

SEMiX604GB176HDs



SEMiX® 4s

Trench IGBT Modules

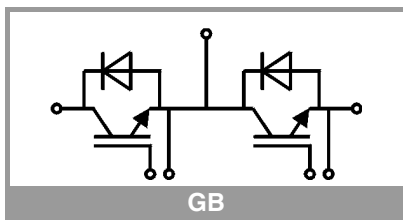
SEMiX604GB176HDs

Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
- UL recognised file no. E63532

Typical Applications*

- AC inverter drives
- UPS
- Electronic welders



Absolute Maximum Ratings					
Symbol	Conditions		Values	Unit	
IGBT					
V_{CES}			1700	V	
I_C	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	567	A	
		$T_c = 80\text{ °C}$	402	A	
I_{Cnom}			400	A	
I_{CRM}	$I_{CRM} = 2 \times I_{Cnom}$		800	A	
V_{GES}			-20 ... 20	V	
t_{psc}	$V_{CC} = 1000\text{ V}$ $V_{GE} \leq 20\text{ V}$ $V_{CES} \leq 1700\text{ V}$	$T_j = 125\text{ °C}$	10	μs	
T_j			-55 ... 150	$^{\circ}\text{C}$	
Inverse diode					
I_F	$T_j = 150\text{ °C}$	$T_c = 25\text{ °C}$	740	A	
		$T_c = 80\text{ °C}$	496	A	
I_{Fnom}			400	A	
I_{FRM}	$I_{FRM} = 2 \times I_{Fnom}$		800	A	
I_{FSM}	$t_p = 10\text{ ms, sin } 180^{\circ}, T_j = 25\text{ °C}$		2700	A	
T_j			-40 ... 150	$^{\circ}\text{C}$	
Module					
$I_{t(RMS)}$	$T_{terminal} = 80\text{ °C}$		600	A	
T_{stg}			-40 ... 125	$^{\circ}\text{C}$	
V_{isol}	AC sinus 50Hz, $t = 1\text{ min}$		4000	V	

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
IGBT						
$V_{CE(sat)}$	$I_C = 400\text{ A}$ $V_{GE} = 15\text{ V}$ chipllevel	$T_j = 25\text{ °C}$		2	2.45	V
		$T_j = 125\text{ °C}$		2.5	2.9	V
V_{CE0}			$T_j = 25\text{ °C}$	1	1.2	V
			$T_j = 125\text{ °C}$	0.9	1.1	V
r_{CE}	$V_{GE} = 15\text{ V}$	$T_j = 25\text{ °C}$	2.5	3.1		$\text{m}\Omega$
		$T_j = 125\text{ °C}$	3.9	4.5		$\text{m}\Omega$
$V_{GE(th)}$	$V_{GE} = V_{CE}, I_C = 16\text{ mA}$		5.2	5.8	6.4	V
I_{CES}	$V_{GE} = 0\text{ V}$ $V_{CE} = 1700\text{ V}$	$T_j = 25\text{ °C}$		0.12	4	mA
		$T_j = 125\text{ °C}$				mA
C_{ies}	$V_{CE} = 25\text{ V}$ $V_{GE} = 0\text{ V}$	$f = 1\text{ MHz}$		35.3		nF
C_{oes}		$f = 1\text{ MHz}$		1.46		nF
C_{res}		$f = 1\text{ MHz}$		1.17		nF
Q_G	$V_{GE} = -8\text{ V...} + 15\text{ V}$			3732		nC
R_{Gint}	$T_j = 25\text{ °C}$			1.88		Ω
$t_{d(on)}$	$V_{CC} = 1200\text{ V}$	$T_j = 125\text{ °C}$		360		ns
t_r	$I_C = 400\text{ A}$			65		ns
E_{on}	$V_{GE} = \pm 15\text{ V}$	$T_j = 125\text{ °C}$		215		mJ
$t_{d(off)}$	$R_{G on} = 3\text{ }\Omega$			900		ns
t_f	$R_{G off} = 3\text{ }\Omega$	$T_j = 125\text{ °C}$		165		ns
E_{off}				165		mJ
$R_{th(j-c)}$	per IGBT				0.058	K/W

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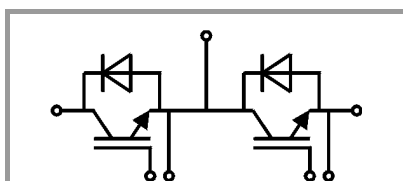
Features

- Homogeneous Si
- Trench = Trenchgate technology
- $V_{CE(sat)}$ with positive temperature coefficient
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Typical Applications*

- AC inverter drives
- UPS
- Electronic welders

Characteristics						
Symbol	Conditions		min.	typ.	max.	Unit
Inverse diode						
$V_F = V_{EC}$	$I_F = 400\text{ A}$	$T_j = 25\text{ °C}$		1.5	1.70	V
	$V_{GE} = 0\text{ V}$	$T_j = 125\text{ °C}$		1.4	1.6	V
	chip					
V_{F0}		$T_j = 25\text{ °C}$	0.9	1.1	1.3	V
		$T_j = 125\text{ °C}$	0.7	0.9	1.1	V
r_F		$T_j = 25\text{ °C}$	1.0	1.0	1.0	mΩ
		$T_j = 125\text{ °C}$	1.3	1.3	1.3	mΩ
I_{RRM}	$I_F = 400\text{ A}$	$T_j = 125\text{ °C}$		560		A
Q_{rr}	$di/dt_{off} = 6600\text{ A}/\mu\text{s}$	$T_j = 125\text{ °C}$		131		μC
E_{rr}	$V_{GE} = -15\text{ V}$	$T_j = 125\text{ °C}$		95		mJ
	$V_{CC} = 1200\text{ V}$					
$R_{th(j-c)}$	per diode				0.081	K/W
Module						
L_{CE}				22		nH
R_{CC+EE}	res., terminal-chip	$T_C = 25\text{ °C}$		0.7		mΩ
		$T_C = 125\text{ °C}$		1		mΩ
$R_{th(c-s)}$	per module			0.03		K/W
M_s	to heat sink (M5)		3		5	Nm
M_t	to terminals (M6)		2.5		5	Nm
w					400	g
Temperatur Sensor						
R_{100}	$T_c = 100\text{ °C}$ ($R_{25} = 5\text{ k}\Omega$)			$493 \pm 5\%$		Ω
$B_{100/125}$	$R_{(T)} = R_{100} \exp[B_{100/125}(1/T - 1/T_{100})]$; $T[K]$			$3550 \pm 2\%$		K



GB

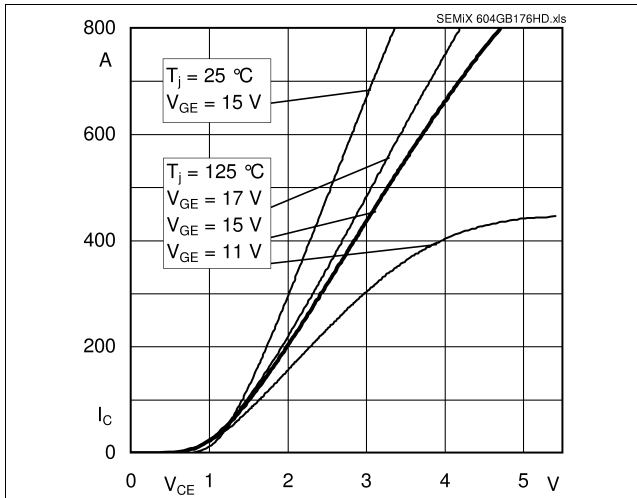


Fig. 1: Typ. output characteristic, inclusive $R_{CC} + E_E$

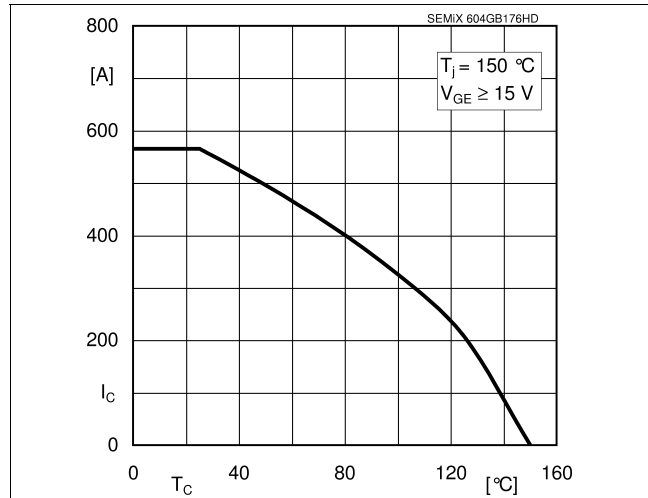


Fig. 2: Rated current vs. temperature $I_C = f(T_C)$

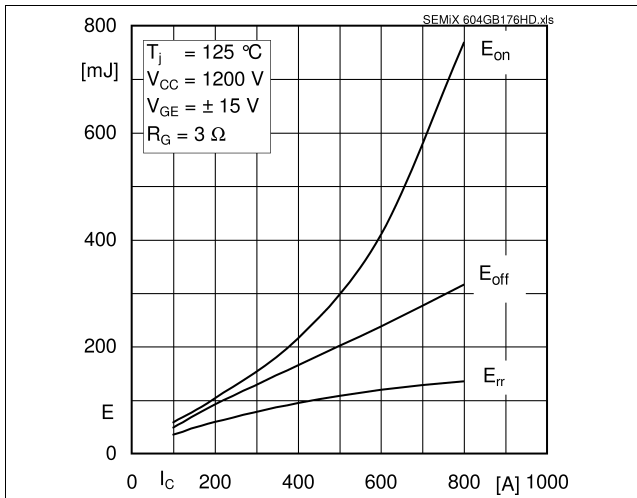


Fig. 3: Typ. turn-on /-off energy = $f(I_C)$

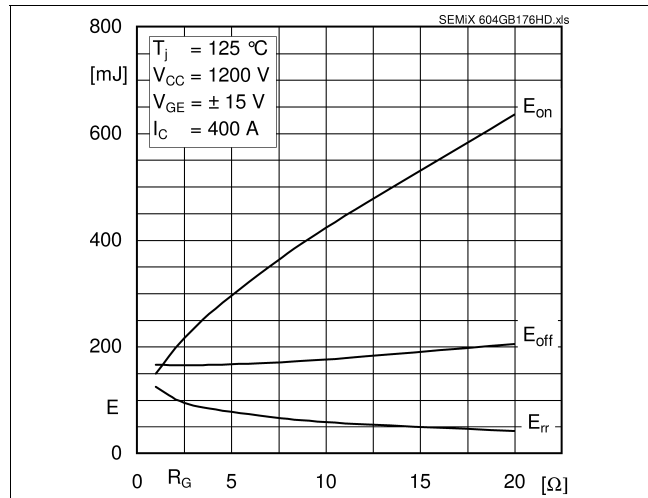


Fig. 4: Typ. turn-on /-off energy = $f(R_G)$

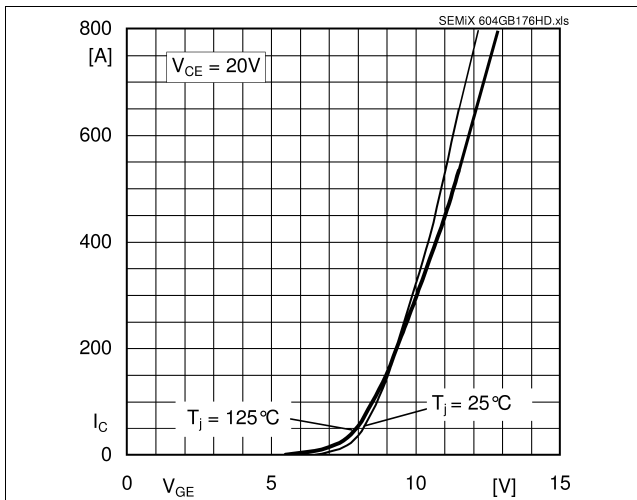


Fig. 5: Typ. transfer characteristic

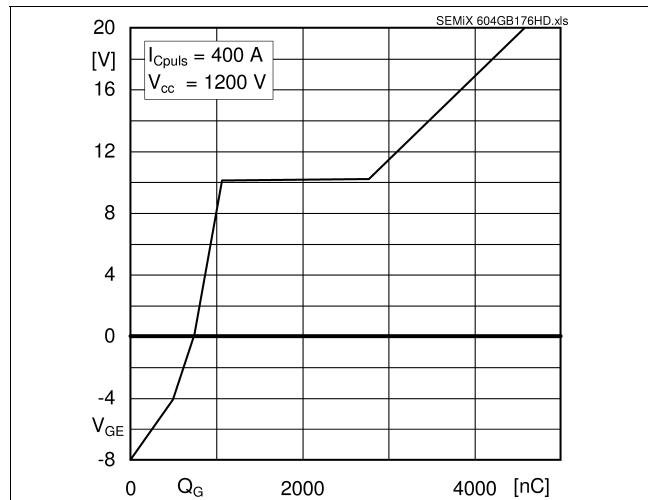


Fig. 6: Typ. gate charge characteristic

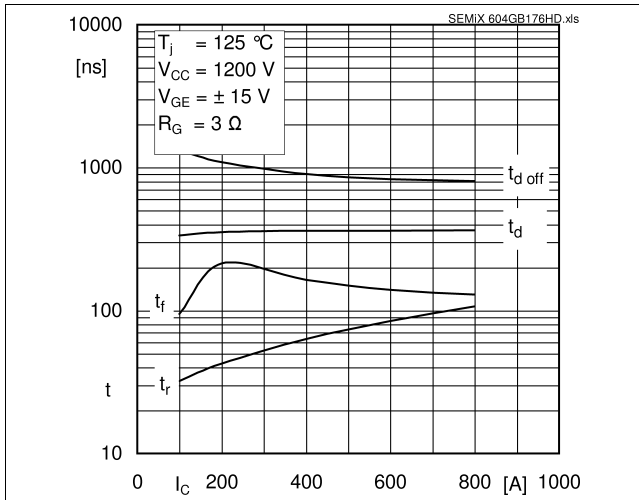


Fig. 7: Typ. switching times vs. I_C

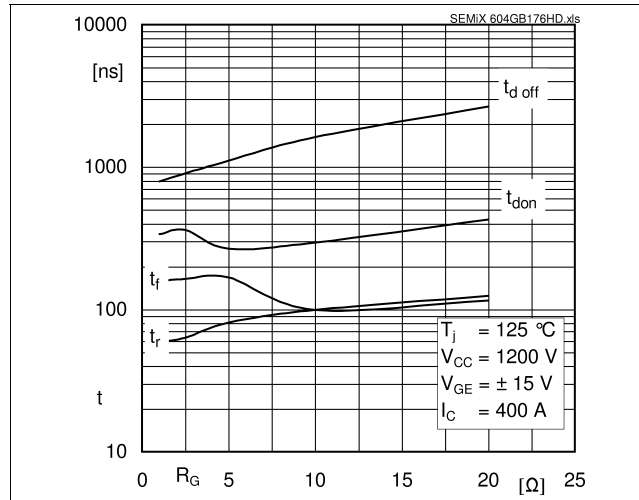


Fig. 8: Typ. switching times vs. gate resistor R_G

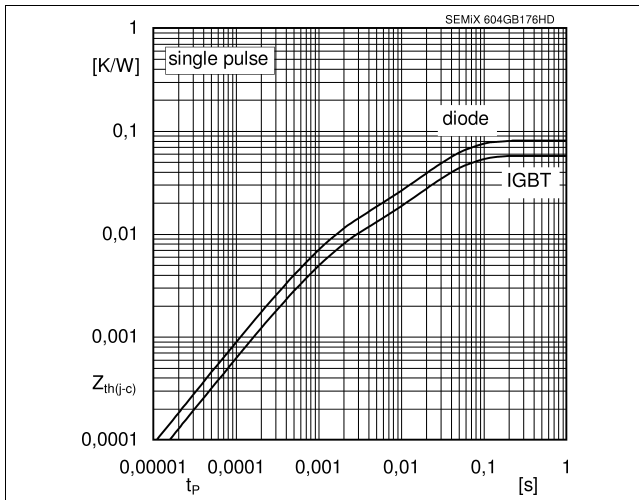


Fig. 9: Typ. transient thermal impedance

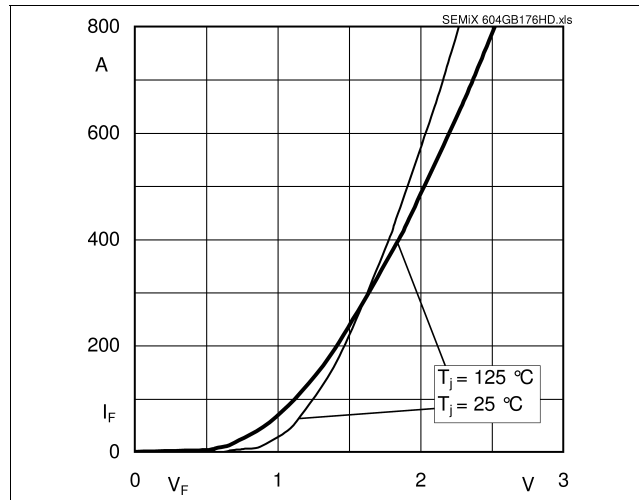


Fig. 10: Typ. CAL diode forward charact., incl. R_{CC+EE}

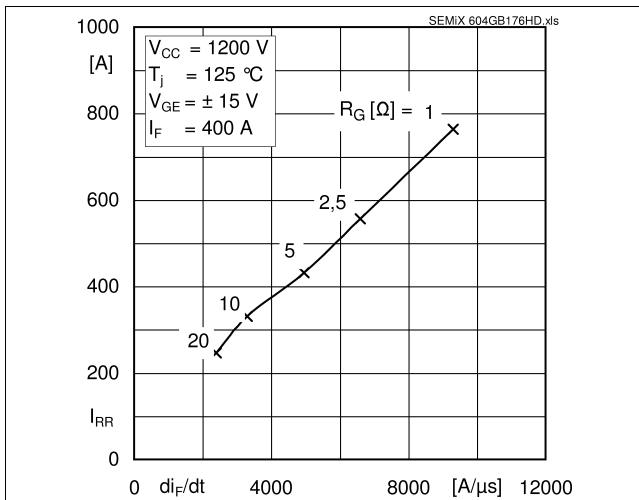


Fig. 11: Typ. CAL diode peak reverse recovery current

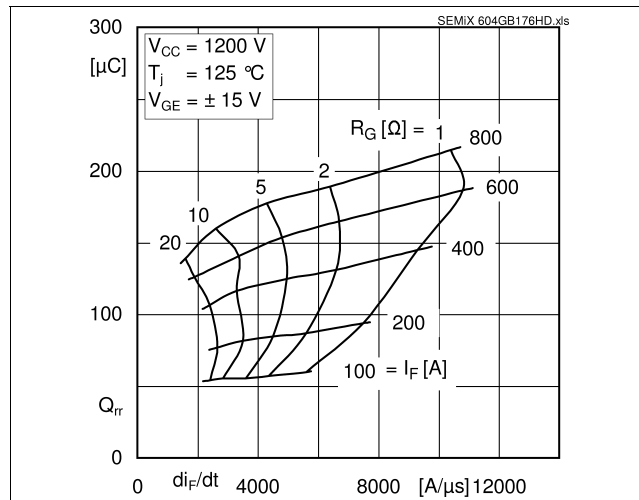
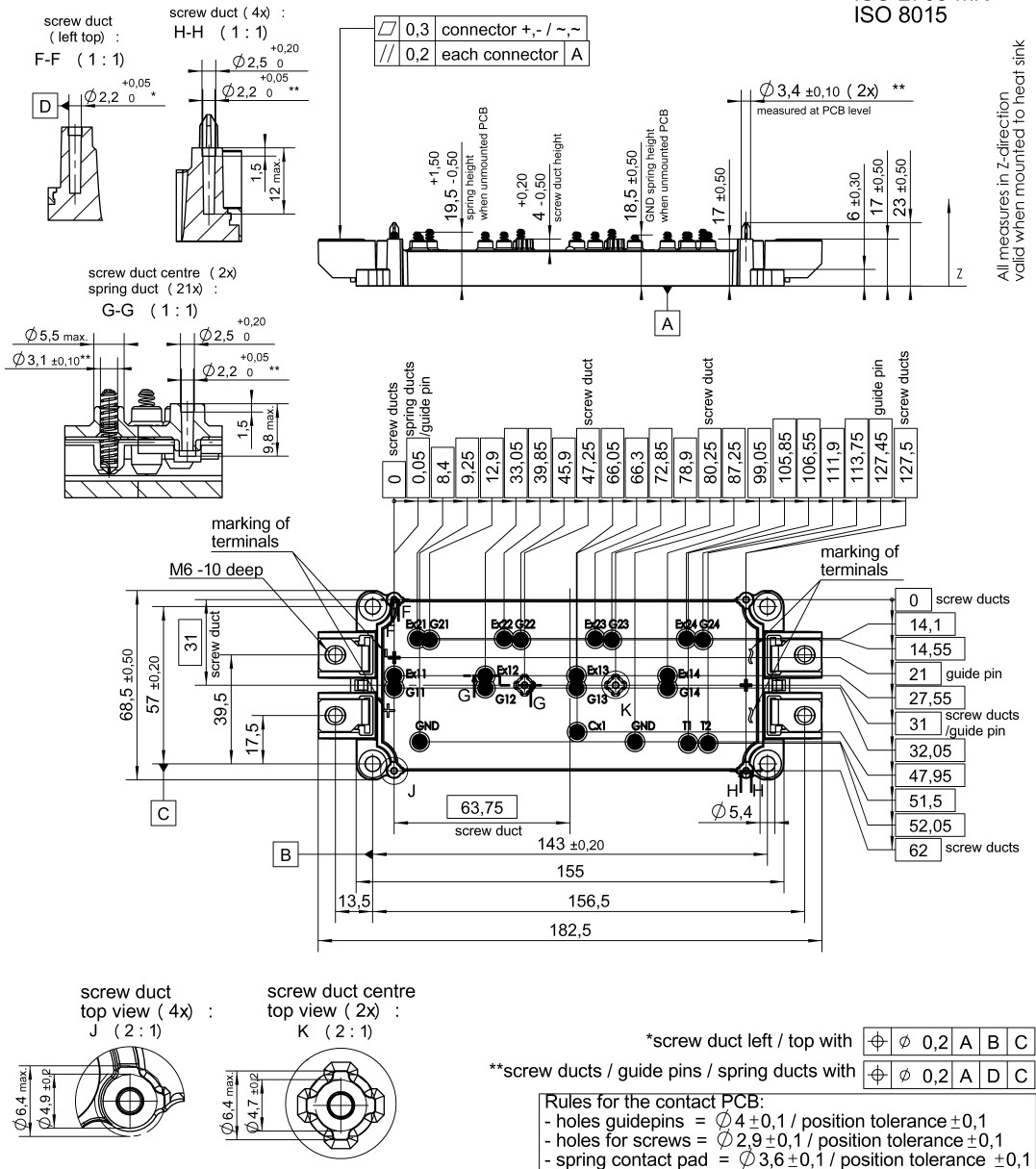


Fig. 12: Typ. CAL diode recovery charge

SEMiX604GB176HDs

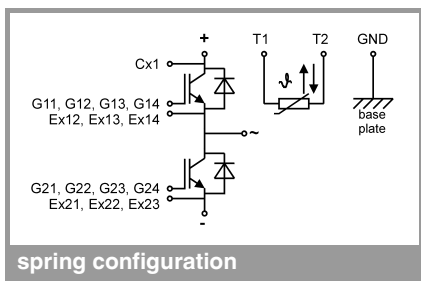
Case: SEMiX 4s

general tolerance:
ISO 2768-mK
ISO 8015



All measures in Z-direction valid when mounted to heat sink

SEMiX 4s



This is an electrostatic discharge sensitive device (ESDS), international standard IEC 60747-1, Chapter IX

* The specifications of our components may not be considered as an assurance of component characteristics. Components have to be tested for the respective application. Adjustments may be necessary. The use of SEMIKRON products in life support appliances and systems is subject to prior specification and written approval by SEMIKRON. We therefore strongly recommend prior consultation of our staff.