2000% 3000% 800%1200 2000% 3000% 800%1200	Oil end length 23 mm (20.125 in) (mm (in)) L Col. 4 1188 <sup>b</sup> (46.73) 1188 (46.73) 1188 (46.73) 1188 (46.73) 1188 (46.73) 1188 (46.73) 1188 (46.73) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (51.5)	Betlam end Current transformer pocket length and distance frem finge mounting until to be frem finge mounting W Cal. 5 S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 (23) S84 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Nominal system veltage (kV) Cel. 1 138 230	Rating Rating Rating Resel (RA) R	Table Rated centinaces current (A) Cal. 3 800%1200 2000 <sup>6</sup> 	Offered kragth ±3 mm (abl.25 in) [mm (bi)] L Col. 4 1188 <sup>b</sup> (46.75) 1188 (46.75) 1188 (46.75) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 (50.25) 1276 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   64           (25)	rnisal Thread class UNF-3A R Cel. 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1-Letters shown in dimension column heading rafer to the letters in Figure 3.1 through Figure 3.6

2-When furnished, the oil gage and the voltage tap should be in line and midway between the adjacent flange mounting bolt holes and between the adjacent bottom terminal tapped holes.

Tor draw-lead application, the continuous-current rating of the bushing is limited to the rating stated on the bushing nameplate. This bushing can be converted from draw-lead to bottom-end application with 1200 A rating.

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• Greg Clanin has 36 years of experience in testing large power and instrument transformers, air core reactors, condenser and bulk bushings and various fundamental breakdown studies for all kinds of oil, pressboard, conductor shapes and SF<sub>6</sub> gas.

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