

SUPERCONDUCTING CURRENT LEADS

CSL

Superconducting ceramic tubes with silver covered ends of a low contact resistance are suitable for current leads to both conventional and high temperature superconducting magnets, transformers and other low temperature equipments. Applications of these leads effectively reduce heat leak into cryostats.



Characteristics

Material:	$\text{Bi}_{1.8}\text{Pb}_{0.26}\text{Sr}_2\text{Ca}_2\text{Cu}_3\text{O}_{10+x}$ (2223 phase)
Density:	$\sim 5.5 \text{ g/cm}^3$
Critical temperature:	110 K

Specifications

Type	Outer diameter	Length (+4%, -0%)	Cross-section area ($\pm 10\%$)	Silver contact length	Silver contact resistance
CSL-5/70.1	5 mm	70 mm	7 mm^2	10 mm	approx. $3 \mu\Omega$
CSL-5/70.2	5 mm	70 mm	7 mm^2	10 mm	approx. $3 \mu\Omega$
CSL-7/70.1	6.6 mm	70 mm	14 mm^2	10 mm	approx. $2 \mu\Omega$
CSL-7/70.2	6.6 mm	70 mm	14 mm^2	10 mm	approx. $2 \mu\Omega$
CSL-10/80.1	9.6 mm	80 mm	22 mm^2	10 mm	approx. $1.5 \mu\Omega$
CSL-10/80.2	9.6 mm	80 mm	22 mm^2	10 mm	approx. $1.5 \mu\Omega$
CSL-12/80.1	12 mm	80 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/80.2	12 mm	80 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/80.3	12 mm	80 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/120.1	12 mm	120 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/120.2	12 mm	120 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/120.3	12 mm	120 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/160.1	12 mm	160 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-12/160.2	12 mm	160 mm	34 mm^2	12 mm	approx. $1 \mu\Omega$
CSL-18/80.1	18 mm	80 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-18/80.2	18 mm	80 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-18/80.3	18 mm	80 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-18/120.1	18 mm	120 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-18/120.2	18 mm	120 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-18/120.3	18 mm	120 mm	78 mm^2	15 mm	approx. $0.7 \mu\Omega$
CSL-26/120.1	26 mm	120 mm	180 mm^2	15 mm	approx. $0.4 \mu\Omega$
CSL-26/120.2	26 mm	120 mm	180 mm^2	15 mm	approx. $0.4 \mu\Omega$
CSL-26/120.3	26 mm	120 mm	180 mm^2	20 mm	approx. $0.3 \mu\Omega$

Type	Minimum self field critical current ^{*)}		Approx. critical current ^{*)} (77 K) at longitudinal ^{**)} magnetic field		
	77 K	64 K	25 mT	50 mT	100 mT
CSL-5/70.1	35 A	70 A	12 A	8 A	5 A
CSL-5/70.2	60 A	120 A	20 A	13 A	8 A
CSL-7/70.1	60 A	120 A	20 A	13 A	8 A
CSL-7/70.2	100 A	200 A	33 A	20 A	13 A
CSL-10/80.1	100 A	200 A	30 A	20 A	12 A
CSL-10/80.2	170 A	340 A	50 A	30 A	20 A
CSL-12/80.1					
CSL-12/120.1	150 A	300 A	50 A	33 A	20 A
CSL-12/160.1					
CSL-12/80.2					
CSL-12/120.2	250 A	500 A	90 A	50 A	33 A
CSL-12/160.2					
CSL-12/80.3	370 A	740 A	180 A	110 A	70 A
CSL-12/120.3					
CSL-18/80.1	300 A	600 A	120 A	80 A	50 A
CSL-18/120.1					
CSL-18/80.2	450 A	900 A	200 A	120 A	80 A
CSL-18/120.2					
CSL-18/80.3	750 A	1500 A	430 A	300 A	190 A
CSL-18/120.3					
CSL-26/120.1	600 A	1200 A	270 A	180 A	110 A
CSL-26/120.2	900 A	1800 A	450 A	270 A	180 A
CSL-26/120.3	1500 A	3000 A	1000 A	720 A	450 A

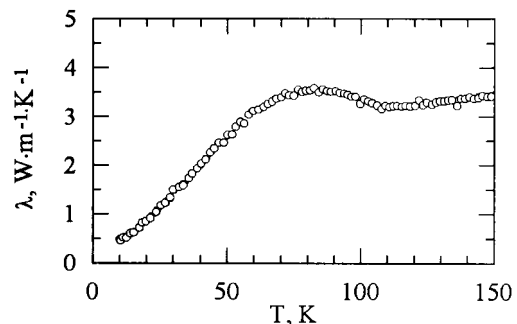
^{*)} Values at 64 K and at double magnetic field are twice higher than the values at 77 K

^{**)} Respective values at transversal magnetic field are lower by approx. 20 %

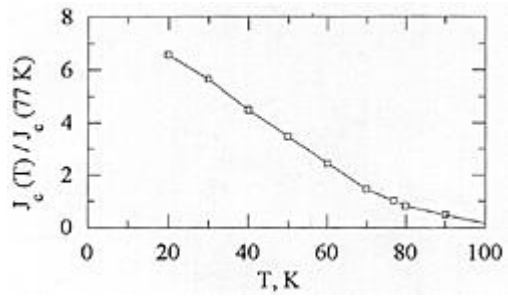
Type	Conductive heat leak per pair	
	77 K - 4 K	64 K - 4 K
CSL-6/70.1, .2	0.04 W	0.025 W
CSL-7/70.1, .2	0.08 W	0.05 W
CSL-7/120.1, .2	0.04 W	0.025 W
CSL-10/80.1, .2	0.10 W	0.07 W
CSL-12/80.1, .2, .3	0.17 W	0.12 W
CSL-12/120.1, .2, .3	0.10 W	0.07 W
CSL-12/160.1, .2	0.07 W	0.05 W
CSL-18/80.1, .2, .3	0.4 W	0.3 W
CSL-18/120.1, .2, .3	0.2 W	0.16 W
CSL-26/120.1, .2, .3	0.6 W	0.4 W

Values without vapour cooling; in case of the vapour cooling the values are substantially lower

Temperature dependence of self-field critical current density $J_c(T)$ normalized to $J_c(77 K)$ for CAN Bi-2223 tube.

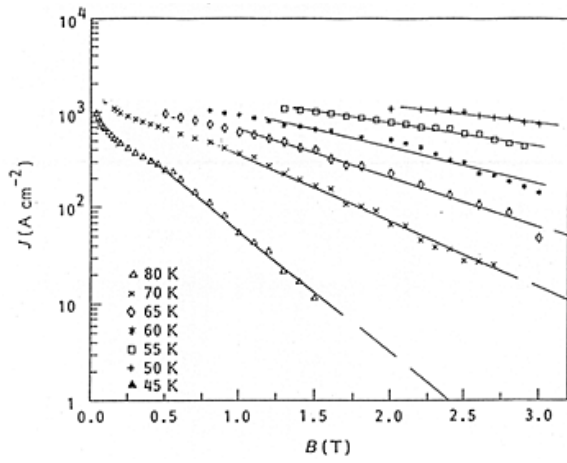


Temperature dependence of thermal conductivity of Bi-2223 superconductor tubes



Magnetic field dependence of J_c for CAN tube grade .3. Orientation of B to z: (A) perpendicular, (B) parallel.

Graph A



Graph B

